PROTEN ANNUAL MONITORING 2020

Odour measurement report

Prepared for:

ProTen Pty Ltd
PO Box 1746
NORTH SYDNEY NSW 2059

SLR Ref: 675.11525-R03
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PREPARED BY

SLR Consulting Australia Pty Ltd
ABN 29 001 584 612
Ground Floor, 503 Murray Street
Perth WA 6000 Australia

T: +61 8 9422 5900
E: perth@slrconsulting.com www.slrconsulting.com

BASIS OF REPORT

This report has been prepared by SLR Consulting Australia Pty Ltd (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with ProTen Pty Ltd (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of the Client. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR.

SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

DOCUMENT CONTROL

Reference	Date	Prepared	Checked	Authorised
675.11525-R03-v1.0	28 April 2020	G Starke	G Starke/E Bath	G Starke

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1 Introduction

ProTen Pty Ltd (ProTen) obtained Development Approval PO 2435/02 in 2007 for 16 poultry sheds and associated infrastructure on Lot 701, Henderson Road, Hopeland, Western Australia (WA) from the Serpentine Jarrahdale Shire (the Shire). The development is known as the Henderson Poultry Broiler Production Farm (Henderson) and has been in operation since December 2008.

SLR Consulting Australia Pty Ltd (SLR) was engaged by ProTen to undertake the annual odour assessment for the poultry farm to determine compliance with Condition 35 of the approval.

Condition 35 states "*Odour emissions from the development shall not exceed those assumed in the report entitled ProTen Ltd - Report for Lot 701 Henderson Road Development Application - Odour and Dust Report (the odour modelling report) prepared by GHD, dated April 2007".*

Refer to **Section 4** for further details on the Shire's requirements.

This report details the methodology and results of the odour monitoring conducted on 12 February 2020 at Lot 701, Henderson Road, Hopeland (hereafter, referred to as "the Project Site").

2 Project Setting

2.1 Site Location

The Project Site is located approximately 50 kilometres (km) south-southeast of Perth. The poultry farm comprises two blocks of sheds, separated by approximately 400 metres (m) (Block A – northern end and Block B – southern end). There are eight sheds to each block.

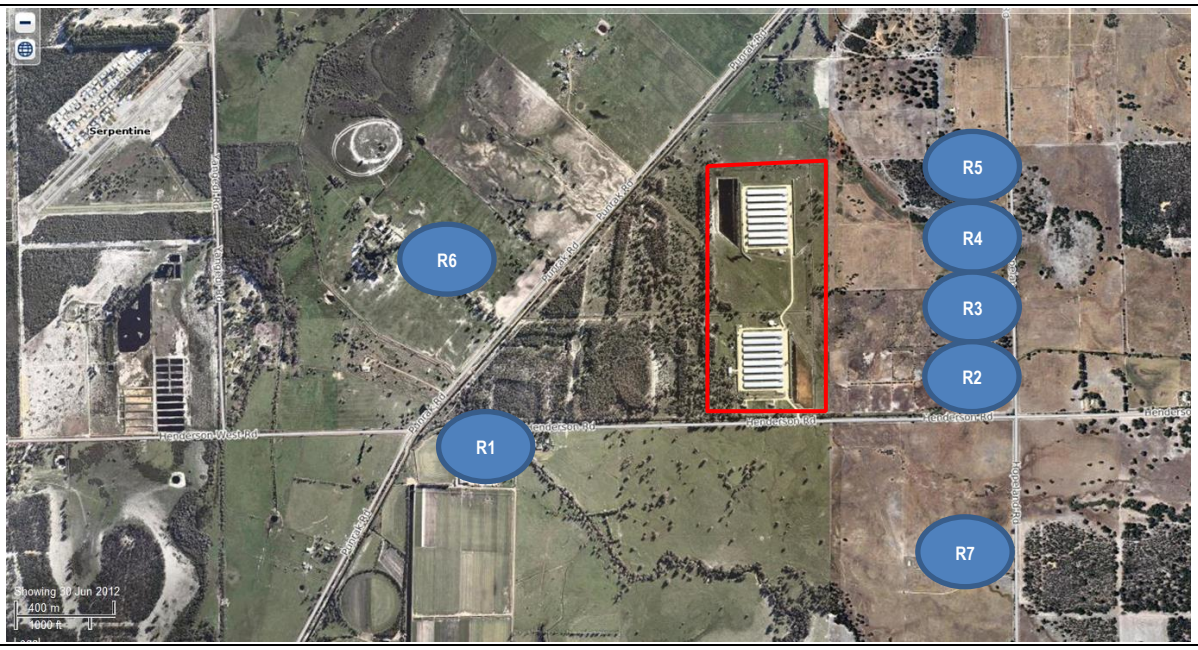
Surrounding land use is primarily rural and comprises rural-residential holdings and agricultural activities including poultry operations to the east and north and a piggery to the east. The nearest township is Serpentine, situated approximately 8 km to the northeast of the Project Site.

