Regional District of North Okanagan
2021-2022 Waste Composition Study

PRESENTED TO
Regional District of North Okanagan

OCTOBER 24, 2022
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EXECUTIVE SUMMARY

Tetra Tech Canada Inc. (Tetra Tech) was retained by the Regional District of North Okanagan (RDNO) to conduct a two-season waste composition study for municipal solid waste being disposed at the Greater Vernon Diversion and Disposal Facility (GVDDF). The waste sorting activities were conducted in Fall 2021 and Spring 2022. The objectives of this study were as follows:

- Obtain waste composition data from various sectors such as residential, commercial, and construction and demolition sectors.

- Obtain data on discarded extended producer responsibility (EPR) materials in the waste stream and to assess the effectiveness of EPR programs.

- Estimate the amount of food waste disposed at the GVDDF and to establish a baseline for the future Commercial Food Waste Disposal Regulation and Municipal Curbside Organics Collection Programs.

- Evaluate the performance of various RDNO waste diversion programs, particularly: Yard & Garden and Wood Waste Diversion and Household Hazardous Waste.

- Identify materials that may be targeted for potential new program initiatives.

- Provide data to assist in updating the region's Solid Waste Management Plan in 2023.

- Compare the Fall 2021 and Spring 2022 results to other previous studies such as the Summer 2012 study.

Sampling and sorting were conducted in accordance with the methodology set out in the Provincial Waste Characterization Framework that was prepared by the Canadian Council of Ministers of the Environment (CCME)[1]. Tetra Tech's field lead worked closely with the RDNO and GVDDF operations staff to identify loads for sampling that are representative of each waste sector. Details of the sampling methodology can be found in Section 2.1 and material categories are discussed in Section 2.2.

The regional composition of the waste disposed at the GVDDF was calculated based on the "by sector" waste composition results from the Fall 2021 and Spring 2022 sorting events, and the proportion of the waste disposed "by sector". Results from the two sorting events were equally weighted to give an overall estimate of the waste composition of the garbage stream. The following pie chart summarizes the average composition of the waste received at the Greater Vernon GVDDF for this study.

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[1] Canadian Council of Ministers of the Environment. 1999. Recommended Waste Characterization Methodology for Direct Waste Analysis Studies in Canada. Prepared under contract by SENES Consultants Limited.
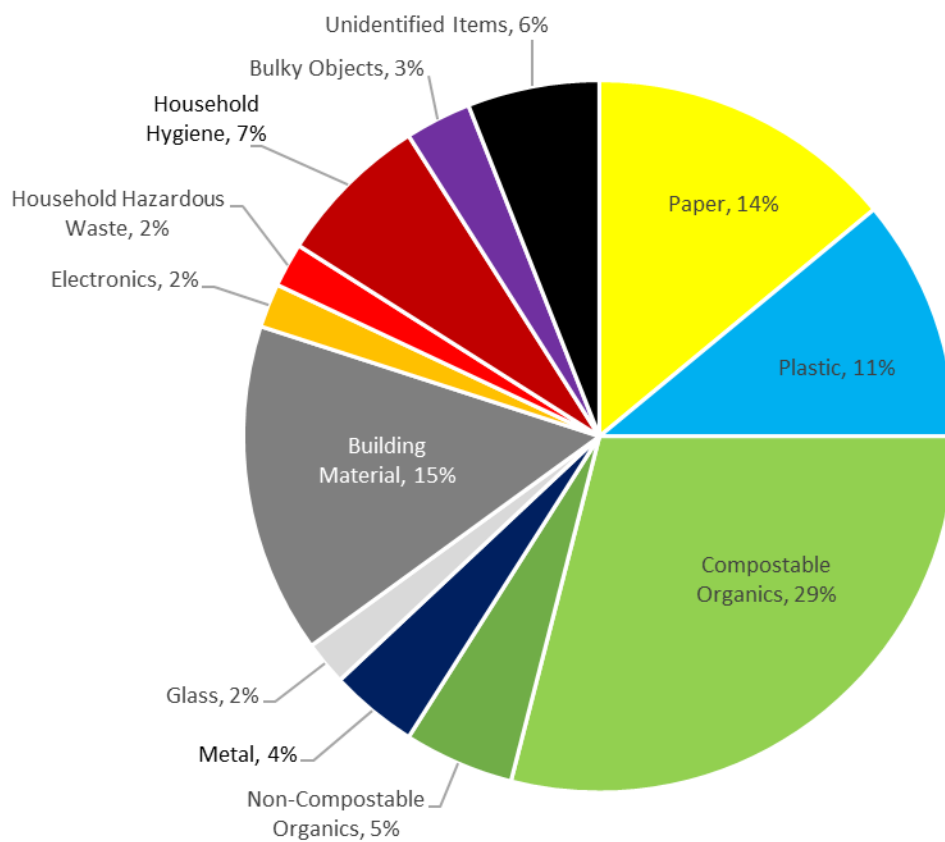
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**Figure 1: Regional Composition of Waste Disposed at the Greater Vernon GVDDF
(Fall 2021 and Spring 2022)**

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ACRONYMS & ABBREVIATIONS

Acronyms/Abbreviations	Definition
BCUOMA	BC Used Oil Management Association
BDL	Brewers Distributor Limited
CBA	Canadian Battery Association
CCME	Canadian Council of Ministers of the Environment
CESA	Canadian Electrical Stewardship Association
CRD	Construction, Renovation & Demolition
DO	Public Drop-Off
EPR	Extended producer responsibility
GRO	Grocery stores
GVDDF	Greater Vernon Diversion and Disposal Facility
HPSA	Health Products Stewardship Association
HRAI	Heating, Refrigeration and Air Conditioning Institute of Canada
ICI	Industrial, Commercial, and Institutional
MARR	Major Appliance Recycling Roundtable
MF	Multi-Family
OPEIC	Outdoor Power Equipment Institute Canada
RDNO	Regional District of North Okanagan
SF	Single Family
Tetra Tech	Tetra Tech Canada Inc.

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LIMITATIONS OF REPORT

This report and its contents are intended for the sole use of the Regional District of North Okanagan and their agents. Tetra Tech Canada Inc. (Tetra Tech) does not accept any responsibility for the accuracy of any of the data, the analysis, or the recommendations contained or referenced in the report when the report is used or relied upon by any Party other than the Regional District of North Okanagan, or for any Project other than the proposed development at the subject site. Any such unauthorized use of this report is at the sole risk of the user. Use of this document is subject to the Limitations on the Use of this Document attached in the Appendix A or Contractual Terms and Conditions executed by both parties.

NOTE TO THE READER

The samples collected and characterized for this study are "snapshots" in time, meaning the reported quantities are estimates and only represent the conditions for the period of time in which they were collected. Annual variability, weather, and other factors can affect the amount and composition of waste and recyclables generated by the various sectors at any given time. Even with combined educational, regulatory and financial initiatives the reader should not assume that it is necessarily easy, practical, or economical to recover a substantial portion of a disposed material from a mixed waste stream or at its source.

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1.0 PROJECT OVERVIEW AND OBJECTIVES

Tetra Tech Canada Inc. (Tetra Tech) was retained by the Regional District of North Okanagan (RDNO) to conduct a two-season waste composition study for municipal solid waste being disposed at the Greater Vernon Diversion and Disposal Facility (GVDDF). The waste composition study was conducted in Fall 2021 and Spring 2022. The objectives of this study were as follows:

- To obtain waste composition data from various sectors such as residential, commercial, and construction and demolition sectors.

- To obtain data on discarded extended producer responsibility (EPR) materials in the waste stream and to assess the effectiveness of EPR programs.

- To estimate the amount of food waste disposed at the GVDDF and to establish a baseline for the future Food Waste Ban.

- To evaluate the performance of various RDNO waste diversion programs, particularly: Yard & Garden and Wood Waste Diversion and Household Hazardous Waste.

- To identify materials that may be targeted for potential new program initiatives.

- To provide data to assist in updating the region's Solid Waste Management Plan in 2023.

- To compare the Fall 2021 and Spring 2022 results and to compare those results with other previous studies such as from the Summer 2012 study.

The sorting event for Fall 2021 was undertaken from October 18 to October 27, 2021 (inclusive) and the Spring 2022 sorting event was undertaken from April 3 to April 9, 2022 (inclusive). A sampling plan was developed in conjunction with RDNO staff. Efforts were made to obtain samples representative of the entire GVDDF service area. The total number of samples collected and characterized during the sorting events are summarized by sector in Table 1-1.

The sectors characterized are defined as follows:

- **Single Family (SF)**: typically, curbside collected waste streams from SF households, row houses, townhouses, and duplexes. This stream was predominantly from the City of Vernon and District of Coldstream.

- **Industrial, Commercial, and Institutional (ICI)**: including Multi-Family (MF) residences, typically waste from light industrial, commercial, and institutional sources and multi-family buildings. Waste from these sources is typically collected by private sector service providers from dumpsters.

- **Grocery (GRO)**: typically, waste disposed from grocery stores and other businesses that typically generate more food waste compared to other commercial businesses.

- **Public Drop-Off (DO):** waste from residents and/or small businesses that would self-haul and drop-off materials that are not typically collected from the curbside collection program. The waste material is commonly deposited into 40-yd^3 bins (at the GVDDF) and aggregated together.

- **Construction, Renovation & Demolition (CRD):** waste material from construction and demolition activities; includes waste generated from new construction, renovation, and demolition projects.

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Table 1-1: Number of Samples Collected by Sector (Spring 2022 and Fall 2021)

Sector	Fall 2021 Samples (garbage only)	Spring 2022 Samples (garbage only)
Single family (SF)	11	14
Industrial, Commercial, and Institutional (ICI), including Multi-Family (MF)	14	12
Grocery (GRO)	5	4
Public Drop-Off (DO)	5	7
Construction, Renovation & Demolition (CRD)	6	7
Total	**41**	**44**

2.0   METHODOLOGY

Sampling and sorting were conducted in accordance with the methodology set out in the Provincial Waste Characterization Framework that was prepared by the **Canadian Council of Ministers of the Environment (CCME)**[2]. Tetra Tech's field lead worked closely with the RDNO and GVDDF operations staff to identify loads for sampling that were representative of each waste sector. As selected sampling loads arrived at the GVDDF, Tetra Tech's field lead would communicate with the scale and loader operators to ensure the target load was emptied at the designated area for sampling. Sample information was collected for each load and included details such as origin of waste, photograph of sample(s), and load weight (scale receipts).

Samples were sorted by Tetra Tech staff who were trained in safety and waste sorting procedures. Personal protective equipment such as safety glasses, steel-toe boots, gloves, and hi-vis vests were worn by all staff according to Tetra Tech's Health and Safety Plan. Tailgate meetings were conducted daily at the start of each day to discuss safety concerns including how to handle material hazards such as sharps and hazardous materials, safe lifting practices, and working around large moving equipment. Prior to the start of the sorting event, all Tetra Tech sorting staff completed a site-specific safety orientation with RDNO staff.

2.1   Sample Collection Methodology

The following describes the collection approach for the various waste streams characterized. Tetra Tech's field supervisor worked closely with RDNO staff to identify and select loads to be characterized for the targeted waste sectors as they arrived at the GVDDF.

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[2] Canadian Council of Ministers of the Environment. 1999. Recommended Waste Characterization Methodology for Direct Waste Analysis Studies in Canada. Prepared under contract by SENES Consultants Limited.

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2.1.1 Single Family

Residential curbside collection loads were selected with input from RDNO staff. Loads were received from the City of Vernon and the District of Coldstream. Trucks were redirected to a designated tip face area (Photo 2-1) where the entire load was tipped (as typical operations). Tetra Tech staff would collect a sample that was approximately 100 kg. The collected material would be taken to a designated sorting area where the Tetra Tech sorting team would sort the sample into its respective categories and weigh the categories.

Photo 2-1: Examples of Typical SF Garbage Loads

2.1.2 Commercial

Commercial or ICI loads were delivered to the GVDDF in front-load trucks. Target loads were identified by Tetra Tech and GVDDF staff and were directed to unload their contents at the designated tip face area (Photo 2-2). At the area, trucks would tip their entire load (as typical operations). Tetra Tech staff would characterize the contents in the roll off bins using a combination of approaches – depending on the percentage of bagged garbage relative to the total volume in the pile. If the load was found to have less than 30% bagged garbage, a volume-based visual estimate was conducted, but if the load was found to have more than 70% bagged garbage then a sample that is approximately 100 kg would be collected and hand sorted. If the sample was to be hand sorted, Tetra Tech staff would then collect a sample that consists of approximately 100 kg and transport that material to the designated sorting area. At the sorting area, the Tetra Tech sorting team would sort the sample into its respective categories and weigh the categories.

Photo 2-2: Typical Truck and Garbage Load from the Commercial Sector

2.1.3 Commercial – Loads from Grocery Stores

Commercial loads from grocery stores and other businesses that generate food waste were selected to obtain a better understanding of the proportion of food waste being discarded. These loads were identified by Tetra Tech and GVDDF staff and redirected to unload their contents at the designated tip face area (Photo 2-3). Tetra Tech staff would then collect a sample that is approximately 100 kg and transport the collected material to the designated sorting area. At the sorting area, the Tetra Tech sorting team would sort the sample into its respective categories and weigh the categories.

Photo 2-3: Typical Garbage Loads from Grocery Stores

2.1.4 Public Drop-Off

Residents can dispose of their bulky and excess materials into designated roll off bins (Photo 2-4) located at the GVDDF in the public drop-off area. Tetra Tech's site supervisor would coordinate with RDNO staff to have the roll off bins tipped and emptied at the tip face. At the area, trucks would tip their entire load (as typical operations). Tetra Tech staff conducted visual estimates of the entire load to determine the composition.

Photo 2-4: Public Drop-Off Area at the GVDDF and an Example of Material Tipped from a Roll Off Bin

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2.1.5 CRD Loads

CRD loads were generally from commercial and residential sources. These loads were directed by GVDDF staff to unload their contents at the designated tip face area (Photo 2-5). Tetra Tech staff would then conduct visual estimates of the entire load to identify the composition of each load.

Photo 2-5: Typical CRD Samples at the GVDDF

2.2 Material Categories

A comprehensive list of material categories along with their descriptions is included in Appendix B. During the sorting event, waste materials were classified into 12 primary categories, which were further broken down into 121 secondary categories. These sorting categories were selected and approved by RDNO staff. These categories were used for both visual estimates and hand sorted materials.

The 12 primary categories include the following:

- Paper and paperboard;
- Plastic;
- Metal;
- Glass;
- Electronics;
- Bulky objects;
- Building material;
- Household hygiene; and
- Compostable organics;
- Non-compostable organics;
- Household hazardous waste;
- Unidentified items (i.e., fines and bagged garbage).

