Food Organics Research Project

Northern Sydney Regional Organisation of Councils

The NSROC Food Organics Project was developed and delivered as a co-operative project between NSROC and Waste Alliance Councils by:

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This project is a NSW Environment Protection Authority initiative funded from the waste levy

Report of the NSROC Food Organics Research Project

Contents

Executive Summary

This Report documents research projects that were funded by grants from the NSW Environment Protection Authority to the five Northern Sydney Councils (Willoughby City, Lane Cove, City of Ryde, Hunter's Hill and Ku-ring-gai) which participate in a joint waste processing and disposal agreement that includes the processing of mixed waste to produce an organic soil additive.

Funding from the grants was applied to create a single regional project developed collaboratively by Councils and the Northern Sydney Regional Organisation of Councils (NSROC) which received a grant to coordinate the regional projects.

A concurrent project was undertaken by the City of Ryde to trial collection of mixed organics from houses, and data from that trial is included in the Report.

A research plan for the Project was devised to improve the reliability and relevance of information available to Councils considering the introduction of food organics services.

Core research questions were how much food organic material is available from households in different areas and dwelling types, how much food waste presented by residents is uncontaminated and useable for compost production, and how resource recovery from food organics compares to production of a compost-like soil additive from mixed waste processing.

The Project was based on a research design tailored to the scale and diversity of the Sydney metropolitan environment and developed by Blue Environment Pty Ltd (detailed in Section 2), and a communications and community engagement plan developed by Spectrum Communications (detailed in Section 3).

The food organics data generated from the Project are set out in Section 4 (food waste presentation), Section 5 (contamination and waste audit) and Section 6 (demographic analysis of food waste segregation). Section 7 documents the responses from residents and participants during and after the trial. Section 8 contains the outcomes of the project in summary form.

Conclusions reached by the Food Organics Project Committee drawn from the data collection, resident and contractor feedback and the experience of consulting with industry to deliver the trials, are set out below and in Section 8 of this report.

Conclusions

- Each LGA's food organics presentation amount and useable food fraction varies according to its share of different dwelling types and its demographic characteristics. Planning for food organics waste management should not apply generalised averages to estimate food weights or food contamination.
- Residents in houses who participate in segregating food waste can be expected to be generally compliant in presenting uncontaminated food.
- The evidence from the food weight monitoring, waste audits, contact records and survey responses indicate that a large share (about two-thirds) of residents in apartments did not participate in separating food waste during the trial and about half of house residents did not participate.
- To address the low food volumes presented from apartments would require new approaches to waste collection and management in bin rooms and bin bays to reduce odour and perceptions of the food bins as unhygienic.
- Resource recovery tonnage of beneficial products from food waste is not better than organics harvesting through mixed waste processing, based on the trial's participation rates.
- There are barriers to participation in areas with higher numbers of residents who have low proficiency as English speakers. These areas were correlated with lower food presentation, higher contamination in food bins and lower response to the end-of-trial survey.

- There is a limited market evident of organics processing service providers for outputs of residential food organics, and inadequate information available to councils on standards in compost output from existing processing services or on the management of gas emissions.
- Councils need more information on the timing and standards of new organics processing capacity so that tenders can be prepared with sound information on efficiency, contamination standards, risk sharing, cost, location, technology, and greenhouse gas capture. Waste contracts are long-term engagements and require significant lead times to prepare and scope, and given the limited supply service market, adequate market information is needed to ensure value for money in procurement.
- The results of the non-residential trial make a case for a more focused trial that would be designed to incorporate the lessons learned from the trial: clearer identification of food waste bins, more reliable collection services and direct engagement with the most prospective organisational types with consistent amounts of food waste (food services) and/or higher volumes (education and health care delivery).
- Based on the data there appears to be a different approach to waste education and information needed for mixed organics bins as the participation rate (Presented Food as a share of Available Food) was much lower than in houses with a separate food organics bin.
- Food waste service introduction will incur significantly increased costs in waste collection and community education.
- No reduction in weekly collections would be possible to offset extra costs, as a majority of the food organics remained in the mixed waste bin.
- Personal contact delivery of food collection materials and direct communication with residents were effective methods to engage residents' interest in food waste segregation and are likely to need to be embedded as an additional council service under a mandated service.
- Regardless of waste education measures, compliance with food segregation depends on residents' commitment to the extra tasks involved in separately disposing of food waste. There is an efficiency case in terms of maximising the presentation of Useable Food for food organics segregation to be an opt-in offer to residents who are committed to this task, which is 33% to 50% of residents, varying with dwelling type.
- Based on the trial, the best prospects for collecting Useable Food waste are from:
  - Residents in houses with a separate food organics bin (not combined with garden organics);
  - Residential areas with larger average household size; and
  - Certain types of commercial and retail businesses where there are contiguous businesses so that collection services can function efficiently.

Terms and Abbreviations

ABS
Australian Bureau of Statistics

Alternative Waste Treatment (AWT)
Treatment of mixed waste through mechanical or biological processes to recover resources

Available Food
Food from households, total including food presented in MSW or FO bin, contaminated and uncontaminated

Compostable liners
Kitchen caddy liners that comply with AS 4736-2006

Contamination
Materials not accepted under EPA regulated standards for FO and FOGO processing

FO
Food organics

FO projects
Council projects delivered as one regional FO Project

FOGO
Food and garden organics

HH
Household

HRA
High-rise apartment, with lift installed

LGA
Local Government Area

LRA
Low-rise apartment, with no lift installed

MBT
Mechanical biological treatment; mixed waste processing

Mixed waste
Waste collected in red-lid bins

MSW
Municipal Solid Waste or mixed waste, other than recyclables and green waste

MUDs
Multi-unit dwellings; units townhouses and apartments

NFPs
Not for profit organisations

Non-residential organisations
Organisations operating from non-residential premises including business services, education, health, food services

NSROC
Northern Sydney Regional Organisation of Councils

NSW EPA
NSW Environment Protection Authority

Presented Food
Food from households, presented in the FO or FOGO bin, contaminated or uncontaminated

Principal Representative
Contract manager for the Waste Agreement between Veolia and the Waste Alliance Councils

Resource recovery
Transformation or extraction of beneficial products from waste

Sample/trial areas
Parts of LGAs where the food segregation trials were offered to residents

SUD
Single unit dwelling; house

Unuseable food
Food waste that is contaminated (including food in non-compliant bags or containers)

Useable food
Food waste that is not contaminated

Veolia
Waste management service provider to Waste Services Alliance Councils

Waste Alliance
Northern Sydney Councils Waste Services Alliance

WOO
Woodlawn Organic Output, soil additive for remediation of mine site tailings dam

FRAMEWORK

1 Background

1.1 Introduction

Municipal solid waste management is a crucial responsibility of councils, as set out in the *Local Government Act (NSW) 1993*. Councils in the Northern Sydney region have a history of cooperation in waste management and work together under a Regional Waste Strategy developed to support the vision of a community actively engaged in waste reduction, recycling and resource recovery, to protect the environment and enhance community well-being. This project was conducted in the context of that shared commitment.

This report has been prepared for the five Council members of the Northern Sydney Regional Organisation of Councils (NSROC) from work done by Council and NSROC officers, supported by project management and other forms of consultancy expertise pertinent to the diverse aspects of the project.

1.2 Councils collaboration

In September 2020, five Northern Sydney councils were successful in obtaining grants from the NSW Environment Protection Authority (EPA) for complementary Food Organics Research Projects (FO projects) under the Local Government Alternative Waste Treatment (AWT) Transition Fund. NSROC also obtained a grant to provide overall coordination for the projects. A total of $990,000 was available to deliver the projects over two years from August 2020 to August 2022.

The goal of the EPA funding program is to allow Councils to determine what services will maximise recovery from the red-lid bin and recirculation of resources safely back into the productive economy.

The five Councils participating in the FO projects have well-established cooperative waste management arrangements in place and have worked together as the Northern Sydney Waste Services Alliance (Waste Alliance). The Waste Alliance was formalised in 2014 by the local governments of Hunter's Hill, Ku-ring-gai, Lane Cove, Ryde and Willoughby.

The Councils are each party to a common contract for the disposal and processing of mixed waste, the Waste Processing and Disposal Agreement (WPDA), with Veolia Australia and New Zealand Pty Ltd. The WPDA commenced its ten-year term in December 2015 and is managed by Councils under a shared governance structure.

The WPDA services includes waste processing to achieve resource recovery from mixed waste to create low-grade compost produced through mechanical biological treatment (MBT) and applied to rehabilitate a tailings dam at a mine site adjacent to the company's Woodlawn Bioreactor. Under the contract, about 40% of total waste delivered to Veolia by the Waste Alliance is subject to the MBT waste processing service. For each tonne processed around 30% is diverted from landfill through the process to create a soil additive, known as Woodlawn Organic Output (WOO). A further 20% of the processed material is used as operational cover in the Bioreactor, which avoids bringing in soil to the site to cap waste deposited in the Bioreactor.

1.3 Role of the Northern Sydney Regional Organisation of Councils

A plan to apply the six EPA grants into a single regional project was developed collaboratively, with sub-projects managed by each Council under a shared research plan and project coordination resourced from NSROC's grant.

The NSROC role in the FO projects was to coordinate projects under a single research design based on shared metrics, communications, and staging.

With active involvement by Councils, NSROC's role was to select and manage expert resources to:

- oversee the research design for all projects to ensure robust methodology and reliable data capture and measurement, allowing valid comparison and consolidation of outcome data;

- provide liaison and coordination between the councils undertaking each component project to ensure learning was shared and duplication minimised;
- undertake single point procurement of food collection materials, call centre services, design and production of communications collateral, to maximise cost-effective purchasing and ensure consistent project messaging to communities;
- support Council projects by in-house establishment and servicing of a food recycling trial website; and
- evaluate the results of the trials and provide a coordinated report to Councils.

1.4 Food Organics Project

The purpose of the FO Project is to create a sound evidence base for Councils to rely on in planning for future waste management services. This requires that alternative approaches to the disposal of food organics are researched so that future services contribute to environmentally and economically sustainable outcomes from waste management.

Each of the FO projects was devised to improve the information available to Councils considering the introduction of food organics services in the future, in the context of current national, state and regional policy positions. The consolidation of the grants into a single regional project allowed for more significant sampling and waste auditing to be undertaken than stand-alone projects would have permitted.

In June 2021 the NSW Government released the NSW Waste and Sustainable Materials Strategy 2041 which includes a mandate for services to collect food organics and garden organics by 2030. The FO projects were devised to deliver useful data for the region to inform the future management of organic waste as councils approach the end of current contract terms.

This evidence will also allow for a rigorous and factually accurate comparison of the potential resource recovery outcomes from separated food organics compared with the processing of mixed waste through the MBT, which relies on organic material remaining in the general waste collection.

A large sample of households/organisations was identified in different suburbs in four of the Waste Services Alliance LGAs, from five premises types. All residents in the three residential areas were asked to participate in a three-month trial of separating food waste for mixed waste as they would in other waste segregation practices. In the non-residential area, a large group food waste generating organisations (businesses and not-for-profit) were invited to participate.

A separate and concurrent project was undertaken for the City of Ryde (Ryde) on a sample of houses separating food organics and disposing them in combination with garden organics (FOGO).

1.5 FO projects and areas

The alternative waste collection services examined in the FO projects were:

- Food organics separately collected from houses and three types of multi-unit buildings from a total of 7 separate geographic areas in three local government areas;
- Food organics separately collected from food businesses and other non-residential premises in one area.

Three Councils (Lane Cove, Willoughby, and Ryde) conducted trials in which residents in separate within the LGA were asked to separate food from general waste and deliver the waste so that it left the premises in a food collection service bin.

Food organics collections from Lane Cove engaged with two geographically and demographically distinctive trial areas of single-unit dwellings (houses).

In Ryde trial areas in four medium density multi-unit buildings (low-rise apartments and townhouses) in geographically and demographically distinctive areas were selected for the trials.

As noted, Ryde Council also identified two geographically separate areas for trialling a mixed food and garden organics collection service conducted concurrently to the FO projects.

In Willoughby households in four towers (high-rise apartments) in multi-unit buildings in one area participated in the trail.

Hunter's Hill Council engaged with non-residential organisations (including cafes, restaurants, professional services and education services organisations) to trial segregating food from mixed waste into food caddies and bins.

Ku-ring-gai Council's grant was applied to engage contractors to conduct waste audits for the project.

This approach maximised the residential sample spread and size within the budget and delivered efficiencies in procurement, management and delivery.

The NSW EPA supported the approach and was advised of key developments during the project.

1.6 Project Management and Support

A Food Organics Project Management Committee made up of the Waste Alliance Councils' Waste Managers, NSROC and project management support was formed in 2020.

It met regularly from September 2020 and fortnightly from April 2021 to July 2022 to oversee development of the projects and ensure the application of the research design and the communications plan in a consistent manner across all sample areas.

The Committee reported to the Waste Alliance Governance Board of General Managers on a three-monthly basis during the FO projects' development and delivery, and six-monthly to the NSW EPA.

The Committee oversaw expert advisory consultancies engaged through the grant funding to ensure that all elements of the project were both innovative and based on best practice standards.

The report was drafted by the project manager, drawing from the advice and analysis of these specialist consulting services engaged to develop, deliver and support the FO Projects:

- Research Design – Blue Environment Pty Ltd (completed June 2021)
- Communications and Community Engagement Plan – Spectrum Communications Pty Ltd (completed July 2021)
- Communications materials design and production coordination – Metro Graphics Group (completed November 2022)
- Call centre operation – OneContact.com.au (completed June 2022)
- Delivery of food collection materials to residents and some of the waste education collateral – EC Sustainable Pty Ltd (completed March 2022)
- FO and FOGO trial areas waste audit – A. Prince Consulting Pty Ltd (completed July 2022)
- Non-residential trial area waste audit – MRA Consulting Group (completed August 2022)
- Data analysis and statistical services – Graduate Research School and Centre for Research in Mathematics and Data Science, Western Sydney University (completed October 2022).

The FO project trial start date was postponed twice in 2021 and once in 2022 due to the COVID pandemic, which rendered door-knock delivery and resident engagement impossible. The final key dates for the trial services under the FO projects in 2022 were:

- Website and call centre go live 10 February
- Rollout of food collection materials and advice to residents: week commencing 14 February (test period 10-11 February)
- Trial Commencement: week commencing 14 March
- FO trial and FOGO trial completion: 24 June
- Non-residential trial completion: 19 July
- Two–week audits (FO, FOGO and non-residential areas): three periods in June and July.

2 Research Design

2.1 Introduction

The FO projects (the Project) were planned and delivered as research projects, not feasibility studies, to create important input into a comparative assessment of options for future waste management in the region.

This section of the Report documents the rationale for the information captured during the FO projects and the approach to analysing the information collected to answer the research questions for the Project.

The research questions were agreed by Councils to be central to the evidence required to design environmentally and economically sustainable waste management services.

The objective of the Project was to determine through practical research the availability and implications of separately collecting food organics from households and food businesses in terms of resource recovery.

Central to the FO projects was the development of a sampling and audit approach to generate robust data necessary to respond to the research questions related to the amount and useability of the food organics collected from households and businesses. The methodology also needed to be adaptable to the delivery of the projects in, dispersed suburban areas over a three-month period.

A specialist research design consultancy, Blue Environment Pty Ltd (Blue Environment), was engaged through a competitive RFQ process.

The Project Committee and the Waste Alliance Governance Board developed the research questions and trial areas that would form the basis of the FO projects and engaged Blue Environment to verify these elements as part of the research design brief.

Independently, Blue Environment devised the auditing program that would deliver reliable and valid data to fill gaps in currently available information on collecting food organics from residences and from small businesses and service organisations in metropolitan Sydney.

The report resulting from the Blue Environment consultancy included discussion on the statistical analysis of waste, how the research approach would address and answer the research questions, and advice on the sample size and audit approach. The brief was to ensure reliable and valid results with low levels of uncertainty. Its content is summarised in this Report; the full Blue Environment report has been provided to stakeholders.

2.2 Research questions

In the early stages of working together on the FO projects Council stakeholders agreed on a series of questions as the basis of designing and measuring the outputs and outcomes of the coordinated short-term FO trials. They are shown in Table 2.1 with the main data sources for each question's resolution. The questions informed all the work done to design and deliver the food organics trial services.

Blue Environment was engaged to devise the methodology to generate data to answer the first three of the research questions. The methodology to address the behavioural and policy research questions (4 to 7) is incorporated into other sections of this report. Question 4 is reported in Section 4; question 5 and 7 in Section 7; and question 6 in Section 8.

An additional data item was integrated into the analysis of the results of the trial to ascertain how different demographic characteristics of suburbs and household types influenced the amount of correctly segregated food organics.

This question is addressed in section 6 of this Report and was supported by specialist statistical consulting services from Western Sydney University.

2.3 Food waste data

The participating councils decided that the format to address the research questions underlying the FO projects would be 14-week trials of added FO collection services from single unit dwellings (SUDs), medium-density and low-rise multi-unit dwellings (LRA), high-rise multi-unit dwellings (HRAs), and non-residential and commercial premises which generate food waste. Under this approach the projects would generate data and information that can be applied to varying types of premises across their LGAs and the region.

Table 2.1 Food Organics Project Research Questions and Data Sources

Research Question		Data Sources
1.	How much food is presented for collection by councils in houses, units, businesses?	Weekly and bi-weekly food load data recorded at the weighbridge at EarthPower
2.	How much food waste is correctly segregated into a separate food container and how much remains in the mixed waste bin?	Audit period data collection
3.	What are the contamination levels in food organics loads and what proportion of collected organics would be recovered or rejected by re-processors?	Waste processor (EarthPower) data on number and weight of rejected loads during trial and weight of contaminated material where part-loads are contaminated. Detailed analysis of food loads during the audit period data collection.
4.	What resource recovery outcomes are achieved from the separately collected food waste in the trials?	Organics processor (Top Soil).
5.	What are the views of participating households on the food segregation service?	Resident and business participant responses during the trials and in surveys at the end of the trial.
6.	What are the additional costs of providing a food organics collection service for houses, apartments and food businesses?	Council analysis of costs additional during and after the trial.
7.	How do the resource recovery outcomes from segregated food waste compare to inclusion of food in mixed waste processing under existing agreements	Analysis of current resource recovery compared to food waste resource recovery from the quantity and quality of material collected during the trial.

As noted in Section 1, City of Ryde Council undertook a parallel project with households in two sample areas where residents were asked to combine food and garden organics collections in the green-lid bin. The weekly weight tracking and waste audit methods applied in FOGO trial were the same as those used for the FO projects.

2.4 Sample areas

The goal of selecting a cross-section of trial areas across three council areas was to maximise the depth of understanding of community participation in FO segregation. The nominated sample areas were based on participating member councils' local knowledge of areas and on analysis of ABS Community Profiles.

The selection's purpose was to ensure the trial areas were sufficiently diverse to represent those housing types in their municipalities and across the five councils.

City of Ryde Council identified four areas of medium density and low-rise apartment buildings in geographically dispersed and demographically diverse areas with the LGA. The suburbs aligned with ABS Community Profiles for suburbs within LGAs, to allow demographic analysis of the participating households' food presentation. In each of the four suburbs, a contiguous group of low-rise apartments and/or townhouses was selected. Buildings were provided with shared kerbside FO bins and residents were asked to walk down their food waste to these bins, as they do for garbage and recycling, in provided compostable bags.

Lane Cove Council delivered the trial in areas of the suburbs of Lane Cove North and Greenwich composed of single unit dwellings (houses). The suburbs aligned with ABS Community Profiles for suburbs within the LGA, to allow demographic analysis of the participating households' food volume presentations. The areas selected in Lane Cove are considered to be generally representative of houses across the region.

Willoughby Council selected 10 high-rise MUDs (towers) with on-floor waste management systems , with centralised drop-points on each floor, and cleaners transporting these to the basement or kerb for collection. Close to the commencement date for the trial this sample was reduced to one area and four tower blocks due to late decisions by building managers not to permit the trials to be conducted. Concerns were expressed about hygiene, space in the chute rooms and additional cleaner costs. The reduced sample was nevertheless significant, being more than 500 households.

A short summary of key demographic characteristics of each trial area is in **Attachment 1.**

2.5 Sample size

In 6 of the FO sample areas, all households were asked to participate in the trial. The final number of participating households (see **Table 2.2**) comprised those householders who accepted personal delivery of the kitchen food caddy or had the caddy left at the door after 2 or 3 attempts to make direct contact. In the case of high-rise apartments, building managers prohibited this approach and the number of participating households is the number of householders who accepted door-knock delivery of the kitchen food caddy. The high-rise apartment trial area may be seen to be more aligned with an opt-in sample than the other residential areas.

Blue Environment supported the scale of variation in the sample area sizes as they added to the reliability of the quantitative results, by allowing identification and compensation for outlier waste audit loads, and provided large sample populations for data analysis and social research.

A summary of Blue Environment's advice in relation to the sampling in the FO projects is set out below:

- On the basis of previous audits, it is recommended that at least 100 households are audited for each sub-group, as this will provide a level of accuracy for food in garbage and FO materials in the order of +/- 10% of the sample mean/average.
- The sample populations (selected by the Project Committee) are larger than many councils' waste and recycling audits that are typically conducted in lower density housing areas. The larger samples are expected to provide statistically strong data levels and allow for assessment of differences between wastes from different areas within housing types.
- The large samples are preferred because there is some uncertainty about: how variable the quantities and proportions of food organics will be in garbage; how many households will participate in the trial; how much food organics will be collected per premises; and how variable contamination of organics will be. The large samples in terms of household numbers will offset uncertainties relating to variability in the quantities and proportions of food organics and of contamination levels and in the level of household participation.
- The larger samples should allow statistically strong data to be collected and for differences between sub-groups within housing types to be assessed. The larger samples will also allow good quality social research data to be collected. The population sizes will allow observations regarding differences in community attitudes and behaviour in how effectively they use the FO service.
- Based on previous research and the Blue Environment research design, in order to obtain a high level of accuracy for food (+/- 5%) in the MSW waste stream, a tonnage sample of the equivalent of at least 300 households is needed. This will be the equivalent to about 2-3 tonnes of kerbside garbage per sampled area for each load. That is, for each MSW waste load in the two weeks of the audit period, 2-3 tonnes are to be sub-sampled through audit of at least 5 sub-samples per load.

Table 2.2 shows the areas of the FO and FOGO trials in each of the LGAs, suburbs, premises type and household numbers in each trial area. With one exception (see page 15, footnote 1) , the advice of Blue Environment was followed in relation to the data collected during the trial to address Research Question 1: how much food is presented for collection by councils in houses, units, businesses?

2.6 Data collection

The methodology applied in the FO projects included a variety of data sources. These are set out in **Table 2.3.**

The data collected from all building types and areas generated detailed records of:

- Tonnage of FO collected each week from the trial areas throughout the trial period. These tonnages allowed calculation of average generation/presentation of food organics per household per week across large samples.

- Tonnage and type of food in garbage through the two-week physical audit phase.
- The unuseable (contaminated) fraction of the FO stream as indicated from visual assessments from time to time throughout the trial, feedback from collectors and transfer terminal operators and processors, and documented in detail for all loads in the two-week audits.
- Granular data from sub-sampling of loads of garbage and FO in the audits to allow statistical analysis of variability within and between loads and different housing types and to estimate the participation rate of residents in different household strata.

2.7 Waste audit

An extensive audit program to measure the amount and type of food organics in the food organics bin and the amount and type of food remaining in the general waste bin, in all sample areas, was devised on the basis of the Blue Environment advice. The waste audit of aggregated truck loads from the trial areas was the principal source of information for answering two of the most significant issues in the FO projects research design:

Research question 2: How much food waste is correctly segregated into a separate food container and how much remains in the mixed waste bin? (Documented in Section 4 of the Report).

Table 2.2 Project trial sample areas and household numbers

Council	Household type	Sample area	Waste Type	Total Households	Participation-enabled Households
Ryde	Low rise apartments	Meadowbank	FO	210	207
	Low rise apartments	Gladesville	FO	227	222
	Low rise apartments	Eastwood	FO	262	246
	Townhouses/ Low rise apartments	Macquarie Park	FO	248	246
Lane Cove	Houses	Greenwich	FO	436	419
	Houses	Lane Cove Nth	FO	293	287
Willoughby	High rise apartments	Chatswood	FO	547	526
Residential FO households			**FO**	**2,223**	**2,153**
Ryde	Houses	Chatswood West, Nth Ryde	FOGO	243	230
Hunter's Hill	Non-residential	Hunter's Hill LGA	FO	90	69

Note: participating household number excludes abandoned or under construction premises in the sample area and households declining to accept delivery of food caddies; includes caddies delivered either in person, collected or left at door after a minimum of two door knock visits including one made after business hours. (1) Hunter's Hill: weekly variable, averages reported based on number of deliveries in each week.

Table 2.3 FO Projects Data Collection

Timing	Data	Source	Assembled/ collected by
Before commencement of the trial period	Historical garbage volume data for the time of year Current monthly total for year to date	Waste Alliance data (PM Web) Council data	Project manager
Each week in the trial period	Garbage totals each week for each of the sample areas[1] Food organics totals each week for each of the 8 sample areas Contamination (rejected loads or bins) Weights of contaminated material removed from delivered loads	Waste Alliance data (PM Web) (garbage) Veolia weighbridge (FO and FOGO) Veolia EarthPower and Council collection contractors Call centre, Councils CRMs and FO Project website records	Project manager with Councils and Waste Alliance Contract Manager (PM Web data)
During the two-week audit phase	Full load or randomised sub-sampling of all loads of garbage and FO collections	Audit	Audit project manager Audit contractor
After completion of the trial period	Analysis of garbage and FO volumes for each building type Analysis of contamination and sources Comparison of resource recovery outcomes with WOO waste processing Assessment of costs Social research to seek input from participant households on usefulness of materials and effectiveness of communications	Council, Veolia and audit data Social research survey of participant households	Specialist support to project; project manager and Project Committee

1. The weight of garbage from the sample areas was not able to be collected every week, but was fully examined in the two-week audit period.

Research question 3: What are the contamination levels in food organics loads and what proportion of collected organics would be recovered or rejected by re-processors? (Documented in Section 5 of the Report).

This data was also applied to analyse how different demographic characteristics of suburbs and household types influenced the amount of correctly segregated food organics.

Blue Environment advice with respect to the audit method was:

- The sample sizes and auditing methods have been designed to obtain statistically valid quantitative waste audit data about the quantities of food diverted from garbage and recovered through the FO service.
- The quantities of FO that need to be sampled to obtain statistically valid samples are subject to different influences. Contamination rates in organics streams tend to be a low weight compared to the organics and are highly variable, with many households contributing no or little contamination, but others presenting grossly contaminated bins. Because the contamination level is expected to be highly variable in the FO loads, and to consist of relatively light materials, a larger load share of FO is required to be sorted.
- To add depth to the whole load data on contamination collected for all weeks of the trial, during the audit phase there will be physical audits of the FO stream garbage, focusing on extracting detailed information on the sources of contamination in the food stream.
- The proposed methods should result in highly accurate data for quantities of food in garbage and that can be recovered via FO services, as well as for contamination levels in FO.

The methodology that the audit service providers (one company for the FO and FOGO areas; another company for the non-residential FO area) were engaged to follow was:

- A two-week physical auditing period with sort and weigh measurement of all collected garbage, FO and FOGO materials from each sample area to be recorded separately.
- To assess variability within and between samples, the audit methodology required the appointed service providers to keep records of individual loads of materials, noting collection area, dates and truck tare weight.
- A sample of full loads of FO and FOGO or least one tonne of each weekly or bi-weekly collected from all trial collection areas
- Auditing of not less than five sub-samples using a randomised grid for every FO and FOGO load equal to not less than 1 tonne of material (whole loads to be audited if the load is less than 1 tonne). This level of sub-sampling will allow the accuracy of the actual sample to be calculated and provide sufficient data even if outliers are excluded that would otherwise skew the audit results. Where this happens, the data should be presented both with and without the outliers included.
- Randomised grid sub-sampling to be applied to all MSW, FO and FOGO loads where the whole load is not sampled.
- The data collected from each load collected from different housing types and each sample collection areas fully audited or sampled during the two-week audit phase included:
- MSW Loads: weights of food in garbage and recyclables in garbage; and of the food in garbage, sub-categories of unpackaged and packaged/contaminated food.
- FO and FOGO Loads: weight of food in all FO and FOGO loads before and after contaminants are excluded; weight of non-compostable contaminants in FO and FOGO loads and identification of sub-categories of unpackaged and packaged/contaminated food.

In recording the contents of the samples examined in the auditing process, the audit contractors were asked to classify contaminants as: soft plastic, hard plastic, glass, potential chemical contaminant (i.e. batteries or chemical containers) and other contamination categories as used at the Veolia EarthPower facility and ‘atypically heavy’ items.

Auditors also identified atypical contamination that may have skewed samples, such as heavy items, which were isolated and weighed separately so they can be excluded from analysis if they are likely to skew results.

Further details on the audit process and the results of the waste audit are in Section 5 of this report.

3 Communications and Community Engagement

3.1 Introduction

The FO projects required a considered and well-coordinated approach to resident communications as part of the overall project framework.

A Communications and Engagement Plan (the Plan) that sat alongside the quantitative research design included clearly articulated and staged contacts with the sample area households to explain the trial and encourage participation. Communication to residents commenced two weeks before the trial and continued via email updates, letterbox drops and call centre and website responses during the 14-week trial period.

A communications and community engagement brief was developed, and a communications consultancy firm was engaged, Spectrum Communications Pty Ltd (Spectrum), to develop a plan for communications and engagement across all the residential trial areas. This ensured consistent methods were applied by all three resident-facing councils and that the FO and FOGO projects' budget would benefit from cost-efficient production of shared content materials.

The Project Committee worked with the consultant to agree key strategies aimed at ensuring maximum community participation across the sample areas while minimising community confusion, and to develop a suite of key messages for communications collateral. Planning included identification of key stakeholders to ensure there was comprehensive consideration of potential community and stakeholder concerns in all messaging.

The Plan was referenced in the months that followed its finalisation in devising all participant communications and briefings to Council stakeholders (management and elected officials). The Plan was adapted to the design and delivery of communications collateral for the non-residential participants (Hunter's Hill Council project) with significant additional methods to suit a business audience and working environment and a much longer pre-trial engagement period.

3.2 Methodology

The communications approach applied for the FO projects is summarised in the staging plan in Table 3.1. For each of four stages, outcomes, tools and messages were documented. Attachment 2 lists the Key Messages identified for the plan and the 24 FAQs which formed the basis of the detailed information made available through the website www.nsroc.com.au/foodrecyclingtrial and the outsourced call centre.

The FAQs were also adapted for use in translated formats for apartment residents. FAQs were updated on the website during the trial in response to resident feedback from calls and emails. The print materials were delivered directly to letterboxes after the trial commenced to promote participation, after low participation in some areas became evident in the initial weeks of the trial period.

The adopted engagement and communications methods drew from previous local government food organics projects adapted to suit the characteristics of the sample areas (as described in Attachment 2). It was decided not to use social media, as the trial areas were limited in scale and broadcast messaging via social media would have created resident confusion and unnecessary workload. It is however intended that whole communities will have access to a summary of the results of the trials.

Table 3.1 Communications Staging Plan – Spectrum Communications

Stage	Outcomes	Tools	Key messages – short form
One **Inform and incentivise**	Participants have the information they need to take part in the trial effectively. Participation in the trial is enhanced through the use of incentives and positive promotion. Council staff and project contractors have the information they need to respond.	• Door knocks (deliver materials and where possible, collect email addresses) • DL flyers • Letters • Phone line • Posters • Social media • Stickers • Website • Veggie peeler distributed with caddies • Social media tiles • Window decals • Briefings and memos • Intranet • Website	NSROC/Councils are undertaking a research project to determine the best way of separating food scraps from garbage collection. Households have been invited to participate in a three-month trial across four council areas. The food scraps collected will be processed into a nutrient rich sludge to be used for agriculture and horticulture. You will be provided with everything you need to participate at no cost. Your caddy, compostable liners and bins will be delivered to you on [insert date]. We can all do our part to reduce our impact on the environment and make this project a success. For more information and to connect with other participants, head to NSROC website.
Two **Track and share**	Participants share contact details so that tips, experiences and results can be shared during and after the trial. Results are tracked during the trial and communications adjusted to support participation.	• Email newsletters • Phone line • Website	We can all do our part to reduce our impact on the environment and make this project a success. Here are some tips to avoid mistakes in using the caddy and food bin, and here is data on how the trial is progressing.

Table 3.1 Communications Staging Plan – Spectrum Communications

Stage	Outcomes	Tools	Key messages – short form
Three **Results and feedback**	Participants and non-participants in the trial have an opportunity to provide feedback on the trial. Feedback opportunities are attractive and receive a high level of interest.	• Survey – online and hard copy • Phone line • Website • Gift vouchers or similar on completion of survey	We want your feedback about what worked and what did not work. Feedback could be sought on: • what worked and what did not • what the barriers or challenges were • the education and information materials • the caddies and bags • the kerbside and larger bins • suggestions for improvement if a food scraps collection service was to be implemented long term • participant and non-participant attitudes to the trial and the broader aim of diverting food waste from landfill.
Four **Close the loop**	All stakeholders are informed about the outcomes of the research project and any next steps.	• Website • Briefings and memos • Email newsletters • Letters • Report summary	Information on the outcomes of the trial including the amount of food waste collected, contamination levels, what happened to the waste collected – where it went and how it was processed – and next steps.

3.3 Materials

An array of communications methods and materials was developed to maximise impact and compensate for the inability to use social and mass media for small area trials. Materials varied in their purpose and content, but used consistent design and language drawn from the Key Messages and the agreed graphic 'look'.

Communications materials included:

- Letters to residents (separate apartment and house versions) delivered three weeks before delivery of the food caddy and bags. Short form information in traditional and simplified Chinese and in Korean on the reverse of the letter
- Four-page A5 brochure (three versions for the three household types) showing how to use the caddy delivered with food caddy and bags by personal contact (door-knock delivery program).
- 'Sorry we missed you' cards left at households not responding to the door-knock when food collection materials were delivered, inviting contact.
- DL-sized prompt with magnet for fridge, showing what goes into the kitchen caddy, and what does not, delivered with the food caddy and bags.
- Vegetable peelers labelled 'For Your Food Scraps' delivered with all kitchen caddies
- Posters for use in foyers and lifts in apartment buildings.
- Bin stickers for household and building bins in chute rooms and bin bays.

The A5 four-page brochure which was delivered with all kitchen food caddies and adapted to suit to houses, low-rise or high-rise apartments was the most detailed advice item (example from page

2, below). The brochures' information content referenced advice from trials by the City of Sydney and Randwick Councils.

Table 3.2 has details of all materials developed and used before, during and after the trial. Attachment 2 includes images of some of the communications materials developed and distributed to residents.

One aspect of the engagement approach was to record resident contacts (inquiries and complaints) each week and disseminate the inquiries through a spreadsheet shared with Project Committee members. The resolution of all contacts was monitored centrally to minimise response delays, and to resolve concerns and questions as promptly as possible so that participation was not negatively impacted. The type, number and source area for inquiries to the call centre, calls to councils and via the website were recorded and are documented in Section 7 of this report.

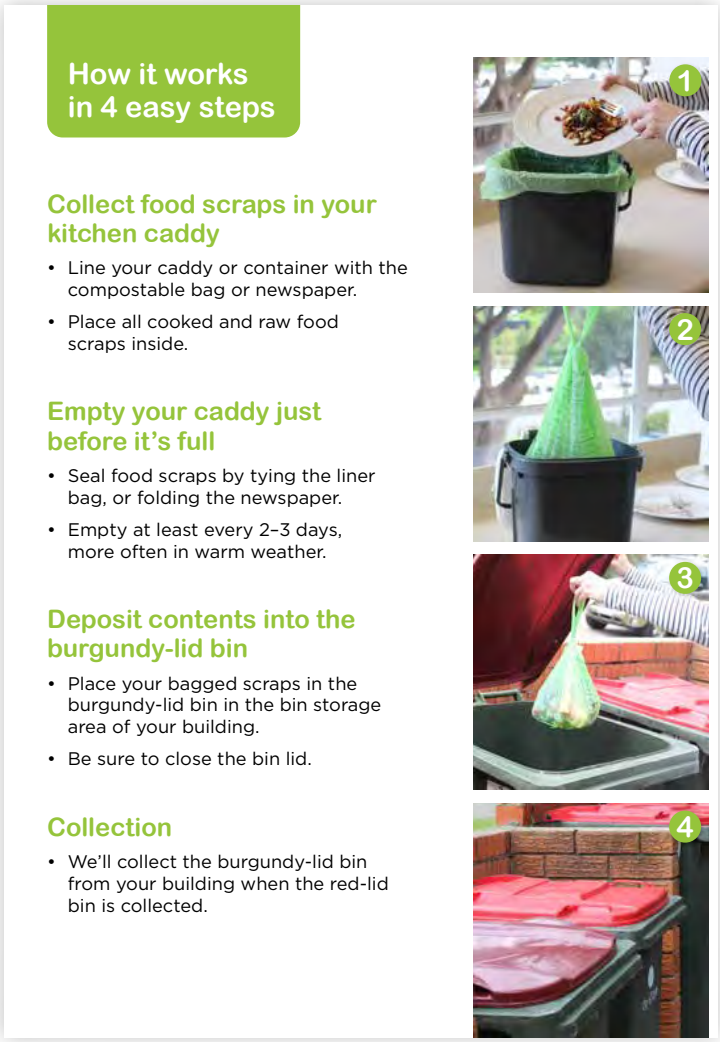


Table 3.2 Communications materials and methods

Method	Key messages
Briefings and memos	Briefings to Council staff and elected officials on the project prior to commencement, updates during trial and results summary at the conclusion.
Door knocks	Project representatives went door-to-door in the sample areas to deliver caddies and information, speak with participants about the Project, what's expected of their participation and answer any questions they had. In the event no-one is home after 2-3 visits, caddies and collateral were left at the door where permitted.
DL Flyers	"Sorry we missed you card" with contact information left with food collection and communications materials where no contact made. In high-rise apartments, advice on how to pick up food caddy left with card.
Email and updates	Four email updates were sent to communicate with participants who had provided email addresses. In Hunter's Hill weekly emails were sent to the organisations who agreed to participate in the trial.
A5 four-page brochures	Detailing the 'who, what, when, where, why, and how' of the trial, including step by step procedure with photos for caddy use and disposal into the food waste bins. Three versions across household types. Flyers included a QR code that links to the trial website.
Letters	Addressed mail sent to participants in the sample areas before commencement to provide an overview of the trial, what was expected of their participation and when they could expect door-knock to deliver caddies and bins. Translated into three community languages on reverse of two letter types (houses and apartments)
Meetings – face to face or online	Scheduled meetings with stakeholders to discuss participation in the trial. These included building managers, businesses and not-for-profit organisations in the non-residential trial area.
Merchandise	Vegetable peelers delivered with every food caddy, with "for your food scraps" printed on them to reinforce purpose of delivered materials.
Phone line/phone calls	Call centre engaged from the commencement of delivery of food collection materials, to answer basic inquiries using the FAQs and to capture and refer actionable enquiries and complaints to council staff or NSROC. Where practical, return calls were made to residents with particular concerns by Project Committee members.
Posters	Visually appealing A3 posters in the common areas of MUDs and participating businesses and NFPs.
Stickers	Bin stickers for all food bins showing what material should go into the bin; Chinese language bin stickers for apartment bins.
Surveys	A two page survey of mainly multi-choice questions (three versions) provided to all residences/participants in the sample areas to seek feedback on their experience during the trial. Surveys provided online and in hard copy via letterbox drop to all residences in the sample areas to encourage responses. Incentives to return surveys offered to all participants (shopping vouchers)
Video	Short video introducing the trial and encouraging participation was professionally produced and loaded onto the food recycling trial website.

