

Composition of Rotorua Lakes Council Kerbside Rubbish and Mixed Recycling Collections

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Contents

1	INTRODUCTION.....	1
1.1	RUBBISH AND RECYCLING SERVICES.....	1
1.2	NOTE ON PRESENTATION OF DATA IN TABLES AND FIGURES.....	1
2	METHODOLOGY.....	2
2.1	SAMPLE SIZE.....	2
2.2	SAMPLING STRATEGY AND EXECUTION.....	3
2.3	AUDIT EXECUTION.....	3
3	COMPOSITION OF KERBSIDE RUBBISH - DEC. 20 - JUNE 21.....	5
3.1	ORGANIC MATTER IN KERBSIDE RUBBISH WHEELIE BINS - DEC. 20 - JUNE 21.....	6
3.2	PAPER IN KERBSIDE RUBBISH WHEELIE BINS.....	7
3.3	PLASTICS IN KERBSIDE RUBBISH WHEELIE BINS.....	7
3.4	SECONDARY COMPOSITION OF KERBSIDE RUBBISH - DEC. 20 - JUNE 21.....	8
3.5	DISTRIBUTION OF KERBSIDE RUBBISH BIN WEIGHTS - DEC. 20 - JUNE 21.....	9
3.6	DIVERSION POTENTIAL OF KERBSIDE RUBBISH - DEC. 20 - JUNE 21.....	9
4	COMPOSITION OF KERBSIDE MIXED RECYCLING.....	11
4.1	COMPOSITION OF KERBSIDE MIXED RECYCLING.....	11
4.2	CONTAMINATION IN KERBSIDE MIXED RECYCLING.....	12
5	DISCUSSION.....	14
5.1	COMPARISON TO RESULTS OF 2017 KERBSIDE RUBBISH AUDIT.....	14
5.2	COMPARISON TO RESULTS OF 2017 KERBSIDE MIXED RECYCLING AUDIT.....	15
	APPENDIX 1 - KERBSIDE RUBBISH CLASSIFICATIONS.....	16
	APPENDIX 2 - MIXED RECYCLING CLASSIFICATIONS.....	17
	APPENDIX 3 - COUNCIL RECYCLING INSTRUCTIONS.....	18
	APPENDIX 4 - DECEMBER 2020 - KERBSIDE RUBBISH.....	19
A 4.1	SAMPLING SCHEDULE - DECEMBER 2020.....	19
A 4.2	COMPOSITION OF KERBSIDE RUBBISH - DECEMBER 2020.....	20
A 4.2.1	<i>Organic matter in kerbside rubbish wheelie bins - December 2020.....</i>	<i>21</i>
A 4.2.2	<i>Plastics in kerbside rubbish wheelie bins - December 2020.....</i>	<i>22</i>
A 4.2.3	<i>Paper in kerbside rubbish wheelie bins - December 2020.....</i>	<i>22</i>
A 4.2.4	<i>Secondary composition of kerbside rubbish - December 2020.....</i>	<i>23</i>
A 4.2.5	<i>Distribution of kerbside rubbish bin weights - December 2020.....</i>	<i>24</i>
A 4.2.6	<i>Diversion potential of kerbside rubbish - December 2020.....</i>	<i>24</i>
	APPENDIX 5 - JUNE 2021 - KERBSIDE RUBBISH.....	26
A 5.1	SAMPLING SCHEDULE - JUNE 2021.....	26
A 5.2	COMPOSITION OF KERBSIDE RUBBISH - JUNE 2021.....	26
A 5.2.1	<i>Organic matter in kerbside rubbish wheelie bins - June 2021.....</i>	<i>28</i>
A 5.2.2	<i>Paper in kerbside rubbish wheelie bins - June 2021.....</i>	<i>29</i>
A 5.2.3	<i>Plastics in kerbside rubbish wheelie bins - June 2021.....</i>	<i>29</i>
A 5.2.4	<i>Secondary composition of kerbside rubbish - June 2021.....</i>	<i>30</i>
A 5.2.5	<i>Distribution of kerbside rubbish bin weights - June 2021.....</i>	<i>31</i>
A 5.2.6	<i>Diversion potential of kerbside rubbish - June 2021.....</i>	<i>31</i>

1 Introduction

Section 42 of the Waste Minimisation Act 2008 requires a territorial authority to adopt a waste management and minimisation plan (WMMP) that promotes effective and efficient waste management and minimisation within its district. In line with this responsibility under the Act, Rotorua Lakes Council (Council) adopted the *Waste Management and Minimisation Plan Rotorua's Waste Strategy 2016 - 2022*.

One of the objectives of the WMMP is to reduce volumes of organic waste disposed of to landfill. Council currently operates facilities for the drop-off and composting of greenwaste, one of the major types of organic waste. The WMMP provides for the continuance of this initiative and undertakes to assess the options for diverting kitchen waste and other putrescible waste.

To provide information for this assessment of organic waste diversion, Council engaged Waste Not Consulting Ltd to conduct a five-day sort-and-weigh audit of Council's kerbside rubbish and mixed recycling collections in December 2020 and a three-day sort-and-weigh audit of kerbside rubbish in June 2021. The audits would determine the quantity of organic materials being disposed of by residents. This report presents the results of the audits.

A similar audit of kerbside collections services was undertaken by Zenzic in 2017. The results of the 2020 and 2021 audits are compared to the results of the 2017 audit in section 5.

1.1 Rubbish and recycling services

Rotorua Lakes Council provides residential properties with rates-funded kerbside collection services for rubbish and recycling. The system comprises a 140-litre wheelie bin for rubbish, a 240-litre wheelie bin for mixed recycling, and a 45-litre crate for glass. The rubbish wheelie bin is collected weekly. The mixed recycling and glass wheelie bins are collected every second week. The materials accepted by the kerbside mixed recycling collection are presented in Appendix 3.

All materials accepted by the kerbside recycling collections are also accepted at the Rotorua Recycling Centre, free of charge. Greenwaste and hazardous waste may be disposed of, for a fee, at Rotorua landfill.

1.2 Note on presentation of data in tables and figures

Subtotals in tables and figures do not always add to the total due to rounding. This is illustrated in the equations below. In the equation on the left, the subtotals are expressed to three decimal points and add up to the total, as shown. When the three decimal points are rounded to two, one, and no decimal points, the subtotals do not add up to the totals.

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= 2.528	= 2.53	= 2.5	= 3

2 Methodology

The methodologies used for the audits of kerbside rubbish and mixed recycling were based on the methodologies recommended by the Ministry for the Environment's *Solid Waste Analysis Protocol 2002* (SWAP).

2.1 Sample size

A 'standard' SWAP audit of kerbside waste materials is usually three to five days in length, with the equivalent of 60 x 140-litre wheelie bins (about 600 kg) of waste being sorted and weighed each day. Such an audit usually gives results of a reasonable level of precision for three to five of the twelve primary categories recommended by the SWAP.

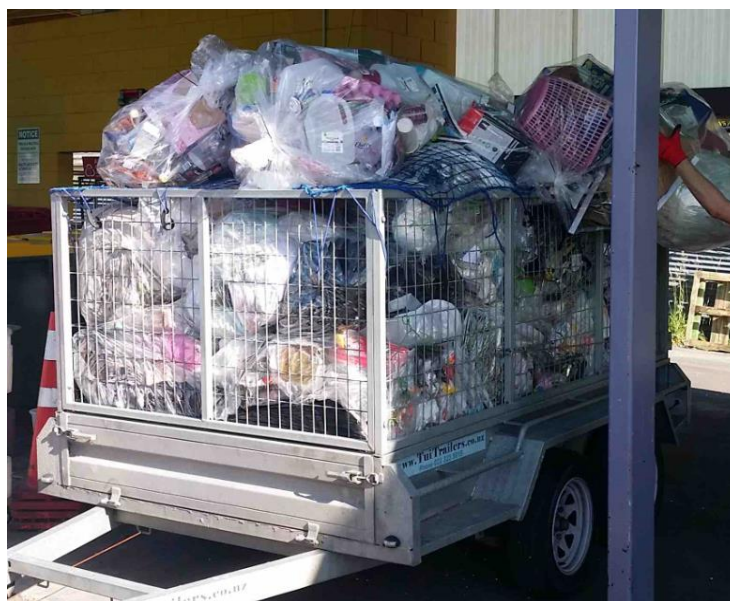
The daily sample size is controlled by both the quantity of waste material that can be sorted in a day by a team of four (about 600 kg) and the volume of waste material that can be transported in the large cage trailer used for the sample collection (also about 600 kg).

As the June audit was to include two different materials (rubbish and mixed recycling), an audit of five days' duration was proposed to Council. Both kerbside rubbish and mixed recycling would be collected and sorted each day.

As an initial target, it was proposed that each day of auditing would include the contents of 52 x 140-litre rubbish wheelie bins and the contents of 12 x 240-litre mixed recycling wheelie bins. Based on the initial target, the five-day audit would sort and weigh the contents of 260 rubbish wheelie bins and the contents of 60 mixed recycling wheelie bins

However, due to the volume of the kerbside mixed recycling, the daily target could not be met as the volume of materials was too great. The trailer used for the December 2020 sample collection is shown below, filled with one day's sample.

The June 2021 audit collected the contents of 52 x 140-litre rubbish wheelie bins each day.



2.2 Sampling strategy and execution

The composition of residential kerbside rubbish and recycling, and the quantity generated per household, vary according to a number of factors, including the socio-economic status of the householders, the occupancy rate per household, the nature of the housing stock, the size of the property, and the range of disposal and recycling services available.

Accordingly, to obtain a representative sample of residential kerbside rubbish and recycling from Rotorua Lakes District, the sample was collected from a range of communities in the urban Rotorua area. To ensure a wide range of communities was included in the sample, each day's sample was collected from a range of streets in that day's Council collection area. The sample was collected from approximately ten streets each day, selected at random while driving throughout the area. For health and safety reasons, the sample was not collected from major roads unless the collection could be undertaken safely.

The December 2020 sample was collected on five weekdays, starting on Wednesday 9 December and concluding on Tuesday 15 December. This allowed the sampling to be aligned with the fortnightly mixed recycling collection, so that the rubbish sample was always collected in an area where residents' recycling had also been set out for collection.

The June 2021 sample, which did not include mixed recycling, was collected on three weekdays, starting on Wednesday 16 June and concluding on Friday 18 June.

For both audits, the sampling was undertaken by a team of two, using a large cage trailer provided by Waste Watchers Ltd. A Waste Watchers Ltd staff member supervised the sample collection and was accompanied by an experienced runner.

The contents of all wheelie bins included in the sample were emptied individually into large plastic bags and labelled to identify whether the material was rubbish or recycling. The emptied wheelie bins were left on the kerbside.

2.3 Audit execution

Each morning, the collected sample was transported to a site provided by Smart Environmental Ltd, Council's collection contractor, for the sort and weigh process. A team of four, comprising one supervisor and a lead hand from Waste Watchers and two casual staff, were used for the sorting process.

Prior to the start of the audit, all staff received the requisite training on the requirements of the audit process and on health and safety procedures. All personal protective equipment was provided by Waste Watchers.

