Characterization Study Based Diversion:

Where does 50% diversion come from? What about 90%?

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OCTOBER 21-24, 2024
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GRAPEVINE (DALLAS), TEXAS

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SOLID WASTE ASSOCIATION OF NORTH AMERICA

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Today's Agenda

- Introduction to GBB
- MSW Composition (Kent County)
- Current Diversion
- Circular Material Management
- Mixed Waste Processing
- Circularity
- Alternative Collections and Advanced Recycling
- Q&A

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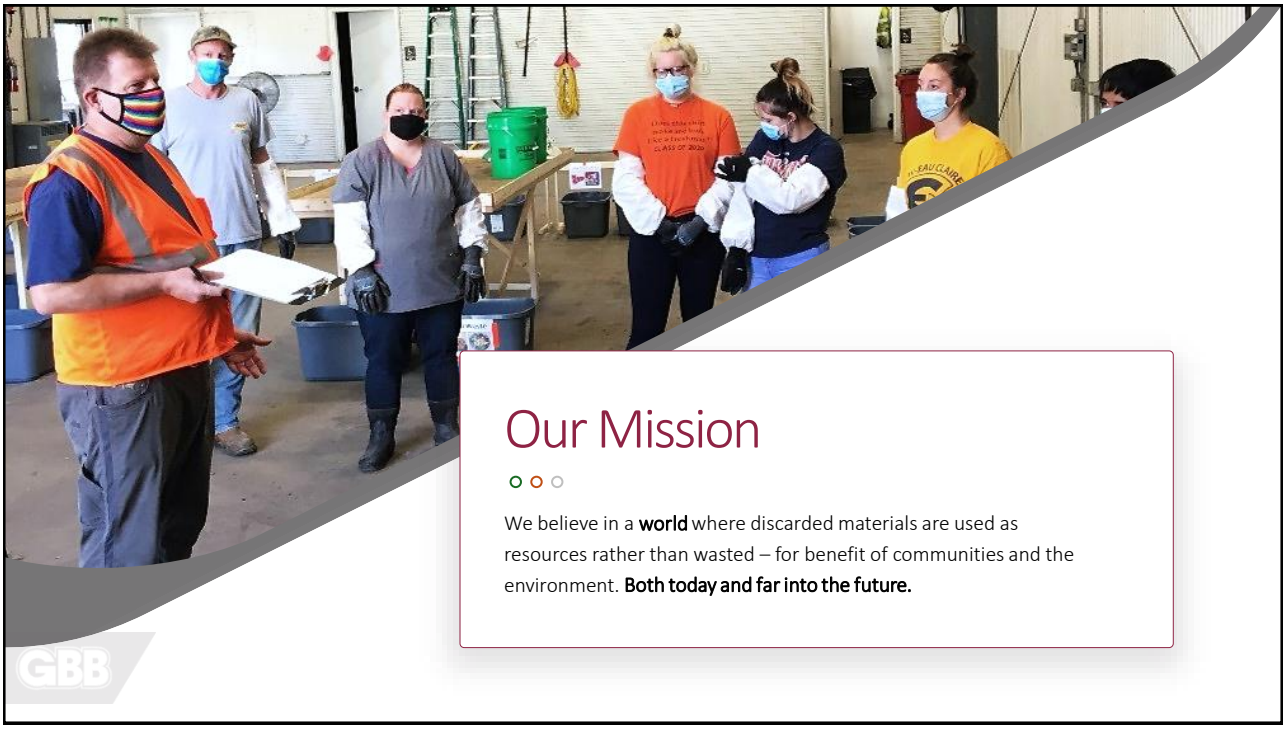

Our Mission

We believe in a **world** where discarded materials are used as resources rather than wasted – for benefit of communities and the environment. **Both today and far into the future.**

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MSW Material Sort – Kent County, MI

GBB – Kent WTE

GBB – South Kent Landfill

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MSW Material Sort – Residential & Commercial

