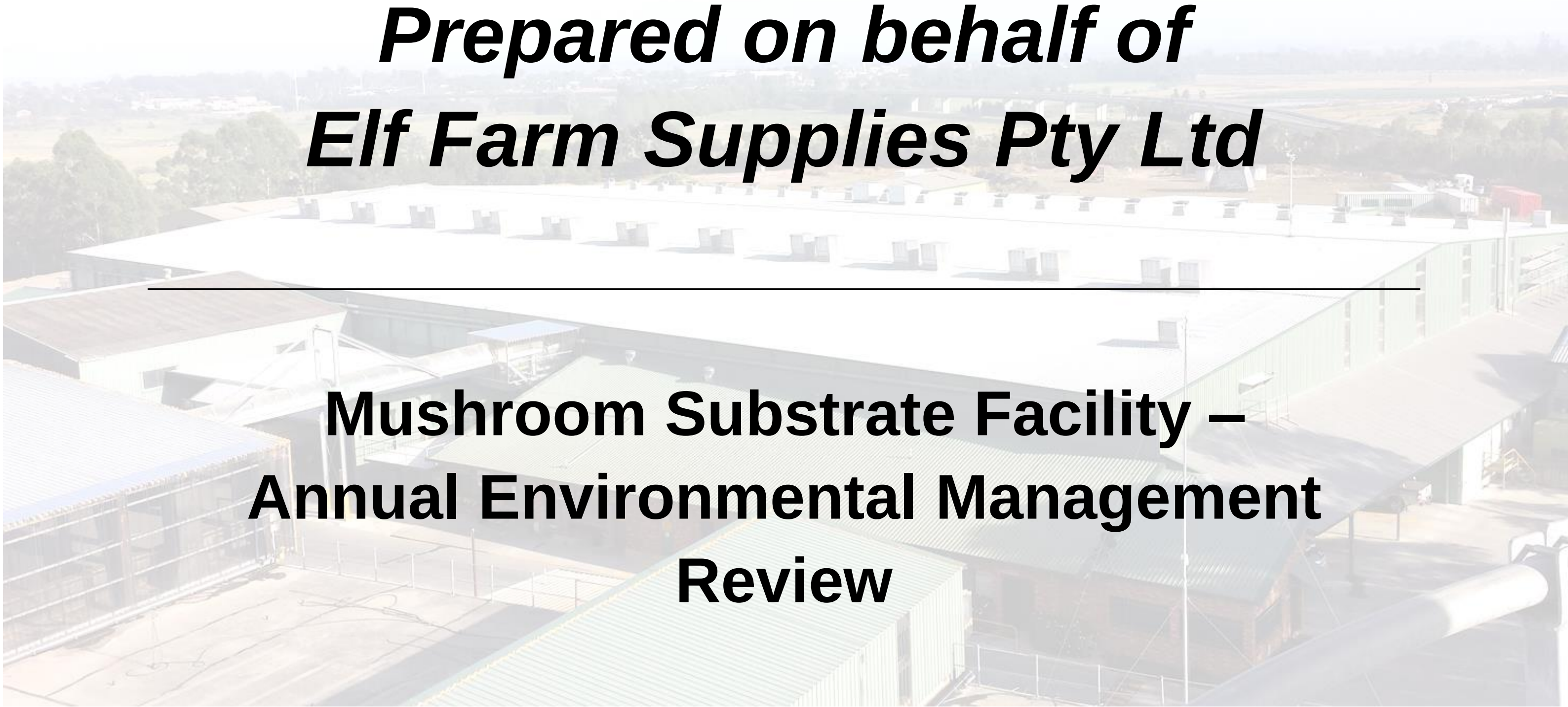


Prepared on behalf of
Elf Farm Supplies Pty Ltd

Mushroom Substrate Facility – Annual Environmental Management Review

Mulgrave, NSW

Final Report

September 2016

Purpose of Annual Environmental Management Review (AEMR)

The purpose of this document is to respond to a condition of project approval No 08_255 MOD1 issued on 11 January 2012 and modified on 14 March 2016. Condition 3 of Schedule 5 of the project approval states as follows:

By the end of September 2016, and annually thereafter, unless otherwise agreed by the Secretary, the Proponent shall review the environmental performance of the Project to the satisfaction of the Secretary. This review must:

a) *describe the operations that were carried out over the reporting period;*
b) *analyse the monitoring results and complaints records of the Project over the reporting period, which includes a comparison of these results against the*
    i. *relevant statutory requirements, limits or performance measures/criteria;*
    ii. *monitoring results of previous years; and*
    iii. *relevant predictions in the EA;*
c) *identify any non-compliance over the reporting period, and describe what actions were (or are being) taken to ensure compliance;*
d) *identify any trends in the monitoring data over the life of the Project; and*
e) *describe what measure will be implemented over the forthcoming reporting period to improve the environmental performance of the Project.*

This report covers the period September 2012 – September 2016. The report refers to the mushroom substrate plant in Mulgrave Road, Mulgrave operated by Elf Farm Supplies. This report has been prepared by following the general reporting structure of the *Annual Review Guideline* for *Post-approval requirements for State significant mining developments (October 2015).*

AEMR Title Block

Name of operation:	Elf Farm Supplies Pty Ltd
Name of operator:	Elf Farm Supplies Pty Ltd
NSW EPA Licence #:	6229
Name of holder of EPA Licence:	Elf Farm Supplies Pty Ltd
Annual review start date:	September 2012
Annual review end date:	September 2016

I, **John Hurley** and **Michael Assal** of **The Odour Unit Pty Ltd** certify that this annual environmental management review report is a true and accurate record of the compliance status of Elf Farm Supplies for the period September 2012 – September 2016, and that I am authorised to make this statement on behalf of Elf Farm Supplies Pty Ltd.

Name of authorised reporting officers:	John Hurley	Michael Assal
Title of authorised reporting officers:	State Manager & Senior Consultant	Senior Engineer & Consultant
Signature of authorised reporting officers:		

Date: 23 September 2016

CONTENTS

APPENDICES

APPENDIX A: STATUTORY COMPLIANCE REPORTS

APPENDIX B: RELEVANT ENVIRONMENTAL STUDY REPORTS

1 Statement of Compliance

1.1 Table of Compliance

Item / Process Source	Parameter	EPA Condition / Licence	Assessor	Assessment Report Date	Compliance Limit / Review Items	Compliance/Completed (Yes / No) and *Comments*	Assessment Report Reference (refer to Appendix A & B)
Odour Audit Report	Odour	U 1 Odour Audit: EPA Environmental Protection Licence No. 6229	Stephenson Environmental Management Australia (SEMA)	11th April 2013	Summary of Complaints 2008-2012	**Yes:** *All complaints summarised and reviewed*	Report A1 – *"5204 Odour Audit Report Elf Farm Supplies"*
					Review of Design & Management Practices	**Yes:** *Refer forthcoming action plan*	
Tunnel Composter: Bio-Scrubber	Odour	EPA Environmental Protection Licence No. 6229	SEMA	17th April 2013	Compliance Limit of 55,400 ou.m^3/s	**Yes**	Report A2 – *"5198 Elf Farm - OEH Odour Report"*
Odour Action Plan	Action Plan following Odour Audit	As a result of EPA commissioning a Field Ambient Odour Assessment (FAOA) Study at McGraths Hills, Mulgrave & Windsor, NSW in 2013	Odour Action Plan – SEMA FAOA – TOU on behalf of EPA	July 2013	-	*Recommendations made to control odour release*	Report A3 – *"5248 Elf Farm - Odour Action Plan"* Report B0 – *"McGraths Hill, Mulgrave, Windsor Field Ambient Odour Assessment Study"*
Tunnel Composter: Bio-Scrubber	Odour	EPA Environmental Protection Licence No. 6229	SEMA	20th September 2013	Compliance Limit of 55,400 ou.m^3/s	**Yes**	Report A4 – *"5253 Elf Farm - OEH Odour Report"*
• Bale Wetting; • Pre-Wet Building; • External Loading Conveyor	Odour	PRP U 2.1: EPA Environmental Protection Licence No. 6229	SEMA	26th September 2013	Mass Odour Emission Rates	**Yes:** *Measured Odour and derived Mass Odour Emission Rates determined and reported; and* • *Pre-Wet Building odour largely contained in-building in accordance with PRP U 1.1* • *Internal Transfer Conveyor is enclosed in accordance with PRP U 1.2* • *Recommend Odour Mitigation Measures be undertaken according to PRP U 1; specifically PRP U 1.3 requiring External Conveyor be fitted with detachable covers for odour control*	Report A5 – *"5255 Elf Farm - PRP U 2.1 Odour Assessment"*
Tunnel Composter: Bio-Scrubber	Odour	PRP U 3.1: EPA Environmental Protection Licence No. 6229	SEMA	31st October 2013	Compliance Limit of 55,400 ou.m^3/s	**Yes:** *Compliance achieved during stages of typical composting on an annual rolling average*	Report A6 – *"5254 Elf Farm - PRP U 3.1 Bioscrubber & Stack Assessment"*

Item / Process Source	Parameter	EPA Condition / Licence	Assessor	Assessment Report Date	Compliance Limit / Review Items	Compliance/Completed (Yes / No) and *Comments*	Assessment Report Reference
Tunnel Composter: Bio-Scrubber	Odour	EPA Environmental Protection Licence No. 6229	SEMA	8th April 2014	Compliance Limit of 55,400 ou.m³/s	**Yes**	Report A7 – *"5339 Elf Farm - OEH Odour Report"*
Technical Review and Assessment Audit of Phase 1 Composting Activities & Infrastructure	Odour	PRP U 1.1 Part 2: EPA Environmental Protection Licence No. 6229	The Odour Unit Pty Ltd (TOU)	16th June 2014	Review of Design, Process & Odour Management Practices as well as Identification of Odour Mitigation Measures	▪ *Pre-Wet Building Roof (east-section) to be sealed prior to 30th April 2014 (completed);* ▪ *Replace Pre-Wet Building Western Wall prior to 31st May 2014 (completed)* ▪ *Replace Pre-Wet Building Roofing (west-section) prior to 31st May 2014 (completed)* ▪ *Pre-Wet Building considered a significant source of malodour if uncontrolled. Sealed and Repaired reduces it potential but the threat remains high* ▪ *Replace Phase 1 Tunnel Building Western Wall prior to 30th April 2014 (completed)* ▪ *Install Covers to Phase 1 External Conveyor prior to 30th April 2014 (completed in accordance with PRP U 1.3)* Odour Mitigation Measures discussed in Section 4 of reference Report A8 for each relevant odour source	Report A8 – *"Elf Farm Supplies Pty Ltd - Technical Review and Assessment Audit"*
Tunnel Composter: Bio-Scrubber	Odour	EPA Environmental Protection Licence No. 6229	SEMA	22nd December 2014	Compliance Limit of 55,400 ou.m³/s	▪ **Yes**	Report A9 – *"5433 Elf Farm - OEH Odour Report"*
Tunnel Composter: Bio-Scrubber	Odour	EPA Environmental Protection Licence No. 6229	SEMA	27th March 2015	Compliance Limit of 55,400 ou.m³/s	▪ **Yes**	Report A10 – *"5488 Elf Farm - OEH Odour Report"*
Tunnel Composter: Bio-Scrubber	Odour	EPA Environmental Protection Licence No. 6229	SEMA	27th November 2015	Compliance Limit of 55,400 ou.m³/s	▪ **Yes**	Report A11 – *"5553 Elf Farm - OEH Odour Report"*
Tunnel Composter: Bio-Scrubber	Odour	EPA Environmental Protection Licence No. 6229	SEMA	12th May 2016	Compliance Limit of 55,400 ou.m³/s	▪ **Yes**	Report A12 – *"5652 Elf Farm Supplies - OEH Odour Report"*

1.2 Table of Non-Compliance

Item	EPA Condition / Licence	Due Date	Licence Condition Number	Compliance Comments	Compliance Status	Reference
Annual Return	EPA Environmental Protection Licence No. 6229	19th May 2016	O1.1 and causing water pollution	Following an ingress of water in the western dam during the minor floods in late April 2015, water from the dam was pumped onto the plant's paddocks. Circumstances during discharge resulted in an overflow of dam water from the paddocks into South Creek. The cause was due to the paddocks becoming waterlogged and excess water draining into South Creek. The normal irrigation paddock was not available due to earthworks. ▪ *Clean-up work undertaken. New pipes have been installed to the irrigation paddock along with procedures to assist with managing water being pumped from the western dam.*	Non-compliant	See **Appendix A** – EPA Licence 6229 Annual Return 2016 and http://www.epa.nsw.gov.au/prpoeoapp/Detail.aspx?id=6229&option=licence&range=POEO&searchrange
		30th September 2014	L5.1	EPA conducted odour survey & observed offensive odours. Cause was fugitive odours. Premises has continued to repair/improve process buildings to minimise fugitive odours. Premises is progressing to install more efficient odour treatment technology. ▪ *Penalty Notice issued*	Non-compliant	
			04.2	Pre-wet building was not fully closed nor maintaining a negative pressure. Insufficient ventilation capability in the building. Operational procedures changed. Premises is progressing to install more efficient odour treatment technology. ▪ *PRP to address non-compliance(s) issued*	Non-compliant	
			U 1.1	During an inspection of premises EPA observed vapour emanating from both ends of a conveyor that transports material between buildings. Covers have been installed to seal fugitive odours. EPA officer is currently reviewing the non-compliance. ▪ *PRP to address non-compliance(s) issued*	Non-compliant	
		19th May 2013	L5.1	EPA conduct odour survey of the Mulgrave area. During the survey, offensive odour was detected. The source of this odour was investigated and after a site inspection immediately after the survey, it was determined to be emitting from the Bale Wetting Area. ▪ *Bales were taken into the Pre-wet shed as per the day's normal operating schedule. This activity removed the potential odour source.*	Non-compliant	

2 Introduction

Elf Farm Supplies (Elf) process operations involve a complex and dynamic operation that varies both spatially and temporally. The end product of the process is a mushroom substrate used for mushroom farming.

2.1 Existing Process Operations

The Facility produces mushroom substrate by utilising a five-stage composting process as follows:

1. **Raw Materials Storage Shed, Bale Wetting & Stable Bedding Areas:** storing and combining all ingredients ready for transport to the Pre-wet Shed. Bale wetting involves gradually adding water and pulsing fresh air through the straw bales to keep the material aerobic. Similarly, the stable bedding material undergoes wetting and fresh air is pulsed through to keep the material aerobic;

2. **Pre-Wetting**: the straw bales and the ingredients are blended in the Pre-wet Shed and re-blended a number of times whilst adding recycled water;

3. **Phase 1:** the material is processed in bunkers whereby temperature, oxygen and moisture conditions are controlled and regulated;

4. **Phase 2:** material is transferred to clean tunnels where it is pasteurised and peak heated to remove any weed, moulds or pests before spawning; and

5. **Phase 3**: mushroom spawn is added and grown through the substrate for a minimum of two weeks prior to mushroom farm delivery.

2.1.1 Raw Materials Storage Shed

The raw materials storage shed area consists of several bay areas that store dry additive products including chicken manure, cotton seed, gypsum and other seasonal organic nitrogen sources. The ingredients are weighed and mixed together in calculated ratios in a semi-enclosed area, where the dry chicken manure is stored.

The mixing is carried out by the Kuhn mixing machine. Once mixed, the material is conveyed by a front-end loader to the Pre-wet Shed where it is placed on top of the straw bales ready for bale breaking by the Thilot blending machine. The mixing of the raw materials is known as the preparation of the ‘brew’ which is a blend of the above ingredients. This preparation process currently occurs in the south-western corner of the raw materials storage shed. The frequency and duration of this process is approximately eight hours per week.

2.1.2 Bale Wetting Stage

The bale wetting stage involves the wetting of straw bales with process water (comprising predominately of water from the nearby creek) for several days (currently four days per week).

2.1.3 Stable Bedding Area

The stable bedding area is located in the north-eastern corner outside the Pre-wet Building. The stable bedding material is wetted prior to transfer to the Pre-wet Shed and is placed on top of the brew rick as the final layer before the bale breaking process.

2.1.4 Pre-wet Shed

After bale wetting, the wetted bales are transported by front-end loader into the Pre-wet Shed and manually destringed. Whilst inside the Pre-wet Shed, the construction of a rick is undertaken. The process for constructing of a rick involves the breaking of bales and placement of brew and wetted stable bedding material. This essentially forms the construction of a three-layered rick which is, on average, 90 metres long, 2- 3 metres wide and 6 metres high. Once the construction of a rick is complete, a Thilot blending machine is passed over each rick to mix and break all three layers of material. This process is known as bale breaking. During the bale breaking process, air is pulsed through each rick via a proprietary in-floor aeration system. Currently, three ricks are constructed in the Pre-wet Shed.

The initial low temperature stage of the mushroom composting process occurs in the Pre-wet Shed. The building is currently fully enclosed, except for a (curtained) opening on the eastern-side through which a front-end loader transfers material to the Phase 1 Working Hall and two large (door) openings in the south-eastern and north eastern ends of the building. Building ventilation air from the Pre-wet Shed is currently collected by four ducts, each with in-duct axial fans, and conveyed to the Bioscrubber System through the Phase 1 Bunkers for treatment before discharge via a tall stack (known as the Bioscrubber Stack).

2.1.5 Phase 1 Working Hall & Bunkers

The material transferred from the Pre-wet Shed is placed into a hopper mixer in the Phase 1 Working Hall. Material in the hopper mixer is conveyed into designated aerated bunkers via an inclined overhead conveyor, located external to the Phase 1 building. The material is deposited into the bunkers where the aeration rate and temperature are tightly controlled. Material in each filled bunker is removed, deposited back into the hopper mixer and returned to an available bunker, to continue the Phase 1 process. Once the Phase 1 process cycle is complete, material is transferred to the Phase 2/3 building via the Phase 1 to Phase 2 transfer conveyor located outside in the north-western corner area of the Phase 1 Working Hall Area. Ventilation air from the Pre-wet Shed is passed through the Phase 1 bunkers with the subsequent exhaust air emissions from the bunkers treated by the existing Bioscrubber System before discharge via the Bioscrubber Stack.

