



RI Solid Waste Management Plan (SWMP) Advisory Committee

Wednesday, May 7, 2014 @ RI RRC – Johnston, RI - 9:00 AM – 10:30 AM

RI RRC Boardroom

65 Shun Pike, Johnston

AGENDA

1. Draft Plan dated April 24, 2014
 - a. Discussion of Sections IV And V
 - i. Issues
 - ii. Strategies & Options
 - iii. Recommended Actions
 - b. Solid Waste Management Climate Change Issues

 2. Moving Forward
 - a. Ongoing Outreach
 - i. RRC & RI League of Cities & Towns meeting
 - ii. RISEP Spring Luncheon – May 13, 2014
 - b. Meeting Schedule – Next meeting TBD –> August 2014
 - c. Timeline for Remaining Work

 3. Adjourn.
-

SWMP Advisory Board

Meeting Outline May 7, 2014

Section III Key Issues:

- 1) What is the overall strategy to further reduce solid waste volume and extend the LF life?
- 2) What is the best post Central Landfill disposal option?
- 3) How should the system be funded and what is the structure to set pricing?

Section IV Strategy Options:

Issue #1: What is the overall strategy to further reduce solid waste and extend LF life?

- A) Maintain status quo.
- B) Invest in new programs and policies to reduce waste.
- C) Become primarily a municipal disposal facility.

Issue #2: What is the best post Central Landfill disposal option?

- A) Transport/Dispose most RI waste at out of state facilities.
- B) Utilize technology to process solid waste.
- C) Pursue a Zero Waste objective.
- D) Expand landfill capacity in RI.

Issue #3: How should the system be funded and what is the structure to set pricing?

- A) Continue with current structure.
- B) Set target commercial loading and commercial price restrictions.
- C) Municipal governance of RIRRC with revenue sharing.
- D) Enact statewide RIRRC mandated PAYT for residents.

Section V Recommended Actions:

Issue #1: Reduce the amount of solid waste sent to disposal:

- A) Implement a RIRRC mandated statewide PAYT.
- B) Commence a waste characterization study.
- C) Identify underperforming municipalities and barriers to improvement.
- D) Expand producer responsibility.
- E) Improve paper and packaging recycling in the commercial sector.
- F) Support food waste diversion.
- G) Continue to provide public education and technical services.
- H) Employ new and expanded public outreach tools.
- I) Identify underperforming school programs and barriers to improvement.
- J) Consider centralized management of recycling collection services.

Section V (continued):

Issue #2: Determine the Post Central Landfill Disposal Solution:

Recommendation: Evaluate alternative options and recommend best option by 2017; implement by 2021.

Issue #3: How to fund the system and set pricing:

- A) Implement statewide mandatory PAYT.
- B) Implement statutory maximum commercial disposal targets.
- C) Identify alternative models of RIRRC governance to oversee financials.



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SWMP Advisory Committee:

Attached for your review is the most recent draft of the SWMP. While we've made a concerted effort at condensing Section III, clarifying the issues, and at the meeting on Wednesday May 7th, we would ask the group to concentrate on the critical points in Sections IV and V which identify the key issues and suggested recommended strategies and actions to address these issues.

As we have gone through this Plan Update, we continue to receive and process valuable input from key constituents. We have boiled down what we believe to be the Plan's three key issues:

- 1) How to further reduce solid waste volumes and extend landfill life?
- 2) What should be the post-Central Landfill disposal system?
- 3) How to fund the system and what structure should be used to set pricing?

We have also evolved in our thinking about solutions and now have a list of recommended strategies and actions, located in section V, to address the issues. You will notice that (and after much internal discussion) we have recommended implementing a mandatory statewide PAYT as a key action item to address all three key issues.

So we are looking forward to next week's Advisory Committee discussion to ensure we have the right three issues identified and to receiving feedback about the recommended policy initiatives that address these issues. We want to know what you like, don't like, or want to see changed.

Finally, we will discuss the remaining tasks and timeline for Plan completion.

See you next Wednesday May 7th at 9AM at RIRRC.

Mike OConnell

Executive Director RIRRC

Rhode Island Comprehensive Solid Waste Management Plan – Draft

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I. INTRODUCTION, VISION

What is this plan?

This plan updates the Solid Waste Management Plan of 2007 and will ensure that the State of Rhode Island has a comprehensive and coordinated plan to provide cost effective and environmentally compliant waste management and recycling services for residents, businesses, industry, and municipalities. It is intended to guide activities of the Rhode Island Resource Recovery Corporation (RIRRC) and the Department of Environmental Management (RIDEM). As an element of the State Guide Plan, it sets forth goals, objectives, and policies that must be reflected in future updates of municipal comprehensive plans. It also serves to meet the need for a solid waste management plan as required by the Federal Resource Conservation and Recovery Act (RCRA) of 1976. This plan describes existing practices, programs, and activities in all major solid waste management areas and develops recommendations specific to each area. It also describes potential avenues for solid waste management in Rhode Island post-closure of the Central Landfill.

Why has it been developed?

This Plan has several purposes:

- Serve as the long-range policy and program guidance document for the RI Resource Recovery Corporation and other State agencies.
- Function as the Statewide Resource Recovery System Development Plan containing 20-year projections of waste generation, recycling, and disposal compared with capacity.
- Guide the activities of Department of Environmental Management and serves as the state solid waste management plan as required by the Federal Resource Conservation and Recovery Act.
- Serve as the solid waste management element of the State Guide Plan that in turn guides municipal Comprehensive Community Plans.

What issues does it seek to address?

ISSUE #1: What overall strategy with its programs and policies should be adopted now to further reduce solid waste volumes and preserve landfill life beyond the projected 2038 date?

ISSUE #2: What is the post Central Landfill disposal option that will provide the most environmentally sound and economically viable waste disposal services with the least amount of risk?

ISSUE #3: How should Rhode Island fund the system, both in the short term and long term, and what should structure should be used to set pricing?

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Vision Statement

In 2035, responsibility for sound solid waste management is shared. We all understand that each of us has a role to play. We have made strides in reducing the amount of waste each of us generates as individuals, we have implemented statewide Pay As You Throw, and every community uses automated collections systems with 95-gallon carts for recyclables for curbside collections. Our landfill is nearing closure and our recycling facility is at the end of its useful life. The next stage of sustainable waste management is upon us, and difficult decisions must be made.

To be truly sustainable, Rhode Island must invest in full-scale residential composting facilities. We must make organics management a top statewide priority. We must continue to invest in manufacturing processes that use recyclables as feedstock and provide long-term, high-quality jobs. We must implement the best state-of-the-art technologies and public policy practices to maximize the remaining years of the central landfill, increase the remaining usefulness of the Materials Recycling Facility, and begin the transition to the solid waste management practices that will take Rhode Island into the 22nd century.

This plan will describe the path to the 22nd century, using the following goals:

Goal 1: Reduce the amount of Rhode Island generated solid waste requiring disposal through increased source reduction, reuse, recycling, and composting.

Goal 2: Manage the solid waste that ultimately must be disposed in an efficient, equitable, safe and environmentally protective manner, consistent with the statutory solid waste hierarchy.

Goal 3: Adopt stable, long-term funding mechanisms that provide sufficient revenue for state, regional, and local programs while providing incentives for increased waste reduction and diversion.

Goal 4: Communicate proactively plan priorities and processes to municipal officials and planners for incorporation into local guidance documents.

Goal 5: Identify the research and analysis that should be undertaken over the near term (3 years) in order to make informed decisions on the facilities and waste management strategies that will serve Rhode Island leading up to and beyond the final closing of the Johnston Landfill.

II. OVERVIEW OF SOLID WASTE IN RHODE ISLAND

Report Terminology

Solid Waste –the entirety of non-hazardous waste materials disposed and recycled by all sources.

Refuse –materials disposed and recycled from both residential and commercial sources but excluding C&DD, sludge, industrial, and agricultural wastes. What is classified by the USEPA as “municipal solid waste”.

MSW (Municipal Solid Waste) –solid waste for which municipalities take responsibility for collection and disposal.

CSW (Commercial Solid Waste) –solid waste generated by businesses and institutions including industrial and agricultural wastes managed by commercial haulers.

Recycling – will refer to the traditional use - conversion of discarded materials into raw materials, which are then used to make new products; this definition will specifically not include waste to energy.

What is Solid Waste, What is Recycling

We are all responsible for managing wastes at the source of generation, whether at home, in public areas, at work, or in school. Perhaps more important is the role we all play in determining whether solid waste is created in the first place.

Solid waste, more specifically *municipal solid waste* (MSW), and *recycling* are terms used generically that often have different meanings among professions and across jurisdictions. In Rhode Island, Solid Waste is defined by statute (RIGL § 23-18.9-7) as “garbage, refuse, tree waste and other discarded solid materials generated by residential, institutional, commercial, industrial, and agricultural sources, and specifically excludes sewage sludge, used asphalt, and concrete”. MSW as defined in Rhode Island (RIGL § 23-19-5) is “solid waste generated by the residents of a municipality in the course of their daily living, the disposal of which the governing body of that municipality has undertaken in the discharge of its duties to protect the health of the municipality...”, and specifically excludes solid waste generated by any manufacturing or commercial enterprise. The RIDEM regulations differentiate between MSW, *commercial solid waste* (CSW) and *non-municipal residential waste* in order to accommodate recycling regulations across different generators and managers of solid waste. Alternatively, the U.S. Environmental Protection Agency (USEPA) applies the combined categories of material classified in

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Rhode Island as *MSW*, *CSW* and *non-municipal residential solid waste* under the umbrella of “*municipal solid waste*”, specifically excluding solid waste from industrial, agricultural, and construction and demolition sources. However, in practice, solid waste disposal facilities, and in particular RCRA Subtitle D Landfills (often called “municipal solid waste landfills”) handle solid wastes from all sources.

The term *recycling* is defined in Rhode Island statute as “...the reuse of recovered resources in manufacturing, agriculture, power production, or other processes.” However, in most other jurisdictions the production of power from waste is specifically excluded from *recycling*. It is common for people to use *recycling* to refer to the *reuse* of items in their original form (e.g., thrift ship donations). However, most industry professionals regard *reuse* of items as a form of waste prevention, which occurs prior to the actual generation of waste.

These different meanings cause confusion, so for the purpose of this plan we will apply the term *refuse* when referring to those materials classified by USEPA as municipal solid waste (along with *industrial, agricultural, construction and demolition (C&DD)*), and the term *solid waste* used on its own will mean all non-hazardous materials disposed and recycled. The terms *municipal* and *commercial* will be used when differentiating waste and recycling for which municipal governments have taken responsibility or not. We will also use the definition of recycling provided by the USEPA: “the series of activities by which discarded materials are collected, sorted, processed, and converted into raw materials and used in the production of new products; excluding the use of these materials as a fuel substitute or for energy production.” One of the recommended actions of this plan will be to harmonize, standardize, and make consistent in statute more contemporary definitions of solid waste and recycling in Rhode Island.

The materials in solid waste include organics such as paper, yard trimmings, and food waste, and inorganics such as plastics, metal, rubber, leather, textiles, wood, and glass. Sources of refuse include

Figure Figure 1A. Total MSW Generation (by material), 2011

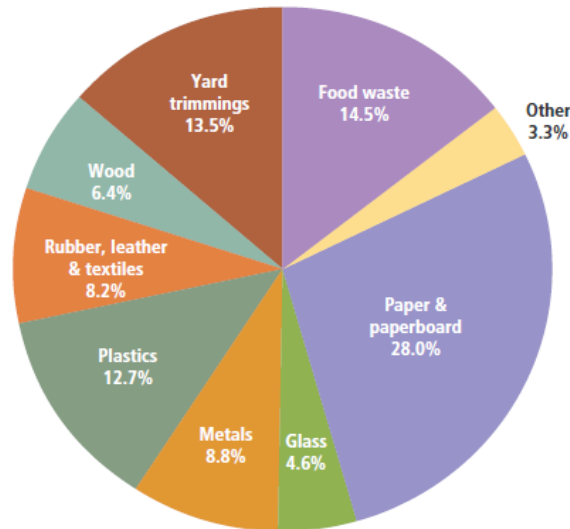
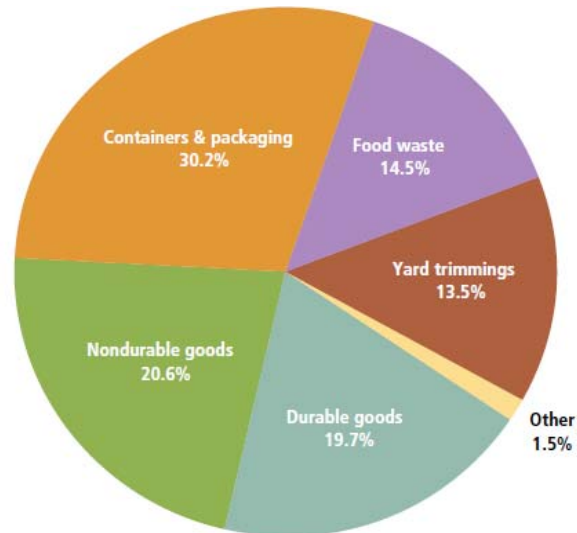


Figure 1B. Total MSW Generation (by category), 2011



Source: USEPA – Municipal Solid Waste Generation, Recycling, and Disposal in the United States

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packaging materials, food waste and yard waste, durable and non-durable goods. The USEPA provides estimates of refuse composition nationally for the year 2011 (See **Error! Reference source not found.**

Where Does Rhode Island Solid Waste Go? Where Could It Go?

Current waste generation and recycling estimates

The amount of solid waste generated in RI peaked between 2005 and 2007, dropping significantly after the economic recession in 2008. Annual waste generation, recycling and disposal have been consistent since then. Rhode Island's current annual solid waste generation, including recycling, is estimated to be approximately 1.5 million tons per year, with the majority being refuse. Forty-five percent (45%) is from municipal and fifty-five percent (55%) is from commercial sources. The next largest class of RI solid waste is C&DD, which represents more than 200,000 tons of material per year. While some C&DD is managed through municipal transfer stations, the large majority is generated, collected, and managed by the commercial sector. In addition, there are significant quantities of soils, sludge, and ash that are disposed at the Central Landfill, much of which is used beneficially in Landfill construction and as alternate cover when permissible.

In RI the majority of solid waste is processed or disposed by RIRRC. However, significant waste materials are being recycled, composted, or transferred to nearby out-of-state waste to energy (WTE) facilities operated by private firms. Table 1, Rhode Island Solid Waste Materials Managed, provides estimates of RI solid waste by sector responsible for collection, type of management, and broken out according to whether it is managed at RIRRC or not.