Number	Type	Category	Average %: All Generators1	Error +/- (90%)	Number	Type	Category	Average %: All Generators1	Error +/- (90%)
1		Old Corrugated Cardboard	8.0%	2.3%	24		Ferrous Metal Containers	0.7%	0.2%
2		Old Newsprint (ONP)	0.3%	0.2%	25		Aluminum Cans (UBC)	0.4%	0.3%
3		Office Paper	2.3%	0.6%	26	Metals	Other Ferrous Metals	2.3%	1.5%
4		Magazines and Catalogs	1.3%	0.4%	27		Other Non-Ferrous Metals	0.5%	0.3%
5	Fiber	Gable Top/Aseptic Containers	0.1%	0.0%	28		Apliances (Small)	1.0%	1.4%
6		Compostable Fibers (Paper Towels, Etc.)	3.1%	0.8%	29	Organics	Food/Putrescible Waste	14.1%	2.6%
7		Other Mixed Recyclable Paper/Kraft	2.6%	0.8%	30		Leaves and Grass	0.9%	0.7%
8		Wet or Soiled Fiber	2.4%	0.6%	31		Brush, Prunings, etc.	0.9%	0.6%
9		Non-recyclable Paper Products	2.7%	1.0%	32		Other Organics	2.4%	1.4%
10		PET Bottles (#1)	1.5%	0.3%	33		Liquids	1.0%	0.3%
11		PET Containers/Packaging (#1)	0.1%	0.0%	34	HHW	Household Hazardous Waste	0.8%	0.4%
12		HDPE Color (#2)	0.4%	0.1%	35		Medical Waste	0.3%	0.5%
13		HDPE Natural (#2)	0.4%	0.2%	36	Electronics	Electronics (Small)	0.5%	0.1%
14		HDPE Tubs and Lids/Other (#2)	0.1%	0.0%	37		Electronics (Large)	1.2%	0.6%
15	Plastic	PolyPropelene (#5)	0.8%	0.2%	38		Batteries	0.1%	0.0%
16		Mixed Containers (#3-#7)	0.7%	0.4%	39	C&D	Clean Wood	3.3%	1.8%
17		EPS Foam	0.5%	0.1%	40		Wood- Painted or Treated	2.8%	1.5%
18		Film & Wrap	5.2%	1.0%	41		Concrete/Brick/Ashpalt etc	0.5%	0.5%
19		Flexible Packaging	1.0%	0.3%	42		Carpet and Padding	0.6%	0.5%
20		Mixed Bulky Plastic	4.0%	3.0%	43		Other C&D	2.1%	1.0%
21		Non-Recyclable Rigid Plastic	1.9%	0.6%	44	Textiles	Textiles	6.0%	1.5%
22	Glass	Recyclable Glass	1.3%	0.4%	45		Leather & Rubber	2.1%	0.8%
23		Non-Recyclable Glass/Ceramic	0.8%	0.4%	46		Diapers	2.4%	0.8%
					47	Other	Fines	4.2%	1.2%
					48		Tires	0	0
					49		Bulky Items	4.2%	1.5%
					50		Other Residue or Composite Items	2.9%	1.0%

Source: GBB – Kent County, MI 2021

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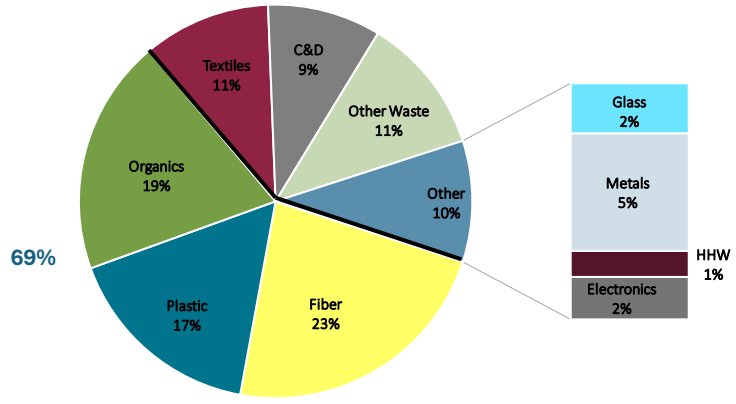
MSW Material – Residential & Commercial



