final report

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Industry environmental sustainability review

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abbreviations

BAT	Best Available Technique
BOD	Biochemical Oxygen Demand
CO_2-e	Carbon dioxide equivalent
CPRS	Carbon Pollution Reduction Scheme
DAF	Dissolved Air Flotation
EEO	Energy Efficiency Opportunities
EPA	Environment Protection Authority
EPR	Environmental Performance Review
EREP	Environment and Resource Efficiency Plans
ESR	Environmental Sustainability Review
FY	Financial Year
G	giga
GFC	Global Financial Crisis
GHG	Greenhouse Gas
GRI	Global Reporting Initiative
HSCW	Hot Standard Carcass Weight
J	Joule

kg	kilogram
kL	kilolitre
kt	kilotonne
KPI	Key Performance Indicator
LPG	Liquefied Petroleum Gas
M	mega
mg	milligram
MLA	Meat & Livestock Australia Limited
NGER	National Greenhouse and Energy Reporting
NOx	Oxides of nitrogen
NPI	National Pollutant Inventory
O&G	Oil and Grease
RMP	Red meat processing
SO_x	Oxides of sulfur
T	terra
t	tonnes

SECTION one

Introduction

1.1 Context of the Study

The five-year period since the 2003 Environmental Performance Review (EPR), was one of major impacts on the red meat processing (RMP) sector. Major influences and drivers impacting the sector in this period included:

- **Drought –** One of the most severe and long lasting droughts was experienced in Australia during 2003-2008, especially in Queensland and northern NSW. The red meat processing facilities responsible for the bulk of Australian production are located in these drought affected areas, which affected the total production of the RMP sector for a number of years. The results of this Environmental Sustainability Review (ESR) covers the period 2008-2009 financial year, when production was close to average production throughput.
- **Water restrictions –** As a direct result of the drought, mandatory and voluntary water reductions were introduced across Australia. For example: Victoria introduced Environment and Resource Efficiency Plans (EREP) for industries using more than 120 ML/year water; NSW introduced Water and Energy Savings Action Plans; and Queensland instituted the Queensland Water Commission which required Water Efficiency Management Plans and a 25% water reduction or operation at world best practice water consumption in the SE QLD area for industrial facilities. The enormous pressure on water usage resulted in RMP plants responding to the challenge and reducing water consumption.
- **Global Financial Crisis (GFC) –** The GFC began late in 2007 and continued through 2008. The impact on the export RMP sector and associated industries, including leather, was severe and continues.
- **Environmental legislation –** New state and federal legislation was introduced, targeting energy efficiency initiatives and associated greenhouse gas emissions. This included the Energy Efficiency Opportunities (EEO) Act which focussed on the larger companies in the sector; the National Greenhouse and Energy Reporting scheme, and a number of State-based schemes such as EREP in Victoria for sites using over 100 TJ/year energy and Water and Energy Savings Action Plans in NSW.
- **Carbon tax –** The Carbon Pollution Reduction Scheme (CPRS) was proposed during 2008 with release of the draft legislation in early 2009. The modelled impacts on the RMP sector and the upstream livestock operations were substantial and the RMP industry was involved in negotiations with the government.
- **Rising fuel costs –** The rising cost of electricity and fuels has had, and will continue to have, an influence on energy usage and efficiency.
- **Increased community focus –** Local communities tend to become more educated on environmental issues and to scrutinise the performance of industry. Transparency of environmental performance is being demanded of individual plants as well as the industry as a whole. This Environmental Sustainability Report seeks to address some of those concerns.
- **Closer neighbours –** In some areas, there have been population increases in regional areas where processing plants are typically sited, which increased encroachment on many facilities. This may result in more frequent odour and/or noise complaints.

1.2 Background

Environmental Performance Reviews (EPR) were conducted at up to ten medium to large integrated red meat industry plants in 1998 and 2003. The EPRs determined a number of environmental metrics and allowed the red meat industry to benchmark its performance against Key Performance Indicators (KPI).

There have been many positive developments in the red meat processing industry since the 2003 study including:

- improved collection, collation, verification and reporting of environmental data
- plant upgrades or new plants incorporating cleaner production principles
- better utilisation and increased energy and water use efficiency at processing plants
- improvements in technology
- new studies and research conducted by the industry, which has resulted in environmental improvements

This Industry Environmental Sustainability Review is the third in the series. It aims to quantitatively assess how the red meat industry has improved environmental performance in recent years, allow processors to assess how changed practices and facilities have resulted in better performance since the previous study, allow comparison against objective industry performance data and allow external stakeholders to objectively assess how the industry as a whole has improved and demonstrated continual improvement in environmental sustainability.

The performance of the industry is assessed against key performance indicators across several important areas of environmental sustainability described briefly in Table A.

Most KPIs are expressed in terms of the measured quantity per tonne Hot Standard Carcass Weight (HSCW), which is a measure of product weight for the RMP. The benefit of this measure is that it provides a measure largely independent of the type of animal processed. The main disadvantage is that it tends to penalise manufacturers working with light, or small animals, since the amount of resource consumed for some operations (e.g. energy and water used to sterilise a knife between bodies) may be similar irrespective of the body weight. For this reason, important KPIs are also expressed per animal (head).

Table A: Summary of RMP Key Performance Indicators

Issue	Description
Water	Water is primarily used to ensure food safety and hygiene during operations. Overall water consumption is reduced by recycle and reuse where permitted under stringent food safety restrictions.
Wastewater	Most wastewater generation results from sterilizing and washing processes, especially of equipment and the many valuable byproducts sourced from animals. Industry endeavours to minimise wastewater generation commensurate with product safety. Wastewater volumes are regulated by State EPAs in all cases.
Nutrients	Nutrients, such as nitrogen and phosphorus, are introduced to wastewater streams across all areas of meat processing. Wastewater treatment is effective in reducing the nutrient concentrations released to the fragile Australian environment. Many factories reuse their wastewater by irrigation on adjacent land where sustainable levels of nutrients help maintain land fertility. Where discharge to rivers or sewers occurs, more sophisticated treatment is used to lower nutrient levels to acceptable standard.
Energy	Refrigeration and production of steam and hot water are the major energy consuming activities in meat processing with lesser amounts used for lighting, motors and the like.
Global Warming	The Greenhouse gas emissions (in relation to the National Greenhouse Accounts Factors June 2008) are primarily related to: • on-site (Scope 1 emissions) • energy production and waste water treatment involving anaerobic pond treatment (Scope 1 emissions) • off-site (Scope 2 emissions). The KPI is expressed in terms of tonnes CO2 equivalents.
Solid Waste	Most solid waste from meat processing is organic in nature and is beneficially recycled by in-house rendering and independent compost producers. Small volumes of miscellaneous solid waste are sent to off-site landfill, which forms the primary KPI for solid waste.
Nuisance	Odour and noise are the most common complaints reported by the surrounding community and the reduction of these is crucial to being a good corporate neighbour.
Management	The overall site management score measures good environment management practice and is not to be confused with the KPIs above.