Detailed waste generation and recycling estimates for Rhode Island, along with the methods and assumptions, are contained in Appendix #: *Rhode Island Solid Waste Generation, Recycling and Disposal Estimates*. These estimates are primarily based on the scale data of waste disposed at RIRRC combined with data on material composition by source of refuse from USEPA publications (US Environmental Protection Agency, 2013). However, more precise estimates will be needed for future facility planning, and those estimates must be based on understanding the detailed composition of materials in the RI waste stream. RIRRC will conduct a thorough sampling and analysis of the RI solid waste stream during 2014-2015, and expect the results to be available in 2016.

Table 1. Rhode Island Solid Waste Materials Managed (tons)

Category	RIRRC Materials (2010 - 12 Average)	Other Facilities (estimated)	Total Materials Managed
Total Solid Waste Generated	1,113,000	393,500	1,506,500
Refuse	838,000	340,500	1,178,500
Commercial	359,000	299,000	658,000
Mixed Refuse	336,000	200,000	536,000
Segregated Paper and Packaging	7,000	75,000	82,000
Yard Debris Composting	9,000	20,000	29,000
Wood	6,000	1,000	7,000
Segregated Durable Goods	1,000	3,000	4,000
Other Recycling	0	0	0
Municipal	479,000	41,500	520,500
Mixed Refuse	354,000	3,500	357,500
Segregated Paper and Packaging	93,000	0	93,000
Yard Debris Composting	30,000	31,000	61,000
Wood	0	0	0
Segregated Durable Goods	2,000	4,000	6,000
Other Recycling	0	3,000	3,000
C&DD	162,000	53,000	215,000
Commercial	152,000	50,000	202,000
Unprocessed C&DD	60,000	50,000	110,000
Processed C&DD and Residuals	92,000	0	92,000
Municipal	10,000	3,000	13,000
Unprocessed C&DD	9,000	3,000	12,000
Processed C&DD and Residuals	1,000	0	1,000
Sludge, Soils and Ash	110,000	0	110,000
Commercial	107,000		107,000
WTE Ash	25,000		25,000
Soil	61,000	0	61,000
Sludge Ash	15,000	0	15,000
Sludge	6,000		6,000
Municipal	3,000		3,000
Sludge	3,000		3,000
Soil	0		0
Industrial	3000	0	3000

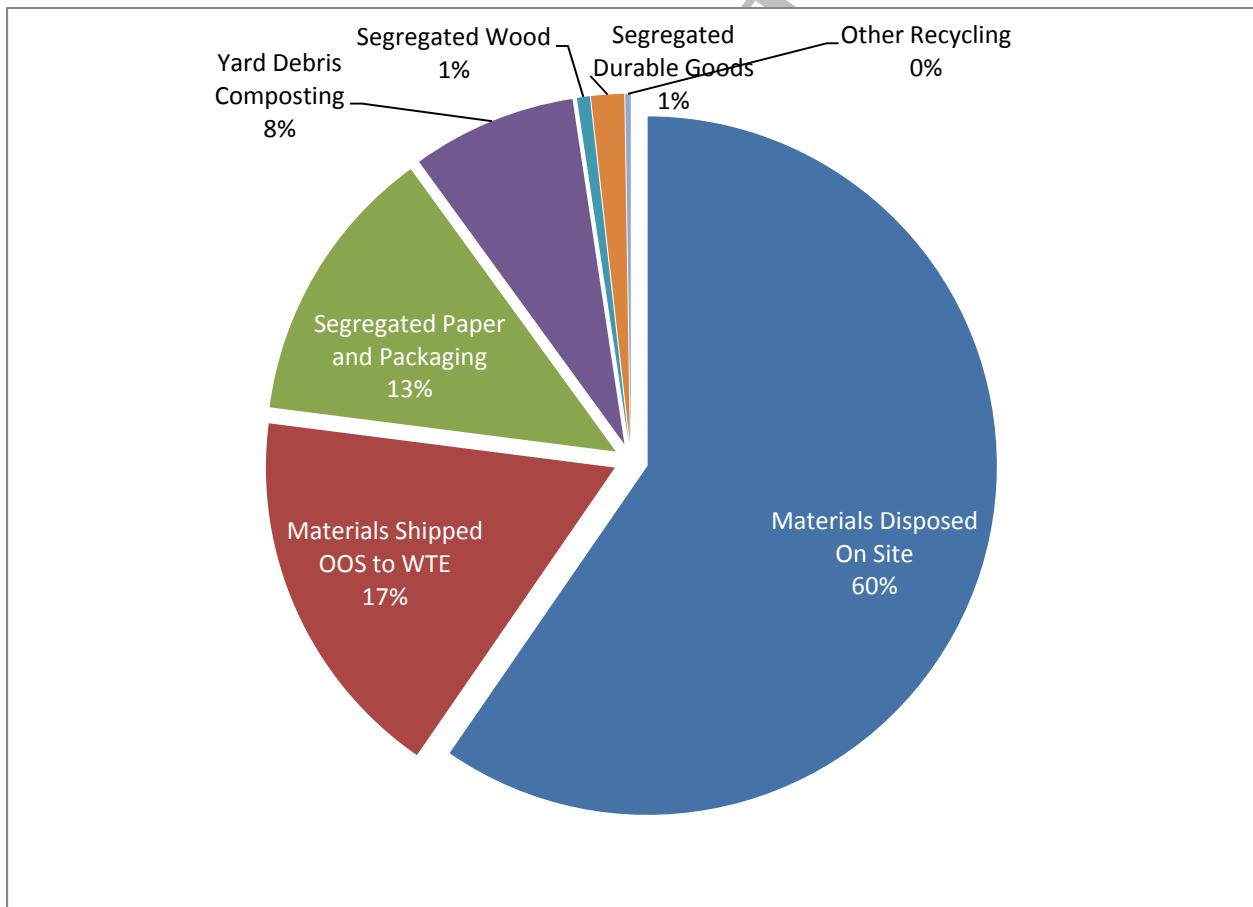
The ultimate destination of RI waste materials depends on who is managing it, how it is segregated at the source and collected, how much material is actually recovered in the processing of recyclables and from sorting refuse at transfer stations and whether it is disposed locally in a RI landfill or shipped to out-of-state disposal facilities. RI municipalities are required by law to bring their solid waste, refuse, and recycling to RIRRC or to facilities designated by RIRRC. This is known as “flow control”, and is a solid waste management tool defined by the USEPA as, “legal provisions that allow state and local

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governments to designate the places where municipal solid waste (MSW) is taken for processing, treatment, or disposal". Figure 2. *Current Disposition of RI Wastes* provides a breakdown of the current disposition of solid waste.

The majority of refuse in RI is disposed, with about 700,000 tons being buried at the RIRRC Central Landfill and another 200,000 exported to nearby states for disposal, primarily in WTE facilities. It is estimated that RI is currently recycling approximately 25% of its refuse, although without additional information from the private sector, this estimate is a best guess. This recycling is primarily municipal paper and packaging processed at the RIRRC Materials Recycling Facility (MRF). Commercial recycling occurs through transfer facilities and private recycling brokers, and yard waste composting at RIRRC and other private facilities. Other materials, primarily durable goods, are collected and recycled through programs run by RIRRC, municipalities, and the private sector. These materials include appliances, electronic waste, mattresses, and textiles.

Figure 2. Current Disposition of RI Wastes



In order to estimate the types of materials that are being captured from the refuse stream and how much material might potentially be diverted in the future, the USEPA's characterization of refuse by source (see Figure 1B.) can be aggregated into the RI refuse management categories identified in Figure

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2 above (with the addition of *food waste*). Applying the estimated refuse generation of 1.2 million tons to the USEPA characterization’s share of refuse by source, we can estimate current capture rates for the RI refuse stream and how much of each material remains disposed. Comparing the list of currently mandated recyclable materials to the USEPA waste characterization helps to understand the potential for further recycling in Rhode Island. **Table 2**, Estimates of Current and Required Recovery for Refuse by Source, shows the estimated disposition of RI waste compared to the USEPA estimate of the share by source.

Table 2: Estimates of Current and Required Recovery for Refuse by Source

Estimated RI Solid Waste Generation And Required Recycling Assumptions

Row Labels	EPA Sum of % of Generation	Estimated Generation (K tons)	Required Recovery	Estimated Recoverable * (K tons)	Estimated Current Recovery	Estimated Required Amount in Waste	Estimated Waste Remaining Under Required Recovery	
Non-Durable Papers, Containers and Packaging	39.00%	479	72.00%	345	182	163	134	
Durable Goods	19.7%	242	19.2%	46	28	18	196	
Food Waste	14.5%	178	0.0%	-	-	-	178	
Yard Debris	13.5%	166	90.0%	149	90	59	17	
Other	9.3%	114	35.3%	40	3	37	74	
Wood	4.0%	49	90.0%	44	7	37	5	
Grand Total	100.0%	1,229	51%	625	310	315	603	
			*Assumed Enforced Recovery Rate	90%	Recycle Rate	25.2%	TPD(K) Landfill	2.32

What are the options for managing wastes?

The most environmentally preferred and most cost effective option for managing solid wastes is to first prevent the occurrence of waste. Efforts to reduce the waste stream through home composting, donating old clothes, and office paper reduction programs, can reduce the amount of specific wastes. However, broadly speaking, when solid wastes are generated, they are either disposed directly as mixed waste in a landfill or incinerator, segregated into material specific fuels for the production of energy (e.g., wood/biomass, tire derived fuels, and anaerobic digestion of organics), or recycled into new products.

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Current Opportunities for Increased Recovery:

- **Paper and packaging:** These materials are targeted in RI's municipal recycling programs and include cardboard, office papers, printed materials, junk mail, paperboard and plastic containers holding fewer than two gallons. It's estimated that only a third of the products estimated to be in the waste stream are recovered for recycling. Commercial sector recycling of paper materials has had some success in larger enterprises, but for most small businesses and facilities, cost effective collection and recycling services are not practical under current markets and incentive structures. Additionally, some materials are not targeted in the existing program due to the lack of markets and the practicality of sorting additional materials.
- **Organics:** Potentially the greatest opportunity for the diversion of waste from disposal is organics diversion. Organic waste comes from two main sources--yard waste and food waste. Yard waste composting occurs at the highest levels of any source materials managed in RI with over half the estimated generation being composted. The feasibility of composting yard waste locally at a fraction of the cost of disposal allows this material to be widely collected. On the other hand, current collection and processing of segregated food wastes is practically non-existent in RI. Current food waste diversion is occurring in the form of home composting, a few instances of local neighborhood composting, mechanical digesting of commercial food waste, and the use of food waste as livestock feed. Current RIDEM regulations governing composting food wastes make it impractical to invest in on a large scale at the municipal level.
- **Durable goods:** Approximately 20% of refuse by source, durable goods offer another opportunity for diversion. Traditional recycling of durable goods occurs namely in the recycling of large metal appliances as scrap, and, until recently, the culling of tires for reuse as a tire-derived boiler fuel. More recent efforts to recycle durable goods have targeted electronic wastes and mattresses through extended producer responsibility (EPR) programs. Nonetheless, current capture rates for durable goods waste remain low.
- **Wood:** Segregated wood products are primarily pallets, clean construction debris, stumps, and large green waste. Segregated clean wood and wood chips managed by RIRRC are ground and used on site to stabilize landfill roads and for related site work. The use of clean wood as mulch or erosion control is the primary opportunity for reuse. The most likely opportunity for diversion of wood wastes from landfilling is to thermal biomass conversion as a boiler fuel.

The last source of refuse in the list above is the "Other" category. The items in this category are primarily non-durable goods and other organics, which include textiles, used motor oil and filters, household hazardous waste (HHW) among other items collected and recycled by municipalities. While there are opportunities to capture and recycle items in this category, its limited share of total refuse and the diverse nature of items covered make gains hard to achieve.

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While not included in the refuse portion of waste, C&DD, sludge, soils, and ash wastes need to be part of the discussion of management options. In practice, these other classes of solid waste are often managed in the same facilities as refuse, and may be used in a beneficial manner in landfills.

Construction & Demolition Debris

Rhode Island currently generates over 200,000 tons of C&DD annually. The C&DD waste stream offers significant opportunity for diversion from landfill disposal. Many materials in C&DD can be recycled: metal, cardboard, roofing shingles, siding, and clean wallboard from construction. Over the last decade in Rhode Island the face of C&DD processing has changed significantly. Historically, there were a handful of C&DD processing operations in RI serving the regional market. These facilities recovered the marketable components of the C&DD waste stream. What remained was buried in the landfill as waste with the screenings used beneficially as alternate daily cover. Just prior to 2000, RIRRC received approval to use ground C&DD debris as an alternate daily cover material for the landfill and entered the C&DD processing market.

While traditional processors significantly reduced the volume of the C&DD prior to disposal, RIRRC's process removed only metals, refuse, and other non-grindable components. Unable to compete with RIRRC's vertically integrated processing with the use of material in the landfill, many of the other C&DD processors ceased operation. Others have closed due to local opposition and poor economic conditions. More recently, in 2012, the use of C&DD materials as landfill cover was prohibited by statute in response to odor issues at the Central Landfill, resulting in RIRRC ceasing operation of its C&DD processing operations. All C&DD currently received at RIRRC is buried in the landfill as waste after the metals and cardboard are removed. As of September, 2013 there is only one C&DD processing facility in operation in RI. The J.R. Vinagro facility is permitted to handle 2,000 tons per day (tpd) of C&DD and 500 tpd of refuse. Much of the C&DD handled at this facility is believed to be from out of state.

Landfill disposal of sludge, soils, and ash ultimately cannot be avoided. Sludge from waste water treatment is closely regulated in RI by RIDEM, and limited amounts are allowed to be disposed at the Central Landfill. Most RI sludge is incinerated, with a small amount being composted with yard debris in Bristol. Ash from local sludge incinerators received at the Central Landfill and used beneficially as an alternate daily cover. Similarly, waste soils are disposed at the Central Landfill, and when permissible used beneficially as cover and as controlled fill in the construction of landfill caps. Sources of these soils are typically construction and remediation projects making year-to-year volume projections difficult, but these materials will continue to be disposed in landfills for the foreseeable future.

