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- Appendix B – Study Composition Results by Site
- Appendix C – Recycling Contamination Examples

## EXECUTIVE SUMMARY

The Township of Algonquin Highlands with the assistance of Waste Diversion Ontario’s Continuous Improvement Fund contracted AET Group Inc. to conduct a recycling depot material composition study. The waste study was conducted over 2 weeks between the dates of August 18<sup>th</sup> and August 28<sup>th</sup>, 2014 with the purpose to assess the composition of each of the two recycling streams (one 40 yard or 20 yard bin of each mixed fibres and mixed containers) at 4 different self drop recycling depots within the Township of Algonquin Highlands.

During the study period, AET staff sampled and classified a minimum 500 kilograms of recyclable material from the mixed fibres and mixed containers stream at each of 4 self drop recycling depots across the Township of Algonquin Highlands.

Key findings from Hawk Lake Recycling Depot:

- The mixed fibres bin composition consists of 95.60% recyclable fibres, 0.54% recyclable containers, and 3.86% all other non-recyclable materials.
- The mixed containers bin composition consists of 77.79% recyclable containers, 3.78% recyclable fibres, and 18.73% all other non-recyclable materials.
- The total overall weekly recycling composition consists of 55.42% recyclable fibres, 34.21% recyclable containers, and 10.37% of all other non-recyclable material (overall weekly contamination rate).

Key findings from Maple Lake Recycling Depot:

- The mixed fibres bin composition consists of 97.76% recyclable fibres, 0.44% recyclable containers, and 1.82% all other non-recyclable materials.
- The mixed containers bin composition consists of 78.34% recyclable containers, 4.54% recyclable fibres, and 17.12% all other non-recyclable materials.
- The total overall weekly recycling composition consists of 64.12% recyclable fibres, 28.53% recyclable containers, and 7.34% of all other non-recyclable material (overall weekly contamination rate).

Key findings from Dorset Recycling Depot:

- The mixed fibres bin composition consists of 97.63% recyclable fibres, 0.96% recyclable containers, and 1.41% all other non-recyclable materials.
- The mixed containers bin composition consists of 82.93% recyclable containers, 4.26% recyclable fibres, and 12.81% all other non-recyclable materials.
- The total overall weekly recycling composition consists of 58.44% recyclable fibres, 35.36% recyclable containers, and 6.20% of all other non-recyclable material (overall weekly contamination rate).

Key findings from Oxtongue Recycling Depot:

- The mixed fibres bin composition consists of 99.30% recyclable fibres, 0.01% recyclable containers, and 0.70% all other non-recyclable materials.
- The mixed containers bin composition consists of 92.35% recyclable containers, 0.54% recyclable fibres, and 7.12% all other non-recyclable materials.
- The total overall weekly recycling composition consists of 76.08% recyclable fibres, 21.71% recyclable containers, and 2.20% of all other non-recyclable material (overall weekly contamination rate).

Key Overall findings:

- The depot with the lowest total weekly contamination rate is Oxtongue at 2.20%.
- The depot with the highest total weekly contamination rate is Hawk Lake at 10.37%.
- The estimated overall weekly recycling contamination rate for the Township of Algonquin Highlands is 6.87%.

## 1.0 INTRODUCTION

### 1.1 Definitions

- Contamination Rate:** The percentage of material in a recycling stream that is not accepted in the current program.
- Recycling Stream:** Materials that are diverted from the garbage stream into either the fibres or containers bins at the self drop depots. It will include non-divertible or non-recyclable material (contamination) where the diversion programs are not operating at 100% efficiency.
- Cross Contamination:** Recyclable material placed within the wrong stream where the recycling program is not co-mingled. Example; placing an aluminum can into the mixed fibres bin rather than the mixed containers bin.

### 1.2 Background

The Township of Algonquin Highlands (The Township) with the assistance of Waste Diversion Ontario’s Continuous Improvement Fund, retained AET Group Inc. (AET) to conduct a recycling depot material composition study. The waste study was conducted between the dates of August 18<sup>th</sup> and August 28<sup>th</sup>, 2014 at the Hawk Lake, Maple Lake, Dorset, and Oxtongue depots. The purpose of the study was to assess the composition of each of the two recycling streams (mixed fibres and mixed containers) at 4 different self drop recycling depots within the Township of Algonquin Highlands. All of the Township’s depots are monitored during operating hours.

The hauling and processing of the Townships recycling is contracted to a private operator. The cost is determined by the contracted hauler/processor and based on average overall annual inbound tonnages not only from The Township, but all sources they service. By completing their own material composition study, a better understanding of *contamination rates* may be revealed. This in turn may aid in the planning process when developing new contracts which may ultimately save money.

The project has been delivered with the assistance of Waste Diversion Ontario's Continuous Improvement Fund, a fund financed by Ontario municipalities and stewards of blue box waste in Ontario.

### 1.3 Objectives

The recycling depot material composition study was intended to accomplish the following objectives when considering The Township’s current program:

- A detailed composition analysis of mixed fibres and mixed containers recycling sampled from 4 selected recycling depots;
- Analysis and reporting of the results with focus on contamination percentages and breakdown per select recycling depot.

### 1.4 Audit Scope

The Algonquin Highlands recycling depot material composition study was conducted from August 18<sup>th</sup> through August 28<sup>th</sup>, 2014 at 4 Township selected recycling depots across the Township of Algonquin Highlands. Specified samples were collected and audited to determine the material compositions (by weight) and (by percentage). The sources for the material audited included:

Material collected directly from self drop mixed fibres and mixed containers bins from Hawk Lake, Maple Lake, Dorset, and Oxtongue recycling depot.

The target weight for each sample was approximately 500 kg. A total of 2 samples were audited per recycling depot (1 per stream) over the study period.

The number of samples collected from each source and the corresponding weight is listed below.

**Table 1.1 Algonquin Highlands Sampling Log**

Sample Source	Number of Samples and Weight (kg)			
	Mixed Fibres	Weight	Mixed Containers	Weight
Hawk Lake	1	502.45	1	502.81
Maple Lake	1	500.64	1	501.69
Dorset	1	505.63	1	519.36
Oxtongue	1	509.12	1	501.74
<b>Total</b>	<b>4</b>	<b>2,017.84</b>	<b>4</b>	<b>2,025.60</b>



## **2.0 APPROACH AND METHODOLOGY**

### **2.1 General**

AET developed a sampling plan and schedule in consultation with the Township of Algonquin Highlands. The plan outlined a minimum specified number of samples to be collected from each recycling depot and specified recycling stream. The following sub-sections detail how samples were specifically collected and reviewed for each stream.

### **2.2 Bin Sampling Process**

Each recycling stream sample was collected by hand by AET employees. A minimum 500 kg sample was retrieved from each recycling stream bin through multiple scoops of full blue boxes or deposited bagged material. Sampling was executed using either a top down approach or through the bin access door depending on safety and efficiency. If space was an issue, the tops of the bins were lifted open and material was sampled from the top moving down. Where space was not an issue, the bin access door was opened and material was sampled from the entry point working inwards. Blue box scoops were random and focus on specific materials was not taken. If deposited bagged material was clearly within the sampling area of the bin, it was retrieved and sampled using the same process. Each full blue box or deposited bagged material retrieved from the recycling bin was weighed and sorted until the total sample size was a minimum of 500 kg.

### **2.3 Material Composition Auditing**

Each material sample (mixed fibres or mixed containers) was sorted, weighed, and recorded separately into its constituent material categories (refer to Appendix A for a full list of material categories).

Each material category was placed in plastic bins and weighed individually. A digital BLS Briefcase 40 scale (model 04020027), with precision to 0.01 kg, was used to weigh all of the sorted material. All of the recycling material sampled was audited and recorded.

The bins were tared and zeroed out to calculate the net sample weight for each material category. Photographs were taken of all materials prior to weighing.

## 2.4 Assumptions & Limitations

The assumptions used when assessing the waste audit results are as follows:

- That the recycling material samples gathered during the study period (1 mixed fibres, and 1 mixed containers per recycling depot) represents the average composition of recycling material generated per week in the Township of Algonquin Highlands per recycling depot.

