

NSW



Environment Protection Authority

2023 C&I Waste Audit Report – Summary

October 2024





Acknowledgement of Country

The NSW Environment Protection Authority acknowledges the Traditional Custodians of the land on which we live and work, honours the ancestors and the Elders both past and present and extends that respect to all Aboriginal people.

We recognise Aboriginal peoples' spiritual and cultural connection and inherent right to protect the land, waters, skies and natural resources of NSW. This connection goes deep and has since the Dreaming.

We also acknowledge our Aboriginal and Torres Strait Islander employees who are an integral part of our diverse workforce and recognise the knowledge embedded forever in Aboriginal and Torres Strait Islander custodianship of Country and culture.

Aboriginal artwork by Worimi artist Gerard Black

Contents

Executive summary	4
Key findings	4
Scope and method	7
Visual assessments	8
Physical audits of bagged material	8
Dashboard.....	9
C&I waste in NSW	10
Main components of C&I waste	11
Load compositions	13
Mixed-material loads.....	13
Single-material loads	15
Sector of origin	17
Recovery opportunities	20

Executive summary

This report contains the results of the fourth New South Wales (NSW) commercial and industrial (C&I) waste audit conducted over the past twenty years. It provides a level of granularity not available from other data sources in relation to the composition, source and delivery mode of NSW C&I waste.

The audit results provide meaningful and timely data for the entire sector, and quantify the nature and amount of the specific materials currently taken to landfill for disposal. The data identifies:

- how well current resource recovery activities are being embraced
- where greatest effort should be directed for further resource recovery by material and source
- where future opportunities exist for further resource recovery.

Based on data from facility reports, most C&I waste (69%) is generated in the Metropolitan Levy Area (MLA), while 26% is generated in the Regional Levy Area (RLA) and 5% in the non-levied area (NLA).

This audit report:

- details selected material categories and sub-categories of C&I waste
 - identifies the composition and generation by industry sectors
 - identifies potentially recoverable materials that are currently landfilled
 - identifies key focus material categories and sub-categories to inform future public policy
 - identifies differences in composition between regions and levy areas
 - compares the 2014 and 2023 audit findings.
-

Key findings

Main components of C&I waste

This audit found the main components of C&I waste to be:

- garbage bags (44.8%)
- residuals (16.2%)
- organics (14.2%)
- plastic (7.9%).

Of material in garbage bags, the largest components were:

- organic materials (25.0%)
- paper and cardboard (20.3%)
- other (17.3%)
- plastic (16.4%).

Load compositions

Most C&I waste (82.5% by weight) arrives at disposal facilities in mixed loads. The rest arrives as 'single-material loads' where 90% or more of the load is just one material. These two types of deliveries differ significantly in composition.

About 80% of mixed loads comprise just three materials: garbage bags (53.7%), organics (16.1%) and plastic (9.2%).

When garbage bags are opened and the contents distributed, the following five materials represent more than 80% of the mixed C&I waste loads:

- organics (29.6%)
- plastic (18.0%)
- paper and cardboard (16.0%)
- other material (9.8%)
- aggregate, masonry and soil (6.8%).

Single-material loads comprise mainly post-processing waste residuals (72.4%); aggregates, masonry and soils (13.1%); and organics (5.1%).

Most single-source loads are from waste management operations (45.7%), manufacturing (31%), and public administration and safety (11.8%).

Sector of origin

By sector, C&I waste is generated by:

- small and medium enterprises (59.4%)
- waste management operations and facilities (10.6%)
- manufacturing (8.0%)
- administration and support services (6.8%).

Garbage bags came mainly from:

- SMEs (88.2%)
- shopping centres (3.7%)
- accommodation and food services (1.8%)
- health care and social assistance (1.3%).

Prospects for recovery

Each material was classified as 'recoverable now' (using current technology), 'recoverable in the future' (using future technology and changes in practice) or 'not recoverable'.

If we exclude garbage bags and their contents (i.e. assume they cannot be accessed):

- 19.9% of C&I waste (610,479 tonnes/year) is recoverable now.
- 34.0% of C&I waste (1,043,802 tonnes/year) is recoverable in the future.
- A total of 53.9% of C&I waste (1,654,281 tonnes/year) is recoverable, either now or in the future.

If we assume that the contents of garbage bags can be accessed:

- 35.2% of C&I waste (1,080,480 tonnes/year) is recoverable now.
- 53.3% of C&I waste (1,635,698 tonnes/year) is recoverable in the future.
- A total of 88.5% of C&I waste (2,716,178 tonnes/year) is recoverable, either now or in the future.

The largest opportunity to improve waste diversion from landfill is to focus on the materials identified in the *Recovery opportunities* section to divert an additional 500–700,000 tonnes of material deemed to be recoverable now.

Scope and method

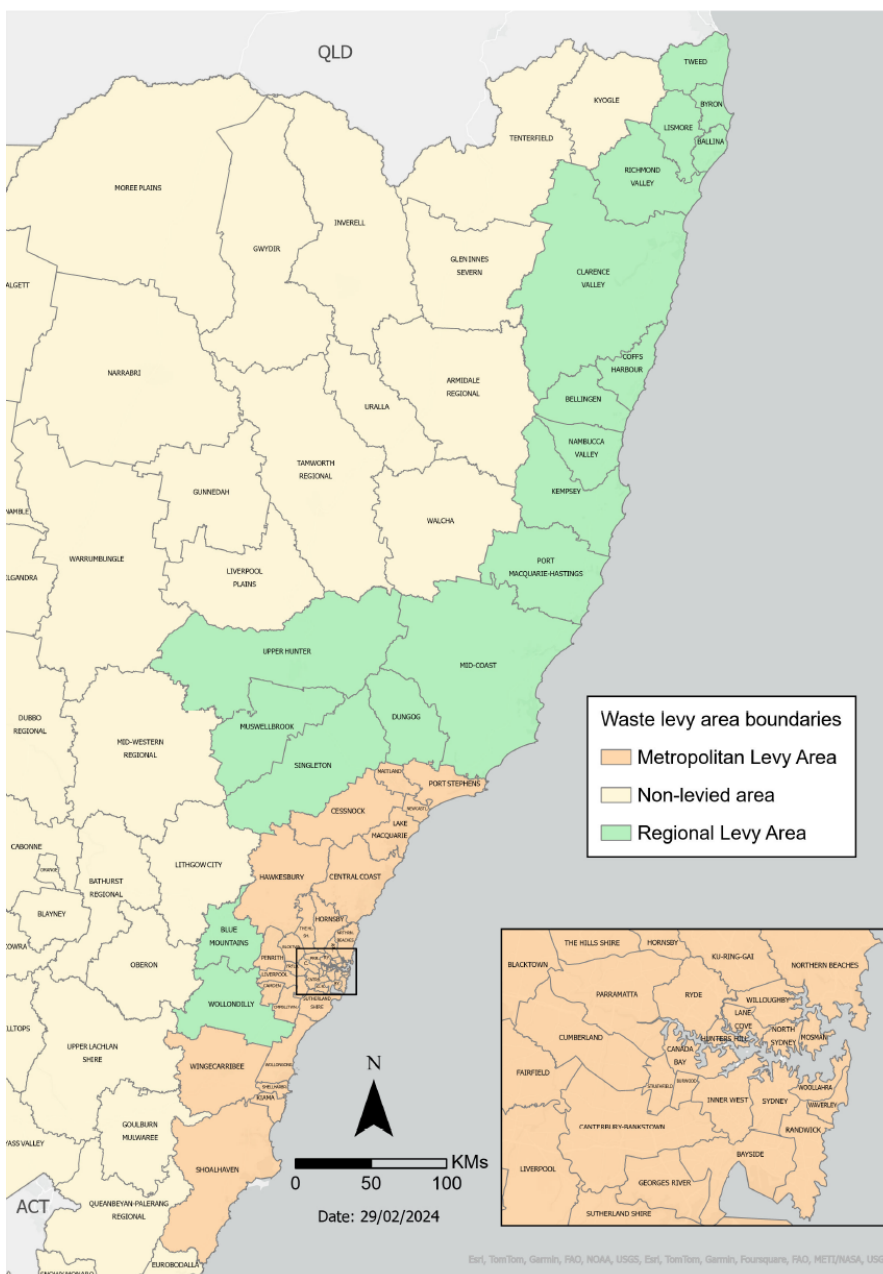
Data was collected by conducting both visual assessments of delivered loads and physical audits of bagged material known as garbage bag audits in accordance with the *Update of the Commercial & Industrial (C&I) Waste Stream Audit Methodology, June 2018*.

