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APICULTURE RISK MANAGEMENT PLAN FOR THE ORANGE WASTE PROJECT

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Amendment Record

Issue	Date of Issue	Section	Reason for Change	Signature
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Project Overview

Orange City Council (Council) is responsible for providing services to the residential, industrial and commercial community of approximately 40,000 people and to visitors of Orange and surrounding areas. Some 3,500 people from surrounding shires work in Orange. Council provides physical infrastructure as well as environmental, social and cultural services for use by the residents of both the City and the surrounding areas.

On 28 April 2010 Council received approval from The Hon Anthony Kelly MLC, Minister for Planning, for the Orange Waste Project. The Orange Waste Project is an integrated project for improving resource recovery and residual waste management for Orange and its surrounds. The project addresses the imminent end of available landfill space at Council's existing facility as well as introducing a composting operation to manage organic materials. The project will deliver greater resource recovery and waste diversion from landfill.

The Project includes operations at two separate sites owned by Council:

- The existing Ophir Road Resource Recovery Centre (ORRRC) located approximately 5 km north east of Orange central business district; and
- The proposed Euchareena Road Resource Recovery Centre (ERRRC) located approximately 44 km from Orange and 5 km northeast of Molong.

The Project will include:

- A new kerbside collection of food and garden waste for all eligible residential properties in Orange;
- The kerbside collected food and organic waste plus self haul and commercial green waste will be delivered to the ORRRC and pre-sorted prior to blending on site. This material will then be transported to ERRRC to the composting facility;
- A composting facility will be operated at the ERRRC to process the food and organic waste;
- All mixed waste (putrecible) will be delivered to the new waste baling facility at ORRRC and pre-sorted to remove hazardous waste, organic materials and recyclables. The residual waste will be baled and wrapped in plastic. These wrapped bales will be transported to the ERRRC to the landfill; and
- All inert waste that can not be baled will be delivered to ORRC then transported to ERRRC for disposal in the landfill.

Council's approval requires compliance with the conditions set out in the Project Approval. One such condition of the Project Approval is Council's need to implement all reasonable and feasible measures to minimise the apiculture risks of the project. This documentation addresses this condition.

Apiculture Risks

Glossary

American foulbrood (AFB)	a serious disease of developing honey bees caused by the bacterium *Paenibacillus larvae larvae.*
Bailing	the process of compressing waste into manageable blocks and strapping the waste so as to retain the structural integrity of the compressed waste – see 'wrapping'
DPI	the New South Wales Department of Primary Industries.
European foulbrood (EFB)	a disease of honey bees caused by the bacterium *Melissococcus plutonius*
ERRRC	the Euchareena Road Resource Recovery Centre.
Green Waste	waste that consists of branches, grass, leaves, plants, loppings, and similar materials, and includes any mixture of those materials (referred to as 'garden waste' in the *DECCW Waste Classification Guidelines.*
HACCP	Hazard Analysis and Critical Control Points is a strategy which assesses the hazards involved in a process and identifies places within the process where some level of control is required in order to deal with the hazard.
Inert Waste	waste that is highly unlikely to contain any risk material (eg: construction waste).
Non Conformance	a system deficiency that compromises an outcome required by this risk management program or could compromise an outcome if not addressed by the responsible person.
ORRRC	the Ophir Road Resource Recovery Centre.
Propolis	Resinous substance collected by bees (usually from plants), then modified and used to seal the inside of a hive and strengthen wax combs.
Residual Waste	Any waste unable to be diverted into recycling or composting waste streams.

Risk Management Plan (RMP)	A document that identifies the risks associated with a project (in this case contained within a risk assessment document) and outlines the strategy to mitigate the identified risks.
Slum Gum	Mixture of pupal cocoons, pollen, propolis and small amounts of beeswax left after brood combs have been rendered down.
Wrapping	the process of enclosing baled waste in plastic – see 'bailing'

Introduction

This risk management program (RMP) was developed in response to a requirement in the "Project Approval and Conditions of Consent for the Orange Waste Project – *Section 75J of the Environmental Planning and Assessment Act 1979".*

Information has been drawn from several sources including Orange City Council's Statement of Commitments and supporting documentation, the most recent being the "Review of the Proponents Statement of Commitment and the Risk Assessment for the Transmission of American Foulbrood Disease for the Euchareena Road Waste Disposal Site" completed by Dr Mark Goodwin, a scientist and Team Leader of the Apiculture and Pollination division of The New Zealand Institute for Plant and Food Research Ltd.

Dr Goodwin's report has formed the basis of the hazard analysis and critical control point (HACCP) analysis that has been undertaken as part of the development of this RMP and Dr Goodwin has also been involved in the review of this RMP to ensure that it accurately reflects the level of risk outlined in the report.

Industry input on this RMP will be sought via advertising the plan and inviting registered beekeepers to make submissions. Each of these submissions will be considered by Mr Byron Taylor and Mr Murray Reid, both Apiculture Technical Advisors of AsureQuality Ltd and Dr Mark Goodwin.

A number of assumptions have been made in the development of the RMP around the processes and procedures that will take place from the receipt of waste at the Ophir Road Resource Recovery Centre (ORRRC) through to the land filling and composting operations at the Euchareena Road Resource Recovery Centre (ERRRC). These are included in a number of documents including:

- The Project Approval
- The Proponents Statement of Commitments
- A number of supporting documents available via the Department of Planning website.

