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Final

Moreland's future kerbside waste and recycling options assessment

31 AUGUST 2021

PREPARED FOR

Moreland City Council

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**Version 1.1. – Modification made to Table 4*

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Abbreviations and glossary

CDS	Container deposit system
CO_2-e	Carbon dioxide equivalents (a unit of measuring greenhouse gases)
DELWP	Department of environment, land, water and planning
FOGO	Food organics and garden organics
GHG	Greenhouse gas
GO	Garden organics
MCC	Moreland City Council
MRF	Materials recovery facility
MRL	Metropolitan Regional Landfill (Ravenhall)

1. Introduction

Moreland City Council (MCC) commissioned Blue Environment to undertake an assessment of potential future kerbside waste management services compliant with the Victorian Government's *Recycling Victoria: a new economy* policy (*Recycling Victoria*).

MCC already provides weekly kerbside garbage and recycling services and a fortnightly organics service. Until recently, the organics service was for garden organics, but residents are now encouraged to divert food waste to the organics bin. The organics service is voluntary, but has a high level of uptake, with about 70% of households receiving a garbage service also using the organics service. Current organics service users have been offered kitchen caddies for the separation of food organics, and can pick up caddies for free from council offices. Relatively few residents have taken up this offer, but all new users of the FOGO service are automatically provided with caddies. The levels of food diversion by organics service users is not currently known, but there has not been a large decrease in household garbage since the organics service started to accept food waste.

The *Recycling Victoria* policy statement sets the following objectives:

- **The provision of food organics and garden organics (FOGO) recovery services to all households by 2030.** MCC is considering options for expanding and increasing community participation in the existing FOGO service, and increasing the amounts of food diverted. Audits of Moreland's garbage bins indicate that, on average, over half of the garbage by weight is made up of discarded food waste. Options for increasing participation and diversion of food from landfill include more effective community engagement and education, providing kitchen caddies to a larger number of users, and changing the frequencies of garbage collection to fortnightly, and FOGO to weekly. In other areas, provision of compostable liners has also been shown to increase household participation and food diversion, but MCC's organics processing contractor currently refuses to receive organics containing compostable liners because liners are incompatible with their decontamination systems and short processing times. Residents could be encouraged to use absorbent compostable paper (paper towels or newspaper) to line caddies and wrap food to reduce mess. Residents can also be encouraged to reduce food waste and manage it on site with well managed home composts or worm farms. This is discussed further in section 2
- **The establishment of options for glass recovery to all households by 2027.** In metropolitan areas this is understood to mean the introduction of a 'fourth bin' collection service and may also involve establishment of drop off points for residents without access to kerbside services. This is discussed further in section 2.
- **Introduction of a container deposit scheme (CDS).** Details of this scheme are unknown at the time of writing, but indications are that it will only apply to some beverage containers and not apply to larger wine and spirit bottle, milk bottles larger than 600ml, or non-beverage packaging formats. The CDS is expected to reduce the quantities of common glass, aluminium, steel and plastic drink containers in kerbside recycling. It is unclear whether the operators or materials recovery facilities will be able to claim a full or partial deposit refund for kerbside collected recyclables (MRF operators in NSW can, those in Queensland cannot) and how it will impact on the economics of kerbside recycling services. This is discussed further in section 2.

This report provides:

- An assessment of the expected economic, environmental and social performance of different options for FOGO and glass collection services
- Assessment of different kerbside service configurations consisting of a four-bin system
- Assessment of operational constraints and opportunities for new kerbside services
- Discussion of factors influencing future kerbside management of recyclables and organics. There is some uncertainty about the future costs of kerbside recycling systems due to the proposed introduction of a CDS and investment in recycling infrastructure These may change cost structures and the competitiveness of future procurement of materials recovery facility services.

2. FOGO modelling

The following section details a review of FOGO options suited to Moreland. This includes modelling of the expected performance and comparative costs of different service provision options. It also considers the practical implications of providing different service options, and provides recommendations about how to reduce risks and improve outcomes from different options.

2.1 Modelled scenarios

The following waste management options have been modelled:

- Scenario 1a: Base case (current service and landfill costs)
- Scenario 1b: Base case (current service with future landfill levy cost increases)
- Scenario 2: Universal weekly FOGO, fortnightly garbage (unlike a voluntary or 'opt in' service, a universal service is one provided to all households unless they meet criteria for not having a service)
- Scenario 3: Universal fortnightly FOGO, weekly garbage
- Scenario 4: Universal weekly FOGO, weekly garbage.

A Microsoft Excel model was developed to compare the comparative performance of options compared to current management practices. The model allows assumptions about different variables to be changed, which allows assessment of different levels of performance within the various scenarios. Assumptions on the performance of each scenario are shown in Table 1. These assumptions are based on the observed performance of different kerbside services in Victoria and other parts of Australia. These assumptions describe high-performing FOGO services. They assume effective community engagement to promote behaviour change.

Table 1 Assumed performance of FOGO scenarios

Parameter	Units	Scenario 1a Base case (current service)	Scenario 1b Base case (current service with future landfill levy)	Scenario 2 Universal weekly FOGO, fortnightly garbage	Scenario 3 Universal fortnightly FOGO, weekly garbage	Scenario 4 Universal weekly FOGO, weekly garbage.
Participation rate[1]	% of household using FOGO	67%	67%	90%	80%	85%
FO diversion rate	% diversion per household	6%	6%	60%	20%	40%
GO diversion rate	% diversion per household	70%	70%	90%	70%	80%
'Additional' organics[2] for new participants	Kg per each new household taking up the service per year	-	-	60	60	60

[1] Participation rate is the number of households using the service out of all households. It is assumed that even when a universal service is offered, not all households will use it.

[2] 'Additional' organics are food and garden organics that household do not currently put into their garbage bins (because they home compost or can't fit them in their garbage bin) but is expected to be disposed to FOGO if a service is provided. In Victoria, councils introducing garden organics of FOGO services typically find that four to five times more garden waste is disposed to the organics service than was previously in residents' garbage bins. This will be less of an issue in Moreland because the garden organics service has been in place for years and has been taken up by many residents with higher quantities of garden organics. However, some 'additional' food and garden organics are expected to be disposed to the FOGO bins.

Key cost assumptions applied in the model include:

- by weight, garbage bins comprise 52% FO and 4% GO[3]
- kitchen caddies would be provided to all new households taking up the FOGO service, as well as 10% of existing FOGO service users
- garbage bin collection costs per bin per collection are the same as at present, inclusive of transport to the waste facility
- FOGO bin collection costs per bin per collection are the same as at present, inclusive of transport to the waste facility
- landfill disposal costs per bin per but will increase by $60 per tonne following Victoria's landfill levy increase over the next three years
- FOGO processing costs will be the same per tonne as current FOGO processing costs offered through a regional organics processing service contract that Moreland is part of
- additional community engagement costs of $5 per participating household per year.

