REPORT

Tonkin+Taylor

Local FOGO Processing Business Case

Prepared for

Mansfield Shire Council, Murrindindi Shire Council

Prepared by

Tonkin & Taylor Pty Ltd

Date

February 2023

Job Number

1089663 v1

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Document control

Title: Local FOGO Processing Business Case					
Date	Version	Description	Prepared by:	Reviewed by:	Authorised by:
February 2023	0	Draft for client comment	CATU/NLV	CHP	CHP
February 2023	1	Final for submission to SV	CATU/NLV	CHP	CHP

Acknowledgement of Country

Tonkin + Taylor respectfully acknowledges Aboriginal and Torres Strait Islander peoples as the Traditional Owners of the land and water on which all Australians rely.

This project is within the Traditional lands of the Taungurung and Wurundjeri people. We pay our respects to their Elders past, present and future as custodians of cultural values, of land, wildlife and waterways.

Distribution:

Mansfield Shire Council, Murrindindi Shire Council	2 copies
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1 Introduction

1.1 Project scope

Tonkin & Taylor Pty Ltd (T+T) has been engaged by Mansfield Shire Council and Murrindindi Shire Council to prepare a business case to assess local processing options for organic material. The key driver for a local processing option is the adoption of food organics and garden organics (FOGO) kerbside collections by both Councils, which is expected to occur around mid-2024 for Mansfield, and 2025 for Murrindindi. This work is being carried out under the proposal, dated 28 September 2022, submitted in response to RFQ E10010 and accepted by Council on 28 October 2022.

Specifically, the scope of work that underlies this report comprised:

Strategic case:

1. The current state:
   - An analysis of the current FOGO options available to both shires with an assessment of nearby FOGO processing facilities and how they operate;
   - An assessment of the current and expected future waste volumes across the two municipalities;
2. Setting the anticipated benefits of establishing local processing capability.

Economic case:

3. Identifying options for local processing of FOGO
4. An assessment of both shires to determine the potential locations for a future FOGO processing facility whilst considering planning zones, buffer zones, proximity to power and water, EPA requirements, and access roads.
5. An assessment of the costs verses the benefits of investment in local processing infrastructure including an indication of the local employment opportunities in the construction phase and in the operational stage of such a facility

Management/Commercial case:

6. A checklist to assist Councils to set up such a facility in the absence of, or lack of interest from, a FOGO processor/contractor/operator when the business case is ready for action;
7. Preliminary recommendation for the best operational model/s for such a facility, taking into account current and emerging technologies and approaches;

1.2 Project approach

1.2.1 Overall approach

Murrindindi and Mansfield Shire Councils have recognised the benefit of collaborating regionally to achieve efficiencies and effectiveness in waste management and minimisation. In this business case, the Councils are looking to explore opportunities for how a regional approach to organic material recovery can improve outcomes for the individual Councils and the communities they serve. Examples include aggregation of material, knowledge sharing, joint procurement, and potential partnerships.

This report summarises a review of options taking an approach that is consistent with the Department of Treasury and Finance Victoria business case approach. This approach focuses on ensuring the issue or opportunity is well defined before considering a range of options to realise the opportunity. Once the preferred option has been identified there is a process of planning for successful delivery, ensuring that timeline and costs reflect the requirements for the project to succeed. The business case approach includes:

- Strategic Case - What is the problem, issue or service need? What are the anticipated benefits from addressing the problem? This is discussed in Section 2.
- Economic Case – What is the best value for money option, is there a compelling case for investing? This is considered in Section 3 and 4.
- Implementation considerations (Management, Financial and Commercial Cases) - Can the project be delivered as planned? How will the project be procured and funded? This is discussed in Sections 5 to 7.

1.2.2 The importance of markets for products

The organic material recovery industry in Victoria has historically been impacted by supply and demand challenges. The presence of a strong market for products that contain recovered organics will 'pull' materials through the system, aiming for a range of end products with a market value that exceeds or equates to the value of the raw materials and inputs and processing costs[1]. In some cases, additional (or more expensive) processing may result in a significant increase in the value of the end products.

The vision to transition to a circular economy will require the industry to transition from a minimum cost approach to one that focuses on product value. This means collection and processing is focussed on maximising product value, reflecting market demand. This is a shift from the current state where the industry is reliant on gate fees rather than product sales for survival. The approach for this assessment is to place a strong emphasis on opportunities that respond to a potential market need for a product, as this will underpin project viability.

1.2.3 Regional tender for organics collection and processing

This work is happening concurrently to a joint tender process between Councils and Alpine Resort Management Boards (ARMBs) belonging to the former North East Waste and Resource Recovery Group and Goulburn Valley Waste and Resource Recovery Group (now amalgamated into Recycling Victoria). The joint tender is for kerbside waste and recovery services including:

- The collection of kerbside landfill waste, comingled recyclables, FOGO, and glass.
- The acceptance and sorting of comingled recyclables.
- The acceptance and processing of FOGO.
- The acceptance and disposal of kerbside landfill waste.

The participation of each Council or ARMB in each component of the joint procurements is voluntary i.e., they may choose whether to participate in any contract. The opportunity to respond to the tender is now closed and responses are currently being evaluated with options available expected to be shared in early 2023.

Councils are intending to use the business case for local processing options as a comparison against the FOGO processing options available through the joint procurement contract.

[1] Victorian Organics Resource Recovery Strategy, Sustainability Victoria, September 2015

1.2.4 Involving key project stakeholders

The project approach has considered the wider organics ecosystem stakeholders which includes:

- Community
  - Producers of organic waste
  - Community groups as collectors/processors
  - Potential users of product (end market)
- Industry
  - Producers of organic waste
  - Collectors of organic waste
  - Transporters of organic waste
  - Processors of organic waste
  - Potential users of product (end market)
- Council
  - Producers of organic waste (from events, meals on wheels, internal organic waste from office and depot kitchenettes, leisure centres, resource recovery centres, transfer stations, satellite operations and sites)
  - Departments that could be potential users of product (i.e., Parks, Infrastructure, Landscape Architects)
  - Senior executive leaders (decision makers)
  - Councillors (decision makers).

The inclusion of commercial and industrial (C&I) organic material can improve the viability of organics processing. This may be through additional processing charges and/or provide an improved mix of feedstock, increasing the value of product(s).

2 Strategic Case

2.1 Problem/Opportunity Statement

A detailed summary of the current state of organics in the region is provided in the interim report (Appendix A). Key findings are described in the section below.

2.1.1 Council FOGO

Significant volumes of organic waste in Mansfield and Murrindindi Shires are currently disposed of to landfill. Waste audits[2,3] from 2021 and 2022 completed in the region indicate that food waste makes up between 26% (Mansfield) and 41% (Murrindindi) of the kerbside landfill waste bin at both Councils. The Victorian government policy (see Section 2.3) requires all councils provide residents access to a separate food and organics recovery service or local composting by 2030. Currently facilities that can accept and process food waste are limited to small scale community facilities in the Shires or large-scale processors located out of the Region (>100 km away). Transport of organics to the existing processing sites is prohibitively expensive, so neither Shire has implemented an organics collection service to date.

The gap in local processing capacity has been recognised in state wide strategy. In the Infrastructure Victoria '*Advice on Recycling and resource recovery infrastructure'* report (2020) [4], Mansfield was recommended as one of three locations for construction of a medium sized (75,000 TPA) in-vessel composting facility by 2039. The report does not explain the source of the 75,000 tonnes but it can be assumed a significant amount of this material could be from out of region.

2.1.2 Commercial organic waste

As part of this project T+T have interviewed a number of businesses to establish a broad overview of the types and quantities of organic waste created, and how this is managed. Murrindindi and Mansfield regions do not have large manufacturing sectors meaning there are no significant volumes of organic waste from a sole source e.g. a food processing plant. Rather, commercial waste is generated by a number of smaller businesses driven by the strong tourism and hospitality sector. Businesses interviewed included cafes, restaurants, aged care facilities, supermarkets and primary producers (growers).

Based on the interviews completed for this project, waste from food preparation and uneaten food (vegetable peelings, grains, meat) is common across a number of sectors including supermarkets, hospitality and aged care facilities. Currently no collections for source separated commercial food waste are available.

Several informal networks exist to manage organic material from businesses. These networks include ad hoc agreements between farmers (stockfeed), worm farmers, employees who are home composters or who have chickens, and individual businesses (such as the zoo). For businesses that do not have an arrangement organic material is disposed of to landfill with general refuse. Not all these informal networks are available at all times of the year or for all material so some businesses would still be interested in a FOGO collection if this were available and/or was perceived as a more reliable alternative to their current arrangement.

[2] Kerbside Residual Waste, Comingled Recycling & FOGO Audit, Just Waste Consulting, March 2021
[3] North East WRRG Regional Household Kerbside Bin System Audit in Spring 2021, EC Sustainable, February 2022
[4] Advice on Recycling and resource recovery infrastructure, Infrastructure Victoria, April 2020. Available at: https://www.infrastructurevictoria.com.au/wp-content/uploads/2020/03/Advice-on-recycling-and-resource-recovery-FINAL-REPORT.pdf

2.1.3 Community composting network

As part of this project T+ T interviewed several community members involved in the community composting network. The most significant project is a dehydrator that processes 800 L per week of food waste from Alexandra Secondary School and local cafes (including coffee grounds). The dehydrator is not currently run at capacity; it is operated twice a week, but it could be run twice a day if required. Landcare also funds four hours of volunteer time to oversee operations and co-ordinate volunteers from the school.

There is reportedly several community compost volunteer activities underway in both Shires including food waste collections from the caravan park, residents who compost food waste from other residents and community food waste education.

2.1.4 Alpine Resort organic waste

Mount Buller and Mount Stirling received 660,000 visitors in the 2022 winter season alone. It is estimated that Mount Stirling produces 700 tonnes of waste per annum and currently 30 tonnes of organic waste is diverted from landfill through the Living Bin program. Organic food material is processed via an onsite in-vessel Closed Loop dehydrator which can dehydrate up to 200kg of material in 24 hours so only 10% remains. Any green waste (grass clippings, pruning's, permitted clearing) is generally mulched onsite by contractors or mulched and taken to free drop off points in the resorts.

2.1.5 Summaries of gap analysis and opportunities

The information collected indicates that there are significant quantities of organic waste from residential properties and businesses being sent to landfill. This presents an opportunity to divert these materials and capture value through their feed, energy and/or nutrient value. This material includes organic material generated by businesses as general waste; organics disposed of general waste in the kerbside collections. The highest diversion potential is kerbside food waste which currently makes up between 26% (Mansfield) and 41% (Murrindindi) of residential kerbside landfill stream, based on 2021 audits[5,6].

2.1.5.1 Collection models and potential capture rates

The organic composition of the landfill kerbside waste stream gives an indication of the maximum potential amount of material which could be diverted. However, the capture rate of organic waste for processing via FOGO and FO kerbside systems varies, and is directly related to the collection service model selected and deployed.

High-performance FOGO/FO kerbside systems usually comprise of several key elements which combine to give capture rates of around 65% of the available organics. This capture rate has been exceeded in some councils so is not the terminal capture rate, but the average expected from a high-performance FOGO system.

The key elements to a high-performing FOGO service are commonly seen to be:

- Weekly collection of organics bins, which also provides better quality end products due to the material not becoming anaerobic while awaiting collection, and therefore more effectively supports end market acceleration
- Fortnightly collection of landfill bins
- Mandatory service provision

[5] Kerbside Residual Waste, Comingled Recycling & FOGO Audit, Just Waste Consulting, March 2021
[6] North East WRRG Regional Household Kerbside Bin System Audit in Spring 2021, EC Sustainable, February 2022

- Provision of a kitchen caddy
- Provision of a compostable caddy liner
- Provision of education pack at service inception
- An ongoing monitoring education program, aligned to available enforcement options and Local Laws
- Continuing support and subsidisation of home composting programs
- Follow up audits and education in the 3-6 period after service implementation

Lower performing systems tend to have one or more of these elements removed or adjusted and afford a lower capture rate of around 30%. A low-performance system may for example include:

- Ongoing weekly landfill bin collection, which largely becomes unnecessary in most cases following the introduction of a kerbside organics service
- Fortnightly organics collection (in addition introducing the propensity for the organic matter to become anaerobic and produce poorer quality end products),
- Opt-in/voluntary service
- Broad based application of exemptions
- No automatic provision of kitchen caddy in preparation service implementation (e.g., not provided, or resident request-based, limited number of caddies available)
- Weak or no follow up auditing and education/enforcement
- No change to existing green waste bin lid messaging, giving rise to potential confusion (e.g., the bin lid states 'green waste only' even after the introduction of food into the stream)

Therefore, the total potential available organic waste should not be assumed to be entirely captured by introducing a FOGO kerbside system *per se*; the outcomes achieved will depend on the model selected for implementation. Even high-performing FOGO systems rarely capture all the available organic waste for diversion.

2.1.5.2 Processing of collected organics

There is a lack of local processing options for source separated organic waste. Under the current arrangements if a FOGO collection is adopted by either Council the material will need to be transported out of the Region for processing.

Gaps in local processing options have been identified for the following materials and estimated quantities:

- Household organic waste (garden, food and other) currently disposed of to landfill through the kerbside bin
  - 680 – 1,500 tonnes Mansfield (30% and 65% capture rates respectively, at 39% of landfill stream)
  - 640 – 1,400 tonnes Murrindindi (30% and 65% capture rates respectively, at 62% of landfill stream)
- Household garden waste currently deposited at the RRC
  - 380 tonnes Mansfield, 2,300 tonnes Murrindindi currently deposited at the RRC.
  -
- Commercial/industrial food waste post-consumer (small quantities)

  - Unknown
- Commercial/industrial pre-consumer food waste (small quantities)
  - Unknown

No industries were identified with significant organic waste streams that could be of interest to this project. Alpine Resorts also already have processes in place for material handling at source.

There is a potential to work with the growing community compost network that is currently active in the region and includes several small-scale pilot projects for processing of organics at source.

2.2 Benefits Statement

Drawing on the terms of reference for the Business Case and discussion with Council staff, key potential benefits from local processing of FOGO have been identified. Where local processing is adopted in the region, the intended benefits are:

- Diversion of waste from landfill and associated greenhouse gas emissions.
- Recovery of the nutrient value/energy from organic waste in line with the principles of the circular economy keeping products/materials in use.
- Provide a local processing option that can provide a cost-effective solution for local organic waste producers and where possible contribute to the local economy.
- Reduction in transportation distances for organic waste processing.
- Reduction in operational carbon emissions from shorter transportation distances.
- Reduction in overall carbon emissions from the reduction of food and green waste to landfill, and its diversion to composting.

2.3 Strategic Alignment (policy and priorities)

It is important to consider how any new activities identified in the Business Case align with the prevailing policy framework and Council priorities. This is discussed in the remainder of this section.

2.3.1 Policy drivers and context

The policy context for the development of this strategic case is detailed in Section 3 of the Interim Report, included as Appendix A.

The drivers for the strategic case include:

- Obligations from the Circular Economy (Waste Reduction and Recycling) Act 2021, including the specific actions required under the provisions of the 'Recycling Victoria, A New Economy' policy and 10-year plan, The State of Victoria Department of Environment, Land, Water and Planning, 2020 (Appendix A Section 3.1.1)
- Mansfield and Murrindindi Shire Councils' circular economy driven waste and resource recovery visions (Appendix A Section 3.1.2)
- The link between organics recovery and decarbonisation/carbon neutrality (Appendix A Section 3.1.4). The estimated greenhouse gas emissions generated from sending food waste to landfill is compared below to other management/processing options (Figure 2.1).

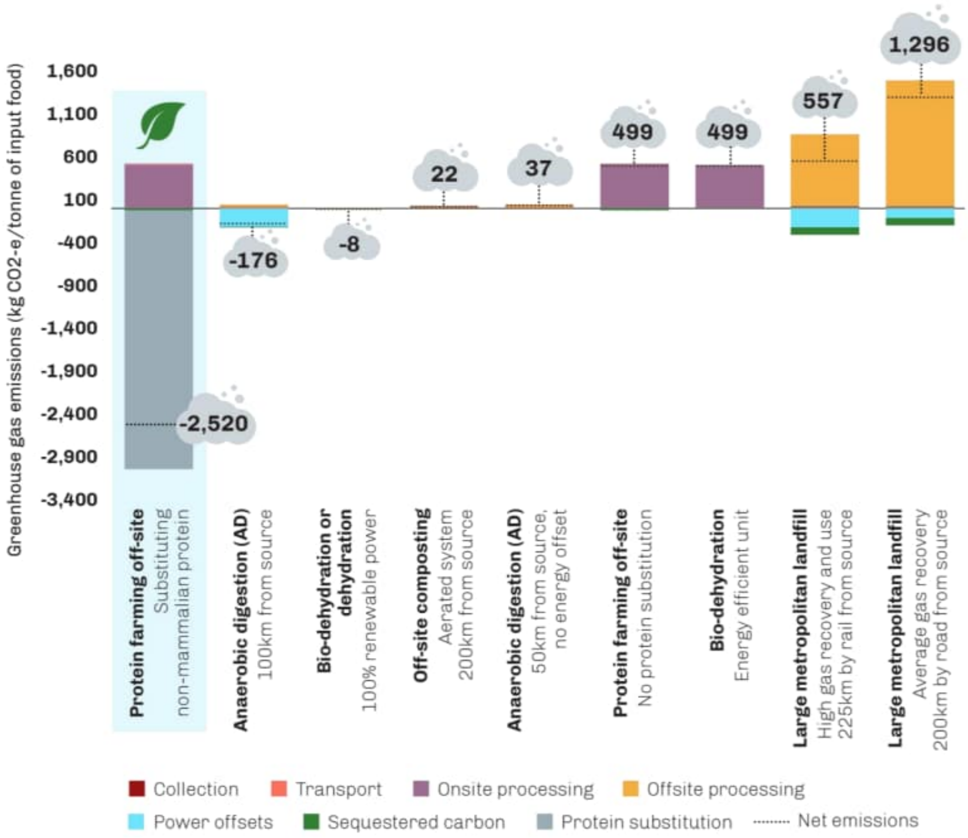

Figure 2.1: Comparison of emissions and offsets from different food waste management systems[7]

In addition to the policy drivers described above and detailed in Appendix A, the need identified by Infrastructure Victoria[8] for Regional Victoria to augment additional organics processing capacity to assist with the projected shortfall in Victoria in 2025 has been considered.

2.4 Evaluation approach

Using the Business Case framework, the first step after understanding the current situation is to develop Project, or Investment, Objectives and Critical Success Factors. These guide the development of options and are used as criteria to evaluate the options. The Objectives and Critical Success Factors set out in Table 2.1 have been developed in collaboration with the Councils.

Table 2.1: Project critical success factors

Criteria	Definition
Objectives	
Opportunity for Community development	• Contributes to community resilience • Enables local food production • Creates local economic opportunity

[7] Emissions impacts of food waste recovery technologies, Fact Sheet, November 2022, NSW EPA accessed from: https://www.epa.nsw.gov.au/your-environment/recycling-and-reuse/business-government-recycling/food-organics-and-garden-organics/emissions-impacts-of-food-waste-recovery-technologies
[8] Advice on recycling and resource recovery infrastructure, Infrastructure Victoria, April 2020

Diversion of organic material from landfill and recovery of products of value	• Option needs to deliver increased diversion of waste from landfill, increased local employment, and needs to deliver products at a quality suitable for end markets and the risks of identified markets need to be considered
Greenhouse gas emissions	• The net carbon impacts covering collection, transport, processing, and use need to be considered • Emissions reduction needs to be an explicit key performance indicator (KPI) for any organic materials recovery facility
Critical Success Factors	
Environmental impact	• Chosen option does not have a negative impact on waterways, land or amenity • A local solution that minimises transport of material • A solution that supports circular systems in which organic material is not a waste but a resource that is used and returned to building soils
Affordability	• Cost needs to be acceptable for households and businesses – linked to capital and operational costs less any rate payer subsidy • If the model includes Council investment, then establishment and ongoing operation costs need to be viable over the long term
Technology maturity	• Considers complexity, safety (integral to any decision-making process), operational requirements and proven technology track record of technology options
Capability to deliver	• Availability of local people, equipment, and infrastructure to deliver the project or service
Synergy with wider resource recovery system	• Chosen option compliments existing or proposed services

In applying these criteria, the performance of each option against each of the evaluation criteria is considered. For ease of interpretation, in addition to comments on the evaluation, the assessment is colour coded to provide a visual cue for each criteria and each option. The evaluation approach and colour coding are described in Table 2.2.

Table 2.2: Evaluation criteria scoring

Evaluation Criteria	Does not support	Somewhat supports	Fully supports
Opportunity for community development	Does not create opportunity for community development	Somewhat create opportunity for community development	Creates opportunity for community development
Diversion of organic material from landfill and recovery of products of value	No change from the current diversion from landfill and materials produced can't be reliably placed in end market.	Up to 30% additional diversion from landfill and materials produced have unreliable or limited markets.	More than 30% diversion from landfill and materials produced have multiple and reliable markets
Greenhouse gas emissions	No change from the current net carbon impact.	A limited improvement in the net carbon impact	A significant improvement in the net carbon impact.
Environmental impact	High potential environmental impacts	Moderate potential environmental impacts	Low potential environmental impacts
The cost to business	High cost to business	Reduced cost to business	Lowest cost to business
Affordability	Significant capital and operational investment required	Moderate capital and operational investment required	No capital or operational investment required
Technology maturity	Not been proven in Victoria	Proven at pilot scale	Proven
Capability to deliver	High complexity, low capability to deliver	Moderate complexity, moderate capability to deliver	Low complexity, high capability to deliver
Synergy with wider resource recovery system	Undermines or conflicts with other system components	Moderate synergy with other system components	High synergy with other system components (different materials targeted, aligns with waste hierarchy)
Evaluation criteria not relevant			

3 Economic Case

3.1 Options

3.1.1 Feedstock

The options for feedstock from the region are included in Table 3.1.

Table 3.1: FOGO material in the Murrindindi/Mansfield Region (2025)

Source	Description	Predicted quantity available (2025)	Assumptions
Mansfield – Household FOGO	Household kitchen scraps and garden waste	680 – 1,500 tonnes	• Assumed kerbside landfill bin composition of 26 % food waste, 9 % garden organics and 4 % other organics. • 2019 kerbside quantity increased at a rate of 1.1% year on year to reflect population growth projections. • No ‘induced’ material (that was previously managed onsite). • No green waste that was previously captured through the RRCs. • 30% capture rate of kerbside bin organics (lower bound). • 60% capture rate of kerbside bin organics (upper bound). • The predicted amount captured has been increased by 10 % to account for induced tonnage (material previously manged onsite that now enters the system).
Murrindindi – Household FOGO	Household kitchen scraps and garden waste	640 – 1,400 tonnes	• Assumed kerbside landfill bin composition of 41 % food waste, 13 % garden organics and 8 % other organics. • 2022 kerbside data increased at a rate of 0.9% year on year to reflect population growth projections. • • No green waste that was previously captured through the RRCs. • 30% capture rate of kerbside bin organics (lower bound). • 60% capture rate of kerbside bin organics (upper bound). • The predicted amount captured has been increased by 10 % to account for induced tonnage (material previously manged onsite that now enters the system).
Mansfield RRC green waste	Household and commercial garden waste	380 tonnes	• 2019 transfer station data increased at a rate of 1.1% year on year to reflect population growth projections.
Murrindindi RRCs green waste	Household and commercial garden waste	2,300 tonnes	• 2021/22 transfer station data increased at a rate of 0.9% year on year to reflect population growth projections.

Source	Description	Predicted quantity available (2025)	Assumptions
Small scale commercial food waste	Pre consumer and post-consumer kitchen scraps	Unknown – small	• Will be reliant on commercial food waste collections being established. • Likely to be small quantities. • Some companies already have established collection/ processing arrangements.
Primary producer waste	Pre-farm gate organic waste (off spec/ damaged vegetables/fruit)	Unknown – small	• FOGO processing would be unlikely to compete with established collection/ processing arrangements that are cost neutral (i.e., stock food).
Large scale industry waste	Organic by products from primary material processing (sludges, slurries other organic by-products)	Not available	• The lack of large industrial processing and alternatives for primary producer waste (i.e., stock feed) indicate commercial organic waste volumes are likely to be small.
Alpine Resort organic waste	Household and business food and green waste	Not available	• It is assumed that Alpine resort waste will continue to be managed at source and the tonnes will not be adopted for this assessment.

Evaluation of potential tonnages indicate a small-scale operation (around 4,000 – 6,000 Tonnes per year) is appropriate, however facilities can be designed in a way that future expansion is a possibility if larger streams of commercial food waste or primary producer waste become available. For the purposes of this business case total feedstock has been assumed to be around 6,000 TPA. This assumes mid-range FOGO adoption and a contribution of commercial organic waste of around 1,000 tonnes.

A detailed overview of the current state of organic material management and potential processing demand is summarised in the interim report (Appendix A). The quantities in Table 3.1 are a prediction of material likely to be available in 2025, and the assumptions are provided. These predictions may be conservative as they do not account for an 'induced' tonnage of material that was previously managed onsite.

It is also possible that the RRC green waste tonnage will decrease and be collected through the FOGO system instead. This has not been considered in the table below as it will not affect the total feedstock for processing, just the mechanism through which it is collected.

3.1.2 Processing technology

The most suitable technology for organic management is largely dependent on the composition of the feedstock. A long list of current technologies and suitability to various feedstocks is provided in the interim report included as Appendix A.

Applying waste composition data to the range of feedstocks making up the estimated 6,000 TPA feedstock, there is a relatively high portion of green waste to food waste (ranging from 50-80 % green waste[9]). Typically processing options fall into three categories (combustion, composting and anaerobic digestion) with the latter being better suited to high nitrogen, high moisture material such as food waste (see Figure 3.1). The high portion of green waste of the feedstock derived in Section 3.1.1 is likely better suited to composting.