The contents of rubbish wheelie bins that were collected each day were sorted in sampling units of four bins. Recycling bins were sorted in sampling units of three bins.

Each bag of material (containing the contents of one wheelie bin) in each sampling unit was weighed individually, opened, the contents spread on a sorting table, and the items sorted into the appropriate categories. When all of the items were sorted, the individual classifications were weighed out and the material disposed of.

The kerbside rubbish sample was sorted into the 12 primary categories identified in the SWAP and 23 secondary categories. The secondary categories used for sorting rubbish are presented in Appendix 1. The classifications were chosen to identify the different types of recyclable and compostable materials present in the rubbish. Classifications used for the sorting of mixed recycling are provided in Appendix 2.

The precise definition for each classification has been based on what materials are described in Council's educational material and/or are acceptable to the materials recovery facility that processes the kerbside recycling. These definitions were finalised in consultation with Council. Council's recycling instructions for residents are shown in Appendix 3.

3 Composition of kerbside rubbish - Dec. 20 - June 21

The combined results of the December 2020 and the June 2021 kerbside rubbish audits are presented in this section. The results of the individual kerbside rubbish audits are presented separately in Appendix 4 and Appendix 5.

Data provided by Council indicated that, during November and December 2020, an average of 339 tonnes per week of kerbside rubbish was collected by Smart Environmental Ltd, Council's kerbside collection contractor. The comparable figure for May and June 2021 was 314 tonnes per week. The average of these two tonnages, 326 tonnes per week, is applied to the audit results throughout this section.

The primary composition of kerbside rubbish is presented in Table 3.1 and Figure 3.1. The secondary composition, which includes all 23 categories, is given in section 3.4. The composition is the weighted average of the two audits, with the weighting based on the weekly tonnages. The bin weight is the arithmetical average of the bin weights from the two audits, and has not been weighted.

Table 3.1 - Primary composition of kerbside rubbish - Dec. 20 - June 21

Rotorua Lakes Council - Kerbside rubbish - Dec. 20 - June 21	Proportion of total weight	Mean weight. per wheelie bin	Tonnes per week
Paper	8.2%	0.81 kg	27 T/week
Plastics	7.9%	0.78 kg	26 T/week
Organics	55.3%	5.48 kg	180 T/week
Ferrous metals	2.0%	0.20 kg	7 T/week
Non-ferrous metals	0.8%	0.08 kg	3 T/week
Glass	3.6%	0.36 kg	12 T/week
Textiles	4.3%	0.42 kg	14 T/week
Sanitary paper	8.1%	0.80 kg	26 T/week
Rubble	4.7%	0.47 kg	15 T/week
Timber	2.1%	0.21 kg	7 T/week
Rubber	1.0%	0.10 kg	3 T/week
Potentially hazardous	1.8%	0.18 kg	6 T/week
TOTAL	100.0%	9.90 kg	326 T/week

The average contents of a 140-litre Rotorua Lakes Council kerbside rubbish bin weighed 9.90 kg. Organic material, which was split relatively evenly between kitchen waste and greenwaste, was the largest component of kerbside rubbish, comprising 55.3% of the total weight or 5.48 kg in the average kerbside rubbish bin.

Paper, sanitary paper (which included nappies, tissues, and paper towels), and plastic were the next largest components, each representing approximately 8% of the total weight.

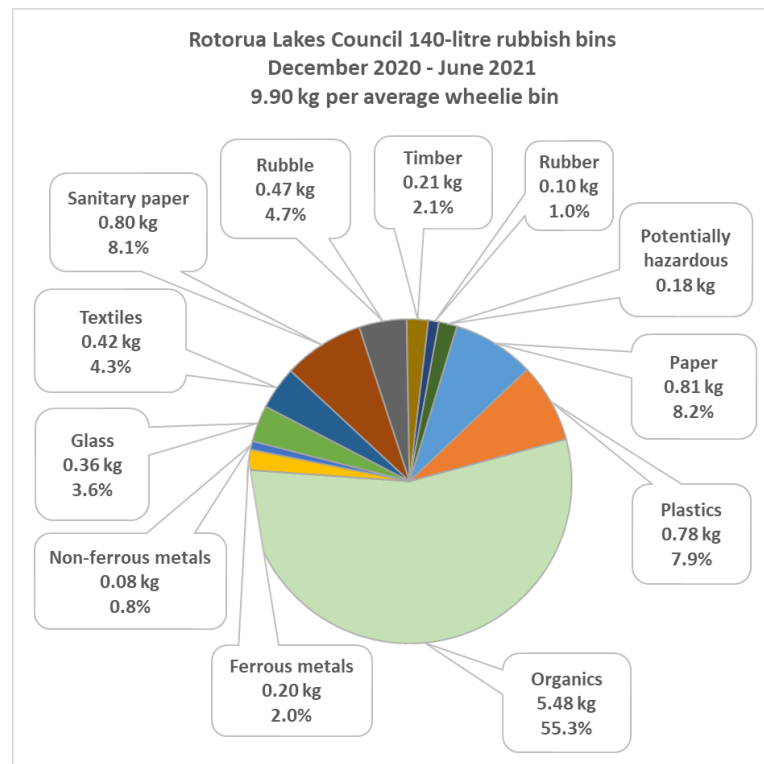


Figure 3.1 - Primary composition of kerbside rubbish - Dec. 20 - June 21

The main components of kerbside rubbish are discussed in detail in the following sections.

3.1 Organic matter in kerbside rubbish wheelie bins - Dec. 20 - June 21

Organic matter comprised 55.3% of the weight of kerbside rubbish. The composition of the organic constituent of the rubbish is shown in Figure 3.2. Kitchen waste comprised 49% of the organic material, an average of 2.68 kg per wheelie bin. Kitchen waste included food preparation waste, left-over food waste, and substantial quantities of perished goods. Greenwaste comprised 47% of organic material, or 2.56 kg per wheelie bin. The 'Other organic' material (4% of organic waste) included vacuum cleaner dust, animal faeces, candles, fireplace ash, and human hair. Much of this material would be suitable for composting.

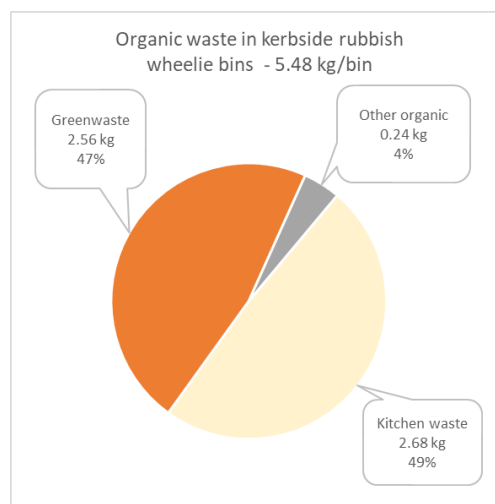


Figure 3.2 - Organic component of kerbside rubbish - Dec. 20 - June 21

3.2 Paper in kerbside rubbish wheelie bins

Paper comprised 8.2% of material in the kerbside rubbish wheelie bins, an average of 0.81 kg per bin. The composition of the paper constituent of the rubbish is shown in Figure 3.3. Recyclable paper comprised 82% of paper, or 0.67 kg per bin. Non-recyclable paper, such as food-contaminated paper, comprised 18% of paper. Some non-recyclable papers would be suitable for composting.

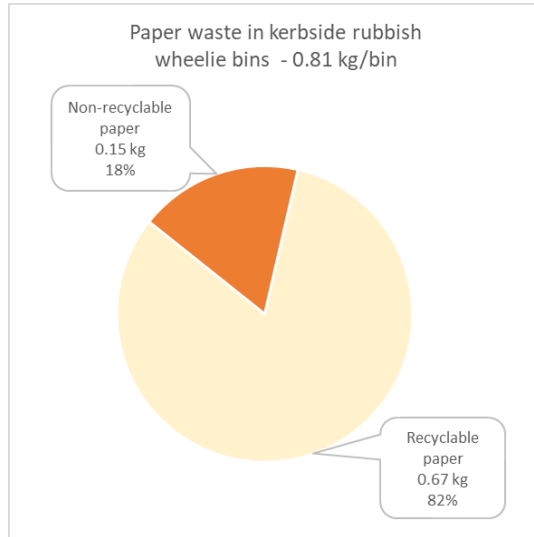


Figure 3.3 - Paper component of kerbside rubbish - Dec. 20 - June 21

3.3 Plastics in kerbside rubbish wheelie bins

Plastics comprised 7.9% of material in the kerbside rubbish wheelie bins, an average of 0.78 kg per bin. The composition of the plastics constituent of the rubbish is shown in Figure 3.4. Plastic bags/film (soft plastics) were the major component of plastics in kerbside rubbish, comprising 50% of all plastics. Other non-recyclable plastics comprised 23% of plastics and #1,2,5 bottles & containers comprised 21% of plastics.

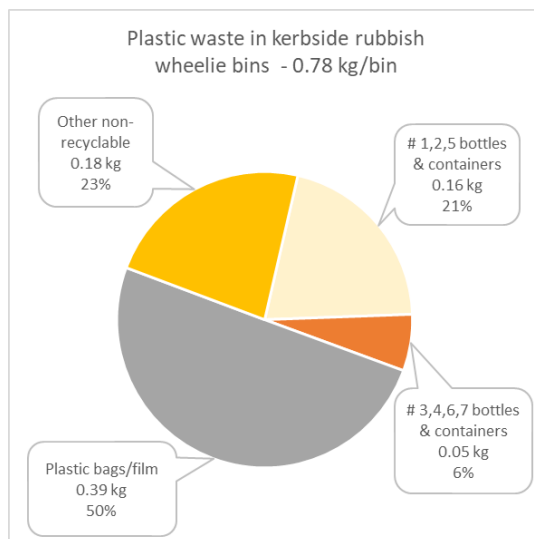


Figure 3.4 - Plastics component of kerbside rubbish - Dec. 20 - June 21

3.4 Secondary composition of kerbside rubbish - Dec. 20 - June 21

Rotorua Lakes Council - Kerbside rubbish - Dec. 20 - June 21		% of total weight	Kg per kerbside rubbish wheelie bin	Tonnes per week
Paper	Recyclable paper	6.7%	0.67 kg	22 T/week
	Non-recyclable paper	1.5%	0.15 kg	5 T/week
	Subtotal	8.2%	0.81 kg	27 T/week
Plastics	# 1,2,5 bottles & containers	1.6%	0.16 kg	5 T/week
	# 3,4,6,7 bottles & containers	0.5%	0.05 kg	2 T/week
	Plastic bags & film	4.0%	0.39 kg	13 T/week
	Other non-recyclable	1.8%	0.18 kg	6 T/week
	Subtotal	7.9%	0.78 kg	26 T/week
Organics	Kitchen waste	27.0%	2.68 kg	88 T/week
	Greenwaste	25.9%	2.56 kg	84 T/week
	Organic other	2.4%	0.24 kg	8 T/week
	Subtotal	55.3%	5.48 kg	180 T/week
Ferrous metals	Steel cans	0.7%	0.07 kg	2 T/week
	Steel other	1.4%	0.14 kg	4 T/week
	Subtotal	2.0%	0.20 kg	7 T/week
Non ferrous metals	Aluminium cans	0.5%	0.05 kg	2 T/week
	Non-ferrous other	0.3%	0.03 kg	1 T/week
	Subtotal	0.8%	0.08 kg	3 T/week
Glass	Recyclable glass	3.1%	0.30 kg	10 T/week
	Non-recyclable glass	0.6%	0.06 kg	2 T/week
	Subtotal	3.6%	0.36 kg	12 T/week
Textiles	Clothing/textiles	2.3%	0.23 kg	7 T/week
	Other textiles	2.0%	0.20 kg	7 T/week
	Subtotal	4.3%	0.42 kg	14 T/week
Sanitary paper		8.1%	0.80 kg	26 T/week
Rubble		4.7%	0.47 kg	15 T/week
Timber		2.1%	0.21 kg	7 T/week
Rubber		1.0%	0.10 kg	3 T/week
Potentially hazardous	Household	1.5%	0.15 kg	5 T/week
	Other	0.3%	0.03 kg	1 T/week
	Subtotal	1.8%	0.18 kg	6 T/week
TOTAL		100.0%	9.90 kg	326 T/week

3.5 Distribution of kerbside rubbish bin weights - Dec. 20 - June 21

Between the two audits, a total of 368 x 140-litre kerbside rubbish wheelie bins were sorted for the audit. The sorted rubbish weighed 3,696 kg. The average weight of rubbish in Council’s 140-litre kerbside rubbish wheelie bins was 9.90 kg.

