Making MRF Audits Routine

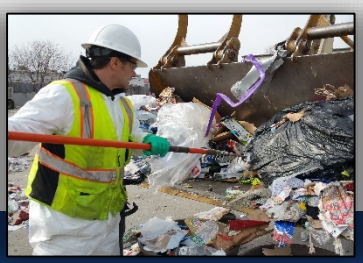
Lessons Learned to Reduce Costs and Standardize Data Management

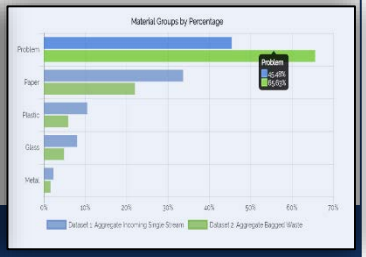
CT DEEP SOLID WASTE ADVISORY COMMITTEE

OCTOBER 23, 2018

MSW CONSULTANTS



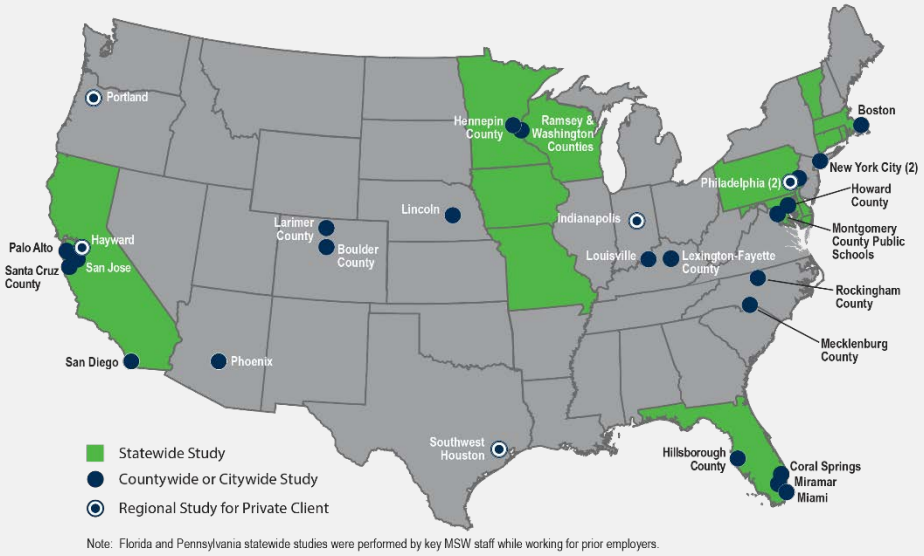




Introduction

- Collection Optimization
- SWMP/Zero Waste
- Procurement Support
- Cost/Rate Studies
- Recycling/Organics

Material Characterization



Note: Florida and Pennsylvania statewide studies were performed by key MSW staff while working for prior employers.

Background

- Minimizing contamination and maximizing yields of targeted recyclables has never been more important in the Recycling Industry!
  - Light-weighting of valuable commodities
  - Increasing diversity of packaging and labeling
  - Increasing contamination in cart-based systems
  - China National Sword

Determining Recycling Composition

- Typical audit: Once per year (if you are lucky)
  - Collaborate with supplier and processor to define material categories
  - Select 15 to 50 loads of single stream recyclables
  - Take grab samples
  - Sort into targeted commodities and problem materials
  - Use a spreadsheet to perform a specialized statistical analysis