Additionally, the authors have carried out a case study (Appendix 2) assessing the level of American foulbrood (AFB) disease reported in managed beehives within 5km of a landfill located near Hamilton, New Zealand. The outcome of this case study confirmed that the level of AFB reported in apiaries within 5km of this site is no greater than the national average.

Purpose and scope

To ensure that activities undertaken at the ERRRC are managed in such a way that they minimise the apiculture risks to the satisfaction of the Director General.

Sources of hazards

Source	Examples of hazard
Beehives and used beekeeping equipment	• American foulbrood disease (*Paenibacillus larvae larvae*)
Used honey containers	• American foulbrood disease (*Paenibacillus larvae larvae*)
Tree logs	• American foulbrood disease (*Paenibacillus larvae larvae*)
Green waste	• Chemical residues
Inert Waste	• American foulbrood disease (*Paenibacillus larvae larvae*)
Leachate and Liquid Residue	• Chemical residues • American foulbrood disease (*Paenibacillus larvae larvae*)

Mandatory requirements

1. Project Approval for the Orange Waste Project – *Section 75J of the Environmental Planning and Assessment Act 1979*
   - Schedule 5, clauses 16 & 17 – Apiculture Risks
   - Appendix 1 – Proponents Statement of Commitments – Apiary Industry
   - Schedule 4, clause 2(b) – Restrictions on Waste Being Sent to Euchareena Road

2. Community Education Program and Communications Strategy – February 2011

General Requirements

1. Preliminary Provisions

1.1 Procedures

- All material destined for the ERRRC must be pre-screened for chemicals and apiculture related equipment.

- All customer complaints must be investigated and followed up as appropriate.

1.2 Records and Monitoring

- Where not otherwise stated, a record of any non-conformance detected and the subsequent corrective actions must be kept.

- A register of bee sightings at the ERRRC must be kept

- Customer complaints must be recorded on the customer complaints register and updated on the Orange City Council website monthly. All supporting documentation relating to the complaint must also be retained on file (Appendix 3).

- A report on issues relating to this RMP must be provided to the Review Committee either by exception or at no less than 6-monthly intervals.

2. Used Beekeeping Equipment

2.1 Definition

Used beekeeping equipment is any fitting, utensil, apparatus or implement that is used, or has been used, for the purposes of, or in connection with beekeeping, or in processing, handling or storing apiary products which include but are not limited to: beeswax, honey, cut comb honey, comb sections, honeydew, bee collected pollen, propolis or royal jelly, supers, frames, hive lids, floorboards, queen excluders, feeders, division boards or any other substance considered to be an apiary product including slum gum.

Included in this definition is any cavity which has contained bees. This includes but is not limited to: bird nesting boxes, buckets, tyres and cavities in construction waste (eg: in a wall). See also section 6 – Inert Waste.

2.2 Hazard Analysis

The Review of the Proponents Statement of Commitments and the Risk Assessment for the Transmission of American Foulbrood Disease for the ERRRC commented that there was a risk associated with used beekeeping equipment entering the waste stream destined for the ERRRC due to the exclusion processes not being 100% effective. The analysis goes on to say that the chance of an item of used beekeeping equipment being missed by the diversion strategies proposed is unlikely due to the method of separating waste streams, and the proposed education program.

Additionally, the risk assessment states that in the unlikely event that an item of used beekeeping equipment is missed, it would be wrapped in plastic prior to being transferred to the ERRRC. Ultimately the risk analysis concludes that the risk of used beekeeping equipment being transferred to ERRRC, and the subsequent risk to apiculture via the potential spread of American foulbrood disease is very low.

This hazard will be effectively managed by several strategies including:

- Not accepting used beekeeping equipment onto the ORRRC
- Effective diversion and burial on site of any material that is accidentally accepted
- A training program for staff, beekeepers and the general public.

As a result of these management practices, no critical control points have been identified for this process.

2.3 Procedures

2.3.1 <u>Ophir Road Resource Recovery Centre (or other council approved blending sites)</u>

- Loads will be subject to inspection at a designated point and any load containing used beekeeping equipment will not be accepted.
- All material accepted on site will be sorted prior to processing.
- Any beekeeping equipment found during the sorting process will be removed from the waste stream for immediate burial on site (consistent with site approvals).

2.3.2 Transport

- Used beekeeping equipment will not be transported to the ERRRC

2.3.3 Euchareena Road Resource Recovery Centre

- Used beekeeping equipment will not be accepted at the ERRRC.

2.4 Records & Monitoring

2.4.1 Records

- Records will be kept of all instances where loads containing used beekeeping equipment have been rejected. This should contain, date stopped, nature of goods, driver details and date reported to site supervisor
- Records will be kept by waste stream of the discovery and subsequent burial of any item of beekeeping equipment that inadvertently enters the ORRRC. This should also contain, date found, nature of goods and date reported to site supervisor.

2.4.2 Monitoring

- Site supervisor to check processes and records quarterly
- Site supervisor to report incidents to the NSW Department of Primary Industries (DPI) as appropriate

3. Used Honey Containers

3.1 Definition

Used honey containers are defined as being any receptacle that contains or has contained honey in consumer ready packaging.

It is accepted that most used honey containers will be commercial retail packs, although some could be from hobby beekeepers or farmers markets, and may include non-conventional packaging.

