

Environment Protection Authority

Consultancy report:

Opportunities for the re-use of winery industry solid wastes

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Review of Opportunities for the Re-use of Winery Industry Solid Wastes

**SA Waste Management
Committee**

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Executive Summary

South Australia is the largest wine producing state in the country, accounting for 52% of wine grapes produced. The State's winery industry is growing rapidly with an overall 77% increase in grape crush projected between the year 2000 and 2005 (Phylloxera and Grape Industry Board, 2000). Wine industry leaders regard themselves as pro-active in addressing the environmental impacts of their businesses. Recently the industry has focused on cleaner production initiatives for the management of winery effluent, and the development of an environmental code of practice. Now the industry recognises the need to also address the sustainability of its solid waste management practices. The following trends and issues within the winery industry have provided the impetus for a review of solid waste management practices:

- *It is estimated that approximately 90% of grape marc generated by the wine industry is collected for distillation processing into alcohol. The continued viability of distillation processing for treating the grape marc generated by the industry is under question due to the fall in fortified wine and brandy production over the last few years and the difficulty in establishing export markets due to tax incentives provided to EU producers of grape alcohol.*
- *With the projected growth in grape marc that will be generated from a significant growth in wine production it is not likely that historical (levels) percentages of total grape marc (as high as 90%) will be required for alcohol distillation, unless exports of grape alcohol can be significantly increased.*
- *Unless grape alcohol sales can be increased it may be no longer economically viable to freight grape marc from winery regions that are more distant from the major alcohol distillation plants which are located in Nuriootpa and Berri.*
- *There is already a significant amount of on-site re-use of grape marc material on vineyards, particularly with smaller sized wineries. With the projected growth in the industry it needs to be ensured that environmental impacts, such as surface water contamination from on-site re-use practices, are minimised.*

In recognition of the above issues and their threat to the sustainability of current winery waste treatment practices, the South Australian Waste Management Committee, through its Rural Grants Waste Management Grants Scheme, supported this study on the potential options for the future treatment and re-use of winery solid waste. This study was also conducted with the in-kind support from the winery industry and assistance from SA Wine and Brandy. The objectives of this research were to:

- *Evaluate the quantities, types and regional distribution of winery solid wastes in South Australia.*
- *Evaluate the effectiveness and sustainability of current waste treatment practices.*
- *Examine the opportunities for the re-use of these wastes as value-adding products for existing composts and mulches.*

- *Provide a preliminary appraisal of infrastructure impediments and opportunities for enhanced solid waste recovery and re-use.*

To achieve these objectives PPK consulted with key industry stakeholders including:

- *SA Wine and Brandy Association;*
- *Tarac Australia Pty Ltd;*
- *major wineries;*
- *processors of recyclable organics; and*
- *the Environment Protection Agency.*

To assist in quantifying current solid waste streams and determine current treatment practices, a survey was distributed to all wineries throughout the State.

From the research conducted the following key findings were established:

- *A total of 61,000 tonnes of grape marc was treated via distillation for the year 2000 vintage. With a projected overall grape crush increase for each region forecasted for the next five years it is estimated that an additional 49,600 tonnes of grape marc will require treatment in 2005.*
- *The future ability of distillation processing to collect and treat 90% of the grape marc generated by the industry is limited due to decreases in alcohol sales.*
- *Use of grape marc by major composting processors near winery regions was negligible. However, most processors acknowledged the opportunity to utilise grape marc as value-adding material to their products.*
- *In comparison to grape marc, filter earth being used for tartaric acid extraction poses less of waste management issue to wineries because most is collected for distillation and tartrate recovery but it then presents disposal problems after this recovery process. It is estimated that approximately 4,800 to 9,600 tonnes of filter earth was produced in the year 2000.*
- *The review of alternative solid waste treatment and infrastructure will be of greater priority for those regions that are more distant from the Nuriootpa and Berri distillation plants such as the McLaren Vale, Langhorne Creek and Limestone Coast Regions, due to the increased cost of collecting grape marc from these areas.*
- *The practice of re-using grape marc on winery vineyards was most common amongst smaller scale wineries. Based on estimated grape crush figures for wineries that crush less than 500 tonnes per annum, it was estimated that a total of 1,120 tonnes of grape marc is currently re-used on-site by this sector of the industry.*
- *Considerable amounts of "spent" grape marc is used on vineyards in all major grape growing areas of South Australia. "Spent" marc being the definition of grape marc after distillation.*

The spent marc is considered to be better for agricultural use after distillation for several reasons. These being:

- seeds are no longer active;
- vinegar and other flies are not attracted to the marc; and
- mould problems are not as great in spent marc as fresh.

Tarac estimate that this year they generated approximately 50,000 tonnes of spent marc.

From a consideration of the key findings and further consultation with key stakeholders, PPK determined the following infrastructure and re-use opportunities for the treatment of winery solid wastes:

- *The establishment of transfer facility infrastructure in regions that are more distant from the Nuriootpa distillation plant to improve the economic viability of collecting marc from these regions for distillation processing. Consultation with Councils within these areas would be required to determine appropriate facility locations.*
- *Grape marc composting trials should be conducted with wineries and growers and potentially off-site composting processors close to priority regions including the McLaren Vale, Limestone Coast (Coonawarra) and Langhorne Creek Regions. Trials should investigate the industry advantages and disadvantages of mulching grape marc material through to developing higher industry compost products. Trialing a range of end products will enable industry favoured products to be determined and will also enable a varied marketing approach. It is also recommended that trials incorporate an analysis of using filter earth, that is not suitable for tartaric acid extraction, as an additive to compost products. Tarac is keen to pursue composting trials using a combination of spent marc after distillation and solids recovered from filter earth and wine/lees after distillation/tartrate recovery. Composting trials should involve a collaboration of the Waste Management Committee, Compost SA, targeted composting companies, SA Wine and Brandy and the CSIRO Land and Water Division.*
- *Best practice guidelines should be developed for the industry in relation to on-site marc storage, mulching practices and re-use on vineyards. This will assist in minimising the potential environmental impacts from these activities. It is recommended that guidelines be incorporated into an Environmental Code of Practice for the industry.*
- *The Waste Management Committee should liaise with the Australian Greenhouse Office, to explore the use of winery solid waste in energy production technologies. It is recommended that a more detailed research report be prepared on energy recovery opportunities for the winery industry, which explores the barriers and opportunities to advancing energy recovery infrastructure in the State. For this to be effective there needs to be a central collection agency so that large quantities are brought into a central point to justify energy recovery plants. Researching options beyond composting will be important considering the vast growth in grape marc that will be generated and the growth of other competing organic waste streams such as olive marc.*
- *The Committee should keep abreast of other advances with other potential treatment options such as the feasibility study that is currently being conducted on the use of grape seeds in grape seed oil production by the Cooperative Research Centre.*

1. Project Objectives

The overall aims of this study were to:

- evaluate the quantities, types and regional distribution of winery solid wastes in SA;
- evaluate the environmental impact and sustainability of current solid waste management practices;
- estimate the cost to the wine industry of current solid waste management practices;
- examine the opportunities for re-use of these winery solid wastes as value-added products such as composts and mulches and other potential value adding practices;
- identify the impediments to the adoption of recycling and value adding practices on a regional basis; and
- provide a preliminary appraisal of infrastructure impediments and opportunities for enhanced solid waste recovery and re-use.

2. Methodology

To achieve the project objectives, PPK undertook the following:

1. Conducted a Survey of Current Solid Waste Management Practices

A survey was distributed to 190 wineries throughout the State which asked wineries to detail their current solid waste management practices. A copy of the survey is presented in Appendix A. From this survey 53 responses were obtained, which represents a participation rate of 28 percent.

The survey was used to obtain information on:

- projected growth of wine production within the industry;
- estimated tonnages of grape marc produced and the trends in disposal methods for grape marc;
- estimated tonnages of filter earth clays produced and trends in current disposal methods; and
- an estimate of the cost of current winery waste disposal or treatment options.

The feedback obtained from the survey was used to analyse trends in waste management practices in the industry which assisted in quantifying practices such as on-site re-use of grape marc and treatments in addition to distillation. From the survey, indicative costs of different treatment methods were also obtained.

2. Held Meetings with Key Stakeholders

Consultation was undertaken with the following key stakeholders to assist in quantifying the current waste management practices and to determine future opportunities for the industry:

SA Wine and Brandy

PPK liaised with the SA Wine and Brandy Association on an ongoing basis throughout the research. The Association assisted with the distribution of the waste practices survey and with identifying opportunities for waste re-use trials.

Tarac Australia Pty Ltd

A meeting was held with representatives of Tarac Australia Pty Ltd (Tarac) to obtain information on:

- the amount of grape marc treated by distillation processing;
- the current state of the market for brandy and fortified wine;
- the capacity of distillation processing to treat estimated future grape marc volumes; and
- the immediate infrastructure requirements to improve the economic viability of distillation processing.

As Tarac collects grape marc from at least 90% of the industry, regional data from the company was used as the primary source for quantifying tonnes of grape marc generated by the winery regions.

PPK also spoke with organisations that are investigating different commercial opportunities for re-using winery industry wastes including the Cooperative Research Centre who are investigating commercial opportunities for grape seed oil production.

3. Undertook Consultation with Composting Companies

To assist in determining value adding opportunities for the re-use of grape marc and to quantify the current level of grape marc composting that is currently undertaken, PPK had discussions with the following composting companies:

- Fin Pty Ltd;
- Van Schaik Organic Soils and Bark Suppliers Pty Ltd;
- Peats Soil and Garden Supplies; and
- Adelaide Vegetation and Mulching Services.

In addition to consulting with the above companies, the current status of composting organic wastes in South Australia (SA) was assessed through a review of the recent research undertaken by Nolan ITU on a 'Review of Organic wastes in South Australia'. In this review, market opportunities for compost, impediments and potential barriers to the increase in compost use and the current status of composting infrastructure in the State are reported.

4. Conducted a Review of other Relevant Industry Reports

Relevant industry information and research reports were reviewed as necessary for this research. A reference list is provided in Section 7.

3. Quantification of Winery Solid Waste Streams and Associated Treatment Methods

3.1 Grape Marc

3.1.1 Distillation Processing

Grape marc comprises of grape stalks, seeds and skins generated from the crushing, draining and pressing stages of wine production.

It is estimated that approximately 90% of grape marc generated by the SA wine industry is collected for distillation processing into alcohol. Tarac has the only major distillation processing facilities located at Nuriootpa and Berri. Grape marc availability for distillation processing is seasonal and is dependent on the length and size of the vintage for the industry.

Generally Tarac currently collects almost all of the grape marc from the industry apart from a small amount (no greater than ten percent) that may be retained by larger sized wineries for re-use on vineyards and marc generated by smaller wineries where collection is not viable. The winery waste survey indicated that the smaller sized wineries stockpile their grape marc material for re-use on their vineyards.

Table 3.1 provides data on the amount of grape marc material collected for distillation processing from the winery regions in South Australia. Based on the estimated preferred grape crush growth for these regions, the likely tonnes of grape marc to be produced in 2005 are also calculated.