2.1.6 Phase 2/3 Building

The existing Phase 2/3 Building consists of a working hall area and a total of twenty two tunnels. Once the Phase 1 process is complete, material is loaded into a second hopper mixer in the Phase 1 Working Hall and outgoing material placed onto a conveyor (known as the Phase 1 to Phase 2 Cross Conveyor) to the Phase 2/3 Working Hall Area. Once material arrives at the Phase 2/3 Working Hall, a series of conveyors transfer the material into a dedicated tunnel. During this process, the tunnel is fully vented for up to two hours until filling is complete. The exhaust air during this process stage is discharged via dedicated roof stacks on the current Phase 2/3 Building and is known as Tunnel Venting.

Material in the tunnels are kept constantly under aerobic conditions. This is achieved via an extensive airflow channel network. The quality of airflow is controlled by the Programmable Logic Controller (PLC) Supervisory which determines the volumes of recirculated air, make-up air and discharged air. The exhaust air is discharged via exhaust roof stacks that exist parallel to the tunnel venting exhaust roof stacks (i.e. the southern section of the Phase 2/3 building). Make-up air is drawn through filters in the Phase 2/3 Fan Room. Each tunnel has dedicated exhaust roof stacks and is capable of processing material through all Phase 2/3 stages.

The Phase 2/3 Building is kept under a slight positive pressure for quarantine reasons and tunnel conditions are monitored, automated and controlled via a PLC System. The Phase 2/3 process operations consist of several process stages with all stages automatically controlled by the PLC system.

2.1.6.1 Phase 2 Process Stages

The Phase 2 process cycle consists of the following stages:

- Tunnel Filling;
- Levelling;
- Warm-up Pasteurisation;
- Pasteurisation;
- Cool-down (conditioning); and
- Conditioning.

Once the Phase 2 process stages are complete, the tunnel will then enter into Phase 3.

2.1.6.2 Phase 3 Process Stages

The Phase 3 process cycle is characterised by the addition of mushroom spawn and consists of the following stages:

- Spawn Run 1;
- Spawn Run 2; and
- Cool-down (spawn/shipout).

Once the Phase 3 stages are complete, the fully processed product is shipped out either as a bulk product or packaged in twenty kilogram blocks.

2.1.7 Bioscrubber System

The existing Bioscrubber System services the Pre-wet and Phase 1 process operations only. Phase 2 and 3 exhaust air emissions are currently discharged via roof stacks.

3 Licence Approvals/Amendments/PRP's & Penalties

Since September 2012, Elf has been issued with renewed licences having conditions and amendments attached as follows:

EPA Notice Number	File Number / Notice Type	Date of Notice	Licence Section Amendments/Details
1507559	LIC07 / 1121 ***s.58 Licence Variation***	**14-Sept-2012**	2.1. The addition of condition **U1** to Section **8 Pollution Studies and Reduction Programs**, which states: **U1 Odour Audit** U1.1 By 1 March 2013 the Licensee must submit an odour audit report to the EPA's Manager Waste Operations. The odour audit report must be conducted by an independent and suitably qualified odour assessment consultant address the following: (a) A summary of any odour complaints received and actions taken to reduce odour where complaints are verified; (b) Benchmark the design and management practices at the Elf Farm Supplies premises against industry best practice for minimising odour. This should include, but not be limited to, storage of stable bedding and other substrates, straw wetting techniques, and leachate collection pit management; and (c) Using the results of (a) and (b), if it is identified that Elf Farm Supplies does not meet industry best practice standards for odour minimisation in any area of the expanded operations, and validated complaints have been received the report must include: ▪ Proposed mitigation works and/or management practices to ensure that odour is minimised as far as is practicable; and ▪ A timetable for the implementation of these works. 2.2. The addition of conditions **E1.3(g)** and **E1.4 (f)** in section **E1 Odour Complaints/Feedback Management System**, which **states**: ▪ E1.3(g) The oxygen content (%) of compost in the pre-wet processing phase is to be obtained and recorded from one hour preceding the odour incident until the time the incident is reported to have ceased. ▪ E1.4(f) The oxygen content (%) of compost in the pre-wet processing phase from one hour preceding the odour incident until the time the incident is reported to have ceased. 3. Due to a change in EPA licensing software this notice contains administrative changes to the numbering of licence conditions. Other than the changes stated in paragraph 2 above, no further licence conditions have been removed, changed and/or added.

EPA Notice Number	File Number / Notice Type	Date of Notice	Licence Section Amendments/Details
1515853	LIC07 / 1121 ***s.58 Licence Variation***	**07-Aug-2013**	**Additions to Section 8 Pollution Studies and Reduction Programs** **U1 Odour Mitigation measures to be implemented** U1.1 Pre-Wet Building ▪ By no later than 30 September 2013 the Licensee must use curtains on the Pre-wet building doors where necessary. U1.2 ▪ By no later than 30 September 2013 the Licensee must install automatic doors closers to the conveyor building on top of the Phase 1 tunnels. U1.3 ▪ By no later than 25 October 2013 the Licensee must use detachable covers on the external transfer conveyor which runs up outside the tunnel building. **U2 Odour Emission Report** U2.1 ▪ By no later than 30 September 2013 the Licensee must submit to the EPA a report, prepared by a suitably qualified professional external consultant to include the following: 1. Bale wetting area Sample and measure odour emission levels from the bale wetting area to identify issues affecting ground level concentrations. 2. Pre-Wet Building Sample and measure the effectiveness of the Pre-Wet Building's foul air extraction system that directs air to the Bioscrubber system. 3. External Loading Conveyor. Sample and measure the odour emission levels from the external conveyor. **U3 Bioscrubber and Stack Assessment Report** U3.1 ▪ By no later than 31 October 2013 the Licensee must submit to the EPA a report, prepared by a suitably qualified professional external consultant to include the following: Bioscrubber and Stack (a) sample and measure the performance of the Bioscrubber system and stack; and (b) investigate the potential for increased loadings and/or optimisation of the Bioscrubber system and stack.

EPA Notice Number	File Number / Notice Type	Date of Notice	Licence Section Amendments/Details
1519001	LIC07 / 1121 ***s.58 Licence Variation***	**15-May-2014**	The Licensee has complied with the Pollution Studies and Reduction programs **(PRP)** and as such has been deleted. The EPA has reviewed the works and reports and considers that further works are required to identify and address outstanding odour management problems, with the following amendments to **Section 8 Pollution Studies and Reduction Programs** as follows: **U1 Odour Mitigation measures to be implemented** U1.1 ▪ In 2013 in response to community complaints about odour in the Mulgrave and Windsor areas, the EPA commissioned an independent assessment of odour in the region. The assessment identified the Elf Farm facility as the major source of odour within the community at the time of the surveys. In response Elf Farm has completed three pollution reduction programs aimed at assessing and mitigating the odour sources on the premises. ▪ Based on the EPA's assessment of the works and review of the reports from these pollution reduction programs, the EPA considers that further works are required to address outstanding odour management problems. The licensee must undertake the following: 1) Identify and seal the following fugitive odour emissions points. Note these works must be completed in a manner that does not create offsite odour impact: a) Pre-wet shed roofing (1m end section) before 30 April 2014 b) Replace the Pre-wet shed western wall before 31 May 2014 c) Replace the Pre-wet shed roofing (1m end section) before 31 May 2014 d) Replace the phase 1 western wall before 30 April 2014 e) Install a cover for the Phase 1 top moveable conveyor located at the northern end of the conveyor enclosure before 30 April 2014. 2) A technical review and assessment of the phase 1 composting infrastructure and activities must be undertaken by a recognised independent odour control specialist agreed to in writing by the EPA with experience in the design and implementation of proven odour control technology. This review and assessment must include, but not necessarily be limited to: a) An audit of each of the phase 1 composting activities and infrastructure to identify and assess all sources of odour with the potential to contribute to offensive odour beyond the boundary of the premises. This audit shall include, but not necessarily be limited to: - The bale wetting process and area; - Process water collection pit and the second flush collection dam; - Fugitive emissions from the phase 1 pre-wet building including doors, walls and roof; - Mixing and transfer of 'dry' materials into the pre-wet building; - Transfer of phase 1 compost from the pre-wet building to the phase 1 transfer hall;

EPA Notice Number	File Number / Notice Type	Date of Notice	Licence Section Amendments/Details
			- Fugitive emissions from the phase 1 transfer hall including doors, wall and roof; - Fugitive emissions form the phase 1 tunnel building external conveyor system; and - Emissions from the bioscrubber and stack. b) Identification of odour mitigation measures proposed to address each of the sources identified in the audit in (2A). The reduction in odour must be quantitatively evaluated in accordance with methodology agreed to by the EPA. The assessment must quantitatively demonstrate how the combination of proposed measures will ensure offensive odours will not be emitted beyond the boundary of the premises. A timetable for the implementation of the proposed measures must be provided, however all measures must be timetabled to be in place by 30 June 2014. c) A report detailing the technical review and assessment must be provided to the Senior Manager Waste Compliance by 31 May 2014. The EPA will review the report and may place agreed measures into a further PRP on this licence.
3085774818	***s.129 Penalty Notice***	**26-June-2014**	**Legislation:** Protection of the Environment Operations Act 1997 - 129(3) **Offence short title:** Contravene section by emission of odours - Corporation
3085774827	***s.129 Penalty Notice***	**29-June-2014**	**Legislation:** Protection of the Environment Operations Act 1997 - 129(3) **Offence short title:** Contravene section by emission of odours - Corporation

EPA Notice Number	File Number / Notice Type	Date of Notice	Licence Section Amendments/Details
523940	EF13 / 4148 ***s.58 Licence Variation***	**24-Sept-2014**	The following variations have been made to the licence: PRP U1.1 has been removed from the licence as the Licensee has generally complied with those requirements: ▪ A PRP (now U1.1) has been added requiring all possible sources of fugitive emissions to be sealed (fugitive emissions means holes, leaks, corrosion points but excludes the air extraction vents) from all conveyors and buildings before the 7 November 2014; ▪ A PRP (U2.1) has been added to construct and operate an air extraction and treatment system that: 1. Maintains negative pressure conditions within the pre-wet and phase 1 buildings under all (barr natural disasters) operating conditions; 2. Includes a structure and extraction system to contain the activities of receiving manures, handling and storing manures, mixing the manure and wetted bale "brew"; 3. Treats air emissions from these three structures to a level that ensures these do not create offsite odour impacts under all (barr natural disasters) operating conditions; and 4. Requires these works be installed and commissioned before 1 June 2015. ▪ A PRP (U3.1) has been added to require the Licensee employ a suitably qualified and experienced community liaison individual or company to engage the community, maintain the 24hr Odour Complaints/Feedback Management System and establish and maintain a community liaison committee that meets quarterly. This requirement will come in to effect for 2 years from the 6 December 2014. ▪ Condition O4.6 previously required that the licensee keep doors to internal process areas closed when not in use, except where this had no significant effect on the plant's odour performance. This condition has been modified to require all doors to process buildings be closed immediately before and after the movement of plant or people through the door; ▪ Condition O4.7 previously required that during the Phase 1 process the door at the north end of the tunnel building must remain closed where necessary. The condition has been modified to require that all movement of material from the Pre-wet building in to the Phase 1 building must be through the sealed corridor that connects these two buildings. That corridor must be effectively sealed during all processing activities. To be ongoing and implemented by the 17 November 2014; and ▪ Operating condition O4.8 has been added to require buildings and conveyor systems be constructed and maintained so that these do not allow fugitive emissions. This must be ongoing from 7 November 2014.

EPA Notice Number	File Number / Notice Type	Date of Notice	Licence Section Amendments/Details
1530938	EF14 / 27618 ***s.91 Clean Up Notice***	**28-May-2015**	The Environment Protection Authority (EPA) directs Elf Farm Supplies Pty Ltd to take the following clean-up action: 1. Cease any discharge to South/Wianamatta Creek from the premises of contaminated stormwater, including stormwater containing leachate from the premises waste processing areas and the leachate dam identified in photo 1 attached to this notice. This direction is to be implemented immediately and maintained ongoing. 2. Remove all leachate contaminated stormwater that has collected in the stormwater drainage paths that flow to South/Wianamatta Creek. This includes, but is not limited to, the bottom sediment pond identified in photo 7 attached to this notice. Provide photos demonstrating the removal of all pooled leachate contaminated stormwater (excluding that within the leachate dam identified in photo 1 attached to this notice) before 4pm Thursday 28 May 2015. 3. In the event of significant rain affecting the premises before 4pm Thursday 28 May 2015, Elf farms must contact the EPA and provide to EPA's satisfaction an alternative timeframe for direction 2 above. 4. Ensure that all leachate and leachate contaminated stormwater is discharged for disposal to a premises that can lawfully receive that liquid waste. This includes: 4.1. Pump out for disposal to a EPA licensed liquid waste facility; or 4.2. Reuse in the Elf Farm processes in a manner that does not create the potential for a pollution incident; or 4.3. Discharge to the EPA approved effluent irrigation field located on the premises. Discharge in this manner must ensure that leachate contaminated runoff will not leave the irrigation area. Application of leachate contaminated discharge to this area must not exceed the treatment capacity of the area and must take in to account any rainfall. Elf required by law to pay a fee of $492 for the administrative costs of issuing this notice. At the time of writing this matter was progressing through court.
3085777788	***s.129 Penalty Notice***	**08-Oct-2015**	**Offence date:** 25 Aug 2015 **Legislation:** Protection of the Environment Operations Act 1997 - 129(3) **Offence short title:** Contravene section by emission of odours - Corporation **Incurred Penalty:** **$8,000**
Current Licence 1535927	EF13 / 5158 ***s.58 Licence Variation***	**08-Mar-2016**	The following variations have been made to the licence: ▪ Add Condition R4.2 and R.4.3 – approved reporting format to the EPA for the Annual Waste Summary Report
3085779869	***s.129 Penalty Notice***	**08-Aug-2016**	**Offence date:** 18 Jul 2016 **Legislation:** Protection of the Environment Operations Act 1997 - 129(3) **Offence short title:** Contravene section by emission of odours – Corporation -Offensive Odour Incident **Incurred Penalty:** **$8,000**

4 Next Reporting Period Forecast Operations

Elf has an existing Project Approval for modifications and upgrades to their Mushroom Substrate Plant at Mulgrave, NSW.

On 27th February 2015, Elf lodged a modification request to its existing Project Approval and Concept Plan MP 08_0255 under Section 75W of the EP&A Act seeking to allow:

- the pre-wet phase of the operation to be undertaken in bunkers instead of in a pre-wet building;
- the installation of an emissions treatment plant comprising six ammonia scrubbers and a biofilter instead of the existing bioscrubber, and the approved second bioscrubber and chimney stack;
- an extension of both the existing Phase 2/3 building and the approved second Phase 2/3 building by approximately 10 m (increasing the number of tunnels from 22 to 25) to allow a longer residence time of substrate in Phase 2/3 processing; and
- the existing pre-wet shed to be used for bale wetting and stable bedding operations.

The effect of the modifications would be to change the method of processing substrate in the pre-wet stage, improve the technology and capability of the odour management system and other minor operational changes to improve the quality of substrate produced.

The proposed changes would mean that, in the longer term, all process operations, including the transfer of compost material throughout the plant, would be undertaken in enclosed buildings and covered conveyors. However, the post 36 hour Phase 2/3 emissions would be vented directly to the atmosphere as odour testing and modelling of these emissions have shown to be not significant from an odour stand point (refer to **Appendix B** - *Modification to Approved Expansion - Odour Impact Assessment (August 2015)*).

The Department of Planning & Environment (DOPE) approved the modification request (Modification No.: MP 08_0255 MOD 1) on 14 March 2016 with support from NSW EPA.

These modifications and engineering upgrades will be undertaken over the next two years during the implementation of the MOD 1 modifications approval.

4.1 Proposed Modifications

The proposed modifications to the approved expansion project (MOD 1) entails the following elements:

1. Raw materials shed area will be contained within a new building enclosure;
2. The establishment of a Bale Wetting Building: the existing bale wetting area and associated process operations will shift from outdoors to indoors. The existing Pre-wet Shed Building will become the new Bale Wetting Building. This modification will be undertaken in two stages;
3. Pre-wet process operations will shift from the existing Pre-wet Shed to newly constructed Pre-wet bunkers with a working hall area;
4. Phase 1 inclined and cross transfer conveyors operation will be contained;
5. Extension of the existing Phase 2/3 Building from twenty-two to twenty-five tunnels and the construction of a new Phase 2/3 building with twenty-five tunnels. This proposed modification will collectively provide up to fifty tunnels for Phase 2/3 process operations;
6. Air emissions generated at the Facility will be directed to an Emissions Plant and Biofilter System. Air emissions will be extracted from the following process areas and sources:
    a. Raw Material Shed Area;
    b. Bale Wetting Building;
    c. The new Pre-wet Bunkers and Working Hall Area;
    d. Phase 1 Working Hall Area;
    e. Phase 1 Bunkers; and
    f. Phase 2 Tunnels (existing and proposed): Only the initial stages of the Phase 2 discharge emissions will be directed to the Emissions Plant and Biofilter System. The latter Phase 2 stages and all of Phase 3 discharge emissions will be directed to dedicated tunnel exhaust roof stacks on the Phase 2/3 Buildings.

7. Future plans to increase on-site Phase 2/3 tunnel capacity to a total of fifty tunnels. This increase in tunnel numbers would necessitate the construction of a new Phase 2/3 building with twenty-five tunnels plus extending the existing Phase 2/3 building by three tunnels (currently there are twenty-two tunnels). The new Phase 2/3 building will be adjacent to the existing Phase 2/3 Building in the north-western corner of the Facility.

8. The mothballing of the Bioscrubber System and stack; and

9. Provision for additional ammonia scrubbers and biofilter bed area. This may require an update to the odour dispersion modelling that has been undertaken in this odour impact assessment study and would be in conjunction with any future plant tonnage increase application to determine if additional emissions treatment capacity is required. This version of the report has considered the installation of two biofilter systems designed to treat all captured emissions from the Facility, as per NSW EPA's 1 May 2015 letter.

