March 2009

SELWYN PLANTATION BOARD LIMITED

Rolleston Odour Assessment - Skellerup Block

Submitted to:
Selwyn Plantation Board Limited

REPORT

Report Number: SELPL-CHC-004

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Golder Associates

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ABBREVIATIONS AND UNITS

Golder	Golder Associates (NZ) Limited
SPBL	Selwyn Plantation Board Limited
SDC	Selwyn District Council
ECan	Environment Canterbury
AEE	Assessment of environmental effects
MfE	Ministry for the Environment
RMA	Resource Management Act, 1991
RRRP	Rolleston Resource Recovery Park
WWTP	Wastewater treatment Plant
GLC	Ground level concentration
OU/m^3	Odour units per cubic metre
PE	Population equivalent

REPORT LIMITATIONS

This report is provided subject to the limitations in Appendix A.

1.0 INTRODUCTION

The Selwyn Plantation Board Limited (SPBL) is proposing to apply for a private plan change to the Selwyn District Plan (SDP). The plan change relates to land SPBL owns near the south-west of Rolleston, referred to as the "Skellerup" block and is situated Dunns Crossing Road, between Brookside Road and Selwyn Road (Figure 1). SPBL is seeking that it be rezoned from rural use to low density rural residential use.

A second block of SPBL land is situated in the area and is referred to as the "Holmes" block and is the subject of a separate report (Golder 2008).

This report provides an assessment of the degree to which the Skellerup block could be constrained by existing potentially odorous activities. Three potentially odorous activities have been identified as follows:

- Tegel Foods Limited's intensive poultry farming sheds (herein referred to as "Tegel's poultry operation").
- Rolleston Resource Recovery Park (herein referred to as "RRRP").
- The new Rolleston Wastewater Treatment Plant and disposal site (herein referred to as the "Pines WWTP").

A qualitative odour assessment approach has been used for each of these activities in order to identify any areas of SPBL Skellerup block that may be constrained for residential development.

In addition to the qualitative assessment, a dispersion modelling assessment of the Tegel poultry operation has also been undertaken. Dispersion modelling of odour emissions from the RRRP or the Pines WWTP was not considered practicable by Golder due to the more complex nature of these operations and the lack of reliable emissions data.

2.0 ASSESSMENT APPROACH

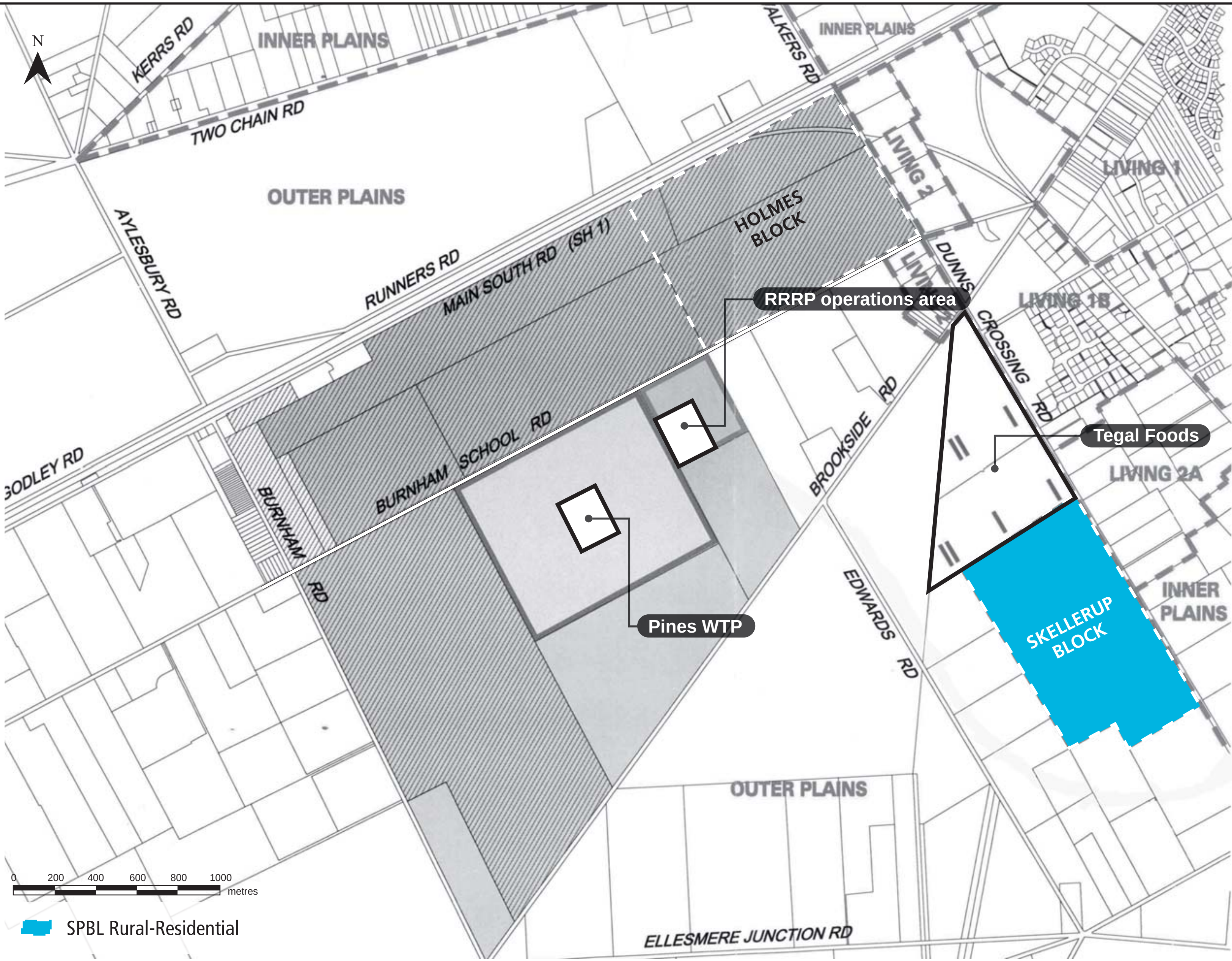
An assessment of the risk of odour impacts on the Skellerup block from each of the three activities listed in Section 1.0 has been carried out. This comprised an examination of each activity to assess its odour potential and to determine a minimum buffer to residential dwellings. The assessment has also considered the odour potential for each activity afresh, with consideration given to the following information where relevant:

- Consent or designation process requirements.
- Assessment of effects on the environment (AEE) where available.
- Process control and best practice.
- Potential for future site expansion.
- Odour Complaint History.

Where necessary, Golder has used its professional judgement in combination with published buffer guidance to determine a suitable buffer for each of the activities.

In addition to the three identified sources of odour in Section 1.0, Golder has confirmed with Environment Canterbury (ECan) that there are no new activities consented to discharge odorous contaminants into air surrounding the SPBL Rolleston Land.

Golder has generally assessed potential odour effects from the different sources as not being additive where the odour character of each source is distinctly different.



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TITLE SPBL LAND (SKELLERUP BLOCK) AND POTENTIAL ODOUR SOURCES

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3.0 POTENTIALLY ODOROUS ACTIVITIES

3.1 Introduction

As discussed in Section 1.0, there are three potentially odorous activities in relatively close proximity to the SPBL Skellerup block, being:

- Tegel Foods Limited's intensive poultry farming sheds (herein referred to as "Tegel's poultry operation").
- Rolleston Resource Recovery Park (herein referred to as "RRRP"); and
- The new Rolleston Wastewater Treatment Plant and disposal site (herein referred to as the "Pines WWTP").

An initial overview of these three activities is provided in this section.

3.2 Tegel Poultry Operation

Tegel operates seven breeder (egg lying) sheds between Dunns Crossing Road and Edwards Road, which are in close proximity to Skellerup Block. Resource consents to discharge to air are not held nor required for this activity. Accordingly, there is no AEE available that would provide an assessment of odour impacts from this activity.

From discussion with Tegel Foods (*pers. comms.* Wayne Millar, 7 August 2008), Golder understands there are no planned expansions of the Dunns Crossing Road farm at this time.

It is understood each of the seven sheds hold approximately 8,000 chickens at a density of 6 birds per square metre. The sheds have forced ventilation to control both temperature and humidity.

The main sources of odour associated with a breeder operation are the litter and the birds themselves; the odour emission is a function of temperature, humidity and bird density. As litter collects waste from the chickens it becomes more odorous, and is considered to be the main potential odour source associated with intensive poultry operations.

Breeder operations are considered to have a lower odour potential and risk of unintended or accidental emissions than the likes of broiler (meat producer) operations. This is because breeder operations have much lower bird densities and litter management requirements than for broiler operations.

ECan has advised that no complaints relating to odour from Tegel's poultry operation along Dunns Crossing Roads had been received at the time of this assessment (*pers. comms.* Jackie Jones, ECan, 20 August 2008 – Appendix D).

Suppliers to Tegel are required to operate chicken sheds according to a code of best practice for the management of litter from their operations and to maintain appropriate shed environmental conditions (i.e., temperature and humidity). However, even with the use of best practice, odour can at best only be minimised. The use of odour control, such as biofiltration, is generally not considered practicable for the poultry industry at this time. Therefore, an appropriate buffer distance is required between chicken sheds and sensitive neighbours to allow dissipation of odours and ensure nuisance effects do not occur. Buffer distance criteria are discussed further in Section 4.0.

3.3 Rolleston Resource Recovery Park

The RRRP consists of two main activities that have the potential to generate odours:

- Refuse transfer operations; and
- Composting of greenwaste and putrescible wastes.

The RRRP was commissioned in March 2006 and it is understood that no odour complaints have been received by ECan regarding the operation to date.

Potential odour impacts associated with the RRRP has been assessed in a separate report for the SPBL Holmes Block (Golder, 2008). In that report a minimum buffer of 300 m for the RRRP composting and waste transfer operations was identified by Golder (2008). The SPBL Skellerup block is more than one kilometre away from the edge of the buffer region and is therefore highly unlikely to experience adverse odour effects from this operation. Therefore, no further consideration is given to the RRRP in this assessment.

3.4 Rolleston Wastewater Treatment Plant

The Pines WWTP has been consented to allow for the projected growth of the Rolleston Township to a population equivalent (PE) of approximately 22,000 people and a maximum flow loading of approximately 7,500 m³/day. The main potential sources of odour from the Pines WWTP are associated with:

- Biosolids handling, storage and disposal;
- Secondary treated effluent irrigation; and, to a lesser degree,
- The primary effluent treatment process.

Potential odour impacts associated with the RRRP has been assessed in a separate report for the SPBL Holmes Block (Golder, 2008). A number of buffer criteria were identified by Golder (2008) for the different activities of this site, with the greatest buffer distance being recommended as 1,000 m from the on-site processing of the digested biosolids. The SPBL Skellerup block is located outside this buffer distance and is therefore unlikely to experience adverse odour effects from this operation. Therefore, no further consideration is given to the Pines WWTP in this assessment.

4.0 BUFFER DISTANCES

4.1 Introduction

Section 3.0 identified that only odours from Tegel's poultry operation have the potential to impact on the SPBL Skellerup block. For this reason, discussion on buffer distances in this section is limited to poultry operations.