Figure 1 illustrates the regional setting of the Project Site, whilst **Figure 2** illustrates the local setting of the Project Site, also identifying the nearest residential receivers.

Figure 1 Regional Setting

Source: Nearmaps

Figure 2 Local Setting



Source: Nearmaps

2.2 Nearest Receivers

A number of sensitive receivers are situated in the area surrounding the Project Site (refer **Figure 2**). A list of the nearest sensitive receivers (R1 to R7) identified in the immediate vicinity of the Project Site and their respective distances are listed in **Table 1**.

Table 1 Surrounding Sensitive Receptor Locations

Receptor Identification	UTM Zone	Northing (m, UTM)	Easting (m, UTM)	Distance (km) / Direction From Project Site
R1	50 H	395,618	6,414,004	0.8 / West southwest
R2	50 H	397,420	6,414,518	0.85 / East
R3	50 H	397,407	6,414,909	0.82 / East
R4	50 H	397,262	6,415,189	0.69 / Northeast
R5	50 H	397,362	6,415,862	1.1 / Northeast
R6	50 H	394,931	6,414,863	1.5 / West
R7	50 H	397,411	6,413,381	1.1 / South-east

Key:
km kilometres
m meters

3 Poultry Farm Operations

3.1 Overview

Henderson comprises two locations developed as poultry production units (PPUs) where broiler birds are grown for human consumption. **Table 2** contains a summary of some of the key elements of the poultry development.

Table 2 Summary of Poultry Development

Development Characteristic	Proposed Development
Purpose	Birds grown for human consumption
Number of PPUs	2
Number of poultry sheds per PPU	8
Type of poultry sheds	Tunnel-ventilated, fully-enclosed, climate-controlled
Maximum PPU population	480,000 birds
Maximum development population	960,000 birds
Maximum bird density within sheds	Approved 40 kilograms per square metre (kg/m^2) Operate at RSPCA 34 kilograms per square metre (kg/m^2)
Hours of operation	24 hours a day, 7 days a week
Production cycle length	Approximately 9 weeks, comprising a maximum bird occupation of 8 weeks and a cleaning phase of 1 week
Number of production cycles per year	On average, approximately 5.7
Purpose	Birds grown for human consumption
Number of PPUs	2

Each PPU comprises 8 tunnel-ventilated fully-enclosed climate-controlled poultry sheds, with associated support infrastructure and staff amenities. Each shed has the capacity to house a maximum of 60,000 broilers at any one time, equating to a PPU population of up to 480,000 broilers and a total development population of up to 960,000 million broilers.

The PPU sites are relatively small and the commercial activity associated with the development is largely confined to these areas.

3.2 Hours of Operation

While the poultry development operates 24 hours a day, seven days a week, the majority of activity is carried out between 7.00 am and 7.00 pm. For reasons of livestock welfare, as the birds reach their desired slaughter weight they are typically removed from the sheds and transported from the site between 10.00 pm and 08:00 am when it is cooler and the birds are more settled.

