

# Research on Recovering Plastics from Kerbside Recycling

Circular Economy Think Tank Three: Plastic Remanufacturing



# Contents

<b>Glossary</b>	<b>03</b>
-----------------	-----------

<b>1.0 Executive Summary</b>	<b>05</b>
------------------------------	-----------

1.1 Summary - Barriers and Opportunities to Recovering More Plastic	09
---	----

1.2 Summary - Opportunities for Councils	11
--	----

<b>2.0 Background</b>	<b>12</b>
-----------------------	-----------

2.1 The Think Tank Series	13
---------------------------	----

2.2 Research Description	14
--------------------------	----

2.3 Kerbside Plastics	15
-----------------------	----

2.4 Kerbside Plastic Supply Chain	16
-----------------------------------	----

2.5 Hierarchy of Plastics Recovery	17
------------------------------------	----

2.6 State Government Focus	18
----------------------------	----

<b>3.0 Key Findings</b>	<b>19</b>
-------------------------	-----------

3.1 Understanding the Supply Chain	21
------------------------------------	----

3.2 Barriers to Recovering Kerbside Plastics	24
--	----

3.3 Opportunities for Sydney Councils	27
---------------------------------------	----

3.4 Opportunities for Specific Recycled Polymers	31
--	----

3.5 End Products	34
------------------	----

3.6 End of Life Considerations	36
--------------------------------	----

3.7 Collaboration	37
-------------------	----

<b>Acknowledgements</b>	<b>38</b>
-------------------------	-----------

<b>4.0 Appendix</b>	<b>39</b>
---------------------	-----------

4.1 Appendix A	40
----------------	----

4.2 Appendix B – Research Questions	44
-------------------------------------	----

# Glossary

There are a few terms used in this paper that may not be familiar to readers in this context.

**Circular economy** is defined in the [NSW Government's Circular Economy Policy](#) as an economy that values resources by keeping products and materials in use for as long as possible. Maximising the use and value of resources brings major economic, social and environmental benefits. It contributes to innovation, growth and job creation, while reducing our impact on the environment.

**Co-mingled** refers to the collection in the household yellow-lidded recycling bin of different types of materials (paper, cardboard, metal, glass and plastic containers and bottles) in the one bin often referred to as “co-mingled recycling.”

**Feedstock** refers to the input material used by manufacturers of plastic products.

**Kerbside plastic** refers to plastic packaging or products collected in the yellow-lidded recycling bin from householders. This is typically collected by councils at the kerbside and then taken to a MRF for sorting into individual material streams.

**Kerbside plastic supply chain** means the different companies involved in collecting, sorting, processing, recycling and repurposing kerbside plastic packaging and products for use in manufacturing.

**Locally** in this paper means within Australia.

**MRFs** are material recovery facilities where co-mingled recyclables are sorted into the various product streams.

**MSW** is Municipal Solid Waste. MSW is solid waste generated by households and collected through Council kerbside collections (also referred to as domestic MSW or household waste). It excludes waste collected from commercial and industrial venues, parks, litter bins and street sweepings.

**Plastic** refers to synthetic polymers, there is a wide range of polymers but the focus in this report is on polyethylene (PE), polypropylene (PP), polystyrene (PS) and expanded polystyrene (EPS) food and beverage packaging typically found in the yellow-lidded recycling bin from householders (see Appendix A for more information).

**Plastic injection moulders** refers to companies that use injection moulding to make plastic products. Injection moulding is a manufacturing process where plastic granules are fed into an injection moulding machine, melted, then the molten plastic is injected into a mould cavity, the material then cools and solidifies to the shape of the cavity.

**Plastic manufacturers** in this report is a broad term that includes secondary processors (that do finer sorting and turn plastic into pellets or flakes), plastic compounders (who do further treatment or mixing of polymers and additives), plastic recyclers, and plastic converters who produce end products from the plastic pellets or flakes. Despite companies identifying themselves as either processors, recyclers of plastic, plastic manufacturers or as plastic converters, all are involved in either processing or manufacturing plastic (with some companies identifying as both recyclers and manufacturers).

# Glossary

**Plastic processing** is the treatment of plastic after it has been sorted at a MRF. Usually done by a different business, though some MRFs are now undertaking some processing and/ or purchasing of plastic processing companies. Activities might include washing, finer sorting, pelletising and grinding. Plastic processors may sell the product direct, or via a broker to manufacturers of plastic products.

**Polymers** in this report is often used to describe plastics, which are synthetic polymers. Polymers are materials made of long, repeating chains of molecules. The materials have unique properties, depending on the type of molecules in the chain and how they are bonded.

**Product** in this report usually refers to the different recycled polymers that are traded for use to make or, mould plastic goods and items, rather than its common use as the item the plastic is used to make (such as a jug, rainwater tank, or widget).

**Plastic recycler** in this report refers to a company either involved in finer processing of recycled plastic materials and/or manufacturing recycled plastic products themselves.

**Secondary processors** of plastics refers to companies involved in the processing of plastics after the initial sorting at a MRF, who undertake finer sorting, washing, and turning plastics into pellets or flakes (see also “plastic processing”); it can also include plastic compounders who undertake further preparation or chemical treatment of the plastics according to manufacturer’s needs.

**SSROC** refers to the Southern Regional Organisation of Councils, an association of 11 Sydney councils including Bayside, Burwood, City of Canada Bay, City of Canterbury Bankstown, City of Sydney, Georges River, Inner West, Randwick City, Sutherland Shire, Waverley and Woollahra Councils.



Yellow lidded recycling bin.  
Source WSROC.

See Appendix A: Understanding Kerbside Plastics for more detailed descriptions of the types of plastic typically collected in kerbside recycling bin.



# 01

## Executive Summary



Recycled Plastic granules. Source istock  
by Aykuterd

# 1.0 Executive Summary – The Project

The [Southern Regional Organisation of Councils \(SSROC\)](#), [NSW Circular](#) and the [University of New South Wales Sustainable Materials Research and Technology Centre \(SMaRT@UNSW\)](#) have collaborated to run a series of three Circular Economy Think Tanks during 2019/20. The Think Tanks covering Material Pathways, Textiles and Plastic Remanufacturing aimed to progress our understanding of which materials could be recovered from the domestic recycling stream and returned to the productive economy.

The third think tank was focused on plastics and the opportunities to recover more polypropylene (PP), high density polyethylene (HDPE), polystyrene (PS) and expanded polystyrene (EPS) from the kerbside recycling stream and divert it into the circular economy. Whilst our focus is on the domestic stream, insights gained apply to other waste streams as well.

Due to COVID-19 restrictions on face to face events, the third think tank consisted of individual interviews rather than a collaborative workshop. The project team undertook phone interviews and online surveys with 31 key informants representing different stages and sectors along the plastics production and kerbside supply chain (see Background section for more details).

It is important to note that the scope of this research means it cannot be said to represent the approaches or plans of all, or even most of the various sectors represented in NSW. It is also a rapidly changing landscape for the companies interviewed in this research, with a number of upcoming State and Federal government targets and policy directions that will influence the kerbside plastics supply chain including the release of the updated NSW Plastic Plan and the 20 Year Waste and Resource Recovery Strategy; and all stakeholders are working towards the Federal Governments timeline on the ban of export of certain plastics<sup>1</sup>.

This research provides valuable insights into the state of play in mid 2020 on the opportunities and challenges for some of the major types of plastic found in the domestic recycling stream. As with our textiles think tank, one of the main calls from participants was for more cross-sectoral collaboration to help us address all parts of the supply chain. We hope that by publishing these research findings we go some way to assisting with that.

This report is therefore written for those who had planned to attend the think tank, as well as interested local and state government agencies, waste and plastic processing industries and manufacturers. Please refer to the Glossary on page three and four for terms used in this report.

<sup>1</sup> For more details on the export ban visit: <https://www.environment.gov.au/protection/waste-resource-recovery/waste-export-ban>

# 1.0 Executive Summary – Utilising Recycled Plastics

In summary, we discovered that there is a lot of activity and interest in using recycled plastics in NSW including:

- Manufacturers and plastic recyclers in NSW are interested in using kerbside collected recycled HDPE and PP in their production processes but they need clean, reliable feedstock and they want to know its provenance – which isn't always clear in the current system. They also need the purchasing demand for recycled plastic products to increase substantially; highlighting the opportunity for government procurement to create a pull market for these materials.
- SSROC councils have committed to preferencing recycled materials in procurement and many other government agencies are adopting similar policies as well.
- There are new and innovative partnerships that cross value chains (examples include iQ Renew and Nestle's soft plastics trial<sup>1</sup>, Cleanaway, PACT and Asahi agreement<sup>2</sup>).
- The waste industry is investing in new facilities and upgrades and working at the boundaries of waste and production (examples include Polytrade, iQ Renew, Cleanaway and VISY).
- There is increasing demand from packaging companies to use recycled content in food and non-food packaging as well as for industrial purposes (for example, Coca Cola Australia's commitment to using entirely recycled plastic for 70% of plastic bottle production in Australia<sup>3</sup>).
- There are organisations dedicated to collaborating with all sectors to progress a Circular Economy in NSW (NSW Circular) and the development of a national Circular Economy Hub and Marketplace (Planet Ark).



<sup>1</sup> Source: <https://www.iqrenew.com/news/iq-renew-and-nestle-partner-on-soft-plastic-recycling-in-resource-recovery-trial>

<sup>2</sup> Source: <https://www.cleanaway.com.au/sustainable-future/pact-asahi-and-cleanaway-announce-joint-venture/>

<sup>3</sup> Source: <https://www.coca-colacompany.com/au/news/coca-cola-australia-working-towards-world-without-waste>

# 1.0 Executive Summary – Utilising Recycled Plastics

Within the research cohort overall, we found that:

- Currently, whilst new opportunities are emerging, use of post-consumer kerbside plastics as input material for the manufacture of products is limited to the higher value streams of recycled plastics such as clear and blue PET and clear or translucent HDPE.
- There are a number of manufacturers specialising in producing recycled plastic products who use different types of post-consumer polyethylene (PE), PP, PS and EPS; however, these are often sourced directly from other businesses that can supply consistent volumes of reasonably clean material rather than from the domestic recycling stream.
- A number of companies have expressed interest in using kerbside recycled PP and PE plastics if it was clean and the procurement demand for their recycled plastic products increased. A few companies interviewed expressed interest in clean PS and EPS collected at council community recycling centres (CRCs) and drop off points, if collections could be aggregated to offset the logistical costs.
- With the exception of manufacturers that specialise in recycled plastics, most plastic injection moulders that do use recycled plastic as an input material for their products source it mostly from pre-consumer sources such as buying leftover plastics (polymers) from other manufacturers.
- Some coloured forms of PET (mostly green and brown), HDPE and PP have lower value and are harder to find markets for. Manufacturers prefer clear or white polymers they can colour to their products' specific requirements.
- There is support for more economic or legislative levers to incentivise packaging companies to use recycled content and to design out difficult to recycle packaging materials. Almost all manufacturers and MRFs interviewed said that PVC needs to be phased out of food and beverage container packaging as it contaminates material streams both in the sorting stage and in the manufacturing stage as plastics can not be recycled with PVC in the mix. Some MRFs and manufacturers interviewed would also like to see PS and EPS designed out of food and beverage containers as it contaminates material streams, creates sorting issues and is difficult to find markets for.
- All interviewees support the move towards a circular economy and many acknowledged that all parts of the supply chain have a role in increasing the recovery of kerbside plastics.
- Participants were also asked what their organisation was willing to contribute to help recover more plastics from the domestic recycling stream. Most organisations are willing to work with the local government sector to contribute expertise on recycling plastics, increase the understanding of the supply chain, provide technological solutions to sort, wash, process and recover recycled plastics (acknowledging that some of the barriers to investing in facilities need to be addressed). Some are also interested in collaborating on trials for aggregating collection of some recycled plastics as discussed in more detail in this report.



