Regional and Rural Infrastructure Model
(RRIM)

Report for Loddon Mallee Waste and Resource Recovery Group
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Executive summary

Ricardo was engaged by Loddon Mallee Waste and Resource Recovery Group (LMWRRG) to produce a Regional and Rural Infrastructure Model (RRIM) that protects regional recycling resilience and promotes local circular economy outcomes. The scope of the project is limited to kerbside collected commingled recyclables and materials that are traditionally placed in the yellow bin, including consideration of the separation of glass as specified by the Recycling Victoria policy.

The development of the RRIM followed four key steps, which included information gathering, options development, waste flow modelling (quantitative assessment), and multi criteria assessment.

Three options were proposed that promote local circular economy opportunities and improve equity of services across the region. These are outlined in this report:

Option	Key features
1 – Optimise existing Materials Recovery Facilities (MRFs)	• Redirection of commingled recycling tonnages away from metropolitan MRFs to local MRFs. • Maximising the throughput of regional MRFs. • Maximising opportunities for local CE at scale.
2 – Maximise early diversion of recyclables	• Consolidation and diversion of glass to local glass sand reprocessing. • Capture of contamination and metals to minimise transport volumes. • Local disposal or reprocessing of diverted materials.
3 – Market pull	• Diversion of glass to reprocessing. • Introduction of local plastics sorting to feed local manufacturers.

Quantitative assessment of overall recovery rates, local reprocessing rates and transport cost savings was carried out for the Loddon Mallee region as a whole. The modelling resulted in all three options showing similar recovery rates and local reprocessing rates. Option 1 had the highest transport savings at 29% savings, with Option 2 at 17% and Option 3 with no transport savings.

A multi criteria assessment was carried out to assess each option through political, environmental, social, technological, legal and economic (PESTLE) considerations. The multi criteria assessment identified Option 2 as the optimal model, with high scores in control of material fate, community acceptance and technological and economic resilience.

While the quantitative and multi-criteria assessments were carried out on the Loddon Mallee region as a whole, the feasibility of the proposed options may vary across Councils. The options are not mutually exclusive, and a combination of the proposed options may be appropriate depending on the individual circumstances of each Council.

Given the preferred solution does not substantially change the MRF processing solutions, there are fewer drivers for establishing procurement clusters. The scale required for the effective processing of separated glass collections may require smaller Councils such as Loddon, Gannawarra, Swan Hill, Buloke and Mt Alexander to partner with a neighbouring council to achieve economies of scale.

The delivery of glass processing infrastructure has been suggested by third parties to be available as a fee for service model where Councils provide the collected glass as a feedstock. This activity could happen at transfer stations or the glass could be provided to a third party location for processing. The likely final structure will depend on each Council's circumstances including consideration of factors such as:

- Distance to existing processing sites;
- Space available at transfer stations for stockpiling material;
- Space available at transfer stations for crushing operations; and
- Any internal Council demand for glass sand material produced.

Ricardo proposes that further assessment should be undertaken to investigate the feasibility of the preferred option for each Council, including the following:

- Confirm whether any partnering or similar arrangements will be in place for managing collected glass (e.g. joining with a neighbouring Council to achieve economies of scale)
- Confirm the business case for implementing the preferred option, specifically tailored to the relevant Council transfer station

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List of Acronyms

	Description
ASQ	Allstone Quarries
BAU	Business as usual
C&D	Construction and demolition
C&I	Commercial and Industrial
CDS	Container Deposit Scheme
COAG	Council of Australian Governments
DELWP	Department of Environment, Land, Water and Planning
FOGO	Food Organics Garden Organics
GO	Garden Organics
HDPE	High Density Polyethylene
LLDPE	Low Linear Density Polyethylene
LMWRRG	Loddon Mallee Waste and Resource Recovery Group
MCA	Multi criteria assessment
MRF	Materials Recovery Facility
PESTLE	Political, environmental, social, technological, legal and economic
PET	Polyethylene terephthalate
PS	Polystyrene
RISP	Recycling industry strategic plan
RRIM	Regional and Rural Infrastructure Model
SV	Sustainability Victoria
SWRRIP	Statewide Waste and Resource Recovery Infrastructure Plan
VRIP	Victorian Recycling Infrastructure Plan

1 Introduction

Loddon Mallee Waste and Resource Recovery Group (LMWRRG) engaged Ricardo Energy, Environment and Planning (Ricardo) to produce a Regional and Rural Infrastructure Model (RRIM) and recommendations report. The project aims to support investment in waste and resource recovery infrastructure within the Loddon Mallee Region.

The Loddon Mallee region is in the north west region of Victoria, extending from Macedon Ranges in the south to the border with South Australia and along the border with New South Wales. The region includes the eight councils of:

- Buloke Shire Council
- City of Greater Bendigo
- Gannawarra Shire Council
- Loddon Shire Council
- Macedon Ranges Shire Council
- Mildura Rural City Council
- Mount Alexander Shire Council, and
- Swan Hill Rural City

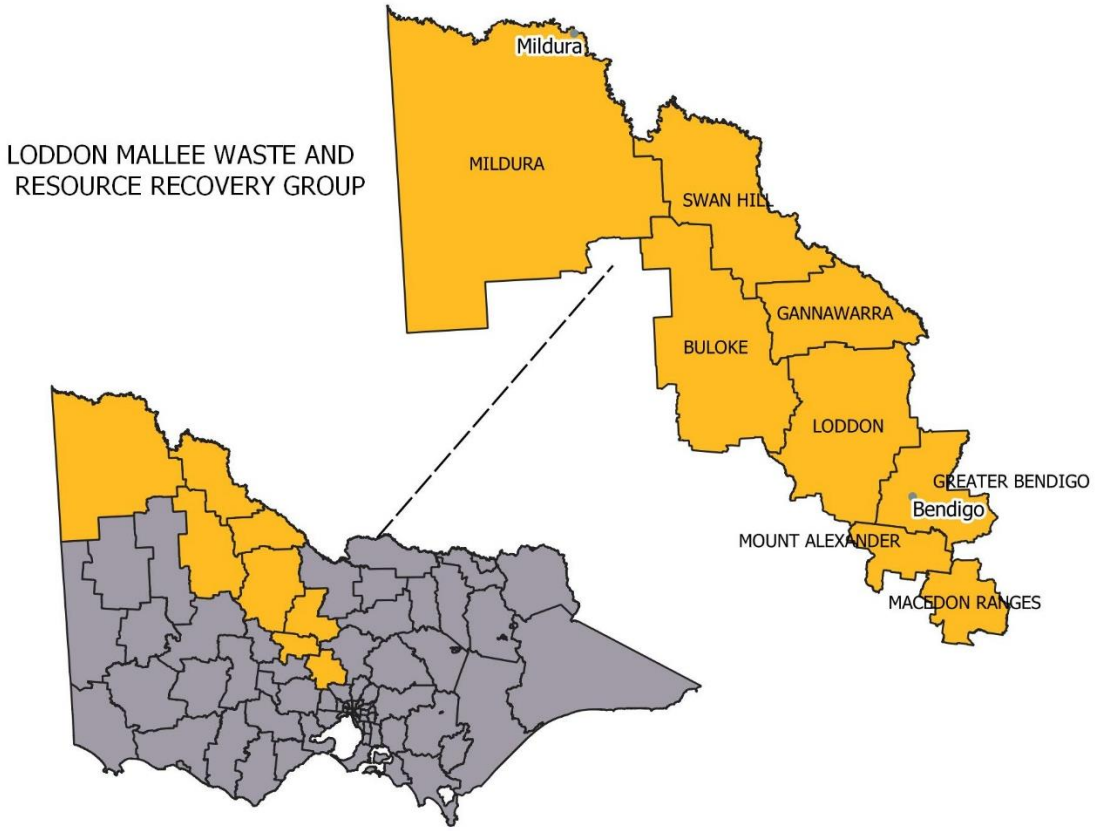

Figure 1-1 Loddon Mallee Region Councils

1.1 Background

The waste and resource recovery industry has experienced significant change in recent years both locally and internationally. These changes stem from China's implementation of their 'National Sword' Policy in 2018 which imposed strict contamination thresholds on the importation of solid waste materials. The collapse in commodity export markets and therefore lower prices for recovered recyclables led to significant instabilities in kerbside recycling systems. The financial impacts of the National Sword Policy were sorely felt by Material Recovery Facilities (MRFs) and local governments, as MRFs chose to increase their gate fees to offset the decline in revenue from recovered materials. SKM Recycling, a key processor of commingled recyclables in Victoria, collapsed within two years of the implementation of the National Sword Policy. The failure of SKM revealed a lack of local alternatives for the processing of commingled recyclables. The lack of infrastructure in some regions led to the landfilling of commingled recyclables, damaging public perceptions of local government kerbside services, and providing poor environmental outcomes for those materials.

SKM's downfall highlighted weaknesses in the Victorian recycling system and lack of clarity around the fate of recyclable materials. These weaknesses have been acknowledged by all levels of government, and actions are being taken to combat the issue.

Key developments include:

- Introduction of the '*Recycling Victoria, A New Economy*' Policy which seeks to reform the Victorian recycling system and transition the economy towards a more circular approach. Implementation of the Policy will also lead to a separate glass and food organics service for all residents, the roll out of a Container Deposit Scheme (CDS) and increased Landfill Levy rates.
- Council of Australian Governments (COAG) bans on the export of waste plastic, paper, glass, and tyres.
- Infrastructure Victoria's advice to the government regarding waste and resource recovery infrastructure requirements. A key recommendation from the advice was to improve infrastructure capacity and capability for recovering and reprocessing priority materials. An Infrastructure Gap Analysis was also completed which resulted in a recommendation for investment in approximately 87 resource recovery facilities across Victoria by 2039.

These changes to the waste industry have led to LMWRRG's recognition that investment in the region's waste and resource recovery infrastructure is needed. Increased system resilience, lower cost and local circular economy opportunities are key drivers for the RRIM.

1.2 Purpose and Scope

The aim of the project is to produce a regional and rural infrastructure model and recommendations to support investment in new regional infrastructure. The scope of the RRIM is limited to kerbside collected commingled recyclables and materials that are traditionally placed in the yellow bin, including consideration of the separation of glass as specified by the Recycling Victoria policy.

1.3 Methodology Summary

The methodology for the development of the RRIM followed four key steps, which included:

1. Information gathering:
    - Requests for Information were circulated to LMWRRG member Councils to obtain information on current and future recycling arrangements.
    - Stakeholder interviews were carried out with local recyclers and reprocessors to understand capacities and demand for recycled products in the region.
    - Regular discussions were held with the steering group to better understand the issues facing LMWRRG Councils and identify priority outcomes.

- A literature review of relevant policies and infrastructure analyses was carried out.

2. Options development
   - Three options were developed following discussions and feedback from the steering group.
3. Waste flow modelling
   - Baseline commingled recycling flows of all LMWRRG councils were modelled up to 2036, including the effect of introduction of separate glass recycling and CDS.
   - Waste flow modelling was then carried out for each of the options, incorporating the specific assumptions for each option into the baseline model.
4. Multi Criteria Assessment
   - A Multi Criteria Assessment based on a Political, Environmental, Social, Technological, Legal and Economic (PESTLE) framework was carried out to determine the best performing option.

