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24th August 2012

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Report Number 10016

Your Order

Report Title **Odour Impact Assessment of Proposed Waste Water Treatment Plant at McWilliams Winery, Hanwood N.S.W.**

Report by John Waters

Authorized

DipAppSc(Chem), CChem, MRACI, MARPS

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1 Introduction

McWilliams Wines Pty Ltd operate a winery on Jack McWilliams Road approximately 8km south of Griffith and 2km south of the town of Hanwood. The winery is located in a rural setting adjacent to a chicken feed processing plant and a grain storage and transfer hub.

A previous odour impact assessment (see Appendix 1) has established a limitation on expansion of the winery due to the current waste water treatment system. The current system is primarily reliant on evaporation pans. The previous assessment has established the reliability of the Ausplume dispersion model for the prediction of odour impacts from the winery. This was done by comparing previously modelled results with a community survey and an on site (and off site) olfactory survey.

McWilliams Pty Ltd has proposed the construction of a purpose designed waste water treatment plant based on various collection and storage lagoons, an aerobic Sequencing Batch Reactor (SBR) and a Covered Anaerobic Lagoon (CAL).

Because of the size and cost of the proposed waste water treatment system it is anticipated that the construction and commissioning of the plant will be staged. The stages have been referred to as “Options” in this report;

- Option 1 represents the situation during construction of the SBR, this option is similar to the current waste water treatment and relies on significant use of the evaporation pan until the SBR is commissioned.
- Option 2 represents the situation after commissioning of the SBR but without the CAL. This option allows for the staged construction of the CAL.
- Option 3 represents the situation at the completion of the project with the CAL fully operational.

This report provides the predicted odour impacts for the three stages of the proposed waste water treatment plant.

The report concludes that the predicted off site odour impact of each stage of the proposed plant will comply with the current New South Wales guidelines for the two identified sensitive receptors. Those being;

1) A child care centre approximately 900m to the north of the McWilliams winery.
2) Isolated farm houses at various distances from the winery, the closest being approximately 250m south west.

The report also concludes that the predicted off site odour impact improves (that is, decreases) at each stage of the project.

2 Odour Sources

2.1 Lagoons 1, 2, 3 and 4

The proposed development includes four lagoons that will contain either, uncontaminated feed water, storm water from paved and roof areas or other relatively clean water. The pre existing lagoons are designated Lagoon 1, Lagoon 2, Lagoon 3 and Lagoon 4. Lagoon 2 is modelled as larger than the actual size to account for possible future expansion (as lagoon 7).

Lagoon 3 will also be used as contingency storage of spilt wine or other liquids in the event of catastrophic failure or bulk spillage. The impact of such events have not been considered in the odour assessment because the events are not planned and any spilt material collected in Lagoon 3 will be immediately pumped into the Covered Anaerobic Lagoon (CAL) for treatment.

It is anticipated that storm water collected in Lagoon 3 will be immediately transferred to Lagoon 4 so the typical contribution to odour impact will be relatively minor.

Based on odour flux measurements of similar storm water storage lagoons at South Australian wineries a nominal odour flux of 0.23 OUV/min/m^2 has been assigned to Lagoon 3 and 0.26 OUV/min/m^2 to Lagoons 1, 2 and 4. The slightly higher flux has been assigned to Lagoons 1, 2 and 4 because they will always contain water and at some times that water will be aged.

Because these three lagoons have a minimal contribution to the odour impact they have been treated as constant odour sources. This is considered a conservative over estimate that ensures the predicted off site odour impacts are over estimated.

2.2 Covered Anaerobic Lagoon

The CAL is not considered as an odour source because it is covered by a gas tight membrane.

2.3 Sludge Lagoon

The 5ML Sludge Lagoon will be used to thicken waste water solids prior to processing in the dewatering plant. This lagoon has been modelled as an area source with a continuous odour flux of 6.79 OUV/mim/m^2. This flux is based on measurements of similar lagoons at South Australian wineries. The Sludge lagoon is not included in Option 1.

2.4 Sequencing Batch Reactor (SBR)

The SBR removes BOD from the waste water by aerobic bio-treatment. The process involved batch treatment of wastewater in above ground tanks using agitation and forces aeration.

The SBR has been modelled as an area source at a height of 6m above ground levels (i.e. the height of the top of the tanks. The ground level footprint of the tank area has been used as the source area. This approach has been used in preference to modelling the SBR as a point source because, although there will be a small vertical momentum to any odour emissions, the source is diffuse rather than located at a single point. The modelling approach used is considered to provide a conservative over estimate of the source impact.

The modelled constant odour flux of 2.41 OUV/min/m^2 was derived from an SBR at a South Australian winery. The South Australian SBR is an open lagoon and it is expected that the McWilliam's SBR will have a lower odour flux because of the more efficient air water interaction in a tank when compared to an open lagoon. Once again, in the interests of providing a conservative over estimate of odour impact the open lagoon SBR flux has been used without modification. The SBR is not included in Option 1.

2.5 Treated Water Storage

Based on experience with similar waste water treatment plants in South Australia it is anticipated that the odour impact from the storage of treated water will be minimal. Odour flux measurements confirm that typical odour flux from stored treated water is comparable with natural water storage lakes and non flowing creeks. A nominal odour flux of 0.26 OUV/min/m^2 has been used for all treated water storage lagoons.

Lagoon 4 will be used for temporary storage of treated water.

For estimation of off site odour impacts Lagoon 7 has been combined with Lagoon 2 and the Irrigation Dam (Lagoon 5) has been modelled separately.

2.6 Marc

Marc will be removed from the site on a daily basis and, therefore will not accumulate on site. There are two areas where temporary storage of Marc will potentially contribute to off site odour impacts. These are designated Marc-5 (the collection bay for marc dispensed from bag presses) and Marc-16 (collection bay for marc and stems dispensed from bag press and fruit crusher.

These potential odour sources have been modelled as area sources at a height of 3m (the height of the building). This approach has been used because the sources are located in open roofed bays surrounded by buildings. The modelling of the sources as volume sources is considered problematic because of the complex building topography around them. Given that the source areas are small and the potential contribution to overall odour impact is relatively small, the errors introduced by modelling them as area sources is considered small and likely to result in an over estimate of the contribution to off site odour impact. Some discussion and confirmatory modelling for the justification of this approach is provided in Appendix 2.

The odour contribution from these two sources has been derived from measurements undertaken at marc processing and storage facilities in South Australia. The odour flux from typical fresh marc storage piles has been scaled based on the area of the source at roof level. A constant value of 173 OUV/min/m^2 for Marc-5 and 106 OUV/min/m^2 for Marc-16 has been used in the model.

A separate model was run with the odour contribution from the marc doubled from these values. This was done to test the sensitivity the modelled impact to errors in estimation of marc odour.

2.7 Grape Receipt Area

The fruit receipt area has been modelled as an area source at a height of 3m. The rational for this approach is discussed above. A variable odour flux of 1 OUV/min/m^2 for January to April and a nominal 0.1 OUV/min/m^2 for May to December has been used. The fruit receipt area is only an odour source during vintage, the vintage flux is based on similar operations in South Australian wineries and has been scaled for the area of the building.

The nature of odour originating from the fruit receipt area is fresh and not considered unpleasant to the majority of the population. Although this is a contributor (albeit, a small one) to modelled off site odour impacts, the actual impact is likely to be small and unlikely to result in adverse public reaction.

2.8 Pressing Area

The pressing area has been modelled as an area source at a height of 3m for reasons discussed above. Based on similar operation in South Australian wineries and scaling the odour flux for the area to be used at the McWilliams winery odour flux values as follows have been used in the model:

January to April	11.7 OUV/min/m^2
May	6.0 OUV/min/m^2
June to December	0.1 OUV/min/m^2 (nominal)

The nature of odour originating from the pressing area is fresh and not considered unpleasant to the majority of the population. Although this is a contributor (albeit, a small one) to modelled off site odour impacts, the actual impact is likely to be small and unlikely to result in adverse public reaction.

2.9 Filtration Area

The filtration building has been modelled as an area source at a height of 3m. A constant odour flux of 163 OUV/min/m^2 has been used based on the footprint of the area and an estimation that odour would be comparable to that produced by marc.

2.10 Evaporation Pans

Odour contribution from the evaporation pans currently in existence at the winery was measured in May 2005 (see report 05076 provided as Appendix 1). At that time the average odour flux from three measurements was 33 OUV/min/m^2.

Three options have been modelled for the use of the evaporation pans, these are:

Option 1 Adjustment of the number of evaporation pans used (between 1 and 4) so that there is always a minimum waste water area in the pans throughout the year. This option represents the current situation at the winery

Option 2 The situation prior to the installation of the CAL. At this stage the evaporation pans will be used as a buffer for the waste water feeding the SBR.

Option 3 Only using the evaporation pans for High Salt waste. This would result in a continuous but relatively low flux. The salt left after evaporation and the highly saline water would typically result in low odour fluxes.

The modelled odour flux for each option is provided in Table 1.

Month	Option 1	Option 2	Option 3
January	8.25	3.3	3.3
February	24.75	24.75	3.3
March	24.75	24.75	3.3
April	24.75	24.75	3.3
May	24.75	24.75	3.3
June	33	16.5	3.3
July	33	8.25	3.3
August	33	3.3	3.3
September	24.75	3.3	3.3
October	16.5	3.3	3.3
November	8.25	3.3	3.3
December	8.25	3.3	3.3

Table 1 OUV/min/m^2 for Evaporation Pan Options

The intended operation of the waste water treatment plant will be to adjust operational controls to minimise odour impacts. The three options listed above are considered the represent the likely range of operational parameters and off site odour impacts.

3 Model Parameters

Concentration or deposition	Concentration
Emission rate units	OUV/min
Concentration units	Odour_Units
Units conversion factor	1.67E-02
Constant background concentration	0.00E+00
Terrain effects	None
Smooth stability class changes?	No
Other stability class adjustments ("urban modes")	None
Ignore building wake effects?	Yes
Decay coefficient (unless overridden by met. file)	0.000
Anemometer height	10 m
Roughness height at the wind vane site	0.300 m

DISPERSION CURVES

Horizontal dispersion curves for sources <100m high	Pasquill-Gifford
Vertical dispersion curves for sources <100m high	Pasquill-Gifford
Horizontal dispersion curves for sources >100m high	Briggs Rural
Vertical dispersion curves for sources >100m high	Briggs Rural
Enhance horizontal plume spreads for buoyancy?	Yes
Enhance vertical plume spreads for buoyancy?	Yes
Adjust horizontal P-G formulae for roughness height?	Yes
Adjust vertical P-G formulae for roughness height?	Yes
Roughness height	0.100m
Adjustment for wind directional shear	None

PLUME RISE OPTIONS (note these are not relevant for area sources)

Gradual plume rise?	Yes
Stack-tip downwash included?	Yes
Building downwash algorithm:	PRIME method.
Entrainment coeff. for neutral & stable lapse rates	0.60,0.60
Partial penetration of elevated inversions?	No
Disregard temp. gradients in the hourly met. file?	No

and in the absence of boundary-layer potential temperature gradients given by the hourly met. file, a value from the following table (in K/m) is used:

Wind Speed	Stability Class					
Category	A	B	C	D	E	F
1	0.000	0.000	0.000	0.000	0.020	0.035
2	0.000	0.000	0.000	0.000	0.020	0.035
3	0.000	0.000	0.000	0.000	0.020	0.035
4	0.000	0.000	0.000	0.000	0.020	0.035
5	0.000	0.000	0.000	0.000	0.020	0.035
6	0.000	0.000	0.000	0.000	0.020	0.035

WIND SPEED CATEGORIES
Boundaries between categories (in m/s) are: 1.54, 3.09, 5.14, 8.23, 10.80

WIND PROFILE EXPONENTS: "Irwin Rural" values (unless overridden by met. file)

AVERAGING TIMES 1 hour

The meteorological file was generated by TAPM supplemented by Bureau of Meteorological data for Griffith Airport for the year 2003.

It should be noted that the Ausplume model used for this report is version 5.4. This is not the most current version of the model however, for area and volume sources, there is no difference between the current model and version 5.4.

Building wake effects have not been included because these are not relevant for area sources. Terrain effects were not modelled because the study area is flat and well removed from mountain and coastal influences.

The Ausplume model input and output files are provided on the disc attached as Appendix 3.

The accuracy of the model is discussed in detail in report 05076 (Appendix 1) which compares the modelled impacts with the results of a community survey and on and off site olfactory surveys.