Tetra Tech field staff transported collected samples to be hand sorted at the designated sorting area (Photo 2-6). Each categorized item was placed into respective bins. The contents of each bin were then weighed and recorded to determine the weight for each secondary category.

As an addition for the Spring 2022 event, materials belonging to four categories were aggregated (if they belong to multiple secondary categories) and counted. The four categories were:

- Deposit beverage containers, including containers made of paper, plastic, metal, and glass.

- Paper packaging - polycoat liquid cups;

- Batteries, all types; and

- Lightbulbs, all types.

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Photo 2-6: Designated Sorting Area at the GVDDF

3.0 WASTE COMPOSITION RESULTS

The following summarizes the waste composition results for the different sectors. Waste composition results for all samples are presented in Appendix C. Selected photographs that highlight the waste sorting events and samples collected and sorted are included in Appendix D.

Results are presented by primary category. Primary category percentages were calculated by aggregating all sample data for each sector. An average percentage by weight was determined by each sector type. For samples where visual estimates were conducted, the volume-based percentages were converted into weight-based percentages (see Appendix E for specific densities for each material category).

3.1 Waste Composition Results

The composition of the waste disposed at the Greater Vernon GVDDF was calculated based on the "by sector" waste composition results from the Fall 2021 and Spring 2022 sorting events, and the proportion of the waste disposed "by sector". Table 3-1 shows the proportion of waste disposed at the Greater Vernon GVDDF in 2021.

Table 3-1: Amount of Waste Received at the Greater Vernon GVDDF in 2021

Sector/Subsector	Amount Received (tonnes)	Proportion of Waste Disposed
Residential	11,615	35%
ICI	11,280	34%
ICI – Grocery Stores	1,000	3%
DO	5,525	17%
CRD	3,692	11%
Total	**33,112**	**100%**

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The overall average waste composition of the garbage stream received at the Greater Vernon GVDDF is summarized on Figure 3-1. For details on the calculation of the average waste composition and the average compositions of the waste from each sector and subsector, see Appendix C.
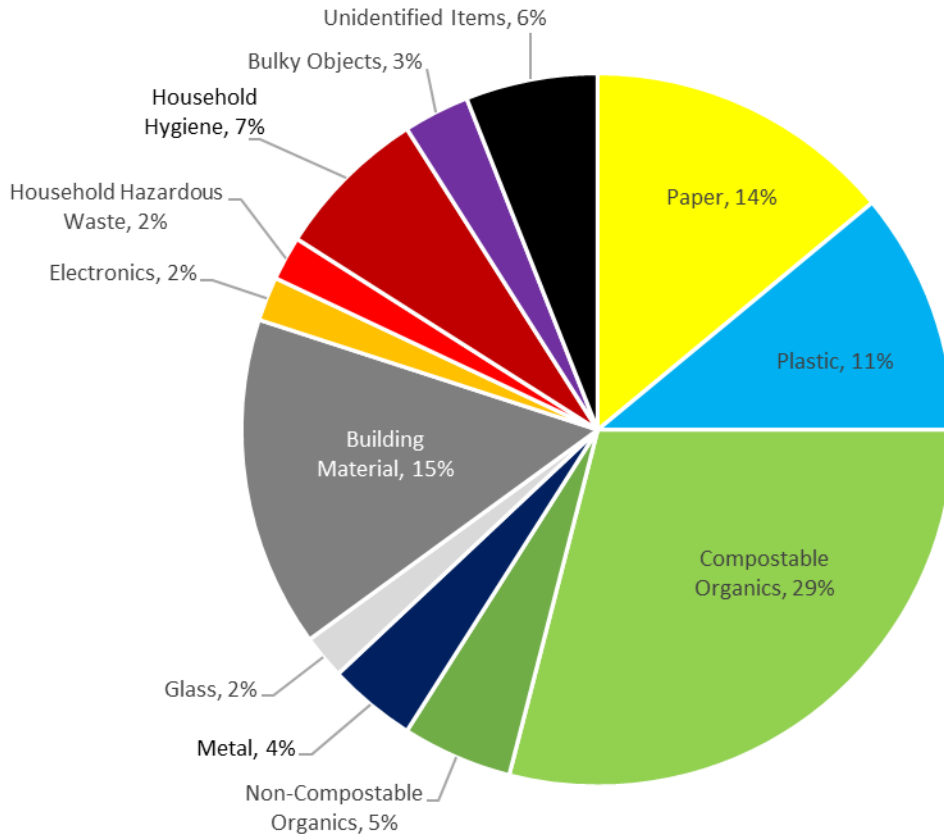
Figure 3-1: Regional Waste Composition of the Garbage Stream Received at the Greater Vernon GVDDF (Fall 2021 and Spring 2022)

3.2   Residential Sector

The residential sector represents waste disposed from SF homes collected from the City of Vernon and the District of Coldstream. The overall average waste composition from the residential sector is summarized on Figure 3-2. Details that explain how the average residential waste composition was calculated are discussed below.

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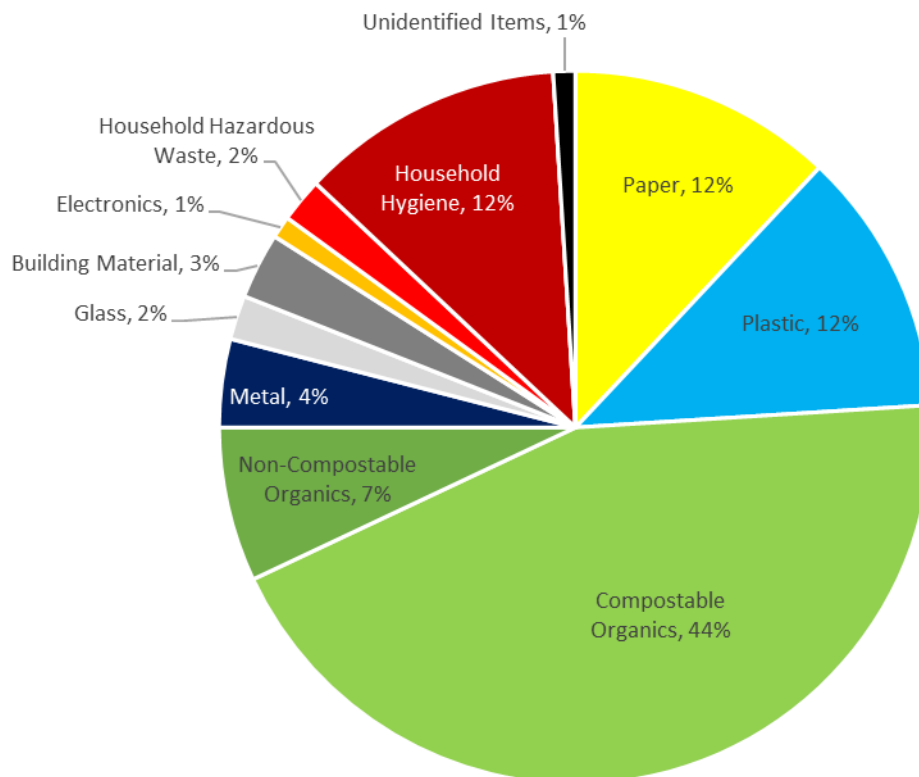
**Figure 3-2: Average Composition of Waste from the Residential Sector
(Fall 2021 and Spring 2022)**

3.2.1 City of Vernon Single Family Garbage

The following summarizes the waste composition results and diversion potential for SF garbage from the City of Vernon for the Fall 2021 and Spring 2022 sorting events. Residential garbage from the City of Vernon represents about 80% of the residential sector for waste that is disposed at the Greater Vernon GVDDF.

3.2.1.1 Summary of Fall/Spring Sample Sessions

Results from the Fall 2021 and Spring 2022 studies for SF garbage from the City of Vernon have been combined in Table 3-2. The overall mean was calculated by equally weighting the means from Fall 2021 and Spring 2022.

Overall, the SF garbage from the City of Vernon was primarily composed of compostable organics (44%), plastic products (12%), paper products (12%), and household hygiene (12%). These four primary categories represent 80% of the waste stream.

The compostable organics category consisted mainly of avoidable food waste (18.2%), small yard and garden waste (17.7%), and backyard compostable unavoidable food waste (6.5%).

Plastic products included other flexible plastic packaging (2.8%), durable plastic products (2.5%), recyclable rigid plastic packaging #1-7 (1.7%), and other film non-packaging – film products (1.5%).

Paper products consisted mainly of food soiled paper (6.2%), fine paper (2.2%), and corrugated cardboard and boxboard (2.0%).

In the household hygiene category, there was mainly other household hygiene (6.5%) and pet waste (5.3%).

Table 3-2: Waste Composition Results for the SF Garbage Stream from the City of Vernon for Fall 2021 and Spring 2022

Primary Category	Fall 2021	Spring 2022	Overall
Paper	13%	11%	12%
Plastic	11%	13%	12%
Compostable Organics	48%	41%	44%
Non-Compostable Organics	4%	10%	7%
Metals	2%	5%	4%
Glass	2%	3%	2%
Building Material	2%	4%	3%
Electronic Waste	1%	1%	1%
Household Hazardous	1%	1%	2%
Household Hygiene	14%	10%	12%
Bulky Objects	1%	0%	0%
Unidentified Items	1%	1%	1%

3.2.1.2   Comparison of Fall 2021 and Spring 2022 Results

Figure 3-3 presents the composition of the SF residential garbage stream from the City of Vernon for the Fall 2021 and Spring 2022 sorting events.

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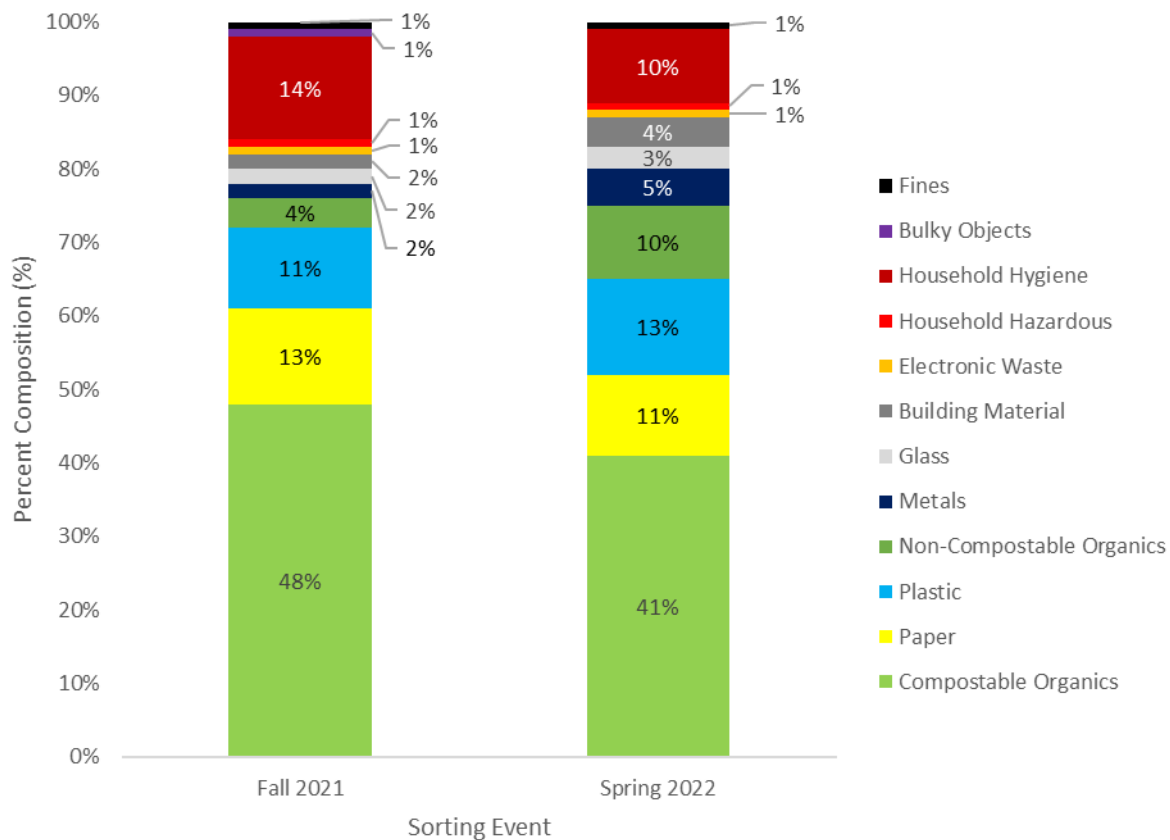
Figure 3-3: Comparison of Fall 2021 and Spring 2022 Compositions for the SF Residential Garbage Stream from the City of Vernon

Differences between the Fall 2021 and Spring 2022 results for Vernon's SF garbage stream include:

- Compostable organics decreased from 48% in Fall 2021 to 41% in Spring 2022. Table 3-3 shows a detailed breakdown of the changes in the secondary categories within the compostable organics category. A notable difference is the drop in avoidable food waste in Spring 2022. This decrease may have been partially due to the fact that the Fall 2021 sorting event was conducted the week after Thanksgiving, while the Spring 2022 sorting event did not follow any major holiday.

- Non-compostable organics increased from 4% in Fall 2021 to 10% in Spring 2022. Comparing the secondary categories, there was a noticeable difference in the percentage of textiles (3.8% in Fall 2021 and 9.4% in Spring 2022).

- Household hygiene decreased from 14% in Fall 2021 to 10% in Spring 2022. Looking at the secondary categories, there was a difference in the amount of pet waste (7.7% in Fall 2021 and 2.9% in Spring 2022).

Table 3-3: Composition of the Compostable Organics Category in the SF Residential Garbage Stream from the City of Vernon for Fall 2021 and Spring 2022

Category	Fall 2021	Spring 2022	Overall
Small yard and garden	18.8%	16.6%	17.7%
Large yard and garden	0.0%	0.5%	0.2
Unavoidable food waste – backyard compostable	6.0%	6.9%	6.5%
Unavoidable food waste – non-backyard compostable	1.7%	0.7%	1.2%
Avoidable food waste	20.9%	15.6%	18.3%
Other compostable organics	0.6%	0.2%	0.4%
Total Compostable Organics	**48.0%**	**40.5%**	**44.3%**

3.2.1.3   Diversion Potential

Table 3-4 summarizes the diversion potential of the City of Vernon's garbage stream. Over the two seasons, the diversion potential of this stream was 73% and that consisted of 51% compostable material, 9% recyclable material, 9% product stewardship program materials, and 4% other divertible material.

