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Draft

Detailed materials flow analysis and end market opportunities

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PREPARED FOR

City of Ballarat

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Abbreviations and glossary

ANZSIC	Australian and New Zealand Standard Industrial Classification
BAU	Business as usual
BWEZ	Ballarat West Employment Zone
CAPEX	Capital expenditure
CDS	Container deposit scheme
CIRRC	Community and Industry Resource Recovery Centre
CoB	City of Ballarat
GCW	Grampians Central West
GCWWRRG	Grampians Central West Waste and Resource Recovery Group
MFA	Material flow analysis
MRF	Materials recovery centre
OPEX	Operational expenditure
PIPs	Priority industry plans

1. Introduction

1.1 Project objectives

The City of Ballarat (CoB) commissioned Blue Environment in October 2021 to undertake material flow analysis (MFA) and an assessment of end-market opportunities for materials recovered from the Ballarat region.

This project identifies materials and waste volumes available for resource recovery, use efficiency and circular economy initiatives within the Ballarat region. It focuses on the intended functions of the proposed Community and Industry Resource Recovery Centre (CIRRC) (waste transfer station) and materials recovery facility (MRF) projects. Both facilities will be co-located at the proposed Circular Economy Precinct in Ballarat, at the Ballarat West Employment Zone.

The MFA maps, and where possible, quantifies the inputs and outputs of materials from the businesses, industries and households within a region defined by the boundaries of the Grampians Central West (GCW) Waste and Resource Recovery Group. Organics and soils are excluded from the project scope and are undergoing a separate feasibility study in collaboration with councils from GCW region.

The project identifies opportunities for regional manufacturing and reprocessing from recovered resources. This provides a prospect for industries to work together and with Council to reduce, recycle/reprocess and reuse material otherwise sent to landfill. The exploration of future markets for recovered material in and out of the CIRRC and MRF hub, is a key feature.

A broad stakeholder engagement and market sounding was included, encompassing the recycling industry, manufacturing sector, and state and local governments. This informed the selection and development of three priority industry plans, for the City of Ballarat.

1.2 Project scope

The project scope entailed:

1. an MFA of regional waste built in Microsoft Excel, supported by local waste data and the consultation program
2. flow mapping images in/out and within the Grampians Central West region
3. a market sounding based on stakeholder consultation, focusing on materials included in the MFA and covering:
 - state government bodies
 - waste generators, manufacturers, transporters, reprocessors and other industry businesses
 - potential businesses who may uptake reprocessed material for future use.
4. market sounding analysis for several selected waste products presented in a clear format
5. development of three priority industry plans that draw upon use the results from the MFA and market sounding to inform business/investment attraction activities
6. reporting of potential correlations between seasonal climate indicators and tonnages within different waste categories.

Items 2 and 6 of the project scope are not covered in this draft report but will be addressed in the final version.

The geographic scope of the project is the GCW region, comprising the boundaries of 12 councils as shown in Figure 1.

Figure 1 Map of the Grampians Central West Region



Source: GCWWRRG (Grampians Central West Waste and Resource Recovery Implementaion Plan 2017, 2017, p. 26).

Materials in scope

The proposed CIRRC and MRF will sort and reprocess various material and product types. This project's immediate focus is MRF materials to inform regional offtake market prospects and create investor certainty. Other forms of those materials will also pass through the CIRRC infrastructure. At a material category level the MFA scope covers:

- glass
- metals
- paper and cardboard
- plastics
- textiles
- tyres.

Organics and soils are not covered. The waste streams included in the MFA are municipal solid waste (MSW), commercial and industrial (C&I) and construction and demolition (C&D) materials.

Presented in Table 1 are the material ‘types’ – the level at which material data are modelled. These material types are mostly those set out in the *Australian Standard for Waste and Resource Recovery Data and Reporting* (BE 2021).

Table 1 *Material types in scope*

Type	Category
Asphalt	Building and demolition materials
Bricks, concrete and pavers	Building and demolition materials
Ceramics, tiles and pottery	Building and demolition materials
Building and demolition materials	Building and demolition materials
Plasterboard & cement sheeting	Building and demolition materials
Soil, sand and rock	Building and demolition materials
Rubble	Building and demolition materials
Iron and steel	Metals
Aluminium	Metals
Non-ferrous metals (ex. aluminium)	Metals
Mixed metals	Metals
Cardboard	Paper & cardboard
Polymer coated paperboard	Paper & cardboard
Office paper	Paper & cardboard
Newsprint & magazines	Paper & cardboard
Mixed paper and cardboard	Paper & cardboard
Polyethylene terephthalate (PET) (1)	Plastics
High density polyethylene (HDPE) (2)	Plastics
Polyvinyl chloride (PVC) (3)	Plastics
Low density polyethylene (LDPE) (4)	Plastics
Polypropylene (PP) (5)	Plastics
Polystyrene (PS) (6)	Plastics
Certified compostable plastics (7)	Plastics
Other plastics (7)	Plastics
Mixed plastics	Plastics
Glass from food and beverage containers	Glass
Other glass	Glass
E-waste	Unclassified materials
Textiles	Textiles, leather & rubber
Leather & rubber (excl. tyres)	Textiles, leather & rubber
Tyres – passenger	Tyres
Tyres – truck	Tyres
Tyres – OTR	Tyres

Sectors in scope

Sectors included in the MFA are framed by the Australian and New Zealand Standard Industrial Classification (ANZSIC) system. In-scope sectors are listed in Appendix A, In-scope ANZSIC .

1.3 Project method

The project tasks are outlined below:

- Task 1 – Project initiation
- Task 2 – Project plan
- Task 3 – Information review
- Task 4 – Preliminary consultations
- Task 5 – Baseline data compilations
- Task 6 – Preliminary report, market sounding proposals and revised project plan
- Task 7 – Research and consultation program (round 2 consultations)
- Task 8 – MFA model development
- Task 9 – Market sounding report
- Task 10 – Priority industry plans
- Task 11 – Project report
- Task 12 – Presentation

This report represents task 11, in draft form. Following discussions with the City of Ballarat, tasks 9 and 10 were rolled into a single output. This report therefore also encompasses those tasks.

Information review (task 3)

An initial information review was conducted to establish an understanding of the project context and provide a foundation for the stakeholder consultations. It covered available literature, audits and information provided by Council and Grampians Central West Waste and Resource Recovery Group (GCWWRRG), as well as resources from the State Government and relevant literature. Further preliminary concept information was reviewed for the proposed CIRRC and MRF. Additional demographic, infrastructure and waste management literature as well as potential external funding sources for infrastructure and other works were also reviewed.

Preliminary consultations (task 4)

With input from CoB and GCWWRRG, Blue Environment compiled a project stakeholder contacts list in MS Excel. Preliminary consultations took place over Microsoft Teams video conferences. We met with Australian Industry Group, Sustainability Victoria, Central Goldfields Shire and the Committee for Ballarat. Consultees were asked about observations and insights on material flows in the GCW region, potential priority industries for resource recovery, advice on available grants and suggestions on private stakeholders who should be involved in the project. In this report, the outcomes of the preliminary consultations are folded into report of the market sounding.

The methods for the market sounding and MFA are described in Sections 2 and 3 respectively.

2. Market sounding

Market sounding is an opportunity for the public sector (in this case CoB and GCWWRRG) to gain knowledge and insights from the private sector. It evaluates public service need, builds market knowledge and in this project informs the priority industry plans to ensure viability into the future.

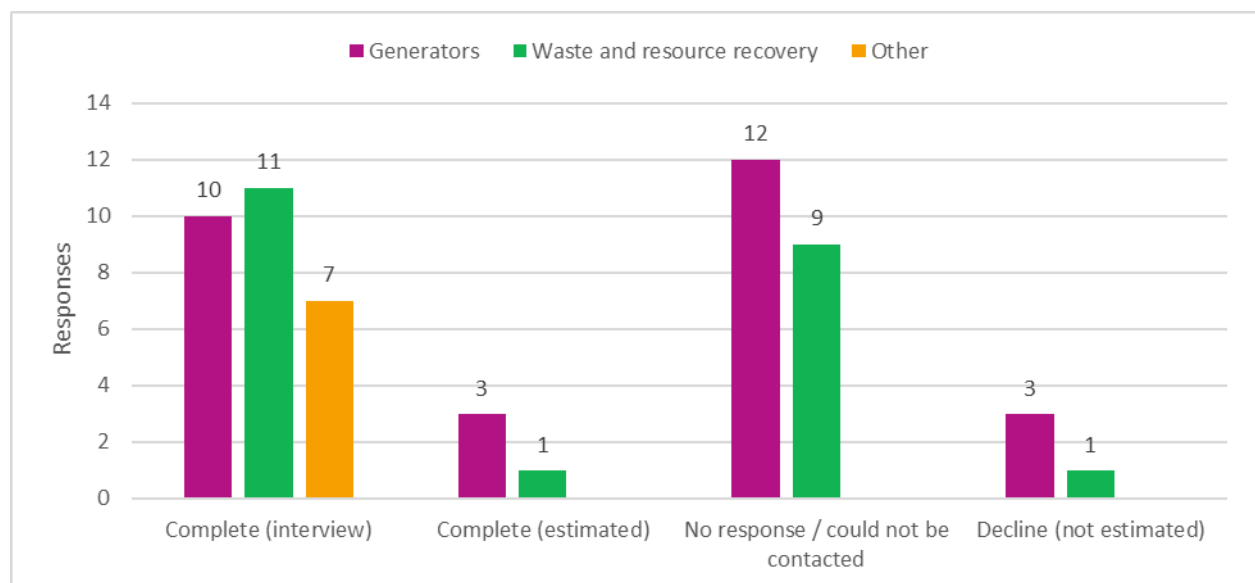
Market sounding was carried out by Blue Environment as the main data gathering exercise of the project. Surveys were undertaken of regional waste generators and recyclers based on detailed survey forms developed in Excel. These covered a wide range of information including operation type, material flow quantities and types, process types etc. (see Appendix B).

Consultations commenced February 2022. The surveys were forwarded to 57 identified stakeholders with a letter of introduction from Council. Appointments were made with 32 respondents and surveys undertaken by Blue Environment staff, mostly via phone.

2.1 Consultation outcomes

Consultations commenced February 2022. Fifty-seven parties were contacted of which 32 (56%) were surveyed. There was an approximately even split of waste generators and resource recovery respondents. Some of the responses were completed using estimates from data otherwise provided or identified from public sources. Responses completion rates are indicated in Figure 2 **Error! Reference source not found.** below.