4.1.1 Emissions Plant & Biofilter System

Appendix B presents the Initial Assessment and Proposed Modifications to the already Approved Expansion (Append B1) and the relevant EPA Determination Reports, EPA Submissions for amendments and Modifications of Ministers Approvals. These documents are:

- Append B1 - MOD to Approved Expansion Final Report v3 20150828;
- Append B1.1 - MOD1 Assessment Report;
- Append B1.2 - MOD1 Project Approval with SOCs;
- Append B1.3 - MOD1 Concept Plan Approval;
- Append B1.4 - MOD1 Determination Report; and
- Append B1.5 - MOD1 Project Approval.

5 Required Actions from previous Annual Review

The most recent Annual Environmental Management Review (AEMR) was undertaken in 2012.

An approved Odour Management Plan (OMP) for the site, undertaken by Todoroski Air Sciences 2012, required that consideration be given to reducing fugitive emissions by enclosing the bale wetting area and optimising the time taken and efficiency of transporting pre-wet material to the Phase 1 tunnels.

On the 12th January 2015, Elf submitted an environmental assessment (EA) for Modification to an Approved Project (MP 08_0255), which includes designed solutions to the suggestions in the 2012 Todoroski OMP.

As part of the recommendations made in the 2012 AEMR along with request for modifications to Elf's current approval (MP 08_0255), the existing approval, **MOD 1**, addresses the works to be undertaken to satisfy a reduction in all odour emissions at the Mulgrave substrate plant.

The MOD 1 works are in addition to all works already undertaken in this reporting period September 2012 – September 2016. Detailed summaries of these works are tabled in **Sections 1, 3 & 4** above and in **Appendix B.**

6 Environmental Performance

During this reporting period (September 2012 – September 2016) ELF has been undertaking its Approved Expansion works and in preparation for the forthcoming Modifications to this Approved Expansion.

6.1 Odour

Environmental outcomes that were/are intended to principally reduce/minimise odour emissions that may escape the processes as fugitive emissions. To this end the control, capture and treatment of odours has been undertaken by the modification of the plant infrastructure as well as modifications to the processes themselves, specifically the handling of the raw and product materials during the mushroom substrate process. Much of the control of fugitive odour emissions has been achieved through infrastructure modifications in accordance with Elf's own undertaking and those of the enforced Pollution Studies and Reduction Programs (PRP). These modifications to both plant and procedure are listed below.

<u>Plant modifications</u>

- Installation and sealing of doors to Pre-wet building and Phase 1 Working Hall;
- Replace cladding on walls of Pre-wet building and Phase 1 Working Hall;
- Replace roof sheeting & capping on Phase 1 working Hall & Pre-wet Building;
- Enclosed Phase 1 inclined conveyor;
- Enclosed the end of the Phase 1 cross conveyor;
- Installing Phase 1 cross conveyor ventilation;
- Covered Phase 1/Phase 2 transfer conveyor;
- Modified cross tunnel curtains;
- Curtain & roof repairs to tunnel Pre-wet to Phase 1 Hall (September 2013)
- Sealed leakage points around air ducts from Pre-wet to Phase 1;
- Constructed an enclosure for the raw materials area;

- Installed a new Phase 1/2 sliding conveyor to increase the compost transfer rate and reduce the operational time; and

- Installing a new odour capture and treatment plant – ammonia scrubbers and biofilter.

Procedure changes

- Eliminated excess compost resulting in no waste or on site storage;

- Stopped external transfer of pre-wet material to Phase 1; and

- Reverted to a single batch process which reduced the number of days of external operations and potential fugitive odour occurrences.

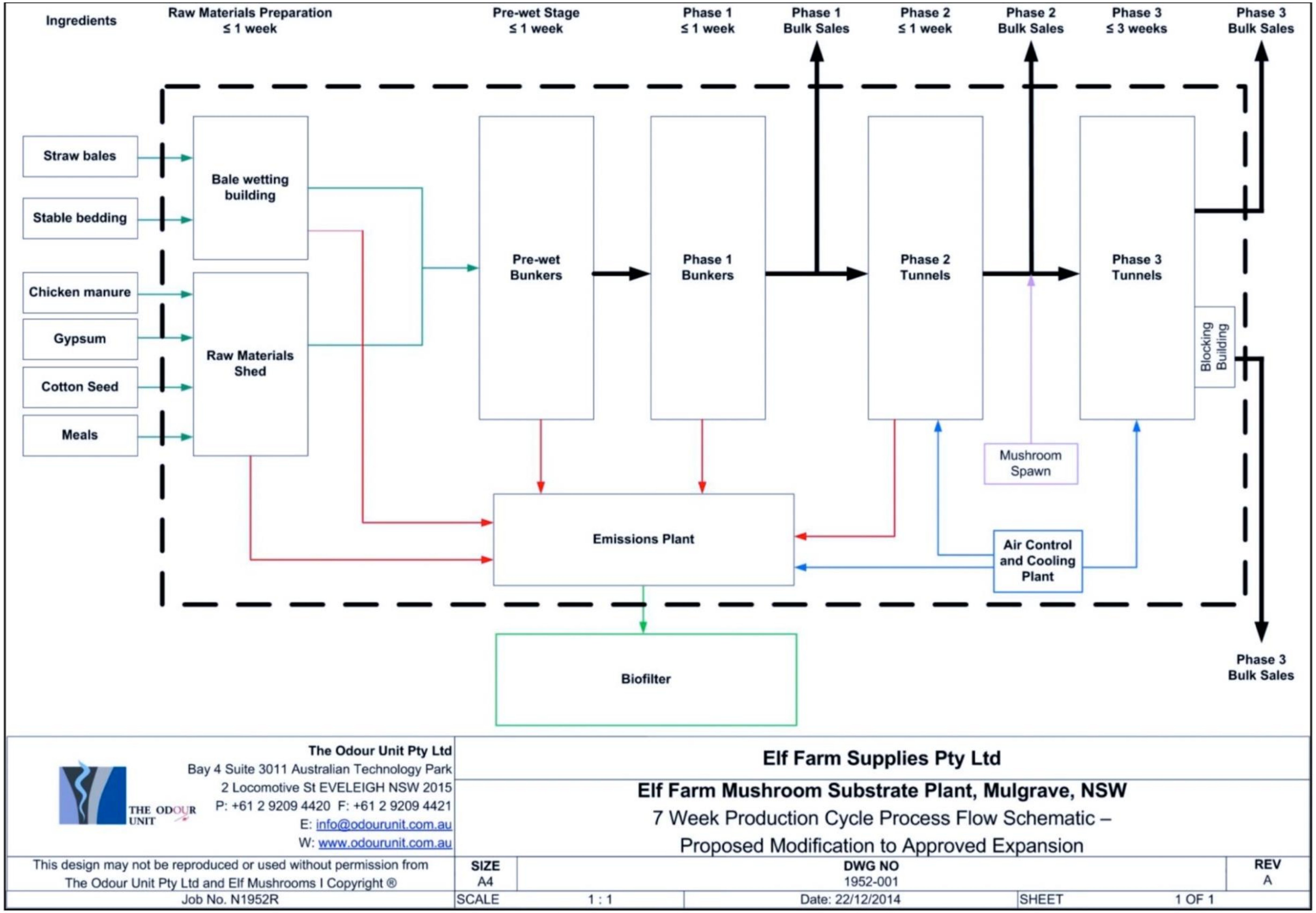
In addition to these plant and procedural changes that have maximized the control of fugitive odour emissions from the site, Elf has:

i) Achieved compliance with its Environment Protection Licence (EPL) odour emissions limit of 55,400 ou.m^3/s from its Bioscrubber stack (*refer 1.1 Table of Compliance*); and

ii) The non-compliance details are presented in *1.2 Table of Non-Compliance*.

6.2 Waste Minimisation

In accordance with EPA Licence Condition L3.2; *"The licensee must ensure that the amount of excess compost that is stored at the premises does not exceed 150 tonnes at any one time".* Elf's process ensures that all materials are utilised in their entirety to ensure there is no waste other than leachate runoff (refer to **Dwg No 1952-001 - Process Flow Schematic**).


Ingredients
Raw Materials Preparation
≤ 1 week
Pre-wet Stage
≤ 1 week
Phase 1
≤ 1 week
Phase 1
Bulk Sales
Phase 2
≤ 1 week
Phase 2
Bulk Sales
Phase 3
≤ 3 weeks
Phase 3
Bulk Sales
Straw bales
Stable bedding
Chicken manure
Gypsum
Cotton Seed
Meals
Bale wetting building
Raw Materials Shed
Pre-wet Bunkers
Phase 1 Bunkers
Phase 2 Tunnels
Phase 3 Tunnels
Blocking Building
Mushroom Spawn
Air Control and Cooling Plant
Emissions Plant
Biofilter
Phase 3
Bulk Sales
The Odour Unit Pty Ltd
Bay 4 Suite 3011 Australian Technology Park
2 Locomotive St EVELEIGH NSW 2015
P: +61 2 9209 4420 F: +61 2 9209 4421
E: info@odourunit.com.au
W: www.odourunit.com.au
THE ODOUR UNIT
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The Odour Unit Pty Ltd and Elf Mushrooms I Copyright ®
Job No. N1952R
Elf Farm Supplies Pty Ltd
Elf Farm Mushroom Substrate Plant, Mulgrave, NSW
7 Week Production Cycle Process Flow Schematic –
Proposed Modification to Approved Expansion
SIZE
A4
DWG NO
1952-001
REV
A
SCALE
1 : 1
Date: 22/12/2014
SHEET
1 OF 1

6.3 Leachate Control & Containment

In accordance with EPA Licence Condition O4.5; the licensee must *"De-Sludge the leachate collection pit (if sludge is present) at least fortnightly and keep a record".* Elf have provided a copy of the most recent desludge undertaking for the purposes of this AEMR. A copy of the register is kept on-site at all times and can be viewed upon request.

6.4 Dust

There were no dust complaints during the reporting period.

6.5 Noise

There was one noise complaint lodged within the reporting period. This was lodged on 16th August 2016. There were no other noise complaints lodged during the reporting period.

6.6 Energy Efficiency

The energy efficiency plan included within the Environmental Management Strategy for the substrate plant (Perram & Partners 2012) addresses efficiency monitoring as follows:

Elf will compile energy consumption data annually. Annual energy results will be reviewed against annual production data to confirm that energy efficiency is being maintained or improved.

The period covered by this AEMR is from September 2012 – September 2016. **Table 6.1** & **Table 6.2** summarise the annual consumption for electrical energy and gas against annual production data, respectively. For each financial year, the electrical energy and gas consumption rate per production tonne of mushroom substrate over the AEMR reporting period was as follows:

Reporting period	Electrical Energy Consumption Rate (kWh/tonne)	Gas Consumption Rate (kJ/tonne)
FY 2017 (to date)	60.2	Not applicable
FY 2016	68.2	23.1
FY 2015	66.0	24.7
FY 2014	62.0	23.4
FY 2013	58.0	20.8
FY 2012	61.4	Not applicable

Table 6.1 – Electrical Energy Consumption Annual Summary: September 2012 – September 2016												
Month	**Financial Year 2017**		**Financial Year 2016**		**Financial Year 2015**		**Financial Year 2014**		**Financial Year 2013**		**Financial Year 2012**	
	Usage (MWh)	**Production (Tonnes)**	**Usage (MWh)**	**Production (Tonnes)**	**Usage (MWh)**	**Production (Tonnes)**	**Usage (MWh)**	**Production (Tonnes)**	**Usage (MWh)**	**Production (Tonnes)**	**Usage (MWh)**	**Production (Tonnes)**
July	410.3	5,962	434.3	6,055	386.8	5,927	422.2	7,541	337.6	6,771	300.7	4,745
August	393.6	7,391	430.6	7,547	403.3	5,962	406.0	5,604	325.4	5,733	338.1	6,220
September	--	--	429.7	6,068	406.8	7,494	375.1	5,875	331.1	5,771	324.7	4,955
October	--	--	474.7	6,041	432.0	6,028	405.6	7,374	356.9	7,209	312.9	4,849
November	--	--	432.0	7,238	409.9	5,554	374.5	5,698	343.1	5,276	313.2	5,697
December	--	--	457.6	6,096	450.4	7,264	414.5	7,637	388.9	7,746	312.1	4,629
January	--	--	488.3	6,067	449.5	5,757	422.7	5,874	423.2	6,166	353.8	4,902
February	--	--	459.1	7,563	415.9	5,850	385.3	5,786	365.9	6,240	335.1	6,134
March	--	--	473.1	5,990	445.9	7,339	413.9	5,870	409.5	6,237	345.0	4,872
April	--	--	431.9	5,935	420.2	5,928	417.6	7,208	385.5	7,501	334.6	5,183
May	--	--	407.9	7,508	403.7	5,928	403.9	5,896	398.3	6,074	355.0	6,866
June	--	--	405.7	6,002	427.1	7,549	379.6	7,413	385.5	5,984	338.7	5,501
Total	**803.9**	**13,353**	**5,324.8**	**78,110**	**5,051.4**	**76,580**	**4,821.0**	**77,776**	**4,450.8**	**76,708**	**3,963.7**	**64,553**
Energy consumption rate (kWh/tonne)	**60.2**		**68.2**		**66.0**		**62.0**		**58.0**		**61.4**	

Table 6.2– Gas Consumption Annual Summary: September 2012 – September 2016												
Month	**Financial Year 2016**			**Financial Year 2015**			**Financial Year 2014**			**Financial Year 2013**		
	Usage (GJ)	**Bill days**	**Production (Tonnes)**	**Usage (GJ)**	**Bill days**	**Production (Tonnes)**	**Usage (GJ)**	**Bill days**	**Production (Tonnes)**	**Usage (GJ)**	**Bill days**	**Production (Tonnes)**
September	464.3	91	6,068	443.44	88	7,494	362.08	90	5,875	367.2	88	5,771
October			6,041			6,028			7,374			7,209
November			7,238			5,554			5,698			5,276
December	472.5	80	6,096	477.31	91	7,264	533.28	98	7,637	325.5	87	7,746
January			6,067			5,757			5,874			6,166
February			7,563			5,850			5,786			6,240
March	391.7	90	5,990	514.93	102	7,339	478.89	89	5,870	425.02	86	6,237
April			5,935			5,928			7,208			7,501
May			7,508			5,928			5,896			6,074
June	477.4	91	6,002	459.47	91	7,549	447.98	86	7,413	478.25	90	5,984
July			6,055			5,927			7,541			6,771
August			7,547			5,962			5,604			5,733
Total	**1,805.9**	**352**	**78,110**	**1,895.2**	**372**	**76,580**	**1,822.2**	**363**	**77,776**	**1,596.0**	**351**	**76,708**
Gas consumption rate (kJ/tonne)	**23.1**			**24.7**			**23.4**			**20.8**		

6.6.1 Commentary on Energy Efficiency

The following commentary is made based on the energy efficiency results in **Section 6.6**:

- Elf commenced commissioning of the cooling circuit modification from October 2015. Since that time, Elf have continued to implement and test the cooling circuit modifications, which appear to now be reducing the electrical energy consumption rate (see results between FY 2016 & 2017);

- The increase in electrical energy usage observed from January 2015 can also be attributed to the higher rainfalls over the 2015 calendar year. A consequence of the higher rainfall is the higher humidity in the ambient air. When extracted and used as part of the composting process, this has a direct impact on increased energy use; and

- The increase observed since FY2013 in gas consumption is related to Elf maintaining the boiler on low-fire as to improve its operational life.

6.7 Annual Returns

All Annual Returns have been lodged in accordance with the NSW EPA requirements.

6.8 Environmental Performance Proposed Improvements

Elf is currently undertaking significant works to significantly improve the control, capture and treatment of process odours in accordance with DOPE Approval 08_0255 MOD 1.

7 Community

Elf has established a Community Liaison Committee (CLC) to facilitate and support effective communication between Elf Farm Supplies and the Mulgrave area community.

Through two-way communication the CLC discusses community issues and concerns in relation to the operation of Elf Farm Supplies.

The CLC is playing a role in monitoring and reviewing the performance of the facility, in terms of its impact on the surrounding community, particularly as new odour mitigation technologies are implemented over time.

While the CLC does not have a formal decision making role, it has assisted Elf to establish a constructive relationship with the community and develop a collaborative approach to discussing and addressing issues of concern that impact on the community, related to the operation of the mushroom compost facility.

This website has been created to provide information about the CLC as well as publish agenda and meeting notes from each quarterly CLC meeting (refer http://www.elfclc.org/).

Further to this, information and reports relating to complaints/feedback received by Elf through its complaint/feedback line are also be uploaded monthly to comply with the Department of Planning and Environment requirements.

The Terms of Reference for the CLC can be viewed at the link below:

http://www.elfclc.org/wp-content/uploads/2015/03/Elf-Farms-CLC-November-2014-Formatted.pdf.

7.1 Complaints Handling Procedure

ELF has developed a comprehensive complaints handling procedure which includes a complaints hotline (1800 155 079) and reference to the CLC website for additional support and information. The complaints procedure can be viewed at the link below:

http://www.elfclc.org/wp-content/uploads/2015/06/Elf-Farm-Supplies-Complaints-Handling-Procedure-FINAL.pdf.

7.2 Summary of Complaints during AEMR Period

Table 7.1 below lists the summary of odour and odour related complaints data and relevant verifications of, and process conditions most likely to elicit those complaints.

Table 7.1 - Summary of Odour & Odour Related Complaints

Complaints Period	Number of Complaints	Number of Wind Direction - Confirmed	Number of Wind Direction - Uncertain	Number of No-Location of Complaint Given	Mushroom Substrate Process		
					Complaints when undertaking Transfer	Complaints when Blending Phase 1	Complaints when Blending PW
Sept-Dec '12	2	1	1	1	n/a	n/a	n/a
2013	109	43	46	22	22	13	39
2014	68	30	30	9	9	13	17
2015	125	74	32	8	14	44	22
Jan-Sept '16	40	21	19	-	10	23	9
Totals	344	**169**	128	40	**55**	**93**	**87**

Of the odour complaints received over the period September 2012 to September 2016 the description of the odours observed more often described a high intensity odour of high offensiveness with descriptors commensurate with odours that would be expected to elicit a strong impact.

There were a total of 344 recorded odour complaints during the review period.

Of the 344, 169 were unable to be verified based on an uncertain or erroneous wind direction at the time of complaint. That is, the complaint did not provide a location for the complaint, or the location was in contradiction to a required wind direction for a complaint at that location.

