Riverina Oils and BioEnergy

Integrated Oilseed Processing Plant

Appendix D
Odour Report

LENNON SALVESTRO planning

REPORT 30-2424 R1R1

Revision 1

Riverina Oils and BioEnergy
Proposed Integrated Oilseed Processing Plant
Odour Impact Assessment

PREPARED FOR

D.M. McMahon Pty Ltd
PO Box 6118
Wagga Wagga 2650 NSW

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HEGGIES PTY LTD
ABN 29 001 584 612

Incorporating New Environment Graeme E. Harding & Associates Eric Taylor Acoustics

Riverina Oils and BioEnergy

Proposed Integrated Oilseed Processing Plant

Odour Impact Assessment

PREPARED BY:

Heggies Pty Ltd
Level 1, 14 Watt Street Newcastle NSW 2300 Australia
(PO Box 1768 Newcastle NSW 2300 Australia)
Telephone 61 2 4908 4500 Facsimile 61 2 4908 4501
Email newcastle@heggies.com Web www.heggies.com

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EXECUTIVE SUMMARY

Heggies Pty Ltd (Heggies) has been engaged by D.M. McMahon Pty Ltd (McMahon) on behalf of Riverina Oils and BioEnergy Pty Ltd (ROBE) to conduct an odour impact assessment for the proposed Integrated Oilseed Processing Plant (IOPP) to be located on land north of the Bomen Industrial Estate, in Wagga Wagga, NSW (hereafter 'the Project Site'). It is understood that this odour impact assessment report will be incorporated within the Plant Verification report for the IOPP.

A quantitative odour assessment has been undertaken, with predicted odour concentrations compared against acceptability criteria published by the NSW Department of Environment, Climate Change and Water (DECCW). Specific attention was paid to the odour concentrations predicted at various potentially sensitive receptor sites which predominantly comprises neighbouring residential properties.

Odour dispersion modelling has been undertaken using the Ausplume Gaussian Plume Dispersion Model software developed by EPA Victoria, (Version 6.0.)

One scenario was modelled to reflect worst case emissions from the Seed Preparation Plant (SPP) and the Solvent Extraction Plant (SEP), where all sulphur will be released as hydrogen sulphide (H_2S). Odour emission rates were calculated from a mass balance of sulphur in the process. The rates were based on a scrubbing efficiency of 99.7% (basis of the design) of the amount of H_2S released from the air for the Seed Preparation Plant (SPP) and the Solvent Extraction Plant (SEP).

The following findings were made from the modelling exercise:

- No identified receptors were predicted to experience odour above 1.0 OU/m^3, indicating that odour impacts at the surrounding residential properties are predicted to be lower then the relevant DECCW odour assessment criterion; and,
- It is noted that a conservative worst-case scenario, both in terms of odour emission rates and operational conditions, was modelled.

TABLE OF CONTENTS

TABLE OF CONTENTS

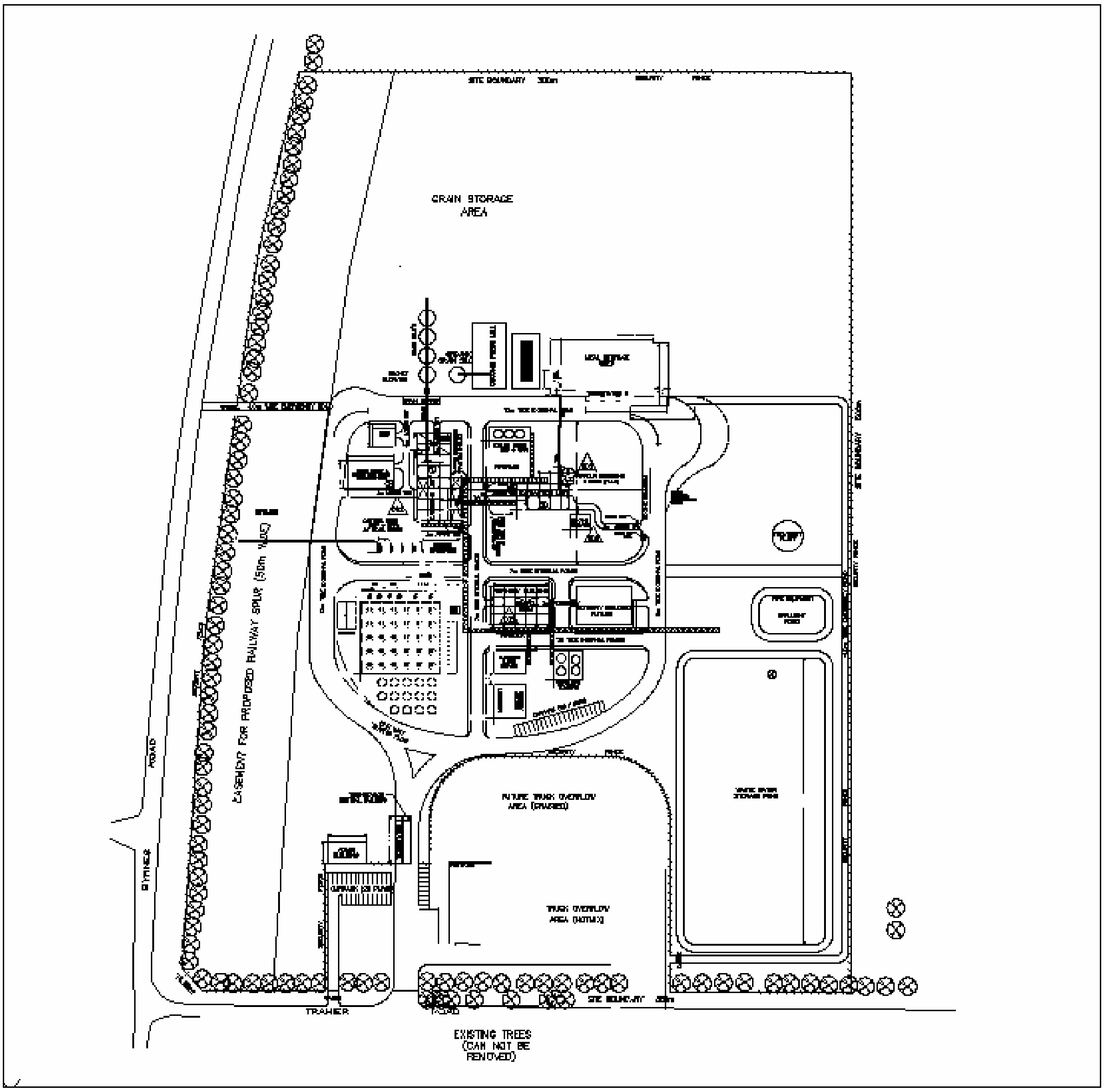
1 INTRODUCTION

Heggies Pty Ltd (Heggies) has been engaged by D.M. McMahon Pty Ltd (McMahon) on behalf of Riverina Oils and BioEnergy Pty Ltd (ROBE) to conduct an odour impact assessment for the proposed Integrated Oilseed Processing Plant (IOPP) to be located on land north of the Bomen Industrial Estate, in Wagga Wagga, NSW (hereafter 'the Project Site'). It is understood that this odour impact assessment report will be incorporated within the Plant Verification report for the IOPP.

A quantitative odour assessment has been undertaken, with predicted odour concentrations compared against acceptability criteria published by the NSW Department of Environment, Climate Change and Water (DECCW). Specific attention was paid to the odour concentrations predicted at various potentially sensitive receptor sites which predominantly comprises neighbouring residential properties.

