

**IDENTIFICATION AND ANALYSIS OF WASTE DIVERSION PROGRAMS &
ACTIVITIES**

Prepared by Sustainable Hudson Valley and ReUse Consulting

for the Ulster County Department of the Environment

County Contract No. 2022-00000490

Submitted for second review June 8, 2023

Table of Contents

Introduction, goals and approach	3
Selection of materials categories for analysis	3
Diversion strategies for UCRRA and Ulster County	4
Materials diversion program opportunities	7
Economic considerations of diversion business opportunities	14
Prioritizing Diversion Opportunities by Material	16
Draft Prioritization Matrix for Programs and Activities	17
Conclusion: selecting enterprises for value in a Reuse Innovation Center	23

Introduction, goals and approach

In the waste characterization study performed as a foundation for assessing the feasibility of a Reuse Innovation Center, three key findings were the extent of the existing ecosystem of materials diversion businesses and programs, the possibilities for additional diversion that are available through realistic modification of existing systems and the availability of significant amounts of useful material that can be diverted.

To address the types of programs and their conditions for success more systematically, this assessment of diversion program types and success conditions is provided. The feasibility of separating each designated component from the waste stream is assessed, including methods of collecting the materials (e.g. drop-off or collection approaches, modification of systems at established facilities to encourage diversion) and methods of reusing the materials and distributing the product through reuse-based enterprises (public, private or hybrid business models). Opportunities for partnerships with transfer stations and other entities are explored. Cost and benefit levels associated with proposed programs are identified, along with job creation potential, staffing needs, equipment needs, operational costs, and needed permits or approvals. A prioritization matrix is provided to facilitate objective consideration of the benefits and challenges of each program type covered by this review.

These findings are based on a literature review, research and field observations on existing business models, and interviews with diversion program operators. It focuses on materials that score the highest in the Prioritization Matrix provided in the Waste Characterization, as well as materials with strong potential for innovative uses, and those that score the highest in particular parameters associated with diversion opportunities that achieve Ulster County's waste diversion, climate and job-creation goals. It is important to note that the Bellingham Reuse Innovation Center handles items from all 26 categories. It is fair to say that the quantities handled and the percentage of sales and dedicated floor space tend to follow the matrix results.

Selection of materials categories for analysis

The Waste Characterization process gave rise to scoring and selection of materials as follows:

- 26 waste stream components were reviewed for potential suitability
- The scoring criteria were: portion of waste stream represented, volume and mass reduction potential, reuse and repair potential, GHG reduction potential, community interest and concern about the material, commodity market values, longevity, toxicity, ease of diversion and whether programs are already in place to divert each material.
- Materials ranked between 52 and 89 on the resulting scale.
- Top scoring materials for waste stream diversion (over 70) were: scrap metal (89), clean wood (79), doors (77), appliances (76), architectural details (76), bicycles (73), C&D (72), and cabinets (71).

In addition, many materials with intermediate scores were found to have specific benefits in the RIC ecosystem. For example:

- Materials scoring highest for ease of separation were appliances/ white goods, bicycles, gypsum board, doors, mattresses and tires. These should be considered as additional candidates to achieve volume of diversion.
- Materials with the highest reuse/ repair potential – suggesting ease of business startups in repair and simple reuse – were appliances, architectural detail, bicycles, clean wood and wood pallets.
- Materials with the highest commodity market value were appliances/ white goods, architectural detail, bicycles, brick, cabinets, clean wood and doors, scrap metal and cardboard. These should be considered as good candidates for high-value reuse businesses that can contribute to the financial stability of the RIC.
- Materials contributing the most to greenhouse gas emissions in their original production and replacement were scrap metal, appliances, electronic waste, wood and tires. In order to minimize the demand for new manufacturing of these items, priority should be given to diversion opportunities that restore them to a usable condition for their original purpose, where possible, rather than repurposing them for an unrelated use (e.g. tires for playground structures).

We capped the broad categories at 26, but tried to include most major categories of materials found in the waste stream. This list included several materials whose disposal is already regulated: appliances, contaminated wood (treated wood), tires, glass and electronic waste. If the RIC's sole purpose were to provide diversion opportunities where none exist, these materials would be eliminated from further analysis. But all these material types have been observed on the tipping floor at UCRRA – and anecdotally by the side of roads in Ulster County. To allow consideration of opportunities for scaled-up diversion and contribution to the variety of the Reuse Innovation Center's offerings, these materials are included in the analysis that follows.

General Diversion Strategies for UCRRA and Ulster County

This section summarizes waste diversion strategies and tactics for consideration by Ulster County to collect materials that may be directed into a Reuse Innovation Center. The strategies differ in scale, cost-effectiveness, complexity, and in their direct relevance to the RIC versus broader role in waste diversion.

1. Improve recycling practices. Overall recycling as well as recycling of targeted materials may be increased through education, incentives and policies. As Ulster County's food scrap law has done, county policy innovations could play a significant role in increasing the volume and predictability of waste diversion, especially for specific materials that are central to the expected focus of the RIC. These include:

- Architectural materials, building fixtures and other construction - and - demolition related materials that could be more consistently diverted if the County were to pass an ordinance phasing in the requirement to deconstruct rather than demolishing specified buildings. This requires that the infrastructure be in place to accomplish the goals of the ordinance, and it can be initiated in phases as the infrastructure develops. Portland, Oregon passed an initial ordinance requiring deconstruction of historic buildings, establishing an expectation and the practice among contractors; later the city extended the ordinance to include buildings constructed in 1940 or earlier, with the goal of eventually extending it through 1978, when lead and asbestos began to be regulated. This law brought the benefit of increased contractor safety and environmental risk management, and has greatly expanded the availability of salvaged building materials, fixtures, etc.
 - Refrigerant-containing appliances, a point of concern in implementing New York State's climate law. A grassroots regional organization called New Yorkers for Cool Refrigerant Management (aka "The Cool Ones") has raised awareness of this #1 climate pollutant and the many gaps in the collection system, including limited oversight of small waste haulers, the inability of utility-funded recycling programs to collect working appliances, and the fast adoption of air source heat pumps, requiring new training and management systems for the entire HVAC industry. "The Cool Ones" have even designed and piloted a community-driven collection event in which volunteers are trained in the proper capture of refrigerants from air conditioners, refrigerators, heat pumps and other common appliances. This network could be mobilized for public education in preparation for policy development.
 - Other materials that can be diverted at higher levels through local regulation include tires, metal, mattresses, glass and electronics.
2. Promote business development. Addressing the needs for diverting the identified priority materials requires an infrastructure of reuse organizations and businesses to be in place. The success of deconstruction or other reuse startups requires growth opportunities, availability of skilled resources, demand from the community, awareness of the service, economic viability of a given business plan, convenient location, well-equipped and sufficient space, etc. The County can assist in cultivating startups and helping grow existing businesses to increase capacity with well-targeted funding such as incubator grants, and regulatory actions like requiring larger waste producers to separate out their plastic and other reusable materials. Funding to address the shortage of workers trained in reuse-specific skills would be very important.
 3. Focus on building deconstruction and salvage. Building deconstruction and salvage is a primary source of materials for the Bellingham RIC and Portland RIC and a promising focus for Ulster County. Since 1993, Dave Bennink of the Bellingham RIC has completed over 5000 deconstruction projects (remodel prep, full building removal, asbestos abatement, hauling). Its