3.3 Poultry Sheds

The poultry sheds have a steel framework, zincalume corrugated iron roofs and coolroom sandwich panel walls (two metal faces with a fully insulted core). The sheds have fully-sealed concrete flooring and are surrounded by a dwarf concrete bund wall to prevent rainwater and runoff entering the sheds and to allow for the controlled discharge of wash down water from the sheds.

Feed and water lines run the length of each poultry shed and are automatically supplied by external silos and water storage tanks. Feed pans and water nipple drinkers (with drip cups) are spaced along these lines at regular intervals so the birds are never more than a few metres from food and water.

The sheds are fully-enclosed climate-controlled and tunnel-ventilated. On each shed, air extraction fans mounted at one end uniformly draw air into the shed through mini-vents along the sides of the shed and later in the growing cycle across cooling pads and through tunnel vents. The air is pulled over the chickens and exhausted through the extraction fans. Temperature sensors within the sheds allow the ventilation to be adjusted as required. Heating, when required, is provided by wall mounted gas heaters.

Tunnel ventilation enables the grower to provide close to optimum conditions for bird comfort, health, growth and performance throughout the year. Additional benefits include control over shed moisture, which is directly related to odour emissions and reduced consumption of power and water.

Additional shed features include front and rear access, external lighting over the loading-unloading, and fully computer controlled and alarm monitored.

3.4 Production Cycle

The cycle of a broiler production farm typically lasts about 9 weeks, with a maximum bird occupation of 8 weeks and a 'down-time' of close to 1 week for cleaning in preparation for the next batch of birds. In summary, the cycle of the PPUs typically comprises the following steps:

1. **Delivery of Bedding Material -** fresh bedding material, such as soft wood shavings, rice hulls or chopped straw, is delivered to the site and spread over the floor of the poultry sheds.
2. **Delivery of Chicks -** day-old chicks are transported to the development site in ventilated chick boxes in air-conditioned rigid trucks. On arrival, the day-old chicks are placed onto the floors of the sheds, where they are initially confined to a smaller area within the shed (the 'brooding area') and given supplementary heating from gas heaters.
3. **Chick Nurturing -** chicks are nurtured and grown within the sheds, with their period of service depending on the live-weight of the birds. The desired processing age is primarily determined by customer weight specifications, but is normally achieved between 5 and 8 weeks of age.
4. **Removal of Birds -** as birds reach their desired slaughter weight, they are removed from the sheds and transported to a processing complex in plastic crates designed for good ventilation and bird welfare. Shed thinning (partial depopulation) occurs at various times during the production cycle depending on the live-weight of the birds. Chickens are typically be harvested between 12.00 am and 12.00 pm when the air is cooler and the birds are more settled.
5. **Removal of Poultry Litter -** when all birds have been removed, after about 8 weeks, the spent bedding material (poultry litter) is removed from the sheds and transported off-site for disposal or re-use.
6. **Cleanout –** the poultry sheds are cleaned and sanitised to reduce the risk of pathogens and disease using high pressure water in preparation for the next batch of chicks. Additional activities include scrubbing feed pans, cleaning out water lines, cleaning the feed silos and scrubbing fan blades and other equipment.

The maximum broiler density for tunnel ventilated sheds is typically 0.051 square metres (m^2) of floor space per bird. Broiler 'pick-ups' (shed thinning or depopulation) are in most instances governed by the further limiting factor of a maximum of up to 34 kilograms of live-weight per square metre (kg/m^2)[1] of floor area.

On this basis, the first round of shed thinning/de-populating typically commences around day 32 of bird occupation. Shed thinning typically occurs on another two occasions, these being at around day 40 and day 45, with the final bird collection at around day 56.

