JANUARY 2025

All Materials Recycling Study:

TOTAL SOLID WASTE | 2023

Prepared for:

DELAWARE SOLID WASTE AUTHORITY

FINAL REPORT, JANUARY 21, 2025

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I | INTRODUCTION

The Delaware Solid Waste Authority (DSWA) has a long-term commitment to the collection and tracking of data on waste generation, composition, recycling, and diversion activity in Delaware. This effort has helped the State to track progress toward waste diversion and reduction goals.

DSWA's commitment has resulted in multiple studies over the last twenty years including:

- The Delaware Solid Waste Authority *Statewide Waste Characterization Study*, completed in 1996, updated roughly every 10 years, most recently in 2015, and expected to be completed again in 2025;
- The State of Delaware *Assessment of Commercial and Industrial Recycling Activity* first completed in June 2006, (Bridge Report) an "on-the-ground" survey of all non-residential recycling and diversion in Delaware[1], updated in 2013 and again in 2018 (*All Materials Recycling Study: Total Solid Waste 2018)*; and,
- The State of Delaware *Assessment of Municipal Solid Waste Recycling*, an annual analysis of municipal solid waste recycling activity in the residential and commercial sectors (most recent report complied in 2024 to track calendar year (CY) 2023 Recycling Activity).

This report*, All Materials Recycling Study: Total Solid Waste 2023 (TSW Report)* represents data gathered on diversion of all solid waste streams, expanding the annual survey of municipal solid waste recycling to track other waste materials generated in Delaware and recycled and diverted from disposal in CY 2023. Materials tracked include: construction and demolition waste; industrial non-hazardous solid wastes; poultry and other food and beverage processing wastes; non-municipal scrap metals and agricultural wastes managed off-site.

Data compiled in this report will assist DSWA along with the Delaware Department of Natural Resources and Environmental Control (DNREC) and the Delaware Recycling Public Advisory Council (RPAC) to track progress towards recycling and diversion goals set forth under the Universal Recycling Law and will help DSWA to update their 2020 *Statewide Solid Waste Management Plan* (Plan).

[1] Note that at the time of the 2006 Commercial and Industrial Solid Waste Recycling Report (Bridge Report) DSM had not yet begun an annual analysis of "municipal solid waste recycling". Therefore, residential recycling was explicitly excluded from the 2006 report. Subsequent Total Solid Waste reports included residential recycling with the advent of the annual RPAC municipal recycling reports in 2007.

2 | SURVEY APPROACH

Data collection on the annual MSW recycling report for RPAC took place from January through April of 2024, with data collection of all other materials occurring primarily in the fall of 2024[2].

The first step was to review reports submitted as part of the CY 2023 Annual MSW Recycling Report to determine which organizations that report annually might also generate additional (non-MSW) materials that would be included in the accounting of TSW (which includes the MSW materials as a sub-set). From this review, a contact list of the annual reporters was finalized. DSM then re-contacted these companies individually (by telephone and email) during 2024 to explain the expanded survey and determine if they had any additional materials to report that are not requested as part of the annual RPAC Report, or if they reported materials recycled that were not part of the MSW stream to confirm and/or update these quantities for CY 2023.

The second step was to review contact lists developed for the two previous TSW reports and develop a database of those organizations that do not report annually but may generate materials that would be included in the TSW materials recycling report. All reporters from 2018 were then emailed an introductory letter from DNREC, as well as an TSW Report form to complete and return to DSM (see Appendix A).

Non-reporters were then contacted by telephone during the fall of 2024 to request a completed report. Multiple telephone calls continued until the majority of the large generators who reported in 2018 had completed the survey.

A more detailed description of the survey methodology follows.

Waste Types Included in Survey

This report concentrates on solid waste only. No gaseous or liquid wastes are included, although solid residuals from the treatment of liquid or gaseous wastes are included to the extent that the materials are beneficially reused or recycled and can be quantified (see below).

Both infectious wastes and Sub-Title C (of RCRA) hazardous wastes are excluded although DSM attempts to include conditionally exempt waste streams, or "universal wastes" as part of the MSW survey. These include waste oil filters and waste oil, mercury containing wastes such as fluorescent tubes, and electronic wastes.[3]

[2] *A letter requesting a report on all materials was sent out in early winter, but efforts to follow up with telephone calls and a second request occurred in late summer and fall of 2024.*

[3] *Waste oil is not included in the TSW or Annual MSW Recycling Report but does get reported regularly on surveys and accounts for roughly 7,000 Tons.*

Potential for Off-Site Disposal

Only those materials which would be disposed off-site if they were not beneficially reused or recycled, and therefore could potentially be delivered to a DSWA landfill, are included in the assessment. Examples include:

- Animal manure, which is typically applied on adjacent agricultural fields for its nutrient value, is excluded, but excess poultry litter or horse manure, which is generated in such large quantities that all of it cannot be applied on adjacent agricultural fields without increasing nutrient releases to the ground and surface water, is included.
- Stumps and land clearing debris not disposed on-site
- Poultry processing waste
- Municipal wastewater sludges that are land applied.
- Pallets that are reused on-site are excluded, but pallets that are shipped off-site or backhauled for reuse and rebuilding are included.
- Re-ground asphalt (RAP) which is recycled for highway and parking lot paving.
- Re-ground concrete used for new construction applications.

Base Years

Data used in the 2018 report was collected in 2017 and 2018, with some data carried forward from 2014. Data used for the current updated report is primarily from CY 2023 with some data carried forward from CY 2018.[4]

DSM began to collect data on non-MSW materials recycled when surveying for the CY 2023 Annual MSW Recycling Report. DSM then prepared a second e-mail with an attached letter from DNREC which was sent to all non-MSW recyclers in February of 2024 who reported in 2018. See Appendix A for a copy of the survey form and DNREC letter used.

Once the MSW recycling report was completed in the Spring of 2024, data on non-MSW recycling contained in those reports was imported to the larger TSW materials database, and work began on contacting non-MSW recyclers. The project was temporarily suspended during the summer of 2024, and then started again in the fall of 2024, with a renewed effort to contact non-reporters, and to research and contact new individuals who could

[4] *Because the TSW survey has not been conducted since 2018, DSM's contact list was not up-to-date and had to be recreated for many generators. Given the difficulty associated with making cold calls due to spam texts, phone calls and e-mails, there are cases where DSM was unable to update the contact list even though DSM knows the company still exists and is likely to generate the same materials, based on internet searches. Therefore, DSM has chosen to carry forward a limited amount of reports from 2018, however the addition to 2023 quantities is less than 10 percent of the total reported for 2023. This is consistent with the methodology used in the annual RPAC MSW recycling report and the previous 2018 TSW recycling report.*

provide the necessary information. The database was subsequently updated so that it would be available the next time the TSW report is completed.

Import and Export

This assessment *excludes* solid wastes that are imported into Delaware for either recycling or disposal. This includes construction and demolition (C&D) wastes that are generated in surrounding states but delivered to the Waste Management/DRPI landfill in New Castle County for disposal or to the Revolution Recovery C&D processing facility for recycling. Also excluded would be any contaminated soils imported from outside of Delaware for treatment at the Clean Earth facility in Wilmington, and recycled asphalt generated outside of Delaware but delivered to an asphalt plant for the production of recycled asphalt pavement (RAP).

Similarly, this assessment *includes* quantities of material generated in Delaware but exported for disposal or recycling outside of Delaware. For example, scrap metal hauled out-of-state for processing or feedstock at mills and smelters, is included, as well as poultry litter generated in Delaware, but land applied in adjoining states.

It is important to note that materials are included to the degree that they can be tracked and quantified. In some cases, reporters provided estimates on the materials generated from Delaware as a percentage of total material handled.

