

Understanding Car Seat Recycling in Massachusetts and Beyond

Eastern Research Group, Inc. prepared this report on behalf of Massachusetts Department of Environmental Protection (MassDEP). This work synthesizes information gathered through reviewing publicly available literature and interviewing relevant stakeholders on car seat recycling efforts in the United States.

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1. Introduction

The Massachusetts Department of Environmental Protection's 2030 Solid Waste Master Plan sets a goal of reducing Massachusetts' solid waste disposal by 30 percent by 2030 and by 90 percent by 2050, compared with 2018 levels. To achieve these targets, the commonwealth plans to improve recycling and reuse rates of materials with high disposal tonnage, reduce the use of materials that are difficult to recycle, increase reuse and donation opportunities, and develop local markets for reuse and recycling.¹ In an effort to make progress towards the commonwealth's Solid Waste Master Plan goals, the fiscal year 2023 state budget included a line item directing the Department to develop and administer a car seat recycling pilot program, potentially in partnership with private organizations or other divisions of the commonwealth. Improving the recycling rate of car seats—a widely used bulky item—can help reduce solid waste disposal in Massachusetts.

By law, every child is required to use a car seat while riding in a moving vehicle. Due to child growth and development, car seats are replaced frequently, resulting in a relatively short life span with a high disposal rate. Additionally, car seats have expiration dates (around six years after the manufacturing date) and must be replaced after they expire or if there is a manufacturer recall. If a car seat is involved in an accident, it also must be replaced. For these reasons, caregivers throw away a total of 12 million car seats each year across the United States.^{2,i} In Massachusetts alone, residents dispose of 240,000 car seats annually (a total weight of 1,440 US tons, based on an average car seat weight of 12 pounds).ⁱⁱ Due to limited recycling and reuse options for car seats in Massachusetts, nearly all car seats in the commonwealth end up in a landfill or are incinerated at waste-to-energy facilities.

Car seats are composed of multiple materials, including high-density plastic, metal, fabric, and foam, and can take years to decompose in a landfill. Polypropylene, the main plastic used for car seats, has adverse impacts on water and soil quality as it decomposes. Additionally, the chemical process to produce polypropylene is a carbon-intensive activity that releases greenhouse gases into the atmosphere.³ These adverse environmental and climate impacts can be mitigated through the reuse of plastics.

According to the U.S. Environmental Protection Agency's (EPA's) Non-Hazardous Materials and Waste Management Hierarchy, reuse is the most preferred and environmentally conscious end-of-life option for car seats, and recycling is the second-most preferred.⁴ Families can pass down car seats to a trusted friend or family member, but car seats expire and can only be used for a

ⁱ ERG assumes that the number of car seats purchased each year equals the number thrown away.

ⁱⁱ ERG calculated the volume of car seats thrown away in Massachusetts by scaling the national estimate (65,000 tons) by two percent, as Massachusetts' population is two percent of the national population.

limited number of years. After reuse, recycling is the next-best option for reducing car seat waste. The high-density plastic and metal components of car seats have secondary recycling markets, but only if the seat has been disassembled and the materials effectively separated, which is labor intensive and requires specific technology. The fabric and foam from car seats can rarely be recycled due to contamination and lack of recycling markets for those materials. However, recycling car seats is important for keeping polypropylene and other materials out of landfills.

ERG was contracted to perform an assessment of existing car seat end-of-life options in Massachusetts, identify and learn from car seat reuse and recycling programs across the country, and make recommendations for a potential pilot program to increase car seat recycling in the commonwealth. This report assesses currently and previously operating car seat recycling and reuse programs and expands upon the challenges associated with car seat recycling. It also draws attention to the key components that made certain car seat recycling programs successful. Ultimately, this report offers recommendations for how Massachusetts can improve car seat end-of-life management in the commonwealth and achieve its goals of reducing overall solid waste disposal tonnage.

2. Methodology

ERG conducted a literature review and stakeholder interviews to gather information on the landscape of car seat recycling in Massachusetts specifically, as well as in the United States more broadly. ERG reviewed publicly available websites and reports that discuss car seat recycling and reuse, as well as plastics and metal recycling. While the literature review provided a general understanding of the car seat recycling process, interviews were integral to gaining an understanding of feasibility, costs, logistics, challenges, and successes associated with existing efforts to reduce the number of car seats entering the waste stream.

ERG identified numerous stakeholders who are currently or were previously involved in one or more aspects of the car seat collection and recycling processes. Interviewing a wide range of stakeholders allowed ERG to understand the process of recycling a car seat from start to finish and to identify challenges and opportunities at each stage of the recycling process.

ERG conducted a total of 13 interviews over a six-week period. Table 1 provides information on the organizations ERG interviewed, where they are located, and their roles in the car seat recycling process.

