Updated Environmental Guidelines for the Egg Industry

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Background: Egg Industry Environmental Guideline

- Integrity Ag has recently completed a revision of the Environmental Guidelines for Layer Farms (Guidelines) on behalf of Australian Eggs.
- The previous version of the Guidelines produced in 2008 and no longer reflected the current state of the industry.
- Revision of environmental guidelines accounts for changing production systems, and changes to regulatory requirements for egg farms over the last 10 years.
Guideline Scope and Purpose

- The guidelines detail development, design and management options for egg industry facilities.

- Assist the egg industry with planning and environmental sustainability issues when developing egg-production facilities and associated infrastructure.

- Cover: breeder farms, pullet rearing facilities, egg production facilities (cage, free range and barn) and on-farm grading floors and feed mills. Not off-site or egg manufacturing facilities.
Consultation Process

Previous guidelines thoroughly reviewed and revised to:
- streamline content
- address gaps in management and regulatory information.

Consultative approach, with input from:
- Egg Producers
- Egg industry specialists
- Government extension officers
- EPA’s
- Australian Eggs Ltd
Major Changes

The latest edition contains:

- Industry specific formula to determine separation distances for new farms.
- Up to date science on nutrient distribution in range areas, and practical management strategies to reduce risk associated with these areas.
- A risk tool for evaluating potential nutrient loss to surface and groundwater.
- Guidance on designing and implementing VFS’s.
- Environmental and planning recommendations based on the current state of the industry, accreditation requirements and regulations (such as welfare and biosecurity).
- Updated management options for by-products and bird mortalities.
New research

- Two major gaps revealed through consultation:
  - Nutrient impacts and management in range areas
  - Odour / separation distances

- Addressed through new research funded by AEL and incorporated into the guidelines.
  - Peer reviewed paper on nutrient distribution in range areas (Wiedemann et al. 2018)
  - Expert reviewed odour report and development of S-factor formula for industry (McGahan & Galvin 2018)
Nutrient Impacts and Management in Range Areas

Stakeholder consultation showed that elevated nutrient levels are a concern in range areas

- QLD DAF: Noted high nutrient levels on ranges and recommended risk based approach for management

- VIC EPA: Guidelines need to include recommendations for runoff capture dams, risk based approach and scientific references to support BMPs
Nutrient Distribution - Background and Need:

- Previous work:
  - Research in meat chickens (Agrifutures) and pork industry (free range) and some overseas work: some baseline data but little on nutrient distribution or management. If industry is not clear what the problem is, how do we manage it?
  - Qld Condamine Alliance: Nutrient distribution across 15 farms - allows quantification of nutrient levels and distinct zones that can be managed differently. Leverages >$150K work.

*Existing information was not robust enough for a guideline, and didn’t clearly describe risks and best practice management strategies*
Nutrient Distribution - Objectives

1. Re-analyse and report nutrient distribution and soil nutrient levels in range areas based on existing datasets and relevant literature.
2. Estimate nutrient deposition zones in range areas from spatial mapping
3. Use these data to explore nutrient risks
4. Develop management practices to address these risks
5. Integrate key findings into the Environmental Guideline to address concerns raised by regulators.
Nutrient Distribution - Methods

1. Review and reanalysis of previous data:
   - Queensland dataset from 15 farms, 6 soil samples / farm
   - Other relevant Australian data / international data

2. Review risk analysis tools / frameworks from other sectors such as the Farm Nutrient Loss Index (FNLI) - are they applicable?

3. Develop management practices, focusing on:
   - Low cost
   - Low impact and complementary to current management
   - Avoiding known 'problem' solutions such as containment ponds (as recommended by some EPAs)
Nutrient distribution - Results

**Results**

- a) lithosols, <25 years old;
- b) dermosols, <25 years old;
- c) sodosols, <25 years old;
- d) vertosols, <25 years old;
- e) vertosols, >50 years old

**Soil nitrate concentration depletion from shed to background**

- 0-50%
- 50-75%
- 75-90%
- 90-95%
- 95-99%

Increasing distance from shed
Nutrient distribution - Results

Figure 9 – Upper soil nutrient concentration boundary across all farms. Determined using exponential model fits for the maximum Nitrate–N and Colwell–P concentration depletion profiles.
Nutrient distribution - Nutrient Management

- Elevated nutrient levels were found in a small area (<0.1ha) close to the sheds

- Management should be based on risk of nutrient impacts on surface water and groundwater

- Risk is dependant on site factors and nutrient deposition zones

- Risk tool developed based on FNLI

- Minimal controls may be required for ‘low risk’ sites
This is an example surface water risk assessment tool from the guideline.