As indicated in Table 3.1, based on projected growth in grape crush an additional 49,600 tonnes of grape marc material will require treatment in 2005.

Assumptions for Table 3.1:

- Data for this table has been rounded to the nearest 100 tonnes.
- Estimated tonnages of grape marc processed for 1999 and 2000 **by region** have been sourced from Tarac Australia Pty Ltd.
- A plus or minus 10% accuracy should be allowed with these figures.
- Projected growth production figures have been sourced from the following reference: Phylloxera and Grape Industry Board of South Australia. "The 2000 South Australian Winegrape Utilisation and Pricing Survey". Phylloxera and Grape Industry Board of South Australia, SA, 2000.
- Estimated Marc Tonnages that will require alternative treatment in 2005 is based on the assumption that the current domestic market for alcohol will have

zero growth between 2000 and 2005 (this is based on feedback from Tarac), at the same time export markets are being vigorously pursued.

- Tarac's data was verified against the grape crush figures sourced from the following reference: Phylloxera and Grape Industry Board of South Australia. "The 2000 South Australian Winegrape Utilisation and Pricing Survey". Phylloxera and Grape Industry Board of South Australia, SA, 2000. This survey estimates that in 2000 the total tonnes of grapes utilised was 482157 which equates to 53,037 tonnes of grape marc (11% of the estimated grape crush, source: Draft Effluent Management Guidelines). This is a 13% deviation from Tarac's figures.

Table 3.1 Tonnages of Grape Marc Treated by Distillation Processing and Forecasted Grape Marc Generation Based on Projected Crush Growth per Region

Region	Estimated Grape Marc Tonnages for 1999 (tonnes)	Estimated Grape Marc Tonnages for 2000 (tonnes)	Projected Grape Crush Growth per region (2000-2005)	Estimated Marc Tonnages for 2005	Estimated Marc Tonnages that will Require Additional Treatment Infrastructure
Barossa Valley	19,500	18,600	98%	36,800	18,200
Clare Valley	2,200	1,900	178%	5,300	3,400
McLaren Vale and Adelaide Hills	7,700	7,800	127%	17,700	9,900
Adelaide Plains	600	600	60%	1,000	400
Riverland	25,400	27,400	39%	38,100	10,700
Limestone Coast (Coonawarra)	5,800	4,700	149%	11,700	7,000
Total	61,200	61,000		110,600	49,600

3.1.2 On-site Re-use, Landfill and Stockfeed

Generally grape marc from the larger wineries is collected for distillation processing, although in addition, they may retain a small percentage for re-use on their vineyards.

Direct On-Site Re-use of Grape Marc

As established from the winery waste survey the majority of direct on-site re-use of grape marc and use of alternative disposal options is associated with smaller wineries that do not generate tonnages that warrant collection by Tarac. For the purpose of this report, the estimation of on-site re-use of grape marc has been calculated for wineries that have a grape crush of less than 500 tonnes per annum.

The following was established from the winery waste survey:

- Out of a total response from 22 wineries, that crush between 50 and 500 tonnes of grapes, 13 wineries composted their grape marc waste material, six wineries had their grape marc treated by distillation and three wineries (all of which are in the Limestone/Coonawarra region) had their grape marc disposed of to landfill or provided as stockfeed. Some wineries had a combination of treatment methods for their grape marc such as distillation and re-use on vineyards.
- Out of nine wineries that crushed less than 50 tonnes in the year 2000, 8 wineries composted all of their grape marc waste and one winery sent its grape marc to distillation.

Table 3.2 provides an estimate of the amount of grape marc generated by smaller wineries (ie. those that crush less than 500 tonnes per annum) that is either treated by re-use on vineyards, disposed of to landfill or provided as stockfeed. The assumptions made in Table 3.3 were derived from the winery waste survey feedback and the estimated winery grape crush data provided in "The Australian and New Zealand Wine Industry Directory Eighteenth Annual Edition". Winetitles, SA, 2000.

Table 3.2 Estimated Regional Tonnage of Grape Marc from Smaller Wineries that is Treated Through On-Site Re-use, Disposal to Landfill or Provided as Stockfeed

Region	Tonnes of Grape Marc Treated by On-Site Re-Use	Tonnes of Grape Marc Treated by other Methods eg. Stockfeed/Landfill
Barossa	253	
Clare	219	
McLaren Vale	262	
Adelaide Plains	10	
Adelaide Hills	157	
Eden Valley	35	
Langhorne Creek	61	
Riverland	11	
Limestone Coast (Coonawarra)	112	155
Total	1,120	155

Assumptions for Table 3.2:

- For the purpose of this table, smaller wineries are defined as those that have an annual grape crush of less than 500 tonnes for annum.
- The grape crush data and number of different sized wineries for each region is based on the data provided in the Winetitles 'The Australian and New Zealand Wine Industry Directory'. The mid-point between the range for the winery size data was used to estimate the grape crush per region eg. for wineries below a

size of 50 tonnes a figure of 25 tonnes/annum has been used. The winery size data used is presented in Appendix C.

- To estimate the grape marc generated, a conversion of 11% of the grape crush was used (source: Draft Effluent Management Guidelines).
- The following generalisations have been used which were derived from the feedback obtained in the winery waste survey:
- 100% of wineries below the size of 50 tonnes re-use their grape marc on site vineyards.
- In all regions (apart from the Coonawarra/Limestone Coast region) for wineries below the size of 500 tonne grape crush 60% of the grape marc generated is utilised on-site and 40% is sent to distillation.
- For wineries below the size of 500 tonne grape crush in the Coonawarra/Limestone Coast region 40% of the grape marc is used on-site and 60% is treated through other means such as provided as stockfeed or disposed of to landfill.

