

# Appendices

# Contents

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<b>Appendix A</b>	
Requirements of the Environment Protection Act 1970	3
<b>Appendix B</b>	
Metropolitan Melbourne Local Government Councils	5
<b>Appendix C</b>	
Metropolitan councils – two- and three-bin service	5
<b>Appendix D</b>	
Future recovery and reprocessing technology opportunities	6
<b>Appendix E</b>	
Transfer stations (public & private) across metropolitan Melbourne	8
<b>Appendix F</b>	
MRF sites across metropolitan Melbourne	9
<b>Appendix G</b>	
Garden and food organic sites across metropolitan Melbourne	10
<b>Appendix H</b>	
Modelling and analysis of MSW infrastructure – outcomes assessment	11
<b>Appendix I</b>	
Metropolitan Melbourne – possible council clusters	17
<b>Appendix J</b>	
Neighbouring RWMGs and local government shires	17
<b>Appendix K</b>	
Technology risk assessment example	18
<b>Appendix L</b>	
EPA compliance checklist	20
<b>Appendix M</b>	
Flowchart of scheduling process	21
<b>Appendix N</b>	
Sequence of scheduled landfill sites	22

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# Appendix A

## Requirements of the Environment Protection Act 1970

### Environment Protection Act 1970 – SECT 50B

Division 2AD—The Metropolitan Waste and Resource Recovery Strategic Plan

#### 50B The Metropolitan Waste and Resource Recovery Strategic Plan

- (1) There is to be a Metropolitan Waste and Resource Recovery Strategic Plan.
- (2) The objective of the Metropolitan Waste and Resource Recovery Strategic Plan is to –
  - (a) provide a long term vision for the management and reduction of waste in metropolitan Melbourne; and
  - (b) identify short term and long term waste infrastructure needs and schedule the development of landfill sites.
- (3) The Metropolitan Waste and Resource Recovery Strategic Plan is to consist of –
  - (a) Part 1 – The Metropolitan Plan;
  - (b) Part 2 – The Municipal Solid Waste Infrastructure Schedule;
  - (c) Part 3 – The Metropolitan Landfill Schedule.
- (4) The Minister must appoint a person or body to be responsible for ensuring that the Metropolitan Waste and Resource Recovery Strategic Plan is prepared.
- (5) The Minister must nominate a person or body to develop Part 1 – The Metropolitan Plan.
- (6) The Metropolitan Waste Management Group must develop Part 2 – The Municipal Solid Waste Infrastructure Schedule.
- (7) The Metropolitan Waste Management Group must develop Part 3 – The Metropolitan Landfill Schedule.

#### 50BA Part 1 – The Metropolitan Plan

- (1) The purpose of Part 1 – The Metropolitan Plan is to set the strategic framework for the management of all solid waste in metropolitan Melbourne.
- (2) Without limiting the generality of subsection (1), Part 1 – The Metropolitan Plan must –
  - (a) include an analysis of the long term trends for the generation, management and reduction of municipal solid waste, construction and demolition waste and commercial and industrial waste;
  - (b) identify future waste volumes and processing needs;
  - (c) include a strategic analysis of existing infrastructure and services for waste management and resource recovery of materials and energy;
  - (d) identify options for waste minimisation and resource recovery, waste collection and transport and waste disposal and provide a social and economic assessment of the options identified;

- (e) identify programs for infrastructure and services development to ensure that projected needs for waste management, resource recovery and resource efficiency can be met;
    - (f) specify measures for litter prevention and control within metropolitan Melbourne.
- (3) Part 1 – The Metropolitan Plan must not be inconsistent with the solid industrial waste management plan.
- (4) The person or body nominated under section 50B(5) to prepare Part 1 – The Metropolitan Plan must –
  - (a) consult with the Metropolitan Waste Management Group, metropolitan councils, industry and other relevant stakeholders; and
  - (b) advertise in a newspaper circulating generally throughout metropolitan Melbourne that a draft Metropolitan Plan has been prepared; and
  - (c) include in the advertisement –
    - (i) an outline of the draft Metropolitan Plan; and
    - (ii) advice as to where a copy of the draft Metropolitan Plan can be obtained or examined; and
    - (iii) a statement inviting anyone with an interest in the draft Metropolitan Plan to make comments within 28 days after the date of publication of the advertisement; and
  - (d) consider any comments that are made in response to the invitation.
- (5) Consultation under this section may be conducted jointly with, or separately from, consultation conducted under sections 50BB and 50BC.

#### 50BB Part 2 – The Municipal Solid Waste Infrastructure Schedule

- (1) The purpose of Part 2 – The Municipal Solid Waste Infrastructure Schedule is to set out a schedule of existing and required infrastructure for municipal solid waste.
- (2) Without limiting the generality of subsection (1), Part 2 – The Municipal Solid Waste Infrastructure Schedule must –
  - (a) include an assessment of the need, priorities and general preferred locations for municipal waste management facilities (other than landfill) within metropolitan Melbourne;
  - (b) contain a detailed description of existing municipal waste and resource recovery infrastructure within metropolitan Melbourne;
  - (c) identify the type, timeframe and general location of new municipal waste and resource recovery infrastructure within metropolitan Melbourne.

- (3) The Metropolitan Waste Management Group must –
    - (a) consult with relevant stakeholders; and
    - (b) advertise in a newspaper circulating generally throughout metropolitan Melbourne that a draft Municipal Solid Waste Infrastructure Schedule has been prepared; and
    - (c) include in the advertisement –
      - (i) an outline of the draft Municipal Solid Waste Infrastructure Schedule; and
      - (ii) advice as to where a copy of the draft Municipal Solid Waste Infrastructure Schedule can be obtained or examined; and
      - (iii) a statement inviting anyone with an interest in the draft Municipal Solid Waste Infrastructure Schedule to make comments within 28 days after the date of publication of the advertisement; and
    - (d) consider any comments that are made in response to the invitation.
  - (4) Consultation under this section may be conducted jointly with, or separately from, consultation conducted under sections 50BA and 50BC.
  - (5) After complying with subsection (3), the Metropolitan Waste Management Group must provide a copy of the draft Municipal Solid Waste Infrastructure Schedule to the Secretary to the Department of Sustainability and Environment for approval.
  - (6) The Secretary to the Department of Sustainability and Environment may –
    - (a) approve the draft Municipal Solid Waste Infrastructure Schedule; or
    - (b) approve the draft Municipal Solid Waste Infrastructure Schedule subject to specified changes being made.
  - (7) If the draft Municipal Solid Waste Infrastructure Schedule is approved under subsection (6), it forms part of the Metropolitan Waste and Resource Recovery Strategic Plan.
- (3) Part 3 – The Metropolitan Landfill Schedule must not be inconsistent with any relevant-
    - (a) State environment protection policy; or
    - (b) waste management policy; or
    - (c) waste management strategy published by Sustainability Victoria; or
    - (d) solid industrial waste management plan.
  - (4) The Metropolitan Waste Management Group must –
    - (a) consult with relevant stakeholders; and
    - (b) advertise in a newspaper circulating generally throughout metropolitan Melbourne that a draft Metropolitan Landfill Schedule has been prepared; and
    - (c) must include in the advertisement –
      - (i) an outline of the draft Metropolitan Landfill Schedule; and
      - (ii) advice as to where a copy of the draft Metropolitan Landfill Schedule can be obtained or examined; and
      - (iii) a statement inviting anyone with an interest in the draft Metropolitan Landfill Schedule to make comments within 28 days after the date of publication of the advertisement; and
    - (d) must consider any comments that are made in response to the invitation.
  - (5) Consultation under this section may be conducted jointly with, or separately from, consultation conducted under sections 50BA and 50BB.
  - (6) After complying with subsection (4), the Metropolitan Waste Management Group must provide a copy of the draft Metropolitan Landfill Schedule to the Authority for approval.
  - (7) The Authority may –
    - (a) approve the draft Metropolitan Landfill Schedule; or
    - (b) approve the draft Metropolitan Landfill Schedule subject to specified changes being made.
  - (8) If the draft Metropolitan Landfill Schedule is approved under subsection (7), it forms part of the Metropolitan Waste and Resource Recovery Strategic Plan.

### 50BC Part 3 – The Metropolitan Landfill Schedule

- (1) The purpose of Part 3 – The Metropolitan Landfill Schedule is to set out a schedule identifying the location and sequence for the filling and operation of landfill sites.
- (2) Without limiting the generality of subsection (1), Part 3 – The Metropolitan Landfill Schedule must –
  - (a) specify the proposed sequence for the filling of available landfill sites for at least the next 10 years;
  - (b) include a program for replacing and rehabilitating existing landfill sites;
  - (c) list the intended or likely date of closure of each landfill site;
  - (d) identify options for future landfill capacity.

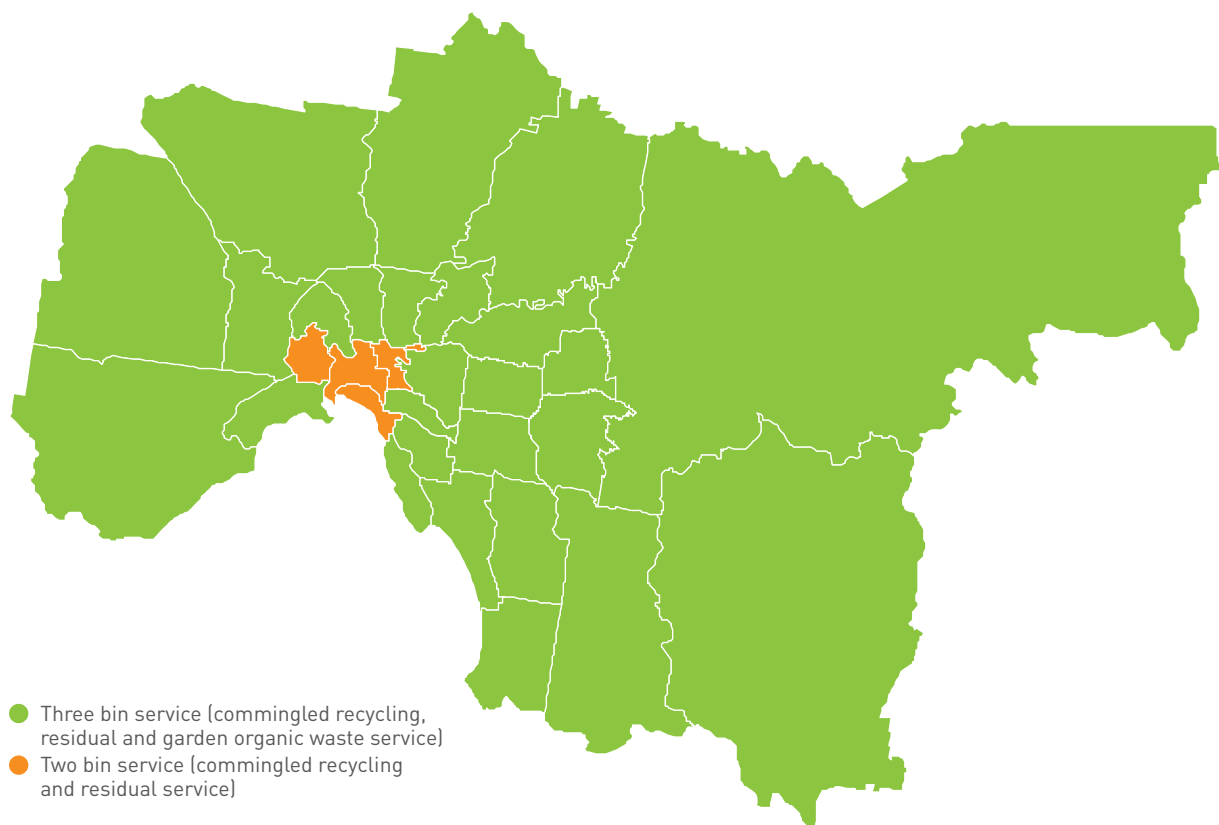
# Appendix B

## Metropolitan Melbourne Local Government Councils

Banyule City Council	Hobsons Bay City Council	Moonee Valley City Council
Bayside City Council	Hume City Council	Moreland City Council
Boroondara City Council	Kingston City Council	Nillumbik Shire Council
Brimbank City Council	Knox City Council	Port Phillip City Council
Cardinia City Council	Manningham City Council	Stonnington City Council
Casey City Council	Maribyrnong City Council	Whitehorse City Council
Darebin City Council	Maroondah City Council	Whittlesea City Council
Frankston City Council	Melbourne City Council	Wyndham City Council
Glen Eira City Council	Melton Shire Council	Yarra City Council
Greater Dandenong City Council	Monash City Council	Yarra Ranges Shire Council

# Appendix C

## Metropolitan councils – two- and three-bin service



Note: Garden organic collections vary across Melbourne (e.g. can be regular or optional).

