City of Baltimore

RECYCLING AND SOLID WASTE MANAGEMENT MASTER PLAN

Interim Report on Task 0

Results from First Seasonal Waste Sort (Winter 2019)

22 February 2019

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Baltimore City Department of Public Works

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receiving single-stream curbside recyclables at the sorting area

18 January 2019

1. Introduction

Purpose

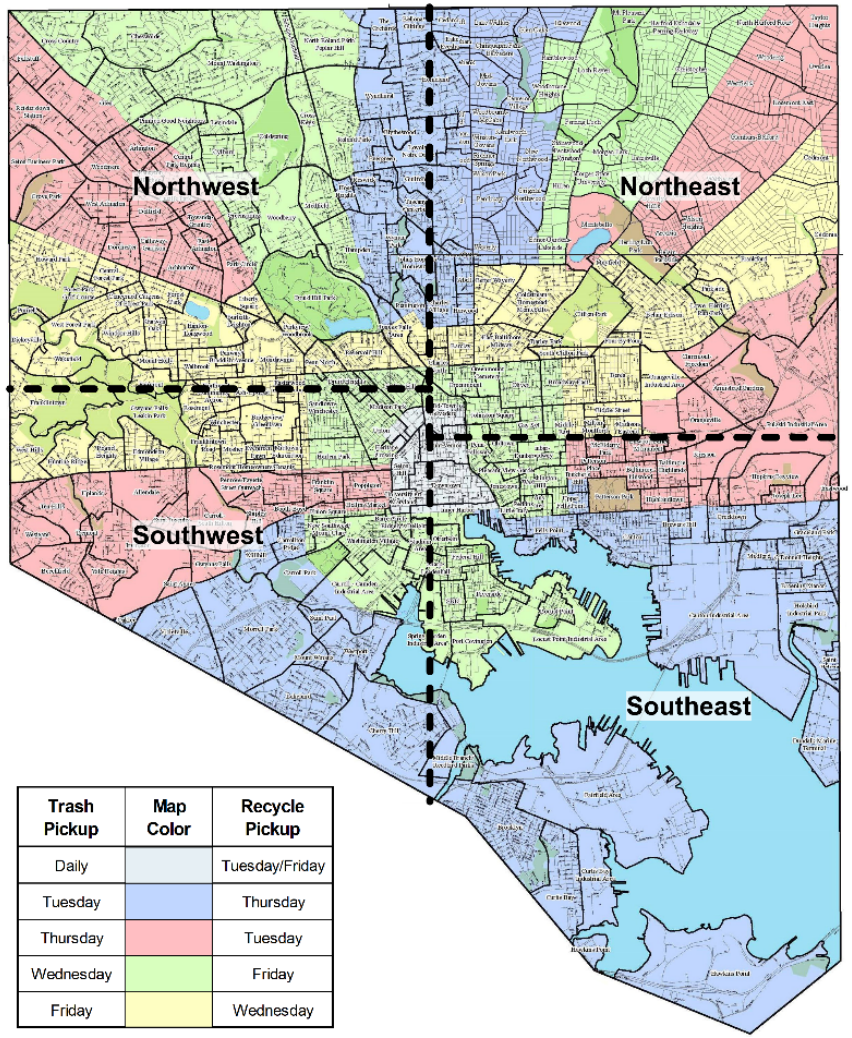
The goal of the waste sort is to provide reliable and up-to-date data on waste characteristics and quantities currently generated within Baltimore City. This data will be used to inform the ongoing Department of Public Works (DPW) planning effort for developing the City's Recycling and Solid Waste Management Master Plan, titled the "Less Waste, Better Baltimore" Plan.

Existing Waste Management System

Curbside waste and recycling services are provided weekly by DPW to households, certain businesses and institutions, and public schools. DPW's collection services are divided into four quadrants: Northwest (NW), Northeast (NE), Southwest (SW), and Southeast (SE). Depending on collection routing, curbside waste collected by DPW is delivered to one of three facilities:

- Baltimore Refuse Energy Systems Co. (BRESCO) waste-to-energy (WTE) plant;
- Quarantine Road Landfill (QRL); or
- Northwest Transfer Station (NWTS), where it is consolidated into larger truckloads for transportation to BRESCO or QRL.

BRESCO is privately owned by Wheelabrator Technologies while QRL and NWTS are owned by DPW. NWTS was closed for renovation at the time of the Winter 2019 waste sort. In its absence, about 80% of waste collected by DPW is delivered to BRESCO while about 20% is delivered to QRL. Most commercial and industrial businesses in the City contract directly for waste collection with private haulers, who primarily deliver waste to BRESCO or QRL.



Trash Pickup	Map Color	Recycle Pickup
Daily		Tuesday/Friday
Tuesday		Thursday
Thursday		Tuesday
Wednesday		Friday
Friday		Wednesday

Map of DPW's Collection Quadrants

Curbside Single-Stream Recycling

Curbside recyclables are normally directed to NWTS to be transferred to the Waste Management Recycle America (WMRA) material recycling facility on Kit Kat Rd. in Elkridge. During renovation of NWTS, however, City recyclables are delivered to Waste Management's Quad Ave. recycling center in Baltimore before being transferred to the Kit Kat Rd. facility.

Residents' Drop-Off Facilities

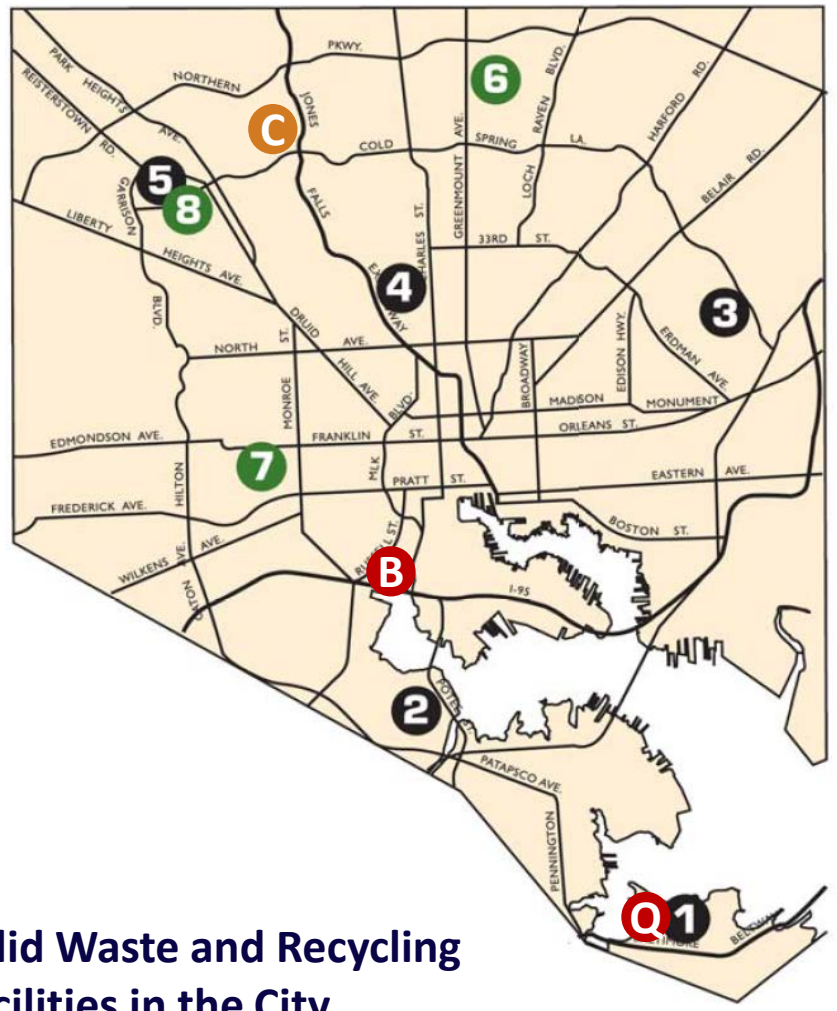
City residents may drop off waste and recycling for free at QRL or NWTS as well as three other full-service convenience centers – Western Sanitation Yard (Reedbird Ave), Eastern Sanitation Yard (Bowleys Lane), and NW Citizens Convenience Center (Sisson St). In addition, DPW operates three convenience centers that only accept recyclables – York Road Substation, Calverton Road Substation, and Lewin Substation. Waste and recyclables collected at these facilities are consolidated and transferred as described previously.

Construction and Demolition Debris

Construction and Demolition (C&D) debris generated in the City may be delivered to QRL; however, the bulk of C&D debris is delivered to private recycling or disposal facilities. Commercial small haulers collecting waste from within the City are permitted to deliver waste to QRL as well as NWTS, which remains operational for this purpose. Many small-hauler loads contain predominantly C&D debris.

Wood Waste

The City's Department of Recreation and Parks operates Camp Small, a wood waste collection yard. City crews and contractors can bring logs, chips, and brush to Camp Small for processing. Processed wood products are sold back to City residents and businesses.