Table 1. Summary of Interviewees

Organization	Location	Stakeholder Group
Car Seats Colorado	Colorado	Collection program
Casella Waste Systems	New York	Recycler
Clek	Canada	Manufacturer takeback program
CMRK	Massachusetts	Reuse/resale collection program
East-Terra Plastics	Indiana	Recycler
E.L. Harvey & Sons	Massachusetts	Recycler
KW Plastics	Alabama	Recycler
Littleton Transfer Station	New Hampshire	Recycler
McLeod County Environmental Services	Minnesota	Recycler
Nurture Omaha	Nebraska	Collection program
Old Car Seat, New Life	Washington	Collection program
Pope/Douglas Solid Waste Management	Minnesota	Collection program
RecycleForce	Indiana	Recycler

Interview questions focused on logistics, costs, and challenges associated with car seat recycling efforts, but varied depending on the type of stakeholder ERG was interviewing. A list of sample interview questions can be found in the [Appendix](#). ERG reached out to the Association of Plastic Recyclers, Car Seat Recycling, Re-Matt, Target, TerraCycle, Triad Recycling and Container Services, Wake County Multi-Material Recycling Facilities, and Yolo County, but these organizations either did not respond to the interview request or declined to participate.

Unless specifically cited, all insights, estimates, and perspectives provided in this report come from one or more of the interviews listed in the table above but are credited generally to maintain anonymity.

3. Car Seat Types, Materials, and Recycling Considerations

Car seats, also known as child restraint devices, are used to protect and secure children in the event of an automobile crash or collision. Car seats are not one size fits all, as the age and development of the child passenger determines the size and type of car seat that is best suited to protect them. This section describes the different types of car seats a child will use at each

stage of their development, the parts and materials of car seats, and the recyclability of each component material.

3.1 Types

Throughout their infancy and youth, children require at least three different types of car seats before they can safely ride in a moving vehicle with just a seat belt. Age, height, and weight determine which car seat type is most appropriate for a child at any given stage in their early life. The National Highway Traffic Safety Administration (NHTSA) acknowledges the three following types of car seats:⁵

1. **Rear-facing car seat (0–3 years).** The rear-facing car seat includes a harness and is specifically manufactured to shift with the child in the case of a collision to protect their still-developing neck and spinal cord. There are different versions of rear-facing car seats, but those made specifically for newborns are often small, portable, and typically outgrown before a child's first birthday.
2. **Forward-facing car seat (1–7 years).** The forward-facing car seat includes a harness to strap the child to the seat and a tether and anchor system (top strap) that secures the car seat to the vehicle. These elements limit the extent to which a child would be thrust forward in a car crash.
3. **Booster seat (4–12 years).** The booster seat raises and situates the child in the correct position for a standard car seat belt to fall snugly and safely across the child's shoulder, chest, torso, and hips. A child should remain in a booster until they have grown to the point where the seat belt snugly restrains their body in the same places without the booster.

The three types of car seats listed above are the minimum standard for the number of car seats a child will use throughout their childhood. Dual-parent homes with more than one car may purchase duplicates of the above models, and extended family members and friends may also procure car seats for car rides with the child. Families with children close in age will often keep car seats for reuse by multiple children so may not purchase more than one of the above models.

3.2 Materials and Recycling Considerations

Car seats are made up of many different parts and materials, which makes them a hard-to-recycle item. The various components of car seats cannot be recycled together, and disassembly is labor intensive. Car seats can weigh anywhere from 7 to 15 pounds, with an estimated composition of 85 percent mixed rigid plastics; 10 percent cloth, strapping, and foam; and 5 percent metal.⁶ Car seats are comprised of the following materials:

3.2.1. *Mixed Rigid Plastics*

“Mixed rigid plastics” is an industry term that categorizes all bulky rigid plastics discarded into the municipal waste stream. Car seats can contain any or all of the following plastics and resin types in their shells and buckles:

- High-density polyethylene (HDPE), #2 plastic
- Low-density polyethylene (LDPE), #4 plastic
- Polypropylene (PP), #5 plastic
- Acrylonitrile butadiene styrene (ABS), #7 plastic
- Polyoxymethylene (POM), #7 plastic
- Polycarbonate (PC), #7 plastic

Recyclability. Because car seats are typically comprised of mixed plastic, several recyclers suggested that the best way to recycle the plastic components in a car seat is to remove the cloth, straps, and belts from the car seat, use a shredder to shred the plastic shell and smaller plastic components (e.g., buckles), use a magnet to remove the contaminant metal pieces, and then sell the shredded mixed plastic for roughly 5 to 7 cents per pound. One recycler sells the mixed shredded plastics to an organization that converts mixed plastics to diesel fuel.