A development plan for the Project Site, provided by ROBE, illustrating the proposed IOPP footprint is presented in **Figure 1**.

Figure 1 Proposed Footprint for Project Site



Source: Riverina Oils and Bio Energy Pty Ltd, 2009

1.1 Study Objective

The main objective of this report is to identify the potential odour impact from the proposed IOPP. The report comprises:

Section 2	A summary of the location, description and nature of proposed development
Section 3	A summary of the considerations taken to determine the appropriate odour criteria for the assessment
Section 4	A discussion of odour sources and emissions data
Section 5	A review of the dispersion modelling and meteorology including: ▪ Meteorological modelling; and ▪ Meteorological conditions
Section 6	A summary of dispersion modelling methodology
Section 7	A review of the dispersion modelling results
Section 8	A discussion of the dispersion modelling results
Section 9	Conclusions

2 PROJECT SETTING AND OVERVIEW

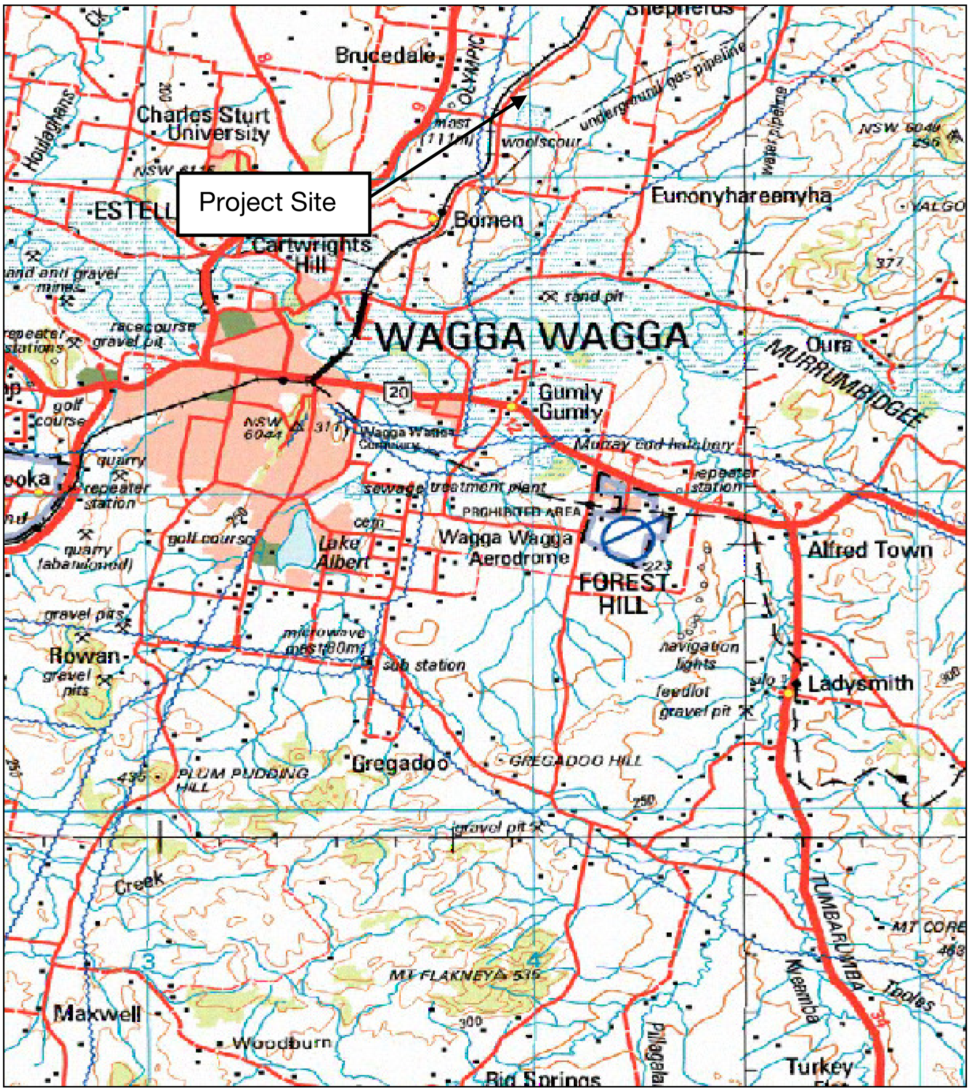
The Project Site is situated on Trahairs Road off The Olympic Highway approximately 2.5 km north of the Bomen Industrial Estate in Wagga Wagga, NSW. **Figure 2** illustrates the regional setting of the Project Site.

Figure 2 Regional Setting of Project Site

Map Source: Google Maps, 2009

The Project Site currently comprises rural land use. Surrounding land use to the northwest, southeast and west is primarily rural and comprises rural residential holdings and agricultural activities. The nearest township is Wagga Wagga, situated approximately 8.5 km to the southwest of the Project Site. The local setting of the Project Site is illustrated in **Figure 3**.

Figure 3 Local Setting of Project Site



Map Source: Geoscience Australia, 2009

2.1 Project Description

The project involves the construction and operation of an Integrated Oilseed Processing Plant (IOPP) which includes the processing of oilseed. The IOPP would process oilseed, primarily canola and safflower seed, as raw material to produce vegetable oil. It is envisaged that the plant will process approximately 165,000 tonnes (t) of oilseed per annum, with refined vegetable oil and protein meal as final products.

The Project Site will comprise of a number of components which collectively comprise the proposed IOPP, including:

- Oilseed crushing plant;
- Solvent extraction plant;
- Vegetable oil refinery; and
- Tank farm.

The Project Site would also incorporate storage and handling facilities for raw materials, products and chemicals, as well as two fully automated weighbridges.

2.1.1 Overview of Process Description

There are a number of stages to the production of edible vegetable oil, each yielding one or more products which would either be sold or undergo further processing. A process flowchart demonstrating the steps in the operation of the proposed IOPP is shown in **Appendix C**, while an outline of the process is described below:

- Oilseed is received and stored in silos prior to crushing;
- Oilseed is fed from the storage silos to the oilseed crushing plant via a conveyor, prior to pre-conditioning and crushing. Conditioned oilseed is mechanically crushed to expel the oil from the seed. This process results in the production of expelled oil and oilcake. Expelled oil is processed in the vegetable oil refinery and oilcake is transferred via conveyor to the solvent extraction plant; and,
- Oil expelled during the oilseed crushing process is refined in the vegetable oil refinery.

Some by-products are produced, stored or further processed and sold onto the local market. These are described below:

- The refining of vegetable oil produces refined oil which is stored in the refined oil storage tanks prior to being sold onto the local market;
- The oilcake produced from the crushing plant is conveyed to the solvent extraction plant;
- The de-oiled meal from the solvent extraction plant is blended with by-products from the crushing plant and refinery. It should be noted that extracted oil from this process would be pumped from the solvent extraction plant to the vegetable oil refinery or to intermediate storage tanks located in the tank farm; and,
- The meal is then transported to the meal shed for storage, loaded onto trucks and distributed.

2.2 Hours of Operation

The proposed hours of operation for the Project Site are twenty-four hours a day, seven days a week.