The distribution of the weights of the contents of rubbish wheelie bins is shown in Figure 3.5.

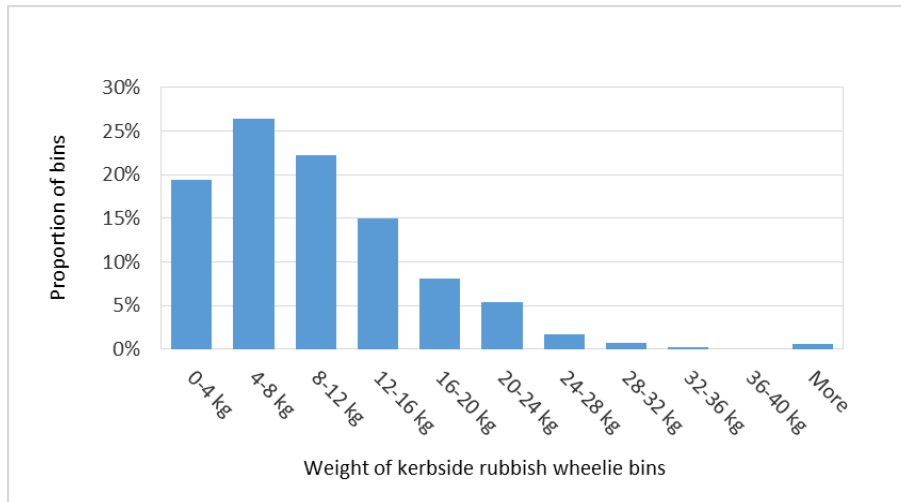


Figure 3.5 - Distribution of kerbside rubbish wheelie bin weights - Dec. 20 - June 21

The contents of 19% of wheelie bins weighed less than four kilograms. The contents of 59% weighed between four and 16 kg. The contents of 12% weighed over 20 kilograms.

3.6 Diversion potential of kerbside rubbish - Dec. 20 - June 21

To reduce waste to landfill, Council provides residential properties in the district with separate kerbside collections of mixed recycling and glass. The kerbside mixed recycling collection accepts #1-7 plastic bottles and containers, clean cardboard and paper, and steel and aluminium cans, excluding aerosols.

Council’s educational material on recycling is presented in Appendix 3. Although the educational material states that #1-7 plastic bottles and containers are acceptable for the kerbside collection, #3,4,6,7 plastics are currently being landfilled by the processing facility.

Council also operates a recycling centre in Rotorua and four rural recycling drop-off centres that accept all of the materials accepted by the kerbside recycling collections.

For the disposal of greenwaste, residents can home-compost or deliver the material to Council’s four rural transfer stations or Rotorua landfill. For the disposal of food waste, residents can home-compost, establish a worm farm, or feed the food waste to hens or other animals.

Table 3.2 shows the proportion of rubbish in kerbside rubbish bins that could have been diverted from landfill disposal using these methods. The weight of each material per average kerbside rubbish bin is also shown.

Table 3.2 - Diversion potential of kerbside rubbish - Dec. 20 - June 21

Rotorua Lakes Council Kerbside rubbish wheelie bins Dec. 20 - June 21 - Diversion potential	% of total weight	Weight per bin	Tonnes per week
RECYCLABLE MATERIALS			
Paper Recyclable	6.7%	0.67 kg	22 T/week
Plastics #1,2,5 bottles & containers	1.6%	0.16 kg	5 T/week
Plastics # 3,4,6,7 bottles & containers	0.5%	0.05 kg	2 T/week
Steel cans	0.7%	0.07 kg	2 T/week
Aluminium cans	0.5%	0.05 kg	2 T/week
Recyclable glass	3.1%	0.30 kg	10 T/week
Subtotal	13.1%	1.30 kg	43 T/week
COMPOSTABLE MATERIALS			
Organics Kitchen waste	27.0%	2.68 kg	88 T/week
Organics Greenwaste	25.9%	2.56 kg	84 T/week
Subtotal	52.9%	5.24 kg	173 T/week
TOTAL DIVERTABLE	66.0%	6.54 kg	215 T/week

Approximately 13.1%, by weight, of the materials in kerbside rubbish bins could have been recycled through Council's kerbside recycling collection or at the recycling drop-off centres. This equates to 1.30 kg in the average kerbside rubbish bin or 43 tonnes per week.

A further 52.9% of materials, by weight, could have been composted, either at home or, in the case of greenwaste, by being disposed of at the four rural transfer stations or Rotorua landfill. This equates to 5.24 kg in the average kerbside rubbish bin or 173 tonnes per week.

Overall, 66.0%, by weight, of materials in kerbside rubbish bins could have been recycled or composted. This equates to approximately 215 tonnes per week. This is a theoretical maximum, as no system is capable of diverting all of a material.

Other materials, such as clothing and other metals, are also recyclable but have not been included in these calculations. A proportion of non-recyclable paper, such as pizza boxes, and some sanitary paper, such as tissues and paper towels, could be composted.

4 Composition of kerbside mixed recycling

During the December 2020 audit of kerbside mixed recycling, a total of 48 kerbside mixed recycling wheelie bins were sorted. The mixed recycling was sorted into the 14 classifications and weighed, in total, 291 kg.

4.1 Composition of kerbside mixed recycling

The composition of materials in kerbside mixed recycling bins is shown in Table 4.1. Data provided by Council indicated that, during November and December 2020, an average of 58 tonnes per week of mixed recycling was collected by Smart Environmental Ltd, Council's kerbside collection contractor. This tonnage is applied to the audit results throughout this section.

Table 4.1 - Composition of kerbside mixed recycling wheelie bins - December 2020

Rotorua Lakes Council Kerbside mixed recycling wheelie bins December 2020		% of total	Weight per bin	Tonnes per week
Paper	Recyclable paper	67.2%	4.08 kg	39 T/week
	Non-recyclable paper	1.6%	0.10 kg	1 T/week
	Subtotal	68.8%	4.18 kg	40 T/week
Plastic	# 1,2,5 bottles & containers	12.6%	0.77 kg	7 T/week
	# 3,4,6,7 bottles & containers	1.0%	0.06 kg	1 T/week
	Plastic bags/film	1.0%	0.06 kg	1 T/week
	Other non-recyclable	3.1%	0.19 kg	2 T/week
	Subtotal	17.7%	1.08 kg	10 T/week
Ferrous	Steel cans	3.6%	0.22 kg	2 T/week
	Steel other	0.2%	0.01 kg	0 T/week
	Subtotal	3.8%	0.23 kg	2 T/week
Non-ferrous	Aluminium cans	2.1%	0.13 kg	1 T/week
	Non-ferrous other	0.9%	0.05 kg	0 T/week
	Subtotal	3.0%	0.18 kg	2 T/week
Glass	Recyclable glass	2.0%	0.12 kg	1 T/week
	Non-recyclable glass	0.0%	0.00 kg	0 T/week
	Subtotal	2.0%	0.12 kg	1 T/week
Bagged rubbish		0.0%	0.00 kg	0 T/week
All other material		4.7%	0.29 kg	3 T/week
TOTAL		100.0%	6.07 kg	58 T/week

The contents of the average mixed recycling bin weighed 6.07 kg. A majority of the material was recyclable paper, which represented 67.2% of the total weight, or 4.08 kg per bin. The second largest component was Plastic #1,2,5 bottles & containers, which represented 12.6% of the total weight, or 0.77 kg per bin.

4.2 Contamination in kerbside mixed recycling

The data from Table 4.1 is broken down in Table 4.2 into five materials that meet Council's published criteria for the kerbside mixed recycling collection (shown in Appendix 3) and nine categories that do not meet the criteria. While the educational material indicates that #1-7 plastic bottles and containers are acceptable for the kerbside collection, #3,4,6,7 plastics are currently being landfilled by the processing facility.

Table 4.2 - Contamination in mixed kerbside recycling

Rotorua Lakes Council Kerbside mixed recycling wheelie bins December 2020	% of total weight	Weight per bin	Tonnes per week
RECYCLABLE MATERIALS - Meets council criteria for mixed recycling bin			
Recyclable paper	67.2%	4.08 kg	39 T/week
Plastics # 1,2,5 bottles & containers	12.6%	0.77 kg	7 T/week
Plastics # 3,4,6,7 bottles & containers	1.0%	0.06 kg	1 T/week
Steel cans	3.6%	0.22 kg	2 T/week
Aluminium cans	2.1%	0.13 kg	1 T/week
Subtotal	86.5%	5.25 kg	50 T/week
CONTAMINATION - Does not meet council criteria for mixed recycling bin			
Non-recyclable paper	1.6%	0.10 kg	1 T/week
Plastic bags/film	1.0%	0.06 kg	1 T/week
Other non-recyclable plastic	3.1%	0.19 kg	2 T/week
Steel other	0.2%	0.01 kg	0 T/week
Non-ferrous other	0.9%	0.05 kg	0 T/week
Recyclable glass	2.0%	0.12 kg	1 T/week
Non-recyclable glass	0.0%	0.00 kg	0 T/week
Bagged rubbish	0.0%	0.00 kg	0 T/week
All other material	4.7%	0.29 kg	3 T/week
Subtotal	13.5%	0.82 kg	8 T/week
TOTAL	100.0%	6.07 kg	58 T/week

Overall, 86.5% of the total weight of materials in kerbside mixed recycling wheelie bins met Council's published criteria for kerbside mixed recycling. Materials that did not meet Council's criteria represented 13.5% of the total weight, or 0.82 kg per bin. Unclassified other materials (4.7% of total weight) and Other non-recyclable plastic (3.1%) were the largest components of the contamination.