The following limitations should be taken into consideration when interpreting the results of the study:

- Recyclable material composition may vary throughout the calendar year due to seasonal changes.
- Some material may have been stale with regards to how long the recycling bin had been collecting material since the last time it was serviced.
- Each of the recycling depots have different material generation periods and service schedules.
- Some material may have been damp due to weather conditions before or during sampling causing some specific material categories or items to be heavier when damp compared to when dry.
- The Townships current contracted service provider does not provide tonnage records for each stream separately, which makes it difficult to calculate relative generation rates and contamination rates over time.

## 2.5 Calculations

The calculations used to analyze the recycling material sampled at each of The Township’s bins can be seen below.

**Contamination Rate –**

$$\left( \frac{\text{unsuitable materials in the recycling stream}}{\text{total weight of material in the recycling stream}} \right) \times 100\%$$

### 3.0 RESULTS AND DISCUSSION

The following section summarizes the results of the sampled recycling material composition per recycling depot studied. Full detailed audit results, including completed breakdowns for each individual sample audited, can be found in Appendix B. All composition data is presented by weight and percentage of the total.

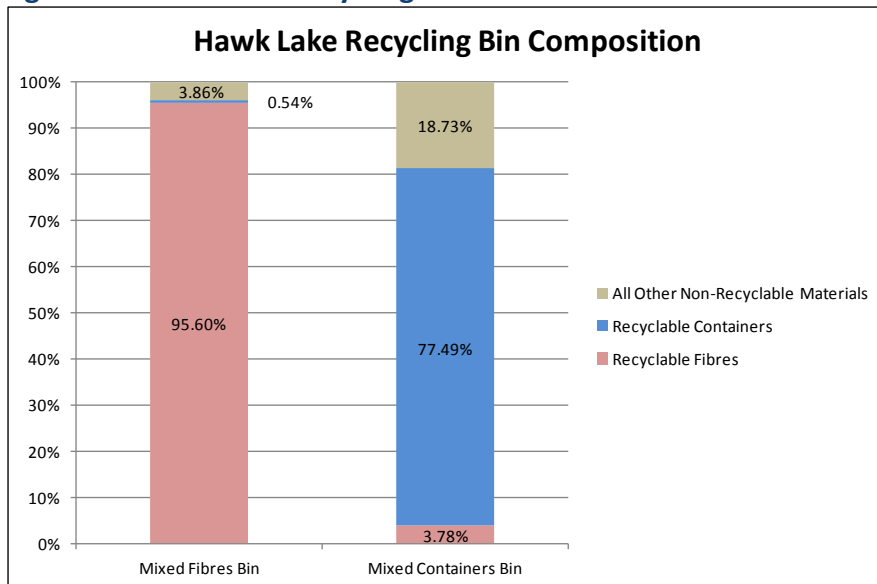
Each recycling depot results present the average composition by weight of material accepted and non accepted (non-recyclable/contamination) by specified recycling stream and sample size. The results are based on what The Township actually accepts within the recycling program at each of the depots as prescribed by the contracted service provider.

#### 3.1 Hawk Lake

Figure 3.1 illustrates the material composition breakdown of the samples retrieved from the Hawk Lake recycling depot by source type. The figure displays the percentage of the corresponding sample that is recyclable fibres, recyclable containers, and all other non-recyclable materials by total weight of sample retrieved.

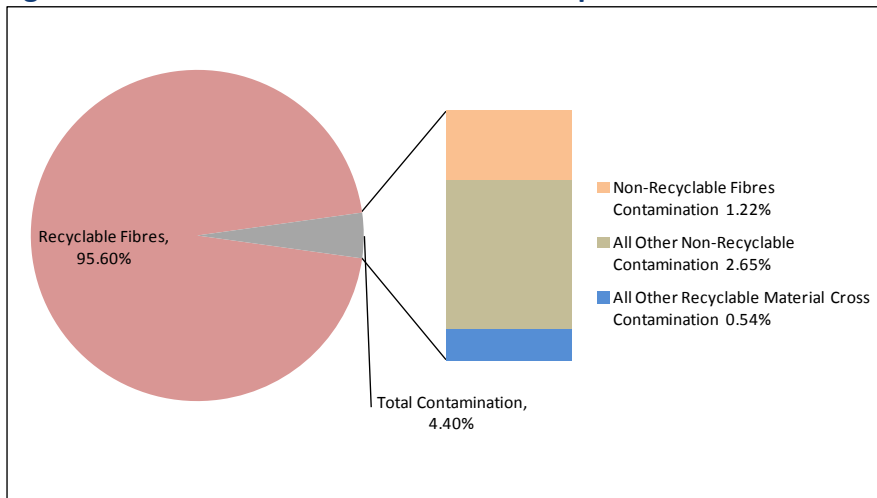
Of the total 502 kg of mixed fibres sampled, approximately 95.60% consisted of recyclable fibres, 0.54% recyclable containers, and 3.86% of all other non-recyclable material by weight. Of the 503 kg of mixed containers sampled, approximately 77.49% consisted of recyclable containers, 3.78% recyclable fibres, and 18.73% of all other non-recyclable materials by weight.

**Figure 3.1 Hawk Lake Recycling Bin Breakdown**



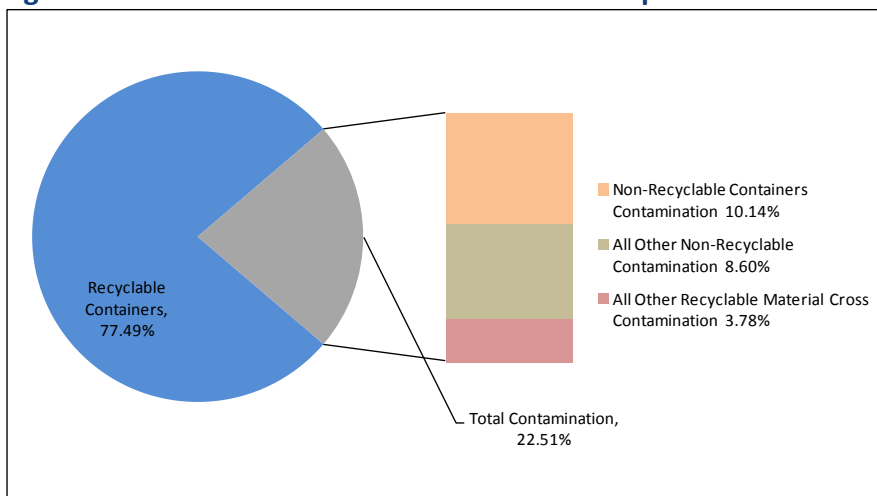
The following figures display the percent composition of the sample taken from each of the different source bins at Hawk Lake. The total contamination rate includes those materials that are not only non-recyclable but recyclable material placed within the wrong stream.

**Figure 3.2 Hawk Lake Mixed Fibres Bin Composition**



Other waste was noted as the greatest contributor to the contamination in the mixed fibres bin at approximately 2.44% of the total sample retrieved from the bin. This waste consisted mainly of textiles, paint trays, and house renovation debris such as flooring.

