SUMMARY OF PHASE 1 AND 2 SOLID WASTE COMPOSITION STUDY DECEMBER 2001

PREPARED FOR: CAPITAL REGIONAL DISTRICT

PREPARED BY: SPERLING HANSEN ASSOCIATES

DECEMBER 4th, 2001

PRJ01025

SPERLING HANSEN ASSOCIATES

- Landfill Services
- Land Reclamation
- Corporate Management
- Groundwater Hydrogeology

SPERLING
HANSEN
ASSOCIATES

• Landfill Services
• Land Reclamation
• Corporate Management
• Groundwater Hydrogeology

December 4, 2001 PRJ01025

Mr. Tom Watkins
Solid Waste Management - Planner
Environmental Services Department
Capital Regional District
524 Yates Street
P.O. Box 1000
Victoria, B.C.
V8W 2S6

Dear Mr. Watkins

Re: Summary of Solid Waste Composition Study.

We are pleased to submit to you our final report summarizing the results of the waste composition study conducted at the Hartland Landfill. Key elements of the report include a total waste stream composition breakdown based on the results of the two waste sorts conducted this past year, a breakout of the waste from the respective residential, ICI (Industrial / commercial I institutional) and DLC (demolition / land clearing / construction) sectors, and a comparison to the results of the 1996 waste composition study.

We have enjoyed working with the CRD in conducting the study, and we believe that the information in this report will help the CRD in its efforts to improve it recycling and waste diversion programs.

Yours truly,
SPERLING HANSEN ASSOCIATES INC.

Dr. Tony Sperling, P.Eng.
President

EXECUTIVE SUMMARY

General Background

In 1991 the Capital Regional District (CRD) adopted an aggressive 50% recycling goal to meet the province wide solid waste diversion target specified by the Ministry of Water, Land and Air Protection (MWLAP). The first step in achieving the waste reduction goal was to compile accurate waste composition information so that diversion programs could be developed that would effectively target waste streams where diversion opportunities existed.

The initial waste composition study was conducted by Cameron Advisory Services in 1990. In 1996, Cameron Advisory Services conducted a second waste composition study to evaluate the effectiveness of the existing solid waste diversion programs, to determine if and how the existing diversion programs could be refined or expanded, and to provide information to aid in the design of additional future programs.

In March 2001 the CRD and the Environment and Plastics Industry Council (EPIC) initiated a competitive proposal call to conduct a third solid waste composition analysis at Hartland Landfill for the year 2001. The contract was ultimately awarded to Sperling Hansen Associates (SHA) in April 2001.

METHODOLOGY

The methodology used in this study was based on guidelines issued by the Canadian Council of the Ministers of the Environment (CCME). Samples were sorted in accordance with the CCME classification system, with the exception of the primary plastic and other categories. The CRD also requested that the other category be subdivided into two separate secondary categories, resulting in 13 Primary and 75 Secondary sorting classes. To establish seasonal variability of the waste stream, the sampling program was split into two sampling periods, being from April 30th to May 26th 2001 and from October 1st to October 25th 2001 respectively The sampling schedule was arranged such that, among other things, the percentage of samples collected from each sector matched the generation breakdown for that sector.

WASTE SORTING RESULTS

Sample and Sorted Weights

A total of 101 samples were sorted during the first period. Out of these samples, 91 were sorted manually into the 75 different categories, and a total of 10 samples were visually sorted. Visual sorts were conducted on loads that consisted of primarily one material (eg. Asphalt/wood shingles), or of a series of oversized (easily discernable) materials. During the phase 2 sampling period, 109 sample loads sorted manually, and 11 samples visually.

Overall Waste Composition

Organic waste was the most common category of solid waste encountered during the waste sort, accounting for one third of all residuals. Second was paper and paperboard, representing approximately 16% of the total sample stream. Third were plastics, representing about 12%. Fourth was wood and wood products at 11%. The remaining waste categories represented 28% of the sample waste stream.

In terms of the waste generation rate, each person within the regional district was responsible for 399 kg of landfilled waste per year. Included in this total was 135 kg of organic waste, 62.5 kg of paper and paper products, and 54 kg of plastics.

Comparison to the 1996 Waste Composition Study

The waste generation rate (landfilled) in 1996 was approximately 424 kg per person per year. When compared to the results of this study, there is an apparent reduction in the waste generation rate (landfilled) of 25 kg/person/year over the last five years.

The categories that show the greatest tonnage increase over the last 5 years after accounting for population changes include "organic waste" (+8,635 tonnes), "wood and wood products" (+1,281 tonnes), and "construction and demolition waste" (+1,265 tonnes). The categories that show the greatest tonnage decrease over the last 5 years include "paper and paperboard" (-10,031 tonnes), "other" (-8,430 tonnes), "plastics" (-1,287 tonnes) and "composite products" (-1,134 tonnes).

Other categories that showed a large percentage changes over the last 5 years include "rubber" (+288.2%), "textiles" (+10.4%), "glass" (-12.4%), "non-ferrous metals" (-12.7%) and "hazardous waste" (-13.0%).

Waste Composition By Sector (Res/ICI/DLC)

In general, waste from the residential and ICI sectors is relatively similar, with the following exceptions:

- The ICI sector had higher relative content of "paper and paperboard", stretch wrap, furniture, electronics, computers, "rubber" and other wood products compared to the residential sector.
- The ICI sector had significantly less "organic waste" compared to the residential sector.

DLC waste on the other hand is quite unique to waste from the other two sectors, with most of the material falling in the "construction and demolition material" (50.42%) and "wood and wood products" (30.2%) categories. Primary subcategories include asphalt shingles (41.3%), wooden shingles (22.9%), carpet and underlay (7.7%), other wood (6.0%), polystyrene (4.4%) and furniture (2.8%).

TABLE OF CONTENTS

LIST OF FIGURES AND TABLES

1. INTRODUCTION

1.1 General Background

In 1991 the Capital Regional District (CRD) adopted an aggressive 50% recycling goal to meet the province wide solid waste diversion target specified by the Ministry of Water, Land and Air Protection (MWLAP) (then known as the Ministry of Environment, Lands and Parks (MoELP)). The first step in achieving the waste reduction goal was to compile accurate waste composition information so that diversion programs could be developed that would effectively target waste streams where diversion opportunities existed. The initial waste composition study was conducted by Cameron Advisory Services in 1990, with the results being summarized in the report entitled "Capital Regional District – Solid Waste Stream Analysis" (dated September 1990).

In 1996, Cameron Advisory Services conducted a second waste composition study to evaluate the effectiveness of the existing solid waste diversion programs, to determine if and how the existing diversion programs could be refined or expanded, and to provide information to aid in the design of additional future programs. The results of the second study were summarized in the report entitled "Capital Regional District – Solid Waste Stream Analysis Final Report" (dated December 1996).

In March 2001 the CRD and the Environment and Plastics Industry Council (EPIC) contracted Sperling Hansen Associates to conduct a third solid waste composition analysis at Hartland Landfill for the year 2001.

1.2 Objectives

In the competitive proposal call, the CRD highlighted the following objectives for this study:

- To determine the overall composition of the residual solid waste stream being deposited at Hartland Landfill by material type (sorted into 13 primary and 75 secondary categories).
- To provide the portion of residual solid waste being received from each of three basic waste generation sectors, namely the residential, industrial / commercial / institutional (ICI) and demolition / land-clearing / construction waste (DLC) sources.
- To characterize the residual waste composition by primary and secondary category in each of the three basic waste generation sectors.
- To profile the residual waste composition produced by apartments and condominiums in the Capital Regional District.
- To profile the residual waste composition produced from four residential areas also serviced by blue box recycling programs. Each of the four routes were pre-selected by the CRD within the four core communities. The results of the analysis will be compared to aggregate plastics disposal rates from blue box collection programs along the same routes.
- To produce a detailed profile of waste plastic being disposed of at Hartland Landfill in accordance with requirements of the Environment and Plastics Industry Council (EPIC).

In addition to the above goals, it was the intent of this study to utilize, where practicable, the waste sorting methodology outlined in the Canadian Council of the Ministers of the Environment (CCME) guide titled "Recommended Waste Characterization Methodology for Direct Waste Analysis Studies in Canada".

2. METHODOLOGY

2.1 Staff, Equipment and Work Days

The sorting team consisted of a six-person crew made up of CRD Landfill and Environmental Services temporary staff. Staff working on the sorting team varied between the two sampling sessions and included:

- Mr. Russ Donison (team leader)
- Mr. Robert Havard
- Ms. Raquel Amaral
- Mr. Lino Lazaro
- Ms. Marna Smith
- Mr. Rafael Gaudio (alternate leader)
- Ms. Cindy Ferreira
- Ms. Kristi Rivait
- Ms. Anita Carreiro
- Mr. Joe Kiss

Sorting staff orientation and training was held on the first day of each sampling period. General methodology and health & safety training was provided by SHA staff, while detailed training in the recognition of various plastic categories was provided by Dr. Fred Edgecome of EPIC. Additional safety awareness training was provided by Ms. Laraine Fowler, CRD's Health and Safety Coordinator.

Equipment that was utilized during the sorting program included:

- Safety Equipment (first aid kit, portable CB radio on the Hartland Landfill frequency, portable eyewash, fire extinguisher)
- Protective Equipment (safety boots, Tyvek® overalls, rubber aprons, inner cotton or latex gloves, outer puncture resistant rubber gloves, dust masks and respirators, safety glasses, high visibility vests)
- Large capacity beam scale
- High resolution electronic scale complete with power generator
- 0.9 by 1.8 metre (3'x6') sorting tables (5)
- 6.0 by 9.0 metre (20'x30') tent to cover work area
- Various sorting containers (120 L totes, 70 L garbage cans, 50 L blue boxes)
- Rakes, brooms, shovels, scoops, utility knifes for opening bags and sorting through materials
- Backhoe with three way front bucket

For the duration of the sorting program, the sorting crew worked a five-day workweek, from Monday through Friday, from 8:30 am to 4:30 pm. The exception was when a statutory holiday occurred during the course of the program, and as a result the sorting crew worked the following Saturday.

2.2 Sampling Categories

Samples were sorted in accordance with the CCME classification system, with the exception of the primary plastic and other categories. As mentioned previously, EPIC wanted to develop a more detailed profile for the waste plastic being disposed of at Hartland Landfill (than is generated using the CCME classification system), and therefore additional plastic secondary categories were added. The

CRD also requested that the other category be subdivided into two separate secondary categories. The resulting 13 Primary and 75 Secondary sorting classes are presented in Table 2-1.

2.3 Sampling Methodology

To establish seasonal variability of the waste stream, the sampling program was split into two sampling periods, being from April 30th to May 26th 2001 and from October 1st to October 25th 2001 respectively. This final report documents the results of both sampling periods.

In order to obtain the desired number of samples from each of the service areas, the generation sectors, and the special study areas, a list of targeted vehicles was prepared prior to the commencement of the respective sampling period (see Table 2-2). This was periodically updated when new information was obtained during the course of the project. The list was developed using scale data provided by the CRD, which provided a breakdown of waste haulers using the Hartland Landfill, and personal communication with said haulers, which provided details on the actual sources and collection areas.

Whenever a target vehicle was identified by Mr. Donison (team leader), the vehicle was directed to unload at a designated area to the side of the active face. Large or bulky items contained in the load were then removed from the load, while the remaining refuse was mixed using the excavator bucket of the backhoe to create a homogenized mixture. A representative sample weighing approximately 125 Kg was then extracted from the homogenized mixture using the three way front bucket and delivered to the sorting table (see Photo 2-1). The details of the load, including the total load weight and the approximate weight of the oversized materials, were recorded on a sample data sheet (see Appendix A).

Photo 2-1. Backhoe with Three Way Front Bucket Loading Sample

In the SHA proposal, the specified sampling sequence was as follows: sort the material into the 13 designated Primary Categories; weigh each Primary Category; further separate the contents of each Primary Category into the associated Secondary Categories; and, weigh each Secondary Category. The impetus of this approach was to provide checks and balances throughout the sampling program. However, it was quickly determined that for several Secondary Categories it was more efficient (various paper products, various glass products) and/or hygienic (food waste, disposal diapers) to sort these materials directly into their secondary categories, depending on whether the overall composition of the sample made it practical to do so. Also, the redundant sampling proved to be demoralizing to the sampling crew. It was therefore decided to allow the sorting crew to modify the sorting methodology as they saw fit to make the process as efficient and accurate as possible.

