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Zero Waste SA

Waste Biomass Opportunities Map for the South East (SA)

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- IMPORTANT NOTES-

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Executive Summary

E.1 Context and Purpose (of Study)

This study was commissioned by Zero Waste SA and the South East (SE) Biomass Group. Its aim is to identify the locations and aggregate amounts of waste biomass occurring in the SE region of South Australia (SA) from four key source categories: (1) crop residues, (2) manufacturing and processing residues, (3) animal wastes and (4) residential and commercial organic waste (including sewage waste). This information will help to identify potential commercial opportunities for improved utilisation of such materials, in particular for energy production, i.e. Waste-to-Energy (WtE).

This report presents the estimated quantities and regional distribution (by local government area) of waste biomass identified for these source categories within the SE region. These estimated quantities include the:

- **'Total Waste Biomass' –** generated by these sources; and
- **'Accessible Waste Biomass'** – that part of the Total Waste Biomass deemed practically available for resource recovery purposes (as collection of some waste biomass components is not considered practical or feasible, e.g. crop roots, field animal waste, etc.).

Some of this Accessible Waste Biomass in the SE region is presently committed to waste management practices involving a level of resource recovery and/or disposal to other uses. Where possible, the current end use or disposal practice of this material has been identified. This material could be available for alternative and more valuable end uses.

This report also provides high-level overviews of energy and water infrastructure present in the SE region, which could be important to siting any potential waste biomass resource recovery facility.

E.2 Overview of Waste Biomass in SE Region

It is estimated that there is around 27 million tonnes per annum (t/p.a.) of Total Waste Biomass generated across the SE region.

Up to 5.5 million t/p.a. (around 21% of Total Waste Biomass) is considered Accessible Waste Biomass. Figure 1 below presents a high-level overview of these Accessible Waste Biomass quantities by source category and Council region. *{Cont. overleaf}*

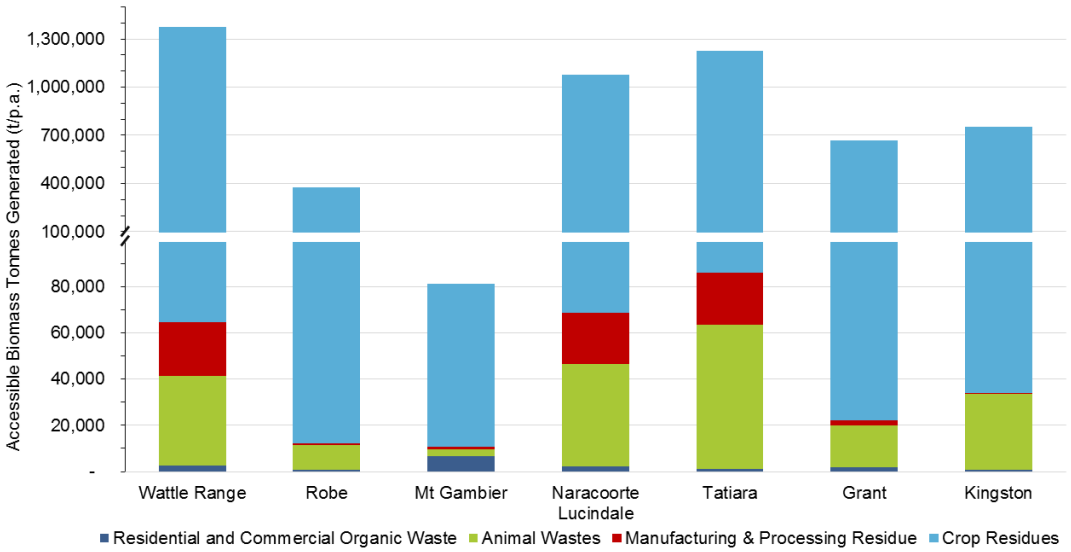

Figure 1: Estimated Accessible Waste Biomass by source and region in SE by source category and Council region

Approximately 5.2 million t/p.a. or 95% of the estimated Accessible Waste Biomass is associated with crop residues. The rest of this material was identified as animal wastes (around 209,000 t/p.a.), manufacturing and processing wastes (estimated 72,000 t/p.a.) and residential and commercial organic waste (around 17,000 t/p.a.).

Up to 3 million t/p.a. of this Accessible Waste Biomass (50-55%) was estimated as currently being committed to waste management practices involving some resource recovery/disposal to other uses. The primary end use for much of this resource recovered/disposed material appears to be compost products or direct land application for agricultural purposes. Opportunity may exist for higher value adding or energy production from this material.

Figure 2 below maps identified point sources[1] generating this Accessible Waste Biomass. This map suggests that most identified point sources are near townships or localised in areas where industry activity (e.g. grape wine and wine production, fishing, meat production, etc.) is taking place. Maps separately showing the location of these identified point sources for each source category are included in this report. Additional information about these identified point sources can be obtained by contacting Zero Waste SA.

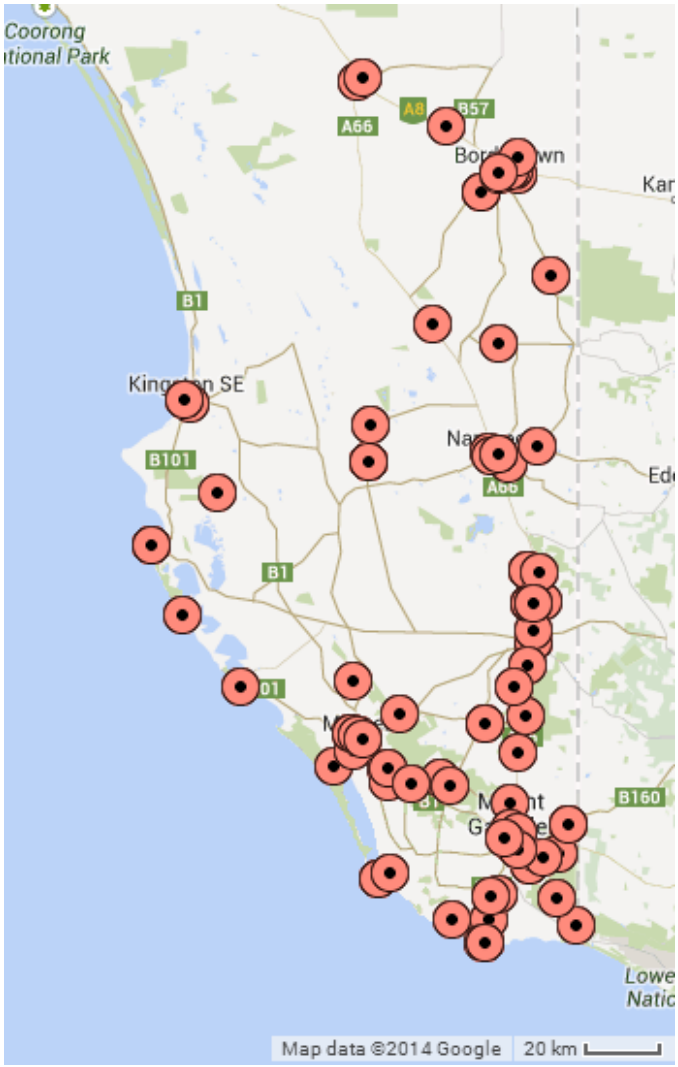

Figure 2: Map of identified point source map of biomass generation within the SE region of SA

[1] An 'identified point source' was defined as a site generating waste biomass that was also required to be licensed by the South Australian Environment Protection Authority (EPA).

E.3 Waste Biomass Profile by Source Category

E.3.1 Crop Residues

Of the estimated 11 million t/p.a. of Total Waste Biomass generated from crop residues in the SE region of SA, up to 5.2 million t/p.a. were considered Accessible Waste Biomass. Figure 3 below provides an overview of Accessible Waste Biomass identified for crop residues in the SE region by crop type and region. The largest source (around 67%) of Accessible Waste Biomass from crop residues appears to be broad acre cereal crops at up to 3.5 million t/p.a. Non-cereal broad acre crops produced the next greatest quantity, estimated at around 910,000 t/p.a. Fruit and nut farmers also appear to contribute up to 460,000 t/p.a.

Accessible Waste Biomass produced from crop residues were generally from diffuse sources within the SE region. It is estimated that up to half of this Accessible Waste Biomass from crop residues might presently be committed to waste management practices involving some resource recovery and/or disposal to other uses.

End uses may include by-products (e.g. straw production, compost), on-farm animal grazing and/or in-situ soil conditioning (i.e. protecting top-soil, nutrient recovery, and carbon retention). There may be opportunity, nonetheless, to value add to this material. Where resource recovery and/or disposal to other uses does not occur, this material would generally be left where it was generated (e.g. in the field). In these situations, methods may exist that could allow this material to be collected or aggregated for resource recovery.

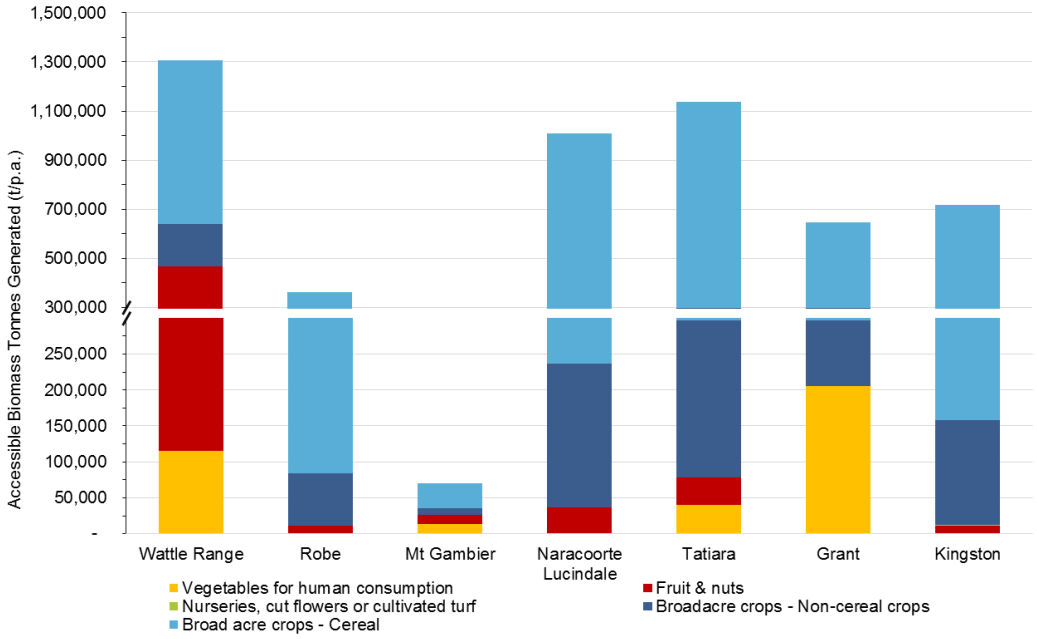

Figure 3: Accessible Waste Biomass crop residue tonnes generated by crop type and Council region

E.3.2 Manufacturing and Processing Residues

Total Waste Biomass generated by manufacturing and processing residues is estimated at 72,000 t/p.a. Figure 4 below summarises the Accessible Waste estimated for manufacturing and processing residue sources in the SE region by industry type and region. Wine production, abattoirs and/or meat rendering, and other food production industries appear to generate most (up to 72% or 52,000 t/p.a.) of this material. It was determined that 30 identified point sources were responsible for the majority (around 85-90%) of this Accessible Waste Biomass. These identified point sources were generally

located in zones associated with a particular industry (e.g. wine industry in Wattle Range; milling and seed processing in Tatiara; and abattoirs/meat rendering in the Naracoorte Lucindale).

Nearly all of this material (95-100%) is believed to be subject to some form of waste management practice involving resource recovery and/or disposal to other uses (e.g. wine marc and lees were being composted; meat processing residue was rendered; etc.). Opportunities may be available to use this material for higher-value end uses or energy production.