**Figure 3.3 Hawk Lake Mixed Containers Bin Composition**

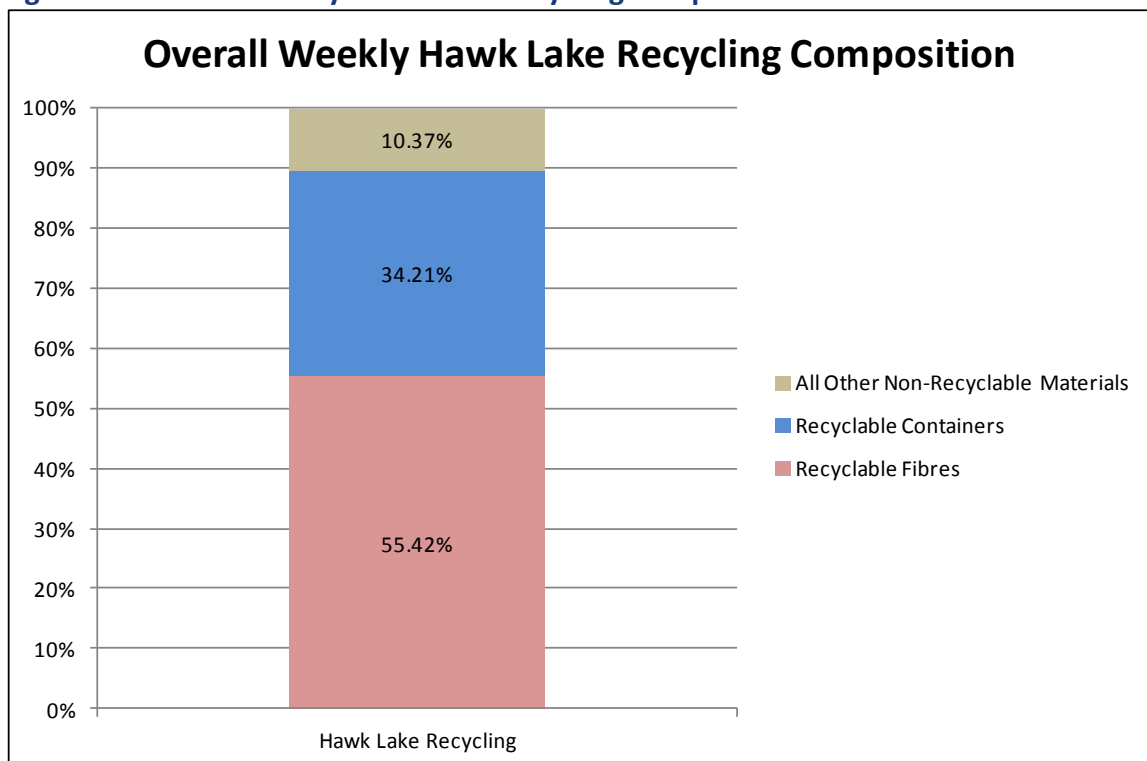


Other waste was also noted as the greatest contributor to the contamination in the mixed containers bin at 6.51% of the total sample retrieved from the bin. This waste consisted mainly of shoes, ceramics, different electronics, meat pads, small water filtre, personal care products,

and miscellaneous small debris sweepings. Non-recyclable plastics such as unmarked plastic packaging and durable plastic products consisting of Tupperware, utensils, a dish basin, and toys was also a significant contributor at 6.44%.

An overall weekly recycling composition was calculated by taking the total weight per stream (the total weight of material within each source bin), dividing by the number of generation days, and multiplying by 1 week (7 days). The following provides an idea of the overall weekly recycling composition (all recycling together, both mixed fibres and containers) and contamination rate for Hawk Lake.

**Figure 3.4 Overall Weekly Hawk Lake Recycling Composition**



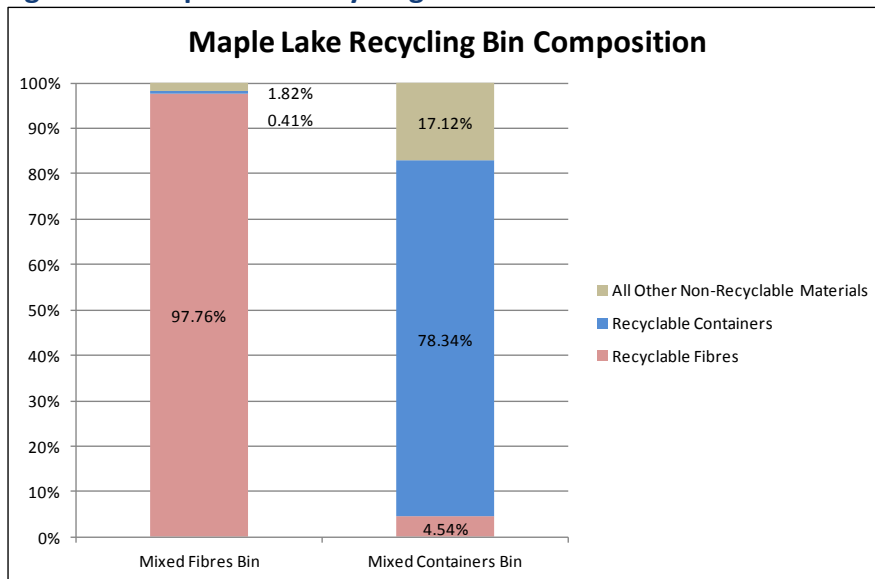
The overall weekly contamination rate for Hawk Lake is approximately 10.37% for both recycling stream sources combined.

### 3.2 Maple Lake

Figure 3.5 illustrates the material composition breakdown of the samples retrieved from the Maple Lake recycling depot by source type. The figure displays the percentage of the corresponding sample that is recyclable fibres, recyclable containers, and all other non-recyclable materials by total weight of sample retrieved.

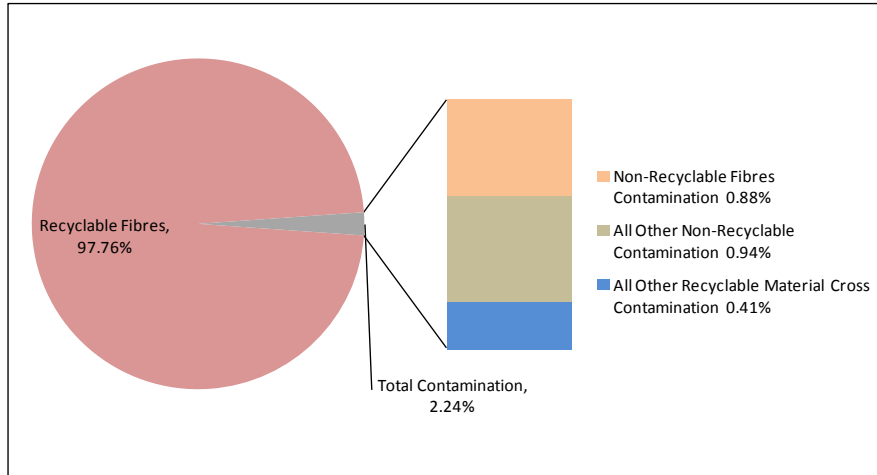
Of the total 501 kg of mixed fibres sampled, approximately 97.76% consisted of recyclable fibres, 0.41% recyclable containers, and 1.82% of all other non-recyclable material by weight. Of the 502 kg of mixed containers sampled, approximately 78.34% consisted of recyclable containers, 4.54% recyclable fibres, and 17.12% of all other non-recyclable materials by weight.

**Figure 3.5 Maple Lake Recycling Bin Breakdown**



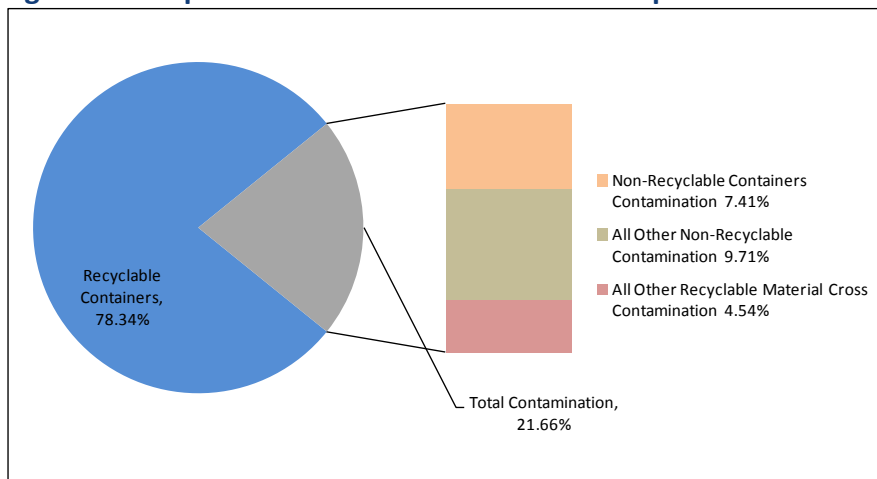
The following figures display the percent composition of the sample taken from each of the different source bins at Maple Lake. The total contamination rate includes those materials that are not only non-recyclable but recyclable material placed within the wrong stream.

