Review of Recycled Organic Wastes

in South Australia

Planning SA

Government
of South Australia

EPA
South Australia

Review of Recycled Organic Wastes in South Australia

- prepared for the Environment Protection Agency
by

Nolan-ITU Pty Ltd

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Executive Summary

This report documents the outcomes of a review of current and proposed organic waste recycling practices from the major urban regions of South Australia. The review has been carried out in three stages:

- a summary of the current and potential supply of recyclable organics;
- identification of the capacity and requirements of existing processors ; and
- identification of existing markets for processed material and an exploration of potential markets.

For the purpose of this review, 'Recyclable Organics' (RO) refers to organic wastes originating from parks, yards, road reserves and gardens which can be utilised for the production of 'Organic Horticultural Products' (OHPs). The study also includes some discussion of other source materials and products that may compete with RO and OHP.

The separate collection and composting of organic wastes has significant environmental benefits over the current waste management practice of sending mixed waste to landfill. These include:

- diverting a major component of the residual waste stream, resulting in conservation of landfill space
- recovering biodegradable wastes to reduce environmental impacts at landfills
- providing beneficial use of organic wastes through application of OHPs. The benefits in facilitating plant nutrient up-take, improving soil structure, and aiding moisture retention to soils are especially relevant in South Australia, with its uniquely dry climate and fragile soils.

Collection services and drop-off facilities

Of the 19 councils in metropolitan Adelaide, ten provide some form of collection of garden wastes from households. Around 67% of Adelaide metropolitan households are currently *offered* some form of garden waste collection service. Around 157 000 households, or 35% of all households in metropolitan Adelaide, are currently *provided* with a garden waste collection service. The difference (67% vs 35%) is mainly due to the fact that, in those councils that offer user-pays garden waste collection, only a small proportion of residents sign up (and pay) for the service.

There are currently 15 facilities providing garden waste drop-off services to residents in the Adelaide metropolitan area. The facilities are predominantly located in the north, west and southern regions of the city.

Recyclable organics quantities disposed and recycled

Table 4.1 presents a break-up of the total estimated quantity of RO disposed of and recycled in metropolitan Adelaide and the major regional centres.

In metropolitan Adelaide, the total estimated quantity of RO *generated* is 244 000 t/yr. Of this 161 000 t/yr (or 148 kg/cap/yr) is generated by the municipal sector, with the remaining 83 000 t/yr generated by the non-municipal sector.

The total quantity of RO *recycled* in metropolitan Adelaide is approximately 93 000 t/yr or 38% of all RO collected. Of this, 69 000 tonnes is recovered from the municipal waste stream and 23 700 from the commercial & industrial (C&I) and construction & demolition (C&D) waste streams. The total quantity of RO *disposed of* to landfill is 151 000 t/yr, or 62%.

The majority of garden wastes generated in Adelaide is sourced from the municipal sector (66%). It is this sector that has by far the largest potential for further waste reduction (57% of municipal garden waste is currently sent to landfill for disposal)..

In major regional centres, approximately 10% of the total 20 000 t/yr of RO generated is currently recycled, with the remainder disposed of at landfills.

In addition to RO, approximately 75 000 t/yr of other organic materials such as biosolids, wool scouring wastes, manures and grape marc are currently recycled. Manures and other organic materials sourced (and re-used or disposed of) outside metropolitan Adelaide and rural centres are not included in this estimate.

Table 1: Summary of Total Recyclable Organics Quantities, metropolitan Adelaide and Regional Centres, 1999 (t/yr)

	Disposal		Recycled		Total	
	(t/yr)	(%)	(t/yr)	(%)	(t/yr)	(%)
Metropolitan Adelaide						
Municipal	92 000	61%	69 000	74%	161 000	66%
Commercial and industrial	34 000	23%	14 200	15%	48 200	20%
Construction and demolition	25 000	17%	9 500	10%	34 500	14%
Total recyclable organics in metropolitan Adelaide (t/yr)	151 000	100%	92 700	100%	243 700	100%
(%)	62%		38%		100%	
Regional Centres	18 000		2 250		20 250	

Projected recyclable organics recovered

Table 5.4 lists projected organic waste quantities requiring processing in the year 2001, and the maximum potential quantities which could be diverted in the longer term (2004). Again, the materials have been separated into the categories recyclable organics (RO), and other organic materials such as manures, wool scouring wastes, biosolids and—in smaller quantities—food, grease trap and other wastes which, to a certain degree, may compete in some markets with RO-derived products. Quantities of RO recovered are expected to increase from a currently estimated 93 000 t/yr to 143 000 t/yr by 2001-02, and up to a maximum of 206 000 t/yr in the long term.

The quantity of other organic materials being processed is not expected to increase significantly as suitable materials (eg grape marc) have been in high demand in the past and other materials (eg food wastes) are much more difficult to process. The quantity of biosolids, however, remains the greatest unknown, as its supply is almost unlimited and will depend on future prices, incentives and promotional campaigns as to how much will actually be fed into the market.

Table 2: Summary of projected recycled organic wastes requiring processing in metropolitan Adelaide (t/yr)

	1999	2001/2	Maximum
Municipal	69 000	98 000	140 000
Non-municipal	23 700	45 000	66 000
Total RO	**92 700**	**143 000**	**206 000**
Other organic materials	50 000	55 000	60 000
Biosolids[1)]	25 000	25 000	25 000
Grand total – RO & other organics	167 000	223 000	291 000

[1)] For this summary, biosolids quantities are assumed to remain unchanged

Processing

In Adelaide, the processing capacity for the composting of recyclable organics is currently at its limit. This has been confirmed through discussions with the major processors of garden wastes. A key issue that has been identified by the major six processors is the need for suitable sites where they can relocate some or all of their composting operations. All processors have expressed problems relating to buffer distances, encroachment by other land uses and the need to be located close to both supply and markets.

This indicates that the key issue for establishing long term organic waste processing facilities to meet Adelaide's needs well in to the next century is the location and establishment of sites that:

- are close to both supply and markets
- are sufficiently protected to ensure unfettered processing activities

- provide long-term security without encroachment by other commercial and residential activities.

Another major barrier to the development of the RO processing industry is garden waste contamination.

Markets

The organic waste recycling industry is very young, and no data exists on how individual market segments have developed that would enable a detailed forecast based on historical patterns. Overall, however, the use of OHPs has increased dramatically: Based on the supply of garden waste from the municipal sector (by far the largest supplier of RO), the overall market growth for RO-derived products has been around 50% annually over the last four years.

A review of all major market segments for OHP was carried out as part of this study. The identified market segments with the largest potential are:

- intensive agriculture (largest potential)
- urban amenity (landscaping etc)
- rehabilitation.

The outcomes of the market assessment indicate that there is sufficient potential in the intensive agricultural sector in metropolitan and outer Adelaide alone to absorb the projected increase in quantities of recycled organic waste over the next two to three years.

Using conservative estimates, the potential demand in the three main market segments within metropolitan and outer Adelaide regions exceeds the expected supply. Assuming reasonable growth rates based on available historic information, and from surveys and discussions with a range of industry representatives, no oversupply of recyclable organics will occur provided that:

- the quality of products is good
- there is no excessive competition from the release of biosolids.

Additional processing capacity

This report confirms that, in Adelaide, the current processing capacity is insufficient to meet projected quantities of RO requiring processing. Historic evidence in Adelaide suggests that the identification and approval of suitable sites is extremely difficult. Given the above, there are benefits from a planning perspective in establishing a smaller number of larger sites rather than a larger number of smaller facilities. It would therefore seem preferable to develop as few new processing sites as possible. The proximity to markets for the end products is also an important consideration.

An options assessment for provision of additional processing capacity was undertaken taking into account the issues referred to above. The following describes the preferred option which is recommended to be used as a guide to augment existing RO processing capacity in Adelaide:

- Develop two additional processing sites, one in the north and one in the south of Adelaide

- RO generated within inner and eastern suburbs is bulked up and hauled to processing sites in the north (50%) or the south (50%) at a transfer station (or two transfer stations depending on location, availability and capacity).

The above steps assume that existing smaller facilities located in the inner and eastern suburbs will process approximately 13 000–15 000 t/yr. The resulting combined facility capacities are presented in Table 11.4.

Table 3: Facility capacities for Option 3 (t/yr)

Facility Type	2001/2	2004/5	Maximum
Smaller processors – Inner	13 000	15 000	15 000
Transfer Station(s) – Inner/East	up to 55 000	up to 62 000	79 000
Processing – North	63 500	72 000	90 500
Processing – South	66 500	77 000	100 500
Total RO Processing Capacity	143 000	164 000	206 000

Considering the current situation, the required combined RO processing capacity in the medium to long term is around 70 000 t/yr of RO input for a site in the north, and around 75 000 t/yr of RO input for a site in the south.

Recommendations

It is recommended that:

- councils continue to be encouraged to provide garden waste collection services to residents

- councils that offer full kerbside collections implement measures that identify the main sources of contamination, and either educate offending householders or remove them from collections. The education program needs to cover all parties involved (councils, ratepayers, collection contractors and processors)

- State Government facilitates these changes in councils in a partnership approach with the Waste Management Committee and industry advice through COMMPOST SA

- one to two garden waste drop-off facilities be established in the south-east

- two sites for processing of RO be identified and established as a matter of urgency, one in the north and one in the south of Adelaide. The required capacity for processing RO is around 70 000 t/yr for the site in the north and around 75 000 t/yr for the site in the south

- there is the need for a review of composting licensing and for tighter product classification guidelines to ensure the production of high quality products that will establish greater confidence in the market

- biosolids be predominantly targeted at markets where they do not directly compete with RO-derived products (eg forestry, extensive agriculture).

- the use of biosolids in markets which are well suited for garden waste-derived products be limited to providing a role as a supplement only

- information be collected and disseminated through continuation of the research commenced by CSIRO and feedback from growers using these products

- targeted education campaigns be run for growers of intensive agriculture crops, in particular in the greater Adelaide region

- State Government supports research into innovative and more cost-efficient compost spreading techniques

- State Government actively supports further research into the benefits of application of recycled organics in the agricultural and horticultural sectors. Proposed research programs should be joint partnerships between relevant stakeholder bodies.

1 INTRODUCTION

1.1 General

The objective of this study was to conduct a thorough review of current and proposed organic waste recycling practices for the flow of these materials from the major urban regions in South Australia: metropolitan Adelaide, the iron triangle cities of Whyalla, Port Augusta and Port Pirie, Port Lincoln on the Eyre Peninsula, Murray Bridge and Mount Gambier in the South-east. This was achieved in three stages:

- summarise the current and potential supply of recyclable organics
- identify the capacity and requirements of existing processors of the material
- identify existing markets for the processed material and explore potential markets for products derived from this material.

For the purpose of this review, the term 'Recyclable Organics' (RO) refers to organic waste originating from parks, yards, road reserves and gardens that can be utilised in the production of 'Organic Horticultural Products' (OHP). OHPs include organic landscaping and gardening products such as mulches, compost, soil conditioners and top dressings, organic fertilisers, potting mix and organically amended soils (for details, refer Glossary). The study also includes some discussion on other source materials and products that may compete with RO and OHP.

1.2 Background

The separate collection and composting of organic waste has significant environmental benefits over the current waste management practice of landfilling with mixed waste. These include:

- diverting a major component of the residual waste stream, thus conserving landfill space
- recovering biodegradable wastes, which reduces the potential for environmental impacts at landfills
- providing benefits through the use of OHPs.

The benefits in facilitating plant nutrient up-take, improving soil structure, and aiding moisture retention to soils are well known but difficult to quantify. This is especially relevant in South Australia, with its uniquely dry climate and fragile soils. The addition of compost often results in long-term changes to the properties of soil. In Australia, soil structure decline is costing farmers $200 million per year in terms of lost productivity, acidification is estimated to cost $300 million annually, and dryland salinity is valued at $243 million per year (Hill; 1997).

A key success factor in the implementation of a coordinated organics diversion program is the development of sustainable markets and uses. An important objective is to maximise the benefits in light of the significant cost and effort required to establish and develop the necessary systems and infrastructure for increased organics diversion from landfill.

1.3 Study Area

The study area shown in Figure 1.1 comprises the State of South Australia. Particular attention is given to the regions near the major urban centres, which have the potential to generate significant quantities of recyclable organics. Figure 1.2 illustrates these local government areas of interest in Adelaide.

1.4 Information Sources

The most important sources of information for this study have been:

- discussions with existing garden waste processors and other relevant industry agents
- discussions with councils and regional council organisations
- discussions with growers and representatives of growers in regions across the State
- data provided by the Waste Management Committee
- the confidential assessment of potential processing sites prepared by Planning SA
- discussions with EPA staff.

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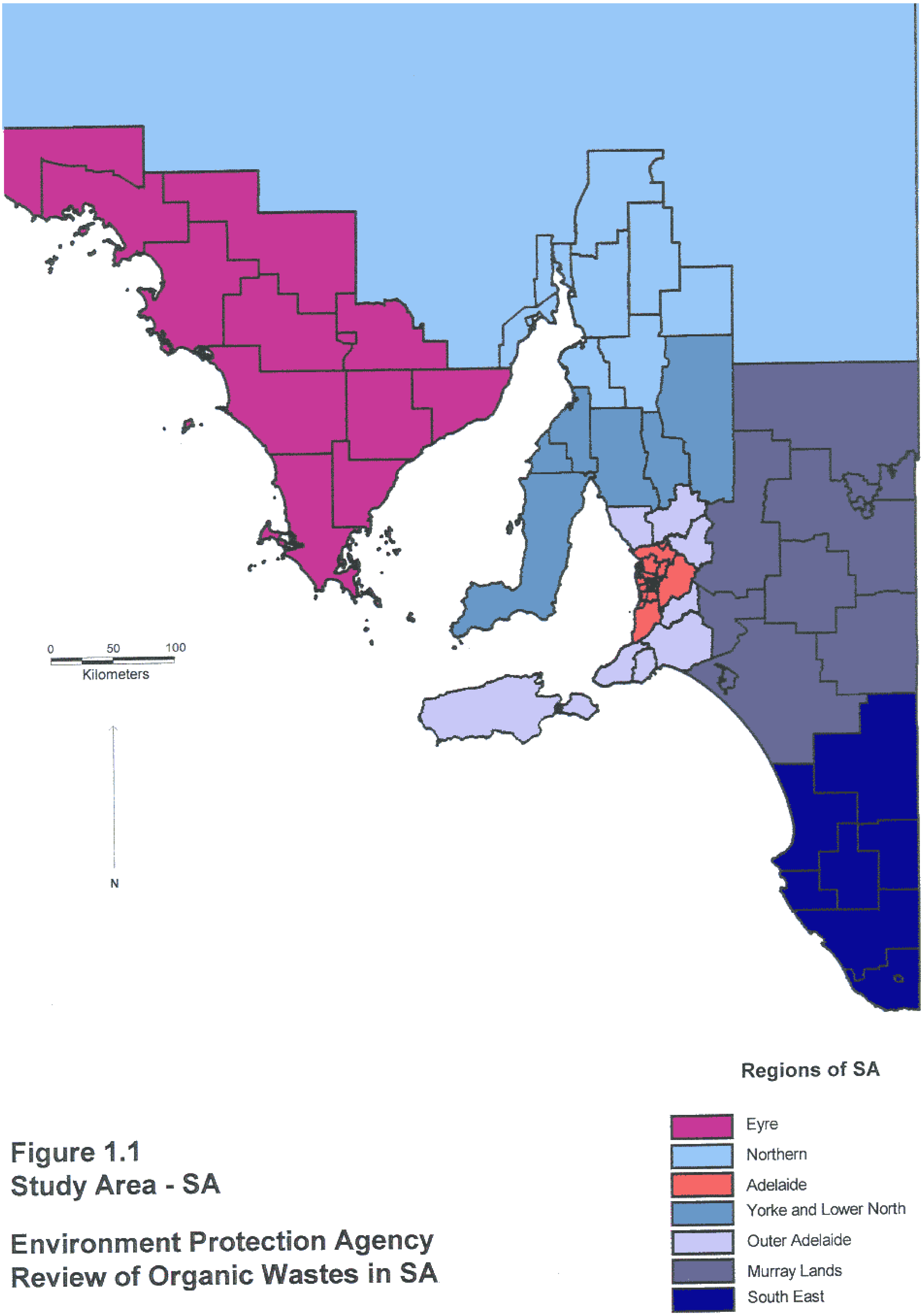

Figure 1.1
Study Area - SA

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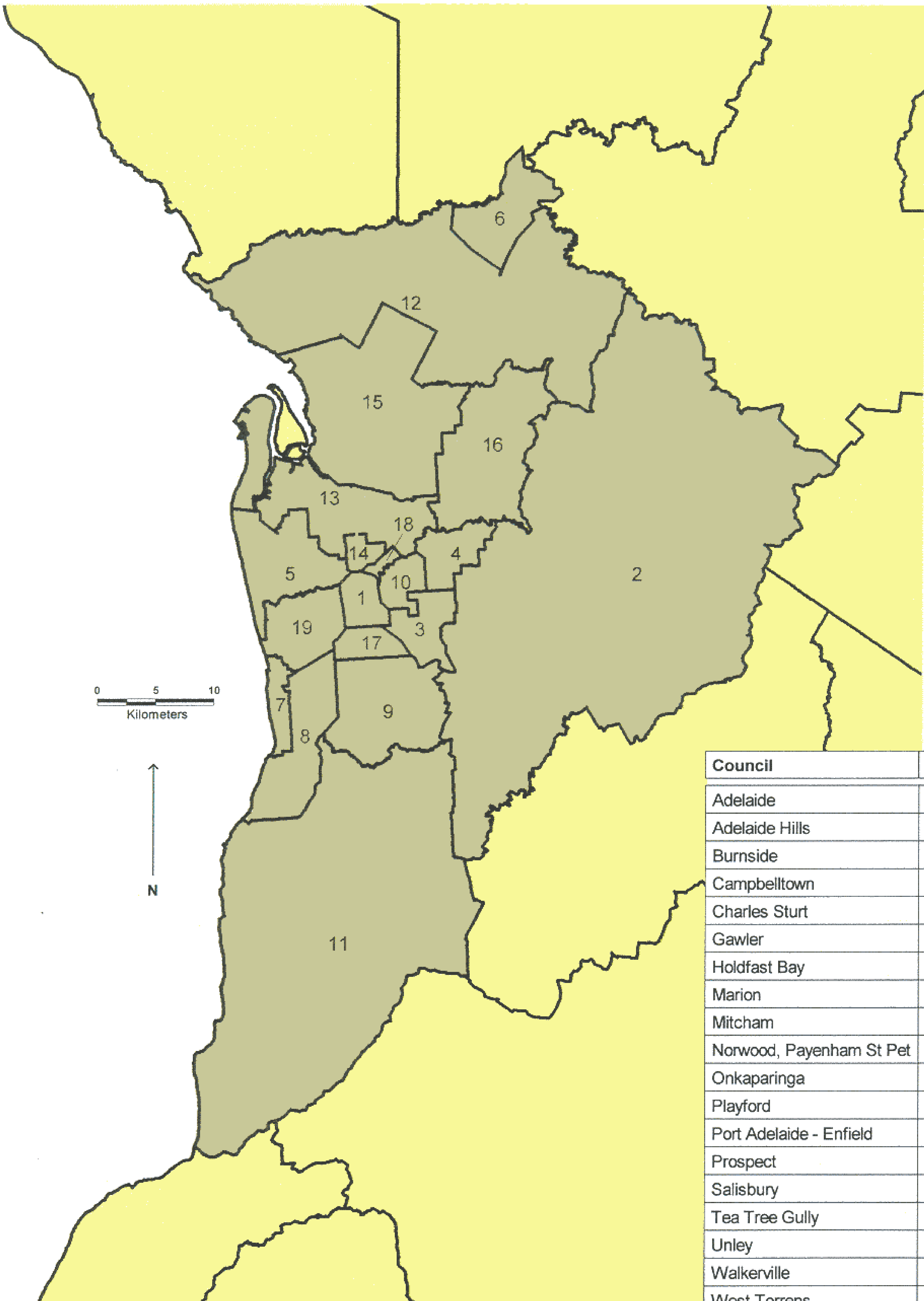

Council	Council_ID
Adelaide	1
Adelaide Hills	2
Burnside	3
Campbelltown	4
Charles Sturt	5
Gawler	6
Holdfast Bay	7
Marion	8
Mitcham	9
Norwood, Payenham St Pet	10
Onkaparinga	11
Playford	12
Port Adelaide - Enfield	13
Prospect	14
Salisbury	15
Tea Tree Gully	16
Unley	17
Walkerville	18
West Torrens	19

Figure 1.2
Local Government Areas of Interest

Local Government Areas

Outside Metropolitan Adelaide

Areas of Interest-Metropolitan Adelaide

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2 MUNICIPAL SUPPLY OF RECYCLABLE ORGANICS

The purpose of this section is to present estimates of the current quantities of garden waste going to landfill and diverted from the municipal waste stream. In particular, it looks at the quantities arising from households and from other council activities, including maintenance of parks and gardens, street sweeping and general clean-up activities.

For information expressed on a local government area or regional basis, quantities referred to are based on materials generated within areas and do not include materials imported from elsewhere.

