



# 2016-2017 Statewide Waste Characterization Study Results



MISSOURI RECYCLING  
ASSOCIATION

AUGUST 11, 2017

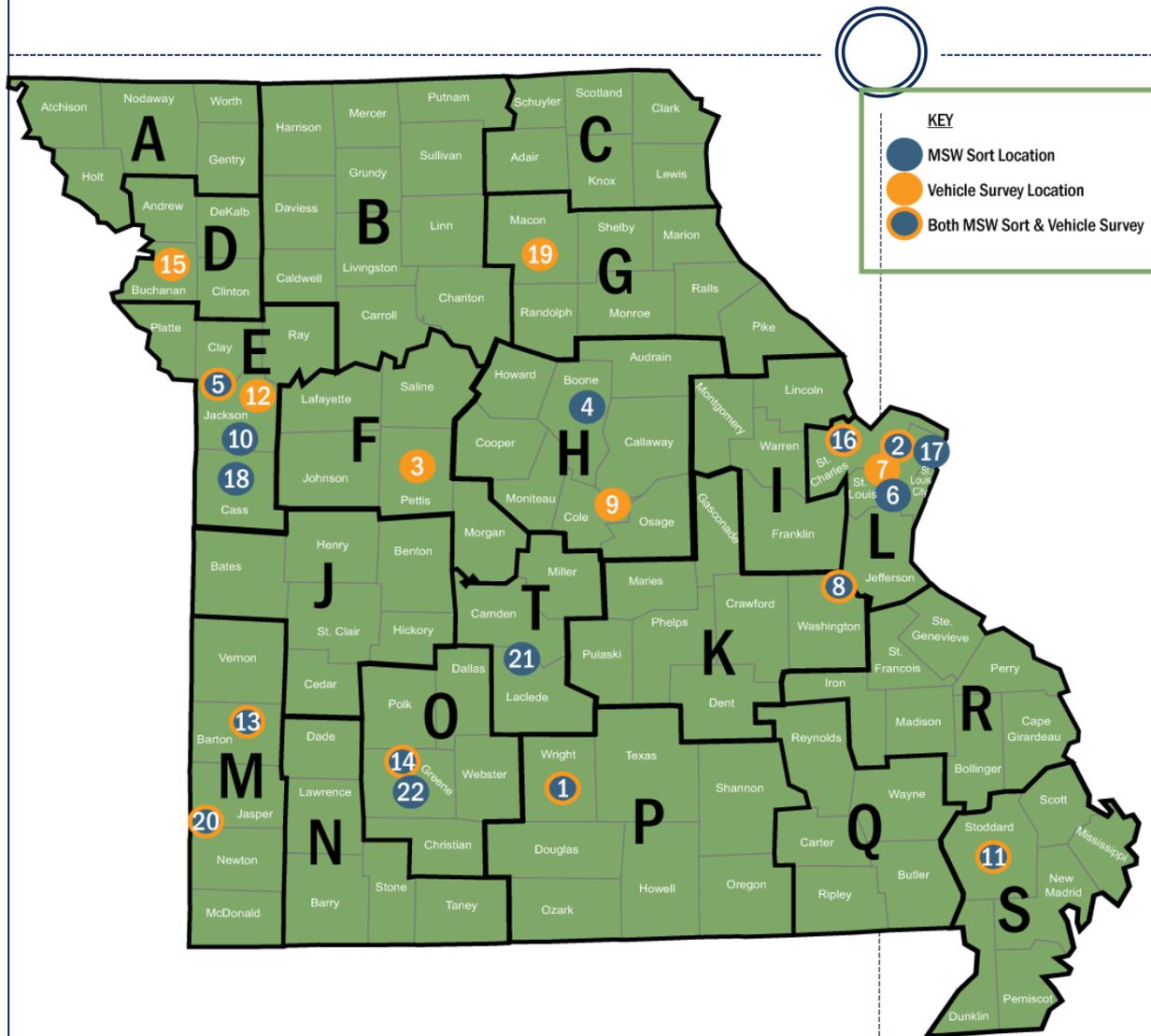


# Objectives

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- Summarize the results of Missouri's 2016-2017 Statewide Waste Characterization Study
- Compare results to prior studies
- Identify and refocus on diversion opportunities

# 22 Host Facilities – THANK YOU!!!



- Black Oak LF
- Bridgeton TS
- Central MO LF
- Champ LF
- Columbia LF
- Courtney Ridge LF
- F.W. Disposal TS
- Jefferson City LF
- Joplin TS
- Lee's Summit LF
- Lemons LF
- Maple Hill LF
- O'Fallon TS
- Ozarks TS
- Pink Hill Acres Demo LF
- Prairie View LF
- Springfield LF
- Springfield Relay TS
- St. Joseph LF
- St. Louis Waste TS
- Timber Ridge
- Town & Country TS

# History



- **1996-1998: Inaugural Study**

- 19 facilities – MSW sort
  - ✦ 26 Material Categories
  - ✦ Three seasons over 2 years
- 14 facilities – non-MSW survey

- **2006-2008: Second Study**

- 15 facilities – MSW sort
  - ✦ 28 Material Categories
  - ✦ Two seasons
- 15 facilities – non-MSW survey

- **2016-2017: Current Study**

- 16 facilities – MSW sort
  - ✦ 48 Categories
  - ✦ Two seasons
- 15 facilities – non-MSW survey
  - ✦ Real-time Visual Volumetric Characterization
- Sampling Plan Based on Demographic Waste Flow

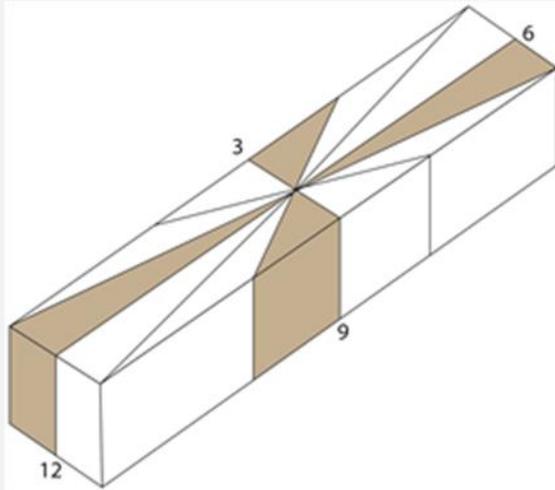
# Similarities Across Studies



- Sample Sizes
    - 200-250 lbs
  - Major Categories
    - MSW
    - Construction
    - Demolition
    - Industrial
    - Special
    - Other
  - Many of the same facilities
- Continued segregation of Residential and CI wastes
    - Full statistical analysis
  - Continued reporting on MSW and All Solid Waste
    - MSW + non-MSW Visuals
    - Divertibility Analysis

# New/Different Elements of 2016-17 Study

- Sampling Plan  
(Demographically)
- Sampling Methodology



- Independent Analysis of  
MSW-Residential and  
MSW-CI

- Visual Surveying  
Volumetric Load  
Characterization



# Interpreting Results

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- **Sample mean:** most likely estimate
- **Confidence Intervals:** reflect the upper and lower range within which the population mean can be expected to fall (to a 90% confidence level)

- Example –  
Newsprint 1.3 to 1.7% of this grouping with a 90% conf. int.