The National Waste Report provides the following definition of C&I waste:

Commercial and industrial (C&I) waste: waste produced by institutions and businesses; includes waste from schools, restaurants, offices, retail and wholesale businesses, and industries including manufacturing.

C&I waste deliveries were assessed across the three levy areas: the Metropolitan Levy Area (MLA), the Regional Levy Area (RLA) and, for the first time, the non-levied area (NLA).

Figure 1 Map of NSW landfill levy boundaries



The audit relied heavily on the co-operation of the audit sites and their customers. The field work was undertaken over 26.5 days between 31 July and 19 September 2023. In total, 14 sites including eight landfills and six transfer stations across NSW participated.

Table 1 Sites assessed

Levy area	Number of sites	Tonnes assessed	Visual assessments	Bag samples for physical audit
MLA	4 landfills 5 transfer stations	3,256	1,136	2,720
RLA	2 landfills 1 transfer stations	433	207	370
NLA	2 landfills 0 transfer stations	236	154	450
Total	8 landfills 6 transfer stations	3,924	1,497	3,540

Visual assessments

The project entailed interviewing drivers delivering C&I waste to determine where the waste was generated and which of the 31 industry sectors and subsectors generated it.¹

In total 1,497 loads were visually analysed, with a volume of 16,882 m³ and a weight of 3,924 tonnes.

The loads were assessed visually, and the material assigned to 51 identifiable categories. All visual assessments were converted from volume to weight using agreed material compaction densities and then scaled to the actual weighbridge weight for every load.

Physical audits of bagged material

Garbage bags are defined as disposable plastic bags used to discard waste from onsite bins at C&I premises. The assessments were undertaken only on loads that appeared to contain more than 20% garbage bags by volume.

3,540 individual bags of waste weighing 5.92 tonnes were extracted from 354 delivered loads at 11 of the 14 sites.

These bags were sorted into a 148 categories. These were then consolidated into the 51 visual categories for reporting. This report should be read in conjunction with the *2023 NSW C&I Garbage*

¹ As defined by Australian and New Zealand Standard Industrial Classification (ANZSIC) code (ABS & SNZ, 2006)

Bag Audit Report, which complements the 2023 C&I Waste Audit Report through greater detail of material identified in garbage bags.

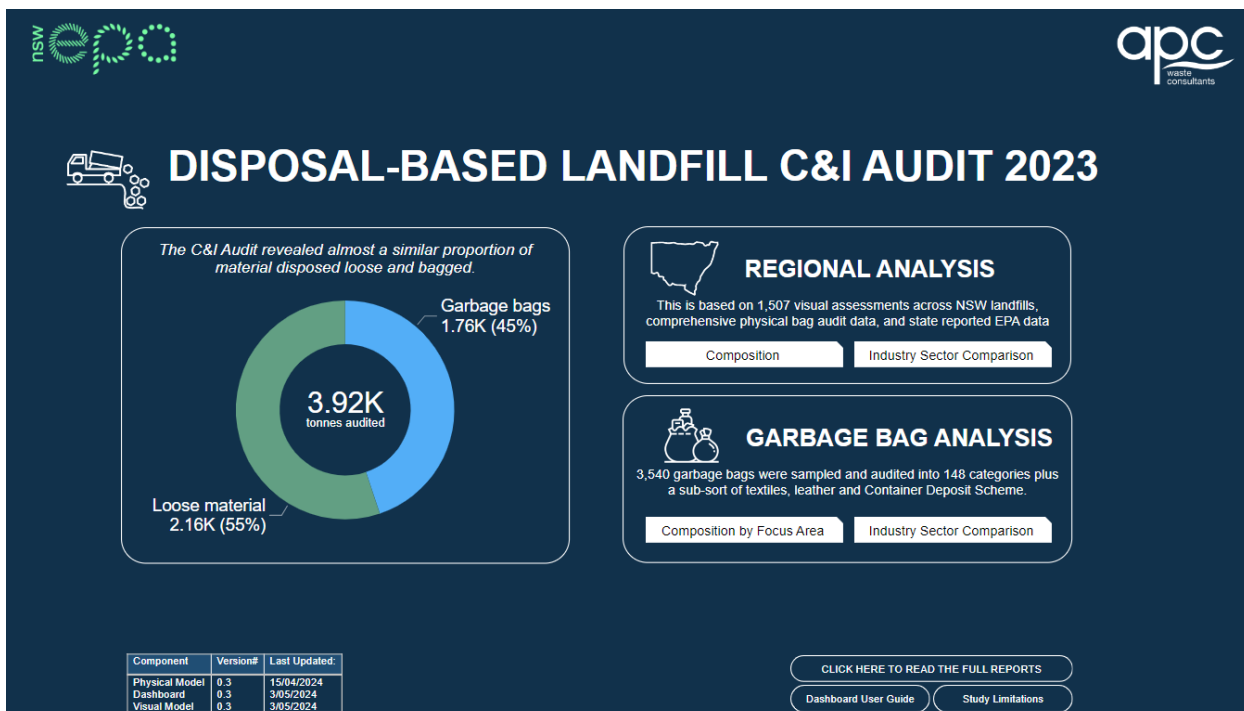
Dashboard

As well as being presented in the 2023 C&I Waste Audit Report, all data has been provided on a public dashboard hosted on the NSW EPA website. The dashboard provides the data collected in this audit in an accessible format to allow for self-service analysis. Given the extensive and comprehensive nature of the data, it is not possible to present every analysis. Providing the data publicly allows users to seek information about specific data sets that are of interest to them.