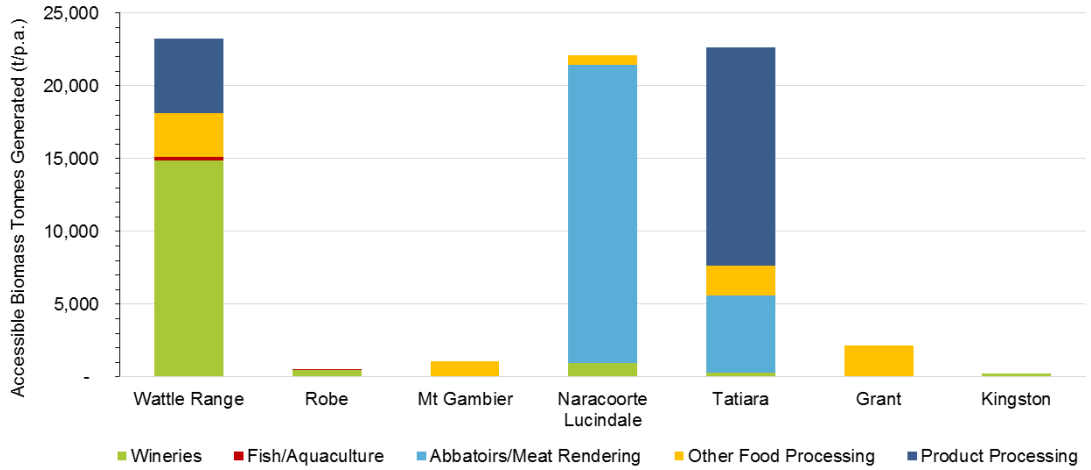

Figure 4: Accessible Waste Biomass from manufacturing and processing residue by industry type and Council region

E.3.3 Animal Wastes

There are potentially large quantities of waste biomass generated from this source category – around 15.5 million t/p.a. of Total Waste Biomass was estimated. Much of this waste biomass is associated with non-intensive farming (i.e. field animals), which generates material in a manner that was not considered practically accessible or resource recoverable.

Up to 209,000 t/p.a. (1% of Total Waste Biomass) was considered Accessible Waste Biomass. Figure 5 overleaf shows how this Accessible Waste Biomass may occur according to type of animal and by region. Cow stockyards, feedlots, dairy cow milking sheds, piggeries, and chicken farms appear to produce most (around 90%) of this Accessible Waste Biomass. The majority (95-100 %) of the animal wastes Accessible Waste Biomass presently appears to be committed to waste management practices involving some resource recovery/disposal to other uses (e.g. composting, direct land application). Value could be added to these biomass waste streams for use by other resource recovery streams such as WtE.

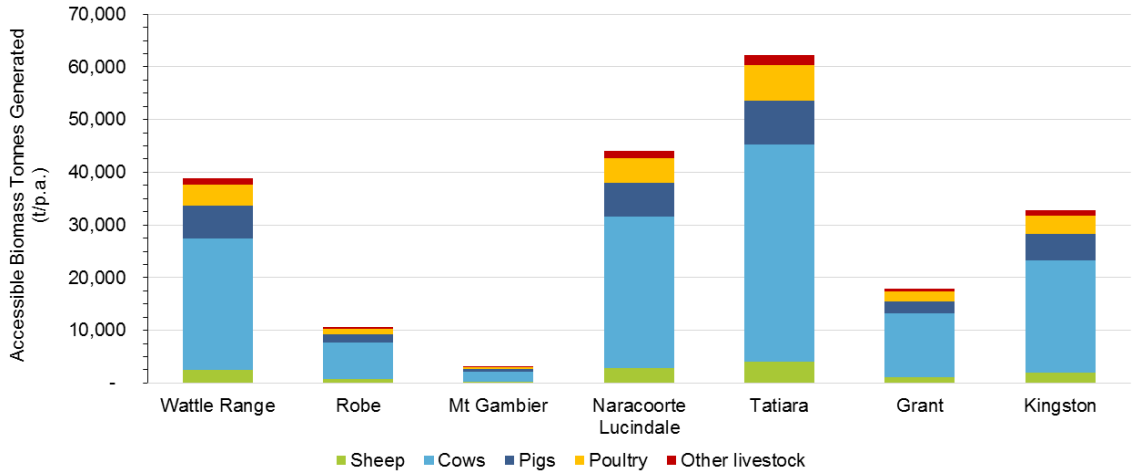

Figure 5: Accessible Waste Biomass animal wastes tonnes generated by Council region and animal type

E.3.4 Residential and Commercial Organic Waste

The estimated Total Waste Biomass generated by residential and commercial organic waste was 20,900 t/p.a. Of this, up to 16,900 t/p.a. is considered Accessible Waste Biomass. Figure 6 below summarises the estimated Accessible Waste Biomass in this source category.

The largest quantity (around 11,000 t/p/a.) was associated with collection of household and commercial waste by Councils, followed by up to 3,100 t/p.a. collected by commercial and industrial waste companies (from sources other than those identified in source categories mentioned above).

Where separate collection services for green or food organics are being provided in the SE region, these materials are generally resource recovered through composting. There could be significant organic material (50-60%) left in residual waste disposed of to landfills, which could be diverted to resource recovery.

Biosolids from municipal and commercial wastewater treatment systems could generate up to another 1,600 t/p.a. of Accessible Waste Biomass in this source category, and grease trap waste could produce up to an additional 1,200 t/p.a. Most (95-100%) of this material is presently committed to waste management practices involving some resource recovery/disposal to other uses, principally by direct land application for agricultural purposes, but also composting. This waste biomass material could also be utilised for higher value purposes.

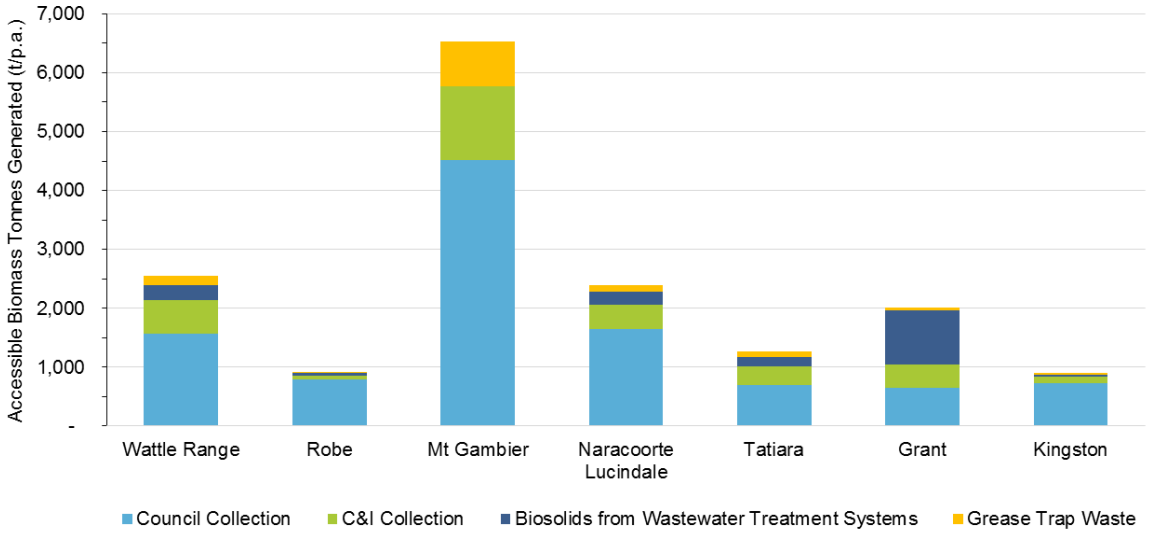

Figure 6: Accessible Waste Biomass residential and commercial organic waste tonnes generated by Council region and type

E.4 Energy & Water Infrastructure

E4.1 Energy

The SE region of SA provides a vitally important corridor for SA's energy infrastructure, connecting the National electricity and gas markets through the SEA Gas Pipeline and the Heywood Electricity Interconnector. The region will soon benefit from a recently approved upgrade to the Heywood Electricity Interconnector that includes upgrades to assets in both SA and Victoria. This will include a reconfiguration of some of the SE region's 132 kV transmission network. At the distribution level, recent restructuring of the local economy has seen reductions in demand for gas and electricity - releasing capacity for future energy projects. The region is also home to significant electricity generation assets in the SE region, including renewable energy from wind, biomass (from forestry residue) and photovoltaic. This report includes additional high-level information around this energy infrastructure in the SE region. The type, location and capacity of this infrastructure should be

considered when assessing potential biomass waste projects, particularly where WtE might be proposed.

E.4.2 Water & Wastewater Infrastructure

Key sources of water supply for the SE region are: River Murray water via the Tailem Bend to Keith pipeline and local groundwater resources. Although the region is considered relatively water secure with reliable rainfall there may be location-based constraints around the capacity, quality, and access to these sources. This should be taken into account when planning or siting waste biomass resource recovery infrastructure.

Wastewater infrastructure in the SE region mainly involves systems providing municipal or residential wastewater (including sewage) collection, treatment and disposal. SA Water operates wastewater treatment schemes at Finger Point (near Port McDonnell), Naracoorte and Millicent. Other community-based wastewater management schemes are operated by Councils across the region. Outside of Mount Gambier and other major townships, most households would operate their own waste control system – which would either be a septic tank or aerobic wastewater treatment plant. All of these systems generate waste biosolids, which were estimated and included in the Residential and Commercial source category waste biomass profile presented above (see Section E.3.4).

In addition, a range of commercial and industrial activities operate grease traps, trade waste pre-treatment systems and/or their own wastewater treatment and disposal systems. The estimated biosolids generated by these sources have also been included in the residential and commercial organic waste source category waste biomass profile above.

E.5 Key Outcome

This study has found that up to 5.5 million t/p.a. of the Total Waste Biomass generated within the SE region of SA could be available as Accessible Waste Biomass.

This suggests new economic development opportunities may exist for the SE region to take advantage of waste biomass from previously untapped sources or by adding value to waste biomass obtained from existing resource recovery/disposal activities.

Interested parties seeking additional information about the data in this report and/or looking for potential partners to help identify and assess potential opportunities, should contact Zero Waste SA.

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1. Introduction

1.1 Background

The South East (SE) region of South Australia (SA) is a major regional population centre of 64,000 people (Australian Bureau of Statistics, 2014a) and covers approximately 21,000 square kilometres (South East Local Government Association, 2011). Economic activity in the region comprises about 4% of the State's total Gross Domestic Product (GDP) (South Australian Centre for Economic Studies, 2012). This activity includes one of the largest areas of managed forests in the Southern Hemisphere (forestry waste is excluded from this report) and a diverse range of primary production and secondary processing activities, principally involving milk production, grape growing and winemaking, vegetables, meat production and aquaculture.

As a consequence, the SE region potentially produces substantial quantities of waste biomass, much of which may remain as an untapped or under-utilised resource. Waste biomass could therefore offer new economic development opportunities for local businesses and communities. Conversion of waste biomass to energy (WtE) has been identified of particular interest as it has scope to contribute to renewable energy production for SA.

Zero Waste SA (ZWSA) has a key objective to promote sustainable waste management practices. These practices aim to avoid, reuse and recycle waste and therefore divert waste from landfill according to the Waste Management Hierarchy (see Figure 1-1 below). ZWSA along with the SE Biomass Group, which is comprised of industry stakeholders and government agencies in the SE region, are seeking to identify and analyse opportunities which promote a more localised, circular economy by further utilisation of waste biomass within the SE region.

The principal goal of this study was therefore to identify the potential locations and quantities of waste biomass generated in the SE region, to provide information for this purpose. This information would allow Zero Waste SA and SE Biomass Group to inform, attract and /or partner with interested parties and/or investors in undertaking additional research and assessment of potential waste biomass resource recovery opportunities for the region.

The study was undertaken by Rawtec. Expert knowledge was also provided by Scholefield Robinson Horticultural Services (SRHS) and St Kitts Associates to towards assessment of the SE region's agricultural activities and energy infrastructure.

Figure 1-1: Waste Management Hierarchy (Zero Waste SA, 2014)

1.2 Objectives & Outcomes

The objectives of the study were:

1. To identify and provide insights into possible waste biomass 'opportunity zones' or sites in the SE; and
2. To provide feedstock and infrastructure background information useful for possible investors in biomass waste technologies.

The desired outcomes from this study were:

- To promote the SE's reputation as a zero waste, clean, premium and sustainable production region;
- To help build regional awareness, and acceptance of, waste biomass utilisation technologies; and
- To promote regional training and employment opportunity associated with skills and expertise in waste biomass energy (and/or product) development in order to enhance economic development and strengthen the SE regional community.

