

Draft report v3

Recycling problematic materials option analysis

24 MARCH 2022

PREPARED FOR

City of Wodonga and project partners comprising the North
East Victoria region



Report title	Recycling problematic materials option analysis
Client	City of Wodonga and project partners comprising the North East Victoria region
Status	Draft report v3
Author(s)	S Ullal, S Guazzo, P Nyunt
Reviewer(s)	C Wardle
Project number	P1303
Report date	24 March 2022
Contract date	27 August 2021
Information current to	10 December 2021
Copyright	City of Wodonga/Blue Environment Pty Ltd

Disclaimer

This report has been prepared for City of Wodonga and project partners comprising the North East Victoria region in accordance with the terms and conditions of appointment dated 27 August 2021, and is based on the assumptions and exclusions set out in our scope of work. Information in this document is current as of 10 December 2021. While all professional care has been undertaken in preparing this report, Blue Environment Pty Ltd cannot accept any responsibility for any use of or reliance on the contents of this report by any third party.

The mention of any company, product or process in this report does not constitute or imply endorsement by Blue Environment Pty Ltd.

© City of Wodonga/Blue Environment Pty Ltd

Blue Environment prints on 100% recycled paper

Blue Environment Pty Ltd
 ABN 78 118 663 997
 Suite 209, 838 Collins St, Docklands Vic 3008
 Email: blue@blueenvironment.com.au
 Web: www.blueenvironment.com.au
 Phone: +61 3 9081 0440 / +61 3 5426 3536

Contents

Summary	iii
1. Introduction	2
2. Current situation.....	4
2.1 Alpine Shire Council	4
2.2 Rural City of Benalla	5
2.3 Falls Creek Resort Management Board	5
2.4 Indigo Shire Council	6
2.5 Mansfield Shire Council	6
2.6 Mt Buller/Mt Stirling Alpine Resort Management Board	7
2.7 Mt Hotham Alpine Resort Management Board.....	7
2.8 Towong Shire Council.....	8
2.9 Rural City of Wangaratta.....	8
2.10 City of Wodonga	9
2.11 Regional overview.....	9
3. Recycling of problematic materials	11
3.1 Polystyrene	11
3.2 Silage wrap.....	11
3.3 Textiles	12
3.4 Mattresses and soft furnishings.....	12
3.5 Hard plastics.....	12
3.6 Paint	12
3.7 Skis, snowboards and boots.....	13
3.8 Batteries	13
3.9 Fluorescent lamps.....	13
3.10 Treated timber	13
3.11 Soft plastics	13
3.12 E-waste.....	14
4. Opportunities	15
4.1 Consultation with recyclers	15
4.2 Potential recycling opportunities.....	16
4.3 Community participation	22
5. Regional analysis	23
5.1 Regional challenges.....	23
5.2 Risks and benefits	26
6. Conclusions and recommendations	28
Recommendations	35
References.....	37

Table

Table 1	Estimated soft plastic generation based on 2021 kerbside audit.....	9
Table 2	Regional overview of problematic materials	10
Table 3	Risks and benefits	26
Table 4	Time-driven estimated costs for polystyrene aggregation at Beechworth and transport	29

Table 5	Time-driven estimated costs for polystyrene aggregation at Mansfield and transport...	29
Table 6	Time-driven estimated costs for hard plastic aggregation at Wangaratta and recycling.	32
Table 7	Time-driven estimated costs for multiple streams aggregation at Wangaratta	34
Table 8	Transport costs, based on time, of 'milk runs' to Melbourne	35

Figures

Figure 1	Estimated route for drop off of aggregated waste streams	35
----------	--	----

Appendices

Appendix A Record of consultation with recyclers

Appendix B Summary of feasible options

Abbreviations and glossary

ARMB	Alpine Resort Management Board
DELWP	Department of Environment, Land, Water and Planning
EPA	Environment Protection Authority
EPS	expanded polystyrene
HDPE	high density polyethylene
L	litre
LDPE	low density polyethylene
NE	north east
NEWRRG	North East Waste and Resource Recovery Group
NTCRS	national television and computer recycling scheme
PET	polyethylene terephthalate
PP	polypropylene
PS	polystyrene
PSS	product stewardship scheme
RMB	Resort Management Board
RRC/TS	resource recovery centre/transfer station
XPS	extruded polystyrene

Summary

The City of Wodonga, in partnership with the other nine council and alpine resort members of the North East Waste and Resource Recovery Group (NEWRRG), commissioned Blue Environment to undertake an options analysis for recycling problematic materials in the region.

A list of problematic materials was defined across consultation Blue Environment held with each northeast (NE) council and alpine resort management board (ARMB). Problematic materials are listed in Table S1, along with the councils and alpine resorts that find them problematic to manage or recycle.

Table S1 Regional overview of problematic materials

Problematic material	Alpine	Benalla	Falls Creek	Indigo	Mansfield	Mt Buller/ Mt Stirling	Mt Hotham	Towong	Wangaratta	Wodonga
Soft plastic	✓	✓	✓	✓	✓		✓	✓		
Polystyrene	✓		✓	✓	✓			✓		
Treated timber	✓	✓		✓					✓	
Silage wrap	✓	✓						✓		
Skis/snowboards/boots			✓			✓	✓			
Textiles (e.g. carpets/underlay)			✓		✓					✓
Hard plastics				✓	✓					
Paint	✓	✓								
E-waste	✓									
Fluorescent lamps								✓		
Lithium ion and household batteries	✓									
Mattresses and soft furnishings						✓				

After collecting information from councils and alpine resorts and exploring data availability, possible recyclers were contacted. Some difficulties were encountered in gathering information from recyclers, mainly because specific data on quantities were not available for every council/ARMB and material. In order to determine implementation-ready solutions for NEWRRG member councils/ARMBs, information was sought from recyclers on:

- whether they were capable of recycling any of the listed problematic materials
- whether they were willing to service the NE region, including remote and rural areas
- whether collection services could be provided or delivery would need to be arranged
- requirements for receiving problematic materials, including contamination and minimum quantity thresholds
- cost considerations and gate fees
- the need for a contract and, if so, any requisite contractual details such as buy-back agreements, long-term lock-ins, non-negotiables, etc.

Among all potential recycling solutions found, only a few could meet the needs of northeast councils and ARMBs. Feasible options by material are outlined in Table S2 below, albeit some are not yet operational (e.g. forthcoming product stewardship schemes). For some problematic materials, no existing or viable recovery pathways were identified.

Table S2 Feasible options for recycling problematic materials

Problematic material	Councils/ARMBs	Known quantities	Key issues identified	Feasible recycler or option	Comment
Soft plastic	Alpine Shire Council	Unknown	Lack of recycling options	Maintain current practices until PSS starts	No recyclers have been deemed suitable for the needs of NE councils/ARMBs. Introducing a NEWRRG-led initiative to collect data on the amount of soft plastic generated may allow this to be revisited in future.
	Rural City of Benalla	32.4 tonnes			
	Falls Creek ARMB	Unknown			
	Indigo Shire Council	Unknown			
	Mansfield Shire Council	Unknown			
	Mt Hotham ARMB	Unknown			
	Towong Shire Council	Unknown			
Polystyrene	Alpine Shire Council	Unknown	Lack of recycling options Cost Lack of sufficient quantity Contamination Lack of storage capacity	Foamex/Unipod or Albury Waste Management Centre	Collaborative procurement agreement between councils and joint aggregation point
	Falls Creek ARMBs	Unknown			
	Indigo Shire Council	2.7 tonnes			
	Mansfield Shire Council	Unknown			
Treated timber	Alpine Shire Council	100 tonnes	Cost	Maintain current practices of mulching and landfilling or using as road/cover material	Can be recycled only as fuel but costs deemed too great to be feasible
	Rural City of Benalla	460 tonnes			
	Indigo Shire Council	308 tonnes			
	Rural City of Wangaratta	430 tonnes			
Silage wrap	Alpine Shire Council	8 m ³	Lack of recycling options	Plastic Forests	Plastic Forests' requirements do not allow regional response; councils may find individual solutions with Plastic Forests
	Rural City of Benalla	10-15 tonnes			
	Towong Shire Council	50-60 tonnes			
Skis/snowboards/boots	Falls Creek ARMB	Unknown	Lack of recycling options		

Problematic material	Councils/ARMBs	Known quantities	Key issues identified	Feasible recycler or option	Comment
	Mt Buller/Mt Stirling ARMB	Unknown	Lack of storage capacity	Maintain current practices until PSS starts	Due to the nature of material, no recyclers have been deemed suitable for ARMBs needs
	Mt Hotham ARMB	Unknown			
Textiles (e.g. carpets/underlay)	Falls Creek ARMB	Unknown	Lack of recycling options Contamination	Recycling through community associations	Recycling not considered feasible due to very low quantities received
	Mansfield Shire Council	Unknown		Landfill disposal	The market does not offer recycling solutions
	Wodonga City Council	Unknown			
Hard plastics	Indigo Shire Council	Unknown	Contamination	GT Recycling	Collaborative procurement agreement between councils and aggregation at Wangaratta TS
	Mansfield Shire Council	Unknown	Inability to separate polymers		
Paint	Alpine Shire Council	Unknown	Cost	Paintback	Participation in pop-up events
	Rural City of Benalla	Unknown	Lack of recycling options		
E-waste	Alpine Shire Council	Unknown	Cost and contamination	Scipher Technologies	Council should seek recycling solution with regional contractor
Fluorescent lamps	Towong Shire Council	Unknown	Lack of recycling options	Scipher Technologies	Council should seek recycling solution with regional contractor
Lithium ion and household batteries	Alpine Shire Council	Unknown	Lack of collectors	B-cycle PSS	The new PSS offers rebates
Mattresses and soft furnishings	Mt Buller/Mt Stirling ARMB	Unknown	Lack of storage capacity	Soft Landing	The company will be leading the future PSS and will offer rebates

After analysing difficulties councils/ARMBs face to recycle certain waste streams, and investigating market opportunities to divert some waste streams from landfilling, solutions for certain materials have been found.

Key recommendations for NEWRRG implementation are provided below.

Polystyrene

- Engage with Indigo Shire Council to obtain consent to function as an aggregation hub for polystyrene at Beechworth RRC/TS and availability to accommodate a compactor.
- Seek agreements from councils that find the material problematic to participate in the aggregation process and sharing of fees.
- Engage with Albury Waste Management Centre with the view to reduce gate fees as polystyrene is brought to the centre already compacted.
- Re-confirm the implementation of the program with Indigo Shire Council and participating councils/ARMBs.
- When councils/ARMBs agree on the implementation of the program and ultimately confirm their participation, explore funding opportunities (e.g. via Sustainability Victoria) for development of relevant infrastructure.

Silage wrap

- In consultation with councils/ARMBs that are already serviced by Plastic Forests, use market leverage to establish similar collections for other councils/ARMBs without the stated requirement for buy-back arrangements.

Paint

- Explore opportunities with Paintback for pop-up events to be held in the NE region.

Hard plastic

- Engage with Wangaratta to trial hard plastic aggregation and recycling with the current contractor, GT Recycling.
- Confirm with councils/ARMBs that find this material problematic quantities in play, aggregation process and sharing of transport costs to GT Recycling facility in Geelong.
- Assess with Wangaratta the need for additional storage space, equipment, etc. to manage the quantities involved.
- Re-confirm the implementation of the program with Wangaratta and participating councils/ARMBs.
- Explore funding opportunities for the establishment of any additional storage infrastructure required.
- If hard plastic aggregation trial is successful, investigate the opportunity to extend the program to other problematic materials and organise 'milk runs' to Melbourne.

1. Introduction

City of Wodonga, in partnership with nine other council and alpine resort members of the North East Waste and Resource Recovery Group (NEWRRG), commissioned Blue Environment to explore options for recycling various materials that are currently problematic to manage. NEWRRG and partners previously explored soft plastic, paint and silage wrap; this second stage examines these materials, as well as additional problematic materials. The NEWRRG is supporting this regional project in a project coordination role, covering the following councils and alpine resort management boards (ARMBs):

- Alpine Shire Council
- Rural City of Benalla
- Falls Creek Resort Management Board
- Indigo Shire Council
- Mansfield Shire Council
- Mt Buller/Mt Stirling Alpine Resort Management Board
- Mt Hotham Alpine Resort Management Board
- Towong Shire Council
- Rural City of Wangaratta
- City of Wodonga.

The ten NEWRRG members have longstanding resource recovery systems in place, including a network of 17 resource recovery centres/transfer stations (RRC/TS) in the region. Some waste materials are considered 'problematic' because they are costly to recycle or dispose of, and/or there are limited or no local recovery options. The materials identified by NEWRRG as problematic for the scope of this project were:

- polystyrene
- silage wrap
- textiles (i.e. carpet/underlay)
- mattresses and soft furnishing
- hard plastics
- liquid household chemicals
- ski/snowboards/boots
- fire extinguishers
- gas bottles
- lithium ion and household batteries
- compact fluorescent lamps
- treated timber.

Some additional problematic materials were identified by councils/ARMBs during the project, viz. e-waste, paint and soft plastics. Possible options for recovery and recycling of all of these materials were explored in this project, which included:

- consulting with each NEWRRG member to identify which materials they considered to be problematic and why
- consulting with potential managers and recyclers of identified problematic materials to explore options and gauge which (if any) are viable

- assessing identified recycling options, considering environmental and social benefits, financial impacts and other risks and requirements
- developing a regional options approach, with council/alpine resort site-specific recommendations where appropriate.

2. Current situation

Blue Environment consulted all NEWRRG members to identify current problematic materials and the specific issues they encounter in management and recycling of these materials. The outcomes of this consultation are discussed in the following section.

Data on the quantity of material generated was sought but was rarely recorded; some materials are also not currently accepted at northeast (NE) facilities, making estimates difficult. Where data was available, it has been included in the following discussion.

2.1 Alpine Shire Council

Alpine Shire Council identified garden waste, silage wrap, soft plastic and treated timber as most problematic. Some additional materials outside Blue Environment's scope were also identified as problematic, viz. e-waste and paint. Each material type is considered problematic for different reasons (discussed below).