The dashboard is broken down into the following sections.

Regional analysis	Garbage bag analysis
Audit data scaled to reflect regional generation and composition	Only garbage bag data with three levels of material granularity.
<p>Composition – by levy region, regional grouping, industry sector, recoverability and material category.</p> <ul style="list-style-type: none"> ○ Based on two scenarios – bags dispersed and bags NOT dispersed. <p>Industry sector comparison – by levy region, regional grouping, industry sector and material category.</p> <ul style="list-style-type: none"> ○ Based on two scenarios – all-sector comparison including unknown (mixed SME) sectors and identifiable sectors only. 	<p>Focus areas – by levy region, regional grouping, industry sector and material category.</p> <ul style="list-style-type: none"> ○ Based on three focus area scenarios – recoverability potential, organics vs non-organics, and packaging vs non-packaging. <p>Industry sector comparison – by levy region, regional grouping, industry sector and material category.</p> <ul style="list-style-type: none"> ○ Based on three scenarios – leviabie regions, organics vs non-organics, and packaging vs non-packaging.

Figure 2 Dashboard home screen



C&I waste in NSW

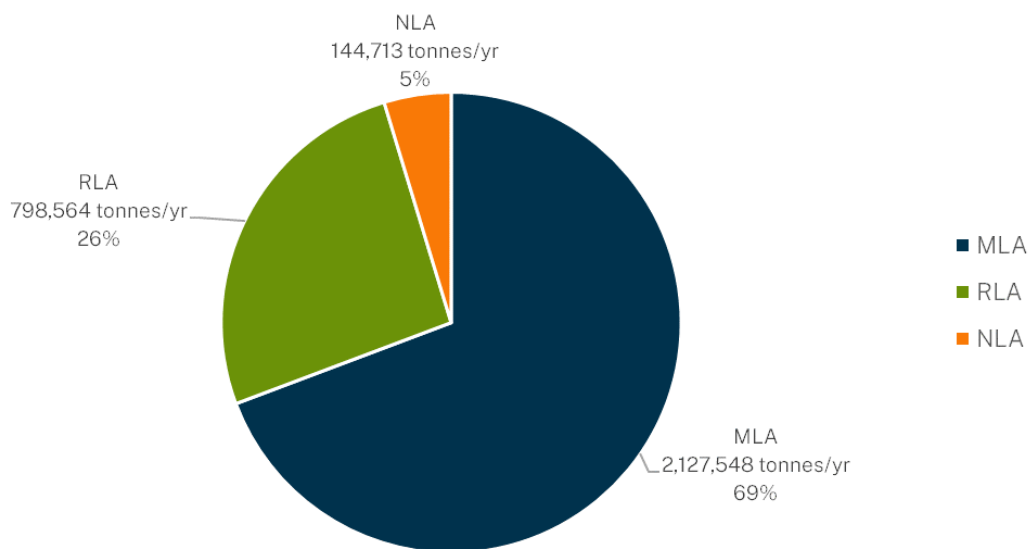
The total C&I waste tonnes has been derived from the Waste Contribution Monthly Report (WCMR) submitted by licensed disposal facilities in the regulated areas of NSW in 2021–22.

A total of 3,070,825 tonnes of C&I waste is disposed of in NSW per year.

Figure 3 describes the segmentation of C&I waste disposed of in each levy area.

- 69% of C&I waste is disposed in the MLA
- 26% in the RLA
- just 5% in the NLA.

Figure 3 Annual C&I disposal by region



Main components of C&I waste

This audit found the main components of C&I waste to be:

- garbage bags (44.8%)
- residuals (16.2%)
- organics (14.2%)
- plastic (7.9%).

Table 2 C&I waste composition

Material	Tonnes per year	% of waste stream
Aggregates, masonry & soils	230,132	7.5%
Electrical & electronic	7,508	0.2%
Garbage bags	1,375,290	44.8%
Glass	6,994	0.2%
Hazardous	12,102	0.4%
Metal	31,178	1.0%
Organics	436,307	14.2%
Other	13,160	0.4%
Paper & cardboard	132,076	4.3%
Plastic	243,053	7.9%
Residuals	498,834	16.2%
Rubber	11,904	0.4%
Textiles	72,289	2.4%
Total	3,070,826	100.0%

Of material in garbage bags, the largest components were:

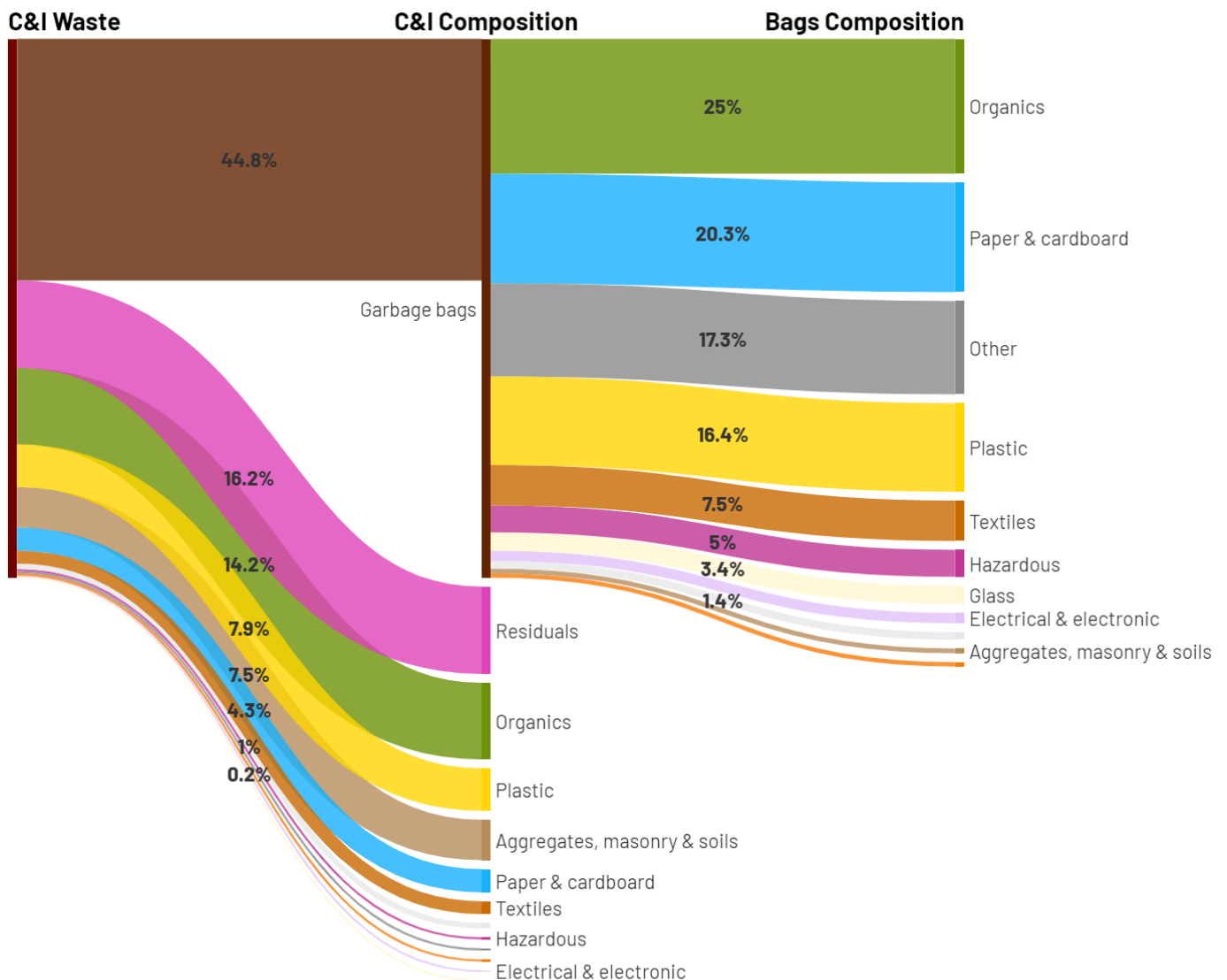
- organic materials (25.0%)
- paper and cardboard (20.3%)
- other (17.3%)
- plastic (16.4%).

