FOGO Feasibility Study

Final Report

Prepared for Shire of Serpentine Jarrahdale

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Signature		

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1 Introduction

The Shire of Serpentine Jarrahdale (the Shire) is situated in the Perth region of Western Australia (WA), roughly 45 kms south of Perth and covers an area of 905 square kms[1]. The Shire is nestled next to the Darling Scarp and has a range of urban and semi-rural properties (see Map in Appendix A). The area is home to over 36,000 residents with majority of the residents living in and around Byford.

The Shire of Serpentine Jarrahdale (the Shire) currently operates a two-bin kerbside waste collection service for its residents. The service includes a weekly collection of residual waste sent to landfill and a fortnightly collection for commingled recycling sent for processing.

The Western Australian Waste Avoidance and Resource Recovery Strategy 2030 (State Waste Strategy 2030)[2] was released in 2019, focusing on material recovery targets. For municipal solid waste (MSW), these targets are 67% by 2025 and 70% by 2030 for the Perth and Peel regions. The State Waste Strategy 2030 also includes a headline strategy that states all Local Governments in Perth and Peel will provide residents with a 3-bin FOGO (food organics and garden organics) service by 2025.

The Shire's Waste Management Strategy 2020-2024[1] (Waste Management Strategy) acknowledges the targets within the State Waste Strategy 2030, outlining that the Shire is to implement FOGO collection by 2025 and investigate options for an in-house FOGO processor. This Waste Management Strategy has prompted the Shire to seek an independent feasibility assessment of:

1. The introduction of a three-bin FOGO kerbside system; and
2. Establishing a FOGO processing facility with the Shire.

Talis Consultants (Talis) was engaged by the Shire to fulfill the requirements of these feasibility assessments.

The Shire is committed to providing its residual waste tonnages to the Kwinana Waste to Energy Project (Avertas Energy) to increase its material recovery and landfill diversion rates. Accordingly, Talis compared two main service options:

- 2-bin system – a two-bin service with processing of recyclables and residual waste sent to WtE; and
- 3-bin system – a three-bin service with source separation of FOGO and recyclables for processing and residual waste sent to WtE.

[1] Shire of Serpentine Jarrahdale (2020)
[2] Waste Authority WA (2021)

1.1 Objectives and Scope

This Report provides a detailed understanding of the findings of the assessment having regard for:

- the waste composition and volumes generated;
- the Shire's dwelling types, demographics and forecasted growth;
- the current and projected cost of providing the services;
- the potential recovery rates achievable;
- case studies from other Local Governments that are currently providing a FOGO service;
- the available FOGO processing options and capacity in the region;
- the available markets for FOGO derived products;
- issues with contamination;
- the barriers to establishing a FOGO processing facility; and
- the merits and risks of available FOGO processing options for the Shire.

2 Legislative Framework and Guidance Documents

This section contains a brief overview of the current legislative and policy context surrounding Local Government waste management.

2.1 National Waste Policy

The National Waste Policy[3] was released in 2018 and asserts that a move towards a circular economy and away from a "take, make, use and dispose" system will allow us to preserve the value of our resources.

The aims of the National Waste Policy are to:

- Respond to the challenges facing waste management and resource recovery in Australia (excluding radioactive waste);
- Reflect the global shift towards a circular economy, including resource-efficient systems, products and services to avoid waste, conserve resources and maximise the value of all materials used; and
- Provide a framework for businesses to embrace innovation and develop technologies that create new opportunities.

A 3-bin organics system is supported by strategy 12 of the National Waste Policy, which is to "reduce organic waste, including garden and food waste, by avoiding their generation and supporting diversion away from landfill into soils and other uses."

2.2 Waste Avoidance and Resource Recovery Act 2007

The *Waste Avoidance and Resource Recovery Act 2007*[4] (WARR Act) is WA State Legislation that came into effect in June 2008. The objectives of the WARR Act are "to contribute to the sustainability, and the protection of human health and the environment, in WA and the move towards a waste-free society by*:*

- Promoting the most efficient use of resources, including resource recovery and waste avoidance;
- Reducing environmental harm, including pollution through waste;
- The consideration of resource management options against the following hierarchy:
    - Avoidance of unnecessary resource consumption;
    - Resource recovery (including reuse, reprocessing, recycling and energy recovery); and
    - Disposal."

The WARR Act establishes the Waste Authority and its duty to "advise and make recommendations on the regulation of waste services," which includes the avoidance of waste generation and increased resource recovery. To carry out this duty, the Waste Authority is required to prepare a waste strategy.

[3] Department of Climate Change, Energy, the Environment and Water (2018)
[4] Department of Justice Parliamentary Council's Office (2007)

2.3 State Waste Strategy 2030

The State Waste Strategy 2030 was published in February 2019 and outlines a vision for WA to "*become a sustainable, low-waste, circular economy in which human health and the environment are protected from the impacts of waste*"[2].

The State Waste Strategy 2030 has three guiding concepts:

- Waste hierarchy;
- Circular economy; and
- Behaviour change.

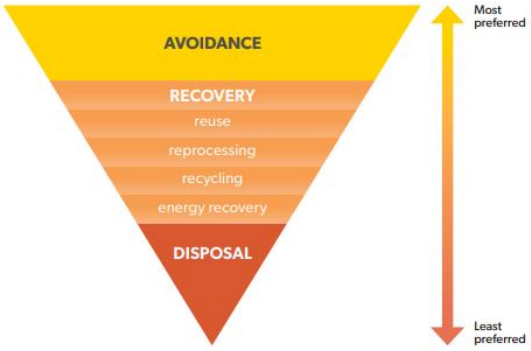

Figure 2-1: Waste Hierarchy

The Waste Hierarchy (Figure 2-1) is an internationally accepted principle used to guide decision making surrounding waste management. It identifies waste management options in order of preference, with the most preferred options located at the top of the hierarchy. Avoiding the generation of waste is the highest priority, followed by various methods of recovery or reprocessing before waste is disposed.

A circular economy (Figure 2-2) is an alternative to a traditional linear economy that aims to retain materials in the economy for as long as possible. This is achieved by recovering and reusing materials as set out in the waste hierarchy.

Figure 2-2: Circular Economy

The State Waste Strategy 2030 aims to change waste management behaviours through a combination of knowledge, infrastructure, and incentives. It states that knowledge is important for starting behaviour changes but must be complemented with incentives to ensure that the decision to change behaviours can be acted upon. As part of this, the State Waste Strategy 2030 includes material recovery targets and has a headline strategy for all Local Governments in Perth and Peel to provide a 3-bin FOGO service by 2025.

It also asserts that it is critical to have the appropriate infrastructure to facilitate behaviour changes. This includes having the facilities necessary to manage and process the different categories of waste that result from behaviour changes.

The State Waste Strategy 2030 has used these three guiding concepts to develop overarching targets for Western Australia under three objectives, "Avoid", "Recover" and "Protect" (Figure 2-3). It states that a 3-bin kerbside collection system, including the separation of food organics and garden organics (FOGO) from other waste categories, should be provided by all Local Governments in the Perth and Peel region by 2025.

Avoid	Recover	Protect
Western Australians generate less waste.	*Western Australians recover more value and resources from waste.*	***Western Australians protect the environment by managing waste responsibly.***
2025 – 10% reduction in waste generation per capita **2030** – 20% reduction in waste generation per capita	**2025** – Increase material recovery to 70% **2030** – Increase material recovery to 75% **From 2020** – Recover energy only from residual waste	**2030** – No more than 15% of waste generated in Perth and Peel regions is landfilled **2030** – All waste is managed and/or disposed to better practice facilities

Figure 2-3: State Waste Strategy 2030 objectives and targets

2.4 Better Bins Programs

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 3-bin FOGO system[5].

The funding available for Local Governments reduces each year and depends on whether the Local Government has accessed the original Better Bins funding (Figure 2-4). The grey bars indicate the funding available to Local Governments (such as the Shire) that have not previously accessed funding, whereas the green bars indicate the funding available to those Local Governments that have accessed funding before. Applications are due by March 31 each year and the funding is released in the following financial year, meaning the current maximum funding a Local Government can receive is the rate for the 2022-23 financial year.

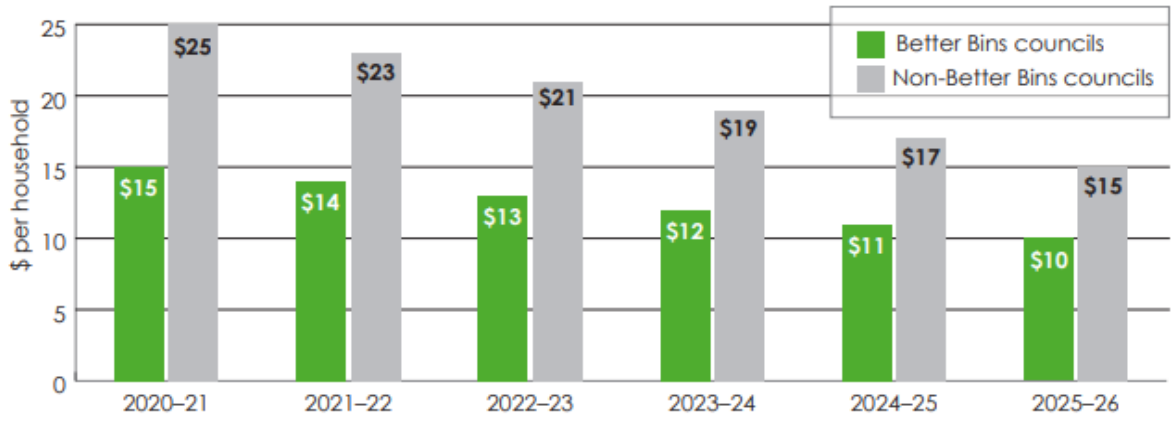

Figure 2-4: Better Bins Plus funding rates for Local Government (per household)

The Shire previously applied for and received Better Bins Plus grant funding from the Waste Authority to the amount of up to $257,364.

[5] Waste Authority WA (2019)

2.5 Better Practice FOGO Collection Guidelines

To support the Better Bins Plus program, the Waste Authority has published a guideline for the current preferred bin service options that a Local Government is required to adhere to in order to receive funding[6]. This document is called the Better Practice FOGO Kerbside Collection Guidelines (FOGO Guidelines) and includes information on the preferred size and collection frequency of each bin type. It states that the guidelines apply to standard single-unit dwellings (SUDs) and recognises a 3-bin FOGO service as better practice.

The preferred bin types, sizes, and collection frequency have been captured in the extract below from the FOGO Guidelines (Figure 2-5):

	Bin types		
	Residual / General waste Red lid	Co-mingled recycling Yellow lid	FOGO Lime Green lid
Bin volume: collection frequency	80, 120 or 140 litres: Fortnightly collection	240 or 360 litres: Fortnightly collection	240 litres: Weekly collection
Equivalent collection volume per week	Maximum 70 litres	Minimum 120 litres	Minimum 240 litres

Figure 2-5: FOGO Guideline recommended service

Additionally, the FOGO Guidelines state that it is better practice for a Local Government to provide kitchen caddies and compostable liners for residents when a FOGO service is provided, and minimum size and quality standards are included in the guidelines.

Local Governments have no obligation to provide FOGO services to dwellings not defined as SUDs by the FOGO Guidelines. This increases the complexity of delivering waste management services, as locations may have a variety of dwelling types, some of which may or may not have a third bin. The efficiency of collection routes may be impacted and the distance between bin lifts may be increased, which would impact collection costs. In addition to this, vehicle requirements would differ depending on the number of each dwelling type and their respective bin system, making the management of waste collection services more challenging.

Talis has used the FOGO Guidelines when undertaking modelling and has adopted the recommended bin size and collection frequency for a FOGO service. Talis has also assumed that the Shire will provide kitchen caddies and compostable liners.

2.6 Better Practice Organics Recycling Guideline

The Better Practice Organics Recycling Guideline released in December 2022 provides information on the standards required for planning, constructing and operating organic recycling facilities[7].

[6] Waste Authority WA (2021)
[7]Department of Water and Environmental Regulation (2022)

The guideline applies to prescribed premises which recycles organic material through processing or compost and includes:

- Aerobic composting;
- Anaerobic digestion;
- Vermiculture; and
- Mechanical processing (chipping, shredding and grinding).

The objectives as per the guidelines are:

- *Enable better environmental management in the organics recycling industry by preventing impacts to the environment, water resources, public health and amenity;*
- *Provide guidance to operators of organics recycling facilities to achieve the State Waste Strategy 2030 target for all waste to be managed and/or disposed to better practice facilities by 2030;*
- *Support the Waste Strategy vision for Western Australia to become a sustainable, low-waste circular economy in which human health and the environment are protected from the impacts of waste;*
- *Increase the industry and community's confidence in the regulatory process; and*
- *Support innovation and growth in the organics recycling industry by providing a benchmark operators can use to inform the development of alternative approaches to achieve environmental performance objectives.*

As a result of this guideline, siting requirements for organic recycling facilities have been changed and are stricter than they had been previously, which will impede the industry's ability to develop the new infrastructure required to satisfy an increased demand for organics processing facilities.

2.7 Australian Standard for Soil Conditioners and Mulches (AS4454)

The Australian Standard for Soil Conditioners and Mulches (AS4454)[8] is currently the only existing standard applicable to compost produced from food and garden organics in Western Australia. It is a voluntary standard and only represents the minimum quality requirement for compost.

There is currently no industry standard for classifying the quality of different composts beyond the minimum standards set out in AS4454. This presents an issue when examining the market for compost as different sectors have different quality requirements but lack a suitable standard to use to determine the quality of compost.

[8] Standards Australia (2012)

3 Current Demographics and Waste Services

This section provides details on the Shire's forecasted population growth and

3.1 Demographics

The current population of the Shire is 34,753. The population is growing substantially and is estimated to increase by more than 50% in the next 10 years (see Figure 3-1)[9].

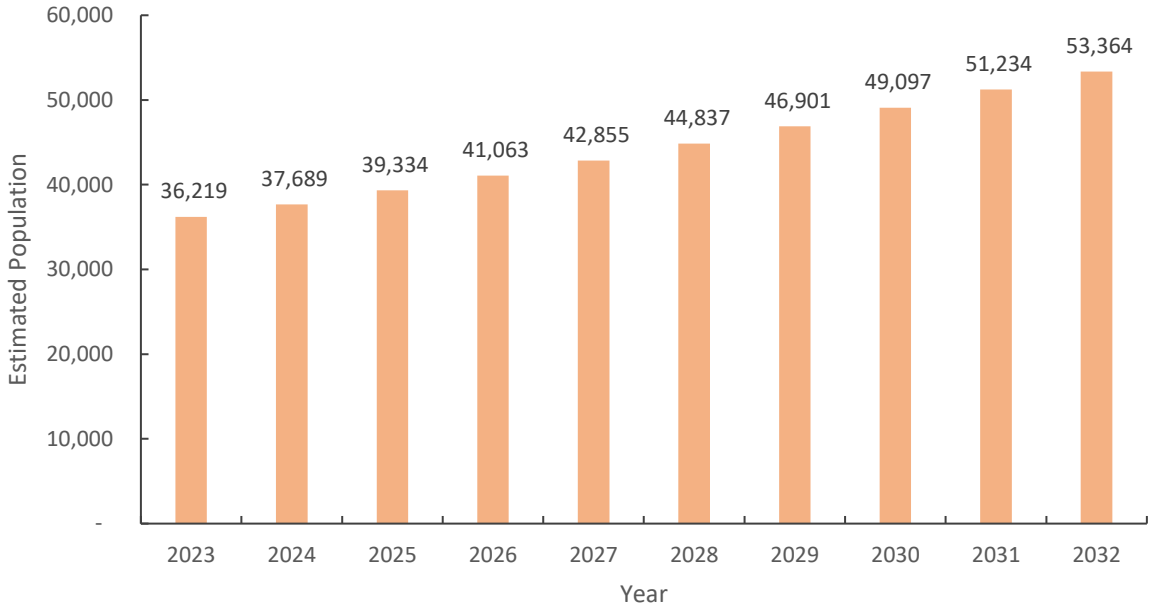

Figure 3-1: Estimated Population

The Shire's residents reside in a range of urban and semi-rural properties, with over 97% living in separate housing, and over 1% live in medium density housing such as town houses and units[9]. There are no high density dwelling types such as an apartment within the Shire.

