Grampians Central West Waste Resource Recovery Group

Audit Feasibility Study and Audit Plan

In association with:

rawtec

RANDELL ENVIRONMENTAL CONSULTING

Document verification

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18/10/2018	V1	Audit Feasibility Study and Audit Plan	Jarvis Webb, Mark Rawson	Paul Randell, REC	Mark Rawson
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Executive Summary

Aim of this project

This project aims to develop a set of overarching audit guidelines and plans to provide a standardised approach for undertaking kerbside and transfer station/landfill waste and recycling audits in the region. Reducing costs to individual Councils and ensuring a consistent set of audits that allow councils to benchmark their performance against councils of similar size in the region and across Victoria are key outcomes of the proposed approach. These guidelines then formed the basis of the development of kerbside and transfers station/landfill audit plans, which provide a schedule for the optimal auditing activities in the region over a 10 year period.

Summary of the background and analysis undertaken

Background investigation and analysis was undertaken to inform the development of the Kerbside Audit Guidelines and Kerbside Audit Plan. This included identifying:

- Waste and recycling services provided to the residents by each council (detailed in Table 4 below).
- Recent audits have been undertaken in the region.
- Population and geographic spread of the main localities (towns and cities) within each council.
- Guidance provided by Sustainability Victoria's Guidelines for Auditing Kerbside Waste in Victoria - Leading practice for measuring kerbside waste, recycling and green organics (SV Guidelines) that should be considered in the development of the audit guidelines and plan.
- Indicative budget ranges that might be available for audits.
- Reasonable statistical confidence levels.

Background analysis and investigation for the Transfer Station/Landfill Audit Guidelines and Audit Plan, included:

- Identification of the types and sizes (tonnes per annum) for transfer stations/landfills in the region
- Recent transfer station/landfill audits have been undertaken in the region.
- Indicative budget ranges that might be available for audits.
- Identification on what is the current best practice methods for undertaking audits of transfer stations/landfills.

Findings from these investigations were considered or referred to in the development the audit guidelines that form the basis of the audit plans (summarised below).

Summary of the Kerbside Audit Plan

It is recommended that kerbside streams are audited based on the "aggregation method" recommend in Sustainability Victoria's Guidelines for Auditing Kerbside Waste in Victoria - Leading practice for measuring kerbside waste, recycling and green organics. This method involves collection of material per stream via the collection vehicles used for the regular collection run (i.e. side-lift) and samples are physical separated and weighed into the categories.

Table 1 below provides a summary of the recommended audit plan for undertaking kerbside audits in the GCWWRRG region over a 10 year period. The Kerbside Audit Plan and proposed sample sizes are based on the review recommended auditing methodology in the SV Guidelines, as well as experience in achieving a balance between gaining sample sizes that provide a reasonable statistical confidence level and what we think is practical, cost effective and efficient for the councils involved. These are also based on what we anticipate would enable appropriate benchmarking of performance against councils of similar size and geographic location in the region and across Victoria.

Table 1: Proposed auditing frequency and minimum number of properties and streams/bins to be audited per council

Council	Proposed frequency of audits	Min. No. localities to audit	Min. No. properties audited	General waste bins	Comingled recycling or recycling (containers only) bins	Organics recycling bins	Total bins	Tied paper bundles to audit (weighed only)
West Wimmera Shire Council	Every 4 Years	2	50	50	50		100	50
Hindmarsh Shire Council	Every 4 Years	2	50	50	50		100	50
Yarriambiack Shire Council	Every 4 Years	2	50	50	50		100	
Pyrenees Shire Council	Every 4 Years	2	50	50	50	50	150	
Northern Grampians Shire Council	Every 4 Years	2	75	75	75		150	
Ararat Rural City Council	Every 4 Years	2	75	75	75		150	
Central Goldfields Shire Council	Every 4 Years	2	75	75	75	75	225	
Hepburn Shire Council	Every 4 Years	2	75	75	75		150	
Horsham Rural City Council	Every 4 Years	2	75	75	75		150	
Golden Plains Shire Council	Every 2 Years	3	100	100	100		200	
Moorabool Shire Council	Every 2 Years	3	100	100	100	100	300	
Ballarat City Council*	Every 1 Years	5	125	125	125	125	375	
	Total	**29**	**900**	**900**	**900**	**350**	**2,150**	**100**

*Note: For Ballarat, localities refer to suburbs.

Summary of the Transfer Station/Landfill Audit Plan

Table 2 below identifies the recommended transfer station/landfills in the GCWWRRG region to undergo scheduled visual assessment auditing, at least every 5 years or as required. It is recommended that the initial audits for these facilities should begin as soon as funding for the audits is available.

The other transfer station/landfill facilities in the region may not need to be regularly audited. These facilities should be audited when:

- Planned infrastructure upgrades are being considered
- There has been a major change in waste recycling streams accepted
- It is a requirement as part of a plan, grant application or contract to undertake audits.

The methodology for undertaking the visual assessment audits should be consistent with the NSW EPA's, *Disposal-based Audit Commercial and Industrial Waste Stream in the Regulated Areas of New South Wales Overview* report. This report provides the current best practice auditing methodology for these facilities and involves visually assessing loads at the tipping point over 2 days in a working week at each facility audited.

It is recommended that visual assessment of loads should only be undertaken for household drop off (car/trailer loads), commercial and industrial vehicles and construction and demolitions vehicles. Kerbside/MSW loads should be excluded from the assessment as the composition will be determined from the kerbside audits.

Table 2: Proposed audit frequency for transfer stations/landfills in the GCWWRRG

Council	Facility type	Tonnes managed annually	Audit frequency
Ararat Rural City Council	Ararat RRC	100 – 200 (indicated possibly greater)	Initially then on an as needs basis
Ararat Rural City Council	Lake Bolac RRC	<100 (indicated possibly greater)	Initially then on an as needs basis
Central Goldfields Shire Council	Carisbrook TS	1,000 - 5,000	Every 5 years
City of Ballarat	Ballarat TS	5,000 - 1,0000	Every 5 years
Hepburn Shire Council	Creswick TS and Resale	1,000 - 5,000	Every 5 years
Hepburn Shire Council	Daylesford TS and Resale	1,000 - 5,000	Every 5 years
Hepburn Shire Council	Trentham TS and Resale	500 - 1000	Initially then on an as needs basis
Hindmarsh Shire Council	Dimboola TS	500 - 1000	Initially then on an as needs basis
Hindmarsh Shire Council	Nhill TS	500 - 1000	Initially then on an as needs basis
Horsham Rural City Council	Horsham TS and RRC	1,000 - 5,000	Every 5 years
Moorabool Shire Council	Bacchus Marsh TS	1,000 - 5,000	Every 5 years
Moorabool Shire Council	Ballan TS	1,000 - 5,000	Every 5 years
Northern Grampians Shire Council	Stawell TS	500 - 1000	Initially then on an as needs basis
Pyrenees Shire Council	Beaufort TS	1,000 - 5,000	Every 5 years
Yarriambiack Shire Council	Warracknabeal LF and RRC	<100 (indicated possibly greater)	Initially then on an as needs basis
All others		Less than 500	As needs basis

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Glossary

AVRWMG	AVRWMG's Association of Victorian Regional Waste Management Groups
GCWWRRG	Grampians Central West Waste Resource Recovery Group
C&I	Commercial and Industrial
Locality or localities	This refers to the township/city and/or surrounding area that is target sample population for undertaking an audit. The Term locality is based on the Australian Bureau of Statistics terminology for 'Urban Centres or Localities' which is used to define townships or cities with a population of at least 200 usual/permanent residents.
MRF	A facility for the sorting, recycling and recovery of waste materials.
Multi-Unit Dwellings (MUDs)	A dwelling that is co-located with other dwelling(s) on a single parcel of land, and that usually share a common carpark, entrance foyer or stairwell. These generally include: • Flats or apartments in a one or more storey blocks • House or flat attached to a shop, office, etc. • Flat or apartment attached to a house
NSW EPA Report	This refers to the NSW EPA's, *Disposal-based Audit Commercial and Industrial Waste Stream in the Regulated Areas of New South Wales Overview.*
Sub-sample(s)	Subsamples refer to the streets, suburbs or smaller township/rural communities that should be sampled from within a larger audit of a locality and/or surrounding area. This is based on the guidance provided in the SV Guide that recommends that where practicable, sampling should break the sampled population into at least five sub-samples (e.g. 25 premises per sample x 5 for a sample population of 125).
SV Guidelines	This refers to Sustainability Victoria's *Guidelines for Auditing Kerbside Waste in Victoria - Leading practice for measuring kerbside waste, recycling and green organics*

1. Introduction and Background

1.1 Introduction and project overview

Grampians Central West WRRG (GCWWRRG) Implementation Plan reinforces the need to establish reliable information that provides the evidence base and confidence to plan and invest in new and existing infrastructure and inform behaviour change campaigns is available. One of the critical pieces of this information is to characterise the waste streams of residents within each of the Councils. This is achieved through undertaking audits (either via physical separation or visual assessment).

The first component of this project was to undertake an investigation to understand what the current level of audit data is available, and frequency of audits recently completed in the region. Based on the findings from this investigation, development of a set of overarching guidelines enabling a standardised approach for undertaking audits in the region was formed.

The aim of the guidelines is to reduce costs to individual councils and simplify audit planning activities. The guidelines also aim to ensued that a consistent set of audits are undertaken that allow benchmarking of audit results for councils against councils of similar size, geographic challenges, and demographics, within the region and across Victoria.

The guidelines then form the basis of the development of audit plans for scheduling optimal auditing activities for undertaking kerbside and transfer station/landfill audits across the region over a 10 year period.

1.2 Sources of information used for project development

The guidelines and audit plan were predominately based on review of Sustainability Victoria's *Guidelines for Auditing Kerbside Waste in Victoria - Leading practice for measuring kerbside waste, recycling and green organic*s (SV Guidelines). However, it should be noted that review of the SV Guidelines determined that they were most likely predominately aimed at undertaking audits for metropolitan Melbourne councils, and do not include guidance on a number of important considerations for regional councils such as:

- Number of different townships and geographic spread of townships within councils.
- Other collection services such as containers only recycling, and bundled paper recycling.