2.3 Sensitive Receptors

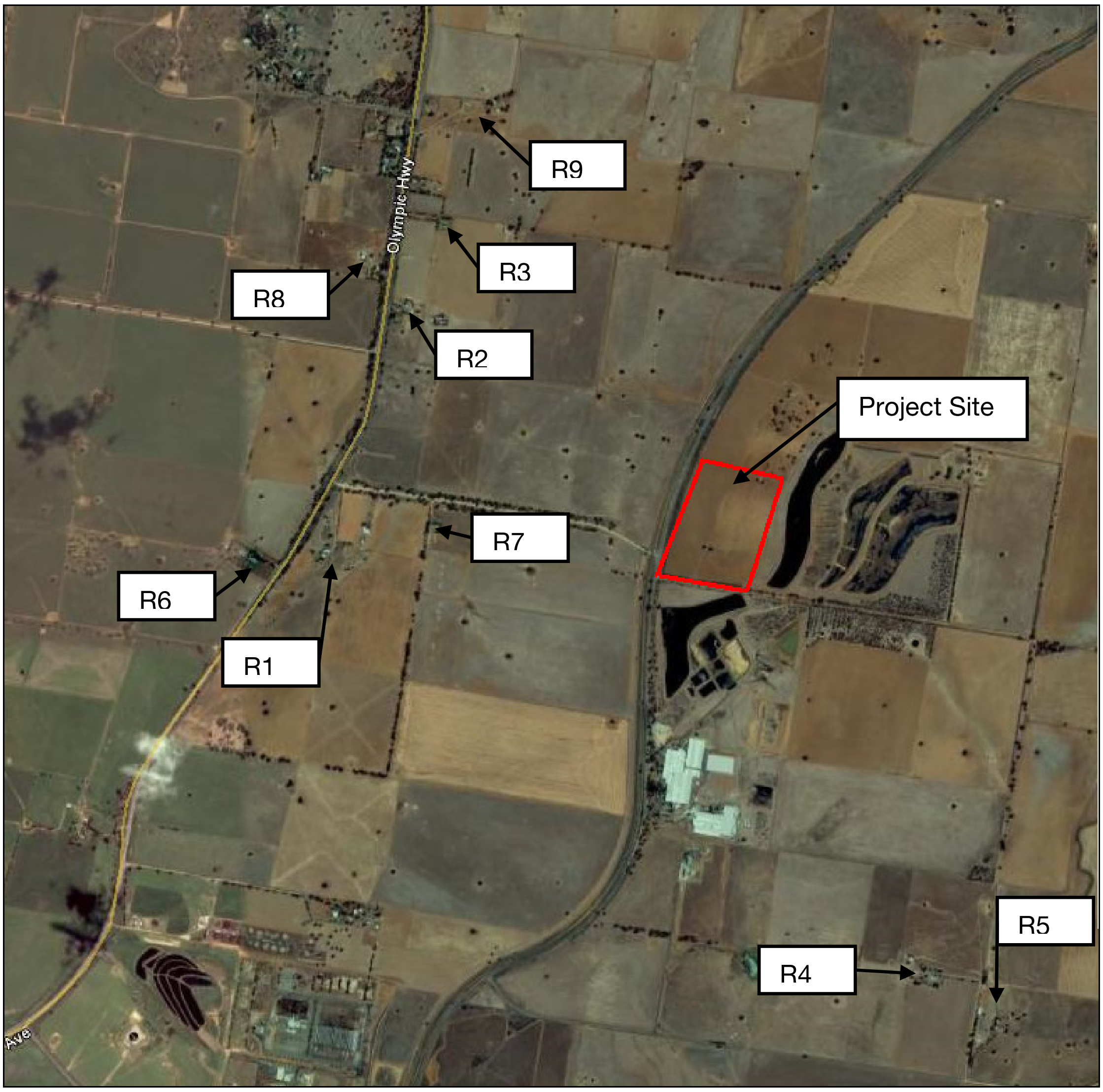
A number of rural residential dwellings are situated in the area surrounding the Project Site. The nearest dwellings were identified as sensitive receptor locations to be taken into account during the assessment of potential odour impacts due to the proposed operations.

A list of existing sensitive receptor points (R1 to R9) identified in the immediate vicinity of the Project Site, and respective distances of such receptor points to the Project Site boundary are listed in **Table 1**. **Figure 4** illustrates the location of the surrounding receptors in relation to the Project Site.

Table 1 Surrounding Sensitive Receptor Locations

Receptor ID	Location (m, MGA)		Distance (km) / Direction From Project Site (Boundary)
	Easting	Northing	
R1	537585	6121770	1.58 / SW
R2	537987	6122859	1.64/ NW
R3	538143	6123261	1.85/NNW
R4	540370	6119797	2.02 / SE
R5	540689	6119582	2.36 / SE
R6	537255	6121720	1.92/SW
R7	538084	6121875	1.07 / W
R8	537766	6123112	1.88 / NW
R9	538247	6123804	1.97 / NNW

Figure 4 Sensitive Receptor Locations



Map Source: Google Earth, 2009

2.4 Local Topography

The Project Site and surrounding residences are located in generally flat, low-lying terrain. A relatively sharp increase in terrain occurs to the east of the Project Site, while a more gradual increase occurs to the southeast.

The Project Site is located at an approximate elevation of between 230 and 240 m AHD, on land that increases gradually to the east. The majority of sensitive receptor locations (see **Table 1**), with the exception of R8 and R9, are located at an elevation at or above that of the Project Site.

3 ODOUR CRITERIA

3.1 Odour Assessment Criteria for Complex Mixtures of Odorous Air Pollutants

Impacts from odorous air contaminants are often nuisance-related rather than health-related. Odour performance goals guide decisions on odour management, but are generally not intended to achieve “no odour”.

The detectability of an odour is a sensory property that refers to the theoretical minimum concentration that produces an olfactory response or sensation. This point is called the *odour threshold* and defines one odour unit per cubic metre (OU/m^3). An odour goal of less than 1 OU/m^3 would theoretically result in no odour impact being experienced.

In practice, the character of a particular odour can only be judged by the receiver’s reaction to it, and preferably only compared to another odour under similar social and regional conditions. Based on the literature available, the level at which an odour is perceived to be a nuisance can range from 2 OU/m^3 to 10 OU/m^3 depending on a combination of the following factors:

- *Odour Quality*: whether an odour results from a pure compound or from a mixture of compounds. Pure compounds tend to have a higher threshold (lower offensiveness) than a mixture of compounds.
- *Population sensitivity:* any given population contains individuals with a range of sensitivities to odour. The larger a population, the greater the number of sensitive individuals it contains.
- *Background level:* whether a given odour source, because of its location, is likely to contribute to a cumulative odour impact. In areas with more closely-located sources it may be necessary to apply a lower threshold to prevent offensive odour.
- *Public expectation:* whether a given community is tolerant of a particular type of odour and does not find it offensive, even at relatively high concentrations. For example, background agricultural odours may not be considered offensive until a higher threshold is reached than for odours from a landfill facility.
- *Source characteristics:* whether the odour is emitted from a stack (point source) or from an area (diffuse source). Generally, the components of point source emissions can be identified and treated more easily than diffuse sources. Emissions from point sources can be more easily controlled using control equipment. Point sources tend to be located in urban areas, while diffuse sources are more often located in rural locations.
- *Health Effects:* whether a particular odour is likely to be associated with adverse health effects. In general, odours from agricultural activities are less likely to present a health risk than emissions from industrial facilities.

Experience gained through odour assessments from proposed and existing facilities in NSW indicates that an odour performance goal of 7 OU/m^3 is likely to represent the level below which “offensive” odours should not occur (for an individual with a ‘standard sensitivity’ to odours). The NSW DECCW recommends within the *Technical Framework: Assessment and Management of Odour from Stationary Sources in New South Wales* that, as design goal, no individual be exposed to ambient odour levels of greater than 7 OU/m^3. This is expressed as the 99th percentile value, as a nose response time average (approximately one second).