Recycling Audit Resource Needs and Costs

	Cat	Class	Sample ID / Subclass	R001	R002	R003	R005	R006	R007	R008	R009	R010	R011	R012
3	PAPER	1	Newspaper	18.2	3.4	10.8	6.8	3.6	1.0	1.0	9.6	5.1	5.4	13.3
4		2	Plain OCC/Kraft Paper:	4.7	0.0	7.6	4.4	6.2	11.6	15.0	32.6	3.4	19.5	11.6
5		3	Waxed OCC/Kraft Paper:	0.0	0.0	0.0	0.0	0.5	0.0	0.1	0.0	0.0	0.0	0.0
6		4	High-Grade Paper:	2.9	0.7	4.3	1.4	0.5	0.5	27.8	3.8	1.0	7.3	2.1
7		5	Mixed Low-Grade Paper:	9.3	2.7	17.9	12.6	2.9	11.7	11.7	11.1	12.4	16.4	16.5
8		6	Phone books	0.0	0.0	0.0	0.0	1.9	0.0	0.0	0.0	0.0	0.0	0.0
9		7	Paperback Books	3.1	0.9	0.3	0.0	0.0	0.0	1.4	0.0	2.3	0.0	0.0
10		8	Polycoated Paper:	0.8	0.0	0.1	0.2	0.6	0.7	0.0	4.5	1.0	0.0	0.5
11		9	Compostable/Soiled Paper:	17.7	3.3	16.1	8.4	9.8	10.5	8.8	18.2	8.7	5.0	13.3
12		10	Composite/Other Paper:	7.7	2.3	6.2	3.3	3.8	5.6	1.0	0.0	2.7	9.2	2.4
13			**SubTotal**	**64.4**	**13.3**	**63.3**	**37.1**	**29.8**	**41.6**	**66.8**	**79.8**	**36.6**	**62.8**	**60.1**
14	PLASTICS	11	PET Bottles:	2.9	1.5	4.6	4.0	1.9	1.4	2.8	4.5	1.0	1.4	5.5
15		12	HDPE Natural Bottles:	1.0	0.8	0.6	1.3	1.5	0.8	0.0	1.6	1.5	0.9	2.5
16		13	HDPE Colored Bottles:	0.0	0.0	1.3	2.7	2.0	1.1	0.2	2.3	2.2	2.0	3.1
17		14	Other Plastic Bottles:	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	2.4	0.0	1.6
18		15	No. 2, 4, and 5 Tubs, Cups, and Lids:	1.1	0.0	1.7	0.0	0.6	2.1	1.0	1.0	1.1	1.2	0.5
19		16	No. 1, 3, 6, and 7 Tubs, Cups, and Lids	1.3	0.0	0.7	1.2	0.9	0.4	0.6	0.4	0.4	0.4	1.3
20		17	Nonfood Expanded Polystyrene:	1.6	0.3	1.5	0.0	0.1	1.0	0.0	1.1	0.1	4.6	0.1
21		18	Other Food Service Plastics:	8.7	1.3	9.0	13.8	12.9	9.0	5.8	2.7	2.5	3.3	5.2
22		19	Other Rigid Packaging:	3.4	0.3	3.7	1.2	1.3	1.5	1.6	1.2	0.7	1.2	0.5
23		20	Clean Shopping/Dry Cleaner Bags:	0.6	0.0	2.2	1.5	0.0	0.9	1.4	1.6	0.8	0.9	2.2
24		21	Other Clean Polyethylene Film:	0.8	0.0	0.7	0.0	1.2	1.1	0.1	0.0	0.0	0.1	0.0
25		22	Other Film:	10.8	3.2	11.3	3.2	6.0	5.7	11.7	8.6	4.5	6.6	9.1
26		23	Plastic Products:	12.7	0.0	1.5	0.4	0.0	16.3	0.0	0.9	0.3	0.5	1.2
27		24	Composite/Other Plastic:	20.9	0.0	3.3	0.0	0.0	0.0	13.4	0.6	0.7	1.8	1.6
28			**Subtotal**	**65.5**	**7.9**	**41.9**	**29.1**	**28.1**	**41.1**	**38.5**	**26.3**	**18.0**	**24.7**	**35.1**
29	GLASS	25	Clear Glass Bottles & Jars:	3.8	0.8	1.9	4.6	2.5	1.6	0.0	3.1	3.1	8.7	10.8
30		26	Green Glass Bottles & Jars:	1.6	0.0	2.1	0.0	0.0	0.0	6.1	0.0	0.4	0.5	0.0
31		27	Brown Glass Bottles & Jars:	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	0.1	5.3
32		28	Plate Glass:	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
33		29	Composite/Other Glass:	0.0	1.4	0.2	1.5	0.0	4.7	0.0	0.0	0.1	0.0	0.0
34			**Subtotal**	**5.4**	**2.2**	**4.2**	**6.1**	**2.5**	**6.3**	**6.1**	**3.1**	**4.9**	**9.3**	**16.1**
35	METALS	30	Aluminum Cans:	0.9	0.0	2.3	0.5	1.7	2.2	1.7	1.5	1.6	2.0	2.6
36		31	Aluminum Foil/Containers:	0.0	0.0	1.1	0.0	1.0	0.1	0.2	0.1	0.1	0.0	1.7
37		32	Other Aluminum:	0.0	0.0	0.9	0.0	1.2	0.1	0.1	0.1	0.1	0.2	0.0
38		33	Other Nonferrous:	0.0	0.0	1.6	0.0	0.0	0.1	0.6	0.0	0.0	0.0	0.0
39		34	Tin/Steel Cans:	0.0	0.0	4.1	3.0	3.0	4.4	1.3	1.6	2.1	1.6	3.9
40		35	Empty Paint and Aerosol Cans:	0.0	0.0	0.0	0.4	0.1	0.0	0.0	0.4	0.0	0.2	0.1
41		36	Empty Propane and Other Tanks:	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