# 1.1 Summary - Barriers and Opportunities

The top four barriers to recovering PE, PP, PS, EPS from the kerbside recycling stream are the:

1. **Quality of the plastic as a raw material for use in manufacturing.** The term quality in this context includes clean plastic products and a reliable, consistent mix.
2. **Contamination of recycled plastics** from food, liquid and other materials in the kerbside recycling stream was raised as a significant barrier by almost all manufacturers and MRFs interviewed. Manufacturers want clean, single polymer streams of recycled material that they can use as feedstock.
3. **Availability of end markets** within Australia connected to supply chains, including buyers of baled kerbside PE, PP, PS and EPS and consumers of recycled plastic products made from these polymers to create the pull market.
4. **Low value or price** of the plastic products. Plastics are tradeable commodities in a global market; informants from both the supply and demand sides cited both the lower relative price of virgin plastics for use as raw material compared to the cost of buying recycled polymers. The cost of logistics for transporting recycled polymers compared to their buying price was also identified as a barrier. In addition, we were advised that higher prices could sometimes be achieved by the Australian based sellers by trading recycled polymers to international market buyers.

Other barriers frequently mentioned included licensing and regulations, education of residents to reduce contamination, coloured plastics (having more limited end uses) and the lack of procurement policies including specifications for recycled materials.

With a specific focus on councils as the primary audience for this paper; the top four opportunities for Sydney councils to focus on to improve the recovery of these plastics are:

1. **Councils to use their procurement power to procure recycled plastic products made from Australian sourced feedstock.**
2. **Councils to collaborate with companies along all parts of the supply chain to collectively find ways to increase recovery.**
3. **Educating residents to reduce contamination.**
4. **Improving source separation in collection systems to reduce contamination of the recycling bin.**

In addition to this, participants also mentioned a number of opportunities to pursue for specific types of polymers, these are outlined in Table 1 on the following pages.

## 1.2 Summary - Opportunities for Councils

Table 1: Summary of Opportunities for Councils

Opportunity	Polymer / product	Potential next steps
<p><b>Procuring recycled plastic products made from Australian sourced feedstock.</b></p> <p><i>“Look at what you are using and think outside the square, e.g. where you use sleepers in parks these could be recycled plastic instead of timber. In building slabs, the expanded polystyrene pods used in the manufacture of these slabs is fully imported. Other recycled materials can be used in place of this.”</i></p> <p><i>“Councils to look at the list of what they buy that is either timber or made from virgin plastic and ensure that when buying these materials, they instead specify recycled plastic and the price point they are willing to pay to create the market.”</i></p>	<p><b>Source separated PP</b> such as milk &amp; bread crates, pot plant holders; wheelie bins; broken water tanks; collected by council depots, nurseries and through the kerbside clean up stream.</p>	<p>Organise supply chain meetings with councils (especially ones with nurseries) and interested manufacturers that use PP to investigate feasibility of closed loop opportunities.</p>
	<p><b>Increasing recycled content</b> in products frequently purchased by councils including construction equipment (recycled pipes, noise walls, pallets, building products); furniture, garbage bins, traffic control equipment, fencing etc.). Other government agencies can also action this.</p>	<p>SSROC councils have already signed a commitment to prioritise recycled content in procurement. SSROC’s <a href="#">Procure Recycled project</a> in 2021-22 could work with civil engineers and facilities managers to increase their awareness and understanding of recycled HDPE plastic piping, recycled plastic infrastructure, landscaping and furniture products and how to specify them in council projects. Identify upcoming procurements where they could be trialed.</p>
	<p>Focus on polymers collected in kerbside recycling particularly HDPE, other types of PE, PP, PS and EPS.</p>	<p>Work with other agencies to develop a list of recycled plastic products made from Australian sourced feedstock. Include examples of where products have been used and any relevant specifications.</p> <p>Provide examples or templates on how to specify for recycled plastic products (that encourages highest proportions of recycled plastic sourced locally and where possible made locally, where cost and performance requirements are met). Provide training or opportunities to share learnings on circular and supply chain focused procurement.</p>

## 1.2 Summary - Opportunities for Councils

Opportunity	Polymer / product	Potential next steps
<p><b>Facilitate collaboration with companies along all parts of the supply chain</b></p> <p><i>“Collaboration is critical. There is too much separation between the various groups that are involved in the process. Responsibility is with all to drive change.”</i></p>	Post consumer PP from kerbside recycling.	The research confirmed there is growing demand for recycled PP from some manufacturers. Investigate interest from MRFs and manufacturers in an end to end trial using PP from kerbside recycling (ideally collected from SSROC councils). Document, evaluate and share learnings.
	Source separated PS and EPS from council drop off locations.	Whilst there was generally low interest in this product from MRFs, a couple of manufacturers saw an opportunity for exploring a lean focused supply chain. Investigate trialing aggregated collection of EPS from council community recycling centres and drop off locations; if logistical barriers such as space requirements and the need to densify before transporting to recyclers can be overcome.
	Source separated soft plastics e.g. low-density polyethylene (LDPE).	Trial aggregating soft plastics from council community recycling centres, drop-off locations or segregated for home collections, then transporting to recyclers and committing to buy back the suitable products.
<p><b>Educating residents to reduce contamination</b></p> <p><i>“Education to householders is the biggest priority.”</i></p>	Kerbside plastics	Continue to prioritise education campaigns that reduce contamination in the recycling stream. Suggestions were made by MRFs for national or state campaigns that advertise what can be recycled in Australia now and what packaging to avoid. SSROC supports the call for state and or federal mainstream advertising and media campaigns. Suggestions were also made to promote examples of recycled plastic products made from plastics commonly found in household recycling, this will be considered through SSROC’s <i>Procure Recycled</i> project.
<p><b>Improve source separation in collection systems.</b></p> <p><i>“There needs to be better source separation of the products to create better recycling. PVC should be banned in packaging as materials can’t be recycled with PVC in the mix.”</i></p>	Kerbside plastics	Consult with councils to gauge their interest in further research on a separate glass kerbside system or reducing the types of plastics collected in kerbside recycling (these were suggested by participants to increase the recovery of plastics in the recycling bin). However, reducing the types of plastics placed in the yellow-lidded recycling bin is a difficult area for councils to control as it is influenced by what types of plastic packaging comes onto the market, the consumption and recycling habits of residents, the sorting facilities at MRFs, individual council contracts with MRFs and also the availability of end markets for a recycled plastic product.
<p><b>Designing out problematic packaging</b></p>	PVC and PS food and beverage packaging.	Support advocacy efforts to phase PVC and PS out of food and beverage packaging, and difficult to recycle coloured plastics.



02

Background



Used crushed plastics ready to be melted for recycling. Source: istock, photo by Satakorn.

## 2.1 The Think Tank Series

### About this project

The Circular Economy Think Tank Series brings together stakeholders from SSROC councils, UNSW, state government and the design, manufacturing, resource and charity sectors to establish collaborative ways of working and to progress our understanding of how to transition to a circular economy with a focus on specific materials found in the domestic waste stream. It is funded by the NSW Environment Protection Authority's 'Waste Less, Recycle More' initiative under the waste levy. The Think Tank Series is supported and endorsed by NSW Circular, a NSW State Government initiative to catalyse and scale circular economy solutions.

### Objectives of the Think Tank Series

The project objectives for SSROC were to partner with a research centre based in the region, to investigate which materials could be recovered from the domestic general waste and recycling streams and be returned to the productive economy; and to collaborate with other organisations on developing beneficial circular economy opportunities for this region, by remanufacturing or reforming materials from the waste stream.

The first think tank held on the 29 August 2019 was focused on understanding material pathways and key barriers and opportunities to recover more materials from the kerbside recycling bin. The second think tank held on 26 November 2019 was focused on textiles recovery. These two think tanks were face to face events and the key findings are captured in reports for each think tank.

The third and final think tank is focused on recovering plastic from the domestic recycling stream and opportunities for remanufacturing. It had intended to bring together stakeholders from the plastic and manufacturing industries, Sydney councils, researchers from the UNSW SMaRT Centre and waste and resource recovery experts to collaborate in the exploration of opportunities to repurpose plastic packaging from the kerbside recycling stream.

The event was due to be held on 2 April 2020 but due to COVID-19 restrictions on face-to-face events the project team instead undertook this study to help inform next steps.

### Research purpose

SSROC and NSW Circular undertook this research to increase understanding of:

1. How to recover polypropylene (PP), high density polyethylene (HDPE), polystyrene (PS) and expanded polystyrene (EPS) from the domestic recycling stream and return it to the productive economy.
2. What strategic opportunities there are in the region to use recycled plastics.
3. Which reprocessed materials councils could use/specify to create a pull market.
4. The next steps for the project and opportunities to collaborate.

## 2.2 Research Description

The priority plastics to focus on in this research were selected based upon their prevalence in the domestic stream, and NSW SMART Centre's understanding of opportunities and their detailed insights to the plastics sector. Participants were selected for interview based on:

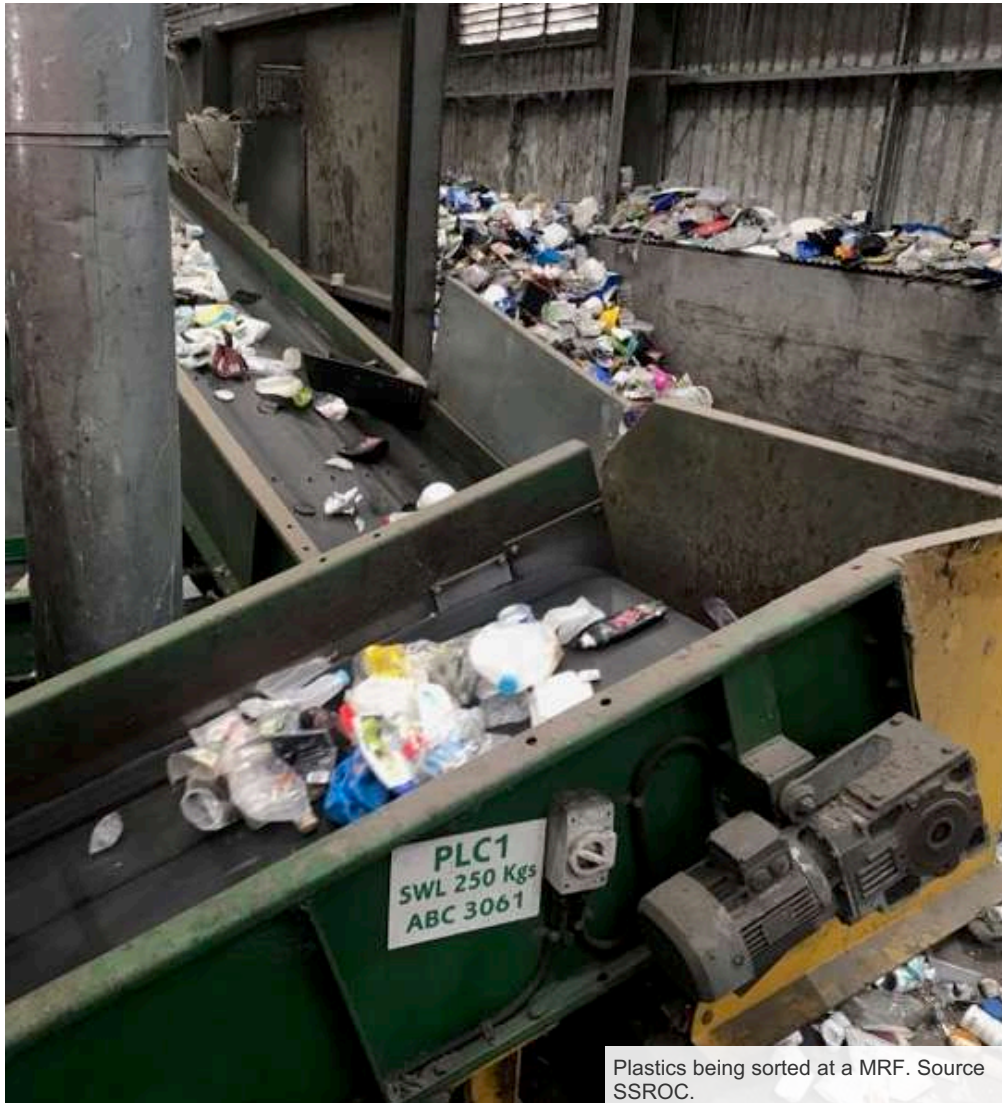
- Their current or potential role in the supply chain of recovering PP, HDPE, PS and EPS from the domestic recycling stream.
- Manufacturers that use PP, HDPE, PS and EPS located within the SSROC region or alternatively within NSW.
- SSROC also prioritised interviewing the parts of the supply chain that local government needs to understand better, such as the companies involved in the processing or manufacturing of kerbside materials once they leave a MRF.

31 stakeholders contributed to the research. Those informants included: SSROC councils; Local Government Procurement's (LGP) Sustainable Choice Program, MRFs; DPIE; APCO; Planet Ark, Plastic Police, NATSPEC; secondary processors, plastic recyclers and manufacturers of plastic products, some of whom preferred to remain anonymous.

A total of 25 (30-60 minute) phone interviews were conducted and six online surveys were completed. Breaking this down by sector we held:

- A total of 12 interviews with a variety of companies involved in the recycling and manufacturers of plastic products which in this report are labelled as "Plastic manufacturers" unless otherwise specified. This category includes secondary processors (finer sorting and turning plastic into pellets or flakes like Australian Recycled Plastic, as well as plastic compounders like Martogg). It also includes plastic recyclers (sometimes involved in both processing recycled plastic and manufacturing new recycled products) and plastic injection moulders that are either interested or already using recycled plastic. Despite companies identifying themselves as either processors, recyclers of plastic, plastic manufacturers or as plastic injection moulders, all are involved in either processing or manufacturing plastic (with some companies identifying as both recyclers and manufacturers). Also included in this category were interviews with plastic industry associations such as Plastics Industry Manufacturing Association (PIMA) and Society of Plastic Engineers (SPE).
- 4 interviews with MRFs.
- 9 interviews with Local Government sector (3 phone interviews and 6 online surveys).
- 2 interviews with State Government.
- 4 interviews with other stakeholders with expertise in plastic packaging. These included Australian Packaging Covenant Organisation (APCO), specifications for plastic products (NATSPEC) and recovering and creating end markets for plastic (Planet Ark and Plastic Police). In this report this diverse group is referred to as "Industry associations".
- Research questions are provided in Appendix B.

## 2.3 Kerbside Plastics



Plastics being sorted at a MRF. Source SSROC.

### Understanding the plastics collected in kerbside recycling

A number of different types of plastic packaging and products are collected in the yellow-lidded household recycling bin. Each type of plastic (also referred to as polymers) has different recovery potential and challenges. SSROC worked closely with plastics experts at the UNSW SMaRT Centre to identify which materials to prioritise for our third think tank. This research focused on polypropylene (PP), polyethylene (PE), polystyrene (PS) and expanded polystyrene (EPS).

Please read Appendix A for more information on why we focused on PP, PE, PS and EPS and to gain a better understanding of the chemical properties of these polymers.

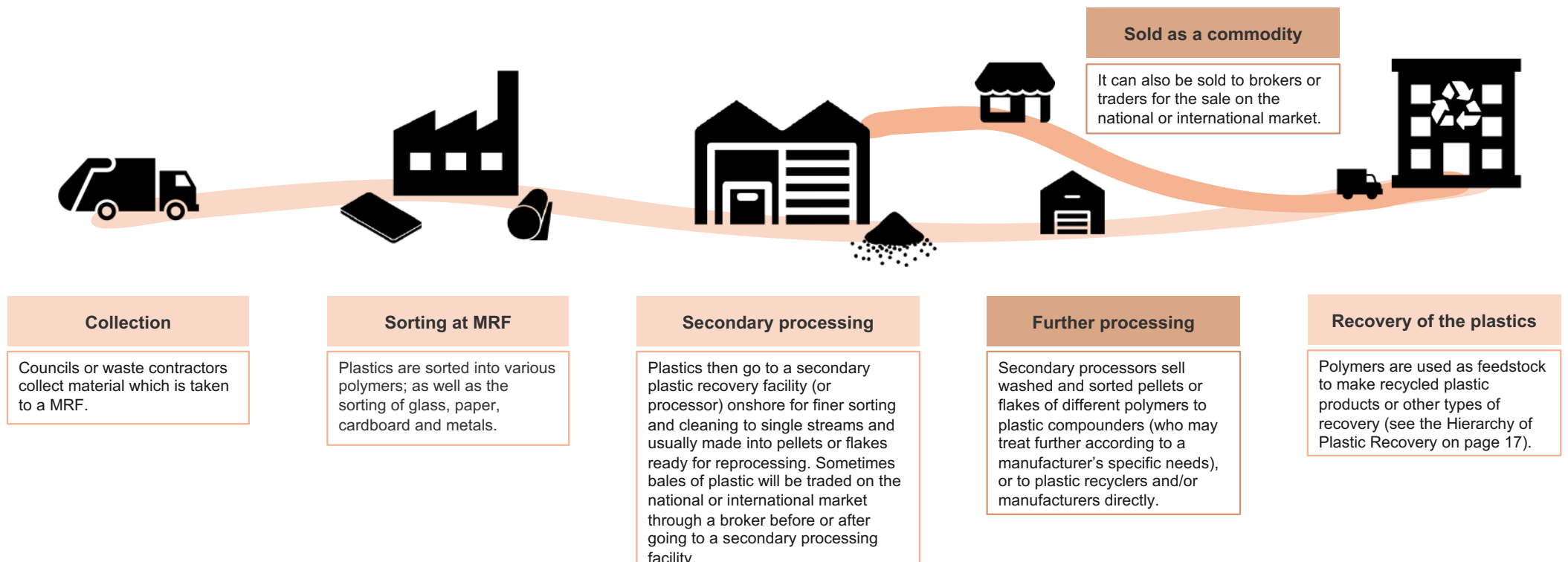
Appendix A also contains a table of the types of plastic products typically found in the kerbside recycling stream.

## 2.4 Kerbside Plastic Supply Chain

### Kerbside plastics supply chain

The kerbside plastics supply chain is highly complex because a number of different companies are involved in the sorting, processing and manufacturing of kerbside plastics. Moreover, materials are difficult to track once they leave a MRF, because like other commodities they can be traded locally or internationally and/or further processed to be used for manufacturing. A full analysis of this supply chain was not a focus on this research. However, it has identified the need for more analysis in order to understand the recovery potential of the low-value bales of mixed plastic.

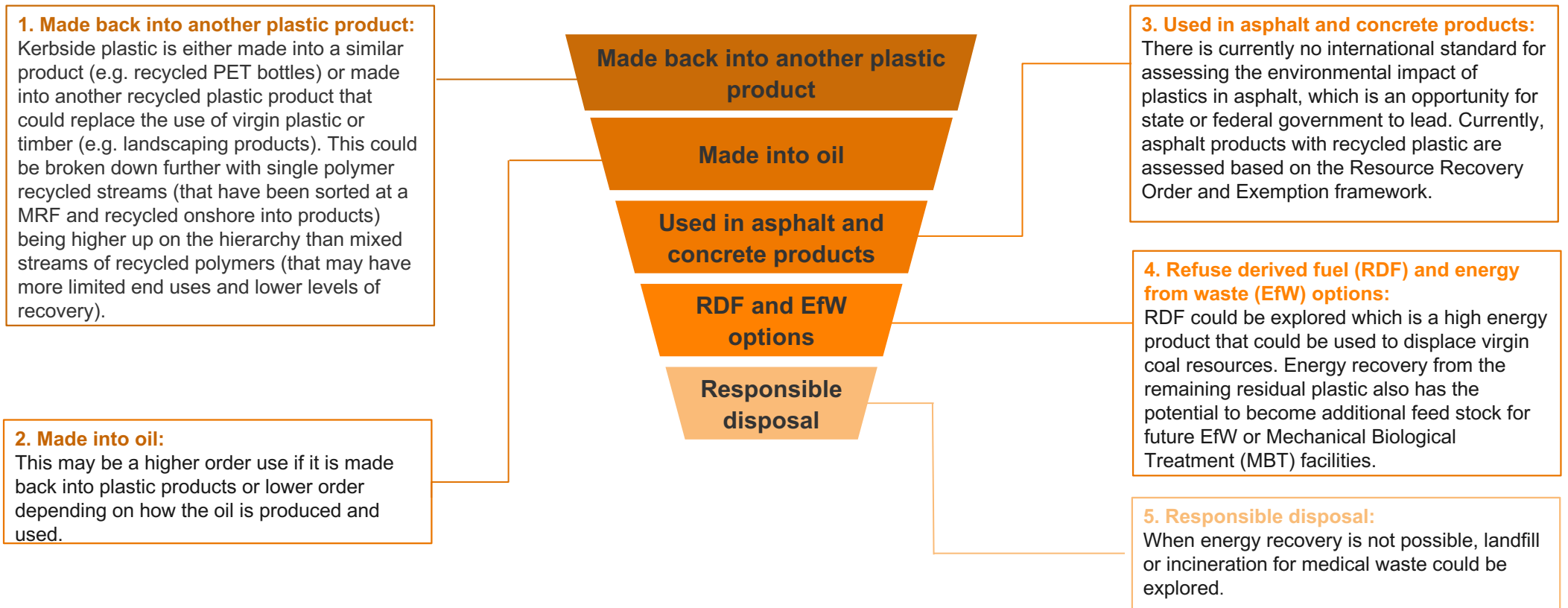
A 'typical' process for the collection, sorting, processing and use of recycled plastics in manufacturing of new products is shown in the illustration below.