Based on nutrient distribution data - determines risk based on site and production factors.

Similar tool for groundwater risk.

### Nutrient distribution - Risk Assessment

<table>
<thead>
<tr>
<th>FACTOR SCORE</th>
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<th>MODERATE</th>
<th>HIGH</th>
<th>VERY HIGH</th>
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This table provides a framework for assessing the risk of nutrient distribution in surface and groundwater based on various factors. Each factor is assigned a weight, and the score ranges from low to very high. The risk for each factor is calculated by multiplying the weight by the score. This tool helps in identifying high-risk areas for nutrient management and pollution control.
Nutrient distribution - Zone Approach

‘High risk’ sites - Management practices employed relative to nutrient distribution. Management zones determined from Wiedemann (2018)

Zone 1. 0-10 m from shed → Verandas, bunding, drainage control to a vegetative filter strip (VFS).

Zone 2. 10-25 m → Maximise groundcover crop rotation, monitor soil nutrient levels.

Zone 3. >25 m → Monitor - no specific controls required.
Odour - Separation distance formula method

1. Review separation distance formula used in Aust. states for meat chickens, and national formulas for pigs and beef cattle feedlots.
2. Reviewed odour emission rates (OER) from layers both in Australian and internationally.
3. Compared these OER to meat chickens to develop a base formula.
4. Combine base formula with scientifically valid components of existing formulae to develop additional S-factors - terrain, surface roughness etc.
5. Test developed formula against “real-world” scenarios via modelling.
1. Concluded that the average OER for layer birds is around 40% of meat chicken birds on a per bird basis.

2. The base formula \( D = N^{0.63} \times S_1 \) (receptor factor) was chosen for layers as it was developed using most rigorous modelling approach.

3. Receptor factor \((S_1)\) changed by factor of 0.6 to reflect lower OER’s for layers compared to meat chickens.

4. Surface Roughness \((S_2)\) and Terrain \((S_3)\) factors added. These factors based on previous modelling studies.

5. Optional Wind Frequency \((S_4)\) factor added as used in National Pig Guidelines.
Separation Distance Formula - Agreed Formula

\[
\text{Separation Distance} = \left(\frac{\text{Number of birds}}{1000}\right)^{0.63} \\
\times S_1 \times S_2 \times S_3 \times S_4 \ \text{(Optional)}
\]

Where:

- \( S_1 \) – Sensitive land use factor – differing factors based on surrounding land use (e.g. rural vs non rural).
- \( S_2 \) – Surface roughness factor - changes to odour dispersion due to changes in the roughness of the land surface.
- \( S_3 \) – Terrain factor - changes to odour dispersion where local met. conditions influenced by local terrain (e.g. valley drainage).
- \( S_4 \) – Wind frequency factor (Optional) - relative odour impact due to the frequency of wind direction for wind speeds less than 3 m/s.
Separation Distance Formula
Testing (250,000 layers) - Griffith

- Red line – Victoria (5 ou)
- Purple line – SA (10 ou)
- Yellow line – Qld (2.5 ou)
- Green line – NSW (5 and 7 ou)
- Blue line – NEG (3 ou)
- Green circle – S-factor **without** S4
- Red crosses – S-factor **with** S4

Griffith Met. data
Separation Distance Formula
Testing (250,000 layers) - Clifton

- Red line – Victoria (5 ou)
- Purple line – SA (10 ou)
- Yellow line – Qld (2.5 ou)
- Green line – NSW (5 and 7 ou)
- Blue line – NEG (3 ou)
- Green circle – S-factor without S4
- Red crosses – S-factor with S4

Clifton Met. data
Separation Distance Formula - Guideline Outcomes

- Formula developed based on most robust S-factors formula components from other intensive livestock industries.

- Testing showed the formula provides more conservative (greater) separation distance than most impact criteria, but not when compared to the very stringent criteria adopted in some states.
Other Changes - VFS recommendations

- Guidance on designing and implementing vegetative buffers.
- Based on existing scientific literature such as Karssies and Prosser (1999)
- Includes practical recommendations such as vegetation types and maintenance requirements

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<th>RAINFALL FACTOR</th>
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Other Changes - Mortalities Management

Updated recommendations regarding the management options of by-products and bird mortalities

Decision hierarchy for disposal of mortalities. Approach outlines the preferred management pathways, and highlights the risks/benefits/concerns associated with each option.
Egg Industry Environmental Guidelines

- Developed in consultation with industry and regulators.
- Reflects changes to production systems, biosecurity, animal welfare, and planning and permitting requirements.
- Incorporates up to date science on environmental impacts and management strategies.
Thanks to Australian Eggs Limited for providing the funding and support to update these guidelines

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