[1] Henderson is approved for 40 kg/m^2 bird density but operates at 34 kg/m^2

4 Reporting Requirements

The relevant conditions from the Shire's Development Approval PO 2435/02 granted on 14th September 2007 states that:

35. *Odour emissions from the development shall not exceed those assumed in the report entitled ProTen Ltd - Report for Lot 701 Henderson Road Development Application - Odour and Dust Report (the odour modelling report) prepared by GHD, dated April 2007;*

37. *Within 12 months of the commencement of the use of one or more of the poultry sheds and thereafter annually during the lifetime of this development, the developer/operator shall commission an environmental engineer with experience in odour emission and mitigation agreed to by the Shire to undertake, at the developer/operator's full cost, an odour assessment report involving odour monitoring of the operation of the development in the final week of a growth cycle, in summer, indicating whether the odour emissions from the development comply with condition 35 of this approval and in the case of any non-compliance what measures or works must be undertaken to achieve compliance. The environmental engineer shall provide the report to the Shire at the same time as providing it to the developer/operator. The Shire shall make the report available for public inspection. The owner shall then undertake and complete any required works or measures within three (3) months of receipt of the environmental engineers report.*

The Shire also specifically requested (via email on 13 September 2019) the following two items be discussed in response to a modification application submitted by EME Advisory (on behalf of ProTen) requesting to reduce the frequency of the odour assessments imposed by condition 37 from annual to every three years and remove the 1.5 m high fencing imposed by condition 36:

Item 1. *A report by a suitably qualified consultant, which includes identification of all sources of odour on the site (including from spent litter as it is removed from the shed) and measurement and modelling all of these sources and demonstrates that the highest measured odour concentration is well below the adopted project criterion of 2,750 OU.*

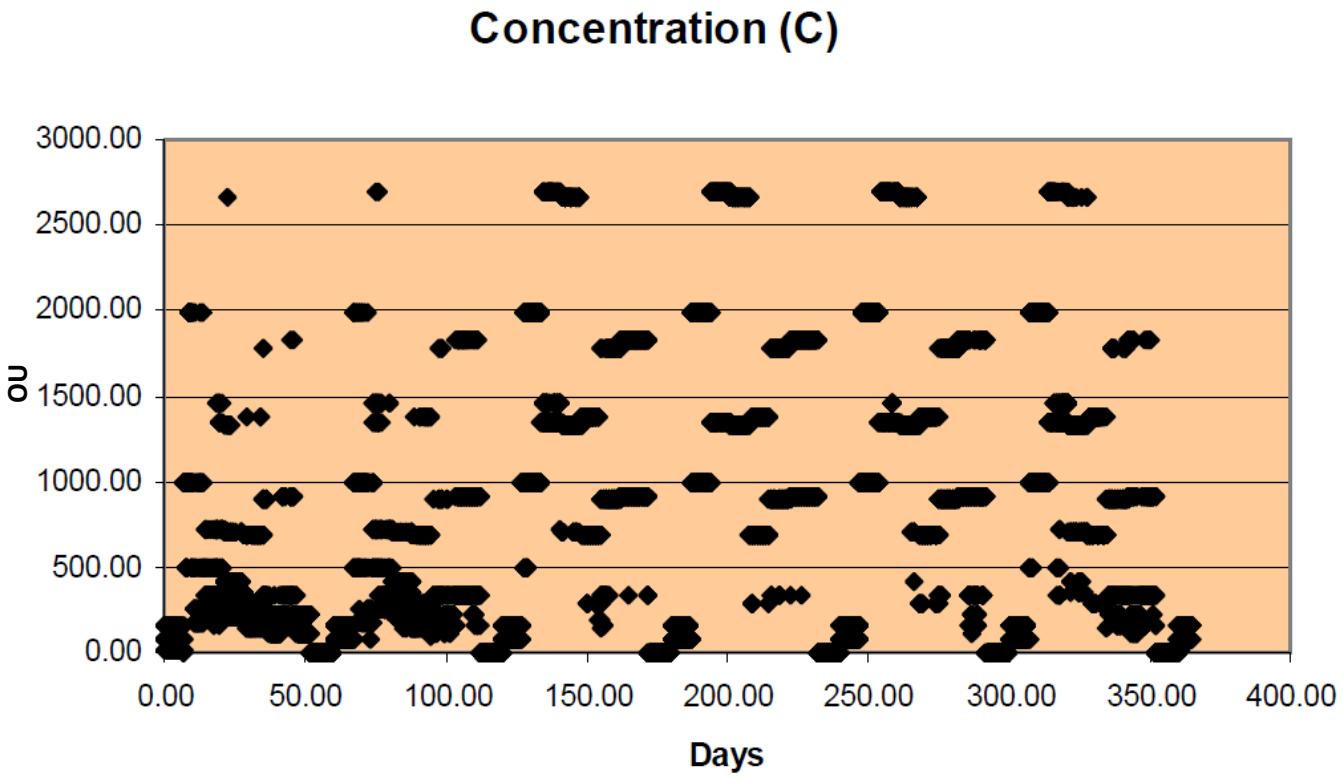
Item 2. *It is noted that the measurement of odour only on the collection of odour samples from the shed. It seems that another potential source of odour emissions is the litter as it is removed from the shed and stored/transported from the premises. I believe that odour samples should be taken of emission from this litter.*