Generator Survey Methodology

As outlined above, DSM utilized the business database of potential reporters for the Annual MSW Recycling Report which includes companies that may produce materials not included in the Annual MSW Recycling Survey. The MSW business database is updated on an annual basis reflecting newly identified companies as well as acquisitions and closings of current companies; but does not track companies that handle non-MSW materials.

Therefore, DSM created an expanded contact list for companies targeted for TSW reporting. This included manufacturers that typically report on MSW materials recycling only but that may divert other materials. For example, scrap metal companies are surveyed annually but only asked to report on white goods, lead acid batteries and aluminum containers recycling for the RPAC report. Therefore, they do not report on other ferrous and non-ferrous metals as they are not tracked in the annual MSW Recycling Report. These types of companies were contacted individually to see if they had additional materials to report as part of the expanded TSW report.

In addition, the contact database includes companies working in construction & demolition (C&D), asphalt paving, concrete casting, poultry processing and niche recycling industries that do not report on an annual basis. Not surprisingly, given the weight of these materials, these non-MSW generators comprise a significant portion of the TSW report, and the resulting recycling rate calculations.[5]

[5] See, for example, *A Century of Human Detritus, Visualized, 'Technostuff' built in the last 100 years outweighs all the living matter on earth,* Dennis Overbye for the New York Times, December 27, 2024.

DSM also attempted to identify new companies that weren't included in the 2018 TSW report. DSM conducted an internet search of Delaware companies that were likely to generate non-MSW solid waste, and also relied on information reported by the Department of Agriculture, Nutrient Management Program; as well as DNREC's data on land application of bio-solids.

Ultimately, a list of roughly 200 companies were targeted for the TSW survey (including those surveyed annually for the MSW recycling report). In most cases, the majority of the largest non-MSW generators have remained the same since 2018, although quantities recycled have changed.

DSM made changes to the MSW Recycling survey form to provide a survey specific to reporting on TSW along with an informational letter. DSM also worked with DNREC to develop a letter provided by DNREC to highlight the importance of this expanded survey effort.

DSM contacted the targeted companies using both email and direct telephone calls. All of the companies that had reported on non-MSW materials in the past were then sent emails with an attached letter from DNREC, as well as the expanded reporting form. DSM then used telephone calls to the companies that had been sent the TSW reporting form, but that had not responded. In many cases, the contact from 2018 had changed, and it was necessary to request a new contact for the survey.

The survey form (and supporting letter) requested that data be provided on each type of material recycled or diverted in CY 2023 or FY 2023, (which-ever was easiest to provide data from).[6] This included the specific material type, weight (in tons), the business name/location where the material was sent for processing, recycling or end use, and the percent of each material generated in Delaware. A copy of the survey form and the accompanying letter can be found in Appendix A.

Generator Categories

DSM assigned a generator category to every business identified in the contact database. This helped to identify any double counting of materials and to perform quality control through comparing or modeling reported data. The following generator categories were used to group survey reporters:

- ***Agricultural Waste Generators and Processors*** – Companies that generate or handle chicken processing wastes, poultry and other manures, and other materials that are sent for off-site composting or nutrient management.
- ***Construction & Demolition Waste Generators*** – This category includes large construction and demolition companies and road paving companies as well as those engaged in site preparation and earth moving.

[6] *Even though the survey outreach process began in the Spring of 2024, companies responding in late 2024 were asked to estimate totals for 2023, or report on a blended year of 2023 and 2024 as some companies conduct recordkeeping on a Fiscal Year instead of a Calendar Year.*

Some of them also operate processing facilities for their own C&D materials such as wood grinders, asphalt plants, or concrete crushers or may operate such a plant independently.

- ***Green Waste Handlers*** – Includes all processors and end users of yard waste, trees and branches, land-clearing debris, and clean wood waste (that is mulched). Primary organizations reporting are landscapers and land clearing companies. In most cases these companies participate in the Annual MSW Recycling Report.
- ***Manufacturers –*** Manufacturers that are suspected to generate large quantities of recyclables, organics, or other unique materials or industrial wastes for diversion were asked to report for this AMRS Report. Many manufacturers participate in the Annual MSW Recycling Report.
- ***Recycling Businesses*** – A broad category describing organizations whose primary function is to recover, process and ultimately market materials received. This includes materials sorting facilities (such as mixed C&D recovery facilities), brokers of plastics or fiber, and scrap metal recyclers. Many of these organizations participate in the Annual MSW Recycling Report, but also generate materials excluded from the annual report, but included in the TSW recycling report.
- ***Retailers and Wholesalers –*** This includes large grocers and department stores, including Walmart and Best Buy as well as pharmacies and other chains. This also includes distributors and other wholesalers who may backhaul pallets, cardboard, shrink wrap or other packaging materials. Almost all of this material is covered in the Annual MSW Recycling Report.
- ***Utilities and Banks and Institutions.***
- ***Solid Waste Haulers*** – While most haulers of MSW report annually on materials recycled and yard waste diverted, they may also handle C&D materials, scrap metals, and other materials that they divert from disposal. Only the larger haulers were targeted for additional TSW Reporting.
- ***Universal Waste Handlers*** – This covers all companies that collect waste oil, oil filters, solvents, mercury container wastes and electronics. Most of these are included in the Annual MSW Recycling Report.
- ***Wastewater Treatment Facilities*** – DSM worked with DNREC to compile data on poultry sludges and biosolids management for beneficial uses such as land application or composting. Both municipal and regional wastewater treatment facilities as well as industrial facilities biosolids were accounted for. In all cases the data available from DNREC is compiled in dry tons. DSM worked with DNREC to convert the dry tons to wet tons.[7]

[7] Material landfilled at DSWA is essentially "wet tons". DSM worked with DNREC to obtain an average percent moisture content for the conversion. *For purposes of this report, Class A biosolids were assumed to have a moisture content of 50%, Class B, 10%, and All Others, 7.5%. Class A and B generated instate but land applied out of state was assumed to have a moisture content of 10%*.

Generator categories and the types of waste(s) that they typically generate are shown in Table 1 below. As shown in Table 1, most but not all generator groupings may report on both MSW and Total Solid Waste (TSW).

Table 1 – *Generator Categories and Waste/Materials Classifications*

Categories	Commercial (MSW)	Industrial (TSW)	Construction and Demolition (TSW)
Agricultural Waste Handlers		✓	
Construction & Demolition Waste Handlers		✓	✓
Banks and Institutions	✓		
Green Waste Handlers	✓		✓
Manufacturers	✓	✓	✓
Recycling Businesses	✓	✓	✓
Retailers and Wholesalers	✓	✓	✓
Solid Waste Haulers	✓	✓	✓
Universal Waste Handlers	✓	✓	
Utilities		✓	
Wastewater Treatment Facilities		✓	

Material Categories

The material categories included as part of the TSW report follow those included in the Statewide Solid Waste Management Plan.[8] Similar to Table 1, material categories in Table 2 are shown as being generated from either municipal solid waste (and therefore part of the annual MSW Recycling Report) or from the industrial or construction and demolition waste streams. In some cases, a material might be generated from more than one category.

This material category classification shows how the TSW report expands beyond the MSW recycling accounting. As shown in Table 2 (starting on the next page), materials that are reported annually, as part of the Annual MSW Recycling report, are included. These are described in detail in the annual Municipal Recycling reports made to RPAC. These materials include all types of residential (or household) recycling, as well as commercial and institutional recycling. A more detailed description of non-MSW recycling materials is presented after Table 2.

