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Manatū Mō Te Taiao

Options for Kerbside Collection of Household Organic Wastes

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Separating organic waste at the household level provides many benefits, including:

- the recovery of a resource (organic material) from the waste stream
- diversion of organic material from landfill and wastewater systems
- the reduction of leachate and landfill gas emissions through having less organic material in landfills
- the creation of compost to return humus and nutrients to the soil.

This paper assesses existing kerbside organic waste collections, both in New Zealand and overseas, and identifies matters for territorial authorities to consider before implementing a collection of this nature. In particular, issues that need to be considered when selecting kerbside organic waste collection systems include:

- the household organic waste diversion targets to be met
- the type of waste to be collected
- whether bags or bins will be used, and which size is appropriate
- the capacity and type of waste treatment facilities available
- the capital and operating costs of the collection system
- any operational constraints (eg, health and safety considerations, multi-tenanted dwellings)
- the markets for the compost produced
- the frequency of collection (eg, climate considerations)
- the ability to monitor the system (eg, through household surveys, waste audits)
- householder co-operation
- convenience
- whether the scheme will be voluntary or compulsory.

The kerbside organic waste-collection system that is appropriate for a particular municipality depends on what type of organic waste is to be collected and what type of treatment facility will be used for producing compost. Local conditions will also affect the choice of kerbside organic waste collection system (eg, climate), and therefore trialling a system before full-scale implementation is generally recommended.

Information about kerbside organic waste-collection systems is summarised in Tables 1 and 2 to provide councils with a way to assess and compare the advantages and disadvantages of different systems.

The case studies presented in this paper show that carefully implemented kerbside organic waste collection systems should be successful. They also provide evidence that kerbside collections of organic waste, if carefully managed, have high participation rates and achieve good rates of organic waste diversion. Consideration of market issues is also an important factor in the selection of kerbside organic waste-collection systems.

1 Introduction

The objective of this report is to help territorial and regional authorities to establish kerbside collections for household organic waste. Household organic waste can include kitchen waste and green waste.

Separating organic waste at the household level provides many benefits, including:

- recovery of a resource (organic material) from the waste stream
- provision of a steady supply of organics to composting facilities
- production of compost – and potentially energy from biogas
- diversion of organic material from landfill
- reduction of leachate and landfill gas emissions associated with having less organic material in landfills
- provision of an alternative for those who are unable to compost at home (eg, those who live in apartment blocks)
- achieving the organic waste targets set out in the *New Zealand Waste Strategy* (Ministry for the Environment, 2002).

The Auckland Organic Waste Working Group (AOWWG)[1] commissioned this report to form part of a suite of reports[2] that cover aspects of household organics kerbside collection, from separation at source through to composting technologies and market issues. The reports cover food-waste composting technologies, food-waste market issues, and a comparison of the "disintegrability" of plastic bags in VCU® (vertical composting unit) processing.

1.1 Scope and objectives

The scope of this document is to assess organic waste kerbside collection methods – both systems already implemented and those undertaken on a trial basis – and to identify matters for territorial authorities to consider before implementing a collection of this nature. The main objectives of this report are to:

- discuss key issues and gaps that need to be taken into consideration for collection systems in New Zealand
- summarise kerbside food-waste collections in New Zealand, in terms of the results and issues encountered
- summarise any overseas work that may be relevant to New Zealand
- present a methodology for assessing and comparing various kerbside organic waste-collection systems.

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[1] The AOWWG consists of representatives from the Auckland, North Shore, Manukau and Waitakere City Councils.

[2] The other reports are: URS New Zealand Limited, 2004a, 2004b; WasteNot Consulting, 2004.

Note: the following are *not* within the scope of this paper:

- a cost–benefit analysis of various kerbside organic waste collection systems
- assessment and/or details of food-waste composting technologies
- information on developing markets for food-waste compost.

1.2 Structure

The next section discusses the factors to consider when selecting kerbside organic waste collection systems. It covers the merits and drawbacks of various kerbside collection systems based on the case studies that are reported in depth in the appendices. In particular, section 2 includes a discussion of types of organic waste, options for kerbside organic waste collection systems, frequency of collection, monitoring and trialling of collections, householder education, and market issues. Section 3 presents a methodology for assessing and comparing various kerbside organic waste-collection systems, and section 4 provides the conclusions of this report.

2 Issues to Consider When Selecting Kerbside Organic Waste-Collection Systems

This section outlines the issues that a council should consider when selecting a kerbside organic waste-collection system. These include:

- the household organic waste diversion targets that need to be met
- the type of waste to be collected
- whether bags or bins will be used, and which size of bin is appropriate
- the capacity and type of waste treatment facilities available
- the capital and operating costs of the collection system
- any operational constraints (eg, health and safety considerations, multi-tenanted dwellings)
- the markets for the compost produced
- the frequency of collection (eg, climate considerations)
- the ability to monitor the system (eg, conduct household surveys, waste audits)
- householder co-operation
- convenience
- whether the scheme will be voluntary or compulsory.

Sections 2.1 to 2.8 address these issues using the case studies appended to this paper by way of example (see Appendix 1 and Appendix 2). Examples of two collection systems are outlined in section 2.2.3.

2.1 What will be collected?

A kerbside collection system needs to provide for the types of household organic waste that may be collected, which will in turn depend on diversion targets and the acceptance criteria of the treatment facility.