The plastic in car seats is difficult to recycle because it is comprised of multiple types of plastics with different resin codes, each requiring a separate recycling process. It is challenging to sort plastics by type once they have been mixed, so selling mixed plastics is often the only viable solution. Additionally, the shredded mixed plastic is a low-value material, which means that the time and labor needed to sort mixed plastics to recycle them individually is often greater than the potential earnings from recycling the materials.

3.2.2. Cloth, Strapping, and Foam

Car seat harnesses, belts, covers, sunshades, and padding are often made using the following materials:

- Polyester webbing
- Nylon/polyester blend
- Expanded polystyrene (EPS)
- Expanded polypropylene (EPP)
- Expandable polyethylene (EPE)

Recyclability. As a safety measure, these materials are often treated with flame retardant. Additionally, these materials are likely to be contaminated with embedded plastic pieces or buckles, in addition to human contaminants, such as spit up and food from babies and toddlers. This range of chemical treatment and contamination make these materials hard to recycle. One reuse/resale program can recycle some cloth materials as part of their larger textile

repurposing system, but only if the materials are not contaminated. Another recycler noted that they are able to recycle foams from car seats by condensing them into bricks and shipping them to a purchaser overseas as part of their expanded polystyrene (EPS) foam recycling program.

3.2.3. Metal

Screws, bolts, buckles, and anchors are essential for keeping car seat parts intact and fastening them securely to the car. These pieces are typically made of the following metals:

- Iron
- Steel

Recyclability. Most recyclers indicated that these metals could be recycled, but only if they were separated from the plastic parts to which they were fastened. Some facilities that specialize in hard-to-recycle items have large magnets that can remove metal pieces after the larger plastic pieces have been shredded.ⁱⁱⁱ These metal pieces are often tossed into a scrap metal container to be recycled. While metal only makes up 5 percent of the car seat, it is the most valuable component material to recycle.

4. End-of-Life Management Options for Car Seats in Massachusetts

ERG estimates that roughly 240,000 car seats reach end of life annually in Massachusetts.^{iv} An average car seat weighs 12 pounds, which means that Massachusetts disposes of roughly 2,880,000 pounds (1,440 U.S. short tons) of car seats annually. Given the limited recycling options in Massachusetts, ERG estimates that nearly all 1,440 tons of car seat waste end up in a landfill and/or are incinerated.

When a car seat reaches end of life in Massachusetts, its owner can throw away the car seat, donate it for reuse, or recycle it. Throwing away car seats is the most common disposal method because reuse and recycling programs are sparse in Massachusetts. Car seats that are not thrown away are likely either passed down to another child for reuse or recycled through nationally operating car seat recycling programs, such as Target's annual car seat collection event.

ⁱⁱⁱ ERG did not identify any recyclers in New England with this equipment and capability.

^{iv} ERG estimated the number of car seats disposed of in Massachusetts by scaling the number of car seats purchased annually across the United States (12 million) to the Massachusetts population (2 percent of the national population). ERG assumes that the number of car seats purchased annually is equivalent to the number of car seats disposed of annually.

4.1 Reuse in Massachusetts

Car seat reuse options in Massachusetts are limited and informal. The majority of reuse in Massachusetts happens when caregivers pass down car seats to a younger sibling, other family members, friends, or neighbors.

While most reuse occurs informally, ERG identified two organizations in Massachusetts that have programs for car seat reuse. Community Giving Tree, with locations in Boxford and Lawrence, Massachusetts, accepts used car seats that are not expired and have not been in a crash.⁷ These seats are reused by families in need in Massachusetts. CMRK, an organization that resells textiles through a secondhand collection program based in Northborough, Massachusetts, does not offer a formal car seat reuse program for Massachusetts residents, but they will redirect the car seats they receive in their drop boxes. CMRK ships car seats to families in need of bassinets and/or baby carriers internationally. Unless a car seat is brand new and in the box (which is extremely rare), all car seats go through a quality and conditioning assessment. If a car seat is damaged, CMRK tries to identify salvageable parts before discarding the seat entirely. By referencing the serial number, CMRK can occasionally rebuild a car seat by using parts from another seat. Under both domestic and international law, car seats are non-resalable items, so CMRK does not make any money off this transaction. They cover shipping fees, and their partner organizations in other countries pay duty fees at ports for containers of car seats. CMRK often loses money by processing the car seats they receive, but they view the process as mission work and are motivated by waste diversion.

Car seats can be reused by siblings or friends or donated to a charitable organization, as long as they meet the requirements of the [NHTSA Used Car Seat Safety Checklist](#). Once a car seat can no longer be used (i.e., it has expired or been in an accident), it will need to be either thrown away or recycled.