Odour performance goals need to be designed to take into account the range in sensitivities to odours within the community, and provide additional protection for individuals with a heightened response to odours, using a statistical approach which depends on the size of the affected population. As the affected population size increases, the number of sensitive individuals is also likely to increase, which suggests that more stringent goals are necessary in these situations. In addition, the potential for cumulative odour impacts in relatively sparsely populated areas can be more easily defined and assessed than in highly populated urban areas. It is often not possible or practical to determine and assess the cumulative odour impacts of all odour sources that may impact on a receptor in an urban environment. Therefore, the proposed odour performance goals allow for population density, cumulative impacts, anticipated odour levels during adverse meteorological conditions and community expectations of amenity.

Where a number of the factors above simultaneously contribute to making an odour "offensive", an odour goal of 2 OU/m^3 at the nearest residence (existing or any likely future residences) is appropriate, which generally occurs for affected populations equal or above 2000 people.

The equation used by the NSW DECCW to determine the appropriate impact assessment criteria for complex mixtures of odorous air pollutants, as specified in the 2005 document "*The Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales*" (hereafter, "the Approved Methods"), is expressed as follows:

$$\text{Impact assessment criterion (OU)} = (\log_{10}(\text{population})-4.5)/-0.6$$

A summary of the impact assessment criteria given for various population densities, as drawn from the Approved Methods, is given in **Table 2**.

Table 2 NSW DECCW Impact Assessment Criteria for Complex Mixtures of Odorous Air Pollutants (nose-response-time average, 99th percentile)

Population of Affected Community	Impact Assessment Criteria for Complex Mixtures of Odours (OU)
Urban area ($\geq$ 2000)	2.0
~300	3.0
~125	4.0
~30	5.0
~10	6.0
Single residence ($\leq$ 2)	7.0

Source: The Approved Methods (DECC, 2005)

The Approved Methods states that the impact assessment criteria for complex mixtures of odorous air pollutants must be applied as follows:

At the nearest existing or likely future off-site sensitive receptor.

The incremental impact (predicted impact due to the pollutant source alone) must be reported in units consistent with the impact assessment criteria (OU), as peak concentrations (i.e. approximately 1 second average) and as the:

- 100th percentile of dispersion model predictions for Level 1 impact assessments, or
- 99th percentile of dispersion model predictions for Level 2 impact assessments.

3.2 Project-specific Odour Impact Assessment Criteria

Given the number of existing dwellings in the immediate vicinity of the Project Site (**Section 2.3**) and an assumed average population of three people per residence, it is expected that an odour impact assessment criteria of 5 OU (expressed as the 99th percentile for a nose response average, i.e. 1-second, average) would need to be met in the area.

4 ODOUR SOURCES AND EMISSIONS DATA

The release of odoriferous compounds is likely to happen while crushing canola, which is the initial process of conditioning and pre-pressing the seed and then while solvent extracting the remaining oil in the cake. The emissions of H_2S from the various processes are combined within each process building prior to emission to atmosphere. There is one combined vent for the seed preparation plant (SPP) and one for the solvent extraction plant (SEP).

These combined emissions are passed to go through a wet scrubbing system before being released into the atmosphere.

4.1 Seed Preparation Plant

When the seeds are received in the seed preparation plant, they are first cleaned of any foreign materials. The next preparation step consists of producing flakes, which is a shape that makes the oil cells accessible for extraction. The flaking efficiency is enhanced by pre-heating the clean seeds prior to the flaking process. The flakes are then cooked and dried; cooking further weakens the cells walls and reduces the viscosity of the oil, while drying improves the gripping and the pressure buildup inside the press. In the press, oil is pressed out and the remaining solids form a cake that is send to the solvent extraction.

4.2 Solvent Extraction Plant

The solvent extraction plant will be housed in a steel structure. The processing units in the plant are maintained under slight negative pressure to prevent the escape of hexane and minimise risk of fire. This process also ensures that there are no fugitive or point source odour releases from the solvent extraction. The air stream from the mineral adsorption solvent contains H_2S, which is an odourous compound. The primary extraction system extracts air from the mineral oil adsorption solvent recovery system where the air displace from the equipment and the air leakage into the system are scrubbed in a mineral oil scrubbing unit. Ancillary processing units generally generate a low odour in air stream.

5 CLIMATE AND DISPERSION METEROLOGY

To adequately characterise the dispersion meteorology of the study site information is needed on the prevailing wind regime and atmospheric stability. The meteorology of the study area was characterised based on:

- Hourly meteorological data from the Bureau of Meteorology (BoM) Automatic Weather Station (AWS) at Wagga Wagga AWS (AWS Number 072150); and
- Site specific datasets generated through Heggies-conducted meteorological modelling.

The location of the monitoring station which is situated in relatively close proximity to the Project Site is summarised in **Table 3**. The data from the monitoring station was used to characterise the local meteorology and provide the input datasets for the meteorological modelling.

Table 3 Meteorological Monitoring Station Details

Station Name	Location (m, MGA)		Distance (km) / Direction From Project Site	Elevation (m, AHD)
	Easting	Northing		
Wagga Wagga	541974	6109167	13 km / SE	210 m

5.1 Methodology

The pollutant dispersion modelling was undertaken using the Ausplume Gaussian Plume Dispersion Model software developed by EPA Victoria, (Version 6.0.)

Ausplume is an approved dispersion model for use in the majority of applications in NSW. Default options specified in the Technical Users Manual (EPA Victoria, 2000) have been used, as per NSW DECC's, "*Approved Methods and Guidance for the Modelling and Assessment of Air Pollutants in New South Wales*".

5.2 Meteorological Modelling

As there are no meteorological observations available for the Project Site, The Air Pollution Model (TAPM) meteorological model (Version 3) was used to simulate the meteorology of the area.

TAPM, developed by the Commonwealth Scientific and Industrial Research Organisation (CSIRO) is a prognostic model which may be used to predict three-dimensional meteorological data and air pollution concentrations, with no local data inputs required.

TAPM model predicts wind speed and direction, temperature, pressure, water vapour, cloud, rain water and turbulence. The program allows the user to generate synthetic observations by referencing databases (covering terrain, vegetation and soil type, sea surface temperature and synoptic scale meteorological analyses) which are subsequently used in the model input to generate site-specific hourly meteorological observations.

Additionally, the TAPM model may assimilate actual local wind observations so that they can optionally be included in a model solution. The wind speed and direction observations are used to realign the predicted solution towards the observation values. This function of accounting for actual meteorological observations within the region of interest is referred to as "data assimilation".