Table 2-1 WASTE SORTING CATEGORIES

Primary Category	Secondary Cetegory
Paper and Paperboard	Newsprint (including flyers)
	Magazines
	Corrugated cardboard
	Waxed corrugated cardboard
	Boxboard
	Telephone books
	Fine paper
	Tissue paper
	Gabletop milk and juice cartons
	Tetra Paks and aseptic drink boxes
	Brown kraft paper, including bags
	Other paper
Glass	Clear food and beverage container glass
	Coloured food and beverage container glass
	Other glass
Ferrous Metals	Food and beverage cans
	Aerosol cans
	Empty paint cans and lids
	Large metal appliances (white goods)
	Other ferrous metals
Non-Ferrous Metals	Aluminum food and beverage cans
	Aluminum foil/pie plates
	Other non-ferrous metal
Plastics	PET bottles - soft drink bottles < 2 L
	PET bottles - soft drink bottles > 2 L
	PET bottles - other beverage containers
	PET food trays
	PET - other
	HDPE milk jugs
	HDPE other beverage containers
	Other HDPE jugs and bottles
	Dairy and dairy related tubs and lids
	PVC containers (#3)
	Polypropylene (#5)
	Polystyrene (#6)
	Plastics (#7)
	Recyclable plastic bags (shopping and other
	Non-recyclable plastic bags (garbage, chip and

Primary Category	Secondary Cetegory
Plastics cont.	Shipping and courier bags
	Durable plastics
	Stretch wrap
	Crates, pails and drums (> 25L)
	Multi-material waste plastics
	Predominantly plastic composite materials
	Other plastics
Organic Waste	Food waste
	Yard waste
	Other organic waste
Wood and Wood Products	Pallets/skids
	Dimensional lumber
	Wooden shingles
	Other wood
Construction/Demolition Material	Drywall
	Asphalt shingles
	Insulation
	Carpet and underlay
	Other C/D wastes
Textiles	Clothing
	Other textiles
Rubber	Vehicle tires
	Other rubber products
Composite Products	Disposable diapers
	Furniture
	Electronics and small appliances
	Computers and monitors
	Other composites
Hazardous Wastes	Fluorescent tubes
	Paints
	Batteries
	Oils
	Oil filters
	Sharps
	Other hazardous waste
Other	Non-distinct fines
	Other wastes

Table 2-2 SAMPLING SCHEDULE (PHASE 1)

RESIDENTIAL

AREA	FRACTION OF TOTAL WASTE RECEIVED AT LANDFILL (%)	REC. NUMBER OF SAMPLES	HAULER
North Saanich	0.36	1	Ron's Disposal
Sidney	0.68	1	Town of Sidney
Central Saanich	1.26	2	Ron's Disposal
Saanich	5.94	6	District of Saanich
Victoria	3.67	4	City of Victoria
Oak Bay	1.36	2	District of Oak Bay
Esquimalt	0.87	1	Township of Esquimalt
View Royal	0.36	1	Ron's Disposal
Colwood/Langford	3.76	4	Alpine Disposal
Sooke	1.23	1	Sooke Garbage Collection
		1	Alpine Disposal
Transfer Station	8.96 (mixed)	4	On-site
		28	

SPECIAL STUDIES

STUDY	AREA	NUMBER OF SAMPLES	HAULER
Neighbourhood	Oak Bay	1	District of Oak Bay
	Esquimalt	1	Township of Esquimalt
	Victoria	1	City of Victoria
	Saanich	1	District of Saanich
Apartment	Oak Bay	1	Alpine Disposal
	Esquimalt	1	Alpine Disposal
	Victoria	1	Alpine Disposal
	Saanich	1	Alpine Disposal
		8	

MIXED LOADS (MULTI FAMILY AND ICI COLLECTION)

HAULER	FRACTION OF TOTAL WASTE RECEIVED AT LANDFILL (%)	REC. NUMBER OF SAMPLES	AREA
Can Waste Front End	10.08	1	Colwood/Langford (Res)
		1	Landford (Res)
		1	Colwood/Metchosin (Res)
		1	Saanich Peninsula (Res)
		1	Victoria (ICI)
		1	Victoria (ICI)
		1	Collwood (ICI)
		1	Esquimalt (ICI)
		1	Victoria (ICI)
		1	Collwood (ICI)
BFI Front End	11.46	3	Saanich Peninsula (Mix)
		3	Oak Bay, Victoria (Res)
		3	Victoria, Sooke, Colwood, Landford (Mix)
		3	Esquimalt/View Royal(ICI)
Ron's Disposal	3.78	1	Sidney (Res)
		1	Victoria (Res)
		1	Sidney (ICI)
		1	Victoria (ICI)
		26	

ICI COLLECTION

HAULER	FRACTION OF TOTAL WASTE RECEIVED AT LANDFILL (%)	REC. NUMBER OF SAMPLES
Disposall Container Ren.	1.4	2
HL Repair	2.34	3
Don Mann Excavating	0.61	1
Macnutt Trucking	0.64	1
Peninsula Bulldozing	6.25	6
Parker Johnston	0.55	1
Salvation Army	0.3	1
Copley Bros Const.	1.19	1
Ellice Recycling	0.62	1
Mitchell Excavating	1.46	2
C & F Equipment Rental	1.1	1
Alpine Disposal (Bins)	4.85	5
Transfer Station	8.96 (mixed)	5
Misc. Bins	Balance	6
		36

Table 2-2 SAMPLING SCHEDULE (PHASE 2)

RESIDENTIAL

AREA	FRACTION OF TOTAL WASTE RECEIVED AT LANDFILL (%)	REC. NUMBER OF SAMPLES	HAULER
North Saanich	0.6	1	Ron's Disposal
Sidney	1.0	1	Town of Sidney
Central Saanich	1.9	2	Ron's Disposal
Saanich	8.1	9	District of Saanich
Victoria	4.7	5	City of Victoria
Oak Bay	2.0	2	District of Oak Bay
Esquimalt	1.2	2	Township of Esquimalt
Saltspring Island	0.9	1	Saltspring Garbage Ser.
View Royal	0.5	1	Ron's Disposal
Colwood/Langford	4.7	5	Alpine Disposal
Sooke	2.0	1	Sooke Garbage Collection
		1	Alpine Disposal
Transfer Station	5.8 (mixed)	3	On-site
		34	

MIXED LOADS (MULTI FAMILY AND ICI COLLECTION)

HAULER	FRACTION OF TOTAL WASTE RECEIVED AT LANDFILL (%)	REC. NUMBER OF SAMPLES	AREA
Can Waste Front End	14.2	1	Colwood/Langford (Res)
		1	Landford (Res)
		1	Colwood/Metchosin (Res)
		4	Saanich Peninsula (Res)
		3	Victoria (ICI)
		1	Victoria (ICI)
		1	Collwood (ICI)
		1	Esquimalt (ICI)
		1	Victoria (ICI)
		1	Collwood (ICI)
BFI Front End	15.9	4	Saanich Peninsula (Mix)
		4	Oak Bay, Victoria (Res)
		5	Victoria, Sooke, Colwood, Landford (Mix)
		4	Esquimalt/View Royal(ICI)
Ron's Disposal	6.2	1	Sidney (Res)
		3	Victoria (Res/ICI)
		1	Sidney (ICI)
		3	Victoria (ICI/Res)
		40	

ICI COLLECTION

HAULER	FRACTION OF TOTAL WASTE RECEIVED AT LANDFILL (%)	REC. NUMBER OF SAMPLES
Alpha Roofing	0.5	1
Alpine Disposal (Bins)	6.05	6
BFI Roll Off	0.7	1
DLS Trucking	0.9	1
Ellice Recycling	1.2	2
HL Repair	3.5	4
Johnson Brothers	0.7	1
Ladah Holdings	0.6	1
Macnutt Trucking	0.8	1
Parker Johnston	1.8	2
Ralmax	0.7	1
Salvation Army	0.5	1
Topline Industries	1.3	1
Transfer Station	5.8 (mixed)	3
		26

The ultimate approach, which proved to be very successful, consisted of sampling all materials directly into the 75 secondary categories. The keys to the success of this approach included:

- Assigning two staff members with the job of opening the bags, removing the more prominent (food waste, other) or bulky (wood waste) items, and pushing the remaining materials further up the table for additional sorting – see Photo 2-2.
- Designating whole primary categories (e.g. plastics) to one staff members, and having that person organize the respective bins. As the remaining material was pushed down the table, the individual removed the items that fell within their categories.

Photo 2-2. Sorting Load of Food Waste from Commercial Sector (Restaurant)

Once the sort was completed, the material in each secondary class was weighed and recorded. Weights were entered onto the master form for each sample (See Appendix A). The contents of each bin were then discarded into a 40-yd bin for future disposal at the active face. All containers and sorting tables were then carefully cleaned up in preparation for the next sample.

Typically, five samples were processed each working day. Samples from the residential waste stream typically took longer to sort, while samples of commercial refuse were typically easier to process because they were inherently more homogeneous.

Completed forms were periodically faxed to SHA's office where the data was entered into Excel spreadsheets by David Kvick, SHA's junior environmental engineer. Special care was taken to ensure that the oversized or bulky items encountered in each load were accounted for.

3. WASTE SORTING RESULTS

3.1 Sample and Sorted Weights

There are two ways of reporting the extent of the waste sort program; based on sample weight; and, based on sorted weight. The sample weight is a measure of the quantity of material that was dumped at the specified location near the active face, and which was visually inspected by the sorting crew. The sorted weight is a measure of the quantity of material that was extracted from the sample material by the backhoe and sorted into the 75 secondary categories.

During the phase 1 sampling period, 101 sample loads were diverted to the designated tipping area with a total weight of 594,602 kg (see Table 3-1); this represents 5.9% of the total waste accepted at the site during the course of the sampling period. From this total, 11,702 kg of material was extracted from the loads and manually sorted into the 75 categories, while 29,796 kg of material was visually sorted; this represents 0.11% and 0.30% respectively (0.41% combined) of the total waste accepted at the site during the course of the sampling period. Visual sorts were conducted on loads that consisted of primarily one material (eg. Asphalt/wood shingles), or of a series of oversized (easily discernable) materials.

Table 3-1 Total sample and sorted weights for phase 1.

	Total weight to landfill during sampling period (kg)	Total weight of sampled loads (kg)	Portion of waste stream sampled (%)	Total weight sorted (kg)	Portion of sample loads sorted (%)	Portion of waste stream sorted (%)
Manual Sort (N=91)	10,160,820	567,806	5.6	11,702	2.06	0.11
Visual Sort (N=10)	10,160,820	29,796	0.3	29,796	100.00	0.30
Combined	10,160,820	594,602	5.9	41,498	6.98	0.41

During the phase 2 sampling period, 109 sample loads were diverted to the designated tipping area with a total weight of 749,373 kg (see Table 3-2); this represents 7.7% of the total waste accepted at the site during the course of the second sampling period. From this total, 13,308 kg of material was extracted from the loads and manually sorted into the 75 categories, while 30,599 kg of material was visually sorted; this represents 0.14% and 0.31% respectively (0.45% combined) of the total waste accepted at the site during the course of the sampling period.

3.2 Composition of Sampled Waste

Table 3-3 presents the overall composition of the residual solid waste sampled during the course of the waste stream composition study. The results for each phase of the study, and the cumulative total are provided. A detailed breakdown of each major waste category into subcategories is portrayed graphically in Figure 3-1, while numerical data is presented in Appendix B (Table B-1).