[8] *The Solid Waste Plan material categories were taken from the 2008 report, State of Delaware Assessment of Commercial and Industrial Recycling Activity, which served as a framework to begin to standardize reporting on materials diversion*

Table 2: *Material Categories and Definitions Included in Reporting on MSW Recycling and on All Other Materials Recycling/Diversion*

	Material Category	*Definition*	*Excluded from MSW*	Delaware Generators of Recycled Materials		
				MSW	*Industrial*	*C&D*
PAPER AND NONPAPER PACKAGING MATERIALS	**PAPER AND PAPER PACKAGING**					
	ONP (old newspapers)	Newspapers and glossy inserts, and items made from newsprint, such as free advertising guides, plain news packing paper, etc.	*Print overruns*	√	√	
	OCC (old corrugated containers)	Corrugated boxes (including cardboard containers and sheets and pieces of boxes and cartons) and Kraft paper bags, (including grocery, dept store and un-soiled fast food bags) and heavyweight sheets of Kraft packing paper.	*Corrugated containers in C&D loads*	√		√
	Mixed Paper (1)	All other recyclable paper including magazines and catalogs, phone books and directories, junk mail, chipboard, and high-grade (sorted) paper (such as uncolored and or lightly colored bond, rag, printer/copier or stationary grade paper) of which most is reported by document destruction companies or health care or financial institutions.	*Print overruns (over issue publications are excluded but hard to disaggregate for reporting)*	√	√	
	NON PAPER PACKAGING					
	Mixed Glass (bottles)	Clear, green, amber or other colored glass beverage and food containers. Examples include whole or broken soda, beer, wine and liquor bottles, fruit juice bottles, peanut butter, mayonnaise and other food containers and jars.		√		
	Plastic Containers	Bottles, Jars, Containers and Tubs including clear or colored PETE (polyethylene terephthalate), natural and colored HDPE (high-density polyethylene) and all other plastic (3-7) bottles, jars and containers and other packaging (other than film) that have the potential to be recycled. This includes soft drink and water bottles, some liquor bottles, cooking oil bottles, milk and juice containers, laundry detergent and shampoo bottles, food containers, yogurt and take out containers, and large jugs (well drained) used for vehicle and equipment fluids. This also includes clamshell, thermoform and press mold plastic recyclable packaging.		√		
	Aluminum Cans and Food Containers	Food or beverage containers made mainly of aluminum including aluminum soda or beer cans, and some pet food cans.		√		
	Ferrous/Bimetal Cans	Rigid containers made mainly of steel and other ferrous metals typically used to store food, beverages, and other household and consumer products including empty spray paint and other aerosol containers, and bimetal containers with steel sides and aluminum ends. ***Rarely are reported separately in Delaware.***		√		
	Polystyrene Packaging	Expanded polystyrene (EPS) foam food containers and consumer goods packaging, and other non-food EPS packaging materials.		√		
	Shrink Wrap/ Recoverable Film	Recyclable film that has not been greatly contaminated by other materials during use. Examples include bread, grocery, newspaper, and dry cleaner plastic film bags, clear and colored film packaging or wrapping, and stretch wraps used for shipping and containerizing pallets.	*Pre-consumer plastic waste.*	√	√	√
	Plastic Retail Bags	Plastic retail and grocery sacks typically collected through retail collection sites and mixed with shrink wrap packaging.		√		
	Pallets, mulched and other	Unpainted wood pallets, crates, and packaging made of lumber/engineered wood.	*Rebuilt or reused pallets and waste oil used as fuel. Only scrap pallets ground for mulch is included in MSW.*	√	√	
	Single Stream or Mixed Recyclables	Recyclables reported as collected as a single stream or mixture of different categories of recyclables. Typically a mix of paper and paper packaging and food and beverage containers.		√		

Table 2: *Material Categories and Definitions Included in Reporting on MSW Recycling and on All Other Materials Recycling/Diversion (continued)*

	Material Category	*Definition*	*Excluded from MSW*	Delaware Generators of Recycled Materials		
				MSW	*Industrial*	*C&D*
SPECIAL WASTES	**VEHICLE WASTE**					
	Oil and Oil Filters	Oil filters from vehicles and used oil separated for recycling.	*Only drained oil filters and oil sent for re-refining is included in MSW.*	√		
	Lead Acid batteries	Lead-acid batteries from passenger cars, trucks, and motorcycles and small equipment when reported separately.	*Batteries from large equipment, boats, heavy duty trucks and tractors, and from industrial applications.*	√	√	
	Tires	Tires from trucks, automobiles, motorcycles, heavy equipment, and bicycles. For tires on rims, an attempt to estimate the portion that is rubber tire vs. the ferrous rim should be made.	*Bus and heavy farm and construction equipment tires; tire derived fuel.*	√	√	
	OTHER SPECIAL WASTES					
	Carpet	Any material consisting mainly of carpet or carpet padding including flooring applications consisting of various natural or synthetic fibers bonded to some type of backing material as well as plastic, foam, felt, and other materials used under carpet to provide insulation and padding.	Scrap carpeting from manufacturers excluded from MSW.	√		√
	Textiles	Items made of thread, yarn, fabric, or cloth including clothes, fabric trimmings, draperies, and all natural and synthetic cloth fibers.		√		
	Mattresses	Mattresses and box springs processed for reclaiming the components including steel, foam, wood and fibers.		√		
	Florescent Bulbs	Mercury containing bulbs and ballasts recycled.		√		
	Other Batteries	Consumer batteries of various sizes and types. Examples include flashlight, small appliance, watch, and hearing aid batteries.		√		
	Electronics/Electronic Goods	Large and small electronic goods including microwaves, stereos, VCRs, DVD players, radios, and non-CRT televisions (such as LCD televisions); as well as computer related electronics such as processors, mice, keyboards, laptops, disk drives, printers, and modems; and other small consumer goods such as PDAs, cell phones, phone systems, computer games and other electronic toys, portable CD players, camcorders, and digital cameras.		√		
ORGANIC WASTES	**AGRICULTURAL PROCESSING, FOOD AND OTHER ORGANIC WASTES**					
	Fats, Oils, Grease	Liquid or solid, composed primarily of fat, oil, and grease from animal or vegetable source		√		
	Food Waste	Food material resulting from the processing, storage, preparation, cooking, handling, or consumption of food	*Food donations.*	√	√	
	Poultry Litter	Includes poultry manures and wastes managed for nutrient value			√	
	Poultry Waste	Includes poultry carcasses and other non salable items separated and sent for processing			√	
	Food Processing Waste	All food remains from food and beverage manufacturing and processing including brewery wastes			√	
	Ag Biosolids	Solid portion of industrial wastewater treatment or composting residue that must be removed after treatment process. Includes some liquids.			√	
	GREEN WASTE					
	Leaf and Yard Waste	Plant material from public or private landscapers that is no bigger than 4 inches in diameter. Examples include leaves, grass clippings, sea weed, and plants, pruning's, shrubs, and small branches.		√		
	Tree Waste	Woody plant material, branches, and stumps that exceed four inches in diameter from any public or private landscapers.		√		√
	Land Clearing Debris	Trees, stumps and branches from trees removed for land clearing that are brought off site for mulching, grinding and/or composting.				√

Table 2: *Material Categories and Definitions Included in Reporting on MSW Recycling and on All Other Materials Recycling/Diversion (continued)*