Table 3-4: Diversion Potential for the SF Garbage Stream from the City of Vernon for Fall 2021 and Spring 2022

Diversion Potential	Fall 2021	Spring 2022	Overall
Compostable	54%	46%	51%
Recyclable	10%	9%	9%
Garbage	24%	30%	27%
Product Stewardship	9%	9%	9%
Other Divertibles	3%	6%	4%

3.2.1.4   EPR Materials

Table 3-5 summarizes the EPR program items found in the City of Vernon garbage stream for the Fall 2021 and Spring 2022 sorting events. Overall, the types of EPR materials found in this stream was quite similar across the two seasons, with Recycle BC materials representing the majority of EPR materials in the SF garbage stream from the City of Vernon.

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Table 3-5: EPR Program Items for the SF Garbage Stream from the City of Vernon for Fall 2021 and Spring 2022

EPR Programs	Fall 2021	Spring 2022	Overall
BC Used Oil Management Association (BCUOMA)	<0.1%	<0.1%	<0.1%
Call2Recycle	0.1%	0.1%	0.1%
Canadian Battery Association (CBA)	0.3%	-	0.1%
Canadian Electrical Stewardship Association (CESA)	<0.1%	0.6%	0.3%
Deposit Beverage Containers	0.6%	0.9%	0.8%
Health Products Stewardship Association (HPSA)	<0.1%	0.2%	0.1%
Heating, Refrigeration and Air Conditioning Institute of Canada (HRAI)	<0.1%	-	<0.1%
Major Appliance Recycling Roundtable (MARR)	-	-	-
Outdoor Power Equipment Institute Canada (OPEIC)	-	-	-
Product Care	0.9%	0.3%	0.6%
Recycle BC	16.5%	15.1%	15.8%
Return-It Electronics	0.3%	0.2%	0.2%
Tire Stewardship BC	0.1%	0.1%	0.1%
Total EPR Products	**18.8%**	**17.5%**	**18.2%**

3.2.1.5   Summary of Observations and Findings

The following are observations and findings from the City of Vernon SF garbage samples.

- Large amounts of avoidable food waste were found in the City of Vernon SF garbage stream. Avoidable food waste is defined as food that could have been edible, including unopened food and leftover items (e.g., fruits and vegetables, full or partially full packages of food). The proportion of avoidable food waste decreased by 5% in the Spring 2022 sorting event when compared to Fall 2021.

- Yard and garden waste was found in the City of Vernon SF garbage stream. Yard and garden waste was typically found in black plastic bags and could have been dropped off at the GVDDF public drop-off bins or saved for the spring curbside leaf pick-up program, which was scheduled for the week after this sorting event.

- Approximately half of the paper category was food soiled paper, which is comprised of tissues and paper towels.

- Compostable and recyclable materials made up a majority of the City of Vernon's garbage stream. Recyclable materials could have been deposited into the recycling carts for curbside collection. Though regular curbside organics collection was not offered by the City of Vernon at the time of the waste characterization studies, a curbside residential organics collection program was launched in Summer 2022 and should be helpful in diverting compostable waste in the future.

3.2.2   District of Coldstream SF Garbage

The following summarizes the waste composition results and diversion potential for SF garbage from the District of Coldstream (The District). The District does not offer a curbside garbage collection program and homeowners could

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contract a private sector waste hauler to receive curbside waste collection services or drop-off their waste into roll off bins (public drop-off area) at the GVDDF.

3.2.2.1 Summary of Fall/Spring Sample Sessions

Results from the Fall 2021 and Spring 2022 studies for SF garbage from the District of Coldstream have been combined in Table 3-6. For details on the calculation of the weighted average, see Appendix C.

Overall, the garbage stream from the District of Coldstream was primarily composed of compostable organics (46%), household hygiene (13%), plastic products (12%), and paper products (10%). These four primary categories represent 81% of the waste stream.

The compostable organics category consisted mainly of avoidable food waste (25.1%), small yard and garden waste (13.9%), and backyard compostable unavoidable food waste (6.3%).

In the household hygiene category, there was mainly pet waste (7.2%) and other household hygiene (4.2%).

Plastic products included other flexible plastic packaging (2.5%), durable plastic products (2.4%), other film non-packaging – film products (1.8%), and recyclable rigid plastic packaging #1-7 (1.6%).

Paper products consisted mainly of food soiled paper (5.2%), corrugated cardboard and boxboard (1.7%), and fine paper (1.5%).

As discussed in further detail in the next section, the compostable organics category was the largest difference between the private-hauled and self-hauled garbage streams. The compostable organics in the private-hauled waste consisted mainly of avoidable food waste (28.1%), small yard and garden waste (15.1%) and backyard compostable unavoidable food waste (7.1%). By comparison, the compostable organics in the self-hauled waste consisted of avoidable food waste (11.8%) and unavoidable backyard compostable food waste (2.9%).

Table 3-6: Waste Composition Results for the SF Garbage Stream from the District of Coldstream for Fall 2021 and Spring 2022

Primary Category	Fall 2021	Spring 2022		Overall
	Private Hauler	Private Hauler	Self Haul	
Paper	9%	11%	11%	10%
Plastic	10%	14%	15%	12%
Compostable Organics	61%	41%	16%	46%
Non-Compostable Organics	5%	4%	10%	6%
Metals	3%	2%	6%	4%
Glass	1%	2%	3%	2%
Building Material	1%	3%	12%	4%
Electronic Waste	0%	0%	1%	0%
Household Hazardous	3%	1%	4%	2%
Household Hygiene	6%	21%	19%	13%
Bulky Objects	0%	0%	2%	0%
Unidentified Items	1%	1%	1%	1%

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3.2.2.2   Comparison of Fall 2021 and Spring 2022 Results

Figure 3-4 presents the composition of the residential garbage stream from the District of Coldstream for the Fall 2021 and Spring 2022 sorting events. For the purposes of the comparison, the data from the Spring 2022 sorting event was divided into results from garbage loads collected by private sector waste haulers (private haulers) and dropped off by residents at the GVDDF (self-haul).
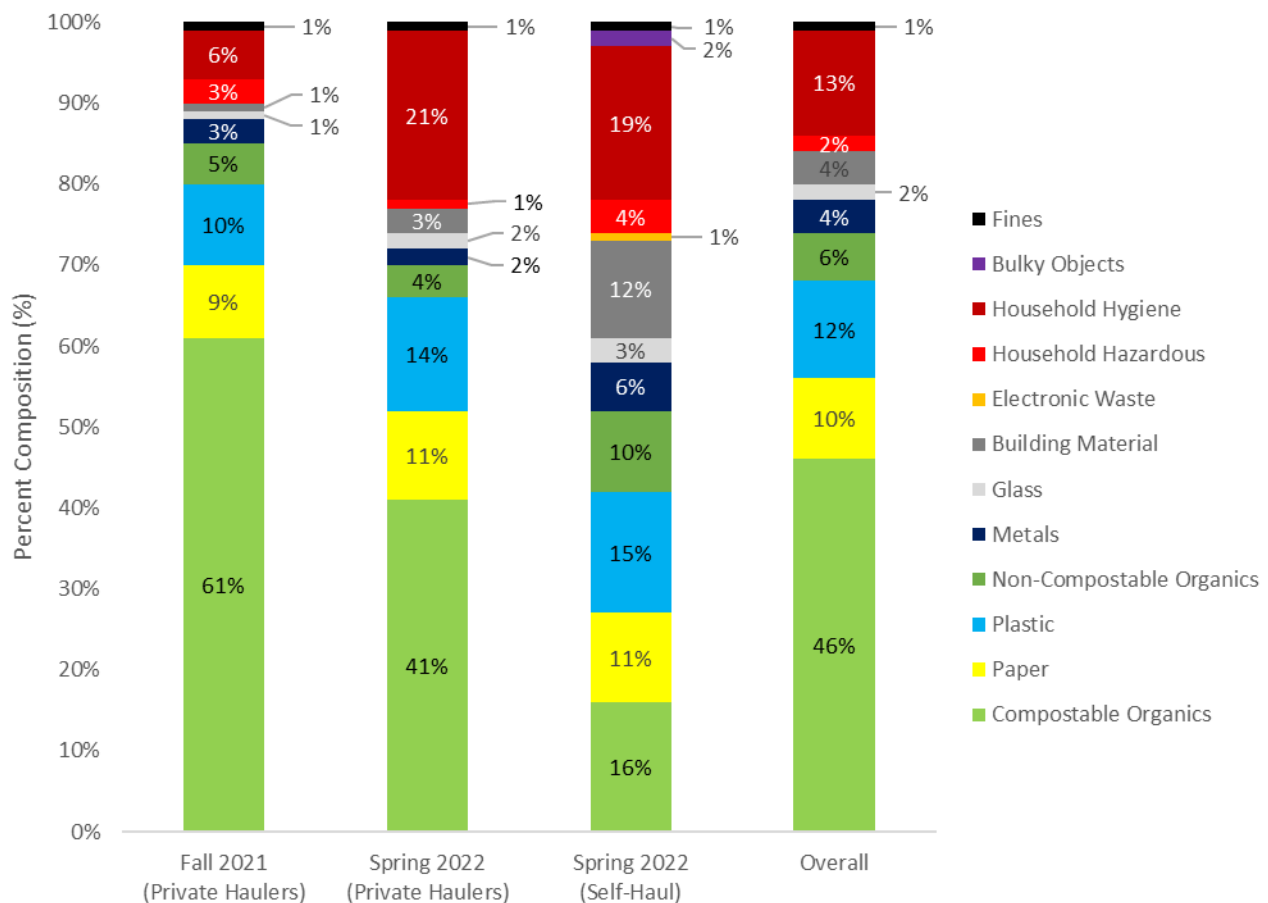
Figure 3-4: Comparison of Fall 2021 and Spring 2022 Composition for the SF Residential Garbage Stream from the District of Coldstream

Differences between the Fall 2021 and Spring 2022 results for Coldstream's SF garbage stream include:

▪ The results from the Fall 2021 sorting event were from two samples and both were from private sector waste haulers who collected from Coldstream residents. Out of the five samples from the District of Coldstream characterized during the Spring 2022 sorting event, two were from private sector waste haulers and three were from residents dropping off waste at the GVDDF. Differences in the waste composition between the two seasons may be due to the difference in the source of the samples in this sector, variability due to small sample sizes, and seasonal variations in waste generation.

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- Compostable organics decreased from 61% in Fall 2021 to 41% for private hauler loads and 16% for self-haul loads in Spring 2022. Table 3-7 shows a detailed breakdown of the secondary categories within the compostable organics category. A notable difference between the two sorting events is the drop in small yard and garden waste in Spring 2022. This decrease may have been partially due to the inclusion of self-hauled waste from Coldstream residents, who may have more incentive to decrease their waste generation when they are personally taking their waste to the GVDDF. This reasoning is supported by the difference between the Spring 2022 samples from the contracted private haulers and self-haul loads, which shows a clear difference in the backyard compostable unavoidable and avoidable food waste, as well as yard and garden waste.

- Household hygiene increased from 6% in Fall 2021 to 21% for private hauler loads and 19% for self-haul loads in Spring 2022. There are noticeable differences in all three secondary categories under household hygiene (Table 3-8).

- Building materials increased from 1% in Fall 2021 to 3% for private hauler loads and 12% for self-haul loads in Spring 2022. Looking at the secondary categories, there are increases in the amount of clean and treated wood waste and drywall, primarily in the self-hauled loads.

Table 3-7: Composition of the Compostable Organics Category in the SF Residential Garbage Stream from the District of Coldstream for Fall 2021 and Spring 2022

Category	Fall 2021	Spring 2022		Overall
	Private Hauler	Private Hauler	Self-Haul	
Small yard and garden	24.1%	6.1%	0.3%	13.94%
Large yard and garden	0.0%	0.0%	0.0%	0.00%
Unavoidable food waste – backyard compostable	7.3%	6.9%	2.9%	6.26%
Unavoidable food waste – non-backyard compostable	0.4%	0.6%	0.6%	0.47%
Avoidable food waste	29.1%	27.2%	11.8%	25.06%
Other compostable organics	0.6%	0.2%	0.2%	0.39%
Total compostable organics	**61.4%**	**41.0%**	**15.6%**	**46.1%**

Table 3-8: Composition of the Household Hygiene Category in the SF Residential Garbage Stream from the District of Coldstream for Fall 2021 and Spring 2022

Category	Fall 2021	Spring 2022		Overall
	Private Hauler	Private Hauler	Self-Haul	
Bio-hazards	0.1%	0.1%	7.7%	1.6%
Pet waste	4.3%	11.5%	7.9%	7.2%
Other household hygiene	1.7%	9.1%	3.1%	4.2%
Total household hygiene	**6.1%**	**20.7%**	**18.7%**	**13.0%**

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3.2.2.3   Diversion Potential

Table 3-9 summarizes the diversion potential of the District of Coldstream's garbage stream. Over two seasons for the District of Coldstream garbage stream, the diversion potential was 74% (consisting of 51% compostable material, 10% product stewardship program materials, 8% recyclable material, and 5% other divertible material).

Table 3-9: Diversion Potential for the SF Garbage Stream from the District of Coldstream for Fall 2021 and Spring 2022

Diversion Potential	Fall 2021 Private Hauler	Spring 2022 Private Hauler	Spring 2022 Self-Haul	Overall
Compostable	67%	47%	19%	51%
Recyclable	7%	9%	10%	8%
Garbage	15%	30%	44%	26%
Product Stewardship	9%	10%	10%	10%
Other Divertibles	2%	4%	17%	5%

3.2.2.4   EPR Materials

Table 3-10 summarizes the EPR program items found in the District of Coldstream garbage stream for the Fall 2021 and Spring 2022 sorting events. Overall, the types of EPR materials showed some variability (e.g., HPSA and CESA materials in the self-hauled loads), with the results varying by a large amount from sample to sample.

Table 3-10: EPR Program Items for the SF Garbage Stream from the District of Coldstream for Fall 2021 and Spring 2022

EPR Programs	Fall 2021 Private Hauler	Spring 2022 Private Hauler	Spring 2022 Self-Haul	Overall Private Hauler
BCUOMA	-	<0.1%	-	<0.1%
Call2Recycle	0.2%	0.1%	<0.1%	0.1%
CBA	-	-	-	-
CESA	-	-	2.6%	0.5%
Deposit Beverage Containers	0.6%	1.3%	0.7%	0.9%
HPSA	-	0.3%	2.8%	0.6%
HRAI	-	-	-	-
MARR	-	-	-	-
OPEIC	-	-	-	-
Product Care	1.9%	0.3%	0.8%	1.2%
Recycle BC	12.9%	17.0%	13.3%	14.2%
Return-It Electronics	<0.1%	-	0.2%	<0.1%
Tire Stewardship BC	-	-	-	-
Total EPR Products	**15.7%**	**19.1%**	**20.5%**	**17.7%**

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3.2.2.5   Summary of Observations and Findings

The following are observations and findings from the District of Coldstream SF garbage samples:

- In Spring 2022, samples were collected from private haulers collecting residential waste from Coldstream as well as loads dropped off by Coldstream residents self-hauling their garbage to the GVDDF. Comparing the composition of the samples from private hauler loads and self-hauled loads found notable differences, particularly in the composition of compostable organics. Less backyard compostable material (e.g., avoidable and unavoidable food waste, yard and garden waste) was found in the self-hauled loads.

