Feedstock review in accordance with the Resource Recovery Criteria of the NSW EfW Policy Statement

A submission to Dial a Dump Industries

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Disclaimer

Executive Summary

The recovery of energy from waste, when consistent with the Resource Recovery Criteria of the NSW Energy from Waste Policy Statement, can improve resource recovery outcomes for NSW.

The proposed energy recovery facility can target at least 552,500 tonnes per annum of waste eligible[1] for energy recovery via current and planned facilities (refer to Table 1). This report will demonstrate that the proposed feedstock is consistent with the Resource Recovery Criteria. As such, the proposed facility will not compromise existing and future recycling, per the framework of the Resource Recovery Criteria as established by the NSW EPA.

Table 1 Summary of the sources of the proposed feedstock

Status	Facility	Description	Eligible[1] tonnes per annum (t)
Current facility or operation	Genesis EC (excl. the Genesis Material Processing Centre)	Accepts separated waste streams. Most of these materials undergo recycling on-site and are transformed into valuable products. Some are processed off-site by specialised recyclers.	751
	Genesis Material Processing Centre (MPC)	Accepts mixed construction and demolition waste. This waste is recovered for recyclables.	41,978
	Genesis EC Landfill	Accepts residual from material recovery facilities (MRFs) and metal recycling plants as well as separated waste streams and landfills.	120,954
	Genesis Alexandria	Accepts mixed construction and demolition waste. The waste is recovered for recyclables.	15,714
SUBTOTAL			**179,397**
Planned facility or operation	Genesis MPC	Increase input stream by 210,700 tonnes p.a.	52,262
	Genesis EC	Increase receival of textiles and waste wood	67,559
	C&I Dirty MRF	Build processing facility for mixed C&I waste (for which a $5 mil grant from the EPA was awarded)	226,162
	Genesis EC Landfill	Increase receival of shredder floc	27,120
SUBTOTAL			**373,103**
GRAND TOTAL (tonnes per annum)			**552,500**

As part of this review, MRA Consulting Group (MRA) also assessed the overall market availability of eligible[1] feedstock in the Metropolitan Levy Area. The results suggest that, from FY19 onward, there will be sufficient amounts of eligible construction and demolition (C&D) and commercial and industrial (C&I) waste to fuel Phase 1 of the proposed facility (552,500 tonnes per annum). However, MRA notes that the Proponent's access to this material will depend on multiple commercial factors and, as such, the Proponent is planning to secure its feedstock via a combination of existing eligible tonnes and additional processing facilities.

Additional eligible[1] feedstock is potentially available in the market via the establishment of processing facilities for recycling that will divert waste currently being directly disposed of in landfill. MRA's modelling estimates that these actions have the potential to generate an additional 1,625,000 tonnes of waste in the market that are eligible for energy recovery. Again, the availability of these tonnes is subject to commercial factors.

[1] Per the Resource Recovery Criteria of the NSW Energy from Waste Policy Statement. As estimated for FY17.

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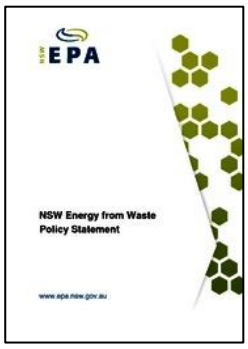
Glossary

Term	Description
the Act	the *Waste Avoidance and Resource Recovery Act 2001 (NSW)*
C&D	Construction and Demolition Waste refers to waste arising from construction and demolition activities
C&I	Commercial and Industrial Waste refers to waste arising from commercial and industrial activities
EfW	Energy from Waste
Eligible tonnes	Waste (tonnes) that may be processed for energy recovery, in compliance with the Resource Recovery Criteria of the NSW Energy from Waste Policy Statement. The processing of these tonnes for energy recovery will not compromise existing and future recycling, per the framework of the Resource Recovery Criteria as established by the NSW EPA.
Eligible waste fuel	"A fuel considered by the [NSW Environment Protection Authority] to pose a low risk of harm to human health and the environment due to their origin, composition and consistency." (NSW EPA, 2015)
Energy recovery facility	A facility that thermally treats a waste or waste-derived material under section 4 of the NSW Energy from Waste Policy Statement, i.e. treats waste or waste-derived material that is not classified as an eligible waste fuel
Mixed waste	Waste that has not been separated (for one or more recyclable stream/s) either via separation at the source or via a processing facility. There is potential for recyclables to be easily recovered from this stream.
MLA	The Metropolitan Levy Area refers to the greater Sydney region and certain regional local government areas. Please refer to the following EPA webpage for more information: http://www.epa.nsw.gov.au/wasteregulation/scheduled-waste.htm
MRA	MRA Consulting Group
MRF	Material Recovery Facility. These facilities process mixed waste and recover valuable recyclables (i.e. they 'perform' recycling).
MSW	Municipal Solid Waste refers to waste arising from municipal and residential sources
NSW EPA	New South Wales Environment Protection Authority
Processing facility	"Facility undertaking bona-fide resource recovery operations producing separate output material streams for reuse or recovery. Facility may be separate to or on the same site as energy from waste facility." (NSW EPA, 2015)
the Proponent	The Next Generation NSW Pty. Ltd.

1. Policy setting



The NSW Energy from Waste Policy Statement, published in January of 2015, provides a policy framework for the recovery of energy from waste in NSW. By it, the NSW Environment Protection Authority (EPA) recognises the role of energy recovery facilities in diverting waste from landfill, maximising the efficient and sustainable use of resources, where re-use or recycling is not feasible, and offsetting the use of non-renewable energy sources. Likewise, the potential detriment of energy recovery facilities to human health and air quality and to the re-use and recycling of resources is also recognised in the Statement. In line with these considerations, the Statement establishes technical, thermal efficiency and resource recovery criteria for energy recovery in NSW.

NSW EfW Policy Statement is available for download at:
http://www.epa.nsw.gov.au/wastestrategy/energy-from-waste.htm

MRA Consulting Group (MRA) has reviewed the proposed facility's compliance with the Resource Recovery Criteria of the NSW Energy from Waste (EfW) Policy Statement (refer to Appendix A to view the Criteria). This report summarises the review's findings and outlines its key assumptions.

The Resource Recovery Criteria are guided by the *Waste Avoidance and Resource Recovery Act 2001 (NSW)*. The Act establishes a hierarchy of waste management outcomes (see Figure 1). It also aims to ensure that waste management in NSW is guided by the resource recovery priorities established by the waste hierarchy.

Figure 1 Waste hierarchy - Source: NSW EPA

Importantly, the waste hierarchy also acknowledges that the most preferable outcomes are at times financially or economically unfeasible. For example, the cost of an activity, be it to individuals, government or business, may far exceed the return or benefit, and thus act as a major disincentive for carrying out the activity.

Recycling, re-use, avoidance and reduction are all preferable to energy recovery under the principles of the waste hierarchy. However, while activities to this effect are carried out in NSW, there remains waste that is not feasible for re-use or recycling. This may be due to the material properties of certain wastes, difficulties in establishing a viable business model for recycling and many other factors.

Within the framework of the waste hierarchy, the Resource Recovery Criteria identifies a specific segment of waste that cannot be further re-used and recycled, this being residual from "processing facilities" (i.e. facilities undertaking recycling or reuse). The Criteria designates such waste, which has undergone a resource recovery process, and yet could not be feasibly recovered through that process, as 'eligible' for energy recovery.

Energy recovery delivers a better resource recovery outcome than waste treatment and disposal and this is reflected in the principles of the waste hierarchy. The Resource Recovery Criteria apply a suitably limited and targeted scope to waste eligible for energy recovery. As a result, the Statement upholds key resource recovery priorities regarding the management of waste in NSW.

2. Eligible waste for energy recovery – generated in the Metropolitan Levy Area

An estimated 894,100 tonnes[2] of waste compliant with the Resource Recovery Criteria (i.e. 'eligible tonnes') was generated in the Metropolitan Levy Area (MLA) this past financial year (FY17). An additional 1,625,000 tonnes[4] of eligible feedstock may have been eligible for energy recovery, had the waste directly disposed of in landfill (in the MLA in FY17) all been diverted to resource recovery. In addition, waste generation has experienced growth over the last decade and is expected to continue increasing. These figures justify consideration of energy recovery as a practicable element of NSW's resource recovery processes. Please refer to Appendix B and Appendix C for a summary of the modelling conducted to determine these figures.

There are two major pathways[3] to secure eligible tonnes per the Resource Recovery Criteria:

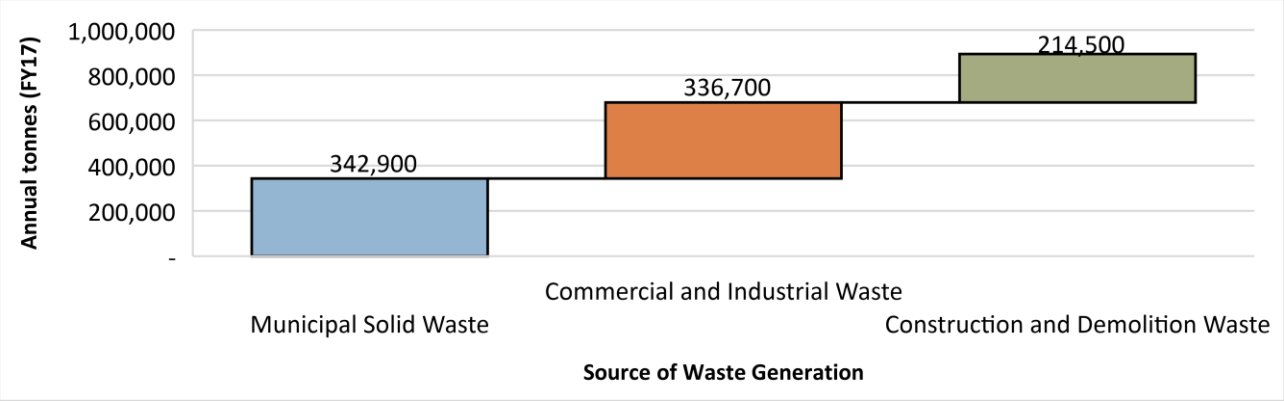
1. Secure residual waste from existing processing facilities. These tonnes can be recovered for energy without further processing, although any hazardous or electrical wastes must be removed; and
2. Secure residual waste by establishing new processing facilities. MRA has assumed that these future facilities will divert waste currently being directly delivered to and disposed of in landfill.

To explore the overall feasibility of undertaking energy recovery in the Metropolitan Levy Area (MLA), MRA has estimated the total waste available in the MLA that may be secured via the two major pathways.

2.1 Eligible tonnes available in the MLA market

MRA conducted modelling to estimate the amount of waste generated in the MLA in FY17 that was ultimately disposed of in landfill as residual from a processing facility. The modelling concluded that approximately 894,100 tonnes[2] of residual waste disposed of in FY17 could have achieved a higher-order resource recovery outcome via energy recovery. Figure 2 provides a breakdown of these tonnes, with respect to the source of generation of the waste. Please note that while waste from municipal sources (MSW) is included in this assessment, the waste that the proponent plans to secure, via the 'first' pathway, will be of commercial and industrial (C&I) and construction and demolition (C&D) origin. 551,200 tonnes[2] of C&D and C&I waste were eligible for energy recovery in the MLA in FY17. By FY19, these tonnes will have increased to an estimated 582,700 tonnes per annum[2].

Figure 2 Eligible feedstock generated in the MLA (FY17) – categorised by source of waste generation



[2] Refer to Appendix B for detailed background to this figure.

[3] The two minor pathways are: 1) secure separated waste streams that can undergo energy recovery without first undergoing resource recovery at a processing facility. These are identified as waste wood, textiles and tyres in Table 1 of the Resource Recovery Criteria; and 2) secure commercial and industrial (C&I) waste that has been source separated for "all relevant waste streams" (Table 1 of the EfW Policy Statement).

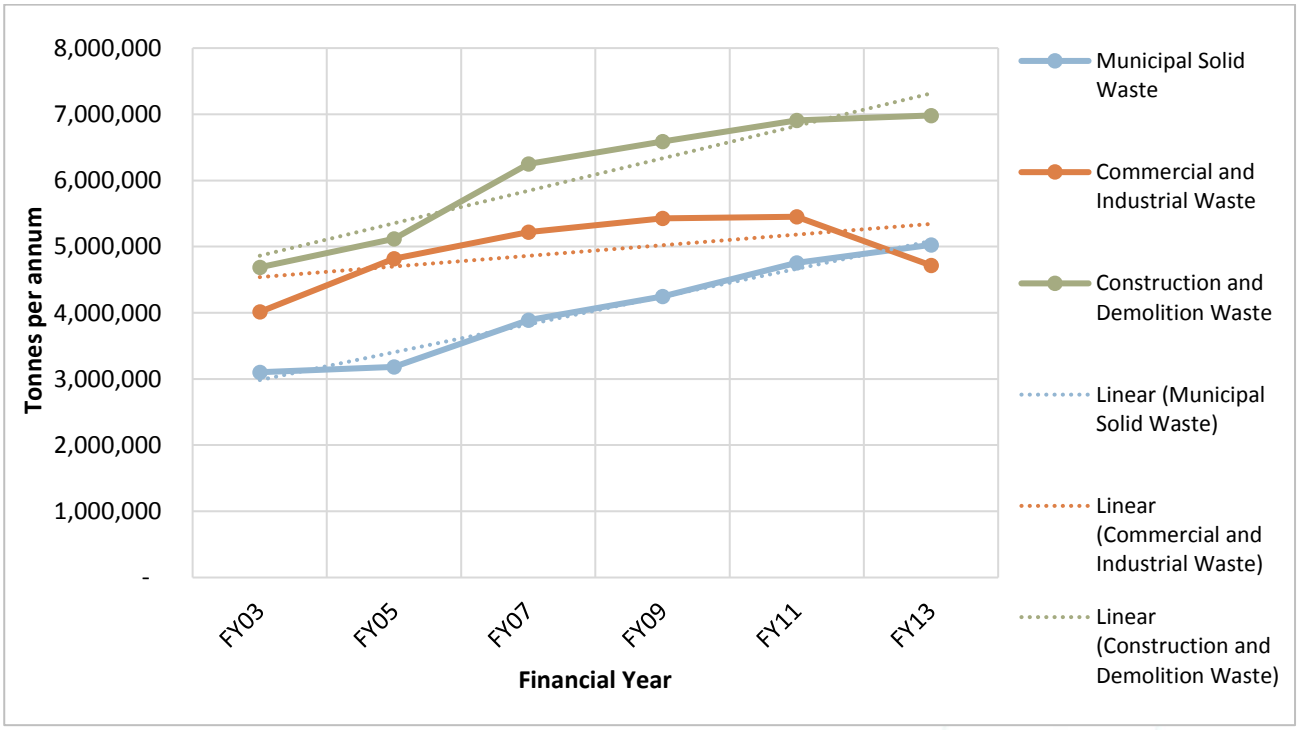
2.2 Potential eligible tonnes in the MLA market

MRA also conducted modelling to estimate the amount of waste generated in the MLA in FY17 that was directly landfilled. These are tonnes that could potentially undergo resource recovery through recycling facilities and the residual may thereby become eligible for energy recovery. The modelling concluded that 5,022,000 tonnes[4] of waste generated in the MLA in FY17 was directly disposed of, without undergoing any resource recovery. If this waste were to be diverted to processing facilities for resource recovery, an additional 1,625,000 tonnes[4] of waste would have been eligible for energy recovery in the MLA in FY17. In total, the market availability of waste for energy recovery in the MLA via both pathways sums to 2,519,100 tonnes (in FY17 in the MLA). Please refer to Appendix C for a summary of the detailed modelling conducted to determine these figures.

2.3 Waste growth and sensitivity analysis

MRA has projected the eligible tonnes available in the MLA market over a 25-year time horizon. The most recent NSW waste data report (NSW EPA, 2015) contains biennially reported data from 2003 to 2013. The data indicates that waste generation has experienced growth over the reported years (see dotted trendlines in Figure 3). Specifically, municipal solid waste is growing at a compound annual growth rate (CAGR) of 5.5%, commercial and industrial (C&I) waste at 1.8% and construction and demolition (C&D) waste at 4.5%. Please find the derivation of these figures in Appendix D.

Figure 3 Waste generation in NSW (FY03-FY13) – categorised by source of waste generation

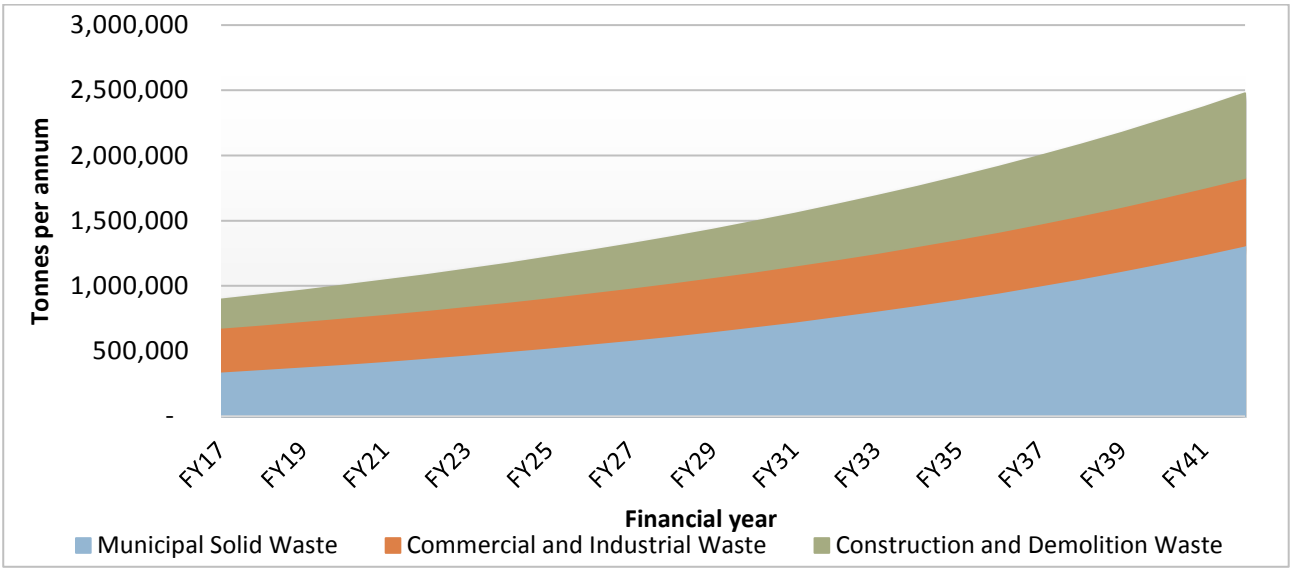


Source: NSW State of the Environment 2015 (NSW EPA, 2015)

The waste generation trends from the State of the Environment 2015 dataset were applied to MRA's estimated eligible tonnes to establish a growth model. The model concludes that eligible tonnes will continue increasing into the future (Figure 4).

