

***The Costs of Beverage Container
Redemption in Vermont***

Final Report

Prepared for:

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of Natural Resources
Solid Waste Program

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TABLE OF CONTENTS

I. Introduction	1
<i>Overview of Vermont's Container Redemption System.....</i>	1
<i>Cost Study Methodology and Limitations</i>	2
II. Handling Costs.....	3
<i>On-site Redemption Center Survey.....</i>	3
<i>On-site Survey Results.....</i>	4
<i>Large Retailers' Handling Costs</i>	5
<i>Factors Affecting Handling Costs</i>	6
III. Bottlers and Distributors Costs.....	8
IV. Total Redemption System Costs.....	10
<i>Additional Costs to the System.....</i>	10
<i>Changes in Container Handling to Reduce Costs: Commingling</i>	12
V. Conclusions	14
 Appendix A	 Redemption Center Survey Form

I. Introduction

The Vermont Agency of Natural Resources (Agency) was charged by the 2006 Vermont Legislature to conduct a study addressing various components of the beverage container deposit law, including a review of the handling fee system and its associated costs and revenues. During the 2006 session the Legislature increased the beverage handling fee from 3 to 3.5 cents, effective July 1, 2006.

The Agency contracted with DSM Environmental Services, Inc. (DSM) to assist with the collection of cost and revenue data from beverage container handlers and distributors. Specifically DSM was charged with reporting on:

- Costs associated with handling returned beverage containers in compliance with Vermont Bottle Bill Law (Title 10 Chapter 53 of Vermont Statutes Annotated) including the costs to small retailers, large retailers, redemption centers associated with a retail operation, and redemption centers not associated with a retail operation;¹
- Revenues associated with handling returned beverage containers;
- Costs to the beverage distributors to comply with the returned beverage container requirements under the law; and,
- Un-reclaimed bottle deposits or “escheats” retained by the beverage distributors and the scrap value of marketed recyclables.

This report details DSM’s findings.

Overview of Vermont’s Container Redemption System

The current system of beverage container redemption works in the following way, although not all containers are redeemed in this manner.

The deposit originates with the distributor (who may or may not be a bottler), who delivers carbonated beverages subject to the deposit to retailers throughout the state, including:

- Grocers and large retailers (e.g. Sam’s Clubs and Costco);
- Convenience stores;
- Restaurants, bars, and lodging establishment who serve drinks (known as “on-premise” sale and consumption); and,
- Licensed redemption centers.

The distributor charges the retailer a price for the product that includes the cost of the five-cent deposit for the container, and in some cases the handling fee as well.² In all exchanges but on-premise accounts, the retailer charges, collects, and accounts for carbonated beverage sales by including a separate 5-cent per container deposit as a cost to the customer. For on-premise

¹ At a project kick off meeting on November 27, 2006, it was determined that DSM should attempt to survey 4-5 small retailers, 4-5 redemption centers with retail operations, and 4-5 redemption only operations, and use available cost data from the retailers using RVMS to represent large retailers. DSM was also asked to exclude on-premise accounts from the study because they represent a small percentage of returned containers (less than 10%) and more importantly do not charge and return a deposit to their customers or operate in a similar way to a redemption center.

² According to the VT ANR, some (if not all) distributors charge retailers for the handling fee as well as the deposit.

accounts, the price of the beverage does not separately show a deposit since the container remains with the establishment after the product is consumed.

The retailer must return a 5-cent deposit to the consumer for each empty carbonated beverage container returned of any brand that the retailer sells. Redemption centers accept, and refund 5 cents, for all brands carrying the Vermont indicia. Redeemed containers must be sorted by and stored by brand, distributor and container type for pickup. The retailer or redemption center then arranges pickup of the empty sorted containers by the distributor or distributor's agent (third party) and is paid back both the deposit and a 3-cent handling fee per container (increased to 3.5 cents on July 1, 2006 for a total of 8 cents prior to July 1, 2006 and 8.5 cents after July 1, 2006) after the distributor or third party collector verifies the number of containers return.

Current accounting of returns is done by brand and by distributor, as is collection of empty containers. This adds to the cost of the redemption system because it requires additional counting and segregation of containers of the same material type (e.g., aluminum, PET) that would otherwise be mixed together. As a result, a retailer or redemption center may be serviced for collection of empties by as many as seven different agents. Some larger redeemers (retailers, redemption centers or on-premise accounts) may be serviced by a third party that spots a trailer at the location while some of the smaller retailers and redemption centers are serviced directly by the distributor at the time of product delivery. In some cases a large account may be serviced both by a trailer spotted at the location, and by a distributor at the time of product delivery.

In all cases, the empty containers are brought back to a processing facility for either baling (aluminum and PET), crushing or bulking (glass). Different distributors use different processing facilities based on geographic location. Some distributors process and market their own material. DSM has no data on the percent of material that goes through a third party processor but suspects that it is more than half of the total material as of the date of this report.

Cost Study Methodology and Limitations

DSM's approach to gathering objective cost data from all parties involved in the redemption process was as follows.