**Figure 3.6 Maple Lake Mixed Fibres Bin Composition**



Non-recyclable fibres were noted as the greatest contributor to the contamination in the mixed fibres bin at 0.88% of the total sample retrieved from the bin. This waste consisted mainly of paper gift bags, gift wrap, coated paper plates, and tissue/toweling. Non-recyclable plastics are also a notable contributor at 0.49%. This material consisted mainly of unmarked plastic packaging.

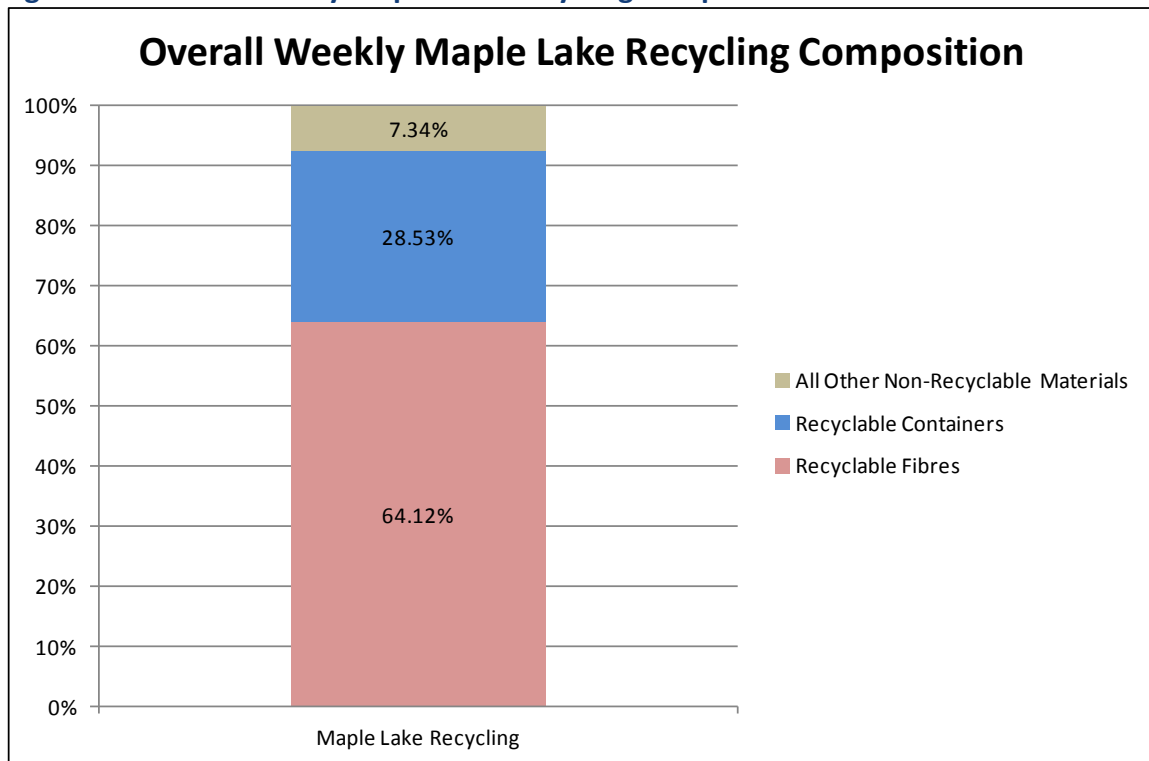
**Figure 3.7 Maple Lake Mixed Containers Bin Composition**



Other waste was noted as the greatest contributor to the contamination in the mixed containers bin at 7.66% of the total sample retrieved from the bin. This waste consisted mainly of food waste, textiles, electrical components, and miscellaneous debris sweepings. Non-recyclable plastics such as durable products consisting of utensils, cups, garden hose, and car parts are also significant contributors at 5.10%.

An overall weekly recycling composition was calculated by taking the total weight per stream (the total weight of material within each source bin), dividing by the number of generation days, and multiplying by 1 week (7 days). The following provides an idea of the overall weekly recycling composition (all recycling together, both mixed fibres and containers) and contamination rate for Maple Lake.

**Figure 3.8 Overall Weekly Maple Lake Recycling Composition**



The overall weekly contamination rate for Maple Lake is approximately 7.34% for both recycling stream sources combined.

### 3.3 Dorset

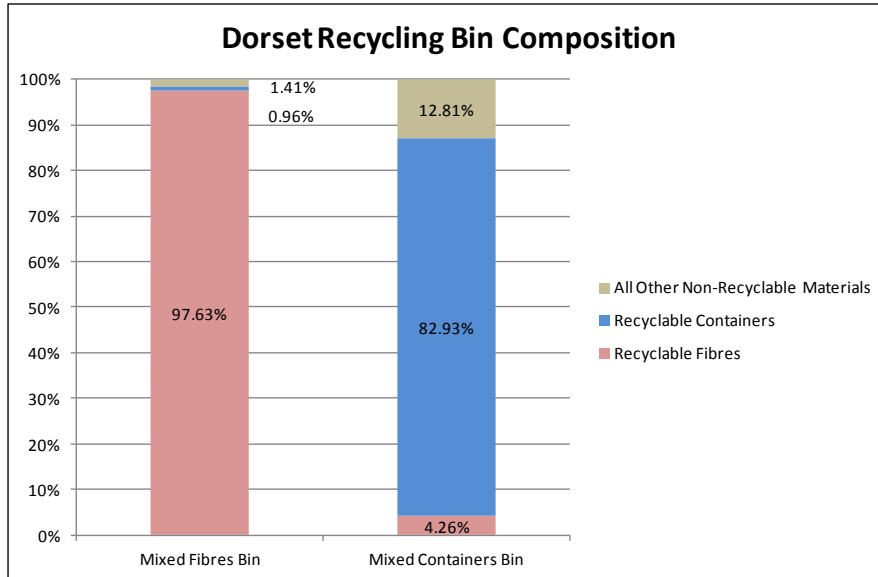
Figure 3.9 illustrates the material composition breakdown of the samples retrieved from the Dorset recycling depot by source type. The figure displays the percentage of the corresponding sample that is recyclable fibres, recyclable containers, and all other non-recyclable materials by total weight of sample retrieved.

Of the total 506 kg of mixed fibres sampled, approximately 97.63% consisted of recyclable fibres, 0.96% recyclable containers, and 1.41% of all other non-recyclable material by weight. Of



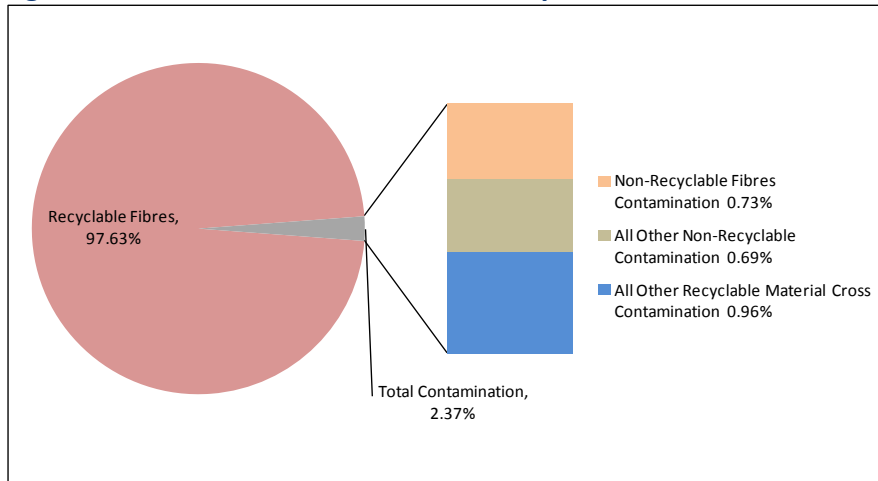
the 519 kg of mixed containers sampled, approximately 82.93% consisted of recyclable containers, 4.26% recyclable fibres, and 12.81% of all other non-recyclable materials by weight.

**Figure 3.9 Dorset Recycling Bin Breakdown**



The following figures display the percent composition of the sample taken from each of the different source bins at Dorset. The total contamination rate includes those materials that are not only non-recyclable but recyclable material placed within the wrong stream.

