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Regional District of Nanaimo
2022 Waste Composition Study

PRESENTED TO
Regional District of Nanaimo

JANUARY 30, 2023
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EXECUTIVE SUMMARY

Tetra Tech Canada Inc. (Tetra Tech) was retained by the Regional District of Nanaimo (RDN) to undertake a waste composition study to determine the characteristics of the municipal solid waste disposed at Nanaimo Regional Landfill (NRL) and Church Road Transfer Station (CRTS).

The RDN is a regional entity that consists of four municipalities and seven electoral areas, covering an area of 2,036 km^2. RDN's population in 2022 was estimated to be 177,305[1]. The RDN owns and operates two solid waste management facilities in the region: the NRL and the CRTS. In 2020, the RDN updated the 2004 Solid Waste Management Plan, which established an updated diversion rate target of 90%, or target disposal rate of 109 kg/capita/year, by 2030.

The 2022 solid waste composition study will enable the RDN to determine where resources should be directed in the future to achieve their waste diversion goals as per their 2020 Solid Waste Management Plan. The objectives of the 2022 waste composition study were as follows:

- Collect data on the current composition of the region's municipal solid waste in the following sectors:

  - Single-family (SF),

  - Multi-family (MF),

  - Industrial, Commercial, and Institutional (ICI),

  - Public Drop Off (DO), and

  - Construction and Demolition (C&D).

- Establish a baseline for new program initiatives.

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

- Provide data to inform future strategies or initiatives.

The sorting event for Fall 2022 was undertaken from October 24, 2022 to October 26, 2022 (inclusive) at the CRTS and from October 27, 2022 to November 2, 2022 (inclusive) at the NRL. Efforts were made to obtain samples from a representative sample of geographical areas in the regional district. A total of 41 samples were collected and characterized during this sorting event.

Waste Composition Results

During the sorting event, materials were classified into 14 primary categories, which were further broken down into 92 secondary categories. Figure E-1 represents the average waste composition of the garbage stream from all sectors in the RDN in Fall 2022. The overall waste composition was calculated based on the waste composition results for each sector (i.e., SF, MF, ICI, DO, and C&D) and the relative proportion of the waste disposed from these sectors in 2022. This is a snapshot of the types and relative quantities of materials that were discarded by residents and businesses at this time of the year.

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[1] Population Estimates & Projections for British Columbia. https://bcstats.shinyapps.io/popApp/.
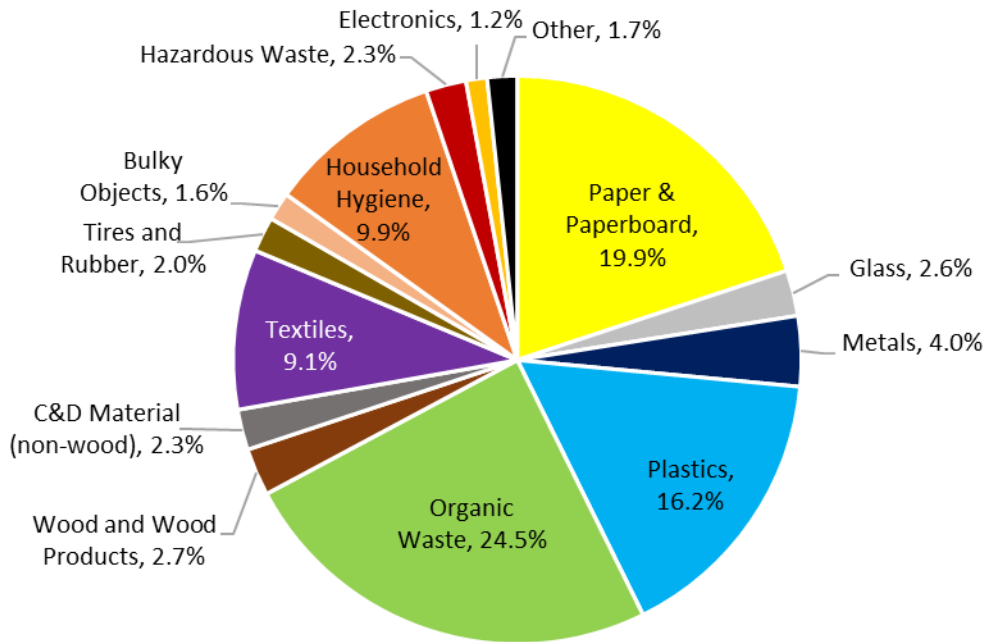
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Figure E-1: Composition of the Overall Garbage Stream

The diversion potential represents the percentage of materials that could be diverted through composting, recycling, or diversion at depots and drop off sites through programs in the RDN (Figure E-2).
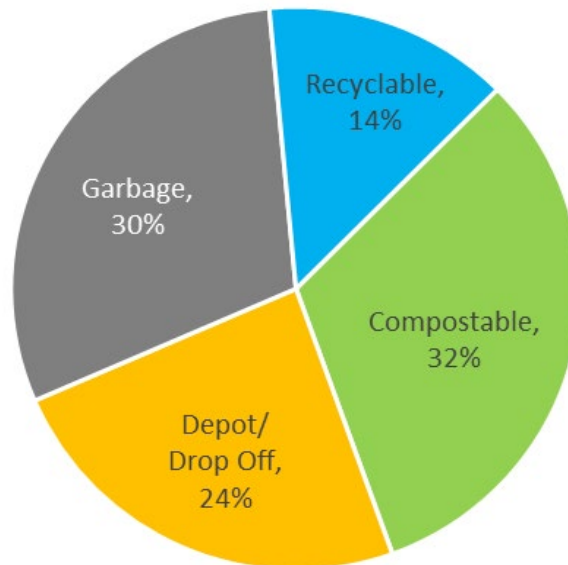

Figure E-2: Diversion Potential of the Overall Garbage Stream

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Comparison to Previous Studies

Results from this study in 2022 were compared to previous waste composition studies that were conducted in 2004 and 2012 (Figure E-3). It should be noted that the primary categories in 2004 and 2012 were different in comparison to 2022. To compare the data, 2004 and 2012 categories were placed into best fit 2022 primary categories. The most notable trend is that organic waste decreased from 36% in 2004 to 31% in 2012, then 25% in 2022.
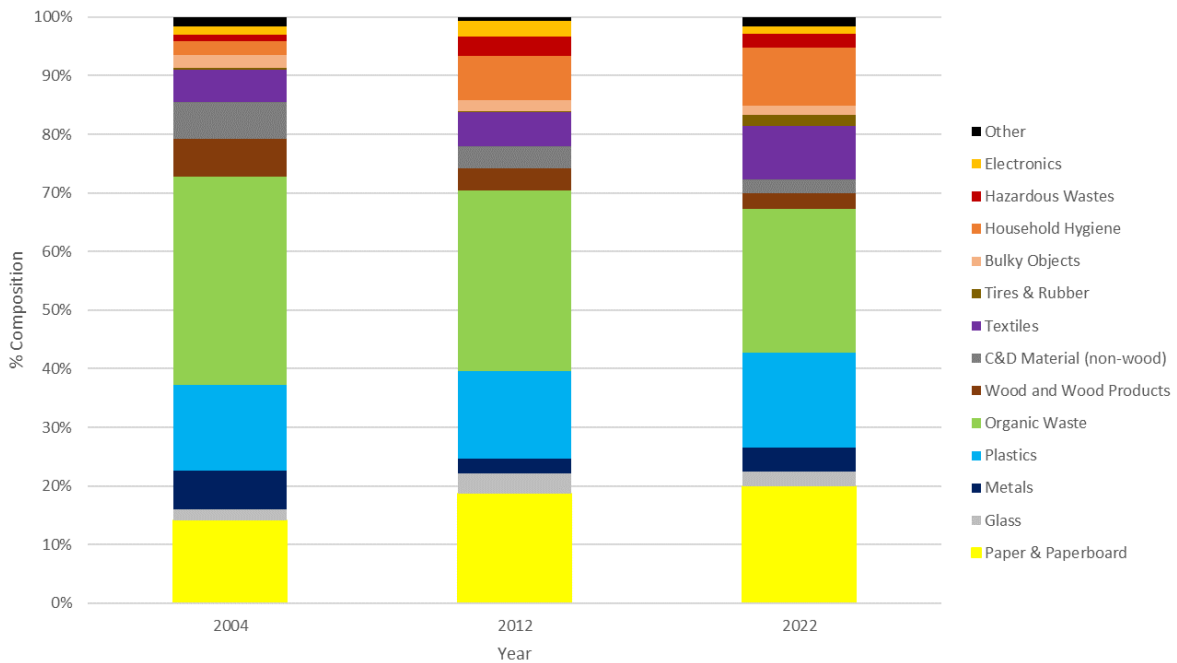

Figure E-3: Comparison of Overall Regional Waste Composition Across Studies

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[2] Disposal tonnages were extrapolated to the entire year using data from January 1, 2022 to December 21, 2022.

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ACRONYMS & ABBREVIATIONS

Acronyms/Abbreviations	Definition
C&D	Construction and Demolition
CCME	Canadian Council of Ministers of the Environment
CRTS	Church Road Transfer Station
DO	Public Drop Off
EPR	Extended Producer Responsibility
ICI	Industrial, Commercial, and Institutional
MF	Multi-Family Residential
NRL	Nanaimo Regional Landfill
RDN	Regional District of Nanaimo
SF	Single-Family Residential
SUI	Single Use Item
Tetra Tech Canada Inc.	Tetra Tech

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LIMITATIONS OF REPORT

This report and its contents are intended for the sole use of the Regional District of Nanaimo 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 Nanaimo, 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 or Contractual Terms and Conditions executed by both parties.

NOTE TO THE READER

The samples collected and audited 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. Seasonal and 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   INTRODUCTION

Tetra Tech Canada Inc. (Tetra Tech) was retained by the Regional District of Nanaimo (RDN) to undertake a waste composition study to determine the characteristics of the municipal solid waste disposed at Nanaimo Regional Landfill (NRL) and Church Road Transfer Station (CRTS).

The RDN is a regional entity that consists of four municipalities and seven electoral areas, covering an area of 2,036 km^2. RDN's population in 2022 was estimated to be 177,305[3]. The RDN owns and operates two solid waste management facilities in the region: the NRL and the CRTS. In 2020, the RDN updated the 2004 Solid Waste Management Plan, which established an updated diversion rate target of 90%, or target disposal rate of 109 kg/capita/year, by 2030.

Previous waste composition studies were conducted in 2004 and 2012 to determine the sources and composition of municipal solid waste. The 2022 solid waste composition study will enable the RDN to determine where resources should be directed in the future to achieve their waste diversion goals as per their 2020 Solid Waste Management Plan.

1.1   Scope of Work

The 2022 waste composition study establishes current data to help the region measure progress on its four goals in the 2020 Solid Waste Management Plan, which established a target diversion rate of 90%, or a disposal rate of 109 kg/capita/year. The objectives of this waste characterization study included the following:

- Collect data on the current composition of the region's municipal solid waste in the following sectors:

  – **Single-family (SF),** typically curbside collected waste streams from a building, consisting of one dwelling unit, used or intended to be used as the residence of one family.

  – **Multi-family (MF)**, typically waste from any building or cluster of buildings consisting of two or more dwelling units. Waste from these sources is typically collected by private sector service providers from communal disposal receptacles, such as dumpsters.

  – **Industrial, Commercial, and Institutional (ICI)**, typically waste from light industrial, commercial, and institutional sources. Waste from these sources is typically collected by private sector service providers from dumpsters and compactors.

  – **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 large roll-off bins and aggregated together.

  – **Construction and Demolition (C&D),** materials and waste from construction, renovation, and demolition activities and includes waste generated from new construction, renovation, and demolition projects. Typically sorted and aggregated offsite by private sector service providers before being brought to the NRL.

- Establish a baseline for new program initiatives.

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

- Provide data to inform future strategies or initiatives.

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[3] Population Estimates & Projections for British Columbia. https://bcstats.shinyapps.io/popApp/.

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The sorting event for Fall 2022 was undertaken from October 24, 2022 to October 26, 2022 (inclusive) at the CRTS and from October 27, 2022 to November 2, 2022 (inclusive) at the NRL. A sampling plan was developed in conjunction with RDN staff. Efforts were made to obtain samples from a representative sample of geographical areas in the regional district. The total number of samples collected and characterized during this sorting event is summarized by sector in Table 1-1.

Table 1-1: Number of Samples Characterized by Sector

Sector	Number of Samples	
	Church Road Transfer Station	Nanaimo Regional Landfill
Single-Family	6	9
Multi-Family	-	2
Industrial, Commercial, and Institutional	3	12
Public Drop Off	-	4
Construction and Demolition	-	5
Total	**41**	

2.0   METHODOLOGY

Sampling and sorting were conducted in accordance with the methodology set out in the *Recommended Waste Characterization Methodology for Direct Waste Analysis Studies in Canada* that was prepared by the Canadian Council of Ministers of the Environment (CCME)[4].