To maximise diversion of organics from the municipal waste stream, collection of both kitchen waste and green waste would be required. Aside from land-filling and incineration[3], anaerobic digestion is a feasible treatment for kitchen waste and green waste, with its associated benefit of biogas production for energy. Outdoor, in-vessel or vermiculture composting as well as anaerobic digestion may be used where kerbside organic waste collections only cater for kitchen scraps and green waste. These options still provide for substantial diversion of organics from landfill.

[3] New high-temperature hazardous waste incinerators have been banned as a method of waste disposal by the Resource Management (National Environmental Standards Relating to Certain Air Pollutants, Dioxins, and Other Toxics) Regulations 2004.

2.1.1 Separate or combined collection of food waste and green waste?

Options for collecting green waste and/or food waste are:

- collecting food waste only
- collecting green waste only
- collecting both food waste and green waste but in separate containers
- collecting combined food waste and green waste.

The combined option was most common in the kerbside collection schemes investigated for this desktop study, basically because this system increases the yield of organic material collected/diverted and only one collection receptacle is required. It is also more user-friendly to collect both waste streams together, saving time for the user and potentially helping to reduce odour and leachate from the food waste.

However, possible drawbacks of this approach are:

- the potential economic impacts on existing private green-waste collection operators, through loss of revenue
- less control of the material mix at the treatment plant compared with separate green-waste and food-waste collections, or only collecting food waste
- the ratio of food waste to green waste may vary substantially between seasons, affecting the material mix at the treatment plant
- a secondary system for food-waste collection may be required from properties where there is no green-waste generation (eg, apartment dwellings).

2.2 Kerbside organic waste-collection systems

2.2.1 Food-waste handling

The URS report on food-waste market issues identifies the following ways that residents can manage handling food waste before it is collected (URS New Zealand Ltd, 2004b: 9.2):

- place kitchen waste in a small kitchen bin, which is supplied by either the householder or the collection provider, then transfer to a larger outdoor bin when full
- wrap the food waste in newspaper (this improves handling and helps control odour and leachate)
- freeze the food waste until collection day (this also improves handling and helps control odour and leachate).

2.2.2 Bins or bags?

The two main receptacle options for organic waste collection are bins (typically mobile garbage bins – MGBs) and bags. Each has its own advantages and limitations. The URS report on food-waste market issues (URS New Zealand Ltd, 2004b: 9.3) identified the following issues.

- Mechanical collection is possible for MGBs, whereas bags require manual collection. Manual collection can improve detection of contaminated organic waste, but has more associated health and safety issues.
- Bags as bin liners reduce cleaning requirements, odour potential and spillage. They may be made of paper, biodegradable corn starch or non-biodegradable plastic. However, they are an additional cost and may require distribution to householders.
- Bags for use at kerbside are a lower-cost system than bins, but they can have a higher cost and/or more complex administration. Bags used without bins are more susceptible to animal strike and may need to be split open and removed at the waste-treatment facility. This can increase the risk of contamination of the end product.
- MGBs come in a variety of volumes to meet different capacity requirements but, like plastic non-breathable bags, can cause accumulation of odours and leachate if not used correctly. Aerated MGBs are designed to alleviate these problems.

Paper bags used as bin liners have been found to have the following benefits (see also Appendix 1[c]).

- There is less accumulated odour due to greater exposure to and diffusion by air (oxygen).
- Collection frequencies can be reduced due to reduced accumulated odour.
- There is greater weight reduction of organic waste due to greater evaporation rates.
- Paper bags do not have the same contamination issues as plastic bags when fed into an organic waste-treatment facility.
- They are user-friendly, with a reduced need to rinse bins as leachate is partly absorbed by the paper bag.
- Bags can have information printed on them.

Biodegradable corn-starch bags used as liners have been found to have the following benefits (see also Appendix [a]):

- 100% biodegradability and compostability (so long as the required temperature and moisture requirements are met)
- completely biodegraded after 10 to 45 days, depending on the composting method (so long as the required temperature and moisture requirements are met)
- moisture reduction in food wastes
- odour control
- bags can have information printed on them.

2.2.3 Systems for kerbside organic waste collection

Detailed case studies of several collection systems are presented in the appendices. This section summarises two of these case studies as examples to illustrate how these quite different collection systems have been designed. The systems are operated by Lismore City Council (New South Wales, Australia) and Mackenzie District Council.

The Lismore City Council combined food-waste and green-waste collection system has been operative for more than five years (see Appendix 2[a] for details). The council supplies 120 or 140-litre MGBs for weekly organic waste collection. Residents are expected to provide their own kitchen tidy bin, wrap their food waste in newspaper and rinse out their MGB. This approach is currently being trialled by Christchurch City Council (Appendix 1[a] for details), although kitchen bins are being provided for convenience and also as a way to educate residents on what they can recycle via a sticker on the bin.

Residents in the Mackenzie District Council's collection areas pre-purchase non-biodegradable plastic bags for their food waste and green waste (see Appendix 1[b] for details). These bags are manually split open at the resource recovery centre to allow the organic waste to be fed into the in-vessel composting system. Households are not provided with a kitchen tidy bin.

Some more sophisticated kerbside organic waste-collection systems use a combination of an MGB, kitchen food-waste bin and either paper or biodegradable bags (see Appendix 1[c] for details). These systems consist of a kitchen container specially designed to maximise airflow around the bag (maintaining the waste's exposure to oxygen reduces odour and water content). Once full, the kitchen bag is placed in a flip-top MGB, which is also designed to promote air flow around the waste. The bin is then placed on the kerbside for collection. Because specially designed containers are provided, these systems are expected to be more expensive than standard MGB or bag systems.