1.3 Waste Biomass Sources (Scope)

The scope of this study was focussed on the following solid waste biomass sources in the SE region:

- Crop residues;
- Manufacturing and processing residues;
- Animal wastes; and
- Residential (MSW) and commercial organic (C&I) waste (including urban wood waste) (residential and commercial organic waste).

1.4 Waste Biomass Definition

For the purpose of the study, the following working definition of waste biomass was applied:

- Waste biomass constitutes a solid or semi-solid organic waste residue by-product, which was left or disposed of as a waste by its generator (e.g. left on ground after harvesting, landfill disposal, sent for composting, etc.) and was not intended as a product that was on-sold to a customer for consumption/use.

{Cont. overleaf}

1.5 Outline of Report

The structure of this report is set out in the table below. This waste biomass profile developed for the SE region is presented in Part A of this report. Part B provides an overview of major energy and water infrastructure in the region. The key findings are summarised in the 'Conclusion' section.

Section	Brief Description
2. Study Approach	Provides an overview to the approach taken to this study, including key project steps and consultations with ZWSA and SE Biomass Group.
Part A – Waste Biomass in the South East	
3. Methodology	Sets out more details around the methodology used for primary data collection and analysis of this data to develop the waste biomass profile for the SE region.
4. Biomass Map for SE	Presents the results of the SE region waste biomass profile as follows.
4.1 Interpretation of Biomass Data	*Defines the terms used to describe different forms of biomass referred to in the report.*
4.2 Summary	*Summarises Total Waste Biomass and Accessible Waste Biomass generated by biomass type and region.*
4.3 Crop Residues	*Provides detailed overview of crop residues' waste biomass including overall tonnes, location, existing resource recovery and/or disposal practices, and accessible tonnes.*
4.4 Manufacturing and Processing Residues	*Detailed overview of the same for waste biomass from manufacturing and processing residues.*
4.5 Animal Wastes	*Detailed overview of the same for waste biomass from animal waste.*
4.6 Residential and Commercial Organic Waste	*Detailed overview of the same for waste biomass from residential and commercial organic waste streams.*
Part B – Energy & Water Infrastructure	
5. Energy	Presents information on major energy and natural gas supply infrastructure, including existing or anticipated zones of high energy demand.
6. Water & Sewage	Information on major water supply and wastewater infrastructure.
Conclusion	
7. Key Findings	Delivers an overview of the key findings achieved from Parts A and B above.

2 Study Approach

The approach taken to this study is outlined at high level below.

1. **Project Inception Meeting** – A meeting was held with ZWSA to confirm the scope and methodology for the study.
2. **Consultation Meeting with SE Biomass Group** – An initial meeting and workshop was held with the SE Biomass Group in Mount Gambier to review the study methodology and engage their local knowledge and assistance in identifying potential waste biomass sources.
3. **Primary Data Collection & Collation** – Data was collected for the SE region:
    - For each of the waste biomass sources, the estimated quantities, locations and current resource recovery and/or disposal method(s) of waste biomass;
    - Energy supply infrastructure and demand zones; and
    - Major water and supply sewage treatment infrastructure.

    Section 3 of this report provides more detail around the approach to data collection and collation of waste biomass data performed for this study.
4. **Data Review, Validation & Analysis** – Data was analysed to provide a profile of waste biomass generated by these source across the SE region, including geographical distribution by local government area and identification of point sources.
5. **Draft Report** – A draft report was prepared and provided to ZWSA and the SE Biomass Group for review and feedback.
6. **Present Key Findings and Review Report** – A presentation was also provided to ZWSA and the SE Biomass Group in Mount Gambier on the study findings
7. **Finalise and Submit Report** – Based on feedback and comments received, the report was finalised.

PART A – Biomass in the South East

3 Methodology

This section provides an overview of the methodology taken to collecting and analysing waste biomass data for study, which was developed in conjunction with the SE Biomass Group.

3.1 South East Region & Geographical Zones

The SE region was defined to include the following local government areas (Councils). Figure 3-1 overleaf illustrates the locality and relevant size of these Council areas within this SE region. These areas were also used to define geographical units for mapping of waste biomass data.

Table 3-1: Local government areas in SE region, including population and major townships in each area (Australian Bureau of Statistics, 2014a)

Local Government area	Approx. population (persons)	Major Townships/population centres
City of Mount Gambier (Mt Gambier)	26,000	Mt Gambier
Wattle Range Council (Wattle Range)	12,000	Millicent, Penola, Beachport
Naracoorte Lucindale Council (Naracoorte Lucindale)	8,300	Naracoorte, Lucindale
District Council of Grant (Grant)	7,900	Port McDonnell
Tatiara District Council (Tatiara)	6,600	Keith, Bordertown, Padthaway
Kingston District Council (Kingston)	2,300	Kingston, SE
District Council of Robe (Robe)	1,400	Robe

3.2 Definition & Interpretation of Waste Biomass Data

The general approach to mapping the SE region waste biomass profile was to first understand the overall waste biomass being generated, then what could be resource recovered, and finally if any of it was already committed to waste management practices involving some resource recovery and/or disposal to other uses and if so, how. The following classification scheme outlined in Table 3-2 was developed to differentiate between waste biomass types and availability.

Table 3-2: Waste biomass classifications

Total Waste Biomass	The total waste biomass tonnes generated per annum, even if that biomass may not be accessible or practically recoverable for collection. Waste biomass is classed as an organic residue, which is treated as waste by its generator and is not intended to be product or sold for consumption/use.
Accessible Waste Biomass	The part of Total Waste Biomass considered practically recoverable. *For example, waste biomass not considered Accessible Waste Biomass were:* • *Roots and stubble in cereal crop residues, even though part of the waste biomass generated from this source.* • *Animal waste from sheep grazing in a field were not considered practically recoverable.*
Current Resource Recovery/Disposal *(of Accessible Waste Biomass)*	Part of the Accessible Waste Biomass may presently be disposed of or resource recovered. *For example:* • *Grape marc to compost manufacture or grape leaves ploughed to soil for nutrients* • *Application of liquid and/or biosolid waste to land conditioning or compost manufacture* • *Animal feed* This waste biomass may be available for higher value end uses or energy production. An estimate of the current resource recovery/disposal level is therefore provided. This estimate is expressed as a percentage range.

Figure 3-1: South East Council area map (South East Local Government Association, 2007)

3.3 Collection and Collation of Primary Data

Primary data around waste biomass generation, resource recovery and/or disposal in the SE region was obtained for each of the four target sources within the study scope. These data sources included:

- 2012-13 Recycling Activity Survey (Zero Waste SA, 2014) – data on manufacturing and process wastes;
- Zero Waste Environment User System (ZEUS) – data on waste organics and composting;
- Primary Industries and Resources SA (PIRSA) (Government of South Australia, Primary Industries and Regions SA, 2014)– information on crop distributions and stock densities across the SE region;
- Australian Bureau of Statistics (ABS) figures (Australian Bureau of Statistics, 2014b) – data on crop production and stock numbers in the SE region as well as number of businesses involved with different activities;
- Members of the SE Biomass Group – local knowledge and intelligence on identified point sources and existing resource recovery and/or disposal activities;
- Contacts within other State Government agencies – similar information to the above;
- Other public data bases, literature and industry reports; and
- The project team's own knowledge and industry experience.

These data sources enabled the range of different types, sources and/or sites for waste biomass generation to be identified. For manufacturing and processing residues, secondary input data and information was additionally obtained by directly contacting relevant companies and businesses in the region. Councils and local waste contractors were also contacted to seek extra information around municipal and commercial waste sources. For crop residues and animal wastes, expert input was provided by Scholefield Robinson Horticultural Services (SRHS).

An overview of the different waste biomass sources or types that were identified and included as part of this data collection phase is given in Table 3-3 overleaf[2].

3.4 Waste Biomass Sources

This study attempted to identify if there were point sources (large, singular sources of biomass waste) where waste biomass was being generated and/or available for resource recovery. Many waste biomass sources are not from single locations but spread across large areas (i.e. are diffuse sources). For example, waste biomass generated from cropping and non-intensive animal farming occurs across large areas on farming properties.

Some point sources were found to be small (and numerous) such that they could not be easily and distinctly identified from publicly available data. For example, small to medium commercial businesses or chicken farms and piggeries.

In view of this, identified point sources were classed as sources that generate waste biomass and are licenced by the South Australian Environmental Protection Authority (EPA) for their activities. Where possible, waste biomass profiles for each of these identified point sources were included in the waste biomass tonnes discussed in Section 4. Due to confidentiality, these identified point sources are not specifically identified, but are presented in an anonymised format by this report. Potential developers or interested parties should approach Zero Waste SA directly regarding specific identified point sources.

[2] Extensive research indicated that the biomass types listed in Table 3-3 are the key biomass generation sub-classifications within the SE region of SA and biomass waste produced from other sources is not likely to be significant.

For diffuse sources, estimates were made of the number of businesses, properties and/or sites likely to contribute to waste biomass generation from available data sources.

Table 3-3: Biomass type classifications included in this report

Biomass Type	Biomass Type Sub-Classification	Biomass Type Minor Sub-Classification	
Crop Residues	Broad acre crops - Cereal	○ Wheat for grain ○ Oats for grain ○ Barley for grain	○ Maize for grain ○ Triticale for grain ○ All other cereals for grain or seed
	Broad acre crops - Non-cereal crops	○ Lupins for grain or seed ○ Chickpeas	○ Oilseeds – Canola ○ Other non-cereal crops
	Nurseries, cut flowers or cultivated turf	○ Nurseries ○ Cut flowers	○ Cultivated turf
	Fruit & nuts	○ Pome fruit (apples) ○ Stone fruit (cherries) ○ All other orchard fruit and/or nuts	○ All other fruit ○ Grapes
	Vegetables for human consumption	○ Potatoes ○ Onions ○ Lettuces	○ Broccoli ○ Other vegetables
Manufacturing & Processing Residue	Wineries	○ Wine made on-site	○ Wine made off-site
	Fish/Aquaculture	○ Southern rock lobster ○ Abalone	○ Scale fish (including aquaculture)
	Abattoirs/Meat Rendering	○ Beef/cattle	○ Sheep
	Other Food Processing	○ Seed production ○ Olives ○ Dairy	○ Oilseeds ○ Cream cheese
	Product Processing	○ Paper processing	○ Milling
Animal Wastes	Sheep	○ Merino	○ All other
	Cows	○ Dairy cattle	○ Meat cattle
	Pigs	○ All pigs	
	Poultry	○ Chickens	○ Other poultry
	Other Livestock	○ Buffalo ○ Deer ○ Goats	○ Horses ○ All other livestock
Residential and Commercial Organic Waste	Council Collection (MSW including some C&I)	○ All Council regions	
	C&I Collection	○ All Council regions	
	Biosolids from Wastewater Treatment Systems	○ All Council Regions	
	Grease Trap Waste	○ All Council Regions	

3.5 Geographical Mapping

Council areas were used to map and understand the geographical location or distribution of identified point sources and diffuse sources for Accessible Waste Biomass data across the SE region (refer to Figure 3-1 for a map of the Council areas). This was intended to provide insight to the potential locations or areas where different types of waste biomass could be sources and/or exploited. For example, Council regions with high quantities of suitable waste biomass could indicate a potential location for a biomass facility utilising regional residual material.

4 Biomass Mapping in South East South Australia

4.1 Interpretation of Biomass Data

Waste biomass data presented in this section is identified according to the following four key sources:

- Crop residues
- Manufacturing and processing residues
- Animal wastes
- Residential and commercial organic waste

For each source, the estimated quantities were classified as follows (as explained in Section 3.2 of this report):

- **'Total Waste Biomass' –** generated by these sources; and
- **'Accessible Waste Biomass'**– that part of the Total Waste Biomass deemed practically available for resource recovery purposes (as collection of some waste biomass components was considered not accessible or feasible, e.g. crop roots, field animal waste, etc.).

For the range of Accessible Waste Biomass above, the geographical distribution and number of identified point sources or businesses involved in generating this waste biomass was mapped according to local government area (see Table 3-1 for list of these areas, including population and major townships).

4.2 Summary

Table 4-1 summarises waste biomass generation in the SE region.

