REGIONAL RESOURCE RECOVERY PROCESSING FACILITIES – PRELIMINARY INVESTIGATION, MODEL AND OPTIONS APPRAISAL

Final report

01 NOVEMBER 2018
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### REVISIONS

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1 INTRODUCTION

Arcadis has been engaged by Grampians Central West Waste & Resource Recovery Group (GCWWRRG) to consider the feasibility of establishing new organic and recyclable processing infrastructure for MSW materials within the Region.

The study has been undertaken to support the ongoing delivery of GCWWRRG’s Regional Implementation Plan by providing a better understanding of the potential reprocessing development options that may be available to the 12 Councils within the Region.

The study is driven by the limited extent of established processing capacity within the Region. For MSW recyclables, all kerbside collected materials are currently processed in Material Recycling Facilities (MRFs) outside of the Region. For MSW organics, current kerbside collections and reprocessing is focused in East of the Region. Interest has been expressed by many Councils in the potential further rollout of GO and/or FOGO collections in the East and the introduction of these services in the West.

This report considers the key options for new processing infrastructure within the Region, informed by the Regional Implementation Plan and previous research on organics generation and markets separately commissioned by GCWWRRG. Arcadis is also aware of GCWWRRG’s and the Councils’ ambitions for collaborative service procurements and has taken this into account in appropriate aspects of the research and analysis presented within this report.

Key Research Components and Approach

This project has included the following key research components:

- Review of GCWWRRG’s Implementation Plan and research reports provided by GCWWRRG
- A preliminary review of the twelve regional Councils’ existing waste services and future plans
- Review of market prices for segregated organic and recyclable output materials
- Review of processing technologies and the costs associated with the provision of infrastructure

The research has informed an initial appraisal of the following initial long list of potential options:

- Separate glass collection services and crushing at regional drop off centres
- Shredding equipment for green wastes collected at regional drop off centres
- Materials recovery facility(ies) (MRFs) in different locations (East and West of the region)
- Composting facilities in different localities (East and West of the region)

Arcadis has developed a waste flow and cost model to support the feasibility assessment and appraisal of these options. The model includes waste tonnage data reported by the Councils to Sustainability Victoria (SV) as an input and applies estimates of future generation rates, based on assumed waste growth and potential service changes.

Outline collection and processing capex and opex costs and potential income from output material sales have also been included. To assist the achievement of transport efficiencies, it has been assumed that transfer/bulking points, centrally located within each Council area, are used for the bulking of kerbside collected materials prior to haulage to the existing and assumed locations of current and new processing facilities.

During an initial assessment of the long list of potential options, some options have been discounted on the basis of high cost, poor service performance or the presence of existing, potentially suitable organic processing infrastructure in the East of the Region. The resulting short-list of options has been taken forward for more detailed modelling and appraisal.

An additional option of a single new MRF facility, designed to receive and process all of the Region’s kerbside collected recyclable materials from the twelve Councils, has subsequently been included within the options appraisal.

This option has been included to determine its relative performance against the separate MRF options for Eastern and Western Councils within the short list and also against the current situation where all recyclable
materials are transported out of the region for processing: i.e. ‘Business as Usual’ (BAU). This addition is intended to provide a more complete and robust analysis that may reflect contractor’s preferences for larger scale facilities with higher tonnage throughputs whilst potentially enabling Councils to benefit from increased economies of scale.

**Detailed Options Appraisal Method**

The four key scenarios and sub-scenarios modelled and appraised in detail within this commission are summarised in Table 1.

*Table 1: Summary of scenarios modelled*

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Details</th>
</tr>
</thead>
</table>
| 1 | MRF | A new MRF constructed in Ballarat¹, operating from 2021 and servicing an “eastern” group of six Councils (defined in Section 3).  
- Scenario 1a is a “low tech” MRF for kerbside recyclables  
- Scenario 1b is a “high tech” MRF for kerbside recyclables |
| 2 | MRF | A new MRF constructed in Stawell¹, operating from 2021 and servicing a “western” group of six Councils (defined in Section 3).  
- Scenario 2a is a “low tech” MRF for kerbside recyclables  
- Scenario 2b is a “high tech” MRF for kerbside recyclables |
| 3 | MRF | A new MRF constructed in Ballarat¹, operating from 2021 and servicing the twelve Councils of the Grampians Central West Region.  
- Scenario 3a is a “low tech” MRF for kerbside recyclables  
- Scenario 3b is a “high tech” MRF for kerbside recyclables |
| 4 | Organics processing facility | A new organics processing facility constructed in Horsham¹, operating from 2021 and servicing the “western” group of six Councils (defined in Section 3).  
- Scenario 4a is an open window (OW) composting process (“low tech”) for kerbside GO with additional tonnes from drop-off GO  
- Scenario 4b is an aerated static pile (ASP) composting process (“high tech”) for kerbside FOGO with additional tonnes from drop-off GO |

The waste flow and cost model components have been progressively developed to show the interactions between collection systems, end processing locations and technologies to provide the quantitative performance metrics used in the appraisal. The key appraisal criteria and their relative weightings applied in the appraisal are as follows:

1. **Cost** (55% weighting for MRF scenarios; 85% weighting for organics scenarios). Based on the difference in Net Present Value (NPV) compared to Business as Usual (BAU), i.e. continuation of the current situation, for each scenario across a 15-year period (2021 to 2036). This includes consideration of changes in collection, disposal and transportation costs. NPV is the present value of the cash flows under each scenario at the selected discount rate which is compared with the NPV of cash flows under BAU. A negative (-) NPV difference indicates that the scenario will provide savings when compared to BAU.

2. **Risk** (45% weighting for MRF scenarios, 15% for organics scenarios). Risk has been qualitatively assessed in relation to two key risk components:

¹ The location is illustrative for modelling purposes and does not imply a preference for or the actual location of a new site/facility.
Regional Resource Recovery Processing Facilities – Preliminary Investigation, Model and Options Appraisal

- Product market risk: access of composting process outputs to local markets for use as a soil improver, land remediation or as landfill cover; and access of MRF process outputs to local (crushed glass), national and international markets for recyclables.

- Contract length. In order to attract adequate market interest to invest in new infrastructure, it has been assumed that contractors would expect longer contract periods with Councils for the provision of guaranteed ‘baseload’ feedstock for new facilities in comparison with established facilities. Longer term contracts are assumed to include higher inherent risks for Councils, due to lost flexibility to change future services and potentially benefit from alternative contractual, technological or market developments and improvements. In contrast, established facilities are assumed to require shorter term contracts and less inherent risk.

Whilst recognising that transport distance is a key consideration that will influence Councils’ ability to cost effectively deliver feedstock to processing facilities, a separate appraisal criterion for transport distance has not been applied. This is because estimated transport costs, based on transport distance, have been included within the financial appraisal criterion and the use of a separate criterion for distance would constitute double counting.

Report Structure
The subsequent sections of the report are structured as follows:

- **Section 2 Research and Short Listing** presents the preliminary research and short-listing process
- **Section 3 Scenario Modelling** presents the key results of the scenario modelling, focussing on the cost model outputs
- **Section 4 Options Appraisal** presents the method and key results from the cost and risk appraisal of options
- **Section 5 Conclusions and Recommendations** summarises the key results of the options appraisal and overall recommendations
- **Appendix A.** Details of the modelling methodology including key data, assumptions, inclusions and exclusions.
2 RESEARCH AND SHORTLISTING

This section summarises the key findings of the preliminary research and the initial short-listing process including the following:

- Review of GCWWRRG’s Regional Implementation Plan
- Separately commissioned research on organics provided by GCWWRRG
- Short listing rationale and short-listed options selected for more detailed analysis

Details of additional research carried out as part of this commission (including offtake material market prices, processing equipment technologies and associated costs) is included in Section 3, Scenario Modelling and Appendix A, Modelling methodology.

2.1 Regional Implementation Plan

GCWWRRG’s Grampians Central West Regional Implementation Plan (2017) was reviewed with a specific focus on MSW recyclable and organic generation rates and local processing capacity.

The implementation plan identified organics recovery as a major opportunity for the region with the majority of Councils not currently offering a kerbside organics collection service. The plan also identifies a number of existing and planned organic waste processing facilities. In contrast, the plan confirms the lack of processing capacity for MSW recyclables within the Region.

The review has identified some anomalies between tonnage data for MSW recyclables reported in the plan when compared with the most recent reported data for year 2016/17 as follows:

Page 32: “A significant amount of mixed recyclables, including around 43,000 tonnes from kerbside collections, are also transported to other facilities in Melbourne for reprocessing.”

Page 33: Extract from Table 9:

| TABLE 9. ESTIMATE OF CROSS REGIONAL FLOWS OF RECOVERED MATERIALS (2013/2014) |
|-------------------------------|---------------------------------|
| MATERIAL TYPE        | DESCRIPTION OF MOVEMENT OF MATERIAL |
| Recovery             | Outflows: significant tonnes of materials from the region’s RRCs/TSS are transported to reprocessing facilities in the metropolitan region and are outlined below by material type. |
| MRF                 | Outflows: 40,000 - 45,000 tonnes of mixed recyclables (includes paper/cardboard, glass, plastics and metals) from council kerbside collections, transported to one or more MRFs in the metropolitan region for reprocessing. Small quantities of materials from councils are transported to the Barwon South West region. |

The 2016/17 tonnage data for kerbside recyclables reported by Councils to SV has been used in the options appraisal modelling by Arcadis. This equates to approximately 25,702 tonnes for 2016/17; approximately 20,000 tonnes less than reported in the Regional Implementation Plan.