Solid Waste and Recycling Facilities in the City

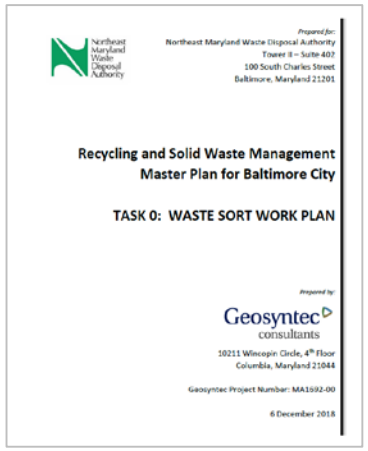
(Q)	Quarantine Road Landfill	(6)	York Road Substation*
(1)	QRL Convenience Center	(7)	Calverton Road Substation*
(2)	Reedbird Ave. Conv. Center	(8)	Lewin Ave. Substation*
(3)	Bowleys Lane Conv. Center	(B)	BRESCO
(4)	Sisson St. Conv. Center	(C)	Camp Small
(5)	Northwest Transfer Station	*	Recyclable items only

2. Work Plan and Schedule for Sorting

Selection of Sorting Venues

As BRESCO and the Quad Ave. and Kit Kat Rd. recycling facilities are privately owned, it was considered too difficult in the short timespan to organize waste sorts at these locations. Given the unavailability of NWTS, therefore, full waste sorts were limited to QRL for the Winter 2019 sorting event. While workable, this was less than ideal as it required sorting in an open, unpaved area at the landfill during winter weather. It is anticipated that sorting at NWTS will be possible for the upcoming Summer 2019 sorting event.

Targeted sorting of loads brought to the City's drop-off facilities was performed at the two largest and most active convenience centers – QRL (item 1 on the map on p.5) and Sisson St. (item 4 on the map on p.5). In addition, a visual observation of loads delivered by small haulers to NWTS (item 5 on the map on p.5) was conducted.


Recycling and Solid Waste Management Master Plan for Baltimore City

TASK 0: WASTE SORT WORK PLAN

Geosyntec consultants

Full details regarding the waste sorting methodology and procedures are provided in Geosyntec's Work Plan (see attachment)

Schedule

The Winter 2019 waste sort took place between January 15th and February 1st. In total, the waste sort included 11 days of field work:

- Six days sorting 33 curbside residential trash loads at QRL;
- Two days sorting 12 curbside residential recycling loads at QRL;
- One day each of visual observation and targeted sorting of materials brought to the QRL and Sisson St. residents' drop-off facilities; and
- One day of visual observation of small-hauler loads at NWTS.

Calendar of Sorting Events

Mon	Tues	Weds	Thur	Fri
Jan 14	Jan 15 QRL Trash 1 4	Jan 16 QRL Trash 2 6	Jan 17 QRL Trash 3 7	Jan 18 QRL Recyl. 1 6
Jan 21 MLK Holiday	Jan 22 QRL Trash 4 6	Jan 23 QRL Trash 5 6	Jan 24 Snow Day	Jan 25 QRL Recyl. 2 6
Jan 28 QRL Drop-Off	Jan 29 Snow Day	Jan 30 NWTS Sm. Haulers	Jan 31 QRL Trash 6 4	Feb 1 Sisson St. Drop-Off

sorting a load of curbside residential trash

15 January 2019

3. Results of Waste Sorting Activities

Curbside Residential Trash

Six days were assigned for sampling curbside residential trash, with a total target of 25 to 40 samples. Residential trash was sampled from DPW waste collection trucks (load packers) with 5 to 10 trucks per City Quadrant targeted in total. Close communication between the sorting crew, QRL staff, DPW's Quadrant Managers, and truck drivers served to ensure that the appropriate number of trucks were directed to the sorting area at QRL on each day of sorting. Due to the difficulties involved in working outside at QRL for the Winter 2019 sorting event, it was not possible to redirect commercial trucks to the sorting area. Sorting commercial loads will be considered for the Summer sorting event, which should be based at NWTS.

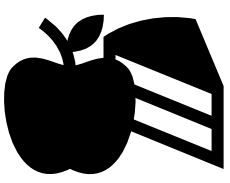
Waste Delivery and Sorting Procedures

Trucks assigned to deliver trash were directed to the tipping area at the sorting area. Truck drivers were interviewed to record their load type and origin. Scale house records were used to obtain the total load tonnage. Once the entire truck load had been tipped, a sample of 200 to 300 lbs. was randomly selected using a backhoe or skid steer and set aside for the sorting crew.

Each sample was pre-weighed and then tipped onto the sorting table for sorting into 11 classifications using 95-gal. toters of known tare weight. Once sorting was completed, each toter was reweighed to obtain the weight of material in each classification. After weighing, the toters were emptied onto the remaining unsorted loads, which were cleared by QRL equipment and transferred to the landfill working face for disposal each day.

Sample Classifications

Samples were divided into 11 classification categories.



Food Scraps

Mixed Paper

Cardboard

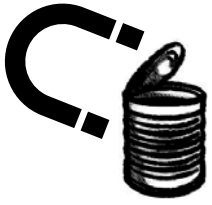
Glass

Aluminum

Mixed Plastics

Plastic No. 1

Plastic No. 2



Ferrous Metal

Yard Waste and Clean Wood

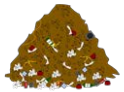
Unclassified (Other)

Unclassified materials are those that do not fit in one of the previous 10 categories, are made up of composite materials, or are unidentifiable. Diapers are a good example.

Number and Size of Samples

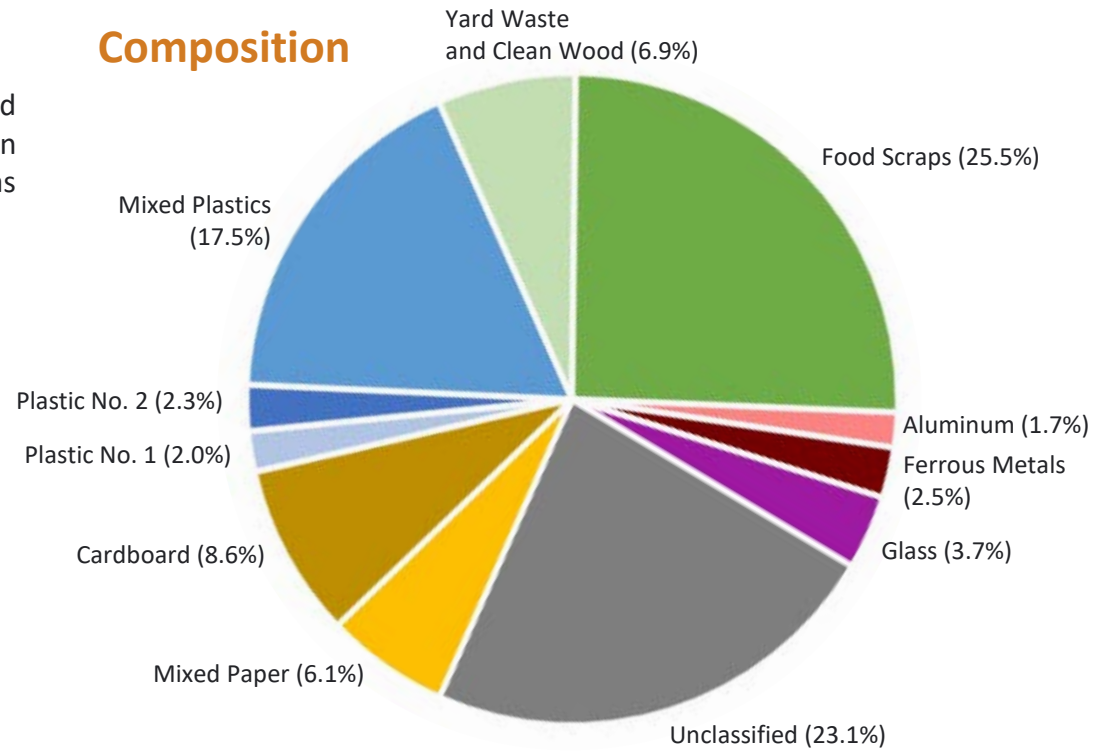
In total, 33 trash loads were sampled over six days. A combined total weight of 216 tons was delivered to the sorting area, an average of about 6.5 tons per truck. From this, about 7,950 lbs. was selected for sorting, an average of about 240 lbs. per sample.