# Appendix D

## Future recovery and reprocessing technology opportunities

### Future waste-treatment options

A broad assessment of future waste-treatment options for each of the three materials streams being generated at kerbside has been undertaken. There are a number of options for the future treatment of these streams.

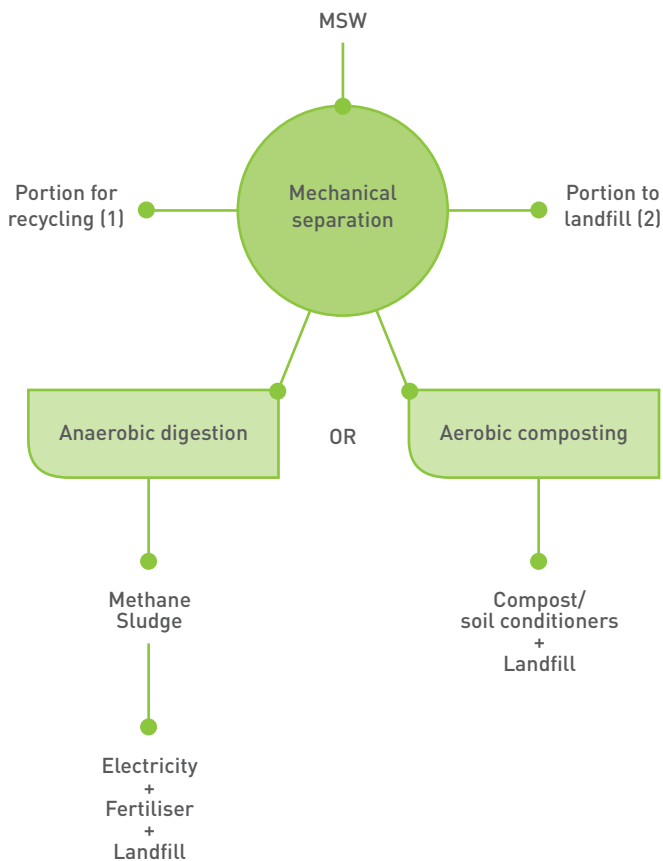
### Municipal solid waste – organic processing

MSW contains substantial quantities of organic waste (food, small items of paper and cardboard, garden organics and other perishable materials) that are available for conversion to energy and/or production of soil conditioners.

Following some sorting at source (generally two- or three-bins) the resultant mixed-waste stream (residual bin) is delivered to an AWT facility for processing.

Organic processing is generally a two-step procedure, outline in Figure D1.

Figure D1: Two-step process for processing organics



(1) Metals, plastics, refuse derived fuel (RDF)  
 (2) Solid inert waste

Using anaerobic biodigestion, mixed organic waste is broken down by microbial activity in the absence of oxygen; with aerobic composting, garden and food organics and pre-separated residual waste is broken down in either an enclosed or open environment.

Issues to consider are:

- waste composition/variability
- plant scale
- sale of products
- adaptability, e.g. the ability to incorporate future innovations or expansion
- reliability/back up
- net operating cost.

The viability of this type of facility is affected by the uniformity of the waste and the waste volume processed. Generally facilities range from 75,000 to 150,000 tonnes per year.

### Biological digestion

As there is a significant C&I organic waste stream available across Melbourne, there is an opportunity to collect dedicated organic streams including vegetable waste, food processing sludges and out-of-date food products and process this by anaerobic digestion to produce methane gas.

This process could be a stand-alone facility or integrated into a MSW anaerobic processing plant.

As the three waste streams – MSW, C&I and C&D – use different collection systems and require different recovery processes, there are generally limited opportunities to integrate the streams before or during processing. However, these differences are smaller in inner-city areas, so there may be an opportunity for dedicated C&I collections to be processed at an MSW facility in these areas.

Due to the difference in inner and outer suburb characteristics, it is likely that separate fit-for-purpose, rather than integrated, facilities will be needed to enhance material recovery from each waste stream.

### Production of biofuels

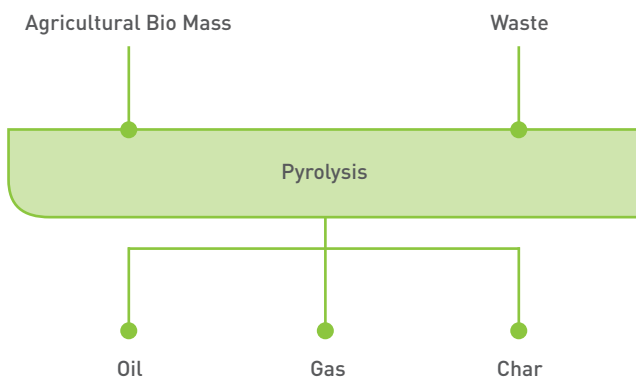
With increasing interest in climate change and the reduction of greenhouse gases, opportunities are now growing for the viable manufacture of biofuels from waste materials and agricultural 'biomass', which can be produced as bio-ethanol.

The waste materials of particular relevance for biofuel production are high calorific value wastes such as 'oily' wastes, cooking oils, organic sludges and other organic wastes. There are limited quantities of these materials in the MSW stream.

## Pyrolysis

Climate change concerns have also created interest in carbon sequestration. This in turn has created interest in the use of 'pyrolysis' (or heat treatment) to process biomass and wastes to produce either gas, oil or char. See Figure D2.

Figure D2: Pyrolysis process



Pre-separated municipal waste is indirectly heated to 400–800°C in the absence of oxygen. The char from this process, depending on the fuel stock, can be used for industrial production as metallurgical and activated carbon or as a soil conditioner to improve soil quality and productivity. When used as a soil conditioner the carbon is sequestered in the soil and slowly released.

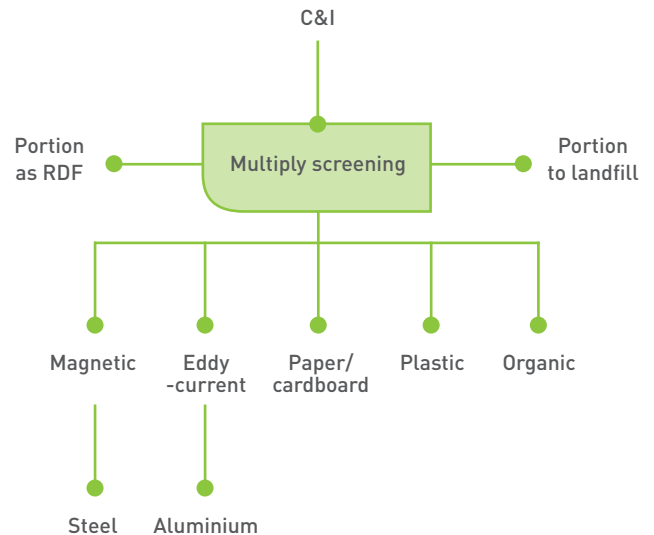
Pyrolysis is a possible treatment process for timber waste that cannot be mulched for landscaping, roadside applications or any other uses.

## Commercial and Industrial – mechanical separation

As C&I contains substantial quantities of metal, plastic and organic waste, separation can lead to significant material recovery. Some C&I sorting has been initiated in Melbourne but no large-scale mechanical separation has been attempted.

C&I processing generally is a screening process combined with magnetic and eddy current separation (see Figure D3).

Figure D3: Screening process for C&I waste



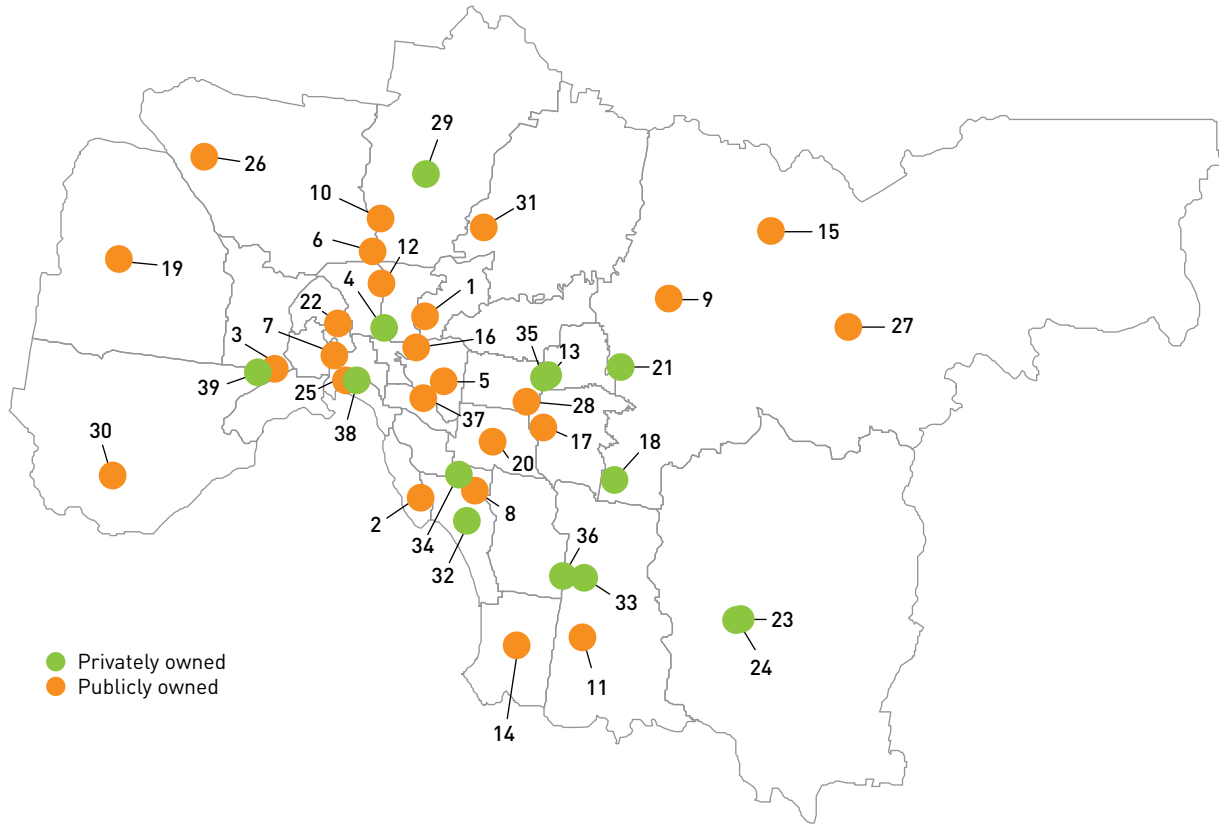
Large-scale C&I separation is still a relatively new waste management technique and will require careful analysis before its introduction is considered.

Issues to consider are the same as for MSW organic processing:

- waste composition/variability
- plant scale
- sale of products
- adaptability, e.g. the ability to incorporate future innovations or expansion
- reliability/back up
- net operating cost.