4.2 Recycling in Massachusetts

Publicized options for recycling in Massachusetts are limited to programs that operate nationwide. ERG did not identify any recycling program operating at the state or municipal level in the commonwealth. In Massachusetts, as in most other states, car seats are not accepted through traditional municipal recycling. Massachusetts residents can recycle car seats through the following national programs.

Target. Due to its accessibility and scale, Target’s takeback program is one of the most widely known car seat recycling programs. Since 2016, Target has run a collection event at least once a year. During these two-week collection events, Target stores across the country collect used car seats for recycling. Customers who drop off a seat receive a 20 percent off coupon to purchase new baby gear from Target.⁸ ERG made a concerted effort to interview Target as part of this effort, but the company declined to participate. Their policy is to not disclose non-public information, so the information included in this report can all be found on their website.

Manufacturer takeback programs. Clek and WAYB run recycling programs for their products. Both manufacturers offer recycling kits for purchase.^{9,10} These programs send prepaid labels that customers use to ship their car seats to the manufacturer’s partner recyclers. By participating in the program, customers also receive a coupon for a future purchase from these manufacturers. These programs are only available for Clek and WAYB car seats, which control a small share of the car seat market.

TerraCycle. TerraCycle offers baby gear recycling kits for purchase on their website. Customers can order a Zero Waste Box™, fill the box with baby gear, and ship the box back to TerraCycle using a prepaid label. A Zero Waste Box™ for baby gear ranges from \$140 to \$263, depending on the size of the box.¹¹

The above recycling programs are either infrequent or expensive, which limits residents’ ability to participate in car seat recycling in Massachusetts. While Target’s program is free, and even comes with a discount on future baby gear, it is only offered once a year. Car seats that reach their end of life at a different part of the year will likely be thrown away. Clek, WAYB, and TerraCycle’s programs can be used at any time, but the high costs associated with these programs may deter people from recycling their car seats.

Extended Producer Responsibility (EPR)

EPR, a concept that assigns greater responsibility to manufacturers for managing a product’s end of life, can help reduce the amount of waste generated by car seats. By improving car seat durability, designing car seats with their end of life in mind, and taking responsibility for car seat waste, car seat manufacturers can help divert car seat waste and promote car seat recycling.

Some manufacturers are beginning to take a more active role in diverting car seat waste from landfills. Clek has worked towards improving the durability of their car seats. Clek’s car seats expire nine years after the date of manufacture, as opposed to the industry-wide average of six years. WAYB has developed a seat that is 100 percent recyclable. Both Clek and WAYB offer recycling programs for their products, providing an easy way for customers to recycle their car seats at end of life.

4.2.1. How Recyclers in Massachusetts Process Car Seats

ERG did not identify any recyclers in Massachusetts that actively run a car seat recycling program or publicize car seat recycling at their facilities. Most recyclers in Massachusetts throw away car seats if they receive them.

ERG identified one company that offers solid waste management services in Massachusetts that recycles car seats if they receive them. As part of their recycling services, they offer construction and demolition (C&D) recycling. While they do not formally accept car seats through any publicized program, they sometimes receive car seats at their C&D recycling facility with materials from home cleanouts collected through their C&D program. If they receive a car seat, they recycle it through the process and technology used for similar C&D materials. This company does not publicize that they recycle car seats, and they have no plans of implementing car seat recycling programming in the future due to low value of the recyclable materials and concern regarding receiving a sufficient volume to make the process worthwhile.

5. Other Car Seat Recycling Programs

ERG identified the following car seat recycling programs across the United States through literature review and interviews. This list includes both currently operating and previously operated programs but is by no means exhaustive.

5.1 Currently Operating Programs

ERG spoke with each of the following programs, which currently accept and seek to recycle car seats in their respective states:

- **Car Seats Colorado.** Colorado Department of Transportation (DOT) runs a child passenger safety program (Car Seats Colorado) that offers child passenger safety certifications, publishes educational materials, and administers car seat recycling statewide to get expired car seats off the road. Car Seats Colorado established their recycling program to mitigate the improper reuse of expired and damaged seats.^v Car Seats Colorado has 18 storage pods set up across the state, the majority of which are located at Colorado State Patrol offices. Colorado residents can drop off used car seats anytime at no cost. When a pod is full, Go Mini's (the storage pod company) transports the pod to All Recycling Inc in Englewood, CO (the program's partner recycler) and returns the empty pod to the drop-off site. Since its inception in 2015, the program has collected over 100,000 car seats across the state. The car seat recycling program is funded by a child passenger safety grant provided by the National Highway Traffic Safety

^v While recycling a car seat effectively destroys it and removes it from service, Car Seats Colorado found that some residents would otherwise pick up seats left on the side of the road that were intended for trash removal and use them again.