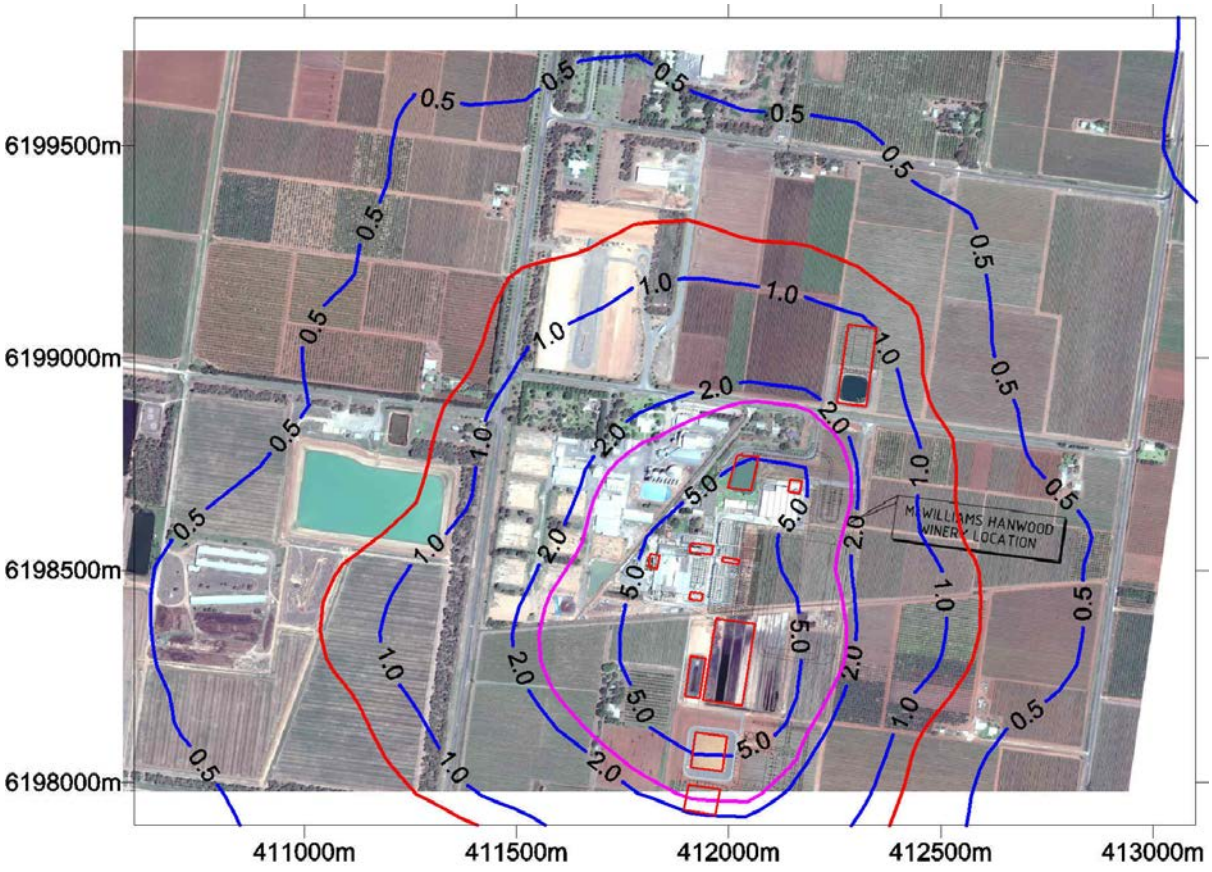
4 Model Results

The results of modelling off site odour impacts for various stages of the proposed development are provided in Figures 1 to 3.

The area surrounding the McWilliam's Winery has a relatively low population density. There are a number of sensitive receptors identified. These are:

1) The child care centre located approximately 700m to the North of the winery. Based on current NSW guidelines the predicted odour impact at this receptor should be less than 0.8 OU (99%, 1 hour average).
2) A number of isolated houses (typical examples are 200m West and 600m East of the proposed waste water treatment plant. Based on current NSW guidelines the predicted odour impact at this receptor should be less than 2.4 OU (99%, 1 hour average).

4.1 Evaporation Pans Option 1



99% 1 Hour Average Predicted Odour Impact, Evaporation Pan Option 1

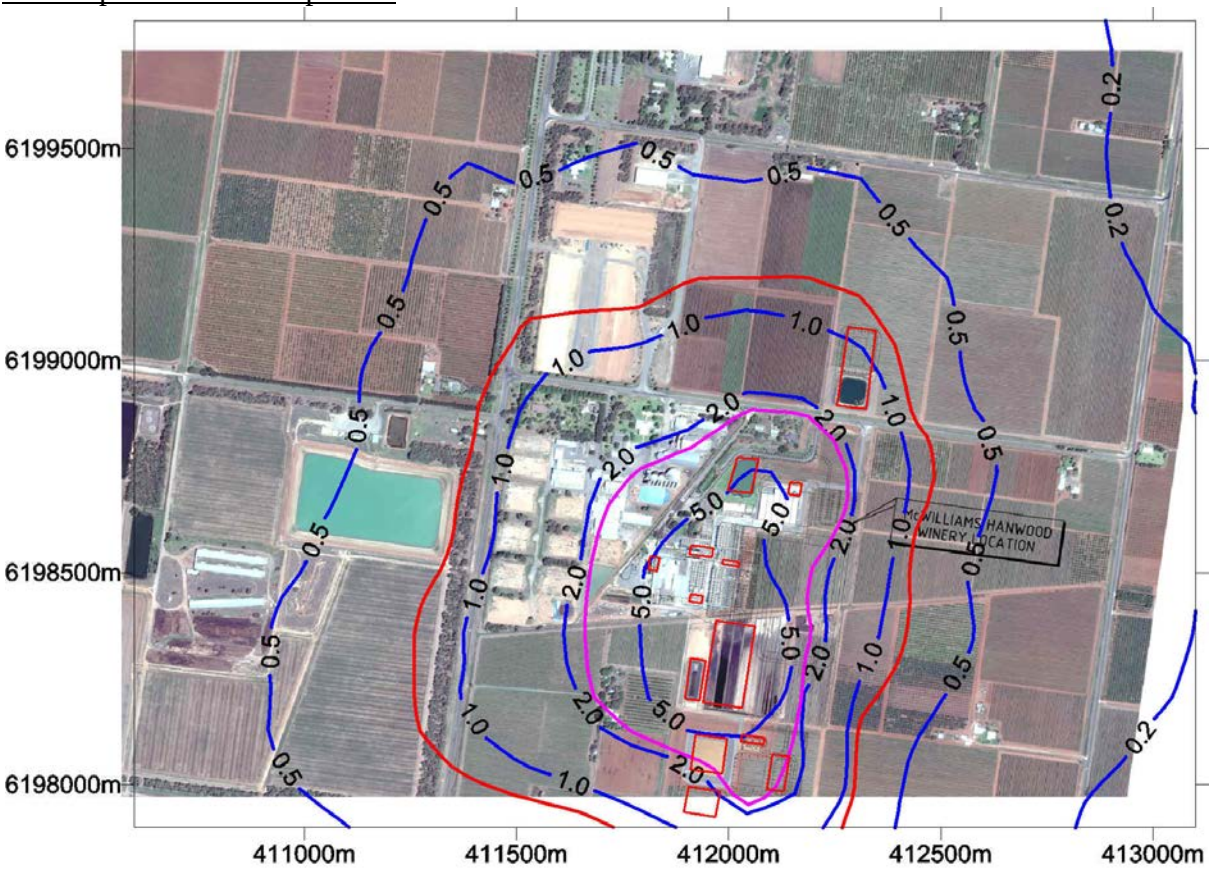
Figure 1

It is clear from the results of modelling option 1 for the evaporation pans that these are the main contributor to predicted off site odour impact. This confirms the use of measured odour flux data from the evaporation pans and estimated odour flux for other sources will not result in significant errors in prediction of off site odour impacts. It is also evident that for this option the predicted odour impact at the identified sensitive receptors is less than the current NSW guideline values except for a single residence approximately 200m to the south west of the evaporation pans. The red contour represents the guideline limit for the child care centre and the mauve contour represents the guideline limit for isolated farm houses.

Option 1 estimates the potential odour impacts during the construction of the proposed waste water treatment plant up to the point when the SBR is commissioned. On commissioning of the SBR, Option 2 will apply.

Although the single farm house 200m to the south west of the evaporation pan is inside the 2.4 OU contour there has been no odour complaints from this resident. The predicted impact at this location is slightly higher than that modelled for report 05076. However, the actual impact is probably less than modelled because the level of waste water currently in the evaporation pan is (in part) due to the high rain fall over the last six months and is likely to produce a lower odour flux than the measured values used in the model.

4.2 Evaporation Pans Option 2



99% 1 Hour Average Predicted Odour Impact, Evaporation Pan Option 2

Figure 2

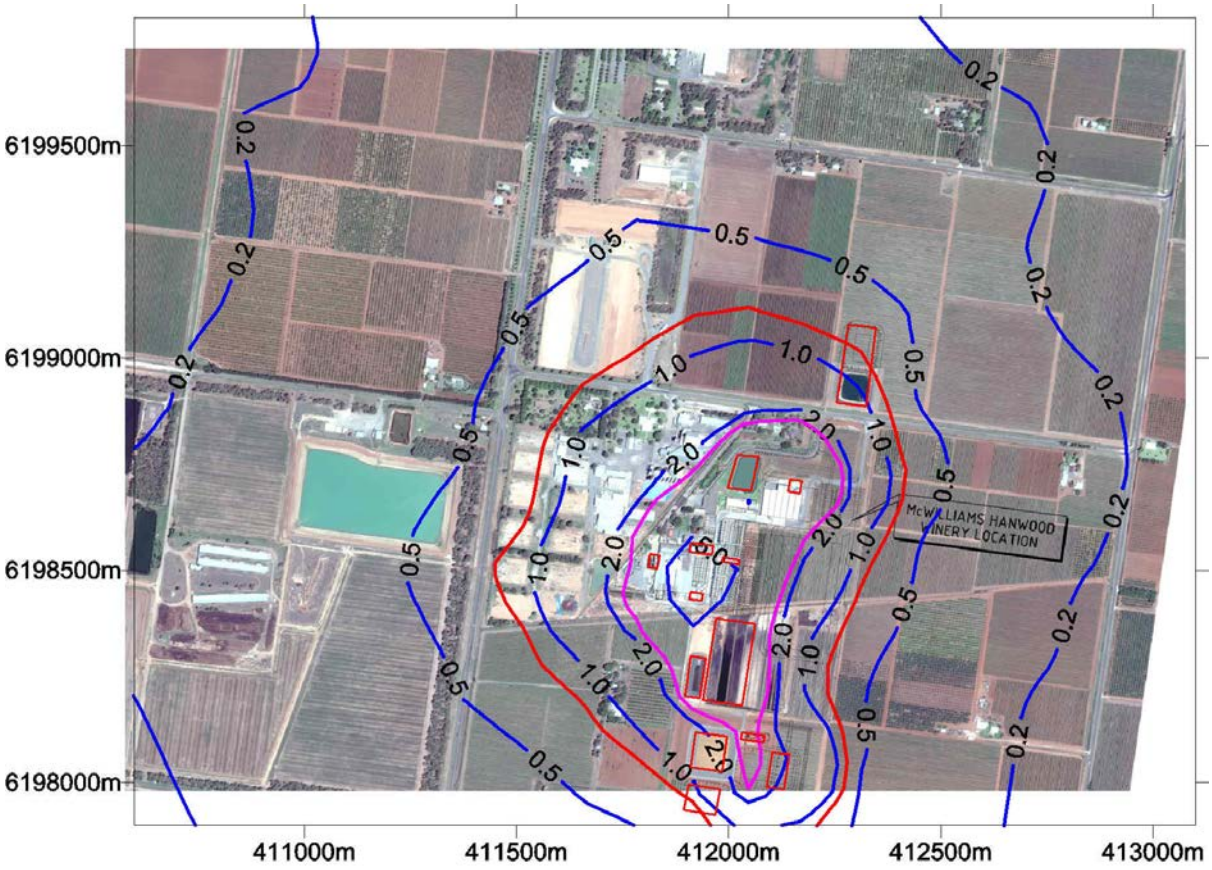
It is clear from the results of modelling Option 2 for the evaporation pans that these are the main contributor to predicted off site odour impact. This confirms the use of measured odour flux data from the evaporation pans and estimated odour flux for other sources will not result in significant errors in prediction of off site odour impacts.

The predicted odour impact provided in Figure 2 represents the situation prior to the installation of the CAL. During this stage of the development the evaporation pans will be used as a buffer to control the waste water feed to the SBR. This is considered necessary because (based on previous experience) overload of the SBR is a significant potential source of off site malodour.

It is also evident that for this option the predicted odour impact at the identified sensitive receptors is less than the current NSW guideline values. The red contour represents the NSW guideline for the child care centre and the mauve contour represents the guideline for isolated residences.

Although meeting the current guidelines for sensitive receptors Option 2 is considered an interim arrangement representing the period after the construction of the SBR but prior to the construction of the CAL. The inclusion of Option 2 allows for a staged approach to the development.

4.3 Evaporation Pans Option 3



99% 1 Hour Average Predicted Odour Impact, Evaporation Pan Option 3

Figure 3

Option 3 represents the predicted off site impacts after the construction and commissioning of the CAL. At this time the CAL will be used to buffer the waste water feed to the SBR. This will remove the necessity to use the evaporation pans for buffering.