2.2.4 Organic waste collection systems for multi-tenanted dwellings

Flats, apartments and other multi-tenanted dwellings need special consideration for recycling services, because space on the kerbside is more limited and environmental impacts such as odour and leachate from putrifying organic wastes may be more significant.

The United Kingdom's Department for Environment, Food and Rural Affairs (DEFRA) commissioned Waste Watch to "produce case studies of recycling and composting schemes in housing areas where design, layout or management considerations make the provision of conventional kerbside collections difficult or inappropriate (for example, flats in estates and high-rise blocks)" (Waste Watch, 2004: 4).

These case studies, although not always specific to organic waste collections, should be considered as part of any investigation into the provision of recycling services (including organics) to multi-tenanted dwellings. The key findings of the study, covering 16 local authorities and three European authorities, are as follows (Waste Watch, 2004: 3).

- A number of different approaches to including flats in recycling schemes have been adopted, including the provision of communal containers at central and near-entrance locations, door-to-door collection and conventional kerbside collections.

- The overriding concern in selecting collection methods for recycling schemes for flats is to provide convenient and secure services at a reasonable cost. There appears to be wide variation in the interpretation of this objective.
- Container location is determined by taking into account factors such as convenience, storage space constraints, other pressures on land space, vehicle access, existing refuse collection arrangements, and acceptability to residents (in terms of, for example, noise, visual intrusion or the potential for vandalism).
- Container choices are influenced by the number of households served, the material segregation arrangements, space availability, bulk purchasing opportunities and vehicle constraints.

2.3 Frequency of collections

It was apparent in the case studies that weekly kerbside collection of organic waste was the preferred frequency, often paired with a fortnightly collection of commingled recyclables and residual waste. The main impetus for weekly collection of organics is to avoid generating unacceptable odours.

Hutchinson City, Minnesota, was able to vary its collection frequency according to season due to having particularly cold, dry winters. Summer collections of household organic waste were weekly but dropped to fortnightly collections in winter (see Appendix 2[c]). Potentially, this approach could be used in the southern parts of New Zealand if the climate is consistently cold and dry enough in winter to keep odour generation from food waste at low levels. Fortnightly collections would be inappropriate in areas of New Zealand that are warmer and more humid.

2.4 Trialling and monitoring kerbside organic waste collection systems

Any kerbside organic waste collection system should be trialled before full-scale implementation to identify any local issues or knowledge gaps. The results of such trials can be used to design the final kerbside organic waste collection service in a way that manages any local effects. Another option is a staged implementation of the collection system to iron out any problems, although detailed research on the type of system is still required beforehand.

The ability to easily conduct waste audits and household surveys should also be considered in the design of any kerbside organic waste collection system. This is particularly important if a key driver for implementing a separate organic waste collection is to meet targets for reducing wastes to landfill, because without the means to easily collect data on waste diversion rates the success of the trial cannot be measured. Similarly, reliable local waste collection data are required before a separate organics collection is introduced.

Key factors you should take into account in the design of a food-waste collection trial are:

- factors affecting the participation rate (see following sections)
- operational issues (eg, in-house and kerbside containers, collection efficiency, odour, consideration of appropriate services for multi-tenanted dwellings)
- contamination (what is considered to be contaminants depends on the intended method of treatment for the organic wastes)
- diversion rates (eg, the rate of domestic composting, seasonal influences).

Christchurch City Council, North Shore City Council and Timaru District Council have all undertaken kerbside organic waste collection trials. These examples are detailed in Appendix 1.

2.5 Participation and contamination rates

High levels of participation by householders can be encouraged through:

- well-defined communication plans implemented before the trial through local community networks, including schools, community boards, residents and ratepayers groups
- ensuring convenience (ie, minimising the effort required to separate wastes)
- minimising the cost to the householder, and/or charging more for residual wastes and less for separated wastes
- ensuring the collection system is easy to keep clean
- special incentives to promote participation in the trial.

Contamination can be managed or reduced by:

- visual assessment by waste collection staff at the kerbside (eg, leave contaminated bins uncollected)
- separation at the waste-processing facility
- householder education, such as leaving householders a "contamination card" following kerbside audits.

The kerbside organic waste collections and trials reviewed for this study are characterised by very high levels of participation (usually greater than 85%) and very low levels of contamination once the service has been established (usually lower than 5%). The exception was the Australian Capital Territory 10-month trial (see Appendix 2[a]), where participation of greater than 90% and low contamination of 1.3% was encountered for the first five months, after which both participation and contamination declined markedly in the second half of the trial. North Shore City Council (see Appendix 1[d]) found in their kerbside organic waste collection trial that contamination was "relatively easy to detect" (North Shore City Council, 2003: 5).

The case studies demonstrate that carefully implemented kerbside organic waste collection systems should be successful.

2.6 Voluntary systems or legislation?

None of the municipalities considered in this paper have a bylaw prohibiting residents from putting organic waste in their residual rubbish. In other words, the organic waste diversion schemes are voluntary at the household level. The difference between the participation, yields and contamination rates in municipalities that require segregation compared to those that use only voluntary measures are not known. This outcome confirms that a voluntary approach may be an appropriate mechanism for achieving separation of organic waste at the household level.

