Solid Waste Generation & Disposal Capacity Report

For Calendar Year 2009

Prepared by the Maine State Planning Office

for the

Joint Standing Committee on Environment and Natural Resources of the 125th Legislature

January 2011

Acknowledgements

This report is prepared by the State Planning Office in accordance with 38 MRSA §2124-A.

Calculations are based on data provided by municipalities, commercial recycling brokers, and public and private disposal facilities. We would like to thank the hundreds of municipal officials and private sector waste management and recycling companies who helped with supplying data. Without them, the State Planning Office could not produce this report.

Data from calendar year 2009 are the most current and complete data available for this report.

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Executive Summary

This report is submitted to the Joint Standing Committee on Environment and Natural Resources pursuant to 38 MRSA §2124-A. It provides an overview of Maine's municipal solid waste generation, recycling, combustion, and landfill activities for 2009, in order to:

1) determine the impact of these activities on available solid waste disposal capacity,
2) identify planned and consumed capacity at disposal facilities, and
3) project the lifespan of capacity.

The report also calculates the State's recycling rate.

The State Planning Office (the Office) prepares this capacity report annually, which allows policymakers to scrutinize progress and effectiveness of Maine's solid waste policies against the most current numbers and projections.

Key Findings

Municipal solid waste (MSW) tonnage generated in Maine continued to decrease but at less than half the rate of decline of the previous year.

Maine residents and businesses generated less waste for a second consecutive year. Waste generation decreased by 3.1% in 2009, less than the 8.7% decrease in 2008, but still a combined decline of over 11% from 2007 levels.

MSW generation is largely tied to our consumption of goods. As the State's economy slowed, so too did Mainer's purchases and, thus, the amount we threw away. Prior to 2007, waste in Maine increased by an average 4% per year. Based on historical trends and a strong correlation with retail sales, the Office expects waste generation to pick up as the economy improves.

Maine recycling tonnage declined but the rate held steady.

The amount of waste collected for recycling declined in 2009, but, because of a corresponding decline in total MSW generated, the state recycling rate held steady at 38.7%, the same as 2008.

Maine's statewide recycling rate is calculated by dividing the total amount of MSW recycled and reused (including composting) by the total amount of MSW generated. Thus, the rate is driven equally by the amount of waste we recycle and the amount we produce.

Maine continued its decades long trend of landfilling less than it combusts or recycles.**

While recycling managed 38.7% of Maine's MSW in 2009, 33.3% was delivered to the four waste-to-energy facilities in 2009. Both activities significantly reduced Maine's reliance on the land disposal of waste. Wastes accepted by waste-to-energy plants and processed into residues before landfilling are reduced in weight by as much as 66%.

Maine landfilled one-quarter (25.4%) of its waste in 2009.[1] Wastes that are directly landfilled, which could be recycled or diverted for other uses, are the major consumer of landfill space. Maine's aggressive recycling goal is designed to reduce the volume of waste requiring landfilling.

Maine solid waste imports rose 8.5% to fuel its waste-to-energy plants.

During 2009, Maine imported more than a half million tons of MSW. Approximately half of that tonnage was delivered to waste-to-energy facilities to produce energy. Reflecting Maine's slow economy, the continued drop in Maine-generated waste, and their need to meet tonnage requirements for energy contracts, waste-to-energy facilities increased their importation of MSW by 41,000 tons over 2008.

The Office expects that the imports of MSW will continue at waste-to-energy facilities for the foreseeable future, to be gradually replaced by Maine MSW only as the economy recovers and generation of domestic waste increases.

The remaining out-of-state-generated MSW, including construction and demolitions debris, was received at the State's two commercial landfills — Pine Tree Landfill in Hampden and the Crossroads Landfill in Norridgewock. While economics have increased the amount of MSW imported by waste-to-energy facilities, the amount of out-of-state waste landfilled will decline sharply due to the closure of the Pine Tree Landfill at the end of 2009, which will be reflected in the Office's capacity report for 2010.

Maine has sufficient statewide disposal capacity until 2020.

Maine will need 24.4 million cubic yards of landfill capacity over the next 20 years to meet the projected disposal needs of the State. The State currently has 17.5 million cubic yards of licensed capacity.

As the table in Appendix A shows, Maine has capacity in our state-owned and commercial landfills together to manage the total wastes generated through 2019-20. The sole remaining commercial landfill, Crossroads Landfill, has projected capacity through 2021-22. Currently, Juniper Ridge, the state-owned landfill, has licensed capacity that will be exhausted at the end of 2017, using a projected 2.8% growth rate.

[1] The percentage landfilled does not include waste produced from the combustion of municipal solid waste (MSW) or other MSW processing residues in order to avoid double counting.

For comparison, if we use a projected zero growth rate in wastes delivered to the facility, the permitted capacity of Juniper Ridge will be consumed in 2018.

Maine has sufficient disposal capacity in the near-term, but will need to plan for additional capacity to come on line before 2020 to avoid service disruptions.

Maine could decrease its landfill capacity needs by 25% and substantially decrease its solid waste management costs over the next 20 years by recycling 50% of its municipal solid waste each year.

Although results at individual landfills will vary due to the kinds and amounts of solid waste they receive, and how that waste is managed at the landfill, recycling 50% of our MSW would decrease Maine's overall capacity needs from 24.4 million cubic yards to 19.3 million cubic yards, depending upon the rate of growth of MSW over the 2010-2029 timeframe. Thus, achieving 50% recycling (or greater) would have a significant effect on Maine's need to develop new capacity.

Costs vary, but the Office estimates that it costs on average $25 per cubic yard to permit and develop new landfill disposal capacity depending on types of waste and size of footprints. Developing new landfill capacity to meet 20 years of Maine's disposal needs after the existing 17.5 million cubic yards of landfill space is consumed is likely to cost $175 million dollars. Reducing the amount of landfill space needed through recycling could lower the landfill development costs by as much as $125 million.

Currently, in Maine much of these development costs are borne upfront by commercial owners or operators and paid back over time by municipalities and other users through tipping fees on the disposal of solid waste. In those municipalities with their own landfills, property taxpayers bear the cost of new landfill development.

We can also estimate the cost to build Maine's recycling infrastructure to accommodate increases in materials and tonnages that would be collected at a 50% recycling rate. This would be roughly $5-6 million and likely would be borne by property taxpayers and private investors, perhaps with some state funds as incentives.

Maine's disposal capacity supply and demand had no measurable effect on disposal pricing in 2009.

State law directs the Office to look at the impact of available disposal capacity on tipping fees, with an eye to monitoring how a decrease in capacity may impact tipping fees charged, collusion, or other forms of monopolistic, oppressive practices.

In 2009, the Office found no significant impact to disposal prices due to a decrease in available disposal capacity. The Office consulted with the Department of the Attorney General in developing this analysis.

The operator of the Juniper Ridge Landfill is bound by a cap on tipping fees, imposed by the State in its operating services agreement. The cap acts as a check on pricing for the disposal of similar materials at other solid waste facilities.

Maine's solid waste industry is diverse and competitive.

The law also asks the Office to analyze the ownership of the collection, recycling, hauling, and disposal sectors of Maine's solid waste industry for undue consolidation and the potential for unfavorable impacts on competition. The Office examines these industry sections to look for conditions that might create either a lack of service or a monopolistic situation.

Maine's solid waste industry is a mix of public and private investments and services that handles 5,000 tons of materials each day (including recyclables). The Office finds that Maine's inter-connected system of private and public sector collection, recycling, hauling, and disposal currently serves Maine's solid waste management needs fairly and effectively. The Office consulted with the Department of the Attorney General in developing this analysis.

Key Questions for Policymakers

The Governor and the Legislature may want to consider the following three policy questions:

1. Should Maine invest public dollars to increase recycling and decrease the need for development of additional disposal capacity?
2. When will Maine need to develop new state-owned landfill capacity?
3. Is owning a landfill, as part of an overall state waste management strategy, an appropriate state function?

State Investment in Recycling

In 2010, the Legislature's Natural Resources Committee examined ways to increase Maine's recycling rate including public investments to recover old corrugated cardboard, yard and leaf waste, and food wastes. The Office concluded that a $5-6 million investment in municipal recycling facilities to divert these waste streams from landfilling would increase the State's recycling rate to over 50%. At the request of the committee, the Office is preparing a report on these issues for their consideration in the 125th session.

New State-owned Landfill Capacity

In anticipation of state-owned landfill space being exhausted in 2017 or 2018, and if the Legislature wants capacity in addition to the commercially-owned Crossroads Landfill, the State needs to begin planning for new, state-owned, landfill capacity in 2011. This timeframe takes into account the current economic slowdown, and the anticipated duration of the complete development process, from the initial preparation of the application for public benefit determination, through construction of new capacity licensed and prepared to receive waste.

Maine law requires the Office to notify the Legislature when there is six years or less of remaining licensed and available statewide disposal capacity (38 MRSA §2156-A) and to recommend to the Legislature's Environment and Natural Resources Committee construction of new disposal capacity for MSW or special waste. Based on the analysis in this report, and assuming no major change in Maine's solid waste generation and management landscape, the Office expects it will reach that trigger point in 2011.

In the 2010 capacity report, we anticipate asking the Committee to consider recommendations for ensuring that Maine does not run out of statewide disposal capacity in order to avoid attempting to construct landfill capacity in a crisis situation.

State Ownership of Landfills

Given the need to start planning the development of landfill capacity in the near future, it is appropriate to examine the State's role in the solid waste disposal system.

In 1989, the Maine Legislature passed landmark waste management legislation that, among other things, banned the development of new commercial solid waste disposal facilities and set Maine state government on a course to own landfills. This was in response to concerns about out-of-state waste consuming Maine landfill capacity.

Under the commerce clause of the U.S. Constitution, states cannot restrict the flow of solid waste (considered a commodity) across state lines through use of its regulatory authority. If Maine wants to limit the importation of solid waste from other states to be disposed of here, it can only do so as the owner of the landfill. Under the 1989 law, existing commercial facilities are being phased out and the State[2] sites and owns future landfills.

Over the past 20 years, legislatures have revisited the policy of banning commercial landfills and upheld it. Most recently, the Natural Resources Committee considered a bill in spring 2010 that would have allowed an expansion of the sole remaining commercial landfill in the State. The committee voted the bill down, but continued to study this question in the summer of 2010 with the intention of re-examining it in the 125th Legislature.

In 2003, as part of an economic development strategy to preserve paper mill jobs in Old Town, the Baldacci Administration negotiated an agreement whereby the State acquired the Georgia Pacific/Fort James paper mill sludge landfill for use by Maine's municipalities and businesses to dispose MSW and residues. The Legislature gave the responsibility for overseeing the landfill to the State Planning Office. The Office contracts with a private waste management company to operate the state-owned landfill, known as Juniper Ridge.

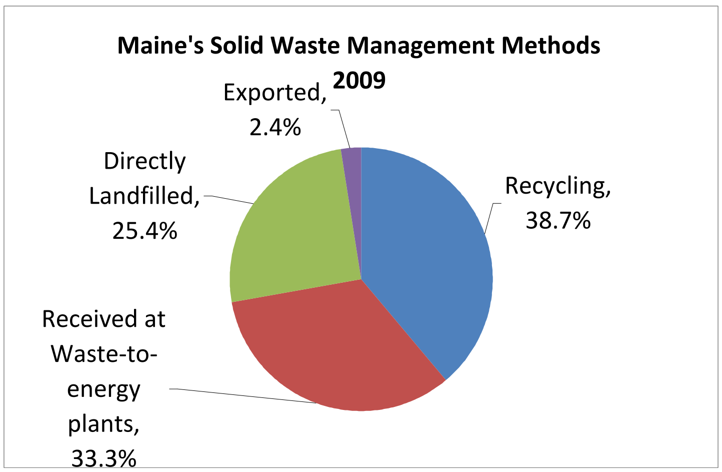
If the Legislature were to amend state law to allow new or expanded commercial landfills, the State could sell the Juniper Ridge Landfill to a commercial entity. There are

[2] In the 1989 law, the Waste Management Agency would have been the agency for state-owned landfills. When the Legislature abolished the agency in 1995, it moved that responsibility to the State Planning Office.

benefits and consequences to privatizing the landfill. On the plus side, the State would be relieved of the duties of overseeing the landfill operations, except for compliance with environmental regulations by the Department of Environmental Protection (DEP), and could realize revenues from the sale of the landfill, a valuable asset. There would be several contractual and legal issues to resolve with the current operator that, while not insurmountable, would take time and reparation to resolve. On the down side, the State would lose its ability to control the importation of solid waste and to prevent out-of-state waste from consuming landfill space that serves Maine residents and businesses.

Maine Municipal Solid Waste Management Summary

The following graph shows how Maine managed its MSW in 2009.



The following tables provide an overview of Maine's MSW (in tons) in 2009 compared to 2008. Where appropriate, clarifications between out-of-state and in-state wastes are noted.

Management of Maine's Municipal Solid Waste

Maine in-state generated solid waste	**2008**	**2009**
Total Municipal Solid Waste Generation	1,833,634	1,777,498
Recycled/Reused	709,624	687,781
Combusted	370,082[3]	352,633[3]
Landfilled	691,490[4]	693,931[4]
Exported	62,438	43,153

[3] includes in-states wastes only.

[4] This figure includes the 25.4 percent of MSW that is directly landfilled and the processing residues and ash from the combustion of Maine MSW which are ultimately landfilled thus included under "landfilled" rather than "combusted" in order to avoid double counting.

Recycling in Maine

Maine in-state recyclables	**2008**	**2009**
Municipal/Public Efforts	266,977	255,097
Commercial/Business Efforts	442,647	432,684
Total Tons Recycled	**709,624**	**687,781**
% of MSW Recycled	**38.7%**	**38.7%**

Processing for Combustion at Waste-to-Energy Facilities

Combined in-state and out-of-state	**2008**	**2009**
Combusted	515,872	522,653
By-pass	20,520	36,160
FEPR	117,069	118,864
Metal	22,138	22,285
Ash	175,261	174,900
Total MSW Delivered to WTE	**850,860**	**874,862**[5]

Disposal Facility Receipts of Out-of-state Generated MSW

facility and the type of waste received	**2008**	**2009**
Maine Energy – MSW	160,118	175,962
PERC – MSW	80,343	92,010
ecomaine – MSW	2,826	16,514
Mid Maine Waste Action Corp. – MSW	110	110
commercial landfills – MSW Landfilled	0	0
Pine Tree – CDD Landfilled	285,728	279,118
Crossroads – CDD Landfilled	0	10,631
Total MSW & CDD Imported	**529,125**	**574,345**

Landfill Disposal

Combined in-state MSW and CDD including all processing residues from the WTE facilities	**2008**	**2009**
Juniper Ridge	426,761	365,287
Municipal Landfills	149,911	149,149
Municipal CDD Landfills	Insufficient data	Insufficient data
2 Commercial Landfills	212,539	302,019
Total Landfilled	**789,211**	**816,455**

[5] 67.5% of the MSW processed at Maine's 4 WTE facilities was generated in Maine, the balance was generated outside Maine. Of the 522,563 tons combusted, 352,633 tons were generated in Maine.

Disposal Capacity in Maine[6]

		3 Years	5 Years	10 Years	20 Years
WTE Facility Capacity	2009 Capacity – currently available (tons/year)	2012 Capacity – projected remaining (tons/year)	2014 Capacity – projected remaining (tons/year)	2019 Capacity – projected remaining (tons/year)	2029 Capacity – projected remaining (tons/year)
MMWAC - Auburn	70,000	70,000	70,000	70,000	70,000
ecomaine - Portland	170,000	170,000	170,000	170,000	170,000
Maine Energy - Biddeford	310,000	310,000	310,000	310,000	310,000
PERC - Orrington	304,000	304,000	304,000	304,000[6]	304,000
Total	**854,000**	**854,000**	**854,000**	**854,000**	**854,000**
Landfill Disposal Capacity at a 1 % projected growth rate	2009 Licensed Capacity – end of year (cubic yards)	2012 Licensed Capacity – end of year (cubic yards)	2014 Licensed Capacity – end of year (cubic yards)	2019 Licensed Capacity – end of year (cubic yards)	2029 Licensed Capacity – end of year (cubic yards)
State Landfills (2):					
Carpenter Ridge – T 2 R 8	Undeveloped	Undeveloped	Undeveloped	Undeveloped	Undeveloped
Juniper Ridge – Old Town	7,114,614	4,664,615	2,995,684	0	0
Juniper Ridge – Old Town (expansion being sought)	Unlicensed	Unlicensed	Unlicensed	Unlicensed	Unlicensed
Municipal Disposal Sites (10)					
8 - Municipal landfills	4,920,282	4,282,877	3,847,246	2,719,474	288,413
2 - Municipal – 'ash'	1,279,397	1,025,849	865,820	451,532	0
Commercial landfills (2)					
Crossroads - Norridgewock	4,254,517	3,351,517	2,736,397	1,143,960	0
Pine Tree - Hampden	0	0	0	0	0
Total	17,568,810	13,655,301	10,993,892	4,386,143	288,413

[6] This table projects the continued operation of the four WTE facilities. Expansions are planned at the Presque Isle and Juniper Ridge Landfills but until those expansions are permitted, no additional capacity is included in these projections.

I. Introduction

Maine law requires the State Planning Office (the Office) to report annually to the Legislature on the State's recycling rate and disposal capacity needs. The full statutory language appears in Appendix B.

The report includes a projection of the solid waste disposal needs of Maine for the next 3, 5,10, and 20 years. The report also analyzes how the fill rate at each solid waste landfill could affect the expected lifespan of that landfill. In addition, the report assesses supracompetitive pricing and its possible implications as well as a review of consolidation within the solid waste industry sectors.

This capacity report provides policymakers with the information to plan for and make decisions about future capacity investment. Maine law requires that the Legislature be notified with recommendations for developing new disposal capacity when there are six years of capacity remaining. This report provides the basis for those recommendations. The report also assists policymakers with understanding progress toward our waste reduction and recycling goals and its impact on disposal capacity.

Our Methodology

Data from calendar year 2009 are the most current, complete data available for this report. The data used from this report come from a variety of sources:

- recycling and waste disposal data submitted in annual reports by local and regional municipal recycling and waste management programs to the Office and Department of Environmental Protection (DEP);

- solid waste data from the public and private disposal and processing facilities' annual license reports to DEP; and

- commercial recycling data from surveys conducted by the Office.

The Office combines the tonnages of waste processed and disposed, as well as that recycled, composted, and reused, to create a reliable estimate of the total municipal solid waste (MSW) generation in Maine.

To estimate recycling, the Office combines municipal and commercial recycling tonnages and adjusts the figures to eliminate duplicate counting of recyclables. To estimate landfill capacity, the Office uses landfill capacity estimates from the public and private facilities, calculates the amount of waste being disposed at each facility, projects the amount of waste expected to be disposed over time (subtracting out expected recycling tonnages), and determines the life span of each facility and a statewide total.

Traditionally, the Office based projections of solid waste generation on historical data. From 1993–2007, solid waste generation increased 4% per year. The years 2008 and 2009 changed all that. Based on two years of economic downturn, which has reduced waste generation in Maine, we have modified our projections. In this report we project zero percent growth in 2010 and 2011, and then, based on averaging into the historical data the downturn years, a more modest increase of 2.8% per year starting in 2012.

In addition, for comparison purposes, the Office also projected a zero growth scenario to measure the impact of a possible slower economic recovery. Using estimates of zero increases in 2010-2020, the Office projects a possible extension of disposal capacity of up to one year.

Lastly, we have examined state economic indicators as an alternative to historical data to project future waste amounts. State economists found a strong correlation between Maine retail sales and waste generation. We have included an analysis of that comparison in Appendix D. As such, waste generation increases appear to closely mirror reliable projections for retail sales in Maine. A preliminary analysis by state economists shows projected growth in retail sales beginning in 2010 and 2011. Based on this, the Office will monitor facility tonnages closely in 2010 and 2011 to determine whether waste generation projections need to increase and to assess any impact that would have on available disposal capacity. If the economy (as measured by retail sales) does begin to turn around in 2010 and 2011 and waste generation increases rather than holds steady at no growth, the State may have less disposal capacity than anticipated.

The Office made several assumptions in making its 10- and 20-year disposal capacity projections. It assumed:

- A constant recycling rate of 38%;
- Exported wastes continue to decline;
- Continued operation of and reliance on the four waste-to-energy facilities, at the existing mix of tonnages (out-of-state waste, processed residues, etc); and
- No significant change in municipally-operated landfills.

Projections and assumptions would change should we see significant closures or start-ups of waste processing or disposal facilities, major swings in market conditions for recyclables, or policy changes to increase public and private recycling.

This report focuses on municipal solid waste (MSW) as defined by Maine law. MSW comprises household, baggable waste, and construction demolition debris, including such items as furniture, tires, and metal.

The report does include some sludge and ash tonnages considered ‘special wastes.’ Special wastes are generated by other than housholds or typical businesses and, due to their quantity or chemical or physical properties, require particular handling. They include primarily ashes, sludges, and some processing wastes. This report provides details on those special wastes, which are residues of managing MSW, primarily incinerator ash.

Industrial wastes are not included in this report. Industrial wastes are not part of the waste managed by municipalities. These wastes are typically managed by the generator and disposed at generator-owned facilities or out-of-state.

The Report and the State Plan

In addition to this disposal capacity report, the Office prepares the state waste management and recycling plan every five years. The state plan contains data on capacity needs. The capacity report updates the numbers annually. We believe the key to achieving Maine's statutory waste management goals is our ability to make the short-term course corrections (consistent with the state plan) when and where they are indicated by the findings in the capacity report.

In this capacity report, the Office identifies the following modifications to the assumptions of the state plan that deserve note.

Recycling

- Markets for recycled materials have continued their rebound from the late 2008 downturn and now exceed the market highs of the first quarter of 2008. Prices on some commodities are at the record prices of 1995.
- The 124th Legislature passed, and the Governor signed into law, milestone product stewardship framework legislation. The Maine DEP has produced the legislation's first report which identifies medical sharps, paint, and pharmaceuticals for review and possible inclusion under the law.

Capacity

- The plan estimated Maine's 20-year land disposal capacity needs at 34 million cubic yards predicated on a 4% annual growth in MSW based on historical trends. This report maintains the downward revision of the 2008 Generation and Capacity Report. This report projects Maine's landfill capacity needs will be 24.4 million cubic yards based on a growth rate of 2.8%. The predicted continued drop in 2009 MSW generation has occurred.

Waste to Energy (WTE)

- The continued drop in Maine's generation of MSW caused the WTE facilties to import more tonnage from out-of-state than in previous years. The plan assumed a gradual but constant decline in the amount of out-of-state waste required by the WTEs as Maine generation grew.
- As of the end of 2009, there has been no change in the status of the Maine Energy Recovery (MERC) facility in downtown Biddeford, although in 2009 Casella Waste Systems, MERC's owner, announced in trade journals it was

actively seeking a buyer for the 24-year-old plant, while at the same time officials in Biddeford and Saco are attempting to find a way to close it down. If Maine Energy did close, there are several possible scenarios for the management of the Maine generated wastes currently received at the facility, but, there would not be an increase demand on in-state landfill disposal capacity. In recent years, the annual tons of Maine generated MSW accepted at Maine Energy have either approximately equalled or been less than the annual tons of residues sent to Maine landfills from the facility.

- Penobscot Energy Recovery Company (PERC) officials announced their active strategic planning for continuing processing wastes after their 2018 disposal-contracts expire, and their planning for the appropriate sized and type of system that will efficiently process less waste. A downsized WTE facility or possible new technology at PERC would translate into decreased demand for landfill capacity.

II. Municipal Solid Waste Generation

A. Definition

<u>*Municipal Solid Waste (MSW)*</u>

MSW is waste typically generated by households and businesses and managed by municipalities. It includes household garbage and other waste including recoverable materials such as cardboard, newsprint, office and mixed papers, food waste, plastics, glass, metals, textiles, appliances, furniture, tires, wood waste, yard waste as well as construction and demolition debris.

Construction and demolition debris (CDD) are the wastes generated by building, remodeling and destruction activities and may include such wastes as wood and wood products, concrete and brick, gypsum board, shingles, and other common components of buildings. Maine includes CDD in its definition of MSW.

B. Statewide Municipal Solid Waste Generation

Maine residents and visitors generated 1,777,498 tons of MSW in 2009. Waste generation is a function of population growth, lifestyles, economic activity, and manufacturing and production practices. The drop in solid waste generation rate reflects the economic downturn that began in 2008.

As shown in Figure 1, over the recent past, waste generation growth had leveled. From 1993 through 2001 MSW grew 42%, at an annual growth rate of 4%. But from 2003 through 2007, overall growth was less than 1%. In 2008 the total waste generated fell by 173,960 tons, an 8.7% decrease while 2009 numbers reflect a continued but less dramatic 3.1% decline.

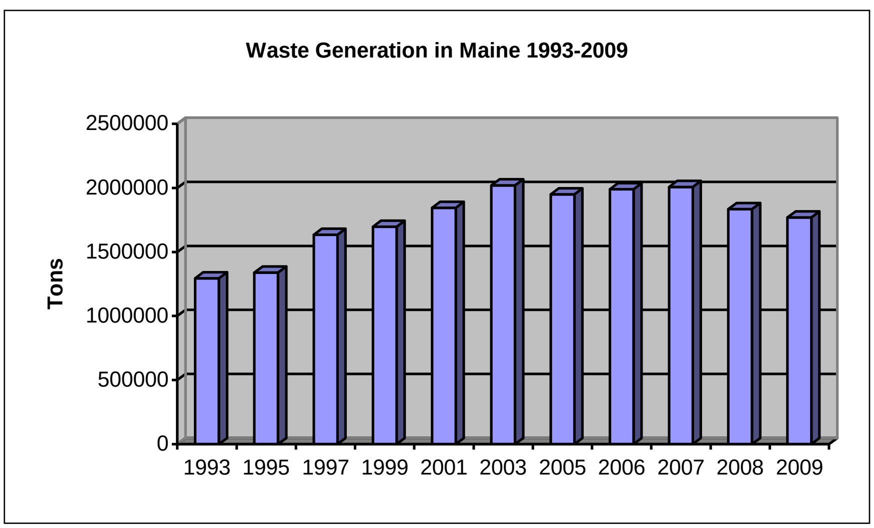


Figure 1: Maine Waste Generation, 1993-2009
Source: State Planning Office

III. Recycling

A. Statewide Recycling Rate

Maine recycled 38.7% of its MSW in 2009, the same as 2008. The statewide recycling rate is calculated by dividing the total amount of MSW recycled (including composting and reuse) by the total amount of MSW generated.

Recycling Trends

Figure 2 shows the tons of waste disposed compared to the tons recycled over time. Until 2008 the growth in waste generation had prevented the recycling rate from increasing despite greater tonnages being recycled. In 2008 and 2009 the recycling rates increased and held steady because overall waste generation declined.

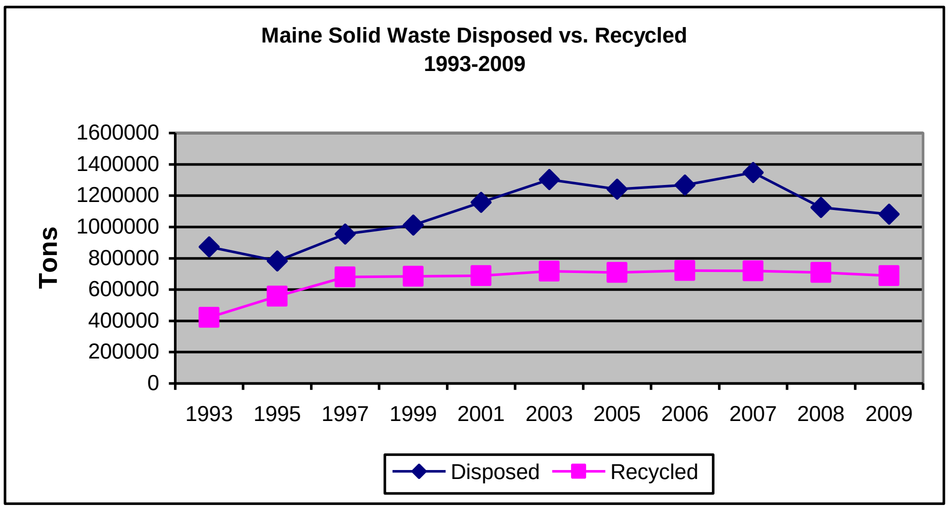


Figure 2: Maine Solid Waste Disposed vs. Recycling, 1993-2009
Source: State Planning Office

Table A shows a breakdown of MSW and CDD waste generated and recycled

Table A: Maine CDD Generation and Recycling - 2009				
MSW (including CDD) generated	1,777,498		MSW w/o CDD generated	1,392,243
MSW with CDD recycled	687,781		MSW w/o CDD recycled	620,760

B. Type and Amount of Materials Recycled

Maine recycles a wide variety of materials with the highest tonnages in fiber products and metal. See Appendix C for a table depicting recyclable categories and tonnages from 1997 to 2009.

C. Progress Toward Achieving State Goals

<u>Maine's Recycling and Waste Reduction Goals</u>

Recycling

In 1989, the Maine Legislature established a goal to recycle 50% of the state's MSW annually. In 2009, Maine held to a 38.7% recycling rate.

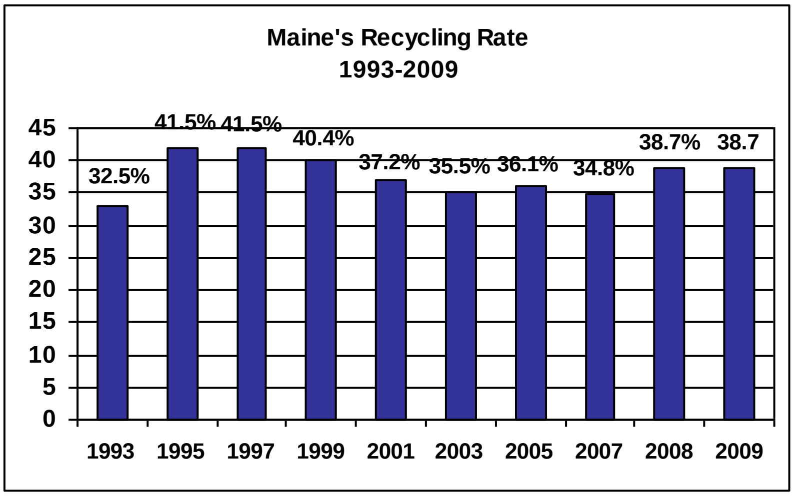


Figure 3: Maine's Recycling Rate, 1993-2009
Source: State Planning Office

While the legislated date to achieve the goal (January 1, 2009) has passed, the State remains committed to reaching the 50% goal in light of the value of reducing overall solid waste management costs, the positive impact on the environment, and a lessening of the need for additional solid waste disposal capacity.

Individual municipal and regional recycling programs are not required to achieve a 50% recycling rate; but they are required to demonstrate progress towards the goal. Recycling progress varies by community, but overall, public programs recovered 15% (255,097 tons) from the State's total MSW stream that would otherwise need disposal.[7]

<u>Achieving our Waste Reduction and Recycling Goals</u>

To reach our statutory recycling goal of 50%, Maine would need to recycle approximately 900,000 tons per year at today's generation levels. That rate is certainly achievable, with new resources and policy changes. For example, the Office estimates that a comprehensive recovery program for the food scraps which Maine residents, institutions, and businesses throw out each year, that included new composting facilities and energized marketing of the finished product would yield two-thirds of the amount of recovered materials needed to break through the 50% threshold.[8]

[7] The remaining tonnages that make up the state's recycling rate are recycled by Maine businesses.
[8] For additional strategies to increase recycling, see the *2009 State Waste Management and Recycling Plan*, available on-line at http://www.maine.gov/spo/recycle/publications.htm.

Increasing recycling and waste reduction can extend the life of our State's landfills. State policy is to encourage municipalities to reduce and recycle solid waste through promotion, grants,[9] and technical assistance. To achieve a significant increase in the statewide recycling rate will require an infusion of resources for municipalities, private investment, stable markets for recyclables, changes in state policy to achieve greater recycling and waste reduction—or all four. The *2009 Waste Management and Recycling Plan* contains a blueprint for policymakers to achieve and move beyond Maine's current goals.

Recycling Capacity

Maine has recycled over 700,000 tons per year during recent years. Approximately 62% is the result of business recycling, handled by private sector resource management companies. The balance of recyclables (38%) are handled by municipal recycling programs. There are approximately 300 local recycling programs relying upon about 145 processing operations (a dozen of those are major municipal recycling processing centers) and over 90 composting facilities.

Assessment of Facilities

There have been significant recent (within the last six years) improvements in processing capacity in the following regional programs: Portland, Bangor, Pittsfield, Skowhegan, Rockland, Camden, Coastal Recycling, and Lincoln County. In 2007, *ecomaine,* Maine's largest recycling region serving its 21 owner/municipalities in Cumberland County, completed a $3.8 million upgrade to its materials recovery facility in Portland and is offering processing of 'single sort' recycling collection services to programs outside their region in order to expand its recycling efforts.

Despite these improvements, municipally-managed public programs do not currently have the capacity to handle the volumes that would be generated at a 50% recycling rate, neither the physical (buildings and equipment) nor human (staffing) capacity.

To achieve a 50% recycling goal would require municipal and private sector recycling programs to handle over 200,000 tons more material based on what Maine generates today. This number will grow to match projected increases in waste generation. To achieve this goal soon both public and private sectors will need to invest to build the infrastructure to manage an increase in recycling.

Over the next 20 years, to maintain the State's current recycling rate (38.7%), will require public and private programs to almost double their recycling handling abilities. As waste generation increases, the annual volume of recyclable materials will increase from 700,000 tons in 2008 to over 1.2 million tons in 2028.[10]

[9] As funds permit.
[10] Based on an assumed 2.8% annual growth in municipal solid waste generation.

In 2009, municipal recycling programs recovered 101,223 tons of 'traditional'[11] recycled materials. The Office estimates the programs as they exist today have additional capacity for another 25,000 to 35,000 tons annually. When combined with the available processing capacity at the *ecomaine* facility that number grows to between 40,000 to 50,000 tons.

The private sector can likely handle additional tonnages from their municipal and private customers or respond with capital investment to grow their tonnages if the economics warrant it. For example, FCR Goodman (Casella) has opened a recycling collection and transfer facility in Hampden to handle Zero Sort® materials recovered through their recycling contracts in the greater Bangor region. In addition, the company has recently upgraded their Charlestown, Massachusetts recycling plant to more efficiently manage Zero Sort® materials. Other private initiatives include developing drop points for consolidating co-mingled recycled materials based on recycling regions and direct marketing of waste and recycling services to residents in selected areas of the State.

Waste Reduction Efforts

Maine has a waste reduction goal in state law to reduce the biennial generation of MSW tonnage by 5% by January 1, 2009, and by an additional 5% every subsequent two years. The Office has ongoing public education programs and media campaigns that advance Maine's waste reduction policy. In addition, the Office assists Maine's efforts to reduce the use and the subsequent disposal of plastic shopping bags through the retail merchants "Got Your Bags, Maine?" campaign.

The State's waste reduction efforts also are promoted through the many product stewardship programs administered by the Maine DEP. Product stewardship is a policy which supports the reduction, re-use, and the recycling of materials in Maine's solid waste stream. Maine law defines "product stewardship" to mean "a producer's taking responsibility for managing and reducing the life-cycle impacts of the producer's product, from product design to end-of-life management." It provides producers with new opportunities to move toward sustainable production in which they design products so that materials can be recaptured and reused to make new products ("cradle-to-cradle" production).[12]

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[11] Meaning paper, glass, tin cans, or other household items, not CDD.

[12] For a thorough review of Maine's Product Stewardship Programs please see *Implementing Product Stewardship in Maine* available on-line at www.maine.gov/dep.

IV. Existing and Planned Disposal Capacity

In 2009, Maine's solid waste disposal facilities included: one state-owned landfill, two commercial landfills, ten municipally-operated landfills, about twenty municipal construction and demolition debris (CDD) landfills, and four waste-to-energy (WTE) facilities. Several processing facilities/operations were available for managing construction and demolition debris.

A. Landfills

Landfills receive a variety of wastes. That variety differs among the facilities, depending upon what their licensing approval allows. Included in that variety of wastes are: raw garbage; construction and demolition debris; residues and ash from WTE facilities; contaminated soils; sludges; ash from bio-mass operations; and other special wastes. This report focuses on MSW, including CDD, as well as the residues from the processing of those wastes. However, in reviewing landfill capacity, the tonnages of the various cover materials that are utilized and the other special wastes that are accepted by the landfills do consume capacity. For that reason, those wastes and their impact on landfill capacity are included in this report.

State-owned Landfill[13]

The Legislature directs the Office to plan and provide for the long-term waste disposal needs for Maine. As part of this process, in 2003, the Legislature authorized the state acquisition of the generator-owned West Old Town Landfill, later renamed the Juniper Ridge Landfill. The Legislature directed the Office to acquire, own, and contract for the operation of this landfill (Resolve 2003, chapter 93).

In 2009, the Juniper Ridge landfill, received a total of 528,622 tons of in-state generated waste, including cover materials. Of this 365,287 tons were MSW: 21,559 tons of MSW by-pass, 187,981 tons of residuals from WTE facilities, and 155,747 tons of CDD and bulky wastes. The balance of the waste buried at the landfill, 163,335 tons, included various types of sludges, residues, contaminated soils, and other approved special wastes from other in-state commercial and industrial generators.

Assessment and Status of the State-owned Facility

Available disposal capacity remaining at Juniper Ridge at the end of 2009 was approximately 7,114,614 cubic yards, which translates into space for approximately

[13] In addition to the Juniper Ridge Landfill, the State Planning Office owns 1,500 acres of land in T2 R8 (near Lincoln), upon which a special waste landfill was permitted in the mid 1990s. Known as Carpenter Ridge, it has a landfill design for about two million cubic yards of waste. It was acquired by the former Maine Waste Management Agency and has been held by the State for development of disposal capacity when it is needed.

6.05 million tons of solid waste. At projected fill rates[14], the present licensed capacity should provide nine years of disposal capacity for the State, consuming that capacity in 2018.

In late 2006, the Juniper Ridge Landfill operator and the Office began its initial investigation into expanding Juniper Ridge to provide an additional 21.9 million cubic yards of disposal capacity. In late 2009, the Office submitted its public benefit determination application as part of the expansion process. The DEP issued a draft denial decision on that application, stopping the planned expansion process. Discussions are currently underway with the DEP to evaluate next steps.

If approved as proposed, an expansion could provide an additional 18-20 years of landfill disposal capacity.

Commercial Landfills

Through 2009, Maine had two commercial landfills grandfathered under the 1989 Solid Waste Management Act that banned the development of new commercial disposal facilities. The two commercial landfills are:

- Crossroads Landfill, located in Norridgewock, owned by Waste Management, Inc.
- Pine Tree Landfill, located in Hampden, owned by Casella Waste Services, Inc. (the facility closed and ceased accepting solid waste at the end of 2009)

The Crossroads Landfill is permitted to take special waste, municipal solid waste, and construction and demolition debris. It provides recycling and disposal services on a contract basis for municipalities and businesses. It currently serves over 40 Maine communities in Western Maine. In 2009, the landfill accepted 287,634 tons of solid waste, including cover materials. Of that tonnage, 184,024 tons were Maine generated municipal solid wastes, CDD and their residues. 103,610 tons were wastes generated outside of Maine.

The Pine Tree Landfill, prior to its December 2009 closure, was permitted to take special waste, by-pass municipal solid waste, and construction and demolition debris. In 2009, the Pine Tree Landfill accepted 413,207 tons of solid waste, including cover materials. Of that, 117,995 tons were Maine generated MSW, CDD and their processing residues. The balance of wastes, 338,829 tons, included out-of-state generated CDD, processing residues and special wastes.

Together the two commercial landfills took in 302,019 tons of Maine-generated MSW, CDD, and residues from Maine processing facilities and WTE plants.

[14] The State Planning Office projected that wastes delivered to Juniper Ridge would average 550,000 tons per year, but would increase to 700,000 tons per year starting in 2010, with in-state wastes diverted from the closed Pine Tree Landfill. The Operating Services Agreement between SPO and Casella/NEWSME LLC, requires Casella to provide disposal capacity for 50,000 tons of mill waste per year from Old Town Fuel and Fiber (OTFF) and for 6,000 tons of Biomass Ash from the Lincoln Pulp and Paper Company (LLP) operation in Lincoln. Thus, of the remaining capacity at JRL, 56,000 cubic yards of space per year is to be kept in reserve for those waste streams.

Table B: Capacity at Maine's Commercial Landfills – end of 2009				
	2009 Fill Rate (tons)	**Remaining Capacity (Cubic Yards)**	**Remaining Capacity (tons)**	**Estimate in years of life remaining based on 2009 fill rates**
Crossroads Landfill	287,634	4,254,517	4,250,000	12-14 years
Pine Tree Landfill (at the end of 2009 this landfill closed)	413,207	0	0	0
Total	700,841	4,254,517	4,250,000	

Assessment of Facilities

The total disposal capacity currently licensed at Crossroads Landfill, the only remaining commercial landfill, is approximately 4.2 million cubic yards. Table B shows estimated remaining disposal capacity at the commercial landfills. The 'fill rate' includes all wastes disposed of at the facility, including MSW, CDD, cover materials, special wastes and other residues, whether generated within the State or delivered from outside the borders.

Municipally-operated Landfills

In 2009, 225,659 tons of solid wastes, including cover materials, were disposed of at ten municipally owned landfills. Of that tonnage, 149,149 tons were MSW including bulky wastes and CDD and 76,510 tons were residues from two WTE facilities. Table C provides information on each individual landfill, including fill rates and estimated available remaining capacity.

Assessment of Facilities

Among the eight municipally-operated MSW landfills[15], there are approximately 4.9 million cubic yards of remaining available capacity that can accept approximately 3 million tons of MSW. Maine municipal operations do not typically achieve the 1 ton to 1 cubic yard compaction ratio of the commercial landfill. This capacity is sufficient to carry the MSW for most of the communities served by these landfills for an average of 20 years or more, based on current waste tonnages and types accepted.

The actual remaining life varies for each landfill, resulting in unevenness of municipal capacity across the State. This variation in when a particular community or region may exhaust their current disposal capacity is independent and possibly irrespective of any possible statewide disposal capacity concern, but would be of significant concern to those regions.

[15] This does not include the 2 municipally owned "ash-fills".

Table C: Municipal Landfill Tonnages – 2009				
Municipal Landfills that accept unprocessed MSW and CDD				
	2009 Fill Rate (all wastes & cover) **(tons)**	**Remaining Capacity Cubic Yards (est.)**	**Remaining Capacity (tons) (est.)**	**Years of life remaining based on 2008 fill rates (estimated)**
MSW Landfills:				
Bath	9,220	355,000	153,000	26 years
Brunswick	4,370	230,000	115,000	17 years
Greenville	4,113	10,000	5,000	To close in 2011
Hatch Hill (Augusta)	38,324	1,807,714	1,350,000	36 years
Presque Isle	20,010	305,146	155,000	15 years
Tri-Community (Fort Fairfield)	29,164	1,790,150	1,250,000	40 years
MidCoast SWC	4,385	75,700	38,000	9 years
Rockland	39,563	346,572	200,000	5 years
CFWF (West Forks)	Closed in 2008			
Total Tons:	**149,149**			
Total Remaining Capacity (est.)		**4,920,282**	**3,266,000**	
Publicly Owned Landfills that accept residues from processing of MSW				
	2009 Fill Rate (all wastes & cover) **(tons)**	**Remaining Capacity Cubic Yards (est.)**	**Remaining Capacity (tons) (est.)**	**Years of life remaining based on 2008 fill rates (estimated)**
Ash Landfills:				
ecomaine	58,361	1,013,111	1,000,000	30 years
Lewiston	18,149	266,286	260,000	15 years
Total Tons:	**76,510**			
Total Remaining Capacity (est.)		**1,279,397**	**1,260,000**	
Total	**225,659**	**6,199,679**	**4,526,000**	20+ years

Municipal CDD Disposal Facilities

There are approximately 20 municipal land disposal facilities that accept locally-generated CDD, inert fill, brush, and trees. Local facilities furnish a 'short-transport' option for the management of these wastes. Data was not available to determine the level of service and tonnages of waste accepted at these facilities for 2009.

Assessment of Facilities

The remaining capacity at individual CDD facilities varies, but based on prior year's data, it appears that this type of landfill capacity will be available for another 10-12 years. A number of these facilities will be full before then, creating 'pockets' where CDD disposal options will need to be reconsidered.

Finding alternatives to land disposal for CDD continues to pose problems in Maine's rural areas. These materials cannot be recycled or reused without investment in equipment, labor, and sufficient land area to aggregate and process them. Markets for processed CDD do exist, but given the often small scale that most Maine towns operate on, with low volume and dispersed facilities, rural operations do not often produce the economics needed for sustainable recycling efforts.

Maine has two large-scale commercial CDD processors: KTI Biofuels in Lewiston and the CPRC Group in Scarborough.

KTI Biofuels is a stationary operation. It accepts only clean wood products (from in-state and out-of-state) for processing for use as biomass fuel. In 2009, it received 115,948 tons of clean wood and CDD, of which 27,329 tons were from in-state generators.

CPRC operates from its Scarborough facility, hauling in multiple types of materials and shipping out a variety of finished products, as well as offering mobile or 'on-site' services. In 2009, it accepted 40,041 tons of various CDD and other products, of which approximately 34,000 tons were from in-state sources.

There are also several commercial wood chippers that move from site to site and are used to manage brush and clean CDD wood at municipal facilities.

CDD can be disposed at Juniper Ridge Landfill and other licensed disposal facilities if there are no other options, but landfilling remains the least desirable management method.

B. Waste-To-Energy (WTE) Facilities

In 2009, 33.3% of Maine's MSW was sent to a WTE facility. Maine's WTE facilities received a total of 874,862 tons of MSW from both in-state and out-of-state sources, an increase of 24,002 tons from 2008. Of these 874,862 tons of MSW, 590,266 tons were generated in-state and 284,596 tons were imported (an increase from the 2008 deliveries).

Of the Maine generated 590,266 tons of MSW, 352,633 tons were combusted, 14,301 tons of metal were recovered, and landfilled residues and by-pass totaled 223,332 tons. Table D shows the processing capacity of the four WTE facilities:

Table D: Maine WTE Capacity		
Waste-To-energy Facility	**Annual processing capacity (tons/year)**	**Tons Received in 2009**
ecomaine	170,000	184,582
Maine Energy Recovery Company	310,000	291,339
Mid Maine Waste Action Corporation	70,000	81,716
Penobscot Energy Recovery Company	304,000	317,225
Total of WTE Facilities	**854,000**	**874,862**

The facilities provide both a product from combustion that needs to be disposed and a reduction of the MSW requiring disposal, thus reducing the need for landfill capacity. They produce a combined capacity of approximately 62 megawatts a day of electricity and reduce the weight of waste requiring landfilling by about two-thirds.

To produce the electrical generation contracted for, WTE facilities need to operate at maximum capacities. The seasonal nature of waste generation causes tonnage overage problems during the summer months and the need to “attract” additional tonnage during the winter months. Facilities bypass waste when they reach their daily operating capacity and import waste to make up for shortfalls.

WTE Residues

The WTE facilities produce several streams of materials and residues: by-pass waste, front-end process residue (FEPR), and ash. These residues, which require disposal in landfills, comprise approximately one-third of the waste processed by these facilities. The metals are recovered for recycling (See Figure 4).

- *Bypass Waste:* Bypass waste is that portion of the MSW stream intended for delivery to and incineration at a WTE facility, but diverted because the facility could not accept it. Solid waste is bypassed if there are operational interruptions or facility shutdowns or if the facility reaches its operational capacity and cannot accept waste that it is contractually obligated to receive. The bypass waste is typically delivered to a landfill for disposal. This category also includes waste that cannot be processed by the facility due to size or composition.

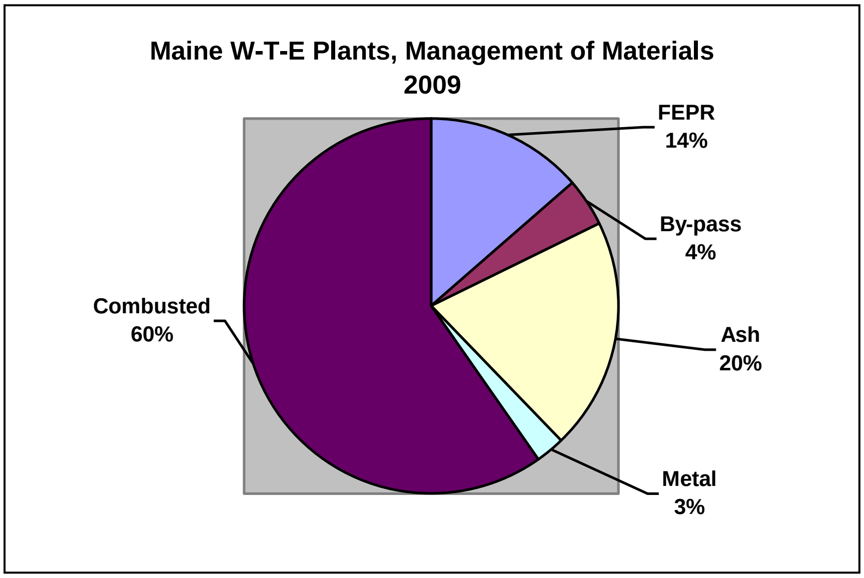

Figure 4: Maine WTE Plants, Management of Materials
Source: Facility Annual Reports, State Planning Office

- *Front-end Process Residue (FEPR):* Maine Energy Recovery Company (MERC) and Penobscot Energy Recovery Company (PERC) use a refuse derived fuel technology and generate FEPR as a by-product of their operations.[16] FEPR is removed prior to incineration because it lowers the burning efficiency. FEPR includes ferrous metals, glass, grit, and fine organic matter. While metals are recycled, most FEPR is landfilled. In the past, FEPR was used in conjunction with landfill closure programs, but this is no longer a viable outlet. While some composting of FEPR has been done, the resulting product typically contains contaminants that restrict its use to limited landfill cover applications only.

- *WTE Facility Ash:* Ash, a by-product of incineration, is classified as a special waste, and is landfilled. The ash from MERC and PERC is disposed of at the commercial landfills and Juniper Ridge. The ash from MMWAC is disposed of at the City of Lewiston's landfill and e*comaine's* ash is buried at the *ecomaine* landfill. The ash and FEPR waste streams have a continuous impact on landfill capacity, since alternatives to landfilling them do not readily exist.

Assessment of Facilities

Three of these facilities are at their 20th year of operation. The plants' maintenance programs, along with upgrades, have kept them functioning well and should continue to do so for the foreseeable future. Facility upgrades occur in response to environmental regulations, primarily aimed at air emissions reductions. All of the Maine WTE facilities perform at or better than their license requirements.

[16] Mid-Maine Waste Action Corporation (MMWAC) and *ecomaine* use a 'mass burn' technology and do not produce FEPR.

Biddeford City officials continue to work to close or move operations of the Maine Energy Recovery Company, which serves 23 municipalities. In addition, disposal contracts for the PERC expire in 2018. Two hundred municipalities rely on the facility. PERC is actively planning for the extension of PERC facility operations in 2018. In the case of both MERC and PERC, their future plans need to be factored into state disposal capacity planning.

C. Imported/Exported MSW

Movement of solid waste across state lines is protected under federal interstate commerce laws from state and local restriction, except in the case of publicly-owned facilities. MSW is considered a commodity and is subject to fluctuations accruing to supply and demand at the regional and national level.

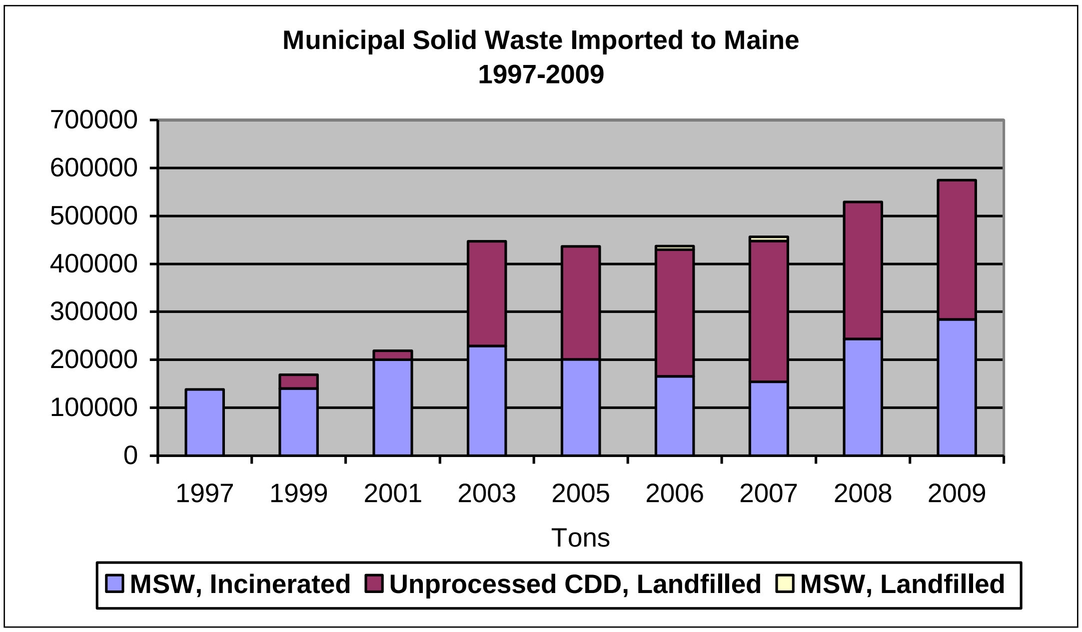

Figure 5: Municipal Solid Waste Imported to Maine, 1997-2009
Source: State Planning Office

In 2009, 574,345 tons of MSW were imported to Maine, up from the 529,125 tons of MSW imported to Maine in 2008. The amount of CDD imported remained relatively constant with a slight increase of 4,000 tons. Zero tons of MSW were imported directly to commercial landfills in 2009. The continued decrease in Maine-generated MSW caused the WTE facilities to increase their deliveries of imported MSW by 41,000 tons. Exports of MSW in 2009 were 43,153 tons, down over 30% from the 2008 tonnage of 62,438 tons (See Figures 5 and 6).

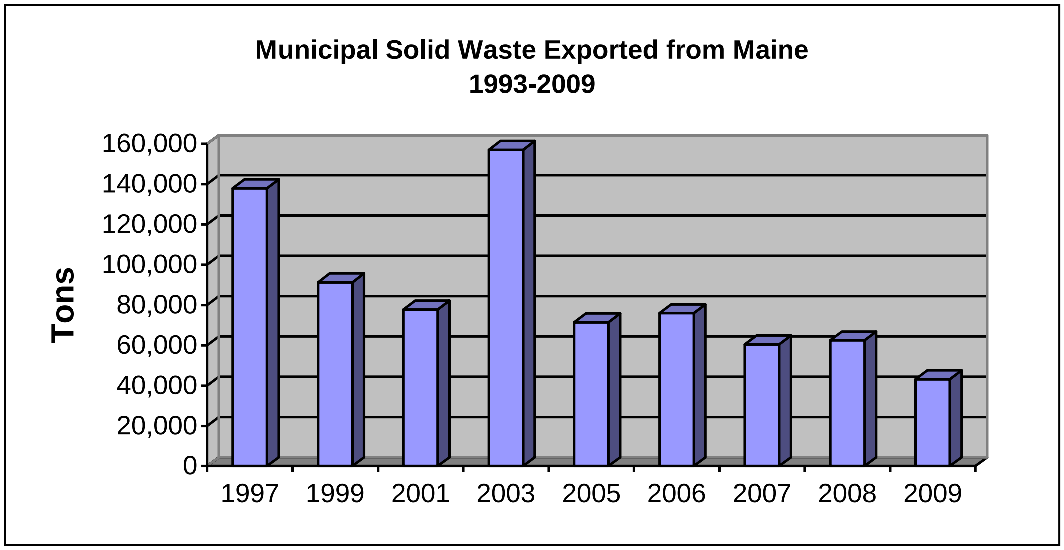

Figure 6: Municipal Solid Waste Exported from Maine
Source: State Planning Office

V. Projected Landfill Disposal Needs and Capacity

Landfill Capacity Calculation

To determine Maine's disposal capacity needs, the Office first calculated the available capacity in 2009. It then projected tons of waste generated in Maine that will need to be managed over 20 years. This projection is based on a 2.8% growth in solid waste per year starting in 2012. Adding in a projected tonnage of imported waste, and subtracting wastes that do not get landfilled in Maine (wastes that are recycled, exported, or combusted), the Office calculated the tons of waste needing land disposal over the 20-year timeframe of this analysis. That tonnage was then converted to cubic yards to compare to the available capacity.

The Office made several assumptions in making its 10- and 20-year disposal capacity projections. It assumed:

- A constant recycling rate of 38%;
- Exported wastes continue to decline;
- Continued operation of and reliance on the four waste-to-energy facilities, at the existing mix of tonnages (out-of-state waste, processing residues, etc); and
- No significant change in municipally-operated landfills.

Maine currently has 17.5 million cubic yards of permitted, available disposal capacity. An estimated 24.4 million cubic yards of landfill capacity will be required over the next 20 years.

Table E: Projected Disposal Capacity Available vs. Needed at 2.8% growth 2009-2029

Landfill Capacity Available (cubic yards)			**Capacity Needed (tons)**	
Municipal Landfills	4,920,282		Total waste generated	44,419,614
Municipal Ash –"Landfills"	1,279,397			
Municipal CDD Landfills	Incomplete data		Imported Waste	4,000,000
Commercial	4,254,517		Recycled	(17,190,391)
Juniper Ridge	7,114,614[17]		Exported	(1,066,071)
			Combusted at WTE	(9,194,860)
Total Landfill Capacity Currently Permitted:	**17,568,810**		**Total Landfill Capacity[18] Needed: Tons to Cyds**	**24,381,735**

Source: State Planning Office

[17] The Juniper Ridge Landfill Operating Services Agreement requires a reserve annual capacity for 56,000 tons of wastes from Old Town Fuel and Fiber and Lincoln Pulp and Paper or 1,120,000 over 20 years.
[18] Converting tons to cubic yards using .86 tons per yard.

Based on the projection in Table A, we can see that Maine has sufficient disposal capacity for 10 years through 2020, but it currently cannot meet projected statewide needs for a 20-year outlook. Maine needs to plan for developing new disposal capacity beyond 2020 in order to meet the waste management needs of the State's municipalities and businesses.

The largest single source of Maine's disposal capacity is the state-owned Juniper Ridge Landfill, which has capacity through 2017-1018. To avoid a shortfall in landfill capacity, the State needs to begin the application process for additional, state-owned, landfill capacity at that landfill in 2011. This timeframe takes into account the current economic slowdown, and the anticipated duration of the complete development process, from the initial preparation of the application for public benefit determination, the permitting process, through construction of new capacity licensed and prepared to receive waste.

Title 38, chapter 24, section 2156-A outlines the Office's responsibility to notify the Legislature of the need to develop more solid waste disposal capacity when there is six (6) years or less of licensed and available disposal capacity for MSW or special waste in the State."[19]

Based on the analysis of remaining landfill disposal capacity at the state-owned Juniper Ridge Landfill and the commercial Crossroads Landfill, the Office believes it will make that finding in 2011.

Factors that can affect Capacity Projections

There are a number of factors that will influence the Office's projections.

Natural or Man Made Disasters

Natural or man made disasters such as floods, ice storms, or oil spills would produce special wastes that would consume landfill capacity. This report does not attempt to estimate potential demand that these types of special waste and CDD disposal may place on Maine landfill capacity in such an event.

Changes in Policy, Law or Regulation

Under Maine's solid waste management hierarchy, landfilling is the least desirable solid waste management option. As policy, all other solid waste

[19] The report must recommend which state agency or department will own the facility and how it will be operated. The report must also include a review of disposal options outside of the State; a review of existing efforts to reduce, reuse, recycle, compost and incinerate the affected municipal solid waste and special waste streams and the impact of these efforts on capacity requirements; a thorough economic analysis of the facility's expected costs; and commitments from entities to utilize the facility and projected revenues. It is the intent of the Legislature that the facility be operated by a private contractor. A state-owned solid waste disposal facility may not be constructed or operated unless authorized by legislation pursuant to subsection 3. [2007, c. 192, §6 (AMD) .] 3. Authorization for development. The joint standing committee of the Legislature having jurisdiction over natural resource matters may report out legislation authorizing construction and operation of a state-owned solid waste disposal facility in response to a report submitted pursuant to subsection 2.

management options should be considered and exercised to the greatest extent possible prior to landfilling of wastes, and thus the hierarchy can affect fill rates generally. Any changes to the hierarchy or to any of the laws and regulations governing the facilitities or the waste streams they manage, such as disposal bans and or mandatory recycling or enforcement of the hierarchy, have the potential to effect capacity projections.

Economy and Demographics

Traditionally, the Office has based its projections on historical waste generation rate trends. We now look at other ways to project generation. State economists found a strong positive correlation between waste generation and retail sales. We have included an analysis of that comparison in Appendix D. The Office will continue to monitor this correlation to supplement its analysis of historical trends.

In addition the Office will use the results of the 2010 Census to better forecast long-term trends in MSW generation and analyze effects of Maine's demographics on our future management needs.

The Office recognizes its assumptions will vary from actual generation. It is possible that actual increases will be lowered or eliminated by improved recycling and waste reduction efforts, or an uncertain economy. However, given the long time frame for the development of disposal capacity, the Office strives to maintain a conservative approach in order to anticipate that time lag, and reduce the possibility of a capacity shortage crisis.

The Office analyzed the lifespan of existing statewide disposal capacity using three different scenarios, zero growth, 1% growth, and 2.8% growth over 10 years. These more conservative projected increases in waste generation would extend the life of Maine's existing state-owned and commercial landfills by one-to-two years, only.

Authority and Control

Although in its annual capacity assessment, the Office counts the available capacity at all landfills, commercial, state-owned and public, *this is an assumption*, as the *actual rate at which Maine landfills accept waste is under the control of their individual owners.* Landfills receive different amounts of waste from year to year based on the varying levels of residential and business activity occuring within their wasteshed. Economic conditions, the level of competition from other facilities, and management decisions and methods can reduce or accelerate the rate of consumption.

The State does exercise control over the fill rate of its own facility at Juniper Ridge, in accordance with the terms of the Operating Services Agreement.

Contracts and Licensing

The current license agreement for the Crossroads Landfill between Waste Management, Inc. and the Maine DEP allows up to 40% of its annual intake to be out-of-state wastes, thus (in theory) only 60% of its capacity is actually available for Maine generated wastes.

The Operating Services Agreement between the State and its operator of the Juniper Ridge Landfill, requires reserving disposal capacity for 50,000 tons of mill waste per year from Old Town Fuel and Fiber and for 6,000 tons of biomass ash from the Lincoln Pulp and Paper Company operation in Lincoln. Thus, of the remaining capacity at the Juniper Ridge Landfill, 56,000 cubic yards of space per year may not be available for statewide capacity.

Compaction Rates

Landfills attempt to achieve a one-to-one ratio of compaction where one ton of waste received consumes one cubic yard of space. Not all waste streams allow for this compaction to occur, however.

Settling Rates

All landfills settle over time due to decomposition of organic materials depending on compaction rates and the types of materials received. So over time they may gain back some space due to settling.

Improvements in Landfill Technology

There are ongoing improvements to the efficiency in operations of all landfills across the State in such areas as leachate and gas management, compaction, slope ratios and the engineering of slopes, and the application of different types and systems of daily and intermediate cover. All of these affect the ratio between the amount of wastes received and the consumption of cubic yards of landfill space.

<u>Current Policy Issues Which Could Affect Capacity Needs</u>

The amount of available landfill disposal capacity can be affected by policy decisions as follows:

Recycling

Recycling will continue to divert significant tonnages from disposal. The Office estimates that over 20 years, recycling will divert an estimated 17 million tons (cumulatively) from disposal, at 2009's recycling rate of 38.7%. If the recycling efforts can be increased, and the expected overall waste generation rates remain as predicted, the required disposal capacity to handle the State's solid wastes will be reduced. Indeed, an active recycling program that achieves the State's 50% recycling goal could reduce Maine's landfill capacity needs by 25% over the next 20 years.

Mainers are actively recycling and public education campaigns to promote recycling hold promise.[20] To achieve a significant increase in the statewide recycling rate will require an infusion of resources for municipalities, growth in markets for recyclables, or changes in state policy to achieve greater recycling and waste reduction—or all three. The *2009 State Waste Management and Recycling Plan* contains a blueprint for policymakers to achieve and move beyond Maine's recycling goal of 50%.[21]

Expansions and Closures

The question of the public benefit of expansion of the Juniper Ridge Landfill was presented to the DEP by the landfill operator and the Office in 2009. The public benefit determination application was withdrawn after issuance of a draft denial by DEP. The Office plans to resubmit at some point in the future.

The Presque Isle landfill received final approval from the DEP to expand their disposal capacity to extend their useful life for up to another 50 years. The Tri-Community Landfill has received approval for an expansion of their landfill.

The 2009 closure of Pine Tree Landfill will have an impact on Maine's current solid waste management system, in that approximately 150,000 tons of in-state generated special wastes and construction and demolition debris waste that were annually disposed of at that landfill is diverted to the Juniper Ridge Landfill.

Out-of-state Waste

The WTE facilities that currently take out-of-state wastes will continue to rely upon that source to fulfill their boiler needs and power contracts. However, for planning purposes, policymakers should anticipate that, as the economy recovers, Maine-generated solid waste tonnages needing disposal will gradually increase, and the WTE facilities' reliance on imported MSW will decrease.[22]

The Office cannot at this time estimate the rate at which this decrease will occur as a review of waste imports to the WTE facilities over the last 11 years reveals wide fluctuations. Imports have varied from 138,000 tons in 1997 to 228,638 tons in 2003, dropping back to 155,068 tons in 2007, then rising to 243,397 tons in 2008 and then to a twelve-year high of 284,596 tons in 2009, as Maine generation of MSW continued to drop along with Maine consumer activity. The relative strength or weakness of the regional economy and changes in waste

[20] As evidenced by survey data which tell us these promotional initiatives are working. When asked, those who reported that they "always" recycle newspapers, for example, was 60% in 2009 compared to 54% in 2006 (before and after implementation of the Maine Recycles public awareness campaign.

[21] This document is available on-line at www.maine.gov/spo/recycle/publications.htm.

[22] The state's remaining commercial landfill may continue to accept unprocessed CDD from out-of-state.

management at the regional level can also affect the price and availability of solid waste imports.

VI. Disposal Prices

A. Disposal Fees

Disposal expenses comprise collecting, transporting, and tipping waste. Disposal fees or tipping fees are a key driver of municipal disposal costs. Current disposal fees range from $40 to $135[23] per ton at Maine's landfills and WTE facilities and are stable, allowing predictability for municipal budgeting and long-term planning.

Tipping fees at the four WTE facilities are fairly consistent and reflect the commitment of the municipalities who either own the facility or have long-term contracts for disposal services.

Energy Revenues

Tipping fees at WTE facilities are influenced by revenues received from the sale of the electricity they generate. The revenues reduce the facility's operating expenses, yielding a reduction in the tip fee charged for solid waste. Should electricity sales revenue drop, tipping fees may increase. Conversely, should the electricity sales value increase, the possibility exists that lower tipping fees, or maintaining current fees, would occur.

B. Supracompetitive Prices

Supracompetitive, as applied to '*prices,'* means prices that are higher than they would be in a normally functioning, competitive market, usually as a result of overconcentration, collusion, or some form of monopolistic, oppressive practice. State law requires the Office to determine whether changes in available landfill capacity have generated, or have the potential to generate, supracompetitive prices and make recommendations for legislative or regulatory changes as necessary.

Disposal capacity at Maine landfills today is sufficient to meet current needs. At the time of this report, the disposal capacity situation does not appear to have generated supracompetitive disposal fees, because disposal prices have not experienced any significant changes for the last three years.

The operator of the Juniper Ridge Landfill is bound by a cap on tipping fees, imposed by the State in its Operating Services Agreement. Because of this cap, Juniper Ridge is perceived by the private and public waste sectors as having a limiting effect on disposal pricing. The cap acts as a check on pricing for the disposal of similar materials at other solid waste facilities.

The Office consulted with the Department of the Attorney General to assist with its analysis of disposal pricing.

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[23] This does not reflect spot market prices.

VII. Analysis of Consolidation within the Solid Waste Industry

The law also asks the Office to analyze the ownership of the collection, recycling, hauling, and disposal sectors of Maine's solid waste industry for undue consolidation and the potential for unfavorable impacts on competition. The Office examines these industry sections to look for conditions that might create either a lack of service or a monopolistic situation.

Maine's solid waste industry is a mix of public and private investments and services that handles 5,000 tons of materials each day (including recyclables). We believe that Maine's interrelated system of collection, recycling, hauling, and disposal currently serves Maine's solid waste management needs fairly and effectively.

The Office consulted with the Department of the Attorney General in reaching the following findings.

Disposal Facilities

During 2009, there was no change in ownership or operation of the disposal facilities, whether WTE facilities or landfills, except that the Pine Tree Landfill in Hampden, owned and operated by Casella Waste Systems Inc., was closed at the end of 2009.

Collection Services

During 2009, the Office found no substantial change in the ownership or operation of the many collection companies servicing residents, businesses, and municipalities. In several areas of the State there was commercial competition for accounts accompanied by increased levels of services offered. For example, several firms/organizations offered single stream recycling or expanded the types of materials they accept for recycling, and competed for municipal recyclables.

As with most industries, there was minor movement of new companies into the arena of solid waste collection services, often with a matching exodus of companies that provided similar services.

Recycling Services

During 2009, continued growth of the 'single sort', 'single stream', Zero Sort® recycling collection service occurred. This service permits residents to place all of their recyclables into a single container. From this single container the recyclables are collected, delivered to a processing facility, and sorted there and then marketed. *ecomaine*, located in Portland, established a single sort recycling program in 2007 and actively works to expand municipal participation in that program. FCR Goodman and Pine Tree Waste, subdivisions of Casella Waste Systems, offer a single stream recycling collection service through their program known as Zero Sort®. The collected recyclables are consolidated and shipped to either of the company's two processing facilities in Auburn, Massachusetts and Charleston, Massachusetts. Based upon municipal reports submitted to the Office, approximately 65 communities participated in a ‘single stream’ recycling program.

Hauling Services

In 2009, there was no substantial change in either the number of companies providing waste hauling services nor in the number of facilities requiring these trucking services. The majority of municipally operated transfer stations use private haulers while a few continue to utilize their own hauling equipment and staff.

APPENDICES

A: Waste Disposal Capacity Available, 2009-2020

Scenario 1 – 'No Growth' in Waste Generation

	Waste Disposal Capacity Available (in cubic yards)											
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
	actual	"0" growth →										
Facility												
Juniper Ridge	7,114,614	6,300,661	5,486,708	4,672,755	3,858,802	3,044,849	2,230,896	1,416,943	602,990	0	0	0
Crossroads	4,254,517	3,954,517	3,654,517	3,354,517	3,054,517	2,754,517	2,454,517	2,154,517	1,854,517	1,554,517	1,254,517	954,517
Total Statewide Capacity (w/o Municipal Landfills)	11,369,131	10,255,178	9,141,225	8,027,272	6,913,319	5,799,366	4,685,413	3,571,460	2,457,507	1,554,517	1,254,517	954,517

Scenario 2 – 'Low Growth' in Waste Generation

	Waste Disposal Capacity Available (in cubic yards)											
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
	actual	0 growth	0 growth	1% growth	1% growth	1% growth	1% growth	1% growth	1% growth	1% growth	1% growth	1% growth
Facility												
Juniper Ridge	7,114,614	6,300,661	5,486,708	4,664,615	3,834,301	2,995,684	2,148,681	1,293,208	429,180	0	0	0
Crossroads	4,254,517	3,954,517	3,654,517	3,351,517	3,045,487	2,736,397	2,424,216	2,108,913	1,790,457	1,468,817	1,143,960	815,855
Total Statewide Capacity (w/o Municipal Landfills)	11,369,131	10,255,178	9,141,225	8,016,132	6,879,788	5,732,081	4,572,897	3,402,121	2,219,637	1,468,817	1,143,960	815,855

Scenario 3 - Growth Rates projected based on actual economic indicators

	Waste Disposal Capacity Available (in cubic yards)											
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
	actual	0 growth	0 growth	2.8% growth	2.8% growth	2.8% growth	2.8% growth	2.8% growth	2.8% growth	2.8% growth	2.8% growth	2.8% growth
Facility												
Juniper Ridge	7,114,614	6,300,661	5,486,708	4,649,964	3,789,791	2,905,533	1,996,516	1,062,047	101,412	0	0	0
Crossroads	4,254,517	3,954,517	3,654,517	3,346,117	3,029,082	2,703,170	2,368,133	2,023,715	1,669,652	1,305,676	931,508	546,864
Total Statewide Capacity (w/o Municipal Landfills)	11,369,131	10,255,178	9,141,225	7,996,081	6,818,873	5,608,703	4,364,649	3,085,762	1,771,064	1,305,676	931,508	546,864

DATA NOTES:

- End of the year 2009 capacity and annual tonnages are based on data from reports submitted to DEP by disposal facilities
- Tons have been converted to cubic yards for consistency, based on reported compaction rates at each facility
- Assumes JRL receives 550,000 tons per year plus 150,000 tons per year previously going to Pine Tree, or 700,000 tons per year = 813,953 cubic yards per year (1 cy = 0.86 tons)
- Assumes Crossroads receives 300,000 tons per year or 300,000 cubic yards (1 cy = 1 ton)
- 2009 is the most recent complete data set available

B. Legislative Reference

Title 38: WATERS AND NAVIGATION
Chapter 24: SOLID WASTE MANAGEMENT AND RECYCLING
Subchapter 2: SOLID WASTE PLANNING

§2124-A. Solid waste generation and disposal capacity report

By January 1, 2008 and annually thereafter, the office shall submit a report to the joint standing committee of the Legislature having jurisdiction over natural resources matters, the Governor and the department setting forth information on statewide generation of solid waste, statewide recycling rates and available disposal capacity for solid waste.

The report submitted under this section must include an analysis of how changes in available disposal capacity have affected or are likely to affect disposal prices. When the office determines that a decline in available landfill capacity has generated or has the potential to generate supracompetitive prices, the office shall include this finding in its report and shall include recommendations for legislative or regulatory changes as necessary.

Beginning on January 1, 2009 and every odd-numbered year thereafter, the report submitted under this section must include an analysis of how the rate of fill at each solid waste landfill has affected the expected lifespan of that solid waste landfill. The January 2009 report must also include an analysis of the solid waste disposal needs of the State as of January 1, 2009 for the next 3, 5 and 10 years.

Beginning on January 1, 2010 and every even-numbered year thereafter, the report submitted under this section must include an analysis of consolidation of ownership in the disposal, collection, recycling and hauling of solid waste.

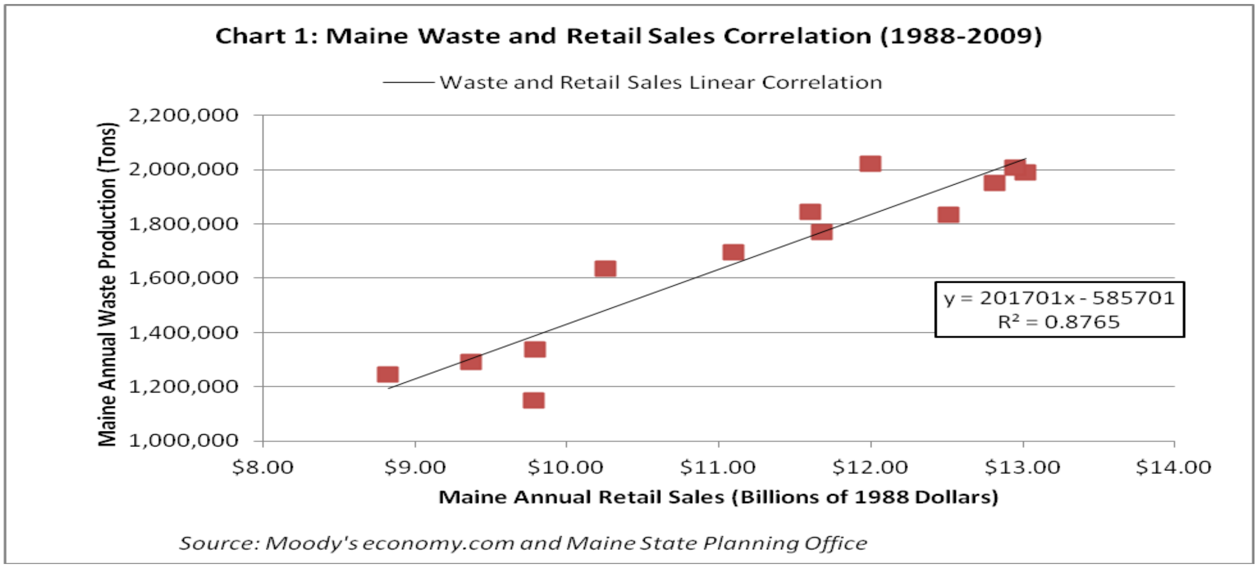
The joint standing committee of the Legislature having jurisdiction over solid waste matters may report out legislation related to the report submitted pursuant to this section.

C. Maine Recycled Materials, 1997-2009

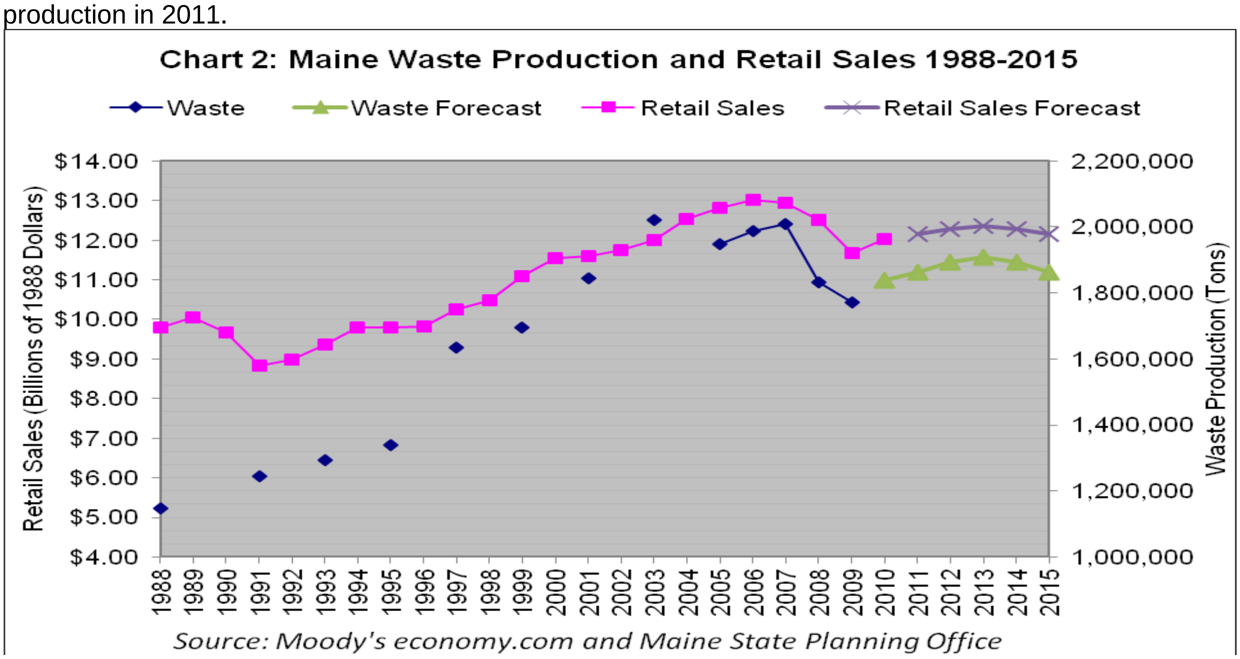
Materials:	2009	2008	2005	2003	1999	1997
high grade paper	23,762	54,226	72,965	3,951	11,570	31,470
corrugated cardboard	79,455	103,692	117,144	88,166	198,442	214,536
newspaper	9,402	16,817	32,300	33,442	42,612	44,710
magazines	1,064	4,238	8,723	1,881	6,104	3,702
mixed paper	7,548	8,250	5,226	13,919	12,860	12,207
other paper	11,328	26,528	8,900	3,166	12,671	6,465
commingled fibers	3,495	31,543	36,805	132,475		
Total paper	**136,054**	**245,294**	282,063	277,000	284,259	313,090
Single Stream	30,200					
Co-mingled Containers	14,367					
Totals	**44,567**					
clear glass	7,693	8,743	11,058	6,334	8,324	10,590
brown glass	13,335	16,422	24,377	11,270	12,545	7,060
green glass	4,813	7,022	12,622	3,142	26,167	11,767
commingled containers		11,215	3,598	21,672	440	1,734
Total glass	**25,841**	**43,402**	51,655	42,418	47,476	31,151
white goods	92,886	87,399	78,401	68,125	142,640	122,895
aluminum	4,359	2,232	2,163	2,109	1,862	1,332
tin cans	1,452	1,955	1,089	3,154	18,833	10,693
non ferrous	25,921	22,467	23,213	18,847	18,652	21,572
other (various metals)	72,287	72,119	68,432	68,984		
Total Metal	**196,905**	**186,172**	173,298	161,219	181,987	156,492
HDPE	8,130	8,632	9,377	3,420	4,410	4,160
PET	5,463	5,166	4,766	8,725	6,521	6,021
LDPE film	1,058	784	526	711		
polystyrene			8	0	6	6
Other	1,986	1,381	631	531	1,211	1,042
Total Plastic	**16,637**	**15,963**	15,308	13,387	12,148	11,229
wood waste	119,813	82,318	93,582	92,154	41,103	38,402
leaves	22,671	26,224	29,938	33,376	27,421	24,528
food waste	1,113	2,745	142	2,623	24,582	23,240
Total Organic	**143,597**	**111,287**	123,662	128,153	93,106	86,170
tires	28,490	28,473	30,374	35,467	32,530	30,559
CDD, other wastes	67,021	66,332	23,425	49,714	39,469	44,209
Mercury-added/UW	3,248	4,872	487	327		
Total Hard to Manage	**98,759**	**99,677**	54,286	85,508	71,999	74,768
Textiles/Reuse	**16,026**	**3,543**	1,724	2,260	6,023	1,726
Other nonbulky MSW	**9,395**	**4,286**	6,935	7,638	2,740	5,252
TOTAL TONS RECYCLED:	**687,781**	**709,624**	**708,931**	**717,583**	**699,738**	**679,878**

D. Maine MSW Generation and Retail Sales Comparison, 1988-2015

The amount of waste that Maine produces every year is dependent on some unknown mix of factors and also random variation. Of the standard economic and demographic variables for which forecasts are available, we expect retail sales to be one of the most highly correlated with waste production. Indeed, a visual examination of the historical data on Chart 1 below suggests a strong correlation, and the correlation coefficient R-square value is .8765, indicating strong correlation.



Assuming this correlation between retail sales and waste production persists into the future, and assuming the Moody's economy.com forecast for retail sales is accurate, we can roughly estimate future waste production using the economy.com retail sales forecast and a linear regression model. Chart 2, below, shows the results of our forecast using the model. Waste production is plotted on the vertical axis on the right and retail sales are plotted on the ertical axis on the left. We predict 1,864,173 million tons of waste production in 2011.



1-1-2014

Maine Materials Management Plan: 2014 State Waste Management and Recycling Plan Update and 2012 Waste Generation and Disposal Capacity Report

Maine Department of Environmental Protection

Report to the Joint Standing Committee on Environment and Natural Resources
126th Legislature, Second Session

Maine Materials Management Plan

2014 State Waste Management and Recycling Plan Update
&
2012 Waste Generation and Disposal Capacity Report

January 2014

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Table of Contents

I. Executive Summary

This update to the Maine Solid Waste Management and Recycling Plan is undertaken every five years, in accordance with 38 MRSA §2122 and must provide guidance and direction to municipalities in planning and implementing waste management and recycling programs at the state, regional and local levels. In addition, the Plan is to incorporate changes in waste generation trends, changes in waste recycling and disposal technologies, development of new waste generating activities and other factors affecting solid waste management as the Department finds appropriate. This Plan update also includes the 2012 Waste Generation and Disposal Capacity Report, which is the source for much of the current data referred to within the Plan.

The Department views this Plan as the opportunity to provide information to municipalities and other solid waste managers on current efforts and other activities supporting the state's solid waste management hierarchy. This includes information on reduction, recycling, beneficial use, and conversion technologies, as well as the cost of solid waste services.

An Advisory Committee, made up of public, private and non-profit solid waste program and policy managers, was convened by the Department to assist in this Plan's development and content. The committee members received background documents on various topics and participated in two meetings. A listing of the Advisory Committee members may be found in Appendix A. The Department thanks the members for their participation and input to this Plan's update.

Priorities determined by the Department, with assistance from the Advisory Committee, are detailed in the Plan. Some of the priorities are unchanged from past plans, e.g., 'increase amount of materials recycled' and 'increase collection and use of organic residuals'. There are also several new priorities, reflecting changing technologies and options now available to municipalities and businesses, including 'conversion technologies'.

The Plan includes strategies and actions for the Department and solid waste management entities to be accomplished in the next five years, including short-term changes and groundwork for longer-term opportunities with capital investments that may require a longer period for return on investment.

II. Vision and Purpose

The 2014 Maine Materials Management Plan includes strategies and actions to foster a continued shift toward a holistic system of materials management in Maine. Such an approach takes a broad view, and addresses the management of materials and products through their complete lifecycles, rather than focusing solely on management at the end of life (e.g. disposal). The materials management approach recognizes the full range of opportunities that exist throughout these lifecycles, from product design and manufacturing to reuse and recycling, in order to conserve resources, foster sustainability and minimize environmental impacts.

This Plan is based on the priorities of Maine's Solid Waste Management Hierarchy (38 MRS §2101(1)) and furthers the hierarchy's policy to "*plan for and implement an integrated approach to solid waste management for solid waste generated in this State and solid waste imported into this State* . . ." The Plan includes strategies to enhance the State's waste reduction and diversion efforts, consistent with policy articulated in Maine law (38 MRS §2101(2)). The Plan builds upon the 2009 Maine Waste Management and Recycling Plan and the successes that have been achieved in such areas as recycling, beneficial use, toxics reduction and extended producer responsibility.

The Department envisions continuing: movement toward comprehensive sustainable materials management in Maine, focus on adherence to the principles of the Solid Waste Management Hierarchy in the development and implementation of programs and waste management systems, and expansion of waste reduction and diversion efforts.

The purpose of the 2014 Maine Materials Management Plan is to provide information, guidance and direction to municipalities, regions, businesses and others, regarding the status, development and implementation of sustainable materials management and waste management programs at the state, regional and local levels. The Plan identifies state priorities and establishes an action plan for the next 5 years, including strategies and actions through which the state can support the materials management, waste diversion, and recycling efforts of municipalities, regions and businesses. Maine statute (38 MRS §2122) provides that:

"The department shall prepare an analysis of, and a plan for, the management, reduction and recycling of solid waste for the State. The plan must be based on the priorities and recycling goals established in sections 2101 and 2132. The plan must provide guidance and direction to municipalities in planning and implementing waste management and recycling programs at the state, regional and local levels."

Specifically, the statute (38 MRS §2123-A) requires that the following elements be part of the plan:

> *"1.* ***Waste characterization****. The state plan must be based on a comprehensive analysis of solid waste generated, recycled and disposed of in the State. Data collected must include, but not be limited to, the source, type and amount of waste currently generated; and the costs and types of waste management employed including recycling, composting, landspreading, incineration or landfilling.*
> *2.* ***Waste reduction and recycling assessment****. The state plan must include an assessment of the extent to which waste generation could be reduced at the source and the extent to which recycling can be increased.*

*3. **Determination of existing and potential disposal capacity**. The state plan must identify existing solid waste disposal and management capacity within the State and the potential for expansion of that capacity.*
*4. **Projected demand for capacity**. The state plan must identify the need in the State for current and future solid waste disposal capacity by type of solid waste, including identification of need over the next 5-year, 10-year and 20-year periods."*

The law provides that the analysis is to be revised by January 1, 2014 and every 5 years thereafter, to incorporate changes in waste generation trends, changes in waste recycling and disposal technologies, development of new waste generating activities and other factors affecting solid waste management as the department finds appropriate.

The plan is based on the priorities and policies of the Solid Waste Management Hierarchy found at 38 MRS §2101:

*"**Priorities**. It is the policy of the State to plan for and implement an integrated approach to solid waste management for solid waste generated in this State and solid waste imported into this State, which must be based on the following order of priority:*

A. Reduction of waste generated at the source, including both amount and toxicity of the waste;
B. Reuse of waste;
C. Recycling of waste;
D. Composting of biodegradable waste;
E. Waste processing that reduces the volume of waste needing land disposal, including incineration; and
F. Land disposal of waste.

It is the policy of the State to use the order of priority in this subsection as a guiding principle in making decisions related to solid waste management.

Waste reduction and diversion. *It is the policy of the state to actively promote and encourage waste reduction measures from all sources and maximize waste diversion efforts by encouraging new and expanded uses of solid waste generated in this State as a resource."*

The Plan is also based upon the State recycling and waste reduction goals found at 38 MRS §2132:

*"**State recycling goal.** It is the goal of the State to recycle or compost, by January 1, 2014, 50% of the municipal solid waste tonnage generated each year within the State.*

***State waste reduction goal**. It is the goal of the State to reduce the biennial generation of municipal solid waste tonnage by 5% beginning on January 1, 2009 and by an additional 5% every subsequent 2 years. This reduction in solid waste tonnage, after January 1, 2009, is a biennial goal. The baseline for calculating this reduction is the 2003 solid waste generation data gathered by the former State Planning Office."*

Although the State's recycling and waste reduction goals are specific to the municipal solid waste (MSW) portion of Maine's solid waste stream, the Plan includes information on the recycling and beneficial uses of construction & demolition debris (CDD) and other solid wastes such as industrial wastes.

In addition to revising the State's Solid Waste Management and Recycling Plan every five years, the Department is also charged with preparing the Solid Waste Generation and Disposal Capacity Report for the Legislature annually (38 MRS §2124-A). This report provides information on the statewide generation of solid waste, recycling rates and solid waste disposal capacity, and an analysis of the relationship between available disposal capacity and disposal prices. This year, the plan and the report have been combined into this single document.

III. Solid Waste Generation and Characterization

Solid waste is commonly categorized based on the type and source of the waste. Municipal solid waste (MSW) is waste that is typically generated by households and commercial businesses. The industrial sector also generates significant amounts of solid wastes that are regulated as "special waste" under Maine law because they have chemical or physical properties that make them difficult to handle or potentially pose a threat to public health, safety or the environment. (See Appendix B for statutory and regulatory definitions.)

Maine's solid waste management infrastructure includes municipal, commercial, and private industrial waste handling facilities. Once collected, solid waste in Maine is stored, transported, recycled, processed, beneficially used in place of virgin materials and as fuel, composted, digested, incinerated, and/or landfilled. Table 1 presents a summary of the types and amounts of solid waste generated in Maine in 2012.

Table 1 - 2012 Maine Solid Waste Types and Amounts

Waste type	2012 amount generated (tons)
Municipal Solid Waste (MSW)	1,307,787
Construction & Demolition Debris (CDD)/wood waste/landclearing debris	438,133
Special wastes (see Table 4 for break out by waste types and amounts)	828,184
Total Maine Generated Solid Waste 2012	**2,574,104**

In 2011, the University of Maine undertook a study to understand the types of solid waste Maine residents are disposing of in the mixed MSW stream. Figures 1 and 2 are reproduced from that report[1] to show the percentages of MSW by material type that currently is disposed of in Maine.

[1] *2011 Maine Residential Waste Characterization Study – School of Economics Staff Paper #601*; Criner, George K. and Blackmer, Travis L., University of Maine; http://umaine.edu/wcs/files/2012/02/2011-Maine-Residential-Waste-Characterization-Study1.pdf

Figure 1 - Composition of Disposed MSW

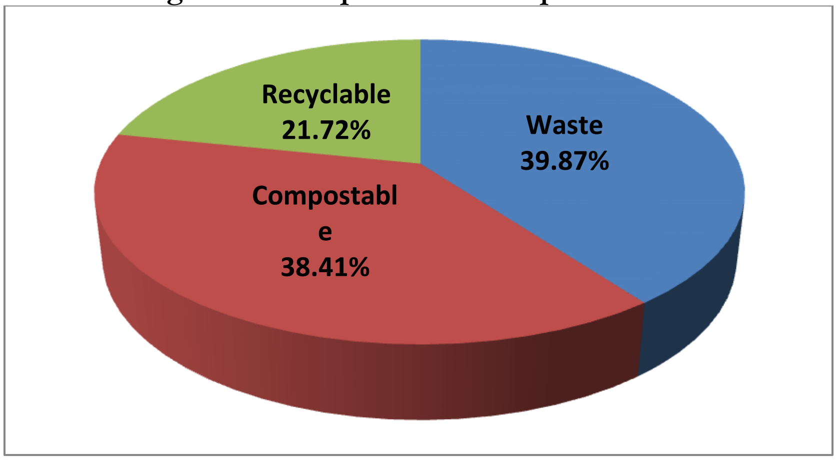
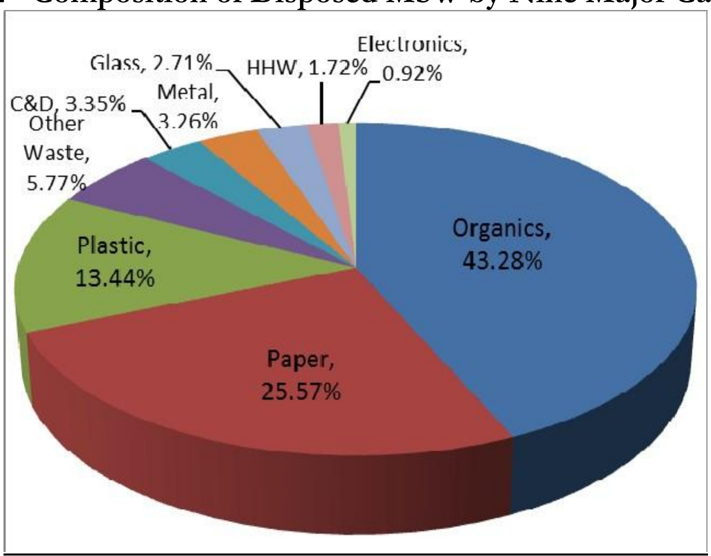


Figure 2 - Composition of Disposed MSW by Nine Major Categories



Understanding the composition of the MSW currently being landfilled or incinerated is critical to identifying the greatest opportunities for reducing MSW generation and increasing Maine's MSW recycling rate. The *2011 Maine Residential Waste Characterization Study* documented organics, paper and plastics as the three largest components in MSW disposed of from Maine. **Diversion of organics from disposal remains the largest opportunity to reduce Maine's waste stream**.

IV. Managing Maine's Solid Waste – Progress toward State Goals

In keeping with the Solid Waste Management Hierarchy (38 MRS §2101), there are a variety of options employed for managing Maine's solid waste. Appendix C is a table that provides an overview of management options currently employed for the various components of Maine's solid waste stream. This table provides a qualitative assessment of the comparative use of the management options. The options are grouped by levels on the Hierarchy, with those listed to the left preferable to those toward the right due to the resulting preservation and use of materials. By examining Maine's waste stream by material type and current management options, we can identify opportunities for "moving up the hierarchy", decreasing disposal and increasing waste reduction, reuse, recycling and beneficial use.

A. Maine's Municipal Solid Waste Reduction Goal

Maine's statutory goals for waste reduction focus specifically on MSW. 38 MRS §2132(1-A) sets a State goal of reducing the biennial generation of municipal solid waste tonnage by 5% beginning on January 1, 2009, and by an additional 5% every subsequent 2 years. As Maine's recycling rate has held steady over the past several years, the State has experienced a reduction in the generation of MSW as reflected in the amounts of MSW disposed of in landfills and waste-to-energy incinerators. While historically there has been a positive correlation of MSW generation with activity in the overall economy, additional factors such as manufacturers' corporate sustainability initiatives that decrease the amount of packaging associated with consumer goods may be having an increasing impact.

In 2012, Maine residents generated and disposed of 0.537 tons (1,074 pounds) of MSW per person. Regional comparisons for 2010 show Mainers generated less MSW per person than any other New England state.

Table 2 - Per Capita MSW Disposal Rates – New England States 2010

State	Tons MSW Disposed 2010	2010 population	Tons per person
Maine	751,270	1,328,361	0.566
New Hampshire	748,028	1,316,470	0.568
Connecticut	2,371,767	3,574,097	0.664
Vermont	449,661	625,741	0.719
Massachusetts	4,830,756	6,547,629	0.738
Rhode Island	1,031,080	1,052,567	0.980

Municipal Solid Waste (MSW) Interstate Flow in 2010, January 30, 2013, Northeast Waste Management Association (www.newmoa.org)

The Department has been working with the Northeast Waste Management Officials' Association (NEWMOA) to quantify and track the interstate flow of MSW destined for disposal since 1999. The data collected show that the amount of MSW (exclusive of CDD and WTE ash) disposed of by Maine residents (both in-state and exported) decreased from 755,086 tons in 2008 to 713,713 tons in 2012. **This is a 5.5% decrease in disposal of MSW in 4 years**.

B. Maine's Municipal Solid Waste Recycling Rate

In 1989, the Maine Legislature enacted 38 MRS §2132, establishing a goal to recycle or compost 50% of the state's municipal solid waste annually. The legislated date to achieve the goal was revised in 2012 and extended to January 1, 2014. Individual municipal and regional recycling programs are not required to achieve a 50% recycling rate, but they are required to demonstrate progress towards the goal. The State remains committed to reaching the 50% goal in light of the value of reducing overall solid waste management costs, the positive impact on the environment, and a lessening of the need for additional solid waste disposal capacity.

The MSW recycling rate is calculated by dividing the total amount of MSW recycled by the total amount of reported in-state generated MSW in accordance with 38 MRS §2132 (3). The term "municipal solid waste" is not defined in Maine law, but has historically been interpreted as solid waste normally managed by municipalities in Maine, including CDD. However, other states and the U.S. Environmental Protection Agency (US EPA) exclude CDD from their calculations of MSW recycling rates. This creates inconsistencies when trying to compare Maine's calculated MSW recycling rate with the MSW recycling rates of other states. To address this, the Department has calculated the recycling rate for MSW as defined by EPA, and a separate recycling rate that includes CDD. This approach allows Maine to perform an apples-to-apples comparison with other states' MSW recycling rates, while also enabling Maine to evaluate where further efforts are needed to improve diversion of the broader spectrum of disposed materials handled by municipalities in Maine.

To determine the amount of material recycled in all years prior to this one, the State Planning Office and the Department utilized the annual municipal solid waste program reports submitted by communities, along with voluntarily reported data from commercial processors and materials brokers to determine MSW recycling from the commercial sector. However, this calculation was not a precise measurement as the data sets were incomplete. Many municipal reports had incomplete or inaccurately-reported data, and the agencies were unable to obtain data from all the commercial processors and materials brokers. This calculated recycling rate also reflects only recorded and reported information, and does not include volumes diverted by activities such as backyard composting, reuse from donations and used goods sales, and other unregulated strategies.

This year the Department engaged in a concerted effort to request recycling data from all commercial processors and materials brokers known to be operating in Maine to better understand the extent of the deficiencies in reporting on recyclables. Almost all of the processors and brokers were able to provide the Department with the amounts by material types and destinations for the materials they managed. This enabled the Department to eliminate any duplicative data (created when a commodity material was handled by multiple processors/brokers), and to check the data reported by municipalities in comparison to the data on municipal recycling reported by the materials processors and brokers.

The results of this effort confirmed that the reported data used to calculate Maine's MSW recycling rate has been incomplete in recent years. This is due to two factors: 1) many of Maine's municipalities do not have the resources needed to ensure complete and accurate reporting on municipal and commercial recycling within their borders in conformance with 38

MRS §2133 (7); and 2) materials processors and brokers of recyclables are not required to report on their activities in Maine.

Based on the data collected in previous years, Maine's recycling rate has remained fairly steady for the past ten years, ranging from a low of 34.8% in 2007 to a high of 39.6% in 2011. However, because deficiencies have been identified in the most recent data reported by municipalities, the Department has calculated the 2012 recycling rate by utilizing the more complete data voluntarily reported by materials processors and brokers. In addition to the 554,225 tons reported as recycled or composted, the Department estimates the non-reporting processors and brokers handled up to 5,000 tons of recyclable materials.

Table 3 - 2012 Maine's MSW Recycling Rate Calculation

	Tons
MSW landfilled in state	237,543
MSW disposed of through incineration in state (amount in minus amount WTE ash)	354,957
MSW incinerator ash landfilled in state	121,213
MSW disposed of out-of-state	39,849
Subtotal Maine MSW (exclusive of CDD) disposed	753,562
Paper, cardboard, plastics and glass recycled - (voluntarily reported by materials processors and brokers)	183,557
Single Stream Recycling (not included above)	25,892
Other MSW recycled (computers and monitors, white goods, metals, tires, vehicle batteries, asphalt shingles, sheetrock, and textiles)	307,725
Reported MSW composted (includes leaf & yard waste, food scraps)	37,051
Subtotal Maine MSW recycled & composted	554,225
Total Maine MSW (exclusive of CDD)	1,307,787
Maine's MSW Recycling Rate (exclusive of CDD)	**42.38%**
Mixed CDD landfilled in state	289,497
Mixed CDD processed/disposed of out of-state	7,190
Landclearing debris landfilled	3,573
Beneficial use of processed CDD and landclearing debris	137,873
Total CDD and landclearing debris	438,133
Maine's CDD & Landclearing Debris Recycling Rate	**31.5%**
Total MSW, CDD & landclearing debris	1,745,920
Total MSW, CDD and landclearing debris recycled (including wood waste used as fuel chips)	692,098
Maine's Combined MSW, CDD & Landclearing Debris Recycling Rate	**39.6%**

C. Additional Waste Diversion

Maine generated more than 800,000 tons of wastes other than MSW and CDD in 2012. **One third of this material was diverted from disposal to composting, agronomic utilization or other beneficial uses.** Examining the various types of materials and the amounts utilized or disposed of as shown in Table 4 may provide insights into additional opportunities to increase diversion of some of these materials from disposal.

Table 4 - 2012 Disposition of Maine Solid Wastes other than MSW & CDD

Waste type	Beneficial use	Compost /N-Viro[2]	Land applied	Exported from Maine	Landfilled	Total
Asbestos/Asbestos Containing Waste	0	0	0	0	3,415	**3,415**
Ash - Boiler	2,912	0	0	0	123,843	**126,755**
Ash - Coal, oil and multifuel boiler	4,660	3,731	11,727	5,594	6,233	**31,945**
Ash - MSW Incinerator	0	0	0	0	121,213	**121,213**
Ash - Wood	40,807	0	0	0	352	**41,159**
Ash- Burn pile/hot loads	0	0	0	0	2,332	**2,332**
Ash/Liming Agent - Other	0	0	15,606	0	0	**15,606**
Catch basin grit and street sweepings	1,570	0	0	0	4,602	**6,172**
Contaminated Soils - non-petroleum	0	0	0	0	5,504	**5,504**
Contaminated soils - Oil	UD	0	UD	0	2,873	**2,873**
Dredge Spoils	7,390	0	0	0	55	**7,445**
Fish/Food Process Residue	0	2,840	38,232	581	0	**41,653**
Industrial/Industrial Process Waste	0	0	0	0	44,554	**44,554**
Other Special Wastes	0	0	0	9	15,403	**15,412**
Pulp/Papermill Sludge	20,162	4,202	0	0	38,973	**63,337**
Sandblast Grit	0	0	0	0	367	**367**
Short-Paper Fiber	29,789	0	0	0	4,884	**34,673**
Shredder Residue	0	0	0	4,871	32,103	**36,974**
WWTP Sludge - industrial	0	0	39	0	96,746	**96,784**
WWTP Sludge - municipal	0	79,068	10,655	0	40,310	**130,033**
Total	**107,290**	**89,841**	**76,258**	**11,055**	**543,760**	**828,184**

[2] N-Viro Soil is a trademarked product

Table 4 does not include all materials that could have become wastes, since many materials never enter the waste stream (e.g. recycled asphalt pavement). The 2012 data for the use of these materials, and some shown in Table 4, are compiled from a variety of sources and remain under development (UD) at the time of this report issuance.

Recent developments in conversion technologies that process organic wastes to create fuels are creating new opportunities to significantly increase the diversion of additional solid wastes from disposal in Maine. Appendix D describes these technologies and the types of materials they may use.

V. Plan for State Action to Move toward Sustainable Materials Management – 2014 - 2018

The priorities for Maine DEP's work on sustainable materials management for the next 5 years are to:

- Encourage the development of new infrastructure for separation from the waste stream and utilization of organics, including composting and technologies such as anaerobic digestion.

- Encourage increased beneficial use and recycling of materials, including identification of incentives and removal of unnecessary barriers.

- Provide tools and assistance to municipalities and businesses to support waste reduction and diversion efforts.

- Continue refinement of data sources and data management systems to more accurately and consistently assess progress toward statewide reduction and recycling goals, and to evaluate the effectiveness of programs and strategies.

The following strategies and actions are identified as ways for the State to focus its resources on the priorities identified as achievable and likely to have the greatest impact in improving waste reduction and diversion in Maine during the next five years.

A. Strategies and Actions to Promote Organics Management and New Technologies

- Provide technical and regulatory assistance to support development of regional and/or co-located processing facilities, including collection, sorting, composting, and biological and chemical conversion technologies.
- Develop solid waste management regulations specific to the licensing and operation of conversion technologies.
- Provide technical and regulatory assistance to support development of local food scrap composting operations, including on-farm operations and expansion of leaf and yard

waste facilities to include food scraps. Engage agricultural community to identify and address needs to increase participation in food scrap composting.

- Assist food scrap generators to identify and work with facilities that offer alternatives to disposal, such as compost facilities and anaerobic digesters.
- Develop outreach and education strategy to assist food scrap generators with separation programs.
- Develop case studies of successful organics separation and management operations, highlighting strategies for addressing potential issues such as odors, staff training, and additional resource needs.

B. Strategies and Actions to Increase Beneficial Use and Recycling

- Update recycling promotional campaign materials, develop additional materials for other diversion strategies, and maintain online.
- Coordinate with other Northeast States to develop regional approaches to support the development of recycling options for discarded mattresses and carpet.
- Identify and remove unnecessary barriers to the use of CDD wood as fuel, including review of waste characterization protocols.
- Explore opportunities to provide incentives for the use of municipally-generated CDD wood as biomass fuel.
- Update non-hazardous waste transporter regulations to reduce/remove requirements that no longer significantly improve environmental outcomes.
- Evaluate collection strategies for single-use (primary) batteries, antifreeze, and small gas cylinders, or other difficult to dispose of products.

C. Strategies and Actions to Support Municipalities and Businesses

- Develop and distribute waste diversion measurement tool for municipalities.
- Identify measurement tools for municipal and business entities to evaluate the environmental impacts of materials management systems, including greenhouse gas emissions.
- Continue program activities related to education, collection and proper disposal of unwanted pharmaceuticals and medical sharps
- Provide assistance to municipalities and businesses to improve collection and recycling of electronic wastes, mercury containing products, and architectural paint.
- Update and distribute building deconstruction guidance.
- Provide for positive public recognition of entities including municipalities, regions, and businesses that have made changes in their processes and systems that result in significant diversion of materials from disposal.

D. Strategies and Actions to Provide Reliable Data to Support Sustainable Materials Management

- Collect, utilize and disseminate reliable data to calculate statewide recycling and diversion rates for MSW and other solid wastes:
  - Develop and implement standardized data collection and management procedures and requirements for reporting of marketed recyclables by materials processors and brokers.
  - Develop and publish annual waste generation, diversion and disposal rates for industrial wastes.
  - Continue to develop and publish annual waste generation rates for MSW, including CDD.
- Assist municipalities in tracking of municipal recycling rates by developing and distributing a model methodology to calculate municipal generation, diversion and disposal rates for MSW.
- Collect, utilize and disseminate reliable data on annual waste diversion through beneficial use, agronomic utilization, anaerobic digestion, and waste conversion practices.

VI. Conclusion

Many opportunities remain in Maine to further divert materials from disposal. Organic materials such as food scraps can be separated from the waste stream and composted or processed by conversion technologies such as anaerobic digesters. Other types of conversion technologies can process a variety of materials to produce synthetic gas or liquid fuel. Additionally, improvements in data quality can assist the Department, municipalities and regions to better evaluate the performance and effectiveness of waste management and diversion programs in Maine.

The Department has identified a number of strategies to increase diversion rates, reduce disposal volumes, and to further utilize materials in Maine. The Department will evaluate and implement programs to encourage food scrap separation by industrial, commercial and institutional entities. The Department will also revise its regulations to clarify and specify licensing requirements for facilities utilizing conversion technologies. The Department recommends that facilities currently producing large volumes of or managing waste materials explore opportunities to establish co-located conversion technologies to achieve the greatest efficiencies through fuel generation and minimization of transportation costs.

These strategies can provide domestic, renewable energy sources, contribute to local economies, reduce greenhouse gas emissions, and extend the lifespan of Maine's existing landfill capacity.

Appendices

Appendix A – 5-Year Plan Advisory Committee

John	Adelman	CPRC, Scarborough
Ed	Barrett	City of Lewiston
Pete	Didisheim	Natural Resources Council of Maine
Mark	Draper	Tri Community Landfill, Caribou
Bob	Duchesne	Consultant to USA Energy Group, LLC
Richard	Geisser	ReEnergy
Victor	Horton	Maine Resource Recovery Association
Jared	Jacobs	One Steel
Joe	Kazar	Mid Maine Waste Action Corporation
Lee	Liner	Bath Public Works
Greg	Lounder	Municipal Review Committee
Jeff	McGown	Waste Management, Crossroads Landfill
Beth	Milligan	TOMRA (Returnable Services)
Troy	Moon	City of Portland
John	O'Connell	Lincoln County
Brian	Oliver	Casella Waste
Mac	Richardson	LAWPCA
Kevin	Roche	ecomaine
Ron	Slater	Sandy River Recycling Association
Dave	St Laurent	City of Rockland
Roberta	Scruggs	Maine Forest Products Council
Sarah	Wintle	Exeter Agri-Energy

Beneficial use of waste (38 MRS §2132 (3)). The use of waste paper, waste plastics, waste wood, including wood from demolition debris, used motor vehicle tires or corrugated cardboard as a fuel in industrial boilers or waste-to-energy facilities for the generation of heat, steam or electricity constitutes recycling only for the purposes of determining whether the goals in subsection 1 are met and for determining municipal progress as provided in section 2133. In order for the use of waste under this subsection to constitute recycling, the department must determine that there is no reasonably available market in the State for recycling that waste and the wastes must be incinerated as a substitute for, or supplement to, fossil or biomass fuels incinerated in the industrial boiler or waste-to-energy facility.

Municipal solid waste (06-096 CMR 400 (NNNN)). "Municipal solid waste" means solid waste emanating from household and normal commercial sources. Municipal solid waste includes front end process residue from the processing of municipal solid waste.

Recycle (38 MRS §1302-C (21)). "Recycle" means to recover, separate, collect and reprocess waste materials for sale or reuse other than use as a fuel for the generation of heat, steam or electricity.

Recycling (38 MRS §1302-C (22)). Recycling. "Recycling" means the collection, separation, recovery and sale or reuse of materials that would otherwise be disposed of or processed as waste or the mechanized separation of waste, other than through combustion, and the creation and recovery of reusable materials other than as a fuel for the generation of electricity.

Solid waste (38 MRS §1302-C (29)). "Solid waste" means useless, unwanted or discarded solid material with insufficient liquid content to be free-flowing, including, but not limited to, rubbish, garbage, refuse-derived fuel, scrap materials, junk, refuse, inert fill material and landscape refuse, but does not include hazardous waste, biomedical waste, septage or agricultural wastes. The fact that a solid waste or constituent of the waste may have value or other use or may be sold or exchanged does not exclude it from this definition.

Solid waste facility (38 MRS §1303-C (31)). "Solid waste facility" means a waste facility used for the handling of solid waste, except that the following facilities are not included:

A. A waste facility that employs controlled combustion to dispose of waste generated exclusively by an institutional, commercial or industrial establishment that owns the facility;

B. Lime kilns; wood chip, bark and hogged fuel boilers; kraft recovery boilers and sulfite process recovery boilers, which combust solid waste generated exclusively at the facility; and [

C. An industrial boiler that combusts mixed paper, corrugated cardboard or office paper to generate heat, steam or electricity if:

(1) The mixed paper, corrugated cardboard or office paper would otherwise be placed in a landfill;

(2) The market value of the mixed paper, corrugated cardboard or office paper as a raw material for the manufacture of a product with recycled content is less than its value to the facility owner as a fuel supplement;

(3) The mixed paper, corrugated cardboard or office paper is combusted as a substitute for, or supplement to, fossil or biomass fuels that constitute the primary fuels combusted in the industrial boiler; and

(4) The boiler combusts no other forms of solid waste except as provided in this subsection.

Special waste (38 MRS §1303-C (34)). "Special waste" means any solid waste generated by sources other than domestic and typical commercial establishments that exists in such an unusual quantity or in such a chemical or physical state, or any combination thereof, that may disrupt or impair effective waste management or threaten the public health, human safety or the environment and requires special handling, transportation and disposal procedures. Special waste includes, but is not limited to:

A. Oil, coal, wood and multifuel boiler and incinerator ash;
B. Industrial and industrial process waste;
C. Waste water treatment plant sludge, paper mill sludge and other sludge waste;
D. Debris and residuals from nonhazardous chemical spills and cleanup of those spills;
E. Contaminated soils and dredge spoils;
F. Asbestos and asbestos-containing waste;
G. Sand blast grit and nonliquid paint waste;
H. (repealed)
I. High and low pH waste;
J. Spent filter media and residue; and
K. Other waste designated by the board, by rule.

Appendix C - Current Management of Maine's Solid Waste by Type

Waste categories & types	Source reduction	Reuse and re-purpose	Recycle	Compost	Beneficial Use			Processing		Disposal	
					Agronomic Utilization	Raw material substitution	Fuel Substitution	Anaerobic Digestion	Conversion (gasification /pyrolysis)	WTE incineration	Landfill
	Note: N = None, I = Incidental, L = Low, M = Medium, H = High, gray shaded = Not applicable (not possible)										
MSW											
Organics											
Food waste	L	L		L				L	N	H	H
Leaves & grass	I	L		M					N	L	M
Prunings & trimmings	I	L		M			L		N	L	M
Other organics	N			N				N	N	H	H
Paper											
Corrugated cardboard (OCC)	L	L	M	L					N	M	M
Newspapers (ONP)	M	M	M	L					N	M	M
Magazines/catalogs	L	L	M						N	M	M
High grade office paper	L	L	M	L					N	M	M
Mixed paper	L	I	M						N	H	H
Plastics											
#1 PETE/PET	M	I	H			N	L		N	L	L
#2 HDPE	L	I	H			N	L		N	L	L
#3 PVC	L	I	M			N			N	M	M
#4 LDPE	L	I	M			N	L		N	M	M
#5 polypropylene	L	I	M			N	L		N	M	M
#6 polystyrene (Styrofoam)	L	I	M			N	L		N	M	M
#7 miscellaneous plastics	L	I	M			N	L		N	M	M

Appendix C - Current Management of Maine's Solid Waste by Type

Waste categories & types	Source reduction	Reuse and re-purpose	Recycle	Compost	Beneficial Use			Processing		Disposal	
					Agronomic Utilization	Raw material substitution	Fuel Substitution	Anaerobic Digestion	Conversion (gasification /pyrolysis)	WTE incineration	Landfill
plastic films	N	I	L			N	L		N	H	H
large rigid plastics	N	L	L			N	L		N	H	H
Metals											
Aluminum cans/foil	M	I	H							L	L
Steel Cans	L	I	M							M	M
Metals - ferrous	N	I	H							L	L
Metals - non-ferrous	N	I	H							L	L
Glass											
Brown/amber glass	I	L	H			L				L	L
Clear glass	I	I	H			L				L	L
Green glass	I	I	H			L				L	L
Consumer products											
Pesticides & fertilizers	I									H	H
Rechargeable batteries			L							H	H
Primary batteries	I		I							H	H
Paint	I	L	I							H	H
mercury-added thermostats	H	I	L							H	H
Mercury-added lamps	I		L							M	M
mercury devices	I		L							M	M
	Source	**Reuse**	**Recycle**	**Compost**	**Beneficial Use**			**Processing**		**Disposal**	

Appendix C - Current Management of Maine's Solid Waste by Type

Waste categories & types	reduction	and re-purpose			Agronomic Utilization	Raw material substitution	Fuel Substitution	Anaerobic Digestion	Conversion (gasification /pyrolysis)	WTE incineration	Landfill
small appliances	I		I							H	H
cell phones & other hand-held electronics	I	I	L							H	H
TVs & computer-related equipment	I	M	H							I	I
other consumer electronics	I	M	L							H	H
Vehicle Batteries			H							N	I
Tires		M	I			M	H		N	I	I
Unused medications	L	I		N					N	H	M
Sharps			N						N	H	H
textiles		L	L				N		N	M	M
mercury auto switches	H		M							M	I
CDD/wood waste/OBW											
Mixed CDD			L						N	I	H
Metal			H							I	L
Clean C&D wood			N			N	M		N	I	M
Coated/contaminated C&D wood						N			N	I	H
Treated wood						N	L		N	I	H
Asphalt roofing material			N			M	N		N	I	M
Wallboard			L		L	N				I	H
Carpet	L	I	L				N		N	I	H
Waste categories	**Source reduction**	**Reuse and re-**	**Recycle**	**Compost**	**Beneficial Use**			**Processing**		**Disposal**	
					Agronomic	**Raw**	**Fuel**	**Anaerobic**	**Conversion**	**WTE**	**Landfill**

Appendix C - Current Management of Maine's Solid Waste by Type

& types		purpose			Utilization	material substitution	Substitution	Digestion	(gasification /pyrolysis)	incineration	
Furniture & mattresses		L	L						N	L	H
Electrical			I							L	H
Asbestos -containing materials										I	H
Asphalt			H								L
White goods		I	H								I
Landclearing debris					L	N	L		N		L
PVC pipe and siding	N		I						?		H
Special wastes											
WWTP sludge				H	L		L	L	N		L
industrial process wastes					L	N	N		N		H
food processing waste				M				L	N		M
Shredder residues						?			N		H
Multi-fuel boiler ash						N					H
Wood ash					M	N					M
Coal ash						N					H
MSW ash											H
Burn pile ash											H
Contaminated soils						N					H
Dredge materials						M					M
Sandblast grit						N					H
Catch basin grit & street sweepings						N					H

There are three broad categories of waste conversion technologies: 1) thermochemical, such as gasification, pyrolysis, and plasma arc technology; 2) physiochemical, such as distillation of ethanol and the production of biodiesel; and 3) biochemical, such as anaerobic digestion and ethanol fermentation and hydrolysis. Potential benefits of these technologies include lower greenhouse gas and other air emissions, renewable energy production, offset of fossil fuels, and beneficial use of waste materials.

Four technologies are briefly discussed here because they are new and have relevance for Maine and large-scale applications for waste management.

1. Gasification

Gasification is a term that describes a chemical process by which carbonaceous (hydrocarbon) materials (coal, petroleum coke, biomass, etc.) are converted to a synthesis gas (syngas) by means of partial oxidation with air, oxygen, and/or steam.

A hydrocarbon feedstock is fed into a high-pressure, high-temperature chemical reactor (gasifier) containing steam and a limited amount of oxygen. Under these "reducing" conditions, the chemical bonds in the feedstock are severed by the extreme heat and pressure and a syngas is formed. This syngas is primarily a mixture of hydrogen and carbon monoxide. The syngas is then cleansed using systems that remove particulates, sulfur, and trace metals. The resulting gas mixture is a fuel.

Gasification is potentially a very efficient method for extracting energy from many different types of carbon-containing materials. More of the energy contained in the materials is extracted by gasification than direct combustion of the original fuel, such as occurs in the current waste-to-energy technologies employed in Maine. In addition, the high-temperature process refines out corrosive ash elements allowing cleaner gas production from otherwise problematic fuels, and produces lower emissions of greenhouse gases than waste-to-energy systems.

2. Plasma Arc Technology

Plasma arc gasification as a waste treatment technology uses high electrical energy and high temperature created by an electrical arc gasifier to break down the waste primarily into elemental gas and a solid waste slag. The process is intended to be a net generator of electricity, depending upon the composition of wastes, and also to reduce the volumes of waste being sent to landfill sites.

A different type of plasma arc waste conversion that uses plasma to refine gases produced during waste conversion, rather than to destroy waste, has recently been shown to be successful on a full commercial test scale in Ontario. Its emissions are lower than other thermal waste processing systems, and by converting waste to CO_2 and water, rather than to methane, the greenhouse gas emissions are much less than those from competing technologies.

There are a number of large scale plasma projects proposed to come on line over the next several years including proposals in Ottawa, Ontario, St. Lucie County, Florida and the City of Tallahassee, Florida.

3. Biochemical – Anaerobic digestion

Anaerobic digestion is a process where microorganisms break down organic materials, such as manure, sewage sludge and food scraps, in the absence of oxygen. This decomposition process produces biogas, made primarily of methane and carbon dioxide, which is captured and combusted to produce electrical energy and heat. The digestion process also produces a liquid digestate that can be used as a soil amendment, and a solid digestate that can be utilized as a bedding material for livestock, composted or applied to crop land to enrich the soil.

Anaerobic digesters may utilize animal manure or sewage sludge as its primarily organic feedstock, with food scraps added as another organic feedstock, or food can be digested at facilities specifically designed for the organic portion of municipal solid waste. Co-digestion is a process whereby additional, energy-rich organic materials (e.g. food scraps or fats, oils, and grease) are added to dairy or wastewater digesters that have excess processing capacity.

There are currently several anaerobic digesters in operation in Maine, using either animal manures or sewage sludge as the primary organic material, with other facilities in planning or discussion phase.

4. Landfill Gas

Landfills can be actively managed for their gas recovery potential. The gas can be used to fuel generators to produce electricity, piped to other fuel combustion facilities, or compressed and bottled. The gas is collected by placing pipes in the landfill, and maintaining slight pressure sufficient to draw the gas into a recovery plant but not enough to draw oxygen in through the landfill cap. The gas is then cleaned and either piped to a generator plant, a local application, or a compressor plant.

There are currently two landfills in Maine capturing landfill gas and combusting it in on-site facilities to generate electrical power for the grid: the closed former Pine Tree Landfill in Hampden (owned by Casella Waste Services) and the currently active Crossroads Landfill in Norridgewock (owned by Waste Management Inc.) The state owned landfill in Old Town, Juniper Ridge, is currently flaring its landfill gas, but discussions are underway to beneficially capture and utilize that gas through an agreement with the University of Maine at Orono.

Federal EPA Overview Conversion Technologies
Table ES-1. Overview of Conversion Technology Characteristics.[1]

Conversion Technologies	Pyrolysis	Gasification	Anaerobic Digestion
Feedstock	Plastics	MSW[2]	Food, yard, and paper wastes
Primary End Product(s)	Synthetic Oil, Petroleum Wax	Syngas, Electricity, Ethanol	Biogas, Electricity
Conversion Efficiency[1]	62–85%	69–82%	60–75%
Facility Size (Capacity)	10–30 tons per day	75–330[3] tons per day	10–100[5] tons per day
Product Energy Value	15,000–19,050 BTU/lb	11,500[4]-18,800 BTU/lb	6,000–7,000[5] BTU/lb

1 Conversion efficiency is defined as the percentage of feedstock energy value (e.g., btu/lb) that is transformed to and contained in the end product (e.g., syngas, oil, biogas).

2 Only certain MSW fractions can be input to a gasifier. Glass, metals, aggregate, and other inerts are not desirable and may cause damage to the reactor.

3 Total capacity permitted based on vendor communications. Geoplasma's St. Lucie, FL plasma gasification plant is permitted up to 686 tons/day, but the vendor could not be reached for confirmation. [Note: as of September 2012, the St. Lucie facility is no longer in development]

4 LHV of ethanol

5 Estimated. AD facilities can span a wide range of sizes, input feedstocks, and designs.

U.S. Environmental Protection Agency's October 2012 report, "State of Practice for Emerging Waste Conversion Technologies" (http://nepis.epa.gov/Adobe/PDF/P100FBUS.pdf)
While the application of these technologies to municipal solid waste (MSW) feedstocks is only emerging in the United States (U.S.), these technologies have been applied for the management of MSW in other parts of the world, such as Australia, Canada, Europe, and Japan. A key aspect of international applications is that they are part of waste systems with advanced segregation, such as source segregated organics collection. Where conversion technologies have been most successful is in locations with already established programs for waste segregation and collection, dedicated waste streams (e.g., plastic from industrial partners), and waste supply contracts so that potential plants can operate economically.

Table 5 - Available Licensed MSW Disposal Capacity in Maine

Waste-to-Energy Facilities	***Annual capacity***	**2012 (tons/year)**	**2017 (tons/year)**	**2022 (tons/year)**	**2032 (tons/year)**
MMWAC – Auburn	70,000	70,000	70,000	70,000	70,000
ecomaine – Portland	170,000	170,000	170,000	170,000	170,000
PERC – Orrington	304,000	304,000	304,000	304,000	304,000
MERC	310,000	310,000	0	0	0
Total incinerator capacity in tons	**854,000**	**854,000**	**544,000**	**544,000**	**544,000**
	2012 Fill rate (cubic yards)	**2012 (cubic yards)**	**2017 (cubic yards)**	**2022 (cubic yards)**	**2032 (cubic yards)**
State-owned landfills:					
Carpenter Ridge – T 2 R 8	N/A	Not developed	Not developed	Not developed	Not developed
Juniper Ridge – Old Town	586,775	5,280,000	2,346,125	0	0
Municipal MSW landfills					
Augusta - Hatch Hill	49,718	961,488	712,898	464,308	0
Bath	23,000	340,000	225,000	110,000	0
Brunswick	9,943	227,337	177,622	127,907	28,477
Presque Isle	19,240	1,455,091	1,358,891	1,262,691	1,070,291
Tri-Community	25,204	1,677,653	1,551,633	1,425,613	1,173,573
Municipal 'ash' landfills					
ecomaine	22,174	772,602	661,732	550,862	329,122
Lewiston	17,559	608,370	520,575	432,780	257,190
Commercial landfills					
WM Crossroads - Norridgewock	255,873	3,910,662	2,631,297	1,351,932	0
Total landfill capacity in cubic yards	1,009,486	15,233,203	10,185,773	5,726,093	2,858,653
Total disposal capacity	**1,553,486**	**15,777,203**	**10,729,773**	**6,270,093**	**3,402,653**

1 cubic yd MSW = 625 lbs.

TABLE 6 - LANDFILLED TONNAGES AND REMAINING LANDFILL CAPACITIES – 2012

Landfill	MSW (tons)	CDD (tons)	Special Wastes (tons)	Other Materials and Descriptions	Capacity Consumed in 2012 (cubic yards)	Constructed Capacity Remaining (cubic yards)	Licensed Capacity Remaining (cubic yards)	Years of Licensed Capacity Remaining at current fill rate
Augusta - Hatch Hill	27,570	(included in MSW)	3,514	13,532 yds^3 of cover materials	49,718	961,488	961,488	17.5
Bath	11,920	1,232	718	25,309 yds^3 of cover materials	23,000	126,000	340,000	14.8
Brunswick	3,346	(included in MSW)	0		9,943	227,337	227,337	22.9
Presque Isle	7,489	1,225	1,881	2,014 yds^3 of cover materials	19,240	265,091	1,455,091	53
Tri-Community	24,979	1,099	1,405	5330 tons of bark mulch as cover materials	25,204	577,653	1,677,653	66.6
ecomaine	0	0	49,838	Excavated 3,987 tons MSW to combust, and 8,254 tons of metal for recycling	22,174	194,240	772,602	34.8
Lewiston	0	724	17,654		17,559 (5 year average)	608,370	608,370	35
Waste Management / Crossroads	68,307	73,780	97,199	Also received 142 tons of clean dirt utilized as ADC; also, 76,250 tons of Special Waste were utilized as ADC	255,873	1,498,912	3,910,662	15.3
Juniper Ridge	94,907	369,069	173,158	Includes 235,546 tons of waste utilized as ADC; special waste includes 101,276 tons MSW incinerator ash	586,775	1,300,000	5,280,000	9.0
MidCoast Solid Waste	0	2,760	0		4,560	10,400	10,400	2.3
Rockland	0	16,553	3231		53,300	212,000	212,000	4.0
Totals	238,518	466,442	348,597	Overall total = 1,053,557				--

Table 7 - 2012 Waste Handling by Maine Waste-to-Energy Incinerators											
FACILITY	Municipal MSW received	Commercial MSW received	Spot market MSW received	Other waste received	Total waste received	Waste shipped as bypass	Front end process residue produced	Metals recovered	MSW combusted	Ash produced	MSW destroyed through combustion
Maine Energy	51,944	178,674	0	9,498	240,116	1,883	37,453	5,068	186,214	45,363	140,851
Ecomaine	62,934	68,822	44,306	0	176,062	1,120	**0**	11,251	163,691	45,945	117,746
Mid Maine Waste Action Corp	36,995	14,014	22,639	0	73,648	11,479	**0**	1,902	60,267	17,421	42,846
Penobscot Energy Recovery Corp.	193,992	100,307	17,332	578	312,209	44	56,692	8,708	246,187	55,880	190,307
TOTALS	**345,865**	**361,817**	**84,277**	**10,076**	**802,035**	**14,526**	**94,145**	**26,929**	**656,359**	**164,609**	**491,750**
	Total MSW received = 791,959				*percent of total*	*1.81%*	*11.74%*	*3.36%*	*81.84%*	*20.52%*	*61.31%*

All amounts are in TONS

Other waste includes wood chips and special wastes - assume 100% destroyed through incineration

Bypass includes non-processible and bulky waste

Ecomaine municipal MSW received was 63,743; 809 tons temporarily landfilled for recovery & burning as needed to operate boiler at maximum efficiency

Maine Energy FEPR amount includes 1007 tons of RDF used as absorbent for clean up

MSW combusted = Total waste received – (other waste received + waste shipped as bypass + FEPR produced + metals recovered)

Components of a municipal solid waste (MSW) management system include collection, transportation, facility operations, marketing of recyclables, and final disposal. 38 MRSA §1305 states that each municipality in Maine is responsible for providing for "solid waste disposal services for domestic and commercial solid waste generated within the municipality." This allows each municipality local control to determine the management system it will use to fulfill this responsibility, including how much of the system will be publically or privately owned and/or operated, and how the system is funded.

The overall cost of MSW management for a municipality and its residents is determined by the amount generated and disposed, the disposal fee, operational and transportation costs, and the cost of or revenue from recycled materials.

Collection

Options for collecting MSW from residences for transport to either a transfer station or disposal facility include: drop off (self-haul by residents), curbside collection by private haulers contracted by individual households, curbside collection by a private hauler(s) contracted by the municipality, and municipally-provided curbside collection. The latter two options result in much more efficient collection than the first two, which involve multiple vehicles engaged in overlapping trips with less waste transported for each mile travelled.

Municipalities that contract for or provide curbside collection can set operational requirements to realize the overall cost savings achieved by such efficiencies. Taking responsibility for collection of MSW from households also enables municipalities to transition to management strategies proven to decrease disposal rates and increase recycling and composting of organics. Such strategies include pay-as-you-throw for disposal, and more frequent collection of compostable organics and recyclables and less frequent collection of trash for disposal. Along with savings realized through transportation efficiencies, additional reductions in waste management costs can be realized where disposal tipping fees are greater than fees for the management of recyclables and compostable organics.

Transportation

Transportation costs can be consistently expressed as the dollar amount per ton per mile. As part of a recent regional solid waste management planning initiative, the MidCoast Economic Development District (MCEDD) determined that MSW transportation costs for 11 different facilities ranged from $2.36/ton/mile to $5.46/ton/mile, with smaller facilities having relatively higher costs.

Disposal

The management system costs determined by the final disposal location include disposal (tipping) fees and transportation costs.

Facilities offering <u>in-state</u> disposal and recent disposal fees include:

Disposal Site	Location	2012 MSW Disposal Fee
Bath Landfill	Bath	$75-$105/ton
Brunswick Landfill	Brunswick	$80/ton
Ecomaine Incinerator	Portland	$88-$110/ton
Hatch Hill Landfill	Augusta	$62-70/ton
MMWAC Incinerator	Auburn	$70-$83/ton
PERC Incinerator	Orrington	$51-$54/ton (after rebate)
Presque Isle Landfill	Presque Isle	$112-$150/ton
Tri-Community Landfill	Fort Fairfield	$85/ton
Crossroads Landfill	Norridgewock	$60/ton

Tipping fees change over time and may be dependent on the waste volume, type and whether the waste is residential or commercial. Towns that are on or near the state borders may want to consider disposal facilities outside the state. Out of state disposal facilities that are used by some Maine towns include: Cogerno Landfill, Rivière-Verte, NB; Southwest Landfill, Lawrence Station, NB; Mt. Carberry, Success, NH; and Waste Management's Turnkey Landfill, Rochester, NH.

Recycling

Recycling programs vary by municipality but contain similar components: separation, collection, processing and marketing. The generator of municipal solid waste makes a conscious decision to separate from their trash those materials and products that are accepted by the local recycling program. Once separated from the trash, the recyclables are provided to the recycling program, and that is where a significant difference can exist. For communities with curbside collection, many have switched from a program where residents placed separated recyclables at the curb to a 'single stream' program where all recyclables are placed curbside in a single container, a more efficient collection system, reducing collection costs and encouraging increased participation in the recycling program. These co-mingled recyclables are then transported to a materials recovery facility (MRF) where sorting of the recyclables occurs, and then the recyclables are processed and marketed. Many other communities still collect separated recyclables at the curb or accept them at their drop-off recycling center where the materials are processed and marketed.

The single-stream recycling programs greatly reduce the collection costs of recyclables but require capital intensive sorting systems. The costs for curbside collection are typically absorbed by the municipality, which then is responsible for delivering the recyclables to a MRF that it either is a part owner of or contracts for its use. Costs at a MRF are typically covered by the value of recyclables, but there is often a recyclable's value point achieved where a municipality may receive a portion of the value in return, or should the recyclable's value point decrease, the municipality may have to pay a fee for the processing and marketing of its recyclables. Actual MRF expenses vary by facility, but operationally, costs per ton of recyclable received and processed ranges from $55 to $75 per ton for the single stream recyclables, with that cost being covered by the value received from the sale of the products.

In a program where residents drop off their separated recyclables, recycling center staff process and market the recyclables. Little sorting of recyclables is necessary. The costs are primarily labor and equipment but the recycling program receives the value of the recyclables it processes. The costs for these programs vary as well, and may range from $40 to $90 per ton, or higher, depending upon the size of the operation, the types and amounts of recyclables accepted, and equipment used for processing. The values received for recyclables vary [see excerpt from the Maine Resource Recovery Association (MMR) monthly markets report below], but in many cases reduce the net cost of managing the recycling program down towards zero. The differences here are that the collection costs are borne by the resident and the value of the recyclables is received by the municipality.

September 2013 MRRA Recycling Markets Report

Prices have continued to bounce around a narrow range with OCC up $10 the most significant change. Economic weakness continues and new uncertainty in the Middle East makes markets nervous. There does not appear to be any impetus to move prices higher at this time.

All prices are net to you and subject to changing market conditions.

	Sept '13	June-July '13
OCC	$115-120	$105-110
NEWS #8	$65	$65
Mixed Paper	$13-37	$35
SOW	$150	$140
HDPE #2 Natural	$674	$634
HDPE #2 Z (Mixed)	$304	$414
HDPE #2 Colored	$294	$354
Plastics #1,3-7 no #2	$0 to -$100	-$80 to -$100
PET #1 (full load of UBC quality)	$454	$534
Tin Cans (p/u - varies w/ freight)	$150	$157
Scrap Metal (p/u - varies w/ freight)	$70-145	$50-130
Tires (negative)	-$65	-$65
MRRA net avg. paid prior month (picked up)	$103	$107
ecomaine single stream (delivered)	-$10	$0

When comparing recycling options and value against the costs of disposal, communities may identify the tipping fee charged and not include the collection, consolidation and/or hauling fees in its disposal costs. Recycling programs are typically more closely monitored for costs, from collection to separation to processing, but the value of recyclables may be not included since that income often goes into the municipality's general fund, and not towards the recycling program.

Composting

Many Maine families utilize a back yard composting system for their organics, which may include leaf and yard trimmings as well as kitchen scraps. This type of system keeps organics out of the waste stream and creates a beneficial product for home use. Backyard composting is a very efficient way to manage organics and reduce dependency upon disposal options.

Over eighty municipalities provide a leaf and yard trimmings compost facility for their residents to utilize, as part of a larger program to reduce the amount of materials being discarded and at the same time generate a product that can be used by residents and the municipality. Leaf and yard trimmings programs are a low operational/maintenance program that can easily divert ten percent or more of the community's waste stream from disposal at a fairly low cost. Composting pads may be constructed of gravel, and the compost piles only need to be turned four times a year. Most programs turn the piles more frequently, which can result in more rapid decomposition of the materials and a better product. These types of composting programs can operate for $25 to $40 per ton and are often welcomed by residents. Most programs do not charge for the finished compost or may charge a nominal fee to assist with the program's costs. These programs support the diversion of waste while keeping the value of the compost product local.

Some municipal composting programs are beginning to accept food scraps from residents, institutions and businesses, which will further reduce the amount of organic residuals sent off for disposal. Composting operations utilizing food scraps require more attention, which may increase facility management costs, but can produce a higher quality compost for community participants. One of the challenges with accepting food scraps is the logistics of delivery of the food scraps from generators to the composting facility.

Since issuance of the previous State plan, several anaerobic digesters that process food scraps commenced operation in Maine. While the primary organic utilized in these digesters is manure, adding food scraps can have a positive effect on the unit's operation. There are logistical challenges with identifying food scrap generators and securing a hauler for delivering those scraps to the anaerobic digester, where they can be mixed with the manure to generate methane gas, which is then combusted to produce electricity.

Appendix G - Consolidation of ownership in the disposal, collection, recycling & hauling of solid waste

The Waste Generation and Disposal Capacity Report, for even-numbered years, is to include an analysis of consolidation in the ownership of the collection, recycling, hauling, and disposal sectors. This is performed to review Maine's solid waste industry for possible undue consolidation and the potential for unfavorable impacts on competition. The Department examines these industry sections to look for conditions that may either create a decrease in services or a monopolistic situation.

For 2012, Maine's solid waste industry was a mix of public and private investments and services that handled nearly 5,000 tons of materials each day. A review of that system and its components shows that the interrelated services of collection and hauling of recyclables and trash, and the processing or disposal of those materials, were provided in a consistent fashion, responding to Maine's solid waste management needs.

Disposal Facilities

During 2012, there was one change in the ownership/operation of a disposal facility, the Maine Energy Recovery Company (MERC), a waste-to-energy (WTE) incinerator. Located in Biddeford, MERC ceased operation the end of December under an agreement with the City of Biddeford. Subsequent to the previous review of consolidation in the waste management industry provided in the 2012 report, the Town of Greenville closed its landfill in 2011.

Collection and Hauling Services

During 2012, no substantial change in the ownership or operation of the many collection and hauling companies servicing residents, businesses, and municipalities was identified. There has been an increase in the 'partnering' or 'sharing of equipment/services' within the hauling sector, where one company contracts with another to provide collection, hauling or equipment services in the hiring company's stead. While these arrangements are typical, it will be an activity that the Department will monitor in the coming years, from the perspective of a potential shift in market share.

Recycling Services

In 2012, both processors and haulers continued promoting their offerings of the 'single stream' recycling collection strategy, also known as 'single sort' or 'Zero Sort®' services, where residents are able to place all of their recyclables into a single container for collection. This single container is then collected, delivered to a processing facility, and the material sorted into commodities and marketed. *Ecomaine*, a non-profit waste management company owned and operated by 21 municipalities in Southern Maine, established a single sort recycling program in 2007. FCR Goodman and Pine Tree Waste, divisions of Casella Waste Systems, Inc. offer a single stream recycling collection service through their program known as Zero Sort®. The collected recyclables are consolidated and shipped to either of the company's two processing facilities in Auburn, Massachusetts and Charleston, Massachusetts. As of this date, Casella is planning on constructing a recyclables processing facility in Lewiston.

Report to the Joint Standing Committee on the Environment and Natural Resources

128th Legislature, Second Session

Maine Solid Waste Generation And Disposal Capacity Report for Calendar Year 2016

January 2018

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Contents

I Introduction

This report is submitted to the Joint Standing Committee on Environment and Natural Resources and the Governor, pursuant to 38 M.R.S. § 2124-A. It provides an overview of Maine's solid waste generation, diversion, and disposal activities for 2016, and an evaluation of Maine's progress toward our waste reduction and recycling goals. The report also includes a projection of the solid waste disposal needs of Maine for the next 5, 10, and 20 years, and how the fill rate at each solid waste landfill could affect the expected lifespan of that landfill.

The information in this report can be utilized by policymakers engaged in solid waste management planning at both the state and local levels. Additional background information is available in the *Maine Solid Waste Generation and Disposal Capacity Report: Calendar Year 2015* available at www.maine.gov/dep/legislative/reports.html.