3.2 Hazard Analysis (HACCP)

The Review of the Proponents Statement of Commitments and the Risk Assessment for the Transmission of American Foulbrood Disease for the ERRRC commented that, while there were some inaccuracies in the original assessment carried out by Emphron due to insufficient or incorrect information, this 'did not significantly alter the conclusion that there is no meaningful risk of AFB contamination from retail honey residues'.

The hazard analysis assumes that most used retail honey containers will be separated into the recycling waste stream by householders as a result of an ongoing education program, and that a significant percentage of those containers that are put into the residual waste stream will be removed when the waste is sorted prior to baling. It is expected that most used honey containers will also be washed before being disposed of or will have lids on and not be accessible to bees (79% according to the Emphron risk assessment).

However, the risk assessment accepts that some used honey containers will be missed and will be processed with residual waste. In this situation, waste is baled and wrapped in plastic prior to being transferred to the ERRRC. Ultimately the risk analysis concludes that the risk of exposing honey bees to American foulbrood disease via used honey containers at the ERRRC is very low.

This hazard will be effectively managed by several strategies including:

- Educating the general public to separate honey containers into the recycling waste stream
- Washing containers before placing in kerbside collection bins
- Diversion of containers found in the residual waste stream into recycling
- Wrapping of baled residual waste destined for the ERRRC.

As a result of these management practices, no critical control points have been identified for this process.

3.3 Procedures

3.3.1 <u>Ophir Road Resource Recovery Centre (or other council approved blending sites)</u>

- All material accepted on site will be sorted prior to processing.
- Any retail honey containers found during the sorting process will be removed from the waste stream and recycled.

3.3.2 Transport

- All residual waste (in this case, containing one or more retail honey containers) will be baled and wrapped in plastic prior to being transported to the ERRRC.

3.3.3 Euchareena Road Resource Recovery Centre

- Baled and wrapped residual waste arriving at ERRRC will be inspected to ensure there has been no serious integrity failure of the wrapping. Any unacceptable bales will not be accepted onto the site.
- Any wrapped bale which suffers a tear or wrapping integrity failure on site will be covered on the day that they are recieved to prevent honey bee access to any exposed waste. Covering may include patching of the tear, placing any torn surface hard against other bales, or covering with soil or sand.

3.4 Records & Monitoring

3.4.1 Records

- A record of any bale rejection is to be kept and is to include date, degree of failure plus any indication of cause, and date reported to management.
- A record of any wrapping tear or failure is to be kept and is to include incident date, corrective action, and date reported to management.

3.4.2 Monitoring

- Site supervisor to check processes and records quarterly

4. Timber or Tree Logs

4.1 Definition

A tree log is defined as a tree or part of a tree large enough to contain a cavity capable of housing a honey bee colony. Honey bees will occupy cavities as small as 12 litres ([1]Seeley 1977). As a general indication, this would include logs with an approximate diameter greater than 250mm and / or any such log or log shaped such that a suitable cavity may be present.

4.2 Hazard Analysis (HACCP)

The Review of the Proponents Statement of Commitments and the Risk Assessment for the Transmission of American Foulbrood Disease for the ERRRC commented that there was a risk associated with trees delivered to the ORRRC destined for the ERRRC. The risk is around the potential presence of feral colonies (whether alive or dead) infected with American foulbrood disease in logs large enough to contain suitable cavities. The risk analysis concluded that there was insufficient data available to accurately measure the risk posed by these colonies and suggested diverting this material away from the ERRRC as a management strategy.

Orange City Council has expressed a desire to assess tree logs for risk and transfer the material from those of no risk to the ERRRC. This will require that the hazard is managed by identifying and segregating logs that meet the risk definition. Logs with a diameter larger than 500mm will be split in preparation for chipping which will allow for an additional inspection to be carried out. All logs containing feral colonies, or the remains thereof, will be retained at the ORRRC. An education plan will also be put in place (covered in this RMP) to train staff in the identification and segregation of these risk logs.

It is accepted that there is a risk associated with restricting inspection and splitting to logs over 500mm. However, if we consider that the majority of feral colonies will be in larger logs, that wax moth and other scavengers will have removed a percentage of potentially infective comb, and that there will be a considerable amount of dilution of material, the risk of AFB transmission is low.

This also pertains to feral swarms that are, or have been, present in containers other than tree logs, such as; wall cavities of buildings, bird boxes, letter boxes, buckets, tyres etc. See section 6 – Inert Waste

4.3 Procedures

4.3.1 <u>Ophir Road Resource Recovery Centre (or other council approved blending sites)</u>

- Tree logs with a diameter greater than 500mm
    - Logs will be automatically segregated for processing.
    - Logs will be split and inspected prior to being chipped
    - Logs found free of risk material should be processed as per standard operating procedures.