Table 4-1: Biomass by type, and Total Waste Biomass and Accessible Waste Biomass

Biomass Type	Total Waste Biomass (t/p.a.)	Accessible Waste Biomass	
		t/p.a.	Current Resource Recovery/ Disposal (%)
Crop Residues	11,030,300	5,240,080	50-55
Animal Wastes	15,546,000	209,000	95-100
Manufacturing & Processing Residue	72,170	72,170	95-100
Residential and Commercial Organic Waste	20,900	16,190	50-55
Total	26,669,370	5,538,150	50-55

It is estimated that up to 5.5 million tonnes per annum (t/p.a.) of Accessible Waste Biomass is generated within the SE region of SA. This represents 21% of the 26.7 million t/p.a. of Total Waste Biomass estimated to be generated within the SE region of SA (see Table 4-1).

Much of the Total Waste Biomass consists of roots and stubble left behind after cropping activities and animal waste from non-intensive farming. This material is not considered to be Accessible Waste Biomass as it is not practically available for resource recovery.

The highest quantity of Accessible Waste Biomass in Table 4-1 is crop residues, at around 5.2 million t/p.a. Existing methods of resource recovery/disposal for this Accessible Waste Biomass includes

straw production, animal feed, nutrient recovery and/or soil conditioning. Section 4.3 later provides more detailed discussion around waste biomass from crop residues.

The next highest quantity of Accessible Waste Biomass is animal wastes at up to 209,000 t/p.a. Some of this Accessible Waste Biomass may already be resource recovered/disposed of in anaerobic lagoons, compost and by farm land application. Section 4.5 provides a more detailed discussion of animal waste biomass residues.

Manufacturing and processing residues are estimated to contribute around 72,000 t/p.a. of Accessible Waste Biomass. Some of this Accessible Waste Biomass may be resource recovered/disposed of by pathways including compost, animal feed or disposal through direct land application for agricultural purposes. Section 4.4 provides a more detailed discussion of manufacturing and processing residues.

Residential and commercial organic waste produces up to 17,000 t/p.a. of Accessible Waste Biomass. Some of this Accessible Waste Biomass is already being resource recovered. Much of the Accessible Waste Biomass material not currently resource recovered is present in mixed waste streams that would require intervention to ensure that it was source separated first. Section 4.6 provides a more detailed discussion of residential and commercial organic waste.

Figure 4-1 below illustrates how the Accessible Waste Biomass is distributed geographically by Council area, including a split graph to clearly display the quantities of each biomass type.

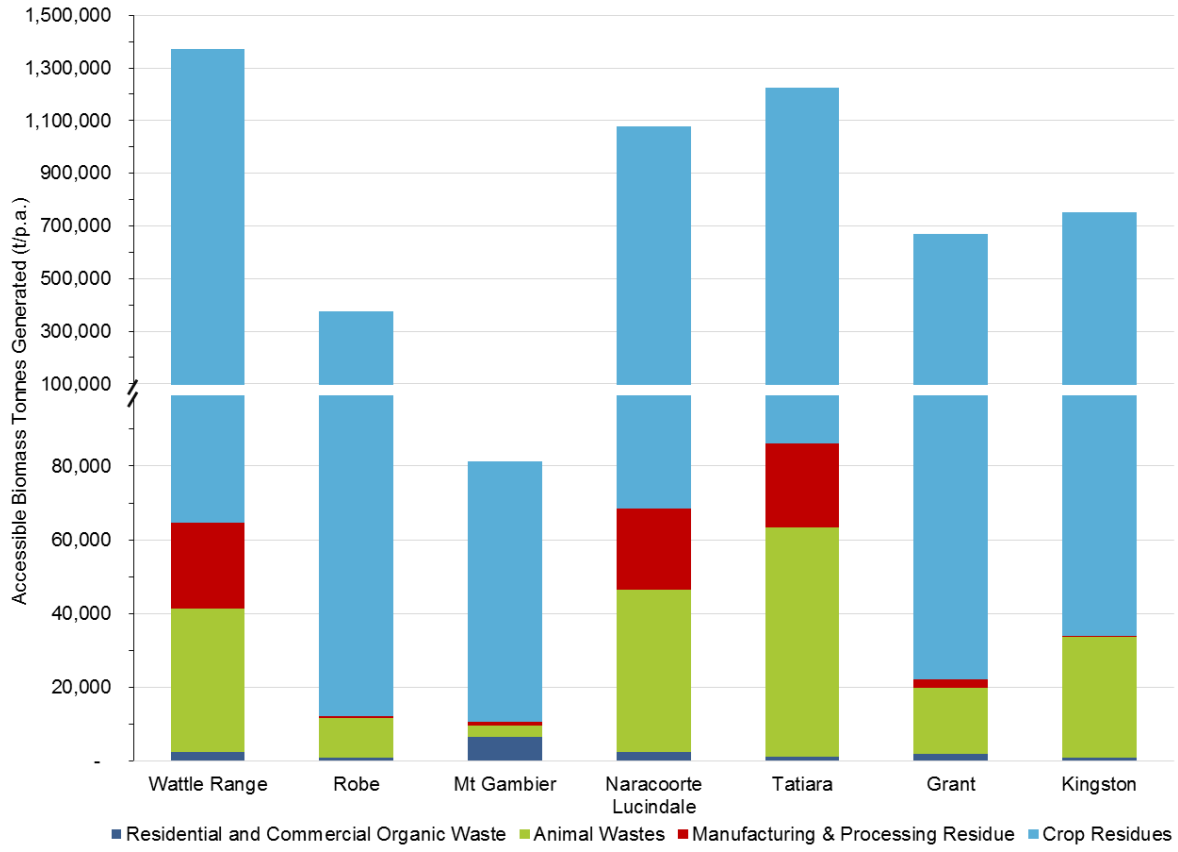

Figure 4-1: Accessible Waste Biomass generated by type and Council region

Figure 4-1 suggests that the Council areas which appear to produce the highest quantities of Accessible Waste Biomass are Wattle Range (up to 1.4 million t/p.a.), Tatiara (up to 1.2 million t/p.a.), and Naracoorte Lucindale (up to 1.1 million t/p.a.). The majority of Accessible Waste Biomass tonnes in these areas arise from crop residues.

Wattle Range, Tatiara and Naracoorte Lucindale also have significant Accessible Waste Biomass quantities generated from manufacturing and processing residues, which can be attributed to wine, product processing and meat/rendering industries, respectively.

Due to its population, Mt Gambier generates a larger quantity of residential and municipal waste than other areas.

More detail around the geographical distribution of waste biomass in the SE region is included in Sections 4.3 to 4.6 below. Figure 4-2 below also illustrates locations of identified (i.e. EPA licensed) point sources within the SE region of SA as a whole.

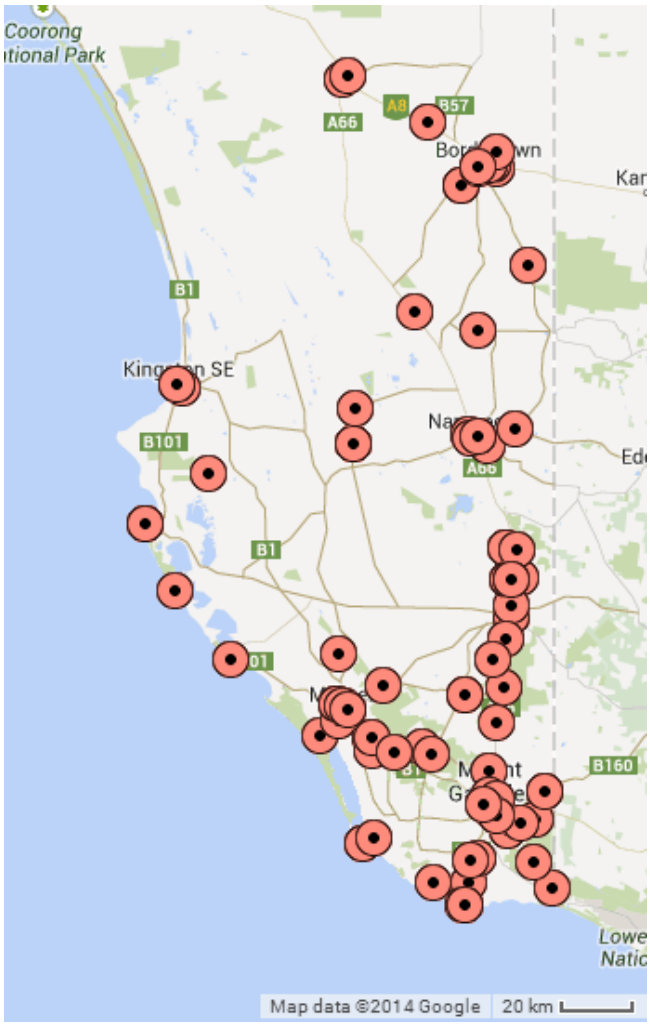

Figure 4-2: Map of identified point sources within the SE region of SA

4.3 Crop Residues

Crop residue biomass waste is considered to be organic matter generated from the production of crops, which is not on-sold as the primary product. There can be considerable volumes of such waste biomass generated by many types of crops.

Table 4-2 below provides an overview of the Total Waste Biomass estimated for each crop residue biomass type sub-classification. The sub-classifications of crop residue biomass waste in Table 4-2 are aligned with ABS agricultural definitions (Australian Bureau of Statistics, 2012). This table includes the potential number of businesses believed to be involved with generating waste biomass within each sub-classification. There were no identified point sources for this source category. Figure 4-3 overleaf illustrates how this Accessible Waste Biomass could be geographically distributed by Council region.

Large differences exist between the Total Waste Biomass generated and the Accessible Waste Biomass for the entire crop residue sub-classifications listed in Table 4-2. This is primarily attributed to the large proportion of Total Waste Biomass remaining in the ground (i.e. as roots) or leaves being discarded by some deciduous crops, which may not be practically recovered.

The highest quantity of Accessible Waste Biomass in Table 4-2 is broad acre crops – cereal (around 3.5 million t/p.a.). This is followed by the broad acre crops – non-cereal crops (up to 910,000 t/p.a.), fruit and nuts (around 460,000 t/p.a.), and vegetables for human consumption (up to 370,000 t/p.a.). Nurseries, cut flowers or cultivated turf generated small quantities of Accessible Waste Biomass (around 80 t/p.a.).

The Council region producing the highest quantity of Accessible Waste Biomass from crop residues was Wattle Range at around 1.3 million t/p.a. (see Figure 4-3). This Council region produced a significant quantity of Accessible Waste Biomass from fruit and nut crops, which was mainly associated with the grape growing areas located around Penola and Padthaway. Both Wattle Range and Grant had significant quantities generated by vegetable crops.

{Cont. overleaf below Figure 4-3}

Table 4-2: Crop residue Total Waste Biomass, Accessible Waste Biomass, and number of diffuse business sources by crop type

Crop Residue Type	Total Waste Biomass (t/p.a.)	Accessible Waste Biomass		No. Businesses (Diffuse) Involved with this Activity
		t/p.a.	Current Resource Recovery/ Disposal (%)	
Broad acre crops - Cereal	5,260,000	3,500,000	55-60	1000+
Broad acre crops - Non-cereal crops	3,800,000	910,000	40-45	1000+
Fruit & nuts	680,000	460,000	25-30	1000+
Vegetables for human consumption	1,290,000	370,000	25-30	150-250
Nurseries, cut flowers or cultivated turf	300	80	60-65	50-100
Total	11,030,300	5,240,080	50-55	