II. Solid Waste Management in Maine - 2016 Highlights

- The total amount of municipal solid waste (MSW) generated in Maine in 2016 was 1,556,711 tons. This tonnage included construction and demolition debris (CDD), and all was managed through various licensed solid waste facilities in 2016. This tonnage is a slight decrease from the total MSW, generated and managed in 2015.

- In 2016, Maine's MSW recycling rate (exclusive of construction and demolition debris) was 36.79%, virtually unchanged from the 2015 rate of 36.76%. Overall disposal of MSW rose slightly from 757,014 to 759,638 tons; the per capita disposal amount also rose slightly from 0.569 to 0.571 tons per person in 2016.

- The tonnage of food scraps and other organic materials reported being diverted from disposal and sent to composting or anaerobic digestion decreased in 2016 compared to 2015.

- Based on the currently licensed and operating disposal facilities and management systems, the disposal capacity for Maine generated MSW and its residual streams remains adequate into the near-term future. This includes three waste-to-energy (WTE) facilities, seven municipally-owned landfills, one active state-owned landfill, and one commercially-owned landfill.

III. Generation and Management of Solid Waste in 2016

A. Maine's Waste Management and Food Recovery Hierarchies

Maine statute includes two hierarchies to be used as guiding principles in decision-making in the management of solid waste. 38 M.R.S. § 2101, *Solid Waste Management Hierarchy*, sets as State policy an integrated approach to solid waste management with waste reduction as the highest priority, followed by reuse, recycling, composting, volume reduction prior to land disposal, and landfilling as the management option of last resort. 38 M.R.S. § 2101-B, the *Food Recovery Hierarchy*, provides additional guidance on the management of food waste in support of the Solid Waste Management Hierarchy. It prioritizes reducing surplus food generation at the source, donating surplus food to feed hungry people, diverting food scraps for use as animal feed, composting of food scraps and diversion to waste utilization technologies to create fuels and recover energy, and finally, incineration or land disposal (See Appendix B).

Preventing the generation of waste is at the top of Maine's Solid Waste Management Hierarchy because it provides the greatest environmental benefits. These include efficient use of material and energy resources, and the reduction of negative environmental impacts caused by virgin materials extraction and energy generation processes. Management options below waste reduction on the hierarchy also offer environmental benefits, although to a significantly lesser extent, with the amount of benefit decreasing with each drop along the hierarchy. Recycling captures and conserves material resources for reuse in manufacturing and production applications, often also reducing the amount of energy needed to create new products. Composting transforms organic wastes into a soil amendment that increases fertility and soil structure, enabling more productive agricultural production. Anaerobic digestion facilities can also utilize wasted food as a feedstock in its system, increasing the generation of biogas produced and available for capture and use in generating electricity and valuable products for agricultural uses. Conversion technologies convert waste materials to fuel, creating a substitute for virgin fossil fuels or other fuel types. Waste-to-energy combustion generates electricity in the process of thermally reducing the volume of waste prior to its landfilling. Finally, energy can be captured from the gasses generated by the degradation of organic wastes placed into landfills and used to generate electricity or serve as a fuel source for other possible uses.

B. Overview of the management of Maine's solid waste in 2016

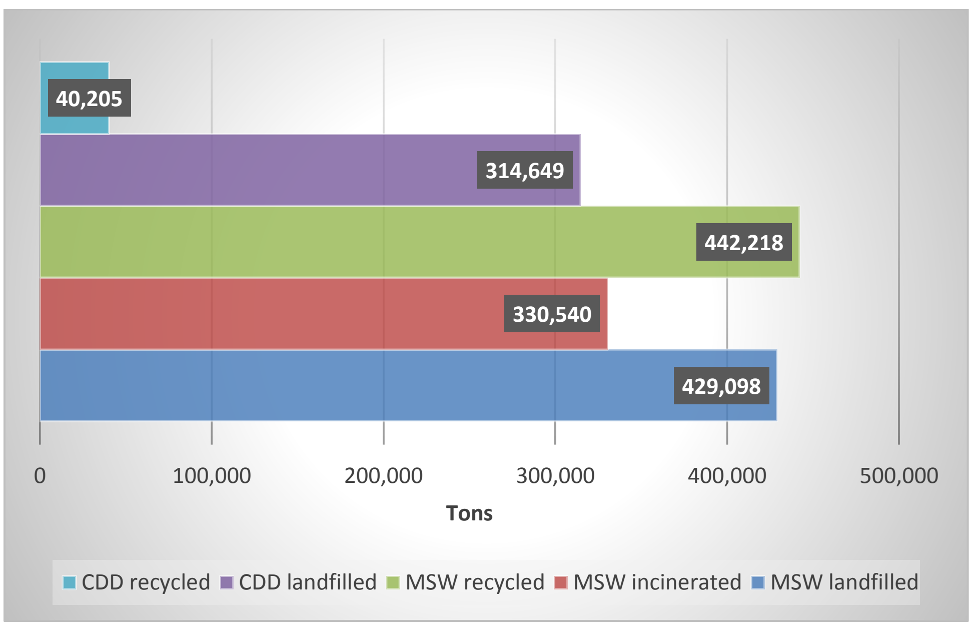
Maine's solid waste management infrastructure includes municipal, commercial, and private industrial waste handling services, operations and facilities. Once collected, solid waste in Maine is stored, transported, recycled, processed, composted, anaerobically digested, or beneficially used in place of virgin materials and as fuel, combusted at one of three waste-to-energy facilities, or landfilled. Table 1 and Figure 1 present a summary of the amounts and disposition of MSW and CDD generated in Maine in 2016.

Table 1 – Amounts & Disposition of Maine-generated MSW & CDD

Waste type and disposition	Amount in tons	Percent of total MSW & CDD	Percent of MSW	Percent of CDD
MSW landfilled*	429,098	28%	35.70%	
MSW destroyed through incineration	330,540	21%	27.50%	
MSW recycled	442,218	28%	36.79%	
CDD landfilled	314,649	20%		88.67%
CDD recycled	40,205	3%		11.33%
TOTAL	1,556,711			

*This includes 102,878 tons of MSW incinerator ash

Figure 1 – Disposition of Maine-generated MSW & CDD



The data for calendar year 2016 utilized in this report are collected from a variety of sources, including:

- licensed public and private processing, composting, and disposal facilities' annual reports submitted to the Department (in accordance with 38 M.R.S. §§ 1304-C, 2205, and 2232), and to other states' regulatory agencies (from out-of-state facilities which receive waste from Maine);

- data on the recycling of electronics, tires, vehicle batteries, consumer batteries, mercury-added lamps and textiles was obtained through a combination of voluntary and mandatory reports from the specialized businesses that manage these consumer products. This includes data reports required by Maine's product stewardship laws, data from hazardous waste manifests, and voluntary reporting by major collectors of these items; and

- voluntary reporting[1] by commercial entities managing recyclables generated in Maine.

Note that data on backyard, school based, and small, on-farm composting operations is not collected, so cannot be included in the calculation of Maine's MSW recycling rate.

IV. Progress toward Maine's Waste Reduction and Recycling Goals

A. Maine's municipal solid waste disposal reduction goal

In 2016, Maine's statutory goal for waste reduction was amended to focus on the readily-measurable amount of MSW sent for disposal. 38 M.R.S. § 2132(1-B) states:

> ***State waste disposal reduction goal.*** *It is the goal of the State to reduce the statewide per capita disposal rate of municipal solid waste tonnage to 0.55 tons disposed per capita by January 1, 2019 and to further reduce the statewide per capita disposal rate by an additional 5% every 5 years thereafter. The baseline for calculating this reduction is the 2014 solid waste generation and disposal capacity data gathered by the department.*

In 2014, Maine generated and sent for disposal (landfilling and incineration) 757,049 tons of MSW, exclusive of CDD. This established the baseline per capita disposal rate at 0.569 tons per person (Maine's estimated 2014 population was 1,330,256).[2] Maine's per capita disposal rate rose to 0.571 tons per person, a 0.35% increase in 2016 compared to the 2014 baseline year.

B. Maine's municipal solid waste recycling rate

38 M.R.S. § 2132.1 sets Maine's statewide goal for the recycling of municipal solid waste:

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[1] The Department is appreciative of the data voluntarily provided by generators/brokers of recyclables and acknowledges the reluctance of others in providing data due to lack of protections from *Freedom of Access Act* requests for information the business may consider as 'confidential business information'.

[2] U.S. Census Bureau, https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src=CF, accessed December 28, 2016

1. State recycling goal. It is the goal of the State to recycle or compost, by January 1, 2021, 50% of the municipal solid waste tonnage generated each year within the State.

In 2016, Maine's recycling rate for MSW exclusive of CDD was 36.79%, virtually unchanged from 2015 (36.76%). Note that the yearly variation in the MSW only recycling rate is likely within a statistical margin of error due to non-participation in voluntary reporting by some recycling brokers operating in Maine. Maine recycled/beneficially reused 11.38% of the CDD generated in 2016.

Maine's MSW recycling rate is calculated by dividing the total amount of MSW recycled and composted by the total amount of in-state generated MSW in accordance with 38 M.R.S. § 2132 (3). This report includes a recycling rate for MSW exclusive of CDD, and a recycling rate for CDD only. This approach allows Maine to perform an "apples-to-apples" comparison with other states' and the national MSW recycling rates which generally exclude CDD, while also enabling Maine to evaluate which parts of the solid waste stream municipalities can focus on to best effect positive changes in diverting materials from disposal.

In early 2017, the Country of China, a major purchaser of recyclables from countries around the world, made a decision known as 'National Sword' in regards to increasing its acceptable standards of recyclables being shipped to China. China notified the World Trade Organization (WTO) of its intention to prohibit the import of certain solid wastes and scrap into their country, including mixed paper and mixed plastics, beginning January 1, 2018. With the gap between domestic processing and market demand of recyclables, the proposed ban could adversely affect municipal recycling programs throughout the country.

In September 2017, China's Ministry of the Environment (MEP) indicated that they are not renewing waste import licenses. A handful of US municipal recycling programs have already begun to adjust the materials they accept in response to the uncertainty created by the pending ban and new contamination standard. Market prices, particularly for paper, dropped significantly in September, with market observers linking that decline to the Chinese actions.

The waste import ban and related issues, including their potential effect on local recycling programs across the United States, were raised in late September 2017 during meetings in China among US Department of Commerce, Office of the United States Trade Representative (USTR), and the US Environmental Protection Agency. To date, China's MEP has been reluctant even to clarify some questions about the affected materials and applicable contamination standards.

As a state, we should be prepared for increased market volatility for the affected materials, though as of this report, the Department has not been made aware of any significant material marketing impacts to in-state recycling facilities or processors. The Department will continue to monitor the situation and the markets, and will assist as appropriate to help keep recycling programs active and successful.

C. Special Wastes and Beneficial Use

Table 2 shows the types of solid wastes other than MSW, CDD and land-clearing debris generated in Maine, and how each waste type was managed in 2016. Much of the material landfilled is managed in generator-owned and operated facilities.

Table 2 – Special Wastes and Beneficial Use

WASTE TYPE	Compost/ N –Viro*	Beneficial Use	Land applied	Anaerobic digestion	Combusted	Landfilled
Asbestos/Asbestos Containing Waste	-	-	-	-	-	X
Ash - Coal, oil and multi-fuel boiler	X	X	X	-	-	X
Ash - MSW Incinerator	-	-	-	-	-	X
Ash- wood & burn pile/hot loads	-		-	-	-	X
Ash/Liming Agent – Other	-		X	-	-	-
Catch basin grit and street sweepings	-	X	-	-	-	X
Contaminated Soils – contam. unknown	-	-	-	-	-	X
Contaminated Soils - non-petroleum	-	X	-	-	-	X
Contaminated soils - Oil	-	X	-	-	-	X
Dredge Spoils	-	X	-	-	-	X
Fish/Food Process Residue	X	X	X	X	-	X
Industrial/Industrial Process Waste	-	-	-	-	-	X
Other Special Wastes	-	-	-	-	X	X
Pulp/Papermill Sludge	X	X	-	-	-	X
Sandblast Grit	-	X	-	-	-	X
Short-Paper Fiber	-	X	-	-	-	X
Shredder Residue	-	-	-	-	-	X
WWTP Sludge - industrial		-	X	-	-	X
WWTP Sludge - municipal	X	-	X	X	-	X

*N-Viro is a company located in Maine that utilizes a conversion process for treatment of sludge

V. Solid Waste Disposal Capacity

In 2016, Maine's solid waste disposal facilities included three WTE facilities, seven municipally-owned landfills, two state-owned landfills, and one commercially owned landfill. The State has another licensed landfill site, known as Carpenter Ridge, located in T2 R8, that remains undeveloped. That site, with a landfill design for approximately two million cubic yards of special wastes, was acquired by the State in the mid-1990's and is held by the State for development of disposal capacity when needed. The state-owned Dolby Landfill in East Millinocket accepted minimal amounts of solid waste and ceased operations in 2016.

Based on the current operations of the licensed disposal facilities in Maine, and their continued functionalities, the Department projects that disposal capacity for MSW (including CDD) generated in Maine will remain adequate into the near term. This conclusion is based on projections calculated using fill rates and capacity use data reported by licensed facilities in their annual reports on calendar year 2016 activity.

Table 3 shows the current and projected available waste-to-energy (WTE) processing/disposal capacity in Maine, by licensed facility, through 2036.

Table 3 - Available Licensed MSW Disposal Capacity at the three Waste-to-Energy Facilities - as of December 31, 2016

Waste-to-Energy Facilities	Annual capacity (tons/year)	2016 (tons/year)	2021 (tons/year)	2026 (tons/year)	2036 (tons/year)
MMWAC – Auburn	70,000	70,000	70,000	70,000	70,000
ecomaine – Portland	170,000	170,000	170,000	170,000	170,000
PERC – Orrington	304,000	304,000	304,000	304,000	304,000
Total Waste-to-Energy Facility capacity in tons	**544,000**	**544,000**	**544,000**	**544,000**	**544,000**

Table 4 shows the current and projected available landfill disposal capacity in Maine, by licensed facility, through 2036.

Table 4 - Available Licensed MSW Disposal Capacity and Projected Landfill Life as of December 31, 2016

Landfills	*2016 Fill rate (yd^3)*	*2016 available (yd^3)*	*2021 available (yd^3)*	*2026 available (yd^3)*	*2036 available (yd^3)*	Years of licensed capacity remaining at current fill rate
State-owned landfills						
Carpenter Ridge – T2 R8	N/A	not constructed	not constructed	not constructed	not constructed	N/A
Juniper Ridge – Old Town	744,393	764,104	8,072,439	4,350,474	0	15.8
Municipal MSW landfills						
Hatch Hill (Augusta)	54,945	759,500	484,775	210,050	0	13.8
Bath	9,939	432,100	382,405	332,710	233,320	43.5
Brunswick	8,570	191,070	0 (closed)	0 (closed)	0 (closed)	4.0
Presque Isle	13,551	1,402,650	1,334,895	1,267,140	1,131,630	103.5
Tri-Community (Fort Fairfield)	35,561	1,566,047	1,388,242	1,210,437	854,827	44.0
W-T-E ash landfills						
ecomaine	17,764	622,422	533,602	444,782	0	35.0
Lewiston	17,284	513,742	427,322	340,902	168,062	29.7
Commercial landfill						
Waste Management - Crossroads – Norridgewock	333,585	2,928,509	1,260,584	0	0	8.8
Total remaining licensed landfill capacity (yds^3)	-	9,180,144	13,884,264	8,156,495	2,387,839	N/A

Available MSW disposal capacity	2016	2021	2026	2036
Annual Waste-to-Energy facility capacity in tons	544,000	544,000	544,000	544,000
Total remaining landfill capacity in tons (MSW*)	7,803,122	11,801,624	6,933,021	2,029,663
Total Capacity for MSW (tons)	8,347,122	12,345,624	7,477,021	2,573,663

**Volume to Weight Conversion Factors*, U.S. Environmental Protection Agency, Office of Resource Conservation and Recovery, April 2016: 1 cubic yard MSW=0.85 tons

In 2016, 1,235,592 cubic yards of landfill capacity in Maine was filled with MSW, CDD, and special wastes, i.e., non-hazardous industrial wastes and wastes requiring special handling (e.g., asbestos). This includes waste from out-of-state sources as well as wastes from Maine, but does not include special wastes disposed of in generator owned landfills affiliated with specific industrial facilities and operations.

Solid wastes generated in other states may be disposed of at the waste-to-energy facilities and the commercially owned landfill in Maine. The disposal capacity at the state-owned Juniper Ridge Landfill is restricted by license condition to wastes generated in Maine, including waste generated by processing or combustion facilities in Maine which may accept wastes from other states. All the MSW disposed of in landfills in Maine was generated in Maine; and approximately 90% of the MSW disposed of through combustion in Maine were also generated in Maine.

In 2016, the Municipal Review Committee, Inc. and Fiberight, L.L.C. received a permit from the Department to develop a new solid waste processing facility designed to accept and manage 650 tons of MSW per day.

Table 5, below, shows the solid wastes received by each of the three currently operating WTE facilities, the percentage by generating state, how the waste was managed, and the various residue streams created.

Table 5 - 2016 Solid Waste Managed by Maine Waste-to-Energy Facilities (in tons)												
Facility	**Total MSW received**	**Other wastes received**	**Total waste received**	**% Maine**	**% MA**	**% NH**	**Waste shipped as by-pass**	**Front end process residue produced**	**Metals recycled**	**Waste combusted**	**Ash**	**Waste destroyed through combustion**
ecomaine	168,440	16,372	184,812	95.96%	0.00%	4.04%	2,673	N/A	5,101	177,008	43,939	133,069
Mid Maine Waste Action Corporation	77,466	0	77,466	99.83%	0.00%	0.17%	7,327	N/A	1,895	69,632	17,036	52,596
Penobscot Energy Recovery Company	310,444	1,017	311,461	80.94%	17.46%	1.60%	9,549	53,180	7,268	241,464	54,001	187,463
TOTALS	556,350	17,389	573,739	88.33%	9.48%	2.19%	19,549	53,180	72,729	488,104	114,976	373,128

VI. Solid Waste Industry Consolidation in 2016

The Waste Generation and Disposal Capacity Report includes an analysis of consolidation in the ownership of the collection, recycling, hauling, and disposal sectors. This is performed to review Maine's solid waste industry for possible consolidation concerns and the potential for unfavorable impacts on competition. The Department examines these industry sectors for conditions that may either create a decrease in services or a monopolistic situation.

During 2016, Maine's solid waste (or "materials management") industry continued to be a mix of public and private investments and services that daily handled thousands of tons of various types of materials. A review of that system and its components shows the interrelated, and often mutual supporting, services of collection and hauling of recyclables and trash. The processing and disposal of collected materials were provided in a steady and consistent fashion, responding to Maine's solid waste management needs.

Disposal Facilities

During 2016, there were no noted changes in the ownership/operation of the licensed disposal facilities in Maine.

Collection and Hauling Services

The Department did not learn of any significant ownership changes in, or to, service areas of trash hauling providers in 2016, aside from the information provided in the 2015 report, where it was noted that there was marked growth in the development of organics collection services, primarily in the Southern Maine region but extending to selected entities throughout the state, which continues to today.

Recycling Services

Two "materials recovery facilities" (MRFs) (facilities that sort mixed recyclables, aka, 'single stream recycling', into marketable commodities) are now in operation within, and serving, Maine's municipalities and businesses: ecomaine, a non-profit waste management company owned by 21 municipalities based in Portland; and, Casella Waste Services, Inc., in partnership with the City of Lewiston, who converted that city's recycling facility into a 'Zero Sort®' materials processing facility. The number of municipalities participating within each of these 'single stream recycling' programs continues to grow.

The municipalities' transition to single stream recycling has led to the abandonment of many long established 'source separated' recycling programs and facilities that had successfully been baling and marketing recyclables for many years.

VII. Disposal Fees and Supracompetitive Prices

A. Disposal Fees

Disposal expenses are comprised of collection, consolidation and transportation costs, and include tipping fees on the disposal of waste at a facility, with the tipping fee often being a major share of those costs.

Current tipping fees vary at each facility, but generally range from $40 to $95 per ton at Maine's waste-to-energy facilities and landfills. While these fees do fluctuate, they have been relatively stable, allowing predictability for municipal budgeting and long-term planning. Many transfer stations impose a fee on municipal solid waste delivered to them, and that fee may reflect the cost of the transfer station's operation, as well as partial or full value of the tipping fee at the intended disposal facility.

Tipping fees at WTE facilities are influenced by revenues received from the sale of the electricity, or other products, that they may generate. The revenues are used to reduce operating expenses, affecting the tipping fee charged for solid waste. Should electricity sales revenue drop, tipping fees may increase; conversely, should the electricity sales value increase, the possibility exists that lower tipping fees, or maintaining current fees, would occur.

The State's operating services agreement with Casella Waste Systems Inc. for the state-owned Juniper Ridge Landfill includes a ceiling for tipping fees, which varies by waste type. This sets an upper limit on how much can be charged for wastes delivered to that landfill.

B. Supracompetitive Prices

Supracompetitive, as applied to 'prices,' means prices that are higher than they would be in a normally functioning, competitive market; usually as a result of overconcentration, collusion, or some form of monopolistic, oppressive practice. State law requires the Department to determine whether changes in the amount of available landfill capacity have generated, or have the potential to generate, supracompetitive prices and if so, provide recommendations for legislative or regulatory changes as necessary.

Currently, the combined and available disposal capacity at all the operating municipal, commercial and state owned landfills within Maine does not appear to have generated, nor does it appear in the near term to have the potential to generate, supracompetitive disposal fees.

In looking ahead, at that point when disposal capacity exists with fewer disposal facilities, or a decline in waste processing capacity occurs, it is possible that prices could become supracompetitive.

Where the actual date and timing of this is not known, nor predictable, it is critical that the Department maintains awareness of this possibility and keeps the Governor and Legislature appropriately informed.

Appendix A - Definitions and Acronyms

<u>The following definitions and acronyms are provided to assist the reader in reviewing this document:</u>

Beneficial Use – *to use or reuse a solid waste or waste derived product: as a raw material substitute in manufacturing, as construction material or construction fill, as fuel, or in agronomic utilization.*

Construction/Demolition Debris (CDD) – *wastes generated by building, remodeling and/or destruction activities and may include such wastes as wood and wood products, concrete and brick, gypsum board, shingles and other common components of buildings.*

Diversion Rate – *Waste diversion is the prevention and reduction of generated waste through source reduction, recycling, reuse (including beneficial reuse), or composting.*

Front-end Process Residue (FEPR) – *residual of municipal solid waste resulting from the processing of solid waste prior to incineration or landfilling, and includes, but is not limited to, ferrous metals, glass, grit and fine organic matter.*

Municipal Solid Waste (MSW) – *solid waste emanating from household and normal commercial activities.*

Special Waste – *wastes that are generated by other than domestic and typical commercial establishments that exist in such an unusual quantity or in such a chemical or physical state that require special handling, transportation and disposal procedures.*

Supracompetitive – *when applied to prices means prices that are higher than they would be in a normally functioning, competitive market -- usually as a result of overconcentration, collusion or some form of monopolistic, oppressive practice.*

Waste-to-Energy Ash – *residue from the combustion of municipal solid waste at waste-to-energy facilities. It may also contain fly ash from the facility's operation and is designated as a "special solid waste".*

Waste-to-Energy facilities (WTE) – *facilities which receive municipal solid waste, and through processing and combustion, recover energy and convert it into electricity, while reducing the volume of waste requiring disposal.*

Appendix B - Maine's Waste Management and Food Recovery Hierarchies

Maine statute includes two hierarchies to be used as guiding principles in decision-making in the management of solid waste.

Maine's Solid Waste Management Hierarchy

38 M.R.S. § 2101, *Solid Waste Management Hierarchy*, establishes:

1. Priorities. *It is the policy of the State to plan for and implement an integrated approach to solid waste management for solid waste generated in this State and solid waste imported into this State, which must be based on the following order of priority:*

A. Reduction of waste generated at the source, including both amount and toxicity of the waste;

B. Reuse of waste;

C. Recycling of waste;

D. Composting of biodegradable waste;

E. Waste processing that reduces the volume of waste needing land disposal, including incineration; and

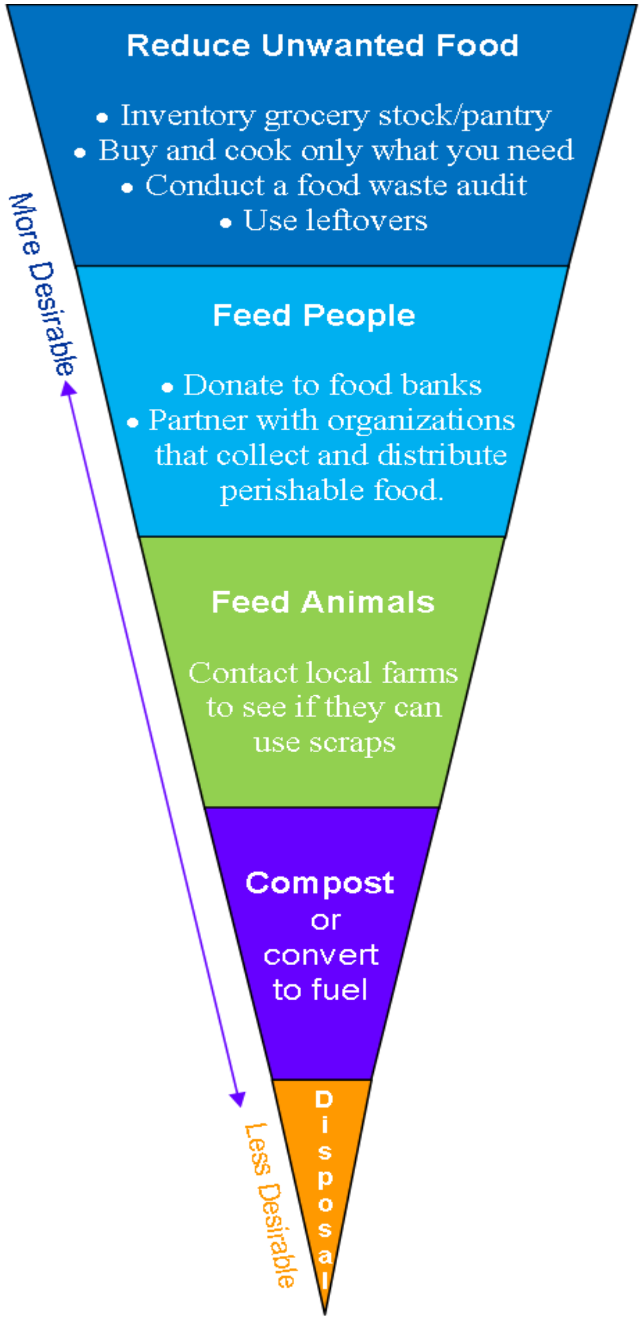
F. Land disposal of waste.

It is the policy of the State to use the order of priority in this subsection as a guiding principle in making decisions related to solid waste management.

2. Waste reduction and diversion. *It is the policy of the State to actively promote and encourage waste reduction measures from all sources and maximize waste diversion efforts by encouraging new and expanded uses of solid waste generated in this State as a resource.*

Maine's Food Recovery Hierarchy

38 M.R.S. § 2101-B, the *Food Recovery Hierarchy*, was enacted in 2016 to provide additional guidance on the management of food wastes. It establishes:



1. Priorities. It is the policy of the State to support the solid waste management hierarchy in section 2101 by preventing and diverting surplus food and food scraps from land disposal or incineration in accordance with the following order of priority:

> *A. Reduction of the volume of surplus food generated at the source;*
>
> *B. Donation of surplus food to food banks, soup kitchens, shelters and other entities that will use surplus food to feed hungry people;*
>
> *C. Diversion of food scraps for use as animal feed;*
>
> *D. Utilization of waste oils for rendering and fuel conversion, utilization of food scraps for digestion to recover energy, other waste utilization technologies and creation of nutrient-rich soil amendments through the composting of food scraps; and*
>
> *E. Land disposal or incineration of food scraps.*

2. Guiding principle. It is the policy of the State to use the order of priority in this section, in conjunction with the order of priority in section 2101, as a guiding principle in making decisions related to solid waste and organic materials management.

Report to the Joint Standing Committee on the Environment and Natural Resources

128th Legislature, First Session

Maine Solid Waste Generation and Disposal Capacity Report: Calendar Year 2015

January 2017

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Contents

I Executive Summary

This report is submitted to the Joint Standing Committee on Environment and Natural Resources and the Governor, pursuant to 38 M.R.S. § 2124-A. It provides an overview of Maine's solid waste generation, diversion, and disposal activities for 2015, the most recent full calendar year of data available, and a projection of how those activities will impact available solid waste disposal capacity. It also includes an evaluation of Maine's progress toward our waste reduction and recycling goals.

The report includes a projection of the solid waste disposal needs of Maine for the next 5, 10, and 20 years. The report also projects how the fill rate at each solid waste landfill could affect the expected lifespan of that landfill.

The information in this report can assist policymakers with planning for future solid waste disposal capacity investment. When the Department of Environmental Protection (Department) determines that a decline in available landfill capacity has generated or has the potential to generate supracompetitive prices, the Department shall include this and recommendations for legislative or regulatory changes as necessary.

Highlights

- The total amount of solid waste generated in Maine in 2015 was 2,475,213 tons (exclusive of solid waste disposed of in generator-owned landfills). This shows a decrease from the total of the 2,770,991 tons of solid waste tonnage generated in 2014. Within that total, the tonnage of Municipal Solid Waste (MSW) decreased only slightly from 2014 to 2015, the generation of Construction or Demolition Debris (CDD) dropped from 695,876 to 537,744 tons, and the tonnage of Special Wastes also decreased from 887,850 to 743,260 tons.

- Using a calculation method that permits Maine's recycling rate to be compared to that of other states, Maine's MSW recycling rate in 2015 was 36.76%, up from the 2014 rate of 36.24%.

- The tonnage of food scraps and other organic materials diverted from disposal and sent to composting or anaerobic digestion increased by 68% from 2014 to 2015, from 23,627 tons to 39,659 tons.

- The capacity for disposal of MSW generated in Maine remains adequate into the near term future, based on the currently operating disposal facilities and management systems in place. This includes three waste-to-energy (WTE) facilities, seven municipally-owned landfills, two state-owned landfills (one of which is in the process of being closed), and one commercially-owned landfill.

II. Background

38 M.R.S. § 2124-A requires the Maine Department of Environmental Protection (Department) to annually submit a "Solid Waste Generation and Disposal Capacity Report" to the joint standing committee of the Legislature having jurisdiction over natural resources matters and the Governor. This report must set forth information on the generation of solid waste in Maine, the statewide recycling rate for municipal solid waste (MSW), and the remaining available disposal capacity for solid waste. The report must also include an analysis of how changes in available disposal capacity have affected or are likely to affect disposal prices, an analysis of how the rate of fill at each solid waste landfill has affected the expected lifespan of that solid waste landfill, and an analysis of consolidation of ownership in the disposal, collection, recycling and hauling of solid waste.

This report focuses on (MSW) as defined by Maine law (06-096 CMR 400, *General Provisions, Maine Solid Waste Management Regulations*). MSW is comprised of household baggable waste and construction demolition debris, including such items as furniture, tires, and metal. The report includes certain sludge and ash tonnages which are considered "special wastes", since the disposal of those wastes at landfills impacts the disposal capacity remaining at the disposal facility, which is one of the metrics tracked in this report. Special wastes are wastes that are generated by other than households or typical businesses and, due to their quantity or chemical or physical properties, require particular handling.

Construction and demolition debris (CDD) is solid waste resulting from construction, remodeling, repair, and demolition of structures, including building materials, discarded furniture, wall board, pipes, metal conduits, and similar debris. Most CDD is generated by the household and commercial (building industries) sector, and is considered to be a subset of MSW. To help with planning for solid waste management, solid waste facilities accepting CDD track those materials separately from MSW, to the extent practicable.

The industrial sector also generates significant amounts of other types of solid wastes that are regulated as "special waste" under Maine law [38 M.R.S. §1303-C(34)] because they have chemical or physical properties that make them difficult to handle, or potentially pose a threat to public health, safety or the environment.

This report includes various tables that contain data on solid waste generated in Maine, as well as data on the amounts and types of solid waste managed by disposal facilities in Maine, including sources and tonnages of solid wastes imported to Maine for disposal. The data on solid waste generated in Maine is used to calculate Maine's recycling rate, while the data on wastes accepted for disposal at waste-to-energy facilities and landfills (including solid waste from out of state) is used to project available disposal capacity into the future (i.e., current fill rates are assumed to continue when projecting future fill rates).

III. Management of Maine-generated Solid Waste in 2015

A. Maine's Waste Management and Food Recovery Hierarchies

Maine statute includes two hierarchies to be used as guiding principles in decision-making in the management of solid waste.

38 M.R.S. § 2101, *Solid Waste Management Hierarchy*, establishes:

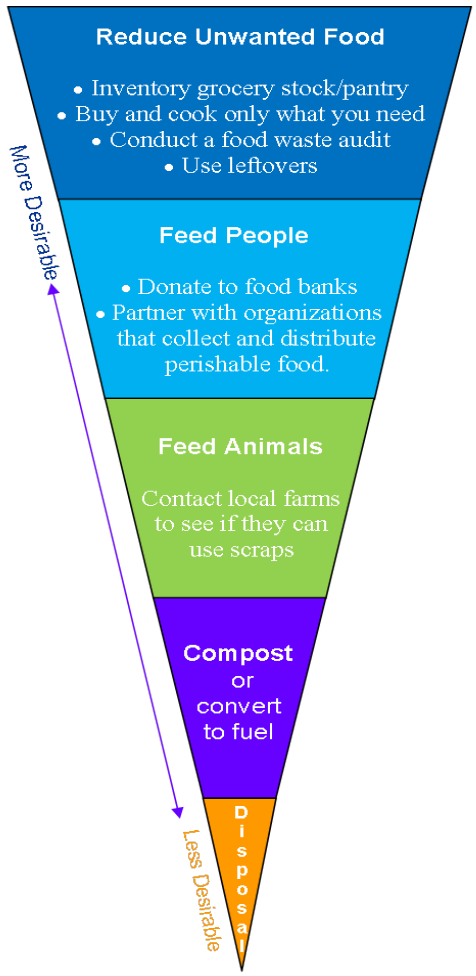
1. Priorities. *It is the policy of the State to plan for and implement an integrated approach to solid waste management for solid waste generated in this State and solid waste imported into this State, which must be based on the following order of priority:*

> *A. Reduction of waste generated at the source, including both amount and toxicity of the waste;*
>
> *B. Reuse of waste;*
>
> *C. Recycling of waste;*
>
> *D. Composting of biodegradable waste;*
>
> *E. Waste processing that reduces the volume of waste needing land disposal, including incineration; and*
>
> *F. Land disposal of waste.*

It is the policy of the State to use the order of priority in this subsection as a guiding principle in making decisions related to solid waste management.

2. Waste reduction and diversion. *It is the policy of the State to actively promote and encourage waste reduction measures from all sources and maximize waste diversion efforts by encouraging new and expanded uses of solid waste generated in this State as a resource.*

38 M.R.S. § 2101-B, the *Food Recovery Hierarchy*, was enacted in 2016 to provide additional guidance on the management of food wastes. It establishes:



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A. Reduction of the volume of surplus food generated at the source;

B. Donation of surplus food to food banks, soup kitchens, shelters and other entities that will use surplus food to feed hungry people;

C. Diversion of food scraps for use as animal feed;

D. Utilization of waste oils for rendering and fuel conversion, utilization of food scraps for digestion to recover energy, other waste utilization technologies and creation of nutrient-rich soil amendments through the composting of food scraps; and

E. Land disposal or incineration of food scraps.

2. Guiding principle. It is the policy of the State to use the order of priority in this section, in conjunction with the order of priority in section 2101, as a guiding principle in making decisions related to solid waste and organic materials management.

B. Overview of the management of Maine's solid waste in 2015

Maine's solid waste management infrastructure includes municipal, commercial, and private industrial waste handling services, operations and facilities. Once collected, solid waste in Maine is stored, transported, recycled, processed, composted, anaerobically digested, or beneficially used in place of virgin materials and as fuel, combusted at one of three waste-to-energy facilities, or landfilled.

The most current, complete data available for solid waste management in calendar year 2015 come from a variety of sources, including:

- licensed public and private processing, composting, and disposal facilities' annual reports submitted to the Department (in accordance with 38 M.R.S. §§ 1304-C, 2205, and 2232), and to other states' regulatory agencies (from out-of-state facilities which receive waste from Maine);

- data on the recycling of electronics, tires, vehicle batteries, consumer batteries, mercury-added lamps and textiles was obtained through a combination of voluntary and mandatory reports from the specialized businesses that manage these consumer products. Along with voluntary reporting by major collectors of these items, this included data reported under Maine's product stewardship laws as well as data from hazardous waste manifests; and

- voluntary reporting[1] by commercial entities managing recyclables generated in Maine.

Table 1 presents a summary of the types and amounts of solid waste generated in Maine in 2015.

Table 1 - 2015 Maine Generated Solid Waste by Type and Amount	
Waste type	**2015 Amount Generated (tons)**
Municipal Solid Waste (MSW)	1,194,209
Construction / Demolition Debris (CDD)/wood waste/land-clearing debris	537,744
Special solid wastes (see Table 3 for break out by waste types and amounts)	743,260
Total Maine Generated Solid Waste - 2015	2,475,213

These same categories reported 2,561,555 tons of waste being generated in 2014 (MSW 1,187,265; CDD 695,876; special wastes 887,850).

Table 2 (next page) shows the amounts of each waste type managed through disposal, recycling, composting, and beneficial use, and includes calculated recycling rates for Maine-generated MSW, and CDD and land-clearing debris.

[1] The Department is appreciative of the data voluntarily provided by generators/brokers of recyclables and acknowledges the reluctance of others in providing data due to that information not being identified as 'confidential business information'.

Table 2 - 2015 Management of Maine's Solid Waste (except Special Solid Wastes) and Calculation of Maine's Recycling & Diversion Rates	
Municipal Solid Waste (MSW) Disposition	**Tons**
Maine MSW landfilled in state	279,231
Maine MSW disposed of at waste-to-energy facilities in state (amount destroyed through combustion)	322,670
Maine MSW waste-to-energy ash landfilled in-state	101,862
Maine MSW disposed of out-of-state	53,251
Subtotal Maine MSW (exclusive of CDD) disposed	757,014
Recycling/Organics Management	
Paper, cardboard, plastics, metals, glass and textiles recycled	228,326
Other MSW recycled (electronics, white goods and other metals not reported by brokers, tires, and vehicle batteries)	171,965
Reported MSW composted (includes leaf & yard rakings, food scraps)	39,659
Subtotal Maine MSW recycled or composted	439,950
Total Maine MSW (exclusive of CDD)	**1,196,964**
Maine's MSW recycling rate (exclusive of CDD)	**36.76%**
Construction or Demolition Debris	
Mixed CDD disposed of in state	393,189
Mixed CDD disposed of out of-state	15,708
Beneficial use of processed CDD and land-clearing debris as fuel (counts as recycling per 38 M.R.S. § 2132.3)	37,309
Other beneficial use of processed CDD and land-clearing debris	93,230
Total CDD and landclearing debris	539,436
Maine's CDD & land-clearing debris recycling rate	**6.92%**
Summary of Management and Disposition	
Total tonnage of MSW, CDD & land-clearing debris	1,736,400
Total MSW, CDD and land-clearing debris recycled (including wood used as fuel)	477,259
Total MSW, CDD and land-clearing debris diverted from disposal	570,489
Maine's combined MSW, CDD & land-clearing debris recycling rate	**27.49%**
Maine's Combined MSW, CDD & Landclearing Debris Diversion from Disposal Rate (includes all beneficial uses)	32.85%

IV. Progress toward Maine's Waste Reduction and Recycling Goals

In keeping with the Solid Waste Management Hierarchy (38 M.R.S. § 2101), there are a variety of options employed for managing Maine's solid waste. Appendix B is a table that provides an overview of management options currently employed for the various components of Maine's municipal solid waste stream. This table provides a qualitative assessment of the comparative use of the management options. The options are grouped by levels on the Solid Waste Management Hierarchy, with the most preferred management option farthest to the left. By examining Maine's waste stream by material type and current management options, we can identify opportunities for "moving up the hierarchy", decreasing disposal and increasing waste reduction, reuse, recycling and beneficial use.

A. Maine's Municipal Solid Waste Disposal Reduction Goal

In 2016, the focus of Maine's statutory goal for waste reduction was changed to focus on reducing the amount of MSW sent for disposal. 38 M.R.S. § 2132(1-B) states:

> ***State waste disposal reduction goal.*** *It is the goal of the State to reduce the statewide per capita disposal rate of municipal solid waste tonnage to 0.55 tons disposed per capita by January 1, 2019 and to further reduce the statewide per capita disposal rate by an additional 5% every 5 years thereafter. The baseline for calculating this reduction is the 2014 solid waste generation and disposal capacity data gathered by the department.*

In 2014, Maine generated and sent for disposal (landfilling and incineration) 757,049 tons of MSW, exclusive of CDD. This established the baseline per capita disposal rate at 0.57 tons per person (Maine's estimated 2014 population was 1,330,256).[2] Maine's per capita disposal rate held steady in 2015 (757,014 tons Maine-generated MSW disposed/1,329,328 residents); this waste generation/disposal rate has been virtually unchanged from 2010 - 2015.

The most recent regional comparisons of per capita disposal rates available for the Northeast show Maine generated on average less MSW per person in 2012 than most other northeast states. The northeast states had an average of 0.7 tons of MSW generation per person, with the rate ranging from 0.52 tons per person for New Hampshire to 0.91 tons per person for Rhode Island (RI data may not fully exclude CDD).[3]

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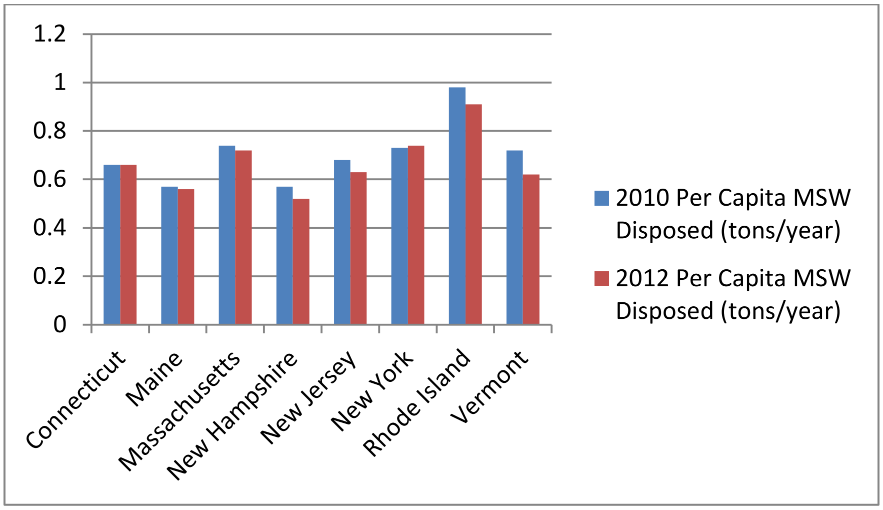
[2] U.S. Census Bureau, https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src=CF, accessed December 28, 2016

[3] *Municipal Solid Waste (MSW) Interstate Flow in 2012*, March 27, 2015, Northeast Waste Management Officials' Association, http://www.newmoa.org/solidwaste/MSW2012DatatReport3-27-15.pdf

2010 & 2012 Per Capita Disposal Rates in the Northeast States



B. Maine's Municipal Solid Waste Recycling Rate

In 1989, the Maine Legislature enacted a statewide goal for the recycling of municipal solid waste at 38 M.R.S. § 2132.1. The timeline for achieving the goal was subsequently amended, most recently in 2016. The current goal is:

> 1. **State recycling goal.** It is the goal of the State to recycle or compost, by January 1, 2021, 50% of the municipal solid waste tonnage generated each year within the State.

Recycling and composting are valuable tools for reducing overall solid waste management costs, lessening the need to develop additional solid waste disposal capacity, and reaping the environmental benefits of decreased extraction of virgin materials to make new products and of increased fertility of local soils.

Maine's MSW recycling rate is calculated by dividing the total amount of MSW recycled and composted by the total amount of reported in-state generated MSW in accordance with 38 M.R.S. § 2132 (3). The term "municipal solid waste" is defined in 06-096 CMR 400, *Solid Waste Management Rules: General Provisions*:

> "Municipal solid waste" means solid waste emanating from household and normal commercial sources. Municipal solid waste includes front end process residue from the processing of municipal solid waste.

Although CDD is a component of MSW, when calculating MSW recycling rates other states and the U.S. Environmental Protection Agency (US EPA) generally exclude CDD from their calculations. To be transparent about what is included in Maine's calculated recycling rate, the Department has calculated the recycling rate for MSW exclusive of CDD, for CDD only, and for MSW including CDD. This approach allows Maine to perform an 'apples-to-apples' comparison with other states' MSW recycling rates, while also enabling Maine to evaluate where further efforts are needed to improve diversion of the broader spectrum of disposed materials handled by municipalities in Maine. For 2015, Maine's recycling rate for MSW exclusive of CDD was 36.76%, up slightly from 2014 (36.24%) In 2015, Maine's CDD recycling rate remained low at 6.92% (down from 8.73% in 2014) (see Table 2).

Changes in the management of organics in Maine from 2014 to 2015 show a positive trend in the increased recovery and utilization of food scraps and leaf and yard wastes to composting or anaerobic digestion facilities, which climbed from 23,627 tons in 2014 to 39,659 tons in 2015. Most of this increase is due to the implementation of new programs to collect food scraps separately from other trash, with savings potentially realized for the generators due to lower tip fees for organics composting (including anaerobic digestion with recycling of residuals) than if that same material was sent for disposal with MSW.

In November 2015, the Northeast Waste Management Officials' Association (NEWMOA) and the Northeast Recycling Council (NERC) prepared a *Fact Sheet on Challenges Facing Municipal Solid Waste (MSW) Recycling in the Northeast*.[4] This document provides a broader context through which to view recycling efforts in Maine. Some notable issues and trends highlighted in this report are:

- The overall U.S MSW recycling rate was approximately 34 percent for 2013, according to EPA's data, which primarily looks at 'bagged MSW' tonnage.

- Recycled materials are part of an international marketplace, with many factors contributing to market volatility. The prices of oil and virgin resin, the value of the U.S. dollar, the economies of foreign markets, and communication among the U.S. materials recovery facilities (MRFs), brokers, processors, and manufacturers about the industry's changing needs, all contribute to the dynamic economics of recycling markets.

- The materials in the traditional recycling stream are changing, creating on-going handling and economic challenges to the recycling industry. There is less newsprint, glass, aluminum, steel packaging, paper board, and paper packaging, and more aluminum foil and closures, corrugated card, high-density polyethylene (HDPE) bottles and other containers, polyethylene terephthalate (PET) bottles and jars, and other plastic packaging.

[4]Presented by Terri Goldberg, NEWMOA Executive Director, November 9-10, 2015 to the Northeast Committee on the Environment (comprised of the Commissioners of the state environmental agencies in New England, New York, and New Jersey); available at https://nerc.org/documents/recycling/NEWMOA%20&%20NERC%20Fact%20Sheet%20on%20Challenges%20Facing%20Municipal%20Solid%20Waste%20Recycling%20.pdf

- Packaging is rapidly changing away from the use of glass and metal toward lighter materials, including multi-layer, multi-resin pouches, plastic packaging, and other types of containers that are either less recyclable or not recyclable. In addition, the plastic that is used for packaging has been light-weighted. The changing waste stream means MRFs need to process more volume with less weight, resulting in increased processing costs per ton managed.[5]

- Single stream programs typically result in significantly more recyclables being collected due to the convenience for residents and the additional space for a bulky recycling stream. However, the quality and value of commodity materials generated from single-stream systems is often lower than that from source-separated systems.

[5] Susan Robinson, Waste Management, November 13, 2014 Presentation, EPA SMM Webinar Academy - http://www2.epa.gov/sites/production/files/2015-09/documents/changng_wste_stream.pdf

C. Special Wastes and Beneficial Use

Table 3 shows the amounts of solid wastes other than MSW, CDD and land-clearing debris generated in Maine and how each waste type was managed in 2015. The last two rows show 2014 data for comparative purposes.

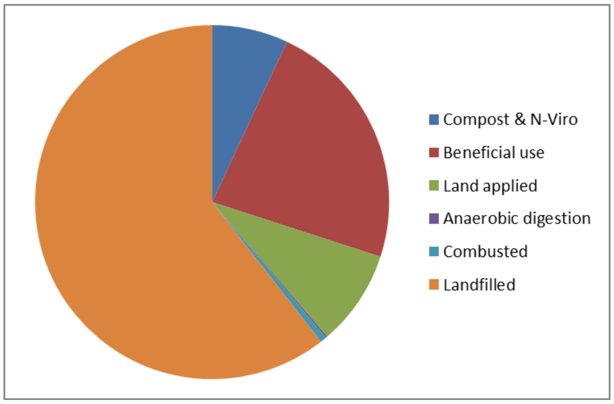
Table 3 - 2015 Disposition of Maine-Generated Special Wastes (in tons)

WASTE TYPE	Compost/ N –Viro*	Beneficial Use	Land applied	Anaerobic digestion	Combusted	Landfilled	Totals
Asbestos/Asbestos Containing Waste	-	-	-	-	-	3,016	3,016
Ash - Coal, oil and multi-fuel boiler	2,592	24,709	23,830	-	-	142,970	194,101
Ash - MSW Incinerator	-	-	-	-	-	104,121	104,121
Ash- wood & burn pile/hot loads	-		-	-	-	1,132	1,132
Ash/Liming Agent – Other	-		8,393	-	-	-	8,393
Catch basin grit and street sweepings	-	4,456	-	-	-	1,303	5,759
Contam. Soils – contam. unknown	-	-	-	-	-	4,221	4,221
Contam. Soils - non-petroleum	-	-	-	-	-	682	682
Contaminated soils - Oil	-	2,047	-	-	-	14,763	16,810
Dredge Spoils	-	16,752	-	-	-	479	17,231
Fish/Food Process Residue	729	1,976	39,853	10,000	-	260	52,818
Industrial/Industrial Process Waste	-	-	-	-	-	34,703	34,703
Other Special Wastes	-	-	-	-	1,051	19,818	20,869
Pulp/Papermill Sludge	1,871	21,722	-	-	-	20,830	44,423
Sandblast Grit	-	2,096	-	-	-	289	2,385
Short-Paper Fiber	-	13,011	-	-	-	15,298	28,309
Shredder Residue	-	-	-	-	-	10,658	10,658
WWTP Sludge - industrial		-	4	-	-	82,443	82,447
WWTP Sludge - municipal	39,887	-	12,783	61	-	54,104	106,835
2015 Totals	**45,079**	**86,769**	**84,863**	**10,061**	**1,051**	**511,090**	**738,913**
2015 percentages	6.10%	11.74%	11.48%	1.36%	0.14%	69.17%	100.00%
2014 Totals	61,752	204,517	77,538	1,458	5,016	537,545	887,826
2014 percentages	7.0%	23.0%	8.7%	0.2%	0.6%	60.5%	100.00%

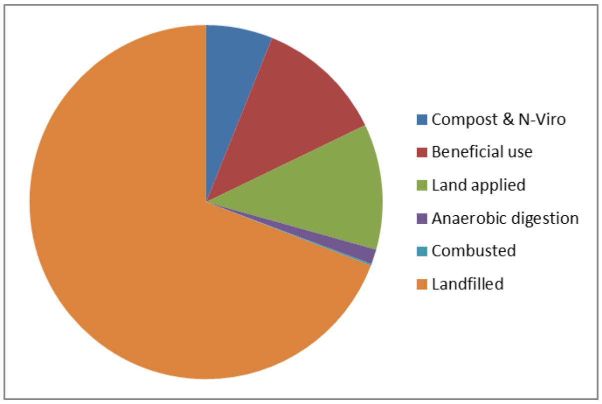
*N-Viro is a soil amendment created from sludge through a treatment process.

The overall tonnage of special solid wastes in 2015 decreased 144,566 tons, when compared with 2014. A significant portion of the decrease is due to a reduction in wastes generated by paper mills, some of which are no longer operating. In 2014 a high proportion of these wastes were beneficially used or composted, so the reduction in this waste stream in 2015 caused a decrease in the percentage of special wastes which were beneficially used in land application as a soil amendment.

Special waste disposition – 2014
887,826 tons total



Special Waste Disposition – 2015
743,260 tons total



In 2015, Exeter Agri-Energy, began accepting food scraps and food processing wastes, and other organic based materials, resulting in the anaerobic digestion of 1.5% of special wastes generated and managed in Maine. 15.6% of special wastes were composted or used as soil amendments for agronomic benefit, and an additional 12.4% was beneficially used in some other way. The beneficial use of waste is the use or reuse of a solid waste as a raw material substitute in manufacturing, as construction material or construction fill, as fuel, or in agronomic utilization.

V. Solid Waste Disposal Capacity

Based on the current operations of the licensed disposal facilities in Maine, the Department projects that disposal capacity for MSW (including CDD) generated in Maine will remain adequate into the near term. This conclusion is based on projections calculated using fill rates and capacity data reported by licensed facilities in their annual reports on calendar year 2015 activity. Table 4 shows the current and projected available waste-to-energy (WTE) processing and landfill disposal capacity in Maine, by licensed facility, through 2035.

In 2015, Maine's solid waste disposal facilities included three WTE facilities, seven municipally-owned landfills, two state-owned landfills, and one commercially owned landfill. The State has another licensed landfill site, known as Carpenter Ridge, located in T2 R8, that remains undeveloped. That site, with a landfill design for approximately two million cubic yards of special wastes, was acquired by the State in the mid-1990's and is held by the State for development of disposal capacity when needed. The state-owned Dolby Landfill in East Millinocket accepted minimal amounts of solid waste in 2015, and ceased operations in 2016.

In 2015, 1,239,086 cubic yards of remaining landfill capacity were consumed in Maine by MSW (264,588 tons), CDD (439,766 tons), and special wastes (333,439 tons). Additionally, 355,445 tons of MSW were destroyed through combustion at the three waste-to-energy incinerators. This 1,393,238 tons of waste disposed of in Maine included waste from out-of-state sources as well as wastes from Maine, but does not include special wastes disposed of in generator owned landfills affiliated with specific industrial facilities and operations.

Solid wastes generated in other states can be disposed of at the waste-to-energy facilities and the commercially owned landfill in Maine. The disposal capacity at the state-owned Juniper Ridge Landfill is restricted by license condition to wastes generated in Maine, including waste generated by processing facilities which may accept wastes from other states. All the MSW disposed of in landfills in Maine was generated in Maine; and 90% of the MSW disposed of through incineration in Maine were also generated in Maine.

The Juniper Ridge Landfill has an application pending with the Department that, if approved, would create an additional 9,350,000 cubic yards of capacity. In addition, in 2016 the Municipal Review Committee, Inc. and Fiberight L.L.C. received a permit from the Department to develop a new solid waste processing facility designed to manage 650 tons per day of MSW. The projections considered in this report do not take into account the proposed and undeveloped capacity of these two facilities.

Table 4 - Available Licensed MSW Disposal Capacity in Maine as of December 31, 2015					
Waste-to-Energy (WTE) Incinerators	**Annual capacity**	**2015 (tons/year)**	**2020 (tons/year)**	**2025 (tons/year)**	**2035 (tons/year)**
MMWAC – Auburn	70,000	70,000	70,000	70,000	70,000
ecomaine – Portland	170,000	170,000	170,000	170,000	170,000
PERC – Orrington	304,000	304,000	304,000	304,000	304,000
Total WTE capacity in tons	**544,000**	**544,000**	**544,000**	**544,000**	**544,000**
	2015 Fill rate (yd^3)	*2015 available (yd^3)*	*2020 available (yd^3)*	*2025 available (yd^3)*	*2035 available (yd3)*
State-owned landfills					
Carpenter Ridge – T 2 R 8	N/A	not constructed	not constructed	not constructed	not constructed
Dolby – East Millinocket	627	335,000	0 (closed)	0 (closed)	0 (closed)
Juniper Ridge – Old Town*	714,803	3,188,797	0	0	0
Municipal MSW landfills					
Hatch Hill (Augusta)	48,170	819,430	578,580	337,730	0
Bath	50,200	245,100	0	0	0
Brunswick	10,808	199,637	145,597	0 (closed)	0 (closed)
Presque Isle	12,721	1,416,201	1,352,596	1,288,991	1,161,781
Tri-Community (Fort Fairfield)	41,091	1,602,336	1,396,881	1,191,426	780,516
W-T-E ash landfills					
ecomaine	44,569	640,208	417,363	194,518	0
Lewiston	46,039	531,026	447,001	362,976	194,926
Commercial landfill					
Waste Management Crossroads - Norridgewock	270,058	2,849,492	1,499,202	148,912	0
Total landfill capacity in yd^3	-	11,827,227	5,837,220	3,524,553	2,137,223
Total remaining landfill capacity in tons (MSW)**	-	8,870,420	4,040,415	2,643,415	1,602,917

*Application pending for 9,350,000 cubic yards additional capacity would add 10-12 operating years

**Assumes average weight of 1 cubic yard of landfilled MSW =1500 pounds, and all remaining licensed landfill capacity will be used for MSW

Table 5, below, shows the types and amounts of solid wastes delivered to landfills in Maine in 2015, and the estimated remaining disposal capacity in cubic yards and years.

TABLE 5 - 2015 Solid Waste Tonnage that was Landfilled, and Remaining Landfill Capacity for MSW (as of December 31, 2015)

Landfill	MSW (tons)	CDD (tons)	Special Wastes (tons)	Capacity Consumed in 2015 (yds³)	Constructed Capacity Remaining (yds³)	Licensed Capacity Remaining (yds³)	Years of Licensed Capacity Remaining at current fill rate
Augusta (Hatch Hill)	30,753	(included in MSW)	4,666	48,170	819,430	819,430	17.0
Bath	10,305	1,051	4411	50,200	245,100	245,100	4.9
Brunswick	4,598	(included in MSW)	0	10,808	199,637	199,637	18.5*
Presque Isle	7,306	2,074	4,484	12,721	226,201	1,416,201	111.3
Tri-Community	23,246	1,624	4,234	41,091	488,891	1,602,336	39.0
ecomaine	5,324	0	45,796	44,569	640,208	640,208	14.4
Lewiston**	0	20571	17,339	46,039	531,026	531,026	31.6
Waste Management / Crossroads	81,484	69,289	93,742	270,058	2,849,492	2,849,492	10.6
Juniper Ridge***	121,245	361,527	148,990	714,803	1,688,797	3,188,797	4.5
TOTALS	**284,261**	**456,136**	**323,662**	**1,238,459**	**7,688,782**	**11,492,227**	--

*Brunswick is planning to close by 2021
**Assumes average fill rate of 16,805 cubic yards/year, excluding 1-time disposal volume that occurred in 2015
***Application pending for 9,350,000 cubic yards additional capacity would add 10-12 operating years

Table 6 shows the state's source of generation of the MSW which was received by each of the three WTE facilities (does not include non-MSW waste received).

Table 6 – Tons of MSW Received at Waste-to-Energy Facilities in 2015 by State of Origin

Facility	Maine	MA	NH	Total Tons		% ME	% MA	% NH
ecomaine	179,973	0	7,512	187,485		95.99%	0.00%	4.01%
Mid Maine Waste Action Corporation	78,114	0	125.18	78,239		99.84%	0.00%	0.16%
Penobscot Energy Recovery Company	260,596	49,875	1,247	311,718		83.60%	16.00%	0.40%
Totals	**522,473**	**49,875**	**9,029**	**577,422**		**89.82%**	**8.64%**	**1.54%**

Table 7, below, shows the source of the MSW received by each of the three WTE facilities, and how that waste was managed, including the various residue streams created.

Table 7 – Solid Waste Handled by Maine Waste-to-Energy Facilities in 2015 (in tons)

Facility	Municipally Delivered MSW received	Commercially Delivered MSW received	Spot market MSW received	Other wastes received	Total waste received	Waste shipped as by-pass	Front end process residue produced	Metals recovered	MSW combusted	Ash	MSW destroyed through combustion
ecomaine (Portland)	67,102	76,123	35,163	13,031	191,419	15,472	0	4,629	175,947	42,611	133,336
Mid Maine Waste Action Corporation (Auburn)	38,412	14,689	25,138	0	78,239	8,562	0	1,716	57,758	17,221	40,538
Penobscot Energy Recovery Company (Orrington)	187,965	110,843	12,911	2,960	314,679	4,283	57,920	7,802	236,805	52,351	184,454
TOTALS	293,479	201,655	73,212	15,991	584,337	28,317	57,920	14,147	470,510	112,183	358,328
2014 totals	297,513	198,366	74,103	8,000	577,983	13,625	57,828	14,789	484,987	115,438	369,549

VI. Solid Waste Industry Consolidation in 2015

The Waste Generation and Disposal Capacity Report includes an analysis of consolidation in the ownership of the collection, recycling, hauling, and disposal sectors. This is performed to review Maine's solid waste industry for possible consolidation and the potential for unfavorable impacts on competition. The Department examines these industry sectors for conditions that may either create a decrease in services or a monopolistic situation.

During 2015, Maine's solid waste (or "materials management") industry continued to be a mix of public and private investments and services that handled over 7,500 tons of materials each day. A review of that system and its components shows the interrelated services of collection and hauling of recyclables and trash. The processing and disposal of collected materials were provided in a steady and consistent fashion, responding to Maine's solid waste management needs.

Disposal Facilities

During 2015, there were no noted changes in the ownership/operation of the licensed disposal facilities in Maine.

Collection and Hauling Services

Since the last Waste Generation and Disposal Capacity Report, the Department has not learned of any significant ownership changes in, or to service areas of trash hauling service providers. However, in 2015, there was marked growth in the development of organics collection services, primarily in the Southern Maine to Lewiston region. Previously, a few collection service businesses had begun working with institutions, restaurants and residents, providing collection of unwanted food scraps, with those scraps being delivered to one of many options: a farm based composting operation; a composting facility that is owned and operated by a collection company; and, to a farm based anaerobic digester. Other haulers, whose primary focus has been trash and recyclables, have also looked into this separated stream of organics, but the Department is not currently aware of any significant commitment by those haulers to separate organics collection and utilization.

Recycling Services

Two "materials recovery facilities" (MRFs) (facilities that sort mixed recyclables into marketable commodities) are now in operation within, and serving Maine's municipalities and businesses: ecomaine, a non-profit waste management company owned by 21 municipalities based in Portland, and Casella Waste Services, Inc., in partnership with the City of Lewiston, converting that city's recycling facility into a 'Zero Sort®' materials processing facility. The number of municipalities participating within one of these 'single stream recycling' programs continues to grow over time.

This has led to the abandonment of many long established 'source separated' recycling programs and facilities that had successfully been baling and marketing recyclables for many years. Household participation in single-sort recycling programs tends to be higher than in "source separated" programs. However, single sort programs have more "residual", i.e., non-recyclable materials, and some of the resultant commodities may be of a lower grade.

VII. Disposal Fees and Supracompetitive Prices

A. Disposal Fees

Disposal expenses are comprised of collection and transportation costs, and tipping fees on the disposal of waste at a licensed facility, with the tipping fee often being a major share of those costs. Current tipping fees range from $40 to $95 per ton at Maine's waste-to-energy facilities and landfills. These have stabilized in most instances, allowing predictability for municipal budgeting and long-term planning. Many transfer stations impose a fee on municipal solid waste delivered to them, and that fee may reflect the cost of the transfer station's operation, as well as partial or full value of the tipping fee at the intended disposal facility.

The State, in its operating services agreement with Casella Waste Systems Inc. for the state owned Juniper Ridge Landfill, established a ceiling for tipping fees. This sets an upper limit on how much can be charged for various categories of wastes delivered to that landfill which continues to have a stabilizing impact on pricing for the disposal of similar materials at other solid waste disposal facilities.

Tipping fees at WTE facilities are influenced by revenues received from the sale of the electricity they generate. The revenues reduce operating expenses, yielding a reduction in the tip fee charged for solid waste. Should electricity sales revenue drop, tipping fees may increase; conversely, should the electricity sales value increase, the possibility exists that lower tipping fees, or maintaining current fees, would occur.

B. Supracompetitive Prices

Supracompetitive, as applied to 'prices,' means prices that are higher than they would be in a normally functioning, competitive market; usually as a result of overconcentration, collusion, or some form of monopolistic, oppressive practice. State law requires the Department to determine whether changes in available landfill capacity have generated, or have the potential to generate, supracompetitive prices and if so, provide recommendations for legislative or regulatory changes as necessary.

Currently, the disposal capacity situation does not appear to have generated, nor does it appear in the near term to have the potential to generate, supracompetitive disposal fees. It is important to consider the pending application for 9,350,000 cubic yards additional capacity, which would add 10-12 operating years at the Juniper Ridge Landfill, where existing capacity is projected to be sufficient for the next 4.5 years. Should that application be delayed, restricting the ability to construct additional disposal capacity, the possibility of supracompetitive pricing may arise.

In looking ahead, at that point when disposal capacity exists with fewer facilities than today, it is possible that prices could become supracompetitive. Where the actual date and timing of this is not known, nor predictable, it is critical that the Department maintains awareness of this possibility and keeps the Governor and Legislature informed.

Appendix A - Definitions and Acronyms

The following definitions and acronyms are provided to assist the reader in reviewing this document:

Beneficial Use – *to use or reuse a solid waste or waste derived product: as a raw material substitute in manufacturing, as construction material or construction fill, as fuel, or in agronomic utilization.*

Construction/Demolition Debris (CDD) – *wastes generated by building, remodeling and/or destruction activities and may include such wastes as wood and wood products, concrete and brick, gypsum board, shingles and other common components of buildings.*

Diversion Rate – *Waste diversion is the prevention and reduction of generated waste through source reduction, recycling, reuse (including beneficial reuse), or composting.*

Front-end Process Residue (FEPR) – *residual of municipal solid waste resulting from the processing of solid waste prior to incineration or landfilling, and includes, but is not limited to, ferrous metals, glass, grit and fine organic matter.*

Municipal Solid Waste (MSW) – *solid waste emanating from household and normal commercial activities.*

Special Waste – *wastes that are generated by other than domestic and typical commercial establishments that exist in such an unusual quantity or in such a chemical or physical state that require special handling, transportation and disposal procedures.*

Supracompetitive – *when applied to prices means prices that are higher than they would be in a normally functioning, competitive market -- usually as a result of overconcentration, collusion or some form of monopolistic, oppressive practice.*

Universal Wastes – *a category of wastes that includes: PCB containing lighting ballasts, Cathode Ray Tube (CRT) containing devices, fluorescent lamps, other lamps containing hazardous wastes, and, mercury-added devices from commercial sources.*

Waste-to-Energy Ash – *residue from the combustion of municipal solid waste at waste-to-energy facilities. It may also contain fly ash from the facility's operation and is designated as a "special solid waste".*

Waste-to-Energy facilities (W-T-E) – *facilities which receive municipal solid waste, and through processing and combustion, recover energy and convert it into electricity, while reducing the volume of waste requiring disposal.*

Appendix B – Current Management of Municipal Solid Waste in Maine

Appendix B provides an overview of the various management options currently employed for the larger components of Maine's municipal solid waste stream. This table provides a qualitative assessment of the comparative use of the 'end of life' management options for these products and materials. Options are grouped by levels based upon the Solid Waste Management Hierarchy, with the most preferred management choice being located farthest to the left. By examining Maine's waste stream by material type and current 'end of life' management options, opportunities can be identified for "moving those disposal choices up the hierarchy", thereby increasing waste reduction, reuse, recycling and beneficial use efforts, while decreasing the need for disposal and preventing loss of resources.

Waste categories & types	Source reduc-tion	Reuse and re-purpose	Recycle	Compost	Beneficial Use - Agronomic	Beneficial Use - raw material substitution	Beneficial Use - fuel	Anaerobic Digestion	Conversion (gasification / pyrolysis)	WTE incineration	Landfill
	N = None, I = Incidental, L = Low, M = Medium, H = High, gray shaded = Not applicable (not possible)										
Organics	L	L		L/M				L	N	H	H
Paper & cardboard	M	M	M	L					N	M	M
Plastics											
#1 PETE/PET & #2 HDPE	M	I	H			N	L		N	L	L
#3 - 7	L	I	M			N			N	M	M
Metals											
Steel & aluminum cans/foil	M	I	H							L	L
other ferrous & non-ferrous metals	N	I	H							L	L
Glass	I	L	H			L				L	L
CDD/wood waste/ Bulky Wastes											
Mixed CDD			L						N	I	H
Clean C&D wood			I			N	M		N	I	M
Carpet	L	I	L				N		N	I	H
Furniture / mattresses		L	L						N	L	H
Asphalt roofing material			N			M	N		N	I	M
Wallboard			L		L	N				I	H

Appendix B – Current Management of Municipal Solid Waste in Maine

Waste categories & types	Source reduc-tion	Reuse and re-purpose	Recycle	Compost	Beneficial Use - Agronomic	Beneficial Use - raw material substitution	Beneficial Use - fuel	Anaerobic Digestion	Conversion (gasification and pyrolysis)	WTE incineration	Landfill
	N = None, I = Incidental, L = Low, M = Medium, H = High, gray shaded = Not applicable (not possible)										
Consumer products											
Pesticides & fertilizers	I									H	H
Consumer batteries	I		L							H	H
Architectural paint	I	L	M							M	M
Mercury-added lamps	I		L							M	M
Small appliances	I		L							H	H
Hand-held electronics	I	I	L							H	H
Consumer electronics	I	M	H							I	I
Vehicle Batteries			H							N	I
Tires		M	I			M	H		N	I	I
Unused medications	L	I		N					N	M	M
Sharps			N						N	H	H
Textiles		L	L				N		N	M	M

STATE OF MAINE
DEPARTMENT OF ENVIRONMENTAL PROTECTION
17 STATE HOUSE STATION AUGUSTA, MAINE 04333-0017

DEPARTMENT ORDER

IN THE MATTER OF

MUNICIPAL REVIEW COMMITTEE, INC. AND	)	SOLID WASTE
FIBERIGHT, LLC	)	LICENSE
HAMPDEN, PENOBSCOT COUNTY, MAINE	)	
SOLID WASTE PROCESSING FACILITY	)	
#S-022458-WK-A-N	)	
(APPROVAL WITH CONDITIONS)	)	NEW LICENSE

Pursuant to the provisions of the *Maine Hazardous Waste, Septage and Solid Waste Management Act*, 38 M.R.S. §§ 1301 to 1319-Y; the *Rule Concerning the Processing of Applications and Other Administrative Matters*, 06-096 C.M.R. ch. 2 (last amended October 19, 2015); and the *Solid Waste Management Rules: General Provisions*, 06-096 C.M.R. ch. 400 (last amended April 6, 2015); *Water Quality Monitoring, Leachate Monitoring, and Waste Characterization*, 06-096 C.M.R. ch. 405 (last amended April 12, 2015) and *Processing Facilities*, 06-096 C.M.R. ch. 409 (last amended July 27, 2014), the Department of Environmental Protection ("Department") has considered the application of the MUNICIPAL REVIEW COMMITTEE, INC. and FIBERIGHT, LLC, with its supportive data, agency review comments, staff summary, and other related materials on file and FINDS THE FOLLOWING FACTS:

1. APPLICATION SUMMARY

A. Application: The Municipal Review Committee, Inc. ("MRC") and Fiberight, LLC, ("Fiberight") have jointly applied to construct and operate a regional solid waste processing facility in Hampden, Maine.

B. History:

(1) The MRC is a non-profit organization comprised of 187 municipalities and inter-municipal entities in central, eastern and northern Maine that currently send their municipal solid waste ("MSW") to a waste-to-energy plant located in Orrington, Maine.

(2) The MRC was formed in 1991 to work with the waste-to-energy plant partnership to improve facility operations and economic performance. The MRC is governed by 9 directors elected by the membership.

(3) The MRC Board of Directors has the authority to manage investments and authorize the disbursement of funds as deemed appropriate under the terms and conditions of their bylaws and agreement(s) with each charter municipality.

(4) Fiberight is a privately held company founded in 2007 with current demonstration facility operations in Lawrenceville, Virginia. The company focuses on transforming post-recycled MSW and other organic feedstocks into next generation renewable biofuels.

(5) Fiberight is recognized by Maine's Bureau of Corporations, Elections and Commissions as a Foreign Limited Liability Company and it filed a Statement of Foreign Qualifications to Conduct Activities (Charter #20150853FC) with a nature of the business described as the solid waste processing of trash into biofuels.

C. Summary of Proposal: The MRC and Fiberight have established a contractual agreement to construct and operate a regional solid waste processing facility in Hampden, Maine. The Application for a Solid Waste Processing Facility (hereinafter "Application") was prepared by CES, Inc. and is dated June 2015. The Application was subsequently revised with supplemental submittals with various dates. The proposed processing facility will accept and process MSW from numerous MRC member communities in central, eastern and northern Maine. The MRC and Fiberight also have an interest in accepting and processing MSW from in-state non-MRC communities that may decide to contract with the MRC and Fiberight. Pursuant to the provisions of 06-096 C.M.R. ch. 2, § 10, a pre-application meeting was held on March 19, 2015. On July 15, 2015, the Application was considered complete for processing.

2. PUBLIC PARTICIPATION

Written public comments were received by the Department including 5 requests for a public hearing pursuant to the provisions of 06-096 C.M.R. ch. 2, § 7(A). The written public comments and public hearing requests were made available to the public via the Department's website.

A. Written Public Comments: Written comments were received from local residents, several municipalities, the Maine Resource Recovery Association, and the Natural Resources Council of Maine.

B. Public Hearing Requests: The Department received 5 requests for a public hearing. The requests included concerns regarding several components of the Application including but not limited to vernal pools, wetlands, a nearby stream, traffic, property values, air emissions, and the waste hierarchy. The Department determined that there was insufficient credible conflicting technical information regarding relevant licensing criteria to necessitate a public hearing. Based on the Commissioner's discretion, a public meeting was held on November 19, 2015 in accordance with the provisions of 06-096 C.M.R. ch. 2, § 8. The purpose of the meeting was to provide an overview and opportunity to comment on the joint applications filed with the Department.

C. Draft License Decision: The Department released a draft Department License Decision (Draft License) on June 13, 2016. The Draft License was made available to the public via the Department's website. The MRC and Fiberight and interested persons were notified of the availability of the Draft License. The comment period on the Draft License closed on July 5, 2016. The Department received several comments regarding the Draft License. All of the comments were reviewed and given consideration in relation to the relevant review criteria in the Maine Hazardous Waste, Septage and Solid Waste Management Act and associated rule. The comments received included concerns regarding several components of the Application including but not limited to title, right or interest, financial ability, technical ability, process design and the solid waste management hierarchy. Included with the comments were additional requests for the Department to hold a public hearing.

(1) Title, Right or Interest: Commenters noted that the MRC does not have the authority to take on joint liability and to expend member funds. The Department notes that the Joinder Agreements executed between each charter municipality and the MRC delegates authority to the MRC to act on behalf of the municipality, consistent with the MRC bylaws. As part of the Joinder Agreement, amended and restated bylaws of the MRC are provided that outline MRC's authority in regards to the proposed processing facility. The Department notes that the MRC has provided an option to purchase the property associated with the proposed processing facility pursuant to the applicable rule. Additionally, the Department notes that the MRC's authority is governed by state law, the MRC bylaws and associated terms and conditions of their respective agreements. Based on this information, the Department finds that the MRC has submitted adequate evidence of title, right or interest.

(2) Financial Ability: Commenters noted that the Application does not demonstrate that the MRC and Fiberight have the financial ability to design, construct, operate, maintain and close the proposed processing facility. The Department notes that Fiberight has provided a letter of "Intent to Fund" in accordance with the applicable rule and that finalized financial documentation will be submitted once the necessary regulatory and local approvals are received. Submittal of the finalized financial documentation is a condition of the license. The Department reviewed and considered the concerns relating to financial ability and determined

that the condition to the Department's license that requires the MRC and Fiberight to demonstrate final financial capacity will provide the Department with adequate assurance that the MRC and Fiberight have the financial ability to design, construct, operate, maintain and close the proposed processing facility in a manner consistent with state environmental regulations.

(3) Technical Ability: Commenters noted that the MRC and Fiberight do not have the technical expertise to design, construct, operate, maintain and close the proposed processing facility. The Department notes that while Fiberight will be responsible for daily operations of the proposed processing facility and Fiberight has experience operating a demonstration scale processing facility, Covanta will be the operator for the proposed processing facility. Covanta has more than 30 years of experience converting MSW into clean renewable energy, recycling metals and other commodities, and helping communities meet their goals for environmental stewardship and sustainability. The Department reviewed and considered the concerns relating to technical ability and determined that the condition to the Department's license that requires the MRC and Fiberight to submit specific professional qualifications for personnel who will be responsible for operations, in addition to the technical ability information provided with the Application, provides the Department with adequate assurance that the MRC and Fiberight have the technical ability to design, construct, operate, maintain and close the proposed processing facility in a manner consistent with state environmental regulations.

(4) Process Design: Commenters noted that there was inconsistent information and terminology regarding the proposed process design. Based on the comments, the Department has revised the relevant sections of the license that pertain to the proposed process. The Department has clarified the proposed use of a reactor, instead of a digester, in the renewable fuel production process, removed the reference to the installation of an evaporator which is not being proposed as part of the Application, and clarified the proposed renewable energy production process design.

(5) Solid Waste Management Hierarchy: Commenters noted that the proposed processing facility project is not consistent with the State's solid waste management hierarchy which establishes that it is the policy of the State to actively promote and encourage waste reduction measures and the maximization of waste diversion efforts, and which sets forth an integrated approach to the management of solid waste. The Department notes that

the MRC and Fiberight will continue to support and encourage local waste reduction, reuse and recycling programs. The Department also notes that the Joinder Agreements entered into by the municipalities include a provision granting the municipality the sole option to establish, continue, expand or discontinue existing or future programs intended to encourage reduction, reuse, or recycling of MSW generated within its borders. Further, the proposed processing facility design will facilitate the removal of recyclables at the proposed processing facility that are not captured by programs implemented at the local level and will convert the remaining organics into renewable products. Based on the comments, the Department has added clarifying language in the relevant sections of the license relating to the solid waste management hierarchy including requiring Department reporting when MSW is brought for land disposal prior to the Commercial Operations Date being achieved and the submittal of a schedule outlining proposed measures that will be implemented in order to reach Commercial Operations.

(6) Public Hearing: Commenters noted that a public hearing is now warranted based on inconsistent and conflicting technical information within the Application. These requests are in addition to the public hearing requests received at the time of Application acceptance. The Department is unable to act on these new requests since they were not received within 20 days of the Application being accepted for processing as required by 06-096 C.M.R. ch. 2. The Department notes that while a series of supplemental submittals were provided after the Application was submitted and accepted for processing, a public hearing will not further the Department's understanding or technical knowledge of the proposed processing facility project. Additionally, the Department notes that the MRC and Fiberight have met the relevant review criteria in the Maine Hazardous Waste, Septage and Solid Waste Management Act and associated rule.

3. PROJECT DESCRIPTION AND SITE DESIGN

The proposed project site is located within an approximate 90-acre parcel located east of the Coldbrook Road in Hampden, Maine. The construction of a new 4,460-foot long road to provide access to the proposed project site from the Coldbrook Road is proposed on an additional 5-acre parcel of property. Department License #L-2647-NJ-A-N and #L-26497-TG-B-N, dated July, 2016, approved the construction of the proposed access road and utility corridor. Existing MRC member communities generate an average of 410 to 550 tons of MSW per day. The proposed processing facility is being designed to process 650 tons per day of MSW. Peak MSW delivery is estimated to be up to 950 tons per day to account for seasonal fluctuations.

The proposed processing facility will consist of a 144,000 square foot building that will provide for the receiving, storage and handling of MSW for processing and/or converting into recyclables, renewable fuels and residues for potential recycling and/or disposal off-site. The proposed processing building will contain a tipping floor designed to accommodate 2 days of inside storage capacity for raw MSW and 2 days of inside storage capacity for first sort material from which unsuitable waste such as textiles and large bulky items have been removed. Two-inch minus fines will also be removed at this stage for further processing. A second sort system will separate curbside-type recyclables from the first sort material that has been processed through a continuous pulper which has pulped and removed the majority of the organic material in the waste stream as a biomass pulp. The separated biomass pulp will be further processed to remove the entrained soluble organics and food waste leaving a clean biomass pulp. The clean biomass pulp will be prepared for enzymatic hydrolysis where the cellulosic fraction will be converted to sugars. The MRC and Fiberight state that the food wastes, other soluble organics and sugars produced from the clean biomass pulp will all initially be converted to bio-methane, via an anaerobic digester, which is proposed to be piped into an existing natural gas pipeline owned by Bangor Natural Gas located adjacent to the project site. In the future, the sugars may be sold directly as industrial sugars subject to prevailing market conditions.

Fiberight anticipates between 70 percent (%) and 80% by weight of all incoming MSW will be converted to renewable fuels or recycled, and the remaining 20% to 30% by weight will be process residues to be disposed off-site. In addition to residues and other unsuitable materials that will require off-site disposal, the MRC and Fiberight have planned for the disposal of MSW bypass waste expected to be generated during scheduled and unscheduled facility downtimes or for other unforeseen circumstances when the facility cannot accept and process MSW.

The Department finds that the MRC and Fiberight have adequately planned for site design; provided that, at least 30 days prior to commencing construction of the proposed access road and associated utility corridor and 60 days prior to commencing construction of the processing facility, the MRC and Fiberight submit a complete set of construction-ready plans and documents for each component of the proposed project to the Department for review and approval.

4. TITLE, RIGHT OR INTEREST

The MRC and Fiberight estimate that approximately 95 acres will be acquired, which includes a 90-acre parcel where the proposed processing facility will be constructed and a 5-acre parcel for the construction of a new 4,460-foot long access road. Pursuant to 06-096 C.M.R. ch. 2, § 11(D)(3), the MRC has provided an *Option to Purchase*, dated December 1, 2014, for the property necessary for the development of the proposed processing facility and access road from the properties current owners, H.O. Bouchard, Inc. and Hickory Development, LLC. The MRC Board of Directors has the authority to manage investments and authorize the disbursement of funds as deemed appropriate under the MRC's bylaws and associated terms and conditions of their agreement(s) with each charter municipality. As outlined in the *Development Agreement*, dated February 4, 2015, between the MRC and Fiberight, the MRC will purchase and own, and/or otherwise secure long-term control of, the properties necessary for the proposed processing facility. Fiberight will retain ownership of the processing facility and will lease the property owned by the MRC as outlined in the *Development Agreement*. The expiration date for the *Option to Purchase* is March 31, 2017.

The Department finds that the MRC and Fiberight have demonstrated adequate evidence of title, right or interest in the properties for the proposed project site; provided that, the MRC and Fiberight submit a copy of the deed(s) or executed long-term lease agreement(s) for the properties purchased and/or leased for the development of the proposed project within 30 days after the closure of sale and/or execution of the long-term lease agreement(s).

5. NOTICE OF INTENT

The MRC and Fiberight have provided documentation of the publication of a "Notice of Intent to File" and have documented notification of abutters and other interested parties as required in 06-096 C.M.R. ch. 2. The Notice of Intent to File was made during June 2015. The application was accepted as complete for processing on July 15, 2015.

The Department finds that the MRC and Fiberight have complied with all of the public notice requirements of 06-096 C.M.R. ch. 2.

6. FINANCIAL ABILITY

The MRC and Fiberight have made shared financial commitments to ensure necessary funding is available for the design, construction, operations, maintenance and closure of the proposed project. The *Development Agreement*, mentioned in Findings of Fact ("FOF") #4 above, outlines the specific financial obligations for each party.

A. <u>MRC:</u> In general, the MRC will be responsible for securing fee ownership or long-term control of the project site appropriate for the development of the proposed project. Additionally, the MRC shall lease or sublease the project site to Fiberight under a long-term agreement having terms and conditions that support the development, financing, construction and operation of the processing facility, with appropriate oversight by the MRC.

Current cost estimates for portions of the development project for which the MRC has conditionally committed funding to have been provided including land acquisition, road and stormwater facilities, water and sewer utilities, natural gas utilities, and electric and telecom utilities. The total project cost estimate which the MRC has committed to funding is $4,230,000. The MRC will self-finance its share of the funding for the proposed project. The source of funds will be via a *Tip Fee Stabilization Fund* ("Fund"), which maintained a balance as of March 31, 2015 of $22,220,628. The MRC submitted a copy of a bank statement showing the Fund balance and a copy of its latest available audited financial statements. The MRC has committed to set aside up to $5,000,000 from the Fund to finance the land acquisition and infrastructure activities. No bonding or borrowing capacity is needed for the MRC to meet its financial commitment to the proposed project.

B. Fiberight: Current cost estimates for portions of the development project for which Fiberight will be responsible for include site development, foundations, concrete and building construction, machinery and equipment, steel, mechanical and electrical installation, and engineering, permits and project management. Total estimated capital costs for which Fiberight is responsible for is $66,976,786. Fiberight will also be responsible for the following estimated expenditures: annual operational costs, annual maintenance costs, and facility closure costs for a total cost of $12,700,000.

Pursuant to 06-096 C.M.R. ch. 400, § 4(B)(2)(b)(i)(b), Fiberight has provided a letter of "Intent to Fund", dated December 18, 2015, from Covanta Energy, LLC ("Covanta") stating that Covanta is engaged with Fiberight to support the development, financing, construction and operation of the proposed processing facility. Covanta conducted a review of financial projections relating to the project and executed a term sheet for a long-term strategic partnership with Fiberight. Covanta has reviewed the estimated budget for the proposed project, totaling approximately $67 million, and confirmed their interest in supporting Fiberight with project finance in the form of an equity investment in the proposed processing facility.

Covanta's letter is not intended to be a binding commitment to provide financing. A binding financial commitment is subject to successful completion of due diligence activities; including, but not limited to, the proposed project receiving relevant Federal, State and local permits, and Fiberight entering into acceptable waste supply agreements with the MRC and its charter municipalities. Covanta's role in the proposed processing facility will be as an investor and operator. Covanta has supplied adequate evidence of its ability to fund the construction and operation of the proposed processing facility; however, the ultimate level of investment is still under consideration by Covanta. The intent is for Fiberight and Covanta to be joint investors in the proposed project.

C. Other: Letters of "Intent to Fund" were also provided by DTE Energy (dated June 11, 2015) and Argonaut Private Equity (dated June 17, 2015). In the event that either DTE Energy or Argonaut Private Equity is utilized for funding, their involvement with the proposed project will be in the form of project financing only, acting as a financial institution.

Once permits are issued, and prior to project construction, final evidence of the specified and sufficient amount of funds for each party will be provided to the Department in accordance with 06-096 C.M.R. ch. 400, § 4(B)(2)(b)(i)(a).

The Department finds that the MRC and Fiberight have submitted adequate evidence of financial capacity to design, construct, operate, maintain and close the proposed processing facility in a manner consistent with state environmental regulations; provided that, the MRC and Fiberight submit, within 30 days of receipt and prior to beginning construction of the proposed processing facility, exclusive of the access road that is funded solely by the MRC, to the Department for review and approval the finalized financial documents for the construction and operation of the proposed processing facility.

7. TECHNICAL ABILITY

The MRC and Fiberight have retained several consultants to support the design, construction, operation, maintenance and closure of the proposed processing facility.

A. MRC: The MRC manages the affairs and concerns of their current 187 municipal members. The member-led MRC has successfully managed the current 30-year contract with the Penobscot Energy Recovery Corporation ("PERC") waste-to-energy facility, located in Orrington, Maine, since 1991. The MRC, on behalf of the Equity Charter Municipalities, purchased and manages a 23% ownership interest in the PERC facility. As part of this function, the MRC conducts the following: monitors the PERC facility's performance, reviews and votes on the facility's annual operating budget and decisions to invest in capital and major maintenance projects, and oversees actions taken and investments made to the PERC facility to ensure that potential environmental impacts are avoided and mitigated appropriately.

B. Fiberight: Fiberight will be responsible for daily operations of the proposed processing facility. Fiberight has demonstrated the technical ability to operate a similar, smaller scale MSW processing demonstration facility located in

Lawrenceville, Virginia. The Fiberight team associated with the proposed processing facility is the same team responsible for the design and operation of Fiberight's demonstration facility in Virginia. Fiberight has submitted the résumés of those individuals responsible for the demonstration facility's design, construction and operation.

C. CES, Inc: CES, Inc. (CES) is an environmental consulting firm, with its headquarters located in Brewer, Maine, with experience in preparing applications for submittal to the Department. CES provided personnel to assist with permit application preparation, site investigation and site design for the proposed project. CES has also been retained by the MRC and Fiberight to provide on-going environmental compliance assistance when needed.

D. S.W. Cole Engineering, Inc: S.W. Cole Engineering, Inc. ("SW Cole") is an engineering firm with offices in Maine, New Hampshire and Vermont that provides construction materials testing and geotechnical services. SW Cole conducted sub-surface explorations to address soil suitability of the proposed project site and provided geotechnical engineering services pertaining to the construction of the foundation for the proposed processing facility building and associated structures.

E. Amec Foster Wheeler**:** Amec Foster Wheeler ("AMECFW") is a British multinational consulting, engineering and product management company with its global headquarters in London, England and branch offices worldwide and in the United States, including Portland, Maine. AMECFW has been retained to provide construction management services including contract scoping and preparation of contract packages, construction scheduling, project cost control, risk identification and management, quality assurance, contractor and construction site monitoring and on-site safety monitoring.

F. CommonWealth Resource Management Corporation: CommonWealth Resource Management Corporation (CRMC) is a management and environmental consulting firm focusing on issues and opportunities related to resource conservation, recovery and utilization. CRMC has been retained for general assistance relating to the design, construction, operation and maintenance of the proposed processing facility.

G. University of Maine: The University of Maine (UMaine) is a public research university with a focus on undergraduate and graduate research throughout Maine and around the world. UMaine Chemical Engineering professors have been retained to perform a peer review of the technological processes associated with the proposed processing facility.

H. Covanta: Covanta has their corporate headquarters in Morristown, New Jersey and places of business in West Enfield and Jonesboro, Maine. Covanta has more than 30 years of experience converting MSW into clean renewable energy, recycling metals and other commodities, and helping communities meet their goals for environmental stewardship and sustainability. Covanta will support the development, financing, construction, operation, and maintenance of the proposed processing facility. Covanta's role in the proposed processing facility will be investor and operator.

The Department finds that the MRC and Fiberight and their retained consultants have provided adequate evidence of technical ability to design, construct, operate, maintain and close the proposed processing facility in a manner consistent with state environmental regulations; provided that, the MRC and Fiberight submit to the Department for review and approval specific professional qualifications for personnel who will be responsible for operations at least 30 days prior to commencing pre-commissioning operations of the proposed processing facility.

8. DISCLOSURE OF CRIMINAL OR CIVIL RECORD

The MRC, Fiberight and Covanta have filed complete civil and criminal disclosure statements in accordance with 06-096 C.M.R. ch. 400, § 12(A).

A. MRC: The MRC is a non-profit corporation formed in 1991 pursuant to State of Maine law whose managerial and executive authority rests with the MRC officers and directors. No officer or director holds any equity or debt in the business entity. The MRC will not have managerial or executive authority over the proposed processing facility. The MRC's officers and directors do not hold more than a 5% equity interest in any company that collects, transports, treats, stores, or disposes of solid or hazardous wastes and do not have any criminal convictions (except for one director who had a misdemeanor criminal conviction in 1991) or civil violations of environmental laws or rules administered by the State, other states, the United States, or another country in the last 5 years. Additionally, the MRC officers and directors have not entered into any administrative agreements or consent decrees or had administrative orders directed at them for violations of environmental laws administered by the Department, the State, other states, the United States, or another country in the last 5 years.

B. Fiberight: Fiberight is a Delaware limited liability company with a main office in Baltimore, Maryland. Managerial and executive authority rests with the Fiberight officers and directors. No officer or director holds any equity or debt in the business entity. Fiberight's officers and directors do not hold more than a 5% equity interest in any company that collects, transports, treats, stores, or disposes of solid or hazardous wastes and do not have any criminal convictions or civil violations of environmental laws or rules administered by the State, other states, the United States, or another country in the last 5 years.

In 2014, Fiberight's Chief Executive Officer entered into a Complaint and Consent Agreement/Final Order (Agreement) with the United States Environmental Protection Agency for alleged violations to Sections 301, 311 and 402 of the *Clean Water Act*, 33 U.S. Code §§ 1311, 1321 and 1342, and regulations promulgated thereunder. Under the terms of the Agreement, Fiberight paid a monetary penalty, updated their facility Storm Water Pollution Prevention Plan (SWPPP), conducted employee training regarding the SWPPP and utilized qualified personnel to conduct inspections, developed and implemented a Spill Prevention Control & Countermeasure (SPCC) Plan, conducted employee training regarding the SPCC Plan and disconnected a pipe that had once been the source of an uncontrolled discharge. No additional Fiberight officers and directors have entered into any administrative agreements or consent decrees or had administrative orders directed at them for violations of environmental laws administered by the Department, the State, other states, the United States, or another country in the last 5 years.

C. Covanta: The MRC and Fiberight have submitted the disclosure information for Covanta's senior officers. Covanta's senior officers do not hold more than a 5% equity interest in any company that collects, transports, treats, stores, or disposes of solid or hazardous wastes and do not have any criminal convictions or civil violations of environmental laws or rules administered by the State, other states, the United States, or another country in the last 5 years. Additionally, senior officers have not entered into any administrative agreements or consent decrees or had administrative orders directed at them for violations of environmental laws administered by the Department, the State, other states, the United States, or another country in the last 5 years.

The Department finds that the MRC, Fiberight and Covanta have filed complete disclosure statements in accordance with 06-096 C.M.R. ch. 400, § 12(A). Based on the disclosure statements submitted and the evaluation criteria contained in 06-096 C.M.R. ch. 400, § 12(B), the Department finds no basis for denying the license.

9. TRAFFIC MOVEMENT

Traffic for the proposed processing facility will enter and exit at a single point of access located at the northeast corner of the project site. The processing facility entrance will be located at the end of a proposed 4,460-foot long access road which will enter onto the Coldbrook Road directly across from an existing truck facility access road. The proposed access road will be paved, approximately 30 feet in width (consisting of 2, 12-foot travel lanes with 3-foot shoulders), and end at a cul-de-sac at the proposed processing facility entrance. An Entrance Permit Application for the access road entrance onto the Coldbrook Road was submitted to, and a permit issued by, the Maine Department of Transportation ("MDOT") (Permit # 15947 – Entrance ID: 1, dated May 22, 2015). Sight distances for the proposed access road exceed the requirements of the MDOT Entrance Permit.

The main traffic associated with the proposed processing facility will be from incoming MSW deliveries and employees. Additional traffic components will include general deliveries, outgoing process residues and recyclables generated by the proposed processing facility, material deliveries related to the proposed processing facility and outgoing product deliveries from the proposed processing facility. Incoming MSW deliveries will enter and exit the proposed processing facility in trucks ranging from packer trucks to trailer trucks. The highest expected total of MSW deliveries to the proposed processing facility on any given day is 89, comprised of 53 packer trucks, 26 roll-off trucks and 10 trailers. A delivery will equate to 2 vehicle trips (1 entering and 1 exiting the facility). Employee, visitor and delivery traffic is expected to generate 168 total vehicle trips per day. Traffic from the shipment of outgoing process residues and recyclables and incoming material deliveries will vary.

A MDOT Traffic Movement Permit is not required because the proposed project's estimated overall traffic volume is less than 100 passenger car equivalents during the peak hour. The MRC and Fiberight estimate a peak traffic volume of 356 vehicle trips per day, spread throughout the entire day. The interior processing facility road network consists of employee and visitor parking lots and site roads varying from 2 to 3 lanes and various lengths. All interior roads will be paved. The speed limit of the interior roads will be 15 miles per hour. The MRC and Fiberight have provided information regarding haul routes, road characteristics and information regarding traffic accidents in the vicinity of the proposed project site in the last 3 years. No high crash locations were identified.

The Department finds that the MRC and Fiberight have made adequate provisions for safe and uncongested traffic movement of all types into, out of, and within the proposed project area.

10. FITTING HARMONIOUSLY INTO THE NATURAL ENVIRONMENT

A. General: The MRC and Fiberight have designed the proposed processing facility to fit harmoniously into the natural environment. CES has provided information related to any protected significant wildlife habitat, unusual natural areas, rare, threatened or endangered plant species, and protected natural resources. CES, on behalf of the MRC and Fiberight contacted the Maine Department of Inland

Fisheries and Wildlife ("MDIFW") and the Maine Natural Areas Program to identify any of the above features.

B. Setbacks and Buffers: The MRC and Fiberight have stated that the areas to the north, east and south of the proposed processing facility will be maintained in their natural wooded condition. The proposed building site will be 4 to 5 feet lower than the surrounding grade to the west. The waste handling area at the proposed processing facility meets all the setbacks required by the Rules.

C. Wildlife and Fisheries: In March 2015, CES sent a letter to MDIFW requesting information for known locations of Endangered, Threatened, and Special Concern Species, designated Essential and Significant Wildlife Habitats, and fisheries habitat concerns within the vicinity of the proposed project site. The MDIFW responded to CES in letters dated March 16, 2015 and March 18, 2015.

(1) Bats: With regard to information for known locations of Endangered, Threatened, and Special Concern Species, MDIFW stated that 7 out of 8 species of bats in Maine are currently listed as Species of Special Concern; however, 3 species of bats are currently being considered through the legislative process for protection under Maine's list of Threatened and Endangered Species. At the time of Application submittal, the Northern Long-eared Bat was listed as Endangered under the Federal Endangered Species Act (listed April 2, 2015). Subsequent to the Application submittal, the Little Brown Bat and Northern Long-eared Bat were listed as Endangered in Maine and the Eastern Small-footed Bat was listed as Threatened in Maine.

In consultation with the U.S. Fish and Wildlife Service ("USFWS"), an acoustical bat survey was developed in order to assess bat activity and to determine the presence, if any, of Northern Long-eared Bats within the proposed processing facility site. The acoustical bat survey was conducted during the summer of 2015. The acoustical bat survey did not identify any federally protected bat species within the proposed processing facility site. The MRC and Fiberight have agreed to follow conservation guidelines for tree cutting, as outlined by USFWS in the interim Federal 4(d) Rule, effective May 4, 2015, to minimize potential impacts to listed bat species. An acoustical bat survey was not completed on the utility corridor; however, an acoustical survey of the utility corridor is planned for July 2016. The submittal to the Department of a forest management plan that contains provisions which will maintain the wildlife habitat functions and values is a condition of Department License #L-26497-NJ-A-N and #L-26497-TG-B-N. Construction activities will follow recommended management guidelines provided by the USFWS to minimize potential impacts to bat species.

(2) Vernal Pools: A comprehensive inventory of vernal pools was completed during spring 2015 and identified 44 vernal pools within the proposed processing facility site. Nine pools met the Department's definition of significant vernal pool. Construction of the proposed access road will occur within 250 feet of one significant vernal pool. This significant vernal pool is designated as Pool #2632 according to the Department's Geographic Information System and VP 1-10 within the Application. Alteration of this vernal pool habitat was authorized under the Natural Resources Protection Act Permit by Rule Notification Form (PBR #59983) pursuant to *Natural Resources Protection Act Permit by Rule* standards, 06-096 C.M.R. ch. 305 (last amended June 8, 2012).

(3) Fisheries: With regards to fisheries habitat, the MDIFW made the following recommendations: a 100-foot undisturbed vegetated buffer be maintained along any mapped or unmapped streams; stream crossings should be avoided, but if necessary, the crossing should be designed to provide adequate fish passage; and Construction Best Management Practices ("BMPs") should be closely followed and that any necessary instream work or work within 100 feet of streams occur between July 15 and October 1. Consideration of MDIFW's recommendations was included in Department License #L-26497-NJ-A-N and #L-26497-TG-B-N.

(4) Deer Wintering Area: MDIFW stated that there is a large mapped Deer Wintering Area ("DWA") within the project search area. MDIFW staff walked the proposed processing facility site with CES staff and commented that a portion of the DWA has been selectively harvested within the last decade and a large amount of softwood cover that characterizes a DWA was removed. MDIFW staff comments that while the specific location to be developed lacks suitable winter shelter habitat, areas located to the east of the proposed processing facility building site do provide appropriate winter shelter for deer. MDIFW recommends that the remaining undeveloped portions of the proposed processing facility site be protected and managed for winter shelter. MDIFW staff comments that a timber management plan that details the management actions necessary to maintain deer winter shelter areas should be drafted and become part of this longer term protection effort.

D. Unusual Natural Areas: The Natural Areas Program within the MDIFW did not find evidence of any rare or unique botanical features on, or adjacent to, the proposed project site. Rare and unique botanical features include the habitat of rare, threatened, or endangered plant species and unique or exemplary natural communities.

E. Protected Natural Resources: Natural resource work has been completed at the proposed project site. The MRC and Fiberight are proposing to impact a total of 105,000 square feet of forested wetland to construct the proposed processing facility, access road, and the utility corridor. The development of the proposed access road and processing facility building will require alterations to freshwater wetlands, significant wildlife habitat and other protected natural resources. Impacts to protected natural resources will be addressed by obtaining a permit pursuant to *Natural Resources Protection Act*, 38 M.R.S. § 480-A et *seq.*, as required. The MRC and Fiberight have submitted Natural Resources Protection Act permit applications to both the Department and U.S. Army Corps of Engineers.

In July 2016, the Department issued Department License #L-26497-NJ-A-N and #L-26497-TG-B-N approving the construction of an access road, utility corridor and alterations to freshwater wetlands, significant wildlife habitat and other protected natural resources on the proposed project site.

The Department finds that the proposed project will fit harmoniously into the surrounding environment; provided that, the MRC and Fiberight: (1) submit the results of the acoustical bat survey to be completed within the utility corridor; and (2) develop a timber management plan that details the management actions necessary to maintain deer winter shelter areas. The Department further finds that at least 14 days prior to commencing construction of the proposed processing facility, the MRC and Fiberight must submit the acoustical bat survey to be completed within the utility corridor and a timber management plan to maintain deer winter shelter areas.

11. AIR QUALITY

The proposed project site is buffered by existing forested areas and is approximately 3,400 feet away from the nearest existing residential building. The proposed processing facility is designed with multiple systems and procedures to minimize the generation of, and provide control of, objectionable and nuisance odors at any occupied building. All unloading of MSW will occur inside the proposed processing facility building. In order to minimize the number of waste delivery trucks in the parking lot at one time, the tipping floor is designed to accommodate 1 transfer trailer and 3 packer trucks simultaneously. The primary operational control for nuisance odors is minimizing the quantity, and the duration, of time that MSW sits on the tipping floor. The tipping floor is designed with storage capacity for 2 days of MSW receipts and 2 days of primary processed material. The MRC and Fiberight will utilize the principle of "First-in-First-Out" operation to the maximum extent possible to minimize the residence time of waste on the tipping floor. The tipping floor and processing portion of the building will be maintained under constant negative pressure by using a multiple hood/intake register air handling system. The air handling system will draw air from inside the building and treat it in either of 2 scrubber systems. One of the scrubbers will be operated at all times when MSW is present on the tipping floor. Both scrubbers will be operated when the high-speed fabric overhead doors used for truck entry or exit are open.

A Start-Up, Shutdown and Malfunction Plan has been developed that includes provisions for odor control during times when processing operations must be limited or suspended to perform equipment maintenance. The MRC and Fiberight have also established an Odor Complaint Response Plan that outlines procedures for odor complaint reporting, should they occur, and subsequent response actions including the use of an odor neutralization agent. As part of the operations of the proposed processing facility, regular odor inspections will be performed. Inspections will include, at a minimum, visual observation of the operations for obvious signs of damage or abnormal conditions within the proposed processing building that will affect collection efficiency of the odor control system and a visual inspection and odor survey around the exterior of the proposed processing facility.

The MRC and Fiberight have stated that during the first month of, and for a total of 6 months during, the first year of operation, a daily inspection and odor survey will be conducted around the proposed processing facility. The daily inspection period will include the summer months when waste odors are expected to be strongest. If operations commence in the winter months and no odor issues are identified during the first month, inspections will be reduced to weekly until the onset of warmer weather. If after 6 months, including summer months, no odor issues are identified then inspections will be reduced to weekly. Inspection results will be submitted to the Department weekly unless an odor incident is noted in which case the Department will be notified within the day. A summary of the odor survey reports will be submitted to the Department with the facility's annual report.

The MRC and Fiberight have submitted an application to the Department for a Minor Source Air License to address potential fugitive emissions from the proposed 2 biomass boilers, other fuel burning equipment and process equipment. The other fuel burning equipment includes a thermal oxidizer and flare. The details of this license can be found in Department License #A-1111-71-A-N, dated July, 2016.

Fugitive dust is not expected to be an issue. All travel ways and parking areas will be paved and no bulk material handling operations will occur outside the proposed processing building. Should fugitive dust emissions occur beyond the property boundary, the processing facility operator will assess the source of the dust and clean the travel ways and, if necessary, spray water to control dust.

The MRC and Fiberight propose to use 2 cooling towers to promote evaporative cooling of waste heat. The MRC and Fiberight have proposed the installation of drift eliminators to minimize any emissions of particulate that may occur. This is not expected to be a sufficient quantity to cause localized fog banks or icing beyond the property boundaries and should not unreasonably alter climate in the area of the processing facility.

The Department finds that there will be no unreasonable adverse effects on air quality and/or climate due to the proposed project.

12. SOIL SUITABILITY AND EROSION CONTROL

A subsurface investigation was completed by SW Cole to evaluate whether soil bearing capacity is sufficient to support the proposed processing facility and associated outdoor storage components. SW Cole concluded that based on the subsurface findings, the construction of the processing building appears feasible from a geotechnical standpoint. SW Cole provided geotechnical recommendations pertaining to the building’s footings and on-grade floor slab and perimeter footings and the need for underdrains near footing grade and adjacent to paved areas. The recommendations have been incorporated into the building design. SW Cole also recommended that a contingency be made for the possible removal of bedrock via drilling or blasting.

The MRC and Fiberight have submitted an Erosion and Sedimentation Control Plan including an inspection and maintenance plan. Any proposed work will be carried out in conformance with the approved erosion and sedimentation control plan, the construction contract documents, and the Maine Erosion and Sediment Control Field Guide for Contractors, March 2015 or its equivalent.

The Department finds that the proposed processing facility will be constructed on soils suitable for the proposed use and will not cause unreasonable sedimentation or erosion of soil. The Department also finds that the MRC and Fiberight have adequately addressed erosion and sediment control for the proposed project, and have demonstrated that the proposed project will be carried out in conformance with the approved erosion and sediment control plan, the construction contract documents, and the Maine Erosion and Sediment Control Field Guide for Contractors, March 2015 or its equivalent.

13. SURFACE WATER QUALITY AND FLOODING

The proposed project site is not located within a 100-year flood plain and is not located within a direct watershed of a waterbody most at risk from new development. A 25-year, 24-hour storm event was modeled to determine the necessary detention and outlet sizing requirements for the proposed project site. The proposed building site will be located on an undeveloped and mainly wooded parcel of land approximately 90 acres in size in the Town of Hampden. Shaw Brook is classified as an Urban Impaired Stream and is located approximately 3,000 feet to the west of the parcel. Runoff from the site generally drains to a large forested wetland area to the south of the parcel before eventually draining to the Penobscot River. Runoff does not drain to Shaw Brook.

The proposed project will be built over a portion of previously undeveloped land and will add approximately 9.7 acres of developed area to the site. The project area will be treated with a combination of 3 vegetated under-drained soil filters and a roofline drip edge filter. All of these treatment measures discharge toward the south and west ends of the project site before re-joining the pre-development flow paths. The results of the post development analysis for the project site indicate that there is a reduction in runoff from the summation points, and that all of the stormwater treatment measures are sized adequately to handle stormwater runoff from 2, 10 and 25-year storm events. There are no anticipated adverse impacts to the downgradient areas, and as a result the development will have no unreasonable effect on run-on, run-off, and/or infiltration relationships on-site or on adjacent properties.

The Department finds that the proposed processing facility will not have an unreasonable adverse effect on surface water quality and will not unreasonably cause or increase flooding on the proposed facility site or on adjacent properties nor create an unreasonable flood hazard to any structure.

14. EXISTING USES AND SCENIC CHARACTER

The proposed building site includes an approximate 90-acre wooded parcel of land established as an industrial zone by the Town of Hampden. The proposed processing facility will be located approximately 0.25 miles from I-95 to the north, 0.8 miles from the Coldbrook Road to the west, 0.7 miles from the Ammo Industrial Park to the east and 1 mile from Route 202 to the south. The project site will be 4 to 5 feet lower than the surrounding grade to the west of the facility. The remainder of the project site is surrounded by a natural wooded buffer to the north, east and south. This buffer will be retained and will provide a visual screen to the north, east and south. There are no airport runways located within 10,000 feet of the existing site, no historic properties, and the existing site is located greater than 2,000 feet from the nearest established public viewing area. A portion of a neighboring property from the southwest to southeast is currently zoned as rural by the Town of Hampden. There are 2 residential subdivisions located approximately 3,400 feet to the south of, but not abutting, the proposed site.

The noise generated from the routine operation of the proposed processing facility must be less than or equal to 70 A-weighted decibel (dBA) for daytime and 60 dBA for nighttime hours at the facility property boundary. There are no protected locations within or in the vicinity of the project site's property boundary. As it relates to this Application, the applicable noises in the thresholds are limited to routine operations of the proposed processing facility. As a result, all applicable noise generating equipment will be located inside the proposed processing building and at no time will processing activities take place outside.

The Department finds that the proposed project will not have an unreasonable adverse effect on existing uses or scenic character. The Department also finds that the proposed project will not result in increased noise levels beyond the proposed project site's property boundary.

15. ADEQUATE PROVISIONS FOR UTILITIES

A. <u>Water:</u> The proposed processing facility will be served by the Town of Hampden Water District ("Hampden WD"), which is a municipal water supply and supplies potable water to the surrounding community. During steady state operation, the proposed processing facility will require an average water demand of 360,000 gallons per day ("gpd") with a peak flowrate of 300 gallons per minute ("gpm"). During maintenance periods, which could occur 3 to 4 times per year, the processing facility will require a maximum water demand of 132,000 gpd with a peak flowrate of 275 gpm, to fill various components in the processing system. The initial fill of the processing system will require approximately 3,500,000 gallons of water, completed over a 30-day period. The Hampden WD provided a letter, dated May 13, 2015, which states that it has the capacity and capability to meet the proposed flow requirements.

B. <u>Wastewater:</u> The MRC and Fiberight estimate that the processing facility will discharge an average daily flow of 150,000 gallons of domestic and process wastewater into the Town of Hampden's (Hampden) municipal sanitary sewer collection system, which is sent for treatment to the City of Bangor's Wastewater Treatment Plant ("Bangor WWTP"). The Bangor WWTP provided an updated letter, dated February 17, 2016, related to the estimated 150,000 gpd of wastewater to be generated by the proposed processing facility. Bangor WWTP states that it has capacity, at this time, to accept this additional flow during non-combined sewer overflow conditions. Further, the Bangor WWTP states that "alternative arrangements such as on-site storage or trucking to alternative sites" needs to be made during combined sewer overflow conditions.

In a March 30, 2016 Memo, CES assumed the need to provide on-site storage of 300,000 gallons or two times the estimated average daily flow. The MRC and Fiberight have proposed the installation of a 150,000 gallon aboveground tank and 100,000 gallon belowground tank and the utilization of 50,000 gallon buffer storage in an already designed process water storage tank. CES notes that the tank construction materials are still being evaluated and will be determined during final design.

Bangor WWTP also requires the user to provide the treatment plant with an Industrial User Permit Application and a Pretreatment Survey and Disclosure Form prior to discharging any effluent to their treatment system. Should it be determined that, for any reason whatsoever, adverse effects are noted or anticipated at the Bangor WWTP, the user shall be required to pre-treat wastewater discharge to acceptable levels. If the Pre-Treatment Survey shows that the proposed processing facility requires a pre-treatment system for its wastewater, the Bangor WWTP must approve the pre-treatment system prior to installation.

C. Solid Waste: The MRC has entered into a Solid Waste Disposal Agreement, dated August 15, 2015, with the Waste Management Disposal Services of Maine Crossroads Landfill in Norridgewock, Maine, to accept "MSW Bridge Capacity" waste (defined as MSW, brought to the facility between April 1, 2018 and the start of commercial operations, that cannot be fully processed), solid waste process residue, and MSW bypass waste for disposal. The MRC and Fiberight estimate a range between 30,000 to 40,000 tons per year of process residue waste and biomass boiler ash will require disposal. In addition, for planning purposes the MRC and Fiberight have made provisions for the disposal of an estimated 37,500 to 50,000 tons per year of MSW bypass waste to address any bypass events that may be necessary. The Master Waste Supply Agreement (MWSA), effective date January 1, 2016, between the MRC and Fiberight requires Fiberight to avoid or minimize bypass events, and only allows bypass events due to Force Majeure, limits on capacity resulting from an outage, a full tip floor, the need to avoid nuisance impacts, permit limits, or other factors beyond its reasonable control. The MWSA specifies procedures for the handling of MSW Bridge Capacity waste. Specifically, the MWSA requires Fiberight to use commercially reasonable efforts to (1) advance the occurrence of the Commercial Operation Date in order to be able to accept and process acceptable waste as soon as possible; (2) allow the facility to be used to accept and process acceptable waste to the extent practical, with the specific sources of acceptable waste being accepted to be determined in consultation with the MRC; and (3) allow the facility to be used to receive acceptable waste, and transfer amounts that are accepted but cannot be processed to the back-up facility, with the specific sources of acceptable waste being accepted to be determined in consultation with the MRC. The Department notes that the MRC and Fiberight need to minimize the amount of time, if any is needed, that MSW Bridge Capacity diversion is utilized, and that monthly reporting to the Department of MSW Bridge Capacity tonnage utilized and an updated schedule outlining the measures needed to reach Commercial Operation is necessary until such time as Commercial Operation is achieved.

The Department finds that the MRC and Fiberight have provided for adequate utilities and will have no unreasonable adverse effect on existing or proposed utilities in the municipality or area served by utilities; provided that: (1) the MRC and Fiberight submit copies of the Bangor WWTP Industrial User Permit and letter approving the operation of a wastewater pre-treatment system, if necessary, to the Department within 30 days of their receipt; (2) the MRC and Fiberight submit, for review and approval, the final design for the on-site wastewater storage tanks at least 60 days prior to construction of the proposed processing facility; and (3) the MRC and Fiberight submit monthly reports to the Department listing the tonnage of MSW Bridge Capacity utilized, if any is needed, and an updated schedule outlining the measures needed to reach Commercial Operation until such time as Commercial Operation is achieved.

16. GROUNDWATER QUALITY

The proposed project site does not overlie a significant sand and gravel aquifer. The closest mapped aquifer is approximately 4,000 feet to the northwest of the proposed project site. Unprocessed and processed MSW will be stored inside the proposed processing building. Residue materials, bypass waste and biomass boiler ash will be stored in trailers and transported off-site to a licensed, secure landfill for disposal. Recyclable materials will be stored on-site in either 100 cubic yard transport trailers or 40 cubic yard dump trailers. No unprocessed or processed materials will be stored outside on the ground.

The Department finds that the proposed processing facility will not pose an unreasonable threat to the quality of a significant sand and gravel aquifer and will not result in unreasonable adverse effects on groundwater quality.

17. PROCESS DESIGN

A. <u>General:</u> The proposed processing facility consists of 4 different processing stages which will process the MSW received into several different categories.

The 4 different processing stages are: materials recovery, renewable fuel production, renewable energy production, and industrial co-products. A series of process benchmarks has been established that will be used to evaluate the proposed process during various stages of project implementation as described below.

B. Materials Recovery Facility (MRF): The first stage in the process (primary MRF) is to remove large bulky items prior to the MSW being loaded into the primary trommel. Unwanted large bulky items will be removed on the tipping floor and on a pre-sort line and loaded on a trailer and transferred for disposal at a licensed landfill facility. The MSW is then fed to the primary trommel which opens and empties the bags of trash and size separates the material into over 20 inch and 20 inch and under. The 20 inch and under material is then further size separated by a fines screen to 2 inches or less in size which fraction continues through to the fines processing area for further processing. The over 2 inch to 20 inch material is stockpiled and subsequently conveyed to a drum pulper that breaks the organic material down to form a biomass, which facilitates separation of the recyclable materials from organic wastes, and prepares the biomass for further cleaning.

Materials exiting the drum pulper pass across a screen to separate recyclables, such as metals and plastics from the biomass pulp. These recyclable materials are then conveyed to the MRF to be further processed. The remaining biomass pulp is conveyed to a two-stage washing system to remove fine contaminants (mostly plastics) and soluble organic material. The first-stage wash removes soluble organic material and pumps high chemical oxygen demand wastewater to a pre-acidification tank prior to entering the high-rate anaerobic digester for biogas production. The second-stage wash dilutes the remaining material, where filters are used to separate out the fine cellulose from the remaining contaminants. The washed cellulose is then pumped into a stock tank. From the stock tank, the cellulose pulp is pumped as slurry into a screw press where it is de-watered to approximately a 50% solids press cake which is then pre-treated prior to being introduced to the hydrolysis system.

C. Renewable Fuel Production: The enzymatic hydrolysis stage starts when the dewatered pulp is conveyed to the pretreatment system whereby water and acid is added into a pretreatment mixer so the appropriate solids concentration and pH is obtained. Slurry from the pretreatment mixer is then pumped to the pretreatment reactor. Fiber exiting the pretreatment reactor is pumped to a medium consistency refiner and then to a screw press to be dewatered, and filtrate is returned to the mix tank. Pretreated fiber press cake is conveyed to the hydrolysis system. The pretreatment reactor, pumps, filtrate tank and screw press are connected to a Clean-in-Place (“CIP”) system for regular cleaning and sterilization. The hydrolysis process is carried out within a high viscosity reactor paired with a set of mixing tanks. The pretreated fibers enter the mixing tanks along with water and enzymes, and wetted fibers circulate through the hydrolysis tank where cellulose within the fiber is converted to sugars on a batch basis.

Temperature and pH are controlled to achieve an optimum mixture which is left in the reactor where the low-temperature biological process is completed. Each reactor, pump, heat exchanger and mixing vessel is connected to a CIP system for regular cleaning and sterilization. A filter press is utilized to separate the undigested post hydrolysis solids ("PHS") from the liquid sugar solution. The sugar solution will be fed directly to the anaerobic digester for conversion into biogas.

D. Renewable Energy Production: The renewable energy production stage begins when the high organically loaded liquid is cooled and sent to an anaerobic digestion system. This system uses microorganisms to digest suspended and dissolved solids contained in the water to reduce the chemical oxygen demand of the water. Clean water and a methane-rich biogas are the byproducts of the stage. The clean water is reused in the washing process. The biogas will be used as supplementary fuel for internal energy production via a boiler and/or injected into a natural gas pipeline. Bangor Natural Gas has provided a February 10, 2016 letter stating that a section of pipe between Bangor and Hampden needs to be upgraded and that upgrades including testing will be completed prior to facility start-up.

Process water recovered from the water treatment system is used to dilute solids in the pulp and wash systems to maintain desired moisture content. A portion of the recovered water is sent to the CIP storage tank. The PHS exiting the hydrolysis filter presses, which is essentially spent fiber with a high lignin content, is processed in a specially designed combustion unit. The heat (steam) from the combustion process is recovered and sent to a steam turbine. The exhaust heat from the turbine is then used to provide process heat. The amount of electrical and heat energy generated by the biomass combustion is sufficient to provide the bulk of the energy demand for the proposed processing facility. The proposal to produce fuel grade ethanol is no longer part of the proposed processing facility project.

Plant water management is conducted via a recycling and reuse system. Purge water from the washing system and from the cook filtrate tank are blended together. Any residual fine suspended material is removed using a dissolved air flotation ("DAF") system with the highly organic liquid created sent to the anaerobic digester and the solids exiting the DAF removed using a belt press.

The solids extracted with the belt press, in the form of cake, are routed via conveyor to be disposed of offsite.

E. Industrial Co-products: The resultant products generated at the proposed processing facility will include recyclables which will be sold on the open commodities market; PHS which will be used to fuel the on-site biomass boilers; and bio-methane which will be piped to the adjacent Bangor Natural Gas Loring Pipeline. The resultant residue waste products generated at the processing facility will include materials typically 2 inches or less in size (glass and grit), large bulky items, dissolved air filtration system residues and combined boiler ash.

F. Process Benchmarks: The MRC and Fiberight have proposed operational benchmarks in a submittal dated June 2, 2016 that include evaluating the proposed process during pre-commissioning, commissioning, start-up and ramp-up. The completion of each benchmark stage will be documented with process improvements proposed as necessary.

(1) The pre-commissioning phase will include verification that systems have been installed in accordance with the applicable specifications, calibration of electrical and instrument controls, equipment alignment and energizing the electrical systems.

(2) The commissioning phase will include verification that each system can run independently and for increasing time periods.

(3) The start-up phase includes start-up of all plant systems to ensure that the systems perform in an integrated fashion. During this phase, initial volumes of MSW will be processed. Once successfully processed, MSW volumes will be increased in a stepwise fashion.

(4) The ramp-up stage includes increasing the volumes of MSW to full-scale loading. This phase is projected to occur for approximately 4 months.

The Department finds that the MRC and Fiberight have submitted adequate information regarding the proposed processing facility and process design; provided that, confirmation of natural gas pipe upgrades and testing and a finalized agreement with Bangor Natural Gas is provided to the Department at least 30 days prior to conveying bio-methane into the pipe.

18. OPERATIONS MANUAL

The MRC and Fiberight have submitted a draft operations manual for the proposed processing facility. Department staff issued final comments on April 28, 2016 regarding the draft operations manual. CES proposes to finalize the operations manual and provide it as a stand-alone document to the MRC and Fiberight after Department review and approval of the document has been completed.

The Department finds that the MRC and Fiberight have submitted an operations manual that addresses the operating requirements of 06-096 C.M.R. ch. 409, § 4; provided that, an updated operations manual is prepared and submitted for Department review and approval at least 60 days prior to full-scale operations which incorporates Department comments from an April 28, 2016 memorandum and process or equipment changes resulting from pre-commissioning, commissioning, start-up and ramp-up activities.

19. WASTE CHARACTERIZATION

Waste residues that will require initial and on-going characterization prior to final disposal include biomass boiler ash and miscellaneous process residues resulting from the DAF water treatment system. With respect to the ash characterization, the Department has requested that the MRC and Fiberight evaluate 4 roll-off containers of ash as part of the initial characterization. The MRC and Fiberight will collect composite ash samples for each of the 4 roll-off containers as part of the characterization process. Samples will be collected from the fly ash and bottom ash conveyors at specific intervals while each roll-off is being filled. The MRC and Fiberight expect the turnaround time for the analytical tests will be approximately 7 days. The MRC and Fiberight estimate that it may need to store up to 9, 30-yard roll-off containers during the initial ash characterization phase. Full roll-off containers will be stored within the proposed processing building as space allows. If the number of roll-offs exceeds the proposed processing building's capacity for inside storage, the excess roll-offs will be stored outside on the paved parking lot while waiting for receipt of laboratory analytical results. Roll-off containers that are stored outside while awaiting laboratory analytical results will be tarped to prevent infiltration of rainwater. After the initial characterization period, the MRC and Fiberight anticipate being able to store the ash roll-offs indoors.

With respect to the DAF process residues, during normal operating conditions the MRC and Fiberight expect to generate process residues at a rate of approximately 1 to 2 roll-offs daily. During initial characterization, these residues will be stored in 30-yard roll-off containers inside the proposed processing building as space allows. If the generation rate of the process residues exceeds the ability of the MRC and Fiberight to store the containerized waste indoors, the excess roll-offs will be tarped and stored outside on the paved parking surface until the MRC and Fiberight receive analytical results from the laboratory. After the initial characterization period, the MRC and Fiberight anticipate being able to store the waste roll-offs indoors.

The Department finds that the MRC and Fiberight have adequately addressed the waste characterization requirements of 06-096 C.M.R. ch. 405, § 6(C) in Section E of its draft operations manual submitted with the Application.

20. SOLID WASTE MANAGEMENT HIERARCHY

A. General: *Solid Waste Management Hierarchy*, 38 M.R.S. § 2101 establishes that it is the policy of the State to "plan for and implement an integrated approach to solid waste management" through an order of priority that places waste reduction, reuse, recycling, composting, and processing before land disposal as a "guiding principle in making decisions relating to solid waste management". Further, 06-096 C.M.R. ch. 409, § 2(C) requires the recycling or processing of all waste accepted at the facility to the maximum extent practicable, but in no case at a rate less than 50%.

B. Reduction: The MRC and Fiberight have supported and will continue to support the existence and incorporation of programs to encourage waste reduction at the source. MRC and Fiberight have demonstrated support for further waste reduction, reuse and recycling through the establishment of an express right, in the municipal contracts for MSW delivery to Fiberight, for municipalities to have the option to expand existing or future programs intending to encourage further reduction, reuse and recycling of MSW generated within its borders. Waste reduction programs are implemented at the local level by municipalities in order to reduce the quantity of waste being generated that requires municipal collection, transfer, transportation and disposal costs. The MRC and Fiberight are committed to ensure that any further arrangements supporting the development of the proposed processing facility will avoid business arrangements, such as minimum tonnage delivery guarantees set at levels that are too high or with insufficient flexibility, that might undermine or conflict with municipal efforts to reduce the amount of waste generated within their borders.

C. Reuse: MRC communities currently sponsor programs to encourage waste reuse that are implemented at the local level by municipalities with an emphasis on education, outreach, swap shops, and technical assistance to residents and the incorporation of local waste reuse programs. The MRC and Fiberight are committed to ensuring these existing programs remain in place.

D. Recycling: MRC municipalities currently sponsor a wide variety of local programs to collect, process, and market recyclables through the operation of curbside collection programs, and drop-off programs, often in connection with the operation of transfer stations and other facilities. The measures described above to support waste reduction and reuse programs will also serve to support the incorporation of local recycling. Recyclables that are not captured at the local level will subsequently be captured at the proposed processing facility. The proposed processing facility will serve to remove recyclables currently not being removed from the waste stream and will convert remaining organics into renewable products. To that end, the MRC's and Fiberight's planned system is expected to divert additional materials from the waste stream and will overall reduce the volume of MSW residues requiring land disposal. This is the first of two step increases in materials management offered by the Fiberight system compared to the existing system that strengthens conformity to the waste management hierarchy. Capturing recyclables on a regional level at a central processing facility increases the quantity of recyclable materials collected, processed and marketed and provides a new level of recycling service beyond that of existing local level programs.

E. Composting/Organics Management: Composting and other methods of processing biodegradable materials are currently being accomplished on the local level through backyard, local and/or regional composting or anaerobic digestion programs. Despite the success of a significant number of local organics composting and diversion programs, the quantities of organics remaining in the waste stream remains a significant fraction of the waste stream. This large fraction of the incoming MSW waste stream will be converted into renewable fuel products and/or biogas. This additional recycling of organics represents a second step increase in improved conformity with the waste management hierarchy compared to the existing system. Due to the proposed processing facility's expected capability to convert biodegradable waste into high value fuel products, the MRC and Fiberight are expecting some local programs may voluntarily select to transition their organics management activities to the proposed processing facility. The MWSA, described in FOF #15 above, contains provisions prohibiting, without the prior consent of Fiberight, joining member communities from initiating new or significantly and materially expanding existing programs to divert organic components from the MSW generated within its borders that otherwise would have been delivered to the proposed processing facility. The Department notes that Fiberight should annually report any such requests from joining member communities and the disposition of such requests, inclusive of the reasons for each determination. The Department further notes that Fiberight should not unreasonably withhold approval of these requests and should make reasonable efforts to replace, if needed, the quantity of removed organics with other acceptable waste.

F. <u>Waste Processing:</u> The MRC and Fiberight have calculated that between 70% and 80% by weight of all incoming MSW will be recycled and processed at the proposed processing facility. As part of each year's annual report, the MRC and Fiberight will need to demonstrate that all wastes accepted at the proposed processing facility have been recycled or processed into fuel for combustion to the maximum extent practicable, but in no case at a rate of less than 50%.

G. <u>Land Disposal:</u> The MRC and Fiberight noted that the availability of secure landfill disposal capacity is an integral part of the development of an integrated system for solid waste management in accordance with the hierarchy of management methods described above. The MRC and Fiberight estimate that between 20% and 30% by weight of all incoming waste will result in process residue that will require landfilling. The process residue includes bulky waste, textiles, DAF system residues and combined boiler ash. In addition, landfill disposal capacity will also be necessary for scheduled and unexpected shutdowns of the processing facility. As described in FOF #15 above, the MRC and Fiberight have entered into a Solid Waste Disposal Agreement with the Waste Management Disposal Services of Maine Crossroads Landfill in Norridgewock, Maine, to accept MSW Bridge Capacity waste, solid waste process residue, and MSW bypass waste for disposal.

The Department finds that the MRC and Fiberight have adequately addressed solid waste management consistent with the State's Solid Waste Management Hierarchy pursuant to 38 M.R.S. § 2101; provided that, the MRC and Fiberight: (1) annually report any requests from joining member communities to initiate new, or significantly and materially expand existing, organic diversion programs and the disposition of such requests, inclusive of the reasons for each determination; (2) do not unreasonably withhold approval to initiate new, or significantly and materially expand existing, organic diversion programs and make reasonable efforts to replace, if needed, the quantity of removed organics with other acceptable waste; and (3) submit monthly reports to the Department listing the tonnage of MSW Bridge Capacity utilized, if any is needed, and an updated schedule outlining the measures needed to reach Commercial Operation until such time as Commercial Operation is achieved.

BASED on the above Findings of Fact, and subject to the Conditions listed below, the Department makes the following CONCLUSIONS:

1. The MRC and Fiberight have planned for site design; provided that, the MRC and Fiberight submit, for Department review and approval, a complete set of construction-ready plans and documents for the proposed access road and associated utility corridor at least 30 days prior to commencing construction and a complete set of construction-ready

plans and documents for the proposed processing facility at least 60 days prior to commencing construction.

2. The MRC and Fiberight have provided adequate evidence of title, right or interest in the properties for the proposed project site; provided that, the MRC and Fiberight submit a copy of the deed(s) or executed long-term lease agreement(s) for the properties purchased and/or leased for the development of the proposed project within 30 days after the closure of sale and/or execution of the executed long-term lease agreement(s).

3. The MRC and Fiberight have complied with all of the public notice requirements of 06-096 C.M.R. ch. 2.

4. The MRC and Fiberight have provided adequate evidence of financial capacity to design, construct, operate, maintain and close the proposed processing facility in a manner consistent with state environmental regulations; provided that, the MRC and Fiberight submit for review and approval, within 30 days of receipt and prior to beginning construction of the processing facility, exclusive of the access road that is funded solely by the MRC, finalized financial documents to fund design, construction, operation, maintenance and closure of the proposed processing facility.

5. The MRC and Fiberight, and their retained consultants, have provided adequate evidence of technical ability to design, construct, operate, maintain and close the proposed processing facility in a manner consistent with state environmental regulations; provided that, the MRC and Fiberight submit to the Department for review and approval adequate evidence of the technical abilities for any additional personnel who will be responsible for operations at least 30 days prior to commencing pre-commissioning operations of the proposed processing facility.

6. The MRC and Fiberight have made adequate provisions for safe and uncongested traffic movement of all types into, out of, and within the proposed project area.

7. The MRC and Fiberight have made adequate provisions for fitting the development harmoniously into the existing natural environment; provided that, the MRC and Fiberight: (1) submit the results of the acoustical bat survey to be completed within the utility corridor; and (2) develop a timber management plan that details the management actions necessary to maintain deer winter shelter areas. The acoustical bat survey and timber management plan will be submitted at least 14 days prior to commencing construction of the proposed processing facility

8. There will be no unreasonable adverse effects on air quality and/or climate due to the proposed project.

9. The proposed processing facility will be constructed on soils suitable for the proposed use and will not cause unreasonable sedimentation or erosion of soil. The MRC and Fiberight have adequately addressed erosion and sediment control for the proposed project, and have demonstrated that the proposed project will be carried out in conformance with the approved erosion and sediment control plan, the construction contract documents, and the Maine Erosion and Sediment Control Field Guide for Contractors, March 2015 or its equivalent.

10. The proposed processing facility will not have an unreasonable adverse effect on surface water quality and will not unreasonably cause or increase flooding on the proposed facility site or on adjacent properties nor create an unreasonable flood hazard to any structure.

11. The proposed processing facility will not have an unreasonable adverse effect on existing uses or scenic character and will not result in increased noise.

12. The MRC and Fiberight have provided for adequate utilities and will have no unreasonable adverse effect on existing or proposed utilities in the municipality or area served by utilities; provided that: (1) the MRC and Fiberight submit copies of the Bangor WWTP Industrial User Permit and letter approving the operation of a wastewater pre-treatment system, if necessary, to the Department within 30 days of receipt and (2) the MRC and Fiberight submit, for review and approval, the final design for the on-site wastewater storage tanks at least 60 days prior to construction of the proposed processing facility.

13. The proposed processing facility will not pose an unreasonable threat to the quality of a significant sand and gravel aquifer and will not result in unreasonable adverse effects on groundwater.

14. The MRC and Fiberight have submitted adequate information regarding the proposed processing facility and process design; provided that, confirmation of natural gas pipe upgrades and testing and the finalized agreement with Bangor Natural Gas is provided to the Department at least 30 days prior to conveying bio-methane into the pipe.

15. The MRC and Fiberight have submitted an operations manual that addresses the operating requirements of 06-096 C.M.R. ch. 409, § 4; provided that, an updated operations manual is prepared and submitted at least 60 days prior to full-scale operations to incorporate Department comments from an April 28, 2016 memorandum and process or equipment changes resulting from pre-commissioning, commissioning, start-up and ramp-up activities.

16. The MRC and Fiberight have adequately addressed the waste characterization requirements of 06-096 C.M.R. ch. 405, § 6(C) in their operations manual.

17. The MRC and Fiberight have adequately addressed solid waste management consistent with the State's Solid Waste Management Hierarchy pursuant to 38 M.R.S. § 2101; provided that, the MRC and Fiberight: (1) annually report any requests from joining member communities to initiate new, or significantly and materially expand existing, organic diversion programs and the disposition of such requests, inclusive of the reasons for each determination; (2) do not unreasonably withhold approval to initiate new, or significantly and materially expand existing, organic diversion programs and make reasonable efforts to replace, if needed, the quantity of removed organics with other acceptable waste; and (3) submit monthly reports to the Department listing the tonnage of MSW Bridge Capacity utilized, if any is needed, and an updated schedule outlining the measures needed to reach Commercial Operation until such time as Commercial Operation is achieved.

THEREFORE, the Department APPROVES the noted application of the Municipal Review Committee and Fiberight, LLC SUBJECT TO THE FOLLOWING CONDITIONS and all applicable standards and regulations:

1. The applicable Standard Conditions of Approval, a copy attached as Appendix A.

2. The invalidity or unenforceability of any provision, or part thereof, of this license shall not affect the remainder of the provision or any other provisions. This license shall be construed and enforced in all respects as if such invalid or unenforceable provision or part thereof had been omitted.

3. At least 30 days prior to commencing construction of the access road and associated utility corridor and at least 60 days prior to commencing construction of the proposed processing facility, the MRC and Fiberight shall submit a complete set of construction-ready plans and documents for each component of the proposed project to the Department for review and approval.

4. Within 30 days after the closure of sale and/or the execution of the long-term lease agreement(s) has occurred, the MRC and Fiberight shall submit a copy of the deed(s) or executed long-term lease agreement(s) for the properties purchased and/or leased for the development of the proposed project.

5. Within 30 days of receipt and prior to beginning construction of the proposed processing facility, the MRC and Fiberight shall submit to the Department for review and approval the finalized financial documents to fund design, construction, operation, maintenance and closure of the proposed processing facility.

6. At least 30 days prior to commencing pre-commissioning operations of the proposed processing facility, the MRC and Fiberight shall submit to the Department for review and approval adequate evidence of the technical abilities for personnel who will be responsible for operations of the proposed processing facility.

7. At least 30 days prior to conveying bio-methane into the natural gas pipe, the MRC and Fiberight shall submit to the Department confirmation of pipe upgrades and testing and the finalized agreement with Bangor Natural Gas.

8. At least 14 days prior to commencing construction of the proposed processing facility, the MRC and Fiberight shall submit the acoustical bat survey of the utility corridor and a timber management plan to maintain deer winter shelter areas.

9. Within 30 days of receipt, the MRC and Fiberight shall submit the Bangor WWTP Industrial User Permit and letter approving the operation of a wastewater pre-treatment system, if necessary, and within 60 days prior to construction of the proposed processing facility, the MRC and Fiberight shall submit, for Department review and approval, the final design for the on-site wastewater storage tanks.

10. At least 60 days prior to commencing full-scale operations, an updated operations manual which incorporates Department comments from an April 28, 2016 memorandum and process or equipment changes resulting from pre-commissioning, commissioning, start-up and ramp-up activities shall be submitted to the Department for review and approval.

11. As part of the Annual Report, the MRC and Fiberight shall report any requests from joining member communities to initiate new, or significantly and materially expand existing, organic diversion programs and the disposition of such requests, inclusive of the reasons for each determination. The MRC and Fiberight shall not unreasonably withhold approval to initiate new, or significantly and materially expand existing, organic diversion programs and make reasonable efforts to replace, if needed, the quantity of removed organics with other acceptable waste.

12. The MRC and Fiberight shall submit monthly reports to the Department listing the tonnage of MSW Bridge Capacity utilized, if any is needed, and an updated schedule outlining the measures needed to reach Commercial Operation until such time as Commercial Operation is achieved.

MUNICIPAL REVIEW COMMITTEE, INC. AND	34	SOLID WASTE
FIBERIGHT, LLC	)	LICENSE
HAMPDEN, PENOBSCOT COUNTY, MAINE	)	
SOLID WASTE PROCESSING FACILITY	)	
#S-022458-WK-A-N	)	
(APPROVAL WITH CONDITIONS)	)	NEW LICENSE

DONE AND DATED AT AUGUSTA, MAINE, THIS 14th DAY OF July, 2016.

DEPARTMENT OF ENVIRONMENTAL PROTECTION

BY: Lesl Affr for
PAUL MERCER, COMMISSIONER

PLEASE NOTE ATTACHED SHEET FOR GUIDANCE ON APPEAL PROCEDURES.

Date of initial receipt of application: June 24, 2015
Date of application acceptance: July 15, 2015

Date filed with Board of Environmental Protection:

Filed
JUL 14 2016
State of Maine
Board of Environmental Protection

XLP79433/

Appendix A

STANDARD CONDITIONS
TO ALL SOLID WASTE FACILITY LICENSES

STRICT CONFORMANCE WITH THE STANDARD AND SPECIAL CONDITIONS OF THIS APPROVAL IS NECESSARY FOR THE PROJECT TO MEET THE STATUTORY CRITERIA FOR APPROVAL. VIOLATIONS OF THE CONDITIONS UNDER WHICH A LICENSE IS ISSUED SHALL CONSTITUTE A VIOLATION OF THAT LICENSE AGAINST WHICH ENFORCEMENT ACTION MAY BE TAKEN, INCLUDING REVOCATION.

1. **Approval of Variations from Plans.** The granting of this approval is dependent upon and limited to the proposals and plans contained in the application and supporting documents submitted and affirmed by the license. Any consequential variation from these plans, proposals, and supporting documents is subject to review and approval prior to implementation.

2. **Compliance with All Applicable Laws.** The licensee shall secure and comply with all applicable federal, state, and local licenses, permits, authorizations, conditions, agreements, and orders prior to or during construction and operation, as appropriate.

3. **Compliance with All Terms and Conditions of Approval.** The licensee shall submit all reports and information requested by the Department demonstrating that the licensee has complied or will comply with all terms and conditions of this approval. All preconstruction terms and conditions must be met before construction begins.

4. **Transfer of License.** The licensee may not transfer the solid waste facility license or any portion thereof without approval of the Department.

5. **Initiation of Construction or Development Within Two Years.** If the construction or operation of the solid waste facility is not begun within two years of issuance of within 2 years after any administrative and judicial appeals have been resolved, the license lapses and the licensee must reapply to the Department for a new license unless otherwise approved by the Department.

6. **Approval Included in Contract Bids.** A copy of the approval must be included in or attached to all contract bid specifications for the solid waste facility.

7. **Approval Shown to Contractors.** Contractors must be shown the license by the licensee before commencing work on the solid waste facility.

8. **Background of key individuals.** A licensee may not knowingly hire as an officer, director or key solid waste facility employee, or knowingly acquire an equity interest or

debt interest in, any person convicted of a felony or found to have violated a State or federal environmental law or rule without first obtaining the approval of the Department.

9. **Fees.** The licensee must comply with annual license and annual reporting fee requirements of the Department's rules.

10. **Recycling and Source Reduction Determination for Solid Waste Disposal Facilities.** This condition does not apply to the expansion of a commercial solid waste disposal facility that accepts only special waste for landfilling.

    The solid waste disposal facility shall only accept solid waste that is subject to recycling and source reduction programs, voluntary or otherwise, at least as effective as those imposed by 38 M.R.S. ch. 13.