5 Odour Assessment Criteria

SLR has reviewed the *report entitled ProTen Ltd - Report for Lot 701 Henderson Road Development Application - Odour and Dust Report (the odour modelling report) prepared by GHD, dated April 2007.*

The report focussed on odour emission from the growth cycle, as is common practice rather than spent litter management for the reasons detailed in **Section 6.3**. **Figure 3** details the peak modelled odour concentration (hourly average) for the GHD Odour Assessment (2007) for the Project site.

Figure 3 Hourly Modelled Odour Concentrations Plotted by Day of the Year



Source: GHD 2007

Figure 3 indicates that the peak modelled odour concentration was 2,750 OU. For the purposes of this monitoring report, the Project assessment criterion is assumed to be 2,750 OU.

6 Methodology

No sampling methodology was specified in the approval granted by the Shire. To ensure consistency between odour assessments SLR adopted the same methodology used in previous assessments completed by GHD and subsequent assessments completed by SLR.

Two samples were to be collected simultaneously from each of Shed No. 9, Shed No. 10 and Shed No.11, totalling 6 samples.

6.1 Sampling Conditions

Odour sampling was conducted on 12 February 2020 between 1430 to 1630 hours in summer conditions.

Bird age was noted as 29 days average across Shed No. 9, Shed No. 10 and Shed No. 11. It is noted that the requirement to sample in the final weeks of the growth cycle has been met. The sampling conditions found within the sheds are outlined in **Table 3.**

Table 3 Sample Conditions

Location	Number of Fans Operating During Sampling	Temperature of Shed (°C)	Age of Birds (Days)	Number of Birds In Shed
Shed 9	19	30.8	30	48093
Shed 10	19	31.5	29	48742
Shed 11	19	28.9	29	48267

6.2 Ventilation Rate Measurements

Ventilation rates were assessed using a vane anemometer. Average velocity and temperature data were collected across four quadrants across the face of the fan. The average velocity and flow rates were calculated based on the fan diameter.

The number of fans operating during the sampling period was a minimum of 19 per shed as outlined in **Table 3**.

6.3 Spent Litter Emissions

The Environmental Code of Practice for Poultry Farms In Western Australia (WABGA, 2004) identifies that:

"*During the cleaning of sheds – when litter/manure is disturbed – ammonia and other odours are released in greater than normal quantities and it is at this time that most complaints are received. It should be noted that cleaning and removal of litter/manure from sheds is usually done in a matter of hours and is a small percentage of the bird growing cycle*."

While it is true that some complaints are generated during this activity some of these complaints have been generated by the application of spent litter on horticultural or other crops in close proximity to broiler farms (RIRDC, 2000) which is not the case for this farm. Additionally, the highly variable nature of the activity, low frequency of occurrence (one to two days, five to six times a year) and the challenge of identifying a sample that captures the fleeting nature of odour emissions from the freshly disturbed activity means that getting a representative odour sample is technically challenging.

For this reason odour emissions from cleanout of sheds are better to be managed than assessed and this is achieved by ensuring that cleanout only occurs during the day (WABGA, 2004), which is when dispersion is the best, and while shed ventilation systems use are minimal (CRC, 2011). Once the litter is removed from the sheds, it should be placed in a covered truck and removed from site. The removal of litter from a shed typically takes a day, and the rest of the cleanout period is associated with washing down and disinfecting the shed and placing fresh litter.