2.1 Collection and drop off systems

2.1.1 Collection systems

There are 19 councils in metropolitan Adelaide and, of these, ten provide garden waste collections from households. Around 67% of Adelaide metropolitan households are currently being *offered* some kind of garden waste collection service. Marion, West Torrens and Unley provide full fortnightly kerbside collections to all residents using a 240 L MGB. Port Adelaide-Enfield provides a full fortnightly collection from January 2000. Burnside has a monthly service. Charles Sturt, Gawler, Norwood Payneham & St Peters, Playford and Salisbury provide various combinations of user pays collections. The level of service is summarised below in Table 2.1.

Table 2.2 lists garden waste collection services within each of the councils in more detail and provides information on the number of households using the services, based on information obtained from a council survey conducted as part of this review. The questionnaire used for this council survey is provided in Appendix A.

In summary, around 157 000 households or 35% of all households in metropolitan Adelaide are currently *provided* with a garden waste collection service (Table 2.2). The main reason for the large difference (67% vs 35%) is the fact that, in councils offering user-pays garden waste services, only a small proportion of residents sign up (and pay) for the service.

The locality and status of organic collection systems is illustrated in Figure 2.1. There is no regular collection of garden waste in any councils outside of the Adelaide metropolitan area.

Table 2.1: Summary of organics collection systems, metropolitan Adelaide, 1999

Organics Collection Type	Number of Councils	Number of households [1)]	Proportion of households
Full fortnightly collection	5	115 300	25.7%
Fortnightly user-pays - bin only	2	60 400	13.5%
Fortnightly user-pays - both bin and collection	3	74 800	16.7%
Monthly	1	18 000	4.0%
Less than monthly	1	10 000	2.2%
Subtotal: Some kind of RO collection offered	12	278 500	62.2%
No collection	7	169 500	37.8%
Total	**19**	**448 000**	100.0%

Source: Council Survey

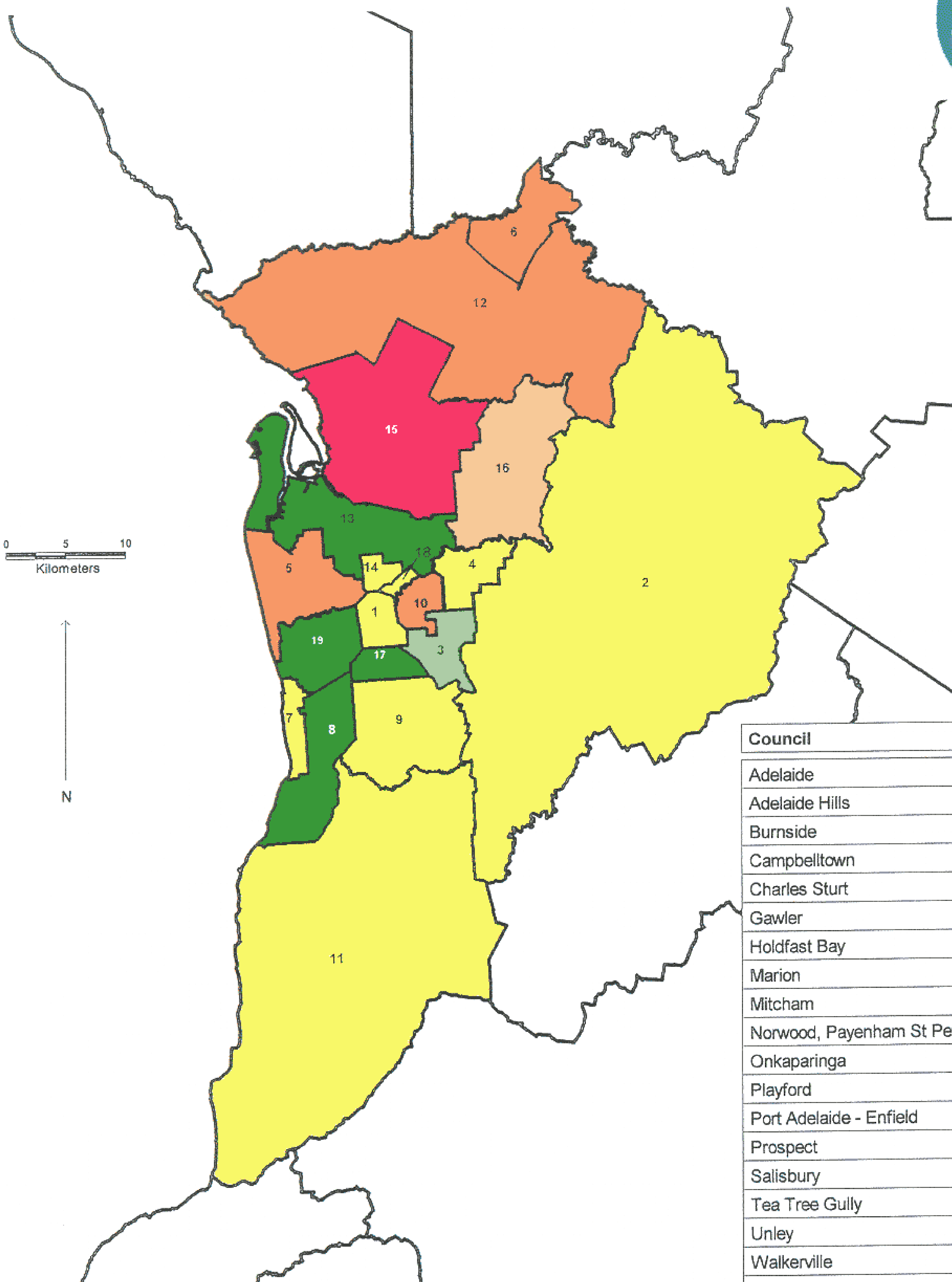
[1)] For user-pays systems, number of households offered the system (not necessarily signed up)

Table 2.2: Summary of kerbside organics collection, metropolitan Adelaide, August 1999

Council	Population	Households	RO collected separately (t/yr)	Number of services provided	Current collection system
Adelaide	16 000	5 500	0	-	no collection provided
Adelaide Hills	37 000	17 000	0	-	no collection provided
Burnside	39 000	18 000	3 700	18 000 plus 1500 user pays	Monthly plus 12 extra services (1 500 hhlds)
Campbelltown	45 000	18 225	0	-	no collection provided
Charles Sturt	103 000	49 500	200[1)]	750 (by end '99)	User-pays – household pays for bin and collection
Gawler	17 000	6 762	200	450	User-pays – bin and coll.
Holdfast Bay	32 000	15 902	0	-	no collection provided
Norwood, Payneham St Peters	35 000	17 500	80	1200	Monthly 240 L MGB– user- pays bin, 1200 residents
Marion	77 430	33 200	11 900	33 200	Fortnightly 240 L MGB
Mitcham	62 700	24 000	0	-	no collection provided
Onkaparinga	146 367	50 000	0	-	no collection provided
Playford	65 000	25 540	470	1 120	User-pays – household pays for bin and collection
Port Adelaide – Enfield	100 000	45 000	[2)]	45 000	Fortnightly 240 L MGB – expecting 5 000
Prospect	19 000	9 000	0	-	no collection provided
Salisbury	112 000	42 728	4 660	10 300	User pays for bin – fortnightly 240L MGB
Tea Tree Gully	95 000	30 000	150	10 000	Via hard waste collection once per year
Unley	35 100	17 500	0[3)]	17 500	Fortnightly, any bin. Commenced September 1999 (expecting 3 500 t/yr)
Walkerville	7 000	3 000	0	-	no collection provided
West Torrens	44 000	19 600	8 200	19 600	Fortnightly 240 L MGB
Total	1,087,597	448 000	**29 600**	**157 000**	

[1)] Commenced July 1999
[2)] Commenced January 2000
[3)] Commenced September, 1999

Source: Council Survey



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Playford	12
Port Adelaide - Enfield	13
Prospect	14
Salisbury	15
Tea Tree Gully	16
Unley	17
Walkerville	18
West Torrens	19

Type of Collection

- Full fortnightly collection
- No collection
- Fortnightly user pays - bin only
- Less than monthly
- Fortnightly user pays - bin and collection
- Monthly

Figure 2.1
Organics Collection Systems in Metropolitan Adelaide

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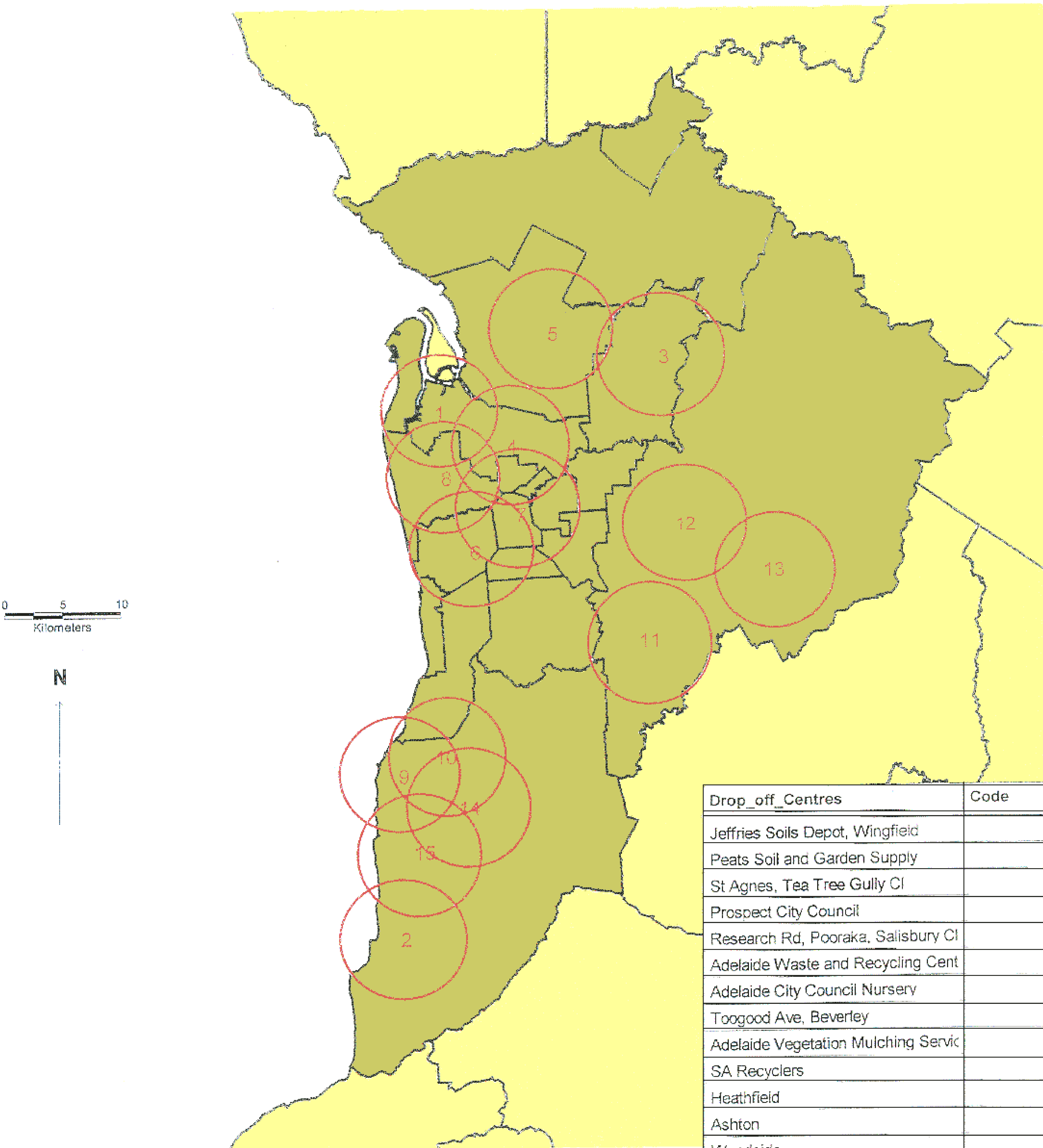
2.1.2 Drop-off facilities – Adelaide metropolitan area

There are currently fifteen facilities providing regular drop-off services to residents in the Adelaide metropolitan area. The facilities are predominantly located in the north, west and southern regions of the city. There are effectively no current facilities located throughout the eastern suburbs, in an arc from Campbelltown through to Mitcham. The drop-off facilities are listed below.

- Jeffries Soils Depot, Wingfield
- Peats Soil and Garden Supply, Willunga
- St Agnes, Tea Tree Gully Council
- Prospect Council Depot
- Research Rd, Pooraka, Salisbury Council
- Adelaide Waste and Recycling Centre (Solo) – West Torrens
- Adelaide City Council Nursery
- Toogood Ave, Beverley
- Adelaide Vegetation Mulching Services, Lonsdale
- SA Composters, Lonsdale
- Heathfield
- Southern Regional Waste Disposal Depot
- Southern Waste Depot (Lucas landfill)
- Ashton
- Woodside

The location of these facilities is displayed in Figure 2.2. Circles of 5km radius have been drawn around each centre to illustrate the extent of the surrounding area deemed convenient for residents to utilise the centre (up to 10-15 minutes one-way travel time).



Drop_off_Centres	Code
Jeffries Soils Depot, Wingfield	1
Peats Soil and Garden Supply	2
St Agnes, Tea Tree Gully Cl	3
Prospect City Council	4
Research Rd, Pooraka, Salisbury Cl	5
Adelaide Waste and Recycling Cent	6
Adelaide City Council Nursery	7
Toogood Ave, Beverley	8
Adelaide Vegetation Mulching Servic	9
SA Recyclers	10
Heathfield	11
Ashton	12
Woodside	13
Southern Region Waste Depot	14
South Waste Depot	15

Figure 2.2
Garden Waste Drop-off Centres in Metropolitan Adelaide

Outside Metropolitan area
Metropolitan area

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2.2 Municipal garden waste generation and recycling

The main source used to obtain information on garden waste in the municipal sector was a survey of councils conducted as part of this study. The survey was conducted for each of the 19 councils in metropolitan Adelaide and the six regional centres.

Survey respondents were asked to provide information on the quantity of garden wastes currently being disposed of in the domestic residual waste stream. In most cases, respondents were able to provide a reasonably accurate estimate of the tonnages of household waste generated per annum, and this was combined with waste audit figures produced by Recycle 2000 in 1998.

Reliable data was more available in the Adelaide metropolitan area than in regional centres. The quantities of garden waste disposed of were based on the proportion of garden waste present in the waste stream (from the latest available waste compositional surveys) and the annual quantity of garbage disposed.

2.2.1 Garden wastes avoidance

The impact of home composting programs is difficult to measure, because the level of material processed this way depends on a range of factors which are not known.

The following relationship has been used to provide a rough estimate of garden waste quantities composted in residential gardens:

$$QA = P \times PH \times GH \times GC$$

where;

QA equals the total garden waste currently avoided

P equals the current population

PH equals the percentage of the population currently home composting

GH equals the percentage of garden waste used for home composting

GC equals the average mass of garden waste generated per capita

The proportion of households home composting (PH) has been estimated at 17%, based on interstate studies (EPA NSW; 1995). The percentage of garden wastes used in home composting (GH) was set at 50% by weight, with the remainder assumed to be either separately collected or disposed of (tree prunings etc). Per capita household total garden waste figures were derived from domestic garden waste recycled figures and domestic garden waste disposed figures obtained in the Council survey.

Based on these estimates, approximately 14 000 tonnes of garden waste was avoided in SA in 1998-9 through the use of home composting systems.

2.2.2 Council garden wastes

The survey also sought to obtain information on council parks and gardens wastes. From the responses received, practically all of this material is either processed and re-used by councils, offered to residents for re-use, or processed at privately-run facilities. The quantity of garden wastes being disposed of to landfill from council parks and gardens activities was found to be negligible.

The *Blueprint for Integrated Resource Recovery within Metropolitan Adelaide* (Recycle 2000 1997) indicated that around 15% of the 'other' municipal wastes disposed of to landfill by councils was from parks and gardens. This represents a total for the Adelaide metropolitan area of 10 400 t/yr. By comparison, it was estimated that around 18 000 t/yr of parks and garden wastes and street sweepings were composted or mulched and re-used by councils. This recycling has already been at least partly included in the flows of material generated through the drop-off facilities operated by Tea Tree Gully, Prospect, Salisbury, Charles Sturt, Adelaide City Council and Adelaide Hills Councils.

Because of the nature of direct re-use, most councils had little accurate information on the quantity of materials. The estimated quantity of municipal and domestic garden wastes taken to drop–off facilities is 39 300 t/yr.

2.2.3 Quantity collected from kerbside

The council survey found that around 161 000 tonnes of garden wastes were generated in metropolitan Adelaide in 1998-9 from kerbside collections or through drop-off facilities linked to local government authorities. Of this material, 29 600 tonnes were collected in regular garden waste collection services provided by some councils. These collection services and the quantities collected through these services are listed in Table 2.2. The provision of collection services is also illustrated in Figure 2.1 (for details refer Table 5.2).

In summary, 143 000 (32%) of households in metropolitan Adelaide are currently being serviced by a regular separate kerbside collection of garden wastes. An additional 135 000 households (30%) can choose to have a separate collection of garden wastes on a user-pays basis. Of these, only a very small proportion of households are currently signing up for this service. The remainder (38% of households) must access drop-off points if they want to recycle their garden wastes other than through home composting.

2.2.4 Quantity dropped-off

In the greater Adelaide metropolitan area, 25 000 t/yr of garden wastes were dropped off at facilities co-ordinated by government. A further 14 300 t/yr of garden wastes were dropped off from households (or service providers like mowing services) at privately operated facilities. A total of 39 300 t/yr of garden wastes were dropped off from the domestic and municipal sector.

2.2.5 Regional Centres

In the six regional centres combined, the survey found an estimated 20 250 t/yr of garden wastes are generated, of which 2 250 t/yr are delivered by residents to drop off facilities provided by councils. The remaining 18 000 t/yr end up in landfills.

2.2.6 Seasonal Variations

To provide an indication of seasonal variation in garden waste supply, data on seasonal yield was obtained from the three Northern Adelaide Waste Management Authority (NAWMA) Councils. Accurate predictions of seasonal trends in any of the Adelaide collections are difficult because of the relative newness of most of the schemes, and the significant changes that have taken place in councils like Burnside. The NAWMA Councils data from September 1998 to August 1999 appeared both reliable in its collection and captured the councils during a relatively stable service-provision period.

The data indicates relative seasonal stability of supply of these materials over the year, with the highest supply of materials occurring during spring and winter. The lowest generation period is summer, indicating that the semi-arid climatic conditions of Adelaide may mitigate against garden waste generation during this period.

This seasonal variation is displayed graphically in Figure 2.3.

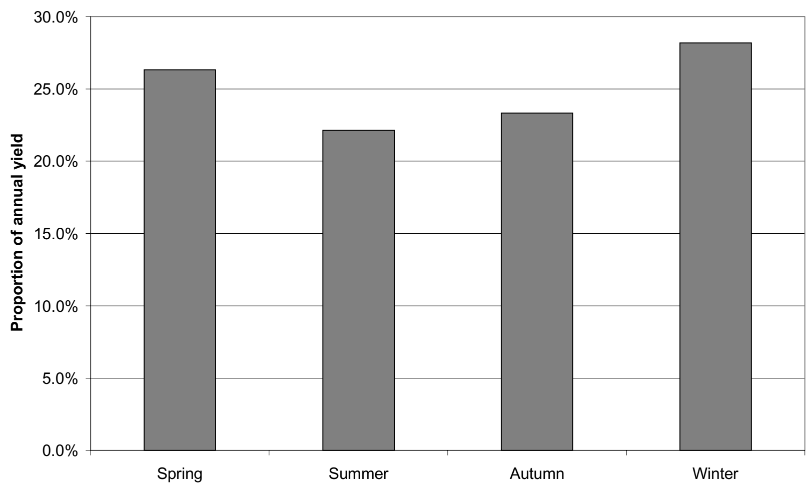

Figure 2.3: Seasonal variation in domestic garden waste generation

2.3 Summary of municipal RO quantities

An estimated 161 000 t/yr of municipal RO are currently generated for disposal and recycling in the Adelaide metropolitan region. The per capita garden waste generation that is either sent to landfill or recycled is estimated to be 148 kg/cap/yr.

In total, around 69 000 t/yr were recovered by kerbside collection and drop-off services, with the remaining 92 000 t/yr ending up in landfill (refer Table 2.3). This equates to around 43% of municipal garden waste being recycled at present.

In the six regional centres, approximately 10% of the 20 000 t/yr of RO generated are being recycled (predominantly mulched), with the remainder being disposed of at landfills.

Table 2.3: Summary of municipal RO quantities (Adelaide)

Municipal Garden Waste Streams	Quantities (t/yr)	(%)	Comment
Collected via dedicated domestic garden waste collection systems	29 600	43%	recycled
Received at drop-off centres (residents and council garden waste)	39 300		
Collected via garbage collection	92 000	57%	landfilled
Total	160 900	100%	
Source: Council Survey			

3 SUPPLY OF NON-MUNICIPAL RECYCLABLE ORGANICS

Recyclable organic wastes are generated across South Australia from both urban and rural locations, from residential, commercial/industrial and construction/demolition sources. The scope of this project does not extend to a quantification and discussion of all organic wastes, including biosolids, wool scouring wastes, timber wastes and manures. Indeed it would be extremely difficult to accurately quantify the generation of these materials because of the extensive on-site re-use, and the disposal of on-farm organic wastes.