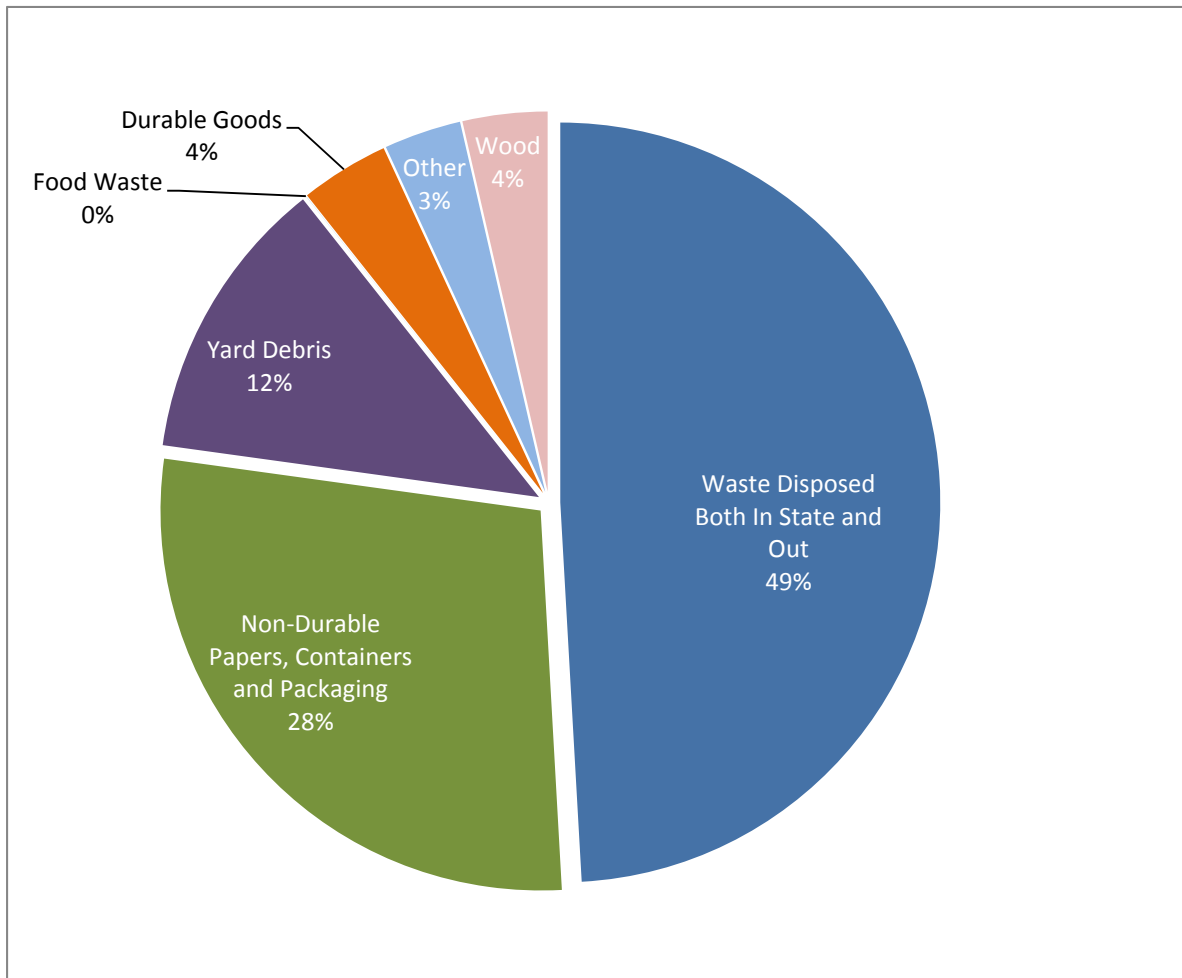
What is the realistically recoverable portion of solid waste and what will it take?

Given the estimates of waste by source, the mandatory materials in each source, and the recovery rates in **Table 2**, it is estimated that 50% of Rhode Island refuse currently mandated is recycled and composted (see Figure 3, Required Disposition of RI Refuse). The mandated materials are largely representative of items for which markets exist. Therefore, the mandated recovery provides a good

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indication of how much materials might be recovered at high rates of recycling. For example, if 80% recovery of food scraps were achieved in addition to the materials currently mandated, the refuse stream could be reduced by more than 60%. This would require a great deal of capital investment in processing facilities, coordination among participants managing waste at all levels, and a willingness among residents and businesses to reduce materials consumption and segregate wastes into multiple streams.

Figure 3. Required Disposition of RI Refuse (K tons)



Capturing 72% of paper and packaging will require a significant increase in collection of these materials, and will use the entire 150,000 ton two-shift capacity of the RIRRC MRF. Commercial sector recycling of paper and packaging will have to expand tremendously, and additional sorting capacity for commercial materials will have to be developed. Markets will have to be fostered for the hard to process plastics, glass, and bulky goods.

Yard waste diversion has been largely successful in RI but there still needs significant improvement to reach 90% recovery. Municipal collection programs will need to be expanded in underserved

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municipalities, and additional processing capacity will need to be permitted and developed. Preferably, yard waste will be composted locally, either at home or at neighborhood facilities, to minimize transportation and distribution costs.

Capturing 80% of RI food waste presents the biggest opportunity and perhaps the greatest challenge confronting this plan. Achieving large scale diversion of food waste requires the permitting and development of significant processing capacity. Comprehensive collection of food waste from both residents and businesses will need to be implemented, changing the way solid wastes are commonly managed at the source.

Collection and recycling of durable and non-durable goods will also need to expand. Some of these materials can be targeted through continued expansion of extended producer responsibility programs, while others such as textiles can be improved through market development and consumer education.

The commercial sector is poised to increase recovery of C&DD materials for recycling and for disposal in WTE facilities. In order to increase actual recycling, C&DD market development of outlets for some materials, such as clean wallboard and roofing shingles, will need to improve.

A final consideration is that the diversion of this magnitude of solid waste from land disposal will involve some form of WTE. This may be refuse incineration, refuse derived fuel, biomass conversion of wood waste, or the anaerobic digestion of organics, and may be operated, in RI or in neighboring states.

Who Does What

Responsibility for solid waste management in Rhode Island is divided among several agencies, but principally sits with the RIRRC and RIDEM. The current arrangement for solid waste management in Rhode Island is the result of major changes over the past 26 years that expanded the role of government and centralized functions at the state level.

In contrast to most other states, Rhode Island state government agencies not only regulate solid and hazardous waste management, but also provide recycling processing and disposal facilities for municipal and commercial solid waste. In Rhode Island, the small size of the state, the dominance of the central metropolitan area, and the minimal level of regional or county government have contributed to centralization of these functions at the state level.

Federal Government

EPA regulates solid waste management under the Resource Conservation and Recovery Act (RCRA). EPA, which has delegated its solid waste management regulatory authority to RIDEM, requires the state to adopt regulations and management plans related to solid, hazardous, and other wastes.

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Rhode Island Department of Environmental Management

In addition to broad authority to “supervise and control the protection, development, planning, and utilization of the natural resources of the state . . .” [RIGL §42-17.1-2], the RIDEM has specific responsibilities for solid waste management.

The Department’s major function is regulatory: permitting and monitoring solid waste facilities and adopting and administering regulations and environmental regulations (particularly, air, water quality, and freshwater wetlands that affect or are affected by waste management). These functions are primarily carried out by RIDEM’S Office of Waste Management. RIDEM also is responsible for enforcing commercial recycling rules and regulations, and for providing program assistance to commercial entities. Specific duties of RIDEM can be found in Appendix A.

Rhode Island Resource Recovery Corporation

RIRRC is charged with developing “an integrated statewide system of solid waste management facilities” [RIGL §23-19-4(b)], including recycling facilities. RIRRC plans, owns, and operates solid waste management facilities, and plans and implements commercial and municipal recycling and waste prevention programs. As the principal solid waste management organization in the state, RIRRC disposes of more than 70% of the state’s solid waste and processes more than 75% of the recyclables recovered from the municipal waste stream. There are two key areas of daily responsibility: Operations and Programs. (Details about RIRRC can be found in Appendix Details about the RIRRC can be found in Appendix *Rhode Island Resource Recovery Background Information*)

Operations

RIRRC manages five distinct operations on-site: the Central Landfill, the Materials Recycling Facility, a compost area, a residential/commercial drop-off area (known as the “Small Vehicle Area”), and a transfer station known as the Tip Facility. These operations function 300 days per year, serving over 210,000 customers annually.

Programs, Public Education, and Outreach ...

RIRRC is also responsible for keeping the public updated and aware of proper methods for disposal and recycling. Popular programs include field trips and public education tours of the facility, providing access to proper disposal of HHW through the Eco-Depot program, and facilitating Earth Day clean-ups through a tip fee waiver program. Program staff also provides technical assistance to municipalities, conducts waste assessments for businesses and institutions, participates in local, state, and regional organizations that further recycling and waste reduction goals, and develops tools and guidelines for recycling coordinators, “green teams”, and the general public to use to reduce solid waste. RIRRC staff maintains three corporation websites (rirrc.org, recycletogetherri.org, and greenzone.org), and manages the social media presence for the corporation as well on Facebook and Twitter.

Other State Departments

The Departments of Administration and Health

Department of Administration

Division of Planning

The Division of Planning provides planning services to the Governor and other state agencies; coordinates development decisions within the framework of state plans; maintains a planning information base; and provides services related to local planning and municipal affairs. The State Planning Council (SPC), which is comprised of State, municipal and federal government representatives and members of the public, provides policy direction to the Division of Planning. The SPC is responsible for promulgation of the State Guide Plan, which includes this Comprehensive Solid Waste Management Plan (Element 171) and other plans related to the physical, social, and economic development of the state.

Office of State Purchasing

The Office of State Purchasing is charged with promoting the purchase of recycled products as well as adopting regulations for purchasing recycled products. This office is also responsible for soliciting bids for and awarding contracts to collect solid waste and recycling from state offices and agencies.

Solid Waste Facilities Siting Board

The Solid Waste Facilities Siting Board was created in 1989 as a part of the Department of Administration. The Siting Board is charged with advising the Governor on the needs of RIRRC to acquire additional future solid waste management facility sites.

Department of Health

The Department of Health regulates management of infectious wastes from hospitals and laboratories as well as drinking water quality.

Local Government

Cities and towns, once the major providers and regulators of local solid waste disposal, continue to have an important but far more limited role in providing solid waste disposal service and in regulating private solid waste service providers. However, in some respects, particularly separation and collection of recyclables and directing the flow of locally generated solid waste, their responsibilities have expanded.

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Providing for Recycling and Disposal

Historical responsibility for solid waste disposal began to transfer from the municipalities to the State in 1974, accelerating through the 1980s as most municipal landfills closed. In 1992, the municipal tipping fee was set by statute at \$32.00 per ton while the average commercial tipping fee has averaged between \$50.00 to \$60.00 per ton.

A 1986 amendment to the solid waste statutes further limited municipal responsibility for disposal by excluding those wastes not acceptable at an RIRRC facility, as well as hazardous wastes. Collection responsibilities of municipalities were broadened, to cover separate collection of recyclables.

State law requires municipalities to adopt ordinances to mandate source separation and recycling programs and allows municipalities to design and implement programs to fit local circumstances. Local conditions vary greatly between rural, suburban, and urban communities.

Municipalities are required to deliver all recyclables recovered from their solid waste to an RIRRC facility. To meet this responsibility, most municipalities provide collection directly or by contract. In some communities, individual residents hire private haulers to collect their solid waste which may or may not be sent to RIRRC. As an incentive to encourage recycling and diversion, the General Assembly, in 1986, enacted a law saying that the discounted municipal tipping fee shall apply only to the solid waste tonnage disposed by each municipality which is less than or equal to an annual solid waste tonnage Cap established by RIRRC. All MSW in excess of a municipality's Cap is disposed of at a CSW tipping fee, which is substantially higher than the municipal tipping fee. In 2012 RIRRC revised the Municipal Cap Procedure to include seasonal households (Appendix xx).

Municipal Regulation

In 1975, the State assumed responsibility for licensing solid waste management facilities. In 1986, municipalities were authorized by state law to license local collectors, haulers, and operators of transfer stations [RIGL §23-18.9-1 (b) (1)]. Under the 1968 Refuse Disposal Act cities and towns were required to regulate collection, hauling, and disposal.

The 1986 legislation established requirements for the adoption of local regulations for:

- the fair allocation of the Municipal Tipping Fee among privately contracted collectors of municipal refuse [RIGL §23-18.9-1(b)(3)]; and
- the separation of solid waste into recyclable and non-recyclable components [RIGL §23-18.9-1(b)(4)].

Financing

Financial assistance, both direct and indirect, by RIRRC for municipal solid waste management activities has been extensive. Municipalities tip their recycled materials free of charge at RIRRC facilities and share in 50% of profits from recycling at the end of each fiscal year. RIRRC financed the first three years of each municipality's recycling program. RIRRC also provided each municipality, free of charge, with new blue and green recycling bins for the Maximum Recycling Program. In 2001, RIRRC began providing free household hazardous waste disposal services to residents. In 2004, the Corporation began receiving and composting leaf and yard waste from municipalities free of charge. In addition, RIRRC has made available annual grants (totaling more than \$100,000 dollars over three years) to municipalities. RIRRC has provided a wide range of recycling and waste prevention-related research and innovative technology and program grants totaling more than one million dollars to municipalities.

Municipal solid waste costs are generally financed by local general revenues, largely the property tax. Charlestown, Hopkinton, New Shoreham, North Kingstown, Richmond, South Kingstown, Narragansett, West Greenwich, Tiverton, Central Falls, North Smithfield, West Warwick and Westerly however, have implemented various types of partial and/or hybrid user-fee programs to pay for the cost of solid waste collection and disposal.

Municipal Facilities and Operations

Tiverton landfill

Aside from the Central Landfill the Tiverton municipal landfill (still in operation at the time that this Plan was adopted) is the only other solid waste disposal facility in RI. Tiverton is the only municipality specifically exempted from the requirement to deliver all solid waste to the Central Landfill because the town has an active landfill. However, this landfill serves Tiverton residents exclusively and disposes of about 3,500 tons per year. It is expected that the Tiverton landfill will be at capacity by 2023.

Municipal Compost operations

Ten municipalities operate yard waste composting facilities accounting for about 20% of the state's permitted composting capacity. The local processing of this waste stream reduces transportation costs.

Municipal Recycling Centers

Municipally-operated recycling centers are few; however those that do exist are highly used. The cities of Warwick and Woonsocket provide the greatest level of service to their residents.

