

Ref: TW23023
Rev: 2.0

604 Newcastle St
Leederville WA 6007
PO Box 454
Leederville WA 6903
enquiries@talisconsultants.com.au
www.talisconsultants.com.au
1300 251 070

Memorandum

Kerbside Organics Assessment

City of Greater Geraldton

To:	Michael Dufour	City of Greater Geraldton
CC:	Jess Felix	City of Greater Geraldton
From:	Ronan Cullen	Talis Consultants Pty Ltd
	Michelle Matsen	Talis Consultants Pty Td
Date:	11 July 2023	

1 Background

Talis Consultants Pty Ltd (Talis) was engaged by the City of Greater Geraldton (the City) to undertake a desktop review of the current Food Organics and Garden Organics (FOGO) two-bin system trial and provide analysis of the findings and its implications for a full roll-out within the City.

Talis previously assisted the City with the FOGO Recycling Program Preliminary Feasibility Assessment (preliminary FOGO Assessment), which included the financial modelling used to support the FOGO trials and guide the service introduction. As part of this review, Talis was engaged to update the previous financial modelling works, based on information collected during the FOGO trial and industry developments, to introduce a full roll-out across the City to all residential properties.

1.1 FOGO Trial Review

The FOGO trial commenced in 2020 and was rolled out over a 12-month period to 530 residential households and 11 commercial properties (of which only three commercial properties actively participated). In May 2022, the City resolved to extend the trial until June 2023. The following section details the key data and learnings collected during the FOGO trial that were highlighted in the Ordinary Meeting of Council Minutes, May 2022 Report (Council Report 2022).

The trial was initiated so that the City could better understand the impacts of introducing a FOGO collection system to its community. However due to a range of different factors including the distance of the City from the Perth metropolitan area, the impacts of COVID-19 and the lack of economies of scale with the size of the trial, the City encountered the following major issues that were discussed in detail in the Council Report 2022:

- Low bin presentation rates – participants not using the FOGO bin;
- High contamination rates – participants placing incorrect materials in the FOGO bin;

- Development of a successful composting system in the City – due to high contamination levels and limited knowledge of the niche requirements with FOGO composting;
- Recruitment difficulties – finding an Education Officer; and
- Increasing costs – due to additional decontamination measures and transport requirements to process FOGO near the Perth metropolitan area.

The trial was planned for expansion to additional properties. However, due to the above-mentioned difficulties, the expanded trial was not pursued. Instead, the City is now considering whether a direct roll-out of FOGO bins to all properties would be more feasible.

On a positive note, the City did experience some benefits of running the FOGO trial, which included:

- Improved data collection and reporting;
- A greater understanding of community behaviour, including:
 - The participation rates;
 - The level and importance of waste education required;
 - The need to retain weekly general waste collections;
 - On-going requirement for provision of compostable liners;
- Resourcing requirements to better manage the FOGO operations;
- Requirements for improvement to the collection contact;
- Requirements for improvement to the processing contract; and
- The opportunity to test the community’s acceptance of a FOGO system.

The trial provided useful data on the participation rates and volumes as summarised in Table 1-1:

Table 1-1: FOGO Trial Participants

	Participants	Active Participants	FOGO Bin Presentation Rate	Non-contaminated annual tonnes
Domestic Properties	530	503	58%	178.47
Commercial Properties	11	3	27%	1.74

Due to limited compositional audit data, the participation rates along with the collected FOGO tonnage data was used by Talis in the modelling. This is discussed in further detail in Section 3.2.5.

1.1.1 FOGO Processing

Material recovery in a FOGO system is achieved through beneficial use of FOGO derived compost. The contamination issues faced during the trial resulted in a poor compost product that could not be used beneficially. The contamination levels also meant additional costs for decontamination of the materials before transporting them to the Go Organics facility in Gingin, a one-way distance of 370 kms.

While the costs of transporting FOGO to Go Organics has been retained in the full roll-out model, it is anticipated that due to consolidation of the larger volumes, some of the costs would reduce. It is also

anticipated that the City would be able to negotiate a lower rate for decontamination of the FOGO materials. This is partly because with increased education across the City, more residents would be better equipped to correctly participate, thus reducing the contaminations levels.

It is also anticipated that higher consistent volumes of FOGO could help stimulate the local market for processing of FOGO and other organic materials within the City’s geographical boundary.

1.1.2 Infrastructure Improvements

The model includes capital costs for the expansion of the concrete pad that would be used to store FOGO for initial screening and/or processing. The City could also invest in mechanical equipment to assist with screening of some of the FOGO material to remove contamination. The capital expenditure including formal approvals have been modelled in the Year preceding the FOGO roll-out.

1.1.3 The GO Option

Given the difficulties experienced by the City with the FOGO trial, including local processing as well as having regard for the City’s existing successful drop-off green waste processing operations, it was determined to also model a two-bin GO option to compare the expected resource recovery and costs with the current one-bin system and the two-bin FOGO system.


2 Options Conceptualisation

It is best practice across Australia, when a FOGO Recycling Program is implemented, for FOGO to be collected weekly and general waste to be collected fortnightly, due to the majority of putrescible waste being diverted from the general waste bin.

The FOGO trial commenced with a fortnightly general waste collection frequency; however, the City chose to transition to a weekly collection frequency for both FOGO and general waste following complaints from the community and insufficient bin capacities, and to also improve participation rates and reduce contamination. For the purpose of the model, weekly collections of general waste for all systems were applied. The City could consider changing to a fortnightly general waste collection frequency at a later stage for the FOGO collection system, in conjunction with increased community education and engagement initiatives to promote the correct use of the service. This has been included in the Sensitivity Modelling in section 5.2.

The three kerbside service options included in this assessment, that were modelled over a 10-year period, have been provided in Table 2-1 below.

Table 2-1: Options Overview

Option #	Description	Bin Configuration	Organics	General Waste
1	One-bin		NA	240L red lid bin Emptied weekly

2	Two-bin GO		240L lime-green lid bin Emptied fortnightly Processed at Meru Waste Disposal Facility (WDF)	240L red lid bin Emptied weekly
3	Two-bin FOGO		240L lime-green lid bin Emptied <u>weekly</u> Initial processing at Meru WDF Processed at Organics Recycling Facility (ORF)	240L red lid bin Emptied weekly

3 Waste Tonnages and Compositional Analysis

To undertake the financial modelling, the future waste tonnages for the City over a 10-year period needed to be estimated. The following section outlines the kerbside waste composition, population growth rates, waste tonnages and key waste data assumptions used.

3.1 Kerbside Waste Tonnages

The City's kerbside waste tonnages supplied by the City was determined from the weighbridge records. The data is summarised in Table 3-1.

Table 3-1: Kerbside Waste Tonnages

Waste Stream	2020-21	2021-22
FOGO	178	182
FOGO Contamination	49	15
General Waste	14,198	14,526
Total Kerbside Waste	14,426	14,723

For the Kerbside Organics Assessment, the City's total kerbside tonnages comprised of the FOGO tonnages during the trials and the general waste tonnages.

