



# **RECYCLING IN DELAWARE: MEASUREMENT AND METHODOLOGY**

**Subcommittee Report for CY 2006**



Addendum to the  
**Recycling Public Advisory Council**  
2007 Annual Report  
March 2008

## **A NOTE ON DATA COMPARISONS**

### **Delaware Versus Other States**

Data in reports of the Recycling Public Advisory Council (RPAC) usually are not directly comparable with data found in reports from other states, counties or municipalities. Important terms including “recycling” and “diversion” are defined differently by different reporting groups, and the calculation of reported tonnages and rates change as definitions change. Therefore readers are cautioned that it can be misleading and inaccurate to compare “recycling rates” reported by different organizations, without first making corrections to resolve differences in reporting methodology.

### **2006 Delaware Data Versus Delaware Data from Earlier Years**

Governor Minner’s Executive Order 90 for the first time directs RPAC to use definitions in the Environmental Protection Agency’s Guidelines document EPA530-R97-011. Consequently data in this and future reports of the Recycling Public Advisory Council are not directly comparable with data in earlier RPAC reports. That is because, in keeping with the requirements of Executive Order 90, the basis for reporting has shifted to one aligned with EPA Guidelines intended to bring uniformity to reporting by different states, counties and municipalities. RPAC fully supports this approach and strongly recommends that this approach is followed in future reports.

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## EXECUTIVE SUMMARY

The Delaware Recycling Public Advisory Council (RPAC) was initially established by Governor Thomas R. Carper in the year 2000. In 2006 Governor Ruth Ann Minner issued Executive Order 90 reestablishing the RPAC and establishing the following goal:

*“ a fifty-one percent (51%) diversion rate for recyclables from Delaware’s municipal solid waste stream comprised of residential and commercial solid waste.”*

RPAC members and advisors include representatives of all entities involved in solid waste generation, collection, recycling, diversion and regulatory activities: the public, the Delaware Solid Waste Authority, Delaware’s Department of Natural Resources & Environmental Control, commercial recycling businesses and waste haulers. In 2006 RPAC determined that its work product would be:

- developed via an open and transparent process,
- recorded in such a way that it could be easily understood by members of the general public, and
- fully endorsed by each organization represented on the Council or serving as resources or advisors.

Additionally, it was determined that the methodology of data collection and presentation would be used with little change in subsequent years so that meaningful trends and comparisons could be established.

The overall intent is not just to report a “recycling rate”, but to also provide insight into how Delaware residents and commercial operations manage their waste. This in turn is expected to lead to more effective, economical and environmentally prudent use of available natural resources.

This report focuses on municipal solid waste (MSW) which consists of residential, commercial and institutional waste. It does not cover non-MSW material such as commercial waste recovered and reused by the companies generating that waste. The Measurement & Methodology Subcommittee has had extensive discussions with the Delaware Solid Waste Authority, DSM Environmental Services, Inc. (DSM) and others who generated primary input data. This report is the most accurate analysis of Delaware’s diversion rate for recyclables that has been reported to date. It includes discussion of the methodology of data acquisition and treatment. It contains all original data as well as a detailed description of how the data are treated to generate reported tonnages, percentages, tables and charts.

During the calendar year 2006, Delaware residences, commercial and institutional operations generated 1,071,889 tons of Municipal Solid Waste. Of this, 823,479 tons ended up in Delaware landfills.

Of the MSW generated, 248,410 tons either was directly recycled (for example, collection, commercial mulching and resale of yard waste) or collected (for example in Delaware Solid Waste Authority igloos) and sent to processors for separation of components and subsequent reprocessing. If the generation of MSW remains constant, achieving the 51% State diversion goal will require the diversion of an additional 298,000 tons of recyclables annually.

Both the tonnage and the percentage of diverted recyclables were similar in the residential sector and in the commercial sector.

	<b>RESIDENTIAL</b>	<b>COMMERCIAL</b>	<b>TOTAL</b>
<b>Diverted Recyclables, Tons</b>	<b>122,448</b>	<b>125,962</b>	<b>248,410</b>
<b>Landfilled MSW, tons</b>	<b>419,602</b>	<b>403,878</b>	<b>823,479</b>
<b>Municipal Solid Waste: Tons Recyclables, Diverted + Landfilled</b>	<b>542,049</b>	<b>529,840</b>	<b>1,071,889</b>
<b>Percent Diverted Recyclables</b>	<b>22.6%</b>	<b>23.8%</b>	<b>23.2%</b>

Preparation of this first report in response to Governor Minner’s Executive Order 90 also has identified actions that can improve data collection and reporting.

Most of Delaware’s solid waste passes through the Delaware Solid Waste Authority (DSWA). They weigh all incoming materials and the quantities are known with considerable accuracy. However significant quantities are disposed, recycled or otherwise diverted outside the control of the Authority. In order to obtain information on the disposition of these materials, organizations handling the materials must be surveyed. These surveys were conducted by an independent third party consultant, DSM, under direction of RPAC (though funded by DSWA).

Despite the considerable efforts of DSM, surveys conducted in this manner are costly, time consuming, and due to their voluntary nature, produce an incomplete and inconsistent record of these independent activities. Better understanding and management of the Solid Waste/Resource Stream is a growing need for citizens and legislators in Delaware. Currently there is no system in place for the reporting and collection of this information. The best management of our solid waste stream requires accurate information and the most accurate and economically efficient method for acquiring this information is by way of a legal reporting requirement. For these reasons, the Delaware Recycling Public Advisory Council recommends legislation to accomplish confidential and timely reporting.

While the Council’s task as defined by Governor Minner is specific to the diversion of MSW recyclables, as defined by EPA, we have elected to report separately on three additional categories of materials. These are important elements of the state’s overall waste management strategy.

- Materials which are not considered MSW by EPA, but which are diverted from Delaware landfills and end up being recycled. The example included is used motor oil. There may be more of these special materials tracked in future years.
- Materials which, though not recycled, are used beneficially *and do not end up in landfills*. Instead they are used in some application that otherwise would have required use of virgin materials. Examples include construction and demolition debris which is used to replace mined stone in roadbeds or as a component of newly manufactured asphalt used on road surfaces.
- Materials which, though not recycled, are used beneficially *in landfills*. The primary example is use of construction and demolition debris in landfills as daily cover. If these wastes were not used in this manner, they would be mixed with MSW and become part of the general landfilled waste – and virgin soils would be used instead for daily cover.

The Council believes that the methodology and measurement procedures instituted for this report on the diversion of recyclables during the calendar year 2006, plus the recommended reporting legislation, will provide a clear understanding of recycling activities and also highlight those areas where additional focus and effort can improve the rates. Ultimately the goal, as established by Governor Minner and for the reasons noted above, is a 51% diversion of recyclables.

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## PART I: BACKGROUND – CHARGE TO THE COUNCIL

The Recycling Public Advisory Council (RPAC) was established by former Governor Thomas R. Carper's Executive Order No. 82 in September of 2000. Most recently it was re-established and expanded in scope by Governor Minner's Executive Order 90 issued on September 6, 2006. The new E.O. stated:

***“It shall be the goal of this State to achieve a fifty-one percent (51%) diversion rate for recyclables from Delaware’s municipal solid waste stream comprised of residential and commercial solid waste.”***

Specific directives regarding the goal include some recommended in 2006 by members of the Council. Important among these are:

- **The goal has been redefined in terms of a “diversion rate for recyclables”.** Defining the goal not as a “recycling goal” but rather as a “diversion of recyclables” goal is significant. Recycling is a multi-step and cyclic process involving collecting recyclable materials, separating them from unusable components, cleaning and otherwise preparing them for reuse, and converting them to usable articles of commerce. In many communities it has been difficult to achieve step #1 – collection. Consequently many recyclable materials have ended up in landfills. Focusing attention and effort on diversion is a crucial component of the Executive Order.
- **The specific goal is set at a 51% diversion rate for “Delaware’s municipal solid waste stream”.** Focusing on Delaware’s municipal solid waste stream, which includes commercial (business and institutional) waste in addition to the residential waste component, establishes a methodology recommended to states and municipalities by EPA to achieve uniformity in reporting.
- **The determination of what should be counted as “recyclable”, and what should not, has been clarified by requiring RPAC to follow a guidance document issued by the U. S. Environmental Protection Agency: EPA530-R-97-011<sup>1</sup>.** However flexibility is provided since E.O. 90 does allow the Council to adopt changes to the EPA definitions.

The Order set forth several specific tasks for RPAC. These include:

- ***“Develop, in conjunction with the Department and the Authority, a methodology for measuring recycling rates”.***

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<sup>1</sup> “Measuring Recycling: A Guide for State and Local Governments”, EPA530-R-97-011, United States Environmental Protection Agency, September 1997.

Historically, in Delaware and elsewhere, many organizations have employed substantially different definitions of *recycling* and different data collection and reporting methodologies. Since these differences result in differences in reported values, long-running and unproductive disputes as to the exact amount of material being diverted or recycled have been common. A consistent methodology is required in order to be able to make meaningful year-to-year comparisons of Delaware's recycling and diversion activities.

A second important task:

- Provide “*an objective, auditable accounting of recycling rates for total solid waste, municipal solid waste, and residential solid waste*”.

The effect of this order is to foster transparency in the process of acquiring data, organizing and reporting it. It also facilitates development of trend line data over a period of years.

To address these two specific tasks established by the Executive Order, the Recycling Public Advisory Council formed a Measurement & Methodology (M&M) Subcommittee.

## PART II: DEVELOPMENT OF METHODOLOGY

The M&M Subcommittee has representation from the Delaware Solid Waste Authority (DSWA), Delaware's Department of Natural Resources & Environmental Control (DNREC) and RPAC. They have jointly agreed that:

RPAC, DSWA and DNREC will develop and agree on methodology and measurement – and together will develop and endorse the numbers eventually reported.

**RPAC, DSWA and DNREC will develop and agree on measurement and methodology – and together will develop and endorse the numbers eventually reported.**

It also was agreed that RPAC reports should additionally report on the disposition of materials that are not recycled, but which are diverted from the landfill or used beneficially. There are significant benefits to reducing the use of virgin materials and of extending the useful life of our landfills. These activities also should be monitored and encouraged.

### **Data Acquisition**

The M&M Subcommittee has elected not to independently acquire data on total solid waste, recycling and diversion, but rather obtain it directly from those who already gather the information. For CY2006 we obtained data from two sources.

- **DSWA**: The Authority gets “hard data”. They weigh all materials, recyclable and otherwise, coming into their possession. Their report to RPAC is included in the Appendix.
- **DSM**: DSM gets data on materials which don't enter the traditional waste stream, but which nevertheless get recycled or disposed in landfills not operated by DSWA. An example is plastic bottles collected at supermarkets and returned directly to reprocessors without any involvement by DSWA. DSM uses a combination of written surveys, phone and face-to-face interviews, and physical spot inspections of vehicle loads. The cover sheet and tables from their thorough report is reproduced in the Appendix.

RPAC has worked closely with DSM and DSWA to insure that both the Authority's and DSM's methodology for data gathering are consistent with EPA guidelines – and that there is no double counting of recycling activities. DSWA plans to continue to fund survey work by DSM in coming years, but beginning with the CY2006 report has transferred program management responsibility to RPAC.

## Definitions and Terminology

Definitions, methodology of data acquisition and actual measurements and estimates of diversion of recyclables are interrelated. In the process of developing methodology, decisions were needed regarding how to treat certain specific materials. Questions concerning a specific material might include: Is it a “municipal solid waste? Was the material recycled? How should we count materials which, though not classified as recyclables, are used “beneficially”?

Executive Order 90 resolved the issue of what definitions will be used in Delaware. It directed RPAC to “*Use the definitions of ‘recycling’ and ‘municipal solid waste’ as stated by the United States Environmental Protection Agency in its document EPA530-R-97-011 dated September 1997.*” A list of EPA definitions is in the Appendix.

