

Provided by



Green Seal
Environmental, Inc.

in partnership with



SOVEREIGN CONSULTING INC.

Construction and Demolition Waste Characterization and Market Analysis

PRELIMINARY DRAFT FINDINGS: 10/27/15



Funding Provided by
the Connecticut
Department of Energy
and Environmental
Protection (DEEP)



Preliminary findings pending acceptance of final study report by CT-DEEP

“C&D” Study

- Part of the C&D and MSW Waste Studies under RFP #DEEP-MMCA-0112015
- Really a C&D and Bulky Waste (AKA Oversized MSW) study
- Included research to determine current “status” of C&D/Bulky Waste collection, transportation, recycling, and disposal
- Included waste load observations to estimate percentages of materials found in inbound loads of C&D/Bulky Waste at VRFs

“C&D” Study

- Reviewed existing regulations, policies and goals for CT
- Reviewed 2013 inbound/outbound materials at CT VRFs (C&D/oversized MSW loads only)
- Conducted interviews with VRFs, haulers, generators (builders), and existing and potential end markets for C&D derived materials
- Reviewed all current VRF operating permits
- Obtained data from regional states (imports, exports)
- Conducted C&D/oversized MSW waste load observations at four (4) VRFs spanning 8 days total; observed 237 loads

Generation in CT

- In 2013, approximately 1,041,643 tons of C&D but...
 - ➔ C&D and Oversized MSW are often tracked the same as inbound materials
 - ➔ In some cases the facilities reported non-C&D materials separately. The total tons of all material entering VRFs was 1,079,933
- Results in a per capita generation of C&D of approximately 0.29 ton per person per year in CT
- In line with regional average per capita rate of approximately 0.30 for comparison

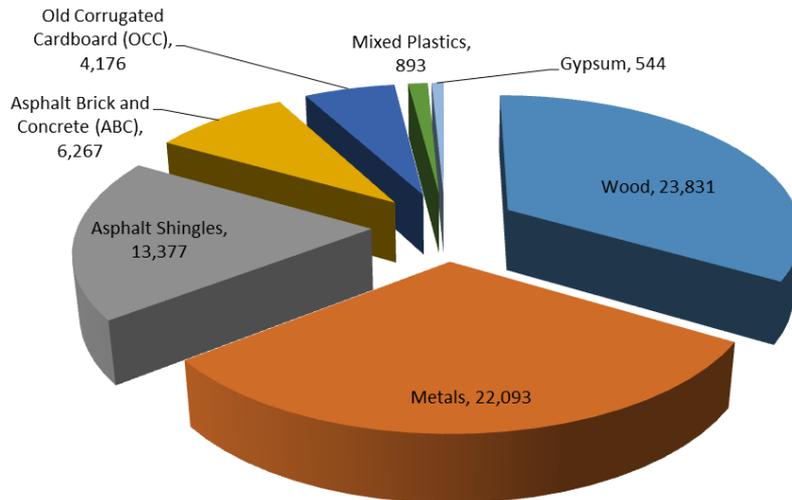
Recycling at VRFs

- CT VRFs recycled approximately 7% of all C&D materials in 2013

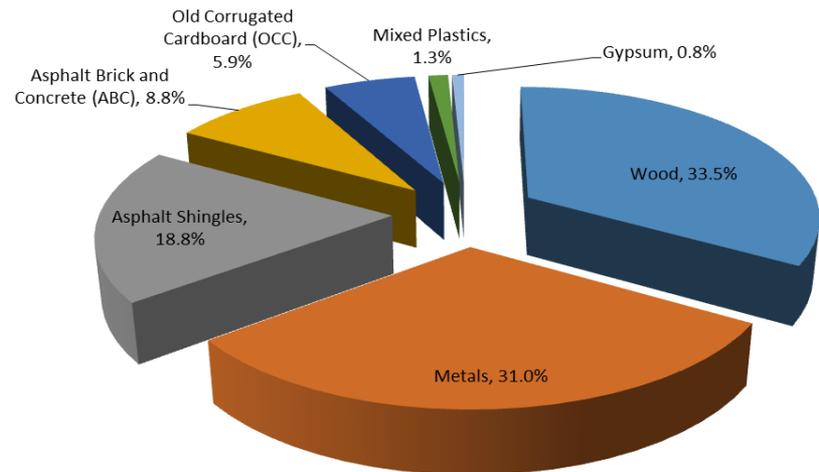
C&D Material	Quantity Recycled (Tons - 2013)	Percentage of Total Recycling
Wood	23,831	33.5%
Metals	22,093	31.0%
Asphalt Shingles	13,377	18.8%
Asphalt Brick and Concrete (ABC)	6,267	8.8%
Old Corrugated Cardboard (OCC)	4,176	5.9%
Mixed Plastics	893	1.3%
Gypsum	544	0.8%
Total	71,181	

Recycling at VRFs

Quality Recycled (Tons – 2013)



