Report on

PACKAGING DISCARDS

July 1996

MINNESOTA OFFICE OF
Environmental Assistance

Report on Packaging Discards – 1996

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Cost of report

The total cost of preparing the Report on Packaging Discards was just under $71,000. State agency costs, including staff time and production, totaled just over $15,000. The 1994 costs for the packaging composition sort contract were $55,300.

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Executive Summary

Legislative requirements

In 1992, the Minnesota Legislature enacted a goal calling for a 25-percent reduction in packaging delivered to mixed municipal solid waste management facilities from 1992 to December 31, 1995 [Minn. Stat. §115A.5501]. Because it was a disposal abatement goal, the goal could be achieved through any or all methods of reduction, reuse and recycling.

This is the fourth and final report on the packaging reduction goal. The *Report on Packaging Discards — 1996* analyzes the data from the packaging composition sorts, assesses the progress towards the "25 by 95" goal and discusses policy options to reduce packaging discards.

Packaging composition sort information

The Minnesota Pollution Control Agency (MPCA) conducted the solid waste composition sorts for the 1992 base year. The Office of Environmental Assistance (OEA) contracted with R.W. Beck and Associates, a solid waste consulting firm, to conduct the packaging composition studies for 1993, 1994 and 1995.

The 1993 and 1994 sorts were conducted only at the Brooklyn Park Transfer Station (BPTS) because the BPTS was thought to be representative of the waste received at solid waste facilities in the Metropolitan Area.

The 1995 packaging composition sorts were expanded to cover a wider geographic area in order to better assess statewide packaging discard trends. In addition to the BPTS, the 1995 sorts were conducted at the Newport Resource Recovery Facility and the Pine Bend Landfill in the Metropolitan Area. Greater Minnesota sorts were conducted at the Carlton County Transfer Station, the Lyon County Regional Landfill and the Olmsted County Waste-to-Energy Plant.

Comparison to 1992 baseline

The "25 by 95" packaging reduction goal was established as a disposal abatement goal calling for a 25-percent per-capita reduction in packaging discards by December 31, 1995. To measure the per-capita rate for packaging discards, the OEA first applied total MSW discard data to Minnesota population figures to arrive at a per-capita discard rate. Next, the packaging percentages from the packaging discard sorts were applied to the overall discard rate to determine the per-capita packaging discard rate.

The data indicates that the "25 by 95" packaging discard reduction goal has not been met. When the waste composition data is expressed as a per-capita discard rate, packaging discards declined from 1.04 pounds per day in 1992 to 0.99 pounds per day, 4.3 percent decrease.

1995 packaging composition results

In 1995, R.W. Beck conducted two seasonal sorts at the six locations listed above. R.W. Beck sampled three different types of waste loads at the sorting locations — commercial, residential and mixed. The OEA estimates that in Minnesota, 55 percent to 60 percent of municipal solid waste is from commercial sources while between 40 percent and 45 percent is from residential sources.

The statewide packaging discard percentage for 1995 was 32.1 percent of waste delivered to the sorting locations. The 90-percent confidence interval for the statewide percentage was 4.5 percentage points around the mean of 32.1 percent.

Commercial waste

- The mean (average) packaging portion of commercial waste from the 1995 sorts was 38.1 percent, compared to 36.2 percent in 1994, 33.9 percent in 1993 and 34.1 percent in 1992.
- The 90-percent confidence interval for commercial waste was 9.9 percentage points around the mean of 38.1 percent, or 33.3 percent to 43.2 percent.

Residential waste

- The mean packaging portion of residential waste from the 1995 sorts was 25.8 percent, compared to 22.0 percent in 1994, 20.7 percent in 1993 and 25.7 percent in 1992.
- The 90-percent confidence interval for residential packaging waste was 3.4 percentage points around the mean of 25.8 percent, or 24.1 percent to 27.5 percent.

Composition of commercial packaging waste discards, 1992 to 1995

- The discard percentages for the commercial generator type were similar from 1992 to 1995.
- The percentages for paper were higher for 1993, 1994 and 1995 than for 1992.
- The percentages for plastic were lower for 1993, 1994 and 1995 than for 1992.
- The 90-percent confidence interval narrowed for the 1995 sorts to 9.9 percentage points around the mean, compared to 18.9 percentage points around the mean for the 1994 and 1993 sorts.

Composition of residential packaging waste discards, 1992 to 1995

- The percentage of packaging discards for the residential generator type was almost identical when comparing 1992 and 1995 data. However, the percentage increased from 20.7 percent in 1993 to 25.8 percent in 1995.
- The total paper, total plastic and total glass categories increased annually from 1993 to 1995.
- The 90-percent interval narrowed each year, moving from 13.4 percentage points around the mean in 1993 to 3.4 percentage points around the mean in 1995.

Discussion of data

Because the 1992 baseline data was derived from solid waste composition studies not specifically designed to measure the amount of packaging in municipal solid waste, concerns have been raised about the reliability of the baseline data. The 1995 sorts were conducted statewide with a specific packaging focus and provide a more accurate assessment of statewide generation of packaging discards.

The OEA believes the packaging sort information is reliable and indicates that the "25 by 95" goal has not been met. The data, while not providing absolute quantification of trends in packaging discards, is reliable because of the consistent results over the goal time period. In addition, the margin of error has narrowed, making the data more reliable. The data also allows an important assessment of which material categories deserve particular attention.

The data, when analyzed for opportunities to pursue significant reductions in packaging discards, favors transport packaging over other packaging types. Transport packaging constitutes approximately one-fifth of the total MSW in Minnesota.

Transport packaging

The OEA believes that significant opportunity exists to decrease packaging discards within the transport packaging material categories. For the purposes of this report, the OEA characterizes transport packaging as old corrugated containers, plastic film and wooden pallets and crates. As part of the *Report on Packaging Discards — 1996*, the OEA focused on transport packaging and the opportunity to pursue reductions. The sort data indicates:

- Transport packaging as a percentage of MSW discards increased from 20.4 percent in 1992 to 22.4 percent in 1995.
- The percentage for old corrugated container discards increased from 7.4 percent in 1992 to 10.6 percent in 1995.
- The discard percentage for wooden pallets and crates remained about the same in 1992, 1993 and 1995, with a significant increase reported for 1994.
- The plastic film discard percentage actually decreased from 4.1 percent in 1992 to 3.6 percent in 1995, but the quantity of discarded plastic film increased annually from 1992 to 1995.

Several barriers to recycling and reuse of transport packaging were identified, including cost of recycling services, lack of storage space and lack of training for employees.

Recommendations and initiatives to reduce packaging discards

In 1994, state law was amended to require the OEA to develop recommendations for the reduction of packaging discards in the waste stream. The OEA is required to make recommendations regardless of whether the "25 by 95" packaging discard reduction goal was met. The OEA considered several factors in selecting these recommendations including market prices for packaging materials, technical barriers to increasing recovery, and resources available for program implementation.

1. Minnesota will implement a program to reduce packaging discards with a particular emphasis on transport packaging.

Early in 1996, the OEA's newly formed Business Environmental Resource Center (BERC) conducted targeting efforts for business assistance. As part of the targeting effort, OEA identified transport packaging as a focus for outreach. Based on information gathered during the targeting effort, the OEA will identify sectors that contribute significantly to disposal of transport packaging.

The OEA's efforts to reduce transport packaging discards will include education, technical assistance and financial assistance. The OEA is currently implementing a number of actions to reduce packaging generation and discards Specifically, the OEA will:

- Survey and visit companies in the targeted business sectors. This will provide the OEA

with baseline data as well as determine what types of assistance should be developed.

The OEA may supplement this effort with focus groups to assist in program design and implementation. The focus groups will help develop a target for diversion of transport packaging discards as well as providing input as to which sectors should be targeted.

- Target financial assistance to encourage reuse and recovery of transport packaging.
- Direct outreach and assistance towards generators of transport packaging.
- Prepare and distribute information materials, such as a training video and a how-to guide, to generators of transpor t packaging to promote source reduction, reuse and recycling.
- Continue to recognize superior efforts to reduce packaging discards through the Governor's Awards for Pollution Prevention.

2. Implement a Design-for-the-Environment (DFE) Advisory Council.

The advisory council would address design considerations for packaging along with electronics and other products containing hazardous materials. The DFE Advisory Council would include designers, manu-facturers and other technical experts interes-ted in pursuing green design concepts.

OEA's DFE program will develop DFE promotion materials, education forums and design guidelines along with case studies of environmentally designed packaging. The advisory council might also make recom-mendations for specific design changes to increase the recyclability or decrease the toxicity of a product. Finally, the DFE council could also advise the OEA on finan-cial assistance opportunities for manufac-turers interested in green design projects.

3. The OEA will encourage businesses to implement education and technical assistance programs with a specific emphasis on transport packaging.

Business should develop efforts to reduce transport packaging discards. Efforts such as WasteWise, a technical assistance and educational organization targeting the business community, should be expanded and targeted to reducing packaging discards. The business community, in conjunction with the OEA, will be encouraged to develop a technical assistance and outreach program to encourage use of reusable and recyclable packaging. WasteWise has the opportunity to build partnerships with business associations such as the Minnesota Grocers Association to promote waste reduction activities and develop implementation strategies tailored for specific business sectors.

4. The Legislature should amend the state packaging hierarchy to adopt packaging principles advanced by the Council of Northeastern Governors (CONEG) Preferred Packaging Guidelines.

The CONEG Preferred Packaging Guidelines encourage source reduction of packaging that is not explicitly considered in the packaging hierarchy for Minnesota. Minnesota's packaging hierarchy is princi-pally designed to reduce toxicity of pack-aging. However, source reduction efforts, which are important to reduction of packaging discards, need to be recognized.

5. Implement government purchasing program to procure packaging which conforms to the packaging hierarchy.

Due to the volume of goods purchased by government entities in Minnesota, govern-ment purchasing can have a significant impact on reducing waste, increasing recycling and supporting environmentally preferable products. The OEA will work with the Department of Administration to adopt purchasing guidelines that more explicitly support the procurement of source-reduced,

reusable and recyclable packaging. State government purchasing could greatly reduce transport packaging discards with preferences for reusable totes and bins, leased pallet programs and more durable pallets. Procurement guidelines would also promote source-reduced packaging.

Policy options to reduce toxicity in packaging

As part of the *Report on Packaging Discards — 1996*, the OEA examined several policy options to reduce the toxicity of packaging. The MPCA, with support from the OEA, recommends that the state initiate a program to test for compliance with the existing toxics-in-packaging legislation, which regulates the levels of certain heavy metals in packaging materials. The MPCA estimates a testing program could be implemented at a cost of $50,000 to $100,000.

Report on Packaging Discards — 1996

Introduction

In 1992, the Minnesota Legislature enacted a goal calling for a 25-percent reduction in packaging discards delivered to mixed municipal solid waste management (MSW) facilities from 1992 to December 31, 1995. The goal was intended to reduce the disposal of packaging discards, enabling it to be met through any combination of reduction, reuse, and/or recycling.

The statute does not specify any consequences if the goal is not met, but does require that the Office of Environmental Assistance (OEA) submit recommendations to reduce the amount of packaging discards regardless of whether or not the packaging reduction goal is met. For the purposes of promoting 25-percent packaging reduction goal to businesses and the public, the OEA labeled the initiative the "25 by 95" goal.

> *It is the goal of the state that there be a minimum 25 percent statewide per capita reduction in the amount of discarded packaging delivered to facilities by December 31, 1995, based on a reasonable estimate of the amount of packaging that was delivered to solid waste composting, incineration and disposal facilities in the calendar year 1992.[Minn. Stat. § 115.5501, subd.1]*
>
> *To measure the overall percentage of packaging in the statewide solid waste stream, the Director of the OEA in consultation with the Commissioner of the Minnesota Pollution Control Agency (MPCA), shall conduct annual solid waste composition studies in the nonmetropolitan and metropolitan areas or shall develop an alternative method that is as statistically reliable as a waste composition study to measure the percentage of packaging in the waste stream. [Minn. Stat. § 115.5501, subd. 2]*
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> *By July 1, 1996, the Director of the OEA shall submit to the Legislative Commission on Waste Management (LCWM) an analysis of the extent to which the waste reduction goal in Minnesota Statute § 115A.5501 has been met. In determining whether the goal has been met, the margin of error must be applied in favor of meeting the goal.*

This is the fourth and final report on the packaging reduction goal. *The Report on Packaging Discards — 1996* analyzes the data from the waste composition sorts, assesses progress towards the "25 by 95" packaging reduction goal, and discusses policy options to reduce packaging discards. With the dissolution of the LCWM on June 30, 1996, the OEA will submit the report to the appropriate policy committees of the Legislature.

While the Legislature did not specifically require toxicity in packaging to be addressed within the context of the reduction goal, the OEA did analyze toxicity as it relates to the amount and type of packaging discards. The OEA also considered toxicity in the development of policy options and final recommendations.

In preparing the *Report on Packaging Discards — 1996*, the OEA convened a Packaging Advisory Work Group in the spring of 1996 composed of representatives from business, state and local government, and the environmental community. The work group provided policy and technical assistance to OEA during analysis of data and the development of recommendations. However, members of the Packaging Advisory Work Group do not necessarily endorse any conclusions or recommen-dations contained in this report.

The statute originally assigned measurement and analytical duties to the MPCA and the Metropolitan Council. The Minnesota Office of Waste Management (OWM) was assigned compilation and reporting duties. As of 1994, all of the duties were transferred to the OEA, formerly the OWM.

Packaging composition sort information

The MPCA and the Metropolitan Council conducted mixed municipal solid waste composition sorts throughout the state from 1990 to 1992. The MSW composition sorts, although not designed to measure packaging specifically, were used to estimate the amount of packaging in MSW and to develop a 1992 packaging discard baseline for measuring progress toward the goal.

The 1992 baseline showed that packaging discards were approximately 35 percent of total waste in the mixed municipal solid waste stream. This is equal to approximately 380 pounds per person per year.

The MPCA did not conduct any waste composition studies in 1993 or 1994. However, the Metropolitan Council hired R.W. Beck and Associates, a solid waste consulting firm, to conduct packaging composition sorts at the Brooklyn Park Transfer Station (BPTS) in Hennepin County in1993 and 1994. The BPTS was one of the original MSW sort locations and was selected because the waste received there is considered to be representative of waste received at solid waste facilities throughout the Metropolitan Area.

Changes for the 1995 packaging sorts

Because the 1992 waste composition sort was not specifically conducted to measure packaging discards and because the 1993 and 1994 sorts were limited to the Metropolitan Area, the OEA revised the 1995 waste composition sorts to provide a more accurate picture of packaging discards generated throughout the state.

The 1995 sort locations were expanded to cover a wider geographic area providing more accurate data for a statewide assessment of packaging discards. Instead of sorts conducted only at the BPTS, Metropolitan Area sorts were also conducted at the Newport Resource Recovery Facility and the Pine Bend Landfill. In Greater Minnesota, sorts were conducted at the Carlton County Transfer Station, the Lyon County Regional Landfill and the Olmsted County Waste-to-Energy Plant.

While the 1993 and 1994 sorts were conducted at the BPTS during the spring, summer, fall and winter seasons, the 1995 sorts were conducted only during the spring and fall. The OEA sought more representative statewide packaging discard data rather than seasonal data for analyzing the progress towards the packaging reduction goal. The OEA is confident that waste composition sorts conducted in the fall and spring provide sufficient data for determining annual packaging discard rates.