[1] Seeley T, 1977. Measurement of Nest Cavity Volume by the Honey Bee (*Apis mellifera).* Behav. Ecol. Sociobiol. 2, 201-227. (http://www.jstor.org/pss/4599130)

- Any tree logs found to contain feral colonies (alive or dead), or the remains of such a colony, will be segregated and processed separately
- Processed material from tree logs, where potentially infective material has been found, must not come in contact with material of a different status and must be retained at ORRRC (or other council approved blending sites).
- The area where contaminated logs or the material from such logs is kept must be controlled so as to limit the chance of material being transferred to Euchareena Road.
- Material from logs that have contained a honey bee colony must be disposed of at the ORRRC (or other council approved blending sites)

- Tree logs with a diameter between 250mm and 500mm and / or any such log or log shaped such that a suitable cavity may be present.
  - Logs will be visually inspected prior to processing.
  - Logs found free of risk material should be processed as per standard operating procedures.
  - Any tree logs found to contain feral colonies (alive or dead), or the remains of such a colony, will be segregated and processed separately
  - Processed material from tree logs, where potentially infective material has been found, must not come in contact with material of a different status and must be retained at ORRRC (or other council approved blending sites).
  - The area where contaminated logs or the material from such logs is kept must be controlled so as to limit the chance of material being transferred to Euchareena Road.
  - Material from logs that have contained a honey bee colony must be disposed of at the ORRRC (or other council approved blending sites)

4.3.2 Transport

- The tree logs, or any other product derived from those logs, sent to ERRRC will have been inspected and deemed to be of no risk.

4.3.3 Euchareena Road Resource Recovery Centre

- The tree logs, or any other product derived from those logs, sent to ERRRC will have been inspected and deemed to be of no risk.

4.4 Records & Monitoring

4.4.1 Records

- A record of feral colonies (alive or dead) found in tree logs must be kept
- Processing, storage and disposal records for risk material must be kept.

4.4.2 Monitoring

- Site supervisor to report instances of feral colonies in tree logs to DPI as appropriate.
- Site supervisor to check processes and records quarterly

5. Green Waste

The Composting Operations section of the conditions of consent (Schedule 5, part 8) states:
"Unless the Director General states otherwise, the Proponent shall ensure that the:
(a) biosolids and food organic waste received on site is either loaded directly into the composting tunnels upon arrival, or covered at all times until it is loaded into the tunnels;
and
(b) windrow composting operations are managed in accordance with:
- AS 4454-2003: Composts, Soil Containers and Mulches (Appendix N) or the latest version of this standard; or
- Protective measures set out in the *Composting & Related Organics Processing Facilities* guideline.

The review of the risk assessment completed by Dr Mark Goodwin (Appendix 1) concluded that the risk associated with pesticides on green waste delivered to the ERRRC appeared to be insignificant and that any risk could be further reduced by ensuring that there is sufficient permanent water close to any hives in the immediate vicinity of the facility.

As a result of this determination, it is the opinion of the authors that the risk to apiculture of green waste arriving at the ERRRC is sufficiently low so as not to require any management strategies around the exclusion of honey bees.

It is the opinion of the authors that waiving the requirements of Schedule 5, Part 8(a) would not significantly alter the risk to apiculture of the ERRRC.

The authors would also note that composting operations have been known to attract individual bees at certain times of the year but not in the quantities required to be a risk to apiculture.

For the purpose of managing apiculture risk, the Apiculture Risk Management Plan does not require food and garden organic material to be covered prior to composting.

6. Inert Waste

Both the review of the risk assessment completed by Dr Mark Goodwin (Appendix 1) and the risk assessment completed by Emphron did not consider the issue of inert waste such as that generated at a construction site. It is understood that by exclusion, no risk had been identified from inert waste. The authors believe it is possible for used beekeeping equipment, or objects that may have contained a swarm, to be included with inert waste. However, it is the opinion of the authors that no additional management of inert waste beyond that which is proposed by Orange City Council is warranted.

The definition of 'used beekeeping equipment' has been made sufficiently broad so that any construction waste or other containers that may have housed bees (such as within a section of the wall of a house) would be treated in the same manner as other used beekeeping equipment as per section 2.

7. Leachate and Liquid Residue

7.1 Landfill

Leachate from the landfill operation will be collected within the landfill itself (see schedule 5, clause 6 of the Project Approval) and, as a result, honey bees will not be able to gain access to it.

The review of the risk assessment completed by Dr Mark Goodwin (Appendix 1) concluded that if the requirements of Schedule 5, clause 6 of the Project Approval are complied with, 'there should be no negative affect on beehives'. This applies to both pesticides and American foulbrood disease.

7.2 Green waste

Liquid residue collected from green waste may be accessible to bees. However; it is assumed that any insecticide which migrated into this liquid residue would be subjected to significant dilution, effectively removing any risk to apiculture.

As a result of this determination, it is the opinion of the authors that no additional management is necessary for liquid residue beyond that which is required by operational parameters and certified by the construction certificate for the final design.

8. Wrapping Baled Residual Waste

8.1 Background

Once any applicable pre-screening has been completed, all residual waste collected at the ORRRC will be processed, baled and wrapped in plastic for transfer to the ERRRC (See Schedule 4, Clause 2(b) of the Project Approval). This wrapping will ensure that any risk item that is not identified and removed from the waste stream will not be visited by honey bees.

8.2 Procedures

8.2.1 Ophir Road Resource Recovery Centre (or other council approved blending sites)

- All residual waste must be baled and wrapped prior to transfer to the ERRRC.
- Wrapped bales must be inspected prior to dispatch to ensure that honey bees are unable to access the waste material.
- Any bale not accepted at the ERRRC and returned to the ORRRC (or other council approved blending sites) due to wrapping failure, must be rewrapped and inspected as above.

8.2.2 Transport

- No additional procedures are required around transport.