## 2.5 Hierarchy of Plastics Recovery

One interviewee<sup>1</sup> suggested that we need to ensure that we recover plastic products to their highest possible value after all other strategies to avoid and reuse plastic have been exhausted. Further research to develop a resource hierarchy approach to plastics recovery is needed (this has been suggested to DPIE through SSROC's submission on the NSW Plastics Plan). However, from the kerbside recycling stream the highest value use after a product is collected for recycling could be that a product is:



<sup>1</sup> This concept of a hierarchy for plastics recovery was raised in an interview with the Australian Industrial Ecology Network and has been expanded upon here by SSROC with their permission.

## 2.6 State Government Focus

In March 2020, the NSW Government released [Cleaning Up Our Act: Redirecting the Future of Plastic in NSW](#) to stimulate discussion and invite consultation on the development of a plan for managing plastic waste and pollution in NSW. Some key points relevant to this think tank are (with corresponding page numbers in the discussion paper provided):

- A NSW Government aspiration for NSW to become a world leader in managing plastics (pg7).
- Plastic manufacturing employs about 85,000 people in Australia and comprises around 10% of all manufacturing activity (pg11).
- NSW consumed 1.1 million tonnes of plastic in 2017-18 (mainly packaging and household items) (pg11).
- Plastic has a poor recycling record. Globally only 18% of all plastic waste generated is recycled. In NSW it is only 10% and in Australia 12% (pg23).
- Only 30% of plastic waste recycled in NSW is remanufactured here. The remainder goes interstate or overseas for reprocessing (pg23).
- There is a lack of local and global markets for the waste plastic we generate, collect and sort (pg23).
- Mixed plastic from kerbside yellow-lidded bins has been steadily declining in value. In 2018–19, 147,000 tonnes of mixed plastics were exported from Australia at an average value of AU\$4/tonne.

The NSW Government is considering a number of targets such as tripling the proportion of plastic recycled in NSW across all sectors and streams. One of the proposals being considered is mandating 30% minimum recycled content in plastic packaging by 2025 to create a pull market for recycled plastics, which is in line with the 2025 National Packaging Targets. If plastic packaging contained a minimum of 30% recycled content, this would equate to more than 100,000 tonnes of recycled plastic. Coupled with initiatives such as industry support and local market development (to ensure recycled content is sourced domestically), NSW could significantly increase the amount of plastics we recycle.



# 03

## Key Findings



## 3.0 Key Findings



Detailed in this section are the key findings to help increase our understanding of the kerbside plastics supply chain, and the barriers and opportunities to recovering kerbside plastics as identified by the research participants.

All participants in this research were asked to share their insights into:

- The **barriers** to recovering HDPE, PP, PS and EPS.
- The most strategic **opportunity for councils** in Sydney to focus on to increase the recovery of HDPE, PP, PS and EPS.
- What their organisation could **contribute** to helping to recover more plastics from the domestic recycling stream.
- Which **topics and people** they wanted to hear from at the next think tank (these answers are not detailed in this report but have been used to help design the project's final webinar).

Additional questions were also asked of specific sectors to gain a more detailed understanding of supply and demand challenges, including:

**MRFs** were asked about the condition that PP, HDPE, PS, EPS and other kerbside plastics are in, once sorted at a MRF. They were also encouraged to share their insights on the volumes of materials they were processing, and the challenges and demand for each type of polymer.

**Councils** were also asked about procuring and specifying recycled plastic products, including identifying what frequently purchased products they buy that could be made from recycled plastics.

**Plastic manufacturers** (including secondary processors, plastic compounders, recyclers of plastic and plastic injection moulders who manufacture products) were also asked:

- What **type/s of recycled plastic** they were processing or manufacturing
- Where it was sourced ("**provenance**"), including which waste stream and whether it was sourced from within Australia or imported.
- What **form or condition** they would need PP, HDPE, PS or EPS to be supplied in (they were also able to mention other types of plastics).
- What types of **recycled plastic products** they could produce that councils use frequently?

Research questions are provided in Appendix B.

## 3.1 Understanding the Supply Chain

This section captures some of the insights particularly from MRFs and plastic manufacturers on the supply chain of kerbside plastics.

### MRFs

Some MRFs are extending their business models, acquiring plastic processing infrastructure, and/or amending their current facility set-ups in order to achieve finer grades of sorting. The four MRFs interviewed provided a number of insights into the recovery of the focus materials as summarised below. They also identified a number of barriers and opportunities which are captured in the next section.

### Polyethylene terephthalate (PET)

Currently, PET is the major focus for MRFs, not least with the announcements from Cleanaway, PACT and Asahi (the planned facility in Albury will be purely PET) and the Veolia Coca-Cola partnership. Coca Cola's commitment to using entirely recycled plastic for 70% of plastic bottle production in Australia is likely to draw recycled PET from across Australia. MRFs interviewed confirmed that clear and blue coloured PET is in high demand while brown and green coloured PET has a much lower value yet the volumes of brown PET have increased considerably with the popularity of health drinks like kombucha using brown coloured PET bottles. Coloured PET trays such as mushroom and meat trays is also hard to find a market for. One of the MRFs commented that some of this low value coloured PET is going into making fibres and that they would like to see the use of coloured PET in food and beverage containers phased out in Australia. This has happened in countries like Japan and more recently in Korea (who phased out PVC and coloured PET in food and beverage containers<sup>1</sup>).



Recycled plastic bottles. Source: iStock photo by Irina Vodneva

### High Density Polyethylene (HDPE)

HDPE (clear or translucent) is also of interest to most MRFs and there is demand for it from manufacturers. Coloured HDPE was reported by a MRF as having less than half the value of clear or translucent HDPE. They also commented that coloured HDPE commonly received by MRFs is not one or two dominant colours but a huge range of different shades of colours making it difficult to sort to a particular shade. An important note on coloured HDPE is that it is often supplied to the manufacturers or moulders as 'jazz' (mixed colours), which unfortunately turns grey or black in the production process. Manufacturers would like the polymers to be available as clear and as a single colour rather than only 'jazz' as that will allow for colouring of their products according to designers and specifiers' preferences.

<sup>1</sup> Source: <https://www.foodnavigator-asia.com/Article/2020/01/31/No-colour-no-PVC-South-Korea-bans-hard-to-recycle-plastic-materials-for-F-B-packaging>

## 3.1 Understanding the Supply Chain

### Polypropylene (PP)

MRFs interviewed also reported growing manufacturing interest in recycled PP and are investigating how to increase that recovery; this demand was also confirmed in our interviews with manufacturers. There are some challenges to overcome, including that many types of PP food packaging such as yogurt, butter and ice cream containers have labels moulded into the plastic; therefore, even clear or white PP containers are treated as coloured PP. Moulded labels also results in high ink loads that create challenges downstream as the inks produce significant volumes of volatile gasses. One MRF commented that some recycled PP was typically going into making plant pots and industrial products such as crates and shipping pallets.

### Polystyrene (PS) and Expanded Polystyrene (EPS)

For some MRFs, PS, EPS, as well as plastics typically numbered seven (expanded polycarbonate, nylons and fiberglass) are not of interest at the moment due to cost, difficulty to treat and the volumes required. For other companies that are investing in different technological solutions (i.e. IQ Renew's Licella and Newtecpoly's Polywaste) many of these lower value plastics could be recycled.

### Polyvinyl chloride (PVC)

None of the MRFs interviewed want PVC and would like to see it phased out of food and beverage container packaging as it contaminates the stream both in the sorting stage and in the manufacturing stage as plastics can not be recycled with PVC in the mix (creates safety issues).

### Phasing out difficult to recycle plastics

There was also support for more economic or legislative levers to encourage packaging companies to use recycled content and to design out difficult to recycle packaging like PVC, PS and EPS from food and beverage packaging and difficult to recycle coloured plastics. An example of this is the UK Plastics Pact which has a voluntary target for members to achieve 30% average recycled content across plastic packaging and has announced that it will tax packaging items containing less than 30% recycled content from April 2022<sup>1</sup>.

*"Need to start standardising plastic packaging, e.g. a cap on a Coke bottle is made from HDPE; and a cap on a Powerade drink bottles are PP. When you are processing this stuff this creates contamination problems because there is no way to easily separate them, the end products then become a mixed recycled plastic product which can impact end uses. If the government said every cap has to be either HDPE or PP (not both) that would be helpful."* (Plastic manufacturer)



PP and HDPE bottle caps. Source iStock photo by Vichai Phububphapan

<sup>1</sup> Source: UK Government, Plastic packaging tax: <https://www.gov.uk/government/consultations/plastic-packaging-tax>

## 3.1 Understanding the Supply Chain

### Manufacturers

The interviews highlighted that – like other commodities (for example, food, fibres and minerals) knowing the provenance is of increasing interest and importance.

It is worth noting that many of the plastic injection moulders interviewed, whose businesses were not specifically focused on recycled plastic products, used pre-consumer recycled plastic referred to as “scrap”. Typically, this was leftover polymers from other manufacturers which they could buy and use as feedstock in their production processes, knowing the quality, condition and source. These interviews indicated that **pre-consumer plastics are well recycled between businesses**.

The plastic injection moulders who purchased post-consumer recycled plastics usually sourced it from trusted suppliers such as a plastic compounder that could correctly identify the polymer type and quality, and process it according to their specific needs. Unless plastic injection moulders specify that the material has to come from Australian sources when they are buying feedstock from compounders or other suppliers, they may not know where the material is sourced from. This meant that some of the plastic injection moulders interviewed for this research weren't able to confirm if they were using local or imported recycled plastic.

Some companies that specialise in processing or manufacturing recycled plastic were able to shed more light on their suppliers. Of these, most were sourcing their PP, HDPE, PS and EPS from other businesses (e.g. PE agricultural wraps directly from farming companies, PS and EPS directly from fruit and vegetable companies, PP plant containers from nurseries). Over time they have established relationships with suppliers that can provide it without much contamination and supply sufficiently large and consistent quantities to offset the logistical costs of collection.

Only a small number of interviewees were using kerbside plastic from the MSW; and usually only the higher value plastics such as clear and blue PET and clear or translucent HDPE. These were sourced either through secondary processors (e.g. Australian Recycled Plastics who wash, sort by polymer type and colour, flake and then transport to recyclers) or through waste brokers.

Secondary processing of kerbside sourced PP is also occurring in some parts of NSW and then being sold to manufacturers. We were able to interview a secondary processor buying kerbside plastics predominantly from non-metro regional MRFs. They sort PP (amongst many other types of kerbside plastics) and confirmed that quality feedstock is in high demand and is then sold to recyclers and plastic compounders. The same company advised that contamination levels of stock sourced from metro areas is a barrier for them.

In conclusion, **both MRFs and manufacturers confirmed that there is high demand for clear and blue PET, clear or translucent HDPE and a growing interest in PP**. Within the research cohort, we did not find any plastic manufacturers using coloured HDPE, PP, PS and EPS that they were able to identify as being sourced from the MSW stream. The plastic manufacturers using post-consumer PP, PS and EPS are mostly sourcing from other businesses rather than the MSW; although one MRF indicated that post-consumer PP from the MSW is going into pot plants, shipping crates and pallets. However, we were unable to trace this supply chain with the information provided and within the time constraints for this research.

Further analysis of the supply chain is needed to understand where post-consumer coloured HDPE, PP and other mixed plastics collected by Sydney metro councils is going after being sorted at the MRF. This would require mapping against the investment opportunities and planned upgrades of Sydney MRFs.

