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University of Adelaide

Hub Central

Waste and Recycling Review

September 2015

- IMPORTANT NOTES-

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Document Verification

Job title		University of Adelaide – Hub Central Waste and Recycling Review			Job number
Document title		University of Adelaide – Hub Central Waste and Recycling Review Report			File reference
Document version		Final Report			
Revision	Date	Filename	Rawtec_Adelaide Uni Hub Waste Review_FINAL		
Final	28/9/2015	Description	Final report		
			Prepared by	Checked by	Approved by
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Draft	03/9/2015	Filename	Rawtec_Adelaide Uni Hub Waste Review_DRAFT		
			Draft report		
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Executive Summary

Background and Purpose of This Report

Rawtec and Dynamic 3E were engaged by the University of Adelaide to conduct a waste and recycling review of the Hub. The purpose of this review was to more fully understand current performance of the Hub's waste and recycling systems (refer photo below), including the volumes and types of recycling that are going to landfill, and the level of contamination of recycling bins in the Hub. This review was also to inform future planning and waste education for the Hub.

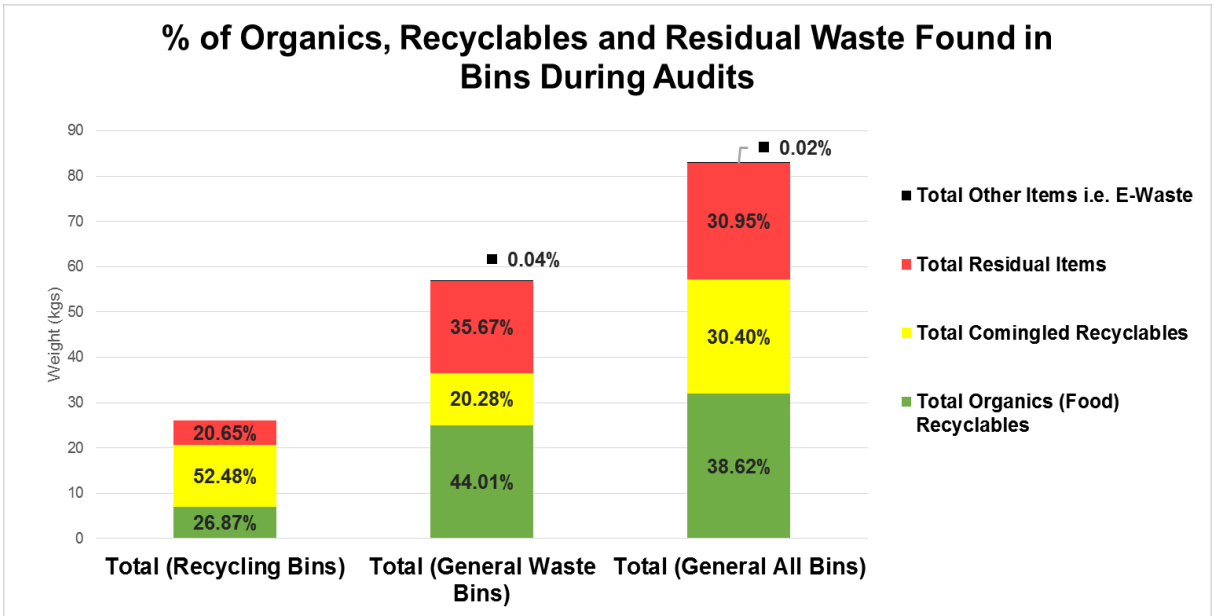
Photo: Inside Hub Bin Station

Photo: Outside Hub Bin Station

Waste and Recycling Audit

Figure E-1 below shows a breakdown of waste and recycling streams found in the bins during the audit.

Figure E-1: Breakdown of audit results into waste streams (all bins)



Key Findings from Audit Analysis

From our analysis of the audit data, it is estimated that the Hub generates approximately **27 tonnes** of waste and recyclables each year. Of this amount it is estimated that approximately:

- **15 tonnes** waste and recyclables are disposed of in the general waste bins; and
- **12 tonnes** of waste and recyclables are disposed of in the recycling bins.

The analysis of the audit data estimates that there is approximately **3 tonnes** of available recyclables disposed of into the general waste bins each year.

The estimated landfill diversion rate for the Hub (calculated using the audit data) is approximately **17**%, which is considered low. However, in reality, due to the amount of contamination that occurs within the recycling bins, it can be expected that **NONE** of the recycling would be sent for resource recovery, and all of the material within the recycling bins would be going to landfill. Therefore, the landfill diversion rate would most likely be **0%**.

The analysis found that coffee cups are a major component of the waste stream, and analysis of the audit data indicates approximately:

- **300** coffee cups are disposed of at the Hub each day (**57%** into the **general waste bins** and **43%** into the **recycling bins**); and
- **73,000** coffee cups are disposed of at the Hub each year.

The audit and analysis results also show that:

- Food waste makes up approximately one third of the waste generated at the Hub.
- There is a large amount of non-recyclable and food waste materials being disposed of into the recycling bins.

Key Findings from Observations of Student Recycling Behaviour

Analysis of the observations data found that the student behaviour witnessed was consistent with results and the items and materials found in bins during the audit.

During the time observing students:

- **66%** of all items that were disposed of into bins, were placed in the correct bin;
- **34%** of items were placed in the incorrect bin.

Analysis of the observations results also found that:

- When a student obviously looked at the bin signage, **81%** of the time they placed the item in the correct bin; compared to
- When a student did not obviously look at the signage on the bin stations, only **53%** of the time they placed the item in the correct bin.

Opportunities to Improve Recycling Outcomes in the Hub

Section 4 provides a breakdown of the issues/problems found during the audit and the student observations, as well as potential opportunities/initiatives to resolve these issues/problems and increase recycling outcomes at the Hub (including examples).

The opportunities/initiatives identified, indicate that the bin stations could be improved, updated, or replaced, and if so, should include:

- Distinctive overall colouring (i.e. red for general waste and yellow for recycling).
- Updated signage that is consistent throughout the Hub (inside and out), which is to be simple, clear, and at eye level, to grab students' attention quickly. Signage should include the pictures of the actual waste and recycling items sold or produced in the Hub, indicating clearly which bins they need to be place in.
- An additional general waste bin, so that the bins stations are positioned in a general waste/ recycling/general waste formation, to provide more general waste capacity and reduce events of overflow into the recycling bins. This type of formation would give students who are not sure which bin an items goes in, more general waste bin options.
- Bin disposal holes that suit the types of waste and recycling materials generated at the Hub.