3.2 Waste Projections

3.2.1 Population and Waste Generation Growth

Talis looked at a range of datasets for both the population and growth rates for the City. The City's growth plan listed two population scenarios for 2036, a base case population of 56,103 and a target population of 65,246. A growth rate was calculated for each scenario utilising the latest available population for the City from the Australian Bureau of Statistics (ABS). An average annual growth rate of 2.27% was calculated based on the two growth rate scenarios and has been utilised to project the increase in waste over the 10-year period modelled.

The population and growth rate data have been provided in Table 3-2 below.

Table 3-2: CGG Population and Growth Rate

Year	2016 (ABS)	'Base Case' 2036	2016 (ABS)	'Target' 2036
Population	38,634	56,103	38,634	65,246
Growth Rate	1.88%		2.65%	
Average Growth rate	2.27%			

3.2.2 Kerbside Commercial Waste Quantities

The City's recorded waste tonnages do not distinguish between domestic and commercial waste as they are collected in the same trucks. The tonnages of commercial waste were estimated based on the preliminary FOGO assessment undertaken for the City which had an average weight of 30kg per commercial bin. The commercial waste services and estimated tonnages are summarised in Table 3-3 below.

Table 3-3: Kerbside Commercial General Waste Services and Estimated Tonnages 2022-23

	Number of Businesses	Number of Services (per week)	Average weight of commercial bin (kg)	Tonnes of commercial waste per annum
Commercial Services	893	1,541	30	2,404

3.2.3 Green Waste Tonnages

An additional source of organic materials included in the Kerbside Organics Assessment is the green waste that is dropped off by the community directly at the Meru WDF. Volumetric data provided by the City was utilised to estimate the average annual tonnes of green waste dropped off. Applying standard conversion factors from the City's 2018-19 Census Report it is estimated that on average 1,938 tonnes of domestic green waste drop off estimated to be generated per annum. It is not anticipated that the tonnages of green waste generated would increase over the 10-year period. Therefore, no growth in green waste drop-off was modelled. These tonnages have therefore not been adjusted in accordance with population growth.

3.2.4 Domestic Kerbside and Green Waste Quantities

Table 3-4 shows the projected baseline domestic general waste and green waste tonnages from 2022-23 to 2024-25, adjusted in accordance with population growth.

Table 3-4: Estimated Baseline Tonnages

Waste Stream	Year 0	Year 1	Year 2
	2022-23	2023-24	2024-25
Total Kerbside General Waste	15,057	15,399	15,748
Kerbside Commercial General Waste	2,404	2,459	2,514
Kerbside Domestic General Waste	12,653	12,940	13,234
Domestic Green Waste	1,938	1,938	1,938

3.2.5 Kerbside Domestic Waste Composition

The composition of FO and GO in the kerbside domestic general waste stream was based on the FOGO trial participation rates, average FOGO tonnages and general waste tonnages in Table 3-1, and the proportion of organics (GO and FO) in the general waste stream from the preliminary FOGO Assessment. The composition data indicates that on average 17% of the City’s kerbside waste is GO, 25% is FO and 58% is general waste, as shown in Figure 3-1 below. Therefore, FOGO presents 42% of all kerbside waste.

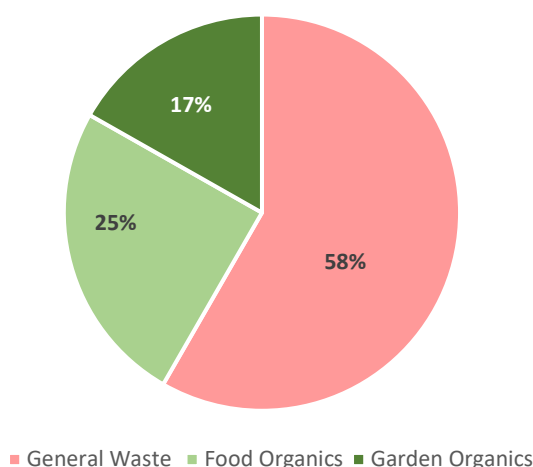


Figure 3-1: Domestic Kerbside General Waste Composition

Based on the organics composition (Figure 3-1), it is estimated that in 2024-25 (Year 2) there will be 2,222 tonnes of GO material and 3,295 tonnes of FO material available in the general waste stream (Table 3-5).

Table 3-5: Estimated Kerbside Domestic Organic Tonnages Available 2024-25 (Year 2)

Waste Stream	Estimated Domestic Kerbside Organics Tonnages (tpa)
GO Tonnages	2,222
FO Tonnages	3,295

3.2.6 Organics Capture Rates

It is impractical to assume that all organic waste generated by a community can be captured in a organics collection system. A capture rate is the measure of how much of the available material, in this case the FO and/or GO material in the general waste stream, that is assumed to be collected when a two-bin organics system is implemented. It is also anticipated that a proportion of the organic material captured in the new GO and FOGO two-bin system will consist of domestic green waste currently deposited by residents directly at Meru WDF. The average capture rates applied to the available organics tonnages, are shown in Table 3-6 below.

Table 3-6: Estimated Organics Capture Rates

Waste Stream	Capture Rates	
	GO Bin	FOGO Bin
FO from general waste bin	0	0.75
GO from general waste bin	0.80	0.80

GO from green waste drop off *	0.15	0.15
--------------------------------	------	------

* Domestic green waste drop-off tonnages expected to move to GO or FOGO bin.

3.2.7 Captured Organics Feedstock

The estimated organic tonnages captured in the two-bin GO and FOGO systems are based on the proportion of GO (17%) and FOGO (42%) available in the kerbside domestic general waste stream, with a capture rate of 0.80 for GO material and 0.75 for FO material applied. These are then applied to the waste projections based on the population growth rate.

As outlined previously, it is anticipated that a proportion of the organic material captured in the organic two-bin systems will consist of domestic green waste currently deposited by residents directly at Meru WDF. A capture rate of 0.15 has been applied to the domestic green waste tonnages and therefore increase the total amount of organic material collected in the kerbside system.

The estimated organic tonnages captured in the two-bin GO and FOGO systems in 2024-25 are shown in Table 3-7 below.

Table 3-7: Kerbside Two-bin System Quantities Captured in 2024-25 (Year 2)

Option	Waste Stream	Year 2
		2024-25
Option 2 – Two-bin GO System	Domestic general waste	11,456
	Community green waste	1,647
	GO	2,069
	Total	15,172
Option 3 – Two-bin FOGO System	Domestic general waste	8,985
	Community green waste	1,647
	FOGO	4,540
	Total	15,172

In 2024-25, it is estimated that there will be 2,069 tonnes of GO material captured, consisting of 1,778 tonnes of GO material from the general waste stream and 291 tonnes of domestic green waste currently deposited at Meru WDF.