On the basis of the experiences of other councils, the model assumes:

- Participation rates (the number of households using the service to divert food and garden organics) and diversion rates (the proportion of food and garden organics that households divert from landfill on average) will be higher if FOGO is collected weekly and garbage is collected fortnightly. Councils that already have a widely used GO service can find it more difficult to change their community's behaviour if fortnightly FOGO and weekly garbage are maintained. Community engagement and provision of caddies (and, where possible, compostable liners) have been found to have some effect, but changing to a fortnightly garbage and weekly FOGO service is a significant change and gets peoples' attention. It makes householders focus on how they manage organics and promotes greater behaviour change when coupled with community engagement and the provision of caddies to those that want them. Other metropolitan councils, such as Boroondara and Hobsons Bay, have recently made this change, and Nillumbik adopted this system over a decade ago. They have significantly reduced landfilled garbage and seen high levels of food diversion from landfill than some councils that have maintained weekly garbage services when introducing FOGO services.
- When provided with a FOGO service, some households will use it to dispose of food and garden organics they currently do not dispose to their garbage. This includes households with lawn clippings and other garden waste they'd normally manage on site and households that compost because they see it as 'the right thing to do', but derive little other benefit from composting. Because most households in Moreland already use the GO service and most of the new service users will be higher density housing with less garden organics, we have assumed that, on average, levels of 'additional' organics will not be as high as many other councils' experience when first introducing an organics collection service. The model assumes an additional 60kg per new service user per year.
- Households using the FOGO service to divert waste from garbage will not use the freed up garbage bin space to dispose of other waste.

2.2 Model outputs

Organics diversion

Model results are shown in Table 2 and Figure 1. These show:

- The greatest diversion from landfill is expected with a universal weekly FOGO service and fortnightly garbage, along with effective community engagement and the provision of caddies to new service users and existing users wanting to have them. Landfilled garbage is expected to fall by 28% because of food and garden organics diversion, but this could be higher as some increase in kerbside recycling could be

[3] Based on Moreland City Council 2015 bin audit

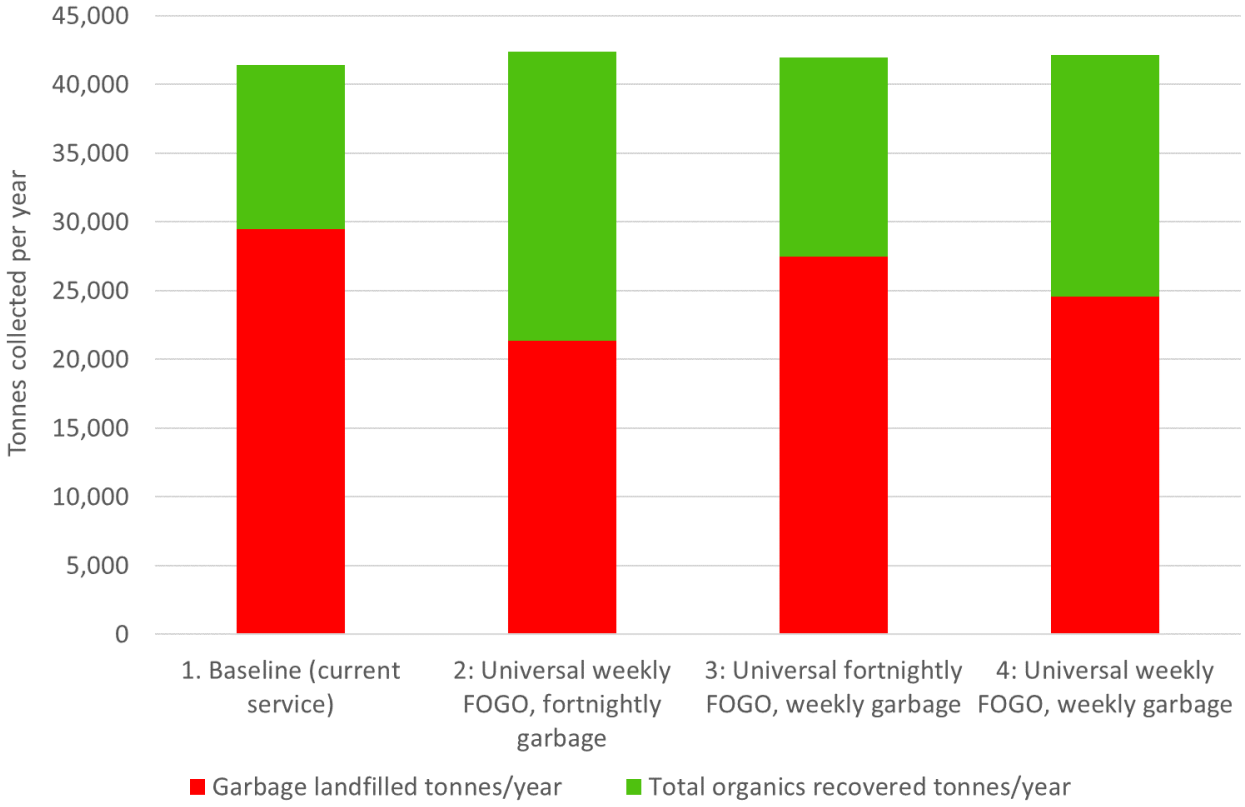
expected because of the shift to a fortnightly garbage service. This option will also result in some increase in 'additional' organics being disposed via the FOGO service.

- A weekly FOGO and weekly garbage option will result in a 21% reduction in landfilled waste, and also see an increase in additional organics disposed to the FOGO service.
- A universal fortnightly FOGO and weekly garbage service is expected to reduce landfilled garbage by a more modest 15% by weight, and result in less additional organics being disposed to the FOGO service.

Table 2 Model outputs under different FOGO scenarios

Parameter	Units	Scenario 1a Base case (current service)	Scenario 1b Base case (current service with future landfill levy)	Scenario 2 Universal weekly FOGO, fortnightly garbage	Scenario 3 Universal fortnightly FOGO, weekly garbage	Scenario 4 Universal weekly FOGO, weekly garbage.
Households in service area	number	72,200	72,200	72,200	72,200	72,200
Participation rate	%	67%	67%	90%	80%	85%
Households using service	number	48,700	48,700	65,000	57,800	61,400
GO diversion rate	%	70%	70%	90%	70%	80%
FO diversion rate	%	6%	6%	60%	20%	40%
Total organics collected	t/year	11,930	11,930	21,000	14,460	17,570
Change in organics	t/year	-	-	9,070	2,530	5,640
% Change in organics	%	0%	0%	76%	21%	47%
Total garbage collected	t/year	29,460	29,460	21,360	27,470	24,570
Change in garbage	t/year	-	-	-8,100	-1,990	-4,890
% Change in garbage	%	0%	0%	-27%	-7%	-17%

Figure 1 Tonnes of organics recovered and garbage landfilled under different scenarios



Economic analysis

The modelling of the relative costs of different options are shown in Table 3 and Figure 2. This shows:

- Legislated landfill levy increases are expected to increase service costs regardless of any changes to kerbside services. The figures compare current costs (1a) with future costs if there were no changes to services (1b) as well as the various new kerbside service options. An important finding of this work is that service costs are expected to rise due to the landfill levy increases and that costs increases from the expansion of the FOGO service have a modest cost increase. If organics diversion rates are higher than modelled, the FOGO service could save money. The increase in levy is expected to increase per household costs by $24 per year.
- A universal weekly FOGO service with fortnightly garbage, or a universal fortnightly FOGO service with weekly garbage will result in modest cost increases associated with increased community engagement and education provision of caddies to new service users and 10% of existing users, and some increase in the additional organics disposed to the FOGO bin. The modelling suggests:
  - A fortnightly FOGO and weekly garbage service option would increase per household costs by $10 per year above the base case with increased landfill levy.
  - A weekly FOGO and fortnightly garbage systems is expected to increase costs by $6 per household per compared to the base case with increased landfill gate fees.