Prior to discussing odour buffer distances relating to Tegel's poultry operation, it is important to recognise that published buffer distances referred to in this report are intended as the distance necessary to allow for odour emissions to dissipate without adverse impacts on sensitive land uses. They are also intended to provide some protection from unintended or accidental emissions.

4.2 Tegel Foods Limited – Intensive Poultry Farming Sheds

4.2.1 Operative Selwyn District Plan – Rural Volume (10 June 2008)

Clause 13.1.5 of Rule III of the Selwyn District Plan – Rural Volume (SDP) sets out a permitted base-line for new buildings locating in the vicinity of established intensive farming activities as follows:

"Any sensitive activity is setback a minimum distance of 300 m from any existing lawfully established intensive farming activity… The separation distance shall be measured from the edge of any permanent building, enclosure or yard in which the intensive farming activity occurs or is permitted by a rule in the Plan (or a resource consent) to the position of the new sensitive activity."

Under the SDP, establishing a new 'sensitive activity' within 300 m of an existing intensive farming activity is a restricted discretionary activity.

Sensitive activities wishing to locate in the vicinity of the existing Tegel intensive farming sheds along Dunns Crossing Road must, therefore, be setback at least 300 m from the chicken sheds. Resource consent would be required for the sensitive activity to be located within this setback.

Without a detailed examination of the background assessment that contributed to the development of the SDP (for example analysis pursuant to section 32 of the Resource Management Act 1991), it is not clear how a separation distance of 300 m was derived. However, Golder has modelled the effects of odour discharges from the Tegel chicken sheds along Dunns Crossing Road in order to confirm the suitability of this setback distance. The results of this modelling are discussed in Section 5.0.

4.2.2 Victoria EPA

The Environment Protection Authority of Victoria (Vic EPA), Australia, has published guidance on buffer distances for industrial residual air emissions (EPA Victoria, 1990). According to correspondence with Vic EPA (Appendix E), these buffer distances are based on overseas and Australian experiences and on the assumption of best practice. The distances are derived through experience and years of observations by EPA Compliance Investigators.

Under the Vic EPA buffer guidelines, a buffer distance of 400 m is recommended between intensive egg layer operations and sensitive activities.

4.2.3 South Australia EPA

The South Australia Environment Protection Authority (SA EPA) published guidance on separation distances in 2000 (SA EPA, 2000). This guidance largely consolidates the work previously been carried out by Vic EPA. However, for poultry production, different categorisation and buffer distances are reported. This includes a buffer of 1,000 m from poultry sheds to urban residential areas and 500 m to dwellings on another property.

4.2.4 Western Australia EPA

The Western Australia Environmental Protection Authority (WA EPA) published guidance on separation distances between industrial and sensitive land uses in 2005 (WA EPA, 2005). Under this guidance, a buffer distance for intensive poultry farming of 300 - 1,000 m is given, depending on the size of the operation. No further guidance is provided by WA EPA (2005), however, it is likely that Tegel's breeder operation would fall at the lower end for this range.

4.2.5 Summary of poultry buffer distances

The various buffer distances discussed above are summarised in Table 1. Of these, it is important to note that a minimum buffer of 300 m is required for the SPBL in accordance with the SDP. In consideration of the various Australian EPA buffer criteria, there is a considerable variation of buffer distances ranging between 300 m and 1,000 m. However, some of the criteria are not specific to any particular type of poultry operation (e.g. broiler, layer, breeder farms) and it is likely they allow for poultry operations with the greatest odour potential and risk of unintended or accidental emissions, i.e., broiler farms.

Ambient temperature and humidity are important components that influence odour emissions from chicken farms. It is important to note that Australia would experience warmer conditions than for Canterbury. Therefore, the Australian buffer guidelines may be overly conservative for NZ conditions.

As discussed in Section 3.0, the Tegel Food's breeder sheds are unlikely to generate as much odour as for a broiler operation. For this reason a buffer distance at the lower end of those recommended by the various Australian EPAs is likely to be most appropriate. In Golder's professional judgement, this is likely to be no more than 300 m. Additionally, Golder considers published buffer criteria presented in this report are likely to be particularly conservative when applied to the Tegel breeder farm operation.

Table 1: Buffer criteria – intensive poultry farming.

Authority	Buffer criteria
Selwyn District Plan	300 m
Vic EPA	400 m
SA EPA	500 – 1,000 m
WA EPA	300 – 1,000 m

Further support of this is given in Section 5.0, in which the results of a dispersion modelling assessment for the Tegel Food poultry operation are presented.

5.0 ODOUR DISPERSION MODELLING

5.1 Introduction

In Section 4.0, it was noted that published buffer criteria presented in this report are likely to be particularly conservative when applied to the Tegel breeder farm operation. For this reason, a refined analysis has been carried out using an odour dispersion modelling approach, which can be undertaken for poultry operations.

It should be noted that odour dispersion modelling of the RRRP and the Pines WWTP has not been undertaken, due to these sources being more complex in nature, both in terms of their processes and their emissions, and there subsequently being less reliable emissions data for such operations.

The remainder of this section describes the odour modelling approach, including specific assumptions and information about the Tegel operation that have been used, and presents the results of that assessment.

5.2 Modelling Approach for Odour Emissions

An odour dispersion modelling assessment of emissions from the Tegel chicken sheds has been undertaken, in order to predict a separation distance suitable to residential areas. The dispersion modelling methodology used for the chicken sheds is discussed in this section.

The odour dispersion modelling has been carried out using an approach consistent with that used in the assessment of odour effects associated with the Rickerby broiler farm, West Melton. This assessment approach has been described by Aurora Environmental (2001) and is referred to as the “Rickerby approach”. The Rickerby approach was scrutinised through Environment Court proceedings (Environment Court Decision C23/2004) and is therefore considered by Golder to be robust.