216 total tons delivered

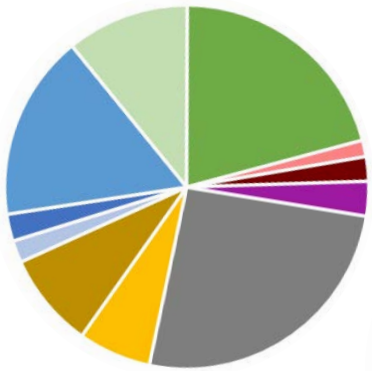


7,950 total lbs. sampled and sorted

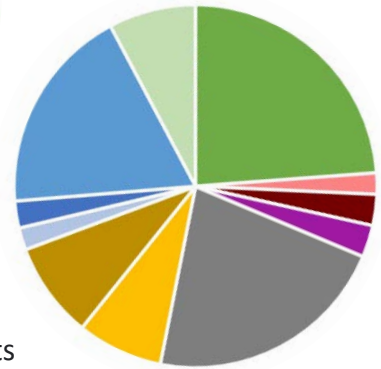
Composition



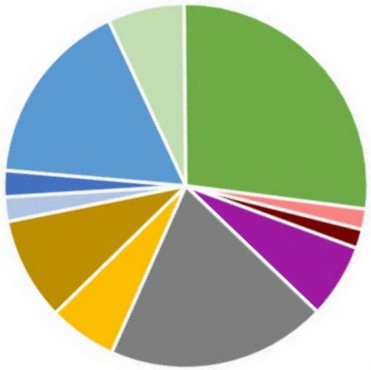
Breakdown by Quadrant



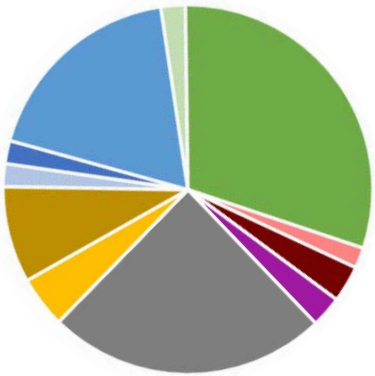
Northwest



Southwest



Northeast

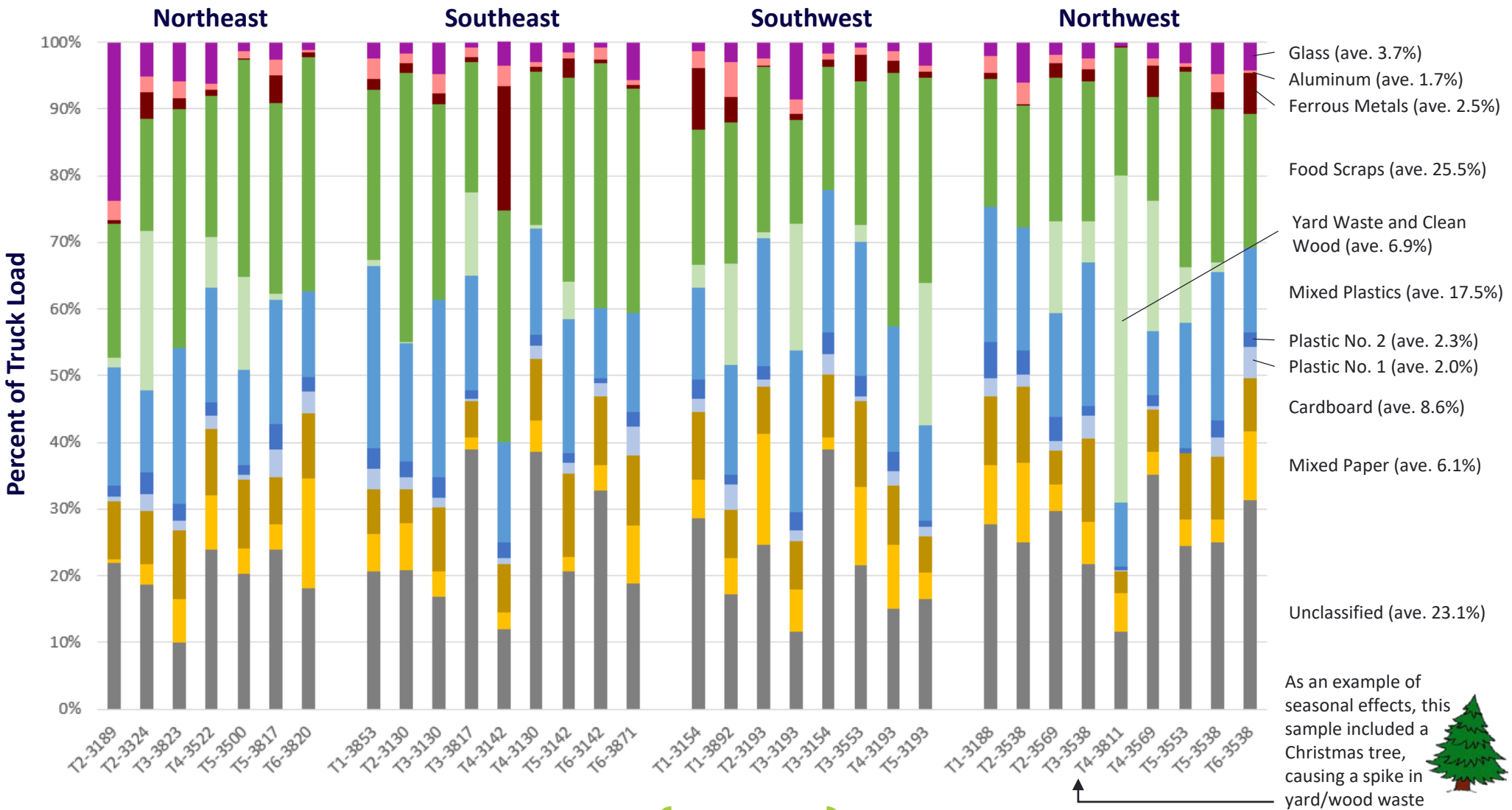


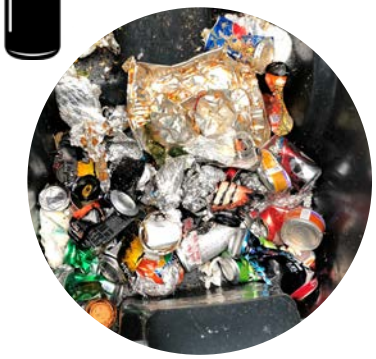
Southeast

Overall, there was relatively little variability in waste composition between quadrants

Breakdown by Quadrant and Load

Each of the 33 trucks were assigned a unique load number based on the type of waste (trash, T), day of sorting (1 to 6), and vehicle tracking number (four digits) as shown in the chart below. Consolidated results and raw data for each load are provided in the appendix to this report.





sorting trash load T3-3817

17 January 2019

Single-Stream Recycling

As recycling loads were expected to be much more homogeneous than trash, only two days were assigned for sampling curbside single-stream recycling, with a total target of 10 to 15 samples. Recycling loads were sampled from DPW waste collection trucks (load packers) with 2 to 4 trucks per City Quadrant targeted. Close communication between the sorting crew, QRL staff, DPW's Quadrant Managers, and truck drivers served to ensure that the appropriate number of trucks were directed to the sorting area at QRL on each day of sorting.

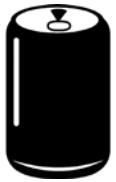
Load Delivery and Sorting Procedures

The methods for delivering, unloading, sampling, sorting, and disposing of single-stream recycling loads were exactly the same as for trash loads.

Rejected materials from recycling sorts at QRL

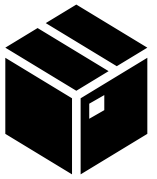
Sample Classifications

Samples were divided into nine classification categories.



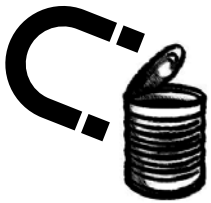
Aluminum

Mixed Paper



Cardboard

Glass



Ferrous Metals

Mixed Plastics

Plastic No. 1

Plastic No. 2

Rejects

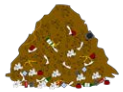
Rejected materials are those that do not fit in one of the previous eight categories. Rejects represent contamination that must be removed at a materials recovery facility before the recyclables can be shipped to an end user. Examples include food and other trash, used paper napkins, composite materials that cannot be easily separated into base constituents, garden hoses, and dirty materials that may otherwise be recyclable (e.g., greasy pizza boxes or unwashed yogurt pots).

Strictly speaking, much of the mixed plastics (especially grocery bags) and mixed paper may also represent contamination since many of these material classes are not accepted for recycling in the City's curbside single-stream collection program. However, these were sorted separately to assess their overall contribution to recycling loads.