Percentage of Total Recycling

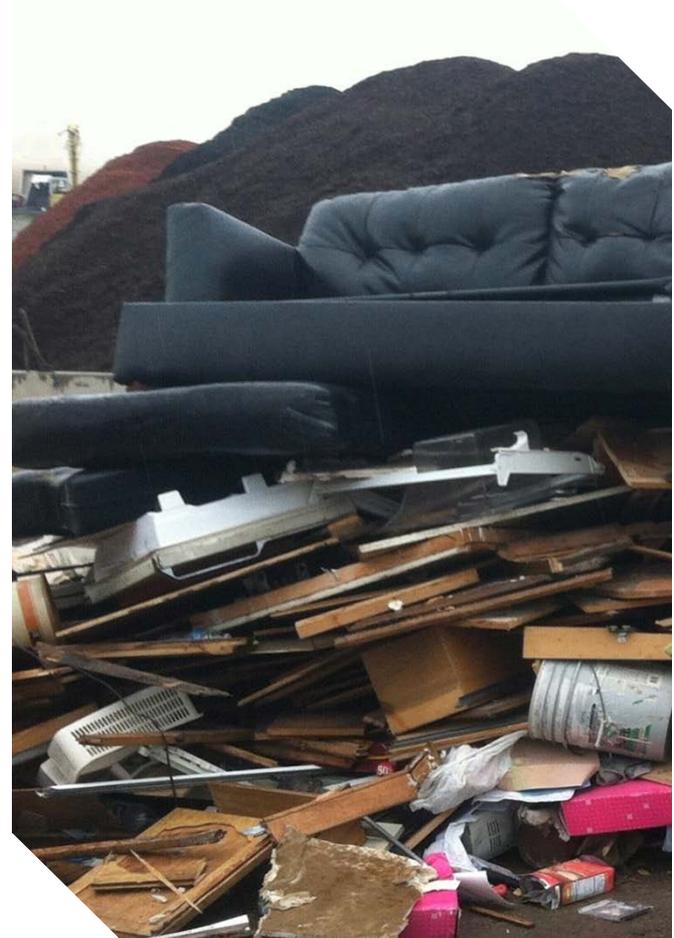


Disposal

Disposal Location by State	Total (Tons)	Percentage
Connecticut	158,593	17.9%
Ohio	494,633	55.9%
New York	122,357	13.8%
Massachusetts	52,985	6.0%
Pennsylvania	44,115	5.0%
Rhode Island	6,036	0.7%
Virginia	2,595	0.3%
Maine	2,824	0.3%
"Unidentified Location"	19	0.0%
Total	884,157	100.0%

Generators Research

- Interviewed to obtain data on decision-making processes, as well as perceived and/or actual economic and/or regulatory limitations
- Included both small and large companies performing small-scale and large-scale construction



Generators: Decision-Making Processes

- Whether the project is required to meet the LEED certification and/or CT high performance building standards,
- Cost reduction if/when it can be achieved through reducing waste and/or recycling (especially true for demolition contractors whose disposal/recycling costs is typically one of the largest cost components of their overall service),
- Design (architect) recommendations,
- Company (construction company's) policies relating to waste reduction and recycling,

Generators: Decision-Making Processes (Cont'd.)

- Ability to source separate materials at the job site (based on adequate room for multiple containers, economies of scale with the size of the job and amounts of materials generated to justify the multiple containers),
- Preferences of owners to recycle and/or reduce waste, including in some instances where the costs would be greater,
- Access to recycling markets as obtained through research by construction company employees (namely project managers), and
- Access to recycling markets as recommended by hauling companies.

Waste Load Observations

- Purpose was to estimate percentages of C&D components in inbound waste loads
- Obtain data to apply to total generation estimate to get a statewide estimate of each material available for recycling/reuse
- Performed over 8 days total; 2 days at each facility
- CT DEEP on-site for portions of the study
- Two independent estimators observed each load.
- Volumes were estimated and converted to weight
- Averages were created and statistical analysis conducted

#	Facility Name	Location	Observation Dates
1	CWPM	Deep River	8/4/15 – 8/5/15
2	Shoham Rd	East Windsor	8/18/15 – 8/19/15
3	Circle of Life	New Haven	9/9/15 – 9/10/15
4	Winter Brothers	Danbury	9/22/15 – 9/23/15