Several key terms and phrases are used repeatedly throughout this report:

- Municipal Solid Waste, EPA Definition: “Refers to wastes such as durable goods, nondurable goods, containers and packaging, food scraps, yard trimmings, and miscellaneous inorganic wastes from residential, commercial, institutional, and industrial sources, such as appliances, automobile tires, old newspapers, clothing, disposable tableware, office and classroom paper, wood pallets, and cafeteria wastes. *Excludes* solid wastes from other sources, such as construction and demolition debris, autobodies, municipal sludges, combustion ash, and industrial process wastes that might also be disposed of in municipal waste landfills or incinerators. MSW excludes waste from industrial processes. U.S. EPA, 1996b).”
- Recycling, EPA Definition: “Refers to the series of activities by which discarded materials are collected, sorted, processed, and converted into raw materials and used in the production of new products. *Excludes* the use of these materials as a fuel substitute or for energy production. (National Recycling Coalition, 1995)”
- Recyclables, EPA Definition: Refers to those materials recovered from the solid waste stream and transported to a processor or end user for recycling. (National Recycling Coalition, 1995)”

Executive Order 90 also provided flexibility by allowing RPAC to adopt other definitions as needed. Terms defined by RPAC and used in this report are:

**Diversion** is an activity which uses a solid waste material in a way such that it does not end up in a landfill.

**Beneficial Use** refers to the use of a solid waste material in an application which displaces natural resources or virgin materials. Beneficial use of a material shall not constitute or be counted as “recycling”, but it shall count as “diversion” if the solid waste material does not end up in a landfill.

**Landfilled** refers to the disposal of a solid waste material in a landfill, regardless of whether or not it could be recycled or diverted for beneficial use.

**Single Stream Collection** refers to a collection procedure wherein various recyclables are mixed together in one collection container instead of being separated into separate commodities and multiple containers.

**Solid Waste** means any garbage, refuse, sludge from a waste treatment plant, water supply treatment plant or air pollution control facility and other discarded material, including solid, liquid, semisolid or contained gaseous material resulting from industrial, commercial, mining and agricultural operations, and from community activities, but does not include solid or dissolved material in domestic sewage, or solid or dissolved materials in irrigation return flows or industrial discharges which are point sources subject to permits under § 402 of the Federal Water Pollution Control Act, as amended (86 Stat. 880) [33 U.S.C. § 1342], or source, special nuclear or by-product material as defined by the Atomic Energy Act of 1954, as amended (68 Stat. 923) [42 U.S.C. § 2014]. (definition from Delaware Title 7, Chapter 64, Subchapter I: General Provisions”, § 6402, Definitions (9)

Notes on definitions:

- The term “*non-recyclable*” is avoided in this report. RPAC believes that all components of MSW are inherently recyclable though they may not appear on the current EPA listing, in part because of economic considerations. Furthermore, the term “*recyclables*” is only used to describe those materials actually collected for recycling and not as an adjective to describe a material’s ability to be recycled.
- It is important to note that while these definitions were selected for the purpose of understanding and calculating recycling rates, they are not necessarily consistent with definitions that may be adopted by DNREC for regulatory purposes.

## PART III: MEASUREMENT OF DIVERSION FOR RECYCLABLES

Determining the percent diversion of recyclables from Delaware's solid waste stream involves the following calculation:

$$\text{Diversion rate of recyclables (\%)} = 100 \times \frac{\text{MSW recyclables, tons diverted}}{\text{MSW recyclables, tons diverted} + \text{MSW, tons landfilled}}$$

There is one complication per Executive Order 90: we are interested not only in the total MSW landfilled tonnage and percent diverted recyclables from MSW. We also are interested in the same information describing waste just from the residential sector versus waste just from the commercial sector. Therefore we need to split total MSW recyclables, and also total MSW landfilled, into the portion coming from the residential sector and the portion coming from the commercial sector.

As discussed below, information in DSM's Waste Characterization Study enables us to split the total into the two sectors.

### **MSW, Tons Landfilled: Residential Vs. Commercial Sectors**

With a few exceptions noted throughout this report and in the appendix, municipal solid waste consists of waste generated by the residential and commercial sectors. In this report, "commercial" includes MSW tonnage from business, institutional and limited waste from industrial sectors.

In Delaware, all of our MSW is either recycled or it is landfilled by DSWA. Data on tonnage arriving at the landfills is readily available since each truckload of trash is weighed upon receipt.

Determining the allocation of MSW between the residential and the commercial sectors is a more complicated process. Although waste is weighed upon receipt at landfills, the percentage of an incoming truckload of waste that is from residential sources and the percentage from commercial sources is not recorded. The M&M Subcommittee had to establish a methodology to estimate these percentages.

Fortunately, following an earlier request from DSWA, DSM recently completed a 12 month waste characterization study during which they visited all DSWA landfill facilities, interviewed drivers, and physically inspected more than 1400 solid waste deliveries. This study is Delaware's most comprehensive waste characterization study to date. With this data DSM was able to estimate the allocation of materials between the residential and commercial sectors for MSW delivered to DSWA landfills over the period covered.

While the 12 month sample period for the Waste Characterization Study is not completely concurrent with the period of this report, the accuracy of the data is unprecedented. The M&M Subcommittee believes that there is no better way to quantify the allocation of material by sector for the Calendar Year 2006. In fact, it is the plan of this Subcommittee to use the allocation determined by this waste characterization study in future reports until such time as another study is completed.

DSM's study revealed the following information on the incoming DSWA Waste Stream Composition by facility:

Facility	Residential	Commercial	C&D	Total
	%	%	%	%
Cherry Island	43%	41%	16%	100%
Pine Tree Transfer Station	41%	41%	18%	100%
Central Landfill	34%	30%	37%	100%
Milford Transfer Station	41%	44%	15%	100%
Rt. 5 Transfer Station	38%	38%	25%	100%
Southern Landfill	26%	28%	46%	100%

This percentage allocation by facility was then applied to the tonnage of received MSW in calendar year 2006 to estimate the allocation by sector shown next. Both of these tables are abstracted from the more detailed information provided in the Appendix.

#### CY 2006 DSWA Waste Stream Composition to Landfill

Facility	Total Tons	Residential		Commercial		MSW Tons	C&D	
		%	Tons	%	Tons		%	Tons
Cherry Island	585,830	43%	252,612	41%	237,975	490,587	16%	95,243
Pine Tree Transfer Station	82,099	41%	33,904	41%	33,265	67,168	18%	14,931
Central Landfill	136,725	34%	46,386	30%	40,350	86,736	37%	49,989
Milford Transfer Station	26,288	41%	10,691	44%	11,556	22,247	15%	4,041
Rt. 5 Transfer Station	31,493	38%	11,862	38%	11,909	23,770	25%	7,723
Southern Landfill	246,405	26%	64,148	28%	68,823	132,971	46%	113,434
<b>Totals</b>	<b>1,108,840</b>	<b>38%</b>	<b>419,602</b>	<b>36%</b>	<b>403,878</b>	<b>823,479</b>	<b>26%</b>	<b>285,361</b>

#### MSW Recyclables, Tons Diverted: Residential Vs. Commercial Sectors

As noted, DSWA weighs all received recyclables. DSM, using surveys, obtains tonnage data from businesses and other organizations who process their own recyclables rather than sending them to DSWA. In each case, total tonnage is recorded by category and detailed information is available on 35 categories of recyclables. These range from old newspapers to white goods to

mixed recyclables. Both DSWA and DSM also have estimated the percentage of each category that comes from residential versus commercial sources. Totals are:

<b>TOTAL RECYCLABLES COLLECTED FOR PROCESSING, TONS</b>		
Residential	Commercial	Total
122,448	125,962	248,410

A complete breakdown of total tonnage of diverted recyclables, by category and by sector, is provided in the “Appendix A, Diverted Recyclables”.

**“Diversion of Recyclables” - Mathematics**

Executive Order 90 directs RPAC to determine the “diversion rate for recyclables from Delaware’s municipal waste stream comprised of residential and commercial solid waste.”

$$\begin{aligned}
 \text{Diversion rate of recyclables (\%)} &= 100 \times \frac{\text{MSW recyclables, tons diverted}}{\text{MSW recyclables, tons diverted} + \text{MSW, tons landfilled}} \\
 &= \frac{100 \times 248,410}{248,410 + 823,479} = 23.2
 \end{aligned}$$

Diversion rates of recyclables calculated similarly for the two sectors are: residential (22.6%) and commercial (23.8%).

**Accuracy of Reported Data**

The M&M Committee has elected to report recycling percentages to one decimal place though we emphasize that there is error in the third significant figure. On the other hand we believe the calculations are more accurate than would be suggested by reporting percentages to only two significant figures.

DSWA reports weighed tonnage which is believed to be accurate about a part per thousand. Individual survey numbers developed by DSM are less accurate, though some offsetting likely occurs with some individual estimates high and others low. In addition, treating of the raw data required some category assignment and estimating by the Committee and these decisions are noted in the appendix. The most effective and efficient route to improved accuracy is through legislation requiring accurate and complete survey responses by individual businesses.

By maintaining a consistent methodology, reasonably accurate and meaningful trend line analysis can be developed over a period of years. This will enable tracking of progress toward Delaware’s overall 51% goal.

PART IV: SUMMARY RESULTS

Summary results for CY2006 are given below:

	<b>RESIDENTIAL</b>	<b>COMMERCIAL</b>	<b>TOTAL</b>
<b>Diverted Recyclables, Tons</b>	<b>122,448</b>	<b>125,962</b>	<b>248,410</b>
<b>Landfilled MSW, tons</b>	<b>419,602</b>	<b>403,878</b>	<b>823,479</b>
<b>Municipal Solid Waste: Tons Recyclables, Diverted + Landfilled</b>	<b>542,049</b>	<b>529,840</b>	<b>1,071,889</b>
<b>Percent Diverted Recyclables</b>	<b>22.6%</b>	<b>23.8%</b>	<b>23.2%</b>

In CY2006, Delaware processed about 1,071,889 million tons of municipal solid waste. Of this, about 248,410 million tons were recyclables diverted from landfills<sup>2</sup>; the remaining 823,479 tons was landfilled<sup>3</sup>. About half the diverted recyclables (122,448 tons) came from residential sources and were handled by DSWA<sup>4</sup> while about half (125,962 tons) came from commercial sources and the data were obtained by DSM using their survey and spot checking methodology.<sup>5</sup>

Chart 1 shows the beginning of a trend line that will be extended in future years. Chart 2 shows visually the ultimate disposition of Delaware MSW in CY2006.

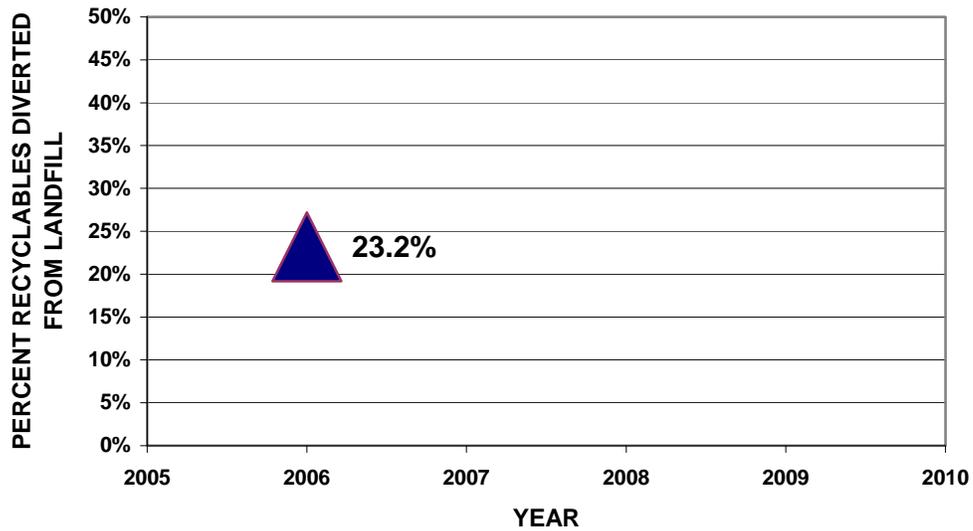
<sup>2</sup> Appendix A. Spreadsheet: "Compiled Master Spreadsheet – Final"; "Category 1"

<sup>3</sup> Appendix A. Spreadsheet: "2007 MSW Allocation final-3"; tab "CY06 Allocation"

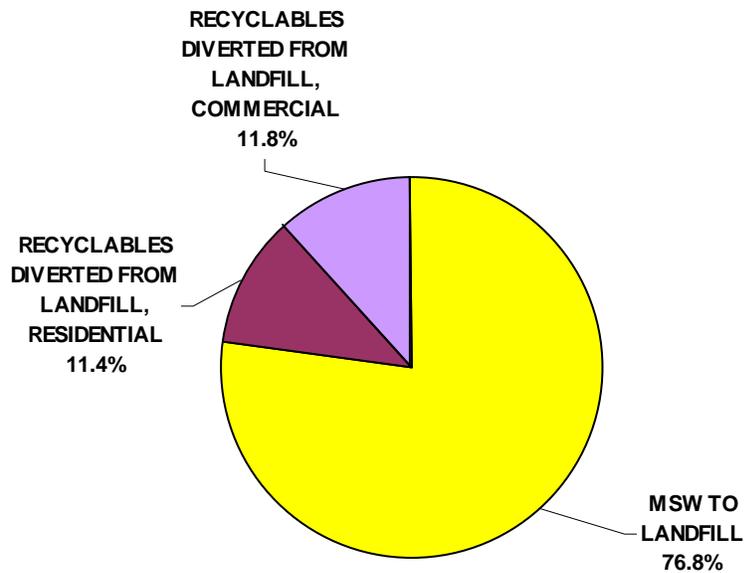
<sup>4</sup> Appendix B. Report, Delaware Solid Waste Authority

<sup>5</sup> Appendix B. Report, DSM Environmental Services, Inc.