[4] Refer to Appendix C for detailed background to this figure.

Figure 4 Projections of eligible tonnes (FY17-FY42) – categorised by source of waste generation



MRA has also tested the sensitivity of these growth projections. The sensitivity analysis concludes that there is a substantial amount of waste in the MLA that is suitable for energy recovery under all growth scenarios modelled (refer to Table 2). Please find more detail regarding the growth model and sensitivity analysis in Appendix D.

Table 2 Summary of sensitivity analysis

Compound annual growth rate (applied to all sources)	Eligible tonnes in FY17 (t) (see Appendix D)			
	C&I sources	C&D sources	MSW sources	Total
As reported in the State of the Environment 2015	336,700	214,500	342,900	**894,100**
-1%	305,000	172,600	301,900	**779,500**
2%	334,300	194,500	320,500	**849,300**
4%	354,900	210,200	333,200	**898,300**
6.2%	378,700	228,600	347,400	**954,700**

2.4 Conclusions

The market availability assessment undertaken by MRA suggests that there is a substantial and growing amount of eligible tonnes generated in the MLA.

While the eligible tonnes generated in the MLA in FY17 from C&D and C&I sources (551,200 tonnes) are not sufficient to satisfy the capacity of Phase 1 of the proposed facility (552,500 tonnes per annum), by FY19, these tonnes will have increased to an estimated 582,700 annual tonnes[2], and would thereby be sufficient to satisfy the capacity of Phase 1. This conclusion holds for all growth scenarios barring the -1% CAGR scenario. Phase 2 of the proposed facility, however, would require the market to divert waste currently being directly landfilled – from landfill and to processing for resource recovery.

While the market availability assessment provides an indication of the magnitude of waste potentially available for energy recovery in the MLA market, the Proponent plans to secure eligible feedstock via multiple pathways. The next section outlines the exact sources of waste, both existing and planned, of the proposed energy recovery facility.

3. Eligible feedstock arising from the Proponent's existing and planned facilities

The Proponent received 179,397 eligible tonnes[5] in FY16. In addition, the Proponent plans to establish a processing facility and grow the tonnes received by its existing facilities to increase its eligible feedstock by at least 373,103 tonnes per annum[5]. In total, the Proponent will secure at least 552,500 tonnes[5] per annum of waste eligible for energy recovery through existing and planned facilities. Please refer to Appendix E for a summary of the modelling conducted to determine these figures.

In FY16, the Proponent received 956,800 tonnes[5] of construction and demolition (C&D) waste and commercial and industrial (C&I) waste through its facilities. Of the waste received, 179,397 tonnes were eligible for energy recovery, per the Resource Recovery Criteria (Table 3). The Proponent plans to undertake expansions to secure an increase in its eligible feedstock. From these targeted expansions, the proponent plans to attract an additional 373,103 eligible tonnes[5] per annum (Table 4). In total, the proponent can target at least 552,500 eligible tonnes[5] per (Table 4 and Table 5), if the tonnes that the Proponent currently receives at its facilities remains constant and if the Proponent carries out the planned expansions outlined.

Table 3 Summary of existing facilities and corresponding eligible tonnes[5]

Facility	Facility type	Classification of waste received and activities undertaken	Eligible tonnes in FY16 (t)
Genesis EC (excl. the Genesis Material Processing Centre)	Recycling centre	Accepts separated waste streams. Most of these materials undergo recycling on-site and are transformed into valuable products. Some are processed off-site by specialised recyclers.	751
Genesis Material Processing Centre (MPC)	Mechanical recycling plant	Accepts mixed construction and demolition waste. This waste is recovered for recyclables.	41,978
Genesis EC Landfill	Landfill	Accepts residual from material recovery facilities (MRFs) and metal recycling plants as well as separated waste streams and landfills.	120,954
Genesis Alexandria	Transfer station	Accepts mixed construction and demolition waste. The waste is recovered for recyclables.	15,714
SUBTOTAL			**179,397**

Table 4 Summary of planned expansions and corresponding eligible tonnes[5]

Facility	Description of expansion	Additional eligible tonnes p.a. (t)
Genesis MPC	Increase input stream by 210,700 tonnes p.a.	52,262
Genesis EC (exl. MPC)	Increase receival of textiles and waste wood	67,559
C&I Dirty MRF	Build processing facility for mixed C&I waste (a $5 mil EPA grant was awarded and a modification to the site has been approved)[6]	226,162
Genesis EC Landfill	Increase receival of shredder floc	27,120
SUBTOTAL		**373,103**
GRAND TOTAL of Table 3 and Table 4 (tonnes per annum)		**552,500**

[5] Refer to Appendix E for key assumptions and a detailed description of the procedure undertaken to determine eligible tonnes. Please note that hazardous or electrical wastes do not contribute to this total.
[6] Refer to Appendix I for details regarding the 'progress' of these planned activities.

Table 5 Material composition of the proposed feedstock – arising from existing and planned facilities[5]

Category	Sub-category	Sources (current or planned)						TOTAL (t)	%
		Genesis MPC and Genesis Alexandria (t)[7]	Genesis EC Landfill		C&I Dirty MRF (t)[8]	Genesis EC (excl. MPC)			
			MRF residual (t)[9]	Shredder Floc (t)[10]		Waste wood (t)	Textiles (t)		
Paper	Recyclable paper	865	4,543	317	46,187	-	-	65,300	11.82%
	Disposable contaminated (soft) paper	687	4,197						
	Cardboard	2,560	4,696						
	Liquid paperboard	11	242						
	Nappies	11	983						
Wood or timber	Untreated wood - MDF board	5,132	346	2,425	38,161	58,557	-	172,182	31.16%
	Untreated wood - All other	60,508	1,531						
	Treated wood - CCA treated	5,343	180			-			
	Treated wood - lead painted	-	-						
Plastic	Recyclable plastic containers excl. EPS	111	1,489	17,428	37,742	-	-	82,641	14.96%
	Other rigid plastics excl. EPS	2,948	4,370						
	EPS	89	388						
	Soft (films) plastics	3,458	10,340						
	Composite plastics	1,507	2,770						
Metal (Ferrous and non-ferrous)	Recyclable metal containers	44	464	1,147	7,554	-	-	13,863	2.51%
	Composite	366	990						
	Other metals	1,663	1,634						
	Food/kitchen - vegetable	11	1,461	-	24,062	-	-		

[7] This waste stream has been characterised as chute residual waste ("CRW") (i.e. residual from mixed C&D processing). Residual from the Genesis MPC has been audited, please refer to Appendix F for the audit report. It is assumed that residual from Genesis Alexandria is of a similar composition to that of residual from the Genesis MPC.

[8] This waste stream has been characterised as mixed C&I, as audited at the point of disposal. The composition of this waste stream was derived from 'Disposal-based audit: Commercial and industrial waste stream in the regulated areas of New South Wales' (NSW EPA, 2015).

[9] This waste stream has been characterised as residual from material recovery facilities ("MRF"). Residual from MRFs currently received by the Proponent has been audited, please refer to Appendix G for a summary of the audit results.

[10] This waste stream has been characterised as shredder floc ("Floc"). Shredder floc currently received by the Proponent has been audited, please refer to Appendix H for a summary of the audit results.

Category	Sub-category	Sources (current or planned)						TOTAL (t)	%
		Genesis MPC and Genesis Alexandria (t)[7]	Genesis EC Landfill		C&I Dirty MRF (t)[8]	Genesis EC (excl. MPC)			
			MRF residual (t)[9]	Shredder Floc (t)[10]		Waste wood (t)	Textiles (t)		
Organic (not wood or timber)	Food/kitchen - meat	-	125	-		-	-	109,492	19.82%
	Garden/vegetables	1,441	713	-	12,746	-	-		
	Textiles/rags	10,907	18,041	8,877	13,738	-	9,812		
	Rubber	488	603	3,905	1,925	-	-		
	Leather	111	526		-	-	-		
WEE	e-waste	-	-	-	-	-	-	-	0.00%
	Mobiles	-	-						
	Toners	-	-						
Hazardous	Medical	-	-	-	-	-	-	-	0.00%
	Chemicals	-	-						
	Paint	-	-						
	Asbestos	-	-						
	Batteries car	-	-						
	Batteries other	-	-						
	Other hazardous	-	-						
Glass	Glass containers	-	55	-	3,844	-	-	6,850	1.24%
	Glass other	111	2,840						
Other (including earth and building materials)	Insulation	67	-	-	11,361	-	-	102,172	18.49%
	Carpet/underlay	887	-						
	Compounds (excl. plastic and metal)	1,053	1,378						
	Asphalt	1,330	-						
	Inert incl. non-hazardous building waste	8,247	1,745	47,263	28,842				
TOTAL (t)		**109,954**	**66,653**	**81,361**	**226,162**	**43,537**	**9,812**	**552,727**	**100.00%**

4. References

NSW EPA, 2015. *Disposal-based audit: Commercial and industrial waste stream in the regulated areas of New South Wales,* Sydney: Environment Protection Authority.

NSW EPA, 2015. *NSW Energy from Waste Policy Statement,* Sydney: Environment Protection Authority.

NSW EPA, 2015. *NSW State of the Environment 2015,* Sydney: Environment Protection Authority.

Appendix A The Resource Recovery Criteria

Figure 5 The Resource Recovery Criteria of the NSW EfW Policy Statement

Resource recovery criteria

The EPA considers energy recovery to be a complementary waste management option for the residual waste produced from material recovery processes or source-separated collection systems.

The policy statement's objectives in setting resource recovery criteria are to:

- promote the source separation of waste where technically and economically achievable
- drive the use of best practice material recovery processes
- ensure only the residual from bona-fide resource recovery operations are eligible for use as a feedstock for an energy recovery facility.

Energy recovery facilities may only receive feedstock from waste processing facilities or collection systems that meet the criteria outlined in Table 1.

Proponents wishing to use waste or waste-derived materials for energy recovery that are not defined in Table 1 must contact the EPA to discuss their proposal. The EPA will consider any such proposals on a case-by-case basis in accordance with the energy from waste considerations outlined in this policy statement and the principles set out in the POEO Act and WaRR Act.

Table 1: Resource recovery criteria for energy recovery facilities

Mixed wastes		
Waste stream	**Processing facility**	**% residual waste allowed for energy recovery**
Mixed municipal waste (MSW)	Facility processing mixed MSW waste where a council has separate collection systems for dry recyclables and food and garden waste	No limit by weight of the waste stream received at a processing facility
	Facility processing mixed MSW waste where a council has separate collection systems for dry recyclables and garden waste	Up to 40% by weight of the waste stream received at a processing facility
	Facility processing mixed MSW waste where a council has a separate collection system for dry recyclables	Up to 25% by weight of the waste stream received at a processing facility

Mixed commercial and industrial waste (C&I)	Facility processing mixed C&I waste	Up to 50% by weight of the waste stream received at a processing facility
	Facility processing mixed C&I waste where a business has separate collection systems for all relevant waste streams	No limit by weight of the waste stream received at a processing facility
Mixed construction and demolition waste (C&D)	Facility processing mixed C&D waste	Up to 25% by weight of the waste stream received at a processing facility
Residuals from source-separated materials		
Source-separated recyclables from MSW	Facility processing source-separated recyclables from MSW	Up to 10% by weight of the waste stream received at a processing facility
Source-separated garden waste	Facility processing garden waste	Up to 5% by weight of the waste stream received at a processing facility
Source-separated food waste (or food and garden waste)	Facility processing source-separated food or source-separated food and garden waste	Up to 10% by weight of the waste stream received at a processing facility

Separated waste streams	
Waste stream	**Feedstock able to be used at an energy recovery facility**
Waste wood	Residual wood waste sourced directly from a waste generator e.g. manufacturing facility
Textiles	Residual textiles sourced directly from a waste generator
Waste tyres	End-of-life tyres
Biosolids	Used only in a process to produce a char for land application
Source-separated food and garden organics	Used only in a process to produce a char for land application

Notes

1. The EPA may give consideration to increases to the maximum allowable percentage of residuals from facilities receiving mixed municipal and commercial and industrial waste where a facility intends to use the biomass component from that process for energy recovery, rather than land application and the facility can demonstrate they are using best available technologies for material recovery of that stream.
2. Waste streams proposed for energy recovery should not contain contaminants such as batteries, light bulbs or other electrical or hazardous wastes.
3. Bio-char or char materials produced from facilities using mixed waste streams will not be able to be considered for land application as a soil amendment or improvement agent.
4. The C&I no limit category is likely to apply only to mixed waste collected from single generators of large volumes of waste (e.g. supermarkets) or precinct based businesses (e.g. shopping centers). Proponents will need to demonstrate that each entity generating waste has effective and operating collection systems for **all** waste streams they generate that have reuse or recycling opportunities (e.g. paper/cardboard collection; organic collection; and residual waste collection). Proponents wishing to use the C&I no limit category will need to contact the EPA to determine the eligibility of each entity.

Appendix B Eligible tonnes calculations for current market

A primary concern regarding the proposed facility is the availability of eligible tonnes within the Metropolitan Levy Area (MLA) that satisfy the Resource Recovery Criteria of the EfW Policy Statement. This appendix aims to address that concern and confirms that there are sufficient tonnes of waste in the MLA market available for energy recovery and in compliance with the Resource Recovery Criteria. Please note that the Proponent is not guaranteed access to waste that is available in the market (as opposed to the waste available via its existing facilities). Rather, the securing of market tonnes is a matter of price and commercial agreements.

The total amount of waste processed in the MLA and corresponding amount of eligible tonnes that satisfy the Resource Recovery Criteria were calculated. The amount of available, eligible market tonnes are calculated by examining each line of 'Table 1' of the EfW Policy Statement (refer to Appendix A).

The modelling demonstrates that 5,022,040 tonnes of waste, from the categories specified in the EfW Policy, are processed in the MLA and, of these, 894,120 tonnes are eligible for energy recovery.

Please note that, for the purposes of this broad market assessment, MRA has not estimated the amount of hazardous and electrical waste in the waste streams. Therefore, hazardous and electrical waste constitute a small fraction of the tonnes estimated. However, the Resource Recovery Criteria states that these wastes must be removed from the waste stream before energy recovery. In the assessment of the proposed feedstock (Appendix E), hazardous and electrical waste are removed from the 'eligible tonnes' total.

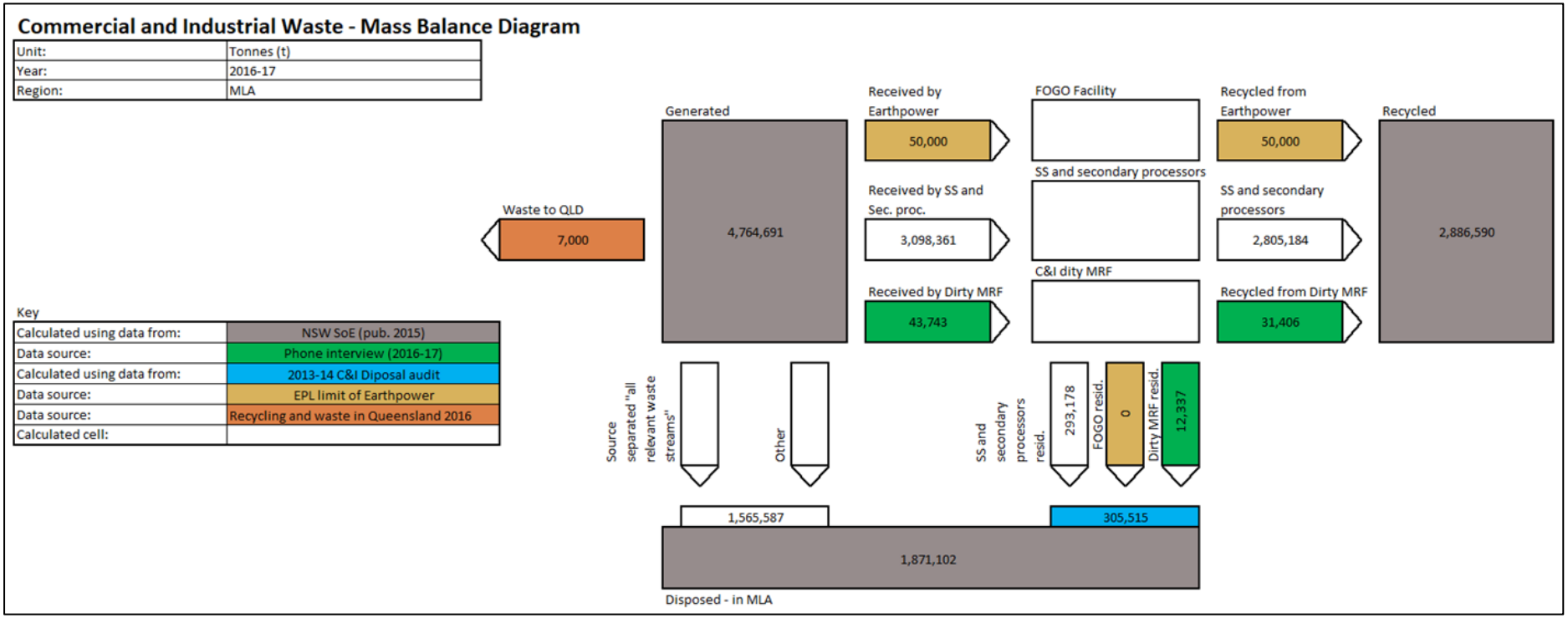
Estimating the tonnes received by processing facilities in the MLA

The following mass balance diagrams (Figure 6 to Figure 8) were created to map the flow of waste in the MLA. These diagrams form the basis of the market assessment for eligible tonnes.