Number and Size of Samples

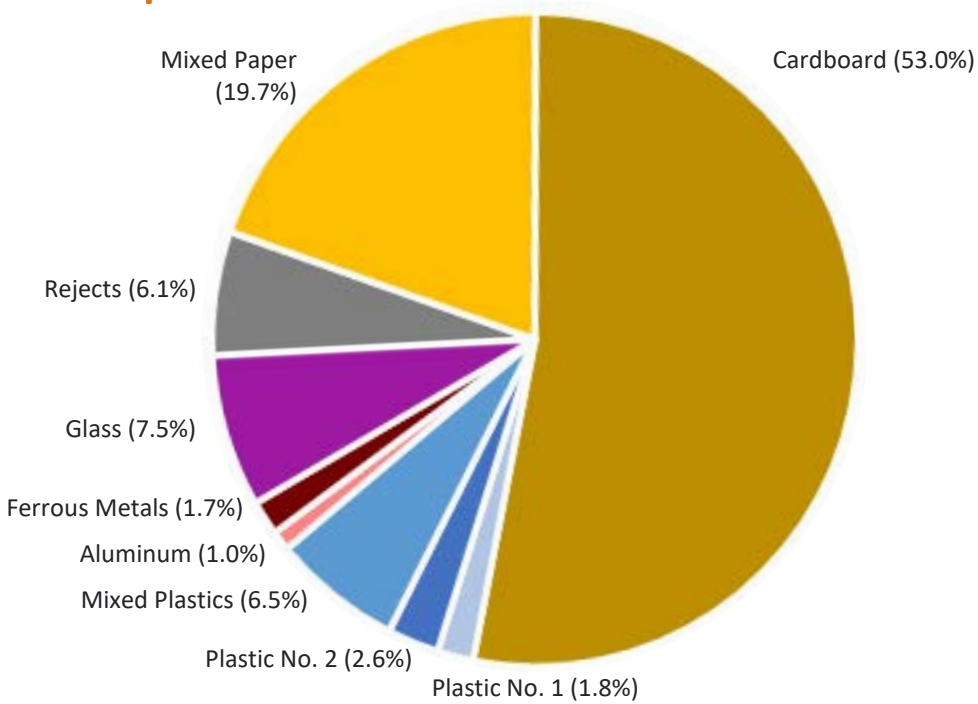
In total, 12 recycling loads were sampled over two days. A combined total weight of 58 tons was delivered, an average of about 4.8 tons per truck. From this, about 3,020 lbs. was selected for sorting, an average of about 250 lbs. per sample.

58 total tons delivered

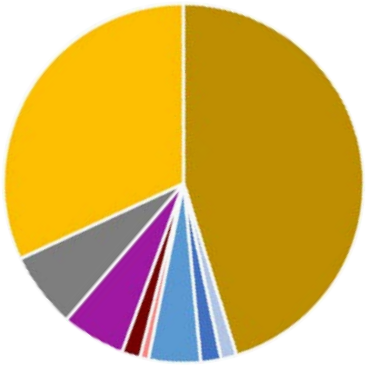


3,020 total lbs. sampled and sorted

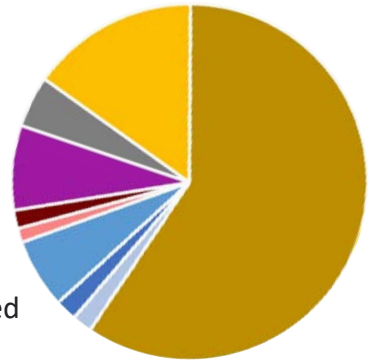
Composition



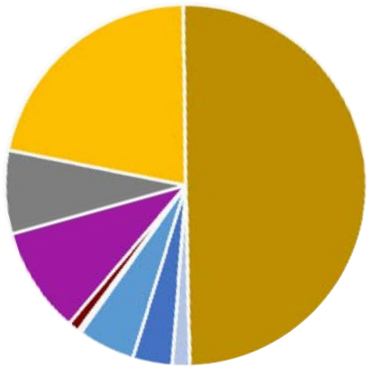
Breakdown by Quadrant



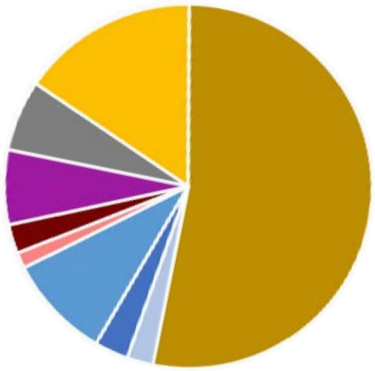
Northwest



Southwest



Northeast

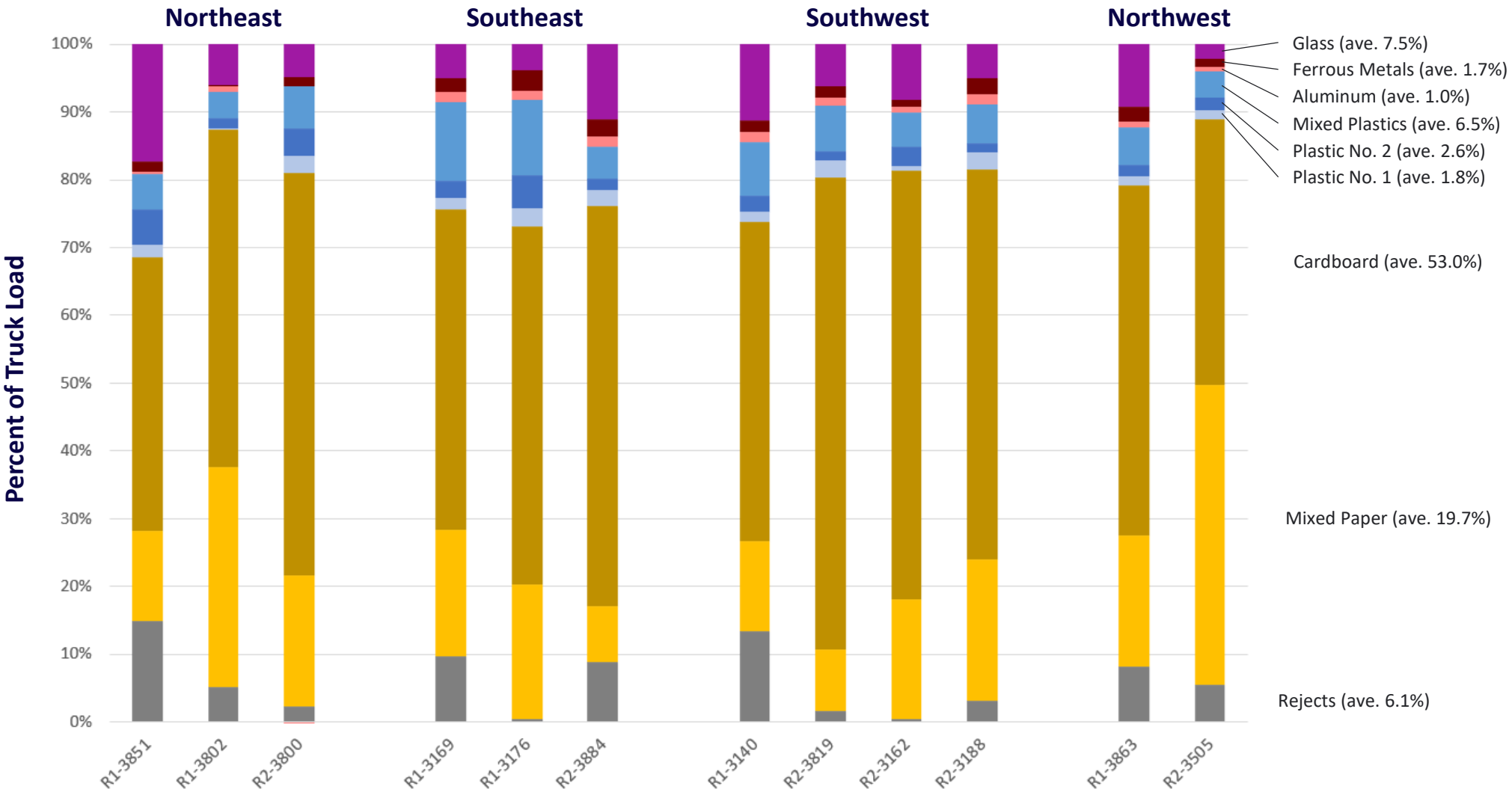


Southeast

Variability between quadrants was most significant in the mixed paper and cardboard categories

Breakdown by Quadrant and Load

Each of the 12 trucks were assigned a unique load number based on the type of waste (recycling, R), day of sorting (1 or 2), and vehicle tracking number (four digits) as shown in the chart below. Consolidated results and raw data for each load are provided in the appendix to this report.



sorting recycling load R1-3140

18 January 2019

Residents' Drop-Off Facilities

As shown on the map on p.5, DPW operates five residents' drop-off facilities (DOFs) for waste and recycling as well as three convenience centers that only accept recyclables. A listing of acceptable materials at each DOF is available here. For the Winter 2019 waste sorting event, targeted sorts of recycling loads were performed at two of the City's larger and more active DOFs: QRL and Sisson St. The goals of the sorting events were twofold:

- To gain an understanding of the types of materials brought in different vehicle classes through the course of an operating day; and
- To measure the quantities of recyclables (i.e., scrap metal and cans, paper and cardboard, no. 1 and 2 plastics, and glass).

The first goal was achieved by conducting a vehicle census, interviewing drivers, and visually recording the composition of drop-off loads. The second goal was achieved by separating and weighing the targeted recyclables brought to the DOFs.

Visual Observation and Sorting Procedures

The recycle sort areas at the DOFs were the paved, raised drop-off platforms. Working in tandem, the sort crew approached vehicles entering the DOF to inform drivers of the procedures. As vehicles were unloaded, targeted recyclables were transferred to 95-gal. toters set up in three separate work zones. In addition to sorting and weighing of recyclables, to the extent possible the sort crew also conducted a visual observation and recording of trash, C&D debris, and other materials. Drivers were also interviewed about the source and nature of the materials being dropped off. At regular intervals, the toters were weighed before being emptied into the drop-off trailers and reset for receiving fresh recyclables. The total mass of recovered recyclables was summed at the end of the day.