Statistical principles

A review of the statistical principles used in the waste composition sort analyses is important in assessing whether the "25 by 95" goal was achieved.

Mean

The "mean" is the mathematical average for the conducted sorts.

Table 1: 1995 Packaging Waste Composition Sort Schedule

Sorting Location	Spring	Fall
Metropolitan Area		
Pine Bend Landfill	X	X
Newport Resource Recovery Facility	X	X
BPTS	X	X
Greater Minnesota		
Olmsted County Waste-to-Energy	X	X
Lyon County Regional Landfill	X	X
Carlton County Transfer Station	X	X

Confidence interval

The "confidence interval," often referred to as the "margin of error," is used to express statistical accuracy. The "confidence interval" presents the upper and lower limits of the true mean based on the mean of the sampled waste sort data. Another principle used in conjunction with the "confidence interval" is "level of confidence." The "level of confidence" indicates the certainty that the true mean falls within the stated confidence interval.

Please see page 37 for a further discussion of the statistical principles used in the report.

Packaging composition study methodology

The 1995 packaging composition sorts were conducted at six locations in the spring and fall of 1995. Please refer to Table 1 for sort locations and seasons. The sorting protocol for the 1993 to 1995 sorts was consistent with the sampling protocol used by the MPCA for the 1992 base year data.

In contrast to the 1992 MPCA study, which was conducted to determine general solid waste composition, the 1993 to 1995 sorts were specifically designed to gather data on packaging discards in MSW. The 28 material categories from the 1992 study were expanded to 31 in order to more accurately categorize packaging material.

For each of the sorting locations, for each season, sorts included at least 50 samples at a minimum of 200 pounds each. The samples were taken from randomly selected hauling vehicles. The 1995 sorts included additional subcategories for household hazardous waste packaging than previous sorts. These subcategories helped to provide more specific information regarding the disposal of household hazardous waste packaging.

Comparison to 1992 baseline

Table 2 shows the per capita discard rate for packaging between 1992 and 1995. To measure progress towards the packaging discard reduction goal, the OEA first determined the MSW discard rate using data from the SCORE reports combined with population data. Next, the per capita MSW data was multiplied by the statewide packaging discard percentage to arrive at the per capita packaging discard data.

Table 2: Per capita discard rate, 1992-1995

	MSW Discards	Minnesota Population	Per Capita MSW Discard Generation	Statewide Packaging Discard %	Per Capita Packaging Discards (tons)
1992	2,430,342	4,480,034	0.542	35.0	0.19
1993	2,531,149	4,517,418	0.560	28.1	0.16
1994	2,547,243	4,567,267	0.558	26.9	0.15
1995	2,608,670	4,609,548	0.566	32.1	0.18

When packaging is considered as a component of the total MSW discards for Minnesota, the 1995 packaging waste composition sort data demonstrates that the "25 by 95" goal has not been met. The data indicates that per-capita packaging discards declined from 0.19 tons per year in 1992 to 0.18 tons per year in 1995. This is a 4.3 percent decline. Expressed as daily discard rate, per-capita packaging discards declined from 1.04 pounds per day in 1992 to 0.99 pounds per day in 1995.

However, the data also demonstrates that per capita packing discards from residential generators increased by 4.7 percent over the 1992 to 1995 study period. Even if the margin of error was applied in favor of the lower statewide packaging percentage, the "25 by 95" goal was not met. If the lower margin of error of 29.9 percent is applied to the statewide packaging percentage, the per-capita packaging discard rate drops to 0.17 tons per year. This results in a 11-percent decrease in per-capita packaging discards.

1995 Packaging Composition Sort Results

This section of the report summarizes the packaging discard data collected in 1995 through sorts conducted at three locations in the Twin Cities Metropolitan Area and three locations in Greater Minnesota. R. W. Beck conducted the three Metropolitan Area sorts in the spring and three sorts in the fall. For the 1995 Greater Minnesota sorts, three sorts were conducted during the spring and three were conducted in the fall.

Though three different types of waste loads reach the sort locations — commercial, residential and mixed — commercial and residential types primarily were used to determine packaging composition.

1995 statewide packaging discard results

The 1995 statewide packaging composition results are presented in Table 3. The data is presented by mean percentage by weight as well as the 90-percent confidence interval.

Please refer to appendix A for tables with the 1995 packaging discard composition sort results.

1995 Metropolitan Area packaging discard results

The 1995 Metropolitan Area packaging results are presented in Table 5. The data is presented by mean percentage by weight of the waste received at solid waste management facilities as well as the 90-percent confidence interval.

Changes in statewide packaging discard results

Table 4 presents a comparison of statewide packaging composition results from 1992 to 1995. When making comparisons to the 1992 baseline for statewide packaging percentages, it is important to note that the 1992, 1993 and 1994 sorts were conducted only in the Metropolitan Area at the Brooklyn Park Transfer Station (BPTS).

The 1995 sorts are the first to provide data on statewide packaging discard percentages. The consistency between the 1995 data and the 1992, 1993 and 1994 data lends some validity to the pre-1995 sort data.

The data shows a three-percentage-point decline in statewide packaging discards from 1992 to 1995. However, as Table 4 demonstrates, the 90-percent confidence interval could not be determined for the 1992 sort since the waste composition study was not conducted specifically to determine packaging discard percentages. The 90-percent confidence interval has narrowed annually since the 1993 sorts. The 1995 statewide packaging percentage is 32.1 percent with a quite narrow 90-percent confidence interval of approximately five percentage points.

Please refer to appendix B for 1992-1995 packaging discard composition results.

Table 3: 1995 Statewide Packaging Discards

	Mean Percentage	90% Confidence Interval	
		Lower	Upper
Total Packaging	32.1%	29.9%	34.4%
Commercial Packaging	38.1%	33.3%	43.2%
Residential Packaging	25.8%	24.1%	27.5%

Table 4: Changes in Statewide Packaging Discard Results

	1992	1993	1994	1995
Mean*	35%	28.1%	26.9%	32.1%
90% Confidence Interval	n/a	23% to 33.6%	22.4% to 31.8%	29.9% to 34.4%

*The mean is composed of commercial, residential and mixed-generator sorts

Table 5: 1995 Metropolitan Area Packaging Discards

	Mean Percentage	90% Confidence Interval	
		Lower	Upper
Total Packaging	31.1%	28.0%	34.3%
Commercial Packaging	38.3%	31.1%	46.3%
Residential Packaging	24.7%	22.5%	27.0%

For commercial waste managed at the Pine Bend Landfill, Newport Resource Recovery Facility, and the BPTS, the mean packaging composition for 1995 was 38.3 percent with a confidence interval of about five percentage points around the mean of 38.3 percent. The 38.3 percent from the 1995 sorts was higher compared to 36.2 percent in 1994, 33.9 percent in 1993, and 34.1 percent in the 1992 baseline data.

For residential waste, the mean packaging composition was 24.7 percent of the total waste delivered to the Metropolitan Area sort locations. In 1994, packaging comprised 22 percent of residential waste discards. The 1993 data showed a 20.7 percent packaging ratio. In 1992, packaging discards were estimated at 25.7 percent of the residential waste stream. For 1995, the confidence interval was about five percentage points around the mean of 24.7 percent. The 90-percent confidence interval is quite small, particularly when the number of sorting locations is considered.

1995 Greater Minnesota packaging discards results

The 1995 Greater Minnesota packaging results are presented in Table 6. Again, the data is presented by mean percentage weight and the 90-percent confidence interval.

For commercial waste managed at the Greater Minnesota sort sites, the mean packaging composition for 1995 was 37.8 percent of the total waste delivered to the sort locations. The confidence interval was about 12 percentage

Table 6: 1995 Greater Minnesota packaging discards

	Mean Percentage	90% Confidence Interval	
		Lower	Upper
Total Packaging	33.3%	29.0%	37.8%
Commercial Packaging	37.8%	31.8%	44.3%
Residential Packaging	27.2%	24.9%	29.6%

points around the mean of 37.8 percent. As noted earlier in the report, packaging composition sorts were not conducted in Greater Minnesota before 1995.

For residential waste, the mean packaging composition was 27.2 percent of the total waste delivered to the Greater Minnesota sort locations. The confidence interval was about five percentage points around the mean.

Comparison of Metropolitan Area sorts to Greater Minnesota sorts

Table 7 is a comparison between the 1995 Metropolitan Area sort data and Greater Minnesota sort data. The data is presented by mean percentage by weight as well as the 90-percent confidence interval.

The packaging composition data of the Metropolitan Area sort locations and the Greater Minnesota locations shows little variation. The largest variation was between the commercial sorts in the Metropolitan Area as compared to Greater Minnesota.

The Metropolitan Area commercial generator results were almost identical to the results from Greater Minnesota. The only significant differences were in the wooden pallet/crate and plastic pallet wrap and other plastic film categories. The Metropolitan Area had a higher percentage of wooden pallets and crates, while Greater Minnesota registered a higher mean percentage for the plastic pallet wrap and other plastic film categories.

A comparison between the Metropolitan Area and Greater Minnesota residential generator data reveals quite similar discard data, with Greater Minnesota 2.5 percentage points higher. The 90-percent confidence interval was around five percent for both Metropolitan Area and Greater Minnesota residential sorts.

Comparison of commercial generator type to residential generator type

Data from the 1995 packaging waste composition sorts demonstrates that packaging discards represent a larger percentage of overall commercial discards than of total discards from the residential generator type (see Table 8). As a percentage of total packaging discards, both the total paper and total plastic packaging material categories are higher for the commercial generator type

Table 7: Comparison of Metropolitan Area and Greater Minnesota packaging discards

	Mean Percentage	90% Confidence Interval	
		Lower	Upper
Metropolitan Area	31.1%	28.0%	34.3%
Greater Minnesota	33.3%	29.0%	37.8%

Table 8: Comparison of commercial to residential generation of packaging discards

	Mean Percentage	90% Confidence Interval	
		Lower	Upper
Commercial packaging	37.8%	31.8%	44.3%
Residential packaging	27.2%	24.9%	29.6%

than for the residential generator type. However, old corrugated containers represent the single largest material category for both commercial and residential generators.

When compared to the residential generator data, the results from the individual material categories for commercial waste have significantly wider confidence intervals. The OEA speculates that the wider confidence intervals for the commercial generator results are due to the diversity of waste generated by businesses combined with seasonal differences in generation.

Changes in commercial packaging waste discards

Table 9 presents a comparison of commercial generator type packaging composition results from 1992 to 1995.

As Table 9 demonstrates, the overall percentages for the commercial generator type have been similar from 1992 to 1995 with annual increases each year. Again, it is important to note that the 1992, 1993 and 1994 waste composition sorts were conducted at BPTS only, while the 1995 sorts were conducted statewide.

The 90-percent confidence interval for the mean percentage has also narrowed from a quite wide 18.9 percentage points to approximately 10 percentage points in 1995.

The 1992 through 1995 data shows significant differences in percentages for total paper and total plastic packaging. Using data from the sorts at BPTS, the percentages of paper for 1993 through 1995 were higher than in 1992. The mean percentage for paper was 19.2 percent in 1995 compared to 16.8 percent in 1994, 19.4 percent in 1993 and 13.4 percent in 1992. However, while the overall paper category percentage increased from 1994 to 1995, the percentage of uncoated corrugated boxes remained stable.

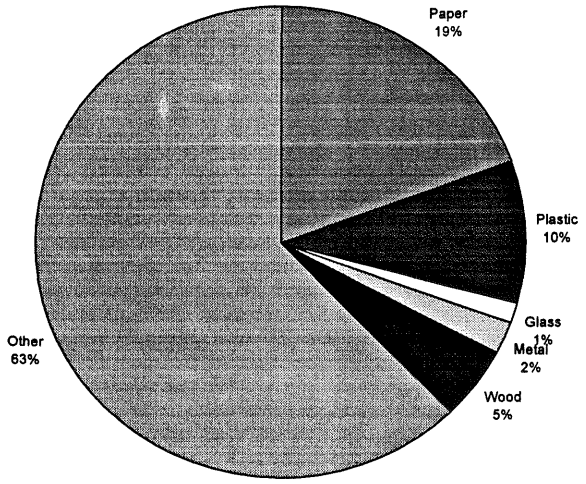
Another category that demonstrated a change over time was total plastic packaging. The data from the 1993 through 1995 sorts reveals consistently lower percentages than the 1992 base year. The percentage of total plastic packaging declined from 9.3 percent in 1992 to 6.8 percent in 1995.

Wooden pallets, crates and other wooden packaging declined to a mean percentage of 5.0 in 1995 from 6.6 in 1992. However, the percentage of wooden pallets and crates, excluding other wooden packaging, remained generally consistent throughout the course of the study. The percentage of wooden pallets and crates from the 1994 sort was very high at

Table 9: Changes in commercial packaging waste discards

	1992	1993	1994	1995
Mean*	34.1%	33.9%	36.2%	38.1%
90% Confidence Interval	n/a	25.1% to 44%	25.1% to 44%	33.3% to 43.2%

1995 Commercial Generator Packaging Discard Composition



*Other is non-packaging MSW discards

8.1 per cent. However, since this was calculated from one sorting location, the data cannot be viewed as accurate to make statewide conclusions.

Changes in composition of residential packaging waste discards

Table 10 presents a comparison of the residential generator type packaging composition results from 1992 to 1995. The data for the residential generator type, again using information from the 1993 and 1994 sorts that were performed only at BPTS, indicates an increase in discard percentages for the residential generator type from 1993 to 1995, growing from 20.7 percent to 25.8 percent. However, very similar results in overall packaging discard rates for individual material categories were documented. The total paper, total plastic, and total glass material categories all demonstrated increases annually from 1993 to 1995 while total metal discards remained steady.

The 90-percent confidence interval for the margin of error narrowed annually. The 1995 confidence interval was approximately three percentage points around the mean of 25.8 percent.

Discussion of data

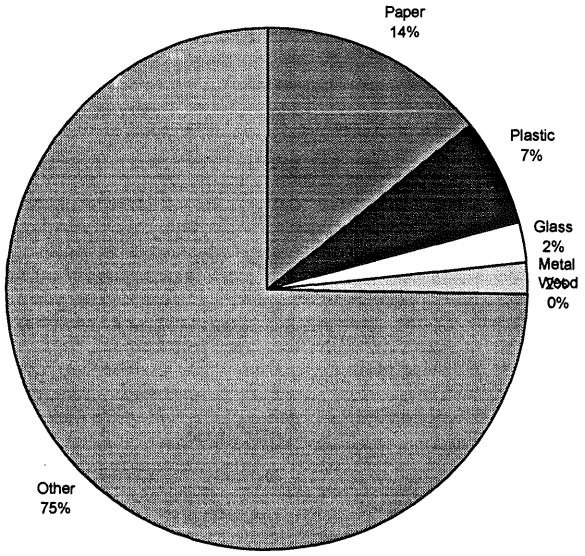
With the revised packaging sorts for 1995, the OEA hoped to improve the data available to assess whether the "25 by 95" goal was achieved. Concerns with the reliability of the waste composition data have been present since the start of the packaging reduction initiative.

First, questions have been raised as to the appropriateness of the 1992 baseline. The

Table 10: Changes in residential packaging waste discards, 1992-1995

	1992	1993	1994	1995
Mean*	25.7%	20.7%	22.0%	25.8%
90% Confidence Interval	n/a	14.6% to 28%	19.6% to 27.9%	24.1% to 27.5%

1995 Residential Generator Discards



*Other is non-packaging MSW discards

1992 baseline data was derived from MSW composition studies not designed to measure packaging discards in municipal solid waste. The material categories used in the 1992 waste composition study were expanded to address the more specific needs of the packaging studies.