	Material Category	Definition	Excluded from MSW	Delaware Generators of Recycled Materials		
				MSW	Industrial	C&D
METALS	**METALS**					
	Aluminum	Any item made of aluminum other than cans including aluminum window frames, aluminum siding, and aluminum foil.	*Nonferrous metals from industrial or construction sources, ferrous metals from transportation equipment or C&D waste. Note that Delaware only counts appliances as part of MSW recycling*		√	
	White Goods / Appliances	Metal appliances including refrigerators and air conditioners (with Freon removed), as well as stoves, water coolers, water heaters and other small (mostly) metal appliances.		√		
	All other Ferrous Metals	Ferrous metals (iron and steel) in furniture, tires, and miscellaneous durables, except for appliances as included above.		√	√	√
	All other Nonferrous Metals	Other nonferrous metals (e.g., lead, copper, zinc) are found in durable products such as furniture or consumers goods other than appliances and lead acid batteries which are tracked separately. Examples include copper wire, shell casings, and brass pipe.		√	√	√
C&D WASTE	**CONSTRUCTION AND DEMOLITIONWASTES**					
	Aggregate	Hard inert materials (such as sand, gravel, or slag) removed from dirt and used for mixing (typically with a cementing material) to form concrete or sized and used as drainage materials	Excluded from MSW		√	√
	Asphalt	Asphalt paving materials that are taken off-site and processed and then reused as RAP.	Excluded from MSW		√	√
	Asphalt Shingles	Asphalt Roofing including composite shingles and other roofing material made with asphalt (i.e. asphalt shingles and attached roofing tar and tar paper).	Excluded from MSW			√
	Concrete	Concrete removed from C&D sites and processed or otherwise used for construction materials. Sometimes contains brick.	Excluded from MSW			√
	Land Clearing Debris	***See Green Waste***				√
	Soils and Stones	Soils and aggregate materials contaminated with petroleum products or other potentially hazardous wastes are removed off site for thermal treatment and then reused.	Excluded from MSW		√	√
	Fines	Materials screened from the mixed C&D debris and may include soil, aggregate, wood, gypsum and other materials depending on the materials removed and degree of processing. The size depends on the screen size.	Excluded from MSW			√
	Clean (C&D) Wood	All untreated and unstained wood, including clean lumber and engineered wood products such as oriented strand board, medium density fiberboard, and plywood.	Excluded from MSW, except for any non C&D clean wood such as furniture scraps			√
	Gypsum Board	Clean cuttings, scraps and demolition gypsum board also known as sheetrock or wall board.	Excluded from MSW			√
	Mixed C&D	Any C&D materials that are recovered for recycling but that are reported as mixed materials instead of by separate commodities.	Excluded from MSW			√
INDUSTRIAL WASTE	**INDUSTRIAL WASTE**					
	Mixed Plastics/Other Plastics	Plastic products such as coat hangers, plastic toys and furniture, and other non-durable plastics. Plastic wastes from a manufacturing process that are taken offsite for reclamation.	Pre-consumer plastic waste is excluded from MSW. On-site reuse or reclamation is excluded from TSW.	√	√	
	Biosolids (Wet Tons)	These are typically from waste water treatment plants and referred to as "sludge" that is land applied or composted. Figures were obtained from DNREC on dry tons, and then corrected to wet tons based on the moisture content reported.	Excluded from MSW		√	
	Bottom and Fly Ash	Bottom ash is the residue remaining in the bottom of the combustion chamber after the combustion of fuel or waste, while fly ash are the particles removed from gases by use of electrostatic precipitators or fabric filters prior to the release from the stack. Fly ash is often used in cement production, but in Delaware in 2014 both were used for the construction of the Phase II cell at the Indian River Landfill. In the past, they had been used to stabilize municipal solid waste with the resultant mix used as a landfill cover material at DSWA facilities.	Excluded from MSW		√	
	Slag	Glass-like by-product left over after metal smelting from raw ore and used in beneficial ways such as landfill cover material.	Excluded from MSW		√	

Residential Recyclables

Residential recycling activity is accounted for as part of the annual MSW Recycling Report and includes cardboard, paper and other paper packaging as well as bottles and cans typically collected in Delaware as mixed or "single stream". Households also generate and recycle yard waste and appliances in large quantities. Finally, items such as automotive waste (tires and lead acid batteries), mattresses, electronics and some universal wastes are recycled by households through special collection programs, many of which are operated by DSWA.

Commercial and Institutional Recyclables

Most of the commercial and institutional recycling activity is also reported annually through the Annual MSW Recycling Report. Businesses that generate and recycle large volumes of material classified as MSW report annually on volumes by material type along with recycling haulers, processors and brokers. Table 1 shows a number of these generator types which include the following groups:

- **Brokers/Processors**, including national companies such as Sonoco, Ekman, GP Harmon, and WestRock, that provide brokering services to large commercial and governmental generators.
- **Wholesalers and Distributors**, based in Delaware including major e-commerce companies such as Amazon, and beverage distributors such as Standard Distributing.
- **Retailers**, including "big-box" department stores such as K-Mart and Target as well as many major chains located in Delaware including Wal-Mart.
- **Groceries/Supermarkets**, including all major supermarket chains operating in Delaware.
- **Automotive Waste Handlers**, including national companies that handle universal wastes such as Heritage Crystal Clean and Safety-Kleen whom handle and process waste oil, oil filters, and other automotive related wastes.
- **Data Destruction Companies** based in and outside of Delaware but who process and recycle confidential paper and electronics generated by Delaware businesses and institutions.

The commercial waste sector primarily reports on materials such as old corrugated cardboard (OCC), mixed and sorted paper, plastics, pallets, and film/shrink wrap but also generates small amounts of metal, plastic and glass food and beverage containers (with restaurants and bars generating large amounts of beverage containers mostly recycled with cardboard).

Special Wastes

This category is a catch-all for all other materials that are being recovered in Delaware such as carpet, textiles, and mattresses, as well as materials considered part of the Universal Waste stream such as electronics, fluorescent bulbs, and batteries (excluding lead acid). Special wastes are reported by most generator groups and cannot be specifically attributed to one specific recycling generator. For the most part, they are reported on annually as part of the Annual MSW Recycling Report.

Agricultural, Food, and Organic Wastes

Agricultural, Food, and Organic Wastes generated in Delaware include poultry raising and processing related wastes, as well as food and brewery processing generated in large quantities and handled off site for beneficial uses. The major waste streams captured in the TSW recycling report include:

- ***Agricultural Processing Wastes:*** Delaware has a large poultry processing industry, operating both hatcheries as well as poultry processing facilities. These facilities generate significant quantities of offal, meat, bones, blood, and feathers which must be properly managed and disposed of. Hatchery wastes such as eggshells, yolks, and related liquids must also be managed. DSM spoke with a representative from DNREC and all of the major poultry processors in the State to gather information on the management of these waste products.
- ***Poultry Litter/Animal Manures*:** Poultry litter and animal manures have been traditionally applied to the land for their nutrient value. However, in 1999 Delaware passed the Nutrient Management Law in response to deteriorating water quality in the Delaware and Chesapeake River basins, requiring (among other things), mandatory nutrient management standards be met for farmers as well as for golf courses and other large lawn care operations. The Nutrient Management Law resulted in an increase in excess poultry litter and animal manure that could no longer be applied directly to the land, and thus, must be hauled off-site for processing and/or alternative uses. These materials are quantified as part of the Delaware Nutrient Management Program as well as reported to DSM by the largest poultry processors as part of this expanded TSW recycling report.[9]
- ***Food Processing Wastes*** are generated by food manufacturers and brewers. Some may have a value (such as spent grain from brewers), but some materials must be managed as a waste product.
- ***Agricultural Biosolids:*** As discussed above, DSM surveyed poultry processors to determine the quantity of poultry wastes recovered for beneficial use including liquid wastes and/or sludges from processing poultry. These agricultural biosolids are often land applied or composted and these data on biosolids generation (reported as wet tons) was obtained from the major poultry processors located in Delaware.
- ***Municipal Biosolids*** are reported in wet tons and are generated from industrial or municipal wastewater treatment. The volumes and types of this material that are beneficially used are reported to DNREC annually as part of the Surface Water Discharge Sections tracking of residuals. The most recent annual data available was for CY 2023.
- ***Green Wastes:*** Green wastes include leaf and yard waste, trees and branches, and land clearing debris. While volume data on leaf and yard waste, and trees and branches are collected annually as part of the

[9] *The most recent published data from the Department of Agriculture, Nutrient Management Commission includes total relocation data for 2021 (see 2024 report) which is used for this TSW recycling report.*

Annual MSW Recycling Report, land clearing debris is not considered to be MSW and therefore only accounted for as part of the TSW Reporting. Green waste generation can be impacted by weather related events and economic impacts such as an increase in planned community building where land must be cleared for development. It is important to note that green waste figures are often provided by generators as estimates because this material is often not weighed. And in the case of large mulch yards, estimates are provided on not only the tons received but also the type of material accepted (yard waste vs. trees and branches vs. land clearing debris), as well as the percentage of each type generated in Delaware (vs. out of state).