Samples were collected and sorted by Tetra Tech staff who were trained on safety and waste sorting procedures. Personal protective equipment such as safety glasses, steel-toe boots, gloves, and hi-vis vests were used by all staff as per 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 given by RDN staff.

2.1   Sample Collection Methodology

The following describes the collection approach for the various waste streams characterized during this study. Tetra Tech's field lead worked closely with RDN staff to identify loads for sampling and characterizing that were representative of each targeted waste sector. As selected loads arrived at the CRTS and NRL, Tetra Tech's field lead would communicate with RDN staff to ensure the target loads tipped their load at the designated area for sampling and characterizing. For each load, sample information was collected which includes origin of waste and photographs of sample(s).

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[4] 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

SF residential curbside collection loads were selected with input from RDN staff at CRTS and NRL. Tetra Tech's field lead communicated with the truck driver to verify the origin of the load and ensure that samples were collected from different areas in the RDN. Truck loads were also collected over a number of days at both CRTS and NRL to capture a variety of collection routes that service different geographical areas. Generally, trucks arriving at the CRTS originated from areas in the RDN outside the City of Nanaimo (e.g., Parksville, Qualicum, Gabriola Island), while trucks at the NRL mostly originated from the City of Nanaimo.

Selected trucks were redirected to a designated tip area where the entire load was tipped, as typical operations (Figure 2-1 and Figure 2-2). RDN staff would then use a loader to pull out material from a random location in the pile and bring the sample material to Tetra Tech's sorting area. From this material, Tetra Tech staff would collect a sample that is approximately 100 kg, sort the sample into its respective categories and weigh the categories.

Figure 2-1: SF Load Tipped at CRTS

Figure 2-2: SF Load Tipped at NRL

2.1.2 Multi-Family

MF loads were identified by Tetra Tech and NRL staff and were directed to unload their contents at the designated tip face area. At the area, trucks would tip their entire load, as typical operations, RDN staff would then use a loader to pull out material from a random location in the pile and bring the sample material to Tetra Tech's sorting area. From this material, Tetra Tech staff would collect a sample that is approximately 100 kg (Figure 2-3), sort the sample into its respective categories, and weigh and record results.

2.1.3 Industrial, Commercial, and Institutional

ICI loads were typically delivered in front load trucks. Target loads were identified by Tetra Tech and RDN staff at CRTS and NRL. Selected trucks were directed to unload their contents at the designated tip area (Figure 2-4). At the area, trucks would tip their entire load, as typical operations, RDN staff would then use a loader to pull out material from a random location in the pile and transport materials to Tetra Tech's sorting area. Tetra Tech staff would collect a 100 kg sample, sort the sample into its respective categories, weigh and record results.

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Figure 2-3: MF Sample

Figure 2-4: Front-load Truck Tipping an ICI Load at the CRTS

2.1.4 Public Drop Off

Residents can dispose of their bulky and excess materials into designated roll-off bins (Figure 2-5) located at the public drop off area at the NRL. RDN staff would identify incoming public drop off bins and a RDN staff member would tip the entire load, as typical operations, at the designated tip area at the active face. Tetra Tech staff would characterize the materials from the roll-off bins using a volume-based visual estimate procedure.

2.1.5 Construction and Demolition

C&D materials at the NRL were typically consolidated and sorted by private sector service providers before being aggregated and brought to the NRL (Figure 2-6). Target loads were identified by Tetra Tech and RDN staff at the NRL and directed by RDN staff to unload their contents at the designated tip face area. At the area, trucks would tip their entire load, as typical operations. Tetra Tech staff conducted visual estimates of the entire load to identify the composition of each load.

Figure 2-5: DO Bin Unloading at the NRL

Figure 2-6: C&D Material Unloading at the NRL

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2.2 Waste Characterization Approach

An initial visual analysis was conducted on each load to determine which of the following methods would be used:

- **Hand Sort (Manual Sort)** – A random sample of about 100 kg was pulled from the load and sorted by hand. This method was used for loads that were composed of more than 75% bagged materials.

- **Visual Estimation (Visual audit)** – The entire load was visually estimated for loads that were composed of 30% or less of bagged materials.

- **Visual Estimation and Hand Sort (Dual)** – For loads that were composed of 30% to 75% bagged materials, the entire load was first visually estimated, then a random grab sample (about 100 kg) of the bagged material was manually sorted. This approach was used for loads that have a mix of large items and bagged materials.

2.2.1 Hand Sort

As selected SF, MF, and ICI loads arrived at the CRTS or the NRL, Tetra Tech's field lead would communicate directly with the driver to determine the origin of the material. Once selected for the study, RDN staff would direct the driver to empty their load at a designated location for sample collection. The loader operator would then collect one loader bucket of the load (approximately 200 kg to 300 kg in weight) and deliver it to Tetra Tech's sorting area (Figure 2-7 and Figure 2-8).

The field team would collect a waste sample that was approximately 100 kg and characterize the sample by sorting the materials into its respective material category. The contents of each bin were then weighed and recorded to determine the weight for each secondary category. In addition, two categories (single-use plastics and compostable plastics) were also individually counted and recorded.

Figure 2-7: Field Staff Collecting a Sample for Hand Sorting at the CRTS

Figure 2-8: Field Staff Hand Sorting a Sample at the Designated Sorting Area at the NRL

2.2.2 Visual Estimates

For C&D and DO loads at NRL, the entire load would first be visually assessed. When the amount of bagged garbage was less than 30% of the load, the samples were visually estimated and characterized by two Tetra Tech field staff who walked around the load (independently) to visually estimate composition by volume, first by primary categories, then by secondary categories (Figure 2-9). Once each staff member completed their estimates, they would compare and average out their results. Results were then recorded electronically.

2.2.3 Hand Sort and Visual Estimation

The loads would be initially analyzed to identify whether the large objects that could be easily sorted or the bagged garbage was greater than 30%. For loads with 30% to 75% bagged garbage, the load would be visually estimated followed by a hand sort. The results of the visual estimates and hand sort would be scaled according to the proportion of bagged garbage from the visual estimates and recorded electronically.

Figure 2-9: Field Staff Conducting a Visual Estimate

2.3 Material Categories

A comprehensive list of material categories along with their descriptions is included in Appendix B. These categories were used in both the visual estimation and hand sorted materials. During the sorting event, materials were classified into 14 primary categories, which were further broken down into 92 secondary categories. These sorting categories were selected and approved by RDN staff.

The 14 primary categories include the following:

- Paper and Paperboard.
- Plastics.
- C&D Material (non-wood).
- Bulky Objects.
- Electronics.

- Glass.
- Organic Waste.
- Textiles.
- Household Hygiene.
- Other.

- Metal.
- Wood and Wood Products.
- Tires and Rubber Products.
- Hazardous Waste.

3.0 WASTE COMPOSITION RESULTS

The following summarizes the waste composition results for the various sectors investigated. 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 for each sector. Waste composition results are presented in Appendix C. Selected photographs are shown in Appendix D.

For samples where visual estimates were conducted, the volume-based percentages were converted into weight-based percentages using specific densities (as summarized in Appendix B) for material categories. For each sample, plastic single-use items (SUIs) and compostable plastics were sorted, weighed, and each individual item was counted.

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Furthermore, the diversion potential was determined for each sector based on the waste composition results. Classifications for what can be diverted through composting, recycling, or depot/drop off are shown in Appendix B. The diversion potential is calculated based on an ideal scenario where residents and/or businesses use currently available waste diversion options. This is the theoretical diversion limit of what is possible given the current waste composition. This is a hypothetical analysis and does not consider different diversion potentials for specific materials and seasonal differences in compositions for different sectors.

Diversion potential of materials in the waste stream was divided into four options:

- **Compostable**: collected as part of the curbside food waste program or at drop off locations that accept yard and garden waste;

- **Recyclable:** typical recyclables, such as cardboard and newsprint that can be collected in Recycle BC;

- **Depot/drop off materials**: divertible materials that can be dropped off at a depot, donation or registered collection site or a transfer station; and

- **Garbage**: residuals that would not fall within the above diversion options that would be disposed/landfilled.

3.1   Overall Waste Composition

The following summarizes the overall waste composition of materials disposed in the RDN and diversion potential based on the overall waste composition. This waste composition was calculated based on the waste composition results for each sector and the relative proportion of the waste disposed from those sectors in 2022, as summarized in Table 3-1. In 2022, it was estimated that 78,884 tonnes of waste was landfilled[5].

Table 3-1: 2022 Disposal by Sector

Sector	Tonnes (Estimated)	Percentage of Total Waste
Single-Family	21,606	27%
Multi-Family	9,652	12%
Industrial, Commercial, and Industrial	46,900	60%
Public Drop Off	N/A	N/A
Construction and Demolition	726	1%
Total	**78,884**	**100%**

Note: Disposal tonnages were extrapolated to the entire year using data from January 1, 2022 to December 21, 2022.

3.1.1   Waste Composition Results

Figure 3-1 represents the average waste composition of the garbage stream from all sectors in the RDN in Fall 2022. This is a snapshot of the types and relative quantities of materials that were discarded by residents and businesses at this time of the year. The garbage stream was primarily composed of organic waste (24.5%), paper and paper products (19.9%), plastics (16.2%), household hygiene (9.9%), and textiles (9.1%). These five primary categories represent 79.6% of the waste stream.

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[5] Disposal tonnages were extrapolated to the entire year using data from January 1, 2022 to December 21, 2022.

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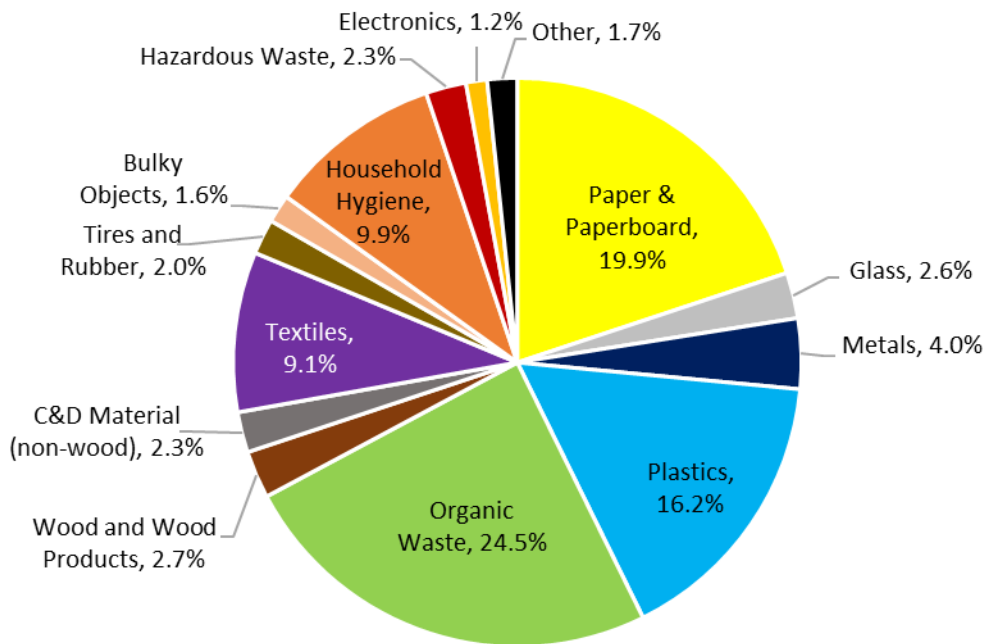
Figure 3-1: Composition of the Overall Garbage Stream

The largest components of organic waste were avoidable or potentially donatable food waste (14.5%), followed by unavoidable food waste (5.7%), and yard and garden waste (3.6%). Yard and garden waste includes grass, leaves, and branches that are less than 3 inches in diameter.

The largest components of paper products were compostable soiled paper (8.1%), followed by printed paper (2.9%), corrugated cardboard (2.7%), paper packaging – dry goods (2.1%), and non-recyclable paper (2.1%). Paper packaging – dry goods consist of boxboard and other paper packaging for products such as cereal, cookies, soap, toothpaste, etc. Examples of non-recyclable paper include waxed cardboard, waxed paper from a bakery or butcher, and laminated signage.

Plastic was mostly composed of other flexible plastic packaging (3.6%), durable plastic products (3.1%), rigid plastic containers (2.8%), and film product – residential (2.6%).

For household hygiene, the largest components were disposable diapers (4.4%) and animal feces (3.8%).

The textile category included other textiles (5.8%) and clothing (2.4%). Other textiles included bedding, towels, fabric scraps, pillows, and bags.