Figure 2 Summary of consultation responses



Responses were predominantly qualitative and were considered in the priority industry and market sounding aspects of the project. The more limited quantitative responses informed the MFA and priority industry plans.

The quantitative results of the waste generator and resource recovery surveys are given in Table 2 and Table 3 respectively.

Table 2 *Waste generation and management by material category as reported by surveyed waste generators (2020-21)*

Material category	Generation (tonnes)			Sent to landfill (tonnes)			Sent for recycling (tonnes)		
	MSW	C&I	C&D	MSW	C&I	C&D	MSW	C&I	C&D
Building and demolition materials	0	3	2,312	0	3	0	0	0	2,312
Metals	0	48	0	0	3	0	0	45	0
Paper & cardboard	0	1,664	0	0	390	0	0	1,274	0
Plastics	0	65	0	0	28	0	0	37	0
Glass	0	76	0	0	50	0	0	26	0
Textiles, leather & rubber	0	2	0	0	0	0	0	2	0
Tyres	0	0	0	0	0	0	0	0	0
Unclassified materials	5	896	0	5	891	0	0	5	0
Total	6	2,752	2,312	5	1,364	0	1	1,388	2,312

The surveyed waste generators producing the largest amount of waste were concrete manufacturers. Both companies recycled their leftover material (concrete) in the GCW region, resulting in minimal waste to landfill. The unclassified material category is largely mixed general waste to landfill from commercial industries. The largest reported waste category to landfill stream is paper and cardboard.

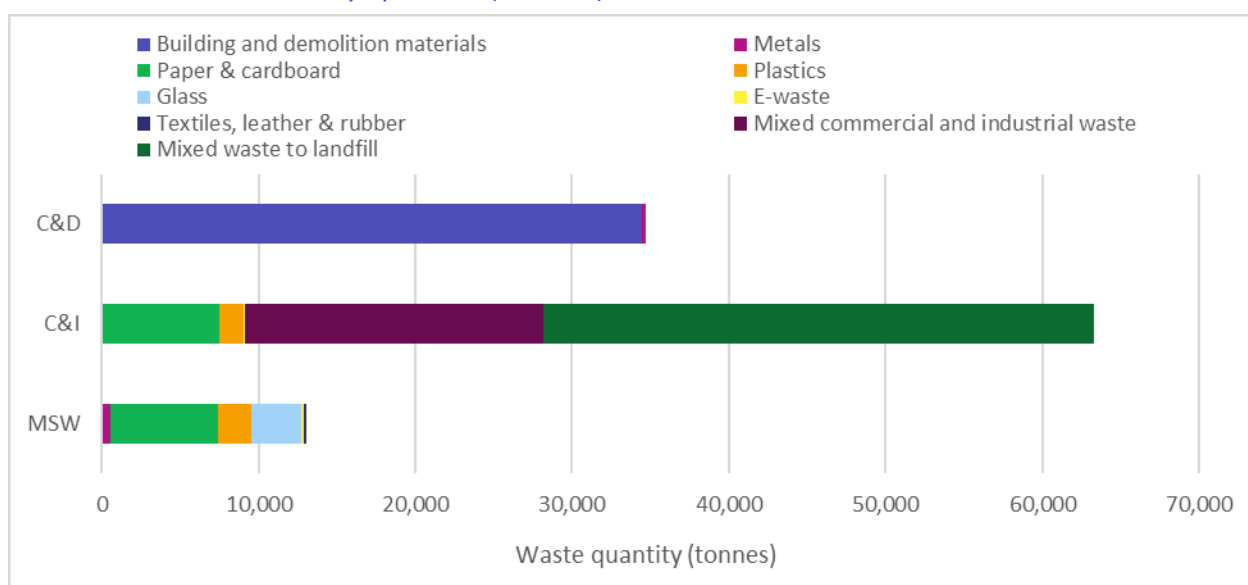
Table 3 *Waste processed by source stream and material type as reported by surveyed waste and resource recovery operators (2020-21)*

Material type	Material category	Waste source stream			
		MSW	C&I	C&D	Total
		(tonnes)	(tonnes)	(tonnes)	(tonnes)
Bricks, concrete and pavers	Building & demolition materials	0	0	29	29
Building and demolition materials	Building & demolition materials	0	0	34,459	34,459
Iron and steel	Metals	349	29	216	594
Aluminium	Metals	222	44	0	267
Cardboard	Paper & cardboard	1,000	5,956	0	6,956
Polymer coated paperboard	Paper & cardboard	42	4	0	45
Office paper	Paper & cardboard	1,434	600	0	2,034
Newsprint & magazines	Paper & cardboard	4,057	805	0	4,862
Mixed paper and cardboard	Paper & cardboard	324	28	0	352
Polyethylene terephthalate (PET) (1)	Plastics	674	58	0	731
High density polyethylene (HDPE) (2)	Plastics	765	528	0	1,293
Polyvinyl chloride (PVC) (3)	Plastics	28	2	0	31
Low density polyethylene (LDPE) (4)	Plastics	144	511	0	655
Polypropylene (PP) (5)	Plastics	268	446	0	714
Polystyrene (PS) (6)	Plastics	8	1	0	9
Other plastics (7)	Plastics	246	21	0	267

Material type	Material category	Waste source stream			
		MSW	C&I	C&D	Total
		(tonnes)	(tonnes)	(tonnes)	(tonnes)
Glass from food and beverage containers	Glass	3,198	0	0	3,198
E-waste	Unclassified materials	118	131	0	249
Textiles	Textiles, leather & rubber	190	16	0	206
Mixed commercial and industrial waste	Unclassified materials	0	19,008	0	19,008
Mixed waste to landfill	Unclassified materials	0	35,131	0	35,131
Total		13,065	63,319	34,704	111,088

Some respondents provided collated information for multiples sites and others for individual sites only. Wherever ‘commingled recyclables’ was listed as a material, audit data was used to identify the stream to a material type level. In this way, textiles are listed in the waste types but no respondent reported textiles directly.

Figure 3 Material processed by source stream and material type as reported by surveyed waste and resource recovery operators (2020-21)



A summary of the qualitative survey outcomes is presented in Table 4. The qualitative results provide a lead-in to the identifying opportunities for improved circular economy within the region.

Table 4 Qualitative survey results

Theme	Suggestions on increasing resource recovery in GCW
Funding	- Funding opportunities that do not require co-payments. - Council grants for local smaller businesses who practice resource recovery. - Simple funding/grant applications. - Availability of council grants for businesses or manufacturers to buy recycled materials or products.

Theme	Suggestions on increasing resource recovery in GCW
Education	- Promote free drop off services in the region for recyclable materials (like metals). - Encourage pre-sorting at building and construction sites to improve downstream resource recovery. - Education campaigns on what is and is not recyclable for each council. - Encourage the community to use recycled products, and promote local companies who are making products with recycled content.
Government	- Offer kerbside glass collection. - Implement a transfer station at Smythesdale landfill. - Procurement policy for recycled product in city operations, particularly glass and plastics. - Give preference to companies who use recycled content in their products/operations.
End-markets	- Improve glass end market opportunities in Ballarat. - Recycled plastic content for civil infrastructure. - Encourage local businesses to make their packaging completely recyclable.
Increased recovery	- Implement a MRF in regional Victoria, so materials no longer have to be baulk hauled to Melbourne. - Manual sorting of materials is not sustainable, a new MRF should have mechanical sorting. - Further research into efficient batch testing for crushed glass for use in construction. - There needs to be enough volume of the material for a resource recovery facility to be viable. - Recycled material needs to be the similar price to virgin material.

In addition to suggestions for resource recovery with respect to circular economy themes as above, stakeholders also highlighted material-specific recovery opportunities. These are outlined in Table 5.

Table 5 Material-specific market sounding opportunities

Material	Opportunities
Glass	- Encourage local companies to use the same colour glass to increase the use of mixed colour cullet. - Support end markets for glass to make recycling viable. - Offer kerbside glass collection in the City of Ballarat. - Procurement process for crushed glass. - Research best practice batch testing for glass crushing to increase cost effectiveness. - Increase demand for glass fibre, which could be made out of recycled glass.
Paper and cardboard	There is a demand for a-grade paper (pure white stream from C&I sector). This usually goes to Visy or APR.

Material	Opportunities
	- Develop a way to recover paper cores, which currently go to landfill from a local company but are of merchandisable quality. - Encourage local companies to make their packaging out of cardboard, as it is easier to recover (compared to packaging made part or wholly of plastic).
Plastics	- Take advantage of demand for plastic flake - Secure feedstock by setting up a plastics reprocessing plant in Ballarat. - Recover soft plastics, which generally goes to Melbourne. - Increase funding available for local plastics reprocessors, to facilitate operation expansion and increase capacity of plastics recovery. - Encourage and/or incentivise local businesses to use recycled plastic products. - Procurement policy for recycled plastic in local infrastructure. - Reprocess soft plastics to 5mm aggregates for use in concrete as a substitute for sand, which was previously successfully trialled in Ballarat. - Ensure recycled product is an economically viable substitute.
Textiles	- There is currently minimal opportunity for recycling textiles in the region, however was a topic of interest in consultations. - Upparel are looking for a large textile reprocessing facility.
Tyres	Rubber crumb from recycled tyres could be used in council operations.
C&I and C&D waste	- A dedicated concrete recycling area in Ballarat that recycles soft and hardened concrete to reduce C&D waste to landfill. Would have to accept products for free to be viable, and be supported by an end market for recycled concrete, like in road bases. - Support for C&D recyclers to increase recovery capacity.
Other wastes	- For e-waste, hard plastics from the dismantling process is difficult to sell on, as there is minimal end market. - Solar panel recycling is very popular interstate due to the silica and copper content. - Provide resources and information for liquid waste disposal, including testing (the liquid needs to be tested to be classified), the service and a reasonable price to promote responsible waste disposal.

3. Materials flow analysis

An MFA was developed for the GCW region in Microsoft Excel to:

- build estimates of current and future material flows, waste generation and current management of in-scope wastes
- help in the selection of priority industry plans
- provide a basis for estimating the impacts of priority industry plans.

The MFA is submitted with this report. It is intended to be transparent and self-explanatory. The material categorisation applied is consistent with the 2021 *Australian Standard for Waste and Resource Recovery Data and Reporting*. This section describes the MFA method and results.

