



# Coffs Harbour City Council

## Domestic Waste Trial

May 2004



# Table of Contents

<b>Glossary of Terms .....</b>	<b>3</b>
<b>Executive Summary .....</b>	<b>4</b>
<b>1. Introduction.....</b>	<b>6</b>
1.1 Background.....	6
1.2 Objectives.....	6
1.3 Analysis of outcomes .....	7
<b>2 Methodology .....</b>	<b>8</b>
2.1 Trial Areas.....	8
2.2 Trial Systems .....	10
2.2.1 Single Dwellings - Trial Systems.....	10
2.2.2 Multi-Unit Dwellings – Trial Systems .....	11
2.3 Contact/Education.....	12
2.4 Media.....	13
2.5 Collection .....	13
2.6 Monitoring and Data Collection .....	14
2.6.1 Audits .....	14
2.6.2 Surveys .....	14
<b>3 Results .....</b>	<b>15</b>
3.1 Audits .....	15
3.1.1 Residual Waste Stream.....	15
3.1.2 Recycling Stream .....	15
3.1.3 Organics Stream.....	16
3.1.4 Total Waste Generation.....	17
3.1.5 Uncertainties .....	17
3.2 On-ground Audits .....	18
3.2.1 Single Dwellings .....	18
3.2.2 Unit Observations.....	20
3.2.3 General Observations .....	21
3.2.4 Uncertainties .....	22
3.3 Qualitative Results .....	22
3.3.1 Pre-trial Survey Results.....	22
3.3.2 Phone Survey Results.....	23
3.3.3 Post-trial Survey Results .....	23
<b>4 Discussion.....</b>	<b>25</b>
4.1 Frequency of Collection .....	25
4.2 Bin Sizes.....	25
4.3 Transfer Receptacles: Use of Newspaper/Bio-bags/ Bio-bin Alone .....	25
4.4 Pests/ Odours .....	26
4.5 Quantity of Food Waste Diverted Using Organics Bin .....	26
4.6 Effect of a Designated Bin on Quantity and Quality of Recyclables .....	27
4.7 Effect of Education on Level of Recycling and Use of Organics Bin.....	27
4.8 Units .....	27
4.8.1 140L Recycling Bin/ Bin Configuration .....	27
4.8.2 Bin Sharing .....	28
<b>5 Conclusions/Recommendations.....</b>	<b>28</b>
<b>6 References .....</b>	<b>30</b>
<b>7 Appendices .....</b>	<b>31</b>

## Glossary of Terms

**Bio-bin** – 10L Sulo bin with handle and flip-top lid used to collect kitchen organics for transfer to organics MGB

**Bio-bag** –The Bio-bag is a thermoplastic biodegradable bag manufactured with a starch-based biomaterial called Mater-bi.

**Contamination** – Any material found in the recycling or organics bins that is not considered recyclable or organic as defined by Coffs Harbour City Council

**Council** - Coffs Harbour City Council

**Diversión** – The amount of recoverable material being diverted away from landfill

**EPA** – The New South Wales Environment Protection Authority

**Food waste** – All food scraps including meat and seafood scraps, vegetable and fruit peelings, seeds/husks and dairy products

**Garden waste/ greenwaste** – Including grass clippings, prunings, weeds, bushes, limbs, branch trimmings and bark.

**In-Sink-Erator**- Food waste processing units located in sinks and leading to sewer.

**Kitchen bin** – Also known as “Bio-bin” used to collect kitchen organics for transfer to organics MGB.

**MGB** – Mobile garbage bin.

**Organics** – Organics is defined as greenwaste and food waste (including fruit/vegetable scraps, meat, seafood, dairy and soiled paper (e.g. Tissues, napkins, teabags) and coffee grinds).

**Recyclables** – All material considered under the current kerbside collection system to be recyclable. These materials are: plastics 1,2 and 3; steel (including food cans, paint tins, aerosol cans); aluminium cans; paper (including newspaper and magazines); and cardboard.

**Residual waste** – The waste that remains after waste generators have source-separated food waste, garden waste and recyclables.

**Transfer receptacles** - Includes the kitchen bin and any other material such as Bio-bags and newspaper that was intended to contain food waste or assist transfer to the organics bin.

**Waste Processing Facility** – The proposed facility that will process all organic waste and extract putrescibles from the residual waste stream

## Executive Summary

Coffs Harbour City Council is endeavouring to meet a target of zero waste to landfill by the year 2020 with a medium-term goal of no putrescibles to landfill beyond 2010. These ambitious goals have been sponsored by the growing awareness among the local and global community for the need to reduce waste disposed to landfill and pursue more sustainable waste management.

Council currently diverts a large amount of the kerbside waste stream from landfill through the processing of recyclables and greenwaste. Food waste comprises a further 37% by weight of the domestic residual waste stream and now Council proposes to process this putrescible component in a planned alternative Waste Processing Facility.

The objective of the trials was to determine what elements will enable the most sustainable delivery of waste services to the domestic sector for collection of organics (including food waste), recyclables and residual waste with maximum diversion of waste from landfill.

The trial systems used tested the following elements:

- Weekly collection of organics and fortnightly alternate collection of residual waste and recycling.
- 240L versus 140L organics MGBs and 240L versus 140L residual waste MGBs.
- Kitchen organics bins (Bio-bins) for kitchen organics collection and transfer alone versus biodegradable bags (Bio-bags) for kitchen organics collection and transfer with Bio-bins versus Newspaper for kitchen organics collection and transfer with Bio-bins,
- Use of 240L designated recycling bin.
- Effect of education on quality and quantity of recyclables and separation of organics.

Further elements were examined for Multi-Unit Dwellings in addition to those above including:

- Use of 140 L recycling MGBs for small properties and
- The sharing of bins among residents for various configurations and service arrangements

Three audits of the waste were conducted during the course of the trial which examined the volume, weight and composition of the three waste streams. In addition, several on-ground audits gathered observations of the contents of bins in each area and the use of the bins by residents.

Three surveys were conducted including pre-trial, phone and post –trial surveys. These surveys gathered valuable information on the demographics of the trial areas and opinions relating to elements of the trial.

The results indicate the following configurations would be suitable for single dwellings:

- Collection of organics on a weekly basis from 240L MGBs using the Bio-bin and newspaper as a transfer receptacle
- Collection of recycling on a fortnightly basis from 240L MGBs
- Collection of garbage from 140L or 240L MGBs on a fortnightly basis (with a Variable Rate Pricing mechanism if policing of recycling occurs)

For Multi-unit Dwellings, it is proposed that where a property has space for storage of bins on the property and placement of bins at the kerb, the recommendations for single dwellings are observed, otherwise the following is recommended for sharing of bins:

- The provision of a bin storage area with adequate access for all residents and service providers.
- The provision of a purpose-built storage area for organics bins (isolated from bulk bins where they occur);
- That the property may bear responsibility for contamination issues and co-operation of its residents; and
- That there is a structure in place to ensure bins are collected or a bin-runner service is provided.

The majority of residents expressed a preference for the trial waste system to the current waste system, however education is going to be a crucial factor in ensuring the success of source separation of organics and recyclables in the domestic sector and hence achieving maximum diversion of waste from landfill under the proposed waste system.