Table 3. Permitted Composting Facility Capacities

Composting Facilities - Solid Waste	Operator Type	yd3/year	Tons/Year
Barrington Compost Facility	Municipal	25,000	6,250
Bristol Compost Facility	Municipal	4,000	1,000

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Burrillville Compost Facility	Municipal	3,500	875
Charlestown Landfill and Compost Facility	Municipal	4,000	1,000
Donnigan Park LLC Compost Facility	Private	15	4
East Providence Composting Facility	Municipal	30,000	7,500
Jamestown T.S. and Composting Fac.	Municipal	600	150
North Kingstown T.S. and Compost Facility	Municipal	8,000	2,000
Pascale Landscaping	Private	2,000	500
Pawtucket Compost Facility	Municipal	5,000	1,250
RIRRC (Central Landfill) Compost Facility	RIRRC	304,000	76,000
Richmond Sand & Stone Compost Facility	Private	150,000	37,500
Site-Ready Materials and Recycling Compost Facility	Private	10,000	2,500
Smithfield Peat Compost Facility	Private	100,000	25,000
Swan Point Cemetery Compost Facility	Private	3,000	750
Warren Compost Facility	Municipal	3,700	925
Warwick Compost Facility and MRF	Municipal	52,000	13,000
Total		704,815	176,204

The Town Of Johnston

In April 1996, RIRRC and the Town of Johnston ratified a Host Community Agreement. Under the agreement, RIRRC annually pays the Town a base payment of \$1.5 million, 3.5 percent of RIRRC's previous fiscal year's gross revenues, allows a set amount of additional free tipping for Johnston residents, and methane royalty payments. In the first full year of the agreement, FY 1997, these payments totaled more than \$3.2 million and have exceeded \$3.2 million annually thereafter due to escalators built into the payments.

The Host Community Agreement contains various "good neighbor" provisions whereby the Corporation agrees to provide in-kind services such as road sweeping and litter pickup in the vicinity of the Central Landfill. Perhaps the most important good neighbor issue is to control odors.

Private Sector Role

As governments have assumed more responsibility over waste management, the role of the private sector has also changed, with most municipal refuse now either collected or transported to the Central Landfill by private haulers under contract to municipalities. In 2014, only five municipalities-- Bristol, Coventry, Lincoln, Warwick, and West Warwick--collected trash and/or recycling curbside using their own staff and equipment. All other municipalities either contract out the collection of trash or leave it to homeowners to individually drop-off trash and recycling or hire private haulers for the purpose. The success of most municipal recycling programs depends not only on the quality of municipal

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management, but also on the effectiveness and efficiency of the haulers' operations and the relationship between the haulers and the municipalities that hire them. While municipalities have maintained an operational and/or management role in the field of municipal recycling, there is little operational involvement by state or local government in commercial recycling.

Haulers

The hauling industry in Rhode Island has undergone significant transformations over the past 20 years. By 2004, after a period of consolidation during the 1990s, the hauling industry in Rhode Island was dominated by two large, publicly-owned national firms, Republic Services and Waste Management, Inc. In addition, three other RI haulers (Patriot, Waste Haulers, and Mega/MTG) have grown dramatically since 2006. Together, these five firms (the "major players") control approximately 75% percent of the commercial solid waste business in the state. There were also roughly 35 small, local privately-owned firms active in Rhode Island in 2014. No private sector firm has owned a landfill in Rhode Island in the past 20 years.

Private haulers recover large volumes of recyclable materials, particularly wood and corrugated cardboard. Some haulers specialize in processing construction and demolition debris and recovering recyclables from the C&DD stream.

The commercial waste hauling industry is segmented into three types of entities; the major full service providers, smaller full commercial service providers, and strictly open top roll-off service. The major players all have some degree of vertical integration into transfer, processing, or disposal markets. They provide all types of collection services but dominate the dumpster front-end loader market. The smaller haulers provide both dumpster and enclosed compactor container services to commercial customers, and may also provide subscription services to residential customers in some locations. These haulers are typically localized and account for 15% of the RI commercial sector waste. The most prevalent service provided by the largest number of commercial solid waste haulers is the open top roll-off. There are about 50 small private commercial haulers that participate in a competitive roll-off container market largely servicing the construction industry. These smaller operators handle about 10% of RI commercial sector solid waste. Finally, special wastes such as sludge, medical wastes, organics, and hazardous wastes are handled by companies that specialize in these materials.

Transfer Stations

Almost 460,000 tons, nearly 40%, of Rhode Island's solid waste moves through transfer stations; 200,000 tons to out-of-state locations, and the rest to RIRRC. Ownership of these facilities is a mixture of public and private, with some municipally-owned transfer stations are operated by private sector contractors. The majority of RI refuse transfer capacity is concentrated at a few large facilities, primarily operated by private waste haulers. These larger transfer stations receive materials from both municipal and commercial collection vehicles to facilitate the transportation of wastes over longer distances in tractor trailers trucks with hauling capacities in excess of 100 yards.

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The rest of the transfer stations are relatively small, operated or owned by municipal governments, and intended to serve residential customers as a drop-off option for small quantities of refuse, recycling and special materials. These smaller facilities are predominantly located in rural communities that often do not provide curbside collection of household refuse, or in municipalities that provide the drop-off facility as another service to residents.

C&DD

As of May 1, 2014, , there were only two C&DD processing facilities permitted in RI, the J.R. Vinagro (aka, Patriot Hauling) facility and RIRRC's operation, both in Johnston. J.R. Vinagro accepts materials from the region, and segregates materials that can be diverted from the waste stream such as cardboard, metal, wood, concrete and other aggregates.

Table 4. Permitted Rhode Island Solid Waste Transfer Stations and Residential Drop-Off Facilities

Transfer Stations	Type	C&DD (Tons Per Day)	Refuse	Privately Controlled
Waste Haulers LLC Transfer Station (N. Smithfield)	Transfer		650	650
Blackstone Valley Regional Transfer Station (Woonsocket)	Transfer	50	600	600
Bristol Transfer Station	Residential		75	
Burrillville Transfer Station	Residential		60	
Charlestown Transfer Station	Residential		15	
Coventry Transfer Station	Transfer		100	
East Greenwich Transfer Station	Residential		8	
Exeter Transfer Station	Residential		40	
Glocester Transfer Station	Residential		35	
J.R. Vinagro Corp. C&DD and Transfer Facility (Johnston)	C&DD	2000	500	500
Jamestown Transfer Station	Residential		36	
Little Compton Transfer Station	Residential		13	
New Shoreham Transfer Station	Residential		31	
Newport Transfer Station	Transfer	200	300	300
North Kingstown Transfer Station and Composting Facility	Residential		25	
Portsmouth Transfer Station	Residential		70	
Providence Transfer Station	Residential		150	
Prudence Island Transfer Station	Residential		4	
Richmond Transfer Station	Residential		50	
Service Transport Group Transfer Station (Woonsocket)	Transfer		30	
South Kingstown (Rose Hill) Transfer Station	Both		390	390
Warren-Barrington Regional Transfer Station	Transfer		75	
Waste Management Transfer Station (Pontiac Ave.)	Transfer		750	750
Waste Management Transfer Station (Warwick)	Transfer		1440	1,440
West Greenwich Transfer Station	Residential		7	
Westerly Transfer Station	Both		200	
Total		2,250	5,654	4,630

Transfer Stations	Type	C&DD (Tons Per Day)	Refuse	Privately Controlled
Tons Per Year (260 days)		585,000	1,470,040	1,203,800

Commercial Recycling

The question “How do we increase commercial recycling in RI?” has been asked, without receiving a satisfactory answer, for more than a decade. There are approximately 28,000 businesses in Rhode Island, only a small percentage of which recycle. Businesses with greater than 50 employees were informed by letter from RIDEM that they are required to recycle and report on how much they recycle. Although there was an initial uptick in the number of companies contracting with waste haulers to recycle, as reported to the Department by various waste haulers, this initial wave faded over the first couple of years as threat of enforcement failed to materialize. The majority of businesses with fewer than 50 employees are either unaware that recycling is mandatory or are unable to find a cost effective means to do so.

Currently, from data collected at the scales going in and out of RIRRC, it is believed that of the material processed at the MRF at RIRRC in 2013, 10% was from the commercial sector. From the data collected in the annual recycling surveys, of the companies that report, the recycling rate for the commercial sector is closer to 30%. Although the recycling rate is increasing slowly, for the commercial sector it is not rising significantly enough to extend the life of the landfill. This may not necessarily be a problem however, as a significant amount of commercial waste, and commercial recycling, is processed outside of Rhode Island.

Legislation Roles and Responsibilities

Commercial generators are made up of businesses and apartments or condominiums that do not have their trash picked up by the municipality. Commercial generators are required by statute¹ (1986) and regulation² (1996) to recycle. Although cities and towns are not required to collect recyclable materials

¹ RIGL "Waste Recycling" 23-18.8-2(5)

² Rules and Regulations for Reduction and Recycling of Commercial and non-Municipal Residential Solid Waste

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from commercial generators, they are encouraged to work with local small businesses to provide the service.

For businesses with 50 or greater employees, RI laws include very specific language requiring them to contract for recycling services if they already contract for trash services³. This law is unofficially called the 'dumpster law' meaning that for every dumpster of trash, there should also be a dumpster of recyclable materials.

Common Misperceptions

Recycling is Free

Commercial entities unlike residents must pay for recycling out-of-pocket at the time the service is provided. Because many businesses employ RI residents, and because residential trash and recycling services are largely paid for through property tax, there is the misperception by employees that recycling is, or should be, "free".

In reality, collecting recyclable materials is free for neither municipalities nor businesses. The costs associated with collection come from an additional truck, extra workers, truck maintenance, and fuel. Larger companies may recycle enough material to see a significant drop in waste disposal which would translate to cost savings. Small businesses will, most likely, pay more to contract for the collection of recyclable materials than they would for one bin of unsorted trash and recyclable materials. RI Law encourages municipalities to work with businesses to collect recyclable materials but does not require that they provide collection services.

Recyclable materials are separated from the trash at RI Resource Recovery Corporation

Because RIRRC is able to separate some recyclable materials (mostly cardboard, wood, and metal) from trash on the tipping floor, many waste haulers have been actively misleading their customers to believe that this is true for bagged trash as well. Some waste haulers have told their customers that it is acceptable for the customers to combine their recyclable materials with their trash or for the waste hauler to combine separated recyclable materials with trash because it will be sorted at RIRRC. This is false.

³ RIGL "Waste Recycling" 23-18.8-2(13)

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The limited sorting done by RIRRC is not comparable to source separated recyclable materials. RIRRC is only able to separate the largest of the recyclable materials such as bulky plastics, clean drywall, and appliances. Bagged trash is always buried directly in the Central Landfill without further sorting.

Obstacles to Improvement

Lack of staffing at State Agencies

RIDEM is currently the only state agency with the authority to enforce the laws and regulations requiring businesses to recycle. Presently, there is only ¼ of a full time employee (FTE) dedicated to Commercial Recycling at RIDEM. Recent legislation, i.e. ‘the dumpster law’, affords RIDEM very clear language to pursue enforcement. The time required to bring a company into compliance can fluctuate if requiring the issue of one letter or phone call to several over the course of a few months. The Department has not established a manner for compelling the estimated 28,000 Rhode Island businesses to recycle without more staff. Cities and towns, facing the same understaffing difficulties, have the authority to adopt ordinances but, with the exception of Westerly, have not done so to date.

RIDEM and RIRRC provide staff for waste assessments and outreach to the public. RIRRC also forwards complaints against businesses or landlords to RIDEM. With these two agencies working together, only 10 – 15 enforcement cases are identified each year. In order to start an enforcement case, the Department requires that someone files a complaint. The Department cannot take enforcement action against a business with only a cursory inspection of the visible containers outside the building.

Lack of Resources

In the past, RIRRC was able to provide recycling bins to schools and businesses that wanted to start recycling programs. Many small businesses, schools, and apartment/condominium complexes are easily frustrated when faced with an immediate capital cost before they institute a recycling program.

Lack of Knowledge in the Commercial Sector

Businesses are often willing to recycle but are confronted with impediments outside of their control. A key impediment is a lack of space for additional containers to facilitate solid waste separation. Many businesses do not have the space to put an additional dumpster or a tote outside their buildings for recyclable materials. In this situation, the only options are to work with the municipality, or to bring recyclables directly to a recycling facility.

Restaurants and bars face significant challenges regarding recycling and composting. Some of these businesses have made attempts to start recycling programs. The kitchens in restaurants and bars are not usually designed to facilitate placement of large bins that can be emptied easily when needed. The space behind the bar is limited as well.

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Hospitals have little free space as well. Although patients are served meals in recyclable containers, finding a place to put a bin to collect those recyclables from the tray is a challenge. However, there is a growing trend in both the hospitality and health care industries towards finding solutions to these issues.

Next Steps

If no additional FTEs can be hired, RIDEM will continue to take enforcement action when appropriate under existing staffing levels. Efforts have been made to reach out to the recycling coordinators of all cities and towns to increase enforcement. RIDEM also collects data from the annual recycling survey. In 2013, compliance with the survey reached 70% for businesses with 50 or greater employees. RIDEM is on-track to introduce new recycling regulations in 2014.

RIDEM and RIRRC will continue to work together to provide waste assessments. RIRRC staff will also maintain an outreach program for schools.

- Education & Outreach

Widespread educational outreach informing businesses that recycling is mandatory is critical. Newspaper articles, online outreach, and mailed flyers or notices (sent with documents from other state agencies such as Division of Taxation) will be the most efficient means of communicating. Staff can also contact professional associations, and chambers of commerce to do brief talks about the recycling laws.

Education must contain both an explanation of how the recycling laws pertain to the businesses and the options a business can take to comply with these laws. Businesses must also be given the names of staff that can help them start recycling.

- Implementation

or those businesses with locations that prove to be underserved by waste haulers, RIDEM or RIRRC staff could help facilitate the formation of co-ops. These co-ops will act like office parks and with combined buying power have waste haulers bid for their services.

- Enforcement

After an agreed upon time, there must be follow-through for those businesses that have not started recycling programs. With additional staff, the Department will have the ability to enhance its enforcement efforts.