3.1.2 Diversion Potential

Figure 3-2 summarizes the diversion potential of the overall garbage stream. The diversion potential represents the percentage of materials that could be diverted through composting, recycling, or diversion at depots and drop off sites through programs in the RDN, such as C&D recycling (e.g., drywall, roofing material, insulation, and carpet) or donation of reusable items (e.g., clothing, tools, furniture), and product stewardship programs. The product stewardship programs are diversion options readily available in the RDN, including materials accepted at Recycle BC depots (e.g., recyclable plastic film, expanded polystyrene, etc.) and materials managed by extended producer responsibility (EPR) programs (e.g., Encorp Return-It for beverage containers, Product Care, Call2Recycle, etc.).

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As shown on Figure 3-2, the total diversion potential was 70% and consisted of 32% compostable materials, 24% depot/drop off recycling material, and 14% recyclable materials.

The main materials that could be diverted in compost/organics were food waste – avoidable or donatable (14%), compostable soiled paper (8%), and food waste – unavoidable (6%).

The main materials that could be diverted through depot/drop off were other textiles (6%), other flexible plastic packaging (4%), film packaging – other bags and overwrap (2%), and clothing (2%).

The main materials that could be diverted in recycling were corrugated cardboard (3%), printed paper (3%), rigid plastic containers – non-deposit (3%), and paper packaging – dry goods (2%).
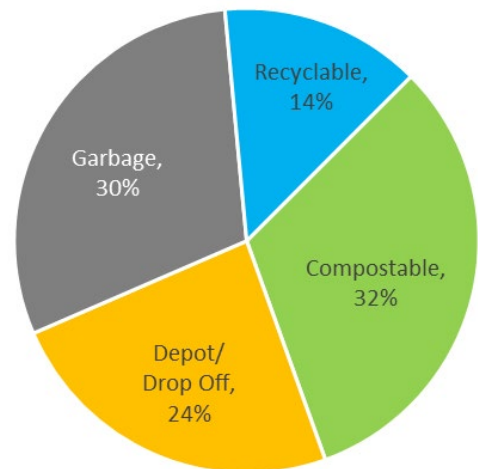
Figure 3-2: Diversion Potential of the Overall Garbage Stream

3.2   Single-Family

The following summarizes the waste composition results and diversion potential for SF garbage. Seventeen samples were collected and sorted. Communities sampled included: Parksville, Qualicum, Coombs, Gabriola Island, and the City of Nanaimo.

3.2.1   Waste Composition Results

Figure 3-3 represents the average waste composition of the garbage stream from SF households in the RDN in Fall 2022. This is a snapshot of the types and relative quantities of materials that were discarded by residents at this time of the year.

SF garbage was primarily composed of organic waste (20.9%), plastics (18.7%), paper and paperboard (16.8%), household hygiene (14.8%), and textiles (11.6%). These five primary categories represent 82.9% of the waste stream.

The largest components of organic waste were avoidable or donatable food waste (13.3%), followed by unavoidable food waste (5.5%), and yard and garden waste (1.4%). Yard and garden waste includes grass, leaves, and branches that are less than 3 inches in diameter.

Plastic was mostly composed of other flexible plastic packaging (6.0%), durable plastic products (2.9%), residential film product (2.7%), non-deposit rigid plastic containers (2.6%), and film packaging – other bags and overwrap (2.1%). Non-deposit rigid plastic containers are plastic containers that would typically be collected in the blue carts, such as ketchup bottles, yogurt containers, shampoo bottles, etc.

The paper and paperboard category included compostable soiled paper (8.7%), followed by non-recyclable paper (2.3%), printed paper (2.1%), and paper packaging – dry goods (1.8%).

For household hygiene, the largest components were disposable diapers (7.9%), animal feces (3.8%), and dog waste (1.7%). Animal feces included cat litter and other animal waste such as hamster bedding.

The textiles category consisted of other textiles (7.8%) and clothing (3.1%).

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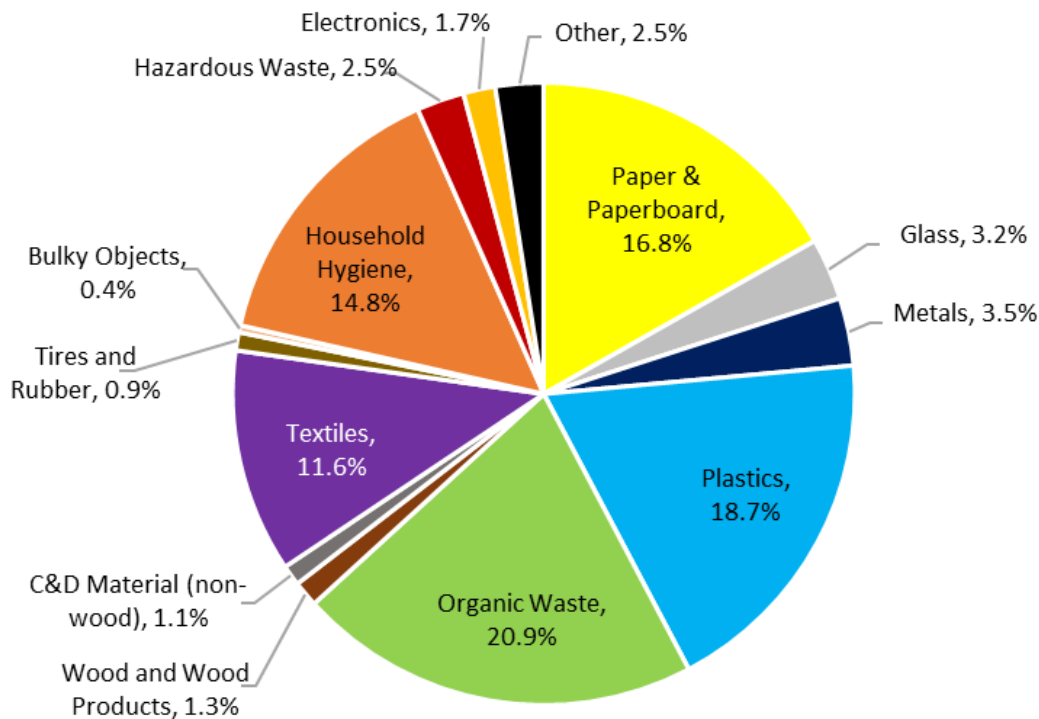
Figure 3-3: Composition of the SF Garbage Stream

3.2.2 Diversion Potential

Figure 3-4 summarizes the diversion potential in the SF garbage stream. The diversion potential represents the percentage of materials that could be diverted through composting, recycling, or diversion at depots and drop off sites through programs in the RDN, such as C&D recycling (e.g., drywall, roofing material, insulation, and carpet) or donation of reusable items (e.g., clothing, tools, furniture), and product stewardship programs. The product stewardship programs are diversion options readily available in the RDN, including materials accepted at Recycle BC depots (e.g., recyclable plastic film, expanded polystyrene, etc.) and materials managed by EPR programs (e.g., Encorp Return-It for beverage containers, Product Care, Call2Recycle, etc.).

As shown on Figure 3-4, the total diversion potential was 66% and consisted of 29% compostable, 27% depot/drop off, and 10% recyclable materials.
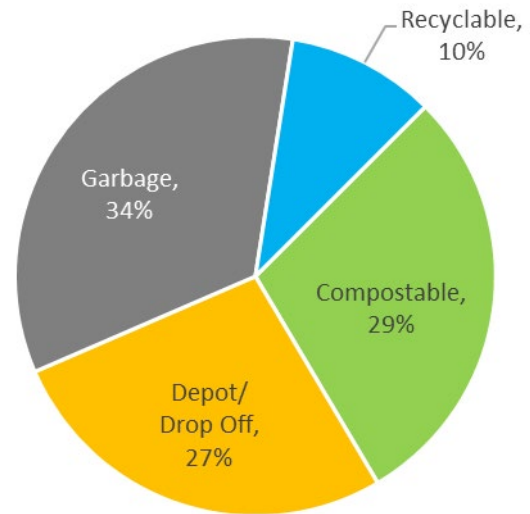
Figure 3-4: Diversion Potential of the SF Garbage Stream

The main materials that could be diverted in compost/organics programs were avoidable or donatable food waste (13%), compostable soiled paper (9%), and unavoidable food waste (5%).

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The main materials that could be diverted through depot/drop off, including donatable materials, consisted of other textiles (8%), other flexible plastic packaging (6%), clothing (3%), and film packaging – other bags and overwrap (2%).

The materials that could be better diverted through recycling programs included non-deposit rigid plastic containers (3%), printed paper (2%), and paper packaging – dry goods (2%).

3.3 Multi-Family

The following summarizes the waste composition results and diversion potential for MF garbage. Two MF samples, originating from multi-dwelling complexes in the City of Nanaimo, were collected and sorted.

3.3.1 Waste Composition Results

Figure 3-5 represents the average waste composition of the garbage stream from MF buildings in the RDN in Fall 2022. This is a snapshot of the types and relative quantities of materials that were discarded by residents at this time of the year. MF garbage was primarily composed of organic waste (30.8%), paper and paperboard (25.5%), household hygiene (13.0%), and plastics (11.6%).

Figure 3-5: Composition of the MF Garbage Stream

For organic waste, the largest components were avoidable or donatable food waste (20.4%) and unavoidable food waste (10.0%).

Paper and paperboard products mainly consisted of compostable food soiled paper (7.8%), corrugated cardboard (7.1%), and printed paper (4.6%).

Household hygiene was mostly composed of animal feces (6.6%) and disposable diapers (4.2%).

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Plastic was mostly composed of other flexible plastic packaging (3.4%), residential film product (2.6%), and non-deposit rigid plastic containers (2.1%). Other flexible plastic packaging include stand-up and zipper lock pouches (e.g., baby food pouches), crinkly wrappers and bags (e.g., chip bags, candy wrappers), woven and net plastic bags (e.g., bags for rice or fruit), flexible packaging with plastic seals (e.g., for deli meat), and non-food protective packaging (e.g., bubble wrap, shipping envelopes). Residential film products include garbage bags and tarps, but excludes commercial film products such as pallet wraps.

3.3.2 Diversion Potential

Figure 3-6 summarizes the diversion potential in the MF garbage stream. The diversion potential represents the percentage of materials that could be diverted through composting, recycling, and diversion at depots and drop off sites through programs in the RDN, such as C&D recycling (e.g., drywall, roofing material, insulation, and carpet) or donation of reusable items (e.g., clothing, tools, furniture), and product stewardship programs.

As shown on Figure 3-6, the total diversion potential was 75% and consisted of 39% compostable, 21% recyclable, and 15% depot/drop off materials.

The main materials that could be diverted in compost/organics programs include avoidable or donatable food waste (20%), unavoidable food waste (10%), and compostable soiled paper (8%).

Figure 3-6: Diversion Potential of the MF Garbage Stream

The materials that could be better diverted through recycling programs included corrugated cardboard (7%), printed paper (5%), and paper packaging – dry goods (3%).

The main materials that could be diverted through depot/drop off, including donatable materials, consisted of other flexible plastic packaging (3%), other textiles (3%), clothing (3%), and glass containers (2%).

3.4 Industrial, Commercial, and Institutional

The following summarizes the waste composition results and diversion potential for the ICI sector. Three samples from businesses in Parksville and Qualicum were collected and sorted at the CRTS. At NRL, 12 samples, mostly originating from businesses in Nanaimo, were collected and sorted.

3.4.1 Waste Composition Results

Figure 3-7 represents the average waste composition of the garbage stream from the ICI sector in the RDN in Fall 2022. This is a snapshot of the types and relative quantities of materials that were discarded by commercial and institutional organizations this time of the year.