The mass balance diagrams rely on data from various sources, these sources are elaborated as each diagram is presented. Please note that, all source data is dated pre-FY17. Therefore, in all instances, the data had to be projected to FY17. MRA applied compound annual growth rates calculated from data reported in the NSW State of the Environment 2015 report to perform these projections. See Appendix D for detail regarding the compound average growth rates used.

Figure 6 presents a high-level estimation of the fate of commercial and industrial waste in the MLA in FY17. This mass balance is used to determine the total number of tonnes in the MLA market that are received by facilities processing mixed C&I waste (43,743 tonnes).

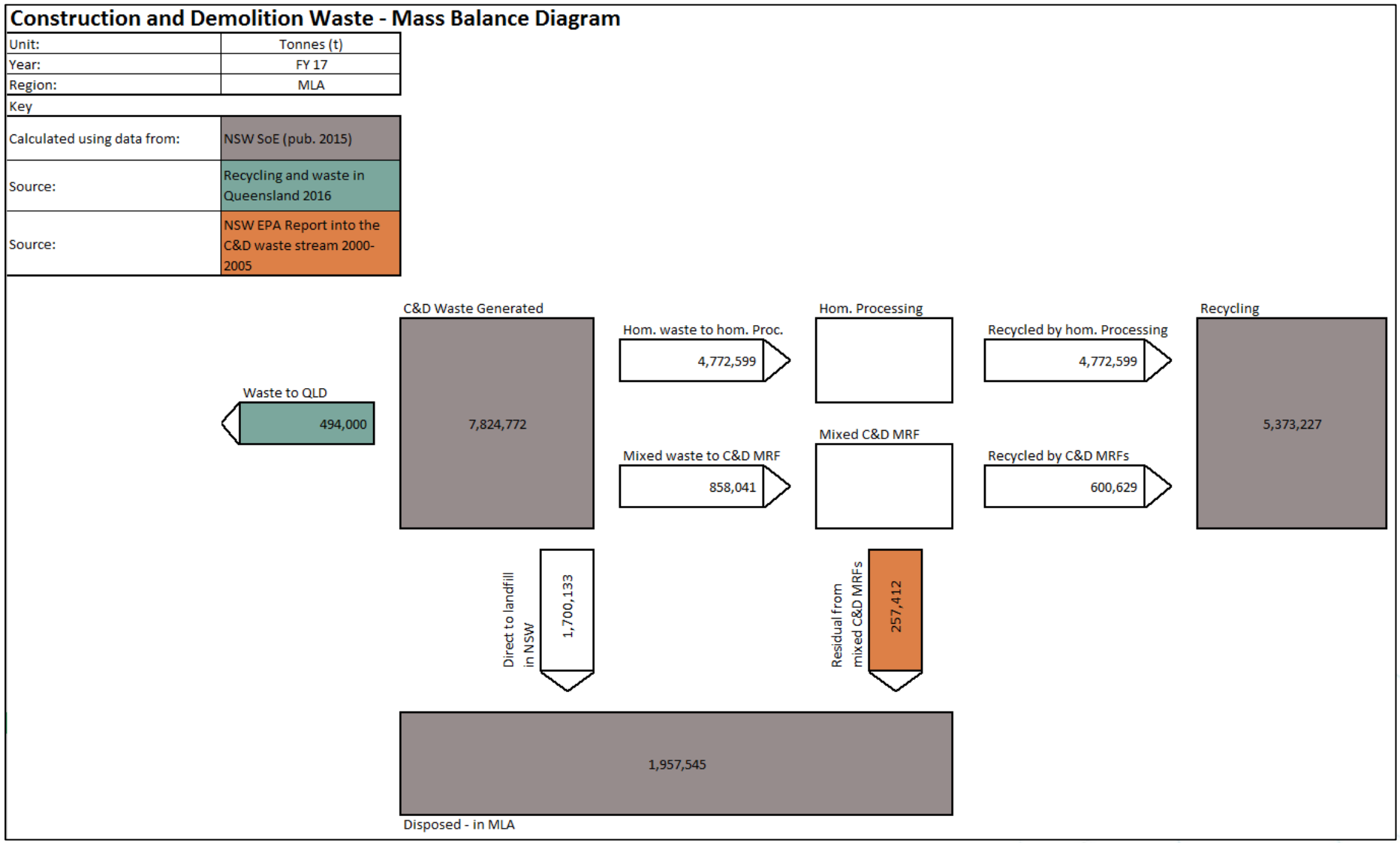
Figure 6 Mass balance of commercial and industrial waste in the MLA



The coloured cells know data, obtained from publicly available reports and phone interviews. The **grey** cells have been calculated using the available State of the Environment (SoE) data, adjusted for the MLA and forecasted forward to FY 2017 using historical trends. The **green** cells have been calculated through phone interviews of C&I dirty MRFs. The **blue** cell is based on the 2013-2014 NSW EPA C&I Disposal Audit data, and is forecasted forward to FY2017 using historical trends. The **brown** cells are based on the licence limitations of Earthpower Pty Ltd, which is the only facility in the MLA that processes organics from C&I generators. There is negligible residual from Earthpower Pty Ltd as the input material is pre-processed. The **orange** cell is sourced from the Recycling and Waste in Queensland report, published in 2016, under the assumption that this remains constant in FY 2017. Using the coloured cells containing know data, MRA calculated the remaining cells.

Figure 7 presents a high-level estimation of the fate of construction and demolition waste in the MLA in FY17. This mass balance is used to determine the total number of tonnes in the MLA market that are received by facilities processing mixed C&D waste (858,041 tonnes).

Figure 7 Mass balance of construction and demolition waste in the MLA

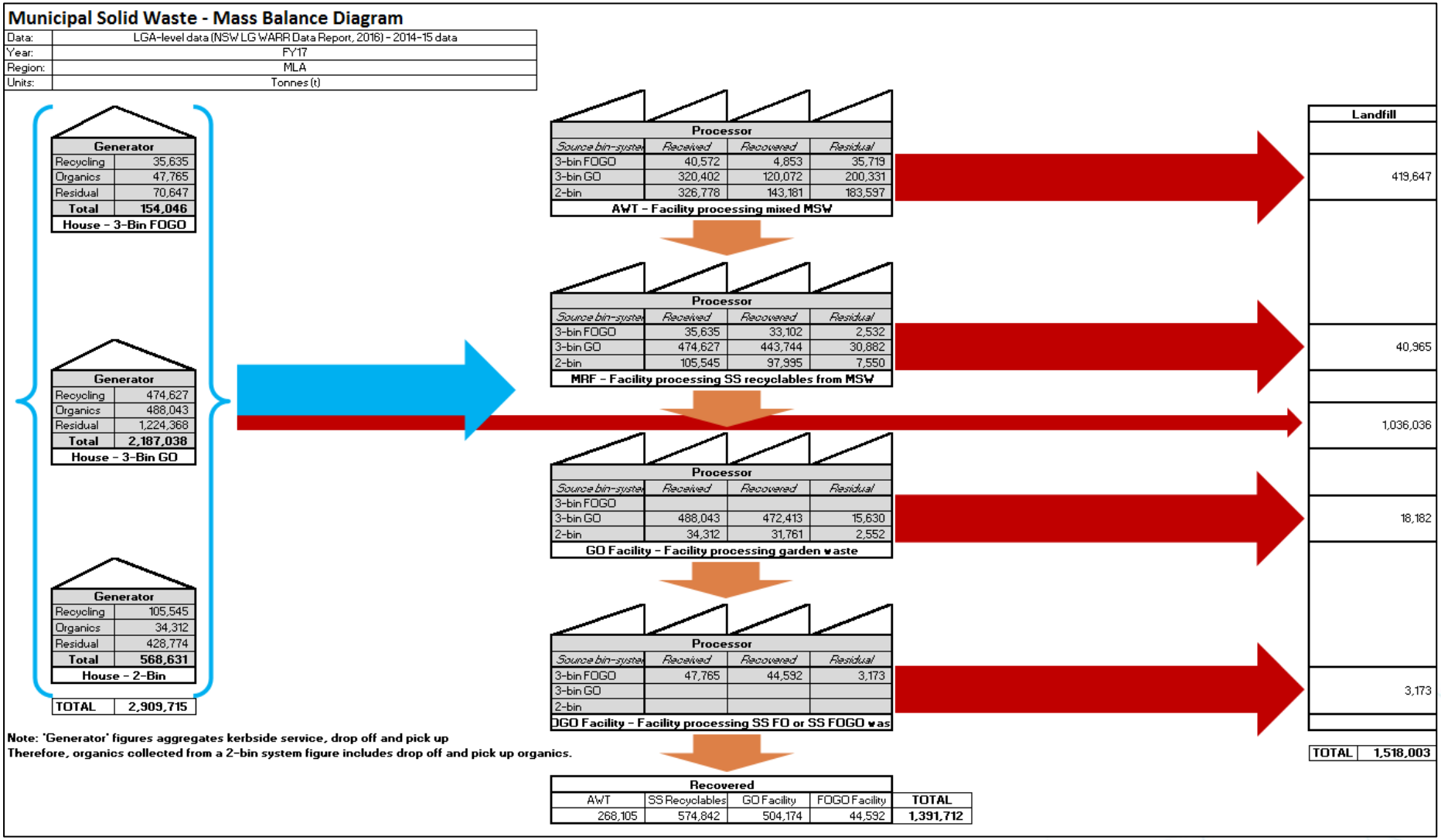


The grey cells have been calculated using the available State of the Environment (SoE) data, adjusted for the MLA and forecasted forward to FY 2017 using historical trends. The **teal** cell is sourced from the Recycling and Waste in Queensland report, published in 2016, under the assumption that this remains constant in FY 2017. The **orange** cells are sourced from the NSW EPA Report into the C&D waste stream, forecasted forward to FY 2017. The remaining white cells were calculated through elimination and summation.

Figure 8 presents a high-level estimation of the fate of municipal solid waste in the MLA in FY17. This mass balance is used to determine the total number of tonnes in the MLA market that are received by:

- facilities processing mixed municipal solid waste:
    - 40,572 tonnes from councils with 3-bin FOGO systems;
    - 320,402 tonnes from councils with 2-bin GO systems; and
    - 326,778 tonnes from councils with 2-bin systems).
- facilities processing source-separated recyclables from MSW:
    - 615,807 tonnes of residual from source-separated recyclables.
- Facilities processing garden waste from MSW:
    - 552,356 tonnes of source-separated garden waste.
- Facilities processing source-separated food or source-separated food and garden waste:
    - 47,765 tonnes of source-separated food waste (or food and garden waste).

Figure 8 Mass balance of municipal solid waste in the MLA



Estimating the generation of separated waste streams in the MLA

The generation of waste wood, textiles and tyres from commercial and industrial (C&I) and construction and demolition (C&D) sources was calculated using publicly accessible EPA audit data, reports published by the former Department of Environment and Climate Change NSW and consultants' reports.

Specifically, it was assumed that the amount of source-separated of waste wood generated from C&D sources would be comparable to the amount of source-separated waste wood from C&D sources that was directly delivered to landfill. In FY17, this figure was estimated to be 161,577 tonnes for the MLA. This figure utilises audit data from the 'Report into the Construction and Demolition Waste Stream Audit 2000-2005' (published by the Department of Environment and Climate Change NSW in 2007. The data was projected from FY05 to FY17 using the compound annual growth rate of 4.5% (as derived from the State of the Environment 2015 report). The amount of source-separated wood waste from C&I sources that was generated in FY17 in the MLA was estimated to be 174,904 tonnes. This figure is derived from the 'Pilot generator site-based audit - Commercial and industrial waste stream in the metropolitan levy areas of NSW' (published by the NSW EPA in 2015. The data was project from FY14 to FY17 using the compound annual growth rate of 1.8% (as derived from the State of the Environment 2015 report).

The same assumptions and sources were utilised for textiles. The amount of source-separated textiles from C&D sources that was directly delivered to landfill in FY17 in the MLA was estimated to be 10,205 tonnes. The amount of source-separated textiles from C&I sources that was generated in FY17 in the MLA was estimated to be 7,373 tonnes.

For tyres, the 'Stocks and fate of end of life tyres – 2013-14 study' published by Hyder Consulting in 2015, was used to estimate waste tyre generation. This figure was estimated to be 116,539 tonnes in FY17 in the MLA. The Hyder report provides historical data (FY08, FY09 and FY10) from which a compound annual growth rate of 10.4% was calculated. The amount for FY14 in NSW was factored by 80% to estimate the MLA generation and then projected to FY17 using this growth rate.

Estimating the eligible tonnes generated in the MLA

Table 6 examines mixed municipal solid waste (MSW), and estimates that a total of 687,752 tonnes of mixed MSW is processed in the MLA by a "facility processing mixed MSW" and, of this amount, 250,427 tonnes are eligible for energy recovery.

Table 6 Mixed MSW, processed and eligible tonnes in the MLA

EfW Policy Statement			Assumptions/Interpretation	Existing tonnes		
Waste stream	Processing Facility	% Residual Waste allowed for Energy Recovery		Processed tonnes in the MLA (t)	Policy Allowance	Eligible tonnes in the MLA (compliant with Policy Allowance) (t)
Mixed municipal waste (MSW)	Facility processing mixed MSW waste where a council has separate collection systems for dry recyclables and food and garden waste	No limit by weight of the waste stream received at a processing facility	Assumes no limit to waste stream received at AWT plants - currently the only facilities processing "mixed MSW".	40,572	100%	40,572
	Facility processing mixed MSW waste where a council has separate collection systems for dry recyclables and garden waste	Up to 40% by weight of the waste stream received at a processing facility	Assumes up to 40% of waste stream received at AWT plants - currently the only facilities processing "mixed MSW" - are eligible.	320,402	40%	128,161
	Facility processing mixed MSW waste where a council has a separate collection system for dry recyclables	Up to 25% by weight of the waste stream received at a processing facility	Assumes up to 25% of waste stream received at AWT plants - currently the only facilities processing "mixed MSW" - are eligible.	326,778	25%	81,694
SUB-TOTAL				**687,752**		**250,427**

Table 7 examines mixed commercial and industrial (C&I) waste, and estimates that a total of 43,743 tonnes of mixed C&I is processed by "facilities processing mixed C&I waste" in the MLA and, of this amount, 21,872 tonnes are eligible for energy recovery.

Table 7 Mixed C&I waste, processed and eligible tonnes in the MLA

EfW Policy Statement			Assumptions/Interpretation	Existing tonnes		
Waste stream	Processing Facility	% Residual Waste allowed for Energy Recovery		Processed tonnes in the MLA (t)	Policy Allowance	Eligible tonnes in the MLA (compliant with Policy Allowance) (t)
Mixed commercial and industrial waste (C&I)	Facility processing mixed C&I waste	Up to 50% by weight of the waste stream received at a processing facility	Assumes that a C&I dirty MRF is classified as "facilit[ies] processing mixed C&I waste" under this policy.	43,743	50%	21,872
	Facility processing mixed C&I waste where a business has separate collection systems for all relevant waste streams	No limit by weight of the waste stream received at a processing facility	Difficult to prove - all mixed C&I tonnes aggregated under "Facility processing mixed C&I waste"	-	100%	-
SUB-TOTAL				**43,743**		**21,872**

Table 8 examines mixed construction and demolition (C&D) waste, and estimates that a total of 858,041 tonnes of mixed C&D is processed by “facilities processing mixed C&D waste” in the MLA and, of this amount, 214,510 tonnes are eligible for energy recovery.

Table 8 Mixed C&D waste, processed and eligible tonnes in the MLA

EfW Policy Statement			Assumptions/Interpretation	Existing tonnes		
Waste stream	Processing Facility	% Residual Waste allowed for Energy Recovery		Processed tonnes in the MLA (t)	Policy Allowance	Eligible tonnes in the MLA (compliant with Policy Allowance) (t)
Mixed construction and demolition waste (C&D)	Facility processing mixed C&D waste	Up to 25% by weight of the waste stream received at a processing facility	Assumes mixed C&D waste refers to non-source separated waste generated from C&D sources. The following are NOT included in this category: source-separated C&D waste (e.g. concrete, bricks), garden organics	858,041	25%	214,510
SUB-TOTAL				**858,041**		**214,510**

Table 9 examines residuals from source-separated materials, and estimates that a total of 5,022,040 tonnes of source-separated material is processed in the MLA and, of this, 407,311 tonnes are eligible for energy recovery.

