



THE CENTER FOR THE
CIRCULAR ECONOMY

SMALL MATERIALS WITH A BIG OPPORTUNITY FOR RECOVERY

Unlocking A Hidden Value Stream To Meet Consumer Demands,
Regulatory Pressures And Increase Recycled Content Supplies



THE CENTER FOR THE
CIRCULAR ECONOMY

ABOUT THE CENTER FOR THE CIRCULAR ECONOMY

At the Center for the Circular Economy at Closed Loop Partners, we are a trusted innovation and research hub, partnering with the world's most influential organizations to solve their toughest material challenges.

As part of Closed Loop Partners' platform, we identify solutions, test them in real-world settings, and scale what works—transforming bold ideas into actionable, scalable strategies. Over the past seven years, we've led groundbreaking projects that reshape industries and redefine sustainability.

Recognized by Fast Company, The Guardian, The Wall Street Journal, and The Financial Times, we have earned the trust of Fortune 500 companies and the global sustainability community as credible, action-oriented thought leaders. Together, we're pushing the boundaries of what's possible in a circular economy.

ABOUT OUR SMALL-FORMAT PACKAGING FIELDWORK

In 2022, **Maybelline New York** approached the Center for the Circular Economy to conduct initial research and tests at recycling facilities to evaluate the viability of small-format packaging recovery solutions.

In 2024, building on the learnings from this initial work, four additional research sponsors—**Kraft Heinz, L'Oréal, P&G, and Target**—joined this effort. Together, our initiative focused on determining the technical, economic and environmental feasibility and impact of recovery interventions for small-format packaging in U.S. materials recovery facilities (MRFs) and glass recycling plants. This report represents the culmination of our learnings and paves the way to now activate proofs of concept in field.

MAYBELLINE
NEW YORK

KraftHeinz

L'ORÉAL
USA



EXECUTIVE SUMMARY

RIGID SMALL-FORMAT PACKAGING IS VALUABLE MATERIAL THAT TODAY IS GOING TO LANDFILL

Why Is Small-Format Packaging Recovery Important?

Every year billions of units of small-format packaging enter the market from across sectors like beauty, pharmacy, foodservice, beverage, retail, and more.

Most of these end up in landfills after use. A small fraction of the materials that reach recycling facilities often slips through sorting equipment due to their size, contaminating the glass stream and ultimately being sent to landfills.

While the Association for Plastics Recyclers (APR) defines small-format packaging as under 2 inches in at least two dimensions, our field data reveals that even larger small items can be lost in the recycling system.

Wasting away in landfills, these materials contribute to **negative environmental, social and economic outcomes**. The urgency for small-format recovery is underscored by:

- **Lost economic value**, as valuable plastic resins in small-format packaging are discarded instead of being recovered and reintegrated into the supply chain
- **Increasing regulatory pressure**, particularly in states with extended producer responsibility (EPR) laws
- **Rising consumer advocacy** for reduced packaging waste and improved design
- **Corporate commitments to incorporating more recycled content** in packaging

The pressure is mounting for brands to act, turning a cross-sector challenge into an urgent opportunity.

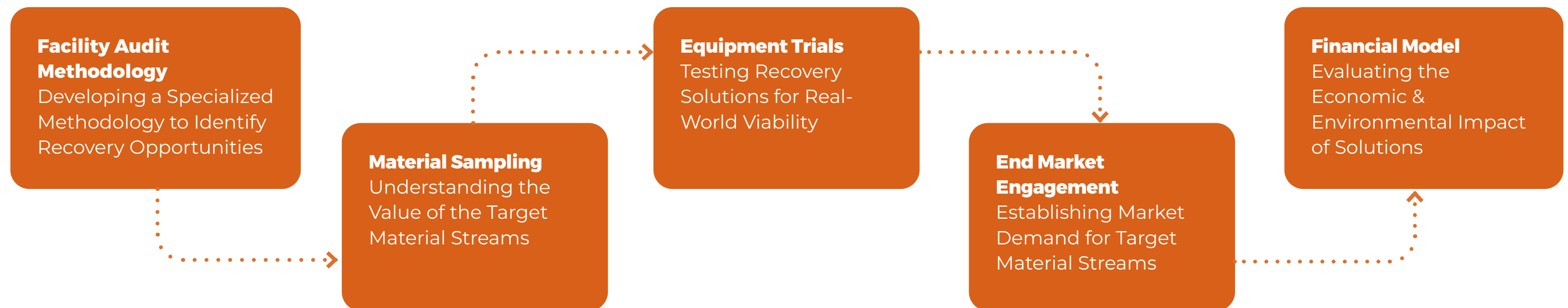
EXECUTIVE SUMMARY

Our Comprehensive Approach to Tackling Small-Format Recovery

The Center for the Circular Economy, in partnership with Circular Services, went into the field and conducted an **extensive, multi-step process to identify solutions** for small-format packaging recovery. This included evaluating glass stream contamination at more than half a dozen materials recovery facilities (MRFs) across the U.S. The Center collected samples from two MRFs' glass streams and one glass recycling plant's residue streams; trialed equipment configurations to sort plastics from these streams; sent samples to reclaimers to test their processability and market value; and iterated this process multiple times.