First, DSM obtained a copy of the list of registered redemption centers from the State of Vermont.

Second, DSM signed three-party confidentiality agreements with Northbridge Environmental and the distributors to access all the underlying survey cost data used in the Northbridge report, *Analysis of Vermont's Bottle Bill: Costs, Impacts and Expansion*.

Third, DSM signed three-party confidentiality agreements with Northbridge Environmental and seven of the largest food retailers in Vermont to access survey cost data prepared for Northbridge on the costs to retailers to redeem containers.

Fourth, DSM obtained confidential collection route lists and pickup quantities per location from TOMRA (the distributors collection agent for many brands) to determine where some of the largest redemption activity occurred.

Finally, DSM selected redemption centers for the cost survey to best represent redemption activity in Vermont and requested that they participate in the study. DSM then visited each of the selected redemption centers to collect data on the cost of operations.³

³ One redemption center was surveyed over the telephone since he was not available for an on-site survey. The data collected and compilation of cost per unit was mailed to him for verification and he was asked to contact DSM if any costs were found to be higher or lower than what he represented in the telephone survey.

II. Handling Costs

On-site Redemption Center Survey

In order to select representative redemption centers for the cost survey, DSM's first step was to attempt to characterize redemption activity in Vermont. The Agency of Natural Resources provided DSM with a list of 108 registered redemption centers. However DSM learned that only those redemption centers who want to receive pickup from the State Liquor Control Agency need to register. DSM learned from the distributors that there are nearly 2000 locations where empty beverage containers must be picked up from in Vermont. According to the distributors approximately 100 of these 2000 locations generate 80% of the materials redeemed. It was further reported that on-premise accounts (restaurants, bars, etc.) account for less than 10% of empties and large grocers, around 7%.

The list of registered redemption centers also did not contain any data on the number of containers redeemed, so DSM contacted TOMRA (who collects the majority of empties in Vermont) and Pepsi (who collects almost all of their own empties), and asked for data on quantities by location. With this data from TOMRA and Pepsi, DSM attempted to determine where the majority of bottle redemption activity was occurring and tried to estimate quantities by location, including determining whether licensed redemption centers were the largest redeemers or whether there were other locations not on the state redemption center list that should be surveyed.

DSM then tried to classify redemption locations by the categories of small retail, redemption associated with a retail operation, and those not associated with a retail operation, as requested in the original RFP. DSM found that making these classifications was challenging because there was not a single source of data on redemption quantities by location, or any description of the redemption center other than a business name.

Finally, DSM attempted to survey centers that geographically covered the state. Using the list of registered redemption centers, combined with TOMRA and Pepsi pickup lists, DSM targeted a mix of small retail, redemption only, and redemption centers associated with a retail operation throughout the state and surveyed a total of 21 redemption operations.

DSM first called the owner of the targeted center and asked for an appointment to go over costs onsite. In some cases, DSM mailed the survey form ahead of time. A copy is included as Appendix A.

DSM then traveled to the redemption center at the scheduled time and met with the owner or manager (in almost all cases it was the owner) to review the costs of redemption operations. Capital costs of the building and equipment, labor costs, and all other operating and maintenance costs, including the costs of redemption bags and boxes, were itemized and written on the survey form.

In many cases capital or operating costs had to be allocated between redemption and retail activities based on assumptions about their share of the cost.⁴ In the case of building costs, the square footage dedicated to redemption verses retail or other activity was measured or estimated. In the case of utilities, major contributors to retail electricity costs, such as refrigeration, were removed from total utility costs to more fairly allocate costs to retail and to

⁴ DSM did not depreciate buildings or equipment because we accounted for amortization or lease payment costs reported by the redemption center. In theory, you would amortize the next building/piece of equipment with borrowed money as well, and therefore depreciation would be viewed as double counting.

redemption. Similar assumptions were made for labor costs in cases where employees performed both retail and redemption functions.

Finally, DSM collected information on revenues from redemption asking each facility owner to accurately provide cost data on bottle throughput and resultant revenues received.⁵

All cost data were entered into a spreadsheet to calculate the total average monthly costs of redemption for each survey participant and the average cost per container handled. Costs were then compared across all categories to identify any discrepancies in reported costs and follow-up telephone calls made to verify cost discrepancies. In addition, the calculated results were mailed or e-mailed back to the survey participant with a request for the owner to contact DSM if any costs were found in error.

On-site Survey Results

DSM conducted 20 on-site surveys and 1 survey over the telephone. These can be broadly classified as:

- Six (6) surveys of operations that were redemption only or mainly redemption;
- Four (4) surveys of small retail operations that performed redemption on the side as required by law; and,
- Eleven (11) surveys of redemption operations associated with a retail operation.

The 21 centers ranged in volume from 9,000 to 875,000 containers (rounded) redeemed per month on average. Monthly revenues from handling fees ranged from \$300 to \$30,000 (rounded) per month. The completed cost survey data is attached in Appendix A. A summary of results is shown below in Table 1.