Proof that this farm has maintained effective odour management practices, including litter management, is that no complaints have been received regarding the farm since October 2015.

6.4 Growth Cycle Odour Concentration Samples

The samples were taken using the lung in a drum method, as shown in **Figure 4**. The sample inlet tubes were placed against the mesh covering the extraction fans in diametrically opposed positions and run at a rate of approximately 2.0 litres per minute for a sampling duration of 15 minutes.

Figure 4 Lung in a Drum Sampling Equipment

Six samples in total were collected, with 2 samples taken at Sheds No. 9, No. 10 and No. 11.

Each sample was labelled individually with the sampling date and time, a unique sample identifier and delivered to a NATA approved laboratory with an associated chain of custody form for dynamic olfactometry analysis in accordance with AS 4323.3:2001 (R2014). All samples were analysed within the 30 hour holding time as required by AS 4323.3:2001 (R2014).

7 Odour Concentration Results

The results from the sampling regime outlined above are detailed in **Table 4** below. The laboratory certificate of analysis is included in **Appendix A**.

Table 4 Odour Analysis Results

Location	SLR Sample Identification Number	Sampling Date and Time	Analysis date and Time	Sample Odour Concentration (ou)
Shed 9	9425 (Drum 8)	12/2/20 14:30-14:40	13/2/20 10:30-11:30	360
	9426 (Drum 12)	12/2/20 14:50-15:00	13/2/20 10:30-11:30	390
Shed 10	9427 (Drum 16)	12/2/20 15:40-15:50	13/2/20 10:30-11:30	280
	9428 (Drum 26)	12/2/20 15:50-16:00	13/2/20 10:30-11:30	280
Shed 11	9429 (Drum 27)	12/2/20 16:10-16:20	13/2/20 10:30-11:30	310
	9430 (Drum 28)	12/2/20 16:20-16:30	13/2/20 10:30-11:30	330

The specific odour emission rate is a function of the ventilation air velocity, the amount of vents, and the sample odour concentration (shown in **Table 4**). These results are shown in **Table 5**. **Table 4** and **Table 5** indicate that the highest measured odour concentration is 390 ou. This is significantly below the adopted project criterion of 2,750 ou.

Table 5 Odour Concentration and Odour Rates

Location	SLR Sample ID No	Bird Age (Days)	Odour Concentration (ou)	Ventilation Rate (m^3/s)	Shed OER ($OU.m^3/s$)	Number of Birds in Shed	Specific OER ($ou.m^3/s/bird$)
Shed 9	9425	30	360	6.21	2492	48093	19.3
	9426	30	390	6.21	2699	48093	17.8
Shed 10	9427	29	280	5.84	1827	48742	26.7
	9428	29	280	5.84	1827	48742	26.7
Shed 11	9429	29	310	7.26	2652	48267	19.4
	9430	29	330	7.26	2572	48267	18.2

Key:

ID	identification
m^3/s	metres per second
No	number
OER	odour emission rate
OU	odour units
$OU.m^3/s$	odour units per cubic meter per second

8 Conclusions

SLR has completed the annual odour assessment for the ProTen Henderson Poultry Broiler Production Farm. The odour sampling was conducted on 12 February 2020.

Odour monitoring indicated that the highest measured odour concentration was 390 ou. This is below the adopted project criterion of 2,750 ou. Assessments undertaken by SLR between 2015 and 2020 show consistent odour emission rates and demonstrate that the poultry farm is compliant with condition 35. The highest measured odour concentration (2,100 ou) of all of the monitoring events was well-below the adopted criterion.

It is therefore concluded that the ProTen Henderson Poultry Broiler Production Farm is consistently compliant with the Development Approval PO 2435/02 and further modelling (as requested by the Shire via email on 13 September 2019) over the existing GHD monitoring is not warranted.