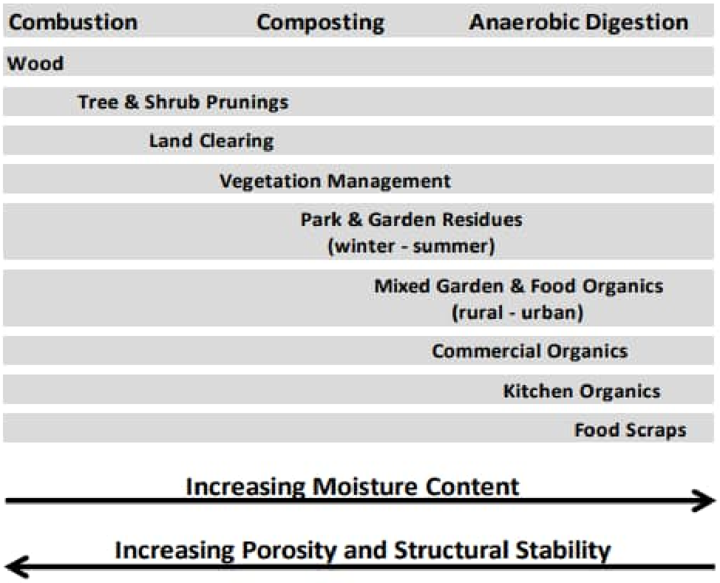

Figure 3.1: Treatment method based on physical and chemical properties[10]

It would also be possible to separately process food waste using anaerobic digestion. This misses the opportunity for economies of scale and would require separate food waste collection. This study did not identify a suitable end user for digestate (liquid, high strength fertilise) or a significant user of process heat that could make use of biogas.

There are also more novel solutions emerging that don't fit into the three categories noted above. For completeness a long list of all established and emerging technologies has been evaluated against criteria in Table 2.2 focussing on technology maturity and suitability for FOGO type feedstock. This evaluation is summarised in Table 3.2. Refer to Appendix A for more detail on each option.

Options not taken forward include:

- Soldier fly larvae – low level of technological maturity and currently limited to commercial source food waste. This process would require a separate, food only, collection and careful management of contamination.
- Hydrothermal liquefaction – low level of technological maturity and expensive.
- Biofuel – low level of technological maturity and expensive, typically woody materials only.
- MBT and MHT – low level of technological maturity and expensive, typically applied to mixed residual waste.
- Gasification – low level of technological maturity and expensive, typically applied to mixed residual waste.

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[9] 50 % assumes mid rang FOGO uptake and 1,000 tonnes of commercial food waste, 80 % assumes low FOGO uptake and minimal commercial food waste.
[10] Understanding the processing options, Fact Sheet 5, DEECCW

- Pyrolysis – low level of technological maturity and expensive, typically applied to mixed residual waste.
- Torrefaction – low level of technological maturity and expensive, , typically applied to mixed residual waste or woody waste.
- Application to land – high environmental impact.
- Windrow composting – limited to green waste.

The technologies/processes taken forward to the short list are:

- Home composting
- Community composting
- Food donations
- Stock food
- Vermicomposting
- Static windrow composting
- In vessel composting
- Landfill (as the status quo)

Table 3.2: Option evaluation summary

Option	Environmental impact	Opportunity for community development	Diversion of organic material	Greenhouse gas emissions	Affordability	Technology maturity	Capability to deliver	Synergy with wider resource recovery system	Short list
Home composting									Yes
Community composting									Yes
Food donations									Yes
Stockfeed									Yes
Windrow composting									No
In vessel composting									Yes
Aerated static pile composting									Yes
Vermiculture									Yes
Soldier fly larvae									No
Hydrothermal liquefaction									No
Anaerobic digestion									No
Biofuel									No
MBT and MHT									No
Gasification									No
Pyrolysis									No

Option	Environmental impact	Opportunity for community development	Diversion of organic material	Greenhouse gas emissions	Affordability	Technology maturity	Capability to deliver	Synergy with wider resource recovery system	Short list
Torrefaction									No
Application to land									No
Landfill/consented fill									Status Quo

Home composting, community composting, food donations, stock food are all important measures for managing organic waste, but experience has shown there is a limited scalability and applicability to all materials.- They score highly as options that are synergistic with other systems and can be supplemented by a larger scale processing option with ability to handle the range of materials contained in the anticipated feedstock. These options should be retained and used in combination with a technology suitable for application aimed at reaching scale of significance.

Landfilling has been taken forward in the short list to represent the status quo scenario. A summary of the advantages and disadvantages of each of the remaining shortlisted technologies is provided in Table 3.3 below.

Table 3.3: Technology shortlist advantages and disadvantages

Technology	Advantages	Disadvantages
Vermicomposting	• Suited food organics only with additional carbon rich bulking agent • May be suited to combined food and green waste provided woody green waste is limited • Outputs are worm castings which are considered a high-quality soil conditioner appropriate for horticulture and gardens • Technology is proven to work in VIC • Scalable (up or down)	• Sensitive to contamination. • Regulating a natural biological process on a large scale takes skill and experience. • Requires adequate buffer distance for odour. • Not suited to woody green waste without pre-processing.
Aerated static windrow composting	• Suited to combined food and green waste • Suited to food organics with additional carbon rich bulking agent • Technology is proven to work in VIC • Scalable (up or down)	• Outputs require further maturation in an open area. • Requires adequate buffer distance for odour. • Requires careful preparation to ensure feedstock is well mixed and enable complete composting of material throughout the compost pile.
In vessel composting	• Suited to combined food and green waste or food organics with additional carbon rich bulking agent • Technology is proven to work in VIC • High controllability of process when variables enter system (seasonality of quantities/quality) or to kill pathogens	• Outputs require further maturation in an open area. • Reduced buffer distance required for odour as process is enclosed. • Significant capital investment (four times more than aerated static). • Higher operational costs (four times more than aerated static). • Locked into a processing capacity.

On balance static aerated windrow composting is well suited to this application. Key factors influencing this assessment include:

- The anticipated feedstock quantity is small, meaning an enclosed system would be relatively expensive with core infrastructure requirements (structures, fixed aeration, control systems) likely oversized for the quantity of feedstock.
- The anticipated feedstock incorporates carbon rich bulking agent (green waste) alongside household food organics and commercial food waste. This is better suited to composting than vermicomposting due to the likely presence of woody green waste.
- Semi-rural locations are available for the processing activity with adequate buffer distances for a non-enclosed facility (with consideration of EPA Separation Distance Guidelines).
- An aerated static pile system is easier to scale for smaller feedstock quantity meaning lower capital costs compared to a fully enclosed system.
- Aerated static pile composting is scalable for unpredictable tonnages (can be easily scaled up or down) with limited cost impact.
- Aerated static pile composting is a proven technology for rural Victoria[11]

However, vermicomposting and in vessel composting also scored highly in the evaluation criteria and could also work if there was significant appetite from private industry to implement one of these technologies.

3.1.3 Structure (network or centralisation)

Organics processing could be run as a network of smaller facilities or one central facility. There was strong messaging from community stakeholders that there is an opportunity to work with community groups to deliver outcomes and process organics at source.

Given the region has such large distances Council could also consider the opportunity to deliver processing as a network of small-scale processing hubs either commercial, council or community owned/operated. Different technologies could be used to create materials suitable for blending, or for pre-treatment (such as dehydration) prior to transport for further processing (increasing transport efficiencies).

Opportunities for the region to integrate this thinking into an approach for material recovery could include:

- Investment in encouraging further uptake of home composting.
- Supporting organics material recovery and processing at community facilities (such as schools).
- Supporting the establishment of organics recovery in partnership with community gardens (where material is recovered and used onsite).
- Supporting community owned centralised facilities (operating as social enterprises) where organic material is recovered.

Other benefits of community scale composting may include support for local food production/food resilience, local employment and volunteer opportunities and participants having increased knowledge of the waste they produce at a household level.

Limitations of community facilities most often relate to scalability and identification of project partners/governance models that ensure a quality and consistency of service. There are examples of

[11] At least two works approval licences have been issued for this technology by EPA Victoria in Melbourne's north east in the last four years

many successful enterprises across Victoria that have adopted a community approach to organics recovery, but each relates to a champion organisation or individual needing to drive the project, with Council support occurring retrospectively.

Because of these limitations, community scale processing is unlikely to be suitable for all the materials identified. This does not preclude community scale initiatives having a role in addressing some materials, particularly those from households, community groups and smaller scale commercial activities where the combined quantities are relatively low.

3.1.4 Location

The location of composting facilities is dependent on several factors which are determined by the following guidelines:

- EPA Publication 1588.1: Designing, constructing, and operating composting facilities, EPA Victoria, 2017
- EPA Publication 1518: Recommended separation distances for industrial landfill air emissions, EPA Victoria, 2013.
- EPA Publication 1949: Separation Distance Guideline (draft), EPA Victoria, 2022

Composting facilities are required to have separation (buffer) distances which are dependent on what the surrounding land uses are, the meteorology, and topography of the location. Understanding the meteorology and topography assists in determining potential pathways of odour, noise, stormwater runoff, and other potential impacts. Separation distances are applicable to all sensitive land uses. This can include (but is not limited to) residential zones, schools, or named waterways.

Calculations for determining separation distances for the facility are determined according to Draft EPA Publication 1949 *Separation Distance Guideline*, as provided in Table 3.4.

Table 3.4: Example separation distances, reference facility 1 (Table 6 of EPA Publication 1949 Draft)

No.	Types of feedstock acceptable (see Publication 1588)	Technology	Size of the plant (tonnes/year)	Recommended separation distance (metres)
1	Lowest risk wastes	• Open air receival • Open turned windrow • Open air maturation	1,200	400
			5,000	650
			12,000	1,100
			20,000	1,500
			36,000	2,000
			50,000	2,200
			>50,000	Case by case
2	Up to medium risk	• Outdoor covered windrows • Continuous aeration • Open air maturation	1,200	400
			5,000	600
			12,000	850
			20,000	1,100
			36,000	1,400
			50,000	1,600
			>50,000	Case by case

No.	Types of feedstock acceptable (see Publication 1588)	Technology	Size of the plant (tonnes/year)	Recommended separation distance (metres)
3	Up to high-risk wastes	• Receival directly to processing bunkers • Outdoor covered windrows in bunkers, semi-permeable covers (i.e., PTFE) • SCARTA controlled aeration • Open air maturation	1,200	200
			5,000	400
			12,000	600
			20,000	750
			36,000	950
			50,000	1,000
			>50,000	Case by case
4	Up to highest risk wastes	• Under cover receival • Enclosed aerobic composting • Under cover air maturation with • Odour capture and treatment	1,200	200
			5,000	350
			12,000	430
			20,000	500
			36,000	550
			50,000	600
			>50,000	Case by case

Note: open air static pile composting is not encouraged except for low volumes (<1200 t/year) of low-risk wastes

Waste accepted by the facility is classified as "mixed source separated kerbside (garden waste/ food waste – FOGO" and considered as a "Medium to high" risk (category 3) according to EPA Guideline 1588.1, Table 5.1.

Whilst the facility is projected to accept 6,000 TPA of waste, the separation distances for 12,000 TPA was adopted to ensure the site could be expanded in the future. Therefore, a separation distance of 600m between the facility and sensitive receptors has been adopted.

Other criteria that considered in the selection of RRC location include:

- Ownership: Council will need to determine whether land will have to be procured, and what the model for lease or rent would be. Ideally, the land should be already owned by Council
- Road accessibility: The appropriate site requires safe driving routes and roads, likely be located on a main road to prevent disruption to private roads and ensure there is space for movements and turning circles of trucks on-site.
- Future proof capacity: Will the location have potential for expansion when required in the future, or is there potential for encroachment of development in the area which would require more controls to be implemented to reduce impacts on the surrounding area
- Fire risk: The proposed location should not have any bushfire overlays, nor should it border bushland
- Environmentally significant areas (ESA): There should not be any ESA overlays for the proposed location, nor should the location border an ESA
- Cultural Heritage: There should not be any Cultural Heritage overlays for the proposed location.
- Size: For an ASP facility of 6000 TPA throughput 1.1 Ha has been assumed to be sufficient.
- Topography: A composting operation requires a large flat area, identifying a site with less requirements for earthworks is desirable.

3.2 Location selection process

To select a location, an initial 'long list' has been created based on lists of potential locations. It is important to remember that the site will be used by both Murrindindi Shire Council and Mansfield Shire Council. To account for this, both Shires were requested to submit a list of potential locations.

Mansfield recommended locations were their current RRC site (Monkey Gulley Road), and their current Council Depot Site (Lakins Road) (See Table 3.4). Murrindindi Shire Council has provided a resource recovery options assessment complete in 2019 that lists several possible sites for waste and resource recovery infrastructure[12].

The long list of recommendations from both Shires is provided in Table 3.5.

Table 3.5: Location assessment – long list

Name	Category	Current use	Landowner
Alexandra RRC	RRC	Current RRC built on decommissioned Alexandra Landfill. Development encroachment possible to the northeast (estate development).	Murrindindi Shire Council
Alexandra Landfill	Closed Landfill	Existing (new) landfill. Located on main arterial road. Limited flat land for processing areas.	Murrindindi Shire Council
Alexandra Lethbridge Street	Private Ownership	Privately owned property in the industrial area. Topography is flat to slightly undulating. Adjacent to residential area.	Private Ownership
Eildon RRC	RRC	Current RRC, developed on closed landfill.	Murrindindi Shire Council
Eildon WWTP	WWTP	Eildon Goulburn Valley WWTP located close to town. At risk to future residential land use encroachment.	State Government
Eildon Sugarloaf Road	Private Ownership	Privately owned property in northern industrial area. Site is quite steep and undulating.	Private Ownership
Kinglake RRC	RRC	RRC with the largest capacity of any MSC RRC.	Murrindindi Shire Council
Kingslake O'Gradys Road (Collers Road)	Private Ownership	Two very similar sites along the east and west of O'Gradys Road. Clear undulating land. Gravel road access.	Private Ownership
Kingslake O'Gradys Road (Johnsons))	Private Ownership	Two very similar sites along the east and west of O'Gradys Road. Clear undulating land. Gravel road access.	Private Ownership
Kingslake Extons Road	Private Ownership	Large size and ample cleared undulating land.	Private Ownership
Kingslake Sutherland Road	Private Ownership	Next to existing timber recycling facility.	Private Ownership

[12] Murrindindi Shire Council Resource Recovery Centre Options Analysis, Reincarnate Strategic Environmental Consultants and Golder Associates Pty Ltd, and Randell Environmental Consulting, 2019

Name	Category	Current use	Landowner
Kingslake Deviation Road	Private Ownership	Large footprint with substantial buffers to residential areas and waterways, undulating land.	Private Ownership
Marysville RRC	RRC	Very small site with limited and seasonal use. Currently heavily encroached and does not comply with residential buffer requirements.	Murrindindi Shire Council
Marysville WWTP	WWTP	Goulburn Valley Water Marysville WWTP. Site has good buffers.	State Government
Taggerty Yellow Creek Road	Private Ownership	Provides large areas of flat and elevated land. A large ridgeline dominates the centre of the site.	Private Ownership
Taggerty Thornton Road	Private Ownership	Provides a large and fully cleared footprint. Site is located along main arterial road.	Private Ownership
Taggerty Swamp Creek Road	Private Ownership	Provides a large and fully cleared footprint. Site is located along main arterial road.	Private Ownership
Yea RRC	RRC	Built on top of former Yea landfill. Site has suitable topography for grade separation.	Murrindindi Shire Council
Yea Flat Lead Road	Council Ownership	Surrounds a saleyard. Proposed site for development of new Yea RRC. Design evaluation concluded separation distances would not support composting activity.	Murrindindi Shire Council
Yea WWTP	WWTP	Goulburn Valley Water Yea WWTP. Situated on a main arterial road.	State Government
Mansfield RRC	RRC	Current RRC, closed landfill and vacant land.	Mansfield Shire Council
Mansfield Depot	Council depot	Council depot with vacant land at the back of the property.	Mansfield Shire Council
Yarck Quarry	Private Ownership	Quarry with undulating topography.	Private Ownership
Duke Street Merton	Public Land	Small vacant site	State Government

The locations of the long list options are shown in Figure 3.2.

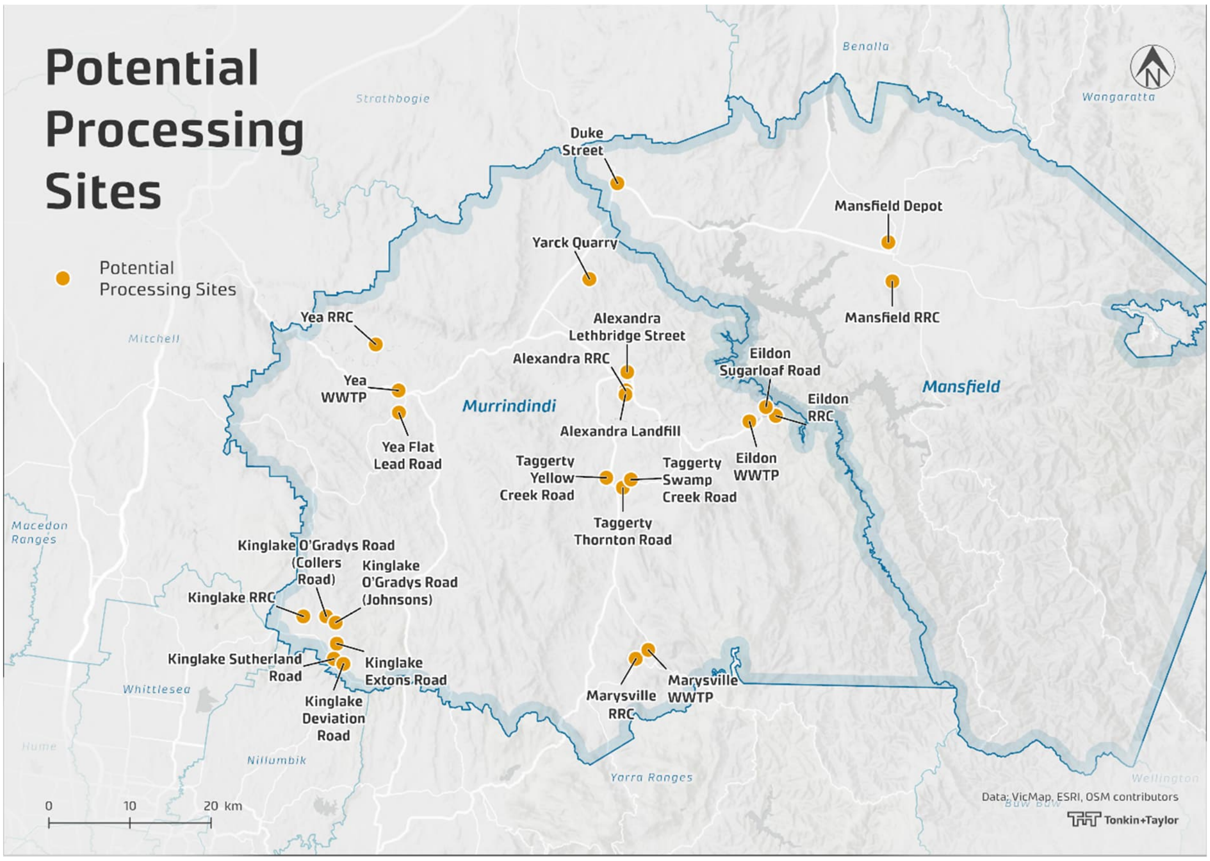

Figure 3.2: Locations of long list options

3.3 Location selection

An evaluation of locations was undertaken based on the criteria outlined in Section 5.1. The size, topography, and presence of residential zones were considered for all long-listed sites to create an initial shortlist. The results of this are provided in Table 3.6.

The resultant short list was compared to population driving times, separation distances, and overlays (Table 3.7). It should be noted that the separation distances are based off the location of a 1.1 ha rectangle nominally mapped onto the site through a desktop study. The actual locations of the facility when constructed may result in a separation distance that differs from that provided below.

Table 3.6: Overall location shortlist

Name	Land parcel	Area (ha)	Is there any potential development encroachment? (i.e. is there a residential zone within 600m)	Topography	Shortlisted?
Alexandra RRC	19H and 19J\PP2009	6	Yes	Undulating.	Yes
Alexandra Landfill	2\LP134784	42	No	Flat in northeast corner. Sloping downhill towards southwest. Small hill in centre of site. Council has indicated there is limited suitable space that is not reserved for future landfill development.	No
Alexandra Lethbridge Street	1\TP824965	3.3	Yes	Undulating.	No
Eildon RRC	1\PS436164	30	No	Rising in southeast, flat/ undulating at north.	Yes
Eildon WWTP	2\PS336972	37	Yes	Flat along south, with incline along north boundary.	No
Eildon Sugarloaf Road	1\LP148257	0.6	Yes	Flat.	No
Kinglake RRC	14H~C\PP2614	7.5	Yes	Flat.	No
Kingslake O'Gradys Road (Collers Road)	1\LP94810	23	No	Undulating.	Yes
Kingslake O'Gradys Road (Johnsons))	1\LP139609	23	No	Undulating.	Yes
Kingslake Extons Road	1\TP126159	34	No	Undulating.	Yes
Kingslake Sutherland Road	2\PS603283	16	No	Undulating with slight rise in centre of site.	Yes
Kingslake Deviation Road	24\LP41481	39	No	Undulating with dams.	Yes
Marysville RRC	1\PS439022	0.78	Yes	Flat.	No
Marysville WWTP	13A\PP5509	25	No	Flat.	Yes
Taggerty Yellow Creek Road	3\LP134573	40	No	Eastern boundary flat but rise towards the southwest corner.	Yes
Taggerty Thornton Road	16~3\PP3521	17	No	Flat, one dam on site and creek nearby.	Yes
Taggerty Swamp Creek Road	2\LP68090	39	No	Flat.	Yes
Yea RRC	2001\PP5316	1.8	No	Flat, majority of site currently used by the RRC which is planned for relocation.	Yes
Yea Flat Lead Road	40A1\PP3979	10.4	No	Slight incline to southeast. Earmarked for RRC development. Organic processing was considered as part or RRC development and evaluated to not be likely to be feasible.	No
Yea WWTP	3\TP877151	1	Yes	Flat.	No
Mansfield RRC	1\TP161184	29	No	Slight incline towards north. Majority of site taken up by RRC and closed landfill. Options could include reusing closed landfill area for maturation or using adjacent land parcel.	Yes
Mansfield Depot	40\PP3056	25	Yes	Slight incline to south.	No
Yarck Quarry	1\PS501719	35	No	Undulating from range 330 - 480 m AHD,	Yes
Duke Street	7A and 7B-1\PP5524	0.67	Yes	Flat	No

Table 3.7: Final location shortlist

Name	Ownership?	Population summary (30 minute drive time)	Population summary (60 minute drive time)	Nearest sensitive receptor	Is it within a Bushfire Management Overlay?	Is there an ES overlay or border an ES overlay?	Is there a Cultural Heritage overlay on site?	Is there potential for expansion? (based on aerials)	Shortlisted?
Alexandra RRC	Council	34	87	390[13]	Yes	No	No	Yes	No
Eildon RRC	Council	22	66	915	Yes	No	Yes	Yes	Yes
Kingslake O'Gradys Road (Collers Road)	Private	22	53	145	Yes	Yes	No	Yes	No
Kingslake O'Gradys Road (Johnsons))	Private	23	57	140	Yes	Yes	No	Yes	No
Kingslake Extons Road	Private	22	57	341	Yes	Yes	Yes	Yes	No
Kingslake Sutherland Road	Private	23	53	175	Yes	Yes	No	Yes	No
Kingslake Deviation Road	Private	22	52	455	Yes	Yes	No	Yes	Maybe
Taggerty Yellow Creek Road	Private	28	85	380	Yes	No	No	Yes	No
Taggerty Thornton Road	Private	29	85	315	No	No	No	Yes	No
Taggerty Swamp Creek Road	Private	29	85	475	No	No	No	Yes	Maybe
Marysville WWTP	Council	20	61	515	Yes	No	Yes	Yes	Maybe
Yea RRC	Council	26	85	330	No	No	No	No	No
Mansfield RRC	Council	42	71	690	Yes	No	No	Yes	Yes
Yarck Quarry	Private	30	97	2575	No	No	No	Yes	Yes

13 Subdivision development planned.

Based on all criteria, the final suitability of each side is summarised in Table 3.8.Three sites were determined as preferable for the construction of a facility, however there are three additional locations where the constraints could be managed. The remaining locations have been deemed not suitable.

In the next stage of the assessment, the sites identified in Table 3.8 where constraints are manageable may also be considered if the preferred options are found to be unsuitable through further analysis.

Table 3.8: Summary of location assessment

Not suitable	Constraints are manageable	Preferable
Alexandra Landfill	Kingslake Deviation Road	Mansfield RRC
Alexandra Lethbridge Street	Taggerty Swamp Creek Road	Yarck Quarry
Eildon WWTP	Marysville WWTP	Eildon RRC
Eildon Sugarloaf Road		
Kinglake RRC		
Marysville RRC		
Yea WWTP		
Mansfield Depot		
Duke Street		
Alexandra RRC		
Kingslake O'Gradys Road (Collers Road)		
Kingslake O'Gradys Road (Johnsons))		
Kingslake Extons Road		
Kingslake Sutherland Road		
Taggerty Yellow Creek Road		
Taggerty Thornton Road		
Yea RRC		

Of the four preferred sites, there are some remaining points to be considered.

- Council owned sites present an opportunity to reduce project complexity (avoiding land acquisition) and reduced costs (no lease required).
- Yarck Quarry is currently privately owned. Additionally, the topography of the Yarck Quarry site presents civil design challenges, with steep slopes and limited flat land for processing facilities.
- Eildon RRC and Mansfield RRC have sufficient buffer distances and topography; however, both have planning overlays that may add complexity to a works approval application (Bushfire Management for both sites, and Cultural Heritage at Eildon RRC) but can certainly be managed.

3.4 Options for Mansfield and Murrindindi

In summary the options for Mansfield and Murrindindi Shires are summarised below.