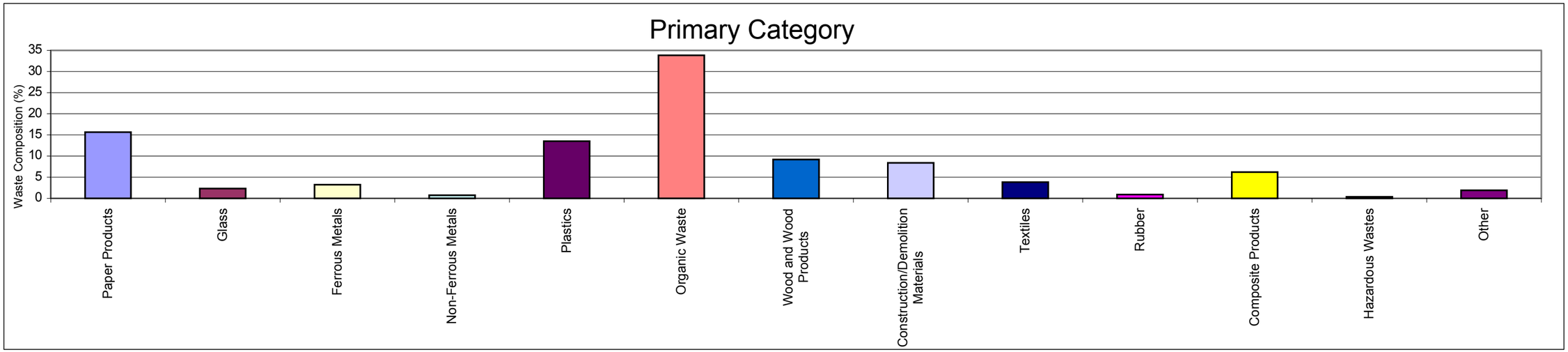
Table 3-2 Total sample and sorted weights for phase 2.

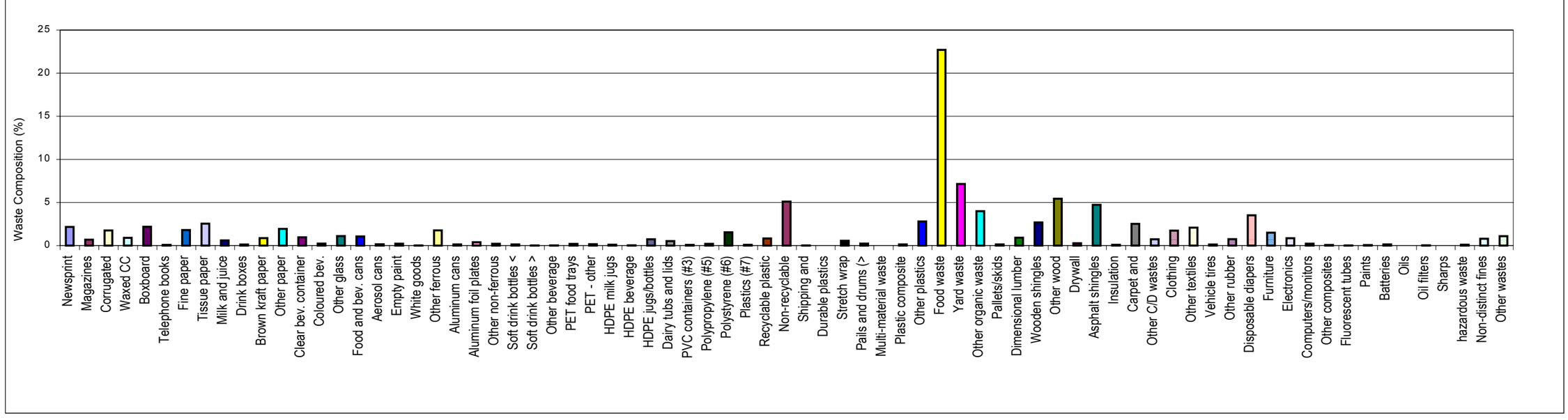
	Total weight to landfill during sampling period (kg)	Total weight of sampled loads (kg)	Portion of waste stream sampled (%)	Total weight sorted (kg)	Portion of sample loads sorted (%)	Portion of waste stream sorted (%)
Manual Sort (N=96)	9,715,840	718,774	7.4	13,308	1.85	0.14
Visual Sort (N=11)	9,715,840	30,599	0.3	30,599	100.00	0.31
Combined	9,715,840	749,373	7.7	43,907	5.86	0.45

Table 3-3 Composition of Sampled Waste.

Waste Category	**Phase 1** Mean (%) N=101	**Phase 2** Mean (%) N=109	**Total** Mean (%) N=210
Organic Waste	32.79	35.01	33.84
Paper and Paperboard	15.58	15.83	15.67
Plastics	12.13	14.80	13.52
Wood and Wood Products	10.92	7.59	9.18
Construction and Demolition Material	7.30	9.43	8.38
Composite Products	6.68	5.81	6.19
Textiles	3.89	3.76	3.82
Ferrous Metal	3.47	3.01	3.23
Other	2.92	0.83	1.90
Glass	1.97	2.32	2.31
Rubber	1.06	0.70	0.87
Non-Ferrous Metal	0.75	0.72	0.73
Hazardous Waste	0.53	0.19	0.35
Total (%)	100.0	100.0	100.0

In the above table, the categories are listed in order of decreasing weight. Organic waste was the most common category of solid waste encountered during the waste sort, accounting for one third of all residuals. Second was paper and paperboard, representing approximately 16% of the total sample stream. Third were plastics, representing about 12%. Fourth was wood and wood products at 11%. The remaining waste categories represented 28% of the sample waste stream.





Project No.:	PRJ01025
Drawn By:	TI
Reviewed By:	TS
Date:	21 Nov. 2001
Filename:	3.2.ppt

SPERLING HANSEN ASSOCIATES

Waste Composition Major and Minor Groups
Capital Regional District
Waste Stream Composition Study

Figure
3-1

3.3 Seasonal Variations

Seasonal variations that were noted between the two waste sorts include:

- Higher "plastics" levels in the fall than in the spring (increases from 12.13% to 14,80%). However, this was mainly due to several small increases in several subcategories, which resulted in an overall large increase in the category as a whole.
- Higher "food waste" levels in the fall than in the spring (increase from 21.36% to 24.09%). There is no apparent reason for the changes.
- Lower "hazardous waste" levels in the fall than in the spring (decrease from 0.53% to 0.19%). The higher spring levels may be due to spring-cleaning for homeowners and companies alike.
- Lower "other wastes" levels in the fall than in the spring (decrease from 2.19% to 0.14%). This is likely due to increased experience of the sorting crew in the fall.

Although there are apparent seasonal fluctuations in both "wood and wood products" and "construction / demolition material", when the two categories are added together (making a construction product category) there is little total seasonal change.

4. OVERALL COMPOSITION OF RESIDUAL SOLID WASTE

4.1 Statistical Analysis for Normalcy

Prior to applying the study results to the entire waste stream, a statistical analysis was done to determine the normalcy of said results. Normalcy is determined through a comparison of the actual distribution of the data to an ideal Gaussian distribution.

When conducting a statistical analysis, the first three parameters that are traditionally calculated are the mean, the standard deviation (SD), and the coefficient of variation (COV). These are the base values from which normalcy is determined, but do not actually prove normalcy. The mean is the average of the data. The SD is a measure of variability subject to the value of the mean; the significance of the SD is that if the data follows a bell shaped Gaussian distribution, then 68% of the values lie within one SD of the mean (on either side) and 95% of the values lie within two SD of the mean. The problem with the SD is that, because it is subject to the value of the mean, the larger the mean the larger the possible SD (which can ultimately be misleading). The COV is simply the standard deviation divided by the mean; what the COV provides is a clear indication of the degree of variability expressed as a percent.

To assess the actual normalcy, the Kolmogorov-Smirnov (KS) test was used. The KS test quantifies the discrepancy between the distribution of the data and an ideal Gausian distribution (the KS-distance), with larger values denoting larger discrepancies. The test then indicates the probability that the discrepancy for a randomly selected sample of the same size that does meet normalcy requirements (follows Gaussian distribution) would be larger than the KS-distance, with the results being referred to as the P-value. Given the sample size within this composition study (N=210), a P-value in excess of 0.05 indicates the data passed the normality test.

The results of the Normalcy testing for each of the primary categories are summarized in Table 4-1. The results indicate that the only categories that were found to meet the normalcy requirements were "organic waste" and "paper and paper products". What this means is that, for all of the other categories, care should be taken when inferring the study results to the entire waste stream, especially if the data is to be comparing to historic or future results to map trends (i.e. used as an indication of effectiveness of recycling programs, etc.).

4.2 Overall Waste Composition

Although used as the primary means of reporting results in past studies, waste composition data expressed in terms of "percentage of waste stream" does not lend itself to tracking changes in waste generation and waste composition. This is because diversion of one particular waste stream (e.g. glass beverage containers) results in a drop in the percentage of glass and a corresponding increase in the percentages of all other material categories. To address this problem, we report the sort results in three ways (see Table 4-2 and Appendix B (Table B-2)):

1) Composition (percentage),
2) Waste disposal (tonnes/year), and
3) Waste generation (kg/person/day).

Table 4-1 Normalcy Test for the Primary Categories

Waste Category	Mean (%) N=210	S.D (%)	Coefficient of Variation (%)	KS-Distance	P-Value	Passing normality test
Organic Waste	33.84	19.6	58	0.08	>0.1	Yes
Paper and Paperboard	15.67	10.2	65	0.09	0.064	Yes
Plastics	13.52	9.9	73	0.19	<0.0001	No
Wood and Wood Products	9.18	17.9	195	0.30	<0.0001	No
Construction and Demolition Material	8.38	20.6	245	0.34	<0.0001	No
Composite Products	6.19	7.0	113	0.19	<0.0001	No
Textiles	3.82	3.8	99	0.16	<0.0001	No
Ferrous Metal	3.23	3.1	96	0.15	<0.0001	No
Glass	2.31	3.6	153	0.26	<0.0001	No
Other	1.90	4.2	219	0.32	<0.0001	No
Rubber	0.87	3.0	352	0.39	<0.0001	No
Non-Ferrous Metal	0.73	1.4	197	0.30	<0.0001	No
Hazardous Waste	0.35	0.8	221	0.33	<0.0001	No
Total	100.0%					

Table 4-2 Overall Waste Composition

Waste Category	Composition (%)	Waste Disposal (Tonnes/year to landfill)	Waste Generation (kg/person/year)
Organic Waste	33.84	46,248	134.94
Paper and Paperboard	15.67	21,417	62.49
Plastics	13.52	18,471	53.89
Wood and Wood Products	9.18	12,549	36.62
Construction and Demolition Material	8.38	11,457	33.43
Composite Products	6.19	8,462	24.69
Textiles	3.82	5,215	15.22
Ferrous Metal	3.23	4,419	12.89
Glass	2.31	3,160	9.22
Other	1.90	2,590	7.56
Rubber	0.87	1,184	3.46
Non-Ferrous Metal	0.73	1,003	2.93
Hazardous Waste	0.35	480	1.40
Total	100.0%	136,654 t	398.7

To calculate the waste disposal rate for each category, the sum of the year 2000 scale data (136,654 tonnes of waste landfilled) for the Hartland Landfill was multiplied by the composition (percentage) data from the waste sort. To calculate the waste generation rate, the respective disposal rates were divided by the year 2000 population for the region (342,718 persons), as provided by CRD Regional Information Services.

Please note that the data in Table 4-2 and Appendix B (Table B-2), with the exception of the data for "organic waste" and "paper and paper products", are questionable (based on the results of the normalcy test discussed above) and should be treated as such.

In terms of the waste generation rate, each person within the regional district was responsible for 399 kg of landfilled waste per year. Included in this total was 135 kg of organic waste, 62.5 kg of paper and paper products, and 54 kg of plastics.

4.3 Comparison to the 1996 Waste Composition Study

Although care needs to be taken when mapping trends due to the non-normalcy of most of the data, we believe it would still be interesting to compare the results of the 1996 and 2001 waste composition studies to see if viable trends would become apparent.

In 1995, a total of 138,303 tonnes of waste was landfilled, while the service population in the Capital Regional District was 326,010 people (according to CRD Regional Information Services). The waste generation rate (landfilled) at that time was therefore approximately 424 kg per person per year. When compared to the results of this study, there is an apparent reduction in the waste generation rate (landfilled) of 25 kg/person/year over the last five years.

Table 4-3 compares the waste disposal rate (tonnes / year) results from the two waste composition studies. To provide an apples-to-apples comparison, the 1996 categories "food waste", "yard waste" and "other organic waste" were combined to match the 2001 "organic waste" category, while wood shingles was moved from the "construction and demolition" category and added to the "wood and wood products" category in the 1996 report to match the sub-category breakdown in the 2001 report. Also, the 1996 Study results were adjusted to reflect what the waste disposal rate for each category would have been with the year 2000 population base, given that the population has increased by over 5% in the interim.