Total costs for the 21 centers ranged from a low of 1 cent to a high of 6.6 cents (rounded) per container. Of the total, labor costs ranged from a low of .4 cents to a high of 4.9 cents per container redeemed, and building costs ranged from a low of .1 cents to a high of 1.2 cents per container. These data are all shown in Appendix A.

As illustrated by Table 1, the **average cost** of the surveyed redemption centers to handle redeemed beverage containers was **3.4 cents per container**, excluding large retail stores using reverse vending machines (as discussed in detail below). However the **weighted average cost**, which totals all costs and divides by all containers redeemed, was 3 cents per container. The weighted average cost is less because the redemption centers with higher throughput tended to have lower costs, thereby lowering the average cost per container.

Note that while Table 1 shows “average” costs for each type of redemption activity, the average cost of all redemption centers is based on all 21 centers surveyed (not the average of the three center types). A weighted average cost is also calculated for all 21 centers surveyed to show the cost if you totaled all monthly costs and divided by all containers handled in an average month.

⁵ Cost/revenue data provided by surveyed redemption centers/retailers accounted for the change in the handling fee from 3 cents to 3.5 cents on July 1, 2006.

Table 1
Average Monthly Handling Costs for Surveyed Redemption Centers (CY 2006)

<i>Number of Surveys</i> Monthly Costs	Redemption Only 6	Redemption with Retail 11	Small Retail 4	Average Cost¹ (21 centers)	Weighted Average² (21 centers)
Building	\$1,129	\$1,840	\$349	\$1,353	\$28,405
Equipment	\$225	\$56	\$0	\$94	\$1,967
Labor	\$4,955	\$7,200	\$593	\$5,300	\$111,300
Other Operating and Maintenance	\$998	\$1,298	\$199	\$1,003	\$20,989
Total:	\$7,306	\$10,394	\$1,141	\$7,749	\$162,727
<i>Containers per month:</i>	220,558	356,623	36,307	256,734	5,391,422
Cost Per Container:	\$0.036	\$0.030	\$0.045	\$0.034	\$0.030

1) The "average cost" is calculated by taking the average monthly cost of beverage container handling (shown by major cost category) at each redemption center surveyed.

2) The "weighted average cost" is calculated by adding all surveyed centers monthly costs and dividing them by the total containers handled at all centers to get a weighted cost per container.

Large Retailers' Handling Costs

DSM was asked to use existing survey data from large retailers on redemption costs since a fairly comprehensive survey had been completed in 2005 – 2006 (using CY 2004 costs). After signing three-party confidentiality agreements with specific retailers and Northbridge Environmental, who was commissioned by the *Beverage Association of Vermont*, the *Vermont Wholesale Beverage Association* and the *Vermont Grocers Association* to perform that analysis, DSM was sent the raw data as well as the computations performed to analyze the costs of redemption by large retailers.

The Northbridge survey of large retailers' costs calculated the costs for large retailers to redeem beverage containers. Seven of Vermont's largest food retailers participated providing cost data for 55 Vermont stores. Six of the seven retailers used reverse vending machines (RVM) and 98% of the containers redeemed through these 55 stores went through RVMs. Costs were provided on use of the RVMs and manual redemption. Table 2 summarizes these reported costs.

**Table 2
Handling Costs to Large Retailers (CY 2004)**

	Range		Average	Total / Weighted Average
	High	Low		
Reverse Vending Machine Use				
Machines in place (typ. store)	4	1		
Containers / Store through RVMs	54,167	3,060	20,084	
Containers / Chain through RVMs	704,167	18,900	221,204	1,327,227
Typical Store Costs – RVMs				
RVM costs (lease, throughput and related)	\$1,012	\$217		
Labor	\$504	\$125		
Other costs (pest control, disposal, space, utilities, etc.)	\$1,318	\$30		
Total	\$2,158	\$407	\$1,168	\$71,416
Cost per container	\$0.134	\$0.032	\$0.081	\$0.054
Manual Redemption				
Containers / Store Manually	12,500	195	2,847	
Containers / Chain Manually	12,500	195	3,918	23,507
Typical Store Costs – Manual				
Space	\$240	\$4		
O&M	\$110	\$62		
Labor	\$680	\$17		
Total	\$1,030	\$21	\$328	\$3,612
Cost per container	\$0.886	\$0.062	\$0.338	\$0.154
Total Monthly Costs				
Total Cost Typical Store	\$2,268	\$428	\$1,235	\$75,028
Average monthly throughput	54,167	3,400	19,249	1,350,733
Cost per container	\$0.136	\$0.032	\$0.087	\$0.056

As shown in Table 2, the average retailer (as defined as a chain, not an individual store), had costs of 8.7 cents per container. The average cost to operate RVMs was slightly lower at 8.1 cents. Note that some chains had no manual redemption and some chains used no RVMs.

The weighted costs of both RVM use and total costs however are significantly lower, at 5.6 cents per container since the costs of some of the larger retailers, who redeem a large percentage of the containers, had much lower costs.