Our goal was to determine the **technical, economic and environmental feasibility** and impact of recovery interventions for small-format packaging in U.S. materials recovery facilities (MRFs) and glass recycling plants. We developed and implemented a rigorous, industry-leading methodology that included conducting numerous tests in field, designing first-of-its-kind sampling techniques, and engaging end markets. Our process reflects our commitment to advancing sustainable solutions through innovation, collaboration, and data-driven decision-making.

OUR METHODOLOGY



EXECUTIVE SUMMARY

What Did We Discover?

There is a clear pathway to recover tens of thousands of tons of valuable small materials and meet the growing demand for recycled materials

Our groundbreaking fieldwork uncovered a major opportunity: significant volumes of small materials, including valuable plastics like polypropylene and metals, are currently ending up in landfills but could be recovered with the right equipment upgrades and reconfigurations at materials recovery facilities (MRFs) and glass recycling plants. For instance, after upgrading the glass screen at a MRF, we observed a 67% relative reduction in mid-to-large-sized “small” plastics contaminating the glass stream. Materials that would have otherwise been considered contaminants and discarded at the glass recycling plant are now effectively sorted and directed into appropriate bales for sale in the recycled materials market. These findings can apply to other recycling facilities across the country, meaning tens of thousands of tons of plastics and metals could be recovered annually, avoiding landfill and generating significant market value.



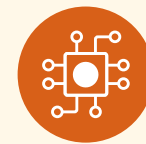
Small materials have market value

Valuable materials, including polypropylene (PP), polyethylene terephthalate (PET), polyethylene (PE), and metals, are present in small-format waste streams that could generate value on the secondary commodities market.



Logistical solutions are available

Some small-formats can be integrated into regular bales of recycled materials, but this requires colocation of MRFs and glass plants to avoid additional costs. Very small items may still pose handling challenges and require alternative solutions.



Existing technologies are enablers

Existing technologies can be configured to target and effectively recover portions of small-formats at MRFs or glass plants, but implementation must be tailored to each facility's unique characteristics, including material acceptance, volumes and layout.



Market demand is strong

Mechanical recyclers show strong demand for clean, sorted small materials like PP, PET, and PE, and often are willing to pay higher prices than molecular recyclers today.



Investment is needed

The business case for small-format recovery depends on achieving sufficient material throughput, aligning with market demand, and minimizing logistical costs. Recovery efforts likely require financial support through EPR programs or brand investments to cover capital and operational costs.

EXECUTIVE SUMMARY

Our fieldwork demonstrates the value, sortability, and market demand for many small-format materials—**now, it's time for action.**

That's why the Center for the Circular Economy is launching the **Consortium for Small-Format Packaging Recovery**, moving beyond research to real-world implementation across the U.S. This initiative will drive proof-of-concepts, accelerate collaboration, investment, and policy. The Consortium will **fund equipment and infrastructure upgrades** for rigid small plastics recovery while **building a strong recovery value chain with recyclers, policymakers, and more.**

If your company is part of the small-format packaging value chain—as a manufacturer, brand owner, or stakeholder—[join us.](#)



WHAT WE SEE IN THE FIELD

IN THE FIELD

Today, small-format packaging ends up wasted in landfills, or worse the environment

If small-format packaging reaches a materials recovery facility, it is often screened out during sorting due to its size. These items slip through gaps in recycling equipment—often called glass screens—designed to separate small glass pieces, ultimately contaminating the glass recycling stream. While the Association for Plastics Recyclers (APR) defines small-format packaging as smaller than 2 inches in at least two dimensions, our field data shows that even larger small items can be lost in the system. Contributing factors include:

- **Wear and tear on equipment** at MRFs and glass recycling plants
- **Material shape and behavior** (e.g., long, thin items spearing through screens)
- **Sheer force of inbound materials**, which pushes additional larger items through screens than originally intended
- **Lack of size-sorting and screening equipment** in smaller, older MRFs across the country

These materials lost during the sorting process end up in landfills and incinerators, contributing to negative environmental, social and economic outcomes. Yet, the small-format materials currently wasted at materials recovery facilities and glass plants nationwide represent just the **tip of the iceberg**. Most consumers discard small-format packaging in the trash rather than recycling bins due to the lack of infrastructure for small-format recovery. As a result, today, the vast majority of these materials go directly to landfills.



IN THE FIELD

The Journey of Small-Format Packaging Today



IN THE FIELD

We conducted audits and sampling of small materials at both the MRF and glass recycling plant levels.

We audited “MRF fines” from materials recovery facilities—consisting of glass and other small-sized material contaminants sold to glass plants—and analyzed glass plant residue containing small-sized materials, such as packaging, that were sent to landfill.



We sorted through these materials streams to find valuable plastics, and here is an example of the polypropylene we identified

IN THE FIELD

We observed small plastics broadly falling into three size categories, with a higher proportion under 2 inches influenced by specific recycling facility factors.

Minus 2"

Aligned with APR guidance, classifying items under 2" as small-format and reflecting average size-sorting mechanisms at MRFs.

2" to 3"

Accounts for variations due to equipment wear, manufacturer differences, MRF types, and throughput, allowing larger materials to enter the glass stream.

Plus 3"

These materials typically shouldn't enter the glass stream and may signal upstream issues, such as malfunctioning equipment at the MRF.