1 Status quo

The status quo for organic waste materials involves the transport of materials to Western Composting or Wangaratta Organics Processing Facility for processing. Other material could be dealt with onsite through home composting or existing community initiatives. Commercial material continues to be disposed to landfill with refuse.

2 Centralised composting facility

Composting is an established and proven technology for all the materials considered as part of the gap analysis. The technology options assessment concluded that on balance an aerated static pile technology would be the most appropriate technology for this application, but other composting technologies would also be acceptable.

Incoming feedstock is ground and then laid in concrete bunkers with aeration channels using wheel loaders. A GORE[14] cover or similar is immediately placed over the material. The integrated system includes the GORE® cover, in-floor aeration, aeration blowers, oxygen and temperature sensors, controllers, computers, software, and cover handling systems (Figure 3.3 and Figure 3.4). The composting process takes four weeks after which the material is moved by front end loader to a maturation pad.

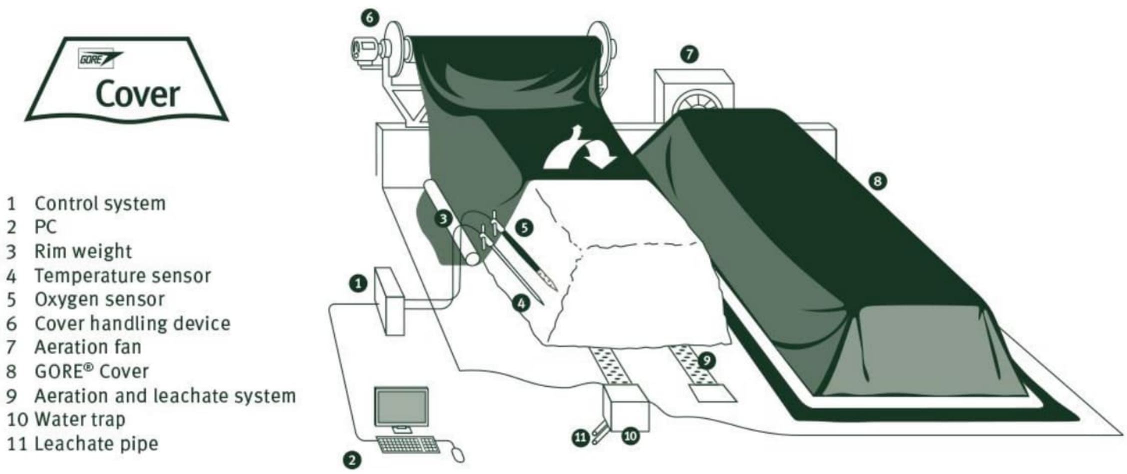

Figure 3.3: Covered static aerated composting overview

[14] The GORE® Cover system technology is centred on membrane laminate technology creating a cover over compost that reduces odour

Figure 3.4: Covered static aerated composting

For any composting operation selection of an appropriate site needs to factor in suitability for a site to manage any potential amenity impacts of operations and to avoid negative impacts on land or water. For instance, composting operation sites need to have adequate buffer distances for odour and potential impact of an unplanned discharge (through proximity to waterways). The locations assessment indicated that there are several locations with the region that could potentially fit this criteria.

Key features of this option include:

- Materials will be transported to a single site for covered aerated static composting.
- The processing site will require careful design to manage odour for materials reception and during aeration.
- The processing site will require design to manage nutrient impacted water (from composting materials, stormwater).
- The operation will require significant capital investment, skilled operators, and marketing expertise for the end product.

An overview of this option is shown schematically in Figure 3.5.

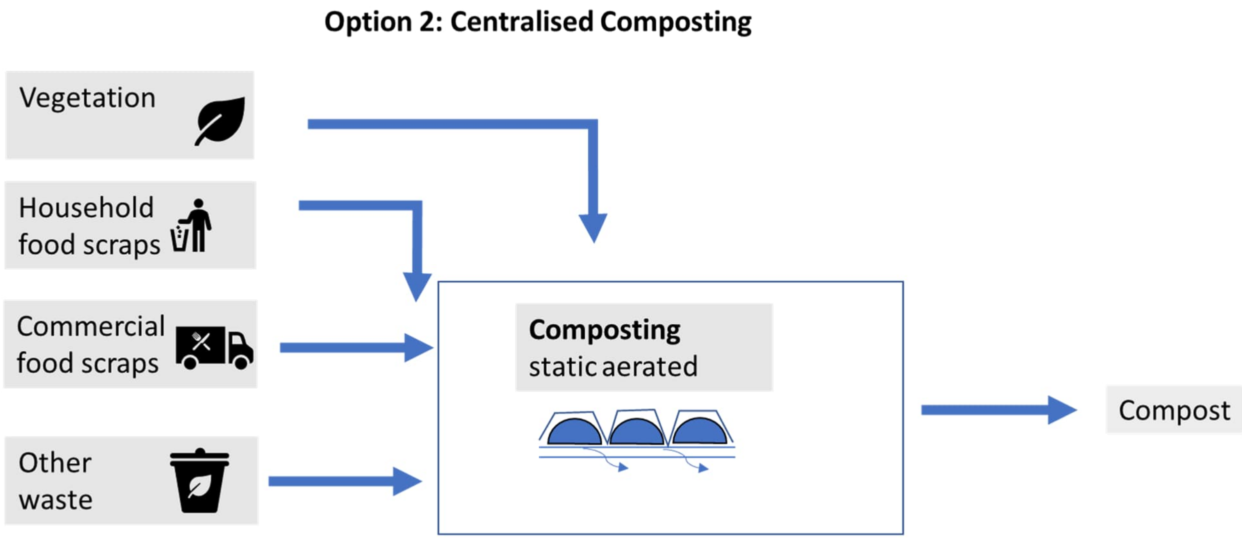

Figure 3.5: Centralised composting process

As discussed in Section 3.1.2 vermicomposting and in vessel composting also scored highly in the evaluation criteria and could also work if there was significant appetite from private industry to implement one of these technologies.

3 Commercial and community network of multiple facilities

Key features of this option include:

- Materials from large volume generators including Council collections will be transported to a two or more sites for processing (aerated windrow composting, in-vessel composting, vermi-composting and/or small-scale anaerobic digestion).
- In some communities, materials will be dropped off or 'locally collected' for composting at community gardens or community facilities. Compost will be used locally – in the community garden or shared with the community.
- For composting, significant bulking (carbon rich, suitable particle size) will be required to enable effective composting, vermi-composting.
- Any larger scale processing site will require careful design to manage odour for materials reception and during aeration.
- Each processing site will require design to manage nutrient impacted water (from composting materials, stormwater).
- Digestate (from anaerobic digestion) or outputs from dehydrators may require further processing before use to manage nutrient availability when applied to land.
- A digestion operation will generate power and/or provide heat e.g., for food processing.
- Larger operations will require significant capital investment, skilled operators, and marketing expertise.

An overview of this option is shown schematically in Figure 3.6.

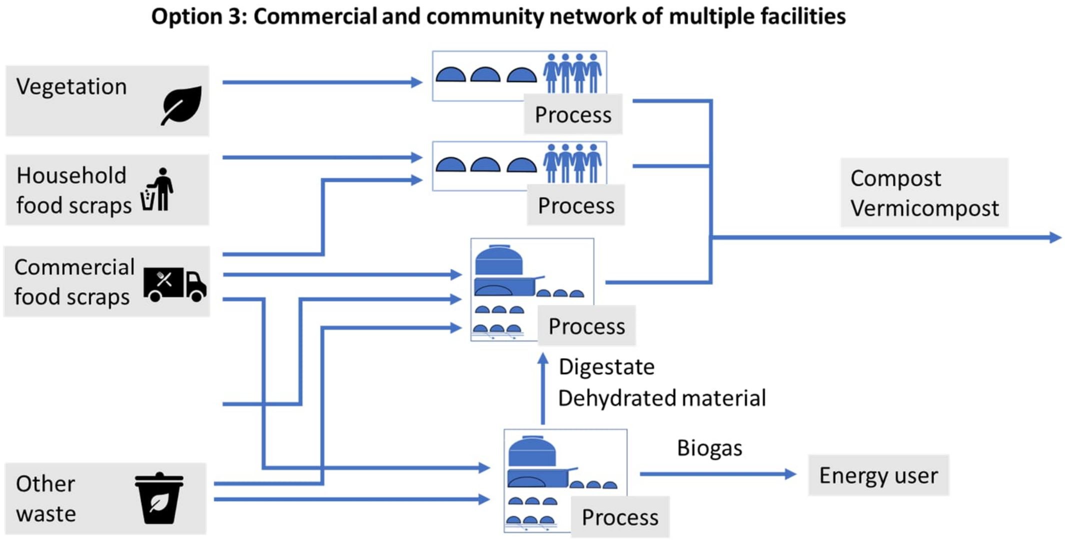

Figure 3.6: Network of multiple facilities

Capital cost for a network of processing facilities including community scale initiatives for the region is highly dependent on the approach adopted, including number of sites or facilities, technologies selected, proximity of biogas energy users and arrangements for the use of digestate and marketing of compost or vermi-cast.

In general, it is expected that for the commercial facilities and the same amount of feedstock capital costs will be higher due to the need to replicate supporting infrastructure and two or more sites. Operational costs at each site are likely to be broadly comparable but at the higher end of the expected range due to less benefits from scale. There may be potential to share some resources, for example environmental management and marketing. Transport costs to the facilities will be lower for facilities located close to source materials.

Community scale facilities could be relatively low cost (for relatively small throughput). Localised processing of material is likely to reduce costs for collection although the focus may be on areas that are not serviced by commercial or Council collections.

Community scale initiatives rely on a motivated core of people to coordinate and actively manage activity. This means it is difficult for Councils to establish community scale initiatives without active partners in the community. There is potential for Council's to provide technical support, suitable locations and/or seed funding for community led initiatives were considered appropriate.

3.5 Options Appraisal

Each of the options identified for consideration in this Business Case have been evaluated using the framework summarised in Section 2.4. The evaluation approach is described in Table 2.2. The evaluation is summarised in Table 3.9 with colour coding to assist in providing an overall view. Table 3.10 provides more detailed comments against the evaluation criteria for each option.

The evaluation suggests that on balance, a *centralised composting facility* should be the preferred option. This reflects strong positive aspects (proven capability to deliver, high technological maturity and ability to meet aspirations to deliver community benefit and divert organic material from landfill). This option could be improved by maximising recovery and carefully managing capital and operational costs (TOTEX).

Developing a network of facilities in partnership with community groups and businesses is also an attractive option, but there is less certainty around capability to deliver (are the right groups/individuals available in the community to deliver) and low technology/system maturity (this would be an innovative model not widely used elsewhere at scale). This option is a possibility but is potentially less attractive to Council.

For this reason, Option 2 has been taken forward for the purposes of this business case.

Table 3.9: Option Evaluation Summary

Evaluation Criteria	1. Status Quo	2. Centralised facility	3. Network of facilities
Opportunity for community development			
Diversion of organic material from landfill and recovery of products of value			
Greenhouse gas emissions			
Environmental impact			
Affordability			
Technology maturity			
Capability to deliver			

Table 3.10: Option evaluation notes

Evaluation Criteria	1. Status Quo	2. Centralised facility	3. Network of facilities
Opportunity for community development	No community development benefits identified	Opportunity to employ local Council staff/ contractors in facility construction/operation.	High potential to engage with local businesses. community groups and residents.
Diversion of organic material from landfill and recovery of products of value	High transport costs have prevented FOGO collections from being undertaken as processing is not affordable.	Centralised facilities can be designed to scale to meet feedstock needs, currently modelled at 6,000 TPA.	Scalability of community facilities to manage 6,000 TPA less certain.
Greenhouse gas emissions	High transport emissions associated with trucking waste out of region. High transport costs are preventing additional source segregated collections and greenhouse gas associated with diversion.	Moderate impacts associated with transport and processing.	Network of facilities could be aimed at processing and reusing more organic material at source, reducing transport related green house gas emissions.
Environmental impact	Large scale processors out of region can manage risk to environment effectively	Moderate potential impacts to the environment, human health and amenity need to be managed so far as reasonably practicable.	Moderate potential impacts to the environment, human health and amenity need to be managed so far as reasonably practicable.
Affordability	High transport costs have prevented FOGO collections from being undertaken as processing is not affordable.	Moderate capital and operational costs Est 5 M and $100/t	Moderate capital and operational costs. Volunteer/paid time needs to be carefully managed. Costs complex to estimate.
Technology/system maturity	Proven to work historically	Similar technologies are used by Council owned facilities in Victoria	Innovative model not widely used elsewhere at scale
Capability to deliver	Processing out of region has worked historically	Similar technologies are used by Council owned facilities in Victoria	Scalability of community facilities less certain.

4 Cost analysis

4.1 Market for compost product

The products created from FOGO processing using aerated static pile technology will be compost. The sale of the product is essential to the ongoing financial viability of an organic processor's operation. The value and use of the processed organics materials differs substantially depending on the type, location, quality, and quantity of materials. If the product cannot be sold, then landfill disposal is often the only option although land remediation may be an option in some cases.

Under AS4454-2012, compost is a soil conditioner of fine particle size, with typically less than 20 per cent of particles exceeding 16mm. It must meet stability requirements set out in AS4454-2012. Compost can be applied as a topdressing or dug into soils to provide biological, chemical, and physical benefits to soils. Assuming composting will reduce the incoming material mass by 40 %[15] an end market will need to be identified for approximately 3600 TPA of material.

Products are typically used in five industry market segments in Victoria including:

- Urban amenity;
- Intensive agriculture;
- Extensive agriculture;
- Rehabilitation;
- Environmental remediation

Given the small tonnages expected to be produced a consideration might be that the facility aims to develop a material targeted at a certain market segment. An overview of agricultural production activity for the two Shires is provided in Table 4.1.

Table 4.1: Agricultural production activity in Murrindindi and Mansfield Shires

Agricultural commodities	Murrindindi[16]	Mansfield[17]
2021 (year ended June 30)		
Area of holding – total area (ha)	139,688	67,532
Dairy cattle – total (no.)	1,356	472
Meat cattle – total (no.)	79,336	39,015
Sheep and lambs – total (no.)	107,139	145,061
Pigs – total (no.)	14.2	3.5
Meat chickens – total (no.)	15.3	NA
Broadacre crops – total area (ha)	4,166	1,190.5
Vegetables – total area (ha)	6.5	6.1
Orchard fruit trees and nut trees – produce intended for sale – total area (ha)	308	35.3
Viticulture[18]	289 (combined)	

[15] This number can range significantly (20-60%)
[16] Region summary: Murrindindi (Vic.), Australian Bureau of Statistics, accessed from: https://dbr.abs.gov.au/region.html?lyr=lga&rgn=25620
[17] Region summary: Mansfield (Vic.), Australian Bureau of Statistics, accessed from: https://dbr.abs.gov.au/region.html?lyr=sa2&rgn=204011057
[18]

With the agricultural industries specific to the region (Table 4.1) taken into consideration options for market development are summarised in Table 4.2.

Table 4.2: Options for market development for compost in Mansfield/Murrindindi

Industry market segments	Description	Opportunities/limitations
Urban amenity	For use in urban areas including residential and commercial landscaping, retail nursery, special projects (such as highway verges). Users could include Council, commercial landscapers, and general public.	• Targeting internal council works, commercial landscapers (associated with residential development happening at urban fringes in the region), general public (sold through transfer station network, through charities/community groups). • This option could be supplemented by creating a narrative for residents around reuse of nutrients from kerbside organic waste. • Urban amenity has had the highest compost use uptake in Australia historically.
Intensive agriculture	Agricultural use including viticulture, vegetable production, fruit and orchards, turf production, nursery production and wholesaling	• Product targeted at horticultural production in the region. • In perennial crops compost can be trenched into planting rows or surface applied at an application rate of (10t/ha). • Overall land area available is small so there would need to be strong market uptake for this market to be sustainable. • Intensive agriculture has had the second largest compost use uptake in Australia historically.
Extensive agriculture	Extensive agriculture: agricultural use including pasture production (livestock including sheep, beef and dairy), broadacre cropping and forestry.	• The region has a large broad acre cropping industry. • Compost can be used as a soil conditioner per sowing at a rate of 7-15 t/ha, most likely at re-sowing every few years • Achieving compost use uptake in extensive agriculture including broad acre cropping have traditionally had less success in Australia to date.
Rehabilitation	Use for landfill cover and rehabilitation, erosion stabilisation, land reclamation, restoration, revegetation, and rectification.	• Low opportunity for value add (often used as a disposal means rather than sold product) • Low uptake in Australia to date for this use
Environmental remediation	Contaminated site and soils remediation, water purification and biofiltration uses.	• Low opportunity for value add (often used as a disposal means rather than sold product) • Low uptake in Australia to date for this use

Assessment	Urban amenity and intensive agriculture markets show promise and stakeholder engagement with these parties should be prioritised when product formulation planning is being undertaken.

Additional considerations for end market include:

- Blending of material with additives or other organic products to target user needs may make end markets more viable but will come at an additional cost.
- Bagging material could open opportunity for sales through retail outlets but would require additional capital and operational expenditure for the facility.
- End markets are dependent on quality assurance and testing which needs to be accounted in operational costs.

4.2 End market product value

Indicative value for compost products depends on the product and target market. Market research from Victoria[19] (escalated to 2022 value) indicates that the following ranges of value may be available for each type of product/market:

Domestic/urban markets:

- Pasteurised and immature soil conditioners ($5-$35/t)
- Composted soil conditioners ($50-$125/t)
- Blended topsoil ($50-$130/t)
- Blended compost fertiliser and soil amendments ($60-$200/t)

Agriculture markets:

- Pasteurised soil conditioner ($5-$10/t + freight)
- Composted soil conditioner ($5-$30/t + freight)
- Blended soil/growing media (limited market potential)
- Blended composts with fertiliser or other soil amendments ($60-$230/t)

During periods of oversupply or if a secure market has not been established some composters will supply composts at delivery cost to avoid exceeding licensing or site capacity limits on the quantities of materials on-site. Selling compost to wholesale to businesses who value add is commonplace in Victoria.

4.3 Net present value analysis

In developing a simple financial model for a centralised composting facility there are several variables that need to be considered. These variables can be optimised to achieve the desired outcome. Each variable is discussed further in Table 4.3. Cost assumptions have been provided in Appendix B.

Table 4.3: Key variables in the preliminary cost model

Variable	Comment
Site throughput (T per year)	Set at 6,000 tonnes.
Approx processing cost ($ per T)	Set at $100 / T based off industry reports.

[19] Victorian waste flows, Prepared for Infrastructure Victoria, Blue Environment Pty Ltd, October 2019

Variable	Comment
Contamination rate (%)	Set at 5%, a decrease in contamination reduces (disposal) costs significantly.
Gate rate (feedstock) ($/T) for drop offs	Set at $180 / T
Landfill gate rate (residual waste) ($/T)	Set at $219 excl. GST in 2023 + levy adjustments. (Alexandra Landfill gate rate). The actual rate will depend on negotiations for the cost of transport and disposal of residual waste.
Revenue for recovery ($/T)	$20 revenue $35 haulage Cost to customer ($55)
Capital Cost ($)	Assumed $5 M
Discount rate for NPV Analysis (%)	4 %
Discount period for NPV Analysis (years)	20 years.

The net present value analysis is summarised in Table 4.4. A centralised composting facility has an NPV of $55,569 based on the assumptions set out in Table 4.3. An iterative process was used to derive a gate rate that generated a breakeven NPV, and this was determined to be $177/t.

Table 4.4: Net Present Value analysis summary

Net Present Value	Output (gate rate of $180)	Output (breakeven gate rate, $177)
Capital NPV	-$4,889,423	-$4,889,423
Revenue (gate) NPV	$16,111,887	$15,843,355
Revenue (recovery) NPV	$929,578	$929,578
Cost (residual disposal) NPV	-$980,140	-$980,140
Cost (processing) NPV	-$8,154,196	-$8,154,196
Council costs NPV	-$2,726,823	-$2,726,823
TOTAL Net Present Value (2023 - 2043)	$290,883	$22,352

The location assessment indicated there may be an opportunity to use a Council owned site which would remove the need for lease costs. Removing lease costs reduced the gate fee to $168/t to reach a positive NPV after 20 years.

4.4 Sensitivity analysis

The assumptions set out in Table 4.3 are subject to varying levels of uncertainty. In completing the economic appraisal it is important to understand the impact of changes in some of the key assumptions. Table 4.5 presents best and worst case figures for each of the key variables.

Table 4.5: Key variables in the economic model - ranges used

Variable	Default	Best case	Worst case
Site throughput (T per year)	6,000	6,000	4,000
Approx processing cost ($ per T)	$100/t	$100/t	$150/t

Variable	Default	Best case	Worst case
Recovery rate (%)	95%	98%	90%
Gate rate (feedstock) ($/T) for drop offs	$180/t	$180/t	$180/t
Landfill gate rate (residual waste) ($/T)	Set at $219 + levy adjustments.	Set at $219 + levy adjustments	Set at $300 + levy adjustments
Revenue for recovery ($/T)	$20/T + haulage	$100/T + haulage	$0/T + haulage
Capital Cost ($)	$5 M	$3.5 M	$6 M

The figures in Table 4.5 have been used to develop best and worst-case estimates of NPV for each scenario. These are summarised in Table 4.6, with assumptions provided in Appendix B. Key points to note include:

- As expected, higher processing costs and lower throughput have a negative impact on NPV.
- There are significant upsides if the best case occurs.
- While the base assumptions are designed to only break even, worst case would result in the facility running at a significant loss.
- An improvement in the revenue from materials recovered through the operation will improve the net position and generate a competitive gate rate.

Table 4.6: Sensitivity test - best- and worst-case estimates

Variable	Outputs (NPV at $180/t)	Break even gate rate
NPV – default assumptions	$290,883	$177/T
NPV – best case assumptions	$4,930,896	$114/T
NPV- worst case assumptions	-$6,851,863	$334/T

4.5 Economic appraisal conclusions

The financial model is highly sensitive to several key input parameters. The ability of the facility to be constructed and operated at a low NPV impact to Council and at a gate rate that is market competitive is dependent on the capital cost of the facility, operational costs and most significantly the value of the material for end use markets. As discussed in Section 4.2 market value ranges from $0 to $230/t for blended value add product. The success of this facility will depend on finding a balance between additional operational costs to achieve a product with value at a local end market. In summary:

- The default case has conservatively assumed that the product will have a market value of $20 , for this facility to break even the gate fee would need to be $160-$200/t. This gate fee is slightly higher than reported by industry $60-$140/t so the facility may risk not being price competitive with larger facilities.
- The higher gate rate may be offset by avoid transport costs to larger (lower gate rate) facilities.
- The best-case assumption is able to run at a much lower gate rate of $116/t driven by the ability to sell the product for revenue and lower operational costs.

- The worst-case assumption requires a very high gate rate to break even and emphasises the importance of securing feedstock, reducing contamination, and securing sustainable markets for the product produced.

Processing gate fees need to be considered alongside haulage costs. The savings from shorter haulage to a local facility may make the overall finances much more attractive. For instance, Mansfield Shire Council is currently hauling material 130 km for processing at a cost of around $100/t. Haulage to a local facility (within 50 km) could potentially halve this cost to less than $50/t. The default case becomes more attractive commercially when haulage is considered.

We understand that Council will compare the outcome from this business case with FOGO processing options from the joint tender process. If the cost of haulage and processing for local processing is similar to the cost for a larger facility further afield further consideration of local processing may be warranted. The analysis presented here suggests if combined the haulage and gate rate is within the range of $180-$230/t then Council should consider exploring detailed processing costs and end market viability in more detail to see how this option stacks up against the regional joint tender processing options.

5 Commercial Case

5.1 Procurement Approach

The project will require procurement of construction and operations services from a suitably qualified contractor or contractors. Councils are moving to include consideration of outcomes that deliver local benefits and it is therefore expected that Contractors will be expected to demonstrate they can deliver on Council's broader outcomes in any tender or proposal. There are a number of other considerations for the tender process. These will be explored in detail in a full Procurement Strategy. A preliminary analysis of procurement risks and opportunities is provided in Table 5.1.

Table 5.1: Procurement risks and opportunities - preliminary analysis

Risk	Threat or Opportunity	Comment
Contractor interest	Threat	To be managed by early engagement with potential contractors and developing a fair and reasonable allocation of risk in the contract specification.
Waste generators may not use the facility	Threat	It is not possible to control the market for management of organic waste in the wider region. It is possible to provide a facility that is attractive to users with a combination of quality of service and pricing. This has been factored into the concepts developed for the facility.
Safe operation	Threat	To be managed through robust H&S planning and management by Council and the selected contractors.
Local economic benefit	Opportunity	To be incentivised through 'social procurement' approach applied through specification development, tender evaluation and contract management.
Secure sufficient throughput	Threat	Securing feedstock is highly reliant on the type of FOGO model adopted and a proportion of commercial organic waste generated in the region. This business case should be reviewed when detailed FOGO collection model planning is underway.
Compost market risk	Threat	To be managed collaboratively by Council, the operations contractor and potential markets/users of materials. Prior to project establishment complete early engagement with potential markets and users of materials to develop product(s) that is fit for local end market uses.
Synergies with other activities	Opportunity	To be incentivised through procurement approach and managed proactively during operation.
Shifting costs for landfill disposal (levy and market)	Opportunity	Ensure that contract structure allows for changes in costs for residual disposal, maximise the impact of increasing disposal costs in terms of cost differential and ability to increase margin on gate rate for the recovery facility.

5.2 Facility construction

For the facility construction the focus will be on securing best value for money through clear quality measures, alongside pricing a defined scope of work. The required construction works are relatively straightforward and are likely to be within the capability of a range of local contractors. Process equipment (blowers, sensors, control system, GORE covers) are more specialised and are likely to be sourced as a package from specialist suppliers.

This business case has concluded that processing should be in the form of an aerated static pile composting process. It is possible that alternative processing solutions could deliver similar outcomes at a similar cost. Final selection of the process could involve the operator of the site, implying that they could have some involvement in the design and construction of the facility. This could take the form of a Design – Build – Operate arrangement or appointing the operations contractor prior to confirming the processing approach.

