

2012 Vermont State-wide Waste Composition Study



DSM ENVIRONMENTAL SERVICES, INC.
MSW CONSULTANTS

Purpose



- **Required by statute**
- **Provide data for implementation of Act 148**
 - Recyclable materials in waste stream
 - Bottle bill materials in waste stream – current and potential expansion
 - Organics in waste stream
 - Composition of C&D wastes

Plastic Sub-Sort



- DSM talked with Association of Plastics Recyclers about funding an add-on detailed plastic sort
- Purpose was to learn more about what types and quantities of plastics are being disposed of in Vermont's waste stream

Waste Sort Categories



- **Paper**
 - 11 categories
- **Plastics**
 - 47 categories
- **Metal**
 - AL Beverage
 - Other AL
 - Steel Cans
 - Other Ferrous
 - Other Non-Ferrous
- **Glass**
 - Beverage
 - Food
 - Other
- **Organics**
 - Food
 - Yard Waste
 - Dirt
 - All Other
- **Electronics**
 - Plug-In
 - Small (rechargeable)
 - Small Appliances
- **Household Hazardous**
 - Mercury Containing
 - Other HHW
- **Construction & Demolition**
 - Clean Wood
 - All Other
- **Other**
 - Textiles
 - Diapers
 - Carpet/Padding
 - Batteries
 - Tires
 - Furniture/Bulky Waste
 - All Other

Plastic Sub-Sort Categories



#1 PET Bottles EBB
#1 PET Bottles BB
#1PET Food and Dairy Bottles and Jars
#2 HDPE Beverage Bottles EBB
#2 HDPE Beverage Bottles BB
HDPE Food and Dairy and Detergent
3 - 7 Bottles EBB
3 - 7 Bottles BB
3 - 7 Bottles Non
3 - 7 Bottles PP
Plastic Cups PET
Plastic Cups PP
Plastic Cups PS
Plastic Cups Keurig
Plastic Cups Other
Tubs and Lids PE
Tubs and Lids PP
Tubs and Lids PS
Tubs and Lids Other
Bulky Rigid >1 Gallons PE
Bulky Rigid >1 Gallons PP
Bulky Rigid >1 Gallons Other
Bulky Rigid >1 Gallons PE Buckets

Thermoforms PET
Thermoforms PS
Thermoforms PVC
Thermoforms PP
Thermoforms PLA
Thermoforms Other
Film, Retail Bags
Film, Other Bags
Film, Wrap
Film, Garbage
Film, Other
Film, Other Metalized
Ag Pots PE
Ag Pots PP
Ag Pots PS
Ag Pots Other
Pouches New
Pouches Old
Pouches Other
Other Plastic Blister
Other Plastic All Other
Bottles PLA
Tubs and Lids PLA
Thermoforms PLA

Logistics



- Sorted incoming waste at four transfer stations representative of VT's population
- Ten days of sorting, over two seasons
- 40 residential samples
- 60 commercial samples
- Sample size large enough for statewide estimate of residential and commercial composition, but not of individual locations
- Conducted using ASTM *Standard Test Method for Determination of the Composition of Unprocessed Municipal Solid Waste, D5231 – 92 (Reapproved 2008)*

Sorting Locations



3/8/13

vermont_map2.gif (500x738)



Locations

- Williston (All Cycle TS)
- Highgate TS (Casella)
- Brattleboro (Triple T TS)
- Sunderland TS (Casella)

Sample and Sorting Basics



- Random selection of incoming trucks to survey
- Questioned to verify 90% of load is residential or commercial
- Load dumped on floor
- 200 – 250 pound sample taken from systematic grid or clock face
- Sample numbered by location with sample number carried through to data analysis

