

COMPOSITION OF WASTE

**Hokitika Landfill
SWAP Study
29 January – 4 February
2007**

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1.0 EXECUTIVE SUMMARY

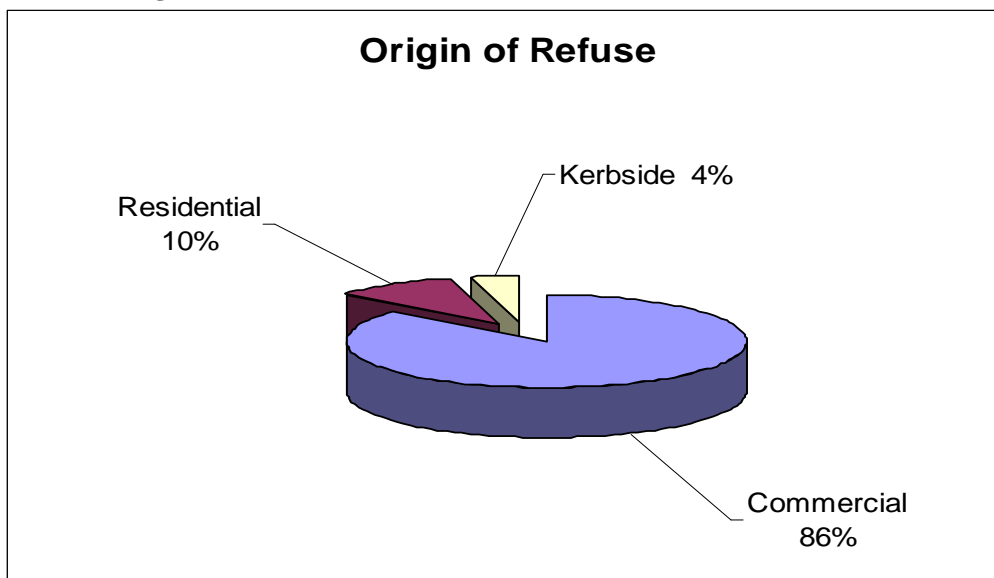
This report presents the results of the fourth waste analysis survey to be conducted at the Hokitika Landfill. The results from this survey and the previous were gained using the SWAP strategy. This strategy was developed by the Ministry for the Environment to standardize information gathered on waste streams and waste disposal throughout New Zealand. The strategy endeavours to gather consistent and factual information that can be used as a tool for managing and monitoring waste streams and for reporting on a national scale.

Following strategy requirements this survey was conducted over a seven day period commencing in late January. This period was chosen to obtain values showing summer seasonal influences.

There were two objectives for the survey. The first objective was to determine the Primary Classifications of the whole waste stream and the second was to determine Secondary Classifications on nominated primary categories. To assist with these objectives the survey recorded the origin of material and the mode of transport for all loads to the landfill.

Origin was recorded as one of three categories: residential, commercial, and kerbside collection. The values for the origin of materials are presented in Chart 1 below.

Chart 1: Origin of Refuse



Transport values were recorded into five classes of vehicle: cars, utes, trailers, compactors and trucks. A total of 376 vehicles accessed the landfill disposing of 607m³, or 241 tonne, of refuse during the survey period.

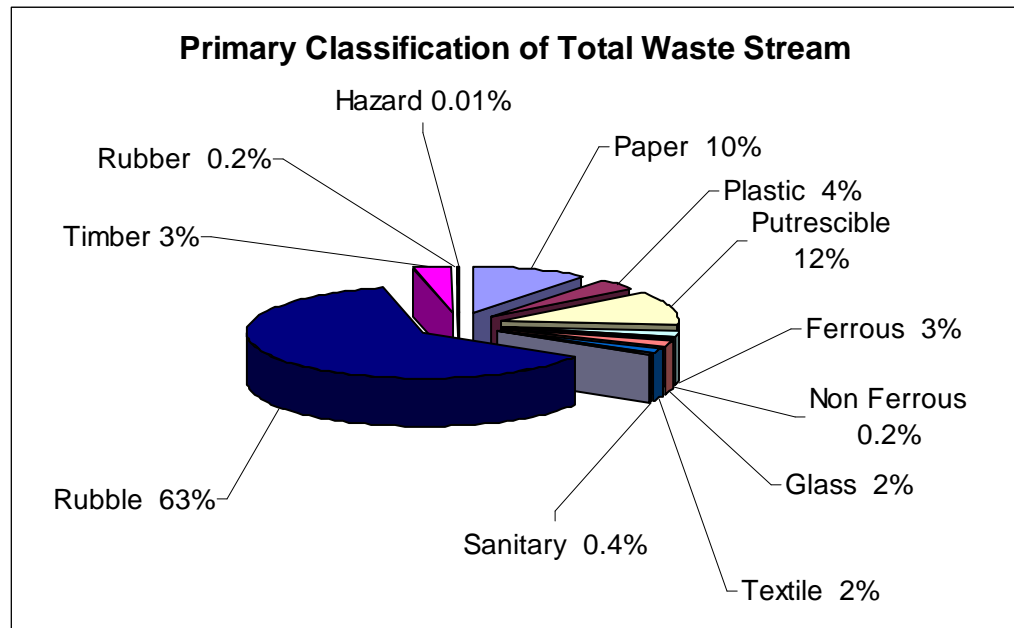
These values have been extrapolated into annual values, for reporting purposes only, of 31,500m³ (loose) and 12,500 tonne.

To meet objectives the survey involved the visual assessment and recording of the breakdown of all loads into the primary classifications. These values were assessed either as a volume percentage of the load, and later converted to a weight value, or estimated weight of each component. Most loads were weighed using a weigh bridge recently installed onsite. Obtaining the true weight of loads allowed improved estimation of component weights and overall accuracy of the survey.

Further to this an analysis of the contents of kerb bags was carried out to determine the ratio and weight of primary and selected secondary components. These values were then applied to all loads of kerb and official bags.

A further number of bags were weighed and an average bag weight of 5.3kg established. The results for the Primary Classification of the total waste stream are shown in Chart 2 below.

Chart 2: Primary Classifications of the Total Waste Stream



Secondary classifications were determined for paper, plastics, putrescible and timber wastes. The values for paper, putrescibles and timber were recorded for each load, however the values for plastics could not be visually determined and only the results from the analysis of kerb bags refuse were recorded.

As the results from this survey are directly comparable with the survey of February 2004 the report plots the results both by percentage and by weight of primary classifications. These charts give a visual appreciation of where any major changes have occurred. The overall quantity of refuse increased by 95% over the 2004 results. This was primarily due to the disposal of a large quantity of rubble from a construction site, the material being stockpiled for use as cover material at a later date. Disposal of such quantities of rubble is not a regular activity, however it was recorded in the results as it occurred during the survey period.

The weight of rubble increased over 200% and this had an effect on the overall density of refuse estimated at 397kg/m³ which is nearly twice the expected density for loose refuse. Other large changes occurred including timber wastes with a 70% increase, possibly from increased building activities, and textiles a 119% increase, mainly from clothing disposed in kerbside bags and paper a 67% increase with no visible reason.

Overall vehicle numbers were down by 9% and this was offset by truck movements being up by 79% on the 2004 survey.

Cardboard, paper, glass and plastics are recycled on site. Steel items including vehicle bodies and appliances are also separated from tip refuse and recycled as scrap steel.

Very small quantities of hazardous waste were encountered with main items being paints, LPG cylinders, and batteries.

2.0 INTRODUCTION

This report presents the results of an analysis survey, conducted over a one-week period commencing in late January 2007, on the incoming refuse at the Hokitika Landfill.

Such surveys, when undertaken over a period of time, can build up a data base on the type and quantity of material being disposed of and will show trends in waste disposal. The results may be used as a tool for measuring the changes to waste disposal and for gauging the effects of various waste strategies.

The survey results can also be used to assist with the constructive planning and management of the district's waste.

2.1 Background

Traditionally, rubbish has been dumped and forgotten. However, growing awareness of environmental effects has increased the expectations of communities for enhanced standards of waste disposal. As a result waste managers have come under pressure to improve disposal practices. For effective decisions to be made, consistent and reliable data on waste streams is required.

Therefore, in response to the needs of operators and managers, and the need for information on a national basis, the Ministry for the Environment in 1992 released a strategy for measuring the components of the waste stream. This strategy was known as the "Waste Analysis Protocol" (WAP), which contained a methodology for categorising and collecting data on waste.

The strategy was revised in March 2002 and is now known as the "Solid Waste Analysis Protocol" (SWAP).

It is under the revised protocol that this survey has been conducted.

2.2 Waste Classification System

The SWAP protocol provides for two levels of classification, these being: -

Primary Classification
Secondary Classification

The purpose of the two classification levels is to allow primary or basic coverage of the waste stream and also to allow detailed analysis of any category where required.

Primary classification divides the waste into 12 categories, with secondary classification further dividing these categories into a total of 47 sub categories.

Secondary classification requires considerable time for analysis and tends to be used more for defining a particular component in the waste stream, such as investigating material for recycling.

2.3 Objectives

The main objective of this survey is to gauge by weight the primary classification of the waste stream during a period of 'summer' seasonal influence.