Table 3.2 Communications materials and methods

Method	Key messages
Website/s	Dedicated project webpage hosted by NSROC to provide a single source of trial information including FAQs, contact information, fact sheets, video, background information and online form for registering for trial updates.
Window decals for non-residential participants	A marketing tool for food businesses and education services to promote their participation in the trial and their commitment to positive environmental outcomes.

3.4 Non-residential trial communications

The communications approach for the non-residential FO project was through direct contact and over an extended period, as was suited to an opt-in program in places of business or service delivery. After visits to explain the trial and enlist participation to more than 100 organisations, 90 agreed to participate. The trial faced both implicit and unforeseeable challenges over the nine-month period that project staff engaged with participants. In some cases, these challenges were unexpected (such as collection contractor service failures) and in others unavoidable in a business trial and a non-contiguous sample area.

The chronology of communications and issues surrounding engagement with, and service delivery to, the non-residential participants is summarised here:

- Personal visits to organisations and participation recruitment May to October 2021
- COVID delay communicated – start date set for November 2021
- 30 November, letter to education providers to advise that in term one 2022 materials would be delivered
- January and February 2022 – visits to business and organisations to retain interest; distribution of decals and posters.
- February 2022 – pre-trial letter delivered to all participants
- 17 February to 7 March 2022 – food collection materials deliveries
- Trial start date (14 March) collection contractors failed to pick up bins
- 22 March collection contractors failed to pick up bins
- 29 March – decision made to engage alternative collection contractors
- 19 April – new collection contractors commence collection, using red-lid bins with FO stickers
- Week 3 additional stickers applied to bins.
- Weekly during trial period – emails to all and visits to many businesses to encourage participation; additional staff recruited to contact businesses.

DATA

4 Food Organics Data Analysis

4.1 Data sources

Four data sources were generated to ensure that the evidence required to answer the research questions would be available:

- Weekly FO & FOGO tonnage data during the trial
- Audit data analysis (reported in Section 5 of this report)
- ABS Census data on the sample areas in the FO projects (reported in Section 6)
- Weekly inbound information report from residents' calls and emails, and feedback from waste management service providers (reported in Section 7)

4.2 Food organics data reporting

Weekly weight data was assembled in a Master Food Organics Weekly Summary (Weekly Summary) prepared by the Principal Representative (contract manager) for the Waste Services Alliance using direct data from the Veolia weighbridge reports.

This source was the principal method of obtaining data to respond to research question 1: how much food is presented for collection by councils in houses, units, businesses?

Veolia data provided to the Waste Alliance came from the delivery of FO & FOGO collections by delivery date, collection service, tare and net weight for each truck load and source council area (LGA) in tonnes. The Weekly Summary captured this data and provided the basis for generating other data items. As a result of this approach, all stakeholders relied on a single source of truth for the food weight data during the trial period.

This Weekly Summary also included sample area and average waste weight per household by the total and participating number of households. It was reviewed each week by the Project Committee so that any anomalies could be rectified. This proved very useful in the early weeks of the trial when the collection contractors were becoming accustomed to the trial areas and delivery arrangements.

The Weekly Summary calculated weekly average per household volumes based on household numbers for each sample area from council information and the results of the door-to-door caddy delivery program.

In Table 4.1 total households (HHs) is the number of residences in a geographic sample area that are not abandoned or unfit for habitation. This total number would come into play in planning for future services and likely food organics volumes from comparable suburbs to the trial areas.

The participation-enabled households are those residences in a trial area where the food caddy was accepted during the door-knock delivery program, or where the food caddy was left at the doorstep after two unsuccessful personal visits in the case of houses (SUDs) and low-rise apartments (LRA)[1]. While acceptance of the food collection materials cannot be taken as compliance with the request to use them for food waste, households in this group were able to participate, as they did not decline delivery of the food caddy – hence 'participation-enabled' as in Table 4.1 (elsewhere in this section, referred to as participating households).

In high-rise apartments (HRA) food caddies were either personally accepted (after 2 or 3 visits) or declined. This situation arose because of late advice from building managers that they would not permit leave materials to be left at the doorstep due concerns that doing so breached fire regulations.

1 ABS: Australian Bureau of Statistics; FO: Food Organics; FOGO: Food Organics and Garden Organics; HH: Households; HRA: High Rise Apartment; LRA: Low Rise Apartment; NSROC: Northern Sydney Regional Organisation of Councils; SUDs: Single Unit Dwellings, houses; LGA: Local Government Area.

Notes were left at these apartments encouraging residents to pick up their food caddy from the building manager or from Council, however only three were collected by residents. This unexpected impediment to the engagement and delivery strategy reduced the participation-enabled households in the high-rise trial area by 190.

The total number of households in all areas was reduced by declined deliveries to derive the participation-enabled household number, as shown in Table 4.1. Caddy delivery was conducted from mid-February to early March in residential areas, and the trial commenced in those areas on 14 March as a pilot week. Full data collection commenced on 21 March and concluded on 24 June (14 weeks).

In this section of the report the FOGO and non-residential sample areas are reported in separate sub-sections.

Table 4.1 All trial areas, household numbers and trial area

Council	Household (HH) type	Sample area	Waste Type	Total households	Participation enabled households
Ryde	Low rise	Meadowbank	FO	210	207
	Low rise	Gladesville	FO	227	222
	Low rise	Eastwood	FO	262	246
	TH/Low rise	Macquarie Park	FO	248	246
Lane Cove	SUDs	Greenwich	FO	436	419
	SUDs	Lane Cove Nth	FO	293	287
Willoughby	High rise	Chatswood	FO	547	526
Residential FO households			**FO**	**2,223**	**2,153**
Ryde	SUDs	Chatswood West, Nth Ryde	FOGO	243	230
Hunter's Hill	Non-residential FO	Hunter's Hill LGA	FO	90	69
Total				**2,556**	**2,452**

Note: participation-enabled household number excludes abandoned or under construction premises in the sample area and households declining to accept delivery of food caddies; includes caddies delivered either in person, collected or left at door after a minimum of two door knock visits including one made after business hours. (1) Hunter's Hill: weekly variable participation week to week with 69 participants in at least one week, averages reported based on number of deliveries in each week.

There were 7 sample residential FO areas: Meadowbank, Gladesville, Eastwood, Macquarie Park, Greenwich, Lane Cove North, and Chatswood; and one non-residential FO sample area in various non-contiguous areas of the Hunter's Hill LGA.

Two small areas (parts of the suburbs of Chatswood West and North Ryde) formed a single FOGO trial sample which was summarised and reported as a single total in the Master FO Trial Weekly Summary and in this Report.

For the sample area in Hunter's Hill LGA for non-residential organisations (such as education services, cafes, restaurants, and professional services businesses) food collection materials were delivered to organisations agreeing to participate in the trial. In all the other trial areas, all residents were asked to participate and were provided with food collection materials unless specifically declined or undeliverable. The non-residential trial commenced on 19 April 2022. Table 4.2 shows the number of participation-enabled households by type of dwelling.

Table 4.2 All trial areas, participation-enabled households by household type

Council	Household (HH) type	Trial area	Participation enabled households	Participating Households by HH type
Ryde	Low rise	Meadowbank	207	675
	Low rise	Gladesville	222	
	Low rise	Eastwood	246	
	TH/Low rise	Macquarie Park	246	246
Lane Cove	SUDs FO	Greenwich	419	706
	SUDs FO	Lane Cove Nth	287	
Willoughby	High rise	Chatswood	526	526
Residential FO households			**2,153**	
Ryde	SUDs FOGO	Chatswood West, Nth Ryde	230	230
Hunter's Hill	Non-residential FO	Hunter's Hill LGA	69	69
All participants			**2,452**	**2,452**

4.3 FO households

The FO trial sample areas reduce space between areas and have a total of 2,223 resident households. Personal delivery of food collection materials to all households was attempted. As noted, in the houses and low-rise apartment areas, caddies were left at the door of residents who did not respond to door-knock delivery after 2 or 3 visits. In Lane Cove 139 caddies were left at the door across the two areas; in the four Ryde sample areas the number of caddies left at the door was 302.

While the number of caddies left at the door was higher than had been hoped, the rate of declining the food collection materials where personal contact was made was much lower than had been assumed. Only 70 of all householders contacted directly declined to accept the food collection materials.

Reasons for declining the caddy reported by the delivery contractor included: no room in the kitchen, not interested and not much food waste. The delivery contractor also reported that non-English speakers were prevalent in the resident group declining to accept the caddy.

As noted, in the high rise apartment buildings, caddies were not left at the door, so all the participants in the sample (526) are those who accepted the caddy when the door-knock delivery was conducted or picked up the caddy from council or building management.

Of the total participation enabled households in the FO trial areas (2,153), 24% (526) were in high rise apartments, 43% were in low-rise apartments (921) and 33% (706) participants lived in single unit dwellings (houses).

Attachment 3 includes details of the food caddy delivery program in all sample areas.

4.4 FO residential data

Figure 4.1 and Table 4.4 show the cumulative average weekly FO weight and the 14-week total weight collected per week per participating household in each sample area in the residential FO trial areas. Added to Table 4.4 is an estimate of the FOGO weight based on the 2-week waste audit finding that 10% of the FOGO bin was food material, extrapolated to the 14 weeks of the trial.

Table 4.3 shows that the waste audit measurement of food presented in the two-week audit period returned very similar average weights in all but one sample area (the townhouses/low-rise apartment sample area). It is logical to rely on the 14-week data for planning purposes as it takes into account the take-up and settling-in periods of using the food caddies and bins.

Tonnages in the FO bins from a relatively small number of bins rejected for collection by waste collection contractors and not delivered to the Veolia EarthPower facility are not included in these averages. Most of the bins rejected by collection contractors were in the low-rise apartment areas. A likely contributing factor to contamination of the food bin and hence rejection, was the similarity in the bin-lid colour, with red lids (general waste) and burgundy lids (food waste) being close in colour and easy to use in error, especially if food bags are dropped off by residents when going to or from work, in low light (see discussion in Contamination section).

However, overall, contamination issues are likely to have inflated average volumes rather than depressed them due to the acceptance of almost all delivered waste from the trial areas, despite the reported presence of plastic bags, termed as ‘minor contamination’ by the waste services provider and dealt with at a later stage of the compost production process by the food organics processor.

Figure 4.1 **Average Overall Weekly FO Weight by Household Type (14 weeks data)**

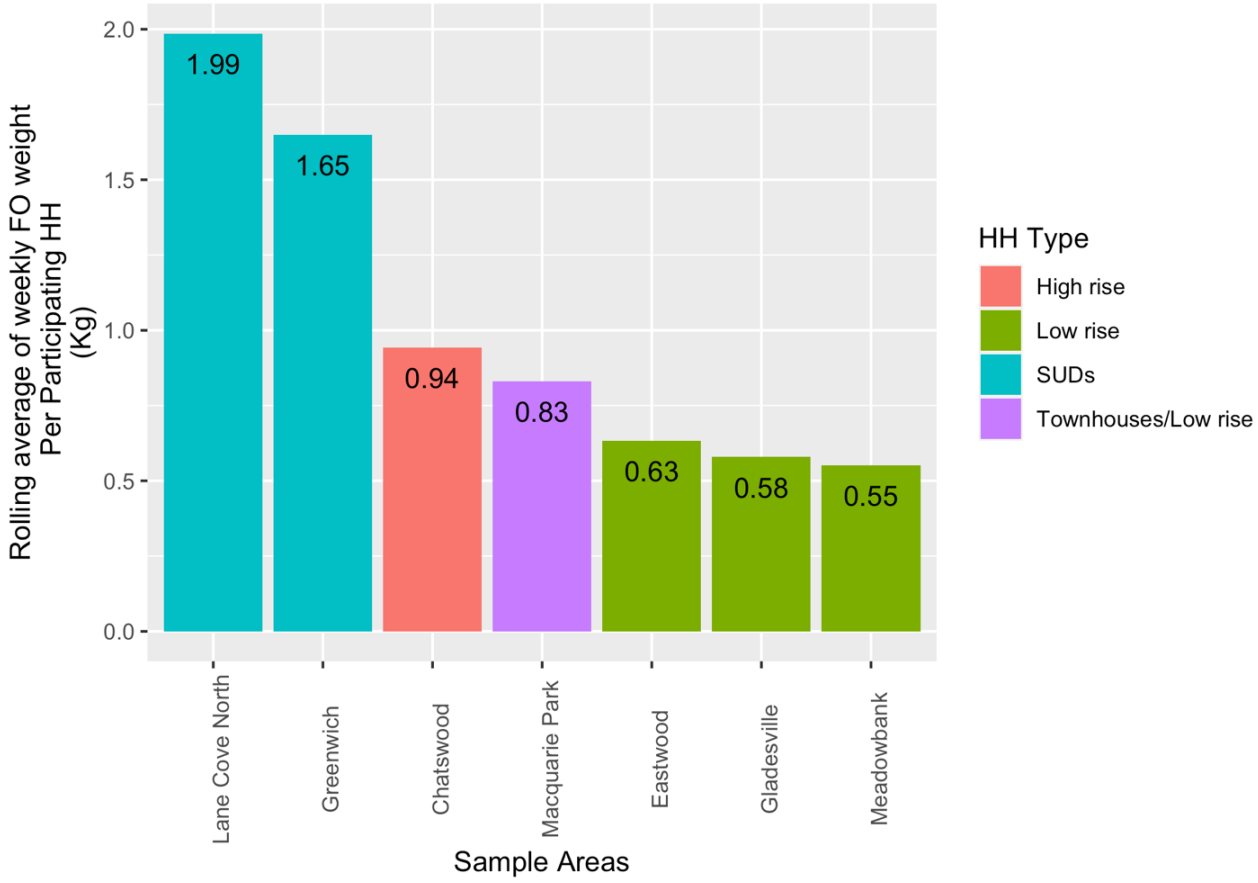


Table 4.3 **Average Weekly Available Food* volume per participating household in FO bins, 14 week trial period and 2 week audit period**

Household (HH)	Available Food in food bins weight during 14-week trial	Available Food in Food bins during 2-week audit
Houses	1.78 kg	1.68 kg
High rise apartments	0.94 kg	0.75 kg
Low-rise apartments	0.59 kg	0.61 kg
Townhouses	0.89 kg	0.75 kg
FOGO Houses	Estimate 1.03 kg	0.73 kg

* Available food – all food material presented, including containerised/contaminated food, which is unusable for compost under EPA regulations.

Table 4.4 Residential survey responses by area and % total sample and response number

Household (HH) type	Sample area	Participating Household #	Total Volume over 14 weeks kgs	FO volume per household over 14 weeks	Average FO per week volume per household
Low rise	**Meadowbank**	207	1,600	7.73	0.55
Low rise	**Gladesville**	222	1,800	8.11	0.58
Low rise	**Eastwood**	246	2,180	8.86	0.63
Townhouses/ Low rise	**Macquarie Park**	246	2,860	11.63	0.83
SUDs	**Greenwich**	419	9,680	23.10	1.65
SUDs	**Lane Cove Nth**	287	7,980	27.80	1.99
High rise	**Chatswood**	526	6,940	13.19	0.94
Houses FOGO	**Nth Ryde** **Chatswood West**	230	FOGO 33,100 FO estimate 3,331	FOGO 143.9 FO estimate 14.4	FOGO 10.28 FO estimate 1.03

4.5 Week-to-week food presentation

As shown in Figures 4.2 and 4.3 in the low rise/medium density trial areas, week to week variations were significant in all trial areas. Some of the lower presentation weeks were those where the collection contractors rejected loads due to the presence of general waste in the food bin. For example, in week 6 in Meadowbank three out of 12 bins were rejected by the collection contractors. In the same week in Gladesville, 3 out of 15 bins were rejected and in Eastwood 4 out of 19 bins were rejected. While the Project's research design relied on all presented FO material being delivered to the food processors so that the contamination could be measured, the terminal operators pushed back on this with the collection contractors to avoid the extra process steps involved in disposing of general waste to another facility. In week 6 (impacting week 7) new bin stickers in Chinese were added to remind residents not to put food in the garbage bin, which could account for the lift in average volume in week 7 in Meadowbank.

In the two houses suburbs, week-to-week variation was much less. It appears from this pattern and the very few inquiries about what could be placed in the food caddy and bin, that the communication materials were effective, as the residents who wanted to participate in the separation of food from general waste did so consistently.

Figure 4.2 **Average Food Organics Weight, 14 weeks: Lane Cove North, Greenwich, and Chatswood**

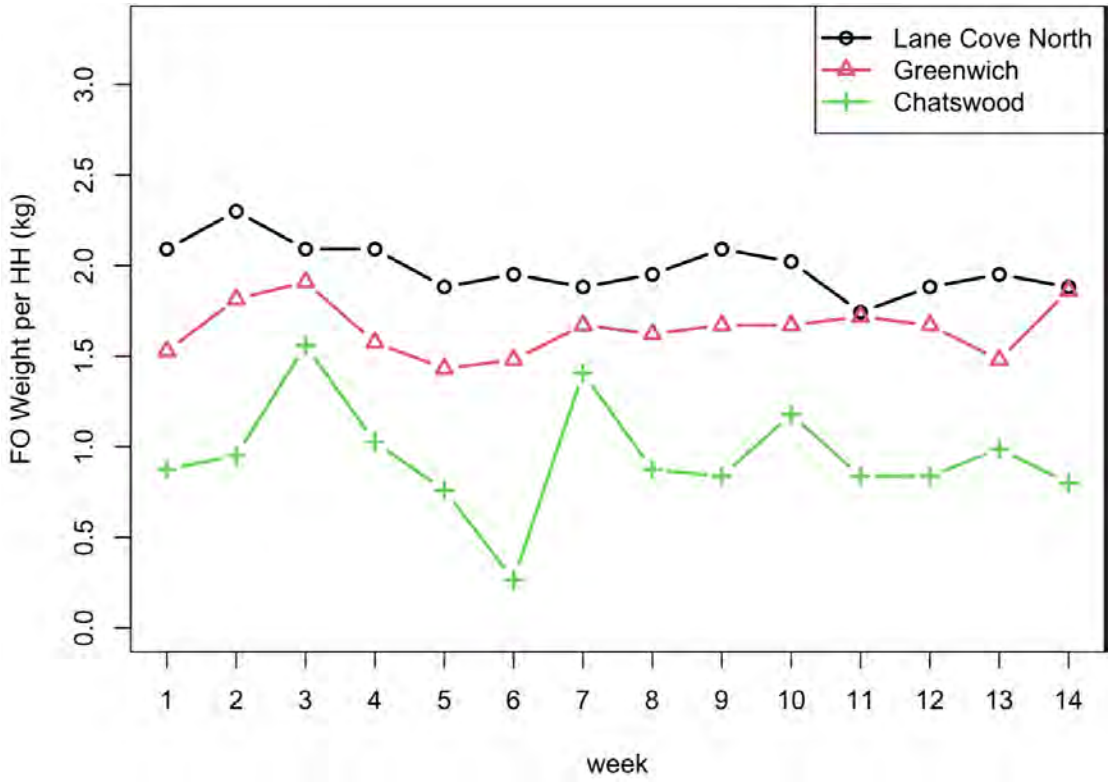
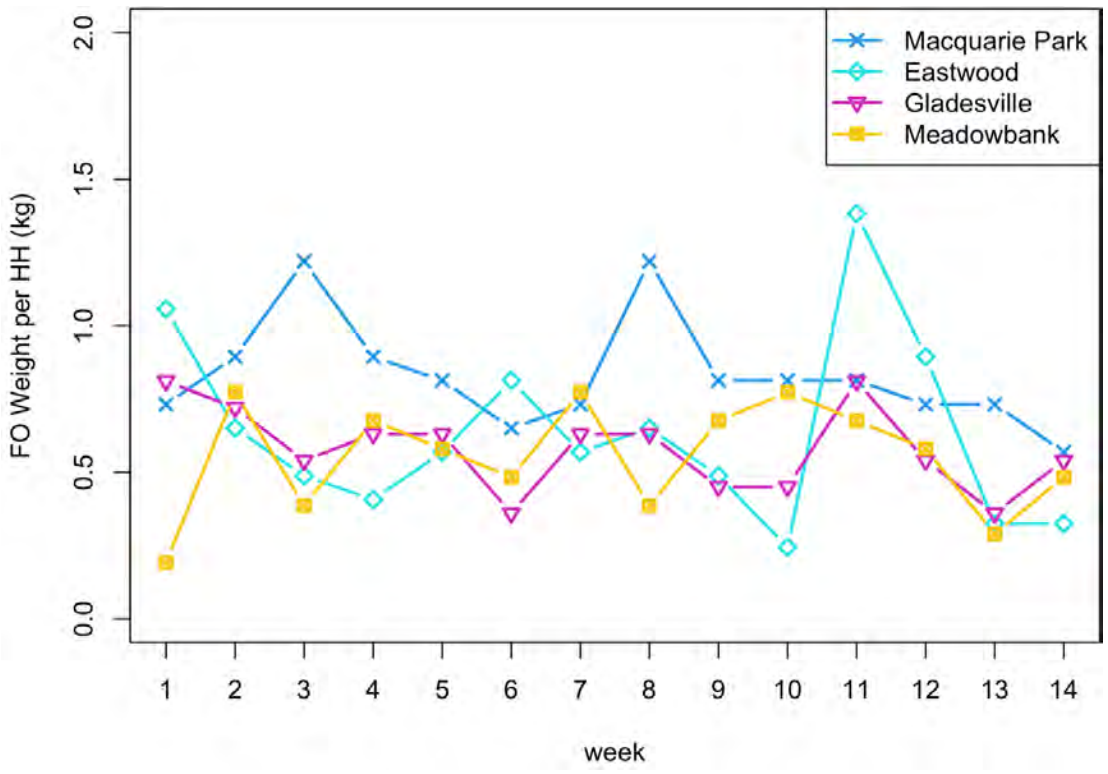


Figure 4.3 **Average FO Weight, each week for Macquarie Park, Eastwood, Gladesville, and Meadowbank**



4.6 Average volume data analysis

Houses (single-unit dwellings or SUDs) presented significantly more food organics in the food organics bin during the trial than any of the three apartment household types and by a significant margin. The medium density (low-rise) area of Macquarie Park is mainly (73%) townhouses, and this area showed a different per household result to the other medium density (low-rise) areas, which were generally 'walk-up' apartment buildings of three stories. Demographic characteristics may have been the drivers of these food volume results (see Section 6 for further discussion).

It is also important to note that 32% of households in the low-rise apartment areas, where much less food organic material per household was presented, were not contacted directly to have the trial explained (discussed in 4.3) because residents were not at home or did not answer the door to the caddy delivery contractor, even after hours, and after two or more visits. This compares to 96% in the high-rise apartments (where caddies could not be left at the door) where per household volumes are much higher on average.

This may indicate that the door-knock, personal approach to engage with the resident was critical to the correct use of the food collection materials and to engendering a willingness to engage in separating food from general waste.

Other factors mentioned in resident contacts (calls and emails) during the trial were:

- Food bin lid colour being too close to the red of the general garbage bin, making collocated red lid and burgundy lid bins in food bin bays hard to distinguish.
- Caddy liners breaking due to being too full or left in the kitchen too long, leading to a bad experience and cessation of participation by residents.
- Food bins being smelly and wet and depositing rubbish in them an unpleasant experience.

Waste presentation is a behaviour influenced by lifestyle, environmental awareness and interest, and capacity to adopt new household waste management practices. The only way to interpret data on the scale of the Project's trial samples, and indeed in all waste audit programs, is to calculate average per household data (volume divided by number of households).

In the absence of knowledge of individual household behaviour, the average per household result should be understood to have various possible meanings in terms of the average food organics presented an area in the food segregation trial.

Average totals can be interpreted in four ways:

- All households participated and presented all their food waste correctly, so the volumes presented are a true measure of available food waste
- All households participated but did not present all food waste, so the volumes reflect some of the available food waste
- A share of all households participated and presented all their available food waste, so the volumes reflect some of the available food waste.
- A share of households is participated but did not present all their food waste, so the volumes reflect partial available food waste.

The reality of these scenarios requires waste management data analysis and planning to rely on multiple data sets – as this Project does – so that the amount of food left in the red-lid bin can be factored into conclusions about which of the four scenarios is most likely to be represented by the data. Logically, the Project's results most likely relate to some households participating and presenting some or all of their food waste.

Comment on the inferred average household participation rate in the sample areas is in Section 5 of this report, drawing from the audit data on food remaining in the general waste bins and on the 14-week food presentation data.

Week-to-week variations in each of the areas also showed differences as shown in **Figures 4.2** and **4.3.** FO per household per week in the single-unit dwelling areas were steady once the initial two weeks of the trial were over, with one or two small dips. In the high-rise apartment buildings volumes varied widely over the 14 weeks but settled into some sort of consistent pattern after the introduction in week 3 of separately engaged cleaning contractors to empty the food bins and clean them each week. The considerable cost of this service ($2,000 per week) would have to be factored into any future service planning.

4.7 FOGO food volume data

City of Ryde Council conducted a concurrent mixed garden and food organics trial with a sample area drawn from two suburbs, reported as a single trial area. Data has been shared in this Report to assist in deepening the information available to compare current waste management services with alternatives. Results from the waste audit conducted under the same methodology as used for the FO trial areas is reported in Section 5 of this Report.

Weights in Figure 4.4 and Table 4.5 include vegetation which is subject to weather effects on the green portion of the bin. The amount of food waste in the FOGO bin cannot be estimated from the weekly delivered tonnages for this reason. The food organics analysis in this report relies on the audit results.

Figure 4.4 Average FOGO Weight per household, each week in Chatswood West/Nth Ryde

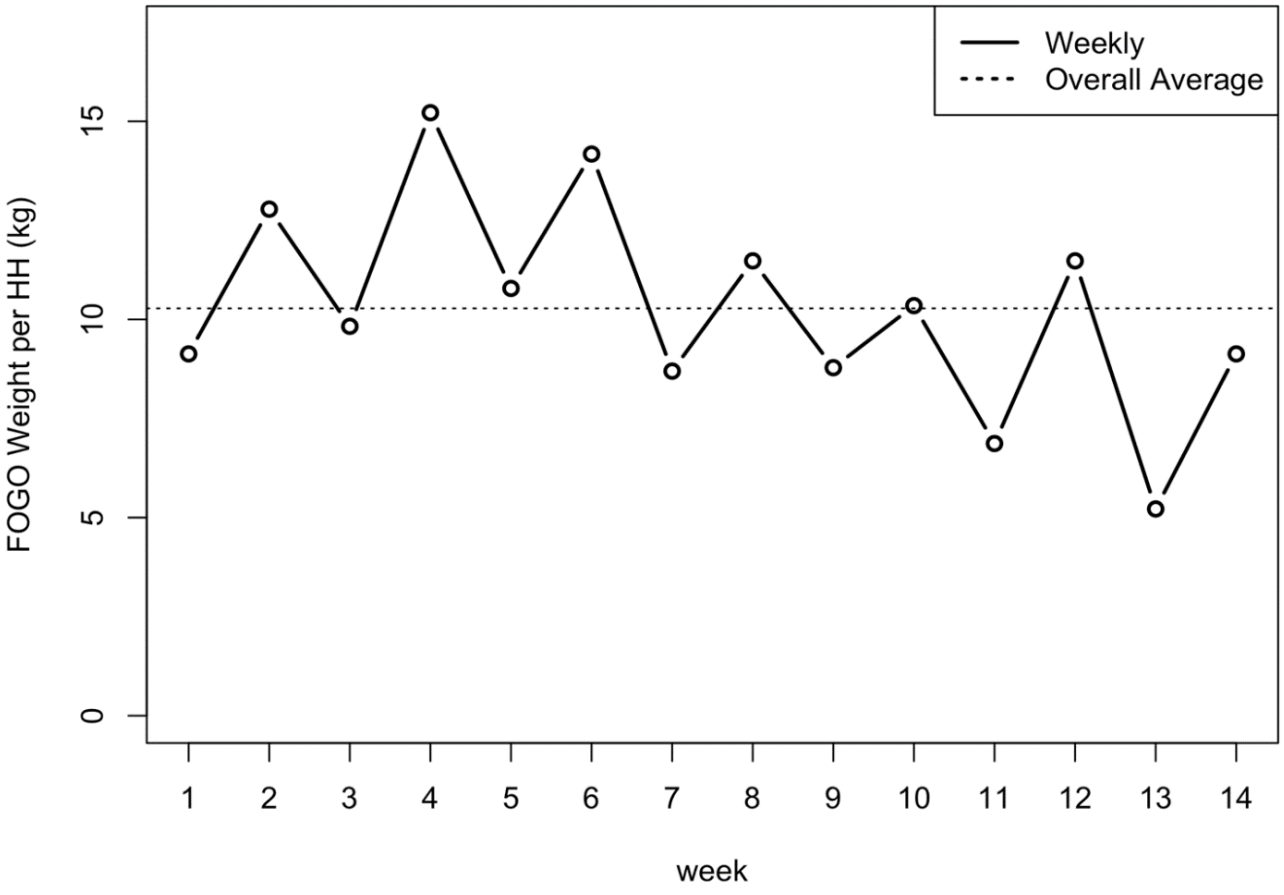


Table 4.5 Ryde – FOGO weight per week

Week	Weight kgs	Week	Weight kgs
1	2100	**8**	2640
2	2940	**9**	2020
3	2260	**10**	2380
4	3500	**11**	1580
5	2480	**12**	2640
6	3260	**13**	1200
7	2000	**14**	2100

4.8 Non-residential areas food organics trial

To gather as much information about the potential of food organics segregation in local areas, a trial of non-residential organisations was devised.

A total of 90 organisations in the Hunter's Hill LGA agreed to participate in the non-residential food organics trial and accepted delivery of caddies and bins. As discussed in Section 2, this trial was comparable to an 'opt-in' trial and needed quite different project management from the residential sample areas in terms of waste collection materials and the timing, nature and content of education and communication methods.

A mix of business types was targeted for the trial, so that comparative data on available food was generated. The diverse nature of the businesses meant that different sizes in kitchen food collection materials were needed, requiring individual consultations to determine the appropriate size of bins for the available space and the likely food organics volume.

Personal calls on the business premises were undertaken on multiple occasions to ensure that all staff working knew about the trial. A personalised communications approach was adopted to meet this distinct difference from residential engagement and is discussed in Section 3 of this report.

The commitment and engagement of non-residential organisations, whose representatives had initially agreed to participate in the third quarter of 2021, was impacted by the delays to the Project commencement due to COVID, with two start dates cancelled (August and November 2021). This unavoidable stop-start communication from the project to the businesses led to difficulties in providing clear messaging to the participants.

In contrast to the residential participants, who were not aware of the trials during the extended lead-up in 2021, the business participants had been 'hearing about it' for months because they were recruited by the project manager to take part in the months before the initially planned trial start date in August and regularly contacted to maintain their interest.

As delays were COVID-related, the project manager could not advise potential participants of the commencement date when contact was made to inform them about delays. This unavoidable situation is likely to account for some of the reduction from 90 agreed participants to 69 organisations who actually presented food waste.

Another complexity facing the non-residential trial was that the participating organisations were not all geographically proximate and used various waste collection services for general waste. In residential areas, existing collectors simply added a truck to pick up FO on the same day as the general waste was collected. For the business trial, it was often the case that participants had to put the food bin out for collection on a different day to the general waste pick-up.

Waste collection service failures also impacted the non-residential trial. The initially-engaged waste collection company was heavily impacted by the extreme weather event in early March and did not have a truck or staff available to pick up the food waste for two weeks from the final commencement date and did not advise of the severity of the problem until after the service was due to commence.

As this issue remained unresolved for more than two weeks, a new service provider was engaged. Implementation of this change was delayed by the need to remove the bins put out by the first contractor, and then by lack of resourcing by the second company to deliver new bins. The only bins available without another multi-week delay had red lids, and while there were explanatory stickers on all the food bins, this almost certainly contributed to the contamination of the FO bins by passing shoppers in cases where the bins were in a public area.

Additional bin stickers were put onto the bins after the first three weeks, which slightly decreased contaminated bin presentations.

There were persistent problems in collection of food bins by the second contractor in the early weeks of the trial, with the large numbers of missed bins or bins picked up in general waste runs. This was likely because collectors were not familiar with the area .

Similar collection issues led to a gap in the quality of data during and after the audit weeks. The end result was 10 weeks of reliable data from 14 weeks of the FO collection service .

As soon as the lack of engagement by organisations which had agreed to participate became clear in the early weeks of the trial, resources were added to visit, call, and email the representatives of the businesses and organisations. This was done repeatedly during the trial.

Even if the trial start-up issues had not been as complex, the experience of the trial made clear that the engagement strategy for non-residential premises requires more contact and project management resources than residential areas and the planning of a service would have to account for many more variables than a residential trial.

Another important reality is that business owners and managers generally allocate only the time to managing waste required by compliance requirements, with limited capacity to attend to waste sorting by staff and variable commitment to the environmental benefits of waste segregation.

4.8.1 Variation in food volume during the trial

A total of 69 organisations presented food waste in at least 1 week of the trial, and 36 organisations did so in 5 or more weeks of the trial. This reduced level of participation from the number recruited, while disappointing, nevertheless produced data that will be useful in understanding how much food waste could be segregated from small businesses and not-for-profit organisations of several types.

The data in Table 4.6 shows that the number and type of pick-up addresses were not by themselves reliable indicators of average weekly volumes. For example, in the weeks that the schools took part (six of the 10 education organisations) more waste was collected because of the size of the operation, however in the July school holiday weeks (weeks 12 and 13) which were the audit weeks, there were fewer pick-ups but comparable average waste volumes. Much more research is needed to understand how the bins were viewed and treated in education settings.

Up until week 8 of the trial bins with general waste apparent on the top of the bin were not picked up by the collection contractors. It is likely that some of the bins in public laneways were added to with general waste by passing shoppers. After week 8 waste collectors were asked to pick up all bins regardless of visual contamination, unless grossly contaminated, so that the level of compliance with the food organics segregation could be measured. For example, two bins containing only office paper waste in week 9 were not picked up. As with most of the other trial area collections, no loads from this area were rejected by the waste terminal over the course of the trial.

4.8.2 Food organics in non-residential trial

Figure 4.5 shows the average of the weights presented per organisation in 10 of the trial weeks, applying a variable participation number to show an average per presenting organisation per week.[1] Even with the difficulties faced in managing the collection of the food waste, between 13 and 23 kgs per week were collected from each participant.

Table 4.6 shows the total volume average in the non-residential trial for each of the 10 weeks, the number of pick-up addresses and the number of bins not collected due to contamination. Contamination was mainly from bags of general waste deposited in the food bin, and these were often in bins that were in publicly accessible areas.

34 of the regular trial participants were restaurants or cafes; however, most cafes and restaurants only had one 120 litre bin. It appears that this business type's waste formed the core of all food waste collected during the trial, with participation from other organisational types varying more widely from week to week.