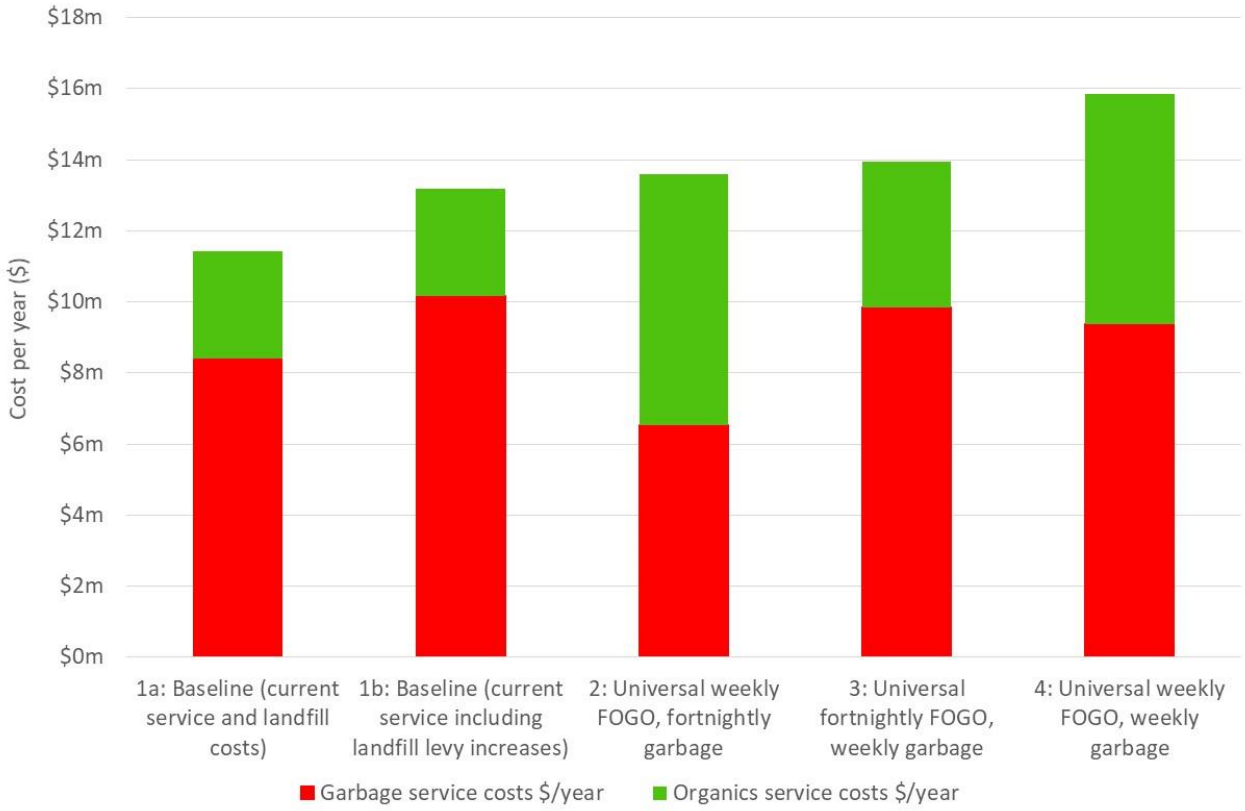
  The weekly FOGO/fortnightly garbage service is cheaper because of higher expected participation and diversion of food from garbage. The modelling suggests that the more organics that are diverted per household and overall, the greater the cost savings to council and the community.
- A weekly FOGO and weekly garbage service option would increase costs more significantly due to increased waste collection service costs**.** Costs per household could be expected to increase by $36 per year compared to the base case with higher landfill costs. Current kerbside collection contracts and in-house collection vehicles and crews would not be adequate to manage a weekly universal FOGO and weekly garbage service, even if recycling transitions from a weekly service to a fortnightly one. Food has higher density than most other wastes, and expected diversion from garbage will not greatly reduce the volumes of garbage, or increase the volume of FOGO bins, so the numbers of households serviced per

vehicle load are likely to remain about the same. Additional collections of FOGO will require additional collection capacity to service new households.

Table 3 Cost outputs under different scenarios

Parameter	Units	Scenario 1a Base case (current service and landfill costs)	Scenario 1b Base case (current service with future landfill levy increase)	Scenario 2 Universal weekly FOGO, fortnightly garbage	Scenario 3 Universal fortnightly FOGO, weekly garbage	Scenario 4 Universal weekly FOGO, weekly garbage.
Garbage collection costs	$ per year	$5,365,700	$5,365,700	$3,057,500	$5,365,700	$5,365,700
FOGO collection costs	$ per year	$1,837,100	$1,837,100	$4,446,200	$2,188,500	$4,196,000
Total collection costs	$ per year	$7,202,800	$7,202,800	$7,503,600	$7,554,300	$9,561,700
Garbage disposal costs	$ per year	$3,039,600	$4,806,900	$3,485,000	$4,482,900	$4,009,900
FOGO processing costs	$ per year	$1,180,900	$1,180,900	$2,292,300	$1,619,500	$1,955,900
Total processing costs	$ per year	$4,220,400	$5,987,800	$5,777,300	$6,102,400	$5,965,800
Additional community engagement costs	$ per year	$0	$0	$324,923	$288,820	$306,871
Total garbage costs	$ per year	$8,405,300	$10,172,600	$6,542,500	$9,848,600	$9,375,600
Total FOGO costs	$ per year	$3,018,000	$3,018,000	$6,738,500	$3,808,000	$6,151,900
Total garbage and FOGO costs	$ per year	$11,423,200	$13,190,600	$13,280,900	$13,656,700	$15,527,500
Net costs from baseline	$ per year	$0	$1,767,400	$1,857,700	$2,233,500	$4,104,300
% Increase from baseline	%	0%	15%	16%	20%	36%
Net cost increase per tonne diverted	$ per year	$0	$0	$213	$649	$624
Net cost increase per tonne recovered	$ per year	$0	$148	$94	$154	$223
Net cost increase from current baseline per all households	$ per household per year	$0	$24	$30	$35	$61
Net cost increase from future baseline with increased landfill levy (S1b) per all households	$ per household per year	$0	$0	$6	$10	$37

Figure 2 Cost per year of FOGO and garbage services under different scenarios



Environmental analysis

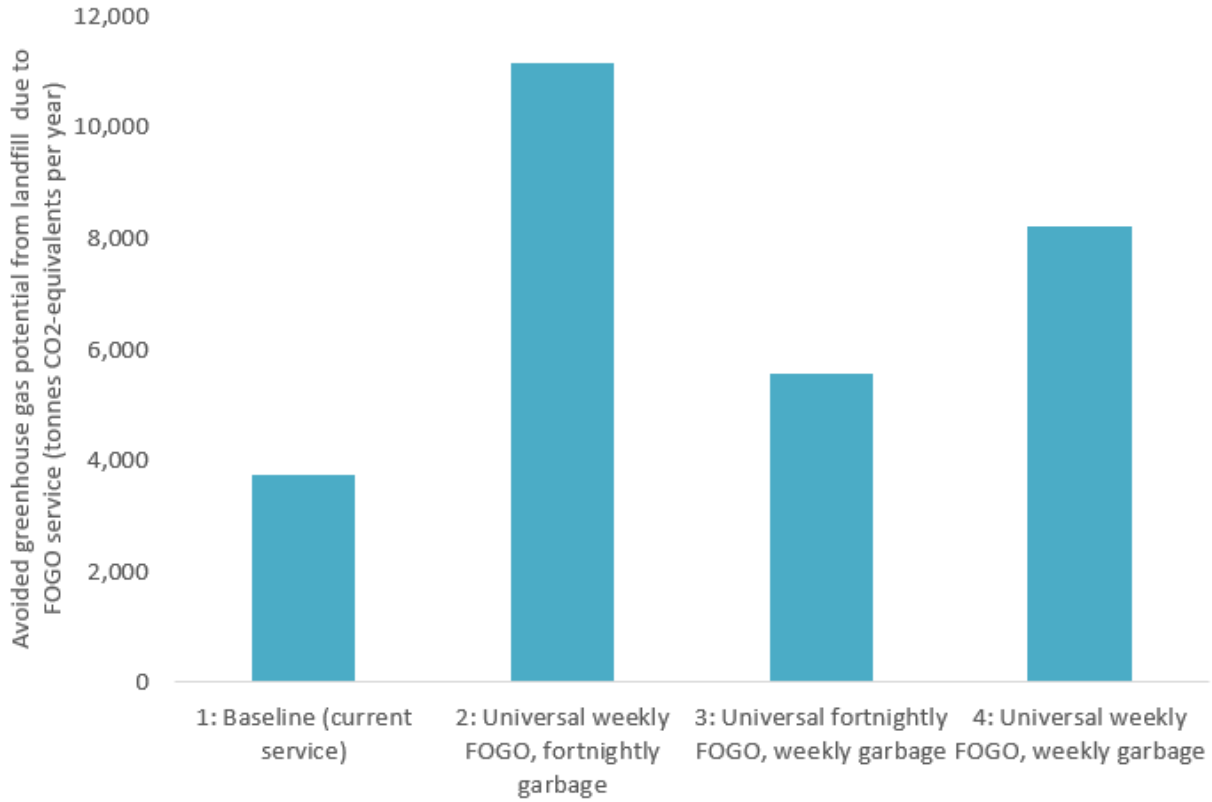
Table 4 and Figure 3 compare the expected diversion and recovery of organics and the greenhouse gas emissions from landfill that would be avoided by the different FOGO collection options.