3.1 MFA method

As the focus of this work was waste materials flows and fates, accuracy in waste flow data was prioritised. The MFA was built drawing on three distinct estimates that were compiled and reviewed to produce the most reasonable estimate. One of these (Estimate 3) was a set of formal MFAs by material type, comprising a multi-year, multi-sector assessment of flows covering the span of production, consumption, use and waste generation and management. The others were waste estimates. Each estimate produced a tabulation of tonnages by waste type and source stream that were then compared. The comparison also encompassed an examination against the market sounding outcomes to ensure consistency. Assumptions are stated throughout the model in red font.

Estimate 1

Estimate 1 used information sources that were as local as possible. These included:

- GCW councils' data as supplied to Sustainability Victoria for 2020-21
- local waste composition audits supplied by the City of Ballarat
- Victorian tonnages of C&I and C&D waste by material category.

Assumptions were made about how the rate of C&D and C&I waste generation and recycling within the region compared with Victorian averages. It was assumed that the per capita rate of C&I waste generation equals the Victorian average but C&I recycling is 75% of the average. C&D waste generation was assumed to equal half the Victorian average and the recycling rate was 30% the Victorian average. The C&D assumptions note that C&D activity and recycling are heavily weighted to Melbourne.

Estimate 2

Estimate 2 comprised previously developed analyses by Blue Environment completed for:

- the development of the regional implementation plans (using 2013-14 data)
- an update of this assessment for Infrastructure Victoria (using 2017-18 data).

The method for developing the original estimate was similar to Estimate 1 but it appears that no adjustment to C&I and C&D generation and recycling were made from the Victorian per capita average. This is likely to exaggerate the results. Estimate 2 also contained some major unexplained gaps, including in relation to recycling of glass and metals.

Estimate 3

Estimate 3 is a complex set of material-specific MFAs constructed for regional Victoria. In this formal sense, an MFA is defined as a quantitative assessment of the state and change of flows and stocks of materials within a system defined in space and time, based on the following concepts:

- System – the object of an MFA investigation, comprising a set of processes, material flows and stocks in a specified space and time (in this case, recoverable waste materials in the GCW region in 2020-21)
- Material – substances (homogenous materials) or goods (materials or products made up of one or more substances)
- Process – transformation, transport or storage of materials (e.g., a glass bottle beneficiation facility crushing, colour sorting and sizing glass cullet to be furnace ready)
- Flow – a mass flow rate per unit time (e.g., year), in or out of a process (e.g., a glass bottle moving from ‘use’ to ‘sorting’, and then to ‘processing’)
- Stock – a quantity of materials stored within a process
- Transfer coefficient – the partitioning of outgoing materials from a process to downstream processes
- Final sink – a reservoir where a substance resides for a long period of time.

The materials included in the MFA were metals, paper & cardboard, plastics, glass, textiles, leather & rubber (excl. tyres), and tyres. The application areas considered included agriculture, the built environment, electrical and electronic, industrial, packaging, transport and ‘other’. The lifespans of materials within these application areas were estimated and modelled using normal distributions.

The outcomes in terms of landfill and recycling of this adapted model were compiled. Compound average growth rates in waste generation for the 10-year period to 2030-31 were derived.

Comparison

The estimates were compared to assess compatibility and select the most appropriate overall estimate. Estimate 2 lacks some recycling data and exaggerates disposal. Estimate 3, it is believed, is likely to do the opposite, exaggerating recycling in the region.

It was determined that Estimate 1, based on local data, was likely to be the most accurate. It should be noted, however, that this is only an estimate. The data on C&I and C&D waste, in particular, has a high level of uncertainty.

Estimated plastics flows were broken into polymer types and proportions of flexible plastics using national data.

Comparison with the market sounding findings resulted in amendment to a few materials estimates. In particular, the recycled quantities of C&I glass and office paper and MSW e-waste were increased slightly.

3.2 MFA outcomes

The MFA results are summarised in Table 6 and the figures below it.

Table 6 Summary of estimated materials flows in the GCW region, 2020-21 in thousands of tonnes or percentages

	MSW		C&I		C&D		All		Generation	Recovery rate	10-year CAGR
	Landfill	Recycling	Landfill	Recycling	Landfill	Recycling	Landfill	Recycling			
Building and demolition materials	7.6	0.0	3.0	1.7	9.7	40.0	20.3	41.8	62	67%	
Metals	1.4	1.1	3.2	30.2	2.1	1.1	6.7	32.4	39	83%	1.8%
Paper and cardboard	9.3	10.4	16.8	35.3	7.2	0.0	33.4	45.7	79	58%	1.0%
Plastics	5.7	3.8	19.3	1.8	7.2	0.0	32.2	5.7	38	15%	3.6%
Glass	4.1	1.4	6.3	1.6	0.7	0.0	11.1	3.0	14	21%	0.5%
Textiles, rubber & leather (excl. tyres)	3.2	0.4	11.7	0.8	8.8	0.0	23.7	1.1	25	5%	1.7%
E-waste	0.5	0.2	0.2	0.0	0.3	0.0	0.9	0.2	1	21%	1.7%
All	32	17	60	71	36	41	128	130	258	50%	1.7%

Figure 4 Estimated generation and management of in-scope waste, GCW 2020-21

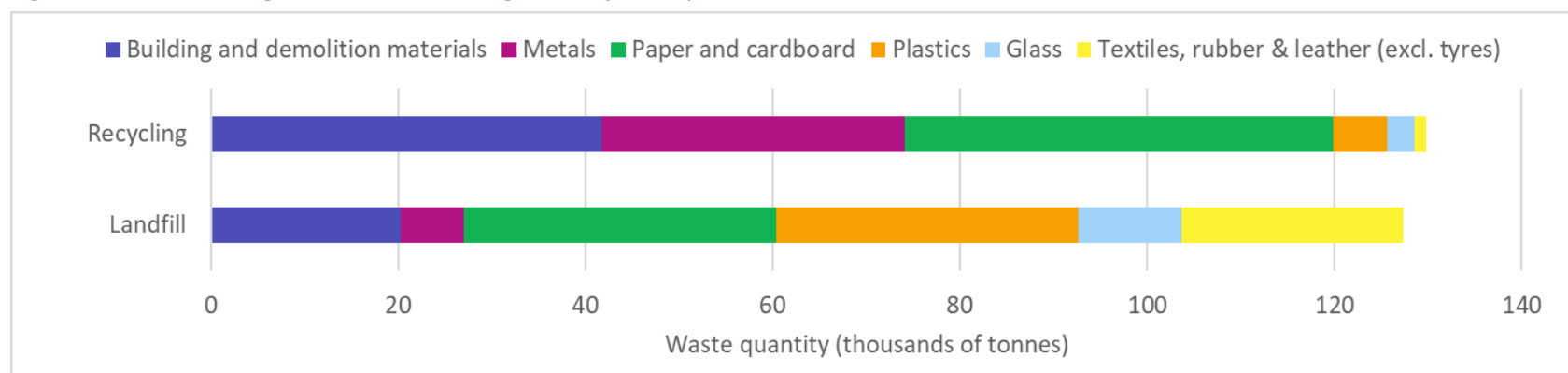


Figure 4 shows that an estimated 258 kt of material was generated of which about half was recycled. The material category generated in the highest quantity was paper and cardboard at 79 kt and a recovery rate of 58%. The next highest category was building and demolition materials, but there is high uncertainty over this estimate.

Figure 5 Estimated waste generation and management of in-scope waste by stream, GCW 2020-21

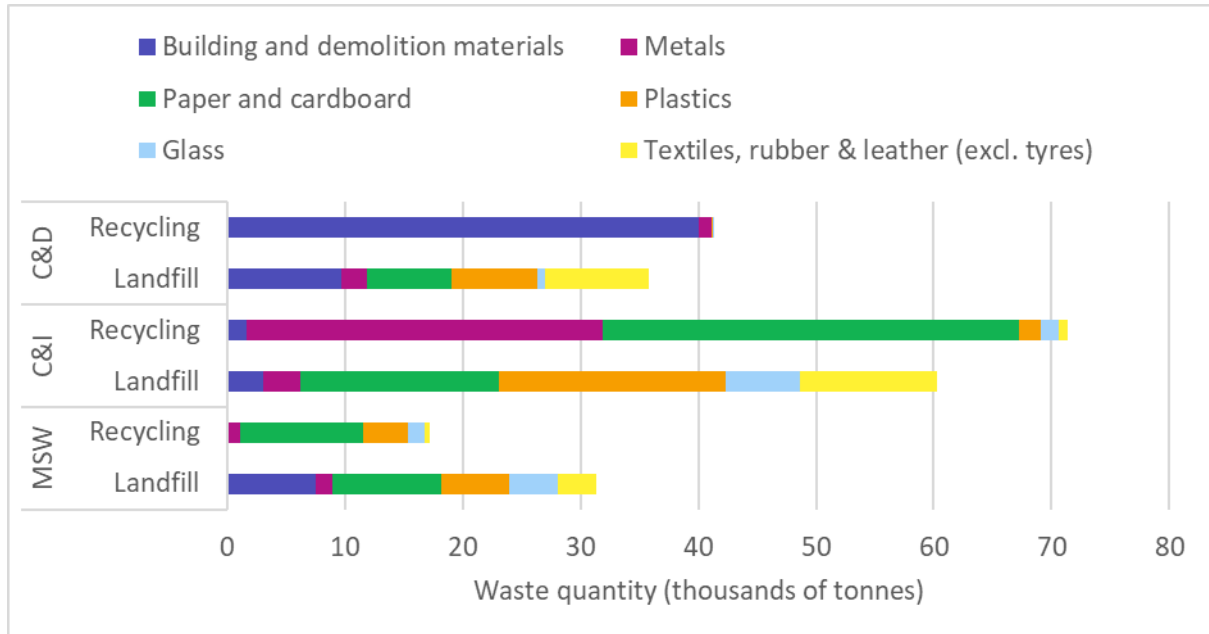


Figure 5 shows that the quantities of C&I material were the highest, followed by C&D, then MSW. The recovery rates of C&I and C&D were similar at a little over 50%. The MSW recovery rate was about 35%. Recall that this excludes organics.