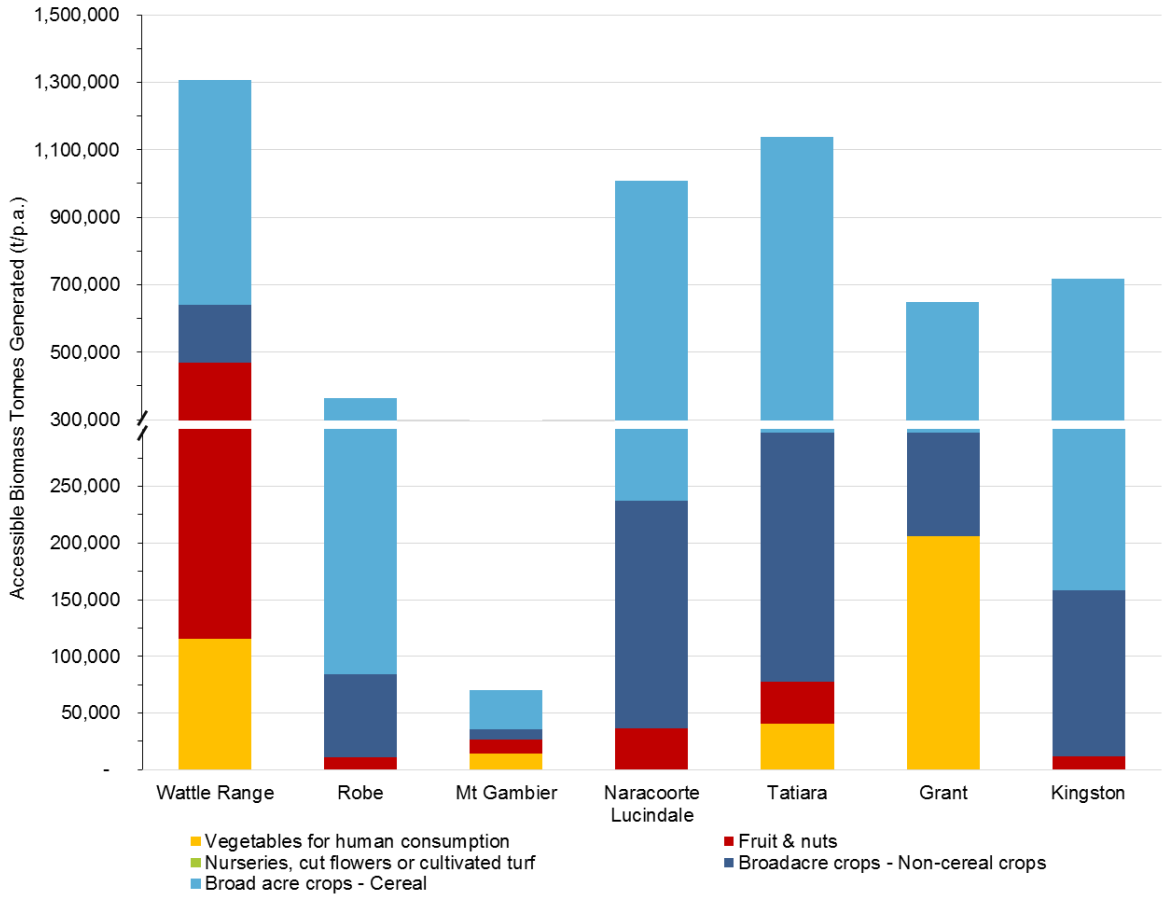

Figure 4-3: Accessible Waste Biomass crop residue tonnes generated by Council region and crop type

Current farming practices involve some recovery of crop residues. In the SE region these practices include straw production from cereal crops, using crop residues for animal grazing, or returning this waste biomass into the soil for conditioning and nutrient recovery. A supplementary report is available from Zero Waste SA which details the potential current resource recovery and/or disposal pathways for the sub-classifications of crop residues and potential opportunities and issues associated with these existing pathways.

Outside of these existing practices, remaining Accessible Waste Biomass for Crop Residues is generally dispersed across several thousand businesses or properties in the SE region. Logistical challenges could be involved with aggregating and collecting this waste biomass. The aggregation step may need to be integrated into harvesting activities, which might require farmers or business owners to invest in new equipment or infrastructure.

4.4 Manufacturing and Processing Residues

Manufacturing and processing residue waste biomass is considered to be the organic residue left over from manufacturing/processing that was classified as waste biomass by its producers and not intended to be and on-sold as a product to a customer. For example the solid residues generated from the production of dairy, abattoir waste sent to rendering, and the vegetable remains from the extraction of seeds. Trade waste water generated in these processes and going to sewer is included in the residential and commercial organic waste section.

Table 4-3 below presents the waste biomass profile developed for manufacturing and processing residues. The waste biomass from this source has been divided into five sub-classifications based around type of source. Figure 4-4 overleaf indicates how the Accessible Waste Biomass from this source could be distributed geographically by Council region. Identified point sources are geographically illustrated in Figure 4-5 (also overleaf). The estimated number of other (outside of identified point sources) businesses or sources contributing to this waste biomass category in included in Table 4-3

The major producers of Accessible Waste Biomass from this source were estimated to be abattoirs/meat rendering (around 26,000 t/p.a.), product processing (up to 29,000 t/p.a.), wine production (around 17,000 t/p.a.) and other food processing (up to 8,800 t/p.a.). The contribution by the fishing/aquaculture industry was about 330 t/p.a. Around 85-90% of this Accessible Waste Biomass is accounted for by 30 identified point sources.

Wattle Range, Naracoorte Lucindale and Tatiara are the Council regions where most Accessible Waste Biomass is generated (see Figure 4-4). In Wattle Range the Accessible Waste Biomass is mainly generated by wineries, product processing and other food processing. Naracoorte Lucindale generates a high quantity of Accessible Waste Biomass from the abattoir/meat processing industry. The Tatiara Council region generates most of its Accessible Waste Biomass from product processing.

We estimate that up to 95-100% of the Accessible Waste Biomass in the SE region could already be subject to some type of resource recovery and/or disposal. A supplementary report is available from Zero Waste SA which details the potential current resource recovery and/or disposal pathways for the sub-classifications of manufacturing and processing residues and potential opportunities and issues associated with these existing pathways.

Table 4-3: Manufacturing & processing residue Total Waste Biomass, Accessible Waste Biomass, and the number of identified point and diffuse business sources by industry type

Industry Type	Total Waste Biomass (t/p.a.)	Accessible Waste Biomass		No. of Identified Point Sources/ Businesses	Estimated No. of other Diffuse Sources/ Businesses
		t/p.a.	Current Resource Recovery/ Disposal (%)		
Abattoirs/ Meat Rendering	26,000	26,000	95-100	<5	0
Product (paper and cereal) Processing	20,000	20,000	95-100	<5	0
Wineries	17,000	17,000	90-100	10-20	60-80
Other Food Processing	8,800	8,800	95-100	5-15	20-30
Fishing/ Aquaculture	370	370	65-70	15-25	20-30
Total	72,170	72,170	95-100		

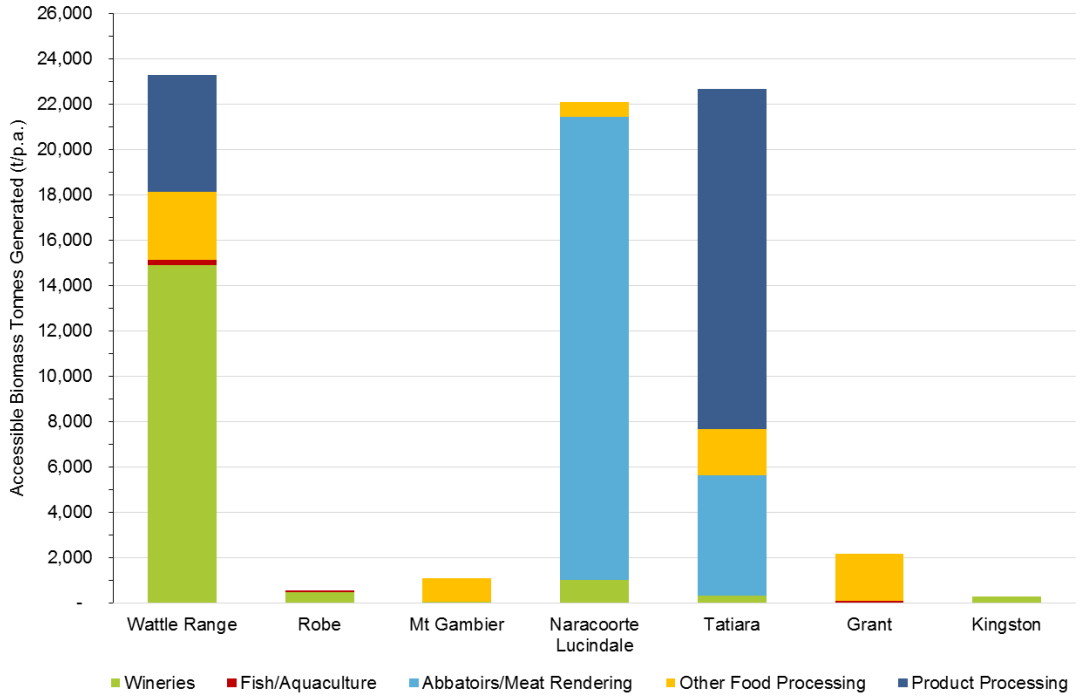

Figure 4-4: Accessible Waste Biomass manufacturing and processing residue tonnes generated by Council region and industry type

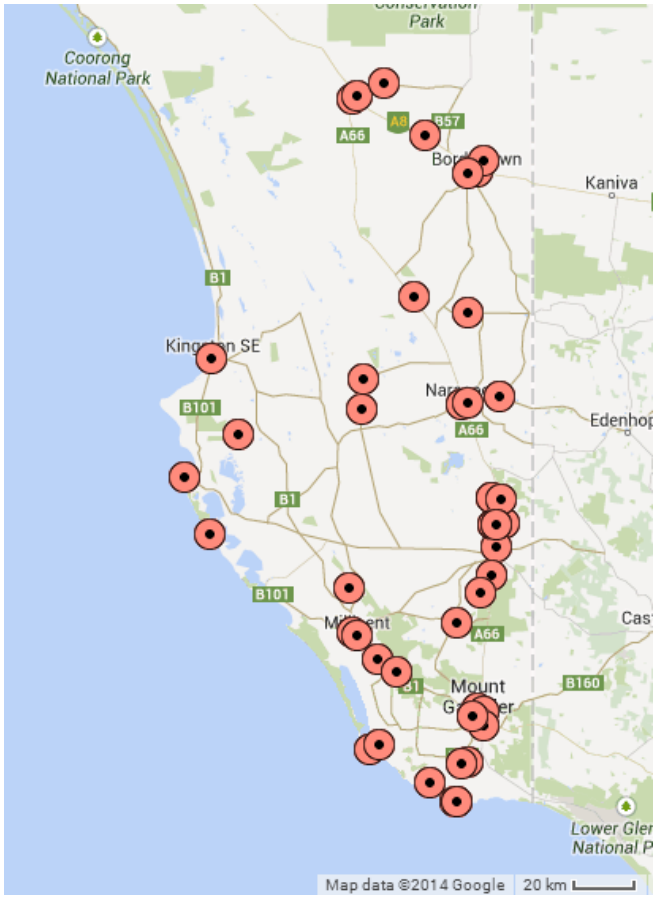

Figure 4-5: Manufacturing and processing identified point source locations within the SE region of SA

4.5 Animal Wastes

Animal wastes are generated in farms, stockyards, sale yards, milking sheds and so on. This biomass is comprised of organic matter produced by animals including faeces and offcuts (e.g. lamb tails). Table 4-4 below details the waste biomass profile developed for animal wastes. The waste biomass from this source was divided into five sub-classifications based around type of livestock (which were also aligned with how livestock data presented in ABS statistics (Australian Bureau of Statistics, 2012). Figure 4-6 shows how the Accessible Waste Biomass estimated for this source is distributed geographically by Council area. The locations of identified point sources in this source category is mapped in Figure 4-7 (overleaf), which were mainly associated with the pig sub-classification. The number of other business likely to be involved in generating this waste biomass in each sub-classification is also estimated in Table 4-4.

Of around 15.5 million t/p.a. of Total Waste Biomass generated, 209,000 t/p.a. were considered Accessible Waste Biomass. In this source category, most animal waste generated occurs during grazing or non-intensive farming practices, and thus, was not considered Accessible Waste Biomass. Accessible Waste Biomass was generally assumed to occur when these animals were aggregated in feedlots, stockyards for sale or milking sheds (dairy cows) or where intensive farming was taking place (e.g. piggeries, chicken sheds, etc.)

In these situations, much of this Accessible Waste Biomass may already be subject to some form of resource recovery due to environmental regulation. This includes via anaerobic lagoons or digesters (at piggeries or feedlots), land application, or composting of this material. A supplementary report that details the potential current resource recovery and/or disposal pathways for waste biomass sub-classifications and identified point sources is available from Zero Waste SA.

From a geographical perspective, most Council areas except Mt Gambier appear to produce Accessible Waste Biomass from animal waste. Animal waste from cows was estimated to produce the highest quantity of Accessible Waste Biomass (around 137,000 t/p.a.). Pigs also potentially produce a high quantity of Accessible Waste Biomass (up to 31,000 t/p.a.), while poultry could generate around 22,000 t/p.a. Sheep and other livestock were estimated to produce up to 13,000 t/p.a. and 6,000 t/p.a. respectively.