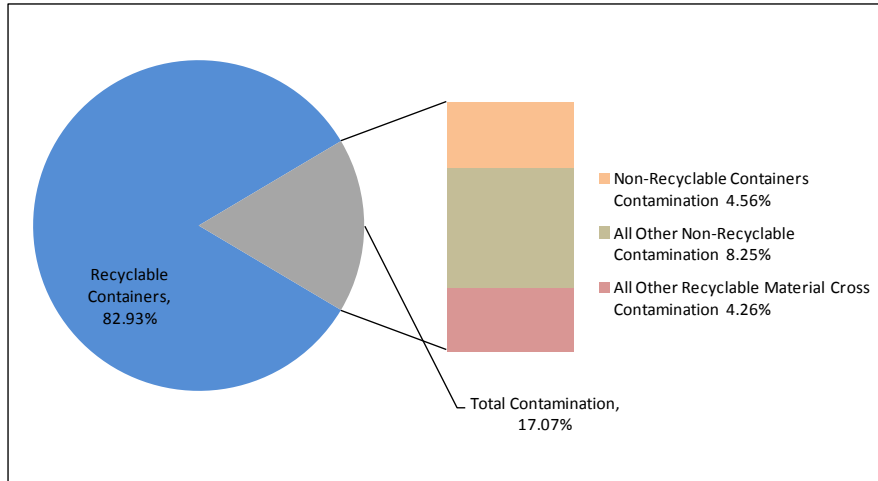
**Figure 3.10 Dorset Mixed Fibres Bin Composition**



Non-recyclable fibres were noted as the greatest contributor to the contamination in the mixed fibres bin at 0.73%. This waste consisted mainly of laminated paper gift bags, paper/bubble

envelopes, and tissue/toweling. Other waste is also a significant contributor at 0.51% consisting mainly of electrical components, food, textiles, and wood.

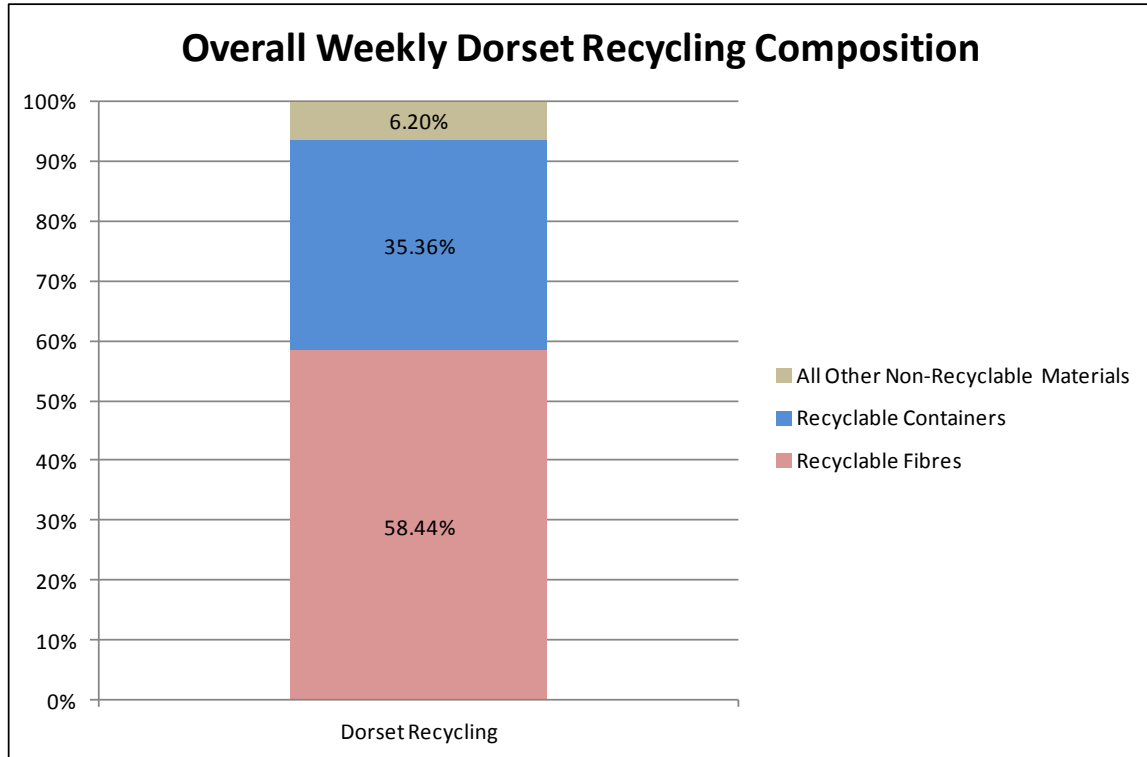
**Figure 3.11 Dorset Mixed Containers Bin Composition**



Other waste is noted as the greatest contributor to the contamination in the mixed containers bin at 6.99%. This waste consisted mainly of a crock pot, food, clothing textiles, sanitary waste, sweepings debris, gloves, cleaning supplies, and electronic components. Non-recyclable plastics are also a significant contributor at 2.82% consisting mainly of other rigid plastic packaging (unmarked items, blister etc.) and durable plastics (dish basin, fridge drawer, plates, utensils, and cutlery).

An overall weekly recycling composition was calculated by taking the total weight per stream (the total weight of material within each source bin), dividing by the number of generation days, and multiplying by 1 week (7 days). The following provides an idea of the overall weekly recycling composition (all recycling together, both mixed fibres and containers) and contamination rate for Dorset.

**Figure 3.12 Overall Weekly Dorset Recycling Composition**



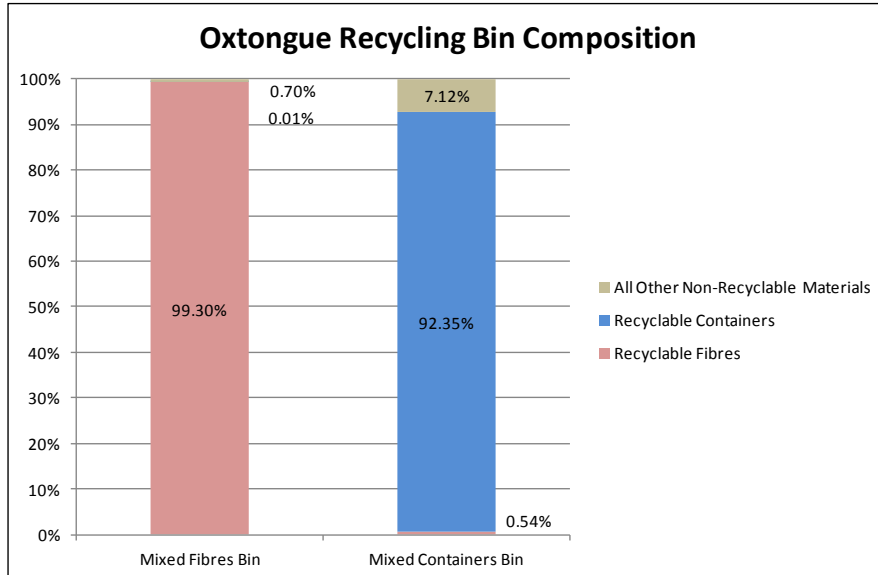
The overall weekly contamination rate for Dorset is approximately 6.20% for both recycling stream sources combined.

### 3.4 Oxtongue

Figure 3.13 illustrates the material composition breakdown of the samples retrieved from the Oxtongue recycling depot by source type. The figure displays the percentage of the corresponding sample that is recyclable fibres, recyclable containers, and all other non-recyclable materials by total weight of sample retrieved.