**MUNICIPAL SOLID WASTE IN DELAWARE  
CHART 1: PERCENT DIVERTED RECYCLABLES**



**CHART 2: DISPOSITION OF DELAWARE MSW - 2006**



## PART V: BENEFICIAL USE AND COMMENTARY ON SPECIFIC MATERIALS

### **Beneficial Use**

Delaware also generates millions of tons of waste not classified as MSW. Examples include construction & demolition debris, organic wastes and coal combustion ash. (See Appendix A, 'Category 3' for more detail). In CY2006, 2,342,661 million pounds of this non-MSW was used beneficially in a variety of applications in order to avoid use of valuable landfill capacity and, in some cases, to avoid having to use virgin materials.<sup>6</sup>

As directed by Executive Order 90, the Recycling Public Advisory Council effort is focused on diversion of MSW recyclables. However RPAC believes it is worthwhile also to monitor and report separately on other diverted materials because diversion of materials from a landfill conserves natural resources and extends landfill life. It also provides a variety of other benefits – economic, social, political and educational.

Diverted materials that are not recycled sometimes are used “beneficially”. Beneficial use is quite different from recycling, where for example a waste material such as an aluminum can, is literally 'recycled' and become part of another aluminum object. Beneficial use occurs when the waste material is not recycled, but nevertheless is put to use in place of virgin materials in some valuable application. For example tires can be shredded to meet civil engineering specifications for use in highway berms, road beds, septic systems and landfill construction. Mixed glass aggregate from a processing facility can be processed and used as an alternate daily cover on a landfill.

There is not a generally accepted definition of the term “beneficial use”. In this Report, we use the following definition: “the use of a solid waste material in an application which displaces natural resources or virgin materials.” Beneficial use of a material shall not constitute or be counted as “recycling”, but it shall count as “diversion” if the solid waste material does not end up in a landfill.

In order to be counted as a “beneficial use”, RPAC will determine on a case-by-case basis whether or not a use of a material fits the above definition and is a qualified “beneficial use”.

The following table lists materials disposition considered by RPAC to be “beneficial uses”. It is patterned after an approach used by the Washington State Department of Ecology (see <http://apps.ecy.wa.gov/bud/>).

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<sup>6</sup> Appendix A. Spreadsheet: “Compiled Master Spreadsheet – Final”; “Category 3”

DESCRIPTION OF SOLID WASTE MATERIAL	DESCRIPTION OF BENEFICIAL USE, RESULTING IN AVOIDANCE OF LANDFILL DISPOSAL
C&D (Asphalt, concrete, stones, masonry)	Construction & Demolition debris (C&D) which is incorporated in asphalt or concrete, or used in roadbed construction.
Poultry Waste, Litter & Sludges:	Material which is converted to fertilizer.
Slag	Slag which is used, mostly by private industry, in construction projects. Some is used for construction at DSWA landfills.

### **Commentary On Specific Materials**

During development of methodology, decisions were required on a number of specific materials. These are summarized below.

Yard Waste. Historically, yard waste has constituted as much as one quarter of landfilled waste nationwide. This represents expensive discard of valuable material. Particularly in the past decade, states and municipalities have established procedures to recapture value via composting and mulching and, at the same time prolong landfill life. On May 23, 2007, Governor Minner signed Senate Joint Resolution 2.SA1 which requires enforcement of the yard waste ban beginning January 24, 2008. It also directed DNREC, DSWA and RPAC to continue to meet with trash haulers and yard waste businesses “for the purpose of developing a program to simplify and economize yard waste recycling for the residents of New Castle County.” This effort is well underway. Year 2006 yard waste diversion tonnage is small. But because of efforts underway to recycle rather than landfill yard waste, it is anticipated that yard waste diversion will substantially increase as collection programs are simplified and spread statewide. We follow the EPA Guidance Document which counts commercial collection, processing and reuse of yard waste as “recycling” – but does not count on-site composting by property owners; EPA calls the latter “waste reduction”. Quantities recycled commercially are listed in the Appendix, Category 1: “Diverted ‘EPA-recyclables’ in MSW”

Used Motor Oil. Although used motor oil is a liquid, it is formally included in definitions of “solid waste”. On the other hand, the Guideline document EPA530-R-97-011 specifically excludes used motor oil in its listing of materials that are municipal solid waste. RPAC has decided to adhere to the Guideline document and not include used oil in its accounting of recyclables diverted from Delaware’s MSW stream. While tonnage is small, the recycling of oil is economically sound (considering the cost of disposition of hazardous materials) and environmentally beneficial. More special wastes may be monitored in the future as we continue to continue to collect and report data on recovery and reuse of these materials. See Appendix, Category 2: “Special MSW Materials, Recovered and Recycled”.

Autobody Scrap. The EPA Guidance Document specifically excludes “ferrous materials from ... transportation equipment” from the category of MSW. Yet large quantities of autobody scrap have been recycled by the industry for almost as long as it has existed. The quantity is as much as one-twentieth of today’s diversion of all other recyclables. RPAC will continue to monitor and encourage recovery and reuse of autobody scrap. Tonnage for 2006 is reported in the Appendix, Category 3: “Non-MSW Recycled or Used Beneficially”.

Construction & Demolition Waste. According to EPA, C&D is not a “municipal solid waste”. RPAC therefore excludes C&D waste from calculations of total MSW and rates of diversion of recyclables. On the other hand, because the quantities are so large, the data are readily available, and the choice of disposal of these large quantities is so important, we have elected to report separately on C&D tonnage. Furthermore, it is notable that some states and municipalities in the US have begun to include C&D recycling activities in their reported recycling rates. See Appendix, Category 3: “Non-MSW Recycled or Used Beneficially in Place of Virgin Materials or Other Natural Resources”.

Biosolids, Bottom Ash and Fly Ash. Some of these materials are used as a component of daily landfill cover. They replace sand, dirt and other materials that otherwise would be used. This is a valuable use of available material. RPAC has elected to report this usage separately as a “Special Waste”. See Appendix, Category 3.

Industrial Process Waste. Industrial process waste is not MSW. Some amounts find their way onto trucks depositing other waste at landfills, and some likely is included in survey data obtained by DSM. However our studies show that the total tonnage is very small. It can be disregarded without affecting total tonnage reports or diversion percentages.

Institutional Waste. In this report, “Institutional waste” is included in tonnage and percentages reported for “Commercial waste”.

Data on tonnage diverted to the listed beneficial use applications is detailed in the Appendix, and summarized below, for informational purposes. All together, including waste used beneficially, while over three million tons of total waste was generated in CY2006, less than a million tons ended up in landfills.

<b>CHART IN "BENEFICIAL USE" LINKED TO THE ORIGINAL</b>	
<b>AMOUNT OF WASTE USED BENEFICIALLY</b>	
<b>Solid Waste: tons of residential, commercial and institutional solid waste, including some non-MSW used beneficially</b>	<b>3,414,552</b>
<b>Beneficial Use, tons</b>	<b>2,342,661</b>

Data on most diverted beneficially used materials in Delaware historically has been – and still is being – collected by the Delaware Solid Waste Authority and DSM. There is no additional data collection burden to track and report this data. If the additional information on material diverted but not recycled proves to be useful, we will continue to include it in future reports.

## PART VI: RECOMMENDATIONS

The M&M Subcommittee makes the following recommendations in order to improve the methodology and year-to-year tracking of the rate of diversion of recyclables and to accelerate progress toward the 51% goal.

- Methodology. We recommend formal acceptance, by the Recycling Public Advisory Council, of the data gathering and management methodology as described in this report. We also recommend a “freeze” in methodology for at least three years, to allow development of initial trend line analysis.
- Spreadsheet Format. We recommend that DNREC provide a programming specialist in order to simplify the format used in this report. This report was created in Microsoft Word with tabular data linked to several Excel® spreadsheets. It is somewhat complex and cumbersome to use. The objective should be a data reporting system can be operated by most computer-literate individuals after minimal training. This for example would allow valuable exploration of “what if?” scenarios by varying input data in order to examine the effect on output information.
- Scope of Report. We recommend extending the scope of the continuing Measurement & Methodology Subcommittee effort to include characterization of the total solid waste stream, not just MSW.
- Increased Diversion. We recommend that RPAC, working with DSWA and DSM, study this year’s information and identify opportunities for additional efforts to improve the diversion rate of specific recyclables.
- Legislation. We recommend legislation requiring timely reporting of recyclables diversion data, by processors and generators identified by DNREC and to an entity designated by DNREC – using methods which guarantee confidentiality of information submitted by individual companies. Furthermore, passage of recycling legislation which makes provisions for the implementation of new recycling programs and expansion of existing recycling programs, such as HB 159, will facilitate achieving a higher diversion rate than would otherwise be possible.

## PART VII: APPENDIX – DOCUMENTATION

Three spreadsheet files plus the DSM report contain all the information which the M&M committee used to produce this report. Complete spreadsheet files are available from the Subcommittee.

Original data came either from DSWA or DSM. DSWA data are reproduced in the Appendix, either in the form of a letter to RPAC or as data used in the 2007 MSW Allocation-final-3 spreadsheets. DSM data are in a separate and lengthy report; a copy of the cover page and tables is included in the Appendix.

“2007 MSW Allocation-final”. This group of tabbed Microsoft® Excel spreadsheets(available upon request) contains all the data, formulas and linked cells used to assemble and process data on the denominator of the equation used to determine percent diversion of recyclables from MSW. Many of the Tables and Charts in the report are linked directly to cells in this spreadsheet. Data also are provided on beneficial use of non-MSW materials.

“COMPILED MASTER SPREADSHEET – FINAL”. This group of Microsoft® Excel spreadsheets contain all the data, formulas and linked cells used to assemble and process data on the numerator of the equation used to determine percent diversion of recyclables from MSW. Many of the Tables and Charts in the report are linked directly to cells in this spreadsheet. Data also are provided on beneficial use of non-MSW materials.

“COMPILED MASTER – V19”. This is the Microsoft® Word file holding this report itself – text, Tables, Charts and Appendix.