2.1 Site visits

The methodology to gather the site information and conduct site visits to assess current environmental performance is outlined below.

A questionnaire was developed to ensure that the assessment was conducted consistently across all the participating plants. Prior to the site visit, a site visit plan was prepared for each site indicating the tasks to be undertaken on site, personnel to be interviewed, documents to be reviewed and approximate time frame for each activity.

MLA invited 15 red meat processing sites to participate in the 2009 Environmental Sustainability Review. Australia has over 130 sites and it is infeasible to survey them all. Consequently, the invited sites were selected to:

- reflect the animal mix processed by the Australian industry at large
- focus on medium to large export processing facilities which process the majority of Australian red meat
- capture participation from the majority of the significant processing companies
- cover the geographic spread of RMP activities across Australia

Of the 15 invited sites, 14 voluntarily participated. Compared to the 10 sites involved in the 2003 EPR, the larger number of sites inspected resulted in greater integrity and reliability of the key performance indicator data. Where possible, the meat processors that participated in the 1998 and/or 2003 study were included as this gives a good picture of the real improvements that have been made.

One day was spent at each site and all site visits were undertaken by an experienced environmental auditor.

The participating sites comprised:

- three sites that had taken part in both previous Environmental Performance Reviews from 1998 and 2003, five sites from 2003 only, two sites from 1998 only and four new sites
- five sites in Queensland, three sites in NSW, three sites in Victoria, two sites in Western Australia, and one site in South Australia
- seven beef only sites, three sheep only, and four mixed
- eight sites classified as large and six as medium size[1]

Data for this ESR was collected over the financial year (FY) 2008–09 period to align with reporting periods for several Government Environmental reporting schemes such as NGERS and to avoid the period in late 2009 when severe wet weather caused major disruptions in animal supply to some major meat plants.

1 A 'large' plant is defined as processing over 600 head/day beef which equates to approximately 42,300 t HSCW/year

SECTION three

Water Usage

- 8,000ML of potable water consumed by red meat processing plants during the surveyed year.
- Increase in water efficiency across red meat processing plants.
- Raw water consumption reduced by 11% since 2003 to an average of 9.4kL/tonne hot standard carcass weight.
- A total of 900ML of treated wastewater recycled for non-potable uses in red meat processing plants.
- Extensive water recycling limited by stringent food export safety regulations.

3.1 Raw water usage

The Australian RMP industry is a significant consumer of water. Raw water is defined as water originating from either mains water, river, dam, etc. It does not include recycled or reused water.

Raw water usage for each of the sites is given in Figure 1 and summarised in Table 1. A comparison of the plant averages from 1998, 2003 and this study is given in Figure 2. The benchmark water usage has reduced significantly from both the 2003 and 1998 levels.

For the first time, an attempt has been made to differentiate water usage from beef only, sheep only and mixed plants. The results indicate that water use per tonne product is lower in beef plants, followed by sheep only plants and then mixed plants. Water usage per head was also calculated. Raw water usage per head increased from 2003. Beef only plants use significantly more water per head than sheep only plants due to higher weight per head.

There is a large variation in water usage across the sites. A similar variability was exhibited for the sites surveyed in the 2003 EPR. and relates in part to issues such as differences between sites in regard to amount of value adding performed, number and length of processing shifts, type of animal processed (within a species) and variances in processing equipment.

Figure 1: Raw water consumption

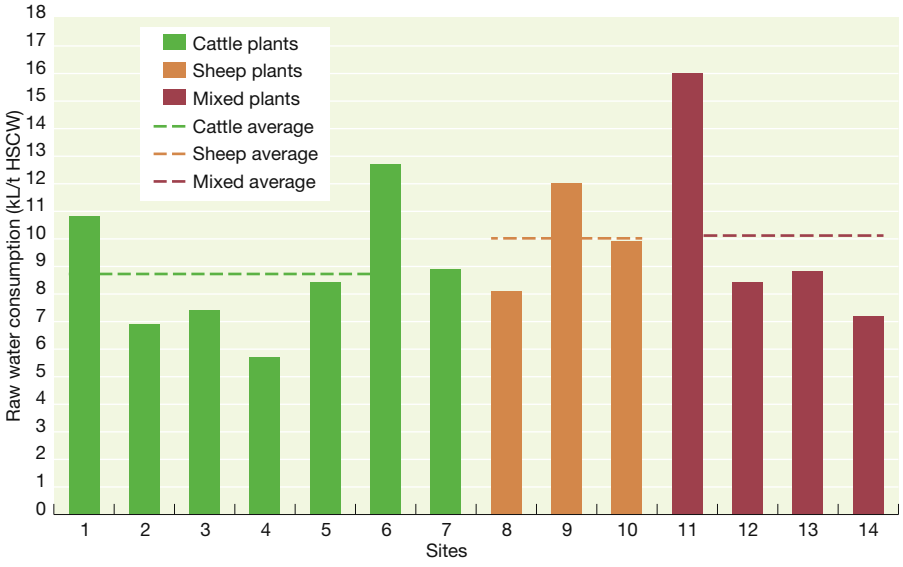
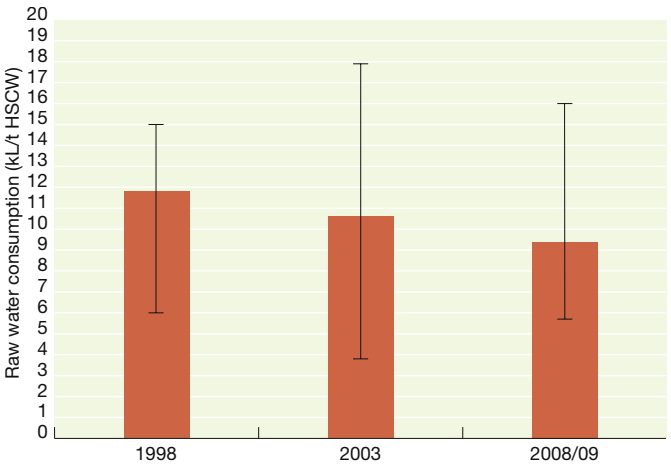


Table 1: Raw water usage

	Water usage (kL/tHSCW)			
	1998	2003	2008–09	Change
Plant average	11.8	10.6	9.4	11% reduction from 2003 20% reduction from 1998
Beef only (plant)	–	–	8.7	–
Sheep only (plant)	–	–	10.0	–
Mixed (plant)	–	–	10.1	–
Water reused*	–	–	0.5	–
Water recycled*	–	5.95	0.9	–
	Water usage (L/head)			
	1998	2003	2008–09	Change
Plant average	–	1,481	1,598	8% increase from 2003
Beef only	–	–	2,510	–
Sheep only	–	–	219	–