- **Batteries:** Household batteries constitute a problem as the transfer stations only receive small quantities, which lead to difficulties in finding suitable collectors. Batteries were previously taken by the e-waste collector; however, this service is no longer in place and addressing the problem is difficult and costly. Household batteries are currently found in residual waste streams.
- **E-waste:** E-waste is being accepted at Alpine facilities in large quantities. The problem with this waste stream is related to its elevated disposal fees and contamination issues. Council engaged a contractor to collect e-waste, but the contractor stopped taking this waste stream as 40% of it was not consistent with the computer and television PSS (and outside their contractual obligations). Council is starting to educate the community on the type of e-waste that can be disposed of at RRC/TS, and is involved in the new (2021) regional collaborative procurement.
- **Paint:** Paint is considered a problem material because its disposal is costly. Cleanaway is currently being contracted to collect the waste paint (it is used for energy recovery). Around 800 L is received each year.
- **Silage wrap:** Silage wrap is problematic because of the scarce availability of recyclers willing to collect it, partly due to its contamination, low quantities and transport issues. Council reports around 8 m³ of silage wrap is collected each year, although this amount could increase if collection was encouraged.
- **Soft plastic:** Soft plastic is currently being collected with general waste, as there are few supermarkets in the area that are part of the REDcycle program for soft plastic recycling.
- **Polystyrene:** Polystyrene is currently landfilled. It can cause litter issues (due to its light weight), as well as contamination of other materials when broken.
- **Treated timber:** Treated timber is accepted only at the Mt Beauty transfer station, with more than 100 tonnes received per year. Recovery options are expensive and limited to energy recovery. It is currently transported to Wangaratta to be used for landfill roads and cover material.

Council highlighted storage as one of the major issues they face for many materials, as it is not viable to store significant quantities of any waste. To facilitate agreements with recyclers, Council could potentially be interested in buy-back arrangements for items such as road signs (but not for high-end furniture such as benches) or materials for works programs.

2.2 Rural City of Benalla

The problematic materials identified by the Rural City of Benalla were paint, silage wrap and soft plastic, and treated timber:

- **Paint:** Paint is not accepted at Benalla's landfill (only empty paint cans are received), however the community would like to have an option to dispose of it correctly and it is believed quantities would be significant if accepted at the landfill.
- **Silage wrap and soft plastic:** Soft plastic and silage wrap were accepted at Benalla RRC (co-located at Benalla landfill), where they were stockpiled, however Council ceased accepting these materials at the RRC due to new Environment Protection Authority (EPA) regulations. It is estimated that about 5% of waste placed in Benalla's red and yellow bins is soft plastics, equating to roughly 32.4 tonnes of the material sent to landfill through the kerbside system each year. Silage wrap is recycled by Plastic Forests; however, the company only accepts the amount it can process, meaning continuous ongoing collections are not guaranteed. Council note that transporting material to Plastic Forests was very costly and needed to be arranged well in advance; bookings for silage wrap collection had to be made 3 months in advance, and cost \$1,000 to transport the material to Plastic Forests' site. When Council was still accepting silage wrap at the RRC, Council purchased Plastic Forests' collection plastic bags and gave them to farmers for free to collect their silage wrap. Council was not buying back any Plastic Forests product. Council estimates that 10-15 tonnes of silage wrap are received at the RRC each year, although this was expected to increase significantly if a more secure program with guaranteed collections was promoted.
- **Treated timber:** Timber materials, including treated timber, furniture and raw timber, are stored together at Benalla RRC, mulched to a 40-50 mm particle size, and used as landfill cover material; any excess volumes are disposed of. It is estimated that about 460 tonnes of treated timber are mulched and utilised/disposed each year.

2.3 Falls Creek Resort Management Board

Falls Creek faces waste management issues common in alpine areas, in that it is relatively isolated and generates low volumes of waste, meaning collectors are less inclined to provide a service. Transport and storage are key issues for the resort, and Falls Creek Resort Management Board (Falls Creek RMB) indicated that to overcome them a system where waste is taken to nearby facilities (as opposed to being stockpiled within the resort) may be required. The resort has recently introduced a new baler, which could resolve some storage issues, as well as a new e-waste storage unit, which could accommodate a cage for other materials (e.g. textiles). Falls Creek RMB also indicated that it must attain approval from its current waste contractor (4 Site Australia) before proceeding with decisions related to waste management and recycling.

Falls Creek RMB identified polystyrene, soft plastics and textiles as its key problematic materials:

- **Polystyrene:** Falls Creek's polystyrene is currently landfilled. Although Falls Creek RMB is aware that polystyrene can be recycled in Albury, it does not have the resources to separate and transport the material to an appropriate RRC for aggregation and further carting. Polystyrene recyclers typically accept only a clean and dry stream that is of sufficient quantity, meaning that even if source separation could be achieved the RMB would likely need to stockpile, and there is no room onsite to do so.
- **Soft plastic:** Soft plastic is generated in Falls Creek domestically and at commercial kitchens. The waste arises in considerable quantities and is landfilled. There are no REDcycle bins in the area. Falls Creek RMB indicated that soft plastics were commonly contaminated with food, which can cause odour, mould and health and safety issues if stored for long periods of time. The RMB has found a

solution for commercial grade soft plastic (e.g. pallet wrap) through JJ Richards, however the company does not accept domestic or restaurant-grade soft plastic.

- **Textiles:** Clothing waste is problematic in Falls Creek and is mostly landfilled. Local schools host annual second-hand market events at which some clothing and snow gear is resold.
- **Snow boots and winter clothing:** Snow clothing (e.g. boots, gloves, etc.) typically comprise a mix of materials (e.g. polystyrene, foam, feathers, etc.) making them difficult to recycle. Some snow gear is resold at annual second-hand markets.

2.4 Indigo Shire Council

The Indigo community is understood to be mindful about waste and sustainability, and there was a community-led soft plastics initiative operating in a small town within the Shire. Indigo Shire Council manages two transfer stations (in Beechworth and Rutherglen) where material could potentially be stored.

Hard plastic, polystyrene, soft plastic and treated timber have been identified as problematic:

- **Hard plastic:** Hard plastic is not collected and is currently being landfilled in considerable quantities in Indigo. DMD was previously engaged to collect and recycle it but the company ceased collections due to concerns of contamination (these concerns were claimed to be unwarranted by Indigo RRC/TS operators).
- **Polystyrene:** Council receives a subsidy from Halve Waste to recycle polystyrene, however Indigo's waste facilities receive four times the amount the subsidy covers. In 2019-20 Beechworth and Rutherglen RRC/TS received 2.7 tonnes of polystyrene. The material's lightweight nature means it sometimes becomes windblown litter. The RRC/TS also face difficulties in keeping polystyrene undercover and dry due to limited storage space.
- **Soft plastic:** The Indigo community led an initiative on separating soft plastics from general waste, however the company previously engaged to collect and process the aggregated soft plastics stream has ceased to do so (for unclear reasons). There are also no REDcycle bins in the area, meaning soft plastics are landfilled, unless the household generating the soft plastic waste takes it out of the Shire to a REDcycle collection point.
- **Treated timber:** Indigo Shire Council separates raw and treated timber to optimise recycling. The separated treated timber (of which there was about 308 tonnes in 2019-20) is mulched and landfilled. A significant amount of timber received at RRC/TS are brought in by local op shops, who (as a charity association) dispose of old and unwanted furniture without paying a gate fee.

2.5 Mansfield Shire Council

Mansfield's RRC/TS was operated by a private contractor until a few years ago. Mansfield Shire Council have since taken over operations, however the previous arrangement meant Council was excluded from a regional contract for tyre collections and ad-hoc collections were organised. Council reported that residents sometimes bring unacceptable wastes such as asbestos and paint into waste facilities, causing contamination issues. Council also noted that it is not in a position to introduce new equipment or additional staff members at its RRC/TS.

Mansfield Shire Council identified hard plastic, polystyrene and soft plastic as the most problematic materials:

- **Hard plastic:** Children's toys and plastic containers are particularly problematic hard plastics for Mansfield. Most hard plastic recyclers require separated streams based on polymer type, which

RRC/TS operators would need to undertake. Council note that sorting toys may be particularly difficult as their composition is not always clear.

- **Polystyrene:** Polystyrene is currently landfilled in Mansfield. There are recyclers willing to service Mansfield but no arrangements have yet been made. For collections, Council notes it may need to satisfy minimum quantity requirements and store material undercover.
- **Soft plastic:** Council has tried to address soft plastics but it remains problematic. Significant quantities of soft plastics are collected and landfilled. Cleanaway was previously contracted to manage Mansfield's soft plastics, however contamination issues coupled with a lack of reprocessing options saw the arrangement cease. There are no REDcycle participating supermarkets in the area, however Council is investigating options to collaborate with local supermarkets to implement a similar business model, where supermarkets become soft plastics drop-off points. Accumulated plastic would be collected from the local supermarkets and taken to transfer stations at no cost. This service could only be implemented if ongoing collections from RRC/TS are guaranteed, and a third-party recycler has not yet been engaged to do this.
- **Textiles:** The Mansfield RRC/TS receives carpets and underlays from Mansfield and Mt Buller, and is mostly sourced from the construction and demolition sector. The material is relatively dirty and is used as an absorbent layer for skips or landfilled.

2.6 Mt Buller/Mt Stirling Alpine Resort Management Board

As an alpine resort, skis and snowboards are problematic for Mt Buller/Mt Stirling; mattresses were also identified as an issue. There is one RRC/TS in the area, and the ARMB utilises nearby facilities (e.g. Mansfield RRC/TS) for managing certain materials (e.g. e-waste). The status for managing problematic materials in Mt Buller/Mt Stirling is outlined below.

- **Skis and snowboards:** Skis and snowboards are problematic due to a lack of recycling solutions and storage issues. Local organisations and artists are known to repurpose some of these items in art installations. Ski rental companies dispose of old skis and snowboards at the local RRC/TS, but often not before compromising or damaging the equipment so it cannot be salvaged. This practice is thought to be adopted by rental companies to boost sales, although it is possible that the equipment is damaged to avoid its reuse for safety reasons.
- **Mattresses:** Mattresses are bulky and can cause storage issues. Mt Buller/Mt Stirling ARMB indicates that stockpiling mattresses onsite (to reach the minimum quantity required by collectors for pickup) is not feasible due to limited storage capacity. Another issue is that mattress waste varies significantly across and between seasons. Mattresses are currently carted to Benalla RRC/TS at cost (for transport and gate fee).

Ski poles are another common waste stream for the alpine resort, however a management solution for them has been found (they are currently delivered to a Melbourne charity as a mobility aid for people who have suffered strokes). Another potential option is to take ski poles to a metal recycler, however the ARMB has not explored this due to the concern that the rubber handle on ski poles would prevent them from being accepted. The ARMB has advised that it will engage with its current scrap metal contractor to confirm if the company is able to accept ski poles.

2.7 Mt Hotham Alpine Resort Management Board

Mt Hotham ARMB listed skis and snowboards and soft plastics as its most problematic waste streams. The alpine resort has issues with storage and may not be able to stockpile the minimum quantities required by third-party recyclers. The ARMB recently purchased a compactor to overcome polystyrene storage issues; once one tonne of compacted polystyrene is accumulated, the material is transported to Albury for recycling.

Mt Hotham's problematic materials are described below.

- **Skis and snowboards:** There are a lack of recycling options for skis and snowboards. Mt Hotham ARMB has tried to engage with local communities to repurpose snowboards for furniture or fencing, but the items are generally not reused or recovered.
- **Soft plastic:** Domestic soft plastics are currently collected at Mt Hotham RRC and taken to a REDcycle-participating supermarket in Bright by a staff member outside working hours. About four to five full bags of soft plastics are taken to the drop-off point weekly, and this does not include commercial-sourced material (shops and lodges dispose of their soft plastics independently). Approximately 90% of the total soft plastic volume is generated during peak winter season. An increase in bubble wrap waste volumes occurs at the start of peak season due to renovations that occur in that time of year, and this stream is particularly problematic because it is too large to be accepted at the REDcycle drop-off point in Bright. The ARMB is potentially willing to bale the bubble wrap, however storage may pose a fire risk. Mt Hotham ARMB have advised that entering a buy-back agreement for bubble wrap and other soft plastics could be an option, however there is limited need for the products on offer.

Fluorescent lamps are a minor problem in Mt Hotham. The ARMB's e-waste contractor accepts fluorescent lamps, however they are sometimes incorrectly placed in garbage bins.

2.8 Towong Shire Council

Soft plastic and silage wrap, fluorescent lamps and blue boards (extruded polystyrene) are problematic materials in Towong. Towong Shire Council indicated that transportation costs are a major barrier for recycling. Council is willing to compact soft and hard plastic to improve transport efficiencies. Council may be interested in entering a buy-back agreement for plastics, depending on the minimum quantity imposed by the recycler and the quality of the end-products.

The current status for Towong's problematic materials is outlined below.

- **Soft plastic and silage wrap:** Council has an arrangement with Plastic Forests to recycle clean silage wrap. Farmers can drop-off silage wrap at Towong's RRC/TS for a fee, which is used to cover the costs of transporting the material to Plastic Forests. However, Council noted that some farmers bury their silage wrap to avoid paying the gate fee. It is estimated that up to 50-60 tonnes of silage wrap waste may be generated in Towong each year.
- **Fluorescent lamps:** Towong's fluorescent lamps are landfilled. Quantities are unknown.
- **Polystyrene:** Blue boards, a type of extruded polystyrene (XPS), are problematic in Towong. Polystyrene recyclers typically do not accept this waste and it is landfilled.

Council noted that potential future problematic materials could be solar panels, smoke detectors and furniture that contains electronic parts (e.g. massage chairs).

2.9 Rural City of Wangaratta

The Rural City of Wangaratta has a functioning buy-back agreement with Plastic Forests for silage wrap recycling. The sole problematic material nominated by Council was treated timber.

- **Treated timber:** Council received 476 tonnes of timber at its RRC/TS in 2019-20, of which 90-95% was treated. The timber received at RRCs is generally low quality and not suitable for repurposing. It is currently shredded and used at landfills as road/cover material. Other options have been explored but not implemented, including waste-to-energy (such as eco-logs for domestic fires and fuel for heated pool boilers, however these are generally not suitable options for treated timber).