The secondary objectives are to gauge by weight the secondary classifications for: -

- Paper by Newspaper, Cardboard and Other categories.
- Plastic by the seven grades of recyclable plastic.

- Putrescible waste by Kitchen or Garden categories.
- Timber wastes by Treated and Untreated categories.

2.4 The New Zealand Waste Strategy

Reducing New Zealand's waste has become the cornerstone of the Government's commitment to sustainable development.

The Ministry for the Environment released The New Zealand Waste Strategy in March 2002. This document outlines the Government's vision to minimize and manage waste resources as part of an overall goal to form a sustainable society. To achieve the waste reduction aim the New Zealand Waste Strategy has three core goals:

- Lowering the social cost and risks of waste.
- Reducing the damage to the environment from waste generation and disposal.
- Increasing economic benefit by more efficient use of materials.

Through the Ministry for the Environment waste programmes and guidelines, national targets will be set for regions to achieve. Target areas include organic wastes, special wastes, construction and demolition wastes, hazardous wastes including contaminated sites and organochlorines, trade wastes and lastly, waste disposal.

The results from SWAP studies can be used to measure both the performance of a region and the government's achievement towards a sustainable society. On a local level the results assist Council with planning and management of the waste stream and disposal options.

2.5 Previous Surveys

Three previous waste analysis surveys have been completed on the Hokitika Landfill waste stream.

The first was completed in November 2000, and the second in December 2001, both of which used the earlier WAP strategy. The results are not directly comparable with the SWAP results. The third survey was conducted during the period 9 – 15 February 2004.

The findings of the survey in 2004 are compared with the current results in section 5 of this report.

3.0 SURVEY DESIGN and METHODOLOGY

3.1 Design Format

The survey format is based on the Solid Waste Analysis Protocol (MfE 2002).

Consistent with the protocol recommendations, supporting data is to be captured over a one-week period. As the Hokitika landfill operates seven days a week, the survey shall be conducted during the hours the site is open to the public, for seven consecutive days.

With an expected low number of vehicle movements at the landfill, the survey is to include a visual analysis of all loads arriving. These loads are to be defined into the 12 primary and nominated secondary classifications by volume or weight and presented as weight values for reporting.

Secondary classifications are required for paper, plastics, putrescible and timber wastes.

The survey will also capture supporting data on the type of transport to the site. As all types of vehicles are permitted on site the following categories are to be used:-

Cars	which includes station wagons and SUVs
Utes	which includes utility vehicles and vans
Trailers	
Compactors	trucks that have refuse compacting devices
Trucks	

The origin of refuse is to be recorded as one of three categories: -

Residential	Domestic household and property type wastes produced by residents.
Commercial	Includes wastes from commercial and industrial operations, building sites, shops, factories, accommodation, and residential properties produced by commercial operators.
Kerb	Domestic and commercial wastes collected through a kerbside bag and kerbside recycling system.

A minimum of 60 kerbside collected refuse bags are to be taken at random and analysed, with sampling spread through the whole collection.

The contents of refuse bags are to be sorted into the 12 primary and nominated secondary classifications and weighed.

To define the average weight of kerbside bags a minimum of 120 bags are to be collected at random and weighed.

Supporting data is to be obtained by use of an on site weigh bridge with all possible loads over 50kg being weighed. If required sample weighing is to be conducted on loads of a single classification material.

3.2 Survey Limitations

Several factors occurred that served to limit the final results. These included: -

Variation in density of load due to wet conditions. Rain occurred on three of the seven survey days. Many loads were wet due to prolonged outside storage.

Vehicles accessing landfill outside opening hours.

Larger than expected quantities of rubble being received. The large quantities possibly distort the overall results.

3.3 Methodology

The survey was predetermined for, and carried out, over the week of 29th January – 4th February 2007 on site at the Hokitika Landfill.

Two staff were involved on site for the full survey period.

Survey forms capturing the required data were developed and used to ensure sufficient information was recorded on site.

A 'hazards assessment' was carried out prior to the event and staff were instructed on safety and made aware of the likely hazards on site.

A recording base was set up adjacent to the weigh bridge at the entry to the landfill. From there all vehicles were observed as they entered the site and where possible loads were weighed and inspected. At times it was necessary for members of the survey team to follow vehicles to various locations to analyse loads as they were discharged.

A further area was established adjacent to the tipping face and used for the analysis of bags and other refuse items. These were set up in line with Health and Safety requirements, and provided a safe working area away from the movement of machinery.

As bags from kerbside collections around Hokitika were delivered on site, staff carried out analysis of the samples taken. The contents were sorted into primary and then secondary classifications. The bags were selected at random from each load.

Staff duties were rotated.

Team members carried out checks on accuracy of evaluation during the survey. These values were discussed to ensure consistency of assessment and coverage of all classifications.

All site data was converted into weight format to conform to the protocol and allow direct comparison with earlier studies.

4.0 RESULTS

4.1 Results

The results are presented in a format similar to the previous survey to allow direct comparison. These are compared in Section 5.

The results are shown by Origin of Refuse, Classification of the Waste Stream, both Primary and selected Secondary classifications, and lastly by Mode of Transport.

4.2 Origin of Refuse

The origin of refuse was recorded as one of three categories: Commercial, Residential or Kerb. These same categories were used in the 2004 survey.

Commercial origin covered all material generated by industrial and commercial activities. This included material from residential properties that was generated by a commercial operator such as grounds maintenance or building alterations.

Residential waste was waste generated by residents from daily living and property maintenance.

Kerb bags contain both residential and commercial wastes. No attempt was made to define the extent of the mix, however the number of commercial bags recovered was, according to the collectors, a small proportion of the total.

The origin was not influenced by the mode of transport to the landfill. Transport is discussed in Section 4.6.

Chart 3: Waste Stream - Origin of Refuse

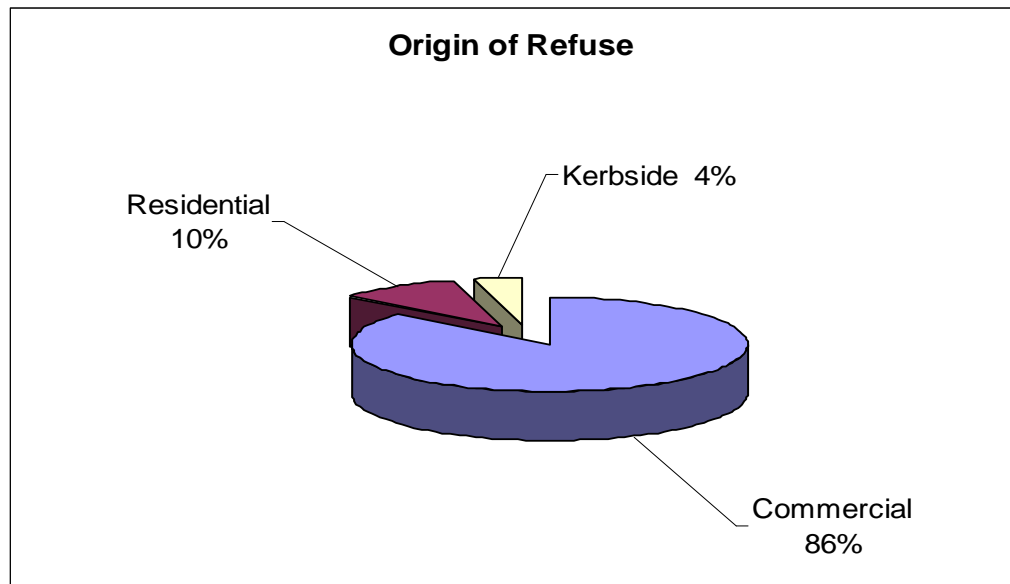


Table 1: Origin of Refuse – Numerical Values

Origin	Weight kgs	Percentage
Commercial	207,366	86.0 %
Residential	24,340	10.1 %
Kerbside	9,330	3.9 %
Total	241,036	100.00

4.3 Primary Classification of the Waste Stream

Primary Classification involves defining the waste stream by weight into twelve categories. To give a better understanding of refuse production the Primary Classification results are shown for the total waste stream and also for each of the three categories of origin.

4.3.1 Primary Classification of the Total Waste Stream

A Summary of the Primary Classifications of the total waste stream, for the period of the survey, is shown below in Chart 4 and Table 2.