The use of the evaporation pans for the storage and evaporation of high salt waste water will significantly reduce the off site odour impact from this source.

4.4 Remote Storage Dam

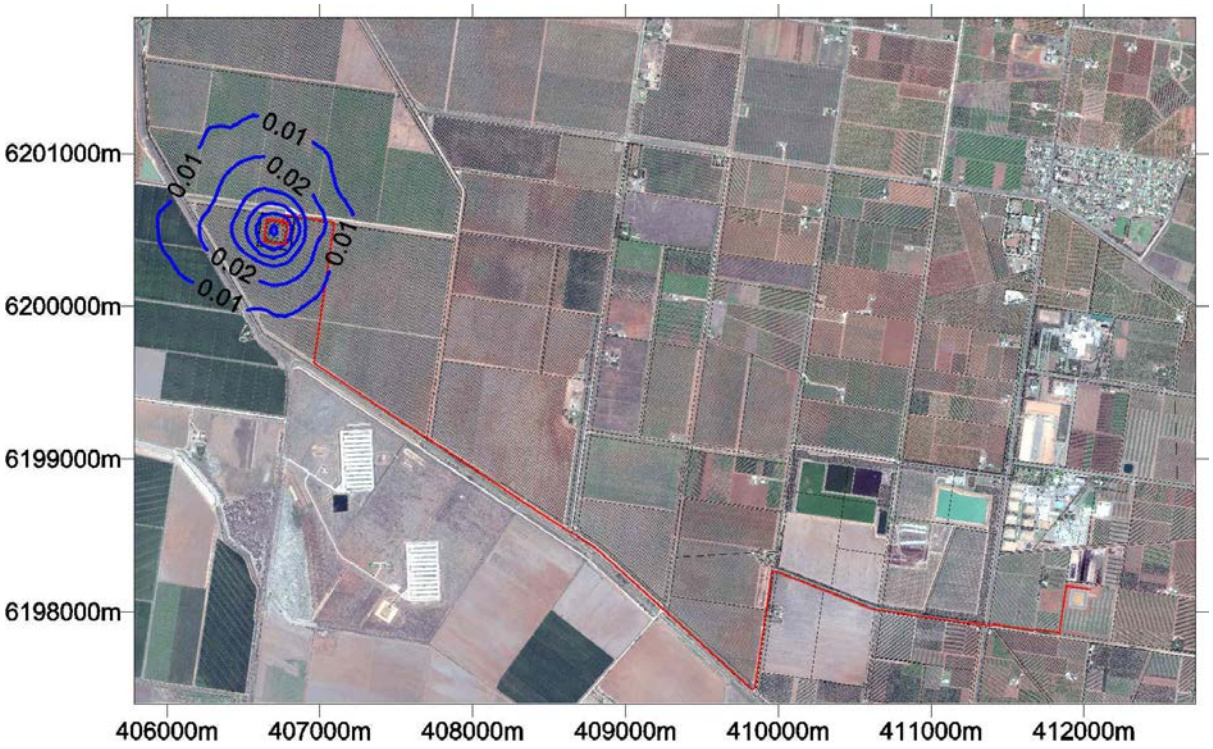
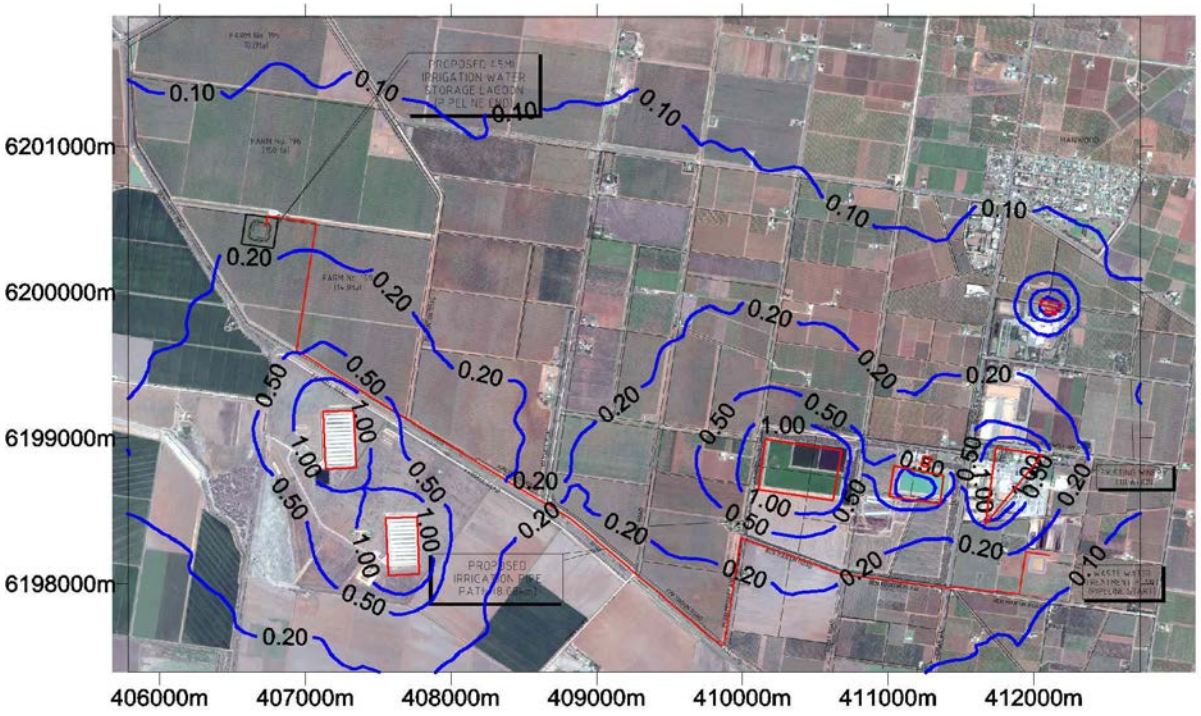


Figure 4

It is evident that the predicted odour impact of the irrigation dam (remote storage dam) is not significant.

This is particularly true in the context of the predicted odour impact from other off site odour sources depicted in Figure 5.

4.4 Non McWilliams Odour Sources



99% 1 Hour Average Estimated Odour Impact, Other Sources

Figure 5

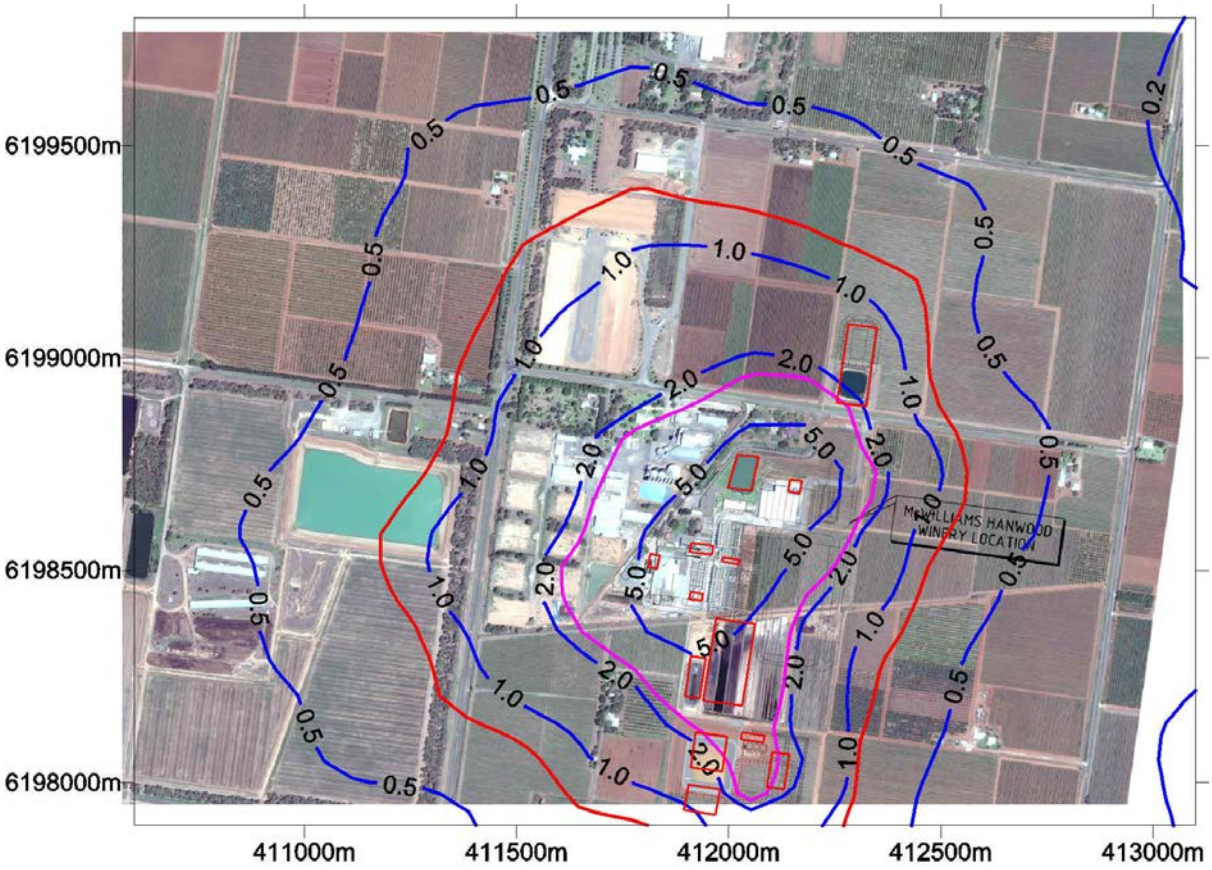
Predicted odour impacts from sources not associated with the proposed McWilliam's development. It should be noted that actual odour values for these sources were not available for the preparation of this report. Values have been assigned for these sources, the assigned values are considered to be very conservative. Consequently the predicted impacts for sources not associated with the McWilliams winery are expected to be very conservative under estimates.

It is evident that at some sensitive receptors (particularly the child care centre) the impact from these sources is of a similar order of magnitude to the impact from the proposed development.

In the case of the irrigation dam the other odour sources are more significant and would dominate any odour impact.

Figures 6 and 7 show the sensitivity of the predicted off site impacts to uncertainty in the estimated odour from various minor odour sources.

4.5 Worst Case Marc and Filtration



99% 1 Hour Average Predicted Odour Impact, Worst Case Marc and Filtration

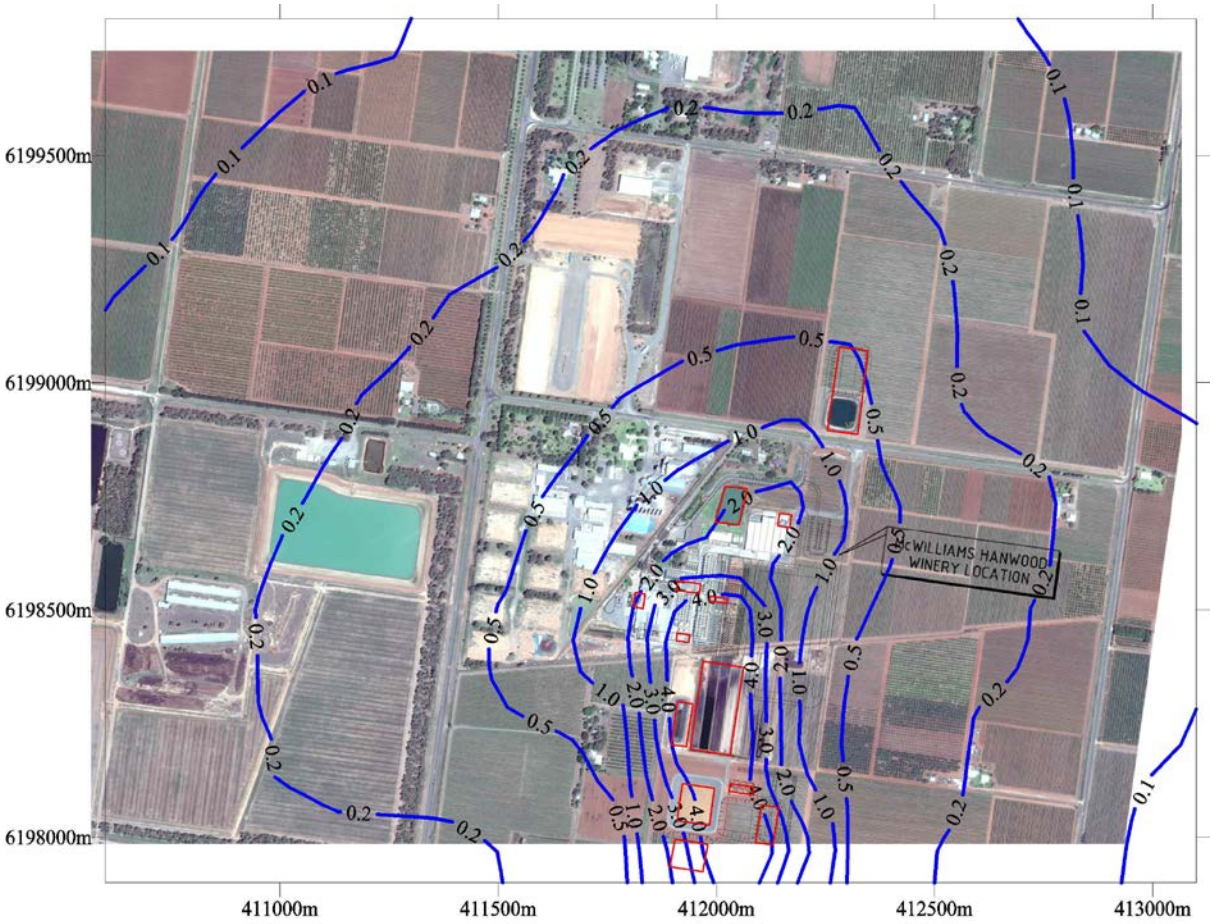
Figure 6

Modelling a worst case scenario for the contribution from Marc and Filtration odours demonstrates that these are not significant contributors to predicted off site odour impact. Figure 6 can be compared to Figure 3.