2 Literature Review

Table 2-1 below summarises key documents and developments pertaining to commingled recyclable collections and separate glass collections and recycling.

Table 2-1 Summary of key documents and developments

Document/Developments	Key content
Recycling Victoria – A New Economy (The State of Victoria Department of Environment, Land, Water and Planning, 2020)	Seeks to reform the Victorian recycling system and transition the economy towards a more circular approach. Implementation of the Policy will lead to • a separate glass bin or access to glass services for all residents by 2027. • a separate food and garden organics (FOGO) bin or service for all residents by 2030. • the roll out of a Container Deposit Scheme (CDS) by 2022-23 • increased Landfill Levy rates by 2022-23. • Mandatory separation of commercial recyclable materials by 2025. The Policy also outlines the development of a new Waste Authority in 2021 to provide better governance of waste and recycling systems.
Recycling Industry Strategic Plan (The State of Victoria Department of Environment, Land, Water and Planning , 2018)	The Recycling Industry Strategic Plan (RISP) sets out the pathway to a resilient and efficient kerbside recycling in Victoria. The Plan identifies specific actions and funding allocations to achieve 4 overarching goals: • Stabilise the recycling sector. • Increase the quality of recycled materials. • Improve the productivity of the recycling sector. • Develop markets for recycled materials. Actions of the RISP are listed in Section 2.2 below.

Advice on recycling and resource recovery infrastructure in Victoria ((Infrastructure Victoria, 2020)	Infrastructure Victoria provided advice to the government regarding waste and resource recovery infrastructure requirements. Key recommendations included:
	• improve infrastructure capacity and capability for recovering and reprocessing priority materials.
	  ○ Improved sorting and recovery of plastics and paper/cardboard at MRFs.
	  ○ Additional glass beneficiation capacity and capability in metropolitan Melbourne.

Document/Developments	Key content
	○ Glass sand reprocessing and use in road construction in regional areas. ○ Assess the viability of establishing small to medium-sized MRF infrastructure in regional Victoria. ○ Optimise recovery centre and transfer station network to improve regional resource recovery. • Remove barriers and strengthen markets for priority materials. An Infrastructure Gap Analysis was also completed which resulted in a recommendation for investment in approximately 87 resource recovery facilities to provide an additional 3.2 million tonnes of capacity across Victoria by 2039.
Statewide Waste and Resource Recovery Infrastructure Plan (Sustainability Victoria, 2018)/ Victorian Recycling Infrastructure Plan (Sustainability Victoria, 2021)	The Statewide Waste and Resource Recovery Infrastructure Plan (SWRRIP) provides Victoria with a roadmap to guide planning and investment in waste and resource recovery infrastructure over the next 30 years. The goals of the SWRRIP are: • Only residual waste where all recyclable materials have been recovered are disposed to landfill • Aggregation of materials volumes to create viability in resource recovery • Waste and resource recovery facilities are managed to provide the best economic, community, environment and public health outcomes • Evidence based infrastructure planning The SWRRIP identified the following infrastructure gaps in the LM region: • Strategic planning of transfer station upgrades • Compaction capacity at transfer stations • Bulk haul consolidation centres • Pre-sort of residual waste The SWRRIP also identified a gap in organics processing capacity in the Loddon Mallee region. Eaglehawk and Mildura landfills were identified as hubs of state importance. Sustainability Victoria (SV) is currently in the process of updating the SWRRIP and the new document will be known as the Victorian Recycling Infrastructure Plan (VRIP). It is anticipated that this RRIM will provide valuable information as an input to the VRIP.
Kerbside Transition Plans	To facilitate the transition of kerbside systems to separate glass and FOGO services, the Department of Environment, Land, Water and Planning (DELWP) required councils to register their intent by the end of July 2020 to signal their willingness to develop a transition plan and be eligible for funding to implement the plan. The transition plans require councils to describe their current service model and the actions needed to implement the four bin or equivalent access service models. The plans will help DELWP to develop a comprehensive statewide transition plan.
Infrastructure Victoria Recycling and Recovery Gap Analysis (Infrastructure Victoria, 2020)	The Gap Analysis was conducted to inform Infrastructure Victoria's advice to government on Victoria's current and future waste and resource recovery infrastructure needs. The report identified significant levels of investment required in MRFs and secondary reprocessing, specifically: • Glass investment between $17.5m to $24.3m to manage 328,000 tonnes per annum

Document/Developments	Key content
	• Paper and cardboard investment between $163m to $205m to manage 2,040,000 tonnes per annum • Plastics between $367.9m to $511.28m to manage 515,000 tonnes per annum • MRF investment between $12m to $20m to manage 80,000 tonnes per annum See **Section 2.3** for further detail
National Waste Policy Action Plan (Australian Government - Department of the Environment and Energy, 2019)	The National Waste Action Plan presents targets and actions to implement the 2018 National Waste Policy. Key action areas are: • Ban the export of waste plastic, paper, glass and tyres. • Phase out problematic and unnecessary plastics. • Governments use their purchasing power to increase recycling. • Improve waste data collection and information sharing.
Ongoing statewide procurement project commissioned by MWRRG (Metropolitan Waste and Resource Recovery Group, 2021)	MWRRG is leading a statewide collaborative procurement project for all local governments to deliver facilities for processing kerbside recyclable materials while delivering economies of scale and reducing costs to Councils. Ricardo are aware that MWRRG is currently undertaking an analysis of preferred models. A summary of Ricardo's current understanding of the analysis is provided in **Section 2.4**.
Container Deposit Scheme (CDS)	The *Recycling Victoria – A new economy* policy commits the State to implement a CDS in Victoria by 2022-23. A discussion paper (The State of Victoria Department of Environment, Land, Water and Planning, 2020) was released on the proposed design in 2020, with community consultation occurring November 2020. The proposed governance model will include a scheme coordinator to administer the scheme and a network operator to manage the network of refund collection infrastructure. The scheme will be funded by the beverage industry. The scheme will also require councils and MRFs to participate in some form of refund sharing agreement for containers processed through kerbside recycling. A consultation report was released in March 2021 (The State of Victoria Department of Environment, Land, Water and Planning, 2021). The report found that the majority of respondents were supportive of the CDS objectives and proposed governance model. However, there are some concerns from local community groups and drinks manufacturers that the current proposed model would make it harder for community groups to make money and make drinks more expensive (Fowler & Smethurst, 2021).
Council of Australian Governments (COAG) Waste Export Ban	In August 2019, a decision was made by COAG to establish a timetable to ban waste exports while building Australia's capacity to generate high value recycled commodities. The ban seeks to phase out the export of waste plastic, paper, glass, and tyres by July 2024. The ban is driven by the collapse of the international waste export market, declining waste commodity prices and growing community concern over the fate of recyclable materials.

Further details on selected key documents are provided below.

2.1 Recycling Victoria – A new economy Policy

2.1.1 Glass recycling

Under Key commitment 5: *Reform the way households recycle, the Victorian Government is implementing changes to the household recycling system to reduce contamination and improve the recovery of recycling and material value.*

By 2027, all residents in Victoria will have a separate kerbside glass bin or access to glass recycling services, while the commingled recycling bin will only be used for combined paper, plastic and metals. In some remote rural areas where logistical and scale issues may be a barrier for an additional bin, an alternative service will be provided such as transfer stations or local drop-off points.

State Government will support Councils to aggregate waste volumes and pursue joint procurement of recycling services to allow for economies of scale.

The Victorian Government will review relevant existing guidelines, policies and regulation to make sure people living in diverse dwelling types, including multi-unit developments, have equitable access to best practice recycling.

2.1.2 CDS

By 2023/23, Victoria will introduce a container deposit scheme where most plastic, glass and metal drink containers can be returned at a collection point for a refund. This scheme is intended to recover clean and high quality material to be manufactured into new products.

The scheme will likely have the following effects on kerbside recycling:

- Divert drink containers out of recycling bins into collection points, hence reducing kerbside commingled recycling yields
- CDS eligible containers recovered through kerbside recycling and sent to MRFs will be subject to some form of revenue sharing agreements between MRFs and Councils

2.1.3 Landfill levy changes

The Victorian Government will increase the metropolitan landfill levy from $65.90/tonne to $125.90/tonne and the regional landfill levy from $33.03/tonne to $62.95/tonne by 2022/23 to discourage interstate waste transport and provide an incentive for further recycling.

2.1.4 Recycling infrastructure

The Victorian Government will establish the Recycling Victoria Infrastructure Fund to stimulate investment in infrastructure that targets recovery and processing of organic, plastic, paper, cardboard, glass, textile and tyre waste.

2.1.5 Mandatory separation of commercial recyclable materials

The Victorian Government will introduce new rules to require businesses to sort commonly recyclable materials and organic waste from unrecoverable wastes. It is expected that these rules will apply to businesses that do not use the kerbside recycling system. Materials to be separated from unrecoverable waste could include paper and cardboard, glass, plastics, metals and organic materials. The Victorian Government will consult with businesses to develop these rules, which are expected to come into effect by 2025.

2.2 Recycling Industry Strategic Plan

The goals and actions of the Recycling Industry Strategic Plan (RISP) are listed in **Table 2-2** below.

Table 2-2 RISP Actions

Goal	Definition	Actions
Stabilise the recycling sector	• Recycling industry continues to operate to ensure kerbside service continuity and minimise costs for households	• Support local government and industry to transition to new contract arrangements for recycling services • Improve contracting and procurement processes for recycling services
Increase the quality of recycled materials	• Households make informed & effective decisions on how to recycle • Systems for collection and processing of recycled material provide higher quality material streams	• Educate the community about recycling • Improve collection of recycled materials • Invest in recycling infrastructure to ensure market readiness of recycled products
Improve the productivity of the recycling sector	• The recycling sector is competitive, efficient and resilient • Recycling collection and processing are safe, sustainable and meet community expectations	• Collaborative procurement of recycling services • Improve safety and amenity of resource recovery facilities
Develop markets for recycled materials	• Markets for recycled material are maximised by creating opportunities and reducing barriers • Government and local government as consumers provide leadership in procurement. • Government, industry and the community partner, where appropriate, to share responsibility for products throughout their lifecycles. • Consumers understand how their purchasing behaviours can minimise waste and create demand for recycled materials.	• Drive demand for recycled products through government procurement • Support the development of end-markets for recycled materials • Industry and government collaboration to accelerate the design of products and packaging for sustainability, develop standards for products and access foreign markets

2.3 Infrastructure Victoria Gap Analysis

The Infrastructure Victoria Gap Analysis identifies sorting and secondary reprocessing requirements for commingled recycling materials through to 2039. Key findings relevant to LMWRRG by material type are summarised below.