It should also be noted that these guidelines were developed in 2009, and do not include guidance on a number of factors and industry trends that have been implemented since their release including:

- Different MRF processes that allow recover of additional materials
- Alternative collection services such as opt-in organics bins and alternative collection frequencies
- Potential for a future container deposit scheme to be implemented in Victoria.

The following other information sources were used to fill gaps of the SV Guidelines:

- Review of other current published guidelines, including:
  - Zero Waste SA's (now Green Industries SA) *Guide to Kerbside Performance Reporting.*
  - NSW EPA's *Disposal-based Audit Commercial and Industrial Waste Stream in the Regulated Areas of New South Wales Overview.*
  - Association of Victorian Regional Waste Management Groups' G*uideline for Data Collection and Reporting Guideline for Waste Management Facilities in Victoria.*
- Sample sizes that allow for a reasonable statistical confidence levels, while minimising the costs for undertaking the audits.
- Consideration of the identified needs, interests and expected funding available from the councils.
- Previous findings form the team's experience undertaking audits, analysing and interpreting audit data and developing council strategy, procurement, and educational programs and materials.

Section A: Kerbside Audit Guidelines and Audit Plan

2. Kerbside Audit Guidelines

2.1 Summary of background investigation undertaken

Background investigation and analysis was undertaken to inform the development of the Kerbside Audit Guidelines and Kerbside Audit Plan. This included identifying:

- Waste and recycling services provided to the residents by each council (detailed in Table 4 below).
- Recent audits have been undertaken in the region.
- Population and geographic spread of the main localities (towns and cities) within each council.
- Guidance provided by Sustainability Victoria's Guidelines for Auditing Kerbside Waste in Victoria - Leading practice for measuring kerbside waste, recycling and green organics (SV Guidelines) that should be considered in the development of the audit guidelines and plan.
- Indicative budget ranges that might be available for audits.
- Reasonable statistical confidence levels.

2.2 Key findings from the background investigation

This section provides the key data tables used in the development of the guidelines to form the basis of the recommended minimum properties to audit.

2.2.1 Properties receiving kerbside waste and recycling services from each council

Table 3: Number of properties (residential and non-residential) receiving kerbside waste and recycling services per each council

Council	General waste	Comingled recycling	Organics recycling
Ararat Rural City Council	4,718	3,533	
Ballarat City Council	44,251	44,251	33,681
Central Goldfields Shire Council	6,451	6,451	1,116
Golden Plains Shire Council	8,230	8,232	
Hepburn Shire Council	7,495	7,627	
Hindmarsh Shire Council	2,791	2,652	
Horsham Rural City Council	8,956	7,816	
Moorabool Shire Council	13,015	12,660	1,531
Northern Grampians Shire Council	6,575	6,235	
Pyrenees Shire Council	2,696	2,875	1,207
West Wimmera Shire Council	1,799	1,400	
Yarriambiack Shire Council	3,559	3,061	
Totals	**110,536**	**106,793**	**37,535**

2.2.2 Kerbside waste and recycling service types provided by each council

Table 4 below provides a summary of the current services currently understood to be provided by councils in the GCWWRRG to their residents.

Table 4: Kerbside waste and recycling services provided by each council

Council	General Waste	Comingled Recycling	Organics Recycling
Ararat Rural City Council	120L bin collected weekly	240L bin collected fortnightly	
Ballarat City Council	140L bin collected weekly	240L bin collected fortnightly	240L organics recycling bin (garden only) collected fortnightly. This is a standard service for the majority of households with the remainder requiring to opt-in to the service
Central Goldfields Shire Council	80L bin collected weekly	240L bin collected fortnightly	Maryborough residents receive a 240L organics recycling bin (food and garden waste accepted) collected fortnightly. All other townships receive a 240L organics recycling bin (garden waste only) collected fortnightly service
Golden Plains Shire Council	240L bin collected fortnightly	240L bin collected weekly	
Hepburn Shire Council	120L bin collected weekly	240L bin collected fortnightly	
Hindmarsh Shire Council	120L bin collected weekly	Tied and bundled paper collected month, and 240L recycling bin (containers only) collected fortnightly	
Horsham Rural City Council	240L bin collected weekly	240L bin collected fortnightly	
Moorabool Shire Council	120L bin collected weekly	240L bin collected fortnightly	
Northern Grampians Shire Council	120L bin collected weekly	240L bin collected fortnightly	
Pyrenees Shire Council	120L bin collected weekly	240L bin collected fortnightly	240L organics recycling bin (garden only) collected fortnightly. This is an opt-in service for all residents receiving a service
West Wimmera Shire Council	120L bin collected weekly	Tied and bundled paper collected monthly, and 240L recycling bin (containers only) collected fortnightly	
Yarriambiack Shire Council	120L bin collected weekly	240L bin collected fortnightly	

Source: GCWWRRG

2.2.3 Analysis of population size and properties serviced for each council

Table 5 below provides a summary of the analysis undertaken on council population and properties serviced to determine population brackets that provided a reasonable basis for benchmarking councils against councils of similar size, geographic challenges, and demographics, within the region and across Victoria. These brackets will be used in the kerbside auditing guidelines for determining the frequency of auditing, minimum number of target localities (towns/cities) and properties/bins to be audited per council.

Table 5: Analysis of population and properties services per council and allocated population bracket

Council	Population	Council Population Bracket	Properties Serviced
West Wimmera Shire Council	3,905	0 - 10,000	1,400
Hindmarsh Shire Council	5,725	0 - 10,000	2,652
Yarriambiack Shire Council	6,675	0 - 10,000	3,061
Pyrenees Shire Council	7,240	0 - 10,000	2,875
Northern Grampians Shire Council	11,436	10,000 - 20,000	6,235
Ararat Rural City Council	11,599	10,000 - 20,000	3,533
Central Goldfields Shire Council	12,993	10,000 - 20,000	6,451
Hepburn Shire Council	15,327	10,000 - 20,000	7,627
Horsham Rural City Council	19,641	10,000 - 20,000	7,816
Golden Plains Shire Council	21,687	20,000 - 50,000	8,232
Moorabool Shire Council	31,820	20,000 - 50,000	12,660
Ballarat City Council	101,689	50,000+	44,251

2.2.4 Analysis of locality sizes within each council

Table 6 overleaf provides a count of the different localities (townships, suburbs or cities) within different population brackets (starting at a minimum of 200 persons) for each council that have been used in the development of the audit guidelines. Appendix 1 provides summary tables of the main localities with population of 200 or above within each council.

Localities of 200 or more persons above have been selected for analysis and as a starting point for planning the audits, due to

- 200 persons as this is the minimum population of usual/permanent residents used to define a township or city (referred to as a "locality") by the Australian Bureau of Statistics, for which reasonable demographic and dwelling data may be available.
- Townships of this size tend to house the majority of the population in a given area and are more likely to have collection services and potentially facilities for undertaking the audits (e.g. transfer stations, depots) nearby.
- Localities of this size provide a reasonable basis for targeting audits and planning collection routes for audit samples (e.g. start and end points for sample collection runs) to ensure that audits are cost effective by minimising the number of locations where auditing is undertaken. However it is recognised that some councils provide regular collections services to townships, communities or rural collection areas with populations that are under 200 persons. These are still able to be considered in audits as sub-samples (guidance provided in 2.3.7). This enables these rural populations to be represented in the audit data.

Table 6: Count of locality size base on population brackets within each council

Council	Population	Count of localities in population brackets				
		200 - 2,000 persons	2,000 - 6,000 persons	6,000 - 20,000 persons	20,000+ persons	Total localities >200 persons
West Wimmera Shire Council	3,905	3				3
Hindmarsh Shire Council	5,725	4				4
Yarriambrick Shire Council	6,675	4	1			5
Pyrenees Shire Council	7,240	3				3
Northern Grampians	11,436	1	2			3
Ararat Rural City Council	11,599	1		1		2
Central Goldfields Shire Council	12,993	2		1		3
Hepburn Shire Council	15,327	2	2			4
Horsham Rural City Council	19,641	1		1		2
Golden Plains Shire Council	21,687	7	1			8
Moorabool Shire Council	31,820	6	1	1		8
Ballarat City Council	101,689	2			1	3
Totals	**249,737**	**36**	**7**	**4**	**1**	**48**

Source: Australian Bureau of Statistics, 2016 Census

2.3 Recommended guidelines for undertaking kerbside audits

2.3.1 Overview of Kerbside Audit Guidelines

The purpose of the Kerbside Audit Guidelines is to provide of standardised, practical and cost-effective approach to undertaking kerbside bin audits across the GCWWRRG region. This will facilitate Councils in the region adopting a repeatable audit methodology and allow them to benchmark their performance with other councils of similar size in the region and across Victoria. The Kerbside Audit Guidelines have also been developed to provide flexibility for councils in planning of audits, and include the recommended:

- frequency of audits per council size
- waste and recycling streams to be audited and proposed auditing methods
- minimum properties and bins per stream audited
- methods for sample selection
- timing for undertaking audits
- other audit sampling method considerations.

2.3.2 Supporting the audit guidelines

This document does not outline all aspects of the audit process. Councils and auditors should refer to Sustainability Victoria's *Guidelines for Auditing Kerbside Waste in Victoria - Leading practice for measuring kerbside waste, recycling and green organics*, for any area where no guidance is provided (e.g. OHS, commissioning and conducting audits, undertaking analysis and reporting on audit results) that is not provided in the Kerbside Audit Guidelines.

2.3.3 Proposed frequency of audits per council size

Table 7 below provides the recommended minimum frequency of audits per each council population size. these ranges have been selected based on:

- Maximising efficiencies and cost savings for less populated councils for when undertaking audits, by aligning the auditing frequency for smaller councils.
- SV Guidelines recommendation that audits should be undertaken at least every two years to allow performance to be tracked and priorities to be reassessed. However review of the SV Guidelines determined that this recommendation is most likely targeted at auditing metropolitan Melbourne councils, and doesn't take into consideration the needs and challenges or rural communities and councils for example:
  - travel distanced between councils
  - population densities
  - personal resources available
  - financial resources available
  - community interest.
- Previous auditing experience identifying that waste compositions or MSW in regional areas changes at a slower pace than metropolitan councils, meaning that there is less need for smaller councils to undertake more frequent audits unless there is a significant change to a service, e.g. new organics recycling implemented or change to general waste collection frequency.