# Appendix E

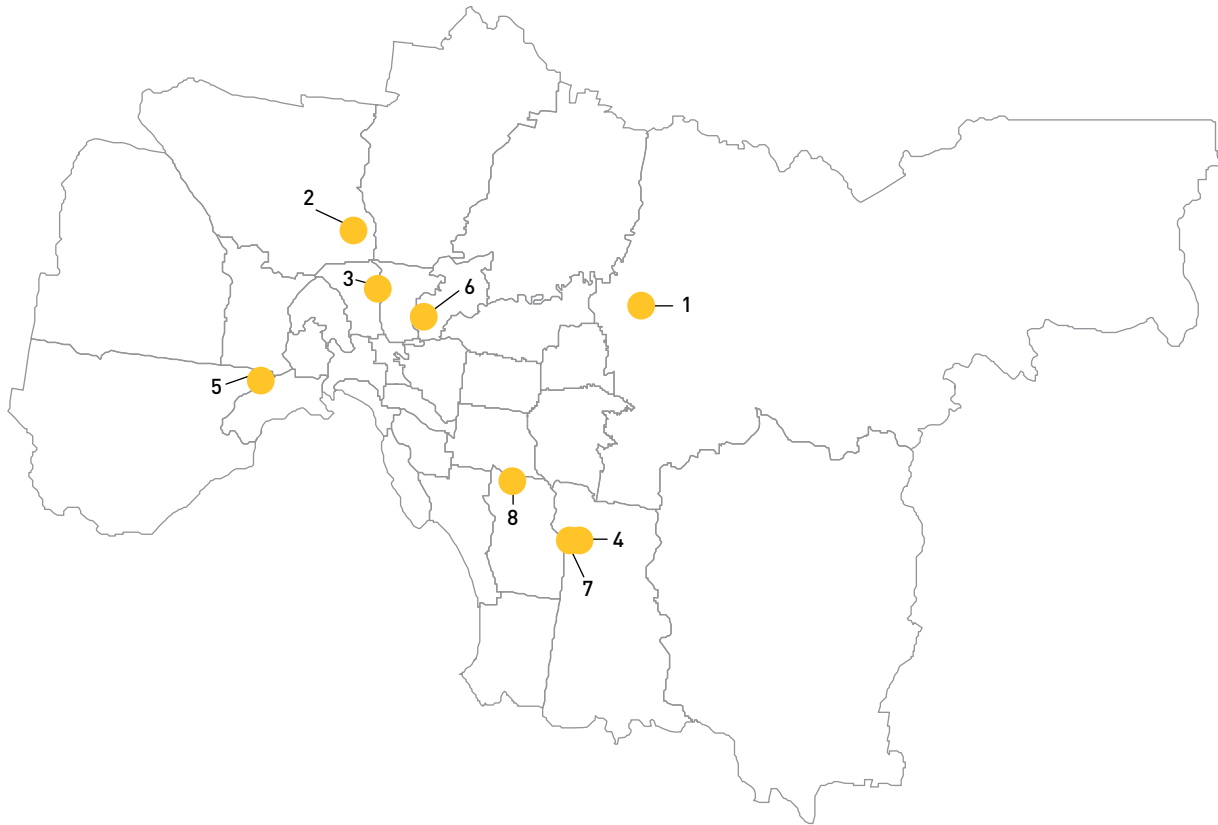
## Transfer stations (public and private) across metropolitan Melbourne



1 Banyule Waste Recovery Centre	Bellfield	20 Monash Waste Transfer & Recycling Station	Notting Hill
2 Bayside Waste & Recycling Centre	Cheltenham	21 Montrose Waste Disposal & Recycling Centre	Montrose
3 Brooklyn Landfill and Waste Recycling	Brooklyn	22 Moonee Valley Transfer Station	Moonee Ponds
4 Brunswick Waste Transfer Station (Whelan Kartaway)	Brunswick East	23 Pakenham Transfer Station	Pakenham
5 Boroondara Transfer Station	Camberwell	24 Cardinia Waste and Recyclers	Pakenham
6 Campbellfield Recycling & Waste Transfer Station (at landfill site)	Campbellfield	25 Port Phillip Transfer Station (the Depot)	South Melbourne
7 CityWide Waste and Recycling Centre	Kensington	26 Sunbury Recycling & Waste Transfer Station (at landfill site)	Sunbury
8 Clayton Transfer Station (at regional landfill)	Clayton	27 Wesburn Recovery & Waste Transfer Station	Wesburn
9 Coldstream Recovery & Waste Transfer Station	Coldstream	28 Whitehorse Recycling & Waste Centre	Vermont South
10 Cooper St Resource Recovery Centre (at landfill site)	Epping	29 Wollert Transfer Station (at Wollert landfill)	Wollert
11 Cranbourne Waste Transfer Station & Recycling Depot	Cranbourne	30 Wyndham Transfer Station (at Wests Road Refuse Disposal Facility)	Werribee
12 Darebin Resource Recovery Centre	Reservoir	31 Nillumbik Recycling & Recovery Centre (Nillumbik Shire Depot)	Plenty
13 Eastern Recycling & Waste Transfer Centre	Ringwood	32 Kingston Waste Transfer Station	Mordialloc
14 Frankston City Recycling & Waste Transfer Centre	Frankston	33 Waste Transfer and Recycling Centre	Hampton Park
15 Healesville Recovery & Waste Transfer Station	Healesville	34 Carroll Road, Clarinda Landfill	Clarinda
16 Kew Depot (Recycling Drop Off Only)	Kew	35 Express Bins Recycling	Ringwood
17 Knox Transfer Station & Recycling Facility	Wantirna Sth	36 Waste Converters Recycling Depot	Dandenong South
18 Lysterfield Transfer Station	Lysterfield	37 Stonnington Waste Transfer Station	Glen Iris
19 Melton Recycling Centre	Melton	38 SKM Bulk Transfer Station	South Melbourne
		39 SKM Recycling Material Recovery Facility	Laverton North

# Appendix F

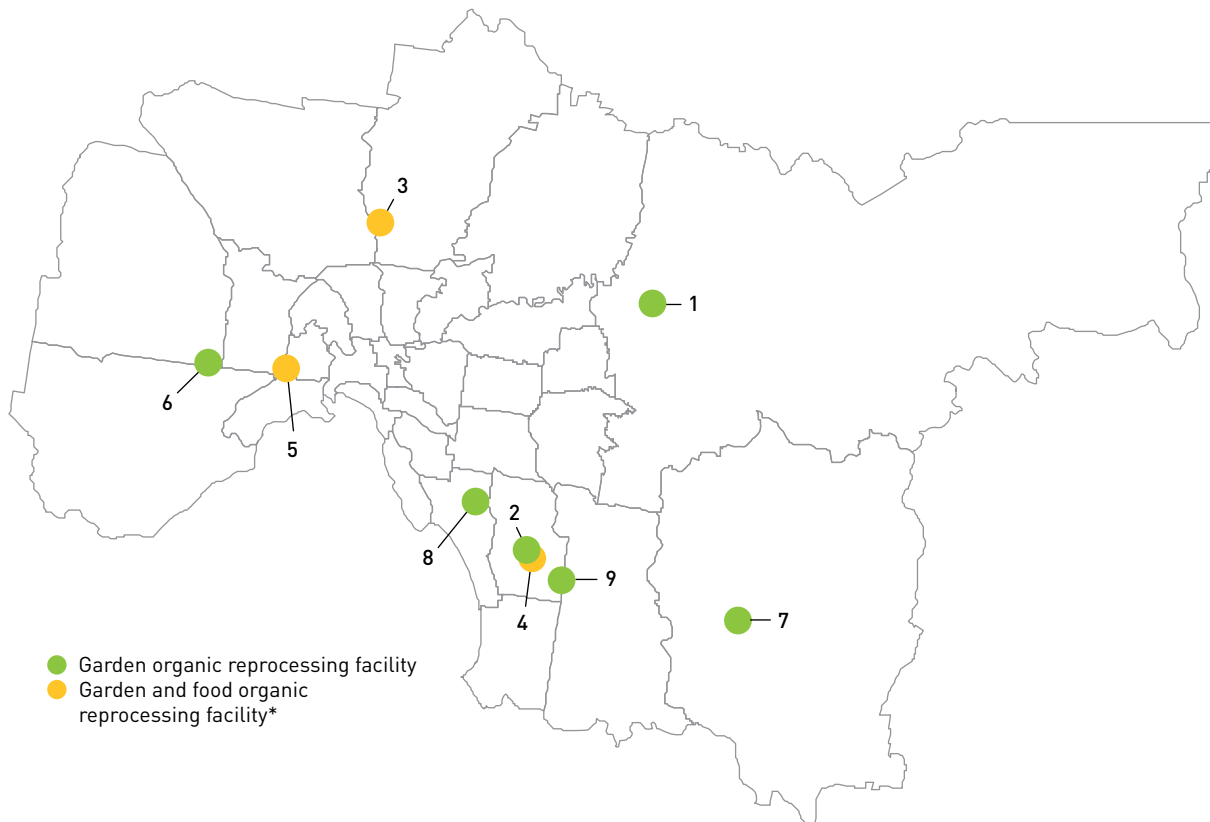
## MRF sites across metropolitan Melbourne



- |   |  |            |
|---|--|------------|
| 1 | Dasma Recycling                            | Lilydale   |
| 2 | SKM Recycling Material Recovery Facility   | Coolaroo   |
| 3 | Theiss Material Recovery Facility          | Coburg     |
| 4 | Thiess Material Recovery Facility          | Hallam     |
| 5 | VISY Recycling Materials Recovery Facility | Laverton   |
| 6 | Visy Recycling Material Recovery Facility  | Bellfield  |
| 7 | JJ Richards Material Recovery Facility     | Hallam     |
| 8 | VISY Recycling Materials Recovery Facility | Springvale |

# Appendix G

## Garden and food organic sites across metropolitan Melbourne



- |   |                               |                 |
|---|-------------------------------|-----------------|
| 1 | Australian Native landscapes  | Coldstream      |
| 2 | Consolidated Waste            | Cranbourne      |
| 3 | Mossrock                      | Epping          |
| 4 | Natural Recovery Systems      | Dandenong       |
| 5 | SITA Environmental Pty Ltd    | Brooklyn        |
| 6 | Pinegro Products Pty Ltd      | Deer Park       |
| 7 | Transpacific Industries Group | Pakenham        |
| 8 | Enviromix                     | Dingley Village |
| 9 | Waste Converters              | Lyndhurst       |

● \* These facilities have an EPA licence or exemption to accept food on site. At the time of preparing this Schedule, many EPA licences for composting facilities were under review.

# Appendix H

## Modelling and analysis of MSW infrastructure – outcomes assessment

Six options were selected for modelling to compare the outcomes from different combinations of bin systems and waste treatment processes. The outcomes were subjected to three kinds of assessment:

- environmental assessment
- social assessment
- financial assessment.

### Environmental assessment

In the modelling, the environmental costs and benefits for each option have been assessed using a life-cycle-assessment (LCA) approach. This LCA takes into account all activities from the collection of waste materials from households, to the transport, sorting, processing and disposal of these materials, and the recovery of resources. It also included credits for the production of virgin materials, fertilisers and electricity etc., which would be consumed in the economy if the waste had not been recovered.

A number of output assumptions are used in the LCA modelling. The most significant of these are summarised in Table H1.