ICI garbage was primarily composed of organic waste (25.3%), paper and paperboard (20.4%), plastic products (16.2%), textiles (8.6%), and household hygiene (7.2%). These five primary categories represent 77.7% of the waste stream.
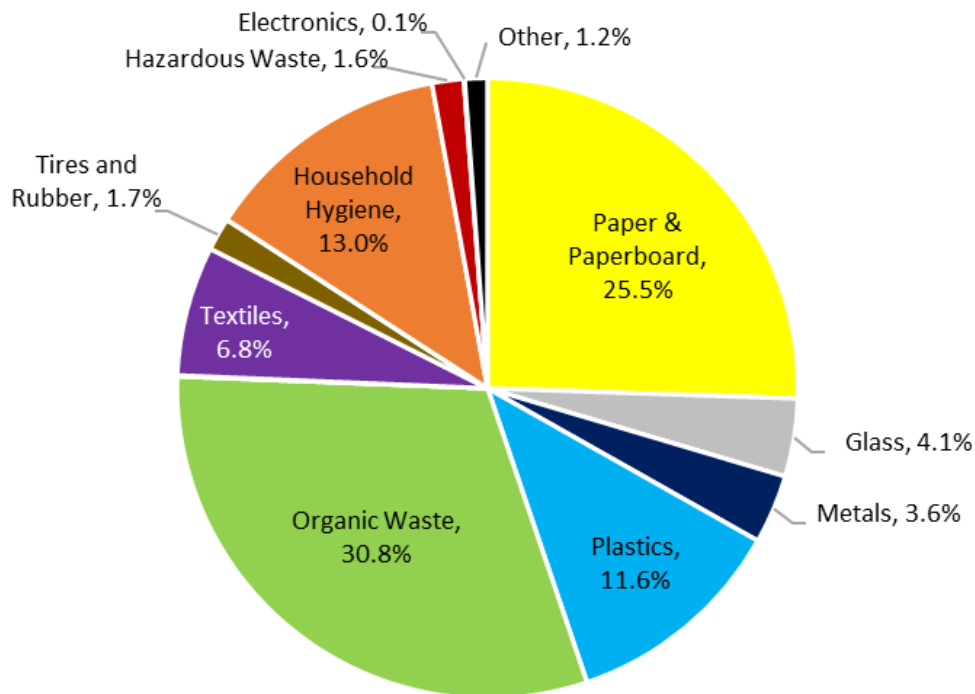
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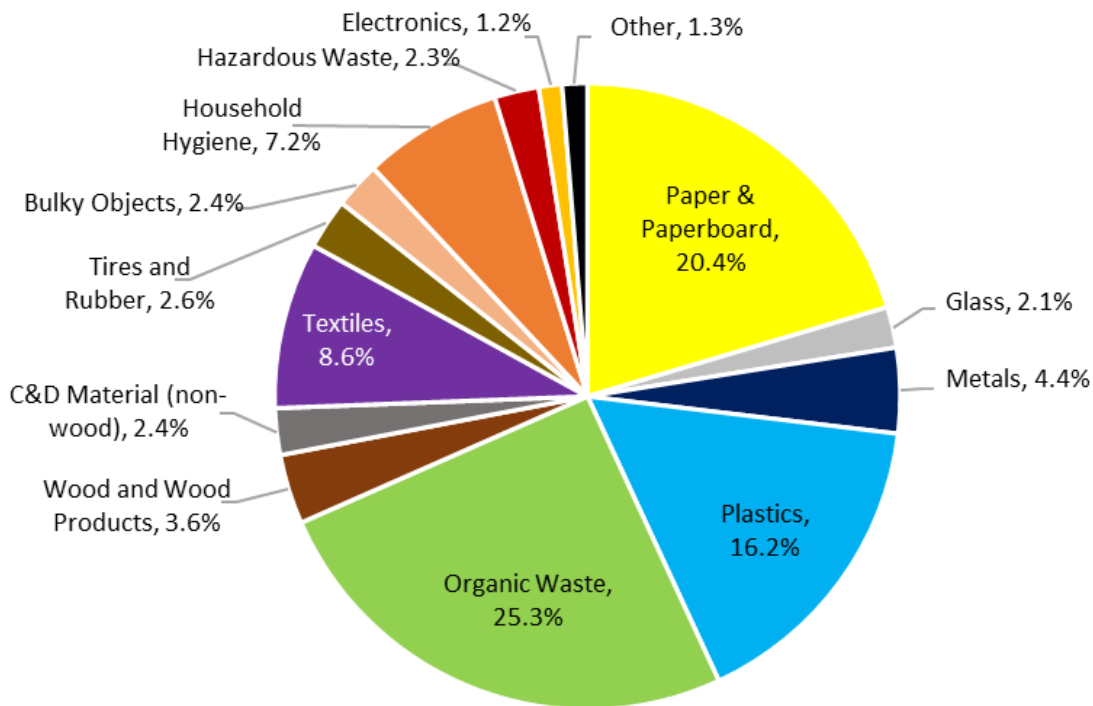
Figure 3-7: Composition of the ICI Garbage Stream

For organic waste, the largest components were avoidable or donatable food waste (14.1%), yard and garden waste (5.3%), and unavoidable food waste (5.1%).

The largest components of paper and paperboard were compostable soiled paper (8.1%), followed by printed paper (3.0%), corrugated cardboard (2.9%), paper packaging – dry goods (2.2%), and non-recyclable paper (2.0%).

The plastic category was mostly composed of durable plastic products (3.6%), non-deposit rigid plastic containers (3.1%), residential film product (2.6%), and other flexible plastic packaging (2.6%). Durable plastic products are non-packaging plastic products such as CDs, toys, and lawn chairs.

The textiles category consisted of other textiles (5.4%), clothing (2.0%), and footwear (1.2%).

The household hygiene category included animal feces (3.3%) and disposable diapers (2.9%).

3.4.2 Diversion Potential

Figure 3-8 summarizes the diversion potential in the ICI garbage stream. The diversion potential represents the percentage of materials that could be diverted through composting, recycling, and diversion at depots and drop off sites through programs in the RDN, such as C&D recycling (e.g., drywall, roofing material, insulation, and carpet) or donation of reusable items (e.g., clothing, tools, furniture), and product stewardship programs.

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As shown on Figure 3-8, the total diversion potential was 71% and consisted of 33% compostable, 24% depot/drop off, and 14% recyclable materials.

The main materials that could be diverted in compost/organics programs included avoidable or donatable food waste (14%), compostable soiled paper (8%), unavoidable food waste (5%), and yard and garden waste (5%).

The main materials that could be diverted through depot/drop off, including donatable materials, consisted of other textiles (5%), other flexible plastic packaging (3%), clothing (2%), and furniture (2%). Other depot/drop off materials that are present in smaller amounts include film packaging – other bags and overwrap, carpet and underlay, footwear, clean wood, and vehicle tires.

The materials that could be better diverted through recycling programs included non-deposit rigid plastic containers (3%), printed paper (3%), corrugated cardboard (3%), and paper packaging – dry goods (2%).
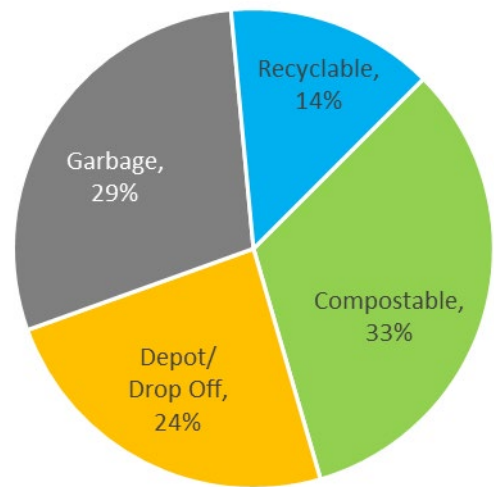
Figure 3-8: Diversion Potential of the ICI Garbage Stream

3.5 Public Drop Off

The following summarizes the waste composition results and diversion potential for DO materials. Waste materials from the public drop off bins were assessed using visual estimate procedures. Four DO samples were characterized.

3.5.1 Waste Composition Results

Figure 3-9 represents the average waste composition of the garbage stream from public drop off in the RDN in Fall 2022. This is a snapshot of the types and relative quantities of materials that were discarded by residents and/or small businesses at this time of the year.

Public drop off garbage was primarily composed of wood and wood products (24.7%), construction and demolition materials (23.6%), and bulky objects (9.4%). These three primary categories represent 57.7% of the waste stream. An additional 28.6% of the waste stream was bagged garbage in the other category. Contents in the bagged garbage were not visually assessed to determine their composition.

The wood and wood products category included treated wood (12.5%) and painted wood (11.1%).

The largest components for C&D material (non-wood) were other flooring (14.5%), other C&D waste (6.6%), and flooring – carpet and underlay (2.2%). Other flooring are flooring materials that do not fall under the other flooring categories of carpet and underlay, vinyl, and tile. Examples include wooden and composite floorboards. Examples of other C&D waste include polyvinyl chloride pipes, siding, house wrap, and metal ducts.

Bulky objects were found to be mainly furniture (6.2%) and mattresses and box springs (2.5%).

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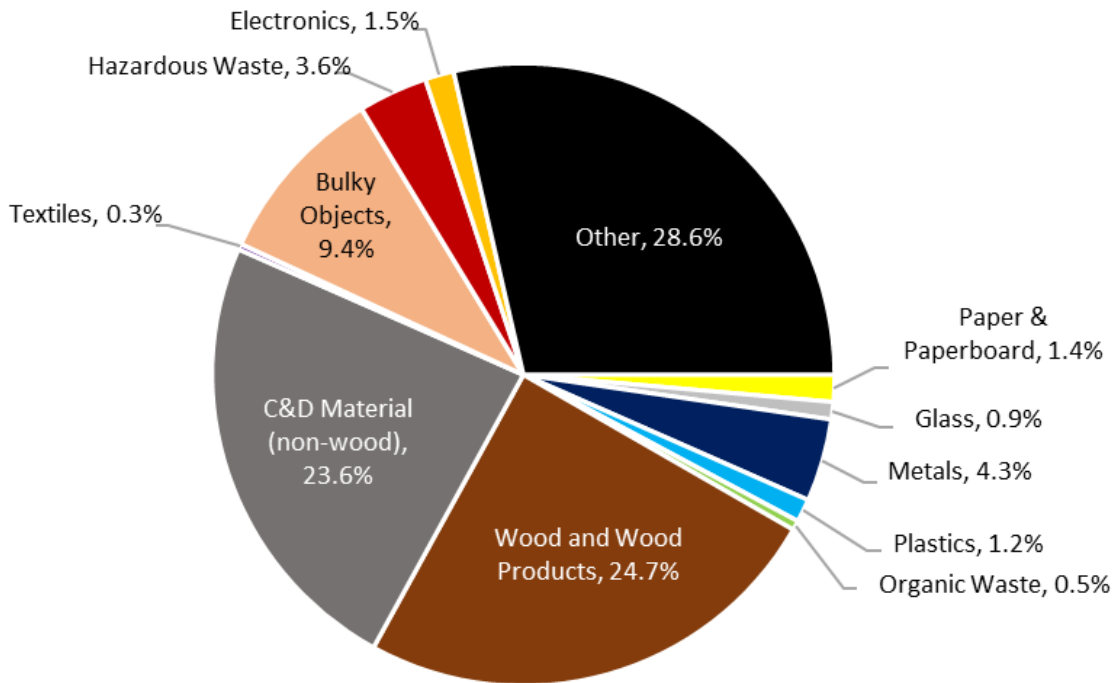
Figure 3-9: Composition of the Public Drop Off Garbage Stream

3.5.2 Diversion Potential

Figure 3-10 summarizes the diversion potential in the DO garbage stream. The diversion potential represents the percentage of materials that could be diverted through composting, recycling, and diversion at depots and drop off sites through programs in the RDN, such as C&D recycling (e.g., drywall, roofing material, insulation, and carpet) or donation of reusable items (e.g., clothing, tools, furniture), and product stewardship programs.

As shown on Figure 3-10, the total diversion potential was 52% and consisted of 50% depot/drop off, 2% recyclable materials, and less than 1% compostable materials.

The main materials that could be diverted through depot/drop off, including donatable materials, consisted of other flooring (15%), painted wood (11%), other C&D waste (7%), furniture (6%), non-EPR paints (4%), and mattresses and box springs (3%).

The materials that could be better diverted through recycling programs included corrugated cardboard (1%).

There were minor amounts of avoidable food waste (less than 1%) that could be diverted through compost/organics programs.
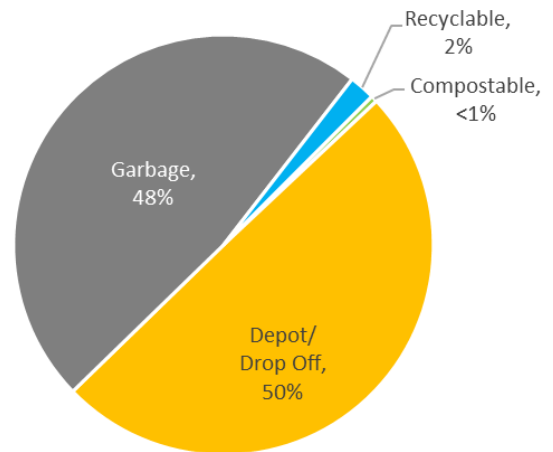
Figure 3-10: Diversion Potential of the Public Drop Off Garbage Stream

3.6   Construction and Demolition

The following summarizes the waste composition results and diversion potential for the C&D sector. C&D materials received at the NRL were generally consolidated by private sector service providers and brought to the RNL in large trucks. Five C&D samples were assessed using visual estimate procedures.

3.6.1   Waste Composition Results

Figure 3-11 represents the average waste composition of the garbage stream from the C&D sector in the RDN in Fall 2022. This is a snapshot of the types and relative quantities of materials that were discarded by this sector at this time of the year.