Figure 3-2 shows the population structure by age groups. The majority (21%) of residents are in 35-49 year, followed by the 15% young workforce category age group of 25-34 year. Residents aged 60 and over including the retirees, seniors and elderly make up 15% of the populations. Whereas babies, school goers and those in tertiary education (Ages 0-24) make up 36% of the Shire's population. [9]

[9] Population ID (2023)

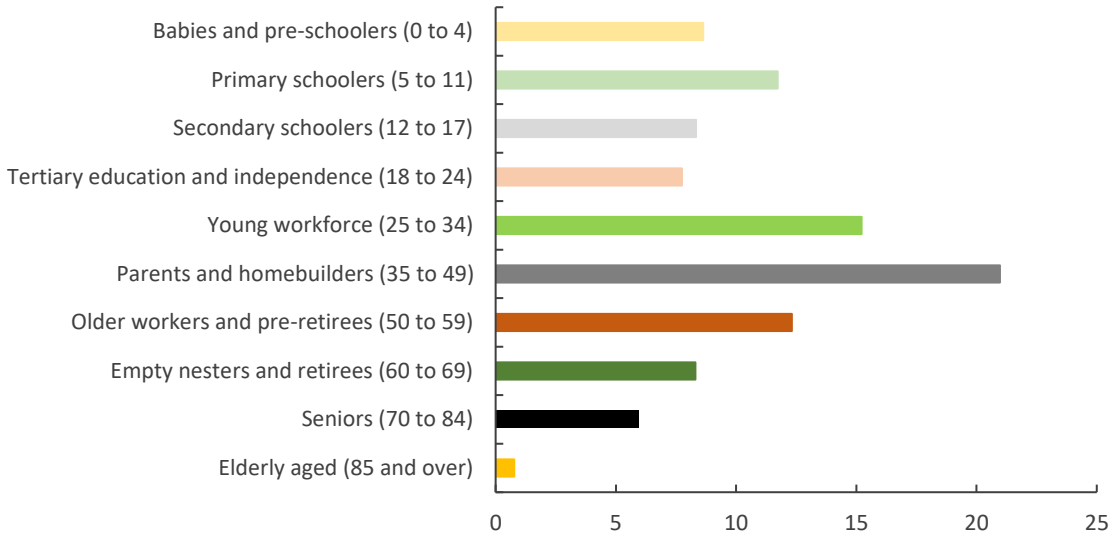

Figure 3-2: Current Population Structure (Data Source: Population ID)

Majority of the residents speak English proficiently, with as little as 0.9% claiming to speak small amounts or none at all[9].

Of the residents within the Shire, 96% are employed, which is 1% over Perth's average, with most earning between $1,000 -$1,249 weekly gross[9]. According to the 2016 ABS socio-economic indexes for areas the Shire is of socio-economic advantages with a score of 1022[10].

3.2 Waste Services Contracts

As of March 2023, the Shire provides a two-bin kerbside waste collection service for its residents consisting of 140L/ 240L residual waste bin collected weekly and a 360L/ 240L recycle bin collected fortnightly. Residents have an option to change their bin sizes depending on capacity requirements.

3.2.1 Collection and Disposal Contract

Since 2018, Cleanaway has been contracted to provide the collections, recycling processing and waste disposal services for the Shire. The contract arrangements with Cleanaway for these services is set to cease on 30 June 2025. Recyclables are transported to Cleanaway's material recovery facility (MRF) in South Guildford for processing. Whereas materials from the residual waste bin are currently being transported to Cleanaway's landfill for disposal.

This contract does not have provisions for FOGO collections, the provision for fortnightly residual waste bin collections in a FOGO scenario, lower cost provisions for mass roll-out of FOGO and residual waste bins or lid changes. The contract is also unlikely provisions for supply and delivery of kitchen caddies and compostable liners during the FOGO roll-out. Therefore, prior to a planned FOGO roll-out the Shire will need to ensure contract arrangements are in place.

[10] Australian Bureau of Statistics (2016)

3.2.2 WtE Waste Supply Agreement

Once operational, the Shire is contractually committed to supply committed tonnes of kerbside residual waste each year (see Table 3-1) to the Avertas Energy facility for 25 years. This will help to increase the Shire's material and resource recovery rates. The Shire needs to ensure that the residual waste tonnes available in the 3-bin FOGO scenario do not fall below the committed tonnes per annum to avoid the risk of having to pay shortfall fees. The Shire can also provide Optional Tonnages of residual waste which may be generated from the waste transfer station operations or bulk waste collection services.

Table 3-1: Contracted WtE Tonnages

	24/25	25/26	26/27	27/28	28/29	29/30	30/31	31/32
Committed Tonnes/ Annum	7,357	6,564	6,702	6,991	7,280	7,570	7,859	8,148
Optional Tonnes/ Annum	5,718	6,502	7,331	7,608	7,902	8,188	8,476	8,765

The Waste Supply Agreement in Clause 16(h)i states that it would be considered wilful misconduct if the Shire were to enter into any agreement, arrangement, or other understanding, the purpose of which is to directly or indirectly result in "Wastes" that should be delivered to the WtE facility being delivered elsewhere.

As per Annexure 9 of the Waste Supply Agreement, Wastes that need to be delivered to the WtE facility include:

1. *Household Weekly Collection Waste;*
2. *Mixed Bulk Verge Collection Waste;*
3. *Contaminated Separated Green Waste;*
4. *Contaminated Separated Organic Waste;*
5. *Litter / Public Place / Events Waste;*
6. *Commercial & Industrial Waste; and*
7. *Construction and Demolition Derived Waste.*

It is understood that there is some uncertainty on whether these clauses restrict the Shire from making a change to 3-bin FOGO system. Talis has also learnt that the Rivers Regional Council has been negotiating an amendment to the Clause to ensure that its Member Councils (including the Shire) will not be in breach of the contract requirements in relation to supply of Wastes from the introduction of a 3-bin FOGO system. Accordingly, until the matter is sufficiently resolved to provide assurance to the Shire that it will not be in breach of the Waste Supply Agreement with Avertas Energy, the Shire should hold off on implementing a 3-bin FOGO system.

3.2.3 Other Contracts

The Shire currently does not offer a verge side collection service but allows residents to take their green and bulky waste to the waste transfer station and recycling centre located at Watkins Road in Mundijong. There are numerous smaller contracts and arrangements to manage disposal and processing of the materials collected at the transfer station.

As above, once the Avertas Energy facility is operational it is anticipated that the Shire will divert bulky residual waste and potential other residual waste types from the transfer station to the WtE facility.

4 Waste Projections and Composition

This section details the estimated food organics (FO) and garden organics (GO) in the Shire's kerbside waste streams and projects the waste generated to 2031-32 based on population growth.

The Population id forecast data suggests that there are 36,000 residents in the Shire. The population is growing substantially and is estimated to nearly double in the next 15years.

4.1 Composition

Recent compositional audits have not been conducted by the Shire. Therefore, the amount of FO and GO in the Shire's kerbside residual waste stream has been estimated. Estimations were based on other semi-rural local government authorities (LGAs) average composition data, which is of similar size and demographics. It is important to note that the Shire is in a semi-rural location and as such, may have less than average food waste compared to urban LGAs. Table 4-1 details the estimated proportion of GO and FO in the kerbside residual waste stream. The Shire could seek more accurate values by conducting a detailed waste compositional audit of at least 100 residual waste and 100 recycling bins from different areas within the Shire.

Table 4-1: Estimated Proportion of GO and FO in Residual Waste Stream

Percent of FO in residual waste	Percent of GO in Residual waste
26%	18%

The kerbside commingled recycling stream will also have GO and FO waste present, although in small volumes. Therefore, the modelling has assumed that this FOGO material will not be diverted out of the kerbside commingled recycling stream.

4.2 Capture Rates

Capture rates refer to the percentage of the total available FO and GO materials that are likely to be captured in the FOGO bin. Based on Talis' industry knowledge and experience with audits, the average capture rates used for the modelling, are represented below in Table 4-2.

Table 4-2: Capture Rates

FO Capture Rate	GO Capture Rate
75%	80%

FOGO capture rates can be increased within the Shire with additional waste education. Providing a strong waste education program that explains the importance of placing the correct waste material in the correct stream, and what material goes into each stream, is pivotal in maximising capture rates.

4.3 Projections

In 2021-22, the Shire collected 7,512 tonnes from the kerbside residual waste stream and 1,761 tonnes from the kerbside commingled recycling stream (19% of the kerbside collected materials). Waste generation was projected for each year until 2031-32 using Population id population and household growth rates. All projections have been split by collection type and include kerbside recycling, kerbside residual waste and where appropriate kerbside FOGO.

Figure 4-1 shows the projected amount of material available in a 2-bin system. In this scenario the proportion of each waste type does not change over time. It is anticipated that by 2031-32, the Shire will be generating 13,188 tonnes will be kerbside residual waste and 3,180 tonnes kerbside recycling.

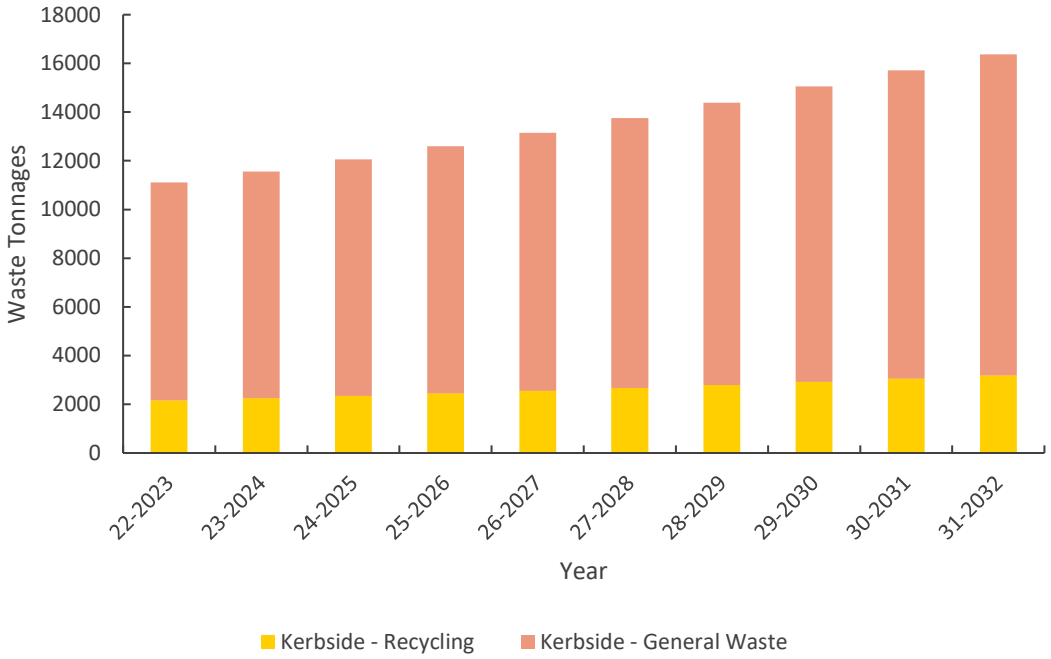

Figure 4-1: Waste Generation Projections for a 2-bin system

Based on the assumptions for waste composition (Table 4-1) and average capture rates (Table 4-2), it is anticipated that with a 3-bin FOGO system in 2031-32, the Shire will be generating 4,471 tonnes of kerbside FOGO, 8,717 tonnes of kerbside residual waste and 3,180 tonnes of kerbside commingled recycling (Figure 4-2).

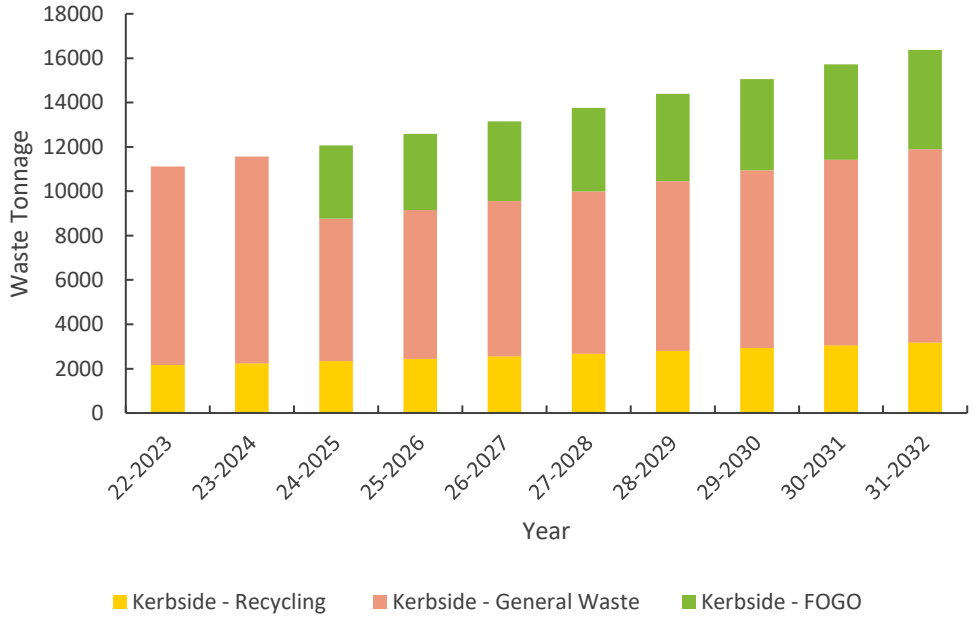

Figure 4-2: Waste Generation Projections for a 3-bin FOGO WtE System

In both bin service options, the recycling content was consistent. As covered above in this section, for the purpose of the model, it was assumed that FOGO is not diverted from the residual stream.

4.3.1 Comparison with Committed WtE Tonnes

As detailed in Section 3.2, the Shire has contractual arrangements to supply a certain number of tonnages to the Avertas Energy facility once operational. Table 4-3 shows the comparison between the committed tonnes and the anticipated residual waste tonnages through a 3-bin FOGO system.

Table 4-3: Comparison of Anticipated Residual Waste and Committed WtE Tonnages

	24/25	25/26	26/27	27/28	28/29	29/30	30/31	31/32
Committed WtE Tonnes/ Annum	7,357	6,564	6,702	6,991	7,280	7,570	7,859	8,148
Estimated 3-bin FOGO Residual Waste Tonnes	6,426	6,708	7,001	7,324	7,662	8,020	8,369	8,717
Shortfall in tonnages	*931*	*(144)*	*(299)*	*(333)*	*(382)*	*(450)*	*(510)*	*(569)*

Table 4-3 indicates that based on agreed committed tonnes, the Shire is likely to have a shortfall in residual waste tonnages to supply the WtE only in the 2024/25 financial year. If the facility commences receiving residual waste tonnes from December 2024, there are likely to be pro-rata adjustments to the required tonnages. Accordingly, the Shire may choose to hold off on the FOGO roll-out until early 2025. Alternatively, the Shire could consider a phased roll-out of FOGO, with the last phase in 2025/26.

5 Recovery Modelling

The following section outlines the kerbside recovery rates for the kerbside collection options, considering material recovery rates in relation to the State Waste Strategy 2030 targets for 2025 and 2030. The overall resource recovery rate is also examined to account for the material and energy recovery gained through thermal treatment techniques including WtE facilities. 'Material recovery' refers to the process of extracting materials through re-use, repurposing, reprocessing, or recycling. 'Resource recovery' refers to the combination of material recovery and recovery of energy from waste.

5.1 Methodology

As the Shire does not currently offer vergeside collection services, recovery data has only been provided for the kerbside recycling activities. All collected residual waste is currently landfilled with no material recovered from the stream. Modelled recovery rates applicable to FOGO and WtE facilities have been estimated as per Table 5-1.

Table 5-1: Facility Recovery Rates

Key Input	Value Used	Source
FOGO Recovery Rate	85%	2018-19 Waste Service Census (Perth and Peel region)[11]
WtE Material Recovery Rate	20%	Avertas WtE[12]
WtE Energy Recovery Rate	75%	Avertas WtE[12]

Material recovery rates for kerbside recycling have remained consistent with 2021-2022 performance values throughout the model. The recovery rates of each stream were assumed to remain consistent between each year. However, in reality further increase to recovery rates are potentially obtainable with a strategy focused education program. WtE facilities would contribute additional material recovery through bottom ash recovery as there are facilities specifically being built to recover this material.

Both the potential material recovery rates and resource recovery rates are demonstrated in the model. The material recovery rates directly relate to the State Waste Strategy 2030 targets for recovery. There are currently no applicable resource recovery targets.

The contamination rate within the FOGO bins will impact overall recovery rates. From information gathered through direct engagement with FOGO processing contractors, the contamination rates could have a substantial impact on recovery rates once contamination is above an acceptable amount, as processors may reject material and compel the Shire to send the contaminated FOGO to landfill.

[11] Waste Authority WA 2020
[12] Avertas Energy 2019

For the purpose of the recovery modelling, it is assumed that the contamination levels will remain within acceptable limits.

It has further been assumed that all properties currently receiving the kerbside collection service would transition to a FOGO service.

5.2 Key Findings

Figure 5-1 presents the material and resource recovery rates for each option. Resource recovery rates include the recovery of waste as energy and reflects the landfill diversion rate for each option.