Re-use of Spent Marc

In addition to grape marc that is directly re-used on-site, wineries and vigneron may receive spent marc from Tarac for use on their vineyards as mulch. Tarac estimate that this year they generated approximately 50,000 tonnes of spent marc, the majority of which is transported to wineries and vigneron for re-use as mulch on vineyards.

Off-site Composting

Currently there are negligible amounts of grape marc material being collected from wineries for off-site composting.

Off-site composting of grape marc is limited to spent marc material collected from Tarac, as well as limited collection of grape marc in the Limestone Coast region during peak wine production periods. There are only two composting companies that utilise small quantities of grape marc in their composting process, Fin Pty Ltd located in Virginia and Van Schaik Organic Soils and Bark Suppliers Pty Ltd located in Mount Gambier.

Fin Pty Ltd

Fin Pty Ltd was the only composting company that indicated that they collect grape marc on an ongoing basis for addition to their compost products. The company collects grape marc material that has been processed at Tarac Distilleries and no material is sourced directly from wineries (therefore this grape marc collected is not in addition to that already quantified under distillation processing). Fin Pty Ltd collected approximately 3,000 tonnes of grape marc in the year 2000 to add to manure for their compost product. They estimate that their collection of grape marc will reduce to approximately 1,500 tonnes per year in the future due to grape seeds in the compost making it less marketable to local agricultural industry.

The company has recently established a new composting facility at Dublin and is not restricted in its infrastructure or siting, in terms of accepting more grape marc

material. However the existing market for the company's compost material would need to be expanded to be able to accept more grape marc in its process. This would require the expansion of organic farming methods in the agricultural industry.

The company also claims that it could increase the use of grape marc in its compost mixture if the quality of what it collects from Tarac could be improved in terms of draining all acidic water from the marc. The company cited that the collection of marc is competing with the collection of organic wastes from other industries such as the livestock industry and olive marc.

Van Schaik Organic Soils and Bark Suppliers Pty Ltd

Van Schaik Organic Soils and Bark Suppliers Pty Ltd has conducted trials involving the utilisation of grape marc in its compost products and the re-use of this product on local vineyards. During peak winery production periods the company accepts a small amount of grape marc (approximately two semi-loads per week) from wineries within the Limestone Coast region.

The company acknowledges the potential to mix grape marc with its other ingredients which is primarily pine bark and foresee that they would be able to handle almost all of the grape marc within the Limestone Coast (Coonawarra) region. The company is not limited in terms of its siting and infrastructure to be able to accept more material in its process. Yet they acknowledge that the cost to wineries for the company to compost grape marc would need to be economically viable, in comparison to the cost of distillation processing, for wineries to favour this option.

3.2 Filter Earth

Filter earth such as, bentonite clay, diatomaceous earth and perlite is used to polish wine or clarify wine by removal of floating organic material (lees). Australian Tartaric currently collect the majority of filter earth waste from the winery industry for the recovery of tartrate. Tarac Distilleries also accept lees and filter earth waste along with grape marc that they collect from wineries throughout the year. Tarac has recently commissioned a tartaric acid recovery plant.

As stated in the Draft Effluent Management Guidelines for Wineries and Distilleries (1995), solid potassium bitartrate and lees or diatomaceous earth containing high concentrations of potassium bitartrate can be sent in a solid or liquid paste form for tartaric acid recovery. However solids not feasible for the recovery of tartrate, ie. those low in concentration of potassium bitartrate, should be disposed of as landfill or mixed with grape marc for distillation.

The feedback obtained from the winery waste survey indicated that:

- Out of the 53 respondents 47 wineries produced filter earth waste.
- The use of filter earth products ie. diatomaceous earth, perlite and bentonite clay varied between wineries.

- Generally the disposal methods for filter earth included: tartaric acid recovery; disposal to landfill; sent with grape marc for distillation processing, and mixed with grape marc for re-use on-site. In some cases wineries used a combination of disposal methods eg. some filter earth waste is sent for tartaric acid extraction prior to landfilling and the waste that does not have a high enough concentration of potassium bitartrate is sent directly to landfill.
- For 18 larger wineries that responded to the survey (those that crush more than 500 tonnes per annum):
 - < 14 wineries sent the majority of their filter earth for tartaric acid extraction;
 - < three combined the majority of their filter earth with grape marc for distillation;
 - < three sent the majority of their filter earth to landfill; and
 - < one winery composted filter earth with grape stalks for re-use on their vineyards.
- For smaller wineries (those that crush less than 500 tonnes of grape per annum) disposal of filter earth to landfill was more common, with 66% of wineries using this option. 22% of these smaller wineries mixed filter earth waste in with grape marc, which is sent for distillation processing. Generally smaller sized wineries may not generate enough filter earth waste to warrant transportation for tartaric acid recovery.
- The cost of filter earth disposal varied from cost neutral to positive for tartaric acid recovery and distillation processing. Depending on distance from distillation/tartrate recovery plants (and wineries, in the case of direct disposal). Disposal costs to landfill varied from \$10 to \$25 per tonne.
- In addition to direct filter earth disposal and treatment from the wineries, the filter earth by-product of tartaric acid recovery is disposed of to landfill. There is opportunity to investigate the re-use of this filter earth as an added value material to compost products.
- Whilst the type of filter earth used varied between wineries, it was determined from the survey responses that filter earth waste generated by wineries generally ranged from approximately 1% to 2% of the winery grape crush.
- Using the data from "The 2000 South Australian Winegrape Utilisation and Pricing Survey" which estimates that the grape crush in 2000 was 482157, this equates to approximately **4,800 to 9,600** tonne of filter earth generated. With a projected grape crush of 855,206 tonnes for the year 2005, this equates to **8,500 to 17,000** tonnes of filter earth.
- Some larger wineries are shifting to the use of high speed centrifuges in order to eliminate the use of filter earth. Sludge produced from this process is generally distilled and then sent for tartrate recovery.