C&D waste was primarily composed of C&D material – non-wood (58.0%) and wood and wood products (16.3%). These two primary categories represent 74.3% of the waste stream.
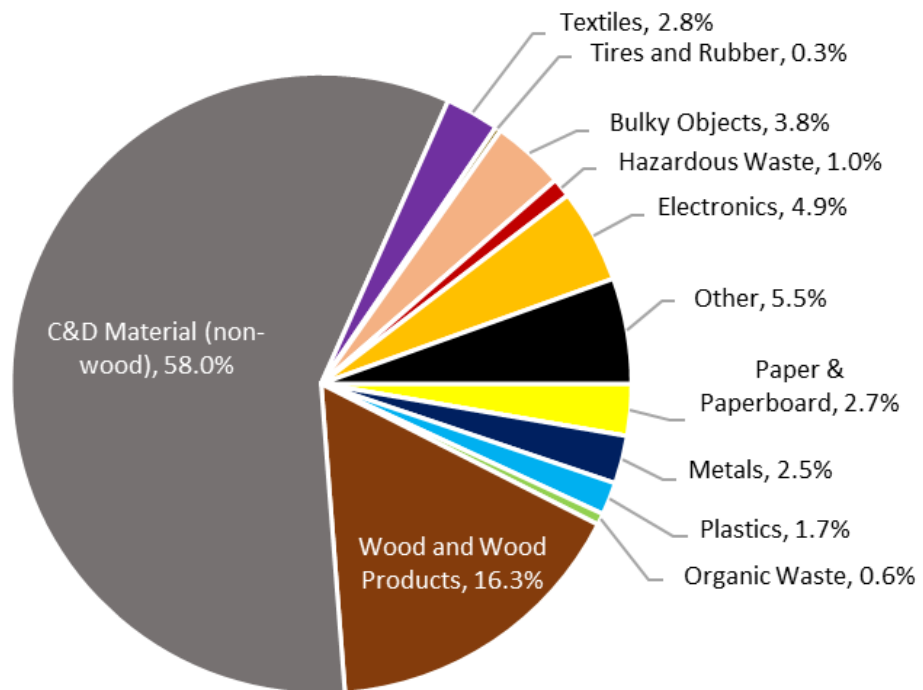
Figure 3-11: Composition of the C&D Garbage Stream

C&D materials was mostly composed of other C&D waste (26.1%), asphalt shingles (10.8%), carpet and underlay (5.5%), drywall (5.5%), tile flooring (3.8%), insulation (3.8%), and other flooring (2.2%). Here, the insulation category includes fibreglass insulation but excludes other types of insulation such as foam board and spray foam insulation.

The largest components for wood and wood products were treated wood (10.6%) and plywood/particle board (5.7%).

3.6.2 Diversion Potential

Figure 3-12 summarizes the diversion potential in the C&D garbage stream. The diversion potential represents the percentage of materials that could be diverted through composting, recycling, and diversion at depots and drop off sites through programs in the RDN, such as C&D recycling (e.g., drywall, roofing material, insulation, and carpet) or donation of reusable items (e.g., clothing, tools, furniture), and product stewardship programs.

As shown on Figure 3-12, the total diversion potential is 73% and consists of 70% depot/drop off, 2% recyclable, and 1% compostable materials.

The main materials that could be diverted through depot/drop off, including donatable materials, consisted of other C&D waste (26%), asphalt shingles (11%), carpet and underlay (6%), drywall (5%), tile flooring (4%), and insulation (4%).

The materials that could be better diverted through recycling programs included corrugated cardboard (2%).

The main materials that could be diverted in compost/organics programs were yard and garden waste (1%).
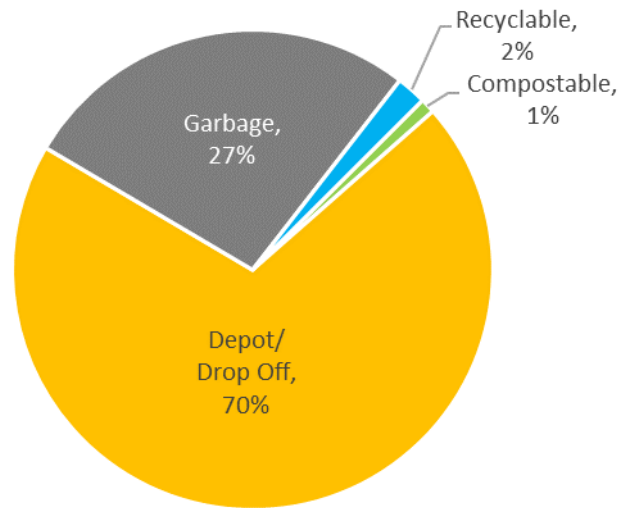
Figure 3-12: Diversion Potential of the C&D Garbage Stream

3.7 Single-Use Items

Plastic SUIs (e.g., plastic cups, takeout containers, cutlery, and straws) and compostable plastics (e.g., plastic bags and takeout cups that are clearly marked compostable) were also assessed as part of this waste composition study. For each sample, plastic SUIs and compostable plastics were sorted, weighed, and individually counted. Table 3-2 summarizes the average number of SUIs per 100 kg found in the garbage stream by sector in 2022.

Table 3-2: Average Number of Single Use Items per 100 kg Found in the Garbage Stream

Sector	Average Number of Items per 100 kg	
	Plastics Single Use Items	**Compostable Plastics**
Single-Family	86.3	5.6
Multi-Family	49.3	5.0
Industrial, Commercial, and Institutional	145.7	2.2

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4.0 COMPARISON TO PREVIOUS STUDIES

This section compares the results from the waste composition studies conducted for in 2004[6] and 2012[7]. To facilitate a more direct comparison with the 2022 results, secondary categories from the 2004 and 2012 studies were reassigned to primary categories according to the 2022 categories list. For example, clean wood was part of the building materials primary category in 2004 and 2012, but have been reassigned to the wood and wood products primary category in 2022. This change has resulted in different percentages than those presented in the 2004 and 2012 reports. In addition, it should be noted that the percentages from the 2004 and 2012 studies may not add up to exactly 100% due to rounding.

4.1 Overall

Figure 4-1 compares the composition of the waste stream in the overall waste stream in the RDN in 2004, 2012, and 2022. It should be noted that the primary categories in 2004 and 2012 were different in comparison to 2022. To compare the data, 2004 and 2012 categories were placed into best fit 2022 primary categories. The most notable trend is that organic waste decreased from 36% in 2004 to 31% in 2012, then 25% in 2022. Increases in the household hygiene (2% in 2004 to 8% in 2012, 10% in 2022) and paper categories (14% in 2004 to 19% in 2012, 20% in 2022) were also observed.
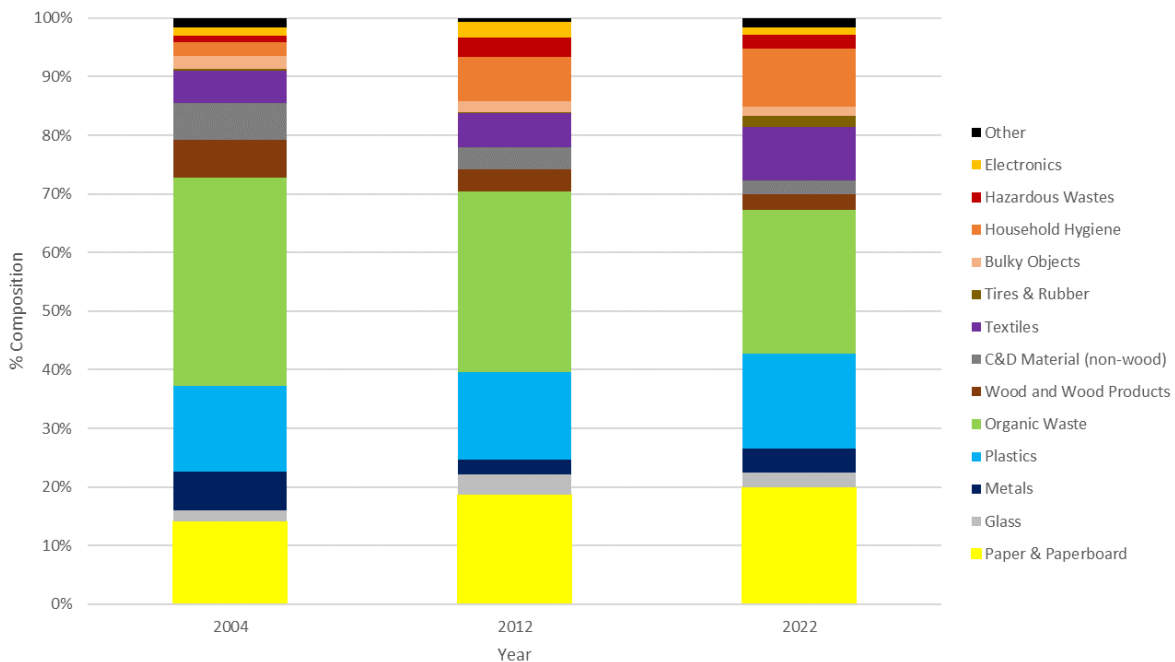
Figure 4-1: Comparison of Overall Regional Waste Composition Across Studies

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[6] Regional District of Nanaimo 2004. *Regional District of Nanaimo Solid Waste Composition Study*. Prepared under contract by Gartner Lee Limited. RDN Waste Composition Study.

[7] Regional District of Nanaimo 2012. *Solid Waste Composition Study Report*. Prepared under contract by Maura Walker and Associates and MJ Waste Solutions. RDN Waste Composition Study (2012).

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4.2   Single-Family

Figure 4-2 compares the composition of the SF waste stream in the RDN in 2004, 2012, and 2022. The most notable change is that organic waste decreased from 58% in 2004 to 29% in 2012, then 21% in 2022. The decreased proportion of organics found in the garbage stream is attributed to increased source-separated organics participation.
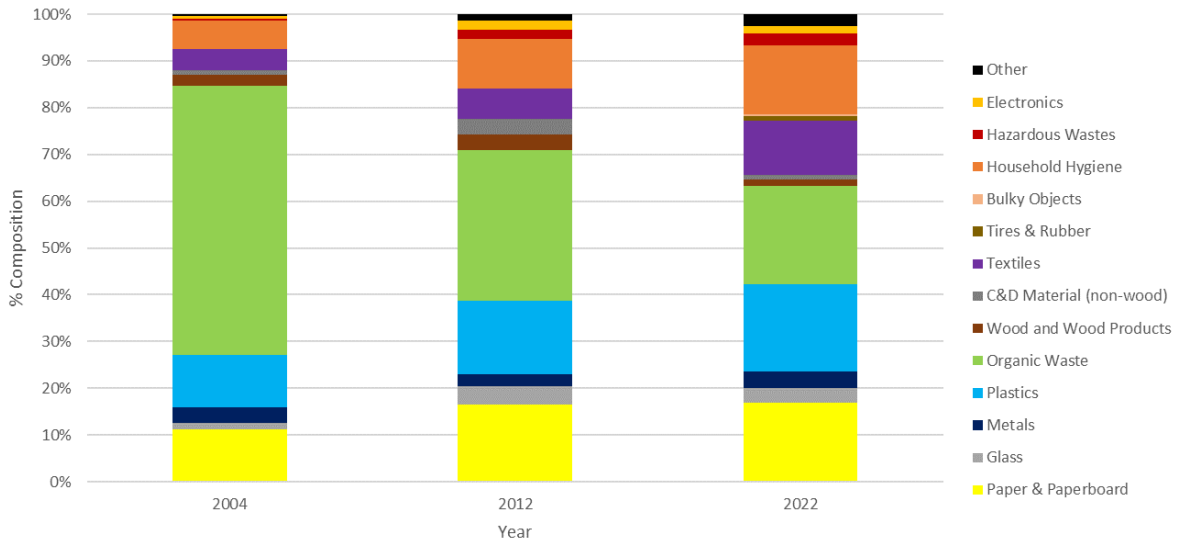
Figure 4-2: Comparison of Waste Composition from the Single-Family Sector Across Studies

4.3   Multi-Family

Figure 4-3 compares the composition of the MF waste stream in the RDN in 2004, 2012, and 2022. It should be noted that in 2012, the MF sector was included within the ICI sector's overall composition. The two MF samples characterized in 2012 was extracted for comparison. The most notable change is that organic waste decreased to 31% in 2022 from 51% in 2004, and 49% in 2012.
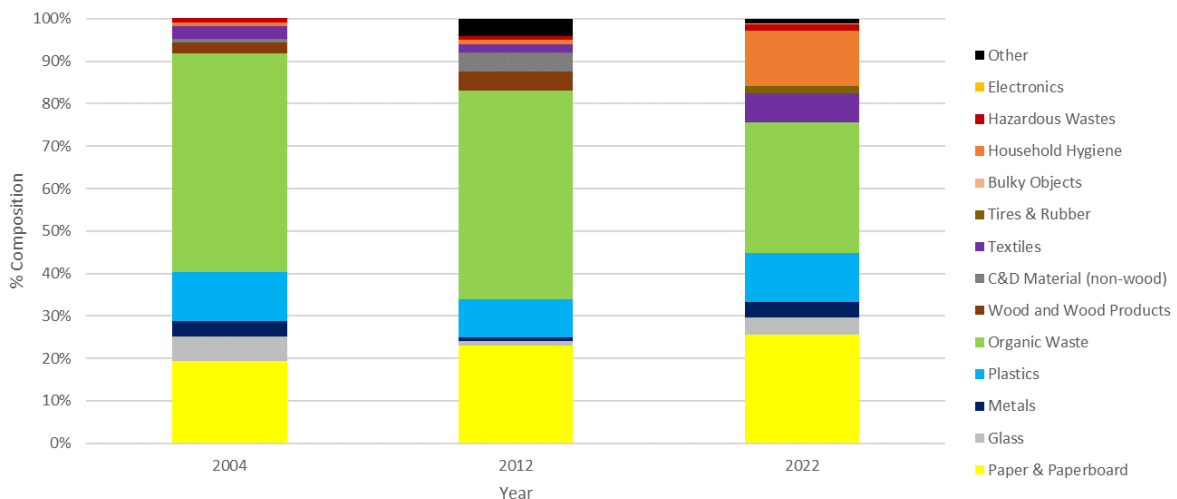
Figure 4-3: Comparison of Waste Composition from the Multi-Family Sector Across Studies