- Comparing the waste composition of the garbage stream collected in Spring 2022 by curbside garbage collection in the City of Vernon and by contracted private haulers found notable similarities. The proportion of compostable organics (41% for both), plastic (13% for Vernon, 14% for Coldstream private haulers), and paper (11% for both) were similar, with some noticeable differences in household hygiene (10% for Vernon, 21% for Coldstream private haulers) and non-compostable organics (10% for Vernon, 4% for Coldstream private haulers).

- Compostable organics was observed to differ between garbage loads that were collected by private haulers or self-hauled to the GVDDF by Coldstream residents. In the Fall 2021 study, large amounts of small yard and garden waste were found in the private-hauled garbage, comprising 24.1% of the overall samples. However, the Spring 2022 study found only small amounts of yard and garden waste in the samples from Coldstream at 6.1% of the private-hauled samples and 0.3% of the self-hauled samples. In addition, avoidable food waste also decreased from 29.1% in Fall 2021 to 27.2% and 11.8% for private hauler and self haul, respectively, in Spring 2022.

- Increases in the household hygiene category, (15% for private-hauled and 13% for self-hauled loads respectively) were observed in the Spring 2022 samples when compared to the Fall 2021 private-hauled samples.

3.3   Industrial, Commercial, and Institutional Sector

The ICI sector represents waste disposed from light ICI sources and multi-family buildings. The grocery store subsector includes commercial loads from grocery stores and other businesses that generate a larger proportion of food waste compared to other businesses. Overall, the average waste composition from the ICI sector can be summarized on Figure 3-5. Details that explain how the average ICI waste composition was calculated are discussed below.

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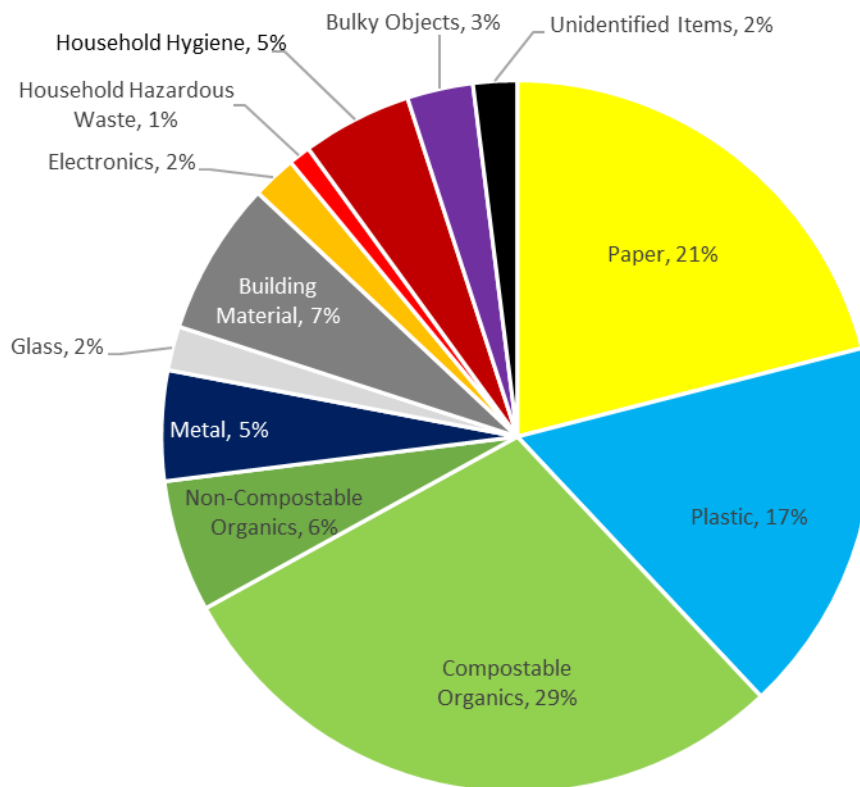
Figure 3-5: Average Composition of Waste from the ICI Sector (Fall 2021 and Spring 2022)

3.3.1 Commercial

The following summarizes the waste composition results and diversion potential from the commercial/ICI garbage stream, including commercial and multi-family units but excluding samples from grocery stores that have high proportions of food waste.

3.3.1.1 Summary of Fall/Spring Sample Sessions

Results from the Fall 2021 and Spring 2022 studies for the ICI garbage stream received at the Greater Vernon GVDDF have been combined in Table 3-11. The overall mean was calculated by equally weighting the means from Fall 2021 and Spring 2022.

Overall, the ICI garbage was primarily composed of compostable organics (25%), paper products (22%), plastic products (17%), building materials (8%), non-compostable organics (7%), household hygiene (6%), and metals (5%). These seven categories represent 90% of the waste stream.

The compostable organics category consisted mainly of avoidable food waste (14.9%) and small yard and garden waste (5.7%).

Paper products consisted mainly of food soiled paper (7.3%), corrugated cardboard and boxboard (6.6%), and fine paper (2.9%).

Plastic products included durable plastic products (3.9%), other (non-Recycle BC) expanded polystyrene packaging (2.8%), recyclable rigid plastic packaging #1-7 (2.4%), other film non-packaging – film products (2.1%), and other flexible plastic packaging (2.0%).

Building materials included treated wood (3.9%), other building material (1.3%), and clean wood (1.0%)

The non-compostable organics category was mainly comprised of textiles (5.6%).

In the household hygiene category, there was other household hygiene (3.9%) and pet waste (1.7%).

Metals mainly consisted of other metal (3.5%), such as metal products and scrap metal.

Table 3-11: Waste Composition Results for the ICI Garbage Stream for Fall 2021 and Spring 2022

Primary Category	Fall 2021	Spring 2022	Overall
Paper	19%	25%	22%
Plastic	20%	15%	17%
Compostable Organics	32%	18%	25%
Non-Compostable Organics	8%	6%	7%
Metals	4%	6%	5%
Glass	2%	2%	2%
Building Material	3%	12%	8%
Electronic Waste	2%	3%	2%
Household Hazardous	1%	1%	1%
Household Hygiene	7%	5%	6%
Bulky Objects	1%	4%	3%
Unidentified Items	1%	3%	2%

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3.3.1.2   Comparison of Fall 2021 and Spring 2022 Results

Figure 3-6 presents the composition of the ICI garbage stream for the Fall 2021 and Spring 2022 sorting events.
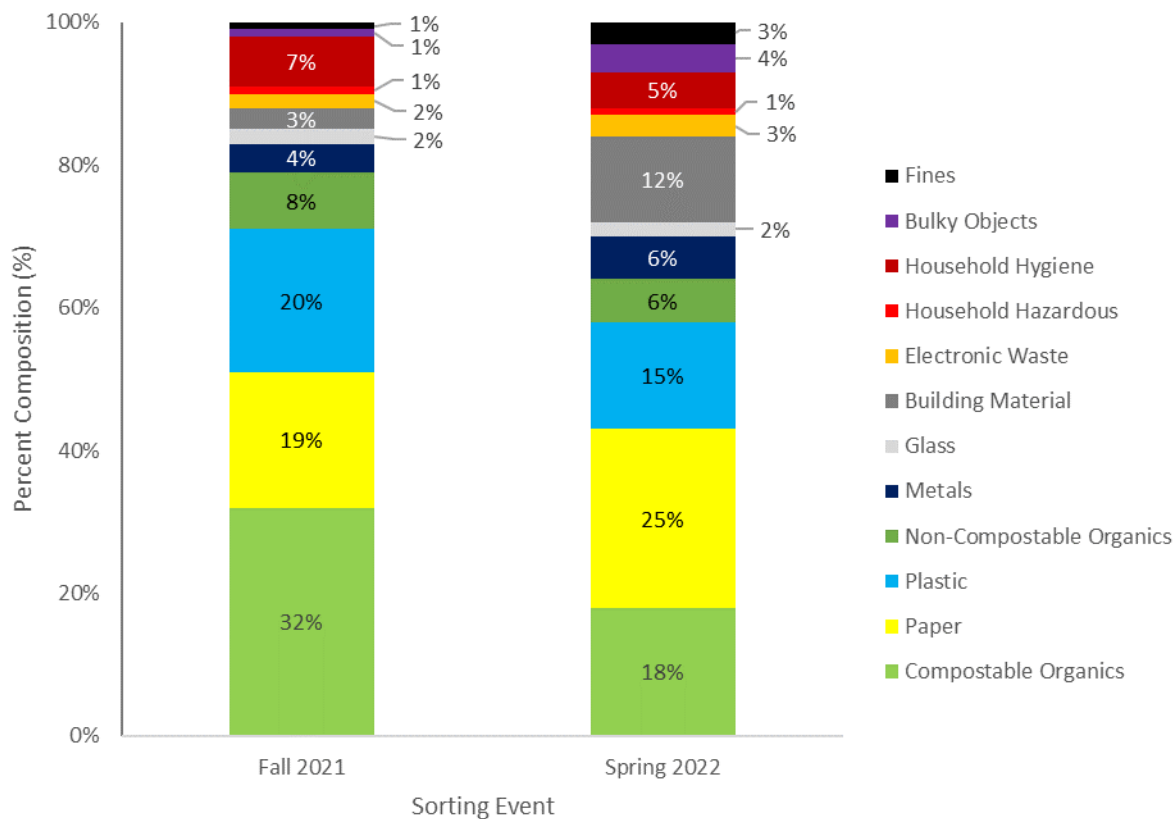
Figure 3-6: Comparison of Fall 2021 and Spring 2022 Composition for the ICI Sector Garbage Stream

Differences between the Fall 2021 and Spring 2022 results for ICI garbage stream include:

- Compostable organics decreased from 32% in Fall 2021 to 18% in Spring 2022. Table 3-12 shows a detailed breakdown of the changes in the secondary categories within the compostable organics category. Generally, decreases in all secondary categories in compostable organics were observed in Spring 2022, with larger decreases in small yard and garden waste, avoidable food waste, and backyard compostable unavoidable food waste.

- Building materials increased from 3% in Fall 2021 to 12% in Spring 2022. Comparing the secondary categories found increased treated wood (1.5% in Fall 2021, 6.4% in Spring 2022), untreated wood (0% in Fall 2021, 1.9% in Spring 2022), and other building material (0.2% in Fall 2021, 2.4% in Spring 2022).

- Paper products increased from 19% in Fall 2021 to 25% in Spring 2022. A noticeable difference was in the amount of corrugated cardboard and boxboard (3.1% in Fall 2021, 10.1% in Spring 2022).

- Plastic products decreased from 20% in Fall 2021 to 15% in Spring 2022. A comparison of the secondary categories found relatively minor changes of 1% or less, with the exception of non-Recycle BC expanded polystyrene packaging, which decreased from 5.0% in Fall 2021 to 0.6% in Spring 2022.

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Table 3-12: Composition of the Compostable Organics Category in the ICI Garbage Stream for Fall 2021 and Spring 2022

Category	Fall 2021	Spring 2022	Overall
Small yard and garden	9.1%	2.4%	5.7%
Large yard and garden	0.0%	0.0%	0.0%
Unavoidable food waste – backyard compostable	5.1%	2.4%	3.8%
Unavoidable food waste – non-backyard compostable	0.6%	0.2%	0.4%
Avoidable food waste	16.5%	13.2%	14.9%
Other compostable organics	0.8%	0.2%	0.5%
Total Compostable Organics	**32.1%**	**18.4%**	**25.3%**

3.3.1.3   Diversion Potential

Table 3-13 summarizes the diversion potential of the ICI garbage stream. Over the two seasons, the diversion potential of this stream was 73% and that consisted of 32% compostable material, 16% recyclable material, 12% product stewardship program materials, and 12% other divertible material.

Table 3-13: Diversion Potential for the ICI Garbage Stream for Fall 2021 and Spring 2022

Diversion Potential	Fall 2021	Spring 2022	Overall
Compostable	40%	25%	32%
Recyclable	13%	19%	16%
Garbage	31%	24%	28%
Product Stewardship	11%	12%	12%
Other Divertibles	5%	20%	12%

3.3.1.4   EPR Materials

Table 3-14 summarizes the EPR program items found in ICI garbage stream for the Fall 2021 and Spring 2022 sorting events. Overall, the types of EPR materials found in this stream was comparable across the two seasons, with materials associated with individual EPR programs being found in similar amounts during the two seasons.

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Table 3-14: EPR Program Items for the ICI Garbage for Fall 2021 and Spring 2022

EPR Programs	Fall 2021	Spring 2022	Overall
BCUOMA	0.1%	0.2%	0.2%
Call2Recycle	0.1%	0.3%	0.2%
CBA	-	-	-
CESA	1.3%	1.4%	1.3%
Deposit Beverage Containers	2.6%	1.3%	1.9%
HPSA	<0.1%	<0.1%	<0.1%
HRAI	-	-	-
MARR	-	-	-
OPEIC	-	-	-
Product Care	0.8%	0.4%	0.6%
Recycle BC	18.9%	25.4%	22.2%
Return-It Electronics	0.4%	0.8%	0.6%
Tire Stewardship BC	<0.1%	0.9%	0.5%
Total EPR Products	**24.3%**	**30.8%**	**27.6%**

3.3.1.5   Summary of Observations and Findings

The following are observations and findings from the ICI garbage samples:

▪ Compostable organics decreased from 32% in Fall 2021 to 18% in Spring 2022. Generally, decreases in all secondary categories in compostable organics were observed in Spring 2022, with larger decreases in small yard and garden waste, avoidable food waste, and backyard compostable unavoidable food.

▪ Approximately 19% of the ICI garbage stream consisted of materials that are typically collected by commercial recycling services, including 10.1% corrugated cardboard and boxboard. These materials could have been diverted to commercial recycling bins instead of being disposed of in the garbage bins.

▪ Non-Recycle BC expanded polystyrene packaging was found in the ICI garbage stream. This category consists of expanded polystyrene products that are not accepted at Recycle BC depots, and includes packing peanuts and Styrofoam products (e.g., decorations).

3.3.2 Commercial – Grocery Stores

The following section summarizes the waste composition results and diversion potential for the garbage stream from grocery stores.