The categories that show the greatest tonnage increase over the last 5 years include "organic waste" (+8,635 tonnes), "wood and wood products" (+1,281 tonnes), and "construction and demolition waste" (+1,265 tonnes). The categories that show the greatest tonnage decrease over the last 5 years include "paper and paperboard" (-10,031 tonnes), "other" (-8,430 tonnes), "plastics" (-1,287 tonnes) and "composite products" (-1,134 tonnes).

Other categories that showed large percentage changes over the last 5 years include "rubber" (+288.2%), "textiles" (+10.4%), "glass" (-12.4%), "non-ferrous metals" (-12.7%) and "hazardous waste" (-13.0%).

.

Table 4-3 Comparison Between 1996 and 2001 Results

Waste Category	1996 Study Mean (T/year) N=222	1996 Study Adjusted Mean (T/year) N=222	2001 Study Mean (T/year) N=210	Difference 1996-2001 (T/year)	Difference 1996-2001 %
Organic Waste	35,779	37,613	**46,248**	+8,635	+23.0
Paper and Paperboard	**29,915**	**31,448**	**21,417**	-10,031	-31.9
Plastics	**18,795**	**19,758**	18,471	-1,287	-6.5
Wood and Wood Products	10,719	11,268	12,549	+1,281	+11.4
Construction and Demolition Material	9,695	10,192	11,457	+1,265	+12.4
Composite Products	9,128	9,596	8,462	-1,134	-11.8
Textiles	4,495	4,725	5,215	+490	+10.4
Ferrous Metal	3,955	4,158	4,419	+261	+6.3
Glass	3,430	3,606	3,160	-446	-12.4
Other	10,483	11,020	2,590	-8,430	-76.5
Rubber	290	305	1,184	+879	+288.2
Non-Ferrous Metal	1,093	1,149	1,003	-146	-12.7
Hazardous Waste	526	552	480	-72	-13.0
Total	138,303	145,390	136,654	-8,736	-6.0

Note: Data found to meet normalcy requirements in each of the reports are bolded.

The increased weight in several of the categories may, in part, be attributed to the efforts of a more diligent sorting crew during the 2001 study. This premise is based on the fact that the "others" component decreased significantly from 1996 to 2001. Items such as sawdust or small bits of food, as examples, may have been treated as "other" waste during the 1996 study due to their fine nature while they were separated into the "wood and wood products", "construction and demolition waste" and "organic waste" categories respectively during the 2001 study.

Other than improved sorting, there was no apparent explanation for the increase in "organic waste" disposal rates; however, similarly high levels of organic waste were encountered at both of the other waste sorts presently being conducted by SHA (North Shore Transfer Station Study for the GVRD and Burnaby Incinerator Study for Montenay Inc).

Significant changes to the amount of "paper and paperboard" disposed of in the landfill is likely due to a combination of greater awareness and use of curbside recycling program for mixed paper; and a landfill ban on the disposal of paper fibres as of May, 1998. The greater awareness and use of curbside recycling and hazardous material disposal programs would also account for the reductions in "plastics", "composite products", "glass", "non ferrous metals" and "hazardous waste". More importantly, the beverage container stewardship regulation came into effect April 1, 1998 that required deposits on all ready to drink beverages (except milk), resulting in a significant reduction in the amount of plastic and glass drink containers being deposited now returned for refund instead.

The increase in the rubber category can be explained by one single load of ICI waste that consisted of over 40% rubber (total weight of 708 kg). This single load of rubber makes up almost the entire difference encountered between the 1996 and 2001 studies. This shows that one single load can alter the results a great deal especially if the percentage of the material within the waste stream is typically low.

Lastly, the increase in textile disposal is likely due to the regular changes in fashion trends that are common place today, especially with the teenage and pre-teen generations.

5. WASTE GENERATION BY SECTOR

The objective of this chapter of the report is to provide the portion of residual solid waste being received from each of three basic waste generation sectors, namely the residential, industrial / commercial / institutional (ICI) and demolition / land-clearing / construction waste (DLC) sources, and to characterize the waste from each sector.

5.1 Generation Breakdown by Sector

In order to partition the waste into the three specified waste generation sectors, a list of all customer accounts linked to destination descriptors "active face" or "the bin area" was generated using scale data from the Hartland Landfill; according to Nigel Lomis of the CRD, these are the only two destination descriptors within the database that represented waste being deposited within the landfill. Each of the customers were then either directly contacted and asked to provide a breakdown of what sectors they collected from, or designated to a sector based on details provided in the phone book (eg. Butchart Gardens is a commercial/tourist venture, therefore it was designated to the ICI sector). Where the customer in question sold construction materials, it was assumed that the waste fell in the DLC sector because most of the waste would be generated during installation rather than from the actual store. The results of the investigation are summarized in Table 5-1.

Table 5-1 Generation Breakdown by Sector

Source	Residential	ICI	DLC
Residential Haulers (Alpine, Ron's, municipal based)	27.5%		
Major Private Haulers (BFI, Canadian Waste, Ron's)	18.1%	18.2%	
Balance of Private Haulers		10.6%	15.9%
Cash Sale[1]	6.5%		2.2%
Total (%)	52.1%	28.8%	18.1%

1 – We assumed that the breakdown for cash sales was 75% residential (from the local area) and 25% DLC (small scale home renovations). This assumption was felt to be valid by onsite staff, and matched the assumptions made in the 1996 report.

5.2 Waste Composition By Sector

During the sampling program, the sampling schedule was arranged such that, among other things, the percentage of samples collected from each sector matched the generation breakdown specified above. For example, out of the 101 samples specified in Phase 2, 53 were to be from the residential sector, 28 from the ICI sector, and 20 from the DLC sector.

Table 5-2 and Appendix B (Table B-3) present the typical waste composition (reported as percent of the total sample) from each of the major waste generation sectors, as well as combined results for the entire waste stream.

Table 5-2 Waste Composition by Sector.

Waste Category	Residential Mean (%) N=108	ICI Mean (%) N=79	DLC Mean (%) N=23	Total Mean (%) N=210
Organic Waste	42.41	31.64	1.15	33.84
Paper and Paperboard	15.49	19.99	1.71	15.67
Plastics	13.50	15.34	7.32	13.52
Wood and Wood Products	4.82	9.05	30.15	9.18
Construction and Demolition Material	3.23	3.19	50.42	8.38
Composite Products	7.01	5.89	3.36	6.19
Textiles	4.05	4.08	1.81	3.82
Ferrous Metal	3.59	3.57	0.43	3.23
Other	1.88	1.83	2.18	1.9
Glass	2.19	3.05	0.36	2.31
Rubber	0.56	1.33	0.72	0.87
Non-Ferrous Metal	0.89	0.66	0.25	0.73
Hazardous Waste	0.38	0.37	0.15	0.35
Total (%)	100.0	100.0	100.0	100.0

In general, waste from the residential and ICI sectors is relatively similar, with the following exceptions:

- More “paper and paperboard” products from the ICI sector, in particular waxed corrugated cardboard which is used to package food waste.
- Also significantly more stretch wrap from the ICI sector; again, a material used for shipping of products.
- More furniture, electronics and computers from the ICI sector; companies and institutions tend up upgrading these items more often than homeowners.
- More rubber and other wood products from the ICI sector; likely related to the industrial sector specifically.
- Less “organic waste” and disposable diapers from the ICI sector; decrease relative to the increase in the other areas mentioned above.

DLC waste on the other hand is quite unique to waste from the other two sectors, with most of the material falling in the “construction and demolition material” (50.42%) and “wood and wood products” (30.15%) categories. Primary subcategories include asphalt shingles (41.31%), wooden shingles (22.98%), carpet and underlay (7.69%), other wood (6.02%), polystyrene (4.42%) and furniture (2.77%).

6. SPECIAL STUDIES

6.1 Apartment and Condominium Study

In order to profile the residual waste composition produced by apartments and condominiums in the Capital Regional District, the CRD contracted a local waste hauling firm to provide a waste sample from one apartment/condominium in each of four municipalities, Esquimalt, Oak Bay, Saanich and Victoria. The individual loads were brought directly to the landfill for sorting as part of this study.

The details of the waste sorts for the apartment and condominium study are provided in Appendix C (Table C-1).

6.2 Blue Box Recycling Program Study

In order to profile the residual waste composition produced from four residential areas also serviced by blue box recycling programs, four routes were pre-selected by the CRD within the four core communities, and individual samples were collected by the respective collection firms. Again, the individual loads were brought directly to the landfill for sorting as part of this study.

The details of the waste sorts for the blue box recycling program study are provided in Appendix C (Table C-2).

6.3 Sharps

During the course of the study, a total of 272 needles were found within the sorted material. Only one load containing 15 needles where recorded to have been found during the first sorting period. The sorting crew was asked to pay closer attention to this during the second sort, and consequently recorded more needles (257) during the second period. Hypodermic needles where found in 12 out of the 109 samples during the second sort. Although some individual needles were found, for the most part, large groups of needles were found together within a few selected loads. Even though up to100 needles where found in one single sample, they could not be accounted for during regular weighing of the garbage samples, since one single hypodermic needle only weigh between 0.2 and 0.5 gram.

7. LIMITATIONS

The waste composition analysis of solid waste residuals at Hartland Landfill has been prepared by Sperling Hansen Associates (SHA) on behalf of the Capital Regional District in accordance with generally accepted engineering practices. The report is based on 210 waste composition samples collected and analyzed by CRD staff over the course of 2001. The report documents our findings and conclusions based on this data.

The report is intended solely for the use of the Capital Regional District. SHA does not accept any responsibility for other uses of the material contained herein.

The report contains intellectual property developed and owned by SHA that has been made available to the Capital Regional District for exclusive use in charting the course of their solid waste management program. Copying of this intellectual property for other purposes is not permitted.

The interpretations presented in this report and the conclusions and recommendations that are drawn are based on information that was made available to SHA during the course of this project. Should additional new data become available in the future, SHA reserves the right to update the findings of this report and modify the conclusions and recommendations drawn, as required.

Report prepared by:

Glenn Herold, P.Eng.
Senior Environmental Engineer

Professional Seal

David Kvick, E.I.T.
Reviewed by:

Poul Hansen
General Manager

APPENDICES

APPENDIX A
Sample Sheets

SAMPLE LOAD DATA SHEET

General Information Sample ID #:_____

Date:_____ Time:_____
Weather Conditions:_____

Hauler:_____ Truck Number:_____ License:_____

MSW □ ICI □ Details:_____

North Saanich □ Sidney □ Central Saanich □ Saanich □
Victoria □ Oak Bay □ Esquimalt □ View Royal □ Colwood □
Metchosin □ Sooke □ Hartland □ Other:_____

Scale Data Total Weight (Inbound):_____ kg
Total Weight (Outbound):_____ kg

Load Weight (In-out):_____ kg

Oversized Materials
Descriptor 1:_____ Weight:_____ kg
Descriptor 2:_____ Weight:_____ kg
Descriptor 3:_____ Weight:_____ kg
Descriptor 4:_____ Weight:_____ kg
Descriptor 5:_____ Weight:_____ kg

Excess Moisture
Volume:_____ m^3 (approximate)
Details:_____

Sample Material Description

_____
_____

Signatures
Sample taken by:_____ Date:_____
Data sheet received by:_____ Date:_____

Filling out the "Sample Load Data Sheet"

GENERAL INFORMATION

Sample ID # - The identification number for the respective sample. Numbering to include sample round (1 or 2) and sample number (1 through 108).

E.G. Sample ID #: 1-10 .

Date - Date the sample arrived at the working face.
Time - Time the sample arrived at the working face.
Weather Conditions - Brief description of weather at the time the load was processed. Include details on temperature, cloud cover, level of precipitation.

Hauler - Name of hauler.
Truck Number – Identification number for the truck.
License # - License plate number for the truck.

Residential/ICI(Industrial/Commercial/Institutional) – specify what type of garbage is included within the load. May be that load contains both.
Details – add whatever relevant details are available for the load, such as collection area, major sources (DND/University), etc.

Mark off which areas the waste came from. May be from more than one area.

SCALE DATA

Obtain the inbound and outbound weights of the vehicle from the scale operator.

OVERSIZED MATERIALS

(This section applies if there is a large volume of particular material in a load. The material should be separated out and weight independently).