Figure 6 is the result of modelling the contribution from Marc and Filtration sources at twice the odour flux used for Figure 3. All other source fluxes are the same.

The result of this worst case modelling for marc and filtration odour sources is an increase in predicted odour impact at the identified sensitive receptors of between 0.1 and 0.3 OU. This confirms that errors associated with estimating odour flux and modelling parameters for these sources will not significantly impact on the overall predicted impacts.

4.6 Worst Case SBR and Sludge



99% 1 Hour Average Predicted Odour Impact, Worst Case SBR and Sludge

Figure 7

Modelling a worst case scenario for the contribution from SBR and Sludge Lagoon odours demonstrates that these are not significant contributors to predicted off site odour impact. Figure 7 can be compared to Figure 3.

Figure 7 is the result of modelling the contribution from SBR and Sludge Lagoon sources at twice the odour flux used for Figure 3. All other source fluxes are the same.

The result of this worst case modelling for marc and filtration odour sources is an increase in predicted odour impact at the identified sensitive receptors of between 0.0 and 0.1 OU. This confirms that errors associated with estimating odour flux and modelling parameters for these sources will not significantly impact on the overall predicted impacts.

5 Conclusions

This report presents the results of Ausplume model predictions of odour impacts from the proposed waste water treatment plant at McWilliams winery.

Although the results provided in this report are based on modelling, they are considered reliable because;

1) The input data for the most significant odour source (the evaporation pan) is based on measurements undertaken at the winery in 2006

2) The input data for minor odour sources and for sources that are not yet constructed is based on data collected from similar waste water treatment plants in South Australia

3) The model is sufficiently robust that significant errors in the estimated input parameters do not significantly impact on the predicted odour impacts

4) The reliability of the model used has been confirmed by comparing modelled impacts with community survey results and olfactory surveys.

The following conclusions are consistent with the model predictions:

1) All stages of the construction and development of the proposed waste water treatment plant will comply with the current N.S.W. guidelines for odour impact. Those being;

    - 0.8 OU for the child care centre 900m north of the winery
    - 2.4 OU for the isolated farm houses near the winery

2) Each stage of the proposed waste water treatment plant development should result in a progressive improvement (i.e. decrease in odour impact)

A single farm house located approximately 200m to the south west of the evaporation pan has a modelled impact above the current N.S.W. guideline of 2.4 OU for the current waste water treatment regime. No odour complaints have been received from this resident. It is likely that the measured odour flux used in the model is higher than the current actual odour flux because of the influx of clean waste water due to the above average rainfall in the past year.

Appendix 1

Report 05076

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Report Title **Odour Impact Assessment of Waste Water Treatment at McWilliams Winery, Hanwood N.S.W.**

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Appendices

1 Executive Summary

An odour impact assessment has been undertaken for the waste water disposal practices at the McWilliams Winery located on Jack McWilliams Road 2km South of the town of Hanwood.

The investigation was undertaken between on the 2nd, 3rd and 4th of May 2005 and included:

- An inspection of the site
- Discussion with winery staff on production and waste issues
- A resident survey via letter delivered through Australia Post
- Odour surveys of the winery surrounds
- Sampling and measurement of odour flux from the evaporation ponds
- Modelling of odour dispersion from the evaporation pond

The findings of the assessment confirm the following conclusions:

1) Assuming current disposal practices are continued the capacity of the current evaporation ponds will be exceeded when production reaches approximately 70,000 Tonne/Year.

2) Assuming current disposal practices are continued predicted odour impacts on the key sensitive receptor (the Child Care Centre located approximately 900m north of the winery) will exceed the NSW assessment criteria (of 2 OU, 1 second estimated peak for 99th percentile of 1 hour average) at a production rate of approximately 65,000 Tonne/Year.

3) Assuming current disposal practices are continued odour impacts at other sensitive receptors (Hanwood township and isolated houses) will not exceed the assessment criteria at a production rate of 65000 Tonne/Year.

4) The dominant odour impact on the town of Hanwood and the Child Care Centre appears to be the Bartters Killing Plant.

5) The odour impact modelled for the period when the odour survey was undertaken predicts odour impacts that are consistent with the survey findings. This suggests that the modelling is accurately predicting off site impacts.

These conclusions suggest that the current waste water disposal practice of using evaporation ponds will remain viable up to a grape crushing rate of approximately 65,000 Tonne/Year. When this production rate is exceeded the evaporation ponds are unlikely to remain viable because:

1) The physical capacity of the current pond to accept waste water will be exceeded
2) The predicted odour impact at the Child Care Centre 900m north of the winery will exceed the assessment criteria.

It is suggested that alternate waste water disposal technology should be investigated and implemented before production crushing rates reach 65,000 Tonne/Year.

2 Introduction

The McWilliam's winery is located on Jack McWilliams Road (off Kidman Way) approximately 6.5 km south of Griffith and 2 km south of the town of Hanwood. The winery is located in a rural setting adjacent to a chicken feed processing plant and a grain storage and transfer hub.

The winery currently processes approximately 30,000 tonne of grapes per year. The throughput is planned to increase over the next five years to approximately 45,000 Tonne per year and approximately 65,000 Tonne per year in the next ten years.

The expanded production capacity will result in an increase in the amount of waste water requiring disposal. The current waste water disposal practice involves pumping the water into evaporation ponds to the south of the winery building.

This report provides an estimation of the potential odour impact from the evaporation ponds resulting from the proposed expansions.

The investigation was undertaken between on the 2nd, 3rd and 4th of May 2005 and included:

- An inspection of the site
- Discussion with winery staff on production and waste issues
- A resident survey via letter delivered through Australia Post
- Odour surveys of the winery surrounds
- Sampling and measurement of odour flux from the evaporation ponds
- Modelling of odour dispersion from the evaporation pond

3 Winery Location and Layout

The location of the winery and surrounding industry is provided in Figure 1.

Figure 1 Winery and Other Industry Locations

Areas identified in Figure 1 are:

1	McWilliam's Winery
2	McWilliam's Winery Evaporation Ponds
3	Chicken Feed Plant
3A	Battery Hen Sheds (now removed from site)
4	Bartter Farm #12
4A	Waste Waters Lagoons
5	Grain Storage Area
6	Child Care Centre
7	Bartter Killing Plant
8	Township of Hanwood

The Winery layout is provided in Figure 2.

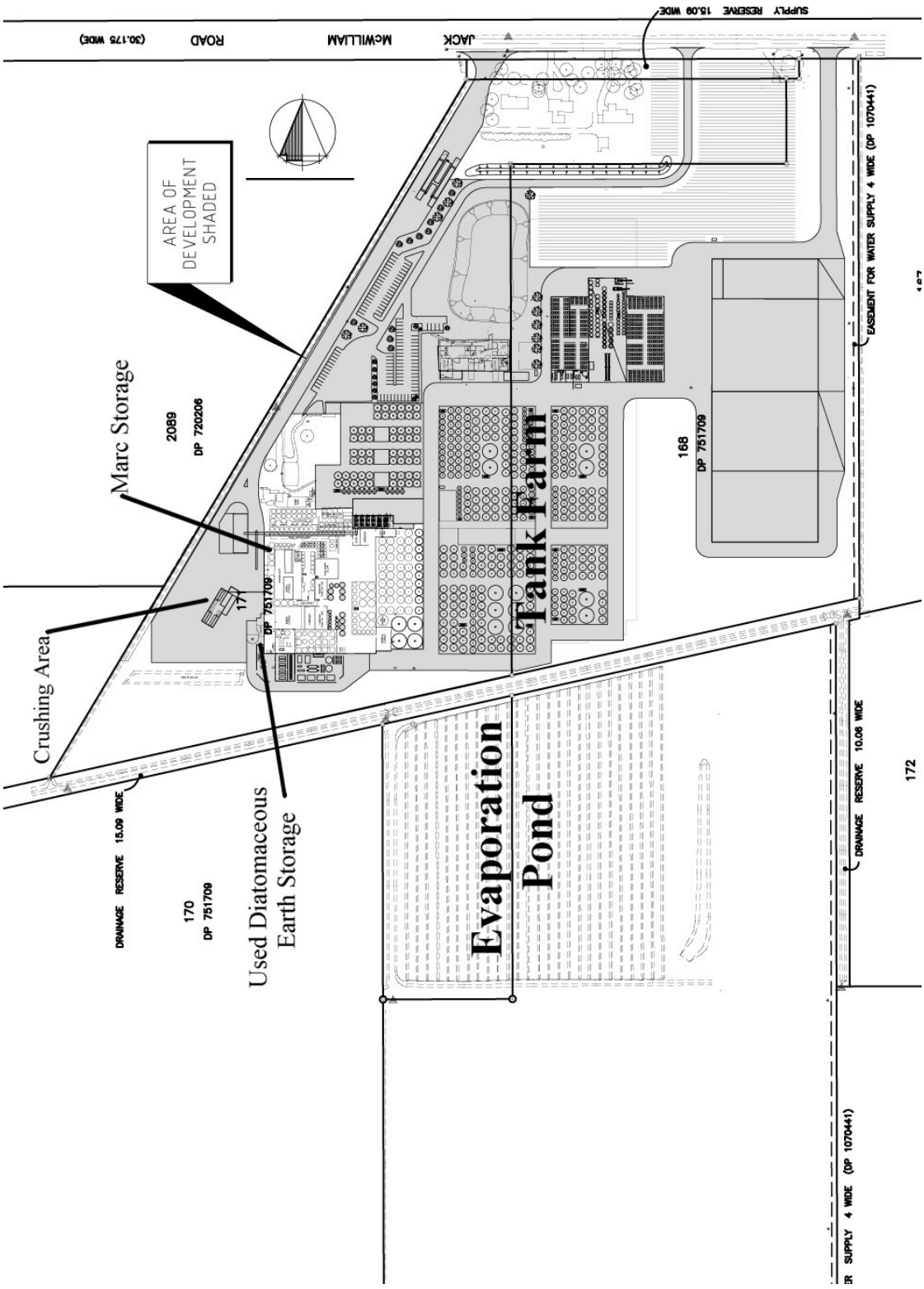

Figure 2 Winery Layout

4 Identified On Site Odour Sources

An inspection of the winery and evaporation pond was undertaken on 2nd May 2006 and the following potential odour sources were identified:

4.1 Grape Crushing Area

During vintage (January to April each year) grapes are received at the winery and processed to remove leaves and stalks. The leaves and stalks are not stockpiled at the winery, meaning that at any given time there is a maximum of approximately 30 tonne of this waste on site stored in a bin or truck (nominally 3 x 5 meters). The rapid and regular removal of this material ensures that unpleasant odours associated with bacterial or fungal activity in the waste do not occur.

Although a potential odour source the nature of the odour (i.e. fresh grapes, leaves and stalks) is not unpleasant and would be typical of any winery region. This part of the plant was not in operation during the inspection, however, based on experience at other wineries, it is considered unlikely that this odour source would result in odour complaints from residents in a wine region.

In any case the proposed increased winery production will not significantly impact on the grape reception area as an odour source. The proposed increased production will not result in additional leaves and stalks being held on site, it will only result in an increased number of trucks leaving the site to remove this waste material.

4.2 Marc

Marc, consisting primarily of grape seeds and skins, is produced as a solid residue after grape pressing to remove the juice. Marc has a characteristic odour (which is usually readily identified by residents of winery areas) that, when fresh, is not generally regarded as unpleasant. As the marc ages over a period of months the odour becomes more intense and more unpleasant.

At the McWilliams Winery the marc is not stored on site for prolonged periods. Marc is regularly removed by truck for disposal or use off site. At any given time there is a maximum of approximately 30 tonne of fresh marc at the winery. This is stored in an open bay in the north east corner of the main winery building (see Figure 3).