Table 4-4: Animal waste Total Waste Biomass, Accessible Waste Biomass, and number of identified point and diffuse business sources by animal type

Animal Type	Total Waste Biomass (t/p.a.)	Accessible Waste Biomass		No. of Identified Point Sources/ Businesses	Estimated No. of Other Diffuse Sources/ Businesses
		t/p.a.	Current Resource Recovery/ Disposal (%)		
Cows	11,500,000	137,000	95-100	<5	1,000+
Pigs	260,000	31,000	95-100	5-10	100-150
Poultry	23,000	22,000	95-100	-	100-150
Sheep	3,700,000	13,000	95-100	-	1,000+
Other Livestock	63,000	6,000	95-100	-	700-900
Total	15,546,000	144,000	95-100		

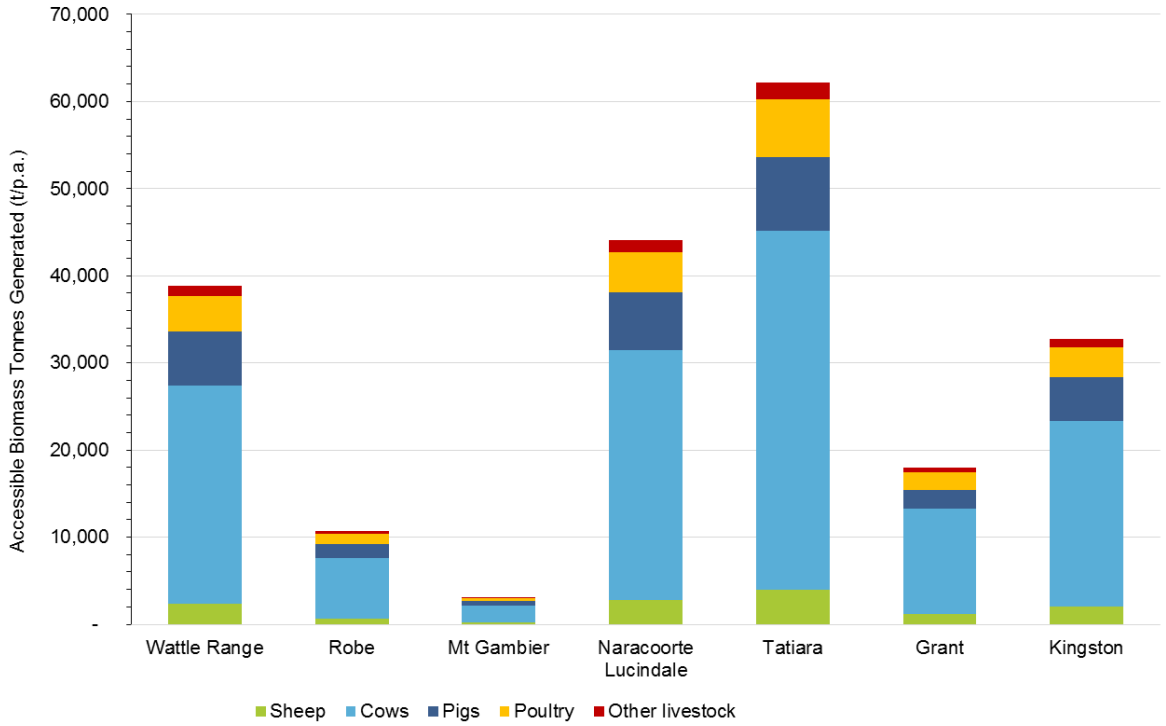

Figure 4-6: Accessible Waste Biomass animal waste residue tonnes generated by Council region and animal type

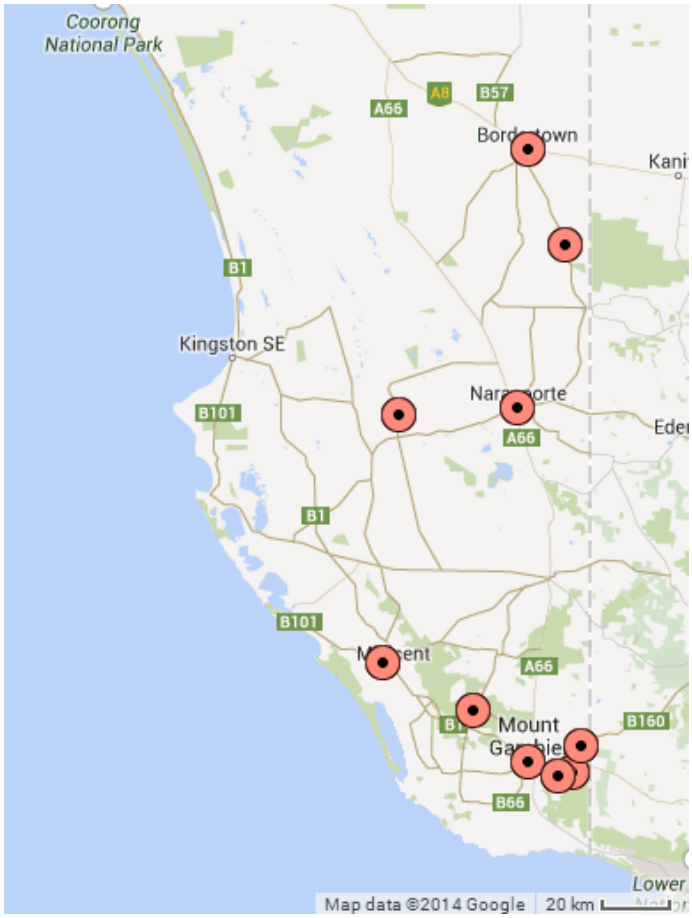

Figure 4-7: Animal wastes identified point source locations

4.6 Residential and Commercial Organic Waste

Residential and commercial organic waste is organic waste generated in residential and commercial settings (not including manufacturing and process residues). For example waste water is treated at a commercial site, producing biosolids. Waste water itself is not included in the waste biomass quantities in this report.

Four main types of waste biomass from residential and other commercial sources were assessed by this study. These were:

- Council collections of residential waste – this includes the kerbside green organics plus organic material still in general waste disposed of to landfill;
- C&I front-lift collections of waste from business and industry – which presently only includes organics still disposed of in the general waste;
- Biosolids from municipal wastewater treatment systems – this includes solids from septic tanks or sewage/septic wastewater collection and treatment schemes;
- Grease trap waste – usually from commercial businesses such as restaurants and fast-food shops or involved with catering (e.g. hospitals, retirement homes, commercial kitchens).

Section 6.2 of this report contains more information about the above biosolids and grease trap sources. Table 4-5 below summarises estimated quantities of waste biomass identified from all of these sources. Figure 4-8 overleaf outlines how the Accessible Waste Biomass from these sources are potentially distributed across the SE region by Council area. Figure 4-9 shows the locations of identified point sources.

Mt Gambier Council region appears to produce the highest quantity of residential and commercial organic waste. Wattle Range and Naracoorte Lucindale also produce relatively high quantities of Accessible Waste Biomass from these sources. This reflects that these areas have major population centres in the SE region (refer to Table 3-1). In this regard, Grant Council region appears to generate a substantial quantity of biosolids from wastewater treatment despite a relatively smaller population. The majority of these biosolids, however, are produced at SA Water's Finger Point wastewater treatment plant near Port McDonnell, which receives and treats sewage pumped from the Mt Gambier Council region.

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Table 4-5: Residential and commercial organic waste Total Waste Biomass, Accessible Waste Biomass, and number of identified point and diffuse business sources by collection type

Residential/ Commercial Organic Waste Type	Total Waste Biomass (t/p.a.)	Accessible Waste Biomass		No. of Identified Point Sources/ Businesses	Estimated No. of Diffuse Sources/ Businesses
		t/p.a.	Current Resource Recovery/ Disposal (%)		
Council kerbside collection	14,000	11,000	50-60	10-20	-
C&I collection	4,100	3,100	0-5	5-15	-
Biosolids from wastewater treatment systems	1,600 (or 400d.w)	1,600 (or 400d.w)	95-100	20-30	1000+
Grease trap waste	1,200	1,200	95-100	-	40-60
Total	20,900	16,900	50-55		

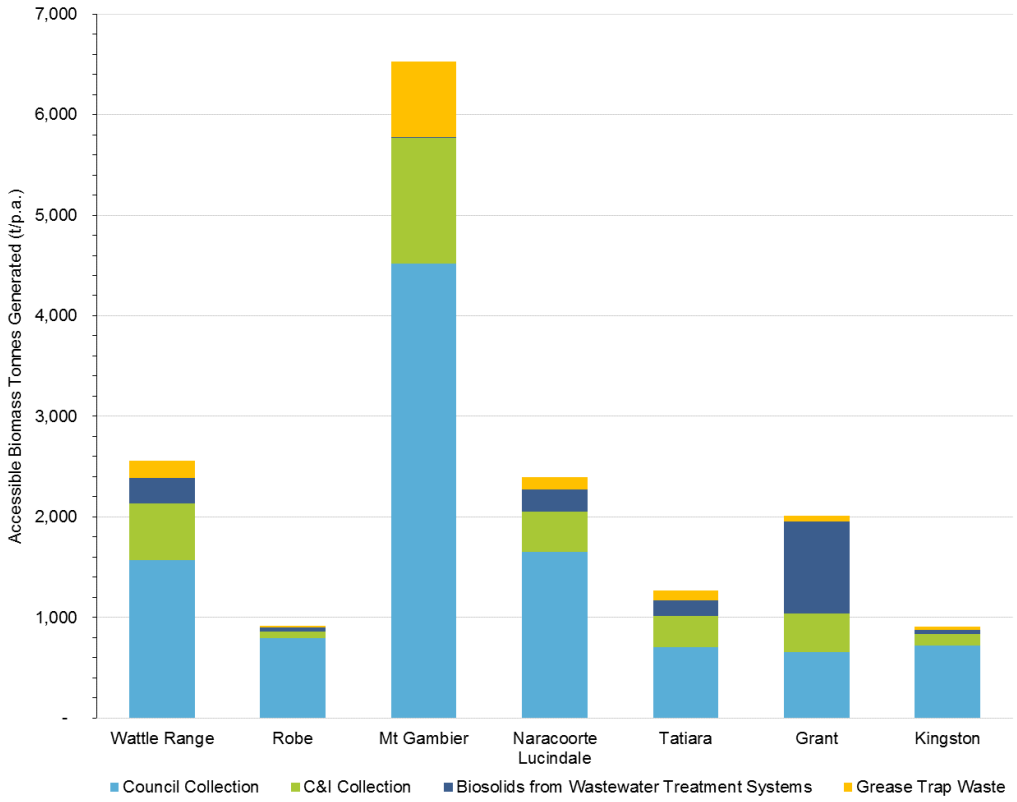

Figure 4-8: Accessible Waste Biomass residential and commercial organic waste tonnes generated by Council region and collection type

Figure 4-9: Identified point source locations for residential and commercial organic waste biomass

For Council kerbside collection, Total Waste Biomass generated in this source category includes the green organics plus organics fraction in the general waste bin. Only part of the organics material in the general waste bin is practically recoverable (can be source separated in uncontaminated form), and therefore accessible for resource recovery and/or disposal to other uses. Based on this insight, the Accessible Waste Biomass from Council kerbside collection in the SE region was estimated at around 11,000 t/p.a. It is suggested that around half (50-60%) of this may presently be resource recovered. Higher quantities of Council kerbside collection biomass could be recovered from the general waste bin with improved source separation (e.g. food organics) and expanded kerbside collection of organics. The kerbside collection systems in the SE region generally aggregate collected waste at depots and/or landfill sites across the SE region which provide identified point sources from which this material could be diverted to resource recovery.

For C&I front-lift collection services, the Accessible Waste Biomass was estimated at up to 3,100 t/p.a. Collection of Accessible Waste Biomass from C&I sources may require the introduction of organic waste collections for these customers. There are locations this material is currently being transported to, where it could be intercepted &/or collected for resource recovery.

Smaller quantities of Accessible Waste Biomass from wastewater treatment systems (up to 1,600 t/p.a.) and grease trap waste (around 1,200 t/p.a.) are also generated in the SE region. Most of this material (95-100%) may presently be going to a form of resource recovery and/or disposal where cheaper than landfill disposal. This generally includes for composting or land application.