Samples Ready for Sorting



Idealized Sorting Area



Actual Sorting Area



Starting a New Sample



Finishing the Sample

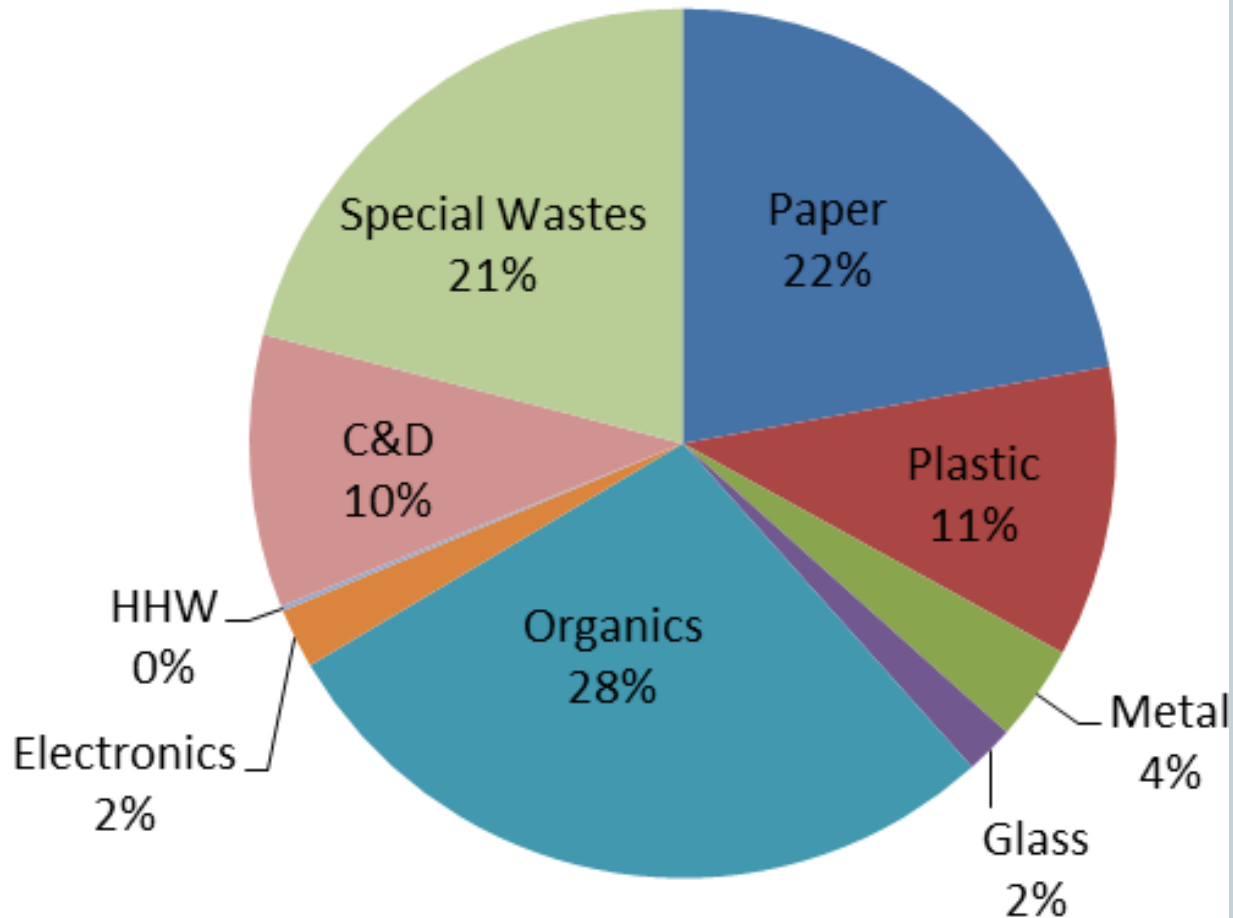


Results

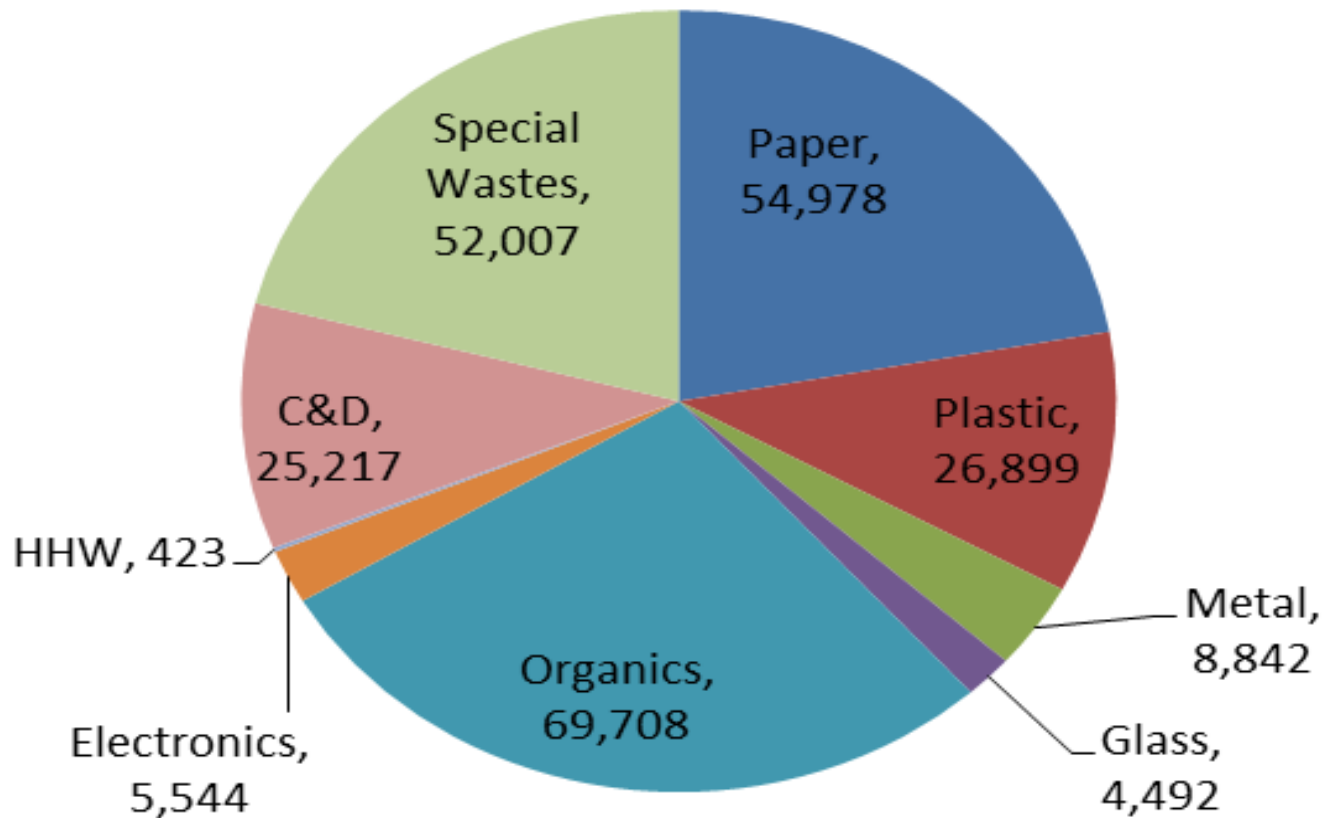


RESIDENTIAL AND ICI WASTE

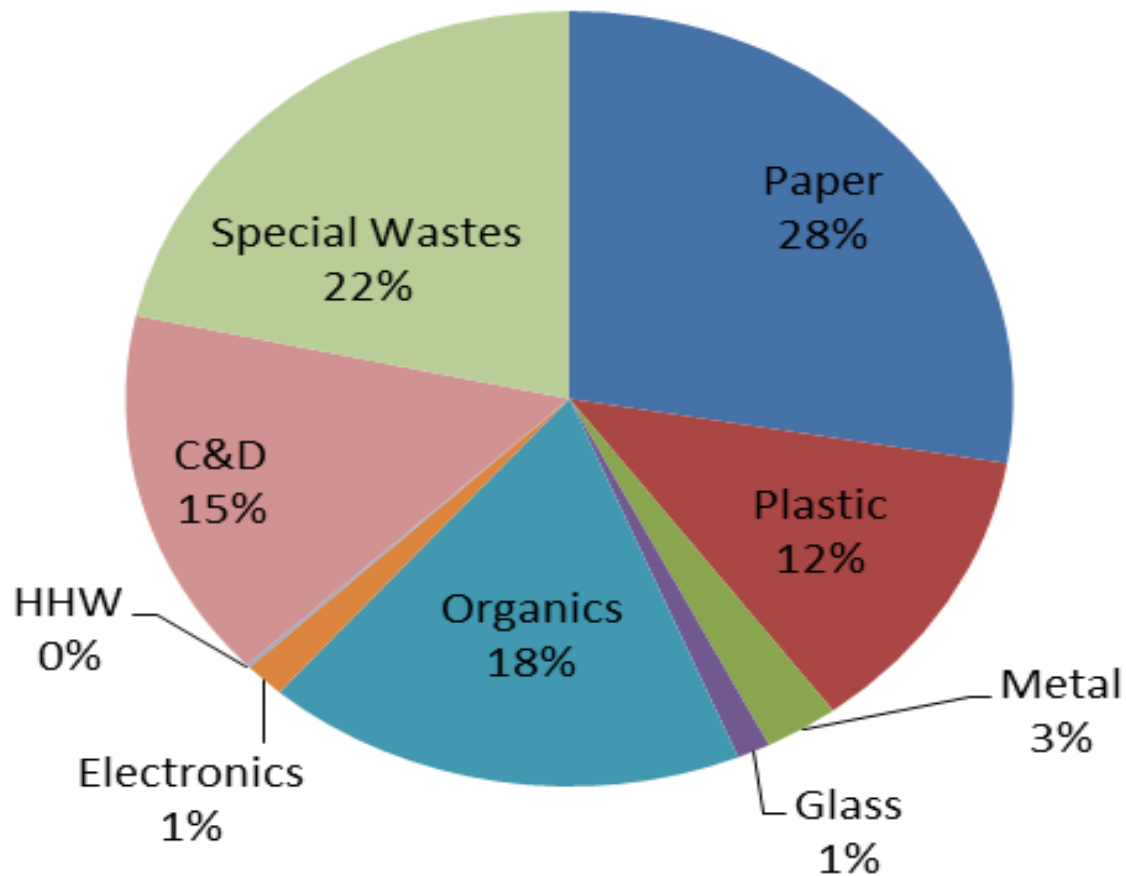
Residential MSW, By Percent



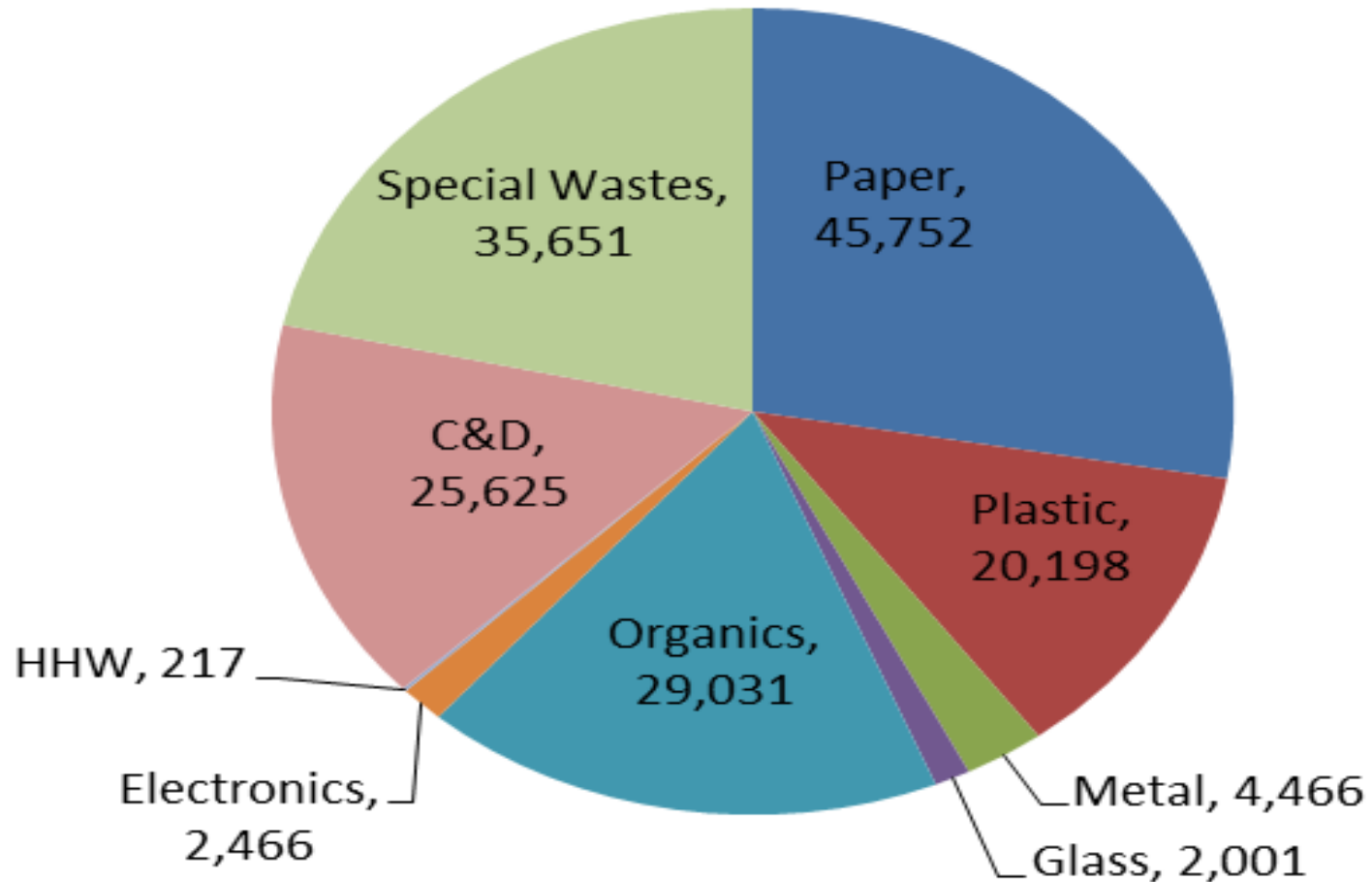
Residential MSW, By Weight



ICI MSW, By Percent

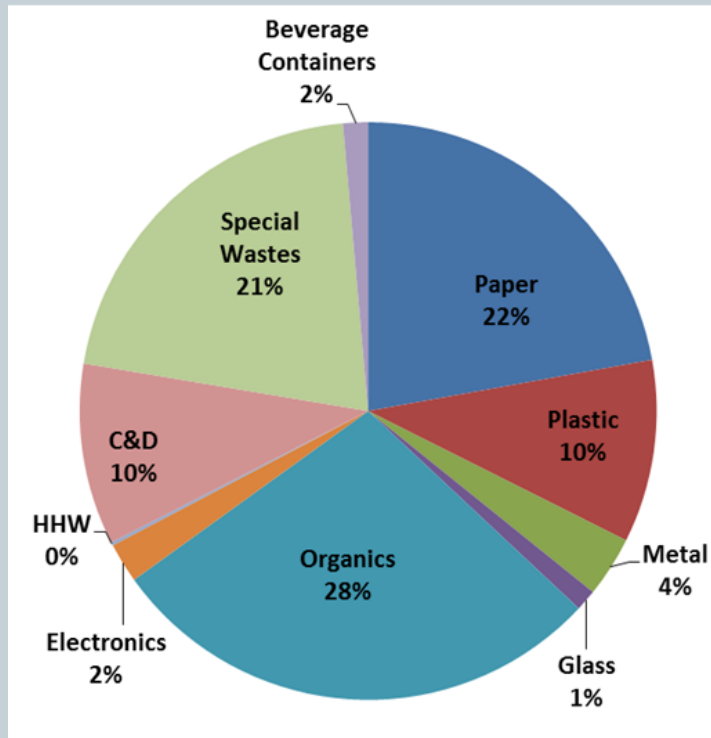


ICI MSW, By Weight

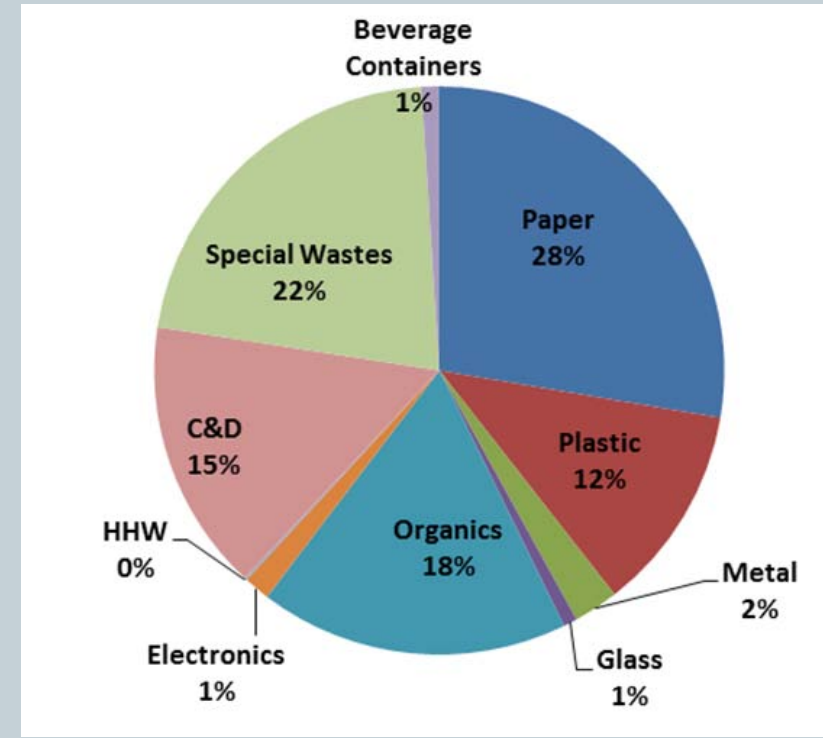


BB and EBB Containers, As Percentage of MSW

Residential MSW



ICI MSW



Results