**Observed food waste wrapped in newspaper**

# 1. Introduction

## 1.1 Background

Council's current domestic waste service consists of the weekly collection of co-mingled recyclables and residual waste in a 240L split Mobile Garbage Bin (MGB). There are presently 23,500 domestic waste services provided in the Coffs Harbour Local Government Area. In addition, a fortnightly 240L MGB greenwaste collection is available to residents on a voluntary basis. Currently 64% of all properties with access to the kerbside garbage and recycling service participate in the greenwaste service.

The proposed new waste system would require the collection of three separate waste streams: recyclables, organics (including greenwaste and food waste) and residual waste. It is proposed that these waste streams be sorted by residents into three designated bins for kerbside collection.

Food waste trials were undertaken by Council in October 1997 and 2000. The results of these trials indicate the support of residents for kerbside collection and processing of household organics (including food waste).

## 1.2 Objectives

The main objective of the trial was to determine a bin configuration that will be most appropriate for the sustainable delivery of the new waste services to domestic premises in the Coffs Harbour LGA. Council's goal of zero waste to landfill requires maximum diversion of waste to landfill through source-separation of organics and recyclables from residual waste.

The trial investigated services to single and multi-unit dwellings.

A number of elements have been identified through literature research as important issues in food waste collection from the domestic sector. These include: odour and pest control, transfer receptacles, containment of food waste, contamination and frequency of collection.

Issues affecting recycling may include use of a designated bin and education.

The following elements were trialled for single dwellings:

1. **Frequency of collection:** Weekly collection of organics and fortnightly alternate collection of residual waste and recycling.
2. **Bin size:**
  - 240 versus 140L organics MGBs.
  - 240 versus 140L residual waste MGBs.

3. **Transfer receptacles:**
  - Kitchen organics bins (Bio-bins) for kitchen organics collection and transfer alone versus;
  - Biodegradable bags (Bio-bags) for kitchen organics collection and transfer with Bio-bins versus;
  - Newspaper for kitchen organics collection and transfer with Bio-bins.
4. **Designated recycling bins:** Use of 240L designated recycling bin.
5. **Education:** Effect of education on quality and quantity of recyclables separation of organics.

Further elements were examined for Multi-Unit Dwellings in addition to those above including:

6. **Bin size:** Use of 140 L recycling MGBs for small properties
7. **Bin sharing:** The sharing of bins among residents for various configurations and service arrangements

### 1.3 Analysis of outcomes

Outcomes will be determined by:

- The diversion of food waste from the residual waste stream measured by audits of residual waste stream composition.
- Food waste diversion measured and observed against type of transfer receptacle.
- The effectiveness of education with regard to recycling measured by volume, weight and composition of recycling bin contents
- The effect of a designated bin for recycling measured by comparisons of recycling weight and volumes and;
- The surveyed opinion of participants as to their preferred collection frequency, bin size and transfer receptacle

## 2 Methodology

### 2.1 Trial Areas

The trial areas have been selected from one general location within Coffs Harbour, close to the CBD in order to enable ease of collection and to ensure a background of similar demographics.

The four trial areas for houses were all located adjacent to one another in one main section bounded by William St, Caltowie Place and King St (Figure 1). This allowed for ease of collection and control. The areas could be serviced from beginning to end in one run by sticking to the left.

**Area A (Bio-bags)**- From 1-10 Caltowie Place and containing 25 dwellings.

**Area B (Newspaper)**- From 8 Caltowie Place, along William St to 12 Tasman Ave containing 25 separate dwellings.

**Area C (Bio-bin alone)** – From 1 Flinders Ave – 33 King St containing 24 dwellings.

**Control Area** – From 31 King St – 1A King St containing 26 dwellings.

Four multi-unit dwellings were selected for the trial to broadly represent the types of units present in the local government area and included:

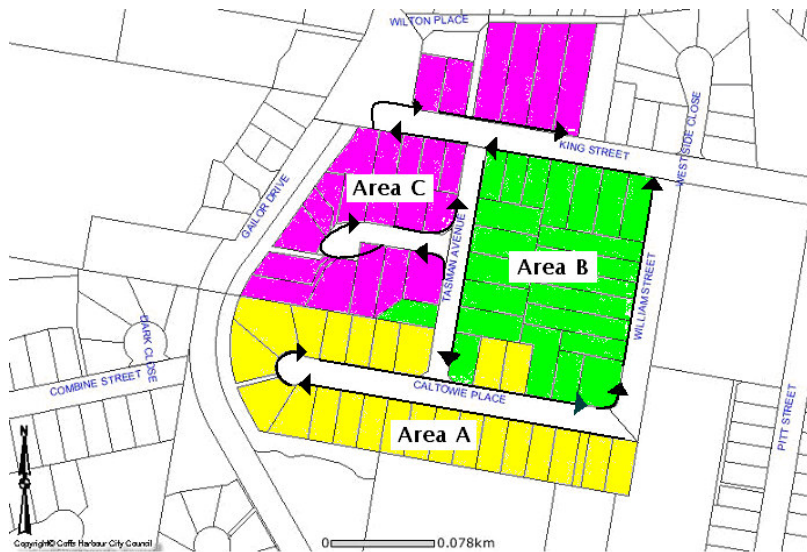
**10-12 Elizabeth St** – A 12-unit, single storey property with largely one-bedroom units and moderate quantities of greenwaste.

**11 Lyster St** – A 7-unit property predominantly single storey with little greenwaste.

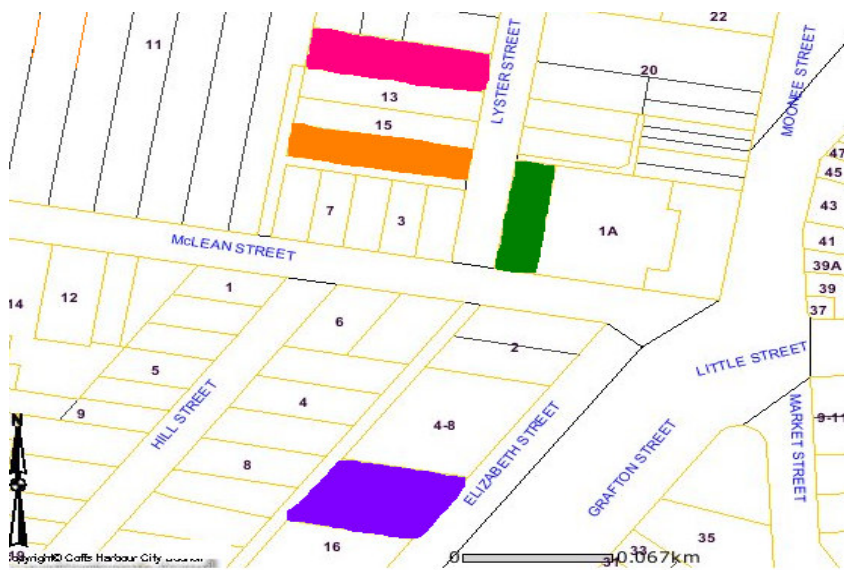
**18 Lyster St** – A 5-unit property with little source of greenwaste.