Chart 4: Primary Classification Values of the Total Waste Stream

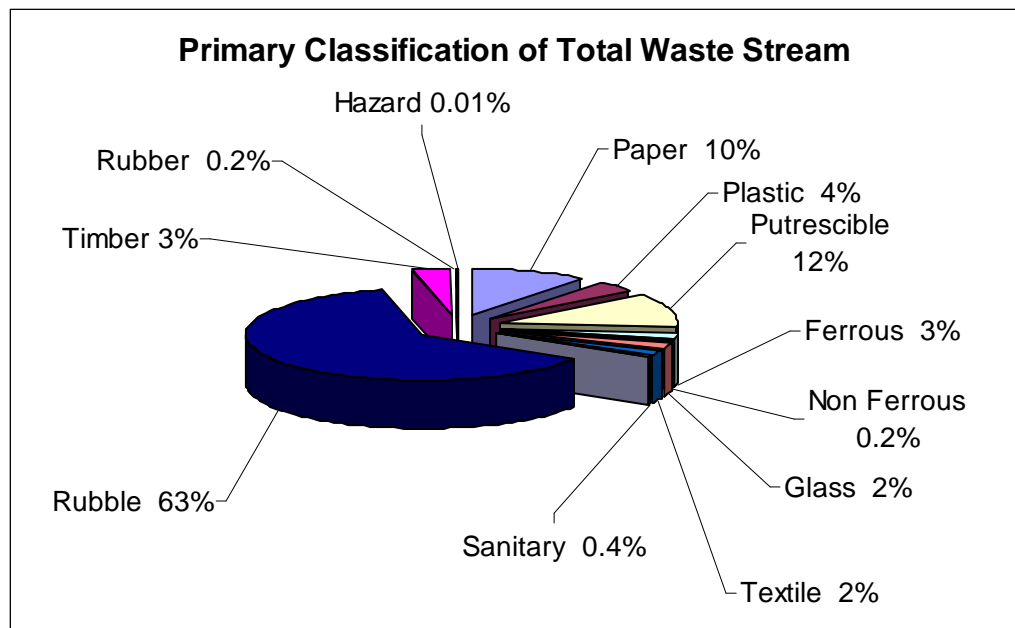


Table 2: Primary Classification Values of the Total Waste Stream

Classification	Total Kgs	% Total
Paper	25,132	10.4
Plastic	9,680	4.0
Putrescible	28,842	12.0
Ferrous	5,965	2.5
Non Ferrous	387	0.2
Glass	5,860	2.4
Textile	4,240	1.8
Sanitary	845	0.4
Rubble	151,414	62.7
Timber	8,235	3.4
Rubber	407	0.2
Hazardous	29	0.01
Total	241,036	100.0

4.3.2 Primary Classification of the Commercial Waste Stream

The Commercial Waste Stream is defined as waste generated by commercial and industrial operations no matter where these operations are situated.

The primary classification values of this waste are shown in Chart 5 and Table 3 below. Table 3 shows the estimated weight for each classification, the values as a percentage of the Commercial Waste stream and also as a percentage of the Total Waste stream.

Chart 5: Primary Classification Values of Commercial Waste

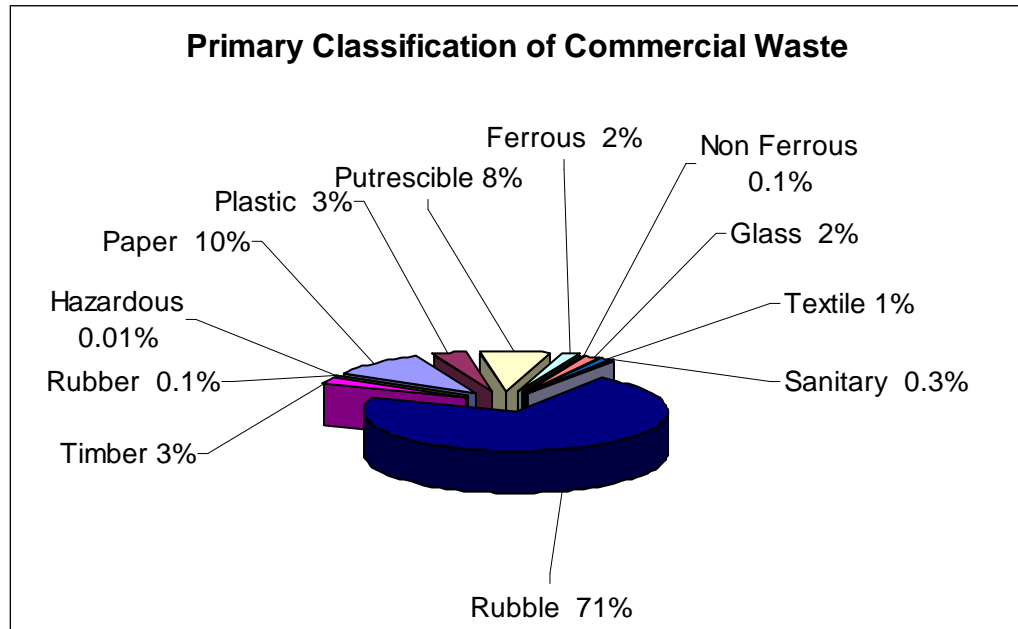


Table 3: Primary Classification Values of Commercial Waste

Classification	Total Kgs	% Commercial	% Total Waste
Paper	21,584	10.4	9.0
Plastic	6,983	3.4	2.9
Putrescible	16,025	7.7	6.6
Ferrous	3,531	1.7	1.5
Non Ferrous	184	0.1	0.1
Glass	3,317	1.6	1.4
Textile	2,360	1.1	1.0
Sanitary	537	0.3	0.2
Rubble	147,282	71.0	61.0
Timber	5,355	2.6	2.2
Rubber	200	0.1	0.1
Hazardous	8	0.0	0.0
Total	207,366	100.0	86.0

4.3.3 Primary Classifications of the Residential Waste Stream

Residential waste arrived at the landfill predominantly in small loads in cars, utes and trailers. A smaller quantity was delivered by truck.

The primary classifications for residential waste are presented in Chart 6 and Table 4 below.

Whereas Chart 6 depicts the classification as a percentage of the residential waste stream only, Table 4 gives further information showing the actual weight value for each classification along with the percentage of both the residential waste stream and the total waste stream.

Chart 6: Primary Classification Values of Residential Waste

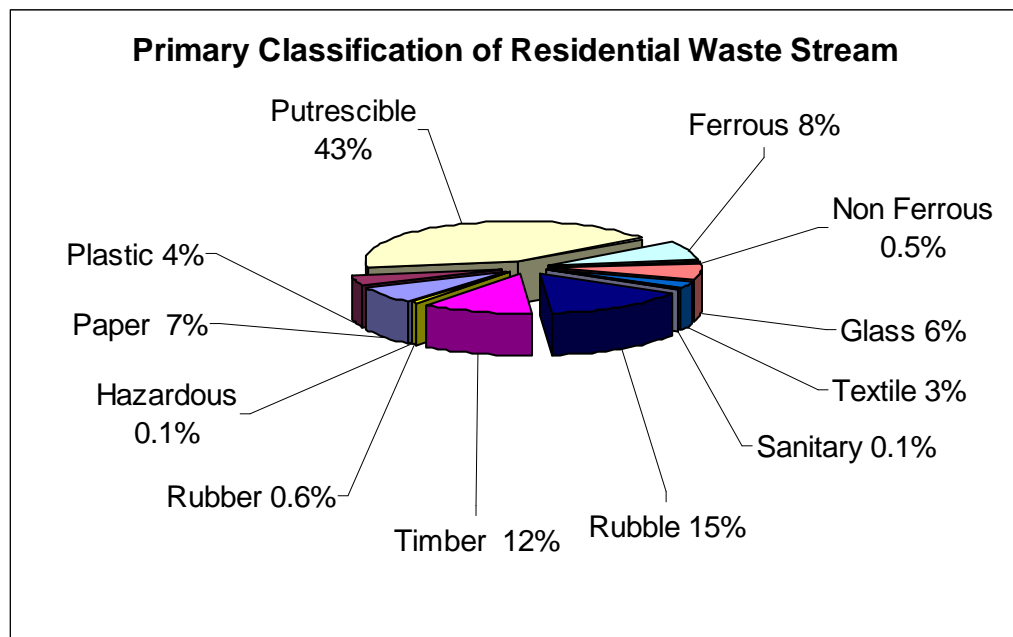


Table 4: Primary Classification Values of Residential Waste

Classification	Total Kgs	% Residential	% Total Waste
Paper	1,809	7.4	0.7
Plastic	961	3.9	0.4
Putrescible	10,440	42.9	4.3
Ferrous	1,822	7.5	0.8
Non Ferrous	128	0.5	0.1
Glass	1,555	6.4	0.7
Textile	828	3.4	0.3
Sanitary	25	0.1	0.0
Rubble	3,737	15.4	1.5
Timber	2,868	11.8	1.2
Rubber	151	0.6	0.1
Hazardous	16	0.1	0.0
Total	24,340	100.0	10.1

4.3.4 Primary Classification of the Kerb Collection Waste Stream

The kerbside collection is carried out in Hokitika on Wednesdays and outlying areas on Thursdays by West Roads Ltd. and covers both residential and commercial properties. The material is collected by truck. The results for kerb collection do not include bags delivered with other waste streams such as commercial skips or residential loads.

Kerbside refuse during the survey period weighed 9,330kg which equates to 3.9% of the total waste stream.

Where visual classification is quickly carried out on open refuse, refuse bags pose a problem, especially bags from residential origin, as the contents can vary greatly both in type and quantity.

The design of the survey took this issue into account and allowed the analysis of contents from sufficient bags to give an acceptable confidence level for the major classification values.

The analysis of bag contents was carried out using the SWAP primary and secondary classification procedure. The values gained were then applied to all loads containing refuse bags.

A summary of the classification values is given in Chart 7 and Table 5 below.