Second, because the 1993 and 1994 sorts were conducted at BPTS only, the value of the data for statewide interpretation has been questioned. The 1992 sorts were conducted statewide but, as mentioned above, were not focused on packaging discards. However, the OEA expanded the sort locations in 1995 to provide a more accurate statewide assessment of generation of packaging discards.

The statistical validity of the data is also important to assess the accuracy of the waste sort data. As Table 4 indicates, the 90-percent confidence intervals were quite wide for the 1993 sorts with some narrowing of the confidence interval for the 1994 sort. The 90-percent confidence interval narrowed again for the 1995 data, particularly in the residential generator type. The margin of error for the 90-percent confidence interval has also narrowed consistently for the commercial generators from 1993 to 1995.

The statistical reliability of the data has increased as the 90-percent confidence interval has narrowed. The confidence interval has narrowed less dramatically for the commercial generator sorts but the 1995 data is sufficiently reliable for making a determination of the goal.

Having noted the concerns with the data, the OEA believes that the waste sort information is reliable and indicates that the "25 by 95" goal has not been met.

As part of the *Report on Packaging Discards — 1996*, the OEA is required by the Legislature to make recommendations for reducing packaging discards. As a result of this requirement, the OEA examined the data for material categories that present opportunities for significant reduction.

As the next section of the report demonstrates, transport packaging contributes significantly

to packaging discards and presents an opportunity for diversion from MSW discards.

Transport packaging

Transport packaging constitutes approximately one-fifth of the total MSW in Minnesota and presents the greatest opportunity for reducing packaging discards. For purposes of the *Report on Packaging Discards — 1996*, transport packaging is characterized as old corrugated cardboard, plastic pallet wrap and other plastic film, wooden pallets and crates.

If Minnesota adopted a 25-percent packaging discard reduction goal in the future similar to the "25 by 95" goal, the goal could be met through reducing transport packaging discards. The following section analyzes transport packaging disposal and recycling data in addition to examining the current barriers to reuse and recycling.

Much of the data and analysis for this section is from *A Study of Pressure Points for Recyclable Materials Wood, Plastic Film, and Corrugated Cardboard* (*Pressure Points* study) by Sure Green, Inc., a solid waste consulting firm. Sure Green's study was completed in February 1996, and funded by the Metropolitan Landfill Abatement Fund.

Combined material generation of transport packaging waste

Table 11 shows the percentage of transport packaging in MSW discards along with the total MSW disposal of transport packaging. The total transport packaging percentage has increased from the 1992 baseline of 20.4 percent to 22.4 percent in 1995.

Old corrugated containers (OCC)

Table 12 summarizes the percentage of OCC packaging in MSW discards along with the total MSW disposal of OCC packaging. The discard percentage of OCC is from sorts conducted at BPTS.

Table 11: Transport Packaging in MSW Discards

Percentage of Transport Packaging in MSW discards	MSW Disposal of Transport Packaging (tons)
1992- 20.4%	495,728
1993- 17.7%	448,013
1994- 25.1%	639,357
1995- 22.4%	584,342

Table 12: MSW Disposal of OCC, 1992-1995

Percentage of OCC in MSW discards	Statewide MSW Disposal of OCC (tons)
1992- 7.4%	179,823
1993- 10.4%	263,239
1994- 12.3%	313,310
1995- 10.6%	276,519

(OCC percentage is from commercial generator sorts conducted at BPTS)

Sources of material

Approximately 715,000 tons of corrugated cardboard were generated in Minnesota in 1995. OCC represents the single largest material category of MSW for both the commercial and residential generator types.

The *Pressure Points* study identified large commercial generators as responsible for one-half of the OCC disposed of in Minnesota with small commercial operations and residences generating the other half. Of the large commercial generators, 83 percent of the OCC is estimated to be from grocery stores, 12 percent from large retailers and five percent from industrial sources. For the small generator type, 40,000 generators dispose of approximately 165,000 tons of OCC per year.

Estimated recovery rate

Approximately 440,000 tons of OCC or 61 percent of the OCC generated Minnesota was recovered in 1995. The OEA estimates that five major end-markets for OCC exist in the state. An additional five markets for OCC exist regionally. The OCC recovered in Minnesota is used in making corrugated medium, boxboard liner, roofing felt, fiberboard and molded paper products.

Potential for recovery

The OEA estimates that approximately 275,000 tons of potentially recyclable corrugated cardboard were disposed of as part of MSW in 1995. Although large generators of OCC contribute significantly to the OCC recovery rate in Minnesota, approximately 130,000 tons of OCC were disposed of by these generators in 1994.

Large commercial establishments have been identified as the generator type with the greatest potential for expanded recovery efforts. According to cost analysis done by Sure Green, Inc., large commercial generators have the opportunity to realize cost savings even if they are required to pay up to $60 per ton in hauling fees. Although small commercial and residential generators can contribute to recovery efforts, the economics of OCC recovery favor an emphasis on large generators.

It is estimated that 10 percent to 12 percent of OCC is generated from the residential sector, providing some opportunities to increase recovery.

Barriers to reuse and recycling of OCC

Research conducted by Sure Green, Inc., and the OEA identified several barriers for which impede business recycling and reuse efforts.

Financial

- Cost of OCC recycling services is often prohibitive.
- Cost of baler is significant, particularly for small generators.
- Most small generators currently must pay for recycling service.
- Economic incentive for small generators only exists if the generator is able to realize reduction in hauling costs.

Operational

- Lack of storage space for recyclable OCC.
- Accidental placement of OCC in disposal container rather than recycling bin or baler.
- Younger employees (under 16) are typically responsible for handling of trash and recycling and are not allowed to operate OCC baler.
- No required "opportunity-to-recycle" for businesses.

Informational

- Lack of management commitment to company recycling program.

- Staff time and training for recycling education is needed.
- Lack of awareness regarding potential cost savings associated OCC recycling.
- Perception that OCC is coated and so cannot be recycled.

Analysis

Because of the expanded opportunities to recycle OCC and the potential for significant reduction in disposal costs for large generators, the OEA it expects that the OCC recycling rate would surpass the current level of 61 percent. The solid waste consulting firm, Franklin and Associates, estimated in 1989 that the maximum potential recovery rate for OCC in Minnesota was 75 percent. Since 1989, however, the capacity to recycle OCC regionally has increased dramatically and recycling programs have matured, making it possible to surpass the current rate of recycling.

However, anecdotal evidence from the waste composition sort team indicates that large generators, who represent the largest opportunity for expanded collection, are still disposing of OCC. Efforts to increase recycling of OCC from the large commercial generators are clearly needed.

Sure Green, Inc., asserts that large generators dispose of OCC due to lack of storage space, poor employee education and lack of participation in recycling programs. Sure Green, Inc., estimates that recovering the majority of OCC currently disposed of by large and small generators could raise the overall state recycling rate by four percentage points.

Wooden pallets and crates

Sources of material

Table 13 demonstrates that wooden pallet and crate discards have increased from 1992 to 1995 despite the growth of pallet recycling services and wood waste collection efforts. Sure Green, Inc., estimates that 75 percent of the pallets disposed of in Minnesota were from large retail stores, grocery stores and manufacturers. Grocers were identified as the single largest source of pallets in MSW discards.

The 20 largest producers of wood waste in Minnesota were identified as responsible for 40 percent of the pallets in MSW discards. The majority of wood waste is broken pallets and other wood packing material; however, reusable pallets in good condition also constitute a portion of wood waste.

Estimated recovery rate

Due to the multiple-use nature of pallets combined with the fact they often do not enter the formal waste management system, it is difficult to ascertain a recovery rate for pallets The OEA estimates that 20 companies offer pallet recycling and reconditioning services in Minnesota. Of the pallets disposed of in.

Table 13: MSW Disposal of Wooden Pallets and Crates

Percentage of MSW discards	Statewide MSW Disposal of Wooden Pallets and Crates (tons)
1992- 3.3%	80,191
1993- 3.1%	78,466
1994- 8.1%	206,326
1995- 3.7%	109,564

(Wooden pallets and crates percentage is from commercial generator sorts conducted at BPTS)

MSW, the vast majority are landfilled or burned in resource recovery facilities. Wood waste in Minnesota is used for a variety of purposes including wood chip production, pallet reuse and reconstruction, landscape mulch and animal bedding.

Potential for recovery

As of 1995, pallets and crates accounted for 109,564 tons of MSW discards. R.W. Beck estimates that of the pallets delivered to MSW facilities during the waste composition sorts, one-third were reusable pallets, one-third were broken but repairable and one-third were beyond repair or were specialty pallets. Sure Green, Inc., estimates that approximately 86 percent of the pallets handled as MSW discards are landfilled or incinerated, and the remaining pallets are recovered for reuse.

The economics of wood waste management clearly favor reuse and recycling over disposal for large-volume generators. Large-volume generators often are not charged for pallet removal. Small generators may also benefit from wood waste recycling, if enough waste can be collected and if hauling rates can be lowered for volume reductions.

Research conducted by Sure Green, Inc., and the OEA identified several barriers which impede business recycling and reuse efforts for wooden pallets.

Barriers to reuse and recycling

Financial

- Cost of inside pallet storage is often significant.
- Pallet recyclers often cannot economically recover pallets in small numbers.

Informational

- Training of employees to recognize potentially recyclable wood is lacking.
- Lack of understanding that broken pallets can be collected and repaired contributes to disposal.
- Lack of education regarding company reuse and recycling programs.
- Lack of awareness among small generators that pallets could be removed at little or no cost.

Operational

- Lack of uniformity in pallets sizes has hampered collection efforts.
- For small generators, the number of pallets required for free collection results in significant storage costs.
- Back-haul arrangements, where distributors take back pallets, usually do not account for broken pallets.

Analysis

The economics of pallet recycling were not identified as a barrier for large generators. Sure Green, Inc., identified pallet reconstruction as the highest-value use for broken pallets; however, other uses for wood waste such as animal bedding and fuel compete for material.

Significant economic incentives exist for large generators to divert pallets from MSW discards to recycling. Several pallet recyclers contacted estimated that 95 percent of pallets are being recycled and those disposed of are from small generators. They also mentioned that a minimum of 100 pallets is necessary to haul pallets economically.

Plastic film

Sources of material

Approximately 160,000 tons of plastic film were disposed of in Minnesota's MSW in1995. Pallet wrap originates primarily from

Table 14: MSW Disposal of Plastic Film*, 1992-1995

Percentage of MSW discards	Statewide MSW Disposal of Plastic Film (tons)
1992- 4.1%	99,631
1993- 4.1%	103,777
1994- 4.7%	119,720
1995- 3.6%	161,737

(Plastic film percentage was obtained from commercial generator sorts conducted at BPTS)

*For the purposes of this report, OEA used the sort categories of pallet wrap and other plastic film.

manufacturers, wholesale distributors, and grocery and variety stores. Sure Green, Inc., estimates that large-volume generators dispose of 40,000 tons of film per year.

However, household and small-volume generators were estimated to contribute 41 percent of the film in MSW. In contrast to the flat sheet film waste generated by industrial and commercial establishments, most residential film waste is in the form of plastic bags.

Estimated recovery rate

The OEA estimates that approximately 12,000 tons of film generated in Minnesota were recycled in 1995. Industrial and large retail generators were responsible for most of the plastic film being recycled.

The OEA estimates that nine companies in Minnesota accept plastic film for recycling. Additionally, the OEA has identified four out-of-state markets for plastic film. Sure Green, Inc., estimates that two-thirds of the plastic film generated by industry and retail establishments is being recycled. Much of the recovered plastic film from Minnesota is being used for industrial film production.

Potential for recovery

The *Pressure Points* study indicated that two-thirds of the film generated by the grocery sector is not being recovered. This sector represents a strong opportunity to increase plastic film recovery statewide. Much of the film waste is generated by stores not doing any plastic film recovery. Economics favor recovery of film if it is contaminant-free (dry with no dirt, paint, etc.). Material handling at point of generation is critical to success of the recycling program.

Sure Green, Inc., estimates that if average recovery rates for large generators were achieved by all of the large generators of plastic film, film recovery would increase by 32,000 tons. Of the small generators contacted by Sure Green, Inc., none were recycling film. Due to the type of plastic film present in household MSW, the potential for significant recovery from residential generators remains low.

Research conducted by Sure Green, Inc., and the OEA identified several barriers which impede business recycling and reuse efforts for plastic film.

Barriers to reuse and recycling

Financial

- The market price differential for virgin and recycled plastic resin is narrow, making it difficult to find end-markets for recovered film.
- Small generators often cannot recover enough material to economically recycle film.

- The cost of recycling programs often exceeds the cost of disposal for small generators, making recycling film not cost-effective.
- Lack of risk-sharing between generators, haulers and collection facilities for rejectionof loads places cost responsibility for disposal on generators.

Operational

- Contamination of a load of plastic film may render it non-recyclable. Contami-nation is a significant problem for grocery stores.
- Storage space is required to maintain contaminant-free film.
- The lack of containers appropriate for storage of film was idenitified as a barrier for film recycling.

Informational

- Lack of identification of markets for film with varying quality standards (level of contamination) contributes to a low recovery rate for plastic film.
- Recycling programs for film require more education of employees than programs for other materials due to the issue of contamination.

Analysis

The Sure Green, Inc., study indicated that recyclable plastic film was often found with OCC in disposal bins. Because of the market for recovered film, the quantities necessary for economical recycling, and the employee education necessary for a successful film recycling program, recovery efforts clearly favor an emphasis on large generators. The cost of film collection is a significant disincentive for small-volume generators.

Opportunities for increased recovery of transport packaging

As the data and analysis above demonstrate, opportunities exist for increased recovery of transport packaging. The study conducted by Sure Green, Inc., indicates that increased recovery rates for film and OCC can be achieved with an emphasis on large generators such as grocers and retailers. However, the opportunity for decreasing disposal of pallets lies primarily with small generators.

Packaging Policies and Initiatives

This chapter provides a general discussion of trends in packaging design and the emerging recognition of design for the environment concepts. It includes a summary of state packaging abatement efforts along with a brief overview of current issues facing solid waste management in Minnesota.

Trends in packaging design

For a more thorough understanding of packaging discards, it is necessary to briefly describe several of the recent trends in packaging design.

Source reduction efforts by manufacturers include a move to lighter materials. One example of lightweighting is the move to plastic packaging from glass or boxboard. Plastic packaging and aseptic drink boxes have benefited by this type of source reduction.

Another example is the aluminum beverage can, which has been made thinner to reduce material use. Many manufacturers and packagers have shifted to lighter materials to save transportation costs but also to reduce the weight and volume of packaging discards. This shift to lighter materials has contributed to the slowed growth by weight of solid waste generation nationwide. One additional impact of lightweighting is that each individual package (box, bottle or can) has less material value. This process indirectly affects recovery programs, which are collecting materials with less resource value.

Elimination of redundant packaging is another source reduction technique. For instance, several consumer products, such as deodorant, are being marketed without redundant packaging. Design changes have allowed the primary packaging to perform functions previously done by the redundant packaging.

Another effort resulting in packaging reduction is the expanded use of concentrates and refillable containers. Through improved technology, flexible packaging and pouches are overcoming technical barriers and finding acceptance among consumers. Flexible packaging often replaces more rigid packaging and reduces weight and volume. For example, many manufacturers and distributors have increased the use of plastic film as a lighter alternative to corrugated cardboard.