This section focuses on the supply of non-municipal recyclable organics (organic waste originating from parks, yards, road reserves and gardens, refer Glossary) from the Adelaide metropolitan area and the regional centres.

The composition of non-municipal wastes disposed of in Adelaide was estimated by the Environment Protection Agency (EPA) in a landfill audit conducted in November and December 1998 It involved a physical and visual inspection of wastes disposed of at the Adelaide City Council landfill at Wingfield. Data was also collected from five other landfill sites during the audit, which was conducted over a period of one week.

EPA SA has advised that these audit figures can be used to estimate annual quantities of non-municipal wastes. The quantities of these materials, in particular construction/demolition (C&D) waste, seem high when compared to figures from other capital cities. Reasons for this may include the following:

1. The catchment area from which wastes were delivered to landfills during the audits included a number of communities and industries located outside metropolitan Adelaide. From the results, it was not possible to clearly distinguish between waste sourced from metropolitan Adelaide and that sourced from outer regions.

2. As waste quantities vary over time (seasonal fluctuations, impact of major building activities etc), an extrapolation from a one-week audit to a full one-year period can result in a considerable margin of error.

3.1 Commercial and industrial recyclable organics

3.1.1 Disposal of commercial recyclable organics

The quantities of commercial and industrial (C&I) wastes disposed of to landfill were estimated at 303 000 t/yr, according to recent audit figures. The composition of this stream is presented in Table 3.1.

Table 3.1: Composition and quantities of C&I wastes disposed of to landfill, Adelaide metropolitan area, 1998

Material type	Proportion of C&I stream	Estimated t/yr
Food/kitchen	23.2%	70 267
Cardboard	16.8%	50 883
Garbags	11.5%	34 831
Paper	8.9%	26 956
Wood/timber	***6.8%***	***20 596***
Soil	6.1%	18 475
Bags/film	5.2%	15 750
Vegetation/garden	***4.3%***	***13 024***
Tyres/rubber	3.9%	11 812
Other	13.1%	39 677
Total	100%	302 876
Source: EPA SA; 1999: Waste Audit Data		

Based on this audit data, there are approximately 21 000 t/yr of wood and timber wastes going to landfill, along with another 13 000 t/yr of garden wastes. There is also a significant proportion of food wastes and soils in this waste stream.

Data on the C&I waste profile for each of the regional centres is not available.

3.1.2 Recycling of commercial organics

For the purpose of this review, the definition of commercial and industrial recyclable organics has been confined to the supply of materials from commercial and industrial premises only. The supply of cuttings and prunings from commercial contractors has been classified as municipal garden wastes, and is included in the data provided in the previous section.

Major commercial operators like Mobile Reclaimers, AWRC and Jeffries Soils report receiving loads of pallets from larger commercial sites, and smaller infrequent loads are reported at other drop-off facilities. The total of recyclable organics and timber waste recovered from the C&I sector in metropolitan Adelaide is estimated to be 14 220 t/yr.

3.2 Construction and demolition recyclable organics

3.2.1 Disposal of construction and demolition recyclable organics

Based on the most recent audit (EPA SA; 1999), around 1 024 000 t/yr of C&D waste are disposed of to landfill. The composition is shown in Table 3.2.

Table 3.2: Composition and quantities of C&D waste disposed of to landfill, metropolitan Adelaide, 1999

Material type	Composition of C&D waste stream	Estimated t/yr
Soil	32.4%	331 898
Clean fill	23.1%	236 631
Clay	15.7%	160 827
Rubble	7.7%	78 877
Concrete	7.2%	73 755
Rocks/bricks	6.6%	67 609
Other	***7.4%***	***75 804***
Total	100%	1 024 378
Source: EPA SA; 1999: Waste Audit Data		

It can be assumed that a significant proportion of the 'other' wastes reported in the C&D waste stream are timber wastes and, to a lesser extent, garden wastes. It is therefore estimated that timber and garden wastes from the C&D stream amount to around 25 000 t/yr. Of this, a certain quantity is treated timber, which may not be suitable for composting.

3.2.2 Recycling of construction and demolition organics

Recovery of C&D wastes is conducted by a small number of facilities in the Adelaide region. Information provided by processors indicates that around 9 500 t/yr of recyclable organics from C&D waste are recycled in metropolitan Adelaide.

3.3 Other organic materials

3.3.1 Biosolids

Biosolids (or sewage sludge) are the stabilised organic solids produced as a by-product from the treatment of wastewater and sewage that, in most cases, can be beneficially recycled. Biosolids contain organic matter and plant nutrients, and hence provide a useful soil conditioner and medium grade fertiliser. They also contain numerous pathogenic bacteria, viruses, protozoa, helminths and fungi, which can be destroyed by treatment like composting.

Early in 1999, the corporatised State Government water utility SA Water announced that it would give away biosolids stockpiled at its Bolivar facility. Detailed information on the give-away has been obtained through discussions with industry representatives and technical experts in the State. SA Water was unable to assist with the preparation of this section of the report.

It is understood that there is approximately 300 000 tonnes of biosolids stockpiled at the Bolivar site. Around 20 000 tonnes of biosolids are apparently generated each year. The stockpiling of the material has presented storage problems for SA Water, which has sought ways of disposing of the product. Representatives from the State's composting industry held discussions with SA Water from early 1998 to develop plans for the composting of the material; however, these were not implemented.

Land application of biosolids can increase soil fertility and provide some nutrients to the soil. The main technical constraint of applying biosolids to land is that they contain varying levels of contaminants—in particular, heavy metals and organic pollutants. Limits are therefore applied to the rate of application to ensure that the contaminant content of the soil does not exceed accepted thresholds.

For crops grown for human consumption, where the harvested part of the crop touches the biosolids/soil mixture (eg lettuce, carrots, potatoes, etc), a significant lag time (eg greater than eighteen months) should be provided from the time the biosolids are applied to the time the crop is grown. Where harvested parts do not touch the soil/biosolids mixture (eg broad acre crops, almonds, stone fruits and grape vineyards), there is a reduced risk associated with biosolids application, hence site activities are much less constrained.

Earlier in 1999, SA Water released a brochure outlining the terms of its give-away. In summary these include:

- a minimum order of 100 tonnes
- analysis of the biosolids (at SA Water's expense)
- details of the receiving land, including a soil survey and analysis of existing metals (at SA Water's expense)
- a declaration that the proposed application will not contradict the general restrictions on the use of biosolids.

The maximum application rate is expected to be in the range of 5-15 t/ha, depending on the concentration of metals in the batch, and the receiving topsoil and crop nutrient requirements.

SA Water indicated that approximately 15 000 tonnes of biosolids have been taken in the first half of 1999. They also indicated that a trial at the Roseworthy Agricultural College since 1990 indicated that applications of 1 to 1.5 t/ha would be adequate to maintain nutrient levels and productivity, and would be cost-effective at a price of approximately $30/tonne.

While it is likely that the main take-up of biosolids will be in broad acre applications, SA Water has also targeted viticulture and other permanent plantings (fruit trees, olives) in its promotion of the give-away. This, combined with the large quantity of biosolids available and their relatively low price—considering the free technical support and the independent estimation of its value at $30/tonne (SA Water, 1999)—would indicate that the material might become a rival to composted products.

At the time of writing, it was unclear whether commercial composters can or cannot take advantage of the give-away offered by SA Water. This was a major concern to some of the composters in the Adelaide region. Certainly, if its primary goal is to clear the stockpile of material at Bolivar (as the give-away appears to be at a cost to SA Water), then it would seem advantageous to have the compost and soil amendment industry involved.

3.3.2 Farm wastes

Some cow and chicken manures are sourced from the Adelaide Hills regions and processed by operators in the Adelaide Hills. These will be covered in more detail in section 6. There are also small quantities of straw produced in the Adelaide hills, although these are in general produced outside the metropolitan region.

3.3.3 Wool scourings

A major supply of recyclable organic material is wool scourings from G.H. Michell & Sons Pty Ltd. The scourings are produced from the cleaning and processing of the wool fibres for spinning and include dirt, grease, suint (potassium-based sheep sweat), seeds and broken wool fibres. Carbonising of some wool types produced a dust with the scourings. The scourings were taken by Jeffries Soils for processing, but the dusts caused treatment problems and forced the processing costs too high. Currently the scourings are being trialed by Salisbury Council and Fertico, and Cleanaway is using the material in their bio-remediation works at their Wingfield facility.

Michells are attempting to improve the quality of the scourings by extracting sludges, and through composting trials with Salisbury Council. These trials have been operating since May 1999.

3.3.4 Other

Jeffries also used to process foundry dust, but have stopped using these materials, primarily because of increased handling costs. These costs were incurred by the dust suppression measures necessary to minimise impact on commercial and industrial activities in the Wingfield area. They still handle small quantities of liquid and grease-trap sludges, dry cleaning wastes, processed chicken fats, quarry slurries and limestone dust.

Cleanaway operates a biosolids treatment facility at Gillman.

4 SUMMARY OF TOTAL SUPPLY OF ORGANIC WASTES

The total quantity of organic wastes recycled in metropolitan Adelaide is approximately 93 000 t/yr, or 38% of all RO being collected. Of this, 69 000 tonnes are recovered from the domestic waste stream, and 23 700 from the commercial and construction waste streams. The total quantity of RO disposed of to landfill is 151 000 t/yr, or 62%.

The majority of garden wastes generated in Adelaide are sourced from the municipal sector (66%). It is this sector which has the largest potential for further waste reduction (57% of municipal garden wastes are currently sent to landfill for disposal). Table 4.1 provides a summary of recycled organics generated, disposed of and recycled.

The total quantities collected in rural centres amount to around 20 000 t/yr, with 11% recycled and 89% being sent to landfill.

In addition, approximately 75 000 t/yr of other organic materials, such as biosolids, wool scouring wastes, manures and grape marc, are currently being recycled. Manures and other organic materials sourced (and re-used or disposed of) outside the metropolitan and rural centres are not included in the above.

Table 4.1: Summary of total recyclable organics, metropolitan Adelaide and regional centres, 1999 (t/yr)

	Disposal		Recycled		Total	
	(t/yr)	(%)	(t/yr)	(%)	(t/yr)	(%)
Metropolitan Adelaide						
Municipal	92 000	61%	69 000	74%	161 000	66%
Commercial and Industrial	34 000	23%	14 200	15%	48 200	20%
Construction and Demolition	25 000	17%	9 500	10%	34 500	14%
Total Recyclable Organics in metropolitan Adelaide (t/yr)	151 000	100%	92 700	100%	243 700	100%
(%)	62%		38%		100%	
Regional Centres	18 000		2 250		20 250	

5 ORGANIC WASTE FLOW PROJECTIONS

5.1 Changes to Municipal Collection systems

A number of Councils are proposing changes to their garden waste collection services. While almost half of the Councils in the Adelaide Metropolitan Region, and all of the Councils representing major regional centres in the State, do not currently provide some type of regular garden waste collection service, there is a general trend by a majority of Councils to review the possibility of providing this type of service.

There are six Councils in metropolitan Adelaide which have committed to upgrading or introducing garden waste collections in 2000. These are Charles Sturt (started in July 1999), Gawler, Playford, Port Adelaide-Enfield (start in January 2000), Prospect and Unley (started in September 1999). Three more Councils have indicated they are considering a review of this service (Campbelltown, Mitcham, Tea Tree Gully), and only three councils have indicated no plans to offer this type of service in any form (Adelaide, Adelaide Hills, Onkaparinga). Details are listed in Table 5.1.

5.1.1 Kerbside collection types

Currently, Marion, West Torrens and Unley provide a regular, fortnightly, containerised garden waste collection. This system has the advantage of maximising the yield of recycled organics, although processors have complained that this is more than offset by the high levels of contamination from this type of collection. Processors report contamination levels up to 5%, which represents significant problems in processing and marketing the materials as higher value-added products.

Councils have conducted various campaigns to reduce contamination, including tagging of bins and education programs. Recent approaches by councils in the eastern states suggest that most of the contamination may be generated by a small number of households. Councils that identify and target these households have had significant success in improving the quality of the materials generated.

Salisbury and Burnside offer user-pays collections where residents pay for the bin only (although Burnside does also offer a free monthly kerbside collection). These schemes, with appropriate management, tend to compromise between reducing contamination to a manageable level and reducing the supply of recycled organic materials. Burnside has recently improved the management of its system, and Jeffries Soils is now receiving the collected RO.

Playford, Gawler and Charles Sturt have implemented full user-pays garden waste collection systems where the residents pay both the cost of the bin and an annual collection fee. This tends to significantly reduce the quantity of material recovered, although the material that is recovered normally has very low levels of contamination. Playford and Gawler are moving to the Salisbury model (see above and Table 5.1) next year.

There appears to be a general shift towards the introduction of this bin-only user-pays system, which results in lower levels of contamination, but also in substantially lower levels of organic material recycling than in full kerbside collections.

5.2 Changes to drop-off and transfer facilities

A reasonably extensive network of drop-off facilities for garden wastes exists in the Adelaide metropolitan area. The only major under-supply of suitable facilities is in the eastern and south eastern suburbs of the city, and to a lesser extent in the far north of the city. The need for this second drop-off coverage is mitigated significantly by the provision and planned upgrade of a regular collection service in that part of the city.

Mitcham Council is currently considering re-opening its former Linton landfill as a transfer and garden waste drop-off facility.

Some changes to the provision of these drop-off facilities may occur if and when Jeffries Soils and Peat Soils relocate their composting operations because of site restrictions. It is possible that Jeffries may continue to operate a drop off and transfer facility at Wingfield, while the levels of organics delivered directly to Peat's Aldinga site are so small that a relocation is unlikely to significantly affect supply.

No other drop-off sites reported any major constraints on their capacity to handle increased flows of materials. The current situation tends to suggest that any increases in supply of garden wastes are more likely to come from improved collection than from increased drop-off.

5.3 Forecast changes in municipal supply

Based on current rates of supply and proposed changes in collection services, it is forecast that the municipal supply of garden wastes in metropolitan Adelaide will increase from 69 000 t/yr to 98 000 t/yr over the next couple of years. These changes in supply of garden wastes are presented in Table 5.1.

If councils continue to upgrade and increase the levels of service, and remaining councils (Onkaparinga, Walkerville and Mitcham) commence regular collections, it is possible that the maximum municipal supply of RO may reach 85-90% of the total quantity generated, in the order of 140 000 t/yr in the longer term.

The rate of increase for regional centres over the next two years is expected to be slower, because of a lack of resources and suitable large-scale processing facilities adjacent to these centres. It is possible that there could be an increase in supply of up to 1 000 t/yr if Whyalla develops some kind of user-pays collection, and Murray Bridge increases the provision of drop-off facilities to its residents. These changes in supply of garden waste are presented in Table 5.2.

Table 5.1: Current and projected supply of garden waste, metropolitan Adelaide, by 2001

Council	Estimated garden waste currently disposed of (t/yr)	Garden waste recycled (t/yr)	Drop off (t/yr)	Total current diversion (t/yr)	Current garden waste collection system	Proposed changes to collection system	Estimated supply of garden waste by 2001 (t/yr)
Adelaide	1000	0	4 500	4 500	None	No changes considered in short run	4 500
Adelaide Hills	1000	0	2 750	2 750	None	None	2 750
Burnside	540	3 700	0	3 700	Monthly plus 12 extra services @ $24/annum (1500)	No change	3 700
Campbelltown	7250	0	0	0	None	Considering review	1 000
Charles Sturt	1900	200	2 100	2 300	User pays for bin and collection – 240 L MGB fortnightly	Expanding new system	7 300
Gawler	1000	200	0	200	User pays for bin and collection – 240 L MGB fortnightly	Moving to user pays for bin only, 1 July 2000	700
Holdfast Bay	5100	0	0	0	None	July 2000 - currently considering tender	2 000
Norwood, Payneham, St Peters	3840	80	0	80	User pays for bin and collection – 240 L MGB fortnightly	Review in 2000	2 080
Marion	1500	11 900	0	11 900	Fortnightly 240 L MGB – full kerbside	Continue with existing system	11 900
Mitcham	6300	0	0	0	None	Will review systems	1 000
Onkaparinga	13500	0	2 500	2 500	None	Nothing proposed	2 500

Table 5.1: Current and projected supply of garden waste, metropolitan Adelaide, by 2001 (cont.)

Council	Estimated garden waste currently disposed of to landfill	Garden waste collection - tonnes recycled per annum	Drop-off t/yr	Total diversion	Current garden waste collection system	Proposed changes to collection system	Estimated supply of garden wastes by 2001
Playford	4400	470	0	470	User pays for bin and collection – 240 L MGB fortnightly	Moving to user-pays for bin only 1 July 2000	1 970
Port Adelaide - Enfield	19800	0	0	0	Fortnightly 240 L MGB– full kerbside	From January 1, 2000	5 000
Prospect	2500	0	60	60	None	240 L fortnightly kerbside	2 060
Salisbury	5400	4 660	5 000	9 660	User pays for bin only – 240 L MGB fortnightly	No changes proposed	9 660
Tea Tree Gully	10500	150	2 750	2 900	Through hard waste collection	possible review to expanded 240 L fortnightly in 2 years	7 900
Unley	4500	0	0	0	Fortnightly 240 L MGB– full kerbside	From Sept. 1999	3 500
Walkerville	1200	0	0	0	None	Considering kerbside collection - in next 12 months	500
West Torrens	680	8 200	5 000	13 200	Fortnightly 240 L MGB– full kerbside	Fortnightly 240 L since Nov 98	13 200
Other drop off facilities			14 640	14 640			14 640
Total	**92 010**	**29 600**	**39 300**	**69 000**			**98 000**
Source: Council Survey							

Table 5.2: Regional garden waste profile and drop-off rates, South Australia, 1999 - 2001

Council	Estimated garden waste disposed of to landfill	Garden waste collection - tonnes recycled per annum	Current collection system	Proposed collection system	Drop off t/yr	Total garden waste recovered per annum	Projected organics recycling per annum
Mt Gambier	3 000	-	Drop-off service	None	450	450	450
Murray Bridge	1 300	-	Drop-off system	Considering collection service	Unknown - small quantities	0	500
Port Augusta	2 200	-	Separation at dump	None	350	350	350
Port Lincoln	1 000	-	Drop-off system	None, no funds	300	300	300
Port Pirie Regional Council	7 500	-	Drop-off system	None, no funds	150	150	300
Whyalla	3 000	-	Drop-off system	Considering user-pays system, no container	1 000	1 000	1 500
Total	**18 000**	**-**			**2 250**	**2 250**	**3 750**
Source: Council Survey							

5.4 Changes in non-municipal supply

A significant change in overall quantities of C&I and C&D organic wastes generated is not expected. The rate of recovery of these materials is, however, expected to increase from the current 29% to up to 80% in the long term. This change is expected as RO from commercial generators are highly sought-after by processors, due to the high quality of material with minimal contamination and the demand for composts derived from these materials. The impact of a change to 80% recovery is presented in Table 5.3.

Table 5.3: Projected Non-Municipal Quantities (t/yr)

	Waste Stream	Disposal	Recycled	Total
Current	Commercial and Industrial	34 000	14 200	48 200
	Construction and Demolition	25 000	9 500	34 500
	Total	59 000	23 700	82 700
Maximum long-term	Total	16 500	66 200	82 700

5.5 Recycled organics projections - summary

Table 5.4 lists expected organic waste quantities requiring processing in the year 2001, and maximum potential quantities which could be diverted in the longer term (2004). Again, the materials have been separated into the category *Recyclable Organics* (RO) as per definition and other organic materials. These include wool scouring wastes, biosolids and—in smaller quantities—food, grease trap and other wastes that, to a certain degree, may compete in some markets with RO derived products. RO are expected to increase from currently 92 000 t/yr to 143 000 t/yr in 2001-02, and up to a maximum of 206 000 t/yr in the long term.

The quantity of other organic materials being processed is not expected to increase significantly, as suitable materials (eg grape marc) have been in high demand in the past, and other materials (eg food wastes) are much more difficult to process (refer sections 3.3.1 and 6.3). However, the quantity of biosolids remains the greatest unknown as the supply is almost unlimited (refer section 3.3), and it will depend on the future prices, incentives and promotional campaigns as to how much will actually be fed into the market.

Table 5.4: Summary of projected recycled organics requiring processing in metropolitan Adelaide (t/yr)

	1999	2001–2	Maximum
Municipal	69 000	98 000	140 000
Non-Municipal	23 700	45 000	66 000
Total RO	**92 700**	**143 000**	**206 000**
Other organic materials	50 000	55 000	60 000
Biosolids[1)]	25 000	25 000	25 000
Grand total – RO & other organics	167 000	223 000	291 000

[1)] For this summary, biosolids quantities are assumed to remain unchanged

6 PROCESSING SYSTEMS

6.1 Introduction

The provision of suitably located and equipped processing facilities is likely to be critical to the efficient transformation of garden wastes into market-competitive soil enhancement products.

To identify existing and planned garden waste processing systems, established processors were surveyed. These were referenced with information provided by councils on the destination of their garden wastes to compile a complete picture of the current processing industry.