The variables influencing the volume of food presented are understood by the project team to be:

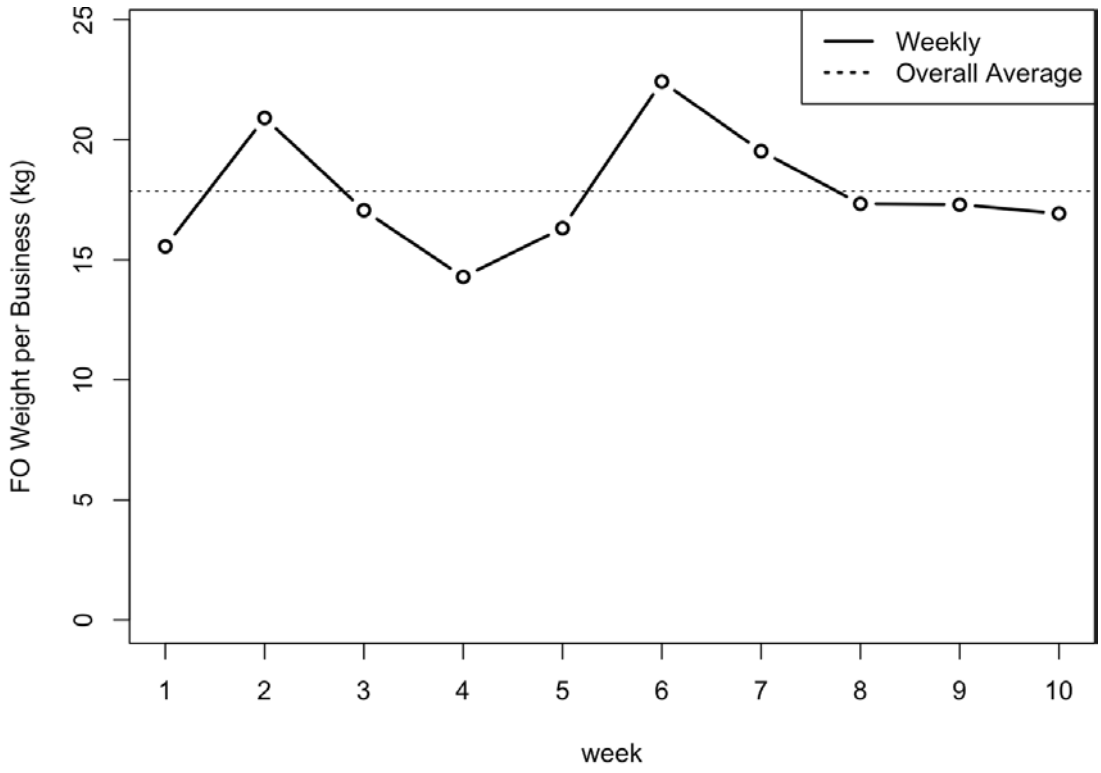
- Use of the bin for general waste, inadvertently by staff or by deposits made into bins in public areas (businesses in shopping arcades);
- The number and size of bins used by the organisation (see Attachment 3 for the bin allocation for each business by type);
- The type and size of the organisation
- The willingness or ability to integrate food waste segregation into the business and production processes of the organisation.

Table 4.6 Waste volume average in non-residential area, by week

	Number of pick-up addresses with bins for collection*	Number of bins not collected due to general waste contamination	Number of addresses' waste delivered to terminal	Total kgs delivered	Average kgs per address
1	27	8	19	280	14.7
2	31	9	22	460	21
3	39	8	31	580	18.7
4	34	5	29	500	17.2
5	44	10	34	620	18.2
6	45	12	33	740	22.4
7	47	5	42	820	19.5
8	49	17	32	780	24.3
9	35	3	33	640	19.9
10	35	17	18	660	36.7

1 In weeks 11-13 the waste auditor picked up available bins instead of the collection contractor; the data from those weeks is reported in Section 5

Figure 4.5 Average non-residential FO Weight, each week in non-residential area



4.8.3 Food organics from types of non-residential organisations

One of the important research interests in the non-residential trial was to find out how much food different types of business types generated, and how willing the organisations were to participate by presenting non-contaminated food waste.

The food waste was collected and weighed at the delivery terminal from the participating organisations in one collection run, so in order to understand more about how much food waste business types generated, data was extracted from the collection contractor's run-sheets to ascertain the number participating from each business category each week and the variation in weekly volumes from all pick-ups (Tables 4.7 and 4.8). This data should be understood as an indirect estimation measure for relative FO contribution from business types.

Table 4.8 makes clear that cafes and restaurants were the most consistent presenters of waste during the trial. However as relatively small businesses, with generally only one small food waste bin, they did not present large amounts of food waste per organisation on average. The private hospital and the education service providers presented higher volumes but participated less reliably, with only 4 (of 10) presenting waste for collection in more five weeks or more.

For example, two bins containing only office paper waste in week 9 were not picked up. As with the other food collections, no loads from this sample area were rejected by the waste terminal over the course of the trial.

Table 4.7 Non-residential organisations presenting food for collection, by type by week

Number Week	Cafes	Restaurant	Other food	Education	Prof services	Hospital/ aged care	Total	FO Volume kgs
1	5	6	4	0	1	0	16	280
2	7	11	3	1	0	0	22	460
3	9	7	4	3	8	0	31	580
4	7	8	6	4	4	0	29	500
5	12	10	6	4	2	0	34	620
6	11	8	4	6	2	1	32	740
7	13	12	7	3	7	0	42	820
8	9	7	4	7	5	0	32	780
9	11	8	4	3	5	1	32	640
10	6	**3**	3	3	2	1	18	660

Table 4.8 Non-residential weekly participation by organisational type

Organisation type	Number of organisations participated*	Number of weeks participation	Average weeks participation by type**
Number of weeks participation	Average weeks participation by type**	112 weeks	7
Restaurants	17	83 weeks	5
Other food (including takeaway)	10	21 weeks	2
Education	10	34 weeks	3
Hospital	1	4 weeks	4
Professional services	14	48 weeks	3
	69		

* Participated for at least one week. 21 organisations presented bins for collection for 1 or 2 weeks. ** Rounded

Table 4.9 shows which business types were most successful in presenting non-contaminated food waste, based on the collection and delivery arrangements in place during the trial (see discussion in Section 5 on Contamination).

The Western Sydney University statistical consultant to the Project, Dr Russell Thomson, worked with the waste audit data to estimate the average volume from each organisation type, adjusting for bin size. Weights across all businesses over the two-week audit period were added and a mean weight calculated per business, for each business type. From this analysis was calculated the food fraction (percentage of weight that is food) in the General Waste and FO bins.

Bakeries, schools, and cafes were the best sources of food volume and presented the least contamination.

The non-residential trial supplies evidence of substantial amounts of available food material in business/service organisations of the type found in areas similar to Gladesville/Hunters Hill. The findings make a case for a more focused trial that would be designed to incorporate the lessons learned about communication and managing waste collection services in commercial areas, and the most prospective organisational types with regular food waste (food services) and higher volumes (education and health care delivery). For long-term and more universally mandated food organics collection, a program backed by compliance tools, including inspection and monitoring of both the businesses presenting the waste and the waste management companies collecting and accepting the waste would be necessary.

Table 4.9 Food weight in food organics bins, by business type

Business type	Food Weight in FO Bin	Total Weight in FO Bin	Food Fraction in FO Bin (%)
Bakery	30.3	35	86.7
Café	16.8	18	93.5
Other Commercial	1.4	6.8	20.8
Restaurant	8.1	10.1	80.1
Schools	21.1	21.2	99.5

5 Food Organics Contamination and Waste Audit Data Analysis

5.1 Introduction

Detailed examination of all loads of waste material in the mixed waste (MSW) and food organics bins from each trial area for two weeks was central to the research design adopted for the Food Organics Project.

Two of the FO projects' research questions required information on how much compost could be produced from FO material collected from the various household areas in the trial and how much material that was unuseable for compost production (due to contamination) was put into the food bins.

The sample sizes and auditing methods were devised to obtain statistically valid data about the quantities of food diverted from garbage and the portion that could be recovered through a separate food organics collection service to create compost that would be compliant with regulated standards.

Two weeks of waste audits were commissioned by Ku-ring-gai Council on behalf of the Project Committee for all MSW, FO and FOGO loads from each area. The data collected allowed assessment of the variability between trial areas and the creation of a picture of the variation in food organics segregation between trial areas and household types. Specialist waste auditors were selected as a result of a competitive RFQ process to undertake audits specified in accordance with the FO Project's research design.

The waste audit objectives were:

- To collect statistically reliable and robust data to provide a key data set
- To establish how much food waste is correctly segregated into a separate food receptacle
- To establish how much food remained in the general waste bin
- To identify contamination levels in food organics loads and the proportion of collected organics that would be recovered or rejected by the processor.

5.2 NSW EPA policy on FO and FOGO bin use

It is important to be clear about the contamination standards in NSW food organics collections to fully understand the waste audit results of the Food Organics Project.

The NSW EPA policy[1] for FO and FOGO state that the only material that can be placed into

FO or FOGO bins for resource recovery is:

- food and, for FOGO bins, garden organics
- compostable plastic kitchen caddy liners that comply with Australian Standard AS 4736-2006 (for commercial composting) used to collect and transfer food waste to the FOGO bin
- fibre-based kitchen caddy liners (e.g., paper or newspaper)

NSW EPA policy is that nothing else should go into FO or FOGO bins, including home-compostable kitchen caddy liners and products (Australian Standard AS 5810-2010), in part because these products provide negligible or no nutrient value to compost.

1 https://www.epa.nsw.gov.au/your-environment/recycling-and-reuse/household-recycling-overview/fogo-information-for-households

Amongst other materials not permitted in the FO and FOGO bins are:

- Compostable or biodegradable plastic products or bags other than those compliant with AS 4736 2006 (for commercial composting);
- Fibre-based food contact materials including baking paper, coffee filters, paper towels, serviettes; fibre-based food containers such as coffee cups, pizza boxes, plates, bowls; paper bags; cardboard packaging; and
- Fibre-based materials, such as bamboo, timber or cardboard packaging and cutlery, paper towels and serviettes.

This standard was adopted in the brief for data capture by waste auditors so that a realistic assessment could be made of the amount of uncontaminated food presented by households in the trial areas.

5.3 Contamination measurement during the trial

The identification and measurement of contamination was built into the weekly monitoring of presented waste so that remedial action could be taken, if unexpected results were reported by waste collection and processing contractors.

Regular data on the weight of materials rejected for processing by either the terminal operator (Veolia EarthPower) or the organics processor (Top Soil) were part of the process steps for the trial. A load assessment template in use at EarthPower was accepted as the most suitable form of record keeping for sharing information on non-food waste material found in delivered loads. To obtain this information, the Project Committee reached agreement with Veolia to monitor contamination and provide feedback on contamination by type and weight for rejected part-loads or full loads. Images of deliveries with contamination were also sent to NSROC to share with the Project Committee, particularly during the first half of the trial period.

The Project Committee had also proposed to send a separate truck-load of Councils' FO waste to the organics processor for feedback as to its useability and the percentage of contaminated content; however, this idea was rejected as unmanageable for the terminal operator and the organics processor. Instead, a visit was made by the Project Committee to the Top Soil operation in Forbes at the conclusion of the trial to better understand what use was made of the FO material collected from Councils' trial areas and how contaminated material was extracted. Information obtained at this visit is documented at 5.6.

5.4 Contamination reports

Data available to the Project on contamination in the weekly deliveries to the Veolia transfer facility was not consistent with the EPA standards for FO/FOGO collections. Virtually all delivered loads were accepted and sent to the Forbes processing facility operated by Top Soil.

Understanding the EPA policy on allowable materials in FO and FOGO bins led the Project Committee to expect that all plastic bags and food in packaging that was delivered in food organics loads would contaminate the load and lead to reduction or rejection of the delivered tonnage.

This was not the experience during the trial. Most reports received that noted only 'minor contamination' were accompanied by images of plastic bags, cardboard, and containerised food. These loads were nevertheless accepted by Veolia, and the removal of contamination moved to the next stage of processing the delivered tonnage.

Of 35 reports on the content of deliveries made by Veolia during weeks 1 to 11 of the trial, most described the presence of plastic bags as the chief contaminant, some with food waste in them, some loose (and likely to have held food waste and been broken open during the collection and delivery process). These reports consistently noted this as 'minor contamination'.

Over the 14 week 3 loads were rejected or major portions sent to landfill from 112 FO loads delivered.

The operations staff at the Veolia EarthPower facility provided feedback on the presence of non-food material in deliveries, but not for every load and mainly in the first 8 weeks of the trial.

Bags of general waste were reported on two occasions; green waste on one occasion and a mixed load of general and food waste on another. Most reports were from three of the low-rise apartment areas (Eastwood, Gladesville, and Meadowbank).

In the two houses' trial areas (Lane Cove North and Greenwich) 3 minor contamination reports were received, and in the high-rise apartment area two reports of minor contamination and one load rejection was advised, the latter due a collector error, with general waste left in the truck which was not fully emptied from its previous run.

It seems likely that the houses and high-rise apartments presented similarly non-compliant material to the low-rise areas but that the low-rise apartment areas had 'minor contamination' more regularly, so more reports were made.

In summary, the information that did reach the Project team was of a general nature and the agreed format (the EarthPower form) for noting the contamination materials and their weight was used only twice in the EarthPower reports.

While non-food material was detected, the reports stated that this was 'minor' as per the examples below of feedback received about accepted deliveries.

23/05/2022	Lane Cove Greenwich	0.70 tonnes	Minor contamination. Several plastic bags otherwise would have been excellent
23/05/2022	Ryde Meadowbank	0.16 tonnes	Minor contamination. Several plastic bags of food waste

5.5 Contamination reports by councils and collection services

In addition to information sent by EarthPower on contamination, in two of the premises' types (low-rise apartments and non-residential organisations) Council staff or contractors regularly conducted visual contamination checks in the first weeks of the trial. This led to loads being rejected and left behind at the point of collection, thus reducing food volumes .

While collectors were asked by Councils to collect all bins so that the actual contamination amounts could be measured, this did not occur consistently because EarthPower management did not wish to accept contaminated loads.

In the non-residential Hunter's Hill trial in weeks 1-8 similar action by collectors resulted in 81 bin loads not being picked up from the non-residential sample area.

Waste collectors for low-rise apartment trial areas also checked for gross contamination at the point of pick up for at least half the trial weeks. On one occasion 6 loads from a trial area were rejected due to the presence of general waste in the food bin.

In the low-rise apartment areas, Project Committee members carried out random visual contamination checks. Below is an example of the checks and results in week 8. These loads were not delivered to the transfer facility.

Such reports from the low-rise apartment areas led to the production of additional bin stickers in Chinese to make clear that general waste should not go into the food bin. These stickers were put onto bins in all the apartment areas.

Consistent reports throughout the trial from resident calls and emails plus the responses to the end-of-trial survey supports the view that the food organics bin-lid colour (burgundy) contributed to contamination in household types with shared bins, as the colour is so close to the red-lid general waste bins.

Complaints about bins being dirty and smelly in both the low-rise bin bays and high-rise apartment bin rooms led to the introduction of bin cleaning to reduce reluctance to use the food bins.

In the Ryde low-rise apartment areas 4-weekly bin cleaning was introduced. In the high-rise apartment buildings weekly removal and cleaning of bins on all floors was initiated in week 3 of the trial.

Contamination visual check result

Meadowbank	**9/05/2022**	**3 x 240L Bin**
6A & 7 Bank Street: 1 bin was ½ full, with medium contamination - left & emptied by garbage truck. **17 Bank Street**: 1 bin was ½ full, with high contamination - left & emptied by garbage truck. **18-19 Bank Street:** 1 bin was ½ full, with high contamination - left & emptied by garbage truck.		
Gladesville	**10/05/2022**	**4 x 240L Bin**
25-27 Ashburn Place: 1 bin was ¼ full, with no contamination + 1 bin was ¼ full, with high contamination - left & emptied by garbage truck. **33 Ashburn Place**: 1 bin was ½ full with high contamination - left & emptied by garbage truck. **23 Wharf Road**: 1 bin was less than ¼ full with medium contamination - left & emptied by garbage truck.		
Eastwood	**11/05/2022**	**4 x 240L Bin**
15-19 Ethel Street (in Rowe Lane): 1 bin was ¼ full, with medium contamination - left & emptied by garbage truck. **30-32 Ethel Street (in Ethel Lane):** 1 bin was ½ full, with high contamination - left & emptied by garbage truck. **6-8 May Street**: 1 bin was ¼ full, with high contamination - left & emptied by garbage truck. **19 May Street (in Ethel Lane)**: 1 bin was ½ full with high contamination - left & emptied by garbage truck.		

5.6 Organics processor management of contamination

While the presence of plastic bags was noted in reports and images from Veolia, the loads were not rejected by EarthPowernor, to the Project Team's knowledge, by the organics processing service provider (Top Soil). When the Project Committee visited the organics processor the operator confirmed that the material reaching them was subjected to a mechanised depackaging process and was therefore useable, with no more than 5% contamination from the delivered material remaining.

Top Soil representatives also estimated that they were using the residential food waste as an approximately 20% share of material they were producing, which they stated exceeded the Australian Compost Standard. They also stated that the material was of a sufficient standard that this percentage could be increased to 50%.

It is apparent from the information gathered during the trial that the waste industry is offering a service at the point of delivery and compaction with at best variable compliance with the EPA policy of what is acceptable for composting from FO and FOGO bins.

The available service during the trial from the largest waste management services provider supporting Sydney councils meant that the information from the weekly waste management services was not a reliable source for tracking contamination in the context of EPA policy.

As a consequence of the acceptance of contamination in FO and FOGO loads, the Project Committee determined that the EPA standard had to be adopted by the waste auditors so as to obtain valid information on the useability for compost production of the collected FO materials.

5.7 Waste audit methodology

The audit methodology required examination of aggregated truck loads from each of the trial areas, using multiple sub-samples drawn from each load, sorted and weighed to allow assessment of variability, or full load analysis for FO deliveries of less than one tonne.

As noted in Section 2 of this Report, the methodology specified for the audit service providers[1] to follow was:

- A two-week physical auditing period with sort and weigh measurement of all collected garbage, FO, and FOGO materials from each sample area.
- To assess variability within and between samples, separate records of individual loads of materials with details to include the collection area, dates, times and truck tare weight.
- Full load sorting of FO and FOGO or least one tonne of each weekly or bi-weekly load collected from all trial areas
- Randomised grid sub-sampling of all MSW loads. A minimum of five samples from each load were sorted and weighed and the composition categorised.

Inclusion of all loads over the audit period and a high level of sub-sampling was specified to ensure accuracy and provide sufficient data in cases where outlier materials were excluded that would otherwise have skewed the audit results.

The specification of full loads of FO (up to one tonne) to be sampled was informed by the need to obtain statistically valid samples of this material.

The research design consultant advised that contamination in organics streams tends to be of low weight compared to the organics and highly variable, with many households contributing no or little contamination, but others presenting grossly contaminated bins. Because the contamination level was expected to be highly variable in the FO loads, and to consist of relatively light materials, the audit required a larger load share of FO loads to be sorted.

The data collected from each load fully audited or sampled during the two-week audit phase included:

- MSW Loads: weights of food in garbage and recyclables in garbage; and of the food in garbage, sub-categories of unpackaged and packaged/contaminated food.
- FO and FOGO Loads: weight of food in all FO and FOGO loads before and after contaminants are excluded; weight of non-compostable contaminants in FO and FOGO loads and identification of sub-categories of unpackaged and packaged/contaminated food.

In recording the contents of the samples examined in the auditing process, the audit contractors were asked to classify contaminants as: soft plastic, hard plastic, glass, potential chemical

1 A. Prince Consulting Pty Ltd for the residential areas; MRA Consulting Group for the non-residential area.

contaminants (such as batteries or chemical containers), other contamination categories used at the organics transfer facility, and 'atypically heavy' items.

The waste auditor for the residential trial areas followed a sampling and measurement process set out in Attachment 4.

Waste samples were physically audited and for MSW, FO and FOGO loads all compostable liners and plastic bags were opened to extract food and contamination including containerised or packaged food.

Audited material was sorted and weighed according to the categories set out in Table 5.1.

5.8 Waste Audit Results for Food Organics Bins

The food organics bins audits were analysed by trial area suburbs and household types. Detailed data from the audits is in Attachment 4. The non-residential trial area's waste audit and contamination results are documented in Section 4.8.2.

In the following discussion, these terms and meanings are used:

Available Food – all food whether contaminated (unuseable for compost production) or uncontaminated (useable for compost production).

Presented Food – all food placed in the food organics collection bins, contaminated (unuseable for compost production) or uncontaminated (useable for compost production).

Useable Food – food that meets the EPA contamination standard and is useable for compost production.

The discussion below presents the data by household types, as this was the principal variable to be applied under the research design.

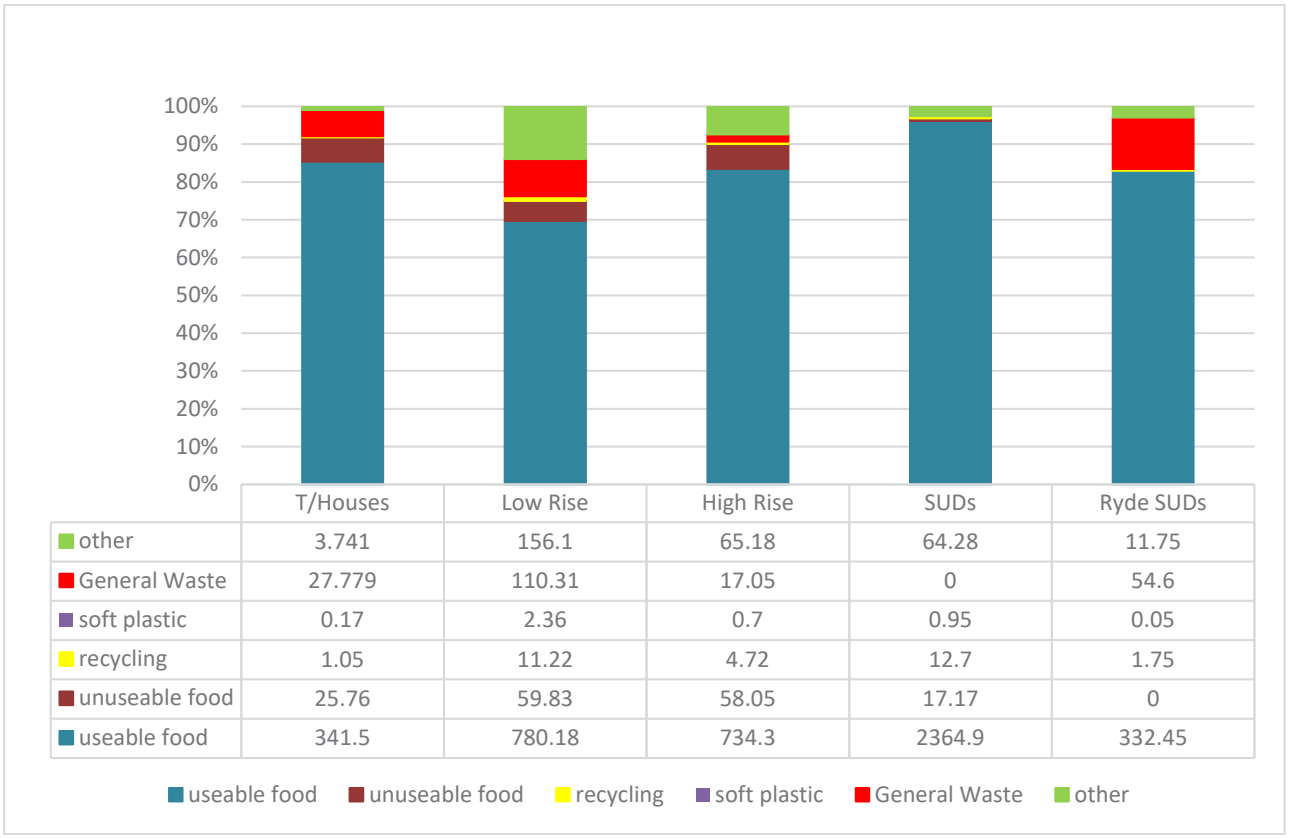
Figure 5.1 charts the contents of the food organics bins by household type. The results show significant differences in the amount of food presented between different dwelling type areas. Houses with food organics bins presented the largest share of useable (non-contaminated) material and multi-unit dwellings (low-rise and high-rise apartments, and townhouses) placed a much higher share of unuseable food material in the food bins. Houses with mixed organics bins (FOGO) presented more general waste in the food bin than houses with food organics bins, and low-rise apartments presented a higher share of general and other waste in the food bins than high-rise apartments and houses.

Another representation of the results of the audit of the food organics bins is in Figure 5.2 which illustrates that low-rise apartments used the food bins poorly compared to other dwelling-type areas. Houses with food organics bins presented less contamination than houses with FOGO bins, where the share of the food bin that was contaminated was more than 15%.

Table 5.1 Waste sort categories and definitions for audits

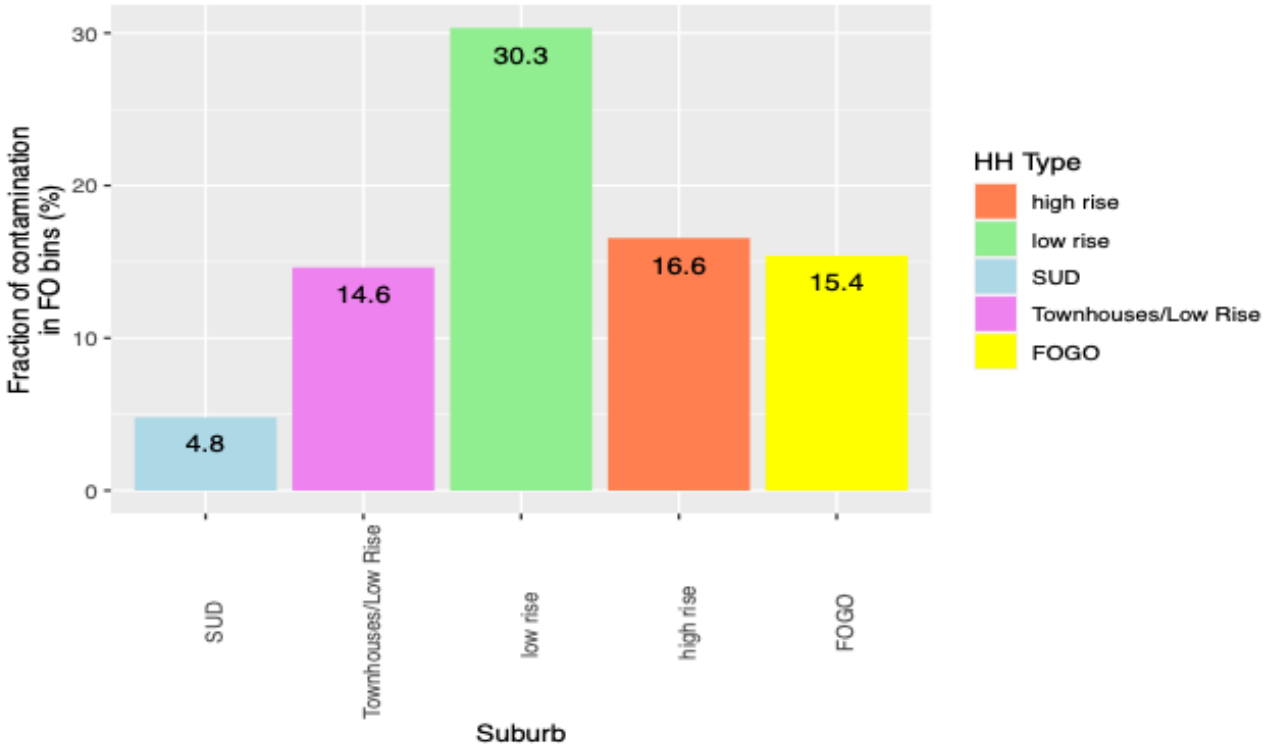
MSW	Definition
Food	Unpackaged - fruit and vegetable scraps, bread, pasta, rice, dairy foods, eggs, meat, bones, tea, coffee, prepared food/cooked food
Containerised/ packaged food	Containers or packaging material (e.g., glass, plastic (soft or rigid), paper or cardboard) containing food. This includes the weight of the container or packaging.
Paper / cardboard / LPB	Newsprint, magazines, stationary, cardboard, milk juice containers
Glass	Beverage and condiments
Plastics	Plastics 1-7 rigid
Aluminium	Beverage containers
Steel	Food and beverage
FO	
Food – loose	Unpackaged - fruit and vegetable scraps, bread, pasta, rice, dairy foods, eggs, meat, bones, tea, coffee, prepared food/cooked food
Food in compostable bag	Food in Council issued compostable bags
Contamination in FO bins	
Food in any other bag	Food in plastic takeaway, shopping, or non-issued council compostable bag
Containerised/ packaged food	Food in container/ packaging
Soft plastics	Plastic bags, film or wrap, flexibles
Hard plastics	Rigid containers, trays
Glass	Container glass
Vegetation / wood	
Chemical contaminants	Batteries/chemical containers
FOGO	
Vegetation	Branches up to 8cm in diameter and 90cm in length, twigs, weeds, prunings, plants, grass clippings, leaves
Food – loose	As for FO
Contamination	As for FO except vegetation/wood

Figure 5.1 Audit results for Food Organics and FOGO bins by household type, 2-week tonnages and percent share by type of waste material



	T/Houses	Low Rise	High Rise	SUDs	Ryde SUDs
other	3.741	156.1	65.18	64.28	11.75
General Waste	27.779	110.31	17.05	0	54.6
soft plastic	0.17	2.36	0.7	0.95	0.05
recycling	1.05	11.22	4.72	12.7	1.75
unuseable food	25.76	59.83	58.05	17.17	0
useable food	341.5	780.18	734.3	2364.9	332.45

Figure 5.2 Audit results for Food Organics and FOGO bins by household type, 2-week tonnages, percent share of bin that was contaminated (unuseable)



Another way to view the data is in Figure 5.3, which shows how much of the useable food was correctly placed in the food bins. This is a measure of compliance and participation and the data shows that house residents with FO bins were most compliant and appear to have the highest participation rate, while apartment residents directed more than 60% of useable food to the red bin. This material would be loose food and suggests a single household bin continued to be used for all waste in many apartments, rather than using the separate bin for food. Further details are in Attachment 4.

The stark difference in compliance with the food bins use between houses with FO bins and houses with FOGO bins is unexpected and suggests that further research on communicating with householders about using a mixed organics bin would be required for any future service.

Figure 5.3 **Audit Results - food segregation compliance - percent share of useable food correctly placed in the food organics bins, by household type**

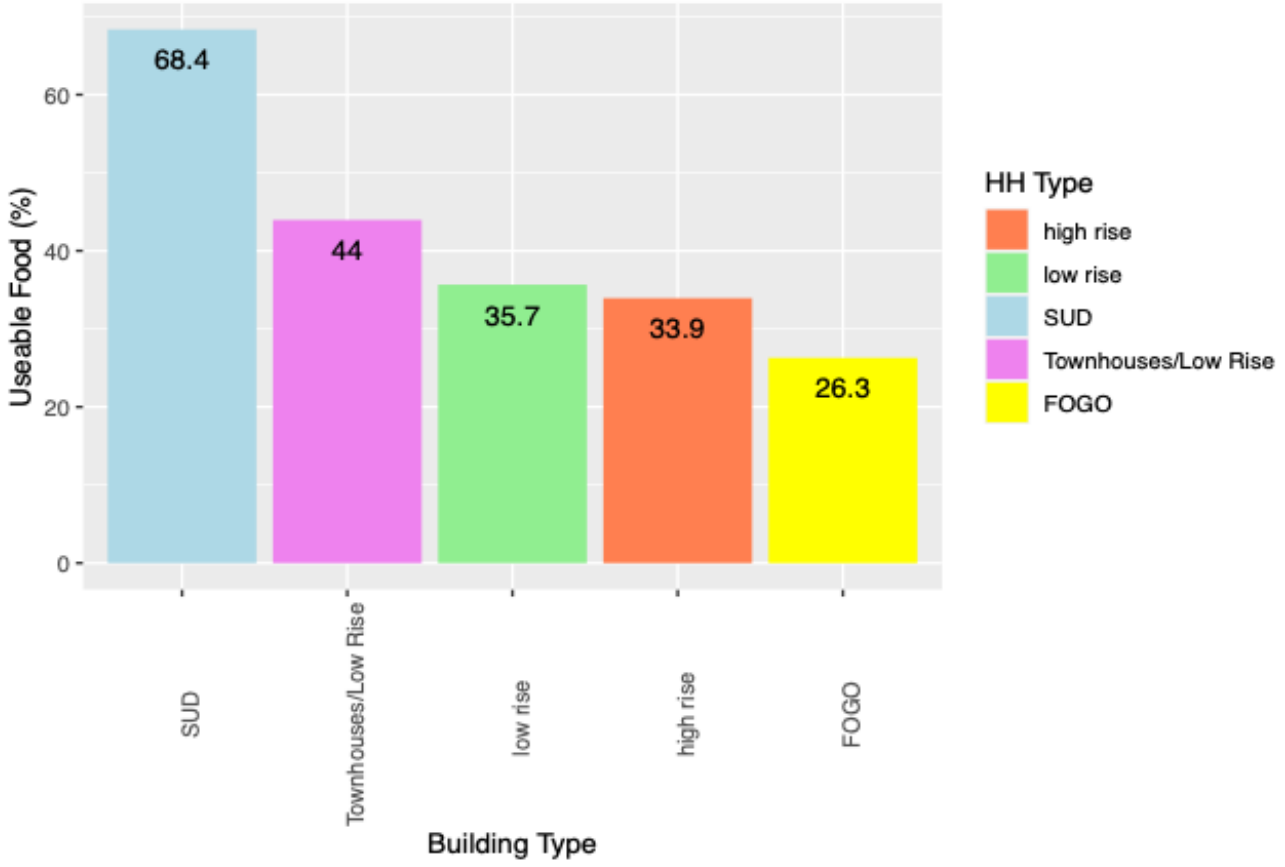
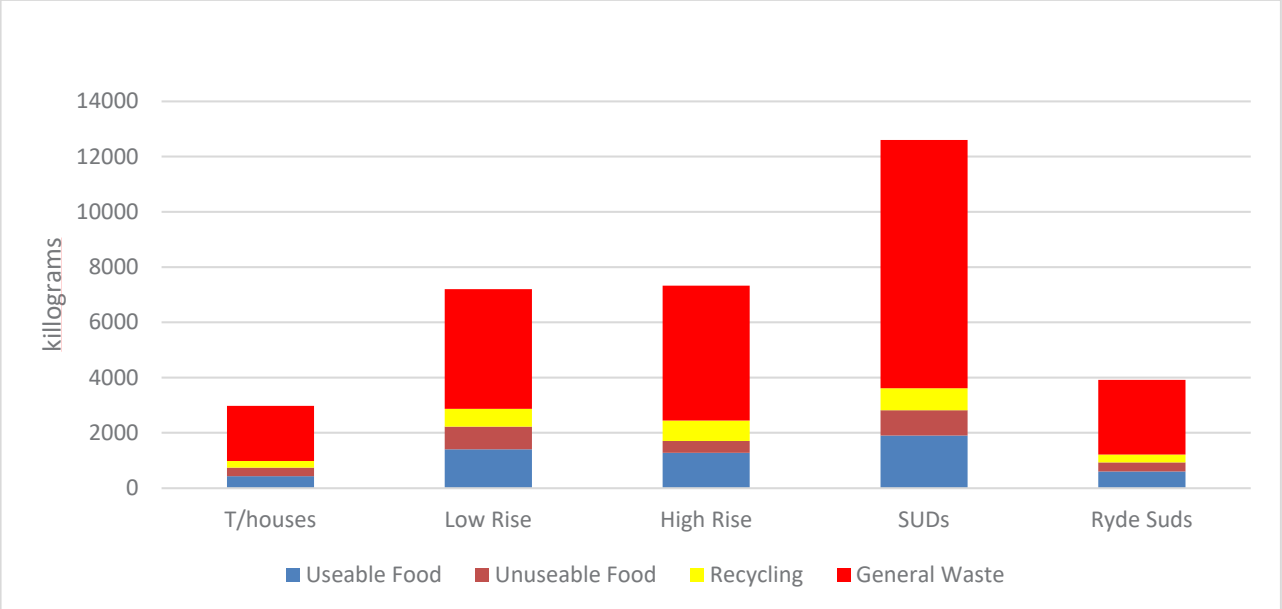


Figure 5.4 **Waste Audit results – Mixed Waste by four waste stream types, by household, kgs**



5.9 Waste audit results for mixed waste bins

To accurately determine participation in separating food from mixed waste the analysis needs to take into account how much food material was put into the general waste (red-lid) bin. The waste audit examined this in detail and the results are in the tables in **Attachment 4**

Figure 5.4 illustrates the average contents in the red-lid bin by waste stream during the two audit weeks. It shows that a sizeable share of the contents of the red-lid bin was material that should have been placed in food waste or dry recyclables bins. Food in the red-lid bin is the second largest category of waste in the mixed waste bin, and most of that is loose food that is uncontaminated by packaging and could have been placed in the food bin. The per household detailed analysis of this data is in **Attachment 4**.

Drawing on the audit of the red-lid bins as well as the food organics bins, the destination of the all the Available Food can be calculated.

Figure 5.5 shows where Available Food was found as between the red-lid bin and the food organics bin during the two audit weeks.

Available Food in the food organics bins is of two types in this breakdown: Useable Food, meaning non-contaminated food waste presented as loose food or in compostable bags of commercial standard (as distributed at no cost to each participation-enabled household). This material meets the EPA standard for compost making. Unuseable Food is food in the food bins that was in containers that would be rejected as contamination under the EPA standard. This material was most often in plastic bags, or in takeaway food containers and food packaging (see **Attachment 4** for detailed breakdown of material found in the food organics bins).