Scrap Metal

While appliance and aluminum packaging recycling are reported annually by most of the major scrap metal handlers, all other types of scrap metals are excluded from annual reporting. For this TSW Materials Report, scrap metal recovery was quantified through survey methods for both in-state scrap yards are well as out-of-state scrap yards that accept material from Delaware.

Scrap metal recovery tonnages are highly influenced by the demolition industries participating in the recovery of recyclable materials. While most of the material reported was by scrap metal handlers and recyclers, some material was reported by large construction and demolition companies.

As shown in Table 2, the scrap metal categories requested for TSW reporting are:

- ***Ferrous Metals*** which are derived from iron or steel and include products such as weight bearing beams, rebar, steel drums and junk automobiles (after fluids are removed as well as reusable parts);
- ***Non-Ferrous Metals*** which are primarily aluminum, lead, and copper;
- ***White Goods*** or appliances that are made primarily from light iron but contain an increasing amount of plastic; and,
- ***Aluminum*** which is used in construction as gutters, siding and roofing as well as used in packaging and many durable goods and is a subset of non-ferrous metals.

Construction & Demolition Waste

Delaware has a C&D processing facility (Revolution Recovery located at DSWA's Recycling Center in New Castle) where mixed loads of C&D waste can be separated by material type for recycling.[10] In addition, there are companies that accept, crush, and process asphalt and concrete for recycling. Both large construction and

[10] *Revolution Recovery reports both incoming mixed C&D and outgoing materials. Outgoing materials are included in the TSW recycling report.*

demolition contractors as well as C&D waste processors reported on materials recovered as part of the AMRS. These materials are not included in the annual MSW Recycling Report.

Materials that are recovered from construction and demolition projects include:

- ***Asphalt:*** Waste asphalt is generated as a result of repaving public and private roadways as well as parking lots and driveways. Asphalt recovered from repaving can be used as input to new asphalt and as a road base material. Under current Delaware Department of Transportation (DelDOT) regulations, allowable recycled asphalt pavement (RAP) in mixes average around 25% and can range as high as 40% depending on the specific mix. DSM surveyed many of the road construction companies as well as asphalt plant operators in and outside of Delaware.

- ***Asphalt Shingles:*** Asphalt shingles recycled are primarily used to make roads. Ground-up shingles are typically added to the pavement and can actually improve the quality.[11] Other uses include using the material as an input to make roofing products. Asphalt shingles are recovered from roofing jobs and typically kept separate and delivered directly to a facility designed to process RAP; however, some material is delivered to a C&D processing facility for separation first.

- ***Concrete:*** Demolition of concrete buildings, foundations, and roadways result in large quantities of concrete which must be disposed of. Many contractors as well as major road construction firms have their own grinders that crush and grind separated concrete, remove any foreign materials, and produce an aggregate for road construction or other construction projects. These grinding operations are located throughout the State and are often operated in conjunction with asphalt plants.

- ***Clean Wood***: Clean Wood is primarily generated from cut-offs, pallets and contractor's excess untreated wood. Generally, on job sites, this material is not kept separate from painted, stained and treated wood scraps except for reused materials which are not accounted for in this survey. While clean wood can be ground for mulch products, specifications for mulch have high standards for the use of recycled wood and many contractors cannot justify the time or expense to keep this material separate.

- ***Gypsum***: Do we have DSWA numbers from Jones Crossroads. What about fines.

- ***C&D Wood***: C&D wood includes all types of construction wood including stained, painted, and engineered wood products as well as plywood and some amount of treated wood (from piers, decks and utility poles). C&D wood is generally recovered at a mixed C&D waste processing facility. Most C&D wood is used as a fuel at biomass facilities (and therefore not accounted for as recycling) although in the northeast much makes it way to a particleboard manufacturer located in Quebec.

- ***Mixed C&D:*** Mixed C&D is a catch all category for construction and demolition waste that is reported as mixed because it is going to a processing facility that performs separation, and then markets the

[11] *Asphalt Roofing Manufacturer's Association: asphaltroofing.org/asphalt-shingle-recycling-faqs/*

separated materials. This TSW recycling report includes reporting of outgoing materials from Revolution Recovery, which is the major mixed C&D processor in Delaware and provides the outgoing quantities sold form incoming mixed loads.

- ***Soils and Stones:*** Soils and stones are primarily recovered from contaminated soils processed at Clean Earth in New Castle County which thermally treats soils. The treated material can then be reused in construction projects.

Industrial Waste

Industrial wastes are non-hazardous solid wastes generated from manufacturing or energy generation that have been recovered or otherwise diverted for recycling or beneficial use. The following categories of industrial waste were reported on for this TSW report, and are not included in the Annual MSW Recycling Report.

- ***Mixed Plastic*** waste is generated from molding and extruding plastic products that are damaged products or cut offs from extruding and are separated for recycling (and sent off-site); they are typically a homogenous resin type and tend to have value. Mixed plastic waste that is generated from packaging used by manufacturers or wholesalers are reported on as part of the Annual MSW Recycling Report.
- ***Industrial fines*** primarily from combustion sources.

Waste Disposal

In addition to the generator surveys, it was also necessary to obtain data on total disposal of solid, non-hazardous, materials in Delaware. This includes data for all materials disposed of at DSWA landfills, as reported by DSWA, as well as material from Delaware disposed at the Waste Management, Delaware Recyclable (DRPI) Management Facility landfill. This report does not account for waste generated in Delaware but disposed out-of-state. This is the case because flow control limits out-of-state disposal, and any out-of-state disposal would be by incineration.

3 | STUDY LIMITATIONS

As with all studies relying on data self-reported by the generator, the information DSM aggregates and reports is only as good as the initial data provided by reporters. DSM believes that the participating companies reported in good faith and to the best of their ability, however, because data were not collected on-site by DSM, there is no way to conclusively verify material quantities or check on the validity of the tonnages reported.

In addition, when accounting for some materials such as asphalt, concrete, and land clearing debris, the source of the material may not be clear to those that report totals. For example, large asphalt plants accept recovered asphalt from a number of small parties and do not request information on the source of the asphalt or if it was

used for a DelDOT project. For this reason, in some cases materials may have been double counted despite DSM and the participating companies' best efforts to identify potential incidents of double counting.

Materials such as land clearing debris are often brought to grinding and mulching sites as manageable pieces of wood and are not easily identified as being the result of land clearing activities. Additionally, some grinding and mulching sites do not have on-site scales and instead must rely on estimation techniques for each material type managed for the year. Finally, some companies do not know for certain if the material brought to them is from Delaware or an adjacent state, which could lead to over reporting green waste tonnages (or underreporting if they assume some of the material was generated out of state).

An important limitation is the reporting requirement and the frequency. As the TSW materials recycling report has taken place only three times before, and has not been conducted since 2018, some companies who do not report annually are not familiar with the data request, and the employee that completed the report for the previous period may no longer be employed at the organization. Finally, as stated above, spam texts, emails, and telephone calls are ubiquitous today; as a consequence, it was much more difficult than in the past to find an individual to talk with at the generator companies.[12]

While reporting for the annual MSW Recycling Report is mandatory under Delaware's Universal Recycling Law, reporting of additional materials for the TSW report is not clearly spelled out in the legislation. Even though DNREC provided a letter to support the information request, targeted companies are not clear as to whether the requirement applies to them, which resulted in a lower participation rate. DSM obtained participation from the majority of large generators (based on the 2018 study), but the majority of the missing reports were from smaller businesses. Consistent with the methodology applied in 2018 – which utilized some data from the 2014/2015 TSW report – DSM incorporated reports from 2018 from smaller generators who did not report despite emails and telephone calls.