Administration. The program operates on an approximately \$60,000 annual budget, \$10,000 of which is designated for recycling and the remaining \$50,000 is used to rent, transport, and dump the storage pods.

- **Nurture Omaha.** Nurture Omaha is a private lactation consulting practice that also provides car seat safety support and education in Omaha, Nebraska. Nurture Omaha's recycling services commenced with breast pumps and expanded to include car seats in response to clear demand during the seasons when Target is not running its national collection event. Nurture Omaha started recycling car seats in 2018 with a one-off collection event held in their office parking lot, and this effort has since grown to consistently hold three publicized car seat recycling events in partnership with Children's Hospital Nebraska each year. The partnership with the hospital helps cover their operational costs, encourages participation due to promoting child passenger safety, and enables residents to drop off car seats for free. Nurture Omaha transports seats to Council Bluffs Recycling Center (a local recycling facility), where the car seats are processed along with other construction materials. After being grinded and separated, the plastic and metal components are recycled. Each collection event runs for two hours and collects an average of 300 car seats.
- **Pope/Douglas Solid Waste Management and McLeod County Environmental Services.** Pope/Douglas Solid Waste Management in Alexandria, Minnesota, runs an ongoing car seat collection program. They collect car seats through a drive-through during their facility's open hours and drop off is free to residents. Over a three-month period, Pope/Douglas Solid Waste Management collects between 350 and 500 car seats (approximately 1,700 car seats annually). Pope/Douglas Solid Waste Management serves both Pope and Douglas counties, with a combined population of just 50,000 residents. Pope/Douglas Solid Waste Management stores the car seats until their partner, Stearn County Household Hazardous Waste, picks up the car seats to be transported to McLeod County Environmental Services every three to four months. Car seats are transported in gaylord boxes that accommodate 10 to 14 car seats per box. Transporting the car seats to McLeod County Environmental Services costs Pope/Douglas Solid Waste Management 7 cents per seat. McLeod County Environmental Services is a recycling center in Hutchinson, Minnesota that serves neighboring counties in Minnesota. At the facility, individuals doing community service through the parole system strip and disassemble the car seats using a variety of household hand tools, reciprocating saws, and scissors. The plastic shells are baled and sent to a recycler for further processing, and the foam components are recycled through McLeod County's EPS foam recycling program. McLeod County Environmental Services charges their normal commodity pricing for car seats (\$59 per ton for in-county and \$63 per ton for out-of-county). Pope/Douglas Solid Waste Management covers the costs of

their program, which include transportation costs (7 cents per seat) and recycling costs (\$63 per ton), which they do not view as cost prohibitive. McLeod County Environmental Services makes enough from the resale of plastic (5 cents per pound) to cover the cost of transportation and storage, but their car seat recycling program does not bring in revenue. They recycle car seats for the sake of diverting waste and providing a service to the community.

- **RecycleForce.** RecycleForce is a nonprofit organization and prison re-entry program based in Indianapolis, Indiana that recycles electronics. Since 2010, they have collected and recycled car seats on an ongoing basis as well. There is a suggested donation for dropping off seats, but it is not required. RecycleForce asks that the car seat be stripped of fabric liners, straps, and seat belts prior to drop-off.¹² RecycleForce employs formerly incarcerated individuals who facilitate additional car seat disassembly and breakdown. They use a shredder to shred the car seat and then use magnets to separate the mixed plastic from the metal components. Once the materials are separated, they transport the metal components to Steel Dynamics (a steel producer and metal recycler with multiple locations in Indiana) and the plastic components to Brightmark (a circular innovation company with a circularity center in Ashley, Indiana). At the Brightmark facility, the plastic components are dried, pelletized, heated, and vaporized, which produces a substance that can be repurposed for other plastic products, as well as diesel fuel. RecycleForce is largely funded by donations and federal grants from the Department of Labor, but they shared that if they were to charge for their car seat recycling services, combined processing costs amount to \$2.84 per seat. From data they have compiled from their car seat recycling services over time, RecycleForce also estimates that the scrap value for 1,000 car seats is \$289, whereas the cost to process them is roughly \$2,000. RecycleForce reiterated that recycling car seats is not a money-making opportunity, but they are motivated by the workforce training opportunity their program provides, getting expired seats off the road, and eliminating waste.

5.2 Previously Operated Programs

ERG identified the following programs that were operational in the past but stopped their services due to funding or logistical constraints. ERG spoke directly with some organizations and learned of others via other program interview responses.

- **Casella Waste Systems.** Casella Waste Systems is a waste management company that provides solid waste, recycling, and resource management services throughout the East Coast. One of Casella Waste System's recycling facilities in Buffalo, New York, ran a pilot car seat recycling program from 2020 to 2021. This program, which accepted car seats on a rolling basis, collected approximately 200 car seats in total. They disassembled

seats manually, but found that without the right shredder, they were unable to grind the car seats into small enough pieces to successfully remove the metal components, such as screws. This program stopped running because the labor required to disassemble car seats and separate the metal from the plastics became too costly.