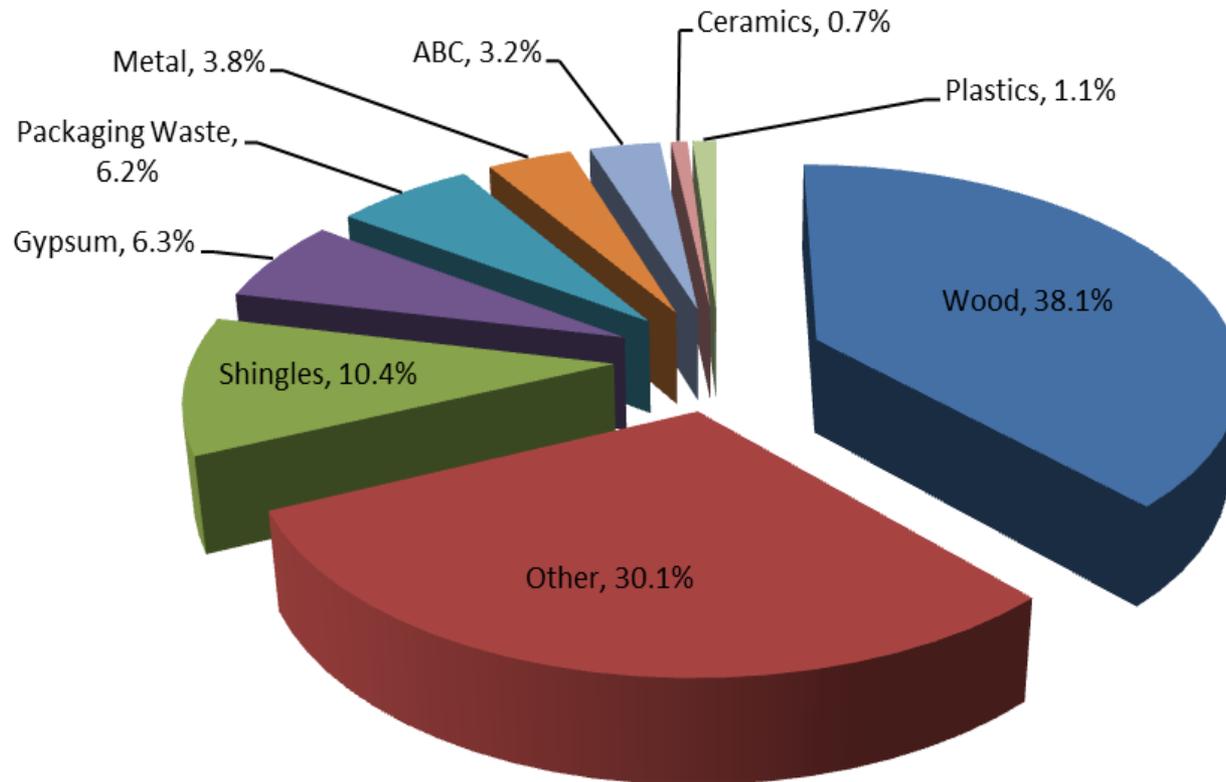
Waste Load Observation Sheet



Category #	Category	Material #	Material
1	Wood	1	Clean Dimensional Lumber
		2	Clean Oriented Strand Board (OSB)
		3	Pallets & Crates
		4	Plywood
		5	Manufactured Wood
		6	Treated Wood
		7	Painted/ Stained Wood
		8	Land clearing/Leaves/Brush
		9	Other Wood:
2	Metal	10	Ferrous
		11	Non-ferrous
3	Packaging Waste	12	Old Corrugated Cardboard (OCC)
		13	Plastic Film/Shrink Wrap
		14	Strapping
		15	HDPE Buckets
		16	Other Paper Packaging
		17	Other Plastic Packaging
4	ABC	18	Other Packaging Waste
		19	Asphalt/Brick/Concrete/Aggregates
5	Ceramics	20	Toilets
		21	Sinks
		22	Other:
6	Gypsum	23	Clean new construction gypsum wallboard scrap
		24	Renovation& demolition gypsum
7	Plastics	25	Plastic Pipe
		26	Vinyl Siding
		27	Other Plastics
8	Shingles	28	Asphalt roofing post-consumer tear off waste
		29	Asphalt roofing off-spec manufacturing waste
9	Other	30	Carpet
		31	Carpet Pad
		32	Mattresses/ Box springs
		33	Tires
		34	Fiberglass Insulation
		35	Glass (windows, mirrors, etc.)
		36	Textiles
		37	Fines
		38	Other Oversized MSW (furniture, appliances, etc.)
		39	Other (to be listed as applicable)