A supplementary report that provides detail around identified point source locations and resource recovery and/or disposal pathways of biomass waste for the sub-classifications in this source category is available upon request from Zero Waste SA.

PART B – Energy & Water Infrastructure

5 Energy

This section sets out an overview of energy infrastructure in the SE region that may be relevant to siting or commercial feasibility of a waste biomass resource recovery plant. Expert advice was provided by St Kitts Associates in preparing this information.

5.1 Infrastructure

The SE region of SA is a vitally important corridor for SA's energy infrastructure. SA connects to the National Electricity and Gas Markets through the SEA Gas pipeline and the Heywood Electricity Interconnector. The region is also home to important electricity and gas distribution networks and significant electricity generation infrastructure.

5.1.1 Electricity

A map of the main electricity transmission/distribution network is provided in Figure 5-1 overleaf. Table 5-2 two pages overleaf also details information around transmission connection points and substations in the SE region.

The region has a peak electricity demand of around 130MW (approximately 4% of a state-wide maximum demand of around 3,400MW) and is home to around 150MW of gas and diesel fuelled peaking generators, 325MW of wind capacity (AEMO 2012a)[3], around 18MW of small-scale solar photovoltaic (PV) systems (see Table 5-1 below) and a recently completed 20MWe combined heat and power (CHP) facility at Millicent (The South Eastern Times, 2013).

Table 5-1: Small scale solar installations by Council region (Australian Government, Australian Renewable Energy Agency, 2014)

Council area	Dwellings (est.)	PV Installs	as % (est.)	kW installed	Demand, MW (est.)
Mt Gambier	10,106	1,222	12%	3,986	25-30
Grant	3,189	489	15%	2,016	30-40
Kingston	1,512	268	18%	947	5
Naracoorte Lucindale	3,560	669	19%	3,122	20-25
Robe	1,359	186	14%	804	5
Tatiara	3,118	646	21%	2,716	20-25
Wattle Range	6,081	1,012	17%	4,012	20-25
Total	28,925	4,492	16%	17,603	

[3] Refer to the Australian Energy Market Operator (AEMO) for further details of performance in the South East Transmission Region: http://www.aemo.com.au/Electricity/Planning/South-Australian-Advisory-Functions/Wind-Study-Report

Figure 5-1: South East electricity distribution region (SA Power Networks, 2013a)

Table 5-2: Large scale electricity transmission connection points and substations, including forecast power demands and network delivery capacity (The South Eastern Times, 2013) (SA Power Networks, 2013b) (Australian Energy Market Operator, 2014)

Transmission Connection Points			Major Substations		
Location	**2013/14 forecast MW (10% PoE)**	**Indicative Delivery Capacity (MVA)**	**Location**	**2013/14 forecast MW (10% PoE)**	**Indicative Delivery Capacity (MVA)**
Blanche	39	61.5	Allendale East	5	4
			Mt Gambier North	7	8
			Mt Gambier West	19	15
Keith	24	37	Bordertown	11	10
			Keith 11kV	6	9
Kincraig	23	30.5	Naracoorte	10	15
			Naracoorte East	6	7
Mt Gambier	22	32.5	Mt Gambier 11kV	16	15
Penola West	11	25	Coonawarra	4	7
			Nangwarry	1	1
			Penola	3	2
Snuggery Rural	17	29	Millicent	6	7
			Robe	4	4
Regional Total	136	*215.5*		98	104

Table 5-3 overleaf details information about local electricity generation assets in the SE region, including renewables. A number of other renewable energy facilities (wind (Australian Energy Market Operator, 2012b) and biomass[4] (Morello, 2014) (Clean Energy Finance Corporation, 2014) (Government of South Australia, Department for Manufacturing, Innovation, Trade, Resources and Energy, 2014)) are also in various stages of development. The South Australian Government, through Renewables SA, has recently published information on some of the smaller scale diesel generation facilities in the region (refer to (Government of South Australia, 2014) for a map).

The region will also benefit from a recently approved upgrade to the Heywood Electricity Interconnector that includes upgrades to assets in both SA and Victoria. This will include a reconfiguration of some of the SE region's 132 kV transmission network. According to SA's transmission network service provider, Electranet, the upgrade is designed to increase interconnector capability in both directions by approximately 40 per cent, and will allow increased wind energy exports from SA, and increased imports of lower-cost generation into SA, particularly at times of peak demand (ElectraNet, 2014).

[4] Biomass renewable energy facilities have mainly been investigated and/or installed for use by the forestry industry in the SE region of SA.

Table 5-3: Energy generation infrastructure in the SE region (SA Power Networks, 2013a)

Generation Location	Generation Organisation	MW	Fuel
Ladbroke Grove	Origin Energy	80	Gas (peaking plant)
Snuggery	GDF Suez Australia	63	Distillate (peaking plant)
Canunda	GDF Suez Australia	46	Wind
Lake Bonney (1, 2 and 3)	Infigen	278	Wind
		324	*Total wind*
Kimberley Clark Millicent CHP	KCA	20	Gas turbine, Combined heat and power
Bordertown Substation	Vibe Energy / SAPN	4	Diesel (network support from October 2013)

5.1.2 Natural Gas

The SEA Gas pipeline transports high pressure gas from Victoria's Pt Campbell (and the Iona storage facility) to Adelaide. The 680km pipeline consists of twin 350mm pipes for approximately half of its length with the remainder being a single 450mm pipe. The pipeline follows a path North of Naracoorte and Padthaway. The SEA gas pipeline is illustrated in Figure 5-2 and SEPS is illustrated in Figure 5-3.

Figure 5-2: SEA gas pipeline map (South Easte Australia Gas, 2014)

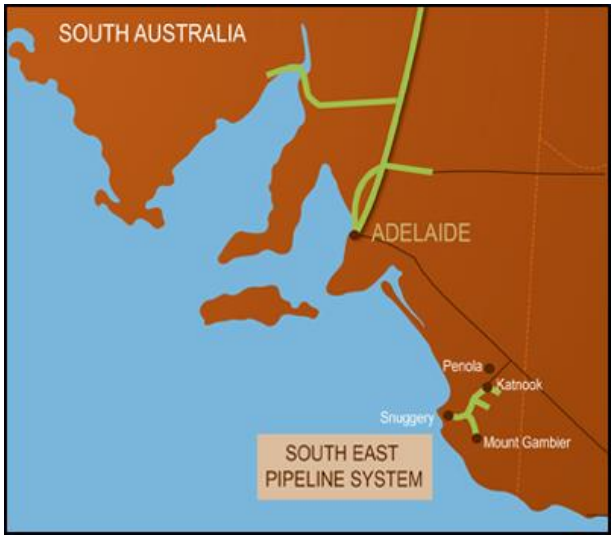

Figure 5-3: South East Pipeline System (SEPS) (Epic Energy, 2009)

5.2 High Energy Demand Zones

5.2.1 Electricity

As shown in Table 5-2, network supply and demand capacity is concentrated in the southern parts of the SE region. The table also illustrates that while the distribution network has some impending constraints, the transmission network connection points appear to have substantial capacity (some of which has been realised following the recent closures of some larger energy consumers in the region). Figure 5-4 overleaf illustrates the existing electricity transmissions regions within the SE.

5.2.2 Natural Gas

The South East Pipeline System (SEPS) was connected to the SEA Gas pipeline in 2005 in response to the decline in production from the SE's Katnook gas field. The SEPS serves major customers in the region and the Mt Gambier Council region. The main 168mm diameter SEPS pipeline has a Maximum Allowable Operating Pressure (MAOP) of 10MPA. Supply and demand capacities are contained in commercially sensitive contracts between pipeline owners, shippers and consumers but it is understood that current demand is in the order of 1PJ pa (around 4-5 TJ/day) (Australian Energy Market Commission, 2014).

5.3 Summary

The SE region represents an important energy transport corridor and is therefore able to access significant transmission capacity for either importing or exporting electricity or natural gas. At the distribution level, recent restructuring of the local economy has seen reductions in demand for gas and electricity - releasing capacity for future energy projects.

Unlike other regions, any potential biomass WtE projects are unlikely to be constrained by the capacity of the local energy infrastructure.

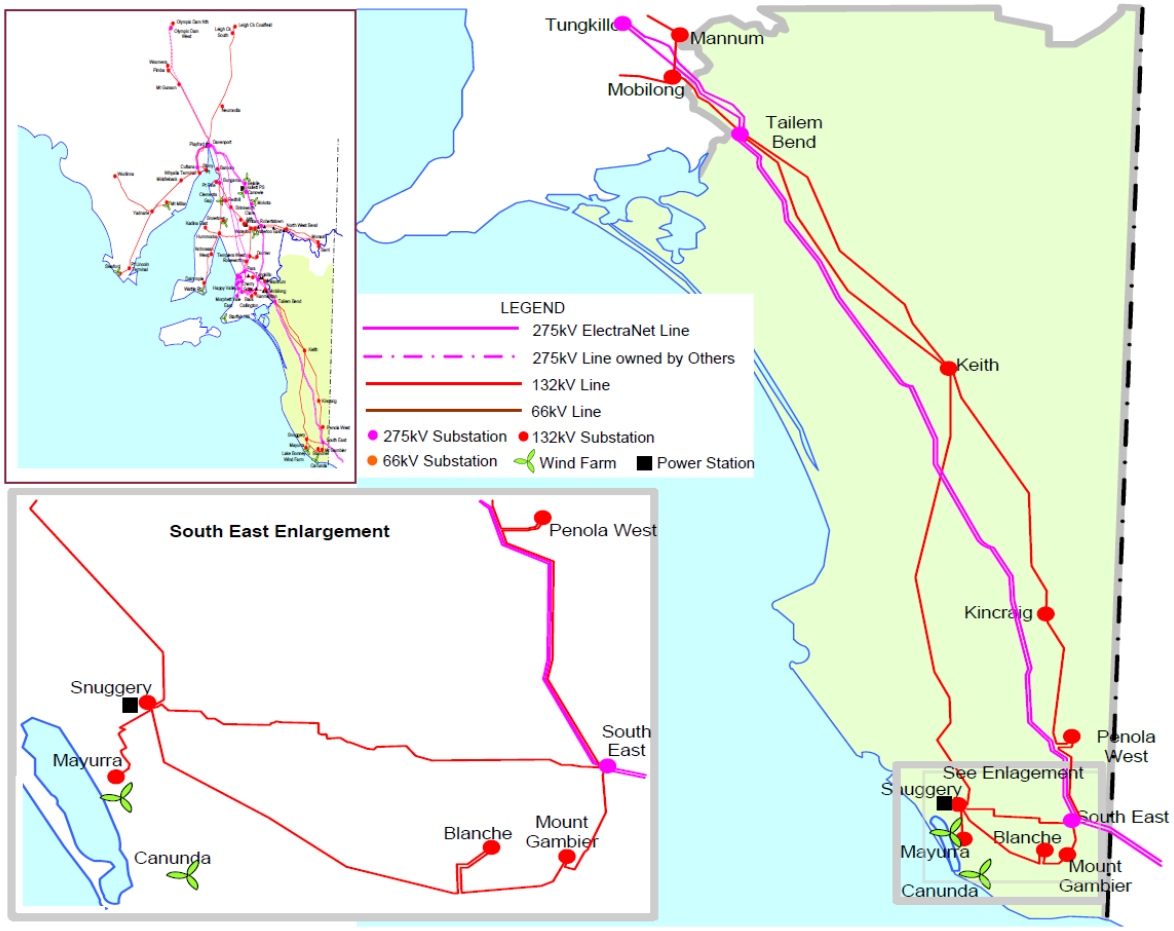

Figure 5-4: South East electricity transmission regions (ElectraNet, 2013)

6 Water & Wastewater Infrastructure

6.1 Major Water Supply

The SE region is supplied with water from two sources:

- River Murray water – via the Tailem Bend to Keith pipeline (see Figure 6-1 overleaf);
- Groundwater – which is otherwise used elsewhere across the region, including for drinking water supplies within all Council regions in the SE region of SA.

SA Water operates, maintains and manages all of the major drinking water supply schemes in the SE region (SA water, 2013). This includes the Tailem Bend to Keith pipeline and 19 separate groundwater supply systems (see Figure 6-2 overleaf) which cover 33 towns. Notably, Mt Gambier is supplied with groundwater sourced from the nearby Blue Lake, a volcanic crater, which (at 36 GL[5]) is the third largest water storage in South Australia.