CONSTRUCTION AND DEMOLITION WASTE

Construction & Demolition Waste



- **General consensus that you cannot sample and sort C&D waste**
 - Large pieces
 - Heterogeneous material
 - Sample will not be representative of load
- **Alternative is visual estimation of volume of entire load**
 - Converted to weight based on load weight and materials density

Procedure

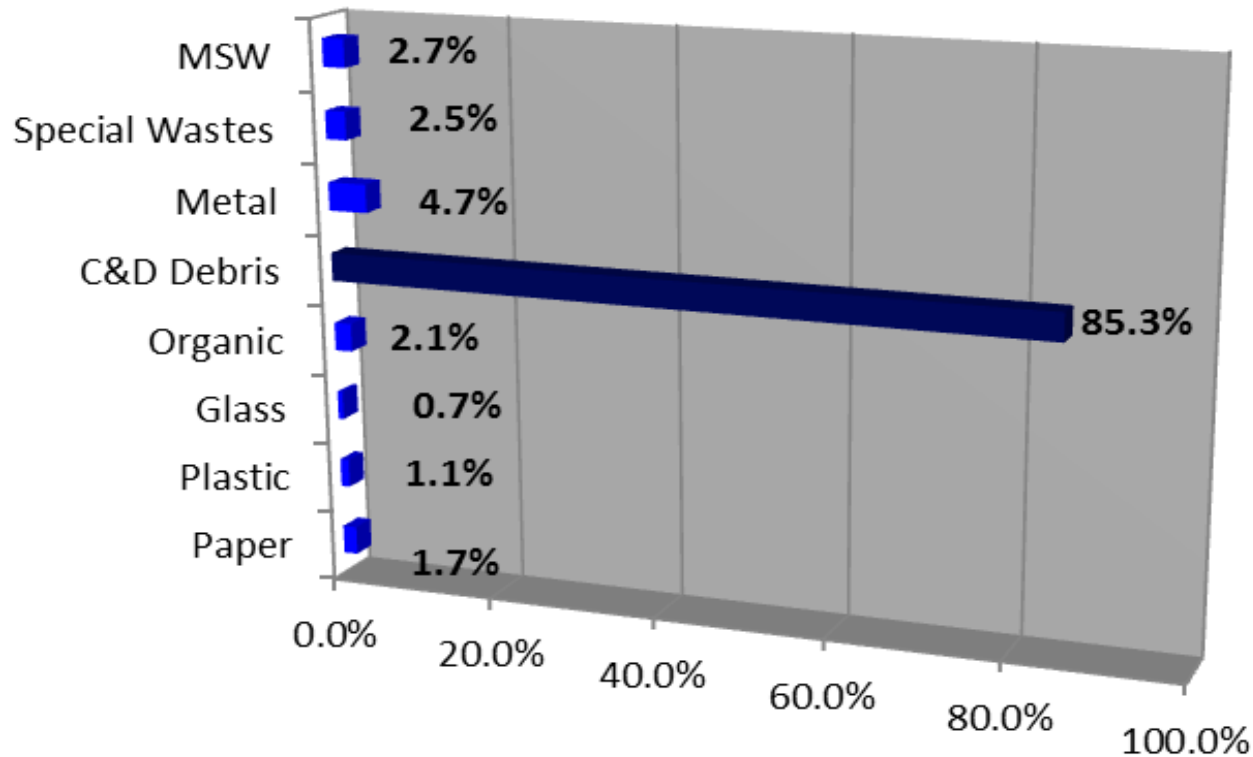


- All loads entering transfer station surveyed if enumerator present
- Driver questioned as to nature of load
 - New construction
 - Demolition
 - Residential or Commercial