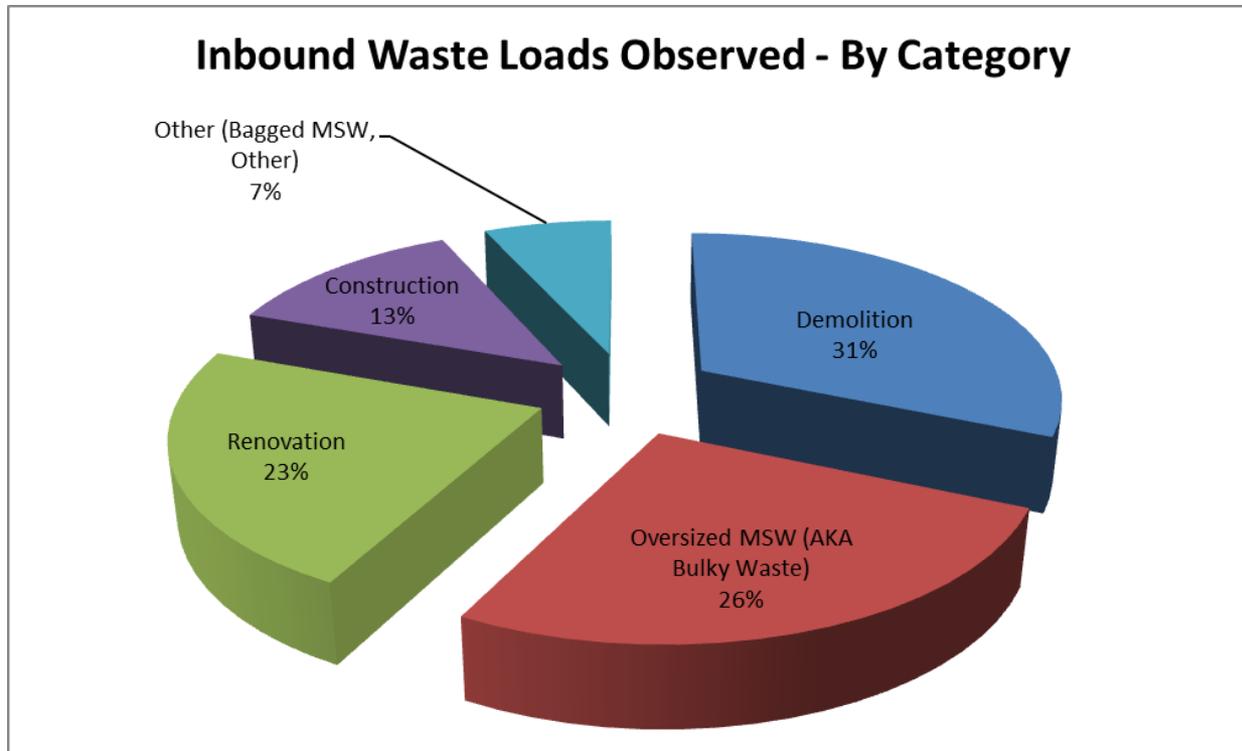
Waste Load Observations

Inbound VRF Waste Composition by Weight



Waste Load Observations

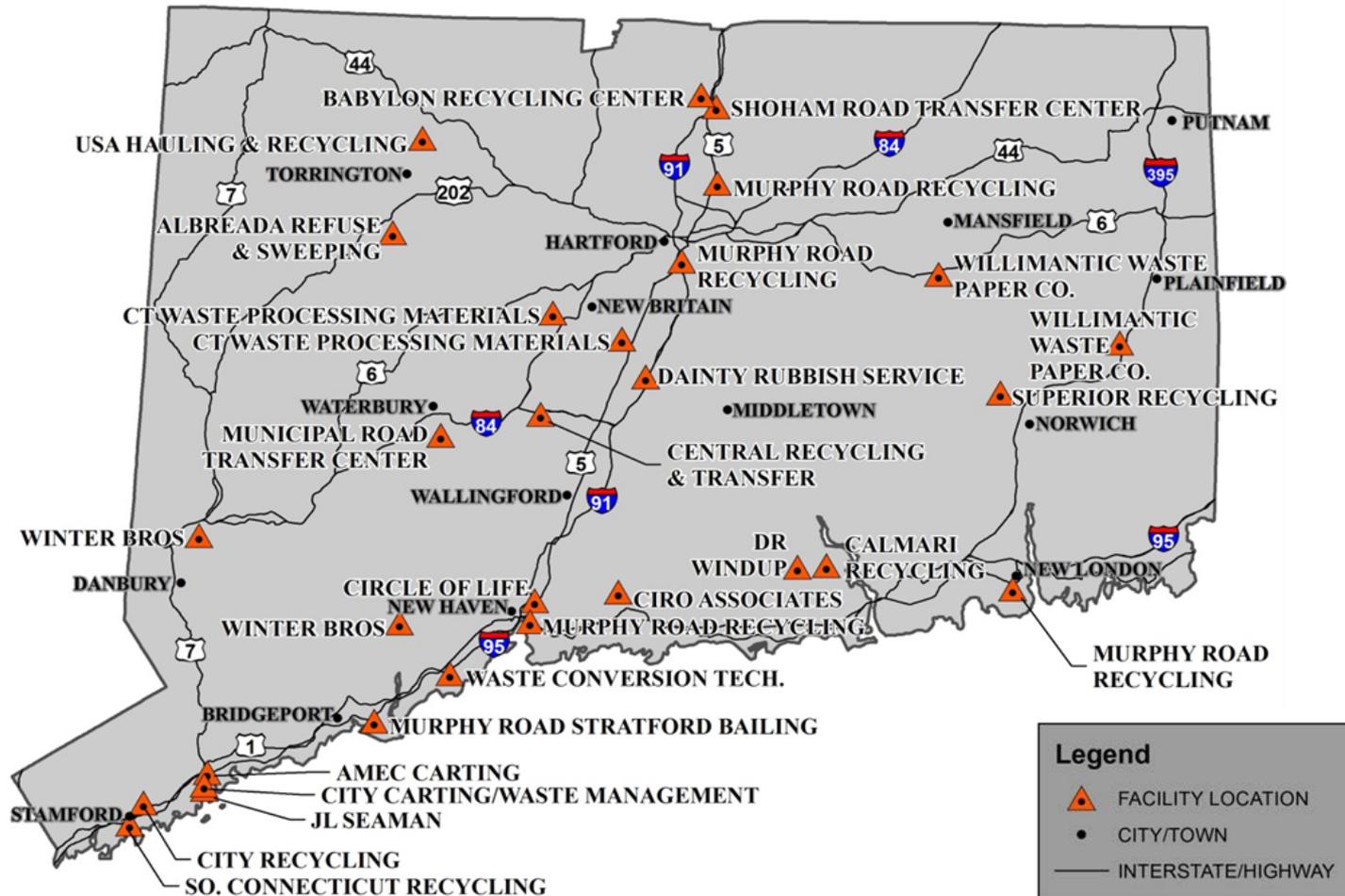
Inbound Waste Loads Observed – By Category



CT-Wide Generation Based on Waste Load Observations

Material Category	Percentage	Tonnage
Wood	38.1%	397,204
Other (Bulky Waste)	30.1%	313,110
Shingles	10.4%	108,131
Gypsum	6.3%	65,951
Packaging Waste	6.2%	64,831
Metal	3.8%	40,085
ABC	3.2%	33,398
Ceramics	0.7%	7,752
Plastics	1.1%	11,180
	100%	1,041,643