Table 3 Composition of garbage bags

Material	Tonnes per year	% of waste stream
Aggregates, masonry & soils	13,008	0.9%
Electrical & electronic	26,660	1.9%
Glass	46,471	3.4%

Material	Tonnes per year	% of waste stream
Hazardous	69,176	5.0%
Metal	19,136	1.4%
Organics	344,012	25.0%
Other	237,602	17.3%
Paper & cardboard	279,500	20.3%
Plastic	225,933	16.4%
Residuals	0	0.0%
Rubber	11,000	0.8%
Textiles	102,792	7.5%
Total	1,375,290	100.0%

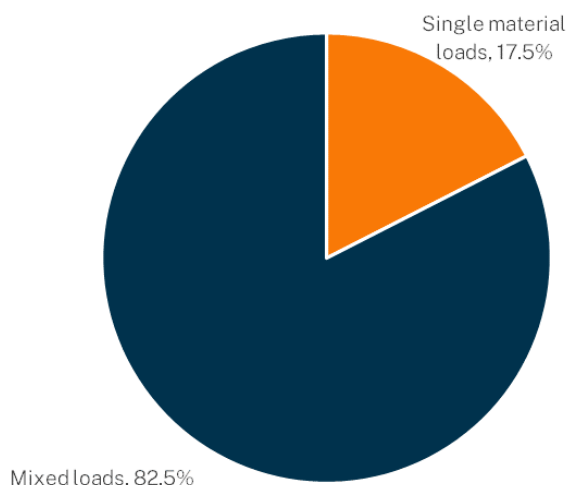
Figure 4 Composition of total C&I waste and C&I bags



Load compositions

Most C&I waste (82.5% by weight) arrives at disposal facilities in mixed loads. The rest arrives as 'single-material loads' where 90% or more of the load is just one material. These two types of deliveries differ significantly in composition.

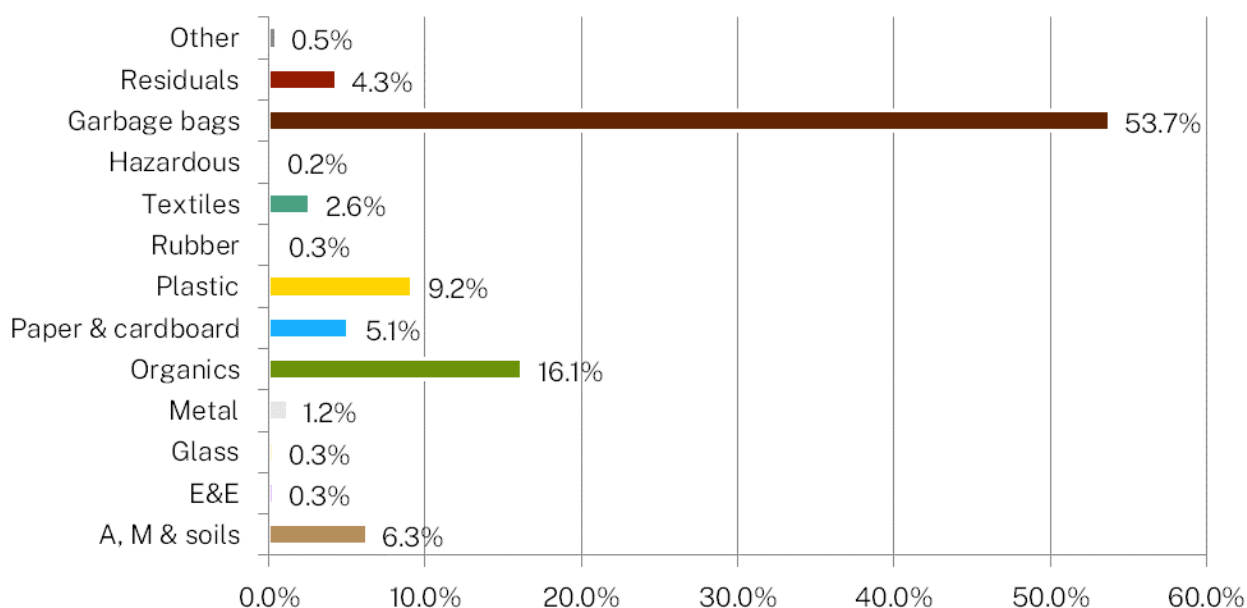
Figure 5 Overall mixed vs single-material loads, by weight



Mixed-material loads

About 80% of mixed loads comprise just three materials: garbage bags (53.7%), organics (16.1%) and plastic (9.2%).

Figure 6 Composition of mixed loads – garbage bags as a category



When garbage bags are opened and the contents distributed, the top three materials are organics (29.6%), plastic (18.0%), and paper and cardboard (16.0%).