The transferability of the Rickerby approach is derived from on-site management practices. The Rickerby approach was developed based on Tegel’s code of practice for the management of chicken sheds that supply Tegel. The same high standard of management practices have been assumed for Tegel’s Rolleston breeder operation, which is the subject of this assessment. Therefore, it is considered appropriate to apply the Rickerby approach for this assessment.

Odour emission factors used by the Rickerby approach are based on broiler farm operations. Because the Tegel operation is a breeder farm, the odour emission rates will be different, and usually lower, than for a broiler farm. To account for this, odour emissions have been calculated for each of the Tegel sheds as a function of the bird age and stock density of breeder farm verses a broiler farm. For a breeder farm there is a constant number of chickens present in each shed over the period of a year. This is not the case for a broiler farm, which has an eight week cycle. For a broiler farm the young chicks are brought into the sheds and grown over a six week period, after which the shed is left empty for two weeks and the process begins again. During their growth cycle, broilers are fed more than breeders in order to promote fast growth; hence the bird density of a broiler shed is far greater than for a breeder shed.

Using the Rickerby approach, odour emissions from a shed are a function of number of birds, bird age and ambient temperature. The bird age factor for the breeder sheds is assumed to be constant and set as for a fully grown broiler. In line with the actual shed stocking rates, it is assumed there are a constant number of chickens in a shed over the whole year. The assumption to model the breeder chickens as full grown broilers is likely to be conservative, as it is expected the odour from fully grown broilers will be more than breeders due to their feeding regime (i.e., higher rate per unit of body mass). Further details of the odour emissions calculations are provided in Appendix B.

The key information and assumptions used in the modelling assessment are summarised below and the modelling input file is attached in Appendix C.

- 8,000 layers per shed
- Seven sheds with locations as shown in Figure 2
- Odour emission was assumed to be from the centre of the shed
- Odour emission rate varies with ambient temperature

AUSPLUME v5.4 was the dispersion model used with Meteorological data from Christchurch Airport 1997/98 – supplied by ECan. This model was used to predict one hour average odour concentrations (99.5th percentile) results.

When using the Rickerby approach for this assessment, an odour modelling guideline of approximately 5 OU/m³ for a one hour averaging time and the 99.5 percentile concentration is considered appropriate. Concentrations below this level are considered to result in only minor odour effects. This guideline is also considered appropriate for this assessment. The results of the odour dispersion modelling from the Tegel Foods Rolleston breeder sheds are presented in Section 5.3.

5.3 Modelling Results

The predicted 99.5 percentile ground level concentrations (GLCs) for odour are shown in Figure 2.

The modelled 5 OU/m³ contour for Tegel's poultry operation extends beyond its site to the west, east and south as shown in Figure 2. With regard to the SPBL Skellerup block that lies along the southwest boundary of Tegel's poultry operation, the 5 OU/m³ contour extends between 100 and 150 m into the Skellerup block. There have been no recorded odour complaints regarding the Tegel poultry operation to date, according to the ECan complaints database. Accordingly, it is expected that only minor odour effects will occur beyond this contour.

It is important to note the odour modelling assessment presented above is consistent with that used for the assessment of existing poultry operations wishing to expand or for sensitive activities wishing to locate within the 300 m SDP setback requirement. Accordingly, Golder considers a buffer of 150 m (the greatest extent of the 5 OU/m³ contour) reflects the nature of potential odours associated with Tegel's poultry operation and is the most appropriate buffer distance for this operation.