In some countries, especially Europe and North America, compulsory targets for waste diversion from landfills, or landfill bans on organic waste, are set out in legislation. In these cases responsibility for meeting targets or preventing organic waste from entering the landfill generally rests with the municipal authority or landfill operator. This means that source separation of organic waste by householders is not compulsory.[4]

Because there is currently no proposed national legislation to require the separation of organic waste, and because there are limits to the availability of processing systems and composting markets, voluntary systems that combine householder education with other mechanisms (eg, direct service options and economic incentives) may be an effective way to get participation in kerbside food-waste collection schemes in New Zealand. However, this does not rule out introducing bylaws prohibiting organic waste in council-collected household refuse if circumstances change. A locally regulated approach would have to be considered on its merits at the time if the voluntary approach was not working.

Issues to take into account in this case would be:

- the design and implementation of an enforcement regime
- the existence of an adequate range of service options, such as home composting, kerbside collection or drop-off centres
- perverse outcomes, such as householders switching from public to private waste collection if the bylaw only applies to public waste collection
- the legal implications of a bylaw applying to private waste contractors.

[4] See the following internet sites for information: Italian and Dutch management of organic waste, see country reports at European Compost Network http://www.compostnetwork.onfo; New Brunswick, Canada, *Waste Reduction and Action Plan,* http://www.gnb.ca/0009/0372/0005/0001-e.asp

2.7 Householder education

The content and type of household education and/or informational material that would accompany the introduction of a kerbside organic waste collection scheme will depend on the option chosen. The URS report on food-waste market issues (URS New Zealand Ltd, 2004b: 9.4) recommends that information presented to residents should include:

- the reasons for providing the organic waste collection service
- the environmental benefits of composting
- instructions for the use and storage of collection receptacles
- a list of acceptable and unacceptable wastes for collection
- instructions for handling food waste
- collection details – frequency, day, placement of kerbside receptacle.

Informational material could take the form of brochures, letters, stickers or fridge magnets. Councils may also want to consider how to expand their marketing beyond direct householder information leaflets and consider alternatives such as presentations and demonstration sessions through local community networks.

2.8 Market issues

Section 2.1 notes the issue of investigating the impact of a publicly operated kerbside collection for organic waste on existing private green-waste collection operators. Other market and economic matters associated with the implementation of kerbside organic waste collection include:

- the extent to which householders would switch to private waste-collection services if a bylaw was introduced prohibiting organic waste in residual household waste, and how this could potentially be remedied through legal or economic instruments
- the development of a suitable market for the compost produced from organic waste collected at the kerbside
- the cost of providing a collection system, and the cost of processing the materials.

Some further work may be required where there are existing organic waste-collection providers that will be affected by a rates-funded collection system and/or a regulatory approach. Key questions include whether Local Government Act bylaws enable a local authority to control material in private waste-collection receptacles, and the competition regulation implications of a rates-funded system competing with the private sector.

3 Assessing and Comparing Organic Waste Collection Systems

This section consolidates the information about kerbside organic waste collection issues set out in section 2. Table 1 gives the advantages and disadvantages for each of the issues that would need to be considered when assessing options for a collection system. These include the:

- type of material collected
- provision of kitchen containers
- provision of kerbside containers
- frequency of collection
- kerbside collection method.

The sub-issues presented in Table 1 are options for how each key issue could be approached.

Cost–benefit analyses of various kerbside organic waste-collection systems are not within the scope of this report. However, household surveys and pilot trials are an appropriate way to quantify the advantages and disadvantages of each issue as part of any cost–benefit analysis (see also section 2.4).

By way of example, a comparison of three kerbside organic waste-collection systems using the methodology presented in Table 1 is given in Table 2.

Table 1: Issues and options to consider when assessing kerbside organic waste collection

Issue	Sub-issue	Advantages	Disadvantages
Material collected	Kitchen waste only	• Compost facility can control material mix • Achieves substantial diversion of organic waste from landfill, in particular diverting the portion of the organic waste stream away from landfill that has the highest potential for vermin attraction and the release of odour, leachate and landfill gas • Single collection system can apply to all dwelling types	• Decreased yield/diversion of total organic material if there is no green waste collection • However, in some areas a private contractor may already collect green waste
	Green waste only	• Compost facility can control material mix • Achieves diversion of organic waste from landfill. How large a diversion that is depends on the current method for collection of green waste (eg, if green waste is collected with refuse)	• Decreased yield/diversion of total organic material if there is no kitchen waste collection • Seasonal variation of green waste generation may affect volumes