6.2 Licence conditions

Under the current *Environment Protection Act 1993* (the Act), operators who wish to compost and produce more than 200 t/yr of finished product must be licensed. Operators of transfer stations and/or waste depots are required to have organic waste moved from their premises within seven days of receipt.

Composting licences are issued to applicants who meet the criteria set by the EPA—in particular that they are operating their facility with suitable minimum buffer zones to neighbouring premises (500 m). There are currently eleven composting licences issued to operators in or around the greater Adelaide metropolitan area.

6.3 Processors

In Adelaide there are two main types of processing facilities:

- fully licensed composters
- other processors producing mulches and other products.

Figure 6.1 illustrates the location of major RO processors in Adelaide.

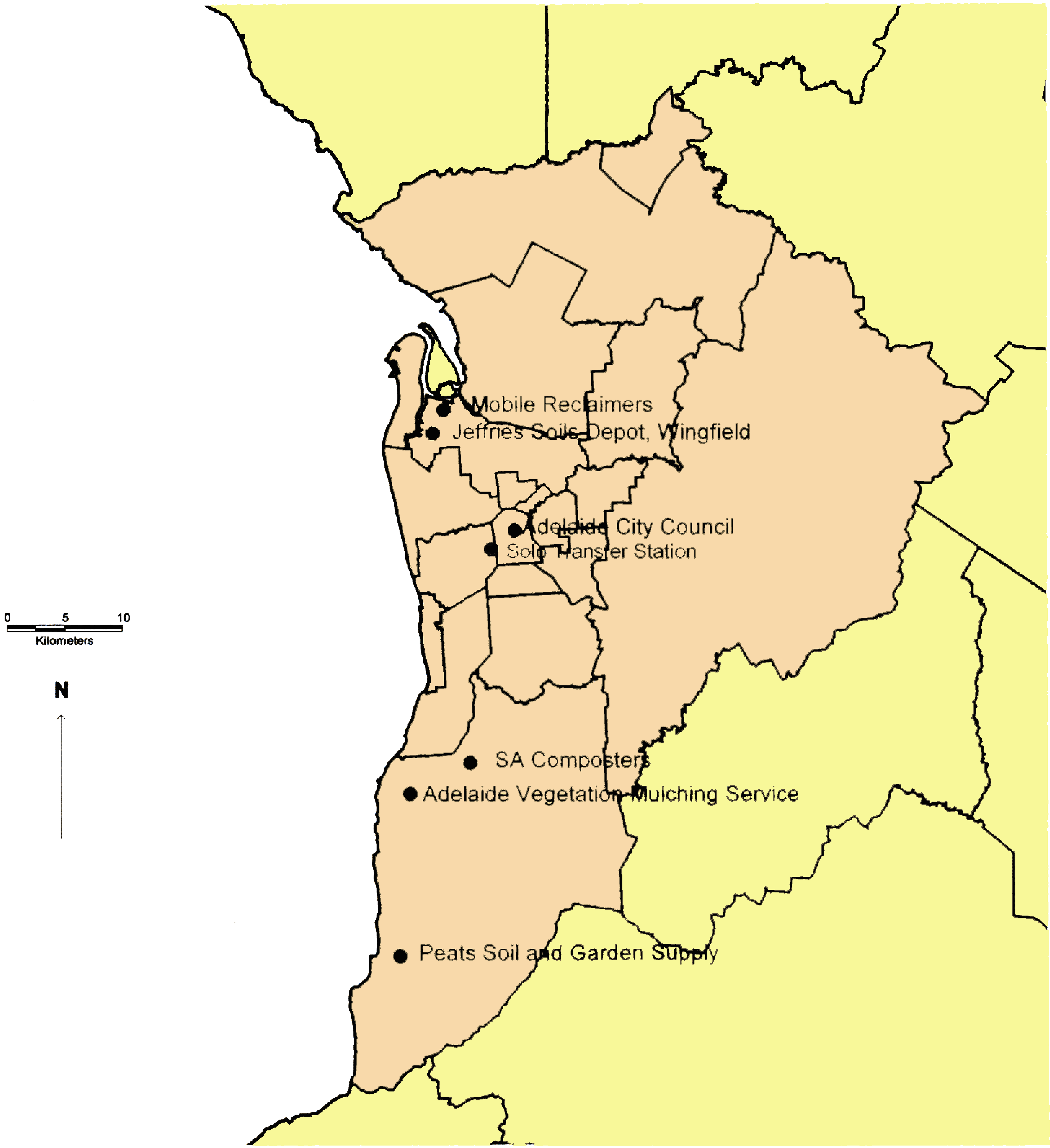

Figure 6.1
Recyclable Organics Processing Facilities

Environment Protection Agency
Review of Organic Wastes in SA

6.3.1 Licenced composting facilities

a) Peats Soil and Garden Supply

b) Jeffries Garden Soils

c) Johnsons

d) Adelaide City Council

e) Adelaide Vegetation Mulching Services

f) Fin Pty Ltd

g) Neutrog

h) Fertico

i) SA Recyclers

j) Cleanaway – Wingfield

6.3.2 Other processing facilities

a) Mobile Reclaimers

b) Tea Tree Gully Council

c) Garden Island

d) Charles Sturt Council – Toogood Ave, Beverley

e) JJJ Recyclers

f) Southern Waste Depot

6.4 The Need for RO Processing Capacity

Approximately 166 000 t/yr of organic material is currently processed in and around the Adelaide region. Of this, 92 700 t/yr are recycled organics (garden and timber wastes, refer Table 4.1 and Table 5.4). The remainder is made up of other materials required for soil amendment, and landscaping materials such as wool scouring waste, manures, grape marc and bark.

While it is difficult to accurately quantify the total processing capacity in Adelaide, there may be some excess capacity in some facilities. However, this often depends heavily on the type of material. When considering the current overall 'potential' capacity, the following should be noted:

1. most processors also require materials other than garden wastes for their operation
2. most processors who claimed to have excess capacity stated that they would only accept materials other than garden wastes from domestic sources (which is the largest component of RO in Adelaide)
3. many processors listed do not fully compost
4. some processors may have overstated their excess capacity.

Considering the above, the actual processing capacity for *composting of Recyclable Organics* is at its limit at the present time in Adelaide. This has been confirmed through discussions with the major processors of garden wastes.

A key issue that has been identified by the six major processors is the need for suitable sites where they can relocate some or all of their composting operations. All processors have expressed problems relating to buffer distances, encroachment by other land uses, and the need to be located close to both supply and markets.

This indicates that the key issue for establishing long-term organic waste processing facilities to meet Adelaide's needs well in to the next century is the location and establishment of sites that:

- are close to both supply and markets
- are sufficiently protected to ensure unfettered processing activities
- provide long-term security without encroachment by other commercial and residential activities.

Given these criteria, there are benefits from a planning perspective in establishing a smaller number of larger sites than a larger number of smaller facilities. This will both reduce the risk of encroachment and the possibility of higher buffer zone demands.

6.5 Proposed Sites for Processing Systems

The provision of new RO processing sites has been an emerging issue in waste management policy and urban planning in South Australia.

Both major processing facilities in Adelaide have been severely constrained by the limited capacities of their sites—both in useable space and in proximity to adjacent residential and industrial land uses. The establishment of facilities that are located relatively close to metropolitan areas and en route to key markets is critical to minimising the transport costs associated with garden waste recycling.

Planning SA has completed two studies on site assessments of suitable locations for new sites both north and south of the metropolitan area. The report was not public at the time of preparing this review.

In general, there is a higher number of suitable sites to the north of Adelaide because of the geography, topography and land use, in particular around the Barker inlet. Sites close to the city south of Adelaide are more difficult to locate. This is partly because of the continued expansion of housing along the southern beaches and the high land values for non-residential applications, in particular viticulture.

Five sites have been identified by the EPA for discussion in this report, although there have been more than 16 sites considered in preliminary planning work. Potential sites to the north of the city of Adelaide include St. Kilda Radio Research Station, Gillman Land Management Corporation, and Penfield. Sites to the south include Pedlar Creek Landfill and Pioneer and Rocla Sand Pits at Maslin Beach.

6.6 Significant Barriers

The development of an efficient organic waste processing industry will require both planning and co-ordination by government, and investment and good management by processors. Because this is an infant industry, there is the potential both for mistakes to be made and for unforeseen problems to emerge. Consideration of the potential barriers to the development of this industry will assist in minimising problems that may arise over the next few years.

6.6.1 Technical Barriers

a) Risk of a shortfall in processing capacity

The rate of garden waste recycling has been rising steadily over the past five years in Adelaide, and is expected to increase by another 59 000 t/yr within the next couple years. There is still another 151 000 t/yr of garden waste currently going to landfill. The existing system is nearing capacity and new processing sites are being considered. It is important to ensure that all new sites provide sufficient scale of expansion both for the increases in garden waste processing and to accommodate the growth in the non-residential supply and processing of organic materials.

Three processors north of Adelaide, one in the hills and one south of the city have indicated they are either at capacity and/or they urgently require to relocate to a more suitable location. For this reason, the establishment of suitable processing locations is critical to the development of the industry.

b) Uncertainty of supply

It is rare to find an industry that has such little control over the supply of its key inputs. Processors of garden wastes have little control over the amount of material supplied to them or the condition it is in. Any measures which can be taken to provide some longer term security both of the quality and quantity of materials would reduce risk in the industry and enable processors to establish routines and reduce costs.

c) Contamination of Garden Waste

Contamination of collected garden waste is a common problem being experienced by the waste industry. High contamination levels reduce the value of the material, require development of further screening technologies, and reduce consumer confidence in the quality of the product being supplied.

'User-pays' schemes, which collect organics only from residents who make a contribution towards the collection costs, have the advantage of significantly increasing the quality of the material collected. However, they also severely limit the quantity of material collected. As an interim step, they enable councils to introduce collections without major increases in rates, and promote high quality collection. However, in the long term, councils may need to consider other collection systems. The participation rate ceiling for user-pays collection is around 30%.

There are two types of garden waste contamination:

- ⇒ visible contamination, which comprises solid materials such as plastics, stones, bricks and metal objects that have entered the garden waste stream
- ⇒ non-visible contamination, which comprises residual chemicals from pesticide application.

Visible Contamination

There are three primary parties involved in garden waste diversion: contractors who collect material either from kerbside or drop-off centres, municipal authorities, and processors. The issue of what represents an 'acceptable' level of contamination and the appropriate level of responsibility borne by the parties involved is currently the subject of some debate.

Contamination levels of 4–5% are generally regarded as very high, with levels of 1–2% more manageable (all % by weight). In discussions concerning contamination, there is still often confusion as to whether percentage figures represent weight or volume. Experienced operators tend to prefer volume based figures, with 4–5 % by volume considered an average level of contamination, which can be reduced over time through ongoing educational measures.

During the conduct of this report, council Waste Managers were asked about contamination levels in their garden waste collection systems. Contamination levels for full kerbside systems were generally around 4–5%, while those for full user-pays systems were as low as 1%.

Increased contamination levels lead to increased processing costs, and hence a reduction in product quality and available markets. For example, it presently costs around of $8–10 /tonne to manually remove bulk contaminants from loads in order to achieve acceptable levels for processing. Given that total processing costs for windrow composting of garden wastes are in the order of $25–$35/tonne, contaminant removal represents a significant proportion of costs.

Non-Visible Contamination

To date, non-visible contamination has not presented significant problems for garden material sourced from dedicated kerbside collections and drop-off centres. Material collected using these methods represent diffuse sources, rather than a small number of 'contaminated' point sources. For some processing facilities, product batches are checked for pesticide and chemical contaminants in order to satisfy quality criteria. This provides a safeguard against contaminated products entering markets due to processing of contaminated feedstock. Non-visible contamination does represent a problem where the garden waste is in contact with other waste materials (ie mixed waste composting).

d) Buffer zones for processing facilities

Adequate buffer distance should be provided between composting facilities and designated residential areas (and other sensitive land uses) in order to provide a basic level of protection from odour, dust and noise. The buffer protects the amenity of the area from accidental emissions which may occur due to equipment failure, accidents, and abnormal weather conditions.

The buffer distance is measured from any potential emission source to the nearest sensitive landuse. For organic waste processing facilities, appropriate minimum buffer distances are dependant on:

- the process employed
- the materials subject to processing
- the scale of the proposed operation
- suitability of the host environment
- types of end-products generated.

The EPA has prepared two guidelines relevant to buffer distances applicable to composting facilities (EPA SA; 1996, *Guidelines for Buffer Distances*, and EPA SA; 1998, *Environmental Guidelines for Composting Works and Organic Waste Treatment Depots in South Australia*). Both of these are currently in draft form only. The *Composting Guidelines* indicate that:

> *All proposed substantial composting works (with a production capacity greater than 200 tonnes per year) with known offensive emission potential must be located a minimum of 500 m away from any possible sensitive land use.*

Apart from the above guideline, a useful reference is the Victorian EPA *Environmental Guidelines for Composting and Other Organic Recycling Facilities* (1996) which includes a method to determine minimum buffer distances for a range of process types, facility feedstocks and throughputs.

6.6.2 Regulatory Barriers

Some existing facilities are reluctant to expand their operations due to the perceived difficulty in obtaining regulatory approvals. There are further problems associated with environmental compliance regulations, specifically in relation to odour and dust emissions.

Uncertainty associated with the regulatory process effectively adds a cost to the processors' operations. Clarification of the regulations relating to composting, mulching, buffer zones and recognised classification of compost products would deliver greater certainty to this process.

6.6.3 Economic Barriers

The organic processing industry is in the business of adding value to waste organic materials supplied to it and selling these higher-value materials into a range of markets. The defining characteristics of this industry are low-value materials, high transport costs, high potential impact on neighbouring properties, and economies of scale. There is likely to be significant imperfections in the markets for the processed goods due to insufficient information about the real and potential added value of these composts and mulches in different applications. These imperfections will be corrected only slowly as research is reported and disseminated and results of trials are verified in the field.

7 MARKET STRUCTURE

The objective of this section is to identify existing and potential market segments for composts and mulches derived from recycled organics, and to evaluate the optimal uses for the resource.

Recycled garden/organic wastes have a range of potential applications. They can be processed in a variety of ways to add to soils or to cover landfills, they can be composted with contaminated soils and materials to neutralise some contaminants, or recovered for their calorific value. The optimal applications will depend on the level of processing of materials, proximity to potential markets, market awareness and acceptance of products derived from garden wastes and the availability of capital to develop appropriate infrastructure and technology. For the purposes of this review, the following broad classifications of potential markets for garden waste have been identified for the South Australian market:

Extensive Agriculture: pasture farming, broadacre farming, forestry

Intensive Agriculture: nurseries, orchards, market gardens, cut flower growers, mushroom growers, turf grass growers, viticulture

Rehabilitation: landfill cover and rehabilitation, erosion stabilisation, land reclamation, revegetation and rectification

Urban amenity: landscape market, local government, nurseries, special projects, State Government, sport, recreation and leisure

Bio-fuels: gasification, pyrolysis, incineration, (organic energy/electricity) power stations, ethanol production, anaerobic digestion, bio reactive landfills, firewood, pelletisation

Bioremediation: contaminated sites, water purification, biofiltration

Export: Interstate, international.

7.1.1 Extensive Agriculture

a) Nature of use

Enhancement of soil structure in pasture farming, broadacre farming and forestry. This leads to improved water holding capacity of the soil, increased microbiological activity and increased availability of slow-release nutrients, which have positive effects on yields.

b) Value

Yields for broadacre crops vary from \$300-400/ha for wheat, up to \$500-600 for oilseeds. The value of applying organic soil-enhancement products can increase yields by 10-30%, depending on type and quantity of material applied. This gives compost a theoretical value of \$10-\$20 per tonne (less transport and application cost, and at an application rate of 5 t/ha).

c) Cost

Cost of application includes transport of material to land and method of application, as when soil is turned. Transport costs will depend on proximity to supply; application costs are likely to be low. Because of the cost of organic material and relatively low returns from crops, application is likely to be limited—ie may not be necessary each year.

d) Current status

The application of organic matter to broadacre applications has generally been regarded as too expensive for the return on the investment. Transport costs are likely to limit its application to land close to Adelaide, and will depend upon the perceived and proven benefits of these materials.

7.1.2 Intensive Agriculture

a) Nature of use

Recycled organic composts and mulches are used to enhance soils, for water conservation, suppression of weeds in horticulture and viticultural applications, eg for cut flowers, fruit trees, vegetables, grapes and mushrooms.

b) Value

Yields for crops vary significantly, from $8 000 to $80 000 per hectare. A summary of a range of crop types and their values per hectare is presented below in Table 7.1.

Table 7.1: Summary of intensive crop types and value per hectare, South Australia, 1997 to 1999

Crop type	Average value of crop ($/ha)
Potatoes	10 000 – 12 000
Cut flowers	12 000 – 15 000
Orchard fruit including nuts	18 000 – 24 000
Berries and tropical fruit	40 000 – 80 000
Grapes - wine and fruit	8 000 – 20 000+

Source: Industry survey, ABS

c) Cost

Costs of use include the transport of material to the site and its application, which can be expensive because of specific requirements. Transport costs will depend on proximity to supply, application costs likely to be around $4-$5 per cubic metre, or up to $10 per tonne. Compost application rates are 50–100 t/ha. This results in application costs per hectare of around $2 000-$3 000.

d) Current status

From interviews with processors, it is estimated that the current demand in the intensive agricultural sector is around 40 000–45 000 t/yr for RO, and at least double for OHP. Trials conducted by the CSIRO have indicated significant benefits of applying composts to soils used for intensive agriculture. These benefits will be discussed in greater detail later in this study. Growers have concerns about applying contaminated material, and organic material that has not completed composting (causing the phenomenon of 'nitrogen draw down' in soils). There are also concerns that if low-grade material is used in the composting process (like street sweepings) it may transmit high levels of heavy metals to the soil. This is particularly relevant in the application of composts to land used for production of vegetables, fruit for export markets and grapes grown for wine export markets.

7.1.3 Rehabilitation

a) Nature of use

Composts and mulches are used as landfill cover, to stabilise eroded land, and for land reclamation, revegetation and rectification.

b) Value

The price paid for cover material is currently around $5 per cubic metre.

c) Cost

Application of recycled organics for this purpose will depend on the scale of the application, its distance from the source of the material and the cost of the material used. The use of recycled organics as cover in landfills may require lower grade material than that used in other applications.

d) Current status

At present, around 4 000 t/yr of recycled organics are used in this market segment. The second stage of the southern freeway is due to commence next year. This is likely to create a spike of demand for recycled organic materials in this sector. Stage II project managers, Maunsells, have already indicated they will be seeking a higher quality of material than that provided for the first stage (there were problems with contamination, in particular by plastics). Other larger scale projects also offer great potential for RO application (eg Garden Island). Prior to commencement of these types of projects it is difficult to estimate the future demand reliably; however, a maximum potential of 40 000 t/yr (quantity to rehabilitate approx. 55 ha, equivalent of 2 km of road with 12.5m on either side) is considered a conservative estimate.

It is conceivable that the market may not be able to meet the demand for materials set by these types of projects. If processors can attract higher prices selling into other sectors, there is little reason to divert organics into these one-off markets.

7.1.4 Urban Amenity

a) Nature of use

The material is used by landscape gardeners, local government (for parks and gardens), nurseries (retail sales).

b) Value

Composts, mulches and manures compete with other chemical soil conditioners on the market. Increasingly, processors are blending organic material with a range of products to meet market specifications. A significant proportion of this market is not traded, ie.councils retain, process and re-use organic material generated locally. The value of organic materials varies from $10/tonne to $300/tonne for bagged and blended products.

c) Cost

Because the amenity market is mostly located close to processing facilities, there are minimal transport costs and no application costs. Some higher value products are bagged.

d) Current status

The scale of the urban amenity market is estimated at around 30 000 t/yr, including the supply of materials from smaller council operated mulch processors. Urban amenity is a reliable source of regular demand for recycled organic wastes, in particular as composts and mulches. The demand from this sector is likely to be relatively elastic – if the price increases significantly, consumers will shift to other similar, cheaper products.

7.1.5 Bio Fuels

a) Nature of use

Transformation of organic materials into energy: gasification, pyrolysis, power stations, ethanol production, incineration, anaerobic digestion and firewood.

b) Value

The value of electrical energy recoverable from garden wastes through a thermal process is in the order of $15 per tonne (4 000 kWh/t * 13% net electrical output * 3c/kW.h). If the steam which is generated as a by-product can be used locally then this could potentially add up to another $15 per tonne.

c) Cost

The costs of energy recovery systems is dependent on the demand of the waste treatment system, which depends largely on the system configuration and, in particular, the degree of emissions treatment. For garden wastes only, the net processing costs would be around of $50 to $80.

d) Current status

There are no large scale energy recovery facilities for garden wastes. Conventional waste-to-energy plants could be modified to handle garden wastes only; however, such facilities are not cost-efficient at capacities below 50 000 t/yr. This is also valid for new thermal technologies such as pyrolysis or gasification. Anaerobic processes generating methane, which is then combusted for energy recovery, are not suitable for garden wastes; these processes are designed for processing of organic materials with high moisture contents.