**17 Lyster St** – A property with four townhouses and moderate quantities of greenwaste.

**Figure 1. Domestic Waste Trial Areas A, B, & C – Houses**



**Figure 2. Domestic Waste Trial Areas – Units**



- 11 Lyster St (7 Units)
- 17 Lyster St (4 Units)
- 18 Lyster St (5 Units)
- 10-12 Elizabeth St (12 Units)

## 2.2 Trial Systems

There were a number of trial systems used in order to test as many elements as possible related to the collection of the three separate waste streams organics, recycling and residual waste from both single and multi-unit dwellings.

### Bio-bin

All participating households in the trial received a kitchen bin known as the “Bio-bin” to trial, a 10L green bin with flip-top lid and handle. The kitchen bin was trialled with bin liners including the Bio-bag, newspaper and on its own.

### 2.2.1 Single Dwellings - Trial Systems

#### Bins

Each household received three MGBs, one red-lidded residual waste bin, a yellow-lidded recycling bin and a maroon-lidded organics bin. All recycling bins were 240L in size while the size of the garbage and organics bins varied as per Table 1. The split bins and greenwaste bins were removed for the duration of the trials.

**Table 1. Size of Bins Provided to Households in each Area**

Waste Stream	Households 1-3	Households 4-5	Households 6-12	Households 13-25
Garbage	140L	240L	140L	240L
Organics	140L	140L	240L	240L

#### Trial Area A - Bio-bags

In this area the use of biodegradable bags was trialled. The Bio-bag is a thermoplastic biodegradable bag manufactured with a starch-based biomaterial called Mater-bi. Two types of bags were given to households with the first 18 dwellings receiving the 8 L light Bio-bags and the remaining 7 given the thicker 10 L Bio-bags.

The residents were given an insert in their educational materials that instructed them on how to use the Bio-bags with their kitchen bin.

#### Trial Area B – Newspaper

In Area B, residents were encouraged to use newspaper as a method of containing their food waste. The insert that the residents received advised residents to ‘line their kitchen bin with newspaper.’

#### Trial Area C – Bio-bin Alone

Residents in Area C were given no advice relating to the containment of organics. Residents were merely supplied with the Bio-bin and the generic education brochure.

#### Control Area

There were no changes to the waste system in the control area. The control area was used as a reference from which to compare waste generation rates and the composition of waste streams.

## 2.2.2 Multi-Unit Dwellings – Trial Systems

With the exception of 10-12 Elisabeth St which used shared bulk bins, all multi-unit dwelling households in the trial initially had their own split garbage and recycling bins and occasionally shared greenwaste bins.

In the trial, many households were sharing bins for the first time. Residents were instructed on how to use the bin system for their property by the insert provided in the education brochure. The insert also informed residents on how to use the Bio-bags or newspaper with the Bio-bin they were supplied.

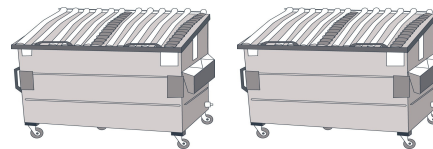
### 10-12 Elisabeth St (12 Units) –

The trial system used at the property was a SHARED bin system using a combination of bulk and wheelie bins:

The ORGANICS bins used during the trial were:  
2 x 240L shared between all residents.



The RECYCLING bin used during the trial was:  
A 1.5m<sup>3</sup> bulk bin shared between all residents.



The GARBAGE bin used during the trial was:  
A 1.5m<sup>3</sup> bulk bin shared between all residents.

Residents were given 10L Bio-bags to use with their Bio-bin

### Units - 11 Lyster St

The trial system used at the property was a SHARED bin system with a BIN-RUNNER service. All bins were collected on a weekly basis:

1 x 240L ORGANICS bin shared between 7 units.



4 x 240L RECYCLING bins shared between 7 units.



3 x 240L GARBAGE bins shared between 7 units.



The bins were located in an area behind the letterboxes from which they were collected and returned by the collection contractors on a weekly basis.

Residents were supplied with 10L Bio-bags to use with their Bio-bin

### Units - 18 Lyster St

The trial system used at the property was a combination of a SHARED and INDIVIDUAL bin system:

The ORGANICS bins used during the trial were:  
1 x 140L per unit collected weekly



The RECYCLING bins used during the trial were:  
4 x 240L bins shared between 5 units collected on alternate fortnights



The GARBAGE bins used during the trial were:  
3 x 240L and 1 x 140L bins shared between 5 units (the 140L bin was added at a later part of the trial upon request)



Residents were encouraged to wrap food waste in newspaper

### Units - 17 Lyster St

All households were supplied with 3 x 140L MGBs for garbage, recycling and organics collection as per single dwellings.

Residents were encouraged to wrap food waste in newspaper.



**Trial bin storage area at  
11 Lyster St**

## 2.3 Contact/Education

There was extensive contact maintained with the trial participants throughout the trial (see Appendix A and B for correspondence and education materials respectively).

Initial contact with residents in the trial areas was in the form of a letter (Appendix A.1) that outlined the purpose of the trial and what it would involve. The letter was followed by door-to-door interviews as part of a pre-trial survey which included the majority of trial households (Appendix D.1). It was expected that direct contact with residents would help to better communicate the purpose of the trial and hence support the participation of residents.

At the pre-trial survey interviews prior to the beginning of the trial, residents were informed of the background and purpose of the trial. Show cards were used (see Appendix B.1) to teach people what materials they should be placing in their bins under the trial.

An informal information session was held on the Saturday morning preceding the trial at a local park in close vicinity to the trial areas. Light refreshments were provided and a demonstration of the use of the bins was made followed by discussion about particular elements of the trial.

A standard set of education materials (see Appendix B.3) was given to all residents in trial areas on delivery of their new bins. These materials included:

- A colour brochure that outlined the objectives and purpose of the trial and informed participants what the trial services would involve and how to use their bins.
- A magnetic calendar indicating the weeks for garbage/recycling collection
- A flyer stating what items they should have received and how to use the bin system including use of the Bio-bags or newspaper with the Bio-bin.

A helpline was also operated by Council staff for residents to complete surveys over the phone or discuss any queries as to the trial, both in the period before and during the trial.

During the trial phone surveys were conducted with a sample of residents that had agreed to be contacted by phone.

Two newsletters were issued during the course of the trial (see Appendices A.2 and A.3) with answers to some common queries and tips on using the trial system

In the case of any issues with residents about their participation in the trial, face-to-face contact was attempted to resolve the issue.

## **2.4 Media**

The media was invited to report on the trials. There was coverage on local television and newspapers including television interviews and a front-page story with an accompanying photo (see Appendix C). It was hoped that media coverage would help encourage participation by residents in the trial.

## **2.5 Collection**

The current collection contractors, Cleanaway and Handybin, undertook the collection of materials during the trial. Cleanaway was responsible for alternate fortnightly collection of waste material from the residual waste and recycling MGBs and Handybin for weekly organics waste collection.

During the course of the trials, each waste stream was collected together for all trial areas A, B and C and the units except when audits were conducted and some materials were collected separately.

## **2.6 Monitoring and Data Collection**

### **2.6.1 Audits**

Quantitative data was obtained through conducting audits of the contents of the various waste streams. The audits were based on the Environmental Protection Authority's *Municipal Waste Stream Methodology For Survey At The Disposal, Recycling And Reprocessing Facility*. The audit methodology is located in Appendix E.