A total of 48 kerbside mixed recycling wheelie bins were sorted for the audit. The average weight per bin was 6.07 kg. The median weight was 4.83 kg. The materials in the lightest bin weighed 0.69 kg and, in the heaviest, 25.58 kg. The distribution of wheelie bin weights is shown in Figure 4.1.

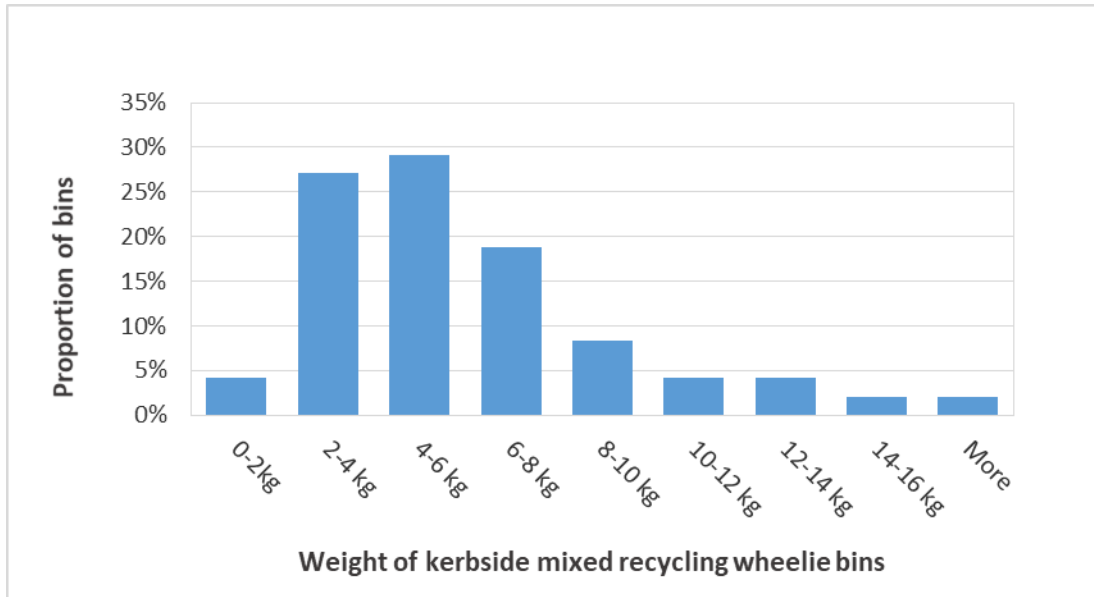


Figure 4.1 - Distribution of kerbside mixed recycling wheelie bin weights

The contents of 75% of bins weighed between two and eight kg. The contents of 8% of bins weighed more than 12 kg.

5 Discussion

5.1 Comparison to results of 2017 kerbside rubbish audit

In 2017, Zenic was contracted by Council to conduct an audit of kerbside rubbish, kerbside mixed recycling, and kerbside glass recycling. The kerbside services provided by Council at the time of the audit, May 2017, were the same as in 2020 and 2021.

The primary compositions from the results of the three audits of kerbside rubbish wheelie bins are compared in Table 5.1.

Table 5.1 - Comparison of 2017, 2020, and 2021 kerbside rubbish audits

Kerbside rubbish - December 2020, June 2021, compared to May 2017	Proportion of total weight			Mean weight per rubbish wheelie bin		
	June 2021	December 2020	May 2017	June 2021	December 2020	May 2017
Paper	8.7%	7.7%	9%	0.78 kg	0.83 kg	0.98 kg
Plastics	8.1%	7.7%	10%	0.73 kg	0.83 kg	1.13 kg
<i>Kitchen waste</i>	31.3%	23.0%	33%	2.81 kg	2.49 kg	2.52 kg
<i>Greenwaste</i>	20.2%	31.1%	13%	1.82 kg	3.37 kg	1.42 kg
<i>Other organic</i>	2.9%	2.0%	5%	0.26 kg	0.21 kg	0.52 kg
Organics - Subtotal	54.4%	56.1%	50%	4.89 kg	6.07 kg	5.45 kg
Ferrous metals	2.1%	1.9%	2%	0.19 kg	0.21 kg	0.22 kg
Non-ferrous metals	0.8%	0.9%	2%	0.07 kg	0.10 kg	0.20 kg
Glass	4.3%	3.0%	3%	0.39 kg	0.33 kg	0.37 kg
Textiles	4.8%	3.8%	6%	0.43 kg	0.41 kg	0.61 kg
Sanitary paper	7.3%	8.7%	10%	0.66 kg	0.94 kg	1.13 kg
Rubble	3.8%	5.6%	3%	0.34 kg	0.61 kg	0.28 kg
Timber	2.4%	1.9%	2%	0.21 kg	0.21 kg	0.22 kg
Rubber	1.0%	1.1%	1%	0.09 kg	0.12 kg	0.06 kg
Potentially hazardous	2.1%	1.5%	2%	0.19 kg	0.17 kg	0.24 kg
TOTAL	100.0%	100.0%	100%	8.98 kg	10.82 kg	10.89 kg

The primary composition and average weight of materials per kerbside wheelie bin were similar in the three audits. The significant difference is the weights of greenwaste, with there being significantly more greenwaste in December 2020 compared to May 2017 and June 2021. This difference is associated with the seasonal differences between the audits. The May 2017 and June 2021 audits took place in early winter, a time of low vegetative growth. The December 2020 audit took place in late spring, a time of high vegetative growth.

The lower quantity of sanitary paper in the three-day June 2021 audit may be related to the sample not being collected in all parts of the city. Some of the other differences may be related to the sorting criteria used in 2017 being different to those used in the 2020 and 2021 audits.

5.2 Comparison to results of 2017 kerbside mixed recycling audit

The primary compositions from the results of the two audits of kerbside mixed recycling wheelie bins are compared in Table 5.2. The secondary classifications, however, are not directly comparable. The recyclability criteria used for the 2020 audit were based on those shown in Appendix 3, which limit the types of plastics that can be recycled to bottles and containers. This differs to the criteria used for the 2017 audit:

“Plastic 6 included a number of meat trays and Plastic 7 included toys, garden plastics and other low-grade plastics which are frequently not recyclable. The Council website allows all Plastics (Numbers 1 – 7) except plastic bags/plastic film to be placed in the recycling bin.”¹*

The 2017 audit did not include a classification for non-recyclable paper. As a result, it is not clear how, for example, food-contaminated or laminated paper were classified.

Table 5.2 - Comparison of 2017 and 2020 kerbside mixed recycling audits

Rotorua Lakes Council Kerbside mixed recycling December 2020 compared to May 2017		Proportion of total weight		Mean weight per mixed recycling wheelie bin	
		2020	2017	2020	2017
Paper	Recyclable paper	67.2%	56%	4.08 kg	3.85 kg
	Non-recyclable paper	1.6%		0.10 kg	
	Subtotal	68.8%	56%	4.18 kg	3.85 kg
Plastic	# 1,2,5	12.6%	24%	0.77 kg	1.63 kg
	# 3,4,6,7	1.0%	4%	0.06 kg	0.33 kg
	Plastic bags/film	1.0%	1%	0.06 kg	0.09 kg
	Other non-recyclable	3.1%	-	0.19 kg	-
	Subtotal	17.7%	29%	1.08 kg	2.05 kg
Ferrous	Steel cans	3.6%	4%	0.22 kg	0.28 kg
	Steel other	0.2%	0%	0.01 kg	0.02 kg
	Subtotal	3.8%	4%	0.23 kg	0.30 kg
Non ferrous	Aluminium cans	2.1%	2%	0.13 kg	0.12 kg
	Non-ferrous other	0.9%	1%	0.05 kg	0.07 kg
	Subtotal	3.0%	3%	0.18 kg	0.19 kg
Glass	Recyclable glass	2.0%	1%	0.12 kg	0.09 kg
	Non-recyclable glass	0.0%	0%	0.00 kg	0.00 kg
	Subtotal	2.0%	1%	0.12 kg	0.09 kg
Bagged rubbish		0.0%	-	0.00 kg	-
All other material		4.7%	5%	0.29 kg	0.45 kg
TOTAL		100.0%	100%	6.07 kg	6.93 kg

A significant difference between the two audits of kerbside mixed recycling was the quantity per bin of plastics. There is no obvious explanation for this difference.

¹ Zencic (2017) *Solid Waste Compositional Audit*, prepared for Rotorua Lakes Council

Appendix 1 - Kerbside rubbish classifications

Primary category	Secondary category	Definitions
Paper	Recyclable paper	Clean cardboard incl. pizza boxes, newspapers, brochures, office paper, magazines, books, printer paper, junk mail, other paper packaging
	Non-recyclable paper	Non-recyclable paper packaging (wet-strength, food contaminated), coffee cups, photographic paper, playing cards, laminated paper, Tetra Pak, gabletop.
Plastics	#1,2,5 bottles & containers	Bottles & containers with recycling # 1,2,5
	#3,4,6 7 bottles & container	Bottles & containers with recycling # 3,4,6,7
	Plastic bags/film	All plastic bags, film, and other soft plastics
	Other non-recyclable	Non-recyclable plastic packaging, including polystyrene meat trays, paint, engine oil, and chemical containers. All other non-packaging materials made primarily of plastic
Organics	Kitchen waste	All kitchen food waste
	Greenwaste	All organic garden waste, excludes soil
	Multimaterial/ other	All other primarily organic items – includes cat tray litter, hair, vacuum cleaner bags
Ferrous metals	Steel cans	All steel cans, except aerosol cans
	Steel other	All other items made primarily of ferrous metal
Non-ferrous metals	Aluminium cans	Food and other aluminium cans, except aerosol cans
	Non-ferrous other	All other items made primarily of non-ferrous metal
Glass	Recyclable glass	Jars, bottles, and other recyclable containers
	Non-recyclable glass	All other items made primarily of glass, includes light bulbs, drinking glasses, and window glass
Textiles	Clothing & textile	All items primarily made of a fabric, such as clothes, curtains, suitable for rags
	Other textiles	Includes shoes, backpacks, handbags, rugs, not suitable for rags
Sanitary paper		Includes disposable nappies, paper towels, tissues
Rubble, concrete		All concrete, rubble, ceramics, and soil
Timber		All items made primarily of timber
Rubber		All items made primarily of rubber (e.g. kitchen gloves)
Potentially hazardous	Household	Batteries, aerosol cans, medicines and cosmetics, cleaning agents
	Other	Potentially hazardous items not associated with domestic activity, such as used oil and garden chemicals.