$$$

Who is Auditing their Recyclables?

- New York City
- Philadelphia
- Miami
- Charlotte, NC
- Arlington County, VA

- What do these local governments have in common?

…large populations and high recycling tonnage

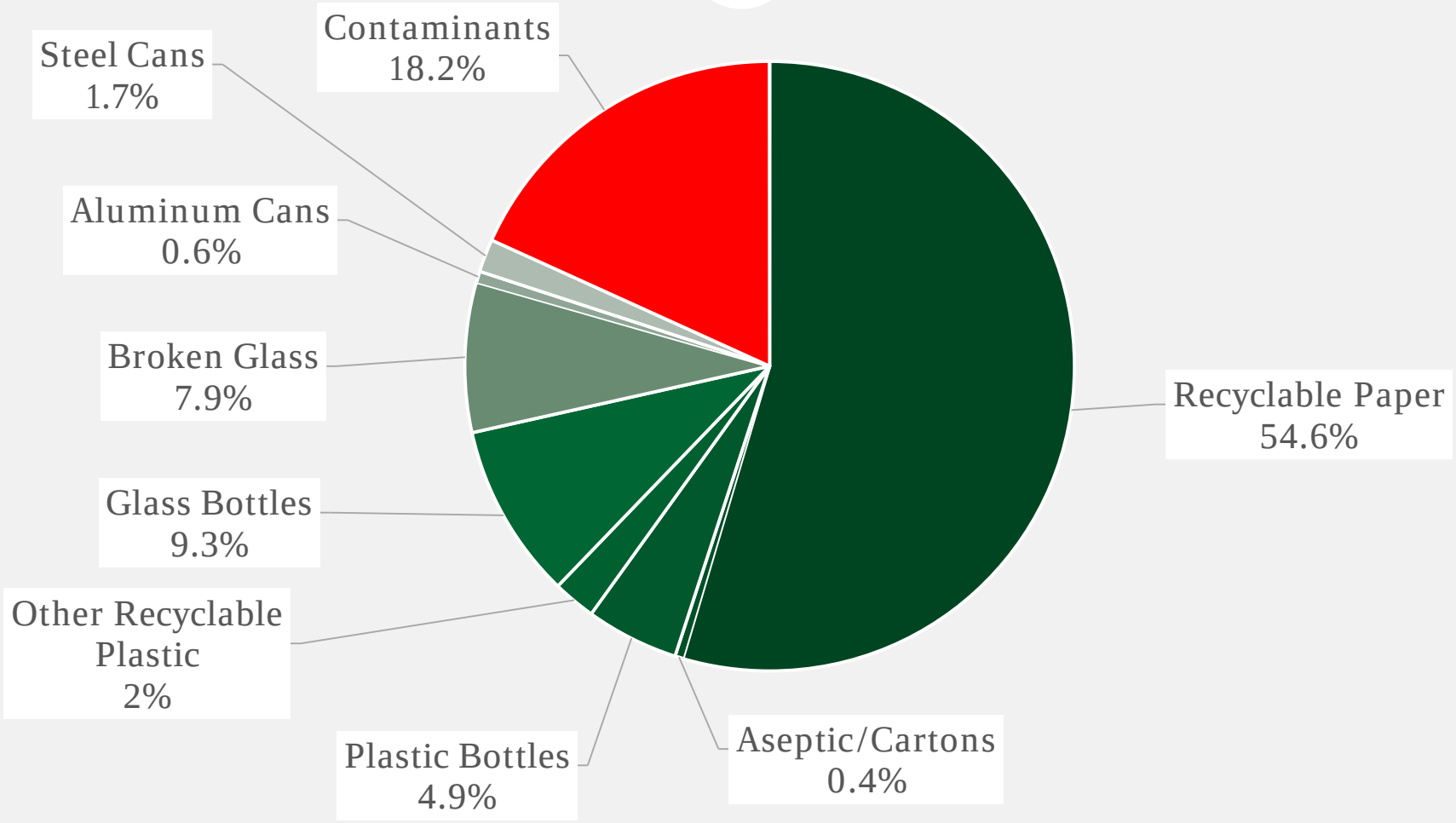
…processing contracts that share revenues based on underlying commodity values