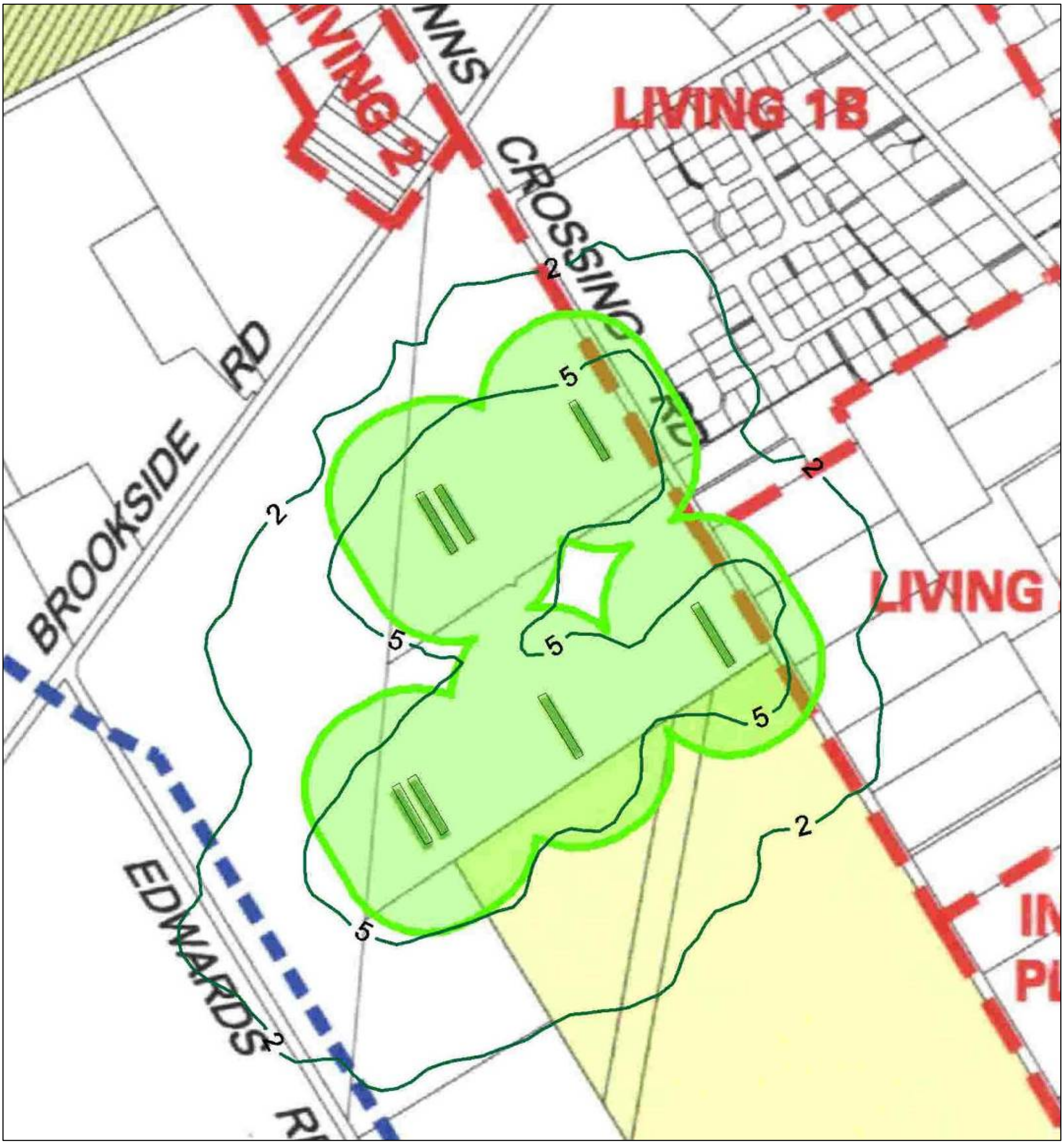


Figure 2: Odour modelling contours – 1 hour average 99.5%ile (OU/m^3).

6.0 DISCUSSION AND CONCLUSIONS

Golder has undertaken an assessment of the possible residential development constraints due to odour effects on SPBL's Skellerup block, which is the subject of a proposed application for a private plan change to the Selwyn District Plan to enable rural/residential landuse.

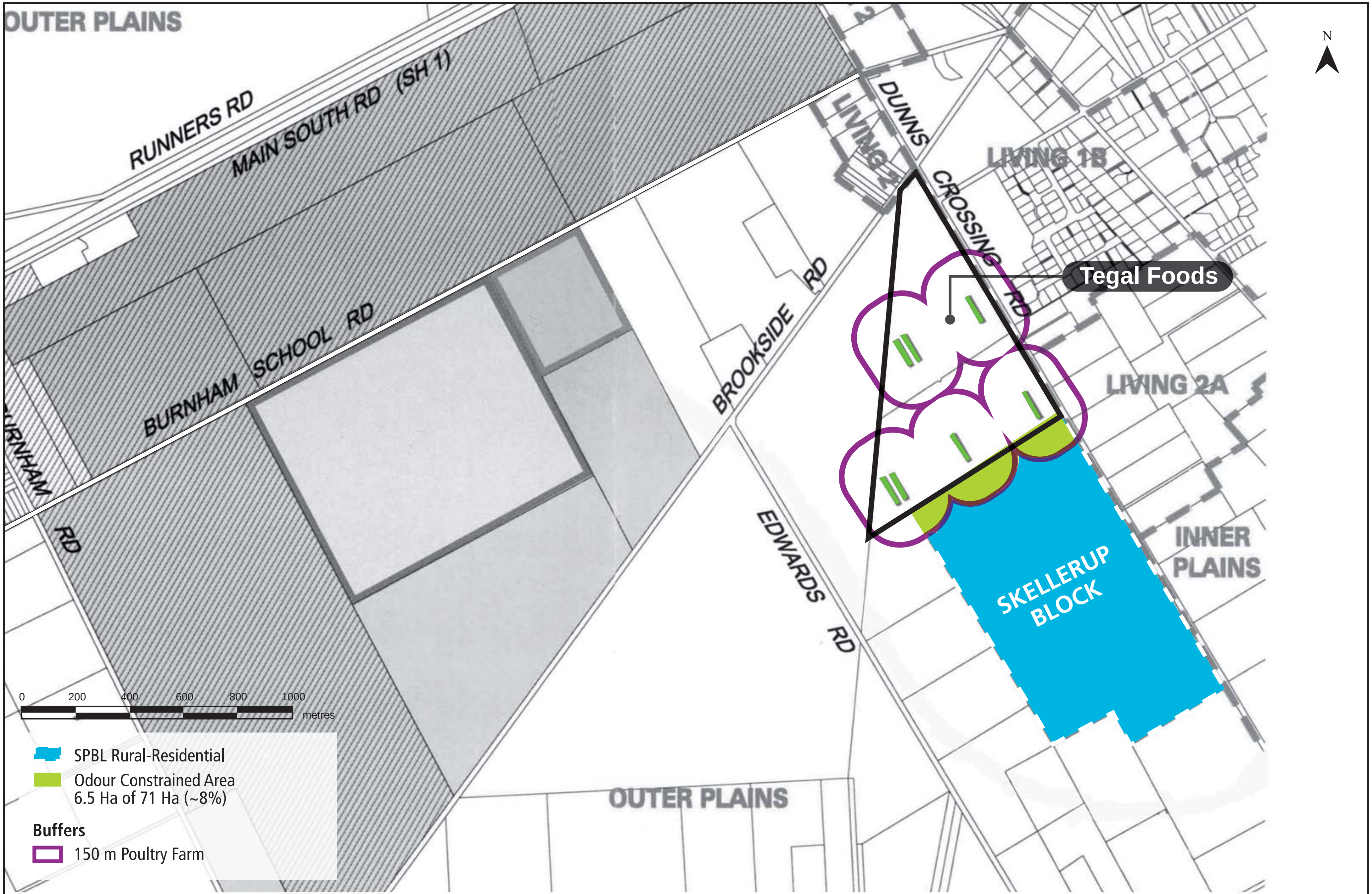
Three potential odour sources were initially considered. However, this was refined to consideration of constraints arising from odour discharges from the Tegel Food Limited breeder farm as other sources were deemed too far away from the Skellerup block to affect it.