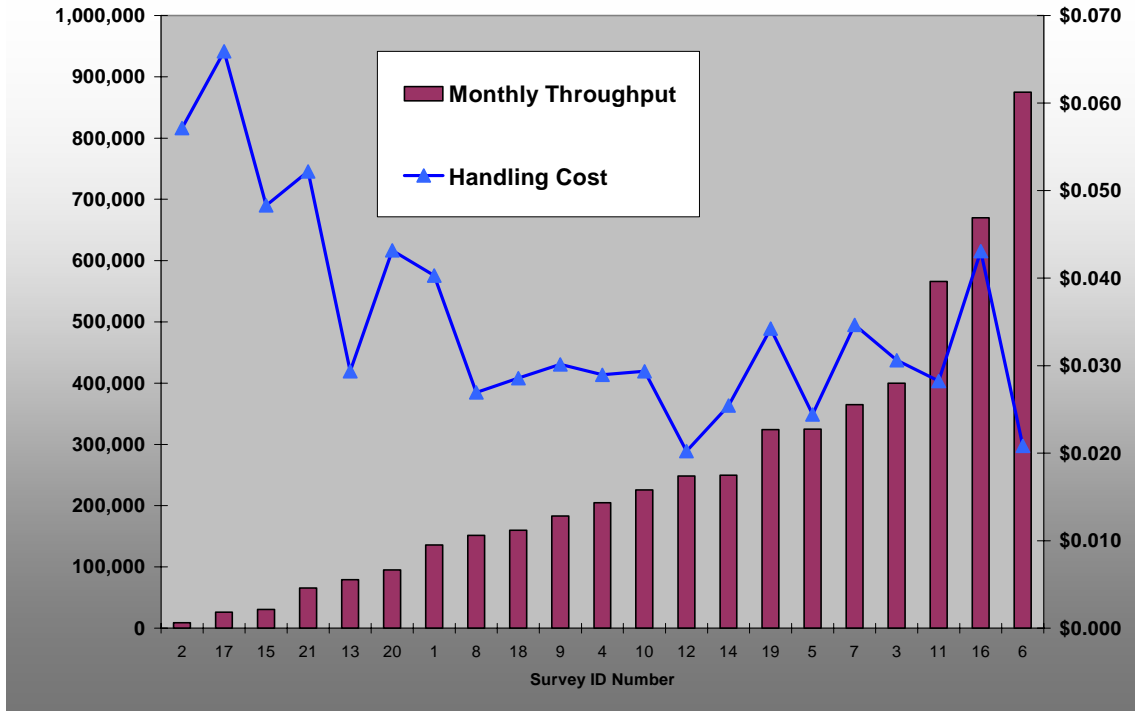
Factors Affecting Handling Costs

In both the case of redemption centers and retailers, throughput was the most important factor affecting costs, followed by labor costs (in the case of redemption centers who used manual sorting techniques) and the lease and throughput related charges of RVMs.⁶

⁶ Two of the redemption centers visited by DSM were using an RVM to process materials however it was used by employees, not by any customers.

The graph below shows the cost per container and the monthly throughput of the 21 surveyed redemption centers.

Figure 1
Monthly Throughput and Cost per Container of Surveyed Redemption Centers
 (CY 2006)



III. Bottlers' and Distributors' Costs

The second component of costs of redemption activity in Vermont is the cost to distributors and bottlers to collect the sorted empty containers and process them for market.

Northbridge Environmental surveyed all major distributors and bottlers in 2005 on their costs. These include the costs of:

- Collection of empty containers both directly (as part of a backhaul or a separate run) and through a third party such as TOMRA and NexCycle;
- Costs to process and market the aluminum, glass and PET bottles internally or through a third party; and,
- Costs of accounting and administration (customer service, dispatch, etc.).

These data were provided to DSM in raw and tabulated form to review. DSM then queried Northbridge on these data.

These data are summarized below in Table 3.

Table 3
Bottlers and Distributors Costs to Collect and Process Redeemed Containers
(Based on CY 2004 Data)

Collection, Processing and Administrative Costs	Number of Containers	\$ / Container	Total Cost
Third Party Collection	96,551,288	\$0.010	\$946,258
Company Collection	111,615,002	\$0.015	\$1,631,236
Estimated Collection Costs For Non Reporting Distributors/Bottlers	20,610,033	\$0.012	\$238,217
Administrative Costs Reported			\$113,141
Total	228,776,323		\$2,928,852

As shown in Table 3, the cost incurred by bottlers and distributors for collecting and processing the 229 million containers collected in 2004 was approximately **\$2.9 million dollars**.

Changes since 2004 include a shift to more third party collection. According to the data shown in Table 3, these will result in lower costs per container. However, since 2004, fuel prices have risen, and much of the larger customers were already on third party collection in 2004.

There are also revenues associated with the redemption process. **Revenues** fall in two areas: the scrap value of material collected and the unclaimed deposits that are retained by the distributors.