3.3.2.1   Summary of Fall/Spring Sample Sessions

Results from the Fall 2021 and Spring 2022 studies for grocery store garbage have been combined in Table 3-15. The overall mean was calculated by equally weighting the means from Fall 2021 and Spring 2022.

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Overall, the grocery store garbage stream was primarily composed of compostable organics (72%), plastic products (13%), and paper products (12%). These three primary categories represent 97% of the waste stream.

The compostable organics category consisted mainly of avoidable food waste (62.9%), with smaller amounts of backyard compostable unavoidable food waste (4.8%), and small yard and garden waste (2.2%).

Plastic products included other film non-packaging – film products (3.2%), recyclable rigid plastic packaging #1-7 (3.2%), recyclable film packaging (stretchable) – other bags and overwrap (2.3%), and other flexible plastic packaging (1.8%).

Paper products consisted mainly of corrugated cardboard and boxboard (4.0%), non-recyclable and non-compostable paper (2.7%), and fine paper (1.5%).

Table 3-15: Waste Composition Results for the Grocery Store Garbage Stream for Fall 2021 and Spring 2022

Primary Category	Fall 2021	Spring 2022	Overall
Paper	10%	13%	12%
Plastic	9%	17%	13%
Compostable Organics	78%	65%	72%
Non-Compostable Organics	1%	1%	1%
Metals	1%	1%	1%
Glass	0%	0%	0%
Building Material	0%	0%	0%
Electronic Waste	0%	0%	0%
Household Hazardous	0%	1%	0%
Household Hygiene	1%	2%	1%
Bulky Objects	0%	0%	0%
Unidentified Items	0%	0%	0%

3.3.2.2   Comparison of Fall 2021 and Spring 2022 Results

Figure 3-7 presents the composition of the grocery store garbage stream for the Fall 2021 and Spring 2022 sorting events.
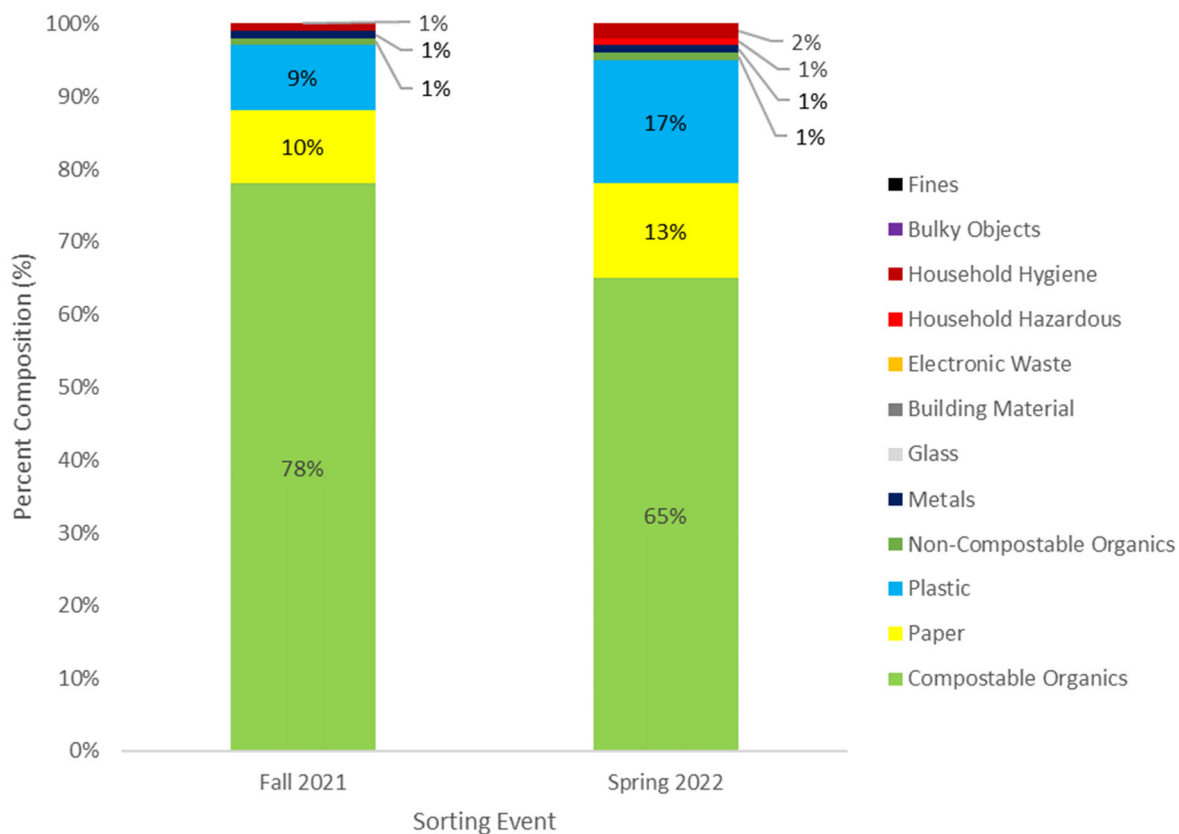
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Figure 3-7: Comparison of Fall 2021 and Spring 2022 Composition for the Grocery Store Garbage Stream

Differences between the Fall 2021 and Spring 2022 results for the grocery store garbage stream include:

- Compostable organics decreased from 78% in Fall 2021 to 65% in Spring 2022. Table 3-16 shows a detailed breakdown of the changes in the secondary categories within the compostable organics category. A notable difference is the drop in avoidable food waste in Spring 2022. It should be noted that the sample from a food processing facility consisted of 49% compostable organics, while the three samples from the grocery stores consisted of 64% to 76% compostable organics.

    - The sample from a food processing facility was categorized as part of the grocery store subsector due to observations that it consisted of 49% food waste, which is more in line with the grocery store garbage streams than typical ICI garbage streams.

- Plastic products increased from 9% in Fall 2021 to 17% in Spring 2022. Notably, the sample from the food processing facility consisted of 40% plastic, while the three samples from the grocery stores consisted of 7% to 11% plastic – which is in line with the Fall 2021 results.

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Table 3-16: Composition of the Compostable Organics Category in the Grocery Store Garbage Stream for Fall 2021 and Spring 2022

Category	Fall 2021	Spring 2022
Small yard and garden	2.2%	2.3%
Large yard and garden	0.0%	0.0%
Unavoidable food waste – backyard compostable	5.6%	4.0%
Unavoidable food waste – non-backyard compostable	0.3%	0.1%
Avoidable food waste	68.7%	57.0%
Other compostable organics	1.0%	1.5%
Total Compostable Organics	**77.8%**	**64.9%**

3.3.2.3 Diversion Potential

Table 3-17 summarizes the diversion potential of the grocery store garbage stream. Over the two seasons, the diversion potential of this stream was 93% and that consisted of 74% compostable material, 10% recyclable material, 8% product stewardship program material, and 1% other divertible material.

Table 3-17: Diversion Potential for the Grocery Store Garbage Stream for Fall 2021 and Spring 2022

Diversion Potential	Fall 2021	Spring 2022	Overall
Compostable	80%	68%	74%
Recyclable	11%	9%	10%
Garbage	4%	10%	7%
Product Stewardship	4%	13%	8%
Other Divertibles	1%	0%	1%

3.3.2.4 EPR Materials

Table 3-18 summarizes the EPR program items found in the grocery store garbage stream for the Fall 2021 and Spring 2022 sorting events. Overall, the types of EPR materials found in this stream was quite similar across the two seasons, with Recycle BC materials representing the majority of EPR materials.

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Table 3-18: EPR Program Items for the Grocery Store Garbage Stream for Fall 2021 and Spring 2022

EPR Programs	Fall 2021	Spring 2022	Overall
BCUOMA	<0.1%	-	<0.1%
Call2Recycle	-	<0.1%	<0.1%
CBA	-	-	-
CESA	-	-	-
Deposit Beverage Containers	0.4%	0.4%	0.4%
HPSA	0.1%	<0.1%	0.1%
HRAI	-	-	-
MARR	-	-	-
OPEIC	-	-	-
Product Care	<0.1%	<0.1%	<0.1%
Recycle BC	14.7%	21.6%	18.1%
Return-It Electronics	-	<0.1%	<0.1%
Tire Stewardship BC	-	-	-
Total EPR Products	**15.2%**	**22.2%**	**18.7%**

3.3.2.5   Summary of Observations and Findings

The following are observations and findings from the grocery store garbage samples.

- Large amounts of avoidable food waste were found in both Fall 2021 (69%) and Spring 2022 (57%). Avoidable food waste included uneaten vegetables, bread, and unopened packages of food that appeared to be edible. In addition to better separation of compostable material for waste disposal, donating edible food may be helpful in reducing the avoidable food waste from this subsector.

- Plastic products increased from by 8% in Spring 2022 compared to Fall 2021. Notably, the sample from the food processing facility consisted of 40% plastic, mostly in the form of food packaging material, while the three samples from the grocery stores consisted of 7% to 11% plastic.

- Compostable organics, paper, and plastic formed the majority of the grocery store garbage stream, comprising 97% of the Fall 2021 samples and 95% of the Spring 2022 samples.

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3.4   Public Drop-Off Sector

The following summarizes the waste composition results and diversion potential for the garbage stream from the public drop-off sector at the GVDDF. Overall, the average sector waste composition from the public drop-off sector can be summarized on Figure 3-8. Details on how the average public drop-off waste composition was calculated are discussed below.
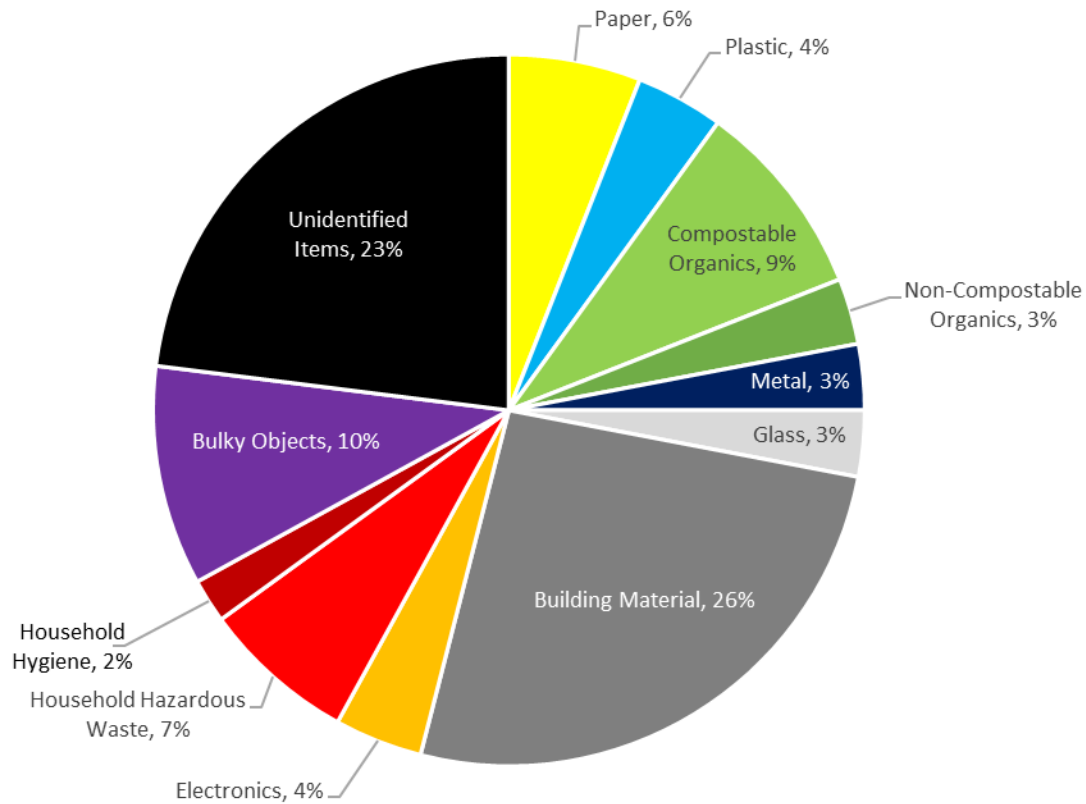

**Figure 3-8: Average Composition of Waste from the Public Drop-Off Sector
(Fall 2021 and Spring 2022)**

3.4.1   Summary of Fall/Spring Sample Sessions

Results from the Fall 2021 and Spring 2022 studies for the public drop-off garbage stream have been combined in Table 3-19. The overall mean was calculated by equally weighting the means from Fall 2021 and Spring 2022.

Overall, the public drop-off garbage from was primarily composed of building material (26%), bulky objects (10%), compostable organics (9%), household hazardous waste (7%), and paper products (6%). These five primary categories represent 58% of the waste stream. Bagged garbage comprised an additional 23% of the waste stream. Contents in the bagged garbage were not visually assessed to determine their composition.

Building materials included carpet (12.9%), other building material (4.8%), treated wood (4.1%), and drywall (3.1%).

Bulky objects included mattresses and box springs (4.3%), furniture (4.3%), and major electric powered appliances (1.2%).

The compostable organics category included avoidable food waste (3.5%), small yard and garden waste (3.1%), and backyard compostable unavoidable food waste (1.4%).

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Household hazardous waste included paint and paint containers (3.1%) and other (non-Product Care, non-BCUOMA) chemicals (2.9%).

Paper products consisted mainly of corrugated cardboard and boxboard (3.0%), food soiled paper (1.7%), and fine paper (1.5%).