Connecticut Local Government Suppliers

- 169 cities and towns
- 2017 average population of 21,000
- Assuming excellent recycling participation…
  - 400 lbs/household recycled
- 1,500 tons of curbside recycling
  - $75,000 commodity value at $50/ton

It often does not make economic sense for small municipalities to fund a recycling composition audit

Connecticut Single Stream Recycling Composition



Source: 2015 Connecticut Statewide Waste Characterization

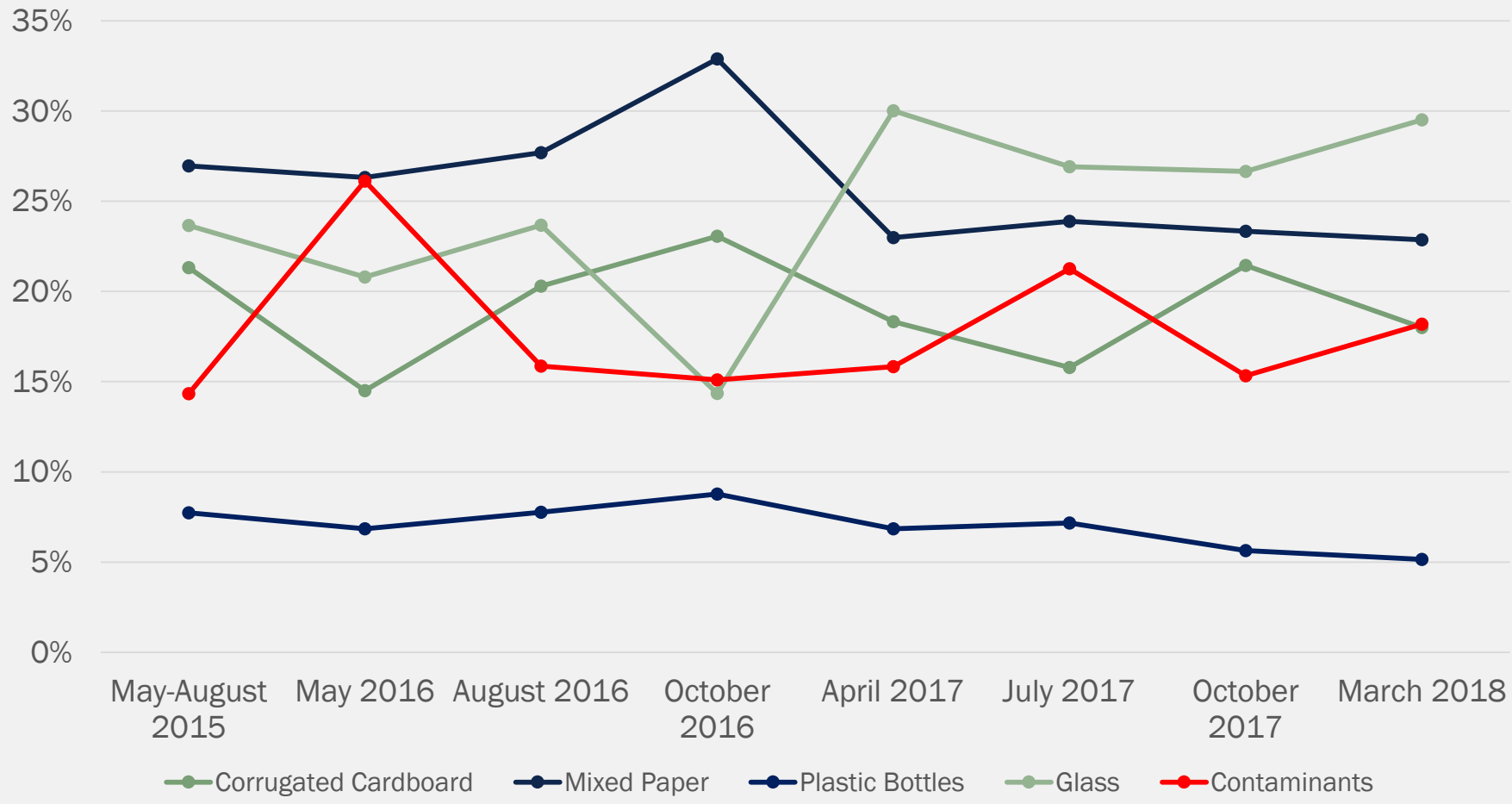
Audit Results

Group	Material	Percent	Market Value ($/Ton)	Weighted Value ($/Ton)
Paper	Corrugated Cardboard	28.9%	$81.25	$23.48
	Residential Mixed Paper	19.6%	$50.31	$9.86
	Aseptic Packaging and Gable-Top Cartons	0.3%	$113.75	$0.36
Plastic	#1 PET Plastics	4.2%	$274.40	$11.41
	#2 HDPE Plastics Natural	1.0%	$618.80	$6.12