It is recommended that the reason for the anomaly in tonnage data is reviewed, if appropriate, or at least acknowledged in future discussions and workstreams on processing capacity requirements to avoid confusion and ensure consistency in data assumptions.

2.2 Grampians Region Organics Review

The recent report by Frontier Ag & Environment entitled Grampians Region Organics Review (August 2018), separately commissioned by GCWWRRG, considers the key sources and quantities of organic waste generation and provides an overview of existing and potential organic reprocessing in the Region. The report provides a number of analyses, observations and recommendations on the potential future development of organic processing activities.

Notably, the report has identified a number of facilities, mainly situated in the East of the Region, with potential capacity to receive and process MSW organics.

Relevant themes and extracts of particular relevance to this Arcadis commission include the following:
**Existing Processing Capacity**

Pg 6: “An immediate opportunity exists to use the spare capacity for green organics processing at the PineGro Products at their Mt Wallace composting site. The facility currently has the capacity to take another 30,000-35,000 tonnes from the region.”

**Existing Practice**

Pg 3: “A number of councils chip garden and woody waste to produce raw mulch, which does not have an end market, but is utilised in their own horticultural practices and in some locations made available to residents; other councils resort to burning GO at collection sites.”

**Costs: FOGO vs Landfill Gatefees**

Pg 4: “Extensive economic modelling of the costs of various approaches to GO and FOGO kerbside collection was conducted in the Grampians region in 2012. A universal FOGO service for the region was estimated to become cost neutral at landfill gate fees of $124-134/tonne (currently landfill costs across the GCW region average $125-130 per tonne)”

**Decentralisation**

Pg 27: “In general, sustainability theory favors the development of decentralized approaches...It is an approach particularly attractive to councils in the regions...”

“The preference for decentralization can apply to both the processing and beneficial utilization of organics, as well as to bioenergy systems.”

**Synergies with Non-MSW Wastes**

Pgs 34-35: “Low population density in many parts of the region currently limits the options available for cost-effective organics recycling. It is thought that increased options for recovery and recycling of municipal organics may become viable if agricultural waste streams could also be captured. Many agricultural wastes, especially those from the intensive animal industries, have high levels of nutrients in them and are sought-after as soil amendments in their untreated form.”

Where relevant, these and other key considerations within the report have been taken forward into the short listing, options appraisal and recommendations for the development of organic processing services and facilities. This approach is intended to provide consistency and a joined-up approach with GCWRRG’s other workstreams and research activities.

**2.3 Shortlisting Process**

Given the large number of potential options available for the development of reprocessing services and infrastructure at the Regional level, a shortlisting process has been applied to identify which options are potentially the most feasible to take forward into the detailed modelling and appraisal within this study.

Although this approach has been taken in order to provide focus at the Regional level, the findings do not suggest that non-short listed options (or aspects of those options) are not feasible for individual Councils or that a ‘one size, fits all’ approach is the most appropriate for all Councils. For example, the centralised development of organic processing facilities may be suited to some neighbouring Councils, with larger waste tonnage concentrations in close proximity across Council boundaries. De-centralised organic solutions will be more suited to Councils whose households are sparser and more remote.

It is recommended that this initial research is built upon, to ensure that future service decisions reflect individual Council circumstances and preferences. This consideration is particularly relevant to organic processing services, which are more suited to individual solutions for each Council as opposed to recyclables, where economies of scale may be achieved through larger scale, centralised solutions.

The initial long-list of potential options initially proposed for this commission was as follows:

- Materials recovery facility(ies) (MRFs) in different locations - East and West of the Region
- Composting facilities in different locations - East and West of the Region

During discussions with GCWRRG, the scope was broadened to consider the following additional options:
- Separate glass collection services and crushing, potentially undertaken at regional drop off centres or other sites
- Shredding of green wastes collected at regional drop off centres

As part of the shortlisting process, this extended long-list of options were initially assessed against the following appraisal criteria:

- Deliverability
- Impacts on existing service performance
- Cost
- Existing organic processing infrastructure (noting the lack of existing recyclable processing infrastructure)
- Appropriate local data initially available for this study

The initial assessment resulted in some of the options being discounted from further detailed analysis at this stage, as summarised in the sub-sections below.

**Green Waste Shredders**

The initial research identified that some Councils currently chip woody waste to produce raw mulch, which is utilised in their own horticultural practices and in some locations made available to residents. This is considered likely to be the best, least-cost local solution for these wastes and may help to minimise bulking and transportation costs to centralised facilities. Large quantities/proportions of woody wastes are often suited to centralised composting processes.

Other initial research findings included:

- Relatively low annual tonnages reported at the regional drop-off centres, noting that higher tonnages may be produced but not reported
- Limited data on existing chipping activities, available tonnages, sites, transport options and costs
- Potentially high cost of fixed and mobile shredding plant. Estimated capex of $600k capex per unit with up to twelve new units potentially required, if one new unit is purchased for each Council

Due to the above limitations, separate green waste shredding options were not taken forward into the detailed options appraisal, but no assumption has been made as to their potential feasibility in some locations, particularly as some Councils may successfully be delivering a similar chipping service already. The details of the current chipping and shredding activities are unknown. It is recommended that further information on current practices are obtained to inform the potential roll out of these service in other locations.

Capex and opex costs for green waste shredding equipment have however been included in the appraisal of new composting facility options as this equipment is a standard inclusion in the technologies used at such facilities.

**Separate Glass Collection and Crushing:**

Councils currently collect glass in their kerbside commingled recyclable collections which is processed with the other commingled materials at MRFs. Glass collected in commingled collections has the potential to reduce the quality of other materials separated at MRFs, in particular the paper streams. The national market for cullet is currently very weak with surplus materials and low/nil market prices reported in different Regions and States.

Glass crushing can provide alternative options to the traditional markets for cullet through the production of a crushed glass product that may be used in construction activities, such as road base for example. The markets and uses for crushed glass are largely influenced by the quality, level of contamination and particle size of the crushed glass product.
The introduction of a separate collection system for glass from households, to be taken to a new glass crushing facility, would require the redesign of the kerbside services including new containers for each household and would incur significant additional costs.

Alternatively, glass could be removed from the comingled bin with new drop-off containers provided to supplement any that are currently provided at the regional drop off centres or elsewhere. This would rely on residents independently separating and transporting the glass to the drop-off points.

Such a change is likely to be perceived as a significant reduction in service and is likely to cause a reduction in capture and recycling rates due to the inability, or lack of will, of residents to deliver the glass separately to drop off points. The change may also be perceived as inequitable, as all households will not have equal access the drop off facilities, either due to the locality of the household, drop off facility or ability to access transport.

These and other initial research findings are summarised as follows:

- Mobile crushing plant potentially moved between drop-off centres: Estimated capex $300k - $500k capex.
- Reliant on new vehicles and containers to transport mobile crusher and materials
- Fixed plant at one locality: Estimated capex $1 - $3 million.
- Reliant on new vehicles and containers to transport materials from numerous collection points to a single site for crushing and high associated transport costs
- High additional cost of new/separate kerbside collection infrastructure, whilst also maintaining the current comingled collections for other recyclable materials
- Potentially inequitable service and service reduction for residents if a revised drop off system were introduced, likely to result in reduced participation and recycling rates

Due to the above findings and limitations, separate glass collection, drop off and crushing activities were not considered further within the detailed options appraisal at this stage.

Capex and opex costs for glass crushing equipment have however been included in the appraisal of new MRF facility options to enable the Councils to potentially benefit from access to alternative markets for crushed glass.

**Composting Facilities**

The initial information review outlined in Section 2.2 has identified a number of organic processing facilities, mainly situated in the East of the Region, with potential capacity to receive and process MSW organics in addition to those already processed from current kerbside organic collection services (Ballarat, Central Goldfields, Pyrenees & Moorabool). The situation in the West is different, with a lack of existing processing services and infrastructure either available or known to these Councils.

Significantly, the Grampians Region Organics Review (August 2018) identifies a number of potential processing options in the East of the Region, including the significant potential capacity of the PineGro Products composting site to process an additional 30,000-35,000 tonnes.

In contrast to recyclables, the initial research suggests that the preferred solution for organics processing is likely to be a decentralised approach with optimal, local solutions identified and commissioned for each Council. This is particularly relevant in the sparser populated/more rural areas which will require tonnage aggregation from a number of Councils to enable a new MSW facility to be viable. This approach will include significant transport distances to a centralised site. Additional options for organics processing may also be available if agricultural and other organic waste streams can be sourced and processed together. The responsibility for this usually lies with facility operators and land owners, but can be facilitated by Councils.

These initial research findings indicate that

- Eastern Councils may have access to adequate processing capacity, noting that further research is needed into the localities and potential capacities of existing or potential facilities prior to investment in a new facility dedicated to MSW organics.
• Potential opportunities for new localised infrastructure for each Council requires further investigation, noting the potential benefits of a decentralised approach.

• New facilities may be developed for individual Councils informed by their characteristics (including geography and sparsity/concentration of households) and potentially in partnership with neighbouring Councils, land owners and other waste producers, for example in the agricultural or horticultural sectors.

• Comparative gate fees charged for existing organics processing and ‘whole system’ costs (including collection and transfer) are unknown.

Informed by the above findings, it is recommended that further investigation into the existing potential opportunities for organics processing is undertaken prior to further detailed options modelling for new MSW organic facilities. This is assumed likely to be the most cost-effective option for all Councils. Depending on the Councils’ circumstances, processing opportunities may best be pursued independently by individual Councils, in partnership with neighbouring Councils and/or third parties.