Material Category	Est. Percent	Conf. Int (+/-)
<b>Paper</b>	<b>24.1%</b>	<b>1.2%</b>
Corrugated Cardboard/Kraft	4.8%	0.7%
Newsprint	1.5%	0.2%
Magazines	1.3%	0.3%
High Grade Office Paper	1.4%	0.4%
Mixed Recyclable Paper	4.6%	0.4%
Compostable Paper	9.1%	0.5%
Remainder/Composite Paper	1.4%	0.3%
<b>Glass</b>	<b>3.5%</b>	<b>0.5%</b>
Clear Glass Containers	1.8%	0.2%
Brown Glass Containers	1.0%	0.3%

# MSW Sampling Plan – Demographic Tonnage basis

District	District Name	No. of Facilities Sampled	Tons (CY16)		Samples		Statewide Tons - Percent
			Tons	Percent of Total	Samples	Percent of Total	
A	Northwest Missouri SWMD	0	0	0.0%	0	0.0%	0.5%
B	North Missouri SWMD	0	0	0.0%	0	0.0%	0.0%
C	Northeast Missouri SWMD	0	0	0.0%	0	0.0%	0.4%
D	Region D Recycling & Waste Mgt. Dist.	0	0	0.0%	0	0.0%	2.0%
E	Mid-America Reg. Council SWMD	3	812,183	24.3%	57	22.4%	14.1%
F	West Central Missouri SWMD	0	0	0.0%	0	0.0%	8.5%
G	Mark Twain SWMD	0	0	0.0%	0	0.0%	4.5%
H	Mid-Missouri SWMD	1	340,757	6.6%	26	10.2%	5.9%
I	East Central SWMD	0	0	0.0%	0	0.0%	0.5%
J	Quad-Lakes SWMD	0	0	0.0%	0	0.0%	0.2%
K	Ozark Rivers SWMD	1	290,831	7.4%	8	3.1%	5.0%
L	St. Louis-Jefferson SWMD	4	2,182,889	17.6%	73	28.7%	37.9%
M	Region M SWMD	2	412,991	17.8%	25	9.8%	7.2%
N	Southwest Missouri SWMD	0	0	0.0%	0	0.0%	0.0%
O	Ozark Headwaters Recycling and Materials Mgmt. Dist.	2	254,776	8.7%	24	9.4%	4.4%
P	South Central SWMD	1	279,300	9.9%	17	6.7%	4.8%
Q	Ozark Foothills Regional SWMD	0	0	0.0%	0	0.0%	0.0%
R	Southeast Missouri SWMD	0	0	0.0%	0	0.0%	0.7%
S	Bootheel SWMD	1	197,124	7.8%	8	3.1%	3.4%
T	Lake of the Ozarks SWMD	1	0	0.0%	16	6.3%	0.0%
<b>Totals</b>		<b>16</b>	<b>4,770,851</b>	<b>100.0%</b>	<b>254</b>	<b>100.0%</b>	<b>100.0%</b>

# Facilities Sampled - MSW



Region	Facility	Demographic	Actual Samples		Total
			Residential	Commercial/ Institutional	
E	Courtney Ridge Landfill	Large Metro	10	15	25
E	Lee's Summit Landfill	Large Metro	9	7	16
E	Town & Country Transfer Station	Rural	9	7	16
H	Columbia Landfill	Small Metro	16	10	26
K	Timber Ridge Landfill	Rural	3	5	8
L	Bridgeton Transfer Station	Large Metro	12	13	25
L	F. W. Disposal Transfer Station	Large Metro	8	8	16
L	St. Louis Waste Transfer Station	Large Metro	5	11	16
L	O'Fallon Transfer Station	Large Metro	10	6	16
M	Prairie View Landfill	Rural	2	6	8
M	Joplin Transfer Station	Small Metro	10	7	17
O	Springfield Relay Transfer Station	Small Metro	4	4	8
O	Springfield Landfill	Small Metro	10	6	16
P	Black Oak Landfill	Rural	14	3	17
S	Lemons Landfill	Rural	4	4	8
T	Ozarks Transfer Station	Rural	11	5	16
		<b>Total</b>	<b>137</b>	<b>117</b>	<b>254</b>