Sample Classifications

Fifteen visual classification categories were established. However, due to time and space constraints, recyclables were only sorted into four general classification categories.

Scrap Metal and Cans

Paper and Cardboard

No. 1 and 2 Plastics

Glass

Quarantine Road Drop-Off Facility

Number of Vehicles using the Facility

Cars
Total = 3

SUVs/Minivans
Total = 17

Pickup Trucks
Total = 34

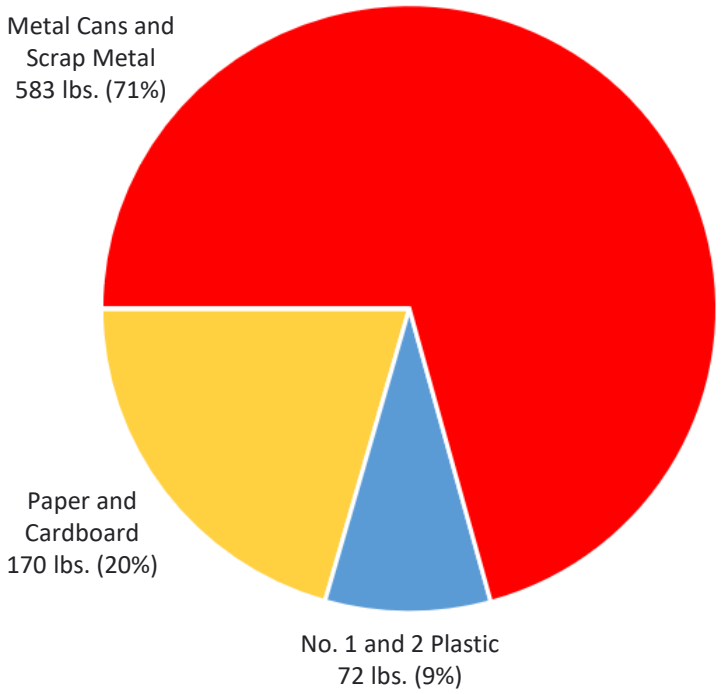
Time indicates number of vehicles using the facility in preceding 30 minutes

Composition

In total, 54 vehicles used the QRL drop-off facility in the seven-hour period of observation between 9:30am and 4:30pm, an average of 7.7 vehicles per hour. A combined total weight of 824 lbs. of targeted recyclables were recovered from these vehicles, an average of about 15 lbs. per vehicle. Used oil/antifreeze, electronics, and scrap metal are currently collected separately but all other materials are comingled for disposal. Consolidated results and raw data are provided in the appendix to this report.

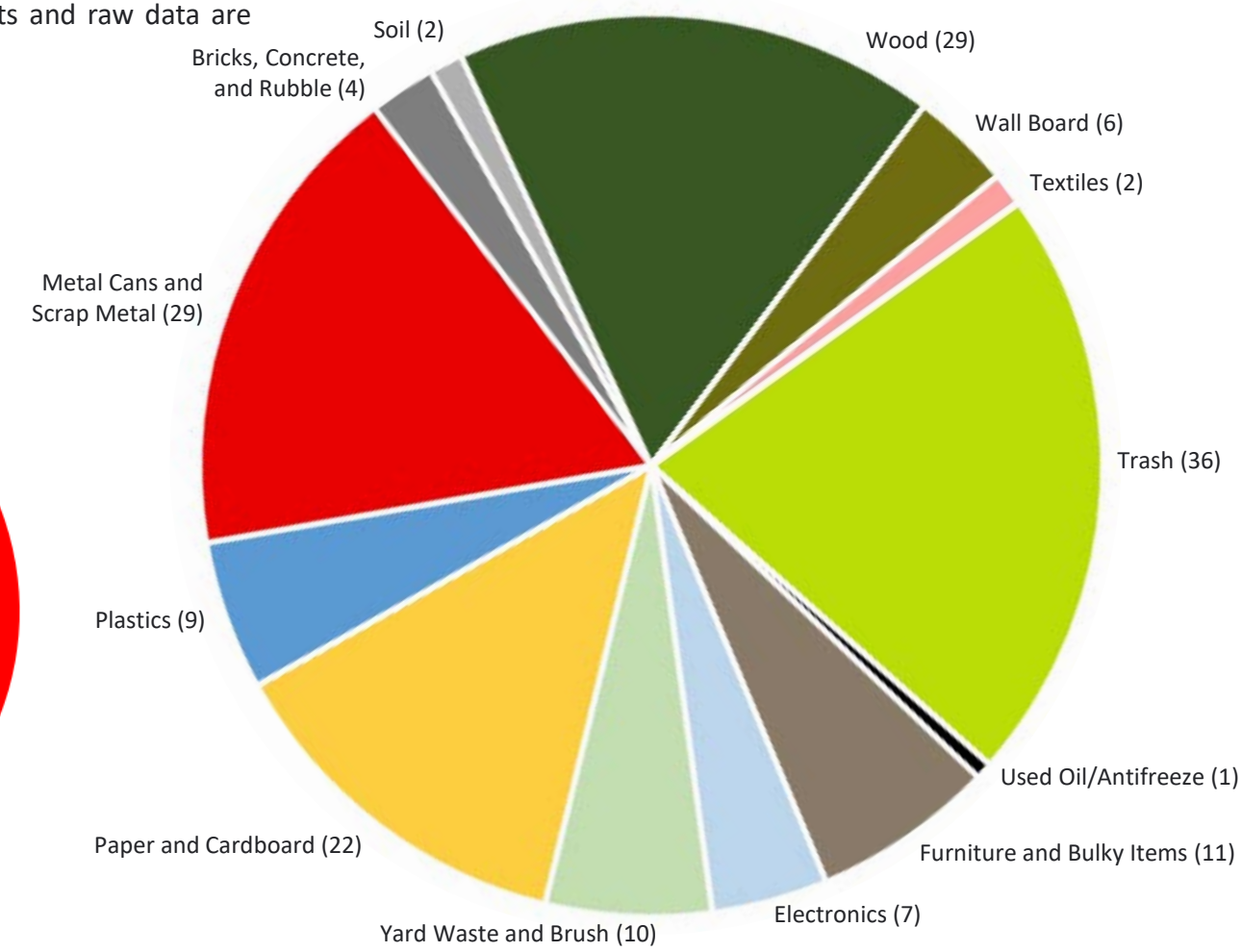
Breakdown of Recovered Recyclables by Weight

Chart shows percentage of total weight of recovered recyclables. No glass was recovered.



Breakdown of Vehicle Loads based on Visual Observation

Chart shows number of vehicles observed to drop off material class in question. Glass and asphalt/shingles were not observed.



Sisson Street Drop-Off Facility

Number of Vehicles using the Facility

Cars
Total = 11

SUVs/Minivans
Total = 19

Pickup Trucks
Total = 35

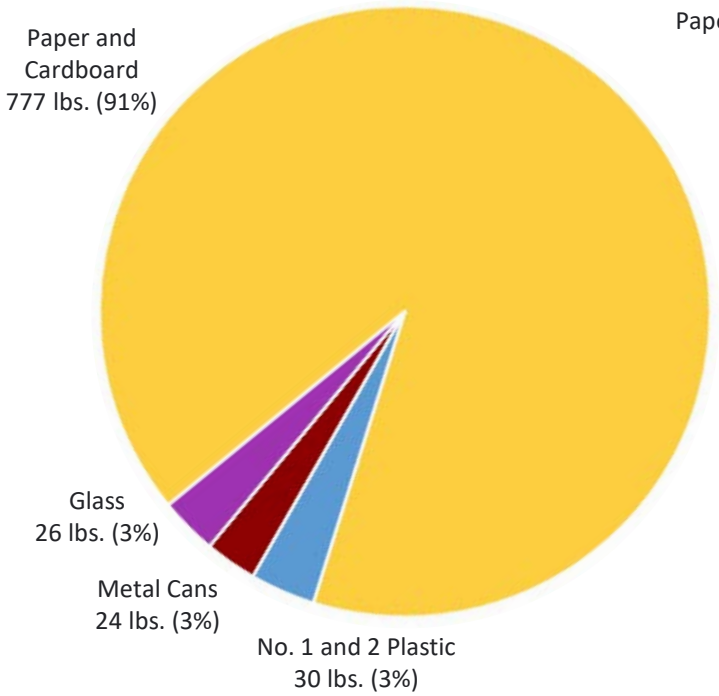
Time indicates number of vehicles using the facility in preceding 30 minutes

Composition

In total, 65 vehicles used the Sisson Street Convenience Center in the 6½ -hour period of observation between 9:00am and 3:30pm, an average of 11.1 vehicles per hour. A combined total weight of 856 lbs. of mixed recyclables were received from these vehicles, an average of about 13 lbs. per vehicle. Sisson St. provides separate collection of used oil/antifreeze, household hazardous waste (HHW), electronics, scrap metal, hard plastic, mixed recyclables, and trash. Consolidated results and raw data are provided in the appendix.