1. Depot audits: Conducted audits of waste streams including volume, weight and composition of waste at three intervals: before the trial; mid-way during the trial and at the conclusion of the trial (pre-trial, mid-trial and final audit).
2. On-ground audits: Inspections of bins prior to collection to examine contents including volume, state of decomposition, odour and composition of waste including contaminants were carried out on regular occasions throughout the trial.

### **2.6.2 Surveys**

Qualitative data was obtained through surveys of the participants in the trials. The surveys included:

1. A pre-trial survey - residents were approached at their homes as much as possible otherwise a survey form was left for residents to complete and return to Council.
2. A mid-trial survey in which a small sample of residents that agreed to be contacted by phone, were interviewed for a mid-trial phone survey.
3. A post-trial survey - a small sample of residents in each area were interviewed and for the remainder, surveys were left for residents to complete and return themselves.

## 3 Results

### 3.1 Audits

A detailed analysis of the audit results is located in Appendix E.

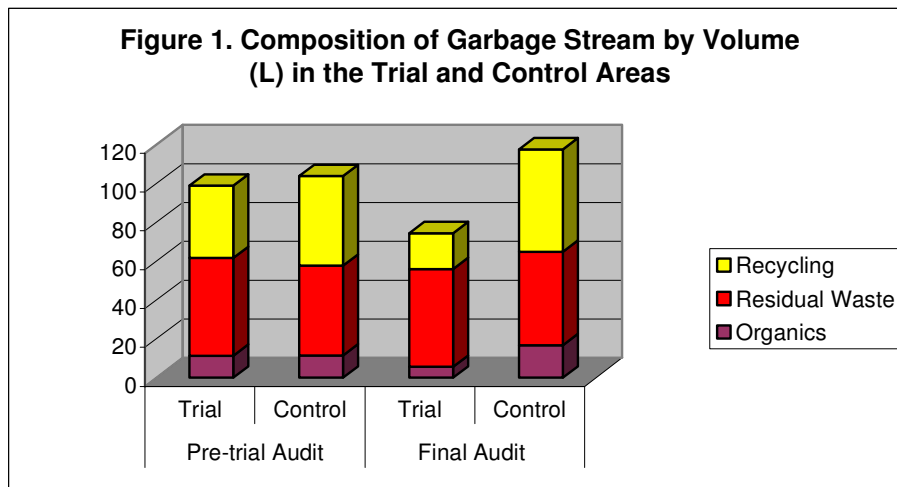
#### 3.1.1 Residual Waste Stream

The results of the pre-trial audit show that in the trial area there was an average of 11.35 L of organic waste deposited in the residual waste stream per household per week. This accounts for 45.2% by weight of the garbage stream (not inclusive of recycling). Significant amounts of material placed in the garbage were recyclables 37.3 L (37.7% by volume). The total weekly volume of residual waste and recycling were respectively 66.5 L and 105.4 L per household.

In the control area the average quantity of organic waste deposited in the residual waste stream per week was 11.5 L or 36.4% by weight of the residual waste stream. The garbage held a significant quantity of recyclables at 44.4%.

At the final audit in the trial area, there was an average of only 5.6 L of organics in the residual waste stream and the recycling content had reduced to 18.4 L (or around 24.7% by volume).

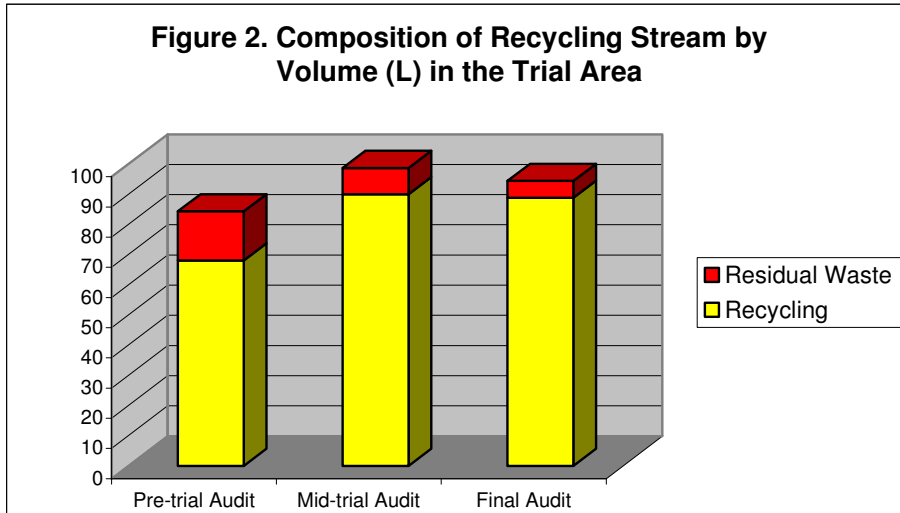
There was overall an approximate 50% reduction in the volume of organics and recyclables found in the residual waste stream of the trial areas between the pre-trial and final audits.



#### 3.1.2 Recycling Stream

The average volume of recyclables in the recycling stream measured during the pre-trial audit was around 68.1L per household. The recycling volume increased to 90.0L in the mid-trial and was measured at 88.8L in the final audit (an increase of 30.4%).

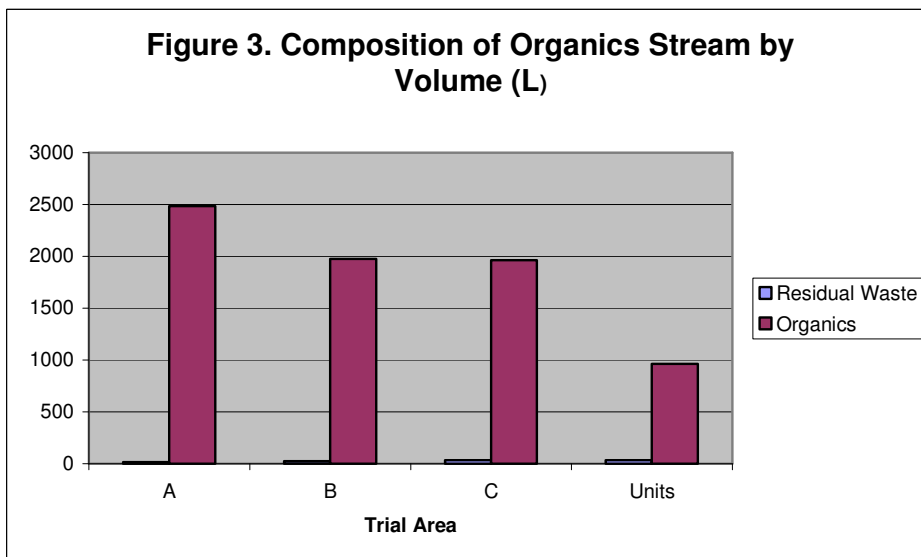
The level of residual waste contamination in the recycling was estimated to be 16.2L or 19.2% by volume per household at the pre-trial audit. The volume of contamination decreased to 8.67L at the mid-trial audit and to 5.6L or just 5.9% by the final audit (a decrease of 46.3%).



### 3.1.3 Organics Stream

The volume of the organics stream at the final audit was greatest in Area A, with a total volume of around 2500L. In areas B and C, the volume was estimated at 2000L, and 1000L within the units

The average level of food waste deposited in the organics was estimated at the mid-trial audit to be approximately 9.77L/household.