Figure 7 Composition of mixed loads – garbage bags distributed

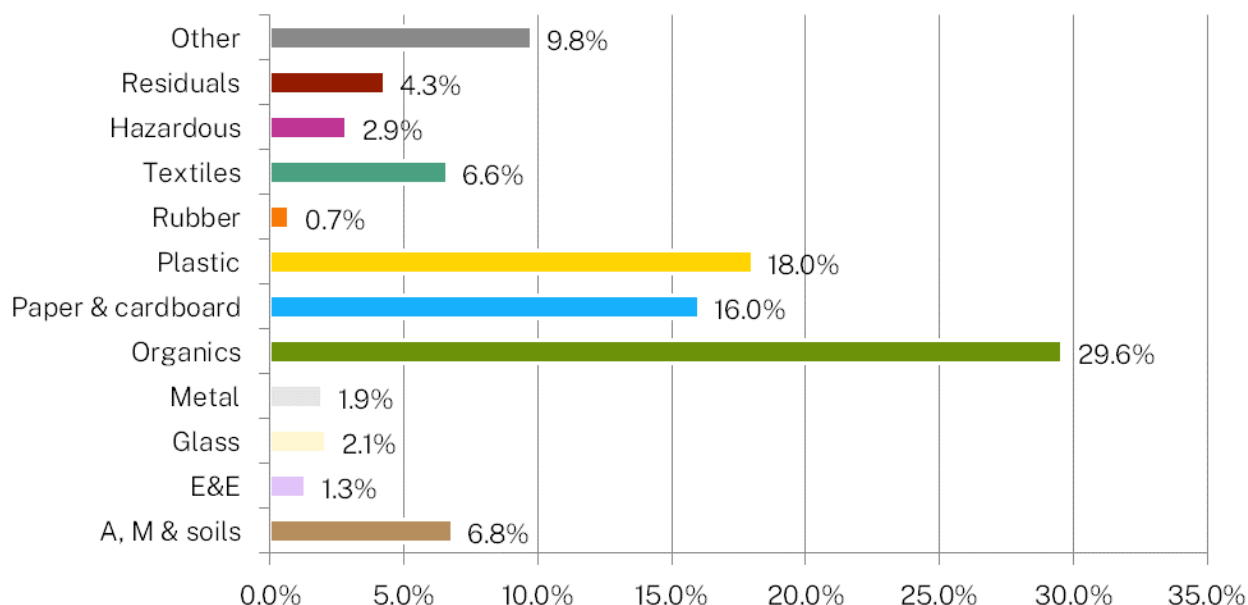


Table 4 Mixed-material loads composition

Material	Tonnes per year (bags as category)	% of waste stream (bags as category)	Tonnes per year (bags as distributed)	% of waste stream (bags as distributed)
Aggregates, masonry & soils	159,492	6.3%	172,358	6.8%
Electrical & electronic	7,116	0.3%	33,491	1.3%
Glass	6,994	0.3%	52,985	2.1%
Metal	30,315	1.2%	49,268	1.9%
Organics	408,747	16.1%	749,276	29.6%
Paper & cardboard	129,004	5.1%	405,663	16.0%
Plastic	232,432	9.2%	456,111	18.0%
Rubber	6,805	0.3%	17,686	0.7%
Textiles	65,481	2.6%	167,192	6.6%
Hazardous	3,803	0.2%	72,177	2.9%
Garbage bags	1,360,944	53.7%	-	-
Residuals	108,672	4.3%	108,672	4.3%
Other	12,358	0.5%	247,285	9.8%
Total	2,532,163	100.0%	2,532,163	100.0%

Single-material loads

Most single-material loads are from waste management operations (45.7%), manufacturing (31%), and public administration and safety (11.8%). Single-material loads comprise mainly:

- post-processing waste residuals (72.4%)
- aggregates, masonry and soils (13.1%)
- organics (5.1%).

There were minimal garbage bags identified (3.9%) in single-material loads. When the material from garbage bags was distributed there was little change to the overall compositional profile.