Table H1: Output assumptions

OUTPUT	ASSUMPTION
Dynamics at landfill (MSW)	<ul style="list-style-type: none"> <li>• Landfill gas capture is in place for all landfills, with 60% of methane captured</li> </ul>
Open composting	<ul style="list-style-type: none"> <li>• 45% of input to process is output compost</li> </ul>
Anaerobic digestion (garden and food organics)	<ul style="list-style-type: none"> <li>• 35% of input to process is output as high-quality compost</li> <li>• 80–100 kWh/t net electricity output</li> </ul>
Anaerobic digestion (mixed-waste AWT)	<ul style="list-style-type: none"> <li>• 50% of input to process is output. Of this 28% is low-grade compost and 72% is stabilised residue sent to landfill</li> <li>• 0–20 kWh/t input net electricity output</li> </ul>
Aerobic composting (mixed waste AWT)	<ul style="list-style-type: none"> <li>• 60–70% of input to process is output. Of this 32% is low-grade compost and 68% is stabilised residue sent to landfill</li> <li>• No electricity output</li> </ul>
Recovery rates in front-end separation	<ul style="list-style-type: none"> <li>• 50% for plastics and 75% for metals</li> </ul>
EfW incineration	<ul style="list-style-type: none"> <li>• 9% bulky fraction to landfill, 66% higher calorific to fluidised bed incinerator</li> <li>• 22% lower calorific value to landfill</li> <li>• 3% metal recovery</li> <li>• Cement stabilisation of fly ash prior to landfill</li> </ul>

Environmental impacts and benefits have been assessed for each option using the following key indicators:

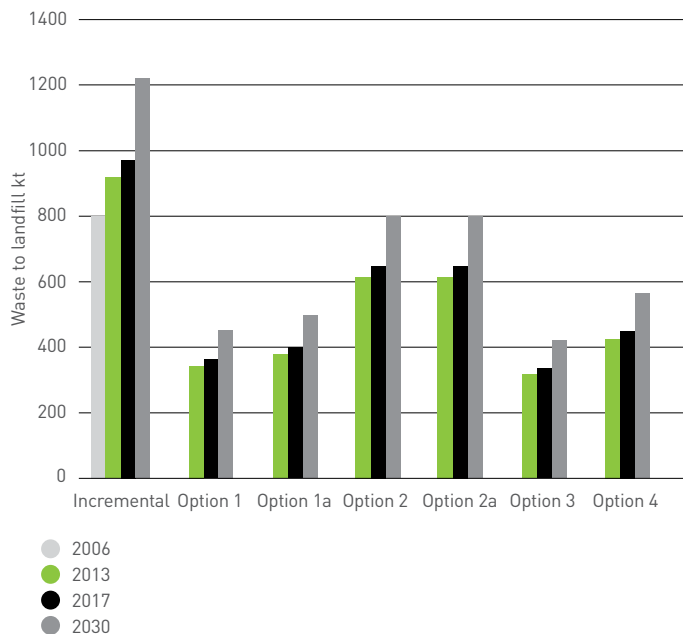
- waste to landfill (tonnes)
- greenhouse gas emissions (expressed as tonnes of CO<sup>2</sup> equivalents)
- energy consumption from fossil fuels (joules)
- water consumption (litres)
- air emissions.

Results are presented below for each with results for the four time periods in the study.

### Waste to landfill

Figure H1 shows the impacts of waste to landfill. The options using anaerobic digestion (options 1 and 3) offer the largest diversion from landfill.

Figure H1: Waste to landfill



## Greenhouse gas emissions

Figure H2 shows the impacts on greenhouse gas generation. All options are better than the base case and Option 1a and Option 3 offer the best performance (note that the lower the number, the better the outcome).

Figure H2: Greenhouse gas emissions results

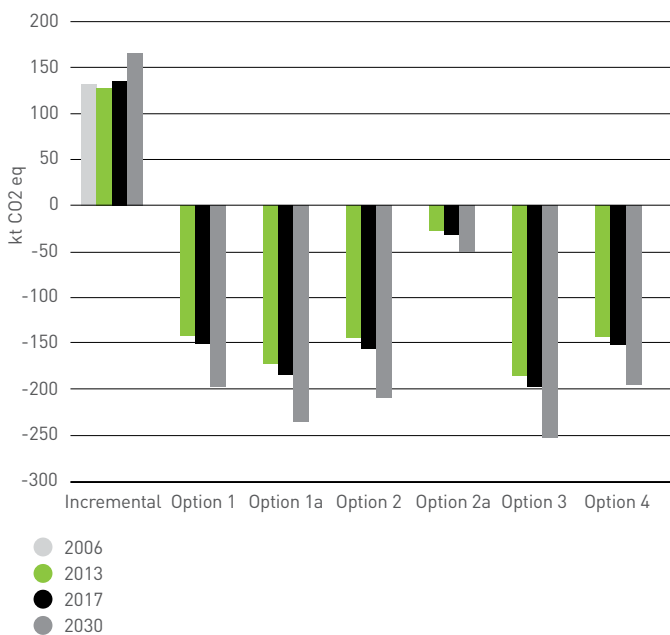


Figure H3 shows the greenhouse gas emissions from different processes within each option modelled. It shows absolute emissions or avoided emissions as a result of the management of the waste fractions.

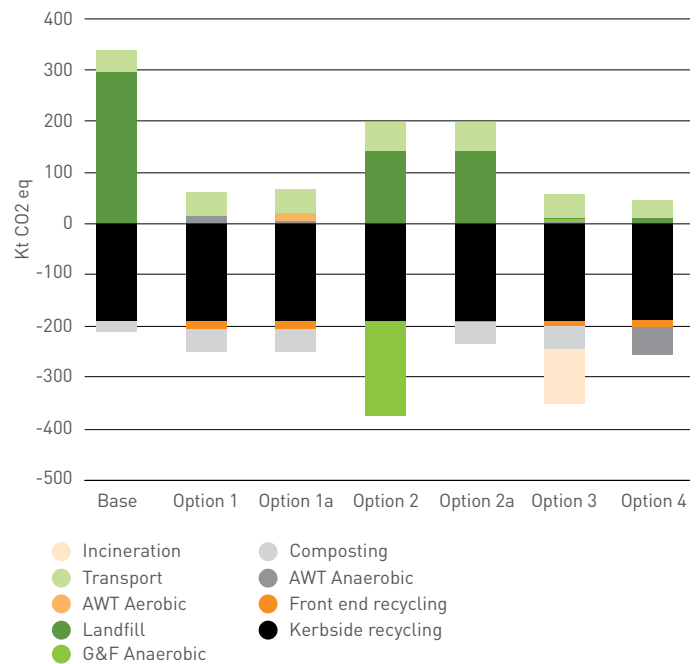
The improvement in greenhouse gas emissions in all cases results from:

- reduced quantities of waste being sent to landfill
- additional recovery of recyclables from the mechanical sorting process.

The difference in greenhouse gas emissions between Options 2 and 2a results from composting the food and garden waste in Option 2a compared to anaerobic processing with electricity generation in Option 2. Waste management can generate greenhouse gas emissions in the form of methane from landfill and transport emissions.

Kerbside recycling produces the largest benefit in the waste management system, but this is consistent across all options. AWT front-end recycling produces a smaller benefit where it is available. The generation of electricity from anaerobic digestion of garden and food organics is a major benefit in Option 2.

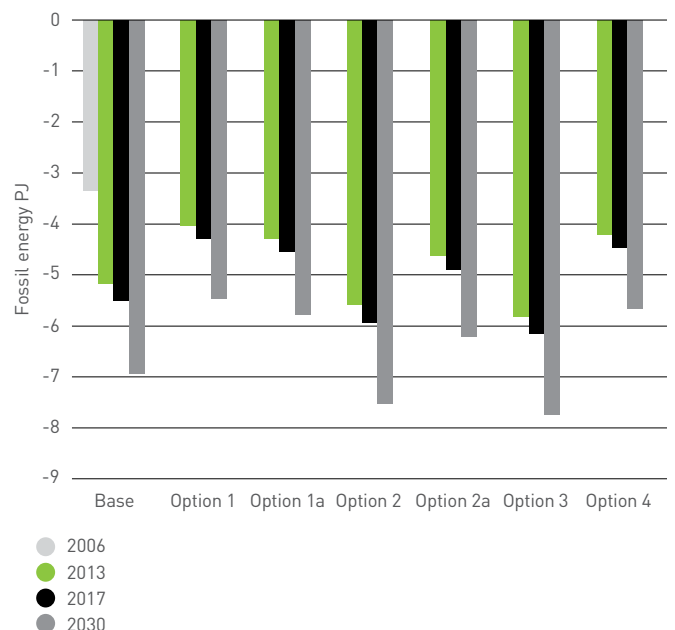
Figure H3: Breakdown of greenhouse gas emissions, Melbourne 2013–14



## Energy consumption from fossil fuels

Figure H4 shows the results for fossil energy use for each option. There is a positive outcome for all options, but fossil energy savings are highest for Options 2 and 3 as they generate the most electricity for export. The base case shows marginally higher fossil energy savings than Option 1, due to electricity production from landfill gas.

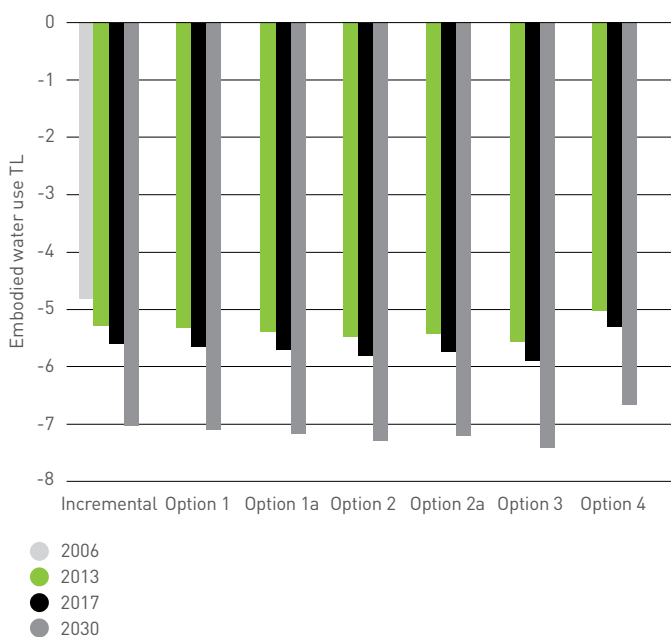
Figure H4: Fossil energy use



## Water consumption

Figure H5 shows the results for water consumption. In all cases water is saved rather than consumed. Water savings occur predominantly through recycling (newsprint, paperboard, glass, aluminium) and aerobic composting. Options 1, 2, 3 and 4 also generate electricity, which contributes to water savings.

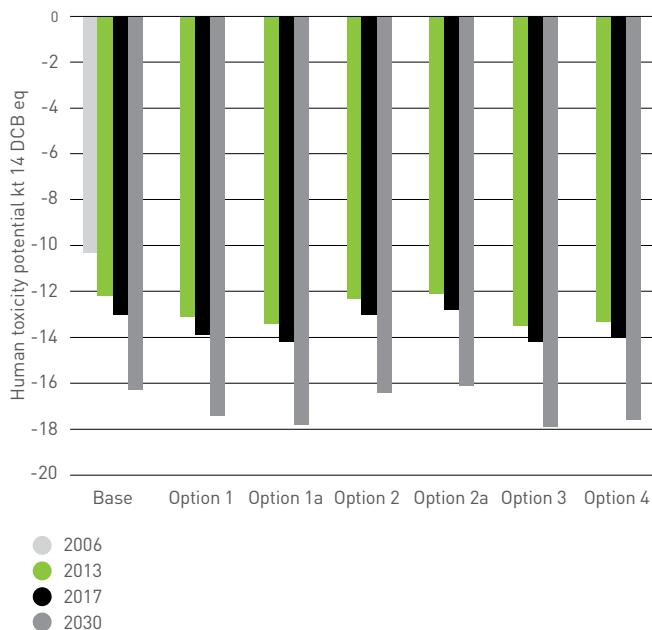
Figure H5: Water consumption



## Air emissions

Figure H6 shows that air emissions are better for all options compared to the base case and the total results do not vary substantially between options. The reason for this is that kerbside recycling contributes the most to the savings, and most options have approximately the same recycling result. These kerbside recycling benefits are due to savings created by steel, aluminium, paper and PET reprocessing.

Figure H6: Human toxicity potential results for four different time points



## Social assessment

The social assessment includes impacts to amenities, such as job creation and transport.

The development of new waste-processing facilities in Options 1–4 will result in significant job creation, both in the construction phase and later during operation; the number of positions created during construction will depend on the technology selected. It is anticipated that up to eight facilities may be required in metropolitan Melbourne. The number of permanent positions created, once all facilities become operational, will be in the order of 250.