estimated total landfill diversion is 100,000,000 lbs including reuse and recycling. The Reuse Innovation Centers in Portland and Bellingham, together, have deconstructed over 1800 buildings and currently have created over 50 "green-collar" jobs. While Bellingham was started without outside funding or regulatory advantages, deconstruction adoption would be more smoothly and quickly accomplished with governmental support in both areas. A county statute similar to the Portland deconstruction requirement would be helpful. However, making a law is only useful if there is already an infrastructure in place that allows for its success. The ideal order of events that will enable deconstruction to grow in a community and decrease risk to startup efforts would be as follows:

- 1) The community agrees there is a problem to be solved
- 2) The community's leadership decides "We will recycle/reuse"
- 3) Identify materials the community wants to address
- 4) incentive program to get someone to address those materials locally; grants to enable business development/startups
- 5) Training programs are crucial to incubating deconstruction; conversations with local stakeholders indicate a shortage of workers trained in this field. Such training involves aspects of skills in construction, logistics/transportation, warehousing, retail, marketing, repair, and small-scale remanufacturing (often an adjunct that makes a deconstruction business economically viable).
- 6) Once there is an industry up and working in a community, you know how much of their material they can handle, and then you can evaluate what you need to expand and how much and when can be required by statute.

In Ulster County, the first three of these conditions exist or are being created through the RIC initiative.

4. Improve collection systems through collaboration with private or nonprofit partners. A great deal of innovation is occurring in this space.

For example, Check Sammy is a company that has created its own army of small scale self-haul companies by working with independent haulers to provide them with umbrella insurance coverage, referrals and dispatching for jobs, and information about local reuse and recycling opportunities. They work with small scale hauling companies around the country, providing them with referrals to larger hauling jobs that make a measurable impact on the waste stream - for example, with manufacturing companies, grocery stores, construction projects, and other large but inconsistent generators of waste and surplus materials. On their own, most of these small haulers do not have enough insurance to participate in larger projects, or the marketing

reach to find them. Check Sammy provides a professional website, coordinated dispatching, and insurance for the haulers, and along the way trains them to maximize waste diversion by bringing materials to local reuse and recycling facilities before taking the balance to the transfer station. They plan to search their hauler database to see if they already serve Ulster County; this could be a good partner for the RIC.

Waste diversion can also be achieved through partnerships between producers and users directly. Bridging the Gap, a Kansas City sustainability organization that hosts a green business network, models a creative initiative that could be an excellent fit in Ulster County: assisting member businesses in exchanging surplus materials for reuse. In Kansas City's case, the group was approached by a community organization looking for reusable bags to store soil; a local distillery was happy to see its empty grain bags repurposed, and a partnership was born. With UGREEN, the Ulster Green Economy Network, formed and active, such an exchange project could be a natural fit. Materials exchange programs are conventionally conceived as located in a physical space, where materials may be deposited without regard to the market for them, and may accumulate without a clear path to reuse. A reusable materials brokerage service (or a simple business to business network allowing these exchanges to take place and become a norm) could be an attractive feature of a Reuse Innovation Center.

5. Design the material separation and collection system in partnership with UCRRA. Design of the collection system associated with UCRRA to allow and incentivize drop-off of reusable materials near the entrance to the facilities, before a drop-off vehicle approaches the scale or tipping floor. This requires allocation of employees and design of proper facilities, which may be as simple as good-sized sheds. As discussed in the Waste Characterization study, the economics of this approach appear favorable.

6. Encourage repair as waste diversion. Repair is not strictly reuse, but it is an important form of waste diversion. Ulster County was the birthplace of the Repair Cafe of the Hudson Valley and Catskills, which is celebrating the tenth anniversary of the first Cafe in New Paltz. This highly successful program boasts:
 - 45 local host teams from Saratoga to southern Westchester County, including 7 in Ulster County (Woodstock, Esopus, Kingston, New Paltz, Gardiner (2) and Rondout Valley);
 - 69 cafe events held in 2022;
 - Average of 40 guests with 1-2 items each;
 - 75% items brought to cafes are fixed during the event;
 - Equals over 3,000 items saved from landfills plus more items fixed after the cafes with advice or parts ordered.



Repair Cafe Locations, Hudson Valley

Ulster County has been the creative epicenter of the Repair Cafe movement. There has been substantial cross-fertilization between advocates of repair and the Reuse Innovation Center. In addition, the wider network of Repair Cafes shows related models for consideration in the Reuse Innovation Center, such as affiliated tool libraries now operating in Hudson and Warwick, and partnerships with maker spaces in Schenectady.

The Repair Cafe organizers network was queried by email, in November, 2022, on the top items they see being brought in for repair. The responses are summarized here:

Castleton-on-Hudson

Lamps

Columbia NE

gluing ceramics and wooden furniture repairs common, Small appliances, Lamps, sharpening, furniture gluing.