## 3.2 Barriers to Recovering Kerbside Plastics

To understand the barriers to recovering plastics from kerbside systems, most participants were asked “What do you think are the top two barriers in recovering these types of plastic (kerbside plastics particularly PP, PE, PS and EPS) and finding end markets for them?”. To understand the barriers to using those plastics in subsequent production processes plastic manufacturers were asked “What are the barriers to using recycled plastic in your production processes?” The analysis provided considers the issues from the perspectives of all the informants unless stated.

### Top 4 barriers to recovering kerbside plastics

#### 1. Quality of the plastic as a raw material for use in manufacturing.

The term quality in this context includes clean plastic products (that are not contaminated by food, liquid or other materials) and a reliable, consistent mix.

Most of the manufacturers interviewed purchased recycled plastic from known, trusted sources to ensure they received quality product; illustrating that the provenance of the material and the relationship with the supplier are critical factors for using recycled plastics.

*“Consistent stream of high-quality clean material is needed - too costly to keep changing equipment/products - need reliable material; if not reprocessed to food grade it can be very risky to recover.” (Industry association)*

#### 2. Contamination of recycled plastics

affecting the quality of the material was raised as a significant barrier by almost all manufacturers and the MRFs interviewed. Manufacturers want clean, single polymer streams of recycled material that they can use as feedstock.

*“Contamination is the biggest issue followed by low value/price. The material has to be clean, the right type, possibly the right colour and the right size. Most MRF’s don’t have the facilities to do this.”  
(Plastic manufacturer)*

**3. Low value or price** of the plastic products. Informants from both the supply and demand sides cited both the lower relative price of virgin plastics for use as raw material compared to the cost of buying recycled polymers. This aligns with CSIRO’s Recycled Plastics Market – Global Analysis and Trends 2017<sup>1</sup> report, which also identified the lower cost of virgin plastic materials as the biggest economic influence in the recycled plastics market.

The low value of recycled plastics is a complex issue. Some companies identified the cost of logistics for transporting recycled polymers compared to their purchase price as a significant barrier; others mentioned that higher prices could sometimes be achieved by sellers based in Australia by trading recycled polymers to international market buyers. One manufacturer mentioned that although buying Australian recycled plastic was more expensive the quality was more reliable if you had a trusted supplier as they had experienced some quality issues with imported materials.

**4. Availability of end markets** within Australia connected to supply chains, including buyers of baled kerbside PE, PP, PS and EPS and consumers of recycled plastic products made from these polymers to create a pull market.

*“People need to understand their role and how to collaborate to create end markets.” (Industry association)*

*“Virgin material is more price competitive than recycled materials.”  
(Plastic manufacturer)*

*“The cost of logistics compared to the low value of the product.”  
(Industry association)*

<sup>1</sup> Source: <https://www.csiro.au/en/Research/MF/Areas/Chemicals-and-fibres/plastic-recycling-analysis>



## 3.2 Barriers to Recovering Kerbside Plastics

### Current licensing and regulations

This issue is integral to making any progress for recovering more plastics onshore and was raised as a significant barrier by most of the MRFs, local government and industry associations interviewed. Both the regulation of waste (or resource) material and licencing conditions for facilities that process the material sits with the NSW Government.

Issues regarding the regulation and definitions of waste that have been raised to the NSW Government on multiple occasions by both industry and local government sectors naturally applies to this stream. To progress towards a circular economy, and in the context of plastics (which undergo chemical treatments), the need to revise the definition of waste and the need for an 'end of waste' policy was raised to address and enable opportunities to turn material from one (waste) state to another (raw product). One MRF offered this insight:

*"iQ Renew is looking at supporting the development of CAT-HTR facilities for metro Sydney that could handle 60KT year (total), plus smaller 20KTPA for regional areas such as Central Coast, Newcastle, Albury or Illawarra. One of the barriers to entry is that this new technology has not been regulated in Australia as yet (turning end of life plastics to crude oil) so gaining all the approvals required is a challenge. It comes back to the definition of waste. Currently, if you had a feedstock of unwanted plastic that was converted into synthetic crude oil, the EPA sees it as waste, thus requiring an order and exemption, but the 7-years of record keeping of all material movements is onerous and kills innovation. An end of waste policy for processed materials (e.g. converted back to oil as there are no waste derivatives) would enable a manufacturer to take material currently defined as waste and create a new product."*

SSROC recently commissioned a review of NSW waste legislation and regulation<sup>1</sup> which also recommended that the Protection of the Environment Administration Act 1991 (NSW) and/or it's supporting regulations revise the definition of 'waste' so that there is a clear distinction between 'waste' and a 'resource' and so that 'resources' are not subject to the same regulatory system as 'waste'. It also recommended that NSW could consider a similar 'end of waste' framework to what is currently used in Queensland. Under Queensland's End of Waste (EOW) Framework, a product which is subject to an EOW code or EOW approval is no longer waste. It only becomes waste again if the code or approval is not complied with or the material is otherwise disposed of, illegally dumped or littered. The strategy behind Queensland's EOW Framework is to transform the perception of waste so that it is seen as a valuable and adaptable resource.

Whilst the MRFs all greatly appreciated the funding available from the state government, without addressing these systemic challenges the attention of the larger companies is likely to be focused in other states in the near future. Victoria, for example is progressing well with the secondary processing facilities, and co-location of services with three of the MRFs commenting positively on their plans in Victoria. Some MRFs with a presence in NSW and VIC are sending NSW plastics to VIC for sorting and processing and on-sell. This might therefore affect the costs of services, as plastics collected in NSW would have to be transported for treatment. One MRF also mentioned the need for a national government perspective when planning or contributing funding to new infrastructure because of material flows across borders and the need to ensure we have the right mix of facilities in each state to process that feedstock.

<sup>1</sup> SSROC commissioned Clayton Utz in 2020 to undertake this review, the final report (*Achieving a Circular Economy – What regulatory reforms are needed?*) is available upon request.

## 3.2 Barriers to Recovering Kerbside Plastics

### Current Licensing and regulations - Continued

Some of the MRFs interviewed also commented on the need for clearer and more efficient planning approval processes for new recovery facilities and licensing. They said that current lengthy approval process for facilities and licenses has the impact of reducing investment.

*“The planning and approvals process is very cumbersome, the lack of transparency over time frames makes investment difficult. Once you win a contract you want to get going, yet it may take 3 years to get the licence and you can’t buy equipment till you have it.”* (MRF)

**Coloured plastics** were also raised as a barrier because mixed coloured plastics can be baled together and difficult to separate. MRFs commented on some types of coloured plastics having a lower value and are harder to find markets for. These include coloured forms of PET (mostly green and brown bottles and PET coloured meat or vegetable trays); HDPE coloured packaging comes in many different shades and can be difficult to sort by colour, and even white PP is often treated as coloured PP as labels are moulded onto food containers. Manufacturers prefer clear or white polymers they can colour to their products’ specific requirements. Some of the MRFs commented that they would like to see more economic or regulatory measures introduced to phase out the use of difficult to recycle coloured plastics from packaging as has already been done in countries such as Japan and Korea (who phased out PVC and coloured PET in food and beverage containers<sup>1</sup>).

*“If you want white products you have to pre-sort to have clear or white; if no colour control the result will be dark grey or black - that colour is actually quite consistent despite variation in the input.”* - (Plastic manufacturer)

In addition, the following were also mentioned as barriers to recovery:

- Educating residents to reduce contamination of the recycling stream.
- Co-mingled recycling can create sorting challenges that limit the recovery of plastics.
- The lack of specifications for recycled products in government procurement and low awareness amongst local government engineers of the properties of recycled plastic products.
- Education between each sector in the supply chain to increase understanding of what is needed at each stage of the process to allow a product to be recycled and have a second life.



Plastic bales at a MRF. Source SSROC

<sup>1</sup> Source: <https://www.foodnavigator-asia.com/Article/2020/01/31/No-colour-no-PVC-South-Korea-bans-hard-to-recycle-plastic-materials-for-F-B-packaging>

## 3.3 Opportunities for Sydney Councils

All sectors were asked “*What do you think is the most strategic opportunity for councils in Sydney to focus on to increase the recovery of these types of plastics?*” This question was open ended, yet very clear themes emerged. Namely that councils should focus on procuring recycled plastic products, collaborating with companies in the supply chain to increase recovery; prioritising educating residents to reduce contamination; improving source separation in collection systems and assisting with advocacy efforts to phase out problematic food and beverage packaging like PS, EPS and PVC.

### 1. Council procurements preferencing recycled plastic products that are made from locally sourced recycled plastic.

The highest response from all sectors was for councils to encourage demand for recycled content through council procurements. Plastic manufacturers and recyclers emphasised the importance of preferencing locally made recycled materials that are sourced from local feedstock. Comments included the need to preference plastic products that contain higher percentages of recycled plastic, whilst others suggested not being too prescriptive in the specifications about the exact percentage of recycled plastic as this will vary according to the item being procured. Comments from councils on this topic also emphasised the importance of developing end markets and the need for targets or regulatory requirements to purchase items with recycled plastic content.

*“Needs to be in procurement - must specify for recycled plastic products to be locally made from locally sourced materials; there are products here that are made in China that are a large percentage of imported wood flour with only small percentage of polymers - so should have a minimum of 60-70% of recycled plastic but ideally 80-90%. The products that are mostly made from wood flour – have good performance but are not recycled plastic.”* (Plastic manufacturer)

*“Council procurement activities should be giving positive weighting to products that contain recycled material.”* (Local government)

*“Rather than saying a minimum amount of recycled plastic content say in the specs we will give preference to the highest recycled content to meet functionality/performance needs - let the market solve that problem.”* (Plastic manufacturer)

*“There's not much we as local government can do in this space if there's no end markets for these items and no regulatory requirement to recycle a given percentage of plastic waste and to purchase items with recycled content. Our best bet is to work alongside DPIE and the industry to make change on a state-wide level. The SSROC commitment to purchase recycled glass in road base is an example of a great collaboration between organisations.”* (Local government)

*What kind of intervention could we make on the push and pull sides to ensure that material is able to be more circular? And what are the costs and impact of those interventions?* (State Government)

## 3.3 Opportunities for Sydney Councils

### 2. Facilitate collaboration between all parts of the supply chain.

The second highest response mentioned by all sectors was for councils to facilitate collaboration between organisations in the supply chain to work together to increase recovery of plastics and to increase mutual understanding of the role and requirements of each part of the supply chain to enable recovery. This was also one of the key objectives of the Think Tank Series and is an action that SSROC councils have committed to as part of the [Procure Recycled project](#), which initially focused on recycled crushed glass from kerbside recycling and will next focus on kerbside plastics.

*“Develop partners at all stages in the supply chain. What would be fantastic is an end to end pilot project where you work through all the problems with supply and demand and demonstrate it can be done.” (Industry association)*

*“The importance of establishing relationships that contribute to the circularity of materials. Some companies operate within their own section of supply chain and don’t understand how to link up/down – and therefore consider the rest of the ‘pipe’. Need integrated supply agreements.” (State Government)*

*“I’m not sure that it is council led - needs to be much higher as impacts design, production, supply, use, end of life recycling. Councils just collect and organise processing contracts for what is in the market and ends up in the residential waste system. Each part of the bigger picture has various levels of control and influence - we need a collective approach. Council needs to focus on minimising contamination and maximising recovery (avoiding loss of recyclables to the red bin).” (Local government)*

### 3. Education of residents to reduce contamination

The third highest response from all sectors was for councils to focus on educating residents to improve the condition of the product for recycling. Many participants commented on the need for more effective state or national education campaigns for residents to reduce contamination of the kerbside recycling stream. These comments ranged from suggestions to just focusing of promoting the materials that can be easily recycled, and encouraging residents to source separate through the CDS scheme and community recycling centres.