The introduction of increased and uniform garden waste household services in the outer suburban areas included in Options 1, 1a, 2, 2a and 3 is expected to be well received (based on previous conversion experience).

It is expected that residents of the outer suburban areas who currently have an expanded service will see returning to a two-bin system, as provided under Option 4, as a reduction in service.

The introduction of additional household sorting of food waste, as provided in Option 2 and 2a, is expected to be less desirable than the current collection arrangement of placing food into the residual waste stream. This concern relates to the need for householders to sort waste appropriately for processing, and the need to provide suitable wrapping material to carry the waste from the kitchen to the mobile garbage bin (MGB). The correct presentation of food organics will be a critical factor to the success of these options.

No significant noise impacts are expected from the various options, as truck numbers will not increase and it is expected that all collections will be completed during normal working hours. Siting will be important in ensuring noise and amenity issues are minimised.

Using existing sites zoned for waste management activities is expected to facilitate obtaining permits.

### Financial assessment

The outcomes of the financial assessment have been estimated in total dollars, dollars per tonne, and dollars per household per year.

For each option, costs for waste collection, delivery, transfer and disposal have been estimated for the years 2013–14, 2016–17 and 2029–30. For comparison purposes, current costs for existing systems have also been estimated.

Total current costs of kerbside-collected domestic waste management services have been estimated for modelling purposes, at \$169 million, or \$124 per household per year. By comparison, the 2005–06 total cost of kerbside services across metropolitan Melbourne, as derived from Sustainability Victoria’s annual survey of councils, is \$161 million or \$122 per household per year.<sup>1</sup> The difference between the estimated cost and the surveyed cost is likely to be attributable to:

- the assumed cost of (best practice) landfill of \$60/tonne being higher than that currently charged by landfill operators;
- the assumed cost of recyclables processing of \$0/tonne is likely to be lower than the average being paid by councils across Melbourne in 2005–06.

A summary of total estimated costs for kerbside collection and disposal services (including processing) is provided in Table H2.

Table H2: Summary of estimated costs for kerbside collection and disposal services

	YEAR	BASE CASE	OPTION 1	OPTION 1A	OPTION 2	OPTION 2A	OPTION 3	OPTION 4
Total cost (\$)	2005-06	\$169M						
	2013-14	\$194M	\$232M	\$221M	\$233M	\$226M	\$268M	\$221M
	2016-17	\$203M	\$241M	\$228M	\$242M	\$237M	\$279M	\$221M
	2029-30	\$252M	\$284M	\$269M	\$291M	\$283M	\$336M	\$279M
Cost per household per year	2005-06	\$124	\$124	\$124	\$124	\$124	\$124	\$124
	2013-14	\$126	\$151	\$144	\$152	\$148	\$175	\$144
	2016-17	\$127	\$151	\$143	\$151	\$148	\$174	\$144
	2029-30	\$137	\$154	\$146	\$158	\$154	\$183	\$152

<sup>1</sup> Victorian Local Government Data Collection, 2006–07.

A breakdown of costs by waste stream is shown in Figures H7, H8 and H9 (\$ per household per annum).

Figure H7: Breakdown of costs per household by waste stream, Melbourne 2013–14

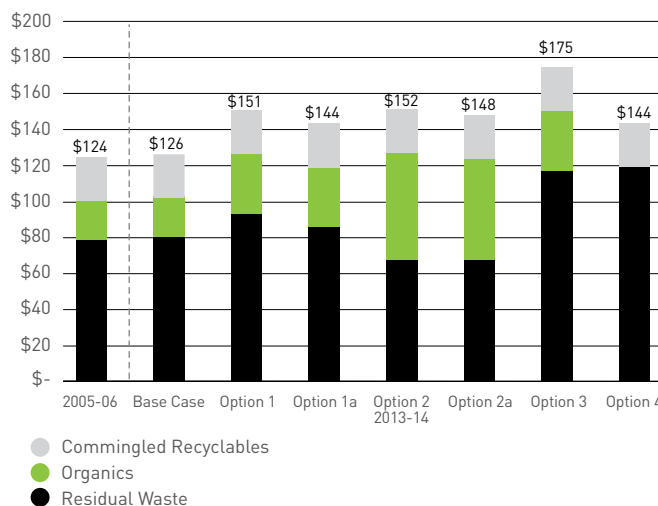


Figure H8: Breakdown of costs per household by waste stream, Melbourne 2016–17

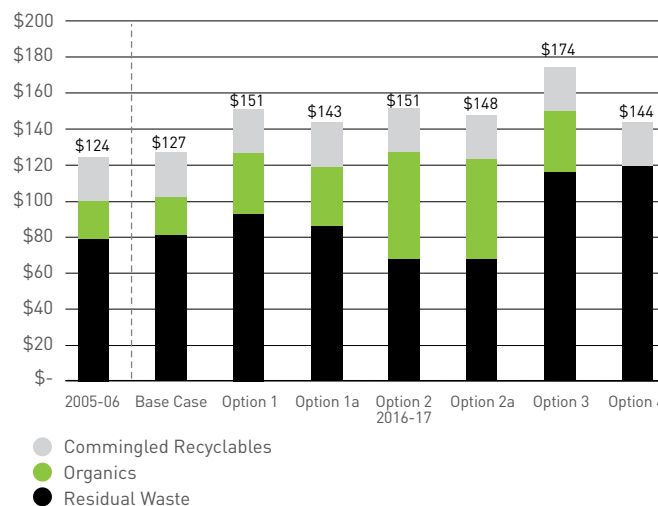
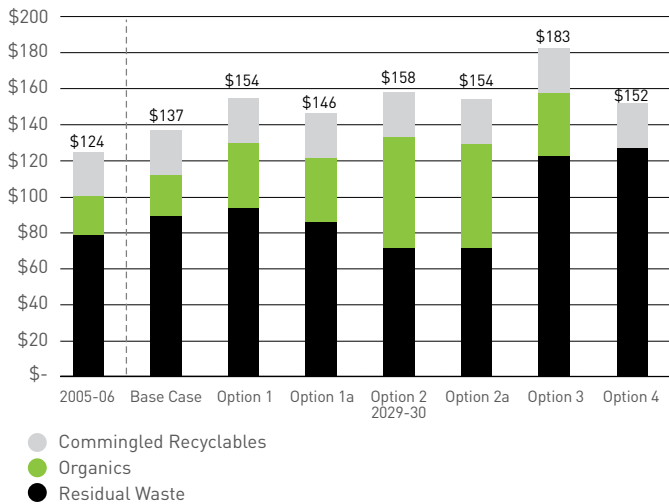


Figure H9: Costs per household per annum, Melbourne 2029–30



### Base case ('business as usual')

For the base case, costs of kerbside-collected waste management services across metropolitan Melbourne are estimated to increase from \$126 in 2005–06 to \$137 per household per annum in 2029–30. The increase in costs between 2016–17 and 2029–30 is primarily a reflection of the closure of two landfills (Regional and TPI landfills, Clayton), resulting in the need to dispose of wastes via transfer stations.

### Options 1–4

Figure H9 summarises the various costs per household per year of implementing the various systems.

In summary, the costs for Options 1, 1a, 2, 2a and 4 are of the same order (i.e. typically \$20–25 per household per annum more than the base case), and Option 3 is significantly higher at \$45–50 above the base case.

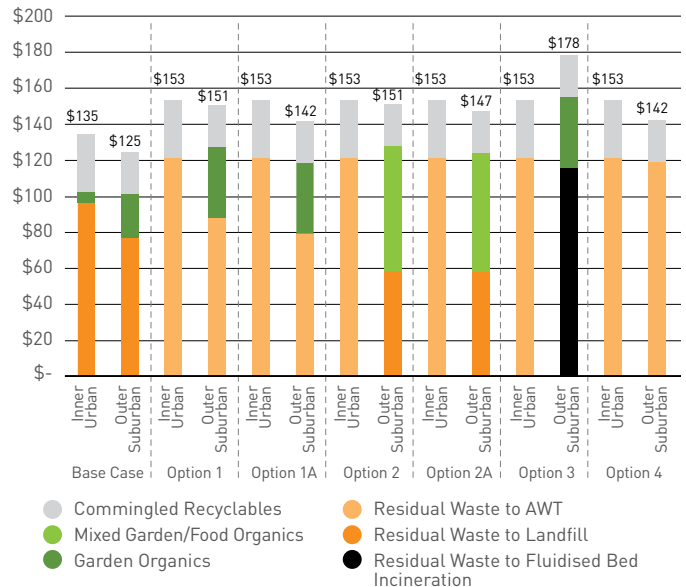
### Inner urban and outer urban

For each option, separate cost estimates have been prepared for inner urban and outer urban areas. These reflect the different waste-generation characteristics and collection and processing systems employed. The difference in per household cost for each option for the year 2013–14 is shown in Figure H10.

For the base case, costs for kerbside-collection services in inner urban areas are estimated to be in the order of \$10 per household per annum more than in outer suburban households. This is mainly due to the need for additional staffing on collection trucks in inner urban areas compared to outer suburban areas.

For Option 4, total cost for kerbside collection in the outer suburban area is lower than Option 1, as a two-bin system is used and there is no separate collection of garden waste.

Figure H10: Cost comparison – inner urban to outer suburban, Melbourne 2013–14



### Sensitivity to landfill cost impacts

The modelling assumes an average landfill cost of \$70 (\$60 plus levy) per tonne across the metropolitan area. This assumption is based on improving landfill standards – especially relating to methane capture – and the costs of recent landfill acquisitions.

In recognition of the significance of landfill costs, a sensitivity analysis has been prepared assuming a landfill charge of \$55 (\$45 plus levy) per tonne.

In this analysis, completed for Options 1, 1a, 2 and 2a, AWT costs were also reduced in line with the reduced landfill charge.

The analysis demonstrates that although there is a higher increase to be recovered from the householder if landfill charges are lower, the landfill charge does not significantly affect the weekly household cost. The results are shown in Table H3.

Table H3: Sensitivity analysis results on assumed landfill disposal costs

SCENARIO	ITEM	BASE CASE	OPTION 1	OPTION 1A	OPTION 2	OPTION 2A
Landfill disposal cost \$60 + levy	Additional cost per household per week (2013-14)	\$0	\$0.48	\$0.35	\$0.49	\$0.42
	Cost per household per annum (2013-14)	\$126	\$151	\$144	\$152	\$148
Landfill disposal cost \$45 + levy	Additional cost per household per week (2013-14)	\$0	\$0.57	\$0.43	\$0.56	\$0.49
	Cost per household per annum (2013-14)	\$118	\$148	\$140	\$147	\$143

Note: Options 3 and 4 had no direct landfill component

### Key factors for modelling predictions

When modelling over a 20-year-plus timeframe, there are a number of impacts that are difficult to predict with any certainty.

In the case of future waste volumes for Melbourne and the outcomes for Options 1 and 2, there are several issues that should be noted. The most significant of these are set out below:

- generation of garden waste
- introduction of carbon trading
- sale of soil conditioners
- technology improvements.

### Generation of garden waste

The waste audits used to project future volumes were conducted in 2005–06, prior to the drought conditions and water restrictions. Should these conditions continue, the volume and composition of future garden waste collections could be affected significantly.

### Introduction of carbon trading

As all options offer large CO<sub>2</sub>-equivalent reductions over the landfill case, there is potential for cost savings from the sale of carbon offset credits when carbon trading is introduced nationally (see Table H4).

Table H4: CO<sub>2</sub> equivalent reduction, 2013–14

OPTION	Ktonne CO <sub>2</sub> EQUIVALENT
1	288
1A	287
2	154
2A	154
4	275

The potential savings were not modelled as it was unclear at the time whether waste management activities – and in particular those that commenced before the new regime was in place – would be included in the new scheme.

### Sale of soil conditioners

As both Options 1 and 2 are likely to produce significant quantities of soil conditioners, it is necessary that new markets be established to consume the output of the proposed facilities. Soil conditioners produced from Option 2 should be more marketable than composts due to their higher nutrient content. Programs such as the Healthy and Sustainable Gardens will assist the development of new markets.