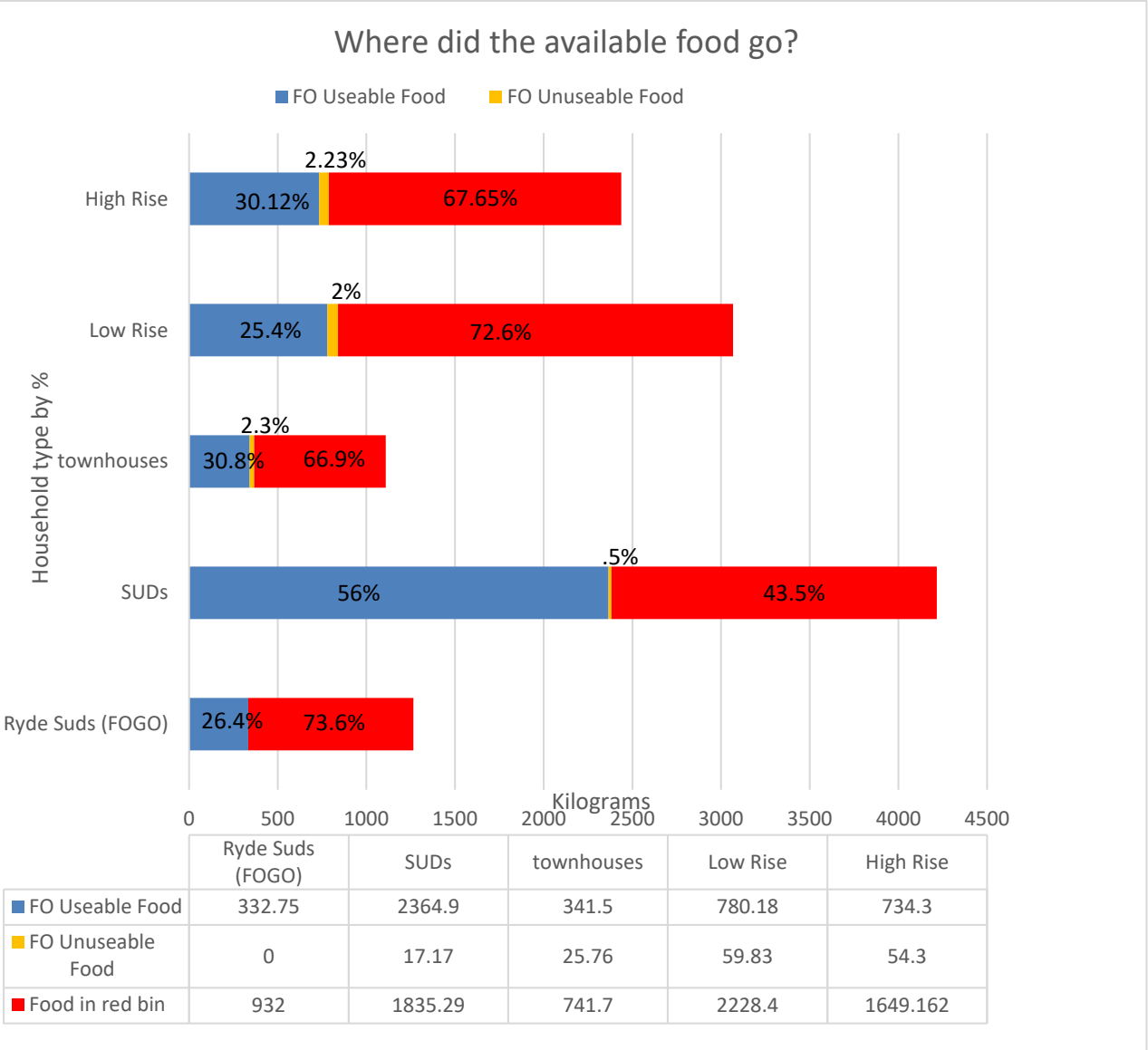
This analysis shows that in all trial areas other than houses with food organics bins, the majority share of Available Food was placed in the red-lid bin during the audit weeks.

Houses with food organics bins presented 56% of all Available Food for collection in the correct bin during the two audit weeks, the highest share of any household type.

Apartment residents variously presented 67% to 73% of Available Food in the general waste bin. Houses with FOGO (mixed organics) bins likewise placed a minor share of Available Food in the food organics bin. Those residents who did place food in the FOGO bin did not present any contaminated food material during the two-week audit period.

As these results are from large, fully audited samples they can be relied on as an indicator of the significant education and communication gap necessary to bridge the differences in these household rates and achieve the potential for resource recovery from food organics.

Figure 5.5 Audit results for Food in MSW and FO/FOGO bins by household type. 2-week tonnages, percent share of all food in organics and general waste bins



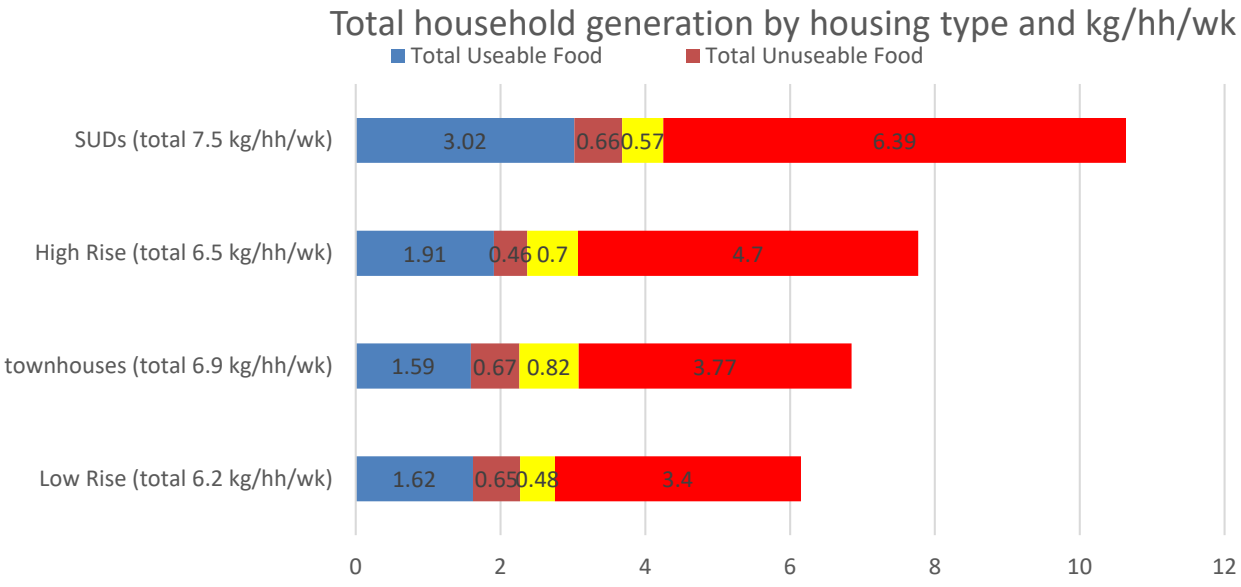
	Ryde Suds (FOGO)	SUDs	townhouses	Low Rise	High Rise
FO Useable Food	332.75	2364.9	341.5	780.18	734.3
FO Unuseable Food	0	17.17	25.76	59.83	54.3
Food in red bin	932	1835.29	741.7	2228.4	1649.162

5.10 Total mixed waste from households

Figure 5.6 graphically represents all the mixed waste presented in the two bins from households of different types. These results may be read as the breakdown of waste types as if a single bin was used for the two-weeks rather than two bins. It shows the kg amount of four categories: Useable and Unuseable Food, dry recycling material and residual waste (that is, everything that is not food of any sort or dry recyclables).

For the period of the waste audit, food material was around 35% of total mixed waste across all households in the FO trial areas.

Figure 5.6 Audit results – weekly total mixed waste by four waste streams – combined MSW and FO bins



	Low Rise (total 6.2 kg/hh/wk)	townhouses (total 6.9 kg/hh/wk)	High Rise (total 6.5 kg/hh/wk)	SUDs (total 7.5 kg/hh/wk)
Total Useable Food	1.62	1.59	1.91	3.02
Total Unuseable Food	0.65	0.67	0.46	0.66
Total Reycling	0.48	0.82	0.7	0.57
Total Residual	3.4	3.77	4.7	6.39

5.11 Analysis of food organics waste audit and trial data

In arriving at answers to the FO Project's research questions (Section 2) and to simplify the large amount of data generated by the trials, one way to work through the results and the differences in behaviour between different household types is to imagine a cascade of food organics availability. The following analysis allows waste management policy managers to see the behaviour gaps that would need to be overcome to maximise resource recovery from food organics.

As discussed in Section 4, the 14-week data on average food volume presentation per week was similar but not the same as the two-week audit data on volumes. For high-rise apartments and townhouses higher average amounts were presented in the 14-week period and can reasonably be thought of as more reliable data on total food presentation. The 14-week data is for all Presented Food, both uncontaminated and contaminated.

For FOGO houses, the waste audit found that 10% of the FOGO bin was food. The 14-week data makes this average per week per household figure 1.03 kgs, while during the audit only 0.73 kgs per household per week was measured.

It is valid to consider these data sets in a 'helicopter' view – taking the 14-week volume data and the 2-week food in the red bin data to derive an average of total food available is likely to be more reliable than using two weeks' data for Presented Food. This data set has been applied to the following analysis of Available, Presented and Useable Food.

Data drawn from the 14 weeks of the trial and the waste audit have been calculated into four categories and are in Table 5.4. Sources and definitions are shown under the Table.

Table 5.4 Summary results - MSW, Available, Presented and Useable Food by Household Type

MSW & Food per household, per week in kgs	Houses – FO N= 706	High rise apartments N=526	Low rise apartments N=675	Townhouses N=246	Houses – FOGO N=230
1 Total MSW	10.6	7.8	6.16	6.85	9.9
2 Available Food	3.77	2.56	2.24	2.48	3.05
3 Presented Food	1.78	0.94	0.59	0.83	1.03
4 Useable Food	1.67	0.7	0.57	0.69	0.73

Definitions and sources
Total MSW: this is the average weekly waste volume in households that would have been in a single MSW bin. Data for this category was sourced from the waste audit which sampled large amounts from each MSW collection in each of two weeks. Sample data scaled up to reflect actual averages based on total volume divided by number of households from which the waste was collected. In the audit weeks, MSW from trial areas was separately collected to match the households with food bins.
Available Food: this is average weekly food waste and includes both useable (uncontaminated) and unuseable (contaminated) food organic material. Data for this category was sourced from average weekly food presented in the FO or FOGO bins in the seven residential trial areas over the 14 weeks of the trial plus the average weekly food presented in the mixed waste (red-lid bin) in the 2-week audit. For FOGO houses the food in the FOGO bin data is a 10% share of all 14 weeks data of FOGO plus the average weekly food presented in the mixed waste (red-lid bin) in the 2-week audit.
Presented Food: this is food placed in the food organics collection bins and includes both useable (uncontaminated) and unuseable (contaminated) food organic material. Data is from the 14 weeks of the trial for the seven FO residential areas. Data for FOGO houses the food in the FOGO bin data is a 10% share of all 14 weeks data of FOGO (audit result).
Useable Food: this is the average weekly volume of uncontaminated food. Data is from the audit results of the FO and FOGO bins food material.

Table 5.4 shows that houses with food organics bins used the food bin for a greater share of food waste more often and/or in greater numbers than all other residents. High rise apartment and townhouse residents used the food bin for their food disposal more reliably than residents in low-rise apartments.

For the food organics trial areas for houses with FO bins and all apartments, the results in Table 5.4 are shown diagrammatically in Figures 5.7 and Figures 5.8. These Figures show visually the scale of the gap between Available Food and the presentation of Useable Food and the distinct difference at the household level in food generation and presentation between single-unit dwellings and multi-unit dwellings.

Figure 5.7 Audit and Trial results – Houses, Available, Presented and Useable Food per household per week

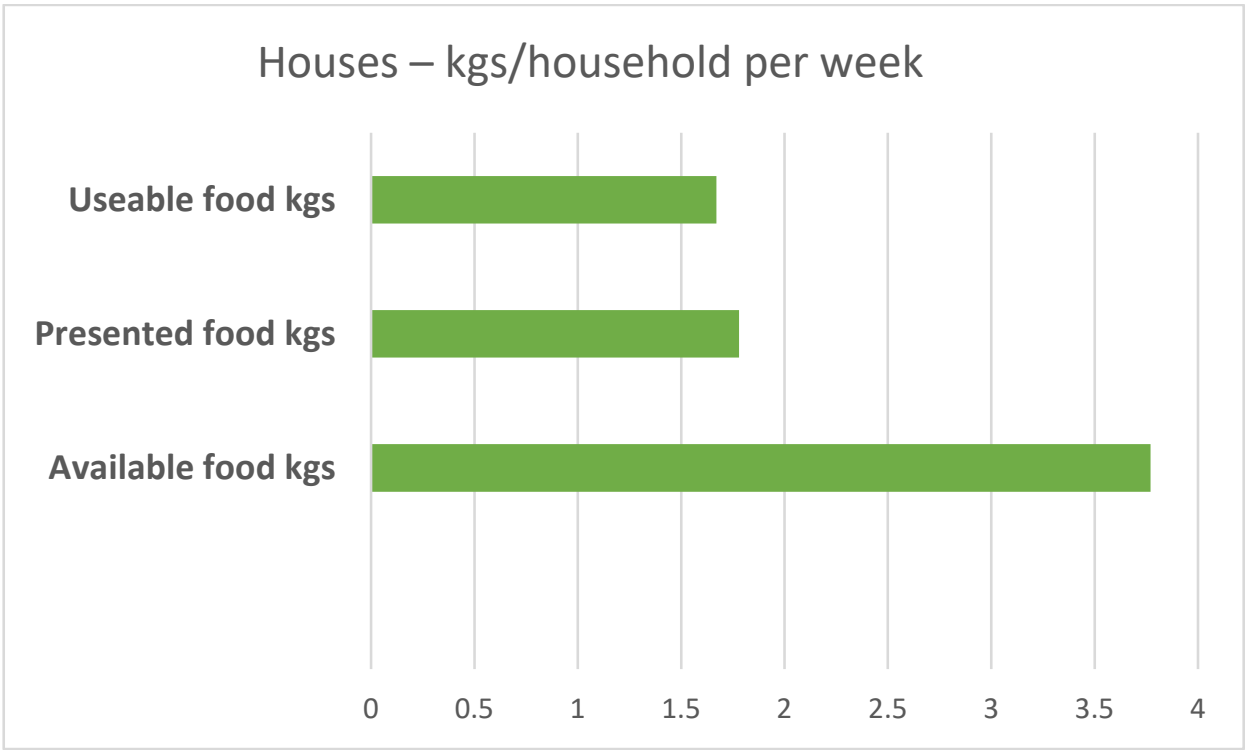
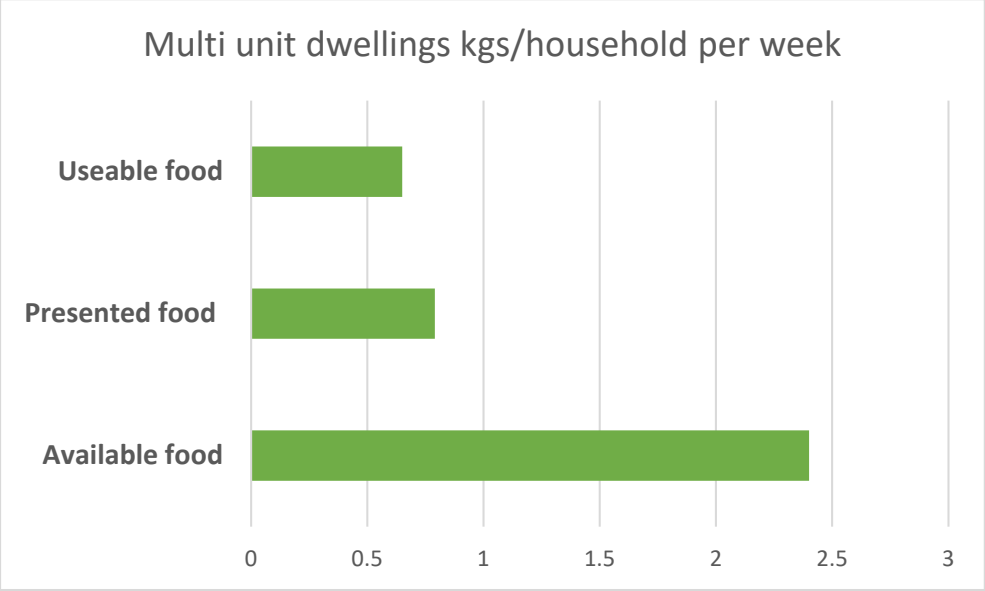


Figure 5.8 Audit and Trial results – Multi-unit dwellings, Available, Presented and Useable Food per household per week



It is also helpful to use this data to create ratios so that comparisons and changes over time can be easily understood.

Table 5.5 presents this information in three ratios:

- Available Food as a share of Total Mixed Waste
- Available Food as a share of Presented food
- Presented food as a share of Useable food.

These ratios may be described as:

Potential recovery measure: the amount of Available Food in total garbage, ratio expressed as %. This was consistent across all FO household types, at 36% except for high-rise apartments which was 33%.

Participation measure: the amount of food that was placed in the FO or FOGO bin from Available Food, ratio expressed as a %. This ratio represents the resident participation in the trial. While not all presented food was uncontaminated, this result may be seen as an attempt to use the bins for food waste disposal.

Useability measure: the amount of useable (non-contaminated) food that was placed in the FO or FOGO bin from Available Food, ratio expressed as a %. This represents a baseline of what could be expected in a food organics service after the type of community engagement applied during the trials.

Table 5.5 Ratios and measures – key results from trials

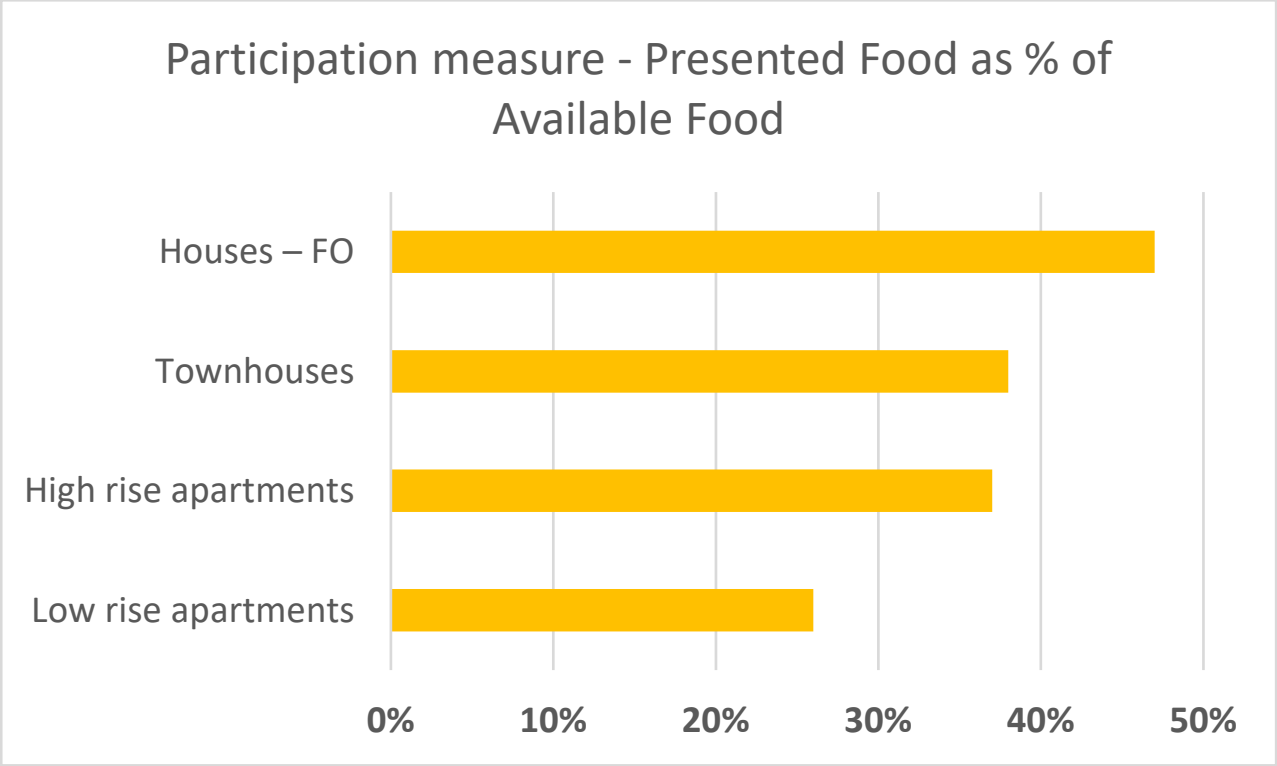
Percentage Food % MSW	Houses – FO	High rise apartments	Low rise apartments	Townhouses	Houses – FOGO
Available Food as % of MSW (measure of potential recovery)	36%	33%	36%	36%	31%
Presented Food as % of Available Food (measure of participation)	47%	37%	26%	38%	34%
Useable as % of Presented Food (measure of useability/non-contamination)	94%	74%	97%	83%	71%

The results of the FO project data can be compared with what had been anticipated prior to the trials. Work was undertaken by the Project Committee to create estimates of how much food was likely to be collected so that the Project could interpret weekly data and respond to any outlier results, and to assist in planning the waste audits. This work was based on previous audits of general waste bins and other estimation methods.

Comparison of how these estimates look in relation to actual participation rates based on the audit of Available Food in both waste streams is in Attachment 4.and demonstrates the value of the detailed audits in the FO project to create a more reliable data set.

Figure 5.9 represents the participation rate, as shown in Table 5.5, in a chart. This chart illustrates the scale of change that would be needed in multi-unit households' presentation of food to reach the level demonstrated by single-unit dwelling householders. It should also be noted that the participation rate in high-rise apartments came with the additional cost of weekly cleaning of bins on every floor and was predicated on personal delivery of food collection materials (that is, to a degree this was a cohort that opted to participate). These measures may not be sustainable in a permanent service.

Figure 5.9 Participation by household type



5.12 Resource recovery comparative analysis

Under existing contracts with Veolia, Waste Alliance Councils have access to MBT processing of a portion of delivered mixed waste. This waste processing service uses unsegregated mixed waste to produce a soil additive or compost-like material (regulated name: Woodlawn Organic Output or WOO). The mine site operator applies WOO to support mandated remediation of a toxic tailings dam at the mine site adjacent to the Veolia Woodlawn Precinct. The licence to produce WOO is in place up until 2025.

The MBT process requires the organic portion of the mixed waste to be available for processing and results in about 30% resource recovery as soil additive

The contracted services also include deposit of residual waste into a pumped landfill, known as the Woodlawn Bioreactor. Pumped landfill gas captures methane and in 2021-22 the Waste Alliance share of energy production from gas pumped from the Bioreactor was 3,940-Megawatt hours[1].

The resource recovery achievement from a separate food waste collection service would reduce the WOO production and landfill gas production by the fraction of organics removed.

Comparison of recovery achievement from food organics separately collected and organics 'harvested' through AWT can be modelled from the data sourced in the FO Project trials and the results of the Waste Alliance contracted waste processing service using MBT.

Data from the Project as discussed in this Section of the Report, tells us that the best case of food separation is that about 50% of Available Food **remains** in the mixed waste bin (houses), while the average in multi dwellings is about 67%. Waste Alliance councils' areas have between 50% and 60% of all householders living in multi-unit dwellings.

1 Source: Veolia data – share of total as provided to Clean Energy Regulator. Annual Report to Waste Services Alliance Service Period 7 2021-22.

Figures 5.10- 5.12 illustrate the resource recovery outcomes from these two waste processing options, for houses and multi-unit dwellings, based on the FO Project industry partners' data and participation rates generated from the Project results.

On a modelled basis, based on 35% of the mixed waste bin being Available Food, resource recovery from one tonne of waste in a residential area dominated by houses that is delivered as unsegregated mixed waste results in landfill gas production plus recovery of recovery of 300 kgs (evaporation and soil additive), and recovery from one tonne of mixed waste delivered in two streams from houses (food and mixed waste) results in recovery of 175 kgs (evaporation and compost). For deliveries from the average of the volume of Useable Food from multi-unit areas, the compost production result would be under 60 kgs.

Further comparative analysis must await more information on organics processing services that are accessible to councils in the Sydney metropolitan area, and which are compliant with regulations applicable to food waste collected either separately or as an element of a mixed organics waste stream.

The future availability of the MBT waste processing option depends on the results of the WOO trial approved up to 2025, so capacity to achieve the modelled estimate for resource recovery after that depends on EPA approval for more WOO production. Demand from the mine owner for this material is expected to continue as the toxic mine site tailings dam covers an area of 100 hectares, of which the trial site for WOO placement is 5 hectares.

In the absence of this knowledge about planned investments by industry and approvals by the regulator, councils will be unable to specify the performance standards for resource recovery from household waste in procurement actions. Without this information an equitable approach to settling on risk apportionment and costs in a contract is objectively unattainable.

Figure 5.10 Resource Recovery from Mixed Waste through MBT – modelled estimate for mixed waste processing through MBT (100% processed), based on resource recovery of 30% (WOO plus evaporation).

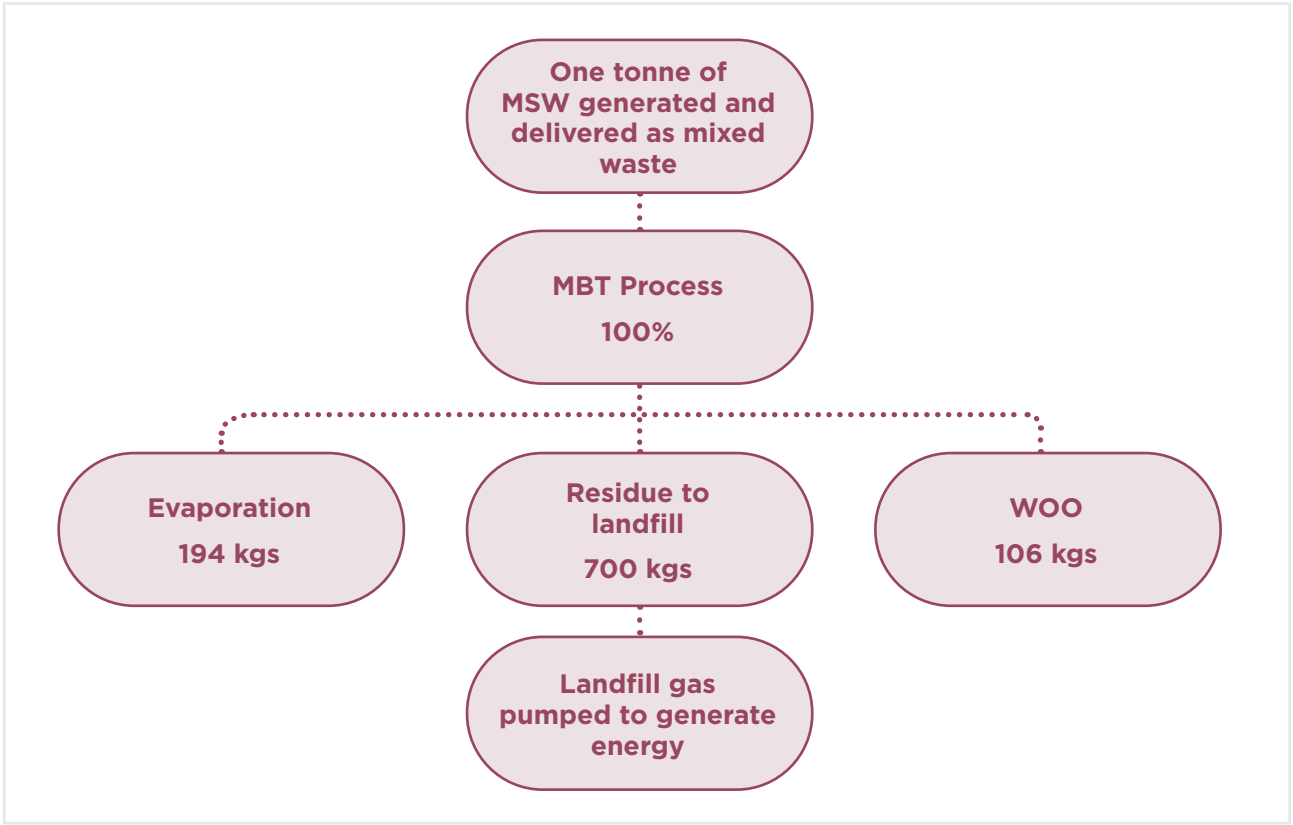


Figure 5.11 Resource Recovery from segregated food waste through compost processing – modelled estimate for houses based on FO Project. Available Food = 35% of MSW; Presented and Useable= 50% of Available Food; evaporation during aerobic composting=50%.

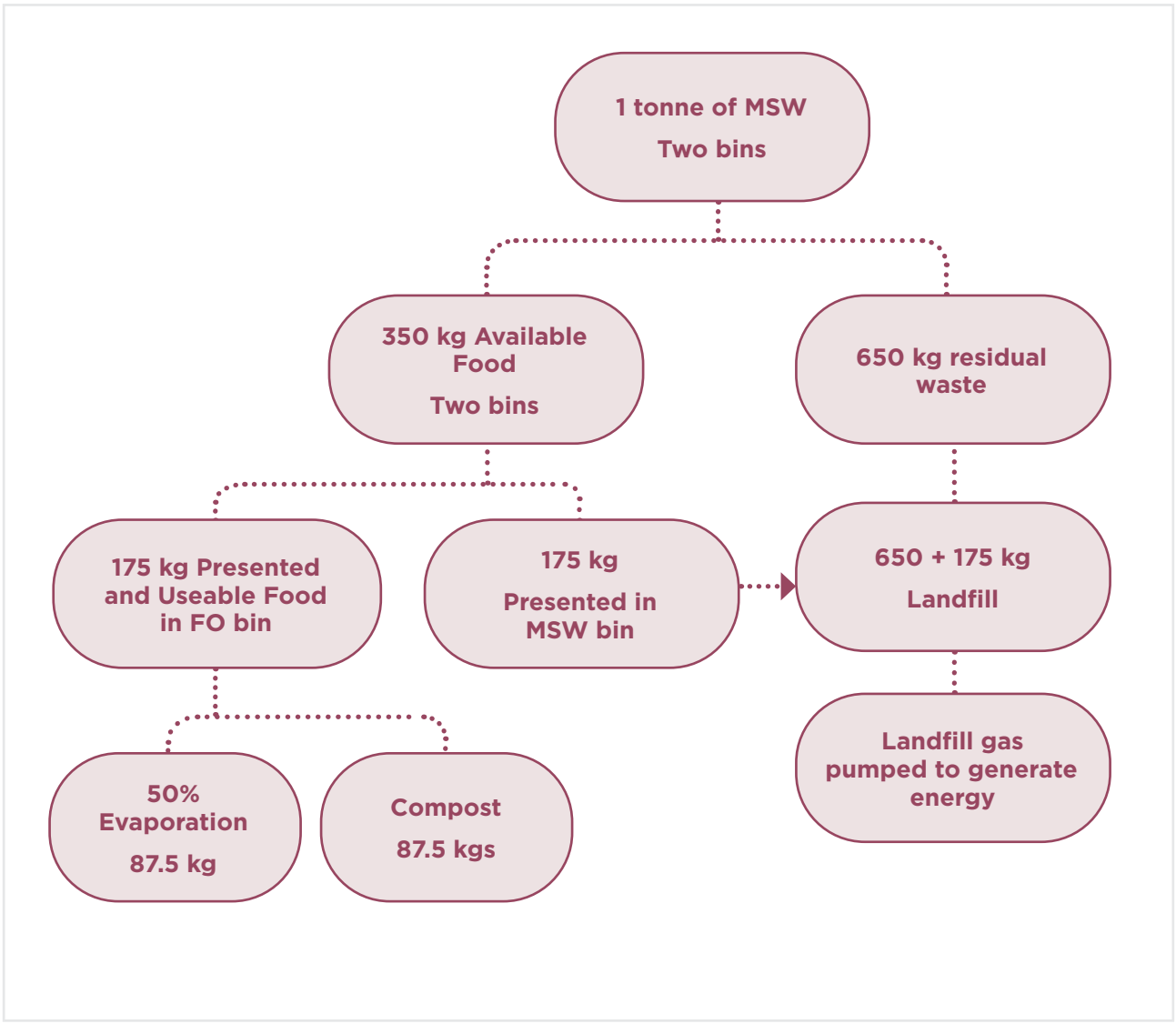
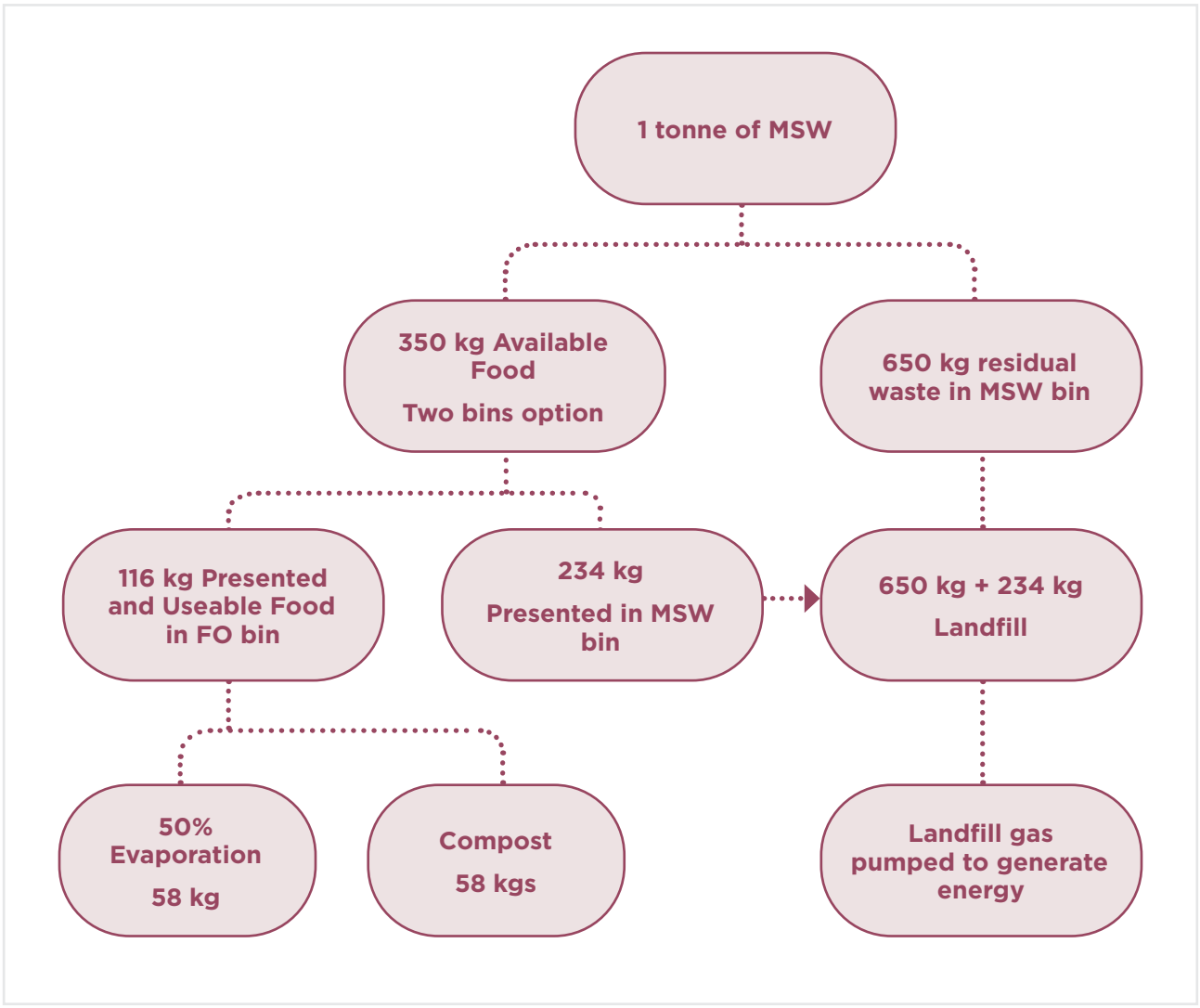


Figure 5.12 Resource Recovery from segregated food waste through compost processing – modelled estimate for multi-unit dwellings based on FO Project. Available Food = 35% of MSW; Presented and Useable= 33% of Available Food; evaporation during aerobic composting=50%.




EDGE

COMMUNITY

6 Demographic Analysis

6.1 Introduction

The Australian Population Census is held every 5 years and is the primary source of comprehensive demographic and socio-economic information on the population, presented by LGA, Statistical Subdivision, and suburb. The Food Organics residential trial areas were selected to align with the spatial presentation of community profile data published by the ABS.

Census data was used in the FO projects to determine the strength of any correlation between certain demographic and socio-economic characteristics and participation in the FO trial, as measured by the amount of food presented by households of separated food organics (average kgs per household) and the degree of contamination in the presented food (amount of useable and unuseable food).

The purpose of this analysis was to add to the understanding of the drivers of variation in trial areas by deepening the information on each area beyond the analysis of the effect of household type on Available, Presented and Useable Food.

The demographic analysis should allow more accurate services planning by understanding how areas with different household characteristics responded to the request to participate in segregating food from mixed waste. This information supplements the evidence base established by the food presentation tracking and waste audits (tonnage and contamination data) and will support more targeted engagement and communication with communities across the region in all areas of waste education.

Four demographic variables from ABS data were applied to results from the food collection data and the waste audit data:

- English proficiency (self-identified)
- Tenure type
- Household income
- Household size

The analysis of the correlation between desirable food segregation behaviour and demographic characteristics was undertaken by Dr Russell Thomson, Statistical Consultant from Western Sydney University. His reporting follows. The colour of the symbols on the scatter graphs supplied by Dr Thomson indicates trial areas of the same household type: blue for low-rise apartments, green for high-rise apartments and red for houses.

6.2 English proficiency and food presentation

The percentage of households that identified as speaking a language other than English at home and spoke English not well or not at all was obtained from the ABS (spreadsheet G13, Community Profiles) for each sample area[1].