Appendix 2 - Mixed recycling classifications

Primary category	Secondary category	Definitions
Paper	Recyclable paper	Clean cardboard incl. pizza boxes, newspapers, brochures, office paper, magazines, books, printer paper, junk mail, other paper packaging
	Non-recyclable paper	Non-recyclable paper packaging (wet-strength, food contaminated), coffee cups, photographic paper, playing cards, laminated paper, Tetra Pak, gabletop.
Plastics	#1,2,5 bottles & containers	bottles & containers with recycling # 1,2,5
	#3,4,6 7 bottles & container	Other bottles & containers with recycling # 3,4,6,7
	Plastic bags/film	All plastic bags, film, and other soft plastics
	Other non-recyclable	Non-recyclable plastic packaging, including polystyrene meat trays, paint, engine oil, and chemical containers. All other non-packaging materials made primarily of plastic
Ferrous metals	Steel cans	All steel cans, except aerosol cans
	Steel other	All other items made primarily of ferrous metal
Non-ferrous metals	Aluminium cans	Food and other aluminium cans, except aerosol cans
	Non-ferrous other	All other items made primarily of non-ferrous metal
Glass	Recyclable glass	Jars, bottles, and other recyclable containers
	Non-recyclable glass	All other items made primarily of glass, includes light bulbs, drinking glasses, and window glass
Bagged rubbish		Bags of rubbish
All other materials		All items that do not fit into any of the other classifications

Appendix 3 - Council recycling instructions

Sorting your rubbish and recycling

What you can put into your yellow lid recycling bin:

All items must be clean and dry so they don't contaminate the other recyclables in your bin.

- Paper and cardboard
 - Cardboard packaging
 - Clean pizza boxes
 - Egg cartons
 - Envelopes and junk mail
 - Newspaper and magazines
- Aluminium and tin cans
 - Clean food cans
- Plastics number 1 – 7
 - Cleaning bottles
 - Ice cream containers
 - Plastic drink bottles
 - Plastic milk bottles
 - Plastic tubs (e.g margarine containers)
 - Yoghurt tubs



What should not go into your yellow recycling bin:

Note: This list does not include all non-recyclable items. If you need clarification on whether something is recyclable or not, please call 07 348 4199 to speak to a customer advisor.

- Bubble wrap
- Wood or building materials
- Empty aerosol cans (e.g deodorant)
- Plastic bags
- Plastic film, such as cling wrap
- Building paper
- Batteries (these can be recycled at the recycling centre only)
- CD, videos and cases they come in
- Clothing or shoes
- Coat hangers of any sort
- Crockery and ceramics
- Dead animals/pets
- Drinking glasses or crockery
- Electronic items
- Fireworks
- Food
- Foil or other metal objects including machinery
- Garden waste
- Glass
- Household appliances
- Light bulbs or window glass
- Liquids or food
- Lithium batteries (fire hazard risk)
- Medical products
- Nappies
- Polystyrene (e.g noodle containers, meat trays or foam packaging)
- Small household appliances
- Tetrapaks
- Wet paper or used paper towels

Appendix 4 - December 2020 - Kerbside rubbish

A 4.1 - Sampling schedule - December 2020

The sample of Rotorua kerbside rubbish and recycling was collected on the five collection days between 9 December and 15 December 2020 from the streets shown in Table A.4.1.

Table A.4.1 - Streets sampled for kerbside rubbish and recycling audit

Date	Street	Date	Street
9 Dec	Kowhai Street	11 Dec	Te Ngai Road
9 Dec	Wylie Street	11 Dec	Basley Road
9 Dec	Sophra Street	11 Dec	Blackmore Drive
9 Dec	Ranolf Street	11 Dec	Iles Road
9 Dec	Carlton Street	14 Dec	Old Quarry Road
9 Dec	Devon Street	14 Dec	Korimako Street
9 Dec	Lytton Street	14 Dec	Mallard Drive
9 Dec	Duncan Street	14 Dec	Matuku Street
9 Dec	Arthur Street	14 Dec	Teal Place
10 Dec	Hall Road	14 Dec	Gordon Road
10 Dec	Everard Place	14 Dec	Park Road
10 Dec	School Road	14 Dec	Brookland Road
10 Dec	Neil Road	14 Dec	Ross Road
10 Dec	Kawaha Point Road	14 Dec	Roosevelt Road
10 Dec	Koutu Road	14 Dec	Inverness Road
10 Dec	Victory Street	14 Dec	Upland Road
10 Dec	Salisbury Road	15 Dec	Manuka Crescent
10 Dec	Walker Road	15 Dec	Puriri Crescent
11 Dec	Coulter Road	15 Dec	Otonga Road
11 Dec	Glenfield Road	15 Dec	Whau Street
11 Dec	Wharenui Road	15 Dec	Jackson Street
11 Dec	Te Ngai Road	15 Dec	Nikau Street
11 Dec	Stanley Drive	15 Dec	Old Taupo Road
11 Dec	Elliott Crescent	15 Dec	Horoeka Street
11 Dec	Walnut Place		

A 4.2 - Composition of kerbside rubbish - December 2020

A total of 212 x 140-litre kerbside rubbish wheelie bins were sorted for the audit. The sorted rubbish weighed 2,295 kg.

The primary composition of kerbside rubbish is presented in Table A.4.2 below and Figure A.4.1 on the following page. The secondary composition, which includes all 23 categories is given in section A.4.2.4.

Data provided by Council indicated that, during November and December 2020, an average of 339 tonnes per week of kerbside rubbish was collected by Smart Environmental Ltd, Council's kerbside collection contractor. This tonnage is applied to the audit results throughout this section.

Table A.4.2 - Primary composition of kerbside rubbish - December 2020

Rotorua Lakes Council - Kerbside rubbish - December 2020 (margins of error for 95% confidence level)	Proportion of total weight	Mean weight. per wheelie bin	Tonnes per week
Paper	7.7% (±2.3%)	0.83 kg (±0.25 kg)	26 T/week
Plastics	7.7% (±0.9%)	0.83 kg (±0.09 kg)	26 T/week
Organics	56.1% (±7.2%)	6.07 kg (±0.78 kg)	190 T/week
Ferrous metals	1.9% (±0.6%)	0.21 kg (±0.07 kg)	7 T/week
Non-ferrous metals	0.9% (±0.4%)	0.10 kg (±0.04 kg)	3 T/week
Glass	3.0% (±1.3%)	0.33 kg (±0.14 kg)	10 T/week
Textiles	3.8% (±1.5%)	0.41 kg (±0.16 kg)	13 T/week
Sanitary paper	8.7% (±1.9%)	0.94 kg (±0.20 kg)	30 T/week
Rubble	5.6% (±2.8%)	0.61 kg (±0.30 kg)	19 T/week
Timber	1.9% (±1.2%)	0.21 kg (±0.13 kg)	7 T/week
Rubber	1.1% (±0.6%)	0.12 kg (±0.07 kg)	4 T/week
Potentially hazardous	1.5% (±0.8%)	0.17 kg (±0.08 kg)	5 T/week
TOTAL	100.0%	10.82 kg (±1.01 kg)	339 T/week

The average contents of a 140-litre Rotorua Lakes Council kerbside rubbish bin weighed 10.82 kg. Organic material, over half of which was greenwaste, was the largest component of kerbside rubbish, comprising 56.1% of the total weight or 6.07 kg in the average kerbside rubbish bin.

Sanitary paper, which included nappies, tissues, and paper towels, was the second largest component, comprising 8.7% of the total weight, or 0.94 kg per bin. Plastics and paper both represented 7.7% of the total weight, with an average of 0.83 kg in each rubbish bin.

The largest components of kerbside rubbish are discussed in greater detail in the following sections.

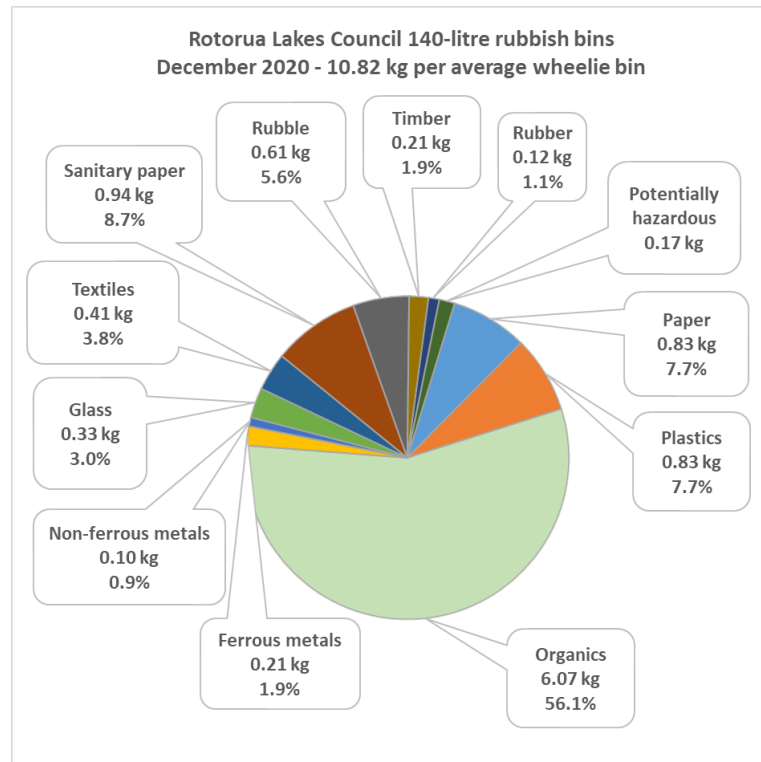


Figure A.4.1 - Primary composition of kerbside rubbish - December 2020

A 4.2.1 - Organic matter in kerbside rubbish wheelie bins - December 2020

Organic matter comprised 56.1% of the weight of kerbside rubbish. The composition of the organic constituent of the rubbish is shown in Figure A.4.2. Greenwaste comprised 55% of organic material, or 3.37 kg per wheelie bin. Kitchen waste comprised 41% of the organic material, an average of 2.49 kg per wheelie bin. Kitchen waste included food preparation waste, left-over food waste, and substantial quantities of perished goods. The ‘Other organic’ material (4% of organic waste) included vacuum cleaner dust, animal faeces, candles, fireplace ash, and human hair. Much of this material would be suitable for composting.

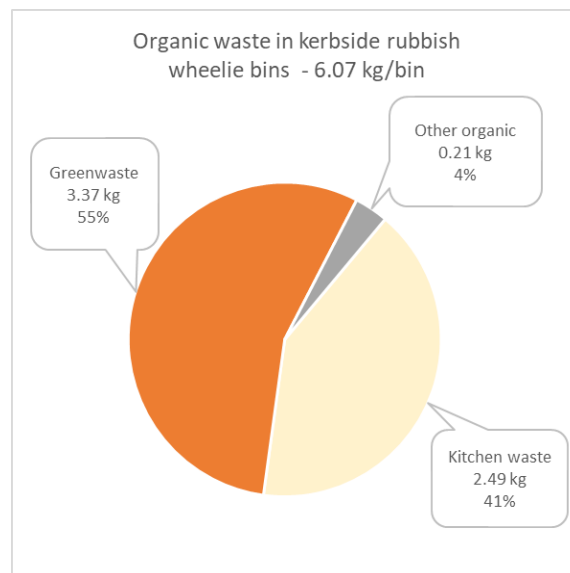


Figure A.4.2 - Organic component of kerbside rubbish

A 4.2.2 - Plastics in kerbside rubbish wheelie bins - December 2020

Plastics comprised 7.7% of material in the kerbside rubbish wheelie bins, an average of 0.83 kg per bin. The composition of the plastics constituent of the rubbish is shown in Figure A.4.3. Plastic bags/film (soft plastics) were the major component of plastics in kerbside rubbish, comprising 52% of all plastics. Other non-recyclable plastics and #1,2,5 bottles & containers both comprised 20% of plastics.