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4.4   Industrial, Commercial, and Institutional

Figure 4-4 compares the composition of the ICI waste stream in the RDN in 2004, 2012, and 2022. The most notable change is that organic waste decreased to 25% in 2022 from 36% in 2004 and 2012. Paper and paperboard has increased from 14% in 2004 to 21% in 2012, and 20% in 2022.
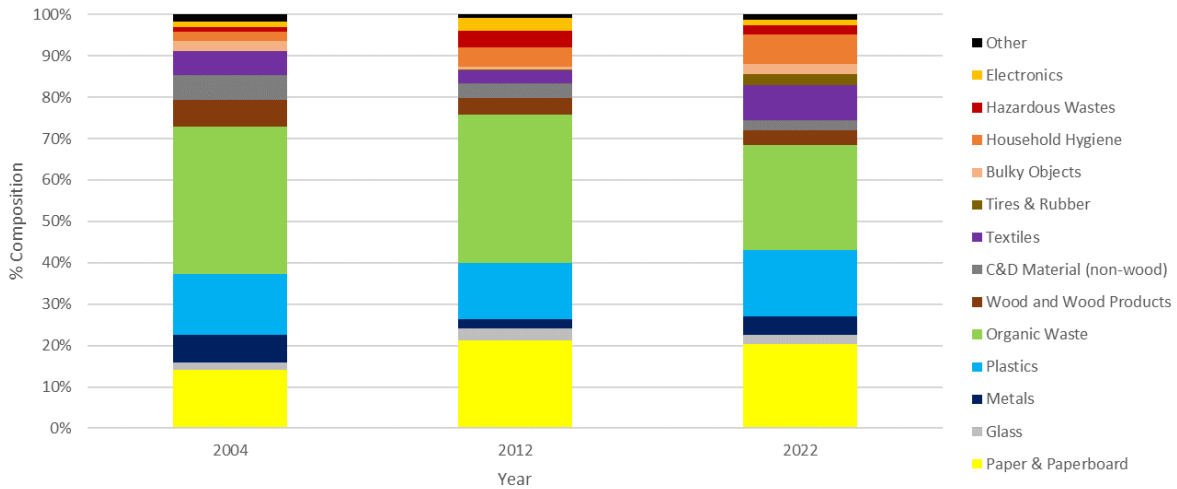
Figure 4-4: Comparison of Waste Composition from the ICI Sector Across Studies

4.5   Public Drop Off

Figure 4-5 compares the composition of the DO waste stream in the RDN in 2004, 2012, and 2022. While the 2004 and 2012 results were comparable, the 2022 results appear to be quite different. This difference may point to discrepancies in what types of loads were considered part of the DO waste stream in the previous studies compared to the 2022 study, as well as changes in the materials that are brought to the landfill for disposal.

Differences included the much smaller amounts of organic waste, paper, plastic, and textiles found in the 2022 waste stream, as well as an increase in wood and wood products. 29% of the 2022 waste stream was part of the other category in the form of bagged garbage, which was not opened to determine the composition of their contents.
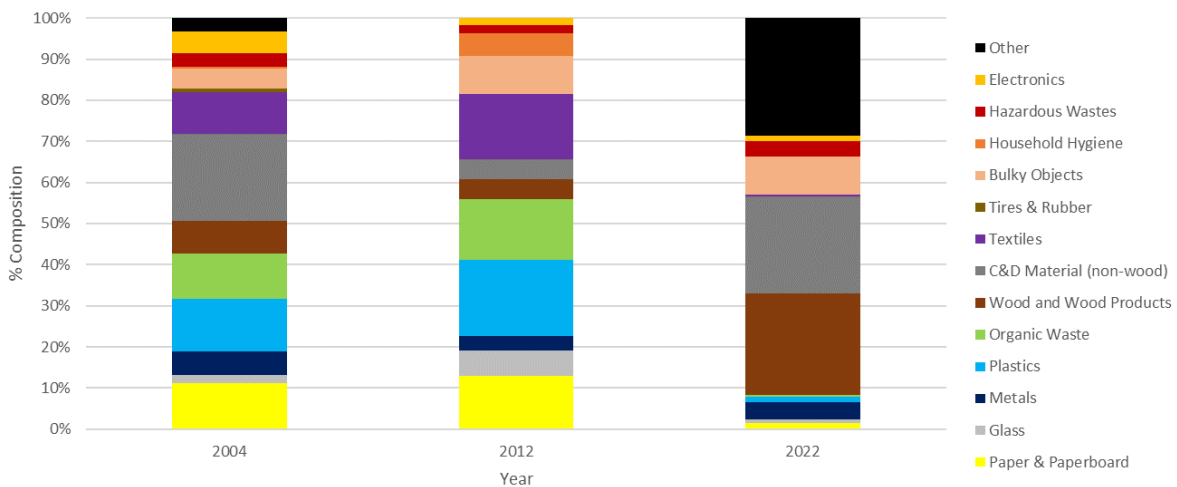
Figure 4-5: Comparison of Waste Composition from the Public Drop Off Sector Across Studies

4.6   Construction and Demolition

Figure 4-6 compares the composition of the C&D waste stream in the RDN in 2004 and 2022. It should be noted that during the 2012 study, a majority of the C&D material was managed at private facilities due to RDN banning C&D material in 2007. As a result, the C&D sector was excluded from the 2012 study. In 2004, samples were characterized into 11 primary categories such as composite wood, pallets, bulky items, metal, flooring, etc., compared to the 14 primary categories in 2022. A significant difference in the composition of the C&D sector is wood and wood products, which was 90% in 2004 and 16% in 2022. This can be accounted for in the difference of characterization of the material and the District of Nanaimo Bylaw No. 1531[8] ban on wood waste.
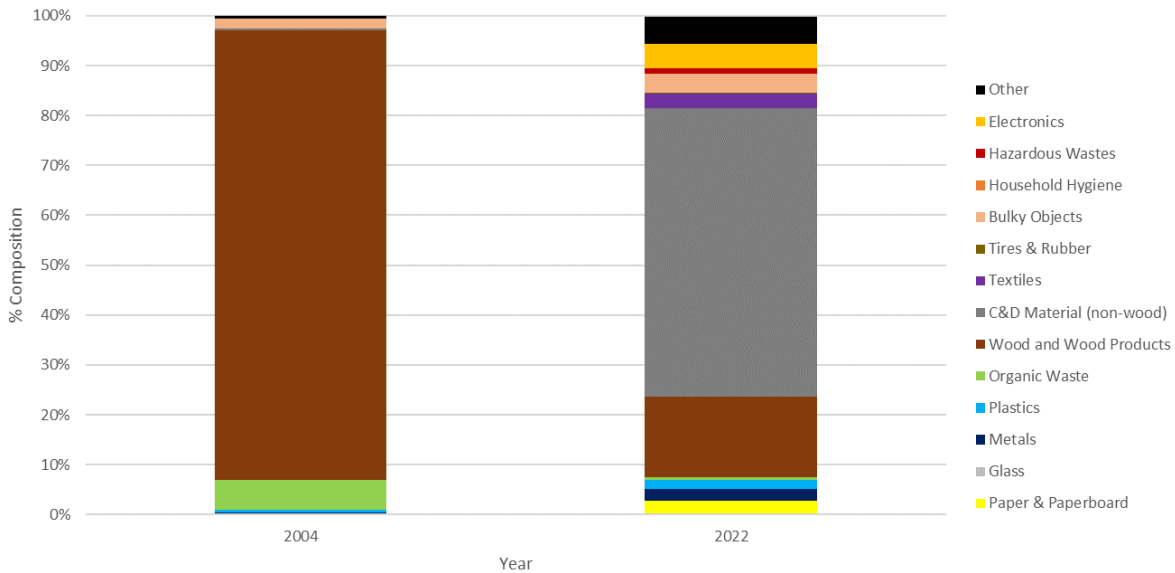
Figure 4-6: Comparison of Waste Composition from the C&D Sector Across Studies

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[8] District of Nanaimo Bylaw No. 1531. A Bylaw to Provide for the Regulation of Solid Waste Management Facilities. 2007.

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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
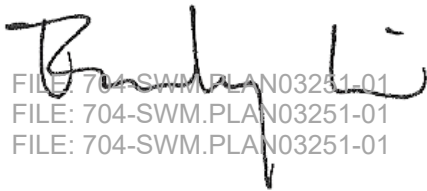
Sector (Generator)	Sample ID	Description	Photograph
Single-Family	FA22-SF-G-01	Electric foot bath	
Single-Family	FA22-SF-G-05	Dead chicken	
Single-Family	FA22-SF-G-15	Portable propane heater	
Industrial, Commercial, and Institutional	FA22-ICI-G-01	Lots of hair (assumed to be from hair salon)	

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Sector (Generator)	Sample ID	Description	Photograph
Industrial, Commercial, and Institutional	FA22-ICI-G-01	Cannabis cuttings	
Industrial, Commercial, and Institutional	FA22-ICI-G-07	Intravenous drips	
Industrial, Commercial, and Institutional	FA22-ICI-G-08	Unused straws	
Industrial, Commercial, and Institutional	FA22-ICI-G-11	Telephone receivers	
Industrial, Commercial, and Institutional	FA22-ICI-G-15	Multiple bike tires and inner tubes	

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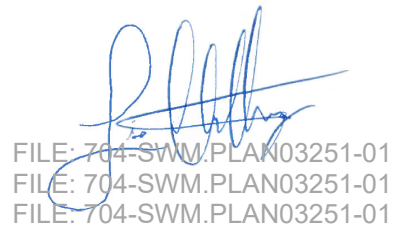
We trust this document meets your present requirements. If you have any questions or comments, please contact the undersigned.

Respectfully submitted,
Tetra Tech Canada Inc.
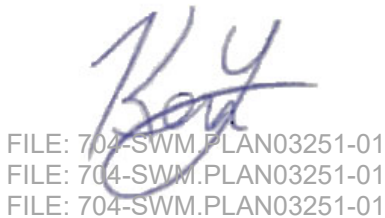
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APPENDIX A

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LIMITATIONS ON USE OF THIS DOCUMENT

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APPENDIX B

MATERIAL CATEGORIES

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Table B-1: Description of Material Categories

#	Category	Description and/or Examples	Diversion Potential	Density (kg/yd^3)
1	**Paper and Paperboard**			
01	Newsprint	▪ Newsprint	Recycling	146.82
02	Printed paper	▪ Magazines and mixed recyclable paper ▪ Fine paper	Recycling	146.82
03	Corrugated cardboard	▪ Corrugated cardboard ▪ Pizza boxes	Recycling	33.88
04	Paper packaging – dry goods	▪ Boxboard ▪ Brown Kraft paper, including bags	Recycling	33.88
05	Paper packaging – multi-material	▪ Composite paper-metal-plastic containers (e.g., spiral wound can)	Recycling	33.88
06	Paper packaging – liquids	▪ Paper cups ▪ Gabletop cartons – non-beverage/deposit (e.g., cream, half, and half, etc.) ▪ Aseptic boxes – non-beverage/deposit	Recycling	22.73
07	Paper beverage containers – deposit (non-dairy)	▪ Gabletop cartons – juice, pop, etc. ▪ Aseptic boxes – juice, pop, etc.	Depot/Drop Off	22.73
08	Paper beverage containers – deposit (dairy)	▪ Gabletop cartons – milk and plant-based substitutes ▪ Aseptic boxes – milk and plant-based substitutes	Depot/Drop Off	22.73
09	Soft-covered books	▪ Soft-covered bound books, colouring book	Depot/Drop Off	146.82
10	Hard-covered books	▪ Hard-covered bound books, textbook	Depot/Drop Off	146.82
11	Non-recyclable paper	▪ Other paper (non-recyclable and non-compost/organics) ▪ Waxed corrugated cardboard ▪ Laminated paper ▪ Paper lined with other materials (e.g., plastic, foil)	Garbage	146.82
12	Compostable soiled paper	▪ Tissue paper, paper towels, napkins ▪ Paper straws ▪ Unlined paper takeout containers	Compostable	210.45
2	**Glass**			
13	Glass beverage containers – deposit	▪ Beverage containers – alcoholic ▪ Beverage containers – non-alcoholic	Depot/Drop Off	172.73
14	Glass containers	▪ Food containers ▪ Other glass containers	Depot/Drop Off	172.73
15	Other glass	▪ Ceramic plates, glass cups, mirrors, window glass ▪ Broken glass ▪ Glass products that are not accepted under Recycle BC	Garbage	172.73
3	**Metals**			
16	Ferrous metal beverage containers – deposit	▪ Beverage containers – alcoholic ▪ Beverage containers – non-alcoholic	Depot/Drop Off	20.91
17	Non-ferrous metal beverage containers – deposit	▪ Beverage containers – alcoholic ▪ Beverage containers – non-alcoholic	Depot/Drop Off	20.91
18	Ferrous metal food containers	▪ Steel, iron containers	Recycling	102.27