Chart 7: Primary Classification Values of Kerb Collection Waste

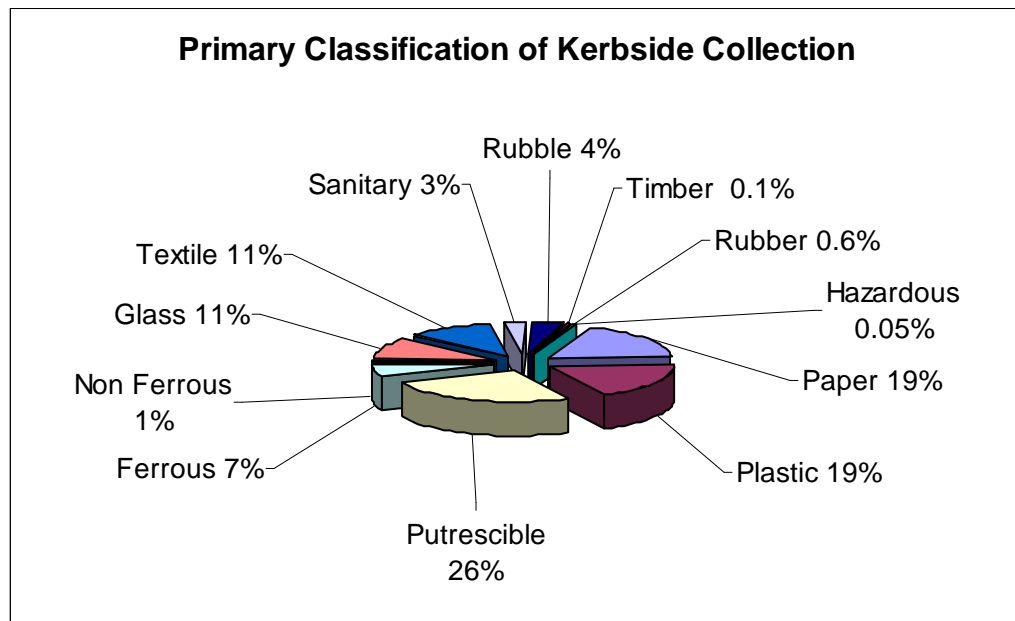


Table 5: Primary Classification of Kerb Collection Waste

Classification	Total Kgs	% Kerb	% Total Waste
Paper	1,739	18.6	0.7
Plastic	1,736	18.6	0.7
Putrescible	2,377	25.5	1.0
Ferrous	612	6.6	0.3
Non Ferrous	75	0.8	0.0
Glass	988	10.6	0.4
Textile	1,052	11.3	0.5
Sanitary	283	3.0	0.1
Rubble	395	4.2	0.2
Timber	12	0.1	0.0
Rubber	56	0.6	0.0
Hazardous	5	0.05	0.0
Total	9,330	100.0	3.9

4.3.5 Summary of Primary Classification Values of the Total Waste Stream

Table 6 presents a summary of the classification values by origin and as a total of the waste stream.

Table 6: Summary of Primary Classification Values of the Waste Stream (By weight kgs)

Classification	Commercial	Residential	Kerb	Total	% Total
Paper	21,584	1,809	1,739	25,132	10.4
Plastic	6,983	961	1,736	9,680	4.0
Putrescible	16,025	10,440	2,377	28,842	12.0
Ferrous	3,531	1,822	612	5,965	2.5
Non Ferrous	184	128	75	387	0.2
Glass	3,317	1,555	988	5,860	2.4
Textile	2,360	828	1,052	4,240	1.8
Sanitary	537	25	283	845	0.4
Rubble	147,282	3,737	395	151,414	62.7
Timber	5,355	2,868	12	8,235	3.4
Rubber	200	151	56	407	0.2
Hazardous	8	16	5	29	0.01
Total	207,366	24,340	9,330	241,036	100.0

4.4 Secondary Classification of the Waste Stream

Secondary Classification involves defining a primary classification into sub classifications or categories.

The SWAP strategy nominates a total of 47 secondary classifications, however the protocol is not restricted to these and others can be used where appropriate.

4.4.1 Secondary Classification of Selected Items in the Waste Stream

Secondary classifications were sought on four primary items: paper, plastics, putrescible and timber. These were defined into the following:-

- Paper: - Newsprint
Cardboard
Other
- Plastics: - Grades 1 - 7
- Putrescible: - Kitchen
Garden
- Timber: - Treated
Untreated

The secondary classification for plastics was only achievable for kerb bag material as there are problems with identifying grades of plastic by quick visual analysis.

4.4.2 Secondary Classification of Paper

Paper makes up 10.4% of the total waste stream.

Analysis for secondary classifications of paper was carried out over the full survey.

The analysis for paper, except kerb bags, was by visual assessment of loads. Kerb bags values were obtained from the bag analysis study.

The values determined are shown in Chart 8 and Table 7 below. This information is further broken down by including origin of loads and is shown in Table 8.

Chart 8: Secondary Classification Values of Paper

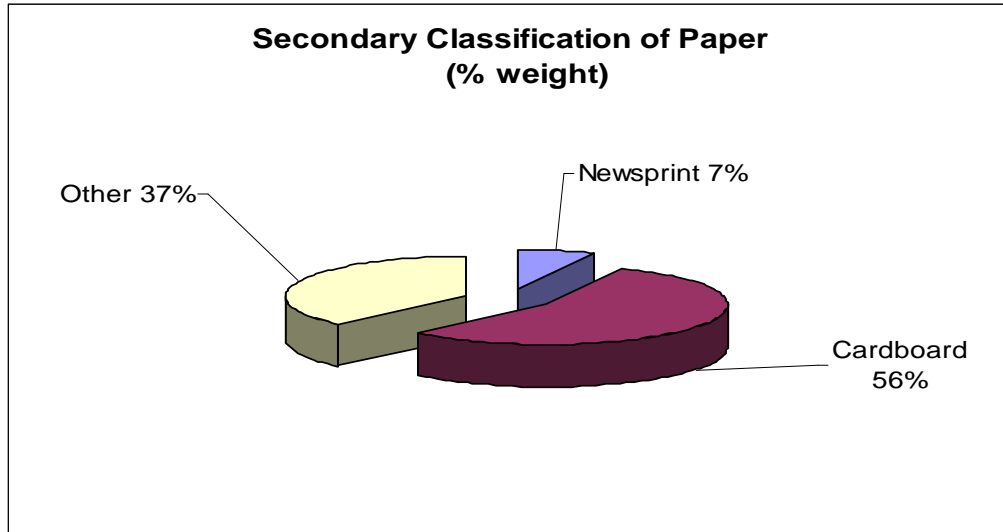


Table 7: Secondary Classification Values of Paper

Classification	Total Kgs	% Paper Wastes	% Total Wastes
Newspaper	1,773	7.1	0.7
Cardboard	13,956	55.5	5.8
Other	9,403	37.4	3.9
Totals	25,132	100.0	10.4

Table 8: Secondary Classification of Paper by Origin

Origin/Classification	Total Kgs	% Paper Wastes	% Total Wastes
Commercial News	957	3.8	0.4
Commercial Card	12,629	50.3	5.2
Commercial Other	7,997	31.8	3.3
Residential News	162	0.6	0.1
Residential Card	998	4.0	0.4
Residential Other	650	2.6	0.3
Kerb News	655	2.6	0.3
Kerb Card	329	1.3	0.1
Kerb Other	755	3.0	0.3
Total	25,132	100.0	10.4

4.4.3 Secondary Classification of Plastics

Plastics make up 4% of the total waste stream.

The SWAP secondary classifications for plastic are based on industrial identification codes for the recycling of plastic. These are generally shown on products as the numbers 1 to 7 inside a triangular recycling logo.

The grades are: -

1. PET polyethylene terephthalate
2. HDPE High-density polyethylene
3. PVC Poly vinyl chloride
4. LDPE Low density Polyethylene
5. PP Polypropylene
6. PS Polystyrene – expanded styrene
7. Other All other plastics

Common items found include:-

- Grade 1 soft drink bottles and food containers
- Grade 2 commodity containers and some super market bags
- Grade 4 bread bags, shop and super market bags, and paste tubes

Secondary analysis was limited to kerb bags as identification cannot be carried out by quick visual analysis.

No large quantities of one grade of plastic were noted.

The values determined are shown in Chart 9 and Table 9 below.