Gardiner/New Paltz

LAMPS, vacuum cleaners, watch batteries, restringing jewelry

LaGrangeville

1, 2 and 3-way lamp switch fixes

Philmont

lamps, laptops, knife and garden blade sharpening

Pleasant Valley

Clothing repairs, knives sharpened, & of course LAMPS

Red Hook

Lamps, electronics, and small electrical appliances; also knife sharpening

Rivertowns

Lamps, small appliances, textiles, jewelry

Stanford

Lamps and vacuum cleaners, jewelry

Yorktown

Electrical (lamps)	21%
Clocks (battery, electric, dome, cuckoo)	12%
Jewelry	9%
Garments	8%
Other	8%
Electrical Appliance (not vac/lamp/kitchen)	8%
Electrical (kitchen appliance)	6%
Electronics (stereos, turntables, CD players, etc.)	6%
Wood repairs	6%
Computers, technology (help with devices)	4%
Ceramics (pottery, plates, mugs, vases)	4%
Other textiles, fabric repairs	3%
Bicycle	2%
Electrical (vacuum, shark,robot vac, shop vac)	2%
Toys and stuffed animals	1%
Total items = 808	100%

In an informal focus group, six Repair Cafe coordinators were asked their thoughts on how the Repair Cafe fits into the competitive landscape of for-profit repair businesses. They agreed that there is synergy as well as competition. Repair business owners often serve as volunteer fixers at Repair Cafes on the weekends, and local Cafes refer customers to these shops when an item cannot be fixed at the Cafe. Therefore, fixable items constitute an important element of the waste diversion picture in Ulster County.

Materials-specific diversion program opportunities

As materials are collected by any of these means, they add to the input streams for diversion programs. These may be public sector programs, private businesses, or public-private partnerships. Types of materials diversion program opportunities are considered in these categories:

- Repair as a service to keep an item useful to its present owner;
- Re-sale of materials "as-is"
- Repair and re-sale of fixable items found in the waste stream;
- Simple reuse of a material, cleaned up but not significantly changed;
- "Upcycling" to remake a material into another in the same category (e.g. fashion);
- Other craft businesses that reuse materials to make something different;
- Remanufacturing;
- Thermal or chemical processing to make new materials (e.g. anaerobic digestion, pyrolysis).

The last two of these categories are generally capital-intensive, technically complex and large-scale, and may require industrial zoning. They are often parts of a Waste Recovery Park, a separate type of facility which could also provide an exciting opportunity for Ulster County over a longer timeframe. A Waste Recovery Park is an all inclusive set of reuse and recycling operations including composting, scrap metal processing, concrete recycling, etc. The RIC can be one of those operations – generally smaller scale and heavily focused on reuse over recycling. The typical county waste stream collection system is designed to handle massive amounts of waste products and to channel them to a limited number of locations where they can be handled more efficiently in volume. The WRP concept revolves around placing it at the landfill or next to a transfer station to try to intercept divertable materials already in the waste stream. Both types of operations are likely to be subsidized by government and grants because of the good they do for the community. We might think of a waste recovery park as a set of filters. The waste stream essentially flows through the WRP and each operation is like a filter, capturing or diverting designated materials that it handles. The RIC can serve as the first filter, having the highest and best use in mind for the type of materials it can handle.

The discussion that follows will emphasize the first six categories: smaller-scale opportunities that – while sometimes involving complex technologies and equipment or sophisticated design – could each be the focus of a successful small to medium sized business that could realistically be started in Ulster County, without major siting, permitting or financing hurdles to overcome. Business types fitting these criteria will be recommended for development or attraction as the centerpieces of an Ulster Reuse Innovation Center. In light of Ulster County's commitment to strategies for Zero Waste and finding an alternative to the Seneca Meadows landfill, there are excellent reasons to consider a Waste Recovery Park as

a separate though related initiative that could be co-located with the Reuse Innovation Center.

CASE STUDY: *ReUse Consulting is involved in a plan for a multi-acre Waste Recovery Park (WRP) in Wisconsin, using land that was designated for a landfill – to avoid filling the landfill! The park is expected to include a Reuse Innovation Center as well as composting, recycling, and other modules. To incentivize the circular economy, the RIC will be the priority destination for materials, followed by recycling, with the landfill as last resort in this integrated facility. Materials from food waste to fluorescent bulbs are part of this vision, allowing for diversion of a high percentage of the waste stream and extending the life of the landfill. This strategy allows for continuous improvement of collection and processing. The anticipated low- or no-rent environment allows for experimentation in diverting hard to divert materials. Fee structures have not been discussed yet, nor the exact structure including whether it is behind the transfer station scales, or in front of them (related to payment/fees).*

The [Outagamie Resource Recovery Park](#) in Wisconsin is a variation of this plan. It centers around a drop-off station with 30 dumpsters that are clearly labeled as to what that bin is for. The customers are allowed to drop off materials, but the bins are generally limited to recycling options instead of reuse. This and other facilities are performing some incineration of trash and we are not making a statement for or against that methodology, but our vision of the waste recovery park places our reuse efforts ahead of the recycling efforts co-located there. The Outagamie example has the drop boxes behind the scale house so customers may be expected to pay to recycle in that example. Models discussed in other areas involved a drop off fee that was 0%-50% of the transfer station fee, but those discussions are continuing. The combination of multiple recyclers and the RIC and reduced fees compared to the transfer station would lead to large percentages of the waste stream being diverted. The buy-in from local participating reuse and recycling businesses and this significant diversion amount should be the encouragement necessary to move efforts like this forward, and justification for local investment in getting the RIC going there.

A number of materials prioritized for Ulster County present opportunities for remanufacturing as well as simple direct reuse, including textiles, plastics, cardboard, gypsum/wallboard and more.

The following chart presents the materials categories identified as priorities for the RIC, and identifies reuse-based businesses that may be created, using them, in a Reuse Innovation Center.

Material	Resell as is?	Repair?	Craft/ Upcycle?