Councils may also wish to consider undertaking audits more frequently for example:

- Ballarat may wish to consider undertaking 6 monthly audits if required to do so due to contract conditions.
- A council that is considering changing service (e.g. frequency of collection) may wish to do a before and after audit of the service change.

Auditing methodology of more audits undertaken outside of the Kerbside Audit Plan should be aligned as close to the audit methodology in the Kerbside Audit Guidelines for consistency and comparison.

Table 7: Proposed minimum frequency for undertaking audits per council population size brackets

Population Size of Council	Proposed Minimum Audit Frequency
0 - 20,000	Every 4 years
20,000 - 50,000	Every 2 years
50,000+	Yearly

2.3.4 Streams to be audited and proposed auditing methods

Auditing kerbside two or three bin system streams

The *"aggregation method"* recommend in the SV Guidelines is proposed to be used for undertaking audits on the kerbside bins system streams:

- General waste
- Comingled recycling / recycling (containers only)
- Organics recycling.

This method involves collection of material per stream via the collection vehicles used for the regular collection run (i.e. side-lift) and samples are physical separated and weighed into the categories. This method is also recommended in the SV Guidelines due to significant OH&S, privacy and efficiency advantages, compared with other auditing types (e.g. bin-by-bin or visual audits). This method also allows assessment of composition, and comparison of sub-samples, and allows assessment of variation in the quantities and composition of materials collected per household/property.

A recommended sampling method for the aggregation method auditing (depending on collection schedules), is to:

1. Collect comingled recycling/ recycling samples in the first week of the audit and store that material at the site for the week and over the weekend.
2. Begin the auditing in the second week and collect general waste and organics (from the same households that the comingled recycling was collected from) during this week.

This method minimised the amount of time that auditors have to be on site and minimised wait times for auditors waiting for the next load to come in.

However, the challenge with this method is for when undertaking comparison of households that opt-in to an organics service vs households that haven't opted-in to the services. For these councils, reliable data on which houses had the op-in service would be required to ensure that the sample sizes are as representative as possible, as houses with an op-in service will not be able to easily be identified during the first week of the audit collection (comingled recycling sample collection).

Auditing for the tied and bundle paper streams

For tied and bundled paper, identified as a provided service by two councils, it is recommended that these are collected via truck/ute and weighed only. This approach is recommended to minimise cost of auditing and it is expected that there would be limited contamination in these streams.

2.3.5 Number of localities audited per council size

The sections below provide our guidance on the minimum number of localities that are above 200 persons for target samples, as well as how to include smaller townships/rural communities as sub-samples .

Main samples (localities greater than 200 persons)

Table 8 below proposes the minimum of localities to audit per each council. As no formal guidance is provided in the SV Guidelines on selection of localities within a Council, these recommendations are based on auditing target samples from a minimum of 2 localities with populations greater than 200 persons per council, targeting the largest locality and one or more smaller locality(s).

We anticipate that this approach provides a reasonable basis for achieving an appropriate sample size for gaining a representative for each council, whilst enabling a cost effective audit. This also gives flexibility for councils on what localities each council selects to audit, based on their understanding of the auditing needs for their regions (e.g. targeting suspected repeat contamination areas) and how to maximise efficiencies for auditing within that council.

Please note that the recommended minimum locality size is intended to be used as a guide only and councils may also wish to select towns or communities with less than 200 persons as target auditing areas based on the audit needs of each council.

Table 8: Proposed minimum number of localities audited per council size

Population of council	Min. localities audited per council
0 - 20,000	2
20,000 - 50,000	3
50,000+	5*

**Note: Larger cities with suburbs (e.g. Ballarat) have the flexibility audit a minimum of 5 suburbs or localities to gain a suitable sample spread*

Sub samples (e.g. smaller townships, rural communities)

Councils should also ensure that smaller satellite communities or rural settlements /collection routes with a population of less than 200 persons, are included in the audits as sub-samples. Guidance (as detailed in the section 2.3.7 below, which providing guidance on the selection of sample areas within localities, overleaf. This guidance recommends at least 25 properties are audited per each sub-sample as indicated in the SV Guidelines.

2.3.6 Number of properties and bins audited per council size

Table 9 below outlines the minimum number of properties and bins to be audited per council population size. The development of this guidance has taken into consideration:

- Review of recommended sample population sizes for audits in the SV Guidelines.
- Analysis bin sample sizes for what can be considered an acceptable range of uncertainty[1] that would provide audit data suitable and relevant to the types of planning activities expected at the recommended confidence interval of at least 90% for undertaking waste audits[2] SV Guidelines.
- Previous audit experience understanding the cost drivers for undertaking regional audits (e.g. set up and travel costs, no. categories audited, number of bins audited).

Table 9: Proposed minimum number of properties/bins audited per service/stream provided per each council size

Population size of council	Min. properties audited	Est. % range of uncertainty at a 90% confidence interval[3]	General waste bins	Comingled recycling/ containers only recycling	Organics recycling	Total bins
0 - 10,000	50	10% - 12.5%	50	50	50	**150**
10,000 - 20,000	75	7.5% - 10%	75	75	75	**225**
20,000 - 50,000	100	7.5% - 10%	100	100	100	**300**
50,000+	125	5% - 7.5%	125	125	125	**375**

If a council requires a greater level of accuracy for the audits using a larger sample size, they may wish to consider auditing the number of properties per council size identified in Table 10 below. This is based on representative scaling of the number of audits per council size, within the ranges recommended for sample sizes of undertaking audits in the SV Guidelines, of:

- General garbage composition audit = 125 – 250 premises
- Recycling bin audit = 125 – 250 premises
- Garden organics bin = 50 – 125 premises

Table 10: Proposed recommended number of. properties audited for councils wanting a to audit a sample size to increase the level of accuracy of the audits

Population size of council	Recommended properties audited	Est. % range of uncertainty at a 90% confidence interval[3]
0 - 10,000	125	5% - 7.5%
10,000 - 20,000	175	5% - 7.5%
20,000 - 50,000	200	5% - 7.5%
50,000+	250	5% - 7.5%

[1] This refers to estimated range of uncertainty ± % range that is considered acceptable for different materials. The smaller the range, the greater the number of samples required. This range is first used when setting the sample size on the basis of assumptions about the relative contribution and variability of items in the waste stream but can be recalculated once the actual audit data has been collected to express the actual range of uncertainty of the audit results for particular materials.

[2] This refers to the level of confidence required based on the probability that the difference between the audit results and the wider population will be within an acceptable range. A confidence interval of 90% means that there is a 90% chance that the audit results are within the allowable range of uncertainty. The higher the confidence interval, the greater the accuracy and the greater number of samples required.

[3] Based on a sample size calculator developed by The Research Advisors (http://research-advisors.com/tools/SampleSize.htm)

2.3.7 Selection of sample areas within localities and sub samples

It is proposed for that samples are selected based on random properties (e.g. every second or third property), from within the minimum number of streets (representing the localities' demographics) in each of the locality brackets identified in Table 11 below. This recommendation is based on:

- Minimising the impact of the regular collection contractor. Previous audits have found that the most efficient sampling method is to select samples based on a range of streets that the regular collection contractors are notified to avoid during the audit.
- Review of the SV Guidelines which recommend that:
  - local knowledge or published data (e.g. ABS) can be used to assess whether the sample chosen is representative based on a council's local knowledge.
  - Where practicable, sampling should break the sampled population into at least (if possible) five sub-samples (e.g. 25 premises per sample x 5 for a sample population of 125). This will allow some statistical assessment of variability within populations.
  - This method can provide an approximation of the wider community on the basis of a mix of sub-populations according to different demographic and dwelling characteristics

More rigorous sample selection methods may be considered by councils as recommended by in the SV Guidelines (e.g. randomised grid method), depending on how flexible collection contractors are in terms of avoiding regular collection activities from areas being sampled (e.g. whole blocks, suburbs or localities) during collection, and the level of accuracy warranted.

Table 11: Proposed minimum number of streets audited

Population of locality	Min. number of streets audited
200 - 2,000	5
2,000 - 6,000	7
6,000 - 25,000	10
25,000+	12
Suburb of Ballarat	5

2.3.8 Time of year for undertaking audits

Although the SV Guidelines recommend auditing households during autumn (March, April, May), as this is the time of the year that is most representative of average waste generation. It was indicated by GCWWRRG that the councils would prefer commencing the audits at the start of the 2019/20 financial year. Based on this, it is recommended that the audits are to take place at the same time each year during the months of September, October or November, avoiding (if possible) public holidays and school holidays and other significant events, as recommended in the SV Guidelines. The timing of the audits should be noted during the data collection and accounted for in the analysis using the guidance provided in the SV Guidelines for adjusting the audit analysis to account for seasonal factors.

2.3.9 Methods for comparing opt-in organics recycling households versus households without the opt-in organics service

If a council wants a representative sample of properties audited for the whole council, the sample should be based on the minimum number of properties outlined above. However, Councils may want to compare performance of households with opt-in organics recycling bins versus households without the opt-in organics recycling bins. The recommended method to do this is to split audit samples evenly into two sample groups, for example:

- Auditing bins from each stream for 50 properties with opt in recycling properties audits
- Auditing bins from each stream for 50 properties with opt in recycling properties audits

For this auditing methodology it should be noted that:

- The fewer the bins in each separate sample, the lower the accuracy of the split audit. If possible, a minimum of 50 bins per sample size should be audited.
- This method is like to incur additional costs for the auditing of the material.

This method might be considered if a council was investigating the feasibility of providing all residents with an organics recycling service rather than an opt-in service.

2.3.10 Sampling of properties that can opt-in for additional bins (e.g. organics bin)

If council provides a service where properties can opt-in/pay for additional bins (commonly additional organics/garden recycling bins), it is recommended that both bins from properties samples should be collected and this information be noted (bin type, size and number of bins for the property). Analysis is to be adjusted based on the additional bins. If a council provides an additional bin service to its residents, then auditors should be notified of the approximate % of properties with additional bins (for each stream), so that they can be accounted for in their quote for undertaking the audit.