In the event that these markets are not established, operating costs of the modelled facilities will increase from the assumed rates, for both digestion and composting.

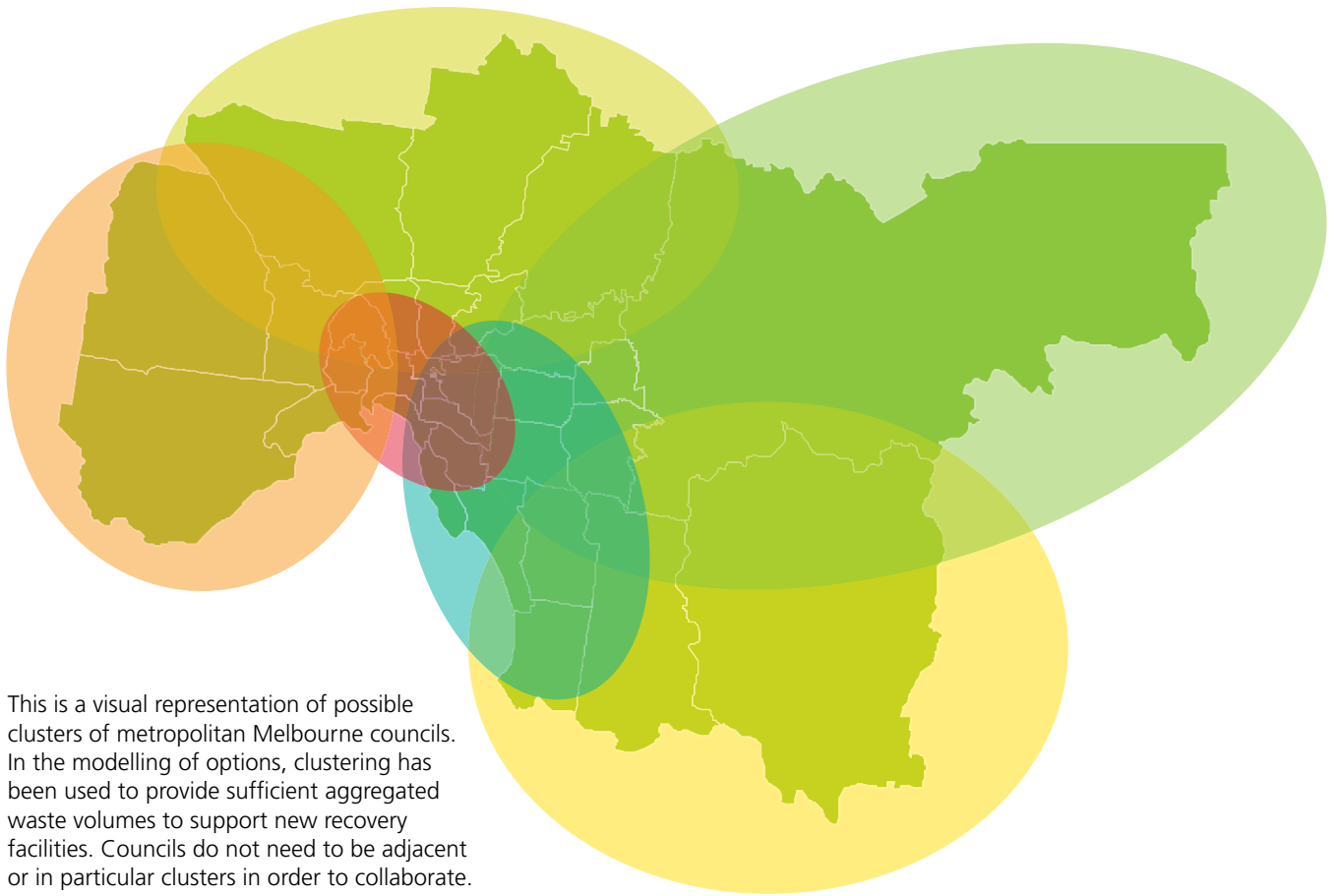
It should also be noted that the use of soil conditioners, composts and residual materials will need to meet all appropriate EPA requirements, as well as any relevant agriculture or horticulture standards for certain applications.

### Technology improvements

As Options 1 and 3 consider the use of anaerobic digestion to process waste residuals, it is important that contamination levels from the waste stream are reduced and that the technology selected will export energy and produce end products that are marketable.

# Appendix I

## Metropolitan Melbourne – possible council clusters



This is a visual representation of possible clusters of metropolitan Melbourne councils. In the modelling of options, clustering has been used to provide sufficient aggregated waste volumes to support new recovery facilities. Councils do not need to be adjacent or in particular clusters in order to collaborate.

# Appendix J

## Neighbouring RWMGs and local government shires

### **Barwon Regional Waste Management Group**

Member councils – Queenscliffe, Greater Geelong, Surf Coast and Colac Otway

### **Calder Regional Waste Management Group**

Member councils – Greater Bendigo, Mount Alexander and Macedon Ranges

### **Gippsland Regional Waste Management Group**

Member councils – East Gippsland, South Gippsland, Baw Baw, Wellington, Latrobe and Bass Coast

### **Goulburn Valley Regional Waste Management Group**

Member councils – Moira, Greater Shepparton, Campaspe, Mitchell, Murrindindi and Strathbogie

### **Highlands Regional Waste Management Group**

Member councils – Ballarat, Central Goldfields, Pyrenees, Hepburn, Moorabool and Golden Plains

### **Mornington Regional Waste Management Group**

Member council – Mornington Peninsula

# Appendix K

## Technology risk assessment example

Table K1 provides an overview of options for resource recovery technologies and the systems supporting these. This assessment should not be considered as definitive – it must be noted that new and modified technologies are being continually developed. A key issue is the quality of organic end-products from different treatment systems. At the time of writing, source separated processing technologies typically have potential to produce more high value organic products, but this has to be balanced by the inability of source-separated collection systems to recover all available organics. Advances in mixed waste processing technologies will likely continue to improve the quality of end products, or alternatively increase the renewable energy yield from residual organics and reduce the need for end markets to be developed for stabilised organics. The performance of mixed waste ARRT and landfills relative to source separated recovery may improve over time. The proposed procurement process will determine how environmental and social objectives can be met most cost-effectively.

Table K1: Options for resource recovery technologies and supporting systems

TECHNOLOGY	RISK/ISSUE	SIGNIFICANCE	RESPONSE/MANAGEMENT APPROACH	CURRENT & PROPOSED PROGRAMS TO SUPPORT MANAGEMENT APPROACH
<b>Source-separated garden and food organics to aerobic composting, anaerobic biodigestion or thermal energy recovery</b>				
General/ common issues	Higher costs due to additional collection service	Moderate	<ul style="list-style-type: none"> <li>→ Where existing 3-bin collection systems are in place, recovery of some food organics via this service will not significantly increase collection costs if more frequent collection is not required</li> <li>→ The frequencies of kerbside organics and/or residual waste collection services need to be considered. (e.g. recovery of food in the organics bin may require weekly collection of this bin, but this may allow fortnightly collection of residuals)</li> <li>→ Promote reduction of food organics through less wasteful consumption and well sited and managed home composting.</li> </ul>	<ul style="list-style-type: none"> <li>→ The Victorian Government supports competitive tendering that allows flexibility in the ways in which contractors deliver outcomes</li> <li>→ Best practice guides and model contracts for the provision of organics recycling collection and processing are available, and will be updated as required.</li> </ul>
	Higher costs due to the use of specialised biodegradable plastic or paper liners and/or kitchen tidies to increase food organics recovery	Moderate	<ul style="list-style-type: none"> <li>→ Processing contractor must be able to handle liners</li> <li>→ Increased costs of liners or kitchen tidies need to be weighed against increased household participation and recovery rates, and potentially lower contamination rates.</li> </ul>	<ul style="list-style-type: none"> <li>→ The Victorian Government supports development of systems that do not necessarily require the use of biodegradable liners.</li> </ul>

Table K1: Options for resource recovery technologies and supporting systems (continued)

TECHNOLOGY	RISK/ISSUE	SIGNIFICANCE	RESPONSE/MANAGEMENT APPROACH	CURRENT & PROPOSED PROGRAMS TO SUPPORT MANAGEMENT APPROACH
<b>Garden and food organics to aerobic composting, anaerobic biodigestion or thermal energy recovery</b>				
	Contamination of feedstock damaging the quality of products	Moderate to high	<ul style="list-style-type: none"> <li>→ Need community education to avoid contamination</li> <li>→ Systems for the reduction and recovery of items that pose more significant risks to products, such as film plastics, household chemicals, and batteries are being expanded</li> <li>→ There is a need for systems to monitor and respond to contamination, such as reminder notices, fines or suspension of service to those detected contaminating their organics bin</li> <li>→ Need processing contractor to have adequate systems and equipment to remove.</li> </ul>	<ul style="list-style-type: none"> <li>→ The Victorian Government supports programs, infrastructure and systems to recover household hazardous chemicals, including Detox Your Home (general household chemicals), Paintback (paint), Byteback (electrical equipment), Batteryback (nickel cadmium, nickel metal hydride, and lithium ion batteries), Flashback (fluorescent lights), and the establishment permanent drop-off facilities for waste oil and oil containers</li> <li>→ The Victorian Government supports initiatives to reduce and increase recovery of film plastics.</li> </ul>
<b>Source-separated garden and food organics to aerobic composting, anaerobic or thermal energy recovery</b>				
General/common issues (continued)	Inadequate/undeveloped markets for recycled organic products	High	<ul style="list-style-type: none"> <li>→ Proponents of technologies and processing contractors need to demonstrate markets for products, and have adequate market development initiatives and outlets to sell all products produced.</li> </ul>	<ul style="list-style-type: none"> <li>→ The Victorian Government actively promotes recycled organics market and industry development through:                             <ul style="list-style-type: none"> <li>- funding support to industry and research organisations to develop and demonstrate profitable uses of recycled organic products</li> <li>- implementation of a Market and Industry Development Strategy developed with the Victorian composting industry</li> <li>- support for a Market and Industry Development Officer</li> <li>- development and promotion of the 'Certified Compost' / 'Australian Standard Plus' product quality scheme</li> <li>- provision of independent advice to recyclers, local government and potential users of products regarding the development and use of recycled organic products</li> <li>- support for renewable and distributed energy projects, including those using wasted organics as biomass.</li> </ul> </li> </ul>