Finally, and most importantly, many factors affect year-to-year swings in both waste generation and recycling/diversion activity. Recycling markets, C&D projects, the economy, road repair budgets, large storms/wind events, and other factors can have dramatic impacts on specific materials generated and diverted.

[12] *Remote workers often use cell phones and do not widely provide their number further challenging the DSM's ability to reach employees that may be the appropriate contact to complete the survey.*

4 | RESULTS

Despite the limitations to the TSW reporting, roughly 75 companies reported diverting materials for the TSW materials recycling report. These were in addition to roughly 95 organizations that already report annually on MSW recycling but that had additional materials to report as part of the TSW report. Finally, as discussed above, small amounts of material reported in 2018 (less than 10%) are included in this calculation of 2023 TSW materials recycling results.

Table 3:

Estimated All Materials Solid Waste Diversion, By Material Type (Tons, CY 2023)

	Material Category	RECOVERY CY 2023 Residential (Tons)	ICI (Tons)	Non-MSW (Tons)	Total Solid Waste (Tons)
PAPER	OCC (old corrugated containers)	56	77,823	-	77,878
	ONP (old newspapers)	0	2,028	-	2,028
	Mixed Paper (1)	15	23,217	-	23,232
	SUBTOTAL, PAPER:	**70**	**103,067**	**-**	**103,137**
PACKAGING	Mixed Glass (bottles)	-	27	-	27
	Plastic Containers	12	922	-	934
	Aluminum Cans	168	19	-	186
	Polystyrene Packaging (2)	28	26	-	54
	Shrink Wrap/Recoverable Film	-	1,873	-	1,873
	Pallets, mulched and other (3)	-	5,910	39,222	45,132
	Retail Bags (4)	145	-	-	145
SINGLE STREAM	"Mixed recyclables": collected mixture of different categories of recyclables. (5)	75,631	33,863	-	109,494
	SUBTOTAL, PACKAGING:	**75,983**	**42,641**	**39,222**	**157,846**
VEHICLE WASTE (6)	Oil Filters	242	61	-	303
	Lead Acid Batteries	2,841	710	-	3,551
	Tires	10,108	2,527	-	12,635
	SUBTOTAL, VEHICLE WASTE:	**13,191**	**3,298**	**-**	**16,489**
SPECIAL WASTES	Carpet	-	-	-	-
	Textiles	19,026	518	-	19,544
	Fluorescent Bulbs	-	32	-	32
	Other Batteries (7)	95	11	-	105
	Mattresses (8)	15	-	-	15
	Electronics / Electronic Goods	1,210	496	-	1,706
	SUBTOTAL, SPECIAL WASTES:	**20,346**	**1,056**	**-**	**21,402**
AG, FOOD, ORGANIC WASTES	Fats, Oil, Grease	-	2,578	-	2,578
	Food Waste (9)	-	3,997	-	3,997
	Poultry Litter	-	-	136,449	136,449
	Poultry Waste	-	-	494,230	494,230
	Food Process Wastes (10)	-	-	979	979
	Ag Biosolids (10)	-	-	71,068	71,068
	SUBTOTAL, AG, FOOD, ORGANIC WASTES:	***-***	***6,574***	***702,726***	***709,300***
GREEN WASTE	Leaf and Yard Waste	111,144	12,349	-	123,494
	Trees and Branches	24,672	24,672	-	49,344
	Land clearing (e.g. trees, stumps), mulched (11)	-	-	29,830	29,830
	SUBTOTAL, GREEN WASTE:	**135,816**	**37,021**	**29,830**	**202,668**
METALS	Aluminum (12)	-	-	3,519	3,519
	White Goods	25,349	2,817	-	28,166
	Ferrous (13)	-	-	75,516	75,516
	Non-Ferrous, All Other (13)	-	-	35,562	35,562
	SUBTOTAL, METALS:	**25,349**	**2,817**	**114,597**	**142,763**
CONSTRUCTION AND DEMOLITION WASTES (14)	Aggregate (15)	-	-	6,767	6,767
	Asphalt	-	-	615,863	615,863
	Asphalt Shingles (15)	-	-	19,685	19,685
	Concrete	-	-	276,670	276,670
	Land clearing (See "Green Waste")	-	-		
	Soils and Stone	-	-	33,262	33,262
	Clean Wood (and Mulch)	-	837	-	837
	Fines (15)	-	-	2,597	2,597
	C&D Wood (15)	-	-	10,911	10,911
	Gypsum (15)	-	-	1,454	1,454
	Mixed C&D (16)	-	-	4,925	4,925
	SUBTOTAL, C+D WASTE:	**-**	**837**	**972,135**	**972,972**
INDUSTRIAL	Mixed Plastics	-	377	1,230	1,607
	Biosolids (10)		-	142,913	142,913
	Bottom and Fly Ash (17)		-	5,922	5,922
	Industrial Fines		-	-	-
	SUBTOTAL, INDUSTRIAL WASTE:	**-**	**377**	**150,065**	**150,442**
	TOTAL RECOVERED:	**270,800**	**197,700**	**2,008,600**	**2,477,000**

TABLE 3 NOTES: *For comparison with previous reports, including the original 2008 "Bridge Report".*

1. *Mixed Office Paper includes Sorted Office Paper that is reported separately in the Annual Recycling Report and represents roughly 32,400 tons of the Mixed Office Paper tonnage.*
2. *Polystyrene Packaging recycling was not included as a tracked material in the CY 2008 Report.*
3. *Pallets, mulched and other, includes pallets backhauled for re-use as well as pallets rebuilt or used for mulch.*
4. *Retail bags were reported separately from shrink wrap and continue to be reported separately as companies improve their ability to recycle plastic retail bags.*
5. *Single stream tons are allocated by reporters and contain residue.*
6. *The majority of vehicle waste is attributed to the residential sector and is allocated based on percentages developed by RPAC.*
7. *Non lead acid batteries or "Other Batteries", including general use household batteries, were not tracked in the CY 2008 Report.*
8. *Mattresses were not tracked in the CY 2008 Report.*
9. *Food waste is primarily generated by grocers and is shipped out-of-state since the closing of Peninsula Compost.*
10. *Reported in wet tons (or converted from dry tons and average solids content)*
11. *Land clearing debris includes stumps generated as a result of land clearing. Reported land clearing debris can be highly influenced by the building industry and weather-related events.*
12. *All aluminum other than aluminum cans and packaging estimates provided above.*
13. *Ferrous and non-ferrous metal recycling is not tracked annually. Ferrous metal recycling, especially in the non-MSW sector, is highly influenced by demolition projects which result in a large amount of recovered steel beams and rebar. Note that DSM asks that scrap automobiles be excluded from metal recycling, consistent with the CY 2008 report.*
14. *C&D Waste generation/recycling experiences significant variations depending on the economy and the construction, demolition and road construction projects that occur during the reporting year.*
15. *Aggregate, Asphalt Shingles, C&D Wood, Fines and Gypsum were not reported separately in 2008.*
16. *Mixed C&D encompasses all or most of the materials listed above but was reported as mixed.*
17. *Bottom and fly ash totals vary greatly year by year due to changing management practices. Subsequent to 2018, the major power plant converted to natural gas, significantly reducing bottom and fly ash.*

2018 Results

Table 4 presents the 2018 results for use in comparison to the 2023 results presented in Table 3.