Table 9 Residuals from source-separated material, processed and eligible tonnes in the MLA

EfW Policy Statement			Assumptions/Interpretation	Existing tonnes		
Waste stream	**Processing Facility**	**% Residual Waste allowed for Energy Recovery**		**Processed tonnes in the MLA (t)**	**Policy Allowance**	**Eligible tonnes in the MLA (compliant with Policy Allowance) (t)**
Source-separated recyclables from C&I	*Facility processing source- separated recyclables from C&I*	*Up to 10% by weight of the waste stream received at a processing facility*	The NSW EPA has confirmed that 10% of C&I generated waste received by pulp mills and glass plants, if documented, would be eligible	3,098,361	10%	309,836
Source-separated recyclables from MSW	Facility processing source- separated recyclables from MSW	Up to 10% by weight of the waste stream received at a processing facility	Assumes 10% of the waste stream received by MRFs from kerbside recycling is eligible.	615,807	10%	61,581
Source-separated garden waste	Facility processing garden waste	Up to 5% by weight of the waste stream received at a processing facility	Assumes 5% of the waste stream received at a GO facility from municipal sources is eligible. Assumes garden organics sourced from C&I or C&D sources are negligible.	522,356	5%	26,118
Source-separated food waste (or food and garden waste)	Facility processing source- separated food or source-separated food and garden waste	Up to 10% by weight of the waste stream received at a processing facility	Assumes 10% of the waste stream received at a FOGO facility from municipal and C&I sources is eligible. Assumes FOGO sourced from C&D sources are negligible.	97,765	10%	9,776
SUB-TOTAL				**4,334,288**		**407,311**
GRAND TOTAL of Table 6 to Table 9				**5,022,040**		**894,120**

Table 10 examines the separated waste streams of waste wood, textiles and waste tyres and confirms that a total of 470,618 tonnes of-this material is generated in the MLA, and the full amount is eligible for energy recovery.

Table 10 Source-separated waste, processed and eligible tonnes in the MLA

EfW Policy Statement			Assumptions/Interpretation	Existing tonnes		
Waste stream	Processing Facility	% Residual Waste allowed for Energy Recovery		Processed tonnes in the MLA (t)	Policy Allowance	Eligible tonnes in the MLA (compliant with Policy Allowance) (t)
Waste wood	Residual wood waste sourced directly from a waste generator e.g. manufacturing facility		Assumes no limit to waste wood directly sourced from a waste generator	336,481	100%	336,481
Textiles	Residual textiles sourced directly from a waste generator		Assumes no limit to textiles directly sourced from a waste generator	17,598	100%	17,598
Waste tyres	End-of-life tyres		Assumes no limit to tyres directly sourced from a waste generator	116,539	100%	116,539
Biosolids	Used only in a process to produce a char for land application			N/A	100%	N/A
Source-separated food and garden organics	Used only in a process to produce a char for land application			N/A	100%	N/A
TOTAL				**470,618**		**470,618**

Appendix C Full MLA market potential for eligible tonnes

Energy recovery facilities also have the potential to encourage and incentivise the development of additional processing and recycling facilities, due to the requirement (of the Resource Recovery Criteria) for all feedstock for Energy recovery facilities be pre-processed to remove recyclables and hazardous material. Since these criteria mandate that only wastes that have undergone processing for resource recovery are eligible for energy recovery, to increase this amount of eligible waste within the market, additional processing capacity or additional facilities would need to be constructed.

MRA estimated the total amount of waste that could undergo energy recovery in accordance with the EfW Policy Statement under a hypothetical scenario of full market saturation of resource recovery. Under this scenario, all waste generated in the MLA is processed to recover recyclables. This scenario provides an estimate of the eligible tonnes for energy recovery should all waste generated in the Metropolitan Levy Area (MLA) be 'made available' for energy recovery i.e. undergo bona-fide resource recovery in a processing facility.

Data for these calculations are derived from the mass balance diagrams (Figure 6 to Figure 8) in Appendix B.

Each line of 'Table 1' of the EfW Policy Statement (please refer to Appendix A) was examined and an estimate of eligible tonnes made under the full market saturation scenario.

Please note that, for the purposes of this broad market assessment, MRA has not estimated the amount of hazardous and electrical waste in the waste streams. Therefore, hazardous and electrical waste constitute a small fraction of the tonnes estimated. However, the Resource Recovery Criteria states that these wastes must be removed from the waste stream before energy recovery. In the detailed assessment for the proposed facility, hazardous and electrical waste are removed from the 'eligible tonnes' total.

Please see tables below for the detailed results.

Table 11 examines mixed municipal solid waste (MSW) and estimates that 1,723,789 tonnes of mixed MSW **could** be processed by facilities processing mixed MSW in the MLA under the given scenario (including the 687,752 tonnes that are currently processed). Of this, 667,587 tonnes would be eligible for energy recovery.

Table 11 Mixed MSW, potentially available for processing and potentially eligible tonnes in the MLA

EfW Policy Statement			Potential tonnes		
Waste stream	**Processing Facility**	**% Residual Waste allowed for Energy Recovery**	**Potentially available for Processing - tonnes in the MLA (t)**	**Policy Allowance**	**Potentially Eligible tonnes in the MLA (compliant with Policy Allowance) (t)**
Mixed municipal waste (MSW)	Facility processing mixed MSW waste where a council has separate collection systems for dry recyclables and food and garden waste	No limit by weight of the waste stream received at a processing facility	70,647	100%	70,647
	Facility processing mixed MSW waste where a council has separate collection systems for dry recyclables and garden waste	Up to 40% by weight of the waste stream received at a processing facility	1,224,368	40%	489,747
	Facility processing mixed MSW waste where a council has a separate collection system for dry recyclables	Up to 25% by weight of the waste stream received at a processing facility	428,774	25%	107,193
SUB-TOTAL			**1,723,789**		**667,587**

Table 12 examines mixed commercial and industrial (C&I) waste, and estimates that 1,609,330 tonnes of mixed C&I waste **could** be processed by facilities processing mixed C&I waste in the MLA under the given scenario (including the 43,743 tonnes that are currently processed). Of this, 804,665 tonnes would be eligible for energy recovery.

Table 12 Mixed C&I Waste, potentially available for processing and potentially eligible tonnes in the MLA

EfW Policy Statement			Potential tonnes		
Waste stream	**Processing Facility**	**% Residual Waste allowed for Energy Recovery**	**Potentially available for Processing - tonnes in the MLA (t)**	**Policy Allowance**	**Potentially Eligible tonnes in the MLA (compliant with Policy Allowance) (t)**
Mixed commercial and industrial waste (C&I)	Facility processing mixed C&I waste	Up to 50% by weight of the waste stream received at a processing facility	1,609,330	50%	804,665
	Facility processing mixed C&I waste where a business has separate collection systems for all relevant waste streams	No limit by weight of the waste stream received at a processing facility	-	100%	-
SUB-TOTAL			**1,609,330**		**804,665**

Table 13 examines mixed construction and demolition (C&D) waste, and estimates that 2,558,174 tonnes of C&D waste **could** be processed by facilities processing mixed C&D waste in the MLA (including the 858,041 tonnes that are currently processed). Of this, 639,543 tonnes would be eligible for energy recovery.

Table 13 Mixed C&D Waste, potentially available for processing and potentially eligible tonnes in the MLA

EfW Policy Statement			Potential Tonnes		
Waste stream	**Processing Facility**	**% Residual Waste allowed for Energy Recovery**	**Potentially available for Processing - tonnes in the MLA (t)**	**Policy Allowance**	**Potentially Eligible tonnes in the MLA (compliant with Policy Allowance) (t)**
Mixed construction and demolition waste (C&D)	Facility processing mixed C&D waste	Up to 25% by weight of the waste stream received at a processing facility	2,558,174	25%	639,543
SUB-TOTAL			**2,558,174**		**639,543**

Table 14 examines residuals from source-separated material, and confirms that all residuals from source-separated waste are currently processed, and thus the figures provided are the same as those in Table 9. There is no potential for additional residuals from source-separated waste to be processed under the given scenario.

Table 14 Residuals from source-separated material, potentially available for processing and potentially eligible tonnes in the MLA

EfW Policy Statement			Potential Tonnes		
Waste stream	**Processing Facility**	**% Residual Waste allowed for Energy Recovery**	**Potentially available for Processing - tonnes in the MLA (t)**	**Policy Allowance**	**Potentially Eligible tonnes in the MLA (compliant with Policy Allowance) (t)**
Source-separated recyclables from C&I	*Facility processing source-separated recyclables from C&I*	*Up to 10% by weight of the waste stream received at a processing facility*	3,098,361	10%	309,836
Source-separated recyclables from MSW	Facility processing source-separated recyclables from MSW	Up to 10% by weight of the waste stream received at a processing facility	615,807	10%	61,581
Source-separated garden waste	Facility processing garden waste	Up to 5% by weight of the waste stream received at a processing facility	522,356	5%	26,118
Source-separated food waste (or food and garden waste)	Facility processing source-separated food or source-separated food and garden waste	Up to 10% by weight of the waste stream received at a processing facility	97,765	10%	9,776
SUB-TOTAL			**4,334,288**		**407,311**
GRAND TOTAL of Table 11 to Table 14			**6,058,077**		**2,519,107**

Table 15 examines potentially available waste from specific separated waste streams, and confirms that all waste from specific source-separated waste streams are currently processed, and thus the figures provided are the same as those in Table 10. There is no potential for additional waste from these specific source-separated waste streams to be processed.

Table 15 Separated waste streams, potentially available for processing and potentially eligible tonnes in the MLA

EfW Policy Statement		Potential Tonnes		
Waste stream	**Processing Facility**	**Potentially available for Processing - tonnes in the MLA (t)**	**Policy Allowance**	**Potentially Eligible tonnes in the MLA (compliant with Policy Allowance) (t)**
Waste wood	Residual wood waste sourced directly from a waste generator e.g. manufacturing facility	336,481	100%	336,481
Textiles	Residual textiles sourced directly from a waste generator	17,598	100%	17,598
Waste tyres	End-of-life tyres	116,539	100%	116,539
Biosolids	Used only in a process to produce a char for land application	N/A	100%	N/A
Source-separated food and garden organics	Used only in a process to produce a char for land application	N/A	100%	N/A
SUB-TOTAL		**470,618**		**470,618**

Appendix D Growth model and sensitivity analysis for eligible tonnes in the MLA market

The growth model and sensitivity analysis presented displays four growth scenarios (-1%, 2%, 4%, 6.2%) as well as the business-as-usual (BAU) scenario. The BAU scenario which utilises the current growth trends for each stream (MSW, C&I and C&D), according to the NSW State of the Environment 2015 dataset, and forecasts them forward linearly.

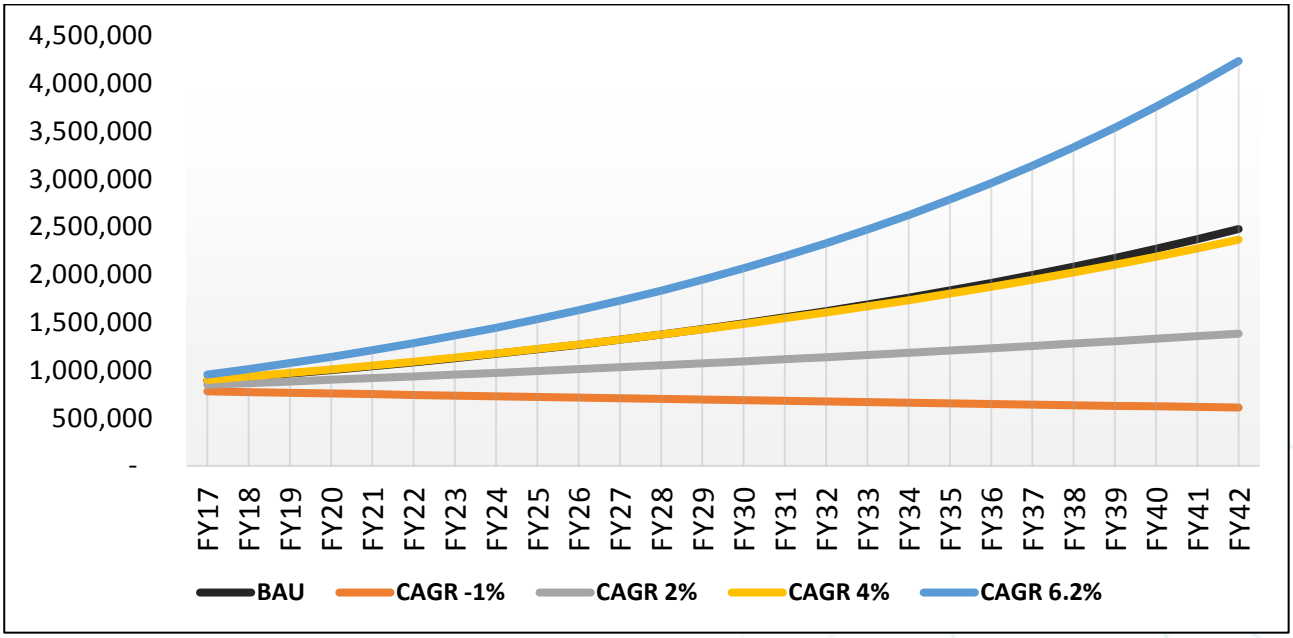
Waste generation, growth rates and compound annual growth rates (CAGR) for the most recent waste data available is shown in Table 16. The BAU scenario uses the CAGRs shown in Table 16, projects the individual streams forward linearly and sums them.

Table 16 Data on waste generation, growth rates and CAGR by waste stream (source: State of the Environment Report 2015)

Year	Municipal Generated (million tonnes)	Municipal Growth	C&I Generated (million tonnes)	C&I Growth	C&D Disposed (million tonnes)	C&D Growth
FY 2002–2003	3.1		4.0		4.7	
FY 2004–2005	3.2	2.6%	4.8	20.1%	5.1	9.2%
FY 2006–2007	3.9	22.3%	5.2	8.3%	6.3	22.1%
FY 2008–2009	4.2	9.2%	5.4	4.0%	6.6	5.4%
FY 2010–2011	4.8	11.9%	5.5	0.5%	6.9	4.8%
FY 2012–2013	5.0	5.7%	4.7	-13.5%	7.0	1.1%
FY 03 – FY 13 CAGR		**5.5%**		**1.8%**		**4.5%**

Figure 9 displays the results of the growth model. The results indicate that there is a substantial amount of waste in the Sydney MLA market, and that even at a sustained -1% CAGR, there are over 600,000 eligible tonnes in the MLA market in FY2042.

Figure 9 Sensitivity Analysis of Growth Model, Eligible Tonnes in MLA Market



Appendix E Eligible tonnes calculations for the Proponent's existing and planned facilities

The calculation of eligible tonnes is a 2-step process:

1. Classify the waste stream according to the categories in Table 1 of the Resource Recovery Criteria (Appendix A) and determine the type of processing facility the waste is being received at (or is residual from). Apply the % residual waste allowed for energy recovery factors to the waste **received** at the processing facility (or assume that the residual waste received is the appropriate fraction of the waste received at prior processing facility). The amount calculated is consistent with Table 1 of the Resource Recovery Criteria.
2. Characterise the waste stream using site-specific audit data OR the best available EPA audit data, to calculate the weight of each material category within the stream. Remove the amount of hazardous and electrical wastes from the total amount of the waste stream. The amount calculated is the eligible tonnes, consistent with the full Resource Recovery Criteria.

Step 1: meeting Table 1 requirements

The first three tables below (Table 17, Table 18 and Table 19) are produced from extracts of weighbridge data from all of the waste entering the Genesis MPC, Genesis EC Facility and Genesis EC Landfill. They demonstrate the total amounts of waste currently eligible for energy recovery based on the source of the waste (i.e. C&I, C&D or MSW), whether it has been processed via a processing facility and its classification (i.e. mixed waste, residual from source-separated materials or separated waste stream).

The following three tables (Table 20, Table 21 and Table 22) are based on planned expansions to the Proponent's operations and facilities. They demonstrate the total amounts of waste that will eventually be eligible for energy recovery following the completion of these expansion projects.

N.B: all quotations in this section refer to Table 1 of the Resource Recovery Criteria.

Table 17 shows that of the 169,265 tonnes of waste received at the Genesis Material Processing Centre (MPC), 42,316 tonnes satisfy Table 1 requirements (of the Resource Recovery Criteria), as this material is classified as "mixed C&D waste".

Table 17 Eligible tonnes arising from the Genesis MPC – current operations

Genesis MPC Input	Category Abbreviation	Tonnes In	% Eligible (EfW)	Eligible Tonnes (EfW)	Notes
Mixed	MIX	169,265	25%	42,316	*25% eligible as classified as "mixed C&D waste"*
SUB-TOTAL		**169,265**		**42,316**	

The assumptions behind Table 17 are as follows:

1. The Genesis MPC currently:
    a. accepts mixed waste of predominantly C&D waste; and
    b. undertakes bona-fide resource recovery operations (i.e. hazardous wastes are removed and appropriately handled and easily retrieved recyclables are recovered).
2. The Genesis Recycling Plant can be classified as a "facility processing mixed C&D waste".
3. The % residual waste allowed for energy recovery from this processing facility is "up to 25% by weight of the waste stream received at a processing facility".

Table 18 shows that the Proponent receives 206,714 tonnes of waste at their Eastern Creek facility, excluding the waste that enters the MPC (shown in Table 17). Of these 206,714 tonnes, 751 tonnes satisfy Table 1 requirements (of the Resource Recovery Criteria) as per the classifications and notes shown.