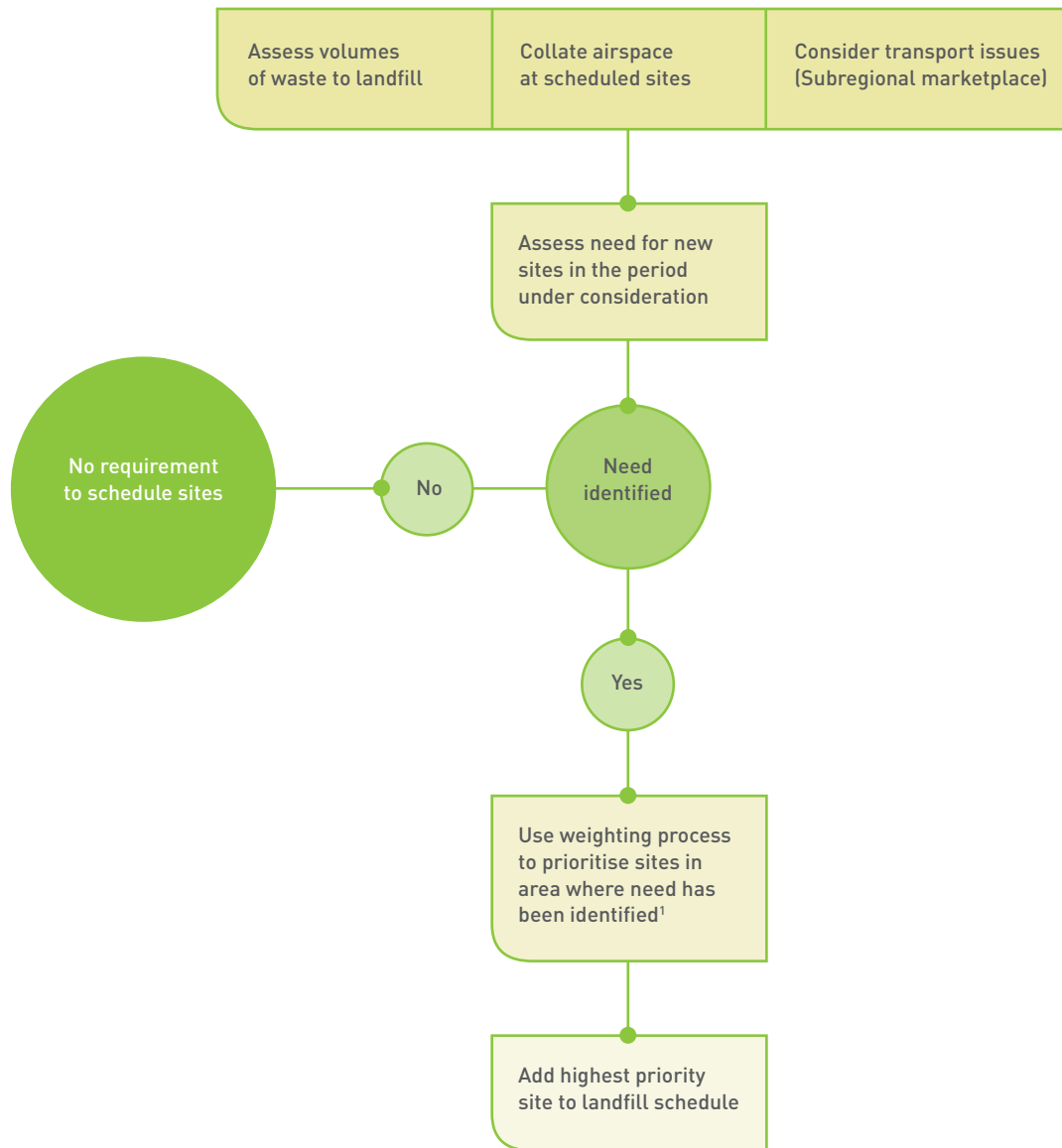
# Appendix L

## EPA compliance checklist

ISSUE	COMPLETED	SECTION
Filling Sequence for 10 years	Yes	Appendix D
Program for rehabilitation	Yes	Section 8
Closure date	Yes	Appendix D
Future Options	Yes	Section 7
Consistent with WMP	Yes	
Consistent with SEPPs	Yes	
Consistent with SV Waste Strategy	Yes	
Consistent with SIWMP	Yes	
Consult with stakeholders	Yes	Section 4
Advertise draft	Yes	
Consider comments on draft	Yes	
Submit draft for approval to EPA	Yes	

# Appendix M

## Flowchart of scheduling process



<sup>1</sup> Using the criteria from the Waste Management Policy, clause 13, the assessment includes:

- Community needs
- Landfill type
- Buffers
- Groundwater
- Surface waters
- Flora/fauna
- Infrastructure
- Geology
- Land ownership

# Appendix N

## Sequence of scheduled landfill sites

This schedule has been prepared to comply with section 50 BC Part 3 (2) (a) of the Environment Protection Act 1970.

### North & West Putrescible

LANDFILL	ADDRESS	LICENCE	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	LIKELY CLOSURE
TPI Brooklyn	Jones Rd, Brooklyn	ES499	Ω											2008
Brooklyn Sunshine Group (Western Land Reclamation) <sup>1</sup>	Jones Rd, Brooklyn	ES26594	→	→	→	→	→	→	→	→	→	→	→	2020
Hume	Lot 21, Riddell Rd, Sunbury	ES465	→	→	→	→	→	→	→	→	→	→	→	post 2022
Boral	Riding Boundary Rd, Truganina	ES37288	→	→	→	→	→	→	→	→	→	→	→	post 2040
Hanson	Bridge Inn Rd, Wollert	ES41808	→	→	→	→	→	→	→	→	→	→	→	post 2040
Wyndham	Westes Rd, Werribee	ES492	→	→	→	→	→	→	→	→	→	→	→	post 2040

### North & West Solid Inert

LANDFILL	ADDRESS	LICENCE	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	LIKELY CLOSURE
Bulla	500 Sunbury Rd, Bulla	ES21321	→	→	→	→	Ω							2012
TPI Market Road	Market Rd, Brooklyn	EX304	→	→	→	→	Ω							2012
Altona North Landfill	McArthurs Rd, Altona	ES26227	→	→	→	→	→	→	→	→	→	→	→	2020
Barro Kealba	McIntyre Rd, Kealba	<sup>2</sup>		→	→	→	→	→	→	→	→	→	→	post 2030

Notes:

- 1 Has regulatory approval to take putrescible waste, but currently only accepts solid inert waste.
- 2 Works Approval issued. The issue of licence is subject to meeting Works Approval requirements.

→ Landfill in operation.

Ω Indicates likely closure year for the facility as advised by the landfill operator.

### South East Putrescible

LANDFILL	ADDRESS	LICENCE	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	LIKELY CLOSURE
SITA Taylors Rd <sup>3</sup>	890 Taylors Rd, Lyndhurst	ES511	→	→	Ω									2010
Clayton Regional	674-718 Clayton Rd, Clayton	ES20872	→	→	→	→	→	→	→	→	→	→	Ω	2017
TPI Clayton	Deals Rd and Fraser Rd, Clayton	ES49849 EM28818	→	→	→	→	→	→	→	→	→	→	→	post 2020
SITA Hallam Rd	274 Hallam Rd, Hampton Park	ES33144	→	→	→	→	→	→	→	→	→	→	→	2027

### South East Solid Inert

LANDFILL	ADDRESS	LICENCE	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	LIKELY CLOSURE
The Glen	75 Quarry Rd, Langwarrin	ES22749	Ω											2008
TPI Victory Rd	Victory Rd, Clarinda	ES419	→	→	→	Ω								2011
TPI Carroll Rd	Carroll Rd, Clarinda	ES45017	→	→	→	→	→	→	Ω					2014
SBI Cranbourne <sup>4</sup>	950 Ballarto Rd, Cranbourne					→	→	→	→	→	→	→	→	2019
TPI Heatherton	Bunnys Lane, Heatherton	ES552	→	→	→	→	→	→	→	→	→	→	→	Post 2020

**Notes:**

3 For putrescible waste, life of Taylors Road may be extended by reducing filling rate. This does not affect its capacity for prescribed waste, which is projected to continue to 2020.

4 The SBI Cranbourne site was scheduled in the SERWMG 2005–2010 plan and is expected to apply for a Works Approval in 2008–09.

→ Landfill in operation.

Ω Indicates likely closure year for the facility as advised by the landfill operator.

# Acronyms

ARRT	Advanced Resource Recovery Technology (commonly referred to as AWT elsewhere)
AWT	Alternative Waste Treatment (referred to as ARRT in this document)
C&I	Commercial and industrial
C&D	Construction and demolition
CPRS	Carbon Pollution Reduction Scheme
DPCD	Department of Planning and Community Development
DSE	Department of Sustainability and Environment
EPA	Environment Protection Authority Victoria
MGB	Mobile garbage bin (i.e. wheelie bin)
MRF	Materials recovery facility
MSW	Municipal solid waste
MWMG	Metropolitan Waste Management Group
NPC	National Packaging Covenant
RWMG	Regional Waste Management Group
SIWMP	Solid Industrial Waste Management Plan
SMEs	Small- to medium-sized enterprises
TZW	Towards Zero Waste
VARRI	Victorian Advanced Resource Recovery Initiative

# Glossary

<b>Advanced resource recovery technology (AART)</b>	Technology that processes solid waste to recover resources such as energy or the various component parts for re-use and recycling. Recovered energy can be used for producing electricity and other applications that substitute for energy produced from primary resources. Advanced resource recovery treatment has historically been referred to as advanced waste treatment, but that term does not convey the clear message that the underlying reason for treatment is to recover resources rather than simply treat waste.
<b>Airspace</b>	The remaining capacity of a landfill.
<b>Alternative waste technology (AWT)</b>	Any technology that is applied to mixed waste other than traditional methods, such as disposal to landfill. AWT facilities typically recover some dry recyclables and treat organic waste by fermentation or other processes.
<b>Anaerobic digestion</b>	A process of biologically degrading organic materials in the absence of oxygen, yielding methane gas (which may be combusted to produce energy) and stabilised organic residues (which may be used as a soil additive).
<b>Best practice facilities</b>	Facilities with high levels of environmental management consistent with EPA and Sustainability Victoria Best Practice environmental management guidelines. In the case of materials processing facilities, best practice also implies high levels of product quality management.
<b>Best practice landfill management</b>	Adoption of measures established in <i>Best Practice Environmental Management – Siting, Design, Operation and Rehabilitation of Landfills (EPA)</i> . This document gives direction through required outcomes and suggested measures on the main aspects of landfill management.
<b>Bio-energy</b>	The conversion of biomass to energy, e.g. electricity, gas or biofuel.
<b>Biomass</b>	A natural resource derived from photosynthesis that is not fossilised, e.g. forest and mill residues, agricultural crops and wastes, wood and wood wastes, animal wastes, livestock operation residues, aquatic plants, fast-growing trees and plants, and municipal and industrial wastes.
<b>Biosolids</b>	Nutrient rich organic materials derived from wastewater solids (sewage sludge) that have been stabilised through processing.
<b>Cogeneration</b>	A highly efficient way of simultaneously converting gas into a number of useable forms of energy, e.g. electricity and useable heat.
<b>Collection system</b>	System for the collection of materials from kerbside, including bin type and collection frequency.
<b>Commingled materials</b>	Materials all mixed together, such as plastic bottles with paper, glass and metal containers. Commingled recyclable materials require sorting after collection before they can be recycled.
<b>Commercial and industrial (C&amp;I) waste</b>	Solid waste generated from trade, commercial and industrial activities including the government sector. It includes waste from offices, manufacturing, factories, schools, universities, state and government operations and small to medium enterprises, e.g. food waste.
<b>Construction and demolition (C&amp;D) waste</b>	Solid waste that is generated from residential and commercial construction and demolition activities, e.g. bricks and concrete.
<b>Composting</b>	A process of biologically degrading organic materials in the presence of oxygen, yielding carbon dioxide, heat and stabilised organic residues that may be used as a soil additive.
<b>Council clusters</b>	A grouping of two or more councils.
<b>Eco-buy</b>	Formerly the Local Government Buy Recycled Alliance. A partnership of local governments committed to purchasing policies and practices that promote the use of recycled products across operations and services. It is a joint initiative of Sustainability Victoria and the Municipal Association of Victoria (MAV), with the Department of Natural Resources and Environment (now Department of Sustainability and Environment) joining the partnership in 2002, broadening the program to cover green purchasing.
<b>Eco-design</b>	An approach to sustainable production and consumption that addresses the link between a product and the environment, recognising the critical influence of the design of a product on its life-cycle impacts.
<b>Ecological footprint</b>	The impacts of human consumption on the earth's ecosystem, expressed in terms of the area of land used to supply these resources.