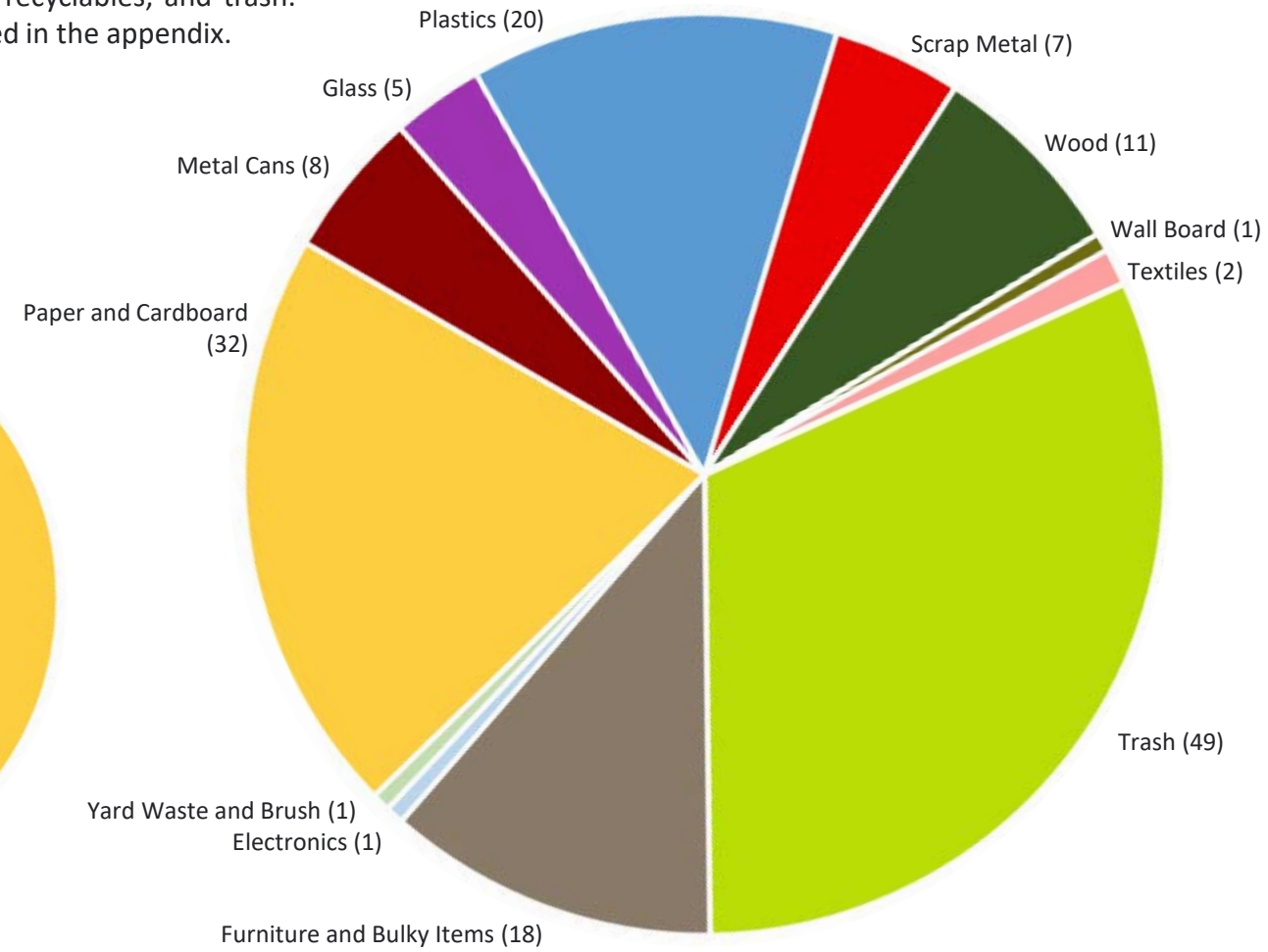
Breakdown of Recovered Recyclables by Weight

Chart shows percentage of total weight of mixed recyclables received.



Breakdown of Vehicle Loads based on Visual Observation

Chart shows number of vehicles observed to drop off material class in question. Used oil/antifreeze; HHW; asphalt/shingles; bricks, rubble, and concrete; and soil were not observed.



trailers of mixed recyclables at Sisson Street

Left photo: 9:00am; Right photo: 3:15pm, 1 February 2019

NWTS Small-Hauler Loads

The final component of the Winter 2019 sorting event was one day of visual observation and recording of the drop-off facility (DOF) at NWTS (although the transfer station was closed for renovations, the DOF remained in operation). The primary goal of the visual waste sort is to gain a quasi-quantitative measure of the materials delivered to the facility by licensed small haulers, focusing on C&D debris. This will help inform the master planning effort as to the potential for recovery and reuse/recycling of C&D debris.

Procedures for Visual Waste Sort

The DOF at NWTS is a raised drop-off platform that allows six or seven vehicles to unload simultaneously into two trailers. Electronics and scrap metal are collected separately, but otherwise no effort to separate waste is made. The DOF is free for City residents although licensed small haulers must pay a fee to use the facility. All vehicles entering the facility pass over the scale.

Working in tandem, the sort crew would intercept vehicles approaching the platform to inform drivers of the procedures. To the extent possible given the volume of traffic, the sort crew conducted a visual observation and recording of trash, C&D debris, and other materials being unloaded. Drivers were also interviewed about the source and nature of their loads. In general, small haulers were bringing waste from small residential construction projects or from cleanouts of basements, storage units, or abandoned buildings.

Vehicle license tag numbers were noted to allow correlation with scale house records. A visual assessment of the composition of vehicle loads was made on a volumetric basis. Using published volume-to-mass conversion factors, the proportional weight of materials per load was calculated, and then the total weight of the load estimated from comparison to scale house records.

Sample Classifications

No physical sorting of materials was conducted. Sixteen visual classification categories were established, of which five were focused on C&D debris (i.e., bricks/rubble/concrete/plaster, soil, wood, asphalt/shingles, and wall board).