Source: GBB – Kent County, MI 2021

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MSW Material – All Waste

Material	Tons per Year	
Recycling (Total)	33,850	
Residential TPY	126,387	
Commercial TPY	117,770	
Compactor TPY	36,313	
Other Hauler TPY	20,334	334,654
C&D TPY	112,768	
Sludge	22,403	
Est. Yard Waste Compost	30,000	
Other Landfill Diversion	7,919	
Est. Bottle Bill Diversion	11,431	184,520
Total	**519,173**	

64.5%

35.5%

Source: GBB – Kent County, MI 2021

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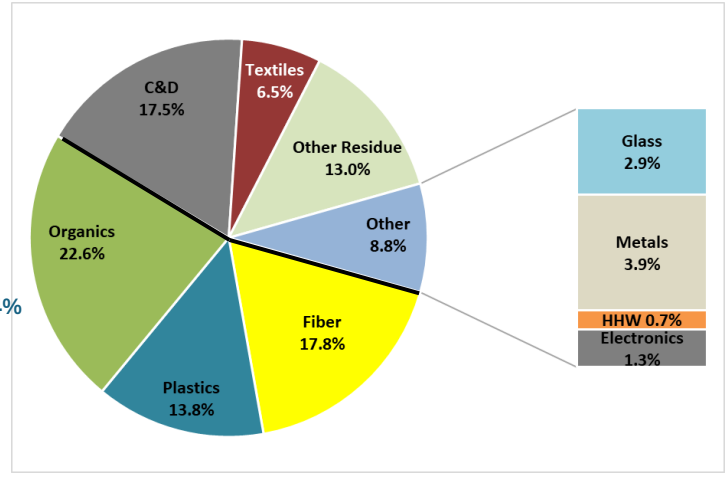
MSW Material – All Waste

Total Tons:
519,173



Source: GBB – Kent County, MI 2021

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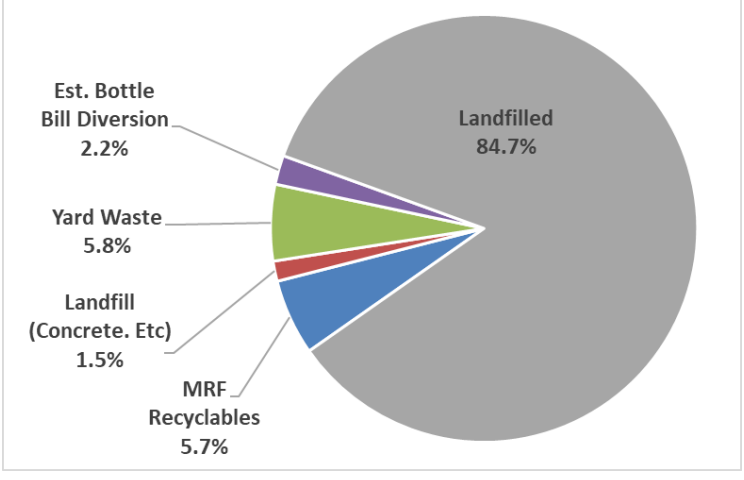
Current Diversion (Not Counting WTE)

Total Tons:
519,173



Source: GBB – Kent County, MI 2021

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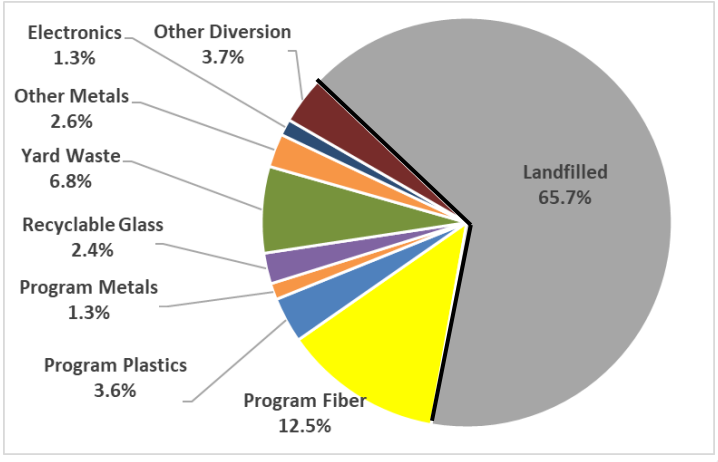
Ideal Collection and Processing