	#2 HDPE Plastics Colored	1.3%	$503.20	$6.31
	#4, #5, #7 Plastics	0.6%	$0.40	$0.00
	Bulky Rigid Plastics	3.0%	$5.00	$0.15
Glass	Glass Bottles and Broken Glass	17.7%	-$15.50	-$2.75
Metal	Aluminum Beverage Cans & Trays	1.2%	$1,315.00	$15.19
	Steel/Aerosol Cans	1.2%	$53.75	$0.66
Contamination		18.0%		

Calculated Value

$70/ton

Case Study: Recycling Composition Fluctuates!!



Is there a better way to audit recyclables?

SEEKING FEEDBACK FROM CITIES, TOWNS AND PROCESSORS

Challenges to Measuring Composition

- Appropriate sampling protocols
- Sorting equipment
- Data management
- Cost for third parties
- Trained personnel to conduct tests

How can audits be easier, cheaper, better?

- **Prerequisite**: Consensus between suppliers and processors that ongoing composition and contamination monitoring is valuable

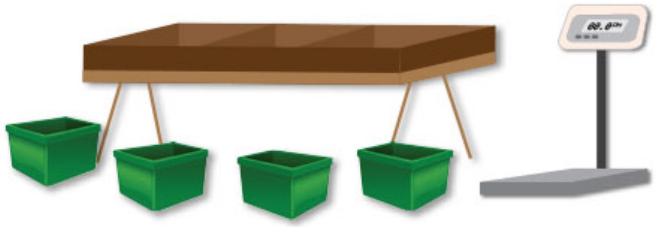
...