The assessment of odour constraints arising from the Tegel breeder farm has involved a two-staged approach: a qualitative assessment based on published buffer criteria and a subsequent refinement of buffer distances using a recognised dispersion modelling assessment approach.

Published buffer criteria for poultry operations have considerable variation of buffer distances ranging between 300 m and 1,000 m. Notwithstanding this, it was noted that the criteria were not specific to any type of poultry operation (e.g. broiler, layer, breeder farms). However, it is likely they allow for poultry operations with the greatest odour potential, such as broiler farms and would be conservative for operations with lower odour potential such as breeder farms. Furthermore, most of the published buffer criteria are for Australia, where higher ambient temperatures are would give rise to greater odour emission than would be expected in Canterbury. Therefore, published buffer criteria are likely to be particularly conservative when applied to the Tegel breeder farm operation.

A refined analysis was carried out to establish a more suitable buffer distance for Tegel's poultry operation. This was done using an odour dispersion modelling approach.

The modelling results for Tegel's poultry operation confirmed that the buffer of 300 m for intensive farming required under the SDP for permitted activities is a greater distance than necessary. Based on the model results, Golder recommends a buffer distance of 150 m as being adequate to mitigate potential nuisance or odour effects in accordance with the modelling assessment. Areas within this 150 m buffer are considered to be constrained for residential development as a result of potential odour discharges from the Tegel poultry operation. Figure 3 shows the buffer region for the Tegel poultry operation, and clearly indicates the areas of the Skellerup block that may be constrained due to potential odour effects. The Tegel poultry operation would constrain approximately 6.5 ha (approximately 8%) of the Skellerup block (71 ha).



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TITLE CONSTRAINED AREAS OF SPBL LAND DUE TO POTENTIAL ODOUR FROM EXISTING ACTIVITES

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7.0 REFERENCES

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MWH 2003: Assessment of Environmental Effects, Rolleston Wastewater Treatment Plant.

South Australia Environment Protection Authority, August 2000: Draft for Consultation – Guidelines for Separation Distances.

South Australia Environment Protection Authority, 1996 – updated 1997: South Australian Biosolids Guidelines for the Safe Handling, Reuse and Disposal of Biosolids.

Western Australia Environmental Protection Authority, June, 2005: Guidance for the Assessment of Environmental Factors No. 3 – Separation Distances between Industrial and Sensitive Land uses.

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APPENDIX A

Report Limitations

REPORT LIMITATIONS

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APPENDIX B

Chicken Shed Odour Emission Rate Calculations

CHICKEN SHED ODOUR EMISSION RATE CALCULATIONS

To run the modelling assessment and produce reliable predictions of the expected odour exposure levels due to the partial expansion it was necessary to establish an odour emission profile for the chicken operation. This was undertaken using the results of odour emission research on Australian chicken sheds.

The amount of odour produced from a chicken shed is primarily a function of temperature, number of chickens, their age and ventilation and litter management. Pacific Air and Environment (PAE) Australia has completed a report investigating these dependencies (PAE, 2003). PAE established equations that related the number of chickens and ambient temperature to the amount of odour produced.

The odour emission rate (OER) per 1000 bird (ou/s) is related to the ambient temperature as described in equation 1 below. The number of birds is based on the initial loading of the shed.

$$OER = 0.38\ T^{2.404} \qquad \text{(Equation 1)}$$

The OER also is dependent on the age of the birds. To account for this a factor, *f*, is multiplied by the OER calculated from equation 1 to give an actual OER. For the layer/breeder modelling, this factor is set at 1 to account for constant age of the birds.

The areas within Australia where the studies were undertaken included high humidity conditions. It is reasonable to expect that the litter would be moister than chicken sheds in Christchurch with modern water dispensing system. Because of Christchurch's lower humidity during warm conditions and good litter management practice of the Hubbard operation, then the Australian odour emission data could be considered to be potentially conservative (i.e., higher than in New Zealand).

There is some debate regarding the effect of removing birds from the sheds on the odour emission rate. With high quality management of dry litter conditions, the odour emissions from the shed will be increasingly linked to actual bird numbers, but will not decrease in exact proportion to the fraction of birds removed from the flock.

For this assessment it was assumed that for any ambient temperature below 15°C, a minimum temperature of 15°C was applied to equation 1 to ensure that a constant minimum odour emission is assumed to occur during cold conditions with minimal ventilation to atmosphere.

The equation used to calculate the odour emitted from each shed on the Tegel farm is shown as equation 2:

$$OER_{Shed} = f\,0.38T^{2.404} \times \frac{N}{1000} \qquad \text{(Equation 2)}$$

Where:

OER_{Shed}	is the odour emission rate from the shed (ou/sec)
f	is the factor allowing for the chickens age, set at 1 for layers.
T	is the ambient temperature in °C (obtained from the met data) - a minimum of 15°C was used if $T \leq 15$ °C.
N	is the number of chickens in the shed on any one day, assumed to be constant over the year.