If Council staff will operate the site, then a design - build arrangement may be appropriate although it is more likely that construction will be a conventional build only contract for enabling works (site civils, utilities, drainage/water management) with processing equipment (blowers, bunkers, covers) installed by the supplier or under their direction.

5.3 Facility operation

The selection of the appropriate operator for the facility is critical to achieving the objectives of the investment. The operator will need to:

- Operate the facility safely - for staff and site users.
- Manage risk to the environment and human health in line with the EP Act and General Environmental Duty.
- Produce a product that has an identified local end market and meets compost quality standards.

One potential role for Councils in a large-scale composting project could be to procure, own and operate a facility with partners.

Alternatively, as noted above Councils could go to market either alone or in partnership with businesses generating organic materials for processing with the offer of a secure waste supply for a private company who build, own, and operate a facility.

Working with operators with extensive organic materials processing experience are likely to be an attractive option for Council, combining an understanding of markets and operations.

Council retaining full control of the facility, including for pricing and markets for materials, allows the operation to focus on maximum use of the facility and waste diversion. Council can also invest to support and develop markets with community organisations, grants and/or industry engagement. For the facility operation there are several aspects to consider, these are discussed below.

5.3.1 Contractor vs council staff

In Victoria Council owned waste facilities are either operated by contractors on behalf of the relevant Council or operated by Council staff. Operation by Council staff has the advantage of avoiding the perception that the facility is under contractor control. Other advantages and disadvantages are shown in Table 5.2.

Table 5.2: Contractor vs council staff

	Contractor operated	Council staff
Advantages	Involvement of a contractor provides access to waste sector expertise across the contractor organisation. Provides access to plant and equipment. Potential to share plant and operators with other activities.	100% Council control of operations means operational activities don't need to return a profit. Facility may be seen as commercially impartial, increasing likelihood of use by all commercial waste contractors. Potential to combine operational management with other utilities activities.
Disadvantages	Operation not 100% in Council control. Contractor will charge a margin on time, costs and plant. Commercial imperatives potentially stronger than waste diversion focus. Commercial operator likely to be less comfortable with financial risk	Requires specialist equipment (transport) - could be sub-contracted. Requires employment of specialist machine operators. Council does not have existing skills or relationships for market compost product.

There are several, relatively discrete, components of facility staffing that can be considered.

Site management - it is anticipated that the facility will have a site manager with around 50% of their time dedicated to the operation. An experienced contractor could allocate a facility manager with other responsibilities within the Mansfield/Murrindindi area. Council could combine management of the facility with other utilities operations activities.

Operations staff (machine operators, labourers) - It is anticipated that the facility will require 2 operators, to provide 5 days a week operation, including allowance for leave. If the site introduces a litter picking line or a bagging operation this number would increase. An experienced contractor would put in place a dedicated team, most likely with a mix of experienced staff and unskilled labour. Council would also need to employ suitable staff, there is some uncertainty in the availability of specialist staff e.g., machine operators.

Moving materials off site - materials will need to be moved off site with a mix of specialist waste collection vehicles and general heavy transport. An experienced contractor is likely to have access to these vehicles but there is also potential to sub-contract waste transporters. Council would need to contract transporters to transport materials to markets.

Identifying markets for compost– product is likely to be sold to several different markets. An experienced contractor is likely to have existing relationships with markets. Council also has relationships with some markets but will need to establish new relationships.

5.3.2 Tender process

Open tender invited tender or negotiate.

Council could negotiate with existing contractors to extend their scope to include operation of the organic materials processing facility. Alternatively, Councils could run an open or invited tender process to appoint a suitably experienced contractor to operate the site.

The operation of the facility requires specialist skills and access to suitable plant and equipment. This means that there is a limited number of potential contractors. Interested parties may include national operators Cleanaway, Veolia, JJ Richards as well as local organisations.

Subject to confirmation through detailed procurement strategy development, it is recommended that a suitable contractor is procured through an invited tender process, with a focus on capability, track record working in partnership with Council, and access to suitable staff, equipment, and markets for recovered materials. This could be proceeded by an Expression of Interest process to identifying suitably qualified contractors.

Table 5.3: Tender process options

	Open Tender	Invited Tender	Direct negotiation
Advantages	Transparent process with wide participation. Creates competitive tension (pricing, innovation).	Transparent process with competent contractors. Limits tenderers to those likely to be capable of operating the site. Reduces Council time and cost (tender process and evaluation). Creates competitive tension (pricing, innovation).	Avoids cost of tendering for multiple contractors. Potential for synergies with existing contracted activities. Potential quick mobilisation.
Disadvantages	Potentially many interested parties - costly evaluation process and cost for contractors. Cost and time required for tender process, evaluation, and contract award. Competitive process can result in risks related to low pricing. Contract mobilisation may delay implementation.	Excludes some potential tenderers. Cost and time required for tender process, evaluation, and contract award. Contract mobilisation may delay implementation.	Limited competitive tension for pricing or quality. Excludes some potential tenderers. Existing contractors may not be able to secure adequate throughput.
Comment	Not preferred	Preferred	Not preferred

5.3.3 Contract structure

Operations contract, facility lease, or hybrid approach

Where the Councils elect to work with an operations contractor, the terms for operation of the compost facility could take a variety of forms. The key issue is operational control, including determining target materials and pricing. Different options and their key advantages and disadvantages are set out in Table 5.4.

Table 5.4: Contract structure options

	Council controlled facility	Facility lease	Hybrid
Advantages	Operator manages risk related to operation including quality. Clear operational costs for Council. Council sets gate rate. Perceived as Council operation rather than private facility. Well understood contract structure and form	Leasee manages risk related to processing cost, quality, and compost value, and makes use of national or international networks. Lessee manages costs, Council has defined lease arrangements - costs are clear.	Depends on the design of the hybrid solution and specifically the risk allocation.
Disadvantages	Council manages risk related to processing cost and compost value. Uncertain overall financial position.	Lessee controls gate rate (with input from Council). Likely to be bespoke lease agreement (cost and complexity risk)	A solution that tries to combine the two options risks introducing complexity that is difficult to manage on a day-to-day basis.
Comment	Preferred	Not preferred	Not preferred

In a lease style arrangement, the operator controls all aspects of the facility, including charging (with Council input) and marketing of materials.

An alternative approach is a Council controlled facility. The facility could be operated by a contractor under Council direction, with Council paying for services and taking revenue (gate and materials sale) from the operation. There is also potential for Council staff to operate the site.

Because this is a new service in the Mansfield/Murrindindi area, direct Council control would be more appropriate to manage the commercial risk during the establishment phase of the operation. Once the operation is established and key factors (throughput, product quality, markets) are well established, a lease style arrangement could be adopted. Given the site is focussed on recovery, and potential operators include companies with investment in landfills waste collections in the area, a conventional operations contract arrangement is preferred with the contractor incentivised to maximise the quality of material recovered.

Subject to confirmation through detailed procurement strategy development, it is recommended that the operations are procured through a conventional operations contract for the initial establishment phase for the facility. This will allow Council to manage the risks that they can control. Specifically, this approach allows Council to manage risk associated with facility throughput and markets for compost. A suitable contractor may be better placed to manage risk associated with operational activity.

5.4 Procurement - recommended approach

Table 5.5 presents a preliminary recommendation based on the discussion in Sections 5.2 and 5.3. This is based on a high-level analysis of the issues and options and will be tested further in the development of a full procurement strategy by Mansfield/Murrindindi following the adoption of this business case.

Table 5.5: Procurement - recommended approach

	Construction	Operations
Council vs contracted	Contractor + nominated equipment supplier Potential with input from the operations contractor.	Contractor
Tender process	Open tender	Invited tender, potentially following an Expression of Interest process.
Contract form	Conventional	Establishment - Conventional (Council carries market risk). Once established - Conventional with incentives for recovery and broader outcomes.
Product ownership	NA	To be determined through Procurement Strategy development. Likely Contractor/Council partnership with contract terms incentivising maximising value.

6 Financial case

6.1 Implementation Costs

The estimated capital and operating costs for the preferred option are outlined in Section 4 Table 4.3, repeated here.

Table 6.1: Capital and operational costs

Variable	Default	Best case	Worst case
Site throughput (T per year)	6,000	6,000	4,000
Approx processing cost ($ per T)	$100/t	$100/t	$150/t
Recovery rate (%)	95%	98%	90%
Gate rate (feedstock) ($/T) for drop offs	$180/t	$180/t	$180/t
Landfill gate rate (residual waste) ($/T)	Set at $219 + levy adjustments.	Set at $219 + levy adjustments	Set at $300 + levy adjustments
Revenue for recovery ($/T)	$20/T + haulage	$100/T + haulage	$0/T + haulage
Capital Cost ($)	$5 M	$3.5 M	$6 M

In addition to capital and operating costs it is important to make provision for project implementation. This accounts for staff and any external consulting or contractor support for procurement (Procurement Strategy, Tender Documents) and contract mobilisation. Table 6.2 provides an estimate of these costs.

Once the facility has been established and operators are in place, there is an ongoing cost for Council to manage contracts, record depreciation and contribute to Council overheads. These costs are also reflected in Table 6.2.

The model accounts for the annual increase in cost of the gate fee as it will likely escalate over time (as will the landfill levy cost). This will increase the cost to users (both commercial customers and Council FOGO collections).

Table 6.2: Implementation costs

Item	One-off cost	Ongoing cost (2023 cost)
Procurement strategy	$25,000	
Tender documentation	$25,000	
Tender process	$10,000	
Contract mobilisation	$25,000	
Other Council costs (staff,...)		$35,000
Lease cost		$50,000
Depreciation – nominal sum		$100,000
Total	$85,000	$185,000

6.2 Funding Source

The project capital costs could be funded by loan funding and/or an external grant (such as those available through Sustainability Victoria or Regional Development Victoria). For the purposes of this business case the capital costs have been reflected in the NPV analysis as a capital injection at Year 1.

Table 4.4 (Net Present Value Analysis) has been replicated as Table 6.3 with a $500,000 capital grant reducing the capital. A gate fee of $169 is required to achieve a positive NPV over 20 years.

Table 6.3: Net Present Value analysis (with $500,000 capital grant)

Net Present Value	Output (Gate rate of $180/t)	Output (Gate fee to break even - $172)
Capital NPV	-$4,408,654	-$4,408,654
Revenue (gate) NPV	$16,111,887	$15,395,803
Revenue (recovery) NPV	$929,578	$929,578
Cost (residual disposal) NPV	-$980,140	-$980,140
Cost (processing) NPV	-$8,154,196	-$8,154,196
Council costs NPV	-$2,726,823	-$2,726,823
TOTAL Net Present Value (2023 - 2043)	$771,653	$55,569

7 Management case

7.1 Governance

Project Sponsor: [TBC w Council]

Business Owner: [TBC w Council]

Project Owner: [TBC w Council]

Project Manager: [TBC w Council]

Operations contract manager: [TBC w Council]

7.2 Benefits Realisation

The key benefit of this project is providing access to a local organic processing option for Council waste collection services and waste collectors that service local businesses. The direct users of the site are anticipated to be waste contractors servicing Council and businesses across the region, as well as some businesses dropping off directly.

The benefits to be measured are:

1. Diversion of waste from landfill and associated greenhouse gas emissions.

   This addresses the objective to reduce net carbon impacts. Establishing a local processing option reduces the carbon impacts associated with transport of material out of region for processing. Local processing options may incentivise further source separated collections (such as from small businesses) which would divert more material from landfill and associated greenhouse gas emissions from organic decomposition from landfill.

2. Recovery of the nutrient value/energy from organic waste in line with the principles of the circular economy keeping products/materials in use .

   This addresses the key objective of the facility, to deliver increased diversion of waste from landfill and create a product that has market demand. This will be measured as the percentage of material processed and delivered to end market on a tonnage basis. This way diversion achieved also reflects products being recovered at a quality suitable for end markets. This also reflects the need to reduce contamination entering the site so that the volume of waste requiring offsite disposal is reduced. Achieving this will require partnership with those responsible for waste education and the FOGO service roll out.

3. Provide a local processing option that can provide a cost-effective solution for local organic waste producers and where possible contribute to the local economy.

   The proposed facility will employ around three staff, including a site manager, machine operators and labourers. The discounted disposal rate will enable waste contractors to maintain a competitive service cost while increasing the recovery of materials from commercial waste in the Mansfield/Murrindindi region.

Benefits will be evaluated periodically, as outlined in Table 7.1. It is proposed that benefits realisation reporting will form part of reporting by the facility operations contractor on an annual basis. Subject to detailed procurement planning and the procurement process, the benefits may form part of Contractor KPIs for performance evaluation. In some cases, KPIs should also influence contract payments.

Table 7.1: Benefits realisation

Benefits	Measurement / KPIs	Timescale	Measured by
Net carbon impacts	Total km travelled to landfill or market (reduce by >20%). Total emissions from landfilled materials (reduce emissions by > 25%).	Measure annually.	Total km travelled to landfill or market, measured by the operator as part of operational reporting. Total emissions from landfilled materials calculated using standard emissions factors.
Waste diversion	Feedstock organics reach Australian Standard and are sold to viable market	Within 6 months of establishment and then annually	Measurement of material quality and tonnes processed and delivered to end markets.
Local economic benefits	New employment Local operational spend	Measure annually	Total number of employees (all new employment) Operational spend (consumables)

7.3 High Level Timeline

The timeline for the project is subject to the outcome of the regional kerbside collection and processing tender.

The tender responses will be evaluated against this business case to compare the costs and benefits between participation in the regional tender and establishment of a local processing option.

If the local processing option is adopted, then the Council will need to ensure the facility is operational prior to the roll out of the Council kerbside FOGO collection so that there is a processing destination for materials collected. Alternatively interim arrangements may be put in place until a local facility is operational. Roll is expected to occur around mid-2024 for Mansfield, and 2025 for Murrindindi.

A high-level timeline is shown in Figure 7.1. Key factors to consider in timeline establishment are that:

- Significant changes to the proposed FOGO model may require updates to the prefeasibility assessment and delay confirmation of processing approach and location.
- Time for EPA to approve a Works Approval has significant uncertainty and has been subject to major delays in recent times. EPA approval timelines will be impacted by the complexity associated with chosen site and technology.
- Construction timelines will be dependent on the preferred construction season for the locality.
- Appointment of an operations contractor is dependent on sufficient interest from the market.
- Any involvement of the Operations Contractor in technology selection will have an impact on timing for procuring any operations contract.

Therefore, the timeline below is indicative only and subject to significant uncertainty.

Local FOGO Processing Establishment

Mansifeld Shire Council, Murrindindi Shire Council

Project Start: Sun, 1/1/2023

TASK	PROGRESS	Duration (months)	START	END
FOGO implementation				
Design/planning (Mansifeld)		6	1-Jan-23	1-Jul-24
Design/planning (Murrindindi)		18	1-Jan-23	1-Jul-25
Roll out (Mansfield)		NA	1-Jul-24	31-Dec-26
Roll out (Murrindindi)		NA	1-Jul-25	31-Dec-26
Processing Design/planning				
Confirm processing approach		4	1-Apr-23	30-Jul-23
Confirm processing location		4	1-May-23	29-Aug-23
Procurement strategy		4	1-May-23	29-Aug-23
Detailed facility design + appoint process sup		6	1-Sep-23	28-Feb-24
Works approval		7	30-Jul-23	28-Feb-24
Construction				
Facility construction (civils)		3	1-Mar-24	30-May-24
Facility construction (composting process)		1	1-Jun-24	30-Jun-24
Facility construction (comissioning)		2	1-Jul-24	30-Aug-24
Operations				
Appoint operations contractor		1	1-Feb-24	28-Feb-24
Operations begin		NA	1-Sep-24	30-Dec-26

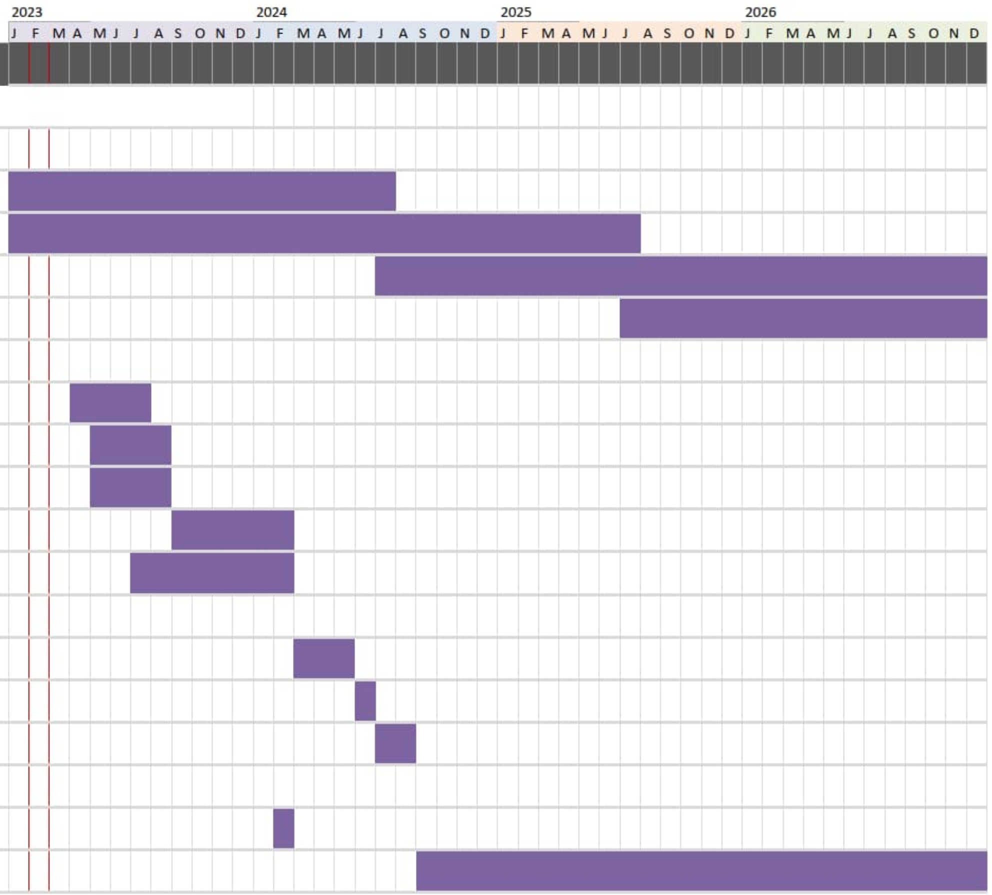

Figure 7.1: High level timeline of project

7.4 Constraints and Dependencies

Dependencies for the preferred option include:

- Availability of land that has been identified as part of this options assessment as fitting the criteria.
- Landowner willing to sell or lease long term.
- Identification of markets for compost products.
- Project success is dependent on the FOGO model adopted as this will be a key driver for the composition and quantity of the feedstock. This business case should be reviewed and updated once a FOGO collection model has been chosen to ensure that the assumptions are still relevant.

7.5 Risk Analysis

This project is classified as a standalone project of medium risk and complexity. This reflects a relatively straightforward construction project, combined with simple but new service offering for waste contractors and businesses in Mansfield and Murrindindi.

A risk register is included as Table 7.2. Health and safety considerations are noted in Section 7.6. A preliminary evaluation of risks associated with procurement are also noted in Section 5.1.

Table 7.2: Risk Register

Risk (Including what were, or are, the causes)	Likelihood (L, M, H)	Severity (L, M, H)	Mitigation "how will this be managed"	Residual Risks
Contractor cannot be sourced with sufficient experience to operate an organics processing facility	M	L	• Notify potential operators with sufficient time • Allow for expressions of interest prior to tendering and meet with interested contractors to discuss. • Capacity building, training, and visits to other organics processing facilities in Victoria if necessary.	Contractor requires close management and further training and capacity building.
Contractor has difficulty finding markets for products	M	H	• Selected contractor has experience sourcing and selling materials to the reuse and recycling market • Contractor required to source and develop local, national and international markets • Both Councils plays a role in supporting new waste diversion enterprises with funding etc.	Contractor requires support in developing and securing markets.

Risk (Including what were, or are, the causes)	Likelihood (L, M, H)	Severity (L, M, H)	Mitigation "how will this be managed"	Residual Risks
Risks to the environment and human health are not managed resulting in amenity impacts.	M	H	• Selected contractor has experience managing organics processing facilities and environmental compliance • Careful selection of location and technology to minimise offsite impacts	
Allocation of land cannot proceed	M	M	• The location assessment identified several potentially suitable alternatives.	

7.6 Health & Safety Overview

A project of this type needs to consider a range of health and safety risks during planning and implementation. The risks are different during construction (reconfiguring the existing site layout) and operation.

7.6.1 Construction

Health and safety risks identified for the construction/reconfiguration of the site include:

- Vehicle movements – construction plant, materials deliveries (fill, concrete, reinforcing, …) staff
- Excavation/filling – civil works for waste acceptance and maturation area, leachate pond (if required)
- Working with concrete and asphalt
- Working with electricity - weighbridge, site office buildings
- General construction site hazards

7.6.2 Operations

Health and safety risks identified for the operation of the facility include:

- Vehicle movements - delivery of waste to the site, removal of waste and recovered materials from the site, sorting of materials in the sorting area, loading/shifting residual material in the loadout area.
- Handling waste materials.
- Combustion of stockpiled material.
- Public Health/amenity impact - risk of odour impacts if the facility does not adequately follow operational and environmental control procedures.
- Risk of leachate impacts to groundwater or surface water and impacting offsite receptors.
- Handling of processing material and finished product (legionella).

7.7 Stakeholders

A range of stakeholders will have a key role, or interest, in the project. Stakeholder engagement was limited during the development of this business case. Proceeding to a detailed business case will require additional stakeholder engagement.

Companies collecting and transporting waste will have a key influence on the success of this facility. The provision of source separated organic collections will increase the amount of feedstock available for processing from commercial entities.

Similarly, there will be a need for further discussion with potential markets for products produced during pre-implementation. In selecting options for the management of organic materials there is a risk that the focus is on the least cost options rather than maximising the value of the materials. The cost of options will be influenced by the value of products i.e., maximising value makes commercial sense. An important aspect of organic materials recovery is focussing on creating high value products that meet market requirements, this contrasts with an approach that focusses on least cost management of organic waste.

The expectations and concerns of landowners neighbouring the property will also need to be managed through early stakeholder engagement.

8 Applicability

This report has been prepared for the exclusive use of our client Mansfield Shire Council, Murrindindi Shire Council, with respect to the brief given to us and it may not be relied upon in other contexts or for any other purpose, or by any person other than our client, without our prior written agreement.

The construction rates utilised for this high-level cost estimate are based on assumed design concepts, estimated quantities and a combination of inputs from the latest available rates from Rawlinsons and our experience of similar construction at other sites. Consequently, a significant margin of uncertainty exists on the cost estimate and the contingency we have allowed should be considered as part of the cost rather than a potential add on. These rates are based on historic information and data and do not include allowance for any cost escalation since the date of the data other than where/as specifically stated.

Consequently, a significant margin of uncertainty exists on the cost estimate and the contingency we have allowed should be considered as part of the cost rather than a potential add on.

We have not made any attempt to allow for the potential impact of COVID-19 in this estimate. Also, supply chain disruptions are currently having quickly changing effects on construction costs and schedules. We recommend you seek up-to-date specialist economic advice on what budgetary allowances you should make for escalation, including for any potential changes in construction costs and timing in relation to both COVID-19 and supply-chain issues.

Tonkin & Taylor Pty Ltd
Environmental and Engineering Consultants

Report prepared by:

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Caroline Turnbull
Environmental Engineer

Authorised for Tonkin & Taylor Pty Ltd by:

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Sze-Fei Peng/Chris Purchas
Project Director/Technical Review

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Appendix A Interim report

REPORT

Tonkin+Taylor

FOGO Processing Business Case

Interim Report

Prepared for
Mansfield Shire Council
Prepared by
Tonkin & Taylor Pty Ltd
Date
December 2022
Job Number
1089663 v1

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www.tonkintaylor.com.au

Document control

Title: FOGO Processing Business Case – Interim Report					
Date	**Version**	**Description**	**Prepared by:**	**Reviewed by:**	**Authorised by:**
December 2022	0	Draft for client review	CATU	NLV/ CHP	SFP
December 2022	1	Draft for client review	CATU	NLV/CHP	SFP

Acknowledgement of Country

Tonkin + Taylor respectfully acknowledges Aboriginal and Torres Strait Islander peoples as the Traditional Owners of the land and water on which all Australians rely.

This project is within the Traditional lands of the Taungurung and Wirrundjuri people. We pay our respects to their Elders past, present and future as custodians of cultural values, of land, wildlife and waterways.

Distribution:

Mansfield Shire Council	1 copy
Murrindindi Shire Council	1 copy
Tonkin & Taylor Pty Ltd (FILE)	1 copy

Table of contents

1 Introduction

1.1 Background

Tonkin & Taylor Pty Ltd (T+T) has been engaged by Mansfield Shire Council and Murrindindi Shire Council to prepare a business case to assess local processing options for organic material. The key driver for a local processing option is the adoption of food organics and garden organics (FOGO) kerbside collections by both Councils, which is expected to occur around mid-2024 for Mansfield, and 2025 for Murrindindi.

This interim, basis of design report summarises our understanding of Council's strategic drivers and a summary of the information on organic material flows which will form the basis of the business case. This report provides the required information for Council's milestone report to Sustainability Victoria (SV) for the approved funding application relating to the business case.

The requirements of the interim project report include:

1 Assessment of the demand for FOGO processing
2 Potential options for FOGO processing
3 Potential issues and opportunities
4 Identification of potential sites for further evaluation.

This work is being carried out under the proposal, dated 28 September 2022, submitted in response to RFQ E10010 and accepted by Council on 28 October 2022.

1.2 Glossary

Definitions of words used throughout this report are provided in Table 1.1.

Table 1.1: Report definitions

Word	Definition
FOGO	Food Organics and Garden Organics
Food waste	Kitchen scraps, uneaten food, off spec food products, also referred to as food organics.
Green waste/ garden organics	Garden, vegetation, wood waste, also referred to as garden organics.