- **Littleton Transfer Station.** The Littleton Transfer Station in New Hampshire accepts and processes solid waste generated from “typical household use” from Town of Littleton residents. This site accepted car seats on a rolling basis and received up to 40 seats per week from Littleton families. When they received a car seat, staff at the site disassembled it by removing the cover, foam, and straps, and baled it with other bulky rigid plastic items. They sold their plastic bales to a recycler that allowed for 2 to 3 percent metal contamination. This meant they did not have to remove all metal pieces during disassembly. The Littleton Transfer Station stopped recycling car seats when the director switched roles. The success of this operation was contingent on the dedicated individual who became skilled and efficient in disassembling car seats. He suggested that when he had materials set up and was disassembling a bunch of seats in a row, it would take him under a minute to disassemble each seat.
- **Old Car Seat, New Life.** Old Car Seat, New Life was a car seat collection program in Washington state. Established through a partnership with CoolMom and Zero Waste Washington, this collection program hosted three car seat collection days between September 2014 and June 2015 and delivered the car seats to a nearby recycling facility, Total Reclaim. Total Reclaim was an electronics recycling facility that has since gone out of business but began recycling car seats in partnership with Old Car Seat, New Life. Old Car Seat, New Life also sent some of the car seats they collected to WestSide Baby, a nonprofit organization that distributes baby gear for reuse to families in need. Over the course of three designated collection days, the program collected 325 seats for reuse or recycling. Over the program’s sustained collection effort and partnership with Total Reclaim, Old Car Seat, New Life easily surpassed their initial program goal of collecting 1,000 car seats. The project was funded by a grant from the Washington State Department of Ecology and ended when grant funding expired and the two organizers transitioned to different roles. After the program ended, Washington residents continued to drop off their car seats for recycling at Total Reclaim for a small fee (\$5 per seat that was stripped of its fabric cover, and \$10 per seat that was not stripped). While the recycling efforts of Old Car Seat, New Life were environmentally motivated, they found that promoting child passenger safety generated additional interest. Because of this, child passenger safety week presented a unique opportunity to encourage participation.
- **Walmart.** Walmart hosted their first-ever Walmart Car Seat Recycling Event in partnership with TerraCycle in September 2019 in celebration of National Baby Safety

Month. This was a national car seat collection program that collected car seats at every store across the country and offered a \$30 gift card for each seat. This event was supposed to run from September 16th to September 30th, but Walmart ended their program after nine days (earlier than they planned and advertised) due to overwhelming response from the public and an unmanageable volume of car seats. In less than one week, Walmart received roughly 1 million car seats. Walmart had formally partnered with TerraCycle to recycle the car seats they received from this event, but because the seats quickly exceeded capacity, they partnered with additional recyclers, including East-Terra Plastics and RecycleForce. Specifically, RecycleForce received 250,000 of the car seats Walmart collected and successfully recycled all of them due to their knowledge of the recycling process, experience recycling car seats, and willingness to take them. Walmart has not run this program since its pilot in 2019.

6. Challenges to Car Seat Recycling

Interviewees identified several challenges associated with car seat recycling that serve as barriers to widely accepted, developed, and scaled car seat recycling opportunities. This section highlights the most frequently cited challenges.

6.1 Cost

Recycling car seats is a low-value, high-cost activity. One of the primary costs is the time and manual labor required to disassemble car seats. Several interviewees noted that car seats are not meant to break apart easily; they are designed to be sturdy and remain intact during a car accident. Disassembly can take several minutes per seat, even with the proper equipment.

Transporting car seats is also quite costly. Car seats are an extremely bulky and hard-to-stack item, so limited car seats can fit in one gaylord and/or truckload. Car seats that are shipped individually to recyclers (such as through manufacturer takeback programs) are expensive to ship because they require a large box and are heavy. Whether the car seat is shipped to the recycler individually or delivered by the truckload, transportation is costly.

Car seat recycling has high labor and transportation costs, and the market value of the component materials are too low to cover these costs. Several interviewees indicated that the resale value of the component plastic and metals is only a few cents per seat, while the cost to recycle a car seat is between \$2.00 and \$3.00, not including transportation to the facility. It is therefore extremely difficult to earn a profit from recycling car seats.

6.2 Equipment

Most recycling facilities do not have the proper equipment to process car seats. To be sold in the secondary market, plastic and metal must be completely separated from each other. This can be done by manually disassembling the car seat and removing all metal pieces, which is labor-intensive, or mechanically by using a shredder that can shred the car seat to fine pieces so that magnets can remove the metal components. Facilities without this equipment reported that the manual labor needed to remove all metal pieces and other contaminants was impractical.