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Other Private Sector Activities

In addition to the private sector waste haulers, other private businesses play important roles in reuse of waste materials, recycling, and the management of special wastes. Scrap yards and paper brokers have been an important part of the recycling industry long before the public sector began taking more responsibility of coordinated municipal recycling. The reuse industry is dominated by both for profit and non-profit entities. Consignment stores, swap shops and refurbishing businesses all foster important reuse activities that help keep goods from being prematurely discarded. In addition there are numerous non-profit organizations (Goodwill/Salvation Army/Big Brothers, etc.) that facilitate reuse through donation of clothing and durable goods. Other non-profits specialize in redistributing surplus supplies to the arts and education (Resources for Rhode Island Education).

Some private enterprises are finding their niches as a result of Extended Producer Responsibility (EPR) laws. For example, the Electronic Waste Prevention Recycling and Reuse Act passed in 2008 has fostered the creation and growth of several firms performing collection, recycling and program management functions surrounding the recovery of e-scrap from residents. Likewise, the recently passed EPR law for paint is being implemented by the industry sponsored group, PaintCare.

Private sector involvement in the management of organic wastes is growing. Privately run yard waste composting facilities shown in Table 3. *Permitted Composting Facility Capacities* serve both municipal and commercial customers. Food banks and soup kitchens redistribute surplus food, and pig farms use post-consumer food scraps as feed. There is limited farm-based composting of food scraps, and as of 2014, two pilot scale localized community food scrap collection and composting projects were operational. As of May 2014, there were two anaerobic digesters being planned, one in North Kingstown and the other in Johnston. At this time, neither has yet been permitted.

Markets for Disposal and Recycling - Yesterday, Today and the Future

RI participates in regional markets for solid waste disposal. Recycled commodities recovered in RI are shipped not only regionally but also to national and international customers

Recycling Markets

While scrap brokers and on-farm composting have been around for years, large scale municipally coordinated residential recycling and composting is relatively new in the United States, with the first programs beginning in the late 1980s. Since that time more and more communities in North America have implemented recycling and composting programs, and the markets for recovered commodities has grown.

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Paper and Packaging Markets

Because commodities markets continue to evolve prices for recycled commodities have been marked by short term periods of instability over the last two decades.

Table 5 below provides commodity prices for commodities shipped from the RIRRC MRF. Paper (or fiber) prices drive the market basket value of paper and packaging recyclables recovered at the MRF. Like all commodities fiber markets are driven by supply and demand, and over the past decade the demand has come mainly from China. Metal fetches the most attractive prices per weight with prices following the scrap market. Plastic container recycling has grown over the last decade and prices typically respond to oil markets as a competing source of plastic resin. While the middle of the last decade was marked by sluggish commodity markets, the years just prior to the economic crises saw prices rise to a peak. When the economy collapsed at the end of 2008, so did commodity prices. The up and down cycle continued, eventually reaching all-time highs in 2011. More recently, commodity prices have returned to the long run averages.

Stable markets for recycled commodities are necessary for the viability of the State's recycling efforts. For municipalities, these revenues fund the MRF sorting operation and, when profits are high, provide profit shares back to municipal customers to help fund public municipal recycling programs. Stable prices for recovered commodities foster commercial recycling by providing certainty to businesses and institutions implementing and funding recycling initiatives. Recycling collection programs cannot easily be turned on and off when markets dip. As a "just-in-time" facility, material is tipped, sorted, baled, and shipped within 48 hours of delivery to the MRF.

Table 5. Average Prices Paid for RIRRC MRF Commodities by Year (\$/ton)

Year	Fiber	Metal	Plastic	Weighted Average
2005	\$63.11	\$343.68	\$464.48	\$110.12
2006	\$56.73	\$500.16	\$379.15	\$110.07
2007	\$90.76	\$511.07	\$409.22	\$145.01
2008	\$108.52	\$551.27	\$442.02	\$163.90
2009	\$59.61	\$277.11	\$241.51	\$89.74
2010	\$99.99	\$491.25	\$419.46	\$157.08
2011	\$131.46	\$605.05	\$614.79	\$208.39
2012	\$86.94	\$484.13	\$383.23	\$151.78
2013 (YTD July)	\$84.02	\$478.02	\$395.58	\$147.63
Weighted Average	\$86.56	\$470.49	\$416.94	\$142.34

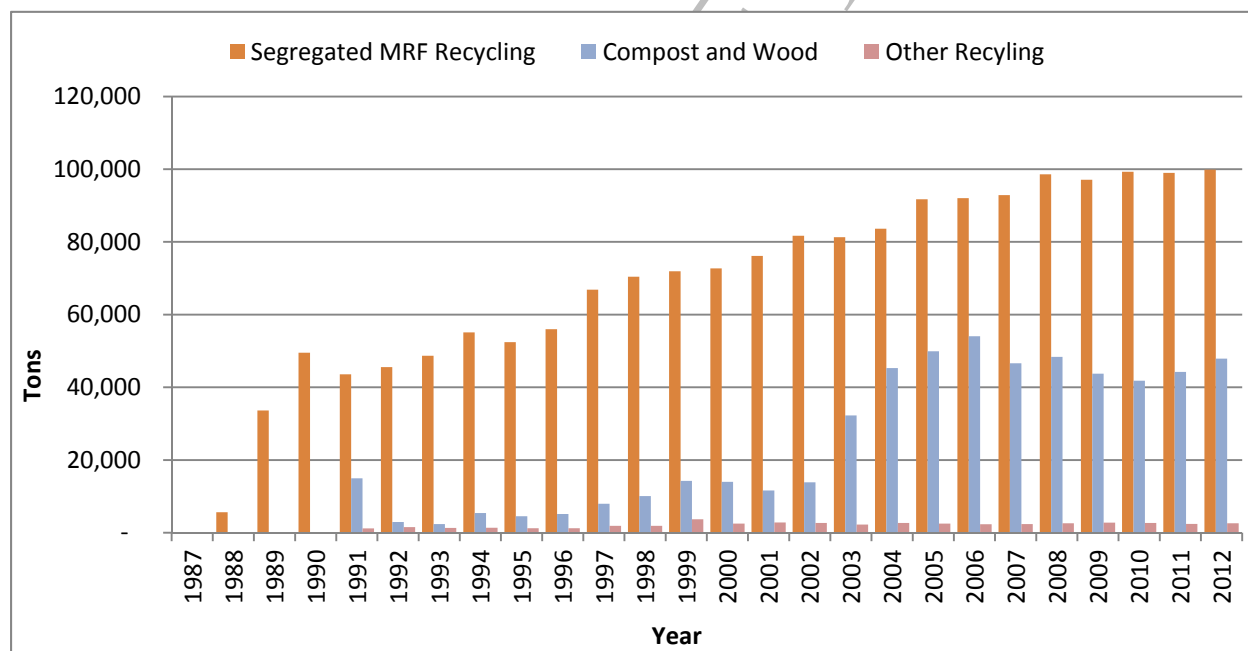
The historical volume of recycling delivered to RIRRC has grown steadily since the program's inception, through the 1990's until about the middle of the last decade (see Figure 2. Historical Recycling Received

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by RIRRC). Volumes grew through the 1990's as RI municipalities gradually implemented the State-mandated recycling program for paper and packaging. The program has been expanded twice since the original program to include additional materials such as mixed papers and plastics. Levels of recyclables recovery at the MRF have been relatively consistent over the last decade even though materials have been added and municipal collection programs improved. Stagnation in total weight recovered has occurred mainly because packaging has changed significantly over the past two decades.

The most marked change in the composition of paper and packaging over the past decade has been the decrease in newsprint generated and recovered. Newsprint, once the staple commodity of municipal recycling programs, is being consumed less. Decreasing circulation and fewer pages being printed per issue have contributed to the decline in weight of this commodity. USEPA estimates indicate that newsprint generation in the United States has fallen 38% from 2000 to 2011. The other major change in paper and packaging has been a shift from glass, steel, and aluminum packaging to plastic containers. While glass, steel and aluminum containers combined have decreased by 16%, lightweight plastic container packaging has increased by almost 30%.

Figure 2. Historical Recycling Received by RIRRC



Compost Markets

The market for composting segregated yard L&Y in RI is composed of RIRRC's facility, a number of municipal operations, and a handful of commercial operations including on-farm composters. The annual volumes of compost received at RIRRC have increased dramatically since 2003. However, markets had little to do with this increase. RIRRC adopted a policy to eliminate the tip fee on yard waste from municipalities in order to encourage collection from residents. While no significant increase in

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collection of residential yard debris resulted, several municipalities diverted material from local and private sector composting operations to RIRRC's facility. Even though the volume processed by RIRRC has increased dramatically, the overall amount of yard waste composting in RI has remained relatively stable.

Markets for compost and wood landscape products are both local and regional. For smaller municipal sites, finished compost is often provided for free or for a small fee to residents. Other sites will distribute to landscapers and end users directly and more compost is being marketed regionally through brokers that distribute to landscaping outlets and large site construction projects markets. Because compost products vary significantly by producer, feedstock and quality and location, valid average price data is not available. Generally, high-end composts can command \$50 per yard retail. Wholesale prices paid to composters are typically much less. RIRRC sells some of its Class "A" compost directly to users for \$30 per yard, and makes approximately \$5 per yard wholesale. As of May 2014 RIRRC has not been able to market the majority of its compost product in any given fiscal year.

Other Materials

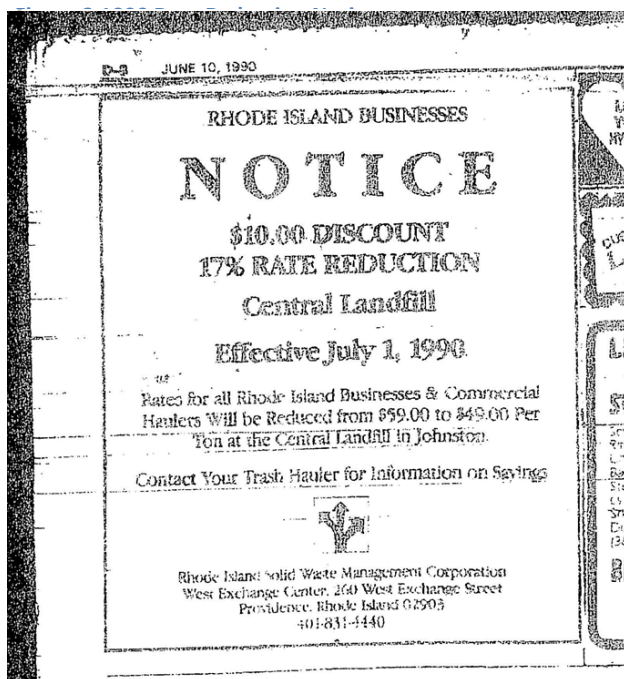
Scrap metal and textiles have well developed markets that existed long before the expansion of coordinated municipal recycling. Markets for other waste materials, such as electronics, mattresses, and tires, are developing, partly in response to EPR initiatives. The collection programs for these "non-MRF" materials must be further developed to encourage the growth of the respective industries.

Solid Waste Disposal Markets

In RI, statute dictates that municipal refuse and recycling be sent to RIRRC for disposal (known as "flow control"). Demand for commercial disposal at the Central Landfill is influenced by regional disposal markets, the relative tip fees being charged and transportation costs. Regional disposal markets are impacted by the economy, waste generation, and recycling efforts.

Regional Disposal Market History

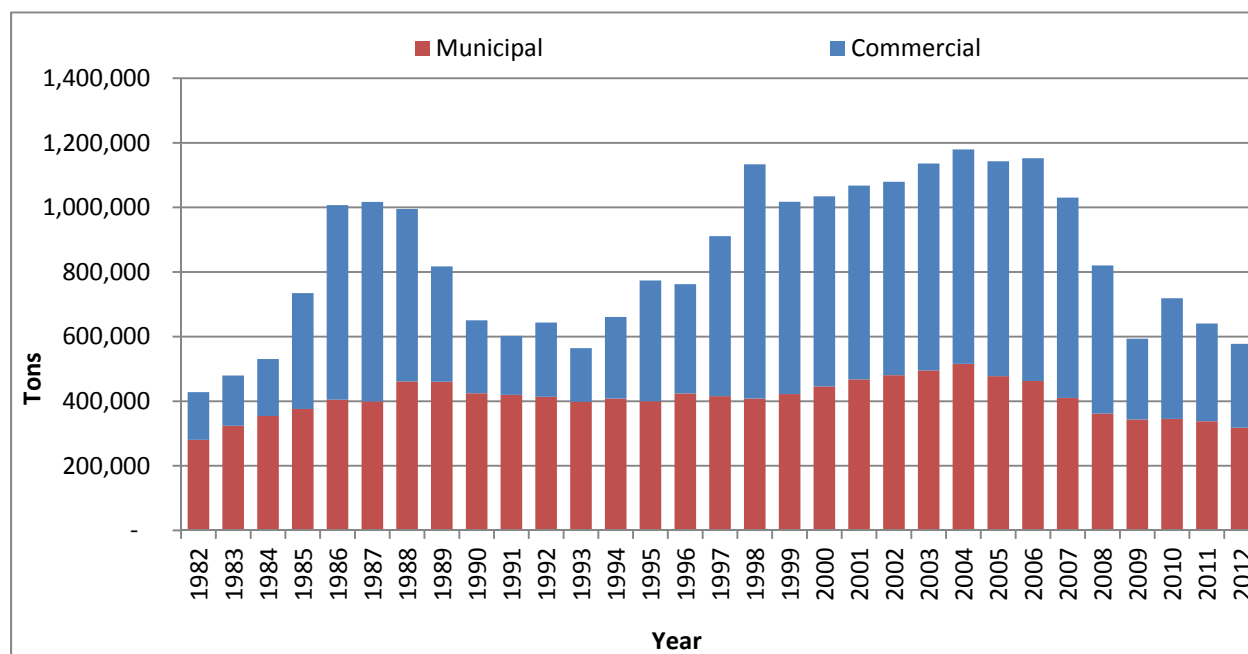
Figure 4. *Thirty Years of Refuse Delivered to RIRRC* provides important historical perspective to the RI commercial waste disposal market. Commercial waste disposal at RIRRC has peaked and declined twice over this time. Because RIRRC is prohibited from accepting wastes from out of state, the peak years for



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disposal are a good approximation of the RI generated refuse disposed. External forces on the RI commercial market included regional capacity issues (adding then removing capacity), WTE development, pricing, and “put or pay” contracts at RIRRC and in MA and CT. The economic crash in 2008 brought waste generation tumbling down and resulted in an excess supply of disposal capacity in the region. In response, commercial disposal volumes at RIRRC dropped again to historic lows bringing lucrative commercial revenues to a halt.