Potential for an Organics Recycling System

The audit and analysis also found that there is a large amount of compostable organic material being disposed of at the Hub. This means that there is significant potential for inclusion of an organics recycling stream to be introduced to complement the recycling and general waste services.

Furthermore, due to the Hub being part of an Education and Training facility, this service could be introduced as a "pilot", and could be developed, managed and assessed by students undertaking environmental/sustainability studies as project or part of a course. There is also the potential for a student project, to find a better use for the significant amount of disposable coffee cups disposed of at the Hub (e.g. investigation into their use as seedling propagation pots for a tree planting organisation).

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1 Background and Methodology

1.1 Background

Hub Central (the Hub) is located in the heart of the North Terrace Campus, offering an inspirational place for students to meet, study, make social connections and exchange ideas. The Hub was finished in 2011 and covers 10,500m², and consists of three levels. The Hub delivers state-of-the-art facilities for students and also contains a number of food and beverage outlets, and seating areas.

Recent waste audits of general waste bins in the Hub campus show that large volumes of recycling are going to landfill. Anecdotally, it also is known that the recycling bins are often contaminated with general waste.

Rawtec and Dynamic 3E were engaged by the University of Adelaide to conduct a waste and recycling review of the Hub. The purpose of this review was to more fully understand the volumes and types of recycling that are going to landfill, and to gauge the level of contamination of recycling bins in the Hub. The review is also to inform future planning and waste education for the Hub.

1.2 Scope of Work

The scope of work includes:

- Undertaking of a physical bin audit (of inside and outside recycling and general waste bins), where waste and recyclables would be sorted into the following categories:
    - Food waste, including differentiating between:
        - Solid waste
        - Liquid waste (from cups & containers)
    - Coffee cups
    - CDL containers
    - White paper
    - Other recyclables
    - Non-recyclable packaging (e.g. chip packets)
    - Other residual waste
- Recording of the number of coffee cups found in audited waste and recycling bins, take photos of audited waste and recyclables, and note any observations, such as:
    - Approximate % of containers that had food
    - Approx. % of drinking containers that liquid waste
    - Any other notable streams, e.g. if we find e-waste, batteries or other streams.
- Observations and recordings of student recycling behaviour at the Hub (across bin both inside and outside the Hub), to provide an understanding as to whether having different signage and facilities in an open space affects recycling behaviour.
- Analyse bin audit results.
- Identification of the opportunities to improve recycling rates and reduce overall waste generation, giving consideration to the source of the waste (packaging, retailers etc.),

waste and recycling bin design and signage, cleaner training and waste and recycling facilities in the Hub.

- Preparation of a report summarising key findings from the above investigations (this report), and provide to the University of Adelaide for review, along with spread sheet of raw audit data, and photos from the audit.

1.3 What This Report Contains

- **Executive Summary –** A summary of the audits, observations, analysis and the opportunities for the improvement of student recycling behaviour
- **Section 1 –** Information regarding the background and context of the project
- **Section 2 –** Results and analysis of the results from the waste and recycling audit
- **Section 3 –** Results and analysis of the results from the observations
- **Section 4 –** Key recommendations and identification of the opportunities to improve recycling rates and reduce overall waste generation
- **Appendix 1 –** Results and analysis tables from the waste and recycling audits.
- **Appendix 2 –** Results and analysis tables form the observations
- **Appendix 3 –** Photos taken during the audit
- **Appendix 4 –** Photos taken during the observations

2 Waste and Recycling Audit

2.1 Waste and Recycling Audit Details

The waste and recycling audit was conducted by Dynamic 3E on the 4th August 2015, and consisted of a physical bin audit of:

- Up to 10 x 240 litre recycling bins and 10 x 240 litre general waste bins from inside the Hub (which consisted of approximately 90% of the day's waste and recyclables); and
- Up to 2 x 240 litre recycling bins and 2 x 240 litre waste bins from outside the Hub (which consisted of approximately 50% of the days waste).

Waste and recyclables were sorted into the following categories:

1. Food waste, including differentiating between:
    A. Solid waste
    B. Liquid waste (from cups & containers)
2. Coffee cups
3. CDL containers
4. White paper
5. Other recyclables
6. Non-recyclable packaging (e.g. chip packets)
7. Other residual waste
8. Additional items (such as E-waste)

2.2 Audit Results

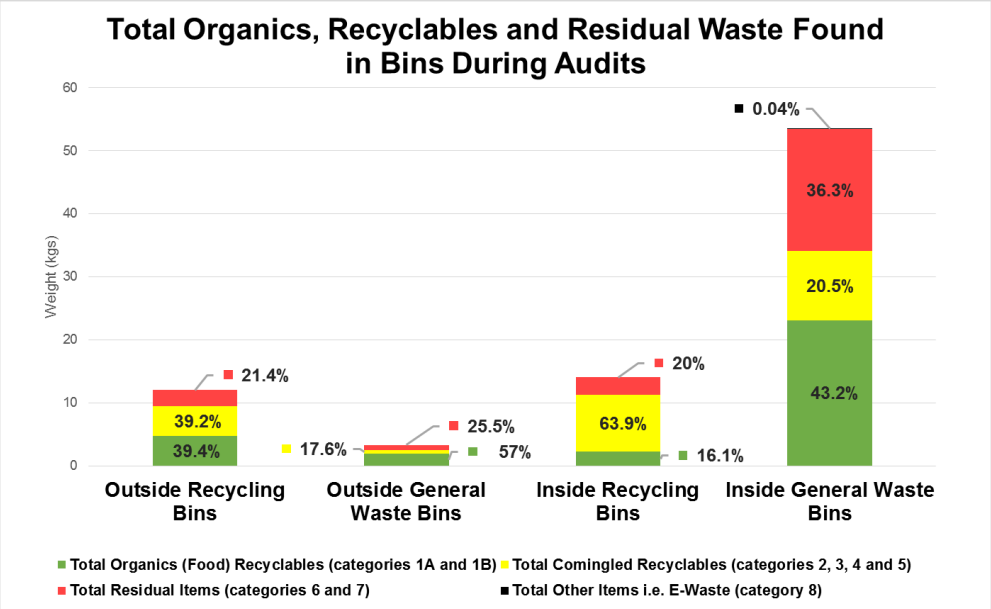
The figures below shows illustrations of the audit results. Tables that these illustrations are referring to can be found in Appendix 1.