# MSW Generator Sectors

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- **Residential** Waste



- **Commercial/**  
**Institutional**



# Taking Samples





# Manual Sorting & Weighing



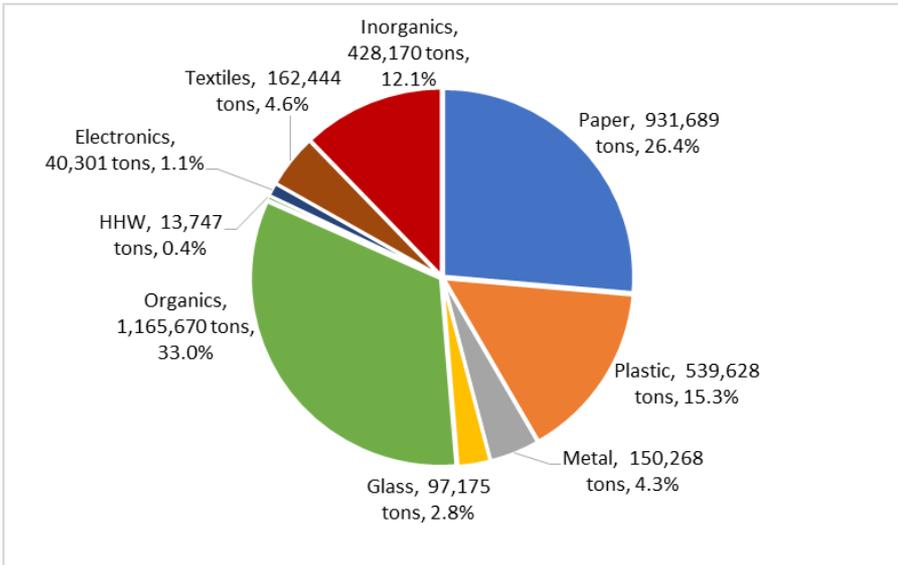
# MSW Results



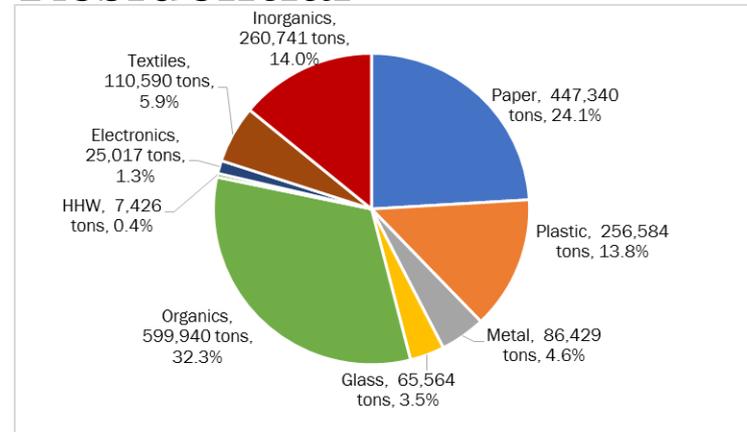
# Results by Material Group



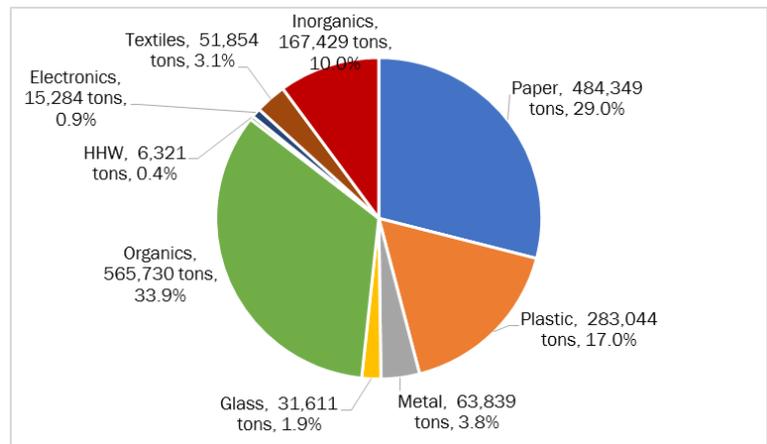
- Statewide MSW



- Residential

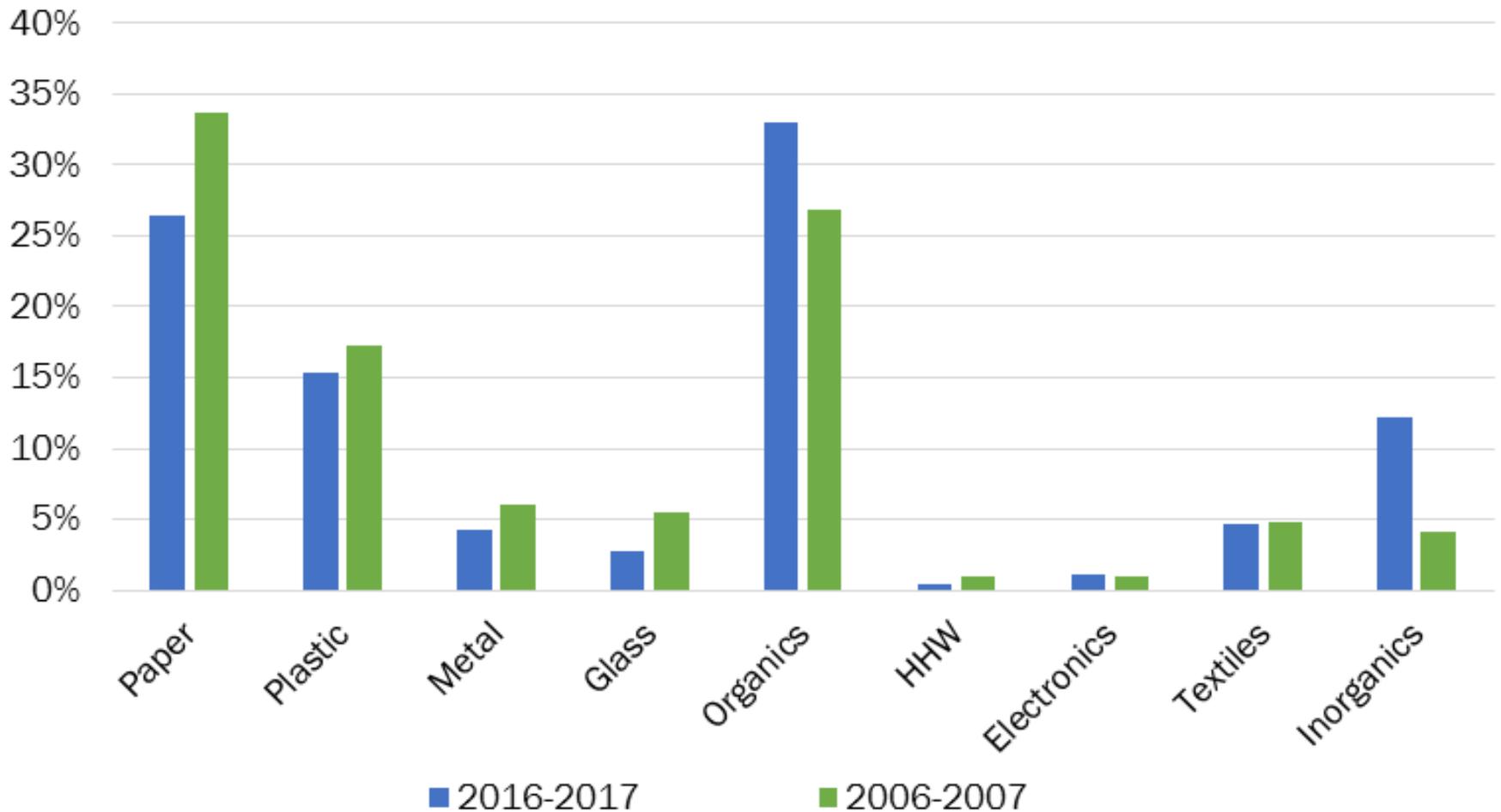


- CI



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# Changes in MSW since 2006-07



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# MSW Changes vs. 2006-08 Study



## Materials that Increased

- OCC/Kraft
- Organics
- Inorganics

## Materials that Decreased

- High Grade Office Paper
- Clear, Brown & Green Glass
- Mixed Recyclable Paper
- Newsprint
- Aluminum Cans & Containers
- Tin/Steel Containers
- PET Bottles/Containers
- HDPE  
Containers(Nat.+Colored)

# Comparison of Most Prevalent in MSW



	Rural	Small Metro	Large Metro
1	Food Waste - 15.3%	Food Waste - 17.0%	Food Waste - 10.7%
2	Compostable Paper - 7.1%	Compostable Paper - 8.8%	Non-Recyclable Paper - 10.3%
3	Contaminated Film/Other Film - 6.8%	OCC/Kraft - 8.6%	OCC and Kraft Paper - 8.5%
4	OCC/Kraft Paper (Uncoated) - 6.7%	Contaminated Film/Other Film - 5.1%	Film/Wrap/Bags - 7.5%
5	Wood - Clean/Untreated - 4.9%	Yard Waste - 4.6%	Mixed Recyclable Paper - 5.4%
6	Wood - Painted/Stained/Treated - 4.8%	Wood - Painted/Stained/Treated - 4.3%	Fines - 5.2%
7	Mixed Recyclable Paper - 4.5%	Wood - Clean/Untreated - 3.8%	Demolition/Renovation/Construction - 4.8%
8	Remainder/Composite Organic - 4.2%	Remainder/Composite Organic - 3.4%	Other Film Plastic - 4.8%
9	Diapers/Sanitary Products - 3.3%	Mixed Recyclable Paper - 3.3%	Textiles and Leather - 4.2%
10	Carpet & Carpet Padding - 2.7%	Carpet & Carpet Padding - 3.0%	Wood – Treated - 3.6%
	<b>Cumulative – 80.1%</b>	<b>Cumulative – 59.1%</b>	<b>Cumulative – 62.8%</b>

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# Comparison of Most Prevalent by Generator



	<b>MSW</b>	<b>Residential</b>	<b>CI</b>
1	Food Waste - 15.3%	Food Waste - 15.1%	Food Waste - 15.5%
2	OCC/Kraft - 9.5%	Compostable Paper - 9.1%	OCC/Kraft - 13.7%
3	Compostable Paper - 8.0%	Contaminated Film/Other Film - 4.8%	Contaminated Film/Other Film - 7.2%
4	Contaminated Film/Other Film - 6.1%	OCC/Kraft Paper (Uncoated) - 4.8%	Compostable Paper - 7.1%
5	Wood - Painted/Stained/Treated - 4.7%	Mixed Recyclable Paper - 4.6%	Wood - Clean/Untreated - 6.7%
6	Wood - Clean/Untreated - 4.2%	Yard Waste - 4.3%	Wood - Painted/Stained/Treated - 5.9%
7	Mixed Recyclable Paper - 3.8%	Diapers/Sanitary Products - 4.2%	Remainder/Composite Organic - 3.1%
8	Remainder/Composite Organic - 3.4%	Carpet & Carpet Padding - 4.0%	Mixed Recyclable Paper - 3.0%
9	Disposable Diapers & Sanitary Prod. - 2.8%	Remainder/Composite Organic - 3.8%	Remainder/Composite Plastic - 2.8%
10	Yard Waste - 2.7%	Wood - Painted/Stained/Treated - 3.5%	Other/Not Classified - 2.2%
	Cumulative – 68%	52.7% of MSW	47.3% of MSW

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# Focus on Fiber and Containers - MSW



Material	Residential	CI
High Grade	1.4%	1.3%
Magazines/Catalogs	1.3%	0.6%
Mixed Paper	4.6%	3%
Newsprint	1.5%	1.4%
OCC/Kraft	4.8%	13.7%
<b><i>All Fiber</i></b>	<b>24.1%</b>	<b>29.0%</b>
<b><i>All Containers</i></b>	<b>8.1%</b>	<b>4.6%</b>
<b>Total</b>	<b>32.2%</b>	<b>33.6%</b>

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# Focus on Compostable Organics - MSW



Material	Residential	CI
Compostable Paper	9.1%	7.1%
Yard Waste	4.3%	1.3%
Food Waste	15.1%	15.5%
Wood – Untreated	1.3%	6.7%
<b>Total</b>	<b>34.4%</b>	<b>30.6%</b>