Although it is also assumed that a centralised facility in unlikely to be feasible in the West, largely due to the relatively high transport distances required to aggregate the organic materials at a central location, noting that the West currently has a lack of known existing processing facilities, a centralised facility has been taken forward into the modelling in order to consider the potential performance of a new facility for the six Western Councils.

2.4 Shortlisted Options

Following the assessment of the long list of options, with the discounting of the options discussed in Section 2.3, the resulting short-list of options taken forward for more detailed modelling and appraisal was as follows:

• Materials recovery facilities (MRFs) in two different locations - East and West of the Region (including glass crushing equipment)

• A composting facility in the West of the Region (including green waste shredding equipment)

Additional research with MRF operators and equipment suppliers has suggested that a centralised approach to the processing of recyclables is likely to be more feasible. Feedback from industry has indicated that lower capacity facilities (<15-20,000 tpa) are unlikely to be economically viable, particularly with the existing significant issues in the global market for recyclables.

Therefore, an additional option of a single new MRF facility able to receive and process the whole Region’s kerbside collected recyclable materials has subsequently been included within the options appraisal.

This additional option has been included to determine its relative performance against the short-listed new MRF options and also against the current situation where all recyclable materials are transported out of the region for processing: i.e. ‘Business as Usual’ (BAU).

This addition is intended to provide a more complete and robust analysis that may reflect contractor's preferences for larger scale facilities with higher tonnage throughputs whilst potentially enabling Councils to benefit from increased economies of scale.
3 SCENARIO MODELLING

3.1 Overview of the scenarios and technologies

The short-listing process described in Section 2 has identified four scenarios to be taken forward for detailed modelling and appraisal. In three of the four scenarios the twelve Councils are considered as two separate groups, as shown in Table 2. These groupings have been developed to consider the potential aggregation of tonnages from different Councils as feedstock for centralised processing facilities and applied within the waste flow and cost modelling processes.

Table 2: Grouping of councils in East and West of the region

<table>
<thead>
<tr>
<th>“Eastern” group of six Councils</th>
<th>“Western” group of six Councils</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central Goldfields</td>
<td>Ararat</td>
</tr>
<tr>
<td>Ballarat</td>
<td>Hindmarsh</td>
</tr>
<tr>
<td>Golden Plains</td>
<td>Horsham</td>
</tr>
<tr>
<td>Hepburn</td>
<td>Northern Grampians</td>
</tr>
<tr>
<td>Moorabool</td>
<td>West Wimmer</td>
</tr>
<tr>
<td>Pyrenees</td>
<td>Yarriambiack</td>
</tr>
</tbody>
</table>

These groupings are illustrative for modelling purposes, noting that multiple different groupings and permutations may be applied. The two groupings reflect the concentration of higher waste generation rates and existing, known organic processing facilities in the East.

The four key scenarios and sub-scenarios taken forward for detailed modelling are described in Table 3 below.

Table 3: Summary of scenarios modelled

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Details</th>
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<tbody>
<tr>
<td>1</td>
<td>MRF</td>
</tr>
<tr>
<td></td>
<td>A new MRF is constructed in Ballarat(^2), operating from 2021 and servicing the “eastern” group of six Councils. As these Councils already have a kerbside recycling service in place, there is no change to collection costs (bin lift costs). Transport costs change in relation to the end facility location (from the BAU location to the new facility location). Processing costs change based on the estimated gate fee charged at the new MRF.</td>
</tr>
<tr>
<td></td>
<td>• Scenario 1a is a “low tech” MRF for kerbside recyclables</td>
</tr>
<tr>
<td></td>
<td>• Scenario 1b is a “high tech” MRF for kerbside recyclables</td>
</tr>
<tr>
<td>2</td>
<td>MRF</td>
</tr>
<tr>
<td></td>
<td>A new MRF is constructed in Stawell(^2), operating from 2021 and servicing the “western” group of six Councils. Costs are as applied for Scenario 1 above.</td>
</tr>
<tr>
<td></td>
<td>• Scenario 2a is a “low tech” MRF for kerbside recyclables</td>
</tr>
<tr>
<td></td>
<td>• Scenario 2b is a “high tech” MRF for kerbside recyclables</td>
</tr>
<tr>
<td>3</td>
<td>MRF</td>
</tr>
<tr>
<td></td>
<td>A new MRF is constructed in Ballarat(^2), operating from 2021 and servicing the twelve Councils of the Grampians Central West Region. Costs are as applied for Scenario 1 above.</td>
</tr>
<tr>
<td></td>
<td>• Scenario 3a is a “low tech” MRF for kerbside recyclables</td>
</tr>
<tr>
<td></td>
<td>• Scenario 3b is a “high tech” MRF for kerbside recyclables</td>
</tr>
</tbody>
</table>

\(^2\) The location is illustrative for modelling purposes and does not imply a preference for or the actual location of a new site/facility.
Scenario 4 details an organics processing facility constructed in Horsham, operating from 2021 and servicing the “western” group of six Councils. In this scenario, the “western” Councils introduce a new kerbside GO or FOGO service (currently these six Councils have 2-bin systems: kerbside recycling and residual), therefore additional collections costs (bin lift costs) and transport costs (to the end facility in Horsham) do not appear under BAU and have been calculated and applied to the scenario. Processing costs for the scenario are based on the estimated gate fee charged at the new organics processing facility.

- Scenario 4a is an open window (OW) composting (“low tech”) for kerbside GO (fortnightly) with additional tonnes from drop-off GO
- Scenario 4b is an aerated static pile (ASP) composting (“high tech”) for kerbside FOGO (weekly) with additional tonnes from drop-off GO

Under Scenario 4b, when the new kerbside FOGO service is introduced, the residual bin collection frequency is reduced from weekly (BAU) to fortnightly (to reflect best practice). Under Scenario 4a, the residual bin collection frequency remains as weekly (same as BAU).

An overview of the facility capacity, technology and cost details assumed in the modelling for MRF and organic process facilities are presented below in Tables 4 and 5.

Table 4: Overview of modelled MRF capacities, technologies and costs applied to scenarios 1, 2 and 3

<table>
<thead>
<tr>
<th>Description</th>
<th>“Low tech” MRF</th>
<th>“High tech” MRF</th>
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</thead>
<tbody>
<tr>
<td>Planned capacity (tpa)^</td>
<td>Scenario 2: 7,000 tpa</td>
<td>Scenarios 1 and 3: 26,000 tpa</td>
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<tr>
<td>Feedstock</td>
<td>Kerbside recycling</td>
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<td>Capital Cost* (full facility) ($)</td>
<td>$4 million</td>
<td>$6 million</td>
</tr>
<tr>
<td>Operating Cost ($ Annual)</td>
<td>$800,000 (approx. $114/t for planned capacity input)</td>
<td>$1.5 million (approx. $58/t for planned capacity input)</td>
</tr>
<tr>
<td>Source</td>
<td>Based on confidential, industry sources.</td>
<td></td>
</tr>
</tbody>
</table>

Notes:
- Capital cost figures are based on conservative estimates (refer to Appendix A, page 31).
- Note, the planned capacity (tpa) informed the initial research undertaken by Arcadis to source capex and opex costs for a facility of a particular size, prior to modelling. The gate fee build-up in the model uses throughput (tpa) based on the modelled data at 2021 (rather than planned capacity) for calculating the tonnes of recyclables processed, income generated and contaminated tonnages sent to landfill.
### Table 5: Overview of modelled organics processing capacities, technologies and costs applied to scenario 4

<table>
<thead>
<tr>
<th>Description</th>
<th>OW composting facility (&quot;low tech&quot;)</th>
<th>ASP composting facility (&quot;high tech&quot;)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Controlled biological decomposition and pasteurisation of garden waste laid out in long rows (open windrows) under aerobic conditions. Low tech - no automated windrow turner. Includes green waste shredder.</td>
<td>Similar to OW however under each row is a perforated pipe which provides air circulation for more controlled aeration and a high standard of composting. Pipe-on-ground, no concrete pad, no textile cover. Includes green waste shredder.</td>
</tr>
<tr>
<td>Planned capacity^ (tpa)</td>
<td>5,000 tpa</td>
<td>7,000 tpa</td>
</tr>
<tr>
<td>Feedstock</td>
<td>Kerbside (fortnightly) and drop-off GO</td>
<td>Kerbside FOGO (weekly) and drop-off GO</td>
</tr>
<tr>
<td>Capital Cost* (full facility) ($)</td>
<td>$750,000</td>
<td>$1.2 million</td>
</tr>
<tr>
<td>Operating Cost ($ Annual)</td>
<td>$175,000 (approx. $35/t of planned capacity input)</td>
<td>$210,000 (approx. $30/t of planned capacity input)</td>
</tr>
</tbody>
</table>

**Source**

Sustainability Victoria (2018)\(^3\), KMH Environmental (2015)\(^4\), Johnson (2015)\(^5\), and confidential clients and industry sources.

---


\(^5\) Johnson, A (2015). *Why commercial composting doesn’t have to cost the earth: Commercial Composting Facility Costing Model.* (Industry presentation by KMH Environmental).
### 3.2 Scenario performance

Arcadis has collated and presented the key outputs of the modelling for each scenario through a series of metrics and graphs, focussing on the incremental changes against BAU.

A summary of the transport and cost modelling results (difference in NPV against BAU, over 15 years (2021 to 2036)) for each scenario is provided in Table 6, with further details on the performance of the scenarios further below.