This percentage was compared to the average weight per household per week for weeks 1-14 of the trial for each sample area. The spearman correlation coefficient between these measures was negative (r=-0.32), suggesting that areas with lower English proficiency had lower weights at participating households.

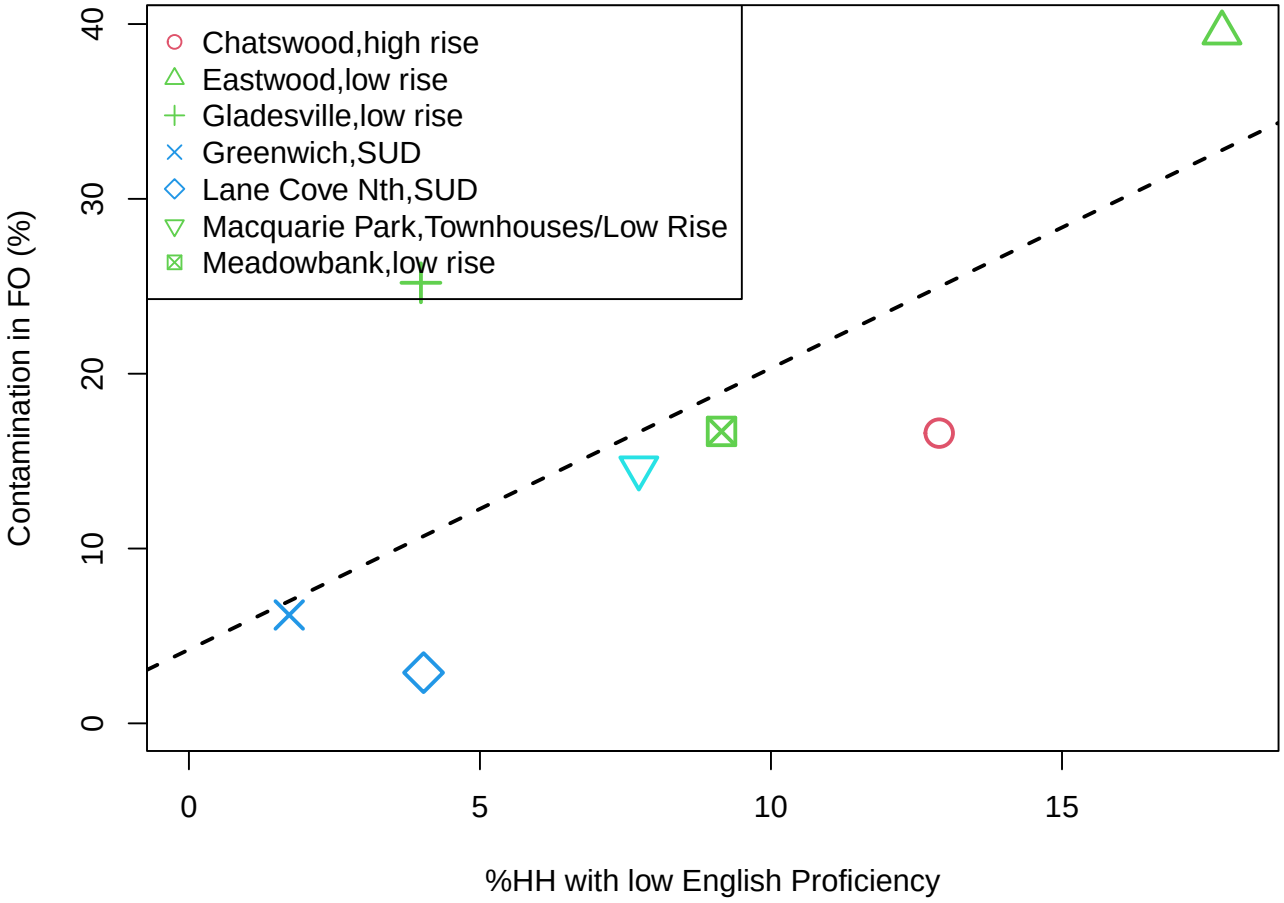
The correlation of -0.32[2] was reasonably highly negative, however this correlation was not significant (p-value=0.5)[3]. A p-value less than 0.05 is thought of as showing a correlation that is significantly different from zero[4].

6.3 English proficiency and contamination

Analysis of the amount of contamination in the material placed in the food bins and lower levels of English proficiency showed the correlation between these measures is reasonably high (Spearman's Rho = 0.54, p-value=0.24). This was a stronger correlation than English language proficiency and food weight per household. See Figure 6.1.

1 % of total persons self-identified as speaking a language other than English at home, and speaking English not well or not at all
2 Correlation (r) varies from -1 to 1, with a value of zero representing no correlation.
3 The p-value represents the chance of seeing this correlation or greater (positive or negative) correlation by chance alone.
4 Where the p-value is 0.05 or greater, in order to confirm that the observed correlation did not occur by chance, a larger sample size (number of areas) is needed. P-values of .05 have a 95% confidence level in the relationship between the variables

Figure 6.1 Scatterplot of household English proficiency and contamination in FO, per sample area.



6.4 Tenure and food presentation

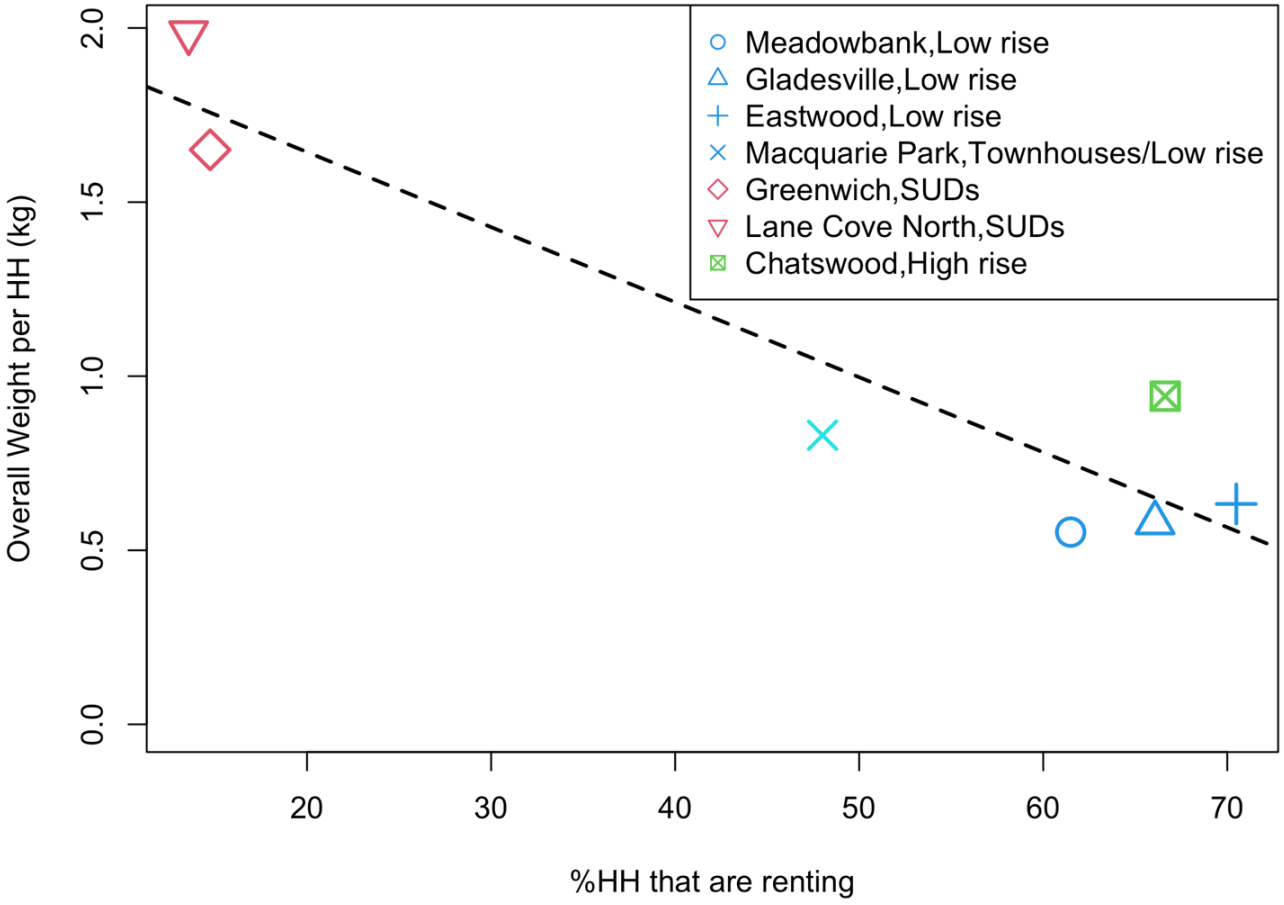
The percentage of households that identified as renting were obtained from the ABS (Community Profiles, spreadsheet G33) for each sample area. The ABS spreadsheet presented the data separately for separate houses, semi-detached, row or terrace house, townhouse etc., flats/ apartments and other dwelling. The separate houses data were used for sample areas where SUDs were sampled, while flats/apartments data were used for sample areas where low or high rise apartments were sampled. For Macquarie Park, where a large number of townhouses was sampled, the column; semi-detached, row or terrace house, townhouse etc., was used.

The percentages of rental dwellings in an area were compared to the average weight per household per week over all trial weeks (1-14) for each sample area (**Figure 6.2**). The spearman correlation coefficient between these measures was negative (r=-0.57), suggesting that areas with less rentals had higher weights at participating households. The correlation of -0.57 was highly negative, however this correlation was not significant (p-value=0.2). The p-value represents an 80% statistical confidence level.

6.5 Household income and food presentation

The median household income data were obtained from the ABS (Community Profiles spreadsheet G02) for each sample area. The median household incomes were compared to the average weight per household per week over all weeks (1-14) for each sample area (**Figure 6.4**). The spearman correlation coefficient between these measures was positive (r=0.54), suggesting that areas with larger household incomes had higher FO weights at participating households. This correlation was significant (p-value=0.24). The correlation of 0.54 was highly positive.

Figure 6.2 Scatterplot of observed average weights per participating household against percentage of rentals for the type of household sampled in the given area. The dashed line represents the line of best fit through the data.



6.6 Household income and contamination

The median household incomes[1] were compared to the percentage of contamination in the food bin per household per week over all weeks (1-14) for each sample area (Figure 6.4).

These variables are negatively correlated (Spearman's Rho=-0.5, p-value=0.27). The correlation of -0.5 was highly negative which means that households with higher incomes presented less contamination in the food bin. The p-value is greater than 0.05, so it is possible that the observed correlation could occur by chance.

6.7 Household size and food presentation

The average number of persons per household were obtained from the ABS (spreadsheet G36) within each sample area[2]. The ABS spreadsheet presented the data separately for separate houses, semi-detached, row or terrace house, townhouse etc., flats/apartments and other dwelling. The separate houses data were used for sample areas where SUDs were sampled, while flats/apartments data were used for sample areas where low or high rises were sampled. For Macquarie Park, where a large number of terrace houses were sampled, the row; semi-detached, row or terrace house, townhouse etc., was used.

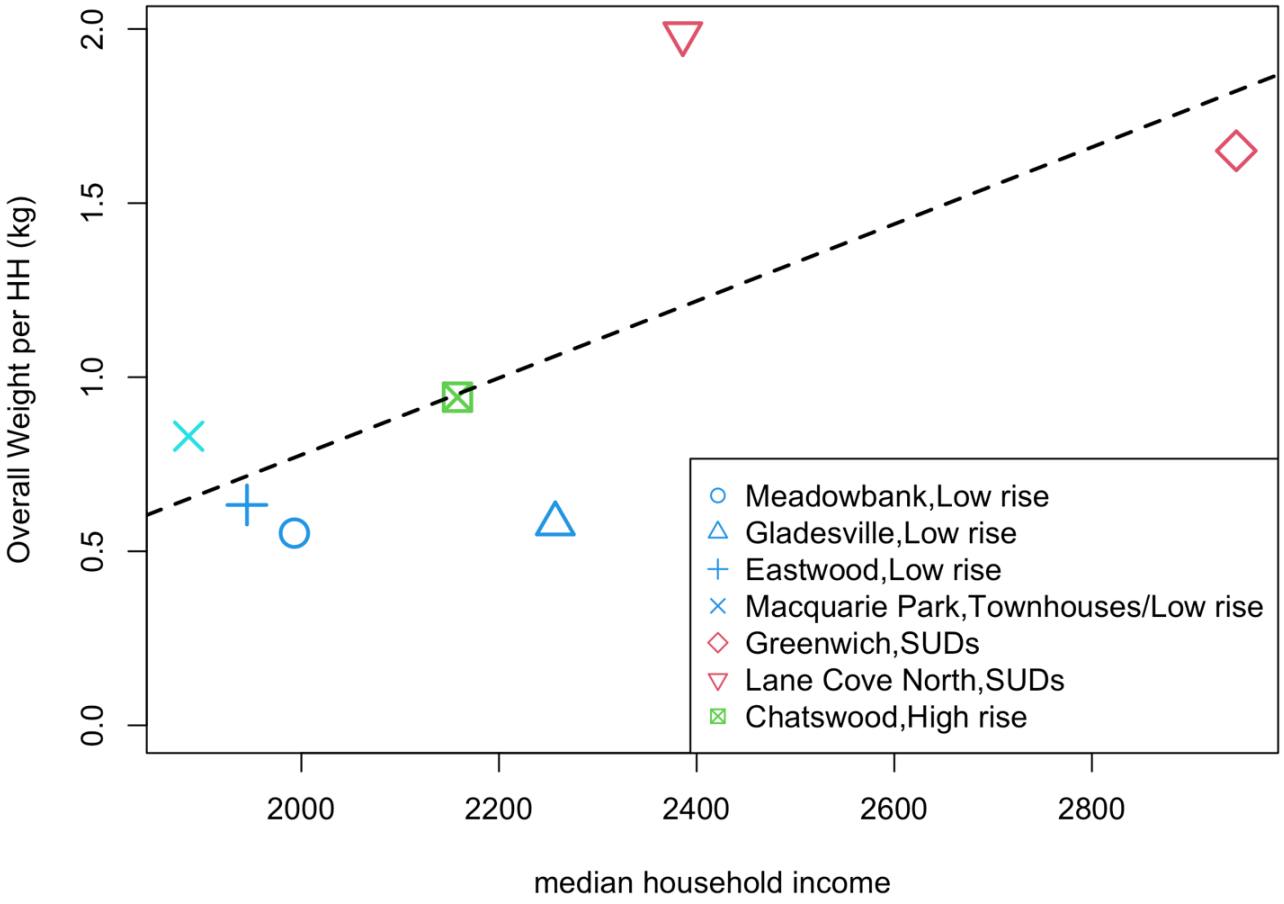
1 Median total household income is applicable to occupied private dwellings. It excludes households where at least one member aged 15 years and over did not state an income and households where at least one member aged 15 years and over was temporarily absent on Census Night. It excludes 'Visitors only' and 'Other non-classifiable' households.
2 Average household size is applicable to number of persons usually resident in occupied private dwellings. It includes partners, children, and co-tenants (in group households) who were temporarily absent on Census Night. A maximum of three temporary absentees can be counted in each household. It excludes 'Visitors only' and 'Other non-classifiable' households.

The average household sizes were compared to the average weight per household per week over all weeks (1-14) for each sample area (Figure 8). The spearman correlation coefficient between these measures was positive (r=0.93), suggesting that areas with larger household size had higher weights at participating households. This correlation was significant (p-value=0.007). The correlation of 0.93 was very highly positive. As the p-value is very low and much less than 0.05, the correlation between household size and the volume of presented food volume has a high degree of statistical confidence.

6.8 Household size and contamination

These variables are negatively correlated (Spearman's Rho = -0.71, p-value=0.09). The correlation of -0.71 is highly negative which means that households of higher average size presented less contaminated food in the food organics bin, and the p-value indicates a 91% statistical confidence level.

Figure 6.3 Scatterplot of observed average weights per participating household against median household income for the type of household sampled in the given area. The dashed line represents the line of best fit through the data.



6.3 Summary of demographic analysis

Correlations were found between food volume and contamination in the presented amount of food and income, tenure type and English proficiency. Correlation scores amongst these three variables and food measures were highest for tenure type (negative) and income levels (positive).

Statistical confidence levels in these results were between 70% and 80% which indicates that larger samples would be needed to ensure that the results were not due to chance.

As could be expected, much stronger confidence levels (more than 90%) were found in the positive correlations between household size and food volume and lower levels of contamination.

These results indicate that areas with larger households are the most prospective for collection of food that is also useable food, while those areas with lower English proficiency, lower average incomes and more rental housing are likely to yield smaller volumes and present higher volumes of contaminated material in the food organics bin.

These findings, summarised in Table 6.1 have implications for planning a food organics collection service in an LGA of variable demographic character between suburbs, which is the case for all northern Sydney Councils. In particular these results bear on estimating the amount of useable food likely to be presented by residents in areas of varying demography, the amount of contamination to which remedial and more costly waste infrastructure and education would have to be applied, and the volume of compliant food waste available to waste processors for recovery into beneficial products.

Figure 6.4 Scatterplot of observed average weights per participating household against the average household size for the type of household sampled in the given area. The dashed line represents the line of best fit through the data.

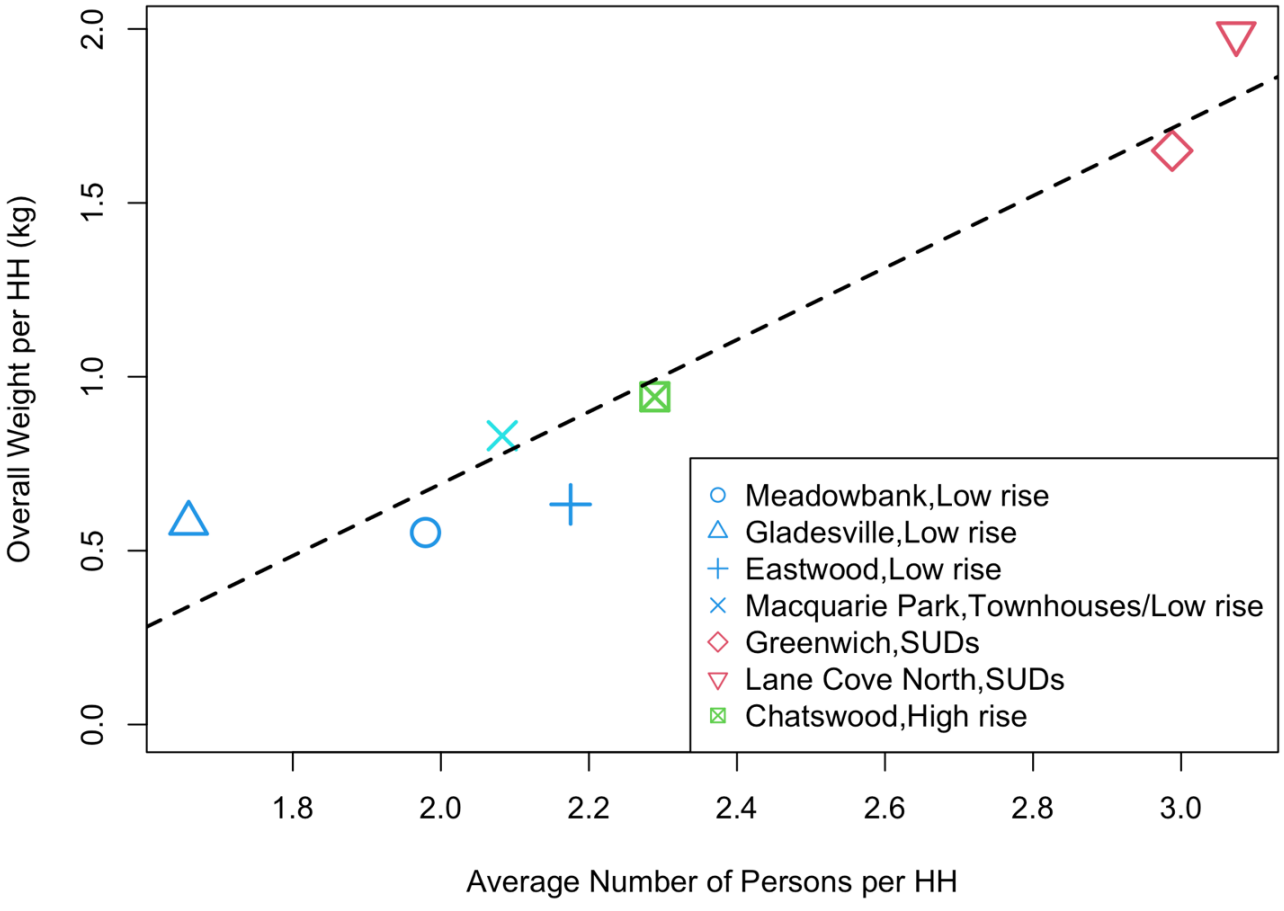


Table 6.1

Correlation between demographic characteristics and food presentation	
Income	Positive correlation between areas with higher average household incomes and the amount of food presented. Negative correlation between the amount of contamination and higher average household income, meaning that higher average household income areas were less likely to present contaminated material in the food waste collection.
Tenure type	Negative correlation between the amount of food presented for collection and rental households. The negative spearman correlation coefficient between these measures (r=-0.57) suggests that areas with more rental housing presented lower FO weights.
English proficiency	Negative correlation was found between the percentage of households that identified as speaking a language other than English at home and spoke English not well or not at all, and food weight presented for separate collection. This means areas with a greater prevalence of low English proficiency households presented lower food volumes. Contamination was also strongly positively correlated with areas with lower English proficiency.
Household size	Strong positive correlation was found between an area's average household size and the average weight of food presented per household per week. The areas with larger household size had higher food volumes with lower contamination weights. The correlation between household size and contamination was highly negative, meaning that larger households presented less material that was unuseable for composting.

7 Participant responses

7.1 Introduction

The communications and community engagement plan for the Food Organics Project included a variety of pathways for trial participants (residents and business managers) to provide feedback, ask questions and have problems or concerns resolved before, during and after the 14-week trial period. The communications approach also included monthly email updates to all residents who had provided email addresses during the caddy delivery program or via other contacts (a total of 480 email addresses).

The methods made available were:

- Call centre
- Project website
- Calls to Councils (residential trials) or Project Manager (Hunter's Hill trial)
- Online and hard copy survey

Results (content, source area, frequency) from these contacts provide valuable information about how the respondents viewed the trial and give a sense of what education and logistical arrangements would best support resident participation in a future service. The information gathered from residents and participants over the course of the FO Project is presented in two sections: resident feedback during trial; and resident survey results.

7.2 Resident feedback responses during the trial

NSROC collated a weekly information report capturing residents' inquiries and complaints from all sample areas. Sources were calls to a dedicated call centre, to councils, via the website and to a dedicated email address.

Analysis of this data was carried out each week to ensure that resident questions and concerns were responded to promptly.

The weekly information report also recorded feedback from the waste management contractors so that remedial action could be activated in areas or buildings where problems with the quality of the presented FO material were identified. This included increased waste education and communication, and direct contact with building managers. An example of such remedial action was the addition of Chinese-language bin stickers to all food bins in all apartment areas in week 6.

Resident inquiries received over the course of the Project were split between these entry points in these shares:

- direct email to the food recycling trial address (30%),
- directly to the City of Ryde via phone or email (31%)
- calls to the food recycling call centre (31%)
- emails via the food recycling trial website (8%).

7.2.1 Timing and sources of contact

The highest number of resident contacts was in the pre-trial weeks while the delivery program was underway, and in weeks 1 to 5 of the food collection service. Contacts in this latter period were mainly by phone (35 contacts in weeks 1-5). After week 5 contacts were mainly by email or via the website. There was a surge in contact in week 7 after the second resident email update was sent to trial participants.

This pattern of contact indicates that those who took the time to contact trial management were residents who were interested in participating and wanted to ensure that they had the materials needed to do so.

Contact at the beginning of the trial period and in the weeks leading up to it were mainly about missing services or food collection materials. From week 4 contacts were mainly about contamination around the shared collection bins in apartments and about the need for more caddy bags.

There is a pattern detectable in the timing of the issues raised by residents across the trial period. Generally, contacts related to rollout delays or missed collections in the early weeks of the trial (pre-trial and weeks 1 to 3). From week 5 contacts were more often about bad odours from shared food bins in apartments and broken compostable bags.

Ryde LRA residents were the most frequent source of contacts and Chatswood HRA and Hunter's Hill the fewest. The Ryde LGA has the highest number of residences in the trial, so this was not unexpected. It is likely that the Hunter's Hill trial participants primarily contacted the project manager for that trial directly as this method of engagement applied throughout the trial.

Outgoing contact with residents was via email updates sent to residents who had provided their email addresses, sent in weeks 4, 7, 10 and 13. Each update related to the stage of the trial and the feedback received. In the first update residents were reminded of what should go in the bin while later updates included tips for avoiding problems with odour and information on how much waste had been collected. The final update gave information about the end of the trial, and what residents could do if they wished to continue to segregate food scraps for composting. The first and second update issue resulted in a 'bump' in telephone and email inquiries via the website.

7.2.2 Issues raised by residents

Over the life of the trial, 62 inquiries or complaints were received from the over 2,000 participating households, over 16 weeks (pre-trial and trial). This is a low figure relative to the number of households, and most related to service difficulties and not to confusion about the use of the food collection materials. This indicates that the waste education materials were effective in communicating with the residents who wanted to participate in the trial.

From week 7 and in similar shares across all household types, the need for more compostable bags was a common cause of contact – likely due to more frequent emptying of caddies and double bagging to manage odours. Both these measures were suggested to residents in the email update sent in week 7 and in response to email contacts about broken bags over the middle weeks of the 14-week trial.

Thirty percent of contacts were about missing collections or missing caddies (pre-trial and early weeks of the trial), followed by the need for more compostable liners (21%) and complaints about odour in bin bays or bin rooms (20%).

Informal feedback about the compostable liners collapsing and odour in the bin bays and rooms was addressed by supplying more liners and suggesting double lining and by the introduction of weekly cleaning of bins in bin rooms, and monthly cleaning of bins in bin bays.

These issues are important learnings for planning a future service, in particular in determining the total costs of a food organics service in multi-unit buildings.

7.3 Participant survey

A common survey (included in **Attachment 5** was sent to all addresses in the trial areas immediately after the trial period, in hard copy and/or online. All 2,223 households received the survey. Residents who sent responses to the Food Trial address or used the online survey tool were sent a $20 local shopping voucher in return for sending the survey back. The total response to the resident FO trial areas survey was 25% and varied significantly between trial areas.

While this result (547 responses) is sufficiently representative to be valid, the result is almost certainly likely to represent the views of residents most interested and engaged with the trial, rather than those who did not participate in segregating food waste from general waste.

Table 7.1 Residential survey responses by area and % total sample and response number

Trial area	Households in trial	Survey responses	% HHs from trial area who responded	% of all responses received from trial area
Greenwich	419	141	33.6%	21.8%
Lane Cove North	287	109	38.0%	16.8%
Chatswood	526	83	15.8%	12.8%
Macquarie Park	246	75	30.5%	11.6%
Gladesville	222	58	26.1%	9.0%
Meadowbank	207	48	23.2%	7.4%
Eastwood	246	33	13.4%	5.0%
Chatswood West/ Nth Ryde	230	102	44.3%	15.7%
	2383	649	100%	100%

The higher participation in the survey by households in the house trial areas (45% of all responses from areas comprising 32% of the total FO sample) was consistent with the higher volumes of food presented by the house trial areas.

A survey was distributed to all potential respondents in all the trial areas. The FOGO trial areas and Hunter's Hill trial area applied an adapted version of the questions in the resident survey in the FO trial areas.

7.3.1 Residential FO Trial Areas

Responses from residents in houses made up 54% of all responses. It is therefore invalid to use a single total result from any question without weighting the responses to the sample group size, as house residents comprised less than 40% of the total residences in the trial.

Dr Russell Thomson, Western Sydney University Statistical Consultant, generated weighted results on key questions to supplement the question-by-question analysis generated by the online survey tool. This gives a more reliable result and compensates for the higher response rate from house residents. In addition, to make any variations between household types apparent, the question-by-question analysis applied filtering by household type groupings. Different filters have been applied to make best sense of the sample size and the question type.

In tables and notes that follow it is important to bear in mind the number of responses in each cell and the number of options in the question – the more splits made of the 547 responses in the question-by-question analysis, the less reliable the results.

House and townhouse residents responded in greater numbers and in higher proportions than their participant numbers compared to apartment residents. FOGO residents (houses) were the highest response share of trial household numbers, at 44%.

Consistent with results on volume, Eastwood low-rise residents responded to the survey in far fewer numbers than residents in houses and other low-rise apartment areas. This is likely to reflect lower participation in the trial in these areas.

7.3.2 Satisfaction and dissatisfaction

The overall response to: "How would you rate your experience with the food recycling trial?" was that 44% of respondents were very satisfied and a further 37% satisfied across the whole response group, weighted to reflect the number of each respondent group with trial numbers from that household type. Table 7.2 and Figure 7.1 illustrate this very strong result.

Applying a household type filter to the results shows that all the residents who responded to the survey reported a high level of satisfaction with the trial, with a range between 77% - 88% in the three household types being satisfied or very satisfied with the trial. The highest level of dissatisfaction as a % of total response was from house residents (26 responses, over 10% just).

Residents who responded that they were dissatisfied with the trial were offered reasons that may apply to why they were dissatisfied. The results are in Table 7.3.

Consistent with feedback received during the trial, the main source of dissatisfaction in apartments was the odour from the caddy or bin. For both apartments and houses, the caddy liners' propensity to break was a similar source of dissatisfaction. In apartments, the available space in the kitchen was a source of dissatisfaction, consistent with apartment resident responses in Table 7.3.

The small number of dissatisfied residents in the survey population and the answers to the question about how to reduce problems with the trial indicates that those who responded to the survey were also uses of the food collection materials. It is likely that few of those who did not participate in the trial responded to the survey. On the basis of the results in sections 4 and 5, this fraction was between 45% and 70% of households in trial areas.

Resident suggestions

- **Stronger compostable liners**
- **Change food bin colour**
- **Education to reduce food waste**
- **Stronger caddies**
- **Check whether residents want the food bin**

Figure 7.1 Weighted response to degree of satisfaction with trial

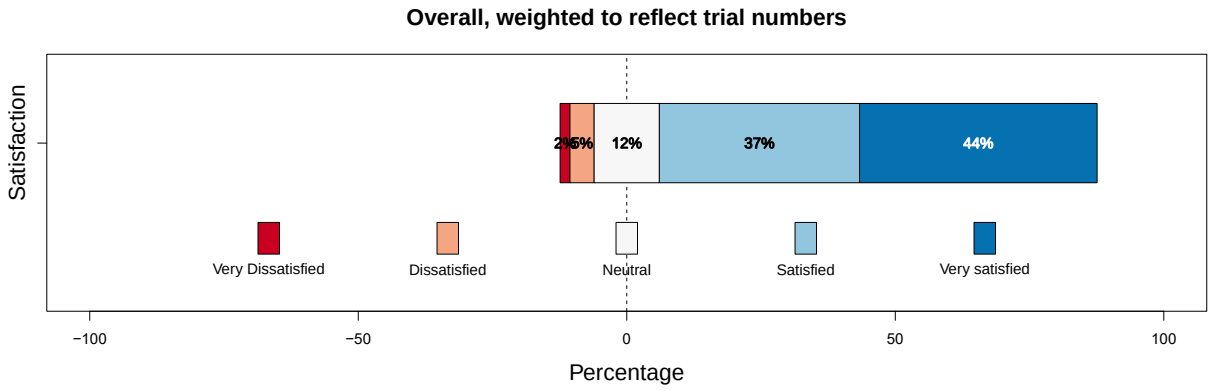


Table 7.2 Resident Satisfaction with food recycling trial

Q7: How would you rate your experience with the food waste recycling trial?

	Very Satisfied	Satisfied	Neutral	Dissatisfied	Very Dissatisfied	Total N
Houses	50%	31.2%	11.2%	5.2%	5.2%	250
Low-rise	50%	37.7%	7.3%	3.6%	1.5%	138
Townhouses	39.7%	39.7%	12.3%	4.1%	4.1%	73
High-rise	33.3%	43.2%	18.5%	4.9%	0	81
FOGO trial	60.8%	34.3%	3.9%	1%	0	102

Table 7.3 Reasons for being dissatisfied with the trial

Q8: Which of the following reasons apply as to why you were dissatisfied? Please select all that apply. 36 respondents nominated a total of 77 reasons from 44 qualified to answer the question.

	Low Rise Apartments + High Rise Apartments + Townhouses	All Houses
The food waste bin lid was smelly and unhygienic	47.1% 8	26.3% 5
The kitchen food caddy created bad smells in my kitchen	41.2% 7	31.6% 6
The caddy liners broke	41.2% 7	42.1% 8
No room in my kitchen for the kitchen food caddy	41.2% 7	26.3% 5
Nobody seemed to be using the food bin in my building	29.4% 5	N/A
I ran out of caddy liners	17.7% 3	0
The food waste bin lid was too similar in colour to the garbage (red-lid) bin	11.8% 2	0
Other reasons	23.5%	47.4% 10

Base number of respondents: Low Rise + High Rise + Townhouses (n=17); Houses (n=19

7.3.3 Use of the food caddy

7.3.3.1 Food share placed caddy

49% of respondents indicated that they used the caddy for nearly all of their food waste. A further 29% responded that they used the caddy for most of their food waste. Very similar response shares to this question were reported across the three main household types. Between 75% and 85% claimed to have put all or most food into the food caddy. Apartment and houses residents in all types were similar in responding that some of it went into the caddy (30%); house residents were twice as likely to have responded 'none' went into the caddy as high-rise apartment residents who were the group claiming the highest share of 'all of it' in response to the questions.

The respondent numbers should be considered in this comment, as only 82 of a possible 526 high-rise households provided completed surveys. Figure 7.3 shows the responses by three household types. The volume and audit data again indicates that most of the responses to this question were from residents who participated in the trial. The food presentation amount and waste audit data makes clear that one of two scenarios applied - at least half of all residents in all areas presented no food waste, or all residents in the highest yield areas presented 50% of available food waste. This evidence also suggests that survey responses were a 'rose-coloured' recollection of actual household behaviour.

Figure 7.2 Weighted response to how much food went into the food caddy

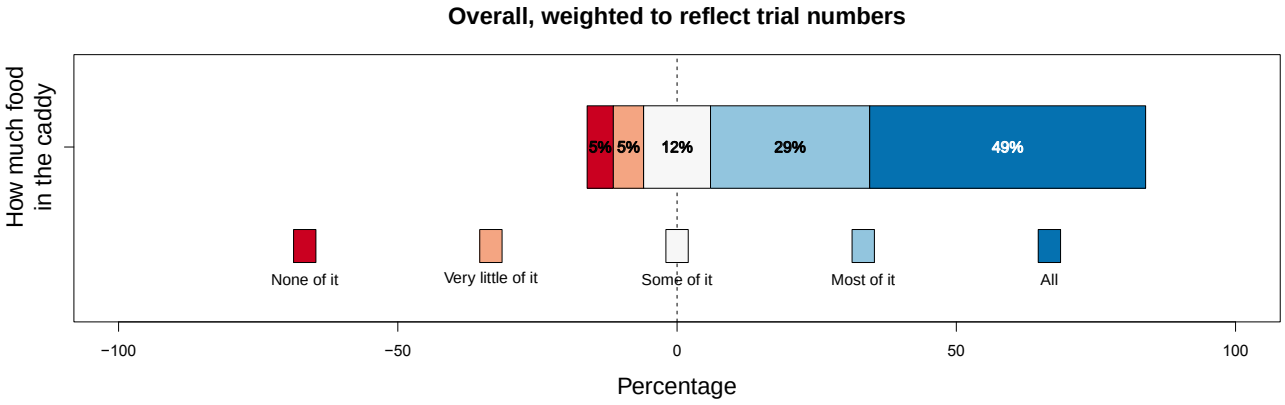
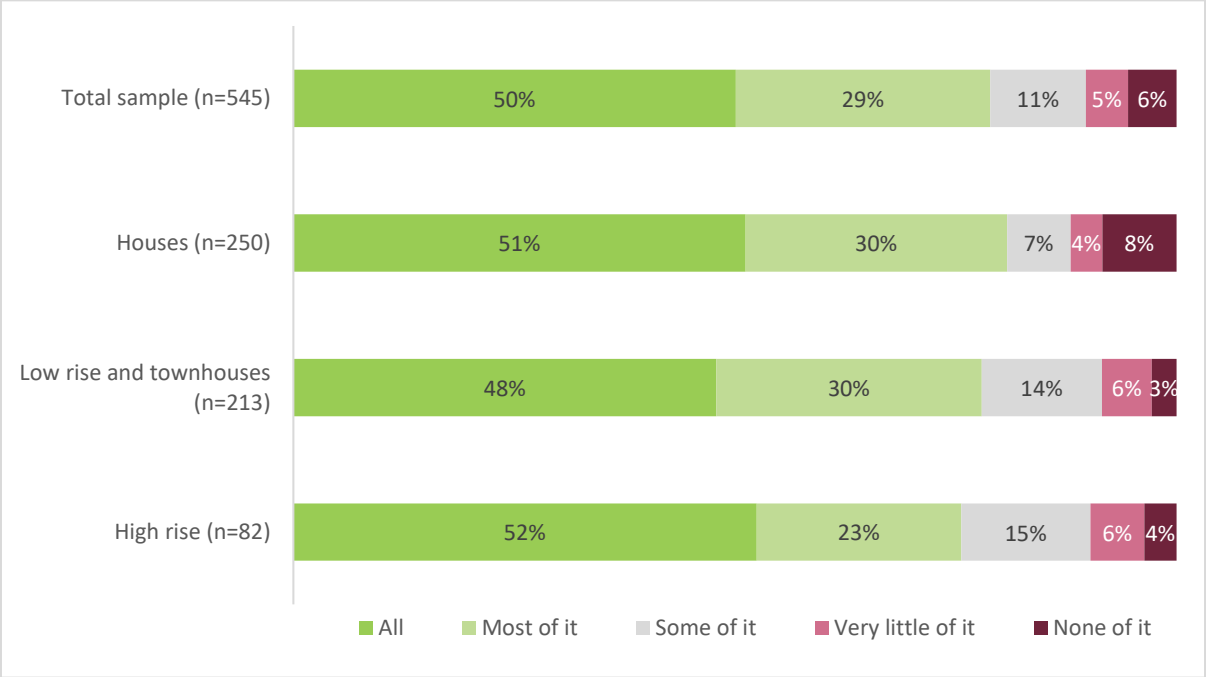


Figure 7.3 Share of waste going in the food caddy

Q4: How much of your food waste usually went into the kitchen food caddy?