Descriptor: description of the material – try to follow the subcategory descriptors.
Weight: independent weight of the specific material.

EXCESS MOISTURE

(If large volumes of moisture are noted when the load is being dumped, try to estimate the volume of water. This may be the case if a bin has been sitting out open for a while).

SAMPLE MATERIAL DESCRIPTION

(Add general comments on how thorough the load was mixed when the sample was drawn. Also add general descriptors of the load, if something stands out)

SIGNATURE

Backhoe operator to sign sheet before handing it in to the project coordinator.
Coordinator to confirm receipt of form by also signing form.

ID #: _____

Secondary Category #	Secondary Category Descriptor	Tare Weight (kg)	Sample Weight (kg)	Material Weight (kg)
Category 1 - Paper and Paperboard				
1:1	Newsprint (including flyers)			
1:2	Magazines			
1:3	Corrugated cardboard			
1:4	Waxed corrugated cardboard			
1:5	Boxboard			
1:6	Telephone books			
1:7	Fine paper			
1:8	Tissue paper			
1:9	Gabletop milk and juice cartons			
1:10	Tetra Paks and aseptic drink boxes			
1:11	Brown kraft paper, including bags			
1:12	Other paper			
	Total Category Weight (kg)			
Category 2 - Glass				
2:1	Clear food and beverage container glass			
2:2	Coloured food and beverage container glass			
2:3	Other glass			
	Total Category Weight (kg)			
Category 3 - Ferrous Metals				
3:1	Food and beverage cans			
3:2	Aerosol cans			
3:3	Empty paint cans and lids			
3:4	Large metal appliances (white goods)			
3:5	Other ferrous metals			
	Total Category Weight (kg)			
Category 4 - Non-ferrous Metals				
4:1	Aluminum food and beverage cans			
4:2	Aluminum foil/pie plates			
4:3	Other non-ferrous metal			
	Total Category Weight (kg)			

Secondary Category #	Secondary Category Descriptor	Tare Weight (kg)	Sample Weight (kg)	Material Weight (kg)
Category 5 - Plastics				
5:1	PET bottles - soft drink bottles < 2 L			
5:2	PET bottles - soft drink bottles > 2 L			
5:3	PET bottles - other beverage containers			
5:4	PET food trays			
5:5	PET - other			
5:6	HDPE milk jugs			
5:7	HDPE other beverage containers			
5:8	Other HDPE jugs and bottles			
5:9	Dairy and dairy related tubs and lids			
5:10	PVC containers (#3)			
5:11	Polypropylene (#5)			
5:12	Polystyrene (#6)			
5:13	Plastics (#7)			
5:14	Recyclable plastic bags (shopping and other food bags)			
5:15	Non-recyclable plastic bags (garbage, chip and crinkly)			
5:16	Shipping and courier bags			
5:17	Durable plastics			
5:18	Stretch wrap			
5:19	Crates, pails and drums (> 25L)			
5:20	Multi-material waste plastics			
5:21	Predominantly plastic composite materials			
5:22	Other plastics			
	Total Category Weight (kg)			
Category 6 - Organic Waste				
6:1	Food waste			
6:2	Yard waste			
6:3	Other organic waste			
	Total Category Weight (kg)			

Secondary Category #	Secondary Category Descriptor	Tare Weight (kg)	Sample Weight (kg)	Material Weight (kg)
Category 7 - Wood and Wood Products				
7:1	Pallets/skids			
7:2	Dimensional lumber			
7:3	Wooden shingles			
7:4	Other wood			
	Total Category Weight (kg)			
Category 8 - Construction/Demolition Material				
8:1	Drywall			
8:2	Asphalt shingles			
8:3	Insulation			
8:4	Carpet and underlay			
8:5	Other C/D wastes			
	Total Category Weight (kg)			
Category 9 - Textiles				
9:1	Clothing			
9:2	Other textiles			
	Total Category Weight (kg)			
Category 10 - Rubber				
10:1	Vehicle tires			
10:2	Other rubber products			
	Total Category Weight (kg)			
Category 11 - Composite Products				
11:1	Disposable diapers			
11:2	Furniture			
11:3	Electronics and small appliances			
11:4	Computers and monitors			
11:5	Other composites			
	Total Category Weight (kg)			

Secondary Category #	Secondary Category Descriptor	Tare Weight (kg)	Sample Weight (kg)	Material Weight (kg)
Category 12 - Hazardous Wastes				
12:1	Fluorescent tubes			
12:2	Paints			
12:3	Batteries			
12:4	Oils			
12:5	Oil filters			
12:6	Sharps			
12:7	Other hazardous waste			
	Total Category Weight (kg)			
Category 13 - Other				
13:1	Non-distinct fines			
13:2	Other wastes			
	Total Category Weight (kg)			
	Total Sample Weight (kg)			

Start Day: _____ Finished Day: _____
Start Time: _____ Finished Time: _____
Data Recorded By: _____ Input to Computer By: _____
Reviewed By: _____

APPENDIX B
Detailed Result Tables
Waste Composition

Table B-1. Composition of Sampled Waste

		Phase 1			Phase 2			Combined (total)		
		Mean (%)	S.D	C.O.V (%)	Mean (%)	S.D	C.O.V (%)	Mean (%)	S.D	C.O.V (%)
Category 1 - Paper and Paperboard										
1:1	Newsprint (including flyers)	1.80	2.16	120.2	2.53	3.54	140.2	2.17	2.98	137.0
1:2	Magazines	0.64	0.86	135.5	0.74	1.22	165.8	0.69	1.06	155.1
1:3	Corrugated cardboard	1.40	1.42	101.3	2.08	2.43	116.5	1.76	2.03	115.3
1:4	Waxed corrugated cardboard	0.54	2.16	402.3	1.24	3.47	280.9	0.90	2.93	325.7
1:5	Boxboard	2.00	1.39	69.7	2.37	1.50	63.3	2.18	1.46	66.8
1:6	Telephone books	0.07	0.35	475.3	0.09	0.43	475.0	0.08	0.40	477.9
1:7	Fine paper	1.97	2.31	117.6	1.67	2.10	125.8	1.81	2.20	121.8
1:8	Tissue paper	3.12	2.36	75.7	2.03	2.46	120.9	2.54	2.46	96.8
1:9	Gabletop milk and juice cartons	0.65	0.89	135.5	0.56	0.49	87.7	0.60	0.70	117.4
1:10	Tetra Paks and aseptic drink boxes	0.16	0.28	180.1	0.09	0.15	174.1	0.12	0.22	187.2
1:11	Brown kraft paper, including bags	0.96	1.84	190.5	0.79	0.86	109.1	0.87	1.41	161.9
1:12	Other paper	2.28	1.76	77.1	1.65	1.31	79.4	1.95	1.57	80.5
	Category 1 - Paper and Paperboard	**15.58**	9.00	57.8	**15.83**	11.20	70.7	**15.67**	10.19	65.0
Category 2 - Glass										
2:1	Clear food and beverage container glass	1.02	1.11	108.4	0.90	0.84	93.0	0.96	0.97	102.0
2:2	Coloured food and beverage container glass	0.21	0.48	226.6	0.27	0.48	175.5	0.24	0.48	197.1
2:3	Other glass	0.74	0.95	128.6	1.15	3.23	281.7	1.11	3.36	301.9
	Category 2 - Glass	**1.97**	1.67	84.4	**2.32**	3.42	147.3	**2.31**	3.54	153.0
Category 3 - Ferrous Metals										
3:1	Food and beverage cans	1.03	0.98	95.1	1.09	0.83	76.8	1.06	0.90	85.6
3:2	Aerosol cans	0.15	0.20	138.3	0.17	0.24	144.4	0.16	0.23	142.6
3:3	Empty paint cans and lids	0.22	1.77	795.4	0.24	0.55	227.8	0.23	1.28	549.3
3:4	Large metal appliances (white goods)	0.02	0.17	936.0	0.02	0.16	1038.9	0.02	0.16	986.2
3:5	Other ferrous metals	2.05	2.70	131.3	1.49	2.26	151.2	1.77	2.49	140.4
	Category 3 - Ferrous Metals	**3.47**	3.47	100.0	**3.01**	2.76	91.8	**3.23**	3.11	96.3
Category 4 - Non-ferrous Metals										
4:1	Aluminum food and beverage cans	0.18	0.47	263.0	0.09	0.13	146.9	0.13	0.34	259.8
4:2	Aluminum foil/pie plates	0.35	0.27	77.4	0.41	1.61	395.8	0.38	1.18	309.8
4:3	Other non-ferrous metal	0.22	1.04	474.9	0.23	0.60	262.3	0.22	0.83	374.0
	Category 4 - Non-ferrous Metals	**0.75**	1.13	150.2	**0.72**	1.69	233.3	**0.73**	1.44	196.8
Category 5 - Plastics										
5:1	PET bottles - soft drink bottles < 2 L	0.07	0.14	204.8	0.18	0.26	141.3	0.13	0.22	169.7
5:2	PET bottles - soft drink bottles > 2 L	0.02	0.08	509.1	0.00	0.00	851.5	0.01	0.05	718.8
5:3	PET bottles - other beverage containers	0.05	0.08	161.1	0.00	0.03	938.9	0.03	0.07	251.6
5:4	PET food trays	0.19	0.20	106.0	0.20	0.20	97.1	0.20	0.20	101.0
5:5	PET - other	0.17	0.23	131.1	0.16	0.31	196.2	0.17	0.27	165.6
5:6	HDPE milk jugs	0.11	0.17	156.1	0.12	0.14	121.4	0.11	0.16	137.7
5:7	HDPE other beverage containers	0.05	0.23	429.7	0.01	0.09	666.0	0.03	0.17	530.2
5:8	Other HDPE jugs and bottles	0.64	0.57	88.8	0.82	0.94	115.6	0.73	0.79	107.9
5:9	Dairy and dairy related tubs and lids	0.56	0.49	87.4	0.49	0.54	108.8	0.52	0.51	98.5
5:10	PVC containers (#3)	0.05	0.11	199.7	0.10	0.20	198.2	0.08	0.16	207.9
5:11	Polypropylene (#5)	0.24	0.29	117.5	0.17	0.55	327.2	0.20	0.45	218.7
5:12	Polystyrene (#6)	1.15	0.90	78.0	1.92	9.57	499.2	1.55	6.95	449.6
5:13	Plastics (#7)	0.09	0.37	412.1	0.10	0.55	548.0	0.10	0.47	491.6
5:14	Recyclable plastic bags (shopping and other food bags)	0.73	1.05	144.0	0.92	1.33	144.8	0.84	1.21	144.5
5:15	Non-recyclable plastic bags (garbage, chip and crinkly)	4.46	2.72	61.0	5.71	3.67	64.2	5.09	3.32	65.1
5:16	Shipping and courier bags	0.00	0.00	-	0.01	0.08	584.8	0.01	0.06	811.9
5:17	Durable plastics	0.00	0.00	-	0.00	0.00	-	0.00	0.00	-
5:18	Stretch wrap	0.26	0.48	188.5	0.83	5.92	713.8	0.57	4.30	760.7
5:19	Crates, pails and drums (> 25L)	0.22	1.10	506.7	0.26	0.95	359.1	0.24	1.02	423.1
5:20	Multi-material waste plastics	0.00	0.00	-	0.00	0.00	-	0.00	0.00	-
5:21	Predominantly plastic composite materials	0.00	0.02	995.0	0.24	0.90	375.0	0.13	0.66	521.8
5:22	Other plastics	3.07	3.05	99.4	2.55	5.35	210.1	2.80	4.40	157.2
	Category 5 - Plastics	**12.13**	5.66	46.7	**14.80**	12.45	84.1	**13.52**	9.88	73.1