**Table 6: Summary of cost and transport distance outcomes**

<table>
<thead>
<tr>
<th>Scenario</th>
<th>NPV, difference (from BAU, 15 years: 2021 to 2036)</th>
<th>Average transport distance, difference (from BAU, km one-way from the councils central bulking points to end facility location)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scenario 1 – Eastern Councils</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Low tech MRF</td>
<td>−$0.8 million</td>
<td>−47 km</td>
</tr>
<tr>
<td>b. High tech MRF</td>
<td>$12.6 million</td>
<td>−47 km</td>
</tr>
<tr>
<td>Scenario 2 – Western Councils</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Low tech MRF</td>
<td>$4.3 million</td>
<td>−106 km</td>
</tr>
<tr>
<td>b. High tech MRF</td>
<td>$17.8 million</td>
<td>−106 km</td>
</tr>
<tr>
<td>Scenario 3 – All twelve Councils</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Low tech MRF</td>
<td>−$2.0 million</td>
<td>−100 km</td>
</tr>
<tr>
<td>b. High tech MRF</td>
<td>$14.3 million</td>
<td>−100 km</td>
</tr>
<tr>
<td>Scenario 4 – Western Councils</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Open windrow</td>
<td>$20.8 million</td>
<td>N/A</td>
</tr>
<tr>
<td>b. Aerated static pile</td>
<td>$16.2 million</td>
<td>N/A</td>
</tr>
</tbody>
</table>

- **Scenario 1 MRF in Ballarat servicing the “Eastern” group of Councils**
  - The NPV cost difference compared to BAU for diverting the Councils’ kerbside recyclables to a new facility in Ballarat is −$0.8 million for a “low tech” MRF (a saving compared to BAU) or +$12.6 million for a “high tech” MRF (additional costs compared to BAU), averaged over 15 years (2021 to 2036). As there is a degree of uncertainty in the model and its assumptions, the saving shown for the low tech MRF scenario may not be realised.
  - On average across the “eastern” councils, a reduction (or saving) of 47km in one-way trucking distance to transport the recyclables to the new end facility location has been estimated. Although the NPV cost takes into account transport distance (for both the scenario and BAU), the transport distance reduction for the scenario compared to BAU will provide social and environmental benefits (e.g. road congestion, local air quality) due to reduced transport distances, and will provide local employment at the new MRF within the GCW region.
  - No change to MSW diversion.
  - This scenario (and all MRF scenarios) is subject to significant uncertainty around the current gate fees paid by Councils under their existing MRF contracts. As this detail is not known to Arcadis, the model assumes a $0 gate fee is paid and no rebates are returned to the Councils.

- **Scenario 2 MRF in Stawell servicing the “Western” group of Councils**
  - The NPV cost difference compared to BAU for diverting the Councils’ kerbside recyclables to a new facility in Stawell is $4.3 million for a “low tech” MRF or $17.8 million for a “high tech” MRF, averaged over 15 years (2021 to 2036). Both scenarios cost significantly more than BAU.
On average across the “western” councils, a saving of 106km is achieved in one-way trucking distance to transport the recyclables to the end facility location, which is now contained within the GCW region (Stawell). Additional social and environmental benefits are as described for Scenario 1 above.

- No change to MSW diversion.

This scenario (and all MRF scenarios) is subject to significant uncertainty around the current gate fees paid by Councils under their existing MRF contracts. As this detail is not known to Arcadis, the model assumes a $0 gate fee is paid and no rebates are returned to the Councils.

**Scenario 3 MRF in Ballarat servicing all twelve Councils of the GCW region**

- The NPV cost difference compared to BAU for diverting the Councils’ kerbside recyclables to a new facility in Stawell is –$2.0 million for a “low tech” MRF (a saving compared to BAU) or $14.3 million for a “high tech” MRF (additional costs compared to BAU), averaged over 15 years (2021 to 2036). As there is a level of uncertainty in the model, the “saving” shown for the low tech MRF scenario may not be realised.

On average across all councils, a saving of 100km is achieved in one-way trucking distance to transport the recyclables to the end facility location, which is now contained within the GCW region (Ballarat). Additional social and environmental benefits are as described for Scenario 1 above.

- No change to MSW diversion.

This scenario (and all MRF scenarios) is subject to significant uncertainty around the current gate fees paid by Councils under their existing MRF contracts. As this detail is not known to Arcadis, the model assumes a $0 gate fee is paid and no rebates are returned to the Councils.

**Scenario 4 Organics processing facility in Horsham servicing the “Western” group of Councils**

- The NPV cost difference compared to BAU for diverting organic material (GO or FOGO) to a new facility in Horsham is $20.8 million for an open window (OW) facility composting kerbside GO (26 collections/year; with residual 52 collections/year) and drop-off GO, or $16.2 million for an aerated static pile (ASP) facility composting kerbside FOGO (52 collections/year; with residual 26 collections/year) and drop-off GO. These costs are averaged over 15 years (2021 to 2036).

Overall, this represents additional costs to Councils over 15 years in net present terms. It is noted that these would be new services and accordingly a represent a significant cost increase when compared to BAU.

However, there are some savings achieved: the main saving for Scenario 4b is in residual collections due to the frequency reduction from weekly (BAU) to fortnightly (a saving of $13.3 million compared to BAU), Smaller savings are achieved in residual transport and landfill costs.

Compared to BAU, the NPV cost in this scenario takes into account the cost of a new kerbside organics service: collection costs (bin lifts), transport distance and processing costs (gate fee). BAU does not include these costs because the Western group of Councils do not have existing kerbside organics collection services.

- The cost of the purchasing and roll-out of new containers (caddies, liners and wheelie bins) is not included.

- The kerbside organic materials in this scenario are diverted from the residual bin and landfill, with a reduction in residual transport and landfill costs. Drop-off GO tonnages are the same as BAU, with no additional diversion assumed.

- This scenario is subject to uncertainty around the characteristics and effectiveness of a GO or FOGO roll-out in capturing material and diverting organics.
Cost Performance

Table 7 below shows a breakdown of the net present cost impacts of each scenario relative to BAU. As noted above, this cost appraisal focuses on incremental costs and presents the difference between each scenario and BAU. The data shows the relative scale of costs and savings in collection, transport and processing.

The Table shows estimated transport cost impacts, although it is noted that these are based on broad assumptions and do not necessarily reflect actual transport costs and assumptions used in contracts which are currently unknown. Therefore, the suggested savings are presented for comparative purposes between the scenarios and should not be considered to be the actual transport cost savings that may be achieved during service delivery.

Overall, the results provide an indication of the potential relative cost impacts associated with delivering each scenario when compared to BAU.
Regional Resource Recovery Processing Facilities – Preliminary Investigation, Model and Options Appraisal

Table 7: Breakdown of NPVs relative to BAU ($ millions).

<table>
<thead>
<tr>
<th>Cost Type</th>
<th>Net Present Values $million - 15 years (2021 to 2036), 2021$</th>
<th>Difference (Sc minus BAU)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sc. 1a</td>
<td>Sc. 1b</td>
</tr>
<tr>
<td>Landfill (kerbside) - disposal</td>
<td>n/c</td>
<td>n/c</td>
</tr>
<tr>
<td>Organics - processing</td>
<td>n/c</td>
<td>n/c</td>
</tr>
<tr>
<td>Commingled - processing</td>
<td>$12.2</td>
<td>$25.6</td>
</tr>
<tr>
<td>Residual</td>
<td>n/c</td>
<td>n/c</td>
</tr>
<tr>
<td>Organics</td>
<td>n/c</td>
<td>n/c</td>
</tr>
<tr>
<td>Commingled</td>
<td>n/c</td>
<td>n/c</td>
</tr>
<tr>
<td>Transport</td>
<td>n/c</td>
<td>n/c</td>
</tr>
<tr>
<td>Residual</td>
<td>n/c</td>
<td>n/c</td>
</tr>
<tr>
<td>Organics</td>
<td>n/c</td>
<td>n/c</td>
</tr>
<tr>
<td>Commingled</td>
<td>–$13.0</td>
<td>–$13.0</td>
</tr>
<tr>
<td>TOTAL NPV</td>
<td>–$0.8</td>
<td>$12.6</td>
</tr>
</tbody>
</table>

n/c = no change

Tables 8 and 9 below outline the calculated gate fees used in the scenario modelling. These gate fees have been calculated by Arcadis using a “bottom up” approach taking into account capital and operating costs based on published and confidential industry sources, landfill fees for the disposal of contamination and income generated from the sale of outputs. The cost of acquisition or lease of land is not included.

Table 8 shows that the gate fee for the low tonnage scenario (2, for the Western group of Councils) is comparatively high. This is a result of the low tonnage capacity of the facility and the lack of economies of scale. The gate fees for the higher tonnage scenarios (1 and 3) are comparatively lower, with the “low tech” MRF resulting in a lowest gate fee due to lower capital and operating costs, despite generating less income from the sale of recyclables and paying for the disposal of increased tonnages of contaminants to landfill.