Table 3-19: Waste Composition Results for the Public Drop-Off Garbage Stream for Fall 2021 and Spring 2022

Primary Category	Fall 2021	Spring 2022	Overall
Paper	9%	4%	6%
Plastic	5%	3%	4%
Compostable Organics	11%	8%	9%
Non-Compostable Organics	3%	4%	3%
Metals	3%	3%	3%
Glass	1%	4%	3%
Building Material	31%	21%	26%
Electronic Waste	2%	7%	4%
Household Hazardous	1%	12%	7%
Household Hygiene	2%	1%	2%
Bulky Objects	8%	11%	10%
Unidentified Items	24%	22%	23%

3.4.2   Comparison of Fall 2021 and Spring 2022 Results

Figure 3-9 presents the composition of the public drop-off garbage stream for the Fall 2021 and Spring 2022 sorting events.
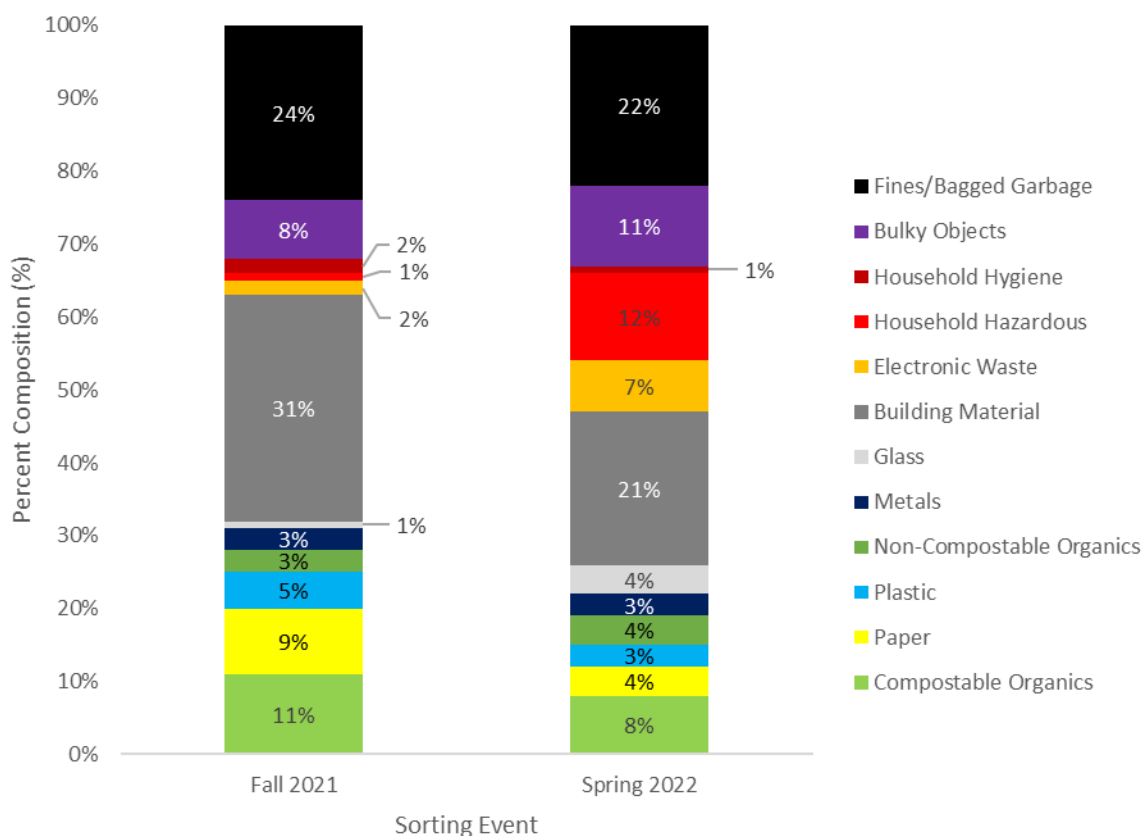
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Figure 3-9: Comparison of Fall 2021 and Spring 2022 Composition for the Public Drop-Off Garbage Stream

Differences between the Fall 2021 and Spring 2022 results for the public drop-off garbage stream include:

- Building materials decreased from 31% in Fall 2021 to 21% in Spring 2022. One notable difference is the amount of carpet found in the samples (21.4% in Fall 2021, 4.5% in Spring 2022). It should be noted that minimal amounts of gypsum were observed in the Fall 2021 samples while 6.3% of the Spring 2022 was comprised of gypsum.

- Household hazardous waste increased from 1% in Fall 2021 to 12% in Spring 2022. The difference may be partially attributed to two specific samples that contained potentially hazardous chemicals (approximately 20% of each in the two samples) in the form of cleaning solutions and pool chemicals. In addition, paint and paint containers observed in four samples also contributed to the relatively high amount of household hazardous waste found.

- Electronic waste increased from 2% in Fall 2021 to 7% in Spring 2022. Vacuums and fans were observed in the Spring 2022 samples.

- Table 3-20 shows a detailed breakdown of the changes in the secondary categories within the compostable organics category. Compared to Fall 2021, yard and garden waste increased and avoidable food waste decreased in Spring 2022.

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Table 3-20: Composition of the Compostable Organics Category in the Public Drop-off Garbage Stream for Fall 2021 and Spring 2022

Category	Fall 2021	Spring 2022
Small yard and garden	0.4%	5.8%
Large yard and garden	0.0%	1.2%
Unavoidable food waste – backyard compostable	2.8%	0.0%
Unavoidable food waste – non-backyard compostable	0.3%	0.0%
Avoidable food waste	6.9%	0.1%
Other compostable organics	0.9%	0.6%
Total Compostable Organics	**11.3%**	**7.7%**

3.4.3 Diversion Potential

Table 3-21 summarizes the diversion potential of the public drop-off garbage stream. Over the two seasons, the diversion potential of this stream was 47%, consisting of 18% other divertible material, 11% compostable material, 11% recyclable material, and 7% product stewardship program materials.

Table 3-21: Diversion Potential for the Public Drop-Off Garbage Stream for Fall 2021 and Spring 2022

Diversion Potential	Fall 2021	Spring 2022	Overall
Compostable	15%	8%	11%
Recyclable	7%	5%	7%
Garbage	57%	49%	53%
Product Stewardship	7%	15%	11%
Other Divertibles	14%	23%	18%

3.4.4 EPR Materials

Table 3-22 summarizes the EPR program items found in the public drop-off garbage stream for the Fall 2021 and Spring 2022 sorting events. Overall, the types of EPR materials found in this stream varied across the two seasons, possibly due to seasonal variability in what residents bring to the GVDDF for disposal.

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Table 3-22: EPR Program Items for the Public Drop-Off Garbage Stream for Fall 2021 and Spring 2022

EPR Programs	Fall 2021	Spring 2022	Overall
BCUOMA	-	<0.1%	<0.1%
Call2Recycle	0.3%	-	0.1%
CBA	-	-	-
CESA	1.0%	3.7%	2.4%
Deposit Beverage Containers	0.3%	0.9%	0.6%
HPSA	<0.1%	-	<0.1%
HRAI	-	-	-
MARR	2.4%	-	1.2%
OPEIC	-	0.8%	0.4%
Product Care	0.5%	7.9%	4.2%
Recycle BC	9.5%	5.9%	7.7%
Return-It Electronics	-	0.4%	0.2%
Tire Stewardship BC	0.3%	0.8%	0.5%
Total EPR Products	**14.3%**	**20.5%**	**17.4%**

3.4.5 Summary of Observations and Findings

The following are observations and findings from the public drop-off garbage samples.

- The public drop-off waste stream included larger items that are not accepted in the curbside collection program, such as bulky items and building materials.

- Building materials represented the largest component of the public drop-off sector. Building materials decreased from 31% in Fall 2021 to 21% in Spring 2022. One notable difference is the amount of carpet found in the samples (21.4% in Fall 2021, 4.5% in Spring 2022).

- Some of the materials disposed at the public drop-off bins could have been diverted and dropped of in bins that are in other areas at the GVDDF. For example, there are specific drop-off areas for drywall, lumber, and mattresses. It should be noted that gypsum/drywall made up 6.3% of the Spring 2022 samples. Gypsum should have been diverted to the appropriate drop-off area in the GVDDF as gypsum decomposing in the landfill is potentially hazardous.

- Two of the Spring 2022 samples contained potentially hazardous chemicals (approximately 20% of each of the two samples) in the form of cleaning solutions and pool chemicals. Paint and paint containers in four samples also contributed to the relatively high amount of household hazardous waste found.

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3.5   Construction, Renovation, and Demolition Sector

The following summarizes the waste composition results and diversion potential for the garbage stream from the construction, renovation, and demolition (CRD) sector. Overall, the average sector waste composition from the CRD sector can be summarized on Figure 3-10. Details that explain how the average CRD waste composition was calculated are discussed below.
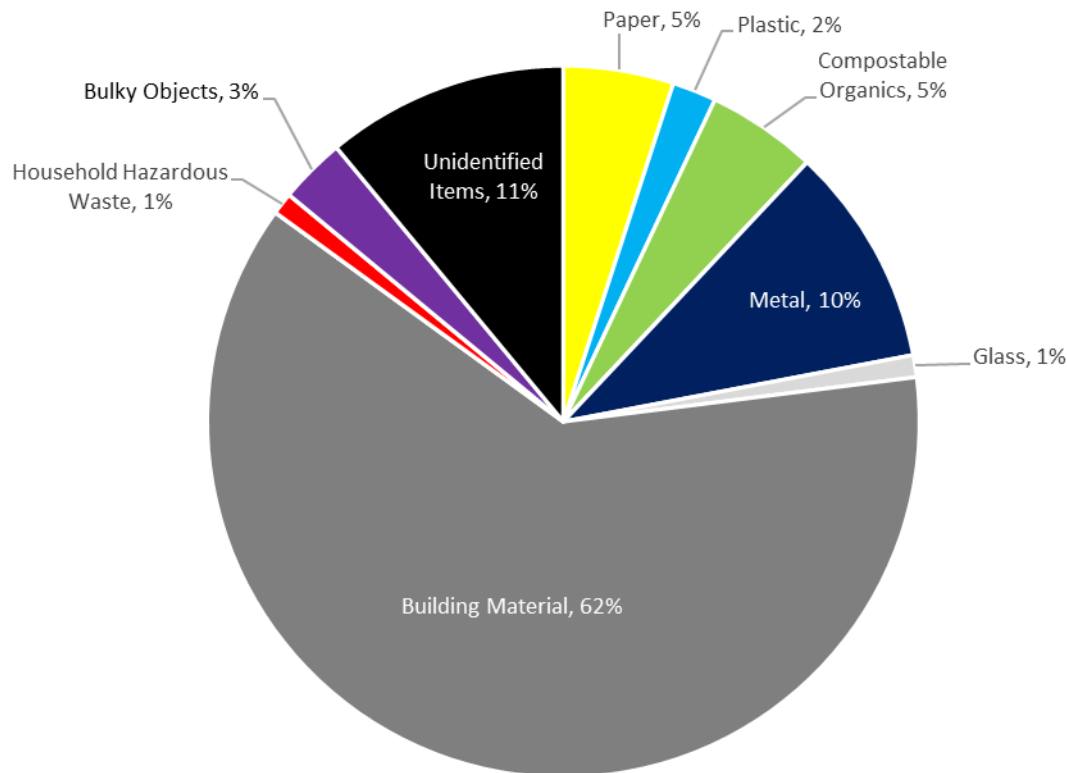

Figure 3-10: Average Composition of Waste from the CRD Sector (Fall 2021 and Spring 2022)

3.5.1   Summary of Fall/Spring Sample Sessions

Results from the Fall 2021 and Spring 2022 studies for the CRD garbage stream have been combined in Table 3-23. The overall mean was calculated by equally weighting the means from Fall 2021 and Spring 2022.

Overall, the CRD garbage was primarily composed of building materials (62%) and metal (10%). These two primary categories represent 72% of the waste stream. Bagged garbage, which could not be visually assessed to determine their contents, represented 11% of the CRD garbage stream.

The building material category consisted mainly of treated wood (27.7%), clean wood (11.3%), gypsum/drywall (8.7%), and other building material (7.8%)

Metals was primarily comprised of other metal (9.3%).

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Table 3-23: Waste Composition Results for CRD Garbage for Fall 2021 and Spring 2022

Primary Category	Fall 2021	Spring 2022	Overall
Paper	1%	8%	5%
Plastic	3%	1%	2%
Compostable Organics	11%	0%	5%
Non-Compostable Organics	0%	0%	0%
Metals	8%	12%	10%
Glass	1%	1%	1%
Building Material	63%	61%	62%
Electronic Waste	0%	0%	0%
Household Hazardous	0%	2%	1%
Household Hygiene	0%	0%	0%
Bulky Objects	1%	4%	3%
Unidentified Items	12%	11%	11%

3.5.2 Comparison of Fall 2021 and Spring 2022 Results

Figure 3-11 presents the composition of the CRD garbage stream for the Fall 2021 and Spring 2022 sorting events.

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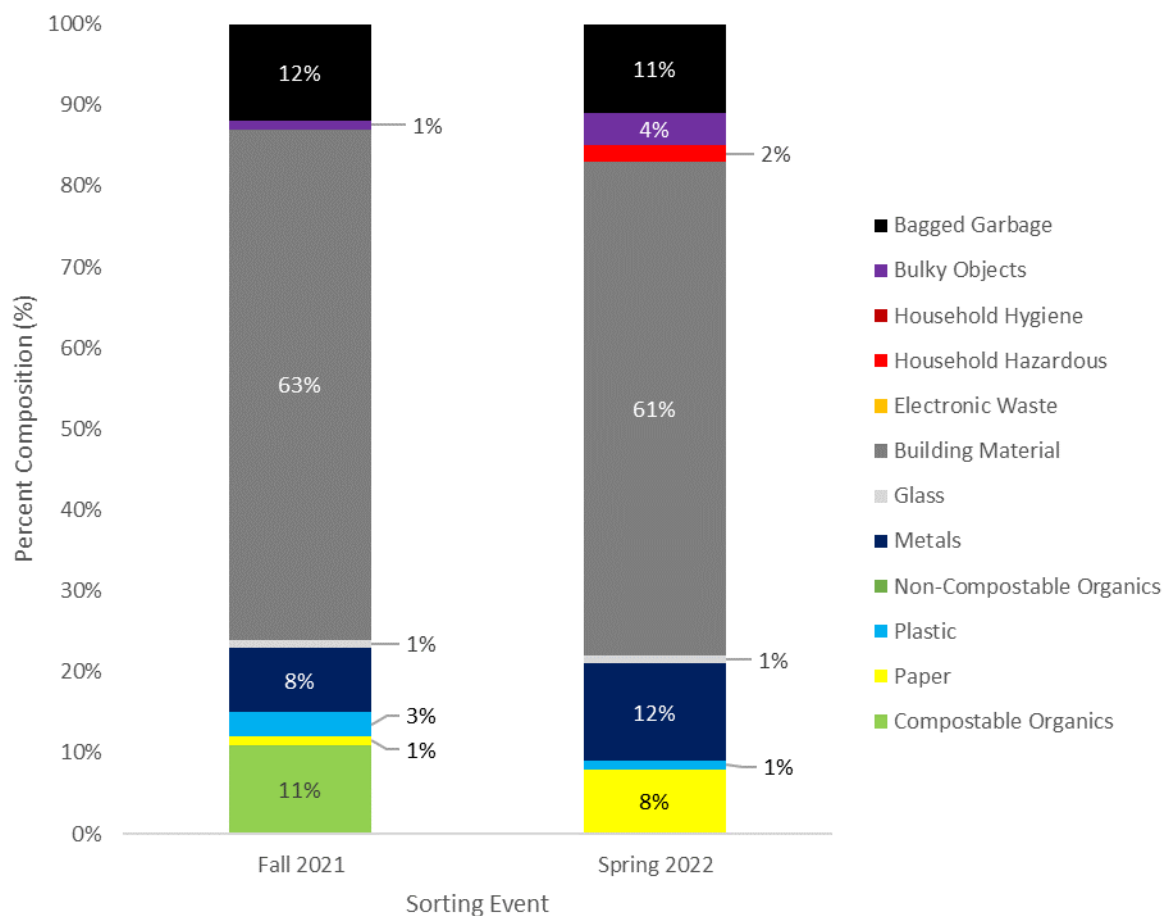
Figure 3-11: Comparison of Fall 2021 and Spring 2022 Composition for the CRD Garbage Stream

Differences between the Fall 2021 and Spring 2022 results for the CRD garbage stream include:

▪ Compostable organics decreased from 10.6% in Fall 2021 to 0.4% in Spring 2022. Table 3-24 shows a detailed breakdown of the secondary categories within the compostable organics category. A notable difference is that the CRD samples from Fall 2021 consisted of 10.6% small yard and garden waste, while the Spring 2014 samples included only 0.4% of this secondary category. The difference may be due to the inherent variability in the CRD samples, which may have included landscaping waste in Fall 2021 but not in Spring 2022.