11. **Deed Requirements for Solid Waste Disposal Facilities.** Whenever any lot of land on which an active, inactive, or closed solid waste disposal facility is located is being transferred by deed, the following must be expressly stated in the deed:

    A. The type of facility located on the lot and the dates of its establishment and closure.

    B. A description of the location and the composition, extent, and depth of the waste deposited.

    C. The disposal location coordinates of asbestos wastes must be identified.

DEP INFORMATION SHEET

Appealing a Department Licensing Decision

Dated: March 2012 **Contact: (207) 287-2811**

SUMMARY

There are two methods available to an aggrieved person seeking to appeal a licensing decision made by the Department of Environmental Protection's ("DEP") Commissioner: (1) in an administrative process before the Board of Environmental Protection ("Board"); or (2) in a judicial process before Maine's Superior Court. An aggrieved person seeking review of a licensing decision over which the Board had original jurisdiction may seek judicial review in Maine's Superior Court.

A judicial appeal of final action by the Commissioner or the Board regarding an application for an expedited wind energy development (35-A M.R.S.A. § 3451(4)) or a general permit for an offshore wind energy demonstration project (38 M.R.S.A. § 480-HH(1)) or a general permit for a tidal energy demonstration project (38 M.R.S.A. § 636-A) must be taken to the Supreme Judicial Court sitting as the Law Court.

This INFORMATION SHEET, in conjunction with a review of the statutory and regulatory provisions referred to herein, can help a person to understand his or her rights and obligations in filing an administrative or judicial appeal.

I. ADMINISTRATIVE APPEALS TO THE BOARD

LEGAL REFERENCES

The laws concerning the DEP's *Organization and Powers*, 38 M.R.S.A. §§ 341-D(4) & 346, the *Maine Administrative Procedure Act*, 5 M.R.S.A. § 11001, and the DEP's *Rules Concerning the Processing of Applications and Other Administrative Matters* ("Chapter 2"), 06-096 CMR 2 (April 1, 2003).

HOW LONG YOU HAVE TO SUBMIT AN APPEAL TO THE BOARD

The Board must receive a written appeal within 30 days of the date on which the Commissioner's decision was filed with the Board. Appeals filed after 30 calendar days of the date on which the Commissioner's decision was filed with the Board will be rejected.

HOW TO SUBMIT AN APPEAL TO THE BOARD

Signed original appeal documents must be sent to: Chair, Board of Environmental Protection, c/o Department of Environmental Protection, 17 State House Station, Augusta, ME 04333-0017; faxes are acceptable for purposes of meeting the deadline when followed by the Board's receipt of mailed original documents within five (5) working days. Receipt on a particular day must be by 5:00 PM at DEP's offices in Augusta; materials received after 5:00 PM are not considered received until the following day. The person appealing a licensing decision must also send the DEP's Commissioner a copy of the appeal documents and if the person appealing is not the applicant in the license proceeding at issue the applicant must also be sent a copy of the appeal documents. All of the information listed in the next section must be submitted at the time the appeal is filed. Only the extraordinary circumstances described at the end of that section will justify evidence not in the DEP's record at the time of decision being added to the record for consideration by the Board as part of an appeal.

WHAT YOUR APPEAL PAPERWORK MUST CONTAIN

Appeal materials must contain the following information at the time submitted:

1. *Aggrieved Status*. The appeal must explain how the person filing the appeal has standing to maintain an appeal. This requires an explanation of how the person filing the appeal may suffer a particularized injury as a result of the Commissioner's decision.
2. *The findings, conclusions or conditions objected to or believed to be in error.* Specific references and facts regarding the appellant's issues with the decision must be provided in the notice of appeal.
3. *The basis of the objections or challenge.* If possible, specific regulations, statutes or other facts should be referenced. This may include citing omissions of relevant requirements, and errors believed to have been made in interpretations, conclusions, and relevant requirements.
4. *The remedy sought.* This can range from reversal of the Commissioner's decision on the license or permit to changes in specific permit conditions.
5. *All the matters to be contested.* The Board will limit its consideration to those arguments specifically raised in the written notice of appeal.
6. *Request for hearing.* The Board will hear presentations on appeals at its regularly scheduled meetings, unless a public hearing on the appeal is requested and granted. A request for public hearing on an appeal must be filed as part of the notice of appeal.
7. *New or additional evidence to be offered.* The Board may allow new or additional evidence, referred to as supplemental evidence, to be considered by the Board in an appeal only when the evidence is relevant and material and that the person seeking to add information to the record can show due diligence in bringing the evidence to the DEP's attention at the earliest possible time in the licensing process <u>or</u> that the evidence itself is newly discovered and could not have been presented earlier in the process. Specific requirements for additional evidence are found in Chapter 2.

OTHER CONSIDERATIONS IN APPEALING A DECISION TO THE BOARD

1. *Be familiar with all relevant material in the DEP record.* A license application file is public information, subject to any applicable statutory exceptions, made easily accessible by DEP. Upon request, the DEP will make the material available during normal working hours, provide space to review the file, and provide opportunity for photocopying materials. There is a charge for copies or copying services.
2. *Be familiar with the regulations and laws under which the application was processed, and the procedural rules governing your appeal.* DEP staff will provide this information on request and answer questions regarding applicable requirements.
3. *The filing of an appeal does not operate as a stay to any decision.* If a license has been granted and it has been appealed the license normally remains in effect pending the processing of the appeal. A license holder may proceed with a project pending the outcome of an appeal but the license holder runs the risk of the decision being reversed or modified as a result of the appeal.

WHAT TO EXPECT ONCE YOU FILE A TIMELY APPEAL WITH THE BOARD

The Board will formally acknowledge receipt of an appeal, including the name of the DEP project manager assigned to the specific appeal. The notice of appeal, any materials accepted by the Board Chair as supplementary evidence, and any materials submitted in response to the appeal will be sent to Board members with a recommendation from DEP staff. Persons filing appeals and interested persons are notified in advance of the date set for Board consideration of an appeal or request for public hearing. With or without holding a public hearing, the Board may affirm, amend, or reverse a Commissioner decision or remand the matter to the Commissioner for further proceedings. The Board will notify the appellant, a license holder, and interested persons of its decision.

II. JUDICIAL APPEALS

Maine law generally allows aggrieved persons to appeal final Commissioner or Board licensing decisions to Maine's Superior Court, see 38 M.R.S.A. § 346(1); 06-096 CMR 2; 5 M.R.S.A. § 11001; & M.R. Civ. P 80C. A party's appeal must be filed with the Superior Court within 30 days of receipt of notice of the Board's or the Commissioner's decision. For any other person, an appeal must be filed within 40 days of the date the decision was rendered. Failure to file a timely appeal will result in the Board's or the Commissioner's decision becoming final.

An appeal to court of a license decision regarding an expedited wind energy development, a general permit for an offshore wind energy demonstration project, or a general permit for a tidal energy demonstration project may only be taken directly to the Maine Supreme Judicial Court. See 38 M.R.S.A. § 346(4).

Maine's Administrative Procedure Act, DEP statutes governing a particular matter, and the Maine Rules of Civil Procedure must be consulted for the substantive and procedural details applicable to judicial appeals.

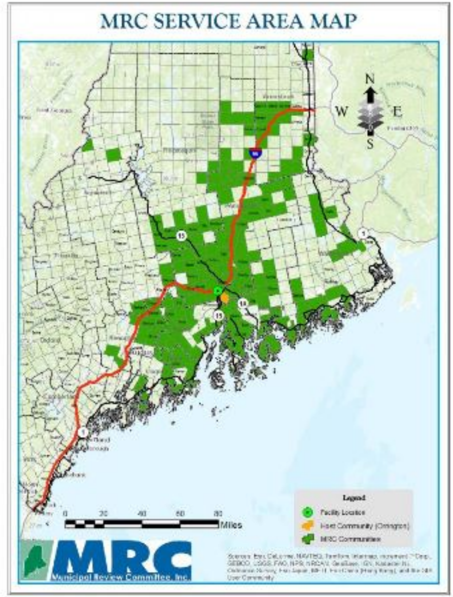
ADDITIONAL INFORMATION

If you have questions or need additional information on the appeal process, for administrative appeals contact the Board's Executive Analyst at (207) 287-2452 or for judicial appeals contact the court clerk's office in which your appeal will be filed.

Note: The DEP provides this INFORMATION SHEET for general guidance only; it is not intended for use as a legal reference. Maine law governs an appellant's rights.

Acceptable Waste

The PERC facility will accept solid waste that meets the following definition found in its waste disposal agreements:



“Acceptable Waste” means Solid Waste, including all ordinary household, municipal, institutional, commercial and industrial wastes which consist primarily of combustible materials, except for the following:

1. Demolition or construction debris from building and roadway projects or locations
2. Liquid wastes or sludges
3. Abandoned or junk vehicles
4. Hazardous Waste
5. Dead animals or portions thereof or other pathological wastes;
6. Water treatment facility residues
7. Tree stumps
8. Tannery sludge
9. Waste oil
10. Discarded “white goods” such as freezers, refrigerators, washing machines, etc.
11. Waste which in the reasonable judgment of COMPANY'S weigh station operator based solely upon a visual inspection has a BTU content of less than 4000 BTUs per pound unless the waste fails to meet the aforementioned BTU minimum requirement solely because of the moisture content of such waste and such moisture content is due to abnormally wet weather conditions; and
12. Waste which, in the reasonable judgment of COMPANY based on a visual inspection at the time of delivery could, if processed, result in damage to the Facility, interruption of normal Facility operations or extraordinary processing or maintenance costs, solely by virtue of the physical or chemical properties of such waste.

STATE OF MAINE
DEPARTMENT OF ENVIRONMENTAL PROTECTION
17 STATE HOUSE STATION AUGUSTA, MAINE 04333-0017

BOARD ORDER

IN THE MATTER OF

STATE OF MAINE, ACTING THROUGH	)	SOLID WASTE LICENSE,
THE BUREAU OF GENERAL SERVICES	)	NATURAL RESOURCES
OLD TOWN, PENOBSCOT COUNTY, ME	)	PROTECTION ACT, AND
JUNIPER RIDGE LANDFILL EXPANSION	)	WATER QUALITY CERTIFICATION
#S-020700-WD-BI-N and #L-19015-TG-D-N	)	
(APPROVAL WITH CONDITIONS)	)	NEW LICENSE

TABLE OF CONTENTS

Reference to “Finding [#]” refers to the specified section in the Findings of Fact narrative portion of the license. Conclusions and Conditions are listed separately at the end of the license.

Pursuant to the provisions of the *Maine Hazardous Waste, Septage and Solid Waste Management Act*, 38 Maine Revised Statutes (M.R.S.) §§ 1301 to 1319-Y; *Solid Waste Management Hierarchy*, 38 M.R.S. §2101; the *Rule Concerning the Processing of Applications and Other Administrative Matters*, 06-096 Code of Maine Rules (C.M.R.) ch. 2 (last amended October 19, 2015); the *Solid Waste Management Rules: General Provisions*, 06-096 C.M.R. ch. 400 (last amended April 6, 2015), *Landfill Siting, Design and Operation*, 06-096 C.M.R. ch. 401 (last amended April 12, 2015), and *Water Quality Monitoring, Leachate Monitoring, and Waste Characterization*, 06-096 C.M.R. ch. 405 (last amended April 12, 2015) (collectively, the Rules); the *Natural Resources Protection Act* (NRPA), 38 M.R.S. §§ 480-A to 480-JJ; Section 401 of the *Federal Water Pollution Control Act*, 33 U.S.C. § 1341; *Wetlands and Waterbodies Protection*, 06-096 C.M.R. ch. 310 (last amended January 26, 2009); and *Assessing and Mitigating Impacts to Existing Scenic and Aesthetic Uses*, 06-096 C.M.R. ch. 315 (effective June 29, 2003), the Board of Environmental Protection (Board) has considered the application of the State of Maine acting through the Bureau of General Services, with all supportive data, agency review comments, and other related materials on file, and FINDS THE FOLLOWING FACTS:

APPLICATION OVERVIEW AND PROCEDURAL HISTORY

1. APPLICATION SUMMARY

A. Application

The State of Maine, acting through the Bureau of General Services (BGS), has applied for Maine Hazardous Waste, Septage and Solid Waste Management Act, Natural Resources Protection Act, and Water Quality Certification approval to construct a 9.35 million cubic yard expansion of the existing Juniper Ridge Landfill (JRL), located in Old Town, Maine. The northern edge of the property parcel borders, and a portion of the access road is located in, Alton, Maine. The solid waste application under the Maine Hazardous Waste, Septage, and Solid Waste Management Act and the land application under NRPA were processed as a consolidated licensing proceeding and are both addressed in this license.

BGS, as the owner of JRL, and NEWSME Landfill Operations, LLC (NEWSME), as the operator of JRL, prepared the application for the proposed expansion.

The NRPA application was originally identified as license #L-24251-TG-C-N, which was incorrect. It is now correctly identified as license #L-19015-TG-D-N.

B. History

The following history is a summary and does not include all licensing actions:

(1) On July 28, 1993, James River Paper Company, Inc. was issued a license to construct and operate a 68-acre secure landfill, known as the West Old Town Landfill, to dispose of the James River Paper Company's pulp and papermaking residuals (license #S-020700-7A-A-N). The project impacted 1.31 acres of freshwater wetland. The compensation package included preservation of 27.92 acres of land adjacent to the facility and the restoration and enhancement of 1.76 acres of wetland within the preserved parcel.

(2) On August 24, 1995, the Department approved, with conditions, a modification to the compensation package (licenses #L-19015-31-A-M and #S-20700-DW-B-M).

(3) On October 21, 2003, the Department issued conditional approval for the transfer of licenses for the West Old Town Landfill, from the Fort James Operating Company, to the State of Maine, State Planning Office (SPO) (licenses #S-020700-WR-M-T and #L-019015-TH-C-T); the transfer became effective when the sale of the landfill to the State of Maine, acting by and through SPO, occurred on February 5, 2004.

(4) On February 5, 2004, the State of Maine, acting by and through the SPO, and Casella Waste Systems, Inc. (Casella) entered into an Operating Services Agreement (OSA) for the operation of the West Old Town Landfill.

(5) On April 9, 2004, the Department approved an amendment application (license #S-020700-WD-N-A) for a vertical increase in the final elevation of the landfill and the disposal of additional waste streams.

(6) In 2006, the West Old Town Landfill became known as the Juniper Ridge Landfill.

(7) On January 31, 2012, the Department issued to the State of Maine, acting through the SPO, a Public Benefit Determination (license #S-020700-W5-AU-N) partial approval, with conditions, for additional landfill capacity of 9.35 million cubic yards, decreased from the original 21.9 million cubic yard capacity proposed.

(8) Pursuant to PL 2011, ch. 655, § GG-69, on July 1, 2012, the BGS, within the Department of Administrative and Financial Services (DAFS), became the state agency acting as the owner and licensee of JRL. The Department

of Economic and Community Development is the manager of JRL. NEWSME, a wholly-owned indirect subsidiary of Casella, operates the landfill for the State of Maine, acting through the Bureau of General Services.

(9) To date, approximately 62.6 acres of the facility's 68-acre existing licensed footprint have been developed, including Cells 1, 2, 3A, 3B, 4, 5, 6, 7, 8, and 9 (current active cell).

C. Terms and Acronyms

The following terms and acronyms can be found in this license and are listed in Table 1 for ease of reference:

Table 1: License Terms and Acronyms

applicant	Refers to both BGS and NEWSME (or a successor operator)
Board	Maine Board of Environmental Protection
BGS	Bureau of General Services
BMP	Best Management Practices
Casella	Casella Waste Systems, Inc.
CDD	Construction and Demolition Debris
C.M.R.	Code of Maine Rules
dBA	Decibels adjusted for frequency extremes
Department	Maine Department of Environmental Protection
EMP	Environmental Monitoring Plan
FEMA	Federal Emergency Management Agency
FEPR	Front End Process Residue
GCL	Geosynthetic Clay Liner
H_2S	Hydrogen Sulfide
HDPE	High-Density Polyethylene
JRL	The Juniper Ridge Landfill
LFG	Landfill Gas
MDOT	Maine Department of Transportation
M.R.S.	Maine Revised Statutes
MSW	Municipal Solid Waste
MSW Bypass	Any MSW that is destined for disposal or processing at a solid waste incinerator, but that cannot be disposed of or processed at that incinerator because of the incinerator's malfunction, insufficient capacity, inability to process or burn, down-time, or any other comparable reason as approved by the Department
NEWSME	NEWSME Landfill Operations, LLC
NRPA	Natural Resource Protection Act

OBW	Oversized Bulky Waste
OSA	Operating Service Agreement
ppb	Parts per Billion
PBD	Public Benefit Determination License
PIR	Preliminary Information Report
Rules	The Department's Solid Waste Management Rules, including 06-096 C.M.R. chs. 400, 401, and 405
SME	Sevee & Maher Engineers, Inc.
Soft Layer	A protective layer of waste above the liner and leachate collection systems
State Plan	Maine Materials Management Plan: 2014 State Waste Management and Recycling Plan Update & 2012 Waste Generation and Disposal Capacity Report, January 2014, prepared by the Maine Department of Environmental Protection
SVP	Significant Vernal Pool

D. Summary of Proposal

The application is for the construction and operation of a 9.35 million cubic yard expansion at JRL. The existing solid waste footprint is proposed to be expanded by 54 acres, to be developed in phases. An additional 20 acres is planned for ancillary infrastructure including roads, piping, sedimentation ponds, scales, and buildings. The proposed expansion would extend the life of the landfill by approximately 10 to 12 years.

The proposed expansion design consists of various engineered systems for the construction and operation of the landfill. Landfill gas generated on-site will be combusted in the facility's flare. The leachate from the expansion will be treated off-site, as is the current practice.

The requested wastes to be placed in the proposed expansion are similar to the accepted wastes currently allowed in the existing landfill. The accepted wastes will include only non-hazardous waste generated within the State and will not include MSW, except for MSW bypass as described in Finding 37 of this license.

The application for the proposed expansion includes the direct alteration of 2.04 acres of freshwater wetlands. A compensation plan was proposed for wetland impacts. Additionally, a Permit-by-Rule Notification Form (PBR#60159) was submitted for clearance for an electrical line and perimeter fence through the critical terrestrial habitat of a significant vernal pool (SVP) pursuant to *Permit By Rule Standards*, 06-096 C.M.R. ch. 305, § 19 (last amended June 8, 2012). The Department accepted the PBR on July 29, 2015.

The solid waste and NRPA applications were accepted as complete for processing on August 7, 2015 and July 31, 2015, respectively. The Department commented on various aspects of the application and received responses. These include the following: November 12, 2015 Department review letter on select portions of the application; January 22, 2016 Department review transmittal letter with two technical memoranda; March 4, 2016 BGS and NEWSME response to comments; April 4, 2016 Department follow-up comment transmittal letter with two technical memoranda; May 13, 2016 BGS and NEWSME follow-up responses; and July 1, 2016 Department letter with two memoranda.

E. Ownership and Operation of the Juniper Ridge Landfill

The State of Maine, acting through BGS, owns JRL. Casella is the operator of the landfill through NEWSME, a Casella subsidiary. The terms and conditions of NEWSME's operation of the landfill are established by the OSA between the State of Maine and Casella dated February 5, 2004, and amended on July 24, 2006 and November 2, 2006.

In accordance with the OSA, Casella is required to pay all costs associated with the development, operation, closure and post-closure care of the landfill and the proposed expansion. In addition, Casella is required by the OSA to establish and maintain financial assurances for the landfill and the expansion sufficient to meet the closure and post-closure care provisions of the applicable Rules, assume liability for the landfill and the proposed expansion under both the current and future conditions, and assure that adequate disposal capacity is provided for the wastes currently disposed in the landfill for at least a 20-year period. Resolve 2003, Chapter 93 requires contract terms and conditions to be "revenue-neutral to the State and as the office [former Executive Department, State Planning Office] determines are advisable and in the public interest."

NEWSME has prepared an application to expand JRL in accordance with the terms of the OSA. The OSA is a contract between the State of Maine, acting through BGS, and Casella. The Board and Department are not parties to the OSA. Section 4.1 of the OSA includes language that specifies that the State shall work with Casella in maintaining in the State's name the existing permit, amendments, and all permits, licenses, statutory amendments and legislation, approvals and authorizations reasonably requested by Casella and agreed to by the State for the operation of the landfill in accordance with the terms of the OSA, including without limitation the expansion permit.

Reference to the "applicant" in this license determination refers to both BGS, as the owner of JRL, and NEWSME, as the current operator, acting as an agent on behalf of BGS in accordance with the terms in the OSA.

2. PUBLIC PARTICIPATION

A. Pre-Application Requirements

(1) Preliminary Information Report

A Preliminary Information Report (PIR) is required by 06-096 C.M.R. ch. 401, § 1(E). The PIR, prepared by SME, was submitted to the Department on November 22, 2006 for a larger 106-acre expansion with 22 million cubic yards of capacity. The proposed 54-acre expansion is to be located within the boundary of the area described in the original submittal. A follow-up meeting was held on February 21, 2007 among representatives of the SPO (since abolished), the Department, NEWSME, SME, and Pierce Atwood, LLP to discuss the PIR.

(2) Determination of Environmental Feasibility

The Department issued a letter addressing the PIR on April 13, 2007 stating that the proposed expansion appeared to be environmentally feasible and that the siting criteria of 06-096 C.M.R. ch. 401, § 1(C)(2) did not prohibit the proposed expansion.

(3) Pre-Application Meetings

The Department's rule at 06-096 C.M.R. ch. 2, § 10 includes requirements for pre-application and pre-submission meetings. The applicant held four pre-application meetings in 2014 with the Department and interested persons, including the City of Old Town, the Landfill Advisory Committee, the Penobscot Nation, and the general public. The Town of Alton did not attend the pre-application meetings. The meetings took place September 9, October 16, November 20, and December 18. Additional meetings also occurred among the applicant, the Department, and the U.S. Army Corps of Engineers on October 29, 2014 and April 27, 2015. A representative of the U.S. Fish and Wildlife Service attended the October 29, 2014 meeting.

B. Public Informational Meeting

A public informational meeting was held on June 3, 2015 in the City of Old Town as required by 06-096 C.M.R. ch. 2, § 13. The applicant mailed notice of the public informational meeting to the abutters, the Old Town and Alton municipal offices, the Landfill Advisory Committee and the Penobscot Nation. The notice was published in the Bangor Daily News on May 22, 2015.

C. Notice of Intent to File

A Notice of Intent to File an application was published in the Bangor Daily News and Penobscot Times on July 9, 2015, in addition to being mailed to the abutters, the Old Town and Alton municipal offices, the Landfill Advisory Committee and the Penobscot Nation. The notice and mailing of the notice to the Landfill Advisory Committee fulfilled the public and local participation requirement of 38 M.R.S. § 1310-S(1), the citizen's advisory committee notification requirement of 38 M.R.S. § 1310-N(12), and the public notice requirements of 06-096 C.M.R. ch. 2, § 14.

D. Public Hearing Requests and Board Jurisdiction

The Department received 27 timely requests in August 2015 for a public hearing. On September 17, 2015 the Board, on the recommendation from the Department, voted to assume licensing jurisdiction over the application and convene a public hearing.

E. Public Hearing Process

(1) Intervenors

a. Petitions to Intervene

Intervenor status was requested by several entities. State law at 38 M.R.S. § 1310-S(3) provides municipal intervenor status, if requested, for the municipality in which the facility would be located. The City of Old Town requested intervenor status on June 4, 2015. The Town of Alton notified the Department on July 30, 2015 that it would not be requesting intervenor status. The Board received intervenor status requests from two abutting property owners, Jesse Pekkala and SSR, LLC, who have intervenor status under 38 M.R.S. § 1310-S(3-A). Petitions for intervenor status were received from three interested persons: Edward Spencer, Dana Snowman, and Antonio Blasi.

b. Board Action on Petitions to Intervene by Interested Persons

The Board's First Procedural Order, issued on January 21, 2016, granted intervenor status to Mr. Spencer and Mr. Snowman. Mr. Blasi was denied intervenor status due to the finding that his petition did not demonstrate that he may be substantially and directly affected by the proceeding.

c. Withdrawal from Participation

On May 10, 2016, Mr. Pekkala withdrew as an intervenor.

d. Intervenor Designations

The following entities participated as intervenors in the licensing process:

i. City of Old Town, as a municipal intervenor;

ii. Edward Spencer, as an interested person petitioner;

iii. Dana Snowman, as an interested person petitioner; and

iv. SSR, LLC, as an abutter.

(2) Procedural Orders

Prior to the public hearing, the Board issued six Procedural Orders:

a. The First Procedural Order, issued on January 21, 2016, addressed the designation of intervenors as described in Finding 2(E)(1) of this license.

b. The Second Procedural Order, issued February 25, 2016, documented the pre-hearing conference held on February 10, 2016. The pre-hearing conference included a review of the procedural rules in preparation for, and during, the hearing; the roles and responsibilities of the applicant, intervenors, and Department staff; and the relevant licensing criteria. The Second Procedural Order established the deadline for the intervenors to submit a list of issues they expected to address at the hearing through testimony, along with a list of expert witnesses.

c. The Third Procedural Order, issued May 27, 2016, documented the pre-hearing conference held on May 18, 2016. The pre-hearing conference included a review of the list of issues submitted by the intervenors, agreement on issues not contested by the intervenors, and discussion of the Board's site visit and schedule of pre-hearing testimony submissions. The Third Procedural Order established submission deadlines for the applicant's and intervenors' lists of witnesses, pre-filed direct testimony and exhibits, and pre-filed rebuttal testimony, as well as setting the dates for the public hearing.

d. The Fourth Procedural Order, issued July 7, 2016, addressed the requirements for submission of pre-filed testimony and scheduling decisions made in consultation with the parties following the June 23, 2016 Board meeting.

e. The Fifth Procedural Order, issued August 25, 2016, addressed the rulings of the Presiding Officer on the motions to strike pre-filed direct testimony.

f. The Sixth Procedural Order, issued September 28, 2016, documented the pre-hearing conference held on September 14, 2016. The pre-hearing conference included a review of procedures and a draft schedule for the public hearing.

(3) Site Visit

A site visit to JRL occurred on June 23, 2016 for the purpose of allowing Board members to view the physical features of the site and the nature of the surrounding areas. The applicant and intervenors were also present during the tour. Department staff conducted the tour and responded to Board members' questions.

(4) Public Hearing

The Board held a public hearing on the proposed expansion application on October 18 and 19, 2016 in Bangor, Maine pursuant to the Maine Administrative Procedure Act, 5, §§ 9051-9064; 38 M.R.S. §§ 341-D(2) and 1310-S(2); and the *Rules Governing the Conduct of Licensing Hearings*, 06-096 C.M.R. ch. 3 (last amended February 16, 2015). At the hearing, the witnesses for the parties summarized their pre-filed direct and rebuttal testimony, and were subject to cross-examination by the other parties and questioning by Board members and staff.

The Board held an evening session on October 18 to receive testimony from members of the general public, and 33 persons testified at that session. Prior to the close of the evidentiary record, the Board received 31 written comments from the general public. The testimony and written comments by the general public included opposition to, and support for, the proposed expansion.

Following the filing of post-hearing briefs by the parties on November 23, 2016, the Board held a deliberative session on December 15, 2016 to review the evidentiary record with Department staff.

Issues addressed in pre-filed testimony, hearing testimony, and post-hearing briefs included, but were not limited to: the solid waste management hierarchy regarding CDD and OBW, site geology, design and operation of the proposed expansion, the facility’s odor complaint procedure, stormwater management and extreme weather events, ground and surface water monitoring, leachate treatment and disposal, NRPA alternative analysis, impacts to Atlantic salmon, fees and payments to the City of Old Town for the use of CDD fines and soft layer waste, traffic on Bennoch Road, third party administration of the Declaration of Covenants and Restrictions, and hydrogen sulfide action levels and notification procedures.

Issues raised in testimony by the general public in opposition to the project included: impacts on the Penobscot River and natural resources, impacts on public health, leachate treatment, prohibiting additional waste disposal at the site, out-of-state waste coming into the State for disposal at a State landfill, and the solid waste hierarchy.

Issues raised in testimony by the general public in support of the project included: the facility as a well-designed, operated, and maintained landfill; the importance of the landfill to businesses and the community; and the need for a landfill option for material that cannot be reduced, reused, or recycled utilizing current technology and practices.

The hearing transcript and hearing documents are included in the record on file. Additional discussion of testimony and comments are addressed in the findings of fact of this license, as appropriate.

F. Draft License Comment Period

A draft license was made available for comment on April 14, 2017 through notification to the applicant, intervenors, and interested persons. The draft license was posted on the Department's website and the 15 working day comment period closed on May 8, 2017. A total of 48 commenters submitted written comments on the draft license. All of the comments were reviewed and given consideration in relation to the relevant review criteria of State laws and rules.

Comments were received from the applicant, intervenor Edward Spencer, intervenor Dana Snowman, intervenor City of Old Town, and the public (including three industry entities) and included, but were not limited to, the following:

(1) Applicant

Comments on the draft Board Order included:

a. Insertion of NEWSME in the header as an additional licensee;

b. Removal of sand dune references;

c. Changes to the test pad requirements; and

d. Comment to allow MSW if needed for the soft layer.

(2) Intervenor Edward Spencer

Comments on the draft Board Order included:

a. Hierarchy findings and the definition of waste generated within the state;

b. Usage of vague language;

c. Regulated and regulator control;

d. Non action on the PBD recommendation to review CDD imported and processing residue disposed;

e. OBW information;

f. A need for a more thorough evaluation of other viable site locations;

g. Impact on the Penobscot Nation;

h. Technical issues (underdrains and pumping with possible effect on wetlands, site selection process with respect to wetlands and surface water used, odor);

i. Leachate disposal;

j. Financial ability and criminal or civil record;

k. The endangered species evaluation; and

l. MSW bypass issues.

(3) Intervenor Dana Snowman

Comments on the draft Board Order included opposition to the acceptance of out-of-state waste.

(4) Intervenor City of Old Town

No additional comments on the Board Order were stated.

(5) Industry Entities

Comments on the draft Board Order included:

a. MSW bypass language;

b. Utilizing enforceable provisions to preclude MSW for disposal if it can be processed at another facility;

c. Removal of the clause allowing bypass of waste delivered under interruptible contracts with the PERC incinerator;

d. Additions of definitions and limits on the PERC incinerator's FEPR that may be disposed of at JRL;

e. Recalculation of the OBW limits to use an average tons/year over 5 years and to apply the Consumer Price Index (CPI) for 3 years; and

f. Clarification that if the required third party OBD audit is not completed in a timely manner through no fault of the processing facility, the OBW may be disposed of at the expansion.

(6) Public

Comments on the draft Board Order included:

a. Harm to the environment (air, land, and waters);

b. Environmental justice;

c. Meeting hierarchy requirements;

d. Not taking proactive action to meet the State's waste management goals, priorities, and policies; and

e. State designations of in-state waste and out-of-state waste.

Based on comments received, revisions were made to the draft license that address the relevant review criteria and issues raised within the purview of the Board's authority. The revisions include, but are not limited to, general clarification language, revisions to the liner system barrier soil test pad language, added information in Finding 38 on the association between wetlands and the proposed underdrains, additional clarification of the allowance of only MSW bypass in the proposed expansion, removal of the provision governing waste delivered under an interruptible contract, revisions to the bypass notification requirement, and the addition of a provision concerning the receipt if the third party OBW audit is not completed in a timely manner.

All comments received are part of the record and were made available to the Board and posted on the Department's website.

3. PROJECT DESCRIPTION AND SITE DESIGN

The 9.35 million cubic yard proposed expansion of the existing Juniper Ridge Landfill will be located within the 780-acre parcel in Old Town. The northern edge of the property parcel is on the Alton/Old Town border and a portion of the access road is located in Alton. Six cells, Cells 11 through 16, are proposed to be constructed in a phased manner. The construction is projected to begin in 2018 with Cell 11 and then is proposed to continue with a new cell constructed approximately every 2 years. In total, the proposed expansion footprint will be approximately 54 acres, plus an additional 20 acres of ancillary infrastructure, with the same peak elevation as the existing landfill, approximately 390 feet above mean sea level. The side slopes are designed at 3H:1V (horizontal to vertical), with the south side of the expansion to abut the northern side of the existing landfill.

The proposed expansion design includes an underdrain system and augmented secondary liner system over portions of the proposed expansion footprint, a secondary liner system, a leak detection system, a primary liner system, leachate collection and off-site treatment for liquid in contact with waste, landfill gas collection and control infrastructure, stormwater management, and a water quality monitoring network. Similar types of non-hazardous waste generated within the State, as currently placed in existing landfill cells, are proposed for the expansion, including CDD, FEPR, MSW incinerator ash, wood biomass ash, sludges, contaminated soil, OBW, MSW bypass, and other approved special wastes.

The proposed expansion will have direct impacts on 2.04 acres of freshwater wetlands. As stated in Finding 1(D) of this license, the applicant previously obtained a permit-by-rule for clearing of 0.1 acres of the critical terrestrial habitat associated with a significant vernal pool for construction of the fence and electrical line. The applicant also identified additional vernal pools subject to regulation by the U.S. Army Corps of Engineers. The applicant submitted a compensation plan consisting of a designated on-site preservation area of 266 total acres for impacts to both the wetlands regulated by the State and those regulated by the U.S. Army Corps of Engineers.

GENERAL SOLID WASTE PROVISIONS

4. HOST COMMUNITY AGREEMENTS AND MUNICIPAL INTERVENOR GRANTS

A. <u>Host Community Agreement</u>

State law at 38 M.R.S. § 2170-A requires that host community agreements be in place with all applicable communities prior to issuing a license to a solid waste disposal facility owned or operated by the State. Copies of the two host community agreements with the City of Old Town and the Town of Alton were submitted with the application. The Host Community Compensation and Facility Oversight Agreement, dated December 8, 2005, was signed by the State of Maine, the City of Old Town and Casella Waste Systems, Inc. The Community Benefits Agreement, dated October 6, 2005, was signed by the State of Maine, the Town of Alton, and NEWSME Landfill Operations, LLC.

B. Municipal Intervenor Grants

The Department's rule at 06-096 C.M.R. ch. 400, § 7(B) establishes procedures for the use of funds by a municipality that has requested intervenor status, pursuant to 38 M.R.S. § 1310-S(4), for an expanded solid waste disposal facility proposed to be located in that municipality. A municipal intervenor may request financial assistance to pay for direct expenses associated with its substantive participation in the application review process.

The City of Old Town requested, and was automatically granted, intervenor status on June 4, 2015. The City of Old Town meets the eligibility requirements to receive financial grants to support participation in the licensing process. The Town of Alton notified the Department on July 30, 2015 that it would not be requesting intervenor status.

5. TITLE, RIGHT OR INTEREST

The applicant must demonstrate sufficient title, right, or interest in all of the property which is proposed for development or use pursuant to 06-096 C.M.R. ch. 400, § 4(A). The applicant has provided evidence of the State's title to the property pursuant to the Rules by submitting a copy of its warranty deed to the 780-acre parcel of land on which the proposed expansion will be located. The deed for the parcel is recorded in Book 9188, page 152 at the Penobscot County Registry of Deeds. A deeded right-of-way to the parcel from Route 16 is also recorded in the Registry. The Board therefore finds that the applicant has demonstrated sufficient title, right, or interest in the property proposed for the expansion.

6. FINANCIAL ABILITY AND FINANCIAL ASSURANCE

State law at 38 M.R.S. § 1310-N(2-F)(A) (siting standards) requires that the applicant have the financial ability to develop the project in a manner consistent with state environmental standards and the provisions of the statute. State law at 38 M.R.S. § 1310-Y requires the applicant to provide assurance of its financial ability to satisfy the estimated costs for corrective action and assurance of financial capacity to satisfy the estimated costs of closure and post closure care; however, 38 M.R.S. § 1310-Y applies to privately owned solid waste facilities. The Department's rules at 06-096 C.M.R. ch. 400, § 4(B)(1) and § 11 require financial ability and financial assurance for the design, construction, operation, maintenance, closure and post-closure care of a proposed solid waste facility; however, as a State-owned facility the proposed expansion is not subject to the requirements of § 11 to provide financial assurance sufficient to ensure that funds are available to pay for the anticipated costs of compliance with all facility closure, post-closure maintenance, post-closure monitoring requirements, and corrective action.

Although not all of the financial requirements of the State laws and Rules apply to the State owned JRL, Casella maintains financial assurance as required by the OSA and as described below.

A. <u>Financial Ability: Design, Construct, Operate, Maintain, Close, and Post-Closure Care</u>

Permitting, design, construction, operation, and closure of JRL are funded by Casella, as set forth in the OSA with the State of Maine. Ongoing activities at JRL are funded by revenues generated from the operation of the landfill (i.e., tipping fees). The applicant provided a letter dated May 21, 2015 from the Bank of America, N.A. showing that Casella maintains a secured credit facility administered by that bank. The applicant represented that this letter demonstrates the ability of NEWSME and its ultimate parent company, Casella, to fund the expansion of JRL from working capital, if necessary.

Table 2 includes the opinion of expansion costs submitted by the applicant (Volume I of the application, Table 3-1, page 3-2). The application included an estimated cost of construction for the first cell of the expansion, Cell 11, of $6,240,000.

Table 2: Opinion of Expansion Costs

Activity	Estimated Cost ($)
Design and Permitting	$4,800,000
Construction	$19,800,000
Operations	$7,000,000
Closure	$12,400,000
Post-Closure Care	$8,700,000

Notes:
1. Design costs include MEDEP permit fees in 2015.
2. Construction costs are in 2015 dollars.
3. Operations costs represent estimated yearly costs.
4. Closure costs for the entire project in 2015 dollars at a per acre closure cost at $226,000 per acre.

5. Post-closure care includes costs to maintain and monitor the facility for the 30-year post-closure period in 2015 dollars based on a per-acre cost of $160,400 per acre.

The Board finds that financial ability is maintained by NEWSME as the current operator of JRL to design, operate, maintain, close, and accomplish post-closure care in a manner consistent with applicable State law and Rule requirements.

B. Financial Assurance

The applicant maintains a surety bond as financial assurance for final closure costs and post-closure care costs for the entire developed site for a 30-year period. Financial assurance is required by the OSA, Sections 13.7 and 21. A surety bond will be utilized as financial assurance for the proposed expansion, as well. The closure and post-closure care costs are updated yearly with updates of costs by an independent third party and the documentation of any changes made to the funding agreement submitted in the facility's Annual Report. The most recent updated surety bond documentation was submitted to the Department in an August 9, 2016 letter with attachments.

The Board finds that sufficient financial assurance is maintained by NEWSME as the current operator of JRL for closure and post-closure care, provided NEWSME submits the appropriate financial assurance package updates to the Department on an annual basis.

7. TECHNICAL ABILITY

The applicant must have the technical ability to develop the project in a manner consistent with State environmental standards in accordance with the 38 M.R.S. § 1310-N (2-F)(A) siting standards and must submit evidence that affirmatively demonstrates the technical ability to design, construct, operate, maintain, close, and accomplish post-closure care, as well as meeting civil or criminal record standards as stated in 06-096 C.M.R. ch. 400, § 4(C)(1).

A. Technical Experience

NEWSME has managed JRL since April 2004 and employs qualified management and staff at the facility, along with utilizing qualified consultants for design, construction, and operations. The application included position descriptions and responsibilities, along with resumes, of key personnel. NEWSME's parent company, Casella is also available to provide extensive expertise in solid waste, recycling, and resource management. The specific consultants retained for the proposed expansion application include: SME of Cumberland, Maine as the primary consultant with expertise in geology, hydrogeology, and landfill design; Sanborn, Head & Associates, Inc. of Concord, New Hampshire for landfill gas design; Gorrill Palmer of Gray, Maine for traffic assessment; SMRT, Inc. of Portland, Maine for visual assessment; Epsilon Associates, Inc. of Maynard, Massachusetts for noise assessment; and Stantec Consulting Services, Inc. (Stantec) of Topsham, Maine for wetland and other natural resources assessments.

The Board finds that the combination of BGS staff, NEWSME operations and management personnel, and the consultants retained by the applicant have the technical ability to develop the proposed expansion in a manner consistent with the applicable State law and Rule requirements.

B. Civil or Criminal Record

Finding 23 of this license contains the information on civil and criminal disclosure.

8. PROVISIONS FOR TRAFFIC MOVEMENT

The applicant must make adequate provisions for safe and uncongested traffic movement of all types into, out of, and within the proposed solid waste facility as set forth in the 38 M.R.S. § 1310-N(2-F)(B) siting standards and in 06-096 C.M.R. ch. 400, § 4(D)(1).

The primary waste haul route to JRL utilizes the Interstate system, I-95, to the Route 16 Bennoch Road interchange (exit 199), then Route 16 West for 0.1 miles to JRL's site access road. This haul route is to remain unchanged. New internal roads required for the proposed expansion have been designed for continuous traffic flow to minimize danger to pedestrians or other vehicles. The site access and internal site roads are maintained by NEWSME, including winter plowing and summer dust control.

The applicant submitted a traffic assessment prepared by Gorrill Palmer, dated June 2015, to determine if traffic increase due to the expansion will be adequately accommodated. Based on 2014 weight scale records and turning movement volumes collected on September 30, 2014, it was determined that the 2014 peak design hour trip generation was 28 during the morning and 25 during the afternoon. The proposed expansion is expected to increase accepted waste tonnages to 700,000 tons annually from about 629,000 tons received in 2014, resulting in an estimated 31 and 28 truck round trips during the peak morning and afternoon hours, respectively. For the proposed expansion, the total daily vehicle trips generation is expected to be 203 (one way traffic, therefore, approximately 101 total vehicles per day), of which 20 would be non-trucks and 183 would be various trucks with gross vehicle weights from 70,000 to 100,000 pounds. Gorrill Palmer noted that a disposal volume of approximately 700,000 tons was accepted in both 2010 and 2011.

For the proposed expansion, the primary 30-foot wide paved access road to the landfill will remain at its current location. Prior to a federal law change in 2011 which increased the allowable gross vehicle weight on I-95 from 80,000 to 100,000 pounds, vehicles over 80,000 pounds were required to use the state and local roadways. The weight limit change has reduced the traffic on local roadways by allowing trucks to utilize I-95. The applicant will encourage trucks to utilize the I-95 haul route when trucking waste to the proposed expansion.

In addition to addressing the existing and future traffic volumes and haul routes, the traffic assessment also looked at the future capacity of the facility, the Maine Department of Transportation (MDOT) accident inventory, sight distances, and internal access roads. The assessment concluded that the existing street system will continue to accommodate the vehicles associated with operation of the expansion.

During the course of the application review, traffic issues were raised by the City of Old Town regarding JRL related truck traffic on Bennoch Road (State Route 16). To address road conditions, BGS contacted MDOT concerning the possibility of improvements to the northern part of Bennoch Road. Preservation paving and highway rehabilitation work were added to MDOT's 2018 work plan. To encourage truck usage on I-95 rather than Bennoch Road, the facility has installed two signs that read "Trucks Please Use I-95". One sign is located just beyond the scale house, seen by drivers leaving the scales, and the other is located across from the landfill entrance, seen by drivers as they leave the facility. In addition, MDOT agreed to install two additional signs. At the hearing, the City of Old Town stated that their concerns regarding expansion truck traffic impacts have been addressed.

The Board finds that the applicant has demonstrated that the roads and intersections in the vicinity of JRL have the ability to safely and appropriately handle all of the traffic attributable to the proposed expansion into, out of, and within the facility pursuant to the applicable State law and Rule requirements. The Board further finds that the applicant will continue its policy of encouraging trucks to utilize I-95.

9. FITTING THE SOLID WASTE FACILITY HARMONIOUSLY INTO THE NATURAL ENVIRONMENT

In accordance with the 38 M.R.S. § 1310-N(2-F)(C) siting standards, the applicant must make adequate provisions for fitting the proposed solid waste facility harmoniously into the existing natural environment. Pursuant to the requirements in 06-096 C.M.R. ch. 400, § 4(E)(1), JRL must have buffer strips of sufficient size and quality to adequately protect aquatic and wildlife habitat and the natural environment; and may not unreasonably adversely affect protected natural resources and rare, threatened and endangered plant and animal species. The buffer must be a minimum of 100 feet between the facility site and the listed locations and habitats, unless otherwise approved or required.

The applicant retained Stantec to identify and inventory the presence of wetlands; potential significant wildlife habitats, unusual natural areas; vernal pools; and rare, threatened, and endangered species on the proposed project site. A review of records and contact with the following agencies occurred: the Maine Department of Inland Fisheries and Wildlife, the Department of Agriculture, Conservation, and Forestry, the Department, and U.S. Fish and Wildlife Service. Field studies were performed to assess the potential presence of State or federally listed rare, threatened, and endangered species, along with the delineation of wetlands and waterbodies.

Stantec did not directly observe State or federally listed rare, threatened and endangered plant or wildlife species on site during the field work which took place in 2008-2009 and 2014-2015. However, two areas were identified at the facility for further review: the forested area on site which is located in the range of the northern long-eared bat and the northeast portion of the facility which is located in the National Oceanic Atmospheric Association’s mapped critical habitat for Atlantic salmon.

The northern long-eared bat (Myotis septentrionalis) was listed as threatened effective May 4, 2015 with a 4d ruling by the U.S. Fish and Wildlife Service under the Endangered Species Act. Stantec conducted an acoustic bat survey during the nights of June 10 and 11, 2015 utilizing the current U.S. Fish and Wildlife Service guidelines and did not detect the presence of the northern long-eared bat.

Atlantic salmon are protected under the final 2009 ruling issued by the National Marine Fisheries Service and U.S. Fish and Wildlife Service under the Endangered Species Act. The expansion is proposed to be located approximately 800 feet from an unnamed intermittent brook, 950 feet from an unnamed tributary to Pushaw Stream and 2,350 feet from Judkins Brook. All of these streams are located in the watershed of the Penobscot River which contains Atlantic salmon. Isolated freshwater wetlands occur within the 780 acre facility parcel, including approximately two acres directly impacted by the proposed expansion; however, no delineated or mapped streams were identified within the proposed development area of the site. The Department of Marine Resources (DMR) stated that the proposed project should not cause any significant adverse impact to Atlantic salmon or other marine resources. The Maine Department of Inland Fisheries and Wildlife (MDIFW) stated that fisheries staff does not anticipate any adverse impacts on fisheries resources associated with this landfill expansion.

At the hearing, intervenor Edward Spencer's expert witness, Dr. Stephen Coghlan, questioned the applicant's conclusions regarding no expected impacts to Atlantic salmon. He testified on the life history and habitat requirements of Atlantic salmon and its sensitivity to various toxins, and argued that leachate generated by the project as well as impacts to the freshwater wetlands on-site have the potential to negatively impact its viability. He also argued that potential impacts to Atlantic sturgeon (federally-listed as threatened) and shortnose sturgeon (federally-listed as endangered) which are found in the lower Penobscot River Watershed should be considered. Dr. Coghlan testified that continued deforestation, urbanization and wetland alteration in the Penobscot River watershed have a detrimental impact on the habitat and viability of these endangered species as a result of increased runoff of nutrients and toxic chemicals. Dr. Coghlan also stated that in the event of a catastrophic breach of the liner system or a large storm event, leachate and/or stormwater runoff may contaminate adjacent waterways and ultimately the Penobscot River. Dr. Coghlan pointed out that in light of the success of the Penobscot River Restoration Trust's work on the Penobscot River that other important anadromous fish species have seen population increases recently and that the proposed expansion may put those species at risk again.

In response, Bryan Emerson, the applicant's wetland's expert, stated in his rebuttal testimony that the proposed expansion does not directly impact any river, stream or brook. The largest wetland being impacted in the middle of the proposed expansion is "an isolated forested wetland with no surface hydrological connection to a stream or floodplain wetlands, and the wetlands being impacted on the edge of the expansion are not floodplain wetlands. Therefore, no direct impacts to Atlantic salmon or their habitat are likely to occur." He further testified that Judkins Brook, which is within federally mapped Critical Habitat for Atlantic salmon, is located in a different watershed than the landfill expansion. With respect to Dr. Coghlan's concerns regarding potential impacts to Atlantic sturgeon and shortnose sturgeon in the Penobscot River, Mr. Emerson testified that Judkins Brook is located approximately 6.5 river miles upstream from the Stillwater River, and Pushaw Steam, more than 8.4 river miles. The Stillwater River then flows approximately 6 to 8 river miles before it reaches the mainstream of the Penobsot River, making it "highly unlikely" that there would be any adverse impacts to Atlantic sturgeon or shortnose sturgeon as a result of the JRL expansion.

Based on Stantec's evaluation results; the design of the landfill; the distance from the solid waste boundary to the intermittent and perennial streams; the fact that these streams do not contain habitat for Atlantic Salmon, Atlantic sturgeon, or shortnose sturgeon; and that the leachate is collected and treated at an off-site facility that has a waste discharge license from the Department, the Board finds the project will not have an unreasonable impact to Atlantic salmon, Atlantic sturgeon, or shortnose sturgeon.

The expansion will impact approximately 2.04 acres of primarily forested freshwater wetlands through direct filling and 0.1 acres of the critical terrestrial habitat of one significant vernal pool regulated under the Natural Resources Protection Act. The impacts to the significant vernal pool were authorized in a permit-by-rule that was accepted by the Department on July 29, 2015. Finding 38 of this license addresses impacts to freshwater wetlands and compliance with the Natural Resources Protection Act and associated rules.

In addition to the NRPA regulated wetlands, the applicant identified 14 vernal pools within and adjacent to the expansion area, 12 of which are regulated by the U.S. Army Corps of Engineers. Stantec prepared a Wetlands Compensation Plan to meet both NRPA and Corps requirements.

The MDIFW reviewed the proposed project and stated that, with the exception of one Significant Vernal Pool, there are no other essential or significant wildlife habitats at the project site.

The Board finds that the applicant has demonstrated that the facility will have sufficient buffers to adequately protect aquatic life and wildlife habitat and the natural environment; and that there will be no unreasonable adverse effects to protected natural resources and rare, threatened and endangered plant and animal species pursuant to 38 M.R.S. § 1310-N (2-F)(C) and 06-096 C.M.R. ch. 400, § 4(E)(1).

10. NO UNREASONABLE ADVERSE EFFECT ON EXISTING USES AND SCENIC CHARACTER

The solid waste facility may not unreasonably adversely affect exiting uses and scenic character as set forth in the 38 M.R.S. § 1310-N(2-F)(C) siting standards and in 06-096 C.M.R. ch. 400, § 4(F)(1), including consideration of bird hazard to aircraft, historical sites, established public viewing areas, excessive noise at the property boundary or at any protected location, or existing uses of neighboring property.

A. <u>Bird Hazard to Aircraft</u>

The proposed expansion is located over 13,000 feet from Dewitt Field Old Town Municipal Airport, the closest airfield. The Rules require a description of all airport runways within 10,000 feet of the facility.

Based on the distance to the airport, the Board finds that the expansion is not expected to present a bird hazard to aircraft.

B. Historical Site Preservation

In a letter dated January 15, 2015, from the Deputy State Historic Preservation Officer of the Maine Historic Preservation Commission, it was concluded that there would be no historic properties affected by the proposed expansion.

The Board finds that the proposed expansion will not unreasonably adversely affect historic properties.

C. Visual Assessment

A visual assessment dated July 2015 was prepared for the applicant by SMRT Inc. to evaluate whether the proposed expansion will unreasonably interfere with views from established public viewing areas. Public viewing area is defined in 06-096 C.M.R. ch. 400, § 1(Ll) as "an area designated for the public to view scenic areas, historical sites, unusual natural features or public monuments. These areas include but are not limited to scenic highways; public easements; scenic turnouts; public monuments; and national, state or municipal parks." The Rules require descriptions of protected locations and established public viewing areas within 2,000 feet of the proposed expansion.

The visual assessment included defining the existing site characteristics around the facility, quantification of the site viewshed, identification of public viewing areas, development of maps for line of site and viewsheds, and preparation of final landfill topography illustrations. Computer-generated modeling, weather balloons at strategic locations and elevations, field visits, and photography were used. To determine public viewing areas within 2,000 feet of the proposed expansion, stakeholders contacted by correspondence included Maine Bureau of Parks and Lands, MDOT, City of Old Town, the towns of Alton, Glenburn, Greenbush, Hudson, and Milford, and the Penobscot Nation. No public viewing areas were identified within 2,000 feet of the proposed expansion, but the study area was expanded to a 6-mile distance based on a question raised in a pre-submittal meeting regarding possible views from the western shore of Pushaw Lake and vicinity. The stakeholder process identified the following potential scenic resources within 6 miles of the proposed expansion: Pushaw Lake, Pushaw Stream, Penobscot River, Stillwater River, Hirundo Wildlife Refuge, Sunkhaze Meadows National Wildlife Refuge, Mud Pond (also known as Perch Pond) and the Perch Pond Recreational Trail, the Costigan Historical Cemetery, and the Penobscot River corridor at the public boat launch. Views were also considered from the following roadways: Route 16, I-95 Southbound, and Route 43.

The assessment performed using U.S. Forest Service standards and guidelines in 06-096 C.M.R. ch. 315 concluded that Pushaw Lake and the Penobscot and Stillwater Rivers had no significant scenic features reported or identified within the study area. The scenic resources within the study area were determined not to have views to the landfill or are considered background by the U.S. Forest Service as being 4 miles to the horizon. The area roadways were not defined as public viewing areas, scenic resources, or scenic byways. The views from Route 16 were considered intermittent, the distant view from I-95 includes broken line of sight by roadside vegetation, and Route 43 has a screening of plantings.

Views of the landfill will change during construction and operation. The operating landfill will generally be seen as grayish in color with equipment in sight. Prior to final closure, the landfill is proposed to be covered by a temporary black geomembrane, and at closure it will be fully planted with a vegetative layer and will resemble nearby hillsides with similar height, scale, and form.

The Board finds that the design of the proposed expansion takes into account the surroundings and when completed, capped, and vegetated, the expansion will not have an unreasonable adverse effect on the scenic character of the surrounding area as required pursuant to 38 M.R.S. § 1310-N(2-F)(C) siting standards and in 06-096 C.M.R. ch. 400, § 4(F)(1).

D. Noise

A Sound Level Assessment Report, dated July 2015, was prepared for the applicant by Epsilon Associates, Inc. to evaluate sound levels from the proposed expansion. The Rules include noise standards, as noise is considered unwanted sound and sound levels can be measured in decibels (dBA = decibels adjusted to reflect the ear’s response to different frequency of sound). Table 3 includes the sound level limit standards of 06-096 C.M.R. ch. 400, § 4(F)(2).

Table 3: Sound Level Limit Standards

Sound Level Limit	**Applicable Hours** Daytime: 7:00 am to 7:00 pm Nighttime: 7:00 pm to 7:00 am	**Location**
75 dBA	Daytime and Nighttime	Facility property boundary
60 dBA	Daytime	Protected location zoned or usage not predominantly commercial or industrial (i.e., residential)
50 dBA	Nighttime	

The assessment included existing sound levels around the operating landfill and measurement of potential noise sources (operations and equipment), computer modeling to predict future sound levels for various operating scenarios, and comparisons to the sound level limits. Sound levels from mobile equipment (excluding registered and inspected on-road vehicles), the Thiopaq® landfill gas treatment facility, and the anticipated future on site landfill gas-to-energy plant were included in the modeling. Operations for the proposed expansion were considered to be the same as current operations: 6:00 am to 6:00 pm Monday to Friday and 7:30 am to 2:30 pm Saturday and Sunday.

During periods of operations, modeled results were below the 75 dBA sound level limits for daytime and nighttime at the facility property boundary. However, residential areas are considered protected locations in the Rules and the western and northern property lines border residential properties. Additionally, there is a residential parcel to the south beyond the property boundary. These locations were assessed for compliance with the more restrictive sound level limits. The assessment results were below 60 dBA for the daytime operations, but were above 50 dBA for the one operating hour from 6:00 am to 7:00 am considered nighttime. To meet the sound level limit for this one hour of operation, the facility will be restricted to utilizing landfill equipment with a combined sound level of 77 dBA at 50 feet or less during the 6:00 am to 7:00 am hour when within 60 feet from the western solid waste boundary (approximately 480 feet from the western property line). This equates to utilizing a Caterpillar 836 compactor (77 dBA or less at 50 feet) or a Caterpillar 826 compactor (75 dBA or less at 50 feet), but not both compactors simultaneously.

The applicant will continue to maintain buffer vegetation between the proposed expansion and property lines to minimize sound levels from the facility, with the exception of tree clearing to install the relocated electrical line. The proposed pump stations, future gas-to-energy plant, and other mechanical structures will incorporate acoustical enclosures. Construction and maintenance activities will include environmental noise control devices in proper working condition and maintained as originally provided with the equipment by its manufacturer. Although vehicle warning signals and alarms are exempt from the sound limit levels, NEWSME has replaced the original backup alarms on operating equipment at the landfill with broadband backup alarms having less abrupt sounds.

The Board finds that the noise study for the proposed expansion indicates that routine operations will not generate excessive noise at the property boundary or at any protected location as defined by the Rules; provided that during the hour of 6:00 am to 7:00 am, only equipment with a combined sound level of 77 dBA at 50 feet or less are utilized if within 60 feet of the western solid waste boundary (approximately 480 feet from the western property line).

E. Neighboring Property

The portions of the 780-acre parcel to be developed will be a continuation of the existing site use, with buffers as required by 06-096 C.M.R. ch. 401, §§ 1(C)(2) and (3). Existing land in the vicinity of the expansion is locally zoned for landfilling, rural residences, farming, and under resource protection. The setbacks and buffers from the solid waste boundary in comparison to the Rule requirements are listed in Table 4 (modified from Volume I of the application, Table 3-3, page 3-12):

Table 4: Proposed Expansion Setback and Buffers

Setbacks from the Solid Waste Boundary to:	Actual Proposed (feet)	Rules Setback Requirements (feet)
Prohibitive Siting Criteria		
Class AA or Class SA Waters	> 10,560 (> 2 miles)	1,000
Significant sand and gravel aquifer	5,230 (approximately 1 mile)	300
Fault displaced in Holocene time	None identified on 780-acre parcel. Nearest mapped fault approximately 6 miles northeast of site.	200
Restrictive Siting Criteria		
Nearest public road	2,400	300
Property boundary	420	300
Nearest residence	2,100	1,000
Stratified sand and gravel deposit	275	100
Classified surface water	950	100
Water supply spring or water supply well not owned by the applicant	2,100	1,000

The Board finds that the proposed facility will have no unreasonable adverse effect on existing uses of property neighboring the proposed expansion based on the facility's buffers and setbacks as required in State law and the Rules.

11. NO UNREASONABLE ADVERSE EFFECT ON AIR QUALITY

The solid waste facility may not unreasonably adversely affect air quality pursuant to the siting standards of 38 M.R.S. § 1310-N(2-F)(C) and 06-096 C.M.R. ch. 400, § 4(G)(1). The facility must obtain an air emission license, if required; control fugitive dust and nuisance odor; and prohibit open burning of solid waste other than clean or painted wood waste.

A. Air Emission License

Air emission license renewal #A-921-70-B-R was issued on October 7, 2014 for the existing landfill facility with findings that emissions from the source will receive Best Practical Treatment, will not violate applicable emissions standards, and will not violate applicable ambient air quality standards in conjunction with emissions from other sources. The air emission license renewal includes State and federal emission limits and operational requirements associated with landfill gas collection and control, as well as monitoring and reporting requirements.

The 2014 air emission license renewal addresses control of landfill gas emissions through use of a landfill gas collection and control system, with the extracted and collected landfill gas passing through a Thiopaq® sulfur removal system, then being combusted in either the main flare (Flare #4) or back-up flares prior to release to the atmosphere. In the future, a landfill gas-to-energy facility may be located at the site, at which time the extracted Thiopaq® treated gas may be combusted in engines to produce power as an alternative to flaring. The Thiopaq® system was required to be installed to decrease total reduced sulfur (mainly H_2S) prior to combustion to reduce sulfur dioxide air emissions. Thiopaq® operations began in early 2015, with a sulfur removal Sulfatreat® system installed as backup. In addition to monitoring air emissions from the control equipment, as well as control equipment parameters, the facility is also required by the Federal New Source Performance Standards (NSPS) to perform periodic gas surface scans on the landfill.

An LFG System Expansion Design Report, dated June 2015, was prepared by Sanborn, Head & Associates, Inc. for the proposed expansion consisting of estimates of future landfill gas generation, descriptions of the proposed gas collection and control system, and how the proposed system would connect to the existing gas collection system infrastructure. The report stated that Flare #4 is adequate for the proposed expansion. Flare #4 capacity and operations are addressed in the air emission license renewal.

The Board finds that the applicant has an air emission license, as required by State law and the Rules.

B. Fugitive Dust

The measures to control dust at the proposed expansion will include utilizing water spray trucks to wet secondary roads during dry weather, paving the primary access road to the proposed expansion, and making use of a road sweeper to remove dirt buildup on paved roadways. Calcium chloride may be utilized on an as-needed basis, primarily on internal cell access roads.

On the landfill's active working area, ash will be off-loaded and primarily utilized as a mix within daily cover or as a bulking agent for sludge. The ash will not be prone to being windblown due to quenching, which is to occur at the point of generation, and the placement of ash and ash mixtures on the active landfill area.

The Board finds that the dust control measures proposed by the applicant are sufficient to control fugitive dust as required by State law and the Rules.

C. Nuisance Odors and H_2S

Three potential primary sources of odor identified by the applicant were odors associated with incoming wastes, leachate storage and transport, and landfill related gases. The facility's Odor Complaint Management and Response Plan to manage landfill-related odors and limit off-site odor migration is part of the facility's current Operations Manual. Incoming waste types with the highest potential for odor generation are FEPR, MSW bypass, and wastewater treatment plant sludge. The leachate has potential for odor during storage at the facility and transport to the wastewater treatment facility. Landfill gases, including odorous H_2S, are produced as the waste in the landfill decomposes.

Measures for minimization of odor associated with incoming odorous waste streams will include placement within a small area in the cell, waste compaction, and placement of another lift (or layer) of non-odorous waste such as ash or CDD waste above it. Daily cover will be applied over the active portion of the landfill at the end of each day of waste placement. The facility will also utilize odor neutralizing spray systems, as needed, such as a bulldozer mounted system within the active cell, a trailer spray system for incoming and outgoing trailer loads, and a perimeter misting system.

To minimize leachate odors, the leachate will be collected and transported by piping systems and stored in an enclosed tank sized to hold all of the leachate generated at the landfill prior to being transported for treatment and disposal. Tanker trucks used to haul the leachate to the wastewater treatment facility will be required to have their tanker filling points tightly sealed during transportation and have the ability to add chemicals for odor reduction.

Odor from LFG produced as waste degradation occurs will be minimized by the installation of intermediate or final cover over non-active portions of the landfill and the operation of the facility's LFG collection and control system, which will be expanded to accommodate the proposed expansion.

The facility monitors H_2S concentrations through real-time data collected using six Honeywell Analytics Single Point Monitors, four located off-site (on the access road, West Coiley Road, Route 43, and Old Stagecoach Road), and two located on-site, one adjacent to the perimeter fence and one on NEWSME owned land on Route 16. The location and operation of the four off-site monitors have been pre-determined with the Department's approval. The two on-site monitors are solely utilized to assist in operations, and the location and operation of these monitors may change or cease based on ongoing operations. If the monitors detect concentrations of 15 parts per billion (ppb) or above at any of the off-site monitors, the scale house is alerted by automated telephone message. Personnel then report any alert to supervisory staff for follow-up. In addition to monitoring for compliance with the action level of 15 ppb, the monitor data can be utilized in assisting with odor complaints.

Odor complaints received by the facility will follow a specific procedure. Information will be obtained from the complainant and then given to the appropriate complaint response personnel. Follow-up steps will be taken during the complaint investigation including filling out a Complaint Record Form with data about the day, time, wind direction and speed, H_2S levels, unusual conditions at the landfill, and observed waste materials accepted at the time of complaint. Landfill personnel will communicate directly with the complainant, either in person or by phone. For all complaints, the following will also be documented: remedial actions taken, resolution of the complaint, comments made during the investigation, and any other recommendations.

During the licensing proceedings, the City of Old Town raised the issue of H_2S as it relates to odor and exposure. The City's consultant and expert witness, Denis St. Peter, P.E. of CES, Inc., recommended that the facility use acute action levels for concentrations of H_2S exceeding 15 ppb (for reporting of events in the facility's Monthly Status Report) and 30 ppb, with the Old Town Code Enforcement Officer to be contacted if H_2S levels exceed 30 ppb. The applicant agreed and has incorporated the action levels into the facility's Operations Manual. Mr. St. Peter also recommended that the City set forth its own evaluation protocol to review the effect of possible chronic (long-term) exposure to H_2S on members of the public since JRL does not currently use a chronic exposure standard. A portion of the Host Community funding will be used to hire a consultant to annually review the facility's H_2S data, with the City reporting the findings to the applicant and the Department.

Intervenor Edward Spencer testified on the odor complaint procedure and suggested consideration be made to include law enforcement officials in the process to verify nuisance odors. In response to this concern, Jeremy Labbe, P.E., Environmental Manager at JRL, testified that the City of Old Town receives a summary of every odor complaint at JRL and that JRL can provide copies of individual completed complaint forms to the City if requested. Mr. Labbe further testified that any City employee or citizen may call in an odor complaint.

The Board finds that the applicant has proposed odor control mechanisms sufficient to control nuisance odors from the proposed expansion as required by State law and the Rules. The Board further finds that the facility's current odor complaint procedure includes appropriate documentation and follow-up to odor complaints at this time.

12. NO UNREASONABLE ADVERSE EFFECT ON SURFACE WATER QUALITY

In accordance with the 38 M.R.S. § 1310-N(2-F)(C) siting standards of no unreasonable adverse effect on water quality and the requirements of 06-096 C.M.R. ch. 400, § 4(H)(1), the solid waste facility: may not discharge any water pollutants, directly or indirectly, that affect the state classification of a surface water body, as specified in 38 M.R.S. § 464; may not discharge any pollutant without first obtaining a license pursuant to 38 M.R.S. § 413 (waste discharge licenses); may not degrade water quality by contributing to the phosphorous concentrations in "waterbodies most at risk from new development" as defined in *Direct Watersheds of Lakes Most at Risk from New Development, and Urban Impaired Streams*, 06-096 C.M.R. ch. 502 (last amended December 27, 2006); and may not cause the discharge of a nonpoint source of pollution to waters of the United States that violates any requirement of an area-wide or State-wide water quality management plan that has been approved in compliance with Section 319 of the *Federal Water Pollution Control Act*, as amended.

The proposed expansion includes a leachate collection and off-site treatment system for precipitation that comes into contact with waste and stormwater management and erosion sedimentation control plans to control surface water runoff from covered portions of the facility, construction activities, and non-operational areas. The proposed expansion is not located within the watershed of a "lake at most risk from new development" or an "urban impaired stream." The applicant submitted a Stormwater Management Plan and an Erosion Sedimentation Control Plan, both dated July 2015 and prepared by SME. The plans address effective drainage, flood prevention, and erosion control. The applicant's best management practices include stormwater detention basins, low velocity (lined) ditches, and stone check dams within on-site ditches. The plans are described in more detail in Findings 14 and 17 of this license.

The facility holds a Multi-Sector General Stormwater Permit (#MER05B477) for the discharge of stormwater associated with industrial activity for Sector L: landfills. The facility also submitted the existing Stormwater Pollution Prevention Plan, originally prepared in April 2006 and most recently revised in June 2013. The Stormwater Pollution Prevention Plan will be updated as necessary to address construction as the proposed expansion is developed.

Leachate generated by the proposed expansion will be collected, stored onsite, and trucked off-site to the MFGR, LLC wastewater treatment plant in Old Town. The project was reviewed by the Department's Bureau of Water Quality, which stated that the treatment plant is licensed to accept the leachate and is currently operating in compliance with that license (Department Order #W-002226-5O-O-R, entered into the evidentiary record). Leachate management is described in more detail in Findings 26(D) and 28(E) of this license.

The Board finds that the stormwater and leachate management systems for the proposed expansion meet the applicable State laws and Rules and are designed to prevent the discharge of sediment and other contaminants conveyed by stormwater from polluting the waters of the State and otherwise unreasonably affecting surface water quality.

13. NO UNREASONABLE ADVERSE EFFECT ON OTHER NATURAL RESOURCES

The solid waste facility may not unreasonably adversely affect other natural resources in the municipality or in neighboring municipalities pursuant to the 38 M.R.S. § 1310-N(2-F)(C) siting standards and 06-096 C.M.R. ch. 400, § 4(I)(1). The facility must conform to the standards of NRPA, 38 M.R.S. §§ 480-A to 480-Z, if proposed to be located in, on, over, or adjacent to a protected natural resource; and must be permitted by the federal government for any activities that require a Federal Wetlands permit.

Finding 38 of this license addresses impacts to protected natural resources under the NRPA and includes the Board's findings regarding compliance with NRPA requirements. The applicant has applied to the U.S. Army Corps of Engineers for a permit for impacts to federally regulated wetlands located in and adjacent to the expansion area.

14. SOIL TYPES THAT ARE SUITABLE AND WILL NOT CAUSE UNREASONABLE EROSION

In accordance with 38 M.R.S. § 1310-N(2-F)(D) siting standards and 06-096 C.M.R. ch. 400, § 4(J)(1), the solid waste facility must be located on soil types suitable to the nature of the undertaking and the facility must not cause unreasonable erosion of soil or sediment.

An Erosion and Sediment Control Plan, dated July 2015 and prepared by SME, was submitted with the application to address the site setting including watersheds, wooded areas, and surficial soils; existing and proposed drainage structures, timing and sequence of land disturbance activities during cell construction, landfill operations, and cover placement; temporary, permanent, and standard erosion control measures; and maintenance and inspection of erosion control features to ensure proper function. In addition, a site assessment report was submitted with the application consisting of site investigation findings and site characteristics, along with other analyses.

The surficial soils were investigated with the use of site test pits and soil borings and through the use of the Natural Resources Conservation Service Web Soil Survey of Penobscot County, Maine 2014. The surficial soils under and around the proposed expansion footprint are primarily Plaisted very stony loam and Howland very stony loam. On-site observations and a review of soils mapping did not identify areas near the proposed expansion that would be prone to or highly susceptible to erosion, such as exposed sideslopes.

The design and implementation of all erosion control measures will follow the requirements of the Rules and will be in accordance with the appropriate version of Maine's Erosion and Sediment Control Best Management Practices (BMP) Manual, most recently updated in March 2015 for Contractors and in October 2016 for Designers and Engineers (the previous version was dated 2003). BMP's to minimize erosion from the proposed expansion will include utilizing grass lined and riprap lined channels, catch basins, sediment detention ponds, culverts, ditches, storm drains, riprap aprons, riprap plunge pools, and level spreaders. Analyses were performed to appropriately size and locate these structures. Some existing structures will be utilized as they exist without modifications and others will be modified or removed. For example, Detention Ponds 1 and 9 will be modified, Detention Pond 5 will be removed, Detention Ponds 2 and 6 will remain unmodified, and Detention Ponds 10, 11, and 12 will be added.

Prior to disturbance of soil during development, appropriate erosion and sedimentation control measures will be put in place. Temporary measures will include silt fences, temporary seeding, mulching, and stone check dams. Permanent measures will include downspouts, sedimentation ponds, permanent seeding, mulching, and culvert inlet and outlet protection. The amount of area disturbed at any one time will be minimized by the phased development of the landfill over time.

The Board finds that the construction and operation of the proposed expansion will not cause unreasonable sedimentation or erosion of soil and that suitable soil types underlie the landfill, meeting the applicable State laws and Rules; provided that the erosion and sedimentation control plan is implemented as proposed, incorporating any future revisions as a result of the Department's review and approval of each new cell construction as detailed in a specific design package as phased landfill development occurs.

15. NO UNREASONABLE RISK THAT A DISCHARGE TO A SIGNIFICANT GROUND WATER AQUIFER WILL OCCUR

Pursuant to 38 M.R.S. § 1310-N(2-A), the 38 M.R.S. § 1310-N(2-F)(E) siting standards, and 06-096 C.M.R. ch. 400, § 4(K)(1), the proposed solid waste facility may not: overlie any significant sand and gravel aquifers; pose an unreasonable threat to the quality of a significant sand and gravel aquifer; pose an unreasonable threat to the quality of an underlying fractured bedrock aquifer; or pose an unreasonable risk that a discharge to a significant ground water aquifer will occur. Significant ground water aquifer is defined in 06-096 C.M.R. ch. 400, §§ 1(Ccc) as "a porous formation of ice contact and glacial outwash sand and gravel supplies or fractured bedrock that contains significant recoverable quantities of water likely to provide drinking water supplies", with a similar definition found in 38 M.R.S. § 1310-N(2-A).

The application included a comprehensive Site Assessment Report dated July 2015, prepared by SME, of the geologic and hydrogeologic characteristics of the site, in addition to the water quality of the site, future water quality monitoring, and travel time analyses.

The Maine Geological Survey maps (Open File 08-87, Tolman and Lanctot, 2008) show the nearest mapped sand and gravel aquifer in the vicinity of the proposed expansion is approximately one mile east of the landfill. There are no stratified sand and gravel deposits mapped by the Maine Geological Survey within the facility site (Borns and Thomspson, 1981; Foster and Smith, 2001). Therefore, the proposed expansion does not overlie any significant sand and gravel aquifers.

An investigation was performed to determine whether the proposed expansion would pose a risk or affect the quality of a significant sand and gravel aquifer or a bedrock aquifer. Although no mapped stratified sand and gravel deposits are located near the proposed expansion and ground water from bedrock beneath, directly adjacent to, and immediately downgradient of the proposed site is not likely to be used for domestic consumption due to the State's ownership of land 400 feet downgradient of the proposed solid waste boundary, two formations were evaluated further. These formations consist of the isolated stratified sand zones contained within the basal till greater than 100 feet beyond the southeast side of the proposed expansion boundary and the off-site bedrock immediately adjacent to the site property boundary.

The on-site stratified sand and off-site bedrock formations were evaluated utilizing the time of travel analysis and the contaminant transport analysis included in the application. These analyses are described in more detail in Findings 25 and 29 of this license, respectively.

The Board finds that the proposed expansion will not be located over a significant sand and gravel aquifer and that the facility poses no unreasonable risk to a significant sand and gravel aquifer or underlying fractured bedrock aquifer, as required by State law and the Rules. Adequate protection of water quality will be provided by the soils under the proposed expansion, the design of the proposed expansion, the ground water flow conditions, and implementation of the Water Quality Monitoring Program discussed further in Finding 33 of this license.

16. ADEQUATE PROVISION FOR UTILITIES AND NO UNREASONABLE ADVERSE EFFECT ON EXISTING OR PROPOSED UTILITIES

The applicant shall provide for adequate utilities, including adequate water supplies and appropriate sanitary wastewater disposal, and the facility may not have an unreasonable adverse effect on existing or proposed utilities in the municipality or area served by those utilities, in accordance with the 38 M.R.S. § 1310-N(2-F)(F) siting standards and in 06-096 C.M.R. ch. 400, § 4(L)(1).

Existing sanitary wastewater disposal systems located at the maintenance buildings (on the southeast side of the facility) and the office building and scale house (currently located on the north side of the facility) will continue to be utilized by personnel. However, with the development of Cell 12, the office building and scale house will be relocated northeast from its current position and a well and new on-site sanitary wastewater disposal system will be installed.

Water for dust control, leachate pipe cleaning, and other needs of the facility will continue to be met by the existing on-site water supply sources. The leachate generated by the landfill will continue to be collected and stored on-site and treated off-site.

As part of the proposed expansion, an approximate 3,700-foot portion of the facility's three-phase, 480-volt power electrical service will be relocated. This electrical service enters the site along the existing access roadway which will be modified to accommodate the development of the proposed expansion. The new leachate pump stations associated with the proposed expansion will require three-phase, 480-volt power, which will be supplied to each pump station through additional on-site electrical cables to be installed along the site access roads.

The Board finds that the applicant has provided for adequate utilities and the proposed facility will not have an unreasonable adverse effect on existing or proposed utilities in the municipality or area served by the utilities, pursuant to the applicable State law and Rules.

17. NOT UNREASONABLY CAUSE OR INCREASE FLOODING

The solid waste facility may not unreasonably cause or increase flooding on-site or on adjacent properties nor create an unreasonable flood hazard to a structure pursuant to the 38 M.R.S. § 1310-N(2-F)(G) siting standards. As set forth in 06-096 C.M.R. ch. 400, § 4(M)(1), the facility may not be located in a 100-year flood plain or restrict the flow of a 100-year flood. In addition, the facility must include a stormwater management system that controls run-on and run-off; and infiltrates, detains, or retains precipitation falling on the facility site during a storm of an intensity up to and including a 25-year, 24-hour storm, such that the rate of flow of stormwater from the facility after construction does not exceed the rate of outflow of stormwater from the facility site prior to the construction of the facility.

The most recent Federal Emergency Management Agency (FEMA) flood plain map of the proposed expansion's location shows that the proposed expansion is not located on a 100-year flood plain (Quad panel number 2301120002A, dated April 1978).

The Stormwater Management Plan prepared by SME and dated July 2015 for the proposed expansion application included pre-and post- development stormwater analyses, for storm events up to and including a 25-year, 24-hour storm event. The post-development design includes modifications to some of the existing stormwater structures, along with the addition of three detention ponds and various drainage ditches, catch basin, storm drains, and culverts. The stormwater analyses showed that post-development peak flows did not exceed pre-development peak flows. The results of the submitted analyses are shown in Table 5 (Volume I of the application, Appendix J, Table 4-1, page 9). Changes in precipitation data, requirements, or cell development plans may result in revisions to the analyses as the proposed expansion is developed.

Table 5: Summary of Peak Flows

Analysis Point	Peak Flow (cubic feet per second, cfs)					
	Pre-Development			Post-Development		
	2-Year	10-Year	25-Year	2-Year	10-Year	25-Year
1	29.5	92.6	130.9	16.2	50.4	68.3
2	10.2	26.6	36.0	9.8	24.6	33.2
3	29.1	74.1	100.3	29.1	74.1	100.3
4	36.1	92.1	124.5	33.4	84.7	112.5
5	6.2	14.6	19.3	5.7	13.4	17.7

Note: Peak flow of analysis point after routing through the detention pond and/or reaches.

Dr. Stephen Coghlan, Intervenor Spencer's expert witness, raised concerns in pre-filed direct testimony on the date of the 1978 flood plain map used by the applicant. Department staff verified through a website search of FEMA's floodplain maps that the most recent map for the proposed expansion area was utilized, as required. Dr. Coghlan also testified on the potential for extreme rainfall events and flooding due to climatic changes and questioned the adequacy of an analysis based upon a 25-year, 24-hour storm event. Michael Booth, P.E. of SME, one of the applicant's expert witnesses, testified that the rules require that an event of intensity up to and including a 25-year, 24-hour storm be utilized in the analysis. In addition, Mr. Booth testified that the stormwater ponds include structures that also allow stormwater flow from a 100-year storm to be managed without impacting the integrity of the structures and that with respect to the age of the flood plain maps, the expansion is located on a high point and not susceptible to flooding.

The Board finds that the facility will not be located in a 100-year flood plain and that adherence to the facility's stormwater management plan will control run-on and run-off; and will infiltrate, detain, or retain water falling on the facility site during a storm of an intensity up to and including a 25-year, 24-hour storm, such that post-development stormwater flows from the facility are below pre-development stormwater flows from the facility site. These findings meet the applicable requirements of State law and the Rules.

18. SOLID WASTE MANAGEMENT HIERARCHY

A. Applicable Law

As stated in 38 M.R.S. § 1310-N(1)(D) and 06-096 C.M.R. ch. 400, § 4(N)(1), the purpose and practices of the solid waste facility must be consistent with the State's solid waste management hierarchy (hierarchy) set forth in 38 M.R.S. § 2101(1), which reads as follows:

> Priorities. It is the policy of the State to plan for and implement an integrated approach to solid waste management for solid waste generated in the State and solid waste imported into this State, which must be based on the following order of priority:
>
> A. Reduction of waste generated at the source, including both amount and toxicity of the waste;
> B. Reuse of waste;
> C. Recycling of waste;
> D. Composting of biodegradable waste;
> E. Waste processing that reduces the volume of waste needing land disposal; including incineration; and
> F. Land disposal of waste.

For the purpose of 06-096 C.M.R. ch. 400, § 4(N):

> reducing, reusing, recycling, composting and/or processing waste to the "maximum extent practicable" prior to disposal means handling the greatest amount of waste possible through means as high on the solid waste management hierarchy as possible, resulting in maximizing waste diversion and minimizing the amount of waste disposed, without causing unreasonable increases in facility operating costs or unreasonable impacts on other aspects of the facility's operation. Determination of the "maximum extent practicable" includes consideration of the availability and cost of technologies and services, transportation and handling logistics, and overall costs that may be associated with various waste handling methods.

In addition, 38 M.R.S. § 2101(2) establishes that "it is the policy of the State to actively promote and encourage waste reduction measures from all sources and maximize waste diversion efforts by encouraging new and expanded uses of solid waste generated in the State as a resource."

The Department's rule at 06-096 C.M.R. ch. 400, § 4(N)(2)(a) states that for a solid waste disposal facility, the applicant must affirmatively demonstrate consistency with the hierarchy, including the following:

> that the waste has been reduced, reused, recycled, composted, and/or processed to the maximum extent practicable prior to incineration or landfilling, in order to maximize the amount of material recycled and reused, and to minimize the amount of waste

> being disposed. Such evidence shall include, but is not limited to, a description of the reduction, reuse, recycling, composting and/or processing programs/efforts that the waste is or will be subject to, and that are sufficiently within the control of the applicant to manage or facilitate, including relevant metrics to evaluate effectiveness; and a description of ongoing efforts to increase the effectiveness of these programs/efforts.

State law also imposes limits on the origin of wastes accepted at a State-owned solid waste facility. In accordance with 38 M.R.S. § 1310-N(11),

> a solid waste facility owned by the State may not be licensed to accept waste that is not waste generated within the State. For the purposes of this subsection, "waste generated within the State" includes residue and bypass generated by incineration, processing and recycling facilities within the State or waste, whether generated within the State or outside of the State, if it is used for daily cover, frost protection or stability or is generated within 30 miles of the solid waste disposal facility.

B. <u>Applicant's Summary of Proposed Waste Streams Relative to the Hierarchy</u>

In its application (Volume I) and the testimony of Toni King, P.E., Regional Engineer for Casella Waste Systems, Inc.'s Eastern Region, the applicant provided information, summarized below, on the wastes proposed to be disposed in the expansion and the viable waste management options for these wastes as related to the hierarchy that are sufficiently within the control of the applicant to manage or facilitate:

(1) *CDD* – JRL has received, and is expected to continue to receive in the expansion, CDD from Casella-owned companies and others. Typically, about 30% of the material disposed of at JRL is CDD. In 2014, Casella-owned companies delivered approximately 87,324 tons of CDD material to JRL. Approximately 3,335 tons of clean wood and metals had been removed from this material and JRL has a wood waste handing area which received 46 tons of clean wood and stumps in 2014. These materials were ground and recycled as alternative daily landfill cover. Additionally, Casella controlled/operated transfer stations divert tonnage from JRL, including clean and processed wood and metal, which is removed from the CDD before the CDD is sent to JRL. These Casella facilities also direct or supply CDD to processing facilities such as ReEnergy in Lewiston for beneficial use or recycling.

(2) *FEPR* – FEPR currently comes to JRL from the PERC incinerator in Orrington. PERC's FEPR is approximately 20% by weight of the non-combustible portion of the facility's MSW that cannot be incinerated and is removed mechanically prior to combustion of the refuse-derived fuel. FEPR is currently utilized at JRL as part of the 5-foot layer, referred to as the "soft layer", which is placed above the landfill liner and leachate collection systems as a protective layer. This usage is also proposed for the expansion. At this time, there is no other disposal option allowed in Maine other than secure landfill disposal for FEPR. The applicant states that if FEPR were not available, the facility would need to purchase other materials such as tire chips and sand to provide a soft layer.

(3) *MSW Incinerator Ash and Multi-Fuel Boiler Ash* – The use or reuse of MSW incinerator ash is currently not allowed by regulatory beneficial use standards in Maine due to its chemical characteristics; therefore, the current disposal method is landfilling. Multi-fuel boiler ash is similar to MSW incinerator ash regarding the allowable disposal method, with the exception of a few ashes, such as clean wood ash. Clean wood ash may be land spread or used in the production of flowable fill for certain construction needs. Casella Organics, NEWSME's sister company, has developed, and continues to develop, programs to reuse and recycle suitable clean wood ash, diverting various amounts from the landfill. JRL will utilize ash in its operations as daily cover at the proposed expansion, eliminating the need to use virgin soil (non-waste material) to serve that purpose.

(4) *CDD Processing Fines* – The residue from the processing of CDD is currently utilized as landfill grading, shaping, and alternative daily cover material and is expected to be used in the same manner for the proposed expansion. The current allowable disposal methods for CDD processing fines are either reuse as daily cover or disposal in secure landfills. Use of CDD fines as alternative daily cover materials at landfills is a beneficial use/recycling activity. Approximately 126,000 tons of CDD fines were received at JRL in 2014 and used as alternative daily cover.

(5) *OBW* – OBW is not currently generated by entities within the control of BGS and NEWSME, and there are no prevalent, viable mechanisms for reuse, reduction, or recycling of OBW that are within the control of BGS and NEWSME. The primary management option is landfill disposal for OBW.

(6) *Municipal Wastewater Treatment Plant Sludge* – Municipal wastewater treatment plant sludge not land applied, composted, or alternatively managed is proposed as acceptable waste at the expansion. Casella Organics has developed, and continues to develop, alternative sludge usage programs; however, the usage options for municipal wastewater treatment plant sludge from Maine communities is limited due to factors such as the quality of sludge, available acres for land application, facility capacity restrictions and cost considerations. Landfilling is the disposal option for municipal wastewater treatment plant sludge not otherwise land applied, composted or alternatively managed.

(7) *Industrial Wastewater Treatment Plant Sludge and Residuals* – As with municipal wastewater treatment plant sludge, industrial wastewater treatment plant sludge and residuals are expected to be disposed of in the proposed expansion. Maine industries with wastewater or process treatment plants (the generator of this type of sludge) are responsible for reducing and recycling this waste material to the maximum extent practicable. As stated above, Casella Organics has an active alternative sludge usage program to divert some of this waste material from the landfill; however, the sludge not otherwise processed is landfilled. For example, in 2014 Casella Organics handled approximately 42,000 tons of short paper fiber from the Cascades Auburn Fiber pulp mill in Auburn, Maine, all but 8000 tons of which was diverted from disposal to beneficial uses.

(8) *Contaminated Soils and Oil Spill Debris* – Contaminated soils and oil spill debris are currently accepted at JRL at an estimated amount of about 1% of the total tonnage (approximately 6,500 tons in 2014) and are expected to be accepted in the proposed expansion. This waste type often is the result of accidental spills and releases and is managed in accordance with regulated practices (such as facility spill prevention, control, and countermeasure plans). While some of these wastes can be used in construction projects or in secure settings, reuse is typically limited due to physical and/or chemical characteristics or practical limitations such as transportation costs. Alternate use decisions are within the control of the generator, not BGS or NEWSME.

(9) *Miscellaneous Special Wastes* – Generators of miscellaneous special wastes are responsible for reducing to the maximum practicable extent the amount of these wastes that are landfilled. These special waste streams are handled either through individual one-time or ongoing special waste permits when there is not an alternative to landfilling based on regulatory

standards and practical cost and transportation considerations. Alternative use decisions are within the control of the generator, not BGS or NEWSME.

(10) *MSW Bypass from Maine MSW Incinerators* – The only MSW that will be disposed of in the JRL expansion is bypass from Maine MSW incinerators (pre-filed testimony by Ms. King page 10; pre-filed testimony by Jeremy Labbe, Environmental Manager at JRL, page 13; hearing testimony by Michael Barden, the State's Manager for State-owned landfills, pages 15 and 147 of the hearing transcript; and during questioning of Intervenor Edward Spencer page 419 of the hearing transcript). These incinerators are required by their licenses to provide an alternative management method (bypass) if the facility receives MSW that is in excess of its ability to accept, process, and/or combust that waste (i.e., during planned shutdowns or unplanned production problems). The decision to bypass and where to dispose of the bypass is made by the incinerator facility and is not within the control of BGS or NEWSME.

C. Testimony Regarding the Hierarchy

Compliance with the State's solid waste management hierarchy was a major issue at the hearing.

The applicant testified that the proposed expansion will be developed and operated consistent with the hierarchy and that JRL will promote and encourage waste reduction measures and maximize the waste diversion efforts of JRL users to the maximum extent practicable. Toni King, Regional Engineer for Casella Waste Systems, Inc.'s Eastern Region, testified that a high percentage of material to be disposed of in the proposed expansion is ranked in the State Plan (Maine Materials Management Plan: 2014 State Waste Management and Recycling Plan Update & 2012 Waste Generation and Disposal Capacity Report, January 2014, prepared by the Maine Department of Environmental Protection) as either a high or medium option for landfill disposal; i.e., landfill disposal is the primary management technique available (high) or a middle option (medium). Ms. King testified that approximately 30% of the waste material accepted at JRL is utilized in landfill operations and is considered recycling in accordance with the applicable State laws and Rules. This includes residuals from waste processing facilities used as alternative daily cover, thereby offsetting the amount of landfill capacity used by non-waste materials. Ms. King noted in her testimony that the Department evaluated JRL's use of alternative daily cover as part of the Public Benefit Determination for the proposed expansion and concluded that the amount used at JRL is comparable to the amount used at the Crossroads landfill in Norridgewock, Maine.

Ms. King also testified that NEWSME's parent company operates Casella Recycling, LLC and Casella Organics, both of which contribute to the reduction of waste landfilled. Casella Recycling, LLC, a Zero-Sort facility in Lewiston, recycled approximately 87,700 tons of material in 2014 and the non-recyclable residuals (9% of the waste stream) were sent to the Mid Maine Waste Action Committee (MMWAC) incinerator in Auburn, with ecomaine in Portland available as backup. Casella Organics composts and land applies organic wastes, landfilling their customers' waste only when the physical or chemical properties of the material do not allow for beneficial reuse, if there is a lack of site access for land application, or when reuse/recycling outlets are not available.

Intervenor Edward Spencer addressed the following issues in his testimony and post-hearing brief: a concern that wastes have been coming into JRL without adequate assurance of source reduction; wastes sent to JRL should have been handled according to the State's hierarchy at their source, their point of discard, including wastes discarded outside of Maine and subsequently sent to Maine processing facilities; the definition of "waste generated within the State" is concerning since CDD processing facilities can accept out-of-state wastes but once processed, those wastes (fines, OBW, etc.) are considered in-state waste; and as a state-owned landfill, the focus should be on preserving capacity by exerting more control over the waste accepted for disposal.

With respect to CDD and associated residuals, Mr. Spencer testified that for the last five years (2011 through 2015) wastes categorized as CDD, OBW, and CDD process fines when combined accounted for over 57% of inputs to JRL. Mr. Spencer expressed concern over the origin of CDD ultimately disposed of at JRL, and testified that the majority of wastes entering the Lewiston processing facility (ReEnergy) and "continuing to JRL" were not discarded in Maine. Mr. Spencer expressed concern about the amount of OBW in the CDD, and questioned the amount of effort that goes into recycling various components of OBW such as mattresses, appliances, and furniture. Mr. Spencer argued in support of an annual limit on the amount of OBW disposed of at JRL and for waste audits of processing facilities as set forth in the Public Benefit Determination for the proposed expansion.

Intervenor Dana Snowman raised similar concerns regarding the amount and origin of wastes coming to JRL and the statutory definition of "waste generated within the State" in his questioning of the applicant's witnesses.

In response to these concerns, Michael Barden, the State's Manager for State-owned landfills, testified that out-of-state wastes are "excluded wastes" and disposal at JRL is prohibited, and he affirmed that JRL accepts only waste which meets the definition of "waste generated within the State."

Ms. King further testified that discussion of the "point of discard" is irrelevant; the State's solid waste rules do not require evidence of the point of origin. With respect to CDD and associated residuals, Ms. King testified that CDD processing facilities in Maine must demonstrate that they are complying with Maine State law "by recycling or processing into fuel for combustion all wastes accepted at the facility to the maximum extent practicable, but in no case at a rate of less than 50%." Ms. King testified that two processing facilities cited by Mr. Spencer, ReEnergy in Lewiston and ARC in Eliot, reported recycling rates in 2015 of 78.7% and 84%, respectively, (BGS/NEWSME Exhibits #49 and #50), and have met their statutory recycling and source reduction requirements. Therefore, residuals, including CDD fines and OBW, from these facilities are legally "waste generated within the State" and may be accepted at JRL.

Ms. King testified that the question for the applicant is whether the applicant could further reduce, reuse, compost, or incinerate the post-processing CDD material that JRL receives from these processing facilities. Her response was that it could not; she testified that the fines are used as alternative daily cover (a use which is defined as recycling), the primary option for handling of OBW is landfilling, and that these materials cannot be further reduced, incinerated or composted.

With respect to mattresses, a component of OBW, Ms. King testified that Casella has had limited experience with mattress recycling at other facilities in New England, but that by the time mattresses arrive at JRL, they are in poor condition (fabric contaminated, wood broken) and are not easily recycled.

Ms. King testified that waste streams entering JRL are, and will continue to be, managed consistent with the hierarchy to the extent within the applicant's control and to the maximum extent practicable, and that the hierarchy does not require a solid waste facility to control those who generate waste.

D. Board Finding

The Board finds that Casella-owned facilities have active recycling and reuse programs that divert waste from JRL. In addition, the waste management options available for most of the materials proposed to be disposed of in the landfill expansion, as set forth in the State Plan, are at or near the bottom of the hierarchy.

The concern that OBW from CDD processing facilities are landfilled without limitation is addressed by the establishment of an OBW limit for the proposed expansion in Finding 37 of this license. Compliance with the recycling and source reduction provisions of State law is further addressed in Finding 19 of this license.

With respect to intervenors Edward Spencer and Dana Snowman's argument that generators located outside Maine should be subject to Maine's laws governing recycling and source reduction, the Board finds that under current law, provided the Maine solid waste processing facilities which accept waste from outside Maine are in compliance with the terms of their licenses and State law regarding recycling, residue and bypass generated by these Maine facilities' operations sent to JRL is "waste generated within the State" and may be disposed of in the proposed JRL expansion.

The Board further finds that the applicant's purpose and practices of the proposed expansion are consistent with the applicable State laws and Rules relating to the hierarchy; provided that evolving waste management techniques and practices sufficiently within the control of the applicant continue to be explored and implemented as appropriate to reduce, reuse, recycle, compost, and/or process to the maximum extent practicable prior to landfilling. In each Annual Report, the applicant must summarize the steps taken by the facility in the respective reporting year to meet the hierarchy, submitting relevant metrics to evaluate effectiveness (i.e., tons of material diverted from landfill disposal by Casella companies; tons of materials reused, reduced, recycled at the landfill), a description of ongoing efforts to increase the effectiveness of these programs/efforts, and any additional pertinent hierarchy-related information.

19. RECYCLING

In addition to demonstrating compliance with the State's solid waste management hierarchy as described in Finding 18 of this license, State law at 38 M.R.S. § 1310-N(5-A) requires the applicant to demonstrate that the proposed solid waste disposal facility will accept solid waste that is subject to recycling and source reduction programs, voluntary or otherwise, at least as effective as those in the statute and other provisions of State law; and the applicant has shown consistency with the recycling provisions of the State Plan. Similarly, 06-096 C.M.R. ch. 400, § 6(B) requires a determination by the Department that the volume of the waste and the risks related to its handling and disposal have been reduced to the maximum practical extent by recycling and source reduction prior to being landfilled or incinerated, consistent with state recycling programs and the State Plan.

The applicant submitted the information presented in Table 6 below (Volume I of the application, Table 5-1, page 5-2 and BGS/NEWSME Pre-filed Direct Testimony Exhibit #4 appended to the testimony of Toni King) to address opportunities for recycling of the waste streams proposed to be accepted for disposal in the proposed expansion. The applicant testified that the tonnages of the various waste types in the table were estimated for design purposes and were not intended to be limits on the amounts received.

Table 6: Waste Management Techniques for Proposed Expansion Materials

Material Category	Proposed Waste Types to be Accepted in Expansion		Is Material a Residual from a Processing Facility that reduced the amount of material landfilled?	Is Material subject to recycling efforts by generator or otherwise prior to landfilling or is its use in the landfill considered recycling?	State Plan[1] Ranking of Landfill Disposal as Current Management Method	State Plan[1] Ranking for Source Reduction, Recycle, Compost, Beneficial Reuse Processing As Current Management Method
	Tons	Percentage of Total Tonnage				
Waste Treatment Plant Sludges and Biosolids	70,000	10	No	Yes	L	H,L,N,N/A
Contaminated Soils	30,000	4.3	No	Yes	H	N/A,N
Municipal Solid Waste Incinerator Ash	58,000	8.3	Yes	No	H	N/A
Front-End Processing Residue[2]	54,000	7.6	Yes	No	H	N/A
Biomass and Fossil Fuel Combustion Ash	35,000	5	Yes	Yes	M/H	N/A,M
Construction and Demolition Debris	195,000	27.9	No	Yes	H,M	N/A,N, M
Construction and Demolition Debris Processing Facility Fines	138,000	19.7	Yes	Yes	N/E	N/E
Oversized Bulky Waste	60,000	8.6	No	No	H	L

Material Category	Proposed Waste Types to be Accepted in Expansion		Is Material a Residual from a Processing Facility that reduced the amount of material landfilled?	Is Material subject to recycling efforts by generator or otherwise prior to landfilling or is its use in the landfill considered recycling?	State Plan[1] Ranking of Landfill Disposal as Current Management Method	State Plan[1] Ranking for Source Reduction, Recycle, Compost, Beneficial Reuse Processing As Current Management Method
	Tons	Percentage of Total Tonnage				
Miscellaneous special waste	35,000	5	No	No	M,H	N/A,N,M
MSW Bypass and Soft Layer Material[3]	25,000	3.6	Yes	Yes	M, H	N, N/A
Total[4]	**700,000**	**100**	**44.2**	**70.5**		

Notes: [1] Source: MEDEP Maine Materials Management Plan, January 2014, Appendix C Current Management of Maine's Solid Waste by Type; N=None L=Low; M=Medium; H=High; N/A = Not Applicable (not possible); N/E Not Evaluated.
[2] Listed as shredder residuals.
[3] Note included in Table as an individual category compared to MSW Other Organics.
[4] Values are percent of total material landfilled except tons total.

The applicant also presented evidence on Casella's efforts to facilitate recycling of a number of other waste streams and thereby decrease the volume of wastes landfilled including Casella Recycling's Zero-Sort system used by Maine municipalities (which recycles paper, cardboard, plastic, glass and metals) and Casella Recycling's offer of waste audits to commercial and industrial customers to assist with the recycling of difficult to recycle items (Pre-filed direct testimony of Ms. King).

A summary of testimony at the hearing regarding recycling and source reduction and the hierarchy, and the applicant's responses, are summarized in Finding 18 of this license.

As shown in Table 6, it is expected that 44.2% of waste disposed will be residuals (MSW incinerator ash, 8.3%; FEPR, 7.6%; Biomass and fossil fuel combustion ash, 5.0%; CDD processing fines, 19.7%; and MSW bypass, 3.6%) from processing facilities that already reduce the amount of materials landfilled. Approximately 70.5% of the waste disposed will be materials (waste treatment plant sludges and biosolids, 10%; contaminated soils, 4.3%; biomass and fossil fuel combustion ash, 5.0%; CDD, 27.9%; CDD processing fines, 19.7%; and MSW bypass, 3.6%) subject to recycling at its source or are considered recycling based upon the landfill's use.

While the percentages in the table may vary with actual operations, a review of the data indicates that overall the facility follows the State Plan ranking for recycling. A high percentage of material to be disposed of is ranked in the State Plan as either a high or medium option for landfill disposal; i.e., landfill disposal is the primary management technique available (high) or a middle option (medium). The only low landfill disposal ranked material that will be accepted at JRL includes waste treatment plant sludges and biosolids. Casella Organics, a subsidiary of NEWSME's parent company Casella, does actively compost and reuse this material at the Hawk Ridge Compost Facility in Unity, Maine. The record indicates that in 2014, 29,068 tons of waste water treatment plant sludges and biosolids were manufactured into compost and mulches, while 38,000 tons were brought to JRL for disposal (Volume I of the application, page 5-3).

The Board finds that the applicant has demonstrated that material proposed to be landfilled in the JRL expansion has been reduced to the maximum practical extent by recycling and source reduction prior to being landfilled in accordance with applicable State law and Rules provided the facility's Annual Report includes updates on recycling information similar to that in Table 6 for the waste disposed, as specified by the Department.

20. PUBLIC BENEFIT DETERMINATION

Pursuant to the provisions of 38 M.R.S. § 1310-AA and in accordance with 06-096 C.M.R. ch. 400, § 5, proposals for new or expanded solid waste disposal facilities must be found by the Commissioner to provide a substantial public benefit.

As stated in Finding 1(B)(7) of this license, the applicant originally proposed to expand JRL by 21.9 million cubic yards. The Commissioner issued a PBD approval, with conditions, for a 9.35 million cubic yard capacity increase of JRL on January 31, 2012. On appeal, the Board affirmed the Commissioner's PBD in a decision dated July 19, 2012. Pursuant to 38 M.R.S. §1310-N(3-A)(B), the Commissioner's determination of public benefit is not subject to review by the Board as part of this licensing process.

In the PBD, the Commissioner concluded that the proposed expansion will provide a substantial public benefit, provided the expansion is limited to 9.35 million cubic yards, and provided an annual limit on OBW disposal in the expansion is established. The approval included the following conditions (among others):

3. The applicant shall, if, and when, a license is issued for the construction and operation of the 9.35 million cubic yard expansion, comply with the limit, and any subsequent modifications to the limit, established by the Department in the license on the tonnage of OBW that may be disposed in the 9.35 million cubic yard expansion.

4. Periodic independent third party audits of CDD processing operations that are anticipated to transport more than 10,000 tons of OBW to the 9.35 million cubic yard expansion for disposal on an annual basis shall be conducted to verify the results of the demonstrations required under the provisions of 06-096 [C.M.R. ch. 409, § (2)(C)], focused on the nature and volume of processing residues being sent to JRL for disposal. Third party audits will be conducted by a qualified consultant selected by the Department in consultation with the affected CDD processing facilities and Casella. Casella shall reimburse the Department for the cost of the audits. The first such audit(s) shall occur prior to the disposal of OBW from these processing facilities in the 9.35 million cubic yard expansion. Audits will be conducted at 2 year intervals, unless or until the Department approves their discontinuation.

These conditions of the PBD are included in the conditions of this license. See Finding 37 of this license for further discussion of a limitation on the annual amount of OBW that may be accepted at JRL.

21. HAZARDOUS AND SPECIAL WASTE HANDLING AND EXCLUSION PLAN

Pursuant to 06-096 C.M.R. ch. 400, § 9(A), only permitted wastes may be accepted for handling at a solid waste facility; the operator shall comply with all applicable Federal and State laws regarding the detection, identification, handling, storage, transportation and disposal of special wastes, biomedical wastes and hazardous wastes; and the operator shall develop and implement a Hazardous and Special Waste Handling and Exclusion Plan for the detection, identification, handling, storage, transportation and disposal of any and all wastes that may be delivered to the facility.

Consistent with JRL’s current license, only non-hazardous waste will be allowed to be accepted in the proposed expansion. The types of acceptable wastes for disposal are further described in Finding 37 of this license. Included in the facility’s Operations Manual is a Hazardous and Special Waste Handling and Exclusion Plan which will apply to the waste delivered to the proposed expansion. This plan includes provisions for waste inspection at the gate and at the point of offloading, as well as procedures to follow if non-acceptable waste does enter the site.

Based upon the information provided by the applicant, the Board finds that the facility will not be licensed to accept hazardous waste and has an appropriate Hazardous and Special Waste Handling and Exclusion Plan for the detection, identification, handling, storage, transportation and disposal of delivered wastes. The Hazardous and Special

Waste Handling and Exclusion Plan will be updated as necessary with the annual review and revision of the facility's Operations Manual.

22. LIABILITY INSURANCE

The Department's rule at 06-096 C.M.R. ch. 400, § 10 requires a solid waste disposal facility, except public entities, to submit proof of liability insurance for the active life and closure of the solid waste disposal facility. The applicant is a public entity and is exempt from the liability insurance requirements of 06-096 C.M.R. ch. 400, § 10. Liability insurance is required by the OSA, Section 21. NEWSME submitted the current certificate of insurance maintained for the facility and NEWSME will provide copies of the updates to the current certificate of insurance in the facility's Annual Report during operation of the proposed expansion.

The Board finds that the applicant is exempt from the liability insurance requirements of 06-096 C.M.R. ch. 400, § 10 of the Rules; however, liability assurance is being maintained by NEWSME as the current operator of JRL and will be maintained for the expansion.

23. CRIMINAL OR CIVIL RECORD

In accordance with 38 M.R.S. § 1310-N(7) and 06-096 C.M.R. ch. 400, § 12, a license for a solid waste facility or activity may be denied if the owner or the operator or any person having a legal interest in the applicant or the facility has been convicted of any criminal law or adjudicated or otherwise found to have committed any civil violation of environmental laws or rules of the State, other states, the United States, or another country.

Civil and criminal disclosure statements were submitted for the BGS and NEWSME as part of the application. The disclosure statements included those for NEWSME's operation of JRL, a related entity New England Waste Services of ME, Inc. (operator of the Pine Tree Landfill), and the five officers, directors, and partners of the two businesses. Additionally, in response to the Department's review and comment on the application, the applicant submitted an organizational chart of the Casella companies authorized to do business in Maine.

In the five year environmental compliance history submitted for New England Waste Services of ME, Inc., four notices of violations and one administrative order were listed. These have been addressed through responses required by the notices of violation and administrative order.

Based upon information in the application, the Board finds that the applicant filed complete disclosure statements as required by applicable State law and Rule. Based on the disclosure statements submitted and the evaluation criteria contained in 06-096 C.M.R. ch. 400, § 12(B), the Board finds no basis for denying the license.

24. VARIANCES

Pursuant to 06-096 C.M.R. ch. 400, § 13, an applicant may seek a variance to the requirements of the Rules for establishing, altering, operating or closing a solid waste facility or handling solid waste provided the applicant demonstrates that its proposal will comply with the intent of State laws and the Rules.

The applicant requested no variances from the Rules for siting, design, or operation of the proposed expansion. The applicant submitted two variance requests related to construction practices regarding the maximum barrier soil lift thickness required by the Rules. In lieu of the variance requests, Department staff commented that the alternative design process required by 06-096 C.M.R. ch. 401, § 2(E) should be used to clearly and convincingly demonstrate the technical equivalency of the proposed alternative (see Department technical memorandum dated January 20, 2016 from S. Farrar, V. Eleftheriou, and K. Libbey). The alternative design standard procedure was agreed to by the applicant and is addressed in Finding 27 of this license.

SOLID WASTE SITING, DESIGN, AND OPERATION

25. SITE ASSESSMENT: GEOLOGIC AND HYDROGEOLOGIC

In accordance with 06-096 C.M.R. ch. 401, § 2(B) and (C), an applicant must submit the results of site investigations and assessments performed to properly describe the surficial stratigraphy and bedrock beneath and adjacent to the proposed solid waste boundary; ground and surface water investigations performed to determine water table information and horizontal and vertical ground water flow gradients and for phreatic surface (water table) observations; and geotechnical investigations to support the stability and settlement assessments. The applicant submitted a Site Assessment Report dated July 2015 prepared by SME (Volume II of the application). The applicant must demonstrate the proposed expansion meets the performance standards and siting criteria in 06-096 C.M.R. ch. 401, § 1(C).

Department staff reviewed the geological and hydrogeological aspects of the proposed expansion prior to the hearing and submitted comments to the applicant in several memoranda. The applicant addressed a number of the staff’s comments and made a number of adjustments to the application in response to those comments.

A. General Site Geology Description

Information submitted by the applicant shows that the site of the proposed expansion is in an area underlain by glacial till, on an elongated hill oriented in a northwest-southeast direction understood to have been formed as a glacial drumlin. Dense, silt-clay glacial till is primarily beneath the proposed expansion, with occasional thin, isolated portions of washed till observed typically just above the bedrock. Marine clay was observed over till beyond the proposed expansion boundary. The glacial till ranges from less than 5 feet to greater than 50 feet thick beneath the proposed expansion footprint (average thickness between the landfill base grades and bedrock surface is an estimated 24.5 feet), with approximately 3.6 acres of the footprint having an existing overburden thickness of less than 5 feet. The near-surface till was determined to be fractured above the frost/desiccation zone due to weathering and frost action.

Bedrock beneath the proposed expansion is mapped as interbedded metamorphosed quartzite, siltstone, graywacke, and phyllite of the Vassalboro Formation (Maine Geological Survey mapping, Griffen, 1979a, Osberg et al, 1985), with no bedrock faults mapped within the site. Core samples were primarily metagraywacke and phyllite, with some metasiltstone. Four bedrock outcroppings were observed directly adjacent to the proposed expansion with fracture groupings oriented northwest/southeast and northeast/southwest. The bedrock is only slightly broken, weathered, and stained within the upper several feet, but is generally hard, unweathered, and competent with depth.

Hydraulic conductivities were measured during previous JRL investigations, with the following results: brown and gray glacial tills ranged from 1.8×10^{-5} to 2.4×10^{-8} centimeters per second (cm/sec); discontinuous washed till and sandy zones within the basal till had a geometric mean of 5.3×10^{-4} cm/sec; and bedrock ranged from 3.2×10^{-3} to 9.2×10^{-8} cm/sec.

Based upon the information in the application and supporting documents in the record, the Board finds that the applicant characterized the site geology in accordance with the requirements of 06-096 C.M.R. ch. 401, § 2(B)(1).

B. General Site Ground and Surface Water Description

The application includes information showing that the total 780-acre parcel is divided into four watersheds which drain to the east, northwest, northeast, and southwest. There is a relatively shallow water table from approximately 5 to 10 feet beneath much of the facility property due to the relatively low hydraulic conductivities of the natural soils and bedrock; therefore, the ground water flow generally follows the topography and is expected to flow from the higher elevations towards the west and east following the drumlin as a ground water divide. Recharge at the higher topographical elevations occurs primarily through precipitation and snowmelt, with ground water moving mainly horizontally and discharging to locations along streams and low-lying topography. Upward vertical seepage gradients are located on the east and west lower portion of the drumlin beyond the proposed expansion footprint.

There are no stratified sand and gravel deposits mapped by the Maine Geological Survey within the landfill site. Further discussion of standards related to significant ground water aquifer can be found in Finding 15 of this license.

Based upon the information in the record, the Board finds that the applicant characterized the site hydrogeology in accordance with the requirements of 06-096 C.M.R. ch. 401, § 2(B)(2).

C. Site Investigations and Proposed Expansion Area Specifics

The applicant submitted data and summaries of site-specific investigations conducted within and around the proposed expansion area from 2004 to the present, including:

(1) Wetlands delineation within 2,000 feet of the proposed expansion footprint;

(2) Subsurface test pits and borings to sample and evaluate soil and bedrock lithologies;

(3) Bedrock coring for mapping, fracture frequency measurement, and porosity estimation;

(4) Surficial geophysical surveys using electrical earth resistivity and Very Low Frequency-Electromagnetic (VLF-EM) methods to identify bedrock fracture zones and other features;

(5) Borehole geophysical logging to identify and quantitatively characterize bedrock fracture orientation and structural features;

(6) Installation of multi-level piezometer clusters and monitoring wells to determine seasonal ground water flow rates and direction;

(7) In-situ hydraulic conductivity testing in monitoring wells and piezometers for both till and bedrock;

(8) Testing of soil properties;

(9) Laboratory hydraulic conductivity testing of undisturbed till samples for vertical hydraulic conductivity;

(10) Natural gradient ground water tracer tests to measure ground water velocities in till and bedrock;

(11) Ground water age-dating for ground water velocity verification;

(12) Bedrock pumping tests for fracture interconnectivity; and

(13) Water quality testing of the natural background ground water.

The information collected, specific methods used, and the results of the evaluations were included in the application. The results of the evaluations were utilized to confirm the site characteristics and in the design of the proposed expansion.

The water table (ground water phreatic surface depth) was found to vary between 0 and 2 feet below the existing ground surface during the wet season, whereas the dry season water table varies between 5 and 10 feet beneath the existing ground surface. Due to the shallow water table depth, the northeast side of the proposed expansion will be subject to upward ground water seepage into the construction excavations; therefore, the applicant will install an underdrain in the 12.7-acre area. It is expected that the seepage into the underdrain will continue, but then will eventually diminish since there will be less recharge once the area is covered, first by the liner systems, and eventually by a final cover system.

Information provided by the applicant shows that the fine-grained glacial till can be considered to provide some natural containment under the proposed expansion. The applicant used a variety of hydrogeological methods to estimate the horizontal ground water velocities. The calculated ground water velocities ranged from 1 to 24 feet per year (ft/yr) through the till. The natural gradient tracer test revealed a range of horizontal ground water velocities of about 10 to 24 ft/yr for the near surface weathered till. Subsequent estimates of travel time to sensitive receptors incorporated conservative estimates of horizontal ground water velocities.

Ground water movement through the bedrock under the proposed expansion is a function of the overall interconnectivity of the bedrock's fracture and joint openings. Based on pumping tests, bedrock tracer tests, and other investigative methods, the applicant concluded that the degree of bedrock fracture interconnectivity beneath the proposed expansion allows for a level of predictability of ground water movement through the site's bedrock and could be utilized for controlling ground water flow directions by means of ground water extraction wells if a leachate leak were to occur. The applicant's estimates of site-wide horizontal bedrock ground water velocities range from about 0.4 to 10 feet per day. Based on its ground water modeling, the applicant estimated that post-construction ground water flow directions beneath the proposed expansion are projected to be in a generally southerly direction.

Over the course of the review and comment period on the application, Department staff requested the collection of supplemental data from three additional boreholes at suggested locations within the proposed expansion footprint, and the geophysical downhole logging of those boreholes and the two water supply wells serving the office and scale house. The applicant conducted the requested drilling and geophysical downhole logging and submitted the results of the data collected in a report to the Department on June 7, 2016.

During its review of the application, Department staff raised several questions regarding the interpretation of the pumping test data and resulting ground water level drawdowns. The applicant responded to the Department's questions through additional correspondence, resulting in a Department memorandum dated June 21, 2016 from R. Behr stating that the Department's concerns have been addressed.

In his testimony and cross-examination, intervenor Edward Spencer posed questions regarding the site geology, including the impact of glacial rebound on landfill stability, the use of an underdrain system below ground water level, and potential ground water flow beyond the site. One of the applicant's expert witnesses, John Sevee, P.E., C.G., testified that glacial rebounding will have no effect on the integrity of the landfill or the slope of the drainage pipes since the crustal rebound is occurring over the entire region surrounding the landfill. Michael Booth, expert witness for the applicant, testified that the underdrain system was primarily designed to facilitate construction and will be monitored as part of the water quality monitoring program. Mr. Sevee testified that ground water flow paths were investigated through wells and borings, along with utilizing ground water simulations which indicated that ground water emanating from the landfill site does not pass to ground water users along Route 16, Route 43, or Stagecoach Road.

Based upon the information in the record, the Board finds that the applicant has submitted a site assessment report and subsequent information addressing Department staff's review comments, identified the site characteristics and recommendations for landfill design and construction, identified potential impacted sensitive receptors, and estimated ground water flow time of travel as required by 06-096 C.M.R. ch. 401, §§ 2(B) and (C). See Finding 33 of this license for further discussion regarding the Water Quality Report and Ground Water Monitoring Program.

The Board further finds that the underdrain system was included and designed specifically to minimize ground water intrusion during construction and that, in the future, the ground water level will flatten due to less recharge once the proposed liner system is placed. Addressing the concern of ground water flow beyond the site, the Board finds that extensive site assessments have been undertaken and submitted in the past and with this application to characterize the geology and hydrogeology at the site and to serve as the basis for the selection of the design of the proposed expansion.

D. Geotechnical Investigation

The applicant submitted the results of its geotechnical investigations as part of the site assessment. Based on the information provided by the applicant in the site investigations, including published data, on-site field and laboratory data, and specific seismic information, the Board finds that the applicant gathered sufficient information to support the stability and settlement assessments described in Findings 28A and B of this license, as required by 06-096 C.M.R. ch. 401, § 2(B)(3).

E. Time of Travel Calculations

The applicant submitted a time of travel analysis to demonstrate conformance with the Rule's performance standard of greater than 6 years from the bottom of the landfill to sensitive receptors and greater than 3 years from leachate storage structures and pump stations to sensitive receptors set forth in 06-096 C.M.R. ch. 401, § 1(C)(1)(c). Improvement allowances for the leak detection system and a composite secondary liner system were included in the calculations as described in Finding 26B of this license. An imported soil layer of 12 inches of compacted, low permeability, marine clay to be placed below the secondary liner system in the proposed expansion area was also taken into account in the calculations as allowed in 06-096 C.M.R. ch. 401, § 2(C)(2), based on the use of improvement allowances and the hydraulic conductivity and effective porosity of the marine clay. The analysis included time of travel from each of the proposed expansion cells and the two proposed permanent leachate sumps. The applicant did not include the existing leachate storage tank in its calculations because it was previously addressed in license #S-020700-WD-N-A, dated April 9, 2004.

The sensitive receptors were selected based on the requirements in the Rules and site-specific characteristics and are listed in Table 7 (Volume II of the application, Table 7-1, page 7-6).

Table 7: Identified Site Sensitive Receptors

Identification	Location Description
Point A	Southeast sandy zone
Point B	Hypothetical Groundwater Supply Well at Closest Property Boundary on Eastern Side.
Point C	Surface Water Discharge to the East. An Unnamed tributary to Judkins Brook.
Point D	Surface Water Discharge to the Southwest. An Unnamed Tributary to Pushaw Stream.
Point E	Hypothetical Groundwater Supply Well at Closest Northern Corner of Property Boundary on Western Side.
Point F	Hypothetical Groundwater Supply Well at Closest Southern Corner of Property Boundary on Western Side.
Point G	Surface Water Discharge to the Northwest. An Unnamed Tributary to Pushaw Stream.

The applicant provided results of the time of travel calculations as shown in Table 8 (based on combining two tables in the application, Volume II, Tables 7-3 and 7-4 on page 7-11, and the applicant's update in the second response to comments dated May 13, 2016, with added footnotes for clarity). The analysis was performed twice: under current conditions and under future conditions when the ground water table flattens due to the cutoff of precipitation recharge when the area is covered (first by the liner system, then eventually by the final cover system).

Table 8: Calculated Travel Times to Site Sensitive Receptors

Landfill Node	Site Sensitive Receptor	Offset Credits[1] (yrs)	Imported Soils[2] (yrs)	Existing Conditions		Future Conditions		Rule Require-ment (yrs)
				Calculated Travel Time in Soil and Bedrock (yrs)	Total Travel Time (yrs)	Calculated Travel Time in Soil and Bedrock (yrs)	Total Travel Time (yrs)	
Cell 11 Southern End	Point A	3	3	10.5	**16.5**	10.5	**16.5**	**6**
Cell 11 Center	Point B	2	3	3.9	**8.9**	3.9	**8.9**	**6**

Landfill Node	Site Sensitive Receptor	Offset Credits[1] (yrs)	Imported Soils[2] (yrs)	Existing Conditions		Future Conditions		Rule Require-ment (yrs)
				Calculated Travel Time in Soil and Bedrock (yrs)	Total Travel Time (yrs)	Calculated Travel Time in Soil and Bedrock (yrs)	Total Travel Time (yrs)	
Cell 12 Center	Point C	2	3	11.3	**16.3**	11.4	**16.4**	**6**
Cell 13 Center	Point C	2	3	11.0	**16.0**	11.2	**16.2**	**6**
Cell 13 Leachate Sump	Point C	2	3	35.8	**40.8**	36.1	**41.1**	**3**
Cell 14 Center	Point D	3	3	47.7	**53.7**	62.2	**68.2**	**6**
Cell 14 Center	Point E	3	3	3.3	**9.3**	17.7	**23.7**	**6**
Cell 15 Center	Point F	2	3	1.2	**6.2**	1.4	**6.4**	**6**
Cell 16 Center	Point G	2	3	4.7	**9.7**	5.3	**10.3**	**6**
Cell 16 Leachate Sump	Point G	3	3	10.3	**16.3**	10.3	**16.3**	**3**

Notes: [1] Improvement allowance offset credits are described in Finding 26B of this license.
[2] 06-096 C.M.R. ch. 401, § 2(C)(2) allows for imported soils used for base preparation below liner systems to account for up to three years in the time of travel calculations, as appropriate.

Intervenor Edward Spencer testified that time of travel calculations appear to be an acknowledgement that a landfill leak will occur. Michael Booth, an expert witness for the applicant, testified that the time of travel analysis is required by the Rules and is utilized as a design evaluation tool.

Based on the information in the record, the Board finds that the applicant meets the Rule requirements of ground water time of travel from the bottom of the landfill liner systems (greater than 6 years) and leachate storage structures and pump stations (greater than 3 years) to all identified sensitive receptors. The applicant installed piezometers and water table observation wells at a sufficient number of locations to enable a calculation of ground water time of travel and performed the calculations with the appropriate information in accordance with the Rules.

26. DESIGN STANDARDS: ENGINEERING

The Department's rule at 06-096 C.M.R. ch. 401, § 2(D) requires an engineering design for a proposed landfill to meet specific design and performance standards. The applicant submitted engineering design information in support of the proposed expansion. As noted previously, a number of rounds of comments and responses occurred between Department staff and the applicant on the technical aspects of the proposed expansion design.

In general, the applicant's design of the proposed expansion consists of an underdrain and augmented secondary liner system over portions of the proposed expansion footprint, two liner systems (primary and secondary), a leak detection system, leachate and gas collection and control systems, and intermediate and final cover systems. The outer side slopes are designed at 3H:1V (3 horizontal to 1 vertical), with a maximum final elevation of 390 feet above mean sea level. Six operational cells are proposed. The applicant submitted a detailed engineering design including drawings, contract administrative documents, technical specifications and a construction quality assurance plan for Cell 11 with the application. Similar detailed engineering designs are required to be submitted for Department review and approval prior to each subsequent cell's construction.

A. Liner System Requirements

The liner system proposed for the expansion includes a composite primary liner, a leak detection system, and a secondary liner system. The proposed liner system consists of the following from top to bottom:

(1) A composite primary liner system consisting of an 80-mil HDPE textured geomembrane, a GCL, and a 12-inch compacted clay layer (hydraulic conductivity less than or equal to $1x10^{-7}$ cm/sec);

(2) A leak detection system consisting of a 12-inch layer of sand (average hydraulic conductivity greater than or equal to $1x10^{-2}$ cm/sec and a minimum hydraulic conductivity of $5x10^{-3}$ cm/sec), a network of 6-inch diameter perforated HDPE pipe, and a drainage geocomposite; and

(3) A secondary liner system consisting of a 60-mil HDPE textured geomembrane. The secondary liner system will be augmented with a GCL and 12 inches of compacted clay (hydraulic conductivity less than or equal to $1x10^{-7}$ cm/sec) on approximately 11 acres where the existing soil depth between the bedrock and landfill base grades is less than 10 feet.

Intervenor Edward Spencer voiced concerns in his testimony that the liner systems will eventually leak. In response, Michael Booth, expert witness for the applicant, countered the claim that all liner systems must necessarily leak, focusing on the following proposed expansion items: the expansion primary and secondary liner system was specifically designed to address potential leak issues, the construction process will include an electrical leak location survey of the primary geomembrane, the specifications for the geomembranes require compliance with ASTM standards (including stress cracking standards), construction specifications and practices will mitigate pressure points beneath the geomembrane that could lead to stress cracks, and the proposed expansion design eliminates liner penetrations for piping.

The Board finds that the liner system proposed by the applicant was designed in accordance with 06-096 C.M.R ch. 401, § 2(D)(1). The Board also finds that the proposed HDPE geomembranes for both the primary and secondary liner systems are thicker than the 60-mil and 40-mil Rule requirements, respectively. The Board finds that the geomembranes, GCLs, drainage geocomposites, and soils proposed will meet the performance requirements of the Rules, including material characteristics (i.e., Geosynthetic Research Institute standards and American Society for Testing and Materials (ASTM) standards) and installation requirements. Further, the applicant will be required to submit detailed design packages including the engineering design, drawings, contract administrative documents, technical specifications and a construction quality assurance plan to the Department for review and approval prior to the construction of each cell.

B. Improvement Allowance System (Time of Travel)

The Department’s rule at 06-096 C.M.R. ch. 401, § 2(D)(2) allows for the use of improvement allowance offsets when calculating existing ground water time of travel to achieve the minimum 6 year time of travel to sensitive receptors.

The applicant incorporated improvement allowance offsets in the time of travel demonstration. Finding 25(E) of this license includes additional time of travel information.

The Board finds that the applicant utilized the allowance offsets appropriately as permitted by the Rules for the following two design improvements: a two year offset for the addition and monitoring of a leak detection system and geomembrane secondary liner for the areas of the proposed expansion where the design is applied; and a three year offset for the addition of a composite liner system (secondary liner augmented by a GCL) and leak detection system for the areas where the bottom of the secondary liner system and the bedrock surface is generally less than 10 feet.

C. Base Preparation Below Liner Systems

The base preparation below the liner system proposed by the applicant includes grading native till subgrades, filling with native till material (maximum 12-inch lift), placement of an underdrain system (12 inches of sand and 4-inch collection pipes) where the proposed grades are below the phreatic surface, and placement of 12 inches of compacted clay soils (maximum hydraulic conductivity of $1x10^{-7}$ cm/sec).

Based upon the information provided by the applicant, the Board finds that the base preparation below the liner system proposed by the applicant was designed in accordance with 06-096 C.M.R. ch. 401, § 2(D)(3). The proposed grading plan will result in positive drainage to the perimeter of the landfill for the underdrain, leak detection, and leachate collection systems. The materials and placement will meet the performance criteria in the Rules, including gradation, moisture content, density, and hydraulic conductivity.

D. Leachate Conveyance System and Storage Structure Standards

The applicant submitted leachate collection and conveyance system designs for the proposed expansion to handle the predicted leachate, leak detection, and landfill gas condensate flows. The leachate management system components include leachate collection, leak detection, landfill gas condensate collection, leachate transport from the landfill to on-site storage, and the on-site leachate storage tank. The leachate, leak detection, and gas condensate systems include pumping systems and force mains to pump flows from each collection point to the tank. The design of the piping system for collection and conveyance accounts for the stresses due to dynamic and static loading conditions and climate effects anticipated over the life of the landfill. System designs also address filter criteria such as sizing of piping perforations, soil gradation, and component interfaces, so that clogging of the systems will be minimized. The systems were designed for use during operations, closure, and post-closure. All piping components are designed with access for inspection and cleaning.

(1) Leachate Collection System

The applicant designed the leachate collection system to allow all leachate to drain to a collection sump at the low point of the individual landfill cells. Components of the leachate collection system include 6-inch and 8-

inch diameter HDPE collection piping, 12 inches of sand (average hydraulic conductivity greater than $1x10^{-2}$ cm/sec and minimum hydraulic conductivity of $5x10^{-3}$ cm/sec), filter stone and drainage stone around the piping, and a drainage geocomposite.

The applicant used the U.S. Environmental Protection Agency (EPA)'s Hydrogeologic Evaluation for Landfill Performance (HELP) model to estimate leachate generation rates for the proposed expansion. The leachate depth (head) over the primary liner system will be limited to 12 inches, except in leachate sumps. The leachate levels within the landfill cells will be monitored using pressure transducers located at the bottom of each cell.

The application shows that a five-foot layer of select waste will be placed directly over the drainage sand component of the leachate collection system for frost protection, to protect the liner from puncture by other wastes placed in the landfill, and to serve as a filter medium.

In his testimony, intervenor Edward Spencer questioned whether the horizontal pipes in the leachate collection system may collapse. Michael Booth, expert witness for the applicant, testified that the leachate collection pipes are specifically designed for the expansion setting.

Based on the information in the application and hearing record, the Board finds the leachate collection system proposed by the applicant was designed in accordance with 06-096 C.M.R. ch. 401, § 2(D)(4). The Board further finds that the applicant performed static and seismic stability and settlement analyses to address potential movement of the piping in addition to including piping specifications in the application.

(2) Leak Detection System

The application shows that a leak detection system for the proposed expansion will be located under the primary liner system and will consist of the following, from top to bottom: 12-inches of drainage sand, crushed stone, perforated 6-inch diameter HDPE pipe surrounded with drainage stone and a drainage geocomposite. The applicant designed the leak detection system to detect leachate from each cell's primary liner system within 30 days. The fluids collected in the leak detection system will drain by gravity to individual collection sumps located at the low point of each cell and will be pumped to the leachate collection system and from there pumped into the leachate transport system. Each pump will include a flow meter and sampling ports.

The Board finds the leak detection system proposed by the applicant was designed in accordance with 06-096 C.M.R. ch. 401, § 2(D)(4).

(3) Landfill Gas Condensate System

The application shows that the LFG condensate collection system for the proposed expansion consists of U-shaped condensate traps at low points in the gas conveyance pipe to remove liquid. Condensate collected in the traps will drain to a primary leachate collection system pipe. From there it will be conveyed to an existing landfill leachate header pipe and transported to the on-site leachate storage tank.

The Board finds that the applicant has appropriately addressed collection of LFG condensate as required by 06-096 C.M.R. ch. 401, § 2(D)(4).

(4) Leachate Transport

As stated in the application, leachate transport for the proposed expansion includes temporary and permanent internal cell pump stations that will deliver leachate to dual-walled force mains (6-inch by 10-inch diameter) located within the eastern and western perimeter berms. Temporary pump stations will be installed in each of Cells 11, 12, 14, and 15 and will be utilized during each cell's active period, to be discontinued when each cell becomes inactive and the subsequent lower grade cells are developed. The inactive cell's leachate piping will be connected to the next cell's piping system. The permanent pump stations will be located in Cells 13 and 16 at the lowest base grades and will be operated during active and post-closure periods. Both the temporary and permanent leachate pump stations will utilize a sump and pump design that avoids penetrations of the liner system. The pump stations were sized using the HydroCAD Model to account for storm events and storage volume. Sample ports will be included in all pump stations to allow for the sampling of leachate and each pump will have continuous recording flow meters.

The Board finds the applicant has appropriately addressed the transport of the leachate pursuant to 06-096 C.M.R. ch. 401, § 2(D)(4).

(5) Leachate Storage

As stated in the application, calculations demonstrate that the existing 921,000 gallon above ground glass-lined leachate storage tank is capable of handling the maximum anticipated leachate during the life of the proposed expansion. The storage tank is surrounded by a secondary containment structure with an available volume of 110 percent of the tank. The storage tank was addressed during the issuance of Department license #S-020700-WD-N-A. From the storage tank, tanker trucks will remove the leachate and transport it to the MFGR, LLC wastewater treatment plant in Old Town for treatment and disposal as described in the Leachate Disposal Agreement between MFGR, LLC and NEWSME, effective April 27, 2016. The City of Brewer wastewater treatment plant is available as a back-up disposal facility as described in Industrial Wastewater Discharge Permit #37-2679-07, effective March 3, 2013.

The Board finds the applicant has appropriately addressed on-site leachate storage and off-site treatment and subsequent disposal in accordance with 06-096 C.M.R. ch. 401, § 2(D)(4).

E. <u>Seismic Impact Zone</u>

Information in the application shows that the proposed expansion is located in a seismic impact zone as identified by U.S.G.S. Seismic Hazard Maps. The facility's structures, including liner systems, leachate collection systems, and surface water control systems for the proposed expansion were designed to withstand the maximum horizontal acceleration identified by the Hazard Maps. Additional seismic discussion can be found in Finding 28(A) of this license.

Based upon information in the record, the Board finds that the proposed expansion has been designed to meet the seismic requirements of 06-096 C.M.R. ch. 401, § 2(D)(5).

F. <u>Phased Operations</u>

As set forth in the application, the proposed expansion was designed for phased construction, taking into account waste operations and cover placement, stormwater run-on and run-off, leachate management, protection of the liner system from freeze and thaw effects, and stability. Individual cell size was based on the design waste disposal rates, resulting in approximately 2 years of active waste placement in each cell. Final cover will be installed in a phased manner during construction seasons when new cells are not being developed.

The Board finds that the submitted cell development plans for the 6 proposed cells meet the requirements of 06-096 C.M.R. ch. 401, § 2(D)(6).

27. ALTERNATIVE DESIGN PROCESS

Pursuant to 06-096 C.M.R. ch. 401, § 2(E), an applicant may propose alternatives to the minimum design standard and requirements of section 2(D) of the rule. An applicant is required to submit documentation to clearly and convincingly demonstrate technical equivalency of the proposed alternative.

A. Liner System Barrier Soil Lift Thickness

The landfill liner system requirements include a barrier soil layer placed in maximum lift thicknesses of 9 inches pursuant to 06-096 C.M.R. ch. 401, § 2(D)(1)(g)(iv). The applicant has proposed a barrier soil lift thickness of 12 inches, as has been utilized in the past during construction of Cells 7, 8, and 9 at the existing landfill. The test pad programs utilized during the construction of these cells demonstrated that the performance criteria required in the Rules (densities, moisture content, hydraulic conductivity, soil remolding, and lift bonding) were met utilizing the current available compaction techniques and equipment and project specific soils.

The Board finds that the applicant has submitted documentation referencing past practices that clearly and convincingly demonstrates technical equivalency of placing barrier soil in a 12-inch lift thickness compared to a 9-inch lift thickness, provided that a test pad program is undertaken as proposed in the application and described in Finding 28(L) of this license during construction of each cell of the proposed expansion to demonstrate that the required performance criteria will be met and the results submitted to the Department at least 7 days prior to full scale construction. If the applicant cannot demonstrate technical equivalency, the maximum barrier soil lift thickness will remain 9 inches.

B. Base Preparation Below Liner Systems Lift Thickness

The requirements for constructed base materials below liner systems include a base material maximum allowable compacted lift thickness of 9 inches pursuant to 06-096 C.M.R. ch. 401, § (2)(D)(3)(e). Similar to the liner system barrier soil request described in Finding 27(A) above, the applicant has proposed the placement of barrier soil in a 12-inch lift thickness compared to the required 9-inch lift thickness.

Based on the same reasons noted above for the liner system barrier soil lift thickness, the Board finds that the applicant has submitted documentation during past practices that clearly and convincingly demonstrates technical equivalency of placing barrier soil in a 12-inch lift thickness compared to a 9-inch lift thickness for base material placement, provided that a test pad program is undertaken as proposed in the application and described in Finding 28(L) of this license during construction of each cell of the proposed expansion to demonstrate that the required performance criteria will be met and the results submitted to the Department at least 7 days prior to full scale construction. If the applicant cannot demonstrate technical equivalency, the maximum barrier soil lift thickness will remain 9 inches.

28. ENGINEERING REPORT

The Department's rule at 06-096 C.M.R. ch. 401, § 2(F) requires the applicant to submit an engineering report detailing the basis for engineering design and the proposed construction procedures, utilizing site specific factors and analyzing potential modes and significance of engineered system failures. The application and subsequent information submitted by the applicant addressing Department review comments, included data, calculations, assumptions, and evaluations for the following aspects of the proposed expansion:

A. Stability Assessment

The application for the proposed expansion included a slope stability assessment which analyzed static and seismic loads during construction, operation, and post-closure periods. The stability evaluation included four cross-sections of the proposed expansion representing the steepest base liner slope angle, the steepest final sideslope angles, the greatest waste thickness, and the tallest and steepest exterior waste grades. The geotechnical properties were based on data collected from previous field and laboratory studies and construction projects. The data included density, internal and external friction properties, and cohesion/adhesion as applicable.

The applicant used two potentiometric surfaces in its assessment of landfill stability based on the following: maintenance of the leachate level within the base liner system and a conservative assumption that the potentiometric surface beneath the entire landfill is coincident with the bottom of the base liner system. A sensitivity analysis was completed to evaluate the potential impact of higher water levels. Seismic slope stability was evaluated, utilizing site specific Hazard Maps and the acceptable accelerations. As part of the seismic stability evaluation, the applicant also submitted a liquefaction and deformation analysis. In addition, a sensitivity analysis was performed on two of the cross-sections for horizontal deformation (strain) of the base liner system.

The site specific data and design parameters were used by the applicant as input to the slope stability computer analysis program SLOPE/W. The resultant calculated factors of safety exceeded the minimum acceptable values required by the Rules, demonstrating that in-place waste and foundation soils beneath and adjacent to the waste can support the proposed expansion loads. The results of the stability assessment and comparison to the applicable safety factor requirements are presented in Tables 9 and 10 (based on the application, Volume III, Table 3-9, page 3-21 and separated into two tables for presentation clarity).

Table 9: Stability Assessment Result Summary
Calculated Slope Stability Minimum Factors of Safety
for Construction and Operations

Cross-Section	Static Condition				Seismic Condition			
	Waste, Shallow surficial	Liner, Block	Foundation (circular)	Rule Minimum	Waste, Shallow surficial	Liner, Block	Foundation (circular)	Rule Minimum
A-A’	1.91	1.73	2.65	1.3	1.54	1.37	2.14	1.1
B-B’	2.43	2.01	2.93		1.88	1.50	2.26	
C-C’	1.90	1.75	2.17		1.53	1.39	1.75	
D-D’	1.92	1.82	2.61		1.55	1.45	2.07	

Table 10: Stability Assessment Result Summary
Calculated Slope Stability Minimum Factors of Safety
for Post Closure

Cross-Section	Static Condition				Seismic Condition			
	Waste, Shallow surficial	Liner, Block	Foundation (circular)	Rule Minimum	Waste, Shallow surficial	Liner, Block	Foundation (circular)	Rule Minimum
A-A’	1.81	1.72	2.65	1.5	1.11	1.00	1.62	1.0
B-B’	2.33	1.98	2.90		1.32	1.05	1.64	
C-C’	1.81	1.74	2.17		1.11	1.01	1.33	
D-D’	1.84	1.81	2.54		1.11	1.04	1.52	

As the proposed expansion development occurs, the applicant will perform individual slope and interface stability assessments as part of each cell design to confirm the construction and operational phase stability. Similar assessments for each cover system construction project will also be performed.

Based on the information provided in the application, the Board finds that the applicant has met the requirements in 06-096 C.M.R. ch. 401, § 2(F)(1) for static and seismic stability factors of safety, as demonstrated in a slope stability assessment for static and seismic loads during construction, operation, and post-closure periods.

B. <u>Settlement Assessment</u>

The applicant submitted a settlement assessment to predict total and differential settlements of the landfill liner systems, leachate management systems, and cover system components. The settlement assessment quantified the anticipated primary and secondary settlements of the landfill waste and foundation soils and evaluated the effect of the settlements on the base liner system, leachate collection, and cover system components.

The foundation soils below the proposed expansion are a dense to very dense glacial till. Settlement of the foundation soils is predicted to be between 0.0 to 0.3 feet. It was determined that neither the base liner nor leachate collection systems will be compromised by the predicted settlement, since the strains on the geosynthetics (i.e., geomembrane, GCL, drainage geocomposite) will be within acceptable limits, the base liner slopes are estimated to change by less than 0.1% from the design slopes, and the leachate collection piping would continue to maintain positive drainage.

The waste and cover settlement was projected based on the similar composition and behavior of waste existing at the facility. The calculated combined primary and secondary settlements would be between 0 to 8 feet at the end of the 30-year post-closure period. The applicant does not expect these settlements to compromise the cover system since the settlement is projected to occur in a uniform, gradual manner, the cover system's initial slope angles are sufficient to maintain positive drainage even with the predicted settlement, and tensile strains at 0.1% are well below the allowable strain for the textured, linear low density polyethylene (LLDPE) or HDPE geomembrane to be used as a component of the final cover system.

The Board finds that the applicant has met the settlement requirements in 06-096 C.M.R. ch. 401, § 2(F)(2), confirming future predicted settlement will not adversely affect the landfill liner system, leachate collection system, and cover system components.

C. Stability and Settlement Monitoring Plan

The Stability and Settlement Monitoring Plan submitted in the Design Report prepared by SME (Volume III, Section 3.1.5, page 3-26) and the referenced geotechnical monitoring plan (Operations Manual, Volume IV, Appendix N of the application) proposed for the expansion include the installation and monitoring of pore-water pressure transducers at the base of each cell and geotechnical slope stability and settlement inspections of the facility. The pressure transducers will be connected to the pump station control panels and will measure leachate head on the liner system to confirm the leachate collection system design assumptions. The annual inspections will be performed by a qualified geotechnical engineer to observe slopes for cracks, sloughs, seeps, leachate breakouts, displacements, toe-heaving, areas of stressed vegetation; to observe any water ponding; and to compare recent waste placement topographic maps with the previous year's information.

As part of the annual geotechnical inspection, the applicant proposes to conduct an annual review of waste types, quantities, location of waste placement; evaluation of pore pressure data; and review of site aerial topographic surveys. If the design assumptions such as waste streams and pore pressures have changed, then a reassessment may be warranted. A summary of the geotechnical inspections and evaluations will be included in the facility's Annual Report.

The Board finds that the Stability and Settlement Monitoring Plan submitted by the applicant meets the requirements of 06-096 C.M.R. ch. 401, § 2(F)(3) and that the applicant must include the results of the geotechnical inspections and evaluations in a geotechnical report submitted in the Annual Report.

D. Water Balance

EPA's Hydrologic Evaluation of Landfill Performance (HELP) Model was used by the applicant to evaluate the rates and volumes of leachate, including consolidation water, to be generated by the landfill during operations, closure, and post-closure periods. The model results identified the most critical leachate generation conditions over the life of the proposed expansion and were used to design the leachate collection system. Three simulations were performed under conditions of open active waste filling assuming 10 feet of waste and no cover, an intermediate covered condition assuming 90 feet of waste and 18 inches of soil cover, and a final cover condition. The average daily leachate flows were estimated to be approximately 48,000 gallons per day from the entire facility during the operation of the proposed expansion, with an average daily flow during the peak monthly condition of approximately 57,500 gallons per day. The estimated yearly flows ranged from approximately 22.9 million gallons per year during the operation of Cell 12 to approximately 13.8 million gallons per year during the operation of Cell 15.