Table 8: Scenarios 1, 2 and 3 - Calculated Gate Fees for MRF Facilities

<table>
<thead>
<tr>
<th>Scenario</th>
<th>“Low tech” MRF</th>
<th>“High tech” MRF</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Scenario 2a:</td>
<td>Scenario 2b:</td>
</tr>
<tr>
<td></td>
<td>P.C. 7,000 tpa</td>
<td>P.C. 7,000 tpa</td>
</tr>
<tr>
<td></td>
<td>“Western” group</td>
<td>“Western” group</td>
</tr>
<tr>
<td></td>
<td>Scenario 1a:</td>
<td>Scenario 1b:</td>
</tr>
<tr>
<td></td>
<td>P.C. 26,000 tpa</td>
<td>P.C. 26,000 tpa</td>
</tr>
<tr>
<td></td>
<td>“Eastern” group</td>
<td>“Eastern” group</td>
</tr>
<tr>
<td></td>
<td>Scenario 3a:</td>
<td>Scenario 3b:</td>
</tr>
<tr>
<td></td>
<td>P.C. 26,000 tpa</td>
<td>P.C. 26,000 tpa</td>
</tr>
<tr>
<td></td>
<td>“Western” group</td>
<td>“Western” group</td>
</tr>
<tr>
<td>Gate fee ($/t)</td>
<td>$216.3</td>
<td>$48.4</td>
</tr>
<tr>
<td></td>
<td>$435.3</td>
<td>$101.7</td>
</tr>
</tbody>
</table>

P.C. = Planned Capacity (tpa)
Tables 9 shows the “bottom up” calculated gate fees for the two composting technologies for the West group of Councils. Due to the additional approx. 2,000 tonnes (of food organics), the higher tech ASP technology facility results has a lower calculated gate fee than the lower tech OW technology facility, which actually has lower overall capital and operating costs.

Table 9: Scenario 4 - Calculated Gate Fees for Organics Processing Facilities

<table>
<thead>
<tr>
<th>Scenario</th>
<th>OW GO</th>
<th>ASP FOGO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scenario 4a:</td>
<td>Scenario 4b:</td>
<td></td>
</tr>
<tr>
<td>P.C. 5,000 tpa</td>
<td>P.C. 7,000 tpa</td>
<td></td>
</tr>
<tr>
<td>&quot;Western&quot; group</td>
<td>&quot;Western&quot; group</td>
<td></td>
</tr>
<tr>
<td>GO</td>
<td>FOGO + GO</td>
<td></td>
</tr>
<tr>
<td>Gate fee ($/t)</td>
<td>$174.9</td>
<td>$114.5</td>
</tr>
</tbody>
</table>

P.C. = Planned Capacity (tpa)

To provide a comparison with organic processing activities already in operation in the Region, a comparative analysis of the calculated gate fees above and the estimated existing gate fees in the Region is shown in Figure 1 below.

The gate fees for the existing organic processing facilities are estimated to be approximately half that of landfill gate fees for Councils in the GCW region based on discussions with GCWWRRG. The average the average landfill gate fee (including levy) is estimated to be $122/t.

Figure 1 suggests that it may be more cost-effective for Councils to utilise existing facilities rather than develop new facilities. Currently four Eastern Councils provide a kerbside organic service of some kind (GO or FOGO, optional or mandatory) and the gate fee that these Councils pay for processing their organics is estimated to be, on average, $61 per tonne. However, the significant transport distances to reach an existing Eastern facility would require further analysis if this option is to be pursued by the Western Group of Councils. Alternative, local facility options may also be available to the Western Councils, but further research on potential facilities in the West is required.

![Figure 1: Comparison of the calculated gate fees for scenario 4 against the assumed gate fees at existing regional organic processing facilities used by GCW Councils.](image-url)
3.3 Scenario time series curves

For each scenario, a time series curve showing the net cost profile compared to BAU has been generated, providing a visual depiction of the information described in the sections above. The curves are useful for assessing the interactions between waste streams, collection services and facilities at a scenario level.

Note, “Net Cost” on the charts depicts each Scenario’s net cost minus the BAU net cost and includes (i) collection, (ii) transport and (iii) disposal/processing costs. In case where the “Net Cost” is negative (blue line below the $0 baseline), this indicates a situation where the Scenario net costs are less than the BAU net costs (that is, the Scenario is cheaper than BAU).
Scenario 1a
“Low tech” MRF in Ballarat, operating from 2021 and servicing the “eastern” group of six Councils. Planned capacity: 26,000 tpa of kerbside recyclables. Modelled throughput at 2021: 22,128 tpa of kerbside recyclables.

Scenario 1b
“High tech” MRF in Ballarat, operating from 2021 and servicing the “eastern” group of six Councils. Planned capacity: 26,000 tpa of kerbside recyclables. Modelled throughput at 2021: 22,128 tpa of kerbside recyclables.
Scenario 2a

“Low tech” MRF in Stawell, operating from 2021 and servicing the “western” group of six Councils. Planned capacity: 7,000 tpa of kerbside recyclables. Modelled throughput at 2021: 5,211 tpa of kerbside recyclables.

Scenario 2b

“High tech” MRF in Stawell, operating from 2021 and servicing the “western” group of six Councils. Planned capacity: 7,000 tpa of kerbside recyclables. Modelled throughput at 2021: 5,211 tpa of kerbside recyclables.
Scenario 3a

“Low tech” MRF in Ballarat, operating from 2021 and servicing the twelve Councils of the Grampians Central West Region. Planned capacity: 26,000 tpa of kerbside recyclables. Modelled throughput at 2021: 27,338 tpa of kerbside recyclables (MRF assumed to make operations adjustments, e.g. extra shifts, to process additional tonnes).

Scenario 3b

“High tech” MRF in Ballarat, operating from 2021 and servicing the twelve Councils of the Grampians Central West Region. Planned capacity: 26,000 tpa of kerbside recyclables. Modelled throughput at 2021: 27,338 tpa of kerbside recyclables (MRF assumed to make operations adjustments, as above).
Scenario 4a
Open window (OW) composting facility in Horsham, operating from 2021 and servicing the “western” group of six Councils. Planned capacity: 5,000 tpa of kerbside and drop-off GO. Modelled throughput at 2021: 4,356 tpa of organics.

Scenario 4b
Aerated static pile (ASP) composting facility in Horsham, operating from 2021 and servicing the “western” group of six Councils. Planned capacity: 7,000 tpa of kerbside FOGO and drop-off GO. Modelled throughput at 2021: 7,024 tpa of organics (facility assumed to make operations adjustments, e.g. extra shifts or shorter processing time, to accommodate additional tonnes).
4 OPTIONS APPRAISAL

This section outlines the method applied in the appraisal of each of the four core scenarios and eight sub-scenarios using a system of weighted assessment criteria and performance scores.

4.1 Appraisal criteria weightings and scoring system

In order to determine the relative performance of the different scenarios, Arcadis has applied two key appraisal criteria:

1. **Cost**, assessed against quantitative outputs from the modelling

   - The assessment is based on the difference in Net Present Value (NPV) compared to Business as Usual (BAU), i.e. continuation of the current situation, for each scenario across a 15-year period (2021 to 2036). This includes consideration of changes in collection, disposal and transportation costs. NPV is the present value of the cash flows under each scenario at the selected discount rate which is compared with the NPV of cash flows under BAU. A negative (-) NPV difference indicates that the scenario will provide savings when compared to BAU.

2. **Risk**, qualitatively assessed using research and market knowledge in relation to two key risk components:

   - Product market risk (sale output material from the process) within local markets for compost and local, national and international markets for recyclables. Current markets for comingled recyclables are currently considered to be high risk, with limited alternative options available in the case of market failure. In contrast, markets for compost products are considered to be low risk, with a number of proven and robust market options likely to be available.

   - Contract length. In order to attract adequate market interest to invest in new infrastructure, it has been assumed that contractors would expect longer contract periods with Councils for the provision of guaranteed ‘baseload’ feedstock for new facilities in comparison with established facilities. Longer term contracts are assumed to include higher inherent risks for Councils, due to lost flexibility to change future services and potentially benefit from alternative contractual, technological or market developments and improvements. In contrast, established facilities are assumed to require shorter term contracts and less inherent risk.

Whilst recognising that transport distance is a key consideration that will influence Councils’ ability to cost effectively deliver feedstock to processing facilities, a separate appraisal criterion for transport distance has not been applied. This is because estimated transport costs, based on transport distance, have been included within the financial appraisal criterion and the use of a separate criterion for distance would constitute double counting.

**Weightings**

Relative weightings have been applied to each of the criteria to reflect their perceived relative importance, with consideration of current market conditions and the services being appraised.

*Table 10: Risk weightings*

<table>
<thead>
<tr>
<th></th>
<th>Cost Weighting</th>
<th>Risk Weighting</th>
</tr>
</thead>
<tbody>
<tr>
<td>MRFs (recyclables)</td>
<td>55%</td>
<td>45%</td>
</tr>
<tr>
<td>Composting facilities (organics)</td>
<td>85%</td>
<td>15%</td>
</tr>
</tbody>
</table>

The MRF scenarios have been allocated a higher risk weighting of 45% due to the significant market uncertainty currently relevant to recyclable markets. In contrast, composting products have relatively more robust markets with a number of potential market options available, including use as soil improvers, land remediation activities and as a low-grade landfill cover as appropriate.
Performance Scores

The cost performance scores are quantitative (NPV $millions), as described above. These have been taken directly from the model and then normalised into a score out of 10, where 10 is the highest performing scenario.

The risk results, have qualitatively assessed using research and market knowledge with the considerations described above and scored using the system shown in Table 11.

Table 11: Risk scores

<table>
<thead>
<tr>
<th>Result</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neutral</td>
<td>10</td>
</tr>
<tr>
<td>Low risk</td>
<td>7.5</td>
</tr>
<tr>
<td>Moderate risk</td>
<td>5</td>
</tr>
<tr>
<td>Moderately high risk</td>
<td>3</td>
</tr>
<tr>
<td>High risk</td>
<td>1</td>
</tr>
</tbody>
</table>

4.2 Appraisal results

The results of the options appraisal are shown in Tables 12 and 13 (overleaf). The tables identify the criteria and weightings, the scenarios being appraised and the relative weighted and unweighted scores for each scenario against the appraisal criteria.