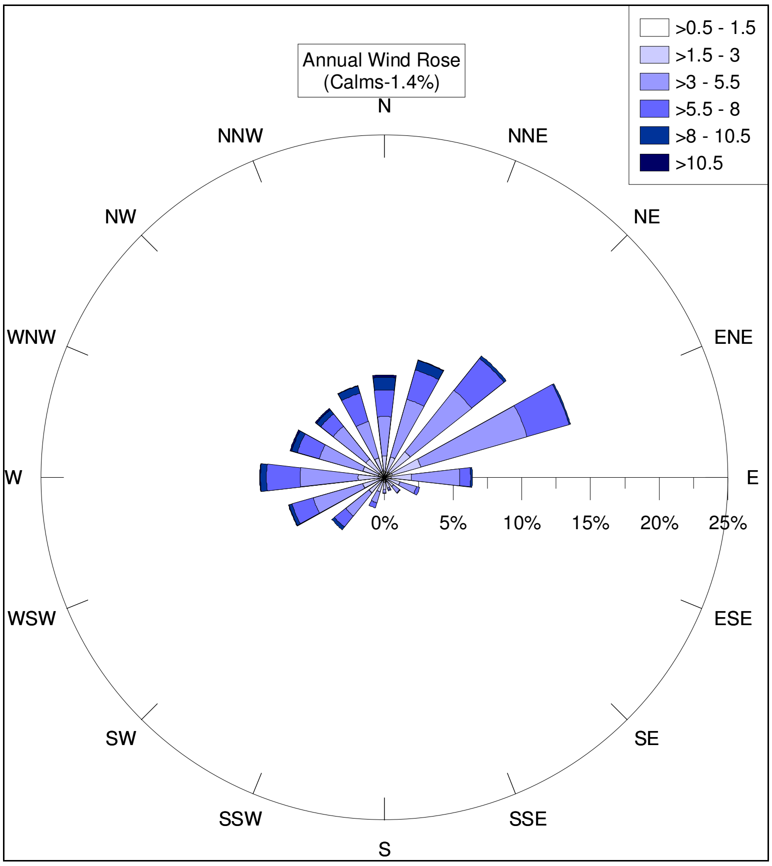
5.2.1 Wind Regime

For this assessment, TAPM was used to generate a complete 2003 meteorological data set for the project site, incorporating hourly observations recorded at the Bureau of Meteorology (BoM) weather station in Wagga Wagga. In accordance with the Approved Methods for the Modelling and Assessment of Air Pollutants (AMMAAP), a meteorological dataset must be 90% complete in order to be acceptable for use an impact assessment. The dataset used within this assessment was 95% completer and therefore was considered appropriate.

A summary of the 2003 annual wind behaviour for the project site presented as a wind rose is illustrated in **Figure 5**. This wind rose is representative of the meteorological input file used in the assessment, and displays occurrences of winds from all quadrants.

The 2003 annual wind rose indicates that north-northeasterly winds dominate at the project site.

Figure 5 Annual Wind Rose for Project Site-2003



The seasonal variation in wind behaviour at the site is also presented in **Appendix A**. The seasonal wind roses indicate that:

- In spring the prevailing wind direction is from the west.
- In summer and autumn the prevailing wind direction is from the north north-east.
- In winter the prevailing wind direction is from the north to north-west.
- In Autumn the prevailing wind direction is from east north-east to the north east

5.2.2 Atmospheric Stability

Atmospheric stability refers to the tendency of the atmosphere to resist or enhance vertical motion. The Pasquill-Turner assignment scheme identifies six Stability Classes, “A” to “F”, to categorise the degree of atmospheric stability. These classes indicate the characteristics of the prevailing meteorological conditions and are used as input into various air dispersion models (**Table 4**).

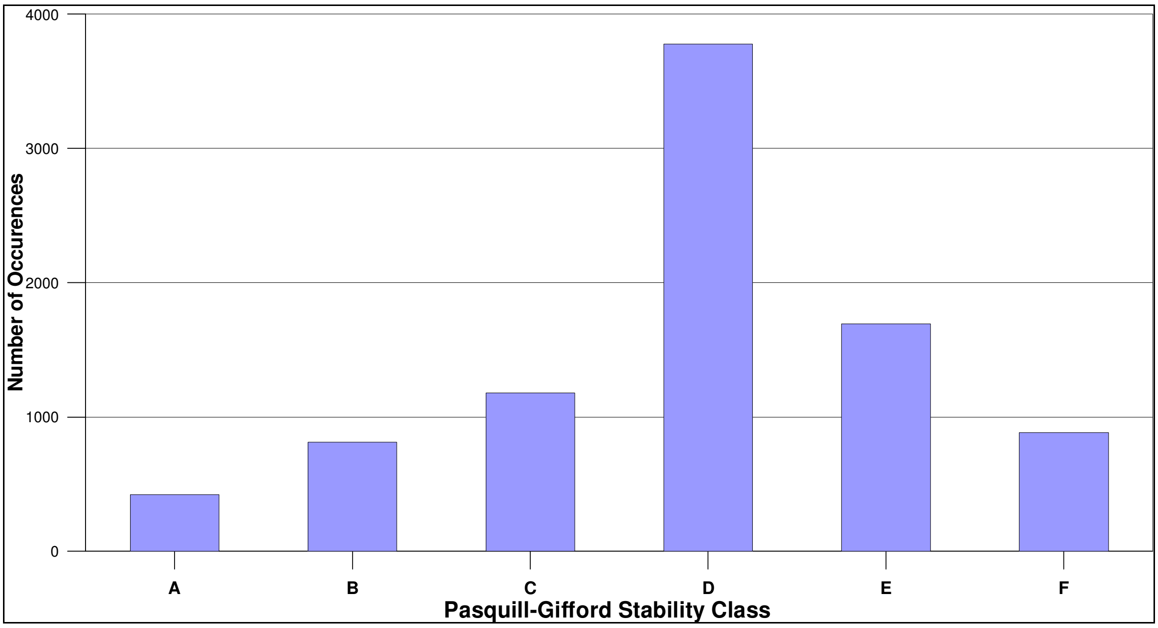
Table 4 Description of atmospheric stability classes

Atmospheric Stability Class	Category	Description
A	Very unstable	Low wind, clear skies, hot daytime conditions
B	Unstable	Clear skies, daytime conditions
C	Moderately unstable	Moderate wind, slightly overcast daytime conditions
D	Neutral	High winds or cloudy days and nights
E	Stable	Moderate wind, slightly overcast night-time conditions
F	Very stable	Low winds, clear skies, cold night-time conditions

The frequency of each stability class at the Project Site is presented in **Figure 6**. The seasonal stability class distributions for each station are included in **Appendix C**.

The results indicate a high frequency of conditions typical to Stability Class “D”. Stability Class “D” is indicative of neutral conditions which neither enhance nor inhibit plume dispersion.

Figure 6 Annual Stability Class Distributions for the Project Site



6 DISPERSION MODELLING CONFIGURATION

6.1 Building Wake Effects

Plumes trapped in building wakes can either be recirculated in the cavity region immediately downwind of a building or subjected to plume downwash and enhanced horizontal or vertical spreading due to the turbulent zone that exists further downwind.

Buildings generate downwind wake effects up to 5 times the lesser of the building height or projected building width. If there are stacks less than approximately 2.5 times the building height within this zone, then the effect of building wakes should be considered. In the dispersion simulations building wake effects were projected for all on site structures.

It is noted that there are a number of buildings associated with the IOPP including the oilseed crushing building, the solvent extraction building and the refinery building.

6.2 Modelling Scenarios

One modelling scenario has been developed for this assessment:

- Scenario 1 was modelled to reflect worst case emissions from the SPP and the SEP, where all sulphur will be released as H_2S.

6.2.1 Estimated Emission Rates

In this study odour emission rates where calculated from a mass balance of sulphur in the process. The rates were based on a scrubbing efficiency of 99.7% (basis of the design) of the amount of H_2S released from the air for the SPP and the SEP. The calculation for the mass balance of sulphur during canola processing is included in **Appendix D.**

Table 5 Odour Emission Rates for the Project Site

Odour Source	**Odour Emission Rate (OUm³/s) by Ambient Temperature (ºC)**						
	Odour concentration (OU/m³)	Emission velocity (m/s)	Temperature (ºC)	Diameter of stack (m)	Height of stack (m)	P/M60	Odour Emission Rate (OU/s)
SPP	171	10.5	75	1.0	29	2.3	2,962
SEP	4,382	9.0	65	1.1	29	2.3	77,598

It is noted that the sources of odour (including stack locations and stack characteristics) were based on the design of the SPP and the SEP.