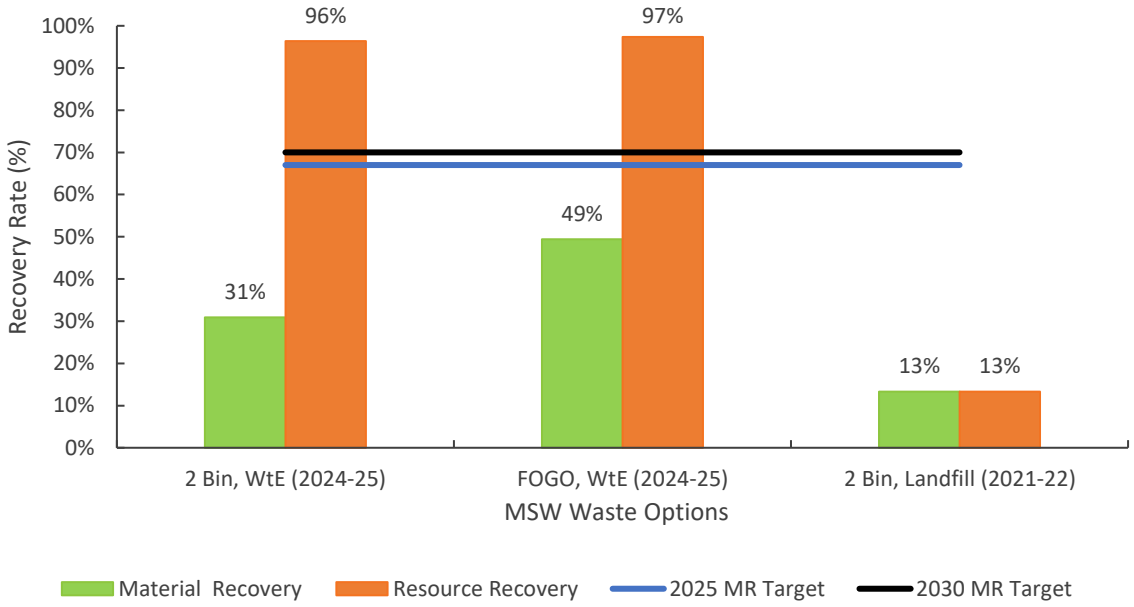

Figure 5-1: Material and resource recovery rates

A 3-bin FOGO service sending residual waste to WtE achieves a higher material recovery rate of 49% and reaches a resource recovery rate of 97%. The 2-bin system with waste to WtE results in a lower material recovery rate of 31%, which is 18% lower than the 3-bin FOGO system. In the current scenario with waste being sent to landfill, both material and resource recovery rates are at 13%.

The WtE counterpart in the 2-bin system compared to the current 2-bin system with waste to landfill results in higher material recovery rates due to the assumed recovery of bottom ash and metals. Resource recovery is similar in both the bin systems with waste sent to WtE. This indicates a high level of landfill diversion when residual waste is sent to WtE facilities rather than landfills.

The material recovery contribution from each waste stream to the overall material recovery rate is shown in Figure 5-2. The total amount of waste generated is the same in each option, and the proportion of each stream is consistent, whether materials are sent to WtE or to landfill. The WtE material recovery rate reflects the amount of residual material resulting from a bin service option, inclusive of the residual material that remains after the recovery of recycling and FOGO materials.

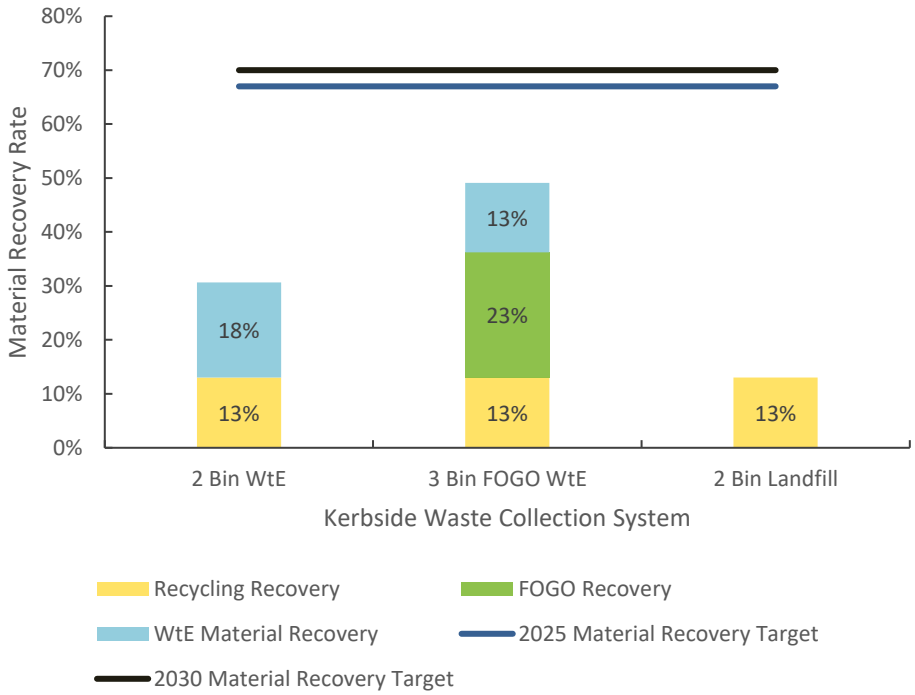

Figure 5-2: Material recovery rate breakdown

The contribution of the recycling bin to the overall material recovery rate is consistently 13%. This is based on the current volumes collected in the recycling bins and proportion of materials that are able to be recycled.

The WtE material recovery differs between bin service systems due to the amount of residual material sent to the WtE facility. The 3-bin FOGO options have a lower WtE material recovery rates as organic material is source-separated and recovered before the residual is sent to WtE. However, this is compensated for with higher material recovery rates (23%) from FOGO collected materials.

The results consistently show that based on the current recovery and modelled assumptions, the Shire will not be able to achieve the State Waste Strategy 2030 MSW targets of 67% or 70% material recovery with either of the kerbside collection options.

6 Financial Modelling

This section details the methods used to undertake the cost modelling and presents the financial implications of adopting a 3-bin FOGO system in comparison with a 2-bin system. It also anticipates that in 2024-25, the Shire's waste will be sent to the WtE facility.

6.1 Methodology

The financials for both kerbside collection systems were analysed individually using cost data provided by the Shire and FOGO estimation costs based on Talis' industry knowledge from procurement projects. The cost analysis considers the collection, processing, bin maintenance and roll-out costs of the kerbside collection options. Costs provided by the Shire were derived from their current contracted prices and recent invoices. These contracted prices and invoices have been listed as 'Contract Price' in the tables below, with the full pricing details outlined in the Confidential Appendix.

The key collection and processing costs which were applied are shown in Table 6-1.

Table 6-1: Key Collection and Processing Costs in 2022-23

Key Input	Value Used	Source
Residual waste collection drive-by rate 140L (2 bin)	Contract price	Contract/ Invoices
Residual waste collection drive-by rate 240L (2 bin)	Contract price	Contract/ Invoices
Residual waste collection drive-by rate 140L (FOGO)	Estimate	Talis value (based on industry knowledge)
Recycling collection drive-by rate 240L	Contract price	Contract/ Invoices
Recycling collection drive-by rate 360L	Contract price	Contract/ Invoices
FOGO collection drive-by rate 240L	Estimate	Talis value (based on industry knowledge)
FOGO processing ($/tonne)	Estimate	Talis value (based on industry knowledge)
Recycling Processing Rate ($/tonne)	Contract price	Contract/ Invoices
Landfill cost with Levy (Dec 22) ($/tonne)	Contract price	Contract/ Invoices
WtE processing cost ($/tonne)	Contract price	Contract/ Invoices

The model allows for household growth based on the .id growth profiles provided by the Shire. Annual collection costs consist of the collection frequency and number of bin services. The kerbside collection and processing costs have been increased annually using the contracted rise and fall formula outlined in the Confidential Appendix. An agreed average annual consumer price index (CPI) increase has been

applied to all other applicable costs. Table 6-2 shows the average annual percentage increase used in the model for all non-collection contract related services.

Table 6-2: Annual Percentage Increase

Input	Value Used	Source
CPI	2.93%	ABS average values over the last four years[13]

Bin maintenance costs were assumed to rise annually with household growth and the contracted rise and fall formula. However, once the new bins are rolled out for the FOGO options, it is assumed that bin maintenance will be halved for the residual waste bins and organics bin.

The key maintenance and roll out costs can be found in Table 6-3.

Table 6-3: Key maintenance and roll-out costs in 2022/23

Key Input	Value Used	Source
Cost of 140L bin (Roll out)	$83.15	Talis value (based on industry knowledge)
Cost of 240L bin (Roll out)	$88.96	Talis value (based on industry knowledge)
Cost of 240L bin lid replacement	Contract price	Contract/ Invoices
Annual bin maintenance	Contract price	Contract/ Invoices
Initial Roll-out & Communications ($/hhld)	$8.00	Talis value (based on industry knowledge)
Waste Education Officer FTE Salary (1 FTE ongoing)	$120,000	Shire value
GIS Officer Salary (0.25 FTE in first year)	$125,000	Shire value
Marketing/Communications Officer Salary (FOGO 0.5 FTE for first two years)	$120,000	Shire value
Administration Person Salary (1 FTE for first year)	$100,000	Shire value
Mass roll out kitchen caddy ($/hhld)	$4.79	Quote from Supplier

[13]Australian Bureau of Statistics (2023)

Key Input	Value Used	Source
Compostable caddy liners ($/hhld)	$7.50	Talis value (based on industry knowledge)
Waste Authority Grant Funding	$257,364	Shire value

Given that there are currently no multiple density dwelling properties in the Shire, it has been assumed that all properties would transition to the designated kerbside collection option being modelled as per the FOGO Guideline. Therefore, within the 3-bin FOGO system it is assumed all households will have a 140L residual waste bin, a 240L recycling bin and 240L FOGO bin.

Several other assumptions have been made to model the potential costs of each option. The modelling has been projected to 2031/32 to provide a ten-year projection. It is assumed that the FOGO roll-outs will take place in 2024-2025. A full list of the assumptions has been outlined in Appendix B. The modelling includes overheads and other waste costs provided by the Shire.

6.2 Key Findings

The overall costs and costs per household for the Shire are presented in Table 6-4. The year one costs are provided, as well as the projected costs for year three when FOGO is introduced along with the year five and ten costs from 2022/23 to 2031/32. The total cost of each option over the lifetime of the model and the average annual cost has also been included.

Table 6-4: Modelled costs for kerbside services

Option	2022-23 ($/hhld)	2024-25 ($/hhld)	2027-28 ($/hhld)	2031-32 ($/hhld)	Average Annual Cost ($/hhld)	Total Cost of Option - 10 Years
2 Bin, WtE	$500	$488	$512	$558	$516	$74.9M
3 Bin FOGO, WtE	$500	$749	$610	$680	$616	$89.7M

The initial cost per household for the 3-bin system is higher than the cost per household in 2030 due to roll-out costs such as providing additional bins and the provision of kitchen caddies. These costs include the Better Bins grant funding already received from the Waste Authority.

Based on the inputs, a 3-bin FOGO system is more expensive than the 2-bin system. It is anticipated that the Shire's total costs over the 10-year modelled period would be $89.7M at an average cost of $616 per household per annum. The 2-bin system, which changes to residual waste to WtE in 2024/25 is likely to cost an average of $516 per household and a total of $74.9M over 10 years. This represents a $15 million total (or on average $100 per household per annum) difference between the two bin system options, which is significant.

Changes to the cost per household over the modelled 10-year period have been graphically represented in Figure 6-1. This modelling shows that the annual difference in costs between kerbside bins collection options widens each year.:

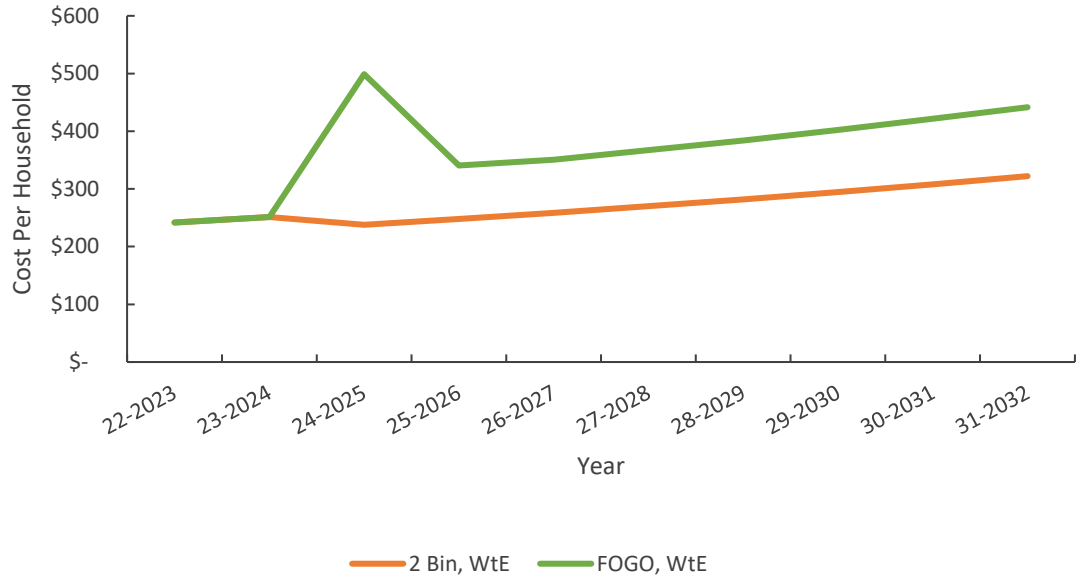

Figure 6-1: Cost per household over 10-years

Figure 6-1 shows that with a 3-bin FOGO system there is a spike in the average cost per household due to the capital costs applicable to the FOGO roll-out. In subsequent years, following the roll-out of FOGO, the cost per household remains higher due to the increased collection and processing costs applicable to the third FOGO bin and materials.

The model anticipates that in 2024-25, the Shire will commence sending residual waste to WtE. The results show a drop in the cost per household in a 2-bin system, demonstrating that sending residual waste to landfill is more expensive than sending it to WtE for the Shire. This is because the price for WtE processing secured by the Shire is lower than the landfill disposal fees. This illustrates that the landfill levy is achieving its aim of diverting materials to more favourable outcomes.

One of the main cost factors is the processing and disposal cost per tonne for FOGO material. The market for FOGO derived soil conditioner and therefore the gate fee in the Perth market has not been well tested. Transport potentially has a significant time and cost impact, so a conservative assumption of $140 per tonne has been assumed. It is possible that when put to market the cost could be lower, which would result in additional cost savings for a FOGO system.

The modelling shows that the costs associated with change to a 3-bin FOGO, WTE system are significant. The increase in costs therefore need to be considered against the environmental benefits of introducing FOGO in-line with the State Waste Strategy 2030.

7 Case Studies

As part of the feasibility assessment five Local Governments that currently provide a 3-Bin FOGO service to residents were engaged. The following section provides an overview of discussions with the City of Fremantle (Fremantle), the City of Melville (Melville), the City of Vincent (Vincent), Shire of Harvey (Harvey) and Town of Bassendean (Bassendean) on the property roll-out, bin infrastructure, contamination, processing, and resourcing considerations for transitioning to a 3-bin FOGO system.

Details in the sub-sections are based on the level of information provided by the Local Government during the phone survey.

7.1 Property Roll-out

Surveyed Local Governments restricted the initial roll-out of FOGO bins to certain properties for the reasons specified below:

Bassendean initially rolled out the FOGO service to residential properties with their own kerbside service (approximately 95% of properties). Commercial properties and properties sharing bins in multiple density dwellings (MDDs) were rolled out shortly afterwards. Bassendean engaged these properties with targeted education strategies and site visits for different groups. An opt in service was provided for commercial and MDDs who wanted to receive the FOGO bins ahead of the main roll-outs for those groups.

Harvey rolled out the FOGO service to all properties with a kerbside service. The only exemptions were for rural properties with no waste charge. Unit developments (duplex/triplexes) were provided with one FOGO bin for each unit. The Shire has emphasised the importance of notifying the community early and regularly with ongoing positive messaging for the first few months following the roll-out.

Vincent FOGO service was rolled out to all households as well as MDDs with up to 10 units (approximately 70% of properties). The remaining large MDDs (around 180 properties) were rolled out in the following few months as their services were more tailored and involved liaising with strata/property managers. Vincent does not provide waste services to commercial properties.

Fremantle FOGO service was only rolled out to single unit residential dwellings (approximately 85% of properties). To provide FOGO services to all properties, Fremantle now has an opt in service for FOGO bins and caddies to MDDs. Through this system, Fremantle now has approximately 99% of properties with FOGO services.

Melville implemented FOGO to 98% of properties. Retirement villages that could not be accessed by collection trucks were not included in the initial roll-out. Properties with walk-out and walk-in services consulted individually to determine service requirements. MDDs with shared services were sent a letter regarding the new service. Limited FOGO bins were provided to MDDs with shared services following commitment by householders to manage contamination levels. MDDs such as the Raffles Hotel were not included in the roll out due to space restrictions. It is now a requirement in Melville that new developments have a FOGO service and cater for space required to house bins in apartments and in the storage areas.

The property types that were included in the initial roll out for each location are listed in below in Table 7-1.

Table 7-1: Property Types Initial Roll-out

Local Government	Property Types Initial Roll-out	Exclusions
Fremantle	• SUDs Approximately 85% of properties	• MDDs*
Melville	• SUDs • MDD with sufficient space that were able to manage contamination provided shared FOGO bins Approximately 98% of properties	• Retirement villages with no access** • MDDs that weren't able to manage contamination with shared services • MDDs with space restrictions
Vincent	• SUDs • MDDs (less than 10 units) Approximately 70% of properties.	• MDDS (10 or more units)** • Commercial Properties
Harvey	• SUDs • MDDs (units and duplexes)	• Rural properties with no waste charge
Bassendean	• SUDs Approximately 95% of properties	• MDDs and Commercial properties**

** Opt in service implemented following initial roll out.*
***Service implemented shortly after initial roll-out. Opt in service provided for properties with initial roll-out.*

As the Shire does not have any MDDs, the roll-out of bins could be to all properties currently receiving the kerbside collection services.