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**APPENDIX A**

<b>"MASTER DATA TABLE" FOR CHARTING (TONS)</b>					
<b>DATA IN BELOW TABLES AND GRAPHS LINKED TO THIS MASTER TABLE</b>					
<b>YEAR</b>	<b>MUNICIPAL SOLID WASTE MATERIALS</b>			<b>SPECIAL NON-MSW WASTE MATERIALS</b>	
	<b>TOTAL MSW COMMERCIAL + RESIDENTIAL, LANDFILLED + DIVERTED SOLID WASTE (Categories 4B + 1)</b>	<b>MSW TO LANDFILL (Category 4B)</b>	<b>RECYCLABLES DIVERTED FROM LANDFILL (Category 1)</b>	<b>RECOVERED AND RECYCLED (App., Category 2)</b>	<b>NOT RECYCLED, BUT USED BENEFICIALLY INSTEAD OF LANDFILLING (App., Category 3)</b>
<b>2006</b>	1,071,891	823,481	248,410	9,312	2,342,661
<b>2007</b>					

<b>CHART 1 DATA (calculated from "Master Data Table")</b>		
<b>YEAR</b>	<b>MSW TO LANDFILL</b>	<b>RECYCLABLES DIVERTED FROM LANDFILL</b>
<b>2006</b>	<b>76.8%</b>	<b>23.2%</b>
<b>2007</b>		

<b>CHART 2 DATA, Tons (calculated from "Master Data Table")</b>			
<b>YEAR</b>	<b>MSW TO LANDFILL</b>	<b>RECYCLABLES DIVERTED FROM LANDFILL, RESIDENTIAL</b>	<b>RECYCLABLES DIVERTED FROM LANDFILL, COMMERCIAL</b>
<b>2006</b>	<b>823,481</b>	<b>122,448</b>	<b>125,962</b>

## APPENDIX A, Cont. Data Spreadsheet – Diverted Recyclables

### RPAC ANNUAL REPORT - CALENDAR YEAR 2006

Tons of Diverted "EPA-Recyclables" in MSW - Source of Data: DSWA and DSM

*"Recyclables" means "those materials recovered from the solid waste stream and transported to a processor or end user for recycling." (EPA530-R-97-011)*

CATEGORIES OF RECYCLABLES	DSM RECYCLABLES SURVEY DATA Delaware Businesses (DSM Report, Appendix) **			DSWA RECYCLABLES – WEIGHED UPON RECEIPT (DSWA Report, Appendix) "%R" is Percent Residential; "%C" is Percent Commercial									TOTAL RECYCLABLES COLLECTED FOR PROCESSING (TONS)			
	Tons of Recyclables			Drop-off Containers *			Other Collections *			Curbside Collection *			Res'l	Comm'l	Total	
	RESIDENTIAL	COMMERCIAL	TOTAL	Tons (Total)	%R	%C	Tons (Total)	%R	%C	Tons (Total)	%R	%C				
<b>Category 1. Diverted "EPA-Recyclables" - MSW materials classified by EPA as "recyclables", diverted from landfill (CY2006)</b>																
PAPER	ONP (old newspapers)		3,870	3,870	10,774	90	10	155	100	0	334	100	0	10,186	4,947	15,133
	OCC (old corrugated containers)		63,700	63,700	2,245	90	10	2,591	0	100	287	100	0	2,308	66,516	68,823
	Mixed Paper		16,700	16,700	1,986	90	10	545	0	100	712	100	0	2,499	17,444	19,943
	Sorted Office Paper		5,900	5,900										0	5,900	5,900
	Undeliverable Mail from Post Office			0				1,173	50	50				587	587	1,173
PACKAGING	Clear Glass			0	1,197	90	10	112	100	0				1,189	120	1,309
	Brown Glass			0	390	90	10	1	100	0				352	39	391
	Green Glass			0	779	90	10	356	100	0				1,057	78	1,135
	Mixed Glass			0				3,516	100	0	288	100	0	3,804	0	3,804
	Plastic Bottles			0	1,146	90	10	269	90	10	66	100	0	1,340	142	1,481
	Aluminum Cans		30	30										0	30	30
	Pallets, mulched		8,500	8,500										0	8,500	8,500
	Shrink Wrap		240	240										0	240	240
Plastic Grocery Bags and Film			0	112	90	10							101	11	112	
VEHICLE WASTE	Oil Filters	72	18	90				505	90	10				527	69	595
	Automotive Lead-Acid Batteries			0				4	100	0				4	0	4
	Lead Acid Batteries	720	180	900										720	180	900
	Tires	5,440	1,360	6,800										5,440	1,360	6,800
SPECIAL WASTE	Carpet and Textiles			0	96	90	10							86	10	96
	Carpet		86	86										0	86	86
	Textiles	4,000		4,000										4,000	0	4,000
	Fluorescent Bulbs		20	20										0	20	20
	Electronics		200	200										0	200	200
	Electronic Goods			0				1,359	90	10				1,223	136	1,359
AG & FOOD WASTES	Fats, Oil, Grease		3,200	3,200										0	3,200	3,200
	Food waste		4,600	4,600										0	4,600	4,600
GREEN WASTE,	Leaf and Yard Waste	32,000	2,500	34,500				7,459	50	50	174	100	0	35,904	6,230	42,133
	Trees and Branches	28,440	3,160	31,600										28,440	3,160	31,600
	Clean Wood (e.g. trees, stumps), mulched		1,800	1,800										0	1,800	1,800
METALS	Aluminum & Steel Cans			0	643	90	10				167	100	0	746	64	810
	White Goods	16,100		16,100				2,962	90	10				18,766	296	19,062
	Ferrous			0										0	0	0
	Non-Ferrous, All Other			0										0	0	0
	Durables, mixed (e.g. small appliances)	200		200										200	0	200
SINGLE STREAM	"Mixed recyclables": collected mixture of different categories of recyclables; includes City of Wilmington collection	917		917							2054	100	0	2,971	0	2,971
Subtotals, Category 1 (Tons)		87,889	116,064	203,953	19,368			21,007			4,082		0	122,448	125,962	248,410

\* NOTE: Drop-off containers commonly known as "Igloos". "Other Collections" are mostly materials delivered to landfill sites by individuals and businesses, not commercial waste haulers. Percentage estimates based on a 2003 DSM study.

\*\* DSM Report: "Evaluation of Enhanced Residential Waste and Recyclables Collection and Processing for New Castle County FINAL REPORT OCTOBER 15, 2003"

**APPENDIX A, Cont.  
Data Spreadsheet – Beneficial Use**

<b>Category 2. Special MSW Materials, Recovered and Recycled (CY2006)</b>						
MATERIALS	DSM RECYCLABLES SURVEY DATA Delaware Businesses  Tons of Special Materials	DSWA OPERATIONS (TONS)			TOTAL NON-RECYCLABLES USED BENEFICIALLY (TONS)	
		Drop-off Containers	Other DSWA Collections	Curbside Collection		
Motor Oil	8,000		1,312		1312	
<b>Subtotals, Category 2 (Tons)</b>	<b>8,000</b>	<b>0</b>	<b>1,312</b>	<b>0</b>	<b>0</b>	<b>9,312</b>

<b>Category 3. Non-MSW Recycled or Used Beneficially in Place of Virgin Materials or Other Natural Resources (CY2006)</b>						
MATERIALS	DSM SURVEY DATA (TONS)	DSWA OPERATIONS (TONS)			TOTAL NON-RECYCLABLES USED BENEFICIALLY (TONS)	
		Drop-off Containers	Other DSWA Collections	Curbside Collection		
C&D (Asphalt, concrete, stones, masonry)			152,672		152,672	
C&D - Asphalt	350,200				350,200	
C&D - Concrete	379,600				379,600	
C&D - Trees & Stumps	25,500				25,500	
C&D - Soils	101,900				101,900	
C&D - Stones	4,500				4,500	
C&D - Mixed Construction Waste	140				140	
Poultry Waste	375,000				375,000	
Sludge	9,400				9,400	
Poultry Litter	77,700				77,700	
Food Processing	9,800				9,800	
Fats, Oil, Grease	3,200				3,200	
Food Waste	4,600				4,600	
Biosolids (wet tons)	63,700				63,700	
Bottom and Fly Ash	101,350				101,350	
Fly Ash			75,789		75,789	
Bottom Ash (mixed with stabilized sludge)			3,830		3,830	
Bottom Ash (road construction)			3,903		3,903	
Mixed Plastics	2,200				2,200	
Soils, decontaminated			498,765		498,765	
Slag	80,000				80,000	
Scrap Cars / Autobody Scrap	9,600				9,600	
<b>Subtotals, Category 3 (Tons)</b>	<b>1,606,390</b>	<b>0</b>	<b>736,271</b>	<b>0</b>	<b>0</b>	<b>2,342,661</b>

## APPENDIX A, Cont. Data Spreadsheet – Total Waste

Category 4A. Delaware's Total Solid Waste To Landfill (CY2006)				
LANDFILL LOCATION	BREAKDOWN - TOTAL SOLID WASTE (%)			TOTAL (%)
	RESIDENTIAL	COMMERCIAL	CONSTRUCTION & DEMOLITION	
Cherry Island	43%	41%	16%	100%
Pine Tree Transfer Station	41%	41%	18%	100%
Central Landfill	34%	30%	36%	100%
Millford Transfer Station (only open one week in FY2006)	41%	44%	15%	100%
Rt. 5 (not open in FY2006)	38%	38%	24%	100%
Southern Landfill	26%	28%	46%	---
<b>BREAKDOWN - TOTAL SOLID WASTE (TONS)</b>				
	RESIDENTIAL	COMMERCIAL	CONSTRUCTION & DEMOLITION	TOTAL (TONS)
Cherry Island	252,612	237,975	95,243	585,830
Pine Tree Transfer Station	33,904	33,265	14,931	82,100
Central Landfill	46,386	40,350	49,989	136,725
Millford Transfer Station(only open one week in FY2006)	10,691	11,556	4,041	26,288
Rt. 5 (not open in FY2006)	11,862	11,909	7,723	31,494
Southern Landfill	64,148	68,823	113,434	246,405
<b>Subtotals, Category 4A (Tons)</b>	<b>419,603</b>	<b>403,878</b>	<b>285,361</b>	<b>1,108,842</b>
Category 4B. Delaware's Municipal Solid Waste To Landfill (CY2006)				
	BREAKDOWN - TOTAL MUNICIPAL SOLID WASTE (%)			TOTAL MSW (%)
	RESIDENTIAL	COMMERCIAL		
Cherry Island	51%	49%		100%
Pine Tree Transfer Station	50%	50%		100%
Central Landfill	53%	47%		100%
Millford Transfer Station (only open one week in FY2006)	48%	52%		100%
Rt. 5 (not open in FY2006)	50%	50%		100%
Southern Landfill	48%	52%		100%
<b>BREAKDOWN - TOTAL MUNICIPAL SOLID WASTE (TONS)</b>				
	RESIDENTIAL	COMMERCIAL		TOTAL MSW (TONS)
Cherry Island	251,134	239,453		490,587
Pine Tree Transfer Station	33,585	33,585		67,169
Central Landfill	46,079	40,658		86,736
Millford Transfer Station (only open one week in FY2006)	10,731	11,516		22,247
Rt. 5 (not open in FY2006)	11,886	11,886		23,771
Southern Landfill	64,023	68,948		132,971
<b>Subtotals, Category 4B (Tons)</b>	<b>417,436</b>	<b>406,045</b>		<b>823,481</b>