What is All Program Materials (MRF) Were Recovered



34.3%

Source: GBB – Kent County, MI 2021

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Full MSW Processing Systems

90 TPH (400,000 TPY) 50%+ Diversion

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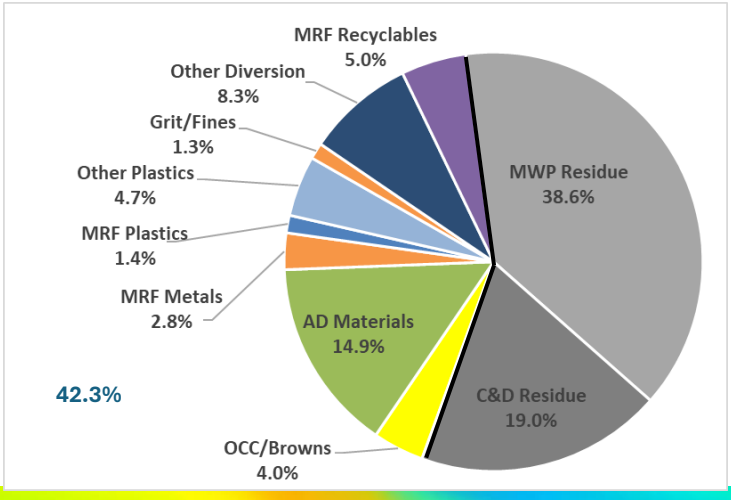
Mixed Waste Processing

- Assumes 10% Bulky Waste Removed at MWPF
- Does Not Count Sludge
- Assumes some Out-of-County Waste for 400,000 total processed
- Single Stream MRF Still Active

Total Tons:
592,091

Source: GBB – Internal Calculations based on Average MWPF



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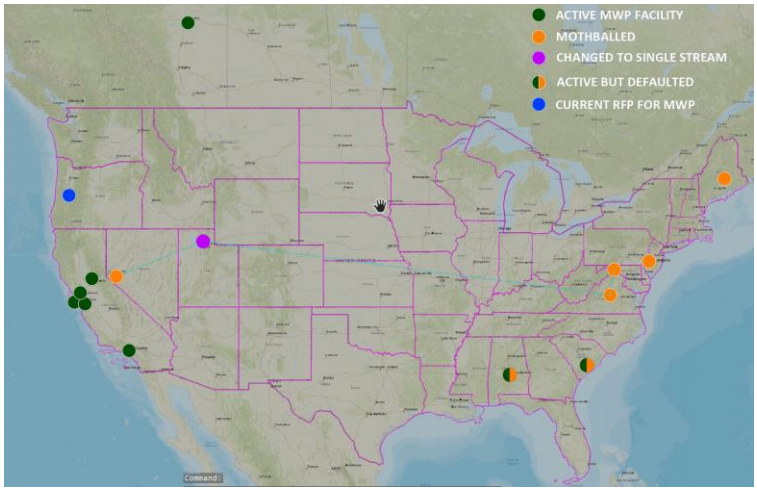
State of MSW Processing

Map of Modern, Highly Automated MWPF Locations



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State of US Recycling Circularity

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Circular Economy and Recycling