Appliances	In working order	Yes	Not often done; some non-working refrigerators make great storage cabinets for animal feed, tools, etc.
Architectural Detail (tiles, mantelpieces, light fixtures...)	Yes	yes	Yes
Bicycles	In working order or for parts	yes	Yes (outfit with special features); bicycles turned into carts/bike trailers
Bricks	yes	no	Incorporate in other structures, use in pathways even if broken
C & D Debris	yes	yes	yes
Cabinets	Yes	Yes	Yes, new finishes, fixtures, etc
Carpet/ padding/ rugs	Yes	Yes	Yes specialty items (cat scratching posts)
Clean wood	yes	yes	Yes
“Contaminated” (specifically pressure-treated) wood	yes	no	yes, pressure treated wood used for outdoor artwork where contacting the ground
Doors	yes	yes	Yes, arty designs, other uses e.g. desks
Electronic Waste	If in working order	Yes in some cases	Extract components for other uses, DIY, small scale or specialty

Film Plastic	no	no	no
Wood Pallets	yes	yes	Yes, e.g. furniture, storage
Glass	yes	Yes, e.g. windshield glass (not recyclable)	tumbled glass, glass mosaics, etc
Gypsum board	yes, when it is unused	no	no
Mattresses	yes - unused surplus	Yes, limited business opportunities	Typically dismantle into components for reuse or recycling
Books/ bags/ boxes	yes	Rebind books	
Durable plastic	yes	In some cases	In some cases, components in other structures (e.g. storage systems)
Aluminum	yes	yes	form certain components into bicycle trailers, other items
Scrap Metal	yes	yes, weld to repair	Yes
Textiles	yes	yes	Yes, upcycled fashion
Tires	yes	yes	Yes, e.g. structural component of Earthship buildings
Bulky Items	Yes	yes	yes
Cardboard	reuse of boxes	n/a	yes but primarily it's recycled into new paper products by large-scale facilities.

Materials diversion business opportunities

Some of the most straightforward reuse opportunities involve simple resale, with refurbishing as needed, and can collect and resell broad categories of materials. Examples include:

- Building materials and fixtures: Rebuilding Center (Portland, OR);
- Furniture and household items: Habitat ReStore (national), many local consignment and resale stores
- Clean Wood: Hudson Company (Pine Plains, NY)
 - Fine furniture and houseware from salvaged forest materials e.g. storm-damaged trees: NY Heartwoods
- Hardware: P & T Surplus
- Clothing – general: Goodwill, Salvation Army
- Plants reclaimed e.g. from buildings when they are sold and scheduled for removal - Second Hand Shrubs, Bellingham, WA

While this category includes common businesses like Goodwill, it also includes one-of-a-kind reuse enterprises that capitalize on the uniqueness of their products. For example:

- Ithaca’s Reuse Center has opened a second facility, a mega-store, with a mega-mural on its facade created by local artists. It also offers services including deconstruction training, free job training in retail and customer service, computer refurbishing for resale, and a repair collective.
- Materials for the Arts, based in Queens, combines the sale of reusable materials with a spectrum of art-making and arts education, including school-based programs and a gallery.
- Reuse Action, based in Buffalo, proclaims itself the largest reuse operation in western New York, offering contractor referrals, space rental, consulting and training in addition to an extensive array of materials for sale.
- The Brooklyn-based BIG Reuse Center combines sale of all things building related, with a curbside compost collection program.

This commitment to leverage and creative marketing is also reflected in the original Reuse Innovation Center in Bellingham, where products are sold not just individually but in kits designed to help the user make something new; training in deconstruction is a mainstay of the business.

Potential Anchor Business Types for Ulster County RIC

One or more of these broad categories of reuse business may benefit an Ulster RIC as the focus of an anchor business, which may be designed for financial stability and meaningful profit margins. In addition, there are many more unique opportunities to divert particular materials types through more specialized businesses.

Appliances Many working or repairable appliances are disposed of when owners decide to upgrade or buy something different. The Bellingham RIC has an appliance repair specialist who repairs and re-sells appliances. This resale process could be part of a more general RIC showroom, or be a stand-alone business in an Ulster RIC.

Bicycles are eminently repair-able and resellable. Children's bikes may simply be outgrown and resellable in their existing condition. Recycle-a-Bicycle, a program of the nonprofit Bike New York in New York City, repairs and resells 1,800 bicycles a year through a Brooklyn based shop and an online portal, as well as reselling donated gear and cycling clothing in good condition. These businesses require only skill, tools and a work-space.

Bricks can be reused as-is or sliced for consistent or customized uses. For example, Chicago Brick, a multi-faceted building materials, construction and preservation company, cuts reclaimed bricks in thin layers for facades, cobblestones, and paving uses. They clean the bricks at each job site and collect in their facility for resale.

Cabinets can be repaired and/or upcycled (e.g. ornamentally) and reused as cabinets.

Cardboard is of interest in this investigation due to its scoring in the Waste Characterization, but a difficult material to identify productive, scalable ways to reuse. When cardboard is collected in good enough condition, it is typically remanufactured into more cardboard.

Carpets/ padding/ rugs can be part of products (e.g. cat scratching posts). Carpets can be cleaned and sanitized for resale, as large companies such as Goodwill routinely do.

Clean wood This is a major segment of valuable materials that can be diverted at much higher rates than at present. Clean wood can be used to make furniture, shelving, stair treads, household items like cutting boards, and more, as well as creating structures like storage sheds, decks, fences, and more. This is the biggest product of the Bellingham Reuse Innovation Center. These are high value uses compared with typical ways to process clean wood, such as grinding to include in mulch, as Taylor Recycling does, or grinding and sending to lumber mills to burn as hog fuel.

Doors can be reused or serve as components of other constructed items (e.g. desks). In the ecosystem of a large salvage and reuse operation with a substantial client base of do-it-yourselfers, doors can be expected to have a market.

Electronic waste Electronic waste can, in theory, be captured for use in rebuilt equipment, but much of it is low value, poor quality and may be manufactured for obsolescence. Markets exist for electronic components but most of these are in Asia where electronics are generally manufactured. The first priority for electronic items should be to repair and maintain their usefulness in original form for as long as possible. When an item can no longer be used, it can be recycled through a company such as Upcycle, LLC.

Glass The marketplace for reused glass products is significant. Windows, glass blocks, jars. Glasses, vases, etc. can be resold directly. Craft opportunities include reclaimed glass and wood products. It is common practice to cut tops off wine bottles and etch the base to make drinking glasses for sale at craft fairs. Windshield glass is non-recyclable, but windshield cracks can be sealed with resin to keep a windshield in use and save the owner money. Ground glass has

multiple uses, for example in tiles and in pozzolan, an ingredient in low-carbon concrete. Bedrock, in the Bellingham ecosystem, grinds and melts glass to make tiles. Pozzotive, a Westchester County company, produces pozzolan and is working with local governments in the Hudson Valley to begin specifying low carbon concrete in their building codes.