Waste streams found in all bins during the audit

Figure 2-1 overleaf shows a breakdown of the audit results into the different waste streams (general waste, recycling and organics), per bin station. The breakdown of audit results into waste streams indicate that:

- Food waste materials (39.4% and 16.1%) and non-recyclable items (21.4% and 20%), make up a large proportion of the materials found in both the **outside and inside recycling bins**.
- Food waste materials also (57% and 43.2%) make up the majority of both the **outside and inside general waste bins**.
- The **inside general waste bins** contain approximately 20.5% recyclables, while the **outside general waste bins** contain 18% recyclables.

Figure 2-1: Breakdown of the waste streams found in bins during audit in all bins



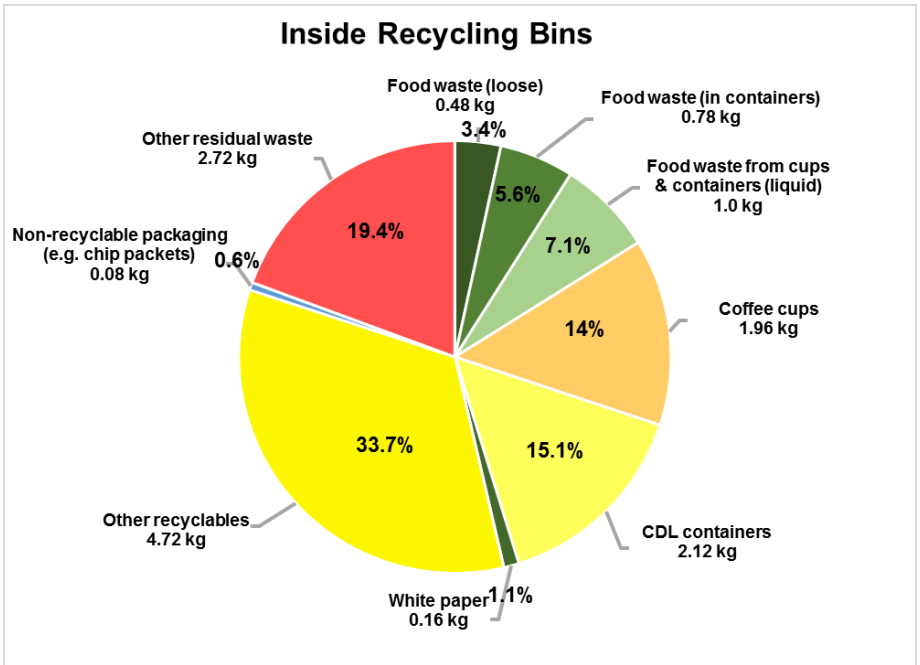
Waste materials found in the inside bins during the audit

The Figures below show a breakdown of the audit results into the different audit categories, for the **inside recycling and general waste bins.**

The audit results from the **inside recycling bins** (Figure 2-2 below), show that there is a large amount of contamination occurring within these bins, consisting of:

- Other residual waste (19.4%); and
- Food waste (loose, liquid, and in containers) (16.1%).

Figure 2-2: Audit results – Inside recycling bins (approximately 90% of one day's waste and recyclables)



The audit results from the **inside general waste bins** (Figure 2-3 below), show that these bins mostly consist of:

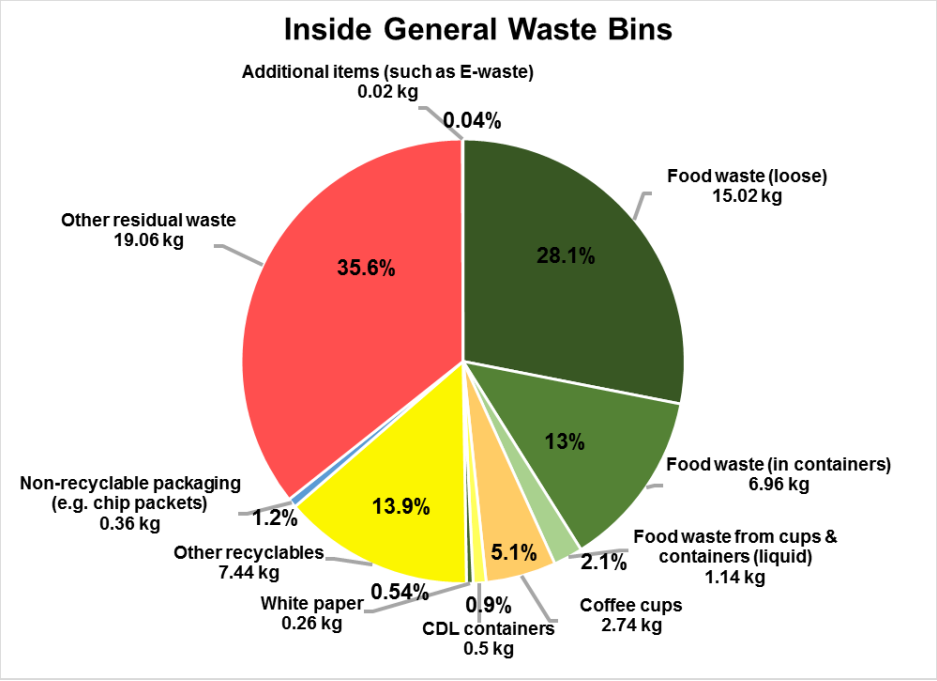
- Food waste (solid) (28.1%); and
- Other residual waste (35.6%).

These inside general waste bins also contain large amounts of recyclable material, including:

- Other recyclables (13.9%); and
- Coffee cups (5.1%).

And a small amount (0.02 kg) of E-waste (batteries).