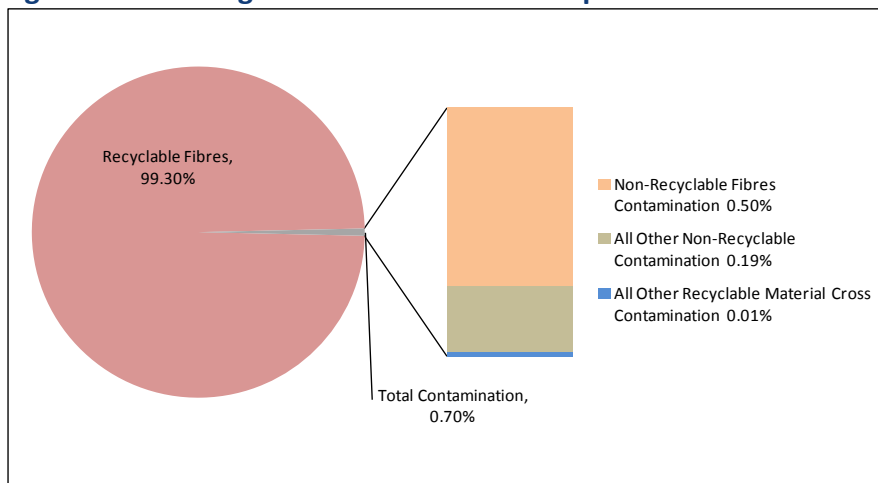
Of the total 509 kg of mixed fibres sampled, approximately 99.30% consisted of recyclable fibres, 0.01% recyclable containers, and 0.70% of all other non-recyclable material by weight. Of the 502 kg of mixed containers sampled, approximately 92.35% consisted of recyclable containers, 0.54% recyclable fibres, and 7.12% of all other non-recyclable materials by weight.

**Figure 3.13 Oxtongue Recycling Bin Breakdown**



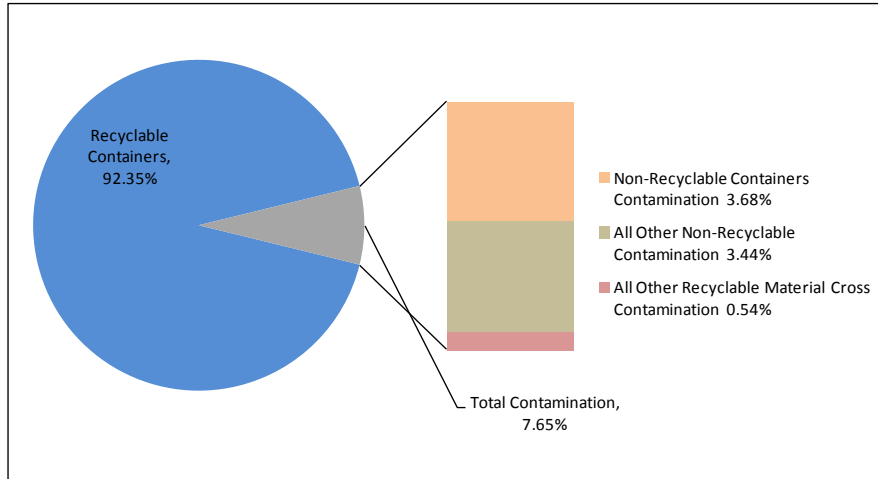
The following figures display the percent composition of the sample taken from each of the different source bins at Oxtongue. The total contamination rate includes those materials that are not only non-recyclable but recyclable material placed within the wrong stream.

**Figure 3.14 Oxtongue Mixed Fibres Bin Composition**



Non-recyclable fibres were noted as the greatest contributor to the contamination in the mixed fibres bin at 0.50%. This waste consisted mainly of puzzles and non-recyclable paper file folders. Other waste was the only other contributor at 0.19% consisting mainly of a stereo speaker and a multi-material project board.

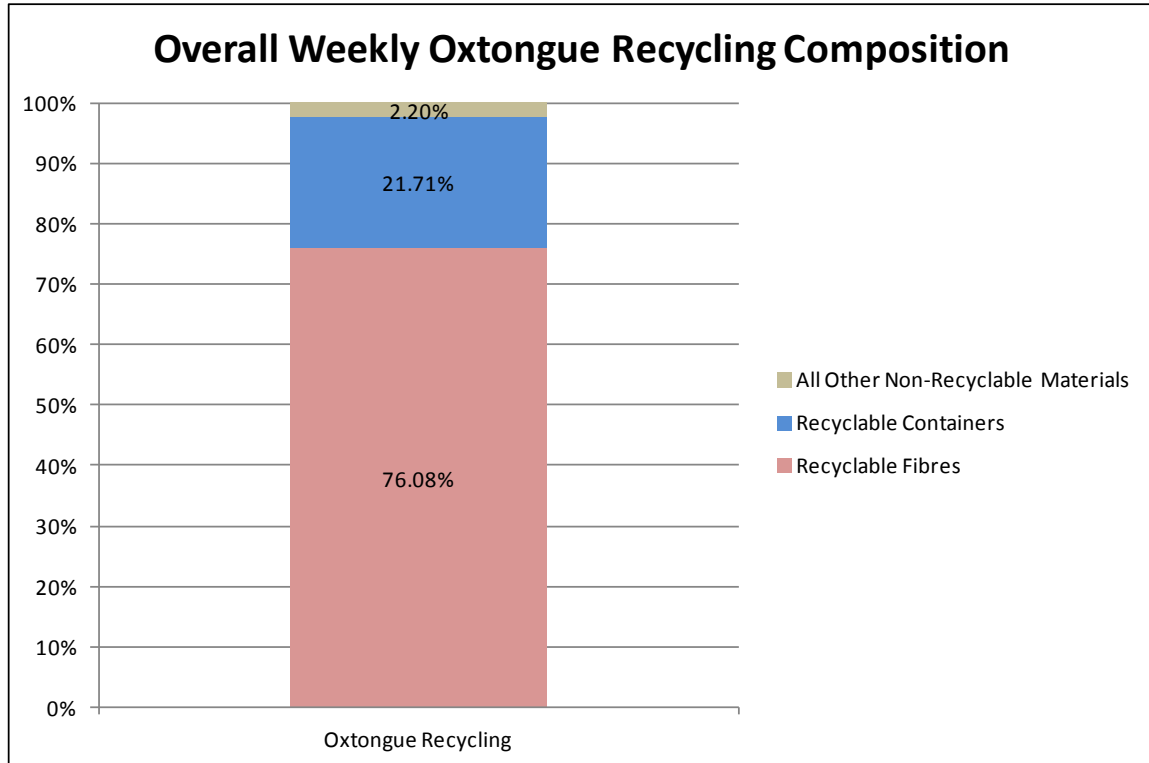
**Figure 3.15 Oxtongue Mixed Containers Bin Composition**



Other waste was noted as the greatest contributor to the contamination in the mixed containers bin at 2.42%. This waste consisted mainly of food, sweeping debris, and miscellaneous liquids. Non-recyclable plastics were also a great contributor to the contamination in the mixed containers bin at 2.34% consisting mainly of unmarked plastic packaging.

An overall weekly recycling composition was calculated by taking the total weight per stream (the total weight of material within each source bin), dividing by the number of generation days, and multiplying by 1 week (7 days). The following provides an idea of the overall weekly recycling composition (all recycling together, both mixed fibres and containers) and contamination rate for Oxtongue.