**APPENDIX A, Cont.**  
**Example: Basic Data for Categorizing Waste at Cherry Island Landfill**

**Sample Results and Calculations of DSM's 12 Month Waste Characterization Study**

Cherry Island Landfill			Summer	Fall	Winter	Spring	Total	Self Haul		Residential		Commercial		C&D	
Veh Type - Name	Veh Type Code	Veh Type - TTL Loads	Veh Type - TTL Tons	Tons	(%)	Tons	(%)	Tons	(%)	Tons	(%)	Tons			
Not Specified	1	475	1,783	1,098	929	1,067	4,876	100%	4,876	-	-	-	-	-	-
Automobile	2	523	40	36	23	36	134	100%	134	-	-	-	-	-	-
Van	3	345	185	166	116	178	646	100%	646	-	-	-	-	-	-
Pick up	4	22,480	10,330	8,905	6,324	8,973	34,532	100%	34,532	-	-	-	-	-	-
Dump Truck	5	1,535	4,496	3,906	2,234	4,106	14,743	-	-	-	100%	14,743	-	-	-
Rear-Load	6	6,157	48,313	46,961	36,354	44,915	176,542	-	-	91%	160,654	9%	15,889	-	-
Sectioned-Combo	8	4	3	2	6	414	425	-	-	-	100%	425	-	-	-
Box Truck	9	248	149	188	310	758	1,405	100%	1,405	-	-	-	-	-	-
Tandem	12	104	1,360	1,493	1,003	33,578	37,434	-	-	-	100%	37,434	-	-	-
Roll-off	16	10,771	42,635	36,558	29,963	872	110,028	-	-	14%	15,404	53%	58,315	33%	36,309
Lugger Box	35	254	430	402	375	0	1,207	-	-	-	100%	1,207	-	-	-
42 ft Trailer	39	4	5	1	4	40,378	40,389	-	-	-	-	-	100%	40,389	-
Front-Load	46	3,989	41,956	41,959	35,776	21	119,712	-	-	36%	43,096	64%	76,616	-	-
Flat Bed	47	13	15	25	35	10	85	-	-	-	100%	85	-	-	-
Flat Dump	48	16	19	3	394	509	925	-	-	-	100%	925	-	-	-
Stake Body	49	753	669	647	735	861	2,912	-	-	-	90%	2,621	10%	291	-
Stake Dump	50	683	889	792	13	13	1,707	-	-	-	90%	1,536	10%	171	-
Step Van	51	91	59	65	76	142	342	-	-	-	90%	307	10%	34	-
Trailer	52	36	92	116	888	805	1,901	-	-	-	90%	1,710	10%	190	-
Cab	53	92	1,241	1,355	84	105	2,784	-	-	-	90%	2,506	10%	278	-
Truck	54	47	136	158	4	5	303	-	-	-	50%	151	50%	151	-
Side Loader	56	420	1,676	1,363	659	1,520	5,218	-	-	85%	4,435	15%	783	-	-
Bucket Truck	58	40	15	20	12	12	59	-	-	-	50%	29	50%	29	-
X tag a long trailer	61	4	4	1	1	1	7	-	-	-	50%	4	50%	4	-
Residential F/E	62	153	1,284	1,459	1,096	1,952	5,791	-	-	100%	5,791	-	-	-	-
<b>WGB - Veh Type - TTLs</b>		<b>49,237</b>	<b>157,783</b>	<b>147,679</b>	<b>117,415</b>	<b>141,230</b>	<b>564,107</b>		<b>41,593</b>		<b>229,380</b>		<b>215,286</b>		<b>77,847</b>

**APPENDIX A, Cont.**  
**Derivation of data on CY2006 DSWA Waste Stream Composition**

**Allocation based upon 12 Month Characterization Study**

Facility	Residential		Commercial		C&D		Self-Haul		Total	
	Tons	%	Tons	%	Tons	%	Tons	%	Tons	%
<b>Cherry Island</b>	229,380	41%	215,287	38%	77,847	14%	41,593	7%	564,107	100%
<b>Pine Tree Transfer Station</b>	39,021	39%	38,246	38%	16,017	16%	6,256	6%	99,540	100%
<b>Central Landfill</b>	49,409	31%	42,436	27%	53,571	34%	12,522	8%	157,938	100%
<b>Milford Transfer Station</b>	17,719	38%	19,238	42%	6,050	13%	3,122	7%	46,130	100%
<b>Rt. 5 Transfer Station</b>	23,545	34%	23,648	34%	14,509	21%	7,058	10%	68,761	100%
<b>Southern Landfill</b>	46,634	21%	50,773	23%	90,266	41%	30,465	14%	218,138	100%
<b>Totals</b>	<b>405,709</b>	<b>35%</b>	<b>389,628</b>	<b>34%</b>	<b>258,261</b>	<b>22%</b>	<b>101,017</b>	<b>9%</b>	<b>1,154,614</b>	<b>100%</b>

9% of the total waste disposed was characterized as "Self Haul" with no attribution data. This means that none of these particular deliveries were interviewed by DSM and therefore no specific information is known regarding the source of this material. DSM's recommendation is that this material be evenly divided between the three classes. Therefore 33.333% of the tonnage from "Self Haul" will be allocated to each category - Residential, Commercial, and C&D, as follows:

**Aggregated Allocation based upon 12 Month Characterization Study**

Facility	Residential				Commercial				C&D				Total
	Tons	SH Tons	Total Tons	%	Tons	SH Tons	Total Tons	%	Tons	SH Tons	Total Tons	%	Tons
<b>Cherry Island</b>	229,380	13,864	243,244	43%	215,287	13,864	229,151	41%	77,847	13,864	91,711	16%	564,106
<b>Pine Tree Transfer Station</b>	39,021	2,085	41,106	41%	38,246	2,085	40,331	41%	16,017	2,085	18,102	18%	99,540
<b>Central Landfill</b>	49,409	4,174	53,583	34%	42,436	4,174	46,610	30%	53,571	4,174	57,745	37%	157,938
<b>Milford Transfer Station</b>	17,719	1,041	18,760	41%	19,238	1,041	20,279	44%	6,050	1,041	7,091	15%	46,130
<b>Rt. 5 Transfer Station</b>	23,545	2,353	25,898	38%	23,648	2,353	26,001	38%	14,509	2,353	16,862	25%	68,761
<b>Southern Landfill</b>	46,634	10,155	56,789	26%	50,773	10,155	60,928	28%	90,266	10,155	100,421	46%	218,138
<b>Totals</b>	<b>405,709</b>	<b>33,672</b>	<b>439,380</b>	<b>38%</b>	<b>389,628</b>	<b>33,672</b>	<b>423,300</b>	<b>37%</b>	<b>258,261</b>	<b>33,672</b>	<b>291,933</b>	<b>25%</b>	<b>1,154,613</b>

While the sampling period for the the 12 month waste characterization study does not correspond exactly with the period in question it is an exceptionally accurate and empirical analysis of the composition of the waste stream. (You may note that the total tons landfilled dropped about 4% from the sample period to CY2006.) If the allocation percentages from the 12 month waste characterization study are applied to the material disposed in DSWA landfills for the calendar 2006 year, then the approximate weight of materials by allocation category can be determined for CY2006 as follows:

**CY 2006 DSWA Waste Stream Composition**

Facility	Total Tons	Residential		Commercial		MSW	C&D	
		%	Tons	%	Tons	Tons	%	Tons
<b>Cherry Island</b>	585,830	43%	252,612	41%	237,975	490,587	16%	95,243
<b>Pine Tree Transfer Station</b>	82,099	41%	33,904	41%	33,265	67,168	18%	14,931
<b>Central Landfill</b>	136,725	34%	46,386	30%	40,350	86,736	37%	49,989
<b>Milford Transfer Station</b>	26,288	41%	10,691	44%	11,556	22,247	15%	4,041
<b>Rt. 5 Transfer Station</b>	31,493	38%	11,862	38%	11,909	23,770	25%	7,723
<b>Southern Landfill</b>	246,405	26%	64,148	28%	68,823	132,971	46%	113,434
<b>Totals</b>	<b>1,108,840</b>	<b>38%</b>	<b>419,602</b>	<b>36%</b>	<b>403,878</b>	<b>823,479</b>	<b>26%</b>	<b>285,361</b>

## APPENDIX B

### Original Data Input

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Original data come from the following sources, and are attached. This data has been transferred “as is” to the master data spreadsheets, Appendix A.

- Delaware Solid Waste Authority
  - Additional data are available in DSWA’s Annual Report and other reports. <http://www.dswa.com/technical.asp>
  
- DSM Environmental Services, Inc.
  - The DSM report is lengthy. It is available from the Council and can be found by following a link on the DNREC web page. <http://www.awm.delaware.gov/Info/Pages/RPAC.aspx>

APPENDIX B, Cont.

Report: Delaware Solid Waste Authority



**DELAWARE SOLID WASTE AUTHORITY**

Pasquale S. Canzano, P.E., BCEE  
Chief Executive Officer

Richard P. Watson, P.E., BCEE  
Chief Operating Officer

December 13, 2007

**Board of Directors**  
Richard V. Pryor  
Chairman  
Ronald G. McCabe  
Vice Chairman  
Theodore W. Ryan  
William J. DiMondi  
Timothy P. Sheldon  
Tonda L. Parks  
Stephanie L. Hansen

Brock J. Vinton II  
Recycling Public Advisory Council  
1201 Mount Lebanon Road  
Wilmington, DE 19803

Dear Mr. Vinton,

The Delaware Solid Waste Authority (DSWA) has enclosed the recycling and facility information requested by the Methodology and Measurement Committee for calendar year 2006. There are two tables that contain the information that was requested. The first table presents the recycling data for all activities controlled by DSWA in calendar year 2006. The second table is the amounts of material, which were processed by DSWA at its three landfills during calendar year 2006. I hope this data meets the needs of the committee for the completion of your report. If more information or any clarification on the data presented is needed, please do not hesitate to contact me.

Sincerely,

Michael D. Parkowski  
Manager of Business Services

C:\My Documents\MDP\2007\M&M Letter.doc  
Attachments: Recycling Data Table  
Materials Processed by DSWA Table

1128 S. Bradford Street, P.O. Box 455, Dover, Delaware 19903-0455  
Phone: (302) 739-5361 Fax: (302) 739-4287  
CITIZENS' RESPONSE LINE: 1-800-404-7080 [www.dswa.com](http://www.dswa.com)

Printed on Recycled Paper

**DSWA Waste Handling and Landfilling Activities  
CY 2006 by Facility**

<b>Cherry Island Landfill</b>	
Asbestos Friable	1,932
Asbestos Non-Friable #1	136
Asbestos Non-Friable #2	356
C&D Debris	6,604
Household Batteries	61
MSW	576,006
12th Street MSW	8
Tires	688
Transfer Pine Tree	5,593
Yard Waste Rejects	39
<b>Total</b>	<b>591,423</b>

<b>CSWMC/ Sandtown Landfill</b>	
Asbestos Non-Friable #2	15
C&D Debris	16,519
MSW	119,623
MSW from Milford	26,288
Shredded Tires	74
Tires	480
Transfer from Pine Tree	76,506
Yard Waste Rejects	14
<b>Total</b>	<b>239,519</b>

<b>SSWMC/ Jones Crossroads Landfill</b>	
Asbestos Non-Friable #2	34
C&D Debris	83,598
MSW	161,169
Shredded Tires	254
Sludge	725
Tires	560
Transfer from RT 5	31,493
Yard Waste Rejects	65
<b>Total</b>	<b>277,898</b>

CATEGORIES OF RECYCLABLES		DSWA RECYCLABLES -- WEIGHED UPON RECEIPT (DSWA CY 2006) "%R" is Percent Residential; "%C" is Percent Commercial								
		Drop-off Containers			DSWA Programs			Curbside Collection		
		Tons (Total)	%R	%C	Tons (Total)	%R	%C	Tons (Total)	%R	%C
PAPER	ONP (old newspapers)	10,744	90	10	155	100	0	334	100	
	OCC (old corrugated containers)	2,245	90	10	2,591	0	100	287	100	
	Mixed Paper	1,986	90	10	545	0	100	712	100	
	Undeliverable Mail from Post Office				1,173	50	50			
PACKAGING	Clear Glass	1,197	90	10	112	100				
	Brown Glass	390	90	10	1	100				
	Green Glass	779	90	10	356	100				
	Mixed Glass				3,516	100		288	100	
	Plastic Bottles	1,146	90	10	269	90	10	66	100	
	Plastic Grocery Bags and Film	112	90							
VEHICLE WASTE	Oil Filters				505	90	10			
	Automotive Lead-Acid Batteries				4	100				
	Motor Oil	1,312	90	10						
SPECIAL WASTE	Carpet and Textiles	96	90	10						
	Electronic Goods				1,359	90	10			
GREEN WASTE	Leaf and Yard Waste				7,459	50	50	174	100	
METALS	Aluminum & Steel Cans	643	90	10				167	100	
	White Goods				2,962	90	10			
SINGLE STREAM	"Mixed recyclables": collected mixture of different categories of recyclables; includes City of Wilmington collection							2,054	100	
C&D	Construction and Demolition				152,672					
BIOSOLIDS & ASH	Biosolids from COW for SSL				52,819					
	Fly Ash from Edgemoor for SSL				75,789					
	Bottom Ash from Edgemoor for Road Construction CIL				3,903					
	Soils				498,765					

**APPENDIX B, Cont.**

**Cover page of Report: DSM Environmental Services, Inc.<sup>7 8</sup>**

**State of Delaware  
Assessment of Commercial and Industrial  
Recycling Activity, and  
Accounting of Municipal Solid Waste Recycling  
For Calendar Year 2006**

**Final Report**

**Prepared for:  
Recycling Public Advisory Council**

**c/o DNREC  
Solid and Hazardous Waste Management Branch  
89 Kings Highway  
Dover, DE 19903**

**Prepared by;  
DSM Environmental Services, Inc.  
P.O. Box 466  
Ascutney, VT 05030-0466  
[www.dsmenvironmental.com](http://www.dsmenvironmental.com)**

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<sup>7</sup> “State of Delaware. Assessment of Commercial and Industrial Recycling Activity, and Accounting of Municipal Solid Waste Recycling For Calendar Year 2006”, December 31, 2007. Report prepared for RPAC by DSM Environmental Services, Inc., P.O. Box 466, Ascutney, VT 05030-0466. [www.dsmenvironmental.com](http://www.dsmenvironmental.com)

<sup>8</sup> Report prepared for RPAC by DSM Environmental Services, Inc., P.O. Box 466, Ascutney, VT 05030-0466. [www.dsmenvironmental.com](http://www.dsmenvironmental.com); issued January 2008.