Figure 8 Composition of single-material loads – garbage bags as a category

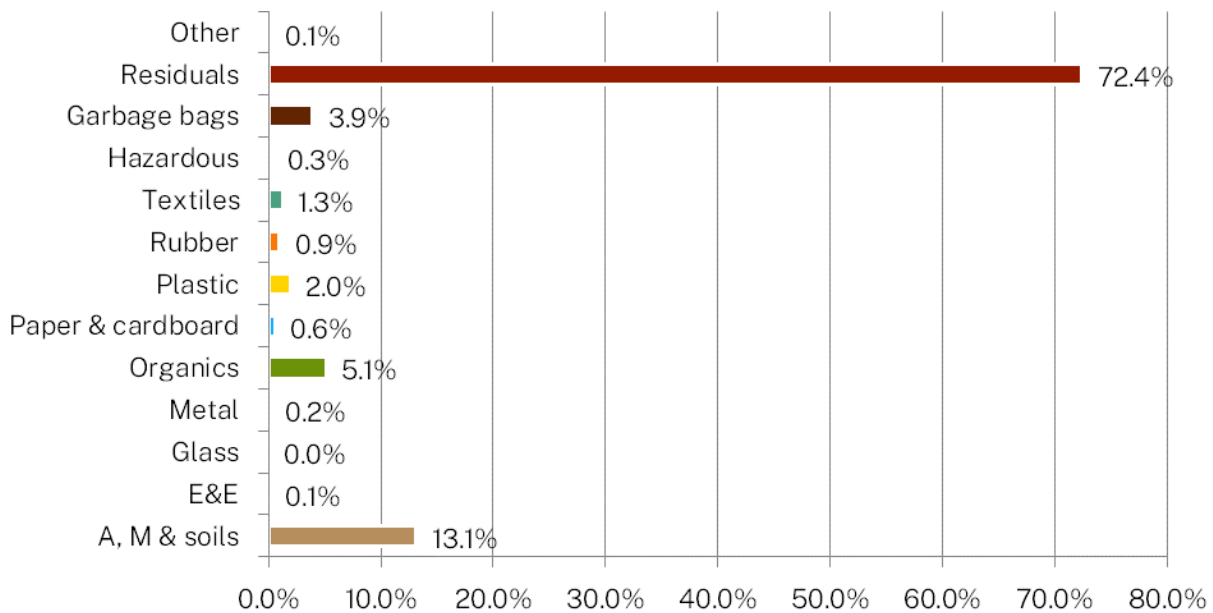


Figure 9 Composition of single-material loads – garbage bags distributed

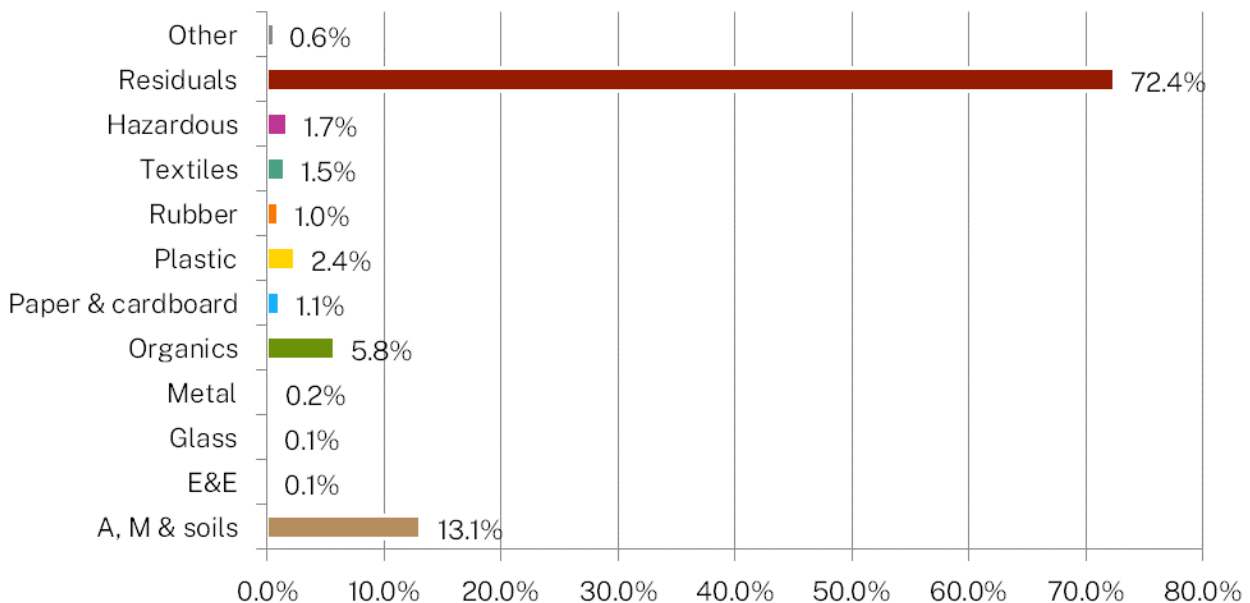


Table 5 Single-material loads composition

Material	Tonnes per year (bags as category)	% of waste stream (bags as category)	Tonnes per year (bags as distributed)	% of waste stream (bags as distributed)
Aggregates, masonry & soils	70,640	13.1%	70,782	13.1%
Electrical & electronic	392	0.1%	677	0.1%
Glass	0	0.0%	480	0.1%
Metal	863	0.2%	1,045	0.2%
Organics	27,560	5.1%	31,043	5.8%
Paper & cardboard	3,072	0.6%	5,913	1.1%
Plastic	10,621	2.0%	12,875	2.4%
Rubber	5,099	0.9%	5,219	1.0%
Textiles	6,808	1.3%	7,889	1.5%
Hazardous	1,801	0.3%	9,102	1.7%
Garbage bags	20,844	3.9%	-	-
Residuals	390,162	72.4%	390,162	72.4%
Other	802	0.1%	3,477	0.6%
Total	538,663	100.0%	538,663	100.0%

Sector of origin

More than 59% of C&I was disposed of by unknown industry sectors, predominantly mixed SMEs. These were loads collected from multiple premises from different industry sectors in front and rear lift vehicles.

The identifiable industry divisions (also referred to as sectors) that dispose of the most C&I waste are:

- other (10.6%), which is predominantly residuals from waste management operations
- manufacturing (8.0%)
- administration and support services (6.8%).

Figure 10 Overall C&I waste disposal by industry sector

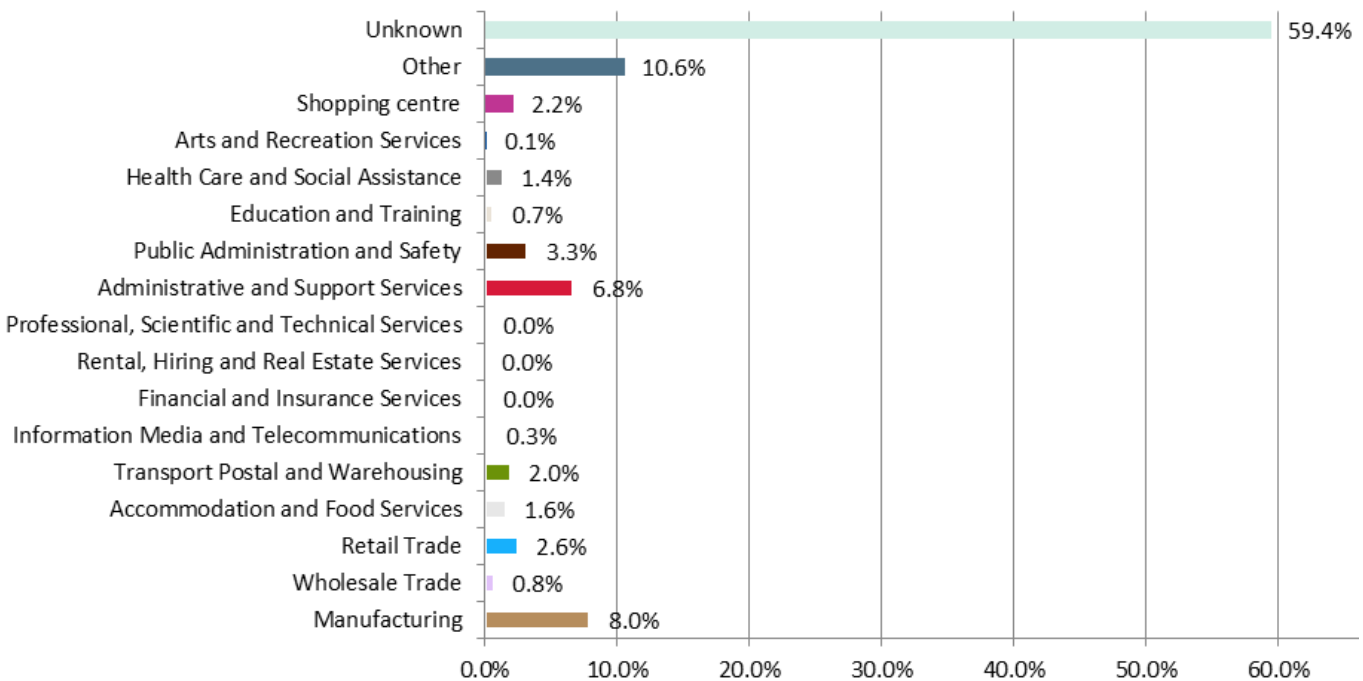


Table 6 Industry composition

Industry	Overall tonnes per year	Overall %
Manufacturing	246,037	8.0%
Wholesale trade	23,679	0.8%
Retail trade	79,352	2.6%
Accommodation and food services	50,337	1.6%
Transport, postal and warehousing	60,695	2.0%
Information media and telecommunications	10,059	0.3%
Financial and insurance services	823	0.0%
Rental, hiring and real estate services	144	0.0%
Professional, scientific and technical services	1,451	0.0%

Industry	Overall tonnes per year	Overall %
Administrative and support services	207,318	6.8%
Public administration and safety	101,554	3.3%
Education and training	22,545	0.7%
Health care and social assistance	43,531	1.4%
Arts and recreation services	3,865	0.1%
Shopping centres	68,253	2.2%
Other	325,616	10.6%
Unknown	1,825,568	59.4%
Total	3,070,826	100.0%

Eighty-eight per cent of all garbage bags disposed of were in loads from small and medium enterprises (SMEs) deemed as unknown.