At the time of the winery inspection there was a second area (adjacent and to the east of the evaporation ponds, see figure 4) used to store a small quantity of marc. It is noted that this waste material did not produce a noticeable odour and is not considered a routine storage option for marc. Other than to note that the material was on the site and that it produced no detectable odour, this marc has not been considered in the odour impact assessment.

In any case the proposed increased winery production will not significantly impact on marc as an odour source. The proposed increased production will not result in additional marc being held on site, it will only result in an increased number of trucks leaving the site to remove this waste material.

Figure 3 Marc Storage Bay

Figure 4 Atypical Storage of Marc Near Evaporation Ponds

4.3 Diatomaceous Earth

Diatomaceous earth is used as a filter material in the winery process. The used diatomaceous earth is stored in a wet condition in an enclosed area at the south west corner of the winery main building (see Figure 5). On the day of the inspection this material did not produce a noticeable odour, however experience at other wineries indicates that the used diatomaceous earth can be a significant odour source.

When fresh the diatomaceous earth has a characteristic wine odour, however if the material is stored for any period of time the odour can become unpleasant due to bacterial activity. This odour is released when the material is disturbed for removal.

At the McWilliams Winery the used diatomaceous earth is removed on a regular basis so that at any given time there is a maximum of approximately 10 m^3 on site. During vintage this material would always be less than a day old.

In any case the proposed increased winery production will not significantly impact on diatomaceous earth as an odour source. The proposed increased production will not result in additional diatomaceous earth being held on site, it will only result in an increased number of trucks leaving the site to remove this waste material.

Figure 5 Used Diatomaceous Earth Storage

4.4 Miscellaneous Sources

There are a number of miscellaneous potential odour sources at the winery. These include:

- Wash out of vats and presses
- Product or washout spillage
- Equipment cleaning
- Elevated and Exposed Filters on Tanks
- Spirit Stills
- Tank Farm

Based on experience at other wineries these sources are considered minor and do not warrant detailed investigation.

For normal winery operation a significant degree of cleanliness is required. For this reason wash out liquids, product spills and waste from cleaning operations are generally well controlled and cleaned up and disposed of quickly. In fact the majority of waste water sent to the evaporation ponds is the result of the efficient clean up of spillage and the collection of wash down and cleaning water.

As demonstrated in Figures 6 to 8, which are typical photographs inside the winery, the level of cleanliness is high.

There is an exposed filter on top of one of the tanks (see Figure 9). This is a potential odour source, however, it is small and any odour originating from it is likely to be perceived as pleasant rather than an annoyance.

The spirit still (see Figure 10) is considered to have a very low potential as an odour source because it is designed to capture the volatile alcohols likely to cause odour. In any case the odour from the still operation is likely to be perceived as pleasant and (based on experience at other sites) not likely to result in adverse impact on, or complaints from, residential neighbours or sensitive receptors.

The Tank Farm (see Figure 11) is a low potential odour source because it is designed to store, without loss, the winery products. Occasional spillage may occur but as discussed above these would be cleaned up quickly under normal operating procedures. In any case, as with the still, any likely odour from the tank farm is more likely to be perceived as pleasant rather than objectionable. Odours from this source are not considered likely to result in adverse impact on, or complaints from, residential neighbours or sensitive receptors.

In summary, these miscellaneous potential odour sources have not been included in the odour assessment because they are, in the context of other sources, minor contributors to total odour and are unlikely to produce odours that would result in adverse impact on, or complaints from, residential neighbours or sensitive receptors.

Figure 6 Typical View Inside Winery

Figure 7 Typical View Inside Winery

Figure 8 Typical View Inside Winery

Figure 9 Elevated Rotary Filter

Figure 10 Still

Figure 11 Tank Farm

4.5 Evaporation Ponds

Based on an odour survey conducted on 2nd May 2006 the evaporation ponds are the dominant odour source at the McWilliams operation. This is due to both the size (approximately 40,000 m^2) of the source and the perceived unpleasant nature of the odour.

The ponds consist of 25 shallow lagoons approximately 200m long (in the north south direction) and 4m wide. The waste water is added to the northern end of an individual lagoon until it is full. This lagoon is then allowed to evaporate over time until it is dry and ready for reuse. During this evaporation period other lagoons are used for receipt of the liquid waste.

At any given time individual lagoons may contain:

1) Fresh liquid waste (red in colour)
2) Aged liquid waste (grey to clear)
3) Wet mud
4) Dried mud
5) Plant growth on dried or semi dried mud

These stages are presented pictorially in Figures 12 to 14. Sampling locations for odour flux measurement discussed below are also shown in these Figures.

Investigation on the 2nd May 2006 indicated that the odour emanated from the liquid and the wet mud. The dried mud and areas overgrown with plant matter emitted little if any perceived odour.

Between 2nd and 4th May 2006 (the period that local odour surveys were conducted) the area of the pond covered by liquid or wet mud waste was estimated at 50%. This figure was obtained by pacing out the various sections of the pond area. This estimate of 50% coverage has been used as a typical post vintage (April, May) usage of the pond for current production rates and methods.

Two areal photographs (one provided by McWilliam's Winery and identified as being taken before the 2006 vintage and one provided by "Google Earth" and taken during 2005) were reviewed to provide estimates of the amount of the ponds covered by water and wet mud. Estimation was based on the length of each lagoon that appeared red or brown in the photograph. These estimated are:

Pre 2006 Vintage	15%
2005 (Time not known)	39%

Based on these estimates a value of 15% has been used for the minimum and 50% used for the maximum coverage by odour producing waste. These values have been applied to the months of December and May respectively.

Figure 12 Typical lagoon during addition of fresh waste
Note aged waste in lagoon to the right

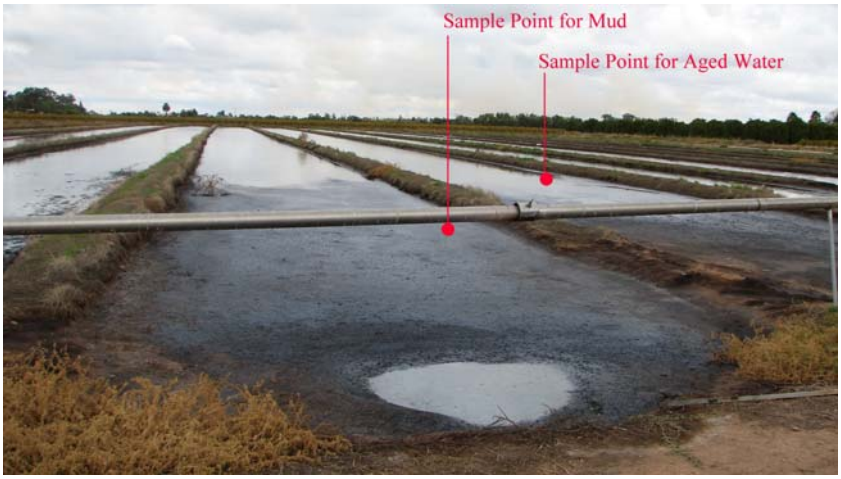

Figure 13 Typical lagoons with wet mud at north end and aged liquid at south end

Figure 14 Typical lagoon with dried mud at north end and overgrown mud at south end
note fully overgrown lagoons to left and right

5 Identified Off Site Odour Sources

Anecdotal and observational data identifies a number of actual and potential off site odour sources in the winery surrounds.

The measurement of these odour sources is beyond the scope of the current investigation, however general comments based on experience at other sites and odour surveys conduced between 2nd and 4th May 2006 are reported.

The locations of these odour sources are identified in Figure 1.

5.1 Drainage Channels

There are drainage channels located along various roads in the area. These are not actually associated with winery activities and are not under winery control. Figures 15 and 16 show typical stagnant channels located approximately 1km east of the winery.

There is the potential for these drainage channels to become an odour source due to algal growth and stagnation. The impacted area for a given channel is likely to be small but because of the widespread distribution of the channels, the effected population could be similarly widespread. On the day of the inspection a noticeable, unpleasant odour associated with some of these channels was noted.

5.2 Domestic and Rural Burning

Odours from the small scale burning of domestic rubbish was evident to the east and south east of the winery.

There was also significant impact from the burning of stubble on rural properties over the whole region. Typical impacts are depicted in Figure 17.

5.3 Chicken Feed Plant

Steggle's (formerly owned by Bartters) operates a plant that produces chicken feed for intensive animal husbandry on the site adjacent to the winery (On the corner of Kidman Way and Jack McWilliam Road), see Figure 18.

In the historical context it is important to note that a number of chicken sheds have been removed from this plant recently. Anecdotal evidence suggests that this action has significantly reduced the adverse odour impact of the plant on the surrounding neighbours. Notwithstanding this, the plant remains a significant local odour source. During the odour surveys conducted between 2nd and 4th May 2006 this plant produced the dominant odour perceived along the length of Jack McWilliam Road.

Figure 15 Typical Drainage Channel

Figure 16 Typical Drainage Channel

Figure 17 Typical Smoke Impact from Stubble Burning

Figure 18 View Looking North East from Kidman Way

5.4 Chicken Killing Plant

The Bartters chicken killing plant is located approximately half way (to the north) between the winery and the township of Hanwood.

This plant is a major local and regional odour source. During the odour surveys conducted between the 2nd and 4th May 2006 this plant was identified as the dominant odour source over an area extending 400m to the west and south and 1600m to the east and north east. During this period the wind varied from the west to the north west.

5.5 Bartter Farm Number 12

Approximately 1km to the west of the winery is "Bartter Farm #12" with what appears to be large (approximately 166,000m^2) waste water lagoons to it's west. Based on the odour survey conducted between 2nd and 4th May 2006 this lagoon is a significant odour source with a perceived odour not dissimilar to the winery evaporation pond. During the survey the impact of this odour source was evident on adjacent roads as far as Kidman Way.

6 Sensitive Receptors

Sensitive receptors that could potentially be impacted by operations at the McWilliam's Winery (and the other industries in the area) are:

6.1 Child Care Centre

The child care centre is located approximately 900m north of the winery. The close proximity of the centre to the chicken killing plant (300m to the north) and the significant odours emanating from that plant suggest that winery odour would not significantly impact on the centre. The child care centre has been identified as the most significant sensitive receptor of winery odour impacts.

6.2 Hanwood Township and School

The town of Hanwood is located approximately 2km north of the winery. The local post office lists 450 residences including isolated farm houses within a few kilometres.

Odour impacts from the winery would require a southerly wind. Such winds would place the chicken killing plant between the winery and the town. It is the opinion of the author that under these circumstances the dominant identifiable odour would be from the chicken killing plant. However, a few respondents to the community questionnaire (see below) specifically identified the McWilliams Winery as the source of objectionable odours detected in the Hanwood townsite. Without commenting on the likely veracity of this identification it is prudent to identify the township as a significant sensitive receptor.

6.3 Isolated Farm Houses

There are approximately 12 isolated farm houses within a 500m radius of the evaporation pond with a further 16 between 500m and 1000m.

In a rural setting it is the authors experience that residents of isolated farm houses are unlikely to perceive typical rural odour as being problematic. However, these isolated houses have been identified as sensitive receptors.

7 Odour Survey

Odour surveys were conducted on six occasions between 2nd and 4th May 2006. The surveys were conducted mid morning and mid afternoon each day by driving along roads within a radius of approximately 2km of the winery and regularly assessing the odour. The assessment was undertaken outside the vehicle by two people. Assessment results were recorded as either:

- No odour
- Week odour (occasional puffs)
- Obvious odour
- Strong Odour

It was also recorded if the apparent origin of the odour could be identified. The results for the three days were compiled and are provided in pictorial form in Figure 19.

To test the veracity of the odour dispersion modelling (discussed below) a model was run using the meteorological conditions for the three days over which the surveys were conducted. The 1 hour average model results were multiplied by 2.5 (the recommended near field peak (1 second) to mean (1 hour) ratio for area sources and a stability class of A, B, C and D). The predicted contour for a 1 second average odour of 2 Odour Units is provided as the black line in Figure 19.