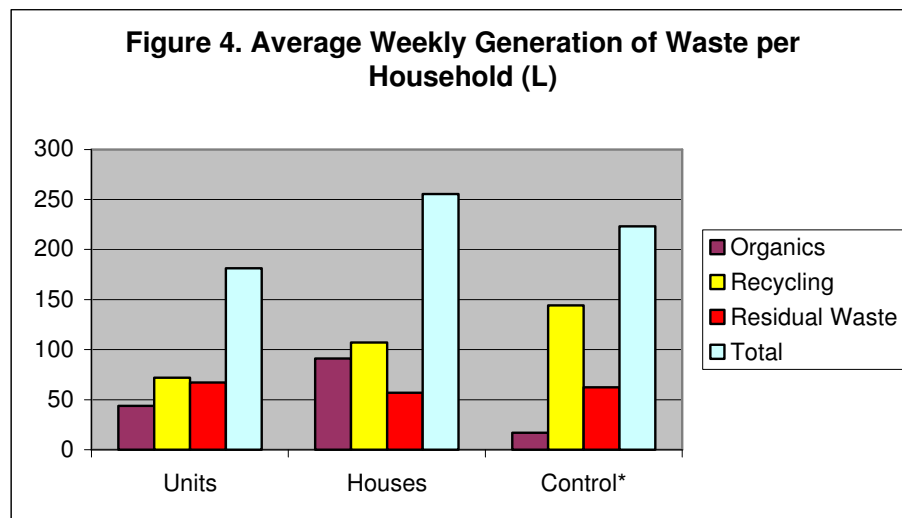


### 3.1.4 Total Waste Generation

The average weekly generation of waste per household varied between the houses, the units and the control area. The average total volume of organics was around 37.0 L amongst the units compared to about 86.7 L within the trial houses.

The volume of recyclables varied from approximately 72.0 L amongst the units to 144.0 L in the control area. The trial area recorded an average of 107.2L of recyclables per household.

The volume of residual waste was lowest in the trial houses at approximately 57.0L per week. The volumes in the units and control area were respectively 67.3 L and 62.0 L per household.



\* The greenwaste was not audited in the Control area. The organics therefore represents organics placed in the garbage stream only.

### 3.1.5 Uncertainties

The audit process contained uncertainties and therefore has allowed for inaccuracies in the quantitative results. The uncertainties include:

- Use of the standard tare to measure the weight of waste streams. The actual tare of collection trucks can vary significantly from the standard tare depending on the amount of fuel carried.
- Human error in visual estimations of volume and composition ratios of organics stream.

## 3.2 On-ground Audits

Observations of bins were carried out throughout the trial to estimate levels of participation in the trial. Volume and components of material placed in bins were estimated and recorded.

Complete results of on-ground audits are located in Appendix E.3.

### 3.2.1 Single Dwellings

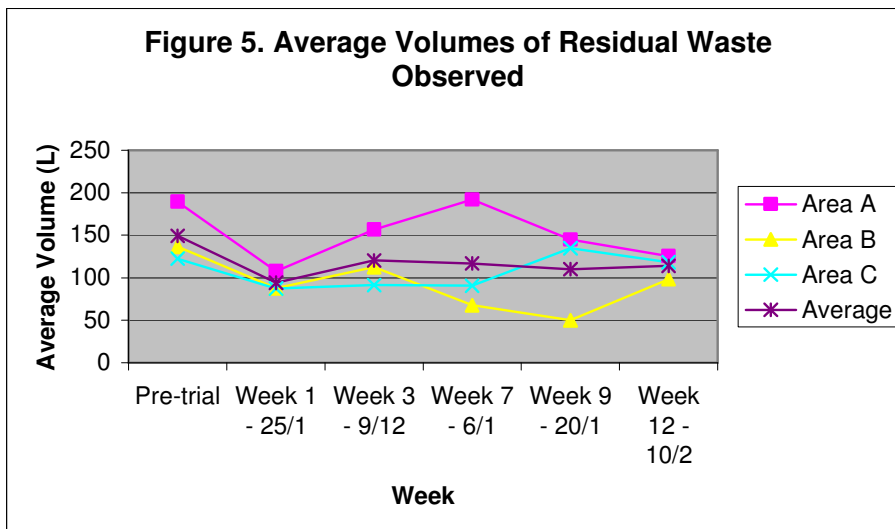
#### Residual Waste Stream

The average estimated residual waste volumes observed in the residual waste bins are shown in Figure 5. In area A there was consistently more residual waste observed in the bins than in either area B or C. Area B had the lowest average volume of residual waste overall with approximately 66% less than area A on average.

Week seven showed the largest average volumes of material in the residual waste bins. This period corresponds to the Christmas/New Year period in which it would be expected that larger amounts of waste would be generated.

There was a greater proportion of bins with contamination (either organics or recyclables) observed in area A than in areas B or C. Area C had the lowest average proportion of contaminated bins.

It was observed that bulky unwanted items were increasingly being placed in the residual waste bins including broken furniture, large pieces of steel, building materials, etc.

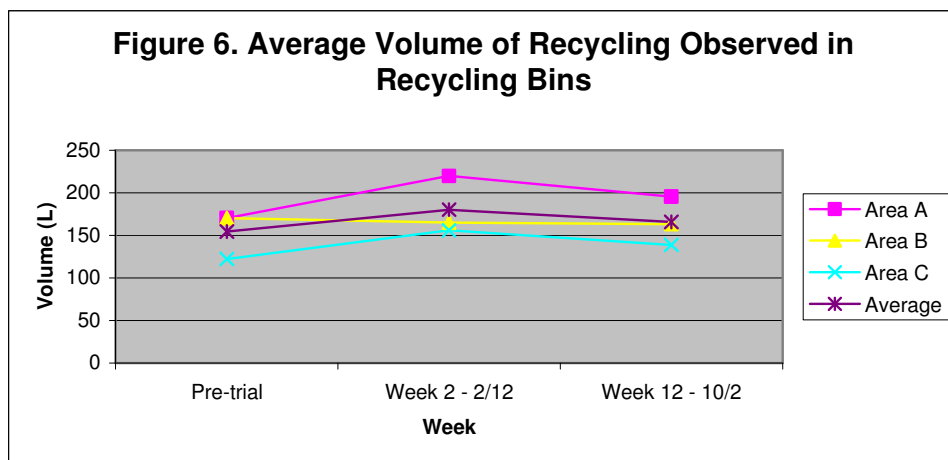


## Recycling Stream

Area A again showed a greater average volume of material in the recycling bin than areas B or C. In area C, the smallest average volume of material in the bins was observed.

The volume of recycling observed in each area appeared to vary less than the volumes of residual waste.

The proportion of recycling bins containing some form of contamination (either non-recyclables or garbage) was initially greatest in area B. At the conclusion of the trial, area B was observed to have the lowest incidence of contamination in its bins. Area C achieved the least improvement in this area.