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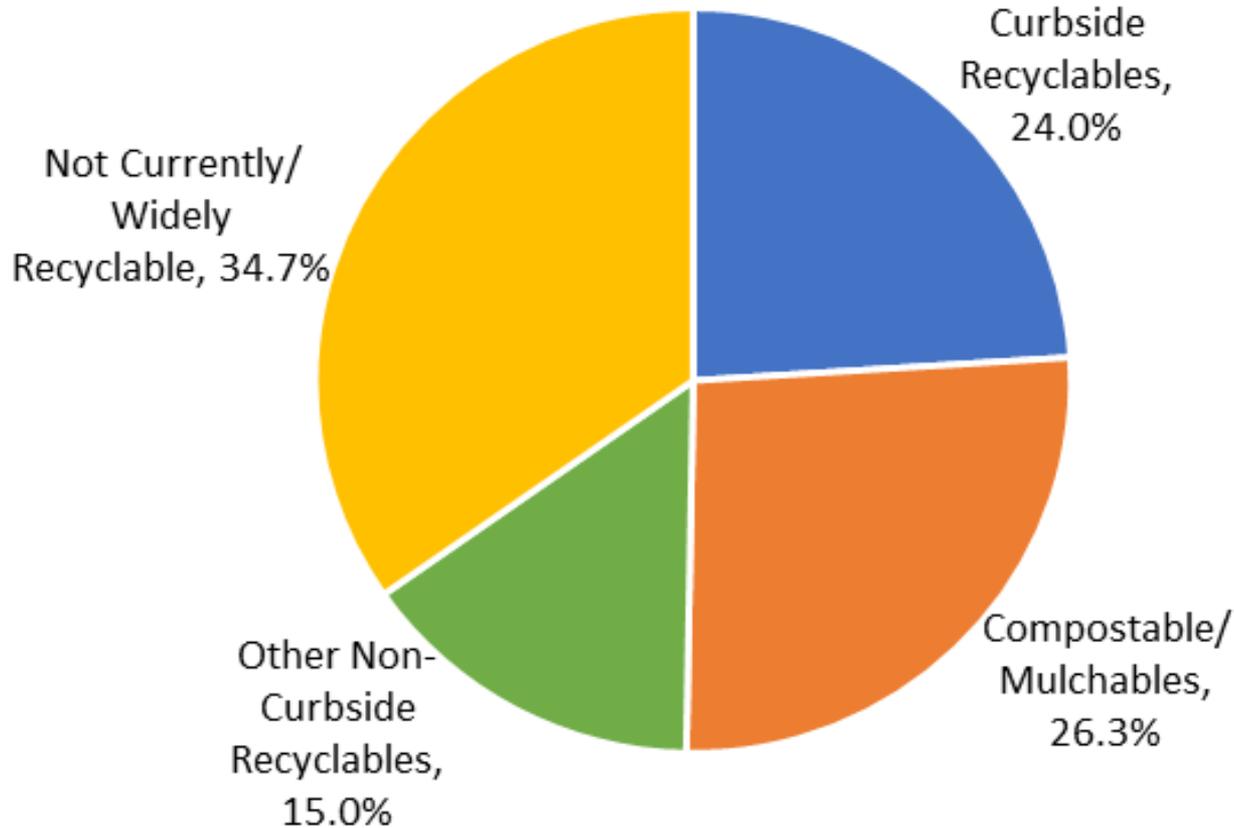
# Focus on C&D -MSW



Material	Residential	CI	MSW
Wood – Untreated	1.3%	6.7%	4.2%
Wood – Treated	3.5%	5.9%	4.7%
Asphalt Pavement, Brick, Rock, and Concrete	0.4%	0.6%	0.5%
Drywall/Gypsum Board	0.7%	0.4%	0.5%
Carpet and Carpet Padding	4.0%	1.0%	2.4%
Other C&D	1.4%	2.0%	1.7%
<b>Total</b>	<b>11.9%</b>	<b>16.8%</b>	<b>14.6%</b>

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# Divertibility Analysis - MSW



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# Non-MSW Results



# Non-MSW Gate/Visual Volumetric Surveying



- Gate Survey

- 6 Sector Breakdown

- ✦ MSW
  - Residential
  - Commercial
- ✦ Construction
- ✦ Demolition
- ✦ Industrial
- ✦ Special
- ✦ Other

- Non-MSW Visual Volumetric Load Survey

- Assess up to 30 loads per site of Construction, Demolition, Industrial
  - ✦ 45 Material Categories
  - ✦ Real-time data balancing

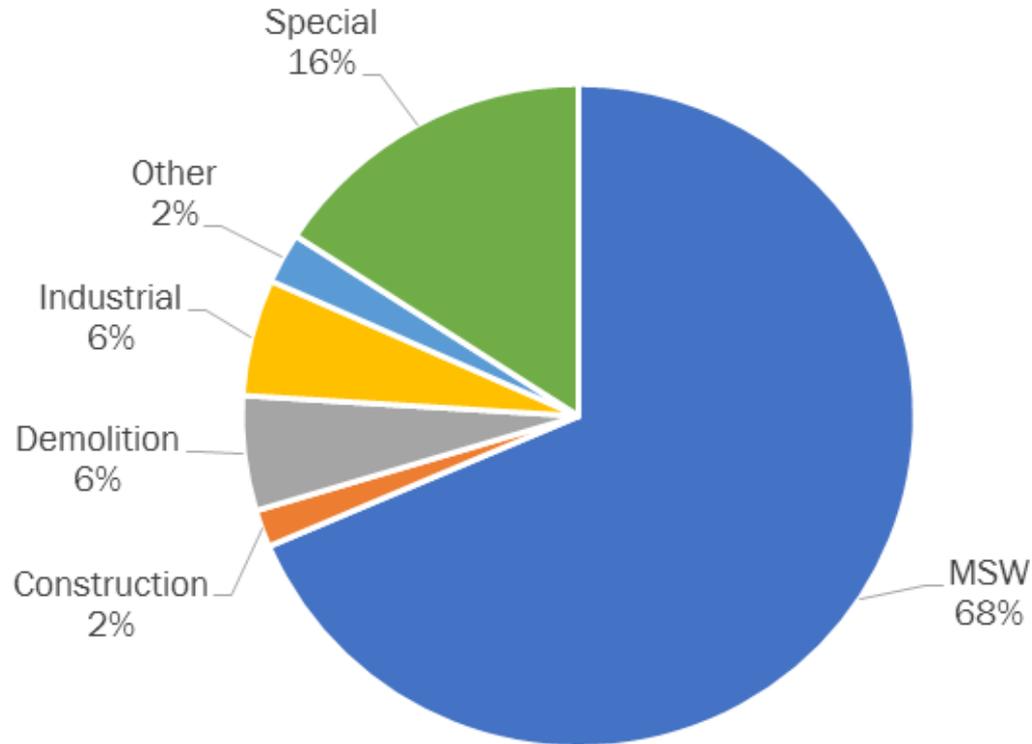
# Gate Survey Results – 6 Sectors



Waste Sector	Percent of Waste Surveyed 2017	Applied to 2016 Statewide Tonnage
MSW	68.6%	3,953,254
Construction	1.8%	104,600
Demolition	5.6%	322,606
Industrial	5.7%	327,305
Special	15.9%	914,606
Other	2.5%	142,283
	<b>100.0%</b>	<b>5,764,654</b>