6.3 Peak-to-Mean Ratios

The Approved Methods state that Peak-to-Mean ratios should be incorporated when conducting atmospheric dispersion modelling of odour.

It is commonly recognised that dispersion models need to be supplemented to accurately simulate atmospheric dispersion of odours. This is because the instantaneous perception of odours by the human nose typically occurs over a time scale of approximately one second but dispersion model predictions are typically valid for time scales equivalent to ten minutes to one hour averaging periods.

To estimate the effects of plume meandering and concentration fluctuations perceived by the human nose, it is possible to multiply dispersion model predictions by a correction factor called a “peak-to-mean ratio”. The peak to mean ratio (P/M60) is defined as the ratio of peak 1-second average concentrations to mean 1-hour average concentrations. To estimate peak concentrations, this assessment has used Table 6.1 of the Approved Methods. Specifically, to establish a conservatively high estimate of peak odour concentrations, a Peak-to-Mean ratio (P/M60) of 2.3 has been applied to the emission rate for all wake affected point sources. This ratio is given as being valid for both near and far field receptors.

7 ODOUR IMPACT ASSESSMENT RESULTS

7.1 Model Results

Table 6 shows the results of the Ausplume prediction for the maximum odour concentrations at each of the nearest discrete receptors using the emission rates detailed in **Section 6.2.1** with peak-to-mean ratios applied over a one year timeframe. No odour isopleths were produced for this assessment due the low concentrations (< 1.0 OU/m^3) across the modelling domain

Table 6 Predicted 99th Percentile Odour Concentrations at Nearest Residences - Proposed Operations

Receptor ID	Predicted Odour Concentration (OU/m^3)	Odour Performance Goal (OU/m^3
R1	0.5	5.0
R2	0.6	5.0
R3	1.0	5.0
R4	0.1	5.0
R5	0.1	5.0
R6	0.1	5.0
R7	0.1	5.0
R8	0.5	5.0
R9	0.3	5.0

The results represented in **Table 6** indicate that the 99th percentile predicted odour concentration is below the odour performance goal of 5.0 OU/m^3 at all the nearest residential receptors.

8 DISCUSSION OF RESULTS

The results of the odour dispersion modelling assessment are presented in **Table 6**. Review of odour concentrations predicted for Scenario 1 operations indicates that the DECCW odour goal of 5 OU/m^3 selected for the area surrounding the Project Site is not exceeded at any of the discrete receptor locations.

It is noted that as the results of the dispersion modelling indicate that none of the identified discrete sensitive receptor locations are likely to be impacted by operations at the Project Site and the fact that the odour assessment criterion was chosen based on assumed affected population density, the assessment criterion adopted in this report can be viewed as conservative.

9 CONCLUSIONS

Heggies Pty Ltd (Heggies) has been engaged by D.M. McMahon Pty Ltd (McMahon) on behalf of Riverina Oils and BioEnergy Pty Ltd (ROBE) to conduct an odour impact assessment for the proposed Integrated Oilseed Processing Plant (IOPP) to be located on land north of the Bomen Industrial Estate, in Wagga Wagga, NSW.

The potential impacts from operation of the Integrated Oilseed Processing Plant were determined to be odour impacts attributable to the emission of hydrogen sulphide (H_2S) during the processing of Canola oil in the Seed Processing Plant (SPP) and the Solvent Extraction Plant (SEP).

Atmospheric dispersion modelling predictions of odour concentrations were undertaken using Ausplume Gaussian Plume Dispersion Model software developed by the Victorian EPA using worst case odour emissions data. Maximum emission rates, varied by ambient temperature, with the peak-to-mean ratio of 2.3 applied, were simulated over a one year time frame (2003).

The following findings were made from the modelling exercise:

- No identified receptors were predicted to experience odour above 1.0 OU/m^3, indicating that odour impacts at the surrounding residential properties are predicted to be lower then the relevant DECCW odour assessment criterion; and,
- It is noted that a conservative worst-case scenario, both in terms of odour emission rates and operational conditions, was modelled.