- Collaboratively developed audit protocol that meets technical standards
- Web-based data management platform
  - Upload and analyze audit data
  - Store pictures of inspected loads and/or audited samples
  - Share data with processor and supplier in real time

WasteInsight™

The Grading and Purity (GAP) System

Customized Audit Protocol

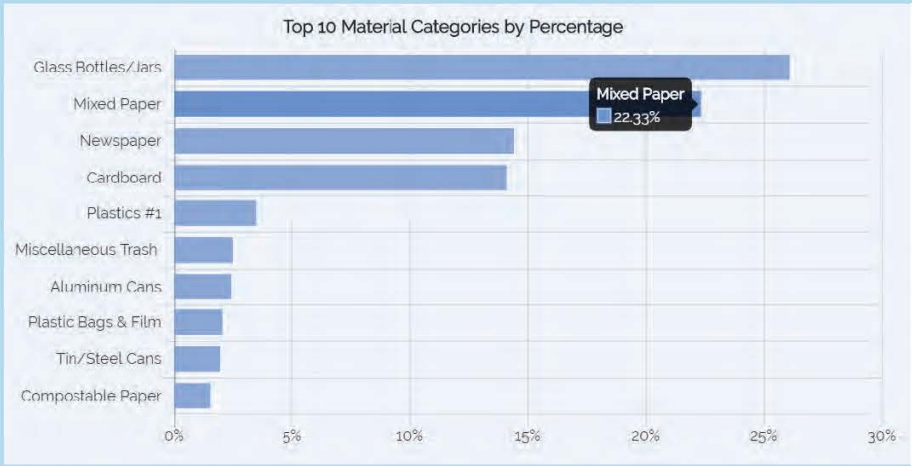


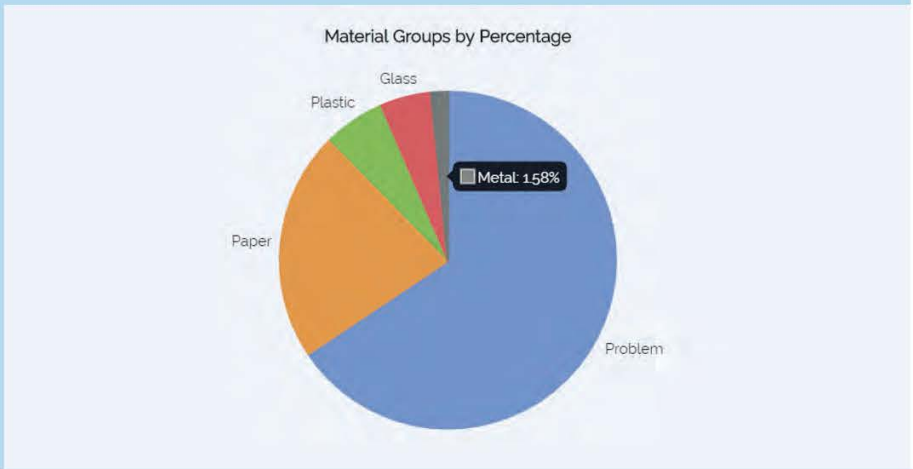
Specified Equipment
for sorting, weighing, and data recording.