Figure 2-3: Audit results – Inside general waste bins (approximately 90% of one day's waste and recyclables)



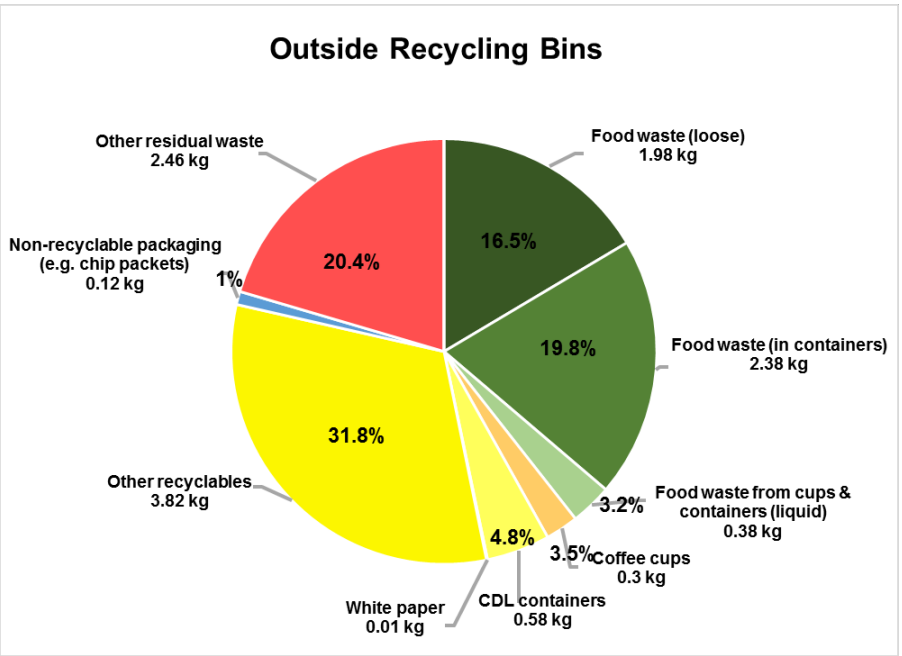
Waste materials found in the outside bins during the audit

The Figures below show a breakdown of the audit results into the different audit categories, for the **outside recycling and general waste bins.**

The audit results from the **outside recycling bins** (Figure 2-4 overleaf), show that there is a significant amount of contamination occurring within these bins, consisting of:

- Food waste (loose, liquid, and in containers) (39.2%); and
- Other residual waste 20.4%

Figure 2-4: Audit Results – Outside recycling bins (approximately 50% a day's waste and recyclables)



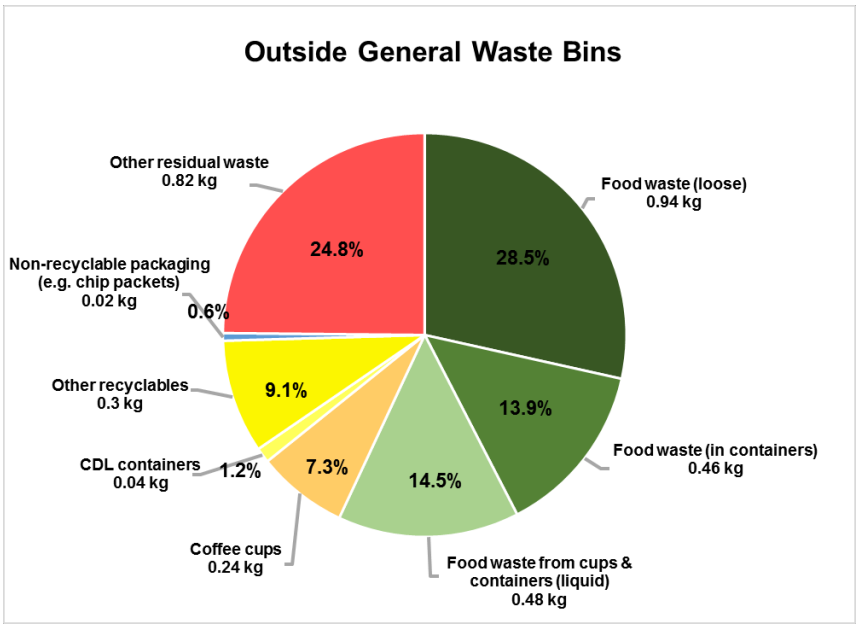
The audit results from the **outside general waste bins** (Figure 2-5 below), show that these bins mostly consist of:

- Food waste (loose, liquid, and in containers) (56.9%); and
- Other residual waste (24.8%).

The outside general waste bins also contain considerable amounts of recyclable material, including:

- Other recyclables (9.1%); and
- Coffee cups (7.3%).

Figure 2-5: Audit Results – Outside general waste bins (approximately 50% a day's waste and recyclables)



2.3 Analysis of Audit Results

2.3.1 Scope of Analysis

Analysis of the audit results included estimating the:

- Volume of waste disposed in comingled recycling bins (tonnes per annum);
- Volume of waste disposed in general waste bins (tonnes per annum);
- Landfill diversion rate % weight (wt);
- Contamination rate %wt. for bins, and identification of contaminants; and
- Volume of available:
    - Recyclable materials in general waste stream (tonnes/year)
    - Compostable materials in general waste and recycling bins (tonnes/year)

2.3.2 Assumptions

For the analysis of the audit data, it was assumed that:

- The Hub operates at close to or near capacity for 50 weeks of the year and operates 7 days a week (operating at 10% of weekday activity on weekends); and
- During the warmer months (4 months), 50% of the inside waste disposed of, is shifted to the outside bins.

2.3.3 Analysis Results

The tables below shows a breakdown of the results from the analysis of the data obtained from the audit results. Tables that provide an additional details of the analysis (such as individual bin station data), can found in Appendix 1.

Volume of waste disposed in the bins per annum

The estimated results from the analysis in Table 2-1 below show that the Hub generates a significant amount of waste and recycling each year (**27 tonnes**).

It is also estimated that between 3,000 and 4,000 students use the Hub daily (based on unique logins). Based on the analysis assumptions and the estimated number of students using the hub daily, it is estimated that **34-52 grams** of waste and recyclables is generated per student per day.

Table 2-1: Estimated volume of waste and recyclables found in bins (tonnes per annum)

Audit Category	**Amount** (tonnes per annum)
Estimated volume of waste and recyclables in all bins	**27**
Estimated volume of waste and recyclables disposed in general waste bins	**15**
Estimated volume of waste and recyclables disposed in comingled recycling bins	**12**

Volume of available recyclable and food waste material in the bins per annum

The results from the analysis Table 2-2 below, show that there are significant tonnes of:

- Available recyclables (**3 tonnes**) within the general waste bins.

Table 2-2: Estimated volume of available recyclable materials (tonnes per annum)

Audit Category	**Amount** (tonnes per annum)
Estimated volume of available comingled recyclable materials in general waste bins	**3**

The results from the analysis in Table 2-3 below show that there are significant tonnes of available compostable materials in:

- The general waste bins **(6.9 tonnes**); and
- The recycling bins (**3.8 tonnes**).