Table 18 Eligible tonnes arising from the Genesis EC Facility (excl. Genesis MPC) – current operations

Genesis EC Facility Input (excl. Genesis MPC Input)	Category Abbreviation	Tonnes In	% Eligible (EfW)	Eligible Tonnes (EfW)	Notes
Aggregate	AGG	41,754	0%	-	*Separated waste stream*
Aluminium	AL	-	0%	-	*Separated waste stream*
Asbestos	ASB	8	0%	-	*Separated waste stream*
Batteries	BATT	-	0%	-	*Separated waste stream*
Brick/Concrete	BC	153,805	0%	-	*Separated waste stream*
Carpet	CARPET	5	0%	-	*Separated waste stream*
Ferrous metals	FE	24	0%	-	*Separated waste stream*
Mattresses	MATT	0	0%	-	*Separated waste stream*
[Unknown]	N/A	12	0%	-	*Separated waste stream*
Non-ferrous metals	NFE	-	0%	-	*Separated waste stream*
Other	OTH	20	0%	-	*Separated waste stream*
Paper/Cardboard	PAPER	-	0%	-	*Separated waste stream*
Plasterboard	PB	324	0%	-	*Separated waste stream*
Plastic	PL	6	0%	-	*Separated waste stream*
Soil	SOIL	6,403	0%	-	*Separated waste stream*
Textiles	TEXT	11	100%	11	*100% eligible - "Separated waste streams - Textiles"*
Tyres	TYRE	17	100%	-	*100% eligible - "Separated waste streams - Tyres" - however facility design prohibits tyres*
Vegetation	VEG	1,305	0%	-	*Separated waste stream*
VENM	VENM	-	0%	-	*Separated waste stream*
Wood	WOOD	741	100%	741	*100% eligible - "Separated waste streams - Waste wood"*
[Blank]		2,280	0%	-	*Separated waste stream*
SUB-TOTAL		**206,714**		**751**	

The assumptions behind Table 18 are as follows:

1. The Genesis Eastern Creek Facility, excluding the Genesis MPC, currently:
    a. accepts and processes separated waste streams of predominantly C&D waste; and
    b. undertakes bona-fide resource recovery operations (i.e. hazardous wastes are removed and appropriately handled and easily retrieved recyclables are recovered).
2. The Genesis Eastern Creek Facility cannot be classified as a “facility processing mixed C&D waste”.
3. The Genesis Eastern Creek Facility can be classified as a site that accepts the “separated waste streams” of “waste wood”, “textiles” and “waste tyres”. These streams are able to be used as feedstock at an energy from waste facility.

Table 19 demonstrates that the Proponent receives 580,783 tonnes of waste at their landfill in Eastern Creek. Of this waste, 139,399 tonnes satisfy Table 1 requirements (of the Resource Recovery Criteria) as per the notes shown.

Table 19 Eligible tonnes arising from the Genesis EC Landfill – current operations

Currently directly delivered to Genesis EC Landfill	Pre-processed through a 'facility'?	Tonnes In	% Eligible (EfW)	Eligible Tonnes (EfW)	Notes
Aggregate	No	61		-	*Separated waste stream*
Asbestos	No	271,495		-	*Separated waste stream*
Brick/Concrete	No	121		-	*Separated waste stream*
Carpet	No	17		-	*Separated waste stream*
Ferrous metals	No	-		-	*Separated waste stream*
Residual Floc	Yes	54,241	100%	54,241	*Residual from a metal recycling plant - "facility processing mixed C&I waste"*
Mattresses	No	4		-	*Separated waste stream*
Mixed - from glass recycling plants	Yes	18,862	100%	18,862	*Residual from glass recycling plants - "facility processing mixed C&I waste"*
Mixed - from C&I processors	Yes	17,510	100%	17,510	*Residual from C&I processors - "facility processing mixed C&I waste"*
Mixed - Genesis Alexandria	Yes	15,841	100%	15,841	*Residual from a C&D processor - "facility processing mixed C&D waste"*
Mixed - Misc.	No	169,574		-	*Unprocessed mixed stream - if processed could count 25% as eligible tonnes*
Other - mill rejects	Yes	7,176	100%	7,176	*Residual from paper mill, which is a "facility processing mixed C&I waste"*
Other - MRF	Yes	25,709	100%	25,709	*Residual from a processor, which is a "facility processing mixed C&I waste"*
Other - Misc.	No	89		-	*Unprocessed mixed stream - if processed could count 25% as eligible tonnes*

Plastic	No	15		-	*Separated waste stream*
Textiles	No	47	100%	47	*100% eligible as classified as "Separated waste streams - Textiles"*
Tyres	No	7	100%	-	*100% eligible - "Separated waste streams - Tyres" - however fuel spec. limits use*
Vegetation	No	0		-	*Separated waste stream*
Wood	No	13	100%	13	*100% eligible as classified as "Separated waste streams - Waste wood"*
SUB-TOTAL		**580,783**		**139,399**	
GRAND TOTAL of Table 17 to Table 19		**956,761**		**182,466**	

The assumptions behind Table 19 are as follows (all quotations refer to Table 1 of the Resource Recovery Criteria):

1. The Landfill currently:
    a. accepts and buries separated waste streams of predominantly C&D and C&I waste; and
    b. accepts and buries residual material from paper mills and other secondary processors; and
    c. accepts and buries residual material from metal recyclers, C&I dirty MRFs and C&D MRFs; and
    d. does not have any processing activity occurring on site, albeit this can be introduced in the future.
2. Material described in (b) constitute residual waste from facilities processing source-separated recyclables from C&I.
3. The EPA has confirmed with MRA via phone and email that “Facilit[ies] processing source-separated recyclables from MSW” may include “Facilit[ies] processing source-separated recyclables from C&I” if properly documented. Therefore, MRA assumed that up to 10% by weight of the waste stream received at a facility processing source-separated recyclables from C&I is allowed for energy recovery.
4. MRA assumed that material received by the Proponent described in (b) amounts to less than 10% of the source-separated materials received by the processing facility.
5. MRA assumed that residual from C&D MRFs received by the Proponent amount to less than 25% of the mixed wastes received by the C&D MRFs.
6. MRA assumed that residual from metal recyclers and C&I dirty MRFs received by the Proponent amount to less than 50% of the wastes received by the facilities.

Table 20 demonstrates that the planned expansion of operations at the Genesis MPC, to the processing capacity of the facility, provides an additional 52,684 tonnes of waste that satisfy Table 1 requirements (of the Resource Recovery Criteria).

Table 20 Eligible tonnes arising from the planned expansion of the Genesis MPC – planned activity

Genesis MPC Input	Original Tonnes In	Expanded Tonnes In	Difference	% Eligible (EfW)	Genesis Expansion Eligible Tonnes	Notes
Mixed	169,265	380,000	210,735	25%	52,684	*Capped at 380,000 tpa - based on conservatively rated processing capacity at Genesis Facility*
SUB-TOTAL	**169,265**	**380,000**	**210,735**		**52,684**	

Table 21 demonstrates that the planned expansion of waste received at the Genesis EC Facility (excluding the MPC), with a prioritisation of certain streams of waste (textiles and wood), provides an additional 258,286 tonnes, of which 67,559 tonnes satisfy Table 1 requirements (of the Resource Recovery Criteria).

Table 21 Eligible tonnes arising from the planned expansion of separated waste received at the Genesis EC Facility – planned activity

Genesis EC Facility Input (excl. Genesis MPC Input)	Original Tonnes In	Target % Composition	Expanded Tonnes In	Difference	% Eligible (EfW)	Genesis Expansion Eligible Tonnes	Notes
Aggregate	41,754	8.98%	41,754	-	0%	-	*Separated waste stream*
Aluminium	-	0.00%	-	-	0%	-	*Separated waste stream*
Asbestos	8	0.00%	8	-	0%	-	*Separated waste stream*
Batteries	-	0.00%	-	-	0%	-	*Separated waste stream*
Brick/Concrete	153,805	71.30%	331,564	177,759	0%	-	*Separated waste stream*
Carpet	5	0.00%	11	6	0%	-	*Separated waste stream*
Ferrous metals	24	0.01%	54	30	0%	-	*Separated waste stream*
Mattresses	0	0.00%	0	0	0%	-	*Separated waste stream*
[Unknown]	12	0.01%	27	15	0%	-	*Separated waste stream*
Non-ferrous metals	-	0.00%	-	-	0%	-	*Separated waste stream*
Other	20	0.01%	45	25	0%	-	*Separated waste stream*
Paper/Cardboard	-	0.00%	-	-	0%	-	*Separated waste stream*
Plasterboard	324	0.16%	730	405	0%	-	*Separated waste stream*

Plastic	6	0.00%	13	7	0%	-	*Separated waste stream*
Soil	6,403	3.10%	14,404	8,001	0%	-	*Separated waste stream*
Textiles	11	2.10%	9,765	9,755	100%	9,755	*100% eligible - "Separated waste streams - Textiles"*
Tyres	17	0.00%	17	-	100%	-	*100% eligible - "Separated waste streams - Tyres" fuel spec. limits use*
Vegetation	1,305	0.63%	2,935	1,630	0%	-	*Separated waste stream*
VENM	-	0.00%	-	-	0%	-	*Separated waste stream*
Wood	741	12.59%	58,545	57,804	100%	57,804	*100% eligible - "Separated waste streams - Waste wood"*
[Blank]	2,280	1.10%	5,129	2,849	0%	-	*Separated waste stream*
SUB-TOTAL	**206,714**	**100.00%**	**465,000**	**258,286**		**67,559**	

The assumptions behind Table 21 are as follows:

1. In total, the Environmental Protection Licence for the Genesis Facility allows for the processing of 1.3 million tpa. In this respect, the waste received by the Genesis Facility can be maximised to 465,000 tpa. This allows for the Plant to be maximised to 380,000 tpa of waste received and the introduction of a sister C&I facility at 455,000 tpa of waste received.
2. If the Genesis Facility is maximised to 465,000 tpa of waste received, the eligible separated waste streams will grow. The streams of Textiles and Wood have been the focus of growth.

Table 22 demonstrates that receival of more shredder floc at the Genesis EC Landfill by 27,120 tonnes per year will provide an additional 27,120 tonnes of waste that satisfy Table 1 requirements (of the Resource Recovery Criteria), assuming that the tonnes received by the Proponent amount to less than 50% of the waste received at the metal recycling plant.

Table 22 Eligible tonnes arising from the expansion of shredder floc received at the Genesis EC Landfill – planned activity

Genesis EC Landfill Input	Original Tonnes In	Target tonnes	Difference	% Eligible (EfW)	Additional eligible tonnes	Notes
Aggregate	61	61	-	0%	-	*Separated waste stream*
Asbestos	271,495	271,495	-	0%	-	*Separated waste stream*
Brick/Concrete	121	121	-	0%	-	*Separated waste stream*
Carpet	17	17	-	0%	-	*Separated waste stream*
Ferrous metals	-	-	-	0%	-	*Separated waste stream*
Shredder Floc	54,241	81,361	27,120	100%	27,120	*Residual from metal recycling plant - "facility processing mixed C&I waste"*
Mattresses	4	4	-	0%	-	*Separated waste stream*
Mixed - from glass recycling plants	18,862	18,862	-	100%	-	*Residual from glass recycling plants - "facility processing mixed C&I waste"*
Mixed - from C&I processors	17,510	17,510	-	100%	-	*Residual from C&I processors - "facility processing mixed C&I waste"*
Mixed - Genesis Alexandria	15,841	15,841	-	100%	-	*Residual from a C&D processor - "facility processing mixed C&D waste"*
Mixed - Misc.	169,574	169,574	-	0%	-	*Unprocessed mixed stream*
Other - mill rejects	7,176	7,176	-	100%	-	*Residual from paper mill, which is a "facility processing mixed C&I waste"*
Other - MRF	25,709	25,709	-	100%	-	*Residual from a processor, which is a "facility processing mixed C&I waste"*
Other - Misc.	89	89	-	0%	-	*Unprocessed mixed stream*
Plastic	15	15	-	0%	-	*Separated waste stream*
Textiles	47	47	-	100%	-	*100% eligible as classified as "Separated waste streams - Textiles"*
Tyres	7	7	-	100%	-	*100% eligible - "Separated waste streams - Tyres" - fuel spec. limits use*
Vegetation	0	0	-	0%	-	*Separated waste stream*
Wood	13	13	-	100%	-	*100% eligible as classified as "Separated waste streams - Waste wood"*
SUB-TOTAL			**27,120**		**27,120**	
GRAND TOTAL of Table 20 to Table 22			**496,142**		**147,363**	

Step 2: remove hazardous and electrical waste to satisfy full Resource Recovery Criteria

Table 23 to Table 26 present the characterisation of the CRW, Floc, MRF and C&I streams that comprise the proposed feedstock. The amount of hazardous and electrical waste in each stream is calculated and removed from the total. Table 27 summarises the key steps of the calculation of the proposed eligible feedstock from current and planned activities.

Table 23 Chute residual waste (CRW) composition[11] - hazardous and electrical removed

Materials	Sub-category	Week average (%)	Genesis Alexandria (total eligible) (t)	Genesis Alexandria (haz. removed) (t)	Genesis MPC CURRENT (total eligible) (t)	Genesis MPC CURRENT (haz. removed) (t)	Genesis MPC PLANNED (total eligible) (t)	Genesis MPC PLANNED (haz. removed) (t)
Paper	Recyclable paper	0.78%	124	124	330	330	411	411
	Disposable contaminated (soft) paper	0.62%	98	98	262	262	327	327
	Cardboard	2.31%	366	366	978	978	1,217	1,217
	Liquid paperboard	0.01%	2	2	4	4	5	5
	Nappies	0.01%	2	2	4	4	5	5
Wood/timber	Untreated wood - MDF board	4.63%	733	733	1,959	1,959	2,439	2,439
	Untreated wood - All other	54.59%	8,648	8,648	23,100	23,100	28,760	28,760
	Treated wood - CCA treated	4.82%	764	764	2,040	2,040	2,539	2,539
	Treated wood - lead painted	0.00%	-	-	-	-	-	-
Plastic	Recyclable plastic containers excl. EPS	0.10%	16	16	42	42	53	53
	Other rigid plastics excl. EPS	2.66%	421	421	1,126	1,126	1,401	1,401
	EPS	0.08%	13	13	34	34	42	42
	Soft (films) plastics	3.12%	494	494	1,320	1,320	1,644	1,644
	Composite plastics	1.36%	215	215	576	576	716	716
Metal (Ferrous and non-ferrous)	Recyclable metal containers	0.04%	6	6	17	17	21	21
	Composite	0.33%	52	52	140	140	174	174

[11] Residual from the Genesis MPC has been audited, please refer to Appendix F for the audit report. It is assumed that residual from Genesis Alexandria is of a similar composition to that of residual from the Genesis MPC.

	Other metals	1.50%	238	238	635	635	790	790
Organic (not wood/timber)	Food/kitchen - vegetable	0.01%	2	2	4	4	5	5
	Food/kitchen - meat	0.00%	-	-	-	-	-	-
	Garden/vegetables	1.30%	206	206	550	550	685	685
	Textiles/rags	9.84%	1,559	1,559	4,164	4,164	5,184	5,184
	Rubber	0.44%	70	70	186	186	232	232
	Leather	0.10%	16	16	42	42	53	53
WEE	e-waste	0.73%	116		309		385	
	Mobiles	0.00%	-	-	-	-	-	-
	Toners	0.00%	-	-	-	-	-	-
Hazardous	Medical	0.00%	-	-	-	-	-	-
	Chemicals	0.00%	-	-	-	-	-	-
	Paint	0.07%	11		30		37	
	Asbestos	0.00%	-	-	-	-	-	-
	Batteries car	0.00%	-	-	-	-	-	-
	Batteries other	0.00%	-	-	-	-	-	-
	Other hazardous	0.00%	-	-	-	-	-	-
Glass	Glass containers	0.00%	-	-	-	-	-	-
	Glass other	0.10%	16	16	42	42	53	53
Other (including earth and building materials)	Insulation	0.06%	10	10	25	25	32	32
	Carpet/underlay	0.80%	127	127	339	339	421	421
	Compounds (excl. plastic and metal)	0.95%	150	150	402	402	500	500
	Asphalt	1.20%	190	190	508	508	632	632
	Inert incl. non-hazardous building waste	7.44%	1,179	1,179	3,148	3,148	3,920	3,920
TOTAL		**100%**	**15,841**	**15,714**	**42,316**	**41,978**	**52,684**	**52,262**

Table 24 Shredder Floc (Floc) composition[12] - hazardous and electrical removed

Material	Composition	Floc (current and planned) at Genesis EC Landfill (t)
Paper	0.39%	317.31
Textiles	10.9%	8,876.52
Wood	3.0%	2,424.57
Rubber/Leather	4.8%	3,905.34
Plastic	20.3%	16,500.07
Polystyrene	1.1%	927.52
Metal	1.4%	1,147.19
Inert	58.1%	47,262.77
TOTAL		**81,361.29**

Table 25 MRF residual (MRF) composition[13] - hazardous and electrical removed

Materials	Sub-category	Composition	MRF residual at Genesis EC Landfill (current) (t)	MRF residual at Genesis EC Landfill (current) (haz removed) (t)
Paper	Recyclable paper	6.56%	4,543	4,543
	Disposable contaminated (soft) paper	6.06%	4,197	4,197
	Cardboard	6.78%	4,696	4,696
	Liquid paperboard	0.35%	242	242
	Nappies	1.42%	983	983
Wood/timber	Untreated wood - MDF board	0.50%	346	346
	Untreated wood - All other	2.21%	1,531	1,531

[12] Shredder floc currently received by the Proponent has been audited, please refer to Appendix H for a summary of the audit results.
[13] Residual from MRFs currently received by the Proponent has been audited, please refer to Appendix G for a summary of the audit results.