CT Permitted VRFs

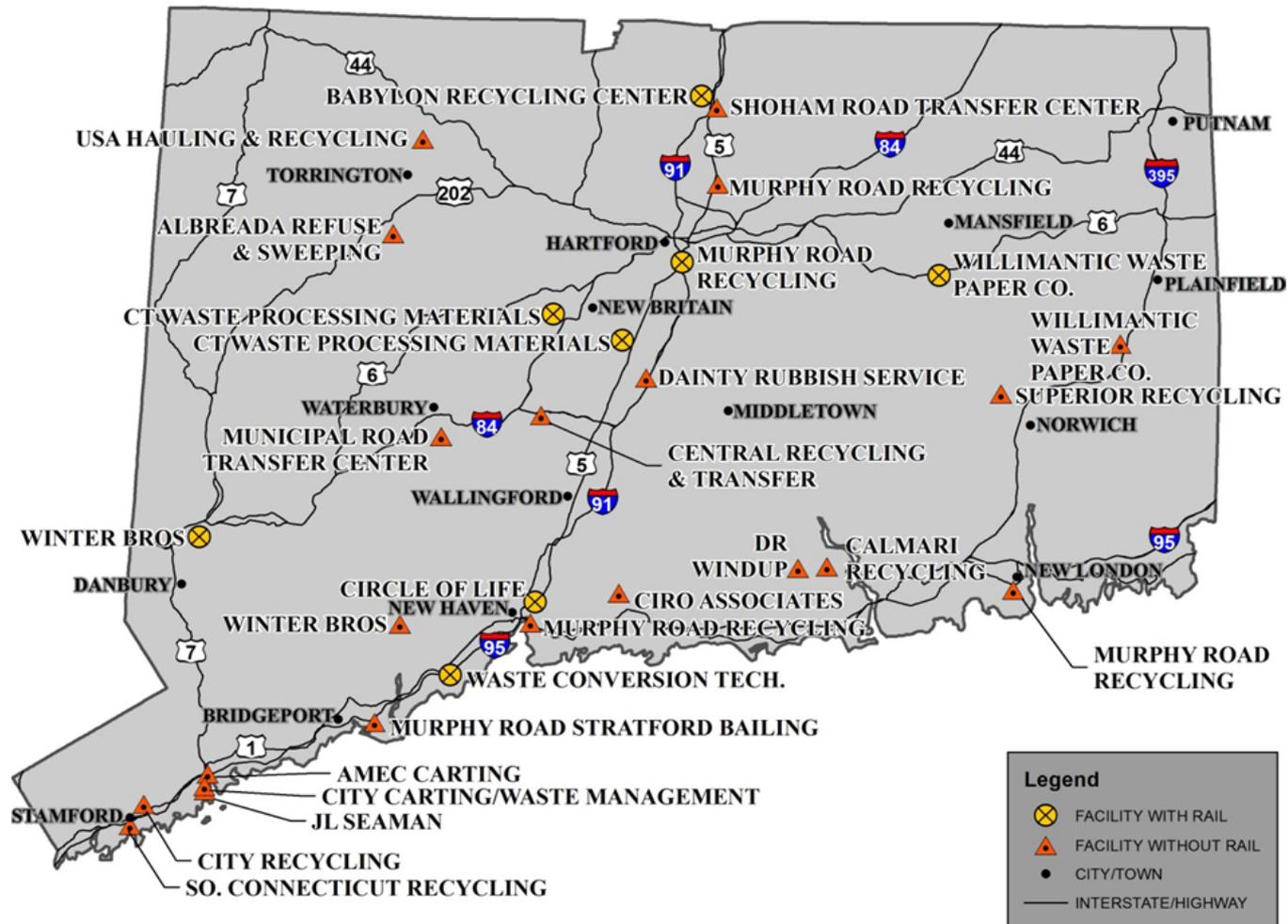


Tipping Fees - VRFs

- Researched waste and recycling fees (market rates) at VRFs and disposal facilities
- VRF tipping fees in the range of \$70-120/ton with weighted average closer to \$70/ton