** Weighted average for the sites that recycled or reused water*

Figure 2: Comparison of raw water consumption for 1998, 2003 and 2008–09

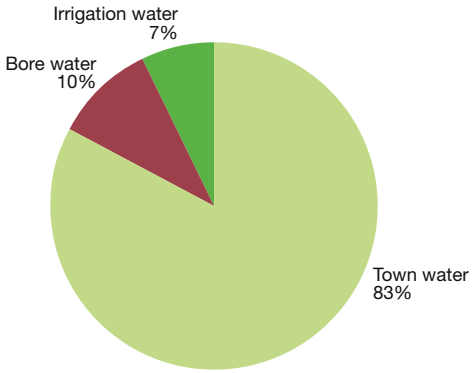


Sub-metering

A number of sites have employed sub-metering of water use around their sites to gain an appreciation of the water use intensive areas, to target water reduction and to track improvements. Six out of fourteen sites (43%) reported that they measured water usage at individual points of usage throughout the site. These included the boning room, slaughter floor, offal rooms, render plant, stockyards, carton sorting, tannery, boiler, refrigeration, condensers, processing, tripe area, and odour biofilter sprays. One site was reported to have 25 water sub-meters, with more planned.

In addition, water consumption is recorded for different shifts and during cleaning for some sites.

Figure 3: Water withdrawal by source



Water sources, recycling and reuse

Eight sites used town water exclusively, two sites used bore water exclusively, three sites used a combination of town and bore water and one site used water from an irrigation water supplier. No sites sourced water from local watercourses or onsite dams.

Total water consumption was approximately 8,000 ML/year from the sources shown in Figure 3. The total volume recycled amounted to 902 ML/y, from six sites. The total volume reused amounted to 167 ML/y, across three sites.

3.2 Recycled water

Eight sites reported that they recycled water. Recycled water is defined as wastewater which has been treated on site and is being returned for non-potable uses such as cattle wash, etc. Due to food safety requirements, a number of sites are unable to recycle water.

Recycled water (kL/tHSCW) appears to have decreased from that measured in 2003. However, a number of sites that recycled water in 2008–09 did not report the quantity, and/or was based on rough estimations only, not direct measurements, so a comparison with 2003 data is not valid.

3.3 Reused water

Five sites reported that they reused water. Reused water is defined as wastewater which is reused within the process before it is sent to treatment. Reuse amounted to 2% of total water usage for the participating sites. Since most water is consumed for food hygiene purposes, it is difficult to reuse large quantities of contaminated water within the meat facility.

All data on recycled water has not been captured and some is based on rough estimations only, not direct measurements. Reused water per tHSCW was not measured in 2003, so no comparisons can be made.

3.4 Participation in state-based water management programs

Seven out of fourteen sites (50%) have participated in state-based or local Council water management programs. General activities undertaken under the management programs include:

- conducting water balances and/or water usage trials
- developing and implementing water efficiency/ management plans
- becoming a member of the Australian Water Association
- participating in the Victorian EPA Environmental Resource Efficiency Program, NSW Sustainability Advantage program (resource efficiency module) and local Council Water Management Action Plans

Water saving initiatives

Extreme pressures on water supplies during the period since the 2003 EPR led to implementation of water saving initiatives by many participating sites. These included:

- reused water captured from sealing and cryovac machines throughout the plant
- reused water used for yards washdown, cattle pre-wash, truck washing and other non-potable applications
- installed sensors on hand wash stations and sterilisers
- hose nozzle size reduction (high pressure, low volume)
- condenser side stream filtration
- establishment of laundry on site
- recycling of viscera table water
- collect steriliser water, hand wash water and boot wash and reuse for washdown at rendering and wastewater treatment areas and other areas requiring non-potable washdown

SECTION four

Wastewater generation

- 7,400ML of wastewater emitted across the participating plants during the survey year.
- Wastewater generation reduced by 13% since 2003 to an average of 8.7kL/tonne hot standard carcass weight.
- 57% of wastewater generated was beneficially reused for irrigation.

The participating sites generated approximately 7,400 ML of wastewater and a plant average of 8.7 kL wastewater per tonne HSCW. Data for each of the sites is given in Figure 4 and summarised in Table 2.

There is a large variation in wastewater generation across the sites for the same reasons as for raw water consumption. A similar variability was exhibited for the sites surveyed in the 2003 EPR.

A comparison of the plant averages from 1998, 2003 and this study is given in Figure 5. There has been a significant 15% reduction in wastewater generation per tonne HSCW since the first review in 1998.

The average wastewater generation per tonne product for the beef only sites was lower than sheep only or mixed sites. However, wastewater generation for beef only sites varied between 4.2 kL/HSCW and 13.1 kL/HSCW.

Wastewater generation was approximately 92% of the raw water usage.

Figure 4: Wastewater generation

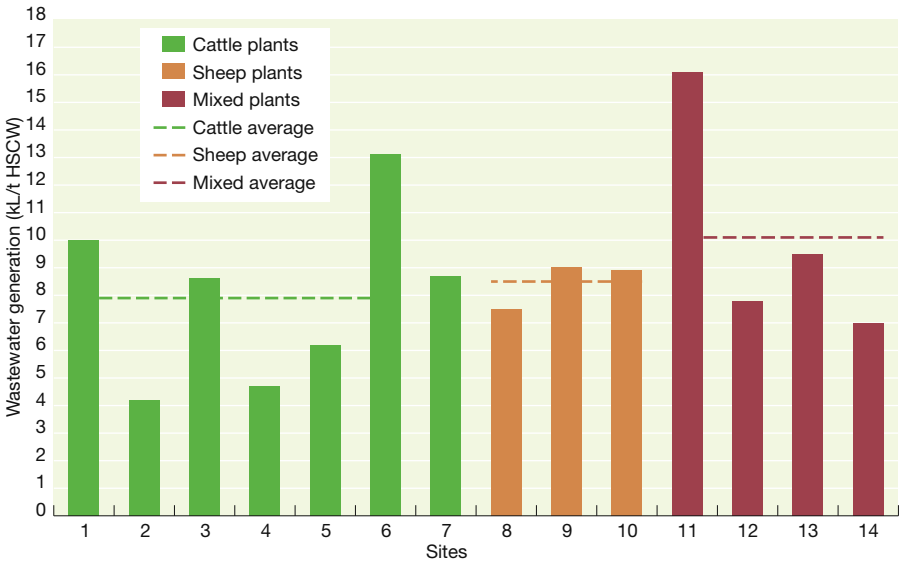
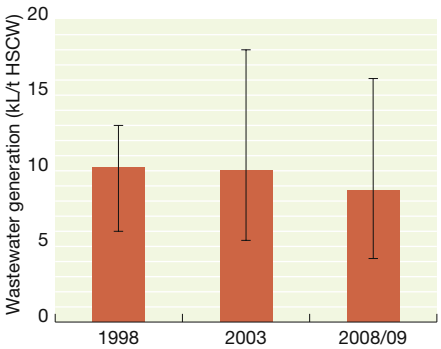