Gypsum board This material can serve as a feedstock for remanufacturing..... This process has a high capital cost and needs considerable scale to be commercially viable. Gypsum board is ground up and the paper covering separated before the rest is reformed into new gypsum panels. The paper may also be recycled. Contractors often have partial unused sheets or full sheets left over from a project and those are often collected and resold as-is.

Mattresses can be disassembled for reuse or recycling of component parts. Contamination (including pet stains and allergens) and material quality are a significant issue. There have been examples of projects in the past that clean lightly-used mattresses and sell them. The use of protective mattress covers, which is becoming more popular, is helping preserve mattresses in good shape and may increase the number of mattresses that can be reused. If disassembled, a high percentage of standard mattresses can be recycled. Foam mattresses may have a second life as a dog bed or similar if they can be cleaned to the proper levels. Intact mattress frames could be building blocks for garden cold frames and other structures.

Books/bags/boxes While there are limited high-value opportunities for these materials, they can also be simply reused. Bags and boxes can be recirculated in reuse and environmentally conscious businesses, and boxes made available for people who are moving. Used bookstores can be viable businesses, especially with associated cafes and cultural activities, and might be more so in the context of a Reuse Innovation Center.

Durable plastics Durable plastics (such as ABS, HDPE, and polycarbonate) can be reused as structural materials for a wide range of home and office uses, one of a kind or as a small [business](#). Plastic piping has been used as an element in shelving and in garden frame construction. These are small business opportunities that require only highly teachable skills and simple tools, but it may be challenging to source the input materials with enough quantity and consistency to make a viable business.

Aluminum New aluminum is sold at a high price. It is manufactured into different materials like beams, square tubing, channel, flatstock and more. It is a versatile material as it doesn't easily degrade and doesn't rust. Salvaged pieces of it can be resold as-is. Window frames or boat trailers made from aluminum may be repaired in some cases to prevent the whole window or trailer from being thrown out. Although harder to weld, it is easy to work with to make carts, furniture, or trailers that are lightweight and strong.

Metals including scrap Tens of thousands of pounds could be diverted weekly at UCRRRA. When metals end up in the waste stream, they are not easily contaminated, and so they can be straightforwardly diverted for reuse or recycling. One option is to ship them to a mill for melting and remanufacture, but this is more energy-intensive than using them locally with more limited

modification. West Kingston Recycling ships metal to be melted down for recycling, but potentially could be supported to develop a separate business line producing usable items from that scrap metal. Furniture and home products that combine metal and wood are popular, from tables to cabinets to seating, suggesting business areas with likely value. Sometimes, products containing metals can be restored to usability quite easily – for example, by reinforcing school teacher and student stools and desks by welding legs tighter. Welding capability is key for a successful, adaptive business in metal reuse. Because businesses produce so much scrap metal, associated services for a metal reuse business could include commercial and institutional waste assessment and diversion programs.

Textiles Clothing and household textiles are an obvious area of opportunity for repair, extended use, upcycling and recycling. The Skirt Sisters is an example of a viable business turning diverse repurposed clothing items into skirts. High-value garments such as wedding dresses and theater costumes provide opportunities for specialized repair businesses. There is a major area of reuse business opportunity to make garments outgrown by one child available to another. For example, Once Upon a Child is a national franchise business to resell gently used children’s clothing, footwear, toys and furnishings. [Upcycling](#) is a popular and increasingly scalable approach using elements of existing garments and trims to make unique products, often with flaws turned into special features. Viable businesses may concentrate on one type of garment (e.g. The Skirt Sisters) or reusing one type of material (the French company Hotel Vetements makes fashion garments out of reclaimed hotel draperies, bedding and other fabric elements). The volume of second-hand clothing being donated is increasing, but quality is decreasing and the resale boutique market is fairly full; upcycling has begun to penetrate the world of fashion, with specialized designers and product lines at major clothing companies like Eileen Fisher and Patagonia.

Tires Used tire retail provides affordable tires and tire installation to people that cannot afford new prices. They also extend the use of the tires. When tires become unsafe, they can be sent to retread operations that add new tread, saving much of the original tire intact. Others are sent to recycling operations that grind the tires up. Many companies that sell and install tires also do repairs on them. Many flat tires are repaired instead of replacing the tire.

Wood pallets There are hundreds of businesses nationwide that repair and sell used pallets for reuse by businesses that ship items on them. This business is relatively simple to start, and competitive as many businesses want the price advantage.

Economic considerations of diversion business opportunities

The materials under consideration here are all selected, based on the waste characterization analysis, for their moderate to high value toward achieving the County’s waste diversion and environmental goals. The matrix below organizes information on the opportunities and potential barriers to waste diversion and reuse-based enterprises using these materials. These enterprises can be private for-profit, nonprofit, publicly owned and/or public-private partnerships; they still need an organizing principle and a consistent way of turning inputs into

products with some sort of value. Creating a viable enterprise requires a clear enough definition of a product, feedstock, process to create, and plan for distribution and use. It may operate on a profit-based or multiple-bottom-line business model. It may merit a public subsidy to achieve an environmental benefit. Or there may be an entirely different model. But that model should be clear, and its criteria for viability should be well understood by all stakeholders.

The RIC as a strategic support for diversion activities and businesses

The Reuse Innovation Center focuses on the concept of sustainability, and an important part of this is getting everyone involved. The idea of an informal 'business cooperative' approach came from 25 years of trying to compete with larger scale linear-economy businesses and status-quo scenarios. If you look at a linear economy business, they might seem independent, but they do not work alone. The typical retail store doesn't manufacture or haul things, they simply order and accept deliveries of product. The typical reuse business must 'produce' their own product, and self-haul it to their store. When the RIC businesses complement each other and work together, they can achieve higher diversion levels, and earn higher revenue too. When they share expenses, they become more stable, more profitable, and the RIC becomes an effective business incubator. This is critical to achieving equity goals and getting people involved who are motivated to do the work.