6.3 Volume

A few interviewees mentioned that collecting enough car seats to create a full load worth recycling could be a barrier to recycling car seats. One recycler estimated a “full load” to consist of between 5,500 and 6,500 car seats. This means it can take months (timeline variable depending on the population the recycler is serving and whether the service is being publicized) to collect enough car seats for a full shipment. This implies that recyclers have sufficient space to store car seats for extended periods of time until the minimum volume is collected.

7. Key Components of Successful Programs

There are several successful car seat recycling programs that have overcome the challenges mentioned above. This section outlines key characteristics common across successfully operating recycling programs.

7.1 Funding Sources

Successful car seat collection programs that do not charge a drop-off fee have secured external funding to subsidize the costs of transportation and recycling. Funding for existing programs has come from a variety of sources, including state government child passenger safety grants, state government Public Participation Grants, federal grants from the Department of Labor, donations, and hospitals. While some car seat collection programs, such as the ones offered by Clek, WAYB, and TerraCycle, charge a fee for recycling, offering car seat collection free of charge eliminates a considerable barrier to recycling car seats, and ultimately makes car seat recycling more accessible and palatable.

7.2 Staffing and Equipment at Recyclers

Collection programs that have been successful over time have partnered with a reliable recycler and established a partnership that can both collect and recycle car seats efficiently and at scale. This involves sufficient staffing at each stage of the process: at collection events and/or facilities where car seats are collected on a rolling basis, for transportation from the collection site to the recycler, and at the recycling center. Staff on site at the recycler with the experience and

capacity to strip and disassemble the car seats as they receive them is critical. One recycler has groups of individuals performing community service come to the facility on certain days to strip car seats of straps, harnesses, and covers. Other recyclers enlist their own staff to strip the car seats.

After car seats have been disassembled, recyclers must have the right equipment to further process car seats and break them down into a material that can be recycled (i.e., an industrial plastic shredder). These recyclers are typically facilities that are already equipped to process other hard-to-recycle items, such as electronics. Notably, a few recyclers that already processed electronics were able to integrate car seats into their existing systems and processes when prompted, as their facility was already equipped with a shredder that can handle large, mixed-material items and magnets that can separate metal from plastics.

However, ERG was not able to identify any recyclers in Massachusetts with sufficient equipment capabilities, labor capacity, or demonstrated interest in recycling car seats at this time.

7.3 Adequate Volume

Material is recycled in bulk to ensure efficiency and reduce costs. This means that recyclers must process a full load of car seats (approximately 5,500 to 6,500 car seats) so that they can recycle the materials in large quantities. Some programs wait to collect a full load of car seats before sending them to a recycler. However, this requires space to store car seats in the interim. Other programs work with recyclers that process other waste that contain similar component materials, such as construction site items or electronics. These recyclers add the shredded plastic from car seats to shredded plastic from other waste that they regularly process, so it is not necessary to collect a full load of car seats. Some programs collect a high enough volume of car seats during a short, defined period and send all seats at once to a recycler. The volume issue can be remedied by either collecting a full load of car seats before recycling, or by recycling car seats along with items of the same material, such as plastic buckets, pet crates, children's toys, and plastic furniture.

8. Recommendations for Massachusetts

To address the current landscape of limited car seat recycling opportunities in Massachusetts, the commonwealth should continue to work towards scalable, long-term car seat recycling options. Outside of national recycling programs, such as Target's and Clek's takeback programs, Massachusetts has no car seat recycling programs or recyclers that publicize that they accept car seats. However, the experience of recycling programs across the country shows that, while car seat recycling is not profitable, it is feasible. Existing programs also demonstrate that

residents will participate in car seat recycling if it is available. This is demonstrated by Car Seats Colorado, Nurture Omaha, and the Pope/Douglas Solid Waste Management and McLeod County Environmental Services partnership, each collecting and recycling hundreds of car seats annually.

As a statewide program with collection sites across the state, the recycling service that Car Seats Colorado offers provides insight into the number of car seats Massachusetts might expect to collect through its own statewide program. On average, Car Seats Colorado collects 0.0017 car seats per person annually.^{vi} Assuming the same collection rate in Massachusetts, the commonwealth could expect to collect over 11,900 car seats annually. ERG estimates that approximately 240,000 car seats are thrown away each year in Massachusetts and a statewide collection program would divert only 5 percent of those, or roughly 70 tons of waste, from the waste stream.