Table 2-3: Estimated volume of available compostable materials (tonnes per annum)

Audit Category	**Amount** (tonnes per annum)
Estimated volume of compostable materials in general waste bins	**6.9**
Estimated volume of compostable materials in recycling bins	**3.8**

Landfill diversion

The landfill diversion rates in Table 2-4 below, give an indication that the Hub is only diverting a small amount of its total waste from landfill that is disposed of at the facility. Due to the contamination within the recycling bins (see contamination section overleaf), it is more than likely that the real landfill diversion rate is lower than what was found in the analysis or that all recycling bin materials is going to landfill.

Table 2-4: Landfill diversion rates (% weight)

Audit Category	**Amount** (% weight)
Current landfill diversion rate (inc. contamination in recycling bins vs total waste generated)	**31%**
Current landfill diversion rate (excl. contamination in recycling bins vs total waste generated)	**17%**

Coffee cups

Table 2-5 below, shows that there is a significant number of disposable coffee cups disposed of at the Hub each year. The analysis also shows that there are a greater number of coffee cups disposed of in the **general waste bins (57%)** vs the **recycling bins (43%).**

Table 2-5: Estimated number of coffee cups disposed of per day and per year (all bins)

Analysis of Coffee Cups Disposed Of	Amount
Estimated number of coffee cups per day	**300**
Estimated number of coffee cups disposed of in all bins per year	**73,000**
Estimated % of coffee cups disposed of in the general waste bins	***57%***
Estimated % of coffee cups disposed of in the recycling bins	***43%***

Contamination

During the audit and student recycling behaviour observations, any materials that were found in/or observed to be placed in the recycling bins, which were not identified as recyclables or were identified as food waste items, were classified as contaminants.

Table 2-6 below shows the estimated tonnes of compostable materials disposed of in the recycling bin per year.

Table 2-6: Amount of contaminated materials in recycling bins identified during the audit (tonnes per annum)

Audit Category	Amount (tonnes per annum)
Estimated total volume of contaminating materials in recycling bins per year	**6.3**

Table 2-7 below shows a breakdown of the contaminants identified from the audits and the observations.

Table 2-7: Contaminated materials in recycling bins identified during the audit

Materials identified as contaminates found in the recycling bins during the audit	Identified materials as contaminates seen to be placed in the recycling bins during the observations
Food waste (loose)	Food containers (with food)
Food waste (in containers)	Food waste (loose)
Food waste (liquid)	Polystyrene foam cup
Non-recyclable packaging (e.g. chip packets)	
Polystyrene foam containers	

The audit and observations also identified additional items/materials placed on the bins that were not consistent with typical public place waste generation material types, as well as some items/materials incorrectly disposed of in the general waste bins.

The items/materials during the audit include:

- A whole bag of flattened cardboard (including a soap dispenser)
- Vacuum contents (in the recycling bin) – Most likely from cleaners/staff
- 2 x bags of paper towels
- 1 x alkaline battery

3 Bin Observations

3.1 Details of the Observations

Observations took place at the same time as the audits on the 4th August 2015. The observations consisted of observing and recording student recycling behaviour at the Hub (across general waste/recycling bin stations – both inside and outside the Hub), to provide an understanding as to whether having different signage and facilities in an open space affects recycling behaviour. In total, 2 hours of time was spend observing student behaviour. This included half an hour of time spent at 2 different bin-set locations for both inside and outside the Hub.

Observation data was gathered on:

- The item disposed in the bin;
- The bin type (general waste or recycling) where the items was placed;
- Whether the item was the correct or incorrect bin for that item; and
- Whether or not the individual obviously looked at signage.

In total, during the 2 hours:

- 58 observations took place (40 inside the Hub and 18 outside the Hub);
- 36 general waste bin observations took place (28 inside the Hub and 8 outside the Hub); and
- 22 recycling bin observations took place (12 inside the Hub and 10 outside the Hub)

3.2 Findings form Observations

The figures below shows illustrations of the audit results. Tables that these illustrations are referring to can be found in Appendix. Photos taken during the observations can be found in Appendix 4.

3.2.1 Analysis of Observation Results

Figure 3-1 below shows that **66%** of all items that were disposed of into bins, were placed in the correct bin for that item. This means that more than **1/3** of waste and recyclables disposed of at the hub, are placed in the incorrect bin. This is consistent with what was found during the bin audit in Section 2 above.

Figure 3-1: Signage correct/incorrect bin placement observations

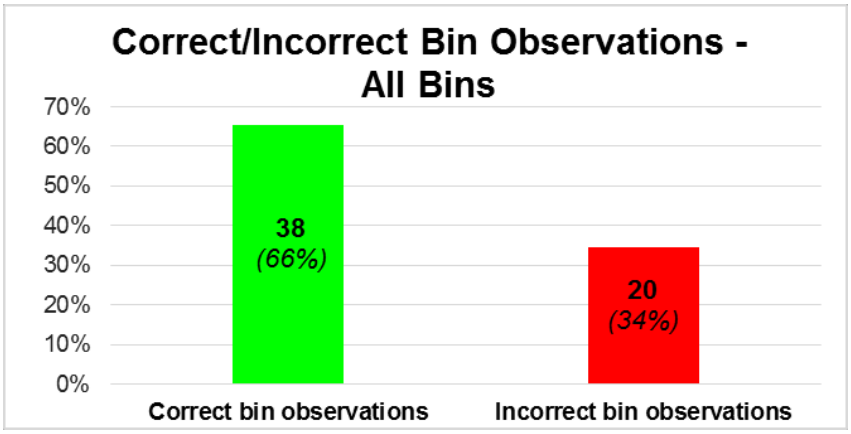


Figure 3-2 below, shows that when a student obviously looked at the bin signage, they were more likely (**81%**) to place the item in the correct bin. The results also show that if a student did not obviously look at the signage on the bin stations, they were less likely (**53%**) to place the item in the correct bin.