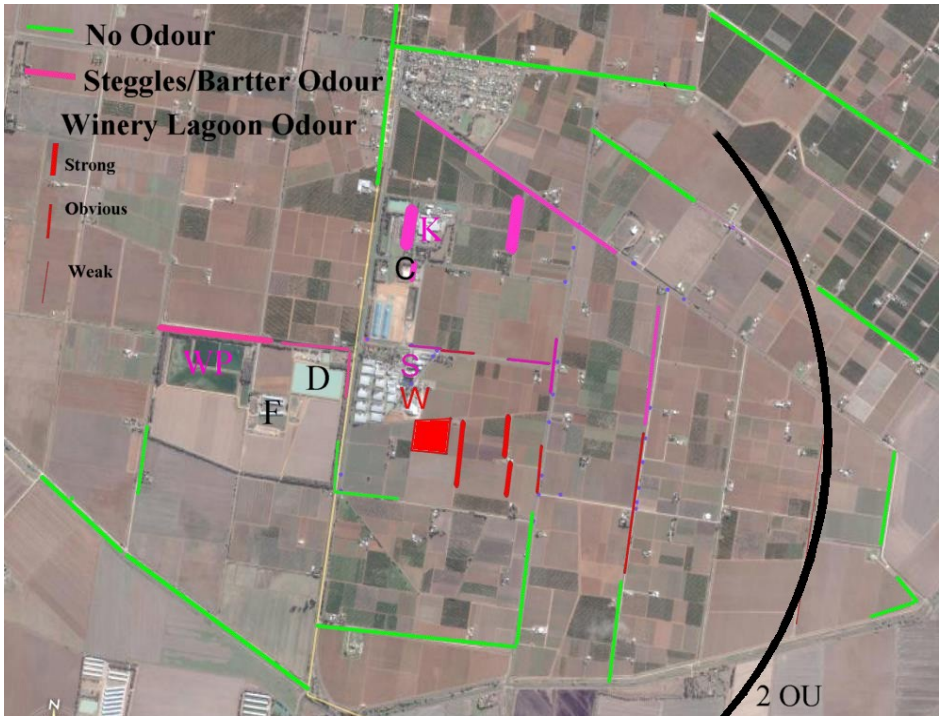

Figure 19 Pictorial Results of Regional Odour Survey

The odours identified as being associated with the Steggle's or Bartter's operations are shown in pink with the thicker lined representing the stronger odours. The associated source for these odours are the Killing Plant (K), the Waste Water Ponds at Farm #14 (WP) and the Steggle's Chicken Feed Plant (S).

The odour source for the winery is the evaporation Pond to the south of the winery and indicated as a red area. Odours identified as being associated with this pond are shown in red with the thicker lined representing the stronger odours.

The Child Care Centre is identified with a "C".

The odour survey confirms the following points:

- The winery evaporation pond does have an off site odour impact
- The Bartters Chicken Killing Plant is a dominant regional odour source
- The Chicken Feed Plant and Farm #14 are significant odour sources having a perceived off site impact similar (in intensity and distribution) to the winery.
- The modelled odour impacts are consistent with the odour survey results, i.e. the predicted 2 odour unit contour (black contour in Figure 19) corresponds well with the areas where the perceived odour is just detected.

8 Community Survey

A community survey was conducted by distribution of 450 questionnaires to residents of Hanwood and the surrounding isolated farm houses. The questionnaires were distributed by the local Australia Post office on the 8th May 2006. There is no mail delivery in the Hanwood area, delivery was through Post Office boxed located at the Australia Post agency on Kidman Way.

17 questionnaires (3.8%) were returned and a summary of the results are provided in Table 1.

Response or parameter	%	Result	Hanwood	Isolated	Not Stated
Number Distributed		450			
Number Returned	3.8	17	6	4	7
Odour Issues	82	14	6	2	6
Regular Odours	71	12	6	2	4
Infrequent Odours	12	2	0	1	1
Source Identification					
Bartters / Steggles	65	11	6	1	4
Winery	24	4	2	1	1
Burning / Smoke	47	8	2	2	4
Not Identified	12	2	1	0	1
Registered Complaint	41	7	3	1	3

Table 1 Summary of Community Survey Results

Fourteen respondents (82%) reported odour issues with most of these reporting regular odour impacts.

Respondents reporting odour issues generally referred to the odour as:

Foul burning meat
Offal
Sour
Acrid
Musty

Although some 4 respondents (24%) identified the odour as originating from a winery (2 identified the McWilliam's Winery) the odour was still described as "sour" or "acrid". The use of these terms rather than "marc" or "sweet" suggests that the odour originates from the evaporation pond rather than from the winery operation.

Two respondents in Hanwood identified a winery as the odour source. These respondents provided a contact number and a follow up interview confirmed that the respondent was convinced that the source was a winery and that they could differentiate the winery odour from the more common Bartters odour. These two respondents did not identify the McWilliam's Winery as the odour source but they did confirm that the odour was not marc or "fresh". This suggests that the likely source of these events was winery waste water. Given that odour from the McWilliams waste water lagoon would pass over the Bartters killing plant (which would dominate the odour impact) to reach the town of Hanwood it is considered likely that these incidents are associated with one of the other wineries in the area.

The most common cited odour source was the "Bartters" or "Steggle's" chicken operations (65%) followed by burning (47%) and winery odours (24%). Approximately 12% of odours were not identified. Note that these results total more than 100% because of multiple odour issues reported by a number of respondents.

Only 41% of respondents have reported odour problems to the suspected source or the regulatory authorities. Three respondents stated that they stopped reporting odours when they discovered that the complaint number was the Bartters plant.

Discussions with the winery staff indicate that a single odour complaint has been received by them over the twelve months to May 2006.

The community survey results suggest that the dominant odour source in the Hanwood area is the Bartters operations (based on the odour survey the source is most likely the killing plant) with winery industry being a minor contributor. The description of the odours identified as being winery odours suggests that the likely source is the evaporation ponds with no reported incidents having descriptions consistent with the winery process being the source.

9 Odour Flux From The Evaporation Lagoon

Odour flux from the evaporation pond was measured on the 4th May 2006. Sampling was conducted in accordance to Victorian EPA draft method B22. This method is based on US-EPA method EPA/600/3-89/008. The method deviated from the US-EPA method in two respects:

1) A metal flux hood is used in place of a plastic hood
2) The hood diameter is 28.7cm

The odour samples were submitted to The Odour Unit Pty Ltd for odour determination according to AS4323.3-2001. The report is reproduced in full in Appendix 1. Sampling conditions and results are provided in Table 2.

Sample		Fresh Waste	Wet Mud	Aged Waste	Average
Date		4/05/2006	4/05/2006	4/05/2006	
Flush Start		10:30	11:00	11:30	
Flush Stop		10:50	11:20	11:50	
Sample Start		11:00	11:30	12:00	
Sample Stop		11:20	11:50	12:20	
Flux Hood Area	m^2	0.06469	0.06469	0.06469	
Sweep Rate	l/minute	1.0	1.0	1.0	
Sample ID		05076-1	05076-2	05076-3	
Reported OU		2050	2900	1449	
Calculated Flux	$OU/m^2/s$	0.5282	0.7472	0.3733	0.5495

Table 2 Odour Flux Sampling Conditions and Results

The odour flux reported in Table 2 has been modified to supply input data for the modelling as discussed below:

The exact mix of fresh waste, aged waste and wet mud at any given time is not known, however, as winery production increases it is likely that more liquid waste will be present in the evaporation pond. Given that the liquid waste has a lower odour flux than the wet mud it is suggested that using the average of the three measured odour fluxes will provide a conservative over estimate of the actual odour flux.

For this reason the average odour flux of 0.5495 $OU/m^2/s$ has been used for the exposed liquid and wet mud waste.

At any given time in the future the lagoons that are in use will not be known. For this reason the model is based on the total area of the evaporation pond emitting the odour but the odour flux is calculated based on the percentage of the pond area that is covered in wet mud or liquid waste. That is, if the area in use is 50% the odour flux becomes 0.5*0.5495=0.275 $OU/m^2/s$ for the total areas. This approach avoids the complex process of adjusting the evaporation pond area for each modelled scenario.

To implement this approach the area of evaporation pond covered by wet mud and liquid waste must be estimated for each month. This is done in Table 3 using the data discussed in section 4.5. That is, the minimum pond coverage is in December and corresponds to approximately 15% and the maximum coverage (at current production of 30,000 T/year) is in April and May and corresponds to approximately 50%. The estimate for other months is a linear extrapolation between these two values. In Table 2 the estimated coverage factors have been rounded up to the nearest 5% to provide a conservative overestimation of modelled odour impact.

Month	Fraction of Pond Covered	Rounded Up as %	Estimation Method	Average Odour Flux
January	0.238	25	Extrapolation	0.137
February	0.325	35	Extrapolation	0.192
March	0.413	45	Extrapolation	0.247
April	0.500	50	Maximum Measured	0.275
May	0.456	50	Extrapolation	0.275
June	0.413	45	Extrapolation	0.247
July	0.369	40	Extrapolation	0.220
August	0.325	35	Extrapolation	0.192
September	0.281	30	Extrapolation	0.165
October	0.238	25	Extrapolation	0.137
November	0.194	20	Extrapolation	0.110
December	0.150	15	Minimum Measured	0.082

Table 3 Estimated Monthly Odour Flux from Total Evaporation Pond Area for Current 30,000 T/Year Production Rate

Winery staff estimate that the production rate can be increased by 15% without the production of additional waste water. Consequently the estimated odour flux provided in Table 3 is valid up to a production capacity of approximately 35,000 T/Year.

Above this value the estimated odour flux calculated by multiplying the values in Table 3 by the ratio of the proposed production rate and 35,000 Tonne. This data is provided in Table 4. Note that those estimates listed in Table 4 as blue values can not be practically achieved because they would require utilisation of more than 100% of the evaporation pond area. This places a physical upper limit of approximately 70,000 T/Year production rate before the working limit of the evaporation ponds (as currently operated) will be reached.

	Tonne/Year Production			
Month	35,000	50,000	65,000	100,000
January	0.137	0.196	0.255	0.393
February	0.192	0.275	0.357	0.550
March	0.247	0.353	0.459	0.707
April	0.275	0.393	0.510	0.785
May	0.275	0.393	0.510	0.785
June	0.247	0.353	0.459	0.707
July	0.220	0.314	0.408	0.628
August	0.192	0.275	0.357	0.550
September	0.165	0.236	0.306	0.471
October	0.137	0.196	0.255	0.393
November	0.110	0.157	0.204	0.314
December	0.082	0.118	0.153	0.236

Table 4 Estimated Odour Flux for Total Evaporation Pond Area for Varying Production Rates

The approach to odour flux estimation detailed above is simple and does not take into account the impact of varying precipitation and evaporation rates over the year. However, the approach is considered robust enough for the current investigation. The estimated odour flux rates are considered conservative over estimates because:

- The input flux rate is the average of fresh waste, aged waste and wet mud when in fact as the production rate increases the proportion of wet mud is likely to decrease. This means the actual odour flux is likely to be less than the average flux rate
- All estimates of pond area use have been rounded up
- No allowance has been made for improved technology for the reduction of waste volumes

10 Other Odour Sources

As discussed above (section 4.4) a number of miscellaneous odour sources have not been modelled because they are considered to be small and to have a negligible impact off site. These include:

- Wash out of vats and presses
- Product or washout spillage
- Equipment cleaning
- Elevated and Exposed Filters on Tanks
- Spirit Stills
- Tank Farm

The impact of crushing, marc and diatomaceous earth have been modelled using the data provided in Table 5. This data was derived from studies conducted by the author at South Australian wineries.

Odour Source	Unit	Marc	Diatomaceous Earth	Crushing	Total
Odour Flux	$OU/m^2/s$	69	130	7	
Notes		1	2	3	
Input Parameters	m^2	20	10	20	
Odour Rate	OU/s	1380	1300	140	2820

Table 5 Estimated Odour Parameters for Minor Odour Sources

Notes for Table 5 are:

1 Typical fresh marc odour measured at South Australian wineries
2 Typical fresh, used diatomaceous earth odour measured at South Australian wineries
3 Estimated at 10% of marc odour

All odour sources listed in Table 5 are area sources .The modelling of these impacts is problematic because the Ausplume model does not account for the impact of building wake effects on area sources and all of these sources are located such that the winery building is between the source and the Child Care Centre (the sensitive receptor with the highest potential impact). As discussed in section 4.4 these sources are expected to remain relatively constant as production volumes increase.

When compared to the odour emission rate from the evaporation pond (11,000 OU/s for current production increasing to 30,000 OU/s at 65,000 T/Year) the odour from the minor sources listed in Table 5 is small. The minor source odour is approximately 25% of the evaporation pond odour at current production levels and will decrease to approximately 10% at 65,000 T/Year.

This conclusion is supported by the fact that no odour from these sources was detected off site during the odour survey conducted between 2nd and 4th of May 2006.

11 Dispersion Modelling

Odour dispersion modelling has been undertaken with the Ausplume Model (version 5.4) using the following parameters.

11.1 Meteorological File

The meteorological file was generated using the TAPM model supplemented by the Bureau of Meteorological data for Griffith Airport for the year 2003. A copy of the file is contained on the CD provided in Appendix 2.

11.2 Source Parameters

The evaporation Pond has been modelled as an area source. The model is based on the total area of the pond (approximately 40,000 m^2) providing an odour flux as listed in Table 4.

11.3 Other Model Parameters

The following parameters have been used in the model:

Land Use	Flat Rural
Averaging Time	1 hour
Horizontal Dispersion	Pasquill Gifford
Vertical Dispersion	Pasquill Gifford
Wind speed category	Default
Wind profile exponent	Irwin Rural
Wake effects	Not included (Ausplume does not model building wake effects for area sources)

All model input parameters are provided in Appendix 2 and on the enclosed CD.

12 Model Results

The results of odour dispersion modelling are provided for in Figures 20 to 23. The Figures present the isopleths in odour units for the 99th percentile of a 1 hour averaging time. Results are tabulated in Table 6. The 1 second peak estimates have been obtained by multiplying the 1 hour average by 2.5 which is the most restrictive peak to mean ratio for an area source provided in Table 6.1 of "Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales".