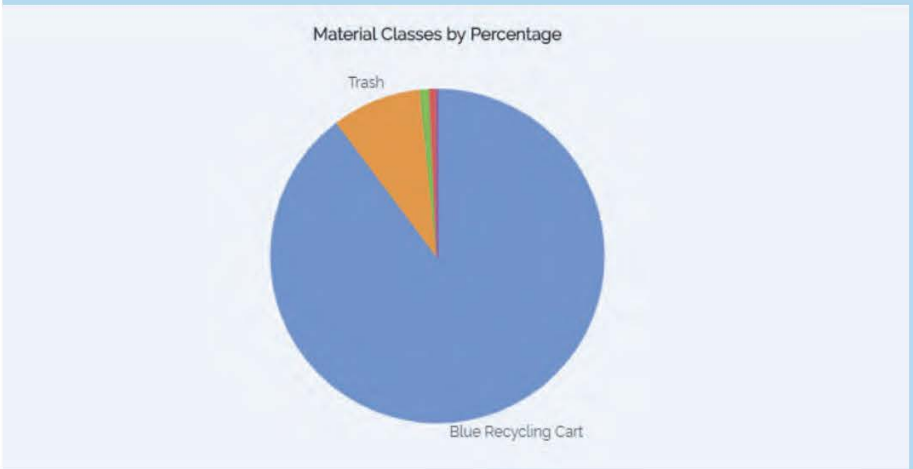
Cloud Based Data Management

Composition, Market Value & Contamination Report
for You / for Your Supplier

All data is provided numerically and graphically. You may download your data into a spreadsheet at any time. Built-in queries provide you with the composition based on any grouping you need to evaluate the material quality. Analyze the composition by individual commodity, or view the level of contamination, or create a custom view to meet your needs.







If you provide the tonnage of material, the system applies the composition estimates and current RecyclingMarkets.net commodity pricing to calculate the value per ton of the audited material stream.

Estimated Composition — Number of samples: 110

Code	Material Description	Mean	Std. Dev.	+/-	Tons	Market*
1	Newspaper	15.54%	8.25%	1.29%	1,554.0	$38,849
2	Cardboard	17.24%	9.23%	1.45%	1,723.6	$120,652
3	Mixed Paper	24.20%	12.53%	1.97%	2,420.3	--
4	Aseptic containers	0.81%	0.51%	0.08%	81.2	--
5	Compostable Paper	0.78%	0.90%	0.14%	77.6	($2)
6	Aluminum Cans	1.76%	1.10%	0.17%	176.2	$102,186
7	Tin/Steel Cans	1.59%	0.85%	0.13%	159.2	$1,776
8	Aluminum Foil and Trays	0.18%	0.24%	0.04%	17.6	$10,218
9	Pots and pans	0.10%	0.33%	0.05%	10.0	($301)
10	Scrap Metals/Small Appliances	0.30%	0.52%	0.08%	30.1	$1,281
11	Plastics (#1-2)	3.20%	2.07%	0.32%	319.9	$15,997
12	Plastics #1	0.97%	1.12%	0.18%	96.5	--
13	Plastics #2 CLEAR	0.41%	0.53%	0.08%	40.6	--
14	Plastics #2 COLORED	0.24%	0.30%	0.05%	24.1	--
15	Plastics (#3, #4, #5, #7)	2.83%	2.12%	0.33%	282.7	$8,482
16	Plastics #6 RIGID	0.83%	0.56%	0.09%	82.9	($2)
17	Flexible plastics	0.01%	0.09%	0.01%	1.4	($43)
18	Non-recycable/contaminated plastics	1.17%	0.88%	0.14%	117.2	($3)
19	Plastic Bags & Film	2.99%	2.16%	0.34%	299.1	($8)
20	Glass Bottles/Jars	20.80%	10.69%	1.68%	2,079.6	($25)
21	Other Glass	0.18%	0.51%	0.08%	18.4	($553)
22	Fluorescent Light Bulbs/Tubes	0.02%	0.08%	0.01%	2.3	($68)
23	Electronics	0.38%	1.57%	0.25%	37.8	($1)
24	Batteries	0.02%	0.06%	0.01%	1.5	($46)
25	Clean Food Waste	0.00%	0.00%	0.00%	0.0	--
26	Contaminated Food Waste	0.92%	1.15%	0.18%	92.3	($2)
27	Leaves, brush, prunings, plants	0.00%	0.00%	0.00%	0.0	--
28	Grass/Sod	0.01%	0.06%	0.01%	1.0	($29)
29	Dirt	0.00%	0.00%	0.00%	0.0	--
30	Ceramics	0.10%	0.19%	0.03%	9.8	($293)
31	Plastics #6 EPS	0.58%	0.49%	0.08%	58.0	($1)
32	Textiles	0.16%	0.37%	0.06%	16.4	($492)
33	Wood	0.06%	0.13%	0.02%	6.0	($179)
34	Miscellaneous Trash	1.63%	2.13%	0.33%	162.6	($4)
	TOTALS:	100.00%	View Market History		10,000.0	$243,615