2.3.11 Audit categories

- Review of the auditing categories as identified in the SV Guidelines.
- Consideration for the materials categories in the AVRWMG's Guideline for Data Collection and Reporting Guideline for Waste Management Facilities in Victoria.
- Providing a better resolution of material types and contamination given the increased focus MRF performance and viability due to China National Sword policies.
- Simplifying the audit categories and process, so that the allocation of materials (e.g. as a contaminate or not) is done during analysis and not during the audit by the auditor, and is flexible depending on the different needs of councils, MRFs etc.
- Consideration for the specific needs of different MRF processes that allow recover of additional materials, regional councils, including items identified from previous audits that regularly contaminate recycling streams in regional areas (e.g. baling twine, irrigation pipe).
- Potential for a future container deposit scheme to be implemented in Victoria.

Table 12 overleaf provides the recommended audit categories for the audits, which are based on:

- Review of the auditing categories as identified in the SV Guidelines.
- Consideration for the materials categories in the AVRWMG's Guideline for Data Collection and Reporting Guideline for Waste Management Facilities in Victoria.
- Providing a better resolution of material types and contamination given the increased focus MRF performance and viability due to China National Sword policies.
- Simplifying the audit categories and process, so that the allocation of materials (e.g. as a contaminate or not) is done during analysis and not during the audit by the auditor, and is flexible depending on the different needs of councils, MRFs etc.
- Consideration for the specific needs of different MRF processes that allow recover of additional materials, regional councils, including items identified from previous audits that regularly contaminate recycling streams in regional areas (e.g. baling twine, irrigation pipe).
- Potential for a future container deposit scheme to be implemented in Victoria.

Table 12: Audit categories

Primary Classification Material Type	Secondary Classification Material Type	General Waste	Comingled Recycling	Recycling (Containers Only)	Organics Garden Only	FOGO
Paper	Plain and printing paper, newspaper	u	a	x	x	a
	Glossy paper, magazines, envelopes	u	a	x	x	x
	Cardboard (including corrugated and non-corrugated)	u	a	x	x	x
	Disposable cups (coffee, milkshake)	a	x	x	x	x
	LPB (milk and juice cartons)	u	a	x	x	x
	LPB (other)	u	a	x	x	a
	Soiled paper and cardboard (no tape or glue)	u	a	x	x	a
Organics	Food waste (loose)	u	x	x	x	a
	Food waste (in compostable starch bags)	u	x	x	x	a
	Food/drinks waste (in plastic bags or containers)	u	x	x	x	x
	Clean compostable wood (wooden disposable cutlery, small non-treated/painted wood pieces)	u	x	x	a	a
	Garden waste (lawn clippings, leaves, weeds, prunings)	u	x	x	a	a
	Other Putrescible (food waste in plastic bags or containers)	u	x	x	x	x
Aggregates, masonry and soils, other building wastes	Dust, dirt, ash, soil (swept into loose pile and weighed)	a	x	x	x	x
	Bricks, tiles, cement, rock, ceramics	u	x	x	x	x
	Plasterboard and plaster products	u	x	x	x	x
	Wood/timber (treated, painted, laminated and composite)	a	x	x	x	x
Textiles	Bagged textiles (clothing, rags or other textiles)	u	x	x	x	x
	Loose textiles (clothing, rags or other textiles)	u	x	x	x	x
Glass	Glass (acceptable broken glass >50mm)	u	a	a	x	x
	Glass beverage containers	u	a	a	x	x
	Glass packaging containers (jars etc.)	u	a	a	x	x
	Mixed glass/fines (<50mm) – Raked into pile and weighed	a	x	x	x	x
	Other glass (Pyrex, wine and drinking glasses, windscreen, spectacles)	a	x	x	x	x
Plastic	Code 1 PET (soft drink, smooth juice bottles)	u	a	a	x	x
	Code 2 HDPE (milk containers, juice cartons)	u	a	a	x	x
	Code 3 PVC (drink, spray bottles)	u	a	a	x	x
	Code 3 PVC (poly irrigation pipe)	u	x	x	x	x
	Code 4 LDPE (Soft plastic, plastic film, loose plastic bags etc.)	u	x	x	x	x
	Code 5 Polypropylene (baling twine)	a	x	x	x	x
	Code 5 Polypropylene (yogurt, deli, biscuit containers)	u	x	x	x	x
	Code 6 Expanded Polystyrene (Styrofoam boxes and packaging)	a	x	x	x	x
	Code 6 Polystyrene (plastic cutlery)	a	x	x	x	x
	Other rigid plastic (cups, buckets, toys, baskets, drums, composite, Tupperware containers)	a	x	x	x	x
Metal	Aluminium food container, foil or aerosol cans	u	a	a	x	x
	Aluminium beverage containers/cans	u	a	a	x	x
	Small domestic metal items (pots and pans etc.)	u	a	x	x	x
	Steel food containers or aerosol cans	u	a	a	x	x
Potentially hazardous	Paint tins with liquid paint	x	x	x	x	x
	Batteries (dry cell/alkaline)	a/u	x	x	x	x
	Batteries (lithium ion)	x/u	x	x	x	x
	Household chemicals (Detox Your Home)	x/u	x	x	x	x
	Light globes (fluorescent and other)	x/u	x	x	x	x
	Nappies/Hygiene products	a	x	x	x	x
	Pharmaceuticals	a				
	Other potentially hazardous items (please list)	x	x	x	x	x
Other *	Car batteries	x/u	x	x	x	x
	Large hard waste items	u	x	x	x	x
	Mixed recycling in bags	u	x	x	x	x
	Paint tins with dry paint	a	x	x	x	x
	Rubber	a	x	x	x	x
	Other (please list)	a	x	x	x	x

** Sorted into categories and weighed or separately reported depending on quantities.*
u = unrecovered resource, a = acceptable item/material, x = contaminant. please note that these may vary between councils, MRFs and processing facility requirements.

3. Kerbside Physical Audit Plan

3.1 Overview of the Kerbside Audit Plan

The Kerbside Audit Plan in the sections below has been developed based on the Kerbside Audit Guidelines proposed in Section 2 above. This considers the SV Guidelines, and what is considered practical, cost effective and efficient for the councils involved.

3.2 Proposed auditing frequency and minimum requirements

Table 13 below provides a summary of the proposed audit frequency, minimum number of localities, properties and bins per stream to audit per each council. Details on the supporting reasoning for each of the proposed minimum standards if provided in the Kerbside Audit Guidelines (Section 2 of this report).

Table 13: Proposed auditing frequency and minimum number of properties and streams/bins to be audited per each council

Council	Proposed frequency of audits	Min. no. localities to audit	Min. no. properties audited	General waste bins	Comingled recycling or recycling (containers only) bins	Organics recycling bins	Total bins	Tied paper bundles to audit (weighed only)
West Wimmera Shire Council	Every 4 Years	2	50	50	50		100	50
Hindmarsh Shire Council	Every 4 Years	2	50	50	50		100	50
Yarriambiack Shire Council	Every 4 Years	2	50	50	50		100	
Pyrenees Shire Council	Every 4 Years	2	50	50	50	50	150	
Northern Grampians Shire Council	Every 4 Years	2	75	75	75		150	
Ararat Rural City Council	Every 4 Years	2	75	75	75		150	
Central Goldfields Shire Council	Every 4 Years	2	75	75	75	75	225	
Hepburn Shire Council	Every 4 Years	2	75	75	75		150	
Horsham Rural City Council	Every 4 Years	2	75	75	75		150	
Golden Plains Shire Council	Every 2 Years	3	100	100	100		200	
Moorabool Shire Council	Every 2 Years	3	100	100	100	100	300	
Ballarat City Council*	Every 1 Years	5	125	125	125	125	375	
Total		**29**	**900**	**900**	**900**	**350**	**2,150**	**100**

3.2.1. Summary of when audits will occur

Table 14 below provides a summary of the proposed frequency of audits over a 10 year period. The audits are to take place approximately the same time each year during the months of September, October or November, avoiding (if possible) public holidays and school holidays and other significant events, as recommended in the SV Guidelines. These are mapped in Figure 1 for reference.

Please note that this outlines the recommended minimum frequency of audits and councils may consider undertaking audits more frequently for example:

- Ballarat may wish to consider undertaking 6 monthly audits if required to do so due to contract conditions.
- A council that is considering changing service (e.g. frequency of collection) may wish to do a before and after audit.

Auditing methodology of more audits undertaken outside of the Kerbside Audit Plan should be aligned as close to the audit methodology in the Kerbside Audit Guidelines (Section 2) as possible for consistency and comparison of the audits.

Table 14: Summary of when the proposed audits occur for each council for each year of the Kerbside Audit Plan

Council	Proposed frequency	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
		2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29
Ararat Rural City Council	Every 4 Years	Yes				Yes				Yes	
Ballarat City Council*	Every 1 Years	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Central Goldfields Shire Council	Every 4 Years	Yes				Yes				Yes	
Golden Plains Shire Council	Every 2 Years	Yes		Yes		Yes		Yes		Yes	
Hepburn Shire Council	Every 4 Years	Yes				Yes				Yes	
Hindmarsh Shire Council	Every 4 Years	Yes				Yes				Yes	
Horsham Rural City Council	Every 4 Years	Yes				Yes				Yes	
Moorabool Shire Council	Every 2 Years	Yes		Yes		Yes		Yes		Yes	
Northern Grampians Shire Council	Every 4 Years	Yes				Yes				Yes	
Pyrenees Shire Council	Every 4 Years	Yes				Yes				Yes	
West Wimmera Shire Council	Every 4 Years	Yes				Yes				Yes	
Yarriambiack Shire Council	Every 4 Years	Yes				Yes				Yes	