Source reduction, however, often does not result in increased recyclability. For instance, many municipal recycling programs offer bombard collection but fail to offer collection for source reduced packaging which may replace bombard. In some cases, source reduced packaging options such as the aseptic juice box are recyclable but not widely collected through curbside recycling programs.

While packaging reduction efforts are embraced by manufacturers for environmental and financial reasons, the growth in packaging discards overall indicates that source reduction of consumer packaging alone cannot decrease the growth in packaging discards.

Demographic impacts on packaging discards

Changing demographic patterns contribute significantly to the per capita growth of packaging discards in Minnesota. Not only is Minnesota's increasing population having an impact on packaging discards, but changing demographic patterns within the population are as well.

Minnesota's population increased by approximately 130,000 from 1992 to 1995. When the growth is combined with the increase in per capita MSW discards, it results in increases in packaging waste discards. Minnesota's population is expected to increase to 5,540,840 by 2020 from 1995, an increase of 16.8 percent. While trends in packaging design are occurring, present source reduction efforts will not result in significant declines in per-capita packaging discards if present trends in the consumption of packaged products continue.

While total population growth in Minnesota is important, changes within the population have implications for the quantity and type of packaging discards. Minnesota, following national trends, saw a significant increase in single-person and two-person households from 1980 to 1990. Single-person households increased by 22 percent from 1980 to 1990. Two-person households increased 19 percent over the same period. Franklin Associates conducted a study that suggests that single-person households spend less time in food preparation than other households, resulting in increased disposal of food packaging. (Franklin Associates, *An Analysis of Trends in Municipal Solid Waste Generation 1972 to 1987*).

Design for the Environment

The OEA recognizes the importance of product design in the minimizing of packaging waste discards. Product design should be a primary component of any effort to reduce discards of products and packaging.

Design considerations are important not only for improving the recyclability or reusability of a product or material, but may also take into account the environmental impacts of the resource extraction and manufacture of the product or package. By adopting a prevention approach to product or packaging design, manufacturers or pack-agers may be able to realize cost savings while easing environmental costs and expand market share by green marketing.

Design efforts such as the Bottle Redesign Project, conducted by Recycle Worlds Consulting, illustrate the potential for cooperation among various interests to examine specific products and develop recommendations to improve environmental performance. In that project, plastic bottle manufacturers, plastic bottle recycling interests and local government officials joined efforts to recommend design changes to improve the recyclability of plastic bottles.

Recommendations from the Bottle Redesign Project included employing compatible resin types, eliminating aluminum caps and HDPE base cups, and the use of water-dispersible labels. The effort was intended not only to benefit recyclers, but also to increase the return on recycling for municipalities. Designing packaging for reuse or for ease of recycling is critical to reducing packaging discards.

Another example of environmental design considerations is the Vehicle Recycling Partnership advanced by Chrysler Corporation, Ford Motor Company and General Motors. The partnership is not only promoting use of recycled material in car parts, but advocating that recyclability become a component of car design.

By integrating environmental design into the early stages of product development along

with material selection, appearance and performance characteristics decisions, management of the product after it has completed its intended use is made much easier.

Although facilitating recycling through improved design is important for increasing collection, manufacturers are starting to employ a broader design-for-the-environment evaluation process. Design for the environment addresses product design, consumption and disposal in a holistic fashion, recognizing the environmental impacts of material selection, resource extraction, production processes, transportation and disposal. Within the design-for-the-environment framework, manufacturing and product selections are determined not only by disposal options but considerations regarding the extraction, energy consumption, and water and air pollution attendant to the product.

Packaging designers and manufacturers are beginning to employ environmental systems that emphasize full-cost accounting, life-cycle analysis, pollution prevention and product stewardship.

Life-cycle analysis

A key tool for assessing environmental impacts is life-cycle analysis. Life-cycle analysis has become more comprehensive to address a large number of environmental impacts for a specific material or product.

Life-cycle analysis typically has three stages — inventory analysis, impact assessment, improvement assessment — which serve as evaluative checkpoints in the determination of comprehensive environmental impact. Life-cycle analysis is addressed in the ISO 14000 environmental management standards and will be particularly important for manufacturers who make environmental claims. A more thorough discussion of ISO 14000 is provided below.

Extended product responsibility

Another design-for-the-environment concept gaining ground is extended product responsibility. The President's Council on Sustainable Development advocates the adoption of extended product responsibility as a key component of a sustainable resource and manufacturing policy.

Extended product responsibility refers to a principle where manufacturers, suppliers, consumers and disposers all share the responsibility for the environmental burdens of a product. While worldwide extended product responsibility efforts have thus far addressed electronics and white goods primarily, many of the questions of durability and life-cycle responsibility are pertinent to packaging.

Extended product responsibility is illustrated by Minnesota's law prohibiting disposal of certain dry cell batteries, and by Digital Corporation's program to recover unwanted computers.

The Minnesota Legislature prohibited disposal of certain batteries in 1990 and required manufacturers to implement recycling collection and processing programs.

Digital Corporation accepts unwanted computers and disassembles them for either reuse, recycling or proper disposal. Digital has also addressed product design to facilitate ease of disassembly and recyclability.

While these two examples are not specific to packaging, the concept of extended product responsibility can be adapted to a wide range of products including packaging.

Reusability and recyclability

Design for the environment plays an important role in the reduction of packaging discards through increasing reusability and recyclability. Environmental design considerations can also result in cost savings,

not only for the manufacturer or packager, but for the waste management system as a whole.

From a pollution prevention perspective, design-for-the-environment concepts are necessary to reduce toxicity in packaging. While design considerations alone cannot drastically decrease packaging discards, design for the environment concepts are integral elements of a sustainable materials management system.

Toxicity in packaging

While the "25 by 95" goal does not target toxicity in packaging, the OEA believes it is appropriate to address toxicity within the context of quantity of packaging discards. To some observers, the toxicity of packaging discards is of greater concern than the quantity of packaging discards. The OEA, in conjunction with the MPCA, supports activities that promote the reduction of toxicity in packaging.

Toxics in Packaging Clearinghouse

Minn. Stat. §115A.965 prohibits the intentional introduction of lead, mercury, cadmium and hexavalent chromium into packaging and the incidental presence of these metals at levels over 100 parts per million (PPM). Minnesota's statute is based on model legislation developed by the Coalition of Northeastern Governors (CONEG). Minnesota is one of 18 states with such legislation and is a member of the Toxics in Packaging Clearinghouse.

As a check on compliance, the Clearinghouse recently requested Certificates of Compliance from about 30 companies nationwide. The Clearinghouse views this as the first step in taking any enforcement action and as an opportunity to educate industry segments which may not be aware of the legislation.

Package testing

In addition, the New York State Department of Environmental Conservation (DEC) recently completed a second round of package testing. They have developed a testing protocol and have tested about 35 different packages.

During the first round of testing, a total of 12 packages were sampled in duplicate and the results of the two tests were averaged. Two packages violated New York's law. During the recently completed second round of testing, a wine bottle was found to have a high lead level. Some of the levels above 100 parts per million may have been because of recycled content, and thus legal under the statute or because of the total chromium (rather than just the hexavalent chromium) content.

If the MPCA were to do similar testing of packaging, it could learn from the experience of the New York DEC. In choosing which packages to test, it would be important to be random and not focus on any particular company or industry sector.

On the other hand, there are some colors and materials that are more likely to contain lead, cadmium or mercury than others. Bright red, yellow and orange have traditionally been obtained using lead and cadmium, and plastics sometimes contain mercury and lead as stabilizers.

The MPCA has heard from those companies that come to the CONEG packaging Clearinghouse that it is important to keep the playing field level by ensuring uniform compliance.

MPCA staff would need to consider the costs versus benefits of such testing. The testing done by the New York DEC cost approximately $20,000. Part of that figure went to developing the testing protocol. It is usually more-cost effective on a per-unit basis to do larger-scale testing (larger numbers of packages). The MPCA estimates that $50,000

would be necessary for an adequate testing program.

State packaging abatement efforts

Since the Legislature adopted the *25 by 95* packaging goal, several steps have been taken to reduce the amount of packaging delivered to waste management facilities. The information presented below is intended to provide information and background on Minnesota's packaging abatement efforts.

Legislative efforts

The 1994 Minnesota Legislature established a state packaging hierarchy declaring that it is imperative to reduce the amount and toxicity of waste that must be managed, and set a goal that items be distributed without packaging. The packaging hierarchy is intended to guide packaging decisions for both packagers and consumers. The hierarchy is intended as state policy only and carries no sanctions for noncompliance.

Packaging hierarchy

When packaging is necessary, the following packaging options are listed in order of preference:

1. Minimal packaging that contains no intentionally introduced toxic materials and is designed to be and actually is reused at least five times.
2. Minimal packaging that contains no intentionally introduced toxic materials and consists of a significant percentage of post-consumer material.
3. Minimal packaging that contains no intentionally introduced toxic materials, that is recyclable, and is regularly collected through recycling collection programs available to at least 75 percent of residents of the state.
4. Minimal packaging that does not comply with numbers one and two above because it is required under federal or state law and for which there does not exist a commercially feasible alternative that does not comply with numbers one and two above.
5. Packaging that contains no intentionally introduced toxic materials but does not comply with numbers one through three above.
6. All other packaging.

Toxics in packaging

The Minnesota Legislature has also addressed toxics in packaging through the passage of the CONEG model legislation in 1991. The legislation prohibits the intentional introduction of selected toxic substances — lead, cadmium, mercury, and hexavalent chromium — in packaging.

WasteWise

The OEA has participated with the Minnesota Chamber of Commerce in developing and implementing the Minnesota WasteWise program. The goal of this program is to increase waste prevention and recycling among businesses of every type and size through education, assistance and recognition. While WasteWise encourages recycling and reuse of packaging materials, the program cannot be expected to result in significant decreases in packaging discards.

Minnesota Technical Assistance Program

The Minnesota Technical Assistance Program (MnTAP) integrates solid waste source reduction into its pollution prevention assistance. MnTAP provides recommendations to businesses about how to reduce packaging waste as part of its solid waste source reduction assistance.

Encouraging reuse of materials

The OEA helped create the Minnesota Materials Exchange Alliance, a statewide umbrella organization. The alliance uses computerized listings and local exchanges to match organizations that have waste materials with organizations that can use them.

The OEA has also provided grants for projects that promote reuse of packaging.

Strengthening end-markets

The development and growth of markets for recycled materials is crucial to increasing the amount of MSW, including packaging, that is recycled. Stronger markets result in increased prices for recyclable materials and greater availability of non-disposal options.

The OEA provides grants, loans, technical assistance and educational materials to facilitate development of strong markets for recycled materials.

Previously considered options in Minnesota

Previously, Minnesota has considered several options to reduce packaging in the waste stream. Some of the options have included:

- Establishing minimum recycled (post-consumer content) requirements for various products such as rigid plastic containers and paperboard packaging, with enforcement and penalty provisions.
- Prohibition on the disposal of certain types of transport packaging such as OCC and wooden pallets and crates, among others.
- Establishing an Advance Disposal Fee on certain consumer packaging.
- Adoption of a CONEG-style packaging scheme which would allow companies to select one of three options to meet packaging reduction goals.
- Establishment of a container deposit system that would place a deposit on beverage containers.
- Sales tax exemption for refillable containers.

Packaging efforts pursued elsewhere

As part of the research for the *Report on Packaging Discards — 1996*, the OEA explored initiatives from other states and countries which are intended to reduce the discarding of packaging. The following section is meant to provide information to the reader only and does not constitute endorsement by the OEA.

United States

After a flurry of activity in the early 1990s, regulatory efforts to reduce packaging discards have not been prominent in state legislatures recently. Only California and Oregon have passed major legislation directly focused on packaging.

Packaging legislation

California and Oregon have implemented requirements that rigid plastic containers meet one of the following criteria:

1. One of three recycling rate options.
2. A recycled-content requirement of 25 percent.
3. A reusability requirement, under which the containers must be reused or refilled.

It is important to note that Oregon's statute exempts food containers, except beverage containers, from complying with the requirement while California has a temporary exemption for in place for food and cosmetic containers.

Landfill bans

Landfill bans have been enacted in several states, most notably Massachusetts and Wisconsin, with the intention of diverting recyclable material such as OCC and aluminum containers from waste management facilities to the recycling infrastructure.

International

Take-back programs

As mentioned in the *Report on Packaging Discards — 1995*, Germany has implemented an aggressive program of manufacturer and distributor responsibility for packaging discards. Several other European nations including the Netherlands, France and Belgium have also implemented comprehensive packaging discard abatement programs.

While such take-back programs have sparked considerable debate and implementation has often been difficult, the European model is being considered by several Asian nations.

Reuse, recycling, recovery directive

The European Union has also adopted a Directive on Packaging and Packaging Waste set to take effect in June 1996. The directive is intended to prevent packaging disposal through reuse, recycling and methods of recovering packaging waste. Member nations are required to submit proposals to the European Union detailing packaging recycling and recovery systems.

Container deposit

Canadian provinces are also implementing expanded container deposit programs, with a few provinces considering post-consumer recycled content mandates for certain packaging materials.

ISO 14000

With the continuing globalization of trade, there is a growing recognition of the need for a standard of environmental management. The ISO 14000 framework for environmental management is a voluntary system of guidelines that represent an attempt to improve a corporation's environmental management through the reduction of waste, energy and raw materials. ISO 14000 provides a set of evaluative guidelines for companies environmental management systems but does not contain any sort of benchmarking or performance goals.

The ISO 14000 process is often viewed as a step towards integrating the principles of sustainability into corporate quality management. While ISO 14000-compliant companies must still adhere to existing federal and state environmental regulations, the guidelines encourage companies to move beyond simply complying with regulatory requirements.

Technical committees are developing guidelines for environmental auditing, life-cycle assessments, environmental labeling, environmental management systems and environmental performance evaluations.

A critical aspect of the ISO 14000 process is the certification whereby companies will be certified in compliance with ISO 14000 environmental management guidelines. Such compliance and certification may become a prerequisite for U.S. companies that trade overseas and present opportunities to develop a competitive advantage. As such, compliance with ISO 14000 may become necessary for firms that do business with the firms that trade overseas.

Solid waste trends in Minnesota that affect packaging waste

While the flow of Minnesota MSW to out-of-state landfills is not, strictly speaking, a packaging issue, it is of significant concern for solid waste policy in the state. The OEA estimates that 321,000 tons or 6.7 percent of Minnesota MSW left the state in 1994 with an increase expected for 1995.

The movement of MSW out of state may have implications for the recycling infrastructure in Minnesota. Recyclables traditionally removed at transfer stations and waste processing facilities could end up going to landfills. As the processing facilities and landfills compete for waste supplies by lowering tip fees, there could be less economic incentive to recycle. Thus, packaging material, much of which is easily recyclable, could be diverted to landfills and waste-to-energy facilities.

The OEA will continue to monitor the out-of-state landfilling of Minnesota MSW, and to work with neighboring states and with counties to implement mutually beneficial solutions.

Although the 1996 SCORE recycling goals have been met by many counties in Greater Minnesota, and the Metropolitan Area is close to the 50 percent goal, recycling tonnages may have declined in 1995 from 1994 levels for Minneapolis and St. Paul, as well as several other cities in the Metropolitan Area.