8.2.3 Euchareena Road Resource Recovery Centre

- Baled and wrapped residual waste arriving at the ERRRC will be inspected by council staff to ensure there has been no wrapping integrity failure. Any unacceptable bale will not be accepted onto the site.
- Any wrapped bale which suffers a tear or wrapping integrity failure on site will be covered on the day they are recieved to prevent honey bee access to any exposed waste. Covering may include patching of the tear, placing any torn surface hard against other bales or covering with soil.

8.3 Records & Monitoring

No additional records are required beyond those specified in previous sections.

9. Education / Personnel Competency

9.1 Background

An education program is required to maximise the efficiency of the Apiculture Risk Management Program. The education strategy should encompass the general public, beekeepers and staff involved with the operation of both the ORRRC and ERRRC.

The "Community Education Program and Communications Strategy – February 2011" covers, in some detail, the public education that is taking place over the duration of this project. Within the document are a number of references to honey bee safety and the importance of separating used honey containers into the recycling waste stream.

Beekeeper education will also be required, particularly around the disposal of used beekeeping equipment, which is not catered for at the ORRRC or ERRRC. This education program will need to be conducted in consultation with the Department of Primary Industries (DPI) in order to maximise the effectiveness of this program.

Training of staff at both the ORRRC and ERRRC will need to be undertaken in order to ensure the requirements of the risk management program can be met.

9.2 Competencies

- The day-to-day manager/s, or the person responsible for this risk management program (RMP), must be familiar with the program and have the following competencies:
    - Have knowledge in honey bee safety in relation to the waste management industry
    - Be able to liaise and communicate effectively with workers and the review committee where necessary
- Workers performing key tasks relating to the RMP must have knowledge and skill in executing the particular task allocated to them.
- New workers must be informed of their job description and relevant procedures relating to this RMP before starting work.
- Ongoing supervision and/or training must be provided to ensure that workers are adequately trained on their specific tasks.

Note: It is expected that staff performing key tasks will attend the DPI Apiculture Pest and Diseases Course (or equivalent) as a component of their training.

9.3 Records & Monitoring

9.3.1 Records

- Induction and training records for all staff performing key tasks relating to the RMP must be kept on file. Staff must sign these records confirming that training has been received.

9.3.2 Monitoring

- Monitoring of staff performance must be carried out by the responsible person at regular intervals.

10. Planting of Trees

The review of the risk assessment completed by Dr Mark Goodwin (Appendix 1) concluded that 'It is unclear whether the planting of flowering trees in the vicinity of the ERRRC will have an impact on the attractiveness of any honey that was exposed at the site'.

As a result of this determination, it is the opinion of the authors that no requirement be placed on Orange City Council in relation to the planting of trees for the purposes of reducing risk to apiculture.

11. Appendices

11.1 Appendix 1

"Review of the Proponents Statement of Commitment and the Risk Assessment for the transmission of American Foulbrood Disease for the Euchareena Road Resource Recovery Centre" by Dr R M Goodwin (pdf copy of report to be supplied separately).

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Review of the Proponents Statement of Commitment and the Risk Assessment for the transmission of American Foulbrood Disease for the Euchareena Road Resource Recovery Centre

Dr RM Goodwin

August 2011

A report prepared for

AsureQuality

Dr RM Goodwin

Plant & Food Research, Ruakura

SPTS No. 5789

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Executive summary

Review of the Proponents Statement of Commitment and the Risk Assessment for the transmission of American Foulbrood Disease for the Euchareena Road Resource Recovery Centre

Dr RM Goodwin, August, SPTS No. 5789

The purpose of this study is to review both the risk assessment 'Implications for Risk of Transmission of American Foulbrood Disease and Propolis from the Proposed Resource Recover and Waste Project. Re-analysis for Baled Waste', produced by Emphron Informatics Pty Ltd, and the 'Proponents Statement of Commitments' that relate to risks to honey bees.

There are areas of the 'Risk Assessment' that use insufficient or incorrect information in assessing the risk of spreading American Foulbrood (AFB) disease. However, these problems do not significantly alter the conclusion that there is no 'meaningful risk of AFB contamination from retail honey residues'.

The Risk Assessment should have included chipped logs that may contain feral honey bee colonies. This risk could be best managed by not transporting chipped logs to Euchareena Rd.

The risk of the green waste poisoning bees because they have collected water from plants that were treated with insecticides before being harvested is minimal. Any risk can be further reduced by providing standing water close to any hives surrounding the site.

The leachate from the site is being handled in a manner that will prevent bees seeking water from feeding from it and therefore should provide no risk to bees. It is unclear whether the planting of flowering trees in the vicinity of Euchareena Rd will probably have an impact on the attractiveness of any honey that was exposed at the site.

Assuming that chipped logs are not transported to Euchareena Rd, with current information there should be very minimal risk of AFB being spread from the site or of bees visiting the site being poisoned.

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Introduction

The purpose of this study is to review both the risk assessment 'Implications for Risk of Transmission of American Foulbrood Disease and Propolis from the Proposed Resource Recover and Waste Project. Re-analysis for Baled Waste', produced by Emphron Informatics Pty Ltd, and the 'Proponents Statement of Commitments' as it relates to risks posed to honey bees.

The risks to beehives that need to be managed are the spread of American foulbrood disease and toxic substances.