- Vehicle identification number taken to obtain net scale weight of load
- Load dumped on tipping floor (or landfill face)
 - May be pushed to flatten and spread out load
- Initial walk around to record percent, by volume, by major categories
- Second walk around to record percents, by volume, within each major category
- Weigh data collected from scale house and added to form
- Volumes converted to tons during analysis using weigh data and densities by materials found in load

Results of C&D Surveys



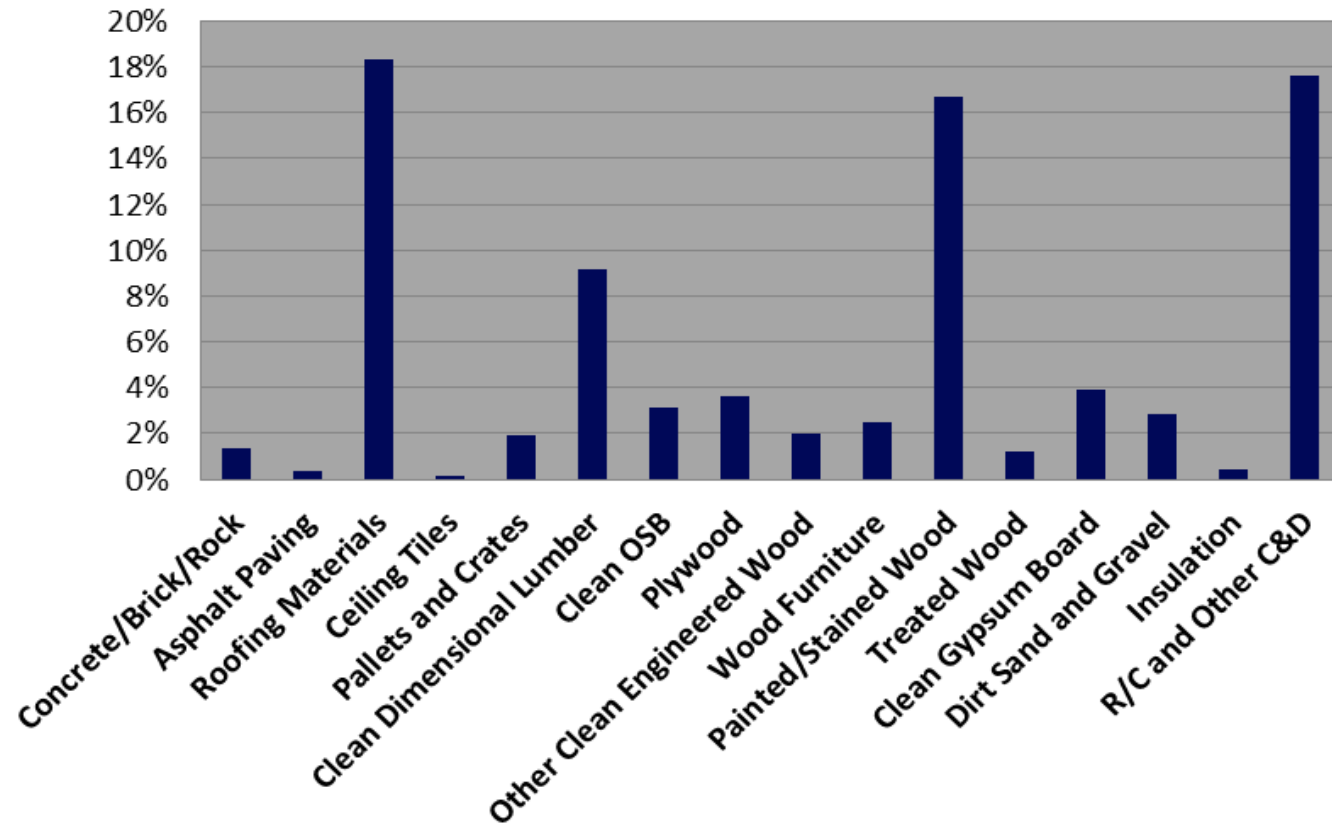
Composition of C&D Waste, By Major Material Type (By Weight)