- MRF processing scenarios
  
  Each of the MRF scenarios have been assessed with the results for each presented separately in Table 12 in addition to the BAU. This allows the performance of each scenario to be directly compared to the ongoing use of existing MRF facilities.

- Organics processing scenarios
  
  The appraisal results for both organic processing scenarios have been presented without the BAU to enable direct comparison between the two scenarios, whilst recognising that the BAU is not an appropriate direct comparator. In contrast to the MRF appraisal, there are no current kerbside organic collection or processing services and therefore no associated costs or risks for kerbside organic collections in Western Councils, therefore the BAU is not considered a useful comparator.
Table 12: MRF options appraisal scores and rankings

<table>
<thead>
<tr>
<th>Theme</th>
<th>Ref</th>
<th>Description / Intent</th>
<th>Weighting</th>
<th>BAU</th>
<th>Sc_1a</th>
<th>Sc_1b</th>
<th>Sc_2a</th>
<th>Sc_2b</th>
<th>Sc_3a</th>
<th>Sc_3b</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cost Assessment</strong></td>
<td></td>
<td>Cost, NPV ($million). Quantitative result directly obtained from the model. Weighed 55% as it is the most critical factor to consider.</td>
<td>55%</td>
<td></td>
<td>$374</td>
<td>$373</td>
<td>$386</td>
<td>$378</td>
<td>$391</td>
<td>$372</td>
</tr>
<tr>
<td><strong>Total Score for Cost</strong></td>
<td></td>
<td></td>
<td></td>
<td>55%</td>
<td>55%</td>
<td>53%</td>
<td>54%</td>
<td>52%</td>
<td>55%</td>
<td>53%</td>
</tr>
<tr>
<td><strong>Risk Assessment</strong></td>
<td></td>
<td>Risk, qualitative assessment (not obtained from the model). &quot;Risk&quot; based on PRODUCT MARKET risk and LONG TERM CONTRACT LIABILITY. Weighted 45% as risk is important in the MRF / recycleables market at the moment, in response to China National Sword.</td>
<td>45%</td>
<td></td>
<td>Neutral</td>
<td>High risk</td>
<td>High risk</td>
<td>Moderate risk</td>
<td>High risk</td>
<td>Moderate risk</td>
</tr>
<tr>
<td><strong>Total Score for Risk</strong></td>
<td></td>
<td></td>
<td></td>
<td>45%</td>
<td>5%</td>
<td>23%</td>
<td>5%</td>
<td>23%</td>
<td>5%</td>
<td>23%</td>
</tr>
</tbody>
</table>

**Combined Score - Summary Table**

<table>
<thead>
<tr>
<th></th>
<th>Weighting</th>
<th>BAU</th>
<th>Sc_1a</th>
<th>Sc_1b</th>
<th>Sc_2a</th>
<th>Sc_2b</th>
<th>Sc_3a</th>
<th>Sc_3b</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost</td>
<td>(Cost Score)</td>
<td>55%</td>
<td>55%</td>
<td>55%</td>
<td>53%</td>
<td>54%</td>
<td>52%</td>
<td>55%</td>
</tr>
<tr>
<td>Risk</td>
<td>(Non-Cost Score)</td>
<td>45%</td>
<td>45%</td>
<td>5%</td>
<td>23%</td>
<td>5%</td>
<td>23%</td>
<td>5%</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td>100%</td>
<td>100%</td>
<td>99%</td>
<td>75%</td>
<td>59%</td>
<td>74%</td>
<td>59%</td>
</tr>
<tr>
<td><strong>Score ranking</strong></td>
<td></td>
<td>1</td>
<td>4</td>
<td>2</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>2</td>
</tr>
</tbody>
</table>

Note, NPV is the monetary value **now** of the project’s future cash flows. In Table 12, the BAU NPV is $374 million over 15 years (2021 to 2036). The Scenario NPVs are $383 million, $386 million, and so on, over 15 years.
Table 13: Organic processing options appraisal scores and rankings

<table>
<thead>
<tr>
<th>Options Appraisal - Organics Processing Facility (OW vs. ASP)</th>
<th>Weighting</th>
<th>Sc. 4a - BAU</th>
<th>Sc. 4b - BAU</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cost Assessment</strong></td>
<td>85%</td>
<td>$20.8</td>
<td>$16.2</td>
</tr>
<tr>
<td>Cost</td>
<td>7.79</td>
<td>10.00</td>
<td></td>
</tr>
<tr>
<td><strong>Total Score for Cost</strong></td>
<td>66%</td>
<td>85%</td>
<td></td>
</tr>
<tr>
<td><strong>Non-Cost Assessment</strong></td>
<td>15%</td>
<td>Moderate risk</td>
<td>Moderate risk</td>
</tr>
<tr>
<td>Risk</td>
<td>5</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td><strong>Total Score for Risk</strong></td>
<td>8%</td>
<td>8%</td>
<td></td>
</tr>
<tr>
<td><strong>Combined Score - Summary Table</strong></td>
<td>100%</td>
<td>74%</td>
<td>93%</td>
</tr>
</tbody>
</table>

In Table 13, the cost result ($million) shown is calculated as the NPV difference of the Scenario minus BAU. In this appraisal, the Scenarios are compared to each other without BAU listed as a separated option. If included, the BAU would be ranked #1 as it will be the cheapest option, without the provision of additional collection services and associated costs.

It should also be noted that a key reason for the difference in cost and ranked position for the two Scenarios is that:
- Scenario 4a assumes fortnightly GO collections with weekly residual waste collections retained (same as BAU)
- Scenario 4b assumes weekly collections for FOGO (to minimise potential odour issues) and fortnightly residual waste collections (reduced from weekly in BAU)
5 CONCLUSIONS AND RECOMMENDATIONS

Overarching Recommendation

- A 'one size, fits all' approach is unlikely to be the most appropriate for all Councils. This consideration is particularly relevant to organic processing services, which are more suited to individual solutions for each Council as opposed to recyclables, where economies of scale may be achieved through larger scale, centralised solutions. It is recommended that this initial research is built upon, to ensure that future service decisions reflect individual Council circumstances and preferences, including the additional recommended research activities identified in the sub-sections below.

Transport, Haulage, Cost Data & Assumptions – Organics and Recyclables

- Clarification of Councils’ existing direct delivery and bulking facility arrangements, transport distances and their associated costs is recommended to better understand the current services and improve the accuracy of future comparative cost modelling. This is particularly important for the improvement of assumptions in relation to current and future transport distances and associated costs.

- Further analysis of potential improvements to bulking and haulage arrangements to determine the optimum and logistically practical processing and/or bulking facility locations for each Council is recommended. This should ideally be undertaken as part of the pre-procurement activities to provide a more developed and coherent offering to the market.

- For recyclables, these activities are likely to be needed for both bulking and new processing sites, as tonnage aggregation from the different Councils is likely to be needed for new, centralised recyclable processing facilities within the Region.

- For organics, these activities should focus on bulking facilities if individual Councils pursue their own individual, decentralised organics processing facility arrangements with existing local processing sites.

- Overall cost estimates will be improved by the provision and inclusion of further details from Councils. These include:
  - current gate fees charged by MRFs for recyclables (this report has assumed a zero gate fee charge and zero rebate which may not be currently accurate)
  - local costs for the acquisition or lease of land for processing facilities, which are not included in the cost modelling
  - up-front capital expenditure for implementing GO/FOGO system such as the purchase of additional vehicles, wheelie bins, supply of kitchen caddies and liners to residents and education programmes.

Procurement Considerations – Organics and Recyclables

- Market testing and discussions are recommended with potential contractors/partners for the development of both new infrastructure and for the use of existing organic processing infrastructure. This will help to inform Councils of their potential options and assist the design of service procurements, including collaborative procurements, and service contract packaging.

- Delivery models, procurement and contract packaging options may include separate processing infrastructure, its incorporation within collection and bulking contract procurements and/or as potential partnership arrangements with land owners and non-MSW waste producers, informed by the market testing.

- If the provision of facilities is not included within collection contracts, suitable clauses should be included within all relevant collection contracts to enable changes to transfer and delivery points to alternative sites.

- Consideration of potential sites’ planning and permitting status should be used to inform the procurement of new facilities and expedite both market discussions and procurements.
The provision of a Council owned site (ideally with the requisite permissions and approvals) may encourage competition and market interest in any opportunity for the provision of a new facility.

**Recyclables: Processing Facilities**

**Recyclables: Options Appraisal Results**

- The highest scoring scenario is BAU (Business as Usual), due to the lower risk resulting from greater potential flexibility presented by shorter term contracts (i.e. Councils may be tied into the arrangements for shorter periods). Shorter contract terms are assumed to be available for the use of existing facilities when compared to new build facilities constructed specifically for the Councils within the Region.

- For the Eastern Councils, Scenarios 1b - High-tech MRF for the Eastern Councils and 3b – High-tech MRF for the All Councils ranked equally in second place (behind BAU).

- For the Western Councils, Scenario 2b - High-tech MRF for the Western Councils is the highest ranked option for the Western Councils.

- If a joint procurement for MRF processing solutions is to be pursued, it is recommended that Scenario 3b – High-tech MRF for the All Councils – is pursued, informed by the additional recommended research activities identified in the sections above and below. This is likely to provide the most cost effective and deliverable solution for all Councils in the Region.