Figure 6 Estimated waste generation and management of in-scope waste by material category in GCW, 2020-21

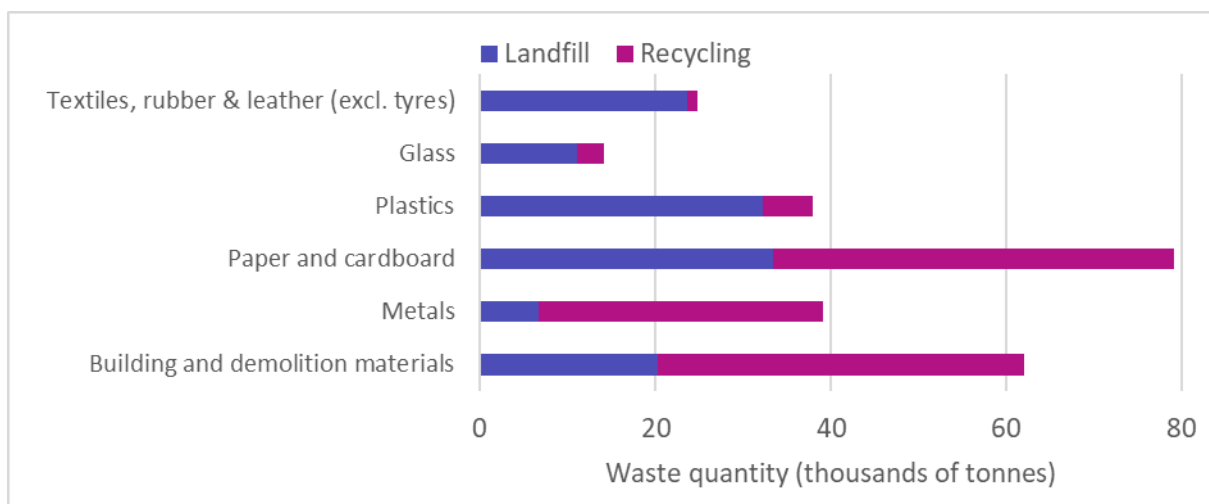


Figure 6 shows the varied generation and recycling rates by material. Paper and cardboard is generated in the highest quantity and metals have the highest recycling rate. Paper and cardboard and building and demolition materials have the next highest rates. The other materials have low rates.

Figure 7 Estimated 10-year growth in the generation of in-scope wastes (excluding building and demolition materials) by material category, GCW 2020-21

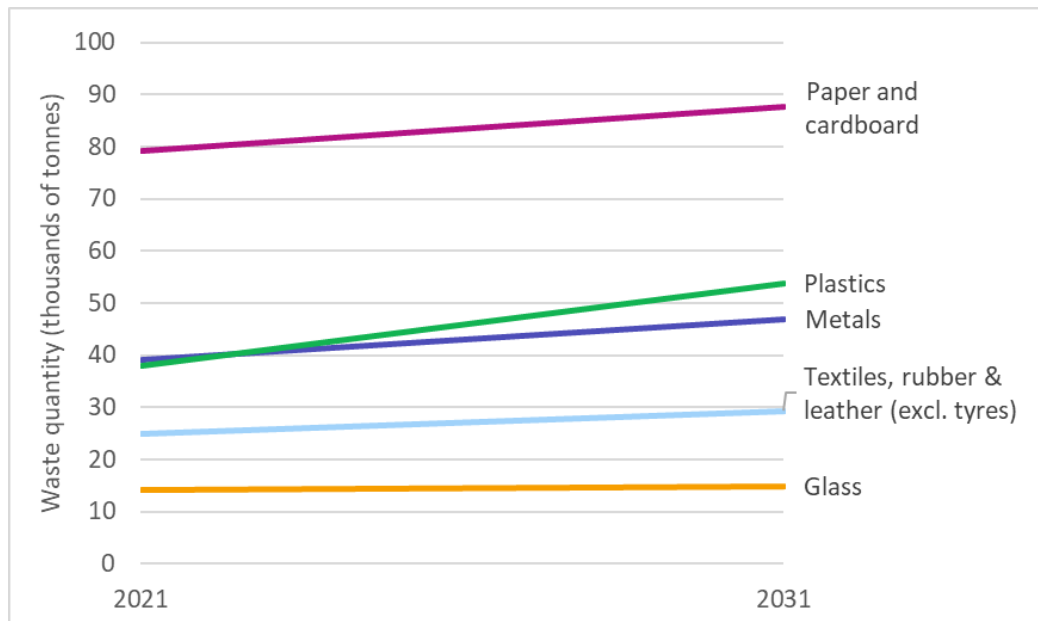


Figure 7 shows that the projected growth rates in waste generation vary between materials. Plastics has the strongest projected growth at 3.6% annual growth (compound average). Glass quantities have the lowest projected growth at 0.5% annual growth. Across all the material types, that projected growth rate was 1.7% annually.

4. Priority industry plans

The development and nature of the three priority industry plans (PIPs) are described in this section. The PIPs are intended to provide a foundation for seeking investment, grant funding, stakeholder engagement, expressions of interest, and to inform future initiatives. They are based on specified materials.

4.1 Priority industry plan selection

In selecting the materials to form the focus of the PIPs, Blue Environment considered the availability of material, existing management arrangements, potential for significant improvement, the potential for the CoB to affect market demand, and the results from market sounding and the MFA. The method for selection included a summary analysis based on the in-scope material categories and a team workshop. The summary analysis is shown below.

Table 7 Summary analysis of in-scope material categories

Material category	Estimated BAU waste to landfill 2025 ¹ (tonnes)	Estimated greenhouse gas emissions (t CO ₂ -e)	Potential environmental benefit	Processing requirements	Estimated market prices, 2021 (\$/tonne)	Material component of key interest	Delivery complexity
Glass	11,000	6,000	Medium	Collection and baling	\$0	Glass from food and beverage containers	Simple
				Low quality glass for road base (unprocessed)	-\$50-80		Simple
				Beneficiation	\$150–\$200		Moderate
Metals	7,200	12,000	High	Baled steel packaging	\$140–\$150	None - recovery already strong	Moderate
				Baled aluminium cans	\$1,300–\$1,400		Moderate
Paper & cardboard	35,000	7,300	Medium	Sorting and baling	\$0–\$100		Simple
							Moderate
Plastics	37,000	23,000	High	Collection and baling	\$300 for PET	Flexible plastics	Simple
				Washed and flaked	\$800 for HDPE		Moderate
Textiles	25,000	Factor unavailable	Medium	Collection	n/a	Unwearable clothes	Simple
				Shredding and compaction	n/a		Moderate
				Alternative fuels	n/a		Complex

Sources: Blue Environment estimates, APCO (2021), Recovered Resources Market Bulletin (March 2021) (SV, 2021).

¹ These values are taken from the MFA. We note they are significantly lower than reported in the initial report.

Based on this analysis and a team workshop, the following materials were selected as a basis for the PIPs:

- glass from food and beverage containers
- flexible plastics
- textiles (unwanted clothing).

The PIPs are outlined in turn in the sub-sections below. Each PIP explores waste generation and recycling projections based on a business as usual (BAU) and proposed pip (PIP) approach. Current management techniques of the priority materials are shown below.

Figure 8 Estimated waste generation and management by priority material in GCW, 2020-21



Each PIP is accompanied by a high-level financial analysis of capital expenditure (CAPEX) and operational expenditure (OPEX). Not included in these figures is the cost of land, groundworks, or service infrastructure installation, as each PIP is located on the CIRRC and it is assumed these costs will be folded into a separate costing program. Transport costs are also not included. CAPEX and OPEX values for each PIP are ranked according to the orders in Table 8.

Table 8 CAPEX and OPEX ranges

	CAPEX	OPEX
High	\$1.5-3 million	\$300,001 - \$500,000
Medium	\$500,001 - \$1.5 million	\$150,001 – \$300,000
Low	\$100,000 - \$500,000	\$50,000 - \$150,000

4.2 Priority industry plan 1: Increasing glass recovery and circularity

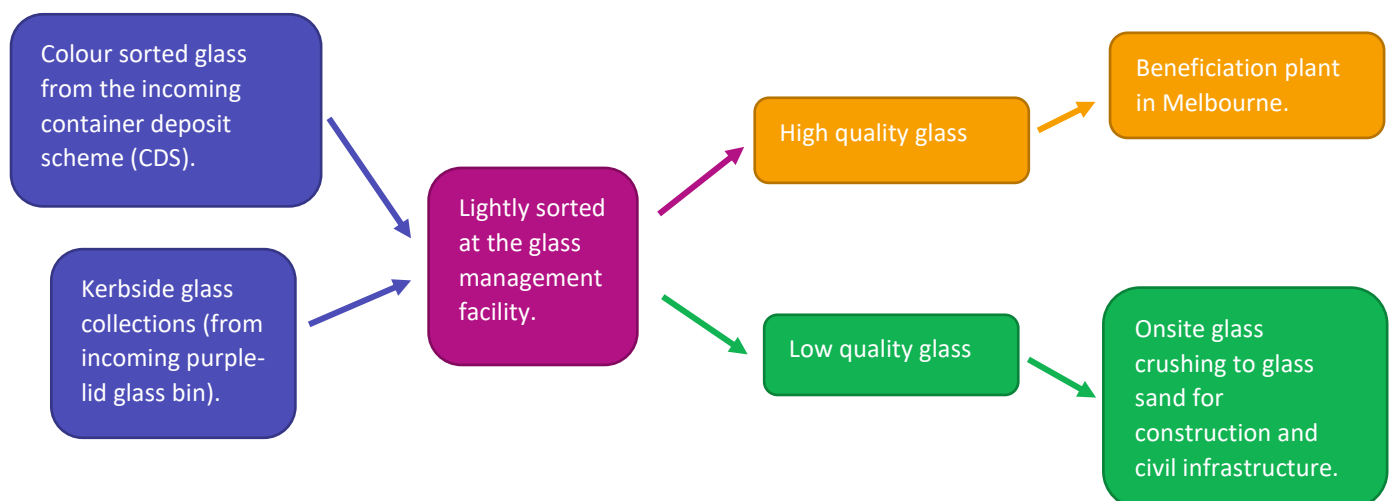
Current waste management

Ten of the 12 councils in the GCW region accept glass in their kerbside recycling collections, with the exceptions being the City of Ballarat and Yarriambiack Shire Council. Yarriambiack Shire Council offers glass drop-off for residents at transfer stations free of charge. In the City of Ballarat, clean residential food and beverage glass can be dropped off at nine selected sites across Ballarat and neighbouring villages, forming the Pass on Glass campaign. Collected glass goes to Visy via Wheelie Waste, a local waste transporter in Ballarat. Glass that does not enter drop offs within these councils enters the landfill waste stream. Shortly, most Victorian households will have a four-bin system, providing a segregated stream for glass collection.

Proposed waste management

Blue Environment propose a separate glass management facility in the City of Ballarat to increase recovery. The facility would accept glass from food and beverage containers, via container deposit scheme (CDS) drop offs and the incoming kerbside glass collections. Feedstock would be lightly sorted. Whole and large pieces of glass would be separated – this will be the high-quality product and go to Melbourne for light beneficiation. This will be recycled into new glass containers. An onsite glass crusher would crush the low-quality stream into glass sand to be soaked up in local construction and civil infrastructure.