First, the **scrap value** was also part of Northbridge's survey on bottlers and distributors costs. Scrap values reported for CY 2004 are shown below and compared against what DSM estimated they would be for 2006, assuming the same distribution and quantities of aluminum, glass and PET were collected.

Table 4
Scrap Value Reported for 2004 and Estimated for 2006

Scrap Value	Tons	2004 (1)		2006 (2)	
		(\$/lb)	Total	(\$/lb)	Total
Aluminum	2000	\$ 0.581	\$2,322,000	\$ 0.700	\$2,800,000
Glass	14,300	\$ 0.005	\$131,000	\$ 0.002	\$57,000
PET	1200	\$ 0.128	\$306,000	\$ 0.150	\$360,000
Subtotal:	17,500		\$2,759,000		\$3,217,000

(1) Average cost per pound reported to Northbridge by surveyed distributors.

(2) Average cost per pound estimated by DSM for 2006.

Second, the **retained deposits** were estimated for 2004 based on the number of containers sold and returned as reported by the distributors. Table 5 shows this figure for 2004. Both Table 5 and Table 6 show a return rate of 84% of containers sold.^{7 8}

Table 5
Revenues from Unclaimed Deposits (CY 2004)

	Number of Containers	\$/ Container	Total
Sales	270,468,691		
Returns	228,776,323		
<i>Unclaimed Deposits</i>	<i>41,692,368</i>	<i>\$0.05</i>	<i>\$2,084,618.42</i>

⁷ Neighboring states of Massachusetts and New York report return rates around 70%.

⁸ The handling fee, now 3.5 cents, is built into the beverage price and is a cost of the redemption system in Vermont in addition to the deposit charged.

IV. Total Redemption System Costs

Total costs for Vermont's redemption system are calculated based on the data presented above and on the handling fee. Note that this is part of a system cost that gets passed on to consumers as part of the price of the product.

These costs are first shown for CY 2004, the year that complete data on distributors and bottlers cost are available and that accurate data on containers sold and returned are available for this analysis. Note that 2004 costs are based on a handling fee of 3 cents per container. The costs for CY 2006 and CY 2007 are estimated using a handling fee of 3.5 cents for 6 months of CY 2006 and all of CY 2007. In addition, the scrap values for 2006 and 2007 are estimated to be higher in these years than 2004 and reflected in the table below. However cost data in 2004, 2006 and 2007 are all based on the beverage sales and return data reported for 2004.

Table 6
Total Estimated Costs of Redemption in Vermont
(CY 2004, 2006 and 2007)

	2004	Estimated for	Estimated for
	(\$)	2006	2007
	(\$)	(\$)	(\$)
Costs			
Handling Fee	\$6,863,290	\$7,435,000	\$8,007,171
Collection, Processing and Accounting	\$2,928,852	\$2,929,000	\$2,929,000
<i>Subtotal:</i>	\$9,792,142	\$10,364,000	\$10,936,171
Revenues			
Scrap Value	-\$2,759,000	-\$3,217,000	-\$3,217,000
Retained Deposits	-\$2,084,618	-\$2,085,000	-\$2,085,000
<i>Subtotal:</i>	-\$4,843,618	-\$5,302,000	-\$5,302,000
Net Cost	\$4,948,524	\$5,062,000	\$5,634,171
Cost Per Container Sold	\$0.018	\$0.019	\$0.021
Cost Per Ton (1)	\$283	\$289	\$322

(1) Based on 17,500 tons of material redeemed.

Additional Costs to the System

There are two types of costs excluded in Table 6 – both important to the total cost of the system.

First, the additional costs **borne by retailers** and other redeemers that is above the handling fee reimbursement. For example the average cost to large retailers, as shown in Table 2, was 8.7 cents per container with a weighted average costs of 5.6 cents per container. If the difference between the *weighted average cost* and the handling fee (or 5.6 minus 3.5 cents) were applied to the total number of containers redeemed by large retailers (reported to DSM to be an estimated 7 percent of total returns, or roughly 16.2 million containers), then the additional cost to large retailers would be roughly \$500,000 per year.⁹

⁹ It could be argued that the retailers have increased traffic at their stores because of the RVMS and therefore increased sales, or that redemption can interfere with sales, where cashier labor must be diverted to the RVM because of a problem. These costs or benefits have not been factored into DSM's analysis.

Second, and more importantly, there is a **cost to consumers** to deliver containers to the point of redemption. This cost, although unknown, could be significant and warrants consideration when looking at changes in policy.