The Board finds that the applicant has met the requirements in 06-096 C.M.R. ch. 401, § 2(F)(4) for adequately designing the leachate collection system to convey the predicted leachate flow from the proposed expansion.

E. Leachate Management

The Rules require the applicant to select an appropriate leachate management method and require a leachate management plan. In accordance with 06-096 C.M.R. ch. 401, § 2(F)(5), leachate management options available to the applicant include "off-site transport to a licensed wastewater treatment facility for treatment and disposal." The applicant has proposed to continue the method currently employed at the existing landfill; namely, leachate will be collected and conveyed through a series of pipes above the primary liner system, pumped to the on-site leachate storage tank and trucked to the MFGR, LLC (MFGR) wastewater treatment plant in Old Town (disposal agreement signed April 27, 2016). A contingency plan for leachate disposal limitations at contracted treatment facilities is required in 06-096 C.M.R. ch. 401, § 2(F)(5)(e)(iii), including a letter of intent or service contracts for such proposed contingencies. To meet this requirement, the applicant has provided a back-up agreement for leachate treatment, held with the City of Brewer wastewater treatment plant (disposal agreement effective March 3, 2013). Both MFGR and City of Brewer disposal agreements have a term of 5 years and both treatment facilities hold current wastewater licenses from the Department, as required by the Rules.

The design calculations and drawings for the leachate collection and transport system were submitted with the application and are further described in Finding 26(D) of this license. The leak detection system, located beneath the primary liner system, includes the capability to measure both flow and quality of liquid collected by the system. The leak detection system was based on a design leakage rate as defined in 06-096 C.M.R. ch. 400. The design leakage rate for the primary liner component of the system was calculated to be 0.26 gallons per acre per day, based on potential variables such as geomembrane imperfections, the head above the primary liner, the uniformity of contact between the geomembrane and underlying soil/GCL, and the hydraulic conductivity of the material in contact with the primary liner. In conjunction with the siting and design specifics of the proposed landfill, the design leakage rate is required to be taken into account for assessing hypothetical failures. The leak detection system was designed to detect leaks from each cell's primary liner system within 30 days, and have sufficient hydraulic capacity to transmit the flow associated with the Action Leakage Rate (ALR) for the proposed expansion. The applicant proposed to determine leachate leakage by comparing the measured specific conductance to values calculated using the selected ALR, leachate specific conductance, and baseline measurements. The monitoring methodology was included in the Liner Action Plan (LAP), submitted as part of the proposed expansion application in the Operations Manual.

During review of the application, Department staff commented on the proposed LAP and recommended an initial two-tiered ALR program based on 20 and 100 gallons per acre per day, followed by consultation with Department staff to determine the appropriate response action (Department technical memorandum dated January 20, 2016 from S. Farrar, V. Eleftheriou, and K. Libbey). Specific conductance could then be utilized to determine further action, but would not be the primary ALR method initially. The applicant may request revisions to the LAP upon submittal of actual field data as the proposed expansion is developed for the Department's approval through changes to the Operations Manual.

Contingency plans were built into the designs for conveyance and transport system failures as described in the application, including conservative design factors and assumptions; materials to be used; periodic maintenance, cleaning, and inspection; monitoring pressure transducers and pressure gauges; alarm systems; back-up pumps and generators; force main dual-containment piping; and easy access to cell pumps.

The volume of leachate generated will be measured through the use of flow meters at each pump station. Leachate and the leak detection system quality will be monitored in accordance with the facility's Environmental Monitoring Plan (EMP), as described in Finding 33 of this license. The leachate management system will be maintained, inspected, and cleaned periodically, as addressed in the facility's Operations Manual section on site maintenance and inspection.

As stated above, the applicant has proposed to transport leachate off-site to the MFGR wastewater treatment facility for treatment and subsequent disposal. Taking into account the proposed expansion, leachate hauling is expected to be approximately 48,000 gallons per day, with an estimated 57,500 gallons per day during peak months. This represents an increase from current hauling loads which average 30,000 gallons per day and 46,000 gallons per day during peak months. The quality of the leachate to be taken off-site and treated is expected to be consistent with the current leachate quality since there is no change in accepted waste types proposed. Leachate samples will be routinely collected from the on-site storage tank and the leachate and leak detection pump stations for characterization. Data on characteristics of the leachate will be sent to the wastewater treatment facility.

During the hearing, intervenor Edward Spencer questioned the adequacy of the MFGR wastewater treatment facility given closure of the pulp and papermaking operations at the former mill site. Mr. Spencer's witness, Dr. Steve Coghlan, expressed concerns regarding the potential for the discharge of pollutants including metals from the wastewater treatment plant to adversely impact the Penobscot River.

The Board finds that evidence in the record indicates that MFGR's waste discharge license was most recently renewed and amended on October 12, 2016 to reflect the change in wastewater loading to the facility including leachate from JRL. The MFGR license specifically recognizes that "the wastewater characteristics are no longer representative of a kraft pulp mill operation as sources of wastewater are primarily storm water, landfill leachate from JRL, wastewater from the commercial LaBree's Bakery, filter backwash from the Orono-Veazie Water District and septage dewatering filtrate, leachate and storm water runoff from a composting facility" (Department license #W-002226-5O-O-R). In addition to State standards, MFGR's wastewater application was evaluated for compliance with National Effluent Guidelines set forth in 40 CFR, Part 445, *Landfills Point Source Category*, Subpart B, *RCRA Subtitle D Non-Hazardous Waste Landfill.*

MFGR's wastewater treatment license places limits on the concentration of various pollutants in the discharge and requires that discharges from the MFGR wastewater treatment facility be monitored for a range of parameters including, but not limited to, flow, pH, biological oxygen demand, total suspended solids, mercury, whole effluent toxicity, and priority pollutants. The license states that the wastewater treatment facility modifies its treatment protocols as appropriate based on operating parameters such as influent flow, strength, and temperature to meet the effluent limits, including those for metals (metals can be present in the sludge and also within the discharged effluent at allowable levels). In issuing MFGR's renewal license, the Commissioner concluded, based upon a knowledge of the influent and the operation of the MFGR facility, that all applicable licensing criteria for the proposed waste discharge had been met and that the "discharge, either by itself in combination with other discharges, will not lower the quality of any classified body of water below such classification" and that "the provisions of the State's antidegradation policy, 38 M.R.S., § 464(4)(F), will be met."

The Board finds that the applicant has met the applicable requirements in 06-096 C.M.R. ch. 401, § 2(F)(5) for leachate management, based on the submitted leachate management design plans and utilization of a licensed wastewater treatment facility, along with a back-up licensed wastewater treatment facility as the contingency plan, for the treatment of the collected leachate; provided that the applicant maintains a valid leachate disposal contract(s) with licensed waste water treatment facility(ies) for the treatment and disposal of leachate from the proposed expansion.

F. Gas Management

The Landfill Gas Expansion Design Report dated June 2015, prepared by Sanborn Head & Associates, Inc. and submitted with the application, addresses LFG management for the proposed expansion. The existing active LFG extraction system will be expanded to accommodate gas generated from future waste placement. The LFG collection and control system consists of horizontal extraction trenches and vertical extraction wells. Once extracted, the LFG passes through a moisture separator, followed by treatment at a Thiopaq® sulfur removal system to reduce hydrogen sulfide, and is then combusted at the flare. The June 2015 report demonstrates that the existing H_2S removal equipment and flares as addressed in the landfill's existing air license renewal are adequate to handle the LFG from the proposed expansion. A landfill gas to energy facility may be proposed in the future as an alternative to flaring and to generate electricity.

The application states that the LFG collection and control system is utilized to control air emissions, including methane and odors from hydrogen sulfide, as described previously in Finding 11(A) of this license. The existing facility is required to meet the EPA's New Source Performance Standards, 40 CFR Part 60, Subpart WWW, *Standards of Performance for Municipal Solid Waste Landfills* (initially published in 61 FR 9919, March 12, 1996). The application included reference to Subpart WWW, but in 2016, 40 CFR Part 60, Subpart XXX, *Standards of Performance for Municipal Solid Waste Landfills that Commenced Construction, Reconstruction, or Modification after July 17, 2014* (published in 81 FR 59368, Aug. 29, 2016) was promulgated. The proposed expansion will be subject to 40 CFR Part 60, Subpart XXX upon commencing construction of Cell 11. Requirements in the federal regulation include operational standards for gas collection and control systems, as well as provisions for compliance and monitoring.

In the application, Sanborn Head & Associates estimated the LFG generation rate using the EPA's *Landfill Gas Emissions Model, Version 3.02* (LandGEM) for the years 2004 to 2050, with a peak collection rate of approximately 3,600 standard cubic feet per minute (scfm) in 2031, assuming LFG at 50% methane and taking into account the proposed expansion construction to commence in 2018. The application states that the LFG collection system will be installed in phases as the proposed expansion cells are built. Horizontal extraction trenches will be located in the waste mass, constructed 4-feet wide by 5-feet deep, and contain a 6-inch perforated HDPE pipe surrounded by coarse aggregate. The trenches will be installed approximately every 40 feet in vertical elevation and spaced approximately 100 feet apart. The permanent vertical extraction wells will be constructed of 8-inch diameter schedule 80 polyvinyl chloride pipe, slotted on the lower portion. They will be installed approximately 100 feet on center. Conveyance HDPE pipes will vary from 4 inches to 24 inches in diameter and will be sloped to provide condensate drainage and account for settlement.

LFG management at the facility also includes the installation of intermediate and final cover on non-active portions of the landfill to promote efficient gas collection.

Intervenor Edward Spencer questioned in testimony whether the horizontal pipes in the landfill gas collection system may collapse. Michael Booth, an expert witness for the applicant, testified that the horizontal gas collector trenches are only a temporary collection method and only need to function until the permanent vertical extraction wells are installed once the appropriate waste depth is achieved.

The Board finds that the applicant has met the requirements in 06-096 C.M.R. ch. 401, § 2(F)(6) for LFG collection and control based on the submitted LFG design report and cell development plans, and the proposed expansion will be subject to the requirements of 40 CFR Part 60, Subpart XXX when JRL commences construction on the proposed expansion. The Board further finds that the design and operation of the LFG collection and control system will minimize LFG related nuisance odors.

G. Cell Development Plan

A Cell Development Plan was submitted with the application which illustrates the sequence of development for the proposed expansion in a phased manner, allowing operation in an active landfill cell while construction occurs on the next cell. Phased intermediate and final cover placement are also proposed. Table 11 includes general cell development information, with a schedule for new cell construction approximately every two years. Table 11 was compiled from information in the application, Volume III, Section 3.5.1. Specific plan details with layout of cells, projected grades, location and timing of intermediate and final cover, location and construction of cell access, relevant aspects of leachate and stormwater management measures, relevant aspects of erosion and sedimentation control measures, and other pertinent facility-specific features are included in the facility's Operations Manual and will be updated with the facility's Annual Report.

Table 11: Proposed Expansion Cell Development Plan Summary*
(cell construction listed from first to last, occurring every two years)

Cell Number	Size (acres)	Disposal Capacity (cubic yards)	Construction Items of Note
11	9.5	1,460,000	• Expansion of existing Detention Pond 9; • Year following Cell 11 construction, final cover placed over approximately 14.3 acres of existing landfill.
12	12.6	1,500,000	• Construction of Detention Pond 10; • Relocation of the administration building; • Year following Cell 12 construction, final cover placed over approximately 18.6 acres of existing landfill.
13	11.8	1,580,000	• Construction of Detention Pond 11; • Relocation of the scale house; • Year following Cell 13 construction, final cover placed over approximately 14.6 acres of existing landfill.
14	6.7	1,670,000	• Year following Cell 14 construction, final cover placed over approximately 13.3 acres of existing landfill.
15	6.0	1,500,000	• Year following Cell 15 construction, final cover placed over approximately 15.0 acres of existing landfill.
16	7.1	1,640,000	• Construction of Detention Pond 12; • Over a several year period following Cell 16 construction, final cover placed over remaining 45.5 acres.
Note: *****Size and capacity information is approximate. Variations in construction scheduling may occur as development progresses.			

The Board finds that the applicant has met the Cell Development Plan Rule requirements in 06-096 C.M.R. ch. 401, § 2(F)(7), including cell development sequencing and phased placement of intermediate and final cover. The Board further finds that the applicant shall update the Cell Development Plan on an annual basis as the proposed expansion is developed.

H. Phased Final Cover System Proposal

The applicant proposed a phased final cover system for the expansion consisting of the following, from top to bottom: 12 inches of vegetative soil, 12 inches of drainage sand, a 40-mil LLDPE or HDPE textured geomembrane, and 24 inches of barrier soil. Prior to each phase of final cover system construction, an engineering report, construction contract bid documents, including drawings, technical specifications, and contract administrative documents and a quality assurance plan will be submitted to the Department for review and approval. The applicant anticipates that final cover system construction will occur about every other year.

The Board finds that the applicant has met the requirements in 06-096 C.M.R. ch. 401, § 2(F)(8) for a phased cover system; provided that an engineering report, construction contract bid documents, including drawings, technical specifications, and contract administrative documents and a quality assurance plan are submitted to the Department for review and approval at least four months prior to each proposed application of a phased final cover system.

I. Waste Storage, Staging, and Burn Areas Design

The applicant has not proposed additional waste storage and staging areas outside of the solid waste boundary, or a burn area for wood waste or CDD. Rather, the applicant proposes to use the existing permitted wood waste handling area adjacent to the maintenance facility for the proposed expansion. In addition, areas within the existing landfill may be used to temporary stockpile soft layer material to be placed in the bottom of newly constructed cells.

The Board finds that the applicant is not proposing additional waste storage and staging areas outside of the solid waste boundary, or a burn area for wood waste or CDD and will utilize the existing permitted wood waste handling area. Therefore, the provisions requiring submittal of a design and operating plan in accordance with 06-096 C.M.R. ch. 401, § 2(F)(9) do not apply to the proposed expansion; however, the facility shall continue to operate the existing storage and burn area in accordance with the applicable operating requirements.

J. Waste Characterization and Design Compatibility

The Department's rule at 06-096 C.M.R. ch. 401, § 2(F)(10) requires that the wastes proposed to be accepted at the expansion must be characterized to enable the Department to determine that the wastes to be landfilled are non-hazardous and suitable for disposal in accordance with the proposed design, and to support the analytical parameters proposed in the Environmental Monitoring Plan (EMP).

The procedures for the characterization, testing and acceptance of waste at JRL are included in the facility's Solid Waste Characterization Plan in the Operations

Manual. The wastes proposed to be accepted in the expansion are similar to the wastes currently approved for JRL, with the exception of MSW (except for bypass) which will not be accepted in the proposed expansion. Generally, the waste types include wastewater treatment plant and miscellaneous sludge, FEPR, contaminated soils, MSW incinerator ash, biomass and fossil fuel ash, MSW bypass from incinerators, CDD, OBW, CDD process fines, and miscellaneous waste. Finding 37 of this license addresses the acceptable wastes in more detail.

The applicant states that the currently accepted waste types have been previously determined by the Department and JRL to be non-hazardous, compatible for commingling, and compatible with the engineered systems components.

The Board finds that the applicant has provided appropriate waste characterization procedures for the proposed expansion as required by 06-096 C.M.R. ch. 401, § 2(F)(10).

K. Surface Water Control Plans

The Department's Rules at 06-096 C.M.R. ch. 401, § 2(F)(11) require that an applicant submit two surface water control plans: an erosion and sedimentation control plan which meets the standards and submission requirements of 06-096 C.M.R. ch. 400, § 4(J) and a stormwater management plan which meets the standards and submission requirements of 06-096 C.M.R. ch. 400, § 4(M). The applicant's Erosion and Sedimentation Control Plan and the Stormwater Management Plan are described in Findings 14 and 17 of this license.

The Board finds that the applicant has submitted the two required surface water control plans required by 06-096 C.M.R. ch. 401, § 2(F)(11) and that these plans meet the requirements of 06-096 C.M.R. ch. 400, §§ 4(J) and 4(M) as set forth in Findings 14 and 17 of this license.

L. Test Pad Submission

The applicant has proposed to utilize test pads to demonstrate that the proposed barrier soil material and construction methods will result in barrier soil meeting the specified requirements. The test pad program will evaluate the construction techniques to determine conformance with the project technical specifications, similar to the program used during construction of the existing cells at JRL. For base grade, liner, and final cover system construction, a test pad covering an area of approximately 50,000 square feet will be constructed in the cell or cover area. During placement and compaction of the test pad, testing will be performed for moisture, density, and in-place hydraulic conductivity at the appropriate locations and frequencies. Once the performance criteria is met, up to four shallow test pits will be excavated in the test pad area to evaluate the remolding and bonding of the barrier soil. If the entities involved in construction and oversight, including the Department, concur with the results, the construction techniques utilized on the test pad will continue for the project and the frequency of in-place hydraulic conductivity testing may be reduced with approval from the Department. If the borrow source or material properties change during the course of construction, a new test pad will be required.

The Board finds that the applicant has submitted an appropriate test pad program as required by 06-096 C.M.R. ch. 401, § 2(F)(12). Any reduction in the frequency of the in-place hydraulic conductivity testing must be authorized by the Department.

M. Special Construction Requirements

In accordance with 06-096 C.M.R. ch. 401, § 2(F)(13), at facilities where ground water monitoring in bedrock is anticipated or is being conducted, the applicant must submit information on all measures to be taken to minimize the disturbance of soil material within five feet of the bedrock surface.

The applicant submitted information on measures to be taken to minimize the disturbance of soil material within 10 feet of the bedrock surface where the augmented secondary liner system will be installed. In these areas, the base grade will be cut one foot to accommodate the additional foot of compacted clay to be placed under the secondary liner system. To achieve minimal soil disturbance, the excavator will complete the cut prior to placement of imported soils.

In other areas of the site where the proposed base grades are below the phreatic surface, the applicant has proposed to install an underdrain system to assist with dewatering and to facilitate base liner system construction.

The Board finds that the applicant has submitted measures to minimize soil disturbance that meet the 5 feet to bedrock separation requirement in 06-096 C.M.R. ch. 401, § 2(F)(13).

29. CONTAMINANT TRANSPORT ANALYSIS

In accordance with 06-096 C.M.R. ch. 401, § 2(G), an applicant is required to provide a thorough analysis of the proposed site and the adjacent area that could be affected during operation and after closure of the landfill in the event of releases of contaminants to ground water beyond engineered systems to assess the potential for an unreasonable threat to sensitive receptors and to identify any operational or monitoring measures needed to ensure protection of sensitive receptors. As defined in the Rules, the potential for an unreasonable threat to a sensitive receptor is an arrival time of less than 6 years from the landfill or less than 3 years from leachate storage structures and pump stations of a concentration of a pollutant which would result in contamination of that sensitive receptor.

The contaminant transport analysis submitted by the applicant consisted of modeling potential leakage scenarios using information from site investigations and appropriate inputs and assumptions. An analytical three-dimensional ground water solute transport equation was used to simulate leachate concentrations from hypothetical leaks. Evaluated hypothetical scenarios included complete failure of the liner system, a leaking liner system, and a leaking leachate force main. The leachate constituents modeled were iron, nitrate, alkalinity, arsenic, chloride, and ammonia since these constituents have the highest concentrations in leachate relative to the ground water and surface water criteria. A sensitivity analysis was also performed.

Based upon information in the application, the Board finds that under the hypothetical failure scenarios, the results of the analysis showed that sensitive receptors in the vicinity of the proposed expansion will not be unreasonably threatened by leachate leaks; the proposed monitoring locations and monitoring frequency will be sufficient to detect changes in water quality from potential failures; and the currently proposed design will provide greater than six years travel time from the landfill's base liner to the sensitive receptors.

The Board further finds that the applicant provided an analysis of potential releases of contaminants to ground water that meets the requirement of the 06-096 C.M.R. ch. 401, § 2(G) and has demonstrated that the proposed expansion will not pose unreasonable threats to sensitive receptors.

30. PLAN VIEW AND PROFILE VIEW DRAWINGS

The Department's rules at 06-096 C.M.R. ch. 401, § 2(H) require that an applicant submit plan and profile drawings that provide information specified in the rule.

The Board finds that the applicant submitted the drawings required in 06-096 C.M.R. ch. 401, § 2(H), including the drawings for existing site conditions, site development, site base grading, underdrain piping, leak detection piping, leachate collection piping, the gas collection and control system, final site drainage, final site development, landfill cross-sections, and specific details of engineered systems.

31. QUALITY ASSURANCE PLAN

The Department's rules at 06-096 C.M.R. ch. 401, § 2(I) requires that an applicant submit a Quality Assurance Plan to assure that design specifications and performance requirements for all facility components are met during construction. The Quality Assurance Plan submitted by the applicant for the proposed expansion includes the following, as related to construction: quality assurance measures to be implemented; the relationship between the Quality Assurance Plan, construction quality control, and the construction contract bid documents; responsible authorities and a resolution process; qualifications of quality assurance personnel and testing laboratories; inspections and tests to be performed for construction conformance; sampling details; recordkeeping and reporting requirements; and a list and description of all items requiring quality assurance certification.

The Board finds that the applicant has submitted a Quality Assurance Plan that addresses the items required by 06-096 C.M.R. ch. 401, § 2(I) to verify conformance with construction design specifications and performance requirements.

32. CONSTRUCTION CONTRACT BID DOCUMENTS

Pursuant to 06-096 C.M.R. ch. 401, § 2(J), an applicant is required to submit construction bid documents. The applicant may submit draft documents at the time the application is filed, and subsequently submit final detailed construction contract bid documents to the Department for review and approval on a schedule approved by the Department.

The application included construction bid documents for Cell 11 consisting of contract administrative documents, technical specifications, and drawings.

The Board finds that the applicant provided the construction contract bid documents for Cell 11 in accordance with the Rules. Prior to the construction of individual subsequent cells (Cells 12 through 16), detailed construction contract bid documents shall be submitted to the Department for review and approval four months prior to commencing construction activities at each cell.

33. WATER QUALITY REPORT AND PROPOSED MONITORING PROGRAM

In accordance with 06-096 C.M.R. ch. 401, § 2(K), an applicant is required to provide a water quality report addressing the site characterization requirements of 06-096 C.M.R. ch. 405, including a water quality monitoring program.

The application includes information on the water quality monitoring program which was established at the site in 1990 and currently includes periodic sampling of 22 monitoring wells, 3 ground water discharge locations, 6 surface water locations, 10 underdrain locations, and 1 leachate location. The specific sampling and monitoring procedures utilized are detailed in the facility's EMP. The proposed expansion will be integrated into the existing water quality monitoring program, with updates and revisions as appropriate.

The proposed expansion will include the addition of 45 monitoring locations consisting of: background and downgradient piezometers and wells, additional surface water and pore water sampling points, and leak detection and underdrain system monitoring points. The locations will be phased in with the development of the proposed cells over a 10 to 12 year period.

Leachate monitoring for the proposed expansion will consist of sampling at the leachate tank; each leak detection sump discharge; and underdrain discharge. Ground water monitoring for the proposed expansion will consist of sampling of 23 new monitoring wells and 11 existing wells and piezometers. Several existing ground water monitoring wells, piezometers, and open-boreholes in the area of the proposed expansion footprint will be abandoned in accordance with the provisions of 06-096 C.M.R. ch. 405, § 5(H). Surface water monitoring will include sampling of two additional locations to characterize potential shallow ground water discharge and runoff impacts to nearby streams and wetland areas. Water quality sampling for the leachate tank, underdrain and leak detection systems, and monitoring wells will be performed three times a year. The leak detection sump discharges and underdrain discharge will be assessed monthly for flow and specific conductance (the Liner Action Plan, included in the Operations Manual, addresses steps to be taken if water quality changes occur).

During review of the application, Department staff commented that the ground water flow directions are anticipated to change with proposed expansion development and that the EMP should provide for an annual assessment of ground water flow directions (Department technical memorandum dated April 1, 2016 from R. Behr).

As set forth in the application, the water quality monitoring program will continue to be adjusted annually based on the operational status of the cells, development at the facility, the previous year's water quality evaluation, and the results of the Department's annual review of the water quality data.

The Board finds that the applicant submitted a water quality report which both characterized the existing site and proposed a water quality monitoring program as required by the Rules. Water quality monitoring shall be performed according to the EMP for the site. An Annual Water Quality Report evaluating JRL's water quality and an assessment of ground water flow directions as the proposed expansion is developed shall be compiled each year and submitted with the facility's Annual Report. Proposed changes to the water quality monitoring program shall require Department approval.

34. OPERATIONS MANUAL

In accordance with 06-096 C.M.R. ch. 401, § 2(L), a copy of the facility's operations manual must be submitted as part of the application. The facility's Operations Manual was prepared in accordance with 06-096 C.M.R. ch. 401, § 4(A) and contains revisions to JRL's existing operations manual to address the proposed expansion. As required, the Operations Manual will be reviewed annually by the operator and will be updated as necessary. Since the July 2015 version of the Operations Manual submitted with the application, updates to portions of the Operations Manual have been submitted to the Department as a result of Department comments during the application review process.

The Board finds that the applicant has submitted an Operations Manual in accordance with the requirements of 06-096 C.M.R. ch. 401, § 2(L).

35. CONSTRUCTION

The proposed expansion is subject to the regulatory requirements of 06-096 C.M.R. ch. 401, § 3 during construction, as summarized below:

A. Preconstruction Conference

Unless waived by the Department, a pre-construction conference will be held between the applicant and/or the agents of the applicant and the Department, with at least a 7-day advance notice given to the Department.

B. Quality Assurance Plan

The Quality Assurance Plan (QAP) must be implemented at the beginning of construction. Construction Quality Assurance (CQA) must include continuous site inspections by the CQA personnel. Geosynthetics and barrier soil layers must be inspected, tested, and certified by qualified CQA personnel separate from the owner/operator and contractor.

C. Liner Installation

Before installation of any type of liner system, the applicant must evaluate the impacts of climatic conditions, proposed installation procedures, and the proposed installation schedule on liner system integrity. Results and recommendations from the test pad program must be submitted to the Department for review and approval. Liner systems may be installed only between April 15 and November 1, and only when the ambient temperature exceeds 32 degrees Fahrenheit, unless a specific cold weather installation plan is submitted to the Department for review and approval.

D. Changes from Approved Plans and Specifications

Prior to implementing any changes to the approved landfill design, the leachate management systems, or project specifications, the applicant must receive approval from the Department through an amendment or minor revision, or through a change order approval.

E. Weekly Inspection Reports

The CQA team responsible for construction inspection at the landfill shall keep daily and weekly construction inspection reports and provide a copy to the Department within one week after each construction week.

F. Photographic Documentation

In the final construction report, the applicant shall provide the Department with representative photographic documentation of each stage of construction.

G. Record Drawings

The applicant shall provide record drawings, signed and stamped by a State of Maine Licensed Professional Engineer, to the Department within 45 days after construction completion of each cell.

H. Final Construction Report and Commencement of Operations

The applicant shall submit a written request that the Department conduct an inspection of the completed construction for a finding of compliance with the facility license. The applicant may commence operations of the landfill upon Departmental approval or ten working days after submitting the written certification stating that the project was constructed in accordance with the approved plans and specifications, and after the Department conducts or waives the need for a final construction inspection. The Department may delay commencement of operations pending resolution of issues identified during its inspection and/or during review of the written certification.

The applicant shall submit a final construction report to the Department within 45 days following construction completion of each cell which includes the items specified in the Rules. The written certification is required as part of the final construction report, but may be submitted prior to the final report in order to expedite approval for commencement of operations.

The Board finds that the applicant must follow the applicable regulatory requirements of the Rules during construction.

36. OPERATIONS

The proposed expansion is subject to the regulatory requirements of 06-096 C.M.R. ch. 401, § 4 during landfill operations, as summarized below.

A. Operations Manual

The Operations Manual must be reviewed annually by the operator and updated as necessary. These updates shall be distributed to the entities holding certified copies, including the Department and key operating and management personnel of the landfill. The landfill operator shall familiarize operating personnel with relevant sections of the Operations Manual.

B. Operator Training and Certification Program

At least two key personnel must be trained in the operation of, and regulatory requirements for, the landfill and be certified as required by the Rules.

C. Operating Requirements

The policy and procedures utilized by JRL to meet the operating requirements in the Rules are addressed in the facility's Operations Manual. These operating requirements include, but are not limited to, updating the Operations Manual on an annual basis, accepting only wastes allowed by the facility's licenses and characterizing these wastes appropriately, and providing for facility inspection and maintenance on a regular basis. Requirements for utilization of an approved cell development plan, environmental monitoring and the appropriate installation of daily, intermediate and final cover are also outlined in the Operations Manual.

D. Annual Report

Pursuant to 38 M.R.S. § 1310-N(6-D) and as stated in 06-096 C.M.R ch. 401, §(4)(D), an Annual Report and fee shall be submitted to the Department in the timeframe stated in the Rules, currently by April 30 of each year. The Annual Report shall contain the applicable information required by the Rules. The operator shall keep copies of the Annual Reports submitted to the Department throughout the operational and the post-closure care period of the landfill.

The Board finds that the applicant has submitted an Operations Manual for the proposed expansion in accordance with the applicable requirements of the Rules, as also discussed in Finding 34 of this license.

37. ACCEPTABLE WASTE AND OBW LIMIT

A. Acceptable Waste

JRL is currently licensed to accept non-hazardous waste generated within the State, including up to 81,000 tons of MSW a year until March 31, 2018 (license #S-020700-WD-BG-Z issued June 19, 2014). The proposed expansion will be licensed to accept similar waste types; however, the proposed expansion will be prohibited from accepting municipal solid waste, except MSW bypass material. For the purpose of this license, MSW bypass is defined as any MSW that is destined for disposal or processing at a solid waste incinerator, but that cannot be disposed of or processed at that incinerator because of the incinerator's malfunction, insufficient capacity, inability to process or burn, down-time, or any other comparable reason as approved by the Department.

Table 12 is a summary of the non-hazardous waste generated within the State currently allowed in the existing landfill (Volume IV of the application, Table 7-1, page 7-2) and also proposed for disposal in the expansion with the exception of MSW as referenced in the paragraph above.

Table 12: Summary of Acceptable Waste for Disposal in the Proposed Expansion

Air & Water Filtration Media	Leather Scrap Waste
Approved Landfill Utilization Wastes	Municipal Solid Waste (MSW)/MSW Bypass
Asbestos (non-friable)	Municipal Solid Waste Ash
Biomass Boiler Ash	Non-hazardous Chemical Related Products
Biomedical Incinerator Ash	Oversized Bulky Wastes
Burned Railroad Ties & Associated Ash	Pigeon Waste
Catch Basin Grit	Pulp & Paper Mill Sludge
Clean Wood Open Burn Ash	Sandblast Grit
Construction & Demolition Debris	Spoiled Foods
Dredged Spoils from Waterways	Sulfur Scrubbing Residue
Dried Paint Residue & Related Debris	Treated Biomedical Waste
Filter Press Cake & Collagen Scrapings	Urban Fill-type Soils

Fossil Fuel Boiler Ash	Virgin Petroleum Contaminated Soil & Debris
Gasoline Contaminated Soil & Debris, Surface Spill	Waste Oil Contaminated Soil & Debris (Oily Debris)
Gasoline Contaminated Soil & Debris, (UST)	Wastewater Treatment Plant Sludge
Grit Screening Waste	Water Treatment Plant Sludge
Laundry Sludge	

In addition to the above waste streams, JRL may accept individually approved wastes after obtaining the proper special waste licenses from the Department.

In accordance with 38 M.R.S. § 1310-N(11), a solid waste disposal facility owned by the State may not be licensed to accept waste that is not waste generated within the State. As set forth in 38 M.R.S. § 1310-N(11) "waste generated within the State" is defined as including "residue and bypass generated by incineration, processing and recycling facilities within the State or waste, whether generated within the State or outside of the State, if it is used for daily cover, frost protection or stability or is generated within 30 miles of the solid waste disposal facility."

During the hearing, intervenor Edward Spencer and a number of commenters at the public session voiced concerns that incinerators, and processing and recycling facilities are allowed to accept waste from out of state, and once the material is processed by these Maine facilities, the residue and bypass is then considered in-state waste that may be taken to JRL for operational use or disposal. Mr. Spencer and commenters raised concerns that waste with out-of-state point of origins would be allowed to be disposed in a state-owned landfill.

The Board finds that the definition of "waste generated within the State" applies to wastes to be disposed of in the proposed expansion. The Board has no authority to alter State statute.

The Board finds that all waste streams accepted at the facility must be characterized (i.e., tested) and accepted following the procedures in the facility's Solid Waste Characterization Plan. For actual delivery onto JRL's site, waste haulers must have the proper manifest documentation as required in the Operations Manual.

B. <u>OBW Limit</u>

Condition 3 of the PBD requires the applicant to comply with a Department-established OBW tonnage disposal limit, and any subsequent modification to this limit, for the proposed expansion. The PBD condition is stated in full in Finding 20 of this license.

Condition 4 of the PBD requires periodic independent third party audits of CDD processing operations that are anticipated to transport more than 10,000 tons of OBW to the proposed expansion on an annual basis, focusing on the nature and volume of processing residues sent to JRL for disposal. The third party audits are to be conducted by a qualified consultant selected by the Department in consultation with the affected CDD processing facilities and the applicant, with the applicant providing reimbursement for the cost of the audits. The first audit(s) is(are) to occur prior to the disposal of OBW from these processing facilities in the proposed expansion and at subsequent 2-year intervals, unless or until the Department approves their discontinuation. The PBD condition is stated in full in Finding 20 of this license.

The term OBW is not defined in regulation or statute; therefore, for the purpose of this licensing action, OBW refers to the standard industry meaning that includes large items that may be difficult to process, such as mattresses, furniture, appliances, and certain other components of demolition debris.

During the hearing, the applicant and the intervenors presenting testimony were asked to propose an OBW limit. The City of Old Town did not propose a limit. Intervenor Edward Spencer testified that he would need to perform calculations utilizing data from other waste disposal facilities and consider the population to determine a limit. Toni King, Regional Engineer for Casella Waste Systems, Inc.'s Eastern Region, initially testified that no OBW limit was necessary since circumstances related to OBW management have changed since the PBD was issued. Later in the hearing, Ms. King testified that if a limit was to be set, she suggested an OBW limit of 118,000 tons, based on the rounded 2011 amount of 99,000 tons and a 3% Consumer Price Index (CPI) annualized to current time. With respect to the amount of 60,000 tons, as listed in Finding 19, Table 6 of this license, Ms. King testified that 60,000 tons was used in the application for design purposes and was not a proposed OBW quantity limit.

In order to establish an appropriate OBW tonnage limit for the proposed expansion, the Board took into consideration the intent of the PBD condition, the expected operating conditions of the proposed expansion, currently available recycling options and potential future conditions. Table 13 below presents the actual data of OBW disposed at JRL over the last 5 years (excerpted from information submitted in the August 1, 2016 letter from Donald Meagher, NEWSME; note added for clarification).

Table 13: Historical Disposal of OBW at Juniper Ridge Landfill

Year	Generator	Tons	Generator	Tons	Generator	Tons	Generator	Tons	Total
2011	KTI Biofuels	97,584	MERC	1,129	PERC	174	-	-	98,887
2012	KTI Biofuels	62,945	MERC	1,700	PERC	44	-	-	64,689
2013	KTI Biofuels	29,873	MERC	126	PERC	24	ReEnergy	24,330	54,353
2014	-	-	-	-	-	-	ReEnergy	48,219	48,219
2015	-	-	-	-	-	-	ReEnergy	47,388	47,388
Note: From 2011 to 2012 operational efficiencies and recovery capability improvements occurred at the KTI Biofuels facility which reduced the volume of OBW sent to JRL.									

The median disposal amount of OBW for the five years was determined to be 54,353 tons. The median CPI from this 5 year timeframe was determined to be 1.5% (the five-year period CPIs were 3.0% (2011), 1.7% (2012), 1.5% (2013) 0.8% (2014), and 0.7% (2015)). During hearing cross-examination, Ms. King noted that 10,000 tons of OBW from the PERC facility will likely need to be disposed of annually at JRL due to an operations change at PERC (based on current 2016 data). Utilizing this information, a calculation consisting of the median plus the estimated PERC amount multiplied by the median CPI was performed with a result of approximately 65,000 tons OBW [((54,353 + 10,000) x 1.015) = 65,000].

The Board finds that an OBW limit of 65,000 tons on an annual basis at the proposed expansion is consistent with the intent of Condition 3 of the PBD and is appropriate to meet the State's current OBW solid waste needs provided that the OBW limit is evaluated annually and adjusted as necessary based on current OBW recycling opportunities, economic factors, and other relevant factors at the time of the annual evaluation. If a limit adjustment is required, the OBW limit will be revised either through the provisions of 38 M.R.S. § 341-D(3) or a license application submitted by the applicant through the provisions of 38 M.R.S. § 344(9) and 06-096 C.M.R. chs. 2 and 400. The Board further finds that the Department will coordinate periodic independent third party audits of CDD processing operations that are anticipated to transport more than 10,000 tons of OBW to the proposed expansion on an annual basis consistent with Condition 4 of the PBD.

NATURAL RESOURCES PROTECTION ACT

38. NATURAL RESOURCES PROTECTION ACT AND WATER QUALITY CERTIFICATION

In accordance with the Natural Resources Protection Act, 38 M.R.S. § 480-D, the Department shall grant a permit when it finds that the applicant has demonstrated that the proposed activity meets the applicable standards including provisions pertaining to the following: existing scenic, aesthetic, recreational and navigational uses; soil erosion; harm to habitats and fisheries; interference with natural water flow; water quality; flooding; sand or gravel supply; and outstanding river segments. NRPA standards applicable to the proposed expansion are discussed in this Finding section.

To identify and assess impacts to protected natural resources, the applicant submitted a natural resources assessment for the expansion prepared by Stantec Consulting Services, Inc. (Stantec).

The natural resources assessment indicates that the proposed expansion will impact approximately 2.04 acres of primarily forested freshwater wetlands through direct filling and 0.1 acres of the critical terrestrial habitat of one significant vernal pool (SVP) due to clearing for a relocated perimeter fence and an electric line. The impacts to the NRPA regulated SVP were authorized in a permit-by-rule that was accepted by the Department on July 29, 2015 and are not further considered in this licensing proceeding. With the exception of the one vernal pool addressed in the permit-by-rule, the wetlands that will be impacted by the expansion are not Wetlands of Special Significance as defined in 06-096 C.M.R. ch. 310, § 4.

Stantec evaluated the functions and values of the impacted wetlands and prepared a Wetlands Compensation Plan which was submitted in support of its NRPA permit application. The Wetlands Compensation Plan also addresses 12 vernal pools within and adjacent to the expansion area which are regulated by the U.S. Army Corps of Engineers but which are not regulated by the Department under NRPA.

A. Existing Scenic, Aesthetic, Recreational, or Navigational Uses

Pursuant to 38 M.R.S. § 480-D(1), the applicant must demonstrate that the activity will not unreasonably interfere with the existing scenic, aesthetic, recreational or navigational uses of the protected natural resources. The Department's rule 06-096 C.M.R. ch. 315, guides the Department in its analysis of impacts to existing scenic and aesthetic uses resulting from activities in, on, over or adjacent to protected natural resources subject to NRPA.

In support of its application and in accordance with 06-096 C.M.R. ch. 315, the applicant submitted a copy of the Department's Visual Evaluation Field Survey Checklist as Appendix A to the NRPA application along with a description of the property and the proposed project. The applicant also submitted several photographs of the proposed project site including an aerial photograph. The Board visited the project site on June 23, 2016 to view the physical features of the site, including portions of the wetlands that will be filled by the expansion, and the nature of the surrounding area.

An unreasonable adverse visual impact is defined in 06-096 C.M.R. ch. 315, § 4 as one that is "expected to unreasonably interfere with the general public's visual enjoyment and appreciation of a scenic resource." The freshwater wetland impacted by the expansion does not meet the definition of a scenic resource as set forth in 06-096 C.M.R. ch. 315 § 10 in that it is not one of the listed scenic resources nor is it a wetland that is "visited by the general public, in part, for the use, observation, enjoyment and appreciation of its natural and cultural visual qualities."

Finding 10(C) of this license analyzes and makes findings on the proposed expansion's compliance with the scenic character criteria under the solid waste Rules.

There is no evidence of any existing recreational or navigational uses of the impacted wetlands.

Based upon the information in the record including the applicant's scenic assessment, photographs of the site, and the site visit, the Board finds that the proposed activity will not unreasonably interfere with existing scenic, aesthetic, recreational or navigational uses of the protected natural resource.

B. <u>Soil Erosion</u>

In accordance with 38 M.R.S. § 480-D(2), the applicant must demonstrate that the activity will not cause unreasonable erosion of soil or sediment nor unreasonably inhibit the natural transfer of soil from the terrestrial to the marine or freshwater environment.

As discussed in Finding 14 of this license, the applicant conducted an assessment of surficial soils at the site and submitted an Erosion and Sedimentation Control Plan, dated July 2015, prepared by SME. The applicant proposes to install silt fence and other temporary erosion control measures, detention ponds and berms for each landfill cell prior to the construction of the cells. Once a cell has been completed and filled with waste, the cell cover will be installed, and final stabilization measures will be taken. The applicant states that the design and implementation of all erosion control measures will follow the requirements of the solid waste Rules and will comply with Maine's Erosion and Sedimentation Control Best Management Practices.

Based upon the information in the record including the construction plan with phased development of landfill cells and the Erosion and Sedimentation Control Plan, the Board finds that the proposed expansion will not cause unreasonable erosion of soil or sediment nor unreasonably inhibit the natural transfer of soil from the terrestrial to the marine or freshwater environment, as required by 38 M.R.S. § 480-D(2).

C. Habitat Considerations

Pursuant to 38 M.R.S. § 480-D(3), the applicant must demonstrate the activity will not unreasonably harm any significant wildlife habitat, freshwater wetland plant habitat, threatened or endangered plant habitat, aquatic or adjacent upland habitat, travel corridor, freshwater, estuarine or marine fisheries or other aquatic life.

The expansion will impact 2.04 acres of primarily forested freshwater wetland due to filling. Impacts to these wetlands and associated compensation are discussed in Finding 38(F). Additionally, the proposed expansion is located approximately 800 feet from an unnamed intermittent brook, 950 feet from an unnamed tributary to Pushaw Stream, and approximately 2,350 feet from Judkins Brook. All of these streams are located in the watershed of the Penobscot River which contains Atlantic salmon, and Judkins Brook is located within federally mapped Critical Habitat for Atlantic salmon.

Intervenor Edward Spencer's expert witness, Dr. Steve Coghlan, testified that the expansion could negatively impact Atlantic salmon, Atlantic sturgeon, and shortnose sturgeon due, in part, to the potential for stormwater and leachate to contaminate adjacent waterways and ultimately the Penobscot River.

The applicant responded that its natural resources assessment prepared by Stantec inventoried and assessed potential impacts to natural resources at the site, including rare, threatened and endangered species. Stantec concluded that the project would not have an unreasonable adverse impact on these resources due in part to the location of the expansion relative to the protected resources, the design of the expansion, and management of stormwater and leachate.

Dr. Coghlan's concerns and the applicant's response are discussed further in Finding 9 of this license which is incorporated herein.

Additionally, Mr. Spencer commented that pumping groundwater to allow for construction will have an impact on the adjacent wetlands and Atlantic salmon habitat. Many of the wetlands surrounding the site are forested wetlands and their hydrology is not due to groundwater discharge, but rather results from surface water perched on the low permeability glacial till. Furthermore, the technical design of the underdrain system is that the underdrains (sand and piping) will collect and transport groundwater by gravity, not by active pumping, over portions of three cells where the bottom of the cell will be below the groundwater table. It is expected that the seepage into the underdrain will continue, but then will eventually diminish over time.

The Maine Department of Marine Resources (DMR) reviewed the proposed project and stated that it should not cause any significant adverse impact to Atlantic salmon or other marine resources.

The Maine Department of Inland Fisheries and Wildlife (MDIFW) reviewed the proposed project and stated that, with the exception of one SVP (impacts to which were authorized in the permit-by-rule), there are no other essential or significant wildlife habitats at the project site.

Based on the setback of the expansion from the streams, the evidence supplied by the applicant in its natural resources assessment and related expert testimony, and the review comments submitted by sister agencies DMR and MDIFW, the Board finds that the activity will not unreasonably harm any significant wildlife habitat, freshwater wetland plant habitat, aquatic or adjacent upland habitat, travel corridor, freshwater, estuarine or marine fisheries or other aquatic life pursuant to 38 M.R.S. § 480-D(3).

D. Water Quality Considerations

Pursuant to 38 M.R.S. § 480-D(4), the applicant must demonstrate that the activity will not unreasonably interfere with the natural flow of any surface or subsurface waters. Pursuant to 38 M.R.S. § 480-D(5) and Section 401 of the Federal Water Pollution Control Act, the applicant must demonstrate that the activity will not violate any state water quality law, including those governing the classification of the State's waters.

As set forth above, the expansion will be located approximately 800 feet from an unnamed intermittent brook, 950 feet from an unnamed tributary to Pushaw

Stream, and approximately 2,350 feet from Judkins Brook. Information in the record shows that the nearest mapped sand and gravel aquifer is located approximately one mile east of the landfill expansion area.

As discussed more fully in Findings 12, 14, and 15 of this license, the applicant submitted a Stormwater Management Plan and an Erosion and Sedimentation Control Plan, dated July 2015, prepared by SME to manage surface water runoff and minimize impacts to surface water quality from siltation. Additionally, the landfill expansion is designed in accordance with the Department's solid waste Rules to minimize the potential for contamination of groundwater. Leachate from the expansion will be collected, stored on-site, and trucked off-site to the MFGR, LLC wastewater treatment plant in Old Town which is licensed to accept the leachate. The project was reviewed by the Department's Division of Water Quality Management which stated that the treatment plant is currently operating in compliance with its license.

The Board finds that the proposed expansion meets state water quality law, including those governing the classification of the State's waters based on the location of the expansion relative to the protected natural resources, the existing and proposed Stormwater Management System, the Erosion and Sedimentation Control Plan, and the collection and subsequent treatment of the leachate at a licensed wastewater treatment facility.

E. <u>Flooding</u>

In accordance with 38 M.R.S. § 480-D(6), the applicant must demonstrate that the activity will not unreasonably cause or increase the flooding of the alteration area or adjacent properties.

As discussed in Finding 17, the expansion will not be located in a 100-year flood plain or restrict the flow of a 100-year flood. The applicant also submitted a Stormwater Management Plan which included pre- and post-development stormwater analyses up to and including a 25-year, 24-hour storm event which demonstrate that post-development peak flows will not exceed pre-development peak flows.

Based upon the location of the expansion outside the floodplain and the Stormwater Management Plan, the Board finds that the expansion will not unreasonably cause or increase the flooding of the alteration area or adjacent properties.

F. Wetlands and Waterbodies Protection Rules

The applicant proposes to directly alter 2.04 acres of primarily forested freshwater wetlands to construct the proposed landfill expansion. Including this proposed project and the previous projects on this site, the total cumulative amount of wetland alteration at the site will be 3.35 acres.

The Department's rule at 06-096 C.M.R. ch. 310 elaborates on the NRPA criteria for obtaining a permit. The rules guide the Department in its determination of whether a project's impacts would be unreasonable. A proposed project would generally be found to be unreasonable if it would cause a loss in wetland area, functions and values and there is a practicable alternative to the project that would be less damaging to the environment. Each application for a NRPA permit that involves a freshwater wetland alteration must provide an analysis of alternatives.

(1) Alternatives Analysis

The applicant provided an alternatives analysis (Volume V, Attachment 2 of the Application) which summarized the need for the project and examined alternatives to the selected project site and project design, including: development of alternative sites, a "no build" alternative, waste reduction/alternative waste management strategies, and alternative designs on-site that would impact less wetland area. The applicant stated that alternative State-owned landfill sites, such as Dolby in Millinocket and Carpenter Ridge in T2R8 NWP (currently undeveloped), and the one commercial landfill (Crossroads in Norridgewock) were not viable options because JRL was the only site which had a Public Benefit Determination. The applicant stated that the "no build/do nothing" option was not viable because existing landfills could not accommodate the anticipated waste volumes and a need for 9.35 million cubic yards of additional landfill capacity had already been documented and approved in the PBD for JRL. The alternatives analysis also considered waste management options (discussed in Findings 18 and 19 of this license). Finally, the analysis examined the placement of the expansion on the site and the design of the expansions cells in relationship to the existing waste disposal cells at JRL.

Intervenor Edward Spencer questioned whether the applicant would be required to demonstrate that the proposed expansion could not occur at another location, such as the state-owned Dolby Landfill in Millinocket or by development of the state-owned site at Carpenter Ridge. In response, the Board Chair ruled in the Third Procedural Order that since the Commissioner had issued a PBD for a 9.35 million cubic yard expansion at JRL, consideration of alternative sites and the no-build alternative were not issues to be addressed in the current licensing proceeding. The Third Procedural Order states:

> The Applicant has received a Public Benefit Determination for the proposed expansion at the Juniper Ridge site and that determination was upheld by the Board on appeal. As stated in the Second Procedural Order, statute prohibits the Board from revisiting the Public Benefit Determination in this licensing proceeding (38 M.R.S. § 1310-N(3-A)(B)). Therefore, the Board will not allow testimony or cross-examination by the parties regarding the need for the proposed 9.35 million cubic yard expansion. Additionally, testimony that the State should seek to develop other landfill sites is not relevant to the current licensing proceeding. However, to the extent the Public Benefit Determination imposes conditions on any license that may be issued in this proceeding, including limits on the types and volumes of waste, those limits are arguably relevant and may be addressed in testimony and cross-examination (Third Procedural Order).

The Board finds that the amount of capacity needed and the general location of disposal were settled with the Commissioner's issuance of the PBD, leaving only the question of whether or not the proposed project could be located on the subject parcel and designed to avoid and minimize wetland impacts.

(2) Avoidance of On-Site Impacts

As discussed above, the applicant submitted an alternatives analysis for the proposed project dated July 2015. The applicant considered two other on-site designs for the JRL expansion, a 70-acre expansion which would have resulted in 4.5 acres of wetland impact and a 60-acre expansion which would have resulted in 3.4 acres of wetland impact. The design submitted for approval and which is the subject of this license will expand the solid waste footprint at JRL by approximately 54 acres and will directly impact 2.04 acres of freshwater wetlands. In its application, the applicant stated that it has located all roads, stormwater ponds, administrative buildings, and other infrastructure to avoid the greatest amount of wetland impacts. According to the applicant, in order to meet the stated project purpose, some impacts to freshwater wetlands are unavoidable.

(3) Minimization of On-Site Impacts

In accordance with 06-096 C.M.R. ch. 310, § 5(B), the amount of freshwater wetland to be altered must be kept to the minimum amount necessary for meeting the overall purpose of the project. The applicant's design of the expansion utilizes upland areas for a majority of the expansion. The applicant proposes to build cells vertically, thereby minimizing the horizontal footprint and associated wetland impacts. Finally, additional capacity is obtained by utilizing the "in-fill" areas between existing landfill cells and the proposed expansion cells. The Board finds that the applicant's design minimizes impacts to wetlands to the greatest extent practicable.

(4) Compensation

In accordance with 06-096 C.M.R. ch. 310, § 5(C), compensation is the off-setting of a lost wetland function with a function of equal or greater value. The goal of compensation is to achieve no net loss of freshwater wetland functions and values. The amount of compensation required to replace lost functions depends on a number of factors including: the size of the alteration activity, the functions of the wetlands to be altered, the type of compensation to be used, and the characteristics of the compensation site. When wetland preservation is the type of compensation proposed, Department rules generally require a ratio of 8:1 (area preserved to area impacted). As stated previously, the applicant's Wetlands Compensation Plan was designed to address both NRPA and Corps requirements.

The applicant proposes to preserve a 266-acre area on the same parcel as the landfill expansion to address NRPA compensation requirements as well as Corps compensation requirements. The proposed preservation area is adjacent to an existing 16-acre preservation area along Judkins Brook. The functions and values of the freshwater wetlands on the parcel were evaluated by the applicant using the U. S. Army Corps of Engineers Highway Methodology (September, 1999). The functions and values of the freshwater wetlands proposed to be impacted by the project include flood flow alteration, nutrient removal, sediment and toxicant removal, and wildlife habitat. There are no SVPs (other than the one which was the subject of the permit-by-rule) or other significant wildlife habitats in the wetlands to be impacted.

The preservation area contains 57 acres of freshwater wetland, 25 vernal pools, and upland habitat. Three of the vernal pools are SVPs and eight others are highly functioning vernal pools that met the biological criteria to be considered an SVP, but did not meet all of the necessary criteria. The functions and values of the preservation area include sediment and toxicant removal, flood flow alteration, nutrient removal, and wildlife habitat. Bryan Emerson, professional wetland scientist and witness for the applicant, testified that the applicant has proposed compensation in excess of that required by both NRPA and the Corps. NRPA requires approximately 16.3 acres of wetland compensation for the 2.04 acres of direct impact to wetlands. The Corps compensation requirements differ from those of the Department and require a greater ratio of acres preserved to acre impacted.

The applicant proposes to preserve the area through the use of a Declaration of Covenants and Restrictions (Declaration) and submitted proposed language that meets Department standards. The City of Old Town has agreed to be the Third Party under the Declaration, with third party rights of administration and enforcement. Prior to the start of construction, the applicant must record the Declaration in the Registry of Deeds and must submit a copy of the recorded deed to the Department's Bureau of Land Resources within 60 days of recording.

Based on the Public Benefit Determination, the applicant's alternatives analysis, the project's design, and the land preservation proposal, the Board finds that the applicant has avoided and minimized freshwater wetland impacts to the greatest extent practicable, and has provided compensation for wetland impacts in accordance with Department rules and in exceedance of NRPA requirements. The Board further finds that the proposed project represents the least environmentally damaging alternative that meets the overall purpose of the project provided that, prior to construction, the applicant records the Declaration of Covenants and Restrictions and submits a copy to the Department's Bureau of Land Resources as described above.

BASED on the above Findings of Fact, and subject to the Conditions listed below, the Board makes the following CONCLUSIONS pursuant to 38 M.R.S. §§ 1310 to 1319-Y, 38 M.R.S. § 2101, and the applicable Department Rules:

1. The applicant has submitted evidence that the proposed expansion will not pollute any water of the State, contaminate the ambient air, constitute a hazard to health or welfare, or create a nuisance pursuant to 38 M.R.S. § 1310-N(1)(A) and 06-096 C.M.R. ch. 400, § 3(D).

2. The applicant has complied with the public and local participation and notification requirements pursuant to 38 M.R.S. §§ 1310-S(1) and 1310-N(12) and 06-096 C.M.R. ch. 2, §§ 10, 13, and 14.

3. The applicant has demonstrated sufficient title, right, or interest in all of the property which is proposed for development or use pursuant to 06-096 C.M.R. ch. 400, § 4(A).

4. The applicant has provided a sufficient demonstration of financial ability and assurance and technical ability for the permitting, design, construction, operation, closure, and post-closure care of the proposed landfill expansion pursuant to 38 M.R.S. §§ 1310-N (2-F)(A) and § 1310-Y, and 06-096 C.M.R. ch. 400, §§ 4(B)(1) and 4(C)(1), provided NEWSME submits the appropriate financial assurance package updates in accordance with the Rules on an annual basis.

5. The applicant has provided a civil/criminal disclosure statement demonstrating that the entities are not in violation of environmental or criminal law pursuant to 38 M.R.S. § 1310-N(7) and 06-096 C.M.R. ch. 400, § 4(C)(1)(b) and § 12.

6. The applicant has provided sufficient provisions for safe and uncongested traffic movement of all types into, out of, and within the proposed landfill expansion pursuant to 38 M.R.S. § 1310-N (2-F)(B) and 06-096 C.M.R. ch. 400, § 4(D)(1); provided the facility continues to encourage waste haulers to use I-95 as a primary hauling route.

7. The applicant has provided sufficient provisions for fitting the proposed landfill expansion harmoniously into the existing natural environment; has provided buffer strips of sufficient size and quality to adequately protect aquatic and wildlife habitat and the natural environment; and will not unreasonably adversely affect protected natural resources and rare, threatened and endangered plant and animal species pursuant to 38 M.R.S. § 1310-N(2-F)(C) and 06-096 C.M.R. ch. 400, § 4(E)(1).

8. The applicant has sufficiently demonstrated that the proposed expansion will not unreasonably adversely affect existing uses and scenic character, including bird hazard to aircraft, historical sites, established public viewing areas, excessive noise at the property boundary or at any protected location, or existing uses of neighboring property pursuant to 38 M.R.S. § 1310-N(2-F)(C) and 06-096 C.M.R. ch. 400, § 4(F)(1); provided equipment use is restricted in the operating hour of 6:00 am to 7:00 am to only equipment

with a combined sound level of 77 dBA at 50 feet or less if within 60 feet of the western solid waste boundary (approximately 480 feet from the western property line).

9. The applicant has sufficiently demonstrated that the proposed expansion will not unreasonably adversely affect air quality pursuant to 38 M.R.S. § 1310-N(2-F)(C) and 06-096 C.M.R. ch. 400, § 4(G)(1).

10. The applicant has sufficiently demonstrated that the proposed expansion will not unreasonably adversely affect water quality or cause an unreasonable threat to the quality of a classified body of surface water pursuant to 38 M.R.S. §§ 1310-N(2-F)(C) and 1310-N(1-A) and 06-096 C.M.R. ch. 400, § 4(H)(1).

11. The applicant has sufficiently demonstrated that the proposed expansion will not unreasonably adversely affect other natural resources in the municipality or in neighboring municipalities pursuant to 38 M.R.S. § 1310-N(2-F)(C) and 06-096 C.M.R. ch. 400, § 4(I)(1).

12. The applicant has sufficiently demonstrated that the proposed expansion will not: overlie any significant sand and gravel aquifers; pose an unreasonable threat to the quality of a significant sand and gravel aquifer; pose an unreasonable threat to the quality of an underlying fractured bedrock aquifer, or pose an unreasonable risk that a discharge to a significant ground water aquifer will occur, pursuant to 38 M.R.S. §§ 1310-N(2-A) and 1310-N(2-F)(E), and 06-096 C.M.R. ch. 400, § 4(K)(1).

13. The applicant has made sufficient provisions for adequate utilities, including adequate water supplies and appropriate sanitary wastewater disposal, and sufficiently demonstrated that the facility will not have an unreasonable adverse effect on existing or proposed utilities in the municipality or area served by those utilities, pursuant to 38 M.R.S. § 1310-N(2-F)(F) and 06-096 C.M.R. ch. 400, § 4(L)(1).

14. The applicant has sufficiently demonstrated that the proposed expansion will be located on soils types suitable to the nature of the undertaking and the facility will not cause unreasonable erosion of soil or sediment pursuant to 38 M.R.S. §§ 1310-N(2-F)(D) and 1310-N(1-A)(A) and 06-096 C.M.R. ch. 400, § (4)(J)(1).

15. The applicant has sufficiently demonstrated that the proposed expansion will not unreasonably cause or increase flooding on-site or on adjacent properties nor create an unreasonable flood hazard to a structure pursuant to 38 M.R.S. §§ 1310-N(2-F)(G) and 06-096 C.M.R. ch. 400, § 4(M)(1).

16. The applicant has sufficiently demonstrated that the purpose and practices for the proposed expansion are consistent with the solid waste management hierarchy pursuant

to 38 M.R.S. §§ 2101 and 1310-N(1)(D) and 06-096 C.M.R. ch. 400, § 4(N)(1), provided that a summary of continued efforts to meet the hierarchy and relevant supporting data are submitted annually in the Annual Report.

17. The applicant has sufficiently demonstrated that the proposed expansion will accept solid waste that is subject to recycling and source reduction programs, voluntary or otherwise, at least as effective as those in the statute and other provisions of State law; the volume of the waste and the risks related to its handling and disposal have been reduced to the maximum practical extent by recycling and source reduction prior to being landfilled or incinerated; and the applicant has shown consistency with the recycling provisions of the State plan pursuant to 38 M.R.S. § 1310-N(5-A) and 06-096 C.M.R. ch. 400, § 6(B).

18. The applicant is exempt from the liability insurance requirements of 06-096 C.M.R. ch. 400, § 10.

19. The applicant has clearly and convincingly demonstrated the technical equivalency of placing a barrier soil layer in a 12-inch lift thickness compared to the required 9-inch lift thickness, provided that a test pad program is undertaken during construction of each cell of the proposed expansion as described in the application and Finding 28(L) of this license to demonstrate that the required performance criteria have been met and the results are submitted to the Department at least 7 days prior to full-scale construction. If the applicant cannot demonstrate technical equivalency, the maximum barrier soil lift thickness will remain 9 inches.

20. The applicant has completed a site assessment report that adequately supports the design of the proposed expansion and will conduct water quality monitoring in accordance with the Rules.

21. The applicant has submitted a quality assurance plan and construction contract bid documents including drawings, technical specifications, and contract administrative documents for Cell 11 of the proposed expansion in accordance with 06-096 C.M.R. ch. 401, § 2 (I) and (J).

22. The applicant has proposed an expansion design meeting the requirements of the Rules, provided that, an engineering report, construction contract bid documents, including drawings, technical specifications, and contract administrative documents, a quality assurance plan and erosion and sedimentation control and stormwater management plans are submitted to the Department for review and approval at least four months prior to the commencement of construction activities within each subsequent cell (Cells 12 through 16) of the proposed expansion; and the applicant maintains a valid leachate disposal contract(s) with licensed waste water treatment facility(ies) for the treatment and disposal of leachate from the proposed expansion.

23. The applicant has submitted a phased final cover system meeting the requirements of the Rules, provided that an engineering report, construction contract bid documents, including drawings, technical specifications, and contract administrative documents, and a quality assurance plan and erosion and sedimentation control and stormwater management plans are submitted to the Department for review and approval at least four months prior to the proposed application of a phased final cover system.

24. The applicant has submitted an Operations Manual that meets the operating requirements of 06-096 C.M.R. ch. 401, § 2(L), provided that the Operations Manual is reviewed annually and updated as necessary with the Annual Report.

25. The PBD partial approval issued by the Commissioner in 2012 requires that an annual limit be established in this license on the tonnage of OBW that may be disposed of in the proposed expansion, with future review and potential subsequent modification to the OBW limit, and established provisions for the independent third party audits of CDD processing operations that are anticipated to transport more than 10,000 tons of OBW to the proposed expansion for disposal on an annual basis.

BASED on the above Findings of Fact, and subject to the Conditions listed below, the Board makes the following CONCLUSIONS pursuant to 38 M.R.S. §§ 480-A through 480-JJ, Section 401 of the Federal Water Pollution Control Act, and the applicable Department rules:

26. The applicant has sufficiently demonstrated that the proposed expansion will not unreasonably interfere with existing scenic, aesthetic, recreational or navigational uses pursuant to pursuant to 38 M.R.S. § 480-D(1).

27. The applicant has sufficiently demonstrated that the proposed expansion will not cause unreasonable erosion of soil or sediment nor unreasonably inhibit the natural transfer of soil from the terrestrial to the marine or freshwater environment pursuant to 38 M.R.S. § 480-D(2).

28. The applicant has sufficiently demonstrated that the proposed expansion will not unreasonably harm any significant wildlife habitat, freshwater wetland plant habitat, threatened or endangered plant habitat, aquatic or adjacent upland habitat, travel corridor, freshwater, estuarine or marine fisheries or other aquatic life pursuant to 38 M.R.S. § 480-D(3), provided the applicant records the Declaration of Covenants and Restrictions as described in Finding 38(F) of this license above.

29. The applicant has sufficiently demonstrated that the proposed expansion will not unreasonably interfere with the natural flow of any surface or subsurface waters pursuant to 38 M.R.S. § 480-D(4).

30. The applicant has sufficiently demonstrated that the proposed expansion will not violate any state water quality law, including those governing the classification of the State's waters pursuant to 38 M.R.S. § 480-D(5) and Section 401 of the Federal Water Pollution Control Act.

31. The applicant has sufficiently demonstrated that the proposed expansion will not unreasonably cause or increase the flooding of the alteration area or adjacent properties pursuant to 38 M.R.S. § 480-D(6).

THEREFORE, the Board APPROVES the noted applications of the applicant, SUBJECT TO THE ATTACHED CONDITIONS, and all applicable standards and regulations:

1. The Standard Conditions of Approval for Solid Waste and NRPA, copies attached.

2. Severability. The invalidity or unenforceability of any provisions, or part thereof, of this license shall not affect the remainder of the provision or any other provision. This license shall be construed and enforced in all respects as if such invalid or unenforceable provision or part thereof had been omitted.

3. Soil Erosion. The applicant shall take all necessary actions to ensure that its activities or those of its agents do not result in unnecessary or noticeable erosion of soils on site during construction and operation of the landfill expansion.

4. Financial Assurance. The applicant shall submit the appropriate financial assurance package updates in accordance with the Rules on an annual basis, including the most recent surety bond documentation.

5. New Cell Construction Submittals. At least 4 months prior to new cell construction and related infrastructure, the applicant must submit the detailed design package for the Department's review and approval. The submittal shall contain the information required by the Rules, including, but not limited to an engineering report, construction contract bid documents consisting of technical specifications, drawings and contract administrative documents, a quality assurance plan and erosion and sedimentation control and stormwater management plans. If the Rules applicable to any aspect of the design and construction of the landfill expansion and its ancillary structures change during the development of the proposed expansion, the applicant shall address the new requirements in subsequent pertinent submittals.

6. Equipment Use - Noise Limitation. From the hour of 6:00 am to 7:00 am, the applicant shall limit equipment use within 60 feet of the western solid waste boundary

(approximately 480 feet from the western property line) to equipment with a combined sound level of 77 dBA at 50 feet or less.

7. Hauler Policy. The applicant shall continue its policy of encouraging hauling trucks to utilize I-95 to reduce use of the Bennoch Road (Route 16).

8. Leachate Disposal Contracts. In accordance with the Rules, the applicant shall maintain valid leachate disposal contract(s) with licensed waste water treatment facility(ies) for the treatment and disposal of leachate from the proposed expansion. A contingency plan for leachate disposal limitations at contracted treatment facilities shall be in place, including a letter of intent or service contracts for such proposed contingencies. Subsequent updates to the leachate disposal documentation shall be submitted to the Department to demonstrate compliance with the leachate management requirements of the Rules.

9. Liner Action Plan (LAP). The LAP shall initially consist of two-tiered action leakage rates of 20 and 100 gallons per acre per day, requiring notification and follow-up interactions with the Department to determine the appropriate response action. Specific conductance shall be utilized as the secondary approach for determining additional response action. As the proposed expansion is developed and upon submittal of actual field data, the applicant may request revisions to the LAP through Operations Manual updates requiring Department approval through the Annual Report.

10. Acceptable Waste

    A. In the landfill expansion, the applicant may accept the same non-hazardous waste generated within the State allowed in the existing landfill and under the previously issued waste stream licenses for the facility, with the exception of MSW.

    B. The applicant is prohibited from accepting MSW in the landfill expansion. MSW bypass may be accepted in accordance with Condition 11 of this license.

    C. OBW disposal at the proposed landfill expansion shall be limited pursuant to Condition 12 of this license.

    D. Prior to accepting any waste for disposal not listed or referenced in the application and previously licensed, the applicant shall submit an application for the new waste to the Department for review and approval.

    E. Allowable wastes shall be accepted at the landfill expansion in accordance with the facility's Solid Waste Characterization Plan and regulatory and statutory requirements.

11. MSW Bypass

A. The applicant shall not dispose of any unprocessed MSW from any source other than MSW bypass from MSW incinerators located in Maine.

B. The applicant shall not accept MSW bypass from an incinerator without verifiable authorization from the owner/operator of an incinerator that a MSW bypass event has been called.

C. The applicant shall notify the Department within 24 hours if a MSW bypass event continues from a particular incinerator for a period exceeding 2 days, and provide the reason for the MSW bypass event.

12. OBW

A. The applicant shall be restricted to an OBW disposal limit of 65,000 tons on an annual basis in the proposed expansion.

B. No OBW from the CDD processing operations subject to audit shall be disposed in the proposed expansion prior to the first independent third party audit of CDD processing operations conducted as set forth in Condition 12(D) of this license, unless otherwise approved by the Department.

C. The OBW limit shall be evaluated annually by the Department and modified as needed based on current OBW recycling opportunities, economic factors, and other relevant factors. Modification of the OBW limit will be accomplished either through a license modification process pursuant to 38 M.R.S. § 341-D(3) or a license application submitted by the applicant pursuant to 38 M.R.S. § 344(9) and 06-096 C.M.R. chs. 2 and 400.

D. NEWSME shall reimburse the Department for periodic independent third party audits of CDD processing operations that are anticipated to transport more than 10,000 tons of OBW to the expansion for disposal on an annual basis. The audits shall be conducted to verify the results of the demonstrations required under the provisions of *Processing Facilities,* 06-096 C.M.R. ch. 409, § 2(C), focused on the nature and volume of processing residues being sent to the JRL expansion for disposal. The independent third party audits shall be conducted by a qualified consultant selected by the Department in consultation with the affected CDD processing facilities and NEWSME. The first such audit(s) shall occur prior to the disposal of OBW from these processing facilities to the proposed expansion, unless otherwise approved by the Department. Audits will be conducted at 2-year intervals, unless or until the Department approves their discontinuation.

13. Monthly Activity Reports. Monthly activity reports shall be provided to the Department and include the quantities of the various waste types, and their sources, delivered to the proposed expansion.

14. Annual Reports

    In addition to the specific requirements set forth in the Rules, the applicant shall include the following in the facility's annual reports submitted to the Department:

    A. The amount of unprocessed MSW bypass received at the proposed expansion from each of the approved sources.

    B. A summary of the steps taken by the facility in the reporting year to continue to meet the hierarchy, including relevant metrics to evaluate effectiveness (i.e., tons of material diverted from landfill disposal by Casella companies; tons of materials reused, reduced, recycled at the landfill); a description of ongoing efforts to increase the effectiveness of these programs/efforts; and any additional pertinent hierarchy-related information.

    C. A geotechnical report, including a summary of the geotechnical inspections; the annual review of waste types, quantities, and location of waste placement; the evaluation of pore pressure data; and the review of site aerial topographic surveys.

15. EMP - Ground Water Quality and Flow. The applicant shall provide for an annual assessment of ground water quality and flow directions as the proposed expansion is developed through updates to the EMP which shall occur on an ongoing basis and in accordance with Department recommendations.

16. Construction Requirements. The applicant shall meet the construction requirements of 06-096 C.M.R. ch. 401, § 3 for the proposed expansion, including, but not limited to: implementing the Quality Assurance Plan; meeting liner installation requirements; receiving approval from the Department for changes to the approved plans and specifications; and documenting and reporting appropriately, including submittal of a final construction report. At least 7 days prior to full scale barrier soil construction, the applicant shall submit the results of a test pad to demonstrate the technical equivalency of placing barrier soil in a 12-inch lift thickness compared to a 9-inch lift thickness. If the applicant cannot demonstrate technical equivalency, the maximum barrier soil lift thickness shall remain 9 inches.

17. Operating Requirements. The applicant shall meet the operating requirements of 06-096 C.M.R. ch. 401, § 4 for the landfill expansion, including, but not limited to: reviewing and updating the Operations Manual as applicable; training and certifying key personnel; operating the facility per the Rule requirements; and submitting an Annual Report and associated fee.

18. Federal Requirements - LFG Collection and Control System. The applicant shall meet the applicable requirements of 40 CFR Part 60, Subpart XXX for the LFG collection and control system for air emissions minimization and odor control.

19. Phased Final Cover. The applicant shall submit the engineering report, construction contract bid documents, consisting of technical specifications, drawings, and contract administrative documents, a quality assurance plan and erosion and sedimentation control and stormwater management plans for the placement of phased final cover to the Department for its review and approval at least 4 months prior to each proposed application of final cover.

20. Declaration of Covenants and Restrictions. Prior to the start of construction, the applicant shall record the Declaration of Covenants and Restrictions for the preservation area in the Registry of Deeds and shall submit a copy of the recorded deed to the Department's Bureau of Land Resources within 60 days of recording.

21. The Findings of Fact, Conclusions and Conditions remain as approved in Department license #L-19015-31-A-M dated August 24, 1995, and subsequent Licenses to date.

DONE AND DATED AT AUGUSTA, MAINE THIS 1st DAY OF June, 2017.

BOARD OF ENVIRONMENTAL PROTECTION

BY: ______________________________
James W. Parker, Board Chair and Presiding Officer

PLEASE NOTE ATTACHED SHEET FOR GUIDANCE ON APPEAL PROCEDURES.

Date of initial receipt of application: July 21, 2015
Date of application acceptance: August 7, 2016 (solid waste); July 31, 2016 (NRPA)

Date filed with the Board of Environmental Protection:

XKT79512 and LC/L19015DN/ATS#79502

STANDARD CONDITIONS
TO ALL SOLID WASTE LANDFILL LICENSES

STRICT CONFORMANCE WITH THE STANDARD AND SPECIAL CONDITIONS OF THIS APPROVAL IS NECESSARY FOR THE PROJECT TO MEET THE STATUTORY CRITERIA FOR APPROVAL. VIOLATIONS OF THE CONDITIONS UNDER WHICH A LICENSE IS ISSUED SHALL CONSTITUTE A VIOLATION OF THAT LICENSE AGAINST WHICH ENFORCEMENT ACTION MAY BE TAKEN, INCLUDING REVOCATION.

1. **Approval of Variations from Plans.** The granting of this approval is dependent upon and limited to the proposals and plans contained in the application and supporting documents submitted and affirmed by the license. Any consequential variation from these plans, proposals, and supporting documents is subject to review and approval prior to implementation.

2. **Compliance with All Applicable Laws.** The licensee shall secure and comply with all applicable federal, state, and local licenses, permits, authorizations, conditions, agreements, and orders prior to or during construction and operation, as appropriate.

3. **Compliance with All Terms and Conditions of Approval.** The licensee shall submit all reports and information requested by the Department demonstrating that the licensee has complied or will comply with all terms and conditions of this approval. All preconstruction terms and conditions must be met before construction begins.

4. **Transfer of License.** The licensee may not transfer the solid waste facility license or any portion thereof without approval of the Department.

5. **Initiation of Construction or Development Within Two Years.** If the construction or operation of the solid waste facility is not begun within two years of issuance of within 2 years after any administrative and judicial appeals have been resolved, the license lapses and the licensee must reapply to the Department for a new license unless otherwise approved by the Department.

6. **Approval Included in Contract Bids.** A copy of the approval must be included in or attached to all contract bid specifications for the solid waste facility.

7. **Approval Shown to Contractors.** Contractors must be shown the license by the licensee before commencing work on the solid waste facility.

8. **Background of key individuals.** A licensee may not knowingly hire as an officer, director or key solid waste facility employee, or knowingly acquire an equity interest or debt interest in, any person convicted of a felony or found to have violated a State or federal environmental law or rule without first obtaining the approval of the Department.

STANDARD CONDITIONS
TO ALL SOLID WASTE LANDFILL LICENSES

9. **Fees.** The licensee must comply with annual license and annual reporting fee requirements of the Department's rules.

10. **Recycling and Source Reduction Determination for Solid Waste Disposal Facilities.** This condition does not apply to the expansion of a commercial solid waste disposal facility that accepts only special waste for landfilling.

The solid waste disposal facility shall only accept solid waste that is subject to recycling and source reduction programs, voluntary or otherwise, at least as effective as those imposed by 38 M.R.S. Ch. 13.

11. **Deed Requirements for Solid Waste Disposal Facilities.** Whenever any lot of land on which an active, inactive, or closed solid waste disposal facility is located is being transferred by deed, the following must be expressly stated in the deed:

A. The type of facility located on the lot and the dates of its establishment and closure.

B. A description of the location and the composition, extent, and depth of the waste deposited.

C. The disposal location coordinates of asbestos wastes must be identified.

Natural Resources Protection Act (NRPA)
Standard Conditions

THE FOLLOWING STANDARD CONDITIONS SHALL APPLY TO ALL PERMITS GRANTED UNDER THE NATURAL RESOURCES PROTECTION ACT, 38 M.R.S.A. § 480-A ET SEQ., UNLESS OTHERWISE SPECIFICALLY STATED IN THE PERMIT.

A. Approval of Variations From Plans. The granting of this permit is dependent upon and limited to the proposals and plans contained in the application and supporting documents submitted and affirmed to by the applicant. Any variation from these plans, proposals, and supporting documents is subject to review and approval prior to implementation.

B. Compliance With All Applicable Laws. The applicant shall secure and comply with all applicable federal, state, and local licenses, permits, authorizations, conditions, agreements, and orders prior to or during construction and operation, as appropriate.

C. Erosion Control. The applicant shall take all necessary measures to ensure that his activities or those of his agents do not result in measurable erosion of soils on the site during the construction and operation of the project covered by this Approval.

D. Compliance With Conditions. Should the project be found, at any time, not to be in compliance with any of the Conditions of this Approval, or should the applicant construct or operate this development in any way other the specified in the Application or Supporting Documents, as modified by the Conditions of this Approval, then the terms of this Approval shall be considered to have been violated.

E. Time frame for approvals. If construction or operation of the activity is not begun within four years, this permit shall lapse and the applicant shall reapply to the Board for a new permit. The applicant may not begin construction or operation of the activity until a new permit is granted. Reapplications for permits may include information submitted in the initial application by reference. This approval, if construction is begun within the four-year time frame, is valid for seven years. If construction is not completed within the seven-year time frame, the applicant must reapply for, and receive, approval prior to continuing construction.

F. No Construction Equipment Below High Water. No construction equipment used in the undertaking of an approved activity is allowed below the mean high water line unless otherwise specified by this permit.

G. Permit Included In Contract Bids. A copy of this permit must be included in or attached to all contract bid specifications for the approved activity.

H. Permit Shown To Contractor. Work done by a contractor pursuant to this permit shall not begin before the contractor has been shown by the applicant a copy of this permit.

DEP INFORMATION SHEET

Appealing a Department Licensing Decision

Dated: March 2012 **Contact: (207) 287-2811**

SUMMARY

There are two methods available to an aggrieved person seeking to appeal a licensing decision made by the Department of Environmental Protection's ("DEP") Commissioner: (1) in an administrative process before the Board of Environmental Protection ("Board"); or (2) in a judicial process before Maine's Superior Court. An aggrieved person seeking review of a licensing decision over which the Board had original jurisdiction may seek judicial review in Maine's Superior Court.

A judicial appeal of final action by the Commissioner or the Board regarding an application for an expedited wind energy development (35-A M.R.S.A. § 3451(4)) or a general permit for an offshore wind energy demonstration project (38 M.R.S.A. § 480-HH(1)) or a general permit for a tidal energy demonstration project (38 M.R.S.A. § 636-A) must be taken to the Supreme Judicial Court sitting as the Law Court.

This INFORMATION SHEET, in conjunction with a review of the statutory and regulatory provisions referred to herein, can help a person to understand his or her rights and obligations in filing an administrative or judicial appeal.

I. ADMINISTRATIVE APPEALS TO THE BOARD

LEGAL REFERENCES

The laws concerning the DEP's *Organization and Powers*, 38 M.R.S.A. §§ 341-D(4) & 346, the *Maine Administrative Procedure Act*, 5 M.R.S.A. § 11001, and the DEP's *Rules Concerning the Processing of Applications and Other Administrative Matters* ("Chapter 2"), 06-096 CMR 2 (April 1, 2003).

HOW LONG YOU HAVE TO SUBMIT AN APPEAL TO THE BOARD

The Board must receive a written appeal within 30 days of the date on which the Commissioner's decision was filed with the Board. Appeals filed after 30 calendar days of the date on which the Commissioner's decision was filed with the Board will be rejected.

HOW TO SUBMIT AN APPEAL TO THE BOARD

Signed original appeal documents must be sent to: Chair, Board of Environmental Protection, c/o Department of Environmental Protection, 17 State House Station, Augusta, ME 04333-0017; faxes are acceptable for purposes of meeting the deadline when followed by the Board's receipt of mailed original documents within five (5) working days. Receipt on a particular day must be by 5:00 PM at DEP's offices in Augusta; materials received after 5:00 PM are not considered received until the following day. The person appealing a licensing decision must also send the DEP's Commissioner a copy of the appeal documents and if the person appealing is not the applicant in the license proceeding at issue the applicant must also be sent a copy of the appeal documents. All of the information listed in the next section must be submitted at the time the appeal is filed. Only the extraordinary circumstances described at the end of that section will justify evidence not in the DEP's record at the time of decision being added to the record for consideration by the Board as part of an appeal.

WHAT YOUR APPEAL PAPERWORK MUST CONTAIN

Appeal materials must contain the following information at the time submitted:

1. *Aggrieved Status*. The appeal must explain how the person filing the appeal has standing to maintain an appeal. This requires an explanation of how the person filing the appeal may suffer a particularized injury as a result of the Commissioner's decision.
2. *The findings, conclusions or conditions objected to or believed to be in error.* Specific references and facts regarding the appellant's issues with the decision must be provided in the notice of appeal.
3. *The basis of the objections or challenge.* If possible, specific regulations, statutes or other facts should be referenced. This may include citing omissions of relevant requirements, and errors believed to have been made in interpretations, conclusions, and relevant requirements.
4. *The remedy sought.* This can range from reversal of the Commissioner's decision on the license or permit to changes in specific permit conditions.
5. *All the matters to be contested.* The Board will limit its consideration to those arguments specifically raised in the written notice of appeal.
6. *Request for hearing.* The Board will hear presentations on appeals at its regularly scheduled meetings, unless a public hearing on the appeal is requested and granted. A request for public hearing on an appeal must be filed as part of the notice of appeal.
7. *New or additional evidence to be offered.* The Board may allow new or additional evidence, referred to as supplemental evidence, to be considered by the Board in an appeal only when the evidence is relevant and material and that the person seeking to add information to the record can show due diligence in bringing the evidence to the DEP's attention at the earliest possible time in the licensing process <u>or</u> that the evidence itself is newly discovered and could not have been presented earlier in the process. Specific requirements for additional evidence are found in Chapter 2.

OTHER CONSIDERATIONS IN APPEALING A DECISION TO THE BOARD

1. *Be familiar with all relevant material in the DEP record.* A license application file is public information, subject to any applicable statutory exceptions, made easily accessible by DEP. Upon request, the DEP will make the material available during normal working hours, provide space to review the file, and provide opportunity for photocopying materials. There is a charge for copies or copying services.
2. *Be familiar with the regulations and laws under which the application was processed, and the procedural rules governing your appeal.* DEP staff will provide this information on request and answer questions regarding applicable requirements.
3. *The filing of an appeal does not operate as a stay to any decision.* If a license has been granted and it has been appealed the license normally remains in effect pending the processing of the appeal. A license holder may proceed with a project pending the outcome of an appeal but the license holder runs the risk of the decision being reversed or modified as a result of the appeal.

WHAT TO EXPECT ONCE YOU FILE A TIMELY APPEAL WITH THE BOARD

The Board will formally acknowledge receipt of an appeal, including the name of the DEP project manager assigned to the specific appeal. The notice of appeal, any materials accepted by the Board Chair as supplementary evidence, and any materials submitted in response to the appeal will be sent to Board members with a recommendation from DEP staff. Persons filing appeals and interested persons are notified in advance of the date set for Board consideration of an appeal or request for public hearing. With or without holding a public hearing, the Board may affirm, amend, or reverse a Commissioner decision or remand the matter to the Commissioner for further proceedings. The Board will notify the appellant, a license holder, and interested persons of its decision.

II. <u>JUDICIAL APPEALS</u>

Maine law generally allows aggrieved persons to appeal final Commissioner or Board licensing decisions to Maine's Superior Court, <u>see</u> 38 M.R.S.A. § 346(1); 06-096 CMR 2; 5 M.R.S.A. § 11001; & M.R. Civ. P 80C. A party's appeal must be filed with the Superior Court within 30 days of receipt of notice of the Board's or the Commissioner's decision. For any other person, an appeal must be filed within 40 days of the date the decision was rendered. Failure to file a timely appeal will result in the Board's or the Commissioner's decision becoming final.

An appeal to court of a license decision regarding an expedited wind energy development, a general permit for an offshore wind energy demonstration project, or a general permit for a tidal energy demonstration project may only be taken directly to the Maine Supreme Judicial Court. <u>See</u> 38 M.R.S.A. § 346(4).

Maine's Administrative Procedure Act, DEP statutes governing a particular matter, and the Maine Rules of Civil Procedure must be consulted for the substantive and procedural details applicable to judicial appeals.

ADDITIONAL INFORMATION

If you have questions or need additional information on the appeal process, for administrative appeals contact the Board's Executive Analyst at (207) 287-2452 or for judicial appeals contact the court clerk's office in which your appeal will be filed.

Note: The DEP provides this INFORMATION SHEET for general guidance only; it is not intended for use as a legal reference. Maine law governs an appellant's rights.

STATE OF MAINE
DEPARTMENT OF ENVIRONMENTAL PROTECTION
17 STATE HOUSE STATION   AUGUSTA, MAINE 04333-0017

DEPARTMENT ORDER

IN THE MATTER OF

STATE OF MAINE, ACTING THROUGH	)	SOLID WASTE LICENSE
THE BUREAU OF GENERAL SERVICES	)	
OLD TOWN, PENOBSCOT COUNTY, ME	)	
JUNIPER RIDGE LANDFILL	)	
#S-020700-WD-BL-A	)	
(PARTIAL APPROVAL WITH CONDITIONS)	)	AMENDMENT

Pursuant to the provisions of the *Maine Hazardous Waste, Septage and Solid Waste Management Act*, 38 Maine Revised Statutes (M.R.S.) §§ 1301 to 1319-Y; *Solid Waste Management Hierarchy*, 38 M.R.S. § 2101; the *Rule Concerning the Processing of Applications and Other Administrative Matters*, 06-096 Code of Maine Rules (C.M.R.) ch. 2 (last amended October 19, 2015); the *Solid Waste Management Rules: General Provisions*, 06-096 C.M.R. ch. 400 (last amended April 6, 2015), *Landfill Siting, Design and Operation*, 06-096 C.M.R. ch. 401 (last amended April 12, 2015), and *Water Quality Monitoring, Leachate Monitoring, and Waste Characterization*, 06-096 C.M.R. ch. 405 (last amended April 12, 2015) (collectively, the Rules), the Department of Environmental Protection (Department) has considered the application of the State of Maine acting through the Bureau of General Services, with all supportive data, agency review comments, and other related materials on file, and FINDS THE FOLLOWING FACTS:

1. APPLICATION SUMMARY

   A. Application

      The State of Maine, acting through the Bureau of General Services (BGS), has applied for Maine Hazardous Waste, Septage and Solid Waste Management Act approval to remove the municipal solid waste (MSW) acceptance date of March 31, 2018 for the disposal of no more than 81,800 tons per year of non-bypass, in-state municipal solid waste (MSW) at the Juniper Ridge Landfill in Department license #S-020700-WD-BC-A, Condition 10, as revised in Board of Environmental Protection Order #S-020700-WD-BG-Z. The Juniper Ridge Landfill (JRL) is located in Old Town, Maine. The northern edge of the JRL property parcel is on the Alton/Old Town border and a portion of the access road is located in Alton.

      BGS, as the owner of JRL, and NEWSME Landfill Operations, LLC (NEWSME), as the operator of JRL, prepared the amendment application.

   B. History

      The following is a relevant historical summary and does not include all licensing actions:

(1) On July 28, 1993, James River Paper Company, Inc. was issued a license to construct and operate a 68-acre secure landfill, known as the West Old Town Landfill, to dispose of the James River Paper Company's pulp and papermaking residuals (license #S-020700-7A-A-N). The project impacted 1.31 acres of freshwater wetland. The compensation package included preservation of 27.92 acres of land adjacent to the facility and the restoration and enhancement of 1.76 acres of wetland within the preserved parcel.

(2) On October 21, 2003, the Department issued conditional approval for the transfer of licenses for the West Old Town Landfill, from the Fort James Operating Company, to the State of Maine, State Planning Office (SPO) (including license #S-020700-WR-M-T); the transfer became effective when the sale of the landfill to the State of Maine, acting by and through SPO, occurred on February 5, 2004.

(3) On February 5, 2004, the State of Maine, acting by and through the SPO, and Casella Waste Systems, Inc. (Casella) entered into an Operating Services Agreement (OSA) for the operation of the West Old Town Landfill.

(4) On April 9, 2004, the Department approved an amendment application (license #S-020700-WD-N-A) for a vertical increase in the final elevation of the landfill and the disposal of additional waste streams.

(5) In 2006, the West Old Town Landfill became known as the Juniper Ridge Landfill.

(6) Pursuant to PL 2011, ch. 655, § GG-69, on July 1, 2012, the BGS, within the Department of Administrative and Financial Services (DAFS), became the state agency acting as the owner and licensee of JRL. The Department of Economic and Community Development is the manager of JRL. NEWSME, a wholly-owned indirect subsidiary of Casella, operates the landfill for the State of Maine, acting through the Bureau of General Services.

(7) On December 20, 2013, the Department approved an amendment application (license #S-020700-WD-BC-A) for the disposal of 81,800 tons per year of MSW at JRL, limited to the period of time during which licensed disposal capacity remains available within the approved horizontal and vertical boundaries of the landfill or March 31, 2016, whichever is earlier.

(8) On June 19, 2014, the Board of Environmental Protection (Board) issued a Denial of Appeals (license #S-020700-WD-BG-Z) which modified Condition 10 in license #S-020700-WD-BC-A to change the date from March 31, 2016 to March 31, 2018.

C. Terms and Acronyms

The following terms and acronyms can be found in this license and are listed in Table 1 for ease of reference:

Table 1: License Terms and Acronyms

applicant	Refers to both BGS and NEWSME (or a successor operator)
Application	Refers to the November 2017 application, the December 14, 2017 Supplemental Information on Solid Waste Management Hierarchy, and associated submittals
Board	Maine Board of Environmental Protection
BGS	Bureau of General Services
Casella	Casella Waste Systems, Inc.
CDD	Construction and Demolition Debris
C.M.R.	Code of Maine Rules
CRM	Coastal Resources of Maine, LLC. CRM refers to the solid waste processing facility in Hampden which was established by Fiberight as a special purpose entity and is managed entirely by Fiberight
Department	Maine Department of Environmental Protection
H_2S	Hydrogen Sulfide
JRL	The Juniper Ridge Landfill
MERC	The former Maine Energy Recovery Company, an incinerator previously operated in Biddeford, Maine
MMWAC	Mid-Maine Waste Action Corporation
MRC	Municipal Review Committee, Inc.
M.R.S.	Maine Revised Statutes
MSW	Municipal Solid Waste
MSW Bypass	Any MSW that is destined for disposal or processing at a solid waste incinerator, but that cannot be disposed of or processed at that incinerator because of the incinerator's malfunction, insufficient capacity, inability to process or burn, down-time, or any other comparable reason as approved by the Department
NEWSME	NEWSME Landfill Operations, LLC
OSA	Operating Service Agreement
PERC	Penobscot Energy Recovery Company
Rules	The Department's Solid Waste Management Rules, including 06-096 C.M.R. chs. 400, 401, and 405

Soft Layer	A protective layer of waste above the liner and leachate collection systems
State Plan	Maine Materials Management Plan: 2014 State Waste Management and Recycling Plan Update & 2015 Waste Generation and Disposal Capacity Report, January 2017, prepared by the Maine Department of Environmental Protection

D. Summary of Proposal

The proposed application includes a request to remove the date in the existing amendment license, #S-020700-WD-BC-A, to allow continued acceptance of no more than 81,800 tons per year of non-bypass, in-state MSW at JRL beyond the currently licensed March 31, 2018 date. The request is applicable to the existing landfill operations and does not extend to the recently licensed landfill expansion.

Condition 10 of Department license #S-020700-WD-BC-A states the following, pertaining to the approval of disposal of no more than 81,800 tons per year of MSW at JRL:

10. The term of this license is limited to the period of time during which licensed disposal capacity remains available for disposal within the horizontal and vertical boundaries approved in Department license #S-020700-WD-N-A, or until March 31, 2016, whichever comes sooner. This condition does not limit the authority of the applicant to accept MSW bypass after March 31, 2016 provided that such acceptance is consistent with the relevant terms of Department license #S-020700-WD-N-A and the soft layer license.

Board Order #S-020700-WD-BG-Z, Denial of Appeals, states:

- Condition #10 is modified to change the date from March 31, 2016 to March 31, 2018.

The applicant states that an approved amendment will serve to meet the ongoing need of primarily southern Maine communities, formerly contracted with Maine Energy Recovery Company (MERC), as a disposal option and asserts that there is a potential shortfall beginning April 1, 2018 in the availability of existing and planned solid waste facilities to manage the MSW generated within the State.

The solid waste application, dated November 2017, along with a supplement titled "Information on Solid Waste Management Hierarchy" dated December 14, 2017 (Application), was accepted as complete for processing on December 15, 2017.

The Department commented on the Application in a February 15, 2018 review letter. On March 1, 2018 BGS and NEWSME submitted a response to comments. A follow-up comment letter by the Department was dated March 12, 2018, and BGS and NEWSME responded to the follow-up comments on March 16, 2018.

E. Ownership and Operation of the Juniper Ridge Landfill

The State of Maine, acting through BGS, owns JRL. Casella is the operator of the landfill through NEWSME, a wholly-owned indirect subsidiary of Casella. The terms and conditions of NEWSME's operation of the landfill are established by the OSA between the State of Maine and Casella dated February 5, 2004, and amended on July 24, 2006 and November 2, 2006.

In accordance with the OSA, Casella is required to pay all costs associated with the development, operation, closure and post-closure care of the landfill. In addition, Casella is required by the OSA to establish and maintain financial assurances for the landfill sufficient to meet the closure and post-closure care provisions of the applicable Rules, assume liability for the landfill under both the current and future conditions, and assure that adequate disposal capacity is provided for the wastes currently disposed in the landfill for at least a 20-year period. Resolve 2003, Chapter 93 requires contract terms and conditions to be "revenue-neutral to the State and as the office [former Executive Department, State Planning Office] determines are advisable and in the public interest."

The OSA is a contract between the State of Maine, acting through BGS, and Casella. The Board and Department are not parties to the OSA. Section 4.1 of the OSA includes language that specifies that the State shall work with Casella in maintaining in the State's name the existing permit, amendments, and all permits, licenses, statutory amendments and legislation, approvals and authorizations reasonably requested by Casella and agreed to by the State for the operation of the landfill in accordance with the terms of the OSA.

Reference to the "applicant" in this license determination refers to both BGS, as the owner of JRL, and NEWSME, as the current operator, acting as an agent on behalf of BGS in accordance with the terms in the OSA.

2. PUBLIC PARTICIPATION

A. Pre-Application Meetings

Pre-application meetings were held on September 19 and October 13, 2017, attended by the applicant and the Department. Although the meetings were not explicitly required by 06-096 C.M.R. ch. 2, § 10, discussions centered on the proposal concept and required application contents.

B. Notice of Intent to File

A Notice of Intent to File an application was published in the Bangor Daily News on November 21, 2017, in addition to being mailed to the abutters and prior appellants, the Old Town and Alton municipal offices, the Landfill Advisory Committee and the Penobscot Nation. The notice and mailing of the notice fulfilled the public and local participation requirement of 38 M.R.S. § 1310-S(1), the citizen's advisory committee notification requirement of 38 M.R.S. § 1310-N(12), and the public notice requirements of 06-096 C.M.R. ch. 2, § 14.

C. Public Hearing Requests

The Department received 19 timely requests for a public hearing in late December 2017 and early January 2018. According to 06-096 C.M.R. ch. 2 § 7(B) of the Department's Rule Concerning the Processing of Applications and Other Administrative Matters, "the Department will hold a hearing in those instances where the Department determines there is credible conflicting technical information regarding a licensing criterion and it is likely that a hearing will assist the Department in understanding the evidence." The hearing requests included many statements that the proposal goes against the State's solid waste management hierarchy. Additional concerns included that out-of-state waste continues to be accepted, MSW was not originally allowed when the State took over the facility and shouldn't continue, Casella has a history of unveiling additional plans immediately after obtaining approvals, the environment will be harmed, the State's interest should be considered not just Casella's, contracts involving Casella should be made available, and disagreement over the State's available solid waste capacity assertions in the Application. Two additional submittals did not include hearing requests, but included comments. One commenter stated concern with the proposal and the second stated support for the Application.

After review of the submitted requests for a public hearing, the Department determined that the requests received did not contain credible conflicting technical information regarding licensing criteria to support holding a public hearing; however, the Department held a public meeting to provide an opportunity for comments to be presented on the Application in a public forum.

D. Public Meeting and Comments Submitted

The Department held a public meeting on the Application on February 28, 2018 in Bangor, Maine pursuant to 38 M.R.S. § 345-A and 06-096 C.M.R. ch. 2, § 8. The public meeting was noticed in the Bangor Daily News on February 17, 2018 and posted on the Department's website with interested persons being separately notified. Approximately 100 people attended the public meeting and approximately 40 total speakers commented on the Application, either in support, in opposition, or neither for nor against.

Additional written comments were received over the course of the licensing process. The comments received during the public meeting and subsequent to the meeting included comments in support, in opposition, and neither for nor against the application.

Comments received in support included, but were not limited to: JRL's MSW capacity is needed for the MRC communities due to the status of the Coastal Resources of Maine, LLC's (CRM) facility and waste transportation costs; concern over the available outlets for solid waste after March 31, 2018 and the need for a landfill like JRL as an option; and recognition of Casella's diversion efforts.

Comments received in opposition included, but were not limited to: concern for the environment and surrounding area: JRL has had time to find other viable options for MSW waste disposal from the former MERC communities; the hierarchy requirements will not be met; landfilling should be the last option considered and shouldn't necessarily be the easiest and least expensive; the State's landfill space should be conserved; JRL will continue to request acceptance of MSW if it's allowed through this licensing process; more should be done to recycle.

Comments received neither for nor against summarized the history of JRL, the solid waste legislative timeline, and some of the past and current solid waste management concerns in Maine. A number of the comments received are further expanded on in Findings of Fact ("Finding") 8.

E. Draft License Comment Period

A draft license was made available for comment on March 23, 2018 through notification to the applicant and interested persons. The draft license was posted on the Department's website and the five-working day comment period closed on March 30, 2018.

Written comments were received on the draft license. The comments on the proposed draft license included, but were not limited to, the following: the term of the MSW amendment license should be until December 31, 2023 to allow sufficient time for PERC and CRM to achieve sustainable operating status; the limited one-year extension perpetuates the considerable uncertainty for solid waste management services; MSW for grading purposes for phased closure over the entire life of the existing landfill should be provided for; the annual license limit of 81,800 tons per year of MSW was never reached; the need for management of commercial MSW should be noted; and suggested clarifying wording changes should be incorporated.

One commenter requested that the Department consider extending the approval term from the one year due to the terms of their waste supply agreement, the short-term extension placing stress on their construction project, and the uncertainty in PERC's role in the region's disposal structure.

Additional comments included: the time extension should be denied and non-bypass MSW be banned from JRL after March 31, 2018; Casella should be diverting more MSW rather than increasing MSW accepted over the previous years; if the one-year extension is granted, the limit for that year should be lower; out-of-state options should be addressed; H_2S production from CDD or CDD fines will occur anyway as the material is currently accepted and will decompose; and the curbside MSW from the Bangor area should not be brought to JRL.

Based on comments received, revisions were made to the draft license that address the relevant review criteria and issues raised within the purview of the Department's authority. The revisions include, but are not limited to, clarification of language, insertion of out-of-state facility information, recognition that former MERC incineration capacity has not been replaced and clarification of the terms of the waste agreements.

3. TITLE, RIGHT OR INTEREST

The applicant must demonstrate sufficient title, right, or interest in all of the property which is proposed for use pursuant to 06-096 C.M.R. ch. 400, § 4(A). The applicant has provided evidence of the State's title to the property pursuant to the Rules by submitting the documentation provided in the 2012 application for amendment #S-020700-WD-B-C: the appropriate site and quitclaim deeds for the parcels of land on which the landfill is located. The Department therefore finds that the applicant has demonstrated sufficient title, right, or interest in the existing landfill property.

4. FINANCIAL ABILITY AND FINANCIAL ASSURANCE

State law at 38 M.R.S. § 1310-Y requires the applicant to provide assurance of its financial ability to satisfy the estimated costs for corrective action and assurance of financial capacity to satisfy the estimated costs of closure and post closure care; however, 38 M.R.S. § 1310-Y applies to privately owned solid waste facilities. The Department's rules at 06-096 C.M.R. ch. 400, § 4(B)(1) and § 11 require financial ability and financial assurance for the operation, maintenance, closure and post-closure care of a solid waste facility; however, as a State-owned facility, it is not subject to the requirements of § 11 to provide financial assurance sufficient to ensure that funds are available to pay for the anticipated costs of compliance with all facility closure, post-closure maintenance, post-closure monitoring requirements, and corrective action.

Although not all of the financial requirements of the State laws and Rules apply to the State owned JRL, Casella maintains financial assurance as required by the OSA. Ongoing activities at JRL are funded by revenues generated from the operation of the landfill (i.e., tipping fees). The applicant provided a letter dated September 8, 2017 from the Bank of America, N.A. stating that Casella maintains a Revolving Credit Facility and has adequate financial resources with all accounts in good standing. Casella maintains surety bonds as financial assurance for final closure and post-closure care costs for the entire developed site for a 30-year period. The closure and post-closure care costs are updated yearly with updates of costs by an independent third party and the documentation of any changes made to the funding agreement are submitted in the facility's Annual Report. The most recent updated surety bond documentation was submitted to the Department in an August 11, 2017 letter with attachments.

The Department finds that financial ability and financial assurance is maintained by NEWSME as the current operator of JRL to operate, maintain, close, and accomplish post-closure care in a manner consistent with applicable State law and Rule requirements, provided NEWSME submits the appropriate financial assurance package updates to the Department on an annual basis.

5. TECHNICAL ABILITY

The applicant must have the technical ability to design, construct, operate, maintain, close, and accomplish post-closure care in a manner consistent with State environmental standards, as well as meeting the civil or criminal record standards in 06-096 C.M.R. ch. 400, § 12.

A. Technical Experience

NEWSME has managed JRL since April 2004 and employs qualified management personnel and operations staff at the facility, along with utilizing qualified consultants as appropriate. NEWSME's parent company, Casella also provides expertise in solid waste, recycling, and resource management.

The Department finds that the combination of BGS staff, NEWSME operations and management personnel, and the consultants retained by the applicant have the technical ability to operate JRL in a manner consistent with the applicable State law and Rule requirements.

B. Civil or Criminal Record

Finding 9 of this license contains the information on civil and criminal disclosure.

6. PROVISIONS FOR TRAFFIC MOVEMENT

The applicant must make adequate provisions for safe and uncongested traffic movement of all types into, out of, and within the proposed solid waste facility as set forth in 06-096 C.M.R. ch. 400, § 4(D)(1).

Traffic movement is not expected to significantly change with the proposed amendment since the request does not include an increase in the volume of MSW delivered to the site from what is currently licensed. A traffic assessment was provided in the 2012 application for amendment #S-020700-WD-B-C for disposal of MSW at the facility and reviewed by the Department during issuance of that amendment license. The primary waste haul route to JRL will remain as currently established: I-95, to the Route 16 Bennoch Road interchange (exit 199), then Route 16 West for 0.1 miles to JRL's site access road. The internal roads currently allow for continuous traffic flow to minimize danger to pedestrians or other vehicles. The site access and internal site roads are maintained by NEWSME, including winter plowing and summer dust control.

The Department finds that the applicant has demonstrated that the roads and intersections in the vicinity of JRL have the ability to safely and appropriately handle all of the traffic attributable to the handling of MSW into, out of, and within the facility pursuant to the applicable State law and Rule requirements.

7. NO UNREASONABLE ADVERSE EFFECT ON AIR QUALITY

The solid waste facility may not unreasonably adversely affect air quality pursuant to 06-096 C.M.R. ch. 400, § 4(G)(1). The facility must obtain an air emission license, if required;

control fugitive dust and nuisance odor; and prohibit open burning of solid waste other than clean or painted wood waste. The proposed amendment is not expected to change the findings of JRL's air emission license or negatively impact JRL's current approved practices regarding fugitive dust and nuisance odor control.

A. Air Emission License

Air emission license renewal #A-921-70-B-R was issued on October 7, 2014 for the existing landfill facility with findings that emissions from the source will receive Best Practical Treatment, will not violate applicable emissions standards, and will not violate applicable ambient air quality standards in conjunction with emissions from other sources. The air emission license renewal includes State and federal emission limits and operational requirements associated with landfill gas collection and control, as well as monitoring and reporting requirements.

The 2014 air emission license renewal addresses control of landfill gas emissions through use of a landfill gas collection and control system, with the extracted and collected landfill gas passing through a Thiopaq® sulfur removal system, then being combusted in either the main flare (Flare #4) or back-up flares prior to release to the atmosphere. In addition to monitoring air emissions from the control equipment, as well as control equipment parameters, the facility is also required by the Federal New Source Performance Standards (NSPS) to perform periodic gas surface scans on the landfill.

The Department finds that the applicant has an air emission license, as required by State law and the Rules.

B. Fugitive Dust

The measures to control dust at the landfill will continue to include utilization of water spray trucks to wet secondary roads during dry weather and making use of a road sweeper to remove dirt buildup on paved roadways. Calcium chloride may be utilized on an as-needed basis, primarily on internal cell access roads.

On the landfill's active working area, MSW and other acceptable wastes are off-loaded and covered with daily cover material which minimizes the potential for airborne dust from the disposed material.

The Department finds that the dust control measures in place at the landfill are sufficient to control fugitive dust as required by State law and the Rules.

C. Nuisance Odors and H_2S

The proposed amendment is not expected to increase the quantity or quality of landfill gas generated at the facility above what was previously projected. The facility manages odors through the operation of an active gas collection and control system which collects, treats via the Thiopaq® sulfur removal system, and combusts the gas through the flares; daily cover practices; the placement of intermediate and final cover; and a misting system to control odors around the active filling areas at the landfill. The facility's current Operations Manual includes the facility's Odor Complaint Management and Response Plan to manage landfill-related odors and limit off-site odor migration.

Due to the composition and characteristics of the waste, MSW has the potential for odor generation as the waste is transported to the facility and off-loaded in the active area, as well as during the production of landfill gases, including odorous H_2S, as the waste in the landfill decomposes. Measures for minimization of odor associated with incoming odorous waste streams such as MSW include placement within a small area in the active cell, waste compaction, and placement of a cover layer of non-odorous material above the disposed waste at the end of each day. The facility also utilizes odor neutralizing spray systems, as needed, including a mobile mounted unit within the active cell, a trailer spray system for incoming and outgoing trailer loads, and a perimeter misting system. The facility minimizes odor from landfill gas produced due to waste degradation by the installation of daily cover, intermediate cover and final cover over non-active portions of the landfill and the operation of the facility's gas collection and control system. An evaluation provided in the 2012 application for amendment #S-020700-WD-BC-A included projected landfill gas generation rates with an MSW acceptance rate that was slightly above the current 81,800 tons per year acceptance rate and it was determined that the collection and control system was appropriate for minimizing air emissions.

The facility maintains an odor complaint hotline, four off-site gas monitors, and two on-site gas monitors. Odor complaints for calendar year 2017 totaled 14, most occurring in the last two months of the year possibly due to intermediate cover damage from a late October wind storm. Each complaint was followed-up by NEWSME personnel. The gas monitors measure H_2S concentrations through real-time data collection and a response procedure has been established and is implemented when specific H_2S thresholds have been measured. The monitoring data is also utilized when responding to odor complaints.

The Department finds that the applicant has odor control mechanisms sufficient to control nuisance odors from the landfill as required by State law and the Rules.

8. SOLID WASTE MANAGEMENT HIERARCHY

A. Applicable Requirements

As stated in 38 M.R.S. § 1310-N(1)(D) and 06-096 C.M.R. ch. 400, § 4(N)(1), the purpose and practices of the solid waste facility must be consistent with the State's solid waste management hierarchy (hierarchy) set forth in 38 M.R.S. § 2101(1), which reads as follows:

> Priorities. It is the policy of the State to plan for and implement an integrated approach to solid waste management for solid waste generated in the State and solid waste imported into this State, which must be based on the following order of priority:
>
> A. Reduction of waste generated at the source, including both amount and toxicity of the waste;
> B. Reuse of waste;
> C. Recycling of waste;
> D. Composting of biodegradable waste;
> E. Waste processing that reduces the volume of waste needing land disposal, including incineration; and
> F. Land disposal of waste.

In addition, 38 M.R.S. § 2101(2) establishes that "it is the policy of the State to actively promote and encourage waste reduction measures from all sources and maximize waste diversion efforts by encouraging new and expanded uses of solid waste generated in this State as a resource."

The Department's rule at 06-096 C.M.R. ch. 400, § 4(N)(2)(a) states that for a solid waste disposal facility, the applicant must affirmatively demonstrate consistency with the hierarchy, including the following:

> that the waste has been reduced, reused, recycled, composted, and/or processed to the maximum extent practicable prior to incineration or landfilling, in order to maximize the amount of material recycled and reused, and to minimize the amount of waste being disposed. Such evidence shall include, but is not limited to, a description of the reduction, reuse, recycling, composting and/or processing programs/efforts that the waste is or will be subject to, and that are sufficiently within the control of the applicant to manage or facilitate, including relevant metrics to evaluate effectiveness; and a

description of ongoing efforts to increase the effectiveness of these programs/efforts.

For the purpose of 06-096 C.M.R. ch. 400, § 4(N):

> reducing, reusing, recycling, composting and/or processing waste to the "maximum extent practicable" prior to disposal means handling the greatest amount of waste possible through means as high on the solid waste management hierarchy as possible, resulting in maximizing waste diversion and minimizing the amount of waste disposed, without causing unreasonable increases in facility operating costs or unreasonable impacts on other aspects of the facility's operation. Determination of the "maximum extent practicable" includes consideration of the availability and cost of technologies and services, transportation and handling logistics, and overall costs that may be associated with various waste handling methods.

State law also imposes limits on the origin of wastes accepted at a State-owned solid waste facility. In accordance with 38 M.R.S. § 1310-N(11):

> a solid waste disposal facility owned by the State may not be licensed to accept waste that is not waste generated within the State. For purposes of this subsection, "waste generated within the State" includes residue and bypass generated by incineration, processing and recycling facilities within the State or waste, whether generated within the State or outside of the State, if it is used for daily cover, frost protection or stability or is generated within 30 miles of the solid waste disposal facility.

B. <u>Application Information</u>

The applicant has proposed to remove the March 31, 2018 licensed date restriction on the allowance to accept 81,800 tons per year of non-bypass, in-state MSW in license #S-020700-WD-BC-A, issued in 2013. The applicant addressed the requirements of the hierarchy for managing MSW and the current MSW disposal capacity at Maine facilities in Section 2.2 of the Application.

(1) Sources of MSW and Past Amounts

The applicant states that the findings regarding the sources of MSW in the 2013 amendment application would not be significantly altered with the removal of the March 31, 2018 date. The waste proposed is consistent with the MSW accepted over the last four years. The contracted municipalities that utilized JRL for MSW disposal in 2017 are shown in Table 2 below, as presented in the table on page 2-2 of the Application.

Table 2:
Contracted Municipalities that Utilize JRL for MSW Disposal, 2017*

Communities Utilizing JRL for Direct MSW Disposal		
Town of Alfred	Town of Arrowsic	**Town of Acton**
Town of Arundel	**City of Biddeford**	Town of Bowdoinham
Town of Buxton	Town of Casco/Naples	**Town of Cornish**
Town of Dayton	Town of Denmark	Town of Dresden
Town of Durham	Town of Frye Island	Town of Harpswell
Town of Kennebunk	**Town of Kennebunkport**	Town of Long Island
Town of Newfield	**Town of North Berwick**	**City of Old Orchard Beach**
Town of Phippsburg	**Town of Sanford**	**Town of Shapleigh**
Town of Sebago	**Town of South Berwick**	Town of Topsham
Town of Wells	City of Westbrook	Town of York

* **Bold** denotes those communities under long-term contracts that formerly used Maine Energy Recovery Company (MERC).

There are 14 communities under long-term contracts with JRL that formerly utilized MERC as a disposal option. These contracts extend to 2025, with the exception of the City of Biddeford whose contract runs to 2022. In the response to comments, the applicant states that the sole reason for the prior amendment application, which resulted in the 2013 Department license to accept non-bypass MSW at JRL, was the closure of the MERC incinerator. The response to comments also includes the statement that in 2016, the 14 communities under long-term contract that formerly used MERC for MSW disposal generated 22,827 tons of residential MSW, in addition to commercial MSW, which was disposed at either JRL or the Penobscot Energy Recovery Company (PERC) incinerator facility in Orrington.

In addition to the 14 former MERC communities, there are also 16 additional southern Maine communities with MSW handling and disposal contracts with JRL, as well as commercial customers throughout Maine currently utilizing JRL for MSW disposal. Table 3 shows the total MSW disposal at JRL, excluding bypass, in a three-year period, excerpted from the table on page 2-3 of the Application.

Table 3: Total MSW Disposal at JRL, Excluding Bypass

Year	Non-Bypass MSW Disposed at JRL (tons)
2014	36,878*
2015	57,521
2016	69,934

* The applicant stated in comments on the public draft license that disposal of MSW did not begin until March 2014.

The Department notes that the amount of non-bypass, in-state MSW disposed of at JRL has increased each year and that not all of the municipalities and commercial entities with JRL disposal contracts appear to be former long-term contracted MERC customers. The applicant noted that the incineration capacity lost due to the MERC closure has not been replaced. The applicant commented, on the public comment draft license, that MSW disposed of at JRL has increased each year but has remained below the licensed 81,800 tons per year limit; that in 2014 and 2015 the applicant diverted MSW temporarily to other landfills which are no higher on the hierarchy than JRL; the applicant has no control over the amount of MSW generated in Maine; MSW generation rates have increased over the years; and the 2013 Department amendment did not limit the non-bypassed MSW disposal at JRL to only municipalities (residential and commercial) that were former long-term contracted MERC customers.

(2) Reduction, Reuse, and Recycling Programs and MSW Diversion Efforts

The Application states that the applicant will continue to promote and encourage waste reduction measures and the maximization of waste diversion efforts of the users of JRL to the maximum extent practicable in accordance with the Rules and licensing requirements. Casella, as an integrated solid waste management company, is involved in state recycling and reuse infrastructure, along with handling logistics and transportation. However, BGS, NEWSME, and Casella's subsidiaries do not have control over the extent to which municipalities, homeowners, and businesses utilize these recycling services.

For the last few years, the applicant states that they have diverted MSW from landfilling at JRL to disposal at various other outlets, as seen in Table 4, which also includes the amount of non-bypass, in-state MSW disposed at JRL for comparison. Table 4 is based on the table in Appendix 4 of the Application.

Table 4: Maine MSW Diversion from Disposal at JRL, Diversion Locations, and MSW Disposed at JRL

MSW Diversion from JRL (Tons)	**2014**	**2015**	**2016**
Maine Recyclables Processed at Casella's Zero-Sort® Program	25,026	28,688	35,851
Cardboard Recycling			
Brokered	37,385	53,244	55,903
Collected/Baled	12,840	29,071	27,288
ecomaine			
Lewiston Zero-Sort® Processing Residue - Incinerator	97	329	-
MSW - Incinerator	42,506	41,130	45,837
Single-stream Recyclables	-	11,430	11,934
MMWAC Incinerator			
Lewiston Zero-Sort® Processing Residue	-	1,742	2,777
MSW	147	32,212	35,384
PERC Incinerator	89,902	89,054	79,443
Bath Landfill	388	6,097	5,740
Brunswick Landfill	10,144	528	3,474
Fort Fairfield Landfill	7,249	10,500	11,204
Norridgewock Landfill	2,495	2,720	2,549
Total Maine MSW Disposal Diverted from JRL	**228,179**	**306,725**	**317,384***
Total Maine Non-bypass, In-state MSW disposed of at JRL	**36,878**	**57,521**	**69,934**

***** Corrected from number in error in the Application.

The Department notes that some of the MSW outlets identified in the table above as taking "diverted" waste may be the result of contracts for waste disposal that would not have been destined for JRL at any point due to logistical, economic, contractual and other factors.

Casella's Zero-Sort® Program allows commingling of all recyclable materials, requiring no sorting or separating. In 2014, a new materials recovery facility in Lewiston was opened by Casella. The benefits of this type of facility include increased ease and convenience, reduction in disposal costs due to reduction in volume, increase in range of recycled materials, and more efficient collection of materials. The number of Maine municipalities participating in Casella's Zero-Sort® Program along with the corresponding year has been: 52 (2014), 62 (2015), and 64 (2016). In 2016, 18 of the 30 municipalities listed in Table 2 utilized Casella for their recycling. The number of Maine businesses participating in Casella's Zero-Sort® Program along with the corresponding year has been: 3,200 (2014), 3,482 (2015), and 3,381 (2016). Casella also brokers and collects and/or bales cardboard at its Maine transfer stations for recycling.

Casella continues to evaluate options for food waste collection and diversion. Casella conducted an eight-month pilot project in 2017 with the Town of Scarborough which included curbside collection with disposal at Exeter Agri-Energy through ecomaine although transportation costs were deemed cost prohibitive.

The former MERC communities have reported a range of recycling rates resulting in an average of 39.96%, similar to the State average. Some communities exceed the state average, such as the City of Biddeford with a reported recycling rate in excess of 53% in 2016. The lowest reported recycling rate is 19.49%.

Additionally, Casella notes that they have served to increase MSW recycling rates over the past few years. The application states that waste disposed at JRL is reduced to the maximum extent practicable by Casella's various programs.

The Department notes that Casella has a diversity of waste management programs, including reduction and recycling that have managed more MSW from 2014 to 2016, but has also increased MSW disposal at JRL from 2014 to 2016. Further, the Department notes that some of the MSW that Casella specifies as being diverted from JRL is already destined and/or contracted to other Maine facilities. Therefore, the Department notes that it is not appropriate to define these practices as diversion from JRL but rather as obligations to transport waste to the most suitable facility based on logistical, economic, contractual and other factors.

(3) Existing Waste Management Facilities Capacities and Potential Shortfalls

a. Maine

The applicant asserts that beginning April 1, 2018, scheduled changes in Maine's solid waste management infrastructure are likely to result in the State not having the capacity for Maine generated MSW and waste may be "stranded" unless JRL is allowed to continue to accept in-state MSW.

The changes identified to occur on March 31, 2018 include:

i. The expiration of existing MSW disposal contracts between MRC municipalities and PERC;

ii. The expiration of the existing disposal agreements between PERC and Casella (30,000 tons per year of former MERC MSW);

iii. Potential changes to PERC's operational structure due to the expiration of the existing above-market power sales agreement with the local utility, resulting in a reduction in MSW processed to approximately 210,000 tons per year and reduction in disposal volumes of PERC residue;

iv. The non-operational status, due to continued construction, of CRM's MSW processing facility in Hampden which was previously expected to be operating by April 1, 2018; and

v. The expiration of the approval for JRL to accept non-bypass MSW for disposal.

The applicant states that with conservative estimates of future planned disposal capacity at PERC and CRM's facility post-2018 (210,000 tons per year and 105,000 tons per year, respectively) and the known capacity at ecomaine and MMWAC, there will likely be a continual shortfall in management options at a higher level on the hierarchy than landfills for MSW generated in Maine, which has not changed since the closure of MERC in 2012. Table 5, below, was included in Appendix 5 of the Application to corroborate the shortfall concept.

Table 5: Management of Maine Municipal Solid Waste (Tons)

	2011	2012	2013	2014	2015		Projected 2018[3]
MSW Generation[1] (not including CDD[2])	1,398,429	1,307,787	1,161,579	1,187,265	1,196,964		1,196,964
MSW Recycled & Composted[1] (not including CDD)	553,778	554,225	480,456	430,215	439,950		439,950
Total MSW Disposal (Landfill & Incineration)	751,187	753,562	681,123	757,050	757,014		757,014
Disposal/Management Availability in Maine: Non-Landfill[4]	854,000	854,000	544,000	544,000	544,000		555,000

(1) Maine Solid Waste Generation and Disposal Capacity Report or Materials Management Plan: Calendar Year 2011; page 10 (calculated), Calendar Year 2012-2013, Table 3; Calendar Year 2014-2015, Table 2
(2) CDD = Construction and Demolition Debris
(3) Data projected to be same as last full dataset (2015) for comparison
(4) Permitted capacity at Maine operating incinerators through 2015, stated future capacity at Maine incinerators and CRM in 2018

The above numbers (2013 through 2015) for non-landfill capacity are taken from the State Plan which specifies a capacity of 170,000 tons per year at ecomaine, 70,000 tons per year at MMWAC and 304,000 tons per year at PERC for a total of 544,000 tons. The projected non-landfill capacity was calculated by BGS and NEWSME in the application as 170,000 ton per year at ecomaine, 70,000 tons per year at MMWAC, 210,000 tons per year at PERC and 105,000 tons per year at CRM for a total of 555,000 tons. The Department has independently calculated the future non-landfill capacity as 170,000 ton per year at ecomaine, 70,000 tons per year at MMWAC, 210,000 tons per year at PERC and 145,000 tons per year at CRM for a total of 595,000 tons. Absent other information, the Department considers the projected non-landfill capacity to be 595,000 tons per year as long as PERC successfully achieves a stable operating capacity and CRM has been constructed and achieves commercial operations.

In the response to comments, the applicant provided copies of two written agreements that Casella has entered into with other Maine waste management facilities. One contract includes an agreement between CRM and Pine Tree Waste, Inc. (a subsidiary of Casella) for Pine Tree Waste, Inc. to deliver 40,000 tons per year of MSW to the CRM facility (20,000 tons from commercial businesses from an identified geographic area and 20,000 tons from the West Bath and Waterville transfer stations). The other contract includes an agreement with PERC, NEWSME, and Pine Tree Waste, Inc. to deliver 30,000 tons per year of MSW to PERC. As clarified in the follow-up response to comments, the originally agreed upon 30,000 tons of former MERC disposed MSW is part of the larger approximate tons listed in Section 2.3 of the agreement (within Category 3, 50,000 tons of in-state MSW as part of the 130,000 total tons). Both the CRM and PERC agreements are contingent on the authorization to accept no less than 81,800 tons per year of non-bypass, in-state MSW after March 31, 2018, with varying terms further described in Finding 8(D)(5).

In the follow-up response to comments, a draft swap agreement between MRC, Waste Management Disposal Services of Maine, Inc. (WMDSM) in Norridgewock, NEWSME, Pine Tree Waste, Inc., and CRM was described further, with the potential for a waste swap on a one to one (1:1) tonnage basis at agreed tip fees.

b. Out-of-State

In the response to comments, the applicant stated that within a transportation distance similar to that of the Westbrook transfer station to JRL, the two identified out-of-state incinerators are either at capacity and will remain so or are charging certain tip fees that, plus the cost of transportation, will make them an uneconomical option. It was also stated that, to the applicant’s knowledge, there are no out-of-state MSW processing facilities within a similar distance of the Westbrook transfer station to JRL. The applicant did acknowledge that there is some limited capacity in out-of-state landfills; however, the applicant stated that utilizing one landfill in favor of another does not address the solid waste management hierarchy standard and it is prudent and sound policy for Maine to provide for management of its own MSW.

(4) Technical Uses for MSW

The applicant states that the acceptance of MSW at JRL is beneficial to site operations and does not unnecessarily consume capacity that would be better utilized by waste that cannot be managed at facilities at higher levels on the hierarchy. The two main beneficial uses of MSW for landfill operations and closure were identified as use as a bulking material to stabilize sludge and use to bring interim grades to final grade prior to placement of the final cover system. In the response to comments, the applicant stated that prior to 2014, JRL received ash and front end process residue (FEPR) from MERC which were used as bulking material. The closure of MERC changed the quantities of these materials received, necessitating different bulking material be utilized, such as MSW. It was also stated that effective bulking material to stabilize sludge includes virgin soil material or CDD/CDD fines; however, the use of CDD or CDD fines provides an opportunity for increased H_2S production from the breakdown of sheetrock in the material. The applicant provided cost estimates to treat the H_2S production if these materials were used as bulking materials.

Additionally, the applicant asserts that JRL operations utilize a higher compaction rate than the average of five other municipal landfills across the state. The average compaction rate for JRL is 0.88 (airspace utilization factor based on tons of waste placed in a single cubic yard of landfill space), as compared to the compaction range of five municipal landfills from 2014 to 2016 of 0.2 to 1.07 with an average compaction rate of 0.55. The applicant states that this difference in compaction rate results in the ability of JRL to place an additional 668 pounds of waste per cubic yard of landfill capacity utilized, as compared to the average compaction rate of the five municipal landfills, proving the efforts of the applicant to prevent unnecessary consumption of valuable landfill space. The information used to calculate the compaction rates is from the information in the Maine Solid Waste Generation and Disposal Capacity Report, Calendar Years 2014 and 2015 and the submitted 2016 Annual Reports for each facility (tons received and volume consumed).

(5) Cost Considerations

As stated in Finding 8(A) above, the hierarchy requirements contain the determination of reducing, reusing, recycling, composting and/or processing waste to the maximum extent practicable, which includes consideration of the availability and cost of technologies and services, transportation and handling logistics, and overall costs that may be associated with various waste handling methods. In the Supplemental Information on Solid Waste Management Hierarchy portion of the Application submitted by the applicant on December 14, 2017 and follow-up responses to comments, the applicant addresses three potential scenarios where additional MSW could theoretically be diverted from JRL and the practicability of the scenarios in terms of cost. The three scenarios are: additional diversion to ecomaine and/or MMWAC; additional diversion to PERC or CRM's facility; and additional separation or processing of the MSW to remove recyclables or organics. Information was also provided on the alternatives and cost implications of not using MSW in site operations and potential disposal of the MSW at other landfill facilities. The applicant states that not using MSW in site operations will increase the cost of JRL's operations.

The applicant states that the southern Maine incinerators (ecomaine and MMWAC) are already at capacity so further diversion of MSW to them is not practicable and therefore, cost considerations are secondary. Both ecomaine and MMWAC have entered into contracts with municipalities previously contracted with PERC through MRC, which with their current long-term contracts, put both facility's operations at or exceeding capacity. Additionally, documentation has been provided stating that ecomaine has notified existing "spot market" waste haulers that ecomaine will not be able to serve them after March 31, 2018 per the information in the applicant's March 1, 2018 response to comments, Exhibit 9.

The agreements Casella has executed with PERC and CRM have been negotiated to supply the two entities with a specific amount of waste, contingent on Department authorization to accept no less than 81,800 tons per year of non-bypass, in-state MSW to meet the ongoing need of primarily southern Maine communities. The applicant states that for Casella and its Pine Tree Waste, Inc. subsidiary as the supplier of the waste, the agreements have a cost limitation related to how much can be paid in tipping or disposal fees while still covering expenses for collecting, consolidating and transporting the MSW to the receiving facility. The applicant states that both CRM's facility and PERC could accept additional volumes of material, but to cover their operational costs and make a profit as commercial entities, the necessary disposal tipping fee would be so high as to preclude Casella's ability to cover the cost of waste handling and management. Restating, it is asserted that it would be uneconomical for the applicant to divert additional MSW to either CRM's facility or PERC at the significantly higher tipping fees those receiving facilities would require, and those receiving facilities would not accept additional MSW at the tip fee the applicant would be able to pay.

The applicant states that the ability to provide additional separation or processing to remove recyclables or organics from MSW consolidated at any transfer station is limited by operational safety considerations, and design, permitting, and construction of such a facility. The majority of the former MERC communities utilize Casella's Westbrook transfer station for the mixed MSW remaining following the individuals' and business' use of their communities recycling programs and/or Casella's Zero-Sort® Program. In order to further separate potentially recyclable materials, the facility would need to be modified from a transfer station to a materials recycling and processing facility, resulting in a number of cost factors that would not financially support a conversion. In the response to comments, the applicant states that organics separation would require an initial estimated capital investment of $1.5 million and organics separation would cost approximately $20.00 more per ton than MSW transfer and disposal on a 20-year amortizable basis. An additional $1.0 million capital investment was estimated for the conversion of the transfer station to a recycle sorting facility.

The applicant addressed the higher cost of utilizing material as an alternative to MSW such as CDD fines, virgin soil or woodchips for landfill closure pre-grading and shaping, as well as for sludge bulking material. As an example, in the response to comments, the applicant estimated that purchasing grading materials at a cost of $10.50 to $13.00 per cubic yard would result in an additional cost in the range of $1.4 to 1.7 million if all 133,500 cubic yards of fill required to achieve final closure grades in the Phase 1 closure area of approximately 15 acres was purchased. A portion of this expense may be able to be reduced by utilizing waste where a deeper fill depth is required. As an alternative to purchasing material for landfill closure grading and shaping, landfill final grades could be reduced, but this would decrease the facility's permitted disposal capacity, potentially resulting in increased cost per ton for the remaining materials disposed in order to fund closure cost requirements. The applicant estimated that if soils were purchased to bulk the sludge at 1.25 parts soil for each part sludge bulked, this would likely require about 47,000 cubic yards of soil at a cost of $10.50 per yard, with potential costs of approximately $500,000 per year that could be offset by using MSW as the bulking agent.

The applicant also addressed the cost of disposal at other Maine landfills other than the local hauling and subsequent disposal that already occurs to these landfills. The statement was made that "while not a requirement of achieving compliance with the hierarchy, [the applicant has] reviewed the availability of alternative landfills to provide capacity for MSW." Augusta, Bath, Brunswick, and Presque-Isle municipal landfills accept MSW, but primarily from within their own municipalities. The Tri-Community Sanitary Recycling and Sanitary Landfill accepts MSW from beyond their communities, but transportation is cost-prohibitive since the facility is located in Aroostook County. The ecomaine landfill is operated only for their own use. WMDSM's Crossroads Landfill in Norridgewock has capacity but the applicant stated disposal fees at Norridgewock and transportation costs would preclude Casella from the ability to cover the cost of waste handling and management from the southern Maine communities. However, there is a draft "waste swap" agreement that addresses a 1:1 tonnage swap among MRC, WMDSM, NEWSME, Pine Tree Waste, Inc., and CRM.

The applicant addressed the potential use of out-of-state incinerators and processing facilities as uneconomical, even if capacity is available as discussed in Finding 8(B)(3).

C. <u>Comments Received</u>

The Department received written comments from various individuals and entities over the course of the licensing process, as well as verbal comments received at the public meeting.

Comments were provided that focused around the timeframe already given to JRL to find an alternative disposal method for the southern Maine MSW. These comments included: JRL had five years to plan for the MSW acceptance end date of March 31, 2018 and should have figured out an alternative disposal plan for the waste; Old Town residents shouldn't be penalized for the lack of Casella planning; and based on past actions, Casella will most likely come in for an amendment to continue any date extensions and to request MSW acceptance in the landfill expansion. Additionally, others stated that if granted, the continued MSW acceptance could prolong the active areas of the existing landfill since all other waste could be put in the expansion and only MSW put in the existing landfill, keeping it open longer than necessary. It was also presented that JRL is asking to accept in a year the same amount of waste that two municipal landfills dispose of, but JRL claims it is a "relatively small portion" of the overall Maine MSW disposal capacity.

Other comments focused on the issue that the intent of the 2013 amendment license was to be a "temporary" allowance due to the closing of MERC and not an ongoing situation. Comments were made that the landfill's operation and licensing history never included MSW acceptance except for the short-term allowance. A number of commenters stated that continuance of MSW acceptance may increase pollution of the area, the river, and the watershed.

Comments were provided stating that landfill options should be made harder to utilize, which would then force usage of options higher on the hierarchy; that the assertion of "stranded waste" is overstated; that other options should be required; that JRL has a lower tipping fee set by the OSA which undercuts other disposal options; and that granting the amendment would give Casella hauler subsidiaries an unfair advantage to disposal capacity that other haulers would not be able to access.

Numerous comments were made in support of the amendment application. Many of these comments stated that the amendment is needed to assist the 115 MRC communities in the short term, for transportation infrastructure and financial reasons, prior to CRM's facility coming on-line. Comments were also submitted by several private haulers over concern for cost effective MSW outlets if JRL is not an option. Supporters also presented that JRL is a well-run facility, Casella is involved in multiple recycling options, Casella contributes to the community and is philanthropic, and landfilling options are needed.

A few commenters mentioned that if an extension is granted, the extension shouldn't be open ended, but should be very specific for the short-term only. Examples were given to possibly allow a one or two year extension with prescriptive requirements.

D. Department Analysis

With respect to the hierarchy requirements, the Department considered the proposed amendment application request and related documents, the intent of the 2013 amendment, the comments received, the overall current and future MSW capacity in Maine, the current and future operating status of Maine's waste management facilities, cost considerations and various options. The following presents the Department's analysis.

(1) Amendment #S-020700-WD-BC-A (issued 2013)

The intent of the 2013 amendment was for MERC waste to be disposed of at JRL temporarily. As stated on page 15, "the Department finds that the applicant has adequately demonstrated the need for disposal of 81,800 tons per year of MSW on a temporary basis." On page 25, it is stated that regarding the limiting of time for MSW acceptance to March 31, 2016 (revised to March 31, 2018 in the Board Order) that "this limitation is appropriate to ensure that activities at JRL support, and do not subvert, the waste management hierarchy." On page 41, it is noted that the "acceptance of additional unprocessed MSW at JRL in addition to bypass and soft layer material for cell construction is consistent with the hierarchy provided that limitations are placed upon such activity to ensure that other waste management options will be implemented for former Maine Energy MSW. Such limitations include a volume limit, a time limit, and requirements for delivery of some MSW to a facility at a higher level on the hierarchy."

The 2013 amendment license #S-020700-WD-BC-A states in Finding 5(B)(3) on page 25 that "alternative waste management options exist for this MSW that are better aligned with the hierarchy." The 2013 amendment license also included requirements for ongoing steps to be taken by JRL to meet the condition of no non-bypass MSW after March 31, 2018.

Condition 5 of the 2013 amendment license #S-020700-WD-BC-A required the following:

5. Casella shall continue to plan for, and will make its best effort to divert MSW from landfilling at JRL to the greatest extent practicable. JRL shall include in each annual report a summary of its efforts to meet this diversion requirement. This summary shall include, but not be limited to:

 5.A. A list and description of all diversion options evaluated and/or pursued by Casella, including currently operating Maine waste-to-energy facilities as options;

 5.B. A narrative detailing the specific efforts made by Casella to implement diversion options; and,

 5.C. A narrative describing the results of Casella's evaluation/pursuit of MSW diversion options, including the volume of waste and diversion destination of MSW successfully diverted, and/or the specific reasons that MSW was not diverted to other destination options.

The Department notes that JRL did include the summary required in its 2014, 2015 and 2016 annual facility reports. The information included, in part, a summary of operations regarding Casella's Zero-Sort® Program, information relating to MSW delivered to Maine incinerators and information relating to MSW delivered to Maine landfills including JRL.

At the time of issuance of the 2013 amendment license #S-020700-WD-BC-A, Maine's solid waste management hierarchy was in statute as a policy, but not as a specific licensing criterion. However, the hierarchy was used as a consideration for the date limitation in Condition 10. The findings of the 2013 amendment are of utmost importance now that the hierarchy is a license criterion.

(2) Casella Recycling Programs

The Department notes that Casella-owned facilities have active recycling and reuse programs that divert waste from JRL. However, the Department also notes that MSW tonnage brought to JRL has increased from 2014 through 2016 (36,878 tons to 69,934 tons) and that the MSW tonnage allowed by the 2013 amendment license was based on the needs of former MERC communities. In 2016, the 14 communities under long-term contract with Casella that formerly used MERC for MSW disposal generated 22,827 tons of residential MSW in addition to commercial MSW.

Although recycling is encouraged by Casella and Casella maintains and manages recycling infrastructure, MSW disposed at JRL has increased without a corresponding increase in the annual generation of MSW in Maine. For example, the State Plan specifies that from 2015 to 2016, the "[o]verall disposal of MSW rose slightly from 757,014 to 759,638 tons; the per capita disposal amount also rose slightly from 0.569 to 0.571 tons per person in 2016." This slight increase in Maine's MSW disposal amount does not equate to the relative increase in MSW disposal at JRL from 2015 to 2016 (57,521 to 69,934 tons).

(3) Currently Available Capacity in Maine for Management of MSW

As of 2018, Maine's solid waste disposal facilities include three waste-to-energy plants, five municipally-owned landfills, one state-owned landfill and one commercially-owned landfill. The State Plan specifies that the total remaining licensed capacity of the seven abovementioned landfills, as of 2016, is 8,043,980 cubic yards although some of this capacity includes landfill space that has not been built. The total available capacity, as of pre-March 31, 2018, at Maine's waste-to-energy plants is approximately 550,000 tons per year with PERC having an average annual processing capacity of 310,000 tons; MMWAC having an average annual processing capacity of 70,000 tons and ecomaine having an average annual processing capacity of 170,000 tons. Solid waste disposal facilities not included in the capacity consideration include generator-owned and CDD or woodwaste landfills.

(4) Future Available Capacity for Management of MSW

a. Maine

At the conclusion of 2018, Maine's solid waste management facilities will include three waste-to-energy plants, one processing facility, five municipally-owned landfills, one state-owned landfill and one commercially-owned landfill. The total available capacity at some point post-March 31, 2018 at Maine's waste-to-energy and processing plants will be 595,000 tons per year with PERC having an average annual processing capacity of 210,000 tons; MMWAC having an average annual processing capacity of 70,000 tons; ecomaine having an average annual processing capacity of 170,000 tons and CRM having an average annual processing capacity of 145,000 tons. Based on 2016 annual report data, Maine's municipal and regional MSW landfills received approximately 87,000 tons of MSW and the commercially-owned landfill received approximately 85,000 tons of MSW. Solid waste disposal facilities not included in the capacity consideration include generator-owned and CDD or woodwaste landfills.

i. <u>PERC.</u> Post-March 31, 2018, PERC will reduce their operating level from 310,000 tons per year to 210,000 tons per year. In the follow-up to comments, a March 9, 2018 letter from PERC to Casella was included stating that the "planned reduction to this level is already being implemented. While PERC may be able to process increased volumes from time to time, low electrical and tipping fee revenues will not support the viability of the plant at significantly higher [MSW] processing levels at this time."

ii. CRM. Construction of the CRM facility is currently underway with the commissioning of the materials recovery facility (MRF) portion expected during the second quarter of 2018. When fully commissioned, the MRF will operate at 55,000 equivalent annual tons. In parallel with the MRF commissioning, the "wet end" of the facility will be constructed and will be fully commissioned during the fourth quarter of 2018. Once fully commissioned, the CRM facility will process the entire 105,000 tons committed to the project by MRC municipalities. The CRM facility has an average annual design capacity of 145,000 tons.

The Department notes that the applicant and some commenters have suggested that there is uncertainty regarding future operations at PERC and the CRM facility, which are both higher on the hierarchy. Specifically, the applicant and some commenters have noted that operations of both PERC at the new tonnage and CRM's commercial operations have yet to be demonstrated.

b. Out-of-State

The Department notes that the applicant evaluated out-of-state options, which are higher on the hierarchy, including incineration and processing for the management of Maine MSW. However, based on information submitted, the capacity constraints and/or economic considerations do not appear to make this a viable option.

(5) Agreements Among Maine Waste Management Facilities

The following summarizes the agreements between a number of Maine's waste management facilities, as presented to the Department, either through submittal of the actual written agreements or through a summary of information submitted regarding the actual agreements.

a. The agreement for waste delivery services between Pine Tree Waste, Inc. and CRM includes 20,000 tons per year commercial MSW and 20,000 tons per year municipal from the West Bath and Waterville transfer stations delivered by Pine Tree Waste, Inc. to CRM's facility once it is able to accept and process waste. Pine Tree Waste, Inc. will pay CRM an agreed upon tipping fee. There is a clause for cost to CRM, if it is necessary and allowed, for CRM to directly bypass non-Pine Tree Waste, Inc. MSW from CRM to JRL and for CRM to pay a tipping fee. At this time, JRL is not licensed to accept bypass waste from CRM. The agreement includes a condition that CRM shall support the JRL amendment application and the agreement is contingent on the Department's authorization to accept no less than 81,800 tons per year of non-bypass, in-state MSW. The term of the agreement is for eight years or coterminous with the duration of approval to take no less than 81,800 tons per year of Maine MSW at JRL, whichever is shorter, unless the agreement is earlier terminated as provided.

b. The agreement for disposal services between Pine Tree Waste, Inc. NEWSME, and PERC (collectively, Maine Waste Processing, LLC and Penobscot Energy Recovery Company) includes delivery of various waste categories in various tonnages (20,000 tons per year from Pine Tree Commercial Waste, 10,000 tons per year from Waterville/West Bath transfer station, 50,000 tons per year from Westbrook/Naples transfer station, and 50,000 tons per year from out-of-state). There is a statement contained in the agreement for bypass if PERC cannot accept waste, that notification will occur and that Pine Tree Waste, Inc. may take the bypass to a facility of its choice. The agreement includes a condition for delivery of acceptable waste to PERC by Pine Tree Waste, Inc. that PERC shall support the JRL amendment application and the term of the agreement is until "the earlier of March 31, 2019 or the expiration, revocation or lapse of the Pine Tree's authorization to accept no less than 81,800 tons per year" of non-bypass, in-state MSW at JRL. The agreement includes a condition for delivery of acceptable waste to JRL of material produced at PERC which has an extension at the option of Pine Tree Waste, Inc. and NEWSME to the earlier of December 31, 2023 or the point at which JRL is no longer authorized to accept 81,800 tons per year of Maine MSW.

c. The waste disposal agreement between the MRC and Waste Management Disposal Services of Maine, Inc (WMDSM) is for the exclusive disposal of MRC's bridge capacity (waste from the communities prior to the CRM facility becoming operational) and bypass at the Crossroads Landfill in Norridgewock. This agreement is for a 10-year period.

d. The waste disposal agreement between PERC and the MRC states that in excess of 62,000 tons per year of waste might be delivered to the PERC facility under certain terms. However, the Department understands that the terms have not been finalized.

e. The Department understands from verbal communications with PERC that they have contracted with local communities to dispose of approximately 31,000 to 38,000 tons per year of MSW starting April 1, 2018, reduced from the municipal contracts they are currently operating under.

f. The Department has received a draft swap agreement between MRC, NEWSME, Pine Tree Waste, Inc., WMDSM and CRM, with the potential for a waste swap on a 1:1 tonnage basis at agreed tip fees.