An estimated 4,540 tonnes of FOGO material will be captured in the FOGO two-bin system, consisting of 291 tonnes of domestic green waste and 4,249 tonnes of FOGO material from the general waste stream. It is anticipated that larger items not suitable for composting will also be captured in a FOGO collection system. A capture rate of 0.20 has been applied to the collected FOGO tonnages following the initial screening of material prior to further processing, resulting in 908 tonnes of FOGO material being diverted to the community green waste stream.

3.2.8 One-bin Waste Projections

Figure 3-2 shows the projected volume of material available in a one-bin general waste system. It is anticipated that by 2032-33, there will be 17,774 tonnes of waste generated in total. This would consist of 15,835 tonnes of kerbside general waste and 1,938 tonnes of domestic green waste dropped off at the Meru WDF.

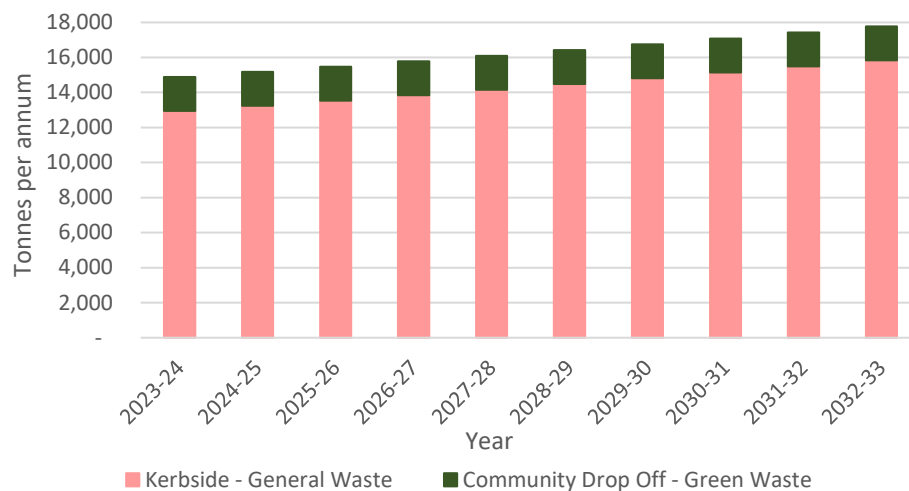


Figure 3-2: One-bin System Waste Projections

3.2.9 Two-bin GO Waste Projections

Figure 3-3 shows the projected volume of material available in a two-bin GO system. It is anticipated that by 2032-33, there will be 17,774 tonnes of waste generated in total. This would consist of 13,708 tonnes of kerbside general waste, 2,418 tonnes of GO and 1,647 tonnes of domestic green waste dropped off at the Meru WDF.

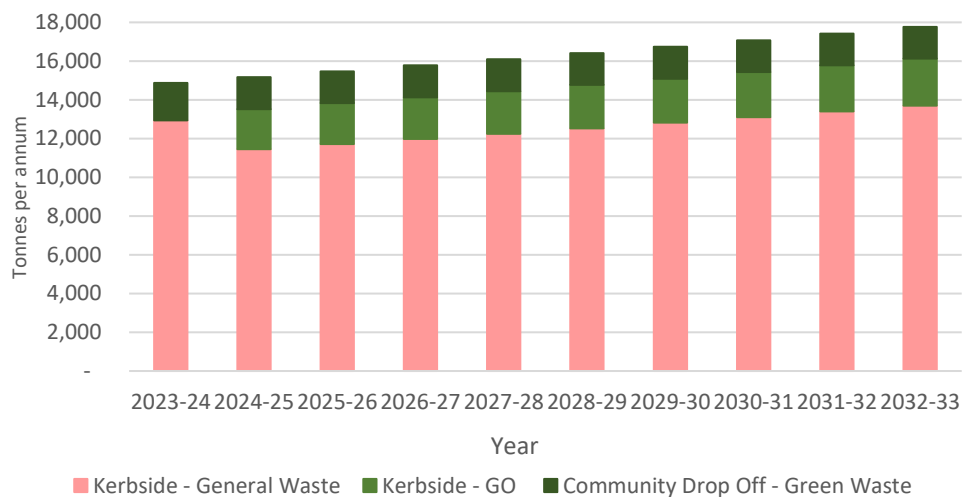


Figure 3-3: Two Bin GO System Waste Projections

3.2.10 Two-bin FOGO Waste Projections

Figure 3-4 shows the projected amount of material available in a two-bin FOGO system. It is anticipated that by 2032-33, there will be 17,774 tonnes in total generation. This would consist of 10,751 tonnes of kerbside general waste, and 5,375 tonnes of FOGO and 1,647 tonnes of domestic green waste dropped off at the Meru WDF.

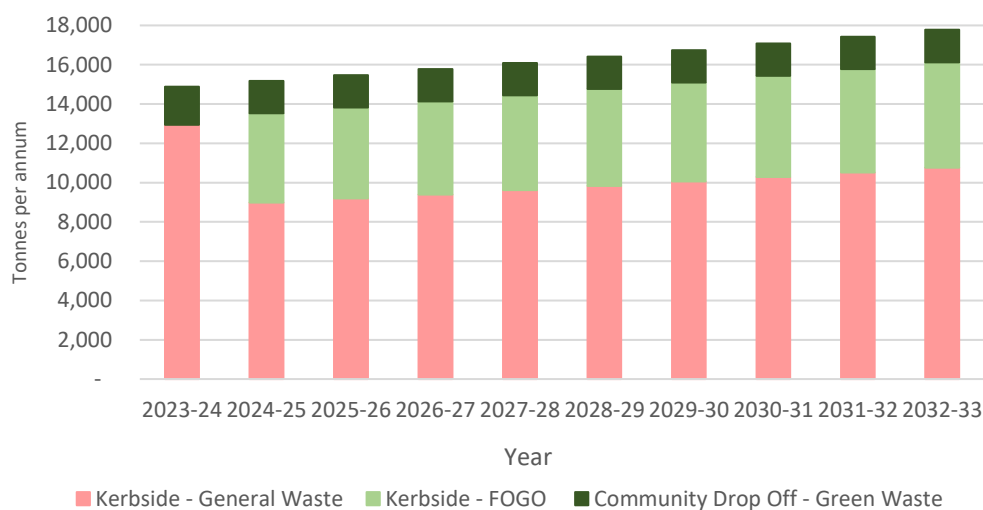


Figure 3-4: Two-bin FOGO System Waste Projections

4 Recovery Modelling

This section outlines the assumptions and values used to undertake the modelling and presents the expected recovery rates resulting from the different bin systems for the City. Table 4-1 shows the key inputs used in the modelling that are specific to the City.