7.2 Data

Each Local Government emphasised the importance of property data management in the lead up to the FOGO roll-out. A key learning from the FOGO roll out for Melville, Fremantle and Harvey was auditing internal property data to ensure that the property list was accurate prior to the roll-out. Bassendean had three full time waste team Officers review rates/property data in the months leading up to the roll-out to list the properties for the initial roll-out and the commercial and MDDs for the second stage of the roll out. Any properties with unclear data were also checked in person as Bassendean's old and inaccurate data made it difficult to differentiate between property types.

For ease of roll-out, the Shire will need to ensure that a list of properties is available in excel format, with unique property identifier, the street address and coordinates for the block that the new bin will need to be delivered to.

7.3 Resources

All five Local Governments required additional resources to assist with the FOGO roll-out. This detail along with ongoing resourcing is illustrated in Table 7-2 below.

Table 7-2: Additional Resources

Local Government	Additional Resources During Roll-out	Ongoing Resources
Fremantle	Part time Project Officer, 0.6 FTE Waste Education Officer, Media Team, Resource Recovery Group (RRG) Resources and GIS Staff for data improvements	1 FTE for waste education, 0.2 FTE for Coordinator (as part of existing role)
Melville	Website Development Officer (4 weeks), Marketing Officer (9 months), Two full-time Customer Service Officers, Project Officer (2 months) and Waste Education Officer.	Two full-time Customer Service Officers and Waste education officer
Vincent	One Admin Officer for customer support.	Waste Education Officer compiles a weekly FOGO Friday posts on Facebook and also has a FOGO webpage. Have implemented Bin Braille kits for visually impaired residents.
Harvey	Media Officer (3 months) GIS Officer (3 months) Administration Officer	Administration Officer
Bassendean	Four full-time Officers and four full-time EMRC Officers (3 weeks)	Had education support from EMRC and the Waste Sorted team at DWER to create stickers, additional flyer etc. EMRC has also been assisting with in person delivery of education on an on-going basis.

It is anticipated that the Shire will need to engage suitable personnel to assist with the initial roll-out. As per Section 6.1, the modelling was conducted on the assumption that the Shire would engage a GIS Officer for 3 months, a Marketing and Communications Officer for 6 months and an Administration Officer for 12 months. Additionally, a full-time Waste Education Officer was accounted for in the models on an ongoing basis from the year of the FOGO roll-out.

7.4 Contamination

There were varying rates of FOGO contamination experienced across all the Local Governments as per the information provided. Table 7-3 summarises the contamination rates estimated for each of the Local Governments including initially after the roll-out and then at a later stage when the system was fully operational.

Table 7-3: Contamination rates

Local Government	Initial Contamination	Contamination Post Roll-out
Fremantle	5%	Decreased – less than 2%
Melville	2.8%	Increased – 3.1%
Vincent	3%	Decreased
Harvey	1.9% - 2.9%	Decreased
Bassendean	16%	Decreased - 3.9%

Harvey's contamination rates were below 1.9 – 2.9% when FOGO was first rolled out, and over time rates have further decreased. This was attributable to the provision of caddies and postage of education material around what goes into each bin. To manage regular contamination, Harvey has opted to provide residents with further information and education rather than remove contaminated FOGO bins.

Bassendean contamination was initially around 16%, although within a few months had rapidly decreased to 8%. The Town's most recent audit in mid-2022 determined rates of 3.9%. Bassendean suggests being prepared to address contamination queries following the roll-out is an important requirement. Following the roll out Bassendean introduced the following contamination process:

- 1st incident – Contamination letter.
- 2nd incident – Contamination letter and suspension.
- 3rd incident – Bassendean officer visits resident to clear up any potential barriers.
- 4th incident – Few months suspension and increase to 240L residual waste bin. After suspension resident contacted to renew service.

Approximately 50 temporary suspensions out of 7,000 services have occurred after three contamination events. Two of the 50 suspensions were made permanent. Bassendean recommends commencing the contamination process at the start of the roll-out. In addition, Bassendean also conducts a compositional audit once per year along with bin tagging to assist in managing contamination.

Vincent bin tagging program in early 2022 saw improvements in the FOGO and recycling contamination rates. In January 2023, the contamination level was averaging approximately 3%, with non-compostable bags/plastics being one of the main issues.

Fremantle contamination rates were approximately 5% when FOGO was first rolled out, and over time this decreased to approximately 3%. Fremantle has not needed to remove any FOGO bins due to misuse, as educational measures and the staged roll out have had a positive impact.

Melville contamination rates were approximately 2.8% when FOGO was first rolled out. This was largely in part due to the trial that was conducted within selected areas. The trial received a lot of publicity and residents not part of the trial knew before-hand what to expect. The contamination level

has now increased slightly to 3.1%, most likely due to COVID leading to increased waste generation and misuse of bins. Melville has removed two FOGO bins from residents misusing them, following multiple bin tags and in person requests to remove contamination. An example of contamination at the RRG facility in Canning Vale is shown below in Figure 7-1.

Figure 7-1: Melville FOGO Contamination

7.5 Bin Infrastructure

With the exception of Harvey, each Local Government elected to use the standard bin sizes recommended in the FOGO Guidelines for the FOGO roll-out, consisting of 140L residual waste bin (new) and a 240L FOGO bin (new or lid replaced on current 240L residual waste bin bin). Harvey has maintained a 240L residual waste bin, which is emptied fortnightly and mentioned that this saved a lot of time handling customer concerns in relation to reduced bin capacity for residual waste.

Bassendean, Fremantle, Melville and Harvey chose to deliver new 240L FOGO bins, whilst Vincent either provided a new FOGO 240L bin or replaced the lid of the existing residual waste bin to a lime green FOGO lid. Replacing existing 240L bin stock was determined to be the best option by Melville, Fremantle and Bassendean as it was felt that bins were old and no longer in good condition. Bassendean also reported that different bin types had been used in the past which would have made bin lid changes difficult. Bassendean recommended conducting a bin stock audit on a collection day to determine the condition and make of each bin.

Vincent also carried out site visits/ pre roll-out audits which showed approximately 3,000 residual waste bins needed replacing. Old lids and bins were sent to CLAW Enviro for recycling. Vincent cited that communication was key to changing the lids as residents were required to leave their residual waste bins on the verge following collection so that the lids could be swapped.

Fremantle and Melville, along with the Town of East Fremantle, purchased new 140L residual waste bins and 240L FOGO bins together through the RRG, which allowed them to receive large discounts. Melville advised that lid changes would save costs significantly, although either lid replacements or new bins would be suitable and would also depend on the age of existing bin stocks.

All surveyed Local Government representatives suggested that although they had opted for new bins, use of existing 240L bin stock by changing lids is a good option to save roll-out costs. However, as above it is important to have a good understanding of the bin stock and have accurate property data to ensure that bin lid changes can be conducted seamlessly.

As per the requirements of the FOGO Guidelines, all five of the Local Governments provided kitchen caddies, compostable liners, and educational material as part of the roll-out. The Local Governments also provide at least 2 rolls of caddy liners at no charge to households annually. Some have introduced charges for additional rolls of caddy liners.

Figure 7-2: City of Vincent Kitchen Caddy and Education Material

Each Local Government had slightly different approaches to managing residents' concerns with the change from a 240L residual waste bin collected weekly to a 140L residual waste bin collected fortnightly.

As mentioned above, Harvey chose to maintain a 240L bin for residual waste. This meant that Harvey only issued a new 240L FOGO bin with kitchen caddies and bin liners to new properties.

Bassendean offered to provide all concerned residents with the option to have a 240L residual waste bin, however this was with an additional charge. Bassendean also introduced a compassionate waste policy where a resident who has a medical condition that produces more waste could have a larger or additional bin at no additional charge.

Melville and Fremantle provided residents with the option to upgrade to a 240L residual waste bin or have an additional 140L residual waste bin (Melville only); however, this upgrade was only for residents with a genuine need. Bin audits were carried out to assist in determining if there was a genuine need for increased service capacity. Fremantle initially offered the upgrade at no additional cost to residents following the bin audit, however a charge of $36.70 now applies to all upgrades with the audit system no longer in place. Fremantle has since reported a decrease in upgrade requests.

Vincent sent out letters and fact sheets to concerned residents, which addressed the additional 70L capacity that would be provided with the FOGO service. Vincent also used this opportunity to further engage with residents and address any concerns for the new organics systems and perceived decrease in capacity. Charges have been introduced for upgrades to a larger 240L bin for waste or an additional 140L bin for waste. There are also charges in place for additional FOGO collections.

The bin infrastructure for each Local Government has been summarised in Table 7-4.

Table 7-4: Bin infrastructure

Local Government	FOGO Bin	Residual waste Bin	Upgrades
Harvey	240L (new)	Existing 240L	Not applicable
Bassendean	240L (new)	140L (new)	240L Residual waste Bin – Charge applicable
Vincent	240L (new or repurposed with lid change)	140L (new)	240L Residual waste Bin or additional 140L Residual waste bin - Charge applicable
Fremantle	240L (new)	140L (new)	240L Residual waste Bin – Free after initial roll out for genuine cases following audit. Charge now applies to all requests
Melville	240L (new)	140L (new)	Additional 140L Residual waste bin or 240L Residual waste Bin to Residents with genuine need for larger bin – No charge applicable

7.6 FOGO Processing

Processing of FOGO is an important element of the 3 bin FOGO system. It is essential to set in place contracts for processing FOGO. This section highlights processes in place for the Local Governments assessed.

FOGO from Harvey is currently sent for processing to the Bunbury Harvey Regional Council Banksia Road Organic Facility. FOGO material is initially screened by litter pickers who remove visible contamination and large, oversized garden waste. There have been several issues with FOGO processing including contamination not being removed adequately, supply levels not being sufficient and consistent, transport costs to deliver FOGO derived composts and the product quality.

Bassendean's FOGO is sent to Eastern Metropolitan Regional Council's (EMRC) Red Hill FOGO Facility. At various times, the contamination has caused issues with the end use of the final product. This is mostly due to glass and plastic not being able to be screened out effectively. Bassendean's agreement with EMRC does not include extra charges for contaminated loads and as such there was no penalty.

Vincent's FOGO is delivered to the Western Metropolitan Regional Council's transfer station in Shenton Park where it has an initial manual screen for contamination. It is then bulk hauled to Purearth to undergo the composting process. The mature FOGO is made into soil conditioners and potting mix.

Fremantle's and Melville's FOGO is sent to the RRG facility in Canning Vale for an initial screen, removal of large branches (greater than 40mm and 20mm branches) and contamination. The materials are then taken to Purearth and Garden Organics for processing. There have been no issues reported in relation to the processing. The final compost product is good quality and blended with other soils, containing up to 35% FOGO content. Bags of compost from Garden Organics are being sold at the Fremantle Recycling Centre.

8 Organics Processing Assessment

This section details the current and future organics processors located in and surrounding Perth and Peel and their anticipated capacity compared against the projected volumes of organic waste from domestic and commercial sources.

8.1 Methodology

A list of the existing organics processors was formed using the available online licence data from DWER, incorporating only facilities that are classified as category 67A prescribed premises[14]. These facilities are described as "compost manufacturing and soil blending", and generate the products used in the markets reviewed in Section 9. Only processors which are licensed to accept domestic FOGO material have been included in the review to avoid overstating the processing capacity available.

Only processors located in Perth, Peel, or the Wheatbelt that currently service Perth and Peel have been included as contributing processing capacity. This is due to facilities in other regions being unlikely to process FOGO waste originating from Perth and Peel due to the significant distance and associated transportation costs. The licence data has been used to determine FOGO processing capacity for these facilities, stating their waste acceptance limit for FOGO where the data was available. If this data was not available, the total licence capacity for the category 67A operations of the facility was used and assumed suitable to process FOGO material.

The works approvals for category 67A facilities that are available from the DWER website (as of December 2022), were used to determine the potential future facilities and their processing capacity. In addition to this, Talis has utilised industry knowledge to determine other facilities that may be able to process additional FOGO material in the future. It is important to note that these facilities may or may not become operational in the next ten years and their estimated opening dates are not certain. They have been included to allow a more comprehensive discussion on future processing capacity.

The results of the information gathered has been used to determine the organics processing capacity available to Perth and Peel until 2030. As licence renewal is common and licence expiry rarely reflects when a facility will close, it was assumed that all current FOGO processing facilities and facilities in a works approval stage will remain in operation until 2030.

8.2 Organics Processing Technologies

On a commercial scale, there are four main types of composting systems. These include open windrow composting, aerated static pile composting, in-vessel composting and anerobic digestion. These systems have been summarised below.

8.2.1 Open Windrow Composting

Open windrow is an extremely common and simple method of processing organics. It consists of large piles, or windrows, of organic material that are left to compost for up to 12 weeks, with only regular turning required to complete the process. A large amount of space is required to accommodate this

[14] Department of Water and Environmental Regulation (December 2022)

processing technology, and sites should be located away from residential areas due to the odour produced[15]. Open windrow can accept both food and garden organics as input material.

This process is more tolerant to contaminants than other processing technologies, however high levels of contamination impact the quality of the product, and consequently the markets that can accept it. The main product, compost, can be used in all markets depending on the quality of the product.

The main risk associated with open windrow composting, apart from odour, is leachate runoff and the potential contamination of surface water. It is typically managed by a requirement for facilities to compost on a pad made from impermeable material such as concrete, and to direct runoff to a storage pond[15].

8.2.2 Aerated Static Pile Composting

Aerated static pile composting is very similar to open windrow composting; the only difference is the method of aeration. The windrows are on top of a perforated pipe that forces air through the pile, which achieves aeration without the need for turning. Sensors can also be installed to automatically aerate the pile when the appropriate temperature and moisture levels are detected. This technology also requires a large amount of space, should be sited away from urban areas, and can accept both food and garden organics[15].

The contamination tolerance of aerated static pile composting is comparable to open windrow composting. It is an appropriate technology where higher levels of contamination restrict the markets that will accept the product. Compost is the main product resulting from this technology, and it can be utilised in most markets, depending on the quality.

This technology has similar issues with odour and leachate runoff as open windrow composting and is subject to the same management requirements. The windrows can also be covered, which reduces the amount of leachate produced and can help to suppress odours[15].

8.2.3 In-vessel Composting

In-vessel composting involves the composting of material in an enclosed container or building, which results in the material being processed much faster. The two methods of in-vessel composting are plug flow or agitated bed systems. Plug flow systems operate similarly to windrow composting in that fresh material is continuously added, and processed material is regularly removed. Agitated bed systems mix the material to reduce odours and the processing time, but no material can be added until the previous batch has been processed[15]. This technology requires far less space than windrow composting and can be located closer to urban areas if odour is managed correctly. Both food and garden organics are acceptable inputs for in-vessel composting.

The contamination tolerance of in-vessel composting differs depending on the specific process used. Some processes have high contamination tolerance whereas others, such as anaerobic digestion, are far more sensitive to large amounts of contaminants. The main product is typically compost, which again can be used in a variety of markets, depending on quality.

[15] Sustainability Victoria (2018)

Unlike windrow composting, there are few issues with odour and leachate runoff with this technology, however odour is always an issue that must be appropriately managed. Air is removed throughout the process and is often treated with a bio-filter to reduce odours. Additionally, in-vessel composting does not always completely decompose or pasteurise the waste. This means that additional processing in windrows may be necessary even after the in-vessel process is complete, making this processing method somewhat dependant on other technologies being available[15].

8.2.4 Anaerobic Digestion

Anaerobic digestion (AD) is a form of in-vessel composting and uses the absence of oxygen to processes organic material. There are two main types of AD, wet and dry. Wet AD is better suited for feedstock with high moisture content such as food organics, and dry AD is better suited for materials containing less moisture, such as garden organics or mixed FOGO. AD can utilise a batch method, more common for dry AD, or a continuous flow method, more common for wet AD[16]. The space required for AD is less than that required by windrow composting, but care must be taken when building an AD facility as odour can be an issue when one is located too close to residential properties.

The contamination tolerance of anaerobic digestion is lower than that of windrow processes, and there may be issues when accepting domestic food waste that includes the presence of inorganic materials and chemical contaminants. There are two products formed through AD, digestate and biogas. Digestate is a soil conditioner that can be in either a solid or liquid form, and biogas is a fuel source that can be used to generate electricity. The digestate is most often sold to the agricultural market, whereas the biogas can be used as a fuel source or to generate electricity the offtake (gas or power) can be used by the facility itself, a third party or electricity sold to the grid[15].

Apart from odour, the main challenge of AD is the complexity of the process, and variables such as oxygen and contamination must be closely and constantly monitored. The material collected from a 3-bin kerbside system may not be suitable for AD as it is not typically suited to process combined FOGO material. This technology may need further development or source separation to effectively process domestic FOGO wastes.

8.3 Current Processors

According to licence data publicly available online[14], there are currently nine Licenced FOGO processors in or around the Perth, Peel and Wheatbelt regions. Processors that are not licenced to accept FOGO material have been excluded for the purposes of this review. Where the information was available, the licence capacity for each facility details the specific capacity for FOGO feedstock, rather than the facility's overall licenced capacity as a composter.