Small hauler drop off activity

Cars
Total = 3

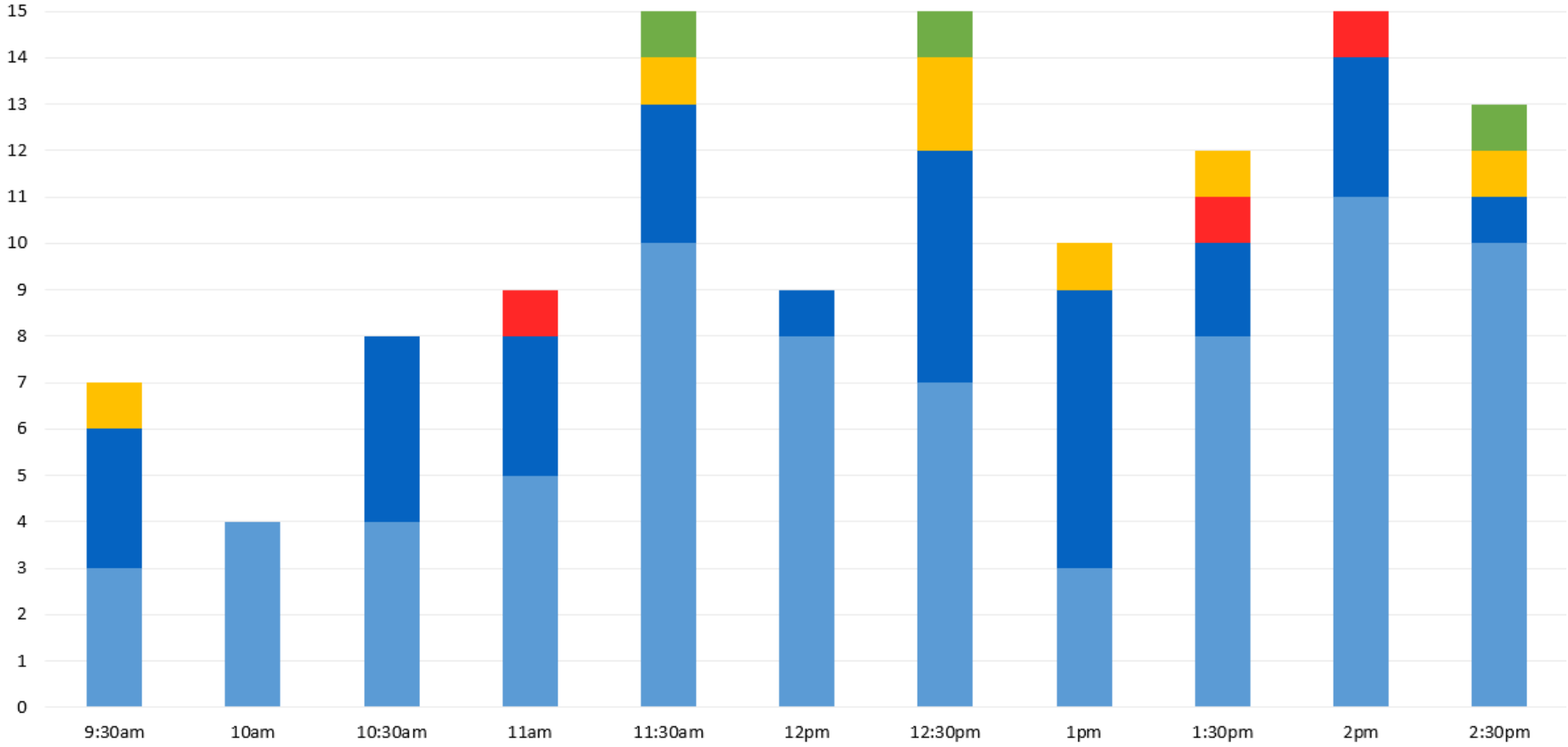
SUVs/Minivans
Total = 7

Pickup Trucks
Total = 73

Modified Trucks
Total = 31

Box Trucks
Total = 3

Time indicates number of vehicles using the facility in preceding 30 minutes



Number of Vehicles using the Facility

Composition

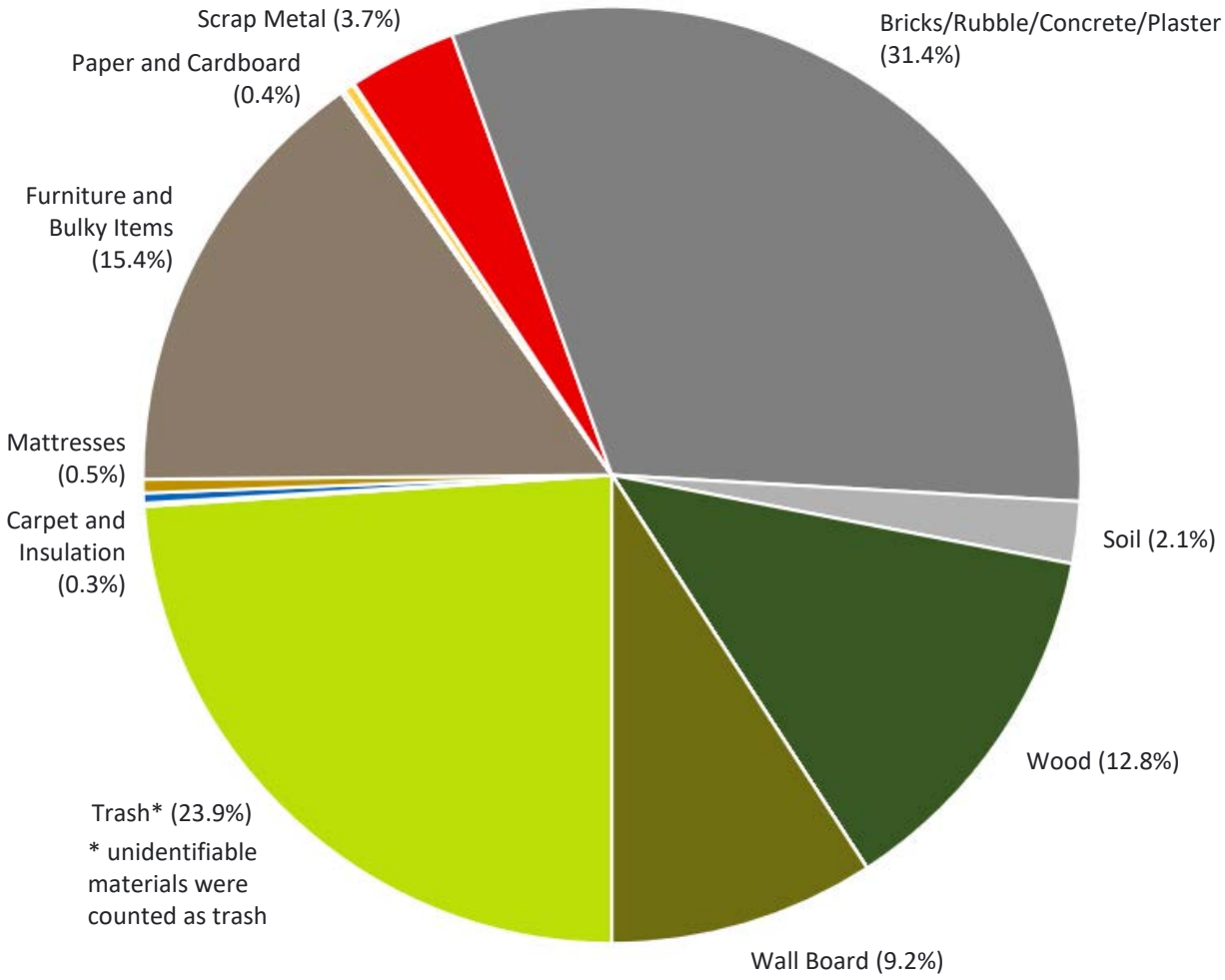
In total, 117 vehicles were observed using the NWTS drop-off facility in the 5½ -hour period of observation between 9:00am and 2:30pm, an average of 21.3 vehicles per hour. Of these, a visual sort of 105 vehicles (90% of total) was conducted by the sort crew. 91 vehicles (78% of total) were logged at the scale house as coming from licensed small haulers or other fee-paying customers.

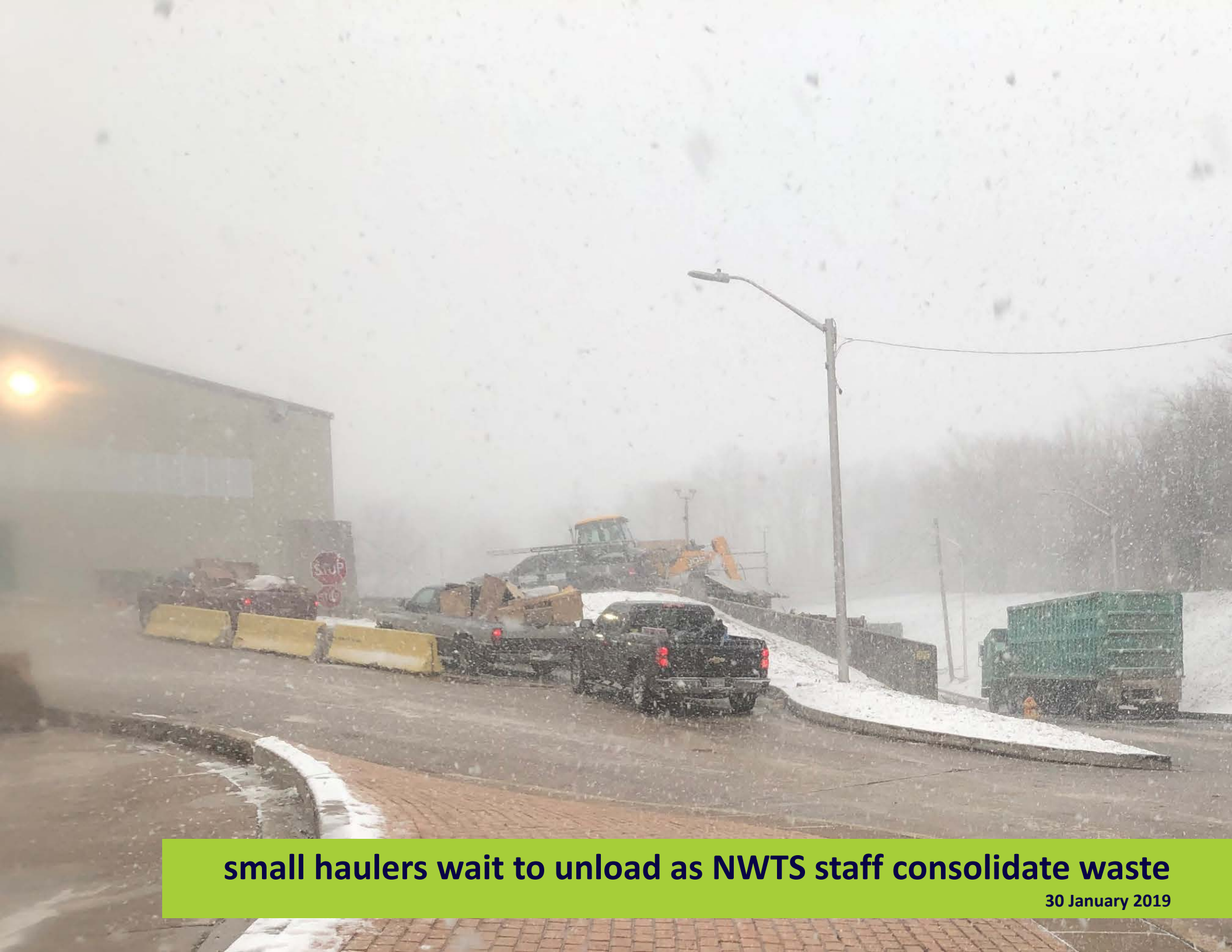
The chart shows total average proportion by weight of drop-off materials in the 105 vehicles visually sorted by the sort crew. Estimates are based on the observed (qualitative) volumetric composition of each load converted to mass using published conversion factors. Consolidated results and raw data are provided in the appendix.