Figure 9 PIP diagram: Glass from food and beverage containers



Further detail on the proposed glass PIP is given below in Table 9.

Table 9 Proposed PIP outline, glass from food and beverage containers

Feature	Description
Target material type	Glass from food and beverage containers
Feedstock	• Colour sorted glass from the incoming container deposit scheme (CDS). • Kerbside glass collections (from incoming purple-lid glass bin). • Generated from municipal sources.
Recovery plan	• Incoming CDS drop-offs will be pre-sorted by colour.

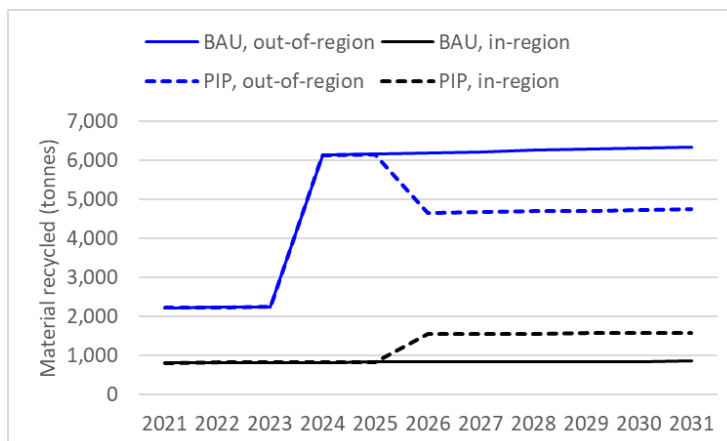
Feature	Description
	• Facility to sort kerbside glass collections (from incoming purple-lid glass bin) by colour and size. • Whole and large pieces of glass to be the high-quality product (to go to Melbourne for light beneficiation). • Onsite glass crusher to crush the low-quality stream into sand (to be soaked up in construction locally).
Output	• Glass sand • High quality glass stream
Siting requirements	Basic siting requirements include (but are not limited to): • Conveyer belt for light sorting • Equipment for glass crushing to sand • Storage capacity • EPA works approval
Offtake markets	• High potential for attracting material from outside region, provided facility is designed to allow for upscaling. • Feedstock for recycled glass products. • Glass use in civil construction. VicRoads stipulates that glass can be incorporated at the following rates: – concrete paving: up to 30% glass fines – granular filter for subsurface drainage: 100% glass fines
Benefits	• Reduce the need for sand mining. • Minimal glass to landfill. • Captures high- and low-quality streams. • Reduces glass contamination at MRFs. • Recycling glass uses less energy to produce compared to virgin materials.
Financial analysis	<i>Assumption: Costing is for a new processing plant, assuming no existing infrastructure.</i> CAPEX: High OPEX: High
Challenges	• Sampling and testing requirements • Educational campaigns • Reducing stock for regional reprocessors (e.g. Clark's and Vic Waste Solutions)
Potential partners and arrangements	• Mandate crushed glass content in council civil infrastructure works. • <i>Horsham Concrete</i> previously worked with RedCycle, incorporating recycled plastic into their cement. During market sounding, they were receptive to the idea of including other recycled material into their cement, as long as the material was virgin material competing in price and support was available for testing requirements. • <i>Re.Group</i> has previous experience in operating advanced MRFs in regional Australia, and with glass implosion technology. Consultations with Re.Group highlighted that they are interested in being involved with CDS as it comes into play, and conferring with the Ballarat City Council regarding an appropriate MRF configuration. • <i>Regina Glass</i> in Ballarat can include recycled glass in about a third of their feedstock. This would be a small amount, approximately 16 tonnes/year and require stronger end markets for glass fibre products.

Feature	Description
	<i>Calleja</i> who operate the transfer station and landfill at Maddeningly Brown Coal conveyed an interest to take additional contracted work from the Ballarat region. They are currently exploring the possibility of incorporating reprocessing at the transfer station to divert material from their landfill. <i>Veolia</i> could implement kerbside glass collection, they currently run this service for some local shires.
Success factors	- Reduced glass to landfill. - Increased glass recovery. - Increased recycled content in civil infrastructure.
Case study	In conjunction with a MRF, regional Lismore City Council in NSW have a glass processing plant which crushes glass using imploder technology to produce glass sand. The Council have used their product in road bases, asphalt and bedding for pipes. They crush around 6,000 tonnes of glass per year, which includes glass from four neighbouring shires.
Government support programs	- Recycling Victoria Infrastructure Fund grants. - Recycling Victoria Recycling Modernisation Fund grants.

Waste projections

Present (2020-21) rates are low due to limited recovery options available to residents, especially in Ballarat. Figure 10 depicts the estimated in-region and out-of-region impacts of implementing glass recovery as per the above PIP, and the rate of increased recovery of glass as a result. After the proposed facility is operational, it is predicted there will be a decrease in out of regional recovery as the glass recovery facility takes some of this stock.

Figure 10 PIP projections, glass from food and beverage containers



Blue Environment estimates that in 2020-21 the lowest recovery rate is from municipal sources, of which 39% ends up in landfill. The sharp increase in tonnes of recovered materials for the BAU approach out of the region shows the effects of an increase in feedstock due to kerbside glass segregation from the state-wide roll out of Recycling Victoria's four-bin waste system as well as the incoming CDS.

4.3 Priority industry plan 2: Flexible plastics collection and recycling

Current waste management

Flexible plastics are generally sent to landfill via garbage collection. There are some recycling options available for residents, who can utilise RedCycle drop offs. In the GCWRRG, there are drop off points at specific Coles or Woolworths located in Bannockburn, Ballarat, Daylesford and Maryborough. Some businesses have a relationship directly with RedCycle, who pick up their clean flexible plastics for reprocessing at Replas in Ballarat.

Proposed waste management

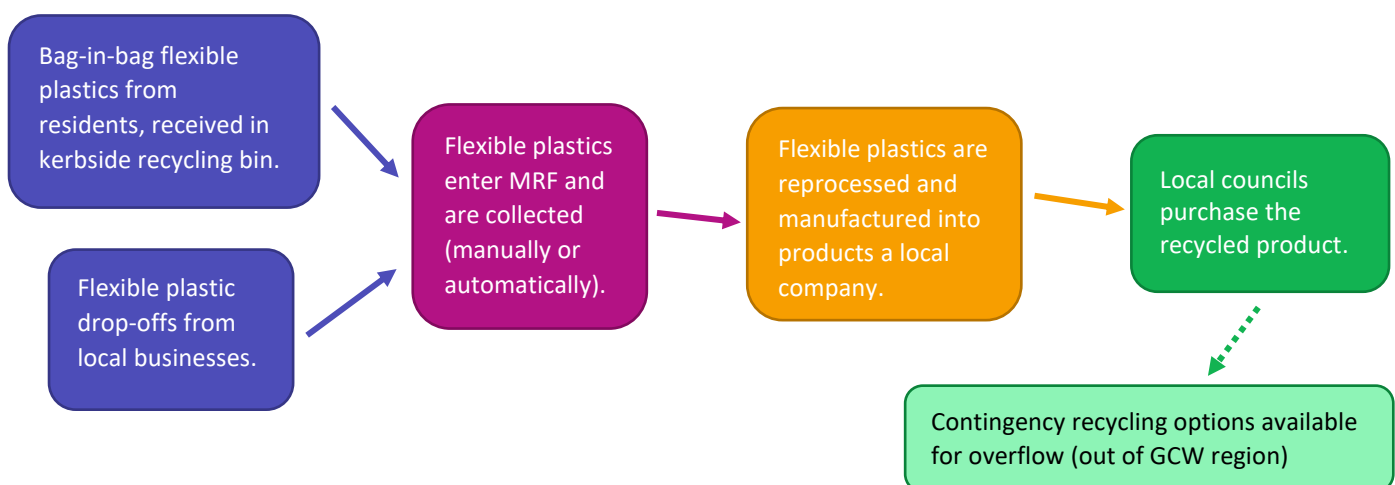
As the CoB is in the early planning stages of MRF design, it is in a good position to further its position as a key national soft plastics recycler. This would contribute to increasing plastics recovery regionally and nationally.

Under this PIP, the new MRF design would make provision for manual or automated removal of bag-in-bag flexible plastics, as the material becomes available. This could be in the form of a conveyer belt where employees can stand and collect bags which contain aggregated soft plastics, which are picked off and enter a film vacuum. Feedstock includes bag-in-bag flexible plastics that enter the MRF through kerbside recyclables, and drop-off for local businesses to ensure that companies can contribute to circular economies within the region.

In the interim, Ballarat could begin collecting soft plastics through drop-off options like regional drop-off bins. The feedstock must be predominantly polyethylene (PE) and polypropylene (PP), and should exclude PVC. This needs to be supported by educational campaigns from councils and promotion within businesses.

The collected flexible plastics would be locally reprocessed and manufactured. Councils within the GCW region would have to commit to purchasing the reprocessed product for civil infrastructure to ensure viability. This would mean working with the selected manufacturer to determine high volume applications, for example sheeting for sound barriers, decking and garden panels.

Figure 11 PIP diagram, flexible plastic



Note: Feedstock must be predominantly PE and PP and exclude PVC.

Further detail on the proposed glass PIP is given below in Table 10.