There are currently nine processors that are licenced to accept FOGO material within or near the Perth metropolitan area. Together, they have a total licenced capacity of 274,000 tonnes per annum. However, five licenced FOGO processors have been excluded for the purposes of this review for the following reasons:

- The Atlas Composting Facility licenced capacity represents the overall capacity of the facility, as no specific limit on FOGO acceptance is available. The Atlas facility used to accept the

[16] Green Industries SA (2021)

organic materials extracted from the City of Stirling's one bin system which ceased in 2015 when it transitioned to a three bin (GO) system. The facility has not accepted any waste since then. Talis is unaware if Atlas has plans to enter the FOGO processing market.

- The Richgro anaerobic digestor in Jandakot is known to receive source separated FO from selected sources within the Commercial and Industrial (C&I) sector. The facility does not intend to receive and process kerbside collected FOGO waste as the GO component can present problems to the AD process.
- The Richgro facilty in Nowergup is too small to accept FOGO from Local Government Authorities (LGAs).
- The Regional Resource Recovery Centre (RRRC) in Canning Vale is owned by the Resource Recovery Group (previously the Southern Metropolitan Regional Council [SMRC]). The facility currently accepts FOGO for pre-processing before the material is transferred to Purearth or Garden Organics for composting. The RRRC is a historical Bedminster facility that extracted the organic element of kerbside residual waste collections. However, that operation ceased several years ago. The RRG has indicated that it may resume composting operations, however the equipment and facility would need to be refurbished, which could take a significant time to deliver (potentially 2 years). With work approvals for increased processing capacity the RRRC facility will have a total licence capacity of $120,000 tonnes per annum.
- The Western Metropolitan Regional Council (WMRC) operate the Brockwaste facility in Shenton Park. The licence allows the WMRC to process up to 60,500 tonnes per annum including FOGO and residual waste. The anaerobic digestion facility is currently not operational and residual waste is transferred to other destinations. GO and FOGO from participating member Local Governments is currently taken to the facility for transfer to the final composting facility.

Table 8-1 details the location, processing technology, and licence capacity of each licenced FOGO processor excluded from the review.

Table 8-1: Excluded FOGO processing facilities

Facility Name	Region	Local Government	Processing Technology	Licenced Capacity (TPA)
Richgro Nowergup (Amazon Soils & Landscaping Supplies Previously)	Perth	Wanneroo	Open Windrow	500
Richgro Garden Products	Perth	Cockburn	Anaerobic Digestion	10,000
Atlas Composting Facility	Wheatbelt	Victoria Plains	Open Windrow	50,000
RRG RRRC Facility	Perth	Canning	Screening and transfer	120,000
WMRC Brockwaste Facility	Perth	Nedlands	Anaerobic Digestion/ Screen and transfer	60,500

Excluding the above licenced FOGO processors, results in four FOGO processors for consideration in the current FOGO capacity assessment. Based on current data on licence capacities, the four FOGO processors can accept a total of 33,000 tonnes of FOGO per annum. Table 8-2 details the location, processing technology, and licence capacity of each remaining FOGO processor.

Table 8-2: Included FOGO processing facilities

Facility Name	Region	Local Government	Processing Technology	Licenced Capacity (TPA)
Red Hill Waste Management Facility	Perth	Swan	Aerated Static Pile	10,000
GO Organics	Wheatbelt	Gingin	Open Windrow	8,000
North Bannister Waste Facility	Wheatbelt	Boddington	Aerated Static Pile	10,000
Purearth Woottating Facility	Wheatbelt	Northam	Aerated Static Pile	5,000

The Eastern Metropolitan Regional Council (EMRC) operated Red Hill facility is licensed to accept 10,000 tonnes per annum and predominantly produce soil conditioners and compost. The products are then typically used in the urban amenity market with a portion of their products being sold to the public.

Three processors are located in the Wheatbelt, possessing a combined licence capacity of 23,000 tonnes. These include the GO Organics in Gingin, the Veolia operated North Bannister site and Purearth in Woottating. Domestic FOGO waste is the majority of the feedstock for these facilities, and each facility uses it to produce compost. Both GO Organics and Purearth produce mulch and fertiliser in addition to compost. The products from all three facilities are used in the agricultural market. As with the processor in Perth, some of GO Organics and Purearth products are sent for retail sale, which include up to 35% of FOGO derived materials.

8.4 Future Processing Operations

There is currently one works approval for a new FOGO facility near Perth and Peel. In addition to this, there are facilities and operators that have either expressed interest in or have the potential to process additional FOGO material in the future. These facilities and their anticipated capacity are discussed below. As some facilities are already operating, only the additional processing capacity for each expansion is included in Table 8-3.

Table 8-3: Potential future FOGO processing facilities

Facility Name	Region	Local Government	Processing Technology	Additional Capacity
Red Hill Waste Management Facility	Perth	Swan	Aerated Static Pile	140,000
Resource Recovery Facility (RRF)	Perth	Wanneroo	Unknown	110,000
North Bannister Waste Facility	Wheatbelt	Boddington	Aerated Static Pile	90,000
C-Wise FOGO Facility	Peel	Murray	Aerated Static Pile	100,000

The North Bannister Waste Facility is the only FOGO processor near Perth and Peel with a works approval. The work approval report is to increase the facilities FOGO processing ability from 10,000 to 100,000 tonnes per annum. Talis is of the understanding that the construction works for this facility is currently underway and should be completed in the near future. Therefore, it has been assumed that the North Bannister facility will be operational by the 2025 interval in the model. The facility will further accept municipal and commercial organic waste and continue to produce compost. The anticipated markets for the increased number of products likely the agriculture and public sector.

Recognising the lack of potential FOGO processing capacity, Talis has undertaken modelling on potential facilities to understand their impact on processing capacity. There are two existing facilities that have the potential to provide a large amount of FOGO processing capacity: the Red Hill Waste Management Facility and the Neerabup Resource Recovery Facility (RRF). Due to the extensive work involved in building or repurposing these facilities into FOGO processors, it is assumed that these facilities will not be in operation until at least 2025. It should also be noted that it is currently unclear whether these facilities will become operational, as none of them are committed projects at this stage. Regardless, these have been included within this study to understand their potential impact on the processing capacity within Perth and Peel.

The EMRC is currently operating its temporary FOGO facility at Red Hill with a tonnage capacity of 10,000 tonnes per annum. The EMRC has obtained approval from the EPA for the construction of a permanent FOGO facility with a capacity range of up to 150,000 tonnes per annum. In 2021, the EMRC commenced a procurement process for the permanent FOGO facility. Talis is of the understanding that the EMRC have not entered into a contract for the permanent FOGO facility at this stage and are looking to retender these works in the near future. With the potential for significant demand for FOGO processing services in the future, it is anticipated that the permanent FOGO facility will be delivered in the coming years.

The RRF is owned by the Mindarie Regional Council (MRC) and originally processed the organic fraction of kerbside residual waste collections. Recently, MRC and Suez agreed to terminate their processing agreement for the facility. This presents an opportunity for the facility to be repurposed into a FOGO processing facility, which MRC is currently investigating. If the facility becomes operational it has been assumed the licenced capacity will remain the same, providing an additional 110,000 tonnes of FOGO capacity.

C-Wise currently operate a GO processing facility in Nambeelup and are looking to expand their operation and process FOGO. It is understood that C-Wise will be seeking approval to allow the facility to process 100,000 tonnes of FOGO per annum.

8.5 Forecast FOGO Capacity

This section outlines the forecast organics processing capacity that may be available to the Perth and Peel regions up to and including 2030. As per the explanation in the previous sections, the capacities for some facilities have been excluded. For the facilities included, their total licenced capacity has been considered as part of the analysis. As part of this analysis, Perth and Peel domestic FOGO waste has been examined. Table 8-4 shows the amount of kerbside domestic FOGO waste generated in Perth and Peel in 2020-21, along with estimated available FOGO from all LGAs committed and/or transitioning to FOGO and the estimated FOGO of all Perth and Peel LGA[5].

As per the Waste Authority website, Local Governments participating in Better Bins Plus: Go FOGO program are:

- the cities of Albany, Bayswater, Belmont, Bunbury, Fremantle, Kalamunda, Melville, Nedlands, Subiaco, Swan and Vincent
- the shires of Augusta-Margaret River, Collie, Dardanup, Esperance, Harvey, Mundaring and Serpentine-Jarrahdale
- the towns of Bassendean, Claremont, Cottesloe, East Fremantle and Mosman Park

Local Governments delivering FOGO services but not currently participating in Better Bins Plus: Go FOGO program are:

- the shires of Capel and Donnybrook-Balingup.

Table 8-4: Values used in organics processing capacity assessment

Key input	Value Used	Source
Domestic FOGO generated in Perth and Peel (2020-21)	32,537	Domestic Waste and Recycling Dashboard 2020-21[17]
Domestic estimated available FOGO from all committed LGAs (2020-21)	79,883	Talis value derived from the Domestic Waste and Recycling Dashboard 2020-21[17]
Domestic estimated available FOGO from all Perth and Peel LGAs	240,172	Talis value derived from the Domestic Waste and Recycling Dashboard 2020-21
FO capture rate from residual waste stream	75%	Talis Value
GO capture rate from residual waste stream	80%	Talis Value

Based on these inputs from Table 8-4 and the current and future processing capacities, Figure 8-1 has been generated to show the current MSW generated FOGO tonnages against the available current

[17] Waste Authority WA Dashboard (2022)

licence capacities, in 2025 and in 2030. The above domestic tonnages include the incidental FOGO waste collected from commercial businesses within the participating Local Governments.

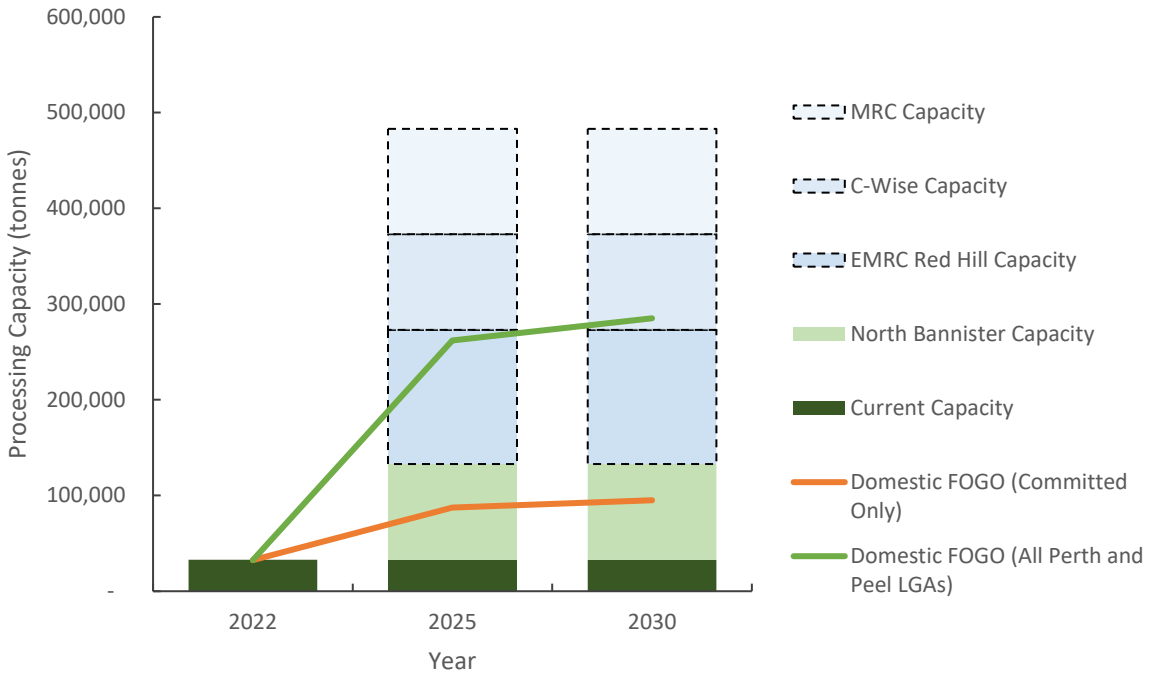

Figure 8-1: Domestic FOGO Processing Capacity

Figure 8-1 demonstrates that there is insufficient capacity available within the currently licenced processing facilities to process the FOGO material anticipated to be generated by all LGAs in Perth and Peel. The results suggest that if the Veolia North Bannister facility, which currently holds a works approval, were to become operational, there would be sufficient processing capacity for the domestic FOGO generated by the Local Governments committed and/or transitioning to a FOGO system. The Red Hill Waste Management Facility has the potential to offer an additional 140,000 tonnes of FOGO processing capacity, which as demonstrated in Figure 8-1, would provide sufficient additional capacity to allow all of the FOGO expected to be generated by all LGAs in Perth and Peel to be processed at an appropriate facility in 2025. By 2030, the additional capacity offered by the expansion of the Red Hill Waste Management Facility's operations would be insufficient to allow all of the anticipated domestic FOGO to be processed. An additional approximately 2,000 tonnes of processing capacity would be required.

If only one potential future FOGO processing facility became operational, the additional capacity that could potentially be offered by the RRF or the C-Wise FOGO facility would be insufficient to process all FOGO material anticipated to be generated if all LGAs in Perth and Peel provided a FOGO system. This demonstrates a severe lack of existing and planned capacity and means that there is limited contingency if one or more facilities become non-operational for a period of time.

It is also important to note that the delivery of FOGO processing facilities, including the design, procurement, approval and construction stages, can be a complex and time-intensive process. The delivery of the potential FOGO processing facilities outlined in Table 8-3 by 2025 is therefore, while possible, considered to be optimistic. These challenges highlight that any delays to the potential FOGO processing facilities may impact the ability to achieve the State Waste Strategy 2030 targets due to an inability to process the FOGO materials expected to be generated if all LGAs in Perth and Peel provided a FOGO system.

Further supporting the results of the Organics Processing Assessment, the Australian Organics Recycling Association (AORA) undertook an assessment of the processing capacity for FOGO waste in Australia, including a separate analysis for each State. The report states that there is a processing capacity deficit compared to the capacity required to achieve a 70% material recovery rate. Recognising that the majority of WA's population resides in the Perth and Peel regions which therefore generate the majority of the State's waste, it is considered that AORA's statement relates strongly to these regions.

8.5.1 Perth and Peel Commercial Waste

As part of this analysis, commercial FOGO waste has also been examined to understand the impacts of additional FOGO material on processing capacity. Table 8-5 shows the values from the Waste Authority Recycling Dashboard[18] 2020-21(Dashboard) and the Waste and Recycling in Western Australia 2020- 21 (WRWA) report[19] that have been used to determine the amount of commercial FOGO from Perth and Peel available for processing each year.

The Dashboard shows the amount of commercial waste recovered by waste type in 2020-21 and the WRMA illustrates the proportion of commercial waste recovered by waste type in 2020-21. The commercial organic material recovered in Perth and Peel is shown in Table 8-5, along with the reported commercial recovery rates of all the FO material generated.

Table 8-5: Values applied in commercial waste generation calculations

Key Input	Value Used
Commercial FO recovered in Perth and Peel (2020-21)	13,521
Commercial food organics recovery rate (2020-21)	6%

The commercial 'food organics' recovery rate was assumed to apply to the FO material type only. Based on these values, the calculated tonnes of commercial FO generated is shown in Table 8-6. Table 8-6 also includes the assumed average capture rates.

Table 8-6: Value used in the FOGO processing capacity assessment

Key Input	Value Used	Source
Total commercial FO generated in Perth and Peel (2020-21)	225,350	Estimate based on WAWR[19], Recycling Dashboard[18]
Average commercial organics capture rate (2021-22 onwards)	25%	Talis value

To determine the volume of commercial organics generated in Perth and Peel up to and including 2030, the same method as discussed in Section 4.3 was used. Population growth rates are considered to be a reasonable method of calculating growth in waste generation for the commercial stream.

[18] Waste Authority WA Dashboard (2022)
[19] Waste Authority WA Report (2022)

For the purpose of the capacity analysis with commercial tonnages, the capacity of the Richgro Cockburn facility was included, which currently processes FO waste from commercial sources. The results of the combined domestic and commercial tonnages are shown in Figure 8-2.