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#	Category	Description and/or Examples	Diversion Potential	Density (kg/yd³)
19	Non-ferrous metal food containers	▪ Aluminum containers ▪ Aluminum foil	Recycling	102.27
20	Other metal	▪ Other ferrous and non-ferrous metals ▪ Metal pots and pans ▪ Metal tools, nails, screws ▪ Metal décor	Garbage	102.27
4	**Plastics**			
21	Plastic beverage containers – deposit	▪ #1 – deposit bottles/jugs ▪ #2 HDPE – milk jugs ▪ Other bottles/jugs – deposit	Depot/Drop Off	18.36
22	Rigid plastic containers	▪ #1 other food containers (not single-use), dish soap, cooking oil ▪ #2 – shampoo, etc. ▪ #3 – lotions, soap, etc. ▪ #4,5,7 – ketchup, etc. ▪ #6 rigid packaging – seed trays ▪ Other rigid containers and lids – ice cream, yogurt ▪ All other (blister package, plant pots, deodorant)	Recycling	18.36
23	Rigid plastic containers – oversized>25 L	▪ Storage totes, bulky plastic containers	Depot/Drop Off	18.36
24	Packaging – expanded polystyrene	▪ #6 foam packaging – meat trays etc. ▪ Foam cushion packaging ▪ Expanded foam	Depot/Drop Off	14.55
25	Film packaging – other bags and overwrap	▪ Non-carry out bags (bread, produce bags) ▪ Overwrap, cling wraps	Depot/Drop Off	15.91
26	Other flexible plastic packaging	▪ Stand-up and zipper lock pouches (e.g., fruit, grated cheese, baby food) ▪ Crinkly wrappers and bags (e.g., chip bags, cereal bags, snack/chocolate bar wrapper) ▪ Woven and net plastic bags (e.g., avocadoes, oranges, rice) ▪ Flexible packaging with plastic seal (e.g., fresh pasta, deli meat) ▪ Non-food protective packaging (e.g., shipping envelopes, bubble wrap)	Depot/Drop Off	15.91
27	Film product – residential	▪ Garbage bags ▪ Tarps	Garbage	15.91
28	Film product – commercial	▪ Pallet wrap ▪ Agricultural wrap	Garbage	15.91
29	Durable plastic products	▪ Non-packaging plastic products (e.g., CDs, toys, lawn chairs)	Garbage	15.91
30	Compostable plastics	▪ Plastics marked compostable	Compostable	15.91

TETRA TECH

#	Category	Description and/or Examples	Diversion Potential	Density (kg/yd³)
31	Single-use plastics	▪ Check out bags ▪ Cutlery ▪ Ring carriers ▪ Stir sticks ▪ Straws ▪ Food service ware	Garbage	15.91
5	**Organic Waste**			
32	Food waste – unavoidable	▪ Waste from food/drink preparation that is not edible (bones, cartilage, etc.)	Compostable	210.45
33	Food waste – avoidable or donatable	▪ Leftovers, plate scrapings, industrial, commercial, and institutional food waste that is not past the expiration date ▪ Unused ready-made, whole meats/fish, baked goods, deli, liquids	Compostable	210.45
34	Food waste – fats, oils, and grease	▪ Brown and yellow fats, oils, and grease	Compostable	210.45
35	Yard and garden waste	▪ Grass, leaves, branches < 3 inches diameter	Compostable	113.64
36	Other organic waste	▪ Chopsticks, wooden utensils ▪ Wax ▪ Animal carcasses	Garbage	113.64
6	**Wood and Wood Products**			
37	Pallets/skids	▪ Pallets and skids	Depot/Drop Off	76.82
38	Wood shingles	▪ Wood shingles	Depot/Drop Off	76.82
39	Wood furniture	▪ >80% wood	Garbage	76.82
40	Clean wood	▪ Unpainted or untreated (dimensional lumber)	Depot/Drop Off	76.82
41	Treated wood	▪ Stained and/or treated (creosote or CCA)	Garbage	76.82
42	Painted wood	▪ Painted only – opaque paint	Depot/Drop Off	76.82
43	Plywood/particle board	▪ Plywood, particle board	Garbage	76.82
7	**Construction and Demolition Material (non-wood)**			
44	Drywall	▪ Drywall	Depot/Drop Off	212.27
45	Asphalt shingles	▪ Asphalt shingles	Depot/Drop Off	332.27
46	Flooring – carpet and underlay	▪ Carpet ▪ Underlay	Depot/Drop Off	66.82
47	Flooring – vinyl	▪ Vinyl flooring	Depot/Drop Off	189.55
48	Flooring – tile	▪ Title flooring	Depot/Drop Off	390.91
49	Flooring – other	▪ Other flooring	Depot/Drop Off	189.55
50	Insulation	▪ Fibreglass insulation	Depot/Drop Off	66.82
51	Insulation – other	▪ Foam insulation	Depot/Drop Off	66.82
52	Masonry	▪ Masonry, bricks	Depot/Drop Off	390.91
53	Stucco/plaster	▪ Stucco, plaster	Depot/Drop Off	390.91

TETRA TECH

#	Category	Description and/or Examples	Diversion Potential	Density (kg/yd³)
54	Rock/sand/dirt	▪ Rock, sand, and dirt	Depot/Drop Off	390.91
55	Other C&D waste	▪ Other C&D (non-wood) waste	Depot/Drop Off	189.55
8	**Textiles**			
56	Clothing	▪ Clothes	Depot/Drop Off	68.18
57	Footwear	▪ Shoes, boots	Depot/Drop Off	68.18
58	Other textiles	▪ Blankets, sheets, etc.	Depot/Drop Off	68.18
9	**Tires and Rubber Products**			
59	Vehicle tires	▪ Tires	Depot/Drop Off	125.00
60	Other rubber products	▪ Gloves	Garbage	125.00
10	**Bulky Objects**			
61	Furniture	▪ Furniture – composite	Depot/Drop Off	65.91
62	Mattresses and box springs	▪ Mattress ▪ Box spring	Depot/Drop Off	65.91
63	Large appliances	▪ Refrigerator, washing machine, ovens, etc.	Depot/Drop Off	65.91
11	**Household Hygiene**			
64	Disposable diapers	▪ Child, adult diapers	Garbage	125.00
65	Feminine hygiene products	▪ Feminine hygiene products	Garbage	125.00
66	Cat litter	▪ Cat litter	Garbage	125.00
67	Animal feces	▪ Rodent bedding, etc.	Garbage	125.00
68	Other household hygiene	▪ Wipes, dental floss, Q-tips, face masks, etc.	Garbage	125.00
12	**Hazardous Waste**			
69	Light bulbs and light fixtures	▪ Fluorescent lighting – CFL bulbs, tubes, ballasts ▪ Light bulbs – Incandescent, halogen, LEDs ▪ Light fixtures	Depot/Drop Off	199.09
70	Batteries – automotive	▪ Lead acid batteries	Depot/Drop Off	125.00
71	Batteries – household	▪ Rechargeable and non-rechargeable	Depot/Drop Off	125.00
72	Oil and antifreeze	▪ Lubricating oil, including containers ▪ Empty oil containers ▪ Oil filters ▪ Empty oil or antifreeze containers	Depot/Drop Off	775.76
73	EPR paints (latex and oil based)	▪ Paints and containers under Product Care, including: – Latex paint, including containers – Empty latex paint containers – Oil based paint, including containers – Empty oil-based paint containers – Paint in aerosol cans – Paint – empty aerosol cans	Depot/Drop Off	775.76

TETRA TECH

#	Category	Description and/or Examples	Diversion Potential	Density (kg/yd³)
74	EPR solvents and pesticides	▪ Solvents/pesticides and containers under Product Care, including: – Solvents including containers (<10 L) (e.g., gasoline, paint thinners, other flammable solvents) – Solvents – empty containers – Pesticides including containers – Pesticides – empty containers	Depot/Drop Off	775.76
75	Non-EPR paints	▪ Paints and containers NOT under Product Care, including – Non-aerosol craft paint, non-aerosol automotive paint – Non- EPR Paint – empty containers – Paint in an unidentified, unknown, unlabeled, and non-original container	Depot/Drop Off	775.76
76	Non-EPR solvents and pesticides	▪ Solvents/pesticides NOT under Product Care, including: – Solvents and containers – Solvents – empty containers – Pesticides and containers – Pesticides – empty containers	Depot/Drop Off	775.76
77	Pharmaceuticals	▪ Including containers	Depot/Drop Off	125.00
78	Needles and sharps	▪ Needles and sharps	Depot/Drop Off	125.00
79	Other empty aerosol cans	▪ Excluding aerosol cans for paints, pesticides, solvents	Recycling	102.27
80	Household hazardous waste – non-hazardous / non-EPR	▪ Personal care products (e.g., shampoo, makeup, soap)	Garbage	125.00
81	Other hazardous waste	▪ Windex, Drano, Armorall ▪ Fertilizers ▪ Other relatively benign household cleaners / products (e.g., glowsticks, COVID tests, silica packs)	Garbage	125.00
13	**Electronics**			
82	TV and audio/video equipment	▪ Display devices (monitors/TVs) ▪ Vehicle audio/video ▪ Home audio/video ▪ Personal/portable audio/video	Depot/Drop Off	155.91
83	Computers and peripherals	▪ Computers (desktop, laptop, netbook, notebook, tablet) ▪ Desktop computer printers, copiers, faxes ▪ Computer scanners ▪ Computer peripherals (keyboards, mice)	Depot/Drop Off	160.91
84	Telephones and answering machines	▪ Non-cell phones and answering machines	Depot/Drop Off	199.09
85	Cell phones	▪ Cell phones, PDAs, pagers	Depot/Drop Off	199.09
86	Electronic or electrical instruments/equipment	▪ Includes toys	Depot/Drop Off	199.09
87	Alarms and thermostats	▪ Alarms – smoke, carbon monoxide ▪ Thermostats – mercury-containing, electronic and mechanical	Depot/Drop Off	199.09

TETRA TECH

#	Category	Description and/or Examples	Diversion Potential	Density (kg/yd³)
88	Heating and cooling products	▪ Commercial heating and cooling products	Depot/Drop Off	199.09
89	Small appliances and power tools	▪ Small appliances and power tools	Depot/Drop Off	199.09
90	Outdoor power equipment	▪ Hand-held (e.g., chain saws, garden shears, lawn blowers) ▪ Walk-behind (e.g., lawn mowers, snow blowers, tiller) ▪ Free-standing (e.g., power washers, mulchers, wood splitters)	Depot/Drop Off	199.09
91	Other electronics	▪ Other electronics that do not fit into the categories above ▪ Charging cables	Garbage	199.09
14	**Other**			
92	Non-distinct fines	< 1 inch	Garbage	125.00
93	Bagged garbage	(For visual estimates only)	Garbage	125.00

C&D – Construction and demolition.

CCA – Chromated copper arsenate.

CFL – Compact fluorescent light.

EPR – Extended producer responsibility.

HDPE – High-density polyethylene.

LED – Light emitting diode.

PDA – Personal digital assistant.