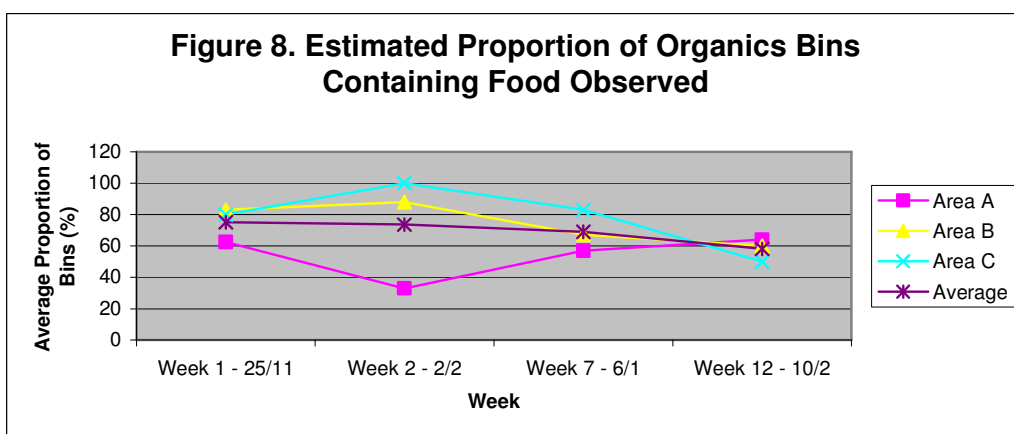
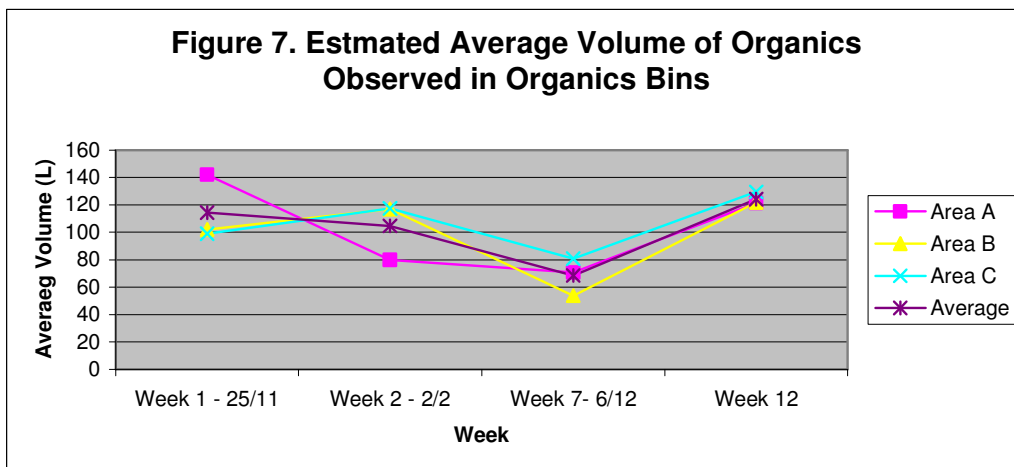


## Organics Stream

The total average volume of organics in each bin varied marginally between areas with area B having an average of approximately 99L, less than areas A and C with 104L and 107L respectively.

The estimated proportion of organics bins containing food averaged 69% overall. Area C demonstrated the greatest proportion of food-containing bins on average with approximately 78% participation followed closely by area B on around 75%. Area A indicated an average of only 54% of households placed food waste in their organics bin.

The average proportion of bins containing food was about 60% at the conclusion of the trial having dropped off from an initial average of about 75%. Area A had the most constant level of participation while Area C experienced the greatest decline over time.



Of those who placed food waste in their organics bins, the use of newspaper as a means of wrapping food waste was observed to be greatest in Area B.

A total average of about 31% of bins in area A had shown the presence of biodegradable bags. The amount of biodegradable bags decreased over time. On average the larger, thicker biodegradable bag was observed in greater numbers than the smaller thinner Bio-bags.

The level of newspaper use remained fairly constant in area B over the course of the trial at about 70%. Area C experienced a small decline in the use of newspaper while in area A, the proportion of newspaper use increased over time.

### 3.2.2 Unit Observations

#### 10-12 Elizabeth St.

There appeared to be few residents participating in the separation of food waste judging from the small numbers of Bio-bags observed in the organics bins. There was little contamination within the organics bin. Recycling appeared to improve moderately yet some contamination (soft plastics) was observed and recyclables were evident in the bulk garbage bin. It was noted at inspections that lifting the lids on the bulk bins was quite difficult.

**11 Lyster St.**

There was some difficulty experienced with the adaptation of two households to the new system. These households continued to move the garbage and recycling bins from the communal storage area to their front door. This placed limitations on the amount of waste the other households could dispose of. There were discoveries of garbage in the recycling bins and on one occasion the organics bin was found to be full of polystyrene.

**18 Lyster St.**

The organics bins appeared to be used communally by residents although this was not the initial intention as each household was provided with its own organics bin. Only three organics bins were available for collection at any one time. The contamination in recycling and organics bins was quite low although there appeared to be poor source separation of recyclables from the residual waste stream. There was erratic placement of the bins at the kerb, which may have contributed to over-filling. There was one occasion on which the garbage bins were overfull. After this event a request was made for an additional bin and a 140L garbage bin was supplied.

**17 Lyster St.**

There was very good presentation of organics bins at all times. The food waste was wrapped neatly in newspaper and no contamination was observed. One household continued to place recyclables in plastic bags.

**3.2.3 General Observations**

- It was observed that some of the organics bins had moisture collecting in the base of the bins which was odorous and unpleasant
- In the absence of greenwaste, failure to use newspaper or Bio-bags to wrap food waste resulted in putrid bins.
- Some bins were observed to have paper shopping bags containing food waste. In other bins, sticky-tape and metal ties were used to seal paper parcels and Bio-bags.
- Christmas hams were observed in many organics bins during the week seven audit.
- The use of the organics bins overall slumped over the Christmas period.
- The 240L MGBs that were provided for use in the trial had holes under the lid for insertion of a divider. The presence of these holes may well have contributed to the problem of insects in some bins.
- Some requests were made by residents for larger garbage bins (five in total) at the initial bin delivery and also during the course of the trial. A bin was delivered to one household temporarily for use over the Christmas/New Year period.

- Maggots appeared to be an issue in one section of King St. Maggots were observed in both garbage and recycling bins on occasion.

### 3.2.4 Uncertainties

The on-ground audits are only visual observations and therefore do not contain accurate quantitative data. The on-ground audits do however serve as a good basic measure of trends. The uncertainties include:

- Human error in visual estimations of volume and composition ratios.
- There was some variation in the number of bins audited at each time and those involved in making observations.
- The average volumes were calculated only using bins present i.e. where a bin was not present for collection, it was not used to calculate the average
- The volume estimates were rounded to the nearest 25% therefore 0, 25%, 50%, 75% and 100%. This allows for a significant discrepancy in results to occur. For volumes between 0 and 25%, the volume was recorded at 25% rather than zero.
- In many cases it was not possible to determine what was in the bin beyond what could be seen on top and therefore the presence of food, recyclables or contamination in many cases could not be accurately determined

## 3.3 Qualitative Results

### 3.3.1 Pre-trial Survey Results

For the complete Pre-Trial Survey Report see Appendix D.1

There was a good overall proportion of residents in the trial area surveyed (71%). The pre-trial survey results help form a picture of the demographic of each area and the trial area as a whole.