2.3.1 Glass

Key findings:

- There is sufficient glass reprocessing capacity through to 2039.
- All glass reprocessing and glass sand processing is in Metropolitan Melbourne only. There is no regional reprocessing capacity. (Since the report was published, Allstone Quarries (ASQ) in the City of Greater Bendigo has developed regional reprocessing capacity. ASQ currently processes glass from Macedon Shire Council and the JJ Richards Bendigo MRF.

- There are regional opportunities for glass sand and aggregate processing, for use in local road and infrastructure construction. These will require collection and aggregation in regional hubs.
- There are opportunities for sand/aggregate plants with crushing, washing and grinding capabilities of up to 10,000 tonnes per annum in Bendigo, Mildura and Echuca (since the report was published, some of these opportunities have been developed and funded).

2.3.2 Paper

Key findings:

- The removal of glass from commingled recycling will improve quality of mixed paper recovered, which will facilitate an increase in consumption by Australian and overseas paper mills.
- However, with the introduction of the COAG waste exports ban for mixed and unsorted paper and carboard on 1 July 2024, there is insufficient reprocessing capacity and capability in Victoria to manage waste paper generation.
- The report proposes the development of an additional 40,000 tonnes per annum of MRF paper separation and sorting capacity in Bendigo and Echuca each.
- Additional reprocessing capacity is proposed in the Metropolitan Melbourne region.
- Commercial C&I recovery capacity is proposed in Metropolitan Melbourne, Ballarat and Geelong.

2.3.3 Plastic

- Current sorting and reprocessing infrastructure will be insufficient to manage future plastics generation, both from capacity and capability perspectives.
- There are no MRF facilities in Victoria that can fully meet the sorting requirements specified by the COAG export ban by 2022 for all input tonnes.
- MRFs will require improvements to operations to separate plastics through increased manual sorting, improvements to mechanical sorting or increased optical sorting.
- Further investment is required in plastics reprocessing infrastructure including to mechanically shred, wash, granulate, flake by single polymer type or pelletise by single polymer type.
- Investment in both metropolitan Melbourne and regional Victoria for additional reprocessing capacity is recommended.
- Regional Victoria has historically proven to be suitable for the reprocessing of plastics and there are opportunities for regional flaking and pelletising infrastructure.
- Two reprocessing facilities are recommended in Bendigo and one in Mildura, providing 10,000 tonnes per annum each of flaking and pelletising capacity.

2.4 MWRRG Joint Procurement Study

MWRRG are currently undertaking a market status report of the kerbside commingled recycling landscape in Victoria to assess the best MRF infrastructure model for the state. Ricardo's understanding is that the current preferred model is the hybrid model where all regional and metropolitan MRFs will continue to operate and be upgraded for increased capacity and capability.

The study has identified that a key consideration for the long-term resilience of the recycling value chain is the proximity of MRF infrastructure to secondary markets.

Further, the study also identified that the Infrastructure Victoria recommendations to government did not consider transport costs of recycling to MRFs and secondary reprocessing facilities.

2.5 LMWRRG Regional Implementation Plan 2016-2026

2.5.1 MRFs

The Regional Implementation Plan highlighted the challenges regional and rural MRFs face in competing with the financial economies of scale offered by transporting materials out of the region. Future needs identified include:

- Supporting market development and joint procurement
- Recovery of C&I waste
- Pre-sorting at landfills

2.5.2 Plastics reprocessing infrastructure

Plastics reprocessing in the region is concentrated in Mildura. Plastics processors outside of LMWRRG region require significant transport of typically high-volume, low-weight plastics. The Implementation Plan identified opportunities to increase recovery of plastics, particularly from the agricultural and industrial sectors, in the southern part of the Loddon Mallee region.

3 Summary of Current Infrastructure

The following section provides a summary of recovery, consolidation and reprocessing infrastructure servicing the LMWRRG region.

3.1 System Description

Commingled recyclables for all LMWRRG councils are currently collected fortnightly at the kerbside for residential properties in selected towns. Kerbside commingled recycling is consolidated at transfer stations where required and transported to contracted MRFs. Recovered materials are then sold by MRF operators to their various markets.

3.1.1 Kerbside configurations

Table 3-1 below lists the current standard kerbside collection system configurations for each of the LMWRRG councils. Macedon Ranges is the only council to have already introduced a separate kerbside glass recycling bin to all residents.

Table 3-1 Current kerbside collection system configurations

Local Government Area (LGA)	Residual	Commingled Recycling	Organics	Glass separate
Buloke Shire Council	120L Weekly	240L Fortnightly.		
Gannawarra Shire Council	120L Weekly	240L Fortnightly.	Garden Organics (GO) 240L Fortnightly.(opt-in)	
City of Greater Bendigo	140L Weekly	240L Fortnightly.	Food Organics and Garden Organics (FOGO) 240L Fortnightly.	
Loddon Shire Council	140L Weekly	240L Fortnightly.		
Macedon Ranges Shire Council	140L Fortnightly	240L Fortnightly..	FOGO 240L Weekly	140L Monthly
Mildura Rural City Council	120L Fortnightly	240L Fortnightly..	FOGO 240L Weekly	
Mount Alexander Shire Council	80/140L Weekly	240L Fortnightly..		
Swan Hill Rural City Council	240L Weekly	240L Fortnightly..	GO 240L Fortnightly (opt-in)	

The State Government has mandated separate glass recycling by 2027, whether through a separate kerbside bin or drop off points. Currently only Macedon Ranges Shire Council has introduced a glass service.

Each Council has developed and submitted a kerbside transition plan to identify how they will introduce glass services. The proposed configurations of the glass collections are outlined in **Table 3-2.**

Table 3-2 Future glass recycling scheme designs

LGA	Glass collection	Date of implementation
Buloke Shire Council	Drop off	2022
Gannawarra Shire Council	80L Monthly	2024
City of Greater Bendigo	Drop off	2022
Loddon Shire Council	Drop off	2027
Macedon Ranges Shire Council	140L Monthly (Commenced)	2020
Mildura Rural City Council	120L Monthly.	2026
Mount Alexander Shire Council	Drop off	2024
Swan Hill Rural City Council	120L Monthly	2025

3.1.2 Transfer stations

Table 3-3 below lists the number of transfer stations servicing LMWRRG councils' recycling streams.

Table 3-3 Loddon Mallee transfer stations

Council	Number of transfer stations
Buloke Shire Council	6
Gannawarra Shire Council	4
City of Greater Bendigo	4
Loddon Shire Council	6
Macedon Ranges Shire Council	3
Mildura Rural City Council	10
Mount Alexander Shire Council	2
Swan Hill Rural City Council	5

The transfer station network in LMWRRG is not expected to be a significant bottleneck to local circular economy operations as it is relatively low cost to build additional capacity.

3.1.3 MRFs

Table 3-4 below lists the MRFs currently servicing the Loddon Mallee region Councils.

Table 3-4 Loddon Mallee region MRFs

MRF	Address	Councils Serviced
Bendigo (JJ Richards)	5-11 Piper Ln, East Bendigo VIC 3550	City of Greater Bendigo
Echuca (Veolia)	11 Reliance Ct, Echuca VIC 3564	Gannawarra Shire Council, Mount Alexander Shire Council, Loddon Shire Council
Melbourne Regional Landfill[1]	1100-1152 Christies Rd, Ravenhall VIC 3023	Buloke Shire Council
Truganina (APR)	9 Felstead Dr, Truganina VIC 3029	Macedon Ranges Shire Council
Coolaroo (Cleanaway)	94 Maffra St, Coolaroo VIC 3048	Mildura Rural City Council, Swan Hill Rural Council

Figure 3-1 below is a visualisation of recycling MRF destinations for each Council. It can be seen that there are large transport inefficiencies for several councils. This is explored in further detail in **Section 5.2**.

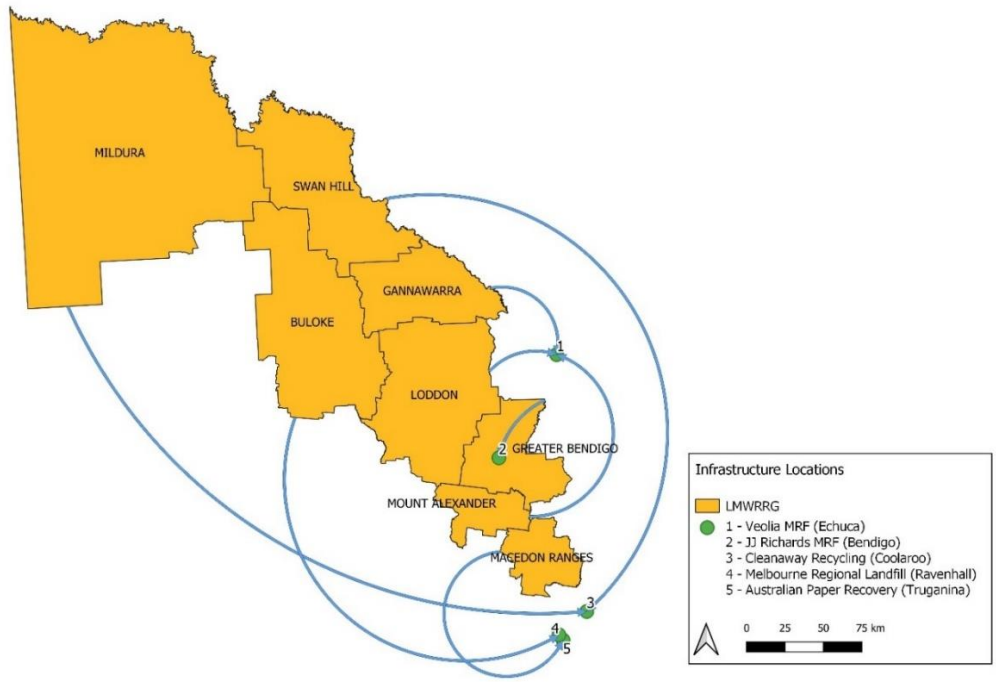

Figure 3-1 Recycling destinations

[1] The extent of processing that occurs at Melbourne Regional Landfill is unclear. To the best of Ricardo's knowledge there is no significant MRF infrastructure at the site. Ricardo has assumed that the material is further processed at an unknown location

3.1.4 Secondary Reprocessing

Table 3-5 below lists known reprocessing and remanufacturing facilities in the Loddon Mallee region.

Table 3-5 Reprocessing and remanufacturing facilities in the LMWRRG region

Site	Material	Location	Capacity/Demand
Allstone Quarries	C&D waste, glass	Greater Bendigo	Currently reprocess glass from Bendigo MRF (approximately 3,500 tonnes) and Macedon Ranges Shire Council (approximately 1,200 tonnes) Capacity to crush 600 tonnes per day. Aiming to crush over 50,000 tonnes per annum. Mobile plant, therefore able to travel to individual councils for stockpile crushing. Currently planning to install a glass wash plant due to NSW regulations for glass to be washed for use as sand substitute.
Hopley Demolition	C&D waste	Greater Bendigo	Not known. Potential to reprocess glass in future.
Epsom Sand and Soil	C&D waste	Greater Bendigo	Not known. Potential to reprocess glass in future.
IR Composite	Composite Recycled Plastics (LDPE, HDPE, PS)	Mildura	1,200 tonnes per annum capacity. Demand approximately. 600 – 700 tonnes per annum. Mostly process agricultural plastics. If additional material required, may source from plastics recyclers. If there was additional demand could take more material from Echuca and Bendigo
Fulton Hogan	C&D waste, glass	Mildura, Bendigo	Able to accept 20,000 tonnes per annum of crushed glass in Bendigo, and 2,000 tonnes per annum in Mildura
RPM pipes	Recycled Plastics (HDPE, LDPE)	Campaspe	Not known

3.2 Container Deposit Scheme

The upcoming CDS scheme is proposed to have a network operator responsible for collecting and consolidating CDS eligible materials and delivering them to recyclers.