As part of the evaluation process for the proposed amendment application, the Department has reviewed the agreements that have been established to ensure the management of MSW during this near-term uncertainty period with Maine's solid waste infrastructure. The Department notes that it is not a party to these agreements and does not have the authority to direct waste flow per *Delivery of Solid Waste to Specific Waste Facilities*, 38 M.R.S. § 1304-B.

(6) Cost Considerations

Cost is a relevant consideration in the determination of whether solid waste has been reduced, reused, recycled, composted and/or processed to the "maximum extent practicable" prior to disposal and whether the greatest amount of solid waste has been handled through means as high on the solid waste management hierarchy as possible, resulting in maximizing waste diversion and minimizing the amount of waste disposed. BGS and NEWSME have shown an increase in financial burden if MSW is taken to another solid waste disposal facility other than JRL or if other materials are substituted for MSW in its operations. The Department has considered these financial burdens in the analysis of near-term capacity and currently available waste management options that are higher on the hierarchy. Included as part of the Department's review was the evaluation of tipping fees established in the current agreements between various solid waste management facilities. This information was provided to the Department as part of an approved request to treat the information as confidential business information in accordance with the definition of trade secret in the *Uniform Trade Secrets Act*, 10 M.R.S. §§ 1542(4)(A) and (B).

Although the applicant evaluated the availability of MSW disposal at other solid waste landfills, the Department notes that this will not result in MSW being managed at a higher level on the solid waste management hierarchy. Therefore, this aspect of the information submitted does not change the Department's analysis.

Although estimated costs were provided for purchasing all material for filling, grading and bulking purposes in lieu of MSW, the Department notes that the possibility exists that other waste material or soil could be utilized for the same purpose.

E. Department Findings

With the respect to the hierarchy requirements, the Department makes the following findings:

(1) Amendment #S-020700-WD-BC-A (issued 2013). The Department finds that the intent of the 2013 amendment license was for MERC waste to be disposed of at JRL temporarily and to ensure that activities at JRL support, and do not subvert, the hierarchy. The Department further finds that the amount of non-bypass, in-state MSW disposal at JRL has increased since the issuance of the 2013 amendment license and that restrictions are necessary to ensure that activities at JRL support, and do not subvert, the hierarchy.

(2) Casella Recycling Programs. The Department finds that although recycling is encouraged by Casella and Casella maintains and manages recycling infrastructure, MSW disposed at JRL has increased without a corresponding increase in the annual generation of MSW in Maine.

(3) Currently Available Capacity in Maine for Management of MSW. The Department finds that disposal capacity for Maine generated MSW, as of pre-March 31, 2018, is sufficient based on current operating conditions in Maine.

(4) Future Available Capacity for Management of MSW. The Department finds that there is uncertainty in the near-term with the solid waste landscape in Maine until PERC's planned reduction in operating level is complete and successfully stabilized and the construction of CRM is complete and commercial operations have been achieved. The Department further finds that sufficient MSW incineration and processing capacity exists in the future provided that the PERC facility is operational at its planned reduction

level of 210,000 tons per year and the CRM facility is operational at its currently contracted capacity of 105,000 tons per year or greater. The Department also finds that these solid waste management options are preferred over disposal at JRL in accordance with the hierarchy. The Department also finds that out-of-state disposal options for Maine MSW, which are higher on the hierarchy, do not appear to be viable given capacity constraints and/or economic considerations.

(5) Agreements Among Maine Waste Management Facilities. The Department finds that a number of Maine's waste management facilities have entered into, or drafted, waste agreements. The agreements serve to manage MSW at varying levels of the hierarchy during this near-term uncertainty period with Maine's solid waste infrastructure. The Department notes that it is not a party to these agreements and does not have the authority to direct waste flow per 38 M.R.S. § 1304-B.

(6) Cost Considerations. The Department finds that given the near-term uncertainty, the applicant has demonstrated that there may be a financial burden if MSW is taken to another solid waste disposal facility other than JRL under the near-term options currently available. The Department finds that, although MSW may be technically appropriate and economical for filling, grading and bulking purposes, there are other materials, including other waste and soil, that can be utilized successfully for these purposes.

The Department also finds that the applicant's proposal to remove the March 31, 2018 date resulting in acceptance of MSW until horizontal and vertical licensed disposal capacity is attained is not consistent with the applicable State laws and Rules relating to the solid waste management hierarchy, as there may be future capacity for all or some of the 81,800 tons per year of non-bypass, in-state MSW that could be directed to facilities that operate at a higher level on the hierarchy. The Department finds that the applicant has demonstrated a need in the short-term to provide disposal options due to unknowns associated with the change in operating capacity of PERC and the construction and commercial operation date of the CRM facility.

The Department further finds that based on the disposal capacity uncertainty of the PERC and CRM facilities and the associated cost considerations (i.e., tipping fees and agreements), along with the applicant's ongoing recycling and reuse efforts to divert waste from JRL to the maximum extent practicable, a short-term extension, for the 81,800 tons per year non-bypass, in-state MSW to be accepted at JRL for one additional year beyond March 31, 2018 with the potential for a one-time extension not to exceed six months beyond the one year meets the applicable State laws and Rules relating to the solid waste management hierarchy, provided that:

a. During the one-year extension period, scheduled to occur from April 1, 2018 through March 31, 2019, BGS and NEWSME must develop and prepare to implement measures that eliminate the need for non-bypass, in-state MSW disposal at JRL. On or before March 31, 2019 these measures must be implemented unless the six-month extension referenced in (b) below is granted by the Department; and

b. If warranted, based on a demonstrated need, BGS and NEWSME may submit a one-time request to the Department for review and approval to extend the timeframe for a period not to exceed six months for the disposal of no greater than 30,000 tons of non-bypass, in-state MSW at JRL. The Department's basis for 30,000 tons is twofold: 1) an approximate 25% reduction in tonnage annualized for six months (81,800/2 * 0.75), which is consistent with the requirements of the solid waste management hierarchy; and 2) the average acceptance rate of non-bypass, in-state MSW over the past 3 years is comparable to this rate. The six-month extension beyond March 31, 2019 must be requested by November 30, 2018 as a Condition Compliance submittal with information detailing the need for the extension based on the then-current solid waste landscape in Maine, with emphasis on the operational status of other solid waste management facilities in Maine which are higher on the hierarchy. This submittal must also include information sufficient for the Department to determine how the approved non-bypass, in-state MSW under this amendment will be handled after September 30, 2019 without utilization of JRL for disposal.

9. CRIMINAL OR CIVIL RECORD

In accordance with 38 M.R.S. § 1310-N(7) and 06-096 C.M.R. ch. 400, § 12, a license for a solid waste facility or activity may be denied if the owner or the operator or any person having a legal interest in the applicant or the facility has been convicted of any criminal law or adjudicated or otherwise found to have committed any civil violation of environmental laws or rules of the State, other states, the United States, or another country.

Civil and criminal disclosure statements dated 2017 were submitted for BGS and NEWSME as part of the application. The disclosure statements included those for NEWSME's operation of JRL, a related entity New England Waste Services of ME, Inc, and the six officers, directors, and partners of the two businesses.

In the five-year environmental compliance history submitted for New England Waste Services of ME, Inc., three notices of violations and one administrative order were listed. These have been addressed through responses required by the notices of violation and administrative order.

Based upon information in the application, the Department finds that the applicant filed complete disclosure statements as required by applicable State law and Rule. Based on the disclosure statements submitted and the evaluation criteria contained in 06-096 C.M.R. ch. 400, § 12(B), the Department finds no basis for denying the license.

10. LANDFILL DESIGN AND OPERATIONS

The applicant must address the appropriate landfill design and operations requirements set forth in 06-096 C.M.R. ch. 401.

A. Geotechnical Properties and Landfill Cell Development

There will be no change in the landfill design and individual cell configurations due to continued acceptance of MSW. The stability evaluations have shown that the required slope stability factors have been met and no slope instability has been detected since NEWSME has been the landfill operator. The use of MSW in the waste mix does not alter the strength and density properties (shear strength of 32 degrees and waste density of 74 pounds per cubic foot) utilized to support the stability analysis and Cell Development Plans.

B. Waste Placement, Compaction and Capacity Consumption

The applicant states that allowance of continued MSW acceptance during final filling, grading, and phased final landfill closure could be advantageous to operations. MSW has physical properties that make it a suitable "select waste" to bring interim grades up to final grade, including that it is easily compacted and non-bulky and with proper compaction the amount proposed to be placed is not expected to have substantial settling. The MSW would be placed and mixed with other approved wastes (i.e., treatment plant sludge and combustion ash for bulking purposes) in the remaining capacity in Cell 10 and used to reach final waste grades in the phased closure of Cells 1 through 10.

An estimate of final cover for the 15-acre area on the northwest side slope is expected to require about 133,500 cubic yards (120,150 tons of material) of slope fill to bring the current interim grades up to final permitted grades. Utilizing MSW as this slope fill material, it is estimated that approximately 7,900 tons of MSW will be needed per acre of closure area.

The applicant states that MSW is also a suitable material for sludge bulking. JRL utilizes a ratio of two to three parts bulking waste to one part sludge, with MSW and PERC incinerator ash as the current wastes used for bulking sludge. The average three-year sludge intake between 2014 and 2016 was approximately 48,000 tons annually. JRL has stated a concern with the volume of ash received post-March 2018 due to the uncertain configuration of PERC.

Overall, the amount of available capacity within the licensed footprint of Cells 1 through 10 after March 31, 2018 is projected to be 1,220,000 cubic yards, and will be approximately 800,000 cubic yards (720,000 tons) by the end of October 2018 when construction of Cell 11 of the expansion is expect to be finalized.

C. Cover

There will be no change in cover practices due to continued acceptance of MSW. The facility currently places daily cover over all areas receiving MSW, front-end processing residue (FEPR), and other wastes with odor generating potential. Geomembrane intermediate cover is placed on areas that have reached interim grades and will be inactive for 6 months or longer. Final cover is proposed in the cell development plan for every other year in a phased approach.

D. Leachate Management

The continued use of MSW is not anticipated to change the current leachate generation rates, quality, or handling procedures.

E. Litter Control

Litter will continue to be minimized with compaction of the MSW as it is placed in the landfill and placement of daily cover or other non-litter producing waste over the MSW. JRL also utilizes litter control fencing at the perimeter of each cell.

F. Vector Control

Vectors will continue to be controlled by placement of daily and intermediate cover; use of the techniques allowed in JRL's depredation permit; implementation of additional techniques to control birds in the active waste placement area, as necessary; and a contract with a local pest control company for rodent control.

G. Environmental Monitoring

Environmental monitoring will not change with the proposed amendment. JRL will continue to monitor the landfill as detailed in the approved Environmental Monitoring Plan located in the Operations Manual, including characterization and evaluation of groundwater and surface water, evaluation of the performance of the primary liner system, and characterization and evaluation of the quality and quantity of leachate.

H. Acceptable Solid Waste, Waste Characterization, and Hazardous Waste Exclusion

The waste acceptance, characterization, and hazardous waste exclusion programs will not change with the proposed amendment. JRL will continue to operate per the approved Waste Characterization and Acceptance Plan in the Operations Manual.

I. Facility Access/Hours of Operation

The proposed amendment will not change access to, or the hours of operation of, the landfill.

J. Hot Loads

Any hot loads received at the landfill will continue to be handled utilizing the procedures in place as described in the Operations Manual.

The Department finds that current JRL design and operations, including the procedures and cell development plans detailed in the Operations Manual, appropriately address handling and disposal of MSW at the landfill pursuant to the requirements in 06-096 C.M.R. ch. 401. The Department further finds that utilization of MSW as grade fill and for waste bulking is a viable option, but it is not the only material available that can be utilized for these operational needs. Additional discussion of the technical aspects as related to the hierarchy can be found in Finding 8.

11. ALL OTHER

All other Findings of Fact, Conclusions and Conditions made in Department licenses #S-020700-WD-BC-A and #S-020700-WD-BG-Z remain unchanged.

BASED on the above Findings of Fact, and subject to the Conditions listed below, the Department makes the following CONCLUSIONS pursuant to 38 M.R.S. §§ 1310 to 1319-Y, 38 M.R.S. § 2101, and the applicable Department Rules:

1. JRL will not pollute any waters of the State, contaminate the ambient air, constitute a hazard to health or welfare, or create a nuisance pursuant to 38 M.R.S. § 1310-N(1)(A) and 06-096 C.M.R. ch. 400, § 3(D); provided that:

   A. The acceptance of up to 81,800 tons per year of non-bypass, in-state MSW at JRL is limited to a period of time up to and including March 31, 2019, except for a possible one-time six-month extension beyond March 31, 2019, based on a demonstrated need, for no greater than 30,000 tons of non-bypass, in-state MSW;

   B. The MSW that is the subject of this license amendment is handled at JRL using the same procedures as the MSW currently licensed for disposal; and

   C. The sources of MSW are limited as described in the Finding 4 of #S-020700-WD-BC-A and this amendment, and the landfill is operated in accordance with the facility's approved Operations Manual.

2. The applicant has complied with the public and local participation and notification requirements pursuant to 38 M.R.S. §§ 1310-S(1) and 1310-N(12) and 06-096 C.M.R. ch. 2, § 14.

3. The applicant has demonstrated sufficient title, right, or interest in all of the property which is proposed for use pursuant to 06-096 C.M.R. ch. 400, § 4(A).

4. The applicant has provided a sufficient demonstration of financial ability and assurance and technical ability to permit, design, construct, operate, close, and accomplish post-closure care of the landfill pursuant to 38 M.R.S. § 1310-Y, and 06-096 C.M.R. ch. 400, §§ 4(B)(1) and 4(C)(1); provided that NEWSME, as the current operator of JRL, submits the appropriate financial assurance package updates in accordance with the Rules on an annual basis.

5. The applicant has provided sufficient provisions for safe and uncongested traffic movement of all types into, out of, and within the landfill pursuant to 06-096 C.M.R. ch. 400, § 4(D)(1); provided the facility continues to encourage waste haulers to use I-95 as a primary hauling route.

6. The applicant has sufficiently demonstrated that the proposed amendment will not unreasonably adversely affect air quality pursuant to 06-096 C.M.R. ch. 400, § 4(G)(1).

7. Restrictions on the amount of non-bypass, in-state MSW disposed at JRL are necessary to ensure that activities at JRL support, and do not subvert, the hierarchy.

8. The applicant has demonstrated that sufficient near-term uncertainty exists in the solid waste landscape in Maine to warrant a short-term extension of up to 81,800 tons per year of non-bypass, in-state MSW at JRL and the Department concludes that an extension of up to 81,800 tons per year of non-bypass, in-state MSW at JRL for one additional year beyond March 31, 2018 with the potential for a one-time extension of six months beyond the one year is consistent with the solid waste management hierarchy pursuant to 38 M.R.S. §§ 2101 and 1310-N(1)(D) and 06-096 C.M.R. ch. 400, § 4(N)(1); provided that:

   A. During the one-year extension period, scheduled to occur from April 1, 2018 through March 31, 2019, BGS and NEWSME shall develop and prepare to implement measures that eliminate the need for non-bypass, in-state MSW disposal at JRL. On or before March 31, 2019 these measures must be implemented unless the six-month extension referenced in Conclusion 8(B) below is granted by the Department; and

   B. If warranted, based on a demonstrated need, BGS and NEWSME may submit a one-time request to the Department for review and approval to extend the timeframe for a period not to exceed six months for the disposal of no greater than 30,000 tons of non-bypass, in-state MSW at JRL. The six-month extension beyond March 31, 2019 shall be requested by November 30, 2018 as a Condition Compliance submittal detailing the need for the extension based on the then-current solid waste landscape in Maine, with emphasis on the operational status of other solid waste management facilities in Maine which are higher on the hierarchy. This submittal must also include information sufficient for the Department to determine how the approved non-bypass, in-state MSW under this amendment will be handled after September 30, 2019 without utilization of JRL for disposal.

9. Sufficient MSW incineration and processing capacity exists in the future provided that the PERC facility is operational at its planned reduction level of 210,000 tons per year and the CRM facility is operational at its currently contracted capacity of 105,000 tons per year or greater. Based on the hierarchy, these solid waste management options are preferred over disposal at JRL.

10. The applicant has provided a civil/criminal disclosure statement demonstrating that the entities are not in violation of environmental or criminal law pursuant to 38 M.R.S. § 1310-N(7) and 06-096 C.M.R. ch. 400, § 4(C)(1)(b) and § 12.

11. The applicant has sufficiently demonstrated that the proposed amendment will meet the appropriate stability and operational requirements of 06-096 C.M.R ch. 401.

THEREFORE, the Department DENIES the noted application of the applicant as proposed to allow for the continued disposal at JRL of up to 81,800 tons per year of non-bypass, in-state MSW but APPROVES the noted application of the applicant to allow for the disposal of up to 81,800 tons per year of non-bypass, in-state MSW up to and including March 31, 2019, with the potential for a one-time extension not to exceed six months beyond the one year based on a demonstrated need for the disposal of no greater than 30,000 tons of non-bypass, in-state MSW at JRL SUBJECT TO THE ATTACHED CONDITIONS, and all applicable standards and regulations:

1. The Standard Conditions of Approval for Solid Waste, copies attached.

2. <u>Severability</u>. The invalidity or unenforceability of any provisions, or part thereof, of this license shall not affect the remainder of the provision or any other provision. This license shall be construed and enforced in all respects as if such invalid or unenforceable provision or part thereof had been omitted.

3. <u>Soil Erosion</u>. The applicant shall take all necessary actions to ensure that its activities or those of its agents do not result in unnecessary or noticeable erosion of soils on site during operation of the landfill.

4. <u>Financial Assurance</u>. The applicant shall submit the appropriate financial assurance package updates in accordance with the Rules on an annual basis, including the most recent surety bond documentation.

5. BGS and NEWSME shall accept no greater than 81,800 tons per year of non-bypass, in-state MSW at JRL, limited to a period of time up to and including March 31, 2019, except for a possible one-time six-month extension beyond March 31, 2019 of no greater than 30,000 tons of non-bypass, in-state MSW based on a demonstrated need as stated in Condition 7 below. The MSW restriction does not limit the authority of the applicant to accept MSW bypass and soft layer material for cell construction after March 31, 2019, provided that such acceptance is consistent with the relevant terms of Department licenses #S-020700-WD-N-A and #S-020700-WD-W-M.

6. During the one-year extension period, scheduled to occur from April 1, 2018 through March 31, 2019, BGS and NEWSME shall develop and prepare to implement measures that eliminate the need for non-bypass, in-state MSW disposal at JRL. On or before March 31, 2019 these measures shall be implemented unless the six-month extension referenced in Condition 7 below is granted by the Department.

7. If a demonstrated need exists, BGS and NEWSME may submit a one-time request for a six-month potential additional extension to the Department for review and approval under the following conditions:

A. The one-time request shall be limited to no greater than 30,000 tons of non-bypass, in-state MSW over the six-month extension period; and

B. The one-time request shall be submitted no later than November 30, 2018 as a Condition Compliance submittal with a specific plan detailing the need for the extension based on the then-current solid waste landscape in Maine, with emphasis on the operational status of other solid waste management facilities in Maine which are higher on the hierarchy. This submittal must also include information sufficient for the Department to determine how the approved non-bypass, in-state MSW under this amendment will be handled after September 30, 2019 without utilization of JRL for disposal.

DONE AND DATED AT AUGUSTA, MAINE THIS 31ST DAY OF MARCH, 2018.

DEPARTMENT OF ENVIRONMENTAL PROTECTION

BY: David Burns for
Paul Mercer, Commissioner

PLEASE NOTE ATTACHED SHEET FOR GUIDANCE ON APPEAL PROCEDURES.

Date of initial receipt of application: November 27, 2017
Date of application acceptance: December 15, 2017

Date filed with the Board of Environmental Protection:

Filed
MAR 31 2018
State of Maine
Board of Environmental Protection

XKT82558

Appendix A

STANDARD CONDITIONS
TO ALL SOLID WASTE LANDFILL LICENSES

STRICT CONFORMANCE WITH THE STANDARD AND SPECIAL CONDITIONS OF THIS APPROVAL IS NECESSARY FOR THE PROJECT TO MEET THE STATUTORY CRITERIA FOR APPROVAL. VIOLATIONS OF THE CONDITIONS UNDER WHICH A LICENSE IS ISSUED SHALL CONSTITUTE A VIOLATION OF THAT LICENSE AGAINST WHICH ENFORCEMENT ACTION MAY BE TAKEN, INCLUDING REVOCATION.

1. **Approval of Variations from Plans.** The granting of this approval is dependent upon and limited to the proposals and plans contained in the application and supporting documents submitted and affirmed by the license. Any consequential variation from these plans, proposals, and supporting documents is subject to review and approval prior to implementation.

2. **Compliance with All Applicable Laws.** The licensee shall secure and comply with all applicable federal, state, and local licenses, permits, authorizations, conditions, agreements, and orders prior to or during construction and operation, as appropriate.

3. **Compliance with All Terms and Conditions of Approval.** The licensee shall submit all reports and information requested by the Department demonstrating that the licensee has complied or will comply with all terms and conditions of this approval. All preconstruction terms and conditions must be met before construction begins.

4. **Transfer of License.** The licensee may not transfer the solid waste facility license or any portion thereof without approval of the Department.

5. **Initiation of Construction or Development Within Two Years.** If the construction or operation of the solid waste facility is not begun within two years of issuance of within 2 years after any administrative and judicial appeals have been resolved, the license lapses and the licensee must reapply to the Department for a new license unless otherwise approved by the Department.

6. **Approval Included in Contract Bids.** A copy of the approval must be included in or attached to all contract bid specifications for the solid waste facility.

7. **Approval Shown to Contractors.** Contractors must be shown the license by the licensee before commencing work on the solid waste facility.

8. **Background of key individuals.** A licensee may not knowingly hire as an officer, director or key solid waste facility employee, or knowingly acquire an equity interest or debt interest in, any person convicted of a felony or found to have violated a State or federal environmental law or rule without first obtaining the approval of the Department.

STANDARD CONDITIONS TO ALL SOLID WASTE LANDFILL LICENSES

9. **Fees.** The licensee must comply with annual license and annual reporting fee requirements of the Department's rules.

10. **Recycling and Source Reduction Determination for Solid Waste Disposal Facilities.** This condition does not apply to the expansion of a commercial solid waste disposal facility that accepts only special waste for landfilling.

    The solid waste disposal facility shall only accept solid waste that is subject to recycling and source reduction programs, voluntary or otherwise, at least as effective as those imposed by 38 M.R.S. Ch. 13.

11. **Deed Requirements for Solid Waste Disposal Facilities.** Whenever any lot of land on which an active, inactive, or closed solid waste disposal facility is located is being transferred by deed, the following must be expressly stated in the deed:

    A. The type of facility located on the lot and the dates of its establishment and closure.

    B. A description of the location and the composition, extent, and depth of the waste deposited.

    C. The disposal location coordinates of asbestos wastes must be identified.

DEP INFORMATION SHEET

Appealing a Department Licensing Decision

Dated: March 2012 **Contact: (207) 287-2811**

SUMMARY

There are two methods available to an aggrieved person seeking to appeal a licensing decision made by the Department of Environmental Protection's ("DEP") Commissioner: (1) in an administrative process before the Board of Environmental Protection ("Board"); or (2) in a judicial process before Maine's Superior Court. An aggrieved person seeking review of a licensing decision over which the Board had original jurisdiction may seek judicial review in Maine's Superior Court.

A judicial appeal of final action by the Commissioner or the Board regarding an application for an expedited wind energy development (35-A M.R.S.A. § 3451(4)) or a general permit for an offshore wind energy demonstration project (38 M.R.S.A. § 480-HH(1)) or a general permit for a tidal energy demonstration project (38 M.R.S.A. § 636-A) must be taken to the Supreme Judicial Court sitting as the Law Court.

This INFORMATION SHEET, in conjunction with a review of the statutory and regulatory provisions referred to herein, can help a person to understand his or her rights and obligations in filing an administrative or judicial appeal.

I. ADMINISTRATIVE APPEALS TO THE BOARD

LEGAL REFERENCES

The laws concerning the DEP's *Organization and Powers*, 38 M.R.S.A. §§ 341-D(4) & 346, the *Maine Administrative Procedure Act*, 5 M.R.S.A. § 11001, and the DEP's *Rules Concerning the Processing of Applications and Other Administrative Matters* ("Chapter 2"), 06-096 CMR 2 (April 1, 2003).

HOW LONG YOU HAVE TO SUBMIT AN APPEAL TO THE BOARD

The Board must receive a written appeal within 30 days of the date on which the Commissioner's decision was filed with the Board. Appeals filed after 30 calendar days of the date on which the Commissioner's decision was filed with the Board will be rejected.

HOW TO SUBMIT AN APPEAL TO THE BOARD

Signed original appeal documents must be sent to: Chair, Board of Environmental Protection, c/o Department of Environmental Protection, 17 State House Station, Augusta, ME 04333-0017; faxes are acceptable for purposes of meeting the deadline when followed by the Board's receipt of mailed original documents within five (5) working days. Receipt on a particular day must be by 5:00 PM at DEP's offices in Augusta; materials received after 5:00 PM are not considered received until the following day. The person appealing a licensing decision must also send the DEP's Commissioner a copy of the appeal documents and if the person appealing is not the applicant in the license proceeding at issue the applicant must also be sent a copy of the appeal documents. All of the information listed in the next section must be submitted at the time the appeal is filed. Only the extraordinary circumstances described at the end of that section will justify evidence not in the DEP's record at the time of decision being added to the record for consideration by the Board as part of an appeal.

WHAT YOUR APPEAL PAPERWORK MUST CONTAIN

Appeal materials must contain the following information at the time submitted:

1. *Aggrieved Status*. The appeal must explain how the person filing the appeal has standing to maintain an appeal. This requires an explanation of how the person filing the appeal may suffer a particularized injury as a result of the Commissioner's decision.
2. *The findings, conclusions or conditions objected to or believed to be in error.* Specific references and facts regarding the appellant's issues with the decision must be provided in the notice of appeal.
3. *The basis of the objections or challenge.* If possible, specific regulations, statutes or other facts should be referenced. This may include citing omissions of relevant requirements, and errors believed to have been made in interpretations, conclusions, and relevant requirements.
4. *The remedy sought.* This can range from reversal of the Commissioner's decision on the license or permit to changes in specific permit conditions.
5. *All the matters to be contested*. The Board will limit its consideration to those arguments specifically raised in the written notice of appeal.
6. *Request for hearing.* The Board will hear presentations on appeals at its regularly scheduled meetings, unless a public hearing on the appeal is requested and granted. A request for public hearing on an appeal must be filed as part of the notice of appeal.
7. *New or additional evidence to be offered.* The Board may allow new or additional evidence, referred to as supplemental evidence, to be considered by the Board in an appeal only when the evidence is relevant and material and that the person seeking to add information to the record can show due diligence in bringing the evidence to the DEP's attention at the earliest possible time in the licensing process or that the evidence itself is newly discovered and could not have been presented earlier in the process. Specific requirements for additional evidence are found in Chapter 2.

OTHER CONSIDERATIONS IN APPEALING A DECISION TO THE BOARD

1. *Be familiar with all relevant material in the DEP record.* A license application file is public information, subject to any applicable statutory exceptions, made easily accessible by DEP. Upon request, the DEP will make the material available during normal working hours, provide space to review the file, and provide opportunity for photocopying materials. There is a charge for copies or copying services.
2. *Be familiar with the regulations and laws under which the application was processed, and the procedural rules governing your appeal.* DEP staff will provide this information on request and answer questions regarding applicable requirements.
3. *The filing of an appeal does not operate as a stay to any decision.* If a license has been granted and it has been appealed the license normally remains in effect pending the processing of the appeal. A license holder may proceed with a project pending the outcome of an appeal but the license holder runs the risk of the decision being reversed or modified as a result of the appeal.

WHAT TO EXPECT ONCE YOU FILE A TIMELY APPEAL WITH THE BOARD

The Board will formally acknowledge receipt of an appeal, including the name of the DEP project manager assigned to the specific appeal. The notice of appeal, any materials accepted by the Board Chair as supplementary evidence, and any materials submitted in response to the appeal will be sent to Board members with a recommendation from DEP staff. Persons filing appeals and interested persons are notified in advance of the date set for Board consideration of an appeal or request for public hearing. With or without holding a public hearing, the Board may affirm, amend, or reverse a Commissioner decision or remand the matter to the Commissioner for further proceedings. The Board will notify the appellant, a license holder, and interested persons of its decision.

II. JUDICIAL APPEALS

Maine law generally allows aggrieved persons to appeal final Commissioner or Board licensing decisions to Maine's Superior Court, see 38 M.R.S.A. § 346(1); 06-096 CMR 2; 5 M.R.S.A. § 11001; & M.R. Civ. P 80C. A party's appeal must be filed with the Superior Court within 30 days of receipt of notice of the Board's or the Commissioner's decision. For any other person, an appeal must be filed within 40 days of the date the decision was rendered. Failure to file a timely appeal will result in the Board's or the Commissioner's decision becoming final.

An appeal to court of a license decision regarding an expedited wind energy development, a general permit for an offshore wind energy demonstration project, or a general permit for a tidal energy demonstration project may only be taken directly to the Maine Supreme Judicial Court. See 38 M.R.S.A. § 346(4).

Maine's Administrative Procedure Act, DEP statutes governing a particular matter, and the Maine Rules of Civil Procedure must be consulted for the substantive and procedural details applicable to judicial appeals.

ADDITIONAL INFORMATION

If you have questions or need additional information on the appeal process, for administrative appeals contact the Board's Executive Analyst at (207) 287-2452 or for judicial appeals contact the court clerk's office in which your appeal will be filed.

Note: The DEP provides this INFORMATION SHEET for general guidance only; it is not intended for use as a legal reference. Maine law governs an appellant's rights.

2011 Maine Residential Waste Characterization Study

School of Economics Staff Paper #601

by Professor George K. Criner and student Travis L. Blackmer
(contact information: george.criner@umit.maine.edu; 207-581-3154)

of the School of Economics

The University of Maine

MAINE

Acknowledgments

The researchers would like to thank George MacDonald and Lana LaPlant-Ellis of the Maine State Planning Office for their generous cooperation with this project. We would also like to thank our trash sorting team, especially student project leader Spencer Hathaway, and fall sort leader Karl Chandler. We wish to thank David Silver for helping write the project grant, being liaison with the Maine Department of Environmental Protection, and providing valuable advice. We also acknowledge Greta Schroeder for her editorial assistance, as well as thank reviewers Jeff Jones, Manager of Transmission Services at Bangor Hydro Electric Co, and Ross Nason, Environmental Planner for Kennebec Valley Council of Governments. We are grateful for funding from the Maine State Planning Office, the College of Natural Sciences, Forestry and Agriculture, and the Maine Agricultural and Forest Experiment Station which made this study possible. The researchers would especially like to thank the following municipal programs, whose kind participation was vital for this study: Bath, Boothbay, Central Penobscot, ecomaine, Hatch Hill, Houlton, Lincoln, Lisbon Falls, Mid Maine, Ogunquit, Old Town, Orono, Paris-Norway, Pittsfield, Pleasant River, Scarborough, Skowhegan, and St. George.

Foreword

By George MacDonald, Maine State Planning Office Program Manager

Maine communities have been providing recycling programs for their residents since the early 1990's, and some have been providing them for longer than that. Municipalities and businesses are currently recycling 38.7% of their solid wastes, which is less than the State's 50% recycling goal.

The objective of the Waste Characterization Study was to observe and quantify the impacts of a variety of municipal recycling program styles. By identifying which recyclable materials and products are still being thrown away by Maine residents, we can discover aspects of our solid waste programs that are working well, and those that need improvement.

The municipal solid wastes examined in this study are typical of what would be found in a thirty-gallon plastic trash bag. Larger, "bulky" items, such as furniture, electronics, appliances and corrugated cardboard boxes were not usually found, nor were they expected to be.

The State Planning Office Waste Management & Recycling Program wishes to thank: the municipalities and their staff for assisting with this study, Professor George Criner and Travis Blackmer for undertaking the study, and the members of the two "sorting teams" for their diligence in completing the study.

Background

The handling of waste has changed through the generations as our knowledge, technology, and economic well-being has improved. As a necessary consequence of the production and consumption of food, consumer goods, and other products, our current society generates a substantial volume of material. Most of this material is ultimately discarded and requires collection, re-use or recycling, or disposal.

This report summarizes and discusses the results of two 2011 waste sorts conducted on Maine residential waste, and makes comparisons with previous research. In the discussion of the various waste components, comments on ease of recycling or composting are included. We hope that this report will be useful for state and municipal officials as they design recycling and disposal systems that balance environmental and economic concerns.

Procedure

Municipality Selection

Seventeen municipal waste programs, representing a wide range of community size, geographic location, and solid waste program type, were selected to participate in this study. Table 1 lists the seventeen municipal programs with the approximate population served and county location of each.

This sample represents twelve of Maine's sixteen counties and approximately 11% of the state's total population. Most of the waste programs selected provide service to an individual town or city. Some, however, represent more than one municipality. In these cases, we have listed the facility and municipality in which the facility is located. The population service size ranged from Ogunquit with 892 to Hatch Hill (Augusta region) with 41,326. Waste from the University of Maine was sampled for demonstration purposes, but was not considered when performing statistical analysis.

Table 1. Municipality, service population, and county.

Municipality, facility	**Approximate 2010 Service Population**	**County**
Bath	8,514	Sagadahoc
Boothbay	3,120	Lincoln
Central Penobscot (Dexter area)	6,531	Penobscot
Hatch Hill (Augusta region)	41,326	Kennebec
Houlton	6,123	Aroostook
Lincoln	5,085	Penobscot
Lisbon Falls	9,009	Androscoggin
Mid Maine (Corinth region)	9,306	Penobscot
Ogunquit	892	York
Old Town	7,840	Penobscot
Orono	10,362	Penobscot
Paris-Norway	10,197	Oxford
Pittsfield	4,215	Somerset
Pleasant River (Columbia Falls)	1,072	Washington
Scarborough (ecomaine[1])	18,919	Cumberland
Skowhegan	8,589	Somerset
St. George (Tenants Harbor)	2,591	Knox
Total	153,691	

Note: Numbers obtained from 2010 Census data.

Table 2 lists the solid waste management system characteristics of each of the municipalities sampled. Eight of the municipalities had full or partial curbside garbage collection, and eight also had curbside collection of recyclables. Some of the municipalities had PAYT (pay-as-you-throw) programs where residents pay for each bag they discard. Under these programs residents buy specially marked garbage bags, or tags to affix to the garbage bags at retail outlets or the town office.

Regarding recycling programs, "single stream" refers to residents placing all of their recyclable material in one bin rather than separating these recyclables by material (which is known as source separated). The single stream method is gaining proponents because it simplifies the work required by residents. It can also allow for economies in sorting, which is often done with mechanization at large centralized facilities. Three participating municipalities used single stream recyclable collection.

[1] The facility ecomaine is a regional nonprofit waste management company owned by Southern Maine communities. The facility is located in Portland, Maine and offers single stream recycling, Waste-to-Energy, and a landfill/ashfill site.

Table 2. Municipal solid waste system characteristics.

Municipality	Curbside Garbage Collection	Curbside Recyclable Collection	Single-Stream	Pay-as-you-throw (PAYT)	Mandatory Recycling Ordinance
Bath	Yes	Yes	Yes	Yes	Yes
Boothbay	Yes (Partial)	Yes (Partial)	No	No	Yes
Central Penobscot (Dexter area)	No	No	No	Yes	No
Hatch Hill (Augusta region)	Yes (Partial)	Yes (Partial)	No	No	No
Houlton	No	No	No	No	No
Lincoln	Yes (Partial)	No	No	No	Yes
Lisbon Falls	No	No	Yes	No	No
Mid Maine (Corinth region)	No	No	No	No	Yes
Ogunquit	Yes (Partial)	Yes (Partial)	No	No*	No
Old Town	Yes	Yes	No	No	No
Orono	Yes	Yes	No	No	Yes
Paris-Norway	No	No	No	No	Yes
Pittsfield	No	Yes	No	No	Yes
Pleasant River (Columbia Falls)	No	No	No	Yes	No
Scarborough (at ecomaine)	Yes	Yes	Yes	No	Yes
Skowhegan	No	No	No	No	Yes
St. George (Tenants Harbor)	No	No	No	No	No

*One free bag a day then $1.00 per bag beyond that.

Waste Sample Selection

The waste sample selection process was designed to ensure as much random selection as possible, while matching the collection system used by each municipality. At facilities where residents dropped off their garbage, the project team requested that every n^{th} individual include their trash in the sample. The number between individuals sampled (n) was determined by the expected amount of total trash that would be dropped off that day, as predicted by the site's facility manager. In municipalities where trash was collected curbside, an attempt was made to select from multiple neighborhoods, and again, trash from every n^{th} household was collected. Usually this was from residencies at least five houses apart. In total, ten tons of trash were collected and sorted.

A more detailed discussion of the waste sorting procedure is available upon request**.**

Sort Dates

The waste sorts were conducted in two seasons (summer and fall) to allow for seasonal variation. The summer sort began August 8 and ran through September 10. The fall sort began October 14 and ran through November 14. Although not part of the municipal sort, the University of Maine waste was sampled for demonstration purposes on November 17, 2011. The following table shows the dates in which the sorts were completed for each municipality.

Table 3. Municipality and sort dates.

Municipality	Sort 1, Summer	Sort 2, Fall
Bath	8/27/2011	11/2/2011
Boothbay	8/12/2011	11/1/2011
Central Penobscot (Corinth region)	8/15/2011	10/21/2011
Hatch Hill (Augusta region)	8/21/2011	11/10/2011
Houlton	9/10/2011	11/14/2011
Lincoln	9/5/2011	10/29/2011
Lisbon Falls	9/3/2011	11/3/2011
Mid Maine (Dexter region)	8/14/2011	10/17/2011
Ogunquit	8/29/2011	11/4/2011
Old Town	8/13/2011	10/20/2011
Orono	8/8,9/2011	10/14/2011
Paris-Norway	8/26/2011	11/8/2011
Pittsfield	8/22/2011	10/18/2011
Pleasant River (Columbia Falls)	8/23/2011	10/26/2011
Scarborough (at ecomaine)	8/28/2011	11/9/2011
Skowhegan	9/9/2011	10/25/2011
St. George (Tenants Harbor)	9/1/2011	10/24/2011
University of Maine	N/A	11/17/2011

Waste Composition

The waste examined in this study is typical of what would be found in a regular thirty-gallon plastic trash bag and does not include larger “bulky” items such as furniture, appliances, car tires, and corrugated cardboard boxes. This non-bulky waste stream is often referred to as “baggable trash”.

The project team sorted the baggable trash into nine major categories and over sixty subcategories. These classifications correspond to those used by other states in recent waste characterization studies, allowing for possible comparisons. As is the convention with waste management studies, all measurements were made by weight.

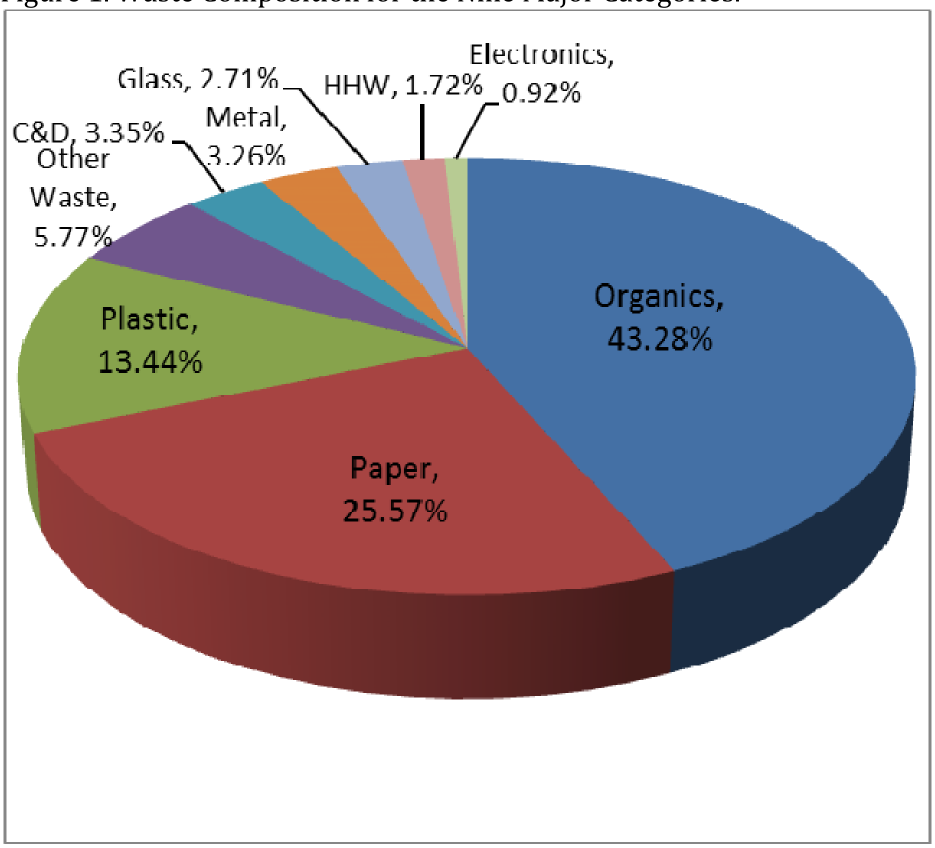
Table 4 below shows the percent of all waste sampled for the nine major waste categories. The largest component was Organics with 43.28%, and the smallest component was Electronics with 0.92%. Figure 1 below shows these percentages. Next, we will discuss each category, from the largest component to the smallest.

Table 4. Waste Composition for the Nine Major Categories.

Major Category	Category %
Organics	43.28
Paper	25.57
Plastic	13.44
Other Waste	5.77
Construction and Demolition Debris (C&D)	3.35
Metal	3.26
Glass	2.71
Household Hazardous Waste (HHZ)	1.72
Electronics	0.92

Note: See Appendix A for a complete category breakdown.

Figure 1. Waste Composition for the Nine Major Categories.



Organics

The phrase "organic" has different meanings depending on usage. From a chemistry standpoint, "organic" technically includes all carbon-based materials such as food, paper, leaves and grass, and even plastics, as plastics are made from and contain hydrocarbons. However, following the convention of others, our Organics category includes only the subcategories: Food Waste, Diapers, Leaves & Grass, Prunings & Trimmings, and Other Organics. Paper and plastic materials comprise their own categories. Table 5 contains a brief description of the five Organics subcategories.

Table 5. Organic waste subcategories and description.

Subcategory	Description
Food Waste	Material resulting from the storage, preparation, and consumption of food. Discarded meat scraps, dairy products, eggshells, coffee grounds, and fruit or vegetable peels.
Other Organics	Organic material that cannot be classified in any other category. Feces-soiled cat litter, cork, hemp rope, cigarette butts, sawdust, bath and body products.
Diapers	All diapers.
Leaves & Grass	All plant material except woody plant material. Fresh grass clippings, leaves, and small plants.
Prunings & Trimmings	All woody plant material up to four inches in diameter. Plant and tree prunings and small branches.

As shown in Table 6, food waste made up 27.78% of the total waste sampled. Food waste, which is nitrogen-rich and highly compostable, is sometimes referred to as a "green waste".

The other four Organics subcategories accounted for 15.42% of the total waste stream. The two largest of these subcategories were Other Organics, comprised mainly of cat litter and animal feces, and Diapers. For health and sanitation reasons these materials are not included in composting programs.

The Leaves & Grass and Prunings & Trimmings subcategories accounted for 1.5% of the trash sampled. This waste has a relatively high concentration of carbon, and when combined with food waste yields a carbon-nitrogen ratio generally well-suited for composting.

Table 6. Organic waste percentages.

Sub-Category	% of Total Waste	% of Organic Waste	Cumulative %
Food	27.86	64.38	64.38
Remainder/Composite Organic	10.97	25.35	89.73
Diapers	2.97	6.86	96.58
Leaves & Grass	1.16	2.68	99.26
Prunings & Trimmings	0.32	0.74	100.00

Paper

Paper accounted for just over a quarter of the total waste collected. Paper was sorted into nine subcategories, as described in Table 7.

Table 7. Paper waste subcategories and description.

Subcategory	Description
Compostable Paper	Contaminated food containers or low-grade paper not capable of being recycled. Paper towels, paper plates, waxed paper, and tissues.
Other Recyclable	"Mixed Paper" including manila folders and envelopes, index cards, notebook paper, construction paper, cereal boxes, paperboard glossy containers, and coated cardboard.
Remainder/ Composite Paper	Items made mostly of paper but combined with other materials. Plastic-coated cardboard, polycoated cartons, frozen juice containers, fast-food wrappers, carbon paper, photographs, and books.
Magazines/Catalogs	Items made from glossy coated paper. Magazines, catalogs, brochures, and pamphlets.
Newsprint	Uncoated ground wood paper, mainly in the form of printed newspapers.
High Grade Office	Standard paper free of ground wood fibers. Office paper, envelopes, computer paper, stationary-grade paper.
Uncoated Corrugated Cardboard/Kraft Paper	Boxes and paper bags made from Kraft paper and uncoated corrugated cardboard. Paper towels, grocery bags, fast food bags, cardboard containers, computer packaging cartons.
Phone Books & Directories	Thin paper between coated covers. Yellow Pages, real estate listings, and some non-glossy mail order catalogs.
Offshore Cardboard	Similar to uncoated corrugated cardboard, but lighter in color with a yellow tint.

As shown in Table 8, the two largest paper subcategories were Compostable Paper and Other Recyclable. Together, these subcategories accounted for just over half of the paper waste. Trash sorters observed that paper towels and plates made up the greatest volume of compostable paper, reporting that it was not unusual to receive a garbage bag with over half of its volume consisting solely of these two items. Remainder/Composite Paper, the third largest subcategory, includes items that cannot be easily diverted from the normal waste stream due to their heterogeneity and complexity (i.e. two materials fused together). Examples include foil-covered paperboard and wax-coated paper.

Table 8. Paper waste percentages.

Subcategory	% of Total Waste	% of Paper Waste	Cumulative %
Compostable Paper	7.93	31.02	31.02
Other Recyclable	4.90	19.15	50.17
Remainder/Composite Paper	4.08	15.95	66.12
Magazines/Catalogs	2.88	11.25	77.37
Newsprint	2.43	9.51	86.88
High Grade Office	1.64	6.41	93.29
Uncoated Corrugated Cardboard/Kraft Paper	1.61	6.29	99.58
Phone Books & Directories	0.11	0.42	100.00
Offshore Cardboard	0.00	0.00	100.00
Total Paper	25.57	100.00	

Plastic

Items made of plastic accounted for 13.44% of the total waste stream. Plastic was sorted into eleven subcategories, as listed and described in Table 9.

Table 9. Plastic waste subcategories and description.

Subcategory	Description
All Plastic Film	Contains both food-soiled and non food-soiled film. Also includes shrink wrap, bubble wrap, garbage bags, small plastic bags, and metalized film.
Remainder/Composite Plastic	All plastic that does not fit into the other subcategories or items primarily composed of plastic but combined with other materials. Auto parts, plastic straws, vinyl, linoleum, plastic lids, CDs.
Durable Plastic Items	Items meant to last a few months to many years. Children's toys, furniture, mop buckets, sporting goods.
#3 - #7 Plastics	Items made of Polyvinyl Chloride, Polyethylene, Polypropylene, or non-expanded Polystyrene.
HDPE Bottles	Containers made of high-density polyethylene plastic (a cloudy white or solid-colored plastic). Includes milk jugs and bottles for shampoos and lotions.
Grocery/Merchandise Bags	Bags meant for transporting merchandise from place of purchase. Also includes dry-cleaning bags.
PET Containers (non-bottles)	All Polyethylene Terephthalate containers that are not meant to hold liquids. Mainly food storage units, including peanut butter jars.
Styrofoam	All expanded polystyrene.
PET Bottles	Clear or colored PET bottles used for liquids such as bottled water or salad dressing.
Redeemable Plastic Beverage Containers	Plastic beverage containers subject to Maine's bottle bill.
HDPE Containers (non-bottles)	Buckets and pails made of high density polyethylene plastic, not including mop buckets.

The most common Plastic subcategory was Plastic Film, which constituted over one-third of the plastic waste and nearly 5% of the total waste (see Table 10). While it is possible to recycle non-food plastic film, less than 5% of Maine municipalities currently offer this type of recycling. The second and third largest plastic subcategories were Remainder/Composite Plastic and Durable Plastic. Many durable plastics have the potential to be recycled, although recycling programs for these plastics are not generally available.

The remaining plastic subcategories accounted for roughly 5% of the total waste sampled. Many of these materials are recyclable. The combined amount of recyclable #1-#7 plastics and Styrofoam accounted for 4.74% of the waste stream. Only 0.36% of the waste stream was made up of plastic beverage containers redeemable under Maine's "bottle bill" legislation. A 2011 Container Recycling Institute publication reports that on average only 24% of bottles eligible for deposit are recycled in states without a bottle bill, while over two-thirds are recycled in states like Maine, where bottle bill legislation is long-established.[2]

[2] Container Recycling Institute. March 2011. "CRI Comments on Natural Logic's White Paper on EPR for Packaging."

Table 10. Plastic waste percentages.

Subcategory	% of Total Waste	% of Plastic Waste	Cumulative %
All Plastic Film	4.78	35.61	35.61
Remainder/Composite Plastic	1.68	12.50	48.12
Durable Plastic Items	1.41	10.48	58.59
#3 - #7 Plastics	1.38	10.25	68.85
HDPE Bottles	1.01	7.50	76.35
Grocery/Merchandise Bags	0.82	6.10	82.45
PET Containers (non-bottles)	0.71	5.31	87.76
Styrofoam	0.67	4.99	92.75
PET Bottles	0.47	3.50	96.25
Redeemable Plastic Beverage Containers	0.36	2.68	98.93
HDPE Containers (non-bottles)	0.14	1.07	35.61
Total Plastic	13.44	100.00	

Other Waste

Materials that could not be sorted into any other category were classified as "Other Waste". Other Waste accounted for 5.77% of the trash sampled. This category was separated into four subcategories, as described in Table 11.

Table 11. Other Waste subcategories and description.

Subcategory	Description
Textiles (non-carpet)	All items (excluding carpet) made of natural or synthetic textiles. Fabric, clothing, curtains, blankets, stuffed animals, and cotton q-tips.
Other Miscellaneous	Any type of waste not listed elsewhere, such as rubber or ceramic items.
Bottom Fines & Dirt	Homogenized granulated residue including dirt, sand, tiny bits of paper, and crumbs.
Bulky Items	Any large item not typical of baggable trash.

Table 12, below, shows percentages for the four Other Waste subcategories. Bottom fines and dirt accounted for less than one-half of a percent of the total waste stream. Only one bulky item was found; this was a suitcase weighing 7.8 pounds. The largest component of the Other Waste category was Textiles, which made up 4.26% of the total waste sampled. Many of the clothing items found were in wearable condition, and some in new condition. While some textile recycling programs exist, Maine municipalities may wish to increase their textile recycling options.

Table 12. Other Waste Percentages.

Subcategory	% of Total Waste	% of Other Waste	Cumulative %
Textiles (non-carpet)	4.26	73.86	73.86
Other Misc	1.01	17.50	91.36
Bottom Fines & Dirt	0.46	7.94	99.29
Bulky Items	0.04	0.71	100.00
Total	5.77	100.00	

Construction and Demolition

The total Construction and Demolition (C&D) waste comprised 3.35% of all waste sampled. In accordance with other studies, an initial seven C&D categories were utilized (as described in Table 13). For households, C&D waste is normally generated with home construction projects.

Table 13. Construction and Demolition waste subcategories and description.

Subcategory	Description
Wood	All treated or untreated wood. Does not include particle board, plywood, or yard waste.
Asphalt, Brick, & Concrete	Items made of asphalt, brick, or concrete. Includes pieces of building foundations, cinder blocks, and pavement.
Asphalt Roofing	Asphalt shingles and other attached roofing material such as roofing tar and tar paper.
Drywall/Gypsum Board	Broken or whole pieces of sheetrock, drywall, gypsum board, plasterboard, Gyproc, and wallboard.
Carpet	Flooring applications consisting of various natural or synthetic fibers bonded to a backing material.
Carpet Padding	Plastic, foam, felt, or other material used under carpet to provide insulation and padding.
Remainder/ Composite C&D	Construction and demolition debris that cannot be included in any other subcategory. Includes composite materials that would be hard to separate, such as linoleum glued to plywood.

Perhaps as a result of only collecting and sorting "baggable" waste, a large volume and variety of C&D was not found. In fact, asides from wood wastes, very few items were found that did not belong in the Wood or Remainder/Composite subcategories. To simplify and make weighing manageable, an "All Other C&D" subcategory was created to encompass all of the non-wood C&D waste. These condensed C&D waste percentages are shown in Table 14.

Table 14. Construction and Demolition waste percentages.

Subcategory	% of Total Waste	% of C&D Waste	Cumulative %
All other C & D	2.21	65.93	65.93
Wood	1.14	34.07	100.00
Total C&D Waste	3.35	100.00	

Metal

Metal accounted for 3.26% of the total waste stream. Metal items were sorted into eight subcategories, as listed and described in Table 15.

Table 15. Metal waste subcategories and description.

Subcategory	Description
Tin/Steel Containers	Magnetic metal containers, such as those used for soup, vegetable, and coffee cans, that are made mainly of steel but with a thin coating of tin on the inside.
Other Ferrous	Other magnetic metal items including clothes hangers, empty paint cans, metal pipes, nails, and some cookware.
Other Non-Ferrous	Nonmagnetic metal items including those made of stainless steel, copper, brass, bronze, and lead. Examples include copper wire, shell casings, and brass pipes.
Remainder/Composite Metal	Items made mostly of metal but combined with other materials such as motors, insulated wire, and food-soiled kitchen foil.
Redeemable Aluminum Beverage Containers	Aluminum containers, such as soda and beer cans, that are Maine deposit refundable.
Appliances	Small metal household appliances such as toasters.
Compressed Fuel Containers	Compressed fuel containers such as propane tanks.
Non-Redeemable Aluminum Beverage Containers	Aluminum containers that are not Maine deposit refundable, such as cans brought into Maine from out of state.

Tin/Steel Containers made up almost half of the metal waste sorted. Food-soiled aluminum foil, not deemed recyclable, was the largest component of the Remainder/Composite Metal subcategory. Redeemable Aluminum Beverage Containers, suitable for redemption under Maine's bottle bill, accounted for less than one-tenth of a percent of the total waste sample. Table 16 lists percentages for all metal subcategories.

Table 16. Metal waste percentages.

Subcategory	% of Total Waste	% of Metal Waste	Cumulative %
Tin/Steel Containers	1.45	44.38	44.38
Other Ferrous	0.93	28.58	72.96
Other Non-Ferrous	0.42	12.85	85.81
Remainder/Composite Metal	0.28	8.69	94.51
Redeemable Aluminum Beverage Containers	0.10	3.22	97.72
Appliances	0.04	1.28	99.01
Compressed Fuel Containers	0.03	0.87	99.87
Non-redeemable Aluminum Beverage Containers	0.004	0.13	100.00
Total Metal	3.26	100.00	

Glass

Glass accounted for 2.71% of the waste stream. Glass was sorted into six subcategories, which are described in Table 17.

Table 17. Glass waste subcategories and description.

Subcategory	Description
Clear Glass Containers	Includes all non-redeemable clear wine bottles and beverage containers, mayonnaise jars, salsa jars, and jelly/jam jars.
Redeemable Glass Beverage Containers	Any glass beverage container subject to Maine deposit law.
Green & Other Glass Containers	Green or other colored bottles including wine, beer, and nonalcoholic beverage containers.
Remainder/Composite Glass	Items made primarily of glass but combined with other materials. Examples include crystal tableware, mirrors, non-florescent light bulbs, car windshields, and curved glass.
Flat Glass (uncoated)	Uncoated, flat glass such as that used for windows, doors, and tabletops, and some auto glass (side windows).
Amber Glass Containers	Amber-colored containers not including alcoholic beverage containers.

The top two glass subcategories in Table 18, Clear Class Containers and Redeemable Glass Beverage Containers, are easily recyclable and accounted for 2.38% of the baggable trash sampled. Redeemable Glass Beverage Containers made up only 0.41% of the waste sampled.

Table 18. Glass waste percentages.

Subcategory	% of Total Waste	% of Glass Waste	Cumulative %
Clear Glass Containers	1.96	72.48	72.48
Redeemable Glass Beverage Containers	0.41	15.23	87.71
Green & Other Glass Containers	0.13	4.84	92.55
Remainder/Composite Glass	0.11	4.00	96.54
Flat Glass (uncoated)	0.07	2.69	99.24
Amber Glass Containers	0.02	0.76	100.00
Total Glass	2.71	100.00	

Household Hazardous

The Household Hazardous waste category includes unwanted residential products that exhibit one or more of the following qualities: flammable, corrosive, reactive, or toxic. [3]Household Hazardous waste accounted for 1.72% of the total trash sampled. Table 19 describes the seven subcategories used to classify the Household Hazardous waste.

[3] These are the same qualities that determine hazardous waste under Maine's hazardous waste rules.

Table 19. Household Hazardous waste subcategories and description.

Subcategory	Description
Other Hazardous Waste	All products characterized as “toxic”, “flammable”, or “corrosive”. Also includes waste contaminated with bodily fluid and discarded needles.
Paint	Items containing oil-based, latex, or fine art paint. Does not include dried paint or empty paint cans.
Batteries	Household batteries such as AA, AAA, D, button cell, 9 volt, and rechargeable.
Vehicle & Equipment Fluids	Containers holding fluids, such as antifreeze or oil , that are used in vehicles or engines.
Empty Metal, Glass, & Plastic Containers	Empty containers that once held toxic or hazardous materials such as antifreeze, oil, or lye.
Pesticides & Fertilizers	Products used to control pests or enhance plant growth.
Ballasts, CFLs, & Other Fluorescents	Includes ballasts (devices that electrically control fluorescent light fixtures), compact fluorescent lamps, and other fluorescent lighting such as tubular lamps.

Other Hazardous Waste, the largest subcategory, consisted mainly of items contaminated with bodily fluids. Paint and batteries were also found in large amounts. Items in the Other Hazardous Waste, Paint, and Batteries subcategories accounted for over 81% of the hazardous waste found. Table 20 shows the percentages of all Household Hazardous waste subcategories.

Table 20. Household Hazardous waste (HHZ) percentages.

Subcategory	% of Total Waste	% of HHZ Waste	Cumulative %
Other Hazardous Waste	0.80	46.50	46.50
Paint	0.37	21.70	68.21
Batteries	0.23	13.39	81.59
Vehicle & Equipment Fluids	0.14	8.09	89.69
Empty Metal, Glass, Plastic Containers	0.10	5.54	95.23
Pesticides & Fertilizers	0.07	3.87	99.10
Ballasts, CFLs, & Other Fluorescents	0.02	0.90	100.00
Total Household Hazardous	1.72	100.00	

Electronics

The smallest of the nine major categories was Electronics, accounting for just 0.92% of waste stream. Electronics were sorted into four subcategories, which are listed and described in Table 21.

Table 21. Electronics waste subcategories and description.

Subcategory	Description
Small Consumer Electronics	Hand-held devices such as cellphones, iPODs, and PDAs.
Computer-Related Electronics	Personal computers and related equipment such as processors and keyboards. Does not include hand-held devices such as calculators.
Other Large Electronics	Larger electronic equipment not related to computers. Stereos, DVD players, VCRs.
TVs and Computer Monitors	Any stand-alone display system including CRT, plasma, and LCD units.

Small consumer electronics made up 73.66% of the Electronics category. No TVs or computer monitors were found, which was expected as these are bulkier items not typical of baggable trash. All electronics percentages can be found in Table 22.

Table 22. Electronics waste percentages.

Subcategory	% of Total Waste	% of Electronic Waste	Cumulative %
Small Consumer Electronics	0.67	73.66	73.66
Computer-Related Electronics	0.13	14.26	87.91
Other Large Electronics	0.11	12.09	100.00
TVs & Computer Monitors	0.00	0.00	100.00
Total Electronics	0.92	100.00	

Comparison to 1991/1992 Data

Prior to this analysis, no large-scale survey of Maine's residential waste had been conducted since 1991/1992. The previous study by Criner, Kaplan, Juric, and Houtman analyzed baggable trash collected at fourteen Maine municipalities in fall, winter, spring, and summer waste sorts. The following section compares data from these sorts with data from our current study in an attempt to identify the changes that have occurred to our waste stream over time. Appendix A and Appendix B contain tables of both waste sorts data.

Some waste components cannot be directly compared between 1991/1992 and 2011, as the studies used slightly different trash classification systems. A note of caution is also needed in regard to comparing changes in composition percentages. Percentages of all subcategories must always sum to 100, so an increase or decrease in the weight of one subcategory will alter the percentages of all other subcategories. However, as percentage comparisons should provide some useful information on changes in the composition of our baggable trash, several materials are discussed below.

Selected Comparisons

Paper

The total amount of paper in Maine's residential waste stream decreased considerably, from 33.04% in 1991/1992 to 25.57% in 2011. Percentages of all comparable paper types also decreased, as shown in Table 23.

Table 23. Comparable paper types percentages, 1991/1992 and 2011.

Type of Paper	**1991/1992 % of Total Waste Stream**	**2011 % of Total Waste Steam**
Corrugated cardboard	2.92	1.61
High grade office	3.04	1.64
Magazines/ catalogs	2.92	2.88
Newsprint	9.88	2.43
Telephone books	0.19	0.11
Total of all paper	33.04	25.57

Note: The paper types listed above do not sum to total, as not all paper subcategories are included.

The greatest decrease was in the Newsprint subcategory, which made up 9.88% of waste sampled in 1991/1992 but just 2.48% of the 2011 waste. There were also decreases (by roughly one-half each) in amounts of high grade office paper, corrugated cardboard, and telephone books. Improved recycling programs have no doubt contributed to these decreases, but another factor is the overall movement away from printed media (e.g. more people are reading the newspaper online).

Plastic

In the last two decades, the percentage of plastic in Maine's residential waste stream has more than doubled. Many plastic types cannot be directly compared between the studies, as four subcategories were used to classify plastic in 1991/1992 and eleven were used in 2011. However, Table 24 presents the comparisons that are possible.

Table 24. Comparable plastic types percentages, 1991/1992 and 2011.

Type of Plastic	**1991/1992 % of Total Waste Stream**	**2011 % of Total Waste Stream**
Plastic bags	1.59	0.82
All HDPE	1.23	1.15
Rigid plastics	1.12	2.92
Total of all plastic	6.69	13.44

Note: The plastic types listed above do not sum to total, as not all plastic subcategories are included.

Between 1991/1992 and 2011 there was an increase by almost two percentage points in the amount of rigid plastics (which here includes the 2011 subcategories #3-#7 Plastics, PET Bottles, PET Containers, and Redeemable Plastic Beverage Containers) in the total waste sampled. There were decreases, however, in percentages of HDPE plastics and plastic bags.

The overall increase in plastics in baggable trash supports the perception that more and more items are being made from, or wrapped in, plastics. Plastic film, which was included in the 1991/1992 Other Plastic subcategory, has since become the principal plastic component of the waste stream. In 2011, plastic film accounted for 35.61% of all plastic waste and nearly 5% of the total trash sorted.

Metal

The percentage of metal was similar in both studies at 3.29% of the waste stream in 1991/1992 and 3.26% of the waste stream in 2011. However, percentages of various metal subcategories changed (see Table 25). There was a decrease in the percentage of tin/steel containers, but an increase in the percentage of other ferrous and non-ferrous metals. The percentage of aluminum also decreased substantially, although at 0.39% in 1991/1992 and 0.10% in 2011, it was not a significant portion of the waste stream in either sort.

Table 25. Comparable metal types percentages, 1991/1992 and 2011.

Type of Metal	**1991/1992 % of Total Waste Stream**	**2011 % of Total Waste Stream**
Tin/steel containers	2.28	1.45
Ferrous	0.55	0.93
Non-ferrous	0.07	0.42
Aluminum	0.39	0.10
Total of all metal	3.29	3.26

Note: The metal types listed above do not sum to total, as not all metal subcategories are included.

Food Waste

Food waste accounted for 27.81% of the sampled baggable trash in 1991/1992 and 27.86% in 2011, remaining essentially unchanged between the two studies. However, food has surpassed paper as the largest major component of the residential waste stream. This change may be the result of the considerable increases in paper recycling since the mid-1990s.

Glass

The percentage of glass in the residential waste stream decreased from 4.06% in 1991/1992 to 2.71% in 2011. A significant reduction can be seen in the Clear Glass Containers subcategory, which accounted for 3.39% of the trash sampled in 1991/1992 and only 1.96% in 2011. This may be due not only to the increased availability of glass recycling but also the general shift away from using glass containers towards using plastic.

Other Waste

Some materials, such as textiles, made up similar percentages of the residential waste stream in 1991/1992 and 2011. Textiles accounted for 4.24% of the trash sorted in 1991/1992 and 4.26% of the trash sorted in 2011. The percentages of hazardous materials in the residential waste stream also did not change significantly. At 1.32% in 1991/1992 and 1.72% in 2011, they stayed within the 1-2% expected range for baggable waste.

Cat litter, the primary component of the Cat Litter/ Pet Bedding subcategory in 1991/1992, and the Other Organics subcategory in 2011, was a noticeable component of the waste stream in both trash sorts. While a perfect comparison between the two studies is not possible, the amount of cat litter in our baggable trash seems to have increased as Cat Litter/ Pet Bedding accounted for 3.86% of the waste stream in 1991/1992, and Other Organics accounted for 10.97% in 2011. Although cat litter has the potential to be composted, care must be taken as it can contain certain bacteria and parasites harmful to humans, particularly pregnant women.

Variation in Recyclable Material

State policy makers, local solid waste managers, and those with environmental concerns would like to know what potential exists for removing more recyclables from the residential waste stream. They would also like to evaluate the effectiveness of different waste management programs such as single-stream recycling and pay-as-you-throw initiatives. To begin this assessment, the variation in the amount of recyclable materials found in municipal waste streams is examined.

We chose two materials, Clear Glass Containers and Newsprint, to begin this analysis. These were selected because the vast majority of Maine residents know that these materials can be recycled and almost all Maine municipalities have some recycling program for them. To explore the variation of these materials, the summer and fall sort data were averaged for each of the seventeen municipalities. In an effort to eliminate accidental extreme data points and make an easy comparison by thirds, municipalities with the highest and lowest percentages were removed from the analysis. The remaining fifteen municipalities could then be organized into low, medium, and high groups of five municipalities each.

Figure 2 illustrates variation in the percentage of Clear Glass Containers in the municipalities' baggable trash. Averages for the low, middle, and high groups are provided. The difference between the low (1.50%) and high (2.48%) averages shows that some municipalities could be recycling more Clear Glass Containers.

Figure 2. Clear Glass Containers Low, Mid, High Averages.

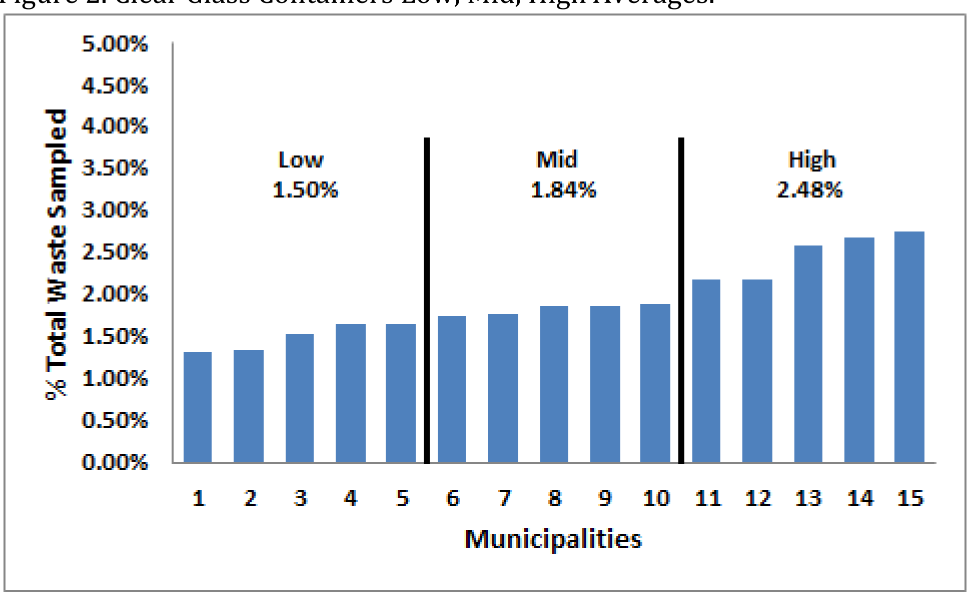
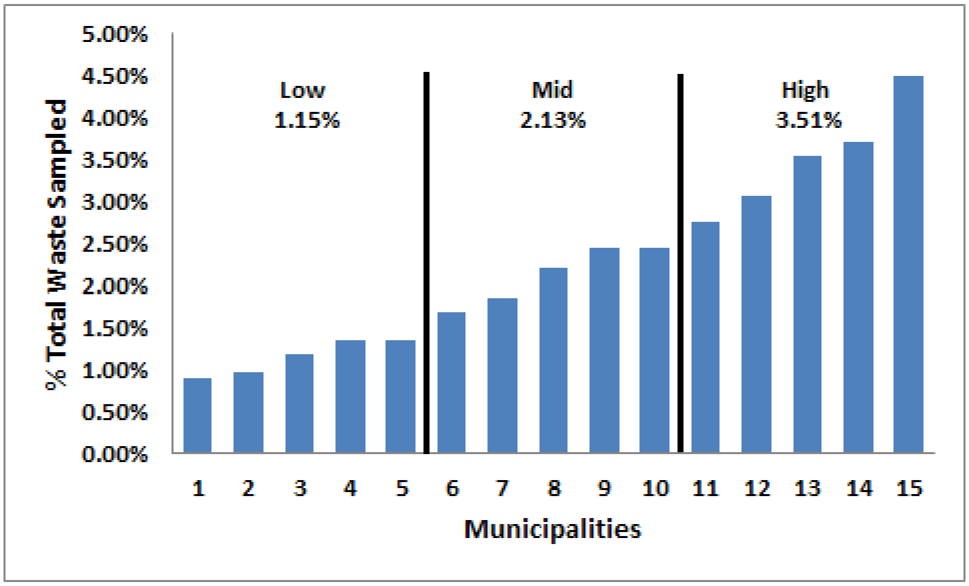


Figure 3 presents a similar graph, illustrating variation in the percentage of Newsprint in the municipalities' baggable trash. Differences between the high, middle, and low averages are greater for this material, with Newsprint comprising 3.51% of the waste stream of the high group, and only 1.15% of the waste stream of the low group.

Figure 3. Newsprint Low, Mid, High Averages.



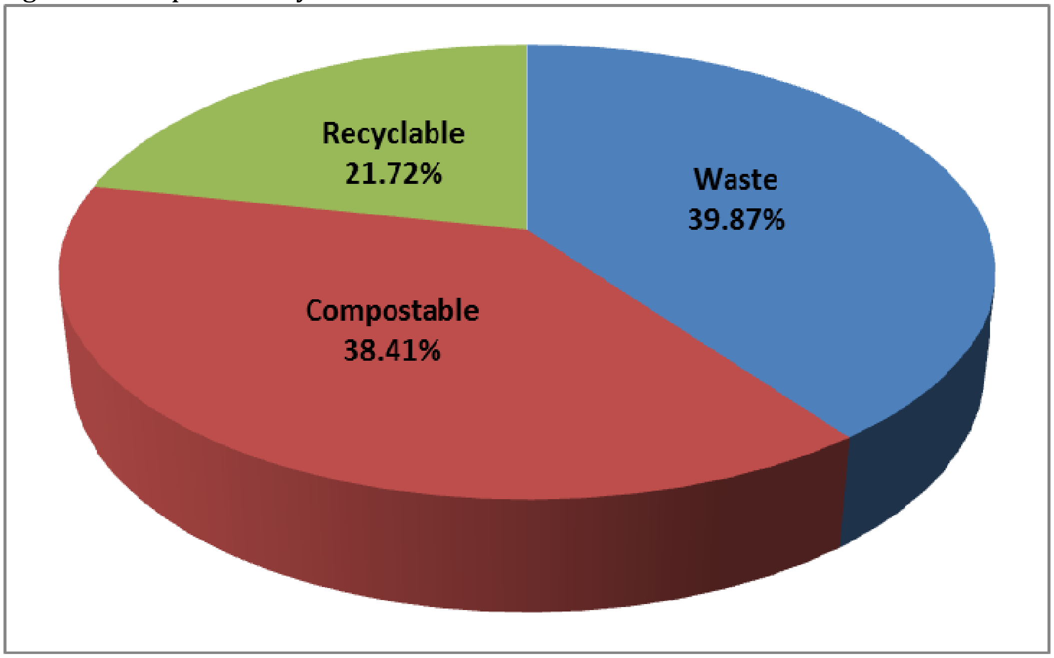
Many factors likely contribute to these variations, including program design (such as pay-as-you-throw and single stream recycling), community involvement and municipal commitment. A preliminary study of the waste/recycling municipal programs supports this conclusion: program design and management appears to make a difference in recycling. Future reports will analyze these factors more closely. However, the variation in the presence of recyclable materials in the waste stream shown above demonstrates the potential for underperforming municipalities to improve their recycling efforts.

Analysis and Discussion

With an eye towards fruitful analysis and the most productive use of these data, we will examine this study's results in two different ways. Doing so may provide additional insights and accompanying recommendations for municipal waste managers.

The first way we analyze the baggable trash sampled in this study is by classifying it into three streams: Waste, Recyclable, and Compostable. These three streams are not exclusive, but are helpful in determining how much of what Maine residents are throwing away could be diverted to better uses. For discussion purposes only, we define "Waste" as materials not easily diverted from the waste stream through current Maine composting or recycling programs. Please see Appendix C for complete details of the waste stream classification used in this analysis. The waste sampled in this study had a roughly 40-40-20 breakdown between Waste materials, Compostable materials, and Recyclable materials, as shown in Figure 4.

Figure 4. Composition by Stream.



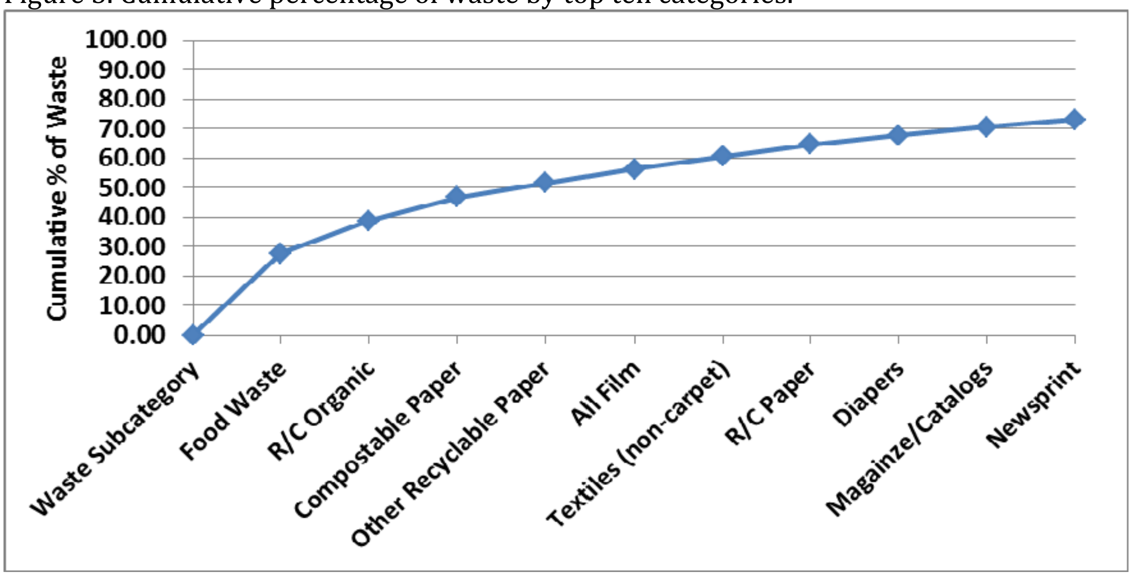
Waste comprised 39.87% of the trash sampled. Efforts could be made to reduce much of this waste at its source by encouraging the use of recyclable materials and/or the use of more reusable items (e.g. refillable razors). The potential also exists for several materials in this category, such as textiles and grocery bags, to be recycled at much higher rates in the future if better recycling programs for these materials can be developed. Compostable materials, at 38.41%, comprised nearly as much of the trash as Waste. Food waste and compostable paper comprised 93.2% of the Compostable stream. Creating municipal or regional composting programs and increasing awareness about backyard composting could greatly reduce the cost of disposing of solid waste in the State of Maine. Recyclable materials comprised just over 20% of the waste sampled. This category contains desirable materials that should be diverted from the normal waste stream to more economical uses. As shown in the previous section, some municipalities could greatly improve their capture of these materials. While Maine communities have been providing recycling programs to residents since the early 1990's, and recycling initiatives have been increasing with time, municipalities and businesses are still recycling much less of their waste than the state's 50% recycling goal that was established by the Maine Congress in 1989. This deadline for this law has been extended each time it is not met.

A second method we use to examine the data relies on identifying the waste subcategories which make up the greatest part of the residential waste stream. The ten subcategories shown in Table 26 made up 73.05% of the waste sampled for this study. Figure 5 shows the cumulative volume of these ten categories.

Table 26. Top ten waste subcategories by percentage.

Waste Subcategory	Category %	Cumulative %	Potential to be Diverted
Food Waste	27.86	27.86	Yes
Other Organics	10.97	38.83	No
Compostable Paper	7.93	46.76	Yes
Other Recyclable Paper	4.90	51.66	Yes
All Plastic Film	4.78	56.44	Yes
Textiles (non-carpet)	4.26	60.70	Yes
Remainder/ Composite Paper	4.08	64.78	No
Diapers	2.97	67.75	No
Magazines/Catalogs	2.88	70.62	Yes
Newsprint	2.43	73.05	Yes

Figure 5. Cumulative percentage of waste by top ten categories.



The three largest components of the waste stream were food waste, other organics, and compostable paper. Food waste and compostable paper have a high potential to be diverted from the normal waste stream, while items in the other organics subcategory do not, as much of these contained fecal matter. Items in several of the other subcategories, such as other recyclable paper, magazines/catalogs, and newsprint, are easily recyclable. Textiles are potentially recyclable, but better textile recycling programs are in need of development. Remainder/composite paper is not currently recyclable, but technical methods may be developed to facilitate this. The majority of plastic film, however is contaminated with food, making it unfit for recycling.

Our knowledge about the recycling potential of each subcategory permits us to focus primarily on those subcategories which have a high potential to be diverted from the normal waste stream. Table 27 lists the ten largest subcategories with a high potential to be diverted, and their percentages of total waste. Together, these ten subcategories constituted over 60% of the baggable trash sampled.

Table 27. Top ten waste subcategories with the potential to be diverted.

Waste Subcategory	% of Total Waste	Cumulative %
Food Waste	27.86	27.86
Compostable Paper	7.93	35.79
Other Recyclable Paper	4.90	40.69
All Plastic Film	4.78	45.47
Textiles (non-carpet)	4.26	49.73
Magazines/Catalogs	2.88	52.61
Newsprint	2.43	55.04
Clear Glass Containers	1.96	57.00
High Grade Office Paper	1.64	58.64
Uncoated Corrugated Cardboard/Kraft Paper	1.61	60.25

Conclusion

This report summarizes the results of a state-wide analysis of Maine's baggable trash. It is our intention that the information provided will be useful in understanding and managing Maine's residential waste. By identifying what materials end up in household baggable trash, municipalities may identify both the areas of their waste management programs that are working effectively as well as those that need improvement. The observed decrease in paper and glass waste from the early 1990's to the present can be explained by the increased use of plastic in packaging and product manufacturing. The composition of plastics and their respective recycling requirements have accordingly become more complex as new types of plastic have been developed.

Importantly, this analysis shows that 38% of current trash has the potential to be composted. Significant revenue loss also appears to occur in the improper disposal of recyclable materials, which make up 21% of the current residential waste stream. Though recycling rates have increased from 32.5% in 1993 to nearly 39% in 2010, vast improvements can still be made, as recycling rates have been stagnant in more recent years. Efforts to increase awareness about composting and recycling, as well as efforts to improve municipal recycling programs, should continue. We anticipate these efforts to be most effective when directed at products from the subcategories shown in Table 27.

Maine has the potential to accomplish its goal of reducing waste through increased recycling, which would lower costs to municipalities and prolong the life of landfills. The research done for this study can provide direction to efforts to improve statewide waste management.

Limitations and Future Research

While this research reports changes since earlier waste studies, more research is needed to assess the impact of particular management programs such as pay-as-you-throw, single stream recycling, mandatory recycling laws, and the availability of curbside pickup. A 1993-1994 Maine study by Seguino *et al.* found that pay-as-you-throw programs reduced per capita residential waste disposal by more than one-half. In this 2011 study, we would accordingly expect to find lower percentages of recyclable material in the trash of municipalities with pay-as-you-throw programs. Similarly, as single-stream systems make recycling easier, we would expect to find less recyclable material in the household waste of communities where these programs exist. Unfortunately our efforts to sample waste from larger municipalities with pay-as-you-throw and single-stream recycling were not successful.

Another analysis that may be of interest in the future is a comparison of the weight (as opposed to percentage) changes of waste composition. As stated above, examining percentage changes in waste components distorts perceived improvements, since a change in the amount of any one component necessarily changes the percentages of all other components (since percentages must sum to 100). For many of the municipalities sampled, we know the number of houses involved as well as total waste weight. This information would allow us to compare pounds of waste per household in order to determine if average pounds per household vary depending on which waste management programs are in use (e.g. single stream recycling, pay-as-you-throw).

Examining the effectiveness of mandatory recycling ordinances is also a potential area of interest. The waste sorters involved in this study reported substantial anecdotal evidence that mandatory ordinances are not enforced thoroughly and may therefore have little to no actual impact on recycling rates. Finally, while this study examined baggable residential waste, future studies might also include household bulky waste, as well as industrial and commercial waste.

Appendix A. 2011 Waste Composition

Major Category	Subcategory	% of Waste	% of Major Category
Organics		43.28	
	Food	27.86	64.38
	R/C Organic	10.97	25.35
	Diapers	2.97	6.86
	Yard Waste	1.48	3.42
Paper		25.57	
	Compostable Paper	7.93	31.02
	Other Recyclable Paper	4.90	19.15
	R/C Paper	4.08	15.95
	Magazine/Catalogs	2.88	11.25
	Newsprint	2.43	9.51
	High Grade Office Paper	1.64	6.41
	Occ/Kraft	1.61	6.29
	Phone Books	0.11	0.43
Plastic		13.44	
	All Film	4.78	35.61
	All Other Plastic	3.76	27.97
	#3 - #7 Plastics	1.38	10.25
	PETE (#1)	1.18	8.81
	HDPE (#2)	1.15	8.58
	Grocery/Merch Bags	0.82	6.10
	Plastic ME Dep. Bev Cont.	0.36	2.68
Other Waste		5.77	
	Textiles (non-carpet)	4.26	73.86
	Other Waste	1.51	26.14
C&D		3.35	
Metal		3.26	
	Other Metal	1.71	52.40
	Tin/Steel Cont.	1.45	44.38
	Al. ME Dep. Bev Cont.	0.10	3.22
Glass		2.71	
	Clear Glass Cont.	1.96	72.48
	Glass ME Dep. Bev Cont.	0.41	15.23
	Amber & Green Glass	0.15	5.60
	All Other Glass	0.18	6.69
HHW		1.72	
Electronics		0.92	

Appendix B. 1991/1992 Waste Composition

Major Category	Subcategory	% of Waste	% of Major Category
Other		52.91	
	Food Waste	27.81	52.56
	Composites	4.74	8.96
	Textiles	4.24	8.01
	Cat Litter/ Pet Bedding	3.86	7.3
	Diapers	3.78	7.14
	Miscellaneous	3.15	5.95
	Household Demolition Debris	2.14	4.04
	Household Hazardous	1.32	2.49
	Deposit Containers	0.67	1.27
	Cosmetic/Toiletries	0.61	1.15
	Furniture/Carpeting	0.46	0.87
	Batteries	0.13	0.25
Paper		33.04	
	Other	14.09	42.64
	Newspaper	9.88	29.91
	Highgrade	3.04	9.22
	Magazines	2.92	8.84
	Corrugated Cardboard	2.92	8.83
	Telephone Books	0.19	0.56
Plastic		6.69	
	Other	2.75	41.07
	Bags	1.59	23.81
	HDPE	1.23	18.41
	Rigid	1.12	16.71
Glass		4.06	
	Clear	3.39	83.46
	Other	0.5	12.26
	Green/Brown	0.17	4.28
Metal		3.29	
	Tin/Steel Cans	2.28	69.43
	Ferrous	0.55	16.72
	Aluminum	0.39	11.76
	Nonferrous	0.07	2.09

Appendix C. Waste Stream Classification

Paper	Stream	Metal	Stream
High Grade Office Paper	R	Non-Redeemable Aluminum Beverage Containers	R
Magazines/Catalogs	R	Redeemable Aluminum Beverage Containers	R
Newsprint	R	Tin/ Steel Containers	R
Offshore Cardboard	R	Appliances	W
Other Recyclable Paper	R	Compressed Fuel Containers	W
Phone Books & Directories	R	Other Ferrous	W
Uncoated Corrugated Cardboard/ Kraft Paper	R	Other Non-ferrous	W
Compostable Paper	C	Remainder/ Composite Metal	W
Remainder/ Composite Paper	W	**Glass**	
Plastic		Amber Glass Containers	R
#3-#7 Plastics	R	Clear Glass Containers	R
HDPE Bottles	R	Green & Other Glass Containers	R
HDPE Containers (non-bottles)	R	Redeemable Glass Beverage Containers	R
PET Bottles	R	Flat Glass (uncoated)	W
PET Containers (non-bottles)	R	Remainder/ Composite Glass	W
Redeemable Plastic Beverage Containers	R	**Organic**	
Styrofoam	W	Food Waste	C
All Plastic Film	W	Leaves & Grass	C
Durable Plastic Items	W	Prunings & Trimmings	C
Grocery/ Merchandise Bags	W	Diapers	W
Remainder/ Composite Plastic	W	Other Organics	W
Household Hazardous		**Electronics**	
Ballasts, CFLs, & Other Fluorescents	W	Computer-Related Electronics	W
Batteries	W	Other Large Electronics	W
Empty Metal, Glass, Plastic Containers	W	Small Computer Electronics	W
Other Hazardous Waste	W	TVs & Computer Monitors	W
Paint	W	**Other Waste**	
Pesticides & Fertilizers	W	Bottom Fines & Dirt	W
Vehicle & Equipment Fluids	W	Bulky Items	W
Construction & Demolition		Other Miscellaneous	W
Wood	C	Textiles (non-carpet)	W
Remainder/ Composite C&D	W		

*R=Recyclable, C=Compostable, W=Waste.

Appendix D. Waste Sorting Procedure

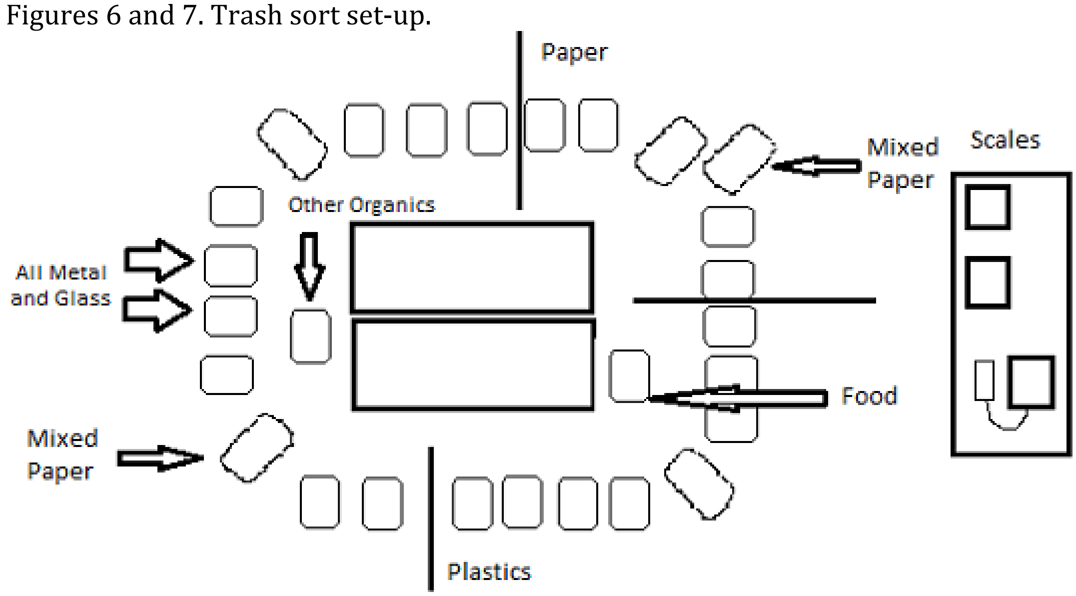
The waste sorting procedure was based on previous studies conducted by the University of Maine and the State of Connecticut. Figures 6 and 7 show the basic trash sort set-up. The project team used two 2'x5' tables covered by an 8'x12' tarp as a sorting surface. Surrounding this were approximately thirty Sterilite storage bins in two sizes, large and small. At one end of the sorting area was a weighing station with three scales. One scale was calibrated for the weight of the large bins, one was calibrated for the weight of the small bins, and one was electronic and used for loose items or for weights that did not register on the other two scales. To protect the sorting are from sun, wind, and rain, a pop-up tent, windscreen, and extra tarps were used at outdoor facilities as needed.

Collecting the sample varied by location. At drop-off facilities, a field supervisor spoke to individuals whose waste was selected for the sample, making sure that this waste could be included in the study and that it qualified as Maine household garbage. In the few instances where individuals did not wish to have their trash sorted, the next individual's trash was chosen for analysis.

Once a trash sample was received, the project team unloaded it on the sorting tables and surveyed the contents for dangerous materials. They worked together to sort the waste into its more general components, then into specific subcategories. Most materials were sorted directly on the table and then placed in designated bins, but some were sorted in two stages. One example of this was mixed paper, which was found in extremely high volumes, and for glass, electronics, and metal which were found in extremely small volumes. It was inefficient to sort these materials directly into their final categories, so they were first grouped together and then resorted. After all of the sorted waste components were removed, the project team used squeegees to collect bottom fines and dirt from the table.

Once a bin was full with a specific subcategory of waste, a field supervisor checked to make sure all of its contents were appropriate. The bin was then brought to the weighing station where a manager weighed the contents, recorded that weight, and discarded the waste.

Figures 6 and 7. Trash sort set-up.



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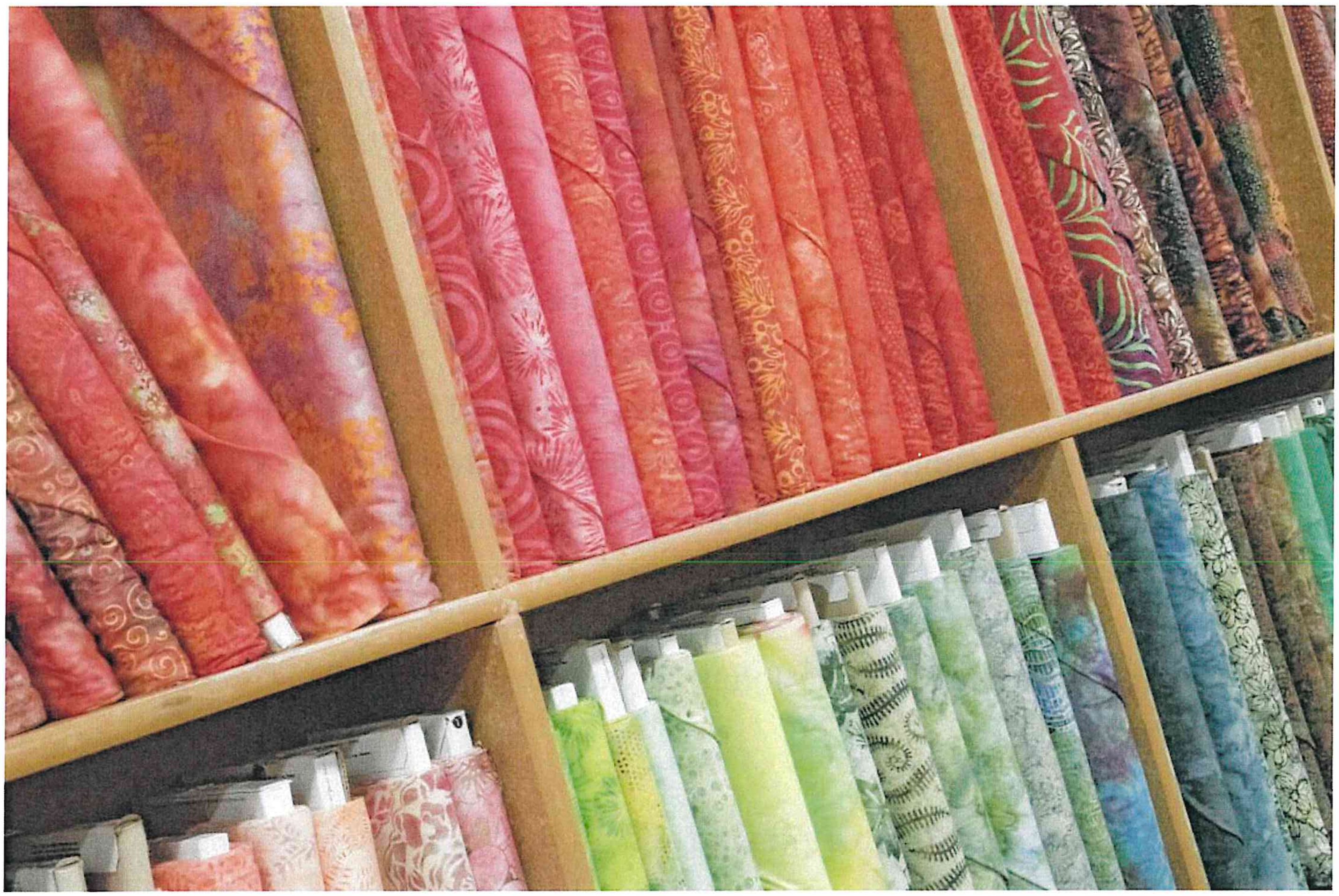
Waste 360



COLLECTION AND TRANSFER > WASTE REDUCTION

Early Efforts to Tackle Mounting Textile Waste (Part One)

Part one of a three-part series this week highlights what's happening on the textiles recovery and reuse front.

Arlene Karidis | May 30, 2018

In a multipart series this week, Waste360 *will examine the problem of textile waste and how some companies and municipalities are working to develop effective and efficient recycling and waste reduction efforts. To read part two, click here . To read part three, click here .*

Textiles are now the fastest growing type of waste, accounting for about 16.2 million tons in the U.S. Most of this waste is landfilled or incinerated, with about 16 percent of it recycled. Each year, Americans throw out more, a pattern that comes with large environmental and financial impacts, with municipalities especially feeling the consequences. Meanwhile, there is almost no infrastructure to manage these materials, with the biggest hurdles being a lack of sophisticated sorting methods and no scalable collections systems.

"Textiles are outpacing almost every waste type in our stream," says Marisa Adler, RRS senior consultant. "It's grown 71 percent in 15 years, while the overall stream has grown by 6 percent. So, we have a textiles crisis, and it doesn't seem to be subsiding because consumers continue purchasing at the same rate with clothes becoming more affordable and people keeping them and other textiles for less time. They are starting to treat them as disposables."

A big question, according to Anne Johnson, vice president of RRS, becomes how can we recover more?

There are emerging trends attempting to answer this question, including a rise in drop box programs. There are nongovernmental organizations programs and nonprofits partnering with brands on takeback programs. There have been curbside collection programs as well, though they are few and spotty.

RRS did a cost analysis of textile waste and found national disposal rates of more than $3 billion, a number Johnson says is projected to rise to more than $4 billion by 2020.

Governments with the strongest waste diversion policies and that heavily focus on consumer education tend to have the lowest percentages in their streams, she said in a recent webinar on textiles, hosted by Textile Exchange and organized by RRS.

"There are brand-sponsored takeback programs [such as Eileen Fisher] and municipalities trying to drive innovation on reuse programs. Some organizations [like Project Green Zone that offers communities secure drop box systems] and regions are active. But we are not seeing collective action. The question is, how do we bring all stakeholders together?" said Johnson in the webinar.

The focus needs to be on regulations, policies and bolstering consumer awareness, she said. The regulations piece is especially critical to support sustainable, reputable programs and to circumvent problems such as those that have arisen with collection boxes in public spaces.

"Some [collectors utilizing boxes] have run into problems with zoning ordinances because people have dumped furniture and other materials that don't belong in the stream. And there has been fraud with less-known organizations providing misleading information on their practices," said Johnson.

A few years ago , CharityWatch disclosed that Planet Aid reported spending 84 percent on programs when it actually only spent 17 percent on programs, which created a large controversy. The Better Business Bureau (BBB), however, rates them very well , but the two use different evaluation methods.

Even much of what is recovered that moves on for reuse is exported to emerging economies, meaning the value is not maximized.

Despite the issues, there is a lot of potential value in recovered textiles to include apparel, housewares like linens and various fibers for reuse and recycling.

There are technologies beginning to emerge, such as mechanical sorting. Industry stakeholders also see promise in technologies where fibers can be extracted and processed into new items, though these methods are still in research and development stages and/or have no infrastructure at scale.

Speaking of already established systems, Johnson said, "Goodwill and other charities are doing a great job. But we've seen the growth in waste is so great that this donation channel cannot keep up. We need to figure out how to take the [donation/recovery] system we have and scale it. I think that means building on something like Goodwill and adding curbside collections. Even with curbside collections and donations we will be flooded, so we need more mechanized sorting ... and we need to build fiber-to-fiber recycling ... that's what we don't have in place, and that's what we need."

Making progress will also mean asking some key questions first, including: How do we find economically viable solutions to reduce waste? Why are some cities more successful? And what is needed to scale solutions?

Source URL: http://www.waste360.com/waste-reduction/early-efforts-tackle-mounting-textile-waste-part-one

Waste or Resource?

Rethinking Solid Waste Policy

State of Maine

Waste Management and Recycling Plan

January 2009

The Maine State Planning Office is directed by the Legislature to develop state policies that promote a balance between economic growth and natural resource conservation. To fulfill that charge within the scope of its mission, the Waste Management and Recycling Program continues to ensure sufficient land disposal capacity within our borders to meet the needs of today's waste management system and the economy that depends upon it. At the same time, we encourage the development of waste-to-resource systems that reduce waste destined for disposal, with the dual aims of alleviating our impacts on Maine's health and environment and enhancing Maine's economy and quality of place.

Maine State Planning Office
Waste Management and Recycling Program
38 State House Station
184 State Street
Augusta, Maine 04333-0038
www.maine.gov/spo
www.mainerecycles.com

January 2009

The State Planning Office would like to thank the Department of Environmental Protection and members of the Maine Waste Solid Management Advisory Council for their input and assistance in developing this plan.

Cover photo features one of a series of posters from the *Maine Recycles* public awareness campaign launched in 2008 and designed to encourage Mainers to recycle more.

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CONTENTS

DEFINITIONS AND ACRONYMS

The following definitions are provided to assist the reader in reviewing this document:

Broker's Survey – *a biennial survey conducted of private sector recycling brokers and end-users to determine level and effort related to management of commercial recyclables.*

Construction/Demolition Debris (CDD) – *these are the wastes generated by building, remodeling and/or destruction activities and may include such wastes as wood and wood products, concrete and brick, gypsum board, shingles and other common components of buildings. It may include such items as wood, large metal appliances and construction materials. These are solid wastes that do not typically fit into a 30 gallon trash container.*

Front-end Process Residue (FEPR) – *residual of municipal solid waste resulting from the processing of solid waste processing prior to incineration or landfilling, and includes, but is not limited to, ferrous metals, glass, grit and fine organic matter.*

Household Hazardous Wastes (HHW) – *items generated by households that are corrosive, toxic, ignitable, or reactive, and as such are hazardous to humans and/or the environment if disposed of improperly.*

Incinerator Ash – *this is the residue from the combustion of municipal solid waste at waste-to-energy facilities. It may also contain fly ash from the facility's operation and is designated as a 'special waste'.*

Municipal Solid Waste Annual Reports – *these are the reports submitted to the State Planning Office by municipalities, as required through 38 MRSA § 2133. These reports convey their efforts related to municipal solid waste management and provide detail on the tonnage of solid wastes they have overseen and a description of the various solid waste management practices utilized.*

Municipal Solid Waste (MSW) – *solid waste emanating from household and normal commercial activities.*

Special waste – *wastes that generated by other than domestic and typical commercial establishments that exist in such an unusual quantity or in such a chemical or physical state that require special handling, transportation and disposal procedures.*

Universal Wastes – *a category of wastes that including: PCB containing lighting ballasts; Cathode Ray Tube (CRT) containing devices; fluorescent lamps; other lamps containing hazardous wastes; and, mercury-added devices from commercial sources.*

Waste-to-energy facilities (W-T-E) – *incinerators which receive municipal solid waste, and through combustion, recover energy and convert it into electricity, while reducing the volume of waste requiring disposal.*

Preface

Declaration of Policy

The Legislature finds and declares it to be the policy of the State, consistent with its duty to protect the health, safety and welfare of its citizens, enhance and maintain the quality of the environment, conserve natural resources and prevent air, water and land pollution, ***to establish a coordinated statewide waste reduction, recycling and management program.***

The Legislature finds and declares that it is the policy of the State ***to pursue and implement an integrated approach to hazardous and solid waste management, which shall be based on the following priorities: reduction of waste generated at the source, including both the amount and toxicity of waste; waste reuse; waste recycling; waste composting; waste processing which reduces the volume of waste needing disposal, including waste-to-energy technology; and land disposal.***

The Legislature finds that it is in the best interests of the State to prefer waste management options with lower health and environmental risk and to ensure that such options are neither foreclosed nor limited by the State's commitment to disposal methods. The Legislature declares that ***it is in the public interest to aggressively promote waste reduction, reuse and recycling as the preferred methods of waste management.***

The Legislature finds that environmentally suitable sites for waste disposal are in limited supply and represent a critical natural resource. At the same time, new technologies and industrial developments are making ***recycling and reuse of waste an increasingly viable and economically attractive option which carries minimal risk to the State and the environment and an option which allows the conservation of the State's limited disposal capacity.***

The Legislature further finds that needed municipal waste recycling and disposal facilities have not been developed in a timely and environmentally sound manner because of diffused responsibility for municipal waste planning, processing and disposal among numerous and overlapping units of local government. The Legislature also finds that direct ***state action is needed to assist municipalities in separating, collecting, recycling and disposing of solid waste,*** *and that sound environmental policy and economics of scale dictate a preference for public solid waste management planning and implementation on a regional and state level* (bold added here for emphasis).[1]

Such was the clarity of our beginnings and, for 20 years, Maine has worked to implement this policy. During this time, the state has made significant progress in reducing, reusing, and recycling its municipal solid waste.

- The state's recycling rate has more than doubled; recycling more than five and a half million tons of solid waste over this period.
- Public recycling services have expanded to serve over 98% of our population.

[1] 38 Maine Revised Statute Annotated, Chapter 13

- Businesses have adopted and implemented recycling programs that support the state's objectives.
- We've reduced toxics in the solid waste stream by banning from disposal in Maine solid waste disposal facilities: mercury-added products, cell phones, and cathode ray tubes (CRTs) found in computer monitors and televisions, and requiring the recycling of hazardous consumer products known as 'universal wastes'.
- The number of municipalities offering collection programs to divert and safely manage household hazardous waste (HHW) has grown to 140 municipalities in 2007. Additionally, two permanent HHW collection facilities have been established to better serve the on-going household hazardous waste management needs of Maine's residents.
- Nearly 100% of the state's unlicensed, unlined, substandard landfills have been capped and closed, significantly reducing their impacts on Maine's environment.

In the decade since the last waste management plan, recycling progress has slowed. The statewide recycling rate leveled off as our growing economy and changing lifestyles resulted in waste generation levels that outpaced our efforts and support of recycling. The amount of solid waste being disposed increased 60 percent.

The legislated date to achieve the state's 50% goal is January 1, 2009. The 2007 state recycling rate is 34.8%, fifteen percentage points short of the goal. The state remains committed to reaching the 50% goal in light of its value on reducing overall solid waste management costs, the positive impact on the environment, and a lessening of the need for additional solid waste disposal facilities.

The state waste reduction goal challenges Mainers to reduce waste generation by 5% every two years. As waste generation continues to climb in Maine, we have not achieved this goal. However, we are seeing a modest trend in waste reduction from decreases in the weight of consumer goods, for example when products get smaller, are made of more lightweight materials, or use lighter weight packaging.

In 2005, a state policy review task force called for Maine to move beyond a 50% recycling goal. Recycling is increasingly critical as a foundation for sustainable production. As the current stewards of this system, we have the obligation to counter the notion of useless waste as an unavoidable conclusion of normal everyday living. Our work for the coming years is to return these "resources" to either their natural or industrial systems.

The Purpose of this Plan

The intent of the ***<u>Declaration of policy</u>*** placed into law in 1989 is unambiguous; as is the direction it provides the plan.

While this plan does offer specific resource management objectives and suggestions to achieve them, and has analytical and informational functions, it is deliberately a forward looking policy document for policymakers and program managers at the state, regional, and municipal level. The plan is intended to encourage them to make full use of the waste hierarchy when crafting decisions about program implementation, to provide them with the policy standards to apply to those decisions and to persuade them to pursue and achieve the state's 50% recycling goal; one of the fundamental legislative reinforcements of the hierarchy.

The plan takes a look at the development of Maine's waste management system in order to assess the effectiveness of current state efforts. The plan also:

- looks at how solid waste is currently being managed in Maine;
- provides an update on issues cited in the last plan ten years ago; and
- identifies issues that warrant monitoring and new trends.

Finally, it describes strategies for how Maine might move forward managing municipal solid waste into the next decade.

In addition, the plan is the basis for:

- communicating Maine's waste management priorities and policies;
- assessing statewide disposal capacity, recycling progress, and waste management strategies; and
- guiding public benefit determination for environmental licensing.

Appendix A provides the statutory references for the plan.

The Plan's Format

This plan update contains edited excerpts from the most current *Solid Waste Generation and Disposal Capacity Report*. The capacity report has been expanded in scope and is now revised on an annual basis. Certain requirements of the plan and the report overlap including determination of existing and potential disposal capacity, and projected demand for capacity.

The goal of this "link up" is to develop mechanisms through which the State Planning Office can readily scrutinize the progress and effectiveness of Maine's solid waste policies and programs against the most current numbers and projections supplied by the capacity report.

This change in format is in keeping with the move to a standing Solid Waste Management Advisory Council from the once-every-five-year task force and the change to the annual report; to develop a more timely, policy-guided review of any changes and trends of Maine's solid waste management practices and translate the information gained into appropriate action.

I. Waste Characterization

Municipal Solid Waste Generation[2]

The amount of municipal solid waste (MSW) generated by Mainers is the starting point for the calculations and projections in this plan. It provides the basis for determining the statewide recycling rate as well as all the projections that follow.

Municipal Solid Waste
This plan considers municipal solid waste and its residues (primarily ash and front-end process residue generated by waste-to-energy facilities). MSW is waste typically generated by households and businesses and managed by municipalities. It includes household garbage and other waste (corrugated cardboard, newsprint, office and mixed papers, food waste, plastics, glass, metals, and textiles) as well as construction and demolition debris, appliances, furniture, tires, wood waste, and yard waste.

Waste Generation Calculation
The State Planning Office uses three pieces of data to determine the statewide generation of municipal solid waste:

1. data provided by municipalities in their annual solid waste reports to the State Planning Office;
2. data provided by public and private disposal facilities in their annual license reports to the Maine Department of Environmental Protection; and
3. data provided by commercial recyclers and end-users in a voluntary survey.

The Office combines the amount of waste processed and disposed and the tonnage recycled, composted, and reused to create a reliable estimate of waste generation in Maine.

A. Statewide Municipal Solid Waste Generation

Maine residents, businesses and visitors generated 2,066,448 tons of municipal solid waste in 2007, up from 1,989,266 tons in 2006. Waste generation is a function of population growth, lifestyles, economic activity, and production practices.

Between 1993 and 2003, municipal solid waste generation in Maine increased over 55%. While we can attribute some of this growth to increased economic activity, we also recognize that improved data collection plays a part. During this period, for each successive reporting year, the Office was able to capture more precise waste generation numbers. However, as can be seen in Figure 1, over the last four years, waste generation increases have slowed. Again, improved accuracy in data plays a part.

[2] Excerpted from the *2007 Solid Waste Generation and Disposal Capacity Report*, Maine State Planning Office, January 2009 (edited)

Nevertheless, a fundamental change in the waste stream is occurring; a change that impacts waste tonnages. Products and product packaging today are increasingly made from lighter weight materials. This saves on both manufacturing and transportation costs. Shifting from glass to plastic packaging, downsizing packaging, and switching from metal to plastic product components are occurring across industries. For example,

- newspapers are smaller and lighter weight;
- aluminum and plastic containers are being manufactured with less material;
- glass is disappearing from supermarket shelves; and
- computer components are often now made of plastic rather than metal.

These changes impact waste stream composition. Plastic, which used to be 7% of the waste stream by weight, now comprises 12-13%, displacing glass and metal. Where 24 aluminum cans used to weigh a pound, now there are 34 cans to a pound. Newspaper is now a smaller percent of the waste stream by weight.

Changes in society also contribute to decreasing the weight of what we dispose. Smaller families, reading their morning newspaper on-line, and eating more restaurant meals, generate less waste. A trend of growing-your-own or buying local produce may also reduce food waste in places.

At the same time, we continue to see increases in disposable, single-use, convenience packaging. Today's on-the-move lifestyle takes advantage of ready-made meals, and also the demands of higher food hygiene standards. Everything from plastic utensils and beverage cups to throwaway floor mops to disposable underwear and socks for travelling represents a growing share of household waste, particularly if you consider its volume. Disposable products and packaging, while increasing in amount also appear to weigh less; a contributing factor to Maine's slowing waste generation tonnages.

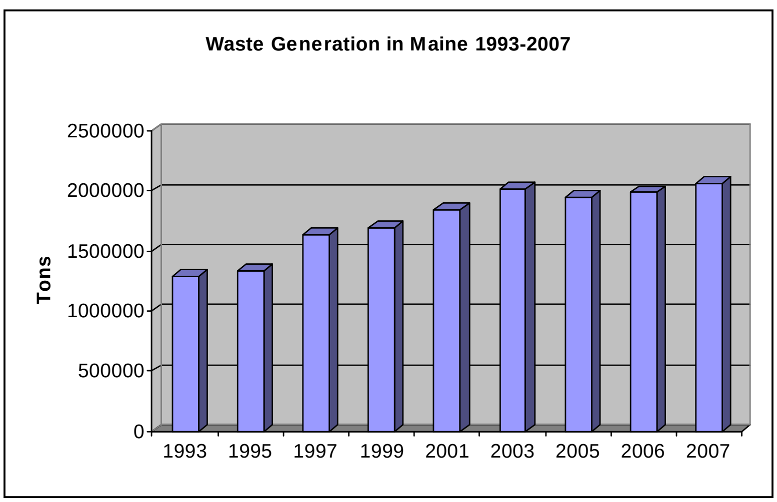

Figure 1: Maine Waste Generation, 1993-2007
Source: State Planning Office

B. Per Person Waste Generation

Municipal solid waste generation, when calculated on a ‘per person’ basis, shows that each Maine resident generates approximately 3,200 pounds of MSW a year, or about 8.8 pounds of waste per person per day.[3] Maine’s per person generation is higher than the 2007 national average of 4.6 reported by the U.S. Environmental Protection Agency.

One reason why Maine’s per person number is higher than the national average is that Maine includes both bulky waste and construction and demolition debris (CDD) in its definition of MSW, which the U.S. EPA does not. If we exclude these wastes from our numbers, the Maine per-person rate drops to approximately 7.5 pounds per day. For comparison, New Hampshire’s 6.9 pounds per person per day in 2007 includes CDD,[4] also higher than the national average.

Another explanation for the higher weight per person is the high success in tracking and capturing commercially-generated solid waste tonnages, as well as the considerable additional impact of visitors on solid waste generation. Maine sees tens of millions of overnight stays and hundreds of thousands of extended stays by nonresidents per year. For example the Mount Desert area with a year round population in the thousands, sees over three million visitors per year that have an enormous impact on MSW generation numbers.

C. Types of Waste

1. Composition of Household Wastes

The plan depends upon the *EPA Waste Characterization Study* of the same data year in order to assess the types and amounts of Maine-generated MSW (See Figure 2 below).

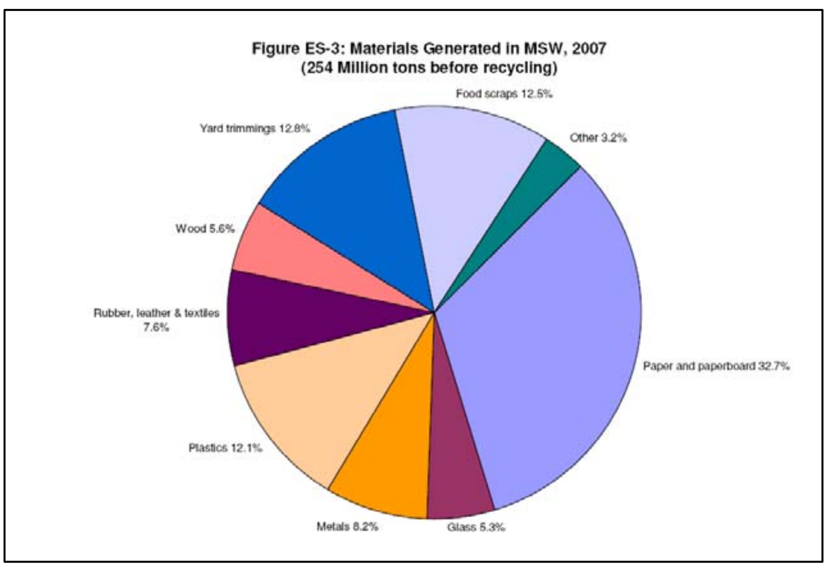

Figure 2: Municipal Solid Waste Characterization
EPA Waste Characterization Study 2007

[3] Based on an estimated 2007 Maine population of 1,315,398, US Census
[4] New Hampshire Department of Environmental Services

We can apply these percentages to the amount of Maine's MSW, but we must subtract CDD as the EPA chart does not include that waste stream.

Subtracting out the 2007 CDD tonnage leaves 1,748,958 tons of MSW generated. By applying the percentages of the chart to Maine's tonnage, we can estimate the types and amounts of MWS as shown in Table 1.

Table 1: Maine Recyclables Generated (in tons) - 2007	
paper and paperboard	571,910
yard waste	223,867
food scraps	218,620
plastic	211,624
household metal	143,415
textile, rubber and leather	132,920
wood waste (other than CDD)	97,942
glass	92,695
other	55,967

It is worth comparing these numbers with the recovered numbers reported in Table 6. While the categories do not match up precisely, they are close enough in definition to warrant their use here. Table 2 shows the percent recovered for selected recyclable materials.

Table 2: Recovery Rates of Selected Recyclable Materials 2007

Waste type	Amount generated	Amount recovered	% recovered
Paper/ paperboard	571,910	286,164	50%
Yard waste	223,867	29,948	13.3%
Food scraps	218,620	214	minimal
Plastic	211,624	15,181	7%
Household Metal	143,415	86,936*	61%
Textile/rubber/leather	132,920	9,498	7.1%
Wood waste	97,942	**	
Glass	92,695	49,520	53.4%

* includes white goods ** no corresponding definition

This comparison confirms current trends in recycling data. The mature recycling commodities – glass, metals, and fiber – have the highest recovery percentages, while plastics is gaining share in generation but lags behind in recovery due to the complexity of chemistries that relates directly to weakness in recycling efforts. It also highlights where Maine can make the most gains by concentrating on fiber, plastics, construction demolition debris, and the organic fraction.

Another way to look at Maine's waste stream is to look at the source of the waste. Maine has a larger commercial share than the US average because of our MSW definition inclusive of CDD (see Table 3).

Table 3: Breakdown of Sources of Waste - 2007

Type of Waste		Percent of MSW Generated	
Residential	Includes waste from single-family and multi-family dwellings	Maine 46%	US 55-65%
Commercial	Includes waste from businesses, schools, institutions, and the MSW portion waste generated by industrial sites (e.g. office waste)	Maine 54%	US 35-45%

2. Composition of Construction/Demolition/Debris

In 2007, Maine generated an estimated 317,490 tons of CDD. Based on waste composition models, as shown in Figure 3, we can assess the types and amounts of the CDD waste stream.

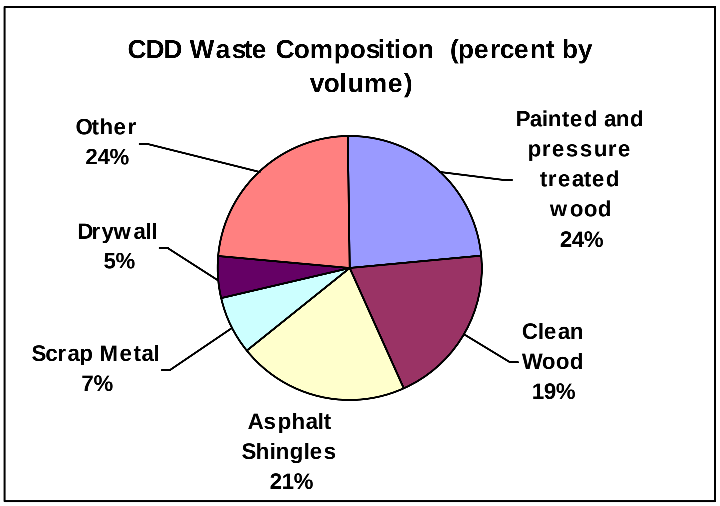

Figure 3: Vermont CDD Composition Study 2003

Using the percentages of Figure 3, it is estimated that Maine generated the following amounts and types of CDD, shown in Table 4:

Table 4: Types of CDD generated – 2007 (in tons)

Painted and other wood	76,198
Clean wood	60,323
Asphalt shingles	66,673
Metals	22,224
Drywall	15,875
Other[5]	76,198

[5] "other" includes carpet, plastic floorings, insulation, plastic conduit, joint compound, containers, and paper products, and mixed materials products that could not be categorized.

Again referring to Table 6, Maine recovered 25,626 tons of CDD and other wastes for a recycling rate of just over 8% of our CDD stream.

State Recycling Goal

A. Recycling Trends

The goal of the state of Maine is to recycle 50% of the state's waste each year. Maine recycled 34.8% of its municipal solid waste in 2007. This reflects a decrease from the 2006 recycling rate of 36.2 % and falls below the recycling rate of 35.5% experienced in 2003. The Office estimates that the overall result is accurate to within two (2) percentage points.

Approximately 33% of Maine's recyclables are handled by municipal/public recycling programs. The balance of recycling efforts statewide is the result of private business-generated and managed recyclables, handled by private sector waste management companies.

Maine's recycling rate grew rapidly in the first ten years following the enactment of the Maine Solid Waste Management Act – from an estimated 17% in 1987 to 42% in 1997. It has since leveled off, declining slightly each year since the high of 42%. Figure 4 shows the state's recycling rate over time.

The rapid rise in recycling rates from 1987 to 1997 was due to a concentrated effort by private sector, local public programs, and the state acting in partnership, with recycling having not only a priority statutory identity, but state level presence and support. During this time, the state invested $12.5 million in local grants for recycling collection and processing equipment, provided for statewide public education, and conducted hundreds of training workshops for local officials. Since 1998, state funding has been available at a fraction of previous levels ($475,000 in 1998, $600,000 in 2003) and local programs compete with other municipal services for their share of property tax dollars.

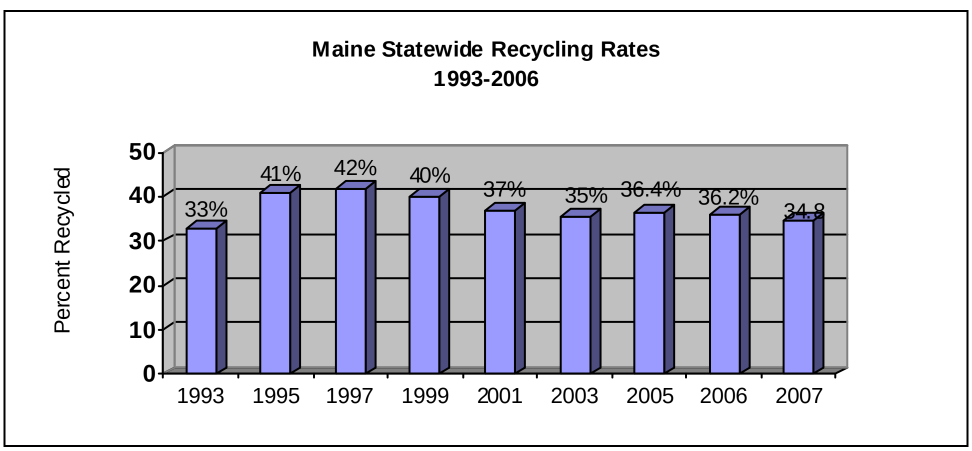

Figure 4: Maine Recycling Rates, 1993-2007
Source: State Planning Office

At the same time, there has been an upward trend in municipal solid waste being generated. Figure 5 shows the tons of waste disposed compared to the tons recycled. The growth in waste generation prevents the recycling rate from increasing despite greater tonnages being recycled.

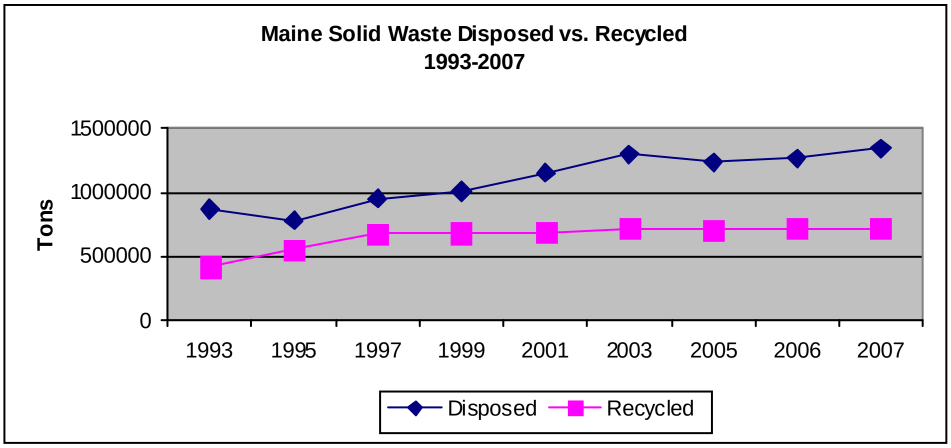

Figure 5: Maine Solid Waste Disposed vs. Recycling, 1993-2007
Source: State Planning Office

There are four broad reasons why recycling rates are falling behind generation rates.

First, recycling has not advanced aggressively into other components of the waste stream that are growing, such as the organic fraction and construction and demolition debris.

Secondly, even though markets for traditional recycling commodities have grown throughout the first half of this decade with strong revenues and encouraging price signals, municipal programs have not sought to follow their lead and increase recycling efforts. This is primarily due to yearly budget constraints that prevent investment to take advantage of market opportunities.

Thirdly, municipal programs typically view recycling as an "add-on" to their MSW program and may lack confidence in recycling as an integral part of their management system, creating a divide between what they are required to do by law and what they may desire to do.

And lastly, municipal recycling programs are often not extended to cover small businesses (i.e. less than 15 employees, the threshold for required recycling under state law) so a large amount of material is missed, falling in the gap between large scale commercial recovery and municipal/residential resource recovery efforts.

B. EPA Definition

We can also compute the state recycling rate using the U. S. EPA's definition for MSW, which excludes CDD. When the 2007 statewide recycling rate for Maine is calculated using the EPA guidelines, our statewide recycling rate becomes 38.8%. Table 5 shows the two methodologies for calculating the state's recycling rate and Figure 6 shows a comparative trend line.

Table 5: Maine Statewide Recycling with and without CDD 2007				
Maine Definition (*CDD included*)			EPA Definition (*CDD not included*)	
MSW with CDD generated	2,066,448		MSW w/o CDD generated	1,748,958
MSW with CDD recycled	718,613		MSW w/o CDD recycled	692,987
Recycling Rate	34.8%*		Recycling Rate	39.6%*

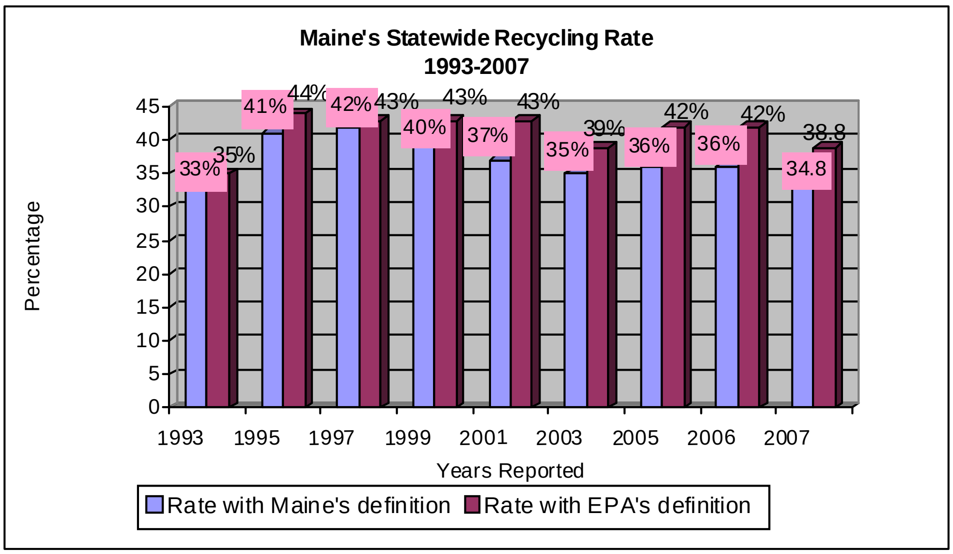

Figure 6: State Recycling Rate with and without CDD included
Source: State Planning Office

Conclusion: Waste Characterization

Waste generation increases appear to have slowed. Societal changes and reduced packaging contribute to this. Mainers are recycling more each year. Nevertheless, we continue to throw away more. Our recycling rate cannot keep pace with waste generation.

Table 6: Type and Amount of Materials Recycled 1997-2007

Materials:	**2007**	**2005**	**2003**	**2001**	**1999**	**1997**
high grade paper	72,846	72,965	3,951	43,125	11,570	31,470
corrugated cardboard	117,324	117,144	88,166	202,129	198,442	214,536
newspaper	26,453	32,300	33,442	32,069	42,612	44,710
magazines	8,532	8,723	1,881	13,259	6,104	3,702
mixed paper	11,131	5,226	13,919	14,766	12,860	12,207
other paper	7,668	8,900	3,166	27,376	12,671	6,465
other grades	42,210	36,805	132,475			
Total paper	286,164	282,063	277,000	332,724	284,259	313,090
clear glass	10,656	11,058	6,334	11,706	8,324	10,590
brown glass	23,544	24,377	11,270	12,200	12,545	7,060
green glass	11,878	12,622	3,142	6,700	26,167	11,767
all other glass	3,442	3,598	21,672	620	440	1,734
Total glass	49,520	51,655	42,418	31,226	47,476	31,151
white goods	82,493	78,401	68,125	115,219	142,640	122,895
aluminum	2,454	2,163	2,109	6,100	1,862	1,332
tin cans	1,989	1,089	3,154	9,754	18,833	10,693
non ferrous	25,655	23,213	18,847	22,491	18,652	21,572
other (various materials)	72434	68,432	68,984			
Total Metal	185,025	173,298	161,219	153,564	181,987	156,492
HDPE	8,530	9,377	3,420	2,274	4,410	4,160
PET	5,277	4,766	8,725	9,042	6,521	6,021
LDPE film	576	526	711	4		
polystyrene		8	0	554	6	6
Other	798	631	531	1,917	1,211	1,042
Total Plastic	15,181	15,308	13,387	13,791	12,148	11,229
wood waste	86,544	93,582	92,154	40,443	41,103	38,402
leaves	29,448	29,938	33,376	26,340	27,421	24,528
food waste	214	142	2,623	23,744	24,582	23,240
Total Organic	116,206	123,662	128,153	90,527	93,106	86,170
tires	30,545	30,374	35,467	19,621	32,530	30,559
CDD, other wastes	25,626	23,425	49,714	38,848	39,469	44,209
Mercury-added/UW	848	487	327	242		
Total Hard to Manage	57,019	54,286	85,508	58,711	71,999	74,768
Textiles	2,196	1,724	2,260	3,827	6,023	1,726
Other nonbulky MSW	7,302	6,935	7,638	3,445	2,740	5,252
TOTAL TONS RECYCLED:	718,613	708,931	717,583	687,815	699,738	679,878

II. Solid Waste Management Infrastructure Capacity

Recycling Capacity

Maine cities and towns by law are responsible for providing for municipal solid waste disposal. Title 38, Chapter 13, section 1305 states, "Each municipality shall provide solid waste disposal services for domestic and commercial solid waste generated within the municipality…"

Individual municipalities and regions are not required to achieve a 50% recycling rate; but they are required to demonstrate progress towards the goal. Recycling progress varies from community to community, but overall programs removed 90,000 tons of paper and plastic and metal and glass containers from the state's waste stream that would otherwise need disposal, and recycled an additional 137,000 tons from other waste streams in 2007.

Based on what we generate today, municipal and private sector recycling programs would need to handle 300,000 tons more of material to achieve a 50% recycling goal. This number will grow each year to match projected increases in waste generation.[6]

Over the next 20 years, simply to maintain a 35% recycling rate will require public and private programs to double their recycling handling abilities. As waste generation increases, the volume of recyclable materials at a 35% rate will increase from 700,000 tons in 2007 to 1.6 million tons in 2027.

To achieve and maintain a 50% recycling goal by 2009 would mean processing 30 million tons from the waste stream over the 20-year period as shown in Figure 7 (increasing from 700,000 tons in 2007, to 1 million tons in 2009 and 2.4 million tons by 2027).

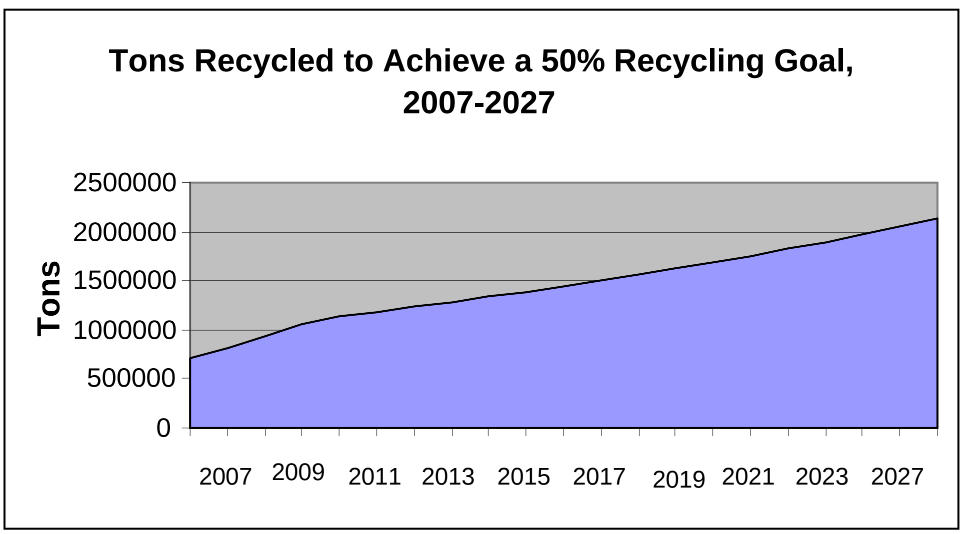

Figure 7: Tons Recycled to Achieve a 50% Recycling Goal
Source: State Planning Office

[6] Based on an assumed 4% annual growth in municipal solid waste generation.

Currently municipalities do not have the capacity to handle these kinds of new volumes; neither the physical (buildings and equipment) nor human (staffing) capacity. Municipal recycling programs currently handle, on average, 90,000 tons of fiber, packaging, products and container recycled materials per year. The Office estimates that they have additional capacity for another roughly 25 to 30,000 tons annually.[7]

The private sector can likely handle additional tonnages or be in a position to respond with capital investment needs to grow their tonnages if the economics warrant it.

There are concerns over where this volume would come from. Higher yields and participation rates can be stimulated with public awareness programs, incentives such as pay as you throw, and technological advances including single sort. Many communities are taking these kinds of actions, but greater effort is needed to generate the tonnage to achieve a 50% recycling goal.

Today there is sufficient down time at most the regional recycling centers[8] that most of the changes needed to meet future capacity needs at those facilities can be met by additional labor time and increases in personnel. There will always be the requirement to have sufficient funds to repair/maintain and replace equipment, but not necessarily the demand to expand processing capacity (i.e. adding more and bigger balers). An alternative would be to add new stationary or mobile infrastructure in order to change over single sort recycling systems, which partially eliminates the need for additional personnel.

We can look at *ecomaine* for a real world example. They are actively seeking more recycling tonnage to go from their 2007 level of approximately 25,000 tons to 40,000 tons. At the higher figure they can run their new MRF at capacity for a single shift. To double that tonnage over 17 years will take some refinement of their current operation to improve throughput, eventually adding a second shift to as their projected throughput builds from 40,000 to 80,000 tons. That one additional shift at that one facility represents 25% of the future recycling capacity needs of Maine's municipalities.

The gradual increase in material levels over the next several years will mean that municipalities will also see pressure to move towards more efficient collection/aggregation systems whether that be improvements in curbside systems or the move from drop off to curbside, or larger more efficient drop offs that eliminate bottle necks and over handling.

It is anticipated that future municipal recycling infrastructure costs will be for collection, containment, and storage, for the traditional recycling stream, and expanding into organics diversion through composting and to accommodate increased CDD recycling.

It will take significant infrastructure capital investment, by both the public and private waste management sectors to achieve our 50% recycling goal. Maine should begin to prepare now to build the infrastructure needed to manage an increase in recycling.

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[7] This does not include the ecomaine recycling collection and processing expansion that is predicted to add 15,000 tons a year of recyclable material or expansion of other single stream materials recovery efforts.

[8] A regional recycling center is defined here as 2 or more communities, several balers or at least one horizontal baler, a tipping floor to handle large amounts of incoming materials, sufficient bale storage for a truckload of more than one type of material, with a transport and marketing system in place and sufficient personnel and auxiliary equipment.

Processing and Disposal Capacity

In 2007, Maine's solid waste disposal facilities included: one state-owned landfill, two commercial landfills, eight municipally-operated landfills, (including Greenville in closure negotiations) 23 municipal construction and demolition debris (CDD) landfills, and four waste-to-energy facilities. Several processing facilities/operations were available for managing construction and demolition debris.

Assumption: Capacity figures provided for the state-owned and commercial landfills assume that operations of those facilities achieve a one-to-one ratio of tons-to-cubic yards using best management practices for landfill compaction.

A. Landfills

Landfills receive a variety of wastes, and that variety differs among the facilities, depending upon what their approval allows for acceptable wastes. Included in that variety of wastes is: raw garbage, construction and demolition debris, residues and ash from waste to energy facilities, contaminated soils, sludge, ash from bio-mass operations, and other special wastes. This report focuses on municipal solid waste, including construction and demolition debris as well as the residues from the processing of those wastes, but in reviewing landfill capacity, the tonnages of the other special wastes that are accepted by the landfills do consume capacity, and for that reason, those wastes and their impact on landfill capacity is included in this report.

1. State-owned Landfill[9]

In 2007, the state-owned landfill in Old Town, known as Juniper Ridge, received a total of 472,600 tons of in-state generated waste, of which 151,073 tons were municipal solid waste and CDD and another 158,877 tons were residues from processing or incineration of MSW. The balance of the waste buried at the landfill included various types of sludge, contaminated soils and approved wastes from other in-state commercial and industrial generators (non-MSW wastes).

Assessment of Facility

Available disposal capacity remaining at Juniper Ridge at the end of 2007 was approximately 8,462,000 cubic yards, which translates into space for approximately 7.15 million tons of solid waste. At projected fill rates[10], the present licensed capacity should provide 10-12 years of disposal capacity for the state.

Starting in 2009/2010, however, with the closure of the Pine Tree Landfill and the initiation of processing at the planned construction/demolition processing facility in

[9] The State Planning Office owns 1500 acres of land in T2 R8 (near Lincoln), upon which a special waste landfill was permitted in the mid 1990s. Known as Carpenter Ridge, it has a landfill design for about two million cubic yards of waste. It was acquired by the former Maine Waste Management Agency and has been held by the state for disposal capacity when it is needed.

[10] The State Planning Office projects that wastes delivered to Juniper Ridge will average 550,000 tons per year, but will increase to 850,000 tons per year starting in 2010, with wastes diverted from the planned closure of the Pine Tree Landfill in 2009, and from additional residues and wastes generated from CDD processing operations within the state.

Westbrook (as permitted by Casella Waste Systems, Inc.) an expected additional 300,000 tons of wastes will be delivered to the Juniper Ridge Landfill for disposal. With the addition of these wastes, the consumption of the space at the landfill is expected to change, from approximately one ton of waste per cubic yard of space to 0.8 tons of waste per cubic yard. This change impacts the planned life of the landfill, leaving approximately 10 years of remaining capacity, at the end of 2007.

2. Commercial Landfills

Maine has two commercial landfills grandfathered under the 1989 Solid Waste Management Act that banned the development of new commercial disposal facilities. Having the commercial landfills has provided competition and disposal options for municipal solid waste, construction and demolition debris, and special wastes. The two commercial landfills are:

- Crossroads Landfill, located in Norridgewock, owned by Waste Management, Inc.
- Pine Tree Landfill, located in Hampden, owned by Casella Waste Services, Inc.

The Crossroads Landfill is permitted to take special waste, municipal solid waste, and construction and demolition debris. It provides recycling and disposal services on a contract basis for municipalities and businesses. It currently serves 30+ Maine communities in Western Maine. In 2007, the landfill accepted 336,854 tons of solid waste. Of that tonnage, 182,525 tons were Maine generated municipal solid waste and CDD and 19,922 tons of residues from the processing of MSW. The balance of wastes included Maine generated special wastes (59,974 tons), and CDD and special wastes generated outside of Maine (74,433 tons).

The Pine Tree Landfill is permitted to take special waste, by-pass municipal solid waste, and construction and demolition debris. In 2007, the Pine Tree Landfill accepted 557,793 tons of solid waste. Of that tonnage, 39,058 tons were Maine generated municipal solid waste, CDD and 158,133 tons of residues from its processing. The balance of wastes included Maine generated special wastes (35,971 tons) and MSW by-pass, CDD and special wastes generated outside of Maine (324,631 tons). Through an agreement reached among the Town of Hampden, Maine Department of Environmental Protection and the landfill's owner, the landfill will cease accepting solid waste by the end of December 2009.

Assessment of Facilities

The total disposal capacity currently licensed at these two commercial landfills is approximately 5.0 million cubic yards. The majority of this capacity is at the Crossroads Landfill, with an estimated 3.9 million cubic yards of capacity remaining at the end of 2007. Table 7 shows estimated remaining disposal capacity at the commercial landfills.

Table 7: Capacity at Maine's Commercial Landfills – end of 2007				
	2007 Fill Rate (tons)	**Remaining Capacity (Cubic Yards)**	**Remaining Capacity (tons)**	**Estimate in years of life remaining based on 2007 fill rates**
Crossroads Landfill	336,854	3,900,000	3,900,000	10-12 years
Pine Tree Landfill	557,793	1,000,000	970,000	< 2 years
Total	894,647	4,900,000	4,870,000	

3. Municipal MSW Landfills

In 2007, 107,248 tons of solid wastes and 59,100 tons of ash were disposed at nine municipally-operated landfills. Table 8 provides information on each individual landfill, including fill rates and estimated available remaining capacity.

Assessment of Facilities

Among the seven municipally-operated MSW landfills (excluding Greenville and West Forks), there is just over 2.4 million cubic yards of remaining available capacity that can accept 1.56 million tons of municipal solid waste. This capacity is sufficient to carry those communities for 15 years (on average), supposing a relatively flat growth in the volume of municipal solid waste requiring disposal.