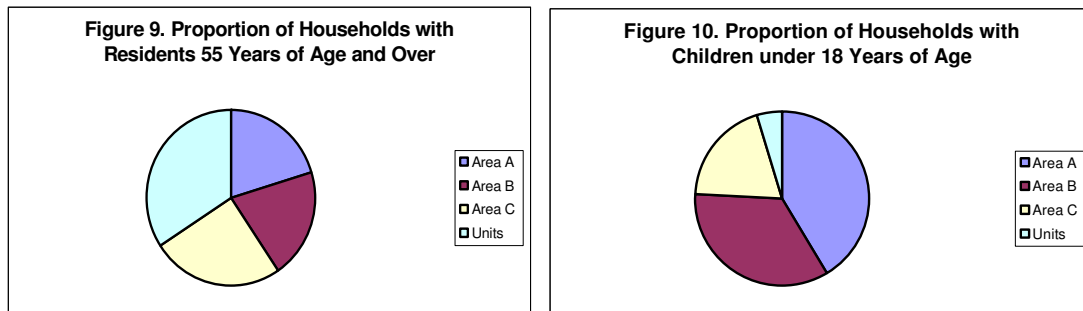
Area A had the largest proportion of children in households (36%) and the units the smallest (6%). Area C with 17% had significantly less households with children than either A or B (30%).

Area A also had the largest proportion of households of three or more people (55%) followed by Area B (30%) and Area C (17%) with the smallest average household size.

The oldest age group was found amongst the units with 59% of residents over the age of 55, followed by Area C with 44%. Areas A and B both had a 35% proportion of older residents.

Overall, 82% of households pay for the voluntary greenwaste service of which 72% claim to use it regularly. Households in Area A had the fewest greenwaste services

(72%) and used it least (55%). Areas B and C indicated the greatest use of the greenwaste service, with respectively 85% and 89% of households participating. The units all had shared greenwaste services available to them although only 59% of residents said they used the greenwaste bins.



Composting of food waste occurred in all areas except for the units with the largest proportion occurring in Area A (45%). In Areas B and C, 30% of households claimed to compost food waste. Residents also mentioned feeding pets and farm animals or the use of In-Sink-Erators as alternate methods of food waste disposal.

### 3.3.2 Phone Survey Results

There was only a small sample rate for phone surveys. For the complete report see Appendix D.2.

The main reasons people gave for not using the organics bin for food waste included: use of compost; feeding scraps to pets or use of an In-Sink-Erator (food waste processing unit).

Types of waste people said they placed in their organics bins included: greenwaste; fruit/vegetable scraps; breads/cereals; meat/seafood/dairy and soiled paper. Others included: cat hairs, droppings from litter box, coffee grounds and vacuum dust. Those organic materials residents chose not to put in the bin were generally meat scraps and dairy products.

What residents said they generally liked about the kitchen bin was its lid and handle, size and aesthetic. There were a small number of respondents who said that they would prefer a smaller bin.

There was generally a poor knowledge of the types of plastics that can be recycled (less than 40%) and steel can/aerosol recycling (around 50%). All respondents knew that plastic bags are unrecyclable through the kerbside collection.

### 3.3.3 Post-trial Survey Results

For the complete Post-Trial Survey Report see Appendix D.3.

Overall, 63% of respondents said they liked the trial system better than the current system and an additional 19% thought the trial system was neither better nor worse than the current system.

A slight majority of residents (54%) would prefer another bin-lid colour other than maroon for the organics bin. The most preferred alternative colour for the organics bin-lid was green. Some residents commented that they experienced difficulty in differentiating between the red and maroon-coloured lids.

Over 89% of residents in the trial said that they used the organics bin to dispose of food waste including 100% of those surveyed in Area C. An average of 85% said that they liked using the organics bin, slightly more in Area B (89%) than in either C or A (both 83%).

Reasons for liking the organics bin included:

- ‘The trial system was very good. I was sad when it ended. I liked having an option for disposing of food waste.’ (Area A)

Reasons for disliking the organics bin included:

- ‘It was smelly and dirty, and encouraged maggots – quite disgusting.’ (Area C)

In Area A, 72% of respondents said they used Bio-bags for food waste disposal in the organics bin and 43% used newspaper at one time or another. Some comments about the Bio-bags included:

- ‘Bio-bags were a bit too weak.’
- ‘Did not like bags. They were too small so they collapsed inside the green bin.’

79% and 89% respondents respectively in Areas B and C said they used newspaper to wrap food waste. Some commented that it was difficult to keep the newspaper from falling apart in the bin and spilling its contents.

With regard to the recycling, 76% overall prefer the single recycling bin to the split garbage/recycling bin and 80% overall said that they disposed of more recycling than garbage.

Opinion regarding bin sizes:

- 58% of respondents overall that were trialling a 140L organics bin believed that it was just the right size while 74% of those using 240L organics bins believed it was the right size.
- 77% overall believed that their 140L garbage bin was just the right size while 55% of those using a 240L garbage bin believed it was the appropriate size.

Opinion regarding frequency of collection:

- Overall, 72% believed organics should be collected weekly, while only 22% believe organics should be collected fortnightly.
- Overall, 66% believe garbage should be collected fortnightly, while only 34% believe garbage should be collected weekly.

## **4 Discussion**

### **4.1 Frequency of Collection**

The majority of residents expressed a preference for weekly collection of organics and fortnightly collection of garbage. It was evident to some residents that removal of putrescibles from the residual waste stream resulted in a non-odorous garbage bin.

A small number of residents expressed a desire for weekly collection of both organics and garbage. Disposal of disposable nappies in a fortnightly garbage collection was recognized as a potential issue.

### **4.2 Bin Sizes**

The results of the audits demonstrate that, based on total source separation of waste in the trial area, it would be possible to provide a 240L recycling and 140L garbage MGB to each property to satisfy average waste generation rates under a fortnightly collection. There was however variation in the waste generation rates of different households. Area A had the largest proportions of households with children and those of three or more people in residence and also had the largest average waste generation rates. For this area, provision of a 140L garbage bin collected fortnightly would appear to be inadequate.

On average the majority of users of 140L garbage bins believed it was adequate under a fortnightly collection and almost half of those that received a 240L garbage bin believed it was too big. There were however, a small number of households that initially had received a 140L bin in the trial that requested a 240L garbage bin instead.

The observations suggest a designated residual waste bin, and particularly a larger 240L bin, may encourage residents to use the bins as a convenient means of disposing bulky unwanted items rather than finding more sustainable means of disposal such as through charity donation/garage sales or delivery to the waste facility's re-use centre.

### **4.3 Transfer Receptacles: Use of Newspaper/Bio-bags/ Bio-bin Alone**

There was general approval for the Bio-bin by residents. Only a small number of residents chose not to use the kitchen bin. There were some residents that would prefer a smaller kitchen organics bin than the 10L bin provided.

Although Bio-bags were on average observed in bins in area A in greater proportions, newspaper was used regularly by residents. The larger, thicker bags were generally more popular than the thinner bags with opinion regarding the bags generally critical of the size and strength of bags. As only 28% of residents in Area A were given the larger bags, further research into bag types and suitability may be undertaken in future.

Overall the majority of food waste was wrapped in newspaper. In Area B where wrapping in newspaper had been encouraged there was consistently a large proportion of newspaper use observed. Most residents in Area C also used newspaper. Some residents however, did find newspaper an inconvenient and unsatisfactory means to wrap and contain food waste, and the decline in participation in Areas B and C may be a result of this.