- Council notes that it is willing to collaborate and help smaller councils in the region, and that its RRC/TS could function as hubs for aggregation of materials.

2.10 City of Wodonga

The City of Wodonga has the geographical advantage of being adjacent to the NSW border and the City of Albury; it is able to readily direct many waste streams to Albury Waste Management Centre for recovery. As a larger city, it has REDcycle participating supermarkets for soft plastics recycling. Council advised that it has no major issues with any waste stream except for textiles:

- **Textiles:** The City of Wodonga receives significant quantities of carpets and underlays from house renovations, however, this material is not clean or reusable and is landfilled.

2.11 Regional overview

Soft plastic has been considered problematic by most councils. A recent kerbside bin waste audit studied the presence of soft plastic and other contaminants in garbage, recycling and FOGO bins. The audit revealed that soft plastic constitutes almost 11% by weight of garbage bins, on average across the region. Combined with material found in the recycling and FOGO bins, the audit found that around 0.69 kg per week per household (kg/hh/wk) of soft plastics was generated. Table 1 estimates soft plastic generation across the region from domestic sources; additional soft plastics are generated by the commercial sector, likely increasing the total amount.

Table 1 Estimated soft plastic generation based on 2021 kerbside audit

Council/ARMB	Number of households*	Waste generated (kg/hh/wk)	Total waste per year (t/year)
Alpine Shire Council	7,188	0.79	300
Rural City of Benalla	6,790	0.513	180
Falls Creek RMB	305	0.69**	10
Indigo Shire Council	6,998	0.578	210
Mansfield Shire Council	5,919	0.721	220
Mt Buller/Mt Stirling ARMB	473	0.69**	10
Mt Hotham ARMB	354	0.69**	15
Towong Shire Council	3,091	0.794	130
Rural City of Wangaratta	13,036	0.751	510
City of Wodonga	16,490	0.684	590
Total	44,154	0.69**	2,175

**source: 2016 Census QuickStats: Victoria (abs.gov.au)*

*** where an estimate was not available, average generation of the area has been calculated*

Table 2 summarises the problematic materials identified by each northeast (NE) council and ARMB.

Table 2 *Regional overview of problematic materials*

Problematic material	Alpine	Benalla	Falls Creek	Indigo	Mansfield	Mt Buller/ Mt Stirling	Mt Hotham	Towong	Wangaratta	Wodonga
Originally identified materials										
Polystyrene	✓		✓	✓	✓			✓		
Silage wrap	✓	✓						✓		
Textiles (e.g. carpets/underlay)			✓		✓					✓
Mattresses and soft furnishings						✓				
Hard plastics				✓	✓					
Household chemicals (paint)	✓	✓								
Skis/snowboards/boots			✓			✓	✓			
Fire extinguishers										
Gas bottles										
Lithium ion and household batteries	✓									
Fluorescent lamps								✓		
Treated timber	✓	✓		✓					✓	
Additional materials										
E-waste	✓									
Soft plastic	✓	✓	✓	✓	✓		✓	✓		

Overall, soft plastic is the most common problematic material in the NE region, followed by polystyrene. Treated timber, silage wrap and textiles are also commonly considered problematic for NE councils and ARMBs. Snow gear such as skis, snowboards and boots are issues for alpine resorts.

Fire extinguishers, gas bottles and household liquid chemicals (other than paint) were included in the scope of the study but no NE council or AARMB identified them as problematic. It is likely that these have found stable recovery pathways (e.g. metal recycling, *Detox Your Home* program).

There are also a number of different reasons why NEWRRG member councils/ARMBs have identified materials as problematic, such as:

- lack of storage capacity
- lack of economic volumes
- inability to sort/separate material (e.g. composite materials, polymer type)
- high costs to transport, manage or treat
- inability to meet material criteria required for reprocessing (e.g. volume, contamination)
- lack of reprocessing opportunities or markets (local or statewide).

While some of these are intractable industry or market issues, there are opportunities to address others at a regional level. These are explored in the following chapters.

3. Recycling of problematic materials

This section explores the issues of recycling for different problematic material types.

Many of the problematic materials identified do not currently have recycling options; this may be due to a lack of available reprocessing options (particularly for composite materials) or end markets. Many NE councils/ARMBs also face difficulties in entering agreements with waste collectors and recyclers due to high transport costs and low economies of scale. Recyclers are often not willing to service a remote area for a small volume of material or charge a large fee to do so. NE councils and ARMBs also face challenges in satisfying the requirements imposed by recyclers, which include source separation and minimum quantity and contamination thresholds.

3.1 Polystyrene

Polystyrene can come in the form of regular polystyrene plastic, polystyrene foam and polystyrene film. NE councils/ARMBs identified polystyrene foams (i.e. expanded polystyrene and extruded polystyrene) as problematic.

Expanded polystyrene is a common packaging material. It is bulky and very lightweight, making it difficult to store and transport. It can cause litter issues and contaminate other waste streams when broken. There are companies and organisations in Victoria capable of reprocessing EPS, however recyclers typically require a clean and dry stream and some impose a minimum threshold quantity. Some NE councils have noted that if a minimum quantity was required, they would not have the infrastructure to stockpile EPS.

Extruded polystyrene is a flexible but rigid foam typically used as insulation. Towong Shire Council was the only NEWRRG member that identified XPS (blue boards) as problematic, however recycling options for XPS in Victoria are minimal.

3.2 Silage wrap

Silage wrap can be generated in high quantities in rural areas and is generally not well recovered. Farmers are known to sometimes bury or burn silage wrap onsite to avoid the effort or cost of disposing or recycling it.

Tapex's Plasback product stewardship scheme (PSS) previously offered a viable recovery pathway for silage wrap, however the scheme ended several years ago. Currently, there are few existing options for silage wrap recovery in Victoria, although some recyclers are theoretically capable of accepting it.

Silage wrap is a combustible material, and storage must meet the requirements of the EPA's *Management and storage of combustible recyclable and waste materials – guideline* (EPA publication 1667.3). The guideline sets out regulatory requirements on identification and assessment of fire risk, effective storage management controls, emergency management plans and other criteria. The Rural City of Benalla advise they have stopped collecting this material at their RRC/TS due to the environmental protection and combustible waste storage regulatory requirements.

It is noted that most plastic waste (as well as many other waste types identified as problematic) is deemed combustible and the management and storage of any combustible waste stream must be in line with EPA regulations.

3.3 Textiles

Textiles include a broad range of wearable and unwearable clothing, carpets, underlays and other material. Generally, NE councils/ARMBs do not find clothing waste to be problematic, with the exception of Falls Creek RMB, likely due to the isolated nature of the resort and limited reuse opportunities.

Carpets and underlays were identified as an issue for Mansfield Shire Council and City of Wodonga. The material received by these councils is sourced from the construction and demolition sector and is dirty and unsuitable for reuse or recycling, meaning it is landfilled.

3.4 Mattresses and soft furnishings

Mattresses are bulky and can cause storage issues. They are of mixed composition, meaning their recovery is relatively labour-intensive, requiring steps for dismantling (often manually), separation of components and tailored recycling for each separated stream. There are several companies capable of accepting and processing mattresses in the NE and most councils/ARMBs do not find them particularly problematic.

Mt Buller/Mt Stirling ARMB was the only NEWRRG member to identify mattresses as an issue, highlighting that it does not have the storage capacity onsite to stockpile enough mattresses for a recycler to collect. The ARMB currently transports mattresses to Benalla RRC/TS and pays the relevant gate fee.

No NE council/ARMB mentioned soft furnishing as a problematic waste stream.

3.5 Hard plastics

Hard plastics are a broad category of plastics that includes polyethylene terephthalate (PET), high-density polyethylene (HDPE), low-density polyethylene (LDPE), polypropylene (PP) and other assorted plastic types (including mixed polymers). Food containers are typically made of hard plastic (mostly PP), meaning it is not uncommon for hard plastic waste to be contaminated with food and oils.

There are a number of hard plastic recyclers in Victoria, however the issue for councils tends to lie in satisfying acceptance requirements. Hard plastics recyclers often require a clean stream that is separated by polymer type, and councils do not always have the resources to achieve this. It is understood that one hard plastics recycling contract in the NE ended due to claims of contamination by the receiving party.

3.6 Paint

Recycling paint is a relatively niche process undertaken by a small number of companies in Australia, however the Paintback PSS offers a viable recovery pathway for paint and paint containers. The issue for some NE councils/ARMBs, however, is that Paintback does not service all remote and regional areas. Within the NE region, only the two largest municipalities (Wangaratta and Wodonga) are part of the Paintback program. NEWRRG have approached the scheme operators to try and establish more accredited sites across the region, but this is apparently not feasible at present.

Alpine Shire Council accepts waste paint at its RRC/TS and pays a high rate for Cleanaway to collect and recover it.

3.7 Skis, snowboards and boots

Skis, snowboards and boots are common wastes in alpine resorts. These items tend to be made of a composite of materials (e.g. fibre glass, metals, plastics) making them difficult to recycle. They are also relatively niche (i.e. they are not a widespread or particularly high volume waste), meaning they have not historically been priority materials to be addressed. It is understood that these items mostly go to landfill, unless they are reused or repurposed.

3.8 Batteries

Alpine Shire Council was the only NE council to identify batteries as problematic. It receives low quantities of household batteries at its transfer station, making it difficult to find a suitable collector.

3.9 Fluorescent lamps

Of all the NEWRRG member councils/ARMBS, fluorescent lamps were identified as an issue for only Towong Shire Council, which sends the material to landfill. Most NE councils have fluorescent lamps managed by their respective e-waste contractor.

3.10 Treated timber

Treated timber refers to timber that has been treated with pesticides and preservatives (such as copper chrome arsenate). Due to its potentially toxic nature, treated timber is challenging to manage and recycle. It can be utilised as refuse derived fuel in cement kilns or other high-temperature combustion applications, however this option is rarely available and/or expensive. Councils may opt to landfill the material instead of paying for the high cost of energy recovery.

Some councils in the NE mulch treated timber for use in low-value applications such as landfill roads and daily cover, while others dispose of it in landfill.

It is understood that Indigo Shire Council is the only local government in the NE that separates raw and treated timber at its RRC. This suggests that for other councils and ARMBS, untreated timber is destined for the same fate as treated timber (i.e. landfill or a low-value application), even though it may be suitable for reuse or recycling.

3.11 Soft plastics

Soft plastic includes silage wrap (discussed separately in Section 3.2), plastic packaging, cling wrap, bubble wrap, pallet wrap and other plastics. Soft plastics have widespread and common applications, meaning that even though they are lightweight they can be generated in considerable volumes. Unlike their rigid counterpart, soft plastics are not accepted in kerbside recycling bins and rarely separated for recycling at RRC/TS. Section 2 identifies soft plastics as the most problematic material in the NE region.

Soft plastics are most commonly recycled through the REDcycle program, which involves community drop-off bins at selected supermarket chains. Collected soft plastics are taken for reprocessing at one of three partner recyclers: Replas, Close the Loop or Plastic Forests. The program is targeted at domestic volumes, with commercial quantities not accepted. REDcycle drop-off points tend to be concentrated around metropolitan areas and larger cities, and most of NE's more rural communities do not have ready access to the program.

Soft plastics have been recognised as an issue in the NE, and NEWRRG and its member councils have worked to address it. A 2020 report (REC 2020) prepared for NEWRRG recommended that NEWRRG and NE councils/ARMBs consider assessing and, if feasible, entering a buy-back agreement with one of REDcycle's partner recyclers for soft plastics recycling. This option was explored in this study, however feedback from consultation with NE councils/ARMBs noted they:

- do not have uses for the recycled products, or only have uses for selected products
- do not have ongoing need for the recycled products
- are uncertain about the quality of the recycled products.

In summary, key challenges for soft plastics management in the NE are:

- where there is no recovery pathway, soft plastics are landfilled
- not all regions and townships have access to REDcycle program drop-off points
- one of the most apparent recovery pathways for NE councils/ARMBs without access to REDcycle is entering a buy-back agreement with a recycler, however this is not ideal for many local governments.

3.12 E-waste

Electronic waste (e-waste) includes any item with a plug, battery or power cord and is reported to be the fastest-growing waste stream in the world (Sustainability Victoria 2021). Although it may still be considered an emerging waste stream, e-waste has received priority attention in recent years because of its high volume and composition, which can include components that are potentially toxic and components that are high in value. E-waste is banned from landfills in Victoria.

There are a number of e-waste recyclers in Victoria, as well as a nationwide product stewardship scheme for television and computers (the National Televisions and Computers Recycling Scheme, or NTCRS). Most NE councils do not find e-waste to be particularly problematic, with the exception of Alpine Shire Council. E-waste is accepted at Alpine facilities in large quantities and is currently disposed of at high cost. Alpine Shire Council previously had an e-waste contractor, but the previous contract ended because a high proportion of the e-waste from Alpine Shire Council was not within the scope of the NTCRS.

Some NE councils/ARMBs noted that certain types of e-waste may prove to be problematic in the future, including solar panels and powered furniture; however these were not considered an immediate issue.

4. Opportunities

Having identified the problematic materials for each NE council and ARMB through the local government and alpine resort consultation phase, Blue Environment consulted potential recyclers. This section presents the recycling opportunities identified from stakeholder consultation, including details on recycler requirements, costs and contractual considerations. Other opportunities, such as product stewardship schemes and community-led initiatives, are also considered and discussed.

4.1 Consultation with recyclers

A list of key stakeholders potentially capable of managing and/or recycling the identified problematic materials was developed by Blue Environment in collaboration with NEWRRG and City of Wodonga. Stakeholders within or close to the NE region were prioritised in order to develop and promote local solutions and maximise transport efficiencies.

Blue Environment approached 41 companies and organisations and sought information on:

- their capability of recycling (including collection and/or reprocessing) any of the problematic materials identified
- their willingness to service the NE region
- whether collection services could be provided or delivery would need to be arranged
- requirements for receiving problematic materials, including contamination and minimum quantity thresholds
- cost considerations and gate fees
- the need for a contract and, if so, relevant contractual details such as buy-back agreements, long-term lock-ins, non-negotiables, etc.