1.3 Approach

1.3.1 Overall approach

Murrindindi and Mansfield Shire Councils have recognised the benefit of collaborating regionally to achieve efficiencies and effectiveness in waste management and minimisation. In this business case, the Councils are looking to explore opportunities for how a regional approach to organic material recovery can improve outcomes for the individual Councils and the communities they serve. Examples include aggregation of material, knowledge sharing, joint procurement, and potential partnerships.

This report summarises a review of options taking an approach that is consistent with the Department of Treasury and Finance Victoria business case approach. This approach focuses on ensuring the issue or opportunity is well defined before considering a range of options to realise the opportunity. Once the preferred option has been identified there is a process of planning for successful delivery, ensuring that timeline and costs reflect the requirements for the project to succeed. The business case approach includes:

- Strategic Case - What is the problem, issue or service need? What are the benefits from addressing the problem? This is discussed in Sections 2 and 3.
- Economic Case - Is there a compelling case for investing? This is considered in Section 4 and 5.
- Management/commercial Case - Can the project be delivered as planned? How will the project be procured? This will be addressed in the final report.

1.3.2 The importance of markets for products

The organic material recovery industry in Victoria has historically been impacted by supply and demand challenges. The presence of a strong market for products that contain recovered organics will 'pull' materials through the system, aiming for an end product with a market value that exceeds or equates to the value of the raw materials and inputs and processing costs[1]. In some cases, additional (or more expensive) processing may result in a significant increase in the value of the end product.

The vision to transition to a circular economy will require the industry to transition from a minimum cost approach to one that focuses on product value. This means collection and processing is focussed on maximising end product value, reflecting market demand. This is a shift from the current state where the industry is reliant on gate fees rather than product sales for survival. The approach for this assessment is to place a strong emphasis on opportunities that respond to a potential market need for a product, as this will underpin project viability.

1.3.3 Regional tender for organics collection and processing

This work is happening concurrently to a joint tender process between Councils and Alpine Resort Management Boards (ARMBs) belonging to the former North East Waste and Resource Recovery Group and Goulburn Valley Waste and Resource Recovery Group (now amalgamated into Recycling Victoria). The joint tender is for kerbside waste and recovery services including:

- The collection of kerbside landfill waste, comingled recyclables, FOGO and glass
- The acceptance and sorting of comingled recyclables
- The acceptance and processing of FOGO and the acceptance and disposal of kerbside landfill waste.

The participation of each Council or ARMB in each of the joint procurements is voluntary i.e., they may choose whether or not to participate in any contract. The opportunity to respond to the tender is now closed and responses are currently being evaluated with options available expected to be shared in early 2023.

Councils are intending to use the business case for local processing options as a comparison against the processing options available through the joint procurement contract.

1.3.4 Involving key project stakeholders

The project approach has considered the wider organics ecosystem stakeholders which includes:

- Community
    - Producers of organic waste
    - Community groups as collectors/processors

[1] Victorian Organics Resource Recovery Strategy, Sustainability Victoria, September 2015

  - Potential users of product (end market)
- Industry
  - Producers of organic waste
  - Collectors of organic waste
  - Transporters of organic waste
  - Processors of organic waste
  - Potential users of product (end market)
- Council
  - Producers of organic waste (from events, meals on wheels, internal organic waste from office and depot kitchenettes, leisure centres, resource recovery centres, transfer stations, satellite operations and sites)
  - Departments that could be potential users of product (i.e. Parks, Infrastructure, Landscape Architects)
  - Senior executive leaders (decision makers)
  - Councillors (decision makers).

The inclusion of commercial and industrial (C&I) organic material can improve the viability of organics processing. This may be through additional processing charges and/or provide an improved mix of feedstock, increasing the value of product(s).

2 Current situation

2.1 The region

Mansfield and Murrindindi Shire Councils are located in north-east Victoria approximately 2 hours and 3 hours drive from Melbourne respectively (Figure 2.1).

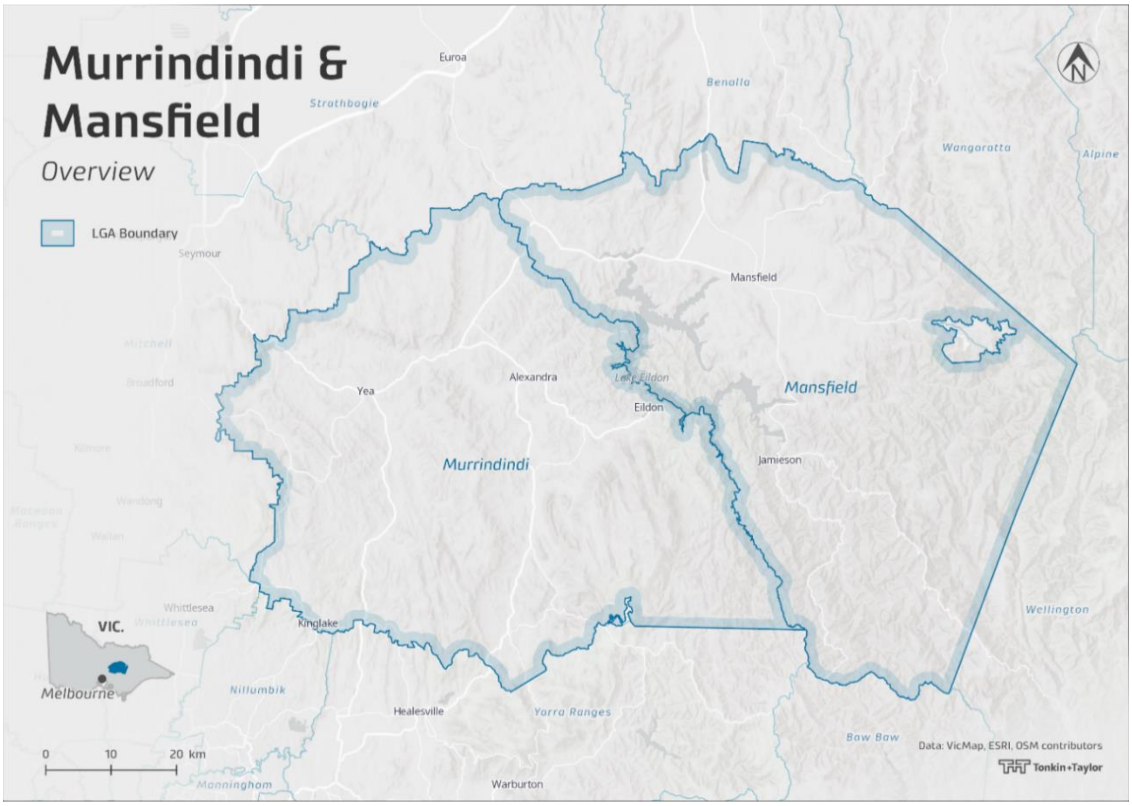

Figure 2.1: Location of Mansfield and Murrindidi Shire Councils

Both Shires boast rural amenity, natural assets, and alpine landscapes that support strong tourism and hospitality sectors. The largest townships in the region are Mansfield, Alexandra, Kinglake and Yea which all have populations between 1,000 and 6,000 people. There are a number of smaller and outlying communities in both Shires, a number of which are popular visitor destinations.

Mansfield Shire's economy is characterised by a services sector based workforce with accommodation and food services and retail trade being the largest industry sectors. The agriculture and construction, education and health sectors are also important to the Shire.

Employment and the economy within the Murrindindi Shire is predominantly in primary production, forestry, tourism, light manufacturing and engineering. A summary of the area characteristics for both Shires are provided in Table 2.1.

Table 2.1: Area characteristics

Council	Mansfield	Murrindindi
Population	10,178[2]	15,197[3]
Land area (sq km)	3,843[2]	3,879[3]
Top industry	Agriculture, Forestry & Fishing[2]	Agriculture, Forestry & Fishing[3]
Population average growth (%) to 2036	1.1%[2]	0.9%[3]
Number of private dwellings	6,578[2]	8,321[3]
Median age (years)	49[2]	50[3]
Tourism income	$182 million per annum (including Mt Buller)[4]	$1.033 million in 2018[5]

2.2 Current waste management and resource recovery systems

2.2.1 Council services and facilities

Mansfield and Murrindindi Shire Councils both currently provide a suite of waste management services for residents in the region including:

- Kerbside waste collection services
- Transfer station drop offs
- Public place litter bins and street sweepings
- Policy, education and behaviour change activity.

The waste management services in these regions have to navigate different challenges to those in metropolitan Melbourne including a widely dispersed population, small population base, and relative isolation from major industry and waste service providers. As a result, the Councils can struggle to source sufficient quantities of material to secure cost effective processing contracts, and significant haulage distances drive up the costs of operations.

Due to the widely dispersed population not all properties have access to the kerbside collection services, and there is high uptake of use of Resource Recovery Centres (RRCs) for domestic landfill

[2] 2021 Census All persons QuickStats: Mansfield, Australian Bureau of Statistics, accessed from: https://www.abs.gov.au/census/find-census-data/quickstats/2021/LGA24250
[3] 2021 Census All persons QuickStats: Murrindindi, Australian Bureau of Statistics, accessed from: https://www.abs.gov.au/census/find-census-data/quickstats/2021/LGA25620
[4] Mansfield Shire Economic Development Strategy 2020 – 2025, Urban Enterprise Pty Ltd, 2020
[5] Murrindindi Shire Tourism and Events Strategy 2019 – 2025, Urban Enterprise Pty Ltd, 2019

waste and recycling drop offs. The region also experiences substantial seasonal fluctuation in waste volume as a result of regional tourist attractions such as Mt Buller, Mt Stirling, Lake Eildon, Lake Mountain and the Cathedral Ranges. Similarly, there is significant fluctuation in green waste received at transfer stations in the region due to extreme weather events such as storms and floods.

2.2.1.1 Collections

The Council kerbside collection service configuration for landfill waste and organics are shown in Table 2.2. The current waste collection contracts end in 2025 for Murrindindi Shire, and 2024 for Mansfield Shire (with an optional one year extension). No separate food or green waste collection system is currently in place and food and green waste is being disposed as part of landfill waste.

Table 2.2: Council kerbside collection services that contain organics

Council	Size of containment and frequency of collection		
	Landfill waste	Green organics	Food organics
Mansfield	120 L bin collected weekly TPA: 4,200 (2019)	No collections provided	No collections provided
Murrindindi	120 L bin collected weekly TPA: 2,935 (2022)	No collections provided	No collections provided

Note: TPA = tonnes per annum

Both Councils are required to introduce a FOGO collection service by 2030 as a requirement of the Recycling Victoria (RV) Policy and 10-year plan[6]. The model of FOGO service that will be adopted (such as the collection frequency, bin size, zone of collection, or if it will be opt in or out) has not been finalised at the time of writing this report.

2.2.1.2 Resource recovery centres

There is a network of RRCs across the two council areas that receive green waste and allow for landfill waste drop off from households and small scale businesses. There are five resource recovery centres owned by Murrindindi (Alexandra, Kinglake, Eildon, Marysville and Yea) and two owned by Mansfield (Mansfield RRC and Woods Point Transfer Station (TS)). The Mansfield RRC is also currently trialling FOGO drop off for processing at Western Composting in Shepparton, although 99 % of the material dropped off is currently garden waste, demonstrating that food waste capture through the RRC remains very low. Woods Point TS is unmanned and unmonitored but accepts green waste. This green waste is disposed through controlled burn-offs as required.

There is also a community green waste drop off point located in Jamieson, which is operated by residents, with no Council inputs.

These transfer stations are small in scale for organic material, collecting between 200 and 800 tonnes of green waste each per annum. The locations of the region's network of transfer stations are shown in Figure 2.2.

[6] Recycling Victoria: A new economy, Department of Environment, Land, Water and Planning (DELWP), February 2020, Available at: https://www.vic.gov.au/sites/default/files/2020-02/Recycling%20Victoria%20A%20new%20economy.pdf

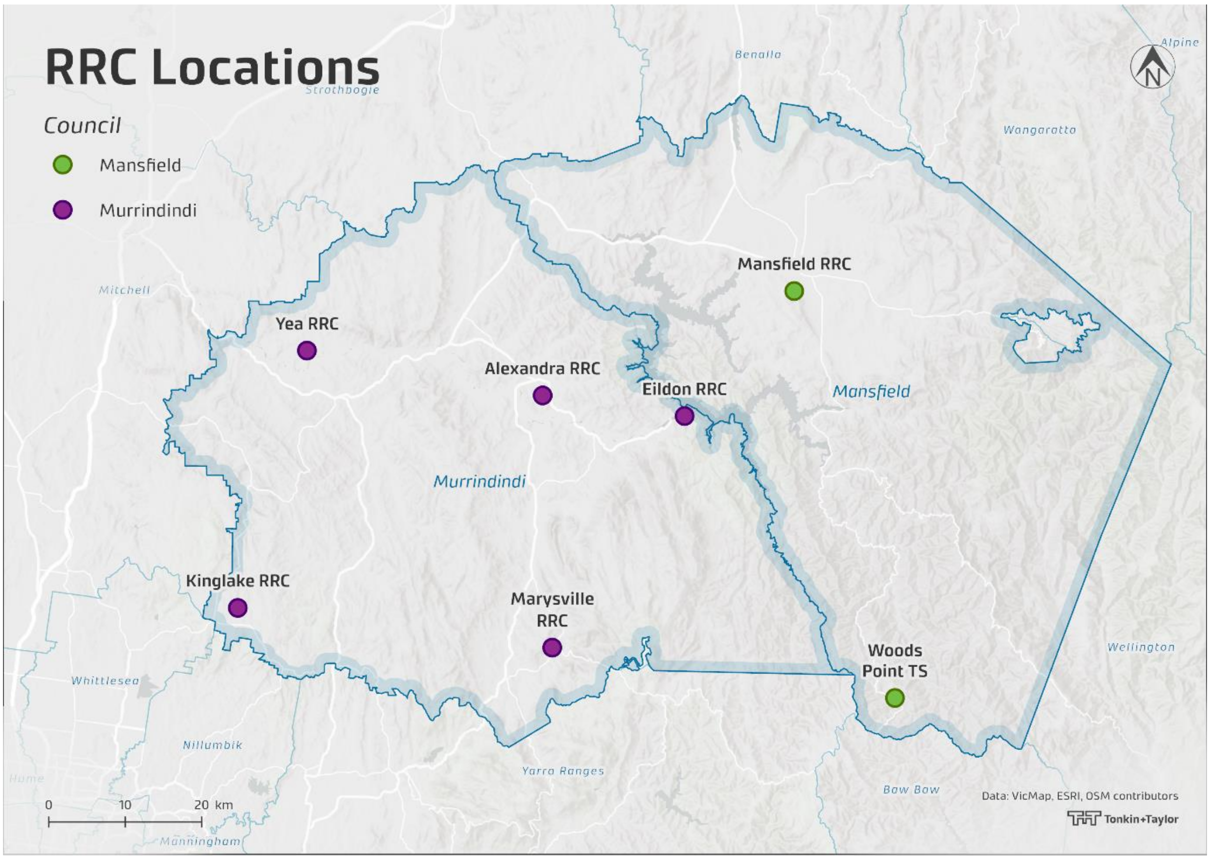

Figure 2.2: Resource recovery centre locations

2.2.2 Private collection services

A small number of private collection services are available in the district. These private collection companies service commercial businesses that are not able to use the Council kerbside collection system. The privatisation of services gives rise to a gap in data availability to Councils. These companies include:

- Cleanaway
- JJ Richards
- Veolia

To Council's knowledge, no businesses or organisations are currently separating their food waste at source and arranging for material to be sent for processing, and there are no commercial providers for source separated food waste collection.

A number of local skip bin companies offer a service for green waste skip collections. These include:

- Waste Management services (Murrindindi only)
- Kinglake Ranges Bin Hire
- Alexandra Skip Bins
- Mansfield Bins and Skips

The above companies (excluding Waste Management services) offer skip bins for general rubbish as well as green waste.

2.2.3 Processing

Options available for the processing of organic material are limited to those available outside of the region. Organic processing facilities are listed in Table 2.3 and their locations shown on Figure 2.3.

Table 2.3: Organic processing facilities in North East Victoria

Name	Location	Processing	Materials accepted	TPA
Western Composting	Shepparton	Open windrow composting, aerated static pile composting, and dry and wet anaerobic digestion	Household FOGO and solid commercial food waste	20,000
Biomix	Carag Carag	In vessel composting, open windrow composting	Food and green organics	100,000
Repurpose It	Epping Hallam (possible transfer station option)	In vessel composting	Food and green organics	Up to 200,000
Wangaratta Organics Processing Facility	Wangaratta	Temperature-controlled bunkers and windrows	Food and green organics	4,500 (capable of composting 18,000)

There are no facilities in Mansfield/Murrindindi region that are able to process food waste with the exception of a small number of community projects. Both Councils promote home composting and worm farms on their council websites.

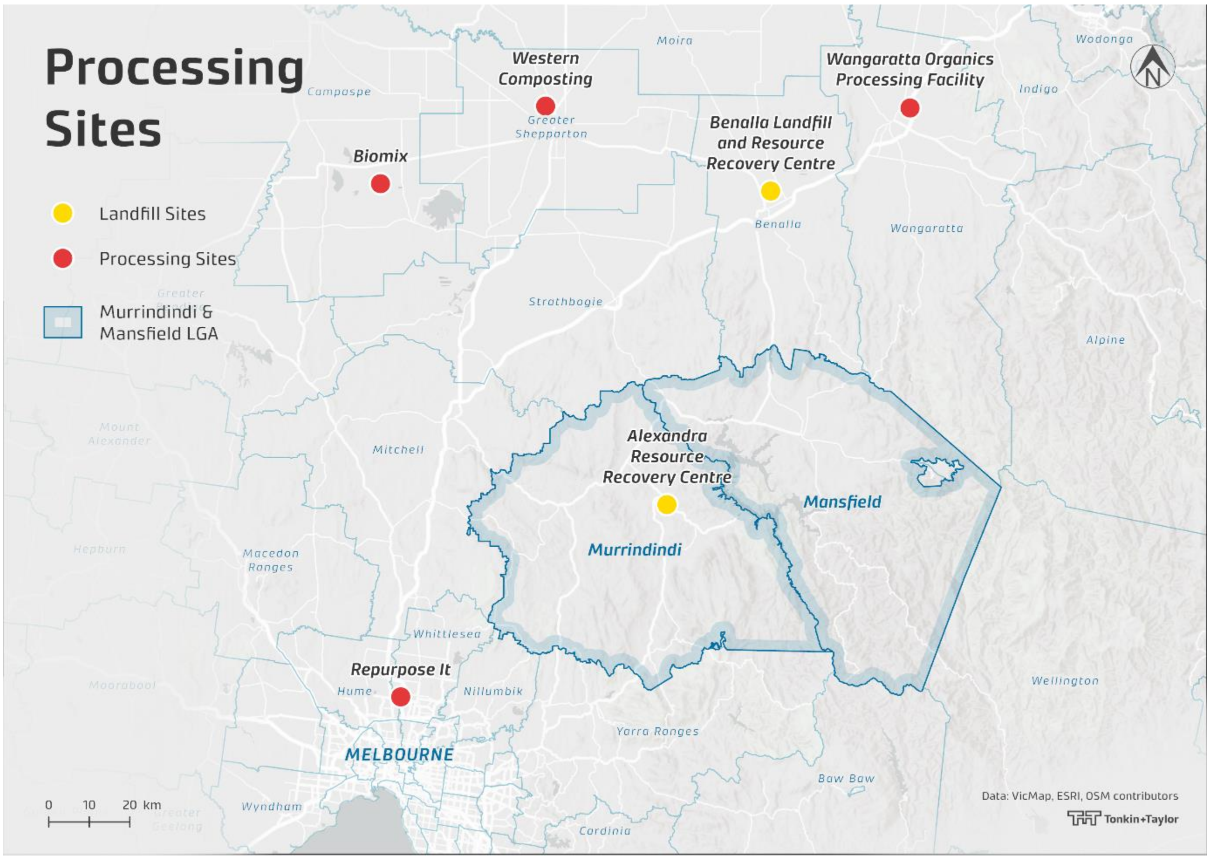

Figure 2.3: Locations of FOGO processing sites

The gap in local processing capacity has been recognised in state wide strategy. In the Infrastructure Victoria '*Advice on Recycling and resource recovery infrastructure'* report (2020) [7], Mansfield was recommended as one of three locations for construction of a medium sized (75,000 TPA) in-vessel composting facility by 2039. The report does not explain the source of the 75,000 tonnes but it can be assumed a significant amount of this material could be from out of region.

2.2.4 Landfill

2.2.4.1 Active landfills

Murrindindi Shire Council currently directs landfill waste collected by Council to the Alexandra Landfill. The Alexandra Landfill is located approximately 1.5 km south of the Alexandra township and is owned and operated by Murrindindi Shire Council. The site is licensed to accept putrescible waste, inert waste, shredded tyres and packaged asbestos (domestic sources only).

Mansfield Shire Council currently directs landfill waste collected by Council to the Benalla Landfill. Benalla Landfill is located approximately 70 km north of the Mansfield township.

2.2.4.2 Closed landfills

Mansfield and Murrindindi Shire Council are responsible for the rehabilitation and environmental compliance of ten closed landfills across the two Shires.

[7] Advice on Recycling and resource recovery infrastructure, Infrastructure Victoria, April 2020. Available at: https://www.infrastructurevictoria.com.au/wp-content/uploads/2020/03/Advice-on-recycling-and-resource-recovery-FINAL-REPORT.pdf

2.3 Organic waste quantities and composition available for local processing

2.3.1 Food waste

Currently household food waste generated in the region is either managed at a household level (fed to animals, home composted) or disposed of in the landfill waste bin and sent to landfill. Mansfield offers the opportunity to self-haul food waste to the RRC but data suggests the quantity captured in this way is very small. Waste audits[8,9] from 2021 and 2022 completed in the region indicate that food waste makes up approximately 30% of the kerbside landfill waste bin at both Councils. This is significantly less than the average from across Victoria (50%+), suggesting there may be significant home composting and on-site recovery activity in the Shires.

Commercial food waste is currently disposed to landfill as part of general waste and the quantities and composition are unknown. In Murrindindi approximately 780 tonnes of C&I waste is directed to landfill each year and it is likely that some of this will contain food waste from local hospitality and food manufacturing businesses. If this material could be source separated it could become available for in-region processing. Audits of the C&I materials being delivered to the landfill would provide further information on the available amounts which could be diverted for recovery.

2.3.2 Food and green (FOGO) organics collections

Both Councils have begun consultation with their communities about which FOGO model they will be likely to adopt. The FOGO model could also be impacted by the outcomes of the regional tender for waste and recycling services.

Different food only (FO) and FOGO models give rise to different diversion rates and overall capture of organics. A high-performance model can capture upwards of 60% of the available organics for composting, however low-performance models may capture around 30% of the available organics, leaving the rest in the landfill waste stream for landfilling or other treatment. Performance of models are driven by factors such as the budget available, collection frequencies of the suite of kerbside services, container size, configuration of kerbside bins, the level of accompanying information/education, and whether services are mandatory or provide the opportunity for exemptions in participation.

Because neither council currently provides a green waste collection service it is also possible that a new FOGO service may collect some of the green waste currently being managed on site or transported to the resource recovery facility. This is sometimes termed ‘induced’ waste.

2.3.3 Green organics

Currently household green waste generated in the region is either managed at a household level (disposed to land, home composted) or disposed of in the landfill waste bin and sent to landfill. Waste audits[10,11] from 2021 and 2022 completed in the region indicate that green waste makes up approximately 10% of the kerbside landfill waste bin in both Councils. Both Councils operate a network of RRCs where households can self-haul green waste for drop off. These resource recovery centres currently receive around 2,500 tonnes of green waste per annum.

Commercial green waste is currently self-hauled to RRCs , managed on site, or sent to landfill as part of landfill waste; the quantities and composition are unknown. If this material could be quantified and subsequently source separated it could become available for in region processing.

[8] Kerbside Residual Waste, Comingled Recycling & FOGO Audit, Just Waste Consulting, March 2021
[9] North East WRRG Regional Household Kerbside Bin System Audit in Spring 2021, EC Sustainable, February 2022
[10] Kerbside Residual Waste, Comingled Recycling & FOGO Audit, Just Waste Consulting, March 2021
[11] North East WRRG Regional Household Kerbside Bin System Audit in Spring 2021, EC Sustainable, February 2022

Some alpine resorts currently manage green waste at their own facilities. These quantities and management systems are currently not well understood. To establish if the organics from alpine resorts may or may not be available and viable for processing at a regional facility, further information would be required from the alpine resorts during the stakeholder engagement process.

2.3.4 Commercial and industry organic material

Murrindindi and Mansfield regions do not have large manufacturing sectors so there is likely to be limited other organic material requiring regional processing. Current quantities and composition are unknown, but as part of this exercise, T+T will be reaching out to businesses identified in collaboration with Council. This is to determine if there are any potential synergies with organic materials requiring processing which could be included to create scale and/or a more desirable end product. Industry stakeholders currently under consideration include:

- Local water authority (Goulburn Valley Water) – biosolids/sludge
- Vineyards – green waste, grape marc, other processing waste
- Horticulture (Stone fruit and berries, olives) – green waste, off specification fruit
- Poultry farmers – bedding, fatalities
- Aquaculture – slurry
- Forestry and timber processing – bark and wood chip
- Hospitality – food waste including spent grain and yeast from micro breweries
- Local supermarkets – food waste (packaged and depackaged)
- Cattle and other livestock – Yea saleyard

2.3.5 Summary

An overview of the material potentially available for a FOGO processing facility is provided in Table 2.4. The tonnes in the table are a prediction of material likely to be available in 2025, and the assumptions are provided. These predictions are likely to be conservative as they do not account for an 'induced' tonnage of material that was previously managed onsite. It is also likely that the RRC green waste tonnage may decrease and be collected through the FOGO system instead. This has not been considered in the table below as it will not affect the total, just the mechanism through which it is collected.