Figure 3-2: Signage observations vs correct/incorrect bin placement for all bins stations

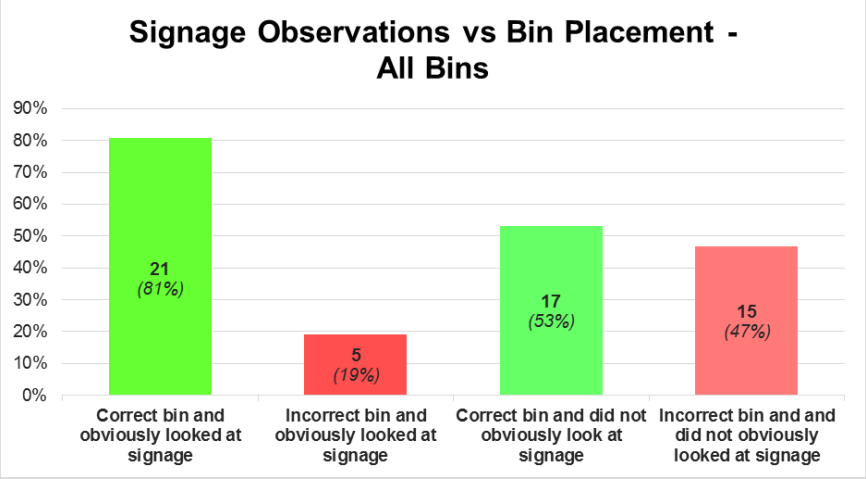


Figure 3-3 and Figure 3-4 below, indicate that the results displayed in Figure 3-2 above, are consistent among both the **inside and outside bin stations**, showing that when a student obviously looked at the bin signage, they were more likely (**81%** and **80%**) to place the item in the correct bin.

Figure 3-3: Signage observations vs correct/incorrect bin placement for the inside bin stations

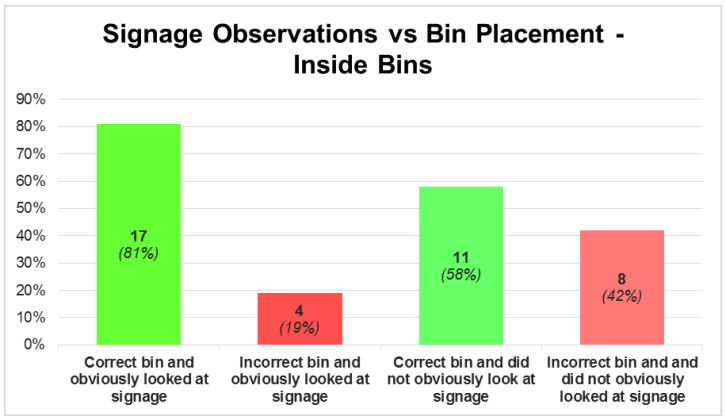
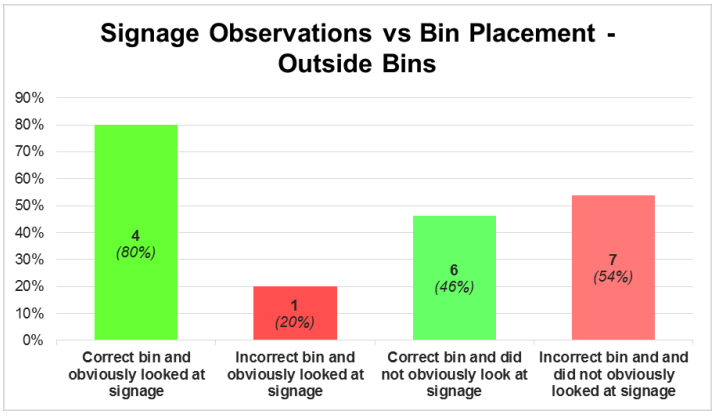


Figure 3-4: Signage observations vs correct/incorrect bin placement for the outside bin stations



3.2.2 Observed Items Incorrectly Disposed Of

Table 3-1 below shows a breakdown of the incorrectly disposed of items witnessed during the observations.

Table 3-1: List of observed items incorrectly disposed of into bins

List of Recycling Items Incorrectly Disposed Of	List of General Waste Items Incorrectly Disposed Of
Food container (with food)	Paper
Food scraps	Old Telephone
Polystyrene foam cup	Food container
	Plastic food container (empty)
	Plastic cup

3.3 Comments from Students/Visitors

During the observations, some general comments from students and visitors were also collected regarding the bins and signage at the Hub. These are as follows.

Law Student – Inside Bin

"I find the bins to be confusing that I am not really a fan of the "bin monsters". Even though I know what to recycle, I still find the bins confusing and I am not sure of the purpose of the little sign is. There is also no need to include that the general waste goes to landfill as we already know that it does. It would be better to make the signage simpler."

Arts Student – Inside bin

"I find the bins to be confusing and you really have to look hard to see what goes in. The artwork is nice but I am not sure if it is helping people put the right things in the right bins."

Parent of student – Outside bin

"I think the signage is sufficient as I didn't notice any issues with which bin my rubbish was supposed to go in."

4 Opportunities to Improve Recycling Outcomes at the Hub

Issue/Problem	**Recycling bins are being contaminated with non-recyclable and food waste materials.**
Aim	To reduce contamination the amount of contamination in the recycling bins, so that they are of a standard that allows the material in the recycling bins to subject to further resource recovery processes.

Opportunities/Initiatives	Examples

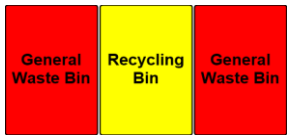
Bin hardware opportunities/initiatives:

- **Bins** should be distinctively coloured (i.e. mostly red for general waste, and mostly yellow for recycling bins), and recycling bins should also be positioned between two general waste bins (Example 1).
  - *This would provide for more general waste capacity and reduce events of overflow into the recycling bins.*
  - *This would also give students who are not sure which bin an items goes in more general waste bin options, therefore decreasing the chances of a non-recyclable items going into the recycling bins.*
- **Bin disposal holes** should suit the types of waste and recycling expected to be generated at the Hub, i.e.:
  - *General waste bin disposal holes should only be large enough to fit the largest general waste item expected from the retail outlets (e.g. largest plastic food container), (Example 3).*
  - *Recycling bins should only be large enough to fit the largest general recycling item expected from the retail outlets (e.g. 660ml soft drink container).*
  - *Disposal holes could also be shaped to make it more difficult for students to place waste in the recycling bin, and easier for students to place waste in the general waste bin (Example 2).*
- **Signage** should be consistent throughout the Hub (inside and outside), and should be simple, clear, and at eye level, to grab students attention quickly (Example 5)
- **Signage** should also be tailored to the specific streams available in the Hub.
- **Other** opportunities/initiatives could include:
  - *Clear sides to the recycling bins with clear bags so show student the materials disposed of in the recycling bins (Example 4).*
  - *The implementation of a Reverse Vending Machine (RVM), which is a vending machine style device that accepts used (empty) beverage containers and returns money and or additional incentives to the users. This RVM could provide an added incentive for Hub users to recycle CDL containers, and could also provide additional data on recycling habits of Hub users.*

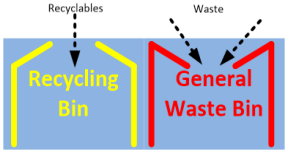
Soft strategy opportunities/initiatives

- Waste and recycling educational messages and awareness campaigns should be on-going throughout the Hub/University, to ensure the message of what is recyclable and what is not continues.