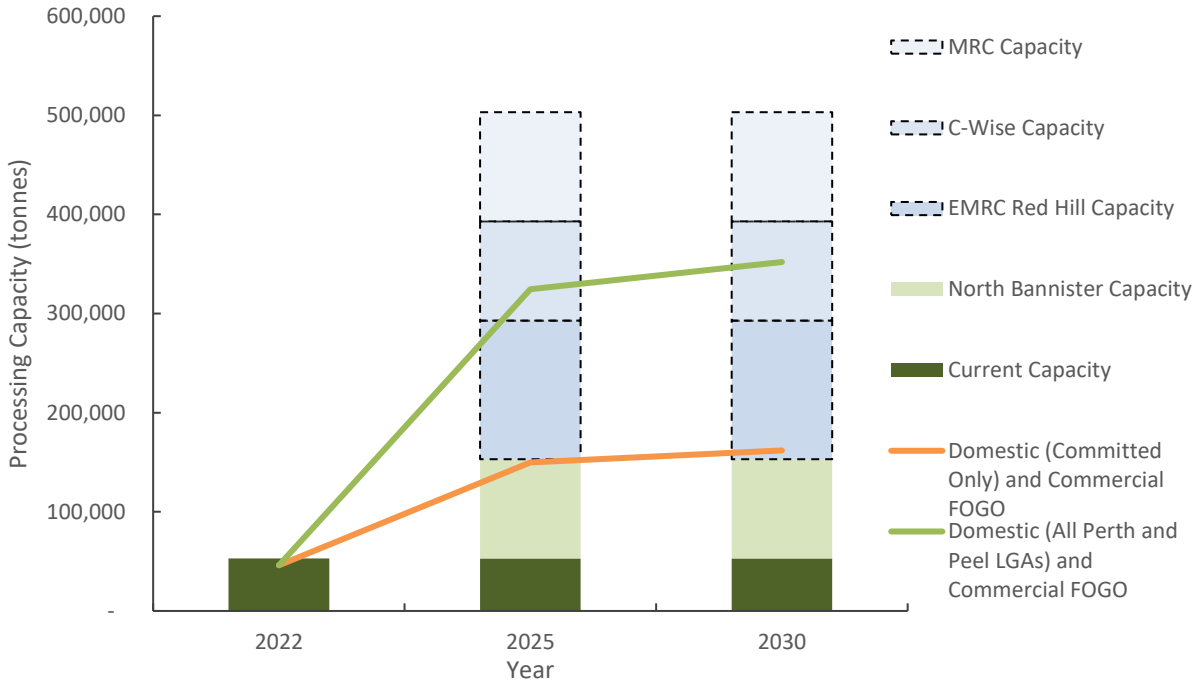

Figure 8-2: FOGO processing capacity - Commercial and domestic FOGO

The results suggest that, when both commercial and domestic FOGO is considered, there is sufficient capacity within the existing facilities and those with works approvals for the committed and/or transitioning LGAs to provide a FOGO system in 2025 only. By 2030, the results suggest that there will be insufficient capacity to accept the anticipated volumes of domestic and commercial FOGO demonstrated if only the committed and/or transitioning LGAs provided a FOGO system.

This further emphasises the requirement for up to two of the potential FOGO processing facilities to become operational to ensure there is sufficient capacity to recover both the domestic and commercial tonnages anticipated to be generated. As previously stated, Talis believes that it would be optimistic to assume that these facilities will be operational by 2025 due to the significant works, hurdles and timeframes associated with their delivery.

9 Market Review

A review of the current markets for recycled organics products was undertaken to determine the likely markets for the products generated from FOGO, should Perth and Peel provide a 3-bin FOGO service to residents. This review considers the market for compost only and does not examine the market for other potential products, such as mulch or electricity. This is because most recycled organics products are compost which represents the largest proportion of the products resulting from a 3-bin FOGO system. Recently published reports were used to determine the four main markets for compost, as well as potential barriers to the marketability of these products.

To determine the amount of market available, Talis utilised a model that has been used in previous market assessment works. The formula shown below was used to calculate the available market.

$$Eqn.\,1 \qquad Estimated\ \text{Potential}\ Market\ Volume = (a_v \times A_T) \times \frac{R}{t}$$

Where:

- a_v is the percentage of the land available for recycled organics application;
- A_T is the total land available in hectares;
- R is the estimated rate of application in tonnes per hectare; and
- t is the number of years between application.

Spatial data obtained from the Australian Collaborative Land Use and Management Program (ACLUMP)[20] was used to determine the amount of land available, according to land use, for the application of recycled organics products. Application rates were gathered from a review of typical and recommended compost application rates and are shown in Table 9-1.

Table 9-1: Values applied in market assessment

Market	Market Sub-category	Value (t/ha)	Source
Urban Amenity	Local Government	168	GHD[21]
Extensive Agriculture	Cropping	21	Department of Agriculture and Food WA[22]
Extensive Agriculture	Pasture	3	Compost for Soils[23]
Intensive Agriculture	Horticulture	7.5	Applied Horticultural Research[24]
Intensive Agriculture	Turf	50	Compost for Soils[25]

[20] Department of Agriculture, Fisheries and Forestry (2022)
[21] GHD (2006)
[22] Department of Agriculture and Food WA (2008)
[23] Compost for Soils (2012)
[24] Applied Horticultural Research (2022)
[25] Compost for Soils (2011)

Market	Market Sub-category	Value (t/ha)	Source
Intensive Agriculture	Vineyard	70	Department of Agriculture and Food WA[22]
Rehabilitation	Rehabilitation	76	Department of Environment and Climate Change NSW[26]

The average application rate for each market was obtained from the application rates for that market's sub-categories. Intensive and extensive agriculture have been calculated separately but have been displayed together as 'agriculture' in the results for discussion purposes as they have similar compost quality requirements. The average applications rates are shown in Table 9-2, as well as the other values used to calculate the available market. The values have been assumed by Talis and are not obtained from a desktop review.

Table 9-2: Key assumptions for market assessment

Market	a_v – Available Land (%)	R – Application Rate (t/ha)	t – Applications (per year)	M – Market Potential (%)
Urban Amenity	10%	168	1	5%
Extensive Agriculture	10%	12	1	5%
Intensive Agriculture	10%	42.5	1	5%
Rehabilitation	10%	76	1	5%

The value 'M' has been applied to calculate the market penetration of recycled organics compost, as it is unlikely that this product will be used in 100% of the market. Other products such as fertilisers, mulch, soil conditioners, are unlikely to be replaced by recycled organics compost, particularly if FOGO-derived products may have issues with contamination.

As organic material loses mass through moisture loss as it is processed, the amount of compost produced is less than the amount of material collected. A moisture loss of 30% was applied to the input material when calculating the volume of compost produced, as Talis understands that this is an industry standard value. The available market has been compared against the expected amount of domestic and commercial FOGO material collected in a scenario where every Local Government in Perth and Peel provides a FOGO service. The projected amount of commercial FOGO produced has been increased according to the average population growth rates for Perth and Peel each year, determined using the methodology in Section 4.3.

The land use assessment included the Perth and Peel regions and was extended 100km and 200km from their respective borders. Figure 9-1shows the land uses 100km from Perth and Peel.

[26] Department of Environment and Climate Change NSW (2008)

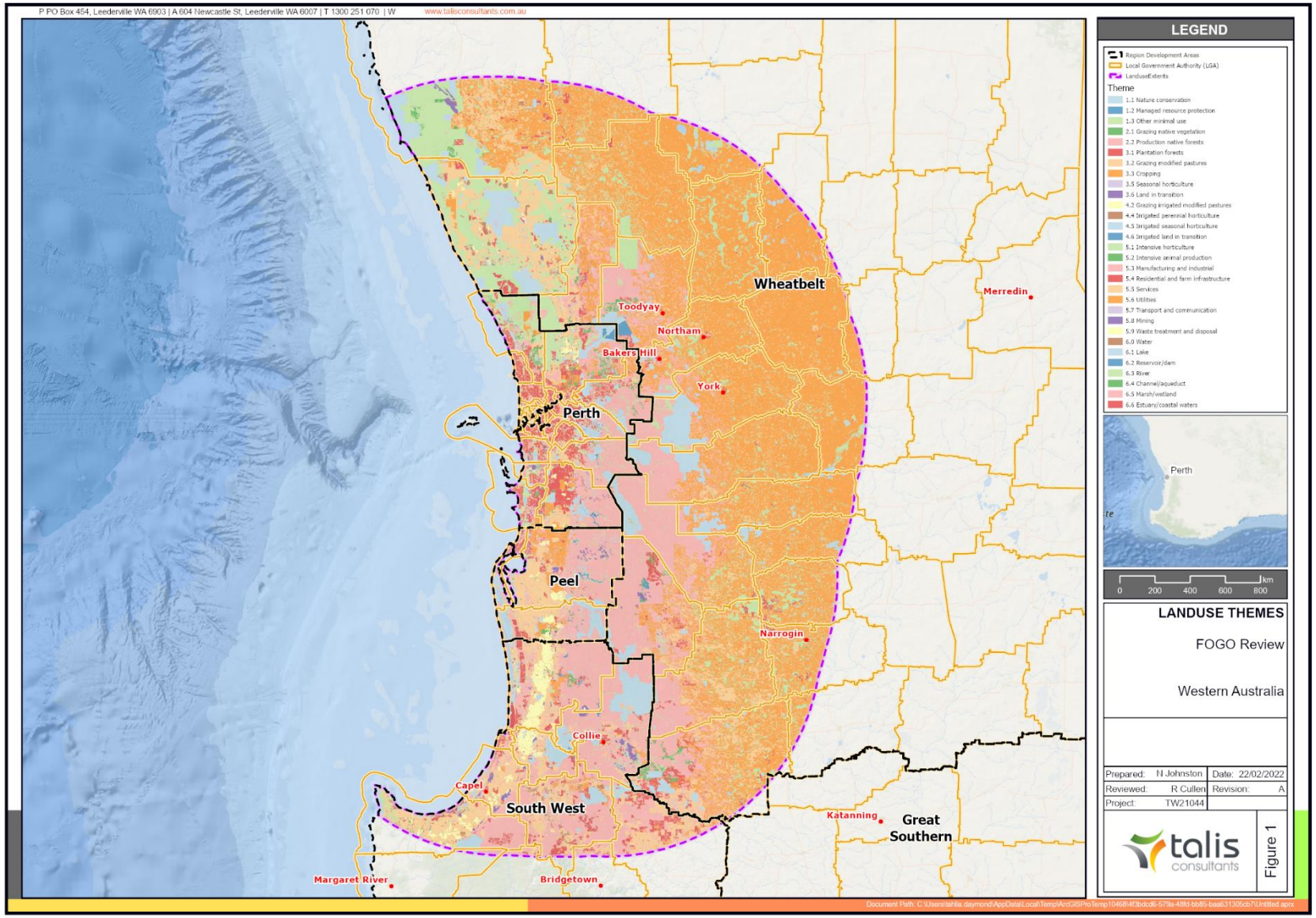

Figure 9-1: Land uses within 100km of Perth and Peel

9.1 Current Markets

In 2020-21, 6.5 million tonnes of recycled organics products were sold in Australia within four main markets:

- Urban amenity;
- Agriculture;
- Rehabilitation; and
- Environmental remediation.

These markets represent a total of 85%, or 5.5 million tonnes, of recycled organic product sales[27] .

9.1.1 Urban Amenity Market

The urban amenity market currently takes over half (52.5%) of all recycled organics products[27], and uses them in areas such as:

- Parks and gardens management;
- Landscaping;
- Retail nursery; and
- Construction projects.

Urban amenity can make use of the most common recycled organics products, such as composts, mulches, and soil conditioners. Other products such as biochar are also occasionally used in urban amenity. The quality of products used in urban amenity is less than those used in agriculture, but generally is of a higher quality than the products used for rehabilitation and remediation.

While products used in urban amenity can contain higher levels of contamination than products used in agriculture, the concentration of one particular contaminant, PFAS, is strictly regulated in urban soils. PFAS can be found in pesticides and herbicides, food packaging, and non-stick cookware[28], and does not easily break down. Accordingly, there may be issues with contamination, which will impact the use of recycled organics products in urban amenity.

9.1.2 Agricultural Market

The agricultural market is diverse and represents one-quarter (26.2%) of sales for recycled organics products[27]. It is split into two types of agriculture and their submarkets:

- Intensive agriculture:
  - Viticulture;
  - Vegetable production;
  - Fruit and orchards;

[27] Australian Organics Recycling Association (2021)
[28] Department of Defence (2021)

    - Turf production;
    - Nursery production;
    - Wholesaling;
- Extensive agriculture:
    - Pasture production;
    - Broadacre cropping; and
    - Forestry.

Like urban amenity, agriculture can make use of the most common products such as composts and mulches. The digestate produced by AD can be used in agriculture, and the market may also find use in biochar. The quality of the products used in agriculture is typically high, particularly for fruit and vegetable production, due to quality management regulations.

The contamination tolerance of agricultural markets is the lowest of the four, due to the strict quality management regulations. Contamination must be carefully managed to ensure products made from domestic FOGO material is suitable for use in agriculture.

9.1.3 Rehabilitation Market

The market for rehabilitation is the smallest of the main four at only 2.3%[27], and includes:

- Landfill cover;
- Erosion stabilisation;
- Land reclamation;
- Restoration;
- Revegetation; and
- Rectification.

Rehabilitation can make use of a wide variety of recycled organics products and has very relaxed quality requirements compared to the urban amenity and agricultural markets. It's not uncommon for products that can't be sold in other markets to be used for rehabilitation purposes.

The products used in rehabilitation have the highest contamination tolerance of the four main markets, meaning that there is a market for some of the more contaminated recycled organics products.

9.1.4 Environmental Remediation Market

The environmental remediation market comprises 4.1%[27] of recycled organic products and involves:

- Contaminated site and soils remediation;
- Water purification; and
- Biofiltration uses.

The recycled organic products used in remediation are usually compost and mulch, as they contain nutrients and microbes that assist with remediation. Like rehabilitation, the quality of the products used in remediation does not have to be particularly high.

As it is unlikely for contamination to impact the bioremediation process, this market has a high contamination tolerance, particularly for materials such as glass and plastic[29]. Products that are unsuitable for use in urban amenity or agriculture may be able to find use in the remediation market.

9.2 Market Barriers

The Australian Organics Recycling Industry Association (AORA) conducted a survey in late 2020 (AORA Survey) to determine the biggest issues facing the growth of the recycled organics industry[27]. The survey identified contamination and government policy as the biggest barriers to growth.

These barriers will impact the amount of product that can be sold to each market and are important to consider when reviewing the potential market for recycled organics products.

9.2.1 Contamination

Contamination of organic material is a concern when implementing a 3-bin system, particularly a FOGO system as levels of contamination as high as nearly 18% were reported in an NSW FOGO trial study[30]. Contamination this high was uncommon however and represented a small proportion of bins; the average amount of contamination was 2.2% in the study.

The acceptable amount of contamination varies depending on the market. The agricultural market demands the lowest levels of contamination, whereas more contaminated products may be able to be used in rehabilitation or restoration. The voluntary AS4454 standards for recycled organics products states that contamination by physical impurities, such as glass and rigid plastics, must be below 0.5%[8]. This does not mean that kerbside contamination must be as low as 0.5% however, as processors can reduce contamination. Processors can remove up to 95% of contamination, which means ideal levels of kerbside FOGO contamination will be below 3%[31]. Processor can also blend FOGO materials which have higher contamination rates with cleaner streams to deal with contamination requirements in final products.

High levels of contamination may also impact the marketability of a FOGO product. Low quality products entering the market may reduce consumer confidence in recycled organics products and lead to a reduced ability to sell products. Recycled organics compost prices may range from $25-$50 per tonne[32], and poor-quality products may be cheaper. Reduced costs will place more burden on processors as it may not be profitable to sell recycled organics products at reduced prices. This could be passed on to Local Governments through increased gate fees or penalties for highly contaminated material.

A strong waste education program is required to reduce the risk of high contamination levels which informs residents of the merits of change. The campaign must also raise awareness of what can and cannot go into each bin to help ease residents with the transition. There is now a plethora of information and resources available from the Waste Authority's Waste Sorted website to assist the Shire with the process.

[29] Compost for Soils (2011)
[30] NSW Environment Protection Authority (2021)
[31] Wilkinson, K., Price, J., % McDonald, D. (2021)
[32] Eastern Metropolitan Regional Council (2019)

9.2.2 Government Policy

Businesses need certainty to invest, grow markets, and produce fit for purpose products. As stated by AORA, changes in government policy and strategies are identified by industry as the largest obstacle to the growth of the recycled organics market[27]. A recent discussion paper released by DWER on proposed legislative framework for waste-derived materials involves legislation that may impact the market[33]. Products created from recycled organic material, including compost, are classified as "Waste-Derived Material" (WDM) which may negatively influence the marketability of the product if it must be advertised or labelled as such.

The legislation is currently under review and is not finalised, but it is one example of the way in which government policy may influence the recycled organics market.

9.3 Forecast Organics Market

The forecast organics market available to Perth and Peel represents the available land for compost application according to land use. Out of each option examined, the amount of domestic organic waste collected, inclusive of verge side greenwaste, is highest in a 3-bin FOGO system. The potential market available for the application of this material is shown in Table 9-3.

Table 9-3: Potential market size (in tonnes)

Market	Within 100km (% of the Market)	Within 200km (% of the Market)
Urban Amenity	4,200 (2%)	9,600 (2%)
Agriculture	177,000 (92%)	520,000 (96%)
Rehabilitation and Remediation	10,000 (5%)	14,100 (3%)
Total	**192,000**	**544,000**

Due to the Wheatbelt being adjacent to Perth and Peel, most of the market available for compost application within 100km and 200km is agricultural land accounting for 92% and 96% of the market. This illustrates the significant reliance and importance of this sector for the acceptance of composting products surrounding Perth. There is some additional capacity for compost to be used in urban amenity and rehabilitation, however this is limited in comparison. Based on the assumption that the cost of recycled organic compost ranges from $25-$50 per tonne, the value of the market 100km from Perth and Peel may range from $4.8M to $9.6M. The value of the market 200km from Perth and Peel may range from $13.6M to $27.2M.

[33] Department of Water and Environmental Regulation (2020)

Agriculture makes up over 90% of the markets, however, is very sensitive to contamination rates. As outlined previously, The Review of Regulations and Standards for Recycled Organics in Australia report stated that contamination rates for compost material for agriculture application needs to be 3% or less. If a higher level of contamination is experienced, the agriculture market may not be willing to accept all the compost resulting from kerbside FOGO, which may have an adverse impact on LGAs if processors then choose to reject or penalise their FOGO material.