Table 10 Proposed PIP outline, flexible plastic

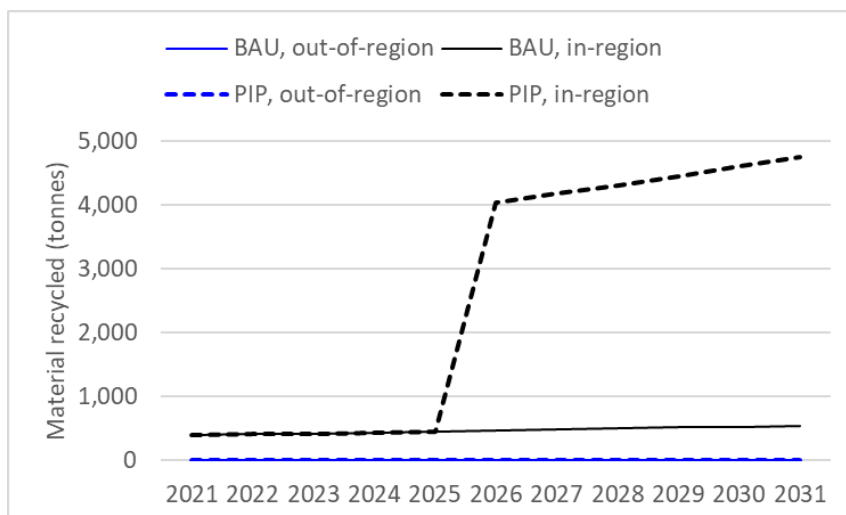
Feature	Description
Target material type	Flexible plastics
Feedstock	• Bag-in-bag flexible plastics from residents. • Flexible plastic drop-off from local businesses. • Predominantly PE and PP and exclude PVC. • Generated from municipal and commercial sources.
Recovery plan	• Flexible plastics enter MRF and are collected (manually or automatically). • Reprocessed and manufactured into products by local manufacturer. Contingency recycling options for overflow. • GCW councils purchase recycled product through mandatory procurement for civil infrastructure and council operations.
Output	• Flexible plastics collected and transported for local reprocessing.
Siting requirements	Basic siting requirements include (but are not limited to): • Flexible plastic capable MRF. • Conveyor belt for manual collection. • Film vacuum. • Storage and transport capacity.
Offtake markets	• High potential for attracting material from outside region. • Product manufacturing with recycled plastic content. • Potential for additional reprocessors to take part.
Benefits	• Reduced demand for fossil fuels and energy requirement. • Fulfill civil infrastructure projects using local manufacturers. • End market for recycled plastic products. • Reduced material to landfill. • Secure feedstock for Replas.
Financial analysis	Assumption: Costing is for a film vacuum in a MRF sorting line, assuming manual sorting, not including the MRF itself. CAPEX: Low OPEX: Low
Challenges	• Ensuring Replas could supply the large quantities of product. • Keeping up demand for the recycled product.
Potential partners and arrangements	• <i>Replas</i> are local to Ballarat, and the largest national recycled plastic manufacturer and are increasing their manufacturing capacity in the near future. Consultation results showed Replas would be interested in increasing flexible plastics reprocessing and product manufacture provided there was a purchasing relationship with Councils. • <i>GT Recycling</i> could act as a contingency company, if there was additional stock Replas could not process. • <i>Licella</i> have a planned advanced plastic recycling facility in Altona, which would act as a contingency for overflow material not able to be processed at Replas or GT Recycling. Material would be charged a gate fee.

Feature	Description
	Horsham concrete trialled 5mm aggregates of recycled plastic (from RedCycle) as a substitute for sand. They liked the product, and would use it again if the cost was virgin material competing.
Success factors	- Reduced plastic to landfill and environment (as litter). - Increased plastic recovery. - Increased recycled content in civil infrastructure.
Case study	Replas, in conjunction with RMIT, developed Polyrok which is recycled plastic used as a substitute for mineral aggregate in concrete. Coles in Horsham installed a footpath using Polyrok in 2020, which uses about 95% RedCycle plastics. Testing has shown that the Polyrok does not release microplastics, makes the concrete more thermally efficient and is lighter and easier to use in construction. Polyrok has since been used in other regional Victorian councils and nationally.
Government support programs	- Plastics (in particular LDPE) is a current top priority for government funding. - Recycling Victoria Infrastructure Fund grants. - Recycling Victoria Recycling Modernisation Fund grants.

Waste projections

GCW is in a unique position wherein the region reprocesses a greater proportion of soft plastics than the rest of the state in BAU. This PIP aims to strengthen this position, see Figure 12. It is assumed the recycling rate of flexible plastics will remain the same in the region, but the increase in collection will result in a higher quantity of material recycled per year once the facility is operational.

Figure 12 PIP projections, flexible plastics



While a BAU approach will see a slight increase in material recovery in the GCW region across the target timeframe, implementing the PIP will mean that an additional 4,400 tonnes of flexible plastics could be diverted from landfill by 2031 compared to 2021 estimates. This represents an almost doubling of the tonnes of plastic recycled.

4.4 Three: Unwanted clothing recovery

Current waste management

In the GCW region, like much of Australia, clothing not fit for charity shops from municipal and corporate (generally uniforms) sectors are discarded to landfill. Small independent up-cyclers exist in the region, however none on a scale that would be meaningful to this project.

Proposed waste management

Clothing consumption within the GCW region is not expected to slow. Consultations found that charity shops are overflowing with stock. In fact, in Australia, a typical charity shop will incur a cost of \$7,243 annually to dispose of clothing not fit for resale (MRA Consulting, 2021). This PIP is could be located at the CIRRC. It aims to manage clothing waste while providing the opportunity for fit for sale clothes to be directed to charity shops, which could reduce their future annual landfill costs.

Due to the relative infancy of textile recycling, markets are not very well developed. Added to this complexity is the preference for keeping the material within the GCW region in order to improve circularity. As such, multiple recovery options are presented.

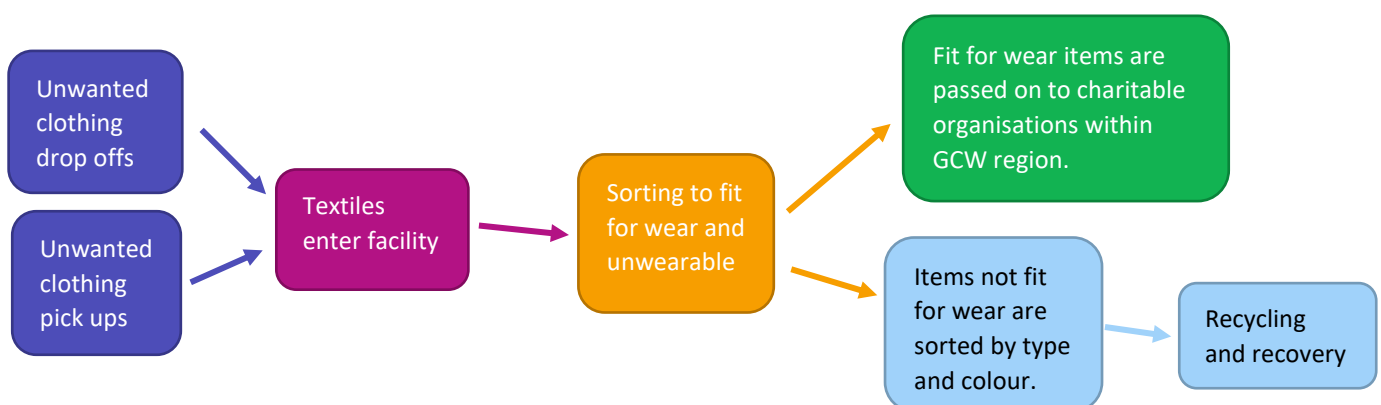
To achieve a high-quality input stream, clothing needs to be clean and dry. It is recommended that the feedstock is aggregated via pick up and drop off to a textile facility within the CIRRC. Current MRF technology is unsuitable to handle textiles due in part to their weight.

This facility would have an initial sorting line to separate wearable and unwearable clothing. Clothing fit for wear would be distributed to charity shops within the GCW region. Remaining stock would be separated by material type and colour for alternative processing at the CIRRC. This could include:

- advanced reprocessing of synthetic materials (polyesters and polypropylene)
- shredding and compaction for reuse in large scale applications
- developing a waste to energy facility for textiles and other material in the GCW region
- shredding and compaction for export to an alternative fuel facility offshore.

A key feature of this PIP, like the others, is that councils within the GCW region must seek and promote opportunities to purchase the recycled product to drive end markets.

Figure 13 PIP diagram, unwanted clothing



Further detail on the proposed glass PIP is given below in Table 11.

Table 11 PIP outline, unwanted clothing

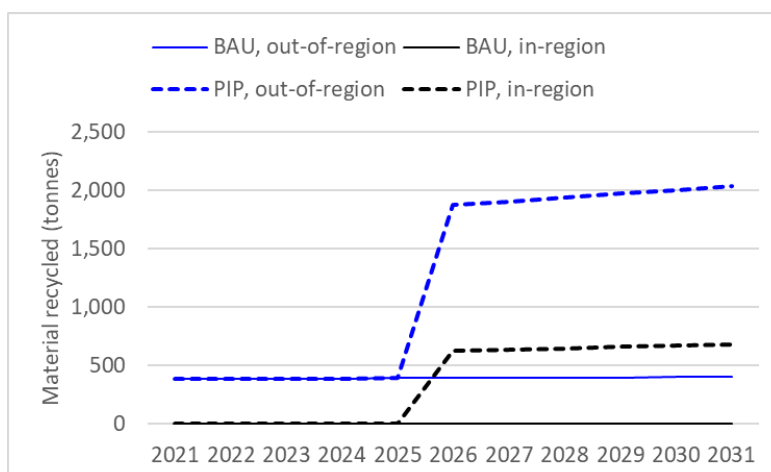
Feature	Description
Target material type	Textiles
Feedstock	Unwanted clothing from the municipal and commercial sectors.
Recovery plan	- Collection via drop offs and pick-ups to a textile facility in the CIRRC. - Wearable clothing directed to charity organisations within GCW region. - Items not fit for wear are sorted by type and colour for recycling and recovery options.
Output	- Sorted stream for charity organisations. - Feedstock for alternative textile recovery.
Siting requirements	Basic siting requirements include (but are not limited to): - Sorting (manual). - Storage and transportation capacity.
Offtake markets	- High potential for attracting material from outside region. - Collection company for pickups. - Opportunity for local industry to run textile facility. - Onsite shredding and compaction for downstream advanced reprocessing (PP and PE) feedstock. - Furniture manufacturing using recycled material fill. - Civil infrastructure applications (like sound barriers) using processed material - Waste to energy facility in the CIRRC for textiles and other material in the GCW region - Onsite shredding and compaction for export to an alternative fuel facility offshore.
Benefits	- Forward thinking investment in textiles recycling. - Textile sorting facility will provide additional jobs for construction, operation and maintenance. - Transport efficiency if facility incorporated into CIRRC. - Supporting social enterprises and charity organisations.
Financial analysis	<i>Assumptions: Costing for warehouse build and initial sorting capacity.</i> CAPEX: Medium OPEX: Medium
Challenges	- Limited end markets. - Further research, market sounding and feasibility studies are required to determine the best application for textile recycling in the Ballarat region. - High costs associated with servicing and running waste to energy facility.
Potential partners and arrangements	Recovered wearable clothing will be distributed to local charity organisations. For unwearable clothing, potential partners include: <i>Upparel</i> run a textile reclamation facility, collecting sorting and shredding material for use as filler (in beds, furniture etc.). Council and Upparel could work in partnership to run the textile facility in the CIRRC, or Upparel could run the collection service only.