Table 4 Avoided greenhouse gas (GHG) emissions under different scenarios

Parameter	Units	Scenario 1 Base case	Scenario 2 Universal weekly FOGO, fortnightly garbage	Scenario 3 Universal fortnightly FOGO, weekly garbage	Scenario 4 Universal weekly FOGO, weekly garbage.
Recovered and diverted garden organics	t/year	11,360	11,760	11,460	11,600
Diverted food organics	t/year	570	8,270	2,450	5,210
Total organics recovered and diverted	t/year	11,930	20,030	13,910	16,810
Avoided GHG emissions[1]	t CO_2-e/ year	3,720	11,150	5,540	8,200
Addition avoided GHG emissions from base case	t CO_2-e/ year	0	7,430	1,820	4,480

[1] Gas capture technology at MRL, Ravenhall Landfill is assumed to capture 50% of emissions from food and 80% of emissions from garden organics. This considers gas generated and emitted before gas capture systems are in place and the level of gas capture and fugitive emissions expected from such a best practice facility.

Figure 3 Avoided greenhouse gas emissions under different scenarios



These show that higher diversion achieved by a weekly FOGO and fortnightly garbage service option can be expected to significantly reduce greenhouse gas emissions from landfill. Abatement above the base case is expected to be in the order of 7,430 tonnes CO_2-e per year

Greenhouse gas emissions from composting associated with fuel and power use and fugitive emissions from compost piles have not been included. These emissions are small compared to the avoided emissions from landfill. Soil carbon and productivity improvement benefits of using compost products have also not been included in this assessment, but these can be significant.

3. Service cost modelling

The following section outlines the modelling and analysis carried out using an Excel model made available by the Victorian Department of Environment, Land, Water and Planning (DELWP). This includes the modelling of several scenarios that consider different potential future kerbside service systems compliant with the *Recycling Victoria* policy statement. The modelling is for the scenarios MCC is considering for FOGO and glass, including changes to collection frequencies for garbage, commingled recyclables and FOGO.

3.1 Baseline data

The DELWP model uses a range of state wide data and assumptions to consider the implementation costs of different service scenarios. The model allows the user to accept assumed default values for a number of variables, or to input overriding figures specific to each council.

The model establishes a 'base case' derived from Council's actual costs in 2019-20, and compares this with cost variances arising from different modelled scenarios. It considers the changes to total costs and the cost per household over the next 10 years (incorporating future costs such as increases to the landfill levy), allowing Council to compare the business case for each scenario in determining the optimum system to implement.

Key data on Council's kerbside waste and recycling services from 2019-20 are shown in Table 5.

Table 5 Baseline data

Parameter	Garbage	Recycling	FOGO
No. of serviced premises	72,205	72,205	48,727
No. of bins in service	68,730	68,000	44,371
Bin size(s)	80 L, 120 L, 240 L	120 L, 240 L	120 L, 240 L
Collection frequency	Weekly	Weekly	Fortnightly
Tonnes collected	29,456	15,784	11,928

Key assumptions applied in the models include:

- new kerbside services would be introduced in 2022-23[4] except for Scenario 7, where glass services are introduced in 2023-24 (post-CDS)
- kitchen caddies would be provided to all new households taking up the FOGO service, as well as 10% of existing FOGO service users
- FOGO education costs for FOGO of $5 per household per year
- glass services would involve a universal kerbside system
- glass education costs of $300,000 in the year before roll-out
- glass processing costs of $40 per tonne
- a fortnightly garbage service would result in 10% garbage diverted to commingled recycling.

It should be noted that the model amortises or annualises the costs of bins and caddies. The expected upfront costs of these items are shown in Table 6.

Table 6 Up front costs of bin replacement and supply for a weekly FOGO, fortnightly garbage, fortnightly commingled and month glass collection scenario.

Bin type	Upfront bin costs ($)[1]
Garbage	$6,521,300
Recycling	$6,964,000
FOGO	$2,037,500
Glass	$5,705,000
Caddies[1]	$201,300

[1] This is the cost in the first year. Additional bins will be required each year as population grows.
[2] Assuming all new organics services and 10% of existing service users are provided with caddies.

3.2 Modelled scenarios

Six scenarios have been modelled using DELWP's cost model, benchmarked against the base case. A description of key differences between these scenarios is shown in Table 7. The modelled outputs are shown in Table 8. It should be noted that the modelled tonnage figures for landfilled garbage and FOGO differ slightly

[4] New kerbside services are actually expected to be introduced in March 2022. However, as this is quite late in 2021-22, the year of implementation has been adjusted to 2022-23 in DELWP models.

from the modelling in Section 2 of this report because the DEWLP model calculates and average annual tonnage over ten years, whereas the Blue Environment FOGO model is based on current tonnages for garbage and organics. The models also have some different assumptions about participation and diversion rates, changes in per household waste generation and changes in future waste and recycling costs. The DELWP model also considers expected decreases garbage due to increased recycling due to a proposed container deposit system (which will see some eligible glass, plastic, carboard and aluminium drink containers diverted from garbage and current kerbside recycling) and improvements in recycling. Despite the slight difference in estimated tonnages, both the DELWP and Blue Environment models are suitable for the purposes of comparing the relative performance of service options.

A comparison of total annual costs under the different scenarios benchmarked against the base case is shown below in Figure 4. This shows that all scenarios result in a significant cost increase above the baseline. This is mainly due to the introduction of an additional glass collection system. The modelling suggests the lowest cost increases will result under scenarios with fortnightly garbage, weekly FOGO, fortnightly commingled recycling, and monthly glass collections. Introducing a glass only bin collection system after the CDS is introduced in 2023 will result in some cost savings compared to introducing it prior to 2023 under the modelled assumptions because glass and other recycling costs will be lower because less materials will be disposed to the kerbside recycling bins.