If contamination rates are kept low and the agricultural market accepts the compost product, then there may be sufficient market available. Figure 9-2 compares the compost generated from commercial and domestic organic waste in a 3-bin FOGO system, assuming that all LGAs in Perth and Peel provide a FOGO system and that all markets will accept all product.

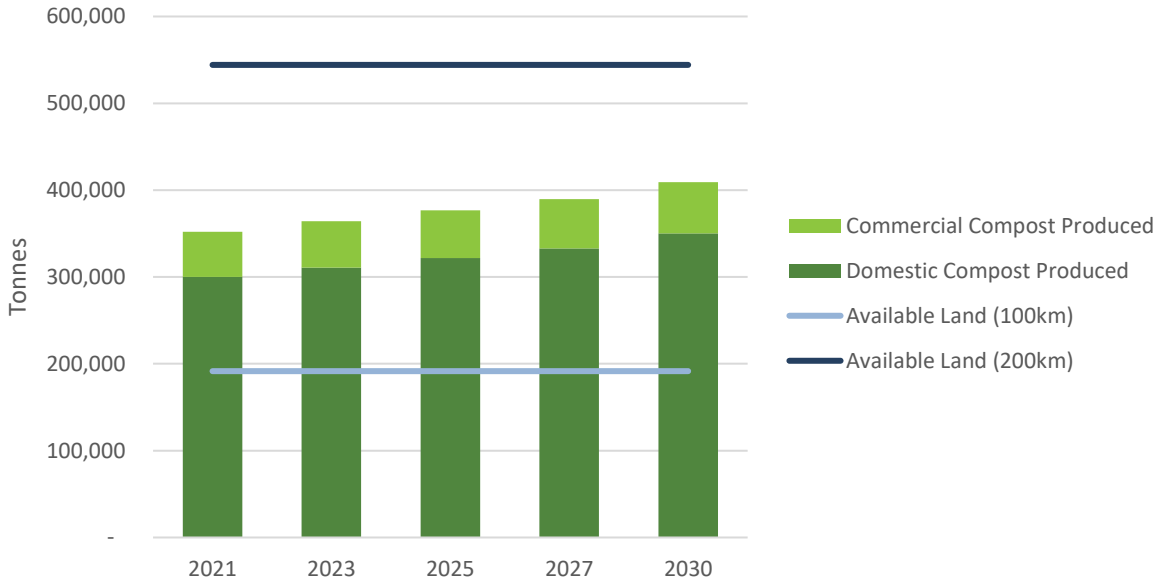

Figure 9-2: Compost produced in a three bin FOGO average capture rate scenario

The results of the Market Review suggest that there is insufficient market capacity within 100km of the Perth and Peel boundary to accommodate the amount of compost produced from processing the FOGO material generated by all LGAs in Perth and Peel. They suggest that there is sufficient land within 100km of Perth and Peel to apply the compost resulting from commercial FOGO waste, however the remaining market can only accept another 150,000 tonnes of compost and cannot accommodate all of the domestic FOGO expected to be generated. The results suggest that there is, however, sufficient market within 200km of Perth and Peel to accept all of the domestic and commercial FOGO anticipated to be generated. The ability to transport compost over 100km away from Perth and Peel appears necessary to ensure that all of the compost produced if all LGAs in Perth and Peel provided a FOGO system can be used.

As agriculture is most of the market available, it is important that kerbside FOGO contamination is managed and kept close to 3% to ensure that it will be suitable for use. If contamination is above acceptable levels for use in agriculture, the lack of additional markets may result in processors rejecting large amounts of material which in turn may increase the financial burden and reduced recovery rates. If this situation does occur, there may be challenges in finding appropriate markets for the compost product that is generated.

10 FOGO Processing Options

The Shire's Waste Management Strategy 2020-2024 specified investigating the feasibility of processing FOGO with the Shire as one of its key projects for 2023. As outlined within Section 8, the Shire understands that there are currently limited number of facilities that are able to process FOGO. Therefore, the Shire is considering the option of introducing further FOGO processing capacity within the Shire.

In this section, Talis considers the FOGO processing and the assessment of various processing options for the Shire.

10.1 Barriers

When considering options to process FOGO within the Shire, the following barriers to entry into the FOGO processing market need to be considered.

10.1.1 Environmental Compliance

10.1.1.1 *Approval Process*

The Shire will need to secure a Category 67A licence from DWER to operate an organics processing facility to process FOGO materials[34]. The approval process is lengthy and can take several years from the initial application. Below are some of the key considerations for the approval process.

10.1.1.2 *Environmental Siting*

The Better Practice Organics Recycling Guideline (the Organics Guidelines) list a range of different criteria for siting an organics processing facility[7]. Where all criteria can be met, the risk considerations for DWER are low. If all requirements cannot be met, further controls would be required to prevent environmental harm.

Table 10-1 below has been taken from the Organics Guidelines and shows the minimum separation distances for organics recycling facilities.

Table 10-1: Minimum Separation Distances for Organics Recycling Facilities[7]

Receptor	*Minimum Separation Distance*
The following wetlands and habitat that are *listed in the Guideline: Environmental siting:* • Ramsar sites • nationally important wetlands	*Organics recycling facilities should be at least 1,000 m from a wetland or habitat of this type which is down-hydraulic-gradient of the premises.*

[34] Western Australian Government Legislation (1987)

Receptor	*Minimum Separation Distance*
• South Coast significant wetlands • geomorphic wetlands (excluding 'multiple use' wetlands of the Swan Coastal Plain) • western swamp tortoise habitat.	
Surface water	*Organics recycling facilities should be at least 500 m from watercourses (see Glossary) or wetlands (see Glossary) which are down-hydraulic-gradient1 of the premises.*
Estuaries	*Organics recycling facilities should be at least 500 m from the high water mark of estuaries, which in relation to tidal waters means ordinary high water mark at spring tides.*
Groundwater	*A minimum vertical separation distance of 2 m should be maintained between the base of any containment infrastructure and the highest groundwater level (including seasonal perched aquifers).*
Private water supply bore	*Organics recycling facilities should be at least 100 m and preferably down-hydraulic-gradient[1] from these bores.*

Note 1: Where the hydraulic gradient cannot be determined at the time of an assessment, a conservative approach that assumes that the relevant receptor is down-hydraulic-gradient of the organics recycling facility will be followed.

The Environmental Protection Authority (EPA) Guidance Statement 3 on Separation Distances between Industrial and Sensitive Land Uses (Guidance Statement 3) further provides advice on the use of generic separation distances (buffers) between industrial uses such as composting facilities and sensitive land uses to avoid conflicts between incompatible land uses[35].

Guidance Statement 3 further goes on to define sensitive land uses as *land use sensitive to emissions from industry and infrastructure. Sensitive land uses include residential development, hospitals, hotels, motels, hostels, caravan parks, schools, nursing homes, childcare facilities, shopping centres, playgrounds and some public buildings. Some commercial, institutional and industrial land uses which require high levels of amenity or are sensitive to particular emissions may also be considered "sensitive land uses". Examples include some retail outlets, offices and training centres, and some types of storage and manufacturing.*[35]

As per the Organics Guideline, Guidance Statement 3 specifies a buffer distance of 1,000m between composting facilities processing mixed food/putrescible and vegetative waste and sensitive land uses to prevent the impacts of noise, dust and odour.

[35] Environment Protection Authority Guidance Statement 3 (2005)

10.1.1.3 *Environmental Performance Objectives*

Environmental Performance Objectives (EPOs) have been established by DWER in the Better Practice Organics Recycling Guidelines to manage impacts to the environment[7]. These include impacts to water resources, public health and amenity. EPOs have been established to reflect the requirements of the *Environmental Protection Act 1986* (EP Act) and provide a link between the governing legislation and regulated organics recycling facilities.[7]

The EPOs listed in the guidelines have been provided in Table 10-2.

Table 10-2: DWER Environmental Performance Objectives

Aspect	*Environmental Performance Objective*
Feedstocks	*Undertake organics recycling using feedstocks that have a beneficial outcome for product quality.*
Emissions to land and water	*Protect the environment by preventing and, where that is not possible, minimising emissions to land and water that may cause pollution or environmental harm.*
Odour	*Protect the environment by preventing and, where that is not possible, minimising odour emissions that may cause pollution or environmental harm.*
Point source emissions to air	*Protect the environment by preventing and, where that is not possible, minimising point source emissions to air that may cause pollution or environmental harm.*
Dust	*Protect the environment by preventing and, where that is not possible, minimising dust emissions that may cause pollution or environmental harm.*
Noise	*Protect the environment by preventing emissions of unreasonable noise and maintaining compliance with the assigned levels in the Environmental Protection (Noise) Regulations 1997 to prevent pollution and environmental harm.*
Emissions of litter and debris	*Protect the environment by preventing and, where that is not possible, minimising emissions of litter and debris that may cause pollution or environmental harm.*
Fire prevention & management	*Protect the environment by minimising the risk of fires and be sufficiently prepared in the event of a fire to prevent and, where that is not possible, minimise pollution and environmental harm.*
Vectors	*Protect the environment by minimising the risk of attraction, refuge, growth and spread of vermin and pests to prevent pollution and environmental harm.*
Product quality	*Contaminants in feedstocks are treated effectively and recycled organic products are fit-for-purpose.*

10.1.1.4 *Recordkeeping and Reporting Requirements*

As per the Better Practice Organics Recycling Guidelines, operators are required to maintain records to demonstrate compliance with all relevant requirements[7]. The licence will stipulate the requirements for each operator specific to the site. In general, organics recycling facility operators could be required to provide the following information:

- Data on incoming feedstock volumes and outgoing products and wastes;
- Environmental monitoring data such as groundwater and ambient field odour monitoring;
- Process monitoring data such as compost stockpile/ windrow in-field temperature levels;
- Emissions monitoring data such as noise, biogas generator stack emissions or odour monitoring;
- Summary of complaints including details and resolution of each complaint; and
- Details of environmental incidents such as fires or failure of pollution control equipment[35].

10.1.2 Feedstock Management

The modelling conducted by Talis, indicates that the Shire will be generating approximately 3,600 tonnes of FOGO materials by 2030 for processing. It is estimated that this amount will grow to 4,400 tonnes in 2035. Therefore, as a minimum, the local processing facility will need to be able to accommodate these volumes. However, with such limited tonnages the cost per tonne for this facility would be extremely high and not competitive with the current market. Therefore, the Shire will need to secure additional tonnages from other Local Governments to secure sufficient tonnages to provide economies of scale and be competitive in the current market. This is a very significant risk for the Shire.

10.1.2.1 *Management of Contamination*

As previously covered in Section 9.2.1, contamination in the FOGO organics stream can be significant. High levels of contamination can have a material impact on the quality of the final product and the options for use of the FOGO derived products.

To minimise contamination to the FOGO waste stream, the Shire will need to consider investment in some of the following options that have been listed in Table 10-3.

Table 10-3: Options for Management of Contamination

Option	Description
Access restrictions	Restrictions on access to residents that could participate in the FOGO collection system. Fewer households would be able to participate in such a system. However, it could have an impact on the collection costs per household.
Education	Most Local Governments that introduce FOGO collection systems, invest in strong education and marketing campaigns to raise awareness of the changes and the requirements to correctly source separate FOGO materials. The modelling budgets for the provision of a new Waste Education Officer.

Option	Description
Administration	Waste collection service contractors provide a range of different technologies including cameras, on-board software, real-time data management, stickers and other notifications. The Shire must ensure that these technologies are available and utilised for maximum effectiveness.
Screening equipment	Facilities such as the RRG in Canning Vale have invested significantly on a conveyor belt for manual sorting and other screening equipment to reduce visible contamination and to pre-sort organic materials by size. This is considered better practice and help improve the quality of the final product.
Technology	Additional technology in the form of screening and other engineering systems for sorting could be used to further remove contamination from the process.

10.1.3 Quality of Recycled Organics Products

As covered in Section 9.1, there are four main markets for recycled organic products which include urban amenity, agriculture, rehabilitation and environmental remediation. The agriculture and urban amenity markets have lower tolerance for contamination in the final compost product as listed in AS4454[8].

The standards also specify minimum levels for certain characteristics such as pH and nutrient levels that are especially applicable and relevant to the urban amenity and agriculture markets. FOGO collected from households, when composted in most instances does not contain the pre-requisites to comply with these requirements. Accordingly, FOGO materials need to be blended with other soils and composts to ensure compliance with the requirements of the standard.

Where the requirements of standard are unable to be achieved, the FOGO derived product can be used for rehabilitation or environmental remediation. As covered in Section 9.2.1, the value of these products is lower than products that could be sold into the urban amenity and agricultural markets. Where the Shire has suitable land that requires rehabilitation or radiation, readily available FOGO derived product could be advantageous.

However, if the Shire is not able to sell FOGO derived products to the agricultural and urban amenity markets, it would mean that none of the operational costs cannot be offset. This is likely to make the operation unviable.

10.1.4 Establishment Costs

Depending on the method of operation and the Shire's involvement, the Shire will need to consider a range of different establishment costs for processing FOGO in the Shire. As the set-up of the organics recycling facility has many variables, Talis estimates the set-up costs could range between $500,000 and $30 million. These costs could be attributed to the following items:

- Consultancy for procurement of suitable land;
- Purchase of or lease of land;
- Consultancy for environmental siting, regulatory approvals and community consultation;
- Selection of preferred treatment technology'
- Design and Procurement of the facility;

- Construction of the facility
- Ongoing operational costs including:
  - Engagement of suitable site personnel;
  - Purchase or hire of processing equipment;
  - Environmental monitoring and compliance
- Establishment of suitable contracts for FOGO and other material inputs; and
- Establishment of contracts for sale of recycled organics products.

10.2 FOGO Processing Options

Through experience with other FOGO and resource recovery projects, Talis recognises three main service delivery models for processing FOGO in the Shire. These include:

1. In-house
2. Partnership/ Collaboration
3. Contracted Services

These options have been further discussed in this Section, having regard for the factors considered in the preceding sections. Talis has assessed each option using a Strengths, Weaknesses, Opportunities and Threats (SWOT) Analysis methodology.

10.2.1 In-house

In this scenario, the Shire would develop its own FOGO facility for the processing of its FOGO materials and potentially materials from other parties. The details of the requirements and considerations for a FOGO processing facility and the available markets for FOGO derived products have been considered in detail in the preceding sub-sections.

The SWOT analysis for this option has been detailed in Table 10-4.

Table 10-4: SWOT Analysis – In-house FOGO Processing

Strengths	Weaknesses	Opportunities	Threats
• The Shire has control over all aspects of the FOGO composting process. • If FOGO products are successfully used in the Shire, it would represent a closed loop system for organics, eliminating costs and emissions related to transport.	• The Shire does not have sufficient volumes to make the facility commercial viable and will therefore need to secure tonnages from other local governments which is not a current core function of the Shire.	• Quality FOGO derived compost could be supplied to residents and used on local parks and gardens. • FOGO derived products could be used for local rehabilitation and environmental remediation projects within the Shire.	• There are existing FOGO processing facilities within surrounding areas, with new approvals for increased capacity anticipated. Due to their scale, these facilities offer competitive market rates which the Shire will struggle to compete with.

Strengths	Weaknesses	Opportunities	Threats
	• The Shire carries all the risk associated with the establishment, operation, marketing and legislative compliance of the facility. The Shire has limited experience with some of these risks. • The establishment costs for such a facility would be significant (See 10.1.4) and are likely to be prohibitive. • Operation of the facility would require inputs and resourcing from a range of existing staff and Councillors in addition to existing workloads. • The Shire would be liable for ongoing operation costs and successful operation of the facility. • The Shire as a government organisation does not have the same flexibility as a business, which will limit its operational ability and increase costs for the facility.	• A successful project will improve the Shire's sustainability credentials.	• The Shire has no experience with processing FOGO materials and the nuances with ensuring a market ready product. • The sale of FOGO derived material will not cover the operational costs, which would require rate increases to cover the budget deficit. • The approval process could take several years. • Failure of the project will result in strong negative public opinion. • There are restricted markets for sale of FOGO compost that has not been blended with other soils. • Local Parks and Gardens teams do not want to use the FOGO derived compost.

In summary, a Shire operated FOGO processing facility may take several years to establish. The Shire doesn't have sufficient tonnages to make this facility commercially viable. It will require significant investment of time, capital and human resources to set up and to operate. If not managed effectively

processing costs could blowout, leading to severe impacts on budgets and rates. There is also no guarantee of being able to on-sell the FOGO derived product.

The benefits of having control over what happens to the Shire's FOGO materials, reduced transportation costs and a closed loop system are far outweighed by the threats (risks) associated with operating a FOGO processing facility in-house. Therefore, Talis does not recommend the Shire further pursue this option.

10.2.2 Partnership Model

This is the second option for the Shire to ensure local processing of the Shire's FOGO materials. The Shire would assist a third party (most likely private industry) with the development of a FOGO processing facility within its jurisdiction. The Shire can provide such assistance through a variety of mechanisms, including but not limited to:

- Supply of FOGO tonnages;
- Provision of long term access to land, including those with existing waste approvals (this may be relevant for the Mundijong Waste Transfer facility);
- Support with obtaining approvals (including access to land that already has waste approvals such as the Mundijong Waste Transfer Station); and
- Support with procuring additional tonnages for neighbouring Local Governments.