**APPENDIX B, CONT.**  
**Selected Sections of Report: DSM Environmental Services, Inc.**

**Table 2: Materials Recovery by Material Type and Breakdown of Materials Included in EPA Definition of MSW Recycling (CY 2006)**

<b>Material Category</b>	<b>Total (tons)</b>	<b>MSW (tons)</b>	<b>Excluded from MSW (tons)</b>	<b>Explanation</b>
<b>Paper</b>				
Corrugated (OCC)	63,700	63,700	0	
Newspaper (ONP)	4,800	3,870	930	Print overruns excluded
Sorted Office Paper	5,900	5,900	0	
Mixed Paper (1)	16,700	16,700	unknown	Breakdown of print overruns unknown
<b>Subtotal:</b>	<b>91,100</b>	<b>90,170</b>	<b>930</b>	
<b>Packaging</b>				
Glass	0	0	0	
Shrink Wrap	240	240	0	
Plastic Containers	0	0	0	
Aluminum Cans	30	30	0	
Pallets (2)	18,400	8,500	9,900	Pallets rebuilt excluded
Mixed Recyclables	917	917		
<b>Subtotal:</b>	<b>18,670</b>	<b>8,770</b>	<b>9,900</b>	
<b>Metals</b>				
White Goods	16,100	16,100	0	
Ferrous	62,000	unknown	unknown	Includes metals removed from vehicles, C&D, etc.
Non-ferrous	12,500	unknown	unknown	Includes metals removed from vehicles, C&D, etc.
Scrap Cars	9,600	0	9,600	Scrap cars excluded and underreported
Durables (mixed)	200	200	0	
<b>Subtotal:</b>	<b>100,400</b>	<b>16,300</b>	<b>9,600</b>	
<b>Green Waste</b>				
Leaf and Yard Waste	34,500	34,500		All DSWA curbside and drop-off excluded
Trees and Branches	31,600	31,600		Trees and stumps from land clearing excluded
Clean Wood	1,800	1,800		Could include some DIY C&D wood
<b>Subtotal:</b>	<b>67,900</b>	<b>67,900</b>	<b>0</b>	

**Report: DSM Environmental Services, Inc. Table 2. Continued**

<b>Material Category</b>	<b>Total (tons)</b>	<b>MSW (tons)</b>	<b>Excluded from MSW (tons)</b>	<b>Explanation</b>
<b>Vehicle Waste</b>				
Tires (3)	7,400	6,800	600	Tire derived fuel excluded from MSW
Lead Acid Batteries	900	900		Severely undercounted
Oil Filters	90	90		
Waste Oil (4)	8,000		8,000	
<b>Subtotal:</b>	<b>16,390</b>	<b>7,790</b>	<b>8,600</b>	
<b>Special Wastes</b>				
Textiles (5)	4,000	unknown	unknown	Textiles were shipped overseas and some were reused
Electronics	200	200	0	Excludes all DSWA recycling activity
Florescent Bulbs	20	20	0	Undercounted
Carpet	86	86	0	
<b>Subtotal:</b>	<b>4,306</b>	<b>306</b>	<b>0</b>	
<b>Ag and Food Wastes</b>				
Poultry Waste	375,400	0	375,400	
Sludge	9,400	0	9,400	
Poultry Litter	77,700	0	77,700	
Food Processing	9,800	0	9,800	
Fats, Oil, Grease	3,200	3,200	0	
Food Waste	4,600	4,600	0	
<b>Subtotal:</b>	<b>480,100</b>	<b>7,800</b>	<b>472,300</b>	
<b>Construction &amp; Demolition</b>				
Asphalt	350,200	0	350,200	
Concrete	379,600	0	379,600	
Trees and Stumps	25,500	0	25,500	All material is counted whether for residential or commercial construction or demolition
Soils	101,900	0	101,900	
Stones	4,500	0	4,500	
Mixed Construction Waste	140	0	140	
<b>Subtotal:</b>	<b>861,840</b>	<b>0</b>	<b>861,840</b>	
<b>Industrial Waste Recovery</b>				
Mixed Plastics	2,200	unknown	unknown	Estimate 50% MSW
Biosolids (Wet Tons)	63,700	0	63,700	2005 figures
Bottom and Fly Ash	101,350	0	101,350	
Slag	80,000	0	80,000	2005 figures
<b>Subtotal:</b>	<b>247,250</b>	<b>0</b>	<b>245,050</b>	
<b>Total Recovery:</b>	<b>1,888,000</b>	<b>199,000</b>	<b>1,608,200</b>	

**See Table Notes**

**Table Notes (Numbers May Not Add Due to Rounding):**

- 1) Mixed Paper: All included in MSW as most was reported from processors who did not reveal sources.
- 2) Pallets: Only pallets ground for mulch are included in the MSW column.

**(Table Notes continued next page)**

- 3) Tires: Roughly 600 tons of the 7400 tons reported went to tire derived fuel, which is excluded from the EPA recycling rate. The end uses of 800 tons of tires are unknown. The balance went to crumb rubber and engineered products including drainage material, landfill cell construction and playground surfacing, which is included in the EPA rate.
- 4) Waste Oil: Waste oil reported to DSM either went to fuel blends or re-refining. DSM confirmed that 82% went to a fuel blend or boiler for energy use.
- 5) Textiles: Used clothing including shoes are exported for recycling or reuse. The end uses change based on the condition and changing markets. The clothing is sorted into 4 color categories and sold as rags, or bagged as is and sold as clothing. No breakdown of the actual end use is available.

**Report: DSM Environmental Services, Inc. Table 3.**

**Estimate of Residential vs. Commercial MSW Recycling Activity (CY 2006)**

<b>Material Category</b>	<b>Residential (tons)</b>	<b>Commercial (tons)</b>	<b>Total MSW (tons)</b>
<b>Paper</b>			
Corrugated (OCC)	0	63,700	63,700
Newspaper (ONP)	0	3,870	3,870
Sorted Office Paper	0	5,900	5,900
Mixed Paper (1)	0	16,700	16,700
<b>Packaging</b>			
Glass	0	0	0
Shrink Wrap	0	240	240
Plastic Containers	0	0	0
Aluminum Cans	0	30	30
Pallets	0	8,500	8,500
Mixed Recyclables (2)	917	0	917
<b>Metals</b>			
White Goods	16,100	0	16,100
Durables (e.g. small appliances)	200	0	200
<b>Green Waste</b>			
Leaf and Yard Waste (3)	32,000	2,500	34,500
Trees and Branches (4)	28,440	3,160	31,600
Clean Wood	0	1,800	1,800
<b>Vehicle Waste (5)</b>			
Tires	5,440	1,360	6,800
Lead Acid Batteries	720	180	900
Oil Filters	72	18	90
<b>Special Wastes</b>			
Textiles (6)	4,000		4,000
Electronics		200	200
Florescent Bulbs		20	20
Carpet		86	86
<b>Ag and Food Wastes</b>			
Fats, Oil, Grease		3,200	3,200
Food Waste		4,600	4,600
<b>Totals:</b>	<b>87,889</b>	<b>116,064</b>	<b>203,953</b>

See Table Notes: **(Continued next page)**

- (1) Includes some print overruns.
- (2) Single stream material from Wilmington pilot, which includes paper and bottles and cans.
- (3) All municipal collected leaf and yard waste (estimated at 9070 tons) classified as residential, as well as 150 tons of residentially delivered yard waste, and 90% of material removed off site for grinding for mulch.
- (4) Ninety percent (90%) of trees and branches reported ground for mulch assumed to be residential.
- (5) Reported source of tires was 80% trucks by one major tire recycler. Reported source of oil and oil filters is unknown. DSM assumed 80% of vehicle waste came from households and the balance from commercial vehicles.
- (6) Documented source of textiles is unknown, however DSM estimates most textiles came from residential sources

## APPENDIX C

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### **Executive Order Number 90: The Recycling Public Advisory Council**

WHEREAS, the average Delawarean produces 1,200 pounds of solid waste annually and much of that waste can and should be recycled;

WHEREAS, increasing Delaware's recycling efforts will benefit the environment and increase the useful life of the state's landfills;

WHEREAS, the Department of Natural Resources and Environmental Control (the "Department") and the Delaware Solid Waste Authority (the "Authority") promote varying aspects of municipal solid waste recycling in the State of Delaware;

WHEREAS, increasing our recycling efforts over the long-term will require a strong commitment on the part of Delawareans;

WHEREAS, schools, colleges, universities, municipalities, not-for-profit organizations, civic associations, and other community organizations are the entities most able to increase recycling within their borders and need assistance to provide the tools necessary to start recycling programs; and

WHEREAS, Delawareans increasingly recognize the importance of recycling and many Delawareans have expressed an interest in participating in curbside and other recycling programs,

NOW, THEREFORE, I, RUTH ANN MINNER, by virtue of the authority vested in me as Governor of the State of Delaware, do hereby declare and Order as follows:

1. It shall be the goal of this State to achieve a fifty-one percent (51%) diversion rate for recyclables from Delaware's municipal solid waste stream comprised of residential and commercial solid waste.
2. The Recycling Public Advisory Council (Council) is re-established and continued. The Council shall be composed of eleven (11) members who shall be appointed by the Governor as follows:
  - a. One member from the Department;
  - b. One member from the Authority;

- c. One member representing county governments with such member being recommended by the Delaware Association of Counties;
- d. One member representing municipal governments with such member being recommended by the Delaware League of Local Governments;
- e. One member representing the recycling industry to be appointed by the Governor;
- f. One member representing the waste hauling industry to be appointed by the Governor; and
- g. Five members representing community-based or public-interest groups to be appointed by the Governor.

3. Members of the Council, except for those appointed pursuant to subparagraphs a, b, and c of paragraph 2 above, shall serve of up to 3 years and may be reappointed. Members of the current Council shall continue in office for the balance of their terms and shall also be eligible for reappointment. Members shall be appointed for staggered terms so that no more than 3 appointments shall expire in any one calendar year. Members may be reimbursed for travel to and from meetings. The Governor shall appoint a Chairman from among the eleven members. Actions of the Council shall be approved by a majority vote of the Council. At least six\_(6) members of the Council shall constitute a quorum.