7.1.6 Bio remediation

a) Nature of use

Used for clean-up of contaminated sites and soils, water purification and biofiltration. Bioremediation is currently conducted by Thiess at the Lucas landfill site and by Cleanaway.

b) Value

The value of composting organic material with contaminated soils is that a range of hydro-carbon based contaminants in soils can be reduced or even eliminated so that they do not require special landfill. The differential between these two depends on the level and type of contamination. The ratio of compost to contaminated soil is approximately 1:2.

c) Cost

The cost of composting is around $25/t of organic material, which translates to around $35 per tonne of contaminated soil.

d) Current status

There are a number of examples of organic materials being used for bioremediation in Adelaide. Around 1 500 tonnes of organic wastes are being used to compost with 4 000 tonnes of heavily contaminated soils from a site in Port Adelaide. The soils were contaminated with pentachlorophenol (wood preservative), and will be able to be safely disposed of after composting. The material may even be able to be used as cover. The same method is being used for 8 000 tonnes of contaminated soil from the clean up of an Adelaide City Council site.

Cleanaway is using compost on an ongoing basis to clean up oily and grease trap sludges. It is using bioremediation to process around 2 500 t/yr of solids from grease trap wastes, which represents around 80% of the total grease trap flow in Adelaide.

Based on the above, the overall quantity of RO used in this market segment at present is therefore between 5 000 and 5 500 t/yr.

7.1.7 Export

a) Nature of use

Organic materials are composted and blended into high value-added products for sale both interstate and overseas. The high transport costs tend to limit export to products which deliver high levels of nutrients to the soil, competing directly with chemical fertilisers rather than as surface covers.

Companies like Neutrog, Fin and Johnsons are producing high value-added products, using organic wastes including manures and carcasses, as well as some waste vegetation. Because these products are higher value, and are enhanced with other soil amendments, they may have lower application rates than basic composts.

b) Value

The value of the products varies depending on the specifications and the markets, but product prices can vary from $50/t to $350/t for high-value products.

c) Cost

The products are developed for use in intensive agriculture, although their high nutrient value means they are generally applied in the soil when land is prepared prior to planting

d) Current status

Currently around 5 000 tonnes of high value-added products are being produced in South Australia, mainly in the Adelaide Hills and Barossa regions. The supply of these materials is constrained mainly by the supply of suitable materials, and by increasing restrictions on composting sites. All processors are looking both to increase supply, if suitable organic waste materials can be sourced, and to relocate to a more permanent site if one becomes available.

8 ECONOMIC ASSESSMENT OF MARKETS

Recycled organic wastes are a commodity. Like any commodity, the optimal application of this resource is where it can achieve the highest return. This incorporates both the costs of collecting, processing and transporting the resource as well as the value that the product delivers in its end use. For organic material, this end use can include a wide range of applications, and research into this emerging commodity is still in its infancy. Applications of compost include:

- reducing the consumption of water and fertilisers
- accelerating the growth of plants, in particular young plants
- reducing the effects of plant pathogens and weeds
- as a substitute for soils (in potting mixes and other low grade materials), or as a source of energy.

With such a diverse range of potential applications, and given the climatic conditions and soil types in South Australia, it is difficult to imagine that the demand for recycled organic materials could ever be exhausted.

This section will review the current and potential values of different applications of these materials, and explore the costs associated with delivering these benefits.

8.1 Collection

8.1.1 Garden waste

The cost of garden waste collection is borne by householders – either indirectly through increased rates, or directly through user-pays charging schemes. The cost of collecting other organic wastes – from the commercial and industrial, and construction and demolition sectors, is generally borne by the respective generator through delivery costs and gate fees to drop-off facilities.

The per-household cost of user-pays charges is generally higher than the cost per household of a full kerbside collection. The cost of providing a fortnightly garden waste collection service for all residents is $20-$25 per household per year, depending on the geography of the collection area and the set-out rates. The collection cost per tonne varies according to the system involved, but for a fortnightly full kerbside MGB collection with a processing facility 10 km outside the council, including a new bin, it is around $80/t (average household setting out 250 kg/yr of garden waste). This per-tonne cost varies significantly, depending on the quantity of material in each bin when it is collected. Processing costs add another $30 per tonne.

This estimate needs to be offset by two savings. The first is the reduced cost of landfill, around $25/t in Adelaide. The second is the reduced costs of operating garbage collection because of reduced materials flows. This rate varies on diversion, but is probably no more than $4/t based on numerous analyses done for Adelaide, Melbourne and Sydney Councils with the Waste and Recycling Cost Model (WRCM), now distributed by the Catchment Research Centre—Waste Management and Pollution Control (CRCWMPC) in Sydney. A summary of the cost components of domestic garden waste management services is illustrated in Figure 8.1.

Currently the cost of this service is borne by ratepayers through council. One of the constraints on supplying recycled organic wastes from households is that some councils are reluctant to impose the cost of the service on all residents.

The alternative to this is to provide user-pays collections. The current experience in Adelaide for full user-pays collections, where residents pay for both the cost of the bin and an annual collection fee, is a participation rate of around 5%-10%. Partial user pays schemes that require an initial up front payment for the extra bin increase participation up to 30%. Participation in full kerbside collections is as high as 90%, although this does significantly increase contamination rates.

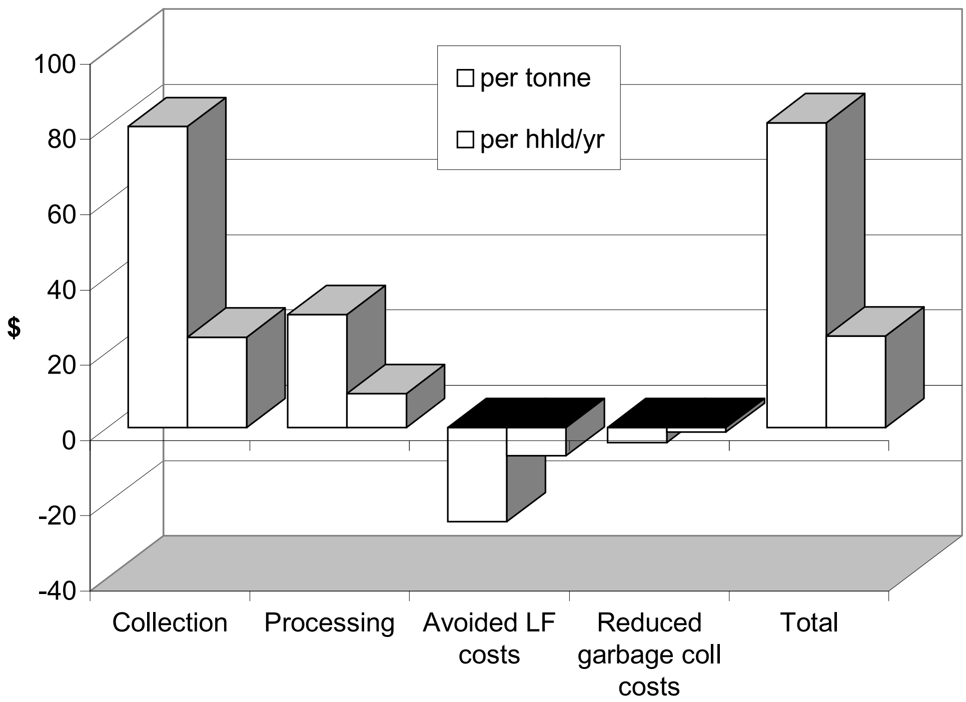

Figure 8.1: Average costs of domestic garden waste management

8.1.2 Commercial organics

The cost of collection for commercial RO is generally lower than for domestic wastes, because more material is collected per pick up point. Increasingly, the cost of recycling of consolidated organic wastes is lower than the cost of disposing of wastes to landfill, creating a commercial incentive for companies to divert organic fractions for recycling.

8.2 Processing

The cost of processing organic material is dependent on the process. For most materials, the process involving the shredding, composting, screening, blending (and occasionally pelletising) of organics adds significant value to the material but also incurs costs.

A standard compost derived from household garden waste will need to be shredded and fully composted before it can be sold as a soil enhancement product. More tailored products, involving blending and treatment of other organic wastes are likely to increase the processing cost of the end product but add value. The creation of soil enhancement products is not dissimilar from wine making, involving sourcing of various materials to make a range of products for different markets at different prices.

In broad terms, the following table outlines the processes and associated costs that can be applied to material.

Table 8.1: Estimated net processing costs per tonne RO (input)

Process	Cost per tonne ($)
Shredding only	5-10
Partial composting	15-20
Full composting	25-35
Pelletising	50-70
Source: Industry estimates	

8.3 Transport

There are two transport costs associated with the recycling of organic wastes: the transport incurred prior to processing, and the transport costs associated with delivery of the organics to their end use. The pre-processing costs represent the collection costs (estimate: $80/t), although this will vary depending on the location of the processing facility and the accessibility of transfer facilities. Garden wastes are light prior to shredding (around 150 kg/m^3) but can be significantly bulked up for more efficient transport by shredding (to around 450 kg/m^3). In general the cost of transporting unshredded garden wastes is around $0.60 per t/km, and is $0.35 per t/km for shredded materials.

8.4 Application

One of the key hidden costs in applying composts to soils is the application cost. The cost of application has been estimated by the industry at around $4/m^3 (around $10/t) for horticultural and viticultural applications. This cost may fall over time if improved technology can be developed to improve the efficiency of application. The lack of adequate or specialised spreading equipment is considered by users to be a major impediment to market expansion.

8.5 Market value and notional net costs

Garden wastes are processed to produce higher value end products. Clearly the higher the value of the end product, the greater the return to the processor which in turn offsets the other costs of production and application. The prices obtained for products derived from recycled organics will vary significantly, depending on the processors technique, the quality of the inputs and the market concerned. Table 8.2 shows average prices paid per tonne for end products. Prices per cubic metre are approximately half the price per tonne.

The following points should be noted in an assessment of the current costs and returns for organic waste processing (Table 8.2 and Table 8.3):

- The *net* cost of collection and processing (minus avoided landfill costs) is borne by the resident through council rates. In general, their current contribution to the process is around $80/t, or around $25 per household per annum. Avoided landfill costs and collection costs are kept separately in the table (two left columns), because they are not costs relevant to the market (processors and users). Therefore they are not factored into the equation. The net cost of collection is likely to fall as the cost of landfill increases with the closure of the Wingfield landfill in 2002.

- The indicative total costs per tonne are calculated by adding the cost components of processing, transport to final destination and application, minus the current value of the product (averages). The gate fees charged by processors (column "Indicative net costs) reasonably reflect the production costs and current market values of the products they are producing. Processors can generally charge less for lower grade materials when they are producing lower grade products—such as cover, or for use in bioremediation where full composting is not usually required.

- The highest value products do not currently use recycled garden wastes, which are seen as inferior inputs. The highest value materials source other organic materials from the commercial sector, in particular the rural sector.

- The total cost of collection, processing, transport and application is significantly more than current market prices.

Table 8.2: Current value of products made from organic materials

End product	$/t
Pelletised soil additives	200-360
Compost	30-50
Mulch	10-20
Cover	10
Fuel	15 (25)
Source: Industry estimates	

Based on these costs and current values, it is possible to determine notional net costs of different applications for organic materials in the current markets. These costs are presented in Table 8.3.

Table 8.3: Notional current net costs per tonne for applications for recycled organics

	Avoided landfill costs	Collection	Processing	Transport	App'cation	Subtotal costs	Current Value [3]	Indicative net costs (processing to application)
Extensive Agriculture	25	80	40	20	10	70	15	55
Intensive Agriculture	25	80	40	15	10	65	35	30
Rehabilitation [1]	-	-	15	0	5	20	5	15
Urban amenity	25	80	40	10	0	50	25	25
Bio-fuels	25	80	70	0	0	70	15	65
Bioremediation	25	0	25	0	0	25	15	10
Export [2]	0	0	150	variable	-	150+	250	0

[1] Avoided landfill & collection costs vary depending on material
[2] Special commercial organic materials only; do not usually require landfilling
[3] Refer Sections 7, 8, 9

8.6 Potential value

The current assessment has considered the net cost of production based on the current value of the end products. However, the market for many new applications for recycled organic materials, in particular soil enhancement products, is immature. There is research emerging which is identifying the potential value of the application of these products in different soil types and in assisting the growth of different plant types.

8.6.1 Potential value in intensive agriculture

Processors have recently reported improving prices for products made from recycled organic wastes in applications where their higher value is being realised – in deep ripping of soils between vine plantings, or on new plantings of trees or vines. Trials conducted by the CSIRO have indicated the following benefits from the application of composts in horticultural applications:

- ***improved soil water holding capacity and reduced evaporation***
- ***reduced fluctuations in soil moisture and temperature***
- ***improved conditions for plant growth with potential for increased yield and quality***
- ***more efficient utilisation of soil nutrients and water***
- ***effective weed control and reduced need for herbicides***
- ***potential for faster establishment and earlier bearing of young trees and vines***

The realisation of these benefits will depend on the specific application of the material and the cost of water. Nevertheless the trials indicated that the value of the product may be significantly higher than the current market rate of around $15-$20 per tonne.

Field trials of 'green-organics' compost by the CSIRO have demonstrated the potential for a compost (and/or mulch) to improve the growth of young trees and vines, and bring them into production earlier. Growers make a considerable investment when they plant or replant an orchard or vineyard, so there are real benefits in advancing the production of marketable fruit.

The value of the product in this application is likely to exceed its current market value, suggesting that there is considerable scope for increases in the value of composts applied in intensive agricultural applications in the future.

Realisation of a value increase will be the result of the market maturing, with further research into the benefits of these materials, and development of systems which can reduce/negate the risk of contaminants and sub-standard composts being released onto the market.

8.6.2 Potential value in other applications

While there is considerable interest in the potential value of composts applied in intensive agricultural applications, it is worth reviewing the potential for changes in the other markets for products derived from recycled organic wastes.

Extensive Agriculture: The primary difficulty with application of soil enhancement products is the relatively low value added. Additional barriers for growth in this market sector include:

- distance from compost sources
- lower value crops, with limited gross margin
- relatively low crop value allows only low rates of compost to be applied—farming practices such as stubble retention would be a cheaper way of maintaining organic carbon levels
- many broadacre industries such as grain/livestock are not already widely using products such as manures, so a substantial change in attitudes would be needed
- higher value industries such as dairy pasture already have access to large quantities of manures generated on site.

Rehabilitation: As with extensive agriculture, the relatively low value of cover materials required and the substitutes available limits significant changes in value in the future.

Urban amenity: Recycled organic products in the urban amenity markets substitute for and compete with chemical fertilisers, manures and a range of soil enhancement products already available. While there may be a premium paid for recycled material, consumers are likely to be constrained by price. Development of improved products through blending and tailoring product to specific conditions poses the best opportunity to add further value in this segment of the market.

Bio-fuels: Currently there is no demand for bio-fuels, although waste-to-energy companies have maintained an active profile in the South Australian market. The main problem facing the introduction of waste to energy facilities in Adelaide is that they would need to compete with the low-cost energy already available through the national grid. For rural centres not on the grid, while waste-to-energy has merits, there is insufficient supply of fuel required to be cost effective and to supply a significant component of the energy required. Research could be conducted into cogeneration with shredded timber waste as an additive (quality requirements, performance, costs/benefits).

Bioremediation: Adelaide has established a small bioremediation industry, both in the treatment of contaminated soils from major clean-up projects and the treatment of regular flows from sludges and trap wastes. The use of low-grade organics in the treatment of these materials is emerging as a cost effective and reliable method of secure disposal. The main value in this process is the breakdown of hazardous compounds that would otherwise be more expensive to dispose of. There is currently only one facility in Adelaide licenced to handle these hazardous wastes (Lucas Landfill, Maslins Beach). There is no indication that the status of this facility will change in the future.

Export: The export market for soil enhancement products is the most value-added sector of the current market. This sector sources material almost exclusively from the commercial sector. Producers have indicated that there is still significant potential growth in the market, both through extended marketing and improved techniques for blending and processing. The key barrier to the expansion of this industry is the location of suitable sites for processing. The demand for suitable buffer zones is greater for this sector of the industry because of the stronger odours emitted in the processing of carcasses, manures and other non-garden organics wastes.

Examples are emerging of the potential for exporting ‘green-organics’ in higher value blended and pelleted forms to Asia and the Middle East.

9 REVIEW OF INTENSIVE AGRICULTURE SECTOR

Given the results of the review of market sectors for recycled organic wastes, a more rigorous review was conducted of the agricultural sector, in particular the intensive agricultural sector. This review was established to determine the nature of the current and potential market, and to determine which crop types and regions may be more receptive to development of these products.

Surveys were conducted with growers from the main horticultural and viticultural regions across the State. These results were then cross-referenced with statistical data on crop types by region to develop a comprehensive review of the size and nature of this market.

9.1 Survey overview

The general awareness of growers towards the use of composts was high. There was consensus between growers in different regions and sectors on the beneficial properties of the products—improved soil conditions and increased water-holding capacity. However, growers had differing viewpoints on the usefulness and relevance of the application of compost on their respective crops.

The intensive horticulture market is sensitive to the presence of contaminants in compost. In particular, growers who had seen compost with higher levels of visible contamination (plastics and household rubbish) expressed concerns over the levels of non-visible contaminants that may also be present in the compost. With growers becoming increasingly accountable for the quality of their produce, they will become more discerning about the quality of soil amendments they choose.

The aesthetics of compost with visual contamination was a deterrent to growers. Generally, growers did not wish to see rubbish in their orchards and vineyards, and were resistant to being considered as a convenient “dumping ground” for metropolitan waste.

Having said this, growers who have been using composts regularly have reported steady improvement in the quality of delivered material.

a) Water

Growers in all regions and crops considered the cost of water to be minimal in terms of their overall production costs, and conceded that they would not consider the potential savings in water costs as a motivation for using compost. However, the potential for saving water, having more water available to better manage the quality of their crops, and more efficient use of water was a major motivation for growers to consider using compost mulches.

- growers with a limited amount of water were keen to save water, to ensure that there was enough available throughout the season
- reduced evaporation and increased water holding capacity of the soil made crops less susceptible to sudden hot, dry weather conditions
- growers were interested in the potential to ‘sell on’ the unused portion of their water allocation.

- water saved could be used to extend plantings.

b) Substitutes

Growers indicated increasing awareness of the benefits of adding organic matter to their soils, and many were actively seeking effective ways to achieve this. The use of organic amendments like manures, straw, sawdust, shredded prunings, grape marc, and pelleted organic matter was high.

c) Weed control

Conventional growers did not identify weed control as being a motivating benefit in the use of compost mulch. However, certified organic growers considered weed control as a major incentive for them to use compost.

d) Other issues

The key practical barrier to the use of compost was the perceived or experienced difficulty in application. Generally, growers who had used compost considered the machinery that was available at the time to be inefficient, or unable to evenly spread the compost. Growers with glasshouses or trellising systems that did not allow enough room to manoeuvre a spreader found it hard to justify the expense and difficulty in manually applying compost. Spreading was of less concern to growers of field vegetables, who generally had access to suitable machinery for broadcasting compost.

9.1.1 Grapes

Application: Growers using composts raised some concerns about difficulties experienced in application. Apart from a high quality product (which is "spreadable"), special equipment is required for efficient application. In several instances, such equipment was not available for the task.

Contamination: Most growers are very sensitive to contamination in the compost. They do not accept (visibly) contaminated compost for the following reasons:

- growers do not wish to see rubbish blowing around in their vineyard
- growers are concerned about 'other', invisible contamination (heavy metals etc.) in the compost especially if it already looks contaminated.

A few growers showed concern over the temperature of the compost, in one case "the heat" (ie immature compost causing nitrogen draw-down) was considered to have killed several vines.

Water: Water conservation was also an issue in some regions, in particular in the Willunga Basin and Barossa Valley, where stricter controls on water consumption are prompting many growers to develop improved growing techniques.

Though water *costs* are not an issue to most growers, water *availability* is a big issue in most regions. Water availability refers to both volume, timing and quality.

Growers in all regions will be seeking ways to optimally manage their water inputs to meet quality specifications. In future, growers may be able to sell-on the unused part of their allocation.

Substitutes: Main substitutes for compost and mulch are:

- straw mulch, particularly in Barossa Valley and Clare
- cover cropping or permanent sward, with slash-and-throw under the vines. This practice is relatively inexpensive, and widespread across all regions
- many growers currently use animal manures as a non-chemical fertiliser alternative for midrow cover crops. Manures are considered cheap, contaminant-free and contractors are available for spreading.

Weed/Pathogen control: Though growers don't place a high value on weed control with compost mulch, they acknowledge that compost is likely to reduce herbicide use. Using compost for weed-control is a strong motivation for organic growers.

9.1.2 Vegetables

Vegetable growers surveyed reported a preference for using compost because of its high proportion of organic carbon, and lower salt and potassium levels than substitutes such as cow manure. There is strong evidence of compost up-take in this industry. Through a very active Landcare group, Virginia growers have trialed compost on almost every crop grown in the region. This has probably contributed to the high uptake of compost in the area

Growers believe that the compost is particularly valuable in glasshouse crops where more intensive, higher value, continuous cropping occurs in a smaller area. Some growers incorporate fertilisers into the compost when applied.

Water: Water management is a major issue for vegetable growers. The main reasons are:

- water supplies in Virginia and the Riverland are often of marginal quality
- currently in Virginia, there are extra charges for excess water use. Water prices may increase over next few years, though this is not clear at present with the recent introduction of a reclaimed water pipeline.