		Phase 1			Phase 2			Combined (total)		
		Mean (%)	S.D	C.O.V (%)	Mean (%)	S.D	C.O.V (%)	Mean (%)	S.D	C.O.V (%)
Category 6 - Organic Waste										
6:1	Food waste	21.36	14.44	67.6	24.09	16.25	67.5	22.70	15.46	68.1
6:2	Yard waste	7.20	8.88	123.4	7.13	10.93	153.3	7.15	9.96	139.3
6:3	Other organic waste	4.23	4.70	111.0	3.80	5.27	138.8	3.99	5.00	125.3
	Category 6 - Organic Waste	**32.79**	18.72	57.1	**35.01**	20.25	57.8	**33.84**	19.55	57.8
Category 7 - Wood and Wood Products										
7:1	Pallets/skids	0.13	0.67	508.8	0.13	0.71	536.4	0.13	0.69	523.7
7:2	Dimensional lumber	1.39	5.62	404.0	0.46	2.29	502.0	0.92	4.23	458.1
7:3	Wooden shingles	4.20	17.87	425.4	1.36	7.73	567.9	2.69	13.53	502.2
7:4	Other wood	5.19	10.94	210.7	5.64	9.96	176.6	5.44	10.39	191.1
	Category 7 - Wood and Wood Products	**10.92**	22.10	202.5	**7.59**	13.10	172.5	**9.18**	17.93	195.2
Category 8 - Construction/Demolition Material										
8:1	Drywall	0.41	1.85	454.2	0.17	0.60	354.7	0.28	1.34	479.5
8:2	Asphalt shingles	4.02	17.51	435.6	5.44	19.95	366.9	4.74	18.76	395.5
8:3	Insulation	0.10	0.53	543.0	0.10	0.61	631.0	0.10	0.57	591.0
8:4	Carpet and underlay	2.04	9.97	487.9	2.98	8.01	268.9	2.52	8.96	355.1
8:5	Other C/D wastes	0.73	2.37	324.4	0.75	2.95	395.3	0.74	2.68	363.0
	Category 8 - Construction/Demolition Material	**7.30**	19.84	271.8	**9.43**	21.35	226.4	**8.38**	20.58	245.5
Category 9 - Textiles										
9:1	Clothing	1.38	1.68	121.8	2.05	3.58	174.7	1.73	2.85	164.8
9:2	Other textiles	2.51	2.80	111.4	1.71	1.76	102.8	2.09	2.33	111.9
	Category 9 - Textiles	**3.89**	3.53	90.8	**3.76**	4.05	107.7	**3.82**	3.80	99.5
Category 10 - Rubber										
10:1	Vehicle tires	0.16	0.85	534.6	0.08	0.43	517.9	0.12	0.66	558.7
10:2	Other rubber products	0.90	4.14	457.3	0.61	1.27	207.5	0.75	2.98	398.8
	Category 10 - Rubber	**1.06**	4.21	395.8	**0.70**	1.33	191.3	**0.87**	3.05	351.7
Category 11 - Composite Products										
11:1	Disposable diapers	3.70	4.82	130.2	3.37	4.45	132.1	3.51	4.62	131.4
11:2	Furniture	1.90	4.93	259.3	1.17	3.13	266.9	1.51	4.08	270.1
11:3	Electronics and small appliances	0.69	1.94	281.8	1.03	2.53	246.2	0.86	2.27	262.6
11:4	Computers and monitors	0.30	1.76	592.6	0.18	1.31	725.8	0.23	1.53	653.7
11:5	Other composites	0.10	0.92	962.9	0.05	0.36	708.0	0.07	0.68	953.5
	Category 11 - Composite Products	**6.68**	7.74	115.9	**5.81**	6.31	108.7	**6.19**	7.02	113.3
Category 12 - Hazardous Wastes										
12:1	Fluorescent tubes	0.01	0.05	718.3	0.00	0.02	490.9	0.01	0.04	673.5
12:2	Paints	0.13	0.59	448.8	0.00	0.01	845.6	0.06	0.41	649.8
12:3	Batteries	0.19	0.70	370.0	0.07	0.10	141.2	0.13	0.49	387.7
12:4	Oils	0.01	0.04	572.4	0.00	0.00	903.5	0.00	0.03	779.7
12:5	Oil filters	0.02	0.10	607.5	0.06	0.18	287.8	0.04	0.15	367.2
12:6	Sharps	0.00	0.00	-	0.00	0.00	-	0.00	0.00	-
12:7	Other hazardous waste	0.18	0.58	314.1	0.05	0.24	461.5	0.11	0.44	383.4
	Category 12 - Hazardous Wastes	**0.53**	1.05	196.9	**0.19**	0.33	175.4	**0.35**	0.78	221.3
Category 13 - Other										
13:1	Non-distinct fines	0.74	2.76	375.2	0.69	1.11	161.1	0.79	2.35	297.0
13:2	Other wastes	2.19	4.91	224.6	0.14	0.98	697.8	1.10	3.58	324.6
	Category 13 - Other	**2.92**	5.46	186.9	**0.83**	1.45	173.7	**1.90**	4.16	219.4
	Total (%)	**100.00**			**100.00**			**100**		

Table B-2. Overall Waste Composition.

		Composition (Percentage)			Waste Disposal (tonnes/year)			Waste Generation (kg/person/year)		
		Mean	S.D	C.O.V (%)	Mean	S.D	C.O.V (%)	Mean	S.D	C.O.V (%)
Category 1 - Paper and Paperboard										
1:1	Newsprint (including flyers)	2.17	2.98	137.0	2969	4068	137	8.66	11.9	137
1:2	Magazines	0.69	1.06	155.1	938	1455	155	2.74	4.2	155
1:3	Corrugated cardboard	1.76	2.03	115.3	2409	2778	115	7.03	8.1	115
1:4	Waxed corrugated cardboard	0.90	2.93	325.7	1231	4010	326	3.59	11.7	326
1:5	Boxboard	2.18	1.46	66.8	2985	1993	67	8.71	5.8	67
1:6	Telephone books	0.08	0.40	477.9	113	540	478	0.33	1.6	478
1:7	Fine paper	1.81	2.20	121.8	2468	3006	122	7.20	8.8	122
1:8	Tissue paper	2.54	2.46	96.8	3473	3361	97	10.13	9.8	97
1:9	Gabletop milk and juice cartons	0.60	0.70	117.4	820	963	117	2.39	2.8	117
1:10	Tetra Paks and aseptic drink boxes	0.12	0.22	187.2	163	305	187	0.48	0.9	187
1:11	Brown kraft paper, including bags	0.87	1.41	161.9	1189	1924	162	3.47	5.6	162
1:12	Other paper	1.95	1.57	80.5	2659	2141	81	7.76	6.2	81
	Category 1 - Paper and Paperboard	**15.67**	10.19	65.0	**21417**	13921	65	**62.49**	40.6	65
Category 2 - Glass										
2:1	Clear food and beverage container glass	0.96	0.97	102.0	1306	1332	102	3.81	3.9	102
2:2	Coloured food and beverage container glass	0.24	0.48	197.1	332	654	197	0.97	1.9	197
2:3	Other glass	1.11	3.36	301.9	1522	4594	302	4.44	13.4	302
	Category 2 - Glass	**2.31**	3.54	153.0	**3160**	4835	153	**9.22**	14.1	153
Category 3 - Ferrous Metals										
3:1	Food and beverage cans	1.06	0.90	85.6	1443	1236	86	4.21	3.6	86
3:2	Aerosol cans	0.16	0.23	142.6	216	308	143	0.63	0.9	143
3:3	Empty paint cans and lids	0.23	1.28	549.3	318	1745	549	0.93	5.1	549
3:4	Large metal appliances (white goods)	0.02	0.16	986.2	23	225	986	0.07	0.7	986
3:5	Other ferrous metals	1.77	2.49	140.4	2419	3396	140	7.06	9.9	140
	Category 3 - Ferrous Metals	**3.23**	3.11	96.3	**4419**	4254	96	**12.89**	12.4	96
Category 4 - Non-ferrous Metals										
4:1	Aluminum food and beverage cans	0.13	0.34	259.8	179	464	260	0.52	1.4	260
4:2	Aluminum foil/pie plates	0.38	1.18	309.8	521	1613	310	1.52	4.7	310
4:3	Other non-ferrous metal	0.22	0.83	374.0	304	1136	374	0.89	3.3	374
	Category 4 - Non-ferrous Metals	**0.73**	1.44	196.8	**1003**	1973	197	**2.93**	5.8	197
Category 5 - Plastics										
5:1	PET bottles - soft drink bottles < 2 L	0.13	0.22	169.7	175	298	170	0.51	0.9	170
5:2	PET bottles - soft drink bottles > 2 L	0.01	0.05	718.8	10	74	719	0.03	0.2	719
5:3	PET bottles - other beverage containers	0.03	0.07	251.6	37	93	252	0.11	0.3	252
5:4	PET food trays	0.20	0.20	101.0	270	273	101	0.79	0.8	101
5:5	PET - other	0.17	0.27	165.6	226	374	166	0.66	1.1	166
5:6	HDPE milk jugs	0.11	0.16	137.7	156	215	138	0.46	0.6	138
5:7	HDPE other beverage containers	0.03	0.17	530.2	45	236	530	0.13	0.7	530
5:8	Other HDPE jugs and bottles	0.73	0.79	107.9	998	1078	108	2.91	3.1	108
5:9	Dairy and dairy related tubs and lids	0.52	0.51	98.5	710	700	99	2.07	2.0	99
5:10	PVC containers (#3)	0.08	0.16	207.9	108	225	208	0.32	0.7	208
5:11	Polypropylene (#5)	0.20	0.45	218.7	279	611	219	0.81	1.8	219
5:12	Polystyrene (#6)	1.55	6.95	449.6	2112	9496	450	6.16	27.7	450
5:13	Plastics (#7)	0.10	0.47	491.6	130	641	492	0.38	1.9	492
5:14	Recyclable plastic bags (shopping and other food bags)	0.84	1.21	144.5	1141	1649	145	3.33	4.8	145
5:15	Non-recyclable plastic bags (garbage, chip and crinkly)	5.09	3.32	65.1	6961	4531	65	20.31	13.2	65
5:16	Shipping and courier bags	0.01	0.06	811.9	10	84	812	0.03	0.2	812
5:17	Durable plastics	0.00	0.00	-	0	0	-	0.00	0.0	-
5:18	Stretch wrap	0.57	4.30	760.7	772	5875	761	2.25	17.1	761
5:19	Crates, pails and drums (> 25L)	0.24	1.02	423.1	328	1388	423	0.96	4.0	423
5:20	Multi-material waste plastics	0.00	0.00	-	0	0	-	0.00	0.0	-
5:21	Predominantly plastic composite materials	0.13	0.66	521.8	173	903	522	0.50	2.6	522
5:22	Other plastics	2.80	4.40	157.2	3827	6017	157	11.17	17.6	157
	Category 5 - Plastics	**13.52**	9.88	73.1	**18471**	13505	73	**53.89**	39.4	73