Draft results pending completion of project report

# Gate Survey → Statewide Generator Sectors

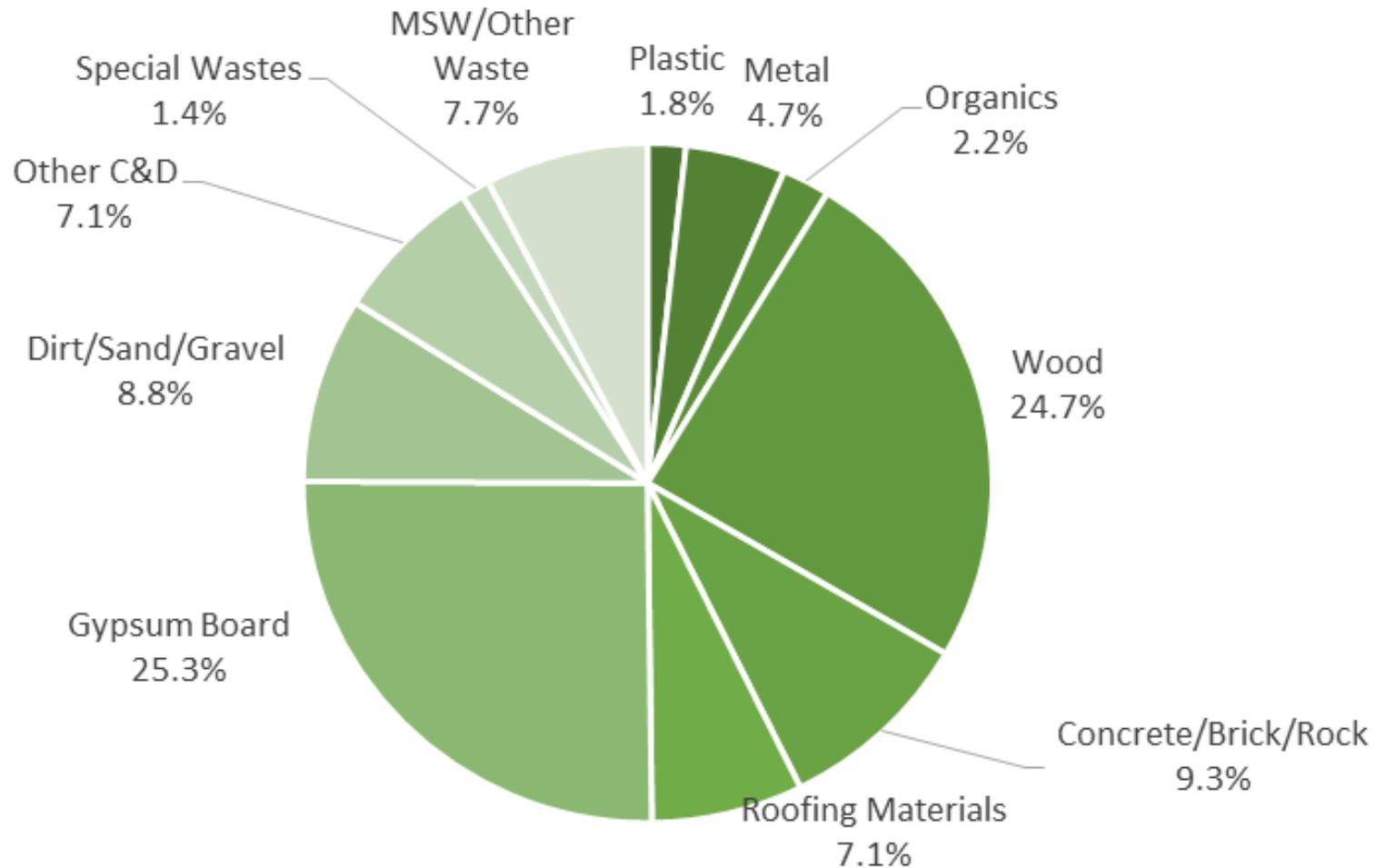


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# Visual Volumetric Surveying