Minus 2"



LESS THAN OR EQUAL TO 2"
IN ANY TWO DIMENSIONS

2"- 3"



BETWEEN 2"- 3" IN ANY
TWO DIMENSIONS OR
2"-3" IN ONE DIMENSION
& 3"+ IN ONE DIMENSION

Plus 3"

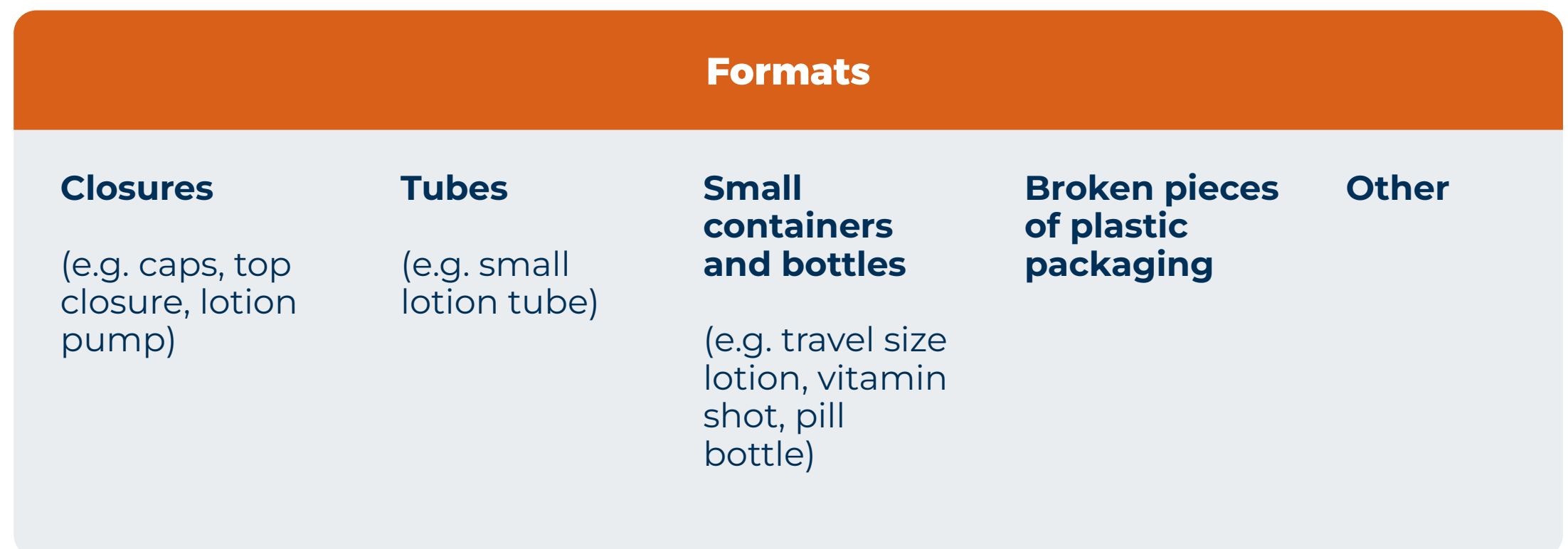
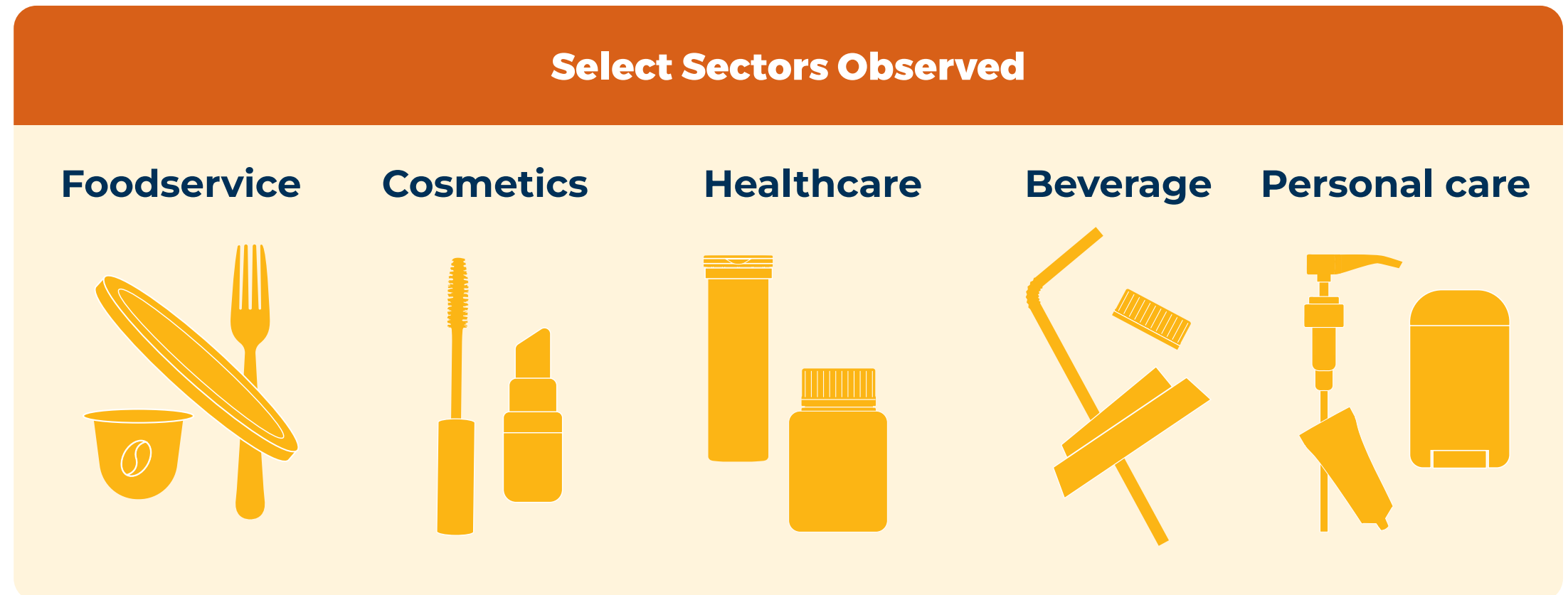