The exact logistics arrangements for Victoria are not known at this time. CDS material is likely to be consolidated and sold into the commodity market as a high quality baled (or loose) recyclable material. This means that it is likely to be delivered to container manufacturers, unless the economics of transport from remote areas to reprocessing facilities are not feasible, in which case CDS material could be reprocessed locally via lower-order pathways (relative to container-to-container recycling) such as glass sand reprocessing.

Any future infrastructure business case should investigate revenue impacts of the Victorian CDS for Materials Recovery Facility (MRF) and transfer station operations and any potential partnership arrangements to gain access to the CDS material, or work as a network operator.

3.3 Infrastructure Limitations

Table 3-6 outlines the limitations on recovery and reprocessing infrastructure that could impact the selection of technologies for processing material from the Loddon Mallee region. These limitations dictate whether infrastructure solutions for particular materials are viable on a local, regional or state/national scale.

Table 3-6 Infrastructure Limitations

Infrastructure Type	Limitation
Glass processing	Glass crushing can be managed at a small scale, local level and generally doesn't have a minimum volume threshold. There are mobile and fee-for-service options which mean that the key limitation is the cost and environmental consequences of stockpiling glass to reach quantities that are cost effective for these service options. Consolidation of glass at a permanent site is also an option that is viable at a local and regional scale. Introduction of the CDS will provide a source of low-contamination and colour separated glass which is desirable for food grade glass manufacture. It is not recommended that a MRF seek to compete in providing colour separated glass.
Fibre - Pulp Mill	Requires large economies of scale which Loddon Mallee do not have. Pulp mills typically operate at over 100,000 tonnes per annum of product.
MRF	The minimum volume threshold for a MRF is approximately 20,000 tonnes per annum. Removal of glass from the feedstock can improve the maintenance requirements and longevity of the plant. Contamination through bagged material and non-recyclable material is a major issue for MRFs.
Local processing of mixed bales	Baling of material into a mixed bale presents small scale opportunities which can lead to transport efficiencies. Removal of glass is a good outcome for mixed baled material as it reduces the potential for contamination by glass fines.

Infrastructure Type	Limitation
LDPE/HDPE plastic remanufacture	Requires medium to large economies of scale.
Plastics Recycling Facility	Minimum threshold for a facility that processes MRF recovered mixed plastics is between 20,000 – 30,000 tonnes per annum.
Soft plastics processing	There is limited opportunity to include soft plastics processing at MRFs because this material emulates paper in current technology which means it typically contaminates the fibre output.
Metals	Ferrous metals are relatively simple to extract from a feedstock through a magnet and don't require minimum thresholds. Overseas markets for metals, including nonferrous metals such as aluminium, are stable.

3.4 SWOT Analysis

Table 3-7 SWOT analysis on current position

Strengths	Competitive, market driven process defining recycling outcomes Local MRFs have been retained as option for reprocessing	Lack of utilisation of group buying power Inefficient material flows across the region	**Weaknesses**
Opportunities	Leverage local remanufacturing capacity to process glass and plastics Promote local economic opportunities, including creating employment opportunities in the sector	Regional MRFs may fail due to lack of economies of scale Dispersed population and long travel times limit cost effective consolidation of waste	**Threats**

4 Waste Flow Modelling

The following section describes the key information and assumptions used in the waste flow modelling for the options.

4.1 Modelling Methodology

Baseline waste generation projections of household kerbside recycling were modelled from 2021 to 2036, taking into consideration existing recycling volumes, population forecasts, available recycling compositional data, implementation of glass services, and implementation of CDS.

The baseline model assumes that the future state of commingled and kerbside recycling in all scenarios will include separate glass services and CDS implementation, i.e., all modelled options have included the same assumptions for implementation of separate glass and CDS. The baseline waste flow model applies to all options.

Figure 4-1 below shows a visualisation of the baseline waste flow model.

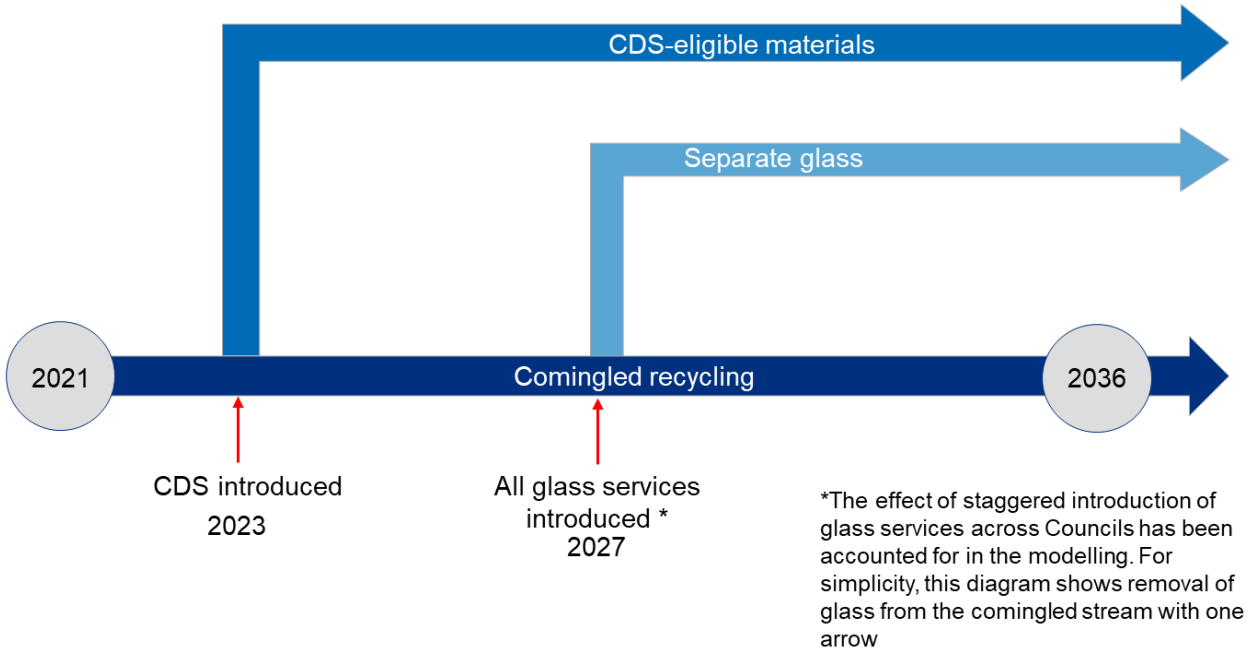

Figure 4-1 Visualisation of baseline waste flow model

4.2 Modelling Assumptions

4.2.1 Population forecasts

Table 4-1 below lists the population forecasts for the LMWRRG councils according to the Victoria In Future 2019 Population and Household Projections (The State of Victoria Department of Environment, Land, Water and Planning, 2019). Projections are available at 5-year intervals. Populations within the provided intervals were interpolated between boundary years on an annual average growth rate basis.

Table 4-1 Population projections

LGA	2021	2026	2031	2036
Buloke Shire Council	6,071	5,742	5,392	5,015
Gannawarra Shire Council	10,488	10,307	10,118	9,928
City of Greater Bendigo	122,241	132,973	143,511	153,759
Loddon Shire Council	7,510	7,448	7,408	7,347
Macedon Ranges Shire Council	51,851	56,035	60,235	64,643
Mildura Rural City Council	56,680	58,578	60,560	62,554
Mount Alexander Shire Council	20,010	20,672	21,238	21,814
Swan Hill Rural City Council	20,682	20,598	20,540	20,517

4.2.2 Recycling Volumes

Projected kerbside collected waste tonnages for 2020/21 were provided by LMWRRG and are detailed in **Table 4-2** below. Most of the region's tonnages (approximately 43%) are generated in Greater Bendigo, followed by Mildura (20%) and Macedon Ranges (11%).

Table 4-2 Recycling Tonnages

Council	Total commingled recycling generation (t)	Share of total regional generation
Buloke Shire Council	975	4%
Gannawarra Shire Council	875	3%
City of Greater Bendigo	12,000	45%
Loddon Shire Council	600	2%
Macedon Ranges Shire Council	2,900[2]	11%
Mildura Rural City Council	5,254	20%
Mount Alexander Shire Council	1,800	7%
Swan Hill Rural City Council	1971	7%
Total	**26,375**	**100%**

4.2.3 Recycling Composition

Recycling audit data was provided by Loddon Shire, Gannawarra, Mildura and Macedon Ranges. The data was consolidated into the following material categories:

- Plastics
- Glass
- Metal
- Paper/cardboard
- Contamination

Table 4-3 below provides the consolidated compositions used in the analysis. All other Councils were assumed to have the average composition of Loddon, Gannawarra and Mildura.

[2] The reported figure for Macedon Ranges' commingled recycling already has glass removed.

Table 4-3 Material compositions

Material	Composition			
	Loddon and Gannawarra	Mildura	Macedon Ranges	Loddon, Gannawarra and Mildura average
Plastics	10%	8%	11%	9%
Glass	30%	28.50%	0%[3]	29%
Metals	5%	3.50%	7%	5%
Paper/cardboard	39%	37.10%	67%	39%
Contamination	16%	23%	15%	18%

4.2.4 CDS

Assumptions for the impacts of the CDS for Victoria have been adapted from the Department of Environment, Land, Water and Planning's (DELWP's) guidance for use in transition planning. The estimated material diverted is shown in **Table 4-4** below.

Table 4-4 DELWP CDS Impacts

Material	% Remaining Post CDS
Plastics	82%
Glass	72%
Metals	82%
Paper/cardboard	100%
Contamination	100%

While the DELWP assumptions are the best available for the Victorian CDS, it is important to be aware that there will be fluctuations in the amount of material remaining in the kerbside system following the introduction of the scheme. Behaviour change modelling has not been completed to inform this.

4.2.5 Other assumptions

Table 4-5 below lists other parameters used in the material flow modelling of the options.

Table 4-5 Other modelling assumptions

Parameter	Value
MRF Sorting losses	10% of clean material
Proportion of HDPE in recovered plastics	36.3% of recovered plastics
Capture of ferrous metals at transfer stations	76.5% of available metals
Contamination removal at transfer stations	50% of contamination
Loss of clean material via contamination removal at transfer stations	5% loss of clean material

[3] Glass is classified as contamination when separate collections are in place. Macedon Ranges Shire Council has reported 2% of the commingled bin contains glass, but for purposes of the modelling this has been included in contamination.