**Recyclables: Service Model: Recyclables**

- A centralised approach to the processing of recyclables is recommended, noting that feedback from industry has indicated that lower capacity facilities (<10-15,000 tpa) are unlikely to be economically viable, particularly with the existing significant issues in the global market for recyclables. This suggests that there may be no market interest in developing a MRF for the Western group of Councils in isolation.

**Recyclables: Data and Contractual Commitments**

- Each of the MRF scenarios are subject to significant uncertainty on the current gate fees paid by Councils under existing contracts. As this detail is not known to Arcadis, the model assumes that a $0 gate fee is paid and no rebates are returned to the Councils. In light of the recent significant issues relating to markets for recyclables, it is recommended that these details are clarified to improve the accuracy of future comparative cost modelling (also identified in the Transport, Haulage, Cost Data & Assumption recommendations).

- It is recommended that the reason for the anomaly in tonnage data (SV data and Regional Implementation Plan Data) is reviewed, if appropriate, or at least acknowledged in future discussions and workstreams on processing capacity requirements to avoid confusion and ensure consistency in data assumptions.

- Clarification of the existing contractual arrangements and end dates, including extension options, should be made to determine the required procurement and commissioning lead times with the aim of minimising/avoiding service disruption to Councils for the provision of new MRF services and facilities.

**Recyclables: Contract Model and Contract Packaging**

- Ideally informed by market testing, MRF services should be included within appropriate procurement and contract packages, potentially as follows:
  - As a stand-alone contract for the provision of MRF services.
  - Combined within the planned joint procurement arrangements which may include collection and bulking services. This approach may limit market interest due the limited number of contractors able to deliver the combined services in-house and the likely need for numerous sub-contractual and partnership arrangements.
  - The preferred contract model (e.g. design, build, own and operate) should be determined in the pre-procurement stages and made clear at the commencement of the procurement to provide clarity on the Councils’ expectations and the requirements for contractors.
Recyclables: Service Delivery

- Appropriate education and enforcement programmes should be developed and applied for any kerbside recyclable collection services to help limit contamination and to improve the long-term feasibility of any new facility, particularly in light of the current lack of available markets for contaminated materials.

Organics: Processing Facilities

Organics: Options Appraisal Results

- Scenario 4b - an aerated static pile (ASP) composting process (“high tech”) for kerbside FOGO with additional tonnes from drop-off GO is the highest ranked Scenario. Noting the simple analysis and comparison against existing, estimated regional gate fees in Section 3.2, it is recommended that the additional research activities identified in the Focussed Local Market Research and Procurement Considerations Sections, in particular, are undertaken. This should include consideration of alternative local options for individual Councils prior to progressing either of the new development scenarios which currently focus solely on MSW inputs.

- For the Eastern Councils planning to secure new organic processing services (not modelled), it is recommended that the additional recommended research activities identified in the Focussed Local Market Research and Procurement Considerations Sections, in particular, are undertaken.

Organics: Service Model

- A decentralised approach to the processing of organics with optimal, local solutions for each Council is recommended. This recognises that tonnages in the sparser populated/more rural areas are small and will require aggregation from a number of Councils to enable a centralised MSW facility to be viable. A centralised approach is likely to include significant transport distances to a centralised site.

- Previous modelling (in 2012) identified that a universal FOGO service for the region may be cost neutral when compared with landfill gate fees. FOGO will also maximise landfill diversion, when compared to GO diversion. It is therefore recommended that Councils focus on FOGO rather than GO-only services. However, the rationale and assumptions in the original 2012 modelling (2012) is not known (e.g. whether it includes ‘whole system costs’ such as the inclusion of additional collection/transport costs and the applicability of the assumption to less densely populated areas). Additional clarification of the original assumptions or new research may be undertaken as appropriate.

Organics: Focussed Local Market Research for each Council

- Further research into local organic processing gate fees and capacity should be undertaken to enable the modelled gate fees for new organic processing facilities to be compared with ‘real’, local gate fee examples (rather than the simplistic, assumed half landfill gate fee price used in the model).

- Councils, GCWWRRG or advisors (as appropriate) should engage with individual composting site operators and/or land owners to identify individual cost-effective and optimal solutions for each Council.

- Depending on the urgency to introduce kerbside organic services, and if discussions/procurements with existing or potential composting service providers are not successful, additional discussions with local farming, agriculture, horticulture and viticulture groups and other waste producers should be undertaken. These discussions may identify additional longer-term options for the collation and treatment of combined municipal and non-municipal organic streams.

- The details of the chipping and shredding activities currently used by Councils are unknown. Further information on current practices should be obtained to inform the potential roll out of these service in other locations and Councils.

Organics: Contract Model and Contract Packaging

- Ideally informed by market testing, organic processing services should be included within appropriate procurement and contract packages, potentially as follows:
  - As a stand-alone contract for the provision of organic processing services. This may include partnership arrangements with existing site operators, landowners and non-MSW waste producers.
• Combined within the planned joint procurement arrangements which may include collection and bulking services. This approach may limit market interest due the limited number of contractors able to deliver the combined services in-house and the likely need for numerous sub-contractual and partnership arrangements.

• The preferred contract model (e.g. build, own and operate) should be determined in the pre-procurement stages and made clear at the commencement of the procurement to provide clarity on the Councils’ expectations and the requirements for contractors.

**Organics: Service Delivery**

• Councils that currently chip woody waste to produce raw mulch, which is utilised in their own horticultural practices and in some locations made available to residents, should continue to do so. This is considered likely to be the best, least-cost local solution for these wastes and may help to minimise bulking and transportation costs. Woody wastes may also be less suited to centralised composting processes.

• Appropriate education and enforcement programmes should be developed and applied, in particular when new FOGO services are introduced, in order to limit contamination and improve any composting scheme’s long-term feasibility.
APPENDIX A – MODELLING METHODOLOGY

This section provides details of the modelling methodology applied in this commission.

Arcadis notes that the focus of this engagement has been on modelling the impact of implementing future MRF and GO/FOGO solutions against the existing service baseline and performance. Arcadis has not accounted for the possible improvement (or decline) in the diversion performance of existing services that may potentially be achieved through other activities, such as improvements to existing recycling capture rates achieved through improved communications, publicity and enforcement, for example.

Key data and modelling assumptions

The model consists of two key components: a waste flow model and cost model (costs of collection, transport and disposal) with gate fee build-up.

For any scenario, the model outputs provide the cost profile (compared to BAU), NPV difference from BAU and other outputs (diversion percentage and distance travelled, compared to BAU, where relevant). The model is built up from a combination of data sources as well as insights gained through discussions with GCWWRGG, as well as data inputs from individual Councils. The gate fee build-up completed by Arcadis is based on research and discussions with confidential client and industry sources for capex and opex cost information for MRFs and organics processing facilities.

A summary of the cost parameters used in this appraisal are provided in Table 14 below.

Table 14: Summary of cost input parameters and assumptions

<table>
<thead>
<tr>
<th>Cost aspect</th>
<th>Key input parameters and assumptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collection</td>
<td>Bin lift costs ($ per bin lift) assumed to be:</td>
</tr>
<tr>
<td></td>
<td>• $1.50 for Ararat, Ballarat, Central Goldfields, Golden Plains, Hepburn, Horsham, Moorabool, Northern Grampians and Pyrenees Councils.</td>
</tr>
<tr>
<td></td>
<td>• $2.25 for Hindmarsh, West Wimmera, and Yarriambiack Councils.</td>
</tr>
<tr>
<td></td>
<td>Bin lift costs are assumed to increase by CPI each year and are inclusive of crew wages, truck use, and transport between households and then to a local bulking/transfer station. (Transport from the local transfer station to the end facility location is accounted for below, under Transport.)</td>
</tr>
<tr>
<td></td>
<td>Collection costs factor in for each Council:</td>
</tr>
<tr>
<td></td>
<td>• Number of households</td>
</tr>
<tr>
<td></td>
<td>• Percentage of households taking up that service (be it kerbside residual, commingled recycling or organics collection services)</td>
</tr>
<tr>
<td></td>
<td>• Frequency of kerbside collections for residual, commingled recycling and organics and number of bin lifts per household per year</td>
</tr>
<tr>
<td>Transport</td>
<td>Truck capacity assumed to be 9 tonnes per truck.</td>
</tr>
<tr>
<td></td>
<td>$0.45 to transport 1 tonne of waste 1 km = $4.05 km per load haulage rate.</td>
</tr>
<tr>
<td></td>
<td>Transport/haulage fee ($ per kilometre per tonne transported), increasing by CPI each year, for transport from the local bulking/transfer station to the end facility location. Arcadis has assumed transportation is direct from a local bulking/transfer station within each Council to the end facility location. Further bulking or handling fees associated have not been included.</td>
</tr>
<tr>
<td>Disposal / Processing</td>
<td>Disposal (residual to landfill) / Processing (recyclables, organics).</td>
</tr>
<tr>
<td></td>
<td>Existing service gate fees ($ per tonne disposed/processed), increasing by CPI each year:</td>
</tr>
<tr>
<td></td>
<td>• Residual to landfill: the landfill gate fee for Councils in the GCW region has been estimated based on discussions with GCWWRGG.</td>
</tr>
<tr>
<td></td>
<td>• Commingled recycling: the model assumes $0 gate fee paid and no rebates returned to the Councils. (Post China National Sword, the current gate fee cost for these councils is unknown /</td>
</tr>
</tbody>
</table>

Table 14: Summary of cost input parameters and assumptions
Cost aspect | Key input parameters and assumptions
---|---
| has not been supplied to Arcadis and Arcadis recognises that the actual charges may be significantly different. | • Organics: the gate fee for the existing organic processing facilities is assumed to be half of landfill gate fee, based on discussions with GCWWRRG.