GREATER THAN 3"
IN ANY TWO DIMENSIONS

IN THE FIELD

We observed the cross-sector nature of the small-format recovery challenge, identifying packaging from across a whole breadth of industries and observing different packaging formats.

As packaging moves through the recycling process, it gets crushed in collection trucks, separated by screens, and abraded as it mixes with other containers. This wear and tear can strip away identifying details about the packaging's origin or product category. Because of this, sector and application overlays are best seen as qualitative, observational tools rather than precise, quantitative data.



IN THE FIELD

Examples observed in our field work



We saw beverage bottle caps as a major category of 'smalls,' despite consumer guidance to keep them attached to the bottles. Current European regulations and potential California legislation include cap tethers to address this.



Packaging near or slightly above the glass screen size threshold—a type of material sorting equipment—isn't guaranteed to be correctly sorted into the intended secondary commodities bale.



This is a cross-sector challenge, as we observed pill bottles, deodorants, coffee pods, closures, lotion pumps, and more.

IN THE FIELD

We saw firsthand how the size, quantity and type of small-format materials observed differed site to site.

This depends on specific facility factors, such as glass screen sizes, age of equipment, type of MRF, material behavior, the force and volume of inbound materials, the maturity and material acceptance of recycling programs in a given community, the collection and transloading of recyclables, among other factors. This underscores the importance of tailored approaches for solutions.

CASE STUDY: In 2024, Rumpke opened its newest materials recovery facility in Columbus, Ohio, equipped with the latest size-sorting technology. **We observed how their facility had minimal contamination of midsize or large small-format materials in the glass stream.** These larger materials are successfully sorted within the main MRF and directed into appropriate bales for sale on the secondary commodities market. Plastic contamination of the glass stream was primarily limited to smaller items, such as bottle caps or broken plastic fragments, rather than larger items like travel-size bottles or deodorants.



IN THE FIELD

We observed the uniqueness of each recycling facility, highlighting the need for tailored equipment upgrades and solutions on a facility-by-facility basis.

The Association of Plastic Recyclers (APR) defines small-format items as under 2 inches in two dimensions, based on average equipment specs like glass screens. However, with no U.S. standard for MRF glass screen sizes, classifications vary. MRFs differ in equipment, with glass screens ranging from 2x2 to 3x3 inches—or none at all—affecting which small-format materials end up in the glass stream. **Importantly, packaging near or just over the screen size threshold doesn't guarantee it will be properly sorted into the desired secondary commodities bale.** Materials are often crushed during curbside collection, transport and transloading to the MRF, where the weight and force of surrounding materials can push them through screens they technically shouldn't pass. **This highlights the gap between the technical intent and the operational reality at MRFs, emphasizing the need for ongoing performance optimization.**



WHAT WE LEARNED



**MATERIAL VALUE
& COMPOSITION**



**HANDLING
LOGISTICS**



**TECHNOLOGY
SOLUTIONS**



**DEMAND
VARIABILITY**



**ECONOMIC
FEASIBILITY**

THE OPPORTUNITY

There is a clear pathway to recover tens of thousands of tons of valuable small materials and meet the growing demand for recycled materials.

Our groundbreaking fieldwork uncovered a major opportunity: significant volumes of small materials, including valuable plastics like polypropylene and metals, are currently ending up in landfills but could be recovered with the right equipment upgrades and reconfigurations at materials recovery facilities (MRFs) and glass recycling plants. For example, at the MRF level, optimizing sorting processes can maximize small plastic recovery while minimizing contamination in glass streams.

The insights from our field trials can apply to other recycling facilities across the country, meaning tens of thousands of tons of plastics and metals could be recovered annually, avoiding landfill and generating significant market value.

The recovery of small materials positively impacts the recovery of multiple material types:

Higher Recycled Glass Value

Reducing plastic contamination in glass stream increases its market value

Lower Landfill Costs

Diverting small plastics and metals from the waste stream at glass recycling plants reduces landfill expenses

Increased Revenue from Material Sales

Capturing small plastics at MRFs and/or glass plants for resale generates additional revenue from recycled plastic and metals sales

As extended producer responsibility (EPR) laws in states like California, Colorado, Maine, Oregon, and Minnesota set higher recyclability standards, brands are working to adapt. In California, SB 54 classifies small-format plastic packaging—per APR's definition—as non-recyclable. Without action, this designation could lead to fines, market restrictions, mandatory redesigns, or even a ban on this type of packaging.

If solutions are deployed in field to recover well designed, mono material small-format packaging, regional educational campaigns could further amplify recovery by encouraging consumers to actively recycle small-format packaging instead of tossing them in the trash. This could create a virtuous cycle, increasing the volume of small-format materials recovered, boosting recycling efficiency, and helping brands achieve their sustainability goals while unlocking the true value of small-format packaging.