American foulbrood disease (AFB) is caused by the spore-forming bacterium *Paenibacillus larvae* subsp. *larvae*. *P. larva attacks* the larvae of honey bee queens, workers and drones (Woodrow 1942; Bailey & Ball 1991). Larvae become infected by ingesting spores contaminating their food (Woodrow 1942). The number of spores required to infect a larva increases with larval age. As few as ten spores may infect 24-hour-old larvae, whereas larger numbers are needed to infect larvae over 2 days old (Woodrow 1942; Brodsgaard 1998). The spores germinate soon after they enter the larval gut and penetrate the body cavity through the gut wall (Bailey & Ball 1991). The infected larva then quickly dies and about 2500 million spores form (Sturtevant 1932). Additional larvae are infected by bees performing house-cleaning duties (Bailey & Ball 1991). *P. larvae* spores may remain viable for at least 35 years (Haseman 1961).

P. larvae spores are not particularly infective. The lowest concentration of spores that have been fed to colonies which were then reported to become infected is 50 million spores/L of syrup (Goodwin et al.1994a; Sturtevant 1932). The lowest number to create an infection is 5 million spores (fed in 100 ml of sugar solution) (Goodwin et al 1994a). The number of spores required to be on other commodities to create an infection is unknown. However, it has been assumed that equipment from colonies with AFB is capable of transmitting the disease.

Implications for Risk of Transmission of American Foulbrood Disease and Propolis from the Proposed Resource Recover and Waste Project. Re-analysis for Baled Waste by Emphron Informatics Pty Ltd

The Risk Assessment assessed the risk of the following:

'It has been suggested that the proposed Euchareena Road landfill site would increase the risk of contamination of local (within 5 km of the development) commercial apiaries by American Foulbrood Disease (AFB). The purported incremental risk has been said to arise through foraging bees coming into contact with contaminated discarded honey containers or the Resource Recover and Waste Project.'

The title of this Risk Assessment includes the risk of the transmission of propolis. The assessment does not, however, discuss the risks associated with propolis. It is unclear why the transmission of propolis should be included in this risk assessment. Bees collect propolis from trees and use it as a building material. Honey bees use it to block up holes in hives that are too small for a bee to move through. Occasionally propolis may be collected from discarded beekeeping equipment. Propolis is not fed to larvae and therefore has little implication for the spread of AFB disease. There might be *P. larvae* spores on the surface of the propolis if it were collected from a beehive. It is, however, no more likely to be contaminated with *P. larvae* spores than the woodwork and wax inside the hive, which are not included in this risk assessment. Propolis therefore presents no additional risk to the spread of AFB outside the risk from used beekeeping equipment.

Used beekeeping equipment

The Risk Assessment assumes that all used hive equipment will be diverted from the waste stream before the waste is transported to the Euchareena Rd site. There is however, an unreported probability associated with hive equipment being missed, entering the waste stream and being transported to Euchareena Rd. If included in the analysis, this would have increased the likelihood of AFB being spread to managed colonies near the site. The size of any increase in risk depends on the likelihood of hive equipment being missed, and the likelihood of the equipment being infected with *P.* larvae a spore that is unreported. Considering the method of separating waste streams, i.e. conveyer belts, and the proposed education programme, it would appear very unlikely that hive parts would be missed at the Ophir Rd site and transferred to the Euchareena Rd site. This is supported by the observation that 32.7% of plastic honey containers are reclaimed. Most hive parts are considerably larger than honey containers and easily identified by trained staff.

Even if the hive parts were missed at Ophir Rd, they would be wrapped in plastic before being transported to Euchareena Rd, preventing honey bee access. The frequency of used hive parts arriving at Ophir Rd would be considerably lower than the frequency of used honey containers. The chance that they would be missed would also be significantly lower than for honey containers. The increase in the AFB risk associated with hives parts transported to Euchareena Rd should therefore be classed as very low.

Feral colonies

The Risk Assessment also does not deal with feral honey bees at Euchareena Rd site. The reason provided for not assessing any risk associated for feral colonies is because of a comment made by Mr Robert Guilliford that:

'I have not seen any substantive evidence that AFB is caught from feral colonies despite that claim often being made by beekeepers that have no other explanations for outbreaks of AFB in their apiaries'.

However, Mr Robert Guilliford's report provides no evidence to support the assumption that feral colonies cannot spread AFB to managed colonies. Feral colonies have been reported to have AFB in other countries (Goodwin et al. 1994b), so there is no reason to suspect that they might not also become infected in Australia. Once having AFB, a feral colony normally dies (Bailey & Ball 1991), leaving contaminated honey that will occasionally be robbed by managed hives, thus spreading the disease.

Although feral colonies can become infected with AFB and may spread the disease to managed colonies, there is no reason to think that feral colonies are more likely to be infected by rubbish at the site than managed colonies, and the reason for including them in this risk assessment is unclear.

It is, however, reported that trees that are delivered to the Ophir Rd site will be chipped and transported to the Euchareena Rd site with the green waste. Some of these trees may contain feral colonies and some may be infected with *P. larvae* spores.

Any known feral colonies should be killed (if alive) removed and disposed of at Ophir Rd. It is however unlikely that all feral colonies will be detected. Some colonies may be dead when they arrive at Ophir Rd which would make them difficult to find. The chipping process will destroy any comb and honey present mixing them with the woodchips. This may result in some honey being exposed to bees when it is transported to Euchareena Rd.

There is therefore a risk associated with chipped feral colonies. Without information on the numbers of feral colonies, the number that will not be detected, the number infected with *P. larvae* spores, the spore concentrations in honey, and the degree of chipping, it is not possible to assess the degree of any risk.