Issue	Sub-issue	Advantages	Disadvantages
	Combined green waste and kitchen waste collection	• Increased yield of organic material/diversion • Only one receptacle for organic waste required • Increased convenience for householder, which should result in higher participation • Addition of green waste may help to control odour and leachate from the food waste (by absorption, masking of odour effects, etc)	• Compost facility cannot control material mix as easily • A secondary system for food-waste collection may be required from properties where there is no green-waste generation (eg, apartment dwellings) • Seasonal variation of green waste generation may affect volumes • Larger, more expensive bins are required • Contamination rates could be higher, with users able to dispose of refuse in larger bins, among organic wastes
	Green waste and kitchen waste both collected but in separate containers	• Increased yield of organic material/diversion • Material mix into treatment facility can be better controlled	• Two receptacles for organic waste are required (greater cost) • Decreased convenience for householder • Seasonal variation of green waste generation may affect volumes
Kitchen tidy bin	Council-provided kitchen tidy bin	• Increased convenience for householders, which should result in higher participation • Decreased cost to householder	• Higher capital, administration and operating costs for council
	Householder-provided kitchen tidy	• Decreased cost and administration for council	• Decreased convenience for householders, which may result in reduced participation • Increased cost for householders
	No liner	• Reduced cost for householder and/or council	• Frequent cleaning of kitchen tidy needed • Less convenient to wrap waste in newspaper • Less convenient to transfer waste to kerbside bin
	Biodegradable paper or corn-starch bin liners	• Increased convenience for householder, which should result in higher participation • Reduced odour potential • Reduced moisture content and therefore weight of waste to be transported • Infrequent bin cleaning required • Can be fed straight into the composting facility	• Higher capital cost and operating cost • Increased cost of council-provided bags to the householder, or increased cost to the householder of purchasing bags
	Plastic shopping bag liner	• Increased convenience encourages participation • Infrequent bin cleaning needed • Reduced cost for householder and council	• Increased odour potential because bags do not ‘breathe’ • No reduction in moisture content, therefore no reduction in mass of waste to transport • Need to mechanically or manually split and separate bag from waste at composting facility, causing increased pre-treatment costs • Higher risk of plastic contamination in end product

Issue	Sub-issue	Advantages	Disadvantages
Kerbside container	Bins	• Increased convenience encourages participation • Reduced odour potential of aerated bins • Mechanical collection, decreases health and safety issues • Reduced susceptibility to animal strike and vermin	• Higher capital, administration and operating costs for council • Increased odour potential of non-aerated bins • Can be difficult for elderly to manoeuvre • Cleaning required
	Bags	• Reduced capital, administration and operating costs for council • No cleaning required	• Manual collection required, creating increased health and safety issues • Increased odour potential • Greater susceptibility to animal strike and vermin
Frequency of collection	Weekly	• Reduced odour potential • Reduced risk of animal strike and vermin • Can reduce collections of residual waste and/or commingled recyclables to fortnightly frequency	• Higher operating costs
	Fortnightly	• Reduced operating costs • Can reduce collection frequency of residual waste and/or commingled recyclables	• Increased odour potential • Increased risk of animal strike and vermin
	Summer weekly/ winter fortnightly	• Reduced frequency during months when odour potential greatest reduces costs	• Increased communication to householders required • Increased odour potential during fortnightly collection period
	Seasonal green waste collection	• Reduced frequency during months when green waste generation is least reduces costs	• Increased communication to householders required
Kerbside collection	Mechanical collection	• Decreased health and safety risks	• Reduced contamination management
	Manual collection	• Improved contamination management at kerbside	• Increased health and safety risks at kerbside

Table 2: Comparison of three kerbside organic waste collection systems

Case study	Collection system summary	Advantages	Disadvantages
Mackenzie District, New Zealand (Appendix 1.2)	Kitchen and "light" green-waste collection, householder-provided kitchen tidy, user-pays non-biodegradable bag, weekly collection, manual collection	• Increased yield of organic material/ diversion as both green waste and kitchen waste collected • Only one receptacle for organic waste required • Increased convenience for householder should result in higher participation • Weekly collection reduces odour potential • Reduced capital, administration and operating costs for Council • No cleaning of bin required • Improved contamination management at kerbside	• Compost facility cannot control material mix as easily • Seasonal variation of green waste generation may affect volumes • Manual collection required • Bags manually split at treatment plant • Increased health and safety risks • Greater susceptibility to animal strike and vermin
Lismore City, New South Wales (Appendix 2.1.2)	Kitchen and "light" green-waste collection, householder-provided kitchen tidy, council-provided kerbside bin weekly collection, mechanical collection	• Increased yield of organic material/ diversion as both green waste and kitchen waste collected • Only one receptacle for organic waste required • Increased convenience for householder should result in higher participation • Weekly collection reduces odour potential • Reduced risk of animal strike and vermin • Can reduce collections of residual waste and/or commingled recyclables to fortnightly frequency • Decreased health and safety risks	• Compost facility cannot control material mix as easily • Seasonal variation of green waste generation may affect volumes • Higher capital, administration and operating costs for council • Increased odour potential of non-aerated bins • Can be difficult for elderly to manoeuvre • Cleaning required • Reduced contamination management at kerbside
City of Toronto, Ontario (Appendix 2.2)	Kitchen waste, nappies, animal waste collection, council-provided kitchen tidy, council-provided kerbside bin weekly collection, seasonal green-waste collection, mechanical collection	• Increased yield of organic material/ diversion as both green waste and kitchen waste collected • Material mix into treatment facility can be better controlled • Increased convenience for householder should result in higher participation • Weekly/seasonal collection reduces odour potential • Reduced risk of animal strike and vermin • Can reduce collections of residual waste and/or commingled recyclables to fortnightly frequency • Decreased health and safety risks	• Two receptacles for organic waste required • Seasonal variation of green waste generation may affect volumes • Higher capital, administration and operating costs for council • Increased odour potential of non-aerated bins • Can be difficult for elderly to manoeuvre • Cleaning required • Reduced contamination management at kerbside

4 Conclusions

There is plenty of evidence that kerbside collection of organic waste is feasible and, if carefully managed, will have high participation and high organic waste-diversion rates.