Table 2.4: FOGO material in the Murrindindi/Mansfield Region (2025)

Source	Predicted quantity (2025)	Assumptions
Mansfield – Household FOGO	500 - 1,200 tonnes	• Assumed kerbside landfill bin composition of 30 % food waste and 9 % garden organics • 2019 kerbside data increased at a rate of 1.1% year on year to reflect population growth • No induced material (that was previously managed onsite) • No green waste that was previously captured through the RRCs • 30% capture rate of kerbside bin organics (lower bound) • 60% capture rate of kerbside bin organics (upper bound)

Source	Predicted quantity (2025)	Assumptions
Murrindindi – Household FOGO	300 - 700 tonnes	• Assumed kerbside landfill bin composition of 30 % food waste and 9 % garden organics • 2019 kerbside data increased at a rate of 0.9% year on year to reflect population growth • No induced material (that was previously managed onsite) • No green waste that was previously captured through the RRCs • 30% capture rate of kerbside bin organics (lower bound) • 60% capture rate of kerbside bin organics (upper bound)
Mansfield RRC green waste	380 tonnes	• 2019 transfer station data increased at a rate of 1.1% year on year to reflect population growth
Murrindindi RRCs green waste	2,300 tonnes	• 2021/22 transfer station data increased at a rate of 0.9% year on year to reflect population growth
Commercial food waste	Unknown	• To be determined through stakeholder interviews
Commercial green waste	Unknown	
Other organic waste	Unknown	

2.4 Markets for products created

The products created from FOGO processing can include the following:

- Compost
- Other soil amendment, such as fertilisers, soil conditioners, mulches
- Biochar
- Energy

A summary of the agricultural production activity across the two Shires is provided in Table 2.5.

Table 2.5: Agricultural production activity in Murrindindi and Mansfield Shires

Agricultural commodities	Murrindindi[12]	Mansfield[13]
2021 (year ended June 30)		
Area of holding – total area (ha)	139,688	67,532
Dairy cattle – total (no.)	1,356	472
Meat cattle – total (no.)	79,336	39,015
Sheep and lambs – total (no.)	107,139	145,061
Pigs – total (no.)	14.2	3.5
Meat chickens – total (no.)	15.3	NA

[12] Region summary: Murrindindi (Vic.), Australian Bureau of Statistics, accessed from: https://dbr.abs.gov.au/region.html?lyr=lga&rgn=25620
[13] Region summary: Mansfield (Vic.), Australian Bureau of Statistics, accessed from: https://dbr.abs.gov.au/region.html?lyr=sa2&rgn=204011057

Agricultural commodities	Murrindindi[12]	Mansfield[13]
Broadacre crops – total area (ha)	4,166	1,190.5
Vegetables – total area (ha)	6.5	6.1
Orchard fruit trees and nut trees – produce intended for sale – total area (ha)	308	35.3

Other horticultural activities across the two shires include:

- Stone fruits and berries
- Vineyards
- Olives
- Plant Nurseries
- Turf and seed production

Other markets that use products produced from FOGO could also include local Councils (Parks team) or households on their home gardens. No high energy users were identified across the two council areas as part of the desktop assessment. The next stage of the project will aim to further explore potential markets for energy or products produced from FOGO in collaboration with Council, informed by a small number of stakeholder interviews where possible.

3 Objectives for organic material recovery

3.1 Policy and priorities

3.1.1 Recycling Victoria (RV) policy

In response to the three Victorian 'recycling crises' events of 2018 and 2019 which saw the release of the China Sword Policy and significant disruption to the Victorian recycling reprocessing network, the Victorian State Government established Recycling Victoria[14] (RV), a new business unit of DELWP. The new RV planning and regulatory structure is expected to be fully operational by December 2023. RV amalgamated the staff and services of the former Waste and Resource Recovery Groups (WRRGs), as of July 2022. RV is tasked with overseeing the waste, recycling, and resource recovery sector, as well as supporting the development of the circular economy.

RV's 10-year plan[15] outlines a package of more than $300 million of waste sector reforms. These include landfill diversion strategies such as a state-wide four-bin kerbside system incorporating organics separation (a key aim is to ensure that every Victorian household has access to FOGO services or local composting by 2030), a container deposit scheme in 2023, and nearly $100 million to support resource recovery infrastructure. It is likely that the current RV strategy of releasing regular funding tranches for resource recovery infrastructure for different streams of works will continue.

The aim of the plan is to develop a new "circular" economy to reform the waste and resource recovery sector over a 10-year period. Key goals included in the policy documents and associated RV plan include:

- Landfill diversion target of 80% by 2030.
- Cutting total waste generation by 15% per capita by 2030.
- Ensuring every Victorian household has access to FOGO services or local composting by 2030.

3.1.2 Council waste vision

Both Councils also have their own waste visions which are circular economy driven, for Murrindindi and Mansfield respectively:

- Murrindindi: Our shire will become a low waste municipality that lives the principles of a circular economy, working locally to protect our natural environment and community from the impacts of waste.
- Mansfield: We are responsible for the waste we create. We reduce, re-use or recycle our waste wherever possible and sustainably manage any landfill waste. We aim to manage all our waste within the Shire.

3.1.3 The transition to a circular economy

Mansfield and Murrindindi Shire Councils have an ambition to support the Hume region's ambition to transition to a low carbon circular economy. The Regional Circular Economy Plan for Hume[16] lists four circular economy aspirations to 2030 that are:

1 Product stewardship is paramount
2 Best practice circular economy approaches are adopted
3 Hume's consumers are active participants in the circular economy

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[14] Circular Economy (Waste Reduction and Recycling) Act 2021
[15] Recycling Victoria A new economy, The State of Victoria Department of Environment, Land, Water and Planning, 2020
[16] Hume Regional circular economy plan, Department of Environment, Land, Water and Planning, October 2022

4 Our local circular economy is sustainable, self-sufficient and resilient to market changes.

The principle of the circular economy underpins the RV Policy as a means to address the negative impacts that the production and consumption of goods has on the environment. In the current "take-make-dispose" linear economy products are not designed for reuse, repair, refurbishment or to be remanufactured, and therefore drive the continuous disposal of valuable resources. A circular economy seeks to reduce the environmental impacts of production and consumption, while enabling economic growth through more productive use of natural resources. The circular economy is based on the following principles:

- Designing out waste and pollution
- Keeping products and materials in use
- Regenerating natural systems.

It is important to highlight that a circular economy is about more than how waste is managed. The circular economy preferences waste avoidance through the consideration of end of use during the design of a product. This requires a whole of economy shift, given today's economy is largely based on the consumption and disposal of goods.

The circular economy requires a systems thinking approach to the way we design solutions, and requires extensive collaboration across stakeholders in each value chain. This provides multiple perspectives on key issues and opportunities, promotes shared ownership of action. In the context of Mansfield and Murrindindi, this has the potential to provide more efficient and effective activity through increased scale.

3.1.4 Linking organics recovery to carbon neutrality

Both Mansfield and Murrindindi Shires are committed to combatting climate change and have either produced (in the case of Mansfield)[17] or are in the process of producing (in the case of Murrindindi) a Shire specific Climate Change Action Plan. Mansfield Shire has also prepared an Environmental Strategy.

When FOGO is disposed of in landfill, anaerobic decomposition (where the materials are decomposed in the absence of oxygen) takes place, resulting in methane production. There is potential to release the methane to the atmosphere if a high performing landfill gas capture and destruction system is not in place. Methane is a potent greenhouse gas, and if 1 tonne of methane is emitted to the atmosphere it will cause the equivalent global warming impacts of 25-30 tonnes[18] of carbon dioxide . Also, keeping products and materials in use, consistent with a circular economy mindset, helps to create a less carbon emission intensive economy. Regional circular economy actions relating to organic materials recovery that support carbon neutrality could include:

- Designing out waste and the associated potential emissions from landfill.
  - For example preventing our food waste at source through education or better manufacturing processes to reduce the embodied carbon of production or emissions associated with organic breakdown in landfill.
- Recovering materials to generate new sources of renewable energy.
  - For example the anaerobic digestion/power generation arrangements that use organic waste as fuel.
- Regeneration of natural systems through the nutrient recovery cycle and associated carbon sink opportunities.

[17] Mansfield Shire Council Climate Action Plan Background Paper (Draft), IronBark Sustainability, 2021
[18] Refer to IPCCC AR6 for most up to date global warming potential figures: https://www.ipcc.ch/report/ar6/wg1/

– Creating products from organic waste that return nutrients and carbon to the soil.

3.2 Project objectives and critical success factors

Using the Business Case framework, the first step after understanding the current situation is to develop Project, or Investment, Objectives and Critical Success Factors. These guide the development of options and are used to evaluate the options. The Objectives and Critical Success Factors set out in Table 3.1 have been developed in collaboration with the Councils.

Table 3.1: Project critical success factors

Criteria	Definition
Objectives	
Opportunity for Community development	• Contributes to community resilience • Enables local food production • Creates local economic opportunity
Diversion of organic material from landfill and recovery of products of value	• Option needs to deliver increased diversion of waste from landfill, increased local employment, and needs to deliver products at a quality suitable for end markets and the risks of identified markets need to be considered
Greenhouse gas emissions	• The net carbon impacts covering collection, transport, processing and use need to be considered • Emissions reduction needs to be an explicit key performance indicator (KPI) for any organic materials recovery facility
Critical Success Factors	
Environmental impact	• Chosen option does not have a negative impact on waterways, land or amenity • A local solution that minimises transport of material • A solution that supports circular systems in which organic material is not a waste but a resource that is used and returned to building soils
Affordability	• Cost needs to be acceptable for households and businesses – linked to capital and operational costs less any rate payer subsidy • If the model includes Council investment, then establishment and ongoing operation costs need to be viable over the long term
Technology maturity	• Considers complexity, safety (integral to any decision making process), operational requirements and proven technology track record of technology options
Capability to deliver	• Availability of local people, equipment and infrastructure to deliver the project or service

4 Processing and recovery options

4.1 Organic material management approaches

The recovery and processing of organic waste should reflect the wider principles of the waste hierarchy and circular economy which is to preference solutions that retain resources in use at their highest economic value. Using this framework, the options for managing organic material in order of preference include:

- Reduce the volume of organic material e.g. through food waste minimisation projects, and home composting
- Recycling or Recovery of organic material to produce a usable product, for example mulch, soil conditioners, or compost
- Recovery of energy using an Anaerobic Digestion process for putrescible organic material or burning of woody organic material to create a green or low emissions fuel source
- Disposal of organic material, either at a dedicated disposal facility or a general waste landfill.

Any organic materials processing facility needs to be able to operate in a complimentary fashion to recovery options further up the waste hierarchy.

4.2 Taking a systems approach

Figure 4.1 shows the generation, collection, processing and markets for the products from organic material processing. The ideal scenario reflects the concept of a circular economy, where nutrients and organic matter in the organic material is used to maintain soil health and becomes incorporated into a product/s. Ideally these products are used in a local context. This may include the recovery of energy as part of re-processing of materials, for example via utilisation of biogas produced through anaerobic digestion. Alternative scenarios represent a linear approach where organic materials end up alongside other waste types in a landfill or are in part destroyed to generate energy with residual (ash, flue gas cleaning residues) landfilled.

The focus of this study is on the processing aspect of the pathway outlined in Figure 4.1. However, it is important to consider that collections and collection systems are an enabler for different types of processing as the quantity, composition and quality of material collected will help to define what processing options are feasible. Similarly, establishing potential markets for outputs of processing during the processing design phase increases their economic viability. Although processing is the focus of this study options need to be considered in the context of the broader organic material life cycle and system.

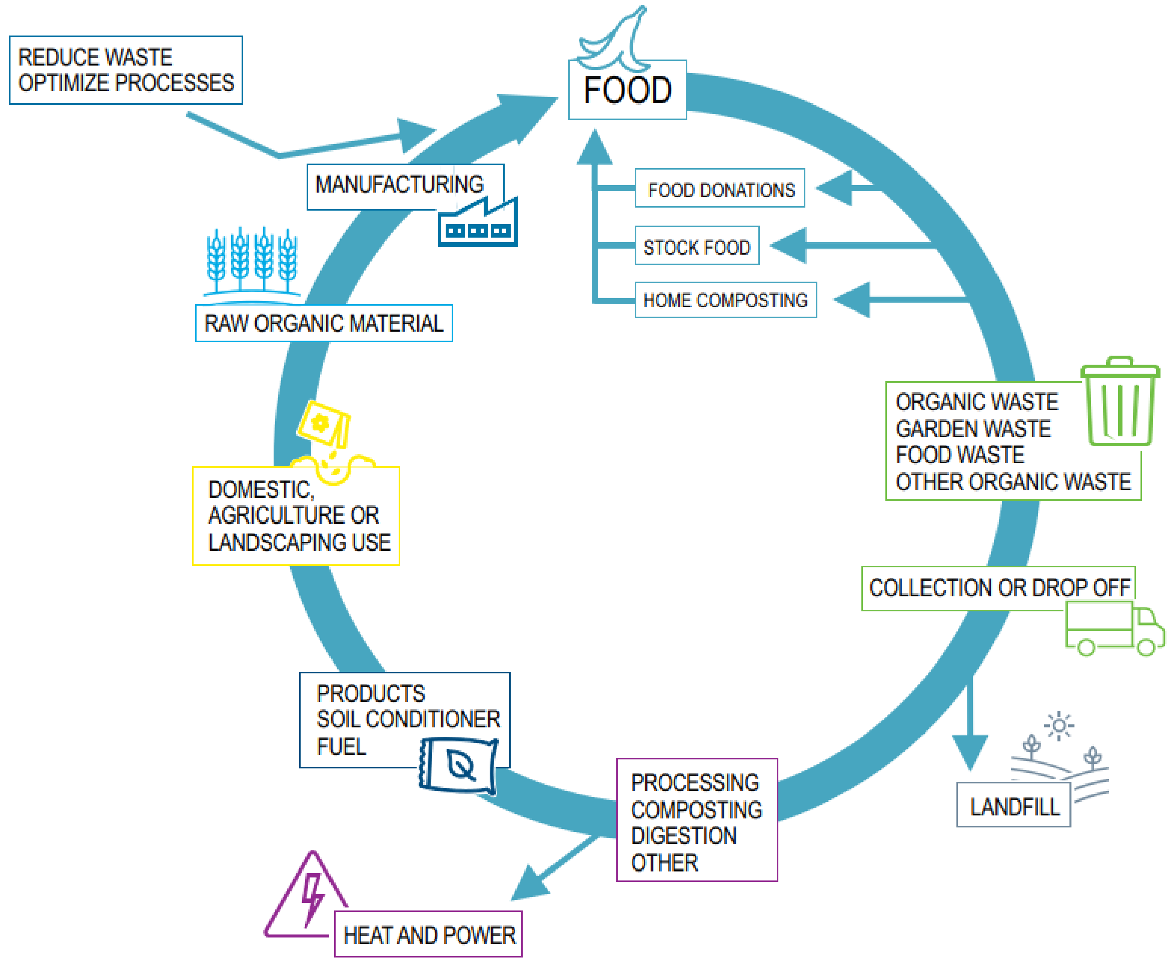

Figure 4.1: Circular and linear pathways for organic material management and use

4.2.1 Organic material reduction

From a Council perspective, the ideal solution is to work at the top of the waste hierarchy, avoiding the generation of green or food waste altogether. Council departments and contractors responsible for the creation and management of organic waste (meals on wheels, leisure services, events) and council staff should all be involved in the reduction of organic waste from council operations. Other examples include changing landscaping approach and process optimisation and/or by-product utilisation for primary processors.

While not reducing the generation of organic material, encouraging households or businesses to manage organic material onsite, or within their own operations, appropriately avoids the need for Council or a third party to collect, process and/or dispose of the material.

Solutions put forward for organic processing should work alongside reduction and on site management approaches where appropriate. This means ensuring that new processing shouldn't replace current and future waste reduction initiatives but be complementary to them. It also means planning needs to take account of likely future materials flows (quantity of material composition and various processing or use options).

4.2.2 Organic material reuse

Options for reusing organic material include re-distribution of food to feed people and redistribution of food to feed animals. Organisations and charities such as *Food Bank*, *SecondBite, REAP,* and *Fareshare* already operate in Victoria and around Australia, redistributing quality food that would have otherwise gone to waste. There are also organisations redistributing organic material to stock food (Waster) or conducting research into substituting feed ingredients with food wastes (Fight Food Waste). These initiatives need to be underpinned by strong education to be successful.

> **Case Study – Second Bite**
>
> Second Bite collects surplus and unsold food from growers, manufacturers, and retailers. The food is then redistributed to over 1,400 charities within Australia.
>
> SecondBite
> Ending Waste. Ending Hunger.

Key considerations for organic material re-use are ensuring feedstocks are fit for purpose, and safe for consumption. Stock food needs to be free of contamination and sometimes requires pre-processing (i.e., removal of packaging or cooking) before it is fit for animal consumption.

Using food waste as feedstock for farm animals is not commonly practiced in Victoria. There are strict rules on which food waste can be fed to certain animals, such as pigs, to reduce the chance for disease or viruses. There are few companies, such as Waster, that currently assist in providing clean food waste (e.g., clean vegetables) to stock feeders. Other less formal agreements are commonly made between animal farmers, and fruit and vegetable producers. Large scale diversion of municipal food waste to stockfeed is not generally considered feasible due to contamination issues.

Successful redistribution of food for human consumption typically involves community or charity organisations. Councils can take a role in supporting these initiatives through access to grants, providing a location for operations and making connections between key stakeholders. The scale of diversion potential is limited as only a small portion of total organic material is suitable for reuse.

4.2.3 Processing technologies

There are several aspects to consider when selecting a processing approach, including:

- Processing technology - suitability for feedstock, management of product quality, management of processing impacts and technology maturity
- Seasonal changes – there is likely to be little green waste collected over the winter months i.e. any process will need to cope with seasonal peaks and variation in both quantity and composition
- Contamination: likely type, source, percentage and effect on processing and product
- Feedstock - garden, food or food and green waste, other organic waste, what additional materials are required for effective processing and to maximise the value of output
- Processing location - collection/transport logistics, surrounding land use, proximity to market
- Processing operations ownership - council, partnership (Iwi Hapū, sub-regional, Council/private or fully private sector)
- Existing processing capability of the region, potential to disrupt or complement the capabilities of existing services.

For all of the processing options considered in the remainder of this section, feedstock mix is important. For biological processes including composting and anaerobic digestion, the feedstock needs to provide the right nutrient mix for successful processing. Physical characteristics are also important with particle size (to support effective aeration where relevant) and water content are often important considerations. In practice this means that a mix of multiple feedstocks is often preferred, for example food waste mixed with green waste or wastewater treatment solids mixed with bark for composting.

The capability of the operator is also important but outside the scope of this early assessment. This is a critical consideration when selecting a processor or contracted operator of an organic materials recovery system. This would be assessed through a tender process when the time comes.

Similar to collections, for larger scale generators of organic materials, ongoing availability of collection and management services is important. In addition to ensuring that processing is available, the location is important with particular consideration required where transport links have the potential to be disrupted. Disruption may occur as a result of natural hazards (earthquake, floods, landslides, bushfires) and/or other events such as pandemic (driver availability).

Anaerobic technologies create environments in which the decomposition of organic matter results in methane generation which can be captured for beneficial use (such as anaerobic digestion). Aerobic technologies utilise organisms or bacteria that require oxygen and the generation of methane is minimal where there is adequate mixing and/or aeration.

4.2.3.1 Composting

4.2.3.1.1 Home and community composting

Composting can be adopted at various scales including at home composting, community composting and commercial scale composting.

Home composting and similar solutions like worm farms, have been promoted by both Murrindindi and Mansfield and are used by many householders across the region. Murrindindi provides composting and worm farm guides to assist residents looking to begin[19]. Mansfield Shire Council are currently conducting community engagement around the new 4-stream bin system, which has included tours of Mansfield Steiner School's established FOGO waste system[20]. While not reducing large volumes of waste, managing organic material at a household level reduces the quantity of waste that enters the waste collection system. There are a number of different products on the market ranging from simple composting bins, multi-chamber composting bins and various worm farming products. It can, however, also introduce uncertainty as to whether the materials are being appropriately composted, captured, and reused, as home composting systems and results can be variable. Systems at household level which are not actively and correctly used and maintained could generate more greenhouse gas emissions than larger scale, appropriately managed systems.

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[19] Composting and Worm Farming, Murrindindi Shire Council. Accessed from: https://www.murrindindi.vic.gov.au/Your-Property/Garbage-and-Recycling/Composting-and-Worm-Farming.

[20] Steiner School Compost Visit, Mansfield Shire Council, 11 November 2022. Accessed from: https://www.mansfield.vic.gov.au/Community/Latest-News/Steiner-School-Compost-Visit

There are a number of successful household and community composting initiatives operating across the country, such as Compost Community®. Where successfully adopted, the integration of community composting with community gardens/urban farming has proven to be a successful model for the reuse of organic material, especially for shared community spaces (e.g. schools). These initiatives require community groups, not for profits or small private enterprises to champion programs. Opportunities for urban areas need to consider compliance with local bylaws and potential amenity impacts.

Case Study – Compost Community®, Melbourne

Compost Community® supports 7,737 households across Metropolitan Melbourne. Compost Community® is Council funded, and provides discounted compost systems for 12 Councils. They also offer free education, advice and support.

Virtual networks are also being established to connect and increase the uptake of community composting initiatives. Compost Connect is Australia's first virtual composting network, which connects foodservice businesses with industrial composters across Australia. Compost Connect is partially funded by the National Product Stewardship Investment Fund. Operating since May 2021, in their first year Compost Connect had 261 foodservice businesses across Australia, New Zealand and the United Kingdom, and have diverted 1,915 tonnes of organic waste from landfill.

Examples of community composting include:

- Compost Community® - Metropolitan Melbourne – Council funded supplier of composting systems, education and support.
- Community Compost Hubs – Victoria – Compost bays installed to be easily accessible to the community 24/7.

4.2.3.1.2 Open windrow composting

Open windrow composting and aerated windrow composting are typically used in Victoria for the processing of green waste only. There are limited examples in Victoria of this approach being used for combined food and green organics[21].

Current composting operations in the region are either for green organics only (such as Veolia Epping Organic Resource Recovery Facility), or for FOGO (such as Western Composting Technology, Repurpose It, and Veolia Bulla Organics Facility).

Where green organics composting is not managed efficiently, anaerobic conditions and thus odour can develop. This is a consideration where composting takes place in close proximity to residential properties. Effective aeration (for example regular turning) mitigates this risk but may require investment in additional equipment or infrastructure such as dedicated a compost turner, forced aeration system or odour management systems. There are similar, but potential more severe, risks with composting FOGO feedstock.

Examples of open windrow composting in Australia includes:

- Wangaratta Organics Processing Plant– open windrow composting (also temperature-controlled bunkers).
- Western Composting Technology – open windrow composting (also aerated static pile composting).
- Veolia Epping Organic Resource Recovery Facility – open windrow composting.
- Biomix – open windrow composting.

[21] Wangaratta's Organics Processing Plant- open windrow composting of food and green organics (from residents' kitchens and gardens)

Considerations for open windrow composting include:

- Management of odour.
- Arrangements for turning of materials.
- Feedstock - best suited to green waste.
- Outputs are compost and soil conditioners, suitable for residential (green centres), council (parks and gardens) and commercial (horticultural) applications.

4.2.3.1.3 In-vessel composting

In-vessel composting is typically employed where putrescible materials, including food waste, are being processed. While the enclosure of the composting process significantly reduces the risk of odour impacts, in-vessel composting is typically located away from sensitive receptors. Careful thought is required to manage materials reception and load out facilities, as well as the composting process.

With respect to materials, in-vessel composting can be flexible with either food, green or a combined feedstock potentially appropriate. A food only feedstock would require mixing with a carbon rich bulking agent, for example green waste or sawdust/wood chips.

The in-vessel composting process is intended to actively manage mixing and aeration components of the composting during the initial phases of composting. Processes are typically designed for several days to weeks residence time with the product then 'matured' in conventional windrows outside. This means in addition to the infrastructure associated with the in-vessel processing space is also required for maturing on a pad with appropriate control of stormwater[22]. The loading rhythm and cycle of in-vessel systems can affect the type of FOGO system which can be used – for example, if compostable liners are provided to residents, a slightly longer loading and processing cycle will be required, than if liners are not provided.

Examples of in-vessel composting in Australia includes:

- Bulla Organics Facility, Bulla (Veolia)
- Natural Recovery System (NRS) Composting Facility, Dandenong South (Veolia)
- Repurpose It, Epping
- Western Composting Technology, Shepparton North
- Biomix, Carag Carag

Melbourne Waste Treatment Plant, Dandenong South Considerations for in-vessel composting include:

- Management of odour including venting, materials reception, and load out
- Compost maturation - space for storing compost post the initial intensive in-vessel processing
- Feedstock - suited to combined food and green waste or food organics with additional carbon rich bulking agent.

4.2.3.2 Vermicomposting

Vermicomposting is also employed in some areas processing industry wastewater solids, municipal biosolids, drilling muds and food waste.

[22] For example, the Living Earth composting process in Christchurch (processing FOGO from household collections alongside other feedstocks) comprises an in-vessel process (approx. 7,500 m^2) and maturing area (approx. 40,000 m^2).

Examples of vermicomposting in Australia includes:

- Worms Downunder, Chandler, Queensland – Design and manufacture of large-scale worm farms and "Worm Brew".
- VermiGold, North Sydney, New South Wales – Producer of fertiliser from vermicompost.
- WormBiz, Mid North Coast, New South Wales – grow and sell compost worms for composting.

Considerations for worm farming are similar to composting with high nitrogen feedstock (such as food waste and wastewater sludges) also requiring considerable carbon rich bulking agent. Outputs are worm castings which are considered a high quality soil conditioner appropriate for horticulture and gardens.