Table 4-1: Recovery Model Key Inputs

Key Input	Value Used	Source
GO recovery rate	96%	Waste Service Census for State-wide Region 2018-19
FOGO recovery rate	85%	Based on the City of Greater Geraldton FOGO Trial
Green Waste recovery rate	100%	City of Greater Geraldton

The recovery modelling only relates to the recovery of kerbside collected streams and domestic green waste drop-off and does not take into consideration other waste streams such as domestic drop off tonnages (i.e., recyclables, e-waste, and bulk hard waste) or commercial waste.

4.1 Key Findings

Figure 4-1 presents the recovery rates for each option, including the contribution of each kerbside waste stream and green waste dropped by the community at the Meru WDF.

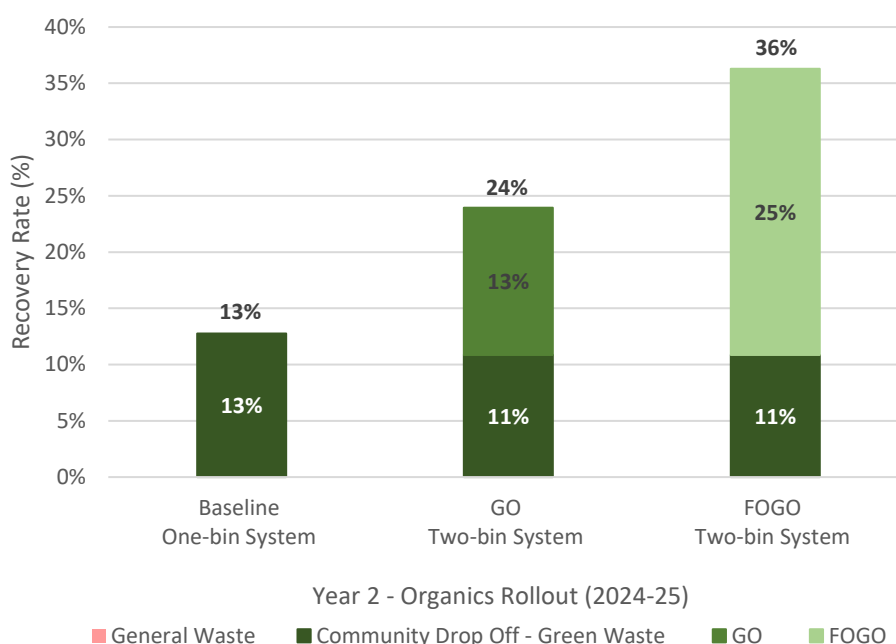


Figure 4-1: Year 2 (2024-25) – Two-bin System Rollout Recovery Rate

The results suggest that a two-bin FOGO system sending general waste to landfill and processing kerbside FOGO and domestic green waste has the highest contribution towards the City’s overall recovery rate at 36% in Year 2, with 11% and 25% recovered from the domestic green waste and FOGO two-bin system, respectively. A one-bin system results in the lowest contribution towards the City’s overall recovery rate, at 13%, with recovery of domestic green waste tonnages only.

A two-bin GO system sending general waste to landfill and processing kerbside GO and domestic green waste improves the City’s overall recovery rate to 24%. This comprises of 11% domestic green waste processing and 13% from the two-bin GO system. This is an overall 11% increase when compared to the one-bin system.

5 Financial Modelling

This section details the key assumptions and values used to undertake the financial modelling and presents the cost implications of adopting the different bin systems. A full list of assumptions used in the financial modelling has been provided in APPENDIX A.

The financials for the kerbside collection systems were analysed using cost data provided by the City and estimates based on Talis’ industry knowledge from various procurement projects. The cost analysis considers the collection, processing, and roll-out costs as applicable. Costs provided by the City were derived from the City’s current contracted prices and recent invoices. Price escalation mechanisms apply to all costs. The City’s Collection Contract Rise and Fall price mechanism has been applied to all collection costs, while Consumer Price Index (CPI) increase has been applied to all other costs.

The number of households and services provided in each option are based on the City’s domestic waste services in 2022-23, projected with a housing growth rate of 0.55% that was calculated utilising the latest available recorded housing data for the City from the ABS. It is assumed that all households currently receiving the general waste services, would receive a lime-green lid, 240L FOGO bin. However, for a GO services, it was assumed that multi-unit dwellings, with shared services would not

receive a lime green lid 240L GO bin. A reduction of 1.6% was applied to the number of domestic services, calculated using the latest available dwelling data from the ABS.

It was assumed that the full roll-out for a GO and FOGO system would be in Year 2 to provide the City with sufficient time to complete capital works associated with either roll-out.

Commercial costs have not been included in any of the modelling works as they are assumed to remain unchanged regardless of the service option.

The roll-out cost in Year 2 includes the cost of additional bins to be delivered to each household, kitchen caddies and compostable bags (FOGO only). The ongoing cost, reflected in Year 3, includes the waste collection and processing costs for the organics and general waste streams, as well as ongoing education costs.

5.1 Key Findings

It is important to note that the cost estimates only model the costs associated with the collection and processing of the various bin systems included in this assessment. Therefore, a variety of other costs associated with the City’s waste management services have been omitted including administration costs and overheads which are beyond the scope of this project.

The total and average annual cost per annum and per household is presented in Table 5-1.

Table 5-1: Costs for Kerbside Services

Option	Year 1	Year 2	Year 3	Year 10	Average Annual Cost (\$/hhld)	Average Annual Cost	Total Cost
	2023-24 (\$/hhld)	2024-23 (\$/hhld)	2025-26 (\$/hhld)	2032-33 (\$/hhld)			
1 – One-Bin System	\$109	\$114	\$118	\$157	\$132	\$2.24M	\$22.35M
2 – Two-Bin GO	\$112	\$250	\$191	\$245	\$208	\$3.53M	\$35.29M
3 – Two-Bin FOGO	\$151	\$372	\$300	\$389	\$324	\$5.49M	\$54.93M

Overall, the two-bin FOGO option is the most expensive, with the total system costs expected to be approximately \$54.93M over the 10-year lifetime of the model and an average of \$324 per household per year. The two-bin GO system is less expensive than the two-bin FOGO option, with a total cost of \$35.29M over 10 years and an average of \$208 per household per annum. The least expensive option is the baseline one-bin system, costing approximately \$22.35M over 10 years and an average of \$132 per household per annum.

Whilst the one-bin general waste system, with tonnages disposed of to landfill, has the lowest costs over the 10-year life of the model. It should be noted that the Western Australian Government is currently undertaking a review of the geographical range of the State Waste Levy. The City, as one of

the States Major Regional Centres¹, is within the geographical area being considered to have a potential levy applied to all waste disposed of to landfill², which would result in an increase in future costs.

A detailed breakdown of the total costs and costs per household over the key activities including bin roll outs, collections and waste processing/ disposal, is provided in Table 5-2.