	Treated wood - CCA treated	0.26%	180	180
	Treated wood - lead painted	0.00%	-	-
Plastic	Recyclable plastic containers excl. EPS	2.15%	1,489	1,489
	Other rigid plastics excl. EPS	6.31%	4,370	4,370
	EPS	0.56%	388	388
	Soft (films) plastics	14.93%	10,340	10,340
	Composite plastics	4.00%	2,770	2,770
Metal (Ferrous and non-ferrous)	Recyclable metal containers	0.67%	464	464
	Composite	1.43%	990	990
	Other metals	2.36%	1,634	1,634
Organic (not wood/timber)	Food/kitchen - vegetable	2.11%	1,461	1,461
	Food/kitchen - meat	0.18%	125	125
	Garden/vegetables	1.03%	713	713
	Textiles/rags	26.05%	18,041	18,041
	Rubber	0.87%	603	603
	Leather	0.76%	526	526
WEE	e-waste	3.69%	2,556	
	Mobiles	0.00%	-	-
	Toners	0.03%	21	
Hazardous	Medical	0.03%	21	
	Chemicals	0.01%	7	
	Paint	0.00%	-	-
	Asbestos	0.00%	-	-
	Batteries car	0.00%	-	-
	Batteries other	0.00%	-	-
	Other hazardous	0.00%	-	-
Glass	Glass containers	0.08%	55	55

	Glass other	4.10%	2,840	2,840
Other (including earth and building materials)	Insulation	0.00%	-	-
	Carpet/underlay	0.00%	-	-
	Compounds (excl. plastic and metal)	1.99%	1,378	1,378
	Asphalt	0.00%	-	-
	Inert incl. non-hazardous building waste	2.52%	1,745	1,745
TOTAL		**100.00%**	**69,257**	**66,653**

Table 26 C&I dirty MRF (C&I) composition[14] - hazardous and electrical removed

Material Category	Composition	C&I Dirty MRF (t)	C&I Dirty MRF (haz removed) (t)
Food	10.58%	24,062	24,062
Plastic	16.59%	37,742	37,742
Wood	16.77%	38,161	38,161
Paper	12.95%	29,455	29,455
Masonry	12.68%	28,842	28,842
Cardboard	7.35%	16,732	16,732
Textile	6.04%	13,738	13,738
Garden organics	5.60%	12,746	12,746
Metal	3.32%	7,554	7,554
Glass	1.69%	3,844	3,844
Rubber	0.85%	1,925	1,925
Electrical	0.59%	1,338	
Other	4.99%	11,361	11,361
TOTAL	**100.00%**	**227,500**	**226,162**

[14] This waste stream has been characterised as mixed C&I, as audited at the point of disposal. The composition of this waste stream was derived from 'Disposal-based audit: Commercial and industrial waste stream in the regulated areas of New South Wales' (NSW EPA, 2015).

Table 27 Summary of calculation of proposed eligible tonnes from current and planned activities

Status	Facility	Characterisation	Eligible tonnes (per Table 1) per annum (t)	Eligible tonnes (hazardous and electrical removed) per annum (t)
Current facility or operation	Genesis EC (excl. the Genesis Material Processing Centre)	Wood and textiles	751	751
	Genesis Material Processing Centre (MPC)	CRW	42,316	41,978
	Genesis EC Landfill	MRF, Floc, wood and textiles	123,558	120,954
	Genesis Alexandria	CRW	15,841	15,714
SUBTOTAL			**182,466**	**179,397**
Planned facility or operation	Genesis MPC	CRW	52,684	52,262
	Genesis EC	Wood and textiles	67,559	67,559
	C&I Dirty MRF	C&I	227,500	226,162
	Genesis EC Landfill	Floc	27,120	27,120
SUBTOTAL			**374,863**	**373,103**
GRAND TOTAL (tonnes per annum)			**557,329**	**552,500**

Appendix F Audit of the Chute Residual Waste (CRW) stream - results

ec Sustainable

REPORT PRODUCED FOR:
Dial A Dump Industries

Chute Residual Waste:
Composition Audit

April 2017

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List of abbreviations

AWT	Alternative Waste Treatment (or Technology)
AS	Australian Standard
C&I	Commercial and Industrial
CRW	Chute Residual Waste
EPL	Environmental Protection License
EPS	Expanded Polystyrene
HAC	Hazard Assessment Check
NSW	New South Wales
OHSMS	Occupational Health and Safety Management System
LPB	Liquid Paperboard
PE	Polyethylene
PET	Polyethylene Terephthalate
PP	Polypropylene
PPE	Personal Protective Equipment
PS	Polystyrene
PVC	Polyvinyl Chloride
SWMS	Safe Work Method Statement
WEEE	Waste Electronic and Electrical Equipment
WHS	Work Health and Safety

1 Introduction

1.1 Background

The Next Generation NSW (TNG) is proposing to develop an energy from waste generation facility at Genesis Zero, a Dial-a-Dump Industries (DADI) waste facility at Eastern Creek. TNG is seeking planning approval for the facility.

The Genesis Zero site includes a landfill and a Materials Recovery Facility (MRF) and is licensed with Environmental Protection License (EPL) 20121 to receive general solid waste as defined in the Protection of the Environment Operations Act, *NSW*, 1997 (POEO Act). The materials removed from the mixed waste for recycling in the MRF include:

- Clean timber, particularly pallets.
- Metals, including ferrous (iron and steel) and non-ferrous.
- Mattresses.
- Plastics.
- Vehicle batteries.
- Fire extinguishers.
- Gas bottles.

The facility also rejects asbestos, with detection using a gun, as well as gypsum because it affects the optical sorting process in the MRF by whitening the waste.

The residual waste is disposed to the landfill via a chute. This is the Chute Residual Waste (CRW). There is approximately 300 tonnes of CRW generated per day. It is proposed to use this CRW, either alone or with other wastes, to fuel the proposed energy from waste facility.

In order to satisfy the NSW Environment Protection Authority (EPA) energy from waste policy requirements, NSW EPA requires some additional data to assess the application for approval as part of the planning process.

The NSW EPA, and its consultants, have raised a range of concerns. Notably these relate to:

- The quantity of the different constituent streams of waste available to qualify as eligible waste fuels;
- The content of certain elements of the eligible waste fuel streams;
- The procedural measures which will be in place to ensure consistency of that content.

This audit seeks to provide information that will assist in handling and mitigating these concerns.

1.2 NSW energy from waste policy

The NSW Energy from Waste Policy (NSW EPA, 2015) sets out the considerations and criteria that apply to recovering energy from waste in NSW. It ensures this energy recovery:

- Poses minimal risk of harm to human health and the environment.
- Will not undermine higher order waste management options, such as avoidance, re-use or recycling.

Under the policy, 'eligible waste fuels', are low risk materials able to be considered for use as a fuel due to their origin, low levels of contaminants and consistency over time.

1.3 Audit objectives

DADI engaged EC Sustainable to conduct an independent audit of the CRW. The objectives were to determine the composition of the CRW over a one week period using a representative sampling regime. The CRW composition data required include:

- Combustible and eligible waste fuel materials that will provide energy.
- Hazardous materials that may require management to prevent them from entering the energy generation process.
- Recyclable materials that could be otherwise processed as a higher order waste management option.

This report provides the results of the audit.

1.4 Document structure

This report provides:

- Section 2: the methods used to obtain the data
- Section 3: the results of the waste audit.
- Section 4: comments.

2 Project methods

2.1 What is a waste audit?

A waste audit is an examination of a particular waste stream including the waste materials within that stream. It includes using classification methods to determine the physical waste stream composition, measurement of the size of the waste stream and verification of other statistics related to the waste stream for planning and decision-making purposes.

2.2 Guidelines.

The audit followed applicable parts of guidelines, such as from NSW EPA in 2008 and 2010 and Office of Renewable Energy Regulator (2001).

2.3 Sample frame

The audit sample frame was designed to comprehensively cover a full week for the operating cycle of the MRF to match the generation of the CRW. Table 1 provides the audit sample frame.

Table 1 - Sample frame

Day	Date	Number of samples	Sample source times
Monday	24/04/2017	9	8:15AM, 9:15AM, 10:20AM, 11:20AM, 12:20PM, 13:45PM, 13:30PM, 15:25PM, 16:40PM
Tuesday	18/04/2017	6	9:55AM, 11:20AM, 12:30PM, 13:40PM, 15:00PM, 16:25PM
Wednesday	19/04/2017	9	7:20AM, 8:35AM, 9:50AM, 11:00AM, 12:15PM, 13:30PM, 14:40PM, 15:40PM, 16:30PM
Thursday	20/04/2017	9	7:30AM, 8:30AM, 9:30AM, 10:50AM, 12:20PM, 13:50PM, 14:20PM, 15:45PM, 16:30PM
Friday	21/04/2017	9	7:40AM, 8:40AM, 10:00AM, 11:00AM, 12:10PM, 13:25PM, 14:20PM, 15:20PM, 16:20PM
Saturday	22/04/2017	No CRW was generated	Facility open, but MRF not running
Sunday	23/04/2017		Facility closed
Total	**-**	**42**	**-**

Generally, the MRF operates from 7am to 5pm.

The sampling included selecting one sample per operating hour, up to nine (9) samples per day for the typical nine (9) operating hours. Tuesday 18 April had a shorter operating time due to the Easter shutdown. The MRF does not generally run on weekends, although the facility is open on Saturday.

2.4 Sampling methods

A target sample size of 100kg was used for the audit. This was designed to maximise the number of samples while ensuring each sample was of an adequate size based on the weight of single items in the sample. The single item weights in each sample are low with almost all material less than 2kg and most items less than 1kg.

Due to the MRF shutdown and start-up times of a combined 1 hour, it would not be practical to stop and start the facility to sample every hour because no CRW would be generated. Therefore, sampling was conducted during operation of the MRF.

The collection of approximately 100kg for each sample was conducted using a bulk bin placed over the flow of CRW down the chute that takes the CRW to the landfill. The CRW audited is therefore representative of the material that goes down the chute after processing in MRF.

The samples were delivered to EC Sustainable in a bulk bin by a forklift. The samples were sorted on the day of sampling, with the exception of the final sample on Wednesday that had to be partially stored overnight due to light safety. That sample was partially sorted on the sampling day, with the remainder of the sample stored in enclosed sealed 240L bins overnight to protect the sample.

ORER (2001) discussed visual audits of C&I waste, considering individual incoming loads not an on-going flow of waste after some processing. The CRW is a post-processing material and not an incoming material and the waste is highly mixed and in small particle sizes. Visual auditing methods would not be appropriate for accurate measurements. Physical weight based auditing provides a higher order method of accurate data collection compared to visual audits.

2.5 Sorting and data collection

2.5.1 Location

A safe undercover sorting site was provided by DADI adjacent to the MRF.

2.5.2 Sorting categories

Table 2 provides the sorting categories used in the audit. These categories are based on applicable components of relevant guidelines such as NSW EPA (2008 and 2010) and ORER (2001).

Table 2 - Sorting categories

Summary ^	Sorting category and number		ORER Guideline (2001) category	
			Name	Renewable eligible
Paper	1	Recyclable paper	Newspaper, magazines, mixed paper	Yes
	2	Disposable contaminated (soft) paper	Paper composite	Yes
	3	Cardboard	Cardboard	Yes
	4	Liquid paperboard (LPB)	Liquid paperboard	Yes 85%
	5	Nappies	Disposable nappies	Yes 90%
Wood/timber	6	Untreated wood – MDF board	Wood	Yes
	7	Untreated wood – All other		
	8	Treated wood – CCA treated		Potentially >
	9	Treated wood – lead painted		
Plastic	10	Recyclable plastic containers excl. EPS	Mixed plastics, PET, PE, PVC, PP, PS not EPS	No
	11	Other rigid plastics excl. EPS		
	12	Expanded Polystyrene (EPS)	Polystyrene (PS)	No
	13	Soft (films) plastics	Plastic film	No
	14	Composite plastics	Plastic composite	No
Metal (Ferrous and non-ferrous)	15	Recyclable metal containers	Not required	No
	16	Composite	Not required	No
	17	Other metals	Not required	No
Organic (not Wood/ timber)	18	Food/kitchen – vegetable	Kitchen organics - veg	Yes
	19	Food/kitchen – meat	Kitchen organics - meat	Yes
	20	Garden/ vegetation	Garden organics	Yes
	21	Textiles/rags	Textiles	No *
	22	Rubber	Rubber	No
	23	Leather	Not required	Potentially
WEEE	24	E-waste	Compounds (radios etc)	No
	25	Mobiles	Mobile phones	No
	26	Toners	Toner cartridges	No
Hazardous	27	Medical	Not required – additional potential combustibles, although hazardous	No
	28	Chemicals		
	29	Paint		
	30	Asbestos		
	31	Batteries car (vehicles)		
	32	Batteries other		
	33	Other hazardous		
Glass	34	Glass containers	Not required	No
	35	Glass other	Not required	No
Other (including Earth and Building Materials)	36	Insulation	Not required – additional potential combustibles	No
	37	Carpet/underlay		No
	38	Compounds (excl. composite plastic, composite metal, e-waste)	Compounds (radios etc)	No
	39	Asphalt	Not required	No
	40	Inert incl. non-hazardous building waste	Not required	No

^ Generally based on NSW EPA (2008 and 2010), with more detail on the C&D and wood materials due to the amount of that material in the CRW and less detail on materials not required in ORER (2001).

> Assumed not eligible in ORER (2001) as a precautionary approach due to the treatments, although all wood is eligible.

* Not from a consistent source of natural fibre based on the audit and therefore not eligible in ORER (2001).

The samples were sorted into two size fractions, with the whole sample sorted. This was for additional information in the raw data. This report analyses the whole sample results. The size fractions were: oversize (>25mm); and fines (<=25mm).

2.5.3 Sorting competency

EC Sustainable is a waste auditing organisation for the NSW EPA through the State Government panel contract for waste auditing services.

A team of trained sorting staff were used to collect and sort the material. All staff had WHS white cards, manual handling training, tetanus vaccinations, and Hepatitis A and B vaccinations. Staff were inducted by DADI at the site.

The audit managers had third party waste audit competency training from a third-party trainer. The waste audit competency training includes WHS awareness relevant to sorting and accurate identification of material types in each category.

2.5.4 Material weighing

The sorted material in each category for each sample was weighed. An accuracy of 10g was used for the weighing. Each weight was verified by a second person for accuracy.

2.5.5 Scale calibration

All scales were calibrated by a senior staff member each day before the commencement of the audit each day. Three weights (200g, 1kg and 5kg) were used. If scales failed to read within 1% of the dedicated weight (for example, a 1kg weight should read between 9.990 and 1.010kg), then the scale was removed and a conforming replacement used.

No scales failed the calibration checks and had been serviced by the supplier before the audit.

2.5.6 Removal of sorted material

The auditors placed the materials into a skip bin provided by DADI following sorting. The skip bin was emptied daily as required by DADI.

2.5.7 Weather conditions

Table 3 provides the weather conditions for the audit period. The weather was generally calm and dry with temperatures from 15 to 27 degrees Celsius. The temperature is higher than the average for late April. However, there is unlikely to be any unusual weather impacts on the audit results with no extreme data.

Table 3 - Weather data

Day	Date	Rainfall (24 hrs)	Temperature		Cloud cover (9am)	Wind (9am)
			9am	Maximum		
Monday	24/04/2017	0mm	17.9 °C	25.8 °C	0/8	SE, 4km/h
Tuesday	18/04/2017	0mm	17.5 °C	26.8 °C	0/8	Calm
Wednesday	19/04/2017	0mm	16.9 °C	24.3 °C	7/8	SW, 6km/h
Thursday	20/04/2017	0.2mm	17.9 °C	25.0 °C	1/8	S/SW, 4km/h
Friday	21/04/2017	0mm	15.7 °C	24.7 °C	4/8	Calm

Source: BOM, 2017, Station 67019, Prospect Reservoir.

2.6 Audit verification and monitoring

A dedicated management staff member was assigned the role of monitoring the audit.

This included factors such as:

- Monitoring WHS compliance and facilitating inductions and procedure management.
- Checking the correct sorting of material.
- Observing the correct sorting of materials.
- Witnessing the correct logging of weights.
- Conducting tests on equipment such as scales to ensure accuracy and trucks to ensure safety.
- Verifying correct data entry.

2.7 Work Health and Safety

To meet Work Health and Safety (WHS) obligations, an Occupational Health and Safety Management System (OHSMS) was developed for the audit. This included completing a safe work method statement and hazard assessment check process for both the collection and sorting tasks in the audit. All staff wore PPE as outlined in the Safe Work Method Statement (SWMS).

3 Results

This section provides the compositional results of the audit. The results are provided in this section for each day and a week average for:

- Detailed compositional results based on all categories of waste sorted.
- Combustible materials, based on the ORER Guidelines (ORER, 2001) with some additional data.
- Recyclable materials, based on fully commingled systems for higher order recovery.

The main confidence intervals are also supplied.

The audit involved sorting approximately 4.5 tonnes of CRW material across 5 days of generation, in 42 samples. The sample weights were characterised as shown below with the detailed weights per sample provided in the Appendix 1 raw data file:

- Minimum sample weight: 86.99kg.
- Maximum sample weight: 145.76kg.
- Average sample weight: 108.31kg.