There were a small number of residences that did not use newspaper or Bio-bags to contain food waste. In the absence of greenwaste this produced an unpleasant situation attracting pests like maggots and leaving a residue on the bin after collection. The residue also appeared to occur more generally after periods of wet weather.

#### **4.4 Pests/ Odours**

Odours and pest problems in bins were largely restricted to bins in which food waste had not been contained by means such as newspaper or Bio-bags or organic material was placed in residual waste bins. In the case of disposable nappies, this could not be avoided.

The use of 240L bins which could be later used as split bins had meant that there were holes present in these bins. These may have facilitated entry by pests at a greater rate than would be expected with normal bins. At Council's administration building where organics bins are currently used, tape was placed over the holes to prevent the entry of pests. This method has been quite effective in reducing insects in the bins.

Comments by respondents and observations indicate bin cleaning is likely to become quite prevalent where owners display "bin pride" or food waste has not been properly contained.

An inability to find a suitable method of containing food waste and/or the presence of pests or odours may lead to a decline in source separation of kitchen organics as indicated in Area C.

#### **4.5 Quantity of Food Waste Diverted Using Organics Bin**

The approximate 50% drop in the average amount of organics detected in the residual waste bins is significant especially in comparison with the 46% increase in organics measured in the control area. It demonstrates efforts by residents to source separate food waste.

Meat and dairy products were mentioned by residents as food waste that people were less likely to place in their organics bins although meat products were observed in audits on many occasions.

Food waste that was found in the residual waste stream largely included that which was difficult to separate such as bread and vegetable matter in plastic freezer bags and small quantities of meat including chicken.

The on-ground audits indicate that approximately 69% of households were participating on average in the separation of food waste into the organics bin during the trial and there was an overall decline in participation from an initial 75% to around 58% at the conclusion of the trial. The greatest decline occurred in Area C.

The surveys indicate that there were a significant number of households that composted food waste or had other alternate means of disposal other than in garbage which may have affected participation rates. This was greatest in Area A that had the least proportion of participating households on average.

#### **4.6 Effect of a Designated Bin on Quantity and Quality of Recyclables**

The average increase in the volume of recycling was around 30%, increasing from 68.1L to approximately 88.8L per week in the trial areas. The level of contamination in the recycling stream reduced by more than 60% from 16.2L to 5.6L indicating that recyclables were being diverted from the residual waste stream into the recycling stream.

The majority of residents expressed a preference for a designated recycling bin over the split garbage/recycling bin adding that it allowed them more room for their recyclables.

#### **4.7 Effect of Education on Level of Recycling and Use of Organics Bin**

The increase in the level of recycling and the reduction in contamination may in part be attributed to the education provided during the trial. While all residents were aware that plastic bags could not be placed in the recycling bins, the gaps in education included knowledge of steel can/aerosol and plastics recycling.

Contact with trial participants through demonstrations, face-to-face and phone interviews and newsletters and the supply of visual education materials including brochures, stickers and calendars helped to educate the trial participants.

There was a particularly positive response to direct contact with residents demonstrated in the attendance at the forum held on the eve of the trial.

#### **4.8 Units**

Participation in the trial among the units was generally poor in comparison with the single dwellings. This may be due to the inherent problems regarding units that include: a transient population; anonymity and issues of shared responsibility.

##### **4.8.1 140L Recycling Bin/ Bin Configuration**

The residents at 17 Lyster St indicated a preference for 240L recycling bins over the 140L recycling bins trialled among the townhouses on a fortnightly collection regime.

The supply of two organics bins among the 12 residents at 10-12 Elizabeth St was sufficient, however not all residents placed food waste in the bins.

The number of bins supplied to 11 Lyster St appeared to be adequate for a weekly collection and there were sufficient recycling and organics bins for residents at 18 Lyster St. An additional garbage bin was requested however the bins were not filled to capacity. Failure to place all bins out for collection is suspected to have led to over-filling on one occasion.

#### **4.8.2 Bin Sharing**

The sharing of organics bins at 10-12 Elizabeth St worked quite well with regard to contamination levels and servicing. This may be due to placement of the bins within a gated compound adjacent to garbage bins.

Bin sharing at 11 Lyster St had some serious failings. Two households were unwilling to share and made the system unworkable. There were also incidences of gross contamination for which the source/s could not be identified.

The sharing of bins among residents at 18 Lyster St was fairly successful. There were however some failures to place bins at the kerbside for collection which indicates a lack of shared responsibility.

## **5 Conclusions/Recommendations**

It may be concluded that the trial was successful in helping to provide Council with important information regarding the collection of organics, residual waste and recycling.

The collection of garbage on a fortnightly basis has the support of the trial participants and residents would generally prefer weekly collection of organics to fortnightly collection. The issue of pests and odours would need to be managed by the residents assisted by education on sorting and containing food waste.

Newspaper was used quite successfully in the trial with consistent use as opposed to the 8 litre Bio-bags. There may be opportunities under focus group trials with Council staff to further develop methods of using newspaper and possible trials of different Bio-bags. The Bio-bin was popular among residents as a kitchen organics bin and transfer receptacle.

The average household could use a 140L garbage bin on a fortnightly collection however some households may still require the provision of a 240L bin. A variable-rate pricing mechanism may be used for the different bin sizes although it would likely require strict controls on recycling/organics bin contamination. A 140L organics bin may be desirable to some residents who don't produce greenwaste or have some alternative source of organics disposal. A 140L recycling bin is unlikely to be adequate for even the smaller premises therefore a 240L recycling bin is recommended.

The provision of a designated recycling bin (and accompanying education) helped to significantly increase the volumes of recyclables collected and reduce the level of contamination as compared with the split-bin arrangement.

Education was effective in gaining diversion of food waste and recycling from the residual waste stream. A combination of different methods of contact with trial participants as well as the supply of visual education materials assisted residents to change their behaviour. These methods may be employed in the future for the proposed collection system.

The results for the units are less conclusive. Bin-sharing appears to present many challenges. It is recommended, based on the findings, that in a bin-sharing situation the following be considered: the provision of a purpose-built storage area for organics bins isolated from bulk bins where they occur; the property may bear responsibility for contamination issues and co-operation of its residents; and that there is a structure in place to ensure bins are collected or a bin-runner service is provided.

## 6 References

- Coffs Harbour City Council (1997) Mini Food Waste Trial
- Coffs Harbour City Council (2000) Food Waste Trial
- Coffs Harbour City Council (2003), Tender for Coffs Harbour Regional Resource Recovery Project - (Contract No. 03/04-147-TS)
- EPA NSW (1997), Waste Stream Data Collection Methodologies –Final Draft December 1997
- Hastings Council (2004), Hastings Council Domestic Organics Recovery Trial
- Impact Environmental (2003), Hastings Council Domestic Organics Recovery Trial (Proposal)
- Nolan-Itu (1999) Food Waste Collection Study, Draft Report for Central Coast Waste Board, October 1999

## **7 Appendices**

### **Appendices**

**Appendix A: Correspondence to Residents**

***Appendix B: Educational Materials***

***Appendix C: Media***

***Appendix D: Surveys and Results***

***Appendix E: Audits and Results***