Outcomes of the consultation with recyclers are detailed in Appendix A.

In some cases, stakeholders were reluctant to disclose information because estimated waste tonnages were not available at council/ARMB level. Problematic materials are often not collected by local governments/contractors, meaning reliable quantity data (by volume or weight) is not always available. Waste quantities impact on collection and reprocessing feasibility, collection frequency, transport costs, etc., so this key data gap impeded many solutions. Overall, we were still able to glean key information and identify a range of feasible recycling options for some problematic materials.

Broadly, there were some comments common to most recyclers consulted:

- some recyclers found distance and travel costs to be a major barrier in servicing the NE
- most recyclers willing to provide a service were happy to proceed without a contract and work on an ad hoc basis
- many recyclers were only willing to accept problematic materials with some initial pre-processing (e.g. source separation)
- some recyclers impose minimum quantity thresholds.

4.2 Potential recycling opportunities

Polystyrene

Residential quantities of expanded polystyrene can be dropped off at Albury Waste Management Centre free of charge, while a fee of \$57 per tonne is charged for commercial quantities. This may be a good option for NE councils and ARMBs that currently find polystyrene to be problematic: Mt. Hotham ARMB currently compacts polystyrene, and once around one tonne of compacted material is reached, the material is transported to Albury Waste Management Centre.

Foamex is an expanded polystyrene reprocessing company that is able to service selected RRC/TS in the NE region, namely in Benalla, Indigo, Mansfield, Wangaratta and Wodonga. The EPS stream must be clean and ideally sealed in plastic bags to prevent contamination. Specific minimum quantities do not apply, however for a regional pick-up the company requires a sizeable quantity to make the trip worthwhile. Self-delivery to Foamex's facility is also available (by appointment only). Foamex list the following costs (excluding GST) for its services:

- truck/trailer pick up fee: \$300
- processing fee: \$125 per truck/trailer load

Foamex can provide free plastic bags for polystyrene storage, but the material must be loose (i.e. not compacted or melted); it does not accept other polystyrene foams. The polystyrene received is reduced into beads which are reformed into new EPS products.

Unipod also offer an EPS pick up and recycling service. The company is strict on contamination: material must be very clean and free of contamination, food particles, sticky tape and cardboard. If the collected polystyrene is not clean the waste will be sent back to the original pick-up point. Waste must be collected in 'polybags' which can be ordered in rolls of 100 from Unipod for \$160 (excluding GST), and a minimum of 10 polybags is required for pick up. Alternatively, stuffed polybags can be delivered to Unipod in Truganina free of charge at any time. The waste material is then reprocessed into new products.

EQ Plastic also accept EPS but require delivery to metropolitan Melbourne, making other options (i.e. pick-up or delivery to closer sites) more attractive.

An industry-led voluntary phase out of certain EPS products is underway, led by the Australian Packaging Covenant Organisation. It is understood that this will begin with the phasing out of EPS loose fill and moulded consumer packaging (DAWE 2021b), and is expected to markedly reduce future EPS waste generation.

Silage wrap

Plastic Forests is the most feasible silage wrap recycler for most NE councils. Three councils in the region already utilise Plastic Forests for their silage wrap, although some report high transport costs and the issue of the company not being able to always accept ongoing quantities (their need for material is subject to their processing capacity and can be ad hoc depending on supply of material from other sources). Plastic Forests advised (and later confirmed) they only accept commercial material from organisations which agree to enter into a buy-back agreement for the recycled products, meaning this option may be unfeasible for councils and ARMBs unwilling to enter such an arrangement. Despite this advice, we understand some councils/ARMBs have recently engaged with this recycler without a buy-back agreement in place.

In 2020, Dairy Australia received funding from the Australian Government's National Product Stewardship Investment Fund to recycle 100% of plastic silage wrap waste from farms by 2030 (Dairy Australia 2020). The scheme is currently in its feasibility, design and planning stage (DAWE 2021a), but it may prove to be the best solution for some NE councils, although its launch is a few years away.

Textiles

Carpets and underlays were identified as the main problematic textile in the NE, but options for their recovery are limited. Ad hoc reuse or repurposing may be suitable for some domestic carpets, but not for unusable carpets and underlays from the construction and demolition sector (which is the type NE councils have identified as problematic). No recyclers we contacted were capable of managing this stream.

Clothing waste is an issue for Falls Creek, but the alpine resort's location makes finding a solution difficult. There are a range of commercial companies that pickup and recover clothing and other textiles, however it is possible they would not be willing to pick up small amounts from Falls Creek. Blue Environment consulted the following clothing recyclers:

- SCR Group accept good and wearable clothing for free but charge a gate fee for unwearables. The gate fee is based on the material's contamination and dirtiness and may be variable load by load. Clothes can be dropped off at the company's facility in Melbourne, otherwise collections can potentially be arranged for a fee.
- Textile Recyclers Australia do not collect, however they can arrange a third-party transporter to do so (transport costs would apply). The company charges a gate fee starting at \$2 per kg, depending on quality of material. Clothes must be clean, and are sent overseas for reuse and recovery.

All textiles (including clothing, carpet and furniture coverings) are included in the Australian Government Minister's 2021-22 priority list for future product stewardship arrangements. There are various milestones planned between 2022 and 2025 for developing appropriate textile arrangements, including design of an end-of-life scheme for recycling workwear by June 2022.

Mattresses and soft furnishing

The following options for recycling of mattresses have been identified:

- The Mattress Recycler offers councils an on-demand mattress and frame collection service from facilities across Victoria. The company can collect a minimum load of 35-40 mattresses with fees depending on collection frequency. For ad hoc collections in the NE, the company estimated a price of \$30 per mattress for inner spring mattresses. Latex mattresses are collected at extra cost as components cannot be recycled, and the company does not collect wooden and metal base frames. Mattresses are deconstructed by hand to maximise the amount of materials salvaged from the mattress. Springs are taken to a metal recycler, foam is sent to carpet manufacturers, timber is broken down and offered to the community for fire kindling, coconut fibre can be used as mulch and weed suppressant and felt is used by furniture removalists, mechanics or donated to animal shelters.
- Soft Landing offers mattress collections at \$55 for the first mattress and \$40 for each additional one.
- WM Waste Management collect mattresses (the City of Wodonga currently utilise WM's services) and take them to its partner recycler (KTS) where mattresses are shredded to separate and recover foam, wood and metals, with the residual suitable for processed engineered fuel. Blue Environment approached WM on a number of occasions but did not receive a response so prices are unknown. WM's trucks can collect from multiple sites at a time and can fit up to 500 mattresses at once. The company also accepts full lounge suites, chairs, bed bases, couches and sofas.
- Towong Shire Council takes mattresses to the local Corryong Men's Shed, where mattresses are shredded and recovered. It is possible that other community-based organisations in nearby NE

councils/ARMBs are able to reprocess some mattresses; however, it is not known how much these associations would be able to reprocess, as it depends on the number of volunteers willing to do so and availability of space to store and dismantle mattresses.

The Australian Government is working towards a national product stewardship scheme for mattresses and bedding, set to launch in 2023 (DAWE 2021c). This is expected to provide a stable pathway for mattress recovery in the near future. The scheme will work with Soft Landing to expand mattress recycling to all states and territories, as well as explore the recycling of pocket springs and textiles in the product (DAWE 2021c). Rebates will be available for accredited collectors if delivering in-scope mattresses to accredited recyclers and will vary depending on collection areas (metro/regional). The end-of-life pathway for mattresses includes:

- collection: mattress delivery swap (preferred method), home collection/drop-off, charity collection, dumped rubbish
- refurbish: for local sale or export
- destination: manual recycling, shredding, energy recovery, landfill.

Mattress refurbishment is currently not supported because there are no proper safety protocols, however, there are ongoing investigations on how to make this option feasible.

Hard plastic

There are a number of hard plastics recyclers willing to accept material from NE councils/ARMBs:

- Albury Waste Management Centre accepts a mixed hard plastics stream without strict contamination requirements. The material must be delivered to Albury, where it is sorted and sold. Domestic quantities are accepted for free but a gate fee of \$57/tonne is charged for commercial quantities.
- DMD Plastic Recycling accepts a clean, baled hard plastics stream separated by polymer type. It must be delivered to Albury. No gate fee is charged, and there are apparently no minimum quantity requirements.
- Olympic Polymers is willing to accept a clean, baled and polymer-sorted hard plastics stream and will not charge a gate fee to receive it. The company mentioned it is willing to help councils set up cleaning and separation protocols for free to ensure it receives recycle-ready material. The company can arrange transport for a fee of \$60 per pallet, but will collect a minimum quantity of 4-5 tonnes. Self-drop off is also available.
- GT Recycling can collect a baled and source separated plastic load. The minimum quantity required for collection is a semi-trailer (about 8-10 tonnes of baled plastic), for which the company charges \$700 to \$1,000. Self drop-off to GT Recycling's facility can be made by appointment as well. The Rural City of Wangaratta currently engage with GT Recycling for processing its hard plastics.
- EQ Plastics can accept a clean hard plastics stream sorted by polymer type. It does not collect, meaning councils/ARMBs would need to deliver to EQ Plastics in Dandenong. Loose (i.e. not compacted or baled) plastics can also be accepted at a gate fee of \$0.50 and \$1 per kg. The company advises it does not usually accept plastics from councils due to contamination concerns, however they are willing to do so if a clean stock is guaranteed. Councils would be required to sign a 12-month supply contract.

The majority of the abovementioned recyclers require some initial steps of pre-processing (e.g. cleaning, sorting by polymer type, baling). NE councils/ARMBs that do not have the resources to do this could engage with community groups and volunteer networks such as men's shed groups. The City of Wodonga have a 50-tonne baler at its RRC/TS, which other NE councils/ARMBs could utilise for compacting hard plastics for further transport and processing. However we note that (apart from

standard items such as PET bottles, HDPE milk cartons, etc. collected via kerbside recycling systems) identification of different polymers for sorting is often problematic. Many plastic products are not labelled according to polymer type, and others may use a mix of polymers for different parts of the product. Traditional methods of identifying polymer types include flame tests and density tests, however these are unlikely to be feasible at NE facilities due to logistical, volume and cost reasons. Preferred options for the region may therefore include those which accept mixed plastics streams (Albury Waste Management Centre/GT Recycling) or those where organisations are prepared to assist in identification protocols (Olympic Polymers).

Paint

Paintback is the most apparent option for paint recycling, but, as discussed in Section 3.6, the scheme cannot currently service the NE's rural and remote areas. Potentially the most feasible option for these areas is to transport paint to Wodonga and Wangaratta and utilise their Paintback sites, however, Paintback do not support aggregation. Other pathways identified were:

- energy recovery (e.g. via Cleanaway), although this involves similar costs to hazardous waste treatment and is expensive
- participation in Paintback pop-up events – while these are ad hoc both in terms of location and frequency, they are likely the most suitable option for the two NE councils that find paint problematic.

Skis, snowboards and boots

None of the recyclers contacted had experience with reprocessing skis, snowboards and boots. Future Recycling indicated that it may be able to accept these items but this would incur a contamination fee due to unwanted components. Alternatively Game On Recycling may be a solution for the recycling of this waste stream. Alpine resorts have recently started to explore recycling solutions with this company and arrangements for a pilot project are being discussed, however, no cost or other information is yet available.

It is understood that a product stewardship scheme for sporting equipment is being scoped (DAWE 2021e). It is anticipated that a network of collection points will be set up across Australia in order to recycle various sporting equipment, including skis and snow boots (the inclusion of snowboards is not known at this stage) (DAWE 2021e). This could be a future cost-attractive option for recycling winter sports gear, but it is not established yet.

Batteries

B-cycle, the national battery stewardship scheme (established by the Battery Stewardship Council) commenced in January 2022. The stewardship program includes collection points provided by industry partners such as Duracell, Energizer, Coles and Woolworths, among others (DAWE 2021d). This is the most feasible recovery option for NE councils and ARMBs that find batteries problematic.

Councils/ARMBs can sign up to become an accredited B-cycle drop-off point, and must commit to:

- provide a safe drop-off point and conform to B-cycle drop-off standards, including the use of approved containers
- acknowledge that legacy batteries from stockpiles are not eligible for rebates without prior consent
- guarantee all used batteries received go to B-cycle accredited collectors, sorters and recyclers
- use B-cycle tracking system
- report fire and other significant incidents.

B-cycle accepts batteries imported without a product, such as AA, AAA, C, D, etc., and batteries imported with a product that can be removed and are specifically designed for that product (e.g. batteries of digital cameras, drones, e-bikes, power tools, etc.). Other batteries are subject to enter the product stewardship based on industry consultations outcomes:

- loose batteries included in products but not designed specifically for the product (batteries found in toys, kitchen scales, small appliances, torches, remote controls, etc.)
- batteries of electric vehicles (lithium batteries) may be accepted in the scheme from July 2022
- batteries imbedded in products (smart watches, GPS, gaming controllers, wireless headphones, etc.) may be accepted as part of B-cycle from July 2022.

Batteries that have an effective operating market and are covered by an existing stewardship scheme (such as used lead acid batteries, batteries included in the NTCRS, MobileMuster and exit lighting) are not included in the B-cycle scheme.

Collection points will have the opportunity to access rebates from March 2022, available for B-cycle accredited collectors; different processes and regions (metro/regional) will earn different rebate amounts. Indirect rebates are available for accredited collection points that have contractual agreements with accredited collectors, sorters and/or recyclers.

Fluorescent lamps

It is understood that most NE councils/ARMBs have their fluorescent lamps managed by e-waste contractors (e.g. Scipher Technologies), and NEWRRG members that find fluorescent lamps problematic should attempt to reach suitable agreements with these. Alternatively, Tekflow is able to accept fluorescent lamps at \$3.50 per kg, excluding transport or collection costs.

Fluorescent lamps have previously been covered by a product stewardship scheme, FluoroCycle, but the scheme is currently unaccredited (DAWE n.d.).