Substitutes: One grower surveyed said the development of quality assurance systems on his crops means that only quality assured products can be used on crops, giving certified composts an advantage over manures and other substitutes.

9.1.3 Cut flowers

The South Australian flower growing industry is small and diverse, with 300 growers producing 100 species [1]. Most of the Adelaide market for cut flowers is supplied by only 15 growers in the Virginia region. Many of these are using composts. The rates of application are generally lower than for other applications (8 t/ha). It was considered to be of more use in the higher-value glasshouse crops.

The cut flower market is very high value, intensive, and high input, but very small. Most cut flowers are grown in glasshouses or plastichouses. Some species are produced in hydroponic systems.

Substitutes: There are a number of organic substitutes applied to flowers including manures, straw and even activated coal.

9.1.4 Almonds

The overriding restriction to the use of compost in almonds is the method of harvest. Almonds are shaken to the ground, allowed to dry, then picked up with a 'sweeper' machine. Leaves and sticks are blown out the back of the harvester. Growers are concerned that the harvester will also pick up the compost, it will be blown around the orchard, and they will lose their under-tree mulch. Growers seek to maintain a bare orchard floor for ease of harvest.

This will also restrict use of compost in other nut crops where this system of harvest is employed.

Almonds are being forced out of the traditional area (Willunga Basin) by higher-value grapes. The Riverland is growing as an almond region.

Controlled allocation of water for sustainable use may soon be introduced. This will present challenges for Willunga almond growers, with most believing they require at least 180 mm for mature trees, and around 300 mm for establishing trees.

9.1.5 Apples and Pears

The apple and pear industry is strongly quality driven. Export markets will be under increasing pressure to demonstrate quality assurance, which will encompass aspects of production such as chemical and fertiliser use, irrigation, soil management, environmental impact, fruit handling and storage and record keeping. There will be pressure from markets to certify for absolute minimal use of chemicals and fertilisers.

Water: apples and pears are generally grown in areas with cheap, adequate, good quality water supply.

Inconsistency in nutrient content between batches of compost would be a problem where growers are working to specific fertiliser programs. Growers need to be assured of the nutrient content and availability, so they can adjust fertiliser programs accordingly.

[1] refer http://www.pir.sa.gov.au/invest_opps/ornPS.shtml#The Cut Flower Industry

Growers indicated that their main focus is to increase the efficiency of their existing methods, before introducing new methods such as composting. They also believed that the compost would have to become more consistent before it was used regularly, to ensure predictable management of fruit quality. Applications of composts on pear crops have been shown to effectively assist in the treatment of nutritional disorders like chlorosis.

9.1.6 Olive Growers

Olive plantings are being expanded. They are grown in a wide array of climates and soils. Olives are a lower value crop than grapes; however, the concerns of olive growers are similar to those of vine growers.

The main concern of many growers was the visual contamination and consistency of compost. Several growers reported the occurrence of plastic within the mix, which made them question possible levels of non-visual contamination.

There was a general concern that the compost was difficult to spread and this made it less attractive to the growers in some cases. It was thought that spreading machinery needed to be more efficient and effective. There were also concerns raised over the amount of nitrogen in the compost (also an issue in vineyards, as excess nitrogen is detrimental to juice quality).

On the other hand, some growers used compost to enhance nitrogen levels in their soils. The provision of a refuge for pests was also an issue. In one case, an olive grower removed compost from around the base of trees as he believed beetles living in the compost had climbed up the trunk and destroyed the buds. It is also perceived that further information regarding the benefit of compost would assist in its widespread use.

9.1.7 Citrus

Water: The cost of water is not considered a major factor in the Riverland, and growers are not seeking to save on irrigation to reduce costs. However, the times of access to irrigation may be restricted, limiting water availability, and leading to long intervals between irrigations.

Substitutes: There are currently no local compost producers, and freighting compost from Adelaide would add considerably to the cost. Some growers were using manures ($350/ha for five tonnes) or grape marc (transport costs only).

Some growers expressed concerns that poorly-composted products would introduce diseases and pests. Riverland citrus growers surveyed said they had insufficient information on the use of composts, which acted as a deterrent to their use.

9.1.8 Other fruits

There is some scope for development of compost blends with additional soil amendments for use in avocados. Avocado growers are seeking ways to suppress root diseases, protect surface roots, and create an environment more suitable for avocados. Gypsum application may become an increasingly important part of avocado production.

Stone fruit (plums, peaches, apricots etc.) are also grown primarily in the Riverland and the situation for water and substitutes is similar to citrus.

Berry fruits are grown in cooler climates, with adequate water supplies. They are high-value crops with high inputs, and with specific methods of production for each berry type. Despite a lack of information on the use of compost in Australian berry growing, there have been examples of interest from berry growers in using compost.

9.2 Demand by region

Demand for organic materials is likely to vary across the different regions of the State – both because of economic conditions (industry types), as well as climate, soil types, availability of other resources like water, and proximity to supply. Given that garden wastes have high transport costs per tonne, this is likely to mitigate against long-hauling unless the value of the application warrants the increasing transportation costs.

For this assessment the market segments will be cross-referenced with the statistical divisions and sub-divisions of the State as defined by the Australian Bureau of Statistics. In the broadest terms, the regions covering the State are:

- Adelaide – the Adelaide metropolitan area (excluding the Adelaide Hills)
- Outer Adelaide – Barossa, Onkaparinga (Adelaide Hills), Fleurieu and Kangaroo Island
- Yorke and Lower North – Yorke Peninsula and Lower North, including the Clare Valley
- Eyre – Eyre Peninsula, and the West Coast
- Murraylands – Riverland and the Murray Mallee
- South East – Bordertown, Robe and Mt Gambier
- Northern – Iron Triangle cities and remainder of the State.

9.2.1 Area under agricultural production by region

South Australia's agricultural profile varies significantly according to the region, as a result of varying climatic and soil conditions. Figure 9.1 shows the areas under extensive agricultural production. More specifically, the area occupied by pastures, cereal crops and non-cereal crops is graphed for each region. This also emphasises the fact that the vast majority of extensive agriculture occurs in the outer regions of SA.

Figure 9.2 displays the area under intensive agricultural production in SA, where the majority of production from cut flowers, grapes, vegetables and fruit is found closer to or within metropolitan Adelaide. The intensive agricultural regions are predominantly in the irrigated Riverland district of the Murraylands, the grape and vegetable growing regions surrounding Adelaide, the wine growing regions of Coonawarra and Padthaway in the South-east, and within the metropolitan area of Adelaide itself. Figure 9.3 displays the Riverland's dominance in grape and fruit production, while the Lower South East and the Lower North sub-divisions also contribute significantly to grape production. Figure 9.4 illustrates the intensive production surrounding Adelaide in the Barossa, Onkaparinga and Fleurieu sub-divisions. As shown, grape production is dominant, while fruit, vegetable and cut flower production occupy a lesser area. As shown in Figure 9.5, different types of intensive agriculture dominate sub-divisions within metropolitan Adelaide. Vegetable production is dominant in northern Adelaide, while grape production is dominant in southern Adelaide. Fruit production is prevalent in all sub-divisions except western Adelaide, where there is only a small amount of grape production.

32% of the State's intensive agriculture production occurs within a 50 km radius of metropolitan Adelaide. This represents a very large market located adjacent to the supply of recycled organics from the major urban centre in the State. A summary of agricultural production by type is presented in Table 9.1.

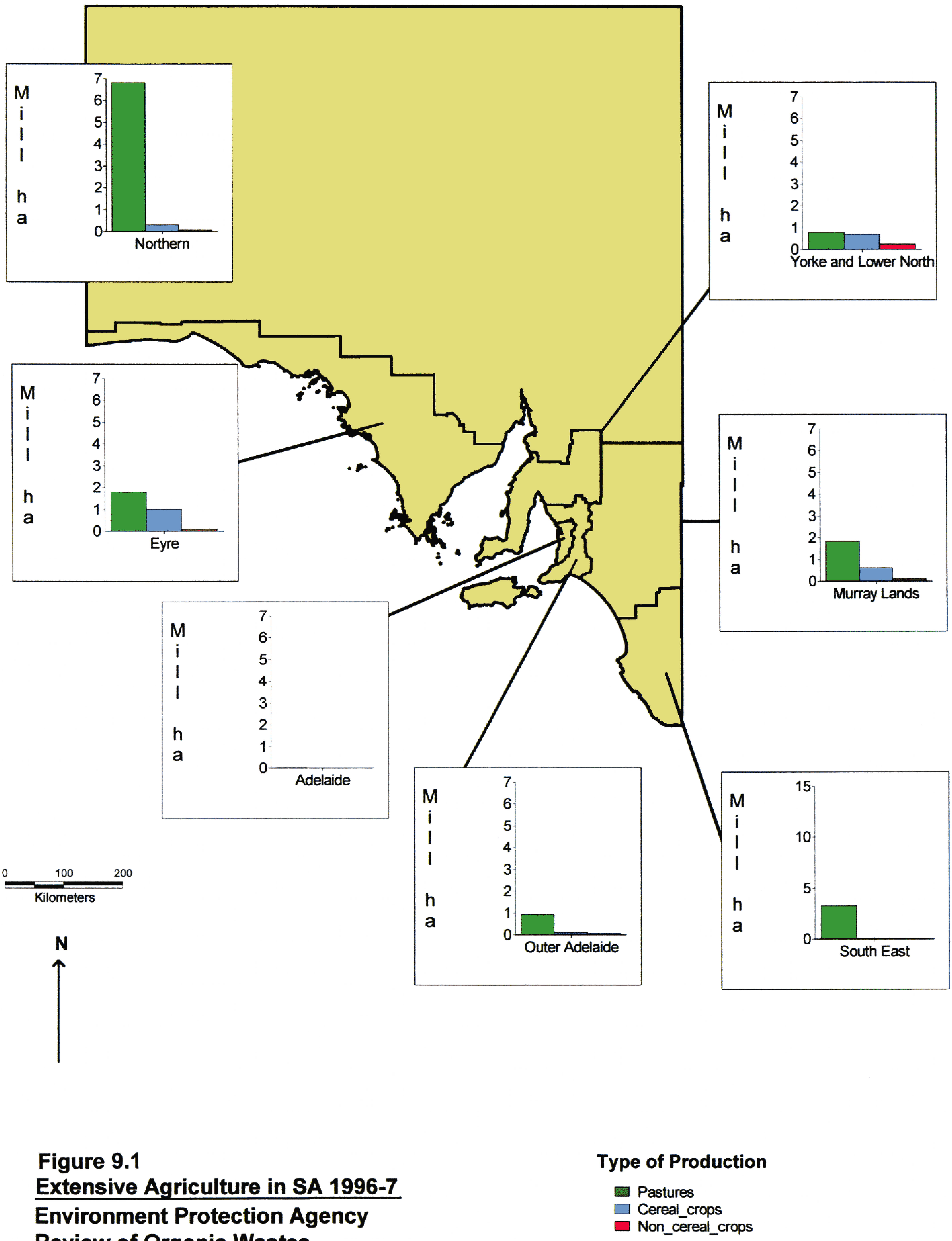

Figure 9.1

Extensive Agriculture in SA 1996-7

Environment Protection Agency
Review of Organic Wastes

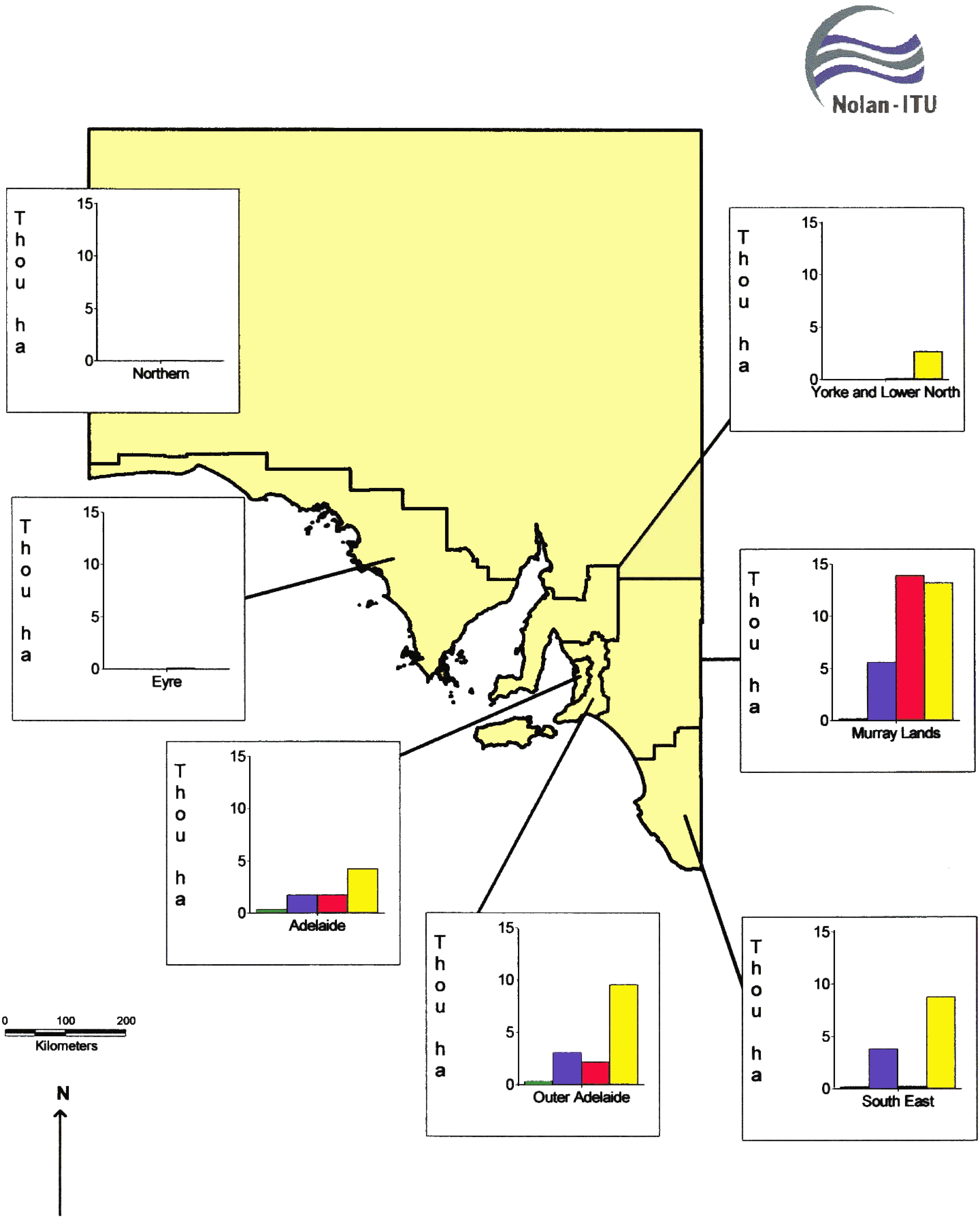

Figure 9.2
Intensive Agriculture in SA 1996-7
Environment Protection Agency
Review of Organic Wastes