The kerbside organic waste-collection system that is appropriate for a particular municipality depends on what type of organic waste is collected, and what type of treatment facility will be used for final compost production. Local conditions will also affect the choice, so trialling a system before full-scale implementation is generally recommended. Another option is a staged roll-out of the collection system.

Consideration of market issues is also an important factor in the selection of kerbside organic waste collection systems. These include the cost of the collection, how an organic waste collection would affect existing green-waste collection contractors, and the end-product qualities required by the market, particularly with respect to contamination.

There is plenty of evidence that kerbside collection of organic waste is feasible and will have high rates of participation and organic waste diversion.

Appendix 1: Kerbside Kitchen Waste Collections in New Zealand

(a) Christchurch City Council

The Christchurch City Council has undertaken one kerbside kitchen waste collection trial and is in the process of beginning another.

Kitchen organics collection trial (May–July 2002)[5]

The first kitchen organics collection trial was undertaken in 2002. It involved 475 households in two suburbs – one affluent suburb and the other less affluent. Each household was provided with a four-litre bucket with a twist top for their kitchen and a 20-litre kerbside bucket with a suction seal lid. The four-litre bucket had labels attached that indicated to participants what materials could and could not be diverted.

Half of the households were given biodegradable corn-starch bags with which to line their kitchen buckets. The remaining participants were provided with bags of EM Bokashi[6] and instructions on how to use it to control odour.

The kitchen waste was collected weekly in a sealed (watertight) refuse collection truck. The 20-litre kerbside buckets were simply tipped into the back of the truck and banged to knock out any material sticking to the inside of the bucket.

Participation was very high, with nearly all households using the service on a regular basis. The organic waste collected was "relatively dry and free of contaminants". The Christchurch City Council surveyed the trial participants and found that "those involved were overwhelmingly supportive and were not only willing to continue to use it ... but were also willing to pay for the service in the rates".

There was no difference in participation rates between the two suburbs taking part in the trial. This indicated that socioeconomic factors may not influence participation in a household organics kerbside collection scheme.

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[5] See Christchurch City Council, http://www.ccc.govt.nz/Waste/Composting/KitchenOrganicsTrial.asp (accessed 14 February 2005).

[6] EM Bokashi is a commercially available dry granular product containing beneficial micro-organisms that can help to reduce odour.

Key recommendations from the trial were as follows.

- Lining the buckets would be crucial for the collection service to be acceptable to the public.
- The kitchen bucket needs a detachable flip-top lid for ease of use.
- The kerbside container should also have a flip-top lid.
- Provision of kerbside organics collections for businesses should be considered.
- Support should be given to maximising commercial green-waste collection services instead of instigating mixed organic refuse collections.
- Supermarkets and retail outlets should be encouraged to move towards biodegradable carry bags to feed into an organics collection system.

According to research undertaken by Polargruppen, use of the company's biodegradable, corn-starch "BioBag" has the following benefits when used in combination with aerated bins:[7]

- 100% biodegradability and compostability
- completely biodegraded after 10 to 45 days depending on the composting method
- moisture reduction of up to 25% by weight in five days
- odour minimisation
- bags can be pigmented with biodegradable material
- bags can have information printed on them.

Kitchen organics collection trial (February–December 2005)

The current Christchurch City Council trial builds on the 2002 trial. The eight-litre kitchen "BioBin" has a flip-top lid and the kerbside container is now a 48-litre or 80-litre flip-top MGB. Collection is again on a weekly basis, involves two suburbs and 500 households, and is for kitchen waste and green waste.

The kitchen bin is not lined and participants are required to empty and wash the bin on a regular basis. Participants are also asked to:

- line the MGB with dry twigs or leaves to reduce material sticking to the inside
- wrap their food scraps from the kitchen bin in newspaper prior to placing in the MGB
- rinse the MGB on a regular basis to avoid odour.

The trial will:

- assess the overall level of participation over time, including those who compost at home, those who use insinkerators and those who do not separate organics from their general household rubbish
- assess public acceptance, opinion and feedback on the organics collection service
- assess the amount of organics collected per household for each bin size over the four seasons, which will enable the Council to assess composting plant options

[7] See Polargruppen at http://www.polargruppen.com/biobag.htm (accessed 14 March 2005).

- test the "cheapest and worst-case" collection option for wrapping food scraps in paper and then compare this with a biodegradable bag liner. Some households will be given Bio-Bags midway through the trial to compare with the paper option. The additional cost and level of service (benefit) can then be assessed.[8]

The organics collected from this trial are being composted in outdoor windrows. A fully enclosed composting system would be used if the Council decided to introduce the service citywide.

(b) Mackenzie District Council[9]

Mackenzie District Council implemented an organic waste kerbside collection scheme in May 2002 in response to landfill closures in the area and the high cost of waste transport to alternative destinations. Residential waste from 1500 households in Twizel, Fairlie and Tekapo is placed in colour-coded, pre-paid bags for kerbside collection. Organics go into a green bag, commingled recyclables into a clear bag and residual waste in a black bag. Residents may include "light" green waste in the organics bag.

The prices for the bags are:

- black rubbish bags $1.00 each
- green bags for compostables $0.50 each
- clear bags for recyclables $0.25 each.

The organics bags are not biodegradable and need to be split open manually to feed the contents into the district's vertical composting unit. This method was assessed as the best practicable option for the district at the time. The Council is investigating the use of 300-litre bins that could contain all of the three types of bags by having them hang on hooks inside the bin. This move is to make household waste management less cumbersome for residents.