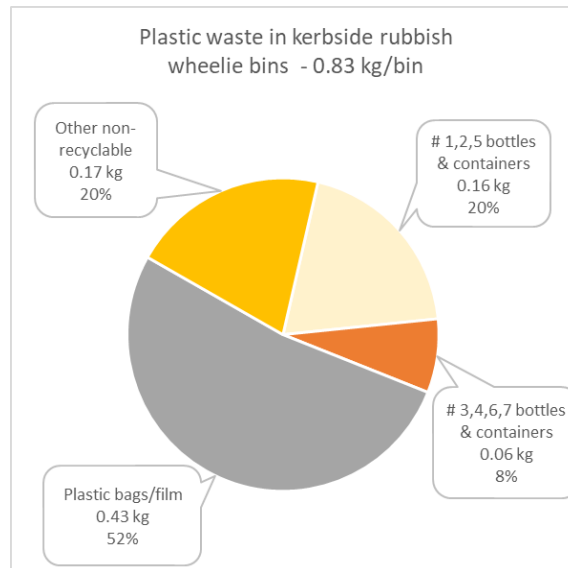


Figure A.4.3 - Plastics component of kerbside rubbish

A 4.2.3 - Paper in kerbside rubbish wheelie bins - December 2020

Paper also comprised 7.7% of material in the kerbside rubbish wheelie bins, an average of 0.83 kg per bin. The composition of the paper constituent of the rubbish is shown in Figure A.4.4. Recyclable paper comprised 79% of paper, or 0.66 kg per bin. Non-recyclable paper, such as food-contaminated paper, comprised 21% of paper. Some non-recyclable papers would be suitable for composting.

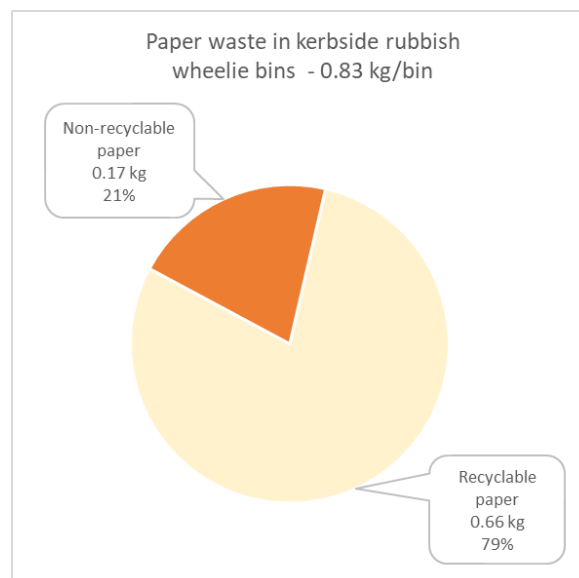


Figure A.4.4 - Paper component of kerbside rubbish

A 4.2.4 - Secondary composition of kerbside rubbish - December 2020

Rotorua Lakes Council - Kerbside rubbish - December 2020 (margins of error for 95% confidence level)		% of total weight	Kg per kerbside rubbish wheelie bin	Tonnes per week
Paper	Recyclable paper	6.1% (±2.3%)	0.66 kg (±0.25 kg)	21 T/week
	Non-recyclable paper	1.6% (±0.3%)	0.17 kg (±0.03 kg)	5 T/week
	Subtotal	7.7% (±2.3%)	0.83 kg (±0.25 kg)	26 T/week
Plastics	# 1,2,5 bottles & containers	1.5% (±0.2%)	0.16 kg (±0.03 kg)	5 T/week
	# 3,4,6,7 bottles & containers	0.6% (±0.1%)	0.06 kg (±0.02 kg)	2 T/week
	Plastic bags & film	4.0% (±0.4%)	0.43 kg (±0.05 kg)	14 T/week
	Other non-recyclable	1.6% (±0.5%)	0.17 kg (±0.06 kg)	5 T/week
	Subtotal	7.7% (±0.9%)	0.83 kg (±0.09 kg)	26 T/week
Organics	Kitchen waste	23.0% (±2.8%)	2.49 kg (±0.31 kg)	78 T/week
	Greenwaste	31.1% (±7.3%)	3.37 kg (±0.79 kg)	105 T/week
	Organic other	2.0% (±0.8%)	0.21 kg (±0.09 kg)	7 T/week
	Subtotal	56.1% (±7.2%)	6.07 kg (±0.78 kg)	190 T/week
Ferrous metals	Steel cans	0.7% (±0.2%)	0.07 kg (±0.02 kg)	2 T/week
	Steel other	1.3% (±0.6%)	0.14 kg (±0.07 kg)	4 T/week
	Subtotal	1.9% (±0.6%)	0.21 kg (±0.07 kg)	7 T/week
Non ferrous metals	Aluminium cans	0.4% (±0.1%)	0.04 kg (±0.01 kg)	1 T/week
	Non-ferrous other	0.5% (±0.3%)	0.05 kg (±0.04 kg)	2 T/week
	Subtotal	0.9% (±0.4%)	0.10 kg (±0.04 kg)	3 T/week
Glass	Recyclable glass	2.5% (±1.2%)	0.28 kg (±0.13 kg)	9 T/week
	Non-recyclable glass	0.5% (±0.4%)	0.05 kg (±0.05 kg)	2 T/week
	Subtotal	3.0% (±1.3%)	0.33 kg (±0.14 kg)	10 T/week
Textiles	Clothing/textiles	2.7% (±1.3%)	0.29 kg (±0.14 kg)	9 T/week
	Other textiles	1.1% (±0.4%)	0.12 kg (±0.05 kg)	4 T/week
	Subtotal	3.8% (±1.5%)	0.41 kg (±0.16 kg)	13 T/week
Sanitary paper		8.7% (±1.9%)	0.94 kg (±0.20 kg)	30 T/week
Rubble		5.6% (±2.8%)	0.61 kg (±0.30 kg)	19 T/week
Timber		1.9% (±1.2%)	0.21 kg (±0.13 kg)	7 T/week
Rubber		1.1% (±0.6%)	0.12 kg (±0.07 kg)	4 T/week
Potentially hazardous	Household	1.2% (±0.7%)	0.13 kg (±0.08 kg)	4 T/week
	Other	0.3% (±0.2%)	0.03 kg (±0.02 kg)	1 T/week
	Subtotal	1.5% (±0.8%)	0.17 kg (±0.08 kg)	5 T/week
TOTAL		100.0%	10.82 kg (±1.01 kg)	339 T/week

A 4.2.5 - Distribution of kerbside rubbish bin weights - December 2020

A total of 212 kerbside rubbish wheelie bins were sorted for the audit. The sorted rubbish weighed 2,295 kg. The average weight of rubbish in Council’s 140-litre kerbside rubbish wheelie bins was 10.82 kg.

The median rubbish wheelie bin weight was 9.94. The contents of the lightest bin weighed 0.47 kg and the contents of the heaviest, 46.79 kg. The distribution of the weights of the contents of rubbish wheelie bins is shown in Figure A.4.5.

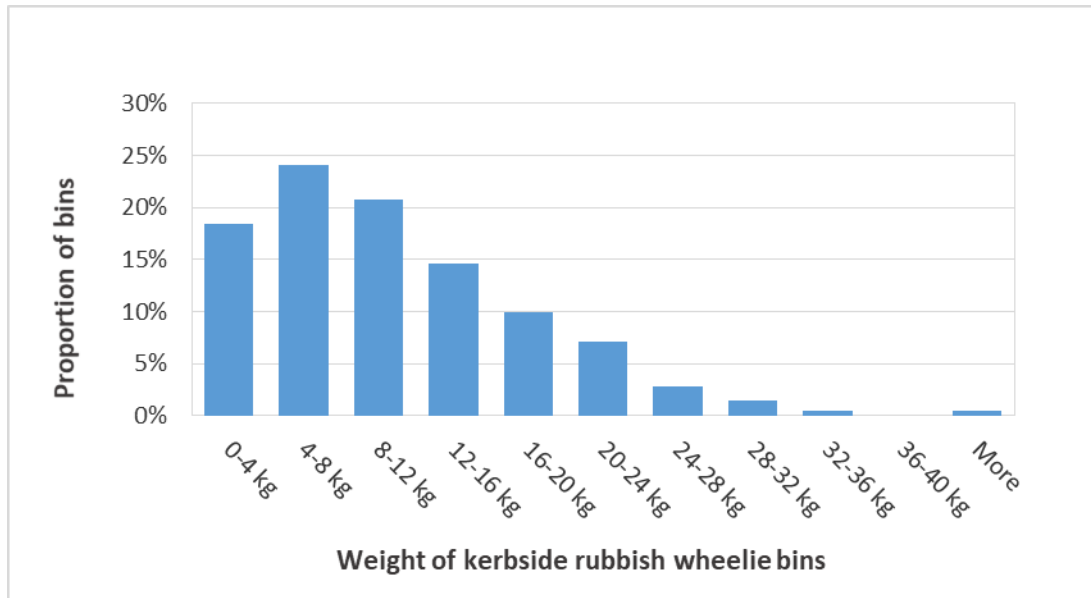


Figure A.4.5 - Distribution of kerbside rubbish wheelie bin weights

The contents of 18% of wheelie bins weighed less than four kilograms. The contents of 59% weighed between four and 16 kg. The contents of 12% weighed over 20 kilograms.

A 4.2.6 - Diversion potential of kerbside rubbish - December 2020

To reduce waste to landfill, Council provides residential properties in the district with separate kerbside collections of mixed recycling and glass. The kerbside mixed recycling collection accepts #1-7 plastic bottles and containers, clean cardboard and paper, and steel and aluminium cans, excluding aerosols.

Council’s educational material on recycling is presented in Appendix 3. While the educational material indicates that #1-7 plastic bottles and containers are acceptable for the kerbside collection, #3,4,6,7 plastics are currently being landfilled by the processing facility.

Council also operates a recycling centre in Rotorua and four rural recycling drop-off centres that accept all of the materials accepted by the kerbside recycling collections.

For the disposal of greenwaste, residents can home-compost or deliver the material to Council’s four rural transfer stations or Rotorua landfill. For the disposal of food waste, residents can home-compost, establish a worm farm, or feed the food waste to hens or other animals.

Table A.4.3 shows the proportion of rubbish in kerbside rubbish bins that could have been diverted from landfill disposal using these methods. The weight of each material per average kerbside rubbish bin is also shown.