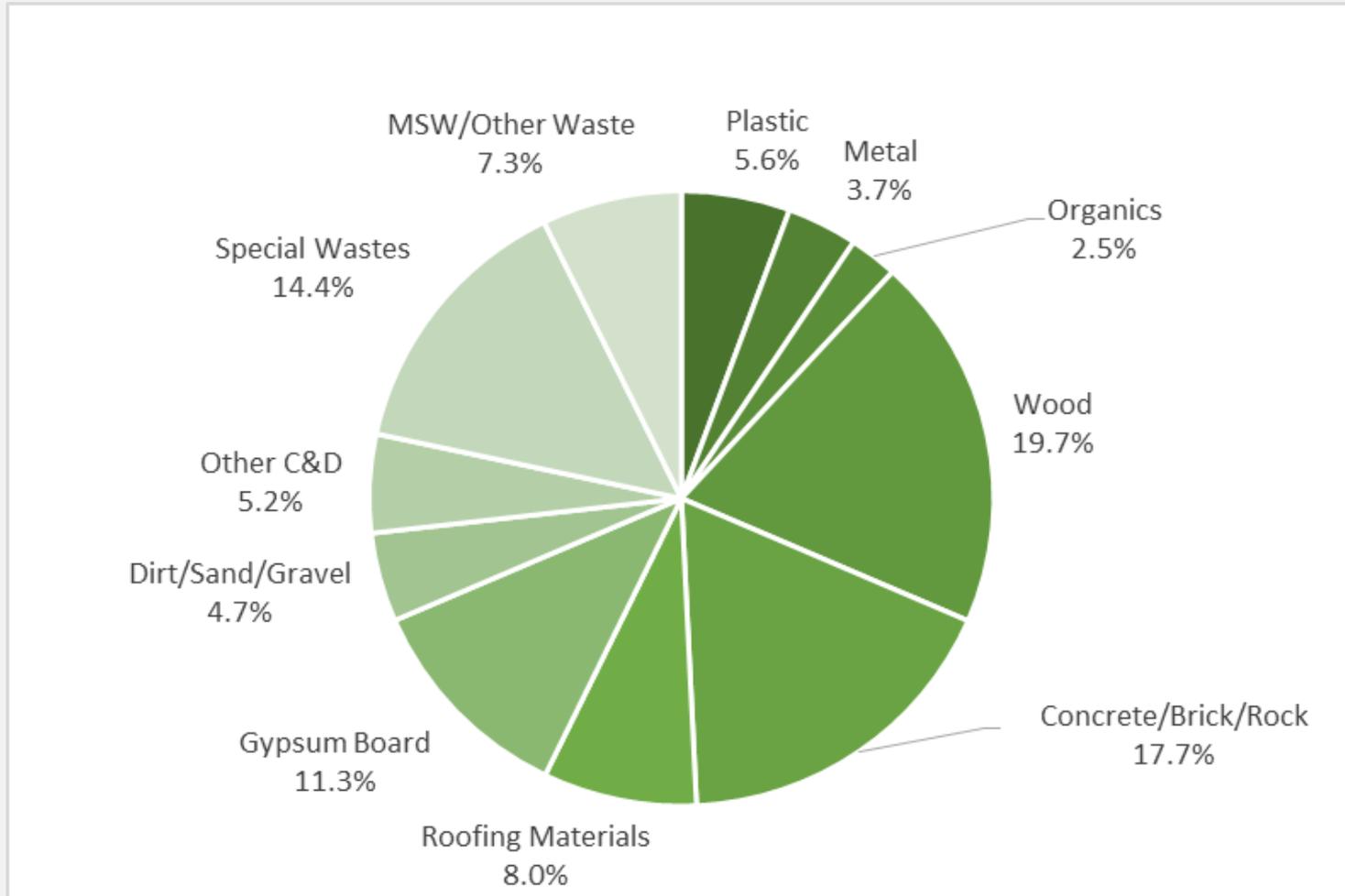


# Non-MSW Category Results - Construction



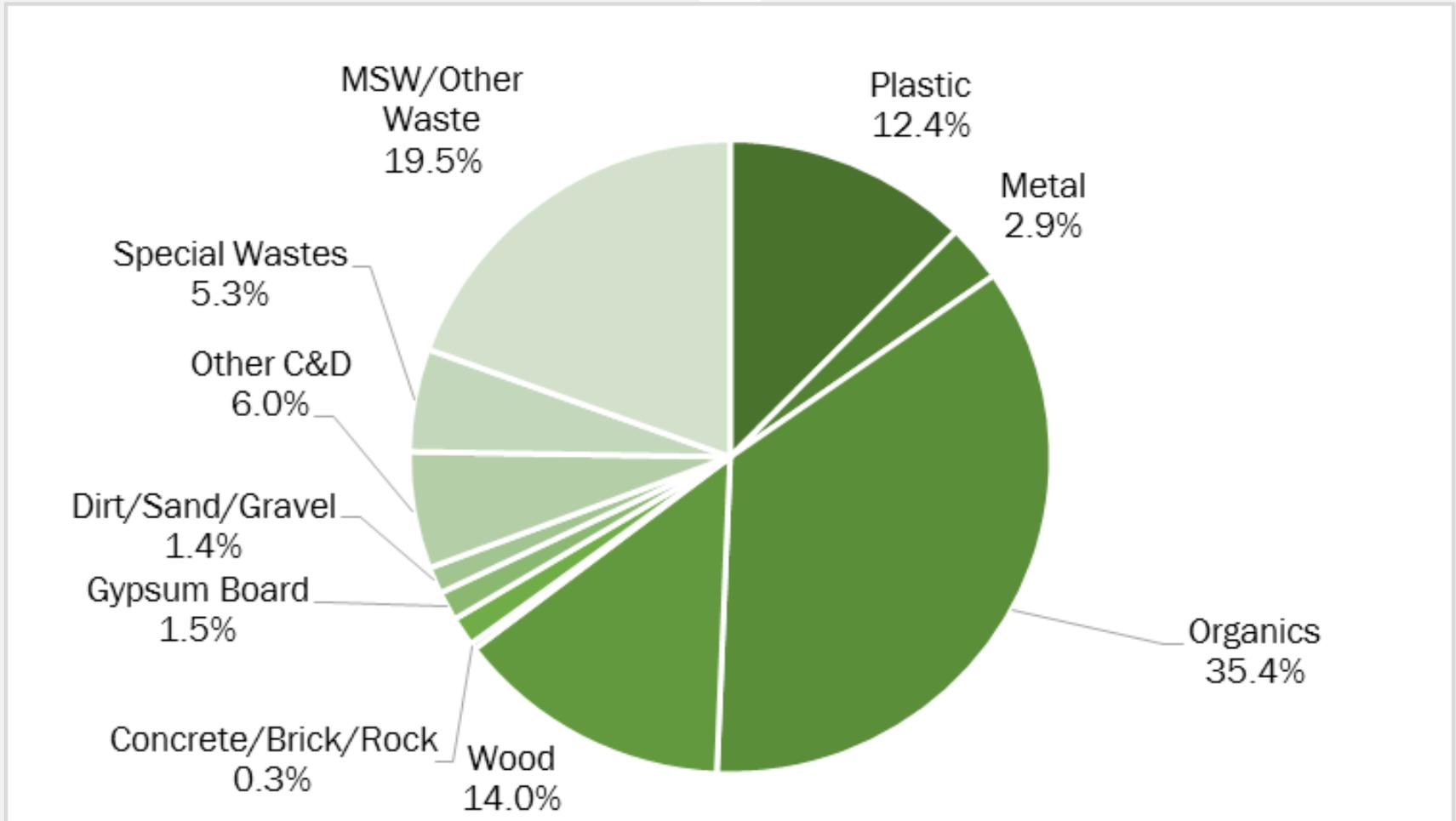
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# Non-MSW Category Results - Demolition



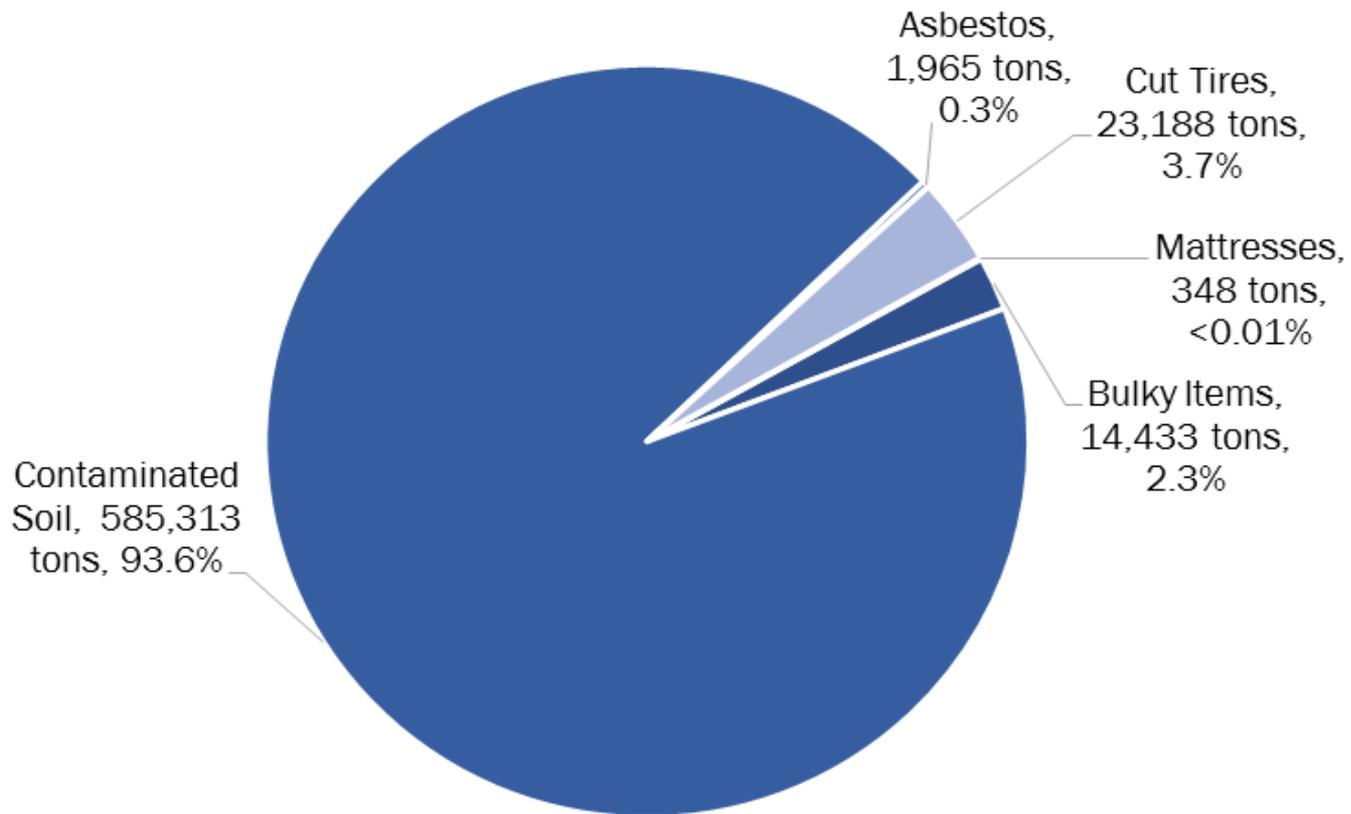
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# Non-MSW Category Results - Industrial



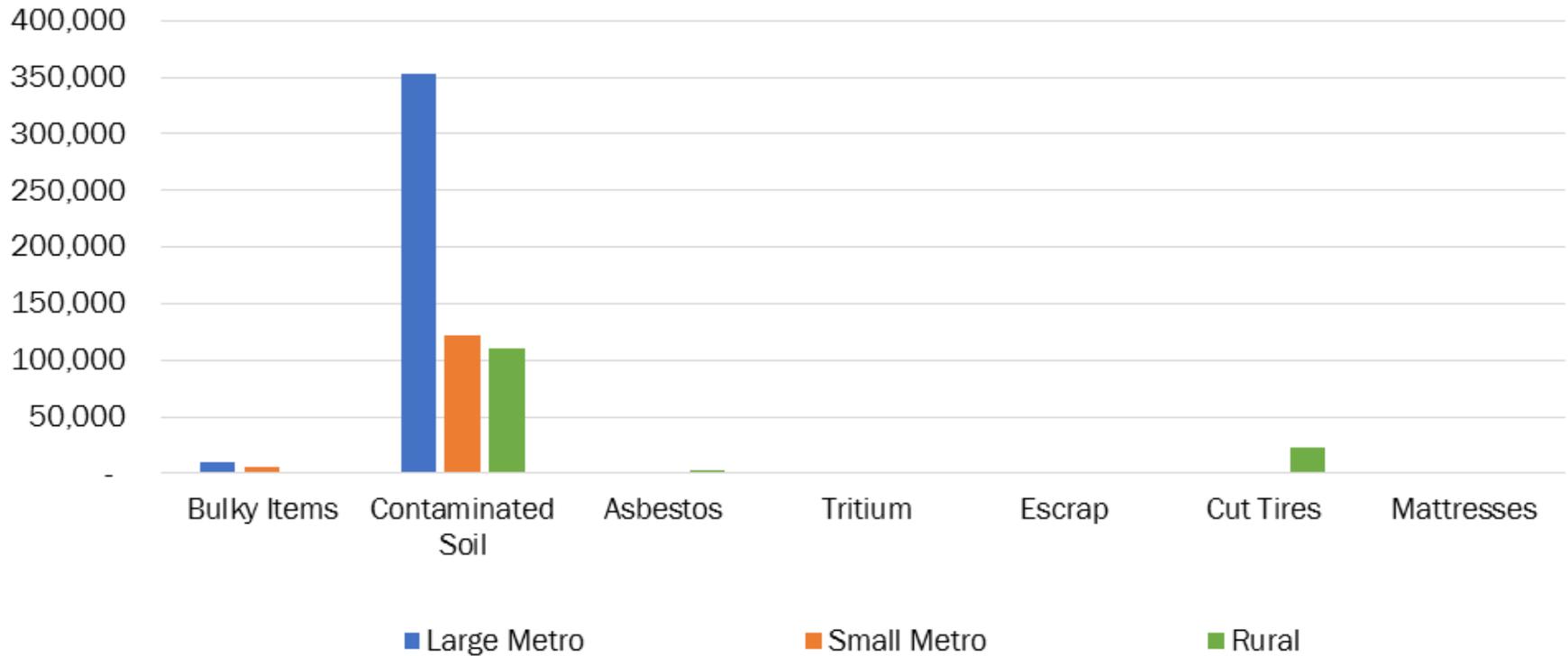
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# Non-MSW Category Results – Special