5 Options Development

The purpose of the RRIM project is to identify opportunities to maximise local circular material flows. Several options were developed following discussions with stakeholders. These options were chosen for assessment as they were considered realistic or feasible options for the LMWRRG Councils. The options include:

- Option 1 – Optimise existing MRFs
- Option 2 – Maximise early diversion of recyclable materials
- Option 3 – Market pull

Alternative kerbside collection systems were not considered in the options development as there are significant cost and behavioural change barriers to overcome. It was agreed that the development of three options that were feasible and achievable in the scope of the report necessitated that the kerbside collection systems remain unchanged.

Table 5-1 Summary of Options

Option	Purpose	Key features
1 - Optimise existing MRFs	There are significant transport inefficiencies with the current recycling transport configurations, with several LMWRRG Councils having to pay for bulk transfer of commingled recycling over large distances towards Melbourne. There are 2 existing MRFs within, or close to, the LMWRRG Region (JJ Richards Bendigo and Veolia Echuca) that have sufficient capacity to receive all LMWRRG's recycling. Consolidation of LMWRRG recycling tonnages within local MRFs builds resilience in the system by maximising the utilisation of local recovery infrastructure and enables local circular economy opportunities at scale.	• Redirection of recycling tonnages away from metropolitan MRFs to local MRFs. • Maximising the throughput of regional MRFs. • Maximising opportunities for local CE at scale.
2 - Maximise early diversion of recyclable materials	There are key opportunities to remove materials from the commingled stream and generate local jobs, local circular economy opportunities and minimise long distance transport of materials that could be processed locally. This option would increase system resilience, reduce cost, particularly for remote councils, and maximise the utilisation of local recovery infrastructure and local circular economy opportunities.	• Diversion of glass to reprocessing. • Capture of contamination and metals to minimise transport volumes. • Local disposal or reprocessing of materials diverted.
3 - Market pull	The key reprocessing activities in the Loddon Mallee region are glass crushing and manufacture of products using HDPE and LDPE. These reprocessors have specific requirements for feedstock that could be met locally, including separate glass collections and separated plastics	• Diversion of glass to reprocessing. • Introduction of local plastics sorting to feed local manufacturers.

5.1 Options scoping

In the development of the following options, it was assumed that when a material is diverted, there is no net cost or saving to doing so. This assumption has been made on the basis that diverting material streams will increase their value by creating a cleaner stream (e.g. separated glass with low contamination from other materials, or increase the value of the remaining stream, (e.g. by removing contamination itself or removing glass to improve post-MRF fibre quality) and that this increase in value will fund the infrastructure and operational costs to divert the material. This assumption must be tested on a case-by-case basis. For example, where contamination that is diverted is disposed to landfill incurring a regional levy rate and the material would otherwise have been transported long distances, the benefits realised will be far greater than where a metropolitan levy rate is incurred and transport distances are short.

In addition, it has been assumed that the local reprocessing of material will be the most cost-effective method. In practice, where materials are separated, the commodity market, including established contracts, business relationships or transport networks may lead to materials being transported away from the region. The benefits to the local economy of local reprocessing jobs should be encouraged to ensure that the region obtains the maximum benefit from its waste products.

5.2 Option 1 – Optimise existing MRFs

Option 1 is centred around maximising the throughput into local regional MRFs to optimise transport efficiency and enable the scale of recycling volumes required for MRFs to realise reprocessing opportunities.

Table 5-2 below summarises the assumptions used in modelling Option 1.

Table 5-2 Option 1 Modelling Assumptions

Item	Detail
Material collection	• Kerbside commingled recycling and separate glass (both kerbside and separate drop-off) are collected and consolidated at local transfer stations and delivered to optimal MRFs.
Optimal MRF locations	• Recycling delivered to MRF destinations as listed in **Table 5-4** below.
MRF Processing	• Contamination and 10% process loss of clean materials from MRF operations disposed to landfill

Fate of materials	• Bendigo and Echuca MRFs:
	  ○ Recovered HDPE delivered to RPM for reprocessing.
	  ○ Recovered glass to Fulton Hogan or ASQ for glass sand reprocessing.
	  ○ All other materials transported out of region for recycling as per current arrangements.
	• APR Truganina MRF:
	  ○ All materials recycled as per other arrangements.

Cost	• Transport cost savings have been estimated based on a cost per tonne and distance basis. Based on information provided by Mount Alexander, a transport cost of $0.18/t/km was used to estimate the transport costs for each Council[4]. • The model has assumed no change in MRF gate fees. • Any additional collection costs associated with separate glass collections are considered out of scope as it is a legislative requirement and cannot be easily modelled at this stage. • There is potential for any increase in collection costs to be offset by reduced processing costs for separated glass.

Table 5-3 below shows the current MRF distances from each LGA, and the alternative closest MRF distances, calculated on one-way road distances.

Table 5-3 Travel distances to MRFs

Council	Current MRF	Current distance travelled[5]	Closest MRF	Distance to Closest MRF
Buloke	Melbourne RL (Cleanaway)	264 km	Bendigo JJ Richards	134 km
Gannawarra	Echuca (Veolia)	110 km	Echuca Veolia	110 km
Greater Bendigo	Bendigo (JJ Richards)	10 km	Bendigo JJ Richards	10 km
Loddon	Echuca (Veolia)	103 km	Bendigo JJ Richards	57.4 km
Macedon Ranges	Truganina (Australian Paper Recycling)	71.1 km	Coolaroo Cleanaway	57.4 km
Mildura	Coolaroo (Cleanaway, formerly SKM)	537 km	Echuca Veolia	383 km
Mount Alexander	Echuca (Veolia)	137 km	Bendigo JJ Richards	46.3 km
Swan Hill	Coolaroo (Cleanaway, formerly SKM)	336 km	Echuca Veolia	160 km

The analysis of MRF distances shows that for all councils other than Macedon Ranges, the closest MRFs to each council are either JJ Richards Bendigo or Veolia Echuca. This represents 8,200 tonnes of recyclables currently transported out of the region that instead could be recovered locally. Waste flow projections and market intelligence suggests that the Echuca and Bendigo MRFs have sufficient headroom capacity to accept all tonnes from LMWRRG Councils.

[4] Ricardo are aware that this rate may not be representative of transport costs for every scenario, particularly for shorter transport distances. This rate was used in this project as a verifiable provided data point.

[5] One way distance from LGA centroid to facility, using Google Maps

Figure 5-1 below shows the combined available headroom capacity at the Echuca and Bendigo MRFs. All LMWRRG tonnes can be redirected to the Echuca and Bendigo MRFs. There is capacity for growth if the identified capital investment in the Echuca MRF is delivered.

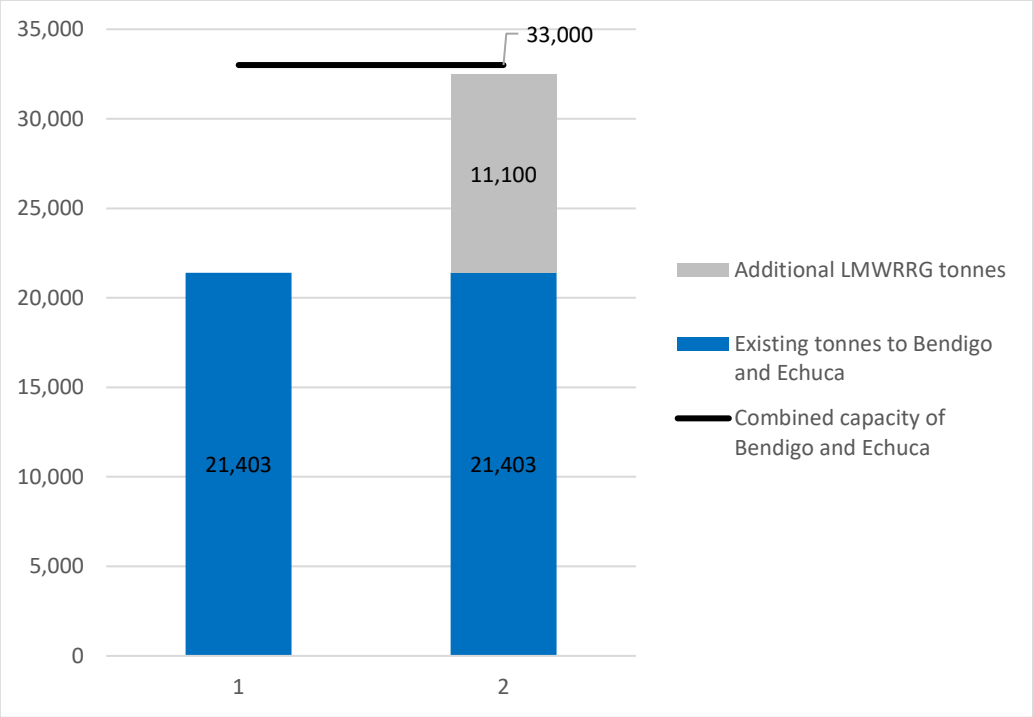

Figure 5-1 Available capacity at Echuca and Bendigo MRFs

In terms of transport inefficiencies within the region, Loddon and Mount Alexander both currently send recyclables to Veolia's Echuca MRF despite the closer proximity of JJ Richards Bendigo. For the analysis of this option, it has been assumed that Loddon and Mount Alexander will continue to send recycling to Echuca as it is considered a local regional MRF and the transport cost savings are not material. Further, the Echuca MRF, as a smaller scale facility, is heavily dependent on each of its existing customers and may not be feasible to operate if it were to lose any of its customers. The closure of the Echuca MRF would be considered a negative outcome for the system resiliency of the region.

The analysis also shows that Macedon Ranges is closer to the Cleanaway Coolaroo MRF that its current MRF, APR Truganina. Likewise with Loddon and Mount Alexander, the transport cost savings from redirecting recycling would be minor. Additionally, Macedon Ranges currently send a glass-free stream of recycling to Truganina as it already has a separate glass recycling service, which attracts major processing cost savings for Macedon Ranges due to a lower gate fee. Therefore this option maintains APR Truganina as the optimal MRF for Macedon Ranges.

Table 5-4 below summarises the potential transport cost savings if each LGA were to send recycling tonnes to the optimal MRF.