Diversity in Diversion

The existing RICs have a diverse base of business owners now. RIC efforts have worked in those communities. One example is a business that is owned by a woman of color and who started her business at the Portland Reuse Innovation Center with very little funding. The barriers to starting were the costs of vehicles and tools, but they had some of those already. Other costs involved renting a facility and hiring extra staff to transport and sell the materials. The RIC took care of that, erasing those costs and allowing them to focus on deconstructing buildings, something they were already profiting from after attending the RIC training program. Very few businesses currently involved had much money to get started, and that includes the Bellingham Reuse Innovation Center. With no business loans or grants or donations or volunteers, it has been profitable and continues to slowly grow each month.

The chart below shows 26 material types and talks about businesses that may start up to tackle the waste issue, but to do it quickly and at scale has costs associated with it. Many people starting this type of business do have some resources available. Some may own a truck or have a garage to store things in. We have listed costs based on having to start from scratch, and some of those start-up costs can be daunting. If you took 3 of the businesses that each were planning to spend \$150,000, and were each going to need to buy a forklift, and you put them together at the RIC where they would share a forklift. That would quickly save \$100,000. The Bellingham RIC has a partnering business that is based out of a room of their home. The woman that owns it makes ornaments out of reclaimed wood. This type of small scale home-based business could be started for less than \$1000 if the RIC is involved. By displaying her ornaments in the RIC showroom, she no longer needs to rent space or do expensive

advertising to get people to purchase her products. Imagine the RIC finding a broken sewing machine, fixing it in the repair station, and then providing it to someone in a disadvantaged people-group. Then another member of the RIC comes across textiles being thrown out and provides that to the small business owner. The possibilities are endless.

Waste needs to be diverted, regardless of whether it is economically advantageous to do so; but there are opportunities to do it wisely. The County needs to look at all costs of waste and realize the benefits the RIC will bring to the community. Subsidizing the diversion of some materials may be cheaper than disposing of them, and will certainly make more environmental sense.

Prioritizing Diversion Opportunities by Material

Following is a table of examples of diversion activities or businesses with their prioritization score from the Waste Characterization task for this project. Some diversion activities do not make sense as single businesses; these are called out.

NYS has numerous regulations regarding solid waste. In terms of regulatory considerations regarding diversion opportunities, our initial review of the “360” regulations indicate they focus on activities that in general have been outside the purview of the RIC and would involve complexity (and the related costs) that would not be recommended for the RIC.

Draft Prioritization Matrix for Programs and Activities: Business Needs

	Cost to start (loosely estimated) [low mod high] L 50-149; M 150-299; H 300+	Gen Profitability <0 = needs subsidy, \$-\$\$-\$\$\$	Facility needs	Equipment needs	Methods well established No/med/yes	Other factors	Threshold Skills	Equipment Costs Low-Med-High L <50K; M 50-150K; H 150K+	Space Needs	Recommended for Inclusion in an RIC
Appliances and white goods repair, upcycling, resale Rank: 76 High	low 2	\$\$ 3	all indoors; showroom and warehouse and workshop 5-25 employees	Tool set; diagnostic equipment; storage racks; carts; trucks; maybe forklift	yes	stand alone business or combined	technical - small appliance repair technical certificate at a college or similar skill set from working. Business: marketing must be done or paid for; website created and maintained. Must know how to handle materials, lift, follow GPS, drive, remove items safely. Pricing, cash register, cleaning.	Med	3-8K sq ft	Yes
Architectural Detail (tiles, mantelpieces, light fixtures, flooring...?) Rank: 76 High	mod 3	\$\$ 3	all indoors; showroom and warehouse and workshop; 5-25 employees	Tool set; storage racks; carts trucks trailers	yes	stand alone business or combined	remove materials, transport, store and sell. Know vocabulary. Training or apprenticeship. see above.	Med	10-20K sq ft	Yes
Bicycles - resale, repair Rank: 73 High	low2	Low - \$ 2	small shop and workshop; 2-10 employees	tool set; small equipment	yes	stand alone business or combined	bicycle repair, apprenticeship, class. see above.	Low	1-3000 sq ft	Yes

Draft Prioritization Matrix for Programs and Activities: Business Needs

	Cost to start (loosely estimated) [low mod high] L 50-149; M 150-299; H 300+	Gen Profitability <0 = needs subsidy, \$-\$-\$-\$	Facility needs	Equipment needs	Methods well established No/med/yes	Other factors	Threshold Skills	Equipment Costs Low-Med-High L <50K; M 50-150K; H 150K+	Space Needs	Recommended for Inclusion in an RIC
Bricks - reuse Rank: 64 Moderate	low2	Low -mod	outdoors mainly. 2-6 employees	forklift; truck; pallets, some tools	yes	stand alone business or combined	Just need to know the technique of removing and cleaning. Learn from business owner	Low-Med	outdoor, 5-10K sq ft	Yes
C & D Debris Concrete, cardboard, sheetrock, insulation, etc. Sorting for reuse. Rank: 72 High	high (partly because sheetrock)	high	Need space, a couple dozen employees. recycling yards employ truck drivers picking up, and office people, billing, sorting, operating scale. Takes a lot of people	forklift racks carts pallets tool set truck/trailer	yes	stand alone business or combined	remove materials, transport, store and sell. Know vocabulary. Training or apprenticeship. see above.	Med-High	20-30K sq ft	Yes Deconstruction Business should be first to initialize at RIC
Cabinets - reuse/repair Rank: 71 High	mod 3	\$\$ - 3	showroom warehouse shop space. Not a single business, realistically part of another business with broader products. 2-8 employees, Size variable on that basis.	tool set; truck and trailer; carts racks	yes	Best if part of a larger effort	remove materials (involves electrical, plumbing, gas so you don't damage someone's home), transport, store and sell. Training or apprenticeship. see above.	Med	5-7K sq ft	Yes, as part of