The new service gate fees ($ per tonne processed) have been calculated by Arcadis using a “bottom up” approach taking into account capital and operating costs (based on published and confidential industry sources), the planned capacity (tpa) of the facility, landfill fees for the disposal of contamination and income generated from the sale of outputs based on the modelled throughput (tpa) of the facilities at 2021.

A summary of the main sources of the baseline data and specific assumptions are provided in Table 15.

Table 15: Summary of global assumptions (baseline inputs)

<table>
<thead>
<tr>
<th>Global Input</th>
<th>Source</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline waste generation</td>
<td>Sustainability Victoria, 2016/17</td>
<td>The model uses the 2016/17 waste generation data for each Council reported to Sustainability Victoria. This provides baseline tonnes of waste collected, recovered and disposed of for the following waste streams: • Kerbside residual waste • Kerbside dry recyclables • Kerbside organics • Kerbside hard waste • Drop-off wastes (residual, recyclables, organics)</td>
</tr>
<tr>
<td>Existing collection systems and current processing facilities</td>
<td>Sustainability Victoria, 2016/17 GCWWRRG discussions, 2018</td>
<td>The model uses the 2016/17 collection systems and processing facilities information in the SV dataset, along with refinements and ‘gap filling’ through discussions with GCWWRRG (such as current contractor, end facility location (suburb), gate fees).</td>
</tr>
</tbody>
</table>
| Population / Households | Victoria in Future 2016 (VIF 2016), Department of Land, Water and Planning (DELWP) | VIF is released annually and is the official state government projection of population and households. Projections by LGA are provided until 2031. From 2032 to 2051, projections are provided for the whole state. This latter data set has been proportionately allocated to the GCW Region Councils across this period, to provide projections until 2051.

Australian Bureau of Statistics (ABS) data has not been used, as projections by LGA to 2051 are not available.

It has been assumed that baseline waste generation will grow proportionately and in-line with household growth (i.e. per HH rate) |
| Residual composition | Grampians Central West Regional Implementation Plan, 2016 | Compositional data published in the Regional Implementation Plan on the indicative landfill composition for households in the GCW region was used, with one adjustment: For Councils in the GCW region without any form of kerbside organics service (8 Councils), Arcadis has increased the GO in the residual bin for these Councils from 6% (published compositional data figure) to 10%.

It is noted that in reality the composition would be expected to be different. For example, 22% food organics (FO) in the residual bin is considered low when most other Councils report FO in residual to be around 40-45%. |
Composition data has significant implications on the modelled tonnages diverted to the organics processing facilities in scenario 4. The model assumes GO in residual to drop from 10% to 1% for the relevant Councils in Scenarios 4a and 4b and FO in residual to drop from 22% to 5% for the relevant Councils in Scenario 4b.

Specific assumptions for each scenario are summarised in Table 16.

Arcadis notes the following key model parameters / assumptions:

- Waste generation has been assumed to grow in line with household numbers only, with no additional per capita growth in waste generation rates expected. The recent Australian National Waste Report (DoEE, 2016) notes that nationally, MSW waste generation on a per capita basis has declined from 2010 to 2015 from 0.62 to 0.57 tonnes/person. At the same time, C&I waste has grown by a similar rate, and Arcadis is of the view that there is likely to have been a transfer of waste from the MSW to C&I stream, rather than a genuine reduction in MSW generation. Nationally, this could be driven by factors such as the classification of waste at the weighbridge, increased processing / transfer of MSW through commercial (private) facilities and increasing housing density in cities resulting in increasing volumes of MSW collected by the commercial sector.

- Assumed no additional diversion of recyclables from BAU rates.

- Assumed no additional diversion of residual recyclables (contamination) or residual hard waste from BAU rates.

- Assumed that only kerbside recyclables are accepted at the MRF for Scenarios 1-3, and kerbside GO/FOGO plus drop-off GO for the organics processing facility in Scenario 4.

- A standard ‘conservative’ MRF/organics processing facility gate fee build up has been used and no sensitivity analysis has been undertaken. Arcadis has estimated conservative MRF/organics processing facility gate fees through a build-up of estimated base capex and opex costs and the rates are considered to be realistic for the Australian market, although this is mostly untested.

- In the NPV calculations, Arcadis has assumed a nominal discount rate of 7% per annum based on estimated cost of borrowing to fund capital expenditure for local government.

### Table 16: Scenario definitions

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business-as-Usual (BAU)</td>
<td>No changes</td>
</tr>
<tr>
<td><strong>Scenario 1</strong></td>
<td>MRF commencement from 2021.</td>
</tr>
<tr>
<td>MRF solution for the “eastern” group of six Councils, located in Ballarat</td>
<td>Transport route distance to collect from households and deliver to a central bulking/transfer station for each Council is assumed to be included in bin lift costs.</td>
</tr>
<tr>
<td>a. Kerbside recyclables tonnes sent to a “low tech” MRF, built and operating from 2021</td>
<td>Kerbside recyclables collated at the transfer station for each Council are then assumed to be transported to the MRF in Ballarat.</td>
</tr>
<tr>
<td>b. Kerbside recyclables tonnes sent to a “high tech” MRF, built and operating from 2021</td>
<td>Inclusion of 100% of kerbside collected recyclables for the percentage of households that have the kerbside recycling service (based on SV data). Collection frequency based on SV data.</td>
</tr>
<tr>
<td><strong>Scenario 2</strong></td>
<td>MRF facility planned capacity is 26,000 tpa.</td>
</tr>
<tr>
<td>MRF solution for the “western” group of six Councils, located in Stawell</td>
<td>As above, however the facility is located in Stawell and has a planned capacity of 7,000 tpa</td>
</tr>
<tr>
<td>Scenario</td>
<td>Description</td>
</tr>
<tr>
<td>------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>a. Kerbside recyclables tonnes sent to a “low tech” MRF, built and operating from 2021</td>
<td></td>
</tr>
<tr>
<td>b. Kerbside recyclables tonnes sent to a “high tech” MRF, built and operating from 2021</td>
<td></td>
</tr>
<tr>
<td><strong>Scenario 3</strong></td>
<td>MRF solution for all twelve Councils, located in Ballarat</td>
</tr>
<tr>
<td>a. Kerbside recyclables tonnes sent to a “low tech” MRF, built and operating from 2021</td>
<td></td>
</tr>
<tr>
<td>b. Kerbside recyclables tonnes sent to a “high tech” MRF, built and operating from 2021</td>
<td></td>
</tr>
<tr>
<td><strong>Scenario 4</strong></td>
<td>Organics processing solution for the “western” group of six Councils, located in Horsham</td>
</tr>
<tr>
<td>a. Kerbside GO + drop-off GO tonnes sent to an open windrow composting facility (“low tech”), built and operating from 2021</td>
<td></td>
</tr>
<tr>
<td>b. Kerbside FOGO + drop-off GO tonnes sent to an aerated static pile composting facility (“high tech”), built and operating from 2021</td>
<td></td>
</tr>
</tbody>
</table>

Same as Scenario 1. Additional tonnages above 26,000 tpa will be absorbed through internal changes to the MRF operations e.g. extra shifts.

Organics processing facility commencement from 2021.

Transport route distance to collect from households and deliver to a central bulking/transfer station for each Council is assumed to be included in bin lift costs.

Kerbside GO/FOGO collated at the transfer station for each Council are then assumed to be transported to the organics processing facility in Horsham.

Introduction of this new service results in the reduction of garden and/or food organics in the residual bin as follows:

- Sc 4a: Reduction in residual GO from 10% to 1%
- Sc 4b: Reduction in residual GO from 10% to 1% and reduction in residual FO from 22% to 5%

Assumed mandatory service, servicing the same percentage of households that have the existing kerbside residual service (based on SV data, this is 82% to 96% of households in the “western” group of councils). Collection frequency for the new kerbside GO/FOGO service assumed to be: 26 collections per year for kerbside GO (fortnightly), 52 collections per year for kerbside FOGO (weekly).

Under Scenario 4b, when the new kerbside FOGO service is introduced, the residual bin collection frequency is reduced from weekly (BAU) to fortnightly. Under Scenario 4a, the residual bin collection frequency remains as weekly (same as BAU).

Facility planned capacities as follows:

- Sc 4a: open windrow composting facility, 5,000 tpa.
- Sc 4b: aerated static pile composting facility, 7,000 tpa.
Summary of exclusions

Arcadis notes the following exclusions in the current modelling, which should be considered when reviewing the outcomes from this model:

**Costs**

- Upfront capital expenditure with implementing GO/FOGO system such as the purchase of additional Mobile Garbage Bins (MGBs); and additional in the case of FOGO - supply of kitchen caddies and liners to residents, education programs, etc.
- Detailed consideration of the capital and operational expenditure components associated with each technology option. High level estimates have been used to derive the MRF and GO/FOGO processing facility gate fee assumptions, but these components do not feature directly in the cost appraisal (only the gate fees are used).
- Accurate consideration of transport costs and dynamics between direct-haul and bulk-haul options.
- Step changes or above inflation increases in any gate fees (MRF or organics) due to market or technology changes.
- Accurate collection costs / bin lift rates.
- The cost of acquisition or lease of land for processing facilities.