4. Issues and Opportunities for Winery Solid Waste Treatment Options

This section addresses the issues and opportunities associated with various winery solid waste treatment options, drawing upon:

- the environmental impacts with treatment methods;
- the costs and infrastructure requirements; and
- the sustainability of the treatment methods taking into account the forecasted increases in waste generated and the consumer demand for recycled products.

4.1 Distillation Processing

4.1.1 Issues

The primary issue to the future sustainability of distillation processing for the treatment of the majority of grape marc generated by the industry is the decrease in alcohol sales which is resulting in the collection of grape marc from certain regions no longer being economically viable.

Currently wineries are paid a return on the alcohol generated from the treatment of their grape marc and Tarac bears the freight cost of collecting the marc from the wineries. As an indication, the cost of freight from the Barossa region is approximately \$5 to \$10 per tonne and the cost from more distant regions such as McLaren Vale, Clare, Coonawarra is approximately \$20 to \$35 per tonne.

Arrangements for wineries in the 2000 Vintage was that grape marc was generally collected free of charge and wineries received payments based on the alcohol content of the marc.

Based on feedback obtained from Tarac, the market potential for spirit products is decreasing within Australia and the markets for alcohol will greatly depend on overseas trade. With decreasing market potential, it will no longer be viable for Tarac to incur the cost of the freight of grape marc material as well as pay wineries a return for their alcohol. The cost of freight will be of particular concern for the regions more distant from the distillation plants such as the McLaren Vale, Limestone Creek and Clare regions.

It is likely that Tarac will in the future either require wineries within these regions to pay for the cost of the freight of their material or will be forced to discontinue collecting grape marc from these areas. As indicated in Table 3.1, if the collection of grape marc from the Limestone Coast and McLaren Vale regions were to be discontinued this would result in approximately 12,500 tonnes requiring alternative treatment based on year 2000 figures and an estimated 29,400 tonnes of material requiring treatment in 2005.

4.1.2 Opportunities

There is opportunity to improve infrastructure to reduce costs for freighting grape marc material and therefore improve the economic sustainability of distillation processing.

Tarac have explored the following infrastructure requirements:

Materials Transfer Facilities

As freight from more distant regions such as the McLaren Vale region is becoming increasingly expensive, the introduction of a materials transfer site would improve the economies of scale of freighting from these regions. Transport could be made more efficient through the ability to transfer material into larger trucks for transport to the Nuriootpa facility. The provision of such a facility would assist in reducing transport costs that may be incurred by wineries in the future. The key issue with establishing a transfer site has been in determining an appropriate site location that will have minimal environmental impacts, such as noise and odour on the local community. Through discussions with the Onkaparinga Council, Tarac have had difficulty in determining an appropriate location for a transfer facility in the McLaren Vale Region. There is opportunity for the government to assist in these negotiations to help determine appropriate transfer facility sites in priority winery regions.

4.2 On-site Re-use of Grape Marc

On-site re-use of grape marc on vineyards may vary in sophistication from stockpiling the grape marc material (usually for a recommended period of 12 months) prior to spreading this material on the vineyard, to actually composting the material to allow its decomposition prior to application. The on-site re-use of grape marc sourced directly after wine production on vineyards is likely to remain the favoured treatment option for smaller scale wineries that do not produce marc tonnages that warrant separate collection. Spent marc that has been through the distillation process is also being re-used on site vineyards. This is usually stockpiled for a period of 6 to 9 months prior to application.

4.2.1 Issues

The main issue associated with on-site re-use of marc is the potential environmental impacts of stockpiling marc material for a recommended period of 12 months prior to spreading on the vineyards.

Impacts may include:

- odour, litter and dust from mulching and composting activities;
- soil and surface water contamination with acidic leachates from stockpile areas; and
- potential fire hazards.

- Breeding of vermin, vinegar flies, maggots etc when marc is dumped and not mulched or composted correctly.

4.2.2 Opportunities

The winery industry would benefit from a more detailed evaluation of best-practice re-use methods and a set of guidelines that outline how to carry out marc re-use activities with minimal environmental impact. These guidelines could form part of a revised industry Environmental Code of Practice. The guidelines could make recommendations in the areas of storage, treatment and application. Minimising the potential environmental impacts of on-site composting will be particularly important for those wineries located in water protection zone regions such as the significant number of smaller sized wineries located in the Adelaide Hills area.

4.3 Disposal to Landfill and Provision as Stockfeed

Feedback obtained from the winery waste survey indicated that current disposal of grape marc to landfill was limited. Only a few smaller wineries in the Limestone Coast region seemed to undertake this practice. The cost of landfill is approximately \$10 to \$25 per tonne. Some wineries in this region provide grape marc as stockfeed. This is generally cost neutral.

Filter earth that is not suitable for the tartaric acid extraction is also disposed of to landfill. It was noted that some wineries mixed filter earth with grape marc for re-application on vineyards. The advantages and disadvantages of using filter earth as an additive to mulches and composts should be determined through on-site trials including Tarac's proposed composting trials using spent marc and solids recovered after distillation/tartrate recovery.