¹ The Waste Authority Waste Avoidance and Recovery Strategy 2030: Western Australia's State Waste Strategy

² Department of Water and Environmental Regulation Review of the waste levy – Consultation summary report (<https://consult.dwer.wa.gov.au/waste-policy/review-of-the-waste-levy/>)

Table 5-2: Detailed Financial Breakdown

Option	Year 1	Year 2	Year 3	Year 10	Average Annual Cost (\$/hhld)	Average Annual Cost	Total Cost
	2023-24 (\$/hhld)	2024-23 (\$/hhld)	2025-26 (\$/hhld)	2032-33 (\$/hhld)			
Option 1 – One-bin System							
General Waste Collection	\$79	\$82	\$85	\$111	\$94	\$1.6M	\$16M
General Waste Disposal	\$26	\$27	\$29	\$41	\$33	\$560,000	\$5.58M
Community Green Waste Processing	\$4	\$4	\$4	\$5	\$5	\$77,000	\$770,000
Total	\$109	\$114	\$118	\$157	\$132	\$2.24M	\$22.35M
Option 2 – Two-bin GO System							
General Waste Collection	\$79	\$82	\$85	\$111	\$94	\$1.6M	\$16M
General Waste Disposal	\$26	\$24	\$25	\$35	\$29	\$490,000	\$4.89M
GO Collection	\$0	\$55	\$57	\$75	\$58	\$987,000	\$9.87 M
GO Processing	\$0	\$9	\$10	\$14	\$10	\$173,000	\$1.73M
GO Roll-out	\$3	\$76	\$10	\$6	\$13	\$215,000	\$2.14M
Community Green Waste	\$4	\$3	\$4	\$4	\$4	\$66,000	\$663,000
Total	\$112	\$250	\$191	\$245	\$208	\$3.53M	\$35.29M
Option 3 – Two-bin FOGO System							
General Waste Collection	\$79	\$82	\$85	\$111	\$94	\$1.6M	\$16M
General Waste Disposal	\$26	\$19	\$20	\$28	\$23	\$393,000	\$3.93M
FOGO Collection	\$0	\$112	\$117	\$152	\$118	\$2.0M	\$20.05M
FOGO Processing	\$0	\$41	\$44	\$61	\$46	\$775,000	\$7.75M
FOGO Haulage	\$0	\$15	\$16	\$22	\$16	\$280,000	\$2.8M
FOGO Roll-out	\$3	\$97	\$13	\$7	\$16	\$274,000	\$2.74M
FOGO Capex	\$39	\$0	\$0	\$0	\$4	\$64,000	\$635,000
Community Green Waste	\$4	\$5	\$6	\$7	\$6	\$102,000	\$1.02M
Total	\$151	\$372	\$300	\$389	\$324	\$5.49M	\$54.93M

The changes in the estimated annual one-bin and two-bin system costs have been graphically represented in Figure 5-1 below.

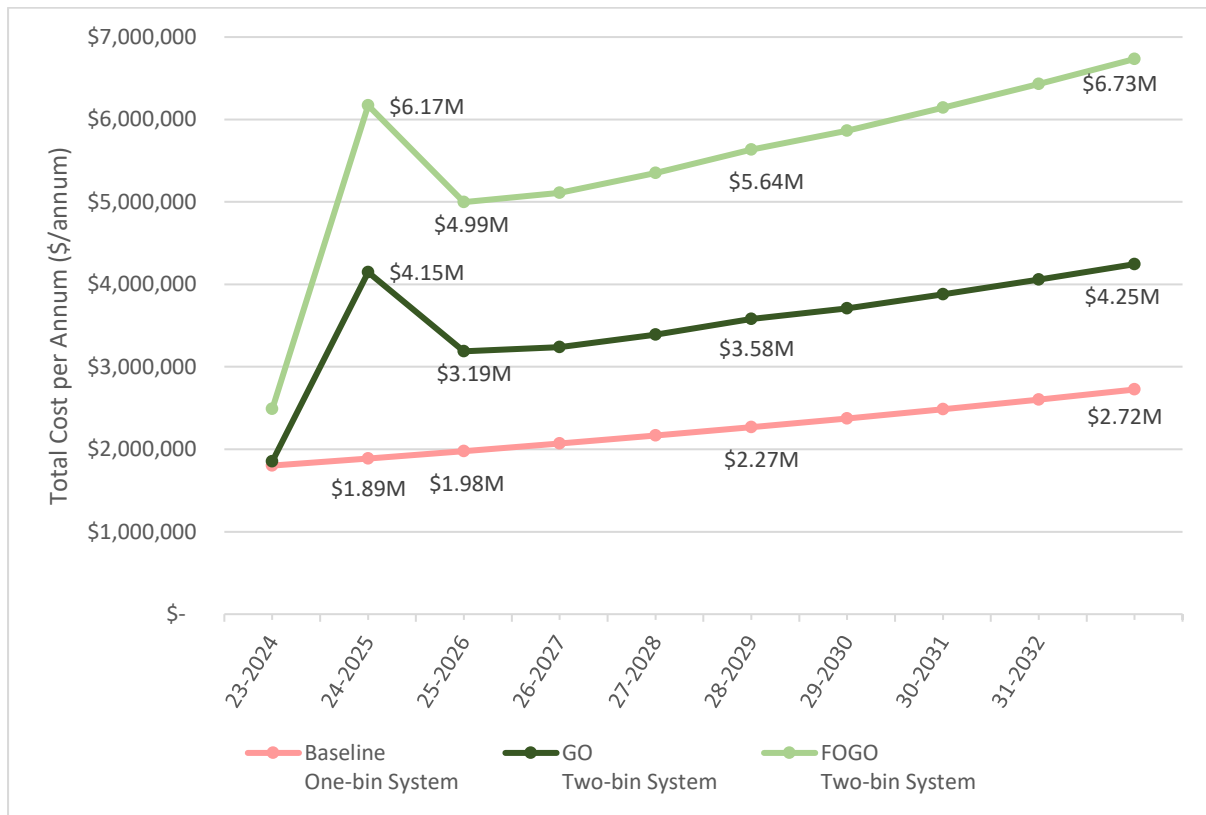


Figure 5-1: Changes to Annual System Costs

The roll-out of the two-bin GO and FOGO systems is modelled to commence in Year 2, 2024-25 financial year. Figure 5-1 shows that with the roll-out of a kerbside two-bin organics system there is a spike in the total costs. The two-bin GO system is approximately \$2.26M more expensive than the one-bin system, whilst the two-bin FOGO system is approximately \$4.28M more expensive. This is largely due to initial costs associated with bin infrastructure, education, increased staffing requirements, and anticipated capital works, costing approximately \$1.26M and \$1.61M for a two-bin GO and FOGO system, respectively.

The costs in Year 3 are more representative of the ongoing costs associated with a two-bin organics collections system. As shown in Figure 5-1, a GO system is estimated to cost \$3.19M and the two-bin FOGO system will cost approximately \$4.99M. However, in the subsequent years, following the roll-out, the annual costs remain higher than the one-bin general waste system.