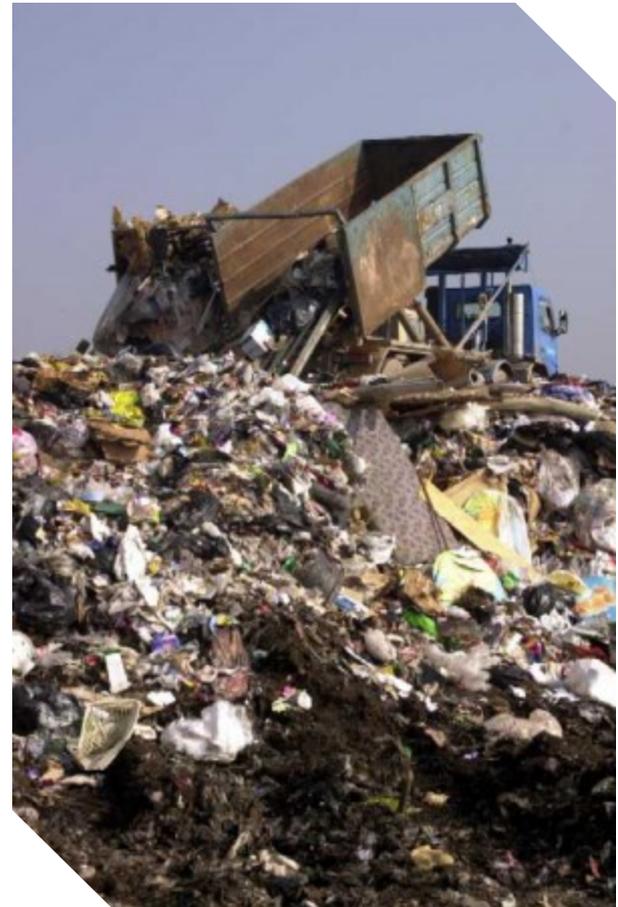


CT VRFs with Rail

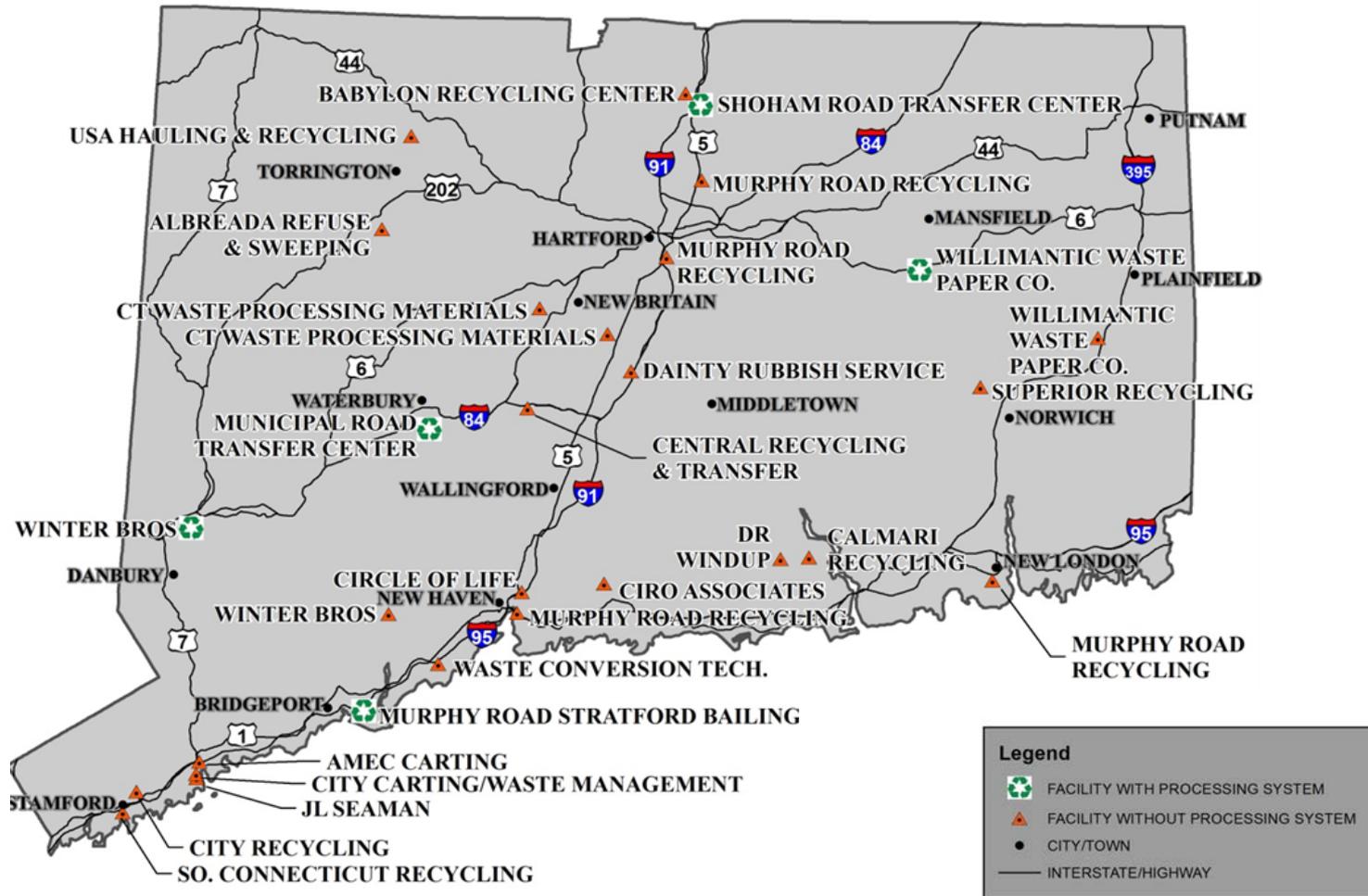


Tipping Fees - Landfills

- Disposal for VRFs most commonly via rail transport to large out-of-state landfills
- Transportation and disposal fee for rail disposal in the range of \$50-\$60/ton, with the average closer to \$55/ton
- Large capacity remaining at OH landfills
- Additional capacity coming on-line in NY



CT VRFs with Processing Systems



Recycling Market Rates

Included:

- Clean Wood
- Mixed Wood
- Metals
- Aggregates
- Gypsum
- Asphalt Shingles



Market Rates – Clean Wood

- Can include items such as land-clearing debris (trees, stumps, etc.), pallets, clean dimensional lumber
- Sorted and sent unprocessed to organics recyclers/mulch manufacturers
- Sorted and ground into mulch/animal bedding
- Blended with mixed wood for biomass fuel
- Majority marketed as mulch/animal bedding
- Currently \$5-\$100/ton+ received for end product depending on many factors (seasonal demand, size/quality of the product, dyed mulch versus plain, bulk versus bagged)

Market Rates – Mixed Wood

- Essentially limited to one facility – Plainfield Renewable Energy given the cost to transport to other out-of-state (and Canada) biomass and recycling markets
- Very small amounts being sent to Plainfield Renewable Energy at the time of this study. Only a snapshot in time. Not indicative of future supply to that facility.
- Prices paid by Plainfield Renewable Energy vary significantly (\$6-\$15/ton paid at their facility), and again only a snapshot of the current (summer/fall 2015) market

Market Rates – Metals

- Lowest value in approximately 8 years
- Still “valuable enough” to sort from mixed loads generally
- Rates dependent on type and class
- Mixed “un-prepared” ferrous scrap approximately \$90/ton at the time of the study
- Mixed “un-prepared” non-ferrous scrap approximately \$850/ton



Market Rates – Aggregates

- Facilities charge approximately \$12-20/ton to take source-separated asphalt, brick, and concrete
- Processed aggregates sold as gravel/stone substitute (usually a sub-base product) for approximately \$14-20/ton
- Rates always tied to demand for virgin materials and thus construction activity



Market Rates – Gypsum

- Limited to one market currently in Pennsylvania
- Accepting materials in PA for approximately \$15-40/ton (E.g. excludes transportation to the market)
- Making bulk and bagged agricultural gypsum products