It needs to be ensured that landfilling of winery industry wastes does not significantly increase, should distillation processing no longer be an option for some regions. Therefore the timing of establishing alternative infrastructure will be crucial to prevent disposal of wastes to landfill.

There is great opportunity to explore waste re-use opportunities outlined in this report for priority regions.

4.4 Composting

Whilst currently off-site composting of grape marc material is limited, composting could provide a successful grape marc re-use alternative considering the future limitations with distillation processing.

The following issues that will need to be overcome to promote composting of marc as well as potential opportunities for using marc as a value adding product to composts were determined through consultation with key composting companies; wineries and Tarac:

4.4.1 Issues

- One of the key issues with composting in South Australia is the capacity and siting restrictions placed on composting facilities due to their potential environmental and nuisance impacts to nearby communities such as odour and dust nuisance. The Nolan ITU report provides an indication of the infrastructure capacity of composting sites close to Adelaide. Out of the fifteen organic processors interviewed as part of the Nolan ITU research only one composting company (Fin Pty Ltd) collected grape marc material, and nine composting companies were either near capacity or constrained by their site location in terms of accepting more material and expanding their process.
- For composting of grape marc to be a favoured treatment option compared to distillation processing and landfill disposal it will need to be competitive in terms of cost. Fin Pty Ltd processes grape marc at a cost of \$15 per tonne and Van Schaik Organic Soils and Bark Suppliers Pty Ltd have composted grape marc at a cost of \$10 per cubic metre plus transport costs. Reducing costs will depend on minimising the cost of freighting marc material and therefore the proximity of composting processors to wineries will be important.
- Traditionally large quantities of spent marc is transported from Tarac distilleries and rotted down in large heaps on land adjacent to vineyards and then spread in these vineyards in the spring of the same year.
- Trials are definitely needed to quantify the advantages and disadvantages of using mulched or composted grape marc on vineyards. This will be important in promoting products and developing a marketing strategy. Industry concerns include the significant cost to spread mulch, potential disease control issues, the cost to transport grape marc material, litter problems such as grape seeds at the surface of vineyards.
- There has been little research conducted to date on composting marc material to produce high nutrient and higher value products such as producing fertiliser in a pellet form for ease of application by the industry. The advancement of compost products will be important in terms of competing with other chemical fertiliser options.
- Composted grape marc may compete with other organic waste streams such as olive marc in terms of use back in the viticultural and horticultural industry. It may also compete with initiatives to promote the use of domestic green organics as mulch on vineyards.
- Significant effort in marketing of compost products in the agricultural industry is still required to strengthen its competition against chemical fertilisers.

4.4.2 Opportunities

- Composting will provide an important marc re-use alternative to distillation processing. Feedback from composting producers clearly indicated that there are opportunities to incorporate grape marc material into compost products.

Fin Pty Ltd indicated that they have the capacity to handle greater amounts of grape marc material. Other compost producers such as Peats Soil and Garden Supplies, Adelaide Vegetation and Mulching Services, and Van Schaik Organic Soils and Bark Suppliers Pty Ltd have indicated that if there were a requirement by the winery industry that they would accept grape marc material into their process. It is also promising that some of these companies such as Adelaide Vegetation and Mulching Services, Van Schaik Organic Soils and Bark Suppliers Pty Ltd are located in close proximity to winery regions where additional infrastructure will be of higher priority (the McLaren Vale and the Limestone Coast regions). These companies also have the capacity to accept additional organic material.

- There are many advantages to wineries in utilising grape marc mulch material on their vineyards such as water savings, reduction in salinity issues, improving the nutrient quality of the soil, altering the pH of soil, suppressing weeds and controlling erosion, pest and disease suppression. There is opportunity to quantify these advantages through on-site trials.
- There is opportunity to support research in the composting of grape marc to produce higher nutrient pellet from fertiliser that would be cheaper in terms of application and spreading on vineyards and may be a favoured product for some wineries. Feedback from the industry suggested that improved support from the government would assist in strengthening research in this area.
- Tarac has a significant interest in conducting composting trials using spent grape marc and solids recovered from the distillation/tartrate recovery processes. These solids have been generated from winery filter cake and sludge from winemaking processes. It is believed that a higher grape compost/fertiliser can be made in this way.

5. Other Potential Waste Re-use Technologies

The Waste Management Committee should also recognise other potential emerging technologies for re-using winery solid wastes including energy recovery infrastructure and grape seed oil production.

5.1 Energy Recovery

In discussions with the Wine and Brandy Association it was determined that there are various energy recovery opportunities for treatment of grape marc waste.

Anaerobic treatment systems for winery effluent are being trialed by different companies such as GH Michel's, ESA and Solar Energy Service. These systems involve the capture of methane for energy production from anaerobic treatment systems. Solar Energy Service in conjunction with the Curtin University in Western Australia are trialing the use of anaerobic digesters for the treatment of winery waste water in the Margaret River Region. They are investigating the addition of solid marc waste to the waste water for anaerobic digestion and the capture of methane from the digester for energy production.

SA Wine and Brandy has also looked into the possibility of grape marc being accepted from the Limestone Coast (Coonawarra) Region, to feed the Boral Energy incinerator that is used to treat pine bark residue from plantations in the area. Energy is generated from this incineration process and fed back into the electricity grid. As it is more economically viable for Boral to keep the incineration process continually running, at times when there is not enough pine wood scraps to feed the incinerator, grape marc could be used.

5.2 Grape Seed Oil Production

If stalks are stripped from grapes prior to crushing, winery marc consists of approximately 30% seeds and 70% skin and pulp. Currently there is no commercial grape seed oil production within Australia and grape seed oil is imported from Europe.