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APPENDIX C

Ausplume Input File

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* If editing is required, under any circumstances do not *
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* this information or changed order of data blocks enclosed *
* in curly braces may render the file unusable. *
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Side length, Effective Radius
{3 1.5 }
Emission type (1-constant, 2-monthly, 3-hours of the day, 4-wind and stability, 5-hour and season, 6-temperarture), Position in Array, Number of particle fractions
{6 0 }
Temperature dependent emission rate
{2043 2043 2043 2043 4079 6975 10811 15661 24589 28655 36915 }

Source ID, Source Type (1 - stack, 2 - area, 3- volume) and X, Y, Z coordinates
{2 3 2458299 5732107 0 }
Source height
{1.5 0 }
Side length, Effective Radius
{3 1.5 }
Emission type (1-constant, 2-monthly, 3-hours of the day, 4-wind and stability, 5-hour and season, 6-temperarture), Position in Array, Number of particle fractions
{6 0 }
Temperature dependent emission rate
{2043 2043 2043 2043 4079 6975 10811 15661 24589 28655 36915 }

Source ID, Source Type (1 - stack, 2 - area, 3- volume) and X, Y, Z coordinates
{3 3 2458531 5732251 0 }
Source height

{1.5 0 }
Side length, Effective Radius
{3 1.5 }
Emission type (1-constant, 2-monthly, 3-hours of the day, 4-wind and stability, 5-hour and season, 6-temperarture), Position in Array, Number of particle fractions
{6 0 }
Temperature dependent emission rate
{2043 2043 2043 2043 4079 6975 10811 15661 24589 28655 36915 }

Source ID, Source Type (1 - stack, 2 - area, 3- volume) and X, Y, Z coordinates
{4 3 2458228 5731590 0 }
Source height
{1.5 0 }
Side length, Effective Radius
{3 1.5 }
Emission type (1-constant, 2-monthly, 3-hours of the day, 4-wind and stability, 5-hour and season, 6-temperarture), Position in Array, Number of particle fractions
{6 0 }
Temperature dependent emission rate
{2043 2043 2043 2043 4079 6975 10811 15661 24589 28655 36915 }

Source ID, Source Type (1 - stack, 2 - area, 3- volume) and X, Y, Z coordinates
{6 3 2458483 5731741 0 }
Source height
{1.5 0 }
Side length, Effective Radius
{3 1.5 }
Emission type (1-constant, 2-monthly, 3-hours of the day, 4-wind and stability, 5-hour and season, 6-temperarture), Position in Array, Number of particle fractions
{6 0 }
Temperature dependent emission rate
{2043 2043 2043 2043 4079 6975 10811 15661 24589 28655 36915 }

Source ID, Source Type (1 - stack, 2 - area, 3- volume) and X, Y, Z coordinates
{5 3 2458255 5731605 0 }
Source height
{1.5 0 }
Side length, Effective Radius
{3 1.5 }
Emission type (1-constant, 2-monthly, 3-hours of the day, 4-wind and stability, 5-hour and season, 6-temperarture), Position in Array, Number of particle fractions
{6 0 }
Temperature dependent emission rate
{2043 2043 2043 2043 4079 6975 10811 15661 24589 28655 36915 }

Source ID, Source Type (1 - stack, 2 - area, 3- volume) and X, Y, Z coordinates
{7 3 2458745 5731899 0 }
Source height
{1.5 0 }
Side length, Effective Radius
{3 1.5 }
Emission type (1-constant, 2-monthly, 3-hours of the day, 4-wind and stability, 5-hour and season, 6-temperarture), Position in Array, Number of particle fractions
{6 0 }
Temperature dependent emission rate
{2043 2043 2043 2043 4079 6975 10811 15661 24589 28655 36915 }

Receptor information

Discrete receptors
Receptor coordinates type (1-Cartesian,0-Polar),Number of Receptors
{1 0 }

Gridded receptors
Receptor coordinates type (1-Cartesian, 0-Polar), Number of X and Y coordinates, Receptor height
{1 20 20 0 }

X grid coordinates
{2457700 2457750 2457800 2457850 2457900 2457950 2458000 2458050 2458100 2458150 2458200 2458250 2458300 2458350 2458400 2458450 2458500 2458550 2458600 2458650 }

Y grid coordinates
{5731000 5731050 5731100 5731150 5731200 5731250 5731300 5731350 5731400 5731450 5731500 5731550 5731600 5731650 5731700 5731750 5731800 5731850 5731900 5731950 }

Model settings and parameters
Emission conversion factor, Averaging Time
{1 0 }

Land use (surface roughness)
{0.1}

Averaging time flags (1,2,3,4,6,8,12,24 hrs, 7, 90 days, 3 month, All hrs
{1 0 0 0 0 0 0 0 0 0 0 0 }

Statistical output options
{0 0 }

Output options (All meteodata, Every concentration/deposition, Highest/2nd highest, 100 worst case table, Save all calculations
{0 0 0 1 1 0 }
Write concentration (1-yes, 0-no), Concentration rank, Write frequency, Frequency Level
{0 1 0 -1 }

Disregard exponents (1-yes, 0-no), Exponent Scheme (1-Irvin urban, 2-Irvin rural, 3-ISCST, 4-User Defined
{0 2 }
Dispersion exponents
{0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.2 0.2 0.2 0.2 0.2 0.2 0.25 0.25 0.25 0.25 0.25 0.25 0.4 0.4 0.4 0.4 0.4 0.4 0.6 0.6 0.6 0.6 0.6 0.6 }

Building wake effects (1-include,0-not) , Default decay coefficient, Anemometr height, Sigma-theta averaging period, Roughness at vane site, Smooth stability changes)
{1 0 10 60 0.3 0 }

Deposition options, Depletion options
{False False False False False False }

Stability class adjustments (0-None, 1-Urban1, 2-Urban2)
{0}
Building wake algorithms (1-Huber-Sneider, 2-Hybrid, 3-Schulman-Scire)
{4}