The cost difference between each of the options for processing domestic green waste is marginal in comparison to the other waste streams. As seen in Table 5-1, there a \$107,000 decrease in the total 10-year costs when moving from a one-bin system to a two-bin GO system. When moving to a FOGO system there is an increase of approximately \$250,000 over the 10-year lifetime of the model, which is due to the large organic material not suitable for composting that is captured in the kerbside FOGO stream.

The main factor leading to the significant cost difference between the options is the collection and processing costs per tonne. As seen in Table 5-1, the average annual collection costs for FOGO bins is \$2.0M (\$118 per household per annum), whilst the collection cost for GO bins is significantly lower with an average annual cost of \$987,000 (\$58 per household per annum), which is attributed to the fortnightly collection frequency of GO bins. The FOGO collection costs could potentially be offset if general waste collections changed from a weekly to fortnightly collection frequency, this is discussed further in Section 5.2.

The GO system has significantly lower processing costs, \$70 per tonne projected to increase with CPI, with an annual average cost of \$173,000 (\$10 per household per annum), compared to the FOGO system that has an average annual processing cost of \$775,000 (\$46 per household per annum).

Currently FOGO is initially processed onsite and then sent to Go Organics for further maturation. A conservative processing rate of \$100 per tonne, including decontamination, projected to increase with CPI, was modelled for FOGO processing at the Meru WDF. A processing rate of \$58 per tonne, projected to increase with CPI, was applied for the FOGO tonnages sent to Go Organics. As FOGO material is hauled to Go Organics for further processing there were also haulage costs factored into the model, resulting in an average annual increase of increase of \$280,000 (\$16 per household per annum). It is possible that when put to market the FOGO processing cost could be lower, which would result in reduced costs for the FOGO system. In addition, if a local FOGO processing facility was established there could be further cost reductions.

5.2 Sensitivity Analysis

The Better Practice FOGO Collection Guidelines, published by the Waste Authority to support the Better Bins Plus Program, includes information on the preferred size and collection frequency of each bin type. The guidelines recommend a FOGO bin be emptied weekly and a general waste be emptied fortnightly. However, it should be noted that the guidelines recognise a three-bin FOGO system, including commingled recycling that is collected fortnightly, as better practice. This provides additional 140L bin capacity for the householders in comparison to the City’s collections assessed as part of these works.

To better understand how a change in collection frequency may influence the cost of a collection system, a sensitivity analysis was undertaken on the FOGO two-bin system. The sensitivity considered a change in general waste collection from weekly to fortnightly in Year 6 of the model. The results are shown in Table 5-3 below.

Table 5-3: Two-bin FOGO Sensitivity Analysis – General Waste Fortnightly Collection Year 6-10

Option		Year 6	Year 1-10	Year 6	Year 1-10
		2028-29 (\$/hhld)	Avg \$/hhld	2028-29 Cost	Total Cost
Option 3	Two-bin FOGO system – weekly collection	\$332	\$324	\$5.64M	\$54.93M
Sensitivity 1	Two-bin FOGO system – fortnightly collection Year 6-10	\$285	\$298	\$4.82M	\$50.49M

The results from the Table 5-3 indicate that the City could save approximately \$800,000 in Year 6 and \$4.5M between Years 6 and 10 of the modelled period by reducing general waste collections to fortnightly.

6 Better Bins Plus

The Better Bins Plus: Go FOGO (Better Bins Plus) program opened in 2020 for six years and is providing \$20 million in funding for Local Governments to move towards a three-bin FOGO system.

The City could be eligible for funding to offset some of its costs through the Better Bins program for the two-bin FOGO system. In 2024-25 there is \$17 per household of funding available for Local Governments that have not previously accessed the Better Bins Funding, equating to a potential \$281,905 available to the City. However, the City would need to engage with the Waste Authority to clarify whether it would be eligible for Better Bins funding with a two-bin (general waste and FOGO) system. For the purpose of this assessment, any Better Bin Plus funding has been omitted from the financial modelling works.

7 Value for Money Assessment

As outlined in Section 4, the two-bin FOGO system would help the City achieve a 23% increase in material recovery from the baseline Year 2. The increase in material recovery with a two-bin GO system is more modest at 11%. However, as detailed in Section 5, the average annual cost increase expected with a two-bin GO system when compared with the one-bin system is approximately \$1.29M. The average annual cost increase expected with a two-bin FOGO system when compared with the one-bin system is approximately \$3.25M.

These two key factors (material recovery and costs) have been used in this value for money assessment to compare the three options. Table 7-1 shows that the one-bin system would cost the City \$174,949 per annum per percent of material recovery, which is the highest. The two-bin GO system would cost the City \$147,347 per annum per percent of material recovery, which is the lowest. The two-bin FOGO system provides a mid-level \$151,334 per annum per percent of material recovery.

Table 7-1: Value for Money Comparison

Option	Recovery Rate Year 2 2024-25	Average Cost per Annum	Value for Money (\$/annum per percent Recovery)
1 – One-bin System	13%	\$2.24M	\$174,949
2 – Two-bin GO System	24%	\$3.53M	\$147,347
3 – Two-bin FOGO System	36%	\$5.49M	\$151,334

Table 7-1 suggests that the two-bin GO system provides the City the best value for money when compared with the achievable material recovery rate. It also shows that although the costs for a one-bin system are the least, it provides the least value for money of the three options.

It is important to note that this value for money assessment is only a comparison tool to analysis the return on investment of the various options. The City need to consider the total costs of each systems over the 10 years as part of its decision making process, which illustrates the \$19.64M increase in costs between the GO and FOGO systems over the 10-year period.

8 Advantages and Disadvantages

Table 8-1 outlines the key advantages and disadvantages of each option, incorporating the key learnings from the FOGO trial and financial modelling.

In addition to the points outlined in the table, the following are advantages of introducing an organics system regardless of which two-bin option is selected:

- Increased opportunity for engagement between the City and residents through the implementation process; and
- Opportunity to explore circular economy principles with organic waste returned to soils.

Table 8-1: Key Advantages and Disadvantages

Option	Advantages	Disadvantages
Option 1 – One-bin	<ul style="list-style-type: none"> • No change in service for residents. • No investment required to alter service arrangements. 	<ul style="list-style-type: none"> • Not considered best practice resource recovery. • Limited circular economy opportunities with organic waste. • Greater impact of potential waste levy if introduced in regional areas resulting in higher disposal costs.
Option 2 – Two-bin GO	<ul style="list-style-type: none"> • Simple system for residents to understand. • Significant improvement on the City current recovery rates and subsequent diversion of materials from landfill. • Could be recognised as a steppingstone for future FOGO recycling option. • More stable market for product. • Opportunity to participate in the circular economy through Council’s parks operations using recovered green waste products. 	<ul style="list-style-type: none"> • Education required for behaviour change. • Does not maximise organics recovery.
Option 3 – Two-bin FOGO	<ul style="list-style-type: none"> • Opportunity to participate in the circular economy through Council’s parks operations using FOGO derived soil conditioner to improve public gardens and grounds. • Greater diversion of materials from landfill. 	<ul style="list-style-type: none"> • More complex recycling systems and greater household behaviour change required. • Potential ongoing cost of providing fully compostable bags to residents. • Market risks for food organics soil conditioner. • Greater complexity and high Cost for FOGO processing.