The risk associated with chipped feral colonies could be eliminated by disposing the chipped trees at a site other than Euchareena Rd.

Expected Number of Honey Containers Reaching the Landfill Site

The detailed assessment of the number of honey containers likely to be in the waste stream appears to be appropriate, as is the analysis of the proportion of these containers that still contain honey.

Accessibility of Discarded Containers for Forage

The assessment of the likelihood of the contents of a bale being exposed to bees appears to be reasonable.

Temperature Dependent Bee Activity

The discussion about the temperatures required for flight activity is problematic. As correctly pointed out by the court-appointed apiary inspector, radiant energy is an important factor, as well as air temperatures. Observational data on flight activity at the site would be needed to be confident on any assessment of the time available for flight.

P. larvae Spores in Retail Honey

Twenty-four out of 36 retail honey samples were reported in the Risk Assessment to contain *P. larvae* spores. The results are reported as colony forming units (CFUs) rather than the number of spores. The analysis of these data uses CFUs rather than actual bacterial concentrations. *P. larvae* does, however, have a very low germination rate on all media used. There is only a 1% germination rate on Brain heart Infusion Agar (Shimanuki & Knox 1988) and an estimated 2% germinate rate on MyPG agar (Hornitzky & Nicolls 1993). J agar is reported to have a lower germination rate (<2%) than MyPG agar (Dingman & Stahly 1983). Although not reported, the Sheep Blood Agar with added naladixic acid used in the survey is likely to have a similar germination rate. The steps used in the testing of the honey may have also reduced the sensitivity of the test, as only 20 µl of 3 g of supernatant from centrifuging 50 ml of honey was spread onto plates. There are therefore likely to be more positive samples than those indicated in Table 7. The concentrations of *P. larvae* spores will also probably be significantly higher than the reported CFUs.

The numbers of positive samples in the survey were very high. This suggests that there are significant AFB issues with the apiaries from which the honey was sourced from. A similar survey of retail honey in New Zealand found no positive samples (Goodwin et al. 2007). This suggests that there is a risk of managed colonies in the vicinity of Euchareena Rd contracting AFB from other managed hives in the area, not just from activities on the site.

Will Honey Bees Forage Over the Landfill Area

The analysis of the distances from hives that bees will forage appears to be appropriate, as is the comment that bees will forage relatively close to their hives if a plentiful food supply is nearby. However, the analysis should have addressed the issue of stocking rates and flowering rates. The number of flowers produced varies from year to year; as does the amount of nectar the flowers produce. The amount of available nectar is also affected by the density of foraging colonies. If there are large numbers of colonies, they may deplete the available nectar close by and have to fly longer distances than if there were few colonies present.

Planting more nectar-producing plants will increase the probability that foraging bees will fly to the site. It may not, however, reduce the probability that bees will forage from the site, as discarded honey may be more attractive than flowering plants.

There is also the issue of what happens when there is a break in flowering. The bees that were foraging on the flowers may search for other food close to where they were foraging, increasing the chance of them foraging from rubbish.

Probability of Detection of an Exposed Honey Container by a Scout Forager

This analysis is complicated by having to use the number of hives currently surrounding the site and their distances from the site. Both of these are likely to vary over the life of the site and may be altered if large plantings of flowering plants occur at the site, as this may attract other beekeepers.

The analysis is also complicated by having to use the data from Ridout et al and V Frisch. Their results were likely to be affected by both the number of bees in the area in which the trials were carried out, and the relative attractiveness of the food source and surface area of the food source to be discovered. As with flight activity and weather, actual data are probably required to answer this question.

Bee Memory

This assessment appears reasonable. The expected number of honey containers exposed at the site and the short exposure times suggest a very low likelihood that bees will become trained to visit the site by a continued supply of honey.

Recruitment of Foragers

This assessment appears reasonable. The number of foragers recruited by a bee feeding on honey is likely to be low because of the short time the infected material is exposed, but recruitment by a forager may increase the number of bees searching in the vicinity of the dump. This would slightly increase the probability of another container being found if exposed soon after the first one.

Probability of Brood Infection

The assessment assumes that cfu number = spore number. This is an incorrect assumption for *P. larvae,* as described above. The calculations are therefore a large under-representation of the actual number of spores that may be carried by a bee. However, the assumption of the number of spores required to create an infection is also an underestimate, because it uses the number of spores required to be fed to a larva. When spores were fed to a colony, the lowest of spores that needed to be fed to create an infection was 5 million spores fed in 100 ml of sugar syrup.

Using the 40 mg crop capacity suggested in the Risk Assessment, a crop would need to contain 2,000 *P. larvae* spores to create an infection (assuming 100 ml was fed), rather than the 10 spores suggested in the Risk Assessment.

The high number of spores required is partly because of the bees' hygienic behaviour. When the spores are fed to larvae, they produce vegetative rods in the gut. These migrate into the haemocoel and multiply, killing the larva and finally producing more spores. The spores are able to infect other larvae if they are fed to them but the vegetative rods are not. Worker honey bees are often able to detect the presence of infected larvae while they still only contain the non-infective vegetative rods, and remove them from their colony at that stage, preventing an infection developing (Woodrow 1942; Rotherbuhler 1958; Woodrow & Holst 1942).

The underestimate of the number of spores in honey (100x) is more than compensated by the large underestimate of the number of spores required to be fed to a colony to create an infection (200x).