Gradual plume rise (1-yes,0-no), Stack tip downwash (1-yes,0-no), Disregard Temperature Gradient (1-yes,0-no), Partial Penetration, Temp Gradient, Adiabatic Entrainment, Stable Entrainment

{1 1 0 0 0.004 0.6 0.6 }
Temperature Gradients for Wind and Stability categories
{0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0.02 0.02 0.02 0.02 0.02 0.02 0.035 0.035 0.035 0.035 0.035 0.035 }

Dispersion curves (1-Pasquill Gifford, 2- Briggs rural, 3-Sigma theta) horizontal < 100 m, ditto vertical < 100 m, ditto horizontal > 100 m, ditto vertical > 100 m
{1 1 2 2 }
Adjust PG curves for roughness - Horizontal, Vertical (1-yes,0-no)
{1 1 }
Enhance plume for buyoancy - Horizontal, Vertical (1-yes,0-no)
{1 1 }
Adjust for wind direction shear
{0}
Shear rates
{0.005 0.01 0.015 0.02 0.025 0.035 }

Wind Speed categories
{1.54 3.09 5.14 8.23 10.8 }

Output file
{'C:\AUSPLUME\SELPLCAN\sheds1-7.txt'}
Meteorological file
{'c:\ausplume\SELPLCAN\CHCH97r2.met'}
SaveAll file
{'C:\AUSPLUME\SELPLCAN\sheds1-7.cal'}

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APPENDIX D

Odour Complaints Confirmation from ECan

APPENDIX D
Odour Complaints Confirmation from ECan

From: Jackie Jones [Jackie.Jones@ecan.govt.nz]

Sent: Wednesday, 20 August 2008 10:04 a.m.

To: Chilton, Richard

Cc: Paul Murney

Subject: RE: Check for odour complaints

Attachments: Rolleston Waste Treatment site - Richard Chilton.xls

Richard

I have no specific complaints registered against Tegel Food, Dunns Crossing Road or Rolleston Resource Recovery Park.

I do have complaints registered for Rolleston Waste Treatment which I have included.

As far as any non compliance for these sites you will have to go through customer services.

Jackie Jones

372-7253

Telephone file note: 20 August 2008

Conversation between: J Jones and R Chilton

R Chilton called J Jones about complaints data relating to the Rolleston Wastewater Treatment Plant. It was subsequently confirmed that the complaints registered related to the old WTP and not the new Pines WTP. This was evident by the receipt of complaints prior to the Pines WTP being commissioned.

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APPENDIX E

Confirmation from VicEPA re Buffer criteria

From: Martine.Yan@epa.vic.gov.au [mailto:Martine.Yan@epa.vic.gov.au]

Sent: Friday, 21 April 2006 6:51 p.m.

To: Richard Chilton

Cc: Piyaratne.Dewundege@epa.vic.gov.au

Subject: Fw: Query regarding AQ 2/86 Odour Buffers

Hi Richard,

Piya has forwarded your query to me in regards to the Recommended buffer distances for industrial residual air emissions(AQ 2/86).

The buffer distances listed in the guideline (AQ 2/86) are based on overseas and Australian experience on the assumption of best practice.

Their value is borne out by years of observations in EPA complaint investigations and experience.

Note that the guideline recommends distances between specified industry types and sensitive land uses to reduce the potential for amenity reducing non routine air emissions to impact on people in sensitive areas. The buffer is intended to protect people from emissions resulting from unusual or upset conditions (spills, accidents, plant upsets, equipment failure, abnormal atmospheric conditions), not normal day to day operations.

Buffer distances are not an alternative to source control of those routine, day to day emissions. However, despite the best use of technology, unintended or accidental emissions from equipment failure, accidents and abnormal weather conditions can lead to amenity reducing fugitive emissions affecting properties beyond the boundaries of the site. Provision of an adequate buffer distances allows the emissions to dissipate without adverse impacts on sensitive land uses.

Separation distances are intended to act as a trigger for risk assessment if the distance specified cannot be provided. A risk assessment should adequately identify and analyse the potential risks to the environment, formulating strategies and measures for avoiding, minimising and managing those risks. The relevant authority must then make a judgement as to whether the separation available will be adequate to prevent unacceptable impacts to nearby sensitive uses.

EPA Publication 508. As for the values for the Environmental Guidelines for composting and other organic recycling facilities, it is also based on EPA expertise and observations in complaint investigations.

I hope this helps.

Regards

Martine Yan

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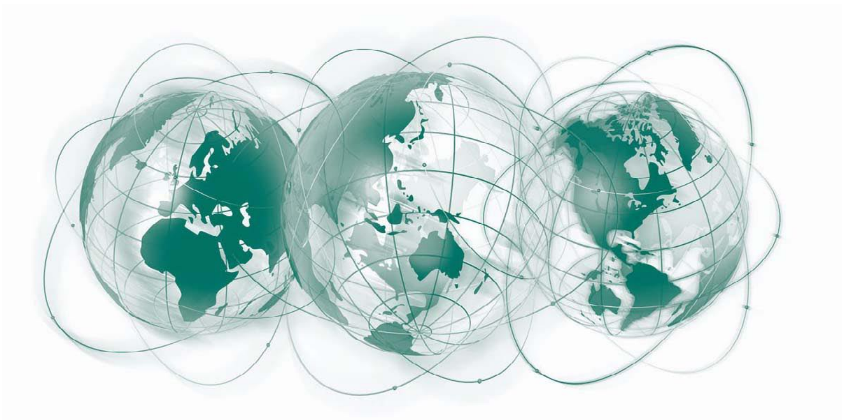

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