	<ul style="list-style-type: none"> • Increased social benefits to the City from meeting community expectations of responsible waste management. 	<ul style="list-style-type: none"> • Lack of local processing option currently within the City.
--	----------------------------------------------------------------------------------------------------------------------------------------------------------------	----------------------------------------------------------------------------------------------------------------

9 Recommendations

Based on the works and findings from this Kerbside Organics Assessment, Talis puts forward the following recommendations for the City’s consideration:

Short Term

- The City should consider changing to a two-bin GO kerbside collection service with the following configuration:
 - a) 240L red lid bin emptied weekly for general waste sent to landfill; and
 - b) 240L lime-green lid bin emptied fortnightly for GO sent for processing.
- Introduce the new GO bins to residents following a thorough community engagement and marketing campaign to inform residents of the changes.
- Following implementation of the two-bin GO system, the City should monitor community green waste tonnages deposited at Meru WDF, to gain further insight into resident participation and diversion of green waste tonnages into the kerbside collection stream.

Medium Term

- If resident participation in the two-bin GO system is not meeting the City’s targets, the City should consider undertaking a feasibility study and risk assessment to introduce a gate fee for community green waste tonnages deposited by residents at Meru WDF, to encourage increased diversion to the kerbside collection stream;
- The City should conduct a detailed compositional bin audit of at least 100 matched pair households, including 100 240L general waste bins and 100 240L GO bins, to measure the success of the roll-out and community education and engagement initiatives on contamination and participation rates;
- The City should continue to investigate processing options for a FOGO two-bin system by undertaking a feasibility study including a:
 - market sounding exercise and risk assessment to determine the financial and technical viability of a local FOGO processing facility;
 - Engage with commercial waste generators to understand who the key local organics waste generators are, their waste types and estimated tonnages they generate, with the view to increase the foundation feedstock to encourage investment from the market suppliers to establish a local FOGO processing facility or a City owned facility; and
 - community consultation to determine the community’s desire for a two-bin FOGO system;
- Pending the outcome of the FOGO Feasibility Study, the City should undertake a competitive procurement process to determine the most appropriate organic processing technology for the City.

Long Term

- If not required earlier, in 2029-30 the City should consider changing to a two-bin FOGO kerbside collection service, with the following configuration to all properties not sharing bins:
 - 240L red lid bin emptied weekly/fortnightly for general waste sent to landfill;
 - 240L lime-green lid bin emptied weekly for FOGO sent for processing, along with a kitchen caddy and an annual supply of compostable caddy liners;
- Support the change to the FOGO collection service through a comprehensive community engagement and marketing; and
- If not implemented as part of the two-bin FOGO system roll-out, the City should undertake a feasibility study and risk assessment to transition the two-bin FOGO collection system from a weekly to fortnightly collection schedule.

APPENDIX A

Assumptions and Metadata

Table 9-1: Assumptions

Option	Assumption
General	<ul style="list-style-type: none"> • Baseline costs are modelled for 10 years from 2023/24 (Year 1) for comparison against organics two-bin scenarios. • No bin replacement costs have been factored into the scenarios; residents pay for replacements. • Housing growth rate applied to all services, 0.55%. • Population growth rate applied to all waste tonnages, 2.27%, excluding community drop off green waste. • CPI is based on average ABS increase of last four years (June 19 – June 22) • CPI applied to costs other than Cleanaway contract services. • City Collection Contractor Rise and Fall is based on ABS index average of last four years (June 19 - June 22). • Rise and Fall applies to collection rates only. • Number of services applied rather than number of rateable properties when calculating cost due to a property having one or more separate service at the same address. • Residential services based on total domestic services supplied by CGG 2022/23. • As the contract is based on a drive-by rate, 100% charge rate has been applied regardless of the actual presentation. • Collection cost = number of services* cost per bin * cost per collections per annum • Total tonnages generated each year remains consistent between each option. FOGO tonnages including contamination have been accounted for in the General Waste tonnages. • Commercial tonnages have been calculated at 30kg per service and have been deducted from the general waste tonnages. • Commercial tonnages have been excluded from all scenarios. • Green waste volumes based on the average volumetric data supplied (2017/18 - 2021/22), converted to tonnes per annum.
Option 1 – One-bin system	<ul style="list-style-type: none"> • All baseline waste volumes are derived from historical waste generation tonnages and projected with annual population growth rate.
Option 2 – Two-bin GO system	<ul style="list-style-type: none"> • Roll-out commences in Year 2 (2024-25). • General Waste collected weekly. • GO collected fortnightly.

	<ul style="list-style-type: none"> • Collection rate - assumes same collection rate as FOGO (\$1.87/drive-by). • Rateable properties based CGG properties receiving a domestic waste service 2022/23. Factoring 1.6% reduction in MUDs and excluding commercial properties/services. • One Project Officer at 0.5 FTE Year 1 & 2, \$97,000 (2022/23), adjusted for inflation. • One Education Officer has been budgeted for first 2 years (0.5 FTE) and thereafter (0.25 FTE) for the duration of the model. Education Officer's salary assumed to be \$90,000 (2022/23) adjusted for inflation. • Admin officer (60% level 6/1) Year 1- 10 adjusted for inflation. • Cost per household: based on total cost per rateable domestic property. • Roll-out costs include - bin construction, 240L bin & 240L lid change. • Revenue from sale of green waste has not been factored into the scenario. • Bin tagging program implemented in Year 1 and 2 from commencement of FOGO roll-out. Based on the City's FOGO costings. • Two compositional waste audits in Years 2 and 6. • GO tonnages include a 15% increase from community green waste drop off tonnages Year 2 - 10.
<p>Option 2 – two-bin FOGO system</p>	<ul style="list-style-type: none"> • Roll-out commences in Year 2 (2024-25) • Roll-out to all properties including MUDs, excluding commercial services/properties. • FOGO services have been based on all current residual services (2022/23) receiving a FOGO service, housing growth rate applied. • FOGO bin emptied weekly after roll-out. • General Waste bin emptied fortnightly after roll-out. • FOGO tonnages include a 15% increase from community green waste drop off tonnages Year 2 - 10. • Processible FOGO tonnages account for a 20% drop in material not suitable for composting. • Green waste drop off tonnages post FOGO introduction include a 20% increase from FOGO tonnages not suitable for composting. • Rateable properties based the City's properties receiving a domestic waste service 2022/23. • FOGO services based on number of the City's domestic services 2022/23, due to rateable properties having one or more one separate service at the same address. • One Project Officer at 0.5 FTE Year 1 & 2, \$97,000 (2022/23), adjusted for inflation. • One Education Officer has been budgeted for first 2 years (0.5 FTE) and thereafter (0.25 FTE) for the duration of the model. Education Officer's salary assumed to be \$90,000 (2022/23) adjusted for inflation. • Admin officer (60% level 6/1) Year 1- 10 adjusted for inflation.