The preliminary data for the first quarter of 1996 reinforces concerns that recycling tonnages may be declining in some areas. While it is too early to speculate on the impact of reduced tonnages on recycling rates, the data raises concerns regarding recycling's ability to slow the growth of MSW discards.

Recommendations

In 1994, state law was amended to require the OEA to include in the *Report on Packaging Discards — 1996* recommendations for reducing packaging discards in the waste stream. OEA is required to make recommendations regardless of whether the "25 by 95" packaging discard reduction goal was met.

Evaluation of the '25 by 95' goal

While it is clear that the "25 by 95" goal was not met, the reasons are complex.

The "25 by 95" goal was established as a compromise in response to aggressive packaging legislation proposed during the 1992 legislative session. Rather than specifying packaging materials for reduction and recycling efforts and establishing a strict timeline for implementing diversion activities, the "25 by 95" legislation established a broad reduction goal for all packaging discards. The legislation did not mandate specific action to achieve the goal. At the time the goal was established, it was envisioned that the goal would be accomplished by voluntary reduction efforts, and that these efforts would be led by business.

The general information and promotion associated with efforts to pursue the goal appear to have been insufficient to achieve the "25 by 95" reduction. As stated earlier in the report, the 25-percent reduction in packaging discards probably could have been achieved through reduction efforts targeted at transport packaging types that comprise a relatively large percentage of packaging waste. At the time the goal was established, however, good data was not available to help the business community and policy-makers determine which materials and business sectors to target with assistance.

The insufficient data, combined with the absence of specific targets or packaging guidance in state law, resulted in a lack of voluntary efforts to move the state toward the "25 by 95" goal. The goal was not embraced and actively endorsed by haulers, generators, solid waste officials or consumers.

The OEA expects that the changes that have occurred since the establishment of the "25 by 95" goal will make future packaging reduction efforts more effective. The data from the packaging discard waste sorts will assist in targeting materials and business sectors that will provide the greatest improvement in the reduction of packaging discards. This information was not present when the goal was set and should help the state move towards greater reduction in packaging waste. The OEA recognizes these changes and the recommendations are designed to build on the new information and state priorities.

There are other factors that contributed to the failure to meet the "25 by 95" goal and will continue to influence packaging reduction efforts. While recycling programs have expanded for packaging materials during the 1992 to 1995 study period, economic growth and consumption have risen as well. Markets for collected materials have also fluctuated, particularly for all paper categories, making recycling less economically attractive. The expansion of markets for some collected materials did not result in the anticipated high

diversion of materials from Minnesota MSW discards.

It is also important to note that efforts to pursue source reduction or meet other environmental goals may have slowed the progress towards packaging discard reduction. For instance, the move from the use of easily recyclable corrugated cardboard to plastic film for shipping — a change that reduces overall packaging used — may have resulted in an increase in plastic film discards. Also, the closure of small incinerators previously used to burn OCC may have contributed more packaging waste to MSW discards.

Policy options to reduce packaging discards

The importance of market-driven changes cannot be overstated in the pursuit of a reduction in packaging discards and the development of a sustainable materials economy. Underlying all of the following policy options is the need to restructure economic incentives to favor material conservation, reuse and recycling. Efforts to reduce packaging discards and solid waste generation overall will be buttressed by changes in the current system of economic incentives.

Through the Sustainable Development Initiative, Minnesota is examining policies and incentives to promote sustainability. Sustainable development is development that maintains or enhances economic opportunity and community well-being while protecting and restoring the natural environment upon which people and economies depend. Sustainable development meets the needs of the present without compromising the ability of future generations to meet their own needs.

A key component of such an analysis is an examination of the current tax system in Minnesota. The property, income and sales tax systems should be analyzed to identify their impacts on sustainability. The current tax structure was developed without consideration of creating incentives to promote environmental sustainability. Increasingly, policy-makers have been discussing opportunities for pursuing sustainability through changes in the tax system.

Benefits such as income, expanding employment and capital investment should be promoted through the tax structure. Economic incentives should be directed towards resource efficiency and environmental product design, and should encourage full-cost accounting.

This long-term economic transition needs to be coupled with the development of a materials management policy that protects environmental quality, rewards sustainable economic development and contributes to the overall progress towards a sustainable future.

The OEA supports the efforts of the Environmental Quality Board to examine Minnesota's tax system and its implications for sustainability.

Recommendations and initiatives to reduce packaging discards

The OEA considered several factors in selecting these recommendations, including market prices for packaging materials, technical barriers to increasing recovery, and resources available for program implementation. The OEA makes the following recommendations to reduce packaging discards.

1. Minnesota will implement a program to reduce packaging discards with a particular emphasis on transport packaging.

Early in 1996, the OEA's newly formed Buisness Environment Resource Center (BERC) conducted targeting efforts for business assistamce. As part of the targeting effort, the OEA identified transport packaging

as a focus for outreach. Based on information gathered during the targeting effort, the OEA will identify sectors that contribute significantly to disposal of transport packaging.

The OEA's efforts to reduce transport packaging discards will include education, technical assistance and financial assistance. The OEA is currently implementing a number of actions to reduce packaging generation and discards. Specifically, the OEA will:

- Survey and visit companies in the targeted business sectors. This will provide the OEA with baseline data as well as determine what types of assistance should be developed. The OEA may supplement this effort with focus groups to assist in program design and implementation. The focus groups will help develop a target for diversion of trnasport packaging discards as well as providing input as to which sectors should be targeted.
- Target financial assistance to encourage reuse and recovery of transport packaging.
- Provide direct outreach and technical assistance towards generators of transport packaging.
- Prepare and distribute information and education materials, such as a training video and a how-to guide for generators of transport packaging promoting source reduction, reuse and recycling of transport packaging.
- Continue to recognize superior efforts to reduce packaging discards through the Governor's Awards for Pollution Prevention program.

At present, the OEA will carry out the transport packaging efforts within already established programs by reallocating staff and other resources.

2. Implement a Design for the Environment (DFE) Program at OEA.

In an effort to promote the prevention of packaging discards, the OEA will examine options to promote DFE in Minnesota. OEA's DFE program will develop DFE promotional materials, education forums and design guidelines along with case studies of environmentally designed packaging.

One option to assist in this effort is to create a Design for the Environment (DFE) Advisory Council to provide technical and policy assistance to the OEA. The DFE Advisory Council would be composed of designers, manufacturers and other technical experts interested in promoting green design projects. The advisory council would address design considerations for packaging along with electronics and other products containing hazardous material.

OEA's DFE program will work with already established federal programs encouraging DFE concepts. The advisory council could also make recommendations for specific design changes to increase the recyclability or decrease the toxicity of a product. The DFE Advisory Council could also provide financial assistance through grants and loans to manufacturers interested in green design projects.

Another option is to integrate design considerations into the OEA's existing business assistance advisory groups.

3. The state will encourage businesses to implement education and technical assistance programs with a specific emphasis on transport packaging.

Efforts such as WasteWise should be expanded and targeted to reduce packaging discards. The business community, in conjunction with the OEA, will be encouraged to develop a technical assistance and outreach program to encourage the use of reusable and recyclable packaging.

Such an effort could also encourage the creation of cooperative recycling programs whereby small businesses would pool recyclables in order to ensure economical collection fees. WasteWise has the opportunity to build partnerships with business associations such as the Minnesota Grocers Association to promote waste reduction activities and develop implementation strategies tailored for specific business sectors. Business initiatives such as WasteWise can readily identify positive examples of business efforts to reduce packaging discards which could serve as models for other businesses.

WasteWise also has the opportunity to develop waste reduction challenge programs for specific sectors of generators. WasteWise has proposed to implement these programs within the next year in partnership with the OEA.

4. The Legislature should complement the state packaging hierarchy with the adoption of packaging principles advanced by the CONEG Preferred Packaging Guidelines.

The CONEG guidelines are as follows:

- Guideline 1: Elimination
- Guideline 2: Minimize
- Guideline 3: Refill/Reuse
- Guideline 4: Recyclable

The CONEG Preferred Packaging Guidelines encourage source reduction of packaging which is not currently considered by the packaging hierarchy for Minnesota. While Minnesota's packaging hierarchy is principally designed to reduce toxicity of packaging, source reduction efforts, which are important to the reduction of packaging discards, need to be recognized.

5. Implement government purchasing programs to procure packaging which conforms to the packaging hierarchy.

Due to the volume of goods purchased by government entities in Minnesota, government purchasing can have a significant impact on reducing waste, increasing recycling and supporting environmentally preferable products. Minnesota currently provides a 10-percent price preference for materials containing recycled content.

Minn. Stat. §16B.122 also requires state agencies to adopt procurement policies which promote the Legislative Declaration of Policy contained in the Waste Management Act. The OEA will work with the Department of Administration to adopt purchasing guidelines which more explicitly support the procurement of reusable packaging.

State government purchasing could greatly reduce transport packaging discards with preferences for reusable totes and bins, leased pallet programs and more durable pallets. Procurement guidelines would also promote the use of source-reduced packaging.

Options for future consideration

In addition to the initiatives described above, the OEA will continue to evaluate the potential of other policy options relating to packaging reduction.

Mandated material recovery targets for packaging remain a viable policy option to reduce packaging discards, but should be considered within the context of the examination of the Waste Management Act which will be taking place over the next 18 months. The Legislature has yet to impose specific material recovery targets, but if recycling rates should continue to flatten and discard tonnages continue to rise, such an option should be given more consideration.

Material recovery targets of a voluntary nature have been adopted by business and trade organizations and have proven successful at targeting efforts to increase collection, expand

markets and increase demand for recycled products. Industry organizations such as the American Forest and Paper Association and the American Plastics Council had established recovery targets for paper and plastics respectively.

The plastics industry has recently backed away from its initial goal of 25 percent recovery nationwide, citing the lack of markets, infrastructure and collection programs available. The experience indicates that material recovery goals can still be effective, but need to be carefully developed and targeted towards specific materials and geographic locations.

However, as the experience of the plastics industry demonstrates, material recovery targets need to emphasize market development and education as well as increasing collection tonnages.

The OEA will also continue to examine the feasibility of bans on disposal of transport packaging and to advance disposal fees for transport packaging. The OEA will also monitor the development of transport packaging take-back schemes, both abroad and in the United States, to see whether these policies would be effective to reduce packaging discards in Minnesota.

Policy options to reduce toxicity in packaging

As part of the *Report on Packaging Discards — 1996*, the OEA examined several policy options to reduce the toxicity of packaging.

No state government action

Under this scenario, the state government would not pursue further activities to reduce the toxicity of packaging beyond what is currently in place. It is assumed that compliance with the CONEG standards is high. No action would be taken to expand the number of metals in the CONEG toxics in packaging standards.

Testing for compliance with toxics in packaging legislation

The state government would initiate a product testing program to monitor compliance with the toxics-in-packaging law. Such a testing program would be conducted by the Minnesota Pollution Control Agency, which would select several packaging products for compliance.

New York has developed a toxics-in-packaging testing program and discovered that several companies were not in compliance. Minnesota would adopt the New York testing protocol and coordinate efforts with New York to reduce duplication.

Expand number of heavy metals addressed in packaging legislation

Under this option, the state government would expand the toxics in packaging legislation to address other toxic heavy metals sometimes present in packaging.

OEA recommendation

The MPCA, with support from the OEA, recommends that the state initiate a program to test for compliance with the toxics-in-packaging legislation. The MPCA estimates a testing program could be implemented at a cost of $50,000 to $100,000.

Statistical Principles

Source: Packaging Composition Study for the Minnesota Office of Environmental Assistance -- 1994 Annual Report. Prepared for the Minnesota OEA by R.W. Beck.

Statistical Principles for Use in Applying the Solid Waste Composition Studies

Due to the variability of solid waste materials, estimates of solid waste composition are only approximate in nature. Similar to the methods used by statisticians in obtaining opinion polls, the technique uses limited samples of solid waste to describe the characteristics of the entire "population." It would be desirable to poll each individual in a country to determine exact numbers on views or opinions. But a representative sampling method must be used instead because of the very great expense in polling every person.

The same principle applies to solid waste composition. Since the entire quantity of solid waste being generated cannot be economically measured or characterized, representative samples must be obtained and these samples must be analyzed to estimate the composition of the entire waste stream.

Sampling methods for characterizing solid waste have evolved to a significant degree since the early 1970s. Now, we feel confident that we are using mathematically advanced, yet practical and economically viable techniques to characterize solid waste.

The terms which are most commonly used to characterize solid waste (and terms used in the solid waste composition analyses), are the "mean," the "confidence interval" and the related "level of confidence". The mean is simply the mathematical average. The confidence interval and level of confidence require a bit more explanation.

The confidence interval is an expression of statistical accuracy. It provides the upper and lower limits of the "actual" mean based on the sampled mean and variance of the observed sampled data. For example, a sample mean for newspaper may be 5 percent for a certain generator, with a confidence interval of 4 percent to 6 percent. This implies that the true population mean for paper is between 4 percent and 6 percent.

Given the limited sample size used in calculating the mean, it is also important to know how much faith we have that the true mean does fall within the 4 percent to 6 percent range. The term used to quantify the amount of faith we have in the confidence interval is the "level of confidence," an expression of how certain we are that the true mean falls within the stated confidence interval. For example, if the level of confidence is 90 percent, we are 90 percent certain that the true mean is within the stated confidence interval. Combining the terms confidence interval and level of confidence, we use the phrase "90-percent confidence interval." Applying this term to the previous example, we would be 90 percent certain that the true mean would fall within the 4 percent to 6 percent range.

We could calculate an 80 percent, or 95 percent, or any other level of confidence, but the 90-percent level of confidence has been accepted as the normal practice in solid waste composition studies. However, the level of confidence and confidence interval have an inverse relationship. For example, for an 80-percent level of confidence, the confidence interval will be smaller than if the level of confidence were 90-percent. And for a 95-percent level of confidence, the confidence interval will be wider than for a 90-percent level of confidence.

In general, the more samples that are sorted, the narrower the confidence interval becomes for a given level of confidence. Again using the example from above, let's assume that the 90 percent confidence intervals were originally calculated based on 25 samples. It may be that if we sort 40 samples instead, the 90 percent confidence interval would narrow to 4.5 percent to 5.5 percent, still with an associated mean of 5 percent. With more samples, we still have a 90 percent level of confidence, but the statistical accuracy is improving.