Composition of C&D Debris Fraction



Composition of the "C&D Debris" Fraction



Results



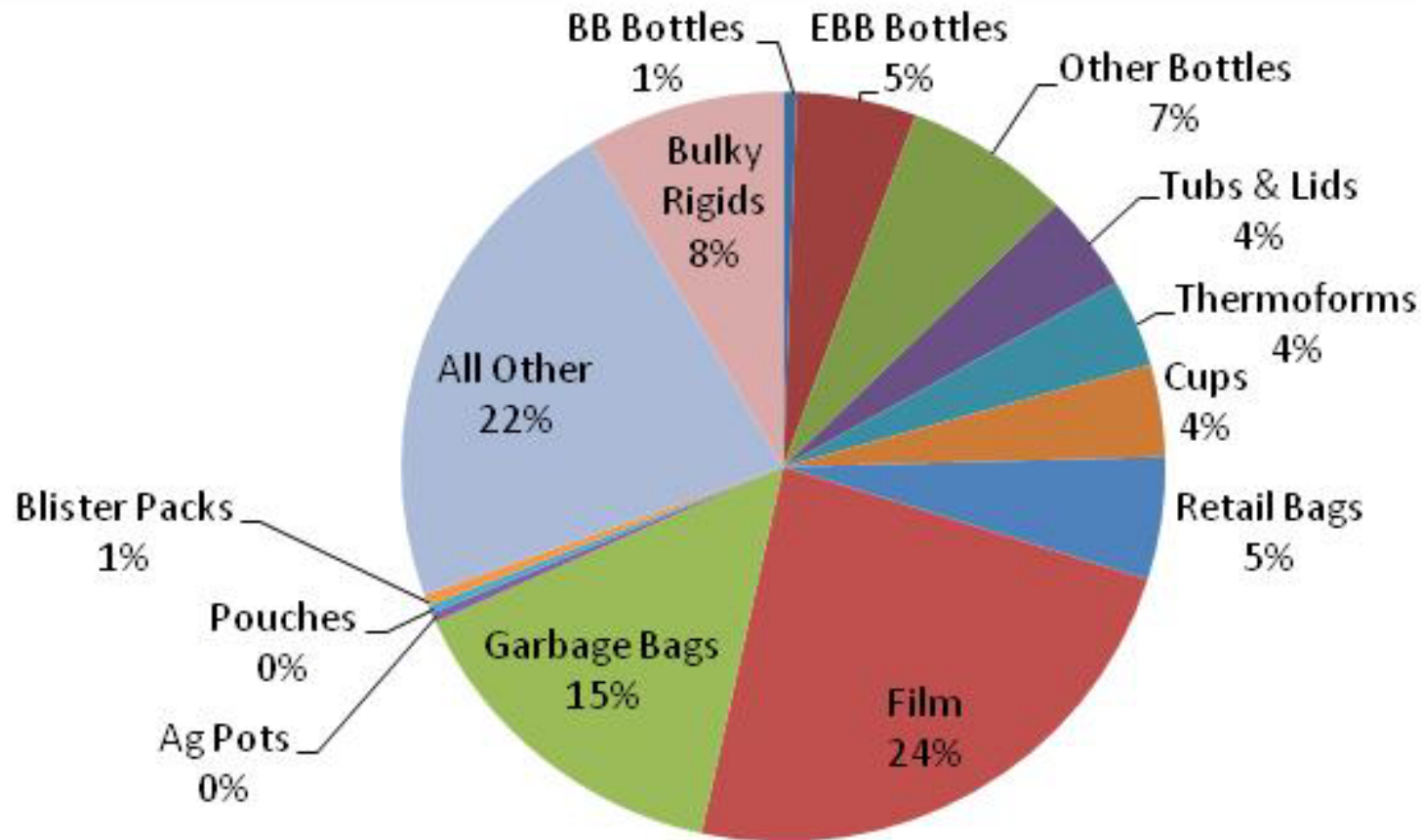
PLASTIC SUB-SORT

Resin Identification

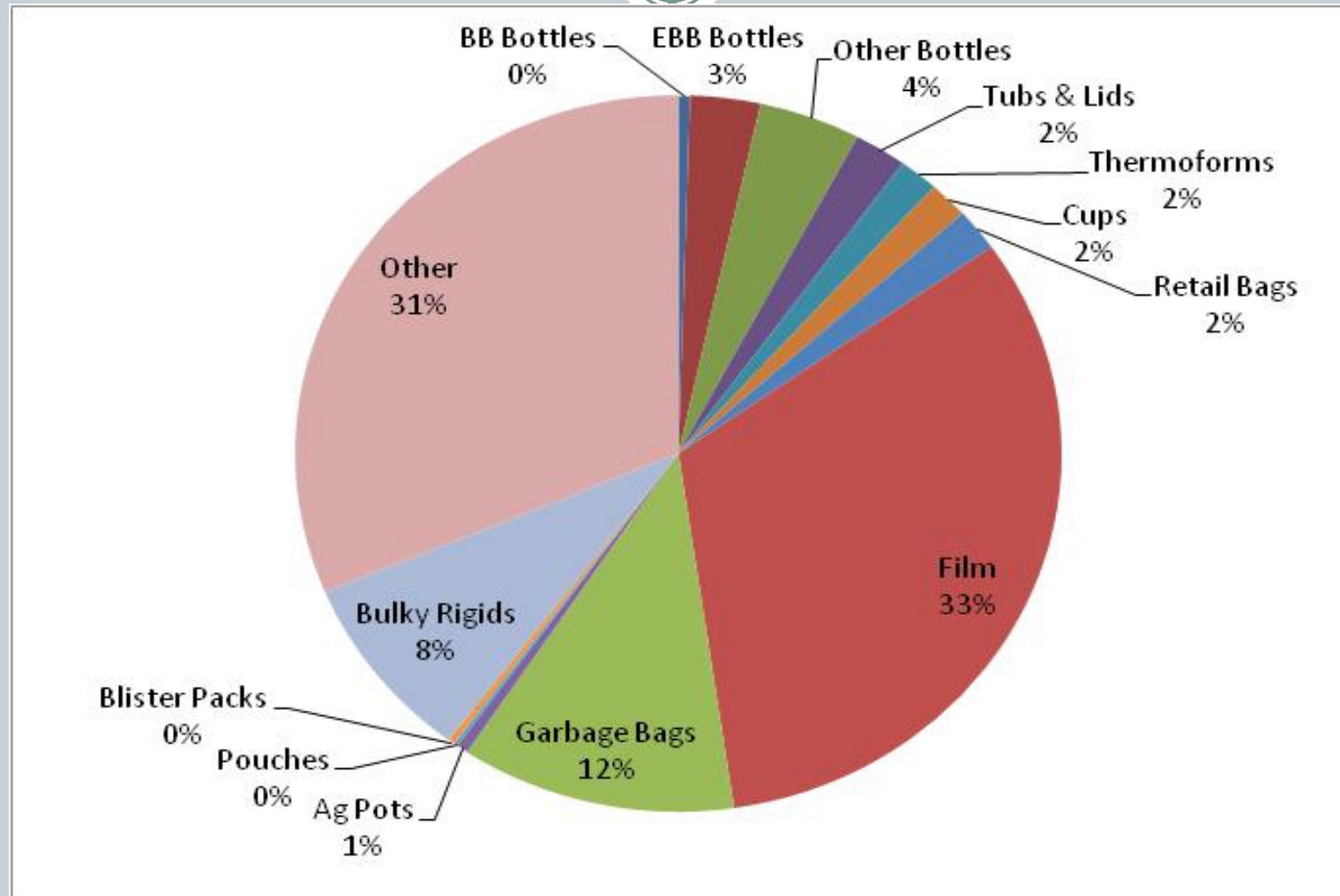
By resin code listed, or Delta Nu Resin Identification Meter



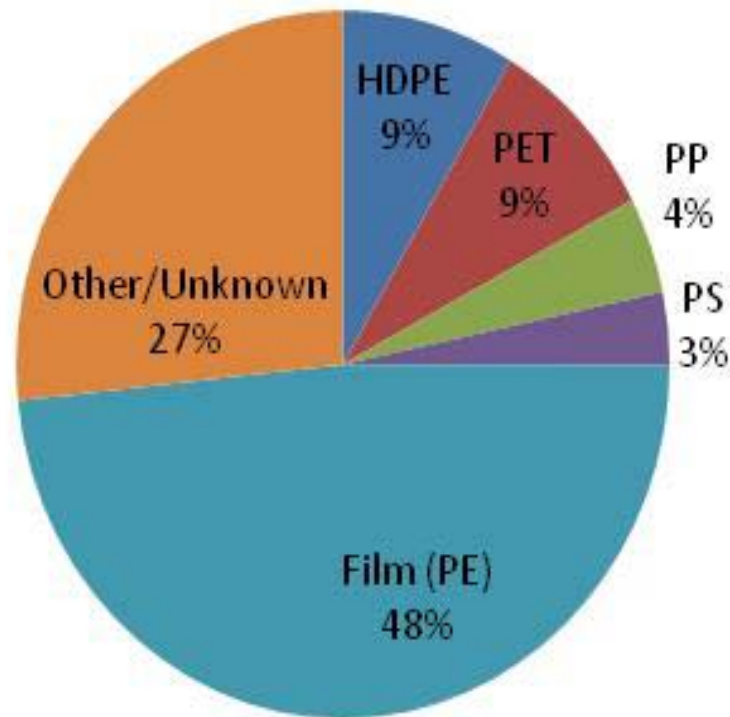