7.3.3.2 Frequency of use of the food caddy

A similar result to the 'how much of the food' question was found in the question about how often the caddy was used (Figure 7.4) divergent bar chart of the answers to question 2:"How often did you use the kitchen food caddy and food waste bin to dispose of your food scraps during the trial?" for each of the suburbs sampled. The main graph gives the percentage of answers that are in disagreement on the left, neutral on the middle and in agreement on the right. The histogram on the far right gives the number of participants that answered this question for each suburb.

Data on response to this question by household type are in Attachment 5. 70-73% across the houses and low-rise apartments and 62% in high-rise resident responses responded that they use the food caddy always or often to dispose of food scraps. The strongest positive response was from the FOGO trial areas, where 81% of the 102 respondents claimed to have always used the caddy for food scraps.

The responses to this question are not borne out by the audit data for overall participation, adding further weight to the view that active participants in the trial are more likely to have the responded to the survey. For example, the data from the FOGO house areas showed that only 26% of available and useable food was in the food bin during the audit period.

It may also be that respondents felt obliged to over-report their participation, to match their interest in the food segregation concept.

The follow-on question to Question 2 asked those who responded that they used the caddy hardly ever or never. There were 90 responses to the question as to why the caddy was not used or hardly ever used, from 60 respondents (27 from multi-unit dwellings; 33 from house residents) (Table 7.4). Most of the 63 respondents qualified to answer did so, in other words.

The reasons most often chosen for not using the food caddy were consistent with feedback during the trial from apartments, and predominantly related to odour. Having little food waste was the second most frequently nominated reason from both household types.

Residents in MUDs were concerned about using the kitchen caddy because they were concerned about the smell and accommodating the caddy in the kitchen. Most of the residents in houses who did not use the separate food collection materials nominated the reason as being because they were already composting food waste or did not have much food waste. More detailed analysis of this question is in Attachment 5.

Figure 7.4 **Frequency of use of the food caddy and food bin**

Q2: How often did you use the kitchen food caddy and food waste bin to dispose of your food scraps during the trial?

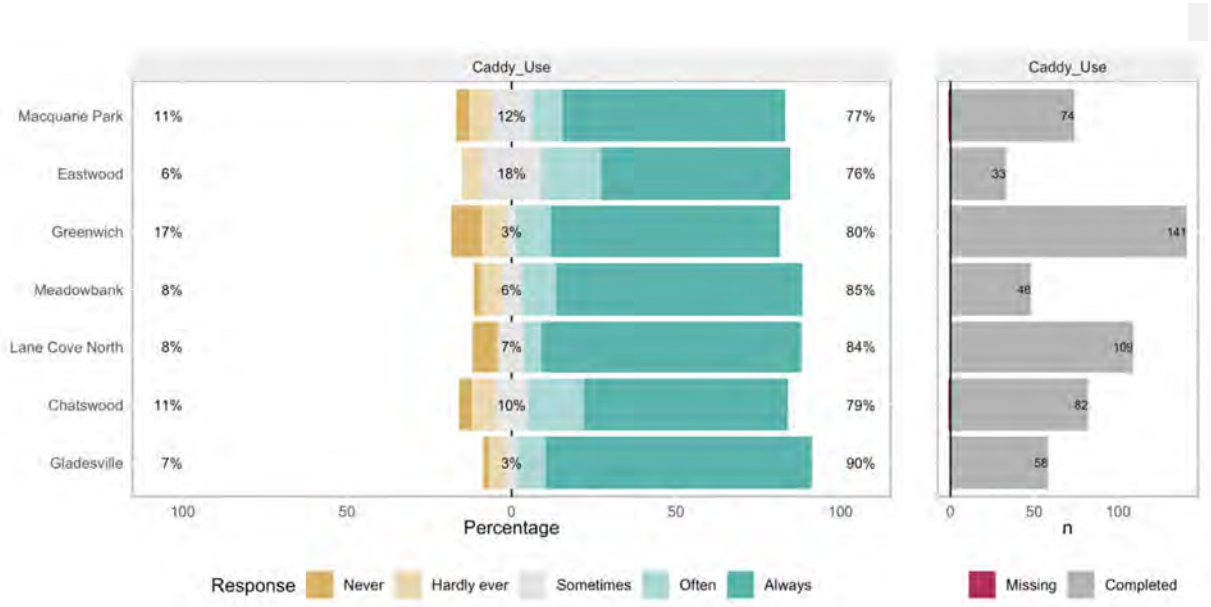


Table 7.4 **Most frequently nominated reasons the food caddy or food bin was not used**

Q3: Why did you not use or hardly ever use the kitchen food caddy and food waste bin? Please select all that apply.

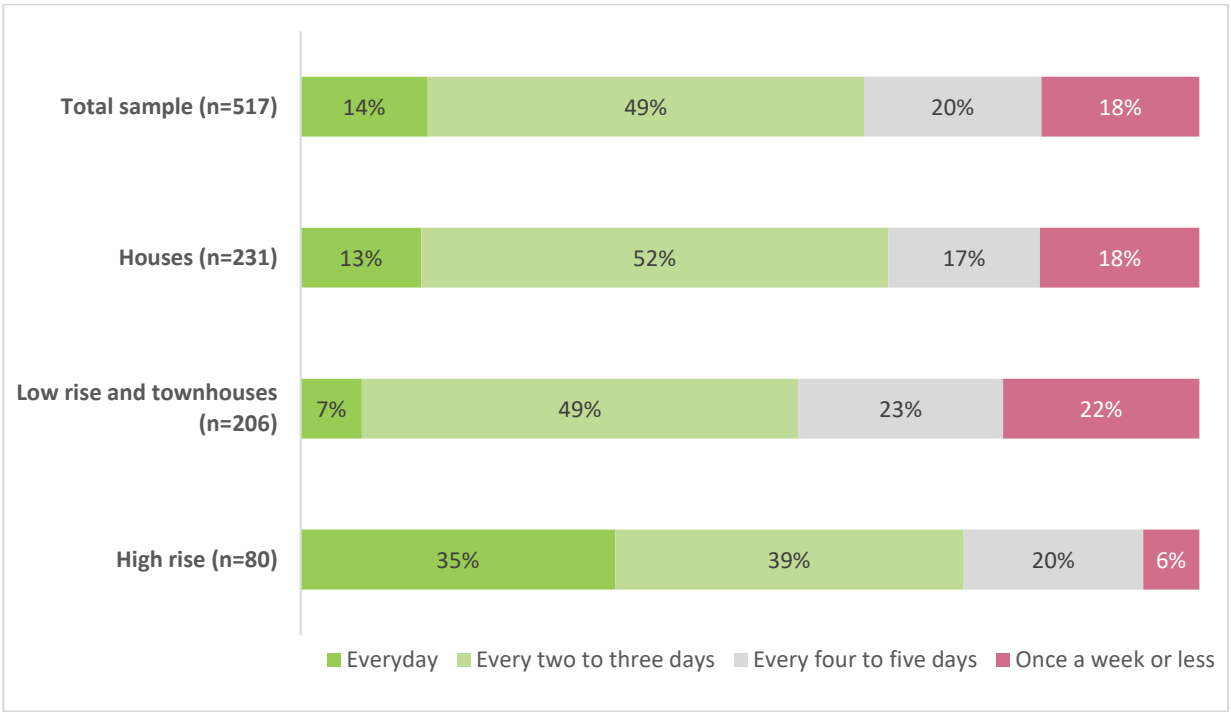
Most to least nominated reason	Houses	Apartments and townhouses
1	Already have a worm farm or compost	Was concerned about the smell
2	Don't have much food waste	Don't have much food waste
3	Was concerned about the smell	Kept forgetting to separate out food waste
4	No room in my kitchen for the food caddy	No room in my kitchen for the caddy

7.3.3.3 Frequency of emptying the food caddy

High rise apartment residents reported much more frequent emptying of the kitchen caddy – 35% stated that they emptied the caddy every day compared to between 7 and 14% by other householders (Figure 7.5). Emptying every 2-3 days (minimum recommended in the distributed waste education material) or every day was reported by 58-65% in houses and low-rise apartments, and 74% in high-rise apartments. High-rise apartment residents who participated in the trial are likely to be more concerned about, and effected by, the impact of odours in smaller kitchens and as a result emptied the caddy more often than residents in other household types.

Figure 7.5 Frequency of emptying the food caddy

Q5: How often did you usually empty your kitchen food caddy into the food waste bin?



7.3.4 Service aspects

Residents were asked (Question 6) to indicate their degree of agreement with a series of statements related to aspects of the food recycling collection service. There were 7 statements for house residents and 8 for apartment residents.

The statements were:

- I understood what could go into the kitchen food caddy
- The kitchen food caddy was suitable for collecting waste in my kitchen
- Once a week collection for the food waste bin was sufficient
- The information materials were useful and clear
- The green compostable liners did a good job of holding the food waste
- I would be willing to buy the compostable liners if a food scraps recycling service was introduced permanently
- The trial has made me more aware of the food waste my household produces

For apartment residents:

- Residents in my building used the food waste bins correctly

A principal component analysis by the statistical consultant to the project found that found that the responses to the 7 common parts of the question were correlated and could be summarised to create one satisfaction score. This new satisfaction score was highly correlated with the overall satisfaction score in responses to Question 7 (r=0.72).

The mean satisfaction score for each type of house (low/high rise, SUD) showed that respondents from low-rise apartments (in particular Gladesville) recorded the highest mean satisfaction score, and respondents from high-rise apartments the lowest. These mean scores were almost but not quite significantly different between house type (p-value = 0.077).

Divergent bar charts of the answers to the 8 different aspects of satisfaction (Question 6) for respondents in each of the three main household groups: low rise apartment, high rise apartment and houses are in Figures 7.6- 7.9.

These results indicate some differences with respect to attitudes about the caddy liners and caddies between houses and multi-unit dwellings. They also contrast with the actual results with respect to available food, again indicating that responses to the survey are not broadly representative of the total households in the trial areas. High-rise apartment residents expressed more concern about the cost of the caddy liners and the participation of other residents in food segregation but only 83 of 526 participation-enabled households returned surveys.

An overall weighting from all respondents to three of the statements is shown in Figure 7.7.

This presentation of the data indicates the most people in the total respondent pool were prepared to buy the compostable liners with 34% of respondents in the survey strongly agreeing that they would buy the compostable liners for a future service, and a further 34% agreeing that they would do so. This leaves 32% who did not agree or were neutral. 85% found the kitchen caddy useable and 78% agreed that once a week collection of food scraps was acceptable.

Figure 7.6 Respondents in high-rise apartments

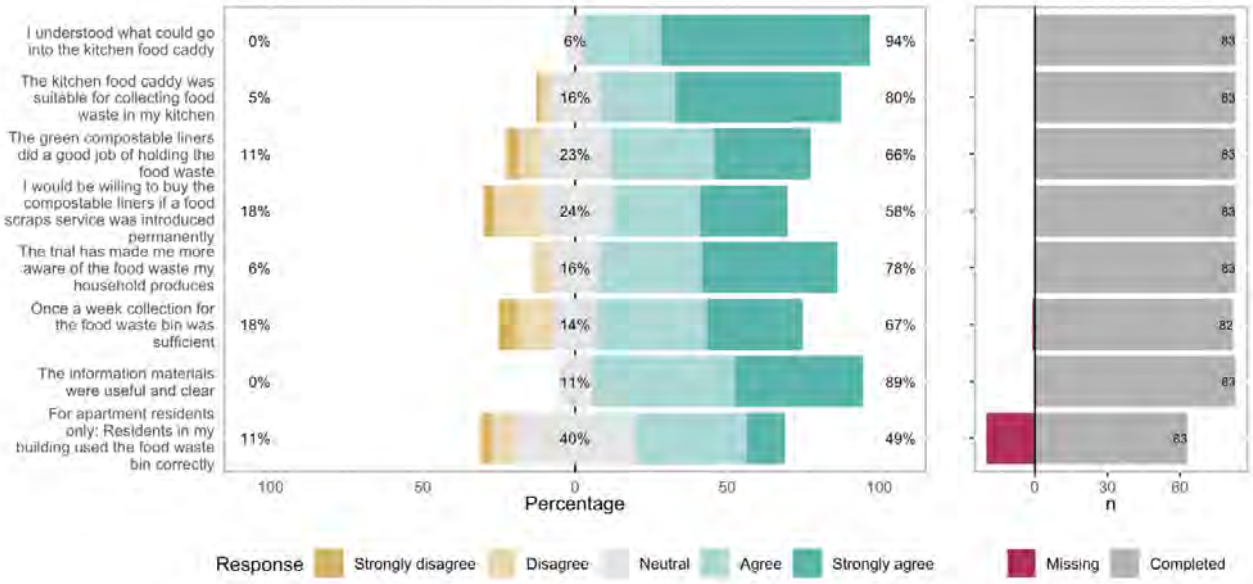


Figure 7.7 Respondents in low-rise apartments

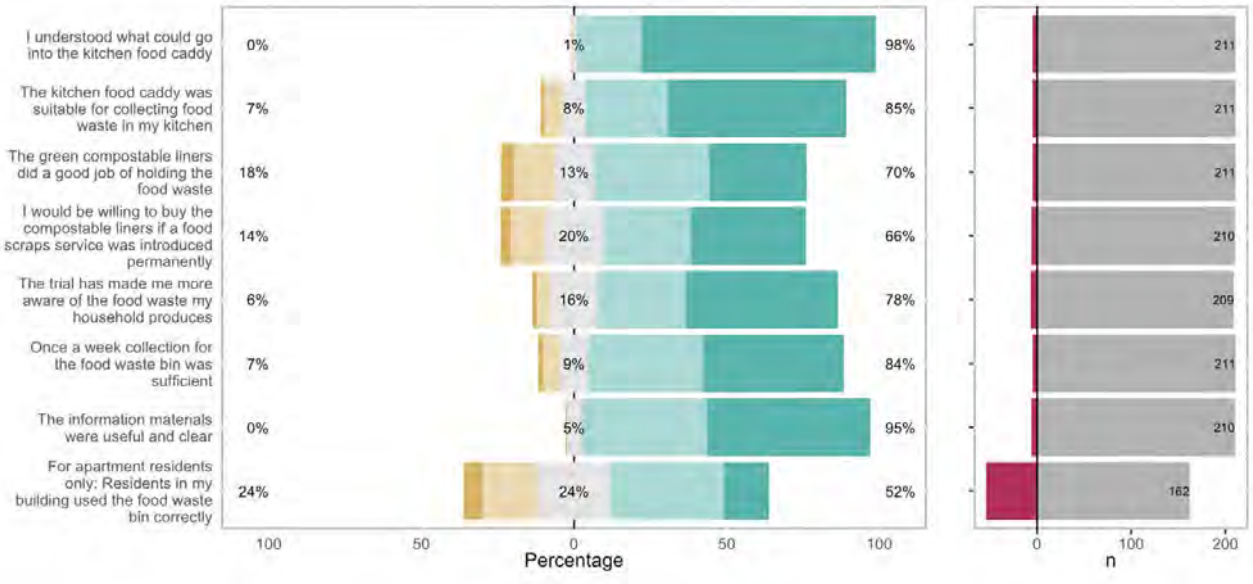


Figure 7.8 Respondents in houses with FO bins

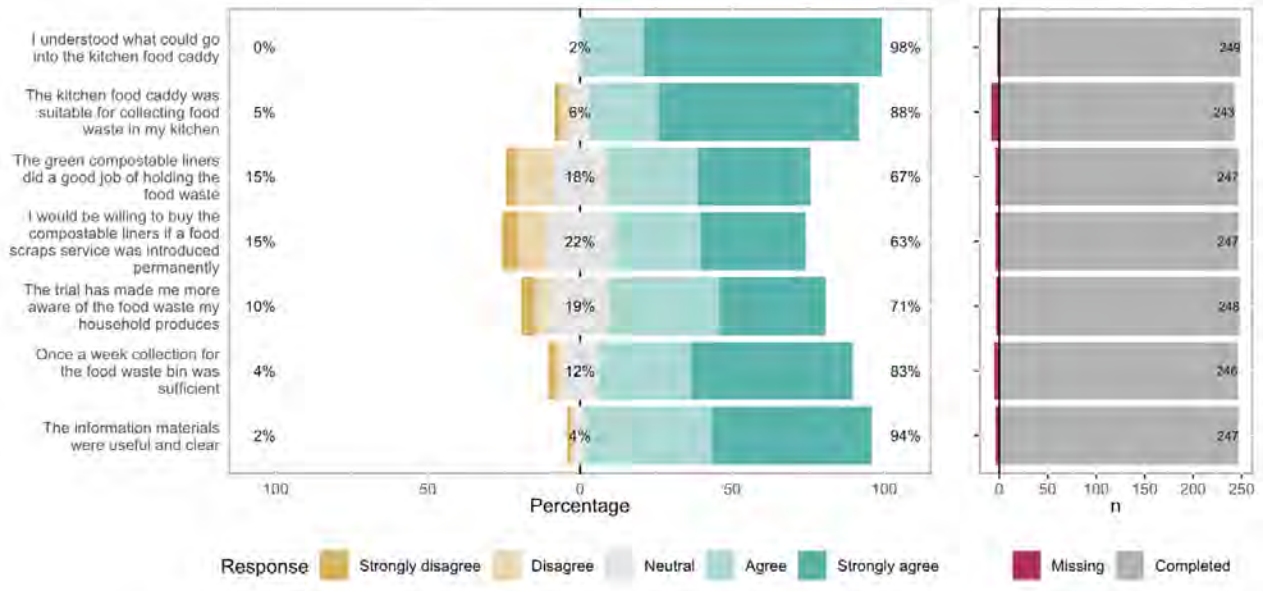
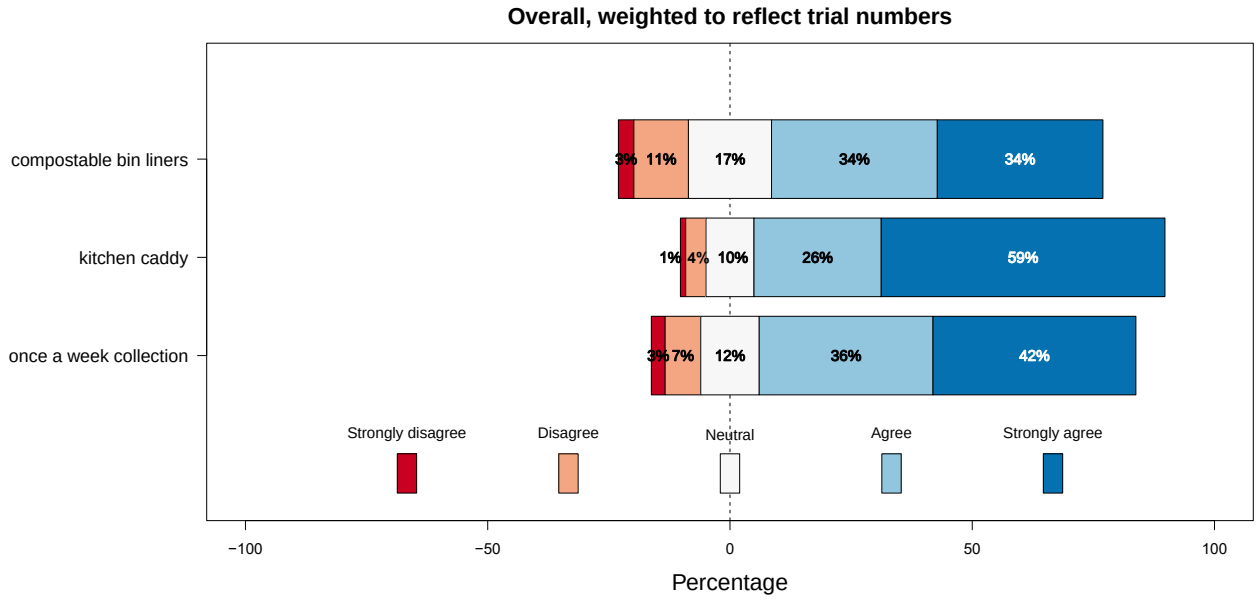


Figure 7.9 Agreement with service aspects – weighted responses



7.3.5 Information sources

The 4-page information brochure delivered with every kitchen food caddy was the most used information source by all residents, followed by the information printed on the caddy and food bin. The brochure was produced in three versions (houses, low rise and high rise apartments), and the positive response to it bears out the effort to create or source relevant images for the three different environments. The fridge magnet was also remembered as a useful source of information by respondents. 542 respondents provided answers to this question. Total results to this question are shown in Table 7.8 and household type analysis of the responses to this question is in Attachment 5.

Table 7.8 Information sources used during trial

Q10: Which of the following information sources did you use during the trial? Please select all that apply.

Information source used	Number of nominated uses
The brochure delivered with the kitchen food caddy	440
Information printed on the kitchen food caddy and food waste bin	307
The fridge magnet	129
The food recycling project website	44
The food recycling project 1300 number (call centre)	17

7.4 Hunter's Hill non-residential food organics trial

A similar survey to the one sent to residential trial areas was sent to all 68 organisations that participated in the non-residential food trial based in the Hunter's Hill Local Government Area. Twenty-seven organisations or 40% responded to the survey which was a strong response. The trial was conducted with a variety of organisational types in order to gather information on the willingness and capacity of organisations to participate in food separation. While as noted in Section 4, 90 organisations were approached, after various disruptions to the trial caused by COVID-related delays and support service failures (principally collection services), 68 participated for at least one week. Responses to the survey were broadly consistent with the participation in the food segregation trial by organisational type.

Table 7.9 Non-residential survey responses by area and % total sample and response number

	Number in trial	% Share	Number of survey respondents	% Share of responses to survey
Restaurant	17	25%	6	22%
Café	17	25%	3	11%
Other food business	10	15%	2	7%
High School	3	4%	3	11%
Primary School	2	3%	3	11%
Preschool/Long Day Care	4	6%	2	7%
Professional Service	14	20%	8	30%
Hospital/Aged Care	1	1%	0	0
Total	68	100%	27	100%

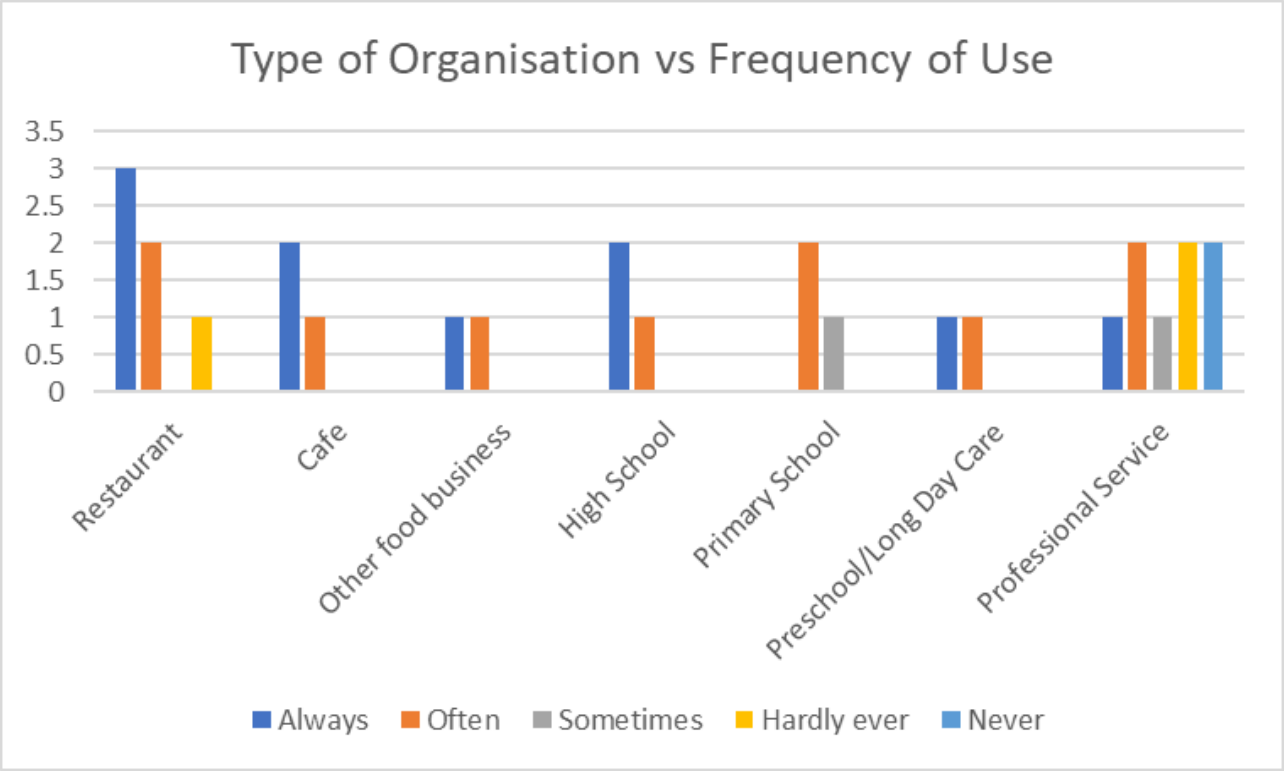
Of the 27 organisations who responded to the survey, 16 reported that they were satisfied or very satisfied with the trial. This result was consistent across organisational types.

Other results from the non-residential areas in Hunter's Hill LGA were: restaurants, cafes, and high schools were more likely to have used the food collection materials always or often.

- A correlation was found between those who reported using the food caddy more frequently and the level of satisfaction.
- The main reasons nominated for not using the food caddy were 'did not have much food waste'; and 'staff kept forgetting or were not engaged' in the trial.
- Primary schools and restaurants were more likely to agree or strongly agree that the trial made them more aware of the amount of food waste generated in their organisations.
- The most frequently used sources of information about the trial were the 4-page brochure delivered with the caddy and direct contact with the Council project manager.

Figures 7.8 shows cross-tabulation between frequency of use of the food collection materials and type of organisation and Figure 7.9 shows the cross-tabulation between frequency use of food collection materials and level of satisfaction with the trial.

Figure 7.10 Non-residential organisation type and frequency of use of the food caddy/bins



FINDINGS AND CONCLUSIONS

8. Food project findings and conclusions

8.1 Key findings

The results of the FO Project provide a significant resource for councils to use in planning future waste services to maximise resource recovery in an economically and environmentally sustainable manner.

Each Section and related Attachments in this Report have more detailed discussion of these Findings. Analysis of the waste data collected during the trials is summarised in **Table 8.1.** These figures are drawn from both weekly trial and waste audit data.

8.1.1 Food presentation

- On average 35% of the mixed waste generated each week by residential households in the FO trial areas is food waste, which is referred to in this Report as Available Food. It includes contaminated and uncontaminated/ containerised food presented in both MSW and FO bins. The Available Food waste share is consistent across houses, low- and high-rise apartments and townhouses. In FOGO houses, Available Food was 31% during the audit weeks.
- Between 2.2 kgs and 3.8 kgs per week of food waste is generated by each household, varying by household type.
- In all areas over the 14 weeks of the trials, most of the Available Food remained in the red-lid bin. Food waste placed in the food bins is referred to in the Report as Presented Food and includes contaminated and uncontaminated food.
- Participation in the food trial (proportion of Available Food presented in the food organics bin) was between 26% and 47%, varying by household type.
- Householders living in houses with food organics bins averaged 3.8kgs of Available Food per week, and of this amount 47% was correctly placed in the food organics bin over the 14 weeks of the trial.
- Householders living in any of the multi-unit dwellings in trial areas averaged 2.4 kg of Available Food per week, and of this amount around 33% was correctly placed in the food organics bin.
- Houses with separate food organics bins correctly separated the greatest share of food waste; houses with mixed organics bins correctly separated a similar share to high-rise apartment and townhouse residents.

8.1.2 Contamination

- Significant variations were found in the amount of contaminated food presented in the food organics bins by different household types.
- Food waste presented by residents in the food organics bins was between 71% and 94% uncontaminated by weight. This share is referred to in the Report as Useable Food measured against the EPA standard for contamination during two weeks of the waste audit.
- Houses with food organics (FO) bins presented the largest share of useable food material while in multi-unit dwellings (low-rise and high-rise apartments, and townhouses) a much higher share of unuseable food material was found in the food bins in the two waste audit weeks.
- Houses with mixed organics (FOGO) bins presented more unuseable food waste than houses with FO bins, and low-rise apartments presented a higher share of general and other waste in the food bins than high-rise apartments and houses.
- Contamination was generally food or other material in plastic bags or food containers. Some of this waste would have been useable if the supplied compostable bags had been used. Residents reported concerns about the compostable bags breaking. It is likely that this uncontaminated amount could be reduced by more communication about options such as double-bagging or wrapping waste in newspaper, or by supplying sturdier caddy liners.

- Minor contamination in food organics loads was accepted at the waste delivery terminal. Food waste was accepted by the waste management company and transported for processing, despite the presence of materials that did not meet the EPA standard for FO/FOGO material acceptable for composting. A few grossly contaminated FO/FOGO loads from trial areas were rejected at the terminal. In low-rise apartment areas and the non-residential trial area, loads were left for general waste pick-up by collection contractors on multiple occasions, which reduced food weights for those weeks and contamination measurement during the audit.

Table 8.1 Summary of Food per household per week, in kgs, MSW, Available, Presented and Useable Food[1]

MSW & Food per household, per week in kgs	Houses – FO N= 706	High rise apartments N=526	Low rise apartments N=675	Townhouses N=246	Houses – FOGO N=230
1 Total MSW	10.6	7.8	6.16	6.85	9.9
2 Available Food	3.77	2.56	2.24	2.48	3.05
3 Presented Food	1.78	0.94	0.59	0.83	1.03
4 Useable Food	1.67	0.7	0.57	0.69	0.73

Definitions and sources

Total MSW: this is the average weekly waste in kgs in households that would have been in a single MSW bin. Data for this category was sourced from the waste audit which sampled large amounts from each MSW collection in each of two weeks. Sampled tonnage scaled up to reflect actual averages based on total weights divided by number of households from which the waste was collected. In the audit weeks, MSW from trial areas was separately collected to match the households with food bins.

Available Food: this is average weekly food waste and includes both useable (uncontaminated) and unuseable (contaminated) food organic material. Data for this category was sourced from average weekly food presented in the FO or FOGO bins in the seven residential trial areas over the 14 weeks of the trial plus the average weekly food presented in the mixed waste (red-lid bin) in the 2-week audit. For FOGO houses the food in the FOGO bin data is a 10% share of all 14 weeks data of FOGO plus the average weekly food presented in the mixed waste (red-lid bin) in the 2-week audit.

Presented Food: this is food placed in the food organics collection bins and includes both useable (uncontaminated) and unuseable (contaminated) food organic material. Data is from the 14 weeks of the trial for the seven FO residential areas. Data for FOGO houses the food in the FOGO bin data is a 10% share of all 14 weeks data of FOGO (audit result).

Useable Food: this is the average weekly weight of uncontaminated food. Data is from the audit results of the FO and FOGO bins food material.

8.1.3 Demographic variations

Demographic variations between trial areas correlated with variations seen in contamination and food presentation. The correlation between data on food weight contamination and community profile characteristics found that:

- Household size was strongly correlated to the amount of food presented. Larger household sizes presented more food and more uncontaminated food than areas with smaller average households.
- A strong correlation was found between areas with higher household incomes and the amount of food presented, and a negative correlation was found between the amount of contamination and higher average household incomes.
- Areas with less rental housing presented high food volumes on average. A negative correlation was found between the amount of food presented in a trial area and rental households.
- Low levels of English language proficiency were negatively correlated with food presentation and positively correlated with contamination. That is, trial areas with higher shares of the population with lower proficiency in English presented lower food volumes and higher levels of contamination.

8.1.4 Resident contact and feedback

- Relatively few residents made contact through the Project's communication channels during the trial to complain or ask questions despite the availability of multiple channels for contact: 62 inquiries or complaints were received from the over 2,000 participating households, over 16 weeks of the pre-trial and trial period.
- These formal contacts were related to service difficulties and not to confusion about the use of the food collection materials. 30% of contacts were about missing collections or missing caddies (pre-trial and early weeks of the trial), complaints about odour in bin bays or bin rooms (20%) (mid-trial weeks) and the need for more compostable liners (21%) (last month of the trial).
- Informal feedback from residents to council staff during the trial concerned caddy liners breaking, bad odours in kitchens and concerns about hygiene and odours in shared bin areas (chute rooms and bin bays).
-
- Residents in the trial areas with the lowest per household food presentation were areas where a larger share of households were not directly contacted when the food caddies were delivered because there was no answer to the door-knock delivery after two or more attempts. In low-rise apartment areas this was 33% of 921 households in the trial . This compares to 96% directly delivered caddies in the high-rise apartments (where caddies could not be left at the door) where per household volumes were higher on average than in low-rise apartments.
- This difference indicates that the door-knock, personal approach to engage with the resident was likely to have been effective in the initiating correct use of the food collection materials and engendering a willingness to engage in separating food from general waste.
- The end of trial survey received a 25% response rate from residential areas, with more than 50% of all 547 responses coming from residents in houses.
- Only 20% of residents in low-rise apartment areas responded to the survey, which is consistent with results on the amount of presented food and suggests that non-participating apartment residents did not generally respond to the survey, even with the incentive of a $20 shopping voucher offered when surveys were lodged.
- On a weighted basis, 81% of survey respondents were satisfied or very satisfied with their experience of the food scraps trial. Most respondents also expressed satisfaction with elements of the trial such as the information materials, compostable liners and caddies.
- The reasons most often chosen for not using the food caddy in houses were that home composting was already in place. For apartments, consistent with feedback during the trial, reasons for non-use of the caddy predominantly related to odour. Having little food waste was the second most frequently nominated reason from both houses and multi-unit apartment residents.
- The small number of dissatisfied residents responding to the survey and the nature of the suggestions they made indicates that respondents to the survey were also those who actively participated in the food trial. It is likely that few of those who did not participate in the trial responded to the survey. On the basis of the results in sections 4 and 5, this fraction can be reasonably estimated to be between 45% and 70% of households in various trial areas.

8.1.5 Non-residential food organics trial

- The non-residential trial supplies evidence of substantial amounts of food waste in business/service organisations similar to those participating from the Gladesville/Hunters Hill areas.
- Between 17 and 20 kgs of food waste per organisation per week was presented.
- Cafes and restaurants presented segregated food waste more consistently than other organisations and bakeries, and education services and cafes presented the least contaminated food for collection.
- Available food presented in the food organics bins was more than 85% of the contents in the audit weeks in waste from cafes, bakeries, and schools.
- Food bins were regularly rejected due to being contaminated with general waste, mostly in bins placed in public areas. 81 bins were rejected at the point of pick-up due to the presence of general waste.

8.1.6 Food waste collection and management infrastructure

- Reports from residents arose during the trial with respect to the colour of food collection bin-lids being too close to the colour of mixed waste bin-lids. It is reasonable to conclude from the results in shared bin areas that this colour closeness added to the amount of general waste presented in the food organics bins.
- Apartment residents expressed concerns about managing the kitchen food caddy in their kitchens, with limited space for an extra container for waste. Caddies of 7 litres, while standard, may not be suitable for smaller households. .
- In high-rise apartments, the odour created in chute rooms from the food bin was a source of aversion to participation. This is likely due to both the experience of using the food bin being unpleasant and the spread of bin-room odours into other shared spaces.
- The trial planned for high-rise apartment buildings demonstrates that lengthy consultation and adaptation to each building's waste facilities is necessary to gain agreement from strata managers to separate food waste collection. The cost of and responsibility for emptying and cleaning chute room food bins was an additional cost in trialling the food service that would have to be accounted for in a mandated food collection service in high-rise apartments.
- Caddy liners compliant with the Australian Standard for commercially compostable liners were provided to residents. Many residents found the liners to be too flimsy for transporting to the food bins (in low-rise apartments in particular) and others reported that the liners started to break down after two days regardless of the amount of waste in them. This feedback is thought to account for some of the non-participation level in multi-unit households and would not be fully addressed by waste education.