Appendix A:

Detailed 1995 Packaging Discard Data

STATEWIDE PACKAGING COMPOSITION RESULTS FOR 1995
Combined Generator Type

Sample Size = 562 loads Total Weight Sorted = 126,822 pounds Average Weight Sorted per Sample = 226 pounds

Solid Waste Category	Mean Percentage	90% Confidence Interval Lower	Upper
TOTAL PAPER	**16.5%**	**15.6%**	**17.4%**
Uncoated Corrugated Boxes	9.1%	8.5%	9.8%
Coated Corrugated Boxes	0.6%	0.5%	0.7%
Uncoated Boxboard Containers	2.8%	2.6%	3.0%
Coated Boxboard Containers	1.2%	1.1%	1.3%
Other Paper Packaging	2.5%	2.3%	2.8%
Envelopes	0.3%	0.3%	0.3%
TOTAL PLASTIC PACKAGING	**8.5%**	**8.0%**	**9.0%**
PET	0.3%	0.3%	0.4%
HDPE	1.0%	0.9%	1.1%
Polystyrene Containers	0.7%	0.7%	0.8%
Polystyrene Packaging	0.1%	0.1%	0.1%
Plastic Pallet Wrap	0.6%	0.5%	0.7%
Other Plastic Film	4.3%	4.0%	4.5%
Other Plastic Packaging	1.5%	1.4%	1.6%
TOTAL GLASS	**1.8%**	**1.6%**	**1.9%**
Clear Containers	1.2%	1.1%	1.3%
Brown (amber)Containers	0.3%	0.3%	0.3%
Green Containers	0.3%	0.2%	0.3%
TOTAL METAL	**2.1%**	**1.9%**	**2.2%**
Aluminum Beverage Containers	0.5%	0.4%	0.5%
Aluminum Foil	0.1%	0.1%	0.1%
Other Aluminum Containers	0.1%	0.1%	0.1%
Steel Beverage Containers	0.0%	0.0%	0.0%
Other Ferrous Food Containers	0.9%	0.8%	1.0%
Other Metal Packaging	0.4%	0.4%	0.5%
OTHER PACKAGING	**2.7%**	**2.3%**	**3.2%**
Wooden Pallets and Crates	2.3%	1.9%	2.7%
Other Wooden Packaging	0.5%	0.4%	0.5%
HOUSEHOLD HAZARDOUS MATERIALS	**0.6%**	**0.5%**	**0.6%**
Non-Empty Aerosol Containers	**0.1%**	**0.0%**	**0.1%**
Paints	0.0%	0.0%	0.0%
Solvents and Other Flammables	0.0%	0.0%	0.0%
Pesticides, Herbicides, Fungicides	0.0%	0.0%	0.0%
Household Cleaners	0.0%	0.0%	0.0%
Automotive Products	0.0%	0.0%	0.0%
Miscellaneous	0.0%	0.0%	0.0%
Non-Empty Non-Aerosol Containers	**0.2%**	**0.2%**	**0.3%**
Paints	0.1%	0.0%	0.1%
Solvents and Other Flammables	0.0%	0.0%	0.0%
Pesticides, Herbicides, Fungicides	0.0%	0.0%	0.0%
Household Cleaners	0.0%	0.0%	0.1%
Automotive Products	0.0%	0.0%	0.0%
Miscellaneous	0.1%	0.0%	0.1%
Empty Aerosol Containers	**0.1%**	**0.1%**	**0.1%**
Empty Non-Aerosol Containers	**0.2%**	**0.2%**	**0.2%**
PROBLEM MATERIALS	**0.9%**	**0.8%**	**1.1%**
Batteries	**0.1%**	**0.1%**	**0.1%**
Rechargeable	0.0%	0.0%	0.0%
Non-rechargeable	0.1%	0.1%	0.1%
Automotive Lead Acid	0.0%	0.0%	0.0%
Light Bulbs	**0.1%**	**0.0%**	**0.1%**
Fluorescent	0.0%	0.0%	0.0%
Incandescent	0.0%	0.0%	0.0%
HID	0.0%	0.0%	0.0%
Electronic Appliances	**0.8%**	**0.7%**	**0.9%**
TV/Computer Monitors	0.1%	0.1%	0.1%
TV/Computer Components	0.0%	0.0%	0.0%
Other Electronic Appliance Components	0.7%	0.6%	0.8%
Mercury Containing Devices	**0.0%**	**0.0%**	**0.0%**
Thermostats	0.0%	0.0%	0.0%
Silent Light Switches	0.0%	0.0%	0.0%
ORGANIC MATERIALS	**18.1%**	**17.0%**	**19.3%**
Food Waste	9.0%	8.3%	9.8%
Yard Waste	2.4%	2.1%	2.7%
Disposable Diapers	2.5%	2.2%	2.8%
Wet and Soiled Paper	4.2%	3.9%	4.5%
OTHER MSW	**48.9%**	**47.1%**	**50.6%**
TOTAL PACKAGING	**32.1%**	**29.9%**	**34.4%**
TOTAL NON-PACKAGING	**67.9%**	**64.9%**	**71.0%**
GRAND TOTAL	**100.0%**		

STATEWIDE PACKAGING COMPOSITION RESULTS FOR 1995
Commercial Generator Type

Sample Size = 231 loads Total Weight Sorted = 52,808 pounds Average Weight Sorted per Sample = 229 pounds

Solid Waste Category	Mean Percentage	90% Confidence Interval Lower	Upper
TOTAL PAPER	**19.2%**	**17.2%**	**21.3%**
Uncoated Corrugated Boxes	12.0%	10.5%	13.5%
Coated Corrugated Boxes	1.1%	0.8%	1.4%
Uncoated Boxboard Containers	2.0%	1.7%	2.3%
Coated Boxboard Containers	1.1%	0.9%	1.2%
Other Paper Packaging	2.9%	2.4%	3.4%
Envelopes	0.3%	0.2%	0.4%
TOTAL PLASTIC PACKAGING	**9.9%**	**8.9%**	**11.0%**
PET	0.3%	0.2%	0.3%
HDPE	1.2%	0.9%	1.4%
Polystyrene Containers	0.7%	0.6%	0.8%
Polystyrene Packaging	0.1%	0.1%	0.1%
Plastic Pallet Wrap	1.2%	0.9%	1.5%
Other Plastic Film	5.0%	4.4%	5.7%
Other Plastic Packaging	1.4%	1.2%	1.7%
TOTAL GLASS	**1.3%**	**1.1%**	**1.6%**
Clear Containers	0.9%	0.7%	1.0%
Brown (amber)Containers	0.3%	0.2%	0.3%
Green Containers	0.2%	0.2%	0.3%
TOTAL METAL	**2.1%**	**1.8%**	**2.4%**
Aluminum Beverage Containers	0.4%	0.4%	0.5%
Aluminum Foil	0.1%	0.1%	0.1%
Other Aluminum Containers	0.1%	0.1%	0.1%
Steel Beverage Containers	0.0%	0.0%	0.0%
Other Ferrous Food Containers	0.9%	0.7%	1.1%
Other Metal Packaging	0.6%	0.5%	0.7%
OTHER PACKAGING	**5.0%**	**3.8%**	**6.3%**
Wooden Pallets and Crates	4.2%	3.1%	5.3%
Other Wooden Packaging	0.8%	0.6%	1.0%
HOUSEHOLD HAZARDOUS MATERIALS	**0.6%**	**0.4%**	**0.7%**
Non-Empty Aerosol Containers	**0.0%**	**0.0%**	**0.0%**
Paints	0.0%	0.0%	0.0%
Solvents and Other Flammables	0.0%	0.0%	0.0%
Pesticides, Herbicides, Fungicides	0.0%	0.0%	0.0%
Household Cleaners	0.0%	0.0%	0.0%
Automotive Products	0.0%	0.0%	0.0%
Miscellaneous	0.0%	0.0%	0.0%
Non-Empty Non-Aerosol Containers	**0.3%**	**0.2%**	**0.4%**
Paints	0.1%	0.1%	0.1%
Solvents and Other Flammables	0.0%	0.0%	0.1%
Pesticides, Herbicides, Fungicides	0.0%	0.0%	0.0%
Household Cleaners	0.1%	0.0%	0.1%
Automotive Products	0.0%	0.0%	0.0%
Miscellaneous	0.1%	0.1%	0.1%
Empty Aerosol Containers	**0.1%**	**0.0%**	**0.1%**
Empty Non-Aerosol Containers	**0.2%**	**0.1%**	**0.2%**
PROBLEM MATERIALS	**0.8%**	**0.6%**	**1.0%**
Batteries	**0.1%**	**0.0%**	**0.1%**
Rechargeable	0.0%	0.0%	0.0%
Non-rechargeable	0.0%	0.0%	0.1%
Automotive Lead Acid	0.0%	0.0%	0.0%
Light Bulbs	**0.0%**	**0.0%**	**0.1%**
Fluorescent	0.0%	0.0%	0.0%
Incandescent	0.0%	0.0%	0.0%
HID	0.0%	0.0%	0.0%
Electronic Appliances	**0.7%**	**0.5%**	**0.9%**
TV/Computer Monitors	0.1%	0.1%	0.1%
TV/Computer Components	0.1%	0.0%	0.1%
Other Electronic Appliance Components	0.5%	0.4%	0.7%
Mercury Containing Devices	**0.0%**	**0.0%**	**0.0%**
Thermostats	0.0%	0.0%	0.0%
Silent Light Switches	0.0%	0.0%	0.0%
ORGANIC MATERIALS	**13.7%**	**12.0%**	**15.6%**
Food Waste	7.6%	6.4%	8.8%
Yard Waste	0.9%	0.7%	1.2%
Disposable Diapers	1.3%	1.0%	1.6%
Wet and Soiled Paper	4.0%	3.4%	4.5%
OTHER MSW	**47.4%**	**43.9%**	**51.0%**
TOTAL PACKAGING	**38.1%**	**33.3%**	**43.2%**
TOTAL NON-PACKAGING	**61.9%**	**56.5%**	**67.5%**
GRAND TOTAL	**100.0%**		

STATEWIDE PACKAGING COMPOSITION RESULTS FOR 1995
Residential Generator Type

Sample Size = 189 loads Total Weight Sorted = 41,980 pounds Average Weight Sorted per Sample = 222 pounds

	Mean Percentage	90% Confidence Interval Lower	Upper
TOTAL PAPER	**14.1%**	**13.3%**	**14.9%**
Uncoated Corrugated Boxes	6.5%	5.9%	7.0%
Coated Corrugated Boxes	0.2%	0.1%	0.2%
Uncoated Boxboard Containers	3.9%	3.7%	4.2%
Coated Boxboard Containers	1.3%	1.2%	1.5%
Other Paper Packaging	1.9%	1.7%	2.1%
Envelopes	0.3%	0.2%	0.3%
TOTAL PLASTIC PACKAGING	**6.9%**	**6.5%**	**7.3%**
PET	0.5%	0.4%	0.5%
HDPE	0.7%	0.6%	0.7%
Polystyrene Containers	0.7%	0.6%	0.8%
Polystyrene Packaging	0.1%	0.1%	0.1%
Plastic Pallet Wrap	0.1%	0.1%	0.1%
Other Plastic Film	3.4%	3.1%	3.6%
Other Plastic Packaging	1.6%	1.4%	1.7%
TOTAL GLASS	**2.3%**	**2.0%**	**2.6%**
Clear Containers	1.6%	1.4%	1.8%
Brown (amber)Containers	0.4%	0.3%	0.4%
Green Containers	0.3%	0.3%	0.4%
TOTAL METAL	**1.9%**	**1.8%**	**2.0%**
Aluminum Beverage Containers	0.5%	0.4%	0.5%
Aluminum Foil	0.2%	0.1%	0.2%
Other Aluminum Containers	0.1%	0.1%	0.1%
Steel Beverage Containers	0.0%	0.0%	0.0%
Other Ferrous Food Containers	0.9%	0.8%	1.0%
Other Metal Packaging	0.3%	0.2%	0.3%
OTHER PACKAGING	**0.0%**	**0.0%**	**0.1%**
Wooden Pallets and Crates	0.0%	0.0%	0.0%
Other Wooden Packaging	0.0%	0.0%	0.0%
HOUSEHOLD HAZARDOUS MATERIALS	**0.5%**	**0.5%**	**0.6%**
Non-Empty Aerosol Containers	**0.1%**	**0.0%**	**0.1%**
Paints	0.0%	0.0%	0.0%
Solvents and Other Flammables	0.0%	0.0%	0.0%
Pesticides, Herbicides, Fungicides	0.0%	0.0%	0.0%
Household Cleaners	0.0%	0.0%	0.0%
Automotive Products	0.0%	0.0%	0.0%
Miscellaneous	0.0%	0.0%	0.0%
Non-Empty Non-Aerosol Containers	**0.2%**	**0.1%**	**0.2%**
Paints	0.1%	0.1%	0.1%
Solvents and Other Flammables	0.0%	0.0%	0.0%
Pesticides, Herbicides, Fungicides	0.0%	0.0%	0.0%
Household Cleaners	0.0%	0.0%	0.0%
Automotive Products	0.0%	0.0%	0.1%
Miscellaneous	0.0%	0.0%	0.0%
Empty Aerosol Containers	**0.2%**	**0.1%**	**0.2%**
Empty Non-Aerosol Containers	**0.1%**	**0.1%**	**0.2%**
PROBLEM MATERIALS	**1.0%**	**0.8%**	**1.2%**
Batteries	**0.1%**	**0.1%**	**0.1%**
Rechargeable	0.0%	0.0%	0.0%
Non-rechargeable	0.1%	0.1%	0.1%
Automotive Lead Acid	0.0%	0.0%	0.0%
Light Bulbs	**0.1%**	**0.0%**	**0.1%**
Fluorescent	0.0%	0.0%	0.0%
Incandescent	0.1%	0.0%	0.1%
HID	0.0%	0.0%	0.0%
Electronic Appliances	**0.8%**	**0.6%**	**1.0%**
TV/Computer Monitors	0.1%	0.1%	0.1%
TV/Computer Components	0.0%	0.0%	0.0%
Other Electronic Appliance Components	0.7%	0.6%	0.9%
Mercury Containing Devices	**0.0%**	**0.0%**	**0.0%**
Thermostats	0.0%	0.0%	0.0%
Silent Light Switches	0.0%	0.0%	0.0%
ORGANIC MATERIALS	**22.9%**	**21.4%**	**24.4%**
Food Waste	11.0%	10.1%	12.0%
Yard Waste	4.2%	3.4%	5.1%
Disposable Diapers	3.3%	2.8%	3.7%
Wet and Soiled Paper	4.4%	4.1%	4.7%
OTHER MSW	**50.4%**	**48.4%**	**52.3%**
TOTAL PACKAGING	**25.8%**	**24.1%**	**27.5%**
TOTAL NON-PACKAGING	**74.2%**	**70.6%**	**77.9%**
GRAND TOTAL	**100.0%**		

Appendix B:

Detailed Packaging Discard Data

1992-1995

ANNUAL COMPARISON OF PACKAGING COMPOSITION RESULTS: METROPOLITAN AREA

Commercial Generator Type (Mean Percentages by Weight)