3.3 Estimated future services costs

The modelling allows comparison of different service options for the collection of commingled recyclables and glass. This suggests:

- Current cost of the weekly commingled service is $7.04 million per year, or about $97 per household receiving the service. This is projected to increase, and will average $121 per serviced household per year over the next ten years (i.e. the average annual costs over the ten years, not the figure at the end of the ten years).
- A weekly commingled recycling and monthly glass only service will slightly decrease the commingled service costs due to reduced MRF costs, but increase overall costs for the two services above the business as usual cost, recycling service only option by about $30 per serviced household per year.
- A fortnightly commingled recycling and monthly glass service will increase overall costs for the two services above the business as usual weekly recycling service only option cost by only around $2 per household per year. This is mainly because of reduced commingled collection costs.
- Cost for commingled recycling are expected to fall slightly with the introduction of the glass service and CDS which will reduce MRF processing costs.
- The glass only service is expected to recover about 840 tonnes of glass per year from commingled recycling and garbage after the introduction of the CDS. The cleaner glass stream will help more glass to go to glass container manufacture (from <35% recycling content now to 70% in the future). Environmental benefits of glass-to-glass recycling in reduced materials and energy consumption are significant compared to non-circular recycling of glass to sand or aggregate substitutes.
- Diversion of glass from commingled should also reduce glass contamination at MRFs, reducing MRF costs and increasing the potential market value of paper and plastics. This will have environmental benefits.

Table 7 Comparison of DELWP model scenarios

Scenario	Garbage		Recycling		FOGO		Glass	
	Collection frequency	Default bin size	Collection frequency	Default bin size	Collection frequency	Default bin size	Collection frequency	Default bin size
Base case: weekly garbage, weekly recycling, fortnightly FOGO	Weekly	80L	Weekly	120L	Fortnightly	120L	n/a	n/a
1: Fortnightly garbage, fortnightly recycling, weekly FOGO, monthly glass	Fortnightly	120L	Fortnightly	240L	Weekly	120L	Monthly	120L
2: Fortnightly garbage, weekly recycling, weekly FOGO, monthly glass	Fortnightly	120L	Weekly	120L	Weekly	120L	Monthly	120L
3: Weekly garbage, fortnightly recycling weekly FOGO, monthly glass	Weekly	80L	Fortnightly	240L	Weekly	120L	Monthly	120L
4: Fortnightly garbage, fortnightly recycling, weekly FOGO, fortnightly glass	Fortnightly	120L	Fortnightly	240L	Weekly	120L	Fortnightly	120L
5: Fortnightly garbage, fortnightly recycling, weekly FOGO, monthly glass (post-CDS)	Fortnightly	120L	Fortnightly	240L	Weekly	120L	Monthly	120L

Table 8 Key model outputs at the final year of transition under different scenarios

Scenario	Garbage landfilled (t/year)	Recycling collected (t/year)	FOGO collected (t/year)	Glass collected (t/year)	Change in service cost (% change from base case including landfill levy cost increases)
Base case: weekly garbage, weekly recycling, fortnightly FOGO	28,710	14,040	12,590	-	-
1: Fortnightly garbage, fortnightly recycling, weekly FOGO, monthly glass	24,920	14,820	20,250	2,170	10%
2: Fortnightly garbage, weekly recycling, weekly FOGO, monthly glass	24,920	14,820	20,250	2,170	21%
3: Weekly garbage, fortnightly recycling weekly FOGO, monthly glass	27,870	11,870	20,250	2,170	19%
4: Fortnightly garbage, fortnightly recycling, weekly FOGO, fortnightly glass	24,920	14,820	20,250	2,170	19%
5: Fortnightly garbage, fortnightly recycling, weekly FOGO, monthly glass (post-CDS)[1]	24,260	14,820	21,140	2,170	9%

[1]*Unlike other scenarios, the outputs for Scenario 5 are shown for 2023-24 (post-CDS)*

Figure 4 Total cost under different scenarios

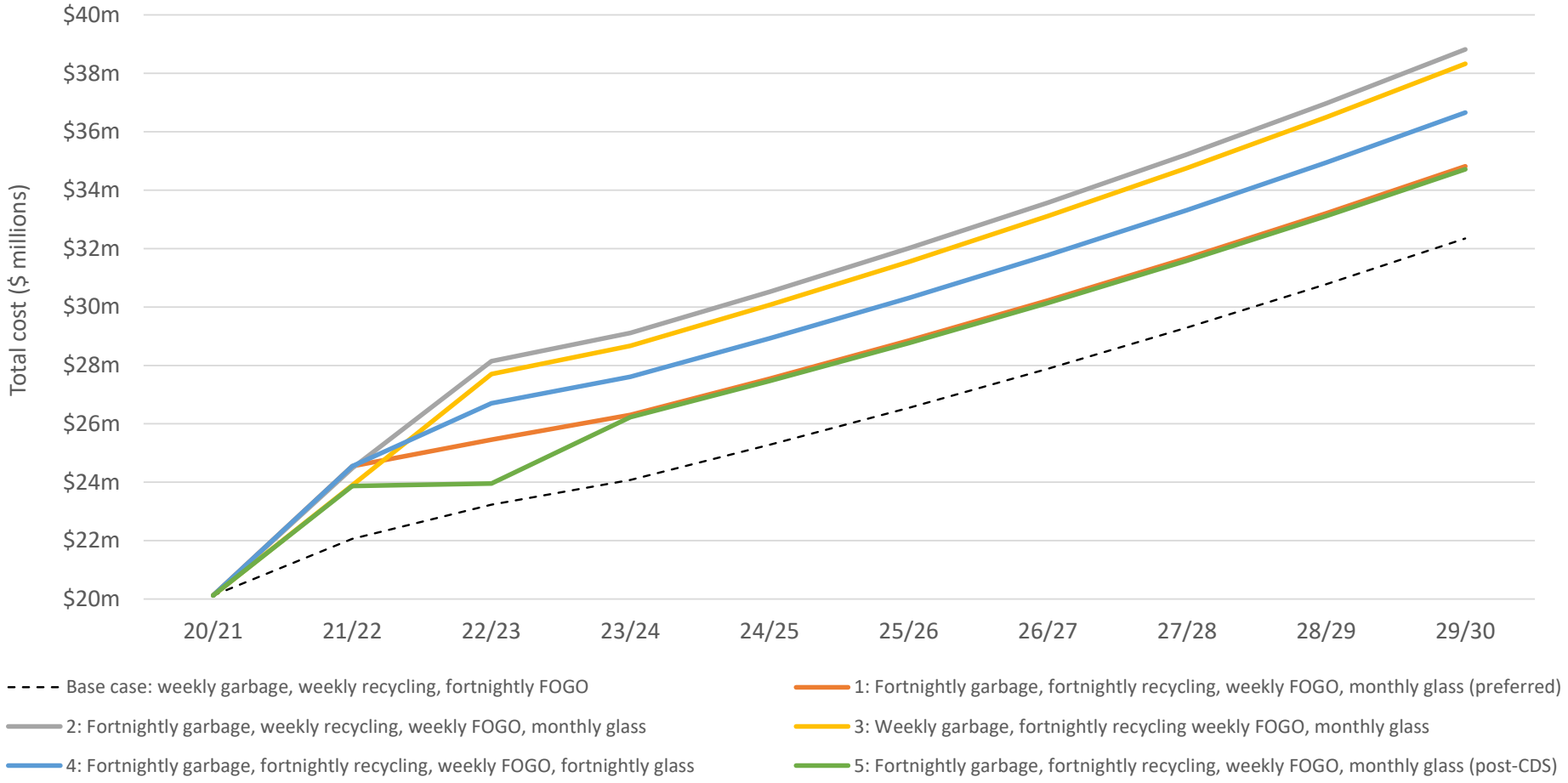


Table 9 summarises the estimated differences in future kerbside recycling costs compared to current costs including projected cost increases. This suggests a fortnightly commingled service and monthly glass collection would only increase service costs by less than $2 per year compared to the current weekly commingled service.