This was followed by the following sectors:

- shopping centre (3.7%)
- accommodation and food services (1.8%)
- health care and social assistance (1.3%).

Figure 11 Garbage bag generation by industry sector

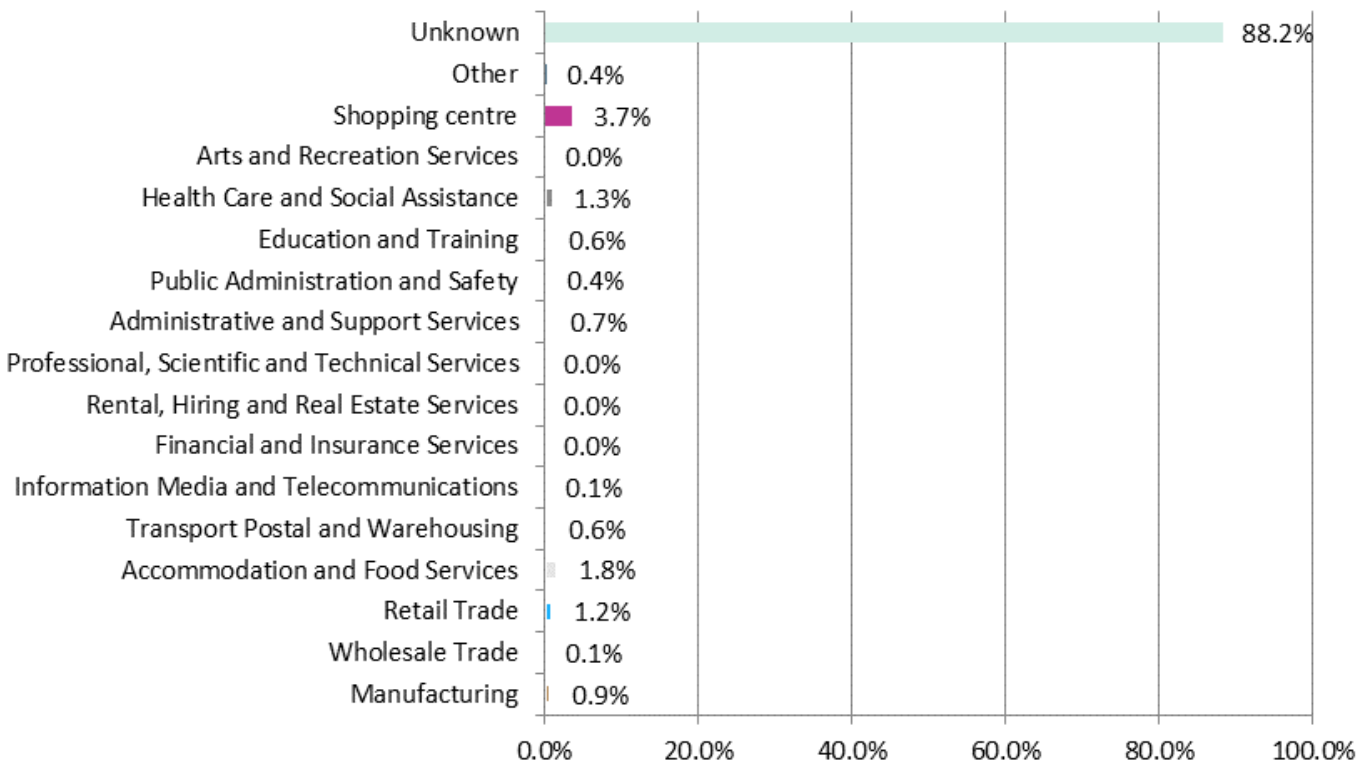


Table 7 Industry composition

Industry	Overall tonnes per year	Overall %
Manufacturing	12,124	0.9%
Wholesale trade	1,013	0.1%
Retail trade	15,860	1.2%
Accommodation and food services	24,846	1.8%
Transport, postal and warehousing	7,870	0.6%
Information media and telecommunications	2,008	0.1%
Financial and insurance services	0	0.0%
Rental, hiring and real estate services	0	0.0%
Professional, scientific and technical services	0	0.0%
Administrative and support services	10,095	0.7%
Public administration and safety	4,820	0.4%
Education and training	8,232	0.6%
Health care and social assistance	17,644	1.3%
Arts and recreation services	588	0.0%
Shopping centres	50,906	3.7%
Other	6,063	0.4%
Unknown	1,213,221	88.2%
Total	1,376,927	100.0%

Recovery opportunities

Each material in the C&I waste audit has been classified as:

- **recoverable now** – using available technology
- **recoverable in the future** – through better source separation, development of emerging recycling technologies, existing recycling technologies becoming more easily accessible across NSW, and/or development of markets for recovered materials
- **not recoverable** – there are no current or emerging technologies that can feasibly recycle this material, or the material is being phased out, therefore recycling technologies and services are not expected to be available/developed to handle the material in the future.