Composition of Plastic by Product Type, Residential Waste



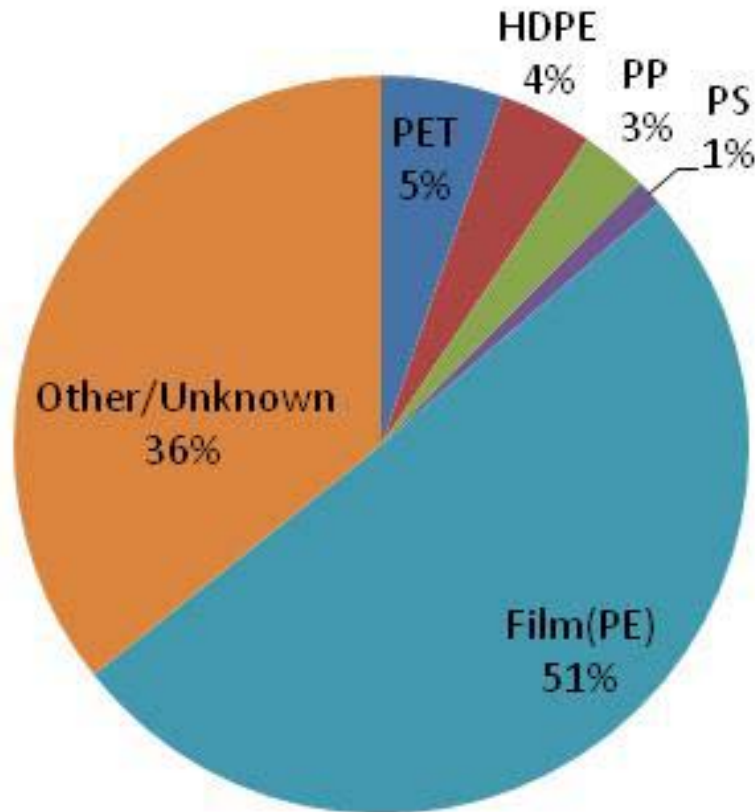
Composition of Plastic By Product Type, ICI Waste



Composition of Plastic by Resin Type, Residential Waste



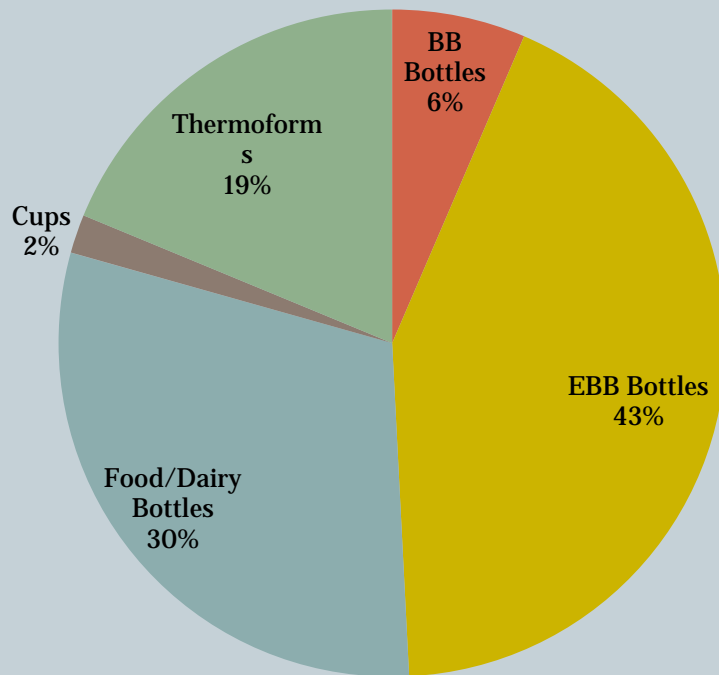
Composition of Plastic By Resin Type, ICI Waste