Table 10-5 considers the feasibility of the Shire's involvement in a collaborative approach.

Table 10-5: SWOT Analysis – Partnership Model for FOGO Processing

Strengths	Weaknesses	Opportunities	Threats
• The Shire may be able to offer suitable land, or zoning parcels for the industry to invest in. • The Shire's involvement in FOGO processing is limited. • Costs of establishment are limited. • If FOGO products are successfully used in the Shire, it would represent a closed loop system for organics, eliminating costs and emissions	• The Shire has limited volumes to assist with attracting processors to consider establishing within its jurisdiction. • Once established the Shire may have limited influence over the processing and sale of the product. • Establishment of a partnership would require inputs and resourcing from a range of existing staff and Councillors in	• Quality FOGO derived compost could be supplied to residents and used on local parks and gardens. • FOGO derived products could be used for local rehabilitation and environmental remediation projects within the Shire. • A successful project will improve the Shire's sustainability and community credentials.	• If the partnering entity is not able to operate the facility profitably, the Shire may need to contribute towards on-going support. • Failure of the partnering entity could result in negative public opinion.

Strengths	Weaknesses	Opportunities	Threats
related to transport.	addition to existing workloads. • Will require additional ongoing resourcing for reporting requirements, especially if on Shire owned/ managed land.		

The risks associated with this partnership are much less than if the Shire operated independently. The most significant difficulty with this option is attracting the most appropriate entity to establish a facility within the region. Where a suitable entity is identified, the Shire would need to consider the best options to add value to the operations while restricting capital investment and limiting the need to get involved in the on-going operations of the facility. For any interested entity, competition with existing FOGO processing facilities, supply of sufficient feedstock volumes and sale of FOGO derived products would be concern they would need to overcome.

The Shire should seek to reduce its risk by adopting a suitable contract arrangement with the operator. As covered above, the Shire could alleviate some of the set up risks of by supplying suitable land, assisting with approvals and providing assurances for supply of FOGO volumes and uptake of the FOGO derived products.

At this stage, Talis is unaware of any private firms that have approached the Shire to establish a facility within its jurisdiction. Therefore, there seems to be little industry interest to date.

Talis recommends that the Shire does not actively pursue this option. However, if the Shire is approached by a private firm seeking to invest in FOGO processing infrastructure in the area, the Shire engages with them but seeking a low risk contract arrangement (waste supply) with support where appropriate – lease of land, approval assistance, etc.

10.2.3 Contracted Services

In this scenario, the Shire's FOGO material is processed at a facility operated by a third party (such as private industry or local or regional local governments). The Shire is not involved in the operation and would pay the contractor for processing FOGO materials from within the Shire. The Shire would most likely also need to pay for purchase of any FOGO derived products, if not agree as part of the Contract. In this scenario it is more likely that the processing would take place at existing and planned new FOGO processing facilities, not within the Shire's jurisdiction although the Shire, using some of the support mechanisms detailed in Section 10.2.2.

The SWOT analysis in Table 10-6 assesses this option.

Table 10-6: SWOT Analysis – Contracted FOGO Processing

Strengths	Weaknesses	Opportunities	Threats
• The Shire is not liable for any set up and ongoing operational costs. • There is no impact on existing staff and Council other than for the set-up of the processing contract. • Unlikely to be budget variations in relation to FOGO processing once the contract is established. • Flexibility with procuring the best prices from the market for processing of FOGO materials. • More appropriate option considering the Shire's limited tonnages.	• The Shire may have to pay separately for purchase of any FOGO derived materials. • It is likely that the Shire will need to budget for additional transportation costs. • The added transportation will result in increased transport related carbon emissions.	• The Shire could lease existing land for a FOGO processing establishment within the Shire.	• High levels of contamination could result in added disposal costs and/ or the contactor choosing not to process the Shire's FOGO materials.

Assuming that there are existing contractors willing to process the Shire's FOGO, this is the most convenient option for the Shire. The Shire is located in the vicinity of existing and new proposed FOGO processing facilities. This provides some assurance for the Shire that collected FOGO will be processed and also limits the associated transport related costs and emissions. If deemed necessary, the Shire may also be able to purchase FOGO derived products and close the loop. It is anticipated that this model would cost less than having to operate the facility in-house. The weaknesses and threats are minor in comparison to the other options. Talis therefore recommends that the Shire priorities the Contracted Processing option for the treatment of its FOGO materials.

10.3 FOGO Processing Recommendation

As specified in the Shire's Waste Management Strategy, it is anticipated that if the Shire were to switch to a 3-bin FOGO system, FOGO materials would initially be sent to an existing FOGO processing facility. The Shire could continue to contract out processing of FOGO materials as it is located in the vicinity of existing processing facilities. This alleviates the need for the Shire to process FOGO in-house. In the scenario that the FOGO processing capacity changes significantly and there is no assurance that the Shire's FOGO will be processed by existing facilities, the Shire should consider collaborating with interested entities. The Shire should only consider in-house processing after exhausting all other options for processing of FOGO.

11 FOGO Procurement

The Shire will need to run a competitive procurement process to obtain offers from the waste industry for the provision of FOGO collections, processing services as well as bin roll out requirements.

As outlined within Section 3.2.1, it is understood that the current waste collection and processing contract expires in June 2025 and has no provisions for the collection and processing of FOGO materials. Therefore, prior to considering a change to a 3-bin FOGO system, the Shire will need to establish suitable contractual arrangements to ensure efficient FOGO operations. Given the requirements of the State Waste Strategy 2030, the Shire should therefore consider discussing this issue with DWER and delay roll-out of FOGO until these services are procured as part of a Total Waste Services contract.

By combining all waste services will provide better economies of scale and may result in overall contract savings for the Shire. However, by combining FOGO roll-out, collection and processing services, the Shire could also potentially sideline providers of one of these specialised services from tendering. This is also relevant for the recycling processing. Accordingly, it is recommended that the Shire considers the use of separable portions in the development of the Total Waste Services contract, to isolate key services, so that specialist firms can participate in the procurement process.

Regardless of what procurement process the Shire decides to pursue for its FOGO collections and processing solutions, a range of different FOGO and related services need to be included within the Tender / contract documents including but not limited to:

1. Collections:
    i) Weekly collection of 240L FOGO bins;
    ii) Fortnightly collection of 140L/ 240L residual waste bins.
2. FOGO processing services; and
3. Bin roll-out services for all participating households including:
    i) Red lidded 140L bins in a mass roll-out scenario;
    ii) Lime green lidded 240L bins or lime green lid changes to existing 240L bins;
    iii) Kitchen caddies; and
    iv) Compostable liners.

Based on the tendered rates for the various FOGO and related services from this procurement process, the Shire will be able to make an informed decision in relation to progressing with a FOGO services for its rate payers. As part of this process, the modelling works contained within this Feasibility Study should be re-evaluated utilising the relevant tendered rates.

12 Summary of Key Findings

Talis was commissioned by the Shire to conduct a feasibility assessment of introducing a three-bin FOGO kerbside collection system and

- Investigate the feasibility of establishing a FOGO processing facility with the Shire. As part of these works, Talis assessed two bin configurations options including:
  - 2-bin system – a two-bin service with processing of recyclables and residual waste sent to WtE; and
  - 3-bin system – a three-bin service with source separation of FOGO and recyclables for processing and residual waste sent to WtE.

As part of the assessment, projections and modelling were conducted based on industry knowledge and data records provided by the Shire. Talis also considered the current legislative and policy context. The following provides a summary of the key findings arising from the works.

Waste Projections:

- If the Shire maintains a 2-bin collection system, it is estimated that in 2031-32, the Shire will generate 13,188 tonnes of residual waste and 3,180 tonnes of recycling materials through the kerbside collection system.

- In a 3-bin FOGO scenario in 2031-32, it is anticipated that 4,471 tonnes would be collected in the FOGO bins, 8,717 tonnes from the residual waste stream and 3,180 tonnes of from the recycling stream.

Financial Implications:

- The 2-bin system is anticipated to cost an average of $516 per household each year and a total of $74.9 million over the modelled 10-year period until 2031-32.
- The 3-bin FOGO system is anticipated to cost the Shire an average of $616 and a total of $89.7 million over the same period.

Recovery Rates:

- The 3-bin FOGO system results in higher material recovery rates of 49%. However, it does not meet the State Waste Strategy 2030 targets or 67% in 2025 and 70% in 2030.
- When the current 2-bin system with 13% material recovery changes with residual waste changes to WtE, the material recovery rates will increase to 31%.
- The overall resource recovery rates of the bin systems ranged from 96 to 97%

Case Studies:

Talis undertook case studies across five Local Governments that are currently providing FOGO collection services to their ratepayers. Based on these case studies, some key guidance on FOGO roll-out has been obtained:

- It is recommended that prior to roll-out, that a Shire prepare a detailed FOGO Implementation Plan detailing the approach.

- As the Shire does not have any MDDs and a number of rural properties that do not pay for waste services, the Shire could choose to roll-out FOGO to all SUDs currently serviced.
- Before a planned roll-out of FOGO bins, it is vital for the Shire to ensure that property data is current and accurate. It will save the Shire costs and additional administrative work with bins not being delivered to the correct locations.
- It is anticipated that before the roll-out, the Shire will need to secure additional marketing, GIS, administration, customer service, project management and waste education personnel to assist with a smooth transition.
- Kitchen caddies, an information package and an on-going supply of compostable liners are standard amongst Local Governments providing FOGO collections.
- For lower contamination levels, the Shire will need to invest in ongoing waste education and personnel. It may also be necessary for the Shire to ensure that the FOGO materials are screened to remove some contamination before the materials are sent for composting. Lastly, the Shire could also introduce administrative controls in the form of letters and follow-up to reduce contamination.
- The Shire could save costs of issuing a smaller 140L bin by sticking with the current 240L residual waste bin. However, this would not comply with the FOGO Guidelines and would most likely result in lower material recovery rates. The Shire may instead opt to use the current 240L bins for FOGO by completing lid changes. Lid changes on the other hand could be time-consuming if the current bin stocks are old and vary between brands.
- It is important to have a contract in place to ensure that once that Shire make the change, the Shire's FOGO will be processed at an acceptable cost, in an acceptable manner.

Processing Capacity:

The results of the FOGO processing assessment suggest that:

- There is insufficient capacity available within the currently licenced processing facilities to process the FOGO material anticipated to be generated by all LGAs in Perth and Peel.
- If the Veolia North Bannister facility, which currently holds a works approval, were to become operational, there would be sufficient processing capacity for the domestic FOGO generated by the LGAs committed and/or transitioning to a FOGO system.
- The Red Hill Waste Management Facility has the potential to offer an additional 140,000 tonnes of FOGO processing capacity, would provide sufficient additional capacity to allow all of the FOGO expected to be generated by all LGAs in Perth and Peel to be processed at an appropriate facility in 2025.
- By 2030, the additional capacity offered by the expansion of the Red Hill Waste Management Facility's operations would be insufficient to allow all of the anticipated domestic FOGO to be processed. An additional approximately 2,000 tonnes of processing capacity would be required.
- When both commercial and domestic FOGO is considered, there is sufficient capacity within the existing facilities or those with works approvals for the committed and/or transitioning LGAs to provide a FOGO system in 2025 only.
- By 2030, the results suggest that there will be insufficient capacity to accept the anticipated volumes of domestic and commercial FOGO demonstrated if only the committed and/or transitioning LGAs provided a FOGO system.

Market Review:

- There are four main markets available for FOGO derived materials:
    - Urban amenity;
    - Agriculture;
    - Rehabilitation; and
    - Environmental remediation.
- Contamination levels in the final product will have an impact on which market the products can be sent to.
- FOGO derived products with low contamination that comply with AS4454 due to lack of other industry standard can be sold for between $25-$50 per tonne.
- FOGO derived products with high contamination levels will be cheaper and limited in their use.

FOGO Processing Option:

- There are a number of potential barriers to introducing FOGO processing services, which should pose a significant risk result in lengthy delays or not being able to introduce the service altogether.
- The three options for the Shire to introduce FOGO processing includes in-house processing, partnership(s) and contracting out the services.
    - In-house processing – The Shire will not be able to generate sufficient FOGO materials to make the operations financially viable. There is also a lack of expertise and flexibility to make the operations cost effective and viable. Therefore, Talis does not recommend the Shire further pursue this option.
    - Partnership model – There are currently no known operators considering a partnership with the Shire. If the Shire is approached by a private firm, it is recommended that the Shire engage with them seeking low risk contract arrangements with a support role where appropriate.
    - Contracted Services – Given the difficulties with in-house processing and the partnership model and the Shire being located in the vicinity of existing and proposed new facilities, Talis recommends this option as the preferred FOGO processing option for the Shire.

13 Recommendations

Based on the works and findings from this FOGO Feasibility Study, Talis puts forward the following recommendations for the Shire's consideration:

1. Continue to support Rivers Regional Council with the Avertas Energy negotiations on the Waste Supply Agreement to further reduce potential restriction on the Shire's resource recovery efforts including potential FOGO collections.
2. Adopt the contracted out service model as the preferred approach for FOGO processing.
3. Undertake a procurement process to secure market rates for the introduction of FOGO collection and processing services.
4. If timing allows, the FOGO services should be included within the Total Waste Services procurement process including all collections, processing and disposal requirements. As part of this approach, the Shire should seek to utilise separable portions to isolate key services such as FOGO roll-out, FOGO processing, recycling processing and disposal services.
5. Based on the responses arising from the procurement process, re-evaluate the costs of introducing a 3-bin FOGO WtE system, by updating the model based on the tendered FOGO and relevant services rates.
6. Undertake a waste and recycling compositional audit of at least 100 residual waste and 100 commingled recycling bins to determine volumes of recycling and organics in each of the streams to feed into the re-evaluation process (Recommendation 5).
7. If the Shire decides to proceed with a 3-bin FOGO system, prepare a FOGO Implementation Plan outlining the key tasks and responsibilities associated with the roll out and introduction of the service.
8. Seek to maximise recovery by preparing and implementing a detailed Waste Education Plan.

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APPENDIX A

Map - Shire of Serpentine Jarrahdale

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115°50'0"E
116°0'0"E
116°10'0"E
116°20'0"E
32°10'0"S
32°20'0"S
32°30'0"S

Armadale
BYFORD
Rockingham
SERPENTINE-JARRAHDALE, SHIRE OF
Mandurah

Data source: Roads, Suburbs, LGA's - Landgate, 2023. Imagery: Landgate, 2023.

LEGEND

- Shire of Serpentine -Jarrahdale
- Local Government Authority (LGA) Boundaries (LGATE-233)
- High Density Populated Area
- Railway Lines
- Freeway / Highway

0 50 100 150 200 km

LOCALITY

SJ FOGO Feasibility Study

Shire of Serpentine - Jarrahdale

N
0 2 4 6 8 km

Coordinate System: GDA2020 MGA Zone 50
Scale @ A3: 1:200,000

Prepared:	E Jackson	Date:	5/04/2023
Reviewed:	C O'Donnell	Revision:	A
Project:	TW22184		

talis consultants

Figure 01

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APPENDIX B
Financial Modelling Assumptions

B.1 General Assumptions

- Number of services used rather than number of households when calculating cost
- Recycling residual is sent to WTE
- GO residual is sent to WTE
- FOGO residual is sent to WTE
- Number of bin services go up with REMPLANS yearly housing growth rate
- Costs go up with CPI (consumer price index) each year or using Cleanaway's rise and fall formula.
- CPI is based on ABS average increase of last four years (March 22 – March 19)
- Collection cost = Number of bin services * cost per bin * collections per annum
- Waste tonnes generated increase with population
- Total waste tonnes generated each year remains consistent between each option
- WtE cost increases with CPI
- Recycling recovery rate stays at 68% as per the 21-22 census data
- The performance of the recycling bin remains consistent each year and between each option
- WTE material recovery 20%
- WTE residual 5%
- WTE energy recovery 75%

B.2 2-bin Specific Assumptions

- Residual waste collected weekly
- Recycling fortnightly
- Bin maintenance costs goes up with CPI and housing growth

B.3 3-bin FOGO Specific Assumptions

- Service only provided for SUDs
- All households will have a 140L residual waste bin and a 240L FOGO bin
- A new waste education officer is required, and the position is permanent full time
- An additional admin person is required for a year
- A GIS officer is required for 6 months part time
- A marketing /communication officer is required for two years part time
- Two rolls of 75 compostable liners per household are given out per year
- Each serviced household gets a kitchen caddie and education/communication pack
- FOGO collected weekly
- Residual waste collected fortnightly
- Recycling collected fortnightly
- FOGO recovery 85%
- 75% of FOGO is diverted from the residual waste stream into the FOGO bin
- FOGO rolled out in 2024-25
- General bin maintenance halved due to new bin from the roll out
- FOGO bin maintenance halved due to new bins
- Residual waste fortnightly drive-by rate 140L estimated to be $1.65 for year 2022-23
- FOGO drive by rate 240L estimated to be $1.81 for year 2022-23
- FOGO processing cost estimated to be $1.40 for year 2022-23
- Cost of a 140L bin for a roll out estimated to be $83.15 for year 2022-2023
- Cost for a 240L bin for a roll our estimated to be 88.96 for year 2022-2023
- Roll out lid replacement assumed same cost as standard lid replacement for year 2022-2023

Assets | Engineering | Environment | Noise | Spatial | Waste

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