KEY FINDINGS

MATERIAL VALUE AND COMPOSITION



Smalls have market value

- High-value materials, including polypropylene (PP), polyethylene terephthalate (PET), polyethylene (PE), and metals, are present in small-format waste streams.
- Polypropylene is the most abundant plastic resin type identified. Its largely mono-material composition makes it particularly well-suited for resale opportunities.
- Recovering small metals is especially appealing due to their higher average market value and the availability of cost-effective technologies for efficient recovery.

WHAT STILL NEEDS TO BE EXPLORED?

Facility-Specific Audits

Each MRF or glass plant varies in equipment, size, layout, and material acceptance, which impacts the type, size, and scale of small-format materials ending up in residue streams. Before implementing any interventions, a material audit must be conducted at the specific facility.

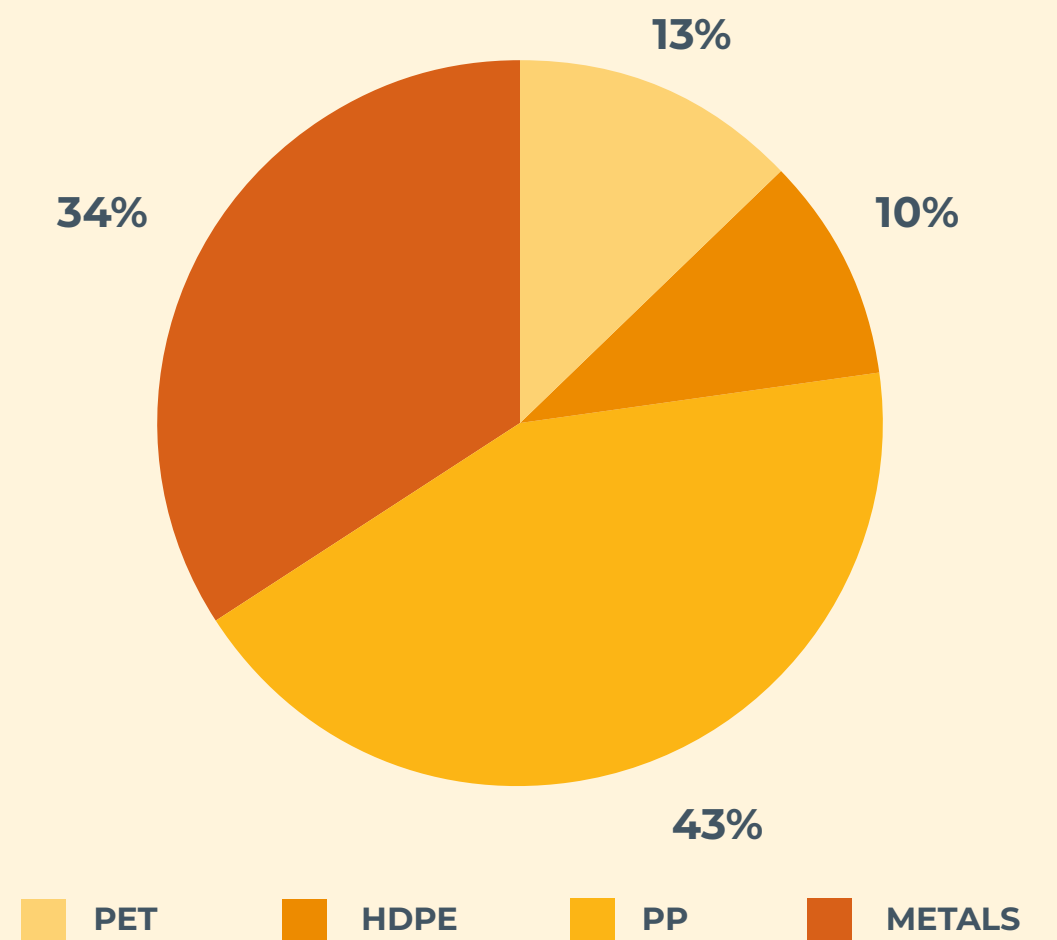
Transparency & Data

Greater tracking, quantification, and visibility are needed to understand the different packaging formats in the residue stream and how they behave. This is challenging because packaging is often broken, difficult to identify, or includes items like bottle caps that could belong to various industries. It is also critical to determine if certain packaging types consistently end up in the smalls category or occasionally make it through the sorting process.

Design Complexities

A deeper analysis of packaging designs is needed to identify features, complexities, or additives that interfere with reprocessing. Understanding how these factors impact recoverability and desirability will help optimize packaging for recycling systems. This will only become more relevant if small-format packaging recovery grows if the infrastructure is in place, contributing greater volumes to regular baled recyclables.

Most Common Valuable Small Materials Contaminating the Glass Stream



The pie chart highlights the valuable resins and materials identified in the sample stream. However, many materials remain unrecoverable due to their multi-material, multi-component nature (e.g., plastic pumps with metal springs) or their low market value (e.g., film, black plastics). These challenges present new design opportunities for improved recyclability.

KEY FINDINGS

HANDLING LOGISTICS



Logistics solutions are available

- Small-format items can potentially be incorporated into regular recycled material bales, such as standard polypropylene (PP) bales, minimizing operational changes to recover them.
- When mixed with regular-sized materials, small-format items are often held in place by the larger materials within the bale, reducing the risk of displacement.