TETRA TECH

APPENDIX C

WASTE COMPOSITION RESULTS

TETRA TECH

Table C-1: Waste Composition Results

#	Category	Overall	SF	MF	ICI	DO	C&D
1	**Paper and Paperboard**	**19.90%**	**16.82%**	**25.53%**	**20.43%**	**1.44%**	**2.66%**
01	Newsprint	0.55%	0.59%	0.38%	0.58%	0.00%	0.00%
02	Printed paper	2.93%	2.09%	4.60%	3.01%	0.00%	0.41%
03	Corrugated cardboard	2.75%	0.39%	7.14%	2.95%	1.36%	1.52%
04	Paper packaging – dry goods	2.11%	1.77%	2.56%	2.21%	0.06%	0.00%
05	Paper packaging – multi-material	0.14%	0.11%	0.05%	0.17%	0.00%	0.02%
06	Paper packaging – liquids	0.76%	0.48%	0.87%	0.88%	0.03%	0.00%
07	Paper beverage containers – deposit (non-dairy)	0.08%	0.06%	0.03%	0.10%	0.00%	0.00%
08	Paper beverage containers – deposit (dairy)	0.13%	0.09%	0.07%	0.17%	0.00%	0.01%
09	Soft-covered books	0.11%	0.07%	0.00%	0.15%	0.00%	0.52%
10	Hard-covered books	0.14%	0.11%	0.00%	0.19%	0.00%	0.09%
11	Non-recyclable paper	2.05%	2.33%	2.02%	1.96%	0.00%	0.09%
12	Compostable soiled paper	8.14%	8.72%	7.81%	8.06%	0.00%	0.00%
2	**Glass**	**2.63%**	**3.20%**	**4.06%**	**2.12%**	**0.89%**	**0.00%**
13	Glass beverage containers – deposit	0.45%	0.30%	0.75%	0.46%	0.23%	0.00%
14	Glass containers	1.03%	1.20%	2.24%	0.72%	0.00%	0.00%
15	Other glass	1.16%	1.71%	1.07%	0.94%	0.66%	0.00%
3	**Metals**	**4.03%**	**3.52%**	**3.59%**	**4.38%**	**4.29%**	**2.50%**
16	Ferrous metal beverage containers – deposit	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
17	Non-ferrous metal beverage containers – deposit	0.18%	0.13%	0.03%	0.24%	0.00%	0.01%
18	Ferrous metal food containers	0.89%	0.61%	1.77%	0.86%	0.00%	0.00%
19	Non-ferrous metal food containers	0.61%	0.80%	1.15%	0.42%	0.00%	0.00%
20	Other metal	2.34%	1.97%	0.65%	2.85%	4.29%	2.49%
4	**Plastics**	**16.22%**	**18.74%**	**11.63%**	**16.23%**	**1.20%**	**1.66%**
21	Plastic beverage containers – deposit	0.30%	0.24%	0.10%	0.38%	0.01%	0.01%
22	Rigid plastic containers	2.82%	2.61%	2.07%	3.11%	0.08%	0.27%
23	Rigid plastic containers – oversized >25 L	0.13%	0.14%	0.00%	0.15%	0.00%	0.03%
24	Packaging – expanded polystyrene	0.59%	0.73%	0.22%	0.61%	0.23%	0.13%

#	Category	Overall	SF	MF	ICI	DO	C&D
25	Film packaging – other bags and overwrap	1.55%	2.11%	1.32%	1.37%	0.00%	0.04%
26	Other flexible plastic packaging	3.59%	6.00%	3.44%	2.57%	0.06%	0.04%
27	Film product – residential	2.62%	2.72%	2.59%	2.62%	0.00%	0.07%
28	Film product – commercial	0.58%	0.23%	0.00%	0.87%	0.31%	0.28%
29	Durable plastic products	3.11%	2.95%	1.29%	3.59%	0.50%	0.78%
30	Compostable plastics	0.09%	0.13%	0.12%	0.07%	0.00%	0.00%
31	Single-use plastics	0.82%	0.87%	0.47%	0.88%	0.01%	0.00%
5	**Organic Waste**	**24.53%**	**20.94%**	**30.81%**	**25.26%**	**0.53%**	**0.59%**
32	Food waste – unavoidable	5.75%	5.48%	9.96%	5.09%	0.00%	0.00%
33	Food waste – avoidable or donatable	14.49%	13.29%	20.38%	14.05%	0.53%	0.00%
34	Food waste – fats, oils, and grease	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
35	Yard and garden waste	3.59%	1.38%	0.23%	5.34%	0.00%	0.59%
36	Other organic waste	0.71%	0.79%	0.25%	0.78%	0.00%	0.00%
6	**Wood and Wood Products**	**2.65%**	**1.33%**	**0.02%**	**3.58%**	**24.70%**	**16.29%**
37	Pallets/skids	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
38	Wood shingles	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
39	Wood furniture	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
40	Clean wood	0.56%	0.14%	0.00%	0.88%	0.00%	0.00%
41	Treated wood	1.26%	0.66%	0.02%	1.64%	12.45%	10.58%
42	Painted wood	0.23%	0.21%	0.00%	0.29%	11.05%	0.00%
43	Plywood/particle board	0.60%	0.33%	0.00%	0.77%	1.20%	5.71%
7	**Construction and Demolition Material (non-wood)**	**2.27%**	**1.07%**	**0.02%**	**2.42%**	**23.63%**	**57.97%**
44	Drywall	0.43%	0.10%	0.00%	0.59%	0.00%	5.46%
45	Asphalt shingles	0.13%	0.03%	0.00%	0.04%	0.00%	10.78%
46	Flooring – carpet and underlay	0.87%	0.29%	0.00%	1.24%	2.23%	5.54%
47	Flooring – vinyl	0.01%	0.02%	0.00%	0.01%	0.00%	0.00%
48	Flooring – tile	0.04%	0.01%	0.00%	0.00%	0.00%	3.77%
49	Flooring – other	0.13%	0.00%	0.00%	0.18%	14.54%	2.23%
50	Insulation	0.06%	0.07%	0.02%	0.00%	0.00%	3.83%
51	Insulation – other	0.13%	0.47%	0.00%	0.00%	0.25%	0.00%

#	Category	Overall	SF	MF	ICI	DO	C&D
52	Masonry	0.01%	0.03%	0.00%	0.00%	0.00%	0.25%
53	Stucco/plaster	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
54	Rock/sand/dirt	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
55	Other C&D waste	0.47%	0.06%	0.00%	0.35%	6.60%	26.12%
8	**Textiles**	**9.13%**	**11.62%**	**6.76%**	**8.56%**	**0.34%**	**2.84%**
56	Clothing	2.36%	3.08%	2.69%	1.99%	0.00%	0.40%
57	Footwear	1.00%	0.73%	0.88%	1.17%	0.00%	0.06%
58	Other textiles	5.76%	7.81%	3.19%	5.39%	0.34%	2.38%
9	**Tires and Rubber Products**	**1.99%**	**0.94%**	**1.72%**	**2.56%**	**0.00%**	**0.26%**
59	Vehicle tires	0.52%	0.24%	0.00%	0.76%	0.00%	0.00%
60	Other rubber products	1.48%	0.71%	1.72%	1.80%	0.00%	0.26%
10	**Bulky Objects**	**1.59%**	**0.35%**	**0.00%**	**2.45%**	**9.35%**	**3.79%**
61	Furniture	1.37%	0.00%	0.00%	2.25%	6.21%	3.05%
62	Mattresses and box springs	0.23%	0.35%	0.00%	0.21%	2.52%	0.73%
63	Large appliances	0.00%	0.00%	0.00%	0.00%	0.61%	0.00%
11	**Household Hygiene**	**9.91%**	**14.82%**	**12.99%**	**7.17%**	**0.00%**	**0.00%**
64	Disposable diapers	4.41%	7.86%	4.23%	2.92%	0.00%	0.00%
65	Feminine hygiene products	0.56%	0.91%	0.95%	0.32%	0.00%	0.00%
66	Cat litter	0.71%	1.67%	0.78%	0.26%	0.00%	0.00%
67	Animal feces	3.80%	3.77%	6.61%	3.30%	0.00%	0.00%
68	Other household hygiene	0.44%	0.61%	0.42%	0.37%	0.00%	0.00%
12	**Hazardous Waste**	**2.26%**	**2.48%**	**1.65%**	**2.30%**	**3.58%**	**0.99%**
69	Light bulbs and light fixtures	0.18%	0.19%	0.23%	0.15%	0.05%	0.82%
70	Batteries – automotive	0.01%	0.04%	0.00%	0.00%	0.00%	0.00%
71	Batteries – household	0.15%	0.33%	0.12%	0.07%	0.00%	0.00%
72	Oil and antifreeze	0.01%	0.01%	0.00%	0.01%	0.00%	0.00%
73	EPR paints (latex and oil based)	0.22%	0.24%	0.00%	0.26%	0.00%	0.00%
74	EPR solvents and pesticides	0.01%	0.00%	0.00%	0.02%	0.00%	0.00%
75	Non-EPR paints	0.09%	0.02%	0.00%	0.15%	3.51%	0.00%

#	Category	Overall	SF	MF	ICI	DO	C&D
76	Non-EPR solvents and pesticides	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
77	Pharmaceuticals	0.10%	0.14%	0.07%	0.09%	0.00%	0.00%
78	Needles and sharps	0.21%	0.10%	0.00%	0.31%	0.00%	0.00%
79	Other empty aerosol cans	0.17%	0.23%	0.22%	0.13%	0.03%	0.17%
80	Household hazardous waste – non-hazardous / non-EPR	0.34%	0.61%	0.52%	0.19%	0.00%	0.00%
81	Other hazardous waste	0.76%	0.59%	0.47%	0.91%	0.00%	0.00%
13	**Electronics**	**1.23%**	**1.66%**	**0.05%**	**1.21%**	**1.50%**	**4.93%**
82	TV and audio/video equipment	0.05%	0.08%	0.00%	0.04%	0.39%	0.53%
83	Computers and peripherals	0.06%	0.04%	0.00%	0.07%	0.00%	0.50%
84	Telephones and answering machines	0.08%	0.11%	0.00%	0.09%	0.00%	0.00%
85	Cell phones	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
86	Electronic or electrical instruments/equipment	0.05%	0.11%	0.00%	0.03%	0.00%	0.00%
87	Alarms and thermostats	0.01%	0.00%	0.00%	0.01%	0.00%	0.00%
88	Heating and cooling products	0.11%	0.39%	0.00%	0.00%	0.00%	0.19%
89	Small appliances and power tools	0.55%	0.62%	0.00%	0.61%	1.10%	2.31%
90	Outdoor power equipment	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
91	Other electronics	0.32%	0.30%	0.05%	0.36%	0.00%	1.40%
14	**Other**	**1.68%**	**2.50%**	**1.17%**	**1.34%**	**28.55%**	**5.51%**
92	Non-distinct fines	1.63%	2.50%	1.17%	1.34%	0.00%	0.42%
93	Bagged garbage	0.05%	-	-	-	28.55%	5.09%
Total		**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**

C&D – Construction and Demolition.
DO – Public Drop Off.
EPR – Extended Producer Responsibility.
ICI – Industrial, Commercial, and Institutional.
MF – Multi-family.
SF – Single-family.

APPENDIX D

SELECTED PHOTOGRAPHS

TETRA TECH

Photo 1: Field Staff Collecting a Sample at the Church Road Transfer Station

Photo 2: Designated Sorting Area

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Photo 3: A Regional District of Nanaimo Truck Tipping a Single-Family Garbage Load

Photo 4: A Garbage Truck Unloading an Industrial, Commercial, and Institutional Load

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Photo 5: A Loader Transporting a Sample to the Sorting Area

Photo 6: Field Staff Conducting a Visual Estimate of a Tipped Load

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Photo 7: Example of a Typical Construction and Demolition Load

Photo 8: Example of a Typical Public Drop Off Load

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Photo 9: Example of a 100 kg Sample Collected for Hand Sorting

Photo 10: Example of the Printed Paper Category

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Photo 11: Example of the Paper Packaging – Dry Goods Category

Photo 12: Example of the Paper Packaging – Multi-material Category

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Photo 13: Example of the Paper Packaging – Liquids Category

Photo 14: Example of the Non-Recyclable Paper Category

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Photo 15: Example of the Glass Containers Category

Photo 16: Example of the Plastic Deposit Beverage Containers Category

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Photo 17: Example of the Rigid Plastic Containers – Non-deposit Category

Photo 18: Example of the Film Packaging – Other Bags and Overwrap Category

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Photo 19: Example of the Other Flexible Plastic Packaging Category

Photo 20: Example of the Durable Plastic Products Category

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TETRA TECH

Photo 21: Example of the Compostable Plastics Category

Photo 22: Example of the Single Use Plastics Category

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Photo 23: Example of the Unavoidable Food Waste Category

Photo 24: Example of the Avoidable or Donatable Food Waste Category

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Photo 25: Example of the Yard and Garden Waste Category

Photo 26: Example of the Painted Wood Category

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Photo 27: Example of the Drywall Category

Photo 28: Example of the Other Construction and Demolition Waste Category

TETRA TECH

Photo 29: Example of the Other Textiles Category

Photo 30: Example of the Other Rubber Products Category

TETRA TECH

Photo 31: Example of the Disposable Diapers Category

Photo 32: Example of the Dog Waste Category

TETRA TECH

Photo 33: Example of the Other Household Hygiene Category

Photo 34: Example of the Household Batteries Category

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Photo 35: Example of the Extended Producer Responsibility (EPR) Paints (Latex and Oil Based) Category

Photo 36: Example of the Non-hazardous and Non-EPR Household Hazardous Waste Category

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Photo 37: Example of the Other Hazardous Waste Category

Photo 38: Example of the Small Appliances and Power Tools Category

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