	<ul style="list-style-type: none"> • Pad expansion and license amendment costs Year 1 based on the City’s FOGO costings. • Caddies, liners, and equipment based on number of services. • Roll-out costs - include - bin construction, 240L bin & 240L lid change, education material, kitchen caddies and liners. • Cost per household based on total cost per rateable domestic property. • Revenue from sale of green waste and compost has not been factored into the scenario. • Bin tagging program implemented in Year 1 and 2 from commencement of FOGO roll-out. Based on the City’s FOGO costings. • Two compositional waste audits in Year 2 and 6. • Haulage based on the City’s FOGO costings, Geraldton to GO organics (one way) and GO Organics to Geraldton (one-way).
--	-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

Table 9-2: Metadata

Key Input	Value Used	Source
Number of households (total)	17,969	Australian Bureau of Statistics 2021
Number of households (SUDs)	17,681	Australian Bureau of Statistics 2021
Number of households (MUDs)	288	Australian Bureau of Statistics 2021
Percentage of MUDs	1.60%	Australian Bureau of Statistics 2021
Population in Shire (2016)	38,634	Australian Bureau of Statistics 2016
Population in Shire (2021)	39,489	Australian Bureau of Statistics 2021
CGG base case population (2036)	56,103	CGG Jobs and Growth Plan
CGG target case population (2036)	65,246	CGG Jobs and Growth Plan
Population growth rate - base case (2036)	1.88%	Geraldton Jobs and Growth Plan 2020-2023: Growing the capital of the Midwest.
Population growth rate - target (2036)	2.65%	Geraldton Jobs and Growth Plan 2020-2023: Growing the capital of the Midwest
Population Growth Rate	2.27%	Average Growth Rate – base case and target 2036
Number of households (total)	17,969	Australian Bureau of Statistics 2021
Number of households (SUDs)	17,681	Australian Bureau of Statistics 2021
Number of households (MUDs)	288	Australian Bureau of Statistics 2021
Percentage of MUDs	1.60%	Australian Bureau of Statistics 2021
Annual CPI	3.32%	Australian Bureau of Statistics 2023
Cleanaway contract Rise and Fall	3.86%	Australian Bureau of Statistics 2023
Rateable residential properties	16,401	Supplied by the City - 2022/23
Domestic Bin services (services/week)	17,550	Supplied by the City - 2022/23
Rateable Commercial Properties	893	Supplied by the City - 2022/23

Number of Commercial Bin Services (services/week)	1,541	Supplied by the City - 2022/23
Number of GO Services (services/week)	17,269	Based on reduction of 1.6% on the number of domestic services
Number of FOGO Services (services/week)	17,550	Based on number of domestic waste services
Tonnages (tpa)		
Residential General Waste collected	14,526	Tonnage data 2021/22 – supplied by the City
FOGO	182	Tonnage data 2021/22 – supplied by the City
FOGO contamination	15	Tonnage data 2021/22 – supplied by the City
Baseline residential General Waste	14,723	Tonnage data 2021/22 – supplied by the City
Commercial General Waste (kg/bin)	30	Talis industry knowledge
Commercial General Waste collected	2,404	based on commercial service 2022/23 and kg/bin
Average Green waste drop off (m3)	12,560	Supplied by the City (average m3 2017/18 - 2020/21)
Conversion Factor m3 to tonnes - Green waste unprocessed	0.15	DWER waste census conversion factors - green waste, logs/wood
Community Green waste drop off	1,938	Supplied by the City Volumetric Data (average 2016/17-2021/22)
Community green waste not suitable for composting	20%	Talis industry knowledge and the City operational experience
Composition and Capture Rates		
FO in General Waste bin (%)	25%	Based on the average FOGO trial tonnage data 2020-21 & 2021-22 per residential bin service
GO in General Waste bin (%)	17%	Based on the average FOGO trial tonnage data 2020-21 & 2021-22 per residential bin service
FO diverted from General Waste bin (%) - Capture Rate	75.00%	Talis industry knowledge
GO diverted from General Waste bin (%) - Capture Rate	80.00%	Talis industry knowledge
Percentage of total FO expected to be diverted (tpa)	19%	Talis industry understanding FO capture rates
Percentage of total GO expected to be diverted (tpa)	13%	Talis industry understanding FO capture rates
Percentage of community green waste drop-off in GO or FOGO bin	15.00%	Talis industry knowledge
Collection, Disposal & Processing Costs		
Residual 240L collection (\$/drive-by) - one-bin and two- bin system	\$1.37	Supplied by the City
GO 240L collection (\$/drive-by)	\$1.87	Assume same as FOGO
FOGO 240L collection (\$/drive-by)	\$1.87	Supplied by the City - Contractor Inv March 2023

FOGO Processing Charge (\$/t) - Meru WDF	\$100.00	Talis Industry Knowledge
FOGO (\$/t) - Perth Based Processor	\$52.50	Supplied by the City
FOGO Processing (\$/t)	\$100.00	Talis Industry knowledge
GO Processing Rate (\$/t)	\$70.00	Green waste processing cost + decontamination (Talis industry knowledge)
Garden Waste (\$/m3)	\$4.95	Supplied by the City
Garden Waste (\$/t)	\$33.00	DWER Conversion Rate, m3 to tonne, applied to the City Green Waste (\$/tonne)
Meru Landfill Gate Fee (\$/tonne)	\$32.21	Supplied by the City
Roll-out Costs		
Bin Construction (\$/bin)	\$3.00	Supplied by the City
Cost of FOGO/GO 240L bin (Roll-out)	\$50.00	Supplied by the City
Cost of Lid Change 240L Bin	\$4.78	Supplied by the City
FOGO roll-out and communication (\$/hhld)	\$8.00	Talis industry knowledge
Kitchen caddy (\$/hhld)	\$3.23	Supplied by the City
Compostable caddy liners (\$/hhld/yr.)	\$3.60	Supplied by the City
Pad expansion	\$600,000.00	Supplied by the City
Licence Amendments	\$15,000.00	Supplied by the City
Bin Tagging cost per bin	\$1.71	Supplied by the City
Compositional Waste Audit	\$28,000	Talis industry knowledge
Administration Officer (30% level 6/1)	\$ 24,379.	Supplied by the City
Administration Officer (60% level 6/1)	\$48,758	Supplied by the City
Waste education officer FTE salary	\$90,000.	75k base + 20% oncosts. Talis Industry Knowledge
Project officer FTE salary	\$97,000.00	Supplied by the City