Given the very low odour concentrations measured at the Farm and the improved industry knowledge of the impacts of solid barriers on odour plume dispersion it is concluded that the 1.5m fencing imposed by condition 36 is not warranted and could be removed from the approval. It is also concluded that the frequency of odour assessments imposed by condition 37 could be reduced from annual to every three years or if there is any significant changes to site operations that could reasonably increase odour emissions.

APPENDIX A

Certificates of Analysis

Ektimo

Address (Head Office)
7 Redland Drive
MITCHAM VIC 3132

Postal Address
52 Cooper Road
COCKBURN CENTRAL WA 6164

Office Locations
VIC NSW WA QLD

Freecall: 1300 364 005
www.ektimo.com.au
ABN: 86 600 381 413

200131

CERTIFICATE OF ANALYSIS

Testing Laboratory:	Ektimo ABN 86 600 381 413
Laboratory Location:	52 Cooper Road, Cockburn Central WA, 6164
Report Number:	WO-00089
Job Number:	R008870
Date of Issue:	13/02/2020
Attention:	Michael Breko
Company Name:	SLR Consulting Australia Pty Ltd
Address:	2 Lincoln Street Lane Cove, NSW, 2066
Date Samples Received:	13/02/2020
Number of samples received:	6
No of samples analysed:	6
Test Method(s) Used:	Odour Analysis: AS4323.3 (NATA accredited) Hedonic Tone and Odour Character: Direct observation (Not NATA accredited)
Olfactometer Calibration Date:	January 2020

Comments
Nil

QUALITY CONTROL / QUALITY ASSURANCE INFORMATION

QC Acceptance Criteria:

Parameter	Criteria	Result	Pass/Fail
Panel Butanol Threshold	20-80 ppb	45.3	PASS
r	≤ 0.477	0.129	PASS
10^r	≤ 3.00	1.346	PASS
A	< 0.217	0.105	PASS
Max Room Temperature	< 25°C	23	PASS
Temperature Variation	< 3°C	0	PASS

Ektimo is accredited by the National Association of Testing Authorities (NATA) for the sampling and analysis of air pollutants from industrial sources. Unless otherwise stated test methods used are accredited with the National Association of Testing Authorities. For full details, search for Ektimo at NATA's website www.nata.com.au.

Ektimo is accredited by NATA (National Association of Testing Authorities) to ISO/IEC 17025 - Testing. ISO/IEC 17025 - Testing requires that a laboratory have adequate equipment to perform the testing, as well as laboratory personnel with the competence to perform the testing. This quality assurance system is administered and maintained by the Quality Director.
NATA is a member of APLAC (Asia Pacific Laboratory Accreditation Co-operation) and of ILAC (International Laboratory Accreditation Co-operation). Through the mutual recognition arrangements with both of these organisations, NATA accreditation is recognised world –wide.
A formal Quality Control program is in place at Ektimo to monitor analyses performed in the laboratory and sampling conducted in the field. The program is designed to check where appropriate; the sampling reproducibility, analytical method, accuracy, precision and the performance of the analyst. The Laboratory Manager is responsible for the administration and maintenance of this program.

REPORT AUTHORISATION

Tom Manton
Ektimo Signatory

NATA Accredited Laboratory 14601

Accredited for compliance with ISO/IEC 17025. NATA is a signatory to the ILAC mutual recognition arrangement for the mutual recognition of the equivalence of testing, calibration and inspection reports

RESULTS

Date received: 13/02/2020
Date and time of analysis: 13/02/2020, 1030-1130
Date of last calibration: January 2020

Sample ID	Sample Location	Dilution ratio			Odour concentration	Confidence Interval	Hedonic Tone	Odour Character
		Pre	Post	Total	(ou)	(ou)		
8	**1**	-	-	-	**360**	300 - 430	mildly unpleasant	livestock, faeces, manure
12	**2**	-	-	-	**390**	330 - 470	mildly unpleasant	livestock, faeces, manure
16	**3**	-	-	-	**280**	240 - 340	mildly unpleasant	livestock, faeces, manure
26	**4**	-	-	-	**280**	240 - 340	mildly unpleasant	livestock, faeces, manure
27	**5**	-	-	-	**310**	260 - 370	mildly unpleasant	livestock, faeces, manure
28	**6**	-	-	-	**330**	280 - 400	mildly unpleasant	livestock, faeces, manure

* Greater than the pre-dilution ratio of 9 (8 volumes of neutral gas to 1 volume of sample) stipulated as a maximum by AS4323.3.