The actual remaining life varies for each landfill, resulting in 'unevenness' of municipal capacity across the state. This variation, as to when a particular community or region may exhaust their current disposal capacity, is independent and possibly irrespective of any possible statewide disposal capacity concern, but will be of significant concern to those regions.

Bath and Brunswick are two of the state's oldest secure landfills. Brunswick serves only its own residents and businesses. Both communities are adopting programs to extend the life of their landfills, such as 'pay-as-you-throw' (PAYT) and single stream recycling collection. The Hatch Hill Landfill in Augusta serves eight communities and was recently expanded. None of these facilities is expected to expand beyond their current footprint.

Together, the Presque Isle and Tri-Community (Fort Fairfield) landfills serve nearly 50 communities in Aroostook County. Both are currently seeking expansions that will serve those communities for an additional fifty years.

As part of an arrangement with the Mid Maine Waste Action Corporation, the City of Lewiston brings its waste to the MMWAC incinerator in Auburn. MMWAC, in exchange, disposes its incinerator ash at the Lewiston landfill. In addition, the Lewiston Landfill accepts CDD and other wastes.

Table 8: Municipal Landfill Tonnages – 2007				
	2007 Fill Rate (tons)	Remaining Capacity Cubic Yards (est.)	Remaining Capacity (tons)	Years of life remaining based on 2007 fill rates at .65 tons/yard[11]
MSW Landfills: [12]				
Bath	23,552	422,000	274,300	11 years
Brunswick	4,850	140,000	91,400	19 years
Greenville see footnote	600	56,000	36,500	60 years
Hatch Hill (Augusta)	25,961	937,000	609,000	20 years
Presque Isle	20,140	149,900	85,800	4 years
Tri-Community (Fort Fairfield)	31,145	703,800	457,500	18 years
CFWF (West Forks) see footnote	1000 (est.)	8,000	5,000	<1 year
Total Tons:	**107,248**[*]			
Total Remaining Capacity (est.)		**2,416,700**	**1,559,500**	
	2007 Fill Rate (tons)	**Remaining Capacity Cubic Yards (est.)**	**Remaining Capacity (tons)**	**Years of life remaining based on 2007 fill rates at 1 ton/yard**
Ash Landfills:				
ecomaine	40,320	915,700	915,700	20-30 years
Lewiston	18,780	268,750	268,750	12 years
Total Tons:	**59,100**			
Total Remaining Capacity (est.)		**1,184,450**	**1,184,450**	

4. Municipal CDD Disposal Facilities

In 2007, 17 municipal disposal facilities reported accepting locally-generated construction and demolition debris (CDD)**,** inert fill, brush, and trees. Local facilities furnish a 'short-transport' option for the management of these wastes. A total estimated 28,000 tons of materials were buried at these sites during 2007; this is a decrease from the 34,839 tons landfilled in 2005, as shown in Figure 8.

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11 Different ton-cubic yard conversion rates are used for different facilities. Household, baggable waste at municipal landfills typically converts at 0.65 tons per cubic yard. Ash is heavier than municipal solid waste, so SPO uses a 1:1 conversion rate with one ton equaling one cubic yard. Commercial landfills, with heavier equipment for compaction and more varied waste streams, also typically achieve a 1:1 conversion rate.

* 83,043 tons were municipal solid waste or construction demolition debris. The balance was other wastes, including special wastes.

12 The CFWF landfill ceased operations in 2008. The Greenville landfill is in closure negotiations.

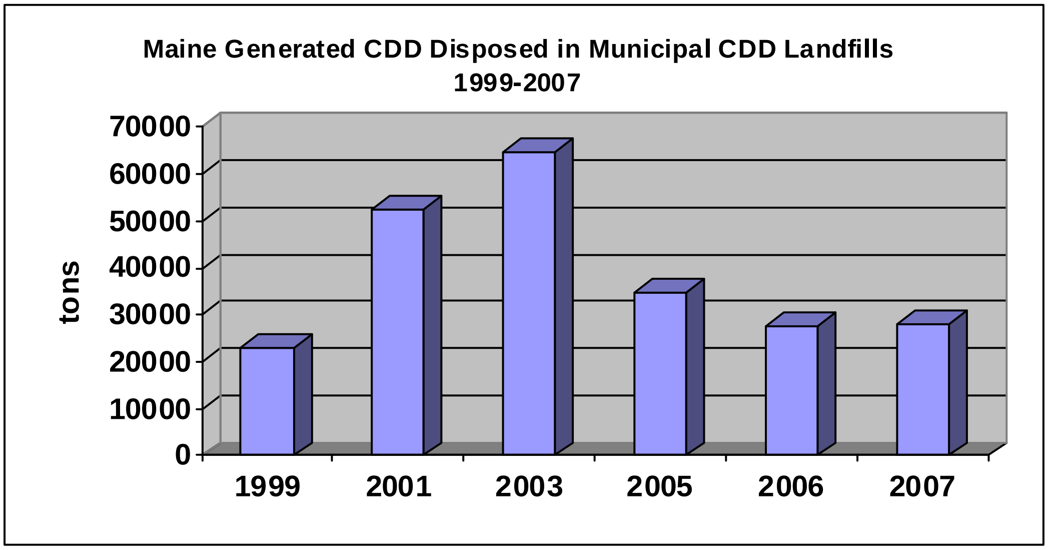

Figure 8: Maine CDD Disposed in Municipal CDD Landfills, 1999-2007
Source: State Planning Office

Assessment of Facilities

The remaining capacity at individual CDD facilities varies. Although statewide numbers indicate landfill space exists for an overall capacity sufficient for another 10-12 years, a number of these facilities will be full before then, creating 'pockets' where CDD disposal options will need to be reconsidered. Four of the facilities have an estimated six years or less of capacity at current fill rates and licensed footprints. One site, located in Marion Township in Washington County, is expected to be full in 2-3 years and the owners of that facility were pursuing development of a replacement disposal site, but those plans have been shelved for 2009.

CDD disposal capacity and management continue to be problematic. These materials are unacceptable at waste-to-energy facilities and cannot be recycled or reused without investment in equipment, labor, and sufficient land area to aggregate and process them. Markets for processed CDD and bulky wastes do exist but the small scale at which most Maine towns operate limits access to those markets. Communities' low volume and dispersed facilities do not often produce the economics of scale needed for sustainable recycling markets.

Maine has several commercial CDD processors: KTI Biofuels in Lewiston; Commercial Paving and Recycling (CPRC) in Scarborough; and Plan-it Recycling in Gorham. KTI is a fixed operation. It accepts only clean wood products (from in-state and out-of-state) for processing for use as biomass fuel. CPRC used to provide mobile services but now operates strictly from its Scarborough facility, hauling in material and shipping out the finished product. Plan-It Recycling also operates from a fixed location. Casella Waste Systems has permitted a CDD processing operation that would accept up to one thousand tons of CDD per day in Westbrook and anticipates building that facility in 2009, providing an additional outlet for Maine-generated CDD. There are also several commercial wood chippers that move from site to site to manage smaller amounts of wood waste.

B. Waste-To-Energy Facilities

In 2007, 32% of Maine's municipal solid waste was sent to a waste-to-energy (W-T-E) facility. Maine's W-T-E facilities received, 826,291 tons of MSW, down from 867,606 tons of MSW in 2006 as shown in Figure 9. Of this, 671,823 tons were generated in-state and 154,468 tons were imported, both a decrease from 2006.

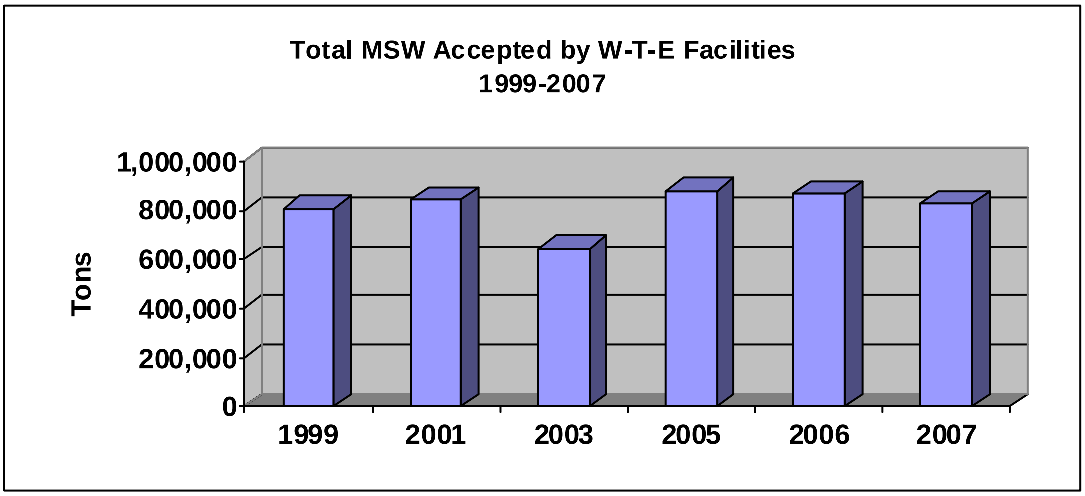

Figure 9: MSW Accepted by W-T-E Facilities, 1999-2006
Source: Facility License Reports, Maine DEP

Table 9 shows the processing capacity of the four waste-to-energy facilities:

Table 9: Maine W-T-E Capacity

Waste-to-energy Facility	Annual Processing Capacity (tons/year)	Tonnage Received in 2007
ecomaine	170,000	157,637
Maine Energy (ME)	310,000	280,210
Mid Maine Waste Action Corporation (MMWAC)	70,000	92,696
Penobscot Energy Recovery Corporation (PERC)	304,000	295,749
Total of W-T-E Facilities	**854,000**	**826,292**

The facilities provide both a product (electrical power) from combustion as well as a reduction of the MSW tonnage requiring disposal, thus reducing the need for landfill capacity. They produce a combined capacity of approximately 62 megawatts a day of electricity and reduce the volume of waste requiring landfilling by about two-thirds.

The four waste-to-energy facilities, while combusting MSW and producing electrical power, also produce several streams of materials and residues: by-pass waste, front-end process residue, and ash. These residues, which require disposal in landfills, comprise approximately one-third of the waste processed by waste-to-energy facilities (see Figure 10 and Table 10).

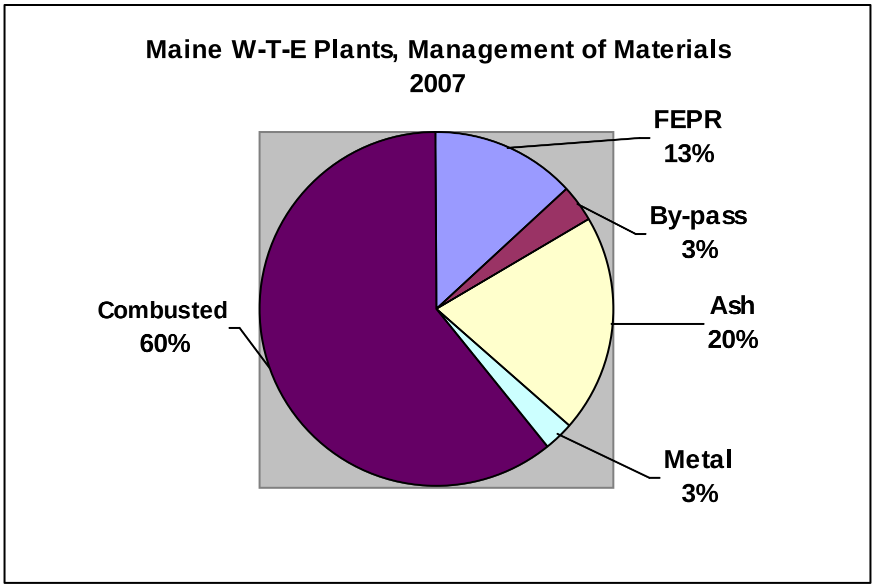

Figure 10: Maine W-T-E Plants, Management of Materials
Source: Facility License Reports, Maine DEP

Table 10 - W-T-E – All Waste Streams - Combined Tonnages		
	2006	**2007**
Delivered MSW tonnage	867,606	826,292
By-pass	36,183	27,014
FEPR	122,512	110,016
Metal	22,044	22,032
Combusted	504,078	503,226
Ash	169,000	164,003

1. By-pass Waste

By-pass waste is that portion of the municipal solid waste stream intended for delivery to and incineration at a waste-to-energy facility but is diverted because the facility could not accept it. Solid waste is 'by-passed' if there are operational interruptions or facility shut-downs or if the facility reaches its operational capacity and cannot accept waste that it is contractually-obligated to receive. The by-pass waste is typically delivered to a landfill for disposal.

2. Front-end Process Residue

Front-end process residue (FEPR) is removed prior to incineration, and may include ferrous metals, glass, grit, and fine organic matter. While metals are recycled, most FEPR is landfilled. In the past, FEPR was used in conjunction with landfill closure programs, but this is no longer a viable outlet. The FEPR waste stream consumes landfill capacity, since alternatives to landfilling it do not readily exist. While some composting of FEPR has been done, the resulting product typically contains contaminants that restrict its use to limited landfill cover applications only.

Maine Energy (MERC) and Penobscot Energy Recovery Company (PERC) use a 'refuse derived fuel' technology and generate front-end process residue as a by-product of their operations. These facilities dispose of the front-end process residue at the Pine Tree Landfill, though a portion was delivered to other disposal facilities. Mid-Maine Waste Action Corporation (MMWAC) and *ecomaine* use a 'mass burn' technology and do not produce FEPR.

3. Waste-To-energy Facility Ash

Ash is a by-product of incineration, is classified as a special waste, and is landfilled. The ash from MERC and PERC was buried at the commercial landfills and Juniper Ridge. The ash from MMWAC was buried at the City of Lewiston's landfill and e*comaine's* ash was buried at their landfill.

Assessment of Facilities

Three of these facilities are at or close to their 20th year of operation. The plants' maintenance programs, along with upgrades, have kept these facilities functioning well, and should continue to do so for the foreseeable future. The facilities are essentially in "as new" operating condition.

Facility upgrades occur in response to environmental regulations, primarily aimed at air emissions reductions. All of the Maine W-T-E facilities perform at or better than their license requirements.

Looking at future supply stream, 2018 is an important date in the planning process. On that date the majority of the municipal disposal contracts held with PERC and MERC will expire.

To produce the electrical generation contracted for, waste-to-energy facilities need to operate at maximum capacities. The seasonal nature of waste generation causes tonnage overage problems during the summer months and the need to 'attract' additional tonnage during the winter months. Facilities bypass waste when they reach their daily operating capacity and import waste to make up for shortfalls (see Section IV.C on Imported/Exported Municipal Solid Waste).

C. Imported/Exported Municipal Solid Waste

Movement of solid waste across state lines is protected under interstate commerce laws. Municipal solid waste is considered a commodity and is subject to fluctuations accruing to supply and demand at the regional and national level.

During 2007, 456,580 tons of municipal solid wastes were imported to Maine, while exports totaled 60,491 tons. The amount of MSW imported to Maine is stabilizing while the amount exported[13] fluctuates as shown in Figures 11 and 12.

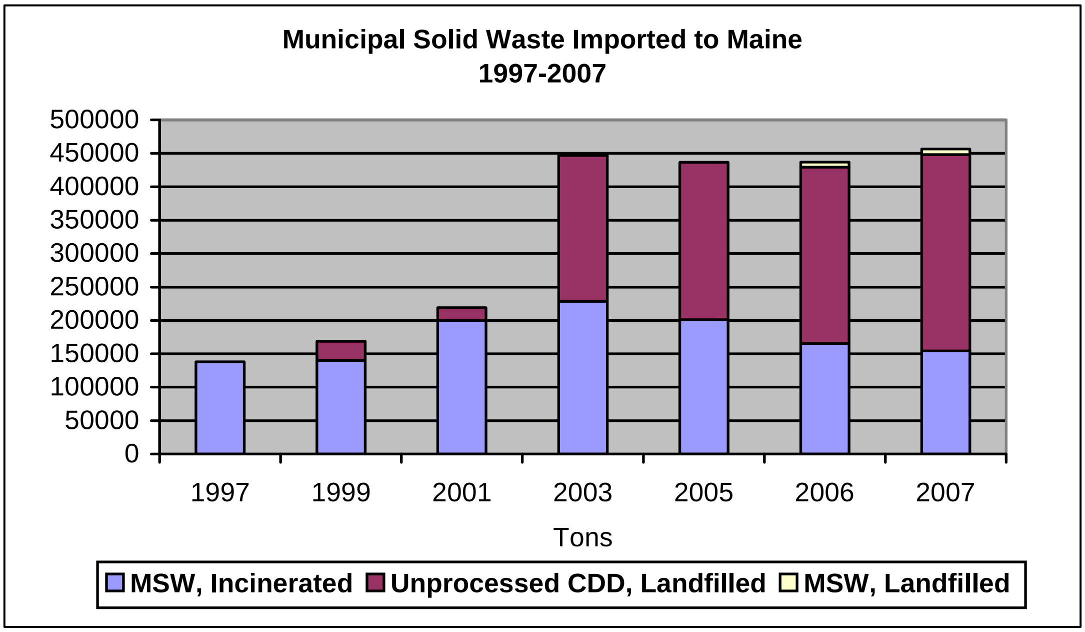

Figure 11: Municipal Solid Waste Imported to Maine, 1997-2007
Source: State Planning Office

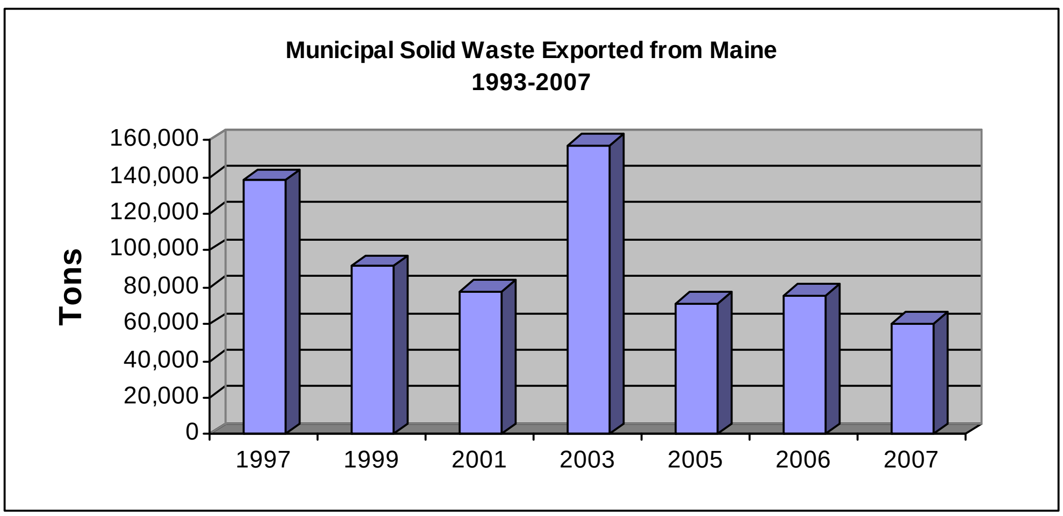

Figure 12: Municipal Solid Waste Exported from Maine
Source: State Planning Office

Imported waste in 2007 consisted of approximately 33% municipal solid waste that was incinerated and 66% construction and demolition debris that was landfilled (see Table 11).

[13] Exported waste was delivered to landfills in New Hampshire and New Brunswick for disposal.

Table 11: Imported Waste by Facility		
	2006	**2007**
MSW – Maine Energy (MERC)	136,472	117,320
MSW – PERC	29,323	37,148
MSW Landfilled – commercial landfills	7,547	8,576
CDD Landfilled – Pine Tree	259,310	290,493
CDD Landfilled – Crossroads	4,385	3,043
Total Imported	**437,037**	**456,580**

Projected Waste Processing and Disposal Demands and Capacity

Based on our projections, Maine will require approximately 34 million cubic yards of landfill capacity over the next 20 years to properly manage the municipal solid waste that is directly landfilled, along with the residues generated by the four waste-to-energy facilities and other processing facilities that also require landfilling. Over this same time, we project there will be 39 million cubic yards of capacity. With approval of the proposed additional disposal capacity, Maine has sufficient capacity to meet its needs for the next 20 years.

A. Statewide Disposal Capacity

1. Capacity Needed

Disposal capacity is a factor of need versus availability. Maine generated just over two million tons of waste in 2007. Assuming a 4% annual increase, we will generate over 4.6 million tons in 2027. With a 34.8% recycling rate, 1.6 million tons per year will be recycled, 0.86 million tons will be sent to a W-T-E facility, leaving 2.4 million tons that will require landfilling.[14] That landfilled waste includes unprocessed solid waste, residues from waste to energy facilities and processing operations, and special wastes such as ash. Figure 13 shows Maine's projected capacity needs over the next 20 years.

To handle this projected tonnage over the next 20 years, Maine will need 34 million cubic yards of landfill capacity based on four assumptions.

1. Continued growth in MSW generation at 4% per year (with no waste reduction assumptions built in and recycling at 34.8%). This four percent increase is conservative and it is possible that actual increases may be softened or eliminated by improved recycling and waste reduction efforts, or an uncertain economy. However, given that development of disposal capacity is not a quick or easy process, having adequate capacity anticipates that time lag and reduces the possibility of a shortage of capacity.
2. Recycling tonnages increase as waste generation increases to maintain a 34.8% recycling rate.[15]

[14] Including out-of-state waste.
[15] Note that even to maintain a 34% recycling rate will require that Maine increase the tons recycled from 700,000 to 1.4 million tons over the next 20 years.

3. Imports decrease as Maine MSW replaces capacity at W-T-E facilities as generation increases and landfills close.
4. Exports remain at 2007 levels.

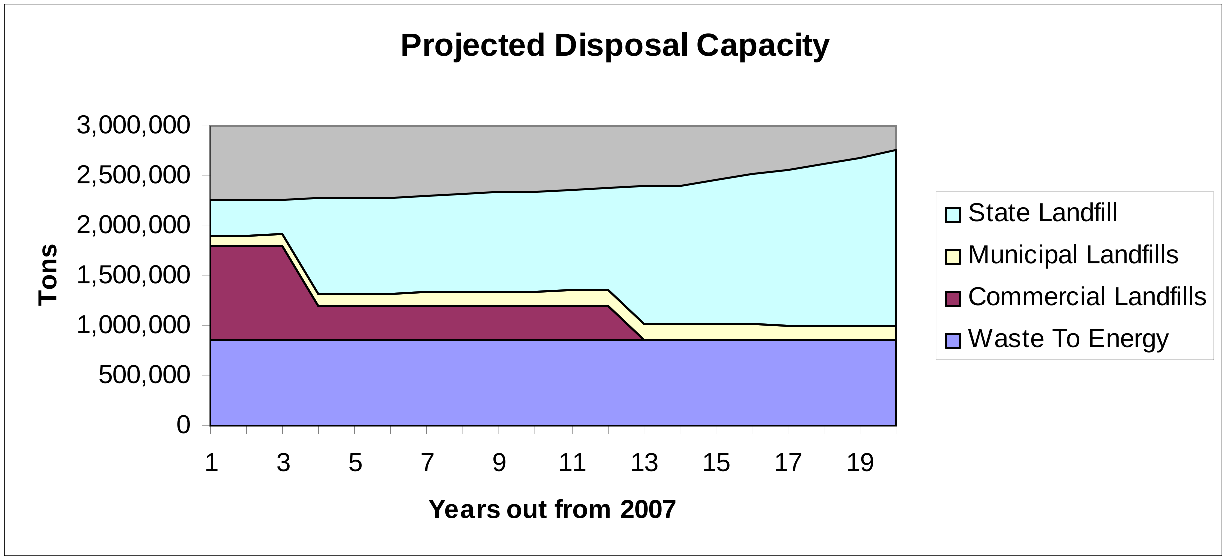

Figure 13: Maine Projected Capacity Needs in Tons, 2007 – 2027
Source: State Planning Office

2. Projected Capacity Available

The projection of solid waste disposal capacity is based on these parameters:

- continued operation of and reliance upon the four W-T-E facilities;
- no significant change in municipally-operated landfills;
- additional capacity is approved for the Presque Isle and Tri-Community landfills;
- closing Pine Tree Landfill;
- Crossroads Landfill ceasing operations around 2017; and
- a license amendment and expansion permit for Juniper Ridge is approved.

Currently, we estimate that Maine has 17 million cubic yards of disposal capacity for municipal solid waste and the residues from waste to energy facilities, as follows:

- 2.4 million cubic yards in municipal landfills (1.9 million tons)
- 1.2 million cubic yards in municipal landfills (1.2 million tons of ash)
- 0.85 million cubic yards in municipal CDD landfills (170,000 tons)
- 4.9 million cubic yards in commercial disposal facilities (4.7 million tons)
- 8.5 million cubic yards in Juniper Ridge Landfill (7.4 million tons)

The amount of available disposal capacity will be affected by both increases and decreases in capacity as follows.

Projected Consumed Capacity

The planned closure of Pine Tree Landfill in 2009 will have an impact on Maine's current solid waste management system, in that approximately 150,000 tons of *in-state* generated special wastes and construction and demolition debris waste that was annually disposed of at that landfill will be diverted to the Juniper Ridge Landfill. In addition, the residues from the processing of construction/demolition debris at Casella Waste System's planned processing facility in Westbrook will also be directed to Juniper Ridge, an additional 150,000 to 200,000 tons expected. The planned closure responds to state policy adopted in 1989 that sought to restrict additional private sector development of disposal capacity.

Projected Planned Capacity

The State Planning Office is seeking an additional 22.5 million cubic yards (18 million tons) of disposal capacity at the state-owned Juniper Ridge Landfill. The effort to permit the proposed capacity expansion at Juniper Ridge is currently underway and is planned to be submitted to the Department of Environmental Protection in early 2009. That review is expected to take several years and if approved and permitted, will provide disposal capacity to the state for an additional 15 to 20 years over its current life.

Impact of Recycling on Disposal

Recycling will continue to divert significant tonnages from disposal. The State Planning Office estimates that over 20 years, recycling will divert 20 million tons (cumulatively) from disposal at today's 34.8% rate.

Out-of-state Waste

The types and amount of out-of-state waste will likely shift in response to changes in Maine's waste generation and management systems.

The waste-to-energy facilities that currently take out-of-state waste will continue to rely upon it to fulfill their boiler needs and power contracts. However, the State Planning Office anticipates that as Maine-generated solid waste tonnages needing disposal increase, waste-to-energy facilities' need for imported municipal solid waste will decrease. The state's commercial landfills will continue to accept unprocessed CDD from out-of-state for economic reasons. But as those facilities fill up and close, imported waste will drop.

For purposes of this report, we estimate a 4% annual reduction in MSW imported and decreases in unprocessed CDD to a nominal amount by 2015, or an estimated 4 million cubic yards (cumulatively) over 20 years.

3. Projected Disposal Capacity, Available vs. Needed

Based on the above analysis, Maine will have an estimated 39 million cubic yards of landfill capacity over the next 20 years, more than meeting our need for nearly 32 million cubic yards as shown in Table 12.

Table 12: Projected Disposal Capacity Available vs. Needed 2007-2027				
Landfill Capacity Available (cubic yards)			**Capacity Needed (tons)**	
Municipal Landfills	2,416,700		Total waste generated	65,000,000
Municipal CDD Landfills	850,000		Imported Waste	4,000,000
Commercial	4,900,000		Recycled	(22,000,000)
Juniper Ridge	8,462,000		Exported	(1,200,000)
Juniper Ridge expansion	22,500,000		Diverted to, combusted at W-T-E	(12,000,000)
Total Landfill Capacity Available:	**39,128,700**		**Total Landfill Capacity Needed:**	**33,800,000**

Source: State Planning Office

While Maine has sufficient landfill capacity to meet its needs, we must not become complacent. Siting new disposal capacity is a costly and highly volatile undertaking. Maine should do all that it can to make the existing capacity last beyond the next two decades. This will require state and local investment in waste reduction and recycling.

In addition, while the state makes use of the remaining capacity at commercial and municipal landfills in these projections, the state does not have any direct control over the rate at which the capacity is consumed at those facilities. In 2007, the state prohibited the disposal of out-of-state wastes in municipal landfills but does not control access to that capacity from waste streams generated within the state.

B. Regional Capacity Issues

Regionally, Maine is divided into "waste sheds" with waste feeding into regional disposal facilities. Some waste sheds are geographically large like PERC (170+ communities) and the Crossroads landfill (30+ communities), some receive municipal solid waste from a single community or a small region, such as the two landfills on the mid-coast in Brunswick and Bath. While this report typically looks at statewide disposal capacity, the State Planning Office has identified some regional or local areas where disposal capacity is uneven or in flux.

1. Regions in Flux

Aroostook County

The Presque Isle Landfill is currently seeking approval of an expansion that is part of an engineered solution to ongoing environmental issues that will, if the entire proposal is pursued and approved, provide in excess of 50 years capacity. Closure of the existing site by the end of 2010 is also being discussed in the context of negotiations on a schedule of compliance.

The Tri-Community Landfill in Fort Fairfield is also seeking a landfill expansion at this time, which will serve those communities for another 15-20 years. These efforts will require significant local resources but should not disrupt the solid waste capacity in the region.

Washington County

The Marion Regional CDD Landfill in Marion Township is reaching capacity and is expected to close in 2008-9. A new construction and demolition debris landfill for that region was in the planning stages in 2008, but the plans have been scrapped for 2009. The potential sources and volumes of the waste, potential costs, intermittent participation in the process by the local communities and their lack of buy-in to the project were given as the reasons. The fate of the project is uncertain.

York County

In 2006, local officials undertook an effort to purchase and close the Maine Energy W-T-E facility. This facility, which serves about 36 communities in York County, is located in downtown Biddeford. Proposals were put to the voters in Biddeford and Saco to raise the money to buy the facility but were turned down.

The loss of disposal capacity in Southern Maine would disrupt Maine's waste management system, but it would not precipitate a crisis. The loss could be absorbed through a combination of aggressive waste reduction and recycling efforts by communities in the service area, transporting waste to other instate and out-of-state disposal facilities[16], and, with a possible license amendment to Juniper Ridge to accept "bagged" or household MWS, transporting waste there.[17] The state, municipalities, and the private sector would need to work in partnership to find the best solution for the long term.[18] These solutions must take into account the environmental impacts of the long distance transport of the waste.

Conclusion: Infrastructure Capacity

Maine has a mature infrastructure for both recycling and disposal. Recycling infrastructure, nearing two decades of use, will need upgrading and expansion to accommodate the increase in materials to meet the 50% recycling goal. Maine's combination of W-T-E facilities and state-owned, commercial, and municipal landfills provide sufficient disposal capacity for 20 years.

[16] The cost-benefit of transporting wastes long distances would have to be considered.
[17] Any change in the type of waste accepted at Juniper Ridge would require approval from the Maine Department of Environmental Protection.
[18] Another consideration for this region is the contract renewal for electrical generation payments. A lower price could increase tip fees and impact volumes at the ME facility.

III. Assessing the Effectiveness of Current State Policies

Recent Policy Discussions

The three previous state solid waste plans were products of the times in which they were written. The 1990 plan signaled the start of Maine's "modern" era of waste management. The 1993 plan was essentially a progress report written just after a large infusion of public bond funds into the state's municipal recycling infrastructure. The 1998 plan noted the success of the ten-year-old policies, the high point in the state's recycling rate, and what had occurred in the three years since the demise of the Maine Waste Management Agency. This plan is no exception and reflects the last five years, during which:

- In 2003, the Legislature authorized the state acquisition of the Juniper Ridge Landfill. In directing the state to purchase the landfill, the Legislature hoped to achieve two public policy goals: providing statewide land disposal capacity, and aiding a financially troubled paper company and the jobs it represented for the Penobscot region. Maine became the one of only two states to own a landfill and the only state to directly own a landfill without creating an intermediary authority.

- In the fall of 2005, 35 people representing the interests of state, regional, and local government, public entities, citizens groups, environmental organizations, the private sector and the general public came together as the Solid Waste Policy Review Task Force.[19] They reviewed current policies and concluded that the state should maintain the ban on commercial disposal facilities, continue to apply the waste management hierarchy, and expand efforts to achieve the 50% recycling goal.

- The Legislature's Natural Resources Committee was prompted to form a Blue Ribbon Commission to examine questions on how Maine manages its municipal solid waste. The Commission met in several locations throughout the summer and fall of 2006 and reported out legislation for consideration by the Second Regular Session of the 123rd Legislature (LD 1908).[20]

- At the direction of the Legislature, a new, permanent state Solid Waste Management Advisory Committee was formed to replace the Solid Waste Policy Review Task Force. This committee met for the first time in June 2008.

The 123rd Legislature passed several pieces of significant solid waste legislation that in sum acted to strengthen the solid waste hierarchy.

[19] The report of the Solid Waste Policy Review Task Force, April 2006, can be found on-line at: http://mainegov-images.informe.org/spo/recycle/docs/wastepolicytaskforce_finalreport04-24-06.pdf.
[20] The report of the Blue Ribbon Task Force, date, can be found on-line at: http://www.maine.gov/dep/rwm/solidwaste/blueribbon/.

Years of Decisions, Decades of Consequences

Coming into 1987, the state faced a solid waste disposal crisis. That crisis was the backdrop for our current policy. There was a potential landfill capacity shortage. Recycling, as a waste management strategy, was accounting for well under ten percent of the waste stream. There was no integrated waste management approach.

In less than three years, we as a state, by actions of the Legislature, decided how we wanted to manage our municipal solid waste. To a great degree, the structure of our current system is a reflection of those few basic decisions made 20 years ago.

The priority objectives were to:

1. bring the state's landfill disposal into compliance and end the use of unlined landfill disposal;
2. prevent the state from becoming a disposal site for MSW produced by the "BosWash" megalopolis to our south; and
3. place into law a policy to pursue a coordinated statewide waste reduction, recycling, and management program implemented through an integrated approach generally referred to as the waste management hierarchy.

To assist in achieving these objectives, the Legislature placed the following into law:

- a ban on new commercial disposal facilities;
- state authority to acquire and to oversee land disposal capacity;
- reinforced municipal responsibility for disposal services; and
- a statewide 50% recycling goal.

These laws were applied through a comprehensive set of solid waste rules over all processing and disposal activities and facilities coupled with financial and technical assistance programs.

A. Ending the Use of Unlined Landfills

To address the looming environmental, financial, and legal problems posed by grandfathered landfills, the Maine Legislature established closure dates for unlicensed landfills and created the Solid Waste Landfill Remediation and Closure Program to close landfills that pose hazards to public health and the environment. Under the landfill closure program, in full swing by the late 1980s, the hundreds of small, open, unlined landfills that had been the standard means of local disposal for all manner of wastes for a century rapidly disappeared from the landscape.

> *Outcome: Bringing Municipally-owned Land Disposal Operations into Environmental Compliance*
>
> In the last two decades, the number of open, operating, unlined, publicly-owned MSW landfills has shrunk from over 300, ranging in size from covering hundreds of acres to only two acres, in Greenville and West Forks, which are in near term closure negotiations.
>
> Just eight licensed municipal landfills are currently in operation, with individual remaining capacity ranging from 6 to 30 years at current fill rates. Only a few

municipalities built their own replacement landfills, many joining with neighboring towns to develop regional facilities.

These landfills are supplemented by some two dozen municipally-owned landfills restricted in size to less than six acres and to the disposal of construction and demolition debris only (CDD.)

Today, landfills overall provide 25% of the disposal needs for Maine's unprocessed municipal solid waste and provide disposal services for the ash and process residue of the waste-to-energy facilities.

B. Controlling Out-of-state Waste

The Legislature placed restrictions on expansions of existing commercial landfills and banned the construction and operation of all new commercial disposal facilities.[21] The ban on new commercial disposal facilities was put in place to shield the state from the importation of 'out-of-state' waste.

Outcome: Banning New Commercial Disposal Facilities
In 2008, the number of commercially-owned and operated solid waste landfills remains at two, the same number as 20 years ago, due to the continuous enforcement of the commercial landfill ban.

C. Ensuring Sufficient Disposal Capacity

In the 1980s, the federal government provided funding to states to invest in alternative solid waste management and disposal systems for energy production. The city of Auburn constructed a waste-to-energy facility using mass burn technology to serve its needs and the needs of several surrounding communities, forming the Mid Maine Waste Action Corporation (MMWAC).

Portland area communities had previously joined together to form the Regional Waste Systems (RWS). Regional Waste Systems (now *ecomaine*) also built a mass burn waste-to-energy facility. Private companies[22] built two refuse-derived fuel facilities large enough to serve regions in York County (in Biddeford) and in Bangor-Brewer (in Orrington) and signed long-term contracts with those towns to provide the waste needed by those facilities. 180 communities have 23% ownership in the PERC facility in Orrington with their interests represented by a Municipal Review Committee, the MRC.

Over 32% of Maine's MSW, almost 700,000, tons is now delivered to and processed for its fuel value in one of the four waste-to-energy (W-T-E) facilities, prior to landfilling. In 2007 the four W-T-Es required landfill space for 301,000 tons of ash, residue and by pass wastes.

From the outset, one of the state's priorities was to make sure that the operations of the four in-state W-T-Es would not be affected by a sudden loss of in-state land disposal capacity for their by-products of ash and front-end process residue.

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[21] Publicly-owned disposal facilities were exempted from this ban.
[22] Both W-T-E facilities were built prior to the ban on commercial disposal facilities.

In order to ensure that there would be sufficient disposal capacity available, the 1989 Solid Waste Management and Recycling Act gave the state the authority to own, design, develop, and operate new solid waste disposal facilities.

That authority, coupled with municipal reluctance to take on the debt and the social and environmental liabilities associated with land disposal, has meant the state has taken on the role of provider of last resort for disposal capacity in Maine.

The state-owned special waste landfill would be a safety net to be brought on line when disposal capacity was needed.

The state purchased land then owned by Lincoln Pulp and Paper on Carpenter Ridge in T2 R8. It was then successfully permitted as a state-owned special waste landfill that remains to this day ready to be developed when it is needed.

The state's strategy to provide capacity for land disposal within Maine has increased by a factor of five with this recent acquisition of Juniper Ridge with 10 million cubic yards adding to the 1.9 million cubic yards of capacity currently permitted at the Carpenter Ridge site.

> *Outcome: Sufficient Disposal Capacity*
> Maine has in-state disposal capacity for municipal solid waste and special waste for the next 12-30 years. This is the direct result of the continued investment in W-T-E upgrades and acquisition and development of Juniper Ridge.[23]

D. Fostering the Solid Waste Management Hierarchy

The 1989 law established a hierarchy of Maine waste management systems. The Legislature also established ambitious waste recycling goals. It instituted both incentives, in the form of credits, grants, and loans, (not currently available) and disincentives, in the form of deposits and fees (removed or expired), to encourage appropriate waste management practices. It also provided in statute for financial and technical assistance to municipalities and businesses to further these practices.

The hierarchy guides state and local decisions regarding solid waste funding and grants, investments in, and the permitting of, solid waste management facilities, the operation of such facilities, and the management of residential and commercial waste.

> *Outcome: Toxics Reduction Success*
> In order to reduce the toxicity of the waste stream, the state has aggressively pursued eliminating the use for and of the overwhelming majority of mercury-added products. Today, mercury-added products from all sources are banned from disposal within Maine and must be recycled. Maine also enacted a first-in-the-nation program for the collection and recycling of electronic waste. Devices, such as computer monitors and TVs containing cathode ray tubes, cellular phones, and other electronic wastes from all

[23] The range in the time frame is based on current projected fill rates and reflects status under current license restrictions versus the potential expanded build out of the facility.

sources are banned from disposal within Maine and must be recycled, the responsibility for proper management shared among the manufacturer, government, and consumer.

In addition to these state-initiated, targeted, pollution prevention programs, many municipalities now offer once-a-year collection for the category of MSW known as household hazardous wastes (HHW). In 2007, 140 municipalities offered such opportunities to their residents. Maine now has two permanent facilities for HHW collection located in Lewiston and Portland open to all Maine citizens. These efforts target a small but toxic part of the municipal waste stream for action.

The Toxics Use Reduction Act (TURA) program created by the Maine State Legislature to reduce the amount of toxic substances introduced annually into Maine's environment from industrial generators, has also had several notable accomplishments including:

1. significant reductions at existing facilities in toxic use, release, and hazardous waste categories;
2. continued success with outreach and education particularly to smaller facilities without full-time environmental staff and in need of greater technical assistance (outreach examples include assisting smaller companies in switching from toxic cleaners and solvents to less hazardous or non-hazardous chemicals);
3. implementation of cost accounting (comparing the costs of utilizing toxic chemicals and generating hazardous waste with the economical benefits of reducing such use and generation) along with introducing worker safety concepts that reduce worker exposure to toxics; and
4. an emerging opportunity in the TURA program to track new toxics coming into the marketplace and to utilize the technical assistance tools adapted by DEP staff to address them.

Outcome: Recycling Success

Through steady local, state, private and public support for recycling and composting and long-term growth of these management systems, in-state markets have developed for the recycling and compost resources diverted from the waste stream, and are further supported by similar gains in regional, national, and global markets.

Over twenty million dollars of state and local match bond funding have resulted in recycling programs and facilities that now consistently manage the municipal share of the approximately 33% of our MSW currently recycled, accomplished through a series of local collection and regional processing programs.

Over 98% of Maine residents and the commercial sector have access to public or private recycling programs that have grown from just 24 programs in place twenty years ago to 320 working programs today. Over 60% of Maine communities have reached a 35% recycling rate or better. Over 22% have reached a fifty percent or better.

One third of Maine's MSW, over 700,000 tons, is physically removed from the waste stream, separated and collected and sent to manufacturers both in-state and around the world for use as replacement of virgin raw materials in their manufacturing processes (recycling). Approximately two-thirds of these recyclables are collected by the private sector from the private sector. The remaining percentage is diverted through municipal programs from residents and local commercial sources.

Though the state made good gains, reaching a high point of 42% in 1997, Maine has yet to reach the 50% recycling goal in statute for 2009, and in 2007 had the same rate as in the mid-1990s.

Outcome: The Hierarchy Applied

As of 2005, waste reduction is now recognized in statute with its own goal. Reuse has gained status through widespread public support for the local institution of municipal reuse centers at transfer stations. On a much larger scale, the Department of Environmental Protection's solid waste rules (Chapter 418) governing the beneficial use of solid waste encourage such opportunities through clear guidelines and standards.

It has been left to municipalities to put the hierarchy into practice as there is no state law mandating the recycling of the majority of the components of Maine's municipal solid waste, other than those discussed above under toxics reduction, or the recovery of its organic fraction. The only state wide disposal bans are on white goods, whole tires in landfills and car batteries, again except for those that apply to toxics reduction.

This local exercise of choice in the degree and method of recycling has determined the wide variation in our largely voluntary recycling system and in our level of support for the hierarchy.

While the goal was to develop a statewide integrated waste management system based on the hierarchy, it was left to local governments to build the links of one approach in the hierarchy to another and how to assure that all resources worth recovering would be removed prior to land disposal.

Waste management programs have tended to flatten the hierarchy in order to focus on the maintenance of a stable range of prices of disposal and stable costs for operations and transportation. The marketplace has responded and disposal prices and costs for now are stable, but this perspective has left us short of our goal and recovery potential. The hierarchy was put in place with an intentional bias; all approaches are not equal.

E. Municipal Responsibility for Solid Waste Disposal

Maine is a home rule state and it is a municipal responsibility to provide disposal services for the residential and commercial activities in their jurisdiction.

The old local dumps have been replaced by a complex set of private and public partnerships, underpinning a system of hundreds of small consolidation transfer stations, largely paid for by municipal bonds, connected by long-term contracts and truck transport to a relatively few disposal facilities. There is now a collection and transportation infrastructure of 240 public transfer stations and several large private facilities serviced by private and public truck transport. There are 320 public recycling programs and over 70 municipalities have set up leaf and yard waste composting sites.

The inter-connected system that has evolved to meet the municipal responsibility has been built by initiative and need, often in concert with private entities. These private/public partnerships have been put together in a wide variety of combinations that manage a large percentage of the collection, consolidation, processing transportation, and disposal of Maine's MSW.

Outcome: Regionalization

One result of the rapid conversion of the state's solid waste management structure was that municipal solid waste programs were among the first public programs to adopt the concept of regionalization to improve cost to benefit performance, and those programs to a noteworthy extent have held together and expanded. Approximately half of Maine's municipalities share solid waste management responsibilities with at least one other municipality, with several regional efforts supported by membership of 20 communities or more. Regionalization helps avoid situations where problems and proposals rise and fall as local issues to which there are no real local solutions.

Local governments remain the <u>key</u> to Maine's MSW management. They have control over the MSW generated within their jurisdictions whether they choose to exercise that control or not. When a proposal for a new municipal facility or an activity is put forward or a change in solid waste management suggested at the local level, the guidelines of the hierarchy, the attainment of the 50% recycling goal and 5% waste reduction goal should attach to the proposal and to the waste stream they intend to manage. The state must remain aware and assert its role as the principle proponent of its own policy.

The state's municipal partners should be encouraged to plan for their future waste management needs to accommodate anticipated growth and development through support for the hierarchy and to achieve the state's recycling and waste reduction goals.

Conclusion: Positive Outcomes of Current Policy

Maine's solid waste policies have largely achieved the Legislature's desired ends.

1. The objective of ending unregulated disposal of solid waste as standard practice was reached well over a decade ago. The Department of Environmental Protection has worked in conjunction with Maine's solid waste professional community to achieve a high level of environmental compliance.

2. The great majority of Maine citizens have the opportunity to recycle as an alternative to disposal.

3. Across the state, on a daily basis, over 5,500 tons of municipal solid waste are collected, consolidated, transported, processed for recycling or combustion, and disposed of in compliance with current regulation. With the commitment of existing public and private efforts, this loosely organized arrangement has the ability to continue to perform its tasks for years to come. Though problems with solid waste arise from time to time, generally they are site or waste stream specific and there is a process in place to manage them.

4. There is sufficient landfill disposal capacity to meet the state's current and projected future needs.

5. For the most part, Maine manages its own municipal solid waste. About three percent of Maine's overall waste stream is currently exported for disposal. This out-of-state disposal is often a local decision made by municipalities near our borders and results in the utilization of land disposal facilities located within New Hampshire or New Brunswick. This is based upon the favorable combination of disposal fees and transport costs, when compared to 'in-state' disposal options.

6. The policy of pursuing an integrated waste management system based on the hierarchy and the four strategies of 1989: the ban on new commercial disposal facilities; municipal responsibility; a recycling goal with measured progress; and state oversight of land disposal capacity are all still in use. The image of Maine as dumping ground for the northeast has not materialized but questions persist for state and local officials about what to do with the out-of-state waste that comes into Maine in response to market forces and legitimate opportunities.

IV. What has Happened Since the 1998 Plan?

Several solid waste issues were identified in the 1998 plan. Among them were:

- The high cost of solid waste management for municipalities;
- The need for secure and stable markets for recycled/composted materials;
- The lack of management options for construction and demolition debris; and
- The desire to promote beneficial use.

The following section is a brief overview of where these issues stand in today.

Costs of Municipal Solid Waste Management

Certainly costs have remained an issue for municipalities. As the 1998 plan predicted, the need to lower municipal costs must coexist with innovations to improve recycling rates. It has had an effect by contributing to and in some ways exacerbating the stagnant character of the state's pursuit of the 50% recycling rate and local enthusiasm for using the waste hierarchy in solid waste decisions.

In 2007, citizens, businesses, municipalities, and others spent an estimated *$200 to $250 million* to reuse, recycle, compost or dispose of the two million tons of municipal solid waste generated within Maine.

Municipalities arranged for the disposal of about 50% of Maine's total municipal solid waste generation, or just over one million tons, and reported spending approximately $90 million per year[24] on the solid waste and recycling services that they provided. Recycling efforts conserved landfill space and provided an avoided disposal cost of approximately $6 million while contributing a net gain of $5 million to those communities from the sale of the recyclables.

On average, according to information from the Maine Municipal Association, Maine communities spend about 10% of their municipal budget to secure and provide necessary solid waste and recycling services. Most municipal expenditures are available on the municipalities' web sites.

Solid waste disposal varies among communities and ranges from municipalities that simply contract with a disposal facility and leave all other responsibilities and costs to their residents and businesses, to communities that pay for the full collection and disposal services as part of the municipal budget.[25]

While the state does not have precise information on municipal costs for MSW management from the early 1990s for comparison, it appears based on municipal information reported to the

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[24] In 2005, businesses and citizens spent another estimated $120 to $160 million to secure these necessary solid waste disposal and recycling services.

[25] Most municipal solid waste expenses are paid by the municipality from tax revenue, although some assess user fees to reduce costs (75% of municipalities versus 25% that offer fee-based waste services).

State Planning Office that costs have recently stabilized in terms of both actual dollars spent and as a percentage of municipal budgets, to a range of $95 to $110 per ton. This figure is supplied with the following caution: that many communities to not apply full-cost accounting measures to their solid waste budgets and many do not bear all the costs of all the municipal solid waste streams generated within their jurisdictions.

A. Disposal Fees

Disposal expenses comprise collecting, transporting, and ‘tipping’ waste. Disposal fees or ‘tipping’ fees are a key driver of municipal solid waste costs. Current disposal fees range from $40.00 to $158.00[26] per ton at Maine’s landfills and incinerators and have stabilized allowing predictability for municipal budgeting and long-term planning.

Tip fees at the four waste-to-energy facilities are stable and reflect the commitment of the municipalities who either own the facility or have long-term contracts for disposal services. A number of regional landfill facilities (Bath, Augusta, *ecomaine*) recently implemented price increases that should hold for the foreseeable future.

The state, in its operating agreement with Casella Waste Systems, established a ‘ceiling’ for tip fees that sets an upper limit on how much can be charged for wastes delivered to the Juniper Ridge Landfill. It is anticipated that this will act as a check on pricing for the disposal of similar materials at other solid waste facilities. In fact tip fees at the state’s W-T-Es have been stable for years. For example, the PERC base tip fee for charter communities has remained at $45.00 per ton for close to fifteen years.

B. Energy Revenues

Revenues from the sale of the electricity largely determine tipping fees at waste-to-energy facilities. The revenues reduce the facility’s operating expenses, yielding a reduction in the tip fee charged for solid waste. Should electrical sales revenue drop, tip fees may increase. Conversely, should the electrical sales increase, the possibility exists to lower or maintain tip fees currently being charged.

C. Municipal Expenses

Expenses vary from municipality to municipality due to a variety of factors such as cost of disposal, operation of a transfer station, number of hours the transfer station is open, level of recycling services, and bulky waste acceptance and processing. The more services that a community offers, generally the more expense is incurred.

Communities have also formed regional programs to gain an “economy of scale” advantage, allowing the smaller towns to offer a larger range of services.

The selected towns listed in Table 13 below have variable collection and disposal costs for municipal solid waste that reflects disposal fees and different levels of municipally-provided services. Table 13 shows the variability in costs, not for an “apples to apples” comparison.

[26] This does not reflect spot market prices.

Table 13: Disposal Costs for Selected Municipalities

Municipality/ Region	Disposal Facility	Collection System	Transfer Station	$ Per Person
Brunswick	Town Landfill	Municipal curbside	No	$55.28
Tri-Community	Regional Landfill	Curbside & Drop off	No	$49.37
Hartford	Crossroads Landfill	Contracted curbside	No	$60.28
Temple	Crossroads Landfill	Contracted curbside	No	$68.30
Livermore Falls	Crossroads Landfill	Subscription	Yes	$55.19
Farmington	Crossroads Landfill	Subscription	Yes	$7.46
Minot	MMWAC	Subscription	No	$28.76
Lewiston	MMWAC	Contracted curbside	Yes	$54.02
Norway-Paris	MMWAC	Drop-off	Yes	$63.16
Sabattus	MMWAC	Drop-off	Yes	$36.97
Bangor	PERC	Contracted curbside	No	$40.07
Unity	PERC	Contracted curbside	No	$68.83
Winthrop	PERC	Drop-off	Yes	$68.74
Yarmouth	ecomaine	Drop-off	Yes	$95.45
Casco-Naples	ecomaine	Drop-off	Yes	$122.42
Portland	ecomaine	Municipal curbside	No	$83.30
Cumberland	ecomaine	Contracted curbside	No	$114.24
Saco	Maine Energy	Municipal curbside	No	$42.08
North Berwick	Maine Energy	Drop-off	Yes	$59.35
Sanford	Maine Energy	Cont Curb	Yes	$69.51

Profiles of two differing local recycling programs are provided in Appendix B that show the variations in local costs.

Markets for Recycled Materials

A. Market Stability and Growth Over the Long-term

There is a direct and obvious correlation between markets and recycling success and support for the hierarchy.

Unlike a decade ago, recycled and composted materials have reached a high level of price stability. This is due in part to new North American mills and to the steady rise in offshore markets for fiber and steel, and an increase in prices for virgin raw materials. Figures 14, 15, and 16 show three examples of pricing trends in the fiber market that illustrate the stability and general upward trend in pricing.

The new market stability is reflected best by the price strength relative to recent history for the category of recycled fiber generally known in Maine as mixed paper (see Figure 16).

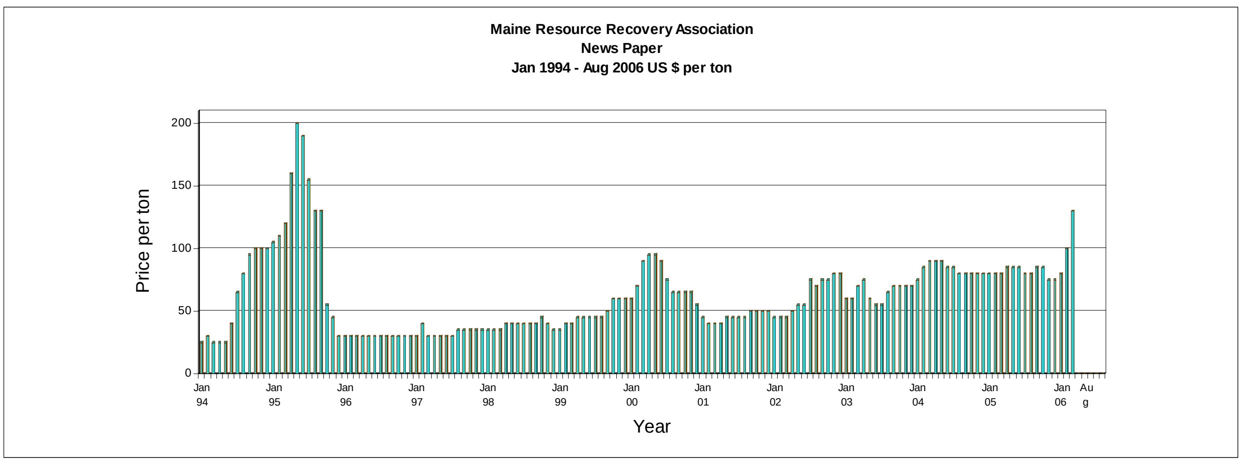

Figure 14: Price Per Ton, Newspaper, 1994 – 2006
Source: Maine Resource Recovery Association

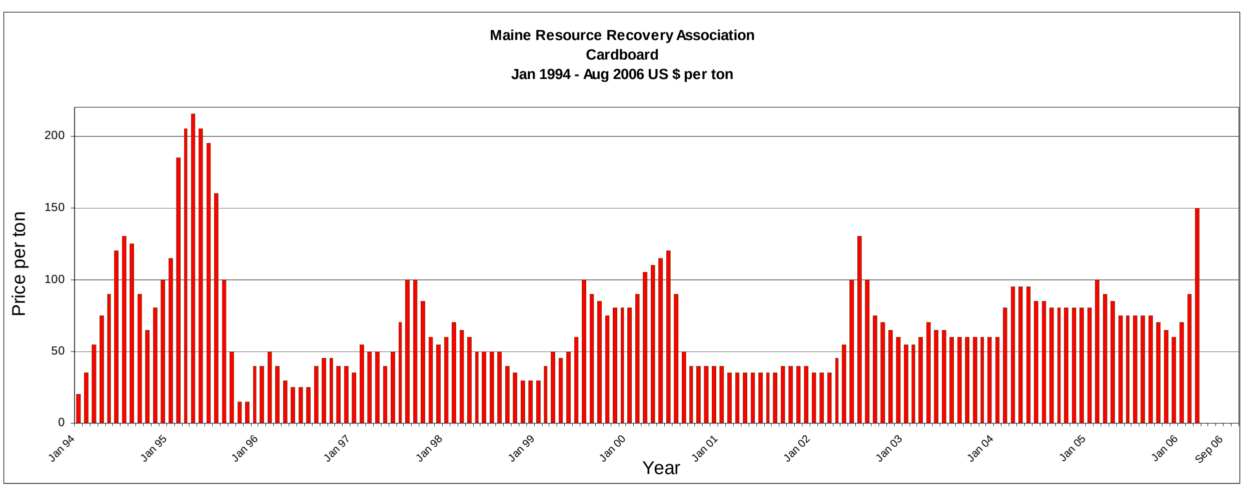

Figure 15: Price Per Ton, Cardboard, 1994 – 2006
Source: Maine Resource Recovery Association

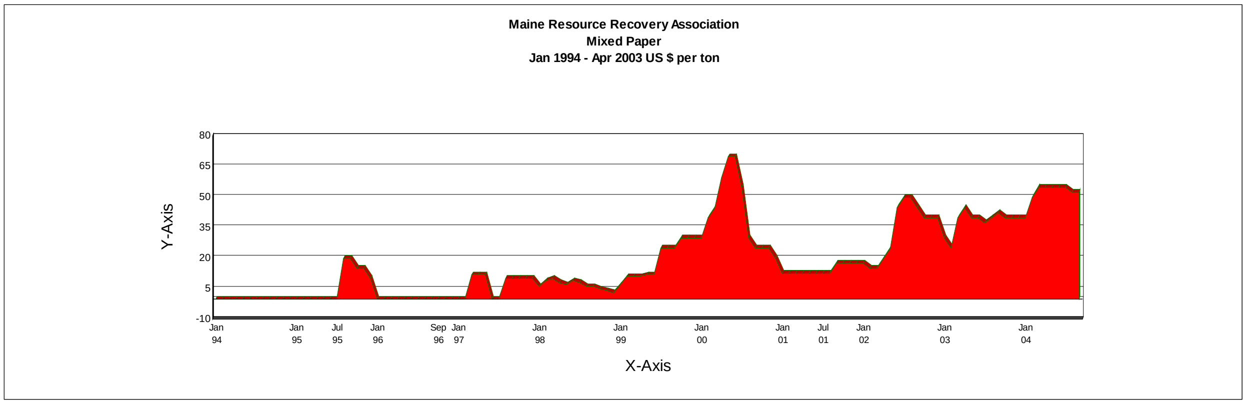

Figure 16: Price Per Ton, Mixed Paper, 1994 – 2004
Source: Maine Resource Recovery Association

Excluding the spike of 1994-95, there is an obvious upward trend in the year-to-year market prices. This is true across the fiber, metals, and plastics markets, but not of glass that is losing market share to lighter weight materials.[27]

Domestic and overseas markets have responded to the industrial growth in Asia. Overseas economies will not produce enough recycled product to meet their own needs for feedstock for at least a decade, meaning they will need to continue to import recycled materials from the U.S. for some time to come.

The challenge for marketers is to commit to move their recovery systems forward to increase supply, at the same time be able to respond to and take advantage of possible changes and opportunities in materials, in products and packaging, manufacturing processes, commodity and product delivery systems, consumer demand, global conditions, and new laws and policies.

In 2008 recycled products remain the number one container ship export from U.S. west coast ports. Recycled product revenues for all products on average exceed $50 per ton. The trend shows the annual cyclical market slowly moving up every year.

As in 1998, nationwide there is still a lack of markets for plastics labeled #3-7. Plastics recycling remains the province of numbers one and two necked containers. There has been some progress in combining the #3-7 resin types of plastics chemistries with other materials to use in structural applications, and they have some value in the low-priced, overseas market.

For the next two decades, the challenge for Maine suppliers will be to make changes to increase supply to take advantage of stable prices. This is particularly true of public, municipally-controlled programs where recovery efforts for fiber and containers have stayed below 100,000 tons annually.

Whatever changes are made, quality controls must be kept at current levels. Maine commodities have always moved in the market even at times of low prices and over supply because of their

[27] The '94 spike in fiber was caused by a temporary high demand from overseas that was misread and led to a huge oversupply to the market that took several months to correct.

reputation for quality. Quality control is essential to mitigating the effects of low price cycles in the commodities’ market.

B. Recent Downturn in Pricing

The global financial crisis of the last quarter of 2008 is reflected in the steep decline in price for recycled materials across the board that has carried into the first quarter of 2009. In this current economic climate there are a few facts worth remembering.

- Recycling markets go through periodic fluctuations; witness the corrugated cardboard boom and bust of the mid ‘90s, but consistently trend upward over the long term, despite two recessions in the last 20 years.

- This is not a structural problem in the recycling industry. It is an economic problem of supply and demand. Once economies around the world and in the U.S. pick up, recycling markets will return.

- In down markets, quality materials have a much better chance with buyers that are looking to keep their own costs as low as possible and produce defect free product. Maine materials have always enjoyed a reputation for quality in the recycled commodity market.

- Recycling reduces disposal fees that are placed on every ton of material that leaves a facility as waste for disposal.

In a down market, recycling program managers should look for ways to increase volume. This may seem to be a contradiction when demand is dropping off, but the more quality recycled product in the market, the more manufacturers will turn away from virgin raw materials when they decide to buy. Buyers prefer to purchase materials from large suppliers with whom they have a good working relationship. The goal is to keep the buyer.

C. Municipal Compost Supply

Although composting of leaf and yard waste now takes place at many municipal facilities and appears to be steady, there has been little growth over the last several years in the number of public programs despite high local consumer demand for the final product. The growth in organics composting beyond leaf and yard to include food waste and other organics in the waste stream has been very slow to develop.

The State Planning Office sponsored a food composting initiative in 2004, which resulted in one successful on- going permanent project. The Office provided financial and technical assistance to a partnership consisting of the town of Farmington, the University of Maine at Farmington, Franklin Memorial Hospital, and the Sandy River Recycling Association, along with assistance and regulatory oversight by the Maine DEP. The regional program composts food wastes from the university and hospital. It gives the finished product to the town for municipal uses.

Management of Construction and Demolition Debris

A 2008 study done by the State Planning Office found that the common factor in successful Maine recycling programs, the ones that exceed 50%, is that they accepted a large number of items for recycling, and they include construction and demolition materials in their recycling programs, such a waste wood, asphalt shingles, sheetrock, metals, unwanted furniture, and other large items. They also have active reuse programs for home construction products and large household items.

The rate of construction and demolition debris (CDD) disposal and recycling is directly related to the state of Maine's economy and to the cycle of residential and commercial construction.

A. CDD Composition

Wood waste makes up between 33-54% of the total volume of the CDD loads, with clean wood totaling between 17-32% by volume. Second to wood waste is asphalt shingles totaling between approximately 15-26% by volume.

Asphalt, brick, and concrete waste overall is found in very small quantities. An all other CDD waste category would include various wastes such as plastic compound buckets, plastic crates, nail boxes, non recyclable packaging, electronics, rugs, bedding, broken tools, bottles and cans, and other municipal solid waste.

B. Municipal Collection and Management

Maine towns manage CDD primarily through their local solid waste facilities. In 2007, municipalities recycled an estimated 13,000 tons, or approximately 50% of the total CDD recycled in-state for the year. This is an estimated 4% of the total 317,490 tons of CDD waste managed within the state.

Most CDD in Maine is landfilled without processing. An estimated 100,000 tons of municipally-managed CDD was landfilled at either the six municipal MSW landfills, the 23 municipal CDD landfills, the state-owned landfill at Juniper Ridge in Old Town, or the Waste Management Inc, landfill in Norridgewock. Additionally a small amount of mixed MSW/CDD tonnage is exported into New Hampshire and Canada by some of Maine's border communities.

The state's four waste-to-energy facilities also receive a small CDD fraction with their other MSW deliveries. Maine Energy is not designed to process these materials into fuel and must remove and landfill them; MMWAC and *ecomaine*, as mass burn facilities, can burn CDD but are limited by their small fuel feed openings. PERC has recently purchased a small grinder for materials too large or problematic for their fuel processing system.

Additionally, at some transfer stations, the wood portion of CDD waste suitable for fuel is not recycled; it is open-burned, without air pollution controls or energy recovery. This practice is allowed under state statute with some limitations and conditions.

The estimated combined generation of asphalt shingles and sheetrock, two components of CDD that are being recycled at some locations, is over 88,000 tons annually in Maine, while the recovery rate for all CDD is just over 25,626 tons. There is a tremendous opportunity for growth in recovery efforts.

C. Quality Control

"Source separation" is the basic strategy for controlling the quality of the CDD waste for reuse, recycling, or processing. It entails the sorting of usable elements of CDD at the point of generation (i.e. a demolition site) or collection (i.e. a municipal transfer station).

Local facilities have significant control of how the waste is delivered and sorted. They have the ability to manage delivery of relatively clean components of the construction and demolition debris waste stream for reuse, recycling, or processing. CDD storage areas and areas set aside to check load contents are inexpensive to construct and operate, but are heavily dependent on supervision of the customers to ensure adequate separation of potential contaminants.[28]

D. Management Options

There has been considerable discussion around the best management options for Maine's CDD stream. Boiler fuel is the largest potential market for locally-generated, source-separated, wood CDD. Local transfer stations, which manage CDD waste wood for the fuel market by requiring source separation, can typically receive a waste stream that is at least 95% wood.

However, potential recycling opportunities are tempered by the relative lack of sufficient concentrated volume outside Southern and Midcoast Maine to guarantee the financial success for any additional expansion of CDD processing capacity, the lack of sufficient local markets, and negative effects of transport costs. Thus, planning for future in-state CDD processing capacity suffers from a lack of long-term volume predictability. There has also been hesitancy on the part of municipal or public programs to commit to recycling of these materials.

If all municipal CDD were managed to separate wood waste at the point of collection, and assuming that 25% of the CDD waste stream could be processed into wood fuel that met market and regulatory specification, Maine municipalities potentially could generate 75,500 tons of CDD wood fuel annually for which there would be a ready in state market.

In the area of municipal construction demolition debris management, the major change will be the gradual closure of the state's two dozen small (under six acres) CDD landfills. If recycling opportunities do not come forward, the present alternative outside of southern Maine will be to continue to land dispose of CDD, which would be using up local landfill capacity.[29]

Whether or not municipal programs will seek to permit and license new, small-scale, CDD disposal facilities or seek to expand an existing one is an open question, given the costs and potential extensive permitting process for either option. Small-scale CDD landfills may no

[28] Maine Department of Environmental Protection. Report on the Substitution of Wood from Construction and Demolition Debris for Conventional Fuel in Biomass Boilers, April 2007
[29] Managing municipal CDD for maximum CDD wood fuel generation could reduce the amount of Maine landfill capacity currently used for disposal of CDD by 133,200 yds annually.

longer pay for themselves and in fact may have to expand in order to be financially viable. The attempt to site one such new facility in Washington County may suggest the complexity of any such undertaking.

If the two dozen small regional CDD disposal facilities do close, that will mean those programs currently using them will face either transport and disposal to the remaining large centralized landfills; or the development of CDD separation and aggregation storage areas to facilitate shipping to processing facilities where the materials are recovered as previously discussed.

Beneficial Use

The solid waste management hierarchy provides guidance on determining, selecting and implementing possible 'end of life' management options for unwanted products and materials, in descending order from reduction to landfilling. The second option within that hierarchy is 'reuse', which includes beneficial use.

A. What is Beneficial Use?

Beneficial use is the term applied when the substitution of a waste product occurs for a raw material in a manufacturing process, as a construction material, or as a fuel. The 1998 state *Waste Management and Recycling Plan* asserted that beneficial use could have a major impact on diverting certain hard-to-manage waste streams, such as tires, wood waste, and ash, from disposal to a different use or application.

Beneficial use is a practice that takes appropriate secondary materials out of the waste stream and uses them in place of more traditional virgin material. Beneficial use has potential in a number of industries, including construction, transportation, electrical generation, and waste treatment, to provide cost effective replacements for aggregate, fill, cementitious material, drying agents, and many other materials currently in demand. Beneficial use not only provides secondary materials for Maine companies to use, but it also decreases cost and demand for disposal facilities and maintenance.[30] Determination of a certain waste product for beneficial use requires Maine Department of Environmental Protection review and approval.

B. Examples of Beneficial Reuse

The use of waste as substitution for raw materials or other items has been practiced for many years. Some examples of secondary materials and their currently approved beneficial use in Maine include[31]:

1. Multi-fuel Boiler Ash – may be used as: alternative liming material; soil stabilizer; odor absorbent for compost and waste treatment; possible concrete additive/cement replacement.

[30] University of Maine. Beneficial Use of Solid Waste in Maine, 2006.
[31] University of Maine. Beneficial Use of Solid Waste in Maine, 2006.

2. Fly Ash – may be used as: raw material in a cement kiln; additive to cement clinker prior to grinding; addition to concrete mix as a partial replacement for cement; lightweight aggregate; controlled low-strength material (flowable fill); autoclaved cellular concrete; structural fill; landfill cover; water treatment; soil stabilization and modification.

3. Cement Kiln Dust – may be used as: soil stabilization; waste stabilization/solidification, Portland cement replacement; asphalt pavement; controlled low strength material (flowable fill); lightweight aggregate; construction fill.

4. Dredged Material – may be used in: wetland management, restoration, creation, and enhancement; shoreline and sedimentation stabilization; erosion control; wildlife habitat development; water quality improvement; recreation and cultural resources; contaminant stabilization; dike construction; rip rap; and other applications.

5. Lime Mud – may be used as: an agricultural liming material; in waste stabilization and sanitation; as a construction material.

6. Tire Shreds – may be used as: lightweight fill for embankment construction on weak foundations; retaining wall and bridge abutment backfill; to limit frost penetration; drainage layers for roads and landfills. Tire shreds have had three principal uses in Maine once they are processed into suitable sized chips: (1) as base grading materials (as demonstrated in the construction of the Sabattus interchange on Interstate 95); (2) as part of the landfill liner systems, and (3) as fuel in solid fueled boilers licensed to burn them.

7. Oil Contaminated Soil – may be used as: aggregate for hot and cold mix asphalt processes; concrete aggregate; raw material replacement.

8. Street Sweepings – may be reused as road sand; as fill material; as landfill cover; as a raw material replacement.

9. Waste Wood/Brush and Construction or Demolition Waste – these are two of the more commonly 'beneficially used' categories of municipal solid waste. To highlight this, the following is devoted to these wastes:
   - *Clean Wood Waste* – discussed below
   - *Construction or Demolition Debris, including concrete and asphalt shingles* – discussed below
   - *Sheetrock/Gypsum* – discussed below

Since 1998, much of the Department's work in this area has been to develop rules (see Maine Department of Environmental Protection, Rule Chapter 418) to allow for the beneficial use of construction and demolition/debris (CDD), and in particular, to create fuel standards for the use of construction derived wood (CDW) as boiler fuel. Wood from construction or demolition debris (CDD wood) refers to the wood component of the solid waste resulting from construction, remodeling, repair or demolition of structures.

The adopted rule also provides guidelines and standards for the use of tire chips, brick, concrete, porcelain, and glass as fill materials, as well as exempting recycling activities that produce secondary products in substitution for virgin materials in manufacturing.

The demand for the recovered wood waste fraction of CDD, principally the CDW, of the waste stream has increased in recent years and has the potential for growth. Several biomass boilers in Maine are permitted to combust this fuel substitute. As a result of increased demand, there has been a corresponding increase in the number and locations of grinding and screening machinery that accepts the CDD and processes it to capture the usable wood fraction.

Clean Wood Waste
Clean wood waste is recovered from demolition sites, and excess wood from the construction process, may also be used in many other ways. CDD can be used as a fill material or aggregate and may be a reasonable alternative to valuable natural resources in certain applications.

Construction or Demolition Debris
CDD contains many products and items, and if a home is demolished, may include the kitchen sink! Consequently, metal is a common component of CDD and is the most-recycled of CDD materials, due largely to the historic market and demand for recovered metals. The metal recovered from CDD is recycled and used to create new products from the old metal.

Concrete
Concrete can be readily crushed and reused. The most common use of crushed concrete is as road-base gravel, but it is often also used as an aggregate in asphalt or concrete manufacturing. One estimate is that 50 million tons of asphalt and concrete from pavement that is torn up is reused.[32] Of that total, up to fifty percent is reused as Reclaimed Asphalt Pavement, or often referred to as 'reclaim', which when properly placed, provides for a solid surface.

Asphalt Shingles
Asphalt shingles separated from CDD streams can be reused in making hot or cold mix asphalt, or even new roofing materials. Excess or cut shingles from construction sites are more widely used for recycling than used asphalt shingles collected from a demolition site, but both have value. What follows is a description of how one Maine business beneficially uses discarded asphalt shingles:

> Commercial Recycling Systems (CRS) of Scarborough, Maine has been successfully recycling asphalt shingles for over seven years. The CRS processing facility currently accepts shingles delivered in both roll-off and dump trailers, containing 12-20 tons per load. Roofing products come from numerous towns, cities, and private roofing contractors in New England.
>
> Collection of the shingles occurs at both municipal and commercial transfer stations, and through direct delivery to the CRS facility. An inspection is performed to make

[32] University of Maine. Beneficial Use of Solid Waste in Maine, 2006.

sure that incoming loads are comprised of shingles only and do not include any wood, flashing, or other debris. After inspection, the shingles are processed into the desired particle size at the facility, with measures taken to both remove roofing nails and minimize asphalt dust. The processed shingles are then incorporated into various road construction products, such as HMA and 'cold patch' at rates based on the product performance requirements. The use of the shingles in the construction materials replaces some or all of the virgin asphalt in the various grades of road building materials, which are produced to meet Maine Department of Transportation product specifications.

Sheetrock/Gypsum

The gypsum material in sheetrock can be removed from the paper backing for use in manufacturing new sheetrock. In addition, the gypsum has many other practical uses as well. Often thought of as having liming abilities, gypsum does not alter the pH of soil or water when added to either.

In looking ahead at methods and practices that reduce the volumes of solid waste destined for disposal, beneficial use continues to be a working option for those materials already permitted and remains an opportunity for further application, given current efforts to consider wastes as resources and divert their 'end of life' management from landfills to 'a second chance'.

Conclusion: Changes over 10 Years

The issues raised in the 1998 state *Waste Management and Recycling Plan* are mostly still of concern today. Municipalities face cost worries, however, waste tip fees have become more predictable and recycling revenues help offset expenditures. Markets for recyclables over the long-term have grown, with spikes and declines that track a global economy. The lack of management options for CDD remains a concern. And, while there are viable options for beneficial reuse, there remain opportunities to do more.

V. Long-term Issues to Watch

Growth in Waste Generation

Maine currently disposes more solid waste than it reduces or recycles. While that fact alone is cause for concern, that we as a state find ourselves in this situation after 20 years of effort to reach 50% recycling goal, the data trend over the last six years shows that the increase in disposal is outpacing any increase in recycling. Though recycling tonnages continue to increase, recycling's share of the MSW stream has declined relative to disposal over the last several years.

This continuing and growing disproportion raises concerns that our current policies and programs are insufficient to guarantee an improved future for Maine citizens when it comes to solid waste management programs that properly reflect the quality of the place we consider Maine to be.

Out-of-state Wastes

A. Why do we Import MSW?

Why not ban out-of-state waste?
Many people wonder why the state doesn't just ban the importation of waste. Movement of solid waste across state lines is protected under the federal commerce clause of the U.S. Constitution. This federal law overrides individual state action to restrict that market at their borders. The law enacted in Maine in 1989 to ban the development of new commercial disposal facilities was in direct response to the limitations imposed by the commerce clause. Those publicly-owned and private disposal facilities that remain in Maine today may accept wastes from beyond Maine's borders as long as that acceptance does not run counter to the regulatory, legal, or contractual provisions under which they operate.

1. Out-of-state Waste Makes Energy and Supports our In-state MSW System

The Fuel Gap
The majority of the state's businesses and residents rely on the four W-T-E facilities to manage their MSW. Since their inception, the four W-T-Es located in Maine have required, either occasionally, or on a seasonal, or permanent year round basis, more fuel (MSW) than is currently available to them from Maine market sources. This *over capacity* creates a demand that their managers have to meet by looking out of state for additional fuel. Given our current level of W-T-E capacity, out-of-state waste is necessary to continue to manage our own MSW. It maintains operational efficiency at the W-T-Es and allows them to meet their contractual responsibilities.

The facilities are not only dependent upon a predictable flow of over 800,000 tons of fuel per year (with a portion of that fuel coming in from out of state); but also upon access to landfills for their own waste streams of by-pass, ash and, for the two refuse-derived fuel plants, front-end process residue (FEPR). Current technology has not achieved any significant resource recovery from either of the two waste streams under present regulatory conditions.

In the long term, we need to decide whether and how the state should sustain this exchange of waste for energy if Maine recommits to and reinforces the hierarchy and with the reality that at least for the next several years the fuel needs of the W-T-Es will need be met by out-of-state sources.

In the meantime out-of-state wastes support the conversion of our own wastes into energy and thus support the hierarchy in preference over landfilling.

Out-of-state Wastes and Biomass Fuel
Maine has by far the largest concentration of biomass steam plants in the northeast region. What Maine lacks is processing capacity for CDD or the waste stream volume to supply wood for those boilers.

Current Market
Only two of the seven boilers approved for construction derived wood (CDW) fuel combustion are presently burning it: Sappi Westbrook and Boralex-Livermore. Roughly two-thirds of the CDW fuel for these plants was fuel processed outside of Maine. If all seven boilers combusted wood waste up to their full capacity allowed by license requirements and by state law,[33] they could generate an annual demand for 1.37 million tons. The Office does not believe that we are likely to attain this full level of demand.

In-state Sources
Maine does not produce enough CDD wastes from which a sufficient amount of CDW can be derived to meet today's fuel demands of in-state biomass boilers, or the fuel demands of new, yet-to-be-proposed technologies, such as gasification, that are under consideration, or the financial requirements for throughput of any future CDD landfills or processing facilities.

At the current rate of capture and processing of wood waste from CDD, Maine municipalities supply less than 1% of the maximum annual projected demand for CDD wood fuel. Processing of in-state commercial waste currently provides an additional 3%. If all municipal CDD were managed to separate wood waste at the point of collection, and assuming that 25% of the CDD waste stream could be processed into wood fuel, Maine municipalities potentially could generate 75,000 tons of CDD wood fuel annually. This is an estimated 6% of the maximum CDD wood fuel permitted for use in Maine biomass boilers today.

Out-of-state Sources
Because of Maine's low volumes of CDD wood waste, there is concern over a potential influx of very large amounts of CDD from out of state to fuel the present seven licensed biomass boilers.

To combust the maximum amount of CDW fuel approved for use, biomass boilers would need to rely upon CDW fuel that originates outside of Maine, or on fuel that is produced in Maine from out-of-state CDD.

[33] DEP licenses for these facilities restrict the annual tonnage of CDW to no more than 50% of its licensed fuel supply.

Recent legislation has written into law that waste, produced by the processing or recycling, or incineration in Maine of out-of-state waste, is considered to be waste generated within the state. Thus those wastes may be received by any facility licensed to receive those types of wastes.

For example, in 2007, 293,536 tons of out-of state, unprocessed CDD was sent to Maine's commercial landfills. If this amount were separated and processed for CDD wood fuel production rather than landfilled, it would create an estimated additional 75,000 tons of CDD wood fuel (roughly 6% of the projected maximum demand) and reduce the landfill capacity used by at least an equivalent amount.

CDD Products and Recyclables (other than Wood)

Most large construction and demolition debris processing facilities produce a variety of recycled products in addition to CDD wood fuel. These facilities remove as much salvageable and reusable material from CDD as is practical in order to recover value from the waste constituents and to minimize the transportation and disposal costs associated with landfilling construction and demolition debris. Materials recovered by these facilities include aggregate from bricks, concrete, asphalt, rocks, and dirt; ferrous and non-ferrous metal; asphalt shingles, un-used gypsum board for reuse, and wood for reuse or for fuel in wood-fired biomass boilers.

Additionally, other CDD components not suitable for recycling may be mixed with the recovered aggregate materials and marketed to operating landfills as a soil substitute to cover waste or for shaping and grading material for landfill closure projects. Generally, 20-35% of a mixed CDD waste stream can be processed into CDD wood fuel.

Typically, the processing facilities offer generators financial incentives to send wood rich loads of CDD separately from wood poor loads or require source separated loads from demolition and building contractors. This allows the processor to use the wood poor CDD loads to create landfill closure material or to by-pass the CDD directly to landfills for disposal.

Maine Processing Facilities

Current in-state processing of CDD wood is performed by mobile shredders that process stockpiles of pre-separated CDD wood into fuel at municipal collection sites, and by five commercial processing plants – Aggregate Recycling Corp (ARC) in Eliot, CPRC Group in Scarborough, KTI Biofuels in Lewiston, Simpson, Inc. in Sanford and Plan-It Recycling in Gorham. Another facility, owned by Casella Waste Systems, is newly licensed to operate in Westbrook, but is not yet operational.

Currently, the wholesale replacement of out-of-state processing capacity by in-state facilities is unlikely since it is significantly less expensive to process locally (nearer the sites of CDD generation) and to pay to transport only the portion of CDD that is processed into wood fuel than to transport mixed CDD into Maine for processing. The degree to which out-of-state CDD processors can increase their operational capacity to meet increased fuel demand is also limited. Out-of-state processors are currently operating at close to capacity.

B. The Impact of Imported CDD on Landfill Capacity

When the state's two commercial landfills reach capacity and are closed, those disposal options for imported CDD will dry up, which will reduce the importation of out-of-state waste for landfilling.[34]

However, given the recent change in law that defines processing waste as waste generated within the state, the residue from the processing of CDD imported from out of state for the purposes of creating fuel for Maine biomass boilers could consume valuable landfill space either at Juniper Ridge or at some future publicly-owned and -controlled disposal facility.

There are five, soon to be six, Maine facilities that may receive out-of-state CDD for processing CDD into fuel. The processing of CDD into wood fuel by these facilities potentially could increase in the future. A possible projection has the processing of CDD into wood fuel generating residues that could use up to 15-20% of Maine's current remaining landfill capacity annually (without an expansion).

Several conditions would have to be present for this scenario to emerge. First, the six processors would need to expand their existing operating capacities to process all the CDW fuel needed. This would require equipment purchases and regulatory consent. There would need to be sufficient building and construction activity to generate the supply of material to be processed. In-state disposal costs would need to be low enough to offset the increased costs of transportation. Finally, there would need to be sufficient demand for the product (i.e. the seven Maine boilers consume CDW fuel up to their licensing and/operational limits). This scenario also assumes that all of these conditions align at the same time and remain constant for a sufficient period of time so that all the necessary investments can be made and permit approvals obtained.

Nevertheless, this situation requires prudent and timely monitoring because of the potential for growth in market supply and demand (based on operational limits of current processing facilities and biomass boilers) that could then escalate the demand on Maine's landfill capacity, a core concern of the state.

Also, it is likely that some of the ash from the biomass boilers will continue to be disposed of in generator-owned landfills to add stability to paper mill sludge, reducing the reliance on public landfill capacity.

Out-of-state Wastes and Bypass

Recent legislation has defined bypass and included bypass waste from Maine waste to energy facilities, recycling and processing facilities under the definition of waste generated within the state. One of the potential consequences of this legislation is that out-of-state waste destined for one of the W-T-Es may be directed on to a licensed public or private disposal facility in Maine.

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[34] Through an agreement with the Maine DEP, Pinetree Landfill in Hampden will close in January of 2009. Crossroads in Norridgewock will reach capacity between 2019 and 2023 (this is only an estimate based upon today's fill rates).

In conclusion, the types and amount of out-of-state waste disposed of in Maine will likely shift in response to changes over time in Maine's waste generation and management systems. Without changes to current law both commercial land disposal facilities will eventually fill and close, shutting off those disposal outlets for out-of-state waste. While new CDD processing facilities may bring out-of-state wastes into Maine, they will also serve to improve the recovery of Maine-generated CDD.

The Role of Local Government

Since their local dumps were ordered closed or radically changed to meet new state law and standards in the 1980s, and the affirmation of home rule, municipalities have wrestled with their role in solid waste management and the questions of who has control, who has ownership, and who has responsibility and what those words mean.

The positive result is that over the last two decades each Maine city and town has chosen, built, and managed their individual MSW systems to their liking, as long as they stayed in compliance with state laws and rules. The people in the 495 civil divisions with their own governance have the right to choose the level of services they want to pay for.

The principle negative result of this system of local control is this same variability of service so that communities next door to one another have widely different levels of service and approaches.

Also, the full life cycle costs and benefits of all the components of the waste stream and the various possible means of their management are often not evaluated or even recognized in the typical annual "services versus taxes" municipal budgeting process. Municipalities are only obligated to provide a means of disposal for MSW generated within their borders. Following that minimal scenario, it is rational and acceptable to send solid waste "downstream" shifting the burden geographically or to future generations, in order to minimize immediate local risks and costs. The long-term environmental and social impacts of "downstreaming" solid waste and the cost of siting future disposal facilities generally are not usually factored into annual budget choices by those who manage the MSW at the local level. [An exception should be noted for those eight communities that still operate their own landfills and must have long term plans for preserving landfill space, possible mitigation, monitoring, closure, and post closure disposal.]

The recent U.S. Supreme Court ruling on flow control does give municipalities potential, wide-ranging control over MSW generated within their jurisdictions. It gives local governments standing as both market regulators and market participants with the power to direct MSW into their own facilities as long as they pass a balancing test where the public benefit is greater than the burden, particularly in those circumstances where those bearing the potential burden are the same as those enacting the law. This new situation may have long-term, positive effects on building greater regional cooperation to direct MSW into municipally-owned recycling and composting facilities.

Other Issues

Besides the growing waste generation versus recycling imbalance, out-of-state wastes, and the role of local government, there are three adjoining issues that concern current policy.

A. Limits to Private/Public Partnerships

Certain private/public partnerships have been very successful in terms of sharing power, providing service, and stabilizing prices —witness the PERC-MRC relationships.

Until recently, financial and environmental risks have limited the number and use of municipal landfills to meet the disposal needs of their municipal owners for solid waste generated within their borders or under contract or agreement with adjacent communities. This status quo has been challenged by proposals for municipal partnerships with private companies that are testing the definition of commercial disposal facilities.

The potential short term advantages for municipalities are: relief from the costs of operations; a reduced or no tip fee for its own solid waste; and, a revenue stream from several possible sources depending upon the terms of the contract. Again depending upon the contract, they may get relief from mitigation, closure, and potential pollution costs connected with a facility.

The private company would receive valuable landfill space in a state with limited permitted sites, with predictable costs and revenues to serve their collection and hauling contracts.

This issue raises many questions, principally; where is the source(s) of the private company's MSW, what types, and volumes of the solid waste would be disposed of; does the use violate state law and would it pass the public benefit determination test. Recent legislation has addressed some of these concerns by prohibiting the disposal of out-of-state wastes into municipal landfills.

B. Changes in Public Attitudes

For generations until the 1970s and into the 1980s, most Mainers lived with unlined open burning dumps within their individual communities, often within a short driving distance to or bordering on residential areas.

Today, environmental, health, and property value considerations, the changing social dynamics around solid waste activities, and concerns over what is in the waste stream and where it is generated are at the forefront of the public's perception about solid waste. Newer facilities built and maintained to stringent environmental standards that were once accepted as part of the local landscape, or even seen as an economic boon to a community, are now often under severe and constant public scrutiny.

It should be noted that all large scale development projects face opposition, even those proposals that seem to benefit the environment. But a 2006 survey published in *Waste News* reflected current public sentiment as waste disposal facilities ranked at the bottom of community development preference, below rock quarries, casinos, and airports.

Communities across Maine have worked for more than a decade to become fully involved in defining what it means to be a host community. Up to now there has been little common ground in discussions of options and alternatives to the present facilities.

This has potentially serious implications for our system that is heavily dependent upon maintaining a small number of relatively large regional waste processing (four W-T-Es) or landfill disposal facilities (eight by 2010).

C. The State of Maine as a Market Participant

Finally, we must consider the effects and future implications of the state as a market regulator and as a market participant. The state has become a market participant with its purchase and operation of the Juniper Ridge Landfill, but not in the manner envisioned by the crafters of the 1989 legislation. It was anticipated that given the eventual demise of the state's two commercial landfills and the reluctance of public entities to seek to replace them with new, large-scale, publicly-owned landfills, that the state would be the provider of last resort of the capacity for the waste streams from the four W-T-Es, special wastes, and CDD, in the manner prescribed in statute. Today, however, unlike the states in the southern tier of New England, Maine continues to have overcapacity in W-T-Es and potentially very significant landfill capacity.

The passage of the legislative resolve of 2003 and the purchase of the landfill bypassed the statutory "trigger" and that anticipated process, but provided the state with the opportunity to gain significant capacity with potentially one of the largest landfills in the Northeast.

We must consider how the capacity at Juniper Ridge can be used to support the hierarchy and to the best advantage for the people of Maine.

Juniper Ridge is already perceived by the private and public waste sectors as having an effect on disposal pricing. It was a significant factor in the decision of Casella Waste Systems, who holds the operating services agreement to operate Juniper Ridge, to close the Pine Tree landfill in Hampden and to permit the CDD processing facility in Westbrook, to aid in fulfilling their obligation under the Operating Services Agreement for the Juniper Ridge Landfill.

Also, Juniper Ridge may be directly impacted over time by the recent legislation defining by-pass and in-state processing wastes as wastes generated within the state. Its capacity may be open for use by those waste streams.

Conclusion: Issues to Watch

Such is Maine's MSW management landscape. But all of these issues and concerns can be turned to our advantage if we apply the hierarchy with all the resources, knowledge and tools developed over the last 20 years, and adhere to the 50% goal as we pursue their solutions.

If the hierarchy is to mean what it says, Maine must move from 'waste management' to 'resource management'. To do so by the 2020s, we must consider what is now called solid waste instead to be feed-stocks and resources from which all potential value is extracted; and we put an end once and for all the practice of down-streaming waste to future generations or someone else, somewhere else.

VI. New Trends

The basic common thread for effective waste management is in the waste itself because there is no difference in the MSW from Berwick to St. Agatha. This commonality of generation, characteristics, and results provides the state with an opportunity to take a lead role in the process of identifying, researching, and if found appropriate for Maine, pushing new trends in MSW management that can be generally applied.

Energy and Greenhouse Gas Initiatives

In 2007 the following language was added to the state waste hierarchy:

> Waste reduction and diversion. It is the policy of the state to actively promote and encourage waste reduction measures from all sources and maximize waste diversion efforts by encouraging new and expanded uses of solid waste generated in this state as a resource (underlining added here for emphasis).

This new language encourages the state to look at new technologies and methods for managing MSW that are currently not part of the waste hierarchy.

Since the first Earth Day, recycling has played a role in discussions on global resource conservation. Now all aspects of solid waste management have been drawn into discussions on several larger environmental issues, such as global warming related to greenhouse gas emissions reduction, changing energy markets, energy self reliance and conservation, toxics reduction, and the carbon cycle. These issues are on the table as we conduct our own debates about what is the best way for us to manage our solid waste, and have the potential to be the controlling issues of the near future.

Landfills are one of the largest human-formed sources of green house gases. Methane, the principle gas released from landfills, is 21 times more potent a greenhouse gas than CO_2. The state of California has estimated that the recycling and composting of all discards would be the equivalent of removing all emissions from all vehicles on their roads.

Recognizing the relationship between solid waste management and greenhouse gases, the US EPA created two web-based tools to aid in this effort: WARM and ReCon.[35]

The Waste Reduction Model (WARM) helps solid waste planners and organizations track greenhouse gas emissions reductions from several different waste management practices. WARM calculates and totals emissions of waste management practices source reduction, recycling, combustion, composting, and landfilling. The model calculates emissions in metric tons of carbon equivalent, metric tons of carbon dioxide equivalent, and energy units across a wide range of material types commonly found in municipal solid waste.

[35] EPA. Office of Climate Change. Waste Web Page.

The Recycled Content (ReCon) Tool helps companies and individuals estimate life-cycle greenhouse gas emissions and energy impacts from purchasing and/or manufacturing materials with varying degrees of post-consumer recycled content.

Maine recognizes the impact of greenhouse gas as well. Maine citizens, the Legislature, and the Executive branch, through the Maine Department of Environmental Protection, are implementing a plan to actively reduce emissions of greenhouse gases in Maine. According to the Department of Environmental Protection, Maine continues to make significant progress toward its goal of reducing greenhouse gas emissions by 10% below 1990 levels by 2020. Maine continued to lead regional efforts toward establishment of the Regional Greenhouse Gas Initiative (RGGI), becoming the first state to adopt rules to implement the program. In addition to directly reducing greenhouse gas emissions in the electrical power sector, the program will generate significant new funds for electrical efficiency investments.

New Technologies

A. Waste Conversion Technologies

There are three broad categories of waste conversion technologies: 1) thermochemical, such as gasification, pyrolysis, and plasma arc technology; 2) physiochemical, such as distillation of ethanol and the production of biodiesel; and 3) biochemical, such as anerobic digestion and ethanol fermentation and hydrolysis.

While research into these technologies is ongoing, key questions remain: do they reduce the carbon footprint, do they reduce the toxics footprint, and do they continue Maine's strong commitment to protect public health and the environment. In general, their touted benefits are lower carbon emissions, lower air emissions, renewable energy, offset fossil fuels, sustainability, and beneficial use of their residual wastes.

Three technologies are briefly discussed here because they are new and have relevance for Maine and large-scale applications for waste management.

1. Gasification

At present, there are gasification proposals being floated in Maine. Gasification is a term that describes a chemical process by which carbonaceous (hydrocarbon) materials (coal, petroleum coke, biomass, etc.) are converted to a synthesis gas (syngas) by means of partial oxidation with air, oxygen, and/or steam.

A hydrocarbon feedstock is fed into a high-pressure, high-temperature chemical reactor (gasifier) containing steam and a limited amount of oxygen. Under these "reducing" conditions, the chemical bonds in the feedstock are severed by the extreme heat and pressure and a syngas is formed. This syngas is primarily a mixture of hydrogen and carbon monoxide. The syngas is then cleansed using systems that remove particulates, sulfur, and trace metals. The resulting gas mixture is itself a fuel.

Gasification is potentially a very efficient method for extracting energy from many different types of organic materials. The potential advantage of gasification is that burning the gas mixture would be more efficient than direct combustion of the original fuel; such as the current W-T-E technology employed in Maine. More of the energy contained in the fuel is extracted. In addition, the high-temperature process refines out corrosive ash elements allowing cleaner gas production from otherwise problematic fuels, and produces lower emissions of greenhouse gases than current W-T-E systems.

2. Plasma Arc Technology

Plasma arc gasification as a waste treatment technology uses high electrical energy and high temperature created by an electrical arc gasifier to break down the waste primarily into elemental gas and a solid waste slag. The process is intended to be a net generator of electricity, depending upon the composition of wastes, and also to reduce the volumes of waste being sent to landfill sites.

A different type of plasma arc waste conversion that uses plasma to refine gases produced during waste conversion, rather than to destroy waste, has recently shown itself to be successful on a full commercial test scale in Ontario. Its emissions are also lower than other thermal waste processing systems, and by converting waste to CO2 and water, rather than to methane, the greenhouse gas emissions of the process are much less than competing technologies.

There has been a number of large scale plasma projects proposed to come on line over the next several years including proposals in Ottawa, Ontario, St. Lucie County, Florida and the city of Tallahassee also in Florida.

3. Landfill Gas-to-energy Projects

This technology actively manages MSW landfills for their gas recovery potential. The gas is then used to fuel generators to produce electricity. Pipes are placed in the landfill; slight pressure is maintained sufficient to draw the gas into a recovery plant but not enough to draw oxygen in through the landfill cap. The gas is then cleaned and piped to the generator plant, which is either connected to the power grid or into a local application. There is also the potential to recover the waste heat created in certain circumstances.

Maine has recently seen its first power to the grid from landfill gas at the Casella facility in Hampden. The amount of solid waste deemed as the minimum amount to make such a project feasible is decreasing, making the technology available for consideration by smaller landfills such as we have in Maine.

Two of those smaller landfills, Bath and Tri-Community in Fort Fairfield are moving forward into the carbon credit market where small facilities are encouraged to reduce their carbon footprint by capturing and flaring landfill gases in exchange for revenue from the credits.

Single Sort Recycling

While not new, but new to Maine in 2007, this collection and processing technology, called “single sort”, offers the ability for recycling programs to collect unsorted, commingled recyclable materials. Its principle benefits are that it is a very efficient collection strategy that also offers convenience that may encourage more people to participate in recycling programs and in turn give the state the opportunity to recycle greater amounts and more items.

Single stream, single sort, fully co-mingled, are all terms used to describe a means for residents and small businesses to mix all recyclables, paper products and containers together in one bin or tote or cart. Those recyclables can then be dropped off into one large undivided container at a recycling drop off facility, or if curbside service is available, collected by one truck with one compartment in which all the recyclables are compacted.

Whether from the drop off facility or by the truck collecting curbside, the mixed recyclables are then transported to a facility, commonly referred to as a “materials recovery facility” or MRF, then and there to be “unmixed”. Separation through a combination of machinery and hand labor prepares them for sale as commodities in the market, and finally materials are shipped to mills around the country and the world.

Thus single stream is a collection <u>and</u> processing operation that emphasizes efficiency in collection in exchange for more expensive infrastructure and more complicated and problematic processing operations. *ecomaine* and FCR Goodman are fully committed to this type of system.

The <u>potential</u> and proven benefits include:

- increased ease and convenience to residents;
- increased participation;
- increased recycling reduces disposal costs;
- wider range of materials: most plastics, most paper grades;
- far less labor intensive: no handling past the collection container;
- compaction, if used, results in fewer trips, lowering transport costs; and
- for curbside, faster collection of materials, collection and transportation savings.

The drawbacks to single sort/single stream are:

- reduced revenue from the sale of recyclables, or the imposition of per ton processing fees, as is currently the case in times of down market cycles;
- communities still need to be involved in quality control process – they cannot leave it all up to the Materials Recovery Facility (MRF); they must keep MRFs “honest” about levels of contamination, residuals etc., not passing on contaminants that increase operating costs and disposal at receiving mills; and
- a loss of 20 years of source separation/quality education of residents, which would be difficult to ‘re-teach’ if is not successful.

Additional questions that communities may want to consider are:

- Is there an additional community benefit (public good will) in continuing with the source separated system?
- Is there a compelling reason to change the current program? Such as going to curbside collection, mandatory recycling or PAYT? Or an external community reason such as a budget crisis?
- Once the program is committed to providing material into a centralized single sort facility, how will single stream facilities react to changes in the marketplace? Will the program end up sharing the costs of processing?
- Will materials from MRFs carry the same reputation in the marketplace as Maine products currently enjoy?
- People still have to overcome their resistance to the basic separation of trash from recyclables. If the program already enjoys a high recycling rate what will be the increase in participation?
- Will the percentage really up-tick, with more people recycling more stuff?
- Does the potential increase in recyclables volume cover the costs of upgrading to a more expensive system?

It remains to be seen what kind of increase in recycling tonnage a program achieves. In other areas, single sort alone has brought an increase of 3-7% in the volume of recyclables.

There are ancillary issues to consider such as local control over the recycling program, the sustainability of existing regional programs that employ source separation in the face of competition with single stream providers, and limited competition in the market (i.e. only two vendors are actively engaged in single sort).

If single sort can deliver the expected growth in recycling tonnages as anticipated by those 50 plus communities that have signed onto it, then it is worthy of serious consideration throughout the state. Initial reports from communities that have adopted single sort are encouraging.

The Product Stewardship Model

The product stewardship model, begun in Maine with the mercury-added products recycling law and then expanded under Maine's first in the nation cathode-ray tube (CRT) management legislation, has recently been expanded again to include thermostats and cellular telephones.

The model puts forth that the responsibility for reducing product impacts on public health and the environment is shared among industry, government, and consumers. Each item of the waste stream is examined for its impacts on the environment, its recyclability, or ease with which it can be returned to the technological resource stream, its marketability, and the condition of those markets. Manufacturers are given guidelines and goals to increase the recyclability of the products and to lower toxicity. Generators are pushed to be responsible and follow the program, and the collective government entities expand access and convenience and enforce the program at all points of the system.

For example, cathode ray tubes (CRTs) found in all televisions and computers prior to flat screen technology contain significant amounts (3-8 lbs.) of lead and other toxic heavy metals.

In Maine, before 2003, these items were landfilled and crushed. The lead was exposed and posed a potential threat to land and water and the health of Maine citizens. To alleviate this risk, the Maine DEP developed legislation that requires the manufacturers to pay for the transportation and recycling of these items generated from Maine households.

The Department also created the regulatory and program structure to achieve this goal efficiently. Municipalities are required to provide the means for home owners to recycle the CRT-containing units. The State Planning Office provided over 1.3 million dollars in grant funding to assist municipalities in developing the CRTs collection infrastructure.

Homeowners are required to separate these items out from their other MSW and deliver them to the appropriate facility or program. Once all program elements were in place, CRTs were banned from disposal and required to be recycled by state law. In Maine to date, several thousand tons of TVs and computer monitors have been recycled through this program.

Product stewardship initiatives are currently being developed in the northeast by the Product Stewardship Institute, of which the Maine DEP is a participating member, and at similar organizations on the west coast, on several products including among others, paint, pesticides, telephone books, carpeting, and pharmaceuticals. By engaging them at the onset of the process, product stewardship efforts encourage manufacturers to take increasing responsibility to reduce the entire life-cycle impacts of a product and its packaging beginning with product design through to its end-of-life management.

Product stewardship is an approach that has the potential to be widely applied to many current products and those new products or new combinations of materials currently making their way into Maine’s MSW stream.

Personal Responsibility

Finally, debates over infrastructure and operations involving hundreds of millions of dollars overshadow and at the same time sidestep the issue of personal responsibility. Products are brought to market and purchased without regard to their disposition after their original use. Generally, there is a disconnection between the consumption of goods and services and the full, life cycle costs; social, environmental, as well as financial of those goods and services.

Municipal solid waste management comes down to mitigating the effects wrought by the choices we make as consumers and the consequences of the actions we take as individuals to manage our own waste. As we move into the next decade, the decisions we make as voting citizens, must shift from personal denial to personal responsibility.

Conclusion: New Trends

Waste management is more than putting garbage at the curb and forgetting it. Economic and environmental considerations dictate that we find new ways to manage our waste and responsibility for this is shared across society. In the future, in Maine and elsewhere, MSW can no longer be considered separately from global environmental issues.

VII. Where Do We Go from Here?

Past plans ('90, '93, '98) focused on the prospects and positive performance of the emergent recycling efforts during those building years. Our perspective is different when we are looking at a mature system and at figures showing us moving away from achieving our stated priorities.

As the current stewards of Maine's MSW program, we know how to protect public health and minimize and mitigate damage to the environment and these will remain our core obligations. But once again as in 1987 we have had extensive public discussion on how we manage our solid waste, and again we have the opportunity to decide what is fitting for Maine. What is our vision of the future, what are our goals for the decades to come? Will it be reactive to external challenges, or will it be forward thinking? We can chart our own course.

This section of the plan describes how Maine might achieve and then move beyond the 50% recycling goal.

Assumptions
The starting point for these strategies is the baseline assumptions of Maine's MSW management out to 2027 at the current 35% recycling rate and a 4% annual increase in waste generation.

Discussion of the growth rate
The 4% annual increase may or may not be viable for all planning scenarios. It is used here because it is based on the growth rate of the previous two decades and because using such a scenario is protective of the state's landfill capacity and of the process required to seek and secure additional new capacity if it be required.

However, the current situation from the latter part 2008 and into 2009 saw flat or declining tonnages at some of Maine's disposal facilities. The economy, particularly the consumer economy, may not come back to present levels for some time and waste is linked to economic activity. Waste reduction strategies in product design, packaging, and consumer choice, may take hold, particularly in this time of economic change, and those strategies may result in permanent reductions in certain components of the MSW stream leading to overall reductions in tonnages.

Thus, the projected 4% growth rate may be too aggressive. It should be qualified by connecting it with overall state economic growth and with progress in waste reduction and other green efforts to slow or reverse the growth of waste. The 4% rate should be seen as the high case Maine's economic growth rate to provide the plan with the background in which to base the forward looking reduction and recycling strategies.

The plan is built from the annual waste generation data contained in the state *Waste Generation and Disposal Capacity Report*. The annual report is aptly more fluid than the plan and reflects actual solid waste conditions in Maine. The plan takes a longer view of waste data in order to assess the effectiveness of statewide policies. It relies on the trends provided over time by the annual data.

Tied to the 4% growth rate question is the issue of the importation of waste. There are questions as to whether or not out-of-state waste will really decline and be supplanted by the growth of in-state waste for the W-T-Es. If delivery numbers from Maine communities continue to decline, due to their economic conditions or recycling and waste reduction efforts, the fuel gap will grow, maintaining the flow of out-of-state wastes.

The Run Up to 50%

A strategy for achieving Maine's 50% recycling goal.

Meeting a 50% recycling goal would extend the life of the state's existing state and municipal land disposal facilities. It would require an increase in recycling by 300,000 more tons a year at today's generation totals and up to 2.3 million tons a year by 2027. It could be accomplished through the expansion of public and private sector recycling efforts. Most local programs could on average achieve a 60% participation rate.

<u>*All strategies and goals assume some level of state assistance within available resources, to encourage these efforts through grants, education, outreach, and technical assistance.*</u>

Objective: Improve collection and participation in public recycling programs.

- Single sort recycling and other efficiency based collection and processing systems would be implemented by all those programs in which the technology demonstrates a clear advantage over their previous method(s). This would include the majority if not all of the most heavily populated areas of the state. It would be combined in many situations with the adoption of curbside collection and PAYT (pay as you throw) programs and an expanded list of items to be recovered.

- Maine materials would still move to market in times of over supply due to improved quality controls installed at the processors and by public education and inspection at the municipal level.

- The relationship of volume to price will stay within acceptable limits (excluding current market conditions) because any potential reduction in revenue will be more than offset by the increase in recycling volume and the decrease in disposal costs.

- The state would provide targeted infrastructure, planning, and equipment grants to regions to improve collection and participation rates..

Objective: Mandate recycling of old corrugated cardboard (OCC).[36]

- OCC is easily identified, easily separated, of good value, and comprises 14% of the MSW stream (excluding CDD). If the majority of recycling programs in Maine had banned corrugated cardboard from disposal, the amount of OCC recycled in 2007 (117,000 tons) would have doubled and thus could have provided <u>20% of the tonnage</u> needed to reach the 50% recycling goal. It is already mandatory for businesses with 15 or more employees to recycle OCC. This strategy would extend that program to all businesses and residences.

Objective: Encourage communities to ban the disposal of leaf and yard waste.

- Municipalities would be encouraged to establish their own leaf and yard waste compost programs to divert up to 13% of their waste stream from disposal and provide quality compost for municipal projects and community use. The goal is to build up the

[36] There has been an ongoing debate on mandatory recycling since the inception of the state recycling goal. There are real questions as to how such programs would gain public acceptance and be monitored and enforced.

composting infrastructure in numbers of locations and the capacity of those locations around the state.

Objective: Encourage recycling the components of the CDD waste stream that can be recycled.

- CDD recycling can have dramatic effects on recycling rates. While they require oversight, space, access, regulatory requirements for operating surface and separation between materials, CDD recycling operations are not complicated and there are many municipal programs in the state with high diversion rates that can serve as model programs and be replicated in other locations. As with the compost facilities, communities would be encouraged to set up and run new programs or expand existing facilities.

Objective: Expand recycling opportunities for commercial sources.

- Businesses would embrace recycling similar to other green energy, efficiency, and green building initiatives. The state would engage business in a public/private grassroots effort to realize the financial and social benefits of recycling, through a grants and technical assistance program through the regional councils as part of their current outreach to business programs. The state will encourage expansion of municipal programs to include recycling from commercial sources.

Objective: Maine state government, the state's largest employer in terms of employees and building square footage, leads by example.

- The state would routinely achieve a 65% recycling rate for its own operations and facilities, including the university and community college systems.

Objective: Continue efforts to remove toxic wastes from Maine's MSW stream.

- Expand the number of permanent HHW facilities from 2 to 16 (every county). Include mobile collection infrastructure with these HHW service centers in order to improve the level of access and convenience for all Maine residents.

Moving Beyond 50%

Once we achieve the 50% goal, what could we do to move beyond it? What if we change our perspective on who's responsible for the products that we make and buy and then no longer want? What if we were to keep the defining line between what we call a waste and what we call a resource always fluid, always moving towards resource?

Beyond 50% will call for building on the steps outlined to get to there and then proceeding on two pathways. One would fully exploit our traditional means of resource recovery. The other would pursue shared responsibility or stewardship for certain individual products or classes of products.

The traditional approach will call for on-going commitments from both the state and municipalities. Not only investments in collection and processing, management and equipment, but recognizing recycling as the centerpiece for managing business' and residents' discards. Waste as unwanted "garbage" must be seen as secondary and only constitutes what has not, as yet, been recycled. Waste systems will be converted to recycling systems and recycling becomes a resource recovery management system.

The second track will entail the development and implementation of a new set of policies based on stewardship of individual products using extended producer responsibility. The goal, to paraphrase the California Product Stewardship Council's mission statement, is to shift Maine's system of managing certain discarded products from one focused on government waste diversion efforts to one that relies on producer responsibility in order to reduce public and environmental costs and drive improvements in product design that promote environmental sustainability.

The following are some of the steps to build all or part of this dual scenario.

A. The State

By direct participation in the management of municipal solid waste, the state will:

Objective: Encourage personal responsibility by building public trust in recycling.

- In order for Mainers to agree to a recycling system, they must trust that: the system is effective; their participation makes a difference; and, is a shared community value that most of the people respect most of the time. This message would be delivered through a continual state public education and awareness campaign in unison with local program elements.

Objective: Enact a statewide ban on the disposal of all commodities for which there is a proven accessible market.

- Cardboard, newspaper, mixed paper, #1, and 2 plastics, steel containers, metals, glass, etc. would be banned from disposal, subject to an emergency provision. The state would provide targeted infrastructure, planning, and equipment recycling and composting grants to regions.

Objective: Encourage the separation and collection of organics, leaf and yard waste and food wastes.

- The full utilization of existing facilities and the development of a system of public and private composting facilities within all major service center areas would support full-scale organics composting.
- Leaf and yard materials would be banned from disposal by 2020.
- Communities that contract for collection service would include organics collection provisions to homes and commercial establishments in their contracts.

Objective: The state would encourage management efficiencies and provide clear state-level direction by:

- Encouraging collection and transportation efficiencies to reduce to the extent practical the energy required to collect and transport Maine's MSW.
- Establishing recycling standards for all materials delivered to disposal facilities and CDD processing facilities based on the waste hierarchy and the state recycling and reduction goals as applied to their annual tonnage.

B. Local Government

Objective: Municipalities join into regional programs in order to take more effective control over their waste streams including the following municipal initiatives:

- Public recycling services would be encouraged through targeted grants to extend to all commercial entities within their jurisdictions;
- Ongoing reuse and recycling clean-up programs would be provided;
- Recycling and trash collection contracting practices in public/private partnerships would be changed so that all parties have the maximum incentive to increase recycling collections tonnage and to process materials to achieve best available market prices as private sector's revenue share (percentage) would increase as recycling tonnage increases. Under the proper structure, the public and private would become genuine partners, both having incentive to maximize recycling and minimize disposal and contamination;
- Recognizing that recycling and composting have to compete with trash for market share, programs would encourage curbside collection, container sizing (larger bins for recycling, smaller bins for garbage), and single sort mechanisms;
- A CDD recycling component would be attached to all building permits, through local ordinance;
- Participation in recycling programs would be incentivized;
- Collection and transportation efficiencies would be increased in order to reduce to the greatest extent practical, the energy required to collect and transport Maine's MSW; and
- 'Flow control' initiatives based on the key points of the Supreme Court ruling would be used.

The state would assist municipalities with enhanced technical and educational recycling assistance for outreach to:

- the commercial sector,
- to multi family units, and
- in public areas and at public events.

C. Product Stewardship

Maine can pursue a product stewardship system by considering each item or class of items and developing legislation, regulations, and programs to address that specific class. This approach has been a success with computer and TV monitors and thermostats —a common process with clear goals but flexible approaches.

As a place to start, the state could use the key elements of our existing electronics waste (E-waste) law as templates for future deliberation. In brief, the basic premise is that the management of products that are disposable and exhibit hazardous characteristic(s) by design and manufacture is not a core function of local government, but should be shared by the producers and consumers and government, with the preponderance of responsibility borne by the producers.

In broad terms, products would be chosen using criteria that looks at their volume, complexity, and characteristics. Complexity refers to the relative ease or difficulty by which the product may be managed through the traditional recycling/resource recovery system.

There would be clear policy goals, guiding principles, definitions, clear roles and responsibilities, governance, products and product categories covered, program effectiveness and measurement. These are the key elements that reflect Maine's E-waste law.

Whichever system we design for the future, the goal is to respond quickly to new products or changes to current products that affect their impact on the environment; identifying them on their way into the market, before they enter the waste stream.

The steps to go beyond 50% could result in the following:

1. Although waste prevention will remain a challenge, as so little of what Mainers consume is produced here, the state will join with other jurisdictions in the region and across the nation to put in place extended producer responsibility programs, using sales bans and mandatory producer recycling efforts and encouraging sustainable purchasing by the retail markets. The reduction and elimination of toxic and complex products will remain the number one priority.

2. There will be on-going public relations and education campaigns across media and in all markets utilizing as many channels as practical with several specific annual elements (for example, Maine Recycles Week, and the yearly best of all media high school and college contests), coordinated through a campus media project and paid for though private sponsorship. The sustained high level of public awareness campaigns may lead to Maine produced ads and advertising agencies finding their way into the national marketplace.

3. There would be a significant increase in recycling volume and participation after the statewide ban on the disposal of all materials for which there was an established, proven market demand; eventually including all fiber products, 1-7 plastics, metals, and glass. Despite some predictable market fluctuations, additional gains would be realized when it becomes the accepted practice for municipalities to extend public recycling services to all commercial entities. With quality assurance practices in place, collection and processing systems such as single stream would be widespread.

4. Market demand and prices for recycled commodities in the long term will remain stable. The overseas markets will mature, as they produce more of their own recycled commodities, but rising standards of living across the globe and the high cost of energy and the relatively low cost and energy efficient nature of recycled resources over virgin extraction will keep them attractive to the market.

5. Local governments' role in MSW management will remain essential as they are encouraged to join into regional entities, a process may lead to the development of several regional waste-to-resources master plans.

6. Although the state will not find it necessary to impose a full ban on the disposal of all organics, local programs will be given incentives and encouraged through grants and aid to pursue the separation and collection of organics, including the full utilization of existing facilities and the development of a system of public and private composting facilities within all major service center areas. Thus, communities that contract for collection service will be rewarded if they included organics collection provisions to homes and commercial establishments in their contracts.

7. There would certainly be effects on and to the state's recycling and disposal capacity. As local recycling programs grow in volume, they will need to choose between expansion of local collection and processing capacity through their own capital investment, and combining with or into larger regional efforts. Among the outcomes would be to extend the life of the state's existing land disposal capacity.

D. Waste and Greenhouse Gases

Addressing waste generation and its impact on disposal capacity and toxicity of waste is only part of an effort to move beyond 50%. To truly move from a waste to resource, we must also look at larger environmental issues such as climate change related to greenhouse gas emissions.

To move beyond 50%, the state of Maine could establish an emissions goal for all waste management facilities:

- through an expanded hierarchy;
- directed by a state solid waste greenhouse gas initiative;
- to take into account energy and emissions using the improved life cycle analysis WARM (model) or the best available technology;

Performance standards for all recycling and waste facilities would be developed so that those facilities may be issued a greenhouse gas initiative rating. The performance measure will encourage collection and transportation efficiencies to reduce to the greatest extent practical the energy required to collect and transport Maine's MSW and the emissions from our facilities.

Common Threads

Maine's solid waste program managers will make their own plans for the future. They may choose to use all or parts of the scenarios outlined in the plan or something else entirely. But there are some common threads that ought to be included as essential parts in any effort from the smallest local program to statewide initiatives.

1. **Waste prevention remains the top priority**. It is the goal of the state to take advantage of every available means to change practices at the source of production through state, local, and regional projects, using all levels of technical and financial assistance, voluntary agreements, and legislative action to reduce the amount of solid waste we produce.

2. **It is the goal of the state to maintain and promote recycling as Maine's preferred solid waste management method.** Recycling is cost-effective and we should actively seek ways to increase recycling tonnage. It will extend the life of existing land disposal facilities and lower health and environmental risks.
3. **It is the goal of the state to continue to make every effort to remove toxics from our MSW stream**. As its has with mercury products, CRTs, and now cell phones, we must continue to find and extract those toxic products from the waste stream and assign appropriate responsibility for their sound and sustainable management. We must find and continue support for household hazardous waste collection and look to find ways to include remedies for very small quantity commercial generators of similar waste types and amounts.
4. **It is the goal of the state to include greenhouse gas emissions reduction, energy self-reliance, and energy conservation** in our present operations and future waste management plans. We should develop measurement and reporting tools so that all parts of our system are aware of the effects and consequences of their operations. This could mean using the EPA WARM system, available life cycle analysis, or any improvement upon those systems.
5. **It is the goal of the state to promote personal responsibility**. If we produce waste, our responsibility does not end at the curb. We are responsible for it as long as it remains waste. In effect, it stays in our custody.

Conclusion: We Have a Choice

Maine is at a crossroads. After 20 years, we have achieved laudable results. We have dramatically reduced the environmental risks posed by our disposal facilities. We have a waste management system that effectively handles the waste we generate. Guided by ambitious goals, with minimal incentives, municipalities and businesses voluntarily recycle a third of Maine's waste stream. We can continue with minimal investment to maintain an effective and respectable system. Or we can go beyond that. We can change the way we view waste. We can enact more aggressive waste management policies. We can make new investments. We can adopt more rigorous standards and regulations. It's a matter for policy makers to choose.

Appendix A: Statutory References for the Plan

These chapters are edited for relevancy to the purposes of this section.

Title 38: Chapter 13: Subchapter 1-A: Article 3: §1310-N. Solid waste facility licenses
1. Licenses. The department shall issue a license for a waste facility whenever it finds that:
C. In the case of a disposal facility or a solid waste processing facility that generates residue requiring disposal, the volume of the waste and the risks related to its handling and disposal have been reduced to the maximum practical extent by recycling and source reduction prior to disposal.
3. Public benefit determination.
5. Recycling and source reduction determination.
5-A. Recycling and source reduction determination. The requirements of this subsection apply to solid waste disposal facilities and to solid waste processing facilities that generate residue requiring disposal.
A. An applicant for a new or expanded solid waste disposal facility shall demonstrate that:
(1) The proposed solid waste disposal facility will accept solid waste that is subject to recycling and source reduction programs, voluntary or otherwise, at least as effective as those imposed by this chapter and other provisions of state law. The department shall attach this requirement as a standard condition to the license of a solid waste disposal facility governing the future acceptance of solid waste at the proposed facility; and
(2) The applicant has shown consistency with the recycling provisions of the state plan.
B. The provisions of this paragraph apply to solid waste processing facilities that generate residue requiring disposal.
(2) A solid waste processing facility that generates residue requiring disposal shall recycle or process into fuel for combustion all waste accepted at the facility to the maximum extent practicable, but in no case at a rate less than 50%. For purposes of this subsection, "recycle" includes, but is not limited to, reuse of waste as shaping, grading or alternative daily cover materials at landfills; aggregate material in construction; and boiler fuel substitutes.
(3) A solid waste processing facility subject to this paragraph shall demonstrate consistency with the recycling provisions of the state plan.

Title 38: Chapter 13: Subchapter 1-A: Article 3: §1310-AA. Public benefit determination
1-A. Public benefit determination for acceptance by publicly owned solid waste landfills of waste generated out of state. Prior to accepting waste that is not generated within the State, a solid waste facility that is subject to this subsection shall apply to the commissioner for a determination of whether the acceptance of the waste provides a substantial public benefit.
2. Process. … In making the determination of whether the facility under subsection 1 or the acceptance of waste that is not generated within the State under subsection 1-A provides a substantial public benefit, the commissioner shall consider the state plan,……..
3. Standards for determination. The commissioner shall find that the proposed facility under subsection 1 or the acceptance of waste that is not generated within the State under subsection 1-A provides a substantial public benefit if the applicant demonstrates to the commissioner that the proposed facility or the acceptance of waste that is not generated within the State:
A. Meets immediate, short-term or long-term capacity needs of the State;

B. Except for expansion of a commercial solid waste disposal facility that accepts only special waste for landfilling, is consistent with the state waste management and recycling plan;
C. Is not inconsistent with local, regional or state waste collection, storage, transportation, processing or disposal;

The following statutes also have bearing on the purposes of this section:

Title 38: Chapter 24: Subchapter 1: §2101. Solid waste management hierarchy
1. Priorities. It is the policy of the State to plan for and implement an integrated approach to solid waste management for solid waste generated in this State and solid waste imported into this State, which must be based on the following order of priority:
A. Reduction of waste generated at the source, including both amount and toxicity of the waste;
B. Reuse of waste;
C. Recycling of waste;
D. Composting of biodegradable waste;
E. Waste processing that reduces the volume of waste needing land disposal, including incineration; and
F. Land disposal of waste.
It is the policy of the State to use the order of priority in this subsection as a guiding principle in making decisions related to solid waste management.

2. Waste reduction and diversion. It is the policy of the State to actively promote and encourage waste reduction measures from all sources and maximize waste diversion efforts by encouraging new and expanded uses of solid waste generated in this State as a resource.

Title 38: Chapter 24: Subchapter 3: §2132. State goals
1. State recycling goal. It is the goal of the State to recycle or compost, by January 1, 2009, 50% of the municipal solid waste tonnage generated each year within the State.

1-A. State waste reduction goal. It is the goal of the State to reduce the biennial generation of municipal solid waste tonnage by 5% by January 1, 2009 and by an additional 5% every subsequent 2 years. This reduction in solid waste tonnage, after January 1, 2009, is a biennial goal. The baseline for calculating this reduction is the 2003 solid waste generation data gathered by the office.

Title 38 MRSA §2122. State waste management and recycling plan
The office shall prepare an analysis of, and a plan for, the management, reduction and recycling of solid waste for the State. The plan must be based on the priorities and recycling goals established in sections 2101 and 2132. The plan must provide guidance and direction to municipalities in planning and implementing waste management and recycling programs at the state, regional and local levels.

1. Consultation. In developing the state plan, the office shall consult with the department. The office shall solicit public input and may hold hearings in different regions of the State.

2. Revisions. The office shall revise the analysis by January 1, 1998 and every 5 years after that time to incorporate changes in waste generation trends, changes in waste recycling and disposal technologies, development of new waste generating activities and other factors affecting solid waste management as the office finds appropriate.

§2123-A. State plan contents

The state plan includes the following elements.

1. Waste characterization. The state plan must be based on a comprehensive analysis of solid waste generated, recycled and disposed of in the State. Data collected must include, but not be limited to, the source, type and amount of waste currently generated; and the costs and types of waste management employed including recycling, composting, landspreading, incineration or landfilling.

2. Waste reduction and recycling assessment. The state plan must include an assessment of the extent to which waste generation could be reduced at the source and the extent to which recycling can be increased.

3. Determination of existing and potential disposal capacity. The state plan must identify existing solid waste disposal and management capacity within the State and the potential for expansion of that capacity.

4. Projected demand for capacity. The state plan must identify the need in the State for current and future solid waste disposal capacity by type of solid waste, including identification of need over the next 5-year, 10-year and 20-year periods.

§2124. Reports

The office shall submit the plan and subsequent revisions to the Governor, the department and the joint standing committee of the Legislature having jurisdiction over natural resource matters.

Appendix B: Municipal Cost of Solid Waste Management: Contrasting Profiles

The communities of Hartford, ME (pop. 963) and Portland (pop. 64,249) offer two very different perspectives on the costs of managing solid waste.[37]

Town of Hartford

- Contracts for curbside MSW and recyclable collection
- Operates small bulky waste transfer station
- MSW Disposal at Crossroads Landfill at $70.50/ton
- Expenses paid from tax revenue

The Town of Hartford, with a population of 963 and 364 year-round housing units, contracts with Archie's, a local trash collection firm, for curbside municipal solid waste collection that is disposed of at Waste Management's Crossroads Landfill. Recyclables are also collected curbside by Archies. Hartford pays a disposal tip fee of $70.50/ton. Hartford has 206 seasonal housing units, and a large summer population. Hartford operates a small transfer station for construction/demolition debris, large bulky items, and metal appliances. In 2005, Hartford disposed of 380.63 tons of municipal solid waste, which is equivalent to 790.6 pounds per person, and recycled 115.71 tons of municipal solid waste, which was equivalent to 240.4 pounds per person.

As shown in the chart below, Hartford spent a total of $58,050, or $60.28 per person:

Personnel	$1,200
Curbside MSW Collection	$25,920
MSW Disposal Fee	$26,155
Recycling	$1,000
Bulky	$3,775
Total:	$58,050

City of Portland

- Provides full service recycling, MSW and bulky waste disposal
- Municipal employees collect residential MSW and recyclables curbside
- Residents "pay-by-the-bag" (PAYT) for solid waste removal
- City operates Riverside bulky waste processing facility
- MSW Disposal at Ecomaine $88/ton + additional financial assessments
- Expenses paid by tax revenue and from the PAYT fees and bulky waste fees

[37] Information presented in these profiles is based upon the annual solid waste management reports submitted to the State Planning Office

The City of Portland, with a population of 64,249 and 29,714 year round housing units, has its public works employees provide curbside pick-up of MSW and recyclables. Portland has a ‘pay by the bag’ trash collection program, where residents are charged $.95 for a 30-gallon bag of trash and $.47 for a 15-gallon bag of trash. Portland has a crew of 20 in solid waste and recycling collection and operates six recycling trucks, four solid waste trucks, and one roll-off truck. Portland services single-dwelling homes and apartment buildings with up to nine units. Portland is a member of *ecomaine*, formerly Regional Waste Systems, where its MSW is incinerated and recyclables processed.

Portland residents have the option of curbside recycling pick-up, or drop-off at 14 recycling roll-off containers placed around the city.

Portland contracts with Commercial Paving and Recycling Company to operate the Riverside Bulky Processing Facility. This facility is open to Portland residents and businesses, as well as surrounding municipalities. Residents and businesses in Portland account for about one-half of the material received at Riverside. The Riverside facility is staffed by four Portland employees and 8-10 Commercial Paving and Recycling Company employees. Portland residents receive an annual punch-pass for their use of the facility. Businesses and commercial waste operators are charged a fee for using Riverside

In 2005, the single-family dwellings and qualified apartment building residents generated 12,249 tons of municipal solid waste, or about 381.2 pounds per person. The city collected 5,018 tons of recyclables, and *ecomaine* recycled 151 tons of metal for a total of 5,169 tons, or 161 pounds per person. About two-fifths of Portland’s solid waste and recycling program is paid through fees collected, and three-fifths from tax revenue.

As shown in the chart below, Portland spent $5,351,834, or $83.30 per person, though not all residents qualified to receive the solid waste services provided by the city:

Personnel	$779,954
Equipment Purchase	$160,000
Equipment maintenance	$101,320
Spring Clean-Up	$100,000
MSW Disposal	$1,110,560
ecomaine Assessment	$1,100,000
Riverside Facility	$2,000,000
Total:	$5,351,834

These two examples highlight the complexity in cost and other points of comparisons between the over three hundred municipal programs and operating systems.

Advancing Sustainable Materials Management: 2014 Tables and Figures

Assessing Trends in Material Generation, Recycling, Composting, Combustion with Energy Recovery and Landfilling in the United States

December 2016

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Table 1. Materials Generated* in the Municipal Waste Stream, 1960 to 2014

(In thousands of tons and percent of total generation)

Materials	Thousands of Tons									
	1960	1970	1980	1990	2000	2005	2010	2012	2013	2014
Paper and Paperboard	29,990	44,310	55,160	72,730	87,740	84,840	71,310	68,620	68,560	68,610
Glass	6,720	12,740	15,130	13,100	12,770	12,540	11,520	11,590	11,540	11,480
Metals										
Ferrous	10,300	12,360	12,620	12,640	14,150	15,210	16,920	16,940	17,720	17,690
Aluminum	340	800	1,730	2,810	3,190	3,330	3,510	3,510	3,500	3,530
Other Nonferrous	180	670	1,160	1,100	1,600	1,860	2,020	1,980	2,010	2,040
Total Metals	*10,820*	*13,830*	*15,510*	*16,550*	*18,940*	*20,400*	22,450	22,430	23,230	23,260
Plastics	390	2,900	6,830	17,130	25,550	29,380	31,400	31,920	32,620	33,250
Rubber and Leather	1,840	2,970	4,200	5,790	6,670	7,290	7,750	8,100	8,350	8,210
Textiles	1,760	2,040	2,530	5,810	9,480	11,510	13,220	14,500	15,320	16,220
Wood	3,030	3,720	7,010	12,210	13,570	14,790	15,710	15,820	15,770	16,120
Other **	70	770	2,520	3,190	4,000	4,290	4,710	4,570	4,440	4,440
Total Materials in Products	54,620	83,280	108,890	146,510	178,720	185,040	178,070	177,550	179,830	181,590
Other Wastes										
Food	12,200	12,800	13,000	23,860	30,700	32,930	35,740	36,430	37,060	38,400
Yard Trimmings	20,000	23,200	27,500	35,000	30,530	32,070	33,400	33,960	34,200	34,500
Miscellaneous Inorganic Wastes	1,300	1,780	2,250	2,900	3,500	3,690	3,840	3,900	3,930	3,970
Total Other Wastes	33,500	37,780	42,750	61,760	64,730	68,690	72,980	74,290	75,190	76,870
Total MSW Generated - Weight	88,120	121,060	151,640	208,270	243,450	253,730	251,050	251,840	255,020	258,460

Materials	Percent of Total Generation									
	1960	1970	1980	1990	2000	2005	2010	2012	2013	2014
Paper and Paperboard	34.0%	36.6%	36.4%	34.9%	36.0%	33.4%	28.4%	27.2%	26.9%	26.5%
Glass	7.6%	10.5%	10.0%	6.3%	5.2%	4.9%	4.6%	4.6%	4.5%	4.4%
Metals										
Ferrous	11.7%	10.2%	8.3%	6.1%	5.8%	6.0%	6.7%	6.7%	6.9%	6.8%
Aluminum	0.4%	0.7%	1.1%	1.3%	1.3%	1.3%	1.4%	1.4%	1.4%	1.4%
Other Nonferrous	0.2%	0.6%	0.8%	0.5%	0.7%	0.7%	0.8%	0.8%	0.8%	0.8%
Total Metals	*12.3%*	*11.4%*	*10.2%*	*7.9%*	*7.8%*	*8.0%*	*8.9%*	*8.9%*	*9.1%*	*9.0%*
Plastics	0.4%	2.4%	4.5%	8.2%	10.5%	11.6%	12.5%	12.7%	12.8%	12.9%
Rubber and Leather	2.1%	2.5%	2.8%	2.8%	2.7%	2.9%	3.1%	3.2%	3.3%	3.2%
Textiles	2.0%	1.7%	1.7%	2.8%	3.9%	4.5%	5.3%	5.8%	6.0%	6.3%
Wood	3.4%	3.1%	4.6%	5.9%	5.6%	5.8%	6.3%	6.3%	6.2%	6.2%
Other **	0.1%	0.6%	1.7%	1.5%	1.6%	1.7%	1.9%	1.8%	1.7%	1.7%
Total Materials in Products	62.0%	68.8%	71.8%	70.3%	73.4%	72.9%	70.9%	70.5%	70.5%	70.3%
Other Wastes										
Food	13.8%	10.6%	8.6%	11.5%	12.6%	13.0%	14.2%	14.5%	14.5%	14.9%
Yard Trimmings	22.7%	19.2%	18.1%	16.8%	12.5%	12.6%	13.3%	13.5%	13.4%	13.3%
Miscellaneous Inorganic Wastes	1.5%	1.5%	1.5%	1.4%	1.4%	1.5%	1.5%	1.5%	1.5%	1.5%
Total Other Wastes	38.0%	31.2%	28.2%	29.7%	26.6%	27.1%	29.1%	29.5%	29.5%	29.7%
Total MSW Generated - %	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

* Generation before materials recycling, composting, combustion with energy recovery, or landfilling. Does not include construction & demolition debris, industrial process wastes, or certain other wastes. Details may not add to totals due to rounding.

** Includes electrolytes in batteries and fluff pulp, feces, and urine in disposable diapers.

Table 2. Materials Recycled and Composted* in Municipal Solid Waste, 1960 to 2014

(In thousands of tons and percent of generation of each material)

Materials	Thousands of Tons									
	1960	1970	1980	1990	2000	2005	2010	2012	2013	2014
Paper and Paperboard	5,080	6,770	11,740	20,230	37,560	41,960	44,570	44,360	43,400	44,400
Glass	100	160	750	2,630	2,880	2,590	3,130	3,210	3,150	2,990
Metals										
Ferrous	50	150	370	2,230	4,680	5,020	5,800	5,590	5,870	5,840
Aluminum	Neg.	10	310	1,010	860	690	680	710	700	700
Other Nonferrous	Neg.	320	540	730	1,060	1,280	1,440	1,390	1,370	1,360
Total Metals	*50*	*480*	*1,220*	*3,970*	*6,600*	*6,990*	7,920	7,690	7,940	7,900
Plastics	Neg.	Neg.	20	370	1,480	1,780	2,500	2,790	2,990	3,170
Rubber and Leather	330	250	130	370	820	1,050	1,440	1,500	1,490	1,440
Textiles	50	60	160	660	1,320	1,830	2,050	2,290	2,380	2,620
Wood	Neg.	Neg.	Neg.	130	1,370	1,830	2,280	2,410	2,470	2,570
Other **	Neg.	300	500	680	980	1,210	1,370	1,310	1,300	1,290
Total Materials in Products	5,610	8,020	14,520	29,040	53,010	59,240	65,260	65,560	65,120	66,380
Other Wastes										
Food	Neg.	Neg.	Neg.	Neg.	680	690	970	1,740	1,840	1,940
Yard Trimmings	Neg.	Neg.	Neg.	4,200	15,770	19,860	19,200	19,590	20,600	21,080
Miscellaneous Inorganic Wastes	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.
Total Other Wastes	Neg.	Neg.	Neg.	4,200	16,450	20,550	20,170	21,330	22,440	23,020
Total MSW Recycled and Composted - Weight	5,610	8,020	14,520	33,240	69,460	79,790	85,430	86,890	87,560	89,400

Materials	Percent of Generation of Each Material									
	1960	1970	1980	1990	2000	2005	2010	2012	2013	2014
Paper and Paperboard	16.9%	15.3%	21.3%	27.8%	42.8%	49.5%	62.5%	64.6%	63.3%	64.7%
Glass	1.5%	1.3%	5.0%	20.1%	22.6%	20.7%	27.2%	27.7%	27.3%	26.0%
Metals										
Ferrous	0.5%	1.2%	2.9%	17.6%	33.1%	33.0%	34.3%	33.0%	33.1%	33.0%
Aluminum	Neg.	1.3%	17.9%	35.9%	27.0%	20.7%	19.4%	20.2%	20.0%	19.8%
Other Nonferrous	Neg.	47.8%	46.6%	66.4%	66.3%	68.8%	71.3%	70.2%	68.2%	66.7%
Total Metals	*0.5%*	*3.5%*	*7.9%*	*24.0%*	*34.8%*	*34.3%*	35.3%	34.3%	34.2%	34.0%
Plastics	Neg.	Neg.	0.3%	2.2%	5.8%	6.1%	8.0%	8.7%	9.2%	9.5%
Rubber and Leather	17.9%	8.4%	3.1%	6.4%	12.3%	14.4%	18.6%	18.5%	17.8%	17.5%
Textiles	2.8%	2.9%	6.3%	11.4%	13.9%	15.9%	15.5%	15.8%	15.5%	16.2%
Wood	Neg.	Neg.	Neg.	1.1%	10.1%	12.4%	14.5%	15.2%	15.7%	15.9%
Other **	Neg.	39.0%	19.8%	21.3%	24.5%	28.2%	29.1%	28.7%	29.3%	29.1%
Total Materials in Products	10.3%	9.6%	13.3%	19.8%	29.7%	32.0%	36.6%	36.9%	36.2%	36.6%
Other Wastes										
Food, Other^	Neg.	Neg.	Neg.	Neg.	2.2%	2.1%	2.7%	4.8%	5.0%	5.1%
Yard Trimmings	Neg.	Neg.	Neg.	12.0%	51.7%	61.9%	57.5%	57.7%	60.2%	61.1%
Miscellaneous Inorganic Wastes	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.
Total Other Wastes	Neg.	Neg.	Neg.	6.8%	25.4%	29.9%	27.6%	28.7%	29.8%	29.9%
Total MSW Recycled and Composted - %	6.4%	6.6%	9.6%	16.0%	28.5%	31.4%	34.0%	34.5%	34.3%	34.6%

* Recycling and composting of postconsumer wastes; does not include converting/fabrication scrap. Details may not add to totals due to rounding.

** Collection of electrolytes in batteries; probably not recycled.

Neg = Less than 5,000 tons or 0.05 percent.

^ Includes paper and mixed MSW for composting.

Table 3. Materials Combusted with Energy Recovery* in the Municipal Waste Stream, 1960 to 2014

(In thousands of tons and percent of total combusted)

Materials	Thousands of Tons									
	1960	1970	1980	1990	2000	2005	2010	2012	2013	2014
Paper and Paperboard		150	860	8,930	9,730	7,800	4,740	4,770	4,990	4,740
Glass		60	300	1,810	1,790	1,660	1,360	1,480	1,450	1,450
Metals										
Ferrous		60	250	1,690	1,610	1,640	1,810	2,020	2,040	2,020
Aluminum		0	30	300	390	410	440	470	460	470
Other Nonferrous		0	20	60	50	50	60	60	50	50
Total Metals		60	300	2,050	2,050	2,100	2,310	2,550	2,550	2,540
Plastics		0	140	2,980	4,120	4,330	4,530	4,990	4,910	4,980
Rubber and Leather		10	70	830	1,970	2,110	1,910	2,350	2,710	2,620
Textiles		10	50	880	1,880	2,110	2,270	2,790	3,030	3,140
Wood		10	150	2,080	2,290	2,270	2,310	2,550	2,500	2,540
Other **		0	30	410	540	510	540	590	580	570
Total Materials in Products		300	1,900	19,970	24,370	22,890	19,970	22,070	22,720	22,580
Other Wastes										
Food		50	260	4,060	5,820	5,870	6,150	6,830	6,970	7,150
Yard Trimmings		90	550	5,240	2,860	2,220	2,510	2,830	2,690	2,630
Miscellaneous Inorganic Wastes		10	50	490	680	670	680	770	780	780
Total Other Wastes		150	860	9,790	9,360	8,760	9,340	10,430	10,440	10,560
Total MSW Combusted - Weight		450	2,760	29,760	33,730	31,650	29,310	32,500	33,160	33,140
Materials	**Percent of Total Combusted**									
	1960	1970	1980	1990	2000	2005	2010	2012	2013	2014
Paper and Paperboard		33.3%	31.2%	30.0%	28.8%	24.6%	16.2%	14.7%	15.0%	14.3%
Glass		13.3%	10.9%	6.1%	5.3%	5.2%	4.6%	4.6%	4.4%	4.4%
Metals										
Ferrous		13.3%	9.0%	5.7%	4.8%	5.2%	6.2%	6.2%	6.2%	6.1%
Aluminum		0.0%	1.1%	1.0%	1.2%	1.3%	1.5%	1.4%	1.4%	1.4%
Other Nonferrous		0.0%	0.7%	0.2%	0.1%	0.1%	0.2%	0.2%	0.2%	0.2%
Total Metals		13.3%	10.8%	6.9%	6.1%	6.6%	7.9%	7.8%	7.8%	7.7%
Plastics		Neg.	5.1%	10.0%	12.2%	13.7%	15.5%	15.4%	14.8%	15.0%
Rubber and Leather		2.2%	2.5%	2.8%	5.9%	6.7%	6.5%	7.2%	8.2%	7.9%
Textiles		2.2%	1.8%	2.9%	5.6%	6.7%	7.7%	8.6%	9.1%	9.5%
Wood		2.2%	5.4%	7.0%	6.8%	7.2%	7.9%	7.8%	7.5%	7.7%
Other **		Neg.	1.1%	1.4%	1.6%	1.6%	1.8%	1.8%	1.7%	1.7%
Total Materials in Products		66.6%	68.8%	67.1%	72.3%	72.3%	68.1%	67.9%	68.5%	68.1%
Other Wastes										
Food		11.1%	9.4%	13.6%	17.3%	18.5%	21.0%	21.0%	21.0%	21.6%
Yard Trimmings		20.0%	20.0%	17.6%	8.5%	7.0%	8.6%	8.7%	8.1%	7.9%
Miscellaneous Inorganic Wastes		2.3%	1.8%	1.7%	1.9%	2.1%	2.3%	2.4%	2.4%	2.4%
Total Other Wastes		33.4%	31.2%	32.9%	27.7%	27.7%	31.9%	32.1%	31.5%	31.9%
Total MSW Combusted with Energy Recovery- %		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

* Products and materials combusted with energy recovery estimated at percentage total MSW after recycling and composting. In 2014, 19.6 percent of MSW after recycling and composting was combusted with energy recovery except for major appliances, tires, and lead-acid batteries (see Table 16). No combustion with energy recovery in 1960 (see Table 35). Does not include construction & demolition debris, industrial process wastes, or certain other wastes. Details may not add to totals due to rounding.