When considering erroneous complaints, there was a revised total of 169 complaints over the review period.

Based on the data and processes being undertaken during complaint, the likelihood of odour complaints arising from Blending represented greater than 76% of all complaints received.

Trends regarding time of day could not be established as the time of complaints ranged across all timeframes and over all days.

Given Elf's current approval for expansion covering the review period, it is clear that much of the complaints would arise from processes related to these works, and existing processes to be upgraded and mitigated.

8 Independent Audits

During the review period there were two (2) Independent Audits as follows:

1) 2013 Odour Audit (Stephenson Environmental Management Australia). In accordance with:

i. EPA PRP U 1 Odour Audit: (EPA Environmental Protection Licence No. 6229). Refer **Appendix A**: Report A1 – *"5204 Odour Audit Report Elf Farm Supplies";*

ii. This Audit summarised complaints from 2008 – 2012 and also undertook a Review of Design & Management Practices; and

iii. The Stephenson report resulted in an Action Plan. Refer **Appendix A**: Report A3 – *"5248 Elf Farm - Odour Action Plan".*

The outcomes and recommendations of the Audit and subsequent Odour Action Plan were:

a) At the time of the Audit, the current Odour Management Practices were undertaken with a view to minimising odour emissions during the various operational phases of the Elf process; including, raw materials receival and storage, processing operations including leachate recycling, tunnel operations and despatch of the finished product, as follows:

- Clean up any spillage in front of the raw material ingredients storage building; including poultry manure, gypsum, meals, corn cobs, cotton seed, straw or elsewhere on a daily basis;

- Remove solid material from the leachate collection pit screen daily when water is flowing to the pit (wet weather or bale wetting);

- De-sludge the leachate collection pit (if sludge is present) at least fortnightly (see **Section 6.3** for details);

- Keep doors to internal process areas closed when not in use, except where this has no significant effect on the plant's odour performance;

- Maintain appropriate conditions of temperature and oxygen content during composting in tunnels, consistent with the needs of the process, to minimise odour generation;

- Ensure the discharge exit velocity of air from the chimney stack always achieves the minimum requirement determined by odour dispersion modelling;

- Operate the bioscrubber in a manner to maximise its efficiency at removing odour from the air stream;

- Minimise as far as practicable the duration of any bypassing of the bioscrubber for maintenance; and

- Time any bioscrubber bypassing to occur when hot substrate is not being turned and when weather conditions will assist dispersion.

b) Proposed actions that would be taken in the immediate near future, following the Odour Audit, to further ensure the minimisation of odour emissions from the Elf Farm facility include:

- Pre-wet building doors are open during processing and closed up at the end of each day's work. It is proposed that the open area of each doorway be reduced during processing to assist the odour extraction system and minimise leakage out of upper section of door openings. This will be achieved by use of curtains which will be lowered some two meters down from door lintel;

- Water management will be more efficient with one batch per week; that is, the leachate collection pit will no longer fill up with leachate because new straw is absorbing water more efficiently in bale wetting stage of process. This in turn will mean that all leachate will be used in the enclosed pre-wet shed for that process. Additional clean creek water will then be used for bale wetting which will reduce potential for odour release from bale wetting process;

- Phase 1 Tunnel building (working hall) has potential to release odours during the above transfer processes. So north end door will be closed to reduce cross flow air movement which may push odour and steam out opposite doorway;

- Phase 1 External transfer conveyor which runs up outside of tunnel building will be enclosed with detachable covers similar to other conveyors currently installed on site;

- Phase 1 Tunnel building (working hall) enclosed transfer conveyor across top of tunnels has a number of open doors which are closed at the end of each days processing. It is proposed to install automatic door closers on these doors to ensure they remain closed during transfers which will facilitate the odour extraction system which is drawing odour into tunnels through open top during transfer. These odours are then processed through bioscrubber; and

- Fullback position if the above are not enough in short term will be to install an odour neutralising agent (ONA) mist spray system which would operate at critical times to reduce the impact off site.

c) Proposed <u>longer term</u> actions including new pre-wet shed and additional bioscrubber to process all pre-wet odours have been outlined in the Odour Management Plan (OMP). The OMP was prepared by Todoroski Air Sciences in April 2012 and audited by Peter William Stephenson, Managing Director of SEMA who was endorsed by the Director-General, as a suitably qualified, experienced and independent auditor.

AND,

2) 2014 Technical Review and Assessment Audit of Phase 1 Composting Activities & Infrastructure (The Odour Unit Pty Ltd). In accordance with:

   i. <u>PRP U 1.1 Part 2:</u> (EPA Environmental Protection Licence No. 6229). Refer **Appendix A**: Report A8 – *"ELF Farm Supplies Pty Ltd - Technical Review and Assessment Audit";* and

   ii. This Audit undertook a_Review of Design, Process & Odour Management Practices as well as Identification of Odour Mitigation Measures

The outcomes and recommendations of the Audit were:

a) The audit found that all repair works set out in the Pollution Studies and Reduction Programs U1.1 have now been completed. Notwithstanding this, there are further measures that the facility can undertake to improve fugitive emissions from its operations as follows:

- Raw Materials Storage Shed - Continue with the installation of plastic strips or similar along the northern section of the Raw Materials Storage Shed;

- Bale Wetting Process and Area & Process Water (Leachate) Collection Pit - Daily olfactory inspections of the process water collection pit and general bale wetting process areas, and, the process water collection pit contents to remain under continuous aeration at all times, independent of bale wetting operating conditions;

- Pre-Wet Building - Install plastic strips or similar in the upper section of the doorways at both the north-eastern and south-eastern corner of the Pre-wet building;

- Phase 1 Building and Working Hall - Continue cladding and sheeting repair works to the southern and eastern wall and 1 metre section (eastern) roofing of the Phase 1 building; and

- Phase 1 to Phase 2 Building Transfer Conveyor - Install/enclose Phase 1 Transfer Conveyor transfer point located next to the Phase 1 building northern wall. This should be carried out in a manner that attenuates fugitive odour emissions from this area.

b) During the Audit, it was advised that the concept design of the upgrade involves the full enclosure of the Raw Materials Storage Shed, Pre-wet building, Phase 1 Building and Working Hall This site-wide enclosure will result in the full containment of all emissions at the facility. The captured air emissions (both point source and ventilation) from the future enclosure of process operations will be directed to a completely new odour control system (OCS) that will consist of a set of acid scrubbers for removal of NH_3 followed by a biofiltration system. This planned major upgrade should minimise all fugitive emission sources from the facility under normal operating conditions, with only the treated emissions from the biofilter system.

c) The Audit also found that an OMP should be considered a ‘live’ document that is readily accessible to site personnel at all times. The OMP document should consider all aspects of monitoring, practices, and protocols adopted at a facility that are designed to attenuate odour emissions from process operations. The handling of odour complaints is addressed in the current Community Consultation Strategy (CCS).

   The audit was supplied a copy of the facility’s current OMP document which was completed by Todoroski Air Sciences (Todoroski) in April 2012 as part of the Project Approval for the expansion works at the time; and

   - The audit endorsed the planned full enclosure of process operations at the facility as per the facility’s current OMP;

   - Whilst outside the scope of the audit, the OMP was reviewed by TOU and the following updates should be considered:

i. The OMP should be a site-specific document that describes the existing process operations and practices at the facility;

ii. A process description section should be included that allows the basic details of the five key stages of the mushroom substrate composting process;

iii. Outline and describe existing protocols, management practices and controls at the facility that are aimed at attenuating odour emissions. This should be specific to each key process area at the facility (i.e. Pre-wet building, Phase 1 Trans Hall, etc.);

iv. Outline and describe how any required maintenance work is carried out and include the measures taken by the facility to attenuate odour emissions during this period. This also should be specific to each key process area; and

v. Reflect the major planned upgrade works to the facility once completed.

Currently, the previous Audits have been implemented, with some parts completed in full.

The remaining recommendations form in part the current Expansion Approval and Modifications to the Approval which are due to be completed in full over the next two years.

8.1 Next Audit Reporting Period

The next Audit is due in a year from this reporting date that is by September 2017 as per the requirements in Condition 3 Schedule 5 of project approval No 08_255 MOD1.

Prepared on behalf of
Elf Farm Supplies Pty Ltd

Mushroom Substrate Facility – Annual Environmental Management Review

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Mulgrave, NSW

<u>Appendices</u>

September 2016

APPENDIX A –

STATUTORY COMPLIANCE REPORTS

Stephenson

Environmental Management Australia

ODOUR AUDIT

ELF FARM SUPPLIES PTY LTD

MULGRAVE, NSW

PROJECT NO.: 5204/13

DATE OF ISSUE: 11 APRIL 2013

Stephenson
Environmental Management Australia

Peter W Stephenson & Associates Pty Ltd
ACN 002 600 526 (Incorporated in NSW)
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ODOUR AUDIT

ELF FARM SUPPLIES PTY LTD

MULGRAVE, NSW

PROJECT NO.: **5204/13**

DATE OF ISSUE: **11 APRIL 2013**

P W STEPHENSON

M KIMBER

A NAGHIZADEH

TABLE OF CONTENTS

TABLE OF TABLES

1 INTRODUCTION

Stephenson Environmental Management Australia (SEMA) was engaged by Elf Farm Supplies Pty. Ltd. to undertake an Odour Audit for the Substrate Plant Site, at Mulgrave, New South Wales (NSW). This audit has been conducted by Peter William Stephenson, Managing Director of SEMA.

This Odour Management Audit addresses Condition U1 of EPA Environment Protection Licence No. 6229, which states:-

U1 Odour Audit

U1.1 By 1 March 2013 the Licensee must submit an odour audit report to the EPA's Manager Waste Operations.

The odour audit report must be conducted by an independent and suitably qualified odour assessment consultant address the following:

a. *A summary of any odour complaints received and actions taken to reduce odour where complaints are verified;*

b. *Benchmark the design and management practices at the Elf Farm Supplies premises against industry best practice for minimising odour. This should include, but not be limited to, storage of stable bedding and other substrates, straw wetting techniques, and leachate collection pit management; and*

c. *Using the results of (a) and (b), if it is identified that Elf Farm Supplies does not meet industry best practice standards for odour minimisation in any area of the expanded operations, and validated complaints have been received the report must include:*

    - *Proposed mitigation works and/or management practices to ensure that odour is minimised as far as is practicable; and*
    - *A timetable for the implementation of these works.*

2 REVIEW OF COMPLAINT RECORDS

2.1 COMPLAINT RECORDS

Complaints management process and records are maintained in hard copy and summarised in a database. Table 2-1 summarises odour complaints for the last four complete calendar years. This data has been provided from the Elf Farm Supplies Complaints log.

A verified odour complaint occurred in January 2011. The action taken to prevent the recurrence of the non-compliance was stopping the practice of storing clean straw adjacent to Stable Bedding material whilst the water boom is operating.

TABLE 2-1 SUMMARY OF ODOUR COMPLAINTS 2008 - 2012

ELR #	Date	Day	Time	Type	Location of complaint		Comments
	17/09/2012	Monday	1:18am	Odour	Windsor		Wind direction contradicts claim
	19/08/2012	Sunday	12:30pm	Odour	Not specified		
	6/06/2012	Wednesday	1:39pm	Odour	Not specified		
	2/01/2012	Monday	Unknown	Odour	Not specified		
130203	1/08/2011	Monday	1:10am	Odour + Water Pollution in South Creek	Not specified		Overflowing creek water storage tank
130203	31/07/2011	Sunday	4:30pm	Odour + Water Pollution in South Creek	Not specified		Overflowing creek water storage tank
129648	4/07/2011	Monday	5:00pm	Odour	Not specified		
129167	8/06/2011	Wednesday	9:15am	Odour	Confidential		
126141	18/01/2011	Tuesday	2:52pm	Odour	Not specified		
123218	26/08/2010	Thursday	11:13am	Odour	McGraths Hill	Windsor Road	Wind direction contradicts claim
122027	28/06/2010	Saturday	6:30am	Odour	Unknown		
121219	20/05/2010	Thursday	9:38am	Odour	Windsor		Wind direction contradicts claim
120716	2/05/2010	Sunday	12:39pm	Odour	Vineyard		Spoke to DECC…. Did not have to report.
120591	24/04/2010	Saturday	11:15am	Odour	Vineyard		Wind direction contradicts claim
118339	18/01/2010	Monday	12:00pm	Odour	Mulgrave		Wind in general direction
116001	3/09/2009	Thursday	7:00am	Odour	Mulgrave	Mulgrave Road	Wind direction contradicts claim
113623	6/05/2009	Wednesday	5:00am	Odour	South Windsor	McQuade Ave	Wind in general direction
110461	2/12/2008	Tuesday	3:45pm	Odour	Windsor	Chisolm Place	Wind in general direction
109088	24/09/2008	Wednesday	8:15am	Odour	Windsor	Chisolm Place	Wind Direction varied due to gusty winds
108855	12/09/2008	Friday	3:45pm	Odour	Windsor	* Windsor	Wind direction contradicts claim
108880	10/09/2008	Wednesday	2:20pm	Odour	Mulgrave	chisolm Place	Wind direction contradicts claim
108782	9/09/2008	Tuesday	4:08pm	Odour	Mulgrave	chisolm Place	Wind direction contradicts claim

ELR #	Date	Day	Time	Type	Location of complaint		Comments
108780	9/09/2008	Tuesday	8:00am	Odour + Water Pollution in South Creek	Windsor	chisolm Place	DECC agreed it was storm water run off
108263	13/08/2008	Wednesday	8:00am	Odour	Mulgrave	Mulgrave Station	Wind Direction varied due to gusty winds
107273	17/06/2008	Tuesday	4:00am	Odour	South Windsor	Chisolm Place	Wind direction contradicts claim
105952	7/04/2008	Monday	3:30pm	Odour	Turramurra	* Windsor	Not required to report
105046	21/02/2008	Thursday	8:15am	Odour	Windsor High School	Freemans Reach	EPL notification time 4 days after incident
105028	21/02/2008	Thursday	5:25pm	Odour	South Windsor	Church Street	Reported 2 days after event
	21/01/2008	Monday	12:00pm	Odour	Windsor Council Chambers		Wind direction contradicts claim
	21/01/2008	Monday	2:04pm	Odour	Windsor		Wind direction contradicts claim
Eggleton	3/01/2008	Thursday	10:11am	Odour	South Windsor		Wind in general direction
Eggleton	3/01/2008	Thursday	8:10pm	Odour	South Windsor		Wind direction contradicts claim
Bathersby	3/01/2008	Thursday	8:11pm	Odour	South Windsor		Wind direction contradicts claim

3 BENCHMARK OF DESIGN AND MANAGEMENT PRACTICES

The assessment of the effectiveness of the odour controls on site in protecting receivers against offensive odours is detailed in Table 3-1.

In essence, the combination of odour fume extraction from the various substrate production processes and discharge to atmosphere via a bio-scrubber and tall stack, have been proven by six monthly odour emission testing to be an effective method of odour control of the tunnel composting process.

Duplication of these odour control measures in the Stage 2 development will further reduce fugitive odour emissions from the site and enable more of the storage and pre-wet processes to be fully enclosed.

Additional mitigation measures are proposed to minimise the odour emissions from the site for the post Stage 2 operations.

TABLE 3-1 BENCHMARK OF DESIGN AND MANAGEMENT PRACTICES AGAINST INDUSTRY BEST PRACTICE

1.1	MUSHROOM COMPOSTING DESIGN PRACTICES	AUDITOR REVIEW	PROPOSED ACTIONS
1.1.i	Under-cover storage to keep raw materials dry	Best practice.	Design and construction of a straw bale storage shed. Aim completion by June 2014. Design complete.
1.1.ii	Fully enclosed processing areas for all potentially odour-generating processes	Best practice.	Consideration to be given to enclosing the bale wetting and stable bedding wetting areas during the proposed Stage 2 expansion, commencing 2014 Consideration to be also given to enclosing the main recycling pit during the proposed Stage 2 expansion, commencing 2014
1.1.iii	Pressurised air-under system existing in the Pre-Wet shed, Bale Wetting areas, Stable Bedding Wetting area and the Phase 1 bunkers to improve aeration during compost processing by maintaining aerobic conditions	Best practice. Adopted in compost yards worldwide.	
1.1.iv	Computer controlled air-under fans to maintain optimum air supply	Best practice.	
1.1.v	Extensive instrumentation to monitor compost processing variables	Best practice.	
1.1.vi	A tunnel to enable fully enclosed transfer of pre-wet material from the pre-wet building to composting tunnels	Best practice.	Enclosed conveyers are being considered for transferring Pre-Wet material to the Phase 1 bunkers during the proposed Stage 2 expansion, commencing 2014
1.1.vii	Enclosed conveyor transport system for Phase 1 bunker blending and transfer to the Phase 2 tunnels	Best practice.	
1.1.viii	A bio-scrubber to remove odorous compounds from exhaust air from Phase 1 tunnels (and currently the Pre-Wet shed) prior to release to atmosphere	Best practice.	