Uncertainty values cited in this table are calculated at the 95% confidence level (coverage factor = 2).
A dash '-' in the dilution columns represents no dilution (dilution ratio = 1).
The pre dilution ratio has been been supplied by the client and taken into account when calculating odour concentration results. ***No pre dilution has been assumed if the pre dilution was not stated.***
If post dilution ratio has been reported, this was done by Ektimo to bring samples within the working range of the olfactometer and taken into account when calculating odour concentration results.

DEFINITIONS

The following symbols and abbreviations may be used in this test report:

~	Approximately
<	Less than
>	Greater than
≤	Less than or equal to
≥	Less than or equal to
ND	Not determined
Odour Emission Rate	The product of the odour level of the waste discharged and the volume rate of the discharge (in wet cubic metres per minute referred to a temperature of 0°C and a pressure of 101.325 kilopascals). Expressed as Odour Unit Volumes per Minute, ouv/min.
Odour Threshold	The concentration of a substance, or of a mixture of substances, which is distinguished from odourless air at 50% panel response. By definition, the odour threshold corresponds to an odour concentration of 1 odour unit per m^3.
OU	The number of odour units per unit of volume. The numerical value of the odour concentration is equal to the number of dilutions to arrive at the odour threshold (50% panel response).
Dilution ratio	Dilution ratio = (Volume sample gas + Volume dilution gas) / Volume sample gas. Pre-dilution values received from the client are asumed to be calculated in this manner for the purposes of calculating reported the sample odour concentrations.
r	Precision, expressed as repeatability; implies that the factor that expresses the difference between two single measurements, performed on the same testing material in one laboratory under repeatability conditions, will not be larger than a factor of 3 in 95% of cases.
A	Accuracy of the odour concentration measurement. The accuracy is a reflection of trueness (expressed as bias) and the precision (r) .

Ektimo

ASIA PACIFIC OFFICES

BRISBANE
Level 2, 15 Astor Terrace
Spring Hill QLD 4000
Australia
T: +61 7 3858 4800
F: +61 7 3858 4801

CANBERRA
GPO 410
Canberra ACT 2600
Australia
T: +61 2 6287 0800
F: +61 2 9427 8200

DARWIN
Unit 5, 21 Parap Road
Parap NT 0820
Australia
T: +61 8 8998 0100
F: +61 8 9370 0101

GOLD COAST
Level 2, 194 Varsity Parade
Varsity Lakes QLD 4227
Australia
M: +61 438 763 516

MACKAY
21 River Street
Mackay QLD 4740
Australia
T: +61 7 3181 3300

MELBOURNE
Level 11, 176 Wellington Parade
East Melbourne VIC 3002
Australia
T: +61 3 9249 9400
F: +61 3 9249 9499

NEWCASTLE
10 Kings Road
New Lambton NSW 2305
Australia
T: +61 2 4037 3200
F: +61 2 4037 3201

PERTH
Ground Floor, 503 Murray Street
Perth WA 6000
Australia
T: +61 8 9422 5900
F: +61 8 9422 5901

SYDNEY
Tenancy 202 Submarine School
Sub Base Platypus
120 High Street
North Sydney NSW 2060
Australia
T: +61 2 9427 8100
F: +61 2 9427 8200

TOWNSVILLE
12 Cannan Street
South Townsville QLD 4810
Australia
T: +61 7 4722 8000
F: +61 7 4722 8001

WOLLONGONG
Level 1, The Central Building
UoW Innovation Campus
North Wollongong NSW 2500
Australia
T: +61 404 939 922

AUCKLAND
68 Beach Road
Auckland 1010
New Zealand
T: 0800 757 695

NELSON
6/A Cambridge Street
Richmond, Nelson 7020
New Zealand
T: +64 274 898 628