** Includes electrolytes in batteries and fluff pulp, feces, and urine in disposable diapers.

Table 4. Materials Landfilled* in the Municipal Waste Stream, 1960 to 2014
(In thousands of tons and percent of total landfilled)

Materials	Thousands of Tons									
	1960	1970	1980	1990	2000	2005	2010	2012	2013	2014
Paper and Paperboard	24,910	37,390	42,560	43,570	40,450	35,080	22,000	19,490	20,170	19,470
Glass	6,620	12,520	14,080	8,660	8,100	8,290	7,030	6,900	6,940	7,040
Metals										
Ferrous	10,250	12,150	12,000	8,720	7,860	8,550	9,310	9,330	9,810	9,830
Aluminum	340	790	1,390	1,500	1,940	2,230	2,390	2,330	2,340	2,360
Other Nonferrous	180	350	600	310	490	530	520	530	590	630
Total Metals	*10,770*	*13,290*	*13,990*	*10,530*	*10,290*	*11,310*	12,220	12,190	12,740	12,820
Plastics	390	2,900	6,670	13,780	19,950	23,270	24,370	24,140	24,720	25,100
Rubber and Leather	1,510	2,710	4,000	4,590	3,880	4,130	4,400	4,250	4,150	4,150
Textiles	1,710	1,970	2,320	4,270	6,280	7,570	8,900	9,420	9,910	10,460
Wood	3,030	3,710	6,860	10,000	9,910	10,690	11,120	10,860	10,800	11,010
Other **	70	470	1,990	2,100	2,480	2,570	2,800	2,670	2,560	2,580
Total Materials in Products	49,010	74,960	92,470	97,500	101,340	102,910	92,840	89,920	91,990	92,630
Other Wastes										
Food	12,200	12,750	12,740	19,800	24,200	26,370	28,620	27,860	28,250	29,310
Yard Trimmings	20,000	23,110	26,950	25,560	11,900	9,990	11,690	11,540	10,910	10,790
Miscellaneous Inorganic Wastes	1,300	1,770	2,200	2,410	2,820	3,020	3,160	3,130	3,150	3,190
Total Other Wastes	33,500	37,630	41,890	47,770	38,920	39,380	43,470	42,530	42,310	43,290
Total MSW Landfilled - Weight	82,510	112,590	134,360	145,270	140,260	142,290	136,310	132,450	134,300	135,920

Materials	Percent of Total Landfilled									
	1960	1970	1980	1990	2000	2005	2010	2012	2013	2014
Paper and Paperboard	30.2%	33.2%	31.7%	30.0%	28.8%	24.7%	16.1%	14.7%	15.0%	14.3%
Glass	8.0%	11.1%	10.5%	6.0%	5.8%	5.8%	5.1%	5.2%	5.2%	5.2%
Metals										
Ferrous	12.4%	10.8%	8.9%	6.0%	5.6%	6.0%	6.8%	7.0%	7.3%	7.2%
Aluminum	0.4%	0.7%	1.0%	1.0%	1.4%	1.6%	1.8%	1.8%	1.7%	1.7%
Other Nonferrous	0.2%	0.3%	0.4%	0.2%	0.3%	0.3%	0.4%	0.4%	0.5%	0.5%
Total Metals	*13.0%*	*11.8%*	*10.3%*	*7.2%*	*7.3%*	*7.9%*	9.0%	9.2%	9.5%	9.4%
Plastics	0.5%	2.6%	5.0%	9.5%	14.2%	16.4%	17.9%	18.2%	18.4%	18.5%
Rubber and Leather	1.8%	2.4%	3.0%	3.2%	2.8%	2.9%	3.2%	3.2%	3.1%	3.1%
Textiles	2.1%	1.7%	1.7%	2.9%	4.5%	5.3%	6.5%	7.1%	7.4%	7.7%
Wood	3.7%	3.3%	5.1%	6.9%	7.1%	7.5%	8.2%	8.2%	8.0%	8.1%
Other **	0.1%	0.4%	1.5%	1.4%	1.8%	1.8%	2.1%	2.0%	1.9%	1.9%
Total Materials in Products	59.4%	66.6%	68.8%	67.1%	72.3%	72.3%	68.1%	67.9%	68.5%	68.2%
Other Wastes										
Food	14.8%	11.3%	9.5%	13.6%	17.3%	18.5%	21.0%	21.0%	21.0%	21.6%
Yard Trimmings	24.2%	20.5%	20.1%	17.6%	8.5%	7.0%	8.6%	8.7%	8.1%	7.9%
Miscellaneous Inorganic Wastes	1.6%	1.6%	1.6%	1.7%	1.9%	2.2%	2.3%	2.4%	2.4%	2.3%
Total Other Wastes	40.6%	33.4%	31.2%	32.9%	27.7%	27.7%	31.9%	32.1%	31.5%	31.8%
Total MSW Landfilled - %	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

* Landfilling after recycling, composting, and combustion with energy recovery. Does not include construction & demolition debris, industrial process wastes, or certain other wastes. Details may not add to totals due to rounding.

** Includes electrolytes in batteries and fluff pulp, feces, and urine in disposable diapers.

Table 5. Paper and Paperboard Products In MSW, 2014
(In thousands of tons and percent of generation)

Product Category	Generation	Recycled		Combusted with Energy Recovery	Landfilled
	(Thousand tons)	(Thousand tons)	(Percent of generation)	(Thousand tons)	(Thousand tons)
Nondurable Goods					
Newspapers/Mechanical Papers†	7,620	5,200	68.2%	470	1,950
Books	830				
Magazines	1,260				
Office-type Papers*	4,530				
Standard Mail**	4,050				
Other Commercial Printing	2,190				
Tissue Paper and Towels	3,640				
Paper Plates and Cups	1,380				
Other Nonpackaging Paper***	3,970				
Subtotal Nondurable Goods excluding Newspaper/Mechanical Papers§	21,850	9,710	44.4%	2,380	9,760
Total Paper and Paperboard Nondurable Goods	29,470	14,910	50.6%	2,850	11,710
Containers and Packaging					
Corrugated Boxes	30,490	27,280	89.5%	630	2,580
Gable Top/Aseptic Cartons‡	590				
Folding Cartons	5,410				
Other Paperboard Packaging	70				
Bags and Sacks	880				
Other Paper Packaging	1,690				
Subtotal Containers and Packaging excluding Corrugated Boxes§	8,640	2,210	25.6%	1,260	5,170
Total Paper and Paperboard Containers and Packaging	39,130	29,490	75.4%	1,890	7,750
Total Paper and Paperboard^	**68,600**	**44,400**	**64.7%**	**4,740**	**19,460**

† Starting in 2010, newsprint and groundwood inserts expanded to include directories and other mechanical papers previously counted as Other Commercial Printing.
* High-grade papers such as copy paper and printer paper; both residential and commercial.
** Formerly called Third Class Mail by the U.S. Postal Service.
*** Includes paper in games and novelties, cards, etc.
§ Valid default values for separating out paper and paperboard sub-categories for recovery and discards were not available.
‡ Includes milk, juice, and other products packaged in gable top cartons and liquid food aseptic cartons.
^ Table 5 does not include 10,000 tons of paper used in durable goods (Table 1).
Neg. = Less than 5,000 tons or 0.05 percent.

Table 6. Glass Products in MSW, 2014

(In thousands of tons and percent of generation)

Product Category	Generation	Recycled		Combusted with Energy Recovery	Landfilled
	(Thousand tons)	(Thousand tons)	(Percent of generation)	(Thousand tons)	(Thousand tons)
Durable Goods*	2,280	Neg.	Neg.	230	2,050
Containers and Packaging					
Beer and Soft Drink Bottles**	5,370	2,120	39.5%	640	3,180
Wine and Liquor Bottles	1,790	570	31.8%	240	1,140
Other Bottles and Jars	2,040	300	14.7%	340	1,790
Total Glass Containers	9,200	2,990	32.5%	1,220	6,110
Total Glass	**11,480**	**2,990**	**26.0%**	**1,450**	**8,390**

* Glass as a component of appliances, furniture, consumer electronics, etc.

** Includes carbonated drinks and non-carbonated water, teas, flavored drinks, and ready-to-drink alcoholic coolers and cocktails.

Neg. = Less than 5,000 tons or 0.05 percent.

Details may not add to totals due to rounding.

Table 7. Metal Products in MSW, 2014

(In thousands of tons and percent of generation)

Product Category	Generation	Recycled		Combusted with Energy Recovery	Landfilled
	(Thousand tons)	(Thousand tons)	(Percent of generation)	(Thousand tons)	(Thousand tons)
Durable Goods					
Ferrous Metals*	15,520	4,260	27.4%	1,900	9,360
Aluminum**	1,520	NA	NA	210	1,310
Lead†	1,380	1,360	99%		20
Other Nonferrous Metals‡	660	Neg.	Neg.	50	610
Total Metals in Durable Goods	**19,080**	**5,620**	**29.5%**	**2,160**	11,300
Nondurable Goods					
Aluminum	200	NA	NA	40	160
Containers and Packaging					
Steel					
Cans	1,670	1,180	70.7%	100	390
Other Steel Packaging	500	400	80.0%	20	80
Total Steel Packaging	**2,170**	**1,580**	**72.8%**	**120**	**470**
Aluminum					
Beer and Soft Drink Cans§	1,270	700	55.1%	110	460
Other Cans	130	NA	NA	30	100
Foil and Closures	410	NA	NA	80	330
Total Aluminum Packaging	**1,810**	**700**	**38.7%**	**220**	**890**
Total Metals in Containers and Packaging	**3,980**	**2,280**	**57.3%**	**340**	**1,360**
Total Metals	23,260	7,900	34.0%	2,540	12,820
Ferrous	17,690	5,840	33.0%	2,020	9,830
Aluminum	3,530	700	19.8%	170	2,360
Other nonferrous	2,040	1,360	66.7%	50	630

* Ferrous metals (iron and steel) in appliances, furniture, tires, and miscellaneous durables.
** Aluminum in appliances, furniture, and miscellaneous durables.
† Lead in lead-acid batteries.
‡ Other nonferrous metals in appliances and miscellaneous durables.
§ Aluminum can recycling does not include used beverage cans imported to produce new beverage cans.
NA = Not Available
Details may not add to totals due to rounding.

Table 8. Plastics in Products In MSW, 2014

(In thousands of tons and percent of generation by resin)

Product Category	Generation	Recycled		Combusted with energy Recovery	Landfilled
	(Thousand tons)	(Thousand tons)	(Percent of generation)	(Thousand tons)	(Thousand tons)
Durable Goods					
PET	540				
HDPE	1,340				
PVC	200				
LDPE/LLDPE	1,990				
PP	3,960				
PS	730				
Other resins	3,390				
Total Plastics in Durable Goods	**12,150**	**910**	**7.5%**	**1,280**	**9,960**
Nondurable Goods‡					
Plastic Plates and Cups§					
LDPE/LLDPE	20				
PLA	20				
PP	140				
PS	840				
Subtotal Plastic Plates and Cups	1,020	Neg.	Neg.	200	820
Trash Bags					
HDPE	200				
LDPE/LLDPE	800				
Subtotal Trash Bags	1,000			200	800
All other nondurables*					
PET	660				
HDPE	570				
PVC	250				
LDPE/LLDPE	1,240				
PLA	30				
PP	1,290				
PS	200				
Other resins	520				
Subtotal All Other Nondurables	4,760	140	2.9%	910	3,710
Total Plastics in Nondurable Goods, by resin					
PET	660				
HDPE	770				
PVC	250				
LDPE/LLDPE	2,060				
PLA	50				
PP	1,430				
PS	1,040				
Other resins	520				
Total Plastics in Nondurable Goods	**6,780**	**140**	**2.1%**	**1,310**	**5,330**

Table 8. Plastics in Products In MSW, 2014
(In thousands of tons and percent of generation by resin)

Product Category	Generation	Recycled		Combusted with energy Recovery	Landfilled
	(Thousand tons)	(Thousand tons)	(Percent of generation)	(Thousand tons)	(Thousand tons)
Plastic Containers & Packaging					
Bottles and Jars**					
PET	2,920	910	31.2%	390	1,620
Natural Bottles†					
HDPE	780	230	29.5%	110	440
Other plastic containers					
HDPE	1,480	320	21.6%		
PVC	20	Neg.			
LDPE/LLDPE	40	Neg.			
PP	230	40	17.4%		
PS	80	Neg.			
Subtotal Other Containers	**1,850**	**360**	**19.5%**	**290**	**1,200**
Bags, sacks, & wraps					
HDPE	760	50	6.6%		
PVC	50				
LDPE/LLDPE	2,530	450	17.8%		
PP	560				
PS	150				
Subtotal Bags, Sacks, & Wraps	**4,050**	**500**	**12.3%**	**700**	**2,850**
Other Plastics Packaging‡					
PET	950	60	6.3%		
HDPE	700	10	1.4%		
PVC	320	Neg.			
LDPE/LLDPE	1,090	Neg.			
PLA	10	Neg.			
PP	930	20	2.2%		
PS	330	30	9.1%		
Other resins	390	Neg.			
Subtotal Other Packaging	**4,720**	**120**	**2.5%**	**900**	**3,700**
Total Plastics in Containers & Packaging, by resin					
PET	3,870	970	25.1%		
HDPE	3,720	610	16.4%		
PVC	390	Neg.			
LDPE/LLDPE	3,660	450	12.3%		
PLA	10	Neg.			
PP	1,720	60	3.5%		
PS	560	30	5.4%		
Other resins	390	Neg.			
Total Plastics in Containers & Packaging	**14,320**	**2,120**	**14.8%**	**2,390**	**9,810**

Table 8. Plastics in Products In MSW, 2014

(In thousands of tons and percent of generation by resin)

Product Category	Generation	Recycled		Combusted with energy Recovery	Landfilled
	(Thousand tons)	(Thousand tons)	(Percent of generation)	(Thousand tons)	(Thousand tons)
Total Plastics in MSW, by resin					
PET	5,070	970	19.1%		
HDPE	5,830	610	10.5%		
PVC	840	Neg.			
LDPE/LLDPE	7,710	450	5.8%		
PLA	60	Neg.			
PP	7,110	60	0.8%		
PS	2,330	30	1.3%		
Other resins	4,300	1,050	24.4%		
Total Plastics in MSW	**33,250**	**3,170**	**9.5%**	**4,980**	**25,100**

‡ Nondurable goods other than containers and packaging.

§ Due to source data aggregation, PET cups are included in "Other Plastic Packaging".

* All other nondurables include plastics in disposable diapers, clothing, footwear, etc.

** Injection stretch blow molded PET containers as identified in *Report on Postconsumer PET Container Recycling Activity in 2014*. National Association for PET Container Resources. Recycling includes caps, lids, and other material collected with PET bottles and jars.

† White translucent homopolymer bottles as defined in the *2014 United States National Postconsumer Plastics Bottles Recycling Report*. American Chemistry Council and the Association of Postconsumer Plastic Recyclers.

Neg. = negligible, less than 5,000 tons

HDPE = High density polyethylene

LDPE = Low density polyethylene

LLDPE = Linear low density polyethylene

‡ Other plastic packaging includes coatings, closures, lids, PET cups, caps, clamshells, egg cartons, produce baskets, trays, shapes, loose fill, etc.

PP caps and lids recycled with PET bottles and jars are included in the recycling estimate for PET bottles and jars.

Other resins include commingled/undefined plastic packaging recycling.

Some detail of recycling by resin omitted due to lack of data.

Table 9. Rubber and Leather Products In MSW, 2014
(In thousands of tons and percent of generation)

Product Category	Generation	Recycled		Combusted with energy Recovery	Landfilled
	(Thousand tons)	(Thousand tons)	(Percent of generation)	(Thousand tons)	(Thousand tons)
Durable Goods					
Rubber in Tires*	3,550	1,440	40.6%	1,960	150
Other Durables**	3,570	Neg.	Neg.	450	3,120
Total Rubber & Leather					
Durable Goods	7,120	1,440	20.2%	2,410	3,270
Nondurable Goods					
Clothing and Footwear	830	Neg.	Neg.	160	670
Other Nondurables	260	Neg.	Neg.	50	210
Total Rubber & Leather					
Nondurable Goods	1,090	Neg.	Neg.	210	880
Total Rubber & Leather	8,210	1,440	17.5%	2,620	4,150

* Automobile and truck tires. Does not include other materials in tires.

** Includes carpets and rugs and other miscellaneous durables.

Neg. = Less than 5,000 tons or 0.05 percent.

Details may not add to totals due to rounding.

Table 10. Products Generated* in the Municipal Waste Stream, 1960 to 2014
(In thousands of tons and percent of total generation)

Products	Thousands of Tons									
	1960	1970	1980	1990	2000	2005	2010	2012	2013	2014
Durable Goods	9,920	14,660	21,800	29,810	38,870	45,060	49,350	50,890	52,520	52,650
(Detail in Table 14)										
Nondurable Goods	17,330	25,060	34,420	52,170	64,010	63,650	53,250	51,430	51,540	52,270
(Detail in Table 18)										
Containers and Packaging	27,370	43,560	52,670	64,530	75,840	76,330	75,470	75,230	75,770	76,670
Detail in Table 22)										
Total Product** Wastes	54,620	83,280	108,890	146,510	178,720	185,040	178,070	177,550	179,830	181,590
Other Wastes										
Food	12,200	12,800	13,000	23,860	30,700	32,930	35,740	36,430	37,060	38,400
Yard Trimmings	20,000	23,200	27,500	35,000	30,530	32,070	33,400	33,960	34,200	34,500
Miscellaneous Inorganic Wastes	1,300	1,780	2,250	2,900	3,500	3,690	3,840	3,900	3,930	3,970
Total Other Wastes	33,500	37,780	42,750	61,760	64,730	68,690	72,980	74,290	75,190	76,870
Total MSW Generated - Weight	88,120	121,060	151,640	208,270	243,450	253,730	251,050	251,840	255,020	258,460

Products	Percent of Total Generation									
	1960	1970	1980	1990	2000	2005	2010	2012	2013	2014
Durable Goods	11.3%	12.1%	14.4%	14.3%	16.0%	17.8%	19.7%	20.2%	20.6%	20.4%
(Detail in Table 14)										
Nondurable Goods	19.7%	20.7%	22.7%	25.0%	26.3%	25.1%	21.2%	20.4%	20.2%	20.2%
(Detail in Table 18)										
Containers and Packaging	31.1%	36.0%	34.7%	31.0%	31.2%	30.1%	30.1%	29.9%	29.7%	29.7%
(Detail in Table 23)										
Total Product** Wastes	62.0%	68.8%	71.8%	70.3%	73.4%	72.9%	70.9%	70.5%	70.5%	70.3%
Other Wastes										
Food	13.8%	10.6%	8.6%	11.5%	12.6%	13.0%	14.2%	14.5%	14.5%	14.9%
Yard Trimmings	22.7%	19.2%	18.1%	16.8%	12.5%	12.6%	13.3%	13.5%	13.4%	13.3%
Miscellaneous Inorganic Wastes	1.5%	1.5%	1.5%	1.4%	1.4%	1.5%	1.5%	1.5%	1.5%	1.5%
Total Other Wastes	38.0%	31.2%	28.2%	29.7%	26.6%	27.1%	29.1%	29.5%	29.5%	29.7%
Total MSW Generated - %	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

* Generation before materials recycling, composting, combustion with energy recovery, or landfilling. Does not include construction & demolition debris, industrial process wastes, or certain other wastes. Details may not add to totals due to rounding.

** Other than food products.

Table 11. Products Recycled and Composted* in the Municipal Waste Stream, 1960 to 2014

(In thousands of tons and percent of total generation)

Products	Thousands of Tons									
	1960	1970	1980	1990	2000	2005	2010	2012	2013	2014
Durable Goods	350	940	1,360	3,460	6,580	7,970	9,390	9,530	9,660	9,750
(Detail in Table 15)										
Nondurable Goods	2,390	3,730	4,670	8,800	17,560	19,770	19,190	17,270	16,410	17,180
(Detail in Table 19)										
Containers and Packaging	2,870	3,350	8,490	16,780	28,870	31,500	36,680	38,760	39,050	39,450
Detail in Table 24)										
Total Product** Wastes	5,610	8,020	14,520	29,040	53,010	59,240	65,260	65,560	65,120	66,380
Other Wastes										
Food, Other^	Neg.	Neg.	Neg.	Neg.	680	690	970	1,740	1,840	1,940
Yard Trimmings	Neg.	Neg.	Neg.	4,200	15,770	19,860	19,200	19,590	20,600	21,080
Miscellaneous Inorganic Wastes	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.
Total Other Wastes	Neg.	Neg.	Neg.	4,200	16,450	20,550	20,170	21,330	22,440	23,020
Total MSW Recycled and Composted - Weight	5,610	8,020	14,520	33,240	69,460	79,790	85,430	86,890	87,560	89,400

Products	Percent of Total Generation									
	1960	1970	1980	1990	2000	2005	2010	2012	2013	2014
Durable Goods	3.5%	6.4%	6.2%	11.6%	16.9%	17.7%	19.0%	18.7%	18.4%	18.5%
(Detail in Table 15)										
Nondurable Goods	13.8%	14.9%	13.6%	16.9%	27.4%	31.1%	36.0%	33.6%	31.8%	32.9%
(Detail in Table 19)										
Containers and Packaging	10.5%	7.7%	16.1%	26.0%	38.1%	41.3%	48.6%	51.5%	51.5%	51.5%
(Detail in Table 25)										
Total Product** Wastes	10.3%	9.6%	13.3%	19.8%	29.7%	32.0%	36.6%	36.9%	36.2%	36.6%
Other Wastes										
Food, Other^	Neg.	Neg.	Neg.	Neg.	2.2%	2.1%	2.7%	4.8%	5.0%	5.1%
Yard Trimmings	Neg.	Neg.	Neg.	12.0%	51.7%	61.9%	57.5%	57.7%	60.2%	61.1%
Miscellaneous Inorganic Wastes	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.
Total Other Wastes	Neg.	Neg.	Neg.	6.8%	25.4%	29.9%	27.6%	28.7%	29.8%	29.9%
Total MSW Recycled and Composted - %	6.4%	6.6%	9.6%	16.0%	28.5%	31.4%	34.0%	34.5%	34.3%	34.6%

* Recycling and composting of postconsumer wastes; does not include converting/fabrication scrap. Details may not add to totals due to rounding.

** Other than food products.

^ Includes collection of soiled paper and mixed MSW for composting.

Neg. = Less than 5,000 tons or 0.05 percent.

Table 12. Products Combusted with Energy Recovery* in the Municipal Waste Stream, 1960 to 2014

(In thousands of tons and percent of total combusted)

Products	Thousands of Tons									
	1960	1970	1980	1990	2000	2005	2010	2012	2013	2014
Durable Goods		60	440	4,480	6,260	6,750	7,070	8,150	8,490	8,410
(Detail in Table 16)										
Nondurable Goods		90	580	7,380	9,000	7,980	6,030	6,740	6,960	6,870
(Detail in Table 20)										
Containers and Packaging		150	880	8,110	9,110	8,160	6,870	7,180	7,270	7,300
Detail in Table 26)										
Total Product** Wastes		300	1,900	19,970	24,370	22,890	19,970	22,070	22,720	22,580
Other Wastes										
Food		50	260	4,060	5,820	5,870	6,150	6,830	6,970	7,150
Yard Trimmings		90	550	5,240	2,860	2,220	2,510	2,830	2,690	2,630
Miscellaneous Inorganic Wastes		10	50	490	680	670	680	770	780	780
Total Other Wastes		150	860	9,790	9,360	8,760	9,340	10,430	10,440	10,560
Total MSW Combusted with Energy Recovery - Weight		450	2,760	29,760	33,730	31,650	29,310	32,500	33,160	33,140

Products	Percent of Total Combusted									
	1960	1970	1980	1990	2000	2005	2010	2012	2013	2014
Durable Goods		13.3%	15.9%	15.1%	18.6%	21.3%	24.1%	25.1%	25.6%	25.4%
(Detail in Table 16)										
Nondurable Goods		19.9%	21.0%	24.8%	26.7%	25.2%	20.6%	20.7%	21.0%	20.7%
(Detail in Table 20)										
Containers and Packaging		33.3%	31.9%	27.3%	27.0%	25.8%	23.4%	22.1%	21.9%	22.0%
(Detail in Table 27)										
Total Product** Wastes		66.6%	68.8%	67.1%	72.3%	72.3%	68.1%	67.9%	68.5%	68.1%
Other Wastes										
Food		11.1%	9.4%	13.6%	17.3%	18.5%	21.0%	21.0%	21.0%	21.6%
Yard Trimmings		20.0%	20.0%	17.6%	8.5%	7.0%	8.6%	8.7%	8.1%	7.9%
Miscellaneous Inorganic Wastes		2.3%	1.8%	1.7%	1.9%	2.1%	2.3%	2.4%	2.4%	2.4%
Total Other Wastes		33.4%	31.2%	32.9%	27.7%	27.7%	31.9%	32.1%	31.5%	31.9%
Total MSW Combusted with Energy Recovery - %		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

* Products and materials combusted with energy recovery estimated at percentage total MSW after recycling and composting. In 2014, 19.6 percent of MSW after recycling and composting was combusted with energy recovery. Does not include construction & demolition debris, industrial process wastes, or certain other wastes. Details may not add to totals due to rounding.

** Other than food products.

Neg. = Less than 5,000 tons or 0.05 percent.

Table 13. Products Landfilled* in the Municipal Waste Stream, 1960 to 2014

(In thousands of tons and percent of total landfilled)

Products	Thousands of Tons									
	1960	1970	1980	1990	2000	2005	2010	2012	2013	2014
Durable Goods	9,570	13,660	20,000	21,870	26,030	30,340	32,890	33,210	34,370	34,490
(Detail in Table 17										
Nondurable Goods	14,940	21,240	29,170	35,990	37,450	35,900	28,030	27,420	28,170	28,220
(Detail in Table 21)										
Containers and Packaging	24,500	40,060	43,300	39,640	37,860	36,670	31,920	29,290	29,450	29,920
Detail in Table 28)										
Total Product** Wastes	49,010	74,960	92,470	97,500	101,340	102,910	92,840	89,920	91,990	92,630
Other Wastes										
Food	12,200	12,750	12,740	19,800	24,200	26,370	28,620	27,860	28,250	29,310
Yard Trimmings	20,000	23,110	26,950	25,560	11,900	9,990	11,690	11,540	10,910	10,790
Miscellaneous Inorganic Wastes	1,300	1,770	2,200	2,410	2,820	3,020	3,160	3,130	3,150	3,190
Total Other Wastes	33,500	37,630	41,890	47,770	38,920	39,380	43,470	42,530	42,310	43,290
Total MSW Landfilled - Weight	82,510	112,590	134,360	145,270	140,260	142,290	136,310	132,450	134,300	135,920

Products	Percent of Total Landfilled									
	1960	1970	1980	1990	2000	2005	2010	2012	2013	2014
Durable Goods	11.6%	12.1%	14.9%	15.0%	18.6%	21.3%	24.1%	25.1%	25.6%	25.4%
(Detail in Table 17)										
Nondurable Goods	18.1%	18.9%	21.7%	24.8%	26.7%	25.2%	20.6%	20.7%	21.0%	20.8%
(Detail in Table 21)										
Containers and Packaging	29.7%	35.6%	32.2%	27.3%	27.0%	25.8%	23.4%	22.1%	21.9%	22.0%
(Detail in Table 29)										
Total Product** Wastes	59.4%	66.6%	68.8%	67.1%	72.3%	72.3%	68.1%	67.9%	68.5%	68.2%
Other Wastes										
Food	14.8%	11.3%	9.5%	13.6%	17.3%	18.5%	21.0%	21.0%	21.0%	21.6%
Yard Trimmings	24.2%	20.5%	20.1%	17.6%	8.5%	7.0%	8.6%	8.7%	8.1%	7.9%
Miscellaneous Inorganic Wastes	1.6%	1.6%	1.6%	1.7%	1.9%	2.1%	2.3%	2.4%	2.4%	2.3%
Total Other Wastes	40.6%	33.4%	31.2%	32.9%	27.7%	27.7%	31.9%	32.1%	31.5%	31.8%
Total MSW Landfilled - %	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

* Landfilling after recycling, composting, and combustion with energy recovery. Does not include construction & demolition debris, industrial process wastes, or certain other wastes. Details may not add to totals due to rounding.

** Other than food products.

Neg. = Less than 5,000 tons or 0.05 percent.

Table 14. Products Generated* in the Municipal Waste Stream, 1960 to 2014 (With Detail On Durable Goods)

(In thousands of tons and percent of total generation)

Products	Thousands of Tons									
	1960	1970	1980	1990	2000	2005	2010	2012	2013	2014
Durable Goods										
Major Appliances	1,630	2,170	2,950	3,310	3,640	3,610	4,020	4,190	4,470	4,650
Small Appliances**				460	1,040	1,180	1,830	1,950	1,950	1,960
Furniture and Furnishings	2,150	2,830	4,760	6,790	8,120	9,340	10,820	11,500	11,620	11,860
Carpets and Rugs**				1,660	2,460	2,960	3,720	3,860	3,820	3,730
Rubber Tires	1,120	1,890	2,720	3,610	4,930	4,910	5,130	5,540	5,760	5,560
Batteries, Lead-Acid	Neg.	820	1,490	1,510	2,280	2,750	3,020	2,890	2,860	2,840
Miscellaneous Durables										
Selected Consumer Electronics***					1,900	2,630	3,120	3,310	3,360	3,360
Other Miscellaneous Durables					14,500	17,680	17,690	17,650	18,680	18,690
Total Miscellaneous Durables	5,020	6,950	9,880	12,470	16,400	20,310	20,810	20,960	22,040	22,050
Total Durable Goods	9,920	14,660	21,800	29,810	38,870	45,060	49,350	50,890	52,520	52,650
Nondurable Goods	17,330	25,060	34,420	52,170	64,010	63,650	53,250	51,430	51,540	52,270
(Detail in Table 18)										
Containers and Packaging	27,370	43,560	52,670	64,530	75,840	76,330	75,470	75,230	75,770	76,670
(Detail in Table 22)										
Total Product Wastes†	54,620	83,280	108,890	146,510	178,720	185,040	178,070	177,550	179,830	181,590
Other Wastes										
Food	12,200	12,800	13,000	23,860	30,700	32,930	35,740	36,430	37,060	38,400
Yard Trimmings	20,000	23,200	27,500	35,000	30,530	32,070	33,400	33,960	34,200	34,500
Miscellaneous Inorganic Wastes	1,300	1,780	2,250	2,900	3,500	3,690	3,840	3,900	3,930	3,970
Total Other Wastes	33,500	37,780	42,750	61,760	64,730	68,690	72,980	74,290	75,190	76,870
Total MSW Generated - Weight	88,120	121,060	151,640	208,270	243,450	253,730	251,050	251,840	255,020	258,460

Products	Percent of Total Generation									
	1960	1970	1980	1990	2000	2005	2010	2012	2013	2014
Durable Goods										
Major Appliances	1.8%	1.8%	1.9%	1.6%	1.5%	1.4%	1.6%	1.7%	1.8%	1.8%
Small Appliances**				0.2%	0.4%	0.5%	0.7%	0.8%	0.8%	0.8%
Furniture and Furnishings	2.4%	2.3%	3.1%	3.3%	3.3%	3.7%	4.3%	4.6%	4.6%	4.6%
Carpets and Rugs**				0.8%	1.0%	1.2%	1.5%	1.5%	1.5%	1.4%
Rubber Tires	1.3%	1.6%	1.8%	1.7%	2.0%	1.9%	2.0%	2.2%	2.3%	2.2%
Batteries, Lead-Acid	Neg.	0.7%	1.0%	0.7%	0.9%	1.1%	1.2%	1.1%	1.1%	1.1%
Miscellaneous Durables										
Selected Consumer Electronics***					0.8%	1.0%	1.2%	1.3%	1.3%	1.3%
Other Miscellaneous Durables					6.0%	7.0%	7.0%	7.0%	7.3%	7.2%
Total Miscellaneous Durables	5.7%	5.7%	6.5%	6.0%	6.7%	8.0%	8.3%	8.3%	8.6%	8.5%
Total Durable Goods	11.3%	12.1%	14.4%	14.3%	16.0%	17.8%	19.7%	20.2%	20.6%	20.4%
Nondurable Goods	19.7%	20.7%	22.7%	25.0%	26.3%	25.1%	21.2%	20.4%	20.2%	20.2%
(Detail in Table 18)										
Containers and Packaging	31.1%	36.0%	34.7%	31.0%	31.2%	30.1%	30.1%	29.9%	29.7%	29.7%
(Detail in Table 23)										
Total Product Wastes†	62.0%	68.8%	71.8%	70.3%	73.4%	72.9%	70.9%	70.5%	70.5%	70.3%
Other Wastes										
Food	13.8%	10.6%	8.6%	11.5%	12.6%	13.0%	14.2%	14.5%	14.5%	14.9%
Yard Trimmings	22.7%	19.2%	18.1%	16.8%	12.5%	12.6%	13.3%	13.5%	13.4%	13.3%
Miscellaneous Inorganic Wastes	1.5%	1.5%	1.5%	1.4%	1.4%	1.5%	1.5%	1.5%	1.5%	1.5%
Total Other Wastes	38.0%	31.2%	28.2%	29.7%	26.6%	27.1%	29.1%	29.5%	29.5%	29.7%
Total MSW Generated - %	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

* Generation before materials recycling, composting, combustion with energy recovery, or landfilling. Does not include construction & demolition debris, industrial process wastes, or certain other wastes. Details may not add to totals due to rounding.

** Not estimated separately prior to 1990. † Other than food products. Neg. = Less than 5,000 tons or 0.05 percent.

*** Not estimated separately prior to 2000. In 2014, the consumer electronics generation method was revised for 2010 through 2014. See https://www.epa.gov/smm/studies-summary-tables-and-data-related-advancing-sustainable-materials-management-report for further information.

Table 15. Products Recycled and Composted* in the Municipal Waste Stream, 1960 to 2014
(With Detail On Durable Goods)
(In thousands of tons and percent of total generation)

Products	Thousands of Tons									
	1960	1970	1980	1990	2000	2005	2010	2012	2013	2014
Durable Goods										
Major Appliances	10	50	130	1,070	2,000	2,420	2,610	2,680	2,620	2,710
Small Appliances**				10	20	20	120	120	120	120
Furniture and Furnishings	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	10	10	10	10
Carpets and Rugs**				Neg.	190	250	270	290	240	210
Rubber Tires	330	250	150	440	1,290	1,640	2,270	2,330	2,330	2,250
Batteries, Lead-Acid	Neg.	620	1,040	1,470	2,130	2,640	2,980	2,860	2,830	2,810
Miscellaneous Durables										
Selected Consumer Electronics***					190	360	650	1,000	1,270	1,400
Other Miscellaneous Durables					760	640	480	240	240	240
Total Miscellaneous Durables	10	20	40	470	950	1,000	1,130	1,240	1,510	1,640
Total Durable Goods	350	940	1,360	3,460	6,580	7,970	9,390	9,530	9,660	9,750
Nondurable Goods	2,390	3,730	4,670	8,800	17,560	19,770	19,190	17,270	16,410	17,180
(Detail in Table 19)										
Containers and Packaging	2,870	3,350	8,490	16,780	28,870	31,500	36,680	38,760	39,050	39,450
(Detail in Table 24)										
Total Product Wastes†	5,610	8,020	14,520	29,040	53,010	59,240	65,260	65,560	65,120	66,380
Other Wastes										
Food, Other^	Neg.	Neg.	Neg.	Neg.	680	690	970	1,740	1,840	1,940
Yard Trimmings	Neg.	Neg.	Neg.	4,200	15,770	19,860	19,200	19,590	20,600	21,080
Miscellaneous Inorganic Wastes	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.
Total Other Wastes	Neg.	Neg.	Neg.	4,200	16,450	20,550	20,170	21,330	22,440	23,020
Total MSW Recycled and Composted - Weight	5,610	8,020	14,520	33,240	69,460	79,790	85,430	86,890	87,560	89,400

Products	Percent of Total Generation									
	1960	1970	1980	1990	2000	2005	2010	2012	2013	2014
Durable Goods										
Major Appliances	0.6%	2.3%	4.4%	32.3%	54.9%	67.0%	64.9%	64.0%	58.6%	58.3%
Small Appliances**				2.2%	1.9%	1.7%	6.6%	6.2%	6.2%	6.1%
Furniture and Furnishings	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	0.1%	0.1%	0.1%	0.1%
Carpets and Rugs**				Neg.	7.7%	8.4%	7.3%	7.5%	6.3%	5.6%
Rubber Tires	29.5%	13.2%	5.5%	12.2%	26.2%	33.4%	44.2%	42.1%	40.5%	40.5%
Batteries, Lead-Acid	Neg.	75.6%	69.8%	97.4%	93.4%	96.0%	98.7%	99.0%	99.0%	98.9%
Miscellaneous Durables										
Selected Consumer Electronics***					10.0%	13.7%	20.8%	30.2%	37.8%	41.7%
Other Miscellaneous Durables					5.2%	3.6%	2.7%	1.4%	1.3%	1.3%
Total Miscellaneous Durables	0.2%	0.3%	0.4%	3.8%	5.8%	4.9%	5.4%	5.9%	6.9%	7.4%
Total Durable Goods	3.5%	6.4%	6.2%	11.6%	16.9%	17.7%	19.0%	18.7%	18.4%	18.5%
Nondurable Goods	13.8%	14.9%	13.6%	16.9%	27.4%	31.1%	36.0%	33.6%	31.8%	32.9%
(Detail in Table 19)										
Containers and Packaging	10.5%	7.7%	16.1%	26.0%	38.1%	41.3%	48.6%	51.5%	51.5%	51.5%
(Detail in Table 25)										
Total Product Wastes†	10.3%	9.6%	13.3%	19.8%	29.7%	32.0%	36.6%	36.9%	36.2%	36.6%
Other Wastes										
Food, Other^	Neg.	Neg.	Neg.	Neg.	2.2%	2.1%	2.7%	4.8%	5.0%	5.1%
Yard Trimmings	Neg.	Neg.	Neg.	12.0%	51.7%	61.9%	57.5%	57.7%	60.2%	61.1%
Miscellaneous Inorganic Wastes	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.
Total Other Wastes	Neg.	Neg.	Neg.	6.8%	25.4%	29.9%	27.6%	28.7%	29.8%	29.9%
Total MSW Recycled and Composted - %	6.4%	6.6%	9.6%	16.0%	28.5%	31.4%	34.0%	34.5%	34.3%	34.6%

* Recycling and composting of postconsumer wastes; does not include converting/fabrication scrap. Details may not add to totals due to rounding.

** Not estimated separately prior to 1990. † Other than food products.

*** Not estimated separately prior to 2000.

^ Includes collection of soiled paper and mixed MSW for composting.

Neg. = Less than 5,000 tons or 0.05 percent.

Table 16. Products Combusted with Energy Recovery* in the Municipal Waste Stream, 1960 to 2014
(With Detail On Durable Goods)
(In thousands of tons and percent of total combusted)

Products	Thousands of Tons									
	1960	1970	1980	1990	2000	2005	2010	2012	2013	2014
Durable Goods										
Major Appliances‡ §		0	0	0	0	0	0	0	0	0
Small Appliances**				90	200	200	310	360	370	370
Furniture and Furnishings		Neg.	90	1,150	1,570	1,700	1,910	2,270	2,300	2,320
Carpets and Rugs**				290	440	490	610	710	710	690
Rubber Tires§		Neg.	30	400	2,260	2,390	2,000	2,580	3,190	3,080
Batteries, Lead-Acid‡		0	0	0	0	0	0	0	0	0
Miscellaneous Durables										
Selected Consumer Electronics										
Other Miscellaneous Durables										
Total Miscellaneous Durables§		60	320	2,550	1,790	1,970	2,240	2,230	1,920	1,950
Total Durable Goods		60	440	4,480	6,260	6,750	7,070	8,150	8,490	8,410
Nondurable Goods		90	580	7,380	9,000	7,980	6,030	6,740	6,960	6,870
(Detail in Table 20)										
Containers and Packaging		150	880	8,110	9,110	8,160	6,870	7,180	7,270	7,300
(Detail in Table 26)										
Total Product Wastes†		300	1,900	19,970	24,370	22,890	19,970	22,070	22,720	22,580
Other Wastes										
Food		50	260	4,060	5,820	5,870	6,150	6,830	6,970	7,150
Yard Trimmings		90	550	5,240	2,860	2,220	2,510	2,830	2,690	2,630
Miscellaneous Inorganic Wastes		10	50	490	680	670	680	770	780	780
Total Other Wastes		150	860	9,790	9,360	8,760	9,340	10,430	10,440	10,560
Total MSW Combusted with Energy Recovery - Weight		450	2,760	29,760	33,730	31,650	29,310	32,500	33,160	33,140

Products	Percent of Total Combusted									
	1960	1970	1980	1990	2000	2005	2010	2012	2013	2014
Durable Goods										
Major Appliances‡ §		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Small Appliances**				0.3%	0.6%	0.6%	1.1%	1.1%	1.1%	1.1%
Furniture and Furnishings		Neg.	3.3%	3.9%	4.7%	5.4%	6.5%	7.0%	7.0%	7.0%
Carpets and Rugs**				1.0%	1.3%	1.5%	2.1%	2.2%	2.1%	2.1%
Rubber Tires§		Neg.	1.1%	1.3%	6.7%	7.6%	6.8%	7.9%	9.6%	9.3%
Batteries, Lead-Acid‡		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Miscellaneous Durables										
Selected Consumer Electronics										
Other Miscellaneous Durables										
Total Miscellaneous Durables§		13.3%	11.6%	8.6%	5.3%	6.2%	7.6%	6.9%	5.8%	5.9%
Total Durable Goods		13.3%	15.9%	15.1%	18.6%	21.3%	24.1%	25.1%	25.6%	25.4%
Nondurable Goods		19.9%	21.0%	24.8%	26.7%	25.2%	20.6%	20.7%	21.0%	20.7%
(Detail in Table 20)										
Containers and Packaging		33.3%	31.9%	27.3%	27.0%	25.8%	23.4%	22.1%	21.9%	22.0%
(Detail in Table 27)										
Total Product Wastes†		66.6%	68.8%	67.1%	72.3%	72.3%	68.1%	67.9%	68.5%	68.1%

Table 16. Products Combusted with Energy Recovery* in the Municipal Waste Stream, 1960 to 2014 (With Detail On Durable Goods)

(In thousands of tons and percent of total combusted)

Products	Percent of Total Combusted									
	1960	1970	1980	1990	2000	2005	2010	2012	2013	2014
Other Wastes										
Food		11.1%	9.4%	13.6%	17.3%	18.5%	21.0%	21.0%	21.0%	21.6%
Yard Trimmings		20.0%	20.0%	17.6%	8.5%	7.0%	8.6%	8.7%	8.1%	7.9%
Miscellaneous Inorganic Wastes		2.3%	1.8%	1.7%	1.9%	2.1%	2.3%	2.4%	2.4%	2.4%
Total Other Wastes		33.4%	31.2%	32.9%	27.7%	27.7%	31.9%	32.1%	31.5%	31.9%
Total MSW Combusted with Energy Recovery - %		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

* Products and materials combusted with energy recovery estimated at percentage total MSW after recycling and composting. In 2014, 19.6 percent of MSW after recycling and composting was combusted with energy recovery. Does not include construction & demolition debris, industrial process wastes, or certain other wastes. Details may not add to totals due to rounding.

** Not estimated separately prior to 1990.

Neg. = Less than 5,000 tons or 0.05 percent.

† Other than food products.

§ Tires: tires to fuel based on industry percentage estimates applied to tire generation. Total Miscellaneous Durables: calculated as difference between total durable goods going to combustion and individual durable goods shown. The amounts of consumer electronics going to combustion with energy recovery are not available and are included in Total Miscellaneous Durables.

± Energy Recovery Council, 2016. Major appliances and lead-acid batteries are not accepted at waste-to-energy facilities.

Table 17. Products Landfilled* in the Municipal Waste Stream, 1960 to 2014 (With Detail On Durable Goods)

(In thousands of tons and percent of total landfilled)

Products	Thousands of Tons									
	1960	1970	1980	1990	2000	2005	2010	2012	2013	2014
Durable Goods										
Major Appliances	1,620	2,120	2,820	2,240	1,640	1,190	1,410	1,510	1,850	1,940
Small Appliances**				360	820	960	1,400	1,470	1,460	1,470
Furniture and Furnishings	2,150	2,830	4,670	5,640	6,550	7,640	8,900	9,220	9,310	9,530
Carpets and Rugs**				1,370	1,830	2,220	2,840	2,860	2,870	2,830
Rubber Tires	790	1,640	2,540	2,770	1,380	880	860	630	240	230
Batteries, Lead-Acid		200	450	40	150	110	40	30	30	30
Miscellaneous Durables										
Selected Consumer Electronics***										
Other Miscellaneous Durables										
Total Miscellaneous Durables	5,010	6,870	9,520	9,450	13,660	17,340	17,440	17,490	18,610	18,460
Total Durable Goods	9,570	13,660	20,000	21,870	26,030	30,340	32,890	33,210	34,370	34,490
Nondurable Goods	14,940	21,240	29,170	35,990	37,450	35,900	28,030	27,420	28,170	28,220
(Detail in Table 21)										
Containers and Packaging	24,500	40,060	43,300	39,640	37,860	36,670	31,920	29,290	29,450	29,920
(Detail in Table 28)										
Total Product Wastes†	49,010	74,960	92,470	97,500	101,340	102,910	92,840	89,920	91,990	92,630
Other Wastes										
Food	12,200	12,750	12,740	19,800	24,200	26,370	28,620	27,860	28,250	29,310
Yard Trimmings	20,000	23,110	26,950	25,560	11,900	9,990	11,690	11,540	10,910	10,790
Miscellaneous Inorganic Wastes	1,300	1,770	2,200	2,410	2,820	3,020	3,160	3,130	3,150	3,190
Total Other Wastes	33,500	37,630	41,890	47,770	38,920	39,380	43,470	42,530	42,310	43,290
Total MSW Landfilled- Weight	82,510	112,590	134,360	145,270	140,260	142,290	136,310	132,450	134,300	135,920

Products	Percent of Total Landfilled									
	1960	1970	1980	1990	2000	2005	2010	2012	2013	2014
Durable Goods										
Major Appliances	2.0%	1.9%	2.1%	1.5%	1.2%	0.8%	1.0%	1.1%	1.4%	1.4%
Small Appliances**				0.2%	0.6%	0.7%	1.0%	1.1%	1.1%	1.1%
Furniture and Furnishings	2.6%	2.5%	3.5%	3.9%	4.7%	5.4%	6.5%	7.0%	6.9%	7.0%
Carpets and Rugs**				0.9%	1.3%	1.5%	2.1%	2.2%	2.1%	2.1%
Rubber Tires	1.0%	1.5%	1.9%	1.9%	1.0%	0.6%	0.6%	0.5%	0.2%	0.2%
Batteries, Lead-Acid	Neg.	0.2%	0.3%	0.1%	0.1%	0.1%	0.1%	0.0%	0.0%	0.0%
Miscellaneous Durables										
Selected Consumer Electronics***										
Other Miscellaneous Durables										
Total Miscellaneous Durables	6.1%	6.1%	7.1%	6.5%	9.7%	12.2%	12.8%	13.2%	13.9%	13.6%
Total Durable Goods	11.6%	12.1%	14.9%	15.0%	18.6%	21.3%	24.1%	25.1%	25.6%	25.4%
Nondurable Goods	18.1%	18.9%	21.7%	24.8%	26.7%	25.2%	20.6%	20.7%	21.0%	20.8%
(Detail in Table 21)										
Containers and Packaging	29.7%	35.6%	32.2%	27.3%	27.0%	25.8%	23.4%	22.1%	21.9%	22.0%
(Detail in Table 29)										
Total Product Wastes†	59.4%	66.6%	68.8%	67.1%	72.3%	72.3%	68.1%	67.9%	68.5%	68.2%
Other Wastes										
Food	14.8%	11.3%	9.5%	13.6%	17.3%	18.5%	21.0%	21.0%	21.0%	21.6%
Yard Trimmings	24.2%	20.5%	20.1%	17.6%	8.5%	7.0%	8.6%	8.7%	8.1%	7.9%
Miscellaneous Inorganic Wastes	1.6%	1.6%	1.6%	1.7%	1.9%	2.2%	2.3%	2.4%	2.4%	2.3%
Total Other Wastes	40.6%	33.4%	31.2%	32.9%	27.7%	27.7%	31.9%	32.1%	31.5%	31.8%
Total MSW Landfilled - %	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

* Landfilling after recycling, composting, and combustion with energy recovery. Details may not add to totals due to rounding.

** Not estimated separately prior to 1990.

*** The amount of consumer electronics going to combustion with energy recovery versus landfilling are not available. These products are included in Total Miscellaneous Durables.

† Other than food products.

Neg. = Less than 5,000 tons or 0.05 percent.

Table 18. Products Generated* in the Municipal Waste Stream, 1960 to 2014 (With Detail on Nondurable Goods)

(In thousands of tons and percent of generation of each product)

Products	Thousands of Tons									
	1960	1970	1980	1990	2000	2005	2010	2012	2013	2014
Durable Goods	9,920	14,660	21,800	29,810	38,870	45,060	49,350	50,890	52,520	52,650
(Detail in Table 14)										
Nondurable Goods										
Newspapers/Mechanical Papers†	7,110	9,510	11,050	13,430	14,790	12,790	9,880	8,380	8,050	7,620
Directories† **				610	680	660	-	-	-	-
Other Paper Nondurable Goods										
Books and Magazines	1,920	2,470	3,390							
Books**				970	1,240	1,100	990	860	850	830
Magazines**				2,830	2,230	2,580	1,590	1,470	1,410	1,260
Office-Type Papers***	1,520	2,650	4,000	6,410	7,420	6,620	5,260	4,750	4,770	4,530
Standard Mail§				3,820	5,570	5,830	4,340	4,150	4,150	4,050
Other Commercial Printing†	1,260	2,130	3,120	4,460	7,380	6,440	2,480	2,130	1,870	2,190
Tissue Paper and Towels	1,090	2,080	2,300	2,960	3,220	3,460	3,490	3,510	3,620	3,640
Paper Plates and Cups	270	420	630	650	960	1,160	1,350	1,290	1,320	1,380
Other Nonpackaging Paper	2,700	3,630	4,230	3,840	4,250	4,490	4,190	4,010	3,940	3,970
Total Other Paper Nondurable Goods							23,690	22,170	21,930	21,850
Disposable Diapers	Neg.	350	1,930	2,700	3,230	3,410	3,700	3,590	3,540	3,560
Plastic Plates and Cups§			190	650	870	930	890	1,060	1,010	1,020
Trash Bags**				780	850	1,060	980	1,020	980	1,000
Clothing and Footwear	1,360	1,620	2,170	4,010	6,470	7,890	9,100	10,310	11,120	12,150
Towels, Sheets and Pillowcases**				710	820	980	1,290	1,290	1,280	1,270
Other Miscellaneous Nondurables	100	200	1,410	3,340	4,030	4,250	3,720	3,610	3,630	3,800
Total Nondurable Goods	17,330	25,060	34,420	52,170	64,010	63,650	53,250	51,430	51,540	52,270
Containers and Packaging	27,370	43,560	52,670	64,530	75,840	76,330	75,470	75,230	75,770	76,670
(Detail in Table 22)										
Total Product Wastes‡	54,620	83,280	108,890	146,510	178,720	185,040	178,070	177,550	179,830	181,590
Other Wastes	33,500	37,780	42,750	61,760	64,730	68,690	72,980	74,290	75,190	76,870
Total MSW Generated - Weight	88,120	121,060	151,640	208,270	243,450	253,730	251,050	251,840	255,020	258,460

Products	Percent of Generation of Each Product									
	1960	1970	1980	1990	2000	2005	2010	2012	2013	2014
Durable Goods	11.3%	12.1%	14.4%	14.3%	16.0%	17.8%	19.7%	20.2%	20.6%	20.4%
(Detail in Table 14)										
Nondurable Goods										
Newspapers/Mechanical Papers†	8.1%	7.9%	7.3%	6.4%	6.1%	5.0%	3.9%	3.3%	3.2%	2.9%
Directories† **				0.3%	0.3%	0.3%	-	-	-	-
Other Paper Nondurable Goods										
Books and Magazines	2.2%	2.0%	2.2%							
Books**				0.5%	0.5%	0.4%	0.4%	0.3%	0.3%	0.3%
Magazines**				1.4%	0.9%	1.0%	0.6%	0.6%	0.6%	0.5%
Office-Type Papers***	1.7%	2.2%	2.6%	3.1%	3.0%	2.6%	2.1%	1.9%	1.9%	1.8%
Standard Mail§				1.8%	2.3%	2.3%	1.7%	1.6%	1.6%	1.6%
Other Commercial Printing†	1.4%	1.8%	2.1%	2.1%	3.0%	2.5%	1.0%	0.8%	0.7%	0.8%
Tissue Paper and Towels	1.2%	1.7%	1.5%	1.4%	1.3%	1.4%	1.4%	1.4%	1.4%	1.4%
Paper Plates and Cups	0.3%	0.3%	0.4%	0.3%	0.4%	0.5%	0.5%	0.5%	0.5%	0.5%
Other Nonpackaging Paper	3.1%	3.0%	2.8%	1.8%	1.7%	1.8%	1.7%	1.6%	1.5%	1.5%
Total Other Paper Nondurable Goods							9.4%	8.8%	8.6%	8.4%
Disposable Diapers	Neg.	0.3%	1.3%	1.3%	1.3%	1.3%	1.5%	1.4%	1.4%	1.4%
Plastic Plates and Cups§			0.1%	0.3%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%
Trash Bags**				0.4%	0.3%	0.4%	0.4%	0.4%	0.4%	0.4%

Table 18. Products Generated* in the Municipal Waste Stream, 1960 to 2014 (With Detail on Nondurable Goods)

(In thousands of tons and percent of generation of each product)

Products	Percent of Generation of Each Product									
	1960	1970	1980	1990	2000	2005	2010	2012	2013	2014
Clothing and Footwear	1.5%	1.3%	1.4%	1.9%	2.7%	3.1%	3.6%	4.1%	4.4%	4.7%
Towels, Sheets and Pillowcases**				0.3%	0.3%	0.4%	0.5%	0.5%	0.5%	0.5%
Other Miscellaneous Nondurables	0.1%	0.2%	0.9%	1.6%	1.7%	1.7%	1.5%	1.4%	1.4%	1.5%
Total Nondurables	19.7%	20.7%	22.7%	25.0%	26.3%	25.1%	21.2%	20.4%	20.2%	20.2%
Containers and Packaging	31.1%	36.0%	34.7%	31.0%	31.2%	30.1%	30.1%	29.9%	29.7%	29.7%
(Detail in Table 23)										
Total Product Wastes‡	62.0%	68.8%	71.8%	70.3%	73.4%	72.9%	70.9%	70.5%	70.5%	70.3%
Other Wastes	38.0%	31.2%	28.2%	29.7%	26.6%	27.1%	29.1%	29.5%	29.5%	29.7%
Total MSW Generated - %	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

* Generation before materials recycling, composting, combustion with energy recovery, or landfilling. Does not include construction & demolition debris, industrial process wastes, or certain other wastes. Details may not add to totals due to rounding.

† Starting in 2010, newsprint and groundwood inserts expanded to include directories and other mechanical papers previously counted as Other Commercial Printing.

** Not estimated separately prior to 1990.

*** High-grade paper such as printer paper; generated in both commercial and residential sources.

§ Standard Mail: Not estimated separately prior to 1990. Formerly called Third Class Mail and Standard (A) Mail by the U.S. Postal Service.

§ Plastic Plates and Cups: Not estimated separately prior to 1980.

‡ Other than food products.

\- Detailed data not available.

Neg. = Less than 5,000 tons or 0.05 percent.

Table 19. Products Recycled and Composted* in Municipal Solid Waste, 1960 to 2014
(With Detail on Nondurable Goods)
(In thousands of tons and percent of generation of each product)

Products	Thousands of Tons									
	1960	1970	1980	1990	2000	2005	2010	2012	2013	2014
Durable Goods	350	940	1,360	3,460	6,580	7,970	9,390	9,530	9,660	9,750
(Detail in Table 15)										
Nondurable Goods										
Newspapers/Mechanical Papers†	1,820	2,250	3,020	5,110	8,720	9,360	7,070	5,870	5,390	5,200
Directories† **				50	120	120	-	-	-	-
Other Paper Nondurable Goods										
Books and Magazines	100	260	280							
Books**				100	240	270	-	-	-	-
Magazines**				300	710	960	-	-	-	-
Office-Type Papers***	250	710	870	1,700	4,090	4,110	-	-	-	-
Standard Mail§				200	1,830	2,090	-	-	-	-
Other Commercial Printing†	130	340	350	700	810	1,440	-	-	-	-
Tissue Paper and Towels	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	-	-	-	-
Paper Plates and Cups	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	-	-	-	-
Other Nonpackaging Paper	40	110	Neg.	Neg.	Neg.	Neg.	-	-	-	-
Total Other Paper Nondurable Goods							10,650	9,570	9,060	9,710
Disposable Diapers				Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.
Plastic Plates and Cups§			Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.
Trash Bags**				Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.
Clothing and Footwear	50	60	150	520	900	1,250	1,250	1,470	1,600	1,900
Towels, Sheets and Pillowcases**				120	140	170	220	230	230	230
Other Miscellaneous Nondurables	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	130	130	140
Total Nondurable Goods	2,390	3,730	4,670	8,800	17,560	19,770	19,190	17,270	16,410	17,180
Containers and Packaging	2,870	3,350	8,490	16,780	28,870	31,500	36,680	38,760	39,050	39,450
(Detail in Table 24)										
Total Product Wastes‡	5,610	8,020	14,520	29,040	53,010	59,240	65,260	65,560	65,120	66,380
Other Wastes	Neg.	Neg.	Neg.	4,200	16,450	20,550	20,170	21,330	22,440	23,020
Total MSW Recycled and Composted - Weight	5,610	8,020	14,520	33,240	69,460	79,790	85,430	86,890	87,560	89,400
Products	**Percent of Generation of Each Product**									
	1960	1970	1980	1990	2000	2005	2010	2012	2013	2014
Durable Goods	3.5%	6.4%	6.2%	11.6%	16.9%	17.7%	19.0%	18.7%	18.4%	18.5%
(Detail in Table 15)										
Nondurable Goods										
Newspapers/Mechanical Papers†	25.6%	23.7%	27.3%	38.0%	59.0%	73.2%	71.6%	70.0%	67.0%	68.2%
Directories† **				8.2%	17.6%	18.2%	-	-	-	-
Other Paper Nondurable Goods										
Books and Magazines	5.2%	10.5%	8.3%							
Books**				10.3%	19.4%	24.5%	-	-	-	-
Magazines**				10.6%	31.8%	37.2%	-	-	-	-
Office-Type Papers***	16.4%	26.8%	21.8%	26.5%	55.1%	62.1%	-	-	-	-
Standard Mail§				5.2%	32.9%	35.8%	-	-	-	-
Other Commercial Printing†	10.3%	16.0%	11.2%	15.7%	11.0%	22.4%	-	-	-	-
Tissue Paper and Towels	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	-	-	-	-
Paper Plates and Cups	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	-	-	-	-
Other Nonpackaging Paper	1.5%	3.0%	Neg.	Neg.	Neg.	Neg.	-	-	-	-
Total Other Paper Nondurable Goods							45.0%	43.2%	41.3%	44.4%

Table 19. Products Recycled and Composted* in Municipal Solid Waste, 1960 to 2014
(With Detail on Nondurable Goods)
(In thousands of tons and percent of generation of each product)

Products	Percent of Generation of Each Product									
	1960	1970	1980	1990	2000	2005	2010	2012	2013	2014
Disposable Diapers				Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.
Plastic Plates and Cups§			Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.
Trash Bags**				Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.
Clothing and Footwear	Neg.	Neg.	Neg.	13.0%	13.9%	15.8%	13.7%	14.3%	14.4%	15.6%
Towels, Sheets and Pillowcases**				16.9%	17.1%	17.3%	17.1%	17.8%	18.0%	18.1%
Other Miscellaneous Nondurables	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	3.6%	3.7%
Total Nondurables	13.8%	14.9%	13.6%	16.9%	27.4%	31.1%	36.0%	33.6%	31.8%	32.9%
Containers and Packaging	10.5%	7.7%	16.1%	26.0%	38.1%	41.3%	48.6%	51.5%	51.5%	51.5%
(Detail in Table 25)										
Total Product Wastes‡	10.3%	9.6%	13.3%	19.8%	29.7%	32.0%	36.6%	36.9%	36.2%	36.6%
Other Wastes	Neg.	Neg.	Neg.	6.8%	25.4%	29.9%	27.6%	28.7%	29.8%	29.9%
Total MSW Recycled and Composted - %	6.4%	6.6%	9.6%	16.0%	28.5%	31.4%	34.0%	34.5%	34.3%	34.6%

* Recycling and composting of postconsumer wastes; does not include converting/fabrication scrap. Details may not add to totals due to rounding.

† Starting in 2010, newsprint and groundwood inserts expanded to include directories and other mechanical papers previously counted as Other Commercial Printing.

** Not estimated separately prior to 1990.

*** High-grade paper such as printer paper; generated in both commercial and residential sources.

§ Standard Mail: Not estimated separately prior to 1990. Formerly called Third Class Mail and Standard (A) Mail by the U.S. Postal Service.

§ Plastic Plates and Cups: Not estimated separately prior to 1980.

‡ Other than food products.

\- Detailed data not available.

Neg. = Less than 5,000 tons or 0.05 percent.

Table 20. Products Combusted with Energy Recovery* in Municipal Solid Waste, 1960 to 2014 (With Detail on Nondurable Goods)

(In thousands of tons and percent of total combusted)

Products	Thousands of Tons									
	1960	1970	1980	1990	2000	2005	2010	2012	2013	2014
Durable Goods	0	60	440	4,480	6,260	6,750	7,070	8,150	8,490	8,410
(Detail in Table 16)										
Nondurable Goods										
Newspapers/Mechanical Papers†	0	30	160	1,420	1,180	620	500	490	530	470
Directories† **				100	110	100	-	-	-	-
Other Paper Nondurable Goods										
Books and Magazines	0	10	60							
Books**				150	190	150	-	-	-	-
Magazines**				430	290	290	-	-	-	-
Office-Type Papers***	0	10	60	800	650	460	-	-	-	-
Standard Mail§				620	730	680	-	-	-	-
Other Commercial Printing†	0	10	60	640	1,270	910	-	-	-	-
Tissue Paper and Towels	0	10	50	500	620	630	-	-	-	-
Paper Plates and Cups	0	Neg.	10	110	190	210	-	-	-	-
Other Nonpackaging Paper	0	10	80	650	820	820	-	-	-	-
Total Other Paper Nondurable Goods							2,310	2,480	2,550	2,380
Disposable Diapers		Neg.	30	460	630	620	650	710	700	690
Plastic Plates and Cups§			Neg.	110	170	170	160	210	200	200
Trash Bags**				130	160	190	170	200	190	200
Clothing and Footwear	0	10	50	590	1,080	1,210	1,390	1,750	1,890	2,010
Towels, Sheets and Pillowcases**				100	130	150	190	210	210	200
Other Miscellaneous Nondurables	0	Neg.	20	570	780	770	660	690	690	720
Total Nondurables	0	90	580	7,380	9,000	7,980	6,030	6,740	6,960	6,870
Containers and Packaging	0	150	880	8,110	9,110	8,160	6,870	7,180	7,270	7,300
(Detail in Table 26)										
Total Product Wastes‡	0	300	1,900	19,970	24,370	22,890	19,970	22,070	22,720	22,580
Other Wastes	0	150	860	9,790	9,360	8,760	9,340	10,430	10,440	10,560
Total MSW Combusted with Energy Recovery - Weight	0	450	2,760	29,760	33,730	31,650	29,310	32,500	33,160	33,140

Products	Percent of Total Combusted									
	1960	1970	1980	1990	2000	2005	2010	2012	2013	2014
Durable Goods		13.3%	15.9%	15.1%	18.6%	21.3%	24.1%	25.1%	25.6%	25.4%
(Detail in Table 16)										
Nondurable Goods										
Newspapers/Mechanical Papers†		6.7%	5.8%	4.8%	3.5%	2.0%	1.7%	1.5%	1.6%	1.4%
Directories† **				0.3%	0.3%	0.3%	-	-	-	-
Other Paper Nondurable Goods										
Books and Magazines		2.2%	2.2%							
Books**				0.5%	0.6%	0.5%	-	-	-	-
Magazines**				1.4%	0.9%	0.9%	-	-	-	-
Office-Type Papers***		2.2%	2.2%	2.7%	1.8%	1.4%	-	-	-	-
Standard Mail§				2.1%	2.2%	2.1%	-	-	-	-
Other Commercial Printing†		2.2%	2.2%	2.2%	3.8%	2.9%	-	-	-	-

Table 20. Products Combusted with Energy Recovery* in Municipal Solid Waste, 1960 to 2014
(With Detail on Nondurable Goods)
(In thousands of tons and percent of total combusted)

Products	Percent of Total Combusted								
	1960	1970	1980	1990	2000	2005	2010	2012	2013	2014
Tissue Paper and Towels		2.2%	1.8%	1.7%	1.8%	2.0%	-	-	-	-
Paper Plates and Cups		Neg.	0.4%	0.4%	0.6%	0.7%	-	-	-	-
Other Nonpackaging Paper		2.2%	2.8%	2.2%	2.4%	2.6%	-	-	-	-
Total Other Paper Nondurable Goods							7.9%	7.6%	7.7%	7.2%
Disposable Diapers		Neg.	1.1%	1.5%	1.9%	2.0%	2.2%	2.2%	2.1%	2.1%
Plastic Plates and Cups§			Neg.	0.4%	0.5%	0.5%	0.5%	0.6%	0.6%	0.6%
Trash Bags**				0.4%	0.5%	0.6%	0.6%	0.6%	0.6%	0.6%
Clothing and Footwear		2.2%	1.8%	2.0%	3.2%	3.8%	4.7%	5.4%	5.7%	6.1%
Towels, Sheets and Pillowcases**				0.3%	0.4%	0.5%	0.7%	0.7%	0.6%	0.6%
Other Miscellaneous Nondurables		Neg.	0.7%	1.9%	2.3%	2.4%	2.3%	2.1%	2.1%	2.1%
Total Nondurables		19.9%	21.0%	24.8%	26.7%	25.2%	20.6%	20.7%	21.0%	20.7%
Containers and Packaging		33.3%	31.9%	27.3%	27.0%	25.8%	23.4%	22.1%	21.9%	22.0%
(Detail in Table 27)										
Total Product Wastes‡		66.6%	68.8%	67.1%	72.3%	72.3%	68.1%	67.9%	68.5%	68.1%
Other Wastes		33.4%	31.2%	32.9%	27.7%	27.7%	31.9%	32.1%	31.5%	31.9%
Total MSW Combusted with Energy Recovery - %		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

* Products and materials combusted with energy recovery estimated at percentage total MSW after recovery for recycling and composting. In 2014, 19.6 percent of MSW after recycling and composting was combusted with energy recovery. Does not include construction & demolition debris, industrial process wastes, or certain other wastes. Details may not add to totals due to rounding.

† Starting in 2010, newsprint and groundwood inserts expanded to include directories and other mechanical papers previously counted as Other Commercial Printing.

** Not estimated separately prior to 1990.

*** High-grade paper such as printer paper; generated in both commercial and residential sources.

§ Standard Mail: Not estimated separately prior to 1990. Formerly called Third Class Mail and Standard (A) Mail by the U.S. Postal Service.

§ Plastic Plates and Cups: Not estimated separately prior to 1980.

‡ Other than food products.

\- Detailed data not available.

Neg. = Less than 5,000 tons or 0.05 percent.

Table 21. Products Landfilled* in Municipal Solid Waste, 1960 to 2014 (With Detail on Nondurable Goods)

(In thousands of tons and percent of total landfilled)

Products	Thousands of Tons									
	1960	1970	1980	1990	2000	2005	2010	2012	2013	2014
Durable Goods	9,570	13,660	20,000	21,870	26,030	30,340	32,890	33,210	34,370	34,490
(Detail in Table 17)										
Nondurable Goods										
Newspapers/Mechanical Papers†	5,290	7,230	7,870	6,900	4,890	2,810	2,310	2,020	2,130	1,950
Directories†**				460	450	440	-	-	-	-
Other Paper Nondurable Goods										
Books and Magazines	1,820	2,200	3,050							
Books**				720	810	680	-	-	-	-
Magazines**				2,100	1,230	1,330	-	-	-	-
Office-Type Papers***	1,270	1,930	3,070	3,910	2,680	2,050	-	-	-	-
Standard Mail§				3,000	3,010	3,060	-	-	-	-
Other Commercial Printing†	1,130	1,780	2,710	3,120	5,300	4,090	-	-	-	-
Tissue Paper and Towels	1,090	2,070	2,250	2,460	2,600	2,830	-	-	-	-
Paper Plates and Cups	270	420	620	540	770	950	-	-	-	-
Other Nonpackaging Paper	2,660	3,510	4,150	3,190	3,430	3,670	-	-	-	-
Total Other Paper Nondurable Goods							10,730	10,120	10,320	9,760
Disposable Diapers		350	1,900	2,240	2,600	2,790	3,050	2,880	2,840	2,870
Plastic Plates and Cups§			190	540	700	760	730	850	810	820
Trash Bags**				650	690	870	810	820	790	800
Clothing and Footwear	1,310	1,550	1,970	2,900	4,490	5,430	6,460	7,090	7,630	8,240
Towels, Sheets and Pillowcases**				490	550	660	880	850	840	840
Other Miscellaneous Nondurables	100	200	1,390	2,770	3,250	3,480	3,060	2,790	2,810	2,940
Total Nondurables	14,940	21,240	29,170	35,990	37,450	35,900	28,030	27,420	28,170	28,220
Containers and Packaging	24,500	40,060	43,300	39,640	37,860	36,670	31,920	29,290	29,450	29,920
(Detail in Table 28)										
Total Product Wastes‡	49,010	74,960	92,470	97,500	101,340	102,910	92,840	89,920	91,990	92,630
Other Wastes	33,500	37,630	41,890	47,770	38,920	39,380	43,470	42,530	42,310	43,290
Total MSW Landfilled - Weight	82,510	112,590	134,360	145,270	140,260	142,290	136,310	132,450	134,300	135,920

Products	Percent of Total Landfilled									
	1960	1970	1980	1990	2000	2005	2010	2012	2013	2014
Durable Goods	11.6%	12.1%	14.9%	15.1%	18.6%	21.3%	24.1%	25.1%	25.6%	25.4%
(Detail in Table 17)										
Nondurable Goods										
Newspapers/Mechanical Papers†	6.4%	6.4%	5.9%	4.7%	3.5%	2.0%	1.7%	1.5%	1.6%	1.4%
Directories†**				0.3%	0.3%	0.3%	-	-	-	-
Other Paper Nondurable Goods										
Books and Magazines	2.2%	2.0%	2.3%							
Books**				0.5%	0.6%	0.5%	-	-	-	-
Magazines**				1.4%	0.9%	0.9%	-	-	-	-
Office-Type Papers***	1.5%	1.7%	2.3%	2.7%	1.9%	1.4%	-	-	-	-
Standard Mail§				2.1%	2.1%	2.1%	-	-	-	-

Table 21. Products Landfilled* in Municipal Solid Waste, 1960 to 2014 (With Detail on Nondurable Goods)

(In thousands of tons and percent of total landfilled)

Products	Percent of Total Landfilled									
	1960	1970	1980	1990	2000	2005	2010	2012	2013	2014
Other Commercial Printing†	1.4%	1.6%	2.0%	2.1%	3.8%	2.9%	-	-	-	-
Tissue Paper and Towels	1.3%	1.8%	1.7%	1.7%	1.9%	2.0%	-	-	-	-
Paper Plates and Cups	0.3%	0.4%	0.5%	0.4%	0.5%	0.7%	-	-	-	-
Other Nonpackaging Paper	3.2%	3.1%	3.1%	2.2%	2.4%	2.6%	-	-	-	-
Total Other Paper Nondurable Goods							7.9%	7.6%	7.7%	7.2%
Disposable Diapers	Neg.	0.3%	1.4%	1.5%	1.9%	2.0%	2.2%	2.2%	2.1%	2.1%
Plastic Plates and Cups§			0.1%	0.4%	0.5%	0.5%	0.5%	0.6%	0.6%	0.6%
Trash Bags**				0.4%	0.5%	0.6%	0.6%	0.6%	0.6%	0.6%
Clothing and Footwear	1.6%	1.4%	1.5%	2.0%	3.2%	3.8%	4.7%	5.4%	5.7%	6.1%
Towels, Sheets and Pillowcases**				0.3%	0.4%	0.5%	0.6%	0.7%	0.6%	0.6%
Other Miscellaneous Nondurables	0.1%	0.2%	1.0%	1.9%	2.3%	2.4%	2.3%	2.1%	2.1%	2.2%
Total Nondurables	18.1%	18.9%	21.7%	24.8%	26.7%	25.2%	20.6%	20.7%	21.0%	20.8%
Containers and Packaging	29.7%	35.6%	32.2%	27.3%	27.0%	25.8%	23.4%	22.1%	21.9%	22.0%
(Detail in Table 29)										
Total Product Wastes‡	59.4%	66.6%	68.8%	67.1%	72.3%	72.3%	68.1%	67.9%	68.5%	68.2%
Other Wastes	40.6%	33.4%	31.2%	32.9%	27.7%	27.7%	31.9%	32.1%	31.5%	31.8%
Total MSW Landfilled - %	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

* Landfilling after recycling, composting, and combustion with energy recovery. Does not include construction & demolition debris, industrial process wastes, or certain other wastes. Details may not add to totals due to rounding.

† Starting in 2010, newsprint and groundwood inserts expanded to include directories and other mechanical papers previously counted as Other Commercial Printing.

** Not estimated separately prior to 1990.

*** High-grade paper such as printer paper; generated in both commercial and residential sources.

§ Standard Mail: Not estimated separately prior to 1990. Formerly called Third Class Mail and Standard (A) Mail by the U.S. Postal Service.

§ Plastic Plates and Cups: Not estimated separately prior to 1980.

‡ Other than food products.

\- Detailed data not available.

Neg. = Less than 5,000 tons or 0.05 percent.

Table 22. Products Generated* in the Municipal Waste Stream, 1960 to 2014 (With Detail on Containers and Packaging)

(In thousands of tons)

Products	Thousands of Tons									
	1960	1970	1980	1990	2000	2005	2010	2012	2013	2014
Durable Goods	9,920	14,660	21,800	29,810	38,870	45,060	49,350	50,890	52,520	52,650
(Detail in Table 14)										
Nondurable Goods	17,330	25,060	34,420	52,170	64,010	63,650	53,250	51,430	51,540	52,270
(Detail in Table 18)										
Containers and Packaging										
Glass Packaging										
Beer and Soft Drink Bottles**	1,400	5,580	6,740	5,640	5,710	6,540	5,670	5,580	5,420	5,370
Wine and Liquor Bottles	1,080	1,900	2,450	2,030	1,910	1,630	1,700	1,820	1,740	1,790
Other Bottles & Jars	3,710	4,440	4,780	4,160	3,420	2,290	1,990	2,000	2,100	2,040
Total Glass Packaging	6,190	11,920	13,970	11,830	11,040	10,460	9,360	9,400	9,260	9,200
Steel Packaging										
Beer and Soft Drink Cans	640	1,570	520	150	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.
Cans	3,760	3,540	2,850	2,540	2,630	2,130	2,300	1,850	1,870	1,670
Other Steel Packaging	260	270	240	200	240	240	440	380	530	500
Total Steel Packaging	4,660	5,380	3,610	2,890	2,870	2,370	2,740	2,230	2,400	2,170
Aluminum Packaging										
Beer and Soft Drink Cans	Neg.	100	850	1,550	1,520	1,450	1,370	1,300	1,270	1,270
Other Cans	Neg.	60	40	20	50	80	70	120	120	130
Foil and Closures	170	410	380	330	380	400	460	430	410	410
Total Aluminum Packaging	170	570	1,270	1,900	1,950	1,930	1,900	1,850	1,800	1,810
Paper & Paperboard Pkg										
Corrugated Boxes	7,330	12,760	17,080	24,010	30,210	30,930	29,050	29,480	30,050	30,490
Other Paper & Paperboard Pkg										
Gable Top/Aseptic Cartons‡			790	510	550	500	-	-	-	-
Folding Cartons			3,820	4,300	5,820	5,530	-	-	-	-
Other Paperboard Packaging	3,840	4,830	230	290	200	160	-	-	-	-
Bags and Sacks			3,380	2,440	1,490	1,120	-	-	-	-
Wrapping Papers			200	110	Neg.	Neg.	-	-	-	-
Other Paper Packaging	2,940	3,810	850	1,020	1,670	1,400	-	-	-	-
Subtotal Other Paper & Paperboard Pkg	*6,780*	*8,640*	*9,270*	*8,670*	*9,730*	*8,710*	*8,630*	*8,530*	*8,510*	*8,640*
Total Paper & Board Pkg	14,110	21,400	26,350	32,680	39,940	39,640	37,680	38,010	38,560	39,130
Plastics Packaging										
PET Bottles and Jars			260	430	1,720	2,540	2,670	2,790	2,880	2,920
HDPE Natural Bottles			230	530	690	800	800	780	780	780
Other Containers	60	910	890	1,430	1,740	1,420	1,830	1,850	1,830	1,850
Bags and Sacks			390	940	1,650	1,640	770	-	-	-
Wraps			840	1,530	2,550	2,810	3,160	-	-	-
Subtotal Bags, Sacks, and Wraps			*1,230*	*2,470*	*4,200*	*4,450*	*3,930*	*3,810*	*3,780*	*4,050*
Other Plastics Packaging	60	1,180	790	2,040	2,840	3,210	4,450	4,550	4,710	4,720
Total Plastics Packaging	120	2,090	3,400	6,900	11,190	12,420	13,680	13,780	13,980	14,320
Other Packaging										
Wood Packaging	2,000	2,070	3,940	8,180	8,610	9,230	9,770	9,610	9,410	9,680
Other Misc. Packaging	120	130	130	150	240	280	340	350	360	360
Total Containers & Pkg	27,370	43,560	52,670	64,530	75,840	76,330	75,470	75,230	75,770	76,670
Total Product Wastes†	54,620	83,280	108,890	146,510	178,720	185,040	178,070	177,550	179,830	181,590
Other Wastes										
Food	12,200	12,800	13,000	23,860	30,700	32,930	35,740	36,430	37,060	38,400
Yard Trimmings	20,000	23,200	27,500	35,000	30,530	32,070	33,400	33,960	34,200	34,500
Miscellaneous Inorganic Wastes	1,300	1,780	2,250	2,900	3,500	3,690	3,840	3,900	3,930	3,970
Total Other Wastes	33,500	37,780	42,750	61,760	64,730	68,690	72,980	74,290	75,190	76,870
Total MSW Generated - Weight	88,120	121,060	151,640	208,270	243,450	253,730	251,050	251,840	255,020	258,460

* Generation before materials recycling, composting, combustion with energy recovery, or landfilling. Details may not add to totals due to rounding.

** Includes carbonated drinks and non-carbonated water, teas, flavored drinks, and ready-to-drink alcoholic coolers and cocktails.

‡ Includes milk, juice, and other products packaged in gable top cartons and liquid food aseptic cartons.

† Other than food products. Neg. = Less than 5,000 tons or 0.05 percent. NA = Not Available - Detailed data not available.

Table 23. Products Generated* in the Municipal Waste Stream, 1960 to 2014 (With Detail on Containers and Packaging)

(In percent of total generation)

Products	Percent of Total Generation									
	1960	1970	1980	1990	2000	2005	2010	2012	2013	2014
Durable Goods	11.3%	12.1%	14.4%	14.3%	16.0%	17.8%	19.7%	20.2%	20.6%	20.4%
(Detail in Table 14)										
Nondurable Goods	19.7%	20.7%	22.7%	25.0%	26.3%	25.1%	21.2%	20.4%	20.2%	20.2%
(Detail in Table 18)										
Containers and Packaging										
Glass Packaging										
Beer and Soft Drink Bottles**	1.6%	4.6%	4.4%	2.7%	2.3%	2.6%	2.3%	2.2%	2.1%	2.1%
Wine and Liquor Bottles	1.2%	1.6%	1.6%	1.0%	0.8%	0.6%	0.7%	0.7%	0.7%	0.7%
Other Bottles & Jars	4.2%	3.7%	3.2%	2.0%	1.4%	0.9%	0.8%	0.8%	0.8%	0.8%
Total Glass Packaging	7.0%	9.8%	9.2%	5.7%	4.5%	4.1%	3.7%	3.7%	3.6%	3.6%
Steel Packaging										
Beer and Soft Drink Cans	0.7%	1.3%	0.3%	0.1%	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.
Cans	4.3%	2.9%	1.9%	1.2%	1.1%	0.8%	0.9%	0.7%	0.7%	0.6%
Other Steel Packaging	0.3%	0.2%	0.2%	0.1%	0.1%	0.1%	0.2%	0.2%	0.2%	0.2%
Total Steel Packaging	5.3%	4.4%	2.4%	1.4%	1.2%	0.9%	1.1%	0.9%	0.9%	0.8%
Aluminum Packaging										
Beer and Soft Drink Cans	Neg.	0.1%	0.6%	0.7%	0.6%	0.6%	0.5%	0.5%	0.5%	0.5%
Other Cans	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	0.03%	0.05%	0.05%	0.05%
Foil and Closures	0.2%	0.3%	0.3%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%
Total Aluminum Packaging	0.2%	0.5%	0.8%	0.9%	0.8%	0.8%	0.8%	0.7%	0.7%	0.7%
Paper & Paperboard Pkg										
Corrugated Boxes	8.3%	10.5%	11.3%	11.5%	12.4%	12.2%	11.6%	11.7%	11.8%	11.8%
Other Paper & Paperboard Pkg										
Gable Top/Aseptic Cartons‡			0.5%	0.2%	0.2%	0.2%	-	-	-	-
Folding Cartons			2.5%	2.1%	2.4%	2.2%	-	-	-	-
Other Paperboard Packaging	4.4%	4.0%	0.2%	0.1%	0.1%	0.1%	-	-	-	-
Bags and Sacks			2.2%	1.2%	0.6%	0.4%	-	-	-	-
Wrapping Papers			0.1%	0.1%	Neg.	Neg.	-	-	-	-
Other Paper Packaging	3.3%	3.1%	0.6%	0.5%	0.7%	0.6%	-	-	-	-
Subtotal Other Paper & Paperboard Pkg							*3.4%*	*3.4%*	*3.3%*	*3.3%*
Total Paper & Board Pkg	16.0%	17.7%	17.4%	15.7%	16.4%	15.6%	15.0%	15.1%	15.1%	15.1%
Plastics Packaging										
PET Bottles and Jars			0.2%	0.2%	0.7%	1.0%	1.1%	1.1%	1.1%	1.1%
HDPE Natural Bottles			0.2%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%
Other Containers	0.1%	0.8%	0.6%	0.7%	0.7%	0.6%	0.7%	0.7%	0.7%	0.7%
Bags and Sacks			0.3%	0.5%	0.7%	0.6%	0.3%	-	-	-
Wraps			0.6%	0.7%	1.0%	1.1%	1.3%	-	-	-
Subtotal Bags, Sacks, and Wraps			*0.8%*	*1.2%*	*1.7%*	*1.8%*	*1.6%*	*1.5%*	*1.5%*	*1.6%*
Other Plastics Packaging	0.1%	1.0%	0.5%	1.0%	1.2%	1.3%	1.8%	1.8%	1.8%	1.8%
Total Plastics Packaging	0.1%	1.7%	2.2%	3.3%	4.6%	4.9%	5.4%	5.5%	5.5%	5.5%
Other Packaging										
Wood Packaging	2.3%	1.7%	2.6%	3.9%	3.5%	3.6%	3.9%	3.8%	3.7%	3.7%
Other Misc. Packaging	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%
Total Containers & Pkg	31.1%	36.0%	34.7%	31.0%	31.2%	30.1%	30.1%	29.9%	29.7%	29.7%
Total Product Wastes†	62.0%	68.8%	71.8%	70.3%	73.4%	72.9%	70.9%	70.5%	70.5%	70.3%
Other Wastes										
Food	13.8%	10.6%	8.6%	11.5%	12.6%	13.0%	14.2%	14.5%	14.5%	14.9%
Yard Trimmings	22.7%	19.2%	18.1%	16.8%	12.5%	12.6%	13.3%	13.5%	13.4%	13.3%
Miscellaneous Inorganic Wastes	1.5%	1.5%	1.5%	1.4%	1.4%	1.5%	1.5%	1.5%	1.5%	1.5%
Total Other Wastes	38.0%	31.2%	28.2%	29.7%	26.6%	27.1%	29.1%	29.5%	29.5%	29.7%
Total MSW Recycled and Composted - %	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

* Generation before materials recycling, composting, combustion with energy recovery, or landfilling. Details may not add to totals due to rounding.

** Includes carbonated drinks and non-carbonated water, teas, flavored drinks, and ready-to-drink alcoholic coolers and cocktails.

‡ Includes milk, juice, and other products packaged in gable top cartons and liquid food aseptic cartons.

† Other than food products.

Neg. = Less than 5,000 tons or 0.05 percent.

Table 24. Products Recycled and Composted* in Municipal Solid Waste, 1960 to 2014 (With Detail on Containers and Packaging)

(In thousands of tons)

Products	Thousands of Tons									
	1960	1970	1980	1990	2000	2005	2010	2012	2013	2014
Durable Goods	350	940	1,360	3,460	6,580	7,970	9,390	9,530	9,660	9,750
(Detail in Table 15)										
Nondurable Goods	2,390	3,730	4,670	8,800	17,560	19,770	19,190	17,270	16,410	17,180
(Detail in Table 19)										
Containers and Packaging										
Glass Packaging										
Beer and Soft Drink Bottles**	90	140	730	1,890	1,530	2,000	2,350	2,290	2,240	2,120
Wine and Liquor Bottles	10	10	20	210	430	250	540	620	600	570
Other Bottles & Jars	Neg.	Neg.	Neg.	520	920	340	240	300	310	300
Total Glass Packaging	100	150	750	2,620	2,880	2,590	3,130	3,210	3,150	2,990
Steel Packaging										
Beer and Soft Drink Cans	10	20	50	40	Neg.	Neg.				
Cans	20	60	150	590	1,530	1,340	1,540	1,310	1,320	1,180
Other Steel Packaging	Neg.	Neg.	Neg.	60	160	160	350	300	420	400
Total Steel Packaging	30	80	200	690	1,690	1,500	1,890	1,610	1,740	1,580
Aluminum Packaging										
Beer and Soft Drink Cans	Neg.	10	320	990	830	650	680	710	700	700
Other Cans	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	NA	NA	NA	NA
Foil and Closures	Neg.	Neg.	Neg.	20	30	40	NA	NA	NA	NA
Total Aluminum Pkg	Neg.	10	320	1,010	860	690	680	710	700	700
Paper & Paperboard Pkg										
Corrugated Boxes	2,520	2,760	6,390	11,530	20,330	22,100	24,690	26,810	26,590	27,280
Other Paper & Paperboard Pkg										
Gable Top/Aseptic Cartons‡			Neg.	Neg.	Neg.	Neg.	-	-	-	-
Folding Cartons			520	340	410	1,190	-	-	-	-
Other Paperboard Packaging			Neg.	Neg.	Neg.	Neg.	-	-	-	-
Bags and Sacks			Neg.	200	300	320	-	-	-	-
Wrapping Papers			Neg.	Neg.	Neg.	Neg.	-	-	-	-
Other Paper Packaging	220	350	300	Neg.	Neg.	Neg.	-	-	-	-
Subtotal Other Paper & Paperboard Pkg							2,160	2,110	2,360	2,210
Total Paper & Board Pkg	2,740	3,110	7,210	12,070	21,040	23,610	26,850	28,920	28,950	29,490
Plastics Packaging										
PET Bottles and Jars			10	140	380	590	780	860	900	910
HDPE Natural Bottles			Neg.	20	210	230	220	220	220	230
Other Containers	Neg.	Neg.	Neg.	20	170	140	300	310	330	360
Bags and Sacks										
Wraps										
Subtotal Bags, Sacks, and Wraps			Neg.	60	180	230	450	440	510	500
Other Plastics Packaging	Neg.	Neg.	Neg.	20	90	90	100	70	80	120
Total Plastics Packaging	Neg.	Neg.	10	260	1,030	1,280	1,850	1,900	2,040	2,120
Other Packaging										
Wood Packaging	Neg.	Neg.	Neg.	130	1,370	1,830	2,280	2,410	2,470	2,570
Other Misc. Packaging	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.
Total Containers & Pkg	2,870	3,350	8,490	16,780	28,870	31,500	36,680	38,760	39,050	39,450
Total Product Wastes†	5,610	8,020	14,520	29,040	53,010	59,240	65,260	65,560	65,120	66,380

Table 24. Products Recycled and Composted* in Municipal Solid Waste, 1960 to 2014
(With Detail on Containers and Packaging)
(In thousands of tons)

Products	Thousands of Tons									
	1960	1970	1980	1990	2000	2005	2010	2012	2013	2014
Other Wastes										
Food, Other^	Neg.	Neg.	Neg.	Neg.	680	690	970	1,740	1,840	1,940
Yard Trimmings	Neg.	Neg.	Neg.	4,200	15,770	19,860	19,200	19,590	20,600	21,080
Miscellaneous Inorganic Wastes	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.
Total Other Wastes	Neg.	Neg.	Neg.	4,200	16,450	20,550	20,170	21,330	22,440	23,020
Total MSW Recycled and Composted - Weight	5,610	8,020	14,520	33,240	69,460	79,790	85,430	86,890	87,560	89,400

* Recycling and composting of postconsumer wastes; does not include converting/fabrication scrap. Details may not add to totals due to rounding.
** Includes carbonated drinks and non-carbonated water, teas, flavored drinks, and ready-to-drink alcoholic coolers and cocktails.
‡ Includes milk, juice, and other products packaged in gable top cartons and liquid food aseptic cartons.
† Other than food products.
^ Includes collection of soiled paper and mixed MSW for composting.
Neg. = Less than 5,000 tons or 0.05 percent. NA = Not Available - Detailed data not available.

Table 25. Products Recycled and Composted* in Municipal Solid Waste, 1960 to 2014 (With Detail on Containers and Packaging)

(In percent of generation of each product)

Products	Percent of Generation of Each Product									
	1960	1970	1980	1990	2000	2005	2010	2012	2013	2014
Durable Goods	3.5%	6.4%	6.2%	11.6%	16.9%	17.7%	19.0%	18.7%	18.4%	18.5%
(Detail in Table 15)										
Nondurable Goods	13.8%	14.9%	13.6%	16.9%	27.4%	31.1%	36.0%	33.6%	31.8%	32.9%
(Detail in Table 19)										
Containers and Packaging										
Glass Packaging										
Beer and Soft Drink Bottles**	6.4%	2.5%	10.8%	33.5%	26.8%	30.6%	41.4%	41.0%	41.3%	39.5%
Wine and Liquor Bottles	Neg.	Neg.	Neg.	10.3%	22.5%	15.3%	31.8%	34.1%	34.5%	31.8%
Other Bottles & Jars	Neg.	Neg.	Neg.	12.5%	26.9%	14.8%	12.1%	15.0%	14.8%	14.7%
Total Glass Packaging	1.6%	1.3%	5.4%	22.1%	26.1%	24.8%	*33.4%*	*34.1%*	*34.0%*	*32.5%*
Steel Packaging										
Beer and Soft Drink Cans	1.6%	1.3%	9.6%	26.7%	Neg.	Neg.				
Cans	Neg.	1.7%	5.3%	23.2%	58.2%	62.9%	67.0%	70.8%	70.6%	70.7%
Other Steel Packaging	Neg.	Neg.	Neg.	30.0%	66.7%	66.7%	79.5%	78.9%	79.2%	80.0%
Total Steel Packaging	Neg.	1.5%	5.5%	23.9%	58.9%	63.3%	*69.0%*	*72.2%*	*72.5%*	*72.8%*
Aluminum Packaging										
Beer and Soft Drink Cans	Neg.	10.0%	37.6%	63.9%	54.6%	44.8%	49.6%	54.6%	55.1%	55.1%
Other Cans	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	NA	NA	NA	NA
Foil and Closures	Neg.	Neg.	Neg.	6.1%	7.9%	10.0%	NA	NA	NA	NA
Total Aluminum Pkg	Neg.	1.8%	25.2%	53.2%	44.1%	35.8%	*35.8%*	*38.4%*	*38.9%*	*38.7%*
Paper & Paperboard Pkg										
Corrugated Boxes	34.4%	21.6%	37.4%	48.0%	67.3%	71.5%	85.0%	90.9%	88.5%	89.5%
Other Paper & Paperboard Pkg										
Gable Top/Aseptic Cartons‡			Neg.	Neg.	Neg.	Neg.	-	-	-	-
Folding Cartons			Neg.	Neg.	7.0%	21.5%	-	-	-	-
Other Paperboard Packaging			Neg.	Neg.	Neg.	Neg.	-	-	-	-
Bags and Sacks			Neg.	Neg.	20.1%	28.6%	-	-	-	-
Wrapping Papers			Neg.	Neg.	Neg.	Neg.	-	-	-	-
Other Paper Packaging	7.5%	9.2%	35.3%	Neg.	Neg.	Neg.	-	-	-	-
Subtotal Other Paper & Paperboard Pkg							25.0%	24.7%	27.7%	25.6%
Total Paper & Board Pkg	19.4%	14.5%	27.4%	36.9%	52.7%	59.6%	*71.3%*	*76.1%*	*75.1%*	*75.4%*
Plastics Packaging										
PET Bottles and Jars			3.8%	32.6%	22.1%	23.2%	29.2%	30.8%	31.3%	31.2%
HDPE Natural Bottles			Neg.	3.8%	30.4%	28.8%	27.5%	28.2%	28.2%	29.5%
Other Containers	Neg.	Neg.	Neg.	1.4%	9.8%	9.9%	16.4%	16.8%	18.0%	19.5%
Bags and Sacks										
Wraps										
Subtotal Bags, Sacks, and Wraps			Neg.	2.4%	4.3%	5.2%	11.5%	11.5%	13.5%	12.3%
Other Plastics Packaging	Neg.	Neg.	Neg.	1.0%	3.2%	2.8%	2.2%	1.5%	1.7%	2.5%
Total Plastics Packaging	Neg.	Neg.	Neg.	3.8%	9.2%	10.3%	*13.5%*	*13.8%*	*14.6%*	*14.8%*
Other Packaging										
Wood Packaging	Neg.	Neg.	Neg.	1.6%	15.9%	19.8%	23.3%	25.1%	26.2%	26.5%
Other Misc. Packaging	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.
Total Containers & Pkg	10.5%	7.7%	16.1%	26.0%	38.1%	41.3%	48.6%	51.5%	51.5%	51.5%
Total Product Wastes†	10.3%	9.6%	13.3%	19.8%	29.7%	32.0%	36.6%	36.9%	36.2%	36.6%

Table 25. Products Recycled and Composted* in Municipal Solid Waste, 1960 to 2014
(With Detail on Containers and Packaging)
(In percent of generation of each product)

Products	Percent of Generation of Each Product									
	1960	1970	1980	1990	2000	2005	2010	2012	2013	2014
Other Wastes										
Food, Other^	Neg.	Neg.	Neg.	Neg.	2.2%	2.1%	2.7%	4.8%	5.0%	5.1%
Yard Trimmings	Neg.	Neg.	Neg.	12.0%	51.7%	61.9%	57.5%	57.7%	60.2%	61.1%
Miscellaneous Inorganic Wastes	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.
Total Other Wastes	Neg.	Neg.	Neg.	6.8%	25.4%	29.9%	27.6%	28.7%	29.8%	29.9%
Total MSW Recycled and Composted - %	6.4%	6.6%	9.6%	16.0%	28.5%	31.4%	34.0%	34.5%	34.3%	34.6%

* Recycling and composting of postconsumer wastes; does not include converting/fabrication scrap. Details may not add to totals due to rounding.
** Includes carbonated drinks and non-carbonated water, teas, flavored drinks, and ready-to-drink alcoholic coolers and cocktails.
‡ Includes milk, juice, and other products packaged in gable top cartons and liquid food aseptic cartons.
† Other than food products.
^ Includes collection of soiled paper and mixed MSW for composting.
Neg. = Less than 5,000 tons or 0.05 percent. NA = Not Available - Detailed data not available.

Table 26. Products Combusted with Energy Recovery* in Municipal Solid Waste, 1960 to 2014
(With Detail on Containers and Packaging)
(In thousands of tons)

Products	Thousands of Tons									
	1960	1970	1980	1990	2000	2005	2010	2012	2013	2014
Durable Goods	0	60	440	4,480	6,260	6,750	7,070	8,150	8,490	8,410
(Detail in Table 16)										
Nondurable Goods	0	90	580	7,380	9,000	7,980	6,030	6,740	6,960	6,870
(Detail in Table 20)										
Containers and Packaging										
Glass Packaging										
Beer and Soft Drink Bottles**	0	20	120	640	810	830	590	650	630	640
Wine and Liquor Bottles	0	10	50	310	290	250	210	240	230	240
Other Bottles & Jars	0	20	100	620	490	350	310	330	350	340
Total Glass Packaging	0	50	270	1,570	1,590	1,430	1,110	1,220	1,210	1,220
Steel Packaging										
Beer and Soft Drink Cans	0	10	10	20	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.
Cans	0	10	50	330	210	140	130	110	110	100
Other Steel Packaging	0	Neg.	Neg.	20	20	10	20	20	20	20
Total Steel Packaging	0	20	60	370	230	150	150	130	130	120
Aluminum Packaging										
Beer and Soft Drink Cans	0	Neg.	10	100	130	150	120	120	110	110
Other Cans	0	Neg.	Neg.	Neg.	10	10	10	20	20	30
Foil and Closures	0	Neg.	10	50	70	70	80	80	80	80
Total Aluminum Pkg	0	Neg.	20	150	210	230	210	220	210	220
Paper & Paperboard Pkg										
Corrugated Boxes	0	40	210	2,120	1,920	1,610	770	530	690	630
Other Paper & Paperboard Pkg										
Gable Top/Aseptic Cartons‡			20	90	110	90	-	-	-	-
Folding Cartons			70	670	1,050	790	-	-	-	-
Other Paperboard Packaging	0	20	Neg.	50	40	30	-	-	-	-
Bags and Sacks			70	380	230	150	-	-	-	-
Wrapping Papers			Neg.	20	Neg.	Neg.	-	-	-	-
Other Paper Packaging	0	10	10	170	320	250	-	-	-	-
Subtotal Other Paper & Paperboard Pkg							1,150	1,260	1,220	1,260
Total Paper & Board Pkg	0	70	380	3,500	3,670	2,920	1,920	1,790	1,910	1,890
Plastics Packaging										
PET Bottles and Jars			Neg.	50	260	350	330	380	390	390
HDPE Natural Bottles			Neg.	90	90	100	100	110	110	110
Other Containers	0	Neg.	20	240	300	230	270	300	300	290
Bags and Sacks										
Wraps										
Subtotal Bags, Sacks, and Wraps			30	410	780	770	620	660	650	700
Other Plastics Packaging	0	Neg.	20	340	530	570	770	880	920	900
Total Plastics Packaging	0	Neg.	70	1,130	1,960	2,020	2,090	2,330	2,370	2,390

Table 26. Products Combusted with Energy Recovery* in Municipal Solid Waste, 1960 to 2014 (With Detail on Containers and Packaging)

(In thousands of tons)

Products	Thousands of Tons									
	1960	1970	1980	1990	2000	2005	2010	2012	2013	2014
Other Packaging										
Wood Packaging	0	10	80	1,370	1,400	1,350	1,330	1,420	1,370	1,390
Other Misc. Packaging	0	Neg.	Neg.	20	50	60	60	70	70	70
Total Containers & Pkg	0	150	880	8,110	9,110	8,160	6,870	7,180	7,270	7,300
Total Product Wastes†	0	300	1,900	19,970	24,370	22,890	19,970	22,070	22,720	22,580
Other Wastes										
Food	0	50	260	4,060	5,820	5,870	6,150	6,830	6,970	7,150
Yard Trimmings	0	90	550	5,240	2,860	2,220	2,510	2,830	2,690	2,630
Miscellaneous Inorganic Wastes	0	10	50	490	680	670	680	770	780	780
Total Other Wastes	0	150	860	9,790	9,360	8,760	9,340	10,430	10,440	10,560
Total MSW Combusted with Energy Recovery - Weight	0	450	2,760	29,760	33,730	31,650	29,310	32,500	33,160	33,140

* Products and materials combusted with energy recovery estimated at percentage total MSW after recovery for recycling and composting. In 2014, 19.6 percent of MSW after recycling and composting was combusted with energy recovery. Details may not add to totals due to rounding.

** Includes carbonated drinks and non-carbonated water, teas, flavored drinks, and ready-to-drink alcoholic coolers and cocktails.

‡ Includes milk, juice, and other products packaged in gable top cartons and liquid food aseptic cartons.

† Other than food products.

Neg. = Less than 5,000 tons or 0.05 percent. NA = Not Available - Detailed data not available.

Table 27. Products Combusted with Energy Recovery* in Municipal Solid Waste, 1960 to 2014
(With Detail on Containers and Packaging)
(In percent of total combusted)

Products	Percent of Total Combusted									
	1960	1970	1980	1990	2000	2005	2010	2012	2013	2014
Durable Goods		13.3%	15.9%	15.1%	18.6%	21.3%	24.1%	25.1%	25.6%	25.4%
(Detail in Table 16)										
Nondurable Goods		19.9%	21.0%	24.8%	26.7%	25.2%	20.6%	20.7%	21.0%	20.7%
(Detail in Table 20)										
Containers and Packaging										
Glass Packaging										
Beer and Soft Drink Bottles**		4.5%	4.3%	2.2%	2.4%	2.6%	2.0%	2.0%	1.9%	2.0%
Wine and Liquor Bottles		2.2%	1.8%	1.0%	0.8%	0.8%	0.7%	0.8%	0.7%	0.7%
Other Bottles & Jars		4.4%	3.6%	2.1%	1.5%	1.1%	1.1%	1.0%	1.0%	1.0%
Total Glass Packaging		11.1%	9.8%	5.3%	4.7%	4.5%	3.8%	3.8%	3.6%	3.7%
Steel Packaging										
Beer and Soft Drink Cans		2.2%	0.4%	0.1%	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.
Cans		2.2%	1.8%	1.1%	0.6%	0.5%	0.4%	0.3%	0.3%	0.3%
Other Steel Packaging		Neg.	Neg.	0.1%	0.1%	0.0%	0.1%	0.1%	0.1%	0.1%
Total Steel Packaging		4.4%	2.2%	1.2%	0.7%	0.5%	0.5%	0.4%	0.4%	0.4%
Aluminum Packaging										
Beer and Soft Drink Cans		Neg.	0.4%	0.3%	0.4%	0.5%	0.4%	0.4%	0.3%	0.3%
Other Cans		Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	0.1%	0.1%	0.1%
Foil and Closures		Neg.	0.4%	0.2%	0.2%	0.2%	0.3%	0.2%	0.2%	0.2%
Total Aluminum Pkg		Neg.	0.7%	0.5%	0.6%	0.7%	0.7%	0.7%	0.6%	0.6%
Paper & Paperboard Pkg										
Corrugated Boxes		8.9%	7.6%	7.1%	5.7%	5.1%	2.6%	1.6%	2.1%	1.9%
Other Paper & Paperboard Pkg										
Gable Top/Aseptic Cartons‡			0.7%	0.3%	0.3%	0.3%	-	-	-	-
Folding Cartons			2.5%	2.3%	3.1%	2.5%	-	-	-	-
Other Paperboard Packaging		4.5%	Neg.	0.2%	0.1%	0.1%	-	-	-	-
Bags and Sacks			2.5%	1.3%	0.7%	0.4%	-	-	-	-
Wrapping Papers			Neg.	0.1%	Neg.	Neg.	-	-	-	-
Other Paper Packaging		2.2%	0.4%	0.6%	1.0%	0.8%	-	-	-	-
Subtotal Other Paper & Paperboard Pkg							3.9%	3.9%	3.7%	3.8%
Total Paper & Board Pkg		15.6%	13.8%	11.8%	10.9%	9.2%	6.6%	5.5%	5.8%	5.7%
Plastics Packaging										
PET Bottles and Jars			Neg.	0.2%	0.8%	1.1%	1.1%	1.2%	1.2%	1.2%
HDPE Natural Bottles			Neg.	0.3%	0.3%	0.3%	0.4%	0.3%	0.3%	0.3%
Other Containers		Neg.	0.7%	0.8%	0.9%	0.7%	0.9%	0.9%	0.9%	0.9%
Bags and Sacks										
Wraps										
Subtotal Bags, Sacks, and Wraps			1.1%	1.4%	2.3%	2.4%	2.1%	2.0%	2.0%	2.1%
Other Plastics Packaging		Neg.	0.7%	1.1%	1.5%	1.8%	2.6%	2.7%	2.8%	2.7%
Total Plastics Packaging		Neg.	2.5%	3.8%	5.8%	6.4%	7.1%	7.1%	7.2%	7.2%
Other Packaging										
Wood Packaging		2.2%	2.9%	4.6%	4.2%	4.3%	4.5%	4.4%	4.1%	4.2%
Other Misc. Packaging		Neg.	Neg.	0.1%	0.1%	0.2%	0.2%	0.2%	0.2%	0.2%
Total Containers & Pkg		33.3%	31.9%	27.3%	27.0%	25.8%	23.4%	22.1%	21.9%	22.0%
Total Product Wastes†		66.6%	68.8%	67.1%	72.3%	72.3%	68.1%	67.9%	68.5%	68.1%

Table 27. Products Combusted with Energy Recovery* in Municipal Solid Waste, 1960 to 2014
(With Detail on Containers and Packaging)
(In percent of total combusted)

Products	Percent of Total Combusted									
	1960	1970	1980	1990	2000	2005	2010	2012	2013	2014
Other Wastes										
Food		11.1%	9.4%	13.6%	17.3%	18.5%	21.0%	21.0%	21.0%	21.6%
Yard Trimmings		20.0%	20.0%	17.6%	8.5%	7.0%	8.6%	8.7%	8.1%	7.9%
Miscellaneous Inorganic Wastes		2.3%	1.8%	1.7%	1.9%	2.1%	2.3%	2.4%	2.4%	2.4%
Total Other Wastes		33.4%	31.2%	32.9%	27.7%	27.7%	31.9%	32.1%	31.5%	31.9%
Total MSW Combusted with Energy Recovery - %		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

* Products and materials combusted with energy recovery estimated at percentage total MSW after recovery for recycling and composting. In 2014, 19.6 percent of MSW after recycling and composting was combusted with energy recovery. Details may not add to totals due to rounding.

** Includes carbonated drinks and non-carbonated water, teas, flavored drinks, and ready-to-drink alcoholic coolers and cocktails.

‡ Includes milk, juice, and other products packaged in gable top cartons and liquid food aseptic cartons.

† Other than food products.

Neg. = Less than 5,000 tons or 0.05 percent. NA = Not Available - Detailed data not available.

Table 28. Products Landfilled* in Municipal Solid Waste, 1960 to 2014 (With Detail on Containers and Packaging)

(In thousands of tons)

Products	Thousands of Tons									
	1960	1970	1980	1990	2000	2005	2010	2012	2013	2014
Durable Goods	9,570	13,660	20,000	21,870	26,030	30,340	32,890	33,210	34,370	34,490
(Detail in Table 17)										
Nondurable Goods	14,940	21,240	29,170	35,990	37,450	35,900	28,030	27,420	28,170	28,220
(Detail in Table 21)										
Containers and Packaging										
Glass Packaging										
Beer and Soft Drink Bottles**	1,310	5,420	5,890	3,110	3,370	3,710	2,730	2,640	2,550	2,610
Wine and Liquor Bottles	1,070	1,880	2,380	1,510	1,190	1,130	950	960	910	980
Other Bottles & Jars	3,710	4,420	4,680	3,020	2,010	1,600	1,440	1,370	1,440	1,400
Total Glass Packaging	*6,090*	*11,720*	*12,950*	*7,640*	*6,570*	*6,440*	*5,120*	*4,970*	*4,900*	*4,990*
Steel Packaging										
Beer and Soft Drink Cans	630	1,540	460	90	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.
Cans	3,740	3,470	2,650	1,620	890	650	630	430	440	390
Other Steel Packaging	260	270	240	120	60	70	70	60	90	80
Total Steel Packaging	*4,630*	*5,280*	*3,350*	*1,830*	*950*	*720*	*700*	*490*	*530*	*470*
Aluminum Packaging										
Beer and Soft Drink Cans	Neg.	90	520	460	560	650	570	470	460	460
Other Cans	Neg.	60	40	20	40	70	60	100	100	100
Foil and Closures	170	410	370	260	280	290	380	350	330	330
Total Aluminum Pkg	*170*	*560*	*930*	*740*	*880*	*1,010*	*1,010*	*920*	*890*	*890*
Paper & Paperboard Pkg										
Corrugated Boxes	4,810	9,960	10,480	10,360	7,960	7,220	3,590	2,140	2,770	2,580
Other Paper & Paperboard Pkg										
Gable Top/Aseptic Cartons‡			770	420	440	410	-	-	-	-
Folding Cartons			3,230	3,290	4,360	3,550	-	-	-	-
Other Paperboard Packaging	3,840	4,810	230	240	160	130	-	-	-	-
Bags and Sacks			3,310	1,860	960	650	-	-	-	-
Wrapping Papers			200	90	Neg.	Neg.	-	-	-	-
Other Paper Packaging	2,720	3,450	540	850	1,350	1,150	-	-	-	-
Subtotal Other Paper & Paperboard Pkg							5,320	5,160	4,930	5,170
Total Paper & Board Pkg	*11,370*	*18,220*	*18,760*	*17,110*	*15,230*	*13,110*	*8,910*	*7,300*	*7,700*	*7,750*
Plastics Packaging										
PET Bottles and Jars			250	240	1,080	1,600	1,560	1,550	1,590	1,620
HDPE Natural Bottles			230	420	390	470	480	450	450	440
Other Containers	60	910	870	1,170	1,270	1,050	1,260	1,240	1,200	1,200
Bags and Sacks										
Wraps										
Subtotal Bags, Sacks, and Wraps			1,200	2,000	3,240	3,450	2,860	2,710	2,620	2,850
Other Plastics Packaging	60	1,180	770	1,680	2,220	2,550	3,580	3,600	3,710	3,700
Total Plastics Packaging	*120*	*2,090*	*3,320*	*5,510*	*8,200*	*9,120*	*9,740*	*9,550*	*9,570*	*9,810*
Other Packaging										
Wood Packaging	2,000	2,060	3,860	6,680	5,840	6,050	6,160	5,780	5,570	5,720
Other Misc. Packaging	120	130	130	130	190	220	280	280	290	290
Total Containers & Pkg	24,500	40,060	43,300	39,640	37,860	36,670	31,920	29,290	29,450	29,920
Total Product Wastes†	49,010	74,960	92,470	97,500	101,340	102,910	92,840	89,920	91,990	92,630

Table 28. Products Landfilled* in Municipal Solid Waste, 1960 to 2014 (With Detail on Containers and Packaging)

(In thousands of tons)

Products	Thousands of Tons									
	1960	1970	1980	1990	2000	2005	2010	2012	2013	2014
Other Wastes										
Food	12,200	12,750	12,740	19,800	24,200	26,370	28,620	27,860	28,250	29,310
Yard Trimmings	20,000	23,110	26,950	25,560	11,900	9,990	11,690	11,540	10,910	10,790
Miscellaneous Inorganic Wastes	1,300	1,770	2,200	2,410	2,820	3,020	3,160	3,130	3,150	3,190
Total Other Wastes	33,500	37,630	41,890	47,770	38,920	39,380	43,470	42,530	42,310	43,290
Total MSW Landfilled - Weight	82,510	112,590	134,360	145,270	140,260	142,290	136,310	132,450	134,300	135,920

* Landfilling after recycling, composting, and combustion with energy recovery. Does not include construction & demolition debris, industrial process wastes, or certain other wastes. Details may not add to totals due to rounding.

** Includes carbonated drinks and non-carbonated water, teas, flavored drinks, and ready-to-drink alcoholic coolers and cocktails.

‡ Includes milk, juice, and other products packaged in gable top cartons and liquid food aseptic cartons.

† Other than food products.

Neg. = Less than 5,000 tons or 0.05 percent. NA = Not Available - Detailed data not available.

Table 29. Products Landfilled* in Municipal Solid Waste, 1960 to 2014 (With Detail on Containers and Packaging)

(In percent of total landfilled)

Products	Percent of Total Landfilled									
	1960	1970	1980	1990	2000	2005	2010	2012	2013	2014
Durable Goods	11.6%	12.1%	14.9%	15.0%	18.6%	21.3%	24.1%	25.1%	25.6%	25.4%
(Detail in Table 17)										
Nondurable Goods	18.1%	18.9%	21.7%	24.8%	26.7%	25.2%	20.6%	20.7%	21.0%	20.8%
(Detail in Table 21)										
Containers and Packaging										
Glass Packaging										
Beer and Soft Drink Bottles**	1.6%	4.8%	4.4%	2.1%	2.4%	2.6%	2.0%	2.0%	1.9%	2.0%
Wine and Liquor Bottles	1.3%	1.7%	1.8%	1.0%	0.8%	0.8%	0.7%	0.8%	0.7%	0.7%
Other Bottles & Jars	4.5%	3.9%	3.5%	2.1%	1.5%	1.1%	1.1%	1.0%	1.0%	1.0%
Total Glass Packaging	*7.4%*	*10.4%*	*9.6%*	*5.3%*	*4.7%*	*4.5%*	*3.8%*	*3.8%*	*3.6%*	*3.7%*
Steel Packaging										
Beer and Soft Drink Cans	0.8%	1.4%	0.3%	0.1%	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.
Cans	4.5%	3.1%	2.0%	1.1%	0.6%	0.5%	0.5%	0.3%	0.3%	0.3%
Other Steel Packaging	0.3%	0.2%	0.2%	0.1%	0.1%	0.0%	0.1%	0.1%	0.1%	0.1%
Total Steel Packaging	*5.6%*	*4.7%*	*2.5%*	*1.3%*	*0.7%*	*0.5%*	*0.6%*	*0.4%*	*0.4%*	*0.4%*
Aluminum Packaging										
Beer and Soft Drink Cans	Neg.	0.1%	0.4%	0.3%	0.4%	0.5%	0.4%	0.4%	0.3%	0.3%
Other Cans	Neg.	0.1%	0.0%	0.0%	Neg.	Neg.	Neg.	0.1%	0.1%	0.1%
Foil and Closures	0.2%	0.4%	0.3%	0.2%	0.2%	0.2%	0.3%	0.2%	0.2%	0.2%
Total Aluminum Pkg	*0.2%*	*0.5%*	*0.7%*	*0.5%*	*0.6%*	*0.7%*	*0.7%*	*0.7%*	*0.6%*	*0.6%*
Paper & Paperboard Pkg										
Corrugated Boxes	5.8%	8.8%	7.8%	7.1%	5.7%	5.1%	2.6%	1.6%	2.1%	1.9%
Other Paper & Paperboard Pkg										
Gable Top/Aseptic Cartons‡			0.6%	0.3%	0.3%	0.3%	-	-	-	-
Folding Cartons			2.4%	2.3%	3.1%	2.5%	-	-	-	-
Other Paperboard Packaging	4.7%	4.3%	0.2%	0.2%	0.1%	0.1%	-	-	-	-
Bags and Sacks			2.5%	1.3%	0.7%	0.4%	-	-	-	-
Wrapping Papers			0.1%	0.1%	Neg.	Neg.	-	-	-	-
Other Paper Packaging	3.3%	3.1%	0.4%	0.6%	1.0%	0.8%	-	-	-	-
Subtotal Other Paper & Paperboard Pkg							3.9%	3.9%	3.7%	3.8%
Total Paper & Board Pkg	*13.8%*	*16.2%*	*14.0%*	*11.8%*	*10.9%*	*9.2%*	*6.5%*	*5.5%*	*5.8%*	*5.7%*
Plastics Packaging										
PET Bottles and Jars			0.2%	0.2%	0.8%	1.1%	1.1%	1.2%	1.2%	1.2%
HDPE Natural Bottles			0.2%	0.3%	0.3%	0.3%	0.4%	0.3%	0.3%	0.3%
Other Containers	0.1%	0.8%	0.6%	0.8%	0.9%	0.7%	0.9%	0.9%	0.9%	0.9%
Bags and Sacks										
Wraps										
Subtotal Bags, Sacks, and Wraps			0.9%	1.4%	2.3%	2.4%	2.1%	2.0%	2.0%	2.1%
Other Plastics Packaging	0.1%	1.0%	0.6%	1.2%	1.5%	1.8%	2.6%	2.7%	2.8%	2.7%
Total Plastics Packaging	*0.1%*	*1.9%*	*2.5%*	*3.8%*	*5.8%*	*6.4%*	*7.1%*	*7.1%*	*7.2%*	*7.2%*
Other Packaging										
Wood Packaging	2.4%	1.8%	2.9%	4.6%	4.2%	4.3%	4.5%	4.4%	4.1%	4.2%
Other Misc. Packaging	0.1%	0.1%	0.1%	0.1%	0.1%	0.2%	0.2%	0.2%	0.2%	0.2%
Total Containers & Pkg	29.7%	35.6%	32.2%	27.3%	27.0%	25.8%	23.4%	22.1%	21.9%	22.0%
Total Product Wastes†	59.4%	66.6%	68.8%	67.1%	72.3%	72.3%	68.1%	67.9%	68.5%	68.2%
Other Wastes										
Food	14.8%	11.3%	9.5%	13.6%	17.3%	18.5%	21.0%	21.0%	21.0%	21.6%
Yard Trimmings	24.2%	20.5%	20.1%	17.6%	8.5%	7.0%	8.6%	8.7%	8.1%	7.9%
Miscellaneous Inorganic Wastes	1.6%	1.6%	1.6%	1.7%	1.9%	2.2%	2.3%	2.4%	2.4%	2.3%
Total Other Wastes	40.6%	33.4%	31.2%	32.9%	27.7%	27.7%	31.9%	32.1%	31.5%	31.8%
Total MSW Landfilled - %	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

* Landfilling after recycling, composting, and combustion with energy recovery. Does not include construction & demolition debris, industrial process wastes, or certain other wastes. Details may not add to totals due to rounding.

** Includes carbonated drinks and non-carbonated water, teas, flavored drinks, and ready-to-drink alcoholic coolers and cocktails.

‡ Includes milk, juice, and other products packaged in gable top cartons and liquid food aseptic cartons.

† Other than food products.

Neg. = Less than 5,000 tons or 0.05 percent. NA = Not Available - Detailed data not available.

Table 30. Selected Examples of Source Reduction Practices

Source Reduction Practice	MSW Product Categories: Durable Goods	Nondurable Goods	Containers & Packaging	Organics (Wood, Yard Waste, Food, etc.)
Product or Packaging Redesign				
Materials reduction	▪ Downgauge metals in appliances	▪ Paperless purchase orders ▪ Concentrated products	▪ Container lightweighting ▪ Right size packaging ▪ Eliminate unnecessary layers of packaging ▪ Refillable/reusable containers, including use of flexible pouches for refills for rigid containers	▪ Xeriscaping ▪ Just in time ordering / inventory control ▪ Adjust menus to reduce frequently uneaten or wasted items
Materials substitution	▪ Use of composites in appliances and electronic circuitry		▪ Replace rigid or heavy packaging with lighter or more compact options, e.g., cereal in bags. coffee in brick packs ▪ Use life cycle data to choose material with lower lifecycle impact	
Lengthen Life	▪ High mileage tires ▪ Electronic components reduce moving parts	▪ Regular servicing ▪ Consider purchasing warranties to make repair more affordable ▪ Extend warranties	▪ Design for secondary use ▪ Design for upgrades (e.g., add computer memory or processing capacity, battery upgrades) ▪ Reusable packaging	▪ Clearer label information on food expiration date ▪ Avoid spoilage by changing: – Packaging – Storage and transportation – Supply chain management
Consumer Practices				
	▪ Purchase long lived products ▪ Regular servicing ▪ Repair ▪ Buying less stuff	▪ Repair ▪ Duplex printing ▪ Sharing ▪ Reduce unwanted mail ▪ Purchasing concentrated products ▪ Buying less stuff	▪ Purchasing products in bulk (less packaging) ▪ Reusable bags and containers ▪ Buying less stuff	▪ Food donation ▪ Avoid spoilage by monitoring and tracking food and purchases and use ▪ Reduce over-purchasing ▪ Proper food storage and preparation ▪ Repurposing (e.g., older bread can be made into croutons) ▪ Backyard composting ▪ Vermi-composting ▪ Grasscycling
Reuse				
By Design	▪ Document materials and methods for disassembly/ repair/reuse ▪ Use materials and systems that exhibit modularity, and standardization to facilitate reuse and repair – Minimize connections between parts and/or make connections more accessible for ease of repair and replacement of parts	▪ Reusable shipping or mailing envelopes	▪ Reusable pallets ▪ Returnable secondary packaging ▪ Reusable/refillable dispensers for cleaning products ▪ Reusable service ware in food service ▪ Use durable reusable water bottles instead of disposable bottles	

Table 30. Selected Examples of Source Reduction Practices

Source Reduction Practice	MSW Product Categories			
	Durable Goods	Nondurable Goods	Containers & Packaging	Organics (Wood, Yard Waste, Food, etc.)
	– Mechanical connections with bolts and screws instead of glues, to facilitate repair – Minimize connections to increase ease of repair or part replacement – Provide adequate tolerances to allow for removal and replacement or repair of parts without affecting adjacent components			
Secondary	▪ Borrow or rent for temporary use ▪ Give to charity ▪ Buy or sell at garage sales	▪ Donate clothing, books ▪ Waste paper scratch pads	▪ Loosefill ▪ Grocery sacks ▪ Dairy containers ▪ Glass and plastic bottles and jars	
Reduce/Eliminate Toxins				
	▪ Eliminate PCBs	▪ Soy or waterbased inks ▪ Waterbased solvents ▪ Reduce mercury	▪ Replace lead foil on wine bottles ▪ Replace BPA-containing plastic products, liners, and coatings with alternative materials	

Table 31. Residential Food Collection and Composting Programs in the U.S., 2014

State	Households Served	State	Households Served
California	1,339,076	New York	101,306
Colorado	54,113	Ohio	73,889
Iowa	39,630	Oregon	216,686
Maryland	18,350	Pennsylvania	580
Massachusetts	13,050	Texas	134,000
Michigan	63,000	Vermont	2,700
Minnesota	85,752	Washington	682,436
New Jersey	9,600	Wisconsin	600
Total U.S. Households Served			**2,848,368**
Total U.S. Households			**117,259,427** **2.4%**

BioCycle January 2015. Residential Food Waste Collection in the U.S. — *BioCycle* Nationwide Survey. Additional web search to supplement *BioCycle* survey.

Table 32. Material Recovery Facilities (MRF), 2014*

Region	Number	Estimated Throughput (tpd)
NORTHEAST	175	29,792
SOUTH	238	45,375
MIDWEST	231	28,003
WEST	153	37,176
U.S. Total	**797**	**140,346**

*Number of facilities and throughput include bale and ship operations receiving fiber, mainly OCC, that bale and ship with no additional processing.

Source: Governmental Advisory Associates, Inc. Data provided December 2014.

Table 33. Municipal Waste-To-Energy Projects, 2014

Region	Number Operational	Design Capacity (tpd)
NORTHEAST	38	44,415
SOUTH	21	32,004
MIDWEST	14	11,524
WEST	7	7,310
U.S. Total*	80	95,253

* Excludes 4 inactive facilities (representing another 996 tpd capacity).
WTE includes mass burn, modular, and refuse-derived fuel combustion facilities.
Source: "The 2014 ERC Directory of Waste-to-Energy Facilities." Energy Recovery Council (ERC). May 2014.

Table 34. Landfill Facilities, 2014

Region	Number of Landfills
NORTHEAST	166
SOUTH	680
MIDWEST	381
WEST	729
U.S. Total	1,908

Source: State environmental websites.

Table 35. Generation, Recycling, Composting, Combustion with Energy Recovery, and Landfilling of Municipal Solid Waste, 1960 to 2014

(In thousands of tons and percent of total generation)

	Thousands of Tons									
	1960	1970	1980	1990	2000	2005	2010	2012	2013	2014
Generation	88,120	121,060	151,640	208,270	243,450	253,730	251,050	251,840	255,020	258,460
Recycling	5,610	8,020	14,520	29,040	53,010	59,240	65,260	65,560	65,120	66,380
Composting*	Neg.	Neg.	Neg.	4,200	16,450	20,550	20,170	21,330	22,440	23,020
Combustion with energy recovery**	0	450	2,760	29,760	33,730	31,650	29,310	32,500	33,160	33,140
Discards to landfill, other disposal†	82,510	112,590	134,360	145,270	140,260	142,290	136,310	132,450	134,300	135,920
	Pounds per Person per Day									
	1960	1970	1980	1990	2000	2005	2010	2012	2013	2014
Generation	2.68	3.25	3.66	4.57	4.74	4.69	4.45	4.40	4.42	4.44
Recycling	0.17	0.22	0.35	0.64	1.03	1.10	1.16	1.14	1.13	1.14
Composting*	Neg.	Neg.	Neg.	0.09	0.32	0.38	0.36	0.37	0.39	0.40
Combustion with energy recovery**	0.00	0.01	0.07	0.65	0.66	0.59	0.52	0.57	0.57	0.57
Discards to landfill, other disposal†	2.51	3.02	3.24	3.19	2.73	2.62	2.41	2.32	2.33	2.33
Population (thousands)	179,979	203,984	227,255	249,907	281,422	296,410	309,051	313,914	316,129	318,857

	Percent of Total Generation									
	1960	1970	1980	1990	2000	2005	2010	2012	2013	2014
Generation	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Recycling	6.4%	6.6%	9.6%	14.0%	21.8%	23.3%	26.0%	26.0%	25.5%	25.7%
Composting*	Neg.	Neg.	Neg.	2.0%	6.7%	8.1%	8.0%	8.5%	8.8%	8.9%
Combustion with energy recovery**	0.0%	0.3%	1.8%	14.2%	13.9%	12.5%	11.7%	12.9%	13.0%	12.8%
Landfilling and other disposal†	93.6%	93.1%	88.6%	69.8%	57.6%	56.1%	54.3%	52.6%	52.7%	52.6%

* Composting of yard trimmings, food and other MSW organic material. Does not include backyard composting.

** Includes combustion with energy recovery of MSW in mass burn or refuse-derived fuel form, and combustion with energy recovery of source separated materials in MSW (e.g., wood pallets and tire-derived fuel). 2014 includes 29,540 MSW, 520 wood, and 3,080 tires (1,000 tons).

† Landfilling after recycling and composting minus combustion with energy recovery. Includes combustion without energy recovery.
Details may not add to totals due to rounding.

Figure 1. Municipal Solid Waste in the Universe of Subtitle D Wastes

Subtitle D Wastes

The Subtitle D Waste included in this report as Municipal Solid Waste (MSW), which includes:

- Containers and packaging such as soft drink bottles and corrugated boxes
- Durable goods such as furniture and appliances
- Nondurable goods such as newspapers, trash bags, and clothing
- Other wastes such as food and yard trimmings.

Subtitle D Wastes not included as MSW in this report are:

- Municipal sludges
- Industrial nonhazardous process wastes
- Construction and demolition debris*
- Land clearing debris
- Transportation parts and equipment
- Agricultural wastes
- Oil and gas wastes
- Mining wastes
- Auto bodies
- Fats, grease, and oils

*Combustion and demolition debris generation is included in this report, but is outside of the scope of MSW.

Figure 2. Definition of Terms

The materials flow methodology produces an estimate of total municipal solid waste (MSW) generation in the United States, by material categories and by product categories.

The term ***generation*** as used in this report refers to the weight of materials and products as they enter the waste management system from residential, commercial, institutional and industrial sources and before recycling, composting, combustion or landfilling take place. Preconsumer (industrial) scrap is not included in the generation estimates. Source reduction activities (e.g., backyard composting of yard trimmings) take place ahead of generation.

Source reduction as used in this report refers to activities that reduce the amount of wastes before they enter the municipal solid waste management system. Reuse is a source reduction activity involving the recovery or reapplication of a package, used product, or material in a manner that retains its original form or identity. Reuse of products such as refillable glass bottles, reusable plastic food storage containers, or refurbished wood pallets is considered to be source reduction, not recycling.

Recycling as used in this report is defined as the recovery of useful materials, such as paper, glass, plastic, metals, construction and demolition (C&D) debris and organics from the waste stream (e.g. MSW), along with the transformation of the materials to make new products to reduce the amount of virgin raw materials needed to meet consumer demands. For recycled products, recycling equals reported purchases of postconsumer collected material (e.g., glass cullet, old newspapers) plus net exports (if any) of the material. Thus, recycling of old corrugated containers (OCC) is the sum of OCC purchases by paper mills plus net exports of OCC. If recycling as reported by a data source includes converting or fabrication (preconsumer) scrap, the preconsumer scrap is not counted towards the recycling estimates in this report. Imported secondary materials are not counted in recycling estimates in this report. For some materials, additional uses, such as glass used for highway construction or newspapers used to make insulation, are added into the recycling totals.

Composting is the decomposition of organic materials by aerobic microorganisms. Composting facilities manage the amount of moisture, amount of oxygen and mixture of organic materials for optimal composting conditions. The composting process emits heat, water vapor and biogenic carbon dioxide, reducing the raw organic materials in mass and volume to create compost.[1] Composting of materials as estimated in this report includes yard trimmings, food waste and mixed MSW containing food waste.

Combustion with energy recovery, often called "waste-to-energy," as used in this report refers to confined and controlled burning with energy recovery, which not only decreases the volume of solid waste destined for landfills, but can also recover energy from the waste burning process.

Landfilling as used in this report refers to the MSW remaining after recycling, composting and combustion with energy recovery. These materials presumably would be landfilled in a discrete area of land or excavation that receives household waste. Some MSW however, is littered, stored or disposed onsite, or burned onsite, particularly in rural areas. No good estimates for these other disposal practices are available, but the total amounts of MSW involved are presumed to be small.

For the analysis of municipal solid waste in this report, products are divided into three basic categories: durable goods, nondurable goods, and containers and packaging. The durable goods and nondurable goods categories generally follow the definitions of the U.S. Department of Commerce.

Durable goods are those products that last three years or more. Products in this category include major and small appliances, furniture and furnishings, carpets and rugs, tires, lead-acid batteries, consumer electronics, and other miscellaneous durables.

Nondurable goods are those products that last less than three years. Products in this category include newspapers, books, magazines, office papers, directories, mail, other commercial printing, tissue paper and towels, paper and plastic plates and cups, trash bags, disposable diapers, clothing and footwear, towels, sheets and pillowcases, other nonpackaging paper, and other miscellaneous nondurables.

Containers and packaging are assumed to be discarded the same year the products they contain are purchased. Products in this category include bottles, containers, corrugated boxes, milk cartons, folding cartons, bags, sacks, and wraps, wood packaging, and other miscellaneous packaging.

[1] Platt, B., Goldstein, N. 2014. State of Composting in the U.S. *BioCycle* 55(6): 19. http://www.biocycle.net/2014/07/16/state-of-composting-in-the-us/.