The NWTS scale house recorded 91 transactions by 53 different licensed small haulers and 16 cash customers (e.g., residents using rented trucks) during the period of observation. The total tonnage recorded for these transactions was about 60 tons, an average of about 1,315 lbs. per load. This average load size was used to estimate the percentage composition presented in the chart.

Electronics were observed being delivered by 8 vehicles but were set aside and are thus not included in the chart. Glass, plastics, and asphalt/shingles were not observed in any loads. Textiles and yard waste comprised less than 0.1% of calculated loads by mass and are omitted from the chart.

Breakdown of Total Vehicle Loads by Weight based on Visual Sort





small haulers wait to unload as NWTS staff consolidate waste

30 January 2019

4. Statistical Analysis

Methodology

Sorting of residential trash and recycling was conducted in general accordance with the methods outlined in ASTM D5231-92 (2016), although aspects of the procedure were modified to meet the requirements and scope of the current project. Detailed statistical analysis of the data will be completed after the Summer 2019 waste sort. In this interim report, the analysis is limited to confirming the statistical representability of the sample size.

Estimating the Sample Size

During planning, the total number of samples to be sorted was estimated as a function of the expected waste components and the desired precision as applied to each component per the procedure outlined in ASTM D5231-92 (2016). In brief, mean and standard deviation values for each expected waste component were first approximated from representative data. For this, recent waste composition data from Anne Arundel County were used. Using a confidence interval of 90% and a precision of 10%, it was estimated that 25 to 38 samples would be required depending on whether food scraps, plastics, or paper/cardboard were the governing component of the unprocessed waste stream. It was assumed that about five or six samples (i.e., sampling from five or six different trucks) could be sorted each day, which corresponded to a conservative total of 40 to 48 samples over eight days of sorting. This gave confidence that enough samples could be obtained within the eight-day window. 200 to 300 lbs. samples were selected from each load for sorting as recommended in ASTM D5231-92 (2016).

Confirming the Statistical Representability of the Sample Size

Following the waste sort, the mean and standard deviation value of each waste component was calculated to confirm that the sample size was large enough to be statistically representative of the total waste stream. For the trash sorts, food scraps were found to be the largest component of the waste stream (see results on p.9), comprising an average of 25.5% by weight with standard deviation (SD) of 7.2%. As the largest component of the waste stream, food scraps were chosen as the "governing component" to confirm the required number of samples for the sort per the recommended procedure in ASTM D5231-92 (2016). With a confidence interval of 90% and a precision of 10%, it was determined that a total of 24 samples (i.e., fewer than the 33 trash samples actually sorted) were required to produce a statistically representative dataset. Using the same procedure for the recycle sorts, it was found that cardboard was the most important component of the waste stream at an average of 53% by weight (SD = 9.1%). Using cardboard as the governing component of the curbside recycle stream with a confidence interval of 90% and a precision of 10%, it was determined that a total of 10 samples were required to produce a statistically representative dataset (again, fewer than the 12 recycle samples actually taken). Therefore, the sample size is adequate to produce meaningful results. Details are provided in the appendix.

Note: This analysis pertains to multi-day sorting events only. Results from one-day observations at drop-off facilities provide a "snapshot" of recycling habits in the City but are not statistically representative.

5. Summary Review of Findings

Residential Trash

The largest single component of trash was food scraps at 25.5%, which suggests that establishing a food waste composting or anaerobic digestion program could significantly reduce the size of the waste stream going to landfill disposal or incineration.

Samples showed limited variability between the four collection quadrants, but there was notable variability between each load.

Yard waste was low at 6.9% of the waste stream, which is as expected given the lack of gardening during winter. Results were highly variable between loads and were skewed by the occasional Christmas tree, illustrating an important seasonal effect.

Mixed plastics (excl. no. 1 and 2 plastics) were relatively abundant, comprising 17.5% of the waste stream. If recycling options for these materials can be identified, the size of the waste stream going for landfill disposal or incineration could be significantly reduced.

The overall content of recyclable paper and cardboard was relatively low at 6.1% and 8.6%, respectively. Similarly, the percentage of other recyclables (i.e., aluminum, no. 1 and 2 plastics, ferrous metals, and glass) in trash loads was low.

Single-Stream Recycling

Recycle loads were dominated by cardboard (53%), which likely reflects the growing importance of online shopping for home delivery in many City households. Given the low overall content of this material in curbside trash, households appear to be doing a good job overall at separating cardboard for recycling.

Recycle loads exhibited more variability between the four collection quadrants than trash; however, this may reflect the smaller total sample size (i.e., 12 recycle loads vs. 33 trash loads). Cardboard and mixed paper were the two most variable material classes.

The percentage of rejects in recycling loads was only 6.1%, significantly below industry reported average rates of contamination of 20% or more. However, mixed plastics and mixed paper were sorted separately and found to comprise an average 19.7% and 6.5% of loads, respectively. Many components of these two classes are not currently recyclable – if half of their contents was added to rejects as a truer estimate of contamination levels, for example, the overall contamination rate would rise to about 19%.

The percentage of glass in recycling (7.5%) was double that of trash (3.7%); however, the percentage of aluminum, no. 1 and 2 plastics, ferrous metals, and glass did not differ significantly between trash and recycling loads. This suggests these materials represent only a small component of the potential recycling stream.

Drop-Offs and Small Haulers

Resident used the QRL and Sisson St. drop-offs at a rate of about 7 to 11 vehicles/hour. An average of 13 to 15 lbs. of recyclables were recovered from each vehicle. DPW offers recycling of scrap metal and electronics at both facilities; however, separate recovery of mixed recyclables is not offered at QRL.

Small haulers brought an average of 1,315 lbs./load to NWTS at a rate of about 21 vehicles/hour. C&D debris comprised 55% of all loads on average. A system to collect these materials separately for reuse/recycling could make a positive impact on landfill disposal.

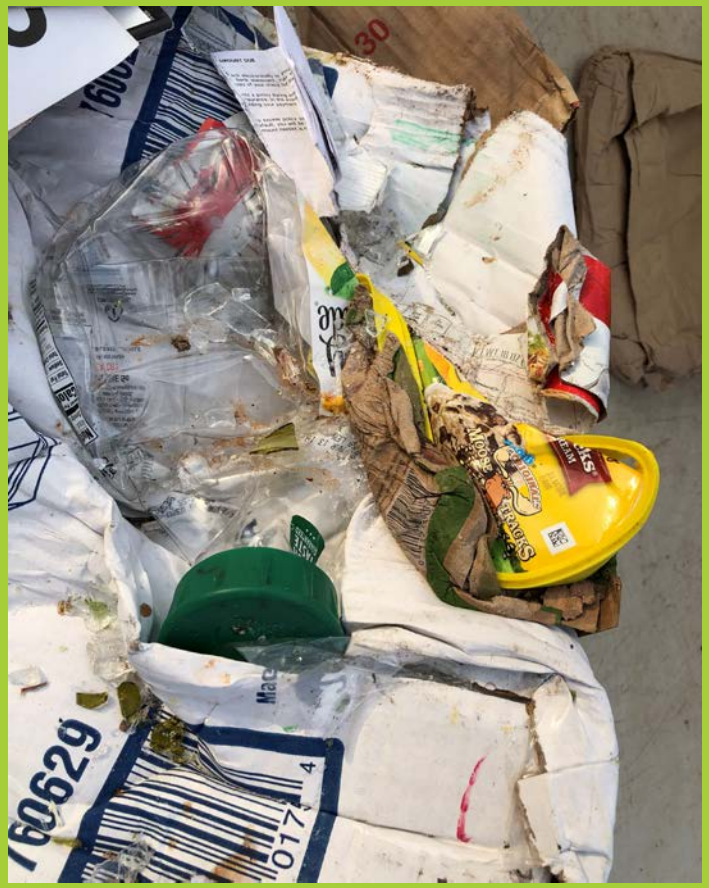
single-stream curbside recyclables from a DPW load-packer

25 January 2019

the issue of contamination in single-stream recycling

Many jurisdictions are grappling with how to provide cost-effective recycling services while maintaining the quality and marketability of the materials collected. While single-stream collection (i.e., all materials in one bin) is convenient for households, it often leads to high contamination rates. Keeping materials clean and dry is one challenge. However, the simple act of comingling different materials in single-stream systems can also jeopardize quality. Glass is especially problematic as bottles often break, which can contaminate the entire load with dangerous and difficult-to-remove shards as well as leaking beer, wine, and other residues.

In the **picture on the left**, various recyclables have been compacted together inside DPW's load-packer truck, making the job of separating these materials more difficult. A PETE plastic bottle has been squashed into a cardboard box along with various other wet food packaging (incl. a cardboard ice cream tub with a plastic rim). Pieces of broken glass are also present. The close-up **picture on the right** shows wet cardboard (likely from an open-top bin left out in the rain) into which shards of broken glass have been ground during compaction in a load-packer truck. These materials may be too contaminated to recycle and need to be sent for landfill disposal.



Both photographs from recycling load R2-3188 on 25 January 2019

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