These SA Water supply schemes generally deliver water that is already or mostly of acceptable quality for drinking purposes. A water treatment plant at Tailem Bend treats all River Murray pumped water to drinking quality standards via the Tailem Bend to Keith pipeline (SA Water, 2014). Some groundwater supply schemes have iron removal plants, including at Penola, Kingston and Robe. The Mt Gambier groundwater supply scheme has recently installed fluoridation.

Outside of the above SA Water supply schemes, groundwater is substantially used across the SE region for household water supplies and primary production, including stock watering, crop irrigation and forestry activities. These supplies are drawn from two main aquifers, an upper, unconfined (or surface) aquifer and the lower, confined aquifer. In 2010-11, there was a total of nearly 950 GL allocated across 4,000+ licences for the unconfined aquifer and a further 76 GL over 150+ licences for the confined aquifer (South East Natural Resources Management Board, 2012). Most of the groundwater resources in the SE region are “prescribed” by the South Australian Government, which means that groundwater access is licensed and strictly controlled. Some areas already experience greater groundwater use from the aquifers than natural recharge occurring, which can limit opportunity to gain access for new supplies (Department of Water, Land and Biodiversity Conservation, 2006).

[5] 1 GL = 1 Gigalitre = 1 billion Litres

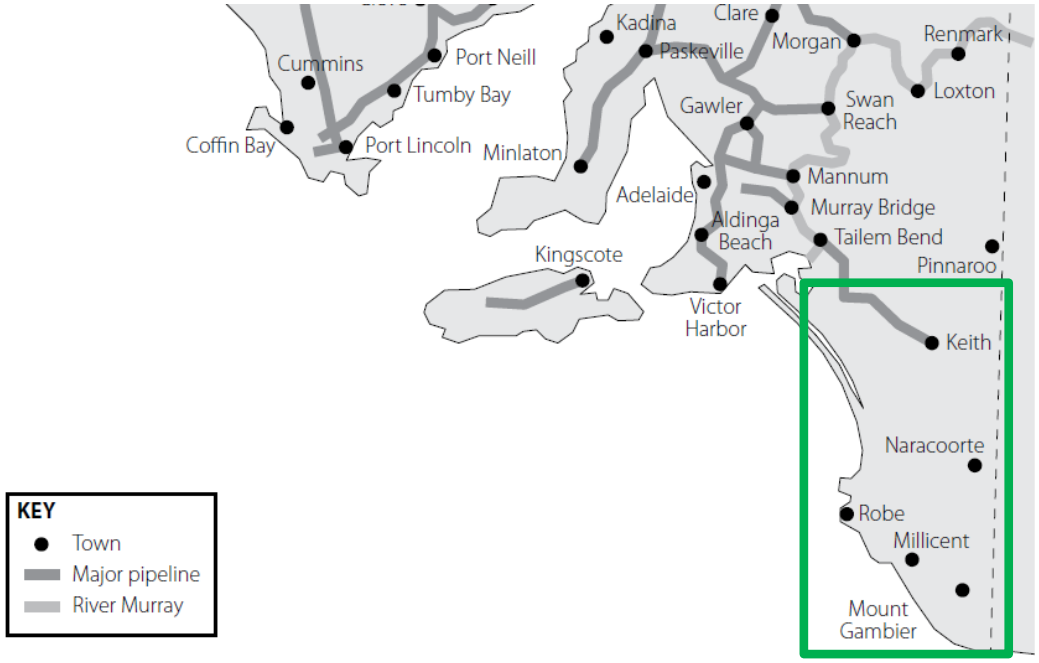

Figure 6-1: Map of water pipeline supply schemes in South Australia operated by SA Water, including the Tailem Bend to Keith pipeline to the South East region (Australian Academy of Technological Sciences and Engineering, 2007)

Figure 6-2: Locations of groundwater supply schemes in the SE region operated by SA Water (SA Water, 2013)

6.2 Wastewater Infrastructure

The wastewater infrastructure in the SE region can be said to consist of five major types as classified below.

1. ***SA Water's Mount Gambier Sewerage Scheme*** – which includes a wastewater treatment plant (WWTP) located at Finger Point near Port McDonnell.
2. ***Community Waste Management Schemes (CWMS)*** – which are also commonly referred to as Septic Tank Effluent Disposal Schemes (STEDS)
    - There are estimated to be up to 22 of these CWMS/STEDS across the SE region (Local Government Association of South Australia, 2013) – see Figure 6-3 overleaf and Table 6-1.
    - SA Water operates five systems within the South East area (Mount Gambier – Finger Point), Millicent, Mount Burr, Nangwarry and Naracoorte – all sewered systems. Others are managed by local Councils.
    - All of these schemes have a collection system connected to residential septic tanks that usually pipe wastewater to a lagoon-type treatment system, except at Port McDonnell which pumps to nearby the SA Water Finger Point WWTP.
3. ***Private household Waste Control Systems (WCSs)*** – which can include:
    - Septic tanks, stand-alone with infiltration trench or connected to an above CWMS; or
    - On-site aerobic wastewater treatment system with disposal of treated effluent usually by above-ground irrigation.
4. ***Grease trap systems*** – used by commercial businesses, usually restaurants and fast food premises or where food preparation is involved (e.g. hospitals, retirement homes)
5. ***Industrial or Trade Waste systems***.
    - This can include stand-alone wastewater treatment plants for industry or pre-treatment systems for Trade Waste connected to the SA Water sewerage scheme or a CWMS.

Categories 1 to 3 are wastewater infrastructure which support municipal or residential activity. Table 6-1 below gives a high-level overview of the population coverage (as %) and the number of identified point sources estimated for each of these three categories in each Council region. In this table:

- Households covered by a CWMS/STEDS usually have their own private WCS/septic tank
- Mt Gambier does not have an identified point source as its wastewater collected by SA Water's sewerage scheme is sent to the Finger Point WWTP located in the DC of Grant

Table 6-1: Overview of estimated population coverage by different types of municipal wastewater treatment infrastructure for each Council region

Local Government Area	% Population Covered in This Area			No. Identified Point Sources
	SA Water	*Private WCS + CWMSs*	*Private WCSs*	
Naracoorte Lucindale	68%	11%	21%	2
Robe		71%	29%	1
Wattle Range	43%	15%	42%	4
Grant	6%	24%	70%	10
Kingston		55%	45%	1
Mt Gambier	97%		3%	
Tatiara		69%	31%	4

Figure 6-3: Locations (indicated by black dot and location name) of CWM/STEDS in the SE region (Department of Environment & Heritage, 2006; Local Government Association of South Australia, 2013). Additional CWMS/STEDS may also exist within the DC of Grant.

These municipal wastewater treatment systems generate waste biomass. The quantity of this waste biomass was estimated and included as biosolids from wastewater treatment systems in the residential and commercial organic source in Section 4.6 of this report. This waste biomass includes:

- Biosolids from SA Water operated schemes and other Council managed CWMS/STEDS treatment lagoons – all of these biosolids appear to be currently taken by farmers for land application, sent to local composters, or are disposed to a landfill.
- Septic effluent periodically pumped from septic tanks by licensed contractors, which would be disposed of to the nearest WWTP or CWMS/STEDS

The quantity of grease trap waste has also been estimated and included as residential and commercial organic waste in Section 4.6 of this report. This grease trap waste is estimated to be generated by around 40 to 60 businesses across the SE region. Most of these businesses would be located in the major population centres/townships. This waste is collected by specialist contractors and currently disposed of via different routes including landfill, agricultural land application, composting or to local WWTP/CWMS; this choice most likely depending on relative disposal cost at a particular location.

For Industrial or Trade Waste Treatment wastewater systems, there is potential for waste biomass to be generated as a by-product of the treatment plant where there is high water use and organic contamination of effluent. In the SE region, such industries or commercial activities are generally in key geographical hot spots, e.g. wineries in Wattle Range, abattoirs/meat rendering in Naracoorte Lucindale, etc. Disposal of this waste biomass usually depends on the local options available and contaminants present, but would generally include landfill disposal, agricultural land application and/or composting. The waste biomass generated by wastewater treatment plants from these sites has been estimated and included under manufacturing & processing residues in Section 4.4 of this report.

CONCLUSION

7 Key Findings

7.1 Biomass in the South East

This report provides a comprehensive profile of potential waste biomass generation and sources for the SE region.

Crop residue biomass generates the highest quantity of Accessible Waste Biomass within the SE region (up to 5.2 million t/p.a.). Around half (50-55%) of this material may already be going to a form of resource recovery and/or disposal (which may or may not have a value attached to it). The logistics of collecting diffuse crop residue waste material spread across the SE will need consideration if access to this material as a feedstock for waste-to-energy (or similar) is sought.

Of animal waste it is estimated that Accessible Waste Biomass is up to 144,000 t/p.a. which is associated with point sources such as stockyards, milking sheds, piggeries and chicken farms. Most (95-100%) of this Accessible Waste Biomass may presently be resource recovered and/or disposed of in some way. Competition for these tonnes could eventuate if a new resource recovery pathway for this material was introduced.

A significant proportion of other waste biomass from animal waste is diffuse and would be challenging to access for resource recovery at a larger scale. This is because the largest quantities being generated are from non-intensive farming of cows and sheep, where most of the animal waste is dispersed widely in the fields where they graze.

Manufacturing and processing residue generates Accessible Waste Biomass of up to 72,000 t/p.a. Most of this material (85-90%) is associated with around 30 identified point sources. This material may be going to resource recovery or disposal currently, but this may be at cost to the waste generator or current be worth minimum value.

For both animal wastes and manufacturing and process residues it may be necessary to compete with existing resource recovery markets to secure waste biomass for a new resource recovery facility.

Accessible Waste Biomass from residential and commercial organic waste was estimated at up to 17,000 t/p.a. There may be opportunities to access this waste by working with Councils and waste contractors to capture this material through improved source separation and expanding collection services.

Overall the larger Councils in the SE region generate the greatest quantities of Accessible Waste Biomass (Wattle Range, Tatiara and Naracoorte Lucindale). Key potential sources of Accessible Waste Biomass generation within these Council regions include:

- Wattle Range
    - Broad acre crops – cereal (up to 666,000t/p.a.)
    - Fruit & nuts (up to 353,000t/p.a.)
    - Broad acre crops- non cereal (up to 174,000t/p.a.)
    - Vegetables for human consumption (up to 115,000t/p.a.)
    - Waste from cows (up to 24,000t/p.a.)
    - Wineries (up to 15,000t/p.a.)
- Tatiara
    - Broad acre crops – cereal (up to 841,000t/p.a.)
    - Broad acre crops- non cereal (up to 219,000t/p.a.)
    - Waste from cows (up to 41,000t/p.a.)
    - Vegetables for human consumption (up to 40,000t/p.a.)
    - Fruit & nuts (up to 38,000t/p.a.)
    - Product processing (up to 15,000t/p.a.)

    - Waste from pigs (up to 9,000t/p.a.)
    - Waste from poultry (up to 7,000t/p.a.)
- Naracoorte Lucindale
    - Broad acre crops – cereal (up to 771,000t/p.a.)
    - Broad acre crops- non cereal (up to 201,000t/p.a.)
    - Fruit and nuts (up to 36,000t/p.a.)
    - Waste from cows (up to 28,000t/p.a.)
    - Abattoirs/meat rendering (up to 20,000t/p.a.)
    - Waste from pigs (up to 6,000t/p.a.)

7.2 Energy and Water Infrastructure

This report provides relevant information around energy and water infrastructure in the SE region. This information provides insight into potential opportunities or constraints around existing energy infrastructure for siting of a new waste biomass facility. It also reiterates potential limitations that may exist around access to water if needed for such a facility.

7.3 Final Remark

The waste biomass profile and other information detailed in this report will help the SE Biomass Group and potential investors identify opportunities for new waste biomass resource recovery facilities, including WtE, which could be built in the SE region.

Parties interested in further exploring potential opportunities associated with waste biomass should contact Zero Waste SA in the first instance. More detailed information surrounding identified point source locations, regional generations of Accessible Waste Biomass and current resource recovery and/or disposal pathways, are contained in a supplementary report, which is available upon request from Zero Waste SA.

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