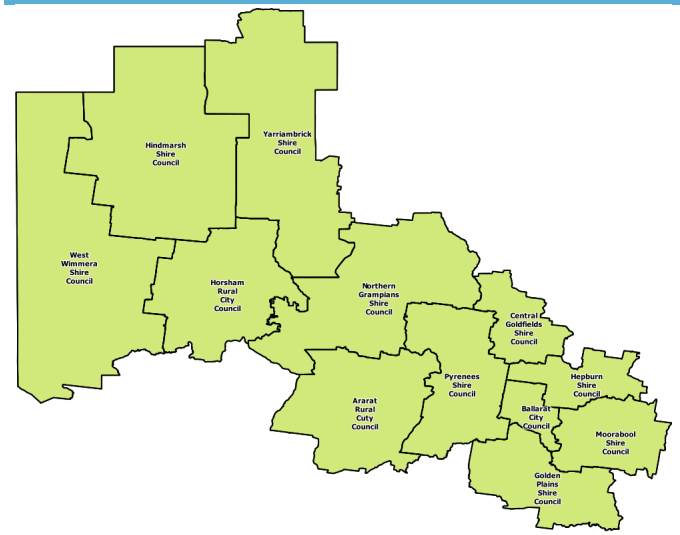
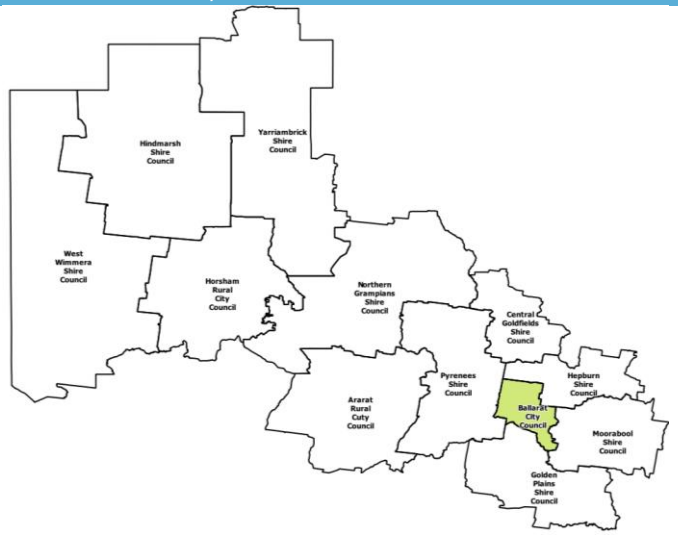
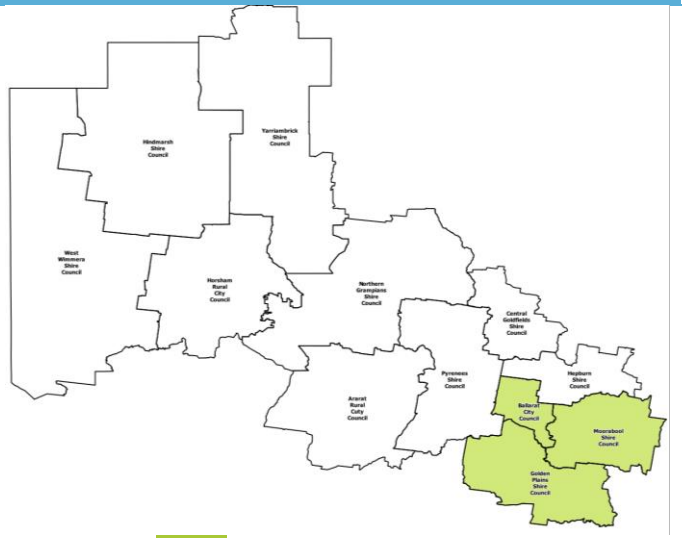
Map of councils audited in: • Year 1 2019/20 • Year 5 2023/24 • Year 9 2027/28	Map of councils audited in: • Year 2 2020/21 • Year 4 2022/23 • Year 6 2024/25 • Year 8 2026/27 • Year 10 2028/29	Map of councils audited in: • Year 3 2021/22 • Year 7 2025/26
		 *Green = Councils undertaking audit in FY*
Councils undertaking audits during years: • Ararat Rural City Council • Ballarat City Council • Central Goldfields Shire Council • Golden Plains Shire Council • Hepburn Shire Council • Hindmarsh Shire Council • Horsham Rural City Council • Moorabool Shire Council • Northern Grampians Shire Council • Pyrenees Shire Council • West Wimmera Shire Council • Yarriambiack Shire Council	Councils undertaking audits during years: • Ballarat City Council	Councils undertaking audits during years: • Ballarat City Council • Golden Plains Shire Council • Moorabool Shire Council

Figure 1: Map of councils audited in each year of the proposed Kerbside Audit Plan

3.2.2 Recommended locality sizes per council for auditing

Table 15 below details the recommended localities sizes for each council when undertaking audits during the Kerbside Audit Plan. Councils may wish to consider smaller satellite communities or rural settlements or collection areas with a population of less than 200 persons as sub-samples (as detailed in the section 2.3.7 in the Kerbside Audit Guidelines).

Table 15: Recommended locality sizes for auditing per each council

Councils undertaking audit during year	Min. no. localities to audit	Locality size 1	Locality size 2	Locality size 3	Locality size 4	Locality size 5
Ararat Rural City Council	2	6,000 - 20,000	200 - 2,000			
Ballarat City Council*	5	Suburb of Ballarat	Suburb of Ballarat	Suburb of Ballarat	Suburb of Ballarat	Suburb of Ballarat
Central Goldfields Shire Council	2	6,000 - 20,000	200 - 2,000	200 - 2,000		
Golden Plains Shire Council	3	2,000 - 6,000	200 - 2,000	200 - 2,000	200 - 2,000	
Hepburn Shire Council	2	2,000 - 6,000	2,000 - 6,000	200 - 2,000		
Hindmarsh Shire Council	2	200 - 2,000	200 - 2,000			
Horsham Rural City Council	2	6,000 - 20,000	200 - 2,000			
Moorabool Shire Council	3	6,000 - 20,000	2,000 - 6,000	200 - 2,000	200 - 2,000	
Northern Grampians Shire Council	2	2,000 - 6,000	2,000 - 6,000	200 - 2,000		
Pyrenees Shire Council	2	200 - 2,000	200 - 2,000			
West Wimmera Shire Council	2	200 - 2,000	200 - 2,000			
Yarriambiack Shire Council	2	2,000 - 6,000	200 - 2,000			

*Note: For Ballarat, localities refer to suburbs that represent appropriate representations of the demographics of the city.

3.2.3. Grouping of audits

Experience in undertaking audits has found that efficiencies and costs savings can be made by minimising the number of locations where physical audits take place. Once councils have determined which localities (and sub sample) they wish to audit, a planning exercise should be undertaken to determine the most suitable locations for centralising and undertaking the physical audits. This should be planned based on:

- Selection of suitable for central auditing facility/locations (e.g. shed space, amenities, utilities, access for truck to be able to drop off material,
- Consultation with facilities selected to determine their needs and capacities, including how long material can be audited for.
- Input from collection contractors where their depots are (to increase collection route efficiencies) and how they fare they are willing to travel with collection vehicles/material (generally one hour travel tends to be the maximum travel distance).

Figure 2 provides an example of how audits could be grouped to increase efficiencies to cost savings.

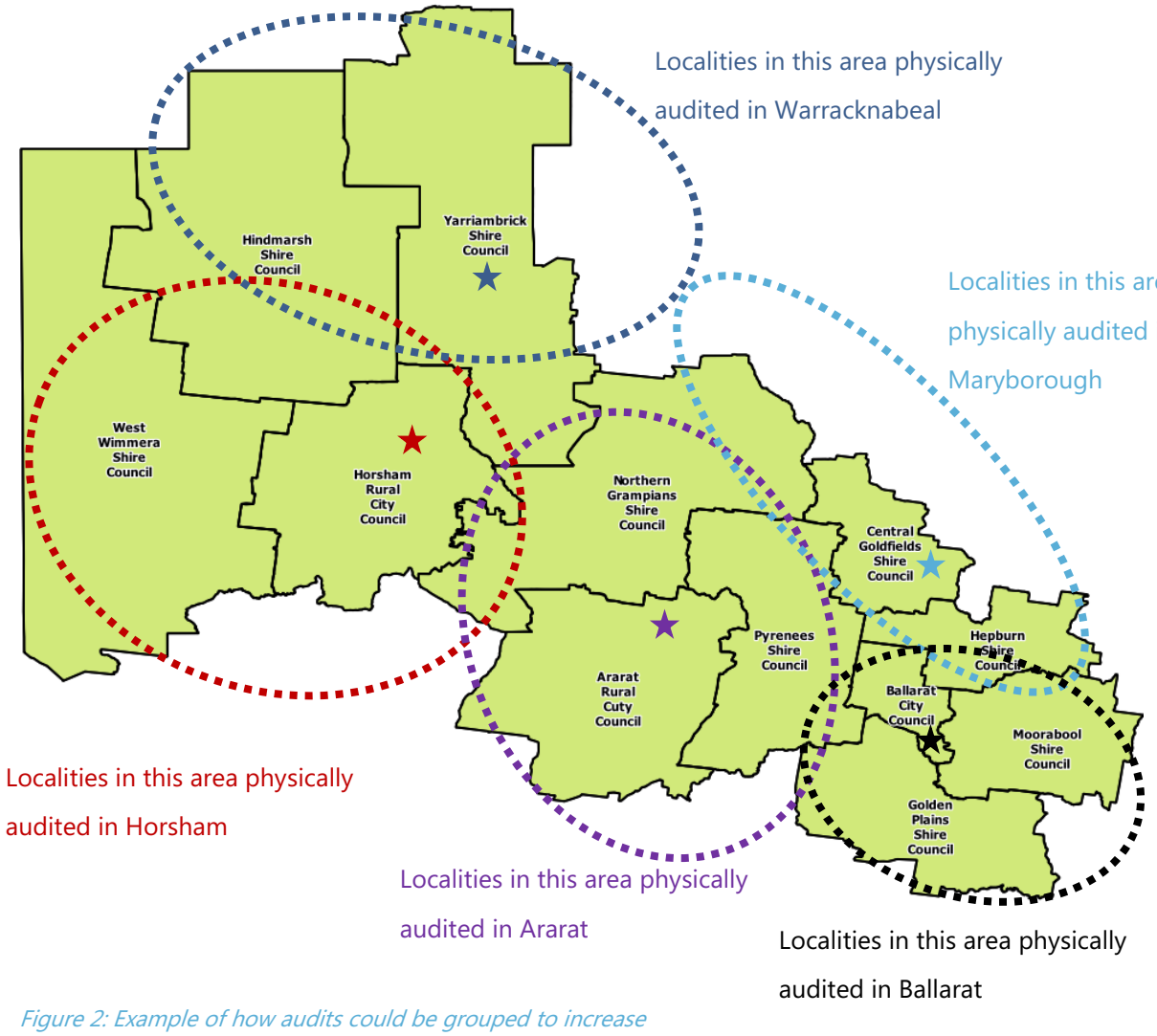


Figure 2: Example of how audits could be grouped to increase

3.2.4. High-level estimated cost and time required for undertaking the audits

A high-level cost estimate for the audits is provided below. This includes the physical audit, consultancy assistance and time estimates for undertaking physical audits for each of the three year scenarios in the Kerbside Audit Plan (as per the proposed grouping of audits in Figure 2 above).