The Idealized Goal

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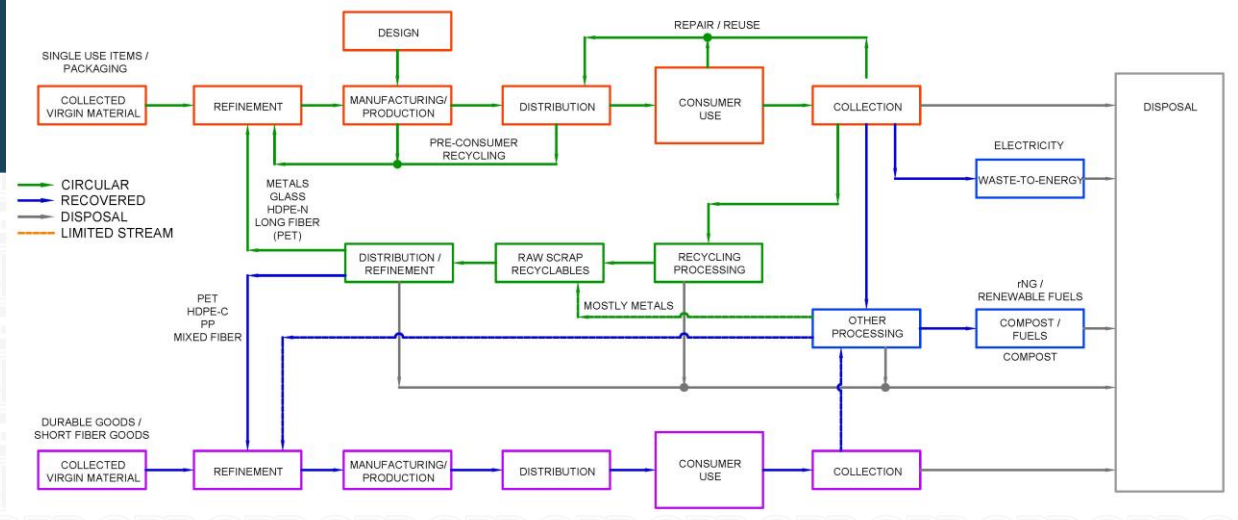
Circular Economy and Recycling
Current Infrastructure and Process



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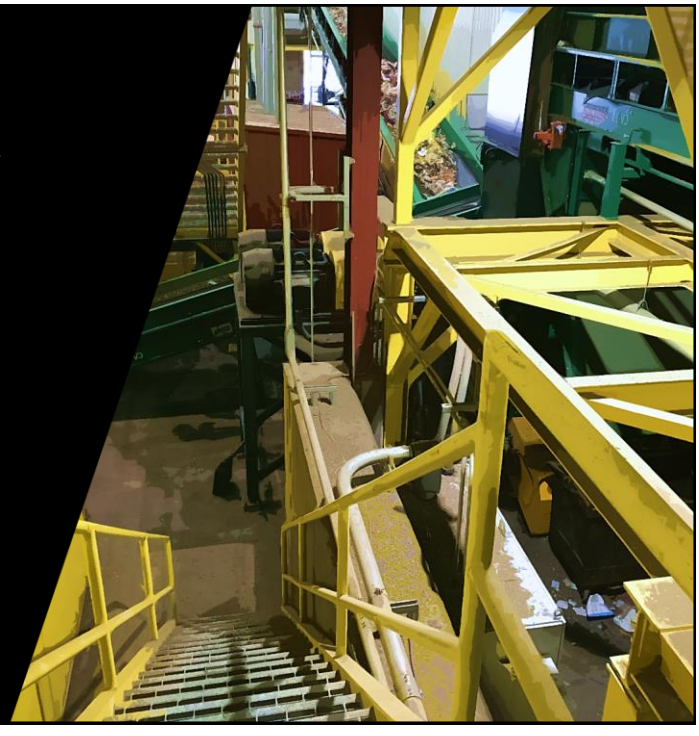
Advanced Recycling Bio Feedstock, & Alternative Collections