**Figure 3.16 Overall Weekly Oxtongue Recycling Composition**

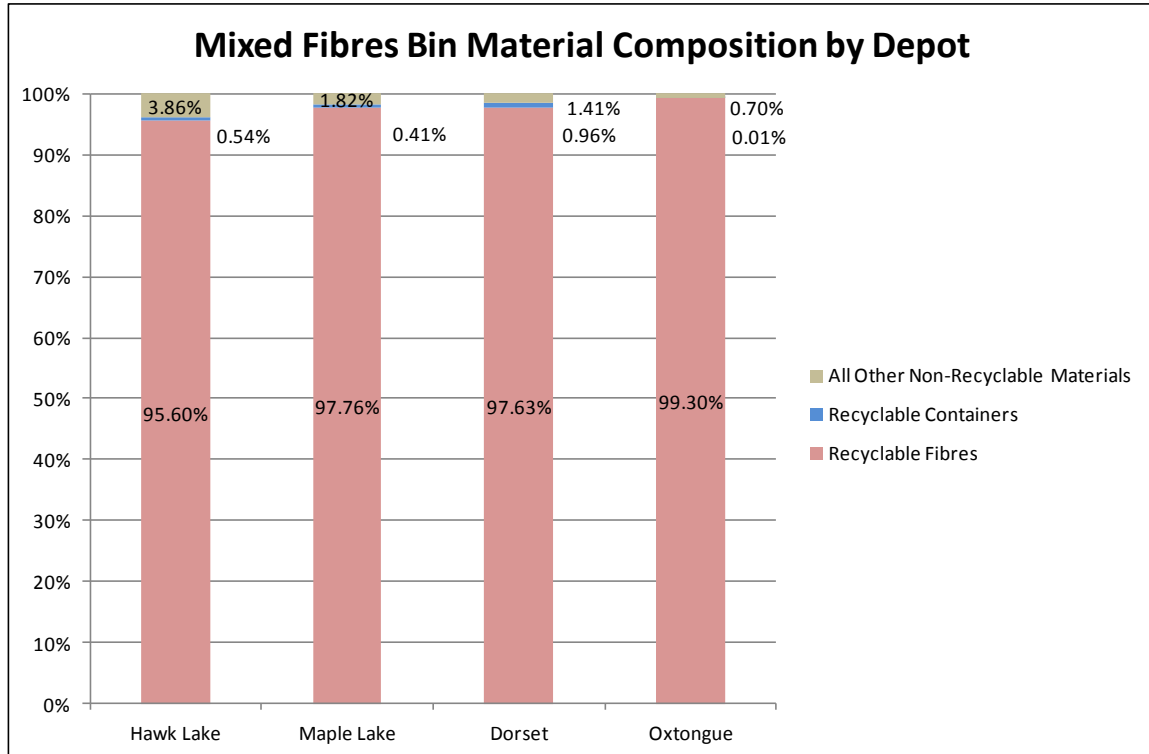


The overall weekly contamination rate for Oxtongue is approximately 2.20% for both recycling stream sources combined.

### 3.5 Recycling Depot Comparisons

This section is designed to visually compare the recycling composition by stream, depot, and total weekly overall. Also included is an overall weekly recycling composition for all 4 recycling depots sampled from during the study period. This will aid in identifying an overall weekly contamination rate for the Algonquin Highlands recycling depots.

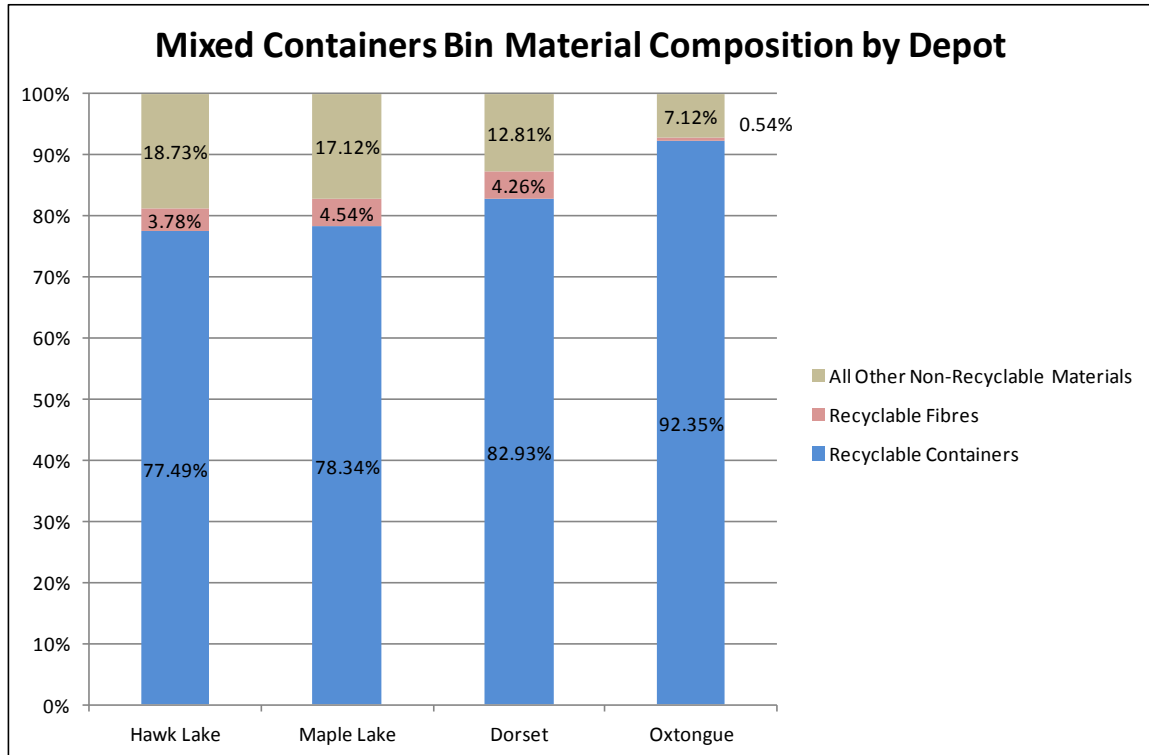
**Figure 3.17 Mixed Fibres Bin Material Composition by Depot**



With regards to the mixed fibres bins, the depot with the lowest contamination of non-recyclable material is Oxtongue at 0.70%. The depot with the highest contamination is Hawk Lake at 3.86%.

Examples of non-recyclable materials found within the mixed fibres bins can be viewed within Appendix C.

**Figure 3.18 Mixed Containers Bin Material Composition by Depot**

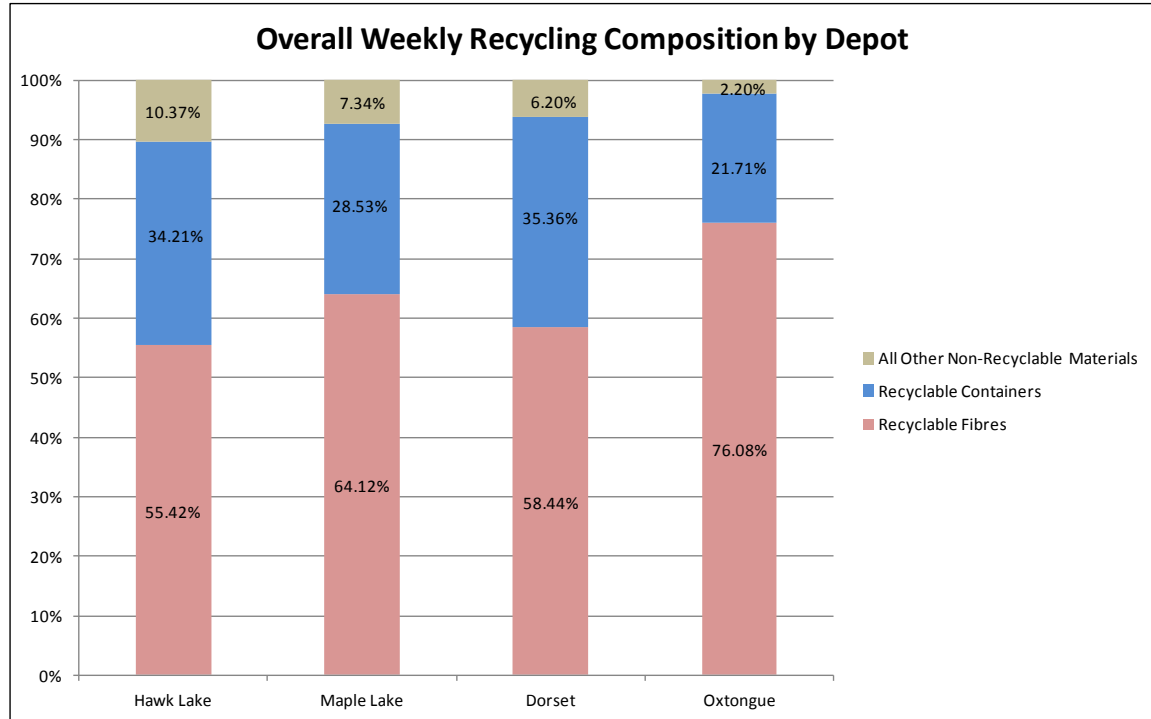


With regards to the mixed containers bins, the depot with the lowest contamination of non-recyclable material is Oxtongue at 7.12%. The depot with the highest contamination is Hawk Lake at 18.73%.