WHAT STILL NEEDS TO BE EXPLORED?

Integration Logistics

Mixing small-format items into regular bales depends on recovery solutions occurring at the MRF level or the collocation of glass plants with MRFs that bale regular recyclables. Without collocation, additional transportation and hauling logistics could add costs and environmental impacts, reducing economic viability.

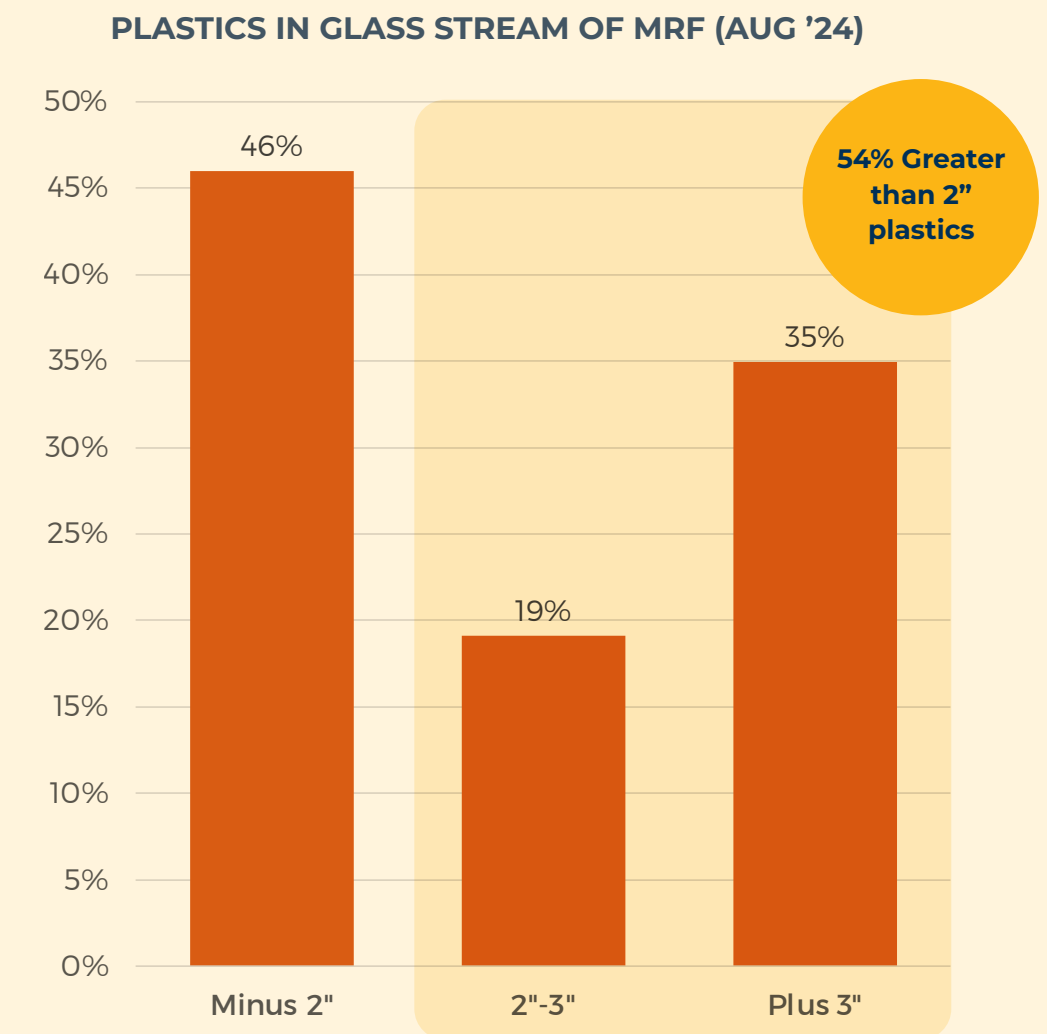
Size Threshold Challenges

Very small items may not be suitable for mixing into regular bales due to handling challenges. These items may require separate solutions, as their inclusion could compromise the bale's integrity and recovery feasibility.

Reclaimer Alignment

Discussions with reclaimers/reprocessors are necessary to ensure they can handle small-format items in regular bales without issues. Many reclaimers use equipment to screen out certain sizes, which could result in small-format items being lost again. Assurances may be needed to bypass or adjust parts of their equipment configurations to prevent this.

What's observed as small-format materials varies based on the characteristics of the facility you're working with. Below is data from one MRF, illustrating the distribution of small plastic materials in the glass stream across three size categories.





Existing technologies are enablers

- Existing technologies and equipment can be configured to target and separate small-format materials at MRFs and glass plants for resale.
- These technologies provide a pathway to recover valuable materials while improving efficiency and reducing waste streams.

WHAT STILL NEEDS TO BE EXPLORED?

Facility-Specific Assessments

Each MRF or glass plant is unique, requiring customized solutions. Spatial constraints, influenced by site layout and infrastructure, can affect the ease of adding or retrofitting equipment. Additionally, whether a MRF is colocated with a glass plant can impact the feasibility of proposed technology configurations.

Material Acceptance Variability

Differences in material acceptance, such as single-stream versus dual-stream systems, affect residue characteristics and influence the design and configuration of recovery systems.

Equipment Variability

Equipment types, ages, and conditions vary across facilities, affecting their ability to separate small-format materials. For example, glass screen sizes differ, with some facilities using 2-inch screens, others larger, and some lacking a glass screen entirely. These differences influence the separation process and highlight the need for customized solutions at each facility.