The Impact assessment criteria provide in Table 6 are taken from Table 7.5 of "Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales". The impact criteria for isolated farm houses has been based on a population of 10 people to account for multiple dwellings at a single location.

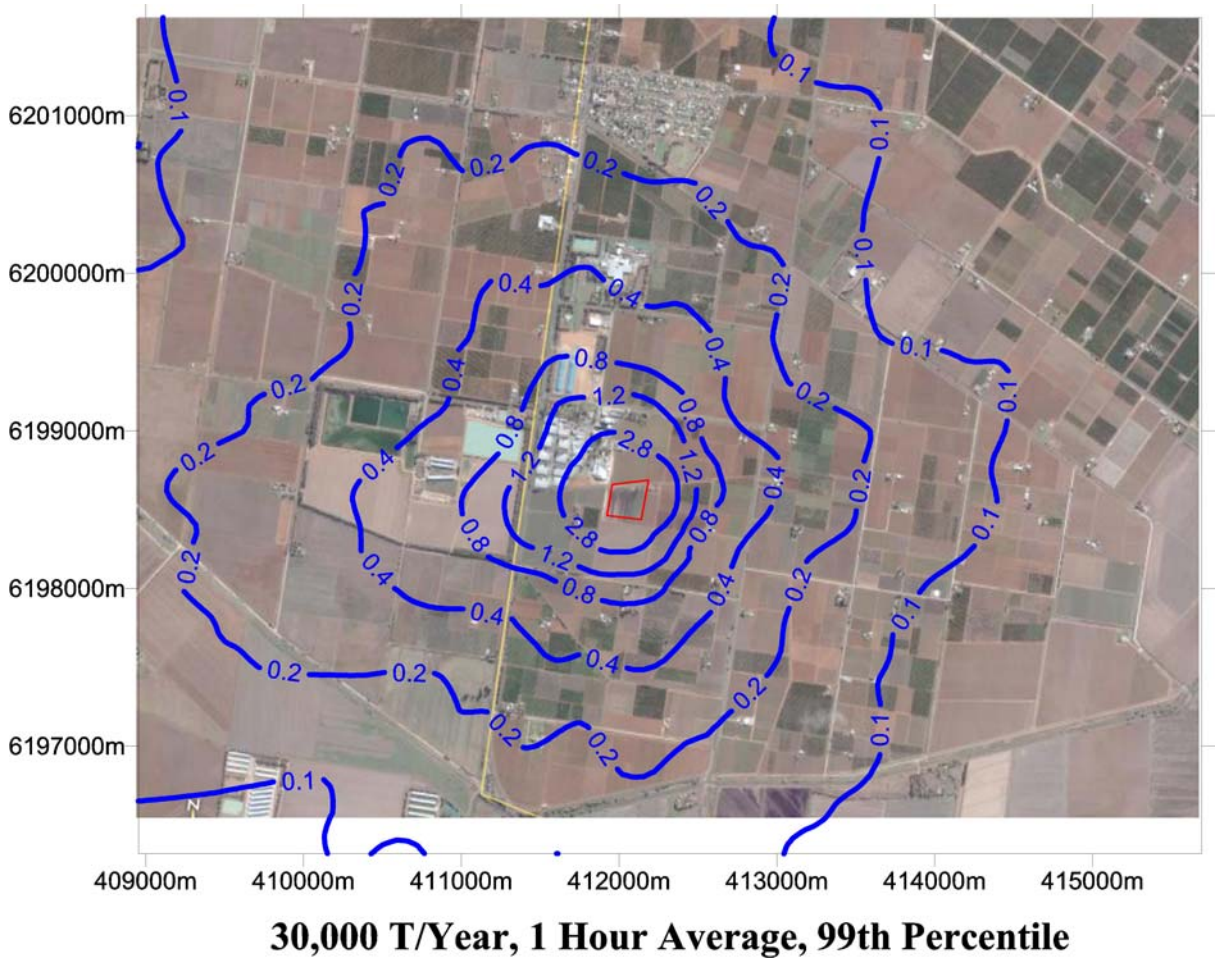

Figure 20 Predicted Odour Isopleths for the 99th Percentile of One Hour Averages for Production Rates Between 30,000 T/Year (current production) and 35,000 T/Year

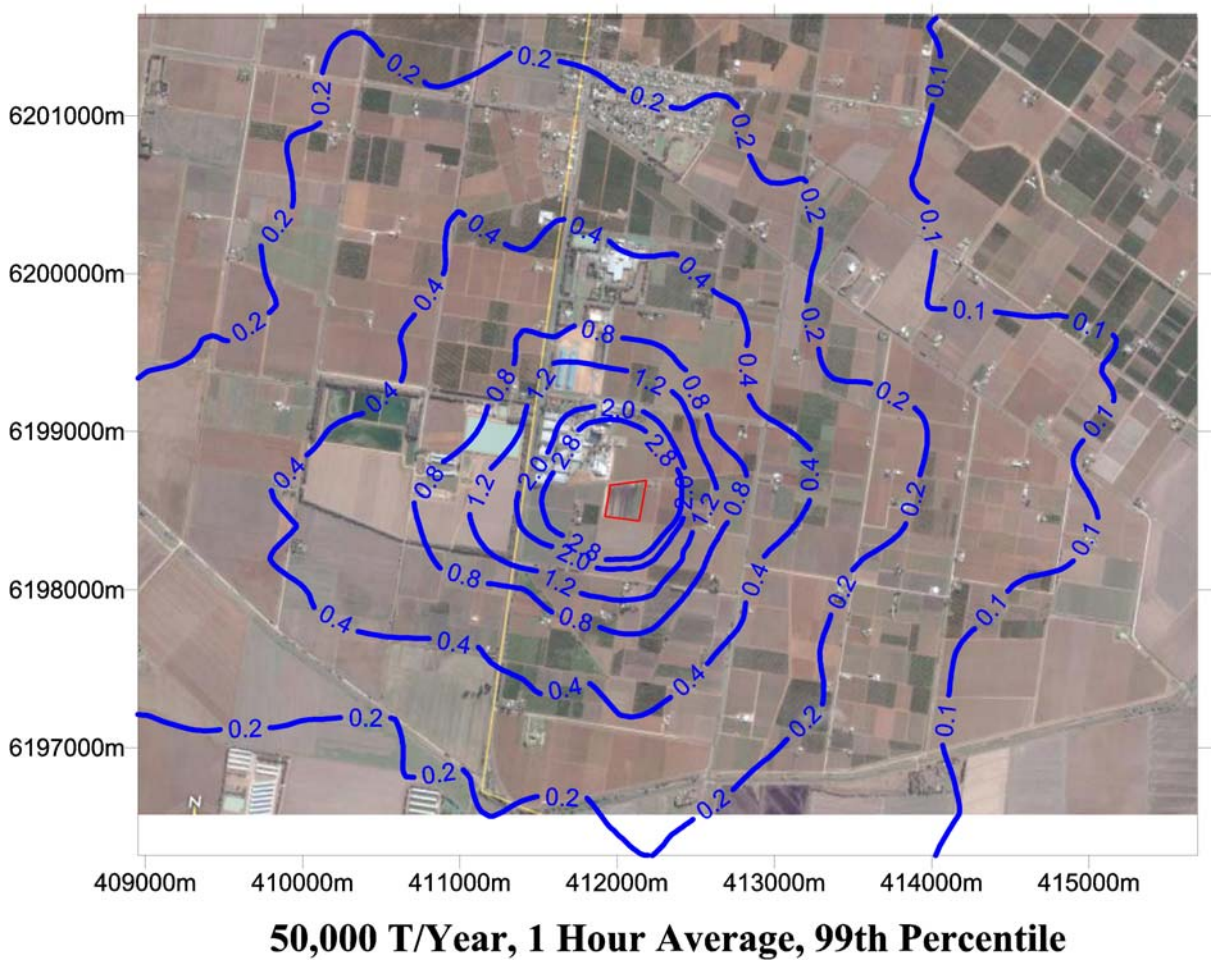

Figure 21 Predicted Odour Isopleths for the 99th Percentile of One Hour Averages for Production Rate of 50,000 T/Year

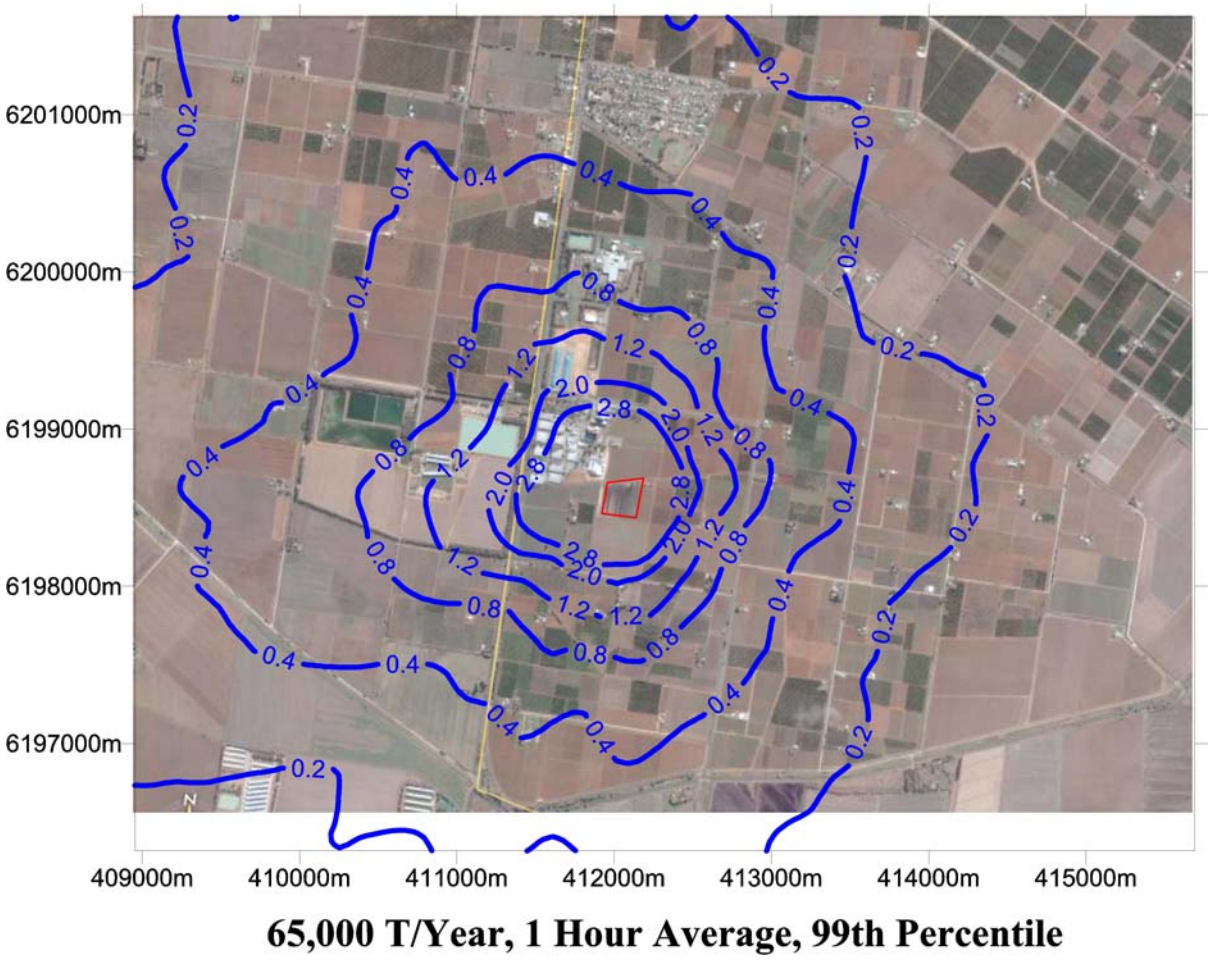

Figure 22 Predicted Odour Isopleths for the 99th Percentile of One Hour Averages for Production Rate of 65,000 T/Year

Sensitive Receptor	Averaging Time	30,000 to 35,000	50,000	65,000	Assessment Criteria
Isolated Houses	1 hour average	0.1- 0.4	0.1-0.8	0.2-1.2	
	1 second peak	0.25 - 1.0	0.25-2.0	0.5-3.0	6.0
Hanwood Town	1 hour average	0.1-0.2	0.15-0.25	0.2-0.4	
	1 second peak	0.25-0.5	0.38-0.5	0.5-1.0	2.0
Child Care Centre	1 hour average	0.6	0.8	1	
	1 second peak	1.5	2	2.5	2.0

Table 6 Tabulated Results (in OU) of Odour Dispersion Modelling for Evaporation Pond

The incremental odour impact from expansion of the winery is predicted to exceed the relevant assessment criteria for the Child Care Centre when the winery production rate approached 65,000 T/Year.