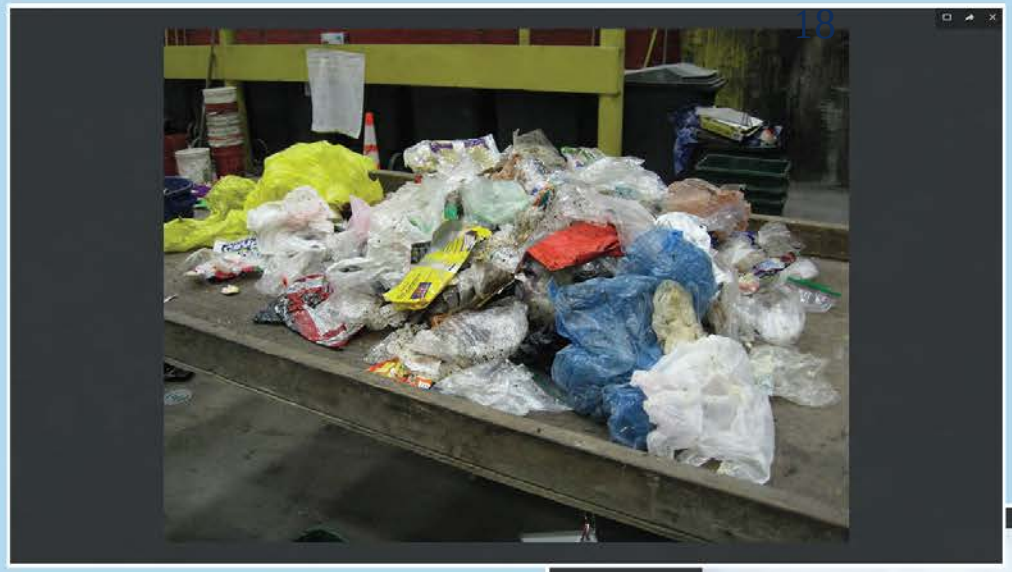
*Recyclable materials market index provided by RecyclingMarkets.net — Current value per ton: $24.36/ton

Add Tonnage/Households — Enter total tons collected: 0

Compare — Export Results

You can also back-calculate the value of the audited material stream for the preceding three years based on RecyclingMarkets.net historical pricing.

Pictures can be browsed and downloaded for each sample or load.
The ***WasteInsight***™ team can help develop customized reports that combine data and photos.



A Guide to Recycling

Connecticut now has a universal list of what belongs in your recycling bin and what doesn't. All items should be **empty, rinsed, clean** and **open**. Do **not** shred, box, bag or bundle. To learn more, go to RecycleCT.com

	What's IN?	What's OUT?
PAPER	Cardboard & boxboard Food & beverage cartons Junk mail Magazines & newspaper inserts Newsprint Office paper Pizza boxes	Gift wrap & gift bags Ice cream containers Paper cups (hot & cold) Shredded paper Take-out food containers Tissue paper
GLASS	Beverage bottles & jars Food bottles & jars	Ceramic mugs & plates Drinking glasses
METAL	Aerosol containers (food grade only) Aluminum foil Cans & bottles Foil containers	Aerosol containers (deodorizers, cleaners, pesticides, etc.) Foil tops from yogurt containers Paint cans Pots & pans

Source: www.recyclect.com

Feedback Requested

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WASTEINSIGHT™

Auditing System in Action