1.1.ix	A chimney stack to discharge exhaust air from the Phase 1 tunnels bio-scrubber 40 metres above ground	Best practice.	
1.1.x	Site monitoring network consisting of cameras & trigger alarms on operational and environmental controls and processes	Best practice.	95% complete. Operational control and process alarms in place. Cameras network installed. Environmental trigger alarms in progress. Scheduled for completion end May 2013.
1.1.xi	Maintaining storage of critical spares for machinery equipment where possible	Best practice.	
1.1.xii	An additional bio-scrubber to remove odorous compounds from exhaust air from the pre-wet shed prior to release to atmosphere (proposed in Stage 2)		Proposed stage 2 expansion work, commencing 2014
1.1.xiii	An additional chimney stack to discharge exhaust air from Pre-Wet sheds bio-scrubber 40 metres above ground (proposed in Stage 2 development).		Proposed stage 2 expansion work, commencing 2014
1.2	**MUSHROOM COMPOSTING MANAGEMENT PRACTICES**	**AUDITOR REVIEW**	**PROPOSED ACTIONS**
1.2.i	Clean up any spillage in front of the ingredients store or elsewhere on a daily basis	Best practice.	Ensure daily clean up occurs.
1.2.ii	Remove solid material from the collection pit screen daily	Best practice.	
1.2.iii	De-sludge the collection pit at fortnightly intervals	Best practice.	
1.2.iv	Keep doors to internal process areas closed when not in use, except where this has no significant effect on the plant's odour performance	Best practice.	
1.2.v	Maintain appropriate conditions of temperature and oxygen content during composting, consistent with the needs of the process, to minimise odour generation	Best practice.	
1.2.vi	Ensure the exit velocity of air from the chimney always achieves the minimum requirement determined by odour dispersion modelling	Best practice.	YES but trigger alarm network scheduled for completion 5/2013
1.2.vii	Operate the bio-scrubber in a manner to maximise its efficiency at removing odour from the air stream	Best practice.	6 monthly testing to confirm EPL compliance

Stephenson

Environmental Management Australia

ODOUR EMISSION SURVEY – OEH REPORT

ELF FARM SUPPLIES PTY LTD

MULGRAVE, NSW

PROJECT NO.:	5198/S22455/13
DATE OF SURVEY:	10 TO 16 APRIL 2013
DATE OF ISSUE:	17 APRIL 2013

Stephenson
Environmental Management Australia

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ODOUR EMISSION SURVEY – OEH REPORT

ELF FARM SUPPLIES PTY LTD

MULGRAVE, NSW

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P W STEPHENSON

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TABLE OF CONTENTS

TABLE OF TABLES

TABLE OF TABLES APPENDICES

TABLE OF FIGURES APPENDICES

1 INTRODUCTION

Stephenson Environmental Management Australia (SEMA) was requested by Elf Farm Supplies Pty Ltd to assess the odour emissions from the stack serving the tunnel composters at their composting facility located at Mulgrave, New South Wales (NSW).

The principal objectives of the tests were to measure odour emission concentrations from the stack and to determine compliance of the odour emission with the facility's Environment Protection Licence (EPL) No. 6229. The EPL was issued by the Environment Protection Authority (EPA) in accordance with the *Protection of the Environment Operations Act 1997*. The EPA is now incorporated into the Office of Environment and Heritage (OEH).

The emission parameters monitored in this survey were:

- Odour concentration
- Stack exhaust gas velocity, exhaust gas temperature, and hence discharge volume
- Moisture
- Mass Odour Emission Rate (MOER).

Odour emission testing was undertaken between 10 and 16 April 2013 at various times during a typical seven (7) day composting cycle. Table 1-1 shows when testing was carried out on the stack.

TABLE 1-1 ODOUR TESTING PROGRAM

Day of the Week	Date	Time of the Day Sample was Taken	Number of Odour Samples Taken per Visit
Wednesday	10/04/2013	PM	1
Thursday	11/04/2013	AM	1
Friday	12/04/2013	AM	1
Monday	15/04/2013	PM	1
Tuesday	16/04/2013	AM	1

Note:

(1) The AM samples were taken between 3-5am and PM samples were taken between 7-9pm over a one-week composting cycle period.

2 PRODUCTION CONDITIONS

The odour emission samples were collected with the composting plant operating under a normal seven-day cycle running from Wednesday to Tuesday.

Elf Farm Supplies hold all relevant production records should they be required for review.

3 RESULTS AND DISCUSSION

3.1 EMISSION TEST RESULTS

The results of the emission tests are presented in Table 3-1. SEMA completed the odour sampling. SEMA is NATA accredited for the odour sampling, NATA accreditation number 15043.

Odour Research Laboratories Australia (ORLA) performed the odour analysis. ORLA is a division of Peter W Stephenson & Associates Pty Ltd and is NATA accredited to AS4323.3 for odour analysis, accreditation number 15043. ORLA is the first NATA accredited odour analysis laboratory in New South Wales.

The Certificates of Analysis, Olfactometer Test Report Nos. 5198/ORLA/01, 5198/ORLA/02 and 5198/ORLA/03 are presented in Appendix A of this report.

The odour emission sampling and olfactometric analysis was conducted in accordance with Australian Standard (AS) 4323.3. Refer to Section 5 of this report for further detail.

TABLE 3-1 ODOUR EMISSION CONCENTRATION RESULTS

Day of Week	**Wednesday**	**Thursday**	**Friday**	**Monday**	**Tuesday**
Date	10/04/2013	11/04/2013	12/04/2013	15/04/2013	16/04/2013
Time Sample Taken (hours)	19:38	04:15	03:25	20:02	03:31
SEMA Sample No.	3648	3649	3657	3659	3660
ORLA Sample No.	722516	722517	722524	722533	722534
Concentration (ou)	**2,169**	**2,371**	**1,984**	**2,548**	**3,073**

Key:
ou = odour unit

3.2 ENVIRONMENT PROTECTION LICENCE NO. 6229

Table 3-2 summarises the odour emission limit for the tunnel composter stack at Elf Farm Supplies Pty Ltd under their EPL Licence No. 6229. The criterion is defined by the 100th percentile concentration limit as a Mass Odour Emission Rate (MOER) in Odour Units per second (ou/s) on a rolling annual average. A copy of the relevant section of this Licence is included in Appendix B.

TABLE 3-2 100TH PERCENTILE ODOUR EMISSION LIMIT

	EPA Licence Criteria
100th Percentile MOER Limit	55,400 ou/s
Averaging Period	Rolling annual

Key:
MOER = Mass odour emission rate
ou/s = Odour units per second which is a misnomer in EPA Licence 6229 (EPL) and should now read odour units. cubic metres per second (ou.m^3/s)

3.3 ODOUR EMISSION RATES

The MOER for all samples was determined to establish compliance with the EPA/OEH EPL criteria.

The MOER can be calculated using the following formula:

MOER = velocity (m/s) x total area of the stack (m^2) x odour concentration (ou)

Velocity = velocity of air in stack in metres per second as shown in Table 3-3
Total Surface Area of the Stack = Cross Sectional Area of the Stack in square metres (m^2).
Odour Concentration = As per Table 2-1 and Table 3-3.

The above formula calculates MOER based on actual conditions. However the Reference Conditions specified that the MOER is to be reported as dry, 293 degrees Kelvin (K) and 101.3 kilopascals (kPa).

SEMA measured the moisture content, temperature and pressure of the exhaust gas stream, at the same time as the odour emissions were sampled. These measurements enabled the MOER to be corrected to the above reference conditions. The MOER for each of the samples is shown in Table 3-3. Refer to Appendix C for detailed Exhaust Gas Flow Data in table format.

TABLE 3-3 ODOUR EMISSION RATES OVER A TYPICAL SEVEN DAY COMPOSTING CYCLE APRIL 2013

Day	Wednesday	Thursday	Friday	Monday	Tuesday
Date	10/04/2013	11/04/2013	12/04/2013	15/04/2013	16/04/2013
ORLA Sample No.	3648	3649	3657	3659	3660
Time (hours)	19:38	04:15	03:25	20:02	03:31
Odour Concentration (ou)	2,169	2,371	1,984	2,548	3,073
Stack Velocity (m/s)	13.3	13.0	12.9	14.4	14.4
Stack Cross Sectional Area (m^2)	1.272	1.272	1.272	1.272	1.272
MOER (ou.v/s)	32,632	35,372	28,988	24,196	47,817
EPL MOER Limit (ou/s)	55,400*	55,400*	55,400*	55,400*	55,400*

Key:

*	=	Rolling annual averaging period		
MOER	=	Mass Odour Emission Rate	m/s =	metres per second
ou.v/s	=	Odour Unit volumes per second	m^2 =	square metres
ou/s	=	Odour Units per second		

4 CONCLUSIONS

This odour emission survey was conducted over a typical seven day composting cycle. The measured stack MOER's for the monitoring period ranged from 24,196 ou.m^3/s to 47,817 ou.m^3/s. The average MOER for the April 2013 composting cycle, which was considered to be typical, was 33,801 ou.m^3/s.

Therefore, these MOER's comply with the EPA/OEH EPL No. 6229 Licence Criteria of 55,400 ou.m^3/s Rolling Annual Average.

5 TEST METHODS

5.1 ODOUR

(Standards Association of Australia AS4323.3 and OEH NSW OM-7)

Samples were collected in 30L Nalophane sampling bags which are enclosed in airtight plastic containers.

Odorous gas for analysis was drawn through a Teflon (PTFE) sample probe. The gas then passes through a Teflon (PTFE) tube connected to the Nalophane sampling bag. The sampling pump is connected to the airtight plastic container to provide a sample gas flow-rate of approximately 0.5 – 1.5 litres per minute. After the required volume has been sampled, the pump is stopped and the bag sealed with a stainless steel valve.

Using a triangular forced choice olfactometer, the Nalophane bag of odour sample was dynamically diluted to various concentrations with dry odour free air.

The diluted sample was then presented to a panel of screened panellists as one of these airflows. The panellists then recorded if they could detect any odour and from which flow. The other two flows were discharging odour free air.

The odour is always presented to the panellists in ascending concentration; that is, from lower to higher concentration. The panellists are required at each dilution level to give a response as to what they are smelling from the flows (forced choice methodology). The response options for the panellists are:

'Guess'	Unable to determine which air flow contains the diluted odours
'Inkle'	Thinks that one of the flows may be different from the other two flows
'Detect' or 'Certain'	Is confident that one of the airflows smells different from the other two flows. Not necessarily able to say what the smell is.
'Recognise'	Thinks that one of the flows may be different from the other two flows and is able to: ▪ Assign a 'hedonic tone' (pleasantness scale number) to the odour ranging from –10 to 10 and/or ▪ Able to assign a character to the odour, as in 'it smells like …' *Note: that the Recognise level concentration and Hedonic Tone and Odour descriptors are obtained with the diluted odour, panellists are not exposed to the full strength odour.*

The percentage panel response and dilution levels used were then entered into a computer programme to determine the 50% panel response. This dilution level corresponds to the odour concentration of the sample.

Sampling and dilution lines are constructed from teflon, stainless or glass to prevent contamination of the sample.

The sampling and the dilution procedures used were in accordance with OEH NSW Methods OM-7 and OM-8 which are based on Standards Association of Australia, AS4323.3.

5.1.1 ODOUR PANEL SELECTION

Odour panellists must meet certain criteria to qualify as and remain panellists. Their average sensitivity to n-Butanol must be between 20 and 80 parts per billion (ppb) and their variability in response to n-Butanol must be within a certain range.

Panellists are tested against n-Butanol before every panel session to ensure they are in compliance.

Panellists should not suffer from respiratory complaints, nor should they eat or smoke or drink anything but water during the half hour preceding or during the test period and their person and clothing should be odour free and have not been exposed to an odorous environment before testing.

5.1.2 ODOUR TERMINOLOGY

The odour level is expressed in odour units and for mixed odours is analogous to concentration expressed in parts per billion. The odour detection level is defined as the ratio of *the volume that a sample of odorous gas would occupy when diluted to the threshold of detection of that odour* to *the volume of the sample*. In simpler terms, the ratio indicated the number of dilutions necessary to reduce the odour to its threshold of detection or odour detection threshold. This ratio is expressed in odour units or number of dilutions to detection threshold. For example, a value of 2,000 odour units would mean the volume of the initial sample of odorous gas would need to be diluted 2,000 times before the odour would just be detectable to the average human nose, that is, at the odour detection threshold.

5.2 EXHAUST GAS VELOCITY

(OEH NSW TM-2 and USEPA Method 12)

Velocity profiles were obtained across the stack utilising an Airflow Developments Ltd. S-type pitot tube and digital manometer.

5.3 EXHAUST GAS TEMPERATURE

(OEH NSW TM- 2, 3 & 4 and USEPA Methods 2, 3 & 4)

The exhaust gas temperature was measured using a Digital thermometer (0-1200°C) connected to a chromel/alumel (K-type) thermocouple probe.

5.4 EXHAUST GAS MOISTURE CONTENT

(OEH NSW TM-22)

Moisture from the stack was collected in accordance with OEH NSW TM-22 sampling train. The collected moisture was weighed and calculated to a percentage of stack gas.

5.5 ACCURACY

All results are quoted on a dry basis.

Appendix C of (British Standard) 893 presents a range of accuracies for various parts of the isokinetic sampling procedure including pressure, velocity, temperature and particulate sampling. At best, an accuracy of ± 10% can be expected.

For odour the ratio between two single measurements, performed on the same testing material in this laboratory under repeatability conditions, will not be larger than 2.65 in 95% of cases. (Source – AS/NZS 4323.3:2001 Appendix B Section B2).

APPENDIX A – CERTIFICATES OF ANALYSIS

Odour Research Laboratories Australia

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Olfactometry Test Report

	The measurement was commissioned by SEMA on behalf of:	
Client	Organisation:	Elf Farm Supplies
	Address:	108 Mulgrave Road, Mulgrave NSW 2756
	Contact:	Neil Cockerell
	Sampling Site:	Main Stack
	Telephone:	02 4577 5000
	Email:	manager@elffarm.com.au
Project	ORLA Report Number:	5198/ORLA/01
	Project Manager:	Peter Stephenson
	Testing operator:	Ali Naghizadeh
	ORLA Sample number(s):	3648, 3649
	SEMA Sample number(s):	722516, 722517
Order	Analysis Requested:	Odour Analysis
	Order requested by:	SEMA on behalf of Elf Farm Supplies
	Date of order:	11 April 2013
	Order number:	3855
	Telephone:	02 9737 9991
	Signed by:	Ali Naghizadeh
	Order accepted by:	Ali Naghizadeh
Report	Date of issue:	15 April 2013

NATA accredited laboratory number 15043.
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Investigated Item	Odour concentration in odour units 'ou' determined by Sensory odour concentration measurements, of an odour sample supplied in a sampling bag. All samples were received in good condition.
Analysis Method	The samples were analysed in accordance with AS/NZS4323.3:2001.
Identification	The odour sample bags were labelled individually. Each label recorded the testing laboratory, sample number, sampling location (or Identification) sampling date and time, dilution ratio (if dilution was used) and whether further chemical analysis was required.
Method	The odour concentration measurements were performed using dynamic olfactometry according to the Australian Standard 'Determination of Odour Concentration by Dynamic Olfactometry AS/NZS4323.3:2001. The odour perception characteristics of the panel within the presentation series for the samples were analogous to that for n-butanol calibration. Any deviation from the Australian standard is recorded in the 'Comments' section of this report.
Instrument Used	The Olfactometer used during this testing session was: AC'SCENT International Olfactometer
Measuring Range	The measuring range of the AC'SCENT International olfactometer is $13 \leq \chi \leq 64{,}281$ ou. If the measuring range was insufficient the odour samples will have been pre-diluted.
Environment	The measurements were performed in an air- and odour-conditioned room. The room temperature is maintained between ± 3°C.
Measuring Dates	The date of each measurement is specified with the results.
Instrument Precision	The precision of this instrument (expressed as repeatability) for a sensory calibration must be $r \leq 0.05$ in accordance with the Australian Standard AS/NZS4323.3:2001. AC'SCENT International Olfactometer: $r = 0.0080$ (March 2013) Compliance – Yes
Instrumental Accuracy	The accuracy of this instrument for a sensory calibration must be $A \leq 0.20$ in accordance with the Australian Standard AS/NZS4323.3:2001. AC'SCENT International Olfactometer: $A = 0.120$ (March 2013) Compliance – Yes
Lower Detection Limit (LDL)	The LDL for the AC'SCENT International Olfactometer has been determined to be 13 ou
Traceability	The measurements have been performed using standards for which the traceability to the national standard has been demonstrated. The assessors are individually selected to comply with fixed criteria and are monitored every session to keep within the limits of the standard. The results from the assessors are traceable to primary standards of n-butanol in nitrogen.

15 April 2013

Peter Stephenson
Managing Director

Odour Research Laboratories Australia

Odour Olfactometry Results – 5198/ORLA/01

Sample Location	Sample ID No.	Sampling Date & Time	ORLA Sample No.	Analysis Date & Time (Completed)	Panel Size	Valid ITEs	Sample Pre-Dilution	Sample Odour Concentration (ou)[1]	Sample Odour Concentration (ou)[2]	Odour Character & Hedonic Tone[^ *]
Sample ID: Stack R1	722516	10/04/2013 1938-1948	3648	11/04/2013 0934-1007	4	8	Nil	2,169	2,169	Sewerage, ammonia, stinky socks, garbage, septic, metallic, garbage tip (-4.5)[^]
Sample ID: Stack R2	722517	11/04/2013 0415-0425	3649	11/04/2013 1012-1048	4	8	Nil	2,371	2,371	Fishy, sewerage, garbage, stinky socks, metallic, garbage tip, septic (-4.5)[^]

Odour Research Laboratories Australia

Odour Panel Calibration Results – 5198/ORLA/01

Reference Odorant	ORLA Sample No.	Concentration of Reference Gas (ppm)	Reference Gas Measured Concentration (ou)	Panel Average Measured Concentration (ppb) [3]	Does this panel calibration measurement comply with AS/NZS4323.3:P2001 (Yes/No) [4]
n-butanol	3647	50.0	1,161	43	Yes

Comments: All samples were collected by Stephenson Environmental Management Australia and analysed by Odour Research Laboratories Australia at their Sydney Laboratory.

Notes from Odour Olfactometry Results:

[1] Sample Odour Concentration: as received in the bag

[2] Sample Odour Concentration: allowing for pre-dilution

[3] Panel Average Measured Concentration: indicates the sensitivity of the panel for the session completed

[4] Target Range for reference gas n-butanol is $20 \le \chi \le 80$ ppb and compliance with AS/NZ4323.3:2001 is based on the individuals rolling average and not on the panel average measured concentration. Panellist Rolling Average: SR = 48.4, PR = 44.2, PP = 39.4, TL = 46.4

^ denotes the Average Hedonic Tone: describes the pleasantness of the odour being presented where (+5) represents Very Pleasant, (0) represents Neutral and (-5) represents Very Unpleasant and has been derived from the panellist responses at the recognition threshold.