Examples of non-recyclable materials found within the mixed containers bins can be viewed within Appendix C.

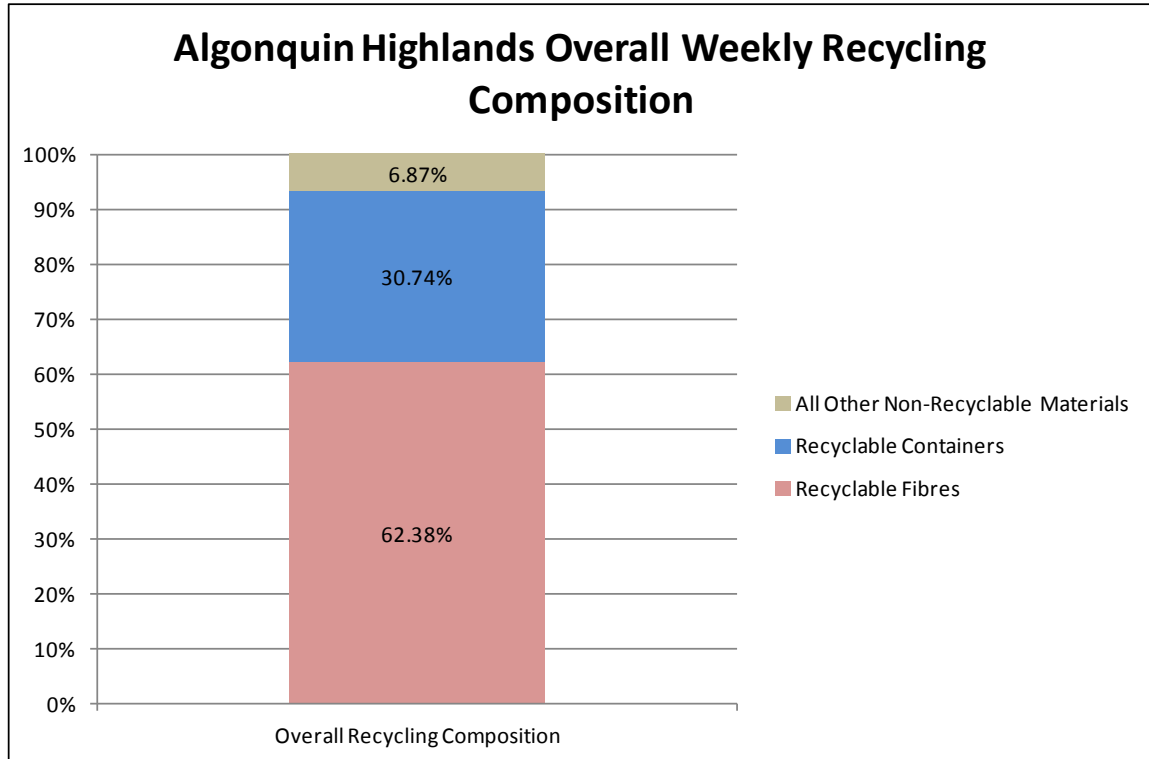


**Figure 3.19 Overall Weekly Recycling Composition by Depot**



With regards to the overall weekly recycling composition (both streams combined) by depot, Oxtongue has the lowest contamination of non-recyclable material at 2.20%. The depot with the highest contamination is Hawk Lake at 10.37%.

**Figure 3.20 Algonquin Highlands Overall Weekly Recycling Composition**



The overall Algonquin Highlands weekly recycling composition has been calculated to contain approximately 62.38% of recyclable fibres, 30.74% of recyclable containers, and 6.87% of all other non-recyclable materials. With that said, the Township of Algonquin Highlands overall weekly contamination rate for the recycling depots is 6.87%.

## 4.0 CONCLUSIONS

AET Group Inc. conducted a recycling depot material composition study for the Township of Algonquin Highlands. The waste study was conducted over 2 weeks between the dates of August 18<sup>th</sup> and August 28<sup>th</sup>, 2014 with the purpose to assess the composition of each of the two recycling streams (one 40 yard or 20 yard bin of each mixed fibres and mixed containers) at 4 different self drop recycling depots within the township of Algonquin Highlands.

During the study period, AET staff sampled and classified 500 kilograms of recyclable material from the mixed fibres and mixed containers stream at each of the 4 self drop recycling depots across the Township of Algonquin Highlands. The following conclusions have been made.

### 4.1 Hawk Lake Conclusions

From the 502 kg of mixed fibres (generated over an 18 day period from a total 2,442 kg) and 503 kg of mixed containers (generated over an 22 day period from a total of 2,323 kg) sampled, sorted, weighed, and categorized, key findings include:

- The mixed fibres bin composition consists of 95.60% recyclable fibres, 0.54% recyclable containers, and 3.86% all other non-recyclable materials.
- The mixed containers bin composition consists of 77.79% recyclable containers, 3.78% recyclable fibres, and 18.73% all other non-recyclable materials.
- The total overall weekly recycling composition consists of 55.42% recyclable fibres, 34.21% recyclable containers, and 10.37% of all other non-recyclable material (overall weekly contamination rate).

### 4.2 Maple Lake Conclusions

From the 501 kg of mixed fibres (generated over a 19 day period from a total 3,950 kg) and 502 kg of mixed containers (generated over a 19 day period from a total 2,230 kg) sampled, sorted, weighed, and categorized, key findings include:

- The mixed fibres bin composition consists of 97.76% recyclable fibres, 0.44% recyclable containers, and 1.82% all other non-recyclable materials.
- The mixed containers bin composition consists of 78.34% recyclable containers, 4.54% recyclable fibres, and 17.12% all other non-recyclable materials.
- The total overall weekly recycling composition consists of 64.12% recyclable fibres, 28.53% recyclable containers, and 7.34% of all other non-recyclable material (overall weekly contamination rate).

### 4.3 Dorset Conclusions

From the 506 kg of mixed fibres (generated over a 10 day period from a total 1,770 kg) and 519 kg of mixed containers (generated over a 10 day period from a total 1,280 kg) sampled, sorted, weighed, and categorized, key findings include:

- The mixed fibres bin composition consists of 97.63% recyclable fibres, 0.96% recyclable containers, and 1.41% all other non-recyclable materials.
- The mixed containers bin composition consists of 82.93% recyclable containers, 4.26% recyclable fibres, and 12.81% all other non-recyclable materials.
- The total overall weekly recycling composition consists of 58.44% recyclable fibres, 35.36% recyclable containers, and 6.20% of all other non-recyclable material (overall weekly contamination rate).

### 4.4 Oxtongue Conclusions

From the 509 kg of mixed fibres (generated over a 79 day period from a total 10,200 kg) and 502 kg of mixed containers (generated over a 61 day period from a total 2,420 kg) sampled, sorted, weighed, and categorized, key findings include:

- The mixed fibres bin composition consists of 99.30% recyclable fibres, 0.01% recyclable containers, and 0.70% all other non-recyclable materials.
- The mixed containers bin composition consists of 92.35% recyclable containers, 0.54% recyclable fibres, and 7.12% all other non-recyclable materials.
- The total overall weekly recycling composition consists of 76.08% recyclable fibres, 21.71% recyclable containers, and 2.20% of all other non-recyclable material (overall weekly contamination rate).

### 4.5 Overall Conclusions

Based on the total overall weekly recycling composition by depot:

- The depot with the lowest total weekly contamination rate is Oxtongue at 2.20%.
- The depot with the highest total weekly contamination rate is Hawk Lake at 10.37%.
- The total overall weekly recycling contamination rate for the Township of Algonquin Highlands is 6.87%.

Report Prepared By:

Jack Maracle, B.Sc., Dip. EMA, EPT  
Waste Sector Team Leader

Report Reviewed By:

Ben Dunbar, BES, EP(Waste)  
Manager of Waste Operations

**Disclaimer**

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This Project has been delivered with the assistance of Waste Diversion Ontario's Continuous Improvement Fund, a fund financed by Ontario municipalities and stewards of blue box waste in Ontario. Notwithstanding this support, the views expressed are the views of the author(s), and Waste Diversion Ontario and Stewardship Ontario accept no responsibility for these views.