Solid Waste Category	1992 Base Year Data (2)		1993 Composition (2)		1994 Composition (3)		1995 Composition (5)	
TOTAL PAPER	**13.4%**		**19.4%**		**16.8%**		20.0%	
Uncoated Corrugated Boxes		7.4%		10.4%		12.3%		12.8%
Coated Corrugated Boxes		0.2%		1.4%		0.0%		0.9%
Uncoated Boxboard Containers		2.1%		3.4%		1.8%		2.2%
Coated Boxboard Containers		1.0%		0.9%		0.5%		0.7%
Other Paper Packaging		2.2%		3.0%		2.0%		2.9%
Envelopes		0.5%		0.4%		0.2%		0.4%
TOTAL PLASTIC PACKAGING	**9.3%**		**7.6%**		**6.6%**		7.3%	
PET		0.2%		0.2%		0.2%		0.2%
HDPE		0.5%		0.7%		0.6%		1.0%
Polystyrene Containers		0.9%		0.5%		0.3%		0.7%
Polystyrene Packing		0.3%		0.1%		0.3%		0.1%
Plastic Pallet Wrap		0.5%		0.3%		0.4%		0.5%
Other Plastic Film		3.6%		3.9%		3.1%		3.3%
Other Plastic Packaging		3.3%		0.2%		1.6%		1.5%
TOTAL GLASS	**1.5%**		**1.6%**		**1.5%**		1.5%	
Clear Containers		0.9%		1.2%		0.9%		1.1%
Brown (amber) Containers		0.3%		0.2%		0.4%		0.3%
Green Containers		0.3%		0.3%		0.2%		0.2%
TOTAL METALS	**2.6%**		**1.5%**		**1.2%**		2.1%	
Aluminum Beverage Containers		0.5%		0.4%		0.4%		0.5%
Aluminum Foil		0.0%		0.1%		0.0%		0.1%
Other Aluminum Containers		0.3%		0.0%		0.0%		0.1%
Steel Beverage Containers		0.1%		0.0%		0.0%		0.0%
Ferrous Food Containers		0.6%		0.4%		0.3%		0.7%
Other Metal Packaging		1.1%		0.6%		0.4%		0.8%
TOTAL OTHER	**6.6%**		**3.4%**		**10.0%**		6.8%	
Wooden Pallets and Crates		3.3%		3.1%		8.1%		5.9%
Other Wooden Packaging		3.3%		0.3%		1.9%		1.0%
TOTAL HOUSEHOLD HAZARDOUS WASTE	**0.7%**		**0.4%**		**0.1%**		0.6%	
Non-Empty Aerosol Containers (4)	**0.1%**		**0.1%**		**0.0%**		0.0%	
Paints								0.0%
Solvents and Other Flammables								0.0%
Pesticides, Herbicides, Fungicides								0.0%
Household Cleaners								0.0%
Automotive Products								0.0%
Miscellaneous								0.0%
Non-Empty Non-Aerosol Containers (4)	**0.3%**		**0.2%**		**0.0%**		0.4%	
Paints								0.1%
Solvents and Other Flammables								0.1%
Pesticides, Herbicides, Fungicides								0.0%
Household Cleaners								0.1%
Automotive Products								0.0%
Miscellaneous								0.2%
Empty Aerosol Containers	**0.0%**		**0.0%**		**0.0%**		**0.0%**	
Empty Non-Aerosol Containers	**0.3%**		**0.1%**		**0.0%**		**0.1%**	
TOTAL PROBLEM MATERIALS							**0.6%**	
Batteries							**0.1%**	
Rechargeable								0.0%
Non-rechargeable								0.0%
Automotive Lead Acid								0.0%
Light Bulbs							**0.0%**	
Florescent								0.0%
Incandescent								0.0%
HID								0.0%
Electronic Appliances							**0.5%**	
TV Computer Monitors								0.0%
TV/Computer Components								0.1%
Other Electronic Appliance Components								0.3%
Mercury Containing Devices							**0.0%**	
Thermostats								0.0%
Silent Light Switches								0.0%
OTHER ORGANIC MATERIALS							**12.8%**	
Food Waste								6.5%
Yard Waste								1.0%
Disposable Diapers								1.5%
Wet and Soiled Paper								3.9%
OTHER MSW							**48.2%**	
TOTAL PACKAGING	**34.1%**		**33.9%**		**36.2%**		**38.3%**	
OTHER NON-PACKAGING	**65.9%**		**66.1%**		**63.8%**		**61.7%**	
TOTALS	**100.0%**		**100.0%**		**100.0%**		**100.0%**	

(1) From Solid Waste Composition Study conducted at the BPTS by MPCA in 1992. The solid waste categories have been modified to correspond to those in the Packaging Study and the percentage composition by weight for each material has been redistributed to conform with the Packaging Study material definitions.

(2) Sort results based upon the results from the 1993 sorts conducted by R. W. Beck at the Brooklyn Park Transfer Station.

(3) Sort results based upon the results from the 1994 sorts conducted by R. W. Beck at the Brooklyn Park Transfer Station.

(4) Weights may include contents as well as container weights; contents not removed to obtain net weights for safety reasons.

(5) Sort results based upon the aggregate of the results from the 1995 sorts conducted by R. W. Beck at the Brooklyn Park Transfer Station.

ANNUAL COMPARISON OF PACKAGING COMPOSITION RESULTS: METROPOLITAN AREA

Residential Generator Type (Mean Percentages by Weight)

Solid Waste Category	1992 Base Year Data (1)		1993 Composition (2)		1994 Composition (3)		1995 Composition (5)	
TOTAL PAPER	**12.0%**		**11.7%**		**12.8%**		**14.0%**	
Uncoated Corrugated Boxes		6.0%		5.1%		6.6%		6.8%
Coated Corrugated Boxes		0.1%		0.4%		0.1%		0.2%
Uncoated Boxboard Containers		2.2%		3.3%		3.9%		3.8%
Coated Boxboard Containers		1.0%		1.2%		1.0%		1.2%
Other Paper Packaging		2.2%		1.2%		1.2%		1.7%
Envelopes		0.5%		0.4%		0.1%		0.3%
TOTAL PLASTIC PACKAGING	**6.1%**		**5.2%**		**5.5%**		**6.1%**	
PET		0.3%		0.2%		0.3%		0.4%
HDPE		0.7%		0.6%		0.8%		0.7%
Polystyrene Containers		0.6%		0.4%		0.4%		0.6%
Polystyrene Packing		0.2%		0.1%		0.2%		0.1%
Plastic Pallet Wrap		0.4%		0.2%		0.0%		0.0%
Other Plastic Film		2.9%		2.7%		2.6%		2.8%
Other Plastic Packaging		1.0%		1.1%		1.2%		1.5%
TOTAL GLASS	**2.2%**		**1.6%**		**1.8%**		**2.3%**	
Clear Containers		1.5%		1.3%		1.3%		1.6%
Brown (amber) Containers		3.3%		0.2%		0.3%		0.4%
Green Containers		0.4%		0.2%		0.2%		0.3%
TOTAL METALS	**3.1%**		**1.8%**		**1.6%**		**1.8%**	
Aluminum Beverage Containers		0.5%		0.4%		0.4%		0.5%
Aluminum Foil		0.0%		0.1%		0.1%		0.2%
Other Aluminum Containers		0.3%		0.1%		0.1%		0.1%
Steel Beverage Containers		0.1%		0.2%		0.0%		0.0%
Ferrous Food Containers		1.0%		0.6%		0.6%		0.8%
Other Metal Packaging		1.2%		0.4%		0.4%		0.3%
TOTAL OTHER	**1.6%**		**0.1%**		**0.1%**		**0.1%**	
Wooden Pallets and Crates		0.8%		0.0%		0.1%		0.0%
Other Wooden Packaging		0.8%		0.1%		0.0%		0.1%
TOTAL HOUSEHOLD HAZARDOUS WASTE	**0.7%**		**0.3%**		**0.3%**		**0.5%**	
Non-Empty Aerosol Containers (4)	**0.1%**		**0.0%**		**0.0%**		**0.1%**	
Paints								0.0%
Solvents and Other Flammables								0.0%
Pesticides, Herbicides, Fungicides								0.0%
Household Cleaners								0.0%
Automotive Products								0.0%
Miscellaneous								0.0%
Non-Empty Non-Aerosol Containers (4)	**0.3%**		**0.1%**		**0.1%**		**0.2%**	
Paints								0.1%
Solvents and Other Flammables								0.0%
Pesticides, Herbicides, Fungicides								0.0%
Household Cleaners								0.0%
Automotive Products								0.0%
Miscellaneous								0.0%
Empty Aerosol Containers	**0.0%**		**0.1%**		**0.1%**		**0.2%**	
Empty Non-Aerosol Containers	**0.3%**		**0.1%**		**0.0%**		**0.1%**	
TOTAL PROBLEM MATERIALS							**1.2%**	
Batteries							**0.1%**	
Rechargeable								0.0%
Non-rechargeable								0.1%
Automotive Lead Acid								0.0%
Light Bulbs							**0.1%**	
Florescent								0.0%
Incandescent								0.1%
HID								0.0%
Electronic Appliances							**1.0%**	
TV Computer Monitors								0.2%
TV/Computer Components								0.0%
Other Electronic Appliance Components								0.9%
Mercury Containing Devices							**0.0%**	
Thermostats								0.0%
Silent Light Switches								0.0%
OTHER ORGANIC MATERIALS							**21.8%**	
Food Waste								10.5%
Yard Waste								4.4%
Disposable Diapers								3.0%
Wet and Soiled Paper								3.9%
OTHER MSW							**52.4%**	
TOTAL PACKAGING	**25.7%**		**20.7%**		**22.0%**		**24.7%**	
OTHER NON-PACKAGING	**74.3%**		**79.3%**		**78.0%**		**75.3%**	
TOTALS	**100.0%**		**100.0%**		**100.0%**		**100.0%**	

(1) From Solid Waste Composition Study conducted at the BPTS by MPCA in 1992. The solid waste categories have been modified to correspond to those in the Packaging Study and the percentage composition by weight for each material has been redistributed to conform with the Packaging Study material definitions.

(2) Sort results based upon the results from the 1993 sorts conducted by R. W. Beck at the Brooklyn Park Transfer Station.

(3) Sort results based upon the results from the 1994 sorts conducted by R. W. Beck at the Brooklyn Park Transfer Station.

(4) Weights may include contents as well as container weights; contents not removed to obtain net weights for safety reasons.

(5) Sort results based upon the aggregate of the results from the 1995 sorts conducted by R. W. Beck at the Brooklyn Park Transfer Station.

PACKAGING COMPOSITION RESULTS FOR 1995: METROPOLITAN AREA VS. GREATER MINNESOTA

Combined Generator Types (Mean Percentages by Weight)

Solid Waste Category	Metropolitan Area 1995 (1) (3)			Greater Minnesota : 1995 (1)(4)		
	Mean Percentages	90% Confidence Intervals Lower	Upper	Mean Percentages	90% Confidence Intervals Lower	Upper
TOTAL PAPER	**16.0%**	**14.7%**	**17.3%**	**17.0%**	**15.0%**	**19.2%**
Uncoated Corrugated Boxes	9.2%	8.3%	10.1%	9.1%	8.0%	10.3%
Coated Corrugated Boxes	0.5%	0.4%	0.6%	0.7%	0.5%	0.8%
Uncoated Boxboard Containers	2.9%	2.6%	3.2%	2.6%	2.3%	3.0%
Coated Boxboard Containers	1.0%	0.9%	1.1%	1.4%	1.2%	1.6%
Other Paper Packaging	2.1%	1.8%	2.5%	3.0%	2.6%	3.4%
Envelopes	0.3%	0.3%	0.4%	0.2%	0.2%	0.3%
TOTAL PLASTIC PACKAGING	**7.1%**	**6.5%**	**7.6%**	**10.2%**	**8.8%**	**11.5%**
PET	0.3%	0.3%	0.4%	0.4%	0.3%	0.4%
HDPE	0.9%	0.8%	1.1%	1.1%	0.9%	1.2%
Polystyrene Containers	0.7%	0.6%	0.8%	0.7%	0.6%	0.9%
Polystyrene Packing	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%
Plastic Pallet Wrap	0.3%	0.2%	0.3%	1.0%	0.8%	1.2%
Other Plastic Film	3.3%	3.0%	3.6%	5.4%	4.7%	6.1%
Other Plastic Packaging	1.5%	1.3%	1.6%	1.5%	1.3%	1.7%
TOTAL GLASS	**2.0%**	**1.8%**	**2.2%**	**1.5%**	**1.3%**	**1.7%**
Clear Containers	1.4%	1.2%	1.6%	1.0%	0.9%	1.1%
Brown (amber) Containers	0.3%	0.3%	0.4%	0.3%	0.2%	0.3%
Green Containers	0.3%	0.2%	0.3%	0.3%	0.2%	0.3%
TOTAL METALS	**2.0%**	**1.8%**	**2.1%**	**2.2%**	**1.9%**	**2.5%**
Aluminum Beverage Containers	0.6%	0.5%	0.6%	0.4%	0.3%	0.4%
Aluminum Foil	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%
Other Aluminum Containers	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%
Steel Beverage Containers	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Ferrous Food Containers	0.8%	0.7%	0.9%	1.1%	1.0%	1.3%
Other Metal Packaging	0.5%	0.4%	0.5%	0.4%	0.3%	0.4%
TOTAL OTHER PACKAGING	**3.6%**	**2.7%**	**4.5%**	**1.8%**	**1.5%**	**2.1%**
Wooden Pallets and Crates	3.0%	2.3%	3.8%	1.5%	1.2%	1.8%
Other Wooden Packaging	0.6%	0.5%	0.7%	0.3%	0.3%	0.4%
TOTAL HOUSEHOLD HAZARDOUS WASTE	**0.5%**	**0.4%**	**0.6%**	**0.6%**	**0.6%**	**0.7%**
Non-Empty Aerosol Containers (2)	**0.0%**	**0.0%**	**0.1%**	**0.1%**	**0.0%**	**0.1%**
Paints	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Solvents and Other Flammables	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Pesticides, Herbicides, Fungicides	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Household Cleaners	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Automotive Products	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Miscellaneous	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Non-Empty Non-Aerosol Containers (2)	**0.3%**	**0.2%**	**0.3%**	**0.2%**	**0.1%**	**0.2%**
Paints	0.1%	0.1%	0.1%	0.0%	0.0%	0.0%
Solvents and Other Flammables	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Pesticides, Herbicides, Fungicides	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Household Cleaners	0.1%	0.0%	0.1%	0.0%	0.0%	0.0%
Automotive Products	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%
Miscellaneous	0.1%	0.0%	0.1%	0.0%	0.0%	0.0%
Empty Aerosol Containers	**0.1%**	**0.1%**	**0.1%**	**0.1%**	**0.1%**	**0.1%**
Empty Non-Aerosol Containers	**0.1%**	**0.1%**	**0.1%**	**0.3%**	**0.3%**	**0.4%**
TOTAL PROBLEM MATERIALS	**0.9%**	**0.8%**	**1.1%**	**0.9%**	**0.8%**	**1.1%**
Batteries	**0.1%**	**0.1%**	**0.1%**	**0.1%**	**0.1%**	**0.1%**
Rechargeable	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Non-rechargeable	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%
Automotive Lead Acid	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Light Bulbs	**0.1%**	**0.0%**	**0.1%**	**0.0%**	**0.0%**	**0.0%**
Florescent	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Incandescent	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
HID	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Electronic Appliances	**0.8%**	**0.6%**	**1.0%**	**0.8%**	**0.6%**	**0.9%**
TV Computer Monitors	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%
TV/Computer Components	0.1%	0.0%	0.1%	0.0%	0.0%	0.0%
Other Electronic Appliance Components	0.7%	0.5%	0.8%	0.7%	0.6%	0.8%
Mercury Containing Devices	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**
Thermostats	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Silent Light Switches	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
OTHER ORGANIC MATERIALS	**17.8%**	**16.4%**	**19.4%**	**18.4%**	**16.2%**	**20.7%**
Food Waste	8.6%	7.7%	9.5%	9.5%	8.3%	10.8%
Yard Waste	2.7%	2.2%	3.2%	2.0%	1.6%	2.4%
Disposable Diapers	2.5%	2.1%	2.8%	2.5%	2.2%	2.9%
Wet and Soiled Paper	4.1%	3.7%	4.5%	4.4%	3.8%	5.0%
OTHER MSW	**50.2%**	**47.9%**	**52.4%**	**47.4%**	**42.3%**	**52.5%**
TOTAL PACKAGING	**31.1%**	**28.0%**	**34.3%**	**33.3%**	**29.0%**	**37.8%**
OTHER NON-PACKAGING	**68.9%**	**65.0%**	**72.9%**	**66.7%**	**59.2%**	**74.3%**
TOTALS	**100.0%**			**100.0%**		

(1) Represents the annual waste composition based upon samples of a minimum of 200 lbs. each.