Example 1



Example 2



Example 3

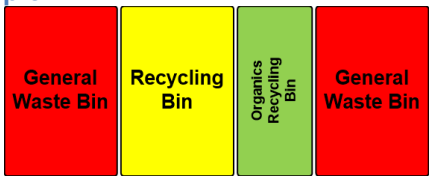
Example 4

[1] Source: http://www.uws.edu.au
[2] Source: http://www.sourceseparationsystems.com.au/

Example 5

Source: http://www.wheeliebinsperth.com

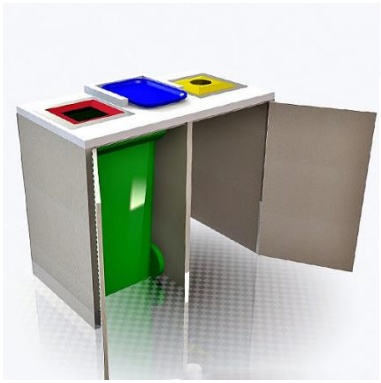
Issue/Problem	**Significant volumes of organic materials are making their way into the general waste and recycling bins.**
Aim	To reduce the amount of food waste going into the recycling bins, and/or general waste bins.

Opportunities/Initiatives	**Examples**
Bin hardware opportunities/initiatives: • **Clearly sign** the recycling bins, to give the message that food waste and food waste in containers is not to go into the recycling bin (Example 6). • Inclusion of **organics bins** within one/some bin stations. >To be able to do this effectively, there would need to be mechanisms in place to ensure that only those students that are committed to recycling their organic waste can, otherwise the additional organics recycling bins will be contaminated in the same manner as the current comingled recycling bins. o *One method is to place an organics recycling bin and a comingled recycling bin, in-between two general waste bins. This would make the easiest option for students to place waste items in the general waste bins (Example 5).* o *In addition to placing the recycling bin in between two general waste bins, there could also be a lid on the proposed organics recycling bin. This would help ensure that only students that are interested in recycling, go to the effort to lift the lid to place their food waste and compostable containers/coffee cups into the recycling bins, and the students that are not interested recycling in take the easiest and quickest option of placing their waste into the general waste bins (Example 8).* o *Additionally, to reduce the chance of contamination in the recycling bins further retail outlets would need to be encouraged to only provide compostable containers, packaging and cutlery, for students.* o *Another option is to encourage retail outlets increase their use of reusable plates, cutlery etc.* **Soft strategy opportunities/initiatives** • Conduct a pilot organics recycling program at one or more bin stations, starting with a location where the most food waste is likely to be disposed of (i.e. next to the retail outlets). • If an organics recycling service was to be trailed/utilised at the Hub, there would need to be specific and ongoing educational messages and awareness campaigns, to ensure the message of what goes into the organics recycling bins is continued and isn't forgotten by the students.	**Example 6**  Source: https://www.ucl.ac.uk/greenucl/resources/materials-and-recycling/three-recycling-bin-streams-2 **Example 7**  **Example 8**  Source: Bin station at the Market Shed on Holland St

Issue/Problem	**A significant number of disposable coffee cups (approximately 73,000) is being disposed of each year in the Hub recycling and general waste bins.**
Aim	To reduce the amount of coffee cups disposed of at the Hub, and/or to ensure recycling/further use of the cups takes place before final disposal.

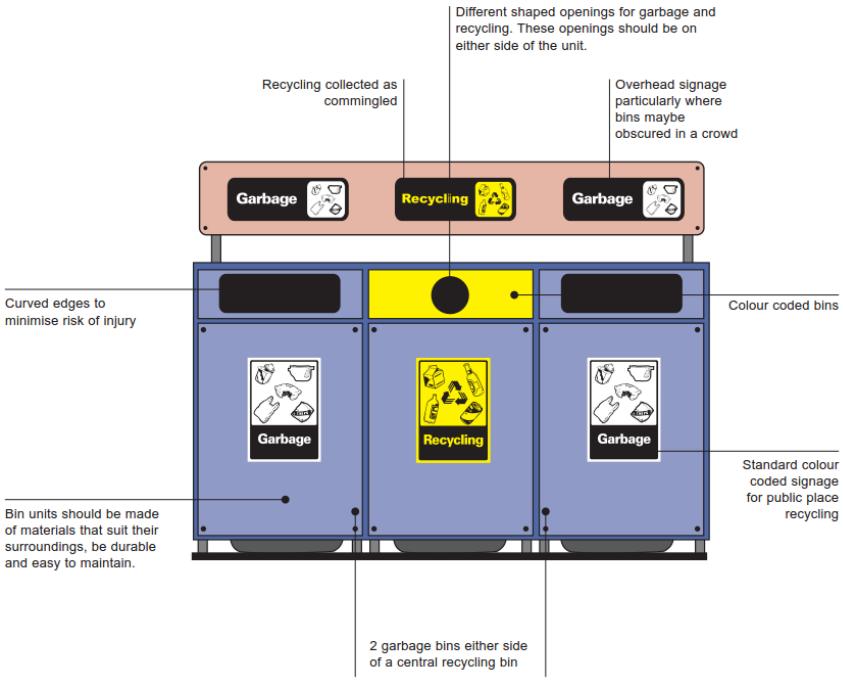
Opportunities/Initiatives	Examples
Bin hardware opportunities/initiatives: • Specific **signage** should be placed on recycling bins to encourage students to dispose of their coffee cups without lids on (depending on type of lid) and without any liquid in the cups (Example 9). • Have the retail outlets only provide compostable coffee cups for the suggested organics bins above. **Soft strategy opportunities/initiatives** • Have the retail outlets provide incentives for students who bring their reusable coffee cups or utilise reusable coffee cups from the retail outlets. • A research/pilot program could also be conducted by some environmental students to find a better use for disposable coffee cups once they have been used by students.; Programs could include: ○ Collection and separation for use by a conservation organisation (such as trees for life) for seedling pots. • A more hard-hitting strategy would to ban disposable coffee cups all together, requiring students to bring their own reusable coffee cups, or utilise reusable coffee cups form the retail outlets.	**Example 9**  Source: http://www.fs.utoronto.ca **Example 10**  Source: http://www.trashrecyclingreceptacles.com **Example 11**  Source: www.yankodesign.com