Case Study – Re-waste – Yarra Valley Water, Wollert, Victoria, Australia

Yarra Valley Water has been operating a food waste anaerobic digestion plant north of metropolitan Melbourne since 2017. The plant accepts 33,000 TPA of commercial food waste including fats, oil and grease, fruit and vegetable wastes, waste from animal processing facilities, restaurant and catering food wastes and brewery and dairy wastes.

The plant generates 1 MW of electricity for 100 t of food waste and supplies electricity to the adjacent Aurora wastewater sewage treatment plant and exports excess to the grid. The company is on a journey to capture value from digestate but progress on the initiative has been hindered by changes to legislation in reportable priority waste residues in Victoria.

4.2.3.3 Anaerobic digestion

Anaerobic digestion (AD) is a series of biological processes in which microorganisms break down biodegradable material in the absence of oxygen. It is in essence the same process by which organic material degrades in a landfill however in this context, the digestion occurs in a sealed tank.

AD is suited to putrescible materials including industry wastewater solids, municipal sewage sludge and food waste. A key consideration in any AD process is providing a consistent feedstock to allow the microbial community in the digestor to establish. This is relatively straightforward for large scale commercial/industrial waste generators but more challenging with inherently variable feedstocks such as household food waste. 'Shocks' in the quantity or strength of feedstock can result in process failure or overproduction of gas.

Conventional methods process low-solids feedstock producing a digestate that is dewatered to produce solid (15-20% dry solids) digestate and liquid. Solids are further processed or disposed of to landfill, liquids are typically recycled through wastewater treatment processes.

There are emerging approaches that involve pre-treatment of feedstock to enhance degradability[23] and others that process very high solids in a batch style process. These are unproven in an Australian context, and at an early stage of commercialisation internationally.

In Australia, AD is common in major wastewater treatment plants. There are examples of municipal wastewater treatment plants co-digesting industrial wastewater solids. Re-waste is a food waste to energy facility operated by Yarra Valley Water, which processes the equivalent of 33,000 tonnes of commercial food waste each year[24].

Further processing may involve dewatering, drying and/or composting of digestate. Drying is energy intensive and typically produces a granular product suitable for soil incorporation and, for some applications, top dressing. Composting is typically in-vessel (to manage odour) and requires a high carbon bulking agent similar to the processing of raw food organic wastes.

[23] Cambi, Ultrasonic or similar pre-treatment designed to breakdown organic waste at a cellular level to improve digestability. These systems have been developed for wastewater solids processing.
[24] Yarra Valley Water, https://www.yvw.com.au/help-advice/food-waste-energy.

Dry digestion is an emerging technology that can reportedly handle a mixed green and food organics feedstock. This technology is relatively unproven and has yet to be implemented in Australia for any feedstock.

AD is more complex than in-vessel composting and variability in feedstocks can have significant impacts on process stability and outputs. Other potential feedstocks for digestion include waste from food processing, agricultural slurries, water treatment solids, all of which are available in Victoria. However, a constant supply/contracted volume over a relatively long time period would be required to ensure a consistent feedstock.

Yarra Valley Water's Re-waste facility was the first commercial scale anaerobic digestion of organic waste in Australia. The facility diverts 33,000 TPA of food waste from landfill, and at full capacity covers 25% of Yarra Valley Water's annual electricity demand. Yarra Valley Water has plans for to construct more Re-waste facilities, the next at Lilydale.

4.2.3.4 Other processing options

There are other processes which can be used for the treatment of organic material. These are discussed briefly below.

4.2.3.4.1 Existing approaches

Wood waste as biofuel - There are multiple examples of the use of wood waste to generate energy on wood processing sites around Australia, including the use of native forest wood waste. There is potential for woody green waste or the oversize fraction from compost screening to be utilised in existing facilities, or a facility established to make use of that material. SV is providing $10 million to encourage investment into bioenergy, and bioenergy is expected to expand as a sector in Victoria into the future.

Mechanical biological treatment or **mechanical heat treatment** (MBT or MHT) is also an option employed for managing mixed waste including organic material. This suite of technologies could be employed in Victoria but are costly. There are several facilities currently operating in NSW that are applied to mixed residual waste, rather than source separated materials.

4.2.3.4.2 Emerging approaches

Soldier fly larvae – The capability of solider fly larvae to turn a range of livestock feeds and fertiliser is well understood but application of the process at an industrial scale is yet to be established in Australasia. HATCH biosystems based in Australia have successfully gained funding to expand the company's BSF bioconversion capacity in 2022 in partnership with Cleanaway.

Bardee, located in Melbourne, are using Black Soldier Fly larvae to turn food waste into feed for animals.

With this approach still in early commercial development there is still some uncertainty regarding suitable feedstock and product value. Early information indicates it is suitable for food waste and similar feedstocks. Products include stock feed (high protein) and fertilisers. In both cases products have a higher value than standard compost or other soil amendments. It is not clear whether this approach has the potential to scale for large scale organic material processing.

Hydrothermal liquefaction of wet wastes for the production of liquid fuels is an emerging technology with significant potential for application at commercial scale. This technology is not proven at a commercial scale internationally and not currently applied in Australia.

Gasification and **pyrolysis** are widely used in other countries for the treatment of a mixture of waste streams and generally for larger volumes of waste. **Torrefaction** is a refinement of gasification and is another emerging technology for improving the quality of material for fuel, combustion and gasification applications. There are some facilities which operate with lower volume feedstocks and focussed on specific material streams, typically urban wood waste or wood processing residues. Products include gas (for further refining or energy generation), liquid (pyrolysis oil, condensate) and solids (biochar, ash). These processes also typically generate air pollution control residues that require treatment prior to disposal as stabilised hazardous waste.

These technologies are typically applied to mixed municipal solid waste or specific C&I waste streams internationally. There are some small scale or pilot projects currently occurring in Victoria. For example, Yarra Valley Ranges Council is intending to open a biochar facility for woody waste which they are anticipating to open in 2022. A pyrolysis technology developed by RMIT is currently being trialled by South East Water and Greater Western Water that converts biosolids into biochar.

4.2.4 Landfill disposal

The disposal of organics to landfill in Victoria is set to decrease under the RV 10-year plan and Policy. Alexandra Landfill in Murrindindi Shire does not currently have a Landfill Gas Collection System, however one is currently being designed. Mansfield Shire waste is taken to Benalla Landfill which has an extraction system, constructed with both vertical and horizontal collection and extraction wells, and a flare.

The efficiency of landfill gas capture is dependent on the location of wells, age of waste and the management and operation of the site. Landfill gas collection efficiency varies significantly across landfills. There is ongoing current debate across the Australian waste industry regarding the efficiency of landfill gas capture systems as a decarbonising tool.

4.2.5 Processing options for each material

Not all technologies are applicable to all materials listed in the gap analysis. Applicability of technologies to each material is shown in Table 4.1.

Table 4.1: Applicability of processing options to each material

PROCESS	Home compost	Compost, windrow	Compost, in vessel	Vermi-compost	Anaerobic digestion	Biofuel	Gasification, pyrolysis, torrefaction	MBT/MHT	Stock food
Food	✓	✗/✓[25]	✓	✓	✓	✗	✓	✗	✓[26]
Garden	✓	✓	✓	✗	~	~	✓	✗	✗
Mixed landfill waste	✗	✗	✗	✗	✗	✗	✓	✓	✗

[25] Okay when making up relatively small portion of total mix. Special consideration of odour management and buffer distances required.
[26] Pre consumer food waste only.

5 Location options

5.1 Requirements

The location of composting facilities is dependent on a number of factors which are determined by the following guidelines:

- EPA Publication 1588.1: Designing, constructing and operating composting facilities, EPA Victoria, 2017
- EPA Publication 1518: Recommended separation distances for industrial landfill air emissions, EPA Victoria, 2013.
- EPA Publication 1949: Separation Distance Guideline (draft), EPA Victoria, 2022

Composting facilities are required to have separation (buffer) distances which are dependent on what the surrounding land uses are, the meteorology, and topography of the location. Understanding the meteorology and topography assists in determining potential pathways of odour, noise, stormwater runoff, and other potential impacts. Calculations for determining exact buffer distances are provided in EPA Publication 1588.1, however recommended distances for sites are provided in Table 5.1 and Table 5.2.

Table 5.1: Example separation distances, reference facility 1 (Table 2 of EPA Publication 1588.1, 2017)

Types of feedstock	Technology being used	Size of the plant	Recommended separation distance (metres)
Green waste Vegetable organics Grease inceptor trap waste	Open air receival Enclosed aerobic composting with secondary odour capture and treatment equipment	1,200 TPA	>300
		14,000 TPA	>500
		36,000 TPA	>800
		55,000 TPA	>1,000
		75,000 TPA	>1,200
		90,000 TPA	>1,400

Table 5.2: Example separation distances, reference facility 2 (Table 3 of EPA Publication 1588.1, 2017)

Types of feedstock	Technology being used	Size of the plant	Recommended separation distance (metres)
Green waste	Open air receival Open turned windrow Open air maturation	1,200 TPA	>600
		14,000 TPA	>1,100
		36,000 TPA	>2,000
		55,000 TPA	>2,000

Separation distances are applicable to all sensitive land uses. This can include (but is not limited to) residential zones, schools, or named waterways.

Other criteria that will be considered in the selection of RRC location include:

- **Ownership:** Council will need to determine whether land will have to be procured, and what the model for lease or rent would be. Ideally, the land should be already owned by Council
- **Road accessibility:** The appropriate site requires safe driving routes and roads, likely be located on a main road to prevent disruption to private roads, and ensure there is space for movements and turning circles of trucks on-site.
- **Future proof capacity:** Will the location have potential for expansion when required in the future, or is there potential for encroachment of development in the area which would require more controls to be implemented to reduce impacts on the surrounding area
- **Fire risk:** The proposed location should not have any bushfire overlays, nor should it border bushland
- **Environmentally significant areas (ESA):** There should not be any ESA overlays for the proposed location, nor should the location border an ESA
- **Cultural Heritage:** There should not be any Cultural Heritage overlays for the proposed location.

5.2 Location selection process

In order to select a location, an initial 'long list' has been created based on lists of potential locations. It is important to remember that the site will be used by both Murrindindi Shire Council and Mansfield Shire Council. To account for this, both Shires were requested to submit a list of potential locations.

Mansfield recommended locations were their current RRC site (Monkey Gulley Road), and their current Council Depot Site (Lakins Road) (See Table 5.1). Murrindindi Shire Council has provided a resource recovery options assessment complete in 2019 that lists a number of possible sites for waste and resource recovery infrastructure[27].

The long list of recommendations from both Shires is provided in Table 5.3.

Table 5.3: Location assessment – long list

Name	Category	Current use	Landowner
Alexandra RRC	RRC	RRC with low service capacity. Currently accepts green waste, tyres, e-waste, white goods, mattress and couches, and more.	Murrindindi Shire Council
Alexandra Landfill	Closed Landfill	Existing (new) landfill. Located on main arterial road.	Murrindindi Shire Council
Alexandra Lethbridge Street	Private Ownership	Privately owned property in the industrial area. Topography is flat to slightly undulating.	Private Ownership
Eildon RRC	RRC	RRC with low service capacity. Site is largely seasonal in nature. There are illegal dumping issues.	Murrindindi Shire Council

[27] Murrindindi Shire Council Resource Recovery Centre Options Analysis, Reincarnate Strategic Environmental Consultants and Golder Associates Pty Ltd, and Randell Environmental Consulting, 2019

Name	Category	Current use	Landowner
Eildon WWTP	WWTP	Eildon Goulburn Valley WWTP located close to town. At risk to future encroachment and flooding.	State Government
Eildon Sugarloaf Road	Private Ownership	Privately owned property in northern industrial area. Site is quite steep and undulating.	Private Ownership
Kinglake RRC	RRC	RRC with the largest capacity of any MSC RRC.	Murrindindi Shire Council
Kingslake O'Gradys Road (Collers Road)	Private Ownership	Two very similar sites along the east and west of O'Gradys Road.	Private Ownership
Kingslake O'Gradys Road (Johnsons))	Private Ownership	Two very similar sites along the east and west of O'Gradys Road.	Private Ownership
Kingslake Extons Road	Private Ownership	Large size and ample cleared undulating land.	Private Ownership
Kingslake Sutherland Road	Private Ownership	Next to existing timber recycling facility.	Private Ownership
Kingslake Deviation Road	Private Ownership	Large footprint with substantial buffers to residential areas and waterways, undulating land.	Private Ownership
Marysville RRC	RRC	Very small site with limited and seasonal use. Currently heavily encroached and does not comply with residential buffer requirements.	Murrindindi Shire Council
Marysville WWTP	WWTP	Goulburn Valley Water Marysville WWTP. Site has good buffers and suitable topography for grade separation.	State Government
Taggerty Yellow Creek Road	Private Ownership	Provides large areas of flat and elevated land. A large ridgeline dominates the centre of the site.	Private Ownership
Taggerty Thornton Road	Private Ownership	Provides a large and fully cleared footprint. Site is located along main arterial road.	Private Ownership
Taggerty Swamp Creek Road	Private Ownership	Largest of the three potential Taggerty RRC sites.	Private Ownership
Yea RRC	RRC	Built on top of former Yea landfill. Site has suitable topography for grade separation.	Murrindindi Shire Council
Yea Flat Lead Road	Council Ownership	Surrounds a saleyard. Good topography allowing for grade separation.	Murrindindi Shire Council
Yea WWTP	WWTP	Goulburn Valley Water Yea WWTP. Situated on a main arterial road.	State Government
Mansfield RRC	RRC	RRC, closed landfill and vacant land.	Mansfield Shire Council
Mansfield Depot	Council depot	Council depot with vacant land at the back of the property	Mansfield Shire Council

The locations of the long list options are shown in Figure 5.1.

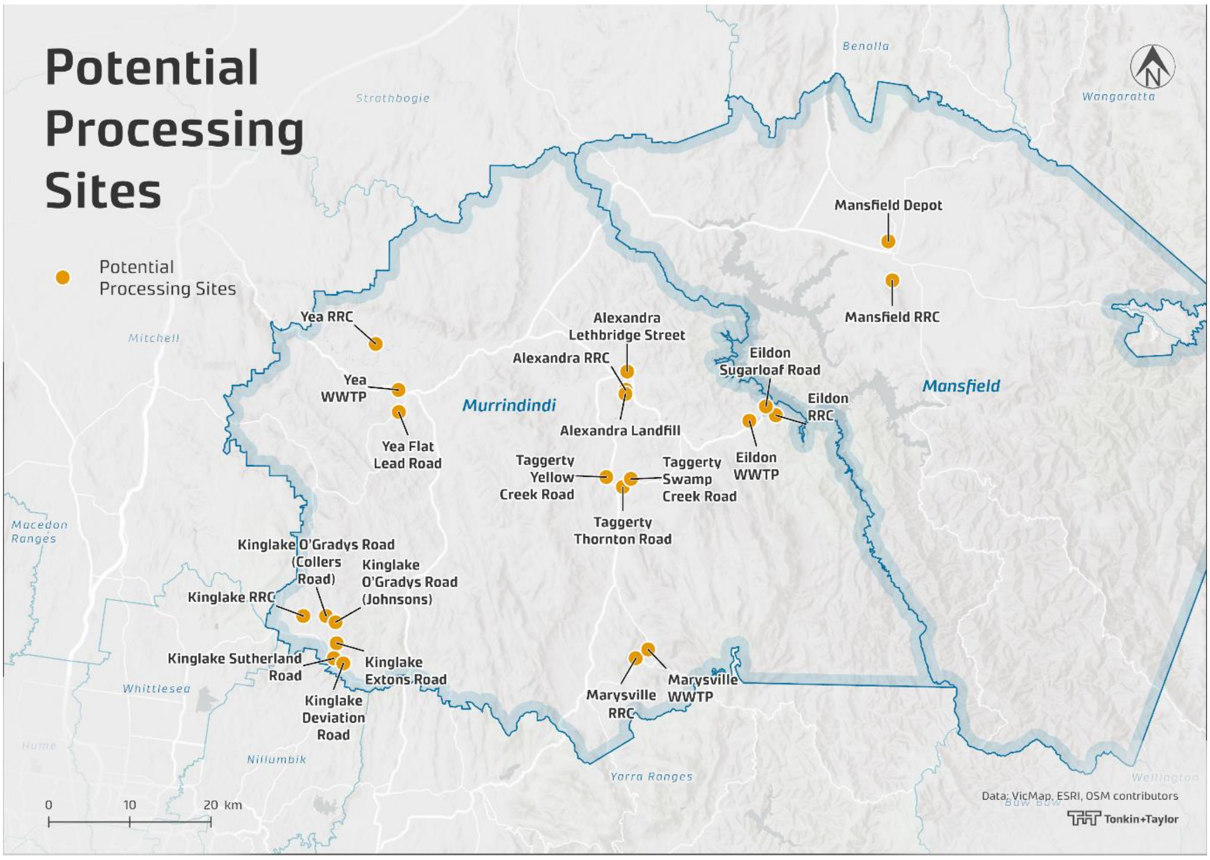

Figure 5.1: Locations of long list options

The next steps required involve a location evaluation process for each option, based on the criteria outlined in Section 5.1 in order to create a short list.

6 Conclusions

6.1 Summary of issues and opportunities

A summary of the issues and opportunities identified at the early stages of this project are summarised in Table 6.1.

Table 6.1: Summary of issues and opportunities

Issues	Opportunities
• Small Council FOGO tonnage available meaning: - Lack of scale will preclude some processing options due to lack of economy of scale - Consolidation of small tonnages over a large area is required • Potential for project partners to supply material currently not well understood, desktop assessment did not identify too many synergies due to a lack of industry and processing at scale in this region • Development encroachment in peri-urban areas needs to be carefully considered • Preferred options for the FOGO roll out are not known and collection will drive processing options	• Small Council FOGO tonnages meaning small scale solutions might be viable which are easier to get approvals for • Availability of a wide range of potential sites • Potential for partnership with organisations motivated to divert organic waste and already doing so i.e. ARMBs • High capture rate of green waste through the RRCs could create a nice mix of material for composting • Small scale or hub based approaches could be considered

6.2 Next steps

Following the issue of this interim report the next steps for this project are as follows:

- Engagement with producers, including commercial sources, of organic material to identify if other organic material would be available at a regional level
- Engagement and further desktop review in collaboration with Council to determine viable markets for products in the region
- Development of a short list of options that meet the project objectives and success criteria
- Location assessment to create a potential location short list
- Prepare the business case report
- Prepare a summary of management and procurement considerations should Council decide to adopt this business case

7 Applicability

This report has been prepared for the exclusive use of our client Mansfield Shire Council and Murrindindi Shire Council, with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose, or by any person other than our client, without our prior written agreement.

Tonkin & Taylor Pty Ltd
Environmental and Engineering Consultants

Report prepared by:

Caroline Turnbull
Environmental Engineer

Authorised for Tonkin & Taylor Pty Ltd by:

Sze-Fei Peng
Project Director

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Appendix B Cost assessment assumptions

Mansfield Shire Council, Murrindindi Shire Council
NPV Analysis - Default
Tonkin + Taylors Ref: 1089663
Ver 1, February 2023

Indicative Commercial Model (NPV Analysis) - Default

	Initials	Date
Prepared by:	CATU	28/02/2023
Checked by:	CHP	28/02/2023

Manual Sort		2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Site throughput (T per year)	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000
Approx processing cost ($ per T)	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
Recovery rate (%)	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%
Gate rate (feedstock) ($/T)	$177	$179	$181	$182	$184	$186	$188	$190	$192	$194	$196
Gate rate (residual waste ($/T)	$219	$221	$223	$226	$228	$230	$232	$235	$237	$240	$242
Revenue for recovery ($/T)	$20	$20	$20	$20	$20	$20	$20	$20	$20	$20	$20
Capital Cost ($)	$5,000,000	$5,000,000									
Implementation costs	$85,000										
Lease cost	$85,000	$85,000	$86,700	$88,434	$90,203	$92,007	$93,847	$95,724	$97,638	$99,591	$101,583
Council costs (depreciation	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000
Finance rate (%)	4.0%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
Finance term (years)	20	20	20	20	20	20	20	20	20	20	20
Capital investment	-$4,889,423	-$5,085,000									
Revenue (gate)	$15,843,355	$1,072,620	$1,083,346	$1,094,180	$1,105,121	$1,116,173	$1,127,334	$1,138,608	$1,149,994	$1,161,494	$1,173,109
Revenue (recovery)	$929,578	$68,400	$68,400	$68,400	$68,400	$68,400	$68,400	$68,400	$68,400	$68,400	$68,400
Cost (residual disposal)	-$980,140	-$66,357	-$67,021	-$67,691	-$68,368	-$69,051	-$69,742	-$70,439	-$71,144	-$71,855	-$72,574
Cost (processing)	-$8,154,196	-$600,000	-$600,000	-$600,000	-$600,000	-$600,000	-$600,000	-$600,000	-$600,000	-$600,000	-$600,000
Council costs	-$2,726,823	-$185,000	-$186,700	-$188,434	-$190,203	-$192,007	-$193,847	-$195,724	-$197,638	-$199,591	-$201,583
Net	$22,352	-$4,795,337	$298,026	$306,455	$314,951	$323,515	$332,146	$340,845	$349,612	$358,448	$367,352

Manual Sort	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042
Site throughput (T per year)	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000
Approx processing cost ($ per T)	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
Recovery rate (%)	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%
Gate rate (feedstock) ($/T)	$197	$199	$201	$203	$205	$208	$210	$212	$214	$216
Gate rate (residual waste ($/T)	$244	$247	$249	$252	$254	$257	$259	$262	$265	$267
Revenue for recovery ($/T)	$20	$20	$20	$20	$20	$20	$20	$20	$20	$20
Capital Cost ($)										
Implementation costs										
Lease cost	$103,615	$105,687	$107,801	$109,957	$112,156	$114,399	$116,687	$119,021	$121,401	$123,829
Council costs (depreciation	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000
Finance rate (%)	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
Finance term (years)	20	20	20	20	20	20	20	20	20	20
Capital investment										
Revenue (gate)	$1,184,840	$1,196,688	$1,208,655	$1,220,742	$1,232,949	$1,245,279	$1,257,731	$1,270,309	$1,283,012	$1,295,842
Revenue (recovery)	$68,400	$68,400	$68,400	$68,400	$68,400	$68,400	$68,400	$68,400	$68,400	$68,400
Cost (residual disposal)	-$73,299	-$74,032	-$74,773	-$75,520	-$76,276	-$77,038	-$77,809	-$78,587	-$79,373	-$80,166
Cost (processing)	-$600,000	-$600,000	-$600,000	-$600,000	-$600,000	-$600,000	-$600,000	-$600,000	-$600,000	-$600,000
Council costs	-$203,615	-$205,687	-$207,801	-$209,957	-$212,156	-$214,399	-$216,687	-$219,021	-$221,401	-$223,829
Net	$376,326	$385,369	$394,482	$403,665	$412,918	$422,241	$431,636	$441,101	$450,638	$460,246

Mansfield Shire Council, Murrindindi Shire Council
NPV Analysis - Default: Asssumed gate rate of $180/t
Tonkin + Taylors Ref: 1089663
Ver 1, February 2023

Indicative Commercial Model (NPV Analysis)- Default: Assumed gate rate of $180/t

Tonkin+Taylor

	Initials	Date
Prepared by:	CATU	28/02/2023
Checked by:	CHP	28/02/2023

Manual Sort

		2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Site throughput (T per year)	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000
Approx processing cost ($ per T)	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
Recovery rate (%)	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%
Gate rate (feedstock) ($/T)	$180	$182	$184	$185	$187	$189	$191	$193	$195	$197	$199
Gate rate (residual waste ($/T)	$219	$221	$223	$226	$228	$230	$232	$235	$237	$240	$242
Revenue for recovery ($/T)	$20	$20	$20	$20	$20	$20	$20	$20	$20	$20	$20
Capital Cost ($)	$5,000,000	$5,000,000									
Implementation costs	$85,000										
Lease cost	$85,000	$85,000	$86,700	$88,434	$90,203	$92,007	$93,847	$95,724	$97,638	$99,591	$101,583
Council costs (depreciation	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000
Finance rate (%)	4.0%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
Finance term (years)	20	20	20	20	20	20	20	20	20	20	20
Capital investment	-$4,889,423	-$5,085,000									
Revenue (gate)	$16,111,887	$1,090,800	$1,101,708	$1,112,725	$1,123,852	$1,135,091	$1,146,442	$1,157,906	$1,169,485	$1,181,180	$1,192,992
Revenue (recovery)	$929,578	$68,400	$68,400	$68,400	$68,400	$68,400	$68,400	$68,400	$68,400	$68,400	$68,400
Cost (residual disposal)	-$980,140	-$66,357	-$67,021	-$67,691	-$68,368	-$69,051	-$69,742	-$70,439	-$71,144	-$71,855	-$72,574
Cost (processing)	-$8,154,196	-$600,000	-$600,000	-$600,000	-$600,000	-$600,000	-$600,000	-$600,000	-$600,000	-$600,000	-$600,000
Council costs	-$2,726,823	-$185,000	-$186,700	-$188,434	-$190,203	-$192,007	-$193,847	-$195,724	-$197,638	-$199,591	-$201,583
Net	$290,883	-$4,777,157	$316,387	$325,000	$333,682	$342,433	$351,253	$360,143	$369,103	$378,134	$387,235