Table 4:

Estimated All Materials Solid Waste Diversion, By Material Type (Tons, CY 2018)

Material Category		Recovery CY 2018 or FY2018 Residential (Tons)	ICI (Tons)	Non-MSW (Tons)	Total Solid Waste (Tons)
PAPER	OCC (old corrugated containers)	17,998	74,055	2,272	94,325
	ONP (old newspapers)	3,437	6,039	-	9,476
	Mixed Paper (1)	21,527	30,106	-	51,633
	SUBTOTAL, PAPER:	**42,963**	**110,200**	**2,272**	**155,435**
PACKAGING	Mixed Glass (bottles)	12,145	1,128	-	13,273
	Plastic Containers	3,561	2,103	-	5,664
	Aluminum Cans	841	85	-	927
	Polystyrene Packaging (2)	12	4	-	16
	Shrink Wrap/Recoverable Film	-	2,066	-	2,066
	Pallets, mulched and other (3)	-	3,980	20,855	24,835
	Retail Bags (4)	284	-	-	284
SINGLE STREAM	"Mixed recyclables": collected mixture of different categories of recyclables. (5)	6,566	26,885	-	33,451
	SUBTOTAL, PACKAGING:	**23,409**	**36,251**	**20,855**	**80,514**
VEHICLE WASTE (6)	Oil Filters	291	73	-	364
	Lead Acid Batteries	1,609	402	-	2,011
	Tires	7,264	1,816	-	9,080
	SUBTOTAL, VEHICLE WASTE:	**9,164**	**2,291**	**-**	**11,455**
SPECIAL WASTES	Carpet	-	78	-	78
	Textiles	3,776	414	-	4,189
	Fluorescent Bulbs	0	24	-	24
	Other Batteries (7)	131	15	-	145
	Mattresses (8)	180	-	-	180
	Electronics / Electronic Goods	1,253	456	-	1,709
	SUBTOTAL, SPECIAL WASTES:	**5,340**	**986**	**-**	**6,325**
AG, FOOD, ORGANIC WASTES	Fats, Oil, Grease	-	3,641	-	3,641
	Food Waste (9)	-	1,550	-	1,550
	Poultry Litter	-	-	83,060	83,060
	Poultry Waste	-	-	426,723	426,723
	Food Process Wastes (10)	-	-	14,471	14,471
	Ag Biosolids (10)	-	-	74,883	74,883
	SUBTOTAL, AG, FOOD, ORGANIC WASTES:	***-***	***5,191***	***599,137***	***604,328***
GREEN WASTE	Leaf and Yard Waste	94,413	10,490	-	104,903
	Trees and Branches	25,484	25,484	-	50,969
	Land clearing (e.g. trees, stumps), mulched (11)	-	-	17,357	17,357
	SUBTOTAL, GREEN WASTE:	**119,897**	**35,975**	**17,357**	**173,229**
METALS	Aluminum (12)	-	-	13,392	13,392
	White Goods	25,431	2,826	-	28,256
	Ferrous (13)	978	155	269,992	271,125
	Non-Ferrous, All Other (13)	965	66	5,536	6,567
	SUBTOTAL, METALS:	**27,374**	**3,047**	**288,920**	**319,340**
CONSTRUCTION AND DEMOLITION WASTES (14)	Aggregate (15)	-	-	3,887	3,887
	Asphalt	-	-	543,925	543,925
	Asphalt Shingles (15)	-	-	19,000	19,000
	Concrete	-	-	486,405	486,405
	Land clearing (See "Green Waste")	-	-	-	-
	Soils and Stone	-	-	81,340	81,340
	Clean Wood (and Mulch)	-	2,205	1,404	3,609
	Fines (15)	-	-	11,831	11,831
	C&D Wood (15)	-	-	15,953	15,953
	Gypsum (15)	-	-	6,235	6,235
	Mixed C&D (16)	-	-	12,386	12,386
	SUBTOTAL, C+D WASTE:	**-**	**2,205**	**1,182,366**	**1,184,571**
INDUSTRIAL	Mixed Plastics	-	1,417	551	1,968
	Biosolids (10)	-	-	81,252	81,252
	Bottom and Fly Ash (17)	-		7,906	7,906
	Industrial Fines	-	-	-	-
	SUBTOTAL, INDUSTRIAL WASTE:	**-**	**1,417**	**89,709**	**91,126**
	TOTAL RECOVERED:	**228,100**	**197,600**	**2,200,600**	**2,626,300**

Comparison, 2023 to 2018

Table 5 compares 2023 to 2018. In all cases the 2018 results are subtracted from the 2023 results. Therefore, a positive difference represents an increase since 2018 and a negative difference represents a decrease since 2018.

Table 5: *Change in Total Tons Recycled, 2023 Compared to 2018*

	Material Category	Change 2023 v 2018 Residential (Tons)	ICI (Tons)	Non-MSW (Tons)	Total Solid Waste (Tons)	Percent Change 2023 v 2018 TSW	Percent Change 2023 v 2018 - Non MSW Only
PAPER	OCC (old corrugated containers)	(17,943)	3,768	(2,272)	(16,447)	-17%	-100%
	ONP (old newspapers)	(3,437)	(4,011)	-	(7,449)	-79%	
	Mixed Paper (1)	(21,512)	(6,890)	-	(28,402)	-55%	
	SUBTOTAL, PAPER:	**(42,892)**	**(7,133)**	**(2,272)**	**(52,297)**	**-34%**	**-100%**
PACKAGING	Mixed Glass (bottles)	(12,145)	(1,101)	-	(13,246)	-100%	
	Plastic Containers	(3,549)	(1,181)	-	(4,730)	-84%	
	Aluminum Cans	(674)	(66)	-	(740)	-80%	
	Polystyrene Packaging (2)	15	22	-	38	234%	
	Shrink Wrap/Recoverable Film	-	(192)	-	(192)	-9%	
	Pallets, mulched and other (3)	-	1,930	18,367	20,297	82%	88%
	Retail Bags (4)	(139)	-	-	(139)	-49%	
SINGLE STREAM	"Mixed recyclables": collected mixture of different categories of recyclables. (5)	69,065	6,978	-	76,043	227%	
	SUBTOTAL, PACKAGING:	**52,574**	**6,390**	**18,367**	**77,331**	**96%**	**88%**
VEHICLE WASTE (6)	Oil Filters	(49)	(12)	-	(61)	-17%	
	Lead Acid Batteries	1,233	308	-	1,541	77%	
	Tires	2,844	711	-	3,555	39%	
	SUBTOTAL, VEHICLE WASTE:	**4,027**	**1,007**	**-**	**5,034**	**44%**	
SPECIAL WASTES	Carpet	-	(78)	-	(78)	-100%	
	Textiles	15,251	104	-	15,355	367%	
	Fluorescent Bulbs	(0)	8	-	8	33%	
	Other Batteries (7)	(36)	(4)	-	(40)	-28%	
	Mattresses (8)	(164)	-	-	(164)	-92%	
	Electronics / Electronic Goods	(43)	40	-	(3)	0%	
	SUBTOTAL, SPECIAL WASTES:	**15,007**	**70**	**-**	**15,077**	**238%**	
AG, FOOD, ORGANIC WASTES	Fats, Oil, Grease	-	(1,063)	-	(1,063)	-29%	
	Food Waste (9)	-	2,447	-	2,447	158%	
	Poultry Litter	-	-	53,390	53,390	64%	64%
	Poultry Waste	-	-	67,507	67,507	16%	16%
	Food Process Wastes (10)	-	-	(13,492)	(13,492)	-93%	-93%
	Ag Biosolids (10)	-	-	(3,816)	(3,816)	-5%	-5%
	SUBTOTAL, AG, FOOD, ORGANIC WASTES:	***-***	***1,384***	***103,589***	***104,972***	**17%**	**17%**
GREEN WASTE	Leaf and Yard Waste	16,732	1,859	-	18,591	18%	
	Trees and Branches	(812)	(812)	-	(1,625)	-3%	
	Land clearing (e.g. trees, stumps), mulched (11)	-		12,473	12,473	72%	72%
	SUBTOTAL, GREEN WASTE:	**15,919**	**1,047**	**12,473**	**29,439**	**17%**	**72%**
METALS	Aluminum (12)	-	-	(9,873)	(9,873)	-74%	-74%
	White Goods	(81)	(9)	-	(90)	0%	
	Ferrous (13)	(978)	(155)	(194,476)	(195,609)	-72%	-72%
	Non-Ferrous, All Other (13)	(965)	(66)	30,026	28,995	442%	542%
	SUBTOTAL, METALS:	**(2,024)**	**(230)**	**(174,323)**	**(176,577)**	**-55%**	**-60%**
CONSTRUCTION AND DEMOLITION WASTES (14)	Aggregate (15)	-	-	2,880	2,880	74%	
	Asphalt	-	-	71,938	71,938	13%	13%
	Asphalt Shingles (15)	-	-	685	685	4%	4%
	Concrete	-	-	(209,735)	(209,735)	-43%	-43%
	Land clearing (See "Green Waste")	-	-	-	-		
	Soils and Stone	-	-	(48,078)	(48,078)	-59%	-59%
	Clean Wood (and Mulch)	-	(1,368)	(1,404)	(2,772)	-77%	-100%
	Fines (15)	-	-	(9,234)	(9,234)	-78%	
	C&D Wood (15)	-	-	(5,041)	(5,041)	-32%	-32%
	Gypsum (15)	-	-	(4,781)	(4,781)	-77%	-77%
	Mixed C&D (16)	-	-	(7,461)	(7,461)	-60%	-60%
	SUBTOTAL, C+D WASTE:	**-**	**(1,368)**	**(210,231)**	**(211,599)**	**-18%**	**-18%**
INDUSTRIAL	Mixed Plastics	-	(1,039)	679	(360)	-18%	123%
	Biosolids (10)	-	-	61,661	61,661	76%	76%
	Bottom and Fly Ash (17)	-		(1,984)	(1,984)	-25%	-25%
	Industrial Fines	-	-	-	-		
	SUBTOTAL, INDUSTRIAL WASTE:	**-**	**(1,039)**	**60,355**	**59,316**	**65%**	**67%**
	TOTAL RECOVERED:	**42,611**	**127**	**(192,042)**	**(149,303)**	**-6%**	**-9%**