Draft Prioritization Matrix for Programs and Activities: Business Needs

	Cost to start (loosely estimated) [low mod high] L 50-149; M 150-299; H 300+	Gen Profitability <0 = needs subsidy, \$-\$-\$-\$	Facility needs	Equipment needs	Methods well established No/med/yes	Other factors	Threshold Skills	Equipment Costs Low-Med-High L <50K; M 50-150K; H 150K+	Space Needs	Recommended for Inclusion in an RIC
Carpet/ padding/ rugs reuse Rank: 63 Moderate	low	-\$2	showroom warehouse 3-5 employees	truck and trailer carts racks cleaning equipment	yes	Best if part of a larger effort	remove materials, cleaning, transport, store and sell. Learn on the job, online resources.	Med	3-6K sq ft	Yes
Clean wood Furniture production Rank: 79 High	mod	mod	showroom warehouse shop space,4-20 employees	Tool set; storage racks; carts trucks trailers	yes	stand alone business or combined	more technical; getting wood is simpler, safety and woodworking skills are more complex than simple resale and may be learned at a technical school or learn on the job.	Med-High	5-10K sq ft	Yes
Doors, reuse/repair Rank: 77 High	low 2	\$ - 3	Showroom warehouse workshop all indoors; 2 to 4 employees	Tool set truck trailer forklift carts	yes	stand alone business or combined	similar to cabinets but less complicated removal and less space	Med	2-5K sq ft	Yes

Draft Prioritization Matrix for Programs and Activities: Business Needs

	Cost to start (loosely estimated) [low mod high] L 50-149; M 150-299; H 300+	Gen Profitability <0 = needs subsidy, \$-\$-\$-\$	Facility needs	Equipment needs	Methods well established No/med/yes	Other factors	Threshold Skills	Equipment Costs Low-Med-High L <50K; M 50-150K; H 150K+	Space Needs	Recommended for Inclusion in an RIC
Electronics repair/reuse Rank: 62 Moderate	mod 3	\$\$ - 3	warehouse workshop all indoors workshop; 4-15 employees	tool set truck and trailer forklift(optional) or pallet jack carts special processing equipment	yes	stand alone business or combined	technical skills, repair and diagnostics usually learned through technical school certification or other relatively expensive training; knowledge of rules related to electronic disposal and materials handling. Ability to evaluate value.	Med	3-5K sq ft	Yes
Glass - recycling or melting and reforming or blowing Rank: 52 Low	mod 3	\$\$ -3	warehouse shop space material storage area; 3-10 employees	truck trailer forklift processing equipment, kiln	yes	stand alone business or combined	just recycling, very low skilled melting and making glass tiles, learn equipment and safety, right types of glass, OTJ Glass blowing, can find classes but usually OTJ.	Med-High	4-8K sq ft	Yes

Draft Prioritization Matrix for Programs and Activities: Business Needs

	Cost to start (loosely estimated) [low mod high] L 50-149; M 150-299; H 300+	Gen Profitability <0 = needs subsidy, \$-\$\$-\$\$\$	Facility needs	Equipment needs	Methods well established No/med/yes	Other factors	Threshold Skills	Equipment Costs Low-Med-High L <50K; M 50-150K; H 150K+	Space Needs	Recommended for Inclusion in an RIC
Books/ bags/ boxes/paper Rank: 54 Low	low 1	0 - 0	must be part of a larger operation; no dedicated employees	no significant equipment	n/a or yes	not a stand alone business	not a separate business. Paper in general is not really part of an RIC. In some way these play into every other category.	N/A	N/A	Yes
Durable plastic - reuse, remanufacturing Rank: 70 Moderate-High	low		must be part of a larger operation; 1-2 employees depending on volume	no significant equipment	yes	not a stand alone business	not a separate business. Plastic pipe in used building equipment stores, toys at Habitat, etc.	N/A	N/A	Yes
Aluminum - reuse Rank: 57 Low			must be part of a larger operation;no dedicated employees		yes	not a stand alone business	not a separate business. In used equipment stores, at Habitat, etc.	N/A	N/A	Yes (as part of welding)

Draft Prioritization Matrix for Programs and Activities: Business Needs

	Cost to start (loosely estimated) [low mod high] L 50-149; M 150-299; H 300+	Gen Profitability <0 = needs subsidy, \$-\$\$-\$\$\$	Facility needs	Equipment needs	Methods well established No/med/yes	Other factors	Threshold Skills	Equipment Costs Low-Med-High L <50K; M 50-150K; H 150K+	Space Needs	Recommended for Inclusion in an RIC
Metals including scrap - processing for recycling Rank: 89 High	high 4	\$\$\$ - 4	large outdoor yard with multiple buildings and processing areas. 10 to 20 employees	heavy equipment; trucks; forklifts; specialized equipment; tools; trucks trailers	yes	stand alone business or combined	Assuming just processing scrap metal to send to a mill. OTJ training; technical college training is common because welding and torch cutting are needed. Draining fluids from vehicles, heavy and other equipment usage. Quite a few skills needed in scrapyards.	Very High	covered and outdoor space mostly, some office space or trailer. 50K sq ft or more.	Yes
Textiles - upcycling Rank: 65 Moderate	3	2	warehouse shop space material storage areas indoors; 2-8 employees	trucks; forklifts; specialized equipment; tools; trucks trailers	med	stand alone business or combined	sewing, weaving, sewing equipment use, pattern making. Design. Evaluate condition of incoming materials, sanitizing. OTJ or class; there are still people out there who know how to sew (e.g. in the Repair Cafe	Med	3-10K sq ft	Yes

Draft Prioritization Matrix for Programs and Activities: Business Needs

	Cost to start (loosely estimated) [low mod high] L 50-149; M 150-299; H 300+	Gen Profitability <0 = needs subsidy, \$-\$\$-\$\$\$	Facility needs	Equipment needs	Methods well established No/med/yes	Other factors	Threshold Skills	Equipment Costs Low-Med-High L <50K; M 50-150K; H 150K+	Space Needs	Recommended for Inclusion in an RIC
							network)			
Wood Pallets - reuse, ??? Rank: 62 Moderate	low 2	-\$2	shop space and outdoor yard; 1-5 employees	truck trailer forklift; small tool set	yes	stand alone business or combined	low skill requirements. Watch a few youtube videos or learn on the job from a business owner	Med	outdoors mostly or unheated; 5-10K	No. Not physically at RIC facility but partner with others. These businesses don't need a retail location. The RIC can help them to find pallets and partners who want pallets.
Cardboard - processing for recycling Rank: 69 Moderate	3	3	warehouse shop space material storage areas indoors' no dedicated employees	trucks; forklifts; specialized equipment; tools; trucks trailers	yes	Not often a business, may be if prices rise again	Assuming just processing cardboard to send to a mill. Assuming just OTJ, zero special skills.	Med	2-10K sq ft	No; but have a drop box for recycling
Tires - resale or recycling Rank: 70 Moderate	3	3	some structures, some outdoor space; 3-7 employees	trucks; forklifts; specialized equipment; tools; trucks trailers; car lifts	yes	stand alone business or combined	Assuming resale of tires and recycling (based on Beacon Battery and Tire in WA) OTJ, learn how to use equipment. Forklift training.	Med	indoor and outdoor covered space. 5-20K sq ft	No