Chart 9: Secondary Classification Values of Kerbside Plastics

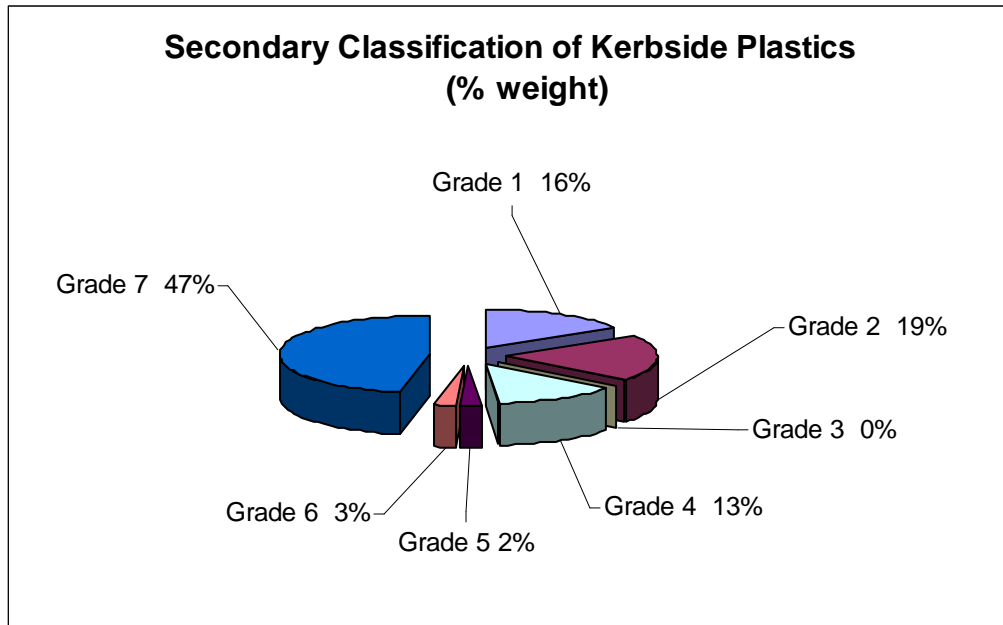


Table 9: Secondary Classification of Kerbside Plastics

Classification	Sample Kgs	% Kerb Plastics	Estimate of Kerb Plastics - kgs
Grade 1	11.5	16.0	278
Grade 2	13.9	19.4	337
Grade 3	0	0.0	0
Grade 4	9.5	13.3	231
Grade 5	1.5	2.1	36
Grade 6	1.8	2.5	43
Grade 7	33.5	46.7	811
Total	71.7	100.0	1,736

4.4.4 Secondary Classification of Putrescible Wastes

Putrescible Wastes were recorded as either Kitchen or Garden wastes. Kitchen wastes included all food scraps, food preparation waste, offal, and shellfish waste. Garden wastes included all vegetation wastes other than food scraps. To help determine quantities kerb bags were sampled and values for each putrescible component determined. All other loads were assessed visually. The results are shown in Chart 10 and Tables 10 and 11 below.

Chart 10: Secondary Classification Values of Putrescible Waste

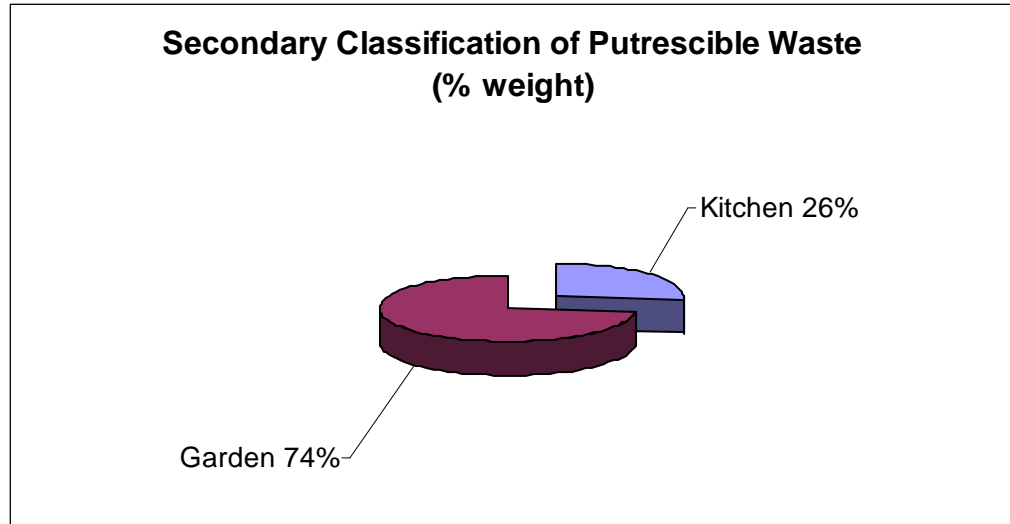


Table 10: Secondary Classification of Putrescible Waste

Classification	Total Kgs	% Putrescible Wastes	% Total Wastes
Kitchen	7,594	26.3	3.2
Garden	21,248	73.7	8.8
Total	28,842	100.0	12.0

Table 11: Secondary Classification of Putrescible Waste by Origin

Origin	Total Kgs	% Putrescible wastes	% Total wastes
Commercial Kitchen	5,162	17.9	2.1
Commercial Garden	10,863	37.7	4.5
Residential Kitchen	328	1.1	0.1
Residential Garden	10,112	35.1	4.2
Kerb Kitchen	2,104	7.3	0.9
Kerb Garden	273	0.9	0.1
Total	28,842	100.0	12.0

4.4.5 Secondary Classification of Timber Wastes

Secondary classification of timber wastes involved the identification of all timber products into treated and untreated categories. These classifications are outside the standard SWAP classifications and are considered more relevant to end use issues.

Treated timber waste comes in many forms, from fencing to offcuts and from sawdust to manufactured boards.

As origin has a huge influence on timber waste values, the results are shown by 'Origin' and 'Secondary' Classification.

The results are shown in Chart 11 and Tables 12 and 13 below.

Chart 11: Secondary Classification Values of Timber Wastes

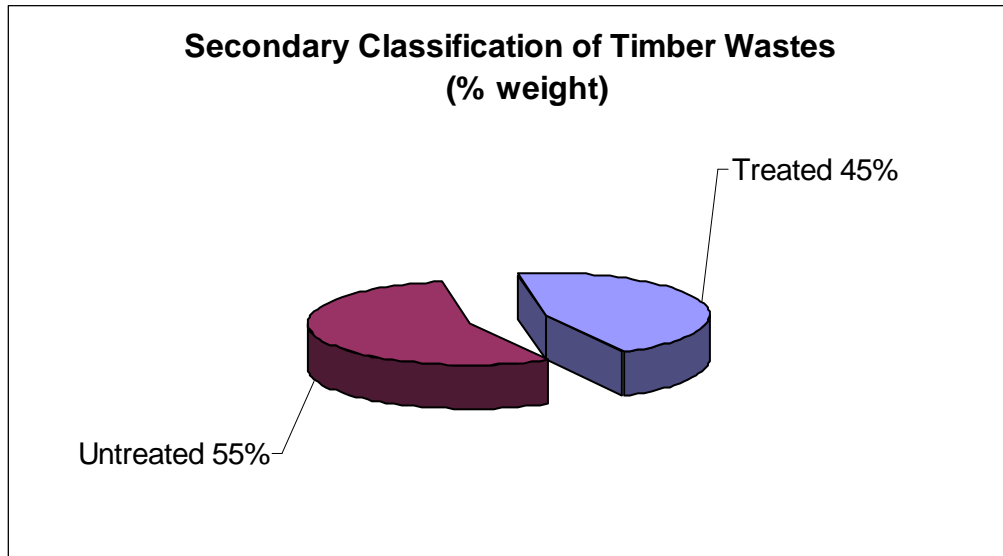


Table 12: Secondary Classification of Timber Wastes

Classification	Total Kgs	% Timber Wastes	% Total Wastes
Treated	3,663	44.5	1.5
Untreated	4,572	55.5	1.9
Total	8,235	100.0	3.4

Table 13: Secondary Classification of Timber Wastes by Origin

Origin	Total Kgs	% Timber wastes	% Total wastes
Commercial treated	3,056	37.1	1.3
Commercial untreated	2,299	27.9	1.0
Residential Treated	602	7.3	0.2
Residential Untreated	2,266	27.5	0.9
Kerb Treated	5	0.1	0.0
Kerb Untreated	7	0.1	0.0
Total	8,235	100	3.4

4.5 Kerb Collection Bag Analysis

The mixture of refuse in kerb bags cannot be visually assessed and therefore the contents of a number of bags were analysed. This work was carried out using the SWAP Primary Classification procedure with Secondary classifications being recorded on paper, plastic, putrescible, and timber classifications.

A summary of the results is attached in Appendix 2.

4.5.1 Kerb Collection Accuracy of Analysis

Investigation for previous SWAP surveys have indicated that analysis of a minimum of 60 refuse bags is needed to give a 95% confidence level on a precision of plus or minus 15% for classifications of 20% or greater. This means that by analysing the contents of 60 or more bags we should have a reasonable average value for the main components of this waste stream.

A total of 70 bags were analysed and these contained 371 kg of refuse.

4.5.2 Average Bag Weight and Refuse Density

Along with the 70 bags analysed for primary classification a further 120 bags were weighed and an average weight calculated from the total.

This mean value equated to 5.3 kg.

Table 14: Average Bag Weight (kgs)

Sample No	No of Bags	Weight kg	Average kg
1	70	371.4	5.31
2	120	635.9	5.30
Total	190	1007.3	5.30

4.6 Transport

Transport accounts for the type of vehicles used in the delivery of refuse to the landfill. It does not determine the type or origin of refuse.

4.6.1 Transport of Refuse

As the site is open to both the public and commercial operators the following categories of vehicles were used:-

- Cars
- Utes
- Trailers
- Compactors
- Trucks

Compactor vehicles were not identified in the 2004 survey, however as they now discharge at the landfill, and their load volumes need adjustment for comparison with other vehicles, they were recorded as a separate category.

The category for Cars includes station wagons and SUVs. Utes include utility vehicles and vans.

Trailers come in a range of sizes although most were less than 2m³ capacity. The largest trailer volume recorded was 6m³. Vehicles towing trailers were not recorded unless they also carried refuse.

Trucks also came in a range of sizes, with the maximum volume being 30m³.