(2) Weights may include contents as well as container weights; contents not removed to obtain net weights for safety purposes.

(3) Seasonal sorts conducted at the Brooklyn Park Transfer Station, Newport Resource Recovery Facility and Brooklyn Park Transfer Station.

(4) Seasonal sorts conducted at the Lyon County Regional Landfill, Carlton County Transfer Station and the Olmsted WTE.

ANNUAL COMPARISON OF PACKAGING COMPOSITION RESULTS: BROOKLYN PARK TRANSFER STATION

Combined Generator Types (Mean Percentages by Weight)

Solid Waste Category	1993 Composition (1)	1994 Composition (1)	1995 Composition (1)
TOTAL PAPER	**15.9%**	**14.3%**	**15.9%**
Uncoated Corrugated Boxes	8.0%	8.7%	8.5%
Coated Corrugated Boxes	0.9%	0.1%	0.1%
Uncoated Boxboard Containers	3.4%	3.2%	3.3%
Coated Boxboard Containers	1.1%	0.8%	1.1%
Other Paper Packaging	2.2%	1.4%	2.6%
Envelopes	0.4%	0.1%	0.3%
TOTAL PLASTIC PACKAGING	**6.6%**	**5.7%**	**6.3%**
PET	0.2%	0.3%	0.3%
HDPE	0.8%	0.7%	0.4%
Polystyrene Containers	0.5%	0.4%	0.5%
Polystyrene Packing	0.1%	0.2%	0.1%
Plastic Pallet Wrap	0.2%	0.2%	0.4%
Other Plastic Film	3.3%	2.7%	2.8%
Other Plastic Packaging	1.5%	1.3%	1.8%
TOTAL GLASS	**1.7%**	**1.7%**	**1.8%**
Clear Containers	1.3%	1.1%	1.2%
Brown (amber) Containers	0.2%	0.3%	0.3%
Green Containers	0.2%	0.2%	0.3%
TOTAL METALS	**1.6%**	**1.5%**	**1.6%**
Aluminum Beverage Containers	0.4%	0.4%	0.5%
Aluminum Foil	0.1%	0.1%	0.1%
Other Aluminum Containers	0.0%	0.1%	0.1%
Steel Beverage Containers	0.1%	0.0%	0.0%
Ferrous Food Containers	0.5%	0.5%	0.6%
Other Metal Packaging	0.5%	0.5%	0.4%
TOTAL OTHER	**2.0%**	**3.7%**	**3.8%**
Wooden Pallets and Crates	1.7%	3.1%	2.8%
Other Wooden Packaging	0.3%	0.6%	1.0%
TOTAL HOUSEHOLD HAZARDOUS WASTE (3)	**0.3%**	**0.2%**	**0.3%**
Non-Empty Aerosol Containers (2)	**0.0%**	**0.0%**	**0.1%**
Paints			0.0%
Solvents and Other Flammables			0.0%
Pesticides, Herbicides, Fungicides			0.0%
Household Cleaners			0.0%
Automotive Products			0.0%
Miscellaneous			0.0%
Non-Empty Non-Aerosol Containers (2)	**0.1%**	**0.1%**	**0.1%**
Paints			0.1%
Solvents and Other Flammables			0.0%
Pesticides, Herbicides, Fungicides			0.0%
Household Cleaners			0.0%
Automotive Products			0.0%
Miscellaneous			0.0%
Empty Aerosol Containers	**0.1%**	**0.1%**	**0.1%**
Empty Non-Aerosol Containers	**0.0%**	**0.0%**	**0.1%**
TOTAL PROBLEM MATERIALS			**1.2%**
Batteries			**0.1%**
Rechargeable			0.0%
Non-rechargeable			0.1%
Automotive Lead Acid			0.0%
Light Bulbs			**0.0%**
Florescent			0.0%
Incandescent			0.0%
HID			0.0%
Electronic Appliances			**1.0%**
TV Computer Monitors			0.3%
TV/Computer Components			0.2%
Other Electronic Appliance Components			0.6%
Mercury Containing Devices			**0.0%**
Thermostats			0.0%
Silent Light Switches			0.0%
TOTAL ORGANIC MATERIALS			**17.5%**
Food Waste			9.0%
Yard Waste			1.5%
Disposable Diapers			2.9%
Wet and Soiled Paper			4.1%
TOTAL OTHER MSW			**51.7%**
TOTAL PACKAGING	**28.1%**	**26.9%**	**29.7%**
OTHER NON-PACKAGING	**71.9%**	**73.1%**	**70.3%**
TOTALS	**100.0%**	**100.0%**	**100.0%**

(1) Represents the annual waste composition based upon samples of a minimum of 200 lbs. each.

(2) Weights may include contents as well as container weights; contents not removed to obtain net weights for safety purposes.

(3) In 1995, the HHW category was divided into subcategories, the difference between 1993 and 1994, and 1995 is shaded.

PACKAGING COMPOSITION RESULTS: BROOKLYN PARK TRANSFER STATION

Commercial Generator Type (Mean Percentages by Weight)

Solid Waste Category	1992 Base Year Data (1)		1993 Composition (2)		1994 Composition (3)		1995 Composition (5)	
TOTAL PAPER	**13.4%**		**19.4%**		**16.8%**		**19.5%**	
Uncoated Corrugated Boxes		7.4%		10.4%		12.3%		10.6%
Coated Corrugated Boxes		0.2%		1.4%		0.0%		0.1%
Uncoated Boxboard Containers		2.1%		3.4%		1.8%		3.1%
Coated Boxboard Containers		1.0%		0.9%		0.5%		0.8%
Other Paper Packaging		2.2%		3.0%		2.0%		4.7%
Envelopes		0.5%		0.4%		0.2%		0.3%
TOTAL PLASTIC PACKAGING	**9.3%**		**7.6%**		**6.6%**		**6.8%**	
PET		0.2%		0.2%		0.2%		0.2%
HDPE		0.5%		0.7%		0.6%		0.3%
Polystyrene Containers		0.9%		0.5%		0.3%		0.5%
Polystyrene Packing		0.3%		0.1%		0.3%		0.1%
Plastic Pallet Wrap		0.5%		0.3%		0.4%		0.7%
Other Plastic Film		3.6%		3.9%		3.1%		2.9%
Other Plastic Packaging		3.3%		0.2%		1.6%		2.2%
TOTAL GLASS	**1.5%**		**1.6%**		**1.5%**		**1.2%**	
Clear Containers		0.9%		1.2%		0.9%		0.9%
Brown (amber) Containers		0.3%		0.2%		0.4%		0.2%
Green Containers		0.3%		0.3%		0.2%		0.2%
TOTAL METALS	**2.6%**		**1.5%**		**1.2%**		**1.4%**	
Aluminum Beverage Containers		0.5%		0.4%		0.4%		0.5%
Aluminum Foil		0.0%		0.1%		0.0%		0.1%
Other Aluminum Containers		0.3%		0.0%		0.0%		0.0%
Steel Beverage Containers		0.1%		0.0%		0.0%		0.0%
Ferrous Food Containers		0.6%		0.4%		0.3%		0.3%
Other Metal Packaging		1.1%		0.6%		0.4%		0.5%
TOTAL OTHER	6.6%		3.4%		10.0%		5.0%	
Wooden Pallets and Crates		3.3%		3.1%		8.1%		3.7%
Other Wooden Packaging		3.3%		0.3%		1.9%		1.3%
TOTAL HOUSEHOLD HAZARDOUS WASTE	**0.7%**		**0.4%**		**0.1%**		**0.2%**	
Non-Empty Aerosol Containers (4)	**0.0%**		**0.1%**		**0.0%**		**0.0%**	
Paints								0.0%
Solvents and Other Flammables								0.0%
Pesticides, Herbicides, Fungicides								0.0%
Household Cleaners								0.0%
Automotive Products								0.0%
Miscellaneous								0.0%
Non-Empty Non-Aerosol Containers (4)	**0.3%**		**0.2%**		**0.0%**		**0.1%**	
Paints								0.0%
Solvents and Other Flammables								0.0%
Pesticides, Herbicides, Fungicides								0.0%
Household Cleaners								0.0%
Automotive Products								0.0%
Miscellaneous								0.0%
Empty Aerosol Containers	**0.0%**		**0.0%**		**0.0%**		**0.0%**	
Empty Non-Aerosol Containers	**0.3%**		**0.1%**		**0.0%**		**0.1%**	
TOTAL PROBLEM MATERIALS							**1.0%**	
Batteries							**0.1%**	
Rechargeable								0.0%
Non-rechargeable								0.1%
Automotive Lead Acid								0.0%
Light Bulbs							**0.0%**	
Florescent								0.0%
Incandescent								0.0%
HID								0.0%
Electronic Appliances							**0.9%**	
TV Computer Monitors								0.1%
TV/Computer Components								0.4%
Other Electronic Appliance Components								0.3%
Mercury Containing Devices							**0.0%**	
Thermostats								0.0%
Silent Light Switches								0.0%
OTHER ORGANIC MATERIALS							**13.2%**	
Food Waste								7.5%
Yard Waste								0.0%
Disposable Diapers								2.1%
Wet and Soiled Paper								3.7%
OTHER MSW							**51.6%**	
TOTAL PACKAGING	**34.1%**		**33.9%**		**36.2%**		**34.2%**	
OTHER NON-PACKAGING	**65.9%**		**66.1%**		**63.8%**		**65.8%**	
TOTALS	**100.0%**		**100.0%**		**100.0%**		**100.0%**	

(1) From Solid Waste Composition Study conducted at the BPTS by MPCA in 1992. The solid waste categories have been modified to correspond to those in the Packaging Study and the percentage composition by weight for each material has been redistributed to conform with the Packaging Study material definitions.
(2) Sort results based upon the results from the 1993 sorts conducted by R. W. Beck at the Brooklyn Park Transfer Station.
(3) Sort results based upon the results from the 1994 sorts conducted by R. W. Beck at the Brooklyn Park Transfer Station.
(4) Weights may include contents as well as container weights; contents not removed to obtain net weights for safety reasons.
(5) Sort results based upon the aggregate of the results from the 1995 sorts conducted by R. W. Beck at the Brooklyn Park Transfer Station.

PACKAGING COMPOSITION RESULTS: BROOKLYN PARK TRANSFER STATION
Residential Generator Type (Mean Percentages by Weight)

Solid Waste Category	1992 Base Year Data (1)	1993 Composition (2)	1994 Composition (3)	1995 Composition (5)
TOTAL PAPER	**12.0%**	**11.7%**	**12.8%**	**14.7%**
Uncoated Corrugated Boxes	6.0%	5.1%	6.6%	7.5%
Coated Corrugated Boxes	0.1%	0.4%	0.1%	0.1%
Uncoated Boxboard Containers	2.2%	3.3%	3.9%	3.9%
Coated Boxboard Containers	1.0%	1.2%	1.0%	1.5%
Other Paper Packaging	2.2%	1.2%	1.2%	1.4%
Envelopes	0.5%	0.4%	0.1%	0.3%
TOTAL PLASTIC PACKAGING	**6.1%**	**5.2%**	**5.5%**	**6.0%**
PET	0.3%	0.2%	0.3%	0.4%
HDPE	0.7%	0.6%	0.8%	0.5%
Polystyrene Containers	0.6%	0.4%	0.4%	0.5%
Polystyrene Packing	0.2%	0.1%	0.2%	0.1%
Plastic Pallet Wrap	0.4%	0.2%	0.0%	0.0%
Other Plastic Film	2.9%	2.7%	2.6%	2.9%
Other Plastic Packaging	1.0%	1.1%	1.2%	1.6%
TOTAL GLASS	**2.2%**	**1.6%**	**1.8%**	**2.1%**
Clear Containers	1.5%	1.3%	1.3%	1.5%
Brown (amber) Containers	3.3%	0.2%	0.3%	0.3%
Green Containers	0.4%	0.2%	0.2%	0.3%
TOTAL METALS	**3.1%**	**1.8%**	**1.6%**	**1.8%**
Aluminum Beverage Containers	0.5%	0.4%	0.4%	0.5%
Aluminum Foil	0.0%	0.1%	0.1%	0.2%
Other Aluminum Containers	0.3%	0.1%	0.1%	0.1%
Steel Beverage Containers	0.1%	0.2%	0.0%	0.0%
Ferrous Food Containers	1.0%	0.6%	0.6%	0.7%
Other Metal Packaging	1.2%	0.4%	0.4%	0.4%
TOTAL OTHER	**1.6%**	**0.1%**	**0.1%**	**0.1%**
Wooden Pallets and Crates	0.8%	0.0%	0.1%	0.0%
Other Wooden Packaging	0.8%	0.1%	0.0%	0.1%
TOTAL HOUSEHOLD HAZARDOUS WASTE	**0.7%**	**0.3%**	**0.3%**	**0.5%**
Non-Empty Aerosol Containers (4)	**0.1%**	**0.0%**	**0.0%**	**0.1%**
Paints				0.0%
Solvents and Other Flammables				0.0%
Pesticides, Herbicides, Fungicides				0.0%
Household Cleaners				0.0%
Automotive Products				0.0%
Miscellaneous				0.0%
Non-Empty Non-Aerosol Containers (4)	**0.3%**	**0.1%**	**0.1%**	**0.2%**
Paints				0.1%
Solvents and Other Flammables				0.0%
Pesticides, Herbicides, Fungicides				0.0%
Household Cleaners				0.0%
Automotive Products				0.0%
Miscellaneous				0.0%
Empty Aerosol Containers	**0.0%**	**0.1%**	**0.1%**	**0.1%**
Empty Non-Aerosol Containers	**0.3%**	**0.1%**	**0.0%**	**0.1%**
TOTAL PROBLEM MATERIALS				**1.0%**
Batteries				**0.2%**
Rechargeable				0.0%
Non-rechargeable				0.2%
Automotive Lead Acid				0.0%
Light Bulbs				**0.1%**
Florescent				0.0%
Incandescent				0.1%
HID				0.0%
Electronic Appliances				**0.8%**
TV Computer Monitors				0.4%
TV/Computer Components				0.0%
Other Electronic Appliance Components				0.5%
Mercury Containing Devices				**0.0%**
Thermostats				0.0%
Silent Light Switches				0.0%
OTHER ORGANIC MATERIALS				**22.2%**
Food Waste				11.3%
Yard Waste				3.1%
Disposable Diapers				3.6%
Wet and Soiled Paper				4.2%
OTHER MSW				**51.6%**
TOTAL PACKAGING	**25.7%**	**20.7%**	**22.0%**	**25.1%**
OTHER NON-PACKAGING	**74.3%**	**79.3%**	**78.0%**	**74.9%**
TOTALS	**100.0%**	**100.0%**	**100.0%**	**100.0%**

(1) From Solid Waste Composition Study conducted at the BPTS by MPCA in 1992. The solid waste categories have been modified to correspond to those in the Packaging Study and the percentage composition by weight for each material has been redistributed to conform with the Packaging Study material definitions.

(2) Sort results based upon the results from the 1993 sorts conducted by R. W. Beck at the Brooklyn Park Transfer Station.

(3) Sort results based upon the results from the 1994 sorts conducted by R. W. Beck at the Brooklyn Park Transfer Station.

(4) Weights may include contents as well as container weights; contents not removed to obtain net weights for safety reasons.

(5) Sort results based upon the aggregate of the results from the 1995 sorts conducted by R. W. Beck at the Brooklyn Park Transfer Station.