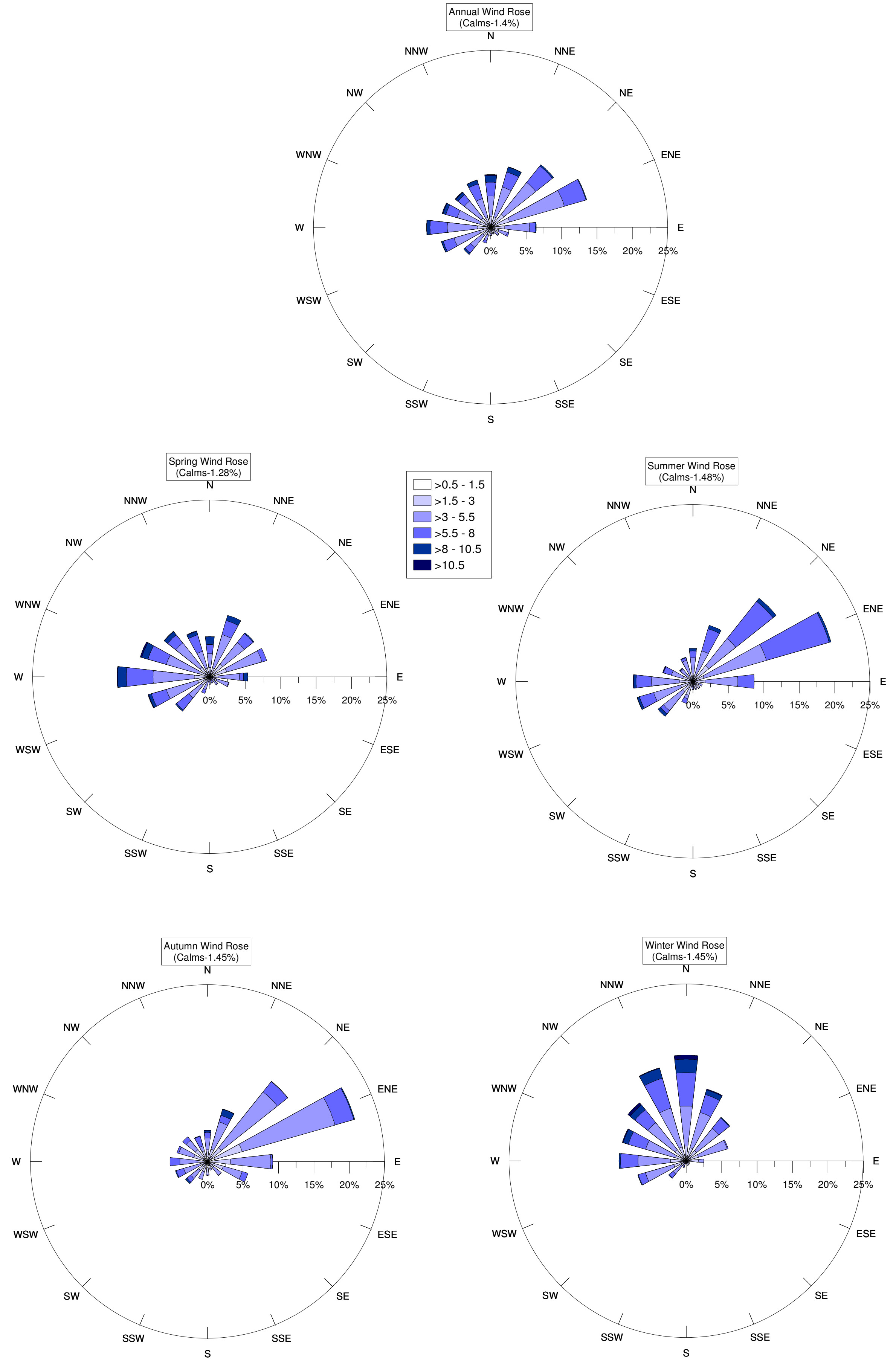
10 REFERENCES

- Australian Standard AS/NZS 4323.3:2001 *Determination of Odour Concentration by Dynamic Olfactometry*
- Bureau of Meteorology, Meteorological observations from the Wagga Wagga Automatic Weather Station for the period 2003.
- HLA-EnviroSciences Pty Ltd-Integrated Oilseed Processing and Biodiesel Plant, Wagga Wagga, Odour Impact Assessment Study, 2008.
- NSW Department of Environment Climate Change, and Water (DECCW), Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales, 2005.
- NSW Department of Environment Climate Change, and Water (DECCW), Technical Framework - Assessment and Management of Odour from Stationary Sources in New South Wales, November 2006.
- NSW Department of Environment Climate Change, and Water (DECCW), Technical Notes - Assessment and Management of Odour from Stationary Sources in New South Wales, November 2006.
- Ormerod R., D'Abreton P. and Holmes G. 2003. Buoyancy Effects Associated with Non-point Odour Sources: Modelling Issues and Implications. Proceedings of National Clean Air Conference: Linking Air Pollution Science, Policy and Management, Newcastle, 2003.

11 GLOSSARY OF TERMS

AWS	Automatic Weather Station
AMMAAP	The Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales
BoM	Bureau of Meteorology
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DECCW	NSW Department of Environment Climate Change, and Water
Heggies	Heggies Pty Ltd
m^3	Cubic metre
NASA	National Aeronautics and Space Administration
OU	Odour Units; concentration of odorous mixtures in odour units. The number of odour units is the concentration of a sample divided by the odour threshold or the number of dilutions required for the sample to reach the threshold. This threshold is equivalent to when 50% of a testing panel correctly detect an odour
OER	Odour Emission Rate ($OU.m^3/s$)
OUV	Odour Unit Volumes; odour units are not concentrations but are a ratio. As such, they may not be used to represent an odour emission. It is necessary to multiply the source odour level (OU) by the volume of air emitted per second, to produce an odour emission rate. Typically odour emission rates may be expressed as OUV/s (point/volume sources) and $OUV/m^2/s$ (area sources) with units of $OU.m^3/s$ and $OU.m^3/m^2/s$ respectively.
P/M60	Peak to Mean Ratio
TAPM	The Air Pollution Model (TAPM) software, developed by the CSIRO

Seasonal Wind Roses for Wagga Wagga AWS - 2003



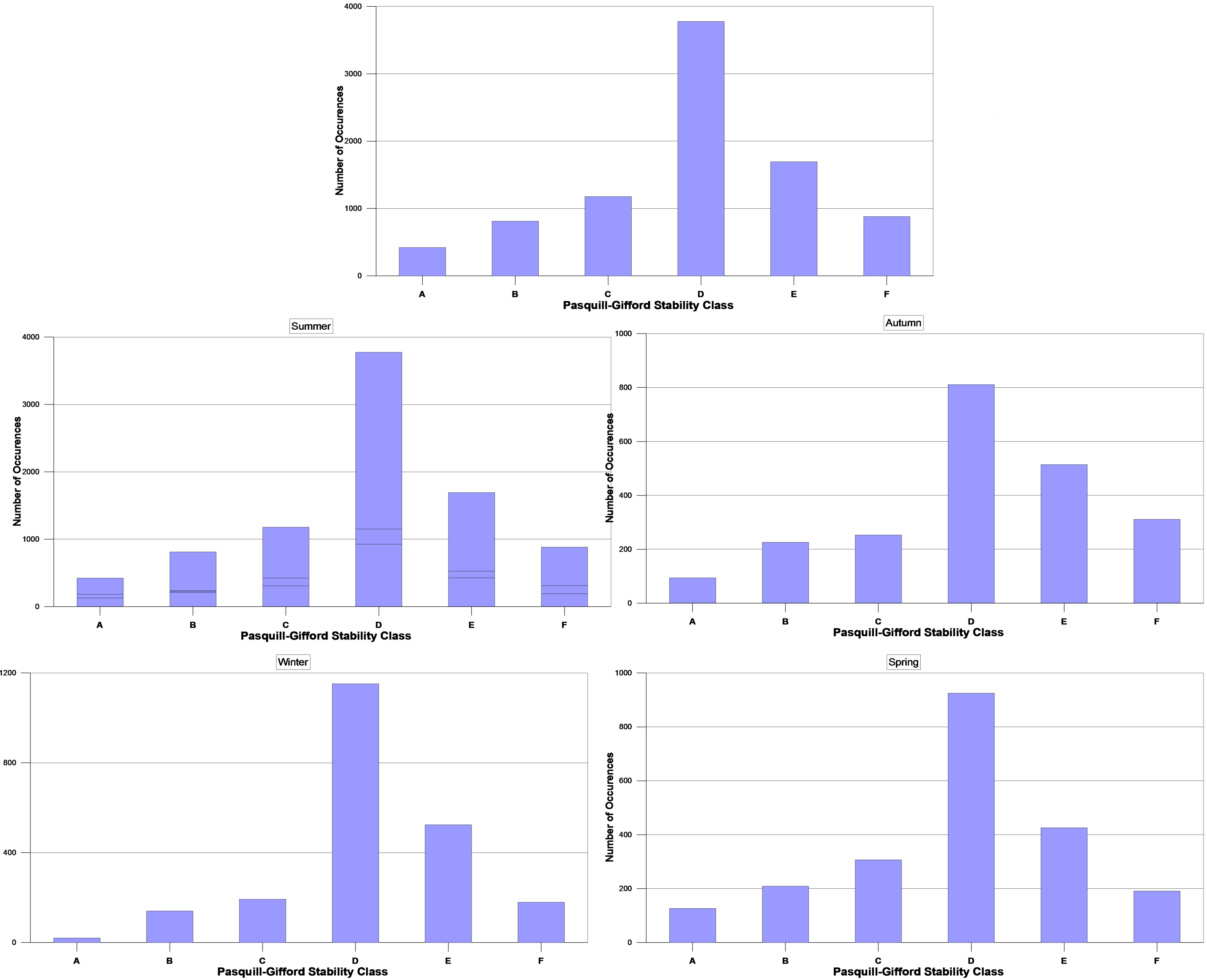
Heggies Pty Ltd
Consulting Engineers
Level 1, 14 Watt Street
Newcastle NSW 2300 Australia
PO Box 1768 Newcastle NSW 2300
Telephone +612 4908 4500 Facsimile +612 49084500
Email Newcastle@heggies.com

Designed by	Checked by	Approved by - date	Filename	Dated
Florence Mananyu	Jason Watson	Jason Watson	30-2424	10/12/2009

Appendix A: Annual and Seasonal Wind Roses for the Project Site (2003)