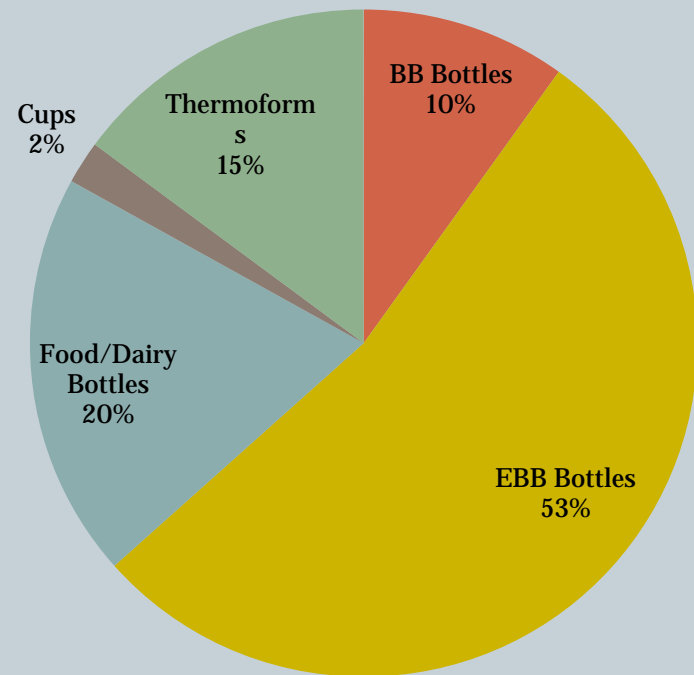
PET



Residential



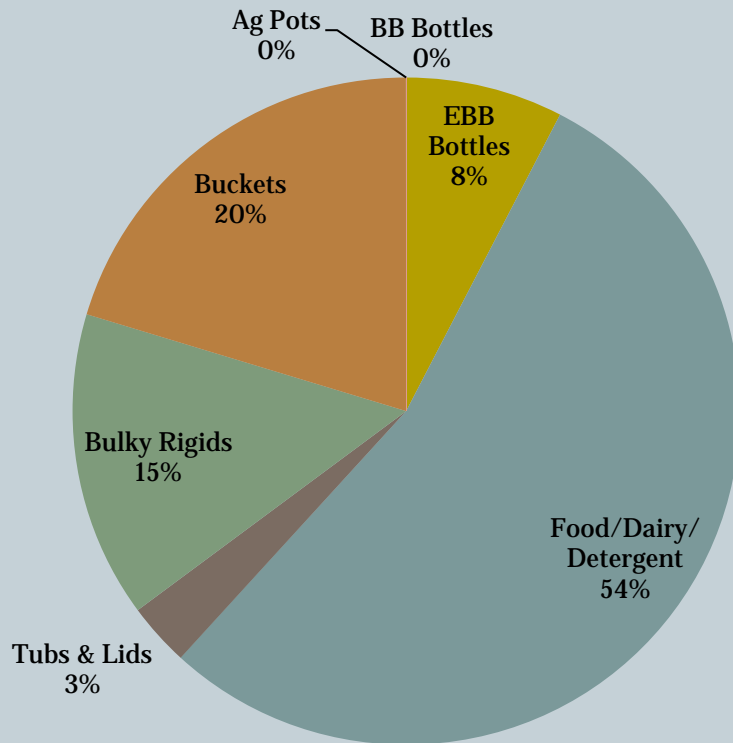
Commercial



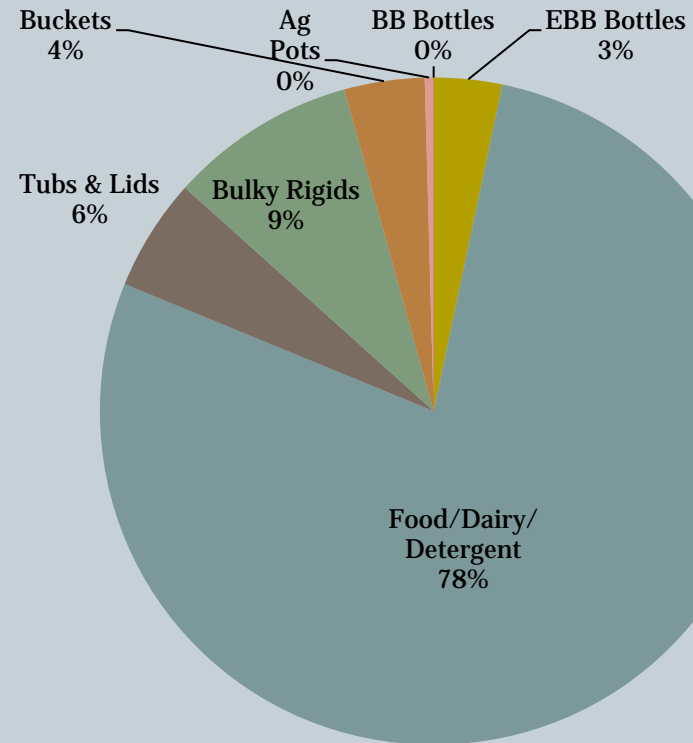
HDPE



Residential



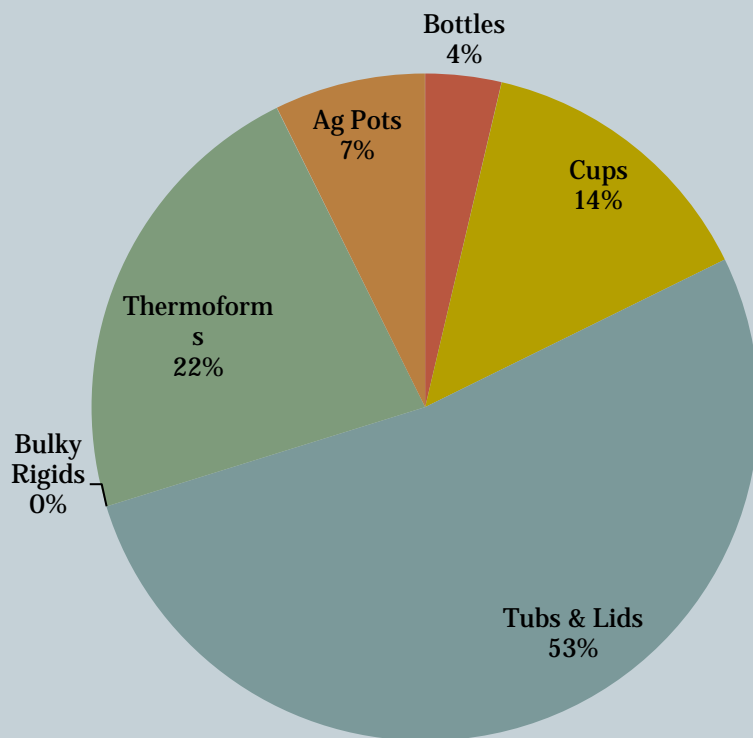
Commercial



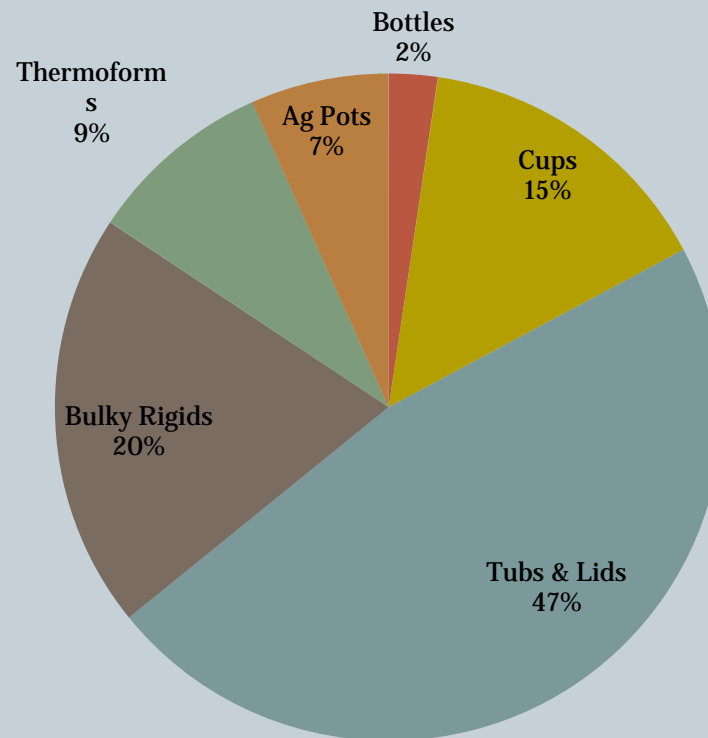
Polypropylene



Residential



Commercial



Findings and Observations



But First A Few Words of Caution



- **Change in relative composition**
 - A significant change in one category will change the relative percentage of all other categories
 - The most significant change over 2002 is the increase in C&D materials in the MSW
 - That lowers the relative percent of other materials
- **Relatively small sample size**
 - Available budget resulted in relatively small number of samples
 - While statistically valid at state-wide level, not so at the facility level or the seasonal level
 - When reading the results pay attention to the confidence interval and recognize that we are 90 % confident that the true mean lies somewhere within the confidence interval

Cautions (cont.)



- **Cannot compare ICI waste between 2002 and 2012 because we did not conduct ICI sampling in 2002**
 - We concentrated on specific sectors
 - In general, ICI waste is significantly more heterogeneous than residential waste
 - As such the mean obscures very large variations in composition depending on the generator type
- **Impact of bulky waste**
 - We ignored bulky waste
 - If bulky wastes represent 10 – 20 % of waste disposed in VT, then ignoring bulky waste skews the quantities of potentially recyclable materials up by a similar amount
 - This means that statements about what percent of the waste stream is potentially recoverable need to be tempered to recognize this important point

Findings - Residential MSW



- Paper in the waste stream has declined by roughly 5 to 6 percentage points between 2002 and 2012
 - Increased recycling
 - Lower quantities of newsprint
 - But OCC has increased – perhaps because e-commerce sends more OCC to the home
- Despite this decline there is still significantly more paper in the waste stream than the US EPA estimate of 16.2%
 - But VT similar to CT and lower than DE
 - These two state studies conducted by same project team using same methodology (but larger sample sizes)
 - Both were bottle bill states (without expanded bottle bill) at the time of the composition studies

Findings – Residential MSW (cont.)



- **E-waste remains about the same between 2002 and 2012**
 - Light-weighting of electronics
 - More aggressive recycling programs
- **Plastics are increasing when compared to 2002, but less than in CT or DE, and less than US EPA estimates**