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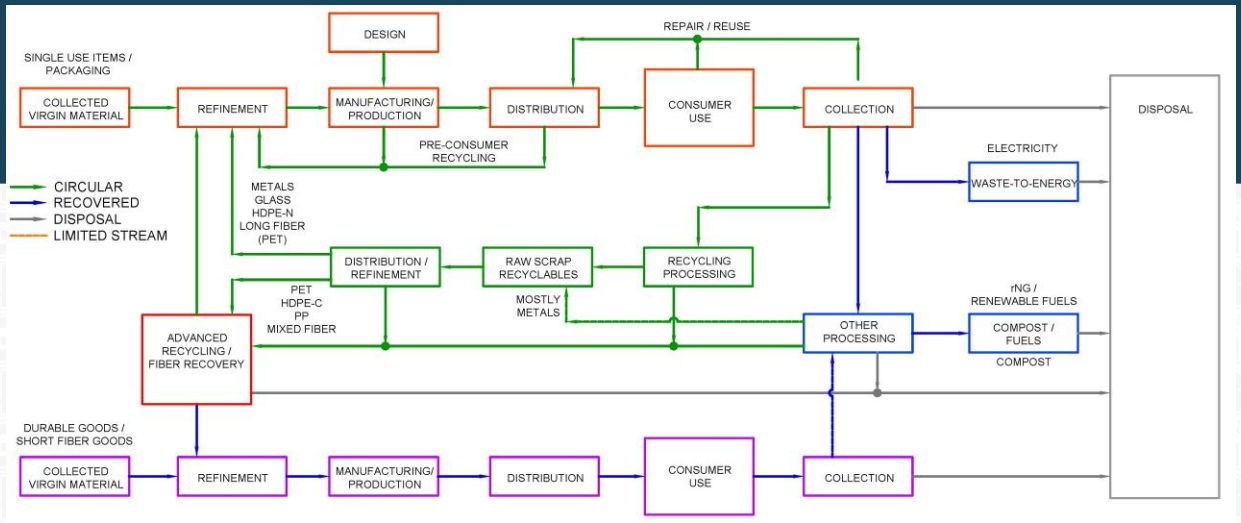
Circular Economy and Recycling
Future Infrastructure and Process



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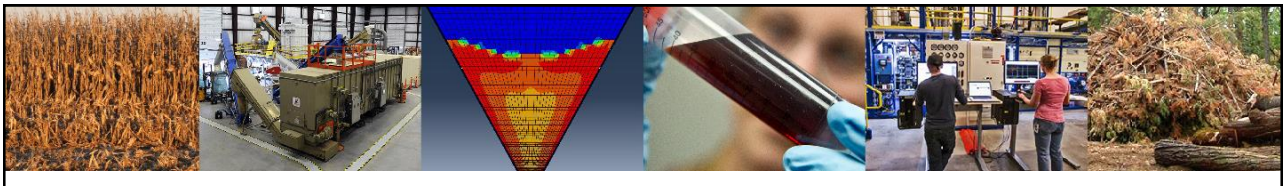

Feedstock-Conversion Interface Consortium (FCIC)

Bioenergy Technologies Office (BETO)

Edward J. Wolfrum, Ph.D.
Principal Investigator

Argonne NATIONAL LABORATORY
BERKELEY LAB
INL Idaho National Laboratory
Los Alamos NATIONAL LABORATORY EST. 1943
NETL NATIONAL ENERGY TECHNOLOGY LABORATORY
NREL NATIONAL RENEWABLE ENERGY LABORATORY
OAK RIDGE National Laboratory
Pacific Northwest NATIONAL LABORATORY
Sandia National Laboratories
fcic FEEDSTOCK-CONVERSION INTERFACE CONSORTIUM U.S. DEPARTMENT OF ENERGY

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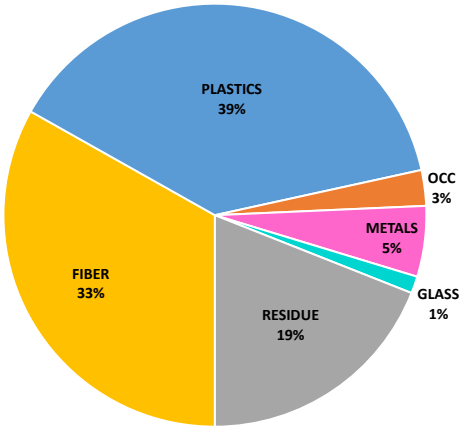
MRF Residue