For example, based on information reported to DSM by distributors and bottlers, 17% of redeemed containers are returned either on-premise (about 10%) or through large retailers (about 7%), with the balance, or 83%, returned through redemption centers (both associated with retail and not) and small retailers. Based on studies done by DSM in the past on special trips to recycle or to return empty beverage containers, it could be expected that a high percent of consumers drove some distance out of their way to return redeemable beverage containers.¹⁰

Assuming that consumers never drove out of their way to return containers to large retailers (since they were grocery shopping anyway) but drove on average 8 miles out of their way (roundtrip) to return all other containers (83% or 189,900,000 containers) and that on average, they returned 200 containers at a time, then they made 949,500 special trips of 8 miles or drove a total of 7,596 million miles to return containers in Vermont. This calculation is shown below:

Table 7
Estimating Miles Driven Per Year by Consumers to Redeem Containers

	Returned Per				
Consumer	Containers	Trip	Trips/year	Miles/trip	Miles/year
Travel	189,900,000	200	949,500	8	7,596,000

Using the IRS rate of 48.5 cents reimbursement per mile driven, the added cost to drive these 7.596 million miles each year would be **\$3.67 million dollars** (rounded).

Recalculating the cost per ton to manage this material including the self-transport costs increases the cost per ton by \$210 to an estimated \$493 per ton (CY 2004) or \$592 (CY 2007).

This still ignores the costs related to greenhouse gas emissions (GHG) associated with vehicle exhaust/emissions. The carbon dioxide emissions from burning a gallon of gasoline are approximately 19.4 pounds.¹¹ Assuming the EPA estimated average fuel economy in 2006 of 21 miles per gallon, roughly 3500 tons of carbon would be emitted from driving beverage containers to redemption centers. This is the equivalent of adding over 500 vehicles on Vermont's roads at an average of 15,000 miles per year per vehicle.¹²

¹⁰ DSM did not conduct surveys of consumer behavior as part of this study. However, DSM did conduct 166 surveys of redemption center users in Massachusetts in 1998. Sixty-eight percent of these users drove an average of 4 miles round trip out of their way to redeem their containers. DSM conducted drop-off recycling surveys in Cornwall and Orwell, Vermont in 1994, where 65 and 85 percent of the drop-off recyclers, respectively, made a special trip to recycle, driving 7 miles for each pound of recyclables delivered. DSM conducted 436 surveys of drop-off recycling behavior in East Central Iowa (Cedar Rapids/Iowa City area) where the average user drove 5.9 miles out of their way to drop-off recyclables, and DSM conducted surveys of 85 drop-off recycling users in Delaware where the average user drove 55 miles out of their way over the course of a year to recycle, even though most drop-offs were located at retail mall locations, or near downtown areas. For this reason we believe that an assumption of 8 miles round trip for those returning on average 200 containers at a time to places other than grocery stores in a rural state like Vermont is a reasonable assumption.

¹¹ Source: EPA/International Panel on Climate Change guidelines for calculating emissions.

¹² Average annual miles per vehicle nationally is 12,500, however, Vermonters are likely to drive more miles per year because of longer commutes.

Table 8
Estimating Fuel Consumption and Carbon Dioxide Emissions from Consumers Returning Beverage Containers for Redemption

Fuel Consumption			Emissions		
Miles	Mpg	gallons	lbs/gal	Total lbs	Total Tons
7,596,000	21	361,714	19.36	7,002,789	3,501

It could be argued that estimation of the cost to consumers of special trips to redeem containers is beyond the purview of this analysis. However, if one were to use the comparison of average versus weighted average costs to argue for reducing handling costs by consolidating redemption activity to the largest, and most efficient redemption centers, the result is highly likely to increase consumer trips, thus transferring costs from redeemers to consumers, as opposed to lowering overall system costs. In addition this change would likely increase CO₂ emissions.

While DSM understands that consolidation of redemptions centers is currently not under consideration, if the handling fee is left at 3.5 cents then the higher cost redemption centers will eventually go out of business leaving the larger, higher volume centers where average costs are less than 3.5 cents.

Changes in Container Handling to Reduce Costs: Commingling

DSM was also asked to provide a limited opinion as to whether a proposed commingling agreement would reduce costs, and if so, how much and to whom these savings would fall based on our visits to the redemption centers.

Currently containers must be sorted into at least 44 brands and sizes. The actual number of sorts is much greater as unusual brands and sizes come into most redemption centers and can account for more than 100 needed sorts according to one redemption center owner. Therefore the redemption center must provide space for between 44 and 100+ different brands and container sizes. And, the number is growing as new carbonated beverages and microbrews enter the Vermont marketplace.

A commingling agreement, depending on how it is structured, could reduce the number of sorts down to as few as 5 assuming:

- All PET bottles could be commingled;
- All aluminum cans could be commingled; and,
- All glass could be separated by color: green, amber and clear.

If five sorts were possible, redemption centers would experience some reduction in labor costs and free up some space at the redemption center. Assuming labor savings were 15% from commingling, the average redemption center could save roughly \$800 per month or .3 cents per container based on DSM's survey data.¹³ Multiplying these average estimated savings of .3 cents per container over all 228.6 million containers handled would equal roughly \$700,000 in handling savings. This savings however would depend entirely on the nature of the commingling agreement and the bags or containers (e.g. gaylords vs. boxes) used by redemption centers to consolidate different materials (e.g. glass, all and PET bottles).