*“Educate on large scale basis as is much more efficient for reducing contamination levels.” (MRF)*

*“Education to householders is biggest priority, do more source separation at the household level like Ireland - get consumers to do some of the work. Expensive to set up but worth investigating.” (Plastic Manufacturer)*

*“Advertise to residents “this what we want” in bins – rather than “what you can’t put in”. I see this as the national education program.” (MRF)*



Recycling workshop. Source SSROC.

## 3.3 Opportunities for Sydney Councils

### 4. Improving source separation in collection systems

Equally third for the participants from the manufacturing and MRF sectors was better source separation in collection systems to improve recovery. Comments ranged from looking at alternatives to co-mingled recycling, to reducing the types of plastic that are allowed in kerbside recycling, expanding the NSW CDS scheme and harmonising bin systems across NSW. The issue of handling glass was also raised within the context of being able to access a cleaner stream from local government and then provide a 'cleaner stream' of material to the plastic manufacturing industry. This links to SSROC's strategic theme since 2013 of working to clean the streams (be it for reuse, recycling or energy recovery).

*"Focus on how we get it to a point where it suitably recycled within Australia, commingled bins means crude sorting which isn't enough - means often no option but to ship offshore." (Plastic manufacturer)*

*"Consistency and standardisation about what is accepted in a bin." (MRF)  
"Plastics that manufacturers are most likely to be interested in is PET clear, HDPE (clear/translucent and possibly colour), PP (isn't clear but has volume to be of interest to manufacturers). However, it is a price led market where product goes to the best buyer/price, so government would need to introduce tariffs to make people buy from within Australia. The rest of the plastics shouldn't be put into kerbside recycling." (MRF)*

*"Get the glass out at kerbside to increase recovery of plastics and glass, ideally a separate system (or more items through CDS), rather than a separate paper system as its easier to sort paper at most MRFs than pull out glass." (MRF)*

### 5. Designing out problematic packaging

Designing out problematic packaging like PVC, PS, EPS and plastics typically numbered 7 from food and beverage packaging was also listed as an opportunity by some plastic manufacturers and MRFs.

In responses to multiple research questions, almost all manufacturers interviewed said that PVC needs to be phased out of food and beverage container packaging as it contaminates the stream both in the sorting stage (looks and behaves like PET in any water sorting processes) and in the manufacturing stage as plastics can not be recycled with PVC in the mix (special machinery and safety equipment is required).

Although Sydney councils have no control over the design and manufacture of packaging, they do undertake considerable advocacy. There is potentially an advocacy role for SSROC, NSW Circular and SMaRT UNSW to support APCO and the NSW State Government to advocate for this change in packaging. Local government must also continue to educate residents on avoiding buying items packaged in difficult to recycle packaging wherever possible. SSROC recently included a recommendation to phase out PVC packaging in food and beverage containers in its submission on the draft NSW Plastics Plan.

*"PVC should be banned in packaging as materials cannot be recycled with PVC the mix." (Plastic manufacturer)*

## 3.3 Opportunities for Sydney Councils

### 6. New infrastructure and technologies

In responses to other questions, a number of participants commented on the opportunities to recover more plastics if MRFs (with upgraded optical sorting facilities), processors and remanufacturers were collocated in waste precincts. MRFs also commented on the importance of long-term council collection contracts for the recycling stream to allow investment in new infrastructure. One plastic manufacturer called for more government regulation of the processing of plastics after they leave a MRF, which aligns with comments from councils interviewed who are wanting more traceability of recyclable products after they leave a MRF. Some insights included:

*“The level of separation and quality of recovered material we are after for a circular economy requires new infrastructure. Yes, there are older MRFs. but we need the refined optical sorting to get quality along with the secondary sorting of the plastics and the capacity to reprocess the plastics.” (MRF)*

*“Long term council collection and processing contracts for recyclables would enable us to justify making such investments – without that, it is hard to build facilities in the hope of winning business.” (MRF)*

*“If MRFs are upscaling and separating products that they are receiving, then its understanding that person in the middle – who reprocesses the plastics. We need some tier one style companies involved in that part of the supply chain as it requires more government regulation and traceability. It needs to be handled by professional companies - ideally you have those businesses located next to an MRF like in a waste precinct then you can have a better business case for lifecycle analysis, using renewables and reducing truck movements.” (Plastic manufacturer)*

Two participants also commented on emerging technologies that can deal with end of life plastics including the [Polywaste](#) technology<sup>1</sup>, which can process mixed polymers with different melting temperatures and cope with 10% contamination, and the [Licella](#) Catalytic Hydrothermal Reactor (CAT-HTR)<sup>2</sup>, which uses water and high pressure to depolymerise chemical recycling that converts end-of-life plastics into a synthetic oil. Two of the main barriers holding back progress of the CAT-HTR technology are securing feedstock and, in NSW, the EPA developing a regulatory framework for the technology, which combines both chemical and physical processing.

Another sent a word of caution to councils:

*“Be conscious if you own the stream (as local government does); understand what the capability of the stream is but be aware most technologies that are good are also very expensive, so make sure you seriously check any business models put to you.” (MRF)*

<sup>1</sup> Polywaste prototype machine is already in operation as at April 2020. Newtecpoly were expecting the commercial machine to be available for purchasing in 2021.

<sup>2</sup> This technology is already underway. First facility in UK, second in Canada, third in Timor Leste. iQ Renew are exploring opportunities to develop a facility in Australia.

## 3.4 Opportunities for Specific Recycled Polymers

In addition to the six opportunities discussed above, other opportunities were also identified by participants for specific polymers. This next section includes a table summarising opportunities and next steps for each of the focus group materials. SSROC will consider pursuing some of these ideas in the next phase of its *Procure Recycled* project.

**Table 2: Opportunities for recycled Polypropylene (PP)**

Types of products most relevant to councils	Waste stream	Form or condition needed	Opportunities	Potential next steps
Wheelie bins, pot plant holders, milk and bread crates, water tanks etc. Usually coloured.	Often business to business. Council managed depots, nurseries and kerbside clean up stream.	Mostly clean and dry, some dirt residue may be accepted. Some recyclers and manufacturers can take source separated PP in its product form without it going to a secondary processor first.	The research indicated there is interest and demand from some manufacturers in clean, source separated PP. Some recyclers indicated they could take PP milk and bread crates, bins, pot plant holders directly from councils for recycling.	Organise supply chain meeting with councils (especially ones with nurseries) and manufacturers interested in PP to investigate closed loop opportunities to recycle source separated PP into a product council could procure.
Coloured food containers (yogurt, ice cream, butter etc.); clear takeaway food containers.	MSW kerbside recycling bin	Baled by a MRF with minimal contamination ideally as a single stream, then goes to a secondary processing facility to be washed, finer sorting and flaked ready to be sent to a plastic compounder or recycler.	<p>More supply chain analysis with MRFs is needed to determine opportunities for recovering kerbside collected PP from Sydney councils. Kerbside PP could be focused on for a trial as research showed PP is of interest to manufacturers yet difficult to determine current recovery pathways for kerbside PP from metro councils due to contamination.</p> <p>More analysis is also needed to see if changing PP takeaway containers to impact copolymer would enable greater recovery.</p>	<p>The Sydney Waste Data and Infrastructure Planning project may identify next steps. If not, SSROC councils to work with MRFs to understand where PP is going and who to target for supply chain meetings. Consider an end to end trial using PP collected from SSROC councils kerbside recycling stream. Document, evaluate and share learnings.</p> <p>Further technical analysis is required by a research centre or an industry association like PIMA or APCO to see if changing to impact copolymer takeaway containers would increase recovery as well as whether MRFs are able to sort between these two types of PP.</p>

Manufacturers insights into end markets for PP:

- *“Single use PP, if it is collected, sorted and cleaned, has broad appeal for re-use”.*
- *“To be of interest in durable as well as consumer single-use goods, the type of PP needs to be impact copolymer<sup>1</sup>. Just a shift from food takeaway containers from homo-polymer to impact co-polymer would provide a significant item that can be easily sorted from the waste-stream and recycled into a useful material. The container being clear also lends itself to then being easily coloured to almost any hue for use in other consumer and durable applications”.*

<sup>1</sup> Polypropylene copolymer is a bit softer and more pliable than the propylene homopolymer but has better impact strength and is more durable.

## 3.4 Opportunities for Specific Recycled Polymers

**Table 3: Opportunities for recycled Polyethylene (PE)**

Types of products recycled relevant to councils	Waste stream	Form or condition needed	Opportunities	Potential next steps
HDPE bottles and caps (food, shampoo, detergent and chemical bottles)..	MSW kerbside recycling bin	Empty, no food or liquid. No metal. Baled by MRF (milk bottles typically baled together, then other colours treated separately). Some manufacturers may buy bales at that point and grind it themselves, others require it to be washed and further processed first.	<p>Councils preferencing procurement of 100% HDPE recycled drainage and stormwater pipes at the design stage.</p> <p>Other 100% recycled PE or mixed products exist including railway sleepers, noise walls and landscaping products. One manufacturer advised that they have sufficient supply of PE from the commercial and industrial stream to meet their demand and that an enlarged consumer base would be needed before they could take PE material from the MSW stream.</p>	SSROC's Procure Recycled project in 2021-22 works with civil engineers and project managers to make them aware of recycled plastic piping and headwall products and how can they can be used in civil works projects.
LDPE soft plastic wrapping, packets	MSW – but needs source separated collection	Empty, no food or liquid. No metal.	Close the loop on soft plastics that are already being collected by councils at community recycling centres or through collection points.	Supply chain meeting to see if there is enough interest from recyclers and councils to trial aggregating collection of soft plastics from SSROC councils' community recycling centres and drop off locations, then transporting to recyclers and committing to buy back suitable products.

Manufacturers insights into end markets for PE:

- *“There is enough supply of post-consumer HDPE, but supply exceeds demand for the recycled plastic product. Need to increase that purchasing demand from government by ensuring that specifications for recycled plastic pipes are included from the design stage in the actual drawings in order for it to translate to a purchase”.*



## 3.4 Opportunities for Specific Recycled Polymers

**Table 4: Opportunities for recycled Polystyrene (PS) and expanded Polystyrene (EPS)**

Types of products recycled relevant to councils	Waste stream	Form or condition needed	Opportunities	Potential next steps
EPS packaging around fragile items, fruit and vegetable boxes and potentially PS	Source separated at community recycling centres, drop off points and from council facilities	Empty and mostly clean (does not necessarily have to be washed but no food/liquids. No metal.	Aggregating collection of EPS from council community recycling centres and drop off locations to bring down the costs of transporting to a recycler; needs to be densified first to be economically viable.	Supply chain meeting with interested councils, EPS and PS recyclers and manufacturers to identify volumes needed, logistics, and potential products that councils could commit to buying back made from the recycled EPS.