Quality System
Quality Endorsed Company
ISO 9001 Lic 3236
Standards Australia

Seasonal Variation in Stability Class for Project Site - 2003

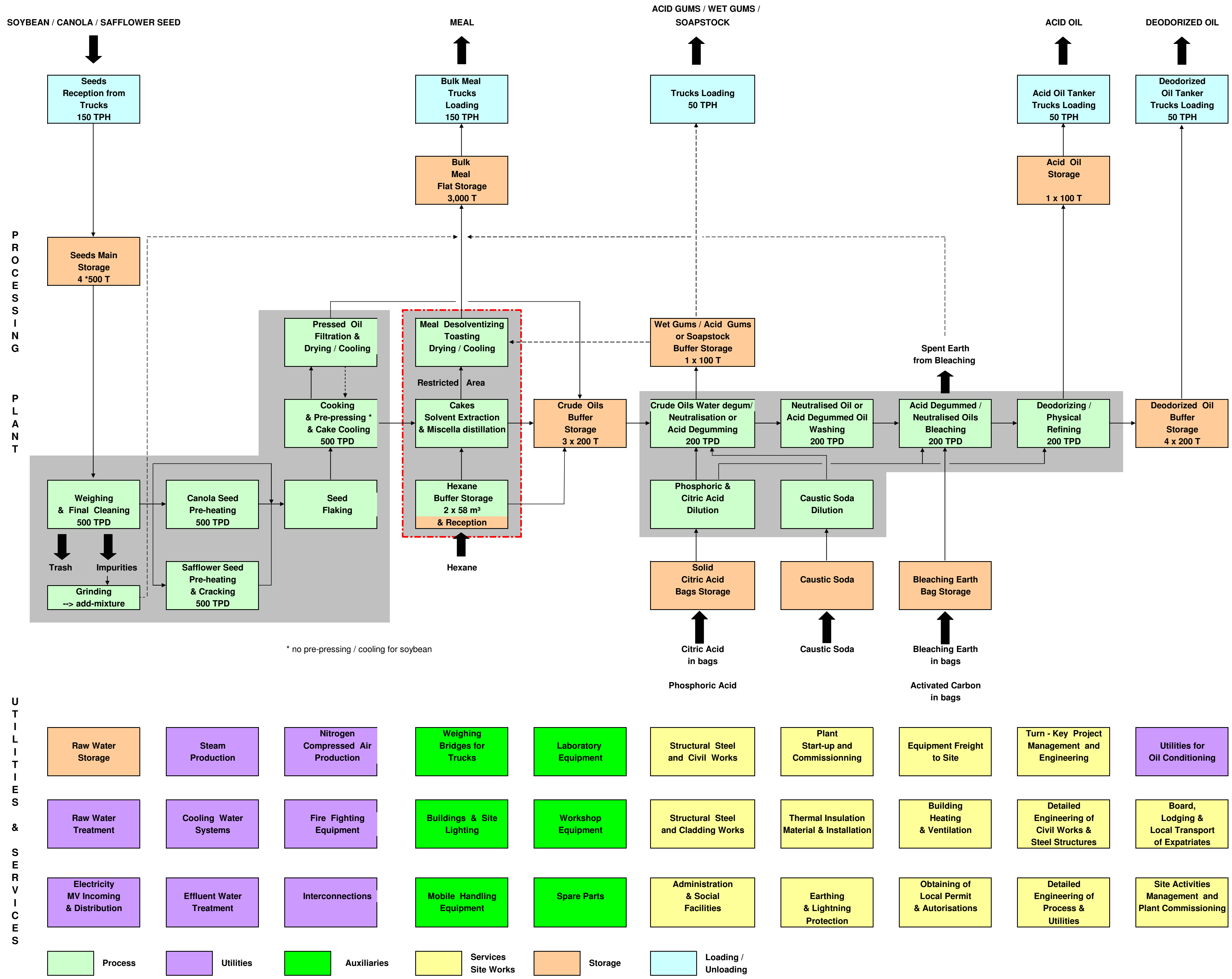


Number of Occurences
4000
3000
2000
1000
0
A
B
C
D
E
F
Pasquill-Gifford Stability Class
Summer
Number of Occurences
4000
3000
2000
1000
0
A
B
C
D
E
F
Pasquill-Gifford Stability Class
Autumn
Number of Occurences
1000
800
600
400
200
0
A
B
C
D
E
F
Pasquill-Gifford Stability Class
Winter
1200
800
400
0
A
B
C
D
E
F
Pasquill-Gifford Stability Class
Spring
Number of Occurences
1000
800
600
400
200
0
A
B
C
D
E
F
Pasquill-Gifford Stability Class

Proposed IOPP Flow Chart Diagram

RIVERINA OILS & BIOENERGY INTEGRATED OILSEED PROCESSING PLANT

500 TPD - CANOLA & SAFFLOWER SEED or 350 TPD SOYBEAN
WAGGA WAGGA, NSW, AUSTRALIA
Principle Block Diagram



ROBE
Riverina Oils & BioEnergy

Calculation of Mass Balance of Sulphur during Canola Processing

Mass balance of sulphur during canola processing

Plant capacity	500	TPD
canola cake	330	TPD
canola crude oil	200	TPD
canola meal	270	TPD

typical values sulphur content			in ppm
canola seed	0.419	%	4189
canola cake	0.624	%	6240
canola crude oil	0.017	%	167
canola meal	0.575	%	5752

sulphur input	2094.5 kg/day	sulphur in canola cake	2059 kg/day
sulphur output			
in meal	1553.04 kg/day	so sulphur removed in SPP	19 kg/day
			0.78 kg/h
in oil	33.3 kg/day		
		so sulphur removed in SEP	490 kg/day
			20.40 kg/h
total sulphur out during crushing	508.16 kg/day		

	Emission point	Input quantities to scrubbing				
		air kg/h	moisture kg/h	sulphur kg/h	sulphur	Total kg/h
SPP	5, 6, 7, 8, 9	27120	1400	0.78	0.003%	28521
SEP	12, 13, 14	28000	1301	20.40	0.070%	29321

as H2S levels

in ppm	*in mg/m^3*
28.95	*43.42*
739.09	*1108.63*

Assuming efficiency scrubbing system 99.7 %
Assuming MOA is not removing any S compounds

		Output quantities after scrubbing				
		air kg/h	moisture kg/h	sulphur kg/h	sulphur %	Total kg/h
SPP	5, 6, 7, 8, 9	27120	1400	0.00	0.00001%	28520
SEP	12, 13, 14	28000	1301	0.06	0.00021%	29301

Considering worse case all sulphur is coming out as

				in mg/m^3	
SPP	5, 6, 7, 8, 9	H2S	0.09 ppm	0.13	released through stack at height > 25 m
SEP	12, 13, 14	H2S	2.22 ppm	3.33	released through stack at height > 25 m

Emissions Inventory

ROBEA INTEGRATED OILSEED PROCESSING PLANT	**Source ID**	**Source Type**	**Odour Concentration (OU/m^3)**	**Emission Velocity (m/s)**	**Temperature (Degrees Celsius)**	**Diameter of Stack (m)**	**Volumeteric Flow rate (m^3/s)**	**Peak-to-Mean ratios**	**Odour Emission Rates (OU/s)**	**Easting (m)**	**Northing (m)**	**Height of Stack (m)**
Point Sources												
Seed Processing Plant	SPP	Stack	171.1	10.5	75	1.0	7.5	2.3	2,962	539307	6121894	29
Solvent Extraction Plant	SEP	Stack	4381.6	9	65	1.1	7.7	2.3	77,598	539364	6121887	29