Figure 4. Thirty Years of Refuse Delivered to RIRRC



Current Disposal Market

As demonstrated by recent history, the southern New England market for waste disposal is sensitive to large changes in waste generation. Based on RIRRC volumes and anecdotal evidence, estimated waste generation in the region fell more than 15% for households and over 20% in the commercial sector. The regional supply of waste disposal capacity is dominated by WTE facilities that must continue to operate at maximum capacity in order to meet power generation obligations and stay profitable (see [Table 4. Rhode Island Market Dominated By WTE](#) below). Therefore, WTE operators are, in the short term, willing to drop their prices well below average costs in order to attract waste from a larger area.

Table 4. Rhode Island Market Dominated By WTE

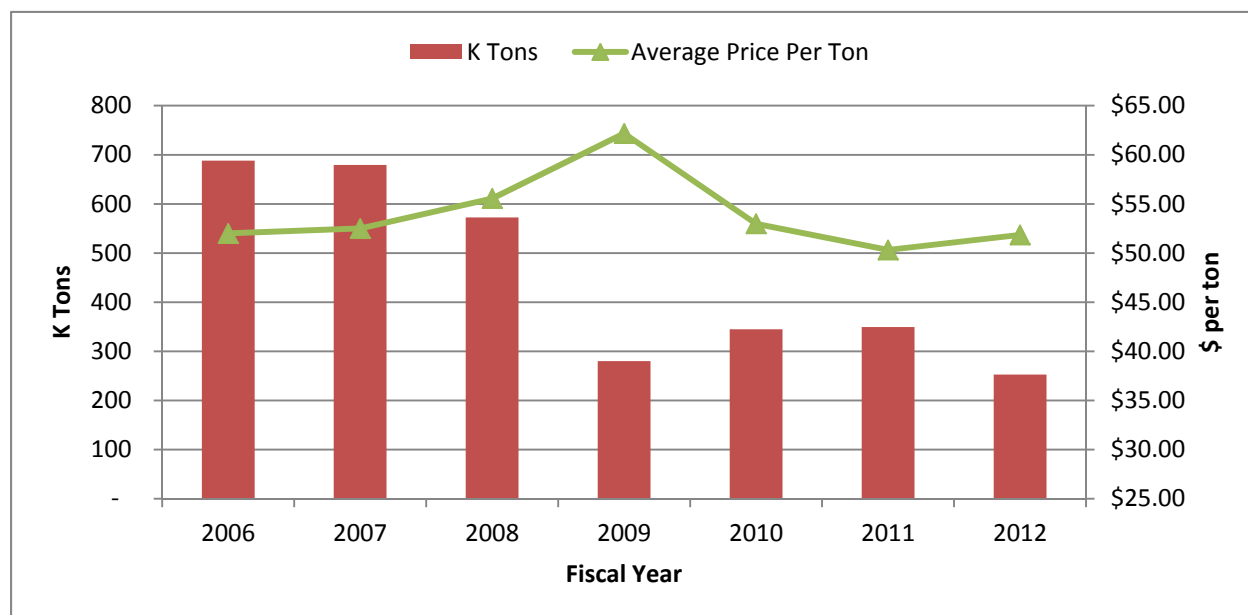
	Number of Incinerators	Percent Incinerated	National Rank
Connecticut	6	65%	1
Massachusetts	7	34%	2
United States	87	7%	N/A

Table 6. New England Solid Waste Disposal Capacity (Annual Tons)

Year	Landfill	WTE	Supply Total	Demand	Excess Capacity
2008	5.9M	6.7M	12.6M	~ 12.6M	None
2015E	5.0M	6.7M	11.5M	~ 10.0M	+1.5M

Currently, waste disposal is a buyer's market. Estimated regional waste generation is about 10 million tons per year with a current supply of disposal capacity at approximately 11.5 million tons, resulting in a significant over supply of capacity in the region. This over capacity will keep pricing unstable for the foreseeable future. Figure 5. Recent RIRRC Commercial Refuse Disposal and Pricing provides commercial volumes and pricing for 2006-2012 and shows that while prices are at all-time lows, the volumes have not returned. Haulers handling large volumes and controlling transfer capacity can shop their waste around the region and command favorable pricing even when factoring in the cost of transportation. Therefore, there is no opportunity to raise RIRRC's commercial disposal prices at this time.

Figure 5. Recent RIRRC Commercial Refuse Disposal and Pricing



Economics of managing waste

The management of solid waste is largely driven by economics. Markets, logistics, and technology all impact our options for managing waste materials. The solid waste management industry is comprised of a vertically integrated mixture of services and commodities. Waste materials flow from the generation sources, through hauling service providers, then on to processors and disposal facilities. Materials from processing facilities can be further refined or sold as commodities for manufacture to process into new goods. Process waste residues from recycling, composting, and waste to energy operations are sent to disposal facilities. While markets play a large role, federal, state and local policy decisions also have a major influence on the fate of our wastes. The decisions made regarding waste at all levels are ultimately based on the costs of the options available, individual knowledge and preferences, and the set of incentives facing all the actors involved in the flow of waste materials to its ultimate fate.

The overall direct cost of waste recycling and disposal is comprised of collection, transportation, and fees for disposal and processing. Sometimes the costs associated with collecting and segregating recyclable materials are offset by the sales of materials. For the casual observer, it is often puzzling why more recycling doesn't occur when recovered materials are worth money and waste costs money to dispose. The fact is that the cost of separating, collecting, and transporting additional materials quite often does not cover the net difference in revenue from the sale of recovered materials and the savings from avoided disposal fees.

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Participants and Incentives

The options facing waste generators are constrained by the programs and services offered by local governments and private service providers. While municipalities have a critical role in the level of service provided to residents and how it will be paid for, the specific materials that can be collected for recycling are dictated by State level policymakers. Likewise, waste haulers and recycling service providers can only provide collection of segregated recycling if there is access to processing capacity and markets for recovered goods.

For many households and businesses waste prevention and recycling is done because it is “the right thing to do”. For many other households the main motivators for participating in available recycling programs is whether their neighbors do, and whether it is enforced. Often for businesses, requirements to recycle and the threat of enforcement are motivations, as is the desire to be “eco-friendly”. Similarly, municipal program managers, policymakers, and waste service providers implement programs and often provide services for recycling to satisfy mandates and the public pressure to be environmentally responsible. However, all participants respond to costs and price signals, and long term sustainable diversion of solid wastes from land disposal will require that recycling collection, processing, and alternative disposal technologies be cost effective.

Costs are distributed differently to households and businesses. For most RI households the cost of recycling and disposal collection is not paid directly, but paid collectively by the municipality through tax revenues. Therefore, most residents do not understand the costs of their waste generation. There are some municipal programs that charge households for disposal based on the amount of waste generated while providing recycling collection for no charge to incentivize participation in recycling and encourage waste prevention. Regardless, for most residents the actual costs of waste management programs are recognized by the local municipal program managers and policymakers tasked with providing a set of public services and faced with a budget constraint. The level of effort by municipal waste managers to provide and promote recycling services is a function of the associated costs, mandates from the state, and political pressure to be “eco-friendly”.

Because commercial waste generators pay for waste and recycling services directly, like the municipal manager, their level of recycling effort will depend largely on the net costs, but also mandates, and the desire to be environmentally responsible. Commercial haulers will provide recycling services when revenues from materials can offset the additional costs for recycling, or when businesses are willing to pay extra for such service. However, in most instances waste hauling firms have very little incentive to promote waste reduction or the segregated collection of recyclables to their customers.

Collection and Transportation Costs

Source separation Logistics

Strategies for recovering materials from the refuse stream can involve varying degrees of source separation of recycling. Most residents and businesses can adapt to some degree of sorting recyclables

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when provided with the proper containers and education. However, in many cases and particularly for small businesses, space constraints can hinder opportunities to source-separate recycling. More important is the impact that multiple material sorts at distributed sources has on the over-all cost of recycling collection.

Collection Costs

Recyclable materials tend to have a greater volume and much lower weight than trash. A truck for recyclable materials requires more trips for the same tonnage of recyclable materials as trash. This is why adding separate recycling collection services is costly, and why RIRRC converted its MRF to a single stream facility, providing municipalities the opportunity to significantly reduce the cost for collecting recyclables. Likewise, reducing the frequency of collection reduces costs, and every other week collection of recycling is being adopted in some communities. For collection services provided to multiple customers per route, the density of stops also plays a factor in costs. Collection costs can vary greatly depending on the type of customer served, but typically they make up the majority of the cost associated with the management of solid for households and small business. Generally speaking collection costs by customer or per volume handled are largely dependent on the amount of material collected at each stop. Costs increase when more materials require separate collection. It was for this reasons that RIRRC converted its MRF to a single stream facility, providing municipalities the opportunity to significantly reduce the cost for collecting recyclables. Reducing the frequency of collection also reduces costs. Every-other-week collection of recycling has been adopted in communities across the country. Route density also plays a factor in costs. Commercial customers serviced via high volume compaction containers and C&DD open top roll-off collection containers have the lowest collection cost per ton. Collecting refuse and recycling from commercial and multi-unit residential customers provided with dumpster service costs more per ton but still less than collecting curbside from households.

Recycling collection costs are related to the program's set out requirements (i.e., how material is to be sorted—for example, separate containers for glass, paper, and cans), frequency of collection, and level of community participation. By adjusting the variables that affect collection costs, communities can lower these costs.

In general, the per-ton or per-household costs of collecting recyclables:

Increase with the number of separately segregated commodities. Single-stream is the least costly to collect, followed by two-stream, etc.

Increase with the frequency of collection. Collecting half as frequently (e.g., every other week instead of weekly) can reduce collection costs by approximately 25 percent, assuming traditional two-stream set outs.

Decrease as more materials are collected by the program. If few households participate in the program and the program does not collect many commodities, the per-household cost soars, as it is costly to drive a recycling truck past household after household that has not set out recyclables.

(US Environmental Protection Agency)

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Transfer and Transportation costs

Transportation is a major factor in waste management costs. More material transported per load equals lower transportation cost per ton. Collection vehicles of all types are limited in volume, with the largest running about 30 cubic yards. When the destination for collected materials is greater than 30 miles, it is more cost effective to use transfer facilities and aggregate waste into large (100+ cubic yard) tractor trailers. This creates transportation efficiency and allows more time for collection vehicles to be on route collecting. Transfer facilities offer an opportunity to screen waste, provide flexibility in choice of disposal destination, provide convenient public drop-off for refuse, and allow for the collection of special wastes.

Solid waste transfer stations are necessary for commercial haulers to move significant amounts of waste to neighboring states. Control of RI transfer capacity allows the larger private haulers the ability to shop for the best prices for their RI commercial wastes. The private firms that control RI's transfer capacity also have an opportunity to attract other haulers and compete directly with RIRRC for RI's commercial waste load. Given that the existing RI solid waste transfer capacity of 1.4 million tons approximates the statewide total waste generation, the potential exists for additional commercial sector waste to move to neighboring states in this time of regional over- supply.

Processing and Disposal Costs

Processing waste and recyclables takes many forms: WTE, refuse-derived fuels, mixed waste processing to separate organics and inorganics, anaerobic digestion, sorting of segregated papers and packaging, and composting to name a few. Disposal takes the form of WTE processing and land disposal. Typically mixed waste and recycling processing costs are offset by revenues from the sale of recovered materials and energy. But for most processing operations for mixed wastes and organics, tip fees are needed to ensure profitability.

Sorting operations for paper and packaging and C&DD have typically been labor intensive. Over the past decade these operations have increasingly relied on automation, requiring high up-front capital costs. Processing that converts waste and segregated organics to energy have even higher initial capital costs, must run at capacity to satisfy energy agreements, and must receive sufficient tip fee revenues to cover fixed costs.

Burying unprocessed solid waste in a landfill is the least expensive method of disposal. However, the economics of landfill disposal differ from processing in that landfills are non-renewable resources of a finite capacity. The upfront costs to construct a landfill and the construction costs to cap and close a landfill once full are amortized over the entire life of the facility and remain constant for each ton landfilled, regardless of the loading rate of waste. In addition to these upfront costs there are operating costs, many of which are fixed, which include personnel, machinery, leachate collection, and landfill gas management costs. While some costs can be adjusted over the long term in response to changes in loading, others cannot. The period of time a landfill cell is open and accepting waste results in higher operational costs in order to manage leachate, gas, and erosion control. Once a cell is capped these

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costs gradually decline. As loading rates increase, the average cost per ton for landfilling decreases. From the standpoint of minimizing cost over the life of a landfill, all the better to fill it up, cap, and close as quickly as possible. Obviously, such a short sighted view neglects to consider the demand for disposal today and in the future. There is a trade-off between revenue today and future revenues. While RIRRC could lower its tip fees further and attract more commercial waste for disposal in the current period, it would come at the risk of higher costs per ton in the future.

Financing Facilities, Planning and Flow Control

Given the high cost of developing WTE, waste processing and recycling facilities, large amounts of capital needs to be raised to fund such projects. Unless project developers, such as RIRRC, can demonstrate the ability to maintain sufficient sources of incoming materials at an adequate tip fee to cover the debt service, such projects are not feasible. Since the 1970's more and more jurisdictions have used solid waste flow control to fund such projects and plan integrated solid waste management systems. Over the last two decades there were key legal challenges to flow control provisions that brought into the question their viability under the commerce clause of the U.S. Constitution. In 2007, the U.S. Supreme Court heard its first solid waste management case in 13 years, *United Haulers Association vs. Oneida-Herkimer Solid Waste Management Authority*, and clarified that the local ordinance that directed locally-generated wastes to publicly-owned waste facilities did not interfere with interstate commerce.

Rhode Island Statute RIGL § 23-19-10(40) specifically provides RIRRC authority over where all RI refuse and recycling may be delivered for processing and disposal, and RIRRC has maintained and exercised control over municipal sector waste and recycling. However, challenges against flow control provisions in other states in the 1990's brought into question the validity of such flow control provisions on RI commercial wastes. Therefore, even though specific flow control regulations were adopted by RIRRC in 1991 that would give RIRRC authority over commercial sector wastes, this authority has yet to be enforced. Given the Supreme Court ruling and the emphasis on waste diversion in this plan, a reconsideration regarding the role of flow control on commercial sector is warranted.

“Flow controls are legal authorities used by State and local governments to designate where MSW must be taken for processing, treatment, or disposal. This waste management approach requires waste to be delivered to specific facilities such as waste-to-energy (WTE) facilities, materials recovery facilities (MRFs), composting facilities, transfer stations and/or landfills. The facilities can be either publicly or privately owned. One of the direct effects of flow control is that designated facilities are assured of receiving a guaranteed amount of refuse and/or recyclable materials. If the designated facilities charge a ‘tipping fee’ for receipt of the refuse/recyclables, flow control assures a source of revenue to meet their capital and operating costs.” (Flow Control and Municipal Solid Waste (EPA 530-R-95-008), 1995).