Market Rates – Asphalt Shingles

- Two stand-alone facilities in CT
- Accepting materials for approximately \$60-\$65/ton
- Making feedstock for hot mix asphalt pavement (base course) and/or blending with processed aggregates



Market Rates – C&D Fines

- No markets currently. Same prices as disposal



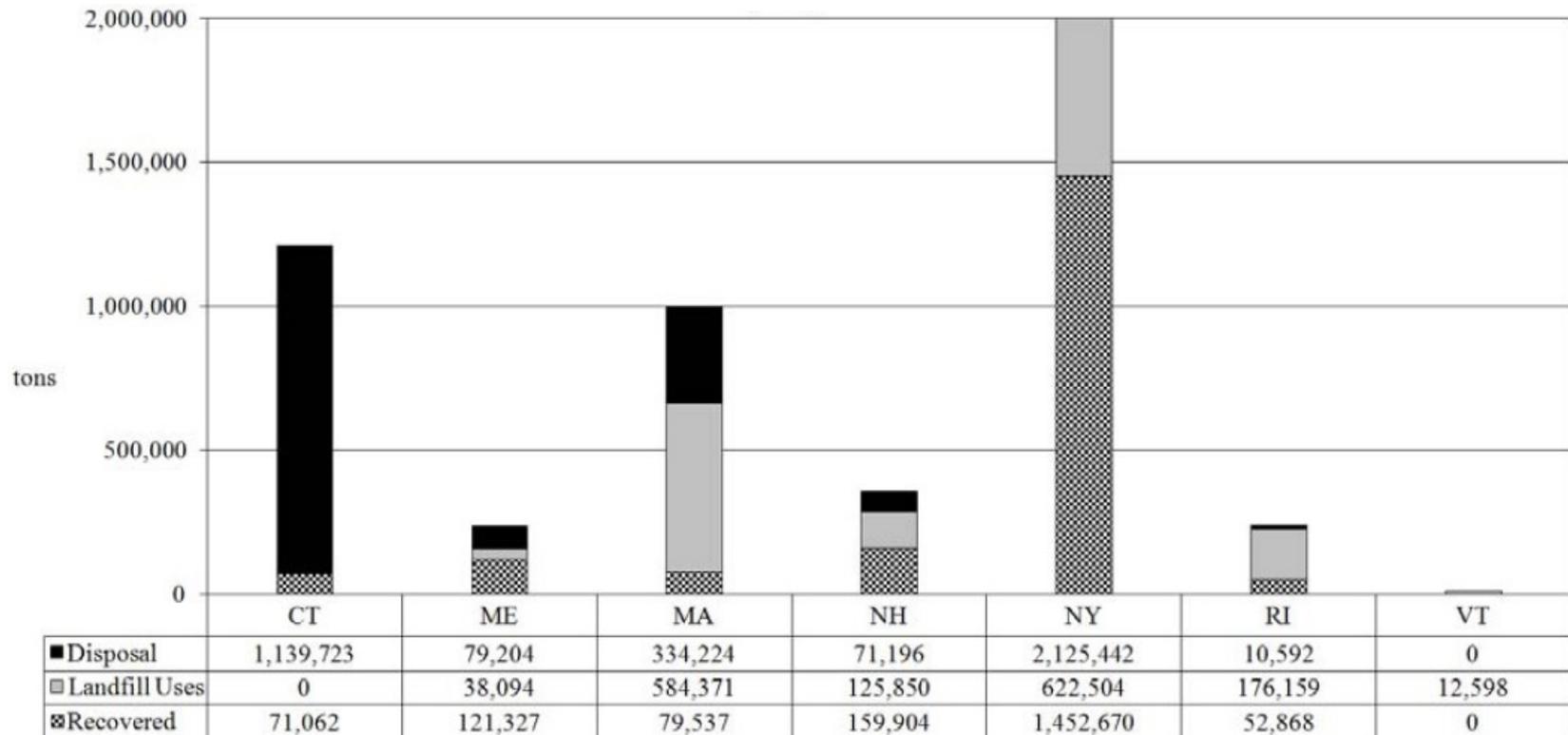
Comparing Regional Practices

- Differences among states in definitions / data tracking for C&D waste:
 - ➔ Inclusion of Road and Bridge Debris in generation/recycling
 - ➔ Inclusion of land clearing debris in generation/recycling
 - ➔ Inclusion of biomass fuel as recycling
 - ➔ Inclusion of landfill uses as recycling/diversion
- Waste bans or “Items Designated (i.e. Mandated) for Recycling”



2009 NEWMOA Study for Comparison of Reporting/Accounting Practices

2006 C&D Waste Processor Outputs (tons)



Comparing Regional Practices

- One state, MA includes C&D components in their waste bans:
 - ➔ Asphalt Pavement, Brick & Concrete
 - ➔ Clean Gypsum Wallboard, and
 - ➔ Treated & Untreated Wood & Wood Waste (Banned from Landfills Only)
 - ➔ Metal
 - ➔ Recyclable Paper (including Corrugated Cardboard)
- In CT, requirement for source-separation of designated recyclables (same as MSW)

Regional Practices

- Recycling requirements implemented by permit in CT
- VRF permit example:

Recovery Rate for Non-Designated Recyclable Items (by weight)