Table 5-4 Optimal MRFs and estimated transport savings

LGA	Optimal MRF	Estimated transport savings
Buloke Shire Council	Bendigo JJ Richards	49%
Gannawarra Shire Council	Echuca Veolia	0% (no change in MRF)
City of Greater Bendigo	Bendigo JJ Richards	0% (no change in MRF)

LGA	Optimal MRF	Estimated transport savings
Loddon Shire Council	Echuca Veolia	0% (no change in MRF)
Macedon Ranges Shire Council	Truganina APR	0% (no change in MRF)
Mildura Rural City Council	Echuca Veolia	29%
Mount Alexander Shire Council	Echuca Veolia	0% (no change in MRF)
Swan Hill Rural City Council	Echuca Veolia	52%

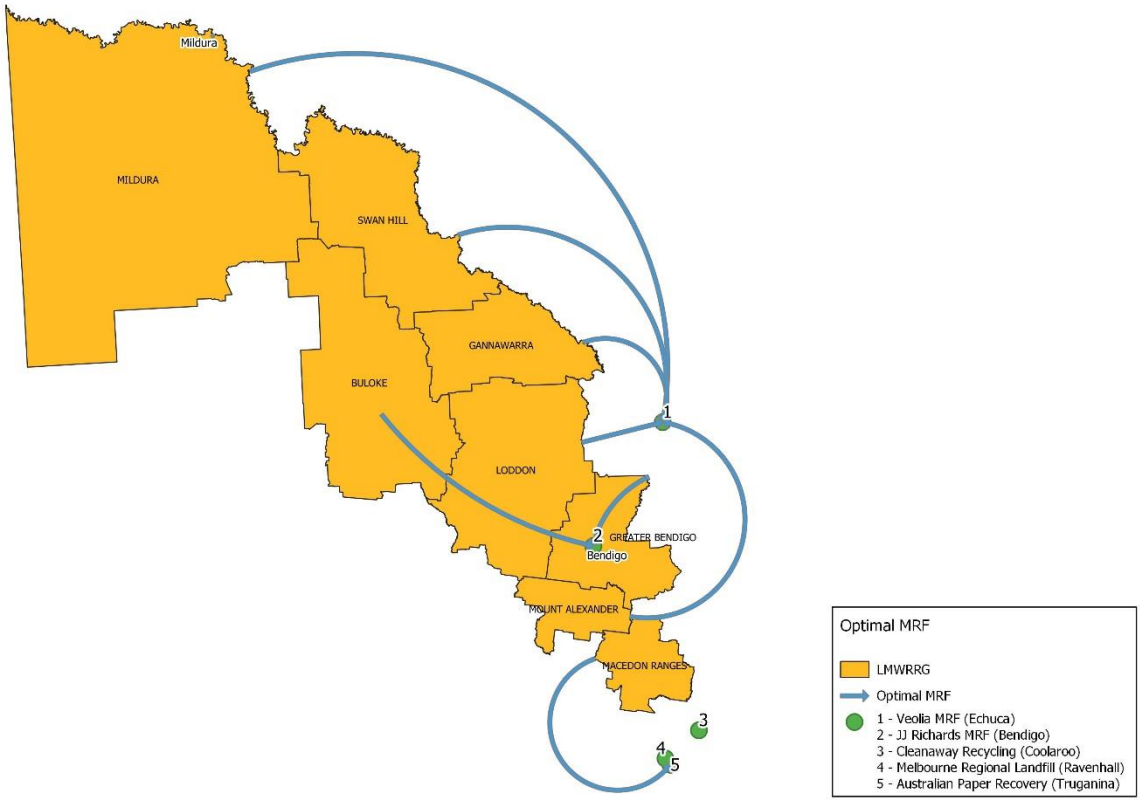

Figure 5-2 Optimal MRFs

Under this option it is assumed that the MRFs would take ownership of collected materials and sell recovered resources to existing offtake markets. Glass will be sold to local regional processors. Fulton Hogan have stated that they can take up to an additional 20,000 tonnes of crushed glass in Bendigo and 2,000 tonnes in Mildura, while Allstone Quarries have also stated that they can receive additional glass in Bendigo.

Option 1 also assumes that both the Echuca and Bendigo MRFs will continue to sort plastics by type, with HDPE washed and flaked outside the region and brought back to RPM Pipes and other manufacturers for reprocessing.

5.3 Option 2 – Maximise Early Diversion

Option 2 is centred around maximising the diversion of materials as early as possible before recycling is sent to a MRF. The rationale for diverting materials early is to maximise local reprocessing opportunities. This prevents unnecessary export of materials outside the region. Based on the

infrastructure limitations identified in **Section 3.3** and the available tonnes of recycling material in the region, appropriate opportunities for early diversion of recyclables are:

- Glass processing: Consolidation of glass at the existing transfer location, crushing and local use as construction material or aggregate
- Separation of ferrous metals: Magnet separation of ferrous metals for resale to a local consolidator as an additional income stream.
- Manual pre-sort of contaminants: Primary removal of contaminants at existing transfer location and transport to landfill for disposal

Paper/cardboard and plastic are not suitable for early diversion mainly due to lack of scale and processing capacity within the LMWRRG region. Paper/cardboard remanufacturing requires very large economies of scale. Paper separation by type (such as office paper, cardboard, magazines etc.) at the kerbside is not feasible due to complexities in collection arrangements and behaviour change. Separation of paper by type at the MRF level requires larger economies of scale due to capital and operational cost requirements. Further separation at the MRF level defeats the purpose of Option 2 which is to carry out diversion before the MRF stage.

While there is remanufacturing capacity for certain plastics in the region, this relies on having clean plastics separated by type (PET, HDPE etc). Like paper/cardboard, early separation of plastics at the kerbside is not feasible. Plastics separation at the MRF stages requires at least 20,000 tonnes per annum to be feasible. Further, the CDS does not capture all plastics; some minor volumes of CDS materials could be processed locally at reprocessors such as Integrated Recycling and RPM pipes

Table 5-5 below lists the modelling assumptions for Option 2.

Table 5-5 Option 2 Modelling Assumptions

Item	Detail
Material collection	• Kerbside commingled recycling and separate glass (both kerbside and separate drop-off) are collected and consolidated at local transfer stations for pre-sorting of metals and contamination
Transfer station pre-sort	• All ferrous metals in commingled recycling (76.5% of all metals) are removed at transfer stations prior to delivery to MRFs. • 50% of contamination in commingled recycling is removed at transfer stations. • 5% of overall remaining clean non-metal materials are lost during the contamination removal process.
Fate of materials captured at pre-sort	• Removed metals are sold to local scrap metal recyclers. • Contamination and clean losses are managed by Councils and disposed of in local landfills
Remaining commingled recycling	• Remaining commingled recycling is then delivered to existing servicing MRFs
MRF Processing	• Contamination and 10% process loss of clean materials from MRF operations disposed to landfill
Fate of materials	• All materials recovered at MRFs recycled as per current arrangements.

Item	Detail
Cost	• Transport cost savings have been estimated based on the avoided cost of transporting removed metals and contamination to existing MRFs on a cost per tonne basis. • The model has assumed MRF gate fees remain constant. • Any additional collection costs associated with separate glass collections are considered out of scope as it is a legislative requirement and cannot be easily modelled at this stage. • There is potential for any increase in collection costs to be offset by reduced processing costs for separated glass.

5.3.1 Glass

Early diversion of glass is viable for LMWRRG councils as there is high local demand for crushed aggregate. Mandated separate glass collections and the upcoming CDS will mean that glass will bypass existing recovery routes and be sent directly to reprocessors.

The current and alternative flows for glass are shown in **Figure 5-3** below. Glass in the commingled recycling stream is currently sent to MRFs where sorted glass and glass fines are then reprocessed into glass sand. The introduction of separate glass collections should in theory divert all glass out of the commingled material stream, but there may still be small amounts of glass remaining which would be captured by the MRFs.

Separated glass collections and drop off will cause glass to flow directly to glass sand reprocessors, bypassing MRFs. This is already occurring with Macedon Ranges who send glass to Allstone Quarries in Greater Bendigo.

The CDS offers a higher order environmental outcome, with colour sorted glass containers able to be sent directly to glass beneficiation and remanufacture of new containers. However, this is dependent on logistics considerations of the CDS in the region. A possible outcome is that CDS recovered containers may flow to glass sand reprocessors if the demand for glass sand and the transport efficiencies outweigh the demand for recycled containers.

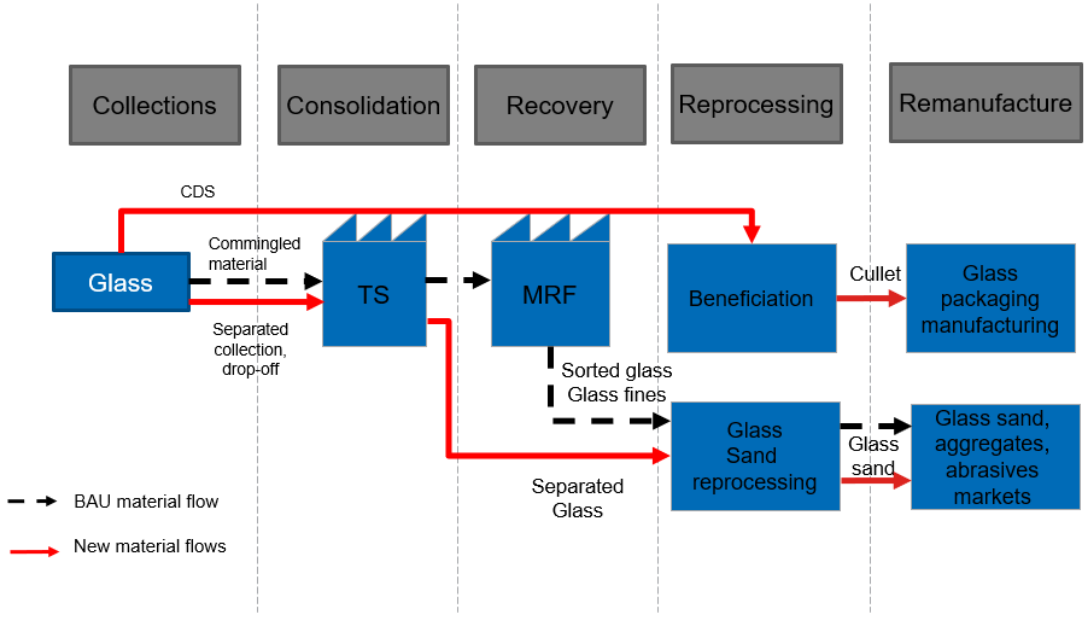

Figure 5-3 Glass material flow

5.3.2 Metals

Early diversion of metals is viable at transfer stations due to the relative ease of the separation process. It has been assumed that only ferrous metals are diverted. The diversion of non-ferrous metals through eddy current separation was considered but discounted as being too expensive and difficult to achieve at small scale. Ferrous metals recovered at transfer stations can bypass MRFs and be sold directly to scrap metal recyclers or exported. The sale of ferrous metals presents a relatively stable opportunity to generate additional income for Councils due to strong markets. However, it is important to note that the sale of metals to reprocessors is a key income stream for MRF operators and that removal of metals from the recycling stream may lead to MRFs operators increasing the gate fee for an overall less valuable feedstock.