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External Costs

In addition to the direct costs associated with managing solid wastes, there are costs to society that are not recognized on financial statements or by disposal markets. These costs, known to economists as external costs, arise from factors such as odor, litter, air pollution, the risk of potential ground water contamination, and various other environmental and social impacts. While pollution abatement and environmental protection efforts at the Central Landfill continue to expand, air emissions or the risk of some future ground water contamination, common risks associated with the operation of any landfill, need to be addressed. Waste to energy, composting, and even recycling operations have associated externalities of some sort. Quantification of such external costs is difficult but not impossible. Policymakers should recognize the existence of such costs and where possible obtain estimates of the magnitude of external costs associated with different waste management options.

Planning & Climate Change

When planning new facilities, consideration must be given to climate change effects of any new technology or location. Additionally, closed and capped municipal landfills in areas vulnerable to sea level rises must be continually evaluated to ensure that there is no possibility of breaching the cap.

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III. KEY ISSUES FOR SOLID WASTE PLANNING IN RHODE ISLAND

The following key issues have been identified:

ISSUE #1: What overall strategy should be adopted now to further reduce solid waste volumes and preserve landfill life beyond the projected 2038 date?

ISSUE #2: What is the post Central Landfill disposal option that will provide the most environmentally sound and economically viable waste disposal services with the least amount of risk?

ISSUE #3 How does Rhode Island fund the system...both in the short term and long term and what should be the structure used to set pricing?

Issue #1: Reduce Solid Waste Disposal

Today RI diverts approximately 25% of its waste from disposal through recycling and composting. In addition, another 200,000 tons per year of Rhode Island's commercial sector waste are disposed at facilities outside of Rhode Island as the result of the competitive regional disposal market. There is more work that can be reduced by generating less and recycling more. While RIRRC does not dictate where commercial waste is disposed, the amount of this sector's waste deposited at the Central Landfill can be influenced through pricing. To extend the life of the Central Landfill beyond 2038, commercial waste diversion programs and policies will need enactment soon in order to shape the decisions regarding the long-term systems that will replace the Central Landfill as the primary destination of RI's solid waste.

In terms of opportunities to reduce disposal, there are several major ones. Just recycling 90% of RIDEM-approved materials⁴ would reduce RIRRC's solid waste disposal by about 25%, or 200,000 tons per year. Other wastes, not currently mandated for recycling including food waste and other organics, construction and demolition debris, and other goods, offer opportunities for diversion in the near term too. Reaching higher levels of recycling will require public education, local champions, and financial

⁴ Primarily paper, packaging, yard debris, and white goods.

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incentives/disincentives for recycling. Furthermore, municipal and commercial sectors will require different approaches to this problem.

Rhode Island residential customers served by municipally run programs generally do a good job recycling paper and packaging and yard debris composting. However, some municipal programs do have significant room for improvement. Those municipalities that do not achieve satisfactory recovery rates for these mandatory materials must be identified and the barriers to more effective programs removed. At the household level, recycling and composting can be improved through the implementation of unit based pricing, user fees, provision of adequate storage capacity for recycled materials, and more education.

Households served by the commercial sector, including multi-unit housing and those with subscription service, tend to be less successful at recycling. This is due to the added collection cost and the lack of any coordinated enforcement of recycling mandates. This constituency should be a primary target for capturing additional mixed paper and packaging for processing at the RIRRC MRF.

Unlike residential waste, discards from businesses are not consistent and not all commercial sector recycling is suited to processing in the mixed residential recycling stream. Commercial sector programs and expectations need to be defined by the industrial classification of the business. In Rhode Island commercial sector recycling is handled by paper and scrap brokers and the hauling industry. Many large commercial and institutional generators currently segregate large amounts of paper and packaging for recycling. However, most small to mid-sized businesses do not have formal programs for recycling due to additional costs for services, storage and collection logistics, and lack of information regarding opportunities to recycle. For most businesses, the potential savings from reduced disposal and revenue from recycling does not offset the added cost of collecting recyclables. While mandatory recycling for commercial businesses has been in place for almost two decades, it is only applicable to large businesses and it has been largely unenforced.

After paper and packaging, food wastes offer one of the greatest opportunities for further waste diversion in Rhode Island. However, given the coordination required among diverse municipalities and RIRRC along with the infrastructure needed to process this material, large-scale statewide residential food waste processing must be considered in the context of the longer-range plan addressed below. Nonetheless, the State can implement programs immediately that target reduction of household food waste and promote home and neighborhood composting of kitchen scraps. Food processors and large institutional or commercial food service operations offer more immediate opportunities for composting and anaerobic digestion. In fact, statutory changes in nearby CT and MA targeting large commercial food waste generators have recently gone into effect and present an opportunity to piggy-back similar initiatives in Rhode Island.

Construction and demolition wastes are another opportunity for diversion. The only local options for generators and haulers of these materials are J.R. Vinagro Corporation C&DD and Transfer Facility or the RIRRC Central Landfill, both located in Johnston. Currently large amounts of C&DD are landfilled,

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unprocessed and as residual waste from sorting operations. Potential outlets for sorted construction and demolition wastes are:

- wood to Biomass energy
- cardboard for recycling
- recovery and reuse of aggregates
- scrap metal
- recycling clean wallboard back into gypsum or soil amendments

While the C&DD stream provides important revenue for RIRRC, the preference is for these wastes to be sorted, recovering the materials with value for reuse and recycling.

Because markets exist for items such as large appliances and other scrap metal, textiles, rigid plastics, and film plastics these opportunities should be expanded, perhaps through improved drop-off locations. However, in some communities access is limited or residents are not aware of the available opportunities. Improved coordination between RIRRC and municipalities to provide and publicize these recycling opportunities should occur. Unfortunately, markets don't yet exist for every item disposed.

Many hard to handle manufactured items lend themselves to recycling if successfully recovered. Extended producer responsibility programs require manufactures to take responsibility for the end of life disposition of their products, and also encourage "design for recyclability". These programs shift the cost burden of managing such wastes from municipalities to manufacturers while incenting manufacturers to design their products to be more readily recycled.

Finally, a common barrier to diverting any of these waste streams is Rhode Island's low overall cost of disposal for both the municipal and commercial sectors. Loading of commercial sector waste at the Central Landfill can be controlled through pricing, and it can be expected that price increases in RI will likely shift waste to out of state disposal facilities. Nonetheless, any upward pressure on price will incentivize entrepreneurs to further reduce, recycle and compost more solid wastes. Municipal activities, most often dictated by mandates, are less subject to market pressure and pricing than the commercial sector. However, municipal managers will advocate and support programs when cost justified, and higher municipal disposal fees will incent further waste diversion from municipal programs.

Issue #2: Post Central Landfill Disposal Options

The Central Landfill will someday close. At current landfill loading rates, and with restraint on future loading, the landfill should remain operational until 2038. That time can be extended if aggressive waste diversion is accomplished, however Rhode Island will soon need to decide on the disposal options for after the landfill closes. This decision cannot be delayed if the state intends to engage in a thoughtful stakeholder process. In order to do this, decision makers will need better information.

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Indeed, the decisions regarding Rhode Island's solid waste system of the future are complex. The options present a host of interrelated tradeoffs among environmental and financial risks, collection and processing technologies, as well as present and future interests. The long-term planning horizon magnifies the uncertainties about markets, economy, technology, environmental law, and other forces affecting solid waste management. All options are expected to cost more than current local landfilling at Johnston. All will have environmental impacts and implementation risks. These factors argue for having maximum flexibility in the chosen disposal system.

The answers to such long-range issues are beyond the scope of this plan. Decision makers need a better understanding of disposal and recycling markets, collection systems, processing technologies and their associated costs, environmental impacts, and associated risks. The recommended actions of this plan must lay the groundwork so that the next five-year update can recommend the system of facilities that Rhode Island can rely on well into the future.

Issue #3: Funding

Underlying both the near term issue of reducing disposal and long-range issue of what to do after the landfill is exhausted is how to fund RIRRC and its system of facilities and programs. One of the major barriers to increasing recycling and composting in the near term is the relatively low cost for disposal of waste. Complicating this issue is the fact that RIRRC's primary source of revenues comes from disposal fees; decreasing disposal results in less revenue to fund operations, including waste diversion programs.

Since 2007, RIRRC has increased the projected landfill life from 15 to 25 years by reducing the annual volume of solid waste by 400,000 tons. Approximately half of the decline was due to reduced overall solid waste generation. The other half resulted when RIRRC increased commercial pricing, encouraging the two largest haulers to take volume out of RI to either their own WTE facilities in CT and MA or to meet long standing 'put or pay' requirements. These changes required RIRRC to reduce costs to offset the lower revenues:

	F2007A	F2013A	Difference	% Change
Tonnage	1.1M	.7M	-.4M	-36.4%
Revenue	\$69.8M	\$46.0M	-\$23.8M	-34.1%
Op Costs	\$66.5M	40.2M	-\$26.3M	-39.5%
Op Profit	\$3.3M	\$5.8M	\$2.5M	NA

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This restructuring has eliminated most discretionary costs as well as excess variable or volume related costs. The remaining fixed costs will not decline with further volume reductions. These costs include the host community fees, insurance, utilities, building and equipment maintenance, amortization etc. This category of fixed costs is now at least half of RIRRC's total landfilling costs.

Disposal Financials	Municipal	Commercial	Weighted Average
Tip Fee/Ton	\$32	\$50	\$45
Landfilling Cost/Ton	\$43	\$43	\$43
Profit (Loss)/Ton	\$(11)	\$7	\$2

Funding is a looming issue because:

- 1) The current municipal tip fee of \$32/ton is below the cost of landfilling (\$43/ton).
- 2) After 22 years of no increases, and despite major cost reductions by RIRRC, cumulative cost inflation combined with volume decreases have overtaken the \$32 rate.
- 3) Commercial fees cannot be increased now without further volume/revenue erosion.
- 4) Any other solid waste volume reductions can no longer be offset by internal cost reductions due to the high level of fixed cost that cannot be reduced with lower volume.
- 5) RIRRC's current cash flow is negative and unsustainable beyond FY2017
- 6) Disposal fee increases or new funding sources will be needed beginning in FY2018.

This is the challenge: The pursuit of environmentally attractive programs to extend landfill life that reduces solid waste volumes (and revenues) will require additional fees or subsidies to implement.

Legislators through various statutes and annual budgetary measures have dictated the rate RIRRC can charge municipalities for disposal for over 20 years. In the absence of any such legislation, RIRRC has the authority to increase the municipal disposal fee. However, given the long history of legislative involvement, any attempt by RIRRC to increase the municipal price is likely to meet swift resistance. Even if a rate increase makes it through such a process, it is likely to be minimal, and based solely on operating cost.

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Clearly, this process is not well suited to addressing the current disposal market, the desire to preserve the local landfill capacity, and the need to fund a system of facilities over the long run. Nor is it likely to achieve the disposal fees high enough to encourage significant waste reduction and recycling.

Given RIRRC's authority over the flow of municipal sector wastes, municipalities are the Corporation's primary customer and have a stake in how to best use the Central Landfill. As such, pricing commercial waste and setting target loading at rates at the Central landfill are factors that need consideration when pricing the municipal sector. A fee setting system is needed that is fair, predictable and promotes diversion from disposal, to best serve the municipalities, commercial entities, and RIRRC.

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IV. Strategy Options That Address Key Issues

Issue #1: Reduce Solid Waste and Preserve Landfill Life

Three broad strategies have been identified for potential implementation, starting in 2015. These strategies should not be seen as mutually exclusive; indeed components of each may make sense to employ together. Continuing to work towards landfill life extension is prudent, so as to not potentially lose ground while studying long-term options for solid waste management beyond 2038.

Option 1: Maintain Status Quo

- Maintain current loading of 750k tons/yr.
- Seek incremental improvements in existing reduction/recycling programs
- Minimal investments in new projects
- Manage facility to minimize tip fee increases

Under the “Status Quo” strategy, the State would not take on new major investments in system, policy, or program enhancements. Rather, Rhode Island would continue along the current path, loading the landfill at approximately 750,000 tons per year, finally exhausting the asset in or around 2038. Incremental improvements to existing waste reduction and recycling programs would include:

- Continue providing technical assistance to Rhode Island cities and towns as they seek continual improvement;
- Continue providing waste reduction and waste prevention assessment services to businesses, municipalities, and schools;
- Continue offering school field trips and public tours of the RIRRC facility and operations;
- Maintain and update as needed the educational material on RIRRC websites; and
- Continue providing access to safe disposal of household hazardous waste via the Eco-Depot.

New projects will be evaluated for statewide application, and projects with limited likelihood of replication by local officials would most likely not be considered. Instead, RIRRC would recommend to local authorities that they seek outside sources of funding for projects not deemed to have statewide appeal.

Under this scenario, RIRRC would minimize tip fee increases by reducing the depth and breadth of free programs offered. As of 2014, school field trips, public facility tours, and off-site educator presentations are all offered free of charge. This practice would be examined for efficiency and potential to raise revenue. The Eco-Depot program is also offered free of charge to Rhode Island residents, and currently operates over 45 events each year at a cost of nearly one million dollars, compared to eight events under RIDEM management. No other state provides the access to HHW disposal that Rhode Island does.

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Option 2: Invest in New Programs and Policies to reduce waste

- Continued funding of existing waste reduction and recycling programs
- Solid Waste loading reduced up to 200K tons
- Increase paper and packaging recycling
- Expand Extended Producer Responsibility
- Increase commercial recycling and begin implementation of food waste diversion
- Mandatory statewide Pay As You Throw implemented
- Consider statewide RIRRC managed residential recycling collection system

This strategy involves reducing landfill loading volume up to 200,000 tons annually, mainly through implementing new programs and maximizing results from existing programs. Implementing new diversion or recycling programs will require a study of the content of the waste stream. In early summer 2014, RIRRC intends to issue a Request for Proposals to conduct a waste characterization study and analysis to guide decisions regarding food waste and organics diversion, waste to energy, and additional recycling needs and potential for recycling market development. It is anticipated the study will be complete in 2015 or 2016.