A total of 376 vehicles transported refuse to the landfill during the survey.

Detail on the weight of refuse and individual vehicle numbers is given in Chart 12 and Table 15 below.

Vehicle counts were down on the previous survey from 412 to 376, an overall 8.7% decrease in vehicle movements. In particular trailers decreased by 42%, however truck numbers increased by 79%.

Chart 12: Refuse by Transport Category

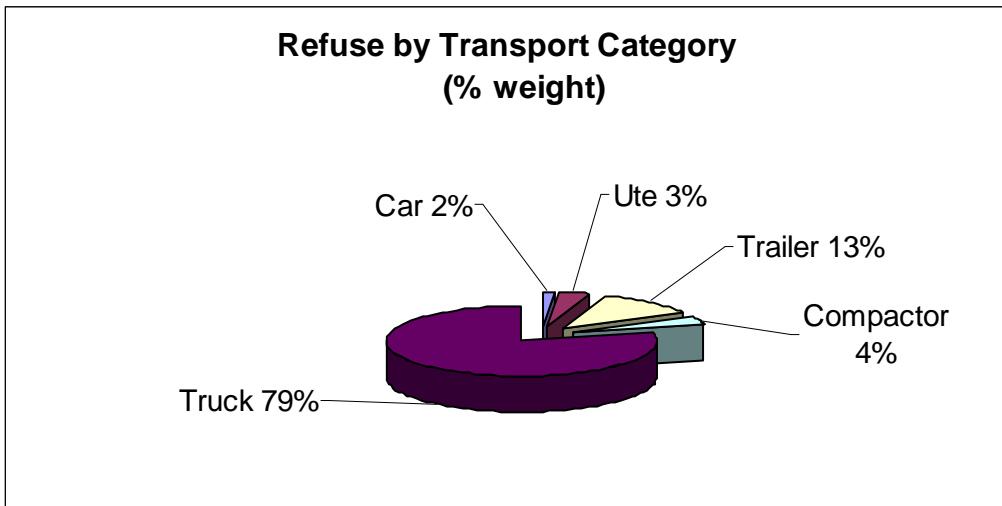


Table 15: Refuse by Transport Category

Category	No of Vehicles	Weight kgs	% Total Weight
Car	107	3,534	1.5
Ute	72	8,241	3.4
Trailer	111	30,433	12.6
Compactor	4	8,910	3.7
Truck	82	189,918	78.8
Total	376	241,036	100

The Transport Category, when combined with Origin information, gives a wider view on how refuse is managed for collection and transport. Values are given in Chart 13 and Table 16 below.

Chart 13: Refuse by Transport and Origin

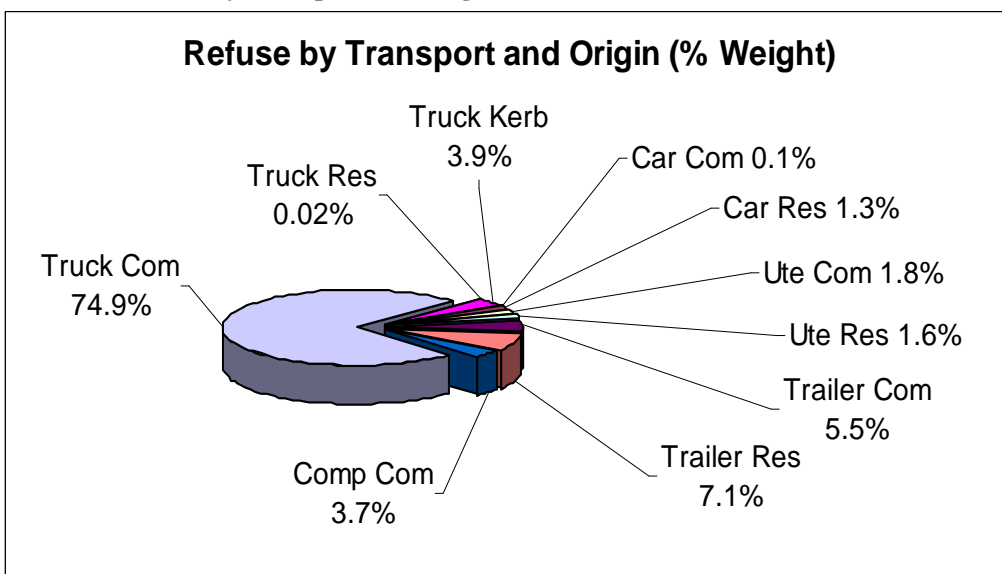


Table 16: Weight of Refuse by Transport Category and Origin of Source

	Commercial	Residential	Kerb	Total
Car	295	3,239	0	3,534
Utility	4,355	3,886	0	8,241
Trailer	13,275	17,158	0	30,433
Compactor	8,910	0	0	8,910
Truck	180,531	57	9,330	189,918
Total	207,366	24,340	9,330	241,036

4.7 Refuse Volume and Weights

4.7.1 Annual Volume and Weight of Refuse

Refuse data was recorded by volume or weight and converted to weight for presentation of results. The values obtained are accurate only for the survey period and extrapolation of results from these values may not be reliable. However as refuse quantities are often expressed in annual values, the results from the survey have been extrapolated to this format. No adjustments or correction factors have been applied so these values should be used for indicative purposes only.

Table 17: Estimated Annual Volume and Weight Values

	Survey Period	Estimated Annual Value
Volume (loose)	607 m ³	31,500 m ³
Weight kgs	241,036 kgs	12,500 tonne

4.7.2 Density of Loose Refuse

A value was determined from the summary survey data. This value is shown in Table 18. It has been calculated on the basis of loose volume. This value is high due to the influence of large quantities of rubble received during the survey.

Table 18: Average Density of Loose Refuse

Total weight kgs	241,036
Total volume m ³	607
Average Density	397 kg/m³

4.8 Conversion Factors

All classifications were assessed either as a percentage of the load volume or as a weight in kilograms.

Percentage values were later converted to weight values using one of four methods.

1. Using conversion factors gained from earlier studies
2. Using a sample weight and applying to full load
3. Use of weigh bridge results for full load
4. Using results of bag analysis data

The conversion values used are shown in Appendix 1.

5.0 Discussion

5.1 Trends of Waste Classifications

The results of this study are directly comparable with the 2004 study and are shown in chart format to give a rapid visual indication where changes are occurring.

The results are presented both as a percentage of the waste stream and by weight, as these formats can present quite different views. Further, for ease of interpretation, two charts are presented for each trend, one showing the high value categories and the other the lower value categories.

Charts 14 and 15 below present trends expressed as a percentage of the waste stream whereas Charts 16 and 17 express trends based on true weight.

In analysing trends consideration should be made of both the percentage and weight charts. Full primary values for the 2004 and 2007 surveys are shown in Table 19.