Table 2: Wastewater generation

	Wastewater generation (kL/tHSCW)			
	1998	2003	2008–09	Change
Plant average	10.2	10.0	8.7	15% reduction from 1998 13% reduction since 2003
Beef only	–	–	7.9	–
Sheep only	–	–	8.5	–
Mixed	–	–	10.1	–
	Wastewater generation (L/head)			
	1998	**2003**	**2008–09**	**Change**
Plant average	–	1,397	1,484	6% increase from 2003
Beef only	–	–	2,291	–
Sheep only	–	–	186	–

Figure 5: Comparison of wastewater generation for 1998, 2003 and 2009



SECTION five

Nutrient Releases

- 1,700 tonne of nitrogen and 310 tonne phosphorus generated per year in raw wastewater prior to treatment across participating plants.
- Nitrogen emissions in treated wastewater were 1.5kg/tonne hot standard carcase weight.
- Phosphorus emissions in treated wasterwater were 0.23kg/tonne hot standard carcase weight.
- Nitrogen loads discharged reduced by 25% since 2003 due to improved treatment methods.
- Phosphorus loads discharged reduced by 32% since 2003 due to improved treatment methods.

Red meat processing sites discharge wastewater to a variety of final destinations. For participating sites, five discharge direct to sewer, eight discharge to a land irrigation system, and one site discharges to a river (Figure 6). The degree to which the effluent must be treated depends on the receiving environment.

5.1 Nutrient releases, raw

Raw wastewater nutrient releases are shown in Table 3. Raw wastewater is defined as wastewater after primary treatment (screening, savealls, dissolved air flotation) but prior to biological treatment.

This key performance indicator measures the adoption of cleaner production and other waste prevention technologies and practices in the factory in reducing the emission of nutrients into the wastewater stream. This is the first time that raw wastewater nutrient releases have been reported in the ESR.

Figure 6: Wastewater discharge destinations

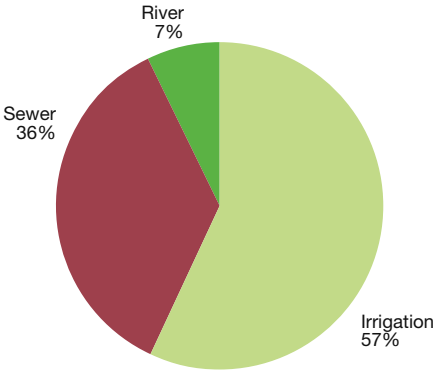


Table 3: Nutrient releases

	Wastewater nutrient releases (kg/tHSCW)		
	1998	2003	2008–09
Raw – Phosphorus	–	–	0.33[b]
Raw – Nitrogen	–	–	1.83[a]
Raw – BOD	–	–	31[c]
Raw – O&G	–	–	12.0[b]
	Wastewater nutrient releases 2008–09(mg/L)		
	1998	2003	2008–09
Raw – Phosphorus	11	77	42[b]
Raw – Nitrogen	33	600	233[a]
Raw – BOD	639	9,045	3,707[c]
Raw – O&G	10	5,979	1,593[b]

Note: a – from 10 sites b – from 11 sites c – from 12 sites

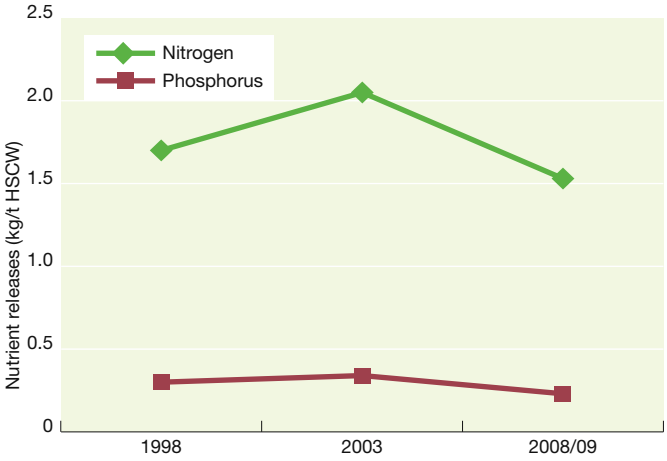
5.2 Nutrient releases, treated

Treated wastewater nutrient releases are also shown in Table 3 and Figure 7. Whereas sites discharging to river and/or sewer need sophisticated treatment systems to reduce nutrient concentrations to meet relatively stringent conditions, sites which apply effluent to land by irrigation obtain a superior sustainability outcome by not removing all the nutrients present in the final irrigated water, since these are beneficial to land fertility at appropriate levels.

The treated wastewater concentrations for phosphorus are unchanged from 2003 levels and nitrogen concentrations have increased. However, the total wastewater nutrient releases to irrigation have reduced significantly from 2003 levels: 32% reduction in phosphorus load; and 25% reduction in nitrogen load.

Comparing raw and treated wastewater nutrient releases, on average, 30% of phosphorus and 16% of nitrogen is removed across the biological treatment system.

Figure 7: Comparison of phosphorus and nitrogen in treated wastewater for 1998, 2003 and 2008–09



SECTION SIX

Energy Usage

- 3.4million Gigajules of electrical and thermal energy emitted during the survey across the participating plants.
- Average of 4,108MJ/tonne hot standard carcase weight of electrical and thermal energy emitted.
- Energy consumption per tonne hot standard carcase weight increased 17.5% since 2003.
- Grid electricity accounted for 31.6% of total energy consumption, natural gas (37%) and coal (19%) accounted for the majority of the remaining consumption.
- One project resulted in a site reducing energy consumtion by 5.3%.

6.1 Total energy usage

Energy usage expressed as MJ per tonne meat product (HSCW) for each of the sites is given in Figure 8 and summarised in Table 4.

A comparison of the plant averages from 1998, 2003 and this study is given in Figure 9.

The plant average for the beef only and mixed sites were similar, however, the average for sheep only sites were significantly higher than the beef or mixed sites.