- **Organics remain the largest single component of residential waste by weight at 28%**
 - Slightly lower than CT or DE, but the difference falls within the 90% confidence interval
- **Largest difference between 2002 and 2012 is in C&D discarded as MSW**
 - 4.6% in 2002, 10.2% in 2012
 - Similar to CT at 10.6%

ICI MSW



- In general, VT's ICI wastes looks very similar to CT's and DE's
- Organic waste represents roughly 17.6% of ICI waste
 - This is a lower percentage than for residential MSW
 - But there are wide variations in the composition of different ICI generators
 - Some ICI generators are large generators of organics, others generate virtually none so the mean is not very meaningful (pun intended)

ICI Findings (cont.)



- Paper is the largest component of ICI waste at 27.7%
 - Like organics, some ICI generators are large generators of paper and some not
 - This is especially the case for OCC, which represented 12.4% of ICI waste despite robust OCC recycling programs and prices



Bottle Bill Related Findings



Material	Residential		ICI		Total	
	BB	EBB	BB	EBB	BB	EBB
	(tons)	(tons)	(tons)	(tons)	(tons)	(tons)
Aluminum	390	32	227	22	617	54
Glass	665	870	333	379	998	1,249
PET	138	908	98	526	235	1,434
HDPE	0	158	0	25	0	183
3-7	15	296	0	45	15	342
						0
Total	1,209	2,265	657	996	1,866	3,261

Plastic Sub-Sort By Product Type



Product Type	ICI Plastic Waste		Residential Plastic Waste	
	(%)	(tons)	(%)	(tons)
Bottles	7.7%	1,560	12.7%	3,412
Tubs & Lids	2.2%	448	4.2%	1,118
Thermoforms	1.7%	338	3.8%	1,012
Cups	1.7%	338	4.0%	1,071
Retail Bags	1.9%	385	5.3%	1,417
Film	32.5%	6,563	23.6%	6,347
Garbage Bags	11.6%	2,345	14.8%	3,975
Ag Pots	0.3%	100	0.4%	110
Pouches	0.2%	33	0.4%	94
Blister Packs	0.3%	59	0.5%	129
Bulky Rigids	8.4%	1,703	8.4%	2,261
Other	31.3%	6,328	22.1%	5,954
Total	99.9%	20,198	100.0%	26,899

Recommendations For Future Waste Composition Studies in Vermont



- Both 2002 and 2012 studies have been under-funded resulting in small sample sizes and larger confidence intervals
 - Given what other states are funding, Vermont needs to at least double the funding to increase sample size and locations sampled
- Vermont should either begin to compile data on the quantity of residential versus ICI waste, or fund an analysis as part of the next study to provide more certainty as to tonnage estimates
 - Consideration should also be given to sampling ICI waste by generator type given large differences in ICI waste composition depending on the generator
- Bulky waste and self-haul waste to transfer stations should be included
- Given the continued growth in plastic wastes the plastic sub-sort should be carried out again to compare against the 2012 baseline.