Figure 3. Paper and Paperboard Products Generated in MSW, 2014

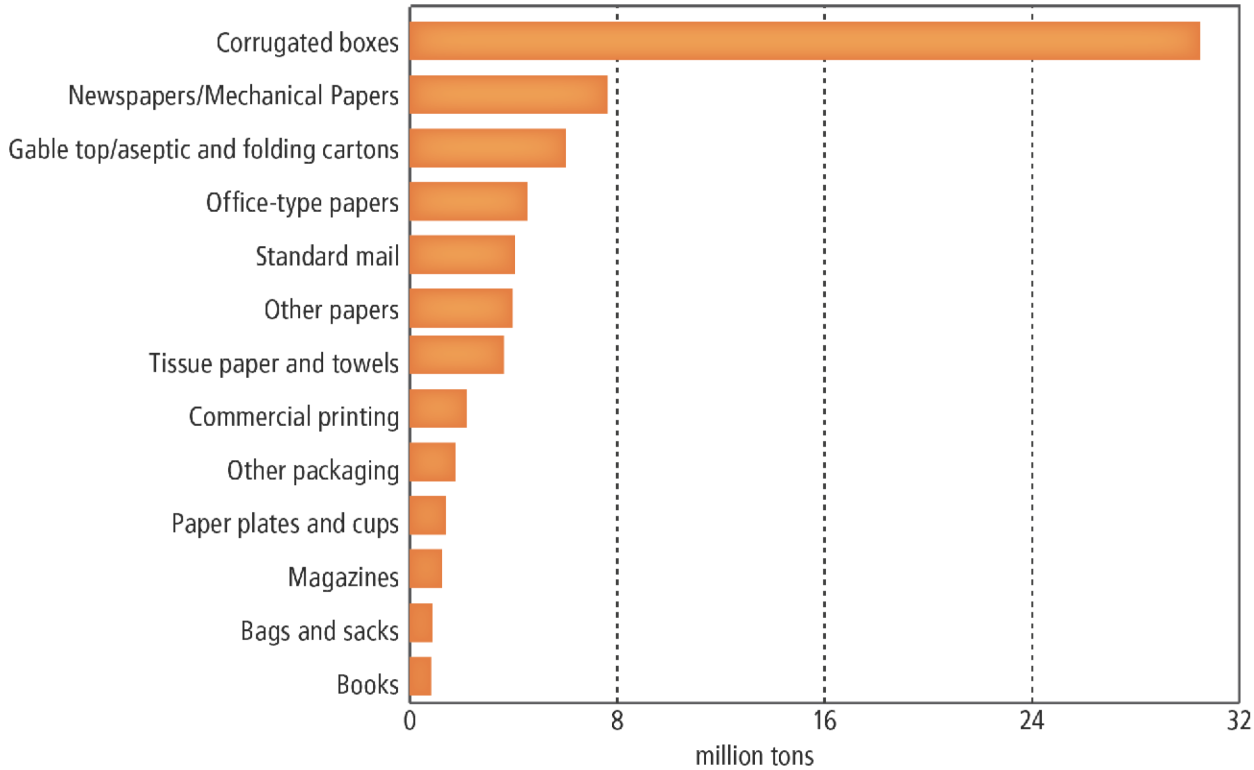


Figure 4. Paper and Paperboard Generation and Recycling, 1960 to 2014

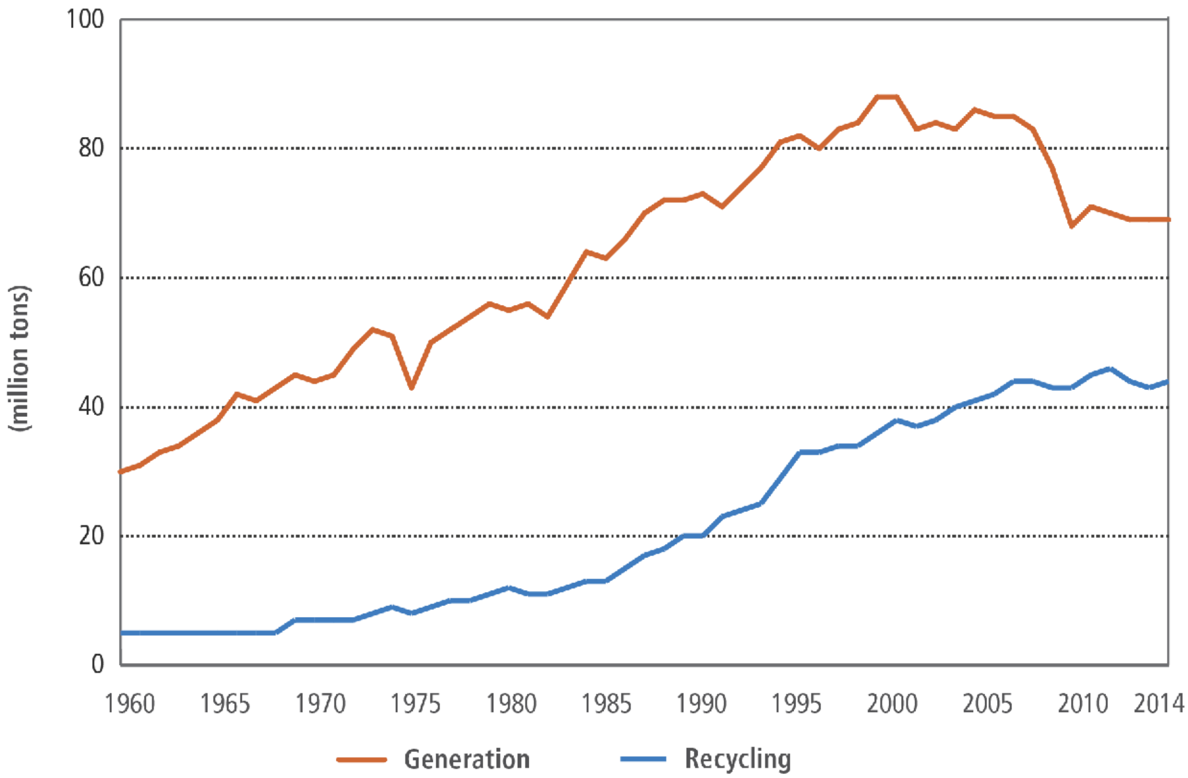


Figure 5. Glass Products Generated in MSW, 2014

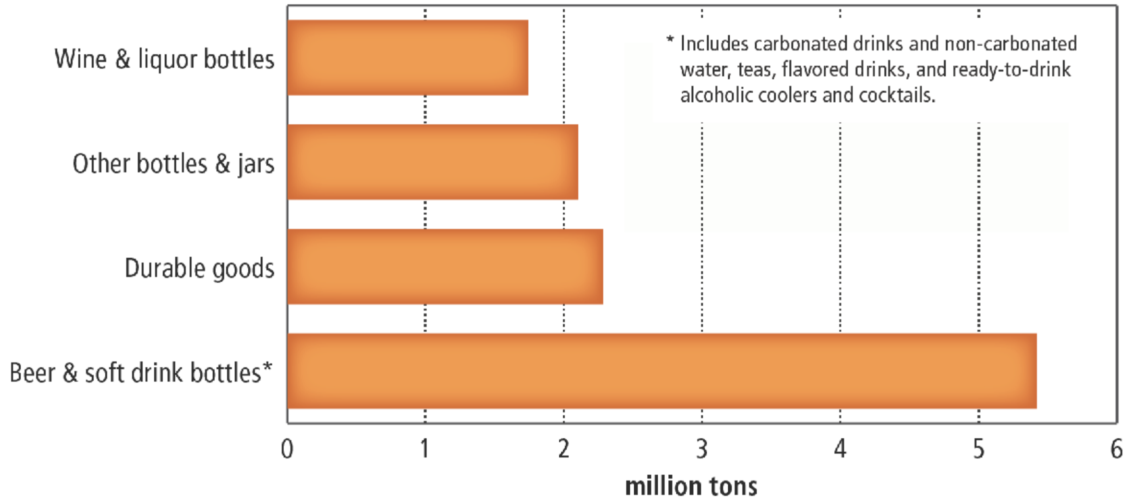


Figure 6. Glass Generation and Recycling, 1960 to 2014

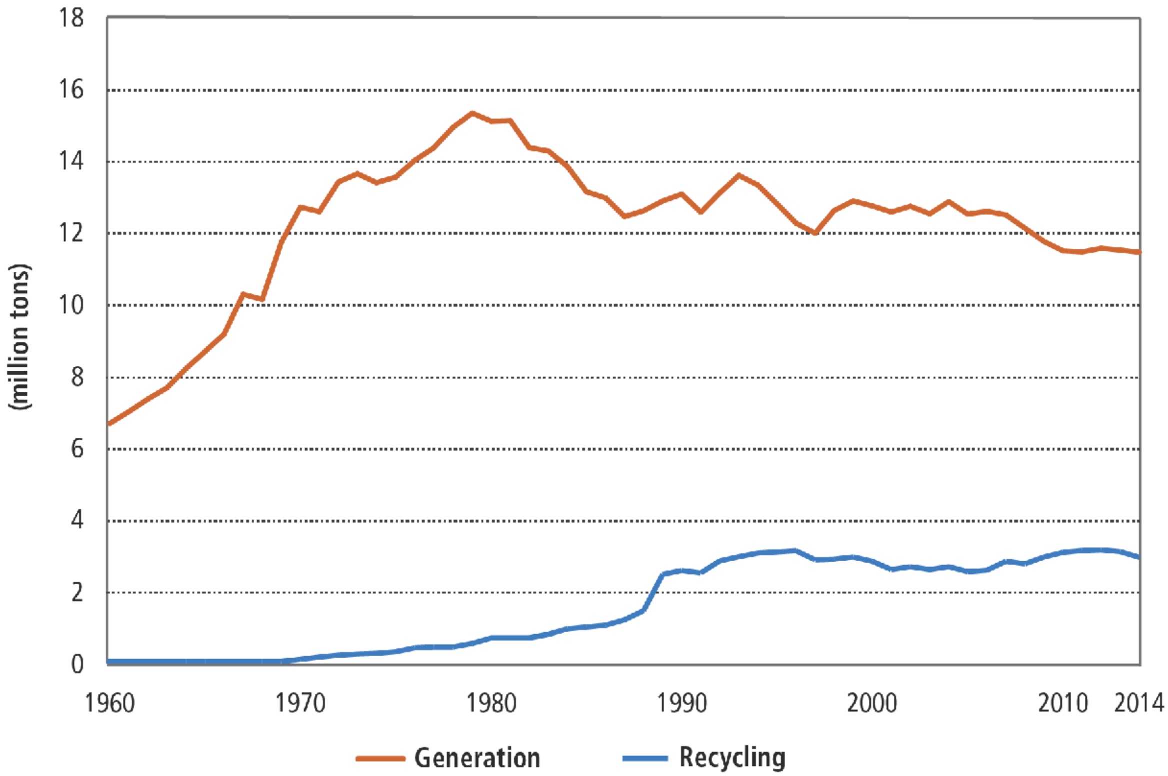


Figure 7. Metal Products Generated in MSW, 2014

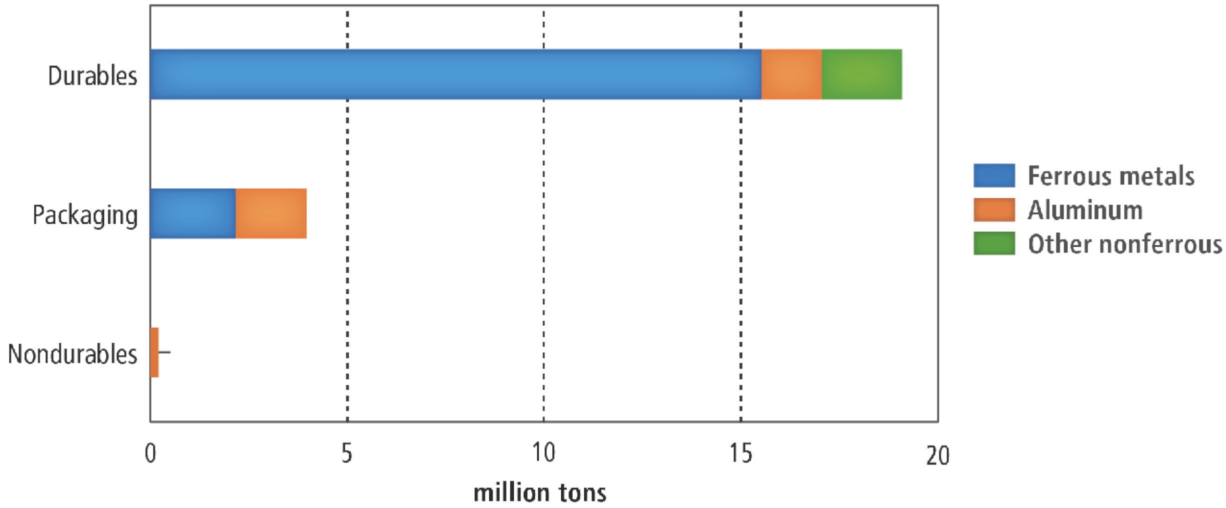


Figure 8. Metals Generation and Recycling, 1960 to 2014

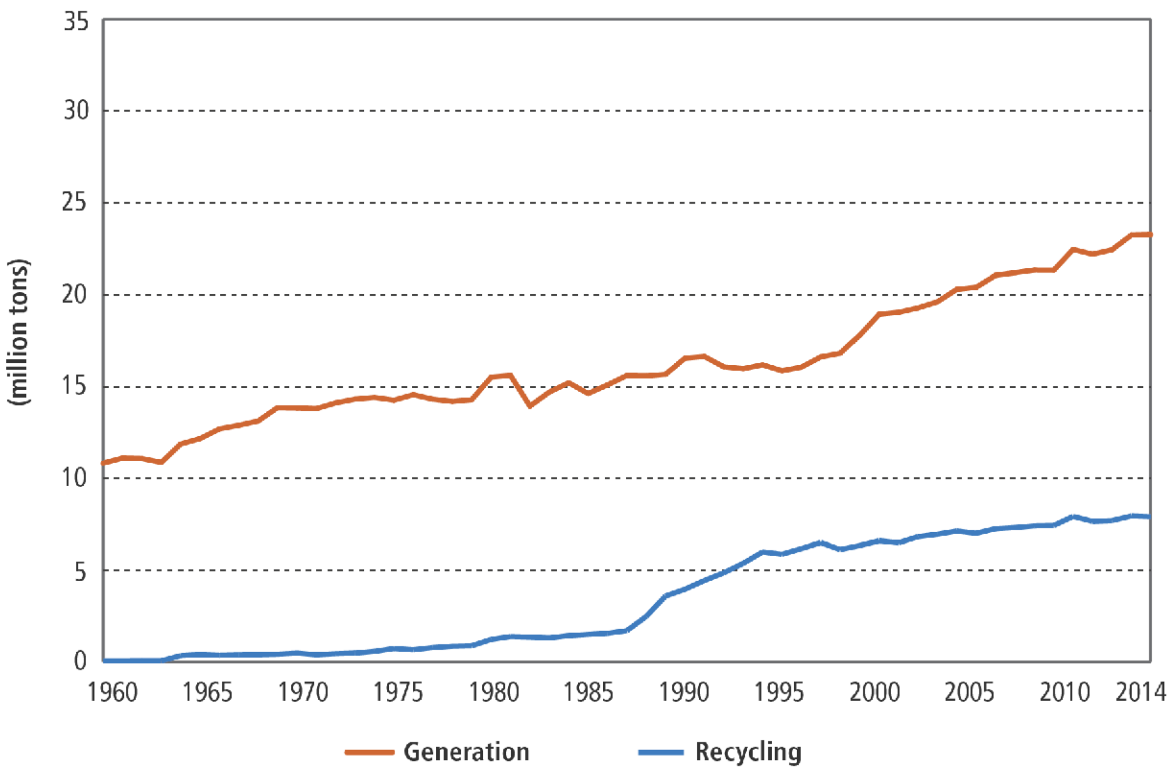


Figure 9. Plastics Products Generated in MSW, 2014

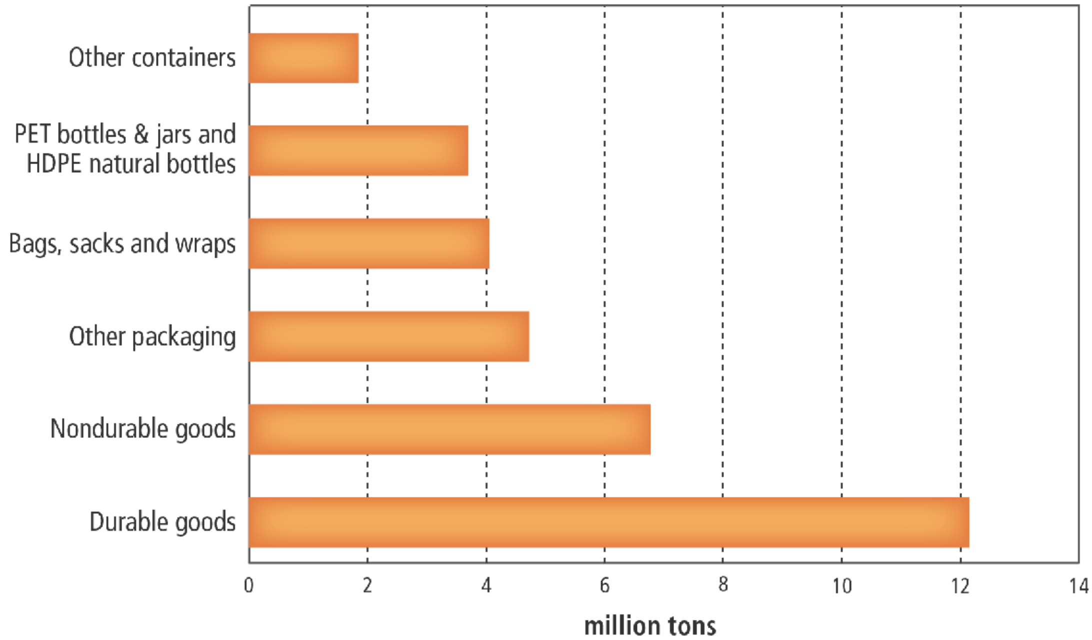


Figure 10. Plastics Generation and Recycling, 1960 to 2014

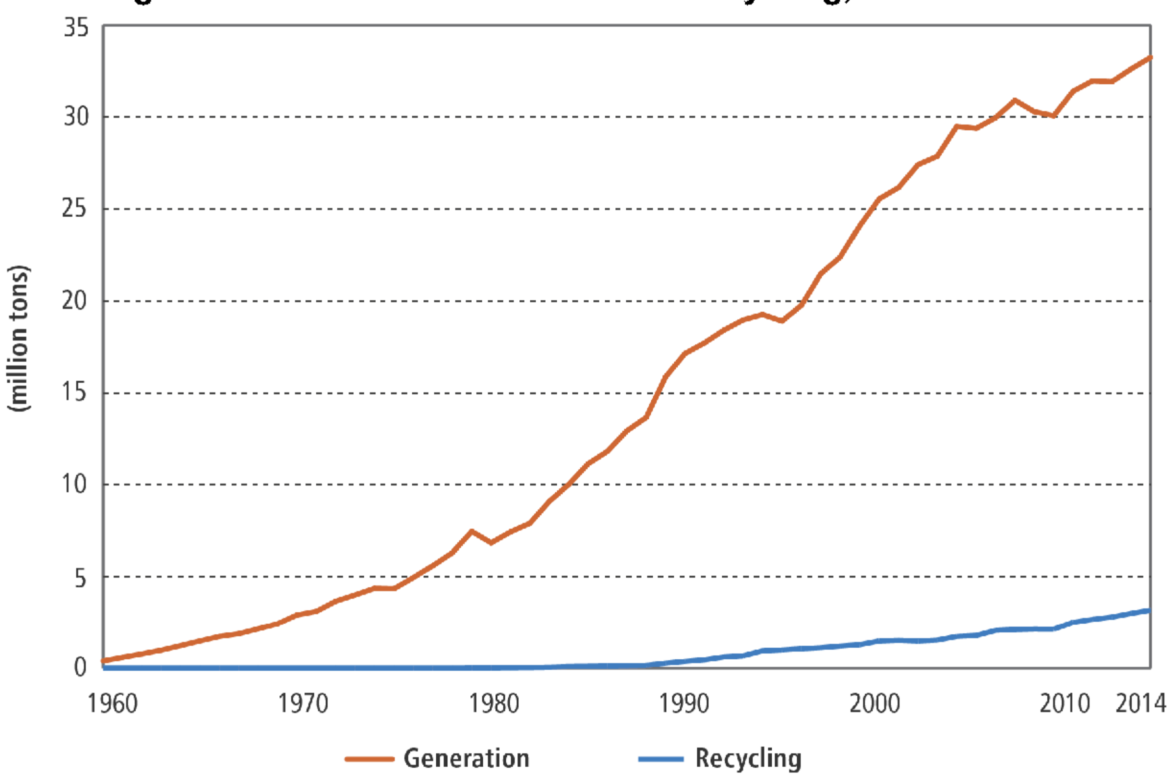
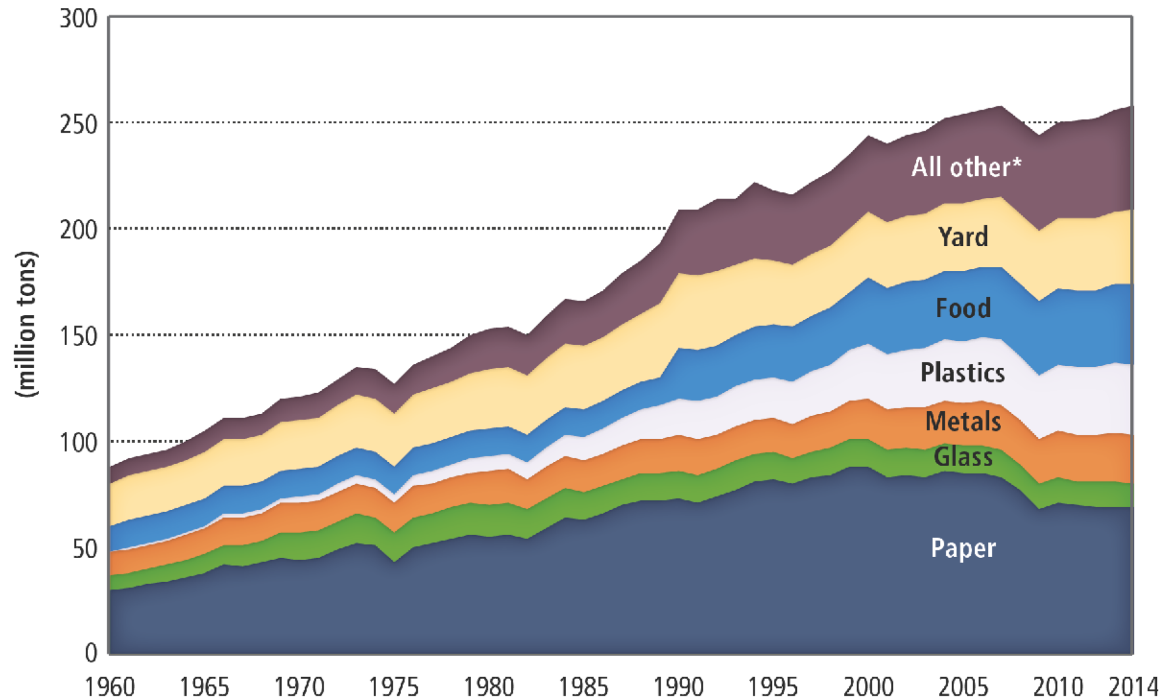
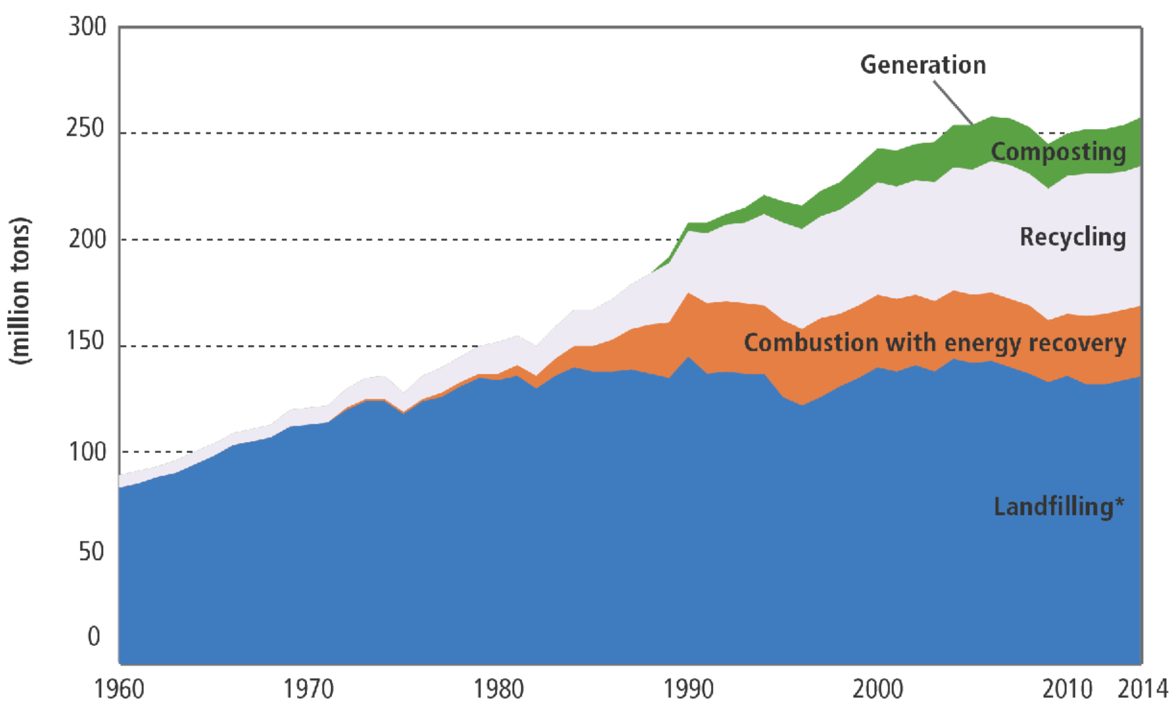


Figure 11. Generation of Materials in MSW, 1960 to 2014



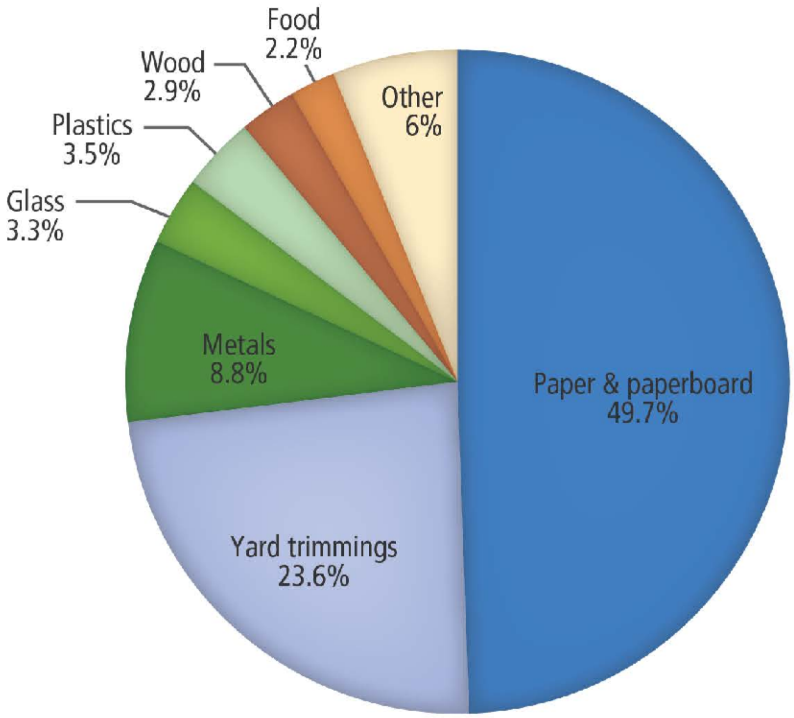
* "All other" includes primarily wood, rubber and leather, and textiles.

Figure 12. Recycling, Composting, Combustion with Energy Recovery and Landfilling of Materials in MSW, 1960 to 2014



*Landfilling after composting, recycling and combustion with energy recovery. Includes combustion without energy recovery.

Figure 13. Materials Recycling and Composting in MSW,* 2014
(89.4 Million tons)



* In percent by weight of total recycling and composting

Figure 14. Materials Generated, Combusted with Energy Recovery and Landfilled in MSW, 2014

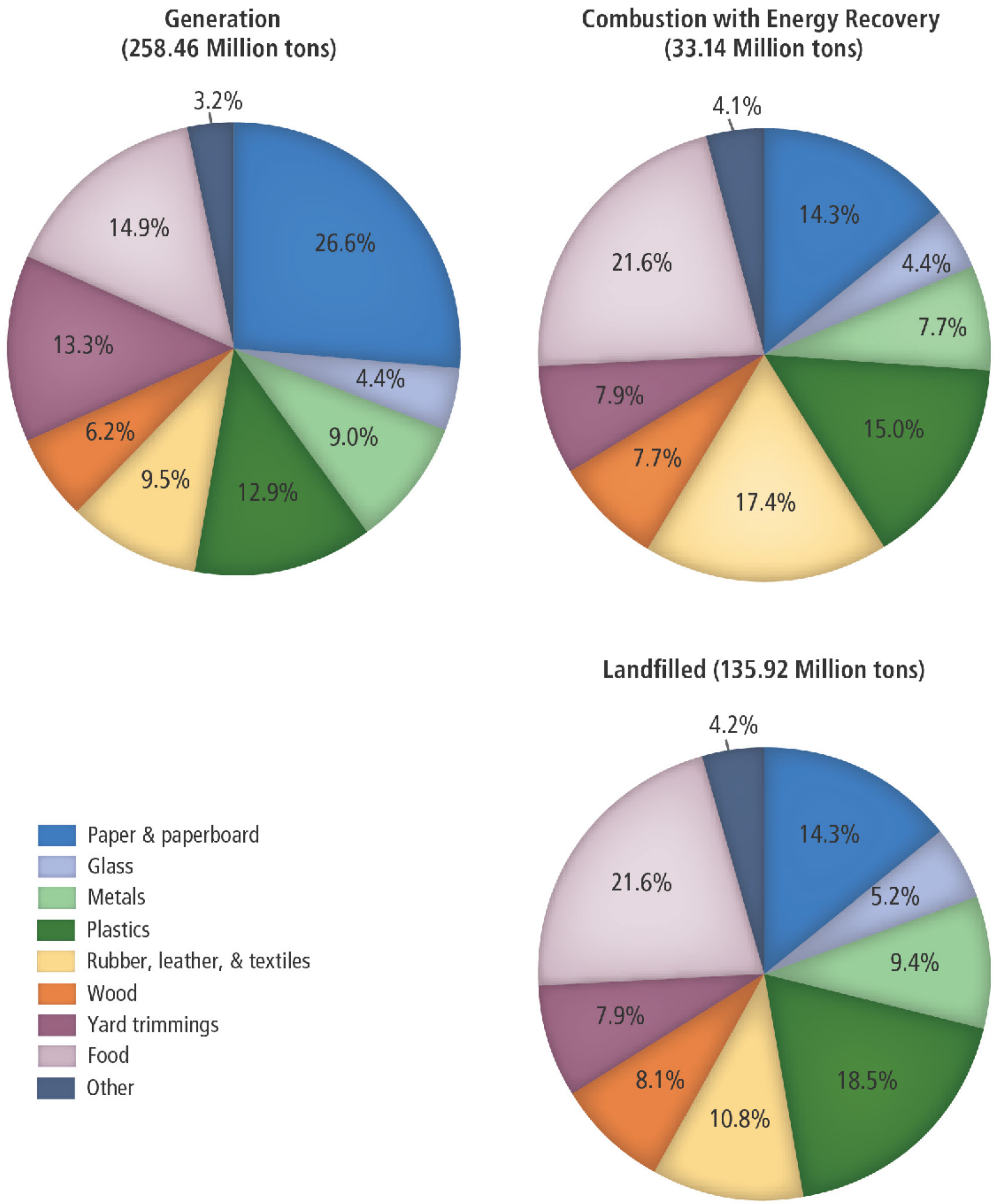


Figure 15. Generation of Products in MSW, 1960 to 2014

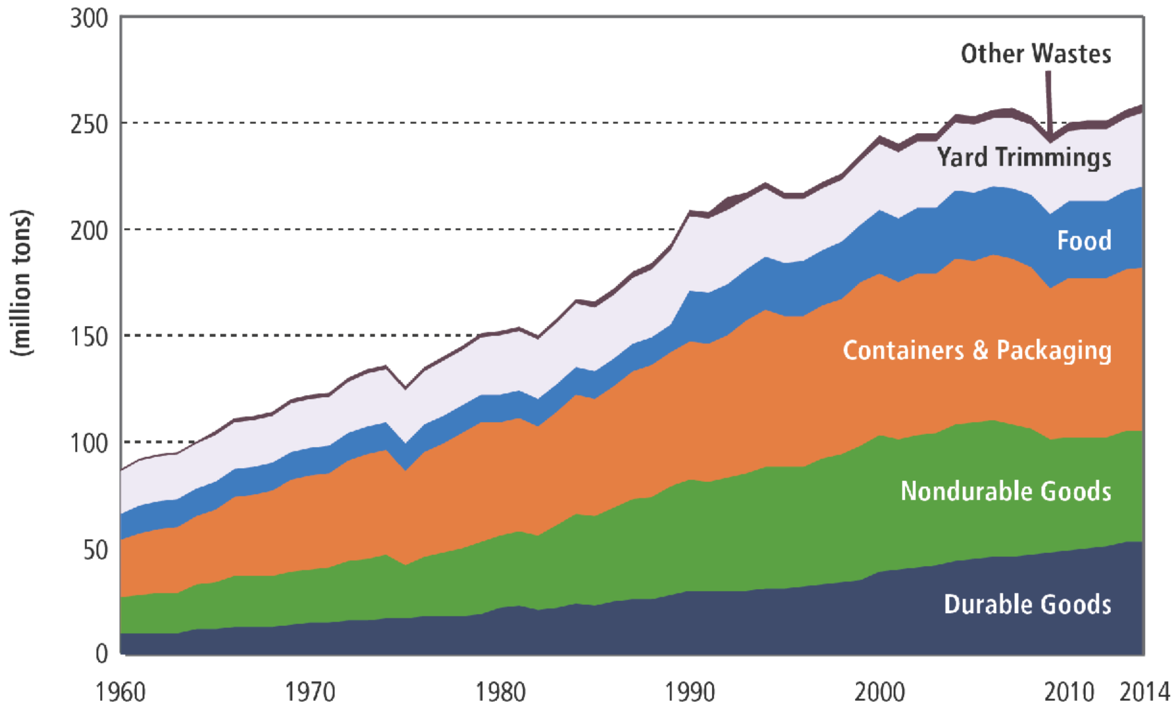


Figure 16. Nondurable Goods Generated, Recycled, Combusted with Energy Recovery and Landfilled in Municipal Solid Waste, 2014

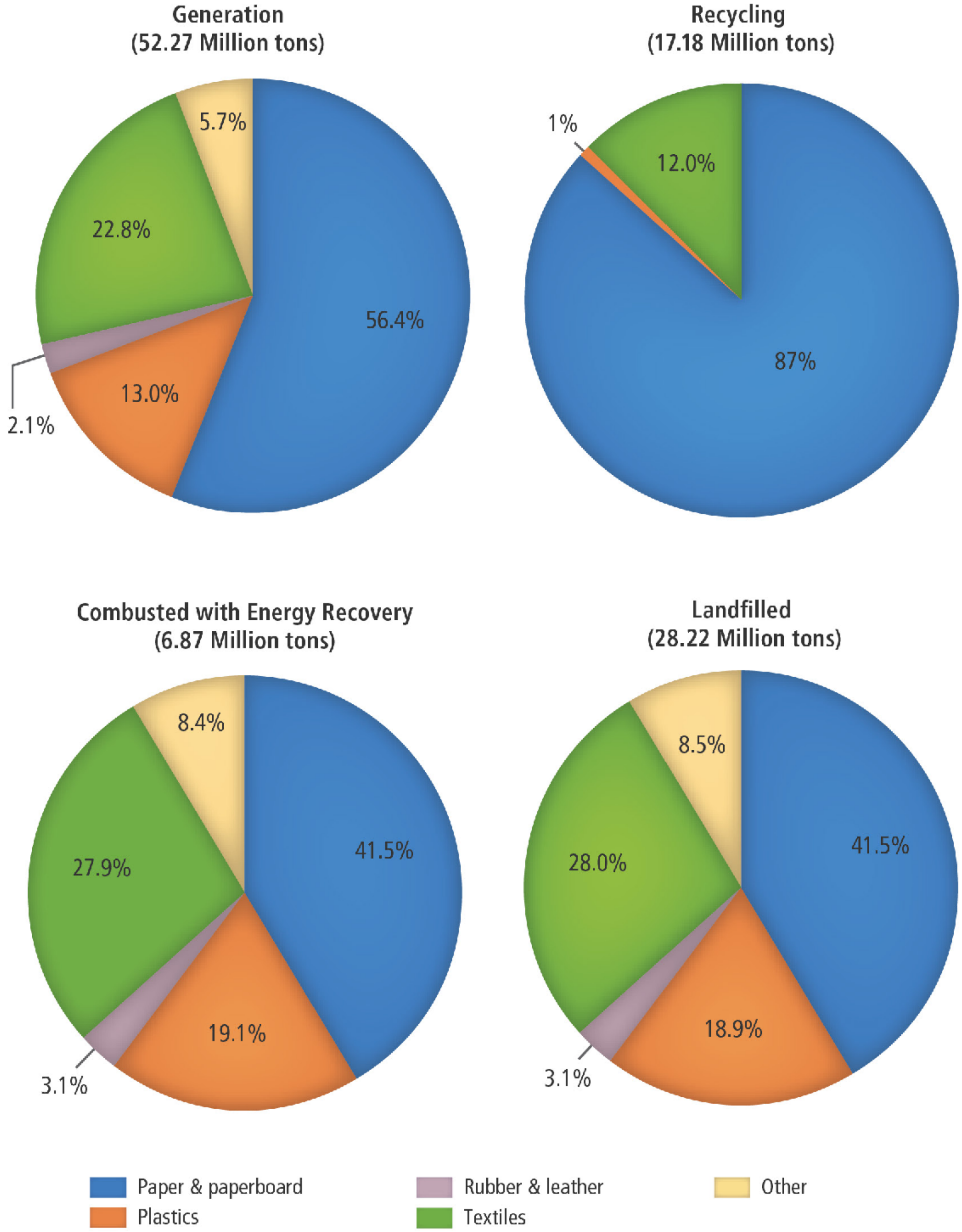


Figure 17. Containers and Packaging Materials Generated, Recycled, Combusted with Energy Recovery and Landfilled in Municipal Solid Waste, 2014

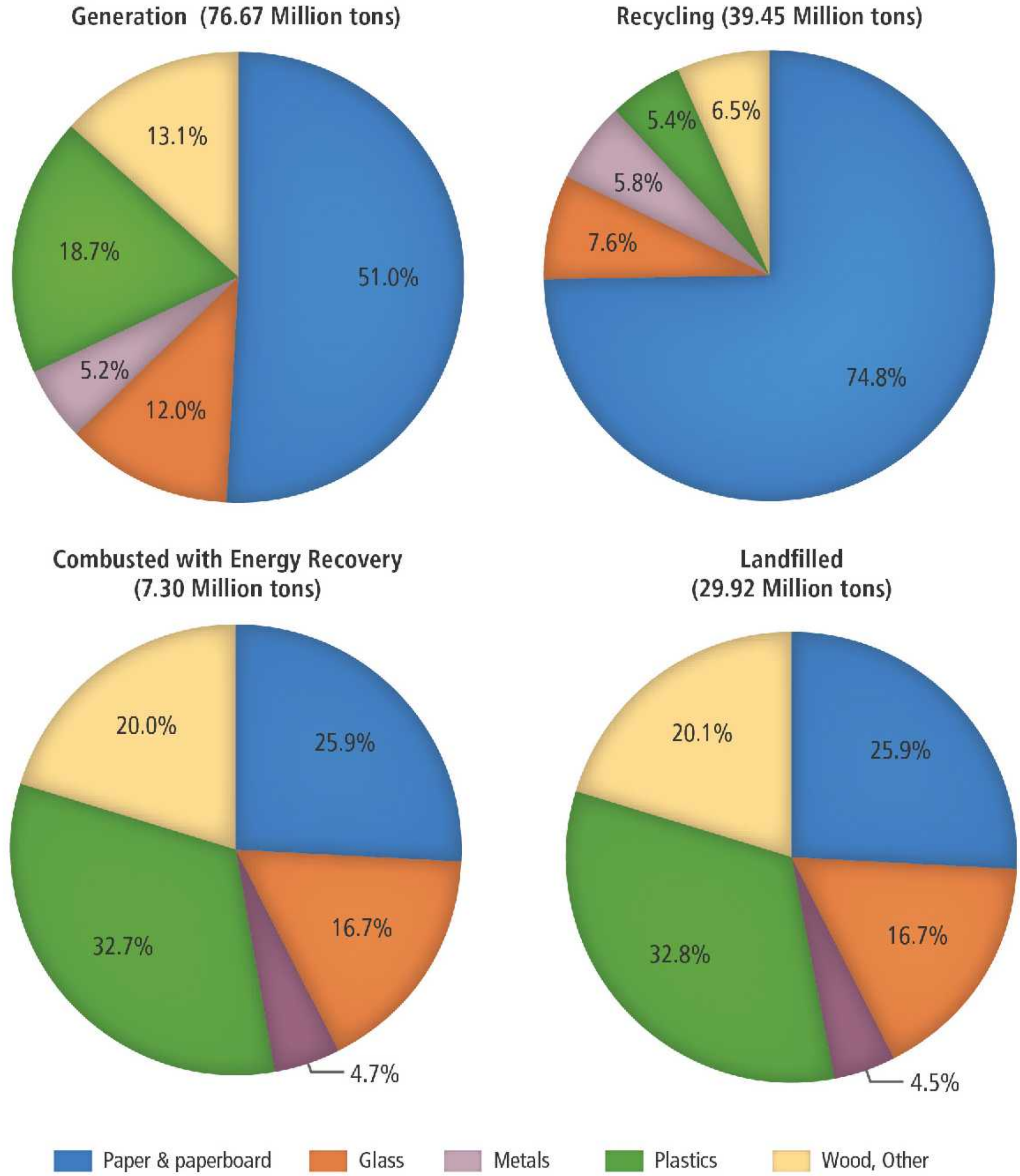


Figure 18. Containers and Packaging Generated, Recycled, Combusted with Energy Recovery and Landfilled in Municipal Solid Waste, 2014

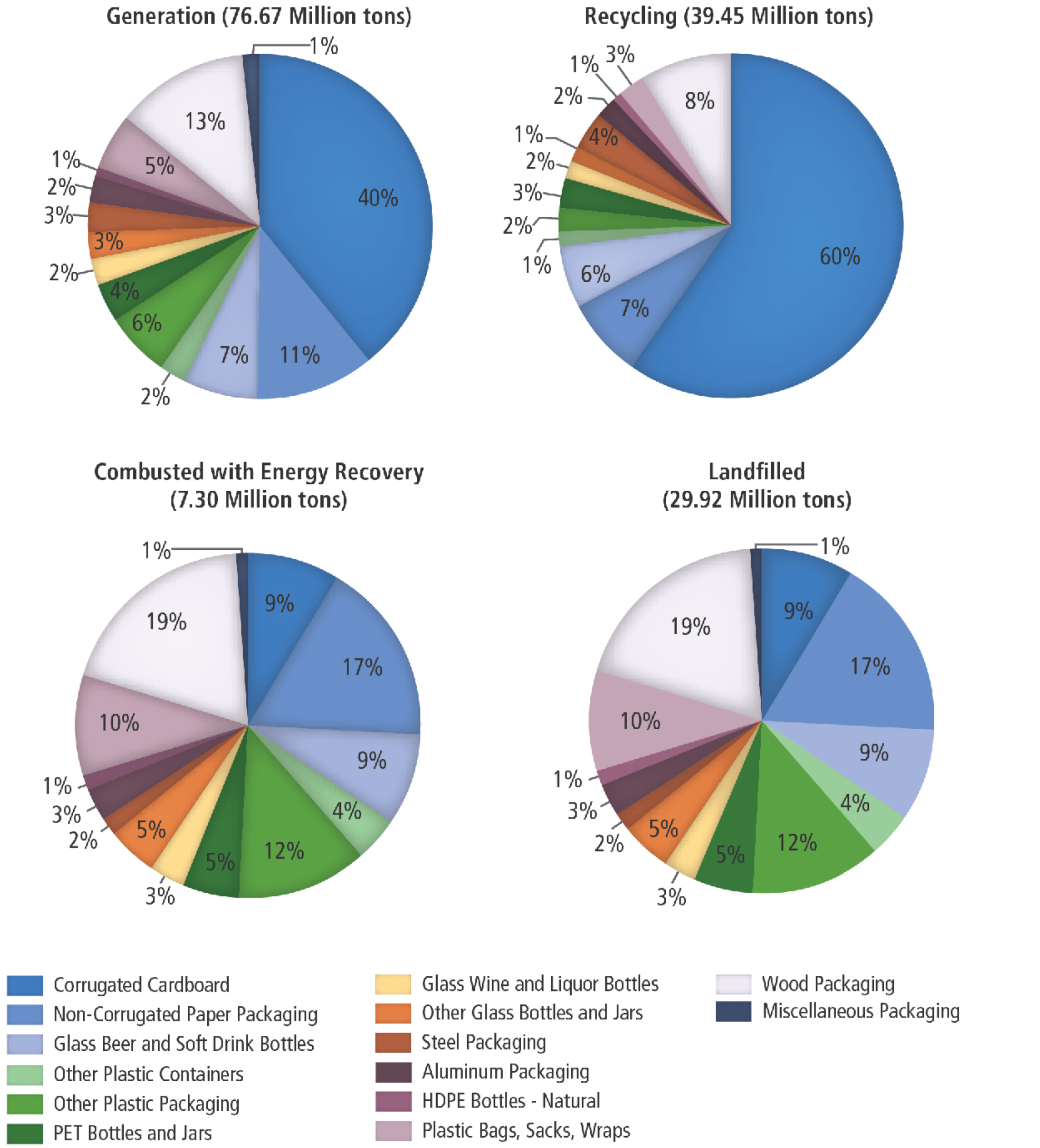


Figure 19. Diagram of Solid Waste Management

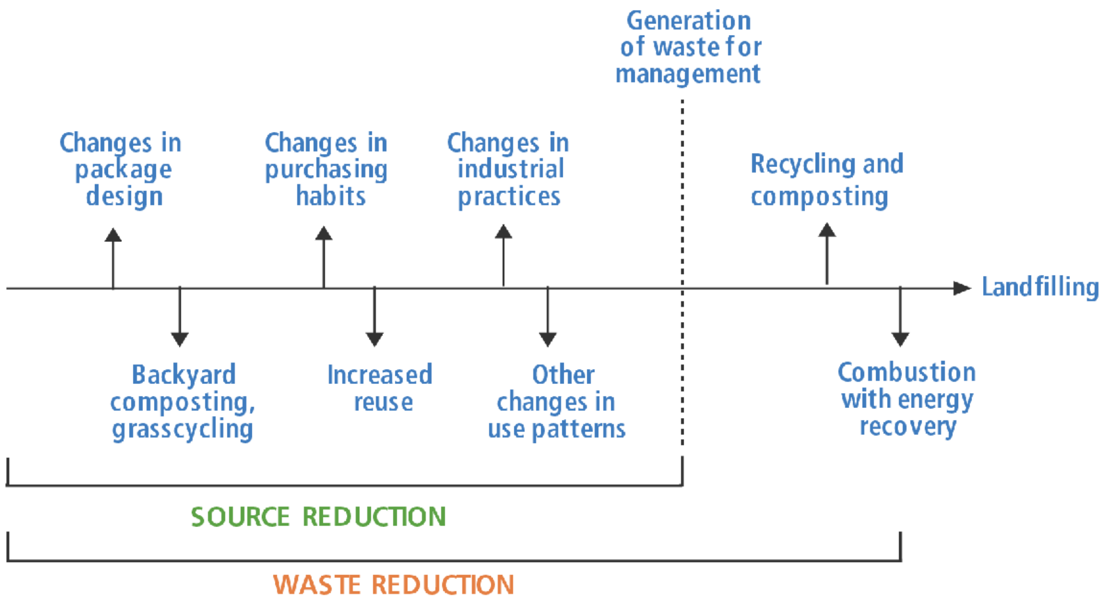


Figure 20. States with Bottle Deposit Rules

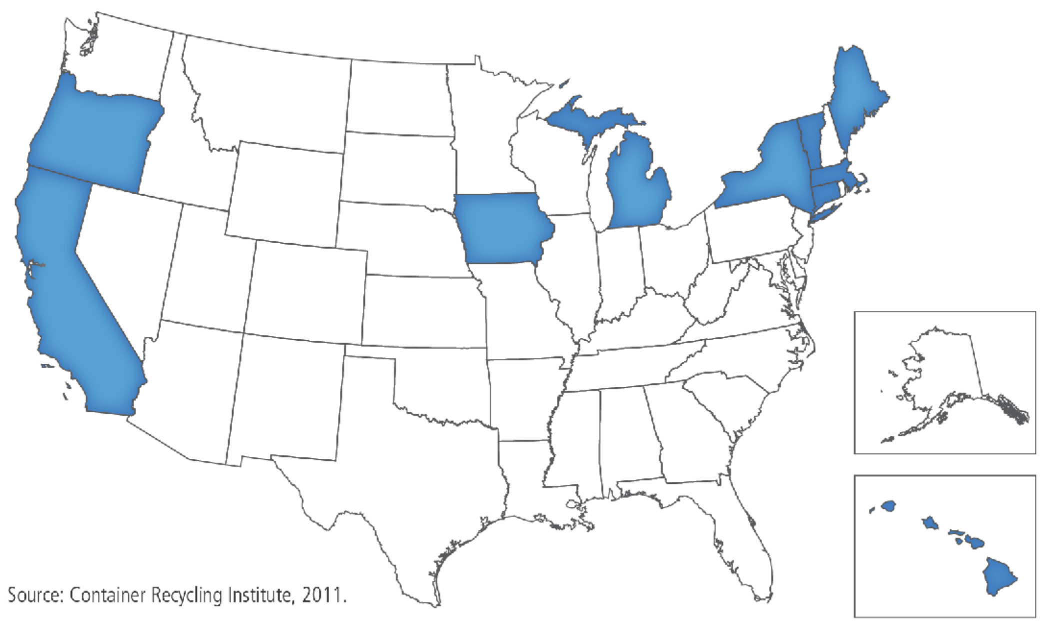
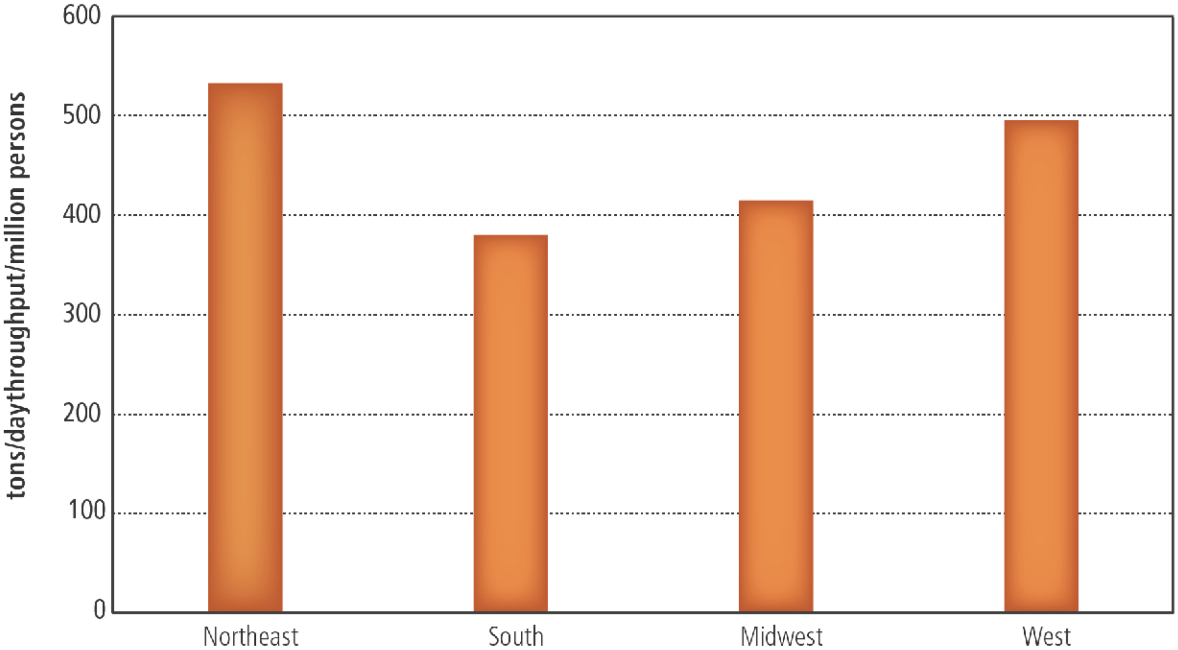


Figure 21. Estimated MRF Throughput, 2014

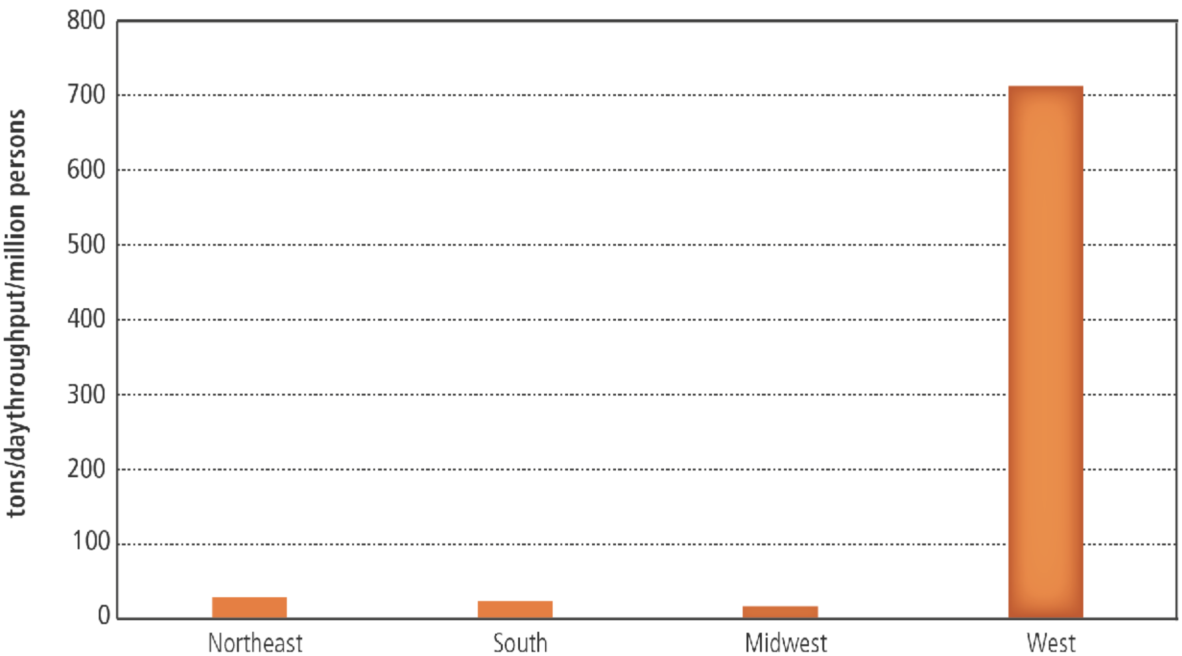
(Tons per day per million persons)



Source: U.S. Census Bureau, Governmental Advisory Associates, Inc. Data provided December 2014.

Figure 22. Mixed Waste Processing Estimated Throughput, 2014

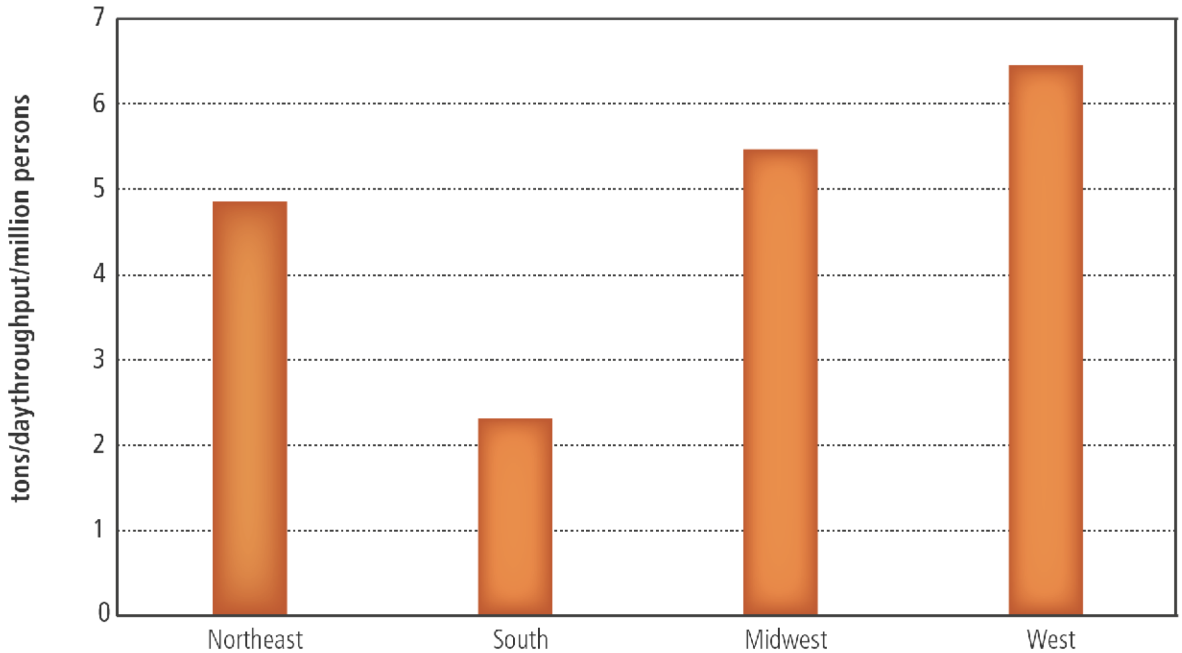
(Tons per day per million persons)



Source: U.S. Census Bureau, Governmental Advisory Associates, Inc. Data provided December 2014.

Figure 23. MSW Composting Capacity, 2014

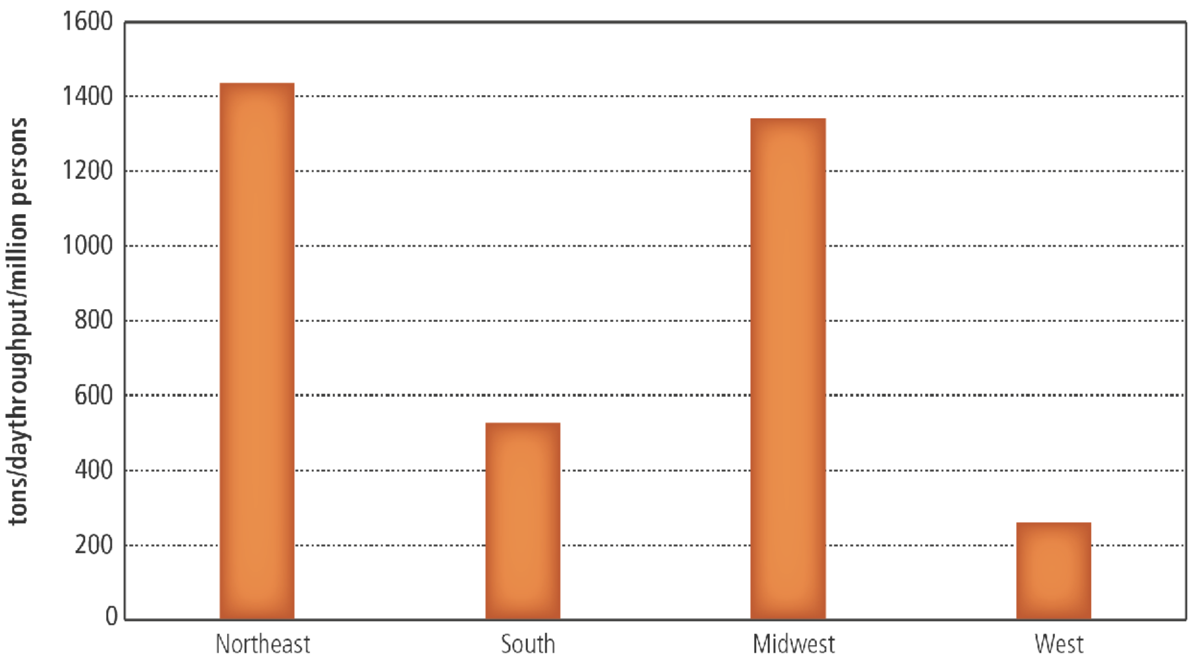
(Capacity in tons per day per million persons)



Source: U.S. Census Bureau; BioCycle, November 2011, Medina County, Ohio and West Wendover, Nevada websites.

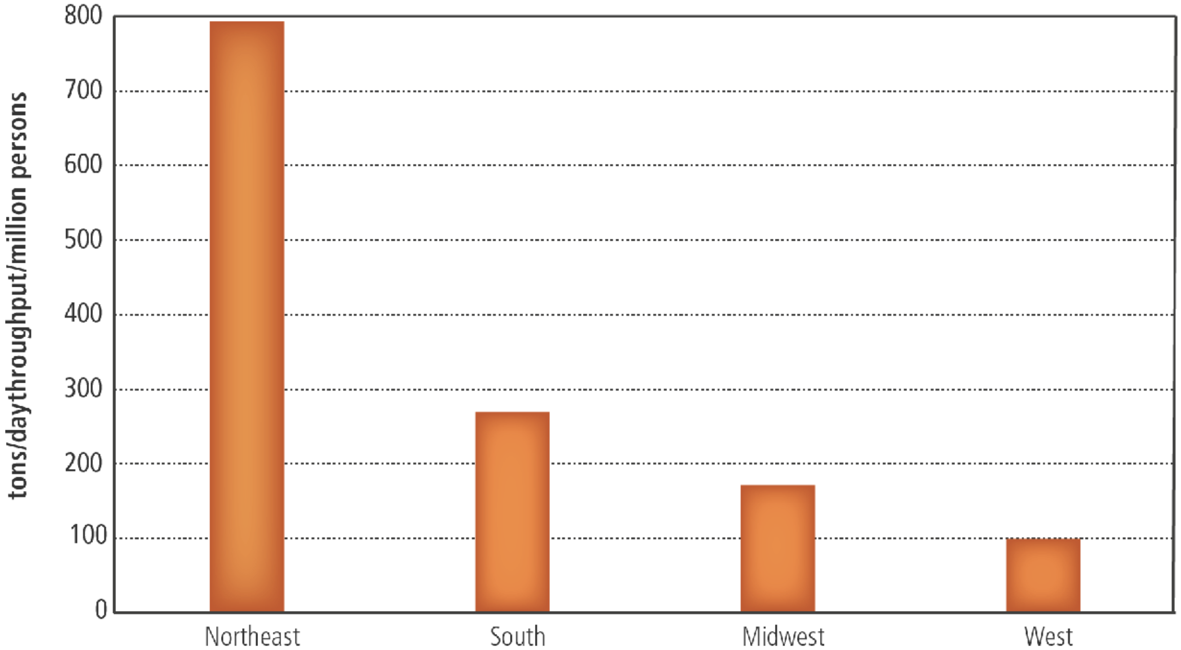
Figure 24. Yard Trimmings Composting Facilities, 2014

(In number of facilities)



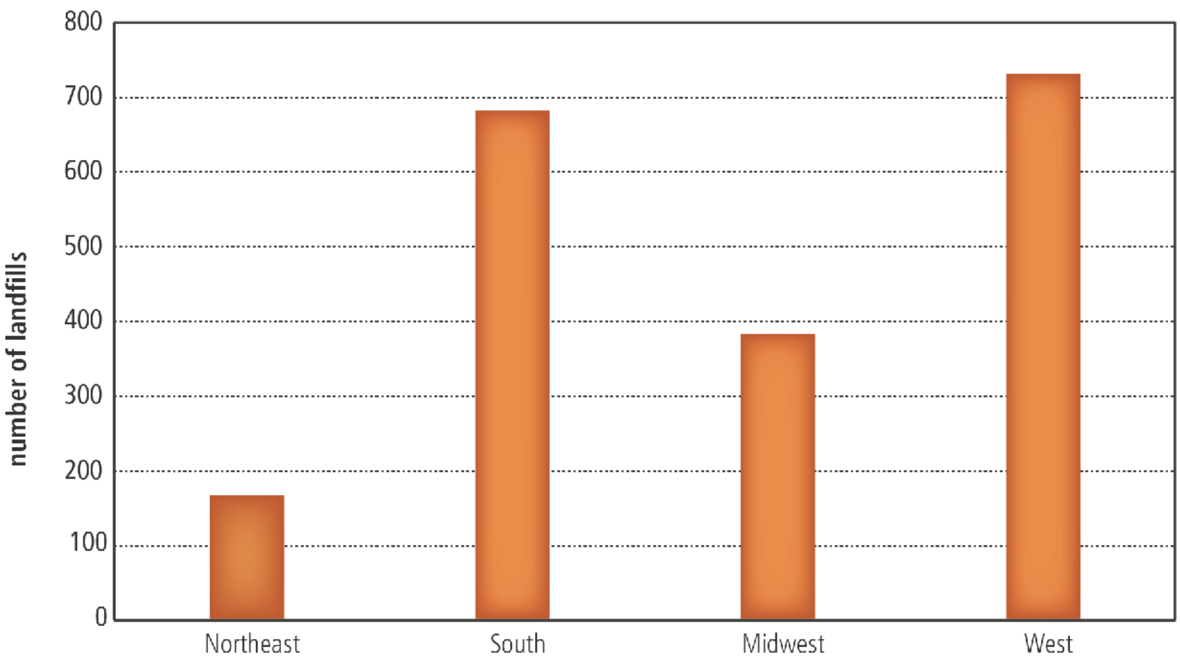
Source: Institute for Local Self-Reliance. July 2014 "State of Composting in the U.S."Facilities composting yard trimmings. Includes data for 48 states. An Internet search provided information for Alaska, Hawaii, Louisiana, Nevada, New Hampshire, Oklahoma, and West Virginia.

Figure 25. Municipal Waste-To-Energy Capacity, 2014
(Capacity in tons per million persons)



Source: U.S. Census Bureau, Energy Recovery Council (ERC). May 2014.

Figure 26. Number of Landfills in the U.S., 2014



Source: State environmental websites.

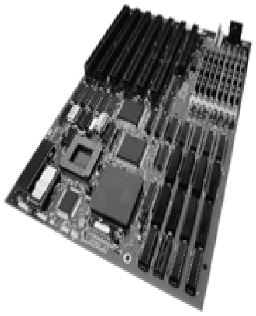
U.S. ENVIRONMENTAL PROTECTION AGENCY

OFFICE OF INSPECTOR GENERAL

Improved Information Could Better Enable EPA to Manage Electronic Waste and Enforce Regulations

Report No. 13-P-0298 **June 21, 2013**





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Abbreviations

CRT	Cathode ray tube
EPA	U.S. Environmental Protection Agency
EPEAT	Electronic Product Environmental Assessment Tool
E-waste	Electronic waste
FEC	Federal Electronics Challenge
GAO	U.S. Government Accountability Office
GSA	U.S. General Services Administration
ICR	Information Collection Request
OECA	Office of Enforcement and Compliance Assurance
OIG	Office of Inspector General
OMB	Office of Management and Budget
OPPT	Office of Pollution Prevention and Toxics
ORCR	Office of Resource Conservation and Recovery
ORD	Office of Research and Development
OSWER	Office of Solid Waste and Emergency Response
PRA	Paperwork Reduction Act
R2	Responsible Recycling Practices
RCRA	Resource Conservation and Recovery Act
SMM	Sustainable Materials Management
TCLP	Toxicity Characteristic Leaching Procedure

Cover photo: Discarded devices such as (from left) cellular phones, computers, and circuit boards found in electronics are commonly referred to as E-waste. (EPA photos)

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Washington, DC 20460

U.S. Environmental Protection Agency
Office of Inspector General

13-P-0298
June 21, 2013

At a Glance

Why We Did This Review

The purpose of this review was to determine whether the U.S. Environmental Protection Agency (EPA) has information of sufficient quality to assess the adequacy of its electronic waste (E-waste) management and the effectiveness of its enforcement policies, to assure that public health is protected. E-waste is the fastest growing domestic waste stream. It includes devices such as computers, televisions, and cell phones. E-waste contains toxic materials that pose hazards to human health and the environment if not properly disposed or recycled. E-waste also contains valuable materials. EPA encourages reuse and recycling of electronics over land-filling and incineration. To that end, EPA manages E-waste via federal regulations, voluntary partnership programs, and support of third-party recycler certification programs.

This report addresses the following EPA's Goals or Cross-Cutting Strategies

- *Cleaning up communities and advancing sustainable development.*
- *Enforcing environmental laws.*

For further information, contact our Office of Congressional and Public Affairs at (202) 566-2391.

The full report is at:
www.epa.gov/oig/reports/2013/20130621-13-P-0298.pdf

Improved Information Could Better Enable EPA to Manage Electronic Waste and Enforce Regulations

What We Found

EPA does not have adequate information to ensure effective E-waste management and enforcement to protect public health and conserve valuable resources. For example, EPA manages E-waste without a consistent approach for defining E-waste. This hampers EPA's ability to effectively collect relevant information and set goals. Further, EPA lacks complete information on E-waste disposition, which hinders the effective use of its resources.

EPA enforcement is hampered by the lack of complete information on cathode ray tube (CRT) exporters in the United States. This incomplete information hinders EPA's ability to set enforcement targets for the CRT Rule. EPA also does not have a practical process to determine the hazardous nature of non-CRT waste. Potentially toxic E-waste could be disposed in municipal landfills or incinerated without potential hazards being identified as required. Further, EPA advocates certified E-waste recyclers but has limited knowledge of the extent of compliance by certified recyclers with federal environmental regulations. In addition, EPA staff stated that E-waste management and enforcement are hampered by federal information collection restrictions and a lack of resources.

Recommendations and Planned Agency Corrective Actions

We recommend that EPA: (1) develop a consistent approach for defining E-waste and identifying information to manage the E-waste universe; (2) develop a practical process to address hazards of non-CRT E-waste that ensures that this waste is managed in an environmentally sustainable manner; (3) evaluate implementation of the certification programs for used electronics; (4) evaluate resource needs for E-waste management; (5) evaluate methods for gathering the information needed to set CRT Rule enforcement targets such as the use of Resource Conservation and Recovery Act Section 3007 information request letters to identify CRT exporters.

EPA concurred with all recommendations, but we consider these recommendations unresolved pending receipt of planned corrective actions and completion dates.

Noteworthy Achievements

EPA helped create the Responsible Recycling Practices certification body and created voluntary E-waste programs. EPA amended the CRT Rule to better track E-waste, and inspected facilities identified by the U.S. Government Accountability Office as "willing to violate" the CRT Rule. EPA also participated in the task force that released the National Strategy for Electronics Stewardship in July 2011.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

THE INSPECTOR GENERAL

June 21, 2013

MEMORANDUM

SUBJECT: Improved Information Could Better Enable EPA to Manage Electronic Waste and Enforce Regulations
Report No. 13-P-0298

FROM: Arthur A. Elkins Jr.

TO: Mathy Stanislaus, Assistant Administrator
Office of Solid Waste and Emergency Response

Cynthia Giles, Assistant Administrator
Office of Enforcement and Compliance Assurance

This is a report on the subject evaluation conducted by the Office of Inspector General (OIG) of the U.S. Environmental Protection Agency (EPA). This report contains findings that describe the problems the OIG has identified and corrective actions the OIG recommends. This report represents the opinion of the OIG and does not necessarily represent the final EPA position. This report contains five recommendations that the EPA agreed to. These recommendations are considered unresolved pending our receipt of EPA's corrective action plan and estimated completion dates.

Action Required

For all recommendations, you are required to provide corrective actions and planned completion dates within 60 days of report issuance. We have no objections to the further release of this report to the public. We will post this report to our website at http://www.epa.gov/oig.

If you or your staff have any questions regarding this report, please contact Assistant Inspector General for Program Evaluation Carolyn Copper at (202) 566-0829 or copper.carolyn@epa.gov; or Acting Director for Toxics, Chemical Management, and Pollution Prevention Jerri Dorsey at (919) 541-3601 or dorsey.jerri@epa.gov.

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Introduction

Purpose

This report addresses the U.S. Environmental Protection Agency's (EPA's) efforts to promote proper management of end-of-life electronic waste (E-waste). We sought to determine whether EPA has information of sufficient quality to assess both the adequacy of its management of E-waste and the effectiveness of its enforcement policies to assure that public health is protected.

Background

Disposal of End of Life Electronic Devices Presents Concerns

The use of electronic products has grown substantially over the past two decades. According to the Congressional Research Service, E-waste refers to obsolete, broken, or irreparable electronic devices. E-waste is the fastest growing category of solid waste in the United States. EPA estimates that the United States generated 2.37 million tons of E-waste in 2009. Of that amount, 75 percent was disposed in landfills or incinerated. Table 1 illustrates the disposal and recycling figures for three key electronic devices in 2009.

Table 1: Management of used and end-of-life electronics in 2009 (millions of units)

	Ready for end-of-life management	Disposed	Collected for recycling	Rate of collection for recycling
Computers	47.4	29.4	18	38%
TVs	27.2	22.7	4.6	17%
Mobile Devices	141	129	11.7	8%

Source: EPA Office of Solid Waste and Emergency Response (OSWER).

Electronic devices are constantly evolving in design and contain varying amounts of plastics, glass, and toxic materials.[1] Electronics also contain precious metals such as gold and rare earth metals.[2] An opportunity for valuable resource conservation is lost when these devices are disposed of in landfills or incinerated. Further, EPA has serious concerns about unsafe handling of E-waste in developing countries that result in harm to human health and the environment. For

[1] Electronic devices may contain the following potentially toxic metals: antimony, arsenic, barium, beryllium, cadmium, chromium, lead, mercury, nickel, selenium, silver, and thallium.
[2] Rare earth metals and their compounds comprise 17 periodic elements. Due to their unique physical and chemical properties they are becoming widely used in electronics. Examples include europium (used in liquid crystal displays and fluorescent lighting), yttrium (used in color television and computer monitors), and terbium (phosphors for lighting and display).

example, open-air burning and acid baths are being used to recover valuable materials from electronic components. This exposes workers and communities to harmful substances. There are also problems with toxic materials leaching into the environment. These practices can expose workers and communities to high levels of contaminants such as lead, mercury, cadmium and arsenic. Such exposures can lead to irreversible health effects, including cancers, miscarriages, neurological damage and diminished intelligence.

According to an EPA Office of Research and Development (ORD) report,[3] domestically, "a concern exists that e-waste may leach toxic chemicals into the leachate of lined landfills or contaminate groundwater near unlined landfills." A Congressional Research Service Report[4] noted that concerns about E-waste landfill disposal have led federal and state governments to encourage recycling. While there is no federal law requiring the recycling of E-waste, 25 states have passed legislation mandating statewide E-waste recycling.[5] Eighteen of those states have determined which type of electronics to ban from state landfills or incinerators and have completely banned disposal of these electronics in landfills or incinerators.

In 2010, the President established the Interagency Task Force on Electronics Stewardship to enhance the sustainable management of electronics throughout the product lifecycle. The task force released the *National Strategy for Electronics Stewardship* (National Strategy) in July 2011 with multiple action items under four main goals. National Strategy is a priority-setting document for the federal government and EPA made commitments as part of the strategy. These commitments are governing the EPA activities and resources available for used electronics. The strategy goals aim to protect human health and the environment from the potentially harmful effects associated with the improper handling and disposal of electronic devices.

EPA's Management of E-Waste

The basis for EPA's E-waste management is the Agency's solid waste management hierarchy (see figure 1). This hierarchy ranks the most environmentally sound methods for municipal solid waste. Source reduction (including reuse) is the most preferred method, followed by recycling, energy recovery, and treatment and disposal. EPA's main objective in its management of E-waste, based on the hierarchy, is to encourage the use of more environmentally sound methods for dealing with discarded electronics.

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[3] EPA ORD Report, USEPA Region/ORD Workshop on Emerging Pollutants, p. 26 (2003).
[4] Congressional Research Service Report, Managing Electronic Waste: Issues with Exporting E-Waste, p. 4 (2010).
[5] Twenty-five states have passed various forms of producer responsibility or take-back legislation; however, in most instances, the laws require that the producer (or importer) of the electronic product offer or finance take-back opportunities to their customers in the regulated states.

Figure 1: EPA solid waste management hierarchy

Source: EPA OSWER.

In support of this hierarchy, EPA enforces regulations, and encourages participation in E-waste voluntary programs and the use of third-party certified recycling companies. We detail each of these in the following sections.

EPA's Regulation of E-Waste

EPA regulates the management and disposal of E-waste through Resource Conservation and Recovery Act (RCRA) authority.[6] As part of the RCRA regulatory program, EPA also issued a specific rule to manage cathode ray tubes (CRTs) after testing confirmed they contained lead above regulatory limits.[7]

RCRA

A RCRA goal is to ensure that hazardous wastes are managed in a manner that is protective of human health and the environment.[8] As part of this goal, hazardous waste cannot be disposed in municipal solid waste landfills and other non-hazardous waste landfills. If waste is listed as hazardous waste or has hazardous characteristics[9] and is not otherwise exempt or excluded from RCRA, the waste is considered RCRA hazardous waste. Hazardous wastes must be treated and disposed in EPA-approved hazardous waste landfills that have more regulatory controls than municipal solid waste landfills. Wastes that are hazardous solely because they have a hazardous characteristic may be considered non-hazardous and disposed in a municipal landfill after they have been treated to decharacterize them and meet other waste treatment requirements.

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[6] 42 U.S.C. § 6901 et seq.
[7] 71 Fed. Reg. 42927- 949, (July 28, 2006) (codified at 40 C.F.R. §§ 261.39 – 261.41). RCRA Toxicity Characterization of Computer CPUs and Other Discarded Electronic Devices (2004), available at www.ees.ufl.edu/homepp/townsend/Research/ElectronicLeaching/default.asp.
[8] 42 U.S.C. § 6902(a)(4).
[9] There are four hazardous waste characteristics: ignitability, corrosivity, reactivity, and toxicity.

E-waste is regulated as a RCRA hazardous waste when a non-household waste generator disposes of used electronics that exhibit a hazardous characteristic at a quantity more than 220 pounds per month.[10] E-waste can be hazardous or non-hazardous, leading to different EPA management approaches. E-waste is considered hazardous by RCRA when a waste generator has knowledge that discarded waste is hazardous or the waste tests hazardous for a characteristic.[11] Under the federal regulations, electronic devices can be disposed in municipal landfills if they are considered non-hazardous or the devices are otherwise exempt or excluded from RCRA.

CRT Rule

Used CRTs are the only electronic devices specifically regulated as hazardous waste.[12] CRTs are the video display component of computers and television monitors.[13] Many CRTs from color monitors exceed EPA's Toxicity Characteristic Leaching Procedure (TCLP) regulatory limit for lead content.[14] Therefore, RCRA controls CRT end-of-life management, including export.[15] EPA's CRT Rule went into effect in 2007. The rule's purpose is to encourage the recycling of used CRTs and CRT glass by conditionally excluding recycled CRTs from full RCRA hazardous waste management requirements.[16] The rule created alternative management requirements for CRT tubes and glass being recycled, and applies to CRT exporters and recyclers in the United States.[17] The rule requires CRT exporters and recyclers in the United States to comply with existing hazardous waste notice and consent requirements and additional hazardous waste management regulations for CRT tubes and glass.[18] Domestic CRT recyclers must follow packaging, labeling, and storage requirements.[19]

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[10] Household and conditionally exempt small quantity generators (generators < 220 lbs per month) are generating hazardous waste if their waste expresses a hazardous characteristic (such as exceeding a toxicity characteristic regulatory value); however, they have been excluded from having to manage those materials in a hazardous waste landfill. See 40 C.F.R part 261 Subpart C; 40 C.F.R § 261.4(b)(1); 40 C.F.R §261.5(a); and 40 C.F.R §262.11.
[11] It is the generators' duty to determine whether they have a hazardous waste.
[12] There is a body of evidence to show that the CRT exceeds the toxicity characteristic regulatory limit for lead. However, if the CRTs are recycled under the required conditions they are excluded from the definition of solid and, therefore, hazardous waste.
[13] 71 Fed. Reg. 42928 (July 28, 2006).
[14] CRTs also contain cadmium and mercury. 71 Fed. Reg. 42930 (July 28, 2006).
[15] 71 Fed. Reg. 42949 (July 28, 2006).
[16] 71 Fed. Reg. 42928 (July 28, 2006).
[17] *Id*.
[18] 40 C.F.R. § 261.39 – 261.41.
[19] 40 C.F.R. § 261.39. Also, on March 15, 2012, EPA proposed a rule change to better track exports of CRTs for reuse and recycling. 77 Fed. Reg. 15336- 343 (March 15, 2012).

EPA's Voluntary Programs

EPA established a number of voluntary programs and initiatives to address the solid waste management hierarchy for E-waste.[20] These efforts encourage federal agencies to purchase greener electronics and manage used electronics in an environmentally safe manner. Specifically, voluntary programs include the Federal Electronics Challenge (FEC) and the Federal Green Challenge under the Agency's Sustainable Materials Management (SMM) Electronics Challenge. EPA also provides technical support for the Electronic Product Environmental Assessment Tool (EPEAT). EPEAT was developed using an EPA grant and is managed by a third party called the Green Electronics Council. The EPEAT program aims to reduce the amount of E-waste that needs to be reused, recycled, or managed while reducing the amount of toxic material found in electronics waste. EPEAT aids purchasers in buying the greenest equipment by informing purchasers of the electronic products' environmental criteria.[21]

Third Party Certifications

EPA encourages recyclers to be certified by one of two electronics recycling certifications. The two available certification programs are Responsible Recycling Practices (R2) and e-Stewards. EPA relies on third parties to ensure that domestic recyclers adhere to certification standards. The certifications share common elements that promote responsible used electronic recycling. Both programs set best management practices for safe electronic device recycling. EPA convened a 3-year multi-stakeholder process to develop the R2 standard. The Basel Action Network, a non-profit organization, created the e-Stewards certification.

Roles of EPA Offices in Managing the Hierarchy

Multiple EPA offices are responsible for managing E-waste under the solid waste management hierarchy:

- Office of Resource Conservation and Recovery (ORCR), within OSWER, develops E-waste policy. ORCR also manages the Federal Green Challenge component of the SMM Electronics Challenge.
- Office of Enforcement and Compliance Assurance (OECA) enforces compliance with the CRT Rule. OECA also provides assistance, monitoring, and enforcing compliance with RCRA hazardous waste regulations by inspecting regulated facilities.
- Office of Pollution Prevention and Toxics (OPPT), within the Office of Chemical Safety and Pollution Prevention, manages the national voluntary programs (e.g., FEC and technical support for EPEAT) with a focus on pollution prevention and federal environmental stewardship practices.

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[20] EPA's E-waste voluntary programs were developed prior to the development of the National Strategy.
[21] The current National Strategy seeks to encourage consumer purchasing of EPEAT products and development of new EPEAT standards for non-EPEAT products.

- ORD works with EPA's program and regional offices to develop research plans for E-waste studies.
- EPA regional offices support and implement the E-waste strategies of the above headquarters offices.

Prior Reports

A prior EPA Office of Inspector General (OIG) report evaluated EPA's various E-waste projects and their outcomes. Report No. 2004-P-00028, *Multiple Actions Taken to Address Electronic Waste, But EPA Needs to Provide Clear National Direction*, was issued September 1, 2004. This report noted that EPA implemented or participated in many projects that enhanced the general awareness of E-waste issues. However, EPA lacked a clear set of program goals and measures of effect. We concluded that due to incomplete actions related to E-waste, EPA could not ensure that it was effectively addressing the human health and environmental risks associated with E-waste. Additionally, EPA had not adequately defined the information required to characterize the E-waste problem or track progress.

The U.S. Government Accountability Office (GAO) also evaluated EPA's management of E-waste in several reports. These reports covered various EPA E-waste issues, including EPA's voluntary programs, CRT Rule enforcement, and the FEC.[22]

Noteworthy Achievements

Since the 2004 OIG report, EPA provided funding to and facilitated R2 development with electronics stakeholders. EPA launched EPEAT and FEC. EPA issued the final CRT Rule in 2006. In March 2012, EPA proposed a CRT Rule amendment to enhance the ability of tracking CRT exports.

Following publication of a GAO 2008 report, *EPA Needs to Better Control Harmful U.S. Exports through Stronger Enforcement and More Comprehensive Regulation*, EPA obtained the names of the 43 companies that GAO identified in its report as "willing to violate the hazardous waste regulations." OECA worked with the regions to investigate all 43 listed companies and took formal or informal enforcement actions as needed.

In 2010, EPA Regions 8, 9, and 10, with OECA coordination, participated in a cargo inspection exercise with the U.S. Department of Homeland Security's

[22] GAO report, *Electronic Waste: Strengthening the Role of the Federal Government in Encouraging Recycling and Reuse 14* (2005); GAO report, *Electronic Waste: EPA Needs to Better Control Harmful U.S. Exports through Stronger Enforcement and More Comprehensive Regulation* (2008); GAO report, *Electronic Waste: Considerations for Promoting Environmentally Sound Reuse and Recycling* (2010); and GAO report, *Actions Needed to Provide Assurance That Used Federal Electronics Are Disposed of in an Environmentally Responsible Manner* (2012).

Customs and Border Protection. The exercise involved inspecting electronic cargo at the seaports in EPA regions. This was part of the International Network for Environmental Compliance and Enforcement’s Seaport Environmental Security Network’s international hazardous waste inspection efforts. This exercise resulted in finding CRT Rule violations in Region 9. In 2012, as part of the Seaport Network’s second inspection project, EPA and Customs and Border Protection conducted targeted, joint inspections of electronic cargo at a Region 9 seaport, also with OECA coordination. Two additional Customs and Border Protection violations involving CRT exports were identified for enforcement action. The international network and its partners, including EPA, have plans to undertake additional cargo inspections at different domestic seaports.

EPA, with the Council on Environmental Quality and the U.S. General Services Administration (GSA), co-chaired and actively participated in the national task force that released the National Strategy in July 2011. The strategy goals aim to protect human health and the environment from the potentially harmful effects associated with the improper handling and disposal of electronic devices.

In 2012, EPA evolved the Plug-In to e-Cycling program to the SMM Electronics Challenge. The objectives of this challenge are to challenge manufacturers and retailers to voluntarily commit to sending 100 percent of used electronics collected for reuse and recycling to third party certified recyclers, increase the total amount of used electronics collected for reuse and recycling, and be transparent about their efforts by publically posting collection information and data.

Scope and Methodology

We performed our evaluation from May 2011 to October 2012 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the evaluation to obtain sufficient and appropriate evidence. Further, this evidence must provide a reasonable basis for our findings and conclusions. The evidence obtained during this evaluation provides a reasonable basis for our findings and conclusions based upon our objectives.

The scope of this evaluation included EPA’s E-waste voluntary programs and OECA’s RCRA enforcement efforts. Additionally, ORD’s role with E-waste research was analyzed to understand its function in contributing to needed science information.

To address our objective, we reviewed and analyzed relevant federal regulations, guidance, appropriations information, public comments, and presentations. Our evaluation of the National Strategy and its action items is limited to their potential role in addressing the findings detailed in this report on EPA’s management of E-waste. We reviewed state electronic waste and producer responsibility regulations. We also conducted a literature review of applicable congressional testimonies, proposed legislative changes, and research articles. We reviewed prior E-waste evaluation reports from GAO and EPA OIG. We also examined international policies that regulate E-waste.

During this evaluation, we interviewed program directors and staff from EPA's OECA, OPPT, ORCR, ORD, Office of Air and Radiation,[23] and Office of International and Tribal Affairs. We interviewed program directors and staff in EPA Regions 4, 5, 7, 9, and 10.[24] We interviewed program directors and staff from the California Environmental Protection Agency and the Illinois Environmental Protection Agency. We also met with representatives from UNICOR,[25] the Information Technology Industry Council, and the Institute of Scrap Recycling Industries to gain their insights on EPA's E-waste management. We reviewed and analyzed documents provided to us at these meetings and documents received from OIG information requests. We also reviewed certified recycling facilities' inspection information in the Agency's Enforcement and Compliance Online database.

[23] ORCR and the Office of Air and Radiation are responsible for E-waste incineration/combustion issues. ORCR is in charge of hazardous waste incineration; Office of Air and Radiation is in charge of municipal solid waste incineration.
[24] EPA regional offices were selected based on ORCR/OECA recommendations.
[25] "UNICOR" is the trade name for Federal Prison Industries, Inc.

Chapter 2
Improved Information Could Better Enable EPA to Manage E-Waste and Enforce E-Waste Regulations

Improved information could better enable EPA to manage E-waste and enforce E-waste regulations. EPA does not have a uniform definition of E-waste and adequate information on E-waste disposition. EPA's lack of a uniform and consistent approach to defining E-waste hampers the Agency's ability to effectively collect relevant disposal information and set management goals for E-waste recycling and reuse. With more accurate and comprehensive information, EPA could better direct its limited resources to the greatest needs of E-waste end of life management. Additionally, EPA lacks complete information on CRT exporters in the United States to help set enforcement targets for the CRT Rule. EPA also does not have a practical process to characterize the hazardous nature of non-CRT waste. Potentially toxic E-waste is disposed in municipal landfills or incinerated without having the hazards identified as required by RCRA. EPA also advocates that E-waste be processed by certified E-waste recyclers but has limited knowledge of the extent of compliance by certified recyclers with federal environmental regulations.

EPA Needs a Consistent Approach to Defining E-Waste to Collect Relevant Information and Set Management Goals

EPA does not have a uniform definition of E-waste or a comprehensive list of electronics that are categorized as E-waste. Further, the National Strategy does not seek to address the lack of a clear and consistent definition. EPA states that defining E-waste is difficult and not practical. The OIG concludes that a consistent approach to defining E-waste, such as a baseline definition or a list of devices, is necessary to properly characterize the size and composition of the E-waste universe. A consistent approach to defining E-waste would also serve to identify the information needed to effectively manage the risks from E-waste. For example, for each activity defining E-waste, EPA could include consistent categories such as types of devices, scarce resources contained, or potential for toxicity. However, EPA defines and lists E-waste differently in each of its programs and initiatives, including the National Strategy. The variance in definitions hampers EPA's overall ability to effectively collect relevant information and set goals to manage the program. Without a clear and consistent management universe, EPA is unable to direct its limited resources toward developing goals and program activities to address program needs. The Agency's 2009 roadmap report for future materials management, *Sustainable Materials Management: The Road Ahead*, discussed the critical need to establish the universe when creating a materials management strategy analytical framework. EPA has not established the universe for its E-waste management strategy.

According to ORCR staff, electronics technology and composition are constantly evolving. These changes make defining E-waste difficult and not practical. Staff stated that the Agency develops official legal definitions when specific terms are included in regulations, such as hazardous waste listings. Since there is no current or proposed federal hazardous waste listing for E-waste,[26] EPA has not seen the need to define E-waste broadly.

ORCR staff expressed concern that a set definition is not flexible enough to adapt to technological changes. The staff said that new electronics emerge on the market and contain components not previously included in an official definition. Under RCRA, hazards from used electronics can be identified as they occur. On the other hand a hazardous waste listing is a static snapshot in time and would need to be frequently updated to incorporate any new hazardous waste electronics that are generated. ORCR staff explained that each program or initiative defines E-waste uniquely to deal with technology changes and shifts in consumer demand. This approach has resulted in numerous Agency E-waste definitions that vary greatly in scope. For example, the National Strategy contains the following broad statement:

> For the purposes of this document, however, the Task Force considers 'e-waste' as subset of 'used electronics.' Used electronics can be reused, refurbished, and recycled, and can be a source of valuable parts and/or raw materials (e.g., gold, copper, glass), which can be returned to the supply chain to reduce overall waste.

In contrast, OPPT defines electronics more specifically for the purposes of the FEC. OPPT targets common office electronics, such as desktop and laptop computers for the FEC. At an EPA headquarters "E-cycling" event in April 2012, 39 separate electronic products were listed as "acceptable materials" for E-cycling. This product list had not been incorporated into an official or commonly utilized Agency definition.

The electronics recycler certifications have two different definitions of what constitutes E-waste. Both programs used approaches to defining E-waste that allow for flexibility with the evolving nature of electronics. R2 lists specific equipment and uses a future provision to deal with the issue of evolving technology. R2 includes "any other or new (future) types of equipment that are designed primarily to store or convey information electronically, and any new accessories to such equipment." A future provision is one option for EPA to address their concern of technological advancement. The other certification body, e-Stewards, addresses the challenge of evolving technology by focusing on the constituents contained in products. e-Stewards also makes a distinction between hazardous and non-hazardous E-waste.

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[26] The CRT Rule is the only federal E-waste-specific regulation. The rule applies to CRTs only and not to other electronic products; while CRT is defined in the rule, E-waste is not.

EPA Needs Complete Information on National E-Waste Disposition to Better Direct Its Limited Resources

The 2004 OIG report on E-waste concluded that EPA lacked complete national information. According to this report, the E-waste information collected was not adequate to support management decisions. In response to the 2004 OIG report recommendation regarding the volume of E-waste disposed in municipal solid waste landfills, EPA issued end-of-life information in a report titled *Electronics Waste Management in the United States Through 2009*. However, 8 years later, the finding remains the same despite EPA's efforts to address the OIG recommendation. EPA lacks accurate and comprehensive information on the volume of E-waste disposed, including information on municipal solid waste landfills and also on the volume of E-waste recycled, in order to gather electronic disposal data. Without such information, EPA cannot track the progress of its efforts to support its waste management hierarchy goal of promoting E-waste recycling and reuse over disposal. EPA is therefore unable to identify areas of greatest need to direct its limited resources. The National Strategy does not fully address this information limitation.

EPA acknowledged in the 2009 report that "there is a need for improved and consistent reporting of electronic products collection and recycling . . . to develop a clearer picture" of the United States' used electronics end-of-life management. Additional stakeholder collaboration, research, and information gathering is necessary to address the existing information gap of representative and comprehensive information concerning national figures for residential and commercial use patterns, life span of electronic devices, and recycling collection quantities. Further, the National Strategy echoes the 2009 EPA report by stating that information on electronic device end-of-life disposition—such as disposal, reuse, and recycling volume—would be useful "to determine the most effective approaches to collection, recycling and reuse" but "there is little information available."

EPA's 2009 report made the caveat that the lack of concrete information for the use and management of end-of-life electronics limited the report findings. In particular, EPA extrapolated the only available information, consisting of eight states and representing 29 percent of the United States population, to estimate the total quantity of electronic devices collected for recycling from residential sources nationally in 2009. EPA also relied on surveys of recyclers to determine the amount of electronic products collected from commercial sources. In the 2009 EPA report, the Agency determined the national figure based on survey responses of only seven recyclers.[27] A Region 4 staff member asserted that the information in the report may be accurate but is limited information and not comprehensive.

[27] EPA does not know the universe of non-certified recyclers. As of May 7, 2012, R2 had 202 certified facilities and e-Stewards had 31 certified facilities.

While implementation of the National Strategy is EPA's current E-waste priority, it does not fully address the limitations that impede EPA's effectiveness in gathering domestic E-waste information. According to EPA staff, the Office of Management and Budget's (OMB's) Paperwork Reduction Act (PRA) requirements and lack of resources hinder the Agency's information gathering activities. The PRA[28] requires agencies to justify any collection of information from the public. Agencies must describe the information to be collected, provide a reason for why the information is needed, and estimate the time and cost for the public to answer the request. Agencies are required to obtain OMB approval for each information collection request (ICR) used.

EPA staff from both the voluntary and enforcement programs indicated that the PRA was a challenge to their E-waste information collection efforts. The current ICR in place allows EPA to collect E-waste information only from its program partners. All other information collection efforts would be subject to PRA's "collection of information" requirement. This requires OMB to pre-approve Agency information requests from 10 or more non-federal entities. EPA is thus limited to surveying nine non-federal entities. If EPA plans to gather information from 10 or more non-federal entities, the Agency will first need to apply for an ICR. According to ORCR staff, programs determine whether to seek an ICR based on need and whether they have a strong justification. In some cases, the willingness of management to pursue the ICR is a factor. Deterrents can range from lack of resources to the knowledge or perception that it would be too difficult to seek an ICR and successfully get OMB approval. EPA E-waste programs have only requested one ICR and it has been in place since 2008.

EPA's lack of staff and resources devoted to the E-waste program further limits the Agency's ability to effectively gather E-waste information. ORCR staff said the Agency's involvement in addressing numerous National Strategy action items has added to their work but additional resources were not provided.

In addition to lacking complete national information on E-waste disposition, EPA is not taking full advantage of information from Agency-sponsored research. Many EPA E-waste staff we spoke to were not familiar with relevant research that the Agency has conducted on various E-waste issues (including the research highlighted in the bullets below). We found that even ORD staff were not aware of any of the E-waste research sponsored by ORD prior to 2011. Staff also said that ORD had not done research on the disposal of end-of-life electronics. Contrary to this claim, we presented EPA with excerpts from ORD's 2007–2012 Multi-Year Plan for the land research program that included the following E-waste issues:

[28] The PRA established the Office of Information and Regulatory Affairs within OMB to provide central Agency leadership and coordinate government-wide efforts to reduce unnecessary paperwork burden and improve the management of information resources.

- Pilot proposal to evaluate toxic constituents in electronic waste.
- Preliminary assessment of research needs for electronics wastes sampling.
- A joint ORD and OSWER (National Electronics Team) preparation of E-waste disposal white paper.

ORD staff said that their responsibility did not include E-waste until they received funding in the 2011 budget to look into E-waste. We concluded, based on this statement and the general lack of awareness of E-waste research by most staff we spoke with, that EPA has not incorporated information from past E-waste research to better its programs.

Agency-sponsored research on E-waste is not stored in a central repository and can be difficult to find for Agency staff. We found several E-waste-related research documents in different websites. We were unable to find certain studies identified in ORD's list of projects.

EPA Needs Information on Domestic CRT Exporter Universe to Target CRT Rule Enforcement Inspections

OECA does not have adequate information on the number of CRT exporters in the United States to help them set enforcement targets for the CRT Rule. EPA used the list of domestic exporters identified in the 2008 GAO report to identify enforcement targets as part of EPA national enforcement initiatives.[29] However, the Agency has not developed up-to-date targets and relevant goals since that initial effort. OECA staff said there are challenges in identifying the universe of exporters. One challenge was that many exporters are "fly-by-night" (transient) businesses. Other exporters go out of business or change names. Another challenge is that EPA is only aware of exporters that are abiding by the CRT Rule because EPA does not have the resources to identify all possible exporters.

According to Agency staff, EPA's enforcement of E-waste is limited by its staffing and funding levels. Regional staff said their mode of operation is more reactive than proactive. Regional staff also stated that they do not have the budget to proactively seek out CRT Rule violators. This lack of resources is why regional staff focus on responding only to tips and complaints concerning potential CRT Rule violations reported by the public and other stakeholders. Region 10 staff said they would like to address E-waste issues in locations that are far from the regional office but lack funds.

As a result of these limitations, EPA does not establish enforcement targets for the CRT Rule. Thus, the Agency cannot measure the results of its CRT Rule enforcement. EPA proposed a rule change in March 2012 for the current CRT Rule to increase EPA's ability to obtain more shipment information from

[29] GAO developed the list of targets by conducting undercover work posing as foreign buyers of broken CRTs and identifying 43 U.S. exporters willing to ship broken CRTs in violation of the CRT Rule.

exporters. However, OECA staff said the proposed changes will not improve the current limitations for domestic exporter universe information. Therefore, the lack of available information will continue to be an issue for CRT Rule enforcement.

Regional Best Practice: Use of RCRA Information Request Letters to Identify CRT Exporters

Some EPA regions are implementing actions we consider a best practice. Under the provisions of RCRA Section 3007(a),[30] EPA may require persons who handle or have handled hazardous waste to provide information relating to such wastes. Several EPA regional offices use RCRA 3007 information request letters to identify exporters of CRTs. Regional offices seek information concerning CRT shipments to countries outside the United States. Of the regions we visited, Regions 4, 9, and 10 utilize this technique. Region 9 was the most successful in having several recyclers respond. Region 9 stated that they also visit recycling facilities if they do not respond to the information request letters.

EPA Needs a Practical Process to Characterize the Hazards of Non-CRT Electronics to Ensure Proper Disposal of Hazardous E-Waste

EPA does not have a practical process for determining the hazardous characteristics of non-CRT E-waste.[31] As such, EPA lacks information on the potential hazard characteristics of non-CRT E-waste sent to landfills by generators. Potentially toxic E-waste is disposed in municipal landfills or incinerated without having the hazards identified as required by RCRA. The lack of available information limits the effectiveness of EPA's existing enforcement efforts. According to Agency staff, the RCRA-required TCLP[32] is not practical for E-waste because it is costly and time consuming.[33] Thus, generators of E-waste are not testing with TCLP. Also, the Agency is not monitoring, identifying, and enforcing improper non-CRT E-waste disposal.

It is difficult to conduct a TCLP on E-waste because the procedure requires small particles for a representative sample. Further, electronic devices are large, bulky, and heterogeneous with respect to locations of toxic elements. There are also complications associated with the variability in testing results among similar devices. For example, hazardous characteristics can differ for an electronic device from the same manufacturer if the device was made in different years.

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[30] 42 U.S.C. § 6927(a)
[31] CRTs are the only electronic devices where TCLP laboratory data were available for EPA to make a hazardous determination. Other devices tested in an EPA-sponsored study include laptops, printers, televisions, cell phones, remote controls, and computer mice. Each of these devices exceeded toxicity characteristic levels in at least one test. However, EPA's opinion is that it has not reached the rulemaking threshold of available laboratory data for such devices.
[32] When establishing RCRA, Congress authorized EPA to establish criteria that characterize wastes by identifying potential hazards to human health and the environment (40 C.F.R. § 262.11(c)(1)). Accordingly, one of the tests EPA designed was the TCLP. This test was intended to predict leaching potential of wastes when mismanaged.
[33] TCLP can take several days and cost as much as $3,000 for a full analysis.

Nonetheless, some electronic devices test hazardous under TCLP. For example, TCLP of circuit boards indicate that circuit board lead levels exceed the RCRA regulatory limit of 5.0 milligrams per liter.

The identification, characterization, and handling of the regulated waste stream are the central goals of OECA's RCRA Compliance Monitoring Strategy. Under RCRA, generators are required to determine whether their solid waste is hazardous. This can be accomplished by either testing the waste or applying their knowledge of the materials or processes used. In contrast, E-waste generators are currently not testing electronics as part of the hazardous waste characterization due to the high cost and time resources. Further, EPA is not enforcing its RCRA authority in this area when warranted and it is not independently testing electronic devices to be able to verify generator determinations. Currently, if the device is not a CRT, EPA does not have the information to challenge the generator's position of the device being hazardous or non-hazardous. Therefore, EPA does not have a practical process to validate generators' non-hazardous waste claims. E-waste generators will likely continue to not test until EPA or another authority enforces and/or mandates this requirement. This gap in enforcement leads to uncertainty on the potential hazards of generator-discarded E-waste in landfills.

In reference to the findings in the 2004 OIG report, EPA stated that the Agency is in the process of assessing the appropriateness of TCLP to non-CRT electronic devices. ORCR staff stated that their office, along with ORD, did research alternative leach testing approaches. However, these approaches would not solve the challenges that exist when applying the TCLP to electronics (i.e., these newly developed tests are just as expensive and time consuming as TCLP). OECA staff said that they have not made any rulemaking requests. However, the staff would like EPA to develop a more practical procedure for identifying hazards in electronics. To reduce the uncertainty regarding used electronics' hazardous waste determination status, EPA should develop a more practical waste characterization process for non-CRT electronics. This would permit enforcement staff to conduct proper enforcement of the RCRA requirement.

EPA Needs Information on Compliance of Recycling Industry to Support Its Advocacy of Certified Recyclers

EPA encourages E-waste recycling companies to receive certification. In addition, the National Strategy has a goal of ensuring that the federal government leads by example. One action item to achieve that goal is to establish a comprehensive government-wide policy on used federal electronics that ensures all federal electronics are processed by certified recyclers. However, the Agency does not know whether certified recyclers comply with the certifying organizations' standards that align with federal regulations.

EPA encourages electronics recyclers to receive certification by either R2 or e-Stewards. Companies voluntarily submit to these independent certifications.

The standards serve as an important control in the electronics recycling process. Both certifying bodies have their own audit processes. However, EPA does not have a routine practice of independently auditing recycling facilities for RCRA compliance.[34] Both certification programs require that facilities comply with all federal and state environmental, health, and safety regulations, including RCRA hazardous waste disposal and record keeping provisions. EPA regional staff expressed concerns with the certification programs inspecting for these provisions. Staff from Region 10 characterized EPA’s reliance on the certification programs as a “challenge.” Region 10 staff explained that they did not know whether the certification organizations were reviewing the recyclers’ compliance. Region 7 staff would not recommend some certified recyclers because of poor housekeeping practices which are violations of RCRA standards. This staff also knew of recyclers that were compliant with standards but, due to the high costs of obtaining a certification, were not certified.

The National Strategy emphasizes the use of certified recyclers for all federal electronics. As part of the on-going National Strategy effort, EPA, in collaboration with GSA and the applicable accreditation board, will review the need to initiate a study of the implementation of the currently used electronics certification programs. This review will also evaluate such aspects as vigorousness of facility and downstream audits, consistency and frequency of audits, and auditor training. The implementation study applies only to recyclers that federal agencies utilize and will be used to assist in determining which certification programs to use. During this review, EPA plans to participate as an observer and accompany GSA on facility visits. Any recommendations will go to the accreditation board or third-party certifier.

This planned upcoming review of the certification programs associated with the National Strategy should provide some level of assurance that certified recyclers are complying with federal regulations. However, the National Strategy review will not address federal regulatory compliance issues at certified facilities that arise outside this limited review. EPA should include certified recyclers in its RCRA inspection work plans to ensure that they are complying with federal regulations. Otherwise, EPA has no assurance the certified recyclers abide by R2 or e-Stewards recycling standards’ requirement that recyclers comply with all applicable environmental, health, and safety regulations. As a result, EPA risks recommending certified recyclers that may fail to adhere to federal environmental regulations, which may ultimately harm human health and the environment.

[34] Of the 233 recycling facilities that R2 and e-Stewards have certified, EPA has inspected 10 R2 facilities and zero e-Stewards facilities (10 inspections equals 4 percent of total certified recyclers) as part of RCRA inspection. These are not “audits” of recycling certification standards but RCRA hazardous waste inspections of facilities. Six of the 10 facilities inspected did not comply with RCRA. The analysis numbers represent OIG’s review performed on May 4, 2012 (R2) and May 7, 2012 (e-Stewards). As of October 26, 2012, 342 electronics recycling facilities have been certified by one or both of the certification programs.

Additionally, EPA lacks information on the size and compliance status of non-certified recyclers. EPA's focus in managing E-waste is to encourage recycling. However, the Agency does not have information about the E-waste sent to the recyclers. EPA Region 4 staff said many of the facilities inspected have RCRA violations. In one case, regional staff found six mason jars (70 pounds) of mercury inside the facility. The staff in Region 4 believe that, based on their inspections, improper recycling of E-waste is a domestic environmental problem. EPA needs to target electronic recyclers in the RCRA inspections to ensure that non-certified recyclers are adhering to federal regulations.

Regional Best Practice: Targeted Inspections of Electronic Facilities

EPA Regions 4 and 7 target electronic recycling facilities as an enforcement priority. Region 4 found RCRA violations during inspections. Region 4 planned to focus on E-waste enforcement in 2011, and the region did carry this focus over to 2012. According to Region 4's *E-Waste Inspection/Enforcement Strategy*, the region proposed to inspect at least 10 E-waste collection facilities. These inspections led to finding RCRA violations at several facilities in 2011.

Additionally, Region 4 identifies "downstream recyclers" based on its inspections of targeted facilities. The region's inspection of several downstream recyclers has resulted in the discovery of RCRA violations. Region 4 staff noted they find the worst violators when they look "downstream" from the initial targeted recycler.

Region 7 is targeting the electronics recycling facilities in its RCRA inspections to identify recyclers who may be exporting CRTs without notifying EPA. Region 7 staff said that the region reviews the results of inspections, including the violations found. Based on this review, Region 7 revises inspection plans for the following year. If inspections find no violations in the electronics sector, the region will look at a different sector for the following year. The region can also conduct compliance outreach based on violations. Region 7 staff stated that they are inspecting the region's recycling contractor with the purpose of assuring that their contractor is RCRA compliant.

Conclusions

EPA has limited information and resources to ensure effective management and enforcement of the fastest growing waste stream in the country. EPA has made several advancements in recent years. However, if more comprehensive measures are not taken, EPA's ability to manage this complex issue will continue to be limited.

Recommendations

We recommend that the Assistant Administrator for Solid Waste and Emergency Response:

1. Develop a consistent approach for defining E-waste to set the conditions for goal setting and tracking. Identify and gather information to manage the goals and, if necessary, submit an ICR request to OMB.

2. Develop a more practical process to address the hazards of non-CRT electronic waste that ensures that this waste is managed in an environmentally sustainable manner.

3. Evaluate the implementation of currently used electronics certification programs as detailed in the National Strategy. If necessary, conduct RCRA inspections (for federal regulations only) of certified recyclers accordingly.

4. Evaluate resource needs for E-waste management and direct available additional resources as needed.

We recommend that the Assistant Administrator for Enforcement and Compliance Assurance:

5. Evaluate methods for gathering the information necessary to set CRT rule enforcement targets such as the use of RCRA 3007 information request letters to identify CRT exporters.

Agency Comments and OIG Evaluation

OSWER concurred with recommendations 1, 2, 3, and 4, and OECA concurred with recommendation 5. These recommendations are unresolved pending receipt of corrective actions and completion dates.

OSWER responded at the exit conference that development of a uniform definition (recommendation 1) is not feasible at this time but reiterated the agency comments that the agency will continue to define for each individual program. At a subsequent meeting, the OIG presented modified recommendation language to facilitate the Agency in considering a more consistent approach to defining E-waste for its various programs. OSWER agreed to the modified recommendation. We consider this recommendation unresolved pending receipt of corrective actions and completion dates.

OSWER disagreed with recommendation 2 in its initial response and to OIG’s modified recommendation language at a subsequent meeting because any drawbacks that the TCLP may have with testing the leachability of waste electronics would also apply to any alternative testing procedures and processes, including alternative leaching processes that could be used. The OIG accepted OSWER's proposed revision to recommendation 2.We consider this recommendation unresolved pending receipt of corrective actions about OSWER's ability to monitor, identify, and ensure proper disposal of non-CRT E-waste disposal, including completion dates.

OECA disagreed with the OIG's initial recommendation 5 because the current regulatory requirements and proposed modifications to the CRT rule will deem additional information gathering efforts unnecessary. The OIG presented modified recommendation language to facilitate the Agency in evaluating methods for gathering information necessary for setting CRT Rule enforcement targets. OECA concurred with the modified recommendation. We consider this recommendation unresolved pending corrective actions and estimated completion dates.

The OIG deleted recommendation 6 which recommended that OECA evaluate E-waste enforcement resource needs and direct available resources as needed. This decision was based on the OIG's review of OECA's response to the draft report stating that it does not have the resources to maintain any initiatives that target E-waste exporters. OECA staff explained that they allocate resources and staff to priority enforcement issues. Currently, E-waste enforcement is not a priority. The OIG accepted the response.

We made changes to the report as appropriate. The Agency's complete response, along with the OIG's evaluation, is in appendix A.

Status of Recommendations and Potential Monetary Benefits

RECOMMENDATIONS						POTENTIAL MONETARY BENEFITS (in $000s)	
Rec. No.	Page No.	Subject	Status[1]	Action Official	Planned Completion Date	Claimed Amount	Agreed-To Amount
1	18	Develop a consistent approach for defining E-waste to set the conditions for goal setting and tracking. Identify and gather information to manage the goals and, if necessary, submit an ICR request to OMB.	U	Assistant Administrator for Solid Waste and Emergency Response			
2	18	Develop a more practical process to address the hazards of non-CRT electronic waste that ensures that this waste is managed in an environmentally sustainable manner.	U	Assistant Administrator for Solid Waste and Emergency Response			
3	18	Evaluate the implementation of the currently used electronics certification programs as detailed in the National Strategy. If necessary, conduct RCRA inspections (for federal regulations only) of certified recyclers accordingly.	U	Assistant Administrator for Solid Waste and Emergency Response			
4	18	Evaluate resource needs for E-waste management and direct available additional resources as needed.	U	Assistant Administrator for Solid Waste and Emergency Response			
5	18	Evaluate methods for gathering the information necessary to set CRT rule enforcement targets such as the use of RCRA 3007 information request letters to identify CRT exporters.	U	Assistant Administrator for Enforcement and Compliance Assurance			

[1] O = recommendation is open with agreed-to corrective actions pending
C = recommendation is closed with all agreed-to actions completed
U = recommendation is unresolved with resolution efforts in progress

Agency Response and OIG Comments

MEMORANDUM

SUBJECT: Response to Office of Inspector General Draft Report No. OPE-FY11-0015: *Improved Information Could Better Enable EPA to Manage Electronic Waste and Enforce Regulations,* dated October 9, 2012

FROM: Mathy Stanislaus, Assistant Administrator
Office of Solid Waste and Emergency Response

Cynthia Giles, Assistant Administrator
Office of Enforcement and Compliance Assurance

TO: Carolyn Copper
Assistant Inspector General for Program Evaluation

Thank you for the opportunity to respond to the issues and recommendations in the draft report *Improved Information Could Better Enable EPA to Manage Electronic Waste and Enforce Regulations,* dated October 9, 2012. Improving the management of electronics and the enforcement of relevant regulations in the United States is an EPA priority.

For those report recommendations with which the Agency agrees, we have provided a description of ongoing actions that respond to the recommendations. For those report recommendations with which the Agency does not agree, we have explained our position. For your consideration, we have included a Technical Comments Attachment to supplement this response.

Significance of the National Strategy for Electronics Stewardship

As you know, EPA co-led, with the General Services Administration (GSA) and the Council on Environmental Quality (CEQ), the development of the National Strategy for Electronics Stewardship. The National Strategy, released July 20, 2011, carries out the Administration's intentions by identifying a leadership role for the U.S. Government, creating incentives for the design of greener electronics and increased domestic electronics recycling, and promoting more responsible management of used electronics with U.S. trade partners. It contains four overarching goals:

1. Build Incentives for Design of Greener Electronics, and Enhance Science, Research and Technology Development in the U.S.;
2. Ensure that the Federal Government Leads by Example;

3. Increase Safe and Effective Management and Handling of Used Electronics in the U.S.; and
4. Reduce Harm from U.S. Exports of e-Waste and Improve Safe Handling of Used Electronics in Developing Countries.

The National Strategy resulted from extensive collaboration among 16 Federal departments and agencies, as well as consultation with stakeholders from the electronics, retail, and recycling industries, environmental organizations, state and local governments, and concerned citizens. As a strategic document, it identifies areas where we lack sufficient information and data, and where more efforts in the electronics product lifecycle are needed. EPA committed publically to a significant number of key projects, programs and initiatives as a result of the intensive and thoughtful cross-government and cross-sectors deliberations that took place in developing the National Strategy. Many of EPA's commitments require input and collaboration across the government and with a broad set of stakeholders.

The National Strategy represents the Federal Government's plan for improving electronics stewardship in the United States and as such, it is EPA's roadmap for actions. EPA noted to the OIG the significance of the National Strategy as a priority setting document and the fact that the commitments EPA made as a consequence of the National Strategy are governing the activities and resources available for used electronics. However, the draft OIG report does not reflect a proper appreciation of the National Strategy's significance in this regard.

OIG Response: OIG added language to the report that highlights the fact that the National Strategy is a priority setting document and is currently governing the activities and resources available for electronics. However, the focus of the evaluation was on existing Agency electronic programs and regulations and the information used in these programs to manage to established goals and targets of programs. As stated in the report, our review of the National Strategy was limited to its potential impacts on existing programs, regulations, and the collection of management information. Further, the National Strategy is focused primarily on federal agencies' activities whereas the OIG evaluation was focused on EPA's national management of E-waste. It is the conclusion of the OIG that the National Strategy and the Agency's role in "key projects, programs, and initiatives" will not adequately address the deficiencies in management information detailed in this report regarding EPA's role in the national management of E-waste. Notably, the National Strategy: (1) does not seek to address the Agency's lack of a uniform definition, (2) echoes the Agency's 2011 report titled, "Electronics Waste Management in the United States Through 2009" in stating that end-of-life disposition of used electronics information would be useful but little information is available, and (3) does not contain specific goals to increase EPA's effectiveness in gathering domestic E-waste information.

We appreciate the OIG's recognition of EPA's achievements in their report. EPA successfully implemented the Plug-In to e-Cycling program in 2004 and evolved the program to the *Sustainable Materials Management (SMM) Electronics Challenge*. EPA worked with stakeholders to develop a voluntary industry standard and certification program for electronics recyclers. Currently, there are two accredited certification programs for the electronics recycling industry: the Responsible Recycling Practices (R2) and the e-Stewards® programs. EPA continues to support safer and more protective recycling by encouraging use of accredited third-party electronic recycling certification programs. The Agency issued the final Cathode Ray Tube (CRT) regulation in 2006 and in 2012 proposed a CRT rule amendment to enhance the ability to track CRT exports. Just recently, EPA launched the national *SMM Electronics Challenge*. The objective of this challenge is to raise the bar on responsible management of used electronics by challenging manufacturers and retailers to voluntarily commit to sending 100% of used electronics collected for reuse and recycling to third party certified recyclers; increasing the total amount of used electronics collected for reuse and recycling; and, being transparent about their efforts by publically posting collection information and data.

OIG Response: The OIG incorporated the above points that were effective after the 2004 OIG report that were not already included in other areas of the report into the Noteworthy Achievements section of the report, such as the launch of the SMM Electronics Challenge.

This response also provides comments on topics that are incompletely or inaccurately discussed and addressed in the draft report, including waste management policies in the U.S., the Resource Conservation and Recovery Act (RCRA) and supporting regulations, and the existence of collaboration across EPA programs beyond RCRA on other aspects of electronics management. For example, the draft report states that *"Domestically, E-waste in landfills can pose potential environmental risks when toxic chemicals from discarded electronics leach into groundwater" (p-2)*, even though EPA shared with the OIG supporting information that shows landfilling waste electronics in a well-managed, modern landfill is not expected to pose a risk to groundwater. Further, the draft report states that *"Concerns about E-waste landfill disposal have led federal and state governments to encourage recycling" (p-2).* As noted previously, EPA believes disposal in a compliant landfill is protective of human health and the environment and is not the reason that the Federal government encourages recycling of used electronics.

OIG Response: The OIG amended the final report to attribute the above statements to an EPA report and a congressional report, respectively.

As the OIG itself acknowledges on p.2 of the report, EPA's Solid Waste Management Hierarchy prioritizes the most environmentally sound methods for municipal solid waste management with source reduction, reuse and recycling being preferred over disposal. Electronic products are made from valuable resources and highly engineered materials, including metals, plastics, and glass that have significant recycling potential. Reusing and recycling electronics conserves our natural resources and avoids air and water pollution, as well as greenhouse gas emissions that are caused during extraction and manufacturing of virgin materials.

It would also be appropriate for the OIG to further discuss and recognize the importance of the Office of Solid Waste and Emergency Response's (OSWER's) and the Office of Chemical Safety and Pollution Prevention's (OSCPP's) collaboration on the Electronic Product Environmental Assessment Tool (EPEAT) due to its importance in source reduction. OSWER contributes expertise on electronics design specific to: easy and safe disassembly, producing less waste, using recycled content, using less packaging, and ensuring proper end-of life management. This collaboration is critical because EPEAT reduces the amount of electronics waste that needs to be reused, recycled or managed while reducing the amount of toxic material found in electronics waste.

OIG Response: The OIG included the statement on EPEAT's effects in the background section.

The draft report appears to reflect some misunderstandings of the RCRA regulatory programs (Subtitle C and Subtitle D), and the way these programs address risks posed by different types of waste generally. The identification of wastes as either hazardous or non-hazardous is a key element to determining which program these wastes will be managed under. Therefore, it is important to have a clear understanding of how EPA defines hazardous waste (e.g., listed vs. characteristic) and also how risks are managed under both Subtitle C and Subtitle D. For example, the hazardous waste regulatory program has identified waste CRTs and printed circuit boards as nearly always expressing a hazardous characteristic, and thus these wastes are regulated as hazardous when disposed. Many other types of used electronics may not meet the definition of hazardous waste, but are nonetheless managed at non-hazardous solid waste disposal facilities, which as stated previously, are protective of human health and the environment.

OIG Response: The OIG finding is specific to non-CRT electronics and it relates to the Agency's statement above: "Many other types of used electronics may not meet the definition of hazardous waste, but are nonetheless managed at non-hazardous solid waste disposal facilities." As the Agency states, non-CRT electronics may not meet the definition of hazardous waste; however the OIG was also told, and studies indicate, that some electronics may meet the definition. The OIG concludes that there is uncertainty regarding the hazardous characteristic of non-CRT electronic waste. Based on the response above, EPA is allowing non-CRT E-wastes to be disposed of in non-hazardous solid waste disposal facilities without requiring testing or review of "generator knowledge." Per RCRA (see 40 CFR § 261), a generator of waste is required to make a determination as to whether its waste is hazardous, using either testing or its knowledge of the waste. The OIG concludes that the hazard characteristic determination requirement of RCRA is not being applied to non-CRT electronics because TCLP is not a practical test for electronics.

The OIG recommended that EPA include certified recyclers in RCRA inspection plans if certification compliance issues arise based on EPA's evaluation of certification programs. However, OIG is confusing the certification bodies' role for ensuring that their voluntary certification standards are met with EPA's independent enforcement role in cases where violations of RCRA have occurred at a recycling facility. Although EPA participated in the development of the practices and environmental standards that are found in one of the electronics recycler certification programs in the U.S. today, these are not EPA programs but programs that are run by private organizations.[35] As such, it is the role of the third party organization or certifying body to audit and certify the electronics recycling facility, and to ensure continuous

[35] The two certification programs are: (1) the e-Stewards® certification program which was created and is run by the Basel Action Network, a private non-profit organization; and (2) the Responsible Recycling Practices (R2) which is run by R2 Solutions, also a private non-profit organization.

conformance to these practices and standards. Conformance to the standards, however, does not relieve recyclers of their RCRA or other federal, state, or local legal obligations. Should EPA learn of potential RCRA violations, EPA will investigate the alleged violations and take appropriate enforcement action, as necessary. EPA Regions and states inspect electronics recycling facilities, which may or may not be certified, and as appropriate will take enforcement actions if a violation is discovered. EPA realizes that these certification programs are not the only answer to ensuring proper electronics management, but we expect that they will raise the environmental floor for the electronics recycling industry as a whole. EPA plans to evaluate the effectiveness of the implementation of the certification programs. Additionally, EPA continues to work with the certification programs to encourage the continual improvement of electronics recycling practices and standards.

OIG Response: The OIG clarified the findings/recommendation language in the report to state that based on the findings of the planned National Strategy review of the certification programs, if necessary, EPA will plan RCRA inspections (for federal regulations only) of certified recyclers accordingly. The OIG has documented articles detailing violations of certification standards as well as federal standards by certified recyclers. The OIG concludes that given the federal initiative to utilize only certified recycling facilities and recent accounts of violating certified recyclers, EPA minimizes risk and increases effectiveness of its E-waste management by including certified recyclers in their inspections.

Finally, it is unclear why certain conclusions in the report are drawn as there are no references cited. It would be helpful to the reader if the OIG provided a bibliography containing the reports, publications, transcripts and information that they used to draw their conclusions. (Note: See Technical Comments Attachment for further discussion of these comments, as well as other comments.)

OIG Response: The OIG draws its conclusions in part, from the information provided by the Agency during the course of our review. Chapter 1 provides the purpose and background, and discusses how we conducted our work and the criteria we relied upon. This report provides our findings and conclusions that address our objectives for performing the evaluation.

<u>EPA Comments on individual recommendations in draft report</u>

***Recommendation #1*: Define e-waste to set the conditions for goal setting and tracking. Identify and gather information to manage the goals, and, if necessary, submit an ICR request to OMB.**

EPA Response:

EPA agrees that we should define, in the context of individual actions, what used electronics is considered by that action, as appropriate.

We appreciate the OIG's suggestion that EPA develop a single definition of used electronics. EPA and the other agencies that participated in the development of the National Strategy for Electronics Stewardship collectively considered this issue and were unable to come up with a meaningful definition that would not quickly become obsolete due to the changing nature of electronic devices and frequent introduction of new and unique products. Even without the single definition of used electronics, agencies were able to set goals, identify projects and set tracking mechanisms for progress. We do agree that for each used electronics action, program or data gathering effort that we first identify the types of electronics that will be included in the effort and any rationale for the decision.

We agree that information on used electronics is important and we currently gather appropriate information as part of our municipal solid waste characterization report and as part of our efforts surrounding certified electronics recycling that allows the Agency to manage our goals. In addition, we already make information that we have on exports of CRTs publically available. Once results from the three export flows projects being conducted under the National Strategy are released (see discussion below), we will assess the information and incorporate that information into our reports and decision-making, as appropriate. We will submit an ICR request to OMB as appropriate and necessary, but have not done so to date.

Since 2005, we have collected and published information about the disposition and end-of life management of electronics collected for recycling and we intend to continue to provide this information to the public. In 2005, based on recommendations from the OIG, we developed two approaches for collecting a set of baseline end-of-life electronics data. This work led to the July 2008 release of a baseline data report. We released an updated report entitled *Electronics Waste Management in the United States through 2009* (November 2010). Although EPA acknowledged in that report that it extrapolated available information to provide national estimates, we believe that the report generally reflects the state of electronics waste in the United States nationally. We intend to continue to collect this type of information and incorporate it into EPA's Municipal Solid Waste Characterization Report.

In addition, we already post data specific to CRTs exported for recycling and reuse on our website and have proposed revisions to the CRT rule that will further enhance our knowledge of CRT exports.

The National Strategy recognized that the U.S. government lacks information on the amount of used electronics that are exported. Consequently, under the National Strategy, there are three ongoing projects that will help to better characterize the flow of used electronics from the United States. Specifically:

- U.S. International Trade Commission (USITC) has launched a study that gathers information from electronics recyclers on what they export and to where;
- EPA, through the organization Solving the E-waste Problem (StEP), is supporting efforts to characterize transboundary flows of used electronics; and
- EPA, through the Commission of Environmental Cooperation, is supporting efforts to characterize the flow of electronics from North America.

OIG Response: OIG understands the Agency's explanation of the complexities of defining E-waste or used electronics (which we also detail in the report). However, the OIG continues to conclude that a uniform definition would allow the Agency to fully identify the universe and ensure effective E-waste management to protect public health and conserve valuable resources. The OIG acknowledges the Agency's response that development of a uniform definition is not feasible at this time. The OIG held a subsequent meeting with the Agency to discuss modified recommendation language to facilitate the Agency in considering a more consistent approach to defining E-waste for its various programs. A consistent approach for defining E-waste would serve as a clear means to set and track goals as well as the basis for necessary information collection. To assist the Agency in this effort, the report detailed methodologies used by the recycler certification bodies in defining E-waste. These entities deal with the same complex issues described above. The OIG requests that the Agency provide estimated timeframes for completion. The Agency concurred with the modified recommendation at the subsequent meeting.

The OIG accepts the Agency's response to the portions of the recommendation regarding identifying and gathering information and utilizing the ICR when necessary. We consider this recommendation unresolved pending corrective actions for all parts of the recommendation and estimated completion dates, and the responsible party/office.

***Recommendation #* 2*:* Develop a more practical characterization procedure for non-CRT electronics.**

***EPA Response*:**

We disagree with this recommendation. We believe that the Toxicity Characteristic Leaching Procedure (TCLP) is an appropriate way to evaluate the potential hazards of e-waste under plausible domestic disposal conditions (i.e., landfilling). Any drawbacks that the TCLP may have with testing the leachability of waste electronics would also apply to any alternative testing procedure, including alternative leaching procedures that could be used. We also believe that development of a broad hazardous waste listing for waste electronics under RCRA would not be supported by currently available data.

EPA evaluated the appropriateness of the TCLP test in the report entitled *RCRA Toxicity Characterization of Computer CPUs and Other Discarded Electronic Devices* (July 15, 2004), prepared by Dr. Timothy Townsend. Later work by Dr. Townsend showed that use of lead-free solders would significantly reduce the lead leaching potential of printed circuit boards used in electronic devices (Townsend et al, 2008). While we acknowledge that the TCLP test has some drawbacks in the case of debris-like waste, such as electronics, the same drawbacks would apply to other testing procedures that could be used to characterize used electronics, such as alternative leaching procedures or testing for the total content of particular metals. Electronics waste is highly heterogeneous and there are a large number of different types and models of waste electronic products collected for management at any time. In addition, the suite of devices available for sale can change rapidly over time (e.g., cell phone turnover is often every 2 years).

We do not plan to require generators to test in order to determine the regulatory status of waste electronics when testing is not required for other types of wastes[36] (the Agency considered and rejected this general approach; see 55 FR 11829-30; March 29, 1990); rather, under the RCRA regulations, the generator may use either testing or knowledge of the materials or processes involved in generating the waste to make the determination. (See 40 CFR 262.11).

Development of a hazardous waste listing under RCRA would also be problematic. It would need to be based on the same type of data described above, with the same issues about e-waste heterogeneity and change over time. Based on the data we currently have, used electronics broadly defined (exclusive of CRTs and printed circuit boards) are unlikely to fail the Toxicity Characteristic regulatory test or exhibit any of the other hazardous waste characteristics, and are unlikely to pose risks to human health and the environment when disposed using plausible U.S. domestic waste management practices. Also, because of regulation in the European Union and the successful voluntary consensus EPEAT standard, the expected trend is that over time more electronics enter end-of life containing less of the known toxins than in the past.

Finally, while the risks from potentially unsafe recycling practices in developing nations are real, RCRA regulations must be based on risks posed by plausible management at disposal facilities within the United States.

OIG Response: The OIG acknowledges the waste characterization difficulties associated with non-CRT E-waste. As the Agency states above, non-CRT electronics are "unlikely to fail the Toxicity Characteristic regulatory test"; however, research studies demonstrate that some electronics may indeed fail the test. The OIG concludes that there is uncertainty regarding the hazardous characteristics of non-CRT electronic waste. EPA is allowing non-CRT E-wastes to be disposed of in non-hazardous solid waste disposal facilities without requiring a test or review of "generator knowledge." Per RCRA (see 40 CFR 261), a generator of waste is required to make a determination as to whether its waste is hazardous, using either testing or its knowledge of the waste. The OIG concludes that the hazard characteristic determination requirement of RCRA is not being applied to non-CRT electronics because TCLP is not a practical test for electronics. The OIG understands from the Agency responses that developing a more practical laboratory procedure at this time is not feasible. The OIG held a subsequent meeting with the Agency to discuss modified recommendation language to facilitate the Agency in considering a broader approach to achieving RCRA requirements. The Agency disagreed with the modified language at the meeting, stating that any drawbacks that the TCLP may have with testing the leachability of waste electronics would also apply to any alternative testing process, including alternative leaching processes that could be used.

OIG accepts the Agency's proposed revision to recommendation 2. We consider this recommendation unresolved pending receipt of corrective actions about EPA's ability to monitor, identify, and ensure proper disposal of non-CRT E-waste, including completion dates.

[36] We would note that the Agency could not mandate a testing requirement without going through a rulemaking.

Recommendation #3: **Evaluate the implementation of the currently used electronics certification programs as detailed in the National Strategy. If certification compliance issues arise after this review, include certified recyclers in RCRA inspection work plans to ensure that they are complying with federal regulations.**

***EPA Response*:**

We agree with the recommendation that we evaluate the implementation of the currently used certification programs as detailed in the National Strategy for Electronics Stewardship.

To meet our obligations and commitments under the National Strategy, EPA is working with GSA and the applicable accreditation board to conduct a study of the implementation of the current used electronics certification programs. This review will evaluate various aspects of the certification programs: vigorousness of facility and downstream audits; consistency and frequency of audits and auditor training. The results of the study will be used to inform the Federal Government's policy on management of its used electronics.

We believe the portion of the recommendation that states that if certification compliance issues arise after this review, include certified recyclers in RCRA inspection work plans to ensure that they are complying with federal regulations is not reflective of EPA's existing policy, and thus, do not support.

The OIG has inappropriately merged two issues: *conformance* to the voluntary practices and standards established under the certification recycling programs and *compliance* with federal regulation. Conformance to electronics recycler certification standards does not relieve recyclers of used electronics of their RCRA or other federal, state, or local legal obligations, nor does conformance to voluntary standards obviate the responsibility of regulatory authorities to conduct RCRA inspections.

Should EPA learn of potential violations of RCRA legal requirements, EPA will investigate the alleged violations and take appropriate enforcement action, as necessary. EPA Regions and states continue to inspect electronics recycling facilities that may or may not be certified, and take enforcement actions as appropriate.

Since the electronics recycler certification practices and standards are voluntary and are not EPA standards, EPA does not audit or certify facilities for conformance with the certification standards and, therefore, is not responsible for decisions related to certification status.

Determining if a facility is in conformance with a standard is the responsibility of the certifying body (CB). The CB also investigates complaints against certified facilities. The severity of the complaint determines whether the CB suspends certification or whether the company loses certification completely.

OIG Response: The OIG accepts the Agency's response to the part of the recommendation regarding evaluating the implementation of the current certification programs. We consider this part of the recommendation unresolved pending estimated completion dates.

The OIG understands the difference between conformance with voluntary practices and compliance with regulation. However, the OIG still concludes that certified recycling facilities should be included in RCRA inspection work plans. The OIG documented accounts where certified recyclers were found to be violating both certification standards and federal regulations. The OIG concludes that given the federal initiative to utilize only certified recycling facilities and recent accounts of violating certified recyclers, it is in the best interest of EPA to include certified recyclers in their inspections.

Regarding the second part of the recommendation, the OIG will clarify the language in the report to state that based on the findings of the planned National Strategy review of the certification programs, if necessary, EPA will plan RCRA inspections (for federal regulations only) of certified recyclers accordingly. We consider this part of the recommendation unresolved pending the inclusion of proposed alternatives to this part of the recommendation, estimated completion dates, and the responsible party/office.

Recommendation #4: **Evaluate resource needs for e-waste management and direct available additional resources as needed.**

***EPA Response*:**

We agree with the recommendation to evaluate resource needs for e-waste management and direct available additional resources as needed.

We will continue to set priorities for responding to action items under the National Strategy considering available resources.

OIG Response: The OIG accepts the Agency's response to this recommendation to evaluate resource needs for E-waste management. We consider this recommendation unresolved pending the inclusion of estimated completion dates.

***Recommendation #5*: Enforce the CRT Rule in a more proactive manner by gathering the information necessary to set CRT rule enforcement targets.**

EPA Response:

We disagree with the recommendation to enforce the CRT Rule in a more proactive manner by gathering the information necessary to set CRT rule enforcement targets.

Given the current regulatory requirements and the fact that EPA has proposed to modify the CRT rule to gather additional information[37], EPA does not believe it is necessary to undertake any additional data gathering efforts. The regulations at 40 C.F.R. §261.41 require companies that export used CRTs for recycling or reuse to submit written notifications to EPA Regional Administrators and Regional Import-Export Coordinators. As of September 2012, 136 companies have notified EPA of their intent to export CRTs for reuse; six companies have notified of their intent to recycle (one company has notified for both reuse and recycling). In total, there are 141 companies that have notified of their intent to export CRTs for reuse or to recycle. This information can be found on EPA's website, under Export Requirements for Cathode Ray Tubes: http://www.epa.gov/osw/hazard/international/crts/reuse.htm

As the OIG previously noted, EPA launched a two year focused enforcement effort directed at CRT exports. Between 2008 and 2010, EPA opened over 125 investigations against electronic waste recyclers. All EPA Regions participated in this effort and conducted 91 inspections and identified violations at 19 facilities. As also noted in your report, Regions 4 and 7 maintained an enforcement priority targeting electronic recycling facilities in 2011 and into 2012. EPA has a well-established compliance monitoring and enforcement program for all RCRA requirements and we now include the CRT requirements in that program. As part of this overall RCRA compliance monitoring and enforcement program, Regions and states continue to inspect electronics recycling facilities, which may or may not be certified, and bring appropriate enforcement actions each year. Regions also continue to respond to any tips received regarding shipments of CRTs and to investigate these facilities as appropriate. The Office of Enforcement and Compliance Assistance (OECA) maintains the expertise developed during the initial focus effort on electronics recyclers and continues to assist the Regions in developing new cases.

OIG Response: The OIG acknowledges the past efforts of the Agency with CRT Rule enforcement. The OIG concludes that based on enforcement results of EPA regions that the OIG visited in this evaluation, enforcement work still remains for the CRT Rule. The OIG also acknowledges the modifications made to the CRT Rule to gather additional information. As detailed in the report, some EPA staff we interviewed do not believe that the modifications will assist in gaining a better understanding of the CRT exporter universe to help set enforcement targets.

The OIG concludes that the Agency needs to evaluate methods for gathering the information necessary to set CRT Rule enforcement targets such as the use of RCRA 3007 information request letters to identify CRT exporters. The OIG presented modified recommendation language to facilitate the Agency in evaluating information gathering methods. OECA concurred with the modified recommendation. We consider this recommendation unresolved pending corrective actions and estimated completion dates.

***Recommendation #6*: Evaluate resource needs for e-waste enforcement and direct available additional resources as needed.**
EPA Response:

[37] The proposed CRT rule also proposed revisions of certain export provisions to better track exports of CRTs for reuse and recycling,

We disagree with the recommendation to evaluate resource needs for e-waste enforcement and direct available additional resources as needed.

Since the CRT enforcement effort was initiated in 2008, EPA's enforcement resources have declined. EPA, therefore, cannot maintain an initiative solely targeted at electronic waste exporters. Instead, EPA will continue to inspect electronics recyclers as part of its routine compliance monitoring and enforcement efforts to address the universe of RCRA-regulated facilities.

OECA continues to share regional questions/challenges of cases about used electronics on monthly teleconferences with the Regions, as well as at annual meetings of import/export regional coordinators. OECA has also provided the regions with a template for a RCRA 3007 information request letter; this was noted in your report as a "Regional Best Practice."

OIG Response: The OIG acknowledges EPA's resource constraints with respect to an enforcement initiative targeted solely on CRT exporters. In a subsequent meeting, OECA staff also explained that resources and staff are directed to address priority enforcement issues. E-waste enforcement is not a priority issue area for OECA currently. The OIG accepts EPA's response and will delete this recommendation.

<u>Contact information</u>

If you have any questions regarding this response, please contact Suzanne Rudzinski, Director, Office of Resource Conservation and Recovery at (703)-308-8895.

Attachment

Appendix B

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Sustainable Materials Management: Non-Hazardous Materials and Waste Management Hierarchy

EPA developed the non-hazardous materials and waste management hierarchy in recognition that no single waste management approach is suitable for managing all materials and waste streams in all circumstances. The hierarchy ranks the various management strategies from most to least environmentally preferred. The hierarchy places emphasis on reducing, reusing, and recycling as key to sustainable materials management.

On this page:

Source Reduction and Reuse

Source reduction, also known as waste prevention, means reducing waste at the source, and is the most environmentally preferred strategy. It can take many different forms, including reusing or donating items, buying in bulk, reducing packaging, redesigning products, and reducing toxicity. Source reduction also is important in manufacturing. Lightweighting of packaging, reuse, and remanufacturing are all becoming more popular business trends. Purchasing products that incorporate these features supports source reduction.

Source reduction can:

- Save natural resources,
- Conserve energy,
- Reduce pollution,
- Reduce the toxicity of our waste, and
- Save money for consumers and businesses alike.

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Recycling and Composting

Recycling is a series of activities that includes collecting used, reused, or unused items that would otherwise be considered waste; sorting and processing the recyclable products into raw materials; and remanufacturing the recycled raw materials into new products. Consumers provide the last link in recycling by purchasing products made from recycled content. Recycling also can include composting of food scraps, yard trimmings, and other organic materials.

Benefits of recycling include:

- Preventing the emission of many greenhouse gases and water pollutants;
- Saving energy;
- Suppling valuable raw materials to industry;
- Creating jobs;
- Stimulating the development of greener technologies;

- Conserving resources for our children's future; and
- Reducing the need for new landfills and combustors.

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Energy Recovery

Energy recovery from waste is the conversion of non-recyclable waste materials into useable heat, electricity, or fuel through a variety of processes, including combustion, gasification, pyrolization, anaerobic digestion, and landfill gas (LFG) recovery. This process is often called waste-to-energy (WTE). Converting non-recyclable waste materials into electricity and heat generates a renewable energy source and reduces carbon emissions by offsetting the need for energy from fossil sources and reduces methane generation from landfills. After energy is recovered, approximately ten percent of the volume remains as ash, which is generally sent to a landfill.

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Treatment and Disposal

Prior to disposal, treatment can help reduce the volume and toxicity of waste. Treatments can be physical (e.g., shredding), chemical (e.g., incineration), and biological (e.g., anaerobic digestor). Landfills are the most common form of waste disposal and are an important component of an integrated waste management system. Modern landfills are well-engineered facilities located, designed, operated, and monitored to ensure compliance with state and federal regulations. Landfills that accept municipal solid waste are primarily regulated by state, tribal, and local governments. EPA, however, established national standards that these landfills must meet in order to stay open. The federal landfill regulations eliminated the open dumps (disposal facilities that do not meet federal and state criteria) of the past. Today’s landfills must meet stringent design, operation, and closure requirements. Methane gas, a byproduct of decomposing waste, can be collected and used as fuel to generate electricity. After a landfill is capped, the land may be used for recreation sites such as parks, golf courses, and ski slopes.

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The New York Times

Your Recycling Gets Recycled, Right? Maybe, or Maybe Not

Plastics and papers from dozens of American cities and towns are being dumped in landfills after China stopped recycling most "foreign garbage."

By Livia Albeck-Ripka

May 29, 2018

Oregon is serious about recycling. Its residents are accustomed to dutifully separating milk cartons, yogurt containers, cereal boxes and kombucha bottles from their trash to divert them from the landfill. But this year, because of a far-reaching rule change in China, some of the recyclables are ending up in the local dump anyway.

In recent months, in fact, thousands of tons of material left curbside for recycling in dozens of American cities and towns — including several in Oregon — have gone to landfills.

In the past, the municipalities would have shipped much of their used paper, plastics and other scrap materials to China for processing. But as part of a broad antipollution campaign, China announced last summer that it no longer wanted to import "foreign garbage." Since Jan. 1 it has banned imports of various types of plastic and paper, and tightened standards for materials it does accept.

While some waste managers already send their recyclable materials to be processed domestically, or are shipping more to other countries, others have been unable to find a substitute for the Chinese market. "All of a sudden, material being collected on the street doesn't have a place to go," said Pete Keller, vice president of recycling and sustainability at Republic Services, one of the largest waste managers in the country.

China’s stricter requirements also mean that loads of recycling are more likely to be considered contaminated if they contain materials that are not recyclable. That has compounded a problem that waste managers call wishful or aspirational recycling: people setting aside items for recycling because they believe or hope they are recyclable, even when they aren’t.

[Here’s a guide to avoiding “aspirational recycling.” First lesson: Don’t recycle greasy pizza boxes.]

In the Pacific Northwest, Republic has diverted more than 2,000 tons of paper to landfills since the Chinese ban came into effect, Mr. Keller said. The company has been unable to move that material to a market “at any price or cost,” he said. Though Republic is dumping only a small portion of its total inventory so far — the company handles over five million tons of recyclables nationwide each year — it sent little to no paper to landfills last year.

But for smaller companies, like Rogue Disposal and Recycling, which serves much of Oregon, the Chinese ban has upended operations. Rogue sent all its recycling to landfills for the first few months of the year, said Garry Penning, a spokesman.

Wiqan Ang for The New York Times

Western states, which have relied the most on Chinese recycling plants, have been hit especially hard. In some areas — like Eugene, Ore., and parts of Idaho, Washington, Alaska and Hawaii — local officials and garbage haulers will no longer accept certain items for recycling, in some cases refusing most plastics, glass and certain types of paper. Instead, they say, customers should throw these items in the trash.

Theresa Byrne, who lives in Salem, Ore., said the city took too long to inform residents that most plastics and egg and milk cartons were now considered garbage. “I was angry,” she said. “I believe in recycling.”

Other communities, like Grants Pass, Ore., home to about 37,000 people, are continuing to encourage their residents to recycle as usual, but the materials are winding up in landfills anyway. Local waste managers said they were concerned that if they told residents to stop recycling, it could be hard to get them to start again.

It is “difficult with the public to turn the spigot on and off,” said Brian Fuller, a waste manager with the Oregon Department of Environmental Quality.

The fallout has spread beyond the West Coast. Ben Harvey, the president of E.L. Harvey & Sons, a recycling company based in Westborough, Mass., said that he had around 6,000 tons of paper and cardboard piling up, when he would normally have a couple hundred tons stockpiled. The bales are filling almost half of his 80,000-square-foot facility.

“It’s really impacted our day-to-day operations,” Mr. Harvey said. “It’s stifling me.”

Recyclers in Canada, Australia, Britain, Germany and other parts of Europe have also scrambled to find alternatives.

Still, across much of the United States, including most major cities, recycling is continuing as usual. Countries like India, Vietnam and Indonesia are importing more of the materials that are not processed domestically. And some waste companies have responded to China’s ban by stockpiling material while looking for new processors, or hoping that China reconsiders its policy.

Republic Services collecting recycled materials in Kent, Wash. Wiqan Ang for The New York Times

Americans recycle roughly 66 million tons of material each year, according to the most recent figures from the Environmental Protection Agency, about one-third of which is exported. The majority of those exports once went to China, said David Biderman, the executive director of the Solid Waste Association of North America, a research and advocacy group.

But American scrap exports to China fell by about 35 percent in the first two months of this year, after the ban was implemented, said Joseph Pickard, chief economist for the Institute of Scrap Recycling Industries, a trade group.

“It’s a huge concern, because China has just been such a dominant overseas market for us,” Mr. Pickard said.

In particular, exports of scrap plastic to China, valued at more than $300 million in 2015, totaled just $7.6 million in the first quarter of this year, down 90 percent from a year earlier, Mr. Pickard said. Other countries have stepped in to accept more plastics, but total scrap plastic exports are still down by 40 percent this year, he said.

“There is a significant disruption occurring to U.S. recycling programs,” Mr. Biderman said. “The concern is if this is the new normal.”

Curbside recycling is typically hauled by a private company to a sorting plant, where marketable goods are separated out. Companies or local governments then sell the goods to domestic or overseas processors. Some states and cities prohibit these companies from dumping plastic, paper and cardboard, but some local officials — including in Oregon, Massachusetts and various municipalities in Washington State — have granted waivers so that unmarketable materials can be sent to the landfill.

Recycling companies “used to get paid” by selling off recyclable materials, said Peter Spendelow, a policy analyst for the Department of Environmental Quality in Oregon. “Now they’re paying to have someone take it away.”

In some places, including parts of Idaho, Maine and Pennsylvania, waste managers are continuing to recycle but are passing higher costs on to customers, or are considering doing so.

"There are some states and some markets where mixed paper is at a negative value," said Brent Bell, vice president of recycling at Waste Management, which handles 10 million tons of recycling per year. "We'll let our customers make that decision, if they'd like to pay more and continue to recycle or to pay less and have it go to landfill."

Wiqan Ang for The New York Times

Mr. Spendelow said companies in rural areas, which tend to have higher expenses to get their materials to market, were being hit particularly hard. "They're literally taking trucks straight to the landfill," he said.

Will Posegate, the chief operations officer for Garten Services, which processes recycling for a number of counties in Oregon, said his company had tried to stockpile recyclables but eventually used a waiver to dump roughly 900 tons. "The warehouse builds up so much that it's unsafe," he said.

In California, officials are concerned that improperly stored bales of paper could become hazards during wildfire season, said Zoe Heller, the policy director for the state's recycling department.

While China has entirely banned 24 materials, including post-consumer plastic and mixed paper, it has also demanded that other materials, such as cardboard and scrap metal, be only 0.5 percent impure. Even a small amount of food scraps or other rubbish, if undetected, can ruin a batch of recycling.

Some waste managers say that China's new contamination standards are impossible to meet, while others are trying to clean up their recycling streams by slowing down their processing facilities, limiting the types of materials they accept or trying to better educate customers on what belongs in the recycling bin.

Waste traveling along a conveyor belt to be sorted. Wiqan Ang for The New York Times

Mr. Bell, the Waste Management executive, said he had seen everything from Christmas lights to animal carcasses to artillery shells come through the company's recycling facilities. "Most of our facilities get a bowling ball every day or two," he said.

Some materials can ruin a load, he said, while others pose fire or health hazards and can force facilities to slow their operations and in some cases temporarily shut down. (And a bowling ball could do serious damage to the equipment.) Approximately 25 percent of all recycling picked up by Waste Management is contaminated to the point that it is sent to landfills, Mr. Bell said.

Recyclers have always disposed of some of their materials. But the percentage has climbed as China and other buyers of recyclable material have ratcheted up quality standards.

Most contamination, Mr. Bell said, happens when people try to recycle materials they shouldn't. Disposable coffee cups — which are usually lined with a thin film that makes them liquid-proof but challenging and expensive to reprocess — are an example. Unwashed plastics can also cause contamination.

"If we don't get it clean, we're not going to be able to market it, and if we can't market it unfortunately it's going to go to the landfill," said Mr. Penning, the Rogue spokesman. In March, Rogue told customers to put everything in the trash except for corrugated cardboard, milk jugs, newspapers and tin and aluminum cans, which the company is finding domestic markets for, Mr. Penning said.

Rogue customers who make mistakes might see an "Oops" sticker the next time they check their recycling bin, he said.

In Eugene, similar restrictions have been imposed by the waste company Sanipac. These have not sat well with some residents. "Eugene is a very green city and people love their recycling here," said Diane Peterson, a resident. "There are a lot of things like yogurt containers that we get all the time, and now we can't recycle them."

Leah Geocaris, another Eugene resident, said the change had prompted her to try to consume less overall. "On the one hand, I hate it, because I don't want stuff to end up in landfill," she said. "On the other hand, it's a wake-up call."

“Recycling is the third R,” she said. “You have to reduce and reuse first.”

Here’s how to recycle smarter

6 Things You’re Recycling Wrong

Can you recycle coffee cups or greasy pizza boxes? If you’re tossing things in the recycling bin out of sheer hope, you might be an “aspirational recycler.”

May 29, 2018

Livia Albeck-Ripka, a former James Reston reporting fellow at The Times, is a freelance journalist covering the environment. @livia_ar

A version of this article appears in print on May 31, 2018, on Page B1 of the New York edition with the headline: Your Recyclables Get Recycled, Right?