Type of Production

- Cut_flowers_and_nurseries
- Vegetables
- Fruit
- Grapes

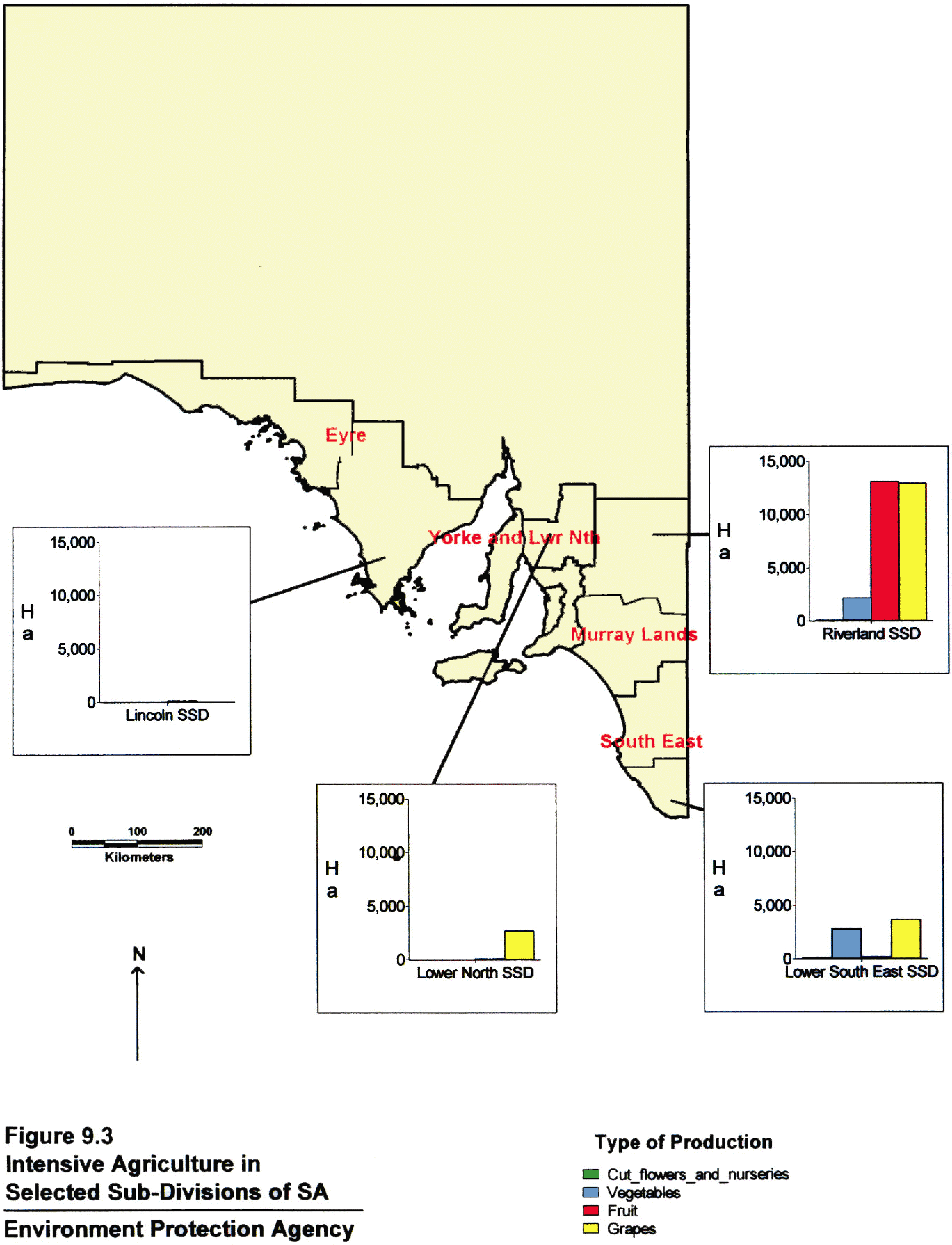

Figure 9.3
Intensive Agriculture in Selected Sub-Divisions of SA

Environment Protection Agency
Review of Organic Wastes in SA

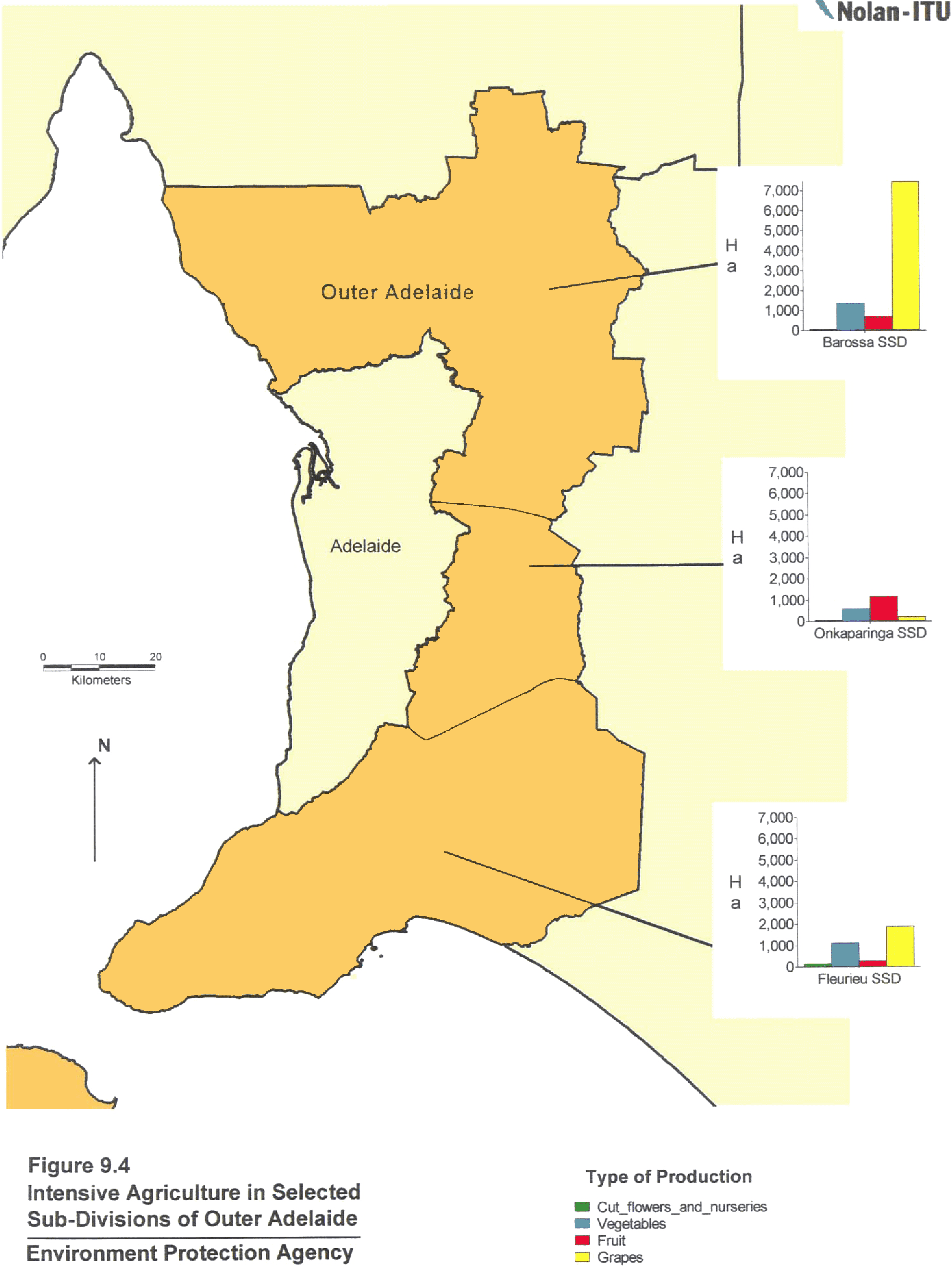

Figure 9.4
Intensive Agriculture in Selected Sub-Divisions of Outer Adelaide

Environment Protection Agency Review of Organic Wastes in SA

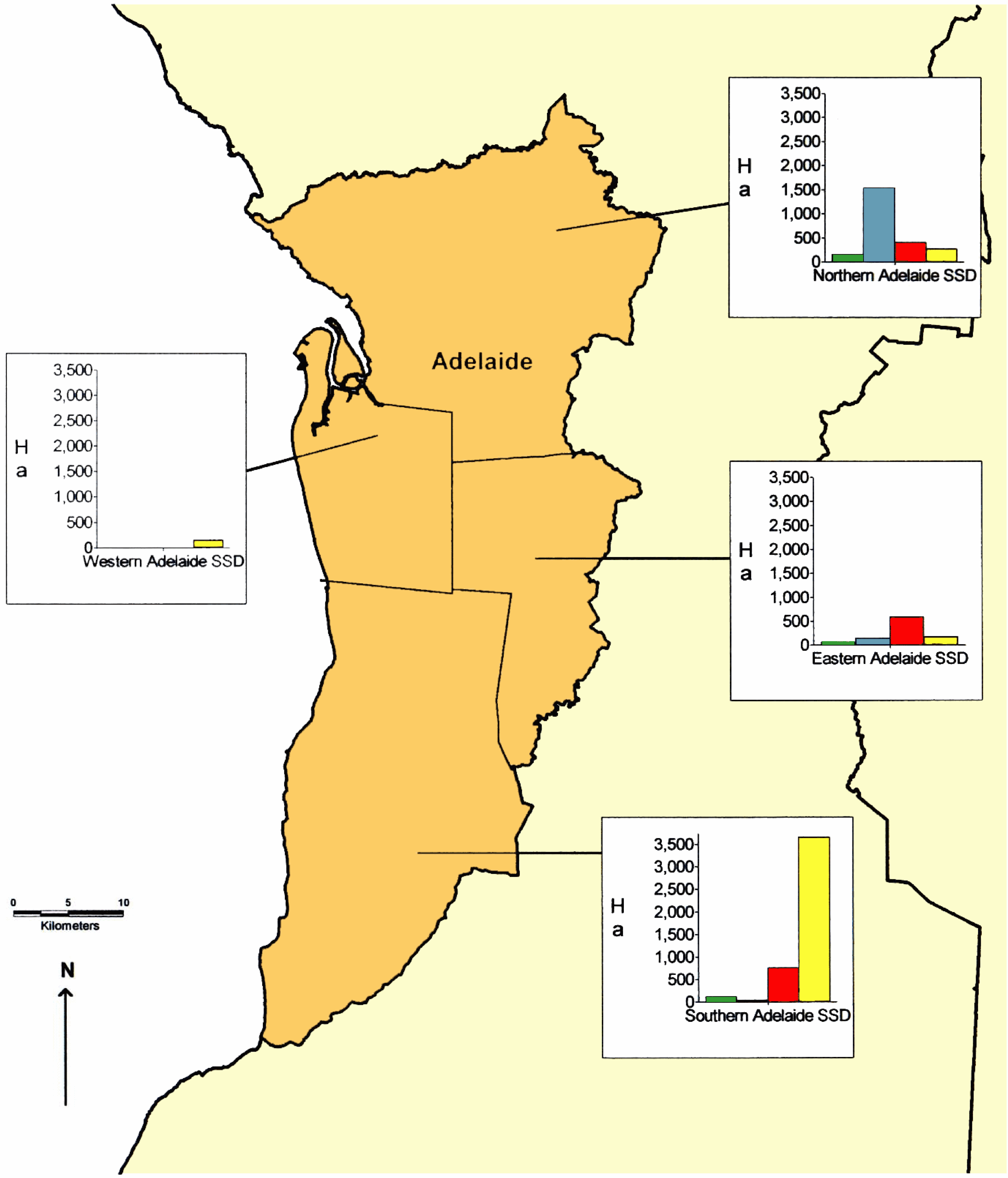

Figure 9.5
Intensive Agricultural Production in Sub-Divisions of Adelaide

Environment Protection Agency Review of Organic Wastes in SA

Type of Production

- Cut_flowers_and_nurseries
- Vegetables
- Fruit
- Grapes

Table 9.1: Summary of agricultural production by type, hectares under production, by statistical division, South Australia, 1996-7

	Adelaide	Outer Adelaide	Yorke and Lower North	Murray Lands	South East	Eyre	Northern	TOTAL SA
Pastures	26 588	912 465	800 105	1 839 498	3 251 147	1 805 087	6 808 038	15 442 927
Cereal crops	3 586	134 862	694 426	620 128	111 189	1 016 160	316 959	2 897 311
Non-cereal crops	1 678	72 505	239 921	96 146	109 565	101 004	87 748	708 566
Extensive agriculture	31 853	1 119 832	1 734 452	2 555 771	3 471 901	2 922 251	7 212 745	19 048 804
Cut flowers and nurseries	334	297	24	182	198	9	0	1 043
Vegetables	1 733	3 056	0	5 607	3 778	3	14	14 191
Fruit	1 757	2 163	84	13 903	227	127	36	18 296
Grapes	4 257	9 553	2 710	13 241	8 752	8	25	38 546
Intensive agriculture	8 081	15 068	2 817	32 932	12 955	148	75	72 077
Total	**39 934**	**1 134 900**	**1 737 269**	**2 588 703**	**3 484 856**	**2 922 398**	**7 212 820**	**19 120 880**

Source: ABS

9.3 Water availability and rainfall

One of the identified benefits of the application of mulches and composts in intensive horticulture is reduced water consumption through retention of water in the topsoil and lower soil temperatures. This is likely to be relevant in those regions where water is expensive or where there will be a tightening of water allocation rights.

9.3.1 Availability of water

An estimate of the availability of water in the key horticultural and viticultural regions in the State is presented below in Table 9.2.

There is considerable variation in water costs within regions; however, water allocations generally play a more significant role than water costs. As indicated in the table, there are specific water allocations in a number of regions with intensive agricultural industries.

Table 9.2: Water availability by region, 1999

Region	Comments
McLaren Vale / Willunga Basin	Proposed allocation of 110 mm/yr
Barossa	Allocation of 100 mm/yr
Clare	Currently unrestricted.
Northern Adelaide Plains	Water allocation limits apply. Charges payable ($15/ML) plus $60/ML pumping costs.
Riverland	Growers able to purchase tradeable allocations from irrigation schemes (can be in excess of needs).
Adelaide Hills	Currently unrestricted.
Note: McLaren Vale, Barossa and Northern Adelaide Plains are having pipeline schemes installed to provide irrigation from reclaimed or offpeak sources.	
Source: CSIRO, industry survey	

9.3.2 Rainfall and temperature

The ability of composts to reduce water consumption is particularly relevant in those regions with high temperatures over summer, and with low rainfall during the summer months prior to harvest. A comparison of the conditions in major viticultural regions in SA and Australia is presented in Table 9.3.

Table 9.3: Comparison of MJT and average rainfall, main viticultural regions in Australia

Region	Mean January temperature	Average rainfall (mm/annum)
Adelaide Plains	22.6	441
Barossa	21.4	503
Clare	21.9	634
Coonawarra	19.6	646
Padthaway	20.4	526
Riverland	23.0	274
Southern Vales	21.7	656
Hunter Valley, NSW	22.7	534
Margaret River, WA	20.4	1159
Yarra Valley, Vic	19.4	911
Source: ABS		

This comparison indicates that a significant proportion of South Australian intensive agricultural activity is conducted in relatively low rainfall and high temperature conditions. This indicates further potential value in the application of this material in these regions.

9.4 Research

The benefits of compost for use in intensive agriculture is highlighted in data prepared for presentation to growers, following field trials conducted recently by CSIRO (see Appendix C). There are clearly opportunities for widespread use of the RO compost to improve the efficiency of management of water and nutrients in irrigated horticulture. The potential value for substantial savings in water-use has been widely demonstrated, and there are clearly benefits with improved soil quality and increases in yields and crop quality.

10 MARKET TRENDS

10.1 Historic information

The organics recycling industry is very young. Therefore no series of data exists on how individual market segments have developed to enable a detailed forecast based on historic evidence.

Overall, however, the use of OHP has increased dramatically: Based on the supply of garden waste from the municipal sector (which is by far the largest supplier of RO), the overall market growth for RO derived products has been around 50% annually over the last four years. (Figure 10.1).

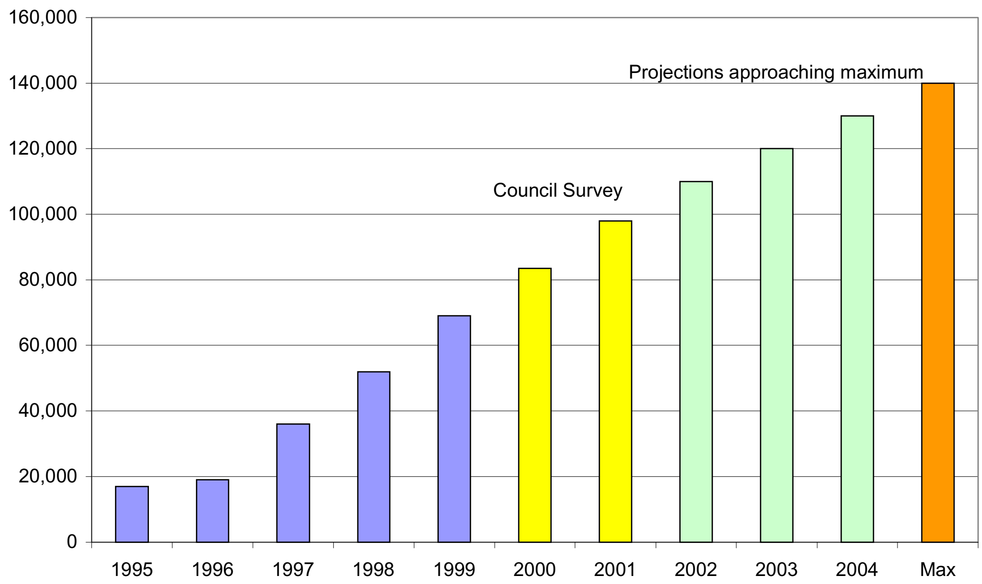

Figure 10.1 :Domestic supply trend of recycled garden waste, metro Adelaide (t/yr)

The demand trends vary according to the market. All markets for OHP (except bio-fuels where no market currently exists in South Australia) have experienced significantly increased demand. This is the result both of the substitution of recycled materials for non-recycled materials (ie substitution of organic products for chemical fertilisers in the urban amenity market, substitution of organic products for low grade soils for cover), as a result of technology changes (bio-remediation, pelletisation for export) and as a result of growth in the overall market (viticulture).

10.2 Estimation of potential demand in Greater Adelaide

Based on the information supplied in this report, it is possible to estimate the potential future demand for OHP in the greater Adelaide region based on the assumptions that:

- intensive agriculture application in metropolitan and outer Adelaide increases from 27% to 50% of land under production, using 50 t/ha every three years

- extensive agricultural application will remain very limited due to the high transport and application costs compared with the relatively low value of crops

- rehabilitation is based on conservative estimate for immediate projects and estimated demand for landfill rehabilitation

- amenity market demand is based on continued market penetration and substitution of recycled organics products for other OHPs

- demand for bio-fuels has not been estimated – this will depend on the available infrastructure being established although demand in the Adelaide region is unlikely to occur in the next five years

- demand for bio-remediation is reaching maturity according to processors although there is the potential for further expansion for clean-up projects

- export demand cannot be estimated.

Based on the above assumptions, a matrix has been developed for all organic waste materials in greater Adelaide. The matrix shows the maximum potential demand by region and industry sector. The results are presented in Table 10.1.

The current uptake of products derived from organic materials is around 165 000 t/yr in metro and outer Adelaide (compare also section 6.4). This analysis suggests that there is extensive potential additional demand in metro and outer Adelaide alone in the order of 150 000 t/yr.

This does not include the immense potential in intensive agriculture in other parts of SA, in the Murray Lands in particular, nor any extensive agricultural applications of compost or mulch.

The result needs to be seen in the light of realistic market penetration rates, which are discussed in the next chapter for the most relevant sectors.

Table 10.1: Current and potential demand for OHP (t/yr) for Greater Adelaide

Market Sector	Adelaide		Outer Adelaide	
	Current	Potential	Current	Potential
Extensive	0	limited	10 000	Limited
Intensive	37 000	61 000	66 000	113 000
Rehabilitation	4 000	40 000	0	10 000
Amenity	30 000	75 000	5 000	10 000
Bio-remediation	5 250	7 000	0	0
Export	0	-	8 000	-
Total	76 250	183 000	89 000	133 000
Total Current	165 000			
Total Potential	316 000			

10.2.1 Market Penetration

a) Intensive agriculture

The current usage of OHP in the intensive agricultural sector in greater Adelaide is around 103 000 t/yr. Assuming an application rate of 50 t/ha every three years, this means that around 27% of the entire area under these crops receives organic materials. Approximately half of these materials are currently derived from garden waste, with the remainder being manures, grape marc etc.

Table 10.2 shows the impact of extending the current area for OHP application by 13% and 18% respectively on the current demand for these products. Based on the surveys conducted for this study, this is considered a conservative estimate. Extending the application to a further 13% of the land used for intensive agriculture would increase the demand by around 50 000 t/yr; extending the application from the current 18% to 45% would increase demand by around 70 000 t/yr. By comparison, the overall increase in RO recovered over the next 5 years is expected to amount to 50 000 t/yr (refer section 5.5).

In other words, there is sufficient potential in the intensive agricultural sector in metro and outer Adelaide alone to absorb the increasing quantities of recycled organics over the next two to three years (provided that the quality is adequate, refer section 9).

Table 10.2: Impact of extending intensive agricultural areas treated with OHP in Greater Adelaide on demand (t/yr)

Intensive Agriculture	Total area with intensive agricultural crops (ha)	Current (t/yr)	Current (% of total sector in ha)	Increase by 13% (from 27% to 40% of area) t/yr	Increase by 18% (from 27% to 45% of area) t/yr
Adelaide	8 081	37 000	27.5%	53 873	60 608
Outer Adelaide	15 069	66 000	26.3%	100 460	113 018
Total	23 150	103 000	26.7%	154 333	173 625
			Increase (t/yr)	51 333	70 625

b) Other market segments

Amenity: Around 30 000 t/yr of recycled organics are currently used in the amenity segment. Available information (refer section 7.1.4 and 10.1) suggests that the demand for OHP in this segment was not more than 10 000 t/yr in 1996. Continuing growth as expected by industry representatives could double the demand within the next five years.

Rehabilitation: Projects such as Stage II of the Southern Freeway offer large potential for RO application (refer section 7.1.3); however, due to the nature of the projects, demand is likely to be subject to great variations.

10.3 Summary

As summarised in Table 5.4, recycled organics recovered from the waste stream in metropolitan Adelaide are expected to increase by 50 000 t/yr (to 143 000 t/yr) by the year 2001–02. If councils continue to upgrade and increase the level of service, remaining Councils commence regular collections beyond 2001, and businesses & institutions are required to separate RO, then the overall supply of organic materials may increase by up to a maximum of 113 000 t/yr.

Using conservative estimates, the potential demand in the three main market segments (intensive agriculture, amenity, rehabilitation) within the metro and outer Adelaide regions exceeds the expected supply. Assuming reasonable growth rates based on available historic information and surveys and discussions with a range of industry representatives, no oversupply of recyclable organics will occur under the following conditions:

- the quality of product is good
- there is no excessive competition from the release of biosolids.

10.4 Barriers

Key barriers to the expansion of these markets for recycled organic materials are detailed below.

10.4.1 Price

a) General

Regarding compost markets, Adelaide is in a fortunate position from a disease and geography perspective. There are currently no quarantine restrictions on the transport of compost within the State that could constrain the application of composts in horticultural regions. Many of the regions surrounding the city have soils low in organic matter, limited access to good quality water and low rainfall. OHPs therefore have a high potential added value.

Having said this, there is still a significant gap between the current prices the market is willing to pay and the added value these materials can bring in many conditions. Growers will not be willing to pay higher prices for products unless they are forced to because of increased competing demand from other growers. Establishing this demand will require a long-term commitment by processors and government to identify the properties of these products. This will enable growers to make more informed long-term decisions about investing in this type of technology.

The level of risk associated with these products also impacts on the price. Growers will expect a discounted price if they perceive there to be risks associated with contamination or the presence of pathogens.

b) Price of Substitutes

The price of substitutes has a significant bearing on the price paid for soil enhancement products. Growers are in many cases reluctant to pay more for a tonne of compost than they would for a tonne of manure, even though the two goods have different properties. Processors need to differentiate their products, where appropriate, to reduce the risk of substitution to other materials. Similarly, water is a substitute for compost. As the price of water increases, the value of compost will also increase.

10.4.2 Information

One of the critical constraints to the development of the intensive agriculture market is the dissemination of information. Growers surveyed were all aware of composts and other recycled organic materials on the market, but their level of knowledge tended to be associated with their willingness to apply it to their crops.

10.4.3 Technical

Contamination is a major barrier to the expansion of the markets for products containing recycled organic materials. Visual contamination creates doubt in the mind of the grower that the product may contain other more harmful contaminants. It also reminds them that the product is made from recycled 'waste'.

There have been concerns raised that the levels of heavy metals and other contaminants could be high when large quantities are used in horticultural applications. Currently, there is some confusion with the composted blends incorporating biosolids, which are marketed in the eastern states. Although high levels of heavy metals in RO compost are extremely unlikely, more work is needed to analyse RO-derived products to document the quality, and possibly to introduce greater controls to guarantee risk-free products to growers.

11 CONCLUSIONS

The following conclusions have been drawn and recommendations made based on the findings of this study. For clarity, these have been divided into supply, processing and market development sections.

11.1 Supply

11.1.1 Council services

Over the past four years, several councils in metropolitan Adelaide have commenced kerbside garden waste collection services for their residents. Several more are considering provision of such services. Councils in Adelaide are therefore gradually increasing the supply of materials to the market.

A number of councils offer user-pays services to residents that result in reduced supply but increased quality. This is an effective interim step given the current condition of the market and should be encouraged until markets are better established and/or better systems are in place to remove contaminants from garden wastes. While the longer term demand for the materials should enable a shift to a full kerbside collection, products derived from low contamination garden wastes are currently (and always will be) more competitive and will have greater market penetration.

Councils that do offer full kerbside collections should implement measures that identify the main sources of contamination, and either educate offending householders or remove them from collections. It should be remembered that the set-out of recyclable materials is a voluntary act by residents, and, in general, the vast majority seek to conform to the required collection standards. The education program needs to cover all parties involved (councils, ratepayers, collection contractors and processors). Contracts need to contain achievable contamination goals.

11.1.2 Costs of Services

The net cost of providing garden waste collection is currently around $25 per household per year, or $80 per tonne. These costs are likely to fall as transport of waste to landfills will become more expensive (distances) and the higher value for the products is more widely understood. This increased value and greater demand will be reflected in greater competition between processors for raw materials and higher prices (lower gate fees) paid for garden wastes. This will also lead to price differentiation between lower and higher quality garden wastes, allowing price signals to guide stricter quality control. However, the combined costs of collection, processing, transporting and application are likely to remain higher than prices paid for RO derived products.

11.1.3 State Government support/facilitation

There is an important role for State Government to facilitate changes in councils to reflect changing market conditions. This could best be done in a partnership or a co-operative approach with the Waste Management Committee, and advice from industry through Commpost SA. It is recommended that State Government encourage councils to provide garden waste collection services to their residents. The nature and frequency of service should be decided by councils, as they are best able to gauge the needs and constraints within their local areas.