Chart 14: Classification Trend by Percentage - High Values

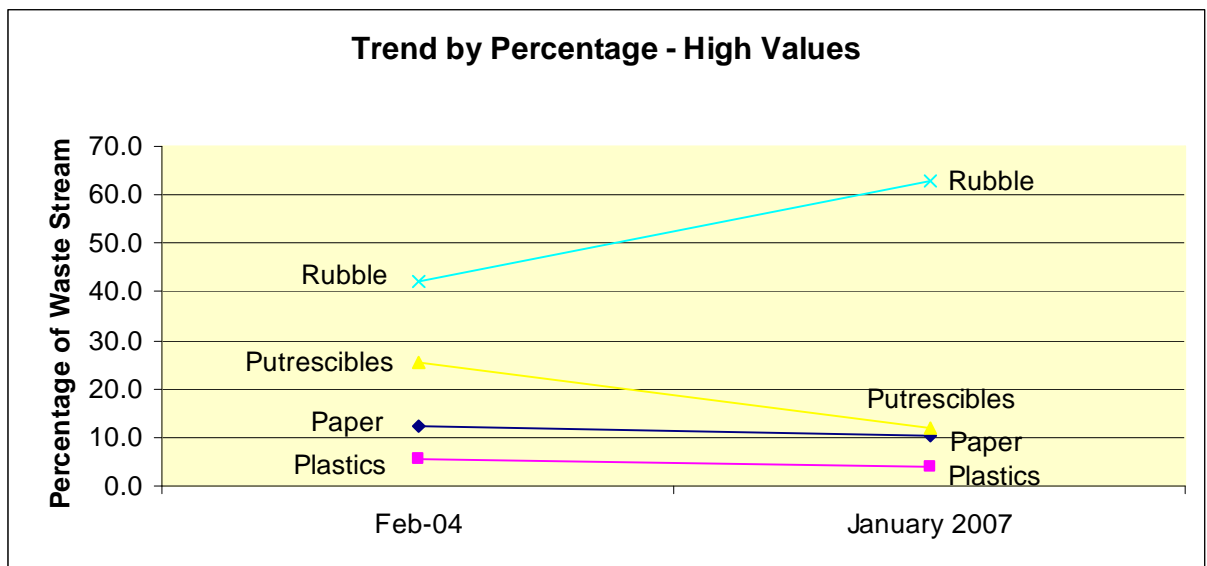


Chart 15: Classification Trend by Percentage - Low Values

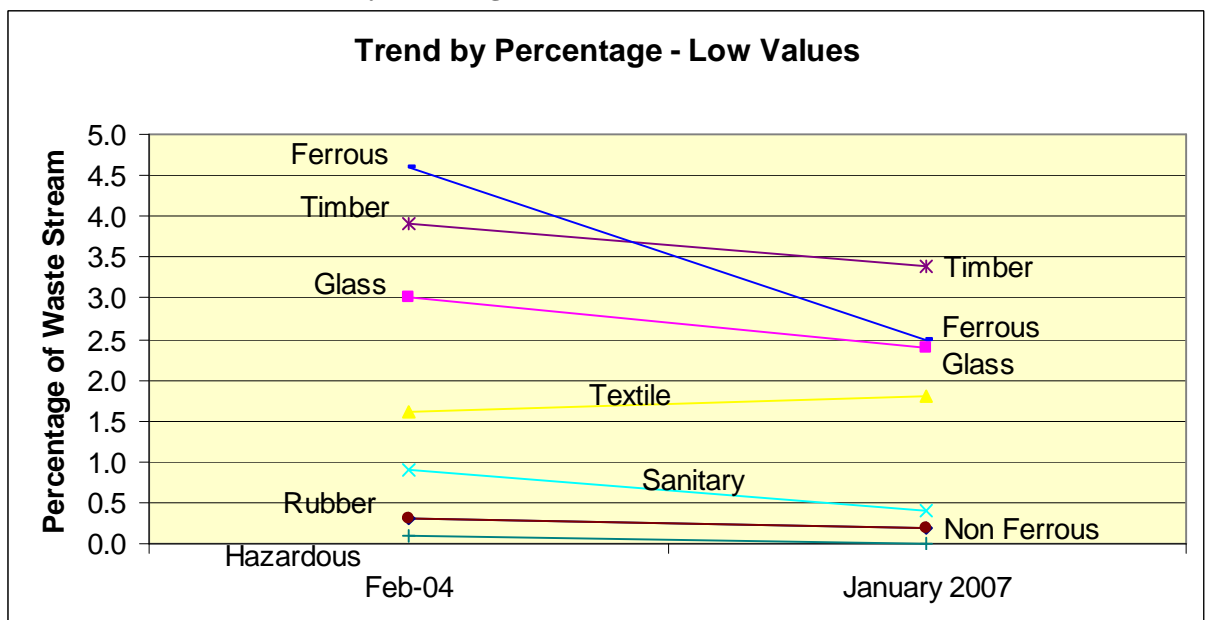


Chart 16: Classification Trend by Weight – High Values

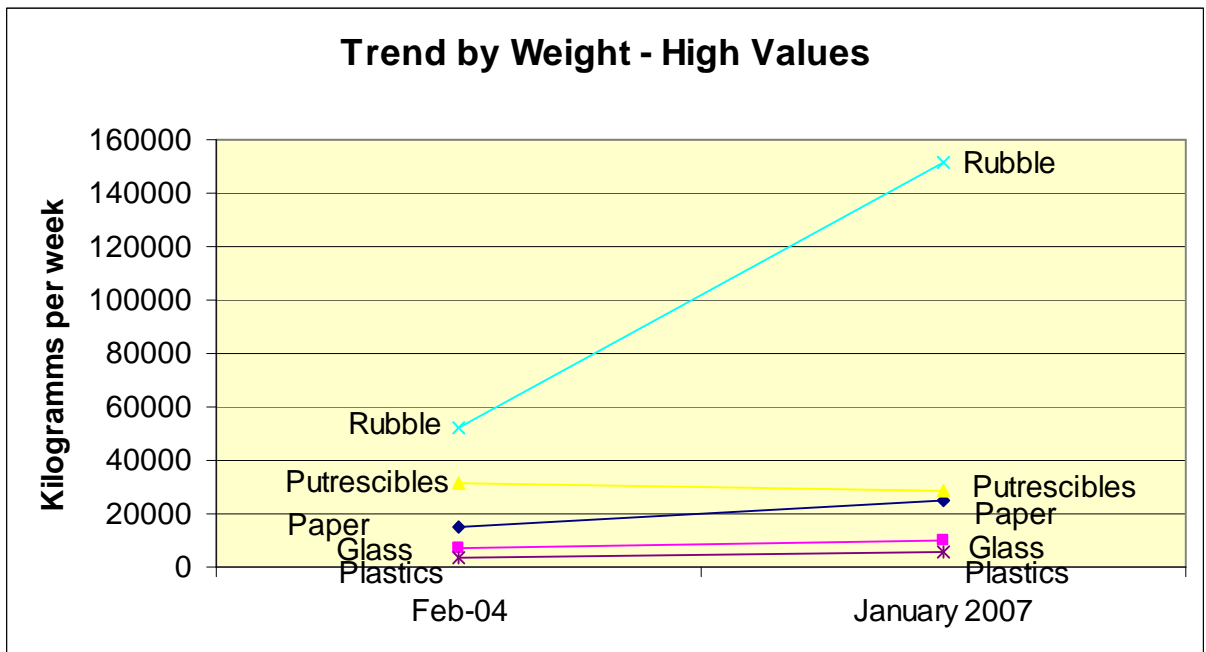
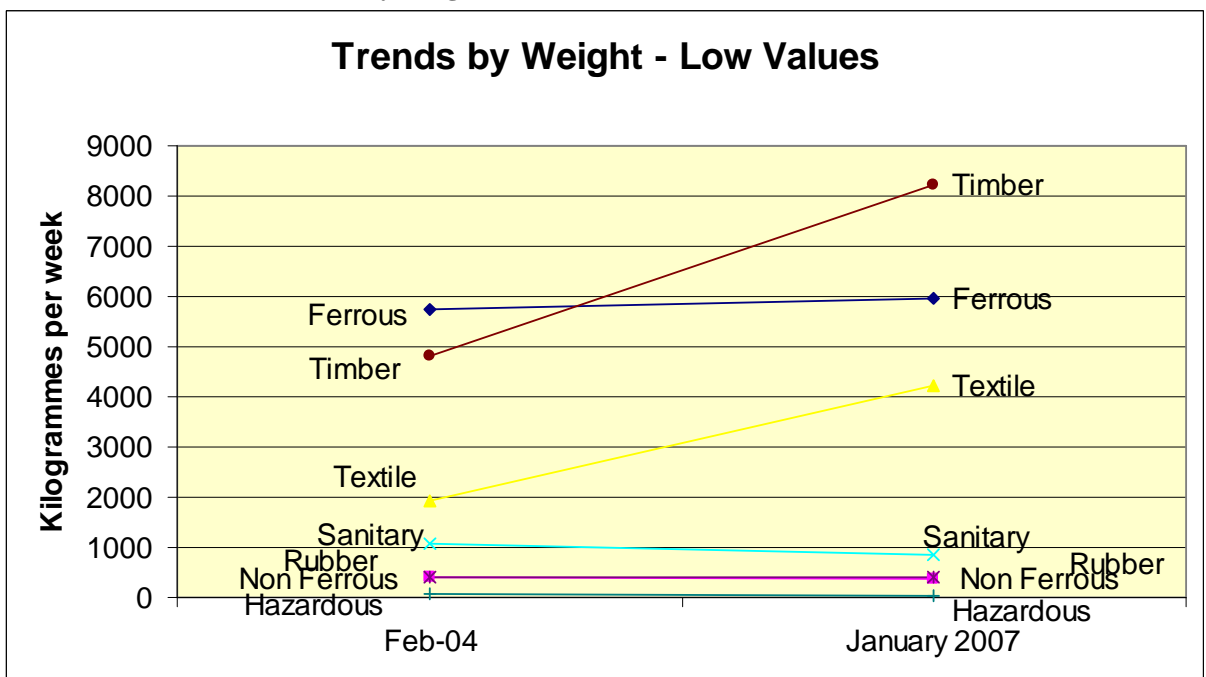


Chart 17: Classification Trend by Weight – Low Values



Major variations in weight are noticeable, particularly with rubble, timber and textiles which all show a huge increase. Rubble increased by just under 100,000 kg or 200% as the result of excavations on a construction site. This appears to be an infrequent activity at the recorded rate of disposal. This value somewhat distorts the overall results and gives a decreasing value to a number of items when presented as a percentage of the waste stream.

An increase from Textiles resulted from the quantity of clothing found in refuse bags and refuse from residential origin. The values obtained for clothing are high especially when compared to communities that have access to clothing collection bins.

The greater quantity of timber came from building and demolition activities, possibly as a result of increased building activities in the region.

Downward trends by percentage of ferrous, timber, glass and sanitary are more from the increase in rubble rather than major declines in these classifications.

Overall there is a marked increase in quantities received.