The physical audit costs have been prepared by a professional auditor who regularly undertakes physical audits in metropolitan and regional areas. Consultancy costs associated with audit design/scheduling, analysis and report preparation are based on Rawtec experience. Please note that these estimated costs should be considered a +/- 20% budget estimate. A detailed breakdown of the costs for each year are provided in Table 16, Table 17 and Table 18 below.

Estimated costs and physical audit time required for each audit year:

- Year 1 (12 councils):
  - Estimated physical audit time required: 6 weeks
  - Estimated cost: $103,000 Excl. GST.
- Year 2 (3 councils):
  - Estimated physical audit time required: 2 weeks
  - Estimated cost: $41,500 Excl. GST.
- Year 3 (1 council):
  - Estimated physical audit time required: 2 weeks
  - Estimated cost: 21,500 Excl. GST.

Please note that these estimates do not include the estimated costs for bin collection supervision. The bin collection supervisor accompanies the collection vehicle and works with the driver to ensure the correct sample is collected (i.e. number of bins, the same houses). The supervisor can also walk alongside the collection vehicle to gather other data through visual inspections of each bin, including:

- bin presentation details (e.g. number of bins out per street per each stream).
- bin fullness
- any significant contamination
- number of visible compostable bags.

This additional data capture can increase the costs and it is recommended that these are undertaken by a local resource (e.g. council staff) to minimise costs and draw upon local knowledge.

Table 16: Year 1 estimated physical audit and consultancy costs

Year 1: Physical audit costs						
Proposed physical audit location	Council	General waste bins	Comingled recycling/ containers only bins	Organics recycling bins	Tied paper bundles (weighed only)	Est. costs +/- 20% (Excl. GST)
Horsham	West Wimmera Shire Council	50 bins	50 bins (containers only)	-	50 bundles	$4,000
	Horsham Rural City Council	75 bins	75 bins	-	-	$5,250
Warracknabeal	Hindmarsh Shire Council	50 bins	50 bins (containers only)	-	50 bundles	$4,000
	Yarriambiack Shire Council	50 bins	50 bins	-	-	$4,000
Ararat	Pyrenees Shire Council	50 bins	50 bins	50 bins	-	$5,250
	Northern Grampians Shire Council	75 bins	75 bins	-	-	$5,750
	Ararat Rural City Council	75 bins	75 bins	-	-	$5,750
Maryborough	Central Goldfields Shire Council	75 bins	75 bins	75 bins	-	$7,000
	Hepburn Shire Council	75 bins	75 bins	-	-	$5,500
Ballarat	Golden Plains Shire Council	100 bins	100 bins	-	-	$7,000
	Moorabool Shire Council	100 bins	100 bins	100 bins	-	$8,750
	Ballarat City Council	125 bins	125 bins	125 bins	-	$10,750
	Total	**900 bins**	**900 bins**	**350 bins**	**100 bundles**	**$73,000**

Consultancy assistance costs	
Audit planning, including meetings, workshopping audit requirements, scheduling	$15,000
Analysis and report development	$15,000
Estimated. consultancy costs ($ excl. GST)	**$30,000**

Total physical audit and consultancy assistance costs	
Total physical audit costs	$73,000
Total consultancy planning, analysis and report development costs	$30,000
Estimated total costs (excl. GST)	**$103,000**

Table 17: Year 2 estimated physical audit and consultancy costs

Year 2: Physical audit costs					
Proposed physical audit location	Council	General waste bins	Comingled recycling bins	Organics recycling bins	Est. costs +/- 20% $ Excl. GST
Ballarat	Golden Plains Shire Council	100 bins	100 bins	NA	$7,500
	Moorabool Shire Council	100 bins	100 bins	100 bins	$9,250
	Ballarat City Council	125 bins	125 bins	125 bins	$12,500
	Total	**325 bins**	**325 bins**	**225 bins**	**$29,000**
Consultancy assistance costs					
	Audit planning, including meetings, workshopping audit requirements, scheduling				$6,500
	Analysis and report development				$6,000
	Estimated consultancy costs ($ excl. GST)				**$12,500**
Total physical audit and consultancy costs					
	Physical audit				$29,000
	Consultancy planning, analysis and report development				$12,500
	Estimated total costs (excl. GST)				**$41,500**

Table 18: Year 3 estimated physical audit and consultancy costs

Year 3: Physical audit costs					
Proposed physical audit location	Council	General waste bins	Comingled recycling bins	Organics recycling bins	Est. costs +/- 20% $ Excl. GST
Ballarat	Ballarat City Council	125 bins	125 bins	125 bins	**$13,000**
Consultancy assistance costs					
	Audit planning, including meetings, workshopping audit requirements, scheduling				$4,700
	Analysis and report development				$3,200
	Estimated consultancy costs (excl. GST)				**$8,500**
Total physical audit and consultancy costs					
	Physical audit				$13,000
	Consultancy planning, analysis and report development				$8,500
	Estimated total costs (excl. GST)				**$21,500**

Section B: Transfer Station/Landfill Audit Guidelines and Audit Plan

4. Transfer Station/Landfill Audit Guidelines

4.1 Summary of the background investigation

In the development of the transfer station/landfill audit guidelines, background analysis and investigations were undertaken on:

- The types and sizes (tonnes per annum) for transfer stations/landfills in the region
- Recent transfer station/landfill audits have been undertaken in the region.
- Indicative budget ranges that might be available for audits.

Findings from this investigation were considered or referred to in the development the Transfer Station/Landfill Audit Guidelines.

4.2 Key findings from the background investigation

Table 19 below summaries transfer station/landfill facilities in the region based on estimates throughput.

Table 19: Count of transfer station based on tonnes per annum ranges for GCWWRRG transfer stations/landfills

Transfer station/landfill size (tonnes per annum)	Number in region
Less Than 100	39
200 - 500	8
500-1,000	4
1,000 – 5,000	7
5,000 – 10,000	1

4.3 Overview of proposed auditing methodology for transfer stations/landfills

Investigation into currently available published guidance on undertaking landfill/transfer station audits identified that the *Disposal-based Audit Commercial and Industrial Waste Stream in the Regulated Areas of New South Wales Overview report*, commissioned by the NSW EPA, contains the most recent and detailed methodology for undertaking the different audit types for these facilities. Based on a review of the data collected by each of the auditing methods in the NSW EPA Report and industry experience recognising the data needs in the region, the visual assessment of incoming loads auditing method is the most relevant and cost effective audit method for assessing the composition of incoming transfer station/landfill loads. However, we recommend that the categories for auditing the visual assessments into, should consistent with the *VicWaste Standardised Reporting Template* in the Association of Victorian Regional Waste Management Group's *Guideline for Data Collection and Reporting Guideline for Waste Management Facilities in Victoria.*

A summary of these have been provided in Section 4.3 below. A summary of the visual assessment auditing method can be found in the Section 4.5 below. Appendix 2 of this report provides an extract of Appendix 1 of the NSW EPA Report which provides the detailed methodology for undertaking visual assessments for councils and auditors, including a visual assessment data recording sheet for collecting audit data.

4.4 Proposed frequency for undertaking transfer station/landfill audits

The NSW EPA Report details that transfer station/landfill audits have been undertaken in NSW three times since this level of auditing began, with on average 5 years in between each audit. It is recommended for comparison to the previously facility audit results in the NSW EPA Report, the GCWWRRG undertakes audits on this same basis. However additional audits should be considered when:

- Planned infrastructure upgrades are being considered
- There has been a major change in waste recycling streams accepted
- It is a requirement as part of a plan, grant application or contract to undertake audits.

This recommendation is based on:

- What we anticipate is a reasonably frequency for undertaking audits for facilities that would benefit from regular auditing that would be cost effective and an also improvement on what has occurred in the past.
- Understanding of the high costs involved in undertaking transfer station/landfill audits.
- Consideration the frequency of similar audits in SA (approximately >10 years) and Vic (around every 8 years).

4.5 Summary of the visual assessment auditing method

This method involves assessors visually auditing targeted loads delivered during opening hours at the tipping point, within safe and practical limitations. The following information is recorded during these audits at the disposal location:

- Date and time of the vehicle arrival
- Registration number and vehicle type
- Vehicle/trailer volume and volume observed at discharge
- Degree of compaction (high/medium/low)
- Clumping of material (yes/no)
- Composition of the load

The NSW EPA Report recommended that visual audits occur over at least two full representative days in the same week from Monday to Friday addressing the number of loads allocated for auditing in each region. Therefore, we recommend that any transfer station/landfill audits undertaken by Councils in the GCWWRRG are consistent with this scheduling .

The NSW EPA Report provides guidance on the other aspects relevant to undertaking these audits, including training requirements, scheduling, OHS and analysis and reporting recommendations etc.).

4.6 Recommended loads to be assessed

It is recommended that assessment of loads should only be undertaken household drop off (car/trailer loads), commercial and industrial vehicles and construction and demolitions vehicles. Kerbside/MSW loads should be excluded from the assessment (apart from noting total kerbside tonnes) as the composition will be determined from the kerbside audits.