4. The Recycling Public Advisory Council shall:

- a. Advise the Department and the Authority on all aspects of recycling;
- b. Advise the Department in developing grant criteria, including local match requirements, and selection of applications as well as provide an annual assessment of the revenue needed to satisfy the grant requirements;
- c. Develop, in conjunction with the Department and the Authority, a methodology for measuring recycling rates;
- d. Provide advice and recommendations regarding the recycling outreach and education programs conducted by the Authority and/or the Department;
- e. Report to the Governor and the General Assembly annually by March 1 of each year on the status of recycling activities in Delaware. Said report shall include, but not be limited to the following:
  - (1) status of attainment of the 51% recycling goal;

(2) an accounting of the recycling grants program and any recommendations for future funding of the grants program;

(3) an assessment of the activities of both the Department and the Authority in achieving a 51% municipal solid waste recycling goal;

(4) an objective, auditable accounting of recycling rates for total solid waste, municipal solid waste, and residential solid waste; and

(5) such other recommendations as the Council shall deem appropriate.

f. Use the definitions of 'recycling' and 'municipal solid waste' as stated by the United States Environmental Protection Agency in its document EPA530-R-97-011 dated September 1997. The Council shall be able to adopt changes to these definitions.

5. The Department's Division of Air and Waste Management, in concert with the Authority and the Council, shall:

a. Monitor the State's recycling initiatives and measure Delaware's achievements toward attainment of the 51% recycling goal;

b. Implement a grant program for use by schools, colleges, universities, municipalities, not-for-profit organizations, civic associations, and other community organizations in reaching the statewide recycling goal specified herein;

c. Design and implement public educational efforts aimed at increasing public awareness of recycling opportunities;

d. Implement a public school recycling initiative whereby our school systems are able to participate in and benefit from increased recycling opportunities;

e. Provide technical assistance to local entities to assist them in increasing their recycling rates;

f. Provide administrative support to the Council;

g. Report to the Governor and the Office of Management and Budget on the need for staff to provide this support; and

h. Promote any other measures identified by the Council to support the achievement of the 51% recycling goal.

6. The Department shall make matching grants available to schools, colleges, universities, municipalities, not-for-profit organizations, civic associations, and other community organizations to implement programs to reduce the amount of municipal solid waste disposed of in Delaware. Grants may be used for implementing or expanding recycling programs, encouraging composting of yard waste, implementing “pay-as-you-throw” programs, or any other activity that supports the achievement of the 51% recycling goal. The availability of grant money shall be subject to annual appropriations by the General Assembly.

7. Executive Order Number 82 adopted September 14, 2000, is rescinded.

Approved: September 6, 2006

## **APPENDIX D**

### **Definitions**

#### **RPAC DEFINITIONS**

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**Beneficial Use** refers to the use of a solid waste material in an application which displaces natural resources or virgin materials. Beneficial use of a material shall not constitute or be counted as “recycling”, but it shall count as “diversion” if the solid waste material does not end up in a landfill.

**Diversion** is an activity which uses a solid waste material in a way such that it does not end up in a landfill.

**Landfilled** refers to the disposal of a solid waste material in a landfill, regardless of whether or not it could be recycled or diverted for beneficial use.

**Single Stream Collection** refers to a collection procedure wherein various recyclables are mixed together in one collection container instead of being separated into separate commodities and multiple containers.

**Solid Waste** means any garbage, refuse, sludge from a waste treatment plant, water supply treatment plant or air pollution control facility and other discarded material, including solid, liquid, semisolid or contained gaseous material resulting from industrial, commercial, mining and agricultural operations, and from community activities, but does not include solid or dissolved material in domestic sewage, or solid or dissolved materials in irrigation return flows or industrial discharges which are point sources subject to permits under § 402 of the Federal Water Pollution Control Act, as amended (86 Stat. 880) [33 U.S.C. § 1342], or source, special nuclear or by-product material as defined by the Atomic Energy Act of 1954, as amended (68 Stat. 923) [42 U.S.C. § 2014]. (definition from Delaware Title 7, Chapter 64, Subchapter I: General Provisions”, § 6402, Definitions (9)

#### **EPA DEFINITIONS (EPA530-R-97-011; Appendix A, Glossary)**

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**Backyard Composting:** refers to the diversion of food scraps and yard trimmings from the municipal waste stream through the onsite controlled decomposition of organic matter by micro-organisms (mainly bacteria and fungi) into a humus-like product. Backyard composting is *excluded* from recycling activities. Rather, it is considered source reduction because the composted materials never enter the municipal solid waste stream. (U.S. EPA, 1991a)

**Brush and Branches:** refers to the natural woody material collected from yard trimmings. *Branches up to 4 inches in diameter and some* whole trees, such as Christmas trees, are included. *Excludes* leaves and grass. Examples of recycling include processing brush and branches into compost additive or mulch.

**Commercial Waste:** refers to waste generated by businesses, such as office buildings; retail and wholesale establishments; and restaurants. Examples include old corrugated containers, food scraps, office papers, disposable tableware, paper napkins, and yard trimmings. (U.S. EPA, 1996b)

**Construction and Demolition (C&D) Debris:** refers to waste that is generated during the construction, remodeling, repair, or demolition of buildings, bridges, pavements, and other structures. C&D debris includes concrete, asphalt, lumber, steel girders, steel rods, wiring, dry wall, carpets, window glass, metal and plastic piping, tree stumps, soil, and other miscellaneous items related to the activities listed above. This category also includes natural disaster debris. (U.S. EPA, 1989, 1994d)

**Ferrous Metals:** refers to magnetic metals derived from iron (steel). (U.S. EPA, 1995d) Products made from ferrous metals include major and small appliances, furniture, and containers and packaging (steel drums and barrels). Examples of recycling include processing tin/steel cans, strapping, and ferrous metals from appliances into new products. (U.S. EPA, 1995d)

**Food Processing Waste:** refers to food residues produced during agricultural and industrial operations.

**Food Scraps:** refers to uneaten food and food preparation wastes from residences and commercial establishments (grocery stores, restaurants, and produce stands), institutional sources (school cafeterias), and industrial sources (employee lunchrooms). *Excludes* food processing waste from agricultural and industrial operations. Examples of recycling include composting and using food scraps to feed pigs, but *excludes* source reduction activities such as backyard (onsite) composting and use of food items for human consumption (food banks).

**Household Hazardous Waste (HHW):** refers to hazardous products that are used and disposed of by residential—rather than industrial—consumers. These products include some paints, stains, varnishes, solvents, and pesticides, and other materials or products containing volatile chemicals that catch fire, react, explode under certain circumstances, or that are corrosive or toxic. HHW is derived from municipal solid waste (MSW) with the exception of used oil which is *excluded* from the category of MSW. Examples of recycling include processing HHW components into new products after they have been diverted from the waste stream. Diversion from the waste stream only does not constitute recycling (i.e., through collection or drop-off programs). (U.S. EPA, 1992, 1993b)

**Industrial Waste:** refers to nonhazardous wastes discarded at industrial sites from packaging and administrative sources. Examples include corrugated boxes, plastic film, wood pallets, lunchroom wastes, and office paper. *Excludes* industrial process wastes from manufacturing operations. (U.S. EPA, 1996b)

**Institutional Waste:** refers to waste generated at institutions, such as schools, libraries, hospitals, and prisons. Examples include cafeteria and restroom trashcan wastes, office papers, classroom wastes, and yard trimmings. (U.S. EPA, 1996b)

**Lead-Acid Batteries:** refers to batteries used in automobiles, trucks, and motorcycles. They contain plastic, lead (a toxic metal), and sulfuric acid. *Excludes* lead-acid batteries from large equipment, heavy-duty trucks and tractors, aircraft, military vehicles, and boats. (U.S. EPA, 1993a, 1996b)

**Leaves:** refers to the foliage of a plant. *Excludes* brush, branches, and grass. (Mish et al., 1988)

**Major (Large) Appliances:** refers to many different types, sizes, and styles of ovens, microwave ovens, air-conditioners, refrigerators, freezers, washers, dryers, dishwashers, water heaters, dehumidifiers, or trash compactors manufactured for household, commercial, or recreational use. Steel is the predominant material used in the manufacture of large appliances. Other materials found in appliances (in varying amounts) include, copper, brass, aluminum, glass, rubber, and paperboard. **Also see White Goods and Bulky Waste.** (Sullivan, 1993 and U.S. EPA, 1995d)

**Medical Waste:** refers to any solid waste generated in the diagnosis, treatment, or immunization of human beings or animals, in research pertaining thereto, or in the production or testing of biologicals, excluding hazardous waste identified or listed under 40 CFR Part 261 or any household waste as defined in 40 CFR Subsection 261.4 (b)(1). (U.S. EPA, 1994d)

**Mixed Glass:** refers to recovered container glass that is not sorted into specific categories (color and grade).

**Mixed Metals:** refers to recovered metal that is not sorted into specific categories (aluminum cans, tin/steel cans, other ferrous, and other nonferrous).

**Mixed Municipal Solid Waste:** refers to municipal solid waste that is not sorted into specific categories (plastics, glass, and yard trimmings).

**Mixed Paper:** refers to recovered paper that is not sorted into specific categories (old magazines, old newspapers, and old corrugated containers).

**Mixed Plastic:** refers to recovered plastic that is not sorted into specific categories (HDPE, LDPE, and PETE).

**Municipal Sludge:** refers to the semi-liquid residue remaining from the treatment of municipal water and wastewater. (U.S. EPA, 1989)

**Municipal Solid Waste (MSW):** refers to wastes such as durable goods, nondurable goods, containers and packaging, food scraps, yard trimmings, and miscellaneous inorganic wastes from residential, commercial, institutional, and industrial sources, such as appliances, automobile tires, old newspapers, clothing, disposable tableware, office and classroom paper, wood pallets, and cafeteria wastes. *Excludes* solid wastes from other sources, such as construction and demolition debris, autobodies, municipal sludges, combustion ash, and industrial process wastes that might also be disposed of in municipal waste landfills or incinerators. (U.S. EPA, 1996b)

**Nonferrous Metals:** refers to nonmagnetic metals such as aluminum, lead, and copper. Products made from nonferrous metals include containers and packaging such as beverage cans, food and other nonfood cans; nonferrous metals found in appliances, furniture, electronic equipment; and nonpackaging aluminum products (foil, closures, and lids from bimetal cans). *Excludes* lead-acid batteries and nonferrous metals from industrial applications and construction and demolition debris. (U.S. EPA, 1996b)

**Office Paper:** refers to high-grade papers such as copier paper, computer printout, and stationery. These papers are almost entirely made of uncoated chemical pulp, although some amounts of ground wood are used. It should be noted that this category of paper also is generated at locations other than offices, such as homes and institutions (schools).

**Old Corrugated Containers (OCC):** refers to corrugated containers made from unbleached, unwaxed paper with a ruffled (corrugated) inner liner. (U.S. EPA, 1993a)

**Old Magazines:** refers to dry, coated magazines, catalogues, and similar printed materials. (Institute of Scrap Recycling Industries, Inc., 1996)

**Old Newspaper:** refers to periodicals printed on newsprint. Includes ground wood inserts (advertisements). Examples of recycling include processing old newspapers into new paper products (newspaper, paperboard, boxboard, or animal bedding). (U.S. EPA, 1996b)

**Other Ferrous Metals:** refers to ferrous metals from strapping, furniture, and metal found in tires and consumer electronics. *Excludes* the large quantities of metals found in construction materials or transportation products, such as automobiles, locomotives, and ships. (U.S. EPA, 1996b)

**Other Glass:** refers to glass from furniture, appliances, and consumer electronics. *Excludes* glass from transportation products and construction and demolition debris. Examples of recycling include processing glass into new glass products such as containers, construction materials (aggregate), or fiberglass (insulation). (U.S. EPA, 1996b)

**Other Nonferrous Metals:** refers to nonferrous metals (lead, copper, and zinc) from appliances, consumer electronics, and nonpackaging aluminum products (foil, closures, and aluminum lids from bimetal cans). *Excludes* nonferrous metals from industrial applications and construction and demolition debris. (U.S. EPA, 1996b)

**Other Paper:** refers to paper from books, third class mail, other commercial printing, paper towels, paper plates and cups, other nonpackaging paper (posters, photographic papers, cards, and games), milk cartons, folding boxes (cereal boxes), bags, wrapping papers, and other paper and paperboard products. (U.S. EPA, 1996b)

**Other Plastic:** refers to plastic from appliances, furniture, trash bags, cups, eating utensils, sporting and recreational equipment, and other nonpackaging plastic products. (U.S. EPA, 1996b)

**Other Recyclables:** refers to household hazardous waste, oil filters, fluorescent tubes, mattresses, consumer electronics, circuit boards, and other miscellaneous recyclable items found in municipal solid waste that cannot be otherwise categorized.