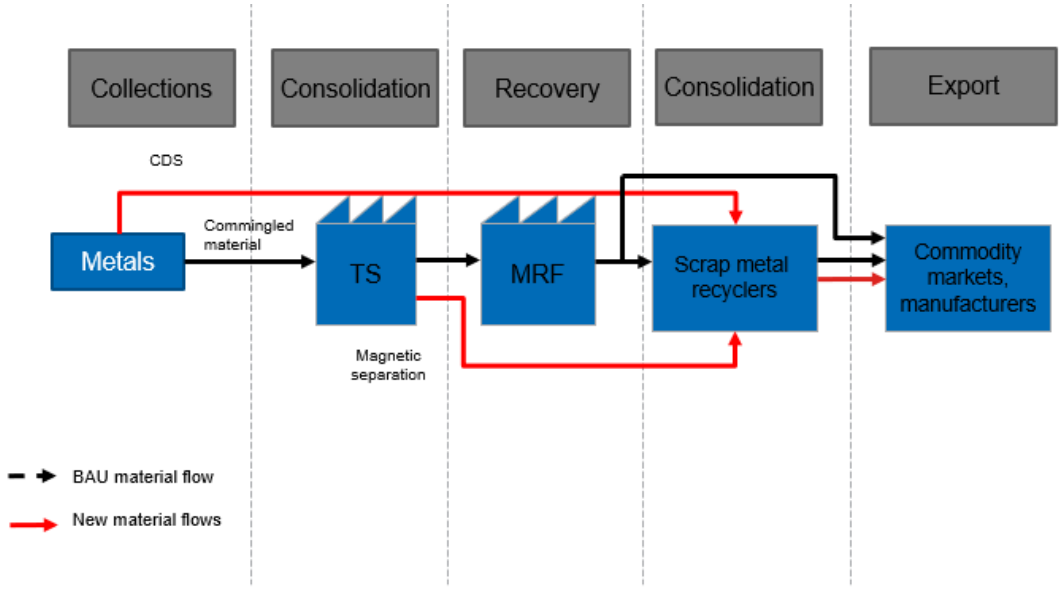

Figure 5-4 Metals material flow

5.3.3 Contamination

Contamination management is a key issue for MRFs, where the cost of managing contamination is usually passed back on to the Councils. Early removal or reduction of contamination before material is sent to the MRF will result in lower fees paid to MRFs.

Recycling contamination can be relatively easily removed or reduced at consolidation points and transfer stations through manual picking with an excavator prior to loading the material into bulk-haul trucks. Contamination can then be disposed at local landfills at a lower rate than is charged in metropolitan Melbourne.

5.4 Option 3 – Market pull

Option 3 is designed to prioritise recovery of materials that have strong local demand for reprocessing. The key reprocessing opportunities in the Loddon Mallee region are glass crushing (Fulton Hogan and Allstone Quarries) and manufacture of products using HDPE (such as RPM Pipes and Integrated Recycling). These reprocessors have specific requirements for feedstock that could be met locally, including separate glass collections and separated plastics.

The future state of separate glass collections is conducive to the requirements of local glass sand reprocessors, as such no additional change to collection or recovery arrangements is proposed. Separated glass can be crushed onsite (using mobile crushing equipment) or consolidated at local transfer stations to be directly transported to local glass reprocessors.

RPM Pipes, a manufacturer of pipes from recycled HDPE, are able to receive washed and flaked post-consumer HDPE. Current MRFs servicing LMWRRG councils do not have the capability at present to wash and flake sorted plastics. APR and Echuca currently have plastics sorting capabilities. It is proposed that sorted HDPE and remaining mixed bales from MRFs be consolidated and transported to a specialised plastics washing and flaking facility, such as GT Recycling in Geelong. Flaked HDPE can then be transported back to plastics reprocessors in or around the LMWRRG region for use in local product manufacture. This option would also align with the MWRRG Joint Procurement Study recommendation for increased plastics reprocessing in the Loddon Mallee region. Ricardo suggests that LMWRRG work with neighbouring waste and resource recovery groups to establish more local options to wash and flake plastics, in line with these recommendations.

Table 5-6 below lists the modelling assumptions for Option 3.

Table 5-6 Option 3 Modelling Assumptions

Item	Detail
Material collection	• Kerbside commingled recycling and separate glass (both kerbside and separate drop-off) are collected and consolidated at local transfer stations before delivery to existing MRFs (no change from BAU)
MRF Processing	• Contamination and 10% process loss of clean materials from MRF operations disposed to landfill
Fate of materials	• HDPE and other recovered plastics from all MRFs consolidated and transported to specialised plastics washing and flaking facility. • Flaked HDPE transported back to RPM Pipes for reprocessing in the LM region. • Glass delivered to Bendigo and Echuca is reprocessed locally at Fulton Hogan or ASQ • Other materials recycled as per existing arrangements
Cost	• Any additional collection costs associated with separate glass collections are considered out of scope as it is a legislative requirement and cannot be easily modelled at this stage. • There is potential for any increase in collection costs to be offset by reduced processing costs for separated glass.

5.5 Quantitative assessment

For each of the options, material flows were modelled, with the assumptions outlined in **Section 4**. **Table 5-7** below summarises the modelling results of the recovery rates, local reprocessing rate and potential transport savings of the Options, in the year 2028[6]. The quantitative assessment was carried out for the Loddon Mallee region as a whole.

[6] 2028 was chosen as the reference year as it is that the first year when all separate glass and CDS services will be online and population data is available.

Table 5-7 Modelling results

Outcome	Option 1	Option 2	Option 3
Recovery rate	77%	75%	77%
Local reprocessing rate	31%	31%	32%
Transport savings	29%	17%	0%

Options 1 and 3 have the highest recovery rate. Option 2 has a marginally lower recovery rate because of a small loss of clean recyclable material during contamination removal at transfer stations. Options 1 and 3 have the same recovery rate because there is no change in the resource recovery configuration, i.e., all recyclable materials are collected and delivered to MRFs in the same manner, with the only difference being the destination MRFs, for which it has been assumed there is no change in recovery rate.

All three options show a similar local reprocessing rate. In Option 1, all non-CDS glass is reprocessed locally, and MRF HDPE is returned to the region to be reprocessed locally. Option 2 has a marginally (less than 1%) higher CE rate than Option 1 due to the separated metals at transfer stations. Option 3 has a slightly higher CE rate than Option 1 as it is assumed that HDPE from all MRFs will be reprocessed locally, while in Option 1 Macedon Ranges' plastics recycling at the Truganina MRF will continue to current markets.

Table 5-8 Local reprocessing

Materials processed locally	Option 1 (tonnes)	Option 2 (tonnes)	Option 3 (tonnes)
MRF-sourced Glass	1,199	748	1,199
MRF-sourced HDPE	616	82	714
Early diversion Glass	5,264	5,264	5,264
Early diversion Metals[7]	0	817	0
All recycled material	*22,783*	*22,200*	*22,783*
Local CE Rate (%)	**31%**	**31%**	**32%**

Option 1 provides the highest transport cost savings due to the redirection of recycling tonnages from metropolitan Melbourne MRFs to regional MRFs. Option 2 provides transport cost savings from the recovery of metals at local transfer stations and the avoided transport for contamination, however there is likely to be additional economic value generated from the sale of the recovered metals that is not captured in the calculated transport cost savings. Option 3 does not provide any additional transport cost savings.

5.6 Applicability of options

The quantitative assessment in Section 5.5 above was carried on the Loddon Mallee region as a whole. Each of the proposed options may be more or less applicable for each Council. The tables below summarise the key criteria for success for each option.

Table 5-9 Drivers of feasibility for Option 1

Characteristic	Factors that support the feasibility of the option	Factors that oppose the feasibility of the option
Transport distances	Option 1 favours Councils that are transporting recyclables over long	Councils that are close to metropolitan MRFs may not

[7] Despite export being the main end market for recovered metals, separated metals are considered to contribute to the local CE rate as they generate local economic value via separation at council owned transfer stations.

Characteristic	Factors that support the feasibility of the option	Factors that oppose the feasibility of the option
	distances, but have closely situated local MRFs, where the savings in transport costs would outweigh an increase in gate fees.	experience significant transport savings from Option 1.
Quantity of recycling and gate fees (economies of scale)	Metropolitan MRFs are able to offer more competitive gate fees than regional MRFs. Option 1 may be more favourable to Councils with smaller volumes of recycling, as the effect of higher gate fees of regional MRFs on smaller volumes may not significantly add additional costs.	Councils with large volumes of recycling may save significant amounts in total gate fees by utilising Metropolitan MRFs.
Political/Strategic drivers	Option 1 favours Councils that prioritise local jobs and the availability of regional services.	Councils that prioritise maximum diversion and resource recovery may not favour Option 1, due to the ability of Metropolitan MRFs to offer higher recovery rates (better separation technology).
Level of contamination	Where contamination is high, regional MRFs may be able to avoid paying metropolitan waste levy fees on contamination removed, reducing the cost of contamination per tonne	

Table 5-10 Drivers of feasibility for Option 2

Characteristic	Factors that support the feasibility of the option	Factors that oppose the feasibility of the option
Quantity of recycling (economies of scale)	Requires sufficient volumes of recycling, to justify capital and operational expenditure of additional infrastructure.	Small volumes of recycling may make removal of some materials inefficient.
Contamination	Councils with higher amounts of contamination may save more from reduced MRF gate fees and transport costs. Councils with regional landfills would incur lower disposal costs and therefore save more.	Manual contamination removal may not be necessary for Councils with low contamination. Councils located close to Metropolitan MRFs may not incur lower disposal costs (due to higher landfill levies) and will not save on transport.
Transfer station size and configuration	Existing transfer stations would need to have sufficient space and capacity to house additional infrastructure. Existing transfer stations would require the ability to implement a bulk haul loading system that incorporates conveyors to remove metals.	May not be feasible for Councils with small transfer stations. May not be feasible for bulk hauling systems that are contracted externally or use systems such as push pits.
Access to local metal recyclers	This option requires access to closely located metal recyclers/traders, or close enough that the revenue from sales of metals exceeds additional transport costs.	Lack of access to metal recyclers/traders.
Method of glass collection	Collection methods that achieve central consolidation of glass volumes would make this option more feasible.	A contracted service and/or decentralised glass collections would make this option less feasible.
Political/Strategic drivers	Option 2 favours Councils that prioritise local jobs, local circular economy, and system resilience.	Councils that outsource waste management with minimal technical involvement or have severely limited resources to manage waste services.
Transport distance	Option 2 favours Councils that are transporting recyclables over long distances where the savings in transport costs would outweigh an increase in gate fees or operational costs.	Councils that are close to Metropolitan MRFs may not experience significant transport savings.

Table 5-11 Drivers of feasibility for Option 3

Characteristic	Factors that support the feasibility of the option	Factors that oppose the feasibility of the option
Access to reprocessors and remanufacturers	Option 3 is dependent on good access to glass and plastics reprocessors, and the ability for reprocessed material to be purchase back into the LM region by local remanufacturers.	Lack of access to reprocessors and manufacturers.
Political/Strategic drivers	Option 3 favours Councils where there are strong circular economy drivers.	-
Market demand	High market demand for recycled plastics and glass.	Low market demand for recycled plastics and glass.
Method of glass collection	Collection methods that achieve central consolidation of glass volumes would make this option more feasible.	A contracted service and/or decentralised glass collections would make this option less feasible.