+ This value is not part of our NATA Scope of Accreditation and AS4323.3

--------------------END OF TEST REPORT--------------------

Odour Research Laboratories Australia

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Olfactometry Test Report

	The measurement was commissioned by SEMA on behalf of:	
Client	Organisation:	Elf Farm Supplies
	Address:	108 Mulgrave Road, Mulgrave NSW 2756
	Contact:	Neil Cockerell
	Sampling Site:	Main Stack
	Telephone:	02 4577 5000
	Email:	manager@elffarm.com.au
Project	ORLA Report Number:	5198/ORLA/02
	Project Manager:	Peter Stephenson
	Testing operator:	Ali Naghizadeh
	ORLA Sample number(s):	3657
	SEMA Sample number(s):	722524
Order	Analysis Requested:	Odour Analysis
	Order requested by:	SEMA on behalf of Elf Farm Supplies
	Date of order:	12 April 2013
	Order number:	3856
	Telephone:	02 9737 9991
	Signed by:	Ali Naghizadeh
	Order accepted by:	Ali Naghizadeh
Report	Date of issue:	15 April 2013

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Instrument Used	The Olfactometer used during this testing session was: AC'SCENT International Olfactometer
Measuring Range	The measuring range of the AC'SCENT International olfactometer is $13 \leq \chi \leq 64{,}281$ ou. If the measuring range was insufficient the odour samples will have been pre-diluted.
Environment	The measurements were performed in an air- and odour-conditioned room. The room temperature is maintained between ± 3°C.
Measuring Dates	The date of each measurement is specified with the results.
Instrument Precision	The precision of this instrument (expressed as repeatability) for a sensory calibration must be $r \leq 0.05$ in accordance with the Australian Standard AS/NZS4323.3:2001. AC'SCENT International Olfactometer: $r = 0.0080$ (March 2013) Compliance – Yes
Instrumental Accuracy	The accuracy of this instrument for a sensory calibration must be $A \leq 0.20$ in accordance with the Australian Standard AS/NZS4323.3:2001. AC'SCENT International Olfactometer: $A = 0.120$ (March 2013) Compliance – Yes
Lower Detection Limit (LDL)	The LDL for the AC'SCENT International Olfactometer has been determined to be 13 ou
Traceability	The measurements have been performed using standards for which the traceability to the national standard has been demonstrated. The assessors are individually selected to comply with fixed criteria and are monitored every session to keep within the limits of the standard. The results from the assessors are traceable to primary standards of n-butanol in nitrogen.

15 April 2013

Peter Stephenson
Managing Director

Odour Research Laboratories Australia

Odour Olfactometry Results – 5198/ORLA/02

Sample Location	Sample ID No.	Sampling Date & Time	ORLA Sample No.	Analysis Date & Time (Completed)	Panel Size	Valid ITEs	Sample Pre-Dilution	Sample Odour Concentration (ou) [1]	Sample Odour Concentration (ou) [2]	Odour Character & Hedonic Tone [^, *]
Sample ID: Stack R3	722524	12/04/2013 0325-0335	3657	12/04/2013 1117-1200	4	8	Nil	1,984	1,984	Rotting fish, rotting meat, fishy, sewerage, strong rotten beans (-4.5)[^]

Odour Research Laboratories Australia

Odour Panel Calibration Results – 5198/ORLA/02

Reference Odorant	ORLA Sample No.	Concentration of Reference Gas (ppm)	Reference Gas Measured Concentration (ou)	Panel Average Measured Concentration (ppb) [3]	Does this panel calibration measurement comply with AS/NZS4323.3:P2001 (Yes/No) [4]
n-butanol	3652	50.0	1,081	46.2	Yes

Comments: All samples were collected by Stephenson Environmental Management Australia and analysed by Odour Research Laboratories Australia at their Sydney Laboratory.

Notes from Odour Olfactometry Results:

[1] Sample Odour Concentration: as received in the bag

[2] Sample Odour Concentration: allowing for pre-dilution

[3] Panel Average Measured Concentration: indicates the sensitivity of the panel for the session completed

[4] Target Range for reference gas n-butanol is $20 \le \chi \le 80$ ppb and compliance with AS/NZ4323.3:2001 is based on the individuals rolling average and not on the panel average measured concentration. Panellist Rolling Average: SR = 48.6, PR = 42.2, PP = 41.1, TL = 48.5, DS = 37.8

^ denotes the Average Hedonic Tone: describes the pleasantness of the odour being presented where (+5) represents Very Pleasant, (0) represents Neutral and (-5) represents Very Unpleasant and has been derived from the panellist responses at the recognition threshold.

+ This value is not part of our NATA Scope of Accreditation and AS4323.3

--END OF TEST REPORT--

Odour Research Laboratories Australia

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Olfactometry Test Report

	The measurement was commissioned by SEMA on behalf of:	
Client	Organisation:	Elf Farm Supplies
	Address:	108 Mulgrave Road, Mulgrave NSW 2756
	Contact:	Neil Cockerell
	Sampling Site:	Main Stack
	Telephone:	02 4577 5000
	Email:	manager@elffarm.com.au
Project	ORLA Report Number:	5198/ORLA/03
	Project Manager:	Peter Stephenson
	Testing operator:	Ali Naghizadeh
	ORLA Sample number(s):	3659, 3660
	SEMA Sample number(s):	722533, 722534
Order	Analysis Requested:	Odour Analysis
	Order requested by:	SEMA on behalf of Elf Farm Supplies
	Date of order:	15 April 2013
	Order number:	3859
	Telephone:	02 9737 9991
	Signed by:	Ali Naghizadeh
	Order accepted by:	Ali Naghizadeh
Report	Date of issue:	16 April 2013

NATA accredited laboratory number 15043.
Accredited for Compliance with ISO/IEC 17025.
This document is issued in accordance with NATA's accreditation requirements.
This report cannot be reproduced unless in full.

Investigated Item	Odour concentration in odour units 'ou' determined by Sensory odour concentration measurements, of an odour sample supplied in a sampling bag. All samples were received in good condition.
Analysis Method	The samples were analysed in accordance with AS/NZS4323.3:2001.
Identification	The odour sample bags were labelled individually. Each label recorded the testing laboratory, sample number, sampling location (or Identification) sampling date and time, dilution ratio (if dilution was used) and whether further chemical analysis was required.
Method	The odour concentration measurements were performed using dynamic olfactometry according to the Australian Standard 'Determination of Odour Concentration by Dynamic Olfactometry AS/NZS4323.3:2001. The odour perception characteristics of the panel within the presentation series for the samples were analogous to that for n-butanol calibration. Any deviation from the Australian standard is recorded in the 'Comments' section of this report.
Instrument Used	The Olfactometer used during this testing session was: AC'SCENT International Olfactometer
Measuring Range	The measuring range of the AC'SCENT International olfactometer is $13 \leq \chi \leq 64{,}281$ ou. If the measuring range was insufficient the odour samples will have been pre-diluted.
Environment	The measurements were performed in an air- and odour-conditioned room. The room temperature is maintained between ± 3°C.
Measuring Dates	The date of each measurement is specified with the results.
Instrument Precision	The precision of this instrument (expressed as repeatability) for a sensory calibration must be $r \leq 0.05$ in accordance with the Australian Standard AS/NZS4323.3:2001. AC'SCENT International Olfactometer: $r = 0.0080$ (March 2013) Compliance – Yes
Instrumental Accuracy	The accuracy of this instrument for a sensory calibration must be $A \leq 0.20$ in accordance with the Australian Standard AS/NZS4323.3:2001. AC'SCENT International Olfactometer: $A = 0.120$ (March 2013) Compliance – Yes
Lower Detection Limit (LDL)	The LDL for the AC'SCENT International Olfactometer has been determined to be 13 ou
Traceability	The measurements have been performed using standards for which the traceability to the national standard has been demonstrated. The assessors are individually selected to comply with fixed criteria and are monitored every session to keep within the limits of the standard. The results from the assessors are traceable to primary standards of n-butanol in nitrogen.

16 April 2013

Peter Stephenson
Managing Director

Odour Research Laboratories Australia

Odour Olfactometry Results – 5198/ORLA/03

Sample Location	Sample ID No.	Sampling Date & Time	ORLA Sample No.	Analysis Date & Time (Completed)	Panel Size	Valid ITEs	Sample Pre-Dilution	Sample Odour Concentration (ou) [1]	Sample Odour Concentration (ou) [2]	Odour Character & Hedonic Tone [^ *]
Sample ID: Stack R4	722533	15/04/2013 2002-2013	3659	16/04/2013 1025-1109	4	8	Nil	2,548	2,548	Rotten, decaying fish, fishy, rotting/decaying food, mouldy, garbage, ammonia (-4.3)^
Sample ID: Stack R5	722534	16/04/2013 0331-0341	3660	16/04/2013 1113-1200	4	8	Nil	3,073	3,073	Rotten, decaying fish, fishy, sewerage, mouldy, earth, garbage, ammonia (-4.5)^

Odour Research Laboratories Australia

Odour Panel Calibration Results – 5198/ORLA/03

Reference Odorant	ORLA Sample No.	Concentration of Reference Gas (ppm)	Reference Gas Measured Concentration (ou)	Panel Average Measured Concentration (ppb) [3]	Does this panel calibration measurement comply with AS/NZS4323.3:P2001 (Yes/No) [4]
n-butanol	3658	50.0	972	51.5	Yes

Comments: All samples were collected by Stephenson Environmental Management Australia and analysed by Odour Research Laboratories Australia at their Sydney Laboratory.

Notes from Odour Olfactometry Results:

[1] Sample Odour Concentration: as received in the bag

[2] Sample Odour Concentration: allowing for pre-dilution

[3] Panel Average Measured Concentration: indicates the sensitivity of the panel for the session completed

[4] Target Range for reference gas n-butanol is $20 \leq \chi \leq 80$ ppb and compliance with AS/NZ4323.3:2001 is based on the individuals rolling average and not on the panel average measured concentration. Panellist Rolling Average: SR = 48.7, PR = 42.4, PP = 41.2, TL = 48.3

^ denotes the Average Hedonic Tone: describes the pleasantness of the odour being presented where (+5) represents Very Pleasant, (0) represents Neutral and (-5) represents Very Unpleasant and has been derived from the panellist responses at the recognition threshold.

+ This value is not part of our NATA Scope of Accreditation and AS4323.3

------------------------------END OF TEST REPORT------------------------------

APPENDIX B – PART OF OEH EPL LICENCE

Section 55 Protection of the Environment Operations Act 1997

Environment Protection Licence

Licence - 6229

NSW EPA

P1 Location of monitoring/discharge points and areas

P1.1 The following points referred to in the table below are identified in this licence for the purposes of monitoring and/or the setting of limits for the emission of pollutants to the air from the point.

Air

EPA identi-fication no.	Type of Monitoring Point	Type of Discharge Point	Location Description
1	Discharge to air Air emissions monitoring	Discharge to air Air emissions monitoring	Bioscrubber chimney labelled as "Chimney" on "Figure 5.2 - Plant Layout" and "Figure 5.5 - Stage 1 - Phase 1 Bioscrubber Detail" contained in the "Mulgrave Mushroom Substrate Plant Environmental Management Plan" dated August 2002.

3 Limit Conditions

L1 Pollution of waters

L1.1 Except as may be expressly provided in any other condition of this licence, the licensee must comply with section 120 of the Protection of the Environment Operations Act 1997.

L2 Concentration limits

L2.1 For each monitoring/discharge point or utilisation area specified in the table\s below (by a point number), the concentration of a pollutant discharged at that point, or applied to that area, must not exceed the concentration limits specified for that pollutant in the table.

L2.2 Where a pH quality limit is specified in the table, the specified percentage of samples must be within the specified ranges.

L2.3 To avoid any doubt, this condition does not authorise the pollution of waters by any pollutant other than those specified in the table\s.

L2.4 Air Concentration Limits

POINT 1

Pollutant	Units of measure	100 percentile concentration limit	Reference conditions	Oxygen correction	Averaging period
Odour	odour units per second	55400			

L2.5 For each monitoring/discharge point specified in the table(s) in L2 above (by a point number), the reference conditions and averaging period of a pollutant discharged at that point must be reported at the reference conditions and averaging period specified for that pollutant in the following table.

Section 55 Protection of the Environment Operations Act 1997

Environment Protection Licence

Licence - 6229

Pollutant	Reference Conditions	Duration	Averaging Period
Odour	dry, 293K, 101.3kPa	1 hour	Rolling annual

L3 Waste

L3.1 The licensee must not cause, permit or allow any waste to be received at the premises, except the wastes expressly referred to in the column titled "Waste" and meeting the definition, if any, in the column titled "Description" in the table below.
Any waste received at the premises must only be used for the activities referred to in relation to that waste in the column titled "Activity" in the table below.
Any waste received at the premises is subject to those limits or conditions, if any, referred to in relation to that waste contained in the column titled "Other Limits" in the table below.
This condition does not limit any other conditions in this licence.

Code	Waste	Description	Activity	Other Limits
NA	Chicken manure		Composting Waste storage	NA
NA	Feather meal		Composting Waste storage	NA
NA	Cotton seed meal		Composting Waste storage	NA
NA	Natural organic fibrous materials	As defined in Schedule 1 of the POEO Act, in force from time to time	Composting Waste storage	NA
NA	Horse stable bedding		Composting Waste storage	NA
NA	General or Specific exempted waste	Waste that meets all the conditions of a resource recovery exemption under Clause 51A of the Protection of the Environment Operations (Waste) Regulation 2005	As specified in each particular resource recovery exemption	NA
NA	Waste	Any waste received on site that is below licensing thresholds in Schedule 1 of the POEO Act, as in force from time to time	-	NA

L3.2 The licensee must ensure that the amount of excess compost that is stored at the premises does not exceed 150 tonnes at any one time.

APPENDIX C – EXHAUST GAS FLOW DATA

Glossary:

%	=	percent
^oC	=	Degrees Celsius
am^3/min	=	cubic metre of gas at actual conditions per minute
Normal Volume (m^3)	=	cubic metre at 0°C and 760 mm pressure and 1 atmosphere
am^3	=	cubic metre of gas at actual conditions
g/g mole	=	grams per gram mole
g/s	=	grams per second
hrs	=	hours
kg/m^3	=	kilograms per cubic metre
kPa	=	kilopascals
m^2	=	square metre
m/s	=	metre per second
m^3/min	=	cubic metre per minute at 0^0C and 1 atmosphere
m^3/sec	=	cubic metre per second at 0^0C and 1 atmosphere
mg	=	milligrams
mg/ m^3	=	milligrams per cubic metre at 0^oC and 1 atmosphere
ou	=	odour units
$ou.m^3/s$	=	odour units cubic metre of gas at dry, 293 K and 101.3 kPa
K	=	degrees Kelvin
O_2	=	Oxygen

Abbreviations for names of SEMA staff who completed the either/and/or Sampling, Analysis and Checking

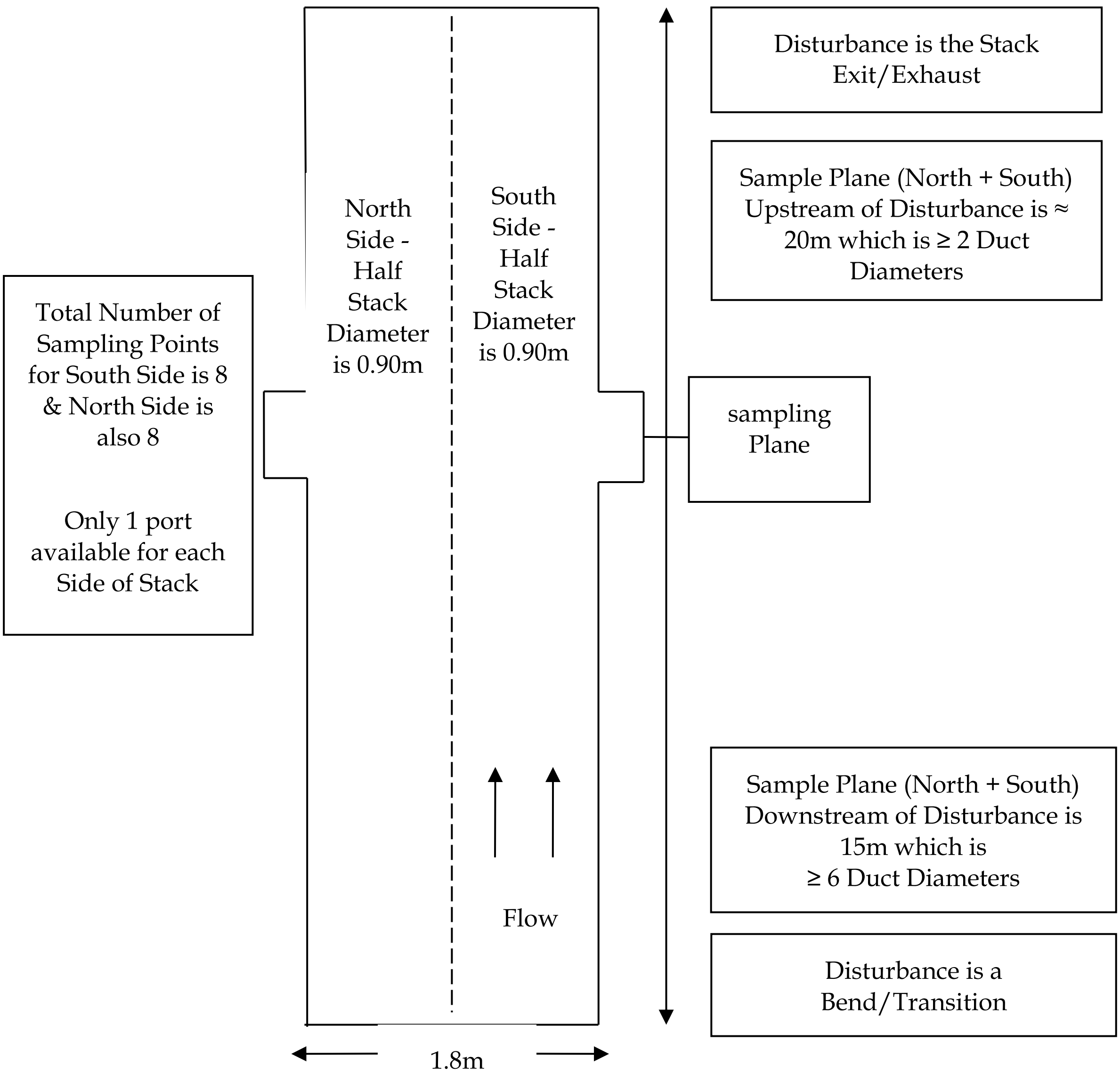
PWS	=	Peter W Stephenson
AN	=	Ali Naghizadeh
SNS	=	Samuel Swain