▪ Paper products increased from 1% in Fall 2021 to 8% in Spring 2022. Looking at the secondary categories, the difference was mainly due to corrugated cardboard (0% in Fall 2021 and 7.9% in Spring 2022).

Table 3-24: Composition of the Compostable Organics Category in the CRD Garbage Stream for Fall 2021 and Spring 2022

Category	Fall 2021	Spring 2022
Small yard and garden	10.6%	0.4%
Large yard and garden	0.0%	0.0%
Unavoidable food waste – backyard compostable	0.0%	0.0%
Unavoidable food waste – non-backyard compostable	0.0%	0.0%
Avoidable food waste	0.0%	0.0%
Other compostable organics	0.0%	0.0%
Total Compostable Organics	**10.6%**	**0.4%**

3.5.3   Diversion Potential

Table 3-25 summarizes the diversion potential of the CRD garbage stream. Over the two seasons, the diversion potential of this stream was 83% and that consisted of 70% other divertibles, 8% product stewardship program materials, and 5% recyclable materials.

Table 3-25: Diversion Potential for the SF Garbage Stream from the City of Vernon for Fall 2021 and Spring 2022

Diversion Potential	Fall 2021	Spring 2022	Overall
Compostable	0%	1%	0%
Recyclable	2%	8%	5%
Garbage	15%	19%	17%
Product Stewardship	13%	2%	8%
Other Divertibles	70%	70%	70%

3.5.4   EPR Materials

Table 3-26 summarizes the EPR program items found in the City of Vernon Garbage stream for the Fall 2021 and Spring 2022 sorting events. Overall, the types of EPR materials found in this stream varied across the two seasons, but Recycle BC materials represented the majority of EPR materials in both seasons.

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Table 3-26: EPR Program Items for CRD Garbage for Fall 2021 and Spring 2022

EPR Programs	Fall 2021	Spring 2022	Overall
BCUOMA	-	0.2%	0.1%
Call2Recycle	-	-	-
CBA	-	-	-
CESA	-	0.2%	0.1%
Deposit Beverage Containers	<0.1%	0.1%	<0.1%
HPSA	-	-	-
HRAI	-	-	-
MARR	-	-	-
OPEIC	-	-	-
Product Care	-	0.7%	0.4%
Recycle BC	1.2%	8.8%	5.0%
Return-It Electronics	-	0.2%	0.1%
Tire Stewardship BC	-	-	-
Total EPR Products	1.2%	10.2%	5.7%

3.5.5 Summary of Observations and Findings

The following are observations and findings from the CRD sector garbage samples:

- The CRD waste stream included larger items that are not accepted in a curbside collection program, such as building materials, furniture, and large pieces of metal. The CRD waste stream also included bagged garbage, which could not be visually assessed to determine their contents due to safety concerns.

- A large proportion of the materials could have been to the appropriate drop-off area at the GVDDF, such as wood waste, gypsum/drywall, and scrap metal. It should be noted that gypsum made up 9.7% of the Spring 2022 samples and should have been diverted to the appropriate drop-off area in the GVDDF as the gypsum decomposition in the landfill is potentially hazardous.

- Compostable organics decreased from 10.6% in Fall 2021 to 0.4% in Spring 2022. The difference was in the amount of small yard and garden waste in the CRD samples.

- Paper products increased from by 7% in Spring 2022 compared to Fall 2021. The difference was mainly due to an increased amount of corrugated cardboard.

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3.6   Material Counts (Spring 2022)

Prior to the Spring 2022 sorting event, Tetra Tech was asked by RDNO to count the deposit beverage containers (all material types), polycoat liquid cups, batteries (all types), and light bulbs (all types) to gain a better understanding of how much of these materials are found in the garbage stream. The results were normalized to give average counts per 100 kg and are presented in Table 3-27.

Table 3-27: Counts for Selected Material Categories in Hand Sort Samples (Spring 2022)

Material Categories	Average Count per 100 kg		
	SF Residential (includes City of Vernon and District of Coldstream)	ICI (excludes grocery stores)	ICI – Grocery Stores
Deposit Beverage Containers (all material types)	16.4	24.8	11.6
Polycoat liquid cups	14.2	50.5	35.2
Batteries (all types)	4.7	17.7	1.2
Lightbulbs (all types)	1.3	0.3	0.5

4.0   COMPARISON TO 2012 RESULTS

The following compares the results from the Summer 2012, Fall 2021, and Spring 2022 waste composition studies. The Summer 2012 study[3] was conducted at three Recycling and Diversion Facilities (RDFs): Armstrong Spallumcheen RDF, Greater Vernon RDF, and Lumby RDF. This comparison is only for the Greater Vernon Diversion and Disposal Facility (GVDDF) with the following sectors compared:

- SF Residential Garbage.

- ICI Garbage.

- Residential Drop-Off.

Another difference worth noting is that the 2012 study was conducted in Summer (July and August), while this study was conducted in Fall (October) and Spring (April).

Another possible source for differences is that the City of Vernon has recently implemented automated residential garbage collection using standardized garbage collection carts (with the exception of the District of Coldstream, which does not have municipal curbside collection).

It should also be noted that the waste characterization studies in 2012 and 2021/22 had the same 12 primary categories but different secondary categories (71 secondary categories in the 2012 study compared to 121 secondary categories in 2021/22, with some of the secondary categories defined as part of different primary categories).

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[3] https://www.rdno.ca/sites/default/files/2021-04/2021_Waste_comp_RPT.pdf.

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4.1   SF Garbage Comparison

Figure 4-1 represents the comparison of the average waste composition from the SF garbage stream received at the Greater Vernon GVDDF in July 2012, October 2021, and April 2022. The data from the 2021/22 study was weighted according to the population data from the 2021 Census:[4]

▪ City of Vernon: 44,519 (80%).

▪ District of Coldstream: 11,171 (20%).

For the District of Coldstream, the data from self-hauled waste was excluded from the comparison. Only the results from the garbage loads collected by contracted private haulers are included to limit the comparison to curbside collected waste.
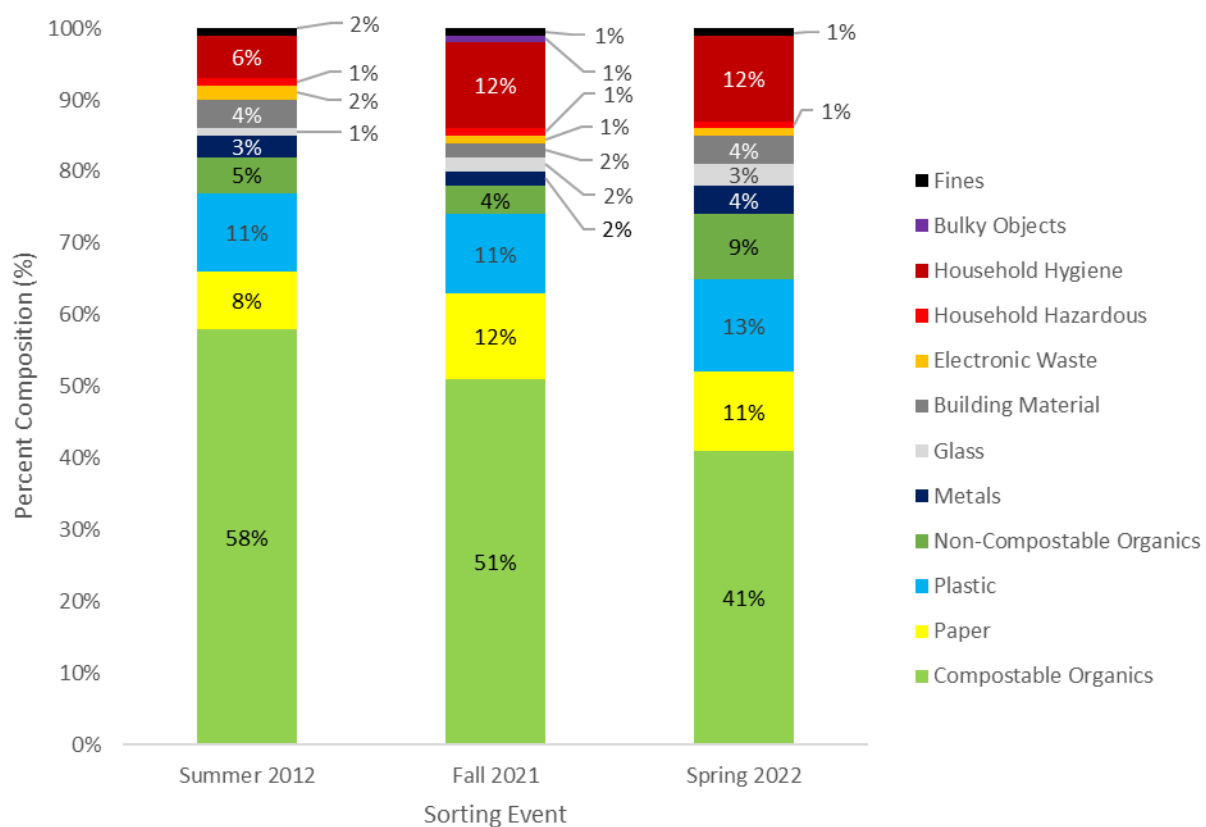
Figure 4-1: Comparison of the SF Garbage Composition in 2012 and 2021/22

SF garbage in Summer 2012 was primarily composed of compostable organics (58%), plastic products (11%), paper products (8%), and household hygiene (6%). These four primary categories represent 83% of the waste stream.

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[4] Population and dwelling counts: Canada and census subdivisions (municipalities) (statcan.gc.ca)

For comparison, SF garbage from Vernon and Coldstream in Fall 2021 was primarily composed of compostable organics (51%), household hygiene (12%), paper products (11%), and plastic products (11%). These four primary categories represent 86% of the waste stream.

SF garbage from Vernon and Coldstream in Spring 2022 was primarily composed of compostable organics (41%), plastic products (13%), household hygiene (12%), paper products (11%), and non-compostable organics. These five primary categories represent 86% of the waste stream.

The largest composition differences between 2012 and both Fall 2021 and Spring 2022 were that compostable organics decreased, household hygiene products increased, and paper products increased. Additionally, non-compostable organics increased in Spring 2022 compared to both Summer 2012 and Fall 2021.
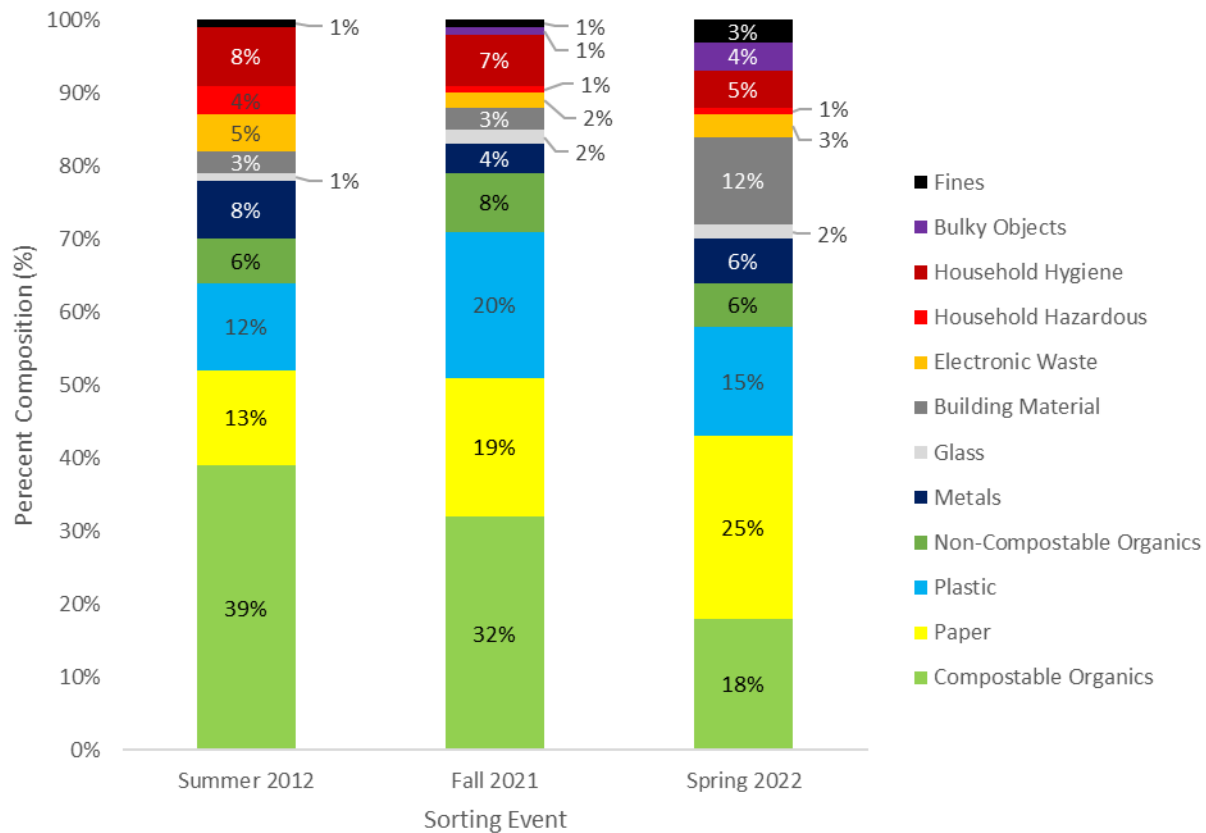
The following are observations and findings from the SF garbage comparison:

- Overall, the primary categories (i.e., compostable organics, household hygiene, paper products, and plastic products) that comprise the majority of the SF waste stream remained the same but with varying relative abundances.

- The greatest change was in the compostable organics category.