Treated timber

Recovery options for treated timber are limited, and those available are expensive. The only current option for the material is energy recovery, undertaken almost exclusively by Cleanaway at their hazardous waste treatment facility in Melbourne at high cost. Given the transport and treatment costs involved, this is not considered financially feasible for NE councils/ARMBs.

Soft plastic

Options for recycling soft plastics were identified in a previous NEWRRG study (REC 2020), which recommended entering a buy-back agreement with Plastic Forests; this was investigated further in this study. Blue Environment consulted Plastic Forests regarding its capacity to recycle soft plastics from the NE region, however the company indicated that it is no longer willing to accept domestic soft plastics. The company advised that the stream was too difficult to manage due to contamination, ink and the range of polymers it may comprise. Plastic Forests can accept silage wrap but it does not appear to be an avenue for soft plastics.

It is understood that some NE councils have reached out to Replas (another REDcycle recycling partner) for soft plastic solutions. Replas offers soft plastics recycling to organisations willing to make initial and ongoing purchases of the recycled products they produce (e.g. bollards, furniture, decking, exercise equipment, etc.); the purchases required would be linked to the quantities of soft plastics provided to Replas.

Replas is willing to initiate a conversation with NE councils/ARMBs to provide more details about the buy-back arrangement but this can only be done when the estimated quantity of soft plastics involved is known. It is worth noting that Replas' recycled plastics product range is much wider than Plastic Forests', however the manufacturing facility is located much further away in Ballarat. For Replas to accept plastics (soft and otherwise) they:

- must be clean and baled
- plastic type LDPE, HDPE or PP
- must be 'low' in colour, i.e. white or clear
- must be delivered to Ballarat.

The distance between the NE region and Ballarat, coupled with the requirement for buy-back of recycled products, may make this option unsuitable for some councils/ARMBs.

DMD Plastic Recycling in Albury can accept soft plastics but only from commercial streams, which include pallet wrap, bubble wrap, shrink wrap and agricultural wrap. Usually commercial soft plastic is less contaminated than domestic soft plastic, however, DMD requires the soft plastic to be clean and separated by polymer type. While no contamination thresholds are specified, no rocks, steel pieces, wires or organics are accepted with the waste loads and the recycler may reject loads if the contamination rate is visibly too high. DMD does not require councils/ARMBs to engage in buy-back arrangements, however, the plastics must be transported to their facility in Albury. The cost of transporting material to Albury will depend on quantities, collection frequency and pick-up location.

Another option for soft plastics is Inspired Waste Solutions, based in the Melbourne metropolitan area. The company can accept a clean stream of LDPE (with no other plastics in the mix). The material must be delivered to their facility but no gate fee is charged. The company did not specify an exact minimum weight requirement, although it only accepts 'large' quantities (e.g. semi-truck load). The company indicated that it can only accept the amount it is able to handle, meaning ongoing drop-offs are not guaranteed and pre-booked drop-off appointments must be scheduled. Inspired Waste Solutions do not reprocess plastics domestically and currently sends plastics overseas.

Olympic Polymers indicate they can accept plastic of any type for free if it is delivered to the company in the Melbourne metropolitan area and the plastics are clean and pre-sorted by polymer type. The company is considering expanding operations to establish sorting capabilities, meaning pre-sorting may not be required in future.

Tekflow can accept soft plastics from domestic and commercial streams, however they specialise in recycling e-waste and indicated they would prefer to initially make arrangements with e-waste before other streams.

Apart from existing recyclers, the Australian Food and Grocery Council has recently received Australian Government funding to implement a national product stewardship for plastic packaging, which will initially target common food-related soft plastics such as bread, cereal and frozen vegetable bags. The scheme will build on the existing REDcycle program and is expected to be operational in the next few years (AFGC 2021). Further details have not yet been released.

E-waste

E-waste does not appear to be a particularly problematic material for most NE councils/ARMBs, however it is a rapidly growing stream and its recovery is important. E-waste recovery in Australia is well covered by national product stewardship schemes, namely the NTCRS and MobileMuster. These involve a handful of prominent partner recyclers, however a number of small and medium e-waste recyclers also operate around Australia.

A product stewardship scheme for photovoltaic systems is proposed to be implemented in 2023 (DAWE 2020). The Minister's 2021-22 priority list for future product stewardship arrangements goes further, outlining 'design for recyclability' requirements for all electrical and electronic equipment by June 2025.

Most NE councils/ARMBs are contracted to Scipher Technologies for collection and recycling of e-waste, batteries and fluorescent lamps. Regardless, as e-waste was identified as problematic by one NE local government, the following additional options were identified:

- Albury Waste Management Centre accepts all e-waste free of charge, but transport to the centre must be organised.
- Tekflow is based in Sydney but looking to expand, and is currently able to accept and pickup e-waste from Victoria. The company claims to charge a collection cost of \$150 per pickup for metropolitan areas, however a regional price was not provided. Gate fees are:
 - for e-waste in scope of the NTCRS: no charge
 - for e-waste out of scope of the NTCRS: \$0.45 per kg
 - solar panels: \$8 per unit
 - fluorescent lamps: \$3.50 per kg
 - air conditioners and fridges: \$25 per unit (with a minimum of 10 units accepted).

4.3 Community participation

During the engagement with councils and alpine resorts representatives, the willingness of communities to engage in better and more efficient recycling systems if given the opportunity was highlighted. Some community groups are already working to separate some waste streams from the general waste; however, councils are not always able to provide an adequate recycling solution.

Currently community initiatives mainly collect soft plastic to divert it from landfill but this could be applied to other waste streams that are currently ending up in the landfill. However, some ARMBs report poor waste behaviours of tourists, and community projects in these areas may face additional challenges.

Some community recycling initiatives are already in place, for instance the Boomerang Bag association in Bright and Beechworth, which uses old textiles to make shopping bags. It is understood that a community association in Towong Shire Council has been interested in starting a project to re-use soft plastic. The community has applied for funds to implement the project, however, the details on when the project will start or how the plastic will be reused or repurposed are unknown. Similar initiatives are in place for re-using skis and snowboards collected at alpine resorts as furniture, art pieces or for fencing.

5. Regional analysis

This section discusses regional impacts and strategic opportunities, as well as the potential role of NEWRRG in facilitating solutions to the problematic materials identified.

5.1 Regional challenges

Key issues

In determining the feasibility of regional intervention, it is important to consider the size, nature and spread of material issues across NE member councils/ARMBs. These are summarised in Appendix B.

The optimal regional response is to address the underlying reasons why the materials were identified as problematic. The key issues identified by councils/ARMBs are as follows:

- **Lack of recycling options:** This study has explored recycling options; potential recyclers for each material are identified in previous sections of the report. NEWRRG could facilitate recycling arrangements with preferred recyclers for its members where considered feasible. The use of regional resources may be of higher priority where the materials are a problem to all or many councils/ARMBs instead of only one or two. For some materials, there are no markets and no recycling options available.
- **Lack of storage capacity:** Some NEWRRG members (particularly ARMBs) have limited space available for storage of materials undercover, or of sufficient capacity to stockpile material until an economically viable quantity for recycling is accumulated. At most ARMBs it is not a case of building another shed for storage as there are limitations on the available land. NEWRRG could address storage issues by facilitating transport of material to regional centres for storage, although this would impose additional transport costs on ARMBs which may undermine recycling feasibility.
- **Lack of sufficient quantity:** Material quantities are of particular importance in minimising transport costs (especially for light-weight materials such as plastics and polystyrene), reaching the minimum quantity thresholds of some recyclers, and identifying the unit cost impact on councils/ARMBs. Without knowing how much waste is generated, it is not possible to calculate the management/recycling costs involved or determine whether recycling of each material is feasible. Table 3 shows that few councils/ARMBs have data on the quantity of each problematic material they generate, inhibiting decision-making on recycling opportunities. NEWRRG could assist members to collect data on materials of concern through audits of landfilled waste, and ensure regional audits of kerbside waste bins itemise specific problematic materials.
- **Cost:** Additional separation, management and transport of materials for recycling will generally result in additional costs to councils/ARMBs. NEWRRG may be able to help reduce the additional cost burden by negotiating regional contracts on behalf of its members. This is more likely to be viable where materials are of concern to all or most councils/ARMBs, and NEWRRG can achieve lower unit rates. However the actual costs for management or transport of their material would still be borne by individual councils/ARMBs, and the scale of these costs may dissuade some NEWRRG members from taking concrete action to address problematic wastes.
- **Contamination:** Reducing contamination (sometimes to zero levels) is a key requirement of many recyclers, and ensuring materials are free from contamination can often be problematic. This can be addressed either pre- or post-separation:
 - Pre-separation relies on waste generators ensuring material is uncontaminated before it is dropped off to councils/ARMBs for recycling; this may require significant community education and engagement to meet this outcome.

- Post-separation would require councils/ARMBs to undertake a sorting and cleaning process before material is transported to recycling facilities. This could involve labour-intensive manual sorting or cost-intensive mechanical sorting, neither of which may be feasible given the investment required.
- The optimal approach is to ensure material is clean of contamination before councils/ARMBs take responsibility for recovery and recycling, and in this respect NEWRRG may be able to assist councils/ARMBs with community education programs and materials.

Safe management of waste

Many of the problematic materials identified by councils/ARMBs are potentially hazardous and require safe handling in accordance with WorkSafe Victoria, EPA or industry protocols. Management of hazardous waste is regulated by both WorkSafe Victoria and the EPA and there are controls around handling, storage and transport. Hazardous waste must only be accepted or transported by EPA licensed facilities and transporters, meaning councils/ARMBs would need to outsource these activities.

There are other industry codes of practice or protocols which also apply to some of the identified wastes. This includes management and handling requirements which apply to accredited collectors under certain product stewardship schemes (such as the NCTRS and B-cycle), as well as best practice guidelines (such as Sustainability Victoria's 2017 *Guide to better practice at resource recovery centres*). These set out requirements for certain wastes (e.g. e-waste, batteries, mattresses) to be stored in banded arrangements and/or undercover, both to protect the environment and to retain material value for recycling.

Collaborative opportunities

NEWRRG members have expressed their willingness to collaborate to maximise recycling in the region and to find solutions for certain problematic materials. Collaborative arrangements could potentially deliver a number of benefits over individual council/ARMB contracts:

- cost savings during the procurement process due to the sharing of resources and legal, probity, advertising, administration and other associated costs. For large tenders these costs savings could be in the order of 40-80% compared to conducting individual tenders, depending on the number of participants.
- more competitive tendering for higher value contracts. This could result in cheaper per unit pricing for services and a wider range of services to more remote and smaller facilities, resulting in greater resource recovery and more equitable delivery of services.
- sharing of knowledge and experience across the region.

NEWRRG has existing arrangements in place for a range of waste and recycling services among collaborating councils/ARMBs, and is well placed to extend this to include management and recycling of problematic materials where appropriate. For maximum effectiveness, at least three member councils/ARMBs are generally involved.

The Rural City of Wangaratta could function as a hub for smaller councils and management has acknowledged the difficulties encountered by smaller councils/ARMBs. Wangaratta and Wodonga are the only two drop-off points for the Paintback program and these councils have worked with other councils/ARMBs to investigate the feasibility of transporting paint collected at their facilities to Wangaratta or Wodonga. Unfortunately, Paintback does not support material aggregation from different councils/ARMBs.

Additionally, most alpine resorts affirmed they are willing to collaborate, especially to reach minimum quantities requested by collectors or recyclers. Alpine resorts and smaller councils would have to bring their waste streams to a central collection point, from which the transporter would collect and the cost would be shared.

Moreover, for councils and alpine resorts that experience storage problems there is the possibility to share mobile equipment and machinery, such as compactors, shredders or balers to help them to address storage issues and be able to store larger quantities while accumulating the minimum required by recyclers.

Sustainable procurement

Some recyclers would only accept waste materials from councils/ARMBs if they were willing to enter into an arrangement to purchase products made from the recycled materials. Initial hesitation to commit to such arrangements was expressed by some councils/ARMBs; this mostly related to potentially higher costs for recycled products, the small range of products available, and the perceived need for these products in future.

More specific detail was sought from two procurement officers in the region, however a response was received from only one ARMB, who advised that a general policy of preferring products with recycled content is in place, but no minimum quantities or details have been documented. It was noted that purchase of recycled products was consistent with the circular economy policies of the Department of Environment, Land, Water and Planning (DELWP), the department to which ARMBs report, and price was not considered a major barrier. The same procurement officer noted that recycled content street furniture was bought some years ago and there is no imminent need for other significant purchases, but highlighted the high quality and durability of the furniture purchased.

NEWRRG role

Due to the regional location of transfer stations and low waste quantities available, recyclers are less inclined to service the NE area, however recyclers contacted have expressed a willingness to provide recycling services when quantities are meaningful. To do so, NEWRRG should have a key role in managing waste flows across the northeast area and its participation could involve:

- overseeing collaborative procurements that councils and alpine resorts enter to manage problematic waste
- ensuring the aggregation points meet storage and design requirements imposed by the EPA, especially for combustible material (polystyrene, soft and hard plastics, e-waste)
- overseeing waste material flows
- ensuring councils and alpine resorts drop-off only the material that can be stored at the aggregation points
- assisting councils/ARMBs with community education initiatives to ensure contamination of recovered material is minimised
- scheduling pick-ups with contractors
- ensuring recyclers requirements are met by all participating councils/ARMBs
- ensuring equitable and proportionate cost arrangements are established between participating councils and alpine resorts
- facilitating clear and effective communication between parties.

5.2 Risks and benefits

There are a range of risks and benefits to regional arrangements for appropriate management and recycling of problematic wastes; key risks and benefits are identified in the table below.