¹³ The average labor costs at the 21 redemption centers surveyed was \$5300 per month (rounded), therefore a 15% reduction represents \$800 (rounded). Reflecting these in per container costs, labor represents an average of \$ 2.3 cents per container handled and 15% reduction would be .33 cents (rounded).

In addition, assuming distributors and bottlers could now all use one collection agent for a region, collection costs would likely be reduced slightly. Using the third party costs as a target but recognizing that smaller redemption entities, and particularly those in rural areas will not see costs as low as current third party costs, the reduction in collection costs might be 20%, or roughly \$600,000.¹⁴ However this might be accompanied by some increase in administration and accounting costs, since processors might now audit (or spot count) a larger percentage of sample bags.

In conclusion, DSM believes the commingling agreement could save some money on both sides, but that the costs savings would be minimal since the necessary function of counting containers and visually inspecting them for the Vermont 5 cents indicia must still be performed.

As far as administering such a system, it would be necessary for all distributors and bottlers to pay into the system based on sales, not returns, and therefore a system of apportioning the scrap value and retained deposits must be developed. This too could be done based on sales but would necessarily require accounting for sales by material type, aluminum, glass and plastic so that scrap value would be fairly apportioned. A third party would need to be retained to manage the accounting system, return the deposit and handling fees to the redemption centers and apportion the scrap value and retained deposits. This would increase the costs slightly if a new entity were developed to manage the system.

¹⁴ This estimate is simply 20% of 2007 estimated collection, processing and accounting costs (rounded) as it assumes that by privatizing the entire system to one or two parties, both collection and processing efficiencies might be maximized. However without more data on the collection and processing system in place, it is impossible to make accurate estimates on system efficiencies.

V. Conclusions

DSM's survey of 21 Vermont redemption centers' handling costs found the average center's cost to handle empties was 3.4 cents per container. The average large retailers' cost was higher at 8.7 cents per container, due to the cost of operating reverse vending machines without a high monthly throughput.

However it must be recognized that a total cost allocation methodology was employed to calculate redemption costs – in other words, all costs of operating the business were allocated to redemption based on the assumed contribution of redemption activity to the costs. This can be subjective and is different from marginal cost accounting where only the additional cost to perform redemption activity is accounted for and some fixed costs – such as taxes or lease or mortgage payments - might be ignored as sunk costs that would be incurred whether or not the redemption occurred.

Many redemption operations were started based on the marginal cost, with the hope that idle labor and a semi-empty back room can be put to use. However, over time labor costs have steadily risen, and this has factored heavily into redemption costs, as evidenced by DSM's survey where labor represents nearly 70% of the cost of redemption.

Mechanized equipment, such as RVMs or crushers or shredders, does not appear to be the key to addressing the high costs of labor. As shown in the retailer survey, the cost to redeem beverage containers through RVMs was much higher, at over 8 cents per container, due mainly to the much lower throughput at the large retailers. (DSM found one redemption center using a RVM to redeem containers but an employee operated it, not customers.)

A handling fee increase was passed in 2006 by the Vermont Legislature from 3 to 3.5 cents per container in Vermont. DSM's survey of 21 Vermont redemption centers' found the average handling costs to be 3.4 cents per container in 2006.

Total handling fees paid out in 2004 were roughly \$6.9 million, however 2006 handling fees are unknown, since there is no annual reporting on returns by redemption centers or distributors. A requirement to report on containers returned by redemption location for registered redemption centers is necessary to better understand the return system in Vermont. And reporting on returns by distributors/bottlers would help to track whether return rates are increasing or decreasing in Vermont year to year and help to target the reasons why.

The other costs of the redemption system include beverage container collection from the point of redemption, materials processing and marketing, and accounting for the deposit and handling fee. These totaled roughly \$2.9 million dollars in 2004.

Revenues to help cover the costs of redemption come from retained deposits, estimated at \$2.1 million (rounded) in CY 2004, and the material scrap value, estimated at \$2.7 million (rounded) in CY 2004. Since material prices are higher now than they were in 2004, scrap values might have totaled \$3.2 million in 2006.

The total net cost of the redemption system in CY 2004 - the sum of (handling fees + collection and processing) minus revenues (scrap value and retained deposits) is estimated at \$4.9 million and will likely rise to \$5.6 million in CY 2007 due to the increase in the handling fee. Including the cost to the consumers to return the containers to the redemption center increases the total cost significantly – adding an estimated \$3.7 million dollars -- since Vermont consumers might drive over 7 million extra miles per year to return empty containers. This cost is important to consider since one of the potential scenarios to streamline redemption might be to operate only the larger, more efficient centers typically located in the more populated regions of the state. If this occurred, some consumers might be driving even further to return containers to collect the deposits.

Converting total costs to a cost per ton is helpful to compare the redemption system costs to the costs of recycling, the other avenue for this material. Excluding consumer travel costs, the cost per ton in CY 2004 was estimated at \$282 and for CY 2007 estimated to be \$322. Including the consumers' travel increases this cost per ton to \$592 in CY 2007.¹⁵

This compares with the cost of drop-off and curbside recycling in Vermont, which is available to most Vermonters. Per ton costs for curbside and drop-off recycling in Vermont vary greatly, but might average around \$200 per ton. And while drop-off recycling can incur these same extra vehicle miles, many Vermonters also drop off their garbage at the same time.