Energy usage per tonne meat product has increased by around 18% since 2003 levels. The inclusion of additional energy sources may go some way to explain the increase in the total energy usage. Additional energy sources included are energy for vehicles, and some minor stationary energy sources (LPG, diesel, fuel oil, petrol, etc) which contribute to 8.6% of the total energy use. Value added meat processing facilities, which are energy intensive, have been installed at some sites. Not all significant data was reported in the 2003 study, including a major use of fuel oil at one site.

Figure 8: Energy consumption

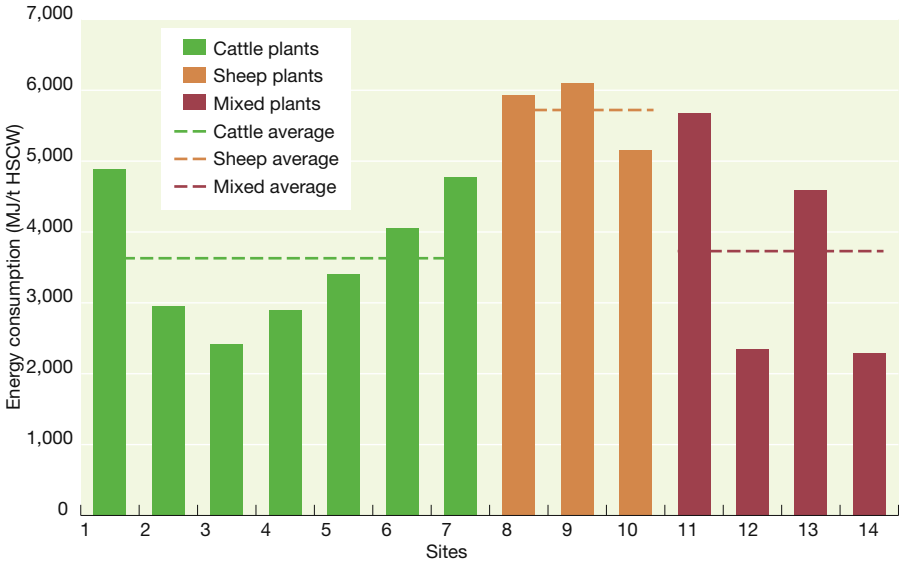


Table 4: Energy usage

	Energy usage (MJ/tHSCW)		
	1998	2003	2008–09
Plant average	3,411	3,389	4,108
Beef only	–	–	3,629
Sheep only	–	–	5,729
Mixed	–	–	3,730
	Energy usage (MJ/head)		
	1998	**2003**	**2008–09**
Plant average	–	463	666
Beef only	–	–	1,056
Sheep only	–	–	125

Energy Usage

There is a large variation in energy usage across the sites. This is due to factors such as variations in refrigerated product mix.

A similar variability was exhibited for the sites surveyed in the 2003 EPR.

6.2 Split of energy into electricity and other thermal energy

The majority of energy used is derived from electrical energy, natural gas and coal. These three energy sources account for 84.6% of total energy used in MJ across the 14 sites, as shown Figure 10.

Figure 9: Comparison of energy consumption for 1998, 2003 and 2008–09

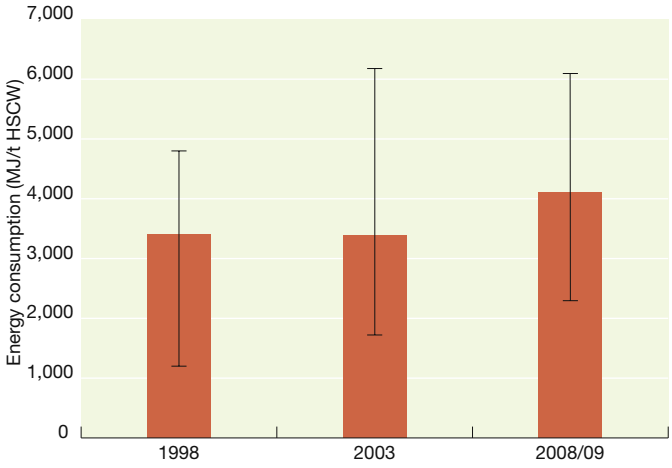
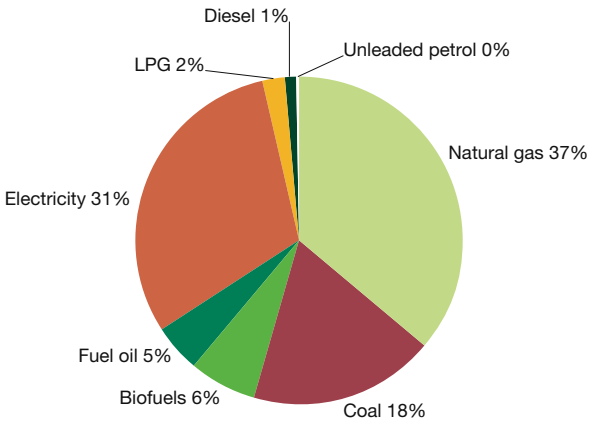


Figure 10: Industry spilt of energy by source



Note: a – Biofuels: wood waste and macadamia nut shells
b – LPG: includes butane used at one site

Energy saved due to conservation and efficiency improvements

The following energy savings were reported by individual participating sites.

- Flash steam recovery project on boiler resulted in a savings of 16,866 GJ/yr (equivalent to 5.3% of the plant's energy usage).
- A reduction in hot water temperature resulted in a savings of 3,335 GJ/yr (equivalent to 1.1% of the plant's energy usage).
- Variable speed drives installed on motors resulted in a savings of 340 MWh/yr (equivalent to 0.4% of the plant's energy usage.
- An Energy Efficiency Opportunity identified a potential reduction of 403 GJ/yr (equivalent to 0.1% of the plant's energy usage).

Total energy savings across the four projects amounted to 93 MJ/ t HSCW (equivalent to 2.2% energy savings from each site). Large energy saving projects were not identified.

Initiatives to reduce energy

Other initiatives to improve energy efficiency and/or reduce energy requirements included:

- power Factor correction installed at a number of sites
- installation of ceiling fans and wall liners in freezer rooms
- introduction of cogeneration plant
- energy audit of sites to identify opportunities for reduction
- installation of high efficiency motors

No sites reported generating electricity from on-site waste methane, solar generation or other renewable energy sources.

Greenhouse Gas Emissions

- 512,000 tonnes CO_2-e emitted during the survey year across participating plants.
- Average emissions of 554kg CO_2-e/tonne hot standard carcase weight.
- Electrical and thermal energy emissions per tonne hot standard carcase weight reduced by 12.2% since 2003.
- 67% of total energy emissions related to electricity use.
- 35% of Scope 1 emissions were contributed by anaerobic wastewater treatment on average.