6 Multi Criteria Assessment

A multi criteria assessment (MCA) is a decision-making tool used to help compare different options where some impacts are not easily translated into monetary terms. The MCA tool used for the RRIM assessed the three options through political, environmental, social, technological, legal, and economic (PESTLE) lenses. Each criteria was assigned a weighting of 1, 2 or 3 with 3 being the highest importance/priority to the project, based on discussions with the LMWRRG project steering group .

The criteria considerations are shown in **Table 6-1** below.

Table 6-1 MCA Considerations

Area	Criteria	Consideration	Weighting
Political	Governance arrangements	Across the region, does the option have clearly defined boundaries of roles and responsibilities among stakeholders?	1
Political	Existing objectives / policies	How well does this option align with current policies / objectives?	1
Political	Control of material fate	To what degree does the Option give the region greater control on the fate of its recyclables?	2
Environmental	Resource recovery	To what degree does the option support the recovery of commingled recyclables?	1
Environmental	Circular economy	How well does the option support local reprocessing of recyclables?	3
Social	Community engagement	How will the region's community view the option?	3
Social	Social Equity	To what degree does the option support equality of service and cost across the region	3
Social	Behaviour change	To what degree will the option require behaviour change from the community?	2
Technological	Quality	How well does the option improve the quality of processed recycled materials?	1
Technological	Resilience	How well does the option respond to changes in feedstock (composition and volume)?	3
Technological	Resilience	Is the MRF capable of adjusting for higher or lower contamination?	2
Technological	Resilience	Do we have a robust remanufacturing market or is it limited to only one remanufacturing option?	2
Legal	Legislations, regulations and policies	How well does the option align with current and impending legislative framework?	1
Economic	Operational costs	To what degree does the option impact costs for the region?	3
Economic	Resilience	How well does the option future proof the region to changes in the waste industry?	2
Economic	Markets	To what degree does the option support the development of markets for recycled material?	2

A simple scoring task was then completed by the Ricardo project team. The rating system is described in **Table 6-2** below.

Table 6-2 MCA Scoring System

Scoring	Description
-3	Significantly worse than base case
-2	Worse than base case
-1	Slightly worse than base case
0	No change from base case
1	Slightly better than base case
2	Better than base case
3	Significantly better than base case

6.1 MCA Results

Table 6-3 below shows the results. Option 2 is the preferred model for the region with the highest overall score of 34, followed by Option 1, scoring 26 and then Option 3, scoring 22.5.

Table 6-3 MCA Weighted Results

Criteria	Weighting	Option 1	Option 2	Option 3
Governance arrangements	1	0	0	-1
Existing objectives / policies	1	1.5	2	2
Control of material fate	2	1	4	4
Emissions	1	2	1	2
Circular economy	3	6	6	6
Community engagement	3	1.5	4.5	4.5
Social Equity	3	3	1.5	0
Behaviour Change	2	0	-1	0
Quality	1	0	2	2
Technological Resilience – feedstock	3	1.5	3	3
Technological Resilience – contamination	2	0	0	0
Technological Resilience – remanufacturing	2	0	1	1
Legislations, regulations, and policies	1	0.5	1	1
Operational costs	3	9	6	0
Economic – Resilience	2	0	2	3
Economic – market development	2	0	1	1
Total weighted result		26	34	22.5

Option 2 was chosen as the optimal solution, with its high scoring due to a broad range of factors. Option 2 scored higher than Option 1 in control of materials, community acceptance and its technological and economic resilience. While Option 1 showed greater potential for cost savings, these opportunities could be built into future procurement activities even if Option 2 is pursued.

6.2 Preferred Option details

The separation of glass will necessitate additional space to be dedicated at transfer stations to handle the collected material. This material must then be either processed further onsite before being sold as a product, or bulk-hauled to a processing facility. Feedback from glass reprocessors suggests that glass crushing infrastructure could be owned by the glass sand manufacturer rather than individual councils, and mobile glass crushing may be an effective solution. Typically quantities of 200 to 400 tonnes of material would allow for the set up and running of a mobile crusher (assuming a week-long campaign run), and material should be consolidated to achieve these volumes. The length of time

between campaigns should be determined by the environmental risk associated with stockpiling and the efficiency involved with campaign-style crushing.

The decontamination activity is a basic form of manual picking, completed with an excavator to handle areas of contamination within the incoming commingled feedstock. A similar activity has been undertaken by the City of Ballarat, where large identifiable contamination is removed from the recycling stream at a consolidation point. While the basic approach of picking means that some recycling is removed, and some contamination passes through, the City of Ballarat estimate that 7-10% of the material stream by weight is removed by this process, including up to 50% of the contamination.

The suggested metals and contamination removal process as outlined in the preferred option is:

1. Commingled material is delivered to existing consolidation points, such as transfer stations, by kerbside collection vehicles. The commingled material is consolidated with other incoming loads of material.
2. An excavator picks out areas of contamination, such as bagged material, and places the contamination in a separate area. Hand picking may be an alternative approach.
3. Contamination is transported to landfill
4. Sorted recycling is loaded onto a conveyor belt
5. The material on the conveyor passes under an over belt magnet which removes the ferrous metals
6. Ferrous metals are stockpiled separately until they are collected for export
7. The remaining material continues on the conveyor belt and is top loaded into a bulk haul truck which transports it to a MRF

6.3 Procurement options

The preferred option is a local solution to divert materials at transfer stations and maximise local reprocessing opportunities and as such the procurement opportunities associated with this option are specific to each council.

The high level infrastructure ownership options include:

- Council-owned and operated (or operations contracted out)
- Fee for Service
- Third party provided to Council requirements

As the contamination and metals removal infrastructure is to be located at transfer stations and contributes to the loading of material for bulk haulage, it is suggested that the infrastructure should be council owned to ensure that the primary function of bulk haulage of materials continues to be efficiently delivered. The contamination removal can then also be optimised to ensure that the net benefit to Council due to reduced MRF contamination charges is maximised.

The delivery of glass processing infrastructure has been suggested by third parties to be available as a fee for service model where Councils provide the collected glass as a feedstock. This activity could happen at transfer stations or the glass could be provided to a third party location for processing. The likely final structure will depend on each Council's circumstances including consideration of factors such as:

- Distance to existing processing sites;
- Space available at transfer stations for stockpiling material;
- Space available at transfer stations for crushing operations; and
- Any internal Council demand for glass sand material produced.

It is suggested that each Council consider the business case for implementing the proposed solutions for their specific situation.

6.3.1 Procurement Clusters

Given the preferred solution does not substantially change the MRF processing solutions, there are fewer drivers for establishing procurement clusters. The scale required for the effective processing of separated glass collections may require smaller Councils such as Loddon, Gannawarra, Swan Hill, Buloke and Mt Alexander to partner with a neighbouring council to achieve economies of scale.

Where Councils wish to pursue future MRF contracts, there are some natural procurement clusters that are created around the existing MRFs.

The Councils closest to the Echuca MRF are:

- Mildura Rural City Council
- Swan Hill Rural Council
- Gannawarra Shire Council

These three Councils share a remoteness from Melbourne and could attract a proposal from Veolia at Echuca or a new service located closer to Mildura. This grouping could also effectively transport material further south to locations such as Bendigo.

It is worth noting that due to the transport links, material from Mildura could be transported to Bendigo at a similar transport distance, however unless there is a clear benefit to utilising this over the Echuca MRF it is suggested that the Echuca MRF should be preferred to maintain volumes at each location.

The Councils closest to the Bendigo MRF are:

- City of Greater Bendigo
- Buloke Shire Council
- Loddon Shire Council
- Mount Alexander Shire Council

These Councils are centred around the City of Bendigo and this grouping could generate sufficient quantities of recyclable material to create investment in a MRF located in Bendigo (assuming that further material can be attracted to the area from other surrounding Councils or from C&I sources).

The remaining Council, Macedon Ranges Shire Council, is equally able to access the Bendigo area or metropolitan Melbourne. As such, it is unclear whether there are sufficient drivers for Macedon Ranges Shire Council to join in a collective procurement exercise and achieve buying power, or to retain access to the metropolitan market without the need to consider the needs of other parties.

6.3.2 Waste Authority

‘Recycling Victoria: A New Economy’ outlined the development of a new Waste Authority. This new Authority has three key functions of the authority as noted:

- Consistent recycling and waste practices
- Strengthening councils’ contribution to improving performance of the system
- Ensuring providers contribute to Victoria’s waste and recycling goals

The Waste Authority may take on some of the functions of existing government entities, including functions of the Waste and Resource Recovery Groups, which includes LMWRRG, and infrastructure planning currently undertaken by the WRRGs and Sustainability Victoria. It is possible that the Waste Authority will have statutory powers to procure waste infrastructure, which may include the ability to hold contracts with infrastructure providers and the power to compel local governments to remain committed to a procurement process.The development of the Waste Authority may impact how the RRIM is procured and implemented.

6.4 Next steps

The next steps for the implementation of the proposed RRIM solution are to investigate the feasibility of the preferred option for each Council.

It is likely that the following approach will be required:

- Undertake a review of spatial utilisation for key transfer stations
- Identify the space requirement for metals and contamination removal, and for glass storage (and reprocessing)
- Confirm whether any partnering or similar arrangements will be in place for managing collected glass (e.g. joining with a neighbouring Council to achieve economies of scale)
- Confirm the suitability of each relevant transfer station to undertake these activities (size and layout)
- Confirm the business case for implementing the preferred option, specifically tailored to the relevant Council transfer station

The City of Greater Bendigo are currently running a procurement process to identify solutions for kerbside collected residual waste. This procurement may result in technology becoming available in the region that could treat kerbside recyclables. As it is currently unclear what the results of the procurement exercise will be, it is suggested that all parties continue to work closely with the City of Greater Bendigo to understand how that procurement may impact the needs of the RRIM.

6.4.1 Timing of Implementation

The development of contamination, glass and metals diversion activities is not limited by a minimum scale, however the establishment of glass diversion is dictated by the kerbside transition plan implementation dates.

The development of contamination and metals diversion are linked due to the requirement to implement a new process for loading bulk haul trucks, including developing an area to decontaminate the material and the installation of a system to enable metals removal prior to loading into bulk haul trucks. This system could be implemented following verification of the business case and design details as outlined above.

7 Conclusions

Ricardo has recommended that the Councils of the Loddon Mallee region maximise the early diversion of materials from the recycling system. This will include new infrastructure to support the outcome and the potential for cost savings due to the combination of a smaller volume of recyclable material to transport, along with lower levels of contamination. This option could assist in the longer term with procuring MRF services due to the lower contamination rates achieved in this option.

No change has been recommended to current MRF destinations, however where opportunities exist to change MRF providers, the development of the proposed Option 1 should guide the future of MRFs in the region as a template for a more efficient recyclables treatment network.

The implementation of the preferred option includes the modification of processes at regional transfer stations. The individual Councils should review the business case for the development of this infrastructure on a case-by-case basis to identify the optimal timing and location for these developments.

Finally, a watching brief should be kept on the progress of the alternative waste procurement process being run by the City of Greater Bendigo to identify opportunities to process kerbside recyclables along with recovered residual waste materials.

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Appendix A

Records of stakeholder engagement – Confidential

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