Table A.4.3 - Diversion potential of kerbside rubbish

Rotorua Lakes Council Kerbside rubbish wheelie bins December 2020 - Diversion potential	% of total weight	Weight per bin	Tonnes per week
RECYCLABLE MATERIALS			
Paper Recyclable	6.1%	0.66 kg	21 T/week
Plastics #1,2,5 bottles & containers	1.5%	0.16 kg	5 T/week
Plastics # 3,4,6,7 bottles & containers	0.6%	0.06 kg	2 T/week
Steel cans	0.7%	0.07 kg	2 T/week
Aluminium cans	0.4%	0.04 kg	1 T/week
Recyclable glass	2.5%	0.28 kg	9 T/week
Subtotal	11.8%	1.28 kg	40 T/week
COMPOSTABLE MATERIALS			
Organics Kitchen waste	23.0%	2.49 kg	78 T/week
Organics Greenwaste	31.1%	3.37 kg	105 T/week
Subtotal	54.2%	5.86 kg	184 T/week
TOTAL DIVERTABLE	66.0%	7.14 kg	224 T/week

Approximately 11.8%, by weight, of the materials in kerbside rubbish bins could have been recycled through Council's kerbside recycling collection or at the recycling drop-off centres. This equates to 1.28 kg in the average kerbside rubbish bin or 40 tonnes per week.

A further 54.2% of materials, by weight, could have been composted, either at home or, in the case of greenwaste, by being disposed of at the four rural transfer stations or Rotorua landfill. This equates to 5.86 kg in the average kerbside rubbish bin or 184 tonnes per week.

Overall, 66.0%, by weight, of materials in kerbside rubbish bins could have been recycled or composted. This equates to approximately 224 tonnes per week. This is a theoretical maximum, as no system is able to divert all of a material.

Other materials, such as clothing and other metals, are also recyclable but have not been included in these calculations. A proportion of non-recyclable paper, such as pizza boxes, and some sanitary paper, such as tissues and paper towels, could be composted.

Appendix 5 - June 2021 - Kerbside rubbish

A 5.1 - Sampling schedule - June 2021

The sample of Rotorua kerbside rubbish was collected on the three collection days from Wednesday 16 - Friday 18 June 2021 from the streets shown in Table A.5.1.

Table A.5.1 - Streets sampled for kerbside rubbish and recycling audit

Date	Street	Date	Street
16 June	Ranolf Street	17 June	Reeme Street
16 June	Devon Street	17 June	Kawaha Point Road
16 June	Kowhai Street	17 June	Grand Vue Road
16 June	Wylie Street	17 June	Tirita Road
16 June	Lytton Street	18 June	Wharenui Road
16 June	Sophia Street	18 June	Glenfield Road
16 June	Carlton Street	18 June	Brent Rd Road
16 June	Duncan Street	18 June	Morey Street
17 June	Hall Road	18 June	McKenzie Road
17 June	Everard Place	18 June	Basley Road
17 June	Hood Street	18 June	Blackmore Drive
17 June	Operiana Street	18 June	Mark Place
17 June	Okona Crescent	18 June	Gareth Place

A 5.2 - Composition of kerbside rubbish - June 2021

A total of 156 x 140-litre kerbside rubbish wheelie bins were sorted for the audit. The sorted rubbish weighed 1,401 kg.

The primary composition of kerbside rubbish is presented in Table A.5.2 below and Figure A.5.1 on the following page. The secondary composition, which includes all 23 categories is given in section A 5.2.4.

Data provided by Council indicated that, during May and June 2021, an average of 314 tonnes per week of kerbside rubbish was collected by Smart Environmental Ltd, Council's kerbside collection contractor. This tonnage is applied to the audit results throughout this section.

Table A.5.2 - Primary composition of kerbside rubbish - June 2021

Rotorua Lakes Council - Kerbside rubbish - June 2021 (margins of error for 95% confidence level)	Proportion of total weight	Mean weight. per wheelie bin	Tonnes per week
Paper	8.7% (±5.8%)	0.78 kg (±0.52 kg)	27 T/week
Plastics	8.1% (±1.2%)	0.73 kg (±0.11 kg)	26 T/week
Organics	54.4% (±9.5%)	4.89 kg (±0.85 kg)	171 T/week
Ferrous metals	2.1% (±1.0%)	0.19 kg (±0.09 kg)	7 T/week
Non-ferrous metals	0.8% (±0.2%)	0.07 kg (±0.02 kg)	3 T/week
Glass	4.3% (±2.1%)	0.39 kg (±0.18 kg)	13 T/week
Textiles	4.8% (±3.2%)	0.43 kg (±0.29 kg)	15 T/week
Sanitary paper	7.3% (±1.9%)	0.66 kg (±0.18 kg)	23 T/week
Rubble	3.8% (±2.6%)	0.34 kg (±0.23 kg)	12 T/week
Timber	2.4% (±2.6%)	0.21 kg (±0.23 kg)	8 T/week
Rubber	1.0% (±1.3%)	0.09 kg (±0.11 kg)	3 T/week
Potentially hazardous	2.1% (±2.5%)	0.19 kg (±0.23 kg)	7 T/week
TOTAL	100.0%	8.98 kg (±1.20 kg)	314 T/week

The average contents of a 140-litre Rotorua Lakes Council kerbside rubbish bin weighed 8.98 kg. Organic material, over one-third of which was greenwaste, was the largest component of kerbside rubbish, comprising 54.4% of the total weight or 4.89 kg in the average kerbside rubbish bin.

Paper was the second largest component, comprising 8.7% of the total weight, with an average of 0.78 kg in each rubbish bin. . Plastics was the third largest component, comprising 8.1% of the total weight (0.73 kg), and sanitary paper, which included nappies, tissues, and paper towels, comprised 7.3% of the total weight, or 0.66 kg per bin

The largest components of kerbside rubbish are discussed in greater detail in the following sections.

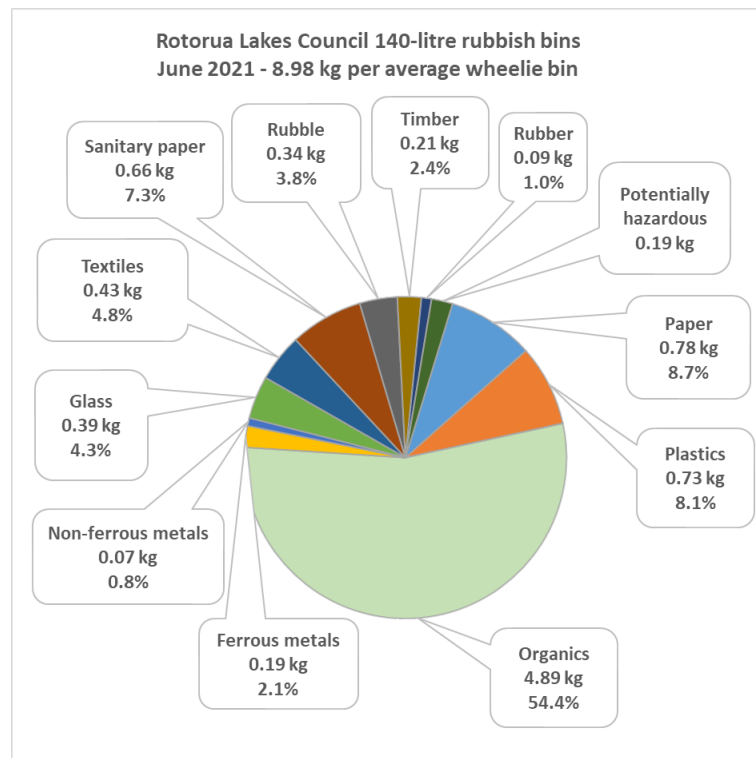


Figure A.5.1 - Primary composition of kerbside rubbish - June 2021

A 5.2.1 - Organic matter in kerbside rubbish wheelie bins - June 2021

Organic matter comprised 54.4% of the weight of kerbside rubbish. The composition of the organic constituent of the rubbish is shown in Figure A.5.2. Kitchen waste comprised 58% of the organic material, an average of 2.81 kg per wheelie bin. Kitchen waste included food preparation waste, left-over food waste, and substantial quantities of perished goods. Greenwaste comprised 37% of organic material, or 1.82 kg per wheelie bin. The 'Other organic' material (5% of organic waste) included vacuum cleaner dust, animal faeces, candles, fireplace ash, and human hair. Much of this material would be suitable for composting.

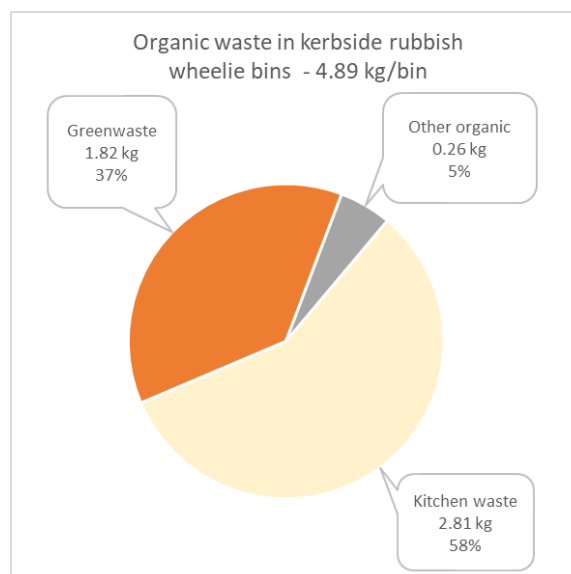


Figure A.5.2 - Organic component of kerbside rubbish

A 5.2.2 - Paper in kerbside rubbish wheelie bins - June 2021

Paper comprised 8.7% of material in the kerbside rubbish wheelie bins, an average of 0.78 kg per bin. The composition of the paper constituent of the rubbish is shown in Figure A.5.3. Recyclable paper comprised 85% of paper, or 0.66 kg per bin. Non-recyclable paper, such as food-contaminated paper, comprised 15% of paper. Some non-recyclable papers would be suitable for composting.

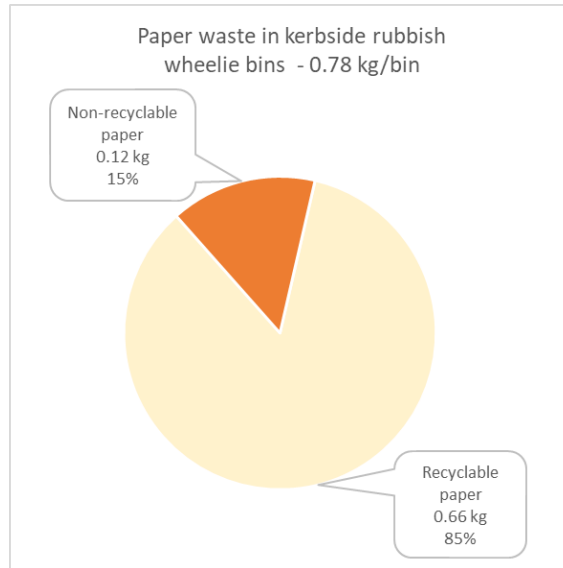


Figure A.5.3 - Paper component of kerbside rubbish

A 5.2.3 - Plastics in kerbside rubbish wheelie bins - June 2021

Plastics comprised 8.1% of material in the kerbside rubbish wheelie bins, an average of 0.73 kg per bin. The composition of the plastics constituent of the rubbish is shown in A.5.4. Plastic bags/film (soft plastics) were the major component of plastics in kerbside rubbish, comprising 48% of all plastics. Other non-recyclable plastics comprised 25% and #1,2,5 bottles & containers comprised 22% of plastics.