	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042
Site throughput (T per year)	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000
Approx processing cost ($ per T)	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
Recovery rate (%)	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%
Gate rate (feedstock) ($/T)	$201	$203	$205	$207	$209	$211	$213	$215	$217	$220
Gate rate (residual waste ($/T)	$244	$247	$249	$252	$254	$257	$259	$262	$265	$267
Revenue for recovery ($/T)	$20	$20	$20	$20	$20	$20	$20	$20	$20	$20
Capital Cost ($)										
Implementation costs										
Lease cost	$103,615	$105,687	$107,801	$109,957	$112,156	$114,399	$116,687	$119,021	$121,401	$123,829
Council costs (depreciation	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000
Finance rate (%)	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
Finance term (years)	20	20	20	20	20	20	20	20	20	20
Capital investment										
Revenue (gate)	$1,204,922	$1,216,971	$1,229,141	$1,241,432	$1,253,846	$1,266,385	$1,279,049	$1,291,839	$1,304,758	$1,317,805
Revenue (recovery)	$68,400	$68,400	$68,400	$68,400	$68,400	$68,400	$68,400	$68,400	$68,400	$68,400
Cost (residual disposal)	-$73,299	-$74,032	-$74,773	-$75,520	-$76,276	-$77,038	-$77,809	-$78,587	-$79,373	-$80,166
Cost (processing)	-$600,000	-$600,000	-$600,000	-$600,000	-$600,000	-$600,000	-$600,000	-$600,000	-$600,000	-$600,000
Council costs	-$203,615	-$205,687	-$207,801	-$209,957	-$212,156	-$214,399	-$216,687	-$219,021	-$221,401	-$223,829
Net	$396,408	$405,652	$414,967	$424,355	$433,815	$443,348	$452,953	$462,632	$472,384	$482,210

Mansfield Shire Council, Murrindindi Shire Council
NPV Analysis - Default, No Lease
Tonkin + Taylors Ref: 1089663
Ver 1, February 2023

Indicative Commercial Model (NPV Analysis) - Default, No Lease

Tonkin+Taylor

	Initials	Date
Prepared by:	CATU	28/02/2023
Checked by:	CHP	28/02/2023

Manual Sort

		2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042
Site throughput (T per year)	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000
Approx processing cost ($ per T)	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
Recovery rate (%)	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%
Gate rate (feedstock) ($/T)	$168	$170	$171	$173	$175	$177	$178	$180	$182	$184	$186	$187	$189	$191	$193	$195	$197	$199	$201	$203	$205
Gate rate (residual waste ($/T)	$219	$221	$223	$226	$228	$230	$232	$235	$237	$240	$242	$244	$247	$249	$252	$254	$257	$259	$262	$265	$267
Revenue for recovery ($/T)	$20	$20	$20	$20	$20	$20	$20	$20	$20	$20	$20	$20	$20	$20	$20	$20	$20	$20	$20	$20	$20
Capital Cost ($)	$5,000,000	$5,000,000																			
Implementation costs	$85,000																				
Lease + Council cost	$35,000	$35,000	$35,700	$36,414	$37,142	$37,885	$38,643	$39,416	$40,204	$41,008	$41,828	$42,665	$43,518	$44,388	$45,276	$46,182	$47,105	$48,047	$49,008	$49,989	$50,988
Council costs (depreciation	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000
Finance rate (%)	4.0%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
Finance term (years)	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Capital investment	-$4,889,423	-$5,085,000																			
Revenue (gate)	$15,037,761	$1,018,080	$1,028,261	$1,038,543	$1,048,929	$1,059,418	$1,070,012	$1,080,712	$1,091,520	$1,102,435	$1,113,459	$1,124,594	$1,135,840	$1,147,198	$1,158,670	$1,170,257	$1,181,959	$1,193,779	$1,205,717	$1,217,774	$1,229,952
Revenue (recovery)	$929,578	$68,400	$68,400	$68,400	$68,400	$68,400	$68,400	$68,400	$68,400	$68,400	$68,400	$68,400	$68,400	$68,400	$68,400	$68,400	$68,400	$68,400	$68,400	$68,400	$68,400
Cost (residual disposal)	-$980,140	-$66,357	-$67,021	-$67,691	-$68,368	-$69,051	-$69,742	-$70,439	-$71,144	-$71,855	-$72,574	-$73,299	-$74,032	-$74,773	-$75,520	-$76,276	-$77,038	-$77,809	-$78,587	-$79,373	-$80,166
Cost (processing)	-$8,154,196	-$600,000	-$600,000	-$600,000	-$600,000	-$600,000	-$600,000	-$600,000	-$600,000	-$600,000	-$600,000	-$600,000	-$600,000	-$600,000	-$600,000	-$600,000	-$600,000	-$600,000	-$600,000	-$600,000	-$600,000
Council costs	-$1,922,240	-$135,000	-$135,700	-$136,414	-$137,142	-$137,885	-$138,643	-$139,416	-$140,204	-$141,008	-$141,828	-$142,665	-$143,518	-$144,388	-$145,276	-$146,182	-$147,105	-$148,047	-$149,008	-$149,989	-$150,988
Net	$21,340	-$4,799,877	$293,940	$302,839	$311,819	$320,882	$330,028	$339,257	$348,572	$357,972	$367,457	$377,029	$386,689	$396,437	$406,273	$416,199	$426,215	$436,323	$446,521	$456,812	$467,197

Mansfield Shire Council, Murrindindi Shire Council
NPV Analysis - Default, With Grant
Tonkin + Taylors Ref: 1089663
Ver 1, February 2023

Indicative Commercial Model (NPV Analysis) - Default, With Grant

Tonkin+Taylor

	Initials	Date
Prepared by:	CATU	28/02/2023
Checked by:	CHP	28/02/2023

Manual Sort

		2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Site throughput (T per year)	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000
Approx processing cost ($ per T)	100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
Recovery rate (%)	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%
Gate rate (feedstock) ($/T)	$172	$174	$175	$177	$179	$181	$183	$184	$186	$188	$190
Gate rate (residual waste ($/T)	$219	$221	$223	$226	$228	$230	$232	$235	$237	$240	$242
Revenue for recovery ($/T)	$20	$20	$20	$20	$20	$20	$20	$20	$20	$20	$20
Capital Cost ($)	$4,500,000	$4,500,000									
Implementation costs	$85,000										
Lease cost + rates	$85,000	$85,000	$86,700	$88,434	$90,203	$92,007	$93,847	$95,724	$97,638	$99,591	$101,583
Council costs (depreciation	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000
Finance rate (%)	4.0%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
Finance term (years)	20	20	20	20	20	20	20	20	20	20	20
Capital investment	-$4,408,654	-$4,585,000									
Revenue (gate)	$15,395,803	$1,042,320	$1,052,743	$1,063,271	$1,073,903	$1,084,642	$1,095,489	$1,106,444	$1,117,508	$1,128,683	$1,139,970
Revenue (recovery)	$929,578	$68,400	$68,400	$68,400	$68,400	$68,400	$68,400	$68,400	$68,400	$68,400	$68,400
Cost (residual disposal)	-$980,140	-$66,357	-$67,021	-$67,691	-$68,368	-$69,051	-$69,742	-$70,439	-$71,144	-$71,855	-$72,574
Cost (processing)	-$8,154,196	-$600,000	-$600,000	-$600,000	-$600,000	-$600,000	-$600,000	-$600,000	-$600,000	-$600,000	-$600,000
Council costs	-$2,726,823	-$185,000	-$186,700	-$188,434	-$190,203	-$192,007	-$193,847	-$195,724	-$197,638	-$199,591	-$201,583
Net	$55,569	-$4,325,637	$267,423	$275,546	$283,733	$291,984	$300,300	$308,681	$317,126	$325,637	$334,213

	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042
Site throughput (T per year)	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000
Approx processing cost ($ per T)	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
Recovery rate (%)	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%
Gate rate (feedstock) ($/T)	$192	$194	$196	$198	$200	$202	$204	$206	$208	$210
Gate rate (residual waste ($/T)	$244	$247	$249	$252	$254	$257	$259	$262	$265	$267
Revenue for recovery ($/T)	$20	$20	$20	$20	$20	$20	$20	$20	$20	$20
Capital Cost ($)										
Implementation costs										
Lease cost + rates	$103,615	$105,687	$107,801	$109,957	$112,156	$114,399	$116,687	$119,021	$121,401	$123,829
Council costs (depreciation	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000
Finance rate (%)	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
Finance term (years)	20	20	20	20	20	20	20	20	20	20
Capital investment										
Revenue (gate)	$1,151,370	$1,162,883	$1,174,512	$1,186,257	$1,198,120	$1,210,101	$1,222,202	$1,234,424	$1,246,768	$1,259,236
Revenue (recovery)	$68,400	$68,400	$68,400	$68,400	$68,400	$68,400	$68,400	$68,400	$68,400	$68,400
Cost (residual disposal)	-$73,299	-$74,032	-$74,773	-$75,520	-$76,276	-$77,038	-$77,809	-$78,587	-$79,373	-$80,166
Cost (processing)	-$600,000	-$600,000	-$600,000	-$600,000	-$600,000	-$600,000	-$600,000	-$600,000	-$600,000	-$600,000
Council costs	-$203,615	-$205,687	-$207,801	-$209,957	-$212,156	-$214,399	-$216,687	-$219,021	-$221,401	-$223,829
Net	$342,856	$351,564	$360,339	$369,180	$378,089	$387,064	$396,107	$405,217	$414,395	$423,641

Mansfield Shire Council, Murrindindi Shire Council
NPV Analysis - Default, Grant and $180/t
Tonkin + Taylors Ref: 1089663
Ver 1, February 2023

Indicative Commercial Model (NPV Analysis) - Default, With Grant: Assumed gate rate of $180/t

Tonkin+Taylor

	Initials	Date
Prepared by:	CATU	28/02/2023
Checked by:	CHP	28/02/2023

Manual Sort

		2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042
Site throughput (T per year)	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000
Approx processing cost ($ per T)	100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
Recovery rate (%)	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%
Gate rate (feedstock) ($/T)	$180	$182	$184	$185	$187	$189	$191	$193	$195	$197	$199	$201	$203	$205	$207	$209	$211	$213	$215	$217	$220
Gate rate (residual waste ($/T)	$219	$221	$223	$226	$228	$230	$232	$235	$237	$240	$242	$244	$247	$249	$252	$254	$257	$259	$262	$265	$267
Revenue for recovery ($/T)	$20	$20	$20	$20	$20	$20	$20	$20	$20	$20	$20	$20	$20	$20	$20	$20	$20	$20	$20	$20	$20
Capital Cost ($)	$4,500,000	$4,500,000																			
Implementation costs	$85,000																				
Lease cost + rates	$85,000	$85,000	$86,700	$88,434	$90,203	$92,007	$93,847	$95,724	$97,638	$99,591	$101,583	$103,615	$105,687	$107,801	$109,957	$112,156	$114,399	$116,687	$119,021	$121,401	$123,829
Council costs (depreciation	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000
Finance rate (%)	4.0%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
Finance term (years)	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Capital investment	-$4,408,654	-$4,585,000																			
Revenue (gate)	$16,111,887	$1,090,800	$1,101,708	$1,112,725	$1,123,852	$1,135,091	$1,146,442	$1,157,906	$1,169,485	$1,181,180	$1,192,992	$1,204,922	$1,216,971	$1,229,141	$1,241,432	$1,253,846	$1,266,385	$1,279,049	$1,291,839	$1,304,758	$1,317,805
Revenue (recovery)	$929,578	$68,400	$68,400	$68,400	$68,400	$68,400	$68,400	$68,400	$68,400	$68,400	$68,400	$68,400	$68,400	$68,400	$68,400	$68,400	$68,400	$68,400	$68,400	$68,400	$68,400
Cost (residual disposal)	-$980,140	-$66,357	-$67,021	-$67,691	-$68,368	-$69,051	-$69,742	-$70,439	-$71,144	-$71,855	-$72,574	-$73,299	-$74,032	-$74,773	-$75,520	-$76,276	-$77,038	-$77,809	-$78,587	-$79,373	-$80,166
Cost (processing)	-$8,154,196	-$600,000	-$600,000	-$600,000	-$600,000	-$600,000	-$600,000	-$600,000	-$600,000	-$600,000	-$600,000	-$600,000	-$600,000	-$600,000	-$600,000	-$600,000	-$600,000	-$600,000	-$600,000	-$600,000	-$600,000
Council costs	-$2,726,823	-$185,000	-$186,700	-$188,434	-$190,203	-$192,007	-$193,847	-$195,724	-$197,638	-$199,591	-$201,583	-$203,615	-$205,687	-$207,801	-$209,957	-$212,156	-$214,399	-$216,687	-$219,021	-$221,401	-$223,829
Net	$771,653	-$4,277,157	$316,387	$325,000	$333,682	$342,433	$351,253	$360,143	$369,103	$378,134	$387,235	$396,408	$405,652	$414,967	$424,355	$433,815	$443,348	$452,953	$462,632	$472,384	$482,210

Mansfield Shire Council, Murrindindi Shire Council
NPV Analysis - Best Case
Tonkin + Taylors Ref: 1089663
Ver 1, February 2023

Indicative Commercial Model (NPV Analysis)- Best Case

	Initials	Date
Prepared by:	CATU	28/02/2023
Checked by:	CHP	28/02/2023

Manual Sort

		2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Site throughput (T per year)	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000
Approx processing cost ($ per T)	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
Recovery rate (%)	98%	98%	98%	98%	98%	98%	98%	98%	98%	98%	98%
Gate rate (feedstock) ($/T)	$114	$115	$116	$117	$119	$120	$121	$122	$123	$125	$126
Gate rate (residual waste ($/T)	$219	$221	$223	$226	$228	$230	$232	$235	$237	$240	$242
Revenue for recovery ($/T)	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
Capital Cost ($)	$3,500,000	$3,500,000									
Implementation costs	$85,000										
Lease cost + rates	$35,000	$35,000	$35,700	$36,414	$37,142	$37,885	$38,643	$39,416	$40,204	$41,008	$41,828
Council costs (depreciation	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000
Finance rate (%)	4.0%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
Finance term (years)	20	20	20	20	20	20	20	20	20	20	20
Capital investment	-$3,447,115	-$3,585,000									
Revenue (gate)	$8,503,496	$575,700	$581,457	$587,272	$593,144	$599,076	$605,066	$611,117	$617,228	$623,401	$629,635
Revenue (recovery)	$3,995,556	$294,000	$294,000	$294,000	$294,000	$294,000	$294,000	$294,000	$294,000	$294,000	$294,000
Cost (residual disposal)	-$326,713	-$22,119	-$22,340	-$22,564	-$22,789	-$23,017	-$23,247	-$23,480	-$23,715	-$23,952	-$24,191
Cost (processing)	-$6,795,163	-$500,000	-$500,000	-$500,000	-$500,000	-$500,000	-$500,000	-$500,000	-$500,000	-$500,000	-$500,000
Council costs	-$1,922,240	-$135,000	-$135,700	-$136,414	-$137,142	-$137,885	-$138,643	-$139,416	-$140,204	-$141,008	-$141,828
Net	$7,819	-$3,372,419	$217,417	$222,294	$227,213	$232,173	$237,176	$242,222	$247,310	$252,441	$257,615

	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042
Site throughput (T per year)	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000
Approx processing cost ($ per T)	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
Recovery rate (%)	98%	98%	98%	98%	98%	98%	98%	98%	98%	98%
Gate rate (feedstock) ($/T)	$127	$128	$130	$131	$132	$134	$135	$136	$138	$139
Gate rate (residual waste ($/T)	$244	$247	$249	$252	$254	$257	$259	$262	$265	$267
Revenue for recovery ($/T)	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
Capital Cost ($)										
Implementation costs										
Lease cost + rates	$42,665	$43,518	$44,388	$45,276	$46,182	$47,105	$48,047	$49,008	$49,989	$50,988
Council costs (depreciation	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000
Finance rate (%)	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
Finance term (years)	20	20	20	20	20	20	20	20	20	20
Capital investment										
Revenue (gate)	$635,931	$642,290	$648,713	$655,200	$661,752	$668,370	$675,054	$681,804	$688,622	$695,508
Revenue (recovery)	$294,000	$294,000	$294,000	$294,000	$294,000	$294,000	$294,000	$294,000	$294,000	$294,000
Cost (residual disposal)	-$24,433	-$24,677	-$24,924	-$25,173	-$25,425	-$25,679	-$25,936	-$26,196	-$26,458	-$26,722
Cost (processing)	-$500,000	-$500,000	-$500,000	-$500,000	-$500,000	-$500,000	-$500,000	-$500,000	-$500,000	-$500,000
Council costs	-$142,665	-$143,518	-$144,388	-$145,276	-$146,182	-$147,105	-$148,047	-$149,008	-$149,989	-$150,988
Net	$262,833	$268,095	$273,400	$278,751	$284,145	$289,585	$295,070	$300,600	$306,176	$311,798

Indicative Commercial Model (NPV Analysis)-
Best Case: Assumed gate rate of $180/t

Tonkin+Taylor

	Initials	Date
Prepared by:	CATU	28/02/2023
Checked by:	CHP	28/02/2023

Manual Sort

		2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Site throughput (T per year)	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000
Approx processing cost ($ per T)	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
Recovery rate (%)	98%	98%	98%	98%	98%	98%	98%	98%	98%	98%	98%
Gate rate (feedstock) ($/T)	$180	$182	$184	$185	$187	$189	$191	$193	$195	$197	$199
Gate rate (residual waste ($/T)	$219	$221	$223	$226	$228	$230	$232	$235	$237	$240	$242
Revenue for recovery ($/T)	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
Capital Cost ($)	$3,500,000	$3,500,000									
Implementation costs	$85,000										
Lease cost + rates	$35,000	$35,000	$35,700	$36,414	$37,142	$37,885	$38,643	$39,416	$40,204	$41,008	$41,828
Council costs (depreciation	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000
Finance rate (%)	4.0%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
Finance term (years)	20	20	20	20	20	20	20	20	20	20	20
Capital investment	-$3,447,115	-$3,585,000									
Revenue (gate)	$13,426,572	$909,000	$918,090	$927,271	$936,544	$945,909	$955,368	$964,922	$974,571	$984,317	$994,160
Revenue (recovery)	$3,995,556	$294,000	$294,000	$294,000	$294,000	$294,000	$294,000	$294,000	$294,000	$294,000	$294,000
Cost (residual disposal)	-$326,713	-$22,119	-$22,340	-$22,564	-$22,789	-$23,017	-$23,247	-$23,480	-$23,715	-$23,952	-$24,191
Cost (processing)	-$6,795,163	-$500,000	-$500,000	-$500,000	-$500,000	-$500,000	-$500,000	-$500,000	-$500,000	-$500,000	-$500,000
Council costs	-$1,922,240	-$135,000	-$135,700	-$136,414	-$137,142	-$137,885	-$138,643	-$139,416	-$140,204	-$141,008	-$141,828
Net	$4,930,896	-$3,039,119	$554,050	$562,293	$570,612	$579,007	$587,478	$596,026	$604,652	$613,357	$622,140

	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042
Site throughput (T per year)	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000
Approx processing cost ($ per T)	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
Recovery rate (%)	98%	98%	98%	98%	98%	98%	98%	98%	98%	98%
Gate rate (feedstock) ($/T)	$201	$203	$205	$207	$209	$211	$213	$215	$217	$220
Gate rate (residual waste ($/T)	$244	$247	$249	$252	$254	$257	$259	$262	$265	$267
Revenue for recovery ($/T)	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
Capital Cost ($)										
Implementation costs										
Lease cost + rates	$42,665	$43,518	$44,388	$45,276	$46,182	$47,105	$48,047	$49,008	$49,989	$50,988
Council costs (depreciation	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000
Finance rate (%)	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
Finance term (years)	20	20	20	20	20	20	20	20	20	20
Capital investment										
Revenue (gate)	$1,004,102	$1,014,143	$1,024,284	$1,034,527	$1,044,872	$1,055,321	$1,065,874	$1,076,533	$1,087,298	$1,098,171
Revenue (recovery)	$294,000	$294,000	$294,000	$294,000	$294,000	$294,000	$294,000	$294,000	$294,000	$294,000
Cost (residual disposal)	-$24,433	-$24,677	-$24,924	-$25,173	-$25,425	-$25,679	-$25,936	-$26,196	-$26,458	-$26,722
Cost (processing)	-$500,000	-$500,000	-$500,000	-$500,000	-$500,000	-$500,000	-$500,000	-$500,000	-$500,000	-$500,000
Council costs	-$142,665	-$143,518	-$144,388	-$145,276	-$146,182	-$147,105	-$148,047	-$149,008	-$149,989	-$150,988
Net	$631,004	$639,947	$648,971	$658,077	$667,265	$676,536	$685,890	$695,329	$704,852	$714,460

Indicative Commercial Model (NPV Analysis) - Worst Case

Tonkin+Taylor

	Initials	Date
Prepared by:	CATU	28/02/2023
Checked by:	CHP	28/02/2023

Manual Sort		2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042
Site throughput (T per year)	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000
Approx processing cost ($ per T)	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150
Recovery rate (%)	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%
Gate rate (feedstock) ($/T)	$334	$337	$341	$344	$348	$351	$355	$358	$362	$365	$369	$373	$376	$380	$384	$388	$392	$396	$400	$404	$408
Gate rate (residual waste ($/T)	$219	$230	$232	$235	$237	$239	$242	$244	$247	$249	$251	$254	$257	$259	$262	$264	$267	$270	$272	$275	$278
Revenue for recovery ($/T)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Capital Cost ($)	$6,000,000	$6,000,000																			
Implementation costs	$85,000																				
Lease cost + rates	$35,000	$35,000	$35,700	$36,414	$37,142	$37,885	$38,643	$39,416	$40,204	$41,008	$41,828	$42,665	$43,518	$44,388	$45,276	$46,182	$47,105	$48,047	$49,008	$49,989	$50,988
Council costs (depreciation	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000
Finance rate (%)	4.0%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
Finance term (years)	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Capital investment	-$5,850,962	-$6,085,000																			
Revenue (gate)	$14,948,250	$1,012,020	$1,022,140	$1,032,362	$1,042,685	$1,053,112	$1,063,643	$1,074,280	$1,085,022	$1,095,873	$1,106,831	$1,117,900	$1,129,079	$1,140,369	$1,151,773	$1,163,291	$1,174,924	$1,186,673	$1,198,540	$1,210,525	$1,222,630
Revenue (recovery)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Cost (residual disposal)	-$1,018,957	-$68,985	-$69,675	-$70,372	-$71,075	-$71,786	-$72,504	-$73,229	-$73,961	-$74,701	-$75,448	-$76,202	-$76,964	-$77,734	-$78,511	-$79,296	-$80,089	-$80,890	-$81,699	-$82,516	-$83,341
Cost (processing)	-$6,115,647	-$450,000	-$450,000	-$450,000	-$450,000	-$450,000	-$450,000	-$450,000	-$450,000	-$450,000	-$450,000	-$450,000	-$450,000	-$450,000	-$450,000	-$450,000	-$450,000	-$450,000	-$450,000	-$450,000	-$450,000
Council costs	-$1,922,240	-$135,000	-$135,700	-$136,414	-$137,142	-$137,885	-$138,643	-$139,416	-$140,204	-$141,008	-$141,828	-$142,665	-$143,518	-$144,388	-$145,276	-$146,182	-$147,105	-$148,047	-$149,008	-$149,989	-$150,988
Net	$40,444	-$5,726,965	$366,765	$375,576	$384,468	$393,441	$402,496	$411,635	$420,857	$430,164	$439,555	$449,033	$458,596	$468,247	$477,986	$487,813	$497,729	$507,735	$517,832	$528,020	$538,301

Mansfield Shire Council, Murrindindi Shire Council
NPV Analysis - Worst Case: Assumed gate rate of $180/t
Tonkin + Taylors Ref: 1089663
Ver 1, February 2023

	Initials	Date
Prepared by:	CATU	28/02/2023
Checked by:	CHP	28/02/2023

Indicative Commercial Model (NPV Analysis) - Worst Case: Assumed gate rate of $180/t

Tonkin+Taylor

Manual Sort		2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042
Site throughput (T per year)	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000
Approx processing cost ($ per T)	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150
Recovery rate (%)	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%
Gate rate (feedstock) ($/T)	$180	$182	$184	$185	$187	$189	$191	$193	$195	$197	$199	$201	$203	$205	$207	$209	$211	$213	$215	$217	$220
Gate rate (residual waste ($/T)	$219	$230	$232	$235	$237	$239	$242	$244	$247	$249	$251	$254	$257	$259	$262	$264	$267	$270	$272	$275	$278
Revenue for recovery ($/T)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Capital Cost ($)	$6,000,000	$6,000,000																			
Implementation costs	$85,000																				
Lease cost + rates	$35,000	$35,000	$35,700	$36,414	$37,142	$37,885	$38,643	$39,416	$40,204	$41,008	$41,828	$42,665	$43,518	$44,388	$45,276	$46,182	$47,105	$48,047	$49,008	$49,989	$50,988
Council costs (depreciation	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000
Finance rate (%)	4.0%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
Finance term (years)	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Capital investment	-$5,850,962	-$6,085,000																			
Revenue (gate)	$8,055,943	$545,400	$550,854	$556,363	$561,926	$567,545	$573,221	$578,953	$584,743	$590,590	$596,496	$602,461	$608,486	$614,570	$620,716	$626,923	$633,192	$639,524	$645,920	$652,379	$658,903
Revenue (recovery)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Cost (residual disposal)	-$1,018,957	-$68,985	-$69,675	-$70,372	-$71,075	-$71,786	-$72,504	-$73,229	-$73,961	-$74,701	-$75,448	-$76,202	-$76,964	-$77,734	-$78,511	-$79,296	-$80,089	-$80,890	-$81,699	-$82,516	-$83,341
Cost (processing)	-$6,115,647	-$450,000	-$450,000	-$450,000	-$450,000	-$450,000	-$450,000	-$450,000	-$450,000	-$450,000	-$450,000	-$450,000	-$450,000	-$450,000	-$450,000	-$450,000	-$450,000	-$450,000	-$450,000	-$450,000	-$450,000
Council costs	-$1,922,240	-$135,000	-$135,700	-$136,414	-$137,142	-$137,885	-$138,643	-$139,416	-$140,204	-$141,008	-$141,828	-$142,665	-$143,518	-$144,388	-$145,276	-$146,182	-$147,105	-$148,047	-$149,008	-$149,989	-$150,988
Net	-$6,851,863	-$6,193,585	-$104,521	-$100,423	-$96,291	-$92,126	-$87,926	-$83,692	-$79,423	-$75,119	-$70,780	-$66,406	-$61,997	-$57,552	-$53,072	-$48,555	-$44,002	-$39,413	-$34,788	-$30,126	-$25,427

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