Research on the feasibility of establishing a grape seed oil production industry in Australia is currently being undertaken. This was initiated through a partnership of EcoRecycle Victoria, the Cooperative Research Centre for Food Manufacturing and Packaging Science and the Australian Centre for Oil Seed Research. This feasibility study has a national focus and has involved investigating market opportunities, and the logistics of manufacturing grape seed oil.

Unfortunately the price of imported grape seed oil from the EU is very low because of tax incentives provided to these producers.

6. Winery Waste Re-Use, Trial and Research Opportunities

6.1 A Summary of Waste Re-Use Opportunities for the Winery Industry

Waste re-use opportunities for the winery industry should aim to discourage the following waste management practices:

- The potential increase in grape marc from wineries being disposed of directly to landfill, should collection for distillation become too expensive or no-longer be an option, (this will be of particular importance for those wineries located further from the distillation processing plants at Berri and Nuriootpa).
- Inadequate on-site stockpiling and mulching methods for fresh grape marc at vineyards that could potentially cause environmental issues such as odour, soil and surface water contamination with acidic leachates, fire hazards and breeding of vermin.
- The disposal of filter earth wastes to landfill directly from wineries and as a by-product of tartaric acid recovery.

To progress re-use of winery solid wastes, PPK recommends that research focuses on the following priority areas:

- The development of best practice guidelines for direct re-use of mulched or composted fresh marc on vineyards and the quantified issues and benefits to utilising mulched or composted fresh marc.
- The development of value-added composted spent grape marc that incorporates an analysis of including filter earth by-products as a value-adding additive to compost material.
- An analysis of the potential for energy recovery from centralised composting operations (this could incorporate a review of international approaches).
- The review of overseas distillation practices to improve the efficiency and ensure the continued viability of distillation processing as an important by-product recovery service for winery industry.

These research opportunities are outlined in further detail below:

6.2 A Study on the Benefits of Utilising Composted Grape Marc in the Industry

It is recommended that the Waste Management Committee facilitate the implementation of grape marc composting trials. PPK have identified wineries and composting processors that are supportive of conducting composting trials and researching value-added opportunities for grape marc. Tarac have also indicated a strong interest in conducting trials on the further composting of spent marc that has been through the distillation process and the addition of filter earth wastes as a value added material the compost product. There is a priority to conduct trials in two categories:

- 1) Where alternative infrastructure to distillation is likely to be required. For example, trials on the mulching or composting of fresh marc could be conducted either on-site with cooperation from wineries and vineyards or with the participation of an off-site composting processor in priority regions.
- 2) Where existing distillation facilities exist and there is the option to combine grape marc after distillation with winery solids such as filter cake and sludge which have been separated after distillation/tartrate recovery.

As part of conducting these trials, the horticultural benefits of utilising compost on vineyards would need to be quantified and the barriers to the utilisation of compost in the industry need to be identified to develop an appropriate marketing approach for mulched or composted products. The government's focus should be on supporting the marketing of compost materials as the continued viability of composted grape marc will not be guaranteed unless the purchase and use of the material back within the industry is ensured.

It is recommended that trials supporting a range of processed products be investigated such as the mulching of the material through to more sophisticated compost products. The advantages and disadvantages of utilising filter earth waste as an additive to products should also be tested.

6.3 The Development of Best-Practice Guidelines for Fresh Grape Marc Re-use

Inclusive of conducting trials to quantify the benefits of utilising mulched or composted marc it is important that environmental impacts associated with stockpiling and mulching of marc material at vineyards are minimised. It is recommended that a more detailed on-site assessment of vineyard stockpiling and mulching practices be conducted for the development of best-practice industry guidelines in this area to become part of the Environmental Code of Practice for the industry. Currently there are industry guidelines on winery effluent management, yet similar guidelines are needed to minimise the potential environmental impacts of on-site solid waste management. Ideal mulching and composting practices also need to be evaluated to provide further guidance to the industry. The development of on-site solid waste management practices would involve extensive consultation

with the industry and an on-site review of existing practices. Best practice guidelines should cover the following:

- methods for stockpiling grape marc material in a manner that prevents leachate contamination to soil, surface and groundwater and minimises odour;
- storage methods that minimise vermin and maggot infestation;
- transport and application of material;
- recommended quality of mulch or compost to be applied to maximise grape yield benefits (as determined through on-site trials).

6.4 Research on Waste to Energy Technology Opportunities

As highlighted by the energy recovery initiatives that are currently being trialed, there is opportunity to utilise grape marc for energy recovery technologies such as through the incineration of grape marc to produce electricity or the anaerobic breakdown of grape marc material to produce methane for use in energy production. It should be noted that generally for renewable energy plants to be viable there is a need for a central distillation facility where large amounts of biomass are collected, stored, by-products recovered and finally energy recovered. Tarac is one such option.

There is the potential for the SA Waste Management Committee to work with SA Wine and Brandy (who are members of the Greenhouse Challenge Program) to investigate sustainable energy production technologies for the winery industry. It is recommended that a more detailed research report on energy recovery opportunities available to the winery industry, and an assessment of the opportunities and implications for the introduction of these technologies in South Australia, be conducted. This would provide direction to considering energy production technologies for the treatment of grape marc and other winery wastes. The SA Waste Management Committee could explore funding opportunities for this research through the Australian Greenhouse Office, the Department of Transport and Regional Services Regional Solutions Program, and the Grape Wine Research and Development Council.