Discussion

It is important to note that changes in material-by-material recovery, and in the totals represent several issues that are irrespective of actual changes.

First, as noted in the introduction to this report, the ability to contact Delaware generators has been exacerbated by the national proliferation of spam texts, emails and telephone calls subsequent to 2018. That means that in a number of cases, despite multiple attempts, DSM was not able to obtain a contact name for some of the large generators who had responded in 2018. This is expected to continue as an issue going forward.

While DSM typically carries forward results from the previous year in the annual MSW report to RPAC where a company is known to still exist, but has not responded, that method is much more difficult to support over a five-year period. As a consequence, DSM did not carry forward data from large generators that did not respond, but instead, only carried forward 2018 data for generators known to exist (through internet searches) representing less than 10 percent of the total for the generator category.

Second, in some cases, the changes were due to differences in the category the material was reported in. For example, while paper and packaging categories are down from 2018, that is primarily the switch to reporting as "Single Stream" as opposed to individual categories of paper and packaging reported.

Similarly, poultry biosolids are down but municipal biosolids are up, primarily due to a change in characterization of these materials.

Third, total metals recovery is down by almost 200,000 tons due to a large construction and demolition firm which undertook a major demolition project in 2018 involving large quantities of structural steel, but did not undertake a similar project in 2023.

5 | ESTIMATING THE DIVERSION RATE

The last step in measuring progress toward diversion goals is to add disposal quantities. In the original analysis (2006 report), waste haulers or self-haulers had access to in-state landfills but also had the option to utilize out-of-state facilities. However, under flow control instituted in January of 2016 for Delaware, waste is no longer transported out-of-state for disposal. Flow control allows for much more accurate data on total waste disposal in the state.

DSWA provided DSM with total disposal data for 2023 by disposal category. DSM added in-state disposal data from the Waste Management, Delaware Recyclable (DRPI) Management Facility in New Castle County.

The diversion rate can be calculated by summing total disposed and total recycled and dividing the total recycled (including diverted from disposal for beneficial use) by the total of disposal and recycling. Table 6, below presents the calculated diversion rate for all materials in Delaware, comparing 2018 with 2023. As illustrated by Table 6, the TSW diversion rate remains essentially unchanged between 2018 and 2023.

Table 6: *Calculation of TSW Diversion Rate*

Disposal	**2018**	**2023**
Ash	51,333	
MSW- Res	350,140	369,427
MSW- Comm	382,474	403,542
C&D	218,506	182,745
DRPI	96,669	99,405
DSWA Special Wastes	5,055	3,855
Total Disposed	**1,104,177**	**1,058,974**
Recovered	**2,626,300**	**2,477,000**
TOTAL	**3,730,477**	**3,535,974**
Diversion (Recycling) Rate	**70%**	**70%**

6 | Conclusions and Observations

In essence, there has been little change in both total disposal or total recovered between 2018 and 2023. Total disposed has slightly decreased, as has total diversion. As a result, the diversion rate has remained unchanged at 70 percent.

In both cases the 2020 Statewide Solid Waste Management Plan (Plan) targets remain consistent with the conclusions of this analysis. The Plan's mid-range projection of disposal of 1,008,000 (rounded) tons in 2030 appears to be an achievable goal; and the diversion rate of 70 percent is within the range of 69 to 76 percent established in the Plan.

As stated above, the inability to find contact individuals, and hence receive reports, from some large generators means that in all likelihood the TSW materials diversion rate is higher than 70 percent, but still within the 69 to 76 percent diversion envisioned in the 2020 Plan.

DSM ENVIRONMENTAL SERVICES, INC.
Resource Economists
Environmental Scientists

Appendix A

Delaware Recycling Activity Report Form
REPORT FORM FOR CALENDAR YEAR 2023

If you have any questions about this form, please e-mail Ted Siegler at the third-party consulting firm, DSM Environmental, at ted@dsmenvironmental.com If you have questions about the reporting requirement, please contact DNREC's Compliance and Permitting Section at (302) 739-9403.

COMPANY INFORMATION

Company Name _____ Subsidiary of _____

Mailing Address _____ Contact Name _____

City _____ State _____ Zip _____ Title _____

☐ Same as mailing *Physical Address* _____ Phone _____ Email _____

City _____ State _____ Zip _____

If you use a waste hauler or recycling service(s) to collect your recyclables please indicate the company (or companies) name, address and contact information and no further information is required ***unless we are unable to obtain quantities from your reported waste hauler or recycling service(s):***

_____

MATERIALS RECYCLED *(between January 1 and December 31, 2023)*

Material Type [1]	**Annual Tons Recycled 2023**	**Please** Describe the **End Use** [2]	***Approx.*** percent of material originating from **Delaware ONLY**[3]
			%
			%
			%
			%
			%
			%
			%
			%
			%
			%

1. **List Each Material Type**
2. **This information is important so that DSM does not double count material that is handled by another recycler that participates in our survey.**
3. If you handle recycling material generated outside the state of Delaware, estimate the percent of material from Delaware only .

NON-DISCLOSURE

The information provided is confidential. Check one: Yes ☐ No ☐

DSM Environmental Services, Inc. (DSM) will hold confidential any information and data provided to us which you specify as confidential, as part of the Delaware Statewide Municipal Recycling Annual Report that DSM is conducting for the Delaware Recycling Public Advisory Council (RPAC). The purpose of the study is to develop reasonable and professional estimates of the quantity of material recovered for recycling from residential and non-residential activities located in Delaware, and to ensure no double counting of material occurs. Data provided to DSM will be aggregated with all other material quantities reported to develop a single, annual quantity

(in tons) of material recycled for each material type which will be reported in RPAC's annual report. Note that participating company names and participation status may