TABLE C - 1 EMISSION TEST RESULTS – FLOW AND ODOUR

Emission Test Results	Flow	Flow	Flow	Flow	Flow
Project Number	5198	5198	5198	5198	5198
Project Name	Elf Farm Supplies	Elf Farm Supplies	Elf Farm Supplies	Elf Farm Supplies	Elf Farm Supplies
Test Location	Stack	Stack	Stack	Stack	Stack
Date	10-Apr-13	11-Apr-13	12-Apr-13	15-Apr-13	16-Apr-13
Run	1	2	3	4	5
Analysis	Flow	Flow	Flow	Flow	Flow
Method	TM-1 & TM-2 & TM-22				
Inlet/Exhaust	Exhaust	Exhaust	Exhaust	Exhaust	Exhaust
Stack Temperature (^oC)	26.8	28.2	30.5	35.5	36.2
Stack Cross-Sectional area (m^2)	1.272	1.272	1.272	1.272	1.272
Average Stack Gas Velocity (m/s)	13.3	13.0	12.9	14.4	14.4
Actual Gas Flow Volume (am^3/min)	1,016	994	983	1,100	1,101
Total Normal Gas Flow Volume (m^3/min)	903	895	877	570	934
Total Normal Gas Flow Volume (m^3/s)	15.0	14.9	14.6	9.5	15.6
Total Stack Pressure (kPa)	101.97	102.27	102.74	101.64	101.55
Moisture Content (% by volume)	3.1	1.6	2.3	41.7	4.2
Molecular Weight Dry Stack Gas (g/gmole)	28.836	28.836	28.836	28.836	28.836
Dry Gas Density (kg/m^3)	1.29	1.29	1.29	1.29	1.29
Oxygen (%)	20.9	20.9	20.9	20.9	20.9
Analysis	**Odour**	**Odour**	**Odour**	**Odour**	**Odour**
Method	AS4323.3	AS4323.3	AS4323.3	AS4323.3	AS4323.3
ORLA Number	3648	3649	3657	3659	3660
SEMA Number	722516	722517	722524	722533	722534
Sample Start Time (hrs)	19:38	4:15	3:25	20:02	3:31
Sample Finish Time (hrs)	19:48	4:25	3:35	20:13	3:41
Odour Concentration (As Received) (ou)	2,169	2,371	1,984	2,548	3,073
Odour Concentration (Final) (ou)	**2,169**	**2,371**	**1,984**	**2,548**	**3,073**
Normal MOER (As Received) (ou m^3/s)	32,632	35,372	28,988	24,196	47,817
Normal MOER (Final) (ou m^3/s)	**32,632**	**35,372**	**28,988**	**24,196**	**47,817**
Mass Odour Emission Rate Limit (ou m^3/s)	55,400	55,400	55,400	55,400	55,400
Sample Storage Period	2 days	2 days	2 days	2 days	2 days
Calculations entered by	AN	AN	AN	AN	AN
Calculations checked by	SNS	SNS	SNS	SNS	SNS

APPENDIX D – SAMPLE LOCATION

FIGURE D - 1 SAMPLE LOCATION



In the absence of cyclonic flow activity ideal sampling plane conditions will be found to exist at 6-8 duct diameters downstream and 2-3 duct diameters upstream from a flow disturbance. The sampling plane does meet this criterion.

The sample plane does meet gas profile for sampling. Therefore the sampling plane is satisfactory for testing and in compliance with AS4323.1

Stephenson

Environmental Management Australia

ODOUR ACTION PLAN IMPLEMENTATION REPORT

ELF FARM PTY LTD

MULGRAVE, NSW

PROJECT NO.: 5248/13

DATE OF ISSUE: 30 JULY 2013

Stephenson
Environmental Management Australia

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ODOUR ACTION PLAN IMPLEMENTATION REPORT

ELF FARM PTY LTD

MULGRAVE, NSW

PROJECT NO.: **5248/13**

DATE OF ISSUE: **30 JULY 2013**

P W STEPHENSON

A NAGHIZADEH

TABLE OF CONTENTS

1 INTRODUCTION

Stephenson Environmental Management Australia has prepared this Action Plan based on the meetings held with Elf Farm personnel.

The Action Plan outlines the short term and long term odour management procedures that will be put in place to control odorous emissions from Elf Farm to ensure that the risk of adverse odour impact at nearby sensitive receptors is minimised as far as possible.

SEMA has broken the Action Plan down into three main stages:

- Stage 1: Actions taken since mid-June 2013,
- Stage 2: Actions for the immediate near future,
- Stage 3: Actions for the longer term.

2 EXISTING ODOUR CONTROL PROCEDURES AND SYSTEMS

2.1 ODOUR CONTROL DESIGN FEATURES

The plant has been designed with the following features to control odour emissions:

- Under-cover storage for raw materials to keep them dry
- Enclosed processing areas for all potentially odour-generating processes
- Air-under system in the pre-wet building and in all Phase 1 tunnels to improve aeration of the compost
- Computer controlled fans to maintain optimum air supply and extraction
- Enclosed conveyor transport for tunnel loading, dispatch loading and transfer to Phase 2 & 3 tunnels
- A bio-scrubber to remove odorous compounds from exhaust air prior to release to atmosphere
- A chimney stack to discharge exhaust air to atmosphere and facilitate satisfactory dispersion of any odour remaining in the emission.

2.2 MANAGEMENT PROCEDURES

Odour control is a combination of plant design and process management. The following actions are undertaken with a view to minimising odour emissions during the various operational phases of this process; including, raw materials receival and storage, processing operations including leachate recycling, tunnel operations and despatch of the finished product, as follows:

(i) Clean up any spillage in front of the raw material ingredients storage building; including poultry manure, gypsum, meals, corn cobs, cotton seed, straw or elsewhere on a daily basis

(ii) Remove solid material from the leachate collection pit screen daily when water is flowing to the pit (wet weather or bale wetting)

(iii) De-sludge the leachate collection pit (if sludge is present) at least fortnightly

(iv) Keep doors to internal process areas closed when not in use, except where this has no significant effect on the plant's odour performance

(v) Maintain appropriate conditions of temperature and oxygen content during composting in tunnels, consistent with the needs of the process, to minimise odour generation

(vi) Ensure the discharge exit velocity of air from the chimney stack always achieves the minimum requirement determined by odour dispersion modelling

(vii) Operate the bioscrubber in a manner to maximise its efficiency at removing odour from the air stream

(viii) Minimise as far as practicable the duration of any bypassing of the bioscrubber for maintenance

(ix) Time any bioscrubber bypassing to occur when hot substrate is not being turned and when weather conditions will assist dispersion.

3 ACTIONS TAKEN SINCE MID-JUNE 2013

One batch per week schedule. Elf Farm has been producing 2 batches per week since July 2009 with very few associated odour issues reported until end January 2013.

Straw in previous seasons has either been drought affected or damaged due to rain during harvest. This has resulted in a poorer quality straw which has composted much more quickly than this season's supply – hence the 2 x batch schedule was OK.

Elf Farm started using new season straw supply in January 2013. New season straw is very long, tough waxy, bright and yellow which absorbs moisture more efficiently in bale wetting but does not lose its structure and integrity before entering pre wet stage. This means that Elf Farm has been struggling to effectively compost the new season straw with only 3 days available in the Pre Wet shed due to the 2 x batch system.

Elf Farm had forecast a change in the straw quality during the latter part of 2011 with the weather pattern changing away from El Niño. This concern lead the Board to decide to purchase a bigger capacity Mobile Blender to allow a single batch of compost to be produced.

The Mobile Blender was ordered from Holland in late 2011, and delivered to Elf Farm in November 2012. This machine is necessary to process the higher tonnages of compost that are required in a single batch (vs 2 x half batches). The Mobile Blender has had a series of engineering and operational problems that have now been effectively resolved after extended commissioning and Dutch technicians being called to site twice.

Over the last 2 weeks, Elf farm has reverted back to a single batch/week production instead of the previous 2 batches/week. This operational change has been made possible with the new Mobile Blender now fully operational. This longer period in pre wet between disturbances means composting is hotter and thus less odorous.

Other actions that have taken place since mid-June 2013 include:

- Reorganising operations in the pre wet shed e.g. bale laying and bale breaking now occur almost in parallel to reduce times that pre wet shed doors are open.
- Water is absorbed more efficiently in bale wetting so less water is required in pre wet.
- Installation of new bale wetting spray boom which enables faster more even delivery of water to straw bales.

4 ACTIONS FOR THE IMMEDIATE NEAR FUTURE

Proposed actions that will be taken in the immediate near future to further ensure the minimization of odour emissions from the Elf Farm facility include:

1. Pre-wet building doors are open during processing and closed up at the end of each day's work. It is proposed that the open area of each doorway be reduced during processing to assist the odour extraction system and minimize leakage out of upper section of door openings. This will be achieved by use of curtains which will be lowered some two meters down from door lintel.

2. Water management will be more efficient with one batch per week; that is, pit will no longer fill up with leachate because new straw is absorbing water more efficiently in bale wetting stage of process. This in turn means all leachate will be used in enclosed pre wet shed for that process. Additional clean creek water will then be used for bale wetting which will reduce potential for odour release from bale wetting process.

3. Phase 1. Tunnel building has potential to release odours during the above transfer processes. So north end door will be closed to reduce cross flow air movement which may push odour and steam out opposite doorway.

4. Phase 1. External transfer conveyor which runs up outside of tunnel building will be enclosed with detachable covers similar to other conveyors currently installed on site.

5. Phase 1. Tunnel building enclosed transfer conveyor across top of tunnels has a number of open doors which are closed at the end of each days processing. It is proposed to install automatic door closers on these doors to ensure they remain closed during transfers which will facilitate the odour extraction system which is drawing odour into tunnels through open top during transfer. These odours are then processed through bio scrubber.

6. Fallback position if the above are not enough in short term will be to install an odour neutralizing agent (ONA) mist spray system which would operate at critical times to reduce the impact off site.

5 ACTIONS FOR THE LONGER TERM

Proposed longer term actions including new pre wet shed and additional bio scrubber to process all pre wet odours have been outlined in the Odour Management Plan. The Odour Management Plan was prepared by Todoroski Air Sciences in April 2012 and audited by Peter William Stephenson, Managing Director of SEMA who was endorsed by the Director-General, as a suitably qualified, experienced and independent auditor.

Stephenson

Environmental Management Australia

ODOUR EMISSION SURVEY – OEH REPORT

ELF FARM PTY LTD

MULGRAVE, NSW

PROJECT NO.:	**5253/S22719/13**
DATE OF SURVEY:	**15 TO 21 AUGUST 2013**
DATE OF ISSUE:	**20 SEPTEMBER 2013**

Stephenson
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P W STEPHENSON

A NAGHIZADEH

TABLE OF CONTENTS

TABLE OF TABLES

TABLE OF TABLES APPENDICES

TABLE OF FIGURES APPENDICES

1 INTRODUCTION

Stephenson Environmental Management Australia (SEMA) was requested by Elf Farm Pty Ltd to assess the odour emissions from the stack serving the tunnel composters at their composting facility located at Mulgrave, New South Wales (NSW).

The principal objectives of the tests were to measure odour emission concentrations from the stack and to determine compliance of the odour emission with the facility's Environment Protection Licence (EPL) No. 6229. The EPL was issued by the Environment Protection Authority (EPA) in accordance with the *Protection of the Environment Operations Act 1997*. The EPA is now incorporated into the Office of Environment and Heritage (OEH).

The emission parameters monitored in this survey were:

- Odour concentration
- Stack exhaust gas velocity, exhaust gas temperature, and hence discharge volume
- Moisture
- Mass Odour Emission Rate (MOER).

Odour emission testing was undertaken between 15 and 21 August 2013 at various times during a typical seven (7) day composting cycle. Table 1-1 shows when testing was carried out on the stack.

TABLE 1-1 ODOUR TESTING PROGRAM

Day of the Week	Date	Time of the Day Sample was Taken	Number of Odour Samples Taken per Visit
Thursday	15/08/2013	PM	1
Friday	16/08/2013	AM	1
Monday	19/08/2013	AM	1
Tuesday	20/08/2013	PM	1
Wednesday	21/08/2013	AM	1

Note:

(1) The AM samples were taken between 3-7am and PM samples were taken between 5-7pm over a one-week composting cycle period.

2 PRODUCTION CONDITIONS

The odour emission samples were collected with the composting plant operating under a normal seven-day cycle running from Thursday to Wednesday.

Elf Farm holds all relevant production records should they be required for review.

3 RESULTS AND DISCUSSION

3.1 EMISSION TEST RESULTS

The results of the emission tests are presented in Table 3-1. SEMA completed the odour sampling. SEMA is NATA accredited for the odour sampling, NATA accreditation number 15043.

Odour Research Laboratories Australia (ORLA) performed the odour analysis. ORLA is a division of Peter W Stephenson & Associates Pty Ltd and is NATA accredited to AS4323.3 for odour analysis, accreditation number 15043. ORLA is the first NATA accredited odour analysis laboratory in New South Wales.

The Certificates of Analysis, Olfactometer Test Reports No. 5253/ORLA/01, 5253/ORLA/02 and 5253/ORLA/03 are presented in Appendix A of this report.

The odour emission sampling and olfactometric analysis was conducted in accordance with Australian Standard (AS) 4323.3. Refer to Section 5 of this report for further detail.

TABLE 3-1 ODOUR EMISSION CONCENTRATION RESULTS

Day of Week	**Thursday**	**Friday**	**Monday**	**Tuesday**	**Wednesday**
Date	15/08/2013	16/08/2013	19/08/2013	20/08/2013	21/08/2013
Time Sample Taken (hours)	18:15–18:48	05:11–05:50	03:17-03:50	17:45-18:03	06:09-06:51
SEMA Sample No.	722850	722851	722911	722920	722921
ORLA Sample No.	3716	3717	3722	3732	3733
Concentration (ou)	**4,278**	**4,677**	**2,835**	**2,371**	**3,099**

Key:
ou = odour unit

3.2 ENVIRONMENT PROTECTION LICENCE NO. 6229

Table 3-2 summarises the odour emission limit for the tunnel composter stack at Elf Farm Pty Ltd under their EPL Licence No. 6229. The criterion is defined by the 100th percentile concentration limit as a Mass Odour Emission Rate (MOER) in Odour Units per second (ou/s) on a rolling annual average. A copy of the relevant section of this Licence is included in Appendix B.

TABLE 3-2 100TH PERCENTILE ODOUR EMISSION LIMIT

	EPA Licence Criteria
100th Percentile MOER Limit	55,400 ou/s
Averaging Period	Rolling annual

Key:
MOER = Mass odour emission rate
ou/s = Odour units per second which is a misnomer in EPA Licence 6229 (EPL) and should now read odour units. cubic metres per second (ou.m^3/s)

3.3 ODOUR EMISSION RATES

The MOER for all samples was determined to establish compliance with the EPA/OEH EPL criteria.

The MOER can be calculated using the following formula:

MOER = velocity (m/s) x total area of the stack (m^2) x odour concentration (ou)

Velocity = velocity of air in stack in metres per second as shown in Table 3-3

Total Surface Area of the Stack = Cross Sectional Area of the Stack in square metres (m^2).

Odour Concentration = As per Table 2-1 and Table 3-3.

The above formula calculates MOER based on actual conditions. However the Reference Conditions specified that the MOER is to be reported as dry, 293 degrees Kelvin (K) and 101.3 kilopascals (kPa).

SEMA measured the moisture content, temperature and pressure of the exhaust gas stream, at the same time as the odour emissions were sampled. These measurements enabled the MOER to be corrected to the above reference conditions. The MOER for each of the samples is shown in Table 3-3. Refer to Appendix C for detailed Exhaust Gas Flow Data in table format.

TABLE 3-3 ODOUR EMISSION RATES OVER A TYPICAL SEVEN DAY COMPOSTING CYCLE AUGUST 2013

Day	Thursday	Friday	Monday	Tuesday	Wednesday	Average
Date	15/08/2013	16/08/2013	19/08/2013	20/08/2013	21/08/2013	
ORLA Sample No.	722850	722851	722911	722920	722921	
Time (hours)	18:15-18:48	05:11-05:50	03:17-03:50	17:45-18:03	06:09-06:51	
Odour Concentration (ou)	4,278	4,677	2,835	2,371	3,099	
Stack Velocity (m/s)	14.8	15.5	14.6	13.3	15.3	
Stack Cross Sectional Area (m^2)	1.272	1.272	1.272	1.272	1.272	
MOER (ou.v/s)	63,645	68,071	44,060	35,496	45,123	51,279
EPL MOER Limit (ou/s) Annual Rolling Average)						55,400

Key:

*	=	Rolling annual averaging period			
MOER	=	Mass Odour Emission Rate	m/s	=	metres per second
ou.v/s	=	Odour Unit volumes per second	m^2	=	square metres
ou/s	=	Odour Units per second			

4 CONCLUSIONS

This odour emission survey was conducted over a typical seven day composting cycle. The measured stack MOER's for the monitoring period ranged from 35,496 ou.m^3/s to 68,071 ou.m^3/s. The average MOER for the August 2013 composting cycle, which was considered to be typical, was 51,279 ou.m^3/s.

Therefore, these MOER's comply with the EPA/OEH EPL No. 6229 Licence Criteria of 55,400 ou.m^3/s Rolling Annual Average.

5 TEST METHODS

5.1 ODOUR

(Standards Association of Australia AS4323.3 and OEH NSW OM-7)

Samples were collected in 30L Nalophane sampling bags which are enclosed in airtight plastic containers.

Odorous gas for analysis was drawn through a Teflon (PTFE) sample probe. The gas then passes through a Teflon (PTFE) tube connected to the Nalophane sampling bag. The sampling pump is connected to the airtight plastic container to provide a sample gas flow-rate of approximately 0.5 – 1.5 litres per minute. After the required volume has been sampled, the pump is stopped and the bag sealed with a stainless steel valve.

Using a triangular forced choice olfactometer, the Nalophane bag of odour sample was dynamically diluted to various concentrations with dry odour free air.