The experience of the Council is that animal strike is not an issue so long as residents put their bags out the night before or on the morning of collection. The introduction of bins will further reduce the potential for animal strikes.

Restaurants in the area are also collecting kitchen waste using 20-litre buckets. These buckets are delivered to the transfer station by the restaurant workers or by a private contractor.

Mackenzie District Council reported that there was some initial resistance to the scheme, but persistent education over 12 months has resulted in 75–80% diversion of organics. The level of contamination in the organic waste is around 5%.

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[8] Personal communication, Tony Moore (Senior Planner – Solid Waste, Christchurch City Council), 15 February 2005.

[9] Personal communication, John McGartland (Solid Waste Manager, Mackenzie District Council), 31 January 2005. See also Mackenzie District Council <http://www.mackenzie.govt.nz/solidwaste/>.

There are a substantial number of holiday homes in the Mackenzie District, and communication with these part-time residents regarding collection services can be difficult. Mackenzie District Council initially provided these residents with a booklet outlining the Council's waste services and residents' own waste management responsibilities but found it to be ineffective. The Council is considering the distribution of a fridge magnet to cover these matters and anticipates that this will be a successful way of communicating with holiday home owners.

(c) Ministry for the Environment

The Ministry for the Environment trialled small-scale food-waste separation from two floors at its head office for a year. A staff member took the food waste to a home-composting system. This pilot trial was expanded to a full-scale operation covering all 13 floors in 2003 under the Govt 3 programme.[10] Organics are collected in an open paper bag placed in an aerated bin, a method founded on the Smedlund "open system" of managing organic waste.

The Ministry's regional offices have source-diverted food wastes since 2001 via buckets to home compost systems. EM Bokashi is used in Christchurch and ordinary sealed buckets are used in Auckland.

The Smedlund system is based around the use of paper bags and the larger paper sacks to provide maximum air flow (ventilation) around the organic waste. The benefits of this approach, according to research undertaken by Smedlund, are:[11]

- less odour due to greater exposure to air (oxygen)
- reduced collection frequencies due to reduced susceptibility of waste to odour
- greater weight reduction of organic waste due to greater evaporation
- paper bags can be fed into any waste treatment facility
- no need to rinse bins.

At the Ministry's head office the bags are collected nightly by the cleaners, folded, closed and placed in a 240-litre MGB for weekly transfer to an in-vessel composting plant. The paper bags compost down in the process with no visible residues. There have been no observed contaminants from staff. Contamination found when the cleaners were learning the new system was removed by the collector.

For household kerbside organic waste collections, Smedlund offer a special holder for the paper bag for use in the kitchen. This bag is then placed in a large paper sack for kerbside collection along with green waste, if need be. The sack can be held in a wire trolley, shaped like an MGB, with a flip-top lid. This design allows ventilation of the sack before collection.

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[10] Ministry for the Environment, http://www.mfe.govt.nz/issues/sustainable-industry/govt3/about-govt3.html> (accessed 21 February 2005).

[11] Smedlund Miljosystem, 1995. See also Smedlund, http://www.smedlund.se (accessed 21 February 2005).

(d) North Shore City Council[12]

An eight-week organic waste collection trial was undertaken by the North Shore City Council in mid-2003 as part of a wider trial looking at the viability of various recycling options for the city. The purpose of the organic waste collection trial was to evaluate the effectiveness of collecting kitchen waste by itself and in combination with garden waste.

All participants in the trial were provided with a seven-litre kitchen bin (unlined) and either a 45-litre MGB for kitchen scraps only or a 120-litre MGB for combined kitchen waste and green waste.

Four hundred households took part in the trial, which had a participation rate of 71%. The average contamination rate of the organic waste was very low at 0.9%. Most residents (68%) were supportive of having a permanent organic waste-collection service for combined kitchen and green wastes.

(e) Timaru District Council[13]

Timaru District Council ran a three-bin kerbside recycling trial for 100 households in December 2004 and January 2005. Commingled recyclables and organic waste (kitchen and garden waste) were collected in two 240-litre bins, and a 120-litre bin was used for residual household waste. The 240-litre bins were emptied weekly, with a fortnightly collection for the 120-litre bins.

Final results from the trial were unavailable at the time this report was written, but over 85% of participants supported the trial and 48% gave strong approval. Significantly, 75% of participants were happy to pay an additional $1.35 per week for the service.

Due to the success of this trial the Timaru District Council are tendering for a collection system, a processing option and market development for the recycled products. The three-bin system is the preferred option at this stage, although the tender process may bring to light an alternative. It is anticipated that the chosen recycling system will be operative by July 2006.

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[12] North Shore City Council, 2003.

[13] Personal communication, Brian Gallagher (Solid Waste Manager, Timaru District Council), 16 February 2005; see also: Council moving to kerbside recycling soon, *Timaru Herald* 9 February 2005: 1.

Appendix 2: Overseas Kerbside Kitchen Waste Collections

(a) Australia

Australian Capital Territory Government[14]

In August 2000 the Australian Capital Territory (ACT) Government began a 10-month household organic material collection trial for approximately 1000 households. Collection was weekly. The suburb of Chifley was chosen because it had the closest-to-average demographics in terms of household numbers, age and income distribution, etc. Participation was initially high at 90% but declined throughout the trial.