Table 9 Comparison of the estimated costs of commingled and glass recycling collection service option

Service	Weekly recycling	Weekly recycling, monthly glass	Fortnightly recycling, monthly glass
Commingled collection service costs per household per year	$97 now (including glass) $121 in future (including glass)	$97 now (including glass) $115 in future (excluding glass)	$97 now (including glass) $86 in future (excluding glass)
Glass service costs per household per year	-	$36	$36
Total costs per household per year over 10 years	$121	$151	$122
Cost increase on base case $/household/year	-	$30	<$2

3.4 Glass recycling service sensitivity analysis

Blue Environment conducted a sensitivity analysis to address the uncertainty of future glass markets. The analysis used Council's preferred, best practice option (Scenario 1: Fortnightly garbage, fortnightly recycling, weekly FOGO, monthly glass) as a baseline. Several iterations of this scenario were run using different cost assumptions for glass values and processing costs. Table 10 shows the different scenarios considered in the analysis. Figure 5 shows the differences in total kerbside service costs under different glass price scenarios. This suggests different glass values/processing costs have a relatively minor effect on total costs due to the low tonnes of glass collected (i.e. averaging around 2,000 tonne/year).

Table 10 Glass sensitivity analysis results (2022-23)

Scenario	Glass value or cost ($/t)[1]
1: Base case glass costs	-$40
1Ga: High glass value (best outcome)	$30
1Gb: Neutral glass cost	$0
1Gc: High glass cost (worst outcome)	-$50

[1]*Costs are denoted as negative values*

Figure 5 Glass sensitivity analysis – total cost under different scenarios

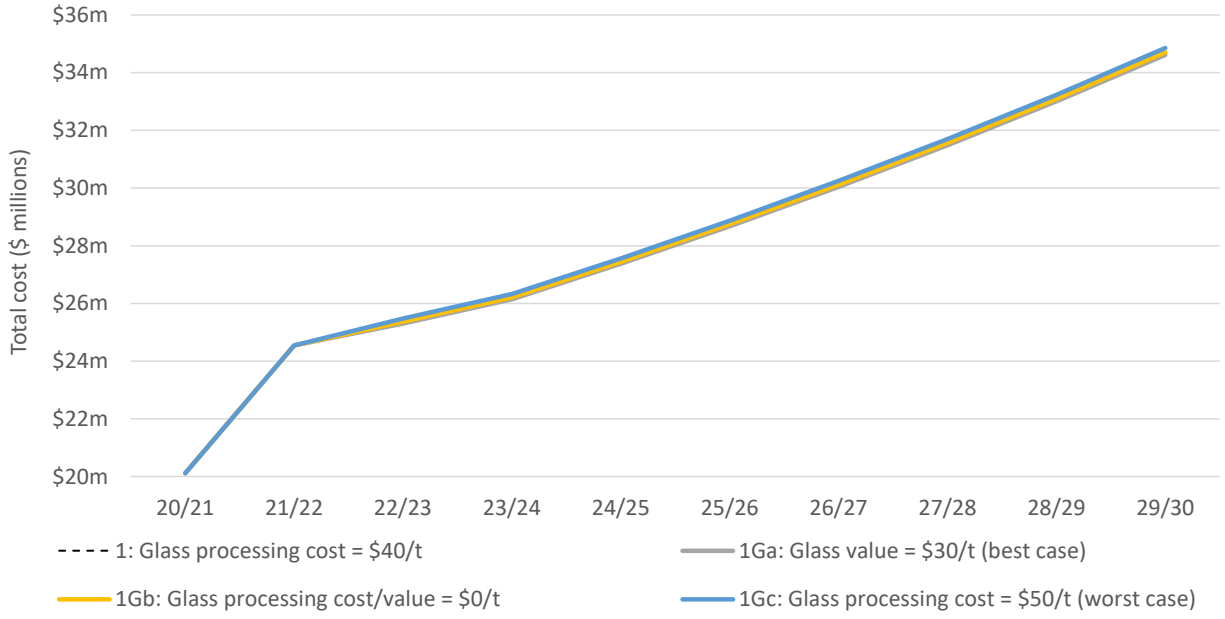


Figure 6 Glass sensitivity analysis – total glass service cost under different scenarios

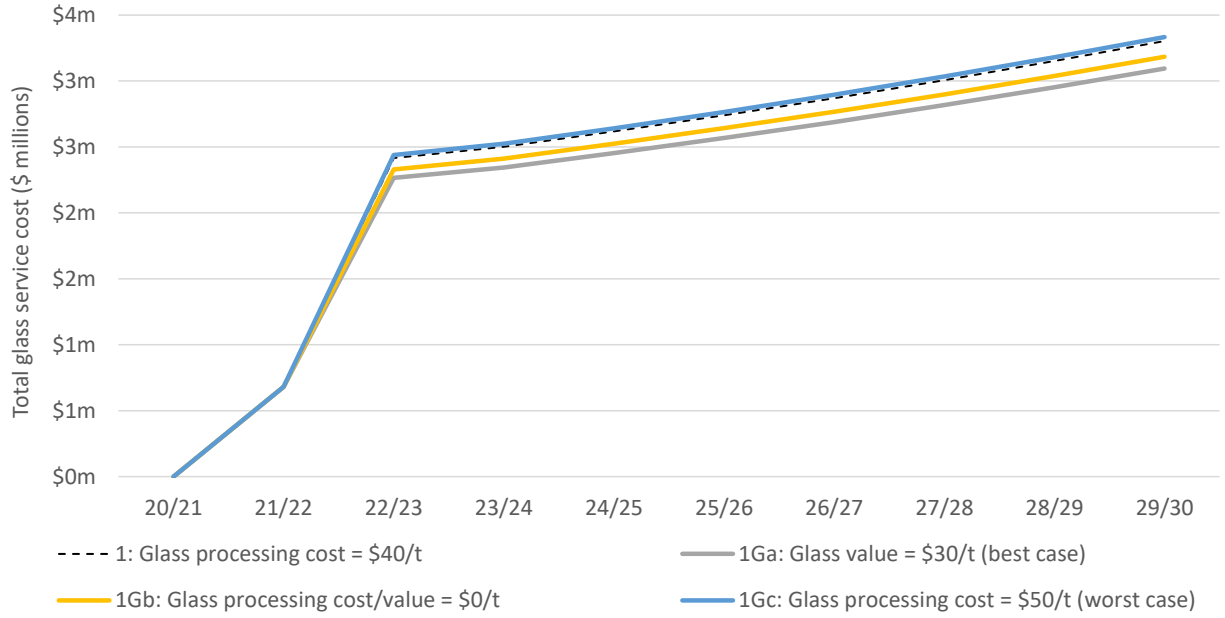


Figure 7 Glass sensitivity analysis – change in total glass service cost compared to Scenario 1