6.5 Continuation of Existing Practices and Investigation of Overseas Processes

The continuation of existing practices of collection and distillation of grape marc for alcohol recovery and filter earth/winery sludge for distillation/tartrate recovery should continue to play a major role in the re-use of winery solid wastes. However, past practices where wineries were paid for solid wastes generated is in need of review because of changed circumstances in the grape alcohol market.

It is also important that some overseas practices in the processing of grape marc should be considered. Especially in European countries where grape marc is first distilled to recover alcohol, followed by washing for tartrate recovery, then seed separation and finally the remainder is either burnt for energy recovery or

composted along with sludge from distillation and tartrate recovery to produce fertilisers for agricultural use.

7. References

Agriculture and Resource Management Council of Australia and New Zealand and the Australian and New Zealand Environment and Conservation Council. "National Water Quality Management Strategy - Draft Effluent Management Guidelines for Wineries and Distilleries". Commonwealth of Australia, ACT, 1995.

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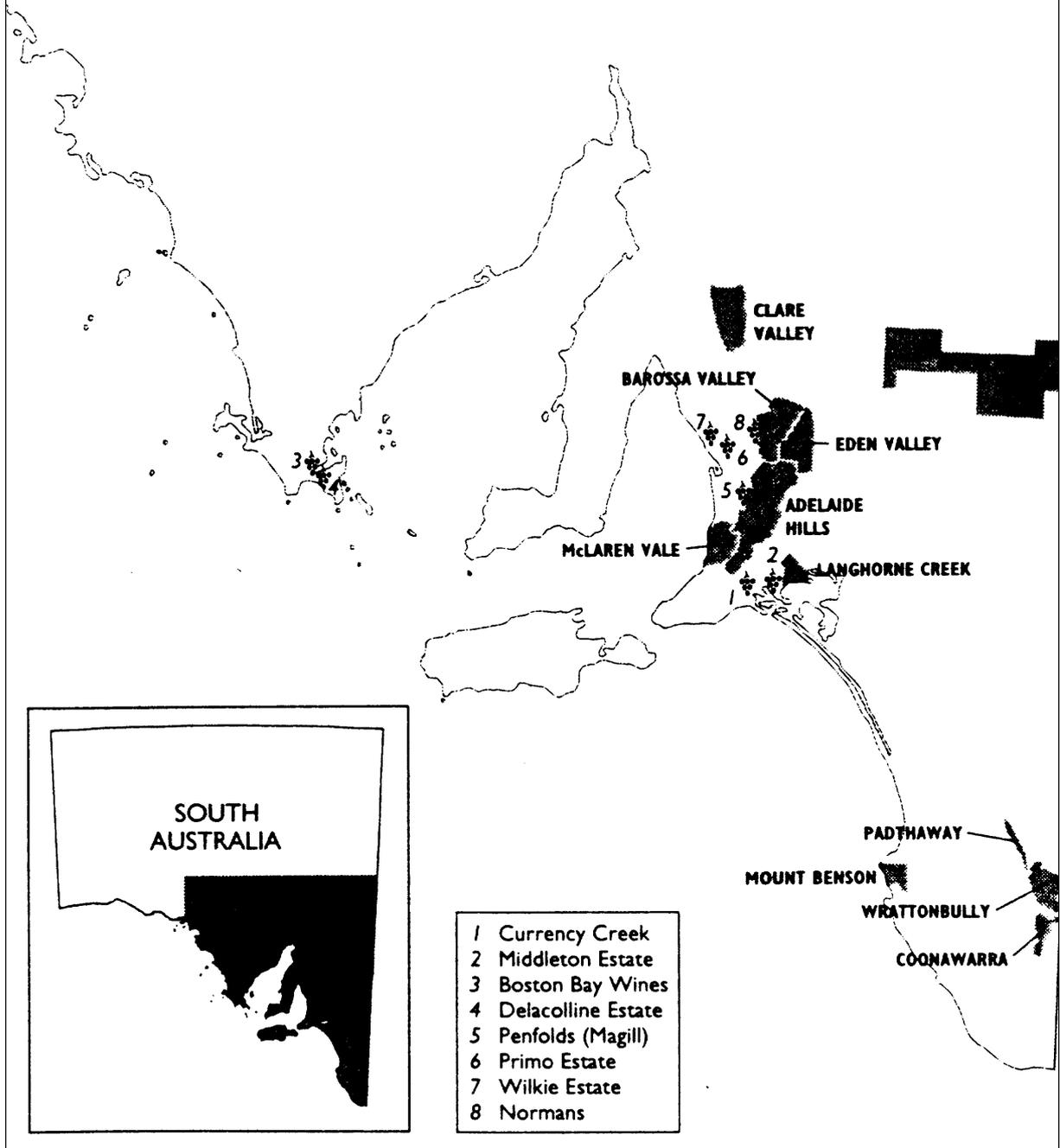
Appendix A

Winery Waste Survey

Appendix B

South Australia's Wine Regions

SOUTH AUSTRALIAN WINE REGIONS



Source: Beeston, J. 'The Wine Regions of Australia'. Allen & Unwin, NSW, 1999

Appendix C

Winery Size Data

Winery Size Data per Region (for Wineries Sized Below 500 Tonnes Grape Crush per Annum)

Region	Grape Crush per Annum		
	<50	<250	250-500
Barossa	5	10	5
Clare	6	11	3
McLaren Vale	4	11	5
Adelaide Plains (Adelaide Superzone)	1	1	1
Adelaide Hills	13	4	3
Eden Valley		3	
Langhorne Creek		1	2
Riverland		1	
Coonawarra/ Limestone Coast	3	7	3

Source: Winetitles. "The Australian and New Zealand Wine Industry Directory Eighteenth Annual Edition". Winetitles, SA, 2000.