Category 6 - Organic Waste										
6:1	Food waste	22.70	15.46	68.1	31024	21125	68	90.52	61.6	68
6:2	Yard waste	7.15	9.96	139.3	9778	13617	139	28.53	39.7	139
6:3	Other organic waste	3.99	5.00	125.3	5446	6826	125	15.89	19.9	125
	Category 6 - Organic Waste	**33.84**	19.55	57.8	**46248**	26715	58	**134.94**	77.9	58
Category 7 - Wood and Wood Products										
7:1	Pallets/skids	0.13	0.69	523.7	180	940	524	0.52	2.7	524
7:2	Dimensional lumber	0.92	4.23	458.1	1262	5782	458	3.68	16.9	458
7:3	Wooden shingles	2.69	13.53	502.2	3680	18483	502	10.74	53.9	502
7:4	Other wood	5.44	10.39	191.1	7427	14197	191	21.67	41.4	191
	Category 7 - Wood and Wood Products	**9.18**	17.93	195.2	**12549**	24498	195	**36.62**	71.5	195
Category 8 - Construction/Demolition Material										
8:1	Drywall	0.28	1.34	479.5	383	1837	480	1.12	5.4	480
8:2	Asphalt shingles	4.74	18.76	395.5	6483	25642	396	18.92	74.8	396
8:3	Insulation	0.10	0.57	591.0	133	783	591	0.39	2.3	591
8:4	Carpet and underlay	2.52	8.96	355.1	3448	12244	355	10.06	35.7	355
8:5	Other C/D wastes	0.74	2.68	363.0	1010	3665	363	2.95	10.7	363
	Category 8 - Construction/Demolition Material	**8.38**	20.58	245.5	**11457**	28130	246	**33.43**	82.1	246
Category 9 - Textiles										
9:1	Clothing	1.73	2.85	164.8	2365	3896	165	6.90	11.4	165
9:2	Other textiles	2.09	2.33	111.9	2850	3188	112	8.32	9.3	112
	Category 9 - Textiles	**3.82**	3.80	99.5	**5215**	5188	99	**15.22**	15.1	99
Category 10 - Rubber										
10:1	Vehicle tires	0.12	0.66	558.7	162	906	559	0.47	2.6	559
10:2	Other rubber products	0.75	2.98	398.8	1022	4076	399	2.98	11.9	399
	Category 10 - Rubber	**0.87**	3.05	351.7	**1184**	4165	352	**3.46**	12.2	352
Category 11 - Composite Products										
11:1	Disposable diapers	3.51	4.62	131.4	4800	6308	131	14.01	18.4	131
11:2	Furniture	1.51	4.08	270.1	2065	5576	270	6.03	16.3	270
11:3	Electronics and small appliances	0.86	2.27	262.6	1179	3096	263	3.44	9.0	263
11:4	Computers and monitors	0.23	1.53	653.7	320	2092	654	0.93	6.1	654
11:5	Other composites	0.07	0.68	953.5	98	933	954	0.29	2.7	954
	Category 11 - Composite Products	**6.19**	7.02	113.3	**8462**	9587	113	**24.69**	28.0	113
Category 12 - Hazardous Wastes										
12:1	Fluorescent tubes	0.01	0.04	673.5	8	52	673	0.02	0.2	673
12:2	Paints	0.06	0.41	649.8	86	556	650	0.25	1.6	650
12:3	Batteries	0.13	0.49	387.7	172	665	388	0.50	1.9	388
12:4	Oils	0.00	0.03	779.7	4	35	780	0.01	0.1	780
12:5	Oil filters	0.04	0.15	367.2	55	203	367	0.16	0.6	367
12:6	Sharps	0.00	0.00	-	0	0	-	0.00	0.0	-
12:7	Other hazardous waste	0.11	0.44	383.4	156	597	383	0.45	1.7	383
	Category 12 - Hazardous Wastes	**0.35**	0.78	221.3	**480**	1063	221	**1.40**	3.1	221
Category 13 - Other										
13:1	Non-distinct fines	0.79	2.35	297.0	1081	3212	297	3.15	9.4	297
13:2	Other wastes	1.10	3.58	324.6	1509	4899	325	4.40	14.3	325
	Category 13 - Other	**1.90**	4.16	219.4	**2590**	5683	219	**7.56**	16.6	219
	Total (%)	**100.00**			**136654**			**398.7**		

Table B-3. Waste Composition from Different Sectors.

		Residential Mean (%) N = 108	ICI Mean (%) N = 79	DLC Mean (%) N = 23	Total Mean (%) N = 210
Category 1 - Paper and Paperboard					
1:1	Newsprint (including flyers)	2.04	2.95	0.14	2.17
1:2	Magazines	0.81	0.70	0.04	0.69
1:3	Corrugated cardboard	1.51	2.45	0.60	1.76
1:4	Waxed corrugated cardboard	0.26	2.04	0.01	0.90
1:5	Boxboard	2.56	2.24	0.22	2.18
1:6	Telephone books	0.10	0.09	0.00	0.08
1:7	Fine paper	1.76	2.29	0.35	1.81
1:8	Tissue paper	2.49	3.33	0.07	2.54
1:9	Gabletop milk and juice cartons	0.71	0.62	0.02	0.60
1:10	Tetra Paks and aseptic drink boxes	0.13	0.14	0.00	0.12
1:11	Brown kraft paper, including bags	0.96	0.97	0.08	0.87
1:12	Other paper	2.15	2.18	0.18	1.95
	Category 1 - Paper and Paperboard	**15.49**	**19.99**	**1.71**	**15.67**
Category 2 - Glass					
2:1	Clear food and beverage container glass	1.01	1.15	0.03	0.96
2:2	Coloured food and beverage container glass	0.25	0.29	0.06	0.24
2:3	Other glass	0.93	1.62	0.27	1.11
	Category 2 - Glass	**2.19**	**3.05**	**0.36**	**2.31**
Category 3 - Ferrous Metals					
3:1	Food and beverage cans	1.30	1.02	0.02	1.06
3:2	Aerosol cans	0.22	0.12	0.02	0.16
3:3	Empty paint cans and lids	0.15	0.40	0.03	0.23
3:4	Large metal appliances (white goods)	0.00	0.04	0.00	0.02
3:5	Other ferrous metals	1.92	1.98	0.04	1.77
	Category 3 - Ferrous Metals	**3.59**	**3.57**	**0.43**	**3.23**
Category 4 - Non-ferrous Metals					
4:1	Aluminum food and beverage cans	0.11	0.19	0.01	0.13
4:2	Aluminum foil/pie plates	0.58	0.22	0.02	0.38
4:3	Other non-ferrous metal	0.21	0.24	0.22	0.22
	Category 4 - Non-ferrous Metals	**0.89**	**0.66**	**0.25**	**0.73**
Category 5 - Plastics					
5:1	PET bottles - soft drink bottles < 2 L	0.13	0.16	0.01	0.13
5:2	PET bottles - soft drink bottles > 2 L	0.01	0.01	0.00	0.01
5:3	PET bottles - other beverage containers	0.03	0.02	0.00	0.03
5:4	PET food trays	0.26	0.16	0.00	0.20
5:5	PET - other	0.21	0.15	0.00	0.17
5:6	HDPE milk jugs	0.12	0.13	0.00	0.11
5:7	HDPE other beverage containers	0.05	0.02	0.00	0.03
5:8	Other HDPE jugs and bottles	0.77	0.87	0.07	0.73
5:9	Dairy and dairy related tubs and lids	0.62	0.51	0.06	0.52
5:10	PVC containers (#3)	0.10	0.05	0.06	0.08
5:11	Polypropylene (#5)	0.28	0.14	0.07	0.20
5:12	Polystyrene (#6)	1.16	1.23	4.42	1.55
5:13	Plastics (#7)	0.10	0.11	0.00	0.10
5:14	Recyclable plastic bags (shopping and other food bags)	0.85	1.04	0.06	0.84
5:15	Non-recyclable plastic bags (garbage, chip and crinkly)	5.91	5.27	0.65	5.09
5:16	Shipping and courier bags	0.00	0.02	0.00	0.01
5:17	Durable plastics	0.00	0.00	0.00	0.00
5:18	Stretch wrap	0.18	1.26	0.00	0.57
5:19	Crates, pails and drums (> 25L)	0.20	0.32	0.14	0.24
5:20	Multi-material waste plastics	0.00	0.00	0.00	0.00
5:21	Predominantly plastic composite materials	0.07	0.23	0.01	0.13
5:22	Other plastics	2.43	3.61	1.77	2.80
	Category 5 - Plastics	**13.50**	**15.34**	**7.32**	**13.52**

Category 6 - Organic Waste					
6:1	Food waste	27.20	23.09	0.23	22.70
6:2	Yard waste	9.15	6.30	0.71	7.15
6:3	Other organic waste	6.06	2.25	0.21	3.99
	Category 6 - Organic Waste	**42.41**	**31.64**	**1.15**	**33.84**
Category 7 - Wood and Wood Products					
7:1	Pallets/skids	0.04	0.13	0.58	0.13
7:2	Dimensional lumber	0.73	1.29	0.57	0.92
7:3	Wooden shingles	0.00	0.47	22.98	2.69
7:4	Other wood	4.05	7.16	6.02	5.44
	Category 7 - Wood and Wood Products	**4.82**	**9.05**	**30.15**	**9.18**
Category 8 - Construction/Demolition Material					
8:1	Drywall	0.36	0.21	0.14	0.28
8:2	Asphalt shingles	0.34	0.12	41.31	4.74
8:3	Insulation	0.02	0.09	0.48	0.10
8:4	Carpet and underlay	1.68	2.17	7.69	2.52
8:5	Other C/D wastes	0.83	0.60	0.80	0.74
	Category 8 - Construction/Demolition Material	**3.23**	**3.19**	**50.42**	**8.38**
Category 9 - Textiles					
9:1	Clothing	1.82	1.89	0.79	1.73
9:2	Other textiles	2.23	2.20	1.02	2.09
	Category 9 - Textiles	**4.05**	**4.08**	**1.81**	**3.82**
Category 10 - Rubber					
10:1	Vehicle tires	0.06	0.23	0.03	0.12
10:2	Other rubber products	0.50	1.10	0.69	0.75
	Category 10 - Rubber	**0.56**	**1.33**	**0.72**	**0.87**
Category 11 - Composite Products					
11:1	Disposable diapers	5.43	1.91	0.01	3.51
11:2	Furniture	0.81	2.11	2.77	1.51
11:3	Electronics and small appliances	0.72	1.13	0.58	0.86
11:4	Computers and monitors	0.03	0.58	0.00	0.23
11:5	Other composites	0.02	0.17	0.00	0.07
	Category 11 - Composite Products	**7.01**	**5.89**	**3.36**	**6.19**
Category 12 - Hazardous Wastes					
12:1	Fluorescent tubes	0.00	0.01	0.01	0.01
12:2	Paints	0.03	0.12	0.01	0.06
12:3	Batteries	0.15	0.12	0.03	0.13
12:4	Oils	0.01	0.00	0.00	0.00
12:5	Oil filters	0.06	0.03	0.01	0.04
12:6	Sharps	0.00	0.00	0.00	0.00
12:7	Other hazardous waste	0.14	0.09	0.09	0.11
	Category 12 - Hazardous Wastes	**0.38**	**0.37**	**0.15**	**0.35**
Category 13 - Other					
13:1	Non-distinct fines	0.62	1.15	0.35	0.79
13:2	Other wastes	1.26	0.68	1.83	1.10
	Category 13 - Other	**1.88**	**1.83**	**2.18**	**1.90**
	Total (%)	**100.00**	**100.00**	**100.00**	**100.00**

APPENDIX C
Detailed Result Tables
Apartment and Condominium Study

Table C-1. Apartment and Condominium Study - Waste Composition.

		Esquimalt	Oak Bay	Saanich	Victoria
		(%)	(%)	(%)	(%)
Category 1 - Paper and Paperboard					
1:1	Newsprint (including flyers)	3.22	2.85	1.82	2.79
1:2	Magazines	1.91	0.00	0.73	0.96
1:3	Corrugated cardboard	3.58	3.10	3.74	4.97
1:4	Waxed corrugated cardboard	0.00	0.00	0.00	0.00
1:5	Boxboard	2.75	2.94	3.47	7.83
1:6	Telephone books	0.00	0.00	0.00	1.66
1:7	Fine paper	3.34	2.53	0.91	1.58
1:8	Tissue paper	2.16	2.09	0.60	2.45
1:9	Gabletop milk and juice cartons	0.76	0.49	0.51	0.90
1:10	Tetra Paks and aseptic drink boxes	0.00	0.09	0.07	0.00
1:11	Brown kraft paper, including bags	0.88	0.44	15.48	0.42
1:12	Other paper	1.44	1.51	0.33	1.36
	Category 1 - Paper and Paperboard	**20.06**	**16.04**	**27.68**	**24.92**
Category 2 - Glass					
2:1	Clear food and beverage container glass	1.48	0.46	2.46	1.42
2:2	Coloured food and beverage container glass	1.24	0.33	0.00	1.05
2:3	Other glass	0.04	2.62	1.33	0.29
	Category 2 - Glass	**2.76**	**3.41**	**3.79**	**2.76**
Category 3 - Ferrous Metals					
3:1	Food and beverage cans	1.83	1.68	0.80	0.91
3:2	Aerosol cans	0.13	0.34	0.11	0.00
3:3	Empty paint cans and lids	0.00	1.17	0.00	0.00
3:4	Large metal appliances (white goods)	0.00	0.00	0.00	0.00
3:5	Other ferrous metals	0.76	0.00	4.71	0.41
	Category 3 - Ferrous Metals	**2.72**	**3.19**	**5.62**	**1.33**
Category 4 - Non-ferrous Metals					
4:1	Aluminum food and beverage cans	0.18	0.38	1.00	0.32
4:2	Aluminum foil/pie plates	0.42	0.20	0.22	0.41
4:3	Other non-ferrous metal	0.00	1.60	0.00	0.00
	Category 4 - Non-ferrous Metals	**0.60**	**2.17**	**1.22**	**0.74**
Category 5 - Plastics					
5:1	PET bottles - soft drink bottles < 2 L	0.16	0.14	0.09	0.02
5:2	PET bottles - soft drink bottles > 2 L	0.00	0.07	0.00	0.00
5:3	PET bottles - other beverage containers	0.00	0.13	0.00	0.17
5:4	PET food trays	0.17	0.07	0.13	0.32
5:5	PET - other	0.61	0.11	0.09	0.63
5:6	HDPE milk jugs	0.29	0.11	0.60	0.23
5:7	HDPE other beverage containers	0.00	0.00	0.00	0.00
5:8	Other HDPE jugs and bottles	0.32	1.33	0.74	0.96
5:9	Dairy and dairy related tubs and lids	0.54	0.42	0.88	0.42
5:10	PVC containers (#3)	0.00	0.00	0.00	0.08
5:11	Polypropylene (#5)	0.00	0.17	0.18	0.29
5:12	Polystyrene (#6)	0.96	2.69	0.55	0.75
5:13	Plastics (#7)	0.00	0.03	0.00	0.00
5:14	Recyclable plastic bags (shopping and other food bags)	0.20	0.33	0.00	0.19
5:15	Non-recyclable plastic bags (garbage, chip and crinkly)	3.58	3.34	2.83	3.01
5:16	Shipping and courier bags	0.00	0.00	0.00	0.00
5:17	Durable plastics	0.00	0.00	0.00	0.00
5:18	Stretch wrap	0.07	0.15	0.00	0.08
5:19	Crates, pails and drums (> 25L)	0.00	0.00	0.00	0.00
5:20	Multi-material waste plastics	0.00	0.00	0.00	0.00
5:21	Predominantly plastic composite materials	0.00	0.00	0.00	0.00
5:22	Other plastics	1.19	3.26	5.75	0.68
	Category 5 - Plastics	**8.08**	**12.36**	**11.84**	**7.82**