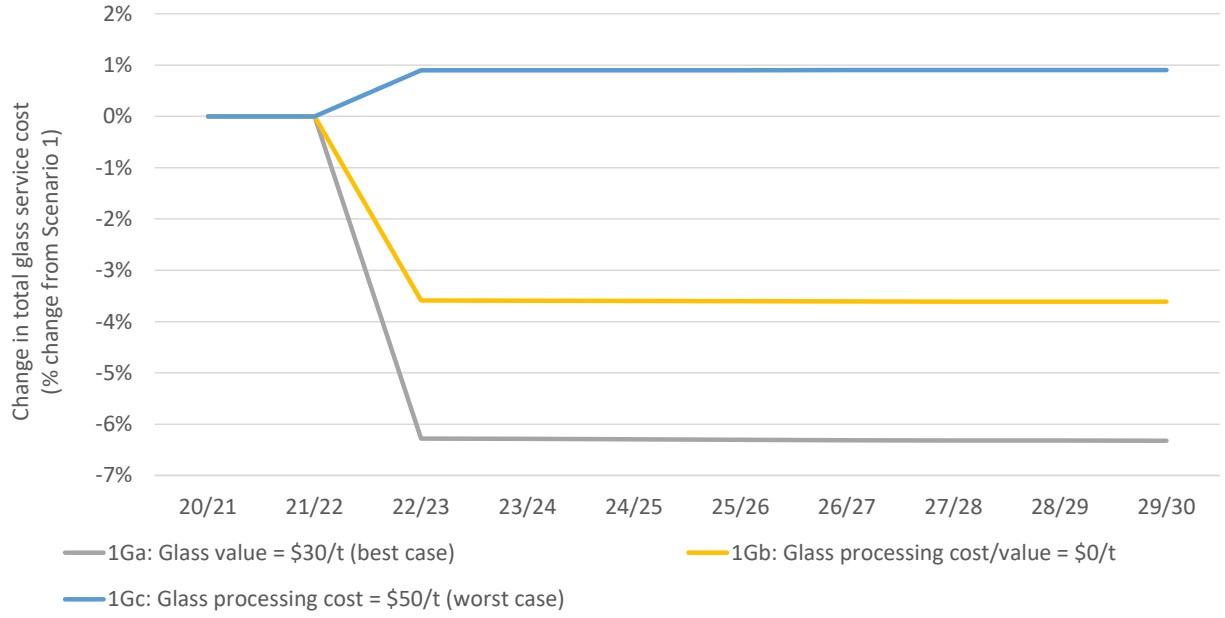


Figure 6 and Figure 7 suggest:

- different glass values/processing costs have a considerable effect on glass service costs, but this is minor compared to total kerbside service costs
- the best case scenario (for glass valued at $30/t) would reduce the glass service cost per bin by over 6%.

A fortnightly garbage service and dedicated glass bin are likely to change the behaviours of households that are not currently recycling well. This will likely result in greater diversion of recyclables, including glass, from garbage to the kerbside commingled and glass recycling bins. This will reduce tonnages sent to landfill but increase recycling costs.

3.5 MRF gate fee sensitivity analysis

MRF gate fees may change after the introduction of source separated glass services. It is understood that some MRFs may charge a lower gate fee to process commingled recycling with glass removed – however, the actuality and extent to which this occurs will not be made apparent until glass services and CDS are in place. Blue Environment developed scenarios using different MRF cost assumptions to test this uncertainty. The analysis used the 'best practice'/best performing option (Scenario 1: Fortnightly garbage, fortnightly recycling, weekly FOGO, monthly glass) as a comparative baseline.

Table 11 MRF gate fee sensitivity analysis results

Scenario	Glass introduced (year)	MRF gate fee ($/t)
1: Base case MRF costs	2022-23	$98
1Ma: High MRF gate fee (without glass removed)	Never	$190
1Mb: Low MRF gate fee (with glass removed)	2022-23	$90

Figure 8 MRF gate fee sensitivity analysis – total cost under different scenarios

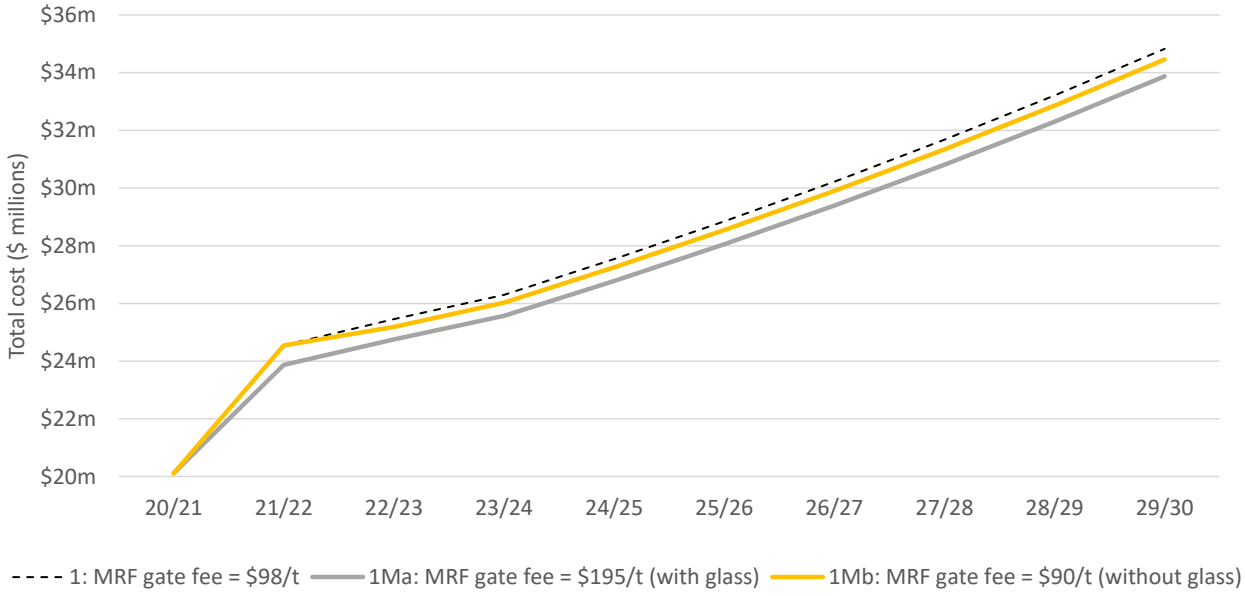


Figure 9 MRF gate fee sensitivity analysis – change in cost per serviced premises compared to Scenario 1

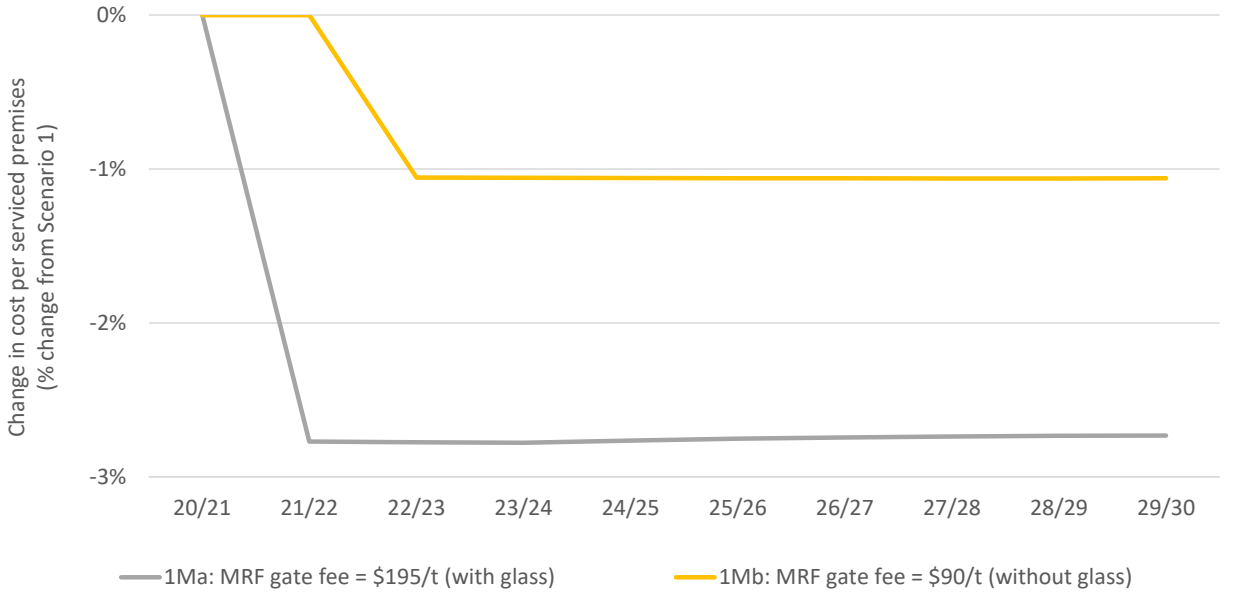


Figure 8 and Figure 9 suggest even at a much higher MRF gate fee, Scenario 1Ma is cheaper than Scenario 1 due to no glass services being provided. This is not compliant with *Recycling Victoria* objectives.