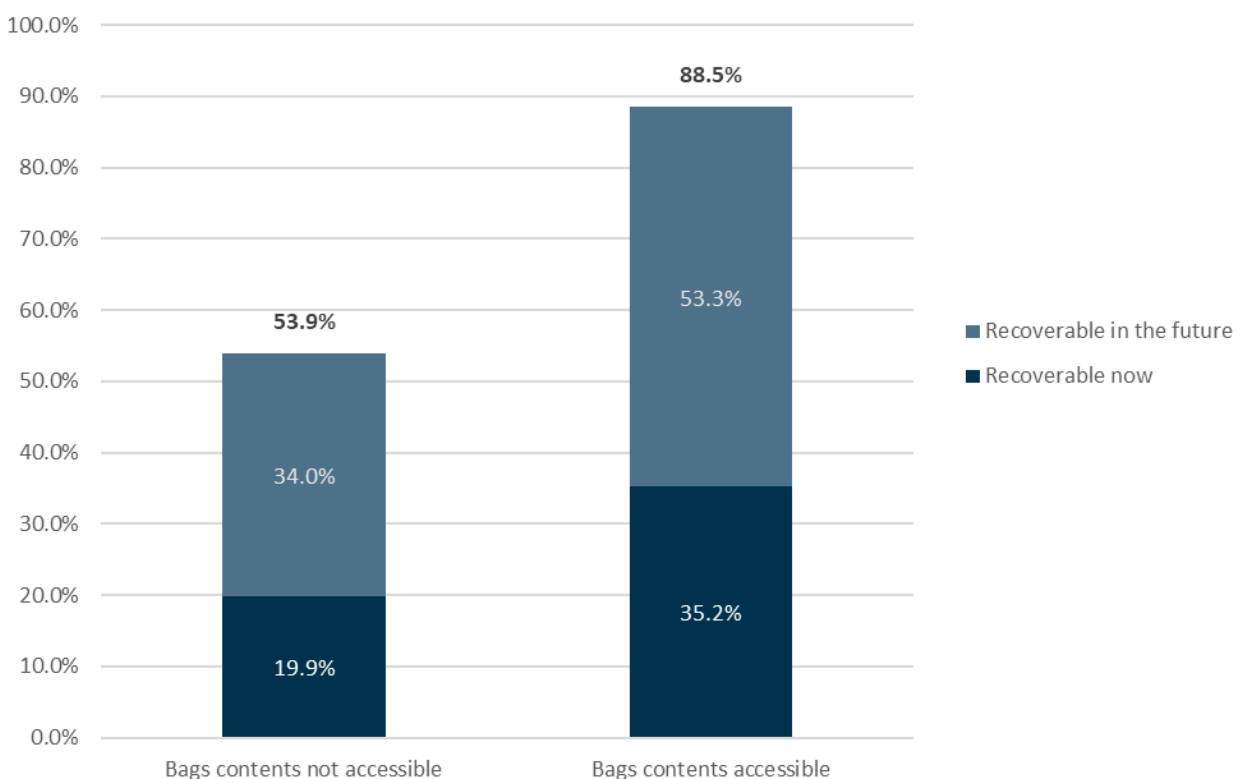
If we assume that the contents of garbage bags are not recoverable because they **cannot be accessed**, then:

- 19.9% of C&I waste (610,479 tonnes/year) is recoverable now
- 34.0% of C&I waste (1,043,802 tonnes/year) is recoverable in the future
- A total of 53.9% of C&I waste (1,654,281 tonnes/year) is potentially recoverable.

If we assume that the contents of garbage bags **can be accessed**, then:

- 35.2% of C&I waste (1,080,480 tonnes/year) is recoverable now
- 53.3% of C&I waste (1,635,698 tonnes/year) is recoverable in the future
- A total of 88.5% of C&I waste (2,716,178 tonnes/year) is potentially recoverable.

Figure 12 C&I waste currently disposed of that could be recovered



The largest opportunity to improve diversion, as shown in Table 8, is to focus on the materials deemed to be recoverable now.

Eleven materials, accounting for over 500,000 tonnes of current C&I waste sent for disposal, have potential to be recovered now.

Table 8 C&I materials landfilled but deemed as recoverable now (tonnes)

Material	Aggregates, masonry & soil	Plastic, cardboard & metal	Organics
Total estimated tonnes	221,343 tonnes	124,484 tonnes	176,421 tonnes
Material and estimated tonnes	<ul style="list-style-type: none"> concrete, brick and asphalt – 106,901 plasterboard – 73,193 soil, clay and rubble – 41,249 	<ul style="list-style-type: none"> cardboard dry – 85,282 metal ferrous – 19,719 plastic – rigid packaging – 19,483 	<ul style="list-style-type: none"> food – 49,447 garden organics – 38,731 sawdust – 33,687 wood pallets – 29,291 wood untreated – 25,265
Target sectors in levy areas with estimated tonnes	<ul style="list-style-type: none"> Public administration – 62,811 in RLA Administration – 29,350 in RLA and 22,905 in MLA SMEs – 24,210 in RLA and 13,272 in MLA 	<ul style="list-style-type: none"> SMEs in MLA – 48,911 SMEs in RLA – 19,029 	<ul style="list-style-type: none"> SMEs in MLA – 66,625 SMEs in RLA – 26,203

Improved access to the contents of bagged material will unlock further recoverable feedstock. This is summarised in Table 9.

If bagged contents are accessible, 700,000 tonnes of C&I waste material across **eight materials** currently disposed of to landfill could be recovered now.

Table 9 C&I materials landfilled but deemed as recoverable now (tonnes) if bagged contents are accessible

Material	Aggregates, masonry & soil	Plastic, cardboard & paper	Organics
Total estimated tonnes	182,399 tonnes	384,523 tonnes	140,489 tonnes
Material and estimated tonnes	<ul style="list-style-type: none"> concrete, brick and asphalt – 106,909 plasterboard – 75,490 	<ul style="list-style-type: none"> cardboard dry – 129,489 paper – packaging – 94,761 paper – other recyclable – 93,085 plastic – rigid packaging – 67,188 	<ul style="list-style-type: none"> food – 81,161 garden organics – 59,328
Target sectors in levy areas with estimated tonnes	<ul style="list-style-type: none"> Public administration in RLA – 59,739 Administration sector in RLA – 25,186 SMEs in RLA – 18,432 Retail trade in RLA – 13,442 	<ul style="list-style-type: none"> SMEs in MLA – 212,828 SMEs in RLA – 82,806 	<ul style="list-style-type: none"> SMEs in MLA – 67,075 SMEs in RLA – 30,299



Published by NSW Environment
Protection Authority

Visit:
6 Parramatta Square
10 Darcy Street
Parramatta NSW 2150

Mail:
Locked Bag 5022,
Parramatta NSW 2124

Phone:
+61 2 9995 5000 (switchboard)

TTY users:
Phone 133 677, then ask for 131 555

Speak and listen users:
Phone 1300 555 727, then ask for 131 555

Email:
info@epa.nsw.gov.au

Website:
epa.nsw.gov.au

Report pollution and
environmental incidents

Environment Line:
131 555 (NSW only) or
info@epa.nsw.gov.au

ISBN 978 1 922963 98 7
EPA 2024P4555
October 2024

© 2024 State of NSW and the NSW
Environment Protection Authority

With the exception of photographs, the
State of NSW and the NSW Environment
Protection Authority (EPA) are pleased to
allow this material to be reproduced in
whole or in part for educational and non-
commercial use, provided the meaning is
unchanged and its source, publisher and
authorship are acknowledged. Specific
permission is required for the reproduction
of photographs.

All content in this publication is owned by
the EPA and is protected by Crown
Copyright, unless credited otherwise. It is
licensed under the Creative Commons
Attribution 4.0 International (CC BY 4.0),
subject to the exemptions contained in the
licence. The legal code for the licence is
available at Creative Commons.

The EPA asserts the right to be attributed as
author of the original material in the
following manner: © State of New South
Wales and the NSW Environment Protection
Authority 2024.