Manufacturers insights into end markets for EPS and PS:

- *“Mildura Council has a separate PS and EPS stream at landfill and delivers to us; the bulk of polystyrene is post-consumer from growers and pharmaceutical companies. Mostly using PS from agricultural sources, so currently have enough supply but once we start producing products at scale (and see more procurement of recycled plastic infrastructure products), we could take more supply from domestic stream and we would be keen to work with councils on that.”*
- *“Need someone at the collection point who is able to correctly identify which type of styrene<sup>1</sup> it is and sort accordingly; otherwise they may be an additional sorting stage which adds costs. Currently, we purchase high impact styrene and PP from the grinders/reprocessors who purchase from manufacturers directly as they know what the quality is.”*

<sup>1</sup> There are different types of polystyrene on the market described in more detail in Appendix A.

## 3.5 End Products

To stimulate thinking about end products for consumers from a different perspective, manufacturers were asked: “What types of recycled plastic products could you produce that councils use frequently?”; and councils were asked: “What are the top five products that your council buys that you think could be made of recycled plastic?”. Pulling responses from both sectors together the highest responses are listed below

### Suggested end products for recycled plastics:

- **Furniture** (12 responses): Benches, stadium seating, seating around pools etc.
- **Garbage bins** (11 responses): Garbage bins already contain recycled content however, it may be able to be increased. Councils have to replace damaged bins or rollout new bins when services change.
- **Traffic control equipment** (10 responses): Parking curbs, safety netting, witches’ hats, bollards etc.
- **Playground equipment** (9 responses): One recycler mentioned regulations in this space are a barrier.
- **Construction equipment** (7 responses): If pipes and headwalls and noise barriers/walls were included in this category it would have the highest response at 17.
- **Fencing** (6 responses).
- **Piping, headwalls and stormwater pits** (6 responses).
- **Noise barriers/walls** (5 responses) and **signage** (5 responses) and soft fall (4 responses).



## 3.5 End Products

### Other end products identified in comments:

- Worm farms and compost bins.
- Boardwalks, edging, bollards and retaining walls.
- Railway sleepers.
- Dog agility equipment.
- Poles, base plates (under poles) and edging.
- PP pot containers contain valuable PP that could be recycled.
- Damaged or broken milk crates, bread crates, water tanks, septic tanks (after cleaning), PE drainage pipe, wheelie bins from council depots or clean up stream.
- Soft plastic pallets could go in concrete underlay<sup>1</sup>.
- Office and community centre fit-outs.

### Other insights included:

- Anything that would contain timber (except for structurally support stuff for timber); timber mouldings could be made from recycled plastic; anything you can injection mould; garden edging; interlocking blocks. (Plastic manufacturer)
- Desks, office and community centre fit-outs, street furniture, would like to see non-slip granite pavers with recycled content available, also looking at recycled carpet; and the potential for garbage bins is huge. (Local Government)

As outlined in the Opportunities section, SSROC will be pursuing opportunities to increase the use of recycled plastics in procurement through the *Procure Recycled* project and will further investigate trials to close the loop and develop new markets.



Car bumps made from recycled plastic. Source: Closed Loop  
<https://closedloop.com.au/news-and-events-bumper-year-for-recycling-innovation/>

<sup>1</sup> The example of recycled soft plastic pallets for concrete underlay provided by the participant was Cromford Film: <http://www.cromford.com.au/cromford-film/?link=cromford-film>

## 3.6 End of Life Considerations



A key consideration for circular economy of course is that we do not want solutions that push a new problem elsewhere.

All the plastic manufacturers interviewed said that, generally, many single polymer products can be recycled repeatedly. There may be some limitations depending on the product, the form and application it is to be recycled into next, and practical restrictions such as the size of the 'first life product' plastic product (that would require shredding to be prepared for its second life).

Mixed plastics can be difficult for some manufacturers. For example, composite plastic products (e.g. recycled plastic landscaping products that contain large amounts of wood flour) can be difficult to recycle again. Insights from plastic manufacturers included:

- *"There are no major problems as long as it's not mixed plastics and is still capable of being recycled to a level that is accepted by the marketplace."*
- *"Composite - can't be recycled - so problematic. Food grade HDPE can be remade into food trays and recycled again. Example, a packet of sausages – the soft bit of plastic stuck to the top won't stick to PET so they put a thin layer of PE so it sticks so now multiple types of plastic layers in one tray so difficult to recycle and can no longer recycle as PET (won't sink or float, then melts at different temperatures; and contaminates PET stream); some of the tray making companies are using a strip of glue instead."*
- *"Depends on the product, e.g. pot plant holders could be recycled over and again; same with wheelie bins."*
- *"Broken pipes can be remelted and reused again to make new recycled pipes."*

## 3.7 Collaboration

### What are companies willing to contribute to help recover more plastics from the domestic waste stream.

Participants were also asked what their organisation was willing to contribute to help recover more plastics from the domestic recycling stream. The wide variety of responses highlighted the potential expertise and technological solutions if organisations in the supply chain collaborated more to address some of the barriers mentioned in this report. Councils collaborating with companies in the supply chain as discussed earlier was identified by participants as the second highest opportunity.



In summary, organisations are willing to work with the local government sector to contribute expertise on recycling plastics, increase the understanding of the supply chain, provide technological solutions to sort, wash, process and recover recycled plastics (acknowledging that some of the barriers to investing in facilities need to be addressed). Some are also interested in collaborating on trials for aggregating collection of some recycled plastics. Where relevant, this information has been captured in the opportunities section of this report in more detail. Some of the answers to this question included:

*“We want to work with waste companies and MRFs to reduce what goes overseas and help waste companies manage it locally.”* (Plastic manufacturer)

*“One of the critical things for use of recycled material is understanding the supply chain and connection to the supply chain.”* (Plastic manufacturer)

*“We are working with packaging members to achieve targets and design out problematic packaging. Inevitable that PS will be phased out pretty soon, all states will go down that path and SA is currently the most progressive.”*  
(Industry association)

*“We’re about linking products and suppliers with council buyers. Users can search the Sustainable Choice database for suppliers with recycled content.”*  
(Local government)

*“We are focused on producing recycled plastic infrastructure materials at scale and we have some in testing now. Once we roll those out, we will be in a position to take more products from the household recycling stream. COVID-19 taught me we can adapt very quickly to change if we need to. The government can respond quickly to medical and scientific advice. We need a similar science-based approach to the development of policy for recycled materials and the rigor to support implementation and to develop markets.”* (Plastic manufacturer)

# Acknowledgements

We would like to thank the following organisations for contributing to this research.

- Astor Industries: <http://astorindustries.com.au>
- Astron Sustainability: <https://astronsustainability.com>
- Australian Industrial Ecology Network: <http://aien.com.au/>
- Australian Packaging Covenant Organisation (APCO): <https://www.packagingcovenant.org.au/>
- Australian Recycled Plastics (ARP): <http://www.arplastics.com.au>
- Cleanaway: <https://www.cleanaway.com.au>
- Department of Planning, Infrastructure and the Environment (DPIE): <https://www.dpie.nsw.gov.au>
- International Moulded Plastics: <https://implastics.com.au>
- Integrated Recycling: <http://www.integratedrecycling.com.au>
- Q Renew: <https://www.igrenew.com>
- Local Government Procurement (Sustainable Choice Program): <https://lqp.org.au/sustainable-choice>
- Martogg: <http://www.martogg.com.au>
- Mela Bar Chairs: <http://melabarchairs.com.au>
- NATSPEC: <https://www.natspec.com.au>
- Newtecpoly: <https://newtecpoly.com>
- NSW Environment Protection Authority: <https://www.epa.nsw.gov.au/work-ing-together/grants/councils/better-waste-and-recycling-fund>
- Planet Ark: <https://planetark.org>
- Plastics Industry Manufacturing Association (PIMA): <http://www.pima.asn.au>
- Plastic Police: <https://plasticpolice.com.au>
- Polytrade: <http://www.polytrade.com.au>
- Society of Plastic Engineers (SPE) – Australia and New Zealand: <https://www.plastics.org.au>
- The Green Pipe: <https://www.thegreenpipe.com.au>
- VISY: <https://www.visy.com.au>

We would also like to thank professionals from procurement, engineering and waste from the 11 SSROC member councils including: Bayside, Burwood, City of Canada Bay, City of Canterbury Bankstown, City of Sydney, Georges River, Inner West, Randwick City, Sutherland Shire, Waverley and Woollahra Councils.

Our thanks also goes to the companies that contributed their valuable time and insights to this research but wish to remain anonymous.

***This project is a NSW Environment Protection Authority, Waste Less Recycle More initiative funded from the waste levy.***





# 04

## Appendix



## 4.1 Appendix A

**Table 5: Plastics typically found in the Kerbside recycling team**

Polymer	Types of products seen in household recycling	Prioritised for research
Polyethylene terephthalate (PET)	Numbered 1 (plastic identification code) on packaging products. PET is used for drink bottles, takeaway food containers and fruit punnets amongst other applications.	Not prioritised, as already recovery pathways are already in place (estimated 43% recovery in 2017-18 <sup>1</sup> ) with additional infrastructure planned. The Pact, Cleanaway and Asahi Beverages facility <sup>2</sup> will focus on PET. The Coca-Cola and Veolia partnership <sup>3</sup> is investigating a potential recycling plant focused on PET; and Coca Cola committed to using entirely recycled plastic for 70% of plastic bottle production in Australia <sup>4</sup> by the end of 2019, so they will be sourcing product from across the country.
High Density Polyethylene (HDPE)	Numbered 2 on packaging products. HDPE is used in milk bottles, shampoo, cleaning detergent, bottle caps and chemical bottles. It is also used for rigid products in the built environment.	Prioritised for research because whilst there are end markets for clear and translucent HDPE (such as milk and juice bottles); recovery of coloured HDPE containers is likely lower (estimated 26% overall recovery of HDPE in 2017-18 <sup>5</sup> ).
Polyvinyl chloride (PVC)	Numbered 3 on packaging products. Used is some fruit and cordial bottles, food trays, detergent and spray bottles. It is also used for rigid products in the built environment.	Not a focus for this research due to safety and recovery issues. Almost all manufacturers and MRFs interviewed said that PVC needs to be phased out of food and beverage container packaging as it contaminates the stream both in the sorting stage (looks and behaves like PET in any water sorting processes) and in the manufacturing stage as plastics can not be recycled with PVC in the mix (special machinery and safety equipment is required). APCO is working with packaging companies to phase it out.
Low Density Polyethylene (LDPE)	Numbered 4 on soft plastic food packets, wrapping products and shopping bags etc.	The focus in this research was on HDPE rather than LDPE because of manufacturing interest however, some information was gathered on LDPE as well. LDPE is a contaminant in kerbside recycling as it gets stuck in the machines and is difficult to recycle with current equipment.