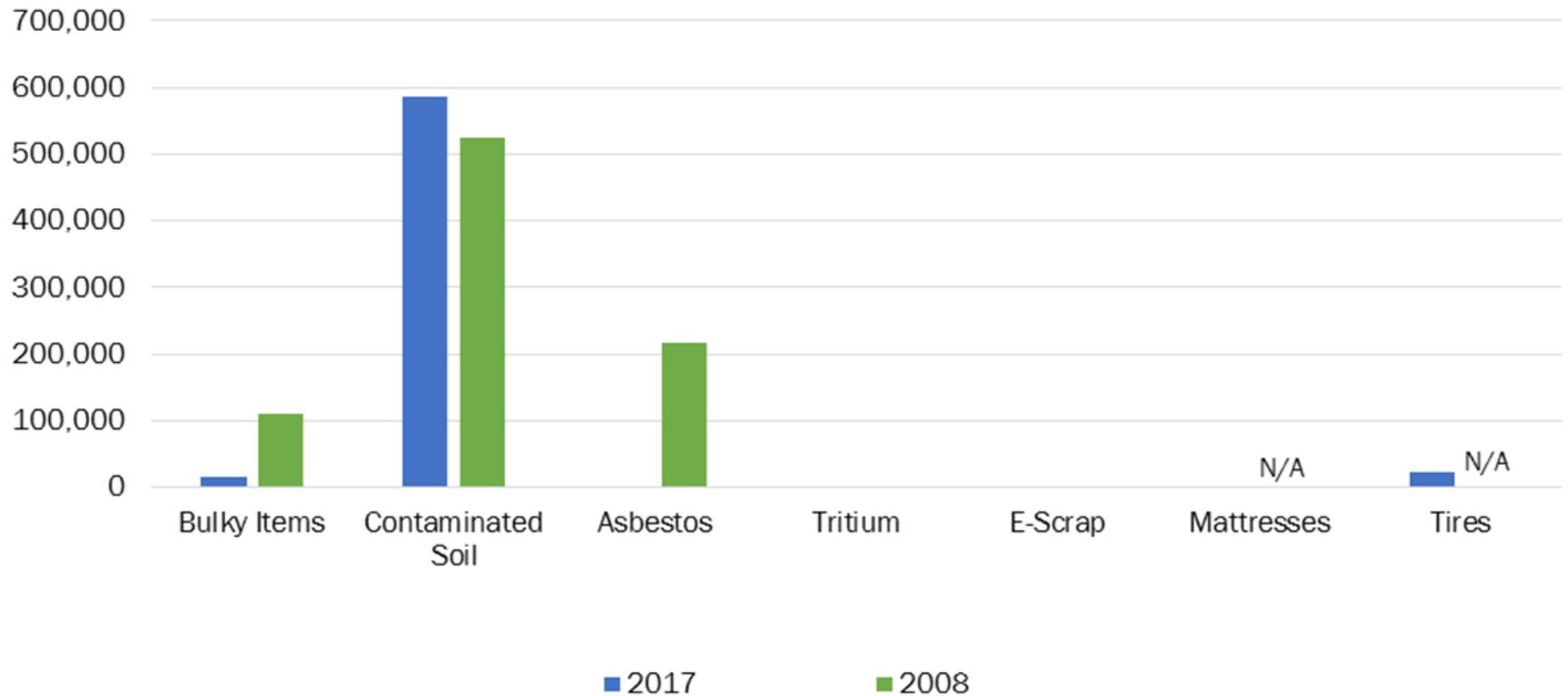
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# Special Waste - Demographically



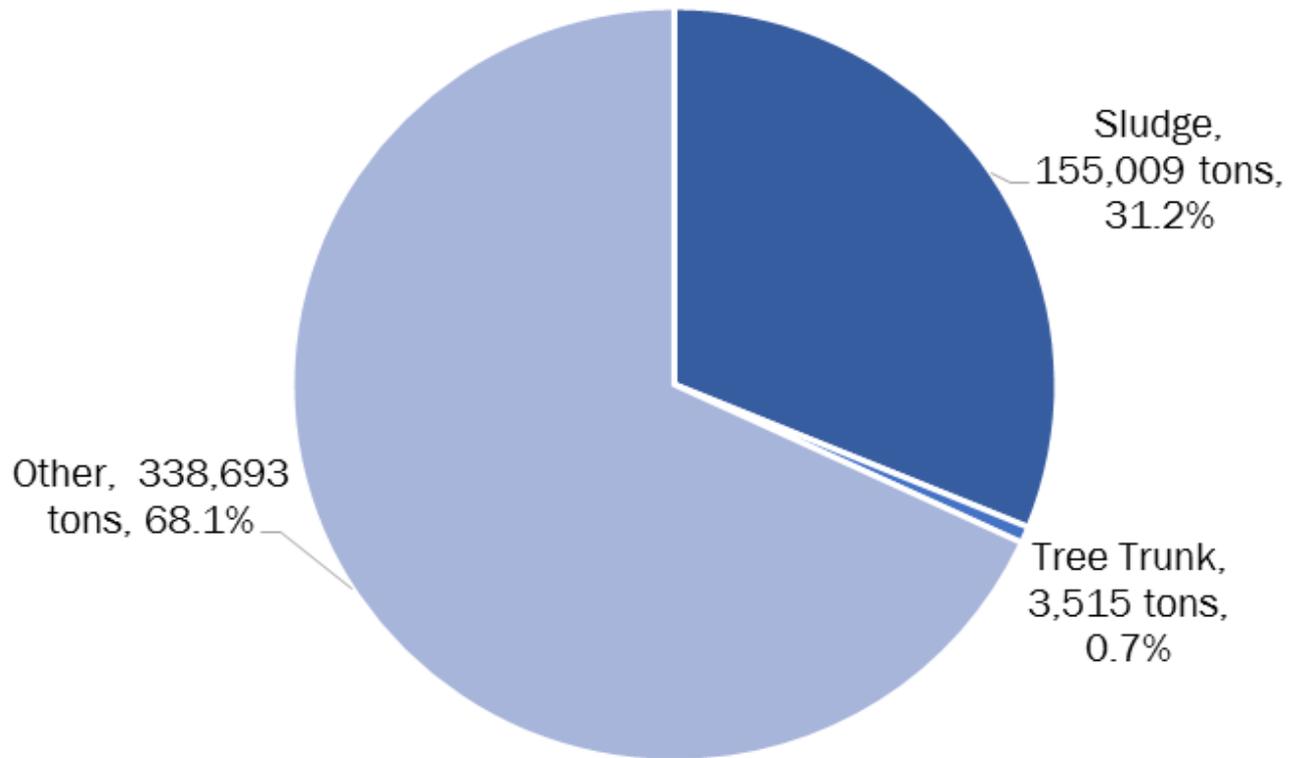
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# Special Waste vs. 2008