4.7 Visual assessment audit categories

Table 20 below provides the recommended material categories for when undertaking visual assessment audits. These are adapted from *VicWaste Standardised Reporting Template* from the Association of Victorian Regional Waste Management Group's *Guideline for Data Collection and Reporting Guideline for Waste Management Facilities in Victoria.*

Table 20: Recommended material categories for visual assessment audits

Material Type	Materials in Category
Aggregates	Aggregates, gravel, street sweeping, asphalt
Soils	Clean fill
Masonry	Concrete, plaster, rubble
Glass	Bottles and jars, laminated, sheet glass, recycled glass, other glass
Hazardous – Household chemicals	Detox your home
Hazardous - Paint	Paint
Hazardous - E-waste	Lights, mobile phones, computers, other household e-waste items
Hazardous – Cooking oils	Cooking oils
Hazardous – Motor oils	Motor oils, motor oil containers
Metals - Ferrous	Steel, steel cans, gas bottles
Metals - Non-ferrous	Aluminium, other
Organics – Garden	Garden waste, mulch
Organics – Timber (clean)	Non-treated or painted timber, sawdust
Organics – Timber (treated or painted)	Treated or painted timber, sawdust
Other – Mattresses	Mattresses
Recyclables – Hard waste	Hard waste, furniture
Recyclables	Comingled recyclables
Waste	Other mixed waste
Paper and cardboard	Cardboard, liquid paperboard, office paper mixed paper, newsprint/magazines, telephone books
Plastic – Hard	All hard plastics
Plastic - Soft	Soft plastics
Rubber – Tyres	Tyres
Rubber - Other	Other rubber
Textiles	Any textiles

4.8 Recommended facilities to be audited

Based on the analysis of transfer station/landfill size in Table 19 above, it is recommended that visually assessment auditing of targeted C&I loads should be undertaken on the below proposed frequencies:

- Facilities that have a throughput greater than 1,000 tonnes per annum be audited initially and regularly (every 5 years) or on an 'as needs' basis, for example when:
  - Planned infrastructure upgrades are being considered
  - There has been a major change in waste recycling streams accepted
  - It is a requirement as part of a plan, grant application or contract to undertake audits.
- Facilities with a throughput of between 500-1,000 tonnes per annum be included in any initial audits, and then on an 'as needs' basis (as per above).
- Smaller transfer stations/landfill should consider undertaking audits on an 'as needs' basis (as per above).

This recommendation assumes that:

- The tonnes received at the smaller transfer stations are bulk transported to the larger transfer stations or to the landfills.
- Sites that receive fewer than 500/1,000 tonnes per annum may only have a small number of residential/commercial customers per day, with most tonnes received from kerbside/MSW sources. This may mean that based on the recommended scheduling of audits over 2 days of one week (in the NSW EPA report), audits might only capture a handful of incoming loads, thereby not providing suitable representative sample of customers. This is compared to the two regional facilities audited in the NSW EPA Report that averaged around 40 visual assessments per day of auditing.

5. Transfer Station/Landfill Audit Plan

Based on the guidelines identified above, Table 21 below identifies the proposed frequency of auditing for transfer stations/landfills in the GCWWRRG region. Facilities that are not proposed to be regularly audited, should be done so on an as needs basis, usually when:

- Planned infrastructure upgrades are being considered.
- There has been a major change in waste recycling streams accepted.
- It is a requirement as part of a plan, grant application or contract to undertake audits.

It is recommended that the initial audits for facilities proposed to be regularly audited begin as soon as funding is available and allocated for undertaking the audits.

Table 21: Proposed audit frequency for transfer stations/landfills in the GCWWRRG

Council	Facility type	Tonnes managed annually	Audit frequency
Ararat Rural City Council	Ararat RRC	100 – 200 (indicated possibly greater)	Initially then on an as needs basis
	Lake Bolac RRC	<100 (indicated possibly greater)	Initially then on an as needs basis
Central Goldfields Shire Council	Carisbrook TS	1,000 - 5,000	Every 5 years
City of Ballarat	Ballarat TS	5,000 - 1,0000	Every 5 years
Hepburn Shire Council	Creswick TS and Resale	1,000 - 5,000	Every 5 years
	Daylesford TS and Resale	1,000 - 5,000	Every 5 years
	Trentham TS and Resale	500 - 1000	Initially then on an as needs basis
Hindmarsh Shire Council	Dimboola TS	500 - 1000	Initially then on an as needs basis
	Nhill TS	500 - 1000	Initially then on an as needs basis
Horsham Rural City Council	Horsham TS and RRC	1,000 - 5,000	Every 5 years
Moorabool Shire Council	Bacchus Marsh TS	1,000 - 5,000	Every 5 years
	Ballan TS	1,000 - 5,000	Every 5 years
Northern Grampians Shire Council	Stawell TS	500 - 1000	Initially then on an as needs basis
Pyrenees Shire Council	Beaufort TS	1,000 - 5,000	Every 5 years
Yarriambiack Shire Council	Warracknabeal LF and RRC	<100 (indicated possibly greater)	Initially then on an as needs basis
All others		Less than 500	As needs basis

Appendix 1: Background Analysis Tables

5.1 Summary localities per each council

Council	Name	Population	Population Bracket	Minimum Properties Audited	Minimum Streets Audited
Ararat Rural City Council	Willaura	263	200 - 2,000	50	4
	Ararat	6,924	6,000 - 50,000	100	2
Ballarat City Council	Learmonth	318	200 - 2,000	50	4
	Cardigan Village	567	200 - 2,000	50	4
	Ballarat	93,761	50,000 - 1,000,000	200	25
	Addington	-	Suburb of Ballarat	50	5
	Alfredton	-	Suburb of Ballarat	50	5
	Ascot	-	Suburb of Ballarat	50	5
	Bakery Hill	-	Suburb of Ballarat	50	5
	Bald Hills (part)	-	Suburb of Ballarat	50	5
	Ballarat Central	-	Suburb of Ballarat	50	5
	Ballarat East	-	Suburb of Ballarat	50	5
	Ballarat North	-	Suburb of Ballarat	50	5
	Black Hill	-	Suburb of Ballarat	50	5
	Blowhard	-	Suburb of Ballarat	50	5
	Bo Peep (part)	-	Suburb of Ballarat	50	5
	Bonshaw	-	Suburb of Ballarat	50	5
	Brown Hill	-	Suburb of Ballarat	50	5
	Buninyong (part)	-	Suburb of Ballarat	50	5
	Bunkers Hill	-	Suburb of Ballarat	50	5
	Burrumbeet (part)	-	Suburb of Ballarat	50	5
	Canadian	-	Suburb of Ballarat	50	5
	Cardigan	-	Suburb of Ballarat	50	5
	Cardigan Village	-	Suburb of Ballarat	50	5
	Chapel Flat	-	Suburb of Ballarat	50	5
	Coghills Creek	-	Suburb of Ballarat	50	5
	Creswick (part)	-	Suburb of Ballarat	50	5
	Delacombe	-	Suburb of Ballarat	50	5
	Durham Lead (part)	-	Suburb of Ballarat	50	5
	Ercildoune (part)	-	Suburb of Ballarat	50	5
	Eureka	-	Suburb of Ballarat	50	5
	Glen Park (part)	-	Suburb of Ballarat	50	5
	Glendaurel	-	Suburb of Ballarat	50	5
	Glendonald	-	Suburb of Ballarat	50	5
	Golden Point	-	Suburb of Ballarat	50	5
	Gong Gong	-	Suburb of Ballarat	50	5
	Invermay (part)	-	Suburb of Ballarat	50	5
	Invermay Park	-	Suburb of Ballarat	50	5
	Lake Gardens	-	Suburb of Ballarat	50	5
	Lake Wendouree	-	Suburb of Ballarat	50	5
	Learmonth	-	Suburb of Ballarat	50	5
	Lucas	-	Suburb of Ballarat	50	5
	Magpie	-	Suburb of Ballarat	50	5
	Miners Rest	-	Suburb of Ballarat	50	5
	Mitchell Park	-	Suburb of Ballarat	50	5
	Mount Bolton	-	Suburb of Ballarat	50	5
	Mount Clear	-	Suburb of Ballarat	50	5
	Mount Helen	-	Suburb of Ballarat	50	5
	Mount Pleasant	-	Suburb of Ballarat	50	5
	Mount Rowan	-	Suburb of Ballarat	50	5
	Nerrina	-	Suburb of Ballarat	50	5
	Newington	-	Suburb of Ballarat	50	5
	Redan	-	Suburb of Ballarat	50	5
	Scotchmans Lead	-	Suburb of Ballarat	50	5
	Scotsburn (part)	-	Suburb of Ballarat	50	5
	Sebastopol	-	Suburb of Ballarat	50	5

Council	Name	Population	Population Bracket	Minimum Properties Audited	Minimum Streets Audited
Ballarat City Council	Smythes Creek (part)	-	Suburb of Ballarat	50	5
	Soldiers Hill	-	Suburb of Ballarat	50	5
	Sulky (part)	-	Suburb of Ballarat	50	5
	Tourello	-	Suburb of Ballarat	50	5
	Warrenheip (part)	-	Suburb of Ballarat	50	5
	Wattle Flat (part)	-	Suburb of Ballarat	50	5
	Waubra (part)	-	Suburb of Ballarat	50	5
	Weatherboard	-	Suburb of Ballarat	50	5
	Wendouree	-	Suburb of Ballarat	50	5
	Windermere and Winter Valley.	-	Suburb of Ballarat	50	5
Central Goldfields Shire Council	Talbot	273	200 - 2,000	50	5
	Carisbrook	856	200 - 2,000	50	5
	Maryborough	7,495	6,000 - 50,000	100	5
Golden Plains Shire Council	Linton	390	200 - 2,000	50	5
	Meredith	394	200 - 2,000	50	5
	Enfield	445	200 - 2,000	50	5
	Smythesdale	568	200 - 2,000	50	5
	Lethbridge	585	200 - 2,000	50	5
	Inverleigh	721	200 - 2,000	50	5
	Teesdale	1,663	200 - 2,000	50	5
	Bannockburn	4,997	2,000 - 6,000	75	5
Hepburn Shire Council	Trentham	760	200 - 2,000	50	5
	Clunes	1,424	200 - 2,000	50	5
	Creswick	2,745	2,000 - 6,000	75	5
	Daylesford - Hepburn Springs	3,419	2,000 - 6,000	75	5
Hindmarsh Shire Council	Jeparit	347	200 - 2,000	50	5
	Rainbow	492	200 - 2,000	50	5
	Dimboola	1,426	200 - 2,000	50	5
	Nhill	1,755	200 - 2,000	50	5
Horsham Rural City Council	Natimuk	396	200 - 2,000	50	5
	Horsham	15,630	6,000 - 50,000	100	5
Moorabool Shire Council	Mount Egerton	215	200 - 2,000	50	5
	Myrniong	236	200 - 2,000	50	5
	Blackwood	293	200 - 2,000	50	5
	Dales Creek	396	200 - 2,000	50	5
	Gordon	457	200 - 2,000	50	5
	Greendale	600	200 - 2,000	50	5
	Ballan	2,293	2,000 - 6,000	75	5
	Bacchus Marsh	17,303	6,000 - 50,000	100	5
Northern Grampians Shire Council	Halls Gap	316	200 - 2,000	50	5
	St Arnaud	2,031	2,000 - 6,000	75	5
	Stawell	5,521	2,000 - 6,000	75	5
Pyrenees Shire Council	Snake Valley	306	200 - 2,000	50	5
	Avoca	976	200 - 2,000	50	5
	Beaufort	1,068	200 - 2,000	50	5
West Wimmera Shire Council	Goroke	218	200 - 2,000	50	5
	Kaniva	621	200 - 2,000	50	5
	Edenhope	687	200 - 2,000	50	5
Yarriambiack Shire Council	Rupanyup	359	200 - 2,000	50	5
	Minyip	391	200 - 2,000	50	5
	Hopetoun (Vic.)	539	200 - 2,000	50	5
	Murtoa	747	200 - 2,000	50	5
	Warracknabeal	2,314	2,000 - 6,000	75	5