Feature	Description
	<i>Southern Cross Recycling</i> would collect wearable items from residents and sort them at the textile facility. Wearable items are sent to charities in Australia, then Malaysia with the leftover unwearable items reused as rags or recovered as alternative fuel. <i>Cleanaway ResourceCo Resource Recovery Facility</i> in Wetherill Park, NSW could process textiles destined for alternative fuel recovery, in particular textiles from the C&D and C&D sector like carpet. <i>Licella</i> planned advanced plastic recycling facility in Altona may be able to accept some PE and PP. - Further work exploring a waste to energy facility that accepts textile waste.
Success factors	- Minimal unwanted clothing to landfill. - Reduction in unwanted clothing leaving GCW region. - Increased employment due to additional jobs available for those in the BWEZ.
Case study	Loop Upcycling in Western Australia have saved over 85 tonnes of uniforms from landfill and employed over 75 people experiencing vulnerability since their inception in 2017. Loop Upcycling work with companies to develop solutions for recycling old uniforms into products such as hats, bags, backpacks and toys.
Government support programs	- Textile recycling is a current top priority for government funding. - Recycling Victoria Infrastructure Fund grants. - Recycling Victoria Recycling Modernisation Fund grants.

Waste projections

Blue Environment estimates show that implementing a PIP to recover unwanted clothing will increase recycling both in and out of the GCW region. Importantly, it shows that adopting a collection system benefits the wider community by providing multiple opportunities for recovery.

Figure 14 PIP projections, unwanted clothing



It is estimated that in 2031, the PIP will divert an additional 2,300 tonnes of unwanted clothing from landfill compared to a BAU approach for the combined inner and outer region.

5. Summary findings

Key findings from research, market sounding, MFA modelling and PIP development are summarised below.

- Market sounding evaluated public need and suggestions on resource recovery including:
 - Availability of additional grants for small local businesses who practice resource recovery, which do not require co-payments and have a simple application process.
 - Community education on what is and is not recyclable.
 - Government (local and federal) procurement policies for recycled products in civil infrastructure.
 - Improve end markets for glass and plastic.
 - Price is the deciding factor for many small businesses when choosing between recycled and virgin material.
 - Various material-specific opportunities for recovery in the GCW region.
- MFA outcomes showed that in the GCW region, metals have the highest recovery rate (83%), and textiles are least recovered (5%). Other low recovery rates are plastics (15%) and glass (21%).
- In the C&D sector, building and demolition materials are generally well recycled although there is some uncertainty around these estimates.
- C&I metals, and paper and cardboard are generally well recycled. There is a proportionally high landfill rate for plastics in this sector.
- Of the municipal stream, the quantity of waste landfilled is higher than that of recycling. This is unique to this stream, as C&D and C&I sectors have a higher recycling rate.
- PIPs were created for three priority materials based on the results of the MDF, market sounding and evaluation of availability and potential success of circularity in the region.
 - **Glass** – incoming CDS and kerbside collections provides an influx of glass from food and beverage containers. It is proposed to separate this into a high-quality stream for beneficiation in Melbourne, and low-quality stream to crush into glass sand for use in civil infrastructure. Predicted increase in local recovery.
 - **Flexible plastics** – proposed inclusion of bag-in-bag flexible plastics into the new MRF, using a film vacuum. Flexible plastics are reprocessed and manufactured locally for use in local infrastructure. Increase in almost 90% of tonnes of plastic recycled in 2031.
 - **Textiles** – proposed textile processing facility for collecting and sorting unwanted clothing from municipal and corporate sources. Wearable items to charity shops and unwearable to various recycling options to divert an estimated 2,300 tonnes compared to BAU approach.
- PIPs can influence social change by employing vulnerable and minority community members.
- PIPs must be supported by mandatory local councils purchasing the recycled product in large volume applications to drive end markets.

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Appendix A In-scope ANZSIC sectors

A1 In-scope ANZSIC sectors

Presented in Table A1 are the sectors modelled in the MFA, as framed by the Australian and New Zealand Standard Industrial Classification (ANZSIC) system.

Table A1 ANZSIC system – Sub-division level codes and labels

Code	Subdivision	Comments
A01	Agriculture	Includes horticulture.
A02	Aquaculture	Includes fishing.
A03	Forestry and Logging	-
B00	Mining, nfd	-
C00	Manufacturing, nfd	-
D00	Electricity, gas, water and waste services, nfd	-
E00	Construction, nfd	-
F00	Wholesale trade, nfd	-
G00	Retail trade, nfd	-
H00	Accommodation and food services, nfd	-
I00	Transport, postal and warehousing, nfd	-
J00–N00	Office based industries	Aggregated office-based divisions (5).
O00	Public administration and safety, nfd	Includes municipal waste that isn't directly generated by households.
P00	Education and training, nfd	-
Q00	Health care and social assistance, nfd	-
R00	Arts and recreation services, nfd	-
S00	Other services, nfd (including households)	Includes municipal waste that is directly generated by households.
X00	Unknown	-

Appendix B Stakeholder surveys

C1. Stakeholder surveysError! Reference source not found.

C1.1. Resource recovery survey

			
Materials flow analysis and market opportunities project – Waste and resource recovery (transporter, sorter and reprocessor) survey form (Survey time period is the 2020–21 financial year)			
Survey guidance: 1. The preferred time period for this survey is the 2020–21 financial year, however the data year is selectable below as required. 2. Please exclude organics from survey responses if possible. 3. Please fill out a separate copy of the survey form for each facility that your company operates in the Grampians Central West Region area (refer map at https://recyclingrevolution.com.au/about-us/our-region/). 4. Please enter data into yellow cells only. 5. Estimates of future activity for new facilities can also be provided for the forecast first full year of production. <i>The survey is detailed in parts, so please do not hesitate to contact us for assistance with completion.</i>			
SECTION 1 – COMPANY AND FACILITY DETAILS			
Company name:		Street address 1:	
Facility name:		Street address 2:	
Organisation type:		Town or suburb:	
ANZSIC subdivision:		Postcode:	
Contact name:		Local council:	[select Council from drop-down list]
Contact position:		Waste and Resource Recovery region of facility:	Grampians Central West WRRG
Phone number:		Latitude and longitude of the facility:	[do not complete]
Email address:		Year the facility commenced operations (e.g. 2005):	
Year of data provided:	2020–21 financial year	Expected facility lifespan (years):	
Survey date (dd/mm/yyyy):		Annual turnover range for your company:	[select range or enter specific value]
Number of employees at facility (equivalent full-time):	0.0	Annual turnover range for the facility:	[select range or enter specific value]

SECTION 2 – MATERIAL TYPES COLLECTED, SORTED AND/OR REPROCESSED

Material designation→	Material A	Material B	Material C	Material D	Material E	Material F
Material types received (see drop-down list in cell)	[select material type]					
Total received (tonnes/yr)	0.0					
Level of accuracy of 'total received' estimate (±%)?	[select range or enter specific value]					
Is quantity reported 'in the gate' (unprocessed) or 'out the gate' (processed product)?	[select point of measurement]					
What % of the 'in the gate' quantity is sold as recycled product?	[select range or enter specific value]					
What is the approximate trend in recovery over the last few years (%/yr)?	[select response from drop-down or type response]					
What is the highest level process that your facility applies to the material?	[select response from drop-down or type response]					
What is the proportion of your facility's potential capacity that is currently utilised (%)?	[select range or enter specific value]					
What is the gate fee for received material (\$/tonne)? (use a negative value if material is purchased)	[select range or enter specific value]					
What is your approximate landfill disposal cost for residual material (\$/tonne)?	[select range or enter specific value]					
What is the main landfill used by your facility? (see drop-down list in cell)	[select landfill]					
What percentage of material received is from municipal sources (%)	[select range or enter specific value]					
What percentage of material received is from C&I sources (%)	[select range or enter specific value]					
What percentage of material received is from C&D sources (%)	[select range or enter specific value]					
Total of material received (100%)	100%					
What was the approximate stockpile of this material type at the beginning of July 2020 (tonnes)?	[enter estimated value at 1 July 2020]					
What was the approximate stockpile of this material type at the end of June 2021 (tonnes)?	[enter estimated value at 30 June 2021]					
Please provide a short description of the factors that influence the size of each material stockpile held at your facility? (e.g. seasonality, supplier requirements, major events, etc.)						

SECTION 3 – ALL MATERIAL SOURCES & DESTINATIONS OF RECOVERED MATERIALS

SOURCES OF ALL MATERIALS								
Material		Source	Source name	Source industry type	% from source	Source location	Upstream collector or sorter name (if applicable)	Further comment on material sources
A	N/A	Source 1	[enter source name]	[enter ANZSIC subdivision from list]	[select range or enter specific value]	[enter town/city or select the LGA from list]	[enter company name]	[free text]
		Source 2						
		Source 3						
B	N/A	Source 1						
		Source 2						
		Source 3						
C	N/A	Source 1						
		Source 2						
		Source 3						
D	N/A	Source 1						
		Source 2						
		Source 3						
E	N/A	Source 1						
		Source 2						
		Source 3						
F	N/A	Source 1						
		Source 2						
		Source 3						
DESTINATIONS OF RECOVERED MATERIALS								

DESTINATIONS OF RECOVERED MATERIALS							
Material	Destination	Destination applications	Destination industry type	% to destination	Destination location	Downstream reprocessor name (if applicable)	Further comment on material destinations
A	Destination 1	[enter application from list]	[enter ANZSIC subdivision from list]	[select range or enter specific value]	[enter town/city or select the LGA from list]	[enter company name]	[free text]
N/A	Destination 2						
	Destination 3						
B	Destination 1						
N/A	Destination 2						
	Destination 3						
C	Destination 1						
N/A	Destination 2						
	Destination 3						
D	Destination 1						
N/A	Destination 2						
	Destination 3						
E	Destination 1						
N/A	Destination 2						
	Destination 3						
F	Destination 1						
N/A	Destination 2						
	Destination 3						

SECTION 4 – FUTURE PLANS

What are the major problems you are currently facing in managing your receipt and processing of materials (e.g. facility space, regulatory, costs, etc.)?	[please provide comments here]		
Do you have any planned changes to your reprocessing capacity (including: staff increases, infrastructure upgrades, reductions or closures) for existing materials at the facility?	[type of change in facility capacity]	[% change in facility capacity]	[If 'yes', please provide a short description here on the nature of these operational or infrastructure changes and the processing capacity increase/decrease. Please identify any grants that have been received.]
Are you currently seeking to expand your facility, or to open any new facilities?	[yes or no]	[If 'yes', please provide a short description here]	
When are these changes expected to be completed (e.g. June 2022)?	[enter date]		
If seeking to expand, are you facing any barriers or limitations to this (e.g. planning permit limits operating hours)?	[yes or no]	[If 'yes', please provide a short description here]	
To assist the growth of recycling in the region, can you suggest any other organisations who may have potential for being more active in resource recovery in the region?	[yes or no]	[If 'yes', please provide a short description here]	
Do you have any other comments you would like to make in relation to your future plans or in relation to the purpose of this survey?	[please provide a comment here]		
Do you have any suggestions on how the City of Ballarat or GCW WRRG could assist your organisation in advancing any existing or planned resource recovery related activities?	[yes or no]	[If 'yes', please provide a short description here]	
Are you interested in being contacted by the City of Ballarat in the future, with updates on potential waste diversion and resource recovery opportunities?	[yes or no]		

Many thanks for completing this survey. It is greatly appreciated and will be of significant assistance in the planning to support the resource recovery industry across the region.