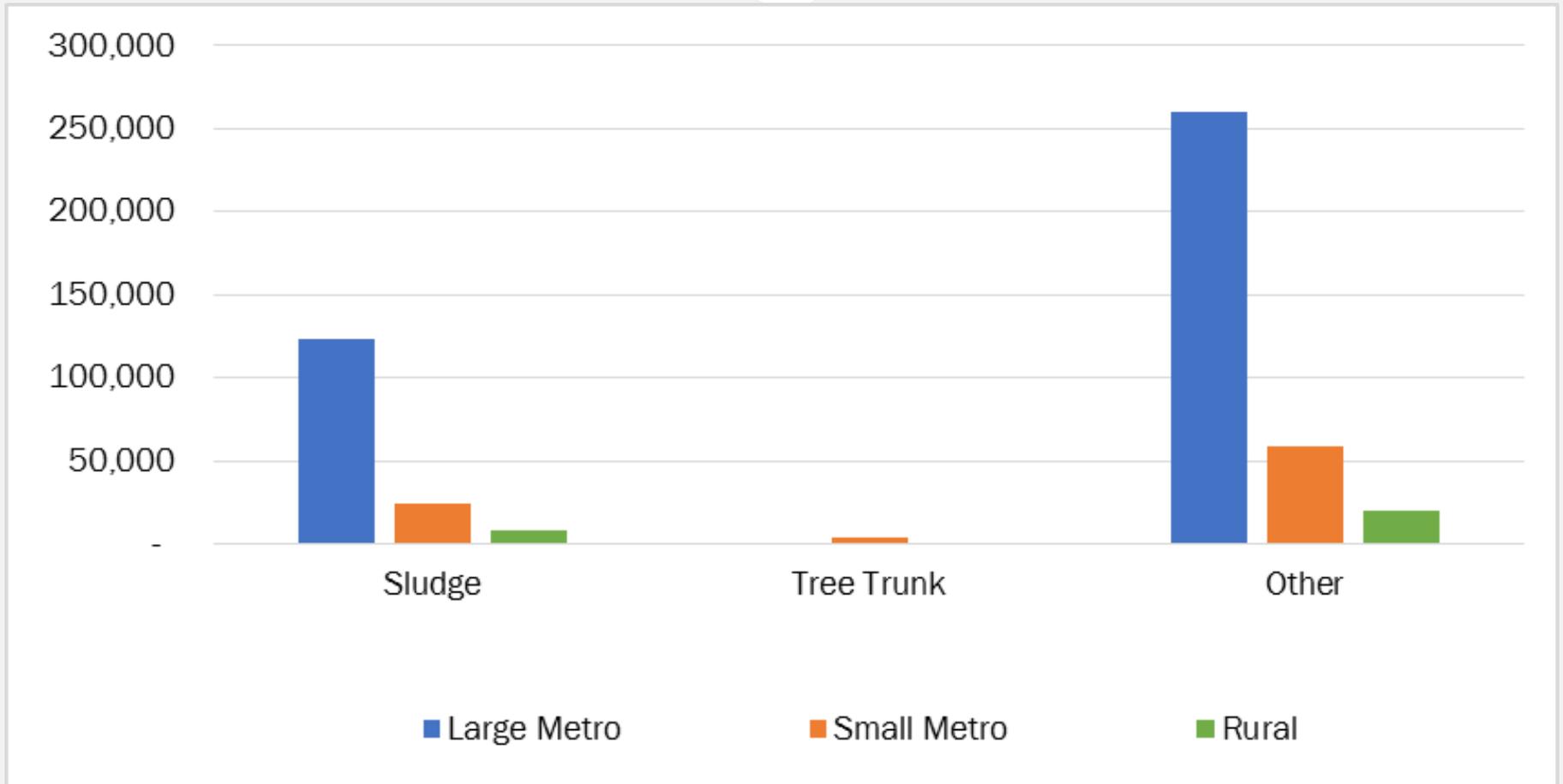
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# Non-MSW Category Results - Other



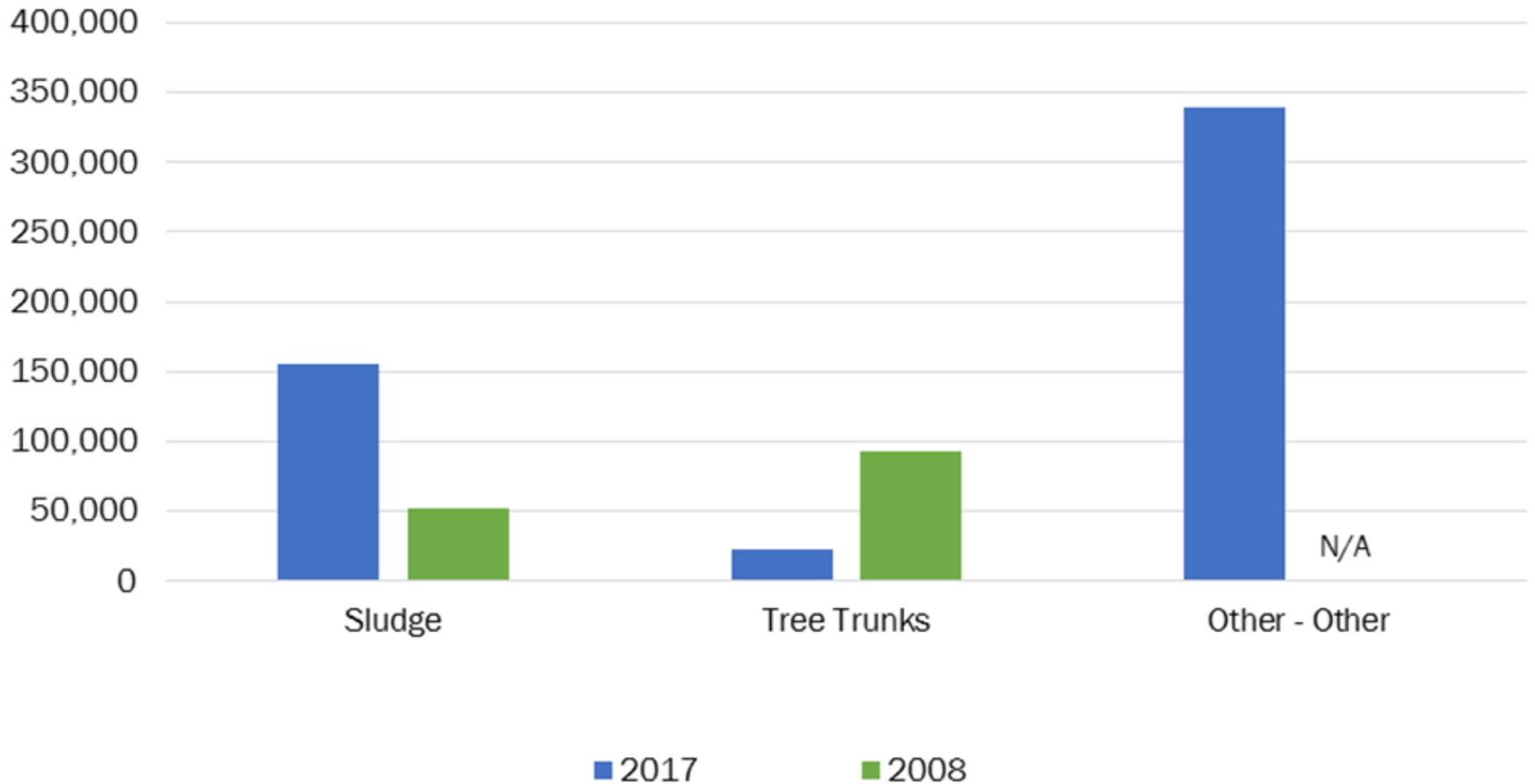
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# Other Waste – Demographically



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# Other Waste vs. 2008



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# Conclusions



- Dwindling incidence of many recyclable materials in disposed waste stream
  - Light-weighting
  - Online vs. printed materials
  - Successful programs are making a difference
- Significant opportunities still exist to boost diversion
  - Organics diversion is still evolving
    - ✦ Spike in yard waste disposal – seasonal or carts?
  - C&D is a significant fraction of the waste stream
    - ✦ Source separated and mixed in MSW
- Significant potential diversion in Industrial stream

# Recommendations



- **Continue to perform statewide waste characterization studies**
  - Invaluable for evaluating recycling program effectiveness
  - Five to seven year interval is reasonable to inform on changes in waste stream
- **Possible Enhancements to future studies**
  - Targeted generator sampling (grocery, retail, restaurant, multi-family residential, etc.)
  - Analysis of contamination and moisture to refine results
  - Energy or higher heating value calculations
  - Include curbside recycling capture rate analysis by including a few recycling facilities

# Questions?



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