<b>Energy from waste</b>	Processing technologies that use waste as a feedstock for generating energy, which can be used for heat or for generating electricity.
<b>End-of-life waste</b>	Products such as cars that have reached the end of their useful life and become waste. This term is often used in the context of the product stewardship responsibilities of manufacturers and brand-owners for wastes discarded by consumers.
<b>Environmental accounting</b>	A discipline for measuring environmental costs that may be applied to the areas of management accounting, financial accounting and national accounting.
<b>Environmental management system (EMS)</b>	A business tool for systematically measuring and improving environmental performance.
<b>Environment Protection &amp; Heritage Council (EPHC)</b>	A national body established in 2001 to ensure the protection of Australia's environment and heritage. Created by amalgamating the National Environment Protection Council (NEPC), the environment protection components of the Australian and New Zealand Environment and Conservation Council (ANZECC), and Heritage Ministers' Meetings.
<b>Fill material</b>	Soil (being clay, silt and sand), gravel and rock, all being naturally occurring materials, having chemical contamination levels below that specified in Table 2 of <i>EPA publication 448</i> . Materials exceeding the minima set in Table 2 must be classified as either low-level contaminated soil or contaminated soil.
<b>Food organics</b>	Food wastes from households or industry including food processing waste, out-of-date or off-specification food, meat, fruit and vegetable scraps. Excludes liquid wastes.
<b>Garden organics</b>	Organics derived from garden sources, e.g. grass clippings, tree prunings.
<b>Gasification</b>	Advanced thermal technology that converts organic material into combustible gases by partial oxidation under the application of heat, leaving an inert residue.
<b>Greenhouse gases</b>	Gases, such as carbon dioxide and methane, that trap heat in the earth's atmosphere, which affects weather and climate.
<b>Hard waste</b>	The term applied to household garbage that is not usually accepted into mobile garbage bins by local councils, e.g. old fridges and mattresses.
<b>In-vessel enclosed compost operation</b>	The biological decomposition of organic material, where oxygen and temperature levels are provided in a controlled environment.
<b>Kerbside waste</b>	Waste collected by local councils from residential properties including garbage, commingled recyclables and garden organics, but excluding hard waste.
<b>Landfill</b>	A site for the disposal of waste to land.
<b>Landfill levy</b>	A levy applied at differential rates to municipal, C&I and prescribed wastes disposed of at licensed landfills in Victoria. Landfill levies are used solely for the purposes of environment protection and fostering environmentally sustainable use of resources and best practice in waste management. They fund the activities of RWMGs, Sustainability Victoria and EPA Victoria, helping to establish waste-management infrastructure, industry waste-reduction programs, education programs, regulatory controls and enforcement regimes. Levies also provide an incentive to minimise the generation of waste, sending a signal to industry that the government supports efforts to develop alternatives to disposal to landfill.
<b>Landfill prohibition</b>	The banning of a certain material or product type from disposal to landfills. The state Environment Protection Policy (Siting and Management of Landfills Receiving Municipal Wastes) allows for the EPA to ban a material from landfill where a higher waste-management option is available.
<b>Life-cycle assessment (LCA)</b>	An objective process to evaluate the environmental burdens associated with a product, process, or activity by identifying energy and materials used and wastes released to the environment, and to evaluate and implement opportunities to affect environmental improvements.
<b>Life cycle of a product</b>	All stages of a product's development, from raw materials to manufacturing, through to consumption and ultimate disposal.

<b>Materials efficiency</b>	'Achieving more with less' by supplying products and services using fewer resources, and generating less waste, to maintain quality of life.
<b>Materials recovery facility (MRF)</b>	A centre for the receipt, sorting and transfer of materials recovered from the waste stream. At a MRF, materials are also sorted by type and treatment, which may include cleaning and compression.
<b>Metropolitan Waste Management Group (MWMG)</b>	A statutory body established on 1 October 2006 under the provision of the <i>Environment Protection Act 1970</i> . The MWMG works with the state government and local councils to: <ul style="list-style-type: none"> <li>• drive planning and investment in alternative waste technologies that have the capacity to generate renewable energy, recycle organics and other materials</li> <li>• facilitate and enable effective resource efficiency and community engagement and education programs</li> <li>• develop new waste contracts that deliver environmental and economic gains.</li> </ul>
<b>Municipal solid waste (MSW)</b>	Solid waste generated from municipal and residential activities, and including waste collected by, or on behalf of, a municipal council. In this document, MSW does not refer to waste delivered to municipal disposal sites by commercial operators or waste from municipal demolition projects.
<b>National Packaging Covenant (NPC)</b>	A self-regulatory agreement between industries involved in the packaging chain and all spheres of government.
<b>Open windrow composting operation</b>	A process where incoming organic materials are shredded, mixed and managed so they decompose aerobically in windrows or piles that are fully exposed to the air.
<b>Optical sorting</b>	Higher levels of quality plastics separation are achieved by the installation of four optical sorting machines that accurately sort plastics by their polymer type. The optical sensor captures this reflection and generates a two-dimensional image, which in turn enables computer software to efficiently determine the type of plastic. It then blows the defined plastic onto a conveyor while the remaining material is further sorted or disposed of.
<b>Organics</b>	Plant or animal matter originating from domestic or industrial sources, e.g. grass clippings, tree prunings, food waste.
<b>Part-enclosed process</b>	A waste process where part of it is undertaken in an enclosed environment and part fully exposed to the open air (e.g. covered windrow composting with open air maturation).
<b>Prescribed waste and prescribed industrial waste</b>	Those wastes listed in the Environment Protection (Prescribed Waste) Regulations 1998 and being subject to requirements under the Industrial Waste Management Policy (Prescribed Industrial Waste) 2000. EPA Victoria closely regulates these wastes because of their potential adverse impacts on human health and the environment. Prescribed wastes carry special handling, storage, transport and often licensing requirements, and attract substantially higher disposal levies than non-prescribed solid wastes.
<b>Processing (of waste materials)</b>	Best practice activities that recover resource value from wastes and prevent harmful emissions from residual materials. Processing may include <ul style="list-style-type: none"> <li>• sorting of mixed-waste streams for recycling</li> <li>• aerobic or anaerobic treatment to produce organic soil enhancement materials</li> <li>• anaerobic or thermal treatment to recover energy</li> <li>• on-site separation of materials for recycling to a standard such that residual materials contain no significant resource value.</li> </ul>
<b>Processing facilities</b>	Facilities which either receive materials directly from collection systems or from recovery facilities for further sorting and/or processing to provide material for use in the generation of new products.
<b>Product stewardship</b>	A concept of shared responsibility by all sectors involved in the manufacture, distribution, use and disposal of products.
<b>Putrescible waste</b>	Waste that readily decomposes. Includes food waste and organic waste from gardens.
<b>Pyrolysis</b>	Advanced thermal technology involving the thermal decomposition of organic compounds in the complete absence of oxygen, under pressure and at elevated temperatures.
<b>Recovery facilities</b>	Facilities established to receive and recover re-usable and recyclable materials that would otherwise be destined for disposal.

<b>Recyclables</b>	While this term strictly applies to all materials that may be recycled, in this document the term is generally used to refer to the recyclable containers and paper/cardboard component of kerbside waste, i.e. it excludes garden organics.
<b>Recycling</b>	A term that may be used to cover a wide range of activities, including collection, sorting, reprocessing and manufacture into new products.
<b>Refuse-derived fuels</b>	Fuels produced from the stabilised organics and other residuals from mixed-waste AWT.
<b>Regional Waste Management Group (RWMG)</b>	Statutory authority established under the <i>Environment Protection Act 1970</i> responsible for planning for municipal solid waste. There are 13 RWMGs across Victoria.
<b>Reprocessing</b>	Changing the physical structure and properties of a waste material that would otherwise have been sent to landfill in order to add financial value to the processed material. Without reprocessing, the beneficial use of waste materials would be lost.
<b>Resale centre</b>	A centre that enables the sale and subsequent re-use of good quality, saleable products and materials that were disposed of by their previous owner.
<b>Residual waste</b>	Waste that remains after any source separation of recyclable materials, including green waste.
<b>Resource recovery</b>	The process of obtaining matter or energy from discarded materials.
<b>Resource recovery centre</b>	A centre for facility where resource recovery occurs.
<b>Re-use</b>	The second-highest option in the waste hierarchy – recovering value from a discarded resources without processing or remanufacture, e.g. garments sold through opportunity shops are, strictly speaking, a form of re-use, rather than recycling.
<b>Sectors, industry sectors</b>	Groupings of industries used to generalise patterns in waste generation and disposal, e.g. construction and demolition; food services, food retail and food manufacturing; small to medium enterprises.
<b>Solid industrial waste (SIW)</b>	Solid waste generated from commercial, industrial or trade activities, including waste from factories, offices, schools, universities, state and federal government operations and commercial construction and demolition work. Excludes MSW, wastes that are prescribed under the <i>Environment Protection Act 1970</i> and quarantine wastes.
<b>Solid waste</b>	Non-hazardous, non-prescribed, solid waste materials ranging from municipal garbage to industrial waste.
<b>Source separation</b>	The practice of segregating materials into discrete materials streams prior to collection by, or delivery to, processing facilities.
<b>State environment protection policies (SEPPs)</b>	Statutory instruments under the <i>Environment Protection Act 1970</i> that identify beneficial uses of the environment to be protected, establish environmental indicators and objectives and define attainment programs to implement the policies.
<b>Sustainability covenant</b>	Under Section 49 of the <i>Environment Protection Act 1970</i> , a sustainability covenant is an agreement that a person or body undertakes to increase the resource use, efficiency and/or to reduce the ecological impacts of activities, products, services and production processes. Parties can voluntarily enter into such agreements with EPA, or could be required to do so, if they are declared by Governor in Council, on the recommendation of EPA Victoria, to have potential for significant impact on the environment.
<b>Sustainability Victoria</b>	Statutory authority established in October 2005 with the key objective of ‘facilitating and promoting environmental sustainability in the use of resources’. Sustainability Victoria works across the areas of energy, waste and water with communities, industries and government applying the best ideas and encouraging action to enable people to change their everyday practices.
<b>Sustainable consumption, sustainable resource use</b>	A change to society’s historical patterns of consumption and behaviour that enables consumers to satisfy their needs with better performing products or services that use fewer resources, cause less pollution and contribute to social progress worldwide.

<b>Transfer station</b>	A facility allowing the drop-off and consolidation of garbage and a wide range of recyclable materials. Transfer stations are an integral part of municipal waste management, playing an important role in materials recovery and improving transport costs.
<b>Triple bottom line (TBL)</b>	Describes the ideal that organisations are responsible for social and environmental as well as financial outcomes.
<b>Victorian Litter Action Alliance (VLAA)</b>	Victoria's peak body for litter management. Formed in April 2000, VLAA was created to coordinate efforts made on behalf of state and local government agencies and the voluntary and private sectors to reduce litter in Victoria.
<b>Walking floor</b>	A waste transport vehicle or trailer that is unloaded at the receiving or disposal site through movement of the floor, rather than through use of a hydraulic ram or tipping of the body.
<b>Waste</b>	Anything that is no longer valued by its owner for use or sale and which is, or will be, discarded.
<b>Waste avoidance</b>	At the top of the waste management hierarchy, avoidance works on the principle that the greatest gains result from efficiency-centred actions that remove or reduce the need to consume materials in the first place, but deliver the same outcome.
<b>Waste generation</b>	Generation of unwanted materials, including recyclables as well as garbage, i.e. waste generation = materials recycled + waste to landfill.
<b>Waste hierarchy, waste management hierarchy</b>	A concept promoting waste avoidance ahead of recycling and disposal, often referred to in community education campaigns as 'reduce re-use recycle'. The waste hierarchy is recognised in the <i>Environment Protection Act 1970</i> , promoting management of wastes in the order of preference: avoidance, re-use, recycling, recovery of energy, treatment, containment, and disposal.
<b>Waste management industry</b>	Applies to those involved in managing waste, i.e. collectors, sorters, processors and landfill operators.
<b>Waste minimisation</b>	The concept of, and strategies for, waste generation to be kept to a minimum level in order to divert materials from landfill and thereby reduce the requirement for waste collection, handling and disposal to landfill.
<b>Waste Management Policy (WMP)</b>	A statutory instrument under the <i>Environment Protection Act 1970</i> that provides the basis for the management of waste and can cover generation, use, transport, storage, treatment, handling, recovery, recycling, re-use and disposal of waste.
<b>Waste reduction</b>	See Waste avoidance.
<b>Waste stream</b>	A classification used to describe waste materials that are either of a particular type (e.g. 'timber waste stream') or produced by a particular source (e.g. 'C&I waste stream').

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