The results of the study will be critical in determining the feasibility of implementing full-scale food scrap collection and processing. In January 2014, the RI General Assembly introduced legislation to require commercial food waste segregation and composting within 20 miles of a licensed food composting facility. If passed, this legislation would incentivize commercial composters to construct digester facilities and/or traditional compost sites in Rhode Island by creating a steady source of feedstock.

EPR laws may provide some financial relief to RIRRC, the state, and cities and towns by requiring manufacturers of targeted products to pay for the responsible disposal or recycling of their product at the end of its useful life. Examples of existing EPR laws in Rhode Island are mercury thermostats, mercury auto switches, electronic waste, paint, and mattresses. Other products so far identified as having high potential for EPR are carpets, sharps, tires, rigid plastics, and paper and packaging.

Mandatory statewide Pay As You Throw (PAYT) was recommended as a potential action item by the Senate Commission to study Paper and Packaging EPR (2013). PAYT is a pricing mechanism by which the generator of solid waste pays directly for its disposal, through either a special bag, a special tag affixed to an ordinary trash bag, a specially designated cart, or at the scalehouse of a transfer station or landfill. In Rhode Island, most residents “pay” for trash and recycling services through their property taxes. There are no bills sent directly to the home or to the resident (the generator of the waste). Collection services are seen, in effect, to be “free”. This perception does not create an incentive to reduce waste and recycle more. However, if the generator is required to purchase a special bag (which is the only bag the municipality will collect), or a special tag (without which the municipality will not collect), then waste becomes more valuable, particularly if recycling services continue to be seen as “free”. PAYT has been shown to increase recycling and decrease waste disposed in each community where it has been

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implemented. Implementing such a program would allow cities and towns to shift the cost of either a portion of the program or the entire program down to the generator of the waste. Doing this would be a way to mitigate any tip fee increases; the bag or tag would be priced to pay the tip fees.

Traditionally, PAYT programs are implemented at the local level and have various pricing mechanisms and rates. A bold alternative to cities and towns implementing individual PAYT programs is to have one system statewide centrally managed by RIRRC. All residents would be required to participate and use a standard refuse bag. However, municipalities would be relieved from the burden of paying disposal fees for those loads consisting of bagged residential refuse. The fees generated from the bag sales would fund RIRRC operations and programs, with the excess fees distributed back to municipalities to offset their refuse collections costs. Such a program would not only accomplish a statewide user fee system for refuse disposal, but also addresses the looming funding issue discussed in more detail on page 51.

Another aggressive program alternative for consideration is statewide RIRRC run residential recycling collection service for all RI households. RIRRC would contract with multiple vendors for the collection of residential recycling statewide, relieving municipalities the burden of collecting MRF processed recyclables. In turn, municipalities would pay a fee per ton for the recyclables collected in each city or town to RIRRC. These fees along with the revenue from the sale of materials at the MRF would on average cover the cost of the statewide collection program. Such a system would improve recovery of residential recycling by standardizing the collection program for all residents, ensure that all residents have convenient collection, and reduce overall collection costs through economies of scale in management and consolidated procurement of services. Furthermore, this arrangement would better instill cooperation and accountability among households, collectors, and the MRF operator to maximize recovery and minimize contamination recyclables in RI's flagship recycling initiative. This model may also provide a mechanism for expansion to a separate organics collection in the future.

Option 3: Become primarily a Municipal Disposal Facility

- Reduce commercial Solid Waste loading by 250,000 tons through price increases, pushing volume out of state
- Preserve landfill capacity for municipalities

The third short-term strategy gains the most landfill life, however the cost to municipalities would be the highest. If all commercial solid waste was eliminated the tip fee would approach \$80/ton and would increase landfill life from 25 years to about 60 years. By using price increases to discourage most of the commercial volume, the vast majority of landfill capacity would be reserved for the cities and towns. In the long run, this may be the best use of the landfill asset. However, with commercial customers no longer subsidizing the municipal disposal fee, the cities and towns would pay the full, true cost of landfill disposal. Paying the full cost of disposal would lead municipalities to make changes to their local diversion programs and collection system, and would focus decision-makers on improving recycling rates.

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If the Central Landfill became a primarily municipal facility, the cities and towns would more keenly feel a sense of responsibility to maintain the asset for as long as possible, and presumably would want a louder voice in how the asset was managed. This could be facilitated by changing the structure of the Board of Commissioners to become more like a private sector shareholder Board of Directors, with municipal representatives holding seats on the Board.

Issue #2: Post Central Landfill Disposal System

The high stakes and major costs associated with managing RI solid waste disposal after 2038 when the existing landfill closes justify an extensive analysis of the solid waste options for RI. Options that warrant evaluation include:

- 1) Transport/Dispose most of RI waste at out of state facilities.
- 2) Upgrade technology to process solid waste.
- 3) Pursue a Zero Waste objective.
- 4) Expand landfill capacity in Rhode Island.

There is no single desirable strategy option. All have positives and negatives. Trade-offs will need to be considered across economic, environmental, and risk parameters so the best overall option can be implemented. Stakeholders will need to take a global view of this trade-off process and may need to be done without perfect information as the long term planning horizons are by definition filled with technological, environmental, economic and legislative uncertainty. RIRRC will utilize experts and consultants to assist in this analysis. It is expected this will need an estimated five years to be researched, confirmed, vetted across many constituencies, funded, permitted, designed, and approved. The target timeframe is to complete the analysis by 2020 with implementation of the recommended long-range action commencing before 2025, or roughly 13 years prior to the landfill's expected expiration.

Option 1: Transport Most RI Waste to Out of State Facilities

This option will consider the opportunity to capitalize on excess capacity at out of state facilities to dispose of 320,000 tons of annual municipal solid waste. There are currently 13 incinerators in MA and CT, in addition to numerous landfills, that offer potential economic advantage compared to other long term options. Contract term, price risk, and environmental and philosophical concerns need to be addressed as part of the evaluation of this option.

Option 2: Utilize Technology to Process RI Solid Waste in Rhode Island

Waste conversion technologies have advanced significantly in the past ten years. RIRRC will undertake a review and analysis of known technologies, and would address their feasibility to process RI's solid waste. Technologies to be studied would include (and not be limited to): mass incineration, pyrolysis, plasma arc, gasification, anaerobic digestion, chemical digestion, and any other newer technologies that

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are known at the time of commissioning the study. The analysis will include (but not be limited to): the capital investment needed for a 2,500 ton per day mixed waste facility; the tip fee required to pay the capital, debt service and fund all operating costs; electricity sale revenues; operating costs; statutory considerations; the timeline for all processes including construction, identifying the source of the funds for the project, and a risk assessment to include environmental as well as economic risk.

Option 3: Pursue Zero Waste

The Zero Waste philosophy is spreading worldwide. This philosophy has no one meaning to all, but common threads are develop policies and plans to maximize diversion from WTE facilities and from landfills to achieve as close to zero disposed waste as possible. Only after all practical diversion efforts have been implemented should technology to process waste be considered. Key diversion opportunities include:

- 1) Organics
- 2) Durables
- 3) MRF materials
- 4) Special, hard to handle wastes

Option 4: Explore Feasibility of a Major Expansion of the Existing Johnston Landfill or site a New Landfill in Rhode Island

This fourth option would depend on the answers to two questions: Could there be another major (20+ years) expansion at the Johnston location, or is there another site in RI that could host a new large landfill? The last siting exercise determined that there were no other suitable locations for a large landfill, however, if zero waste programs and policies are enacted and are successful, perhaps a smaller footprint would suffice, and a new location could be found. These questions will need RIDEM analysis before proceeding.

Issue #3: Funding The System

The time has come to reassess how Rhode Island pays for solid waste management. If the State is to divert more waste from disposal and reduce reliance on commercial waste revenues, municipalities will need to pay more per ton for disposal. The funding mechanism should be fair and predictable for municipalities, the commercial sector, and for RIRRC.

RIRRC has identified the following options to address the funding issue:

Option 1: Continue with current structure.

Under current statutory structure, RIRRC could simply institute a municipal price increase in accordance with the Administrative Procedures Act. However, as in each of the last 20 years, without proper justification legislators would likely thwart any attempt at a fee increase. Even if RIRRC were able to justify increasing the municipal disposal rate, any change would likely be incrementally small and not

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able to promote waste reduction or be able to fund large capital projects. Such ad hoc fee increases would result in unpredictable pricing and municipal budgeting. RIRRC does not recommend this option.

Option 2: Set target commercial loading and enact commercial pricing restrictions.

Setting target maximum commercial loading levels at RIRRC, and if exceeded increase the price, would prevent the recurrence of a wholesale selloff of landfill volume by RIRRC in the event that the regional disposal market returns to the prices of the last decade. This policy would also help stabilize the private sector regional disposal market by setting expectations publicly.

Option 3: Municipal Governance of RIRRC with Revenue Sharing

Make municipalities shareholders in RIRRC with a direct role in determining programs, facilities and establishing fees. Establishing revenue sharing provisions would allow RIRRC to set higher fees for disposal while ensuring that excessive revenues be returned to municipalities. This allows municipalities to reap the benefit in the future by reducing landfill loading now.

Option 4: Statewide RIRRC Managed PAYT For Residents

Implementing statewide PAYT, as described on page 48, would create a single system, centrally managed for residential waste generators to directly pay RIRRC for disposal costs. A uniform bag design would be used by all municipalities, all households. Offer three bag sizes with corresponding pricing to incent maximum recycling and food scrap composting (e.g.: 8-gal = \$0.75 each, 13-gal = \$1.25 each, 33-gal = \$2.00 each). All municipalities would participate, and this would eliminate a tip fee for bagged trash. There would no longer be a need for a municipal "cap". Bag revenues would be held by RIRRC in dedicated accounts to pay or provide:

- Disposal costs (operations);
- Infrastructure/new program needs;
- A rebate of all excess funds to municipalities would be determined by an independent, objective third party.

V. Recommended Actions

To address the immediate issues of reducing disposal and funding the solid waste management system this plan is recommending continuation, with some expansion, of existing efforts. In addition, this plan recommends some bold alternatives be undertaken. Primarily, RIRRC should implement a centrally managed statewide PAYT system for household managed refuse in order to address both the need to incent residential waste reduction and to fund the system. Furthermore, RIRRC should explore the feasibility of a statewide residential recycling collection system in order to collect the maximum amount of recyclables in a cost effective manner.

In terms of the long-range system of facilities for reducing and managing wastes, this plan calls for significant research and analysis of alternatives be undertaken in the next four years. The goal of this research is to provide the information needed so that the next update of this plan can recommend most appropriate path for managing solid wastes once the existing landfill is exhausted.

The specific recommendations implementation schedule and responsible agency are listed below.

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Unless otherwise noted, the “Date” in the third column is the target completion date for the Action. The actions are categorized into four “Types” and are listed in the next column. The four Action types are: Program (P), Study (S), Regulation (R), and Legislation (L). The

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Key Issue #1: Reduce the Amount of Waste Sent to Disposal

Recommended Strategy: Hybrid of Option 1 (Status Quo) and Option 2 (Invest in New Programs)

Action	Responsible Agents	Date	Type	Statutory Reference
Implement a RIRRC mandated managed statewide residential PAYT program. <ul style="list-style-type: none"> - Identify and recommend statutory required statutory revisions - Develop and adopt rules and procedures for program - RFP for bag vendor - Implementation 	RIRRC, Municipalities	2015-17	L, P, R	
Commence a Waste Characterization study for RI generated solid waste that captures the contents of the waste by commercial/municipal/transfer station segments, seasonality, and by waste type. Study to begin in the summer of 2014 and be completed by	RIRRC	2015	S	

Action	Responsible Agents	Date	Type	Statutory Reference
the fall of 2015. This study is needed to:				
<ul style="list-style-type: none"> • Discretely identify waste stream contents by source necessary to justify funding programs to reduce. • Identify additional opportunity areas. • Set realistic targets for curbside recycling programs. • Update for solid waste market changes since the last study was done in 1990. 				
Identify underperforming municipalities and the barriers preventing capture of recyclable materials.	RIRRC, Municipalities	2015	P	
Using results of the Waste Characterization Study (see above), implement programs to target the mistakenly disposed of recyclables.	RIRRC, Municipalities	2015-16	P	
Expand Producer Responsibility coverage to include tires, carpet, unwanted medications/sharps, batteries, CFLs, and paper and packaging.	RIDEM	2015-16	L	
Improve paper and packaging recycling in the commercial sector through improved reporting and outreach.	RIDEM	2015-16	P	
Support food waste diversion in the commercial sector through policies that encourage development of private processing. In addition, support food waste diversion in the residential sector through at-home and community based food waste composting.	RIDEM, RIRRC	Ongoing	P	

Action	Responsible Agents	Date	Type	Statutory Reference
Continue to provide public education services and technical assistance to the commercial and municipal sectors.	RIRRC	Ongoing	P	
Employ new and expanded public outreach tools such as social media to encourage waste reduction and recycling.	RIRRC	Ongoing	P	
Identify underperforming municipal and school programs and provide assistance to upgrade.	RIRRC	Ongoing	P	
Consider centralized management of recycling collection services. <ul style="list-style-type: none"> - Working group to design system - Identify required statutory revisions and advocate for adoption - Develop and adopt governing rules and procedures - RFP for collection services - Implementation 	RIRRC	2015-2017	P, L, R	

Key Issue #2: Determine Post Central Landfill Disposal System

Recommendation: Evaluate Alternative Options and Recommend Best Option by 2017; Implement by 2021

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Action	Responsible Agents	Date	Type	Statutory Reference
Design evaluation work and secure experts needed.	RIRRC	2015		
Evaluation completed/*option selected.	RIRRC	2017		
Reconvene Advisory Board for advice.	RIRRC	2018		
Solid Waste Plan and SDP Updated	RIRRC	2019		
Modify enabling legislation if necessary	RIRRC	2020		
Begin Implementation/Construction	RIRRC	2021		
Key Issue #3: Funding				
Implement RIRRC Managed Statewide PAYT (See first action under Key Issue #1)	RIRRC	2015-17	L, P, R	
Implement statutory changes requiring adherence to maximum commercial sector disposal targets at the Central Landfill. <ul style="list-style-type: none"> - Identify required statutory revisions - develop recommended Statute and rules 	RIRRC	2015-16	L, P, R	

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Action	Responsible Agents	Date	Type	Statutory Reference
- implement				
Identify alternative models for RIRRC governance that clarify the relationship between RIRRC and municipalities in order to:				
- Set fees - Determine distribution and amount of revenue sharing of disposal and recycling revenues	RIRRC	2015-2017	P, L, R	

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