4.1 Additional Examples of Public Place Bin Stations



Source: http://www.sourceseparationsystems.com.au/

Source: http://www.wheeliebinsperth.com/recycling-bins.php



Source: NSW EPA Better Practice Guide for Public Place Recycling

Source: http://planetark.org

Source: http://your.kingcounty.gov

APPENDIX 1: Audit Results and Analysis Tables

Table A-1: Audit results by waste stream (kg)

Audit Categories	Waste Stream Breakdown	Outside Recycling Bins (kg)	Outside Waste Bins (kg)	Inside Recycling Bins (kg)	Inside Waste Bins (kg)	Total (all bins) (kg)
1A, 1B & 1C	**Total Organics (Food) Recyclables**	4.74	1.88	2.26	23.12	**32.00**
2, 3, 4 & 5	**Total Comingled Recyclables**	4.71	0.58	8.96	10.94	**25.19**
6 & 7	**Total residual Items**	2.58	0.84	2.8	19.42	**25.64**
8	**Total Other Items**	0	0	0	0.02	**0.02**

Table A-2: Audit results by audit category (kg)

Audit Categories	Audit Categories	Outside Recycling Bins (kg)	Outside Waste Bins (kg)	Inside Recycling Bins (kg)	Inside Waste Bins (kg)	Total (all bins) (kg)
1A	**Food waste (solid waste)**	1.98	0.94	0.48	15.02	**18.42**
1B	**Food waste (liquid waste) - from cups & containers)**	2.38	0.46	0.78	6.96	**10.58**
1C	**Food waste from cups & containers (liquid)**	0.38	0.48	1.00	1.14	**3.00**
2	**Coffee cups**	0.30	0.24	1.96	2.74	**5.24**
3	**CDL containers**	0.58	0.04	2.12	0.50	**3.24**
4	**White paper**	0.01	0.00	0.16	0.26	**0.43**
5	**Other recyclables**	3.82	0.30	4.72	7.44	**16.28**
6	**Non-recyclable packaging (e.g. chip packets)**	0.12	0.02	0.08	0.36	**0.58**
7	**Other residual waste**	2.46	0.82	2.72	19.06	**25.06**
8	**Additional items (such as E-waste)**	0.00	0.00	0.00	0.02	**0.02**
	Total	**12.03**	**3.3**	**14.02**	**53.48**	**82.83**

Table A-3: Estimate waste and recycling volumes (tonnes per annum)

	Outside Recycling Bins (tonnes per annum)	Outside Waste Bins (tonnes per annum)	Inside Recycling Bins (tonnes per annum)	Inside Waste Bins (tonnes per annum)	Total (tonnes per annum)
Estimated Volume of waste disposed in bins per year	**8.4**	**2.3**	**3.4**	**12.9**	**27**
Estimated Volume of residual waste in bins per year	1.8	0.6	0.7	4.7	**7.8**
Estimated Volume of comingled recycling disposed in bins per year	3.3	0.4	2.2	2.6	**8.5**
Estimated Volume of compostable material disposed in bins per year	3.3	1.3	0.5	5.6	**10.7**

Table A-4: Estimate coffee cups disposed of per day and per year (no.)

	Outside Recycling Bins	Outside Waste Bins	Inside Recycling Bins	Inside Waste Bins	Total
Estimated number of coffee cups per day	32	26	101	144	**300**
Estimated number of coffee cups per year	11,000	9,000	22,000	31,000	**73,000**

APPENDIX 2: Observations Results and Analysis Tables

Table A-5: Observations results and analysis

	All Bins		Inside Bins		Outside Bins	
	%	No.	%	No.	%	No.
Total observations	*100%*	58	*100%*	40	*100%*	18
General waste bin observations	*62%*	36	*70%*	28	*44%*	8
Recycling bin observations	*38%*	22	*30%*	12	*56%*	10
Obviously looked at signage observations	*45%*	26	*53%*	21	*28%*	5
Did not look obviously look at signage observations	*55%*	32	*48%*	19	*72%*	13
Correct bin observations	*66%*	38	*70%*	28	*56%*	10
Incorrect bin observations	*34%*	20	*30%*	12	*44%*	8
Correct bin and obviously looked at signage	*81%*	21	*81%*	17	*80%*	4
Incorrect bin and obviously looked at signage	*19%*	5	*19%*	4	*20%*	1
Correct bin and did not obviously look at signage	*53%*	17	*58%*	11	*46%*	6
Incorrect bin and did not obviously looked at signage	*47%*	15	*42%*	8	*54%*	7

APPENDIX 3: Photos Taken During the Audit

Photo	Photo Description
	Separated materials identified within the outside recycling bins

Photo	Photo Description
     	Separated materials identified within the outside recycling bins (Cont…)

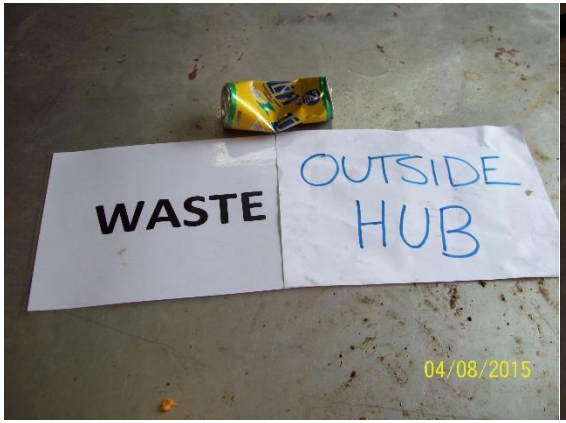
Photo	Photo Description
  	Separated materials identified from within the outside general waste bins

Photo	Photo Description
  	Waste and recycling bins materials delivered to auditors.

Photo	Photo Description
      	Separated materials identified from within the inside recycling bins

Photo	Photo Description
	Separated materials identified from within the inside general waste bins.