<sup>1</sup> APCO Packaging consumption and recycling data – 2017–18 baseline data; visit: <https://www.packagingcovenant.org.au/documents/item/3164>

<sup>2</sup> Source: <https://www.cleanaway.com.au/sustainable-future/pact-asahi-and-cleanaway-announce-joint-venture/>

<sup>3</sup> Source: <https://www.veolia.com/anz/newsroom/heads-agreement-signed-potential-recycling-plant-australia>

<sup>4</sup> Source: <https://www.coca-colacompany.com/au/news/coca-cola-australia-working-towards-world-without-waste>

<sup>5</sup> APCO Packaging consumption and recycling data – 2017–18 baseline data; visit: <https://www.packagingcovenant.org.au/documents/item/3164>



## 4.1 Appendix A

**Table 5: Plastics typically found in the Kerbside recycling team**

Polymer	Types of products seen in household recycling	Prioritised for research
Polypropylene (PP)	Numbered 5 on food containers. PP is used for yogurt, butter and ice cream containers, takeaway containers as well as the majority of plastic storage containers. Mainly in rigid formats for household products but also found in flexible forms of soft plastics. It is also used for rigid products in the built environment.	Prioritised for research because relatively low recovery of kerbside PP (estimated 11%), mostly recovered industry to industry yet PP is widely used in food packaging containers and in the built environment. Most PP in the kerbside stream is coloured and MRFs reported that PP containers tend to have labels moulded on which means they are treated as coloured plastics even if they are white.
Polystyrene (PS)	Numbered 6 on plastic packaging like food trays (prepacked meat, fruit or vegetable trays) and vending cups etc.	Prioritised for research because problematic material in kerbside recycling and little evidence of recovery of kerbside collected PS.
Expanded Polystyrene (EPS)	Used to package fragile goods and often ends up in red and yellow-lidded bins.	Prioritised for research because of bulky volumes, contamination in recycling bin and it causes problems for MRFs. Potential to aggregated demand as some councils now allow residents to drop EPS at community recycling centres and at collection events.
Number 7 plastics	Other plastics including acrylic, polycarbonate, polylactic fibres, nylon, fibreglass.	Not a focus for this research as there are too many types and are problematic to recover. However, research indicated the emerging technologies <u>Polywaste</u> and the <u>Licella</u> CAT-HTR technology will be able to deal with most of these end of life plastics when these machinery and/or facilities become operational in NSW.

## 4.1 Appendix A

### Additional information on HDPE, PP, PS and EPS Polymers

#### High Density Polyethylene (HDPE)

There are both flexible and rigid types of HDPE. HDPE is a low cost polymer that is translucent/waxy, weather resistant, and displays toughness at very low temperatures. It has very low water absorption and excellent electrical insulating properties. Some disadvantages of HDPE include susceptibility to stress cracking, lower stiffness than polypropylene and poor UV and low heat resistance.

APCO have set a new 2025 average recycled content target for HDPE of 20% (compared to 2% achieved in 2017/18). This may increase demand for recycled HDPE.



Post consumer HDPE milk and juice bottles shredded and then melted to make recycled plastic drainage pipes. Source: The Green Pipe.

<https://www.thegreenpipesydney.com.au/the-green-pipe-sydney.htm>

#### Properties of Polypropylene (PP)

PP is a tough, rigid plastic and is one of the most common types of plastic used today. APCO's paper on 2025 Recycled Content Targets<sup>1</sup> states that "PP is Australia's third most widely used packaging plastic with 164,000 tonnes placed on the Australian market in 2017-18". The new recycled content target for PP is 20% (compared to 3% achieved in 2017-18); according to this paper it is "baled as mixed plastics for export by MRFs".

There are two main types of PP called PP homopolymer and PP copolymer; their properties are compared in the table<sup>2</sup> below:

PP Homopolymer	PP Copolymer
<ul style="list-style-type: none"><li>• High strength to weight ratio, stiffer and stronger than copolymer</li><li>• Good chemical resistance and weldability</li><li>• Good processability</li><li>• Good impact resistance</li><li>• Good <u>stiffness</u></li><li>• Suitable for corrosion resistant structures.</li></ul>	<ul style="list-style-type: none"><li>• A bit softer but has better impact strength; tougher and more durable than homopolymer</li><li>• Better stress crack resistance and <u>low temperature toughness</u></li><li>• High processability</li><li>• High impact resistance</li><li>• High <u>toughness</u>.</li></ul>

<sup>1</sup> <https://www.packagingcovenant.org.au/documents/item/3212>

<sup>2</sup> Source: Omnex's Definite Guide to Polypropylene: <https://omnexus.specialchem.com/selection-guide/polypropylene-pp-plastic>

## 4.1 Appendix A

### Commercial Polystyrenes (PS)

Semi rigid, rigid and expanded types of PS that are used in many different applications from packaging, toys, appliances, cushioning and containers. The production volume of polystyrene and styrene copolymers is several million tonnes per year worldwide. It is sold under various trade names, including Styrofoam™, Styropor®, and Styron™

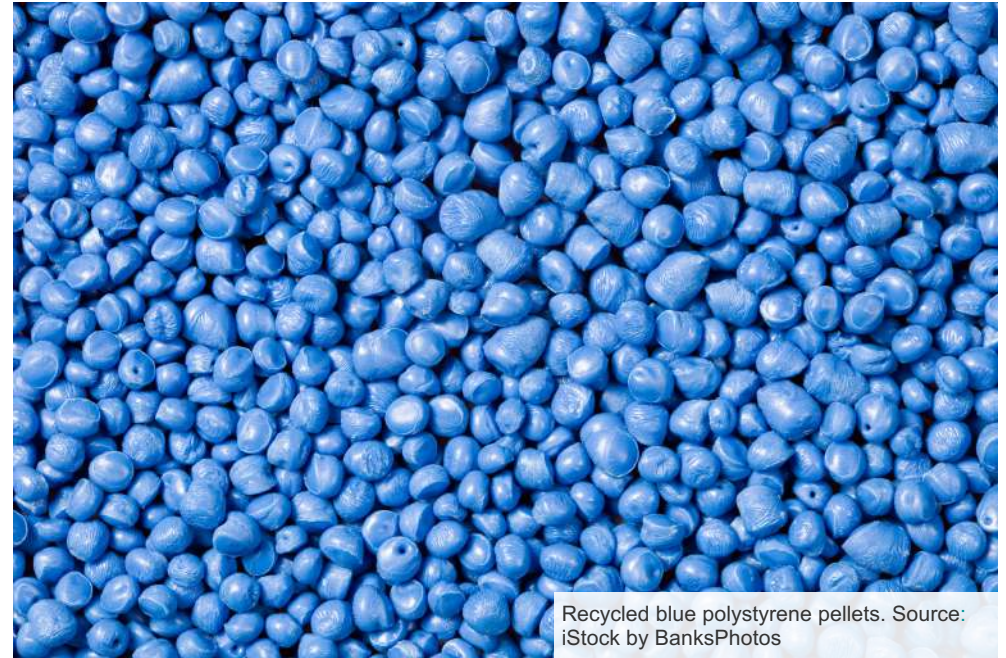
The three most important grades of styrene are:

**General purpose polystyrene (GPPS):** Also known as crystal-clear polystyrene, this is a fully transparent, rigid and rather brittle low-cost thermoplastic made from styrene monomer. It is used in some clear plastic products like see through container lids. GPPS is a solid product manufactured in the form of 2-5 mm pellets.

**High impact polystyrene (HIPS):** Usually 5-10% rubber (butadiene) and is used for parts which require higher impact resistance

**Expandable polystyrene (EPS):** Consists of micro-pellets or plastic beads containing a blowing agent (usually pentane). The expanded or foamed polystyrene is thermally insulating, has high impact resistance and good processability.

Styrene copolymers and their blends are considered engineering thermoplastics because their properties can be tailored over a wide range of applications with a broad range of processing methods which permits the manufacture of high quality, very durable plastic products.



## 4.2 Appendix B – Research Questions

Questions one to seven were asked of all participants in this research; additional questions were asked of MRFs, manufacturers (including recyclers of plastic, secondary processors and plastic injection moulders) and councils.

Thinking about the purpose of the think tank, and the sectors represented at the think tank:

1. What do you want to find out?
2. Who do you want to hear from and why?
3. What one or two things do you want to get across to the other sectors?
4. What do you think are the top two barriers in recovering these types of plastic and finding end markets?
5. What do you think is the most strategic opportunity for councils in Sydney to focus on to increase the recovery of polypropylene, polystyrene and HDPE?
6. What can your organisation contribute to helping to recover more plastics from the domestic recycling stream?
7. Do you wish to be named in our research?
8. Are you interested in attending a webinar to explore this further?

### **Additional questions for MRFs:**

- What condition are the following types of plastics in, once they are sorted at a MRF?
  - PP
  - HDPE
  - Polystyrene
  - EPS
  - Other kerbside plastics
- Approximately what volumes/tonnage are you seeing at the back end of a MRF per day/week?
- Any other comments: MRFs were encouraged to give their insights on the challenges, opportunities and demand for PP, HDPE, PS and EPS or other kerbside plastics.

## 4.2 Appendix B – Research Questions

### Additional questions for manufacturers of plastic products:

- Are you currently using recycled plastic material in any of your production processes? If yes:
  - Which types of plastics?
  - Sourced from Australia or overseas?
  - If recycled, sourced from what waste stream?
- If no, what are the barriers to using recycled plastic in your production processes?  
Availability of end markets
  - Quality of the plastic
  - Contamination (e.g. food or liquid)
  - Mix of colours
  - Transportation costs
  - Other (please specify)
- Thinking about PP, HDPE, PS or EPS collected from the kerbside recycling stream; which of these plastics could you use in your production processes now or in the future?
  - PP
  - HDPE
  - Polystyrene
  - EPS
  - Other (please specify)
- What form or condition would you need PP or HDPE, PS or EPS to be supplied in?
  - Cleaned
  - Dry
  - Pellet
  - Flake
  - Other (please specify)
  - Can you process it onsite?
- What other issues need to be resolved before you could start using these recycled plastics?
  - Transport (costs & logistics)
  - Quantity (e.g. What volumes would you need to make it viable?)
  - Pricing issues
  - Limitations on mixing coloured packaging
  - Contamination levels
  - Other (please specify)

## 4.2 Appendix B – Research Questions

- What types of recycled plastic products could you produce that councils use frequently? For example:
  - Garbage bins
  - Fencing
  - Furniture
  - Playground equipment
  - Soft fall
  - Traffic control equipment
  - Piping
  - Noise walls (e.g. on freeways)
  - Signage
  - Construction equipment (specify type)
  - Other (please specify)
- Are there any issues with these products that contain recycled content then being recycled again at end of life?

### **Additional questions for local government:**

- What are the top five products your council buys that you think could be made of recycled plastic?
  - Garbage bins
  - Fencing
  - Furniture
  - Playground equipment
  - Soft fall
  - Traffic control equipment
  - Piping
  - Noise walls (e.g. on freeways)
  - Signage
  - Construction equipment (specify type)
  - Other (please specify)
- Are there upcoming park/playground/stadium/community centre/facility upgrades that may be able to include the use of recycled plastic or products? E.g. new garbage bin roll outs?

## 4.2 Appendix B – Research Questions

- What staff at your council would be involved in specifying for these products?
  - Procurement
  - Parks/facilities managers
  - Waste or sustainability Teams
  - Other (please specify)
- What Australian standards or specifications would you refer to in your tender documents?
- What issues need to be resolved before your council or organisation could increase the use of recycled plastics in procurement?
  - Pricing issues
  - Specifications for recycled plastic products
  - Changing procurement policies (e.g. including a minimum requirement or target)
  - Educating other teams
  - Availability of products
  - Other (please specify)