Impact on other sensitive receptors (isolated houses and the town of Hanwood) does not exceed the relevant assessment criteria at a production rate of 65,000 T/Year. This conclusion is valid if the 28 isolated house are taken in aggregate (assuming an average occupancy of four people per house) resulting in a population of 112 people with a corresponding assessment criteria of 4.0 odour units (1 second peak).

Modelling has not been done for a production rate of 100,000 T/Year because this production rate would exceed the capacity of the evaporation pond area (see Table 4)

Conclusions

An odour impact assessment has been undertaken for waste water disposal via evaporation ponds for the current and proposed expansion of the McWilliams Winery located on Jack McWilliams Road 2km south of Hanwood. The findings of the assessment confirm the following conclusions:

1) Assuming current disposal practices are continued the capacity of the current evaporation ponds will be exceeded when production reaches approximately 70,000 Tonne/Year.

2) Assuming current disposal practices are continued predicted odour impacts on the key sensitive receptor (the Child Care Centre located approximately 900m north of the winery) will exceed the NSW assessment criteria (of 2 OU, 1 second estimated peak for 99th percentile of 1 hour average) at a production rate of approximately 65,000 Tonne/Year.

3) Assuming current disposal practices are continued odour impacts at other sensitive receptors (Hanwood township and isolated houses) will not exceed the assessment criteria.

4) The dominant odour impact on the town of Hanwood and the Child Care Centre appears to be the Bartters Killing Plant.

5) The odour impact modelled for the period when the odour survey was undertaken predicts odour impacts that are consistent with the survey findings. This suggests that the modelling is accurately predicting off site impacts.

These conclusions suggest that the current waste water disposal practice of using evaporation ponds will remain viable up to a grape crushing rate of approximately 65,000 Tonne/Year. When this production rate is exceeded the evaporation ponds are unlikely to remain viable because:

1) The physical capacity of the current pond to accept waste water will be exceeded
2) The predicted odour impact at the Child Care Centre 900m north of the winery will exceed the assessment criteria.

It is suggested that alternate waste water disposal technology should be investigated and implemented before production crushing rates reach 65,000 Tonne/Year.

Appendix 1

The Odour Unit Pty Ltd

Report

THE ODOUR UNIT PTY LIMITED

THE ODOUR UNIT

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Form 06 - Sydney Laboratory
Odour Concentration Measurement Results

The measurement was commissioned by:

Organisation	On Site Technology Pty Ltd	Telephone	0417 846 826
Contact	John Waters	Facsimile	-
Sampling Site	Confidential	Email	OSTEnvironment@aol.com, patwaters@gmail.com
Sampling Method	Isolation Flux Hood	Sampling Team	OST

Order details:

Order requested by	J. Waters	Order accepted by	S. Hayes
Date of order	04/05/2006	TOU Project #	1264
Order number	05076/03	Project Manager	A. Balch
Signed by	J. Waters	Testing operator	J. Schulz

Investigated Item	Odour concentration in odour units 'ou', determined by sensory odour concentration measurements, of an odour sample supplied in a sampling bag. Odour character is also assessed, however, this assessment is not covered by AS4323.3:2001.
Identification	The odour sample bags were labelled individually. Each label recorded the testing laboratory, sample number, sampling location (or Identification), sampling date and time, dilution ratio (if dilution was used) and whether further chemical analysis was required.
Method	The odour concentration measurements were performed using dynamic olfactometry according to the Australian Standard 'Determination of Odour Concentration by Dynamic Olfactometry AS/NZS4323.3:2001. The odour perception characteristics of the panel within the presentation series for the samples were analogous to that for butanol calibration. Any deviation from the Australian standard is recorded in the 'Comments' section of this report.
Measuring Range	The measuring range of the olfactometer is $2^2 \leq \chi \leq 2^{18}$ ou. If the measuring range was insufficient the odour samples will have been pre-diluted. The machine is not calibrated beyond dilution setting 2^{17}. This is specifically mentioned with the results.
Environment	The measurements were performed in an air- and odour-conditioned room. The room temperature is maintained between 22°C and 25°C.
Measuring Dates	The date of each measurement is specified with the results.
Instrument Used	The olfactometer used during this testing session was: ODORMAT SERIES V02
Instrumental Precision	The precision of this instrument (expressed as repeatability) for a sensory calibration must be $r \leq 0.477$ in accordance with the Australian Standard AS/NZS4323.3:2001. ODORMAT SERIES V02: $r = 0.1684$ (2/28 February, 2006) Compliance – Yes
Instrumental Accuracy	The accuracy of this instrument for a sensory calibration must be $A \leq 0.217$ in accordance with the Australian Standard AS/NZS4323.3:2001. ODORMAT SERIES V02: $A = 0.1725$ (2/28 February, 2006) Compliance – Yes
Lower Detection Limit (LDL)	The LDL for the olfactometer has been determined to be 16 ou (four times the lowest dilution setting)
Traceability	The measurements have been performed using standards for which the traceability to the national standard has been demonstrated. The assessors are individually selected to comply with fixed criteria and are monitored in time to keep within the limits of the standard. The results from the assessors are traceable to primary standards of n-butanol in nitrogen.

Date: Friday, 5 May 2006

Report Number / Panel Roster Number: SYD20060505_041

T. Schulz
Principal and Managing Director

J. Schulz
Authorised Signatory

THE ODOUR UNIT PTY LIMITED

Odour Sample Measurement Results

Sample Location	TOU Sample ID	Sampling Date & Time	Analysis Date & Time	Panel Size	Valid ITEs	Nominal Sample Dilution	Actual Sample Dilution (Adjusted for Temperature)	Sample Odour Concentration (as received, in the bag) (ou)	Sample Odour Concentration (Final, allowing for dilution) (ou)	Odour Character
05076-1	SC60210	04.05.2006 1100hrs	05.05.2006 1027hrs	5	10	-	-	2,050	2,050	Grapes, sour
05076-2	SC60211	04.05.2006 1130hrs	05.05.2006 1125hrs	5	8	-	-	2,900	2,900	Grapes, sour
05076-3	SC60212	04.05.2006 1200hrs	05.05.2006 1222hrs	5	8	-	-	1,449	1,449	Grapes, rancid

THE ODOUR UNIT PTY LIMITED

Odour Panel Calibration Results

Reference Odorant	Reference Odorant Panel Roster Number	Concentration of Reference gas (ppb)	Panel Target Range for n-butanol (ppb)	Measured Concentration (ou)	Measured Panel Threshold (ppb)	Does this panel calibration measurement comply with AS/NZS4323.3:2001 (Yes / No)
n-butanol	SYD20060505_041	49,600	$20 \leq \chi \leq 80$	832	59	Yes

Comments None.

Disclaimer Parties, other than TOU, responsible for collecting odour samples hereby certify that they have voluntarily furnished these odour samples, appropriately collected and labelled, to The Odour Unit Pty Limited for the purpose of odour testing. The collection of odour samples by parties other than The Odour Unit Pty Limited relinquishes The Odour Unit Pty Limited from all responsibility for the sample collection and any effects or actions that the results from the test(s) may have.

Note This report shall not be reproduced, except in full, without written approval of The Odour Unit Pty Limited.

END OF DOCUMENT

Appendix 2

Ausplume Modelling Data

The CD attached to page 37 contains the following files:

Model used to compare modeled impacts with odour survey shown in Figure 19.

Griff_May06.met	Meteorological file for 2nd, 3rd and 4th May 2006
Griffith_Pond_May06.cfg	Configuration file for 2nd, 3rd and 4th May 2006 model
Griffith_Pond_May06.txt	Output file for 2nd, 3rd and 4th May 2006 model
Griffith_Pond_May06.dat	Data file for 2nd, 3rd and 4th May 2006 model

Model used for evaporation pond odour impacts

Griffith_Pond_1Hr.cfg	Configuration file for 30,000 to 35,000 T/Year production
Griffith_Pond.cal	Calculation file
Griffith_Pond.txt	Output file
Griffith_Pond.dat	Data file
Griffith_Pond.sta	Statistical utility output file
Griffith_Pond_50K_1Hr.cfg	Configuration file for 30,000 to 35,000 T/Year production
Griffith_Pond_50K.cal	Calculation file
Griffith_Pond_50K.txt	Output file
Griffith_Pond_50K.dat	Data file
Griffith_Pond_50K.sta	Statistical utility output file
Griffith_Pond_65K_1Hr.cfg	Configuration file for 30,000 to 35,000 T/Year production
Griffith_Pond_65K.cal	Calculation file
Griffith_Pond_65K.txt	Output file
Griffith_Pond_50K.dat	Data file
Griffith_Pond_50K.sta	Statistical utility output file

Report Files

05076_r.pdf	This Report
Tables.xls	Report Tables

Data CD

Appendix 2

Validation of Use of
Area Source Modelling

A number of the odour sources at the McWilliams winery are what is typically modelled as “volume” sources because they are contained within buildings. These sources include:

1) The two Marc storage areas Marc-5 and Marc-16
2) The Grape receipt area
3) The Pressing area
4) The Filtration area

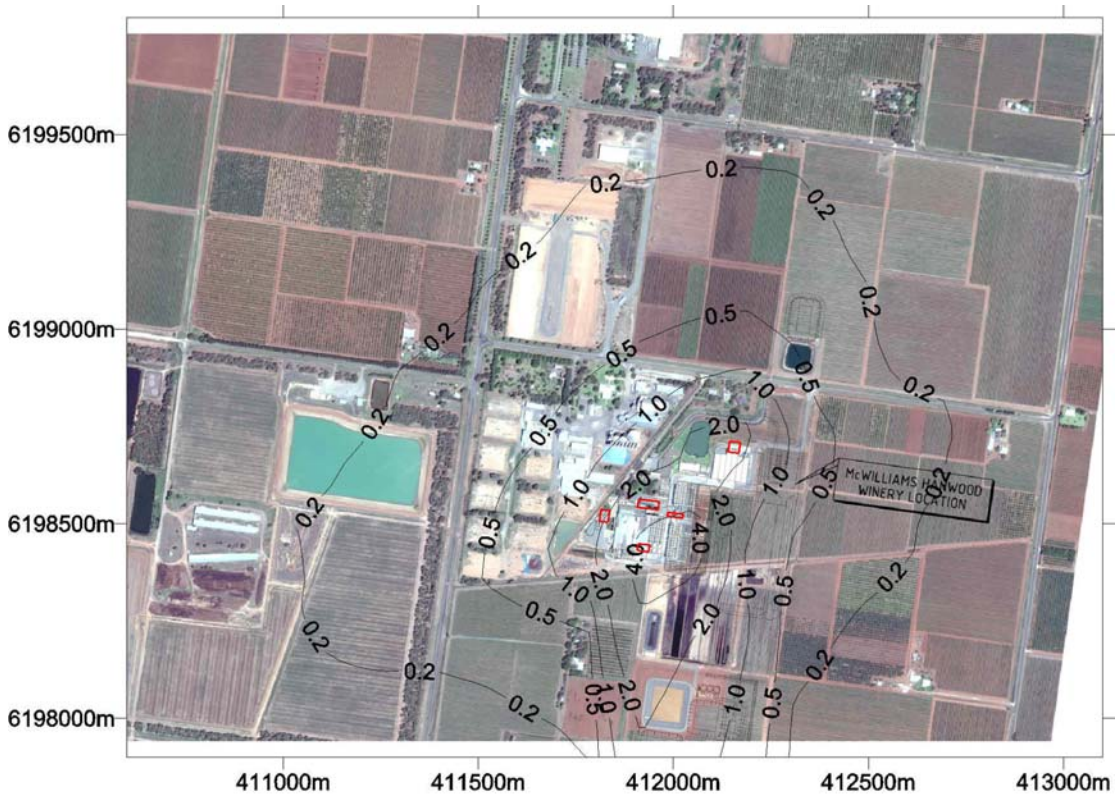
As discussed in the main report these sources are relatively minor contributors to the total odour from the winery. For the current investigation these sources have been modeled as “area” sources with a height equal to the top of the building based on the following points:

1. The sources are generally located in bays within the building and emission of any odour is via roof vents above or open doors adjacent to the area of concern.
2. The building profile is complex and extends for a considerable distance in various directions from the source

In the context of the McWilliams winery modelling these sources as “volume” sources is problematic because the statistical output file produced by Ausplume (for “volume” sources) is not easily compatible with the program used to plot the results. In order to validate the accuracy of using the “area” source approach the four sources were modelled as both “area” and “volume” sources (with a nominal building width of 250m).

The two results are shown in the next two Figures. It is evident that there is minimal difference between the predicted impacts using the two methods. The use of the simpler “area” source approach results in a slightly (although not significant) higher predicted impact for receptors close to the winery.

Based on this validation it was decided to use the “area” approach for these sources because it was simpler to implement.



Misc Sources as Area 99% 1 Hour Average

Misc Sources as Volume 99% 1 Hour Average

Appendix 3

Ausplume Data Files

Note that Appendix 3 is not available in a printable version.
All files provided as Appendix 3 require the Ausplume model to run.
They are available in electronic form on request or as an appended CD.