**Other Solid Waste:** refers to nonhazardous solid wastes, other than municipal solid waste, covered under Subtitle D of the Resource Conservation and Recovery Act, such as municipal sludge, industrial nonhazardous waste, construction and demolition waste, agricultural waste, oil and gas waste, and mining waste. (U.S. EPA, 1996b)

**Other Wood:** refers to wood from furniture, cabinets from consumer electronics, and other nonpackaging wood products. *Excludes* wood recovered from construction and demolition activities (lumber and tree stumps) and industrial process waste (shavings and sawdust). Examples of recycling include processing wood into mulch, compost additive, or animal bedding. (U.S. EPA, 1996b)

**Overissue Publications (Overissues):** refers to printed publications, such as newspapers and magazines, that are defined as unsold inventory by the publisher. Overissues are not considered postconsumer waste.

**Paper:** refers to paper products and materials such as old newspapers, old magazines, office papers, telephone directories, old corrugated containers, bags, and some paperboard packaging. Examples of recycling include processing paper into new paper products (tissue, paperboard, hydromulch, animal bedding, or insulation materials). (U.S. EPA, 1996b)

**Plastic:** refers to plastic containers and packaging made from various resins, including PETE, HDPE, PVC, LDPE, PP, and PS. *Excludes* plastics in transportation (automobiles) and construction products (PVC piping). (U.S. EPA, 1996b)

**Postconsumer Materials/Waste:** refers to recovered materials that have been used as a consumer item and are diverted from municipal solid waste for the purpose of collection, recycling, and disposition (aluminum beverage cans, plastic bottles, old newspapers, and yard trimmings). *Excludes* materials from industrial processes that have not reached the consumer, such as glass broken in the manufacturing process or overissues of newspapers and magazines. (U.S. EPA, 1994d, 1995c) is printed beyond the quantity specified. (Walden-Mott, 1981)

**Recovery:** refers to the diversion of materials from the municipal solid waste stream for the purpose of recycling or composting. *Excludes* reuse and source reduction activities such as yard trimmings diverted to backyard (onsite) composting, the repair of wood pallets, and the refilling of beverage containers. (U.S. EPA 1996b)

**Recyclables:** refers to those materials recovered from the solid waste stream and transported to a processor or end user for recycling. (National Recycling Coalition, 1995)

**Recycling:** refers to the series of activities by which discarded materials are collected, sorted, processed, and converted into raw materials and used in the production of new products. *Excludes* the use of these materials as a fuel substitute or for energy production. (National Recycling Coalition, 1995)

**Residential Waste:** refers to waste generated by single- and multi-family homes including old newspapers, clothing, disposable tableware, food packaging, cans and bottles, food scraps, and yard trimmings. *Excludes* food scraps and yard trimmings that are diverted to backyard (onsite) composting. (U.S. EPA, 1996b)

**Solid waste:** means any garbage, refuse, sludge from a waste treatment plant, water supply treatment plant or air pollution control facility and other discarded material, including solid, liquid, semisolid or contained gaseous material resulting from industrial, commercial, mining and agricultural operations, and from community activities, but does not include solid or dissolved material in domestic sewage, or solid or dissolved materials in irrigation return flows

or industrial discharges which are point sources subject to permits under § 402 of the Federal Water Pollution Control Act, as amended (86 Stat. 880) [33 U.S.C. § 1342], or source, special nuclear or by-product material as defined by the Atomic Energy Act of 1954, as amended (68 Stat. 923) >42 U.S.C. § 2014]. [Delaware Code Title 7, Chapter 64, Subchapter 1, §6402 (9)]

**Tires:** refers to passenger car and light- and heavy-duty truck tires. *Excludes* high-speed industrial tires (from airplanes), bus tires, motorcycle tires, and special service tires, such as military, agricultural, off-road, and slowspeed industrial tires (from construction vehicles). Examples of recycling include processing car and truck tires into new rubber products (trash cans, storage containers, and rubberized asphalt), and the use of whole tires for playground and reef construction. (U.S. EPA, 1994b)

**Tree Stumps:** refers to the portion of a tree remaining after it has been cut. Tree stumps are categorized as yard trimmings when found in municipal solid waste. Otherwise, tree stumps are generally found in, and categorized as, construction and demolition debris. (Mish et al., 1988)

**Used Oil:** refers to spent motor oil from passenger cars and trucks that is collected at specified locations for recycling. Used oil is *excluded* from the category of municipal solid waste.

**White Goods:** refers to major appliances such as refrigerators, stoves, air conditioners, and washing machines. **Also see Major Appliances and Bulky Waste.** (U.S. EPA, 1989)

**Wood Packaging:** refers to wood products such as pallets, crates, and barrels. *Excludes* wood from furniture and other nonpackaging wood products. Examples of recycling include processing wood into new products (mulch and compost). (U.S. EPA, 1996b)

**Yard Trimmings:** refers to grass, leaves, tree branches (*up to 4 inched in diameter*) and brush, and tree stumps from residential, institutional, and commercial sources. Examples of recycling include processing yard trimmings into compost, mulch, or other similar uses, and landspreading leaves (when the depth of the application allows for degradation of the organic plant material). (U.S. EPA, 1996b)

**APPENDIX E**  
**Recyclables: Inclusion and Exclusion According to EPA530-R-97-011**

**TABLE A. SCOPE OF MATERIALS INCLUDED IN THE STANDARD MSW RECYCLING RATE**

<b>MATERIAL<sup>1</sup></b>	<b>WHAT IS MSW</b>	<b>WHAT IS NOT MSW<sup>2</sup></b>
Food Scraps	Uneaten food and food preparation wastes from residences and commercial establishments (restaurants, supermarkets, and produce stands), institutional sources (school cafeterias), and industrial sources (employee lunchrooms).	Food processing waste from agricultural and industrial operations.
Glass Containers	Containers; packaging; and glass found in appliances, furniture, and consumer electronics.	Glass from transportation equipment (automobiles) and construction and demolition (C&D) debris (windows).
Lead-Acid Batteries	Batteries from automobiles, trucks, and motorcycles.	Batteries from aircraft, military vehicles, boats, and heavy-duty trucks and tractors.
Tin/Steel Cans and Other Ferrous Metals	Tin-coated steel cans; strapping; and ferrous metals from appliances (refrigerators), consumer electronics, and furniture.	Ferrous metals from C&D debris and transportation equipment.
Aluminum Cans and Other Nonferrous Metals	Aluminum cans; nonferrous metals from appliances, furniture, and consumer electronics; and other aluminum items (foil and lids from bimetal cans).	Nonferrous metals from industrial applications and C&D debris (aluminum siding, wiring, and piping).
Paper	Old corrugated containers; old magazines; old newspapers; office papers; telephone directories; and other paper products including books, third-class mail, commercial printing, paper towels, and paper plates and cups.	Paper manufacturing waste (mill broke) and converting scrap not recovered for recycling.
Plastic	Containers; packaging; bags and wraps; and plastics found in appliances, furniture, and sporting and recreational equipment.	Plastics from transportation equipment.
Textiles	Fiber from apparel, furniture, linens (sheets and towels), carpets <sup>3</sup> and rugs, and footwear.	Textile waste generated during manufacturing processes (mill scrap) and C&D projects.
Tires	Tires from automobiles and trucks.	Tires from motorcycles <sup>4</sup> , buses, and heavy farm and construction equipment.
Wood	Pallets; crates; barrels; and wood found in furniture and consumer electronics.	Wood from C&D debris (lumber and tree stumps <sup>5</sup> ) and industrial process waste (shavings and sawdust).
Yard Trimmings	Grass, leaves, brush and branches, and tree stumps. <sup>5</sup>	Yard trimmings from C&D debris.
Other	Household hazardous waste (HHW) <sup>6</sup> , oil filters, fluorescent tubes <sup>7</sup> , mattresses, and consumer electronics.	Abatement debris, agricultural waste, combustion ash, C&D debris, industrial process waste, medical waste, mining waste, municipal sewage and industrial sludges, natural disaster debris <sup>8</sup> , used motor oil, oil and gas waste, and preconsumer waste.

**TABLE B. SCOPE OF ACTIVITIES INCLUDED IN THE STANDARD MSW RECYCLING RATE**

<b>RECYCLABLE MATERIAL</b>	<b>WHAT COUNTS AS RECYCLING</b>	<b>WHAT DOES NOT COUNT AS RECYCLING<sup>1</sup></b>
Food Scraps	Composting of food scraps from grocery stores, restaurants, cafeterias, lunchrooms, and private residences, and the use of food scraps to feed farm animals.	Backyard (onsite) composting of food scraps, and the use of food items for human consumption (food banks).
Glass	Recycling of container and packaging glass (beverage and food containers), and recycling of glass found in furniture, appliances, and consumer electronics into new glass products such as containers, packaging, construction materials (aggregate), or fiberglass (insulation).	Recycling of glass found in transportation equipment and construction and demolition (C&D) debris, recycling of preconsumer glass or glass from industrial processes, and reuse of refillable glass bottles.
Lead-Acid Batteries	Recycling of lead-acid batteries found in cars, trucks, or motorcycles into new plastic and lead products.	Recycling of lead-acid batteries used in large equipment, aircraft, military vehicles, boats, heavy-duty trucks and tractors, and industrial applications.
Metals	Recycling of aluminum and tin/steel cans, and recycling of metals found in appliances and packaging into new metal products.	Reuse of metal containers, packaging, furniture, or consumer electronics, and recycling of metals found in transportation equipment (autobodies) and C&D debris.
Paper	Recycling of paper products (old newspapers and office papers) into new paper products (tissue, paperboard, hydromulch, animal bedding, or insulation materials).	Reuse of paper products, recycling of preconsumer or manufacturing waste (trimmings, mill broke, print overruns, and overissue publications), and combustion of paper for energy recovery.
Plastic	Recycling of plastic products (containers, bags, and wraps), and recycling of plastic from furniture and consumer electronics into new plastic products (fiber fill and plastic lumber).	Reuse of plastic products (storage containers and sporting equipment), recycling of preconsumer plastic waste or industrial process waste, and combustion of plastics for energy recovery.
Textiles	Recycling of textiles into wiper rags, and recycling of apparel and carpet fiber <sup>2</sup> into new products such as linen paper or carpet padding.	Reuse of apparel.
Tires	Recycling of automobile and truck tires into new products containing rubber (trash cans, storage containers, and rubberized asphalt), and use of whole tires for playground and reef construction.	Recycling of tires from motorcycles, buses, and heavy farm and construction equipment, retreading of tires, and combustion of tire chips for energy recovery.
Wood	Recycling of wood products (pallets and crates) into mulch, compost, or similar uses.	Repair and reuse of pallets, combustion of wood for energy recovery, recycling of industrial process waste (wood shavings or sawdust), and recycling of wood from C&D debris.
Yard Trimmings	Offsite recycling of grass, leaves, brush or branches <sup>3</sup> , and tree stumps <sup>4</sup> into compost, mulch, or similar uses; and landspreading of leaves <sup>5</sup> .	Mulching of tree stumps <sup>4</sup> from C&D debris, backyard (onsite) composting, grasscycling, landspreading of leaves <sup>5</sup> , and combustion of yard trimmings for energy recovery.
Other	Household hazardous waste (HHW) <sup>6</sup> , oil filters, fluorescent tubes <sup>7</sup> , mattresses, circuit boards, and consumer electronics <sup>8</sup> .	Recycling of used oil, C&D debris (asphalt, concrete, and natural disaster debris), transportation equipment (autobodies), municipal sewage sludge, and agricultural, industrial, mining, and food processing waste.