Draft Prioritization Matrix for Programs and Activities: Business Needs

	Cost to start (loosely estimated) [low mod high] L 50-149; M 150-299; H 300+	Gen Profitability <0 = needs subsidy, \$-\$-\$-\$	Facility needs	Equipment needs	Methods well established No/med/yes	Other factors	Threshold Skills	Equipment Costs Low-Med-High L <50K; M 50-150K; H 150K+	Space Needs	Recommended for Inclusion in an RIC
Gypsum board - recycling Rank: 57 Low	high 4	\$ - 4	warehouse shop space material storage area; 4-16 employees	heavy equipment forklift storage bins; processing equipment including crusher	medium; not yet common in many areas	stand alone business or combined	Know how to watch out for contaminants; specialized equipment knowledge, OTJ training and specialized training for the specialized equipment for grinding. Need to use heavy equipment.	Very High	20-40K sq ft	No
Mattresses, multiple materials, various uses Rank: 61 Low-Moderate	med 3	-\$2	warehouse shop space material storage areas indoors; 5-10 employees	processing equipment forklift storage bins tool set truck and trailer	medium; must be subsidized in many areas	Best if part of a larger effort	OTJ training; stripping, grinding metal, handling wood, identifying contamination, etc.	Med-High	inside + covered storage 10-20K sq ft	No

Notes: By and large the costs estimated here assume starting from scratch and doing it alone. In real life, many people already have a truck, for example, so the cost may be under 50K in such an instance.

With an existing RIC operational, equipment could be shared, reducing initial costs considerably and making it easier for startup businesses to get up and running. The waste stream is ever changing and the RIC will need to be adaptable. Something may change in priority or demand/value over time. Individual items of value and resellable may be accepted by an RIC even if the overall category is not ranked high as such.

Conclusion: selecting enterprises for complementary value in a Reuse Innovation Center

This analysis shows that a majority of the materials identified by Ulster County as priorities for diversion are a good fit with available business opportunities. A driving purpose of the Reuse Innovation Center initiative in Ulster County is to maximize diversion of these designated priority waste streams, in order to achieve sharp reductions in associated costs and greenhouse gas emissions. A centerpiece of the RIC effort, therefore, is to identify and cultivate reuse-based business opportunities that divert heavy materials, as well as materials with high embodied carbon in their production. These may be thought of as anchor enterprises for the RIC.

At the same time, the strength of the Reuse Innovation Center is its organization as an ecosystem of diverse enterprises that bring complementary value, including contributing to market share and profit margins, supporting innovative public policies and providing education. These include:

- businesses that consumers are ready to patronize for reused materials - such as furniture and clothing - because they are familiar and their value is understood;
- businesses with well established specialty markets - e.g. garden or renovation supplies - that can attract large numbers of customers to the RIC;
- businesses that educate, intrigue, provide beauty or demonstrate crafting skill – including upcycled textiles and clothing, wood and glass craft, and innovative, high-quality reuses of materials across the board – reuses that build the reputation of the Center as an interesting destination;
- enterprises and service programs that engage specific populations, such as art materials exchanges catering to schools;
- enterprises and service programs that further educate and encourage reuse and repair, such as tool lending libraries.

The analysis above has identified several ways to increase diversion of these materials, and has shown the viability of reuse-based enterprises in each of these key categories. In the Conceptual Plan that follows, priority diversion programs and enterprise types will be discussed as parts of an emerging picture of a Reuse Innovation Center for Ulster County.

Ulster County should support building up the deconstruction industry in the region. This effort involves educating the public about the benefits of deconstruction, encouraging businesses to provide these services, and supporting this new circular industry through funding and training. The key is to provide enough support that it positively affects the balance of supply and demand for the reclaimed materials generated through the deconstruction services. It is not enough to just convince contractors to perform the work. There must be somewhere for the reclaimed materials to go, as well as additional recyclable materials generated.

A normal first step would be to initiate a pilot project, where a structure(s) is removed and the results are analyzed. This would be a funded project with a goal of 90%+ landfill diversion. The next step might be to match a grant-funded support program with job/business training. Minnesota has set up an example of this where contractors were trained to do the deconstruction, and a county in Minnesota provides micro-grants to any building owner that wants to do full deconstruction instead of demolition. These grants of approximately \$2000-\$5000, and help offset the added cost of deconstruction compared to a demolition bid. Over time, as the deconstruction contractors improve, these subsidies are expected to be used less and less. Ulster County could also require deconstruction on their own building projects, thus generating work for the industry and encouraging participation.

Supporting the start of the Reuse Innovation Center, at the same time as the deconstruction industry starts up, will give the contractors somewhere to send the deconstructed materials. The RIC will not only generate demand for the supply, but it will train workers that can be added to the growing deconstruction crews, and it will also help generate more interest in the industry which will lead to more work for the contractors. Customers of the RIC will find an array of reclaimed materials, and this will spark the production of remanufacturing in the County. The production of these quality products will contribute to the slowing of the waste stream compared to new products designed to wear out in just a few years.

Investments made by Ulster County in the beginning will begin to pay off in the form of job creation, landfill diversion, sales tax, and other benefits for County residents. As the industry matures, other measures to increase landfill diversion can be taken. The now experienced crews are well suited for gutting buildings in preparation for remodels, doing tenant improvements in commercial buildings, and providing other diversion services such as garage cleanouts. One example from Washington State is a reuse store that was provided a \$25,000 grant to get started in 1993. The operation had 50 people working by 2004, generating \$1.75 million in annual sales at that time and saving struggling County residents over \$3,000,000 each year compared to buying the materials new.