Recommendation 1: Establish Infrastructure for Processing Bulky, Mixed-Material Items

To offer car seat recycling in Massachusetts, the commonwealth would first need to establish the necessary infrastructure to process car seats. To do this, the Department could either identify a facility that would be willing to accept car seats (if there is one that already has sufficient processes and equipment in place) or support an interested recycler in purchasing the necessary equipment.^{vii} Ultimately, the Department would need to financially support the purchase of the equipment and offer funding to the recycler to help close the gap between the costs to process the seats and the revenue generated from the recycled materials. While purchasing this equipment could be costly,^{viii} the commonwealth's investment in equipment for processing car seats would also extend to processing electronics, toys, and more. Therefore, rather than focusing on recycling car seats alone, Massachusetts could focus on establishing infrastructure to recycle a broad range of bulky, mixed-material items.

Investing in infrastructure to process bulky, mixed-material items would allow Massachusetts to broaden the scope of items that the commonwealth is able to recycle. While a car seat recycling program would only divert around 70 tons of waste, having the infrastructure to recycle similarly hard-to-recycle items could divert much more. Aggregating car seats with other items would also help resolve the volume issue that several programs called out as a barrier to car seat recycling. To accept car seats, recyclers must either collect a full load of car seats, which can require long periods of time and abundant storage space, or combine car seats

^{vi} Car Seats Colorado has collected 100,000 car seats since the program began in 2015 (approximately 10,000 annually). Colorado's population is 5.9 million, so Car Seats Colorado collects 0.0017 car seats per person annually.

^{vii} One recycler ERG interviewed uses an SSI Shredding System Quad® Q85 shredder to process car seats. MassDEP and a partner recycler could do additional research into similar equipment types to identify the most appropriate equipment.

^{viii} SSI shredders can range in cost from \$60,000 to over \$1,000,000.

with existing loads of other items. Establishing a recycler in Massachusetts that can accept common bulky rigid items as well as car seats would help ensure adequate and consistent loads of similar materials for recycling.

Increasing the recycling capabilities of Massachusetts recyclers would provide economic benefits, including jobs for Massachusetts residents, and lower costs associated with transporting items to recyclers in other states. Processing mixed plastic and mixed material items in the commonwealth would also create a long-term solution for addressing the end of life of these products. While a one-time car seat collection program could likely identify a recycler within New England that could temporarily accept seats, procuring infrastructure with the Department's support would set up a long-term market within the commonwealth for recycling bulky materials. This solution could divert much more waste than a program that only recycles car seats. A necessary first step would be to confirm whether any recyclers in Massachusetts have the equipment, capacity, and willingness to pilot accepting bulky items with support from the commonwealth. If no recyclers meet these criteria, Massachusetts could put out a bid to identify a recycler that would be willing to partner with the commonwealth in procuring the necessary equipment to recycle car seats and other bulky items.

Recommendation 2: Publicize and Host Collection Events

After Massachusetts helps equip a recycler with the adequate equipment and processes in place to recycle mixed material items, the immediate next steps would be to publicize these newly established recycling capabilities to Massachusetts residents. Conducting outreach and calling out the common household items the recycler would be able to accept would be fundamental to starting to recycle and divert more of these items from the landfill. Organizing collection programs for these items would also draw attention to the new infrastructure and kickstart the influx of these items. Many municipalities across the commonwealth have collection days for hard-to-recycle items. These municipalities could begin to accept a wider array of mixed material items and bulky rigid plastics and transport them to the recycler. The commonwealth could also administer its own collection days in various areas during which residents could drop off car seats, toys, baby gear, and other bulky items. Ultimately, ERG believes that the sequential implementation of both recommendations will allow Massachusetts to divert more car seat waste, as well as more waste from bulky, mixed-material items more broadly within the commonwealth.

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Appendix: Sample Interview Questions

Interview questions differed by stakeholder and were geared towards each interviewee's organization. The following is a sample interview guide with questions taken from across interviews.

Pre-Interview

Are there any reports, articles, or resources (metrics reports, additional info) that you would like to share with us in advance of your interview?

Background Information/Introductions

Project purpose: Interview relevant stakeholder groups about opportunities and barriers to recycling car seats in Massachusetts. Solicit practical insights about the market for the various materials that make up car seats and both the logistical and financial viability of recycling car seats.

Interviewee	Organization	Role

Interview Questions

- Describe your business model.
- How did the program begin and what motivated the project?
- Do you charge a fee for collection/recycling?
- Describe your process for disassembling the car seat and recycling the component parts.
- Is there a resale market for the recyclable materials?
 - Do you have approximate value estimates for the various component parts?
 - Who do you sell the recyclable materials to?
- What do you do with the non-recyclable materials?
- What costs go into running a program like this? Can you provide us with some rough estimates of operational costs?
- What are the key coordination logistics to consider?
- More generally, what works well about your program?
- Do you have a sense of how many car seats you collect over a given time period (month, year)?
- Is there anyone else we should reach out to on this topic?