Table 3 *Risks and benefits*

Risks	Benefits
Recycling	
• Failure of recycling services will result in ongoing landfill use • Increasing traffic and noise as more recyclers access the site • Different gate requirements in different councils/ARMBs and therefore aggregation problems may arise • Recyclers do not guarantee ongoing collections • May not meet recyclers requirements • Imposition of buy-back agreements • Contamination and therefore load rejections	• Diverts material from landfill for useful products • Increase recycling rate of councils and ARMBs • Communities see their efforts in separating waste rewarded • Community-lead recycling programs may be incentivised • Recycling contributes to conservation of virgin resources • Decrease pollution and cut greenhouse gas emissions
Environmental and social	
• Poor management of hazardous waste may result in pollution and unsafe work practices • Aggregating combustible material may increase fire hazard • Storing considerable quantities of waste may cause odour problems and community complaints	• Meets community recycling expectations • Aggregation makes recycling feasible for smaller councils/ARMBs • Community can dispose of all their waste at their local resource recovery centre • Communities see their effort in separating waste rewarded • Less waste to landfill • Longer landfill lifespan • Recycling may create more job opportunities • Energy saving in manufacturing processes • Less pollution effects on wildlife
Financial	
• Investing in infrastructure and equipment that may be useful for a short time frame • Transport of waste to aggregation point might be too expensive for smaller councils/ARMBs • Increased gate fees to cover extra expenses might result in increase of illegal dumping • More employees may be needed to handle more waste	• Avoid waste levy • May be able to access rebates though PSS • Contribution to move towards circular economy • Waste aggregation and compaction reduce transport costs to recycling facilities
Infrastructure and equipment	
• EPA requirements apply to new infrastructure • Increased storage may affect permissions or licencing of facilities of aggregation • New equipment may introduce new risks and additional training to new machinery operators must be provided	• Waste is stored undercover to avoid weather-related problems • Increased storage space • Help to meet recyclers requirements • May increase ability to recycle material

Risks	Benefits
• More management and emergency procedures needed if accepting new type of waste	
Collaborative procurement agreements	
• Some councils/ARMBs interested in collaboration	• Combined contracts may attract more recyclers and competitive bids • Better unit pricing for recycling material • Reduce tendering and management costs by 40%-80% compared to individual recycling agreements • Share knowledge and experience • Smaller councils have more opportunities for recycling

6. Conclusions and recommendations

After considering the problematic materials for each NE council/ARMB and potential recyclers capacity and requirements, potential solutions for recycling some waste streams have been found. Unfortunately, some waste streams cannot be diverted from landfill due to lack of recycling options, lack of storage capacity and/or lack of sufficient quantities. Additionally, some councils/ARMBs have limited resources available and meeting recyclers contamination and separation requirements has not been considered viable.

Solutions for recycling waste streams that are currently landfilled are outlined below. Even though recycling solutions currently do not exist for each waste stream, current solutions for selected materials are explained in detail below, along with tailored recommendations to councils/ARMBs, and summarised in Appendix B.

Polystyrene

Five NEWRRG members (Alpine Shire Council, Falls Creek Resort Management Board, Indigo Shire Council, Mansfield Shire Council, Towong Shire Council) nominated polystyrene as problematic to recycle.

Difficulties arise from recyclers' dryness requirements, storage and minimum quantities accepted. To overcome these issues, material could be aggregated at a strategic aggregation point in order to reach minimum quantities imposed by recyclers in a shorter time frame and make transport more cost-efficient.

The strategic aggregation point should be determined according to recyclers' requirements and destination point vicinity. Beechworth RRC/TS is considered the most suitable collection point if polystyrene is directed to Albury Waste Management Centre because of the short distance and lower transport costs involved. However, Mansfield RRC/TS is considered a better solution if Foamex or Unipod are contracted, as the centre is closer to Melbourne than other facilities. Councils and alpine resorts that find this material problematic would need to transport this material to the chosen aggregation point at their own expense and share the cost of the pickup and recycling process. Expenses could be managed by NEWRRG to ensure the cost of collection and recovery of polystyrene is fairly divided between participating councils and alpine resorts.

The facility chosen as aggregation point for polystyrene would see an increase in quantities to be stored awaiting collection. Foamex and Unipod offer bags in which the material must be stored to prevent any contamination and to ensure dryness requirements are met, therefore there is no need to establish further storage structures. These bags are expected to be of suitable size to contain the domestic polystyrene stream, with no additional operations needed; however, as polystyrene is a lightweight material, it is suggested to store full bags in cages to prevent windblown litter.

Albury Waste Management Centre (which accepts the material either loose or compacted) does not offer bags or collections, therefore transport from participating NE councils/ARMBs would need to be organised. To minimise transport costs, the purchase of a compactor for use by NE councils/ARMBs would be beneficial. This could involve a mobile compactor (e.g. on a trailer) moved between councils/ARMBs as needed.

It is estimated that the cost of a truck and trailer pickup ranges between \$450 and \$600 including the cost of bags in which to store the material. However, councils that have to transport waste to other RRC/TS have to engage third parties to do so, with an estimated cost around \$120-150 per hour of

transport (the cost will depend on the distance travelled). It is noted that quantities of polystyrene received in RRC/TS will diminish in coming years due to the planned phase out of polystyrene loose fill and moulded consumer packaging. The costs are listed in more details in Table 4 and Table 5 and are based on an hourly fee rather than on quantities of waste collected. If the material is brought to Albury Waste Management Centre, transport can be more cost efficient as it can be compacted.

Table 4 Time-driven estimated costs for polystyrene aggregation at Beechworth and transport

Council/ARMBs	Estimated travel time to Beechworth*	Loading time	Transport costs to Beechworth	Pick up and processing fees**	Total per council
Alpine Shire Council	25 mins – 1h 5 mins	30 mins	\$120 - \$240	\$180 - \$220 (based on 1 h estimated travel time to Albury + 30 mins loading time)	\$160 - \$290
Falls Creek Resort Management Board	1h 30 mins	30 mins	\$240 - \$300		\$280 - \$350
Indigo Shire Council	N/A	N/A	N/A		\$40 - \$50
Mansfield Shire Council	1h 40 mins	30 mins	\$260 - \$325		\$300 - \$370
Towong Shire Council	1h - 1h 45 mins	30 mins	\$180 - \$340		\$220 - \$400

*Travel time has been estimated using the National Heavy Vehicle Regulator route planner, <https://www.service.nhvr.gov.au/#page=informationHub/routePlannerTool>

**Pick up and processing fees have been equally divided by participating councils/ARMBs

It is noted that a gate fee of \$57 per tonne applies at Albury Waste Management Centre, which must be paid by participating councils/ARMBs, accordingly to the amount generated in each municipality. It may be possible to negotiate this gate fee as the waste stream would be clean and already compacted.

Table 5 Time-driven estimated costs for polystyrene aggregation at Mansfield and transport

Council/ARMBs	Estimated travel time to Mansfield*	Loading time	Transport costs to Mansfield	Pick up and processing fees**	Total per council
Alpine Shire Council	1h 45 mins – 2h 30 mins	30 mins	\$270 - \$450	\$450 - \$600 (based on truck and trailer pick up from Melbourne)	\$360 - \$570
Falls Creek Resort Management Board	3h 20 mins	30 mins	\$460 - \$575		\$550 - \$700
Indigo Shire Council	1h 40 mins	30 mins	\$260 - \$325		\$350 - \$450
Mansfield Shire Council	N/A	N/A	N/A		\$90 - \$120

Council/ARMBs	Estimated travel time to Mansfield*	Loading time	Transport costs to Mansfield	Pick up and processing fees**	Total per council
Towong Shire Council	2h 30 mins – 3h 30min	30 mins	\$360 - \$600		\$450 - \$720

**Travel time has been estimated using the National Heavy Vehicle Regulator (NHVR) route planner.
<https://www.service.nhvr.gov.au/#page=informationHub/routePlannerTool>*

***Pick up and processing fees have been equally divided by participating Councils and ARMBs*

Cost calculations show that Alpine Shire Council, Falls Creek ARMB and Towong Shire Council would incur higher costs if the material is aggregated at Mansfield and Beechworth RRC/TS is therefore the preferred regional collection point. It is noted that the Council that receives the material and functions as an aggregation point has the benefit of sharing transport costs to the recycling facility, however, the site would be responsible for the correct stockpiling of the material awaiting collection, implementation of storage infrastructure to accommodate quantities from other councils and ensure EPA storage and management requirements are met.

Aggregation of polystyrene would see much of this material diverted from landfill, making available landfill airspace for waste streams that do not have a recycling option. This diversion would positively impact councils and alpine resorts recycling rate, would save landfill levy costs, and would encourage the community to recycle the waste stream as viable recycling options are available.

Unfortunately, no solutions have been found for XPS or blue boards in Towong with landfilling remaining the only feasible solution.

Silage wrap

Three councils in the NE area find silage wrap problematic: Alpine Shire Council, Rural City of Benalla and Towong Shire Council. Silage wrap is recycled by Plastic Forests, but councils advise that ongoing collections are not guaranteed, and high transport fees apply. Unfortunately, no other recycler is available to service the area, and currently the market does not offer alternative solutions for the recycling of silage wrap. However, a PSS is in its feasibility phase and should be fully implemented by 2030.

Towong Shire Council already liaise with Plastic Forests, and it is suggested to continue to do so and to establish a gate fee based on estimated expenses:

- transport costs are estimated to be around \$200/tonne to the Plastic Forests facility in Albury
- 205 litre bags in which to store the silage wrap awaiting collection are priced at \$2.90 each.

It was estimated by the Council that a gate fee of \$3.50-\$4.00 per large bag (circa 205 L) would cover, at least in part, these expenses.

The Rural City of Benalla previously stopped accepting this waste stream due to concerns over storage and management requirements (as a combustible waste, storage and management needs to meet relevant EPA requirements specified in *EPA publication 1667.3, Management and storage of combustible recyclable and waste materials*). While most of the EPA requirements centre on operational practices to manage risk, it is unclear whether infrastructure at Benalla RRC/TS may need to be upgraded (e.g. to provide additional undercover storage space) or if the EPA permissions system (which outlines threshold amounts for receipt of combustible waste) would impose additional costs or imposts on Council. Council would need to give careful consideration to the costs and benefits involved in participating in a silage

wrap recycling initiative and determine their approach. If Council decides to participate, it would be beneficial to mirror Towong arrangements with Plastic Forests and establish a gate fee to cover transport expenses.

Alpine Shire Council received around 7 tonnes of silage wrap during 2020-21, an amount considered very modest by recyclers. As Plastic Forests is the only viable recycler, it is suggested to establish a storage space in order to stockpile necessary quantities to make the transport worthwhile and to impose a gate fee to cover these costs. The storage facility must keep the material dry, as per Plastic Forests' acceptance requirements, thus a covered skip bin may satisfy Council's storage needs. It is estimated that the purchase price range for a skip bin is between \$2,500 and \$10,000 depending on size; a contract for combined skip lease and transport may prove more financially advantageous. Additionally, the council has expressed their willingness to enter a buy-back agreement for low-end plastic material i.e. wheel stops, bearers, posts, which is the type of product offered by Plastic Forests.

As councils/ARMBs highlighted that Plastic Forests only accept the amount of material they are able to process and re-manufacture into new products, it is not suggested to aggregate the stream in a communal point. Silage wrap is considered plastic material and therefore combustible. Stockpiling considerable quantities awaiting collection may increase fire hazard and/or cause other health and safety issues, i.e. vermin infestation, mosquito breeding, odour.

Textiles

Wearable textiles are considered problematic only by Falls Creek RMB, but due to low quantities received and the isolated location, no recyclers have been found. The most convenient solution for this material lies in the Boomerang Bag group in Bright, which accepts old textiles and re-purposes them into shopping bags. Recyclers that we have contacted are able to accept clothes in wearable condition, however, the cost of transporting this waste stream to Melbourne is extremely high due to low volumes received.

Mansfield Shire Council and Wangaratta City Council find carpets and underlays problematic to recycle. Unfortunately, the recyclers contacted are unable to handle this waste stream and there are no current alternatives to landfill.

Mattresses

Mattresses are found problematic only by Mt Buller/Mt Stirling ARMB due to low storage space and seasonality. A solution to this problem can be found by starting a conversation with lodges and resorts, as they currently dispose of their old mattresses independently. Collections could be organised at the beginning or end of the winter season or when minimum quantities are reached. Under this scenario, lodges and resorts would store the unwanted mattresses awaiting collection within their property and pay the collection fees. This solution would benefit not only the ARMB, as costs to transport few mattresses to Benalla would be avoided, but also lodges and resorts of the area, as a solution is readily available to them.

All the recyclers contacted are willing to service the area and constitute valid solutions. However, it may be advantageous to engage with Soft Landing as it will be leading the PSS that will start in 2023 and will also offer rebates. Current prices for mattress pick-ups are between \$30 and \$55 per mattress.

Hard plastic

Only two councils find hard plastic problematic: Indigo Shire Council and Mansfield Shire Council. As previously mentioned, there are several recyclers willing to take this material, however, councils cannot meet separation and cleanliness requirements. A solution for this material could be aggregation at

Wangaratta RRC/TS, which is serviced by GT Recycling. Mansfield Shire Council and Indigo Shire Council would need to transport their material to Wangaratta and share the cost of transport to GT Recycling's facility in Geelong with Wangaratta Shire Council.

Transfer station managers in Wangaratta have expressed their willingness to help other councils in diverting waste from landfill and ability to function as a hub for certain waste streams. Additionally, no storage issues have been outlined during the consultation phase and it is therefore assumed that the facility can accommodate volumes. If storage issues arise due to significant quantities aggregated at the centre, development of a small storage space may be required. Costs related to this infrastructure are likely to be in the order of \$710-765 per m², for a high bay warehouse with precast or tilt-up walls and including plumbing, fire and electrical services. Current GT Recycling prices for a semi-trailer pick up are between \$700-\$1,000, which correspond to about 8-10 tonnes of baled plastic. If the plastic is also compacted, transport would be more cost efficient as more quantities can be transported at the same time. Compactors are estimated to range between \$20,000 to \$50,000 depending on size. Wangaratta RRC/TS received 11.6 tonnes of hard plastic in 2019-20 and a small compactor would likely satisfy the facility's needs, even when accepting material from other councils. Table 6 shows estimated costs for aggregation of hard plastic and transport fees.