The results for each day were based on the average of the percentage of each sample rather than the weight of each material in each sample. This averaging method has been used to factor every sample equally regardless of its mass. The mass of samples varied naturally based on the volume of the sample with the target being an estimated 100kg. Samples that were larger should not have more impact on the results, because they were larger due to natural variation in the volume selected.

The MRF may process varying amounts of waste in each hour throughout the day. The results are not factored against the actual generation tonnages.

3.1 Detailed compositional results

Table 4 provides the compositional results of samples from each day and an overall audited average based on the detailed sorting categories.

The data shows that the CRW materials in the week were mainly:

1. Untreated wood excluding MDF, 54.59% of the CRW.
2. Textiles/rags, 9.84% of the CRW.
3. Inert including non-hazardous building waste, 7.44% of the CRW.
4. Treated wood - CCA treated, 4.82% of the CRW.
5. Untreated wood - MDF board, 4.63% of the CRW.
6. Soft plastics (films), 3.12% of the CRW.
7. Other rigid plastics excluding EPS, 2.66% of the CRW, which is rigid plastic excluding containers.
8. Cardboard, 2.31% of the CRW.
9. Other metals, not containers, 1.50% of the CRW.
10. Composite plastics, 1.36% of the CRW.

The remaining material was 7.73% of the CRW.

Other rigid plastics excluding EPS would include PVC piping if it was in the samples, although there was not a high amount of PVC in the audit. PVC was not separately sorted, but is estimated to be less than 5% of the other rigid plastics excluding EPS category. This would amount to up to 0.13% of the overall CRW across the audit. Only a small number of examples were identified.

The waste was quite consistent by day. However, the main variations by day were:

1. Untreated wood excluding MDF on Tuesday, 62.67% of the CRW.
2. Textiles/rags on Tuesday, 4.43% of the CRW.
3. Inert including non-hazardous building waste on Monday and Tuesday, 11.82% and 3.13% of the CRW respectively.
4. Capet/underlay on Thursday, 3.48% of the CRW.
5. Asphalt on Thursday, 3.58% of the CRW.
6. Compounds (excluding plastic and metal) on Monday, 2.73% of the CRW which was a mattress and floor lino.

The CRW is a post-processing material. The waste is highly mixed because it has been stockpiled, loaded into the MRF, picked on a conveyor and transported out of the MRF technology down a chute. This processing assists to make the material more consistent than it would be between the incoming loads. Each incoming load is likely to have more variability than the CRW.

Table 4 - Results – all materials – detailed by day (% by weight)

Materials		Mon average	Tue average	Wed average	Thurs average	Fri average	Week average
Paper	Recyclable paper	0.65	1.07	0.99	0.42	0.87	0.78
	Disposable contaminated (soft) paper	0.75	0.28	0.74	0.21	1.01	0.62
	Cardboard	2.23	1.88	2.88	0.93	3.50	2.31
	Liquid paperboard	0.00	0.00	0.00	0.01	0.02	0.01
	Nappies	0.01	0.00	0.00	0.00	0.01	0.01
Wood/ timber	Untreated wood - MDF board	3.55	5.29	4.67	4.40	5.45	4.63
	Untreated wood - All other	47.90	62.67	55.20	59.02	50.86	54.59
	Treated wood - CCA treated	4.59	6.89	4.05	3.95	5.30	4.82
	Treated wood - lead painted	0.00	0.00	0.00	0.00	0.00	0.00
Plastic	Recyclable plastic containers excl. EPS	0.11	0.10	0.10	0.05	0.14	0.10
	Other rigid plastics excl. EPS	2.51	3.46	2.83	1.91	2.88	2.66
	EPS	0.06	0.11	0.02	0.04	0.18	0.08
	Soft (films) plastics	5.01	2.87	3.42	1.20	3.03	3.12
	Composite plastics	1.41	0.25	0.68	1.17	2.91	1.36
Metal (Ferrous and non-ferrous)	Recyclable metal containers	0.01	0.02	0.06	0.02	0.05	0.04
	Composite	0.50	0.00	0.09	0.33	0.64	0.33
	Other metals	1.38	2.14	1.15	1.19	1.87	1.50
Organic (not Wood/ timber)	Food/kitchen – vegetable <	0.01	0.00	0.00	0.00	0.01	0.01
	Food/kitchen – meat <	0.00	0.00	0.00	0.00	0.00	0.00
	Garden/ vegetation	1.72	0.67	1.50	1.13	1.24	1.30
	Textiles/rags	11.50	4.43	11.15	8.67	11.65	9.84
	Rubber	0.39	1.44	0.19	0.26	0.26	0.44
	Leather	0.00	0.35	0.16	0.09	0.00	0.10

< Food/kitchen waste was a negligible amount only registering to 1 decimal place rounded up. Food waste was only an incidental item from a worksite, like a lunch remnant, totalling 254g in the whole audit.

Table 4 (*cont.*) - Results – All materials – detailed by day (% by weight)

Materials		Mon average	Tue average	Wed average	Thurs average	Fri average	Week average
WEEE	E-waste	0.81	0.74	0.49	0.72	0.88	0.73
	Mobiles	0.00	0.00	0.00	0.00	0.00	0.00
	Toners	0.00	0.00	0.00	0.00	0.01	0.00
Hazardous	Medical	0.00	0.00	0.00	0.00	0.00	0.00
	Chemicals	0.00	0.00	0.00	0.00	0.01	0.00
	Paint	0.00	0.00	0.00	0.34	0.00	0.07
	Asbestos	0.00	0.00	0.00	0.00	0.00	0.00
	Batteries car	0.00	0.00	0.00	0.00	0.00	0.00
	Batteries other	0.00	0.00	0.00	0.00	0.00	0.00
	Other hazardous	0.01	0.00	0.00	0.00	0.00	0.00
Glass	Glass containers	0.00	0.00	0.00	0.00	0.00	0.00
	Glass other	0.06	0.21	0.11	0.08	0.10	0.10
Other (including Earth and Building Materials)	Insulation	0.28	0.00	0.00	0.00	0.00	0.06
	Carpet/underlay	0.00	0.00	0.00	3.48	0.24	0.80
	Compounds (excl. plastic and metal)	2.73	0.31	0.00	0.00	1.50	0.95
	Asphalt	0.00	1.69	0.00	3.59	0.89	1.20
	Inert incl. non-hazardous building waste	11.82	3.13	9.52	6.79	4.49	7.44
Total		**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**

3.2 Combustible materials

3.2.1 Summary

Table 5 provides the summary categories for combustible materials including eligible was fuels in ORER (2001). Figure 1 provide the data graphically.

The data shows that 88.4% of the CRW materials were combustible:

- Combustible renewable, 64.3% of the CRW, which are eligible waste fuels in ORER (2001).
- Combustible non-renewable non-hazardous, 18.6% of the CRW, which are not eligible waste fuels in ORER (2001).
- Combustible non-renewable WEEE, 0.7% of the CRW, which are not eligible waste fuels in ORER (2001).
- Combustible hazardous, 4.9% of the CRW. Generally, these materials are not discussed in ORER (2001).

3.2.2 Detail

Table 6 provides the results for each sample source and an overall audited average based on the combustibility of the materials. This is based on previous audits conducted by DADI with some additions. Figures 2 and 3 provide the data graphically by week and days.

The combustible materials were mainly:

- Wood general, 54.59% of the CRW.
- Textiles, 9.84% of the CRW.
- Other plastic, 7.24% of the CRW.
- Wood treated, 4.82% of the CRW.

Non-combustible materials were mainly inert which included non-hazardous building waste.

Table 5 - Results – combustible materials – summary by day (% by weight)

Materials	Mon average	Tue average	Wed average	Thurs average	Fri average	Week average
Combustible						
Renewable non-hazardous (eligible waste fuels)	56.82	71.86	65.98	66.12	62.97	64.26
Non-renewable non-hazardous <	21.27	13.01	18.55	16.87	21.29	18.56
WEEE	0.81	0.74	0.49	0.72	0.89	0.73
Hazardous ^	4.60	6.89	4.05	4.29	5.31	4.89
Combustible sub-total	***83.50***	***92.50***	***89.07***	***88.00***	***90.46***	***88.44***
Not combustible						
Not combustible	16.50	7.50	10.93	12.00	9.54	11.56
Total	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**

^ Treated wood, including CCA treated wood and lead painted wood, is not classified as renewable or eligible in this study. It is classified as combustible. The treatments used are non-renewable, although the wood component is renewable. This is a precautionary approach to avoid overestimating the renewable eligible waste fuels based on the guidelines, even though ORER (2001) treats all wood as renewable eligible.

> Non-renewable non-hazardous includes some materials that are not mentioned in ORER (2001), such as leather, that actually may be renewable. This is a precautionary approach to avoid overestimating the renewable eligible waste fuels based on the guidelines.

Figure 1 - Results – combustible materials – summary by day (% by weight)

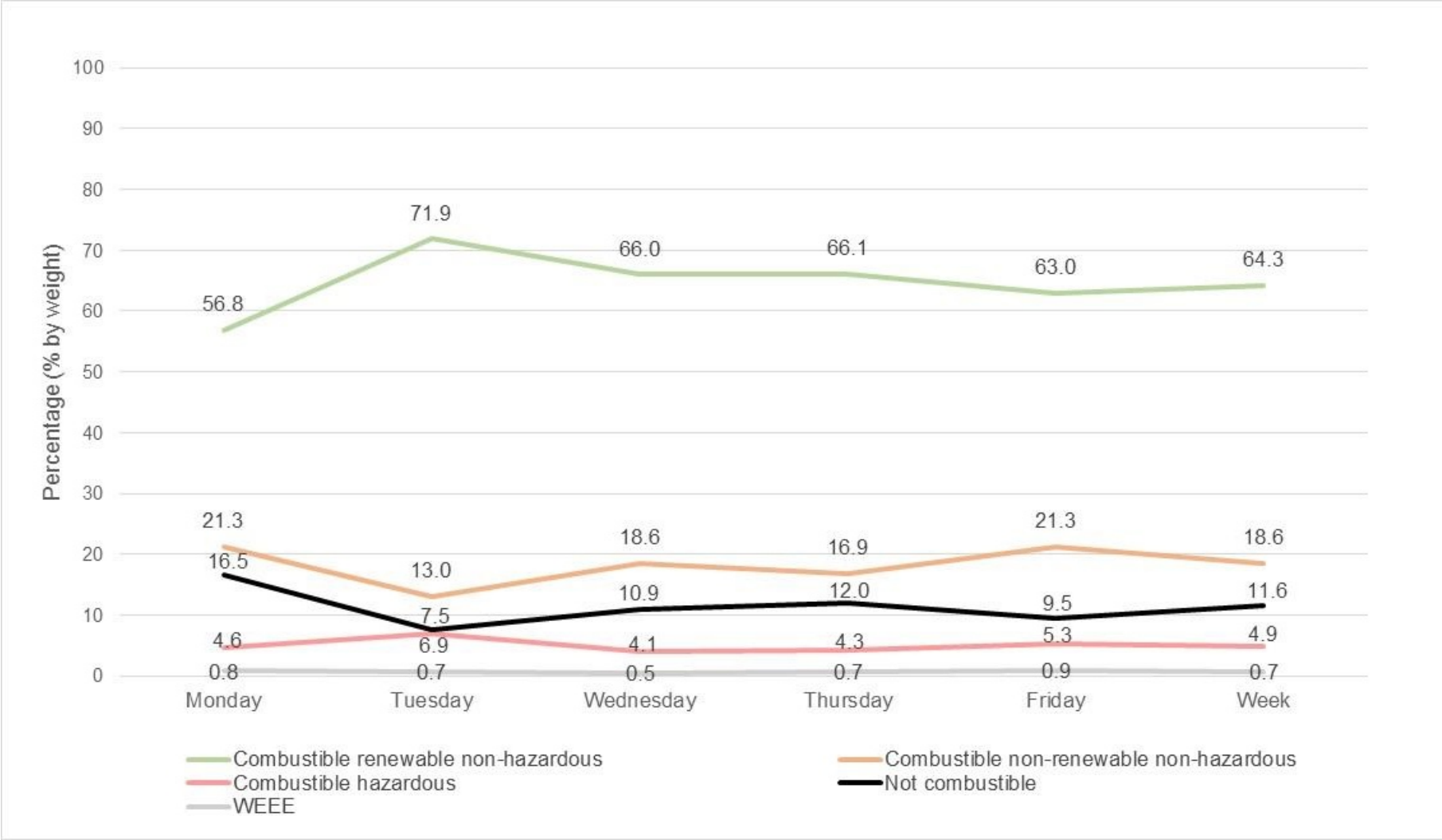
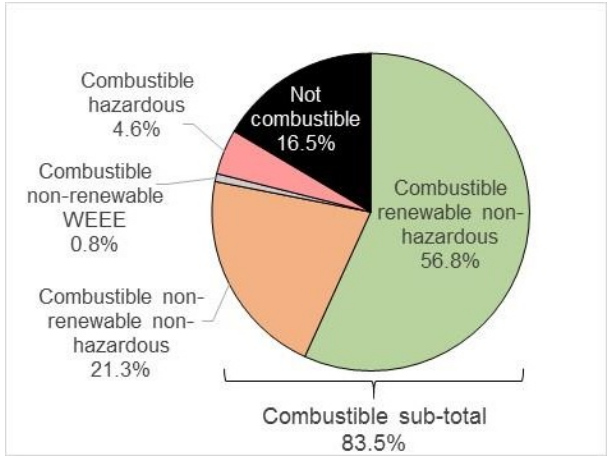
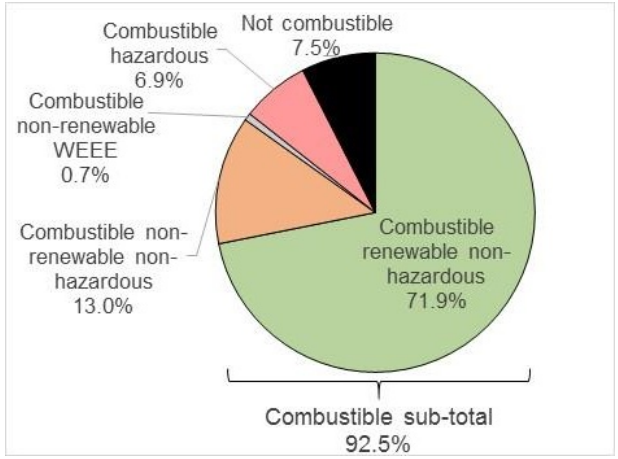


Figure 2 - Results – combustible materials – summary by day (% by weight)

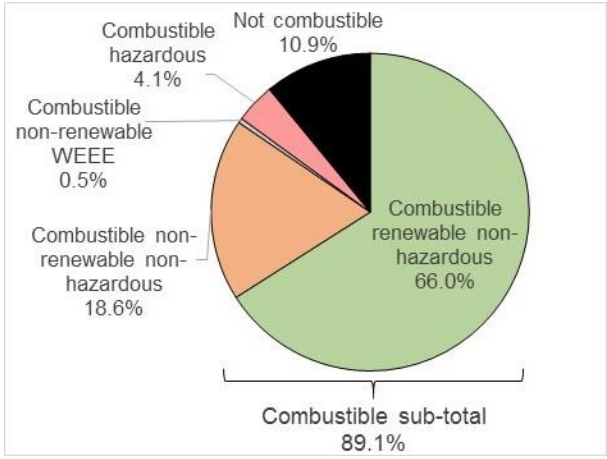
Monday average



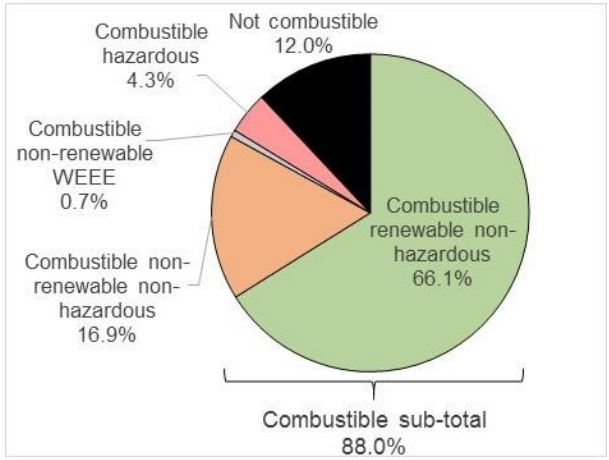
Tuesday average



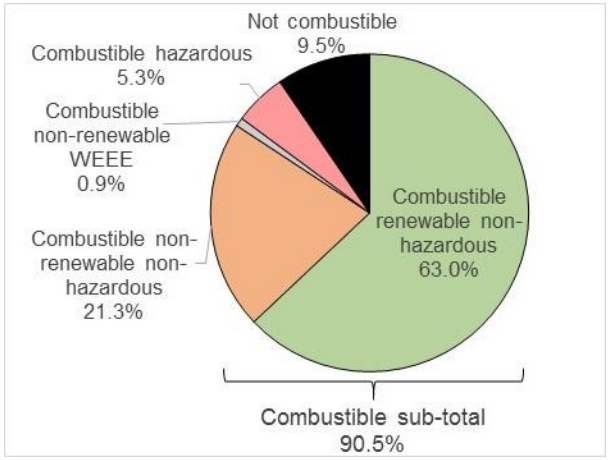
Wednesday average



Thursday average



Friday average



Week average

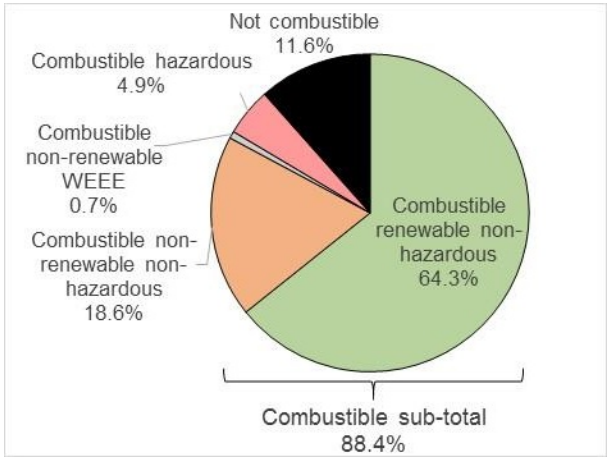


Table 6 - Results – combustible materials – detailed by day (% by weight)