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We've seen how with the right tweaks and creative applications of existing technologies, recycling facilities have the potential to significantly improve material recovery, reduce waste, and redirect valuable plastics from landfills to the secondary commodities market.

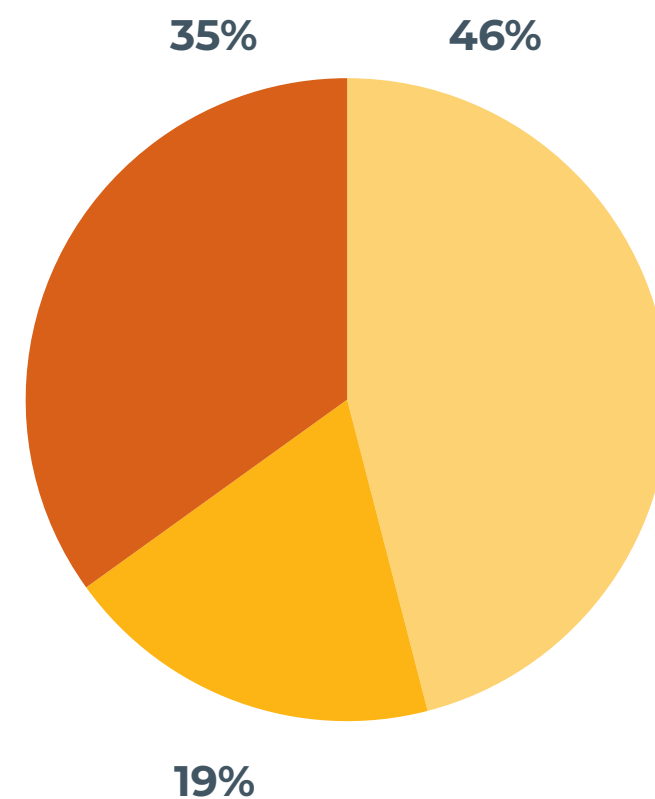
**—Tom Outerbridge, President,
Circular Services Recycling**

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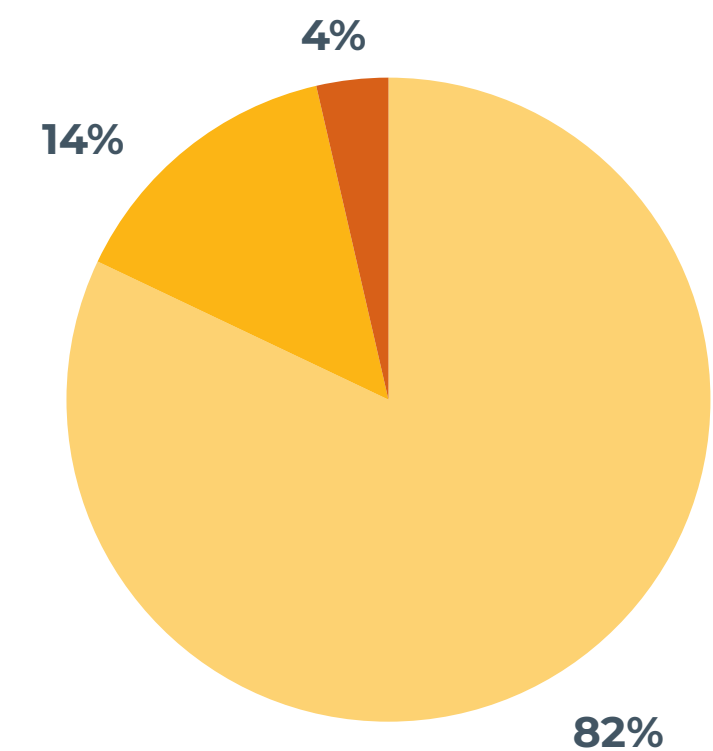
CASE STUDY FROM THE FIELD


In September 2024, a U.S. materials recovery facility installed a new glass screen, **resulting in a relative reduction of approximately 67% in mid-to-large size “small” plastic contamination** in the glass stream.

BEFORE
GLASS SCREEN UPGRADE




AFTER
GLASS SCREEN UPGRADE



 **Less than 2"**
(Small-sized smalls)

 **2" to 3"**
(Mid-sized smalls)

 **Greater than 3"**
(Large-sized smalls)

KEY FINDINGS

DEMAND



Market demand is strong

- Both mechanical and chemical (molecular) recyclers have shown interest in small-format materials, creating potential end markets.
- Mechanical recyclers are currently willing to pay higher prices than chemical recyclers for clean, sorted materials like polypropylene.

WHAT STILL NEEDS TO BE EXPLORED?

Molecular Recycling Market Limitations

- Currently, many molecular recyclers require resin inputs that are just as clean and well-sorted as those used by mechanical recyclers. However, they often offer lower prices for feedstock than mechanical recyclers.
- Depending on the activation location, molecular recycling markets may not align with evolving regulations, which could limit their viability as responsible end markets. For example, post-consumer recycled content mandates could potentially exclude molecularly recycled materials.

Plastic Recovery Challenges

- Recovery of plastics beyond polypropylene, such as small polyethylene, may be more complex due to higher contamination risks, reducing their desirability to reprocessors.
- Some small packaging still requires upstream redesign and optimized material choices, with a focus on monomaterials to enhance their downstream value in recycling markets.