Finally, it should be recognized that Vermont's bottle bill, like many other states, was passed primarily as a litter control bill, not a recycling bill. However, that was nearly 30 years ago and recent litter studies indicate that beverage containers are a small part of the litter problem. A study done by Gershman, Brickner and Bratton (Published in *Resource Recycling*, May 2007) found the percentage of beer and soft drink containers in litter to range from a high of 9.8 percent to a low of 2.1 percent and to average 6.4 percent. For other beverage containers, the range was from a high of 4.1 percent in New Jersey to a low of .5 percent in California. When all packaging related to beverage containers were included, including cartons, carriers and bottle caps, it totaled 15.5 percent of visible litter in New Jersey.

¹⁵ Note that tonnage data is only available for CY 2004 and estimated at 17,500 tons, of which 200 was aluminum and 1200 was PET. These same tonnage figures were used to make the calculations for 2006 and 2007.

APPENDIX A
REDEMPTION CENTER SURVEY FORM

Redemption Center Cost Study

(One Form Per Location)

CONFIDENTIAL INFORMATION

Redemption Center Name

Address

City/State/Zip

Contact Name

Telephone

E-mail Address

Date

STATEMENT OF NON DISCLOSURE

DSM Environmental Services, Inc. (DSM) of Ascutney, Vermont will hold confidential all information and cost data provided to us as part of the Vermont Agency of Natural Resources commissioned study, Review of the Handling Fee System and the Associated Costs and Revenues. The study purpose is to develop professional estimates of the costs of Vermont's Redemption System and explicitly the costs of operating redemption centers in Vermont. Cost data provided to DSM will be held confidential and reported out only by generic location (suburban/urban or rural). Costs provided will be aggregated with all other center costs in order to develop average costs for different types of redemption centers (retail, redemption only, etc.) DSM agrees not to release, divulge or report any individual's data points or information reported by you to any party, including the Vermont Agency of Natural Resources. DSM will report cost data by generic location in order to illustrate the full costs of redemption and legitimize the study results.

Redemption Center Identification #	to be filled in by DSM
Location	<i>Urban /Suburban or Rural</i>
# of containers handled/month	
% beer containers	
% of redeemed containers that you deliver to distributors/recyclers	

REDEMPTION CENTER COSTS

Building Costs	
Building size (square feet)	
Area devoted to container handling	_____ %
<i>Area devoted to sorting</i>	_____ %
<i>Area devoted to storage</i>	_____ %
<i>Area devoted to product sales</i>	_____ %
Lease or own?	
Lease or mortgage payment (per month)	
Electricity cost (per month)	
Heating costs/month	
Water and sewer costs/month	
Property taxes (annual)	
Personal property or other taxes (annual)	
Other building related costs (annual costs - please list)	
<i>Alarm systems</i>	
<i>Repairs</i>	

MONTHLY HANDLING COSTS AT CENTERS - page 2

Equipment Costs	Total Cost / Years Amortized
Moving equipment	
<i>Forklift (6-8 years)</i>	
<i>Truck</i>	
<i>Pallet Jack(s) - Electric (5 - 8 yrs)</i>	
<i>Pallet Jack(s) - Hand (5 - 8 yrs)</i>	
<i>Storage trailer, other (list)</i>	
Stationary Equipment	
<i>Office equipment (3-5 yrs)</i>	
<i>Computer</i>	
Labor Costs (Monthly, unless otherwise noted)	
Administrative	
Labor	
Overhead	
<i>Worker's Compensation</i>	
<i>Social Security/Medicare</i>	
<i>State taxes</i>	
<i>Benefits (health, dental, IRA, other)</i>	
Other Operating and Maintenance Costs	
Equipment O&M	
<i>Fuel costs (monthly)</i>	
<i>Maintenance (monthly)</i>	
<i>Vehicle Insurance (if applicable)(annual)</i>	
<i>Telephone and internet costs per month</i>	
Bags, Cartons and Containers (Monthly)	
<i>Plastic bags</i>	
<i>Mother cartons from distributors, other cartons</i>	
<i>Tape, markers, rope</i>	
<i>Shrink wrap</i>	
<i>Pallets, gaylords, other</i>	
Other Supplies (Monthly)	
<i>Office supplies</i>	
<i>Employee Personnel Protection (gloves, eye/ear protection, uniforms, cleaning supplies)</i>	
Professional/Outsourced Services (Annual unless otherwise noted)	
<i>Pest Extermination</i>	
<i>Waste Disposal</i>	
<i>Accounting Costs</i>	
<i>Payroll costs</i>	
<i>Liability/Fire Insurance</i>	
<i>Income Taxes (State and Federal Corp Taxes)</i>	
Other Annual Costs (List)	