Category 6 - Organic Waste					
6:1	Food waste	21.13	23.65	19.54	22.67
6:2	Yard waste	7.59	0.33	2.25	11.94
6:3	Other organic waste	21.56	0.42	5.93	1.05
	Category 6 - Organic Waste	**50.29**	**24.40**	**27.72**	**35.66**
Category 7 - Wood and Wood Products					
7:1	Pallets/skids	0.00	0.00	0.00	0.00
7:2	Dimensional lumber	0.00	0.00	0.00	0.00
7:3	Wooden shingles	0.00	0.00	0.00	0.00
7:4	Other wood	0.72	2.46	0.00	0.00
	Category 7 - Wood and Wood Products	**0.72**	**2.46**	**0.00**	**0.00**
Category 8 - Construction/Demolition Material					
8:1	Drywall	0.00	0.00	0.00	0.00
8:2	Asphalt shingles	0.00	0.00	0.00	0.00
8:3	Insulation	0.00	0.00	0.00	0.00
8:4	Carpet and underlay	0.00	3.67	0.00	0.00
8:5	Other C/D wastes	0.00	0.03	0.00	8.63
	Category 8 - Construction/Demolition Material	**0.00**	**3.70**	**0.00**	**8.63**
Category 9 - Textiles					
9:1	Clothing	0.48	4.57	1.14	0.93
9:2	Other textiles	1.91	4.98	5.75	0.13
	Category 9 - Textiles	**2.39**	**9.54**	**6.89**	**1.06**
Category 10 - Rubber					
10:1	Vehicle tires	0.00	0.00	0.00	0.00
10:2	Other rubber products	0.00	0.82	2.25	0.00
	Category 10 - Rubber	**0.00**	**0.82**	**2.25**	**0.00**
Category 11 - Composite Products					
11:1	Disposable diapers	12.26	21.91	5.31	4.86
11:2	Furniture	0.00	0.00	0.00	0.00
11:3	Electronics and small appliances	0.00	0.00	1.01	7.38
11:4	Computers and monitors	0.00	0.00	0.00	0.00
11:5	Other composites	0.00	0.00	0.00	0.00
	Category 11 - Composite Products	**12.26**	**21.91**	**6.33**	**12.24**
Category 12 - Hazardous Wastes					
12:1	Fluorescent tubes	0.00	0.00	0.00	0.00
12:2	Paints	0.00	0.00	0.00	0.00
12:3	Batteries	0.13	0.00	5.63	0.02
12:4	Oils	0.00	0.00	0.00	0.00
12:5	Oil filters	0.00	0.00	0.00	0.00
12:6	Sharps	0.00	0.00	0.00	0.00
12:7	Other hazardous waste	0.00	0.00	0.00	0.00
	Category 12 - Hazardous Wastes	**0.13**	**0.00**	**5.63**	**0.02**
Category 13 - Other					
13:1	Non-distinct fines	0.00	0.00	1.02	4.82
13:2	Other wastes	0.00	0.00	0.00	0.00
	Category 13 - Other	**0.00**	**0.00**	**1.02**	**4.82**
	Total (%)	**100.00**	**100.00**	**100.00**	**100.00**

Table C-2. Blue Box Recycling Program Study - Waste Composition.

		Esquimalt	Oak Bay	Saanich	Victoria
		(%)	(%)	(%)	(%)
Category 1 - Paper and Paperboard					
1:1	Newsprint (including flyers)	2.64	0.31	0.58	1.25
1:2	Magazines	0.25	0.00	0.00	0.00
1:3	Corrugated cardboard	0.34	0.00	0.67	1.53
1:4	Waxed corrugated cardboard	0.00	0.00	0.00	0.00
1:5	Boxboard	2.56	2.04	2.50	2.97
1:6	Telephone books	0.00	0.00	1.53	0.00
1:7	Fine paper	0.78	0.39	0.42	0.58
1:8	Tissue paper	3.23	4.37	2.39	3.22
1:9	Gabletop milk and juice cartons	0.50	1.26	0.37	1.28
1:10	Tetra Paks and aseptic drink boxes	0.23	0.31	0.38	0.32
1:11	Brown kraft paper, including bags	0.68	1.59	0.88	1.25
1:12	Other paper	1.91	2.64	2.80	2.74
	Category 1 - Paper and Paperboard	**13.12**	**12.91**	**12.52**	**15.14**
Category 2 - Glass					
2:1	Clear food and beverage container glass	1.90	0.47	0.93	1.22
2:2	Coloured food and beverage container glass	0.07	0.43	0.00	0.00
2:3	Other glass	0.52	1.74	0.00	0.93
	Category 2 - Glass	**2.49**	**2.65**	**0.93**	**2.15**
Category 3 - Ferrous Metals					
3:1	Food and beverage cans	2.07	0.40	0.63	0.00
3:2	Aerosol cans	0.18	0.12	0.28	0.20
3:3	Empty paint cans and lids	0.00	0.00	0.24	0.00
3:4	Large metal appliances (white goods)	0.00	0.00	0.00	0.00
3:5	Other ferrous metals	0.43	1.35	0.75	1.35
	Category 3 - Ferrous Metals	**2.67**	**1.87**	**1.90**	**1.55**
Category 4 - Non-ferrous Metals					
4:1	Aluminum food and beverage cans	0.06	0.02	0.06	0.00
4:2	Aluminum foil/pie plates	0.37	1.08	0.37	0.77
4:3	Other non-ferrous metal	0.00	0.00	0.00	0.00
	Category 4 - Non-ferrous Metals	**0.44**	**1.10**	**0.43**	**0.77**
Category 5 - Plastics					
5:1	PET bottles - soft drink bottles < 2 L	0.00	0.00	0.00	0.00
5:2	PET bottles - soft drink bottles > 2 L	0.00	0.00	0.00	0.00
5:3	PET bottles - other beverage containers	0.00	0.00	0.03	0.12
5:4	PET food trays	0.36	0.40	0.33	0.45
5:5	PET - other	0.10	0.16	0.24	0.41
5:6	HDPE milk jugs	0.05	0.00	0.06	0.23
5:7	HDPE other beverage containers	0.00	0.00	0.00	0.00
5:8	Other HDPE jugs and bottles	1.19	0.29	0.86	1.07
5:9	Dairy and dairy related tubs and lids	0.89	0.63	0.33	0.65
5:10	PVC containers (#3)	0.07	0.09	0.00	0.00
5:11	Polypropylene (#5)	0.73	0.13	0.42	0.30
5:12	Polystyrene (#6)	3.65	1.49	1.25	1.63
5:13	Plastics (#7)	0.00	0.00	0.00	0.05
5:14	Recyclable plastic bags (shopping and other food bags)	0.42	0.00	1.94	0.29
5:15	Non-recyclable plastic bags (garbage, chip and crinkly)	8.47	9.03	8.76	6.62
5:16	Shipping and courier bags	0.00	0.00	0.00	0.00
5:17	Durable plastics	0.00	0.00	0.00	0.00
5:18	Stretch wrap	0.24	0.19	0.08	0.08
5:19	Crates, pails and drums (> 25L)	0.00	0.00	0.00	0.00
5:20	Multi-material waste plastics	0.00	0.00	0.00	0.00
5:21	Predominantly plastic composite materials	0.00	0.00	0.00	0.00
5:22	Other plastics	0.85	1.18	1.25	1.92
	Category 5 - Plastics	**17.03**	**13.59**	**15.56**	**13.81**

Category 6 - Organic Waste					
6:1	Food waste	22.53	41.40	40.97	45.93
6:2	Yard waste	16.44	2.72	7.09	0.00
6:3	Other organic waste	8.28	7.90	4.06	9.17
	Category 6 - Organic Waste	**47.26**	**52.01**	**52.12**	**55.10**
Category 7 - Wood and Wood Products					
7:1	Pallets/skids	0.00	0.00	0.00	0.00
7:2	Dimensional lumber	0.00	0.00	0.00	0.00
7:3	Wooden shingles	0.00	0.00	0.00	0.00
7:4	Other wood	0.00	0.60	0.42	0.77
	Category 7 - Wood and Wood Products	**0.00**	**0.60**	**0.42**	**0.77**
Category 8 - Construction/Demolition Material					
8:1	Drywall	0.00	0.00	0.00	0.00
8:2	Asphalt shingles	0.00	0.00	0.00	0.00
8:3	Insulation	0.00	0.00	0.00	0.00
8:4	Carpet and underlay	0.00	0.00	0.00	0.00
8:5	Other C/D wastes	0.00	2.03	0.22	0.00
	Category 8 - Construction/Demolition Material	**0.00**	**2.03**	**0.22**	**0.00**
Category 9 - Textiles					
9:1	Clothing	1.01	0.94	1.08	0.35
9:2	Other textiles	0.85	3.38	3.84	0.00
	Category 9 - Textiles	**1.86**	**4.32**	**4.92**	**0.35**
Category 10 - Rubber					
10:1	Vehicle tires	0.00	0.00	0.00	0.00
10:2	Other rubber products	0.00	0.00	0.36	0.23
	Category 10 - Rubber	**0.00**	**0.00**	**0.36**	**0.23**
Category 11 - Composite Products					
11:1	Disposable diapers	14.42	6.80	8.09	7.06
11:2	Furniture	0.00	0.00	0.00	0.00
11:3	Electronics and small appliances	0.32	0.00	2.19	2.99
11:4	Computers and monitors	0.00	0.00	0.00	0.00
11:5	Other composites	0.00	0.00	0.00	0.00
	Category 11 - Composite Products	**14.74**	**6.80**	**10.28**	**10.05**
Category 12 - Hazardous Wastes					
12:1	Fluorescent tubes	0.00	0.00	0.00	0.00
12:2	Paints	0.00	0.00	0.00	0.06
12:3	Batteries	0.06	0.04	0.34	0.03
12:4	Oils	0.00	0.00	0.00	0.00
12:5	Oil filters	0.00	0.00	0.00	0.00
12:6	Sharps	0.00	0.00	0.00	0.00
12:7	Other hazardous waste	0.32	0.02	0.00	0.00
	Category 12 - Hazardous Wastes	**0.38**	**0.06**	**0.34**	**0.09**
Category 13 - Other					
13:1	Non-distinct fines	0.00	0.00	0.00	0.00
13:2	Other wastes	0.00	2.04	0.00	0.00
	Category 13 - Other	**0.00**	**2.04**	**0.00**	**0.00**
	Total (%)	**100.00**	**100.00**	**100.00**	**100.00**