Table 6 Time-driven estimated costs for hard plastic aggregation at Wangaratta and recycling

Council/ARMB	Estimated travel time to Wangaratta*	Loading time	Transport costs to Wangaratta	Pick up and processing fees**	Total per council
Indigo Shire Council	30 mins	30 mins	\$120 - \$150	\$700 - \$1,000	\$360 - \$500
Mansfield Shire Council	1h 15 mins	30 mins	\$210 - \$265		\$450 - \$600
Rural City of Wangaratta	N/A	N/A	N/A		\$240 - \$340

*Travel time has been estimated using the National Heavy Vehicle Regulator route planner, <https://www.service.nhvr.gov.au/#page=informationHub/routePlannerTool>

**Pick up and processing fees have been equally divided by participating Councils and ARMBs

Paint

Recycling opportunities for paint rely on the Paintback program or energy recovery. Energy recovery via Cleanaway is the current solution that the Alpine Shire Council adopts to dispose of this waste stream, however disposal costs are reported to be very high. The Rural City of Benalla is not accepting paint at their site and the community is asking for solutions.

The Paintback program is not looking to expand their current collection network, however, pop-up events can be organised. Mobile events are the only economically advantageous solution as the community can drop-off up to 100 litres of unwanted paint per visit for free.

Skis, snowboards, and boots

This waste stream is found problematic in alpine resort areas and difficulties in managing this waste stream have arisen at Falls Creek ARMB, Mt Buller/Mt Stirling ARMB and Mt Hotham ARMB. No viable outputs have been found; disposal costs to use the material as fuel can be as high as \$220/tonne plus transport, and the market does not offer other recycling options. For this stream, the only viable solution for the small quantities received is landfilling, at least until the PSS for sporting equipment starts.

Batteries and fluorescent tubes

NE councils/ARMBs have batteries and fluorescent lamps managed by e-waste contractors (e.g. Scipher Technologies). Alpine Shire Council finds batteries problematic, whilst Towong Shire Council finds fluorescent lamps an issue. It is suggested to find recycling options with the current e-waste recycler as they can collect and process these waste streams.

Another solution for batteries lies in the B-cycle PSS, which has just started and is open for councils and alpine resorts to join. From March 2022, rebates will also be available. Fluorescent lamps can also be recycled through Tekflow, however costs are likely to be high for the small quantities received at Towong.

Treated timber

Treated timber is a widespread issue within the NE region and the only available solution is energy recovery. However due to the high costs involved, maintaining current management practices (mulched and used for landfill roads/cover material) is seen as the only viable option.

Soft plastic

Councils and alpine resorts that find soft plastic problematic are:

- Alpine Shire Council
- Falls Creek RMB
- Indigo Shire Council
- Mt Buller/Mt Stirling ARMB
- Mt Hotham ARMB
- Towong Shire Council
- Rural City of Benalla.

The problems faced by councils/ARMBs lies in limited options for domestic soft plastic recycling and in meeting recyclers' separation requirements for commercial soft plastic.

Despite Replas being the only recycler willing to take domestic soft plastic, it is not considered a viable solution for NE councils/ARMBs due to the significant transport costs involved and the imposition of buy-back agreements. The only viable option seems to be the proposed PSS for food-related soft plastic, led by the Australian Food and Grocery Council. No time frames are given for the implementation of the scheme.

Commercial soft plastic has many recycling opportunities available, however, councils and alpine resorts find difficulty in meeting separation obligations (such as polymer identification, contamination and material characteristics). Meeting these requirements would need additional human and financial resources, workforce training and management procedures, and these are likely to outweigh the costs of landfilling.

It is suggested to continue current practices until the PSS starts. Where and when possible, it is good practice to separate soft plastic and take it to the nearest REDcycle point, as is currently happening in Mt Hotham Alpine Resort.

E-waste

E-waste is considered problematic only by Alpine Shire Council and, as a regional solution is present through Scipher Technologies, Council should engage with them to find suitable outlets for its e-waste.

Although a regional contract is in place and no major issues were identified during the consultation with councils, other e-waste recyclers have been contacted. If an alternative was needed, Tekflow may be suitable, as it can collect a wide range of materials (including solar panels); it is also expanding its network, looking to engage with councils in regional areas and may offer advantageous prices.

Regional aggregation

Regional aggregation of different waste streams and ‘milk runs’ to Melbourne have also been considered, by investigating the feasibility to aggregate different waste streams at a communal point and transport the waste material to Melbourne in one vehicle that would then drop off the waste streams at different recyclers.

This option aims to help smaller councils that would need to landfill some material because of the high transport costs and small quantities generated, however, it has been deemed feasible only for certain types of waste streams. In fact, it is not considered advantageous to aggregate certain material, i.e. mattresses and/or soft furniture due to their bulky nature and/or hazardous material, such as paint, due to stricter transport requirements.

The optimal aggregation point is considered Wangaratta RRC/TS. The site is in a central position with respect to other councils and ARMBs, has reported to have no storage issues and may be able to accommodate waste from other councils/ARMBs without the need for infrastructure upgrades. Aggregation is considered advantageous for textiles, hard plastic and e-waste. Table 7 identifies estimated costs for councils and ARMBs to transport waste streams to Wangaratta, whilst Figure 1 and Table 8 show the estimated route for ‘milk runs’ to Melbourne for the recycling of the three waste streams and related costs.

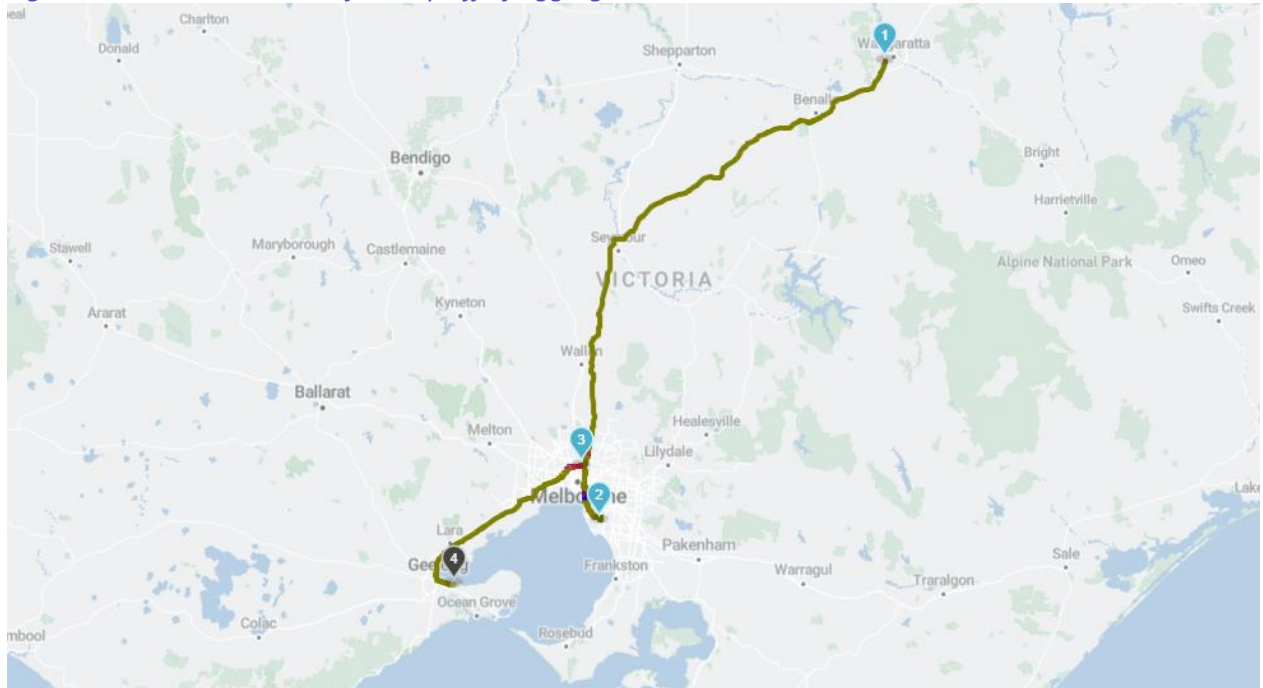
Table 7 Time-driven estimated costs for multiple streams aggregation at Wangaratta

Council/ARMBs	Estimated travel time to Wangaratta*	Loading time	Transport costs to Wangaratta
Alpine Shire Council	45 mins – 1h 30 mins	30 mins	\$150 - \$300
Falls Creek Alpine Resort Management Board	1h 45 mins	30 mins	\$270 - \$340
Indigo Shire Council	30 mins	30 mins	\$120 - \$150
Mansfield Shire Council	1h 15 mins	30 mins	\$210 - \$265
Towong Shire Council	1h 30 mins – 2h 15 min	30 mins	\$240 - \$420
City of Wodonga	1 h	30 mins	\$180 - \$250

Figure 1 shows the recommended route for the drop-off of waste collected at Wangaratta at three different recyclers. Points in the map are:

1. Wangaratta RRC/TS
2. Scipher Technologies drop off facility for e-waste recycling
3. Southern Cross group facility for textile drop off
4. GT Recycling facility for hard plastic drop off.

Figure 1 Estimated route for drop off of aggregated waste streams



Source: NHVR route planner, Route Planner Tool (nhvr.gov.au)

Table 8 Transport costs, based on time, of 'milk runs' to Melbourne

Location	Estimated travel time	Loading/unloading time	Cost
Wangaratta RRC/TS	N/A	2 hrs	\$240 - \$300
Scipher Technologies facility	3 hrs	30 mins	\$420 - \$530
SCR facility	30 mins	30 mins	\$120 - \$150
GT Recycling facility	1hr 15 mins	30 mins	\$210 - \$270
TOTAL			\$1,000 - \$1,300

It is noted that transport costs to different recyclers in Melbourne must be shared between participating councils and ARMBs.

Recommendations

After analysing difficulties councils/ARMBs face to recycle certain waste streams, and investigating market opportunities to divert some waste streams from landfilling, solutions for certain materials have been found.

Key recommendations for NEWRRG implementation are provided below.

Polystyrene

- Engage with Indigo Shire Council to obtain consent to function as an aggregation hub for polystyrene at Beechworth RRC/TS and availability to accommodate a compactor.
- Seek agreements from councils that find the material problematic to participate in the aggregation process and sharing of fees.

- Engage with Albury Waste Management Centre with the view to reduce gate fees as polystyrene is brought to the centre already compacted.
- Re-confirm the implementation of the program with Indigo Shire Council and participating councils/ARMBs.
- When councils/ARMBs agree on the implementation of the program and ultimately confirm their participation, explore funding opportunities (e.g. via Sustainability Victoria) for development of relevant infrastructure.

Silage wrap

- In consultation with councils/ARMBs that are already serviced by Plastic Forests, use market leverage to establish similar collections for other councils/ARMBs without the stated requirement for buy-back arrangements.

Paint

- Explore opportunities with Paintback for pop-up events to be held in the NE region.

Hard plastic

- Engage with Wangaratta to trial hard plastic aggregation and recycling with the current contractor, GT Recycling.
- Confirm with councils/ARMBs that find this material problematic quantities in play, aggregation process and sharing of transport costs to GT Recycling facility in Geelong.
- Assess with Wangaratta the need for additional storage space, equipment, etc. to manage the quantities involved.
- Re-confirm the implementation of the program with Wangaratta and participating councils/ARMBs.
- Explore funding opportunities for the establishment of any additional storage infrastructure required.
- If hard plastic aggregation trial is successful, investigate the opportunity to extend the program to other problematic materials and organise 'milk runs' to Melbourne.

References

AGFC (Australian Food and Grocery Council 2021) *Food and Grocery Manufacturers Step Up with National Plan to Tackle Plastic*, accessed 9 December 2021, <https://www.afgc.org.au/news-and-media/2020/11/food-and-grocery-manufacturers-step-up-with-national-plan-to-tackle-plastic>

Blue Environment (2018) *Regional optimisation study*, prepared by Blue Environment for the North East Waste and Resource Recovery Group

Dairy Australia (18 November 2020) *Dairy farm plastics recycling target receives Federal funding boost*, accessed 7 October 2021, <https://www.dairyaustralia.com.au/news-repository/2020/11/18/dairy-farm-plastics-recycling-target-receives-federal-funding-boost#.YWLtIjBzIU>

DAWE (2021a) *Recycling farm plastics*, accessed 7 October 2021, <https://www.environment.gov.au/protection/waste/publications/recycling-farm-plastics>

DAWE (2021b) *National Plastics Plan - Pathway to more sustainable use of expanded polystyrene*, accessed 12 October 2021, <https://www.environment.gov.au/protection/waste/publications/npp-pathway-to-more-sustainable-use-eps>

DAWE (2021c) *Recycling mattresses and bedding*, accessed 11 October 2021, <https://www.environment.gov.au/protection/waste/publications/recycling-mattresses-bedding>

DAWE (2021d) *Battery Stewardship Council*, accessed 7 October 2021, <https://www.environment.gov.au/protection/waste/publications/battery-stewardship-council>

DAWE (2021e) *Recycling sports equipment*, accessed 8 October 2021, <https://www.environment.gov.au/protection/waste/publications/recycling-sports-equipment>

DAWE (2020) *Partnering for a sustainable environment Partnership Call: product stewardship scheme for photovoltaic systems*, accessed 10 December 2021, <https://www.awe.gov.au/sites/default/files/env/consultations/d4ee67c7-ffa0-4560-beaa-6d83c1bc9b3c/files/partnership-call-product-stewardship-photovoltaic-systems.pdf>

DAWE (n.d.) *FluoroCycle*, accessed 8 October 2021, <https://www.environment.gov.au/protection/waste/product-stewardship/products-schemes/FluoroCycle>

EPA (2021), publication 1667.3, *Management and storage of combustible recyclable and waste materials – guideline*, <https://www.epa.vic.gov.au/about-epa/publications/1667-3>

Expanded Polystyrene Australia (EPSA) (n.d.) *EPS and Recycling*, accessed 7 October 2021, <http://epsa.org.au/sustainability/eps-and-recycling/>

Planet Ark (n.d.) *Carpets & Rugs*, accessed 8 October 2021, <https://businessrecycling.com.au/recycle/carpets-rugs>

Randell Environmental Consulting (REC 2020) *Problematic materials management options: flexible plastics, silage wrap and paint NE WRRG regional summary*, prepared by REC for NEWRRG

Rawlinsons Publishing, *Rawlinsons Australian Construction Handbook* (2022), accessed on 9 March 2022, <https://www.rawlhouse.com.au/publications/2022-australian-construction-handbook>

Soft Landing (n.d.) *Materials recycled*, accessed 7 October 2021, <https://softlanding.com.au/recycling/>

Sustainability Victoria (2015) *Collaborative Guidelines for Regional Waste and Resource Recovery Groups*, 2015, <http://www.beancomms.com.au/wp-content/uploads/2016/05/Collaborative-Procurement-Guidelines-for-RWRRG-Nov-2015.pdf>

Sustainability Victoria (2021a) *Dispose of fluorescent lights*, accessed 8 October 2021, <https://www.sustainability.vic.gov.au/recycling-and-reducing-waste/at-home/dispose-of-household-waste/e-waste/fluorescent-lights>

Sustainability Victoria (2021b) *Recycle e-waste*, accessed 8 October 2021, <https://www.sustainability.vic.gov.au/e-waste>

Appendix A

Record of consultation with recyclers

The following recyclers were consulted by Blue Environment; the table includes relevant information received.