7.1 Greenhouse gas emissions

Greenhouse gas emissions for each of the sites is given in Figure 11 and summarised in Table 5.

The federal government introduced mandatory National Greenhouse and Energy Reporting of greenhouse gas emissions in 2008–09 for sites that exceeded certain thresholds. The thresholds for 2008–09 were:

- 25kt CO_2-e emissions or 100 TJ energy use for individual facilities
- 125kt CO_2-e emissions or 500 TJ energy use for corporate groups.

Only sites that exceeded a nominated threshold were required to participate in the National Greenhouse and Energy Reporting (NGER) scheme. Twelve of the participating sites from this study reached this threshold, of the two sites that were not required to participate in the NGER scheme, one did not provide any data on greenhouse gas emissions.

Greenhouse gas emissions were 6% higher than calculated in 2003. The results for 2003 and 2008–09 cannot be directly compared as different greenhouse gas emission sources have been included. Also, the variability in GHG emissions intensity between sites depends on the fuel type used, the state-based electricity emission factors, as well as the product mix.

Figure 11: Greenhouse gas emissions

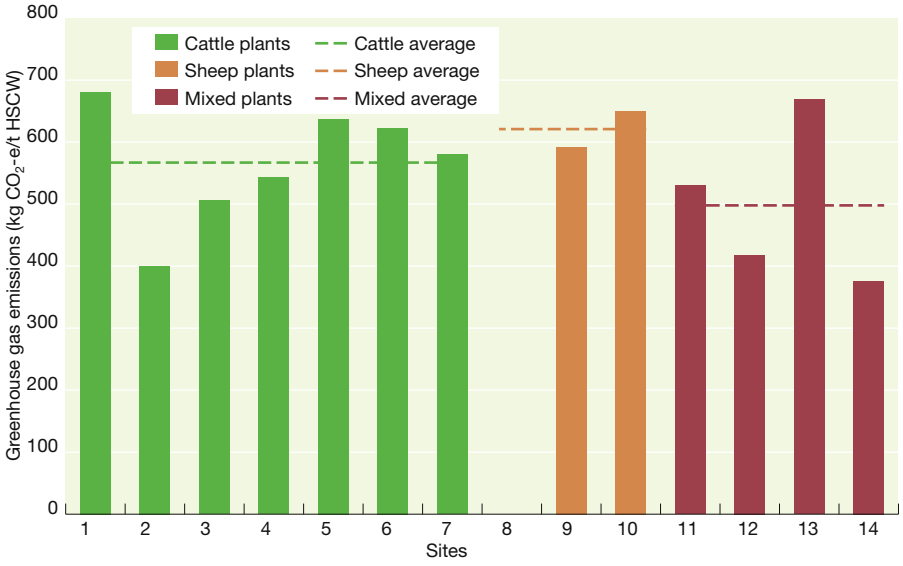


Table 5: Greenhouse gas emissions

	Greenhouse gas emissions (kg CO_2-e /tHSCW)		
	1998	2003	2008–09
Plant average	–	525[a]	554[b]
Beef only	–	–	567
Sheep only	–	–	621
Mixed	–	–	498
	Greenhouse gas emissions (kg CO_2-e /head)		
	1998	2003	2008–09
Plant average	–	76	104
Beef only	–	–	165
Sheep only	–	–	14

Note: a – Emissions from wastewater were not included
b – Includes emissions from wastewater. GHG emissions, excluding wastewater emissions were 461 kg CO2-e /tHSCW.

7.2 Split of GHG emissions into emissions from electricity and other thermal energy

The greenhouse gas emissions by energy source are shown in Table 6 and Figure 12. The greenhouse gas emissions factors have been taken from the National Greenhouse Accounts Factors June 2008 which was applicable for the 2008–09 financial year. Only Scope 1 and Scope 2 emissions have been included.

The greenhouse split can be compared to the energy split reported in Table 5. The majority of greenhouse emissions are from electrical energy consumption which accounts for 66.6% of total emissions across the 14 sites. However, electricity provided only 31.6% of the total energy consumed across the 14 sites. This is because electricity (produced from the combustion of coal) is more greenhouse gas emissions-intensive (ie produces more CO_2-e per unit of energy) than natural gas or other fuel sources.

Biofuels (in this case wood waste and macadamia nut shells) are considered to be close to zero emission sources as it is assumed that the biofuels are derived from renewable sources[2] and are thus assigned an emission factor close to zero.

Of the participating sites, no sites reported purchasing of Green Power or electricity from renewable sources to reduce the greenhouse intensity of purchased energy.

A number of sites reported on energy reduction initiatives, which would have subsequent greenhouse gas emissions reductions. No sites reported on other initiatives specifically to reduce greenhouse gas emissions.

Figure 12: Industry greenhouse gas emissions by energy source

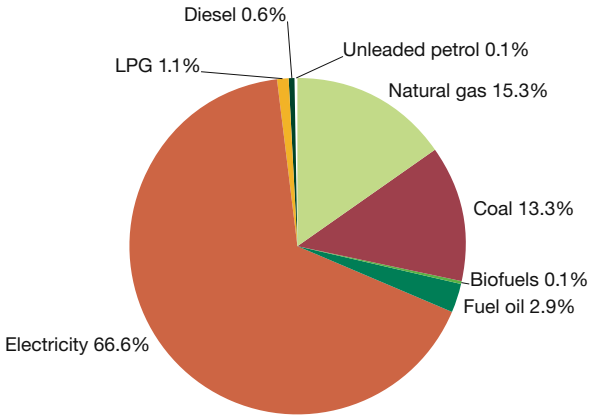


Table 6: Greenhouse gas emissions by energy source

Energy source	Total energy usage (TJ)	GHG emissions (t CO_2-e)	Greenhouse split (%)
Thermal			
Natural gas	1,249	64,122	15.3
Coal	630	55,755	13.3
Biofuels[b]	223	402	0.1
Fuel oil	167	12,196	2.9
Electricity			
Grid electricity	1,043	278,907	66.6
Transport			
Diesel	36	2,583	0.6
Unleaded petrol	6	396	0.1
LPG[a]	77	4,705	1.1
Total	**3,433**	**419,067**	**100**

Note: a – includes butane used at one site
b – wood waste and macadamia nut shells

2 The source of the wood waste was not verified during the EPR as being from renewable sources.

SECTION eight

Solid Waste

- 85% of organic waste solids recycled.
- 11.3kg/tonne hot standard carcase weight of solid waste sent to landfill.
- 57% reduction in waste solids sent to landfill since 2003.

The majority of waste solids generated by RMP factories are organic in nature and are gainfully recycled. Waste meat scraps and bones are rendered into tallow and meat and bone meals. Other organic solids, especially large quantities of partially digested contents of animal stomachs, or biological treatment sludges are recycled by composting or used for mine site rehabilitation.