  - As seen in Table 4-1, the proportion of yard and garden waste in the SF garbage stream has noticeably decreased in 2021/22, which could be due to seasonal variations in yard and garden waste or access to more options for disposing of yard waste in the City of Vernon. It should be noted that the Spring 2022 study was conducted while the weather was still cold, so more yard and garden waste could be expected for later in the Spring.

  - The proportion of food waste (all types of food waste combined as there was no distinction between avoidable and unavoidable food waste in the 2012 study) fluctuated as shown in Table 4-1. These differences may be due to seasonal variations. For example, the Fall 2021 study was conducted the week after Thanksgiving, so more food waste may have been generated due to the holiday. In addition, the SF samples from Spring 2022 included three samples from the self-haul loads from Coldstream residents, which had less food waste than the overall average for Spring 2022 (15.1%).

  - The notable decrease in the compostable organics category for the Spring 2022 study may also cause the other categories to increase in their relative percentages.

- Household hygiene products also increased by 6% (from 6% in 2012 to 12% both Fall 2021 and Spring 2022). This difference may be partly due to definitions of what constitutes household hygiene. Bio-hazardous waste (i.e., gloves, needles, and other medical waste except for pharmaceuticals) was part of the household hazardous primary category in 2012 but part of the household hygiene category in 2021. The increased use of disposable gloves in 2021/22 likely also contributed to the increased proportion of household hygiene waste in 2021/22.

- Paper products also increased (from 8% in 2012 to 12% in Fall 2021 and 11% in Spring 2022). It is not clear where the difference comes from because the secondary categories for paper products were not the same in the 2012 and 2021/22 studies.

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Table 4-1: Composition of the Compostable Organics Category in the SF Garbage Stream in 2012 and 2021/22

Category	Summer 2012	Fall 2021	Spring 2022
Small yard and garden	35.9%	19.9%	13.8%
Large yard and garden	0.0%	0.0%	0.4%
Food waste (all categories)	19.5%	30.2%	23.2%
Other compostable organics (2021/2022 only)	N/A	0.6%	0.2%
Clean wood (2012 only)	2.1%	In Building Materials category for 2021/2022	
Total Compostable Organics	**57.5%**	**50.7%**	**37.6%**

4.2   Commercial Garbage Comparison

Figure 4-2 represents the comparison of the average waste composition from the commercial/ICI garbage stream received at the GVDDF in July 2012, October 2021, and April 2022. For the purposes of the comparison, the 2021/22 results presented here exclude the results from the grocery store subsector.

ICI garbage in Summer 2012 was primarily composed of compostable organics (39%), paper products (13%), plastic products (12%), metal (8%), and household hygiene (8%). These five primary categories represent 80% of the waste stream.

For comparison, ICI garbage in Fall 2021 was primarily composed of compostable organics (32%), plastic products (20%), paper products (19%), non-compostable organics (8%), and household hygiene (7%). These five primary categories represent 86% of the waste stream.

ICI garbage in Spring 2022 was primarily composed of paper products (25%), compostable organics (18%), plastic products (15%), and building material (12%). These four primary categories represent 70% of the waste stream.

The largest composition differences between 2012 and both Fall 2021 and Spring 2022 were that compostable organics decreased and paper products increased. Additionally, non-compostable organics increased by 9% in Spring 2022 compared to both Summer 2012 and Fall 2021.
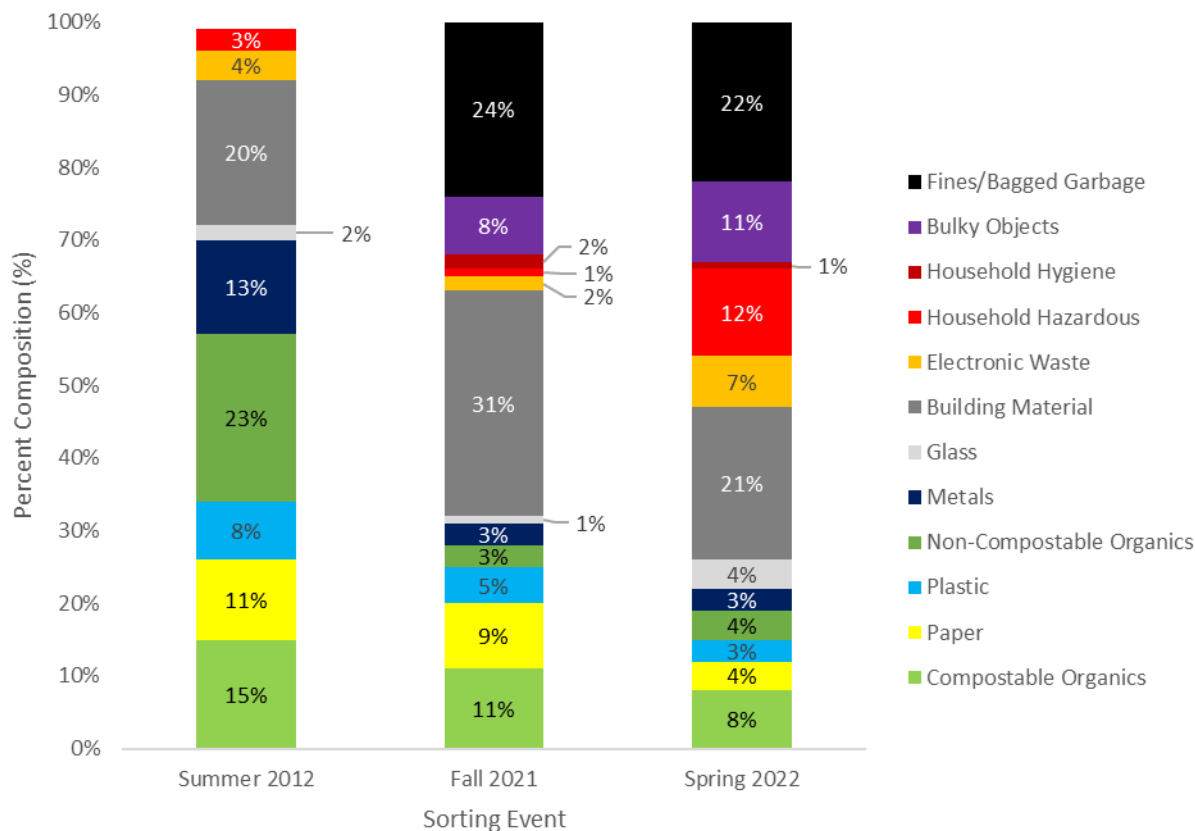
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Figure 4-2: Comparison of the ICI Garbage Composition in 2012 and 2021/22

The following are observations and findings from the ICI sector garbage comparison:

- The top three categories (compostable organics, paper products, and plastic products) made up the majority of the commercial garbage stream and stayed the relatively the same for each season, with the relative percentages of each category varying slightly.

- The greatest change was in the compostable organics category.

  - As can be seen in Table 4-2, the proportion of yard and garden waste in the ICI garbage stream noticeably decreased in 2021/22, which could be due to seasonal variations in yard and garden waste or access to more options for disposing of yard waste. It should be noted that the Spring 2022 study was conducted while the weather was still cold, so more yard and garden waste could be expected for later in the spring.

  - The proportion of food waste (all types of food waste combined as there was no distinction between avoidable and unavoidable food waste in 2012) decreased overall, with a more substantial decrease in Spring 2022. These differences may be due to seasonal variations. For example, the Fall 2021 study was conducted the week after Thanksgiving, so more food waste may have been generated due to the holiday.

  - The notable decrease in the compostable organics category for the Spring 2022 study may also cause the other categories to increase in their relative percentages.

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- Paper products also increased from 13% in 2012 to 19% in Fall 2021 and to 25% in Spring 2022. It is not clear where the difference comes from because the secondary categories for paper products were not the same in the 2012 and 2021/22 studies. It should be noted that corrugated cardboard comprised 10.1% of the ICI garbage in Spring 2022 while making up 3.1% of the ICI samples in Fall 2021 and 3.8% in Summer 2012. The proportion of paper towels/food soiled paper also changed: 1.8% in Summer 2012, 7.7% in Fall 2021, and 6.8% in Spring 2022.

- The increase in building material in the Spring 2022 sorting event was observed across multiple samples, with 7 of the 12 ICI samples consisting of more than 10% building materials.

Table 4-2: Composition of the Compostable Organics Category in the ICI Garbage Stream in 2012 and 2021/22

Category	Summer 2012	Fall 2021	Spring 2022
Small yard and garden	12.3%	9.1%	2.4%
Large yard and garden	0.0%	0.0%	0.0%
Food waste (all categories)	23.4%	22.2%	15.8%
Other compostable organics (2021/2022 only)	N/A	0.8%	0.2%
Clean wood (2012 only)	3.3%	In Building Materials category for 2021/2022	
Total Compostable Organics	**39.0%**	**32.1%**	**18.4%**

4.3   Public Drop-Off Garbage Comparison

Figure 4-3 represents the comparison of the average waste composition from the residential drop-off garbage stream in July 2012, October 2021, and April 2022.

Public drop-off garbage in Summer 2012 was primarily composed of non-compostable organics (23%), building materials (20%), compostable organics (15%), metals (13%), and paper products (11%). These five primary categories represent 82% of the waste stream.

For comparison, public drop-off garbage in Fall 2021 was primarily composed of building material (31%), compostable organics (11%), paper (9%), and bulky objects (8%). These four primary categories represent 59% of the waste stream. Bagged garbage comprised an additional 24% of the samples.

Public drop-off garbage in Spring 2022 was primarily composed of building material (21%), household hazardous waste (12%), bulky objects (11%), and compostable organics (8%). These four primary categories represent 52% of the waste stream. Bagged garbage comprised an additional 22% of the samples.

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The largest composition differences between 2012 and 2021 is that bagged garbage was not a category in the 2012 study. The top categories in each season, as well as the percentages of each category vary, with only building materials consistently comprising more than 10% of the sample for each sorting event.

Figure 4-3: Comparison of the Public Drop-Off Garbage Composition in 2012 and 2021/22

The following are observations and findings from the public drop-off garbage comparison:

▪ Overall, the top primary categories for the public drop-off waste stream varied between 2012 and 2021/22. Only building materials consistently comprised more than 10% of the sample for each sorting event.

▪ The largest composition difference between 2012 and 2021/2022 was that bagged garbage was not a category in the 2012 study. Bagged garbage made up 24% and 22% of the public drop-off stream in Fall 2021 and Spring 2022, respectively, but was not identified as a category in 2012.

▪ The proportion of building material fluctuated, 20% in Summer 2012, 31% in Fall 2021, and 21% in Spring 2022. However, it should be noted that clean wood was classified in the compostable organics category in 2012 and a building material in 2021/22.

  – Table 4-3 shows the composition of the compostable organics category. As mentioned above, clean wood was considered in the compostable organics category in 2012 and consisted of a large proportion of the compostable organics category. In addition, food waste was observed to comprise 10.1% of the samples in Fall 2021, but was a minor component during the other two seasons.

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▪ The non-compostable organics category decreased from 23% in Summer 2012 to 3% in Fall 2021 and 4% in Spring 2022. The difference may be mainly attributed to the classification of treated wood, which was in the non-compostable organics category in 2012 but in the building materials category in 2021/22. Treated wood comprised 21.0% of the overall weight of the public drop-off samples in Summer 2012.

▪ Bulky objects increased from 0% in Summer 2012 to 8% in Fall 2021 and 11% in Spring 2022. This category may be more variable depending on what public drop-off customers decided to bring to the GVDDF at the time that the studies were conducted.

Table 4-3: Composition of the Compostable Organics Category in the Public Drop-Off Garbage Stream in 2012 and 2021/22

Category	Summer 2012	Fall 2021	Spring 2022
Small yard and garden	1.9%	0.4%	5.8%
Large yard and garden	0.0%	0.0%	1.2%
Food waste (all categories)	1.8%	10.1%	0.1%
Other compostable organics (2021/2022 only)	N/A	0.9%	0.6%
Clean wood (2012 only)	11.3%	In Building Materials category for 2021/2022	
Total Compostable Organics	**15.0%**	**11.4%**	**7.7%**

5.0   INTERESTING FINDS

Table 5-1 lists some of the notable, unexpected, and unusual materials found during the waste composition study. These materials will not necessarily skew the results as it is not atypical to have these types of materials present in the various waste sectors and streams.

Table 5-1: List of Uncommon Materials Found During This Study

Sector (Generator)	Sample ID	Description	Photo
Grocery	FA21-GRO-04	Large amount of unopened avoidable food waste	
Commercial	FA21-ICI-02	A rolled carpet	

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Sector (Generator)	Sample ID	Description	Photo
Commercial	FA21-ICI-05	Catheter	
CRD	FA21-CRD-02	Stroller	
Commercial	FA21-ICI-12	Large amount of clothing	
Commercial	FA21-ICI-14	All-in-one printer	
Commercial	FA21-ICI-15	Air filters	
SF	FA21-SF-01	Wall insulation	
Drop-Off	FA21-DO-04	Cameras	

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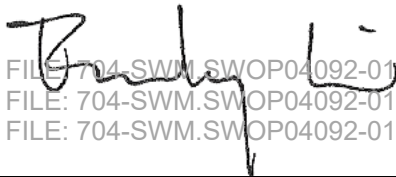
Sector (Generator)	Sample ID	Description	Photo
Grocery Store	SP22-GRO-02	Large amount of avoidable food waste – bread	
Grocery Store	SP22-GRO-03	Large amount of avoidable food waste – fresh vegetables, potatoes, and fruits	
Commercial	SP22-ICI-05	Large amount avoidable food waste – unopened packages of mixed nuts, croutons, and dipping sauce	
SF	SP22-SF-03	Chainsaw	
Commercial	SP22-ICI-09	A large amount of household batteries – medium size, non-rechargeable	
Commercial	SP22-ICI-10	Vehicle Tire	

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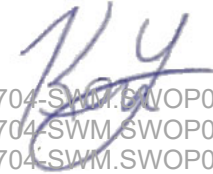| Sector (Generator)	Sample ID	Description	Photo
SF	SP22-SF-05	Many insulin syringes	
SF	SP22-SF-03	Butane tank	
SF	SP22-SF-02	Dialyzer	
Public Drop-Off	SP22-DO-03	Mattress	
CRD	SP22-CRD-01	Door	

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6.0   CLOSURE

We trust this document meets your present requirements. If you have any questions or comments, please contact the undersigned.

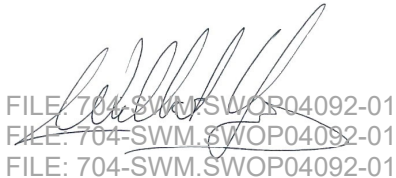Respectfully submitted,
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