8.1.7 Potential composting, participation and useability measures

The wealth of data collected during the trial allows the calculation of three rates to understand the results in terms of how resources from food waste may be recovered for compost production. Definitions are as set out under Table 8.1.:

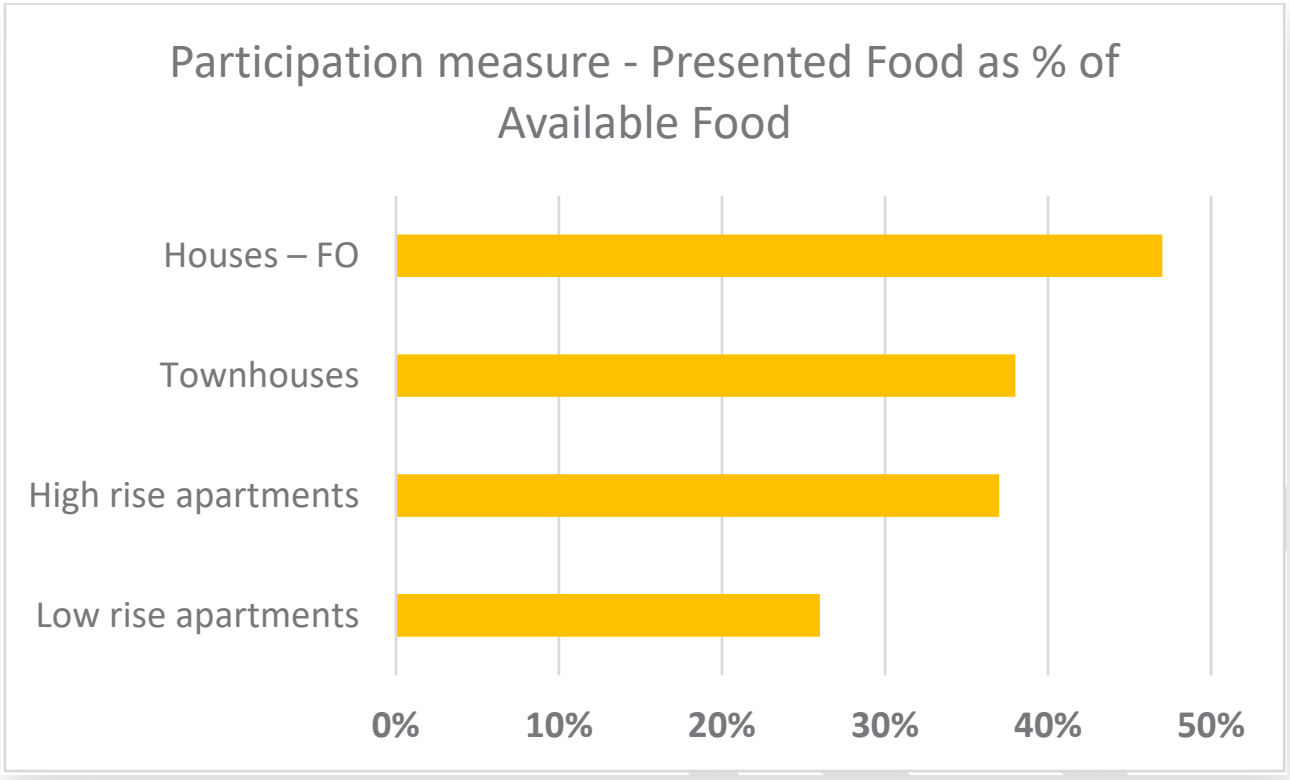
- Potential Compost Measure - Available Food as % of MSW
- Participation measure - Presented Food as % of Available Food
- Useability measure - Useable Food as a % of Presented Food

Table 8.2 and Figure 8.1 and chart illustrate the scale of change needed in multi-unit households' presentation of food to reach the participation level that single-unit householders demonstrated during the trial. It should also be noted that the participation rate in high-rise apartments came with the additional cost of weekly cleaning of bins on every floor and was initiated through personal delivery of food collection materials at the commencement of the trial. That is, to a degree this was a cohort that opted in to participate, but nevertheless only presented 37% of Available Food. It is likely that without these measures, the rate of participation would be closer to that seen in low-rise apartments.

Table 8.2 Available, Presented and Useable food by household type, % rates

Percentage Food % MSW	Houses – FO	High rise apartments	Low rise apartments	Townhouses	Houses – FOGO
Available Food as % of MSW (measure of potential compost recovery)	36%	33%	36%	36%	31%
Presented Food as % of Available Food (measure of participation)	47%	37%	26%	38%	34%
Useable as % of Presented Food (measure of useability)	94%	74%	97%	83%	71%

Figure 8.1 Participation by household type



8.2 Research questions

The FO Projects research methodology was designed to help councils answer the research questions identified for the trials (Section 2, Table 2.1). Responses to the questions are reported throughout this document and summarised below.

1. How much food is presented for collection by councils in houses, units, businesses?

The top-line results in relation to food volume from the FO trial areas are that:

- Between 33% (high-rise apartments) and 36% (all other dwelling types) of material in mixed waste is food material. This share represents a measure of the potential amount available for recovery to make compost.
- On average, over the 14-week trial period, between 1.78 kgs and 0.59 kgs per week per household was presented for separate collection in a food organics bin.
- The rate of presentation of food for separate collection as a share of available food was between 26% (low-rise apartment areas) and 47% (houses with FO bins).

2. How much food waste is correctly segregated into a separate food container and how much remains in the mixed waste bin?

The amount of correctly segregated food, or Useable Food, presented in trial was between 0.6 to 1.7 kgs per household per week. This represented between 26% and 47% of Available Food.

In houses with FO bins, 43% of Available Food can be modelled to have been presented in the mixed waste bin over the 14 weeks of the trial. In low-rise apartments 73% of Available Food was presented in the mixed waste bin. Across all multi-unit dwellings, 63% of Available Food stayed in the mixed waste bin.

In houses with FO bins, 68% of Useable Food was presented in the FO bin, while in low-rise apartments 36% of Useable Food was presented in the FO bin.

Results from the audit of the small sample non-residential trial indicate that between 17 and 20 kgs of food waste is available per week from cafes, restaurants, bakeries, and schools and that 80% or more of Presented Food material in the food organics bin is uncontaminated. See discussion below at 8.2 and in Section 5 of the Report.

3. What are the contamination levels in food organics loads and what proportion of collected organics would be recovered or rejected by re-processors?

Collection contractors declined to pick up grossly contaminated food organics bins from low-rise apartments and non-residential premises on several occasions. A small share of delivered food organic waste (2-3 loads) was rejected at the transfer terminal by the waste management company. The end-destination organics processor advised the Project Committee that the material delivered that was in containers or plastic bags (the principal sources of contamination in the food organics collections) was useable because they had a decanting equipment that removed food from containers and bags and that about 5% of the weight of the delivered material was contaminated. The processing company also intended to blend only a small share (20% estimated) of residential food organics into the end compost product.

The experience of the Food Projects indicates that there is a mismatch between EPA standards for acceptance of FO and FOGO material and the services available to councils for collection, delivery, and management of residential food waste by the organics processing industry.

As the trial did not provide reliable information on contamination, the Project results rely on the two-week audit which measured contamination in accordance with EPA standards.

The audit found low levels of contamination from Presented Food from houses with FO bins (3-4 %) and that multi-unit dwellings presented between 17% and 26% unuseable (contaminated) material in the FO bins.

4. What resource recovery outcomes are achieved from the separately collected food waste in the trials?

The organics processing company advised that by using their decanting and debagging equipment 95% the delivered residential food waste could be used as part of a blending process to make compost. They also advised that their open windrow process results in 50% evaporation of food waste during the three to four months of the composting process.

5. What are the views of participating households on the food segregation service?

The FO project data provides valuable information on the real willingness and capacity of residents in households in different built environments to segregate food waste from mixed waste and to do so without contaminating the waste stream with non-food material unuseable for compost production.

The participation rate of households in the different trial areas was determined by dividing the amount of food waste available in both the MSW and FO bins by the amount presented in the FO bin.

There were significant differences in the participation rate amongst households in different built environments. The range was between 26% and 47%.

Attitudes to the food segregation trial collected through the post-trial survey showed high levels of satisfaction with the experience based on 25% of the total sample population in the response group. Weighted by trial area population, 44% of respondents (201) were very satisfied with the food segregation trial and a further 37% were satisfied.

Residents living in houses responded to survey much more than multi-unit residents. It is likely that non-participants in the trial were not adequately represented in the survey response.

Feedback during the trial through direct contact showed that apartment residents were concerned about the compostable liners breaking, the caddies creating odour in the kitchen and the shared food bins being smelly and unclean.

High levels of caddy use reported in the survey are not aligned with the actual average of food waste collected in any of the trial areas. It is likely that residents who participated in the trial were the dominant group responding to the survey, based on the food volume results and the number of surveys received from low-volume trial areas. See Section 7 for further discussion of this anomaly.

6. What are the additional costs of providing a food organics collection service for houses, apartments and food businesses?

There were additional service costs to deliver the food organics trial that more than offset the small reduction in the cost of disposal of the slightly reduced tonnage of mixed waste. Some costs arose from food collection materials distribution that would be service establishment costs, while others were recurrent costs that would have to be budgeted for in a future service. No reduction in weekly collections would be possible to offset extra costs, as a majority of the food organics remained in the mixed waste bin. No reduction in weekly collections would be possible to offset extra costs, as a majority of the food organics remained in the mixed waste bin.

Councils reported food collection costs (additional truck per area) and cleaning of bins in apartment areas as the two major additional costs in offering the food organics collection service.

The focus of the trials data collection was not on costs of a permanent service as the Project was a research study focused on the amount of food and the resource recovery potential of Presented Food, however some of the reported costs provide the basis for further analysis:

- The provision and collection of FO bins for 706 houses over 15 weeks cost about $50,000.
- Cleaning bins in apartments was an unforeseen cost at $2,000 per week for 526 high-rise properties and $1,000 per month for 921 low-rise apartments.
- The cost of communications materials, and rollout of food collection materials to reach 2,000 households was about $60,000.
- Food collection materials were another substantial cost item - caddies at $4.50 each and caddy liners at $5.65 per roll of 75. Each household was given 1 roll but many more were requested and provided as problems with caddy liners breaking emerged.
- Councils reported significant staff time in procurement, communications, and contractor monitoring.

7. How do the resource recovery outcomes from segregated food waste compare to inclusion of food in mixed waste processing under existing agreements?

Under existing contracted services, Waste Alliance Councils have access to MBT processing of a portion of mixed waste. This waste processing services from unsegregated mixed waste results in about 30% resource recovery including production of a beneficial soil additive for mine site remediation (WOO). Waste education costs are minimal and only one collection is required.

Recovery from mixed waste with organics includes pumped landfill gas to generate energy. In 2021-22 the Waste Alliance share of energy production from landfill was 3,940 Megawatt hours.

The resource recovery achievement from a separate food waste collection service would reduce the WOO production and landfill gas production by the fraction of organics removed.

Data from the Project tells us that the best case of food separation is that about 50% of Available Food is removed from the mixed waste bin (houses); the average in multi dwellings is about 33%.

The analysis in Section 5.13 of the Report illustrates the resource recovery outcomes from the two processing options based on industry supplied data and trial results. On a modelled basis assuming 100% of MSW is subject to MBT processing and using the results of the FO Project to estimate Useable Food waste presentation, resource recovery from one tonne of waste in a residential area with mainly houses that is delivered as unsegregated mixed waste results in landfill gas production plus 300 kgs of soil additive and evaporation, and resource recovery from one tonne of mixed waste delivered in two streams (food and mixed waste) results in 175 kgs of compost plus evaporation. For deliveries from multi-unit areas, the compost production would be 117 kgs.

8.3 Conclusions

- Each LGA's food organics presentation volume and useable food fraction varies according to its share of different dwelling types and its demographic characteristics. Planning for food organics waste management should not apply generalised averages to estimate food weights or food contamination.
- Residents in houses who participate in segregating food waste can be expected to be generally compliant in presenting uncontaminated food.
- The evidence from the food weights, waste audits, contact records and survey responses indicate that a large share (about two-thirds) of residents in apartments did not participate in separating food waste during the trial and about half of house residents did not participate.
- To address the low food volumes presented from apartments would require new approaches to waste collection and management in bin rooms and bin bays to reduce odour and perceptions of the food bins as unhygienic.
- Resource recovery tonnage of beneficial products from food waste is not better than organics harvesting through mixed waste processing, based on the trial's participation rates.
- There are barriers to participation in areas with higher numbers of residents who have low proficiency as English speakers. These areas were correlated with lower food presentation, higher contamination in food bins and lower response to the end-of-trial survey.
- There is a limited market evident of organics processing service providers for outputs of residential food organics, and inadequate information available to councils on standards in compost output from existing processing services or on the management of gas emissions.
- Councils need more information on the timing and standards of new organics processing capacity so that tenders can be prepared with sound information on efficiency, contamination standards, risk sharing, cost, location, technology and greenhouse gas capture.
- The results of the non-residential trial make a case for a more focused trial that would be designed to incorporate the lessons learned from the trial: clearer identification of food waste bins, more reliable collection services and direct engagement with the most prospective organisational types with consistent amounts of food waste (food services) and/or higher volumes (education and health care delivery).

- Based on the data there appears to be a different approach to waste education and information needed for mixed organics bins as the participation rate (Presented Food as a share of Available Food) was much lower than in houses with a separate food organics bin.
- Food waste service introduction will incur a significantly increased costs in waste collection and community education. Service introduction is more complex than giving residents a caddy, food bin and compostable liners.
- No reduction in weekly collections would be possible to offset extra costs, as a majority of the food organics remained in the mixed waste bin.
- Personal contact delivery of food collection materials and direct communication with residents were effective methods to engage residents' interest in food waste segregation and are likely to need to be embedded as an additional council service under a mandated service.
- Regardless of waste education measures, compliance with food segregation depends on residents' commitment to the extra tasks involved in separately disposing of food waste. There is an efficiency case in terms of maximising the presentation of Useable Food for food organics segregation to be an opt-in offer to residents who are committed to this task, which is 33% to 50% of residents, varying with dwelling type.
- Based on the trial, the best prospects for collecting Useable Food waste are from:
- Residents in houses with a separate food organics bin (not combined with garden organics)
- Residential areas with larger average household size
- Certain types of commercial and retail businesses where there are contiguous businesses so that collection services can function efficiently.

For the foreseeable future councils cannot reliably use procurement for the policy achievement of resource recovery from food organics collection and processing. Councils

ATTACHMENTS

ATTACHMENT 1

KEY DEMOGRAPHIC CHARACTERISTICS OF FOOD ORGANICS TRIAL AREAS[1]

Lane Cove North
Lane Cove North has an estimated population of 11,776 people (2021 ABS) living in an area of approximately 2.4 square kilometres. Median age in 2021 was 36 and median household income was $2,386 per week.

41% of the population in the area are aged between 25 and 44 years.
In Lane Cove North, 37% of people speak a language other than English at home. The most common languages spoken at home (excluding English) are Chinese languages.

About 58% of households were purchasing or fully owned their home.

The sample area for the FO trial included 436 total households living in separate houses.
Average per household FO presented per week over the trial period was 1.99 kgs per week.

Greenwich
It has an estimated population of 5,469 people (2021 ABS) living in an area of approximately 1.7 square kilometres. The median age was 42 and the median household income in 2021 was $2,946 per week.

In Greenwich, 77% of residents speak only English at home, and about 19% of people speak a language other than English at home. The most common languages spoken at home (excluding English) are Chinese languages.

The largest age group in this area is 45- to 54-year-olds. About 65% of households were purchasing or fully owned their home.

The sample area for the FO trial included 436 households living in separate houses.
Average per household FO presented per week over the trial period was 1.65kgs per week.

Chatswood
The suburb of Chatswood has an estimated population of 25,553 people (2021 ABS) living in an area of approximately 5 square kilometres. The trial was conducted in a small area within the Census suburb and the relevance of the community profile is likely to be less than in other areas.
The median age in 2021 was 37 and the median household income was $2,158 per week.

[1] Source ABS Population Census 2021 Community Profiles

In Chatswood about 65% speak a language other than English at home. The most common languages spoken at home (excluding English) are Chinese languages (36% of total population).

The largest age group in Chatswood is 35–44-year-olds, 35% are aged between 25 and 44 years old. 46% of all residents in the suburb own or are paying off their residence.

The sample area for the FO trial included 526 households living in high-rise apartments. Average per household FO presented per week over the trial period was 0.94kgs per week.

Gladesville
Gladesville has an estimated population of 12,867 people (2021 ABS) living in an area of 3.5 square kms. The median age is 39 and the median total household income is $2,257.

In Gladesville, about 27% of people speak a language other than English at home. The most common languages spoken at home (excluding English) are Chinese languages, Greek, Italian and Indian languages.

The largest age group in this area is 25 to 34-year-olds and 32% of the population is aged between 25 and 44. 59% of households were purchasing or fully owned their home.

The sample area for the FO trial included 222 households. The average per household FO presented per week over the trial period was 0.58 kgs.

Meadowbank
A population of 5,089 people lives in Meadowbank's 0.7 sq km area. The median age of the population is 34 and the median household income is $1,993 per week.

In Meadowbank, about 60% of people speak a language other than English at home. The most common languages spoken at home (excluding English) are Chinses languages and Korean.

The largest age group in this area is 32% are aged 25–34-year-olds. 61% of households are renting their residence.

The sample area for the FO trial included 207 households. The average per household FO presented per week over the trial period was 0.55 kgs.

Eastwood
Eastwood has a population of 18,695 people. The median age in 2021 was 39. Median household income was $1,945 per week.

In Eastwood, about 69% of people speak a language other than English at home. The most common languages spoken at home (excluding English) are Mandarin, Cantonese and Korean.

The largest age group in this area is 25-34-year olds. 58% of households were purchasing or fully owned their home with almost 42% being privately rented.

The sample area for the FO trial included 246 households. The average per household FO presented per week over the trial period was 0.63 kgs.

Macquarie Park
Macquarie Park has a population of 11,071 people living in an area of 6.8 square kms. The median age is 31 and the median household income is $1,886 per week.

In Macquarie Park, about 65% of people speak a language other than English at home. The most common languages spoken at home (excluding English) are Chinese languages and Indian languages. The largest age group in this area is 25-34 year olds. 31% of households were purchasing or fully owned their home.

The sample area for the FO trial included 246 households. The average per household FO presented per week over the trial period was 0.58 kgs.

ATTACHMENT 2
COMMUNICATIONS CONTENT AND MATERIALS

FAQS – USED ON FOOD RECYCLING TRIAL WEBSITE AND BY CALL CENTRE

1. Why was I selected to participate in the trial?

The properties in the trial have been selected to ensure that diverse properties and communities across the region are included. These include single houses, medium and high-density units. We'll also be trialing the collection service with businesses that produce food waste, such as cafes and restaurants, schools and aged care facilities.

2. If other people want to take part in the trial, can they apply to receive a kitchen caddy and liners?

All houses in the trial areas have been given food collection caddies, and the selection of those areas was based on available funding, so we cannot add households from other areas.

3. Why do we need a trial for food waste?

The data collected from this trial will be used to inform the future of food waste removal, with a target of reducing food waste in landfill by 50% by 2030. Leftover food from homes and businesses is one of the most prevalent forms of waste. In fact, around a third of garbage in the red-lid bin is made up of food waste. Most of this waste ends up in landfill where it can become a significant source of methane, a harmful greenhouse gas. Food waste and other organic materials can be transformed into a resource by converting it into compost and this trial will tell us how much food waste is available for this purpose.

4. Can I opt out of the trial?

The trial is based on everyone in the building/property taking part; just the same as council asks everyone to separate recyclable items from your red-lid bin waste and dispose of them in the yellow-lid bin. If you do not separate your food waste during the trial, we will not have a full picture of how much food could be collected. Remember that the trial will provide feedback to Council on the uptake of separating food waste, reducing the amount of waste going to landfill and utilising food as a valuable resource.

5. How long will the trial last?

The trial will last about three months starting on 14 March and ending on 24 June 2022

6. Why is the food waste collection trial only for three months?

The purpose of the trial is to collect information on the best way forward for waste management of food waste. Three months' data will inform decision-making about future services once current contracts for waste management come to the end of their terms.

Right now, some of the food waste in the red-lid bin is being processed to make a soil additive to rehabilitate a mine site near Goulburn. This will continue once the food waste collection trial has ended and until the time a decision is made on the best way to capture the resources in food waste and reduce greenhouse gas emissions.

7. What can I put in my food waste bin?

- Fruit and vegetables (including avocado seeds)
- Bread, rice, and cereals
- Coffee grinds and tea bags, soiled paper towels, serviettes and hair
- Meat, chicken and fish
- Dairy products
- Cakes, biscuits and sweets
- Small bones such as fish bones and chicken wings
- Seafood such as fish bones, crab shells, prawn shells

8. What can't I put in my food waste bin?

- Food that is still in its packaging. Please remove all packaging first.
- Plastic bags, food should only be put into compostable bags or wrapped in newspaper.
- No hard shells such as oysters, clams, mussels, abalone and scallop shells. Prawn and crab shells are OK.
- Large bones such as steak, leg ham and BBQ rib bones. Fish and chicken bones are OK.
- Green waste such as leaves, branches, flowers.

9. Will my rates go up because of this trial?

No. The trial is being jointly funded by the five participating councils and the NSW Environment Protection Authority (EPA). The purpose of the trial is to help councils understand the best way to reduce the amount of food scraps that end up in landfill. Any food waste collection service to be rolled out in the future would be discussed with communities and would include any

10. Why can't I put my food waste in the green-lid bin?

The garden waste in the green -lid bin goes to a different facility and is processed in a different way.

11. What happens to the caddies and the bins at the end of the trial?

At the end of the trial, you may keep the caddy and use it in any way you want. If you have the space to do so, you may want to set up your own home composting system for your food scraps.

The larger burgundy-lid food waste bins and lids will be collected by council and used for other waste streams.

12. What if I run out of bags/bin liners?

We will provide you a roll of 75 compostable bags. This should be enough for a three-month trial. If you do run out, you can contact Council to request more bags. Until you receive more liners, you can line

your caddy with newspaper or place food scraps directly into the caddy. The caddy can be washed after you empty it using dishwashing detergent and water.

Please DO NOT use plastic bags because they do not decompose when the scraps are processed and will contaminate the compost.

13. Can I use my own bags?

For this trial, we ask that you only use the compostable bags we have provided you because they break down the most efficiently and plastic bags do not. These bags are approved by the company that will be processing the collected food waste to make compost. You can also place food scraps directly into the caddy with no bag or by lining the caddy with newspaper. We recommend giving the caddy a wash with dishwashing detergent and water each time you empty it.

14. Is the food caddy dishwasher safe?

Yes, the food caddy can go in the dishwasher.

15. My caddy is damaged. Can I get a replacement?

We may be able to replace broken or damaged caddies so please contact council if this happens. We do not have an unlimited supply so it's important we understand how or why the caddy broke. As part of the trial, we may ask you some questions when you ask for another one.

16. My caddy is too small and I have to empty it all the time. Can I get a larger one?

We will provide everyone in the trial with a 7-litre plastic caddy for their kitchen or food preparation area. We understand that this may need to be emptied frequently if you have a large family or are or a business. At the end of the trial, we will be asking for feedback about the caddy, including size. If your situation is unworkable, please get in touch with us to discuss alternatives

17. The caddy in my kitchen is starting to smell. What can I do?

If your caddy starts to smell, it's probably time to empty it into the larger burgundy-lid food waste bin (located on your house property or in the chute room or bin bay of your building). We also recommend washing the caddy with dishwashing detergent and water or in the dishwasher each time you empty it.

18. Will the food waste caddies and bins attract pests?

Everything going into your food scraps bin is the same as what was going into your kitchen tidy for disposing of in your red-lid bin so the food caddies and bins will not attract pests any more than a normal garbage bin will. Try to keep your food scraps caddy away from sunlight and in a cool, dry place in your kitchen. The lid on the caddy locks firmly and food waste should not cause problems if you make sure the caddy lid is shut firmly and empty it regularly. Ensure the lid of your larger burgundy-lid food waste bin is closed after you drop waste into it.

In hot weather, caddies and food waste bins may attract vinegar flies. These small flies can be avoided by sprinkling bi-carbonate soda on the base of the food bin.

19. Where will the food waste collected during the trial go?

The collected food waste is taken to a waste management company in the Sydney suburb of Camellia and then transferred to a composting facility in regional NSW. The facility converts food waste into a nutrient-rich sludge which is dried, granulated and sold to agriculture and horticulture markets. The process also creates a combustible gas, similar to natural gas, that is captured and used as a renewable fuel as green electricity.

20. When will the food waste kerbside bin (burgundy-lid) be collected?

Kerbside bins for food waste will be collected on the same day/s that your red-lid general waste bin is collected. If you live in a house please put your food waste bin out at the same time as your red lid bin. Food waste will be collected by a separate truck dedicated to collecting food waste only.

21. I live in a high-rise apartment. Who's responsible for emptying the food waste bin on my floor?

Your building manager or cleaners are responsible for emptying the food waste bins on each floor. Please contact your building manager if they need emptying or start to smell

22. I live in a house and use a compost bin for my food waste. Do I still have to participate in the trial?

We love compost bins but unfortunately, they are not suitable for all types of food scraps. You can use your food waste caddy and a bin for items you cannot compost such as dairy, bones, meat and fish scraps.

23. The compostable bag in my caddy is leaking.

Compostable bags are designed to break down completely when composted. This process can begin within two or three days in a moist environment, especially if the scraps include citrus juice. There are some steps you can take to stop the leak being a problem:

- Empty the compostable bag into the food waste bin every two or three days;
- Put absorbent paper into the bottom of the bag when placing it in the kitchen caddy;
- Use absorbent paper in the base of the kitchen caddy;
- Keep the kitchen caddy and compostable bags in a cool dry place and away from sunlight;
- Carry the kitchen caddy with the compostable bag inside to empty the contents into the food waste bin if too much liquid is present.

If there is too much fluid in the food waste bin, you can put some cardboard in the base of the bin

24. Can I put paper in the kitchen caddy?

A small amount of paper towel can be useful to soak up excess liquid in the base of the caddy liner, but the food caddy is **not** the place for paper and tissues generally.

DL FOR FRIDGE

Food scraps recycling trial

- Collect food scraps in the kitchen food caddy
- Empty your kitchen caddy bag into the burgundy-lid food bin
- Give your caddy a quick clean and new liner, refill it with food scraps

All food waste except shells from oysters, clams, scallops and mussels

NO packaging, stickers and plastic

No plastic bags or liners

This project is a NSW Environment Protection Authority initiative funded from the waste levy

NSROC Northern Sydney Regional Organisation of Councils

For more information scan the QR code. To ask a question or report a problem call 1300 053 862.

STICKERS

LETTER TO RESIDENTS BEFORE TRIAL (FRONT)

Food scraps recycling trial is coming

IN MARCH 2022

City of Ryde
Lifestyle and opportunity @ your doorstep

Willoughby City Council

NSROC
Northern Sydney Regional Organisation of Councils

Dear Resident

The Northern Sydney Regional Organisation of Councils is trialing a food scraps recycling service for three months with some of its member councils in March 2022.

We want to let you know that your residence is in the trial area.

A diverse range of properties and areas in Lane Cove Council, City of Ryde, Willoughby City Council and Hunter's Hill Council areas have been selected so we can see what works for people in houses, low-rise residential units and high-rise residential apartments.

The aim is to find out if separate collection of food scraps delivers a better result than the current approach. Currently food scraps collected in your red-lid bin go through a process that turns waste into low grade compost for rehabilitating a mine site.

Changing to a new food service in addition to the garbage system we have now will require new processes and infrastructure so we need more information about how much food is available.

All the materials you will need to participate in the food waste collection trial will be provided at NO COST to every household in the trial area.

Before the start date you will receive a food caddy with a handle and lid, a roll of compostable bags to line the caddy and information on what can go in the caddy and how to use and empty it.

All types of food scraps can be placed in the caddies including raw and cooked food, meat, small bones, fish and seafood, fruit and vegetables, dairy products, eggs and eggshells, bread, biscuits and pastries, rice, grains, cereals and noodles, tea bags, tea leaves and coffee grounds.

The bins and the caddies for the trial will be delivered to the trial areas starting on 14 February, unless there are COVID-related reasons to delay the delivery process.

You should start collecting food scraps in the week commencing 7 March.

WE WILL START COLLECTING THE FIRST FOOD WASTE BINS IN THE WEEK COMMENCING 14 MARCH. The food waste bins will have a burgundy coloured lid and will be collected on the same day as your red lid bin. All your other bin collections – waste (red lid), recycling (yellow lid) and garden organics (green lid) – remain the same. Make sure you place these bins out as usual the night before your collection day.

Want to know more now?
Check the website
nsroc.com.au/foodrecyclingtrial

NSW GOVERNMENT

This project is a NSW Environment Protection Authority initiative funded from the waste levy

LETTER TO RESIDENTS BEFORE TRIAL (BACK)

음식물 찌꺼기 재활용 시범 운영

2022년 3월

노던 시드니 지역 카운슬 협의회 (Northern Sydney Regional Organisation of Councils)는 일부 소속 카운슬과 함께 2022년 3월부터 3개월 동안 음식물 찌꺼기 재활용 서비스를 시범적으로 운영합니다.

귀하의 거주지가 시범 지역에 있다는 것을 알려드리고자 합니다.

음식물 쓰레기 수거 시범 운영에 참여하는 데 필요한 모든 자재들은 해당 시범 지역의 모든 가정에 무료로 제공해 드립니다.

시범 운영을 시작하기 전에 손잡이와 뚜껑이 달린 음식물 쓰레기통과 통 안에 받칠 친환경 쓰레기 봉투 한 롤, 그리고 통에 무엇을 버릴 수 있는지, 어떻게 사용하고 비우는지에 관한 안내를 받게 될 것입니다.

날음식과 조리음식, 육류, 뼈 조각, 생선과 해산물, 과일, 채소, 유제품, 계란과 계란껍질, 빵, 비스킷, 페이스트리, 쌀, 곡물, 시리얼, 국수, 티백, 찻잎, 커피 찌꺼기 등을 비롯한 모든 종류의 음식물 찌꺼기를 통에 넣을 수 있습니다.

2022년 3월 14일부터 주중에 첫 번째 음식물 쓰레기통을 수거하기 시작할 것입니다. 음식물 쓰레기통은 붉은색 뚜껑이 달려 있으며, 빨간색 뚜껑의 쓰레기통과 같은 날에 수거됩니다.

자세한 내용은 웹사이트 참조: www.nsroc.com.au/foodrecyclingtrial

食物废料回收服务即将开始试行

时间：2022 年 3 月

悉尼北部地区市议会组织 (Northern Sydney Regional Organisation of Councils) 将携手其市议会成员试行食物废料回收服务，将于 2022 年 3 月开始，为期三个月。

我们想通知您，您的住所在试行区域内。

试行区域的每一住户都将免费收到参与食物废料回收试行服务所需的全部用具。

在试行开始前，您会收到一个带把手和盖子的食品回收桶、一卷用来套在回收桶里的可降解胶袋，以及什么可以倒入回收桶中、如何使用和清理回收桶的相关信息。

任何食物废料都可以倒入回收桶中，包括未经煮熟或已经煮熟了的食材、肉类、小骨头、鱼、海鲜、果蔬、乳制品、蛋类及蛋壳、面包、饼干及糕点、大米、谷物、谷类及面条、茶包、茶叶、咖啡渣等。

我们将从 2022 年 3 月 14 日开始的那一周开始收集第一批食物回收桶。这些食物回收桶有一个酒红色盖子，并将与红色盖子的垃圾桶在同一天收集。

了解更多信息，请访问网站：www.nsroc.com.au/foodrecyclingtrial

食物廢料回收服務即將開始試行

時間：2022 年 3 月

北悉尼地區市議會聯合組織將攜手其市議會成員試行食物廢料回收服務，該服務將於 2022 年 3 月開始，為期三個月。

我們想通知你，你的住所在試行區域內。

試行區域內的每一住戶都將會免費收到參與食物廢料回收試行服務所需的全部用具。

在試行開始前，你會收到一個附設把手和蓋子的食物廢料收納箱、一卷可降解的膠袋用作收納箱內襯，以及一份資訊說明什麼可以倒入箱中、使用和清理收納箱的方法。

所有種類的食物廢料都可以倒入收納箱中，包括未經煮熟或已經煮熟的食材、肉類、小骨頭、魚和海鮮、果蔬、乳製品、蛋類及蛋殼、麵包、餅乾及糕點、大米、穀物、穀類食品及麵條、茶包、茶葉、咖啡渣等。

我們將從 2022 年 3 月 14 日的那一周開始收集第一批食物廢料收納箱。這些食物廢料收納箱有一個酒紅色蓋子，並將與有紅色蓋子的垃圾桶在同一天收集。

瞭解更多資訊，請瀏覽網站：www.nsroc.com.au/foodrecyclingtrial

POSTER Willoughby version

Food scraps recycling trial

FOR FOOD SCRAPS ONLY

NSW GOVERNMENT

This project is a NSW Environment Protection Authority initiative funded from the waste levy

NSROC Northern Sydney Regional Organisation of Councils

City of Ryde

A5 BROCHURE (4 pages)

HOUSEHOLD INFORMATION GUIDE

Food scraps recycling trial

This project is a NSW Environment Protection Authority initiative funded from the waste levy

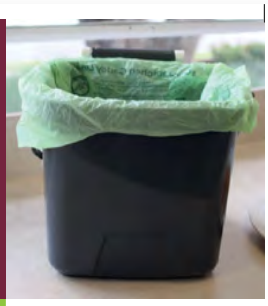
NSW GOVERNMENT

NSROC Northern Sydney Regional Organisation of Councils

To get you started we have supplied you with a kitchen caddy and compostable caddy liner bags.

If you use caddy liner bags they must be AS 4736 certified compostable.

Never use plastic, degradable, or biodegradable bags.



What goes in your kitchen food bin?

How it works in 4 easy steps

Collect food scraps in your kitchen caddy

- Line your caddy or container with the compostable bag or newspaper.
- Place all cooked and raw food scraps inside.

Empty your caddy just before it's full

- Seal food scraps by tying the liner bag, or folding the newspaper.
- Empty at least every 2–3 days, more often in warm weather.

Deposit contents into your burgundy-lid bin

- Place your bagged, wrapped or loose scraps in your burgundy-lid bin.
- Be sure to close the bin lid.

Put out your burgundy-lid bin for collection

- Put your burgundy-lid bin out for every weekly collection, even it's not full.
- We'll collect your food bin when the red-lid bin is collected.

Handy hints

- Wrap bones and other sharp items in paper to avoid piercing your liner bag.
- Fully close your caddy and bin lid when not in use.
- Rinse your food caddy with warm, soapy water every time it's used. Allow it to dry before before you put a new liner in.
- Discourage insects and bad smells by storing your caddy and burgundy lid bin away from direct sunlight.
- If odours are an issue, store your caddy in the fridge and/or freeze meat and seafood scraps until the night before collection.

Save money and avoid food waste by:

- planning your meals
- shopping thoughtfully
- using up leftovers and
- storing your food wisely.

Where will your food scraps go?

We will deliver your food scraps to EarthPower, Australia's first food waste-to-energy processing facility. Here your scraps will be prepared for conversion to green electricity and nutrient-rich fertiliser. More about this at nsroc.com.au/foodrecyclingtrial

For more information scan the QR code.
To ask a question or report a problem call 1300 053 862.

END OF TRIAL LETTER

Food scraps recycling trial is coming to an end

IN JUNE 2022

City of Ryde
Lifestyle and opportunity @ your doorstep

Willoughby City Council

NSROC
Northern Sydney Regional Organisation of Councils

Dear Resident

The trial period for the Northern Sydney Regional Organisation of Councils food scraps recycling service finishes on **24 June**. Thank you to those people who participated.

We have been able to collect valuable information about how much food is available and what works for people in houses, medium density residential apartments and high-rise apartments.

Waste collection services during the week of **20 to 24 June** will be the last pick-ups of separated food waste from your residence or building.

Bins will be progressively removed or changed back to red-lid bins after the last pick-up.

What happens at the end of the trial?

- You are able to keep the food caddy for kitchen scraps
- Food bins from houses, bin bays and chute rooms will be collected and re-used for other waste collections
- Food scraps in the red-lid bin will continue to go through a process that turns organic waste into low-grade compost for rehabilitating a mine site
- The results of the trial will be written up as a report and summary information will be available to residents
- A short survey will be sent out after the trial period ends so you can tell us how you found the service and the experience of separating food from other waste.

Can I keep recycling my food scraps after the trial finishes?

If you live in the **Lane Cove Local Government Area** (houses in the trial suburbs Greenwich and Lane Cove North)

Council is making a compost bin available for each household in the trial areas until 8 July, at no cost. It will be delivered to your home once we receive an email from you with your address. Only one bin per address is allowed.

Email: sustainability@lanecove.nsw.gov.au

If you live in the **Willoughby City Council Local Government Area** (trial area apartment buildings in Chatswood CBD)

If you live in The Bentleigh at 1 Katherine Street contact your Building Manager to access the compost bins in the community garden.

If you are in one of the other buildings in the Chatswood trial area, we are looking into options for re-using food scraps, but for the time being go back to using the garbage chute as you previously did.

If you live in the **City of Ryde Local Government Area** (trial area apartment buildings in Meadowbank, Gladesville, Eastwood and Macquarie Park)

Council will be offering residents in the medium density units in the trial areas who would like to continue to separate their food a free compost bin for the property. Interested Strata Committees wishing to establish a food garden on-site can contact Council for further information.

Email: waste@ryde.nsw.gov.au

NSW GOVERNMENT

This project is a NSW Environment Protection Authority initiative funded from the waste levy

Want to know more now?
Check the website
nsroc.com.au/foodrecyclingtrial

EMAIL UPDATE

The food recycling research project is more than half way and over eight weeks 19 tonnes of segregated food waste has been collected from across the seven residential food only collection areas, a positive result.

As well, close to 2 tonnes of food waste has been collected from a small sample group of commercial and school premises in just 4 weeks.

Thank you and please continue your efforts so we can build up a good understanding of the challenges in managing food waste in our area.

It's not too late for residents who haven't yet started using the food caddy to join in.

If you get a chance to encourage your neighbours to participate, please do – the more food waste we can collect during the trial the more we will find out what it would take for a service to work in the future.

Feedback and responses

As mentioned in the last Update, Councils have engaged commercial cleaning of the food bins, which is helping to reduce the problems with odour.

Last time we reported that some residents were putting general waste in the food bin. Bin stickers in a community language to make clear that general waste doesn't belong in the burgundy-lid bin are helping to address this mistake.