The primary environmental concern with waste solids from meat processing plants concerns the miscellaneous solids that must be landfilled.

Available solid waste data indicated that solid waste sent to landfill was 11.3kg/t HSCW compared to 26.7kg/t HSCW in 2003. The values ranged from 2–50kg/t HSCW. A comparison of the plant averages from 1998, 2003 and this study is given in Figure 13.

The data reported from the majority of the sites is not complete or accurate. Most of the data is not measured and is estimated from a number of waste bins times the frequency of removal. The unrecorded fullness of the bin at emptying and the estimated bulk density of the waste add to the inaccuracy of the estimation. Many sites did not (and could not) provide an estimation of the quantity of different waste types produced, recycled and disposed of to landfill. Recycled wastes are often taken off site by a third party and records are not kept by the plant.

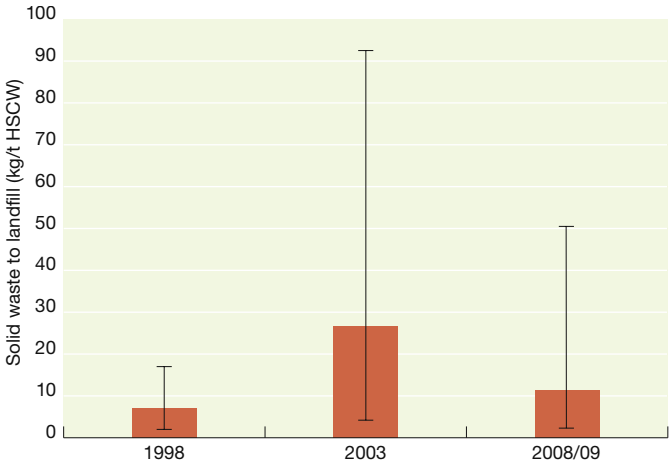
Eight sites had data on recycling of organic waste, which totalled 62.8Mt/a, with an average organic waste diversion rate of 85%.

Six sites reported recycling of paper and cardboard wastes, with an average recycling rate of 79%.

Data was not available on recycling of plastics. Quantities of other non-organic wastes that were recycled were recorded for one site (number of batteries, number of fluorescent tubes, waste oil).

One site was a signatory to the National Packaging Covenant.

Figure 13: Comparison of solid waste sent to landfill for 1998, 2003 and 2008–09



Solid waste

Solid wastes reported as being recycled include:	
Non-organic	*Organic*
• boiler ash	• cardboard and paper
• fluorescent tubes	• paunch solids
• waste oil	
• batteries	
• plastic	

SECTION nine

Air and noise emissions

- Average of 2.2 odour complaints per plant during the survey year.
- Odour identified by the majority of plants as a significant community issue.
- Average of 0.26 noise complaints per plant during the survey year.

9.1 Odour complaints

The number of complaints, averaged over the last three years, was 4.7 per plant per year. The results are skewed by one plant that, as a matter of policy, records all enquiries as complaints (that is, even if the odour cannot be ultimately attributable to the site, it is still recorded as a complaint). Removing this outlier, reduces the average number of complaints per plant to 2.2. It was noted that three sites recorded no complaints in the last three years.

In 2003, the odour benchmark was reported as number of complaints, averaged over three years/ kt HSCW. Complaints are not related to production capacity, but to the processes occurring on site, odour control/removal equipment, weather conditions (temperature and wind direction) and the proximity of sensitive receptors. For comparative purposes only, the average number of complaints in 2003 was 0.1 complaints/kt HSCW compared with 0.06 complaints/kt HSCW in 2008–09.

The majority of sites (10 out of 14 or 71%) reported that odour was a perceived issue with the local community or regulator. There is a link between the number of complaints per year and the type of land use that is closest to the plant. More complaints were made at plants that were closest to residential areas, followed by commercial/industrial areas and then rural areas (Table 7).

Seven sites have undertaken odour dispersion modelling to better understand the impacts from their sites. Twelve sites reported having a formal odour complaints register.

Odour abatement technologies installed or practices included:

- biofilters
- ozone odour destruction
- adsorption technologies
- afterburners, with temperature > 760°C
- enclosure of equipment (eg: rotary drum filter)

Table 7: Complaints by land use

Most sensitive receptor < 500 m	Average complaints per site per year
Residential	6.7 (2.6)*
Commercial/Industrial	1.3
Rural	0.9

** 2.6 with outlier removed*

Source of odour complaints

The most common sources of odour complaints were:

- wastewater treatment areas, particularly wastewater ponds
- irrigation area
- rendering and by-products plants
- truck deliveries for rendering
- animal urine and faeces

9.2 SO_x and NO_x

Reporting of oxides of sulfur (SO_x) and oxides of nitrogen (NO_x) was not consistent across the sites. In some cases, NO_x was estimated, but SO_x was not. In most cases, SO_x and NO_x were not measured, but estimated using default factors such as those from the National Pollutant Inventory manuals.

Total estimated SO_x from nine sites that reported amount to 6,800 tonne/year. SO_x emissions were on average 15g/tonne HSCW, with a range of 1–58g/tonne HSCW.

Total estimated NO_x from eleven sites that reported amount to 105,000 tonne/year. NO_x emissions were on average 210g/tonne HSCW, with a range of 20–620g/tonne HSCW.

Due to the different fuel types used on site (coal, diesel, natural gas, LPG) and different boilers, it is not sensible to provide a comparison between sites.

Air and noise emissions

9.3 Noise Complaints

The number of noise complaints, averaged over three years was 0.26 per plant per year.

In 2003, the noise benchmark was reported as number of complaints, averaged over three years/kt HSCW. Complaints are not related to production capacity, but to the processes occurring on site, noise control/removal equipment and the proximity of sensitive receptors. For comparative purposes only, the average number of complaints in 2003 was 0.2 complaints/kt HSCW compared to 0.003 in 2008–09.

Only four sites reported that noise was a perceived issue with the local community or regulator. Two of these sites have conducted noise modelling to better understand the impacts from their sites.

Ten sites reported having a formal noise complaints register. The most common sources of noise complaints were:

- boiler steam blowdown
- bellowing cattle
- gunshots
- air curtains

Noise abatement technologies installed included:

- noise walls and barriers
- acoustic housing of noise sources

10.1 Site management performance (%)

The overall environmental management performance of each of the sites is shown in Figure 14. This was determined as the total score divided by the total maximum score. Scoring was assessed across eight environmental management areas including:

- general environmental
- energy
- wastewater
- irrigation
- solid waste
- noise
- air emissions
- community relations

The scoring for previous EPRs was that a low score indicated good environmental management and a high score indicated poor environmental management. This scoring system is counter intuitive. For this audit, the scoring has been inversed so that a high score indicates good environmental performance. The scores from previous audits have been inversed to provide a comparison of the plant averages from 1998, 2003 and this study (Figure 15).