5.2 Summary transfer stations/landfills per each council

Council	Facility type	Est tonnes currently managed (annually)
Ararat Rural City Council	Ararat RRC	100 - 200
	Elmhurst RRC	Less Than 100
	Lake Bolac RRC	Less Than 100
	Moyston RRC	Less Than 100
	Pomonal RRC	Less Than 100
	Streatham RRC	Less Than 100
	Tatyoon RRC	Less Than 100
	Willaura RRC	Less Than 100
Central Goldfields Shire Council	Bealiba TS	Less Than 100
	Carisbrook TS	1000 - 5000
	Dunolly TS	Less Than 100
	Talbot TS	Less Than 100
City of Ballarat	Ballarat TS	5000 - 10000
Golden Plains Shire Council	Rokewood TS	Less Than 100
Hepburn Shire Council	Creswick TS and Resale	1000 - 5000
	Daylesford TS and Resale	1000 - 5000
	Trentham TS and Resale	500 - 1000
Hindmarsh Shire Council	Dimboola TS	500 - 1000
	Jeparit TS	100 - 200
	Kiata Depot DO	Less Than 100
	Netherby Depot DO	Less Than 100
	Nhill TS	500 - 1000
	Rainbow TS	100 - 200
	Yanac Depot DO	Less Than 100
Horsham Rural City Council	Horsham TS and RRC	1000 - 5000
	Jung TS and RRC	Less Than 100
	Mt Zero (Laharum) TS and	Less Than 100
	Pimpinio TS and RRC	Less Than 100
	Quantong TS and RRC	Less Than 100
	Toolondo TS and RRC	Less Than 100
Moorabool Shire Council	Bacchus Marsh TS	1000 - 5000
	Ballan TS	1000 - 5000
	Mt Egerton TS	200 - 300
Northern Grampians Shire Council	Halls Gap TS	Less Than 100
	St Arnaud TS and LF	300 - 400
	Stawell TS	500 - 1000
Pyrenees Shire Council	Avoca TS	200 - 300
	Beaufort TS	1000 - 5000
	Carranballac DO	Less Than 100
	Crowlands DO	Less Than 100
	Landsborough TS	Less Than 100
	Snake Valley TS	300 - 400
West Wimmera Shire Council	Apsley TS	Less Than 100
	Chetwynd TS	Less Than 100
	Dergholm TS	Less Than 100
	Edenhope TS	100 - 200
	Goroke TS	Less Than 100
	Harrow TS	Less Than 100
	Kaniva TS	Less Than 100
Yarriambiack Shire Council	Beulah TS and RRC	Less Than 100
	Hopetoun TS and RRC	Less Than 100
	Minyip TS and RRC	Less Than 100
	Murtoa TS and RRC	Less Than 100
	Patchewollock LF and RRC	Less Than 100
	Rupanyup TS and RRC	Less Than 100
	Speed/Tempy LF and RRC	Less Than 100
	Warracknabeal LF and RRC	Less Than 100
	Woomelang TS and RRC	Less Than 100
	Yaapeet LF and RRC	Less Than 100

Appendix 2: Transfer Station/Landfill Visual Assessment Auditing Methodology

The sections below provide an extract of Appendix 1 of the NSW EPA's, *Disposal-based Audit Commercial and Industrial Waste Stream in the Regulated Areas of New South Wales Overview*, which provides the detailed methodology for undertaking visual assessments for councils and auditors, including a visual assessment data recording sheet for collecting audit data. Please refer to the NSW EPA report for further guidance on this methodology.

5.3 Audit scheduling

It is anticipated the Disposal Based Auditing (DBA) audits, undertaken, will typically occur over at least two full representative days in the same week from Monday to Friday addressing the number of loads allocated for auditing in each region. The DBA (vehicles) audit programs must be undertaken concurrently with the bags being retrieved from loads that were visually assessed.

5.4 Pre-audit site visits and site specific documentation

Waste audit contractors must arrange a minimum of one pre-audit inspection of each selected landfill and transfer station to:

- ensure its suitability for inclusion in the audit program
- identify audit locations taking safety, weather sensitivity and amenity into consideration
- agree upon any access restrictions or WHS issues which may impact upon the audit.

The waste audit contractor must provide each site operator with drafts of the following site documentation for discussion and finalisation:

- site work procedure
- WHS plan (including a risk assessment)
- site and safety induction procedure and checklist.

All waste audit team members will be required to undergo site and safety induction for every site at which they undertake auditing activities.

5.5 Survey on vehicle arrival

All loads of C&I waste must be recorded at the gatehouse and/or disposal point with loads from non-C&I sources disregarded. The information in the Table below should be recorded by the waste audit contractor at the gatehouse and the waste auditor at the appropriate drop-off area notified of the vehicle carrying mixed C&I loads for visual assessment.

The following data will need to be recorded on vehicle arrival:

Vehicle arrival data	Collected by site Operator	Collected by waste audit contractor
Vehicle registration number	✓	✓
Date	✓	✓
Time of entry	✓	✓
Vehicle company	✓	✓
Waste material type by Section 88 classification (see Section 4.7 of this report)	✓	✓
Net weight of waste (tonnes)	✓	✓
Waste stream (C&I, C&D, municipal, transfer station, private)	✓	✓
Vehicle type (bulk bin, front lift, rear lift, side lift, skips, trucks & trailers, utilities & small trailers, on-site packers, cars, other)		✓
Estimate of the vehicle volume (m^3)		✓
Type of business where the waste was generated by C&I waste ANZSIC industry division/subdivision source where possible, otherwise: Mixed SMEs; Office waste; or Shopping centre waste. If the load relates to more than one source type, then the percentage of waste related to each must be		✓
Geographical source location by council area		✓
Disposal point (tipping face location if the site has multiple tipping faces – to alert the visual auditors, push pit, or recycling bin)		✓
Whether it is a single material load (with category)		✓

The waste audit contractor must negotiate the location at which the information is collected with each site operator. Participating site operators have previously indicated a preference for collecting some of the required information at the disposal point / tip face or pit rather than at the gatehouse. Mixed loads of C&I waste are to be identified at the gate house for visual auditing. Single material loads and loads from transfer stations are not required to be visually audited, however the details as outlined above must be recorded. The site operator data is to be requested and obtained by the waste audit contractor. The waste audit contractor will negotiate with participating facilities for the provision of this data during audit preparations. This data is to be reconciled by the waste audit contractor against the auditor recorded data.

5.6 Visual vehicle audit method

A visual assessment of the composition must be conducted on each mixed C&I load being discharged at the tip face if at landfill, or the push pit if at transfer station. Visual observations are to be recorded on approved data-recording sheets.

For these loads the following data, in addition to that collected at the vehicle entry, should be recorded by one auditor at the drop-off area:

- Date and time
- Vehicle registration number
- Disposal point
- Observed volume (m^3).
- Degree of compaction (low/medium/high)
- Degree of mixing (i.e. is there clumping of material in the load?)
- Material composition
- Loads where greater than 90 per cent of the load is a single material – these are classified as 'single material loads.
- Load with clumps of potentially recoverable materials (rather than being distributed throughout the load).

If time permits, visual assessment of mixed loads should be refined by making a second assessment when the loads is well spread, or some material removed for recycling.

A general assessment on the materials removed for recycling should be made based on the effectiveness of recovery on site and disposal volumes of material types further refined using a site specific per cent rate of recovery.

The draft data recording sheets will be prepared by the waste audit contractor for review. Approved data sheets will be pre-numbered to ensure all recording sheets are accounted for after the audit. Waste audit contractors are not to copy the sheets. Each auditor using any pre-numbered sheet will need to enter their name at the top of the sheet and initial a chain of custody at the bottom of the sheet.

The material categories on the data record sheet should be used for recording composition. A section on the sheet for recording other categories, such as specific items present in large quantities or items made from unknown/composite materials should be provided. However, use of these categories should be reserved for special cases and not used as a matter of course.

Compositions are recorded as either a volume percentage or per cubic metre of the total load, whichever the auditor's judge will provide the more accurate estimate. Minute or minor quantities of material categories should be recorded as <1 per cent. While usually a practical auditing reality, whenever possible auditors should avoid rounding to the nearest five per cent or 10 per cent, as this produces data artefacts during the statistical analysis.

Other information of interest to be incorporated into the visual assessment includes identifying loads where greater than 90 per cent of the load is a single material and/or where the load includes clumps of potentially recoverable materials rather than materials being distributed throughout the load. The reporting required will include a discussion of these aspects.

All completed hardcopy visual audit recording sheets are to be kept in a central location at the audit site.

Conversion of volume data to weight data must be undertaken using the agreed density factors provided. The estimated weight (based on the converted volumetric data) and the actual load weight must be compared. The estimated weight of each material type component should be scaled so that the aggregate equals the known measured weight of waste in each vehicle.

5.7 Auditor training

Close observations of site operations and liaison with site management will need to be undertaken prior to the commencement of the DBA (vehicles) to:

- refine the visual assessment techniques and WHS provisions (if required)
- train auditors to ensure they have the necessary skills and experience to under visual audits in a busy and hazardous environment
- ensure consistent application of the audit method across all sites.

It is important to ensure all audit staff have the required experience (ideally three to five years) in undertaking visual audits and working in a busy, hazardous environment. Auditor training should be undertaken at a site that has relatively safe operating conditions and should target the completion of approximately 50 trial visual audits of mixed C&I loads collectively by all field staff.

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