C1.2. Waste generator surveys

		
Materials flow analysis and market opportunities project – Waste generator and recycled materials user survey form (Survey time period is the 2020–21 financial year)		
Survey guidance: 1. The preferred time period for this survey is the 2020–21 financial year, however the data year is selectable below as required. 2. Please exclude organics from survey responses if possible. 3. Please fill out a separate copy of the survey form for each facility that your company operates in the Grampians Central West Region area (refer map at https://recyclingrevolution.com.au/about-us/our-region/). 4. Please enter data into yellow cells only. 5. Estimates of future activity for new facilities can also be provided for the forecast first full year of production. <i>The survey is detailed in parts, so please do not hesitate to contact us for assistance with completion.</i>		
SECTION 1 – COMPANY AND SITE DETAILS		
Company name:		Street address 1:
Facility name:		Street address 2:
Organisation type:		Town or suburb:
What was the approximate stockpile of this material type at the beginning of July 2020 (tonnes)?	[enter estimated value at 1 July 2020]	
What was the approximate stockpile of this material type at the end of June 2021 (tonnes)?	[enter estimated value at 30 June 2021]	
Please provide a short description of the factors that influence the size of each waste stockpile held at your facility? (e.g. seasonality, major events, etc.)	[free text]	
SECTION 3 – WASTE DESTINATIONS		
Material	Waste fates	Waste fate
A	Waste fate 1	[enter waste fate]
N/A	Waste fate 2	[select range or enter specific value]
	Waste fate 3	[enter receiver name]
B	Waste fate 1	[enter town/city or select the LGA from list]
N/A	Waste fate 2	[enter ANZSIC subdivision from list]
	Waste fate 3	[free text]
C	Waste fate 1	
N/A	Waste fate 2	
	Waste fate 3	
D	Waste fate 1	
N/A	Waste fate 2	
	Waste fate 3	
E	Waste fate 1	
N/A	Waste fate 2	
	Waste fate 3	
F	Waste fate 1	
N/A	Waste fate 2	
	Waste fate 3	

SECTION 4 – RECYCLED MATERIALS USED AND SOURCES (this section applies to potential end-users of recovered materials)						
RECYCLED MATERIALS USED OR POTENTIALLY USED						
Material designation→	Material A	Material B	Material C	Material D	Material E	Material F
Recycled materials that are used or that could potentially be used?	[select material type]					
Total recycled material that is used (tonnes/yr)	0.0					
Total recycled material that could be used (tonnes/yr)	0.0					
What is the approximate trend in the use of recycled materials over the last few years (%/yr)?	[select response from drop-down or type response]					
Total quantity of virgin + recycled material that is used (tonnes/yr)	0.0					
What is the proportion of your facility's potential manufacturing capacity that is currently utilised (%)?	[select range or enter specific value]					
What is your approximate purchase cost for the recycled content material, excluding transport (\$/tonne)?	[select range or enter specific value]					
What is your approximate purchase cost for the competing virgin content material, excluding transport (\$/tonne)?	[select range or enter specific value]					
Please provide a description of the factors that prevent greater use of this recycled material type.	[free text]					

SOURCES OF RECYCLED MATERIALS							
Material	Source	Source name	Source industry type	% from source	Source location	Reprocessor name (if applicable)	Further comment on material sources
A	Source 1	[enter source name]	[enter ANZSIC subdivision from list]	[select range or enter specific value]	[enter town/city or select the LGA from list]	[enter reprocessor name]	[free text]
N/A	Source 2						
	Source 3						
B	Source 1						
N/A	Source 2						
	Source 3						
C	Source 1						
N/A	Source 2						
	Source 3						
D	Source 1						
N/A	Source 2						
	Source 3						
E	Source 1						
N/A	Source 2						
	Source 3						
F	Source 1						
N/A	Source 2						
	Source 3						

SECTION 5 – FUTURE PLANS

What are the major problems you are currently facing in managing your waste (e.g. facility space, regulatory, costs, etc.)?	[please provide comments here]	
Do you have any planned changes for the facility capacity that have implications for your waste generation quantity, fate, and/or waste material profile?	[yes or no]	[If 'yes', please provide a short description here]
Do you have any planned changes for the facility capacity that have implications for your use of recycled content materials?	[yes or no]	[If 'yes', please provide a short description here. Please identify any grants that have been received.]
When are these changes expected to be completed (e.g. June 2022)?	[enter date]	
What assistance (of any kind) could you be provided with to improve the local viability of any initiatives to increase the use of recycled materials?	[please provide a comment here]	
Do you have any waste audit data available for your organisation? If so, can we please be provided with a copy?	[yes or no]	[If 'yes', please provide a short description here]
To assist the growth of recycling in the region, can you suggest any other organisations who may have potential for being more active in resource recovery in the region?	[yes or no]	[If 'yes', please provide a short description here]
Do you have any other comments you would like to make in relation to your future plans or in relation to the purpose of this survey?	[please provide a comment here]	
Do you have any suggestions on how the City of Ballarat or GCW WRRG could assist your organisation in promoting any existing or planned resource recovery related activities?	[yes or no]	[If 'yes', please provide a short description here]
Are you interested in being contacted by the City of Ballarat in the future, with updates on potential waste diversion and resource recovery opportunities?	[yes or no]	

Many thanks for completing this survey. It is greatly appreciated and will be of significant assistance in the planning to support the resource recovery industry across the region.

C1.3. Summary of completed surveys

Company names	Organisation type	Survey type	# of sites surveyed
Ballarat Engineering Plastics (estimated)	Manufacturer	Waste generator	1
Bartlett Blinds (estimated)	Manufacturer	Waste generator	1
Danbar Plastics	Manufacturer	Waste generator	1
Eureka Concrete (Holdings) Pty Ltd	Material supplier	Waste generator	1
Federation University	Generator – Household and commercial	Waste generator	5
Ferndale Confectionary	Manufacturer	Waste generator	1
Grampians Health Services	Generator – Large and industrial	Waste generator	2
Horsham Concete	Material supplier	Waste generator	1
Laminex	Manufacturer	Waste generator	1
Regina Glass	Manufacturer	Waste generator	1
Sovereign Press	Retailer	Waste generator	1
Sovereign Hill (estimated)	Generator – Large and industrial	Waste generator	1
Australian Paper Recovery (APR)	MRF or sorting facility operator	Waste recovery	1
Axis Worx	MRF or sorting facility operator	Waste recovery	1
Ballarat Regional Industries (estimated)	MRF or sorting facility operator	Waste recovery	1
Calleja Group	Landfill operator	Waste recovery	1
Downes Recycling	MRF or sorting facility operator	Waste recovery	1
Replas	Reprocessor	Waste recovery	1
Veolia/Suez	Transporter and/or collector	Waste recovery	1
Vic Waste Solutions	Transfer station operator	Waste recovery	1
Visy - Laverton (Glass & Cardboard Recycling) (estimated)		Waste recovery	1
Waste Busters Wimmera Recycling	MRF or sorting facility operator	Waste recovery	1
Westonvic Waste	MRF or sorting facility operator	Waste recovery	1
Wimmera Mallee Waste	Transporter and/or collector	Waste recovery	1
Zero Plastics Australia	Reprocessor	Waste recovery	1
			30

Appendix C CIRCC concept plan report

C1 CIRCC concept plan report

In 2019, the City of Ballarat commissioned a report on the business case for implementing a MRF in Ballarat, following the material import bans China implemented in 2018. This informed subsequent work of a CIRCC concept plan report. Combined, the purposes of the CIRCC and MRF is to aggregate recovered resources from the region and maximise resource recovery to support a local circular economy. The CIRCC and MRF will provide primary and secondary processing and some small-scale commercial opportunities with larger scale commercial operations occurring within the BWEZ.

Key features of the proposed MRF include:

- advanced Resource Recovery Centre (proposed relocation and upgrade of Ballarat Transfer Station)
- C&I recovery centre
- bulky goods recovery
- resales centre (indoor and outdoor)
- materials recovery facility (high-tech)
- repairs & trade skills
- business incubators / micro-factories
- multi use industrial shedding
- shared services (e.g. driveway, hardstands, weighbridge etc.).

This previous work also provided a high-level overview of indicated material inflows for the combined CIRCC and MRF, outlined below.

Table 1A *Proposed CIRCC/MRF materials inflows*

Feature (tonnes per annum)	Process
3,000 C&D	Receive/Store and Sort/Process
27,500 C&I	Receive/Store and Sort/Process
12,000 Transfer Station (recyclables and residual wastes)	Receive/Store range of Industrial, Priority and Reportable Priority Wastes (e.g. tyres, e-waste, Asbestos). Likely some “pre-processing” activities occur (e.g. chipping, grinding, compacting) for general operational performance (i.e. improve storage and handling, improve transport efficacy)
20,000 Food Organics / Garden Organics	Receive/Store (NB: interchange only)
2,500 MSW Glass (and potential aggregation other sources)	Receive/Store (NB: interchange only)
30,000 Comingle MSW (possible C&I and services for CDS Network Operator)	Receive/Store and Sort/Process
15,000 MSW Kerbside General Waste	Receive/Store (NB: interchange only) but possible Sort/Process at inception or future opportunity
115,000 TOTAL (rounded) at inception, designed to grow with population and active facilitation of circular economy opportunities	

This MFA and market opportunities report provides key knowledge in supporting the proposed CIRCC and MRF by identifying target materials as well as priority industry plans to underpin investor certainty.