Following feedback about the green bags breaking when they go into the food bin, we made inquiries with the supplier of the compostable bags

They told us that as well as the amount of food in the green bag the length of time the food spends in the caddy is a big factor in breakages, as the decomposition process starts and water is produced from the time the waste goes into the caddy, making it heavier.

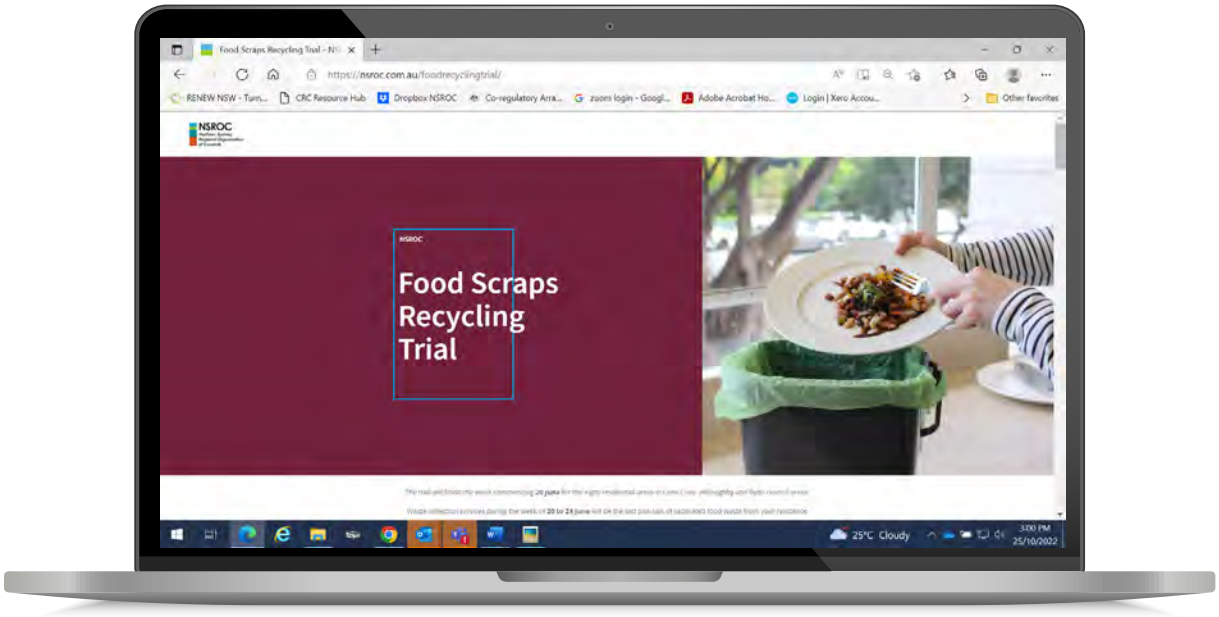
The best approach is to empty your food caddy every 2 to 3 days even if it is not full, to minimise green bags breaking open when they are dropped into the food bin.

Tips

- Make sure you close the lid of the food bin when you drop the green bags in, same with the food caddy – this avoids flies being able to get into the waste.
- The food caddy is a good destination for out-of-date packaged food hiding in the pantry – just be sure to remove food packaging from any food you are throwing out – this material can't be made into compost. See the image showing how packaging and general waste can turn up in the food collection and interfere with (contaminate) the food waste.
- Double bag your caddy if you are finding bags are breaking.
- What happens at the end of the trial?
- The trial finishes at the end of June and you will be able to keep the kitchen caddy.
- Food bins will be collected and re-used for other waste collections.
- We'll be asking you to complete a short survey on how you found the service and the experience of separating food from other waste
- We'll be making suggestions if you want to keep separating your food waste so look out for the next Update.

Unsubscribe: let us know if you don't wish to receive these updates by return email to foodrecyclingtrial@lanecove.nsw.gov.au.

Website home page



Still from Youtube video

ATTACHMENT 3
FOOD ORGANICS ANALYSIS

Section 4.2 CADDY DELIVERY PROGRAM

Single unit dwellings

Sample area	Number of sample area HHs (1)	Caddies delivered in person	Number of caddies declined at delivery	Caddies left at door (2)	Caddies directly accepted %
Greenwich	436	333	17	86	76%
Lane Cove North	293	234	6	53	79%
All houses	729	567	23	139	78%

1. All residences in sample areas not abandoned or under construction
2. After two attempts at door-knock delivery

Medium density dwellings (low-rise apartments and townhouses)

Sample area	Number of sample area HHs (1)	Caddies delivered in person	Number of caddies declined at delivery	Caddies left at door (2)	Caddies directly accepted %
Gladesville	227	152	5	70	67%
Meadowbank	210	136	3	73	65%
Eastwood	262	154	16	92	59%
Macquarie Park (3)	248	182	2	67	73%
All medium density	948	624	26	302	66%

1. All residences in building, includes vacant apartments
2. After two attempts at door-knock delivery
3. 73% townhouses

High-rise apartments

Sample area	Number of sample area HHs (1)	Available HHs (3)	Caddies delivered in person or picked up by resident (2)	Number of caddies declined at delivery	Caddies directly accepted by available households %
Chatswood	734	547	526	21	96%

1. All residences in building, includes vacant apartments
2. After three attempts at door-knock delivery

The estimates per household, per week for segregated food waste were:

Low-rise apartments: 2.3 kg per household, based on 2021 audit of general waste bins in units and houses, compostable average, sample 154 units in the Ryde LGA.

High-rise apartments: 1.8 kgs per household based on audit of general waste bins in 2018 and 2020 audit of high rise units in Willoughby LGA, average food share, sample 491 units.

Single-unit dwellings (houses): 3.4 kg per household based on 800 properties (from a mainly houses part of the LGA) in 2022 x 40% food share, being an average derived from recent audits share of food in general waste in other northern Sydney council areas.

The table below shows these estimates and the actual per household per week results. In some discussions of residential food waste services, 50% is used as the benchmark of expected participation, however the results of the Project show this to be only the case for single unit houses with food organics bins.

Actual and Expected Average FO weights based on overall average for weeks 1-14

Sample area	**Expected Available Food kg per HH per week**	**Actual FO kg per HH per week during trial**	**Weeks 1- 14 "Participation rate"** based on expected Available Food rate and actual 14 weeks food* Presentation weight	**Participation rate as Presented Food % of Available Food** 14 weeks weight of Presented Food as a % of Available Food**
Meadowbank	2.3	0.55	24%	25%
Gladesville	2.3	0.58	25.2%	
Eastwood	2.3	0.63	27.5%	
Macquarie Park	2.3	0.83	36.1%	36%
Greenwich	3.4	1.65	48.5%	47%
Lane Cove Nth	3.4	1.99	58.4%	
Chatswood	1.8	0.94	52.4%	37%

* Available and Presented Food includes food material, whether contaminated or not; during trial as presented in FO bins only

** Available Food data from Project waste audit of FO and MSW bins

The data in the table shows that participation estimates can only be reliably measured if the amount of food presented is weighted against the amount of food that was available. As both the food bin and the general waste bin were weighed and the contents measured, more accurate participation or 'food retrieval' rates can be estimated from the audit results. Using small samples and not allowing for differences in dwelling type household behaviour (as per the sources for the column on Expected volume) is unreliable. The Project methodology verified that using actual volumes presented even from large samples alone does not give a fully accurate picture of the share of population that participate in separation food waste. Audit of both FO bin and MSW bins is necessary. The consequence of the Project's research design is that the FO Project has generated more detailed and reliable information on which to plan future services.

3. Building management would not permit 187 caddies to be left at door, reducing available total HHs

All residential households, all areas

All sample areas Three HH types All households	Number of caddies declined	Participating Households
2,223	**70**	**2,153**

Section 4.8 NON-RESIDENTIAL TRIAL

Bin size and numbers by organisation type

Organisation type	1 x 120l	2 x 120l	3 x 120l	1 x 240l	2 x 240l
Café	18			2	
Professional Service	15				
Restaurant	23				2
Hospital		2			
Education	2	7	1		

SECTION 4.4 FO RESIDENTIAL AREAS

Actual and Expected Food Weight Volumes

A critical part of the FO and FOGO projects was the detailed audit of all material collected from all trial areas over a two-week audit period (three separate two-week periods for FO; FOGO and non-residential). This data on what share of total available food organic material is in the food bin and what remains in the general waste bin, and how much of the food material is useable, that is, not contaminated with non-food material, is set out in Section 5 of this report.

Work was undertaken by the Project Committee to create estimates of how much food was likely to be collected so that the Project could respond to any outlier results emerging from week-to-week, and to assist in planning the waste audits. This work was based on previous audits of general waste bins and other estimation methods. These metrics were also used to interpret weekly data during the trial.

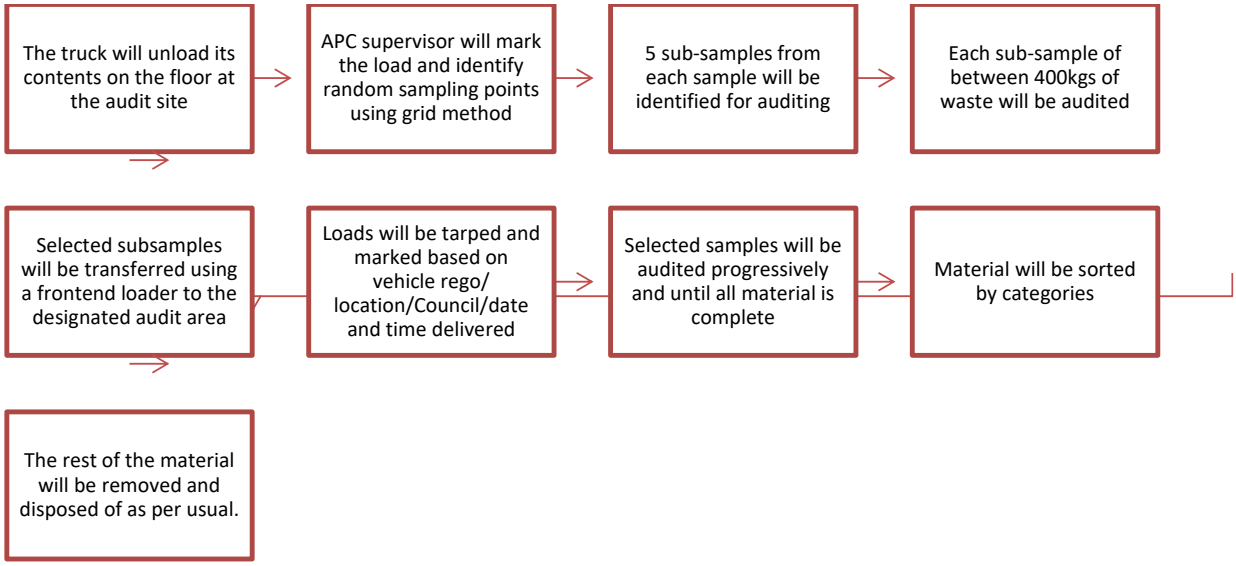
Three benchmarks of expected per week, per household food waste volumes were agreed with Councils based on best available data. All three estimates were subject to small sample sizes and other methodological limitations. One of the main results sought from the FO Project is to build better evidence of available and non-contaminated food waste likely to be presented by households where the service is not voluntary but requested of and resourced for all households in an area.

ATTACHMENT 4
WASTE AUDIT DATA ANALYSIS

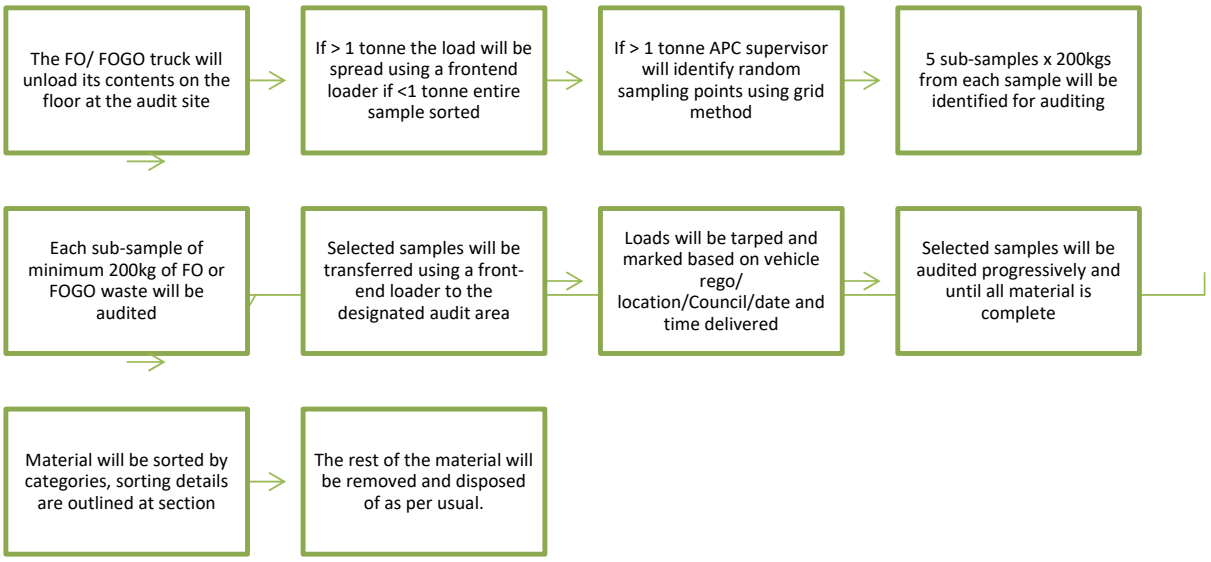
Section 5.7 Waste audit methodology

WASTE AUDIT PROCESS STEPS

MSW sample selection process



Food organics sample selection process



Section 5.9 WASTE AUDIT RESULTS - DETAILED WASTE AUDIT TABLES

HOUSES WITH FOOD ORGANICS BINS

Single unit dwellings with Food organics bins, MSW composition detailed by weight and proportion by kg per HH per week

Single Unit Dwellings						
Suburb	**Lane Cove Nth**		**Greenwich**		**Total**	
Food	Kg/hld/ week	%	kg/hld/ week	%	kg/hld/ week	%
Loose Food	1.55	17.30%	1.11	12.60%	1.33	14.99%
Food In Compostable bags	0.018	0.20%	0.030	0.40%	0.002	0.21%
Sub-total	1.56		1.14		1.34	
Containerised/packaged food						
Containerised/packaged food	0.684	7.6%	0.62	7%	0.65	7.30%
Recycling						
Paper / cardboard / LPB	0.144	1.6%	0.17	2.1%	0.16	1.85%
Glass	0.099	1.1%	0.12	1.5%	0.11	1.30%
Plastics	0.198	2.2%	0.19	2.3%	0.19	2.20%
Aluminium	0.018	0.20%	0.01	0.20%	0.01	0.20%
Steel	0.054	0.60%	0.05	0.60%	0.053	0.60%
Sub-total	0.513		0.59		0.52	
General Waste						
GW in compostable bags	0.009	0.1	0.03	0.4	0.0267	0.25%
General Waste	6.22	69.1	6.22	72.9	6.33	71%
Sub-total	6.23		6.21		6.35	
Total	8.987		8.56		8.86	

Single Unit Dwellings audit totals MSW/General Waste	**Households**
Greenwich	419
Lane Cove North	287
Total	706
	kilograms/week
Total MSW Volume/week	6300
Total sample/week	4080

Single unit dwellings with Food organics bins, Food Organics composition detailed by weight and proportion by kg per HH per week

Single Unit Dwellings						
Suburb	Lane Cove Nth		Greenwich		Total	
	Kg/hld/ week	%	kg/hld/ week	%	kg/hld/ week	%
Food						
Loose Food	0.13	6.84%	0.12	7.21%	0.12	7.05%
Food in compostable bag	1.67	91.26%	1.47	91.45%	1.55	91.40%
Sub-total	1.8		1.59		1.67	
Contamination						
Food in plastic/other bag	0.02	1.15%	0.00	0.30%	0.01	0.67%
Containerised / packaged food	0.00	0.04%	0.00	0.04%	0.00	0.04%
Soft plastics	0.00	0.08%	0.00	0.01%	0.00	0.04%
Hard plastics	0.00	0.00%	0.00	0.01%	0.00	0.01%
Vegetation/wood	0.00	0.03%	0.00	0.14%	0.00	0.09%
Metals	0.00	0.00%	0.00	0.03%	0.00	0.02%
Cardboard/Paper	0.01	0.59%	0.01	0.43%	0.01	0.48%
Dog poo/kitty litter	0.00	0.00%	0.01	0.36%	0.00	0.19%
Other interesting (Shade cover) *	0.00	0.02%	0.00	0.00%	0.00	0.01%
Total	**1.83**		**1.69**		**1.75**	

Single Unit Dwellings audit totals Food Organics	Households
Greenwich	419
Lane Cove North	287
Total	706
	kilograms/week
Total FO Volume/week	1230
Total sample/week	1230

LOW RISE APARTMENT TABLES WITH FOOD ORGANICS BINS

Low rise apartments MSW composition detailed by weight and proportion by kg per HH per week

Low-rise Apartments										
Suburb	**Macquarie Park**		**Meadowbank**		**Gladesville**		**Eastwood**		**Low Rise MUDs**	
	kg/hld /week	**%**	**kg/hld /week**	**%**	**kg/hld /week**	**%**	**kg/hld /week**	**%**	**kg/hld /week**	**%**
Food										
Loose food	0.82	13.5%	0.68	17.3%	0.81	14.5%	1.47	23.1%	0.96	17.3%
Food in compostable bags	0.07	1.1%	0.01	0.2%	0.07	1.3%	0.03	0.5%	0.04	0.8%
Sub-total	0.89		0.69		0.88		1.5		1	
Containerised/packaged food										
Containerised/ packaged food	0.62	10.3%	0.45	11.5%	0.68	12.2%	0.69	10.8%	0.61	11.1%
Recycling										
Paper/cardboard/LPB	0.12	1.9%	0.10	2.4%	0.13	2.4%	0.14	2.2%	0.12	2.2%
Glass	0.13	2.2%	0.09	2.3%	0.13	2.3%	0.11	1.8%	0.12	2.1%
Plastics	0.17	2.9%	0.14	3.7%	0.19	3.4%	0.22	3.4%	0.18	3.3%
Aluminium	0.01	0.2%	0.01	0.4%	0.02	0.3%	0.02	0.3%	0.02	0.3%
Steel	0.04	0.7%	0.03	0.7%	0.04	0.7%	0.05	0.7%	0.04	0.7%
Sub-total	0.48		0.37		0.51		0.54		0.48	
General Waste										
General waste in compostable bags	0.00	0.0%	0.04	1.1%	0.04	0.6%	0.01	0.1%	0.02	0.4%
Residual waste	4.05	67.2%	2.37	60.6%	3.49	62.3%	3.64	57.1%	3.43	61.8%
Sub total	4.05		2.41		3.52		3.65		3.45	
Total	**6.03**		**3.91**		**5.60**		**6.38**		**5.54**	

Low Rise Apartments audit totals MSW/General Waste	Households
Macquarie Park	246
Meadowbank	207
Gladesville	222
Eastwood	246
Total	921
	kilograms/week
Total MSW Volume/week	5090
Total sample/week	4080

Low-rise apartments Food Organics composition detailed by weight and proportion by kg per HH per week

Low-rise apartments										
SUBURB	Macquarie Park		Meadowbank		Gladesville		Eastwood		Low Rise MUDs	
	kgs/ hld/ week	%	kgs/ hld /week	%	kgs/ hld / week	%	kgs /hld /week	%	kgs /hld /week	%
Food										
Loose Food	0.028	3.5%	0.035	5.6%	0.061	9.0%	0.097	8.6%	0.056	6.8%
Food in compostable bag	0.666	82.9%	0.489	77.8%	0.445	65.8%	0.591	52.0%	0.553	67.2%
Sub-total food	0.694		0.523		0.506		0.689		0.609	
Contamination										
Food in plastic/other bag	0.002	0.2%	0.011	1.7%	0.000	0.0%	0.086	7.6%	0.026	3.1%
Containerised/ packaged food	0.050	6.3%	0.001	0.0%	0.001	0.2%	0.025	2.2%	0.021	2.5%
Soft plastics	0.000	0.0%	0.000	0.0%	0.000	0.0%	0.004	0.4%	0.001	0.2%
Hard plastics	0.000	0.0%	0.000	0.1%	0.003	0.4%	0.003	0.2%	0.002	0.2%
Glass	0.000	0.0%	0.000	0.0%	0.000	0.0%	0.001	0.1%	0.000	0.0%
Metals	0.000	0.0%	0.000	0.0%	0.001	0.1%	0.000	0.0%	0.000	0.0%
Cardboard/Paper	0.002	0.3%	0.005	0.8%	0.001	0.1%	0.011	0.9%	0.005	0.6%
Total	0.748		0.540		0.512		0.819		0.664	

Low Rise Apartments audit totals Food Organics	Households
Macquarie Park	246
Meadowbank	207
Gladesville	222
Eastwood	246
Total	921
	kilograms/week
Total FO Volume/week	760
Total sample/week	760

HIGH RISE APARTMENTS WITH FOOD ORGANICS BINS

High rise apartments MSW composition detailed by weight and proportion by kg per HH per week

High-rise Apartments		
Chatswood		
	kg/hld/week	**%**
Food		
Loose food	1.19	17.3%
Food in compostable bags	0.006	0.1%
Containerised/packaged food		
Containerised/packaged food	0.41	6.0%
Recycling		
Paper / cardboard / LPB	0.27	3.9%
Glass	0.09	1.4%
Plastics	0.27	3.9%
Aluminium	0.013	0.2%
Steel	0.034	0.5%
Sub-total	**1.107**	
General Waste		
General waste in compostable bags	0.027	0.4%
Residual waste	4.58	66.1%
Sub-total	4.607	
Total	**6.91**	

High Rise Apartment audit totals General Waste	Households
Total	526
	kilograms/week
Total MSW Volume/week	5020
Total sample/week	2040

High rise apartments Food Organics composition detailed by weight and proportion by kg per HH per week

High-rise apartments		
Chatswood		
	kg/hld/week	**%**
Food		
Loose Food	0.02	2.02%
Food in compostable bag	0.68	81.43%
Sub total	0.70	
Contamination		
Food in plastic/other bag	0.05	6.17%
Containerised / packaged food	0.004	0.43%
Sub total	0.054	
Soft plastics	0.00	0.08%
Hard plastics	0.00	0.06%
Glass	0.00	0.05%
Vegetation/wood	0.00	0.03%
Chemical contaminants	0.00	0.00%
Metals	0.00	0.02%
Cardboard/Paper	0.00	0.40%
Textiles	0.00	0.00%
Bagged general waste	0.02	1.94%
Other interesting (shoes)	0.00	0.48%
Residual waste	0.06	6.88%
Sub total	0.08	
Total	**0.834**	

High Rise Apartment waste audit totals Food Organics	
Households	526
Total FO Volume/week	440

HOUSES WITH FOOD AND GARDEN ORGANICS BINS

Houses with FOGO bins, MSW composition detailed by weight and proportion by kg per HH per week

Houses with FOGO bins	Chatswood West/North Ryde	
	kgs/hhld/week	%
Food and vegetation		
Loose food	1.23	13.4%
Food in compostable bags	0.16	1.8%
Sub total	1.39	
Containerised/packaged food		
Containerised/packaged food	0.77	8.4%
Recycling		
Paper / cardboard / LPB	0.22	2.4%
Glass	0.16	1.7%
Plastics	0.22	2.4%
Aluminium	0.02	0.2%
Steel	0.05	0.5%
Sub total	0.66	
Other		
General waste in compostable bags	0.01	0.1%
Residual waste	6.38	69.2%
Sub total	6.39	
Total	**9.22**	

Houses with FOGO bins waste audit totals MSW/General Waste	Households
Chatswood West/ North Ryde	230
Total	230
	kilograms/week
Total MSW Volume/week	2120
Total sample/week	1960

Houses with FOGO bins, Food Organics composition detailed by weight and proportion by kg per HH per week

Houses with FOGO bins	Chatswood West/North Ryde	
	kgs/hhld/week	%
Food and vegetation		
Loose Food	0.01	0.1%
Food in compostable bag	0.72	10.0%
Vegetation/wood	6.32	88.1%
Sub total	7.05	
Contamination		
Soft plastics	0.00	0.00%
Hard plastics	0.00	0.01%
Glass	0.00	0.02%
Metals	0.00	0.00%
Cardboard/Paper	0.00	0.03%
Dog poo/kitty litter	0.00	0.01%
Bagged general waste - plastic bags	0.12	1.65%
Other interesting*	0.01	0.11%
Total	**7.17**	

Houses with FOGO bins waste audit total Food and garden organics	kgs
Chatswood West/ North Ryde	230
Total	230
	kilograms/week
Total FO Volume/week	1650
Total sample/week	1650

ATTACHMENT 5
PARTICIPANT RESPONSES

Section 7.3

Northern Sydney Councils
Food Scraps Recycling Service

RESIDENT SURVEY

The Northern Sydney Regional Organisation of Councils food scraps recycling trial has now finished and we are very keen to know how residents found the experience of separating food from other waste.

Your views are important whether you participated fully or partly in the trial. The survey will take about 5 minutes to complete and your answers will remain anonymous.

Please complete this survey either by accessing the survey via the QR code (above) or by filling in the survey and returning it in the prepaid envelope.

As a thank you for completing this survey when we receive your response we will send you a $20 local shopping voucher. Only one voucher per household is offered.

To receive the voucher please complete the survey and return it by 15 July.

This project is a NSW Environment Protection Authority initiative funded from the waste levy.

1. Which suburb do you live in? Tick only one.
- ❑ Eastwood
- ❑ Macquarie Park
- ❑ Gladesville
- ❑ Meadowbank
- ❑ Greenwich
- ❑ North Ryde
- ❑ Lane Cove North
- ❑ Chatswood

2. How often did you use the kitchen food caddy and food waste bin to dispose of your food scraps during the trial? Tick one
- ❑ Always
- ❑ Often
- ❑ Sometimes
- ❑ Hardly Ever
- ❑ Never

2 (a) If you answered Never or Hardly Ever, do any of the following reasons apply to why you did not use or hardly ever used the kitchen food caddy and food waste bin? Tick any that apply.
- ❑ Already have worm farm or compost.
- ❑ Food waste recycling is optional not compulsory
- ❑ Don't have much food waste
- ❑ Too busy to get involved in this
- ❑ Kept forgetting to separate out food waste
- ❑ Didn't know what went into the kitchen food caddy
- ❑ No room in my kitchen for the kitchen food caddy
- ❑ Was concerned about the smell

3. How much of your food waste usually went into the kitchen food waste caddy?
- ❑ All
- ❑ Most of it
- ❑ Some of it
- ❑ Very little of it
- ❑ None of it

4. How often did you usually empty your kitchen food caddy into the food waste bin? Tick only one.• Every day
- ❑ Every two to three days
- ❑ Every four to five days
- ❑ Once a week
- ❑ Other (comment)

5. To what extent do you agree with the following statements? Tick one option for each statement.

I understood what could go into the kitchen food caddy
- ❑ Strongly Agree
- ❑ Agree
- ❑ Neutral
- ❑ Disagree
- ❑ Strongly disagree

The kitchen food caddy was suitable for collecting food scraps in my kitchen
- ❑ Strongly Agree
- ❑ Agree
- ❑ Neutral
- ❑ Disagree
- ❑ Strongly disagree

Section 7.3.3

QUESTION 2: FREQUENCY OF USE OF THE FOOD CADDY OR FOOD BIN

	Always	Often	Sometimes	Hardly ever	Never	Total
FO Houses	73.6% 184	8.4% 21	4.8% 12	4.8% 12	8.4% 21	250
Low-rise apartments + Townhouses	71.4% 152	10.8% 23	9.4% 20	6.1% 13	2.4% 5	213
High-rise apartments	62.2% 51	17.1% 14	9.8% 8	7.3% 6	3.7% 3	82
FOGO houses	81.4% 83	9.8% 10	6.9% 7	2% 2	1% 1	102

QUESTION 3 REASONS FOR NOT USING THE FOOD CADDY OR HARDLY EVER USE THE FOOD CADDY AND FOOD WASTE BIN? PLEASE SELECT ALL THAT APPLY.

	Low Rise + High Rise + Townhouses	Houses
Was concerned about the smell	59.3% 16	15.2% 5
Don’t have much food waste	37.0% 10	36.4% 12
Kept forgetting to separate out food waste	29.6% 8	0% 0
No room in my kitchen for the kitchen food caddy	22.2% 6	12.1% 4
Already have a worm farm or compost	7.4% 2	63.6% 21
Food waste recycling is optional not compulsory	7.4% 2	0% 0
Too busy to get involved in this	7.4% 2	0% 0
Didn’t know what went into the kitchen food caddy	7.4% 2	3.0% 1

QUESTION 10: INFORMATION SOURCES USED DURING TRIAL

	Houses	Low Rise	High Rise	Townhouses
The brochure delivered with the kitchen food caddy	79.2%	83.3%	72.8%	93.2%
Information printed on the kitchen food caddy and food waste bin	58.4% 146	71.0% 98	56.8% 46	72.6%
The fridge magnet	17.2%	33.3%	28.4%	23.3%
The food recycling project website	6.40%	10.1%	11.1%	6.9%
The food recycling project 1300 number (call centre)	3.6%	2.9%	2.5%	2.7%
Other reason	0.8%	1.5%	0	1.4%
None of the above	6.4%	3.6%	2.5% 2	1.4%

Base number of respondents: Houses (n=250); Low rise (n=138); High rise (n=81); Townhouses (n=73)

QUESTION 11: DATA FROM SURVEY RESPONSES - FAMILY COMPOSITION BY HOUSEHOLD TYPE

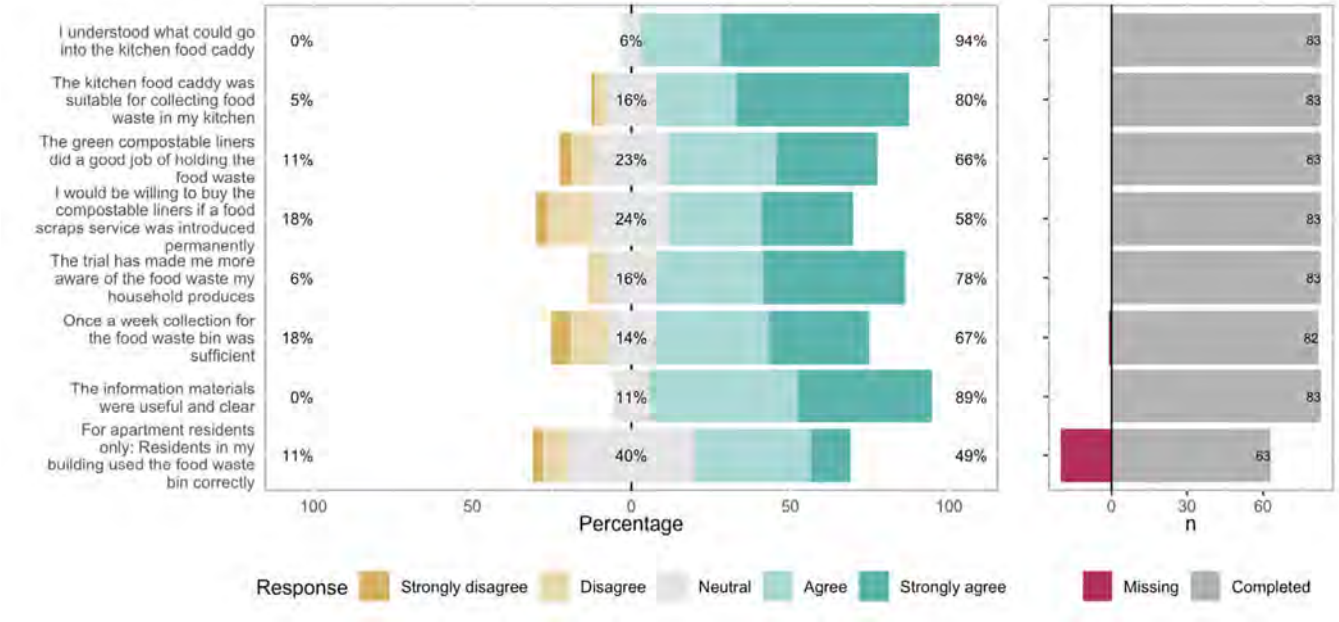
	Low Rise + High Rise + Townhouses	HOUSES
Family with children under 18	20.9% 61	31.2% 78
Couple without children	31.9% 93	30% 75
Family with adult children	6.5% 19	21.6% 54
Single person household	31.9% 93	11.6% 29
Shared house	6.5% 19	2.4% 6
Other	2.4% 7	3.2% 8
Number of respondents	**292**	**250**

Section 7.3.4

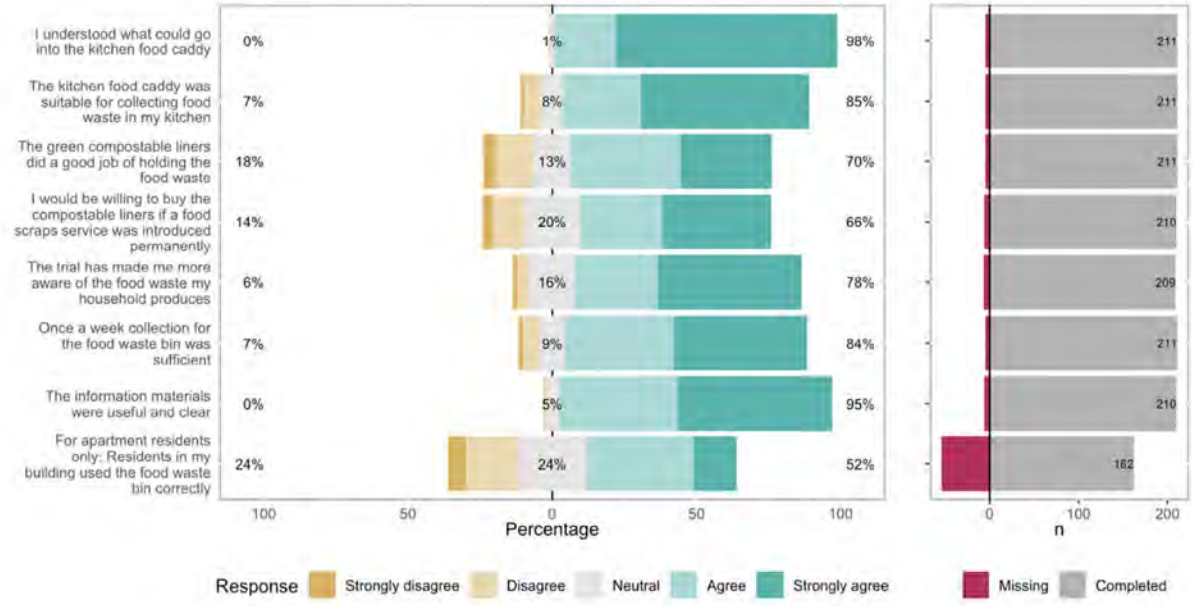
DIVERGENT BAR CHARTS – Question 6

A divergent bar chart of the answers to the 8 different aspects of satisfaction with the scheme, as part of question 6, for respondents in a)Low-rise apartments b) High-rise apartments and c) Single unit dwellings. The left side shows the statements where a response was sought. The main graph gives the percentage of answers that are in disagreement on the left, neutral on the middle and in agreement on the right. The histogram on the right gives the number of participants that answered each question.

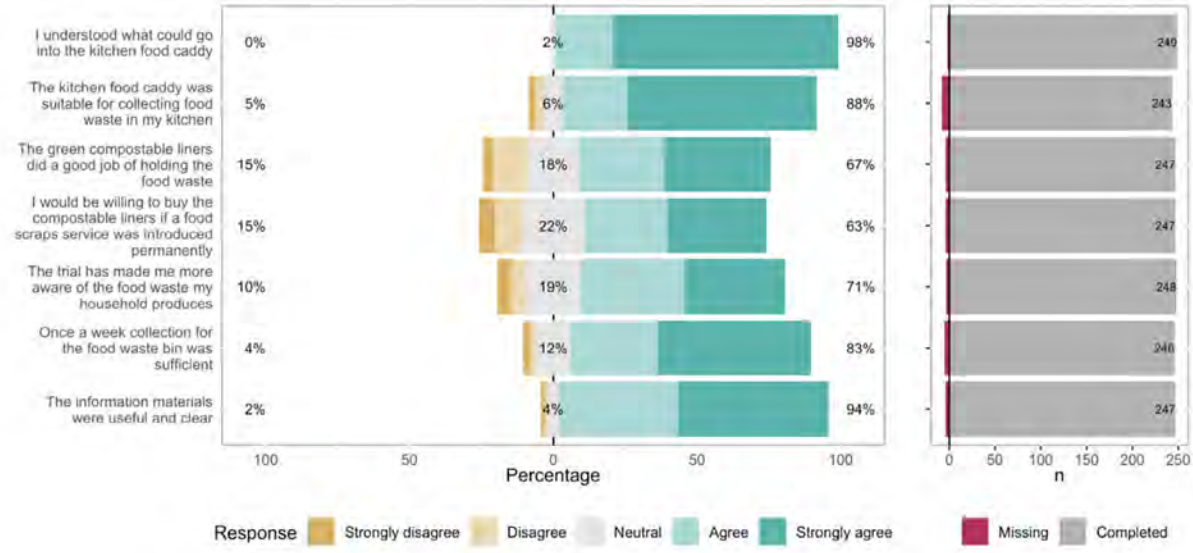
A) Respondents in High Rises.



B) Respondents in low rise apartments



C) Respondents in single unit dwellings



Northern Sydney Regional Organisation of Councils

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