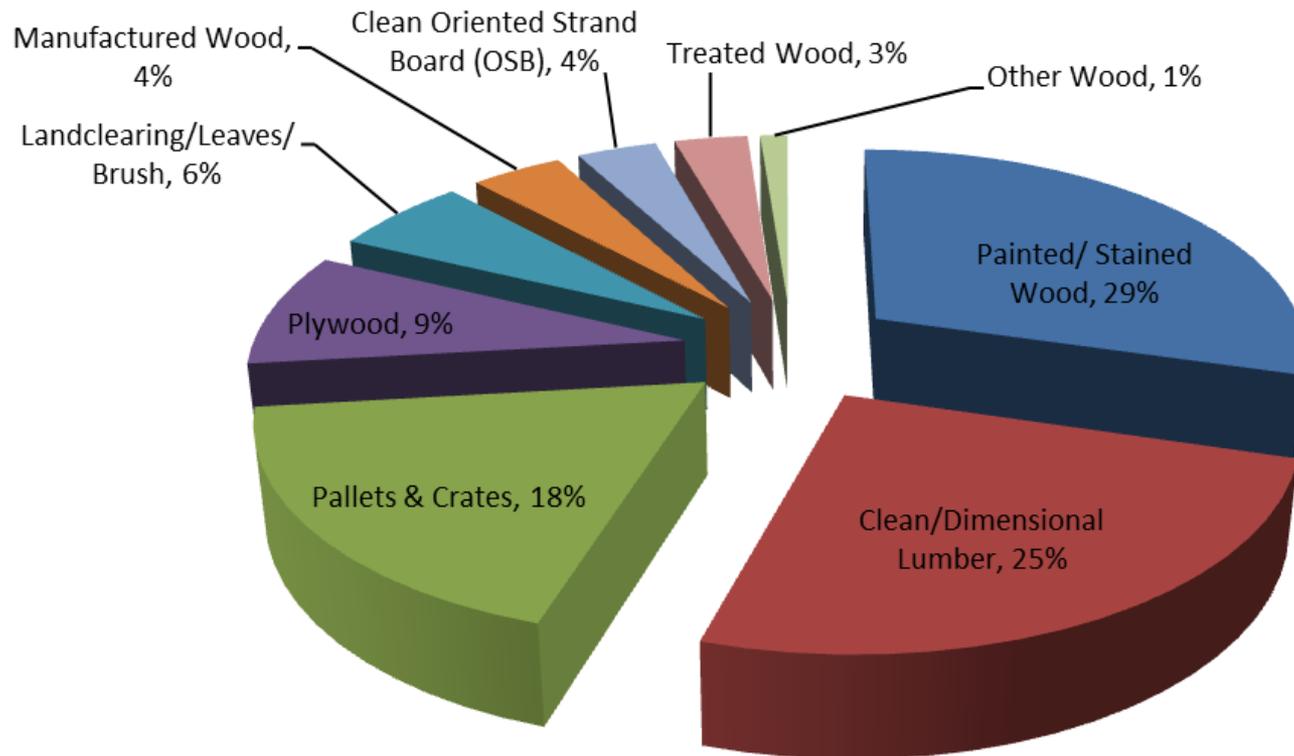
Year of the Permit	Percent of Total Waste Received
First Year	10%
Second Year	20%
Third Year	30%
Fourth Year	35%
Fifth Year	40%

Intrastate and Interstate Waste Flow

- From point of generation, mostly being transported commingled via roll-off containers to CT VRFs. Very little source-separation being done.
- Similar tipping fees in CT compared to those in surrounding states. Didn't find significant quantities imported/exported to/from CT from point of generation
- From the VRFs, primarily transported via rail to a combination of MSW and C&D landfills in OH. Some C&D transported over-the-road in long-haul 100CY livefloor trailers for VRFs without rail to NY landfills

In-depth Analysis of Wood

Breakdown of "Wood" Category by Weight



In-depth Analysis of Wood

Material Components	Mean (Average) Percentage by Weight of Each Material Per Sample	Estimated Tons (Components)
Painted/ Stained Wood	11.20%	117,118
Clean Dimensional Lumber	9.60%	100,187
Pallets & Crates	7.10%	73,439
Plywood	3.40%	35,037
Land clearing/Leaves/Brush	2.30%	23,789
Manufactured Wood (Particle Board)	1.50%	16,024
Clean Oriented Strand Board (OSB)	1.30%	13,997
Treated Wood	1.20%	12,840
Other Wood:	0.50%	4,773

In-depth Analysis of Wood

- Regional Outlets for Managing Wood:
 - ➔ Wood Heating Pellets: Not being used currently. One market prior to 2014. Physical/chemical characteristics cited as limitation.
 - ➔ Bulk Biomass Fuel: Numerous markets available in ME, NY, and Canada in addition to Plainfield Renewable Energy in CT. None utilized due to transportation inefficiencies with CT's 80,000 GVW restriction
 - ➔ Manufactured Wood Products: One market available in Quebec, Canada. Also not being utilized because of the 80,000 GVW restriction

Undervalued/Underutilized Markets

- **Mixed Wood:** Highly underutilized and undervalued. Limited amounts being used for biomass fuel.
- **Asphalt Shingles:** Highly underutilized and undervalued. Limited amounts being used for base course asphalt paving mixtures
- **Gypsum:** Highly underutilized. Limited amounts being used for both bulk and retail products.
- **C&D fines:** Highly underutilized. Currently being disposed versus alternative landfill applications

What's Next?

- Identification of current barriers (regulations, policies, etc.) to increasing recovery
- Identification of potential inefficiencies in collection, processing, and end market use
- Recommendations for increasing recovery



Contacts

- Greg Wirsen, Project Principal
Green Seal Environmental, Inc
Greg@gseenv.com
- John Blaisdell, Project Principal
Sovereign Consulting, Inc.
Jblaisdell@sovcon.com