3.6 Uncertainties about future glass management and costs

At the time of writing, there is a degree of market uncertainty for glass recovery options in metropolitan Melbourne and Victoria. This is mainly due to:

- The Victorian state government's *Recycling Victoria – A new economy* policy indicates that a Victorian container deposit system (CDS) will be in place by 2023, and from 2021 councils will be supported to introduce 'fourth bin' glass-only kerbside collection services. The *Recycling Victoria* policy statement requires *that all households will have a glass bin or access to a service by 2027.*

This means councils can provide alternative recovery systems to a dedicated kerbside bin recycling service, such as community drop points for glass that could be associated with CDS. The CDS and more councils providing source separated glass services will result in large volumes of relatively clean cullet coming onto the market. At present, clean source separated cullet can have a market value of $30-70/tonne, but when more product is available through CDS and council collections, the market value may fall due to increased supply and lack of effective competition for cullet.

- The proposed CDS will likely allow materials recovery facility (MRF) operators to claim a refund for a portion of glass recovered and sent to markets. This may reduce the gate fees they are currently charging for commingled recyclables containing glass. In NSW, MRF operators can claim a CDS refund for a portion of glass and other eligible packaging. This increases the value of recyclables and glass in the recycling stream, and MRF operators may bid more competitively for commingled recyclables containing glass once the CDS is introduced if they able to claim a CDS refund. They are also more likely to invest in materials sorting equipment to be able to more efficiently manage glass. Glass also adds weight to commingled recyclables, and where MRF operators charge on a per tonne rate, the weight of glass may be valuable to them.
- The main glass-to-glass packaging remanufacturer in Victoria, VISY Industries at Spotswood have a stated intent to increase the recycled content of glass packaging made at Spotswood from under 35-40% by weight to up to 70%. This will increase market demand, but this may not increase market prices paid by VISY because of increased supply of clean cullet via CDS and council 'fourth bin' glass collection services and limited competition for this material.
- Other players, such as Alex Frasers, Australian Paper and Polytrade, are expressing interest in investing in glass recovery and reprocessing infrastructure for glass that is not accepted by VISY or other glass packaging manufacturers, and may seek to bid for receival of kerbside collected glass.
- Federal and state government and packaging industry objectives are to restrict the export of lower value recyclables, increase domestic remanufacture and market development, increase the recycled content of new packaging, and ensure that all packaging is either commercially recyclable or compostable by 2025. Export restrictions on glass are to be finalised, but it is understood beneficiated and clean, un-beneficiated cullet meeting contamination thresholds will be allowed to be exported provided it is verified that a glass recycling facility would receive the material. This will particularly be the case if the glass is part of a supply chain importing product into Australia.
- Investment in alternative glass processing infrastructure and market development to produce and create demand for crushed glass to be used.

These impact on how glass is and will be managed across Victoria, and the nature of the glass recycling stream. The effect on market prices is uncertain, but both the CDS and glass-only collection systems will require infrastructure upgrades and investment in glass beneficiation and processing infrastructure.

Council should also consider what commingled recycling contamination rates will be if 'heavier' glass is diverted from commingled recyclables, and any glass remaining in the commingled stream is counted as contamination. Other councils that have introduced glass only collection services have found that the contamination rate in commingled recyclables is higher, and higher penalties could be charged by MRF operators. It is possible that a contamination rate of 10-15% in commingled with glass could increase to more than 20% by weight after introduction of the CDS. Despite this, these councils have found that the reduction in the weight of commingled has significantly reduced total MRF costs.

Blue Environment suggests that it may be prudent to wait until to see how the CDS, infrastructure investment, and market development impact on the viability and necessity of a glass only recovery service. It is suggested composition audits should be conducted for commingled recyclables after the introduction of a CDS to determine the likely costs and benefits of moving to a fourth bin glass only service. This implies deferring a decision to introduce a glass only service until after 2023/24.

4. Conclusions and recommendations

Key findings of this study are:

1. The costs of kerbside services are expected to increase due to legislated increases in the EPA landfill levy, which is increasing by $60 per tonne over the next three years. Without any change in services, this would increase per household costs by $24 per year. It will be important to communicate this to the community so they do not conflate increases costs with the change in kerbside services and to promote the message that higher food diversion will reduce costs.
2. Introduction of an expanded universal weekly FOGO with fortnightly garbage service is expected to result in the greatest diversion and least cost increase of the FOGO scenarios considered. It is estimated to increase the combined organics and garbage service costs by only $6 per household per year above expected cost increase in current costs. Waste to landfill and resulting greenhouse gas emissions from landfill will be reduced by 25-30%. Costs could be lower if more food is diverted than modelled, but conversely, costs will be higher if less food is diverted.
3. A fortnightly FOGO and weekly garbage service is expected to have higher cost increases ($10 per household per year) above expected baseline cost increases, but would only reduce landfilled waste by around 7%.
4. A weekly FOGO and weekly garbage service would be less effective in diverting organics than the weekly FOGO/fortnightly garbage service option (reducing waste to landfill by 17%), but would increase service costs by $37 per household per year above the expected cost increases in current management.
5. Promotion of food waste reduction and well managed home composts should be part of the community engagement program as this will further reduce FOGO service costs.
6. Introduction of a monthly glass only collection service is expected to have relatively minor cost impacts on future service costs, but this is dependent on the cost of managing collected glass. Replacement of the currently weekly commingled recycling service with a fortnightly commingled recycling service excluding glass and a monthly glass collection service is expected to increase per household annual recycling costs by less than $2 per household per year. Maintaining a weekly commingled service plus a monthly glass recycling service will increase annual per household costs by around $30 per household per year.
7. If MCC can receive payment for collected glass, the cost increases will be reduced, but it is considered more likely that processing costs for glass will be between $0-40/tonne.
8. A weekly FOGO, fortnightly garbage, fortnightly commingled recycling and monthly glass collection service is expected to increase service costs by around 10%. A fortnightly FOGO, weekly garbage, fortnightly commingled and monthly glass service will have slightly lower net cost, but will not be as effective in diverting waste from landfill.
9. Although the MRL, Ravenhall landfill achieves high levels of gas capture, it does not capture all gas and a significant portion of emissions from rapidly decomposing food will be lost to the atmosphere before gas collection systems are fully in place. Diversion of food would also reduce risks associated with leachate generation, odour and vermin associated with landfilling.
10. There is uncertainty about how a proposed container deposit system and investments in recycling infrastructure will impact on glass and other recycling markets and future pricing of material recovery facility services. It is possible that the CDS and investments in infrastructure and market development will make MRF pricing more competitive for commingled recyclables containing glass, which would reduce the economic viability of separate glass only collection services. A separate glass collection could see more glass returned to glass container recycling and reduced glass contamination of other recyclables. It is suggested that MCC wait until after 2023/24 to introduce a glass only collection service.