Market Alignment

Further discussions with both mechanical and molecular recyclers are needed to ensure alignment on material quality, pricing, especially for diverse material streams like small-formats.



75%

of mechanical recyclers engaged were interested in the material



25%

of mechanical recyclers said they likely couldn't recover the smallest of the small materials due to 2-inch screen sizes in their facilities, causing the small materials to slip through the screens and be lost in their facilities

*We mapped over 40 chemical and mechanical recyclers across the U.S. and conducted in-depth assessments with 9 mechanical recyclers, providing the data referenced above.



Investment is needed

- Small-format recovery is not a priority for most MRFs or glass recycling plants, as their focus remains on core business operations.
- Advancing recovery efforts will likely require financial support, whether that is through EPR schemes or direct brand investment, given capital and operational expenditures to implement recovery, as well as value of the secondary commodity markets.
- To warrant investment, sufficient volumes of recoverable material are essential. Explorations at both MRFs and glass plants reveal that even some of the largest MRFs in the country currently lack adequate volumes. Achieving higher material throughput is critical to justify recovery efforts.
- Glass plants, as aggregation sites, often handle higher volumes, making them strategic locations for targeted interventions. Plastics Recycling Facilities (PRFs) offer another potential site for solutions deployment to explore.

WHAT STILL NEEDS TO BE EXPLORED?

Costs versus Benefits

A deeper understanding of the costs versus benefits at different facilities is essential to determine where financial investment will yield the greatest return. This includes considering site-specific factors like infrastructure readiness and local market demand for recovered materials.

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Unlocking the untapped value of small-format recovery starts with data and the right investments. We build program plans in states with EPR legislation to support the right investments at facilities to help turn any lost material into opportunity.

—Jeffrey Fielkow, CEO, Circular Action Alliance

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WHAT'S NEXT

OUR VISION FOR THE FUTURE

A future where **well designed small-format packaging is curbside recyclable**, thanks to investment in the **widespread development of recovery infrastructure**.



OUR VISION FOR THE FUTURE

A Collaborative Path Forward

Over two years ago, Closed Loop Partners began uncovering the hidden value of small-format packaging in collaboration with Maybelline New York. Bolstered by the support of four additional partners—Kraft Heinz, L'Oréal, P&G, and Target—in 2024, our work has expanded into a comprehensive exploration of this untapped opportunity. We've proven that small-format packaging, currently lost to landfills, holds value. We've demonstrated the feasibility of implementing technologies to divert it and identified strong market demand for these materials.

Now, with the necessary groundwork laid and rigorous diligence completed, we are ready to take the next step. It's time to move beyond research and into action—putting our findings to the test in real-world scenarios across the U.S. That's why the Center for the Circular Economy is launching the **Consortium for Small-Format Packaging Recovery**, a bold initiative designed to drive **activation** and **acceleration**. The Center for the Circular Economy is inviting research-phase partners to join while also expanding participation to brands across various sectors.

A CONSORTIUM FOR SMALL-FORMAT PACKAGING RECOVERY

Driving real-world proof-of-concepts and accelerating collaboration, investment, and policy to transform small-format recovery nationwide. Together, we will:

Deploy equipment and infrastructure upgrades for rigid small plastics recovery in the field, demonstrating proof of concept and resulting in quantifiable:

- **Tons of plastic diverted from landfill**
- **Carbon emissions avoided**
- **Post-consumer recycled content generated**

Lead the establishment and engagement of a robust value chain for recovery of small materials, from recyclers, to reclaimers, to policymakers, and more.

**IF YOU'RE PASSIONATE
ABOUT ADVANCING
SMALL-FORMAT
PACKAGING RECOVERY
AND WANT TO BE PART
OF THIS NEXT PHASE,
GET IN TOUCH TODAY.**

Together, we
can unlock the
potential of these
materials, catalyze
innovation, and
create a more
sustainable future.

Let's connect!

Thank You to Our Collaborators

MAYBELLINE
NEW YORK

KraftHeinz

L'ORÉAL
USA



Thank You to the Leaders Driving Small-Format Recovery Forward in the U.S.

Circular Services: Advancing innovative recycling solutions, including exploring efforts to capture and process small-format materials. Circular Services is the largest privately-held recycling company in the United States with over 20 locations across the nation. Created by Closed Loop Partners. [Learn more here.](#)

The Sustainability Consortium: A multi-stakeholder organization that provides tools and research to make consumer products more sustainable. TSC has been working since 2020 with brands and recyclers with the vision of making small format plastic curbside recyclable and estimating the business opportunity. [Learn more here.](#)

Glass Packaging Institute: Founded in 1919 as the Glass Container Association of America, the Glass Packaging Institute (GPI) is the trade association representing the North American glass container industry. GPI is focused on cleaning up the glass stream, which includes removing small plastics and other small contaminants from the glass stream. [Learn more here.](#)

Pact Collective: A nonprofit organization uniting the beauty industry to take responsibility for its packaging waste. Pact has developed collection programs for small-format and hard-to-recycle packaging in the cosmetics industry enabling material recovery, while curbside solutions are still not widely available. [Learn more here.](#)

Thank you to our advisors

Curt Cozart of Common Sense Solutions, Tom Outerbridge of Circular Services Recycling, and Jessica Long of Closed Loop Partners.

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