Materials		Mon average	Tue average	Wed average	Thurs average	Fri average	Week average
Combustible renewable non-hazardous (eligible waste fuels)	Paper and cardboard	3.63	3.23	4.61	1.56	5.38	3.71
	LPB *(85% renewable)*	0.00	0.00	0.00	0.01	0.02	0.01
	Nappies *(90% renewable)*	0.01	0.00	0.00	0.00	0.01	0.01
	Wood general	47.90	62.67	55.20	59.02	50.86	54.59
	Wood MDF	3.55	5.29	4.67	4.4	5.45	4.63
	Food and kitchen	0.01	0.00	0.00	0.00	0.01	0.01
	Garden and vegetation	1.72	0.67	1.50	1.13	1.24	1.30
Combustible non-renewable non-hazardous	Other plastic (not polystyrene)	9.04	6.68	7.03	4.33	8.96	7.24
	Polystyrene	0.06	0.11	0.02	0.04	0.18	0.08
	Textiles	11.50	4.43	11.15	8.67	11.65	9.84
	Rubber	0.39	1.44	0.19	0.26	0.26	0.44
	Leather	0.00	0.35	0.16	0.09	0.00	0.10
	WEEE	0.81	0.74	0.49	0.72	0.89	0.73
	Insulation	0.28	0.00	0.00	0.00	0.00	0.06
	Carpet/underlay	0.00	0.00	0.00	3.48	0.24	0.80
Combustible hazardous	Wood treated ^	4.59	6.89	4.05	3.95	5.30	4.82
	Other hazardous <	0.01	0.00	0.00	0.34	0.01	0.07
Not combustible	Metal	1.89	2.16	1.30	1.54	2.56	1.87
	Glass	0.06	0.21	0.11	0.08	0.10	0.10
	Asbestos	0.00	0.00	0.00	0.00	0.00	0.00
	Asphalt	0.00	1.69	0.00	3.59	0.89	1.20
	Other compounds *	2.73	0.31	0.00	0.00	1.50	0.95
	Inert incl. non-hazardous building waste	11.82	3.13	9.52	6.79	4.49	7.44
Total		**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**

^ Treated wood is not classified as renewable in this study. It is classified as combustible. The treatments used are non-renewable, although the wood component is renewable.

< The category of "Other hazardous" in combustible waste includes the detailed audit categories of Medical, Chemicals, Paint, Batteries car, Batteries other and Other hazardous. Asbestos was included in not combustible waste. While the category includes these materials, no car batteries were in the samples audited, as shown in Table 4. The MRF removes car batteries within the process before the CRW is generated. There was also no medical waste and no batteries other, as shown in Table 4.

* Other compounds exclude composite plastic, composite metal and e-waste.

Figure 3 - Results – combustible materials – detailed by week (% by weight)

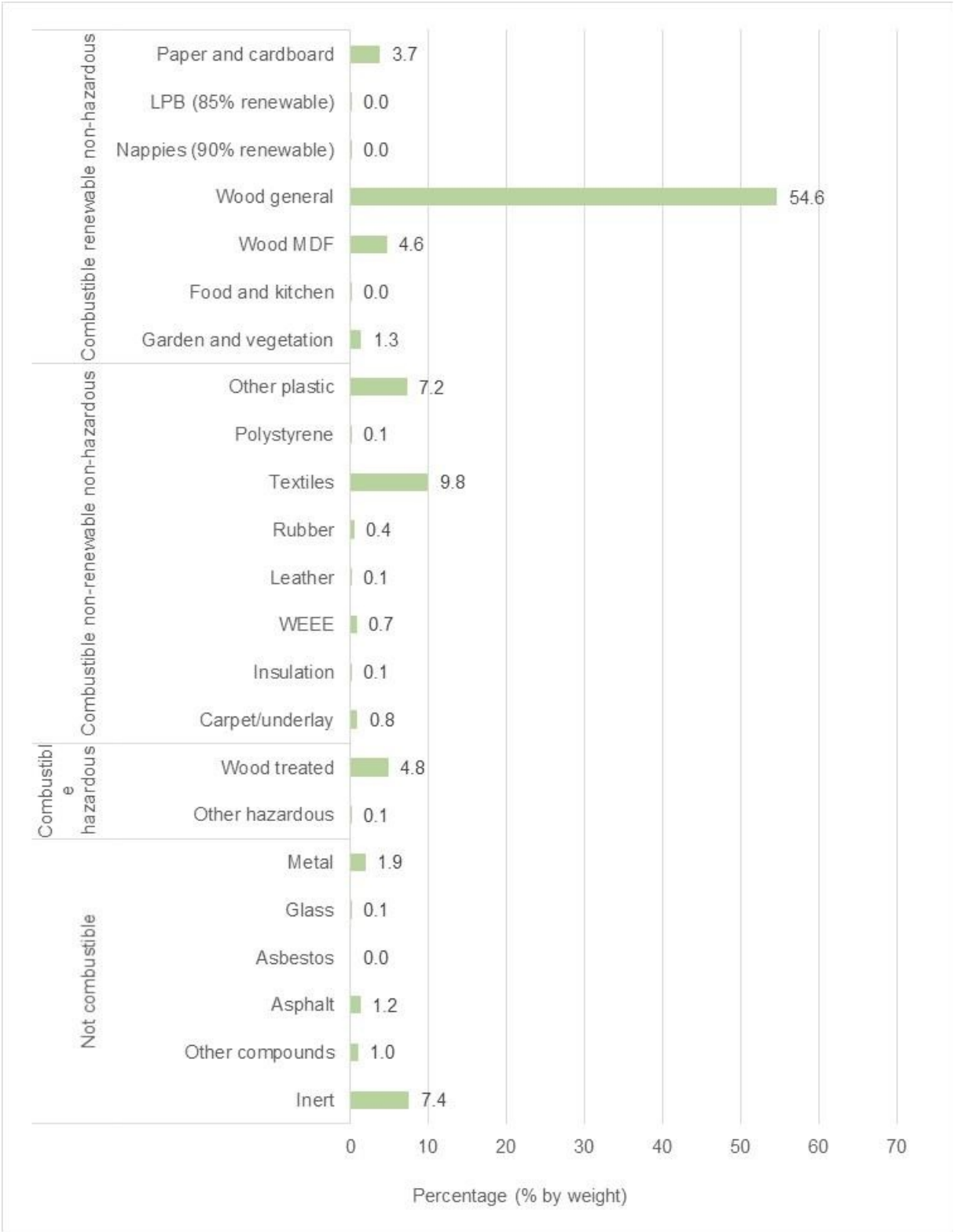
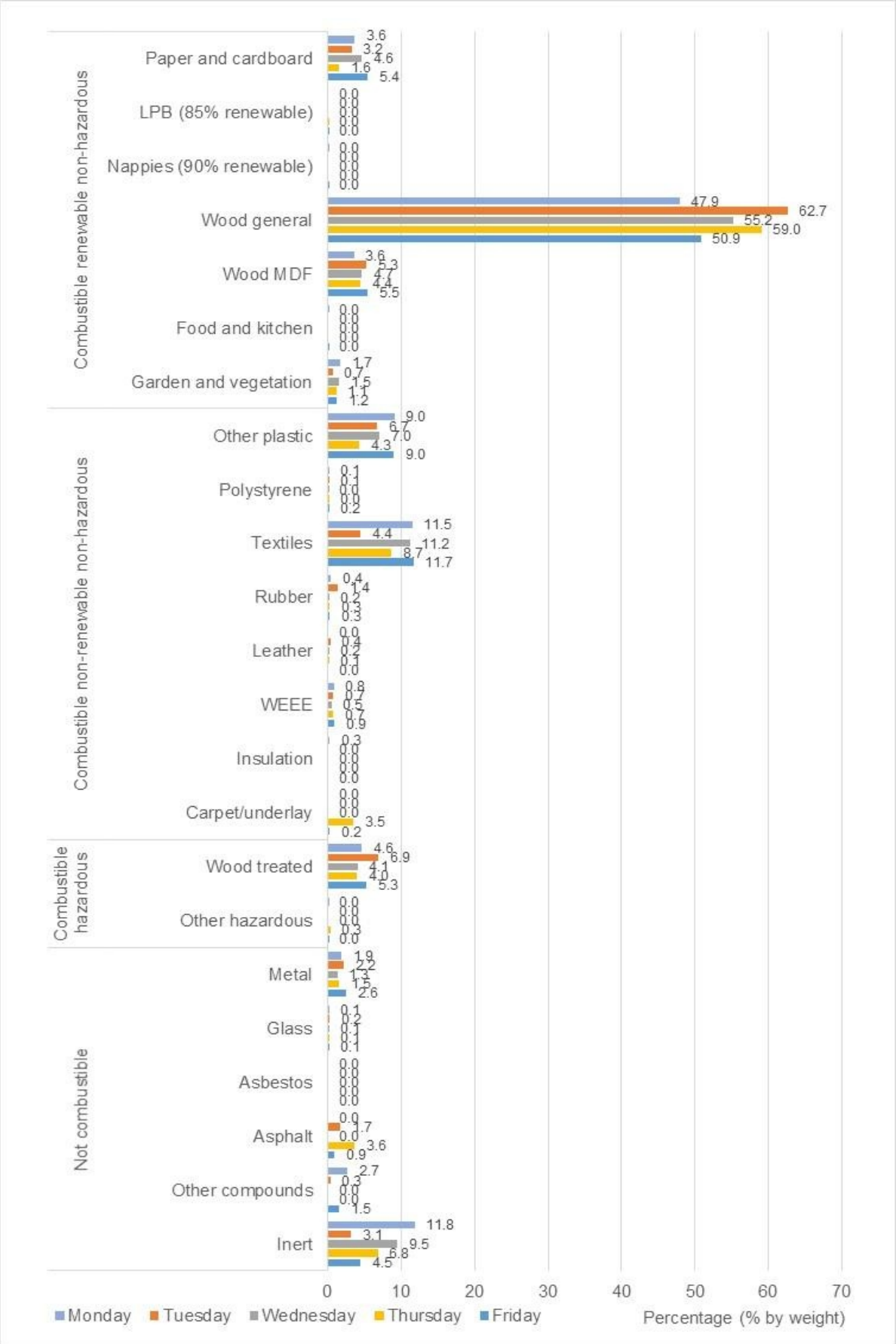


Figure 4 - Results – combustible materials – detailed by day (% by weight)



3.3 Recyclable materials

This section provides the amount and composition of recyclable materials in CRW, based on fully commingled materials like paper, cardboard and containers. Table 7 provides the data.

The data shows that there was a low level of these recyclable materials in the CRW. The CRW was 3.24% recyclables, which was mainly recyclable paper and cardboard at 3.09% of the CRW. Most of this paper and cardboard was soiled to some extent and generally not suited a MRF recovery process by the time it was audited.

The energy from waste policy preferences higher order recycling over combustion. Based on the audit week, there is a not a substantial opportunity for further recovery of recyclables from the CRW.

The CRW is mainly timber which presents in a form that is not reusable, probably not avoidable and not economically viable to further separate which is why it is currently being landfilled.

Table 7 - Results – recyclable materials (% by weight)

Materials	Mon average	Tue average	Wed average	Thurs average	Fri average	Week average
Recyclable paper and cardboard	2.88	2.95	3.87	1.35	4.37	3.09
Recyclable plastic containers	0.11	0.10	0.10	0.05	0.14	0.10
Recyclable metal containers	0.01	0.02	0.06	0.02	0.05	0.04
Recyclable glass containers	0.00	0.00	0.00	0.00	0.00	0.00
Recyclable liquid paperboard	0.00	0.00	0.00	0.01	0.02	0.01
Sub-total recyclables	***3.00***	***3.07***	***4.03***	***1.43***	***4.58***	***3.24***
Not recyclables	97.00	96.93	95.97	98.57	95.42	96.76
Total	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**

3.4 Confidence intervals

Table 8 provides the confidence intervals at a 90% confidence level for the main target materials. The audit involved sorting approximately 4.5 tonnes of CRW material across 5 days of generation in 42 samples.

The hazardous category, which is of main concern to NSW EPA has the lowest confidence interval of 5.5%, with a maximum of 10.4% hazardous material at the upper confidence interval value at 90% certainty. The mean value is 4.9%.

The renewable combustible materials (eligible waste fuels) have a larger confidence interval of up to 12.2%, but even at the lower confidence interval value at 90% certainty is still over half (52.1%) of the material is combustible, renewable, non-hazardous material. The mean value is 64.3%. Therefore, the waste stream was highly eligible based on the material composition audited.

Combustible materials in total were at least 80.3% of the material at the lower confidence interval value at 90% certainty. The mean value is 88.4%. Therefore, the waste was highly combustible based on the material composition audited.

Table 8 - Results – confidence intervals

Materials	Confidence interval	Mean percentage	Lower value	Upper value
Combustible materials				
Renewable non-hazardous (eligible waste fuels)	+/- 12.2%	64.3	52.1	76.5
Non-renewable non-hazardous	+/- 9.9%	18.6	8.7	28.5
Non-renewable WEEE	+/-2.2%	0.7	0.0	2.9
Hazardous	+/- 5.5%	4.9	0.0	10.4
Combustible sub-total	***+/- 8.1%***	***88.4***	***80.3***	***96.5***
Non-combustible materials				
Not combustible	+/- 8.1%	11.6	3.5	19.7
Recyclable materials – paper, cardboard and containers				
Recyclable materials	+/- 4.5%	3.2	0.0	7.7

4 Comments

The CRW material, the residual of waste delivered as mixed residual waste, is currently being sent to landfill after a substantial post-collection recovery effort in the onsite MRF.

A robust audit sampling regime was implemented covering the CRW generation cycle as the output from the MRF during the MRF operating hours. The audit data represents the audit week.

These audit results show the CRW has:

- A high level of combustible material, potentially suited to an energy from waste facility.
- A high level of combustible material that were eligible waste fuels based on ORER (2001).
- A low level of recyclables that could be processed in higher order recycling initiatives like fully commingled systems.
- A low level of hazardous waste, although there is some limited amount of e-waste and paint. These materials could be managed through onsite removal or through safe combustion in the processing technology option.
- No visually identifiable asbestos in the audit week in the samples audited, which is likely to be partly be due to the asbestos detection gun.
- No visually identifiable lead painted wood waste in the audit week in the samples audited.

The presence of asbestos, lead painted wood and other hazardous compounds should be tested for in a laboratory. The moisture and chemical characteristics of the waste were not measured in this audit.

The CRW is a post-processing material. The waste is highly mixed because it has been stockpiled, loaded into the MRF, picked on a conveyor and transported out of the MRF technology down a chute. This processing assists to make the material more consistent than it would be between the incoming loads. Each incoming load is likely to have more variability than the CRW.

The processing technology should be assessed for its ability to handle the waste composition.

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Appendix 1

This Appendix provides a separate raw data file in Excel.

Appendix 2

This Appendix provides the aggregation of the sorting categories for reporting.

Table 9 - Aggregation of sorting categories for combustibility and recyclability

Summary ^	Sorting category and number		Combustibility	Recyclability
Paper	1	Recyclable paper	Yes	Yes
	2	Disposable contaminated (soft) paper	Yes	No
	3	Cardboard	Yes	Yes
	4	Liquid paperboard	Yes	Yes
	5	Nappies	Yes	No
Wood/timber	6	Untreated wood – MDF board	Yes	No
	7	Untreated wood – All other	Yes	No
	8	Treated wood – CCA treated	Yes	No
	9	Treated wood – lead painted	Yes	No
Plastic	10	Recyclable plastic containers excl. EPS	Yes	No
	11	Other rigid plastics excl. EPS	Yes	Yes
	12	EPS	Yes	No
	13	Soft (films) plastics	Yes	No
	14	Composite plastics	Yes	No
Metal (Ferrous and non-ferrous()	15	Recyclable metal containers	No	Yes
	16	Composite	No	No
	17	Other metals	No	No
Organic (not Wood/ timber)	18	Food/kitchen – vegetable	Yes	No
	19	Food/kitchen – meat	Yes	No
	20	Garden/ vegetation	Yes	No
	21	Textiles/rags	Yes	No
	22	Rubber	Yes	No
	23	Leather	Yes	No
WEEE	24	E-waste	Yes <	No
	25	Mobiles	Yes	No
	26	Toners	Yes	No
Hazardous	27	Medical	Yes	No
	28	Chemicals	Yes	No
	29	Paint	Yes	No
	30	Asbestos	No	No
	31	Batteries car	Yes	No
	32	Batteries other	Yes	No
	33	Other hazardous	Yes	No
Glass	34	Glass containers	No	Yes
	35	Glass other	No	No
Other (including Earth and Building Materials)	36	Insulation	Yes	No
	37	Carpet/underlay	Yes	No
	38	Compounds (excl. composite plastic, composite metal, e-waste)	No	No
	39	Asphalt	No	No
	40	Inert incl. non-hazardous building waste	No	No

< These materials are classified as combustible in ORER (2001). In practice, a fraction of the material may not combust, such as metal and glass components of e-waste.

Appendix G Audit of the MRF residual stream – results