Recycler	Material accepted	Comments
Albury Waste Management Centre (Albury)	Residential quantities of all waste streams are accepted but limits on commercial quantities.	Albury Waste management Centre can accept commercial quantities of different waste stream coming from other councils. Transport must be arranged by councils and alpine resorts as the centre does not have its own fleet for waste pick-up services. However, as the Centre is of considerable dimensions and because they have in place machinery and processes to recycle as much as possible, it could be cost-effective to bring some of the problematic materials to this waste facility. E-waste, part of the NTCRS and not part of the NTCRS, is accepted for free. Hard plastic is accepted, sorted, and sold, but for commercial quantities there is a disposal fee of \$57/tonne. DrumMuster containers must be triple washed before disposing of them. Residential quantities of polystyrene can be dropped off at the facility free of charge, whilst a fee of \$57/tonne is charged for commercial quantities. Gas and fire extinguishers are accepted for free but not in commercial quantities. Mixed loads are accepted but incur in a fee of \$157/tonne. Skis and snowboard are not accepted, nor is soft plastic from domestic streams. Clear and clean commercial soft plastic is accepted.
Aldonga Engineering (Wodonga)	LPG gas bottles, butane bottles, welding and oxygen bottles, helium bottles and fire extinguishers	Aldonga Engineering receives the bottles loose in a mesh cage delivered on an open truck for toxic fumes reasons. They can take up to a semi load at a time Price is based on per cylinder: LPG bottles \$6 +GST Helium Bottles \$1.60 +GST Butain bottles/cans \$1.60 +GST Fire Extinguishers \$7.50 +GST Welding and oxygen bottles \$6.00 + GST. Transport to be organized by councils Delivered to 14 - 16 Osburn St Wodonga VIC 3690. We Currently supply this service to Cleanaway and to City of Wodonga Transfer station.
Astron Sustainability	No response received	
Carrington Plastics	Not suitable	This recycler does not take councils waste because of the high risk of contamination.
DMD Plastic Recycling (Albury)	Hard plastic, commercial soft plastics	Can accept clean hard plastics stream separated by polymer type and commercial soft plastics. Cannot pickup, must be delivered to Albury. No gate fee. No minimum quantities but load must be baled.
Ecofeet\ (Melbourne)	Gas bottles and refrigerants	Gas bottles must be empty. They do not apply a call out fee, however, they accept a minimum of 20 bottles at each site for multiple pick-ups, depending also on how far away councils are from each other. Fridges are priced at \$20/fridge for a minimum of 60 fridges across three sites. The more they can collect the lower is the price.
Envirostream	No response received	

Recycler	Material accepted	Comments
EQ Plastics (Melbourne)	Polystyrene and hard plastic	Single polymer plastic streams are accepted but not mixed streams. The company usually do not accept plastic from councils, however, if the material will be clean, they are willing to consider accepting it. They do not have a collection service and the waste must be delivered to their facility in Dandenong. Additionally, the plastic is accepted loose but a gate fee between \$0.50 and \$1 per kilo is applied. Councils will be required to sign a 12-month contract with no buy-back agreements in it.
Foamex (Melbourne)	Polystyrene, only EPS	Foamex can accept EPS from councils transfer stations, however, the company is able to service only the Rural City of Benalla, Indigo Shire Council, Mansfield Shire Council, Rural City of Wangaratta and City of Wodonga. The waste must be clean and ideally sealed in plastic bags to prevent any contamination. Minimum quantities do not apply, however, for a regional area pick-up they would require a sizeable quantity to make the transport worthwhile. The waste stream can also be delivered at their facility by appointment only. The price for a truck and trailer picks up would be of: \$300+GST pick-up fee \$125+GST processing fee They can also provide plastic bags for polystyrene storage.
Future Recycling (Melbourne)	Fire extinguishers and gas bottles	The company requires the handle and powder inside fire extinguishers to be removed and gas bottles to be cut in half. They might be able to recycle skis and snowboards, but it will incur a contamination fee. They can provide bins to customers and pick them up on schedule. There is not a minimum pick up quantity if the pickup is based on the bins they provide, but there is a minimum of 2.5 tonnes for ad-hoc services. They apply rebates on materials only to regular customers.
Garden City Plastic	Not suitable	They only recycle PP5 plastic, and the waste must be dropped off at one of their collection points.
Global Industrial Group	Not suitable	The company is not in the recycling industry
GT Recycling (Geelong)	HDPE, PP, LDPE, film, plastic drums, wheelie bins, shrink bins, garden pot, storage containers, bread and milk crates, buckets.	They can accept the material dropped off at their facility by appointment or collect. However, if they collect the waste must be baled and separated per plastic type. Some contamination is accepted. The minimum for collection is a semi-trailer (which is about 8-10 tonnes of baled plastic), for a cost of \$700-\$1000.
InfraBuild Recycling	Not suitable	Distance is cost ineffective.
Inspired Waste Solutions (Melbourne)	Lower density polyethylene	The waste must be single stream and clean, it cannot be contaminated with any other plastic material. They accept bale frames full of plastic bags. Drop off at their location must be arranged by appointment but there are no minimum quantities accepted, additionally, there is no gate fee.
KS Environmental	No response received	
MAP precision Plastic	Not suitable	They do not recycle plastic anymore
Martogg LCM	Not suitable	Martogg LCM only deals with processed plastic. They have suppliers that take the plastic waste from RRCs, wash it, reprocess it, shred it, and send it to Martogg LCM.

Recycler	Material accepted	Comments
Megara	Not suitable	They do not take outside plastic and only reprocess in-house plastic
National Polystyrene System	Not suitable	They do not accept commercial quantities and distance is not cost effective.
Norstar Steel Recyclers (Melbourne)	Fire Extinguishers	They take fire extinguishers only if all valves are taken out. They are also willing to take the metal parts of skis and snowboards, but not the whole item.
Olympic Plastics (Melbourne)	Hard and soft plastic	The company is willing to accept hard and soft plastic at their facility free of charge, however, the material must be clean and sorted by polymer type. The company is willing to help councils and alpine resorts in setting up a cleaning and separation process for free in order to ensure they receive the plastic material ready to be recycled. They can arrange transport, or the material can be dropped off at their facility. They can collect a minimum of 4-5tonnes and the fee for transport is \$60 per pallet. They accept the plastic only baled, compacted or not, but compacted plastic would be more cost-efficient as more quantities can be transported at the same time.
PCP Global Recycling (Melbourne)	No response received	
Plastic Forests (Albury)	Not suitable	Plastic Forests already has some arrangements in place for silage wrap. The wrap must be collected in the bags they provide, clean and dropped off at their facility. Bags can be purchased from PF's website at \$159.50 for 50 bags. They are not willing to take any soft domestic plastic. They had previously and they are partners of the REDcycle programme. However, the material is too problematic in terms of contamination, ink and the range of polymers collected together.
Recycal	No response received	
Replas	Not suitable	Buy back agreement necessary with purchases required on an ongoing basis and significant distance from their facility in Ballarat.
RMAX Rigid Cellular Plastic	No contact details found	
RPM Pipe	No response received	
SIMS Metal	No response received	
Smart Pallets	Not suitable	They do not recycle treated timber or any other material.
Smart Recycling	Not suitable	They do not recycle treated timber or any other material.
Soft Landing (Melbourne)	Mattresses and some types of bed frames	\$55 per piece + \$40 each per additional piece.
Southern Cross Recycling Group (Melbourne)	Textiles	Textiles in good and wearable conditions can be dropped off at the SCRgroup facility in Coburg free of charge, whilst material in not good conditions can be dropped off for a fee. Additionally, transport can be arranged.

Recycler	Material accepted	Comments
Tekflow and E3sixty (Sydney)	E-waste, EPS, batteries, soft plastic and textiles, solar panels, fluorescent lamps	The company accept e-waste of all sorts: e-waste part of the National Television and Computer Recycling Scheme (NCRS) will not incur in any fee if delivered to their facility in Sydney. E-waste that is not part of the NCRS will incur in a gate fee of \$0.45/kilo. The waste is accepted loose. Solar panels are accepted and fluorescent lamps but there is a gate fee of \$8/panel and \$3.50/kilo respectively. Pre-paid boxes for fluorescent lamps are also available. Air conditioners and fridges, including degassing, are priced at \$25 each for a minimum of 10 units. E-waste cages can be rented for \$7/week. Metropolitan pick up is priced at \$150, but regional pick-up price is not given. Soft plastic is accepted too but details are unknown.
TES-AMM Victoria	Not suitable	Not in a position to help.
Textile Recyclers Australia (Melbourne)	Textiles, carpets, underlay and apparel.	The company do not collect; however, they can arrange a third-party transporter, paid by councils. If the material is dropped off at their facility there is a gate fee from \$2/kg, depending on quality. The material must be clean and mainly free of contamination. There are fees for sorting, shredding and baling, as the waste stream is sent overseas.
The Mattress Recycler (Geelong)	Mattresses	The recycler does not take soft furnishing but only mattresses. A minimum load is of 35-40 units with fees depending on frequency. For the northeast councils and ad hoc collections, it is estimated a price of \$30 per unit.
TIC Group	No response received	
Unipod (Melbourne)	Polystyrene	The material must be 100% clean. Must be free of contamination, food particles, sticky tape and cardboard. If the collected polystyrene is not clean the waste will be sent back to the original pick-up point. Waste must be collected in Poly Bags and a minimum of 10 poly bags is required for pick up. Poly Bags are sold at \$160+GST per 100 bags.
Viscount Plastics	Not suitable	They do not accept plastic waste. They only work with reprocessed plastic.
Welvic	No response received	



Appendix B

Summary of feasible options

Problematic material	Councils and ARMBs	Known quantities	Key issues identified	Feasible recycler or option	Comment
Soft plastic	Alpine Shire Council	Unknown	Lack of recycling options	Maintain current practices until PSS starts	No recyclers have been deemed suitable for the northeast councils and ARMBs needs Introducing a NEWRRG-led initiative to collect data on the amount of soft plastic generated may allow this to be revisited in future
	Rural City of Benalla	32.4 tonnes			
	Falls Creek ARMB	Unknown			
	Indigo Shire Council	Unknown			
	Mansfield Shire Council	Unknown			
	Mt Hotham ARMB	Unknown			
	Towong Shire Council	Unknown			
Polystyrene	Alpine Shire Council	Unknown	Lack of recycling options Cost Lack of sufficient quantity Contamination Lack of storage capacity	Foamex/Unipod or Albury Waste Management Centre	Collaborative procurement agreement between councils and aggregation point
	Falls Creek ARMBs	Unknown			
	Indigo Shire Council	2.7 tonnes			
	Mansfield Shire Council	Unknown			
Treated timber	Alpine Shire Council	100 tonnes	Cost	Maintain current practices of mulching and landfilling or using as aggregate	Can be recycled only as fuel but costs deemed too great to be feasible
	Rural City of Benalla	460 tonnes			
	Indigo Shire Council	308 tonnes			
	Rural City of Wangaratta	430 tonnes			
Silage wrap	Alpine Shire Council	8 m ³	Lack of recycling options	Plastic Forests	Councils should find individual solutions with Plastic Forests
	Rural City of Benalla	10-15 tonnes			
	Towong Shire Council	50-60 tonnes			
Skis/snowboards/boots	Falls Creek ARMB	Unknown	Lack of recycling options Lack of storage capacity	Maintain current practices until PSS starts	Due to the nature of material, no recyclers have
	Mt Buller/Mt Stirling ARMB	Unknown			

Problematic material	Councils and ARMBs	Known quantities	Key issues identified	Feasible recycler or option	Comment
	Mt Hotham ARMB	Unknown			been deemed suitable for ARMBs needs
Textiles (e.g. carpets/underlay)	Falls Creek ARMB	Unknown	Lack of recycling options Contamination	Recycling through community associations	Recycling not considered doable because of extremely low quantities received
	Mansfield Shire Council	Unknown		Landfill disposal	The market does not offer recycling solutions
	Wodonga City Council	Unknown			
Hard plastics	Indigo Shire Council	Unknown	Contamination Inability to separate polymers	GT Recycling	Collaborative procurement agreement between councils and aggregation at Wangaratta TS
	Mansfield Shire Council	Unknown			
Paint	Alpine Shire Council	Unknown	Cost	Paintback	Organisation of pop-up events
	Rural City of Benalla	Unknown	Lack of recycling options		
E-waste	Alpine Shire Council	Unknown	Cost and contamination	Scipher Technologies	Council should seek recycling solution with its regional contractor
Fluorescent lamps	Towong Shire Council	Unknown	Lack of recycling options	Scipher Technologies	Council should seek recycling solution with its regional contractor
Lithium ion and household batteries	Alpine Shire Council	Unknown	Lack of collectors	B-cycle PSS	The new PSS offers rebates
Mattresses and soft furnishings	Mt Buller/Mt Stirling ARMBs	Unknown	Lack of storage capacity	Soft Landing	The company will be leading the PSS and will offer rebates