Source: RRS – Kent County, MI 2021



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Wet – Dry Collections

- Dry Packaging and Wet Organics and Packaging (single-use) are collected weekly
  - Dry Fiber and Plastics
  - Dry Metals
  - Wet/Compostable Fiber
  - Organics & Diapers
- Other Residue Collected Monthly
  - Other Recycling Possibilities (Wood, textiles)
  - Can be Processed like C&D
- Produces an Easier to Process Feedstock
- Is Easier for Consumers to Understand
- Collection Costs are not Greatly Increased

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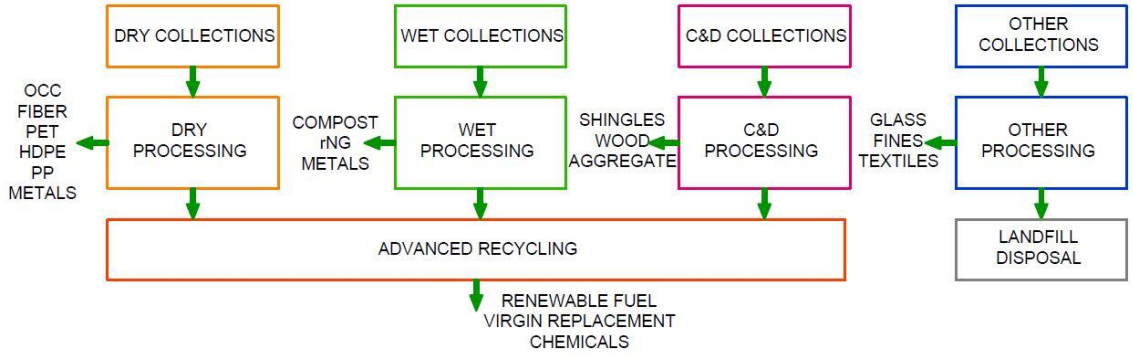
Alternative Collections System

- Wet / Dry / C&D / Other



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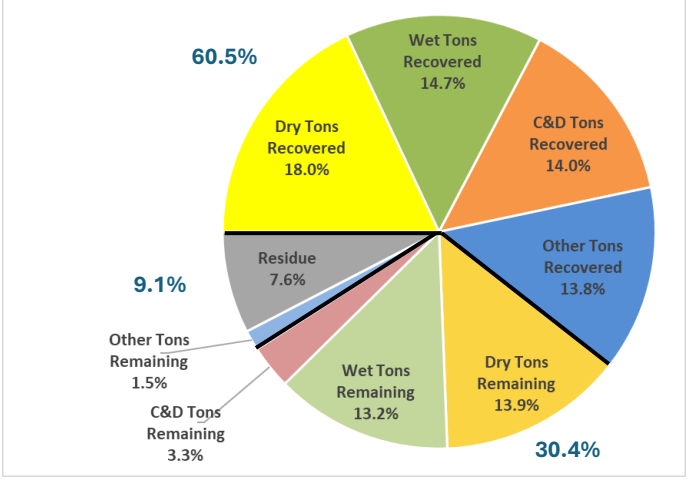
Wet/Dry/C&D and Other Processing Diversion

- Assumes Sludge to Wet
- Assumes C&D Waste to Adv. Rec. (except cement)
- Assumes Fines and Textiles can be Recovered and Repurposed
- Some C&D Recovered may also go to Adv, Rec.



Source: GBB – Internal Calculations

Total Tons: **518,373**

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Conclusions

- Current Mechanical Recycling and Organics Processing MAY get you to 50% diversion and recovery, but will take extensive infrastructure and likely will also need C&D processing
- Without additional outlets, large MWPF will also not go beyond 50% diversion
- Changing how material is collected will make streams easier to process (and less capital intensive)
- Dealing with Sludge will be an issue for diversion (PFAS)
- Advanced Recycling or Fuel Conversion will likely be needed to achieve 80% Diversion
- Additional recovery or use advancements, including for textiles and fines, will be needed to achieve 90% diversion

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Characterization Study Based Diversion:

Questions and Comments:

- Was this Useful?
- Ideas on Assumptions?
- Did this help your Understanding of Diversion?

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