Table 19: Comparison of 2004 /2007 Primary Classification Values

Classification	2004 kgs	2007 kgs	2004% Total	2007% Total
Paper	15,108	25,132	12.2	10.4
Plastic	6,989	9,680	5.7	4.0
Putrescible	31,523	28,842	25.5	12.0
Ferrous	5,724	5,965	4.6	2.5
Non Ferrous	408	387	0.3	0.2
Glass	3,673	5,860	3.0	2.4
Textile	1,937	4,240	1.6	1.8
Sanitary	1,070	845	0.9	0.4
Rubble	51,943	151,414	42.0	62.7
Timber	4,829	8,235	3.9	3.4
Rubber	422	407	0.3	0.2
Hazardous	86	29	0.07	0.01
Total	123,713	241,036	100.0	100.0

5.2 Baseline data

The Ministry for the Environment maintains a database on results from WAP and SWAP studies completed at a number of sites throughout New Zealand and in particular four indicator sites, Silverstream Landfill Lower Hutt, Green Island Landfill Dunedin, Matamata Transfer Station Matamata and Kaikoura Landfill Kaikoura. The information database on the MfE website has not been updated since September 2004, however their latest information on the New Zealand mean value is presented along with results from the last two studies at the Marlborough Regional Landfill, the Westport Landfill and the McLeans Pit landfill as well as the two studies at the Hokitika Landfill in Table 20 below.

Table 20: Baseline Data – By Percentage of Waste Stream

	NZ mean	Marlb	Marlb	Westport	Westport	McLeans	McLeans	Hokitika	Hokitika
	2004	Jan 2005	Sept 2006	July 2005	Jan 2007	August 2005	January 2007	February 2004	January 2007
Paper	11.5	11.5	10.3	25.5	15.0	21.2	17.4	12.2	10.4
Plastic	7.6	11.1	10.0	7.6	5.8	8.2	8.0	5.7	4.0
Putrescible	22.0	26.0	23.0	16.2	19.8	24.3	23.9	25.5	12.0
Ferrous	6.0	1.6	5.0	7.7	5.7	9.7	9.6	4.6	2.5
Non ferrous	0.9	0.1	0.2	0.2	0.4	0.4	0.6	0.3	0.2
Glass	2.8	3.7	3.5	8.3	6.6	7.2	5.4	3.0	2.4
Textiles	5.6	0.7	1.7	1.8	2.6	2.5	4.1	1.6	1.8
Sanitary	1.8	0.2	1.4	2.0	1.2	0.6	0.9	0.9	0.4
Rubble	19.1	37.6	24.7	21.0	37.4	15.2	20.2	42.0	62.7
Timber	11.7	7.4	19.0	8.6	4.9	9.2	8.9	3.9	3.4
Rubber	1.8	0.2	0.8	0.8	0.6	1.0	0.7	0.3	0.2
Hazardous	9.2	0.03	0.2	0.3	0.1	0.4	0.3	0.07	0.01

5.3 Paper

A major effort is made to collect and recycle cardboard on site, with most cardboard being recycled rather than landfilled. Landfill customers are aware of this and generally make the effort to drop cardboard at the collection centre, in particular commercial operators. This is helped by the no charge policy for recycled materials and a covered drop off point. Newspaper and magazines are also collected but not on the same scale as the cardboard.

The weather has an impact on recovery of paper and cardboard as wet material is not acceptable for recycling.

Paper has increased significantly by weight, 67%, since the 2004 survey.

Recycled quantities are included in the total results.

5.4 Plastics

The classification of plastics is very difficult for all loads by visual analysis and as a result the secondary classification was carried out on kerb bag plastics only.

Plastic quantities have increased by 38% overall weight.

There is a small amount of plastics recycling with the collection and baling of grades 1 and 2 plastic bottles.

5.5 Putrescible Material

Putrescible material by weight decreased by 8.5%.

By secondary analysis kitchen wastes increased and garden wastes decreased. No explanation was found for this decrease in garden waste.

5.6 Hazardous Wastes

Hazardous waste is managed and stored separately on site by the landfill contractor. There appears to be little hazardous waste reaching the landfill face and material intercepted during the survey consisted of batteries, paint and LPG cylinders.

Again small quantities were detected in refuse bags and these consisted of small batteries, cell phones, and solvents. Although the quantities detected do not give an accurate value based on probability, it does give some indication that the materials are being disposed of other than to landfill.

5.7 Recycling

An effort is made to recycle a number of items on site. These include ferrous and non ferrous items, glass, cardboard and paper and plastic bottles.

A composting plant is partly built and could be an asset to the site. Currently green waste is disposed of in an area away from general refuse.

Timber is stored on site and is available for recovery but is more likely to be burnt when conditions permit.

6.0 ACKNOWLEDGEMENTS

I would like to thank the following:

Mike Mackie who willingly assisted with all field work.

The staff of Hokitika Waste Management, who allowed interruption of their work and willingly assisted with the intention of the survey.

7.0 REFERENCES

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8.0 APPENDIX

8.1 : Appendix 1: Standard Conversion Factors

Basic values for converting volume to weight shown as kg/m³

updated September 2006

Item		Low	General	High	Notes
Paper	loose		100		
	compactor loads		200		
	flattened cardboard		380		
Plastics	loose		100		
	compactor loads		200		
	polystyrene		105		
	vineyard irrigation	90 coils	120 lengths		
Putrescible	general loose	160	250	400+	
	garden weeds / soil		400		
	offal		580		600 skins/ offal
	offal, paunch		1000		
	paunch dry		380		
	garlic		425		
	olives		1100		
	mussels		610		
	mussels inc shell		800		
	kina		310		450 wet
	compactor truck		300 loose		600 compacted vol
	fish / salmon		800		
Ferrous	loose		250		wire, roofing, appliances
	heavy gauge		500		machinery, pipes, beams
	timber yard strapping	180			
Non ferrous			100		
Glass	bottles		420		250 for skip loads
	batts		60 dry	120 damp	
Textile	rags, clothes		120		
	carpet	150	180	240	
Sanitary	council		800		
Rubble	mussel shells		800		
	ash		600 coal	1000 wet	
	soil	850	1000	1260	
	gravel		1600		
	concrete, broken		1200		
	gib board		680		
	builders loose		400		
	diatomaceous earth		1150	1200	Winery filter medium
Timber	builders skips		250		
	transfer bins		400		where packed
	transfer bins loose		300		
	particle board	300	517	700	
	sawdust, dry	220	300	400	450 wet
	shavings dry	90	153	167	
	timber yard offcuts	125	186	500 solid	
	timber battens		120		
Rubber	general loose		200		
	tyres cut up		600		Cut & stacked in each other
	tyres whole		150	loose	
	tyres each	car 8	ute 10	SUV 14	
	tyres truck each		22		
	underlay		180		
	furniture / mattress		180		
Hazardous			as weighed		
Bags	commercial cleaners		120		

	hospital bags		36	100	
	road side / town		150		
Vehicles					
top loader	Envirowaste & NS		210		
compactor			250 loose		500 compacted

8.2 : Appendix 2: Kerb Bag Analysis (weight in kgs)

Date		31/1/07	1/2/07	1/2/07	2/2/07	Total	% kerb waste	
No of Bags		15	10	30	15	70	Secondary classifications	Primary classifications
Paper	News	3.6	0.5	6.8	2.1	13.0	3.50	
	Cardboard	5.0	3.2	2.1	3.3	13.6	3.66	
	Other	7.0	6.2	11.6	6.4	31.2	8.40	
Total paper						57.8		15.56
Plastics	1	1.9	2.7	3.3	3.6	11.5	3.10	
	2	3.9	3.1	4.6	2.3	13.9	3.74	
	3	0	0	0	0	0	0	
	4	4.1	1.2	2.1	2.1	9.5	2.56	
	5	0.6	0	.3	0.6	1.5	0.40	
	6	0.3	0.2	1.0	0.3	1.8	0.49	
	7	5.8	2.6	17.2	7.9	33.5	9.02	
Total Plastics						71.7		19.31
Putrescible	Kitchen	19.0	10.2	33.9	23.8	86.9	23.40	
	Garden	0.2	0	10.8	0.3	11.3	3.04	
Total Putrescible						98.2		26.44
Ferrous	Cans	2.9	2.7	7.3	2.1	15.0	4.04	
	Whiteware	0	0	0	0	0	0	
	Other	0	0.3	8.9	0.8	10.3	2.77	
Total Ferrous						25.3		6.81
Non Ferrous		0.1	0.2	2.6	0.2	3.1	0.84	
Total Non Fer						3.1		0.84
Glass	Clear	6.8	0.3	3.5	0.9	11.5	3.10	
	Green	2.1	0.6	4.9	1.7	9.3	2.50	
	Brown	7.3	2.2	8.6	1.9	20.0	5.39	
Total Glass						40.8		10.99
Textiles	Clothes	5.1	9.4	16.7	8.8	40.0	10.77	
	Other	1.0	0.2	2.0	0.3	3.5	0.94	
Total Textiles						43.5		11.71
Sanitary		6.3	1.9	2.3	1.2	11.7	3.15	
Total Sanitary						11.7		3.15
Rubble	Ash	-	-	-	-	-		
	Soil	-	-	-	-	-		
	Concrete	-	-	-	-	-		
	Plaster	-	-	-	-	-		
	Other	0.1	2.6	10.3	3.3	16.3	4.39	
Total Rubble						16.3		4.39
Timber	Treated	0	0	0	0.2	0.2	0.05	
	Untreated	0	0	0.3	0	0.3	0.08	
Total Timber						0.5		0.13
Rubber	Tyres	-	-	-	-	-	0	
	Other	0	0	2.3	0	2.3	0.62	
Total Rubber						2.3		0.62
Hazardous		0	0	0.2	0	0.2	0.05	
Total Hazardous						0.2		0.05
					Total	371.4		