The assessment of the likelihood of a honey pot infecting colonies is therefore probably an overestimate.

Proponents Statement of Commitments

Risk Associated with Green Waste

There has been a suggestion that green waste transported to Euchareena Rd may pose a hazard to bees because of chemicals that have been applied to the plant material before it was taken to Ophir Rd. The only chemicals that are likely to be significant are insecticides. It is difficult, however, to suggest why an insecticide might be applied to plant material close to the time when the material was to be harvested and taken to Ophir Rd. Even should this occur, the green waste will generally not be attractive to bees, as there will not be any nectar present. Bees might be attracted if there was water associated with the green waste. However, there are likely to be other water sources more prominent and more available for the bees. Therefore the risk associated with insecticide-treated green waste would appear to be insignificant. The minimal risk can be further decreased by ensuring there is sufficient permanent water at the site close to any nearby hives.

Planting Trees

It is unclear whether the planting of flowering trees at the Euchareena Rd site will have any impact on the attractiveness on any honey exposed at the site. When flowering and producing nectar, the trees will reduce the number of bees available to search for honey. However, whether this would be a significant effect on the chance of a bee finding a honey pot will depend on the numbers of trees and bees. Planting trees could possibly attract bees to the site from hives that are more distant, and which would not normally visit the site.

Leachate

The description of the leachate management from the site indicates that bees will not have access to any leachate. If this is the case, there should be no negative effect on beehives

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Conclusions

There are areas of the 'Risk Assessment' that use insufficient or incorrect information in assessing the risk of spreading American Foulbrood disease. However, these problems do not significantly alter the conclusion that there is no 'meaningful risk of AFB contamination from retail honey residues'.

The Risk Assessment should have included chipped logs that may contain feral honey bee colonies. This risk could be best managed by not transporting chipped logs to Euchareena Rd.

The risk of the green waste poisoning bees because they have collected water from plants that were treated with insecticides before being harvested is minimal. Any risk can be further reduced by providing standing water close to any hives surrounding the site.

The leachate from the site is being handled in a manner that will prevent bees seeking water from feeding from it and therefore should provide no risk to bees. It is unclear whether the planting of flowering trees in the vicinity of Euchareena Rd will have an impact on the attractiveness of any honey that was exposed at the site.

Assuming that chipped logs are not transported to Euchareena Rd, with current information there should very minimal risk of AFB being spread from the site, or of bees visiting the site being poisoned.

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11.2 Appendix 2

Case study in American foulbrood (AFB) infection rates in managed colonies within 5km of the Horotiu landfill near Hamilton, New Zealand.

Introduction & Background

This case study was undertaken to evaluate the conclusions drawn from the risk assessment for the transmission of American foulbrood disease for the ERRRC.

American foulbrood disease (AFB) is managed in New Zealand by way of a pest management strategy, which is owned by the New Zealand beekeeping industry. The strategy requires that all colonies are inspected for AFB at least once per year by someone competent in the diagnosis of the disease. Furthermore, the strategy requires that any incidence of AFB is reported within 7 days of discovery and is destroyed within the same timeframe.

A key tool used in the management of AFB is an apiary register. All New Zealand beekeepers are required to be registered and the location of every apiary operated must also be registered on the apiary database. The information relating to each apiary on the database contains both textual data (such as disease reports) as well as geospatial information. This allows apiaries to be plotted on a map and allows more complex analysis of disease incidence by area and by beekeeping operation.

European foulbrood (EFB) disease has not been detected in New Zealand and it is currently illegal to feed antibiotics for the control of AFB. Both of these facts increase the sensitivity of our surveillance resulting in a high percentage of AFB cases being identified and reported.

Ultimately this gives us the ability to be able to assess the reported AFB disease incidence in any part of New Zealand at a level that is not possible in New South Wales.

Findings

An area assessment was undertaken in order to substantiate the claims that a landfill presents a very low risk of contaminating surrounding hives with AFB.

The assessment looked at all registered apiaries within 5km of the landfill located at Horotiu, just north of Hamilton. 19 apiaries were located in the area containing 377 hives. No AFB has been reported in hives on any of these sites in recent history (since 1 July 2009). This is obviously below the national average which is currently 0.3% of hives

Discussion & Conclusion

This data relates to just one case study and therefore care must be taken when extrapolating any findings. Having said that, it would appear that the presence of this landfill is not linked with an elevated incidence of AFB in the surrounding area suggesting that the Horotiu landfill is not a risk factor with respect to incidence reporting of AFB.

As mentioned previously, the prevalence of *Paenibacillus larvae larvae* spores (the causative agent of AFB) in New Zealand retail honey packs is much lower than New South Wales as confirmed by retail honey analysis comparisons. One could argue that in an area with higher prevalence of *P. larvae* spores in honey, there is more

chance of infected material being dumped (illegally or otherwise) and therefore more opportunity for a landfill to consolidate and spread AFB disease.

It should also be pointed out that the volume and quality of apiculture risk mitigation measures proposed for the ERRRC far surpass those of the Horotiu landfill, which was the subject of this case study. The authors would suggest that, while this case study cannot be used as a direct comparison with the ERRRC, the findings for Horotiu are still encouraging.

11.3 Appendix 3

Complaints Register

Date	Time	Person	Contact Details	Incident Description	Incident Location	Action Taken	Follow up Action Required