The overall site performances were between 40% (site 10) and 87% (site 4). The average of the 14 sites was 66% which indicates a significant improvement from 2003 and 1998. All 14 sites in this study were above the average in 2003 and 13 sites were above the 1998 average. This suggests that there has been an overall improvement in environmental management.

Figure 14: Overall plant performance

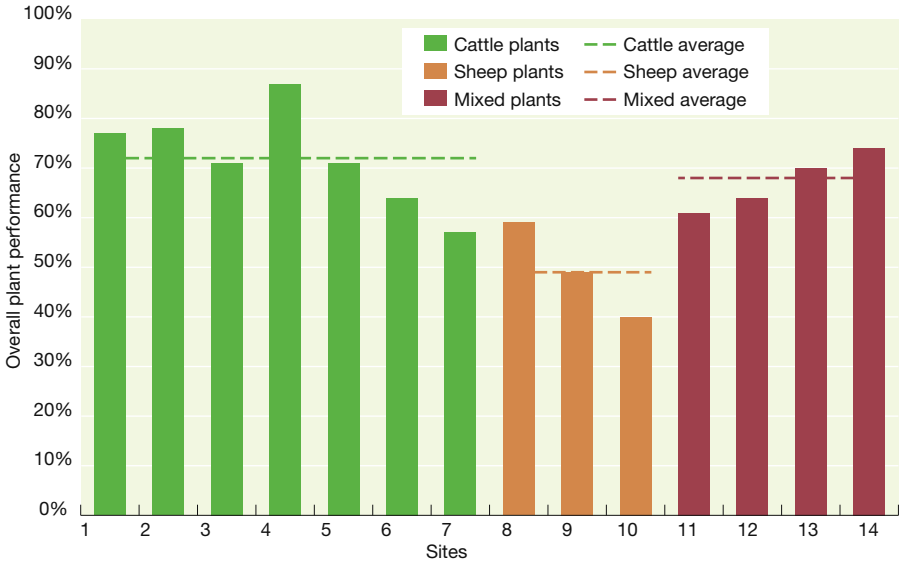
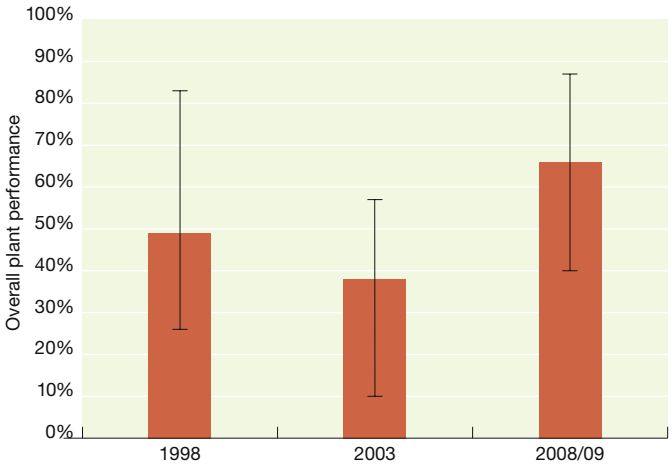


Figure 15: Comparison of overall plant performance for 1998, 2003 and 2009



Conclusions

A summary of environmental performance for 2008–09 is shown in Table 8 below. For comparison, plant averages for 1998 and 2003 are also shown. The highlighted data indicates where performance has improved since 2003.

Table 8: KPI Performance Improvement

Environmental area	KPI	Units	Year		
			1998	2003	2008–09
Water	Raw water usage	kL/tHSCW	11.8	10.6	9.4
		L/head	–	1,481	1,598
	Wastewater generation	kL/tHSCW	10.2	10.0	8.7
		L/head	–	1,397	1,484
Wastewater loads	Phosphorus – treated	kg/tHSCW	0.3	0.34	0.23
	Nitrogen – treated	kg/tHSCW	1.7	2.05	1.53
	Phosphorus – untreated	kg/tHSCW	–	–	0.33
	Nitrogen – untreated	kg/tHSCW	–	–	1.83
	BOD – untreated	kg/tHSCW	–	–	31
	O&G – untreated	kg/tHSCW	–	–	12
Energy	Energy usage	MJ/tHSCW	3,411	3,389	4,108
		MJ/head	–	463	666
	Energy saved	MJ/tHSCW	–	–	93
		% per site	–	–	2.2
Greenhouse	Greenhouse gas emissions	kg CO_2-e/tHSCW	–	525	554
		kg CO_2-e/head	–	76	104
Solid waste	Solid waste to landfill	kg/tHSCW	7	26.7	11.3
		kg/head	–	1.6	ND
Complaints	Odour complaints	Complaints/ktHSCW	1	0.1	0.06
		Complaints/site	–	–	4.7
	Noise complaints	Complaints/ktHSCW	1	0.2	0.003
		Complaints/site	–	–	0.26
Overall site performance	**Overall site performance**	**%**	**49**	**38**	**66**

ND = No/insufficient data

Further information on the red meat industry and environmental best practice guidelines can be accessed at www.redmeatinnovation.com.au.

The guidelines provide an overview of the red meat processing sector and guidelines on energy, wastewater, waste solids, odour and effluent irrigation.

appendix a

Glossary	
Industry average	Weighted average ie total energy consumption at all sites/total tHSCW for all sites
Large plant	A 'large' plant is defined as processing over 600 head/day beef which equates to approximately 42,300 t HSCW/year. Note that this is not an official threshold, but is used internally by MLA.
Mixed plant	A mixed plant processes both large and small animals, such as cattle and sheep.
Plant average	A numerical average of all sites
Recycled water	Wastewater which has been treated on site and is being returned for non-potable uses such as cattle wash, etc.
Reused water	Wastewater which is reused within the process before it is sent to treatment.
Scope 1 emissions	Greenhouse gas emissions created directly by a person or business from sources that are owned or controlled by that person or business. This includes emissions from the combustion of fuels such as natural gas, coal, diesel etc. Scope 1 emissions also include fugitive emissions such as those created during wastewater treatment.
Scope 2 emissions	Greenhouse gas emissions created as a result of the generation of electricity, heating, cooling or steam that is purchased and consumed by a person or business. These are indirect emissions as they arise from sources that are not owned or controlled by the person or business who consumes the electricity.
Scope 3 emissions	Greenhouse gas emissions that are generated in the wider economy as a consequence of a person or business's activities. These are indirect emissions as they arise from sources that are not owned or controlled by that person or business but they exclude Scope 2. No sites reported on Scope 3 emissions.

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