While there is already a reasonable drop-off network in metropolitan Adelaide, a need exists to provide drop-off facilities in the south-east. It is understood that discussions are being held with Mitcham Council to establish a garden waste drop-off facility. These should be further pursued.

11.1.4 Non-municipal supply

Landfill prices and the accessibility of drop-off facilities generally drive the supply of organic waste materials from the non-municipal sector. This supply is already reasonably effective at diverting materials, and processors are seeking to source more material from this sector because of its high quality.

11.2 Processing options development

11.2.1 Future sources of RO

The development of the organics recovery industry in Adelaide is being severely constrained by the lack of suitable processing sites. A separate study is currently being conducted to assess the suitability of sites.

Based on the information presented earlier in this report, three options have been developed for transporting and processing RO sourced from metropolitan Adelaide. These are presented below.

As a first step, the metro area was split into four separate regions: Inner, East, North and South. An "eastern area" has been kept as a separate area for this purpose because it is understood that potential sites in the Adelaide Hills are being considered, and because the South-Eastern Freeway will provide better access into the Hills.

The councils within each of the regions are presented in Table 11.1 which provides estimates of future RO quantities recovered from the waste stream. The expected quantities are given on a council basis for the year 2001–02, based on council data presented in section 5. The non-municipal RO quantities recovered have been apportioned to individual Councils on a population basis. Totals are provided for each of the areas for three forecasts which have been calculated as follows:

2001–02: Council estimates as discussed in section 5.3. Non-municipal quantities for 2001 as discussed in section 5.4., and apportioned to individual councils on a population basis.

2004: Council estimates as above, plus assuming maximum non-municipal RO recovery, apportioned as described above.

Maximum: 87.5% of total council RO recovered plus maximum non-municipal RO recovery.

Table 11.1: Projected quantities of RO recovered within metropolitan Adelaide (t/yr)

Council	Map #	Area	2001–02			2004	Maximum
			Non-Mun.	Municipal	Totals	Totals	Totals
Adelaide	1	Inner	662	5 292			
Charles Sturt	5	Inner	4 262	8 584			
Port Adelaide - Enfield	13	Inner	4 138	5 880			
Prospect	14	Inner	786	2 422			
Walkerville	18	Inner	290	588			
West Torrens	19	Inner	1 821	15 522	50 000	56 000	62 000
Burnside	3	East	1 614	4 351			
Campbelltown	4	East	1 862	1 176			
Mitcham	10	East	2 594	1 176			
Adelaide Hills	2	East	1 531	3 234	18 000	21 000	32 000
Gawler	6	North	703	823			
Playford	12	North	2 689	2 317			
Salisbury	15	North	4 634	11 359			
Tea Tree Gully	16	North	3 931	9 290	36 000	41 000	51 000
Holdfast Bay	7	South	1 324	2 352			
Norwood, Payneham St Peters	8	South	1 448	2 446			
Marion	9	South	3 204	13 993			
Onkaparinga	11	South	6 056	2 940			
Unley	17	South	1 452	4 116	39 000	46 000	61 000
Total			45 000	97 860	**143 000**	**164 000**	**206 000**

11.2.2 Options

Three options have been developed to identify the future processing capacity required in various areas; these are described below. Without the opportunity to specify potential locations, it was not possible to calculate transport costs for each of the options. Experience in Adelaide and other cities has shown that actual transport costs depend to a significant extent on individual companies' depot locations and other circumstances which cannot be modelled.

a) Option 1

Of the quantities expected to be generated from the inner Adelaide area, 13 000–15 000 t/yr are being processed within the area by existing smaller operations (refer section 6). For Option 1, it is assumed that the remainder (37 000 t/yr in 2001–2) is bulked up at a transfer station (located preferably within or adjacent to the area) and hauled to a processing site in the south. There, the material is processed together with the RO sourced from the southern councils.

The material from the northern and eastern areas is being processed at a facility in the north. The resulting combined facility capacities are presented in Table 11.2.

Table 11.2: Facility capacities for Option 1 (t/yr)

Facility Type	2001/2	2004/5	Maximum
Smaller processors - Inner	13 000	15 000	15 000
Transfer Station – Inner	37 000	41 000	47 000
Processing - North	54 000	62 000	83 000
Processing - South	76 000	87 000	108 000
Total RO Processing Capacity	143 000	164 000	206 000

b) Option 2

Of the RO quantities expected from the inner Adelaide area, approximately 13 000–15 000 t/yr are being processed within the area by existing smaller operations. For Option 2, it is assumed that the remainder is bulked up at a transfer station (located preferably within or adjacent to the area) and hauled to a site in the Adelaide Hills. There, the material is processed together with RO sourced from the eastern councils.

Councils in the north and in the south are serviced by their local processing facility(ies). The resulting combined facility capacities are presented in Table 11.3.

Table 11.3: Facility capacities for Option 2 (t/yr)

Facility Type	2001/2	2004/5	Maximum
Smaller processors – Inner	13 000	15 000	15 000
Transfer Station – Inner	37 000	41 000	47 000
Processing – Eastern (Hills)	55 000	62 000	79 000
Processing – North	36 000	41 000	51 000
Processing – South	39 000	46 000	61 000
Total Ro Processing Capacity	143 000	164 000	206 000

c) Option 3

Of the RO quantities expected from the inner Adelaide area, approximately 13 000–15 000 t/yr are being processed within the area by existing smaller operations. For Option 3, the eastern councils are not seen as a separate region but as part of 'inner'. The material from both 'inner' and 'eastern' is bulked up at a transfer station (or two transfer stations depending on location, availability and capacity) and hauled to processing sites in the north (50%) and in the south (50%). The resulting combined facility capacities are presented in Table 11.4.

Table 11.4: Facility capacities for Option 3 (t/yr)

Facility Type	2001/2	2004/5	Maximum
Smaller processors - Inner	13 000	15 000	15 000
Transfer Station(s) – Inner/East	up to 55 000	up to 62 000	up to 79 000
Processing - North	63 500	72 000	90 500
Processing - South	66 500	77 000	100 500
Total RO Processing Capacity	143 000	164 000	206 000

d) Discussion

Additional Capacity

At present, there are two larger scale operations (Jeffries and Peats) processing around 58 000 t/yr of RO, and eight small to medium operators processing a combined total of approximately 33 000 t/yr (refer table 6.1).

To assess the total future RO processing capacity required for metropolitan Adelaide, the following factors need to be taken into consideration:

1. Some RO processors are currently working at (or even above) their capacity. Capacity at composting facilities is usually restricted by available space rather than by equipment. This situation has negative consequences such as:

   - product quality problems as the compost is not sufficiently matured both through inadequate windrows (too high, no turning possible) and through a reduced maturing time on site [reducing maturing time from 12 weeks to 6 weeks almost doubles annual capacity; however, immature products pose a risk to young plants (nitrogen drawdown), selected other crops (heat damage) and are more difficult to apply].

   - odour problems from windrows that are too high for adequate composting/ maturing.

2. RO quantities requiring processing are expected to increase by 50 000 t/yr within the next two years, up to a maximum of 103 000 t/yr by 2004.

Additional capacity required will depend on if and how current facilities will remain operational. However, due to the present situation with facilities operating at or above capacity, total additional capacity required will be rather greater than the expected increase in RO quantities.

Facility Size

As stated previously there are a number of smaller operations servicing either particular councils or responding to particular local needs. These need to be taken into consideration when comparing the combined processing capacity required in each of the options.

In general however, larger RO processing facilities have several advantages over smaller facilities for the following reasons:

- economies of scale—higher capacity facilities enable the purchase of better and more specialised equipment (screens, shredders, windrow turners, equipment for contaminant removal etc)

- homogenous quality—if the market has fewer suppliers, the quality of material is more homogenous than if supplied by a larger number of smaller operators. Experience has also shown that the product quality from larger facilities is generally (though not always) higher.

The general trend in Sydney and Melbourne is for processing facilities with capacities between 30 000 t/yr and 100 000 t/yr. For example, four regional composting facilities exist in Melbourne with a capacity of 40 000 t/yr each (three operational, one in the approval stage). In Greater Sydney, there are four facilities with capacities between 30 000 and 50 000 t/yr, plus one with a capacity in excess of 100 000 t/yr.

Preferred Option

The findings of this report confirm that the current situation in relation to processing of recyclable organics in Adelaide is not sustainable. The selection of the preferred option will largely depend on the availability and location of processing sites.

Historic evidence in Adelaide suggests that the identification and approval of suitable sites is extremely difficult. Given the criteria discussed in this section and in section 6.4, there are benefits from a planning perspective in establishing a smaller number of larger sites than a larger number of smaller facilities. It seems therefore preferable to select an option with as few new processing sites as possible, ie either Option 1 or Option 3.

As a next step, the proximity to markets for the end products can be taken into account. In addition to the market segments 'urban amenity' (landscaping) and 'rehabilitation', both of which establish the demand predominantly within the metropolitan area, intensive agriculture around Adelaide is the most important market for RO derived products. Figure 9.4 and Figure 9.5 illustrate that the short-term potential demand in this market segment is both in the northern and southern regions of outer Adelaide. Hence it is desirable to achieve an equal distribution of RO to the north and to the south.

For the above reasons it is recommended Option 3 be adopted as a guide in establishing RO processing sites in Adelaide.

Considering the current situation (refer section 6), the required combined capacity for processing RO is around 70 000 t/yr of RO input for a site in the north and around 75 000 t/yr of RO input for a site in the south.

The key criterion for site selection is to provide a secure location for processors to operate from for the next 15 to 20 years. Sites which are likely to undergo future changes in land use or encroachment from other neighbouring uses are not appropriate. Buffer zones for composting facilities should be at least 500 m, and preferably greater than 1 km if the site is to be approved for composting of organic wastes other than garden and timber wastes, because of the significant increase in odour emissions. The industry has indicated that the transport cost increases for more remote sites are easily offset if the sites are secure and do not encroach upon other activities.

Regulatory Controls

There is the need for a review of composting licencing and for tighter product classification guidelines (as per eg Australian Standards 4454-1999, 4419-1998, 3743-1996) to ensure high quality products that will establish greater confidence in the market. Currently a number of unlicensed composting facilities exist that are technically in breach of the regulations but which are ignored because of the perceived need to not discourage organic waste recovery. Tighter controls would also allow the market to better distinguish between full composting and mulching.

11.3 Market development

11.3.1 Trends

a) Projections

Using conservative estimates, the potential demand in the three main market segments (intensive agriculture, amenity, rehabilitation) within the metro and outer Adelaide regions exceeds the expected supply. Assuming reasonable growth rates based on available historic information and surveys and discussions with a range of industry representatives, no oversupply of recyclable organic wastes will occur if:

- the quality of product is good
- there is no excessive competition from the release of biosolids.

b) Competing Products

The quantity of biosolids remains the greatest unknown as the "supply" is almost unlimited (refer section 3.3). If biosolids were to compete substantially (at, say, 80 000 t/yr for the next three to four years) with garden waste in the same market segments with the largest growth potential (intensive agriculture, urban amenity, rehabilitation), an oversupply with subsequent price deterioration would likely occur.

It is therefore recommended that biosolids predominantly target different markets, such as forestry and extensive agriculture. It is also recommended that biosolids use in markets well-suited for garden waste-derived products be limited to providing a role as a supplement only (maximum of 10% to 20% biosolids added to garden waste). This should only occur in conjunction with appropriate testing and compliance with relevant quality standards. Under these circumstances, the markets would likely be able to accommodate additional biosolids quantities without major problems.

11.3.2 Lack of information

One of the critical barriers to the development of the market for products containing recycled organic material is a lack of information in the market. Growers still only have limited information on the benefits of applying these products in commercial applications, and they are identified as being the major source of potentially high value demand for these products. The information required is a continuation of the research commenced by CSIRO, feedback from growers using products, research into plant pathology, and targeted education campaigns for growers, in particular in the greater Adelaide region.

11.3.3 Water pricing and use

The ongoing reforms to pricing and the use of water will provide continuing incentives for growers to shift production practices to incorporate more water-efficient growing techniques.

11.3.4 Transport

In almost any market, the transport costs are significant. In the case of marketing composts sourced from metropolitan Adelaide, transport costs are relatively low, as areas with the highest current and future demand are within a 50 km radius of the CBD (transport costs of $10 to $15 /t).

11.3.5 Application techniques

A key cost in applying composts to soils is spreading. This cost may fall over time if improved technology can be developed to improve the application efficiency. This is considered by users to be a major impediment to market expansion. It is therefore recommended that the State Government support research into innovative and more cost-efficient application techniques.

11.3.6 Alternative use of garden organics

It is unlikely that waste to energy facilities in rural regions would be cost effective because of insufficient availability of organic wastes for energy plants, and the economies of scale required for this type of energy generation.

11.3.7 Potential value of compost

Considerable research has recently been undertaken to better define the potential value of garden waste-derived products to industry. There are strong indications that the value of these types of products may be higher than current market prices. Realisation of this increased value will be the result of the market maturing, further research into the benefits of these materials, and development of systems which can reduce/negate the risk of contaminants and sub-standard composts being released onto the market.

12 RECOMMENDATIONS

Based on the information and conclusions contained in this report, the following recommendations have been made and are summarised in this section. It is recommended that:

- councils continue to be encouraged to provide garden waste collection services to residents
- councils that offer full kerbside collections implement measures that identify the main sources of contamination, and either educate offending householders or remove them from collections. The education program needs to cover all parties involved (councils, ratepayers, collection contractors and processors)
- State Government facilitates these changes in councils in a partnership approach with the Waste Management Committee and industry advice through COMMPOST SA.
- one to two garden waste drop-off facilities be established in the south-east;
- two sites for processing of RO be identified and established as a matter of urgency, one in the north and one in the south of Adelaide. The required capacity for processing RO is around 70 000 t/yr for the site in the north, and around 75 000 t/yr for the site in the south
- a review of composting licencing be undertaken, and tighter product classification guidelines be adopted to ensure the production of high quality products that will establish greater confidence in the market
- biosolids be predominantly targeted at markets where they do not directly compete with RO-derived products (eg forestry, extensive agriculture).
- use of biosolids in markets that are well suited for garden waste-derived products be limited to providing a role as a supplement only
- information be collected and disseminated through continuation of the research commenced by CSIRO and using feedback from growers applying these products.
- targeted education campaigns be run for growers of intensive agriculture crops, particularly in the greater Adelaide region
- State Government support research into innovative and more cost-efficient compost spreading techniques
- State Government actively support further research into the benefits of application of recycled organic wastes in the agricultural and horticultural sectors. Proposed research programs should be joint partnerships between relevant stakeholder bodies.

13 REFERENCES

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GLOSSARY

Descriptions of terms used in this report for source materials, processes, and end products are described below.

biosolids	Solid, semi-solid or slurry material produced by the treatment of urban sewage. The term "sewage sludge" is also used
compost	Material resulting from the controlled microbiological transformation of natural organic materials under aerobic and thermophilic conditions
composting	The process of the aerobic conversion of organic materials by micro-organisms into soil conditioners, compost or humus. By definition, it is a process that must be carried out under controlled conditions yielding cured products
feedstock	Input material
food waste	Waste food materials, including: non-fatty food wastes such as vegetable, fruit and cereal wastes; fatty food wastes such as carcasses and parts of carcasses, blood, bone, and fish wastes; fatty and oily sludges such as de-watered grease trap waste
fresh compost	Compost removed from a vessel, heap, or windrow after a short period of thermophilic decomposition
garden waste	Any waste material which in its raw form comprises vegetation, including grass, leaves, mulch, plants, branches and twigs, tree poles and stumps, and tree loppings
greater Adelaide	Metropolitan Adelaide and outer Adelaide comprising Barossa, Onkaparinga and Fleurieu Statistical Subdivision (refer Figure 9.4)
herbicides	An agent that is destructive to weeds or causes an alteration in their normal growth
home composting	Domestic on-site composting
mature compost	Organic materials at an advanced stage of decomposition following extended curing
mulch	Any natural organic material that is suitable for placing on soil surfaces
municipal waste	Solid and inert wastes arising from the three waste sub-streams: • Domestic waste—household solid and inert wastes placed out for kerbside collection • Other domestic waste—residential solid and inert wastes arising from domestic clean-up and garden waste • Other council waste—council generated solid and inert wastes arising from street sweepings, litter bins, parks and garden clean-ups, tree loppings and council engineering work.

OHP	Organic landscaping and gardening products such as mulches, compost, soil conditioners and top dressings, organic fertilisers, potting mix and organically amended soils
on-site composting	This term is used very broadly to describe several backyard on-site organic waste management techniques, including mulching with lawn clippings, leaves or chipped garden prunings, composting in containers or heaps, and home vermiculture with containers operating as worm farms
organics processing facility	A facility at which organic materials such as garden wastes are received and processed. Processing may include sorting, classifying, shredding, composting
other organic wastes	Biosolids, and food scraps from restaurants, educational institutions, hospitals and food processors etc
pathogen	Any disease-producing micro-organism.
pesticide	A poison used to destroy pests of any sort
potting mix	A growing media suitable for the culture of a wide range of plants in containers
recyclable organics	Organic waste originating from parks, yards, road reserves and gardens which can be utilised in the production of 'Organic Horticultural Products' (OHPs)
shredding	Process by which green organic wastes are chopped into pieces that are smaller than a specified size
soil conditioner	Any material of natural organic origin that is produced or sold for adding to or mixing with soils. This term also includes 'soil amendment', 'soil improver' and similar terms
transfer station	Location and facility where waste is deposited and bulked up before its transfer to a landfill
wood waste	Waste items such as wooden pallets, construction timber, boards

Abbreviations

ABS	Australian Bureau of Statistics
C&D	Construction and Demolition
C&I	Commercial and Industrial
EIS	Environmental Impact Statement
EPA SA	Environmental Protection Authority South Australia
kg/cap/y	kilogram per capita per year
MGB	Mobile Garbage Bin
MSW	Municipal Solid Waste
OHP	Organic Horticultural Products
R&D	Research and Development
RDF	Refuse Derived Fuel
RO	Recyclable Organics
t/yr	tonnes per year

Appendix A

Council Survey Questionnaires

Nolan-ITU questionnaire for South Australian Councils

Nolan-ITU has been engaged by the EPA to conduct a review of the markets for Organic Wastes in South Australia. We are updating our databases on the current and potential supply of garden wastes from your Council.

Question	Response
What is the name of your Council?	
What is your name?	
What is the population of your Council?	
How many services/rateable properties are there?	
We are updating information on your domestic waste profile, focussing on garden wastes.	
Do you have a recent waste audit or profile of the total quantity and composition of domestic waste going to landfill from your Council?	
Do you have a recent waste audit or profile of the total quantity and composition of Council waste going to landfill from your Council?	
How many tonnes of domestic garbage are landfilled per annum?	
In particular, do you know or can you estimate what proportion of your garbage is made of up garden waste?	
Does Council provide a garden waste collection service?	
Does Council provide a garden waste drop off service?	
How many t/yr of garden waste does your Council collect per annum?	
Where is it taken? Is there a fee?	
How much organic waste does Council generate per annum? What does it do with this material?	

Does your Council plan to upgrade or introduce a garden waste collection service?	
If yes, when is its planned introduction?	
Will it be a user pays collection or a full kerbside collection or a drop off service?	
Will a container be provided? What type?	

Appendix B

Growers Survey Questionnaires

Organics Questionnaire

	Question	Response	Purpose of question
1.	Name of company/organisation		Basic information
2.	Contact name, telephone number etc (in case of follow up)		
3.	Produce type		
4.	Region/District(s) represented		
5.	Hectares under production		Identify proportion of new planting and size of facility/ regional production
6.	Proportion of new planting's this season		
7.	Likely trend of new planting's for next five years		
8.	What is the average value of your crop per hectare per season?		Identify value of crop to determine whether material is more valuable to higher value added crops
9.	What is the cost of water (measured either per ha, or per unit of water, so long as the costs are comparable)?		Cost of water and rate of usage (and therefore potential value of compost)
10.	On average, how much water do you use per ha per annum?		

	Question	Response	Purpose of question
11.	What products/materials do you currently use to condition/ enhance the soil? (include fertilisers) - how much product per ha - price paid per ha - where is this materials sourced from? - How do you apply them (method, timing etc) -		Compliments and substitutes
12.	What reasons do you apply these materials?		
13.	Are you aware of the availability of composts for soil enhancement?		Market awareness for compost.
14.	Do you/ have you ever applied composts to your soils?		
15.	What are the main constraints that you have to applying composts to your soils: - no information - contamination – risk - cost - transport - other (detail)		Evaluate perceptions – constraints to use and trying to attach $ value to each of the constraints
16.	Can you attach an estimated value of these constraints: how much do they reduce the value of composts to you?		

	Question	Response	Purpose of question
17.	If you have used composts, how beneficial are they for your product? In which areas do you consider them to be beneficial: - reduced water consumption - increased plant growth - reduction of weeds - reduced need for fertilisers - other -		Estimating value of composts to market.
18.	Given what you know about composts, what would you be willing to pay for compost (either per tonne or per cubic metre, so long as the measure is comparable with other units)?		
19.	Would this change significantly if any/ all of the constraints identified in question 15 were addressed – by how much ($)?		
20.	Any other useful information?		