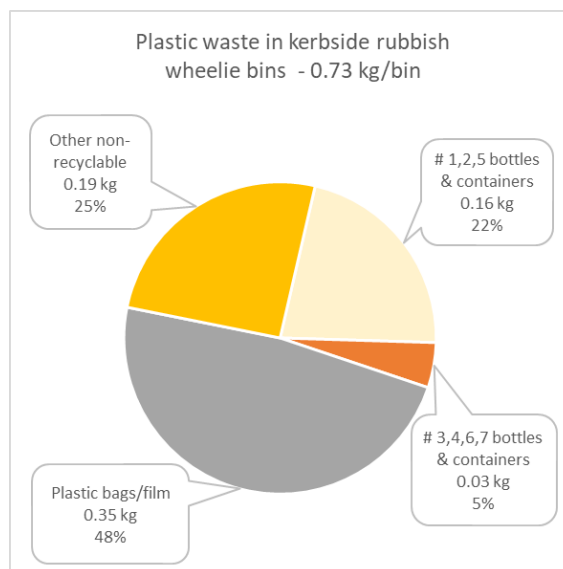


Figure A.5.4 - Plastics component of kerbside rubbish

A 5.2.4 - Secondary composition of kerbside rubbish - June 2021

Rotorua Lakes Council - Kerbside rubbish - June 2021 (margins of error for 95% confidence level)		% of total weight	Kg per kerbside rubbish wheelie bin	Tonnes per week
Paper	Recyclable paper	7.4% (±5.8%)	0.66 kg (±0.52 kg)	23 T/week
	Non-recyclable paper	1.3% (±0.5%)	0.12 kg (±0.04 kg)	4 T/week
	Subtotal	8.7% (±5.8%)	0.78 kg (±0.52 kg)	27 T/week
Plastics	# 1,2,5 bottles & containers	1.8% (±0.3%)	0.16 kg (±0.03 kg)	6 T/week
	# 3,4,6,7 bottles & containers	0.4% (±0.2%)	0.03 kg (±0.01 kg)	1 T/week
	Plastic bags & film	3.9% (±0.5%)	0.35 kg (±0.04 kg)	12 T/week
	Other non-recyclable	2.1% (±0.9%)	0.19 kg (±0.08 kg)	6 T/week
	Subtotal	8.1% (±1.2%)	0.73 kg (±0.11 kg)	26 T/week
Organics	Kitchen waste	31.3% (±4.4%)	2.81 kg (±0.40 kg)	98 T/week
	Greenwaste	20.2% (±9.7%)	1.82 kg (±0.87 kg)	63 T/week
	Organic other	2.9% (±1.4%)	0.26 kg (±0.13 kg)	9 T/week
	Subtotal	54.4% (±9.5%)	4.89 kg (±0.85 kg)	171 T/week
Ferrous metals	Steel cans	0.7% (±0.2%)	0.06 kg (±0.01 kg)	2 T/week
	Steel other	1.5% (±1.0%)	0.13 kg (±0.09 kg)	5 T/week
	Subtotal	2.1% (±1.0%)	0.19 kg (±0.09 kg)	7 T/week
Non ferrous metals	Aluminium cans	0.7% (±0.2%)	0.06 kg (±0.02 kg)	2 T/week
	Non-ferrous other	0.1% (±0.1%)	0.01 kg (±0.01 kg)	0 T/week
	Subtotal	0.8% (±0.2%)	0.07 kg (±0.02 kg)	3 T/week
Glass	Recyclable glass	3.6% (±2.1%)	0.33 kg (±0.18 kg)	11 T/week
	Non-recyclable glass	0.7% (±0.4%)	0.06 kg (±0.03 kg)	2 T/week
	Subtotal	4.3% (±2.1%)	0.39 kg (±0.18 kg)	13 T/week
Textiles	Clothing/textiles	1.9% (±0.9%)	0.17 kg (±0.08 kg)	6 T/week
	Other textiles	3.0% (±2.9%)	0.27 kg (±0.26 kg)	9 T/week
	Subtotal	4.8% (±3.2%)	0.43 kg (±0.29 kg)	15 T/week
Sanitary paper		7.3% (±1.9%)	0.66 kg (±0.18 kg)	23 T/week
Rubble		3.8% (±2.6%)	0.34 kg (±0.23 kg)	12 T/week
Timber		2.4% (±2.6%)	0.21 kg (±0.23 kg)	8 T/week
Rubber		1.0% (±1.3%)	0.09 kg (±0.11 kg)	3 T/week
Potentially hazardous	Household	1.8% (±2.5%)	0.16 kg (±0.23 kg)	6 T/week
	Other	0.3% (±0.3%)	0.03 kg (±0.03 kg)	1 T/week
	Subtotal	2.1% (±2.5%)	0.19 kg (±0.23 kg)	7 T/week
TOTAL		100.0%	8.98 kg (±1.20 kg)	314 T/week

A 5.2.5 - Distribution of kerbside rubbish bin weights - June 2021

A total of 156 kerbside rubbish wheelie bins were sorted for the audit. The sorted rubbish weighed 1,401 kg. The average weight of rubbish in Council’s 140-litre kerbside rubbish wheelie bins was 8.98 kg.

The median rubbish wheelie bin weight was 8.18. The contents of the lightest bin weighed 1.22 kg and the contents of the heaviest, 43.28 kg. The distribution of the weights of the contents of rubbish wheelie bins is shown in Figure A.5.5.

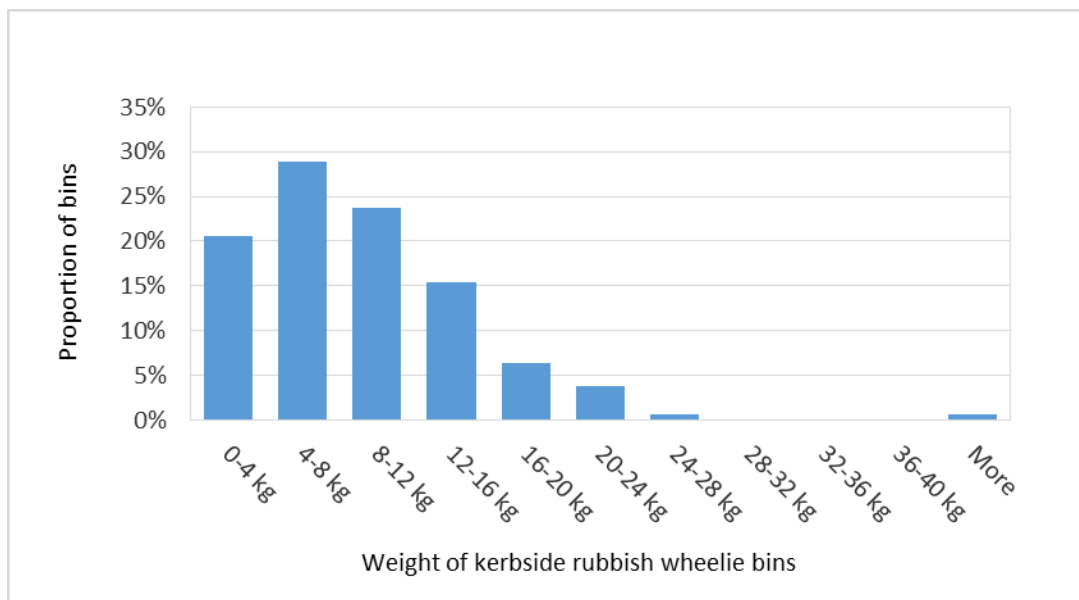


Figure A.5.5 - Distribution of kerbside rubbish wheelie bin weights

The contents of 21% of wheelie bins weighed less than four kilograms. The contents of 68% of bins weighed between four and 16 kg. The contents of 5% weighed over 20 kilograms.

A 5.2.6 - Diversion potential of kerbside rubbish - June 2021

To reduce waste to landfill, Council provides residential properties in the district with separate kerbside collections of mixed recycling and glass. The kerbside mixed recycling collection accepts #1-7 plastic bottles and containers, clean cardboard and paper, and steel and aluminium cans, excluding aerosols.

Council’s educational material on recycling is presented in Appendix 3. While the educational material indicates that #1-7 plastic bottles and containers are acceptable for the kerbside collection, #3,4,6,7 plastics are currently being landfilled by the processing facility.

Council also operates a recycling centre in Rotorua and four rural recycling drop-off centres that accept all of the materials accepted by the kerbside recycling collections.

For the disposal of greenwaste, residents can home-compost or deliver the material to Council’s four rural transfer stations or Rotorua landfill. For the disposal of food waste, residents can home-compost, establish a worm farm, or feed the food waste to hens or other animals.

Table A.5.3 shows the proportion of rubbish in kerbside rubbish bins that could have been diverted from landfill disposal using these methods. The weight of each material per average kerbside rubbish bin is also shown.

Table A.5.3 - Diversion potential of kerbside rubbish

Rotorua Lakes Council Kerbside rubbish wheelie bins June 2021 - Diversion potential	% of total weight	Weight per bin	Tonnes per week
RECYCLABLE MATERIALS			
Paper Recyclable	7.4%	0.66 kg	23 T/week
Plastics #1,2,5 bottles & containers	1.8%	0.16 kg	6 T/week
Plastics # 3,4,6,7 bottles & containers	0.4%	0.03 kg	1 T/week
Steel cans	0.7%	0.06 kg	2 T/week
Aluminium cans	0.7%	0.06 kg	2 T/week
Recyclable glass	3.6%	0.33 kg	11 T/week
Subtotal	14.5%	1.30 kg	46 T/week
COMPOSTABLE MATERIALS			
Organics Kitchen waste	31.3%	2.81 kg	98 T/week
Organics Greenwaste	20.2%	1.82 kg	63 T/week
Subtotal	51.5%	4.63 kg	162 T/week
TOTAL DIVERTABLE	66.0%	5.93 kg	207 T/week

Approximately 14.5%, by weight, of the materials in kerbside rubbish bins could have been recycled through Council's kerbside recycling collection or at the recycling drop-off centres. This equates to 1.30 kg in the average kerbside rubbish bin or 46 tonnes per week.

A further 51.5% of materials, by weight, could have been composted, either at home or, in the case of greenwaste, by being disposed of at the four rural transfer stations or Rotorua landfill. This equates to 4.63 kg in the average kerbside rubbish bin or 162 tonnes per week.

Overall, 66.0%, by weight, of materials in kerbside rubbish bins could have been recycled or composted. This equates to approximately 207 tonnes per week. This is a theoretical maximum, as no system is able to divert all of a material.

Other materials, such as clothing and other metals, are also recyclable but have not been included in these calculations. A proportion of non-recyclable paper, such as pizza boxes, and some sanitary paper, such as tissues and paper towels, could be composted.