Householders were provided with a five-litre kitchen bin and an 85-litre kerbside MGB. No bin liners were used. Kitchen scraps and green waste were accepted for collection. It was recommended that householders wrap their kitchen scraps in newspaper and line their kerbside bins with leaves or twigs.

Contamination was low in the first five months (1.3%) but increased over the remaining months of the trial. The average rate of contamination was 9.2%.

A permanent organics collection system was rejected after the trial on the basis that the recovery rate of organics from household waste (60%) could not justify the expense of more refuse collection trucks at the time. As an alternative to source separation of waste, the ACT government is investigating an advanced material recovery facility with mechanical separation of a mixed waste stream.

Lismore City, New South Wales[15]

Lismore City has been operating a weekly kerbside collection for mixed organics for over five years. It covers the metropolitan area only, which includes around 10,400 homes and 1300 businesses. Residual waste is collected fortnightly and currently there is no provision for recyclables collection.

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[14] Personal communication, Joss Haiblan (ACT Government) 28 January 2005; see also Australian Capital Territory Government, 2001.

[15] Personal communication, Phil Klepzig (Acting Solid Waste Manager, Lismore City Council) 16 February 2005; see also Lismore City Council, http://www.liscity.nsw.gov.au (accessed 16 February 2005).

The householders need to provide their own kitchen bin, and the council provides a 120-litre kerbside bin for the mixed organics. Kitchen waste is wrapped in newspaper prior to placement in the kerbside bin. Food scraps, paper, cardboard and light green waste are collected, whereas nappies and animal waste are not.

The organics are taken to a vermiculture composting facility, where they are shredded and pre-composted prior to being fed to the worms. This facility will be the largest in the southern hemisphere when it reaches full capacity. Using worms to compost organic waste has helped to keep contamination rates low (around 1.4% by weight) because residents remember that "worms can't eat plastic".

The participation rate in the scheme is around 90%. There have been instances of continual contamination in some low socio-economic areas characterised by transient populations. After various attempts at education (rejection stickers on bins, personalised letters, rewards schemes, etc) the collection service was withdrawn in these areas.

(b) City of Toronto, Ontario[16]

In response to a 300% increase in landfill fees, the City of Toronto implemented a weekly kerbside collection for organics. This is supported by fortnightly collections of commingled recyclables and residual waste, and seasonal collection of green waste. The collection does not include multi-tenanted buildings at present, and pilot projects are under way to assess the best system for these dwellings.

Residents are provided with a kitchen bin (19 cm in height) and a kerbside MGB (67 cm in height). The kerbside bin has a tight-fitting latch in order to deter dogs and racoons. The organics collection includes kitchen waste, household plants, nappies, sanitary products and animal waste. The collected material is processed in a two-step composting facility. The material is sterilised by anaerobic digestion and then composted. Biogas is a by-product of the digestion process.

The City of Toronto provides the option of lining the kitchen bin with a plastic shopping bag for hygiene purposes, and also because it prevents the material freezing to the interior of the kerbside bin in winter. It is recommended that the bag is twisted or loosely tied closed so that the manual separation at the treatment plant is easier.

A waste survey was undertaken in 2003 to gather data on participation rates and waste composition (City of Toronto Policy and Planning Group, 2004: v-v1, 48). The survey found:

- participation in the "green bin" collection service was high, at 89% of households
- the average recovery rate of organic waste was 72.19%
- materials in the kerbside organic bin comprised 96.3% (by weight) solicited organic materials, 2.41% film plastic (including bin liners and contaminants) and 1.29% other contaminants

[16] City of Toronto, http://www.city.toronto.on.ca/greenbin/index.htm (accessed 15 February 2005).

- a significant quantity of film plastic was present as a contaminant (ie, other than film plastic used as a bin liner), and the study recommended introducing programmes to reduce this source of contamination
- the residual waste comprised 30.36% (by weight) organics.

(c) City of Hutchinson, Minnesota[17]

Hutchinson has a voluntary citywide kerbside collection operation for kitchen waste and green waste. The council provides residents with two biodegradable bags per week for kitchen waste and an MGB.

Residents may choose between a 30-, 60- or 90-gallon MGB. They are provided with the incentive of a reduced monthly refuse bill by down-sizing. Residents also have the option of purchasing more biodegradable bags or using paper grocery bags if they need more than their allocation.

The collection frequency of the organic waste is weekly in the summer months and fortnightly in winter to take account of seasonal variations in temperature and therefore the difference in odour generation potential throughout the year. Information relating to contamination and participation rates was unable to be provided.

[17] City of Hutchinson, http://www.ci.hutchinson.mn.us/pdf/organiccompostprog.pdf (accessed 22 February 2005).

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Internet sites

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Christchurch City Council	http://www.ccc.govt.nz/waste/composting
City of Hutchinson	http://www.ci.hutchinson.mn.us
City of Toronto	http://www.city.toronto.on.ca/greenbin/index.htm
EcoRecycle	http://www.ecorecycle.vic.gov.au
EM Bokashi	http://www.emnz.com
European Compost Network	http://www.compostnetwork.info
Lismore City Council	http://www.liscity.nsw.gov.au
Mackenzie District Council	http://www.mackenzie.govt.nz/solidwaste/
Ministry for the Environment	http://www.mfe.govt.nz
North Shore City Council	http://www.northshorecity.govt.nz
Smedlund Miljosystem	http://www.smedlund.se
Waste Watch	http://www.wastewatch.org.uk
Waste Online	http://www.wasteonline.org.uk