The diluted sample was then presented to a panel of screened panellists as one of these airflows. The panellists then recorded if they could detect any odour and from which flow. The other two flows were discharging odour free air.

The odour is always presented to the panellists in ascending concentration; that is, from lower to higher concentration. The panellists are required at each dilution level to give a response as to what they are smelling from the flows (forced choice methodology). The response options for the panellists are:

'Guess'	Unable to determine which air flow contains the diluted odours
'Inkle'	Thinks that one of the flows may be different from the other two flows
'Detect' or 'Certain'	Is confident that one of the airflows smells different from the other two flows. Not necessarily able to say what the smell is.
'Recognise'	Thinks that one of the flows may be different from the other two flows and is able to: ▪ Assign a 'hedonic tone' (pleasantness scale number) to the odour ranging from –10 to 10 and/or ▪ Able to assign a character to the odour, as in 'it smells like …' *Note: that the Recognise level concentration and Hedonic Tone and Odour descriptors are obtained with the diluted odour, panellists are not exposed to the full strength odour.*

The percentage panel response and dilution levels used were then entered into a computer programme to determine the 50% panel response. This dilution level corresponds to the odour concentration of the sample.

Sampling and dilution lines are constructed from teflon, stainless or glass to prevent contamination of the sample.

The sampling and the dilution procedures used were in accordance with OEH NSW Methods OM-7 and OM-8 which are based on Standards Association of Australia, AS4323.3.

5.1.1 ODOUR PANEL SELECTION

Odour panellists must meet certain criteria to qualify as and remain panellists. Their average sensitivity to n-Butanol must be between 20 and 80 parts per billion (ppb) and their variability in response to n-Butanol must be within a certain range.

Panellists are tested against n-Butanol before every panel session to ensure they are in compliance.

Panellists should not suffer from respiratory complaints, nor should they eat or smoke or drink anything but water during the half hour preceding or during the test period and their person and clothing should be odour free and have not been exposed to an odorous environment before testing.

5.1.2 ODOUR TERMINOLOGY

The odour level is expressed in odour units and for mixed odours is analogous to concentration expressed in parts per billion. The odour detection level is defined as the ratio of *the volume that a sample of odorous gas would occupy when diluted to the threshold of detection of that odour* to *the volume of the sample*. In simpler terms, the ratio indicated the number of dilutions necessary to reduce the odour to its threshold of detection or odour detection threshold. This ratio is expressed in odour units or number of dilutions to detection threshold. For example, a value of 2,000 odour units would mean the volume of the initial sample of odorous gas would need to be diluted 2,000 times before the odour would just be detectable to the average human nose, that is, at the odour detection threshold.

5.2 EXHAUST GAS VELOCITY

(OEH NSW TM-2 and USEPA Method 12)

Velocity profiles were obtained across the stack utilising an Airflow Developments Ltd. S-type pitot tube and digital manometer.

5.3 EXHAUST GAS TEMPERATURE

(OEH NSW TM- 2, 3 & 4 and USEPA Methods 2, 3 & 4)

The exhaust gas temperature was measured using a Digital thermometer (0-1200°C) connected to a chromel/alumel (K-type) thermocouple probe.

5.4 EXHAUST GAS MOISTURE CONTENT

(OEH NSW TM-22)

Moisture from the stack was collected in accordance with OEH NSW TM-22 sampling train. The collected moisture was weighed and calculated to a percentage of stack gas.

5.5 ACCURACY

All results are quoted on a dry basis.

Appendix C of (British Standard) 893 presents a range of accuracies for various parts of the isokinetic sampling procedure including pressure, velocity, temperature and particulate sampling. At best, an accuracy of ± 10% can be expected.

For odour the ratio between two single measurements, performed on the same testing material in this laboratory under repeatability conditions, will not be larger than 2.65 in 95% of cases. (Source – AS/NZS 4323.3:2001 Appendix B Section B2).

APPENDIX A – CERTIFICATES OF ANALYSIS

Odour Research Laboratories Australia

A Division of Peter W. Stephenson & Associates Pty Ltd
ACN 002 600 526 (Incorporated in NSW)
ABN 75 002 600 526

Newington Business Park
Unit 7/2 Holker Street
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Tel: (02) 9737 9991
Fax: (02) 9737 9993
E-Mail: pstephenson@orla.com.au

Olfactometry Test Report

	The measurement was commissioned by SEMA on behalf of:	
Client	Organisation:	Elf Farm
	Address:	108 Mulgrave Road, Mulgrave NSW 2756
	Contact:	Neil Cockerell
	Sampling Site:	Main Stack
	Telephone:	02 4577 5000
	Email:	manager@elffarm.com.au
Project	ORLA Report Number:	5253/ORLA/01
	Project Manager:	Peter Stephenson
	Testing operator:	Ali Naghizadeh
	ORLA Sample number(s):	3716, 3717
	SEMA Sample number(s):	722850, 722851
Order	Analysis Requested:	Odour Analysis
	Order requested by:	SEMA on behalf of Elf Farm
	Date of order:	16 Aug 2013
	Order number:	3950
	Telephone:	02 9737 9991
	Signed by:	Ali Naghizadeh
	Order accepted by:	Ali Naghizadeh
Report	Date of issue:	23 August 2013

NATA accredited laboratory number 15043.

Accredited for Compliance with ISO/IEC 17025.

Odour Research Laboratories Australia
A Division of Peter W. Stephenson & Associates Pty Ltd
ACN 002 600 526 (Incorporated in NSW)
ABN 75 002 600 526

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Olfactometry Test Report

	The measurement was commissioned by SEMA on behalf of:	
Client	Organisation:	Elf Farm
	Address:	108 Mulgrave Road, Mulgrave NSW 2756
	Contact:	Neil Cockerell
	Sampling Site:	Main Stack
	Telephone:	02 4577 5000
	Email:	manager@elffarm.com.au
Project	ORLA Report Number:	5253/ORLA/01
	Project Manager:	Peter Stephenson
	Testing operator:	Ali Naghizadeh
	ORLA Sample number(s):	3716, 3717
	SEMA Sample number(s):	722850, 722851
Order	Analysis Requested:	Odour Analysis
	Order requested by:	SEMA on behalf of Elf Farm
	Date of order:	16 Aug 2013
	Order number:	3950
	Telephone:	02 9737 9991
	Signed by:	Ali Naghizadeh
	Order accepted by:	Ali Naghizadeh
Report	Date of issue:	23 August 2013

NATA accredited laboratory number 15043.

Accredited for Compliance with ISO/IEC 17025.

Investigated Item	Odour concentration in odour units 'ou' determined by Sensory odour concentration measurements, of an odour sample supplied in a sampling bag. All samples were received in good condition.
Analysis Method	The samples were analysed in accordance with AS/NZS4323.3:2001.
Identification	The odour sample bags were labelled individually. Each label recorded the testing laboratory, sample number, sampling location (or Identification) sampling date and time, dilution ratio (if dilution was used) and whether further chemical analysis was required.
Method	The odour concentration measurements were performed using dynamic olfactometry according to the Australian Standard 'Determination of Odour Concentration by Dynamic Olfactometry AS/NZS4323.3:2001. The odour perception characteristics of the panel within the presentation series for the samples were analogous to that for n-butanol calibration. Any deviation from the Australian standard is recorded in the 'Comments' section of this report.
Instrument Used	The Olfactometer used during this testing session was: AC'SCENT International Olfactometer
Measuring Range	The measuring range of the AC'SCENT International olfactometer is $13 \leq \chi \leq 64{,}281$ ou. If the measuring range was insufficient the odour samples will have been pre-diluted.
Environment	The measurements were performed in an air- and odour-conditioned room. The room temperature is maintained between ± 3°C.
Measuring Dates	The date of each measurement is specified with the results.
Instrument Precision	The precision of this instrument (expressed as repeatability) for a sensory calibration must be $r \leq 0.05$ in accordance with the Australian Standard AS/NZS4323.3:2001. AC'SCENT International Olfactometer: $r = 0.0080$ (March 2013) Compliance – Yes
Instrumental Accuracy	The accuracy of this instrument for a sensory calibration must be $A \leq 0.20$ in accordance with the Australian Standard AS/NZS4323.3:2001. AC'SCENT International Olfactometer: $A = 0.120$ (March 2013) Compliance – Yes
Lower Detection Limit (LDL)	The LDL for the AC'SCENT International Olfactometer has been determined to be 13 ou
Traceability	The measurements have been performed using standards for which the traceability to the national standard has been demonstrated. The assessors are individually selected to comply with fixed criteria and are monitored every session to keep within the limits of the standard. The results from the assessors are traceable to primary standards of n-butanol in nitrogen.

23 August 2013

Peter Stephenson
Managing Director

Odour Research Laboratories Australia

Odour Olfactometry Results – 5253/ORLA/01

Sample Location	Sample ID No.	Sampling Date & Time	ORLA Sample No.	Analysis Date & Time (Completed)	Panel Size	Valid ITEs	Sample Pre-Dilution	Sample Odour Concentration (ou) [1]	Sample Odour Concentration (ou) [2]	Odour Character & Hedonic Tone [^ +]
Sample ID: Elf Stack R1	722850	15/08/2013 1822-1832	3716	16/08/2013 0945-1031	4	8	Nil	4,278	4,278	Fishy, swampy, garbage smoky, rotten garbage, burnt milk, putrid, offensive (-5.0)[^]
Sample ID: Elf Stack R2	722851	16/08/2013 0522-0532	3717	16/08/2013 1338-1424	4	8	Nil	4,677	4,677	Rotten, fishy, garbage, Ammonia, chicken faeces, dead fish (-4.8)[^]

Odour Research Laboratories Australia

Odour Panel Calibration Results – 5253/ORLA/01

Reference Odorant	ORLA Sample No.	Concentration of Reference Gas (ppm)	Reference Gas Measured Concentration (ou)	Panel Average Measured Concentration (ppb) [3]	Does this panel calibration measurement comply with AS/NZS4323.3:P2001 (Yes/No) [4]
n-butanol	3715	50.0	1,062	47.1	Yes

Comments: All samples were collected by Stephenson Environmental Management Australia and analysed by Odour Research Laboratories Australia at their Sydney Laboratory.

Notes from Odour Olfactometry Results:

[1] Sample Odour Concentration: as received in the bag

[2] Sample Odour Concentration: allowing for pre-dilution

[3] Panel Average Measured Concentration: indicates the sensitivity of the panel for the session completed

[4] Target Range for reference gas n-butanol is $20 \le \chi \le 80$ ppb and compliance with AS/NZ4323.3:2001 is based on the individuals rolling average and not on the panel average measured concentration. Panellist Rolling Average: PR = 40.1, GP = 57.5, SS = 44.1, TL = 39.8, SR = 46.7

^ denotes the Average Hedonic Tone: describes the pleasantness of the odour being presented where (+5) represents Very Pleasant, (0) represents Neutral and (-5) represents Very Unpleasant and has been derived from the panellist responses at the recognition threshold.

+ This value is not part of our NATA Scope of Accreditation and AS4323.3

--END OF TEST REPORT--

Odour Research Laboratories Australia

A Division of Peter W. Stephenson & Associates Pty Ltd
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Unit 7/2 Holker Street
Newington NSW 2127 Australia
Tel: (02) 9737 9991
Fax: (02) 9737 9993
E-Mail: pstephenson@orla.com.au

Olfactometry Test Report

	The measurement was commissioned by SEMA on behalf of:	
Client	Organisation:	Elf Farm
	Address:	108 Mulgrave Road, Mulgrave NSW 2756
	Contact:	Neil Cockerell
	Sampling Site:	Main Stack
	Telephone:	02 4577 5000
	Email:	manager@elffarm.com.au
Project	ORLA Report Number:	5253/ORLA/02
	Project Manager:	Peter Stephenson
	Testing operator:	Ali Naghizadeh
	ORLA Sample number(s):	3722
	SEMA Sample number(s):	722911
Order	Analysis Requested:	Odour Analysis
	Order requested by:	SEMA on behalf of Elf Farm
	Date of order:	19 Aug 2013
	Order number:	3952
	Telephone:	02 9737 9991
	Signed by:	Ali Naghizadeh
	Order accepted by:	Ali Naghizadeh
Report	Date of issue:	23 August 2013

NATA accredited laboratory number 15043.

Accredited for Compliance with ISO/IEC 17025.

Investigated Item	Odour concentration in odour units 'ou' determined by Sensory odour concentration measurements, of an odour sample supplied in a sampling bag. All samples were received in good condition.
Analysis Method	The samples were analysed in accordance with AS/NZS4323.3:2001.
Identification	The odour sample bags were labelled individually. Each label recorded the testing laboratory, sample number, sampling location (or Identification) sampling date and time, dilution ratio (if dilution was used) and whether further chemical analysis was required.
Method	The odour concentration measurements were performed using dynamic olfactometry according to the Australian Standard 'Determination of Odour Concentration by Dynamic Olfactometry AS/NZS4323.3:2001. The odour perception characteristics of the panel within the presentation series for the samples were analogous to that for n-butanol calibration. Any deviation from the Australian standard is recorded in the 'Comments' section of this report.
Instrument Used	The Olfactometer used during this testing session was: AC'SCENT International Olfactometer
Measuring Range	The measuring range of the AC'SCENT International olfactometer is $13 \leq \chi \leq 64{,}281$ ou. If the measuring range was insufficient the odour samples will have been pre-diluted.
Environment	The measurements were performed in an air- and odour-conditioned room. The room temperature is maintained between ± 3°C.
Measuring Dates	The date of each measurement is specified with the results.
Instrument Precision	The precision of this instrument (expressed as repeatability) for a sensory calibration must be $r \leq 0.05$ in accordance with the Australian Standard AS/NZS4323.3:2001. AC'SCENT International Olfactometer: $r = 0.0080$ (March 2013) Compliance – Yes
Instrumental Accuracy	The accuracy of this instrument for a sensory calibration must be $A \leq 0.20$ in accordance with the Australian Standard AS/NZS4323.3:2001. AC'SCENT International Olfactometer: $A = 0.120$ (March 2013) Compliance – Yes
Lower Detection Limit (LDL)	The LDL for the AC'SCENT International Olfactometer has been determined to be 13 ou
Traceability	The measurements have been performed using standards for which the traceability to the national standard has been demonstrated. The assessors are individually selected to comply with fixed criteria and are monitored every session to keep within the limits of the standard. The results from the assessors are traceable to primary standards of n-butanol in nitrogen.

23 August 2013

Peter Stephenson
Managing Director

Odour Research Laboratories Australia

Odour Olfactometry Results – 5253/ORLA/02

Sample Location	Sample ID No.	Sampling Date & Time	ORLA Sample No.	Analysis Date & Time (Completed)	Panel Size	Valid ITEs	Sample Pre-Dilution	Sample Odour Concentration (ou) [1]	Sample Odour Concentration (ou) [2]	Odour Character & Hedonic Tone [^ +]
Sample ID: Elf Stack R3	722911	19/08/2013 0327-0340	3722	19/08/2013 1003-1040	4	8	Nil	2,835	2,835	Manure, garbage, mulch, earth, tangy, sewerage, septic, rotten garbage, yeasty, dead mouse (-3.8)[^]

Odour Research Laboratories Australia

Odour Panel Calibration Results – 5253/ORLA/02

Reference Odorant	ORLA Sample No.	Concentration of Reference Gas (ppm)	Reference Gas Measured Concentration (ou)	Panel Average Measured Concentration (ppb) [3]	Does this panel calibration measurement comply with AS/NZS4323.3:P2001 (Yes/No) [4]
n-butanol	3721	50.0	1,308	38.2	Yes

Comments: All samples were collected by Stephenson Environmental Management Australia and analysed by Odour Research Laboratories Australia at their Sydney Laboratory.

Notes from Odour Olfactometry Results:

[1] Sample Odour Concentration: as received in the bag

[2] Sample Odour Concentration: allowing for pre-dilution

[3] Panel Average Measured Concentration: indicates the sensitivity of the panel for the session completed

[4] Target Range for reference gas n-butanol is $20 \le \chi \le 80$ ppb and compliance with AS/NZ4323.3:2001 is based on the individuals rolling average and not on the panel average measured concentration. Panellist Rolling Average: PR = 40.0, GP = 60.0, SR = 45.4, TL = 38.1, PP = 44.4

^ denotes the Average Hedonic Tone: describes the pleasantness of the odour being presented where (+5) represents Very Pleasant, (0) represents Neutral and (-5) represents Very Unpleasant and has been derived from the panellist responses at the recognition threshold.

+ This value is not part of our NATA Scope of Accreditation and AS4323.3

---END OF TEST REPORT---

Odour Research Laboratories Australia

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Olfactometry Test Report

	The measurement was commissioned by SEMA on behalf of:	
Client	Organisation:	Elf Farm
	Address:	108 Mulgrave Road, Mulgrave NSW 2756
	Contact:	Neil Cockerell
	Sampling Site:	Main Stack
	Telephone:	02 4577 5000
	Email:	manager@elffarm.com.au
Project	ORLA Report Number:	5253/ORLA/03
	Project Manager:	Peter Stephenson
	Testing operator:	Ali Naghizadeh
	ORLA Sample number(s):	3732, 3733
	SEMA Sample number(s):	722920, 722921
Order	Analysis Requested:	Odour Analysis
	Order requested by:	SEMA on behalf of Elf Farm
	Date of order:	21 Aug 2013
	Order number:	3957
	Telephone:	02 9737 9991
	Signed by:	Ali Naghizadeh
	Order accepted by:	Ali Naghizadeh
Report	Date of issue:	23 August 2013

NATA accredited laboratory number 15043.

Accredited for Compliance with ISO/IEC 17025.

Investigated Item	Odour concentration in odour units 'ou' determined by Sensory odour concentration measurements, of an odour sample supplied in a sampling bag. All samples were received in good condition.
Analysis Method	The samples were analysed in accordance with AS/NZS4323.3:2001.
Identification	The odour sample bags were labelled individually. Each label recorded the testing laboratory, sample number, sampling location (or Identification) sampling date and time, dilution ratio (if dilution was used) and whether further chemical analysis was required.
Method	The odour concentration measurements were performed using dynamic olfactometry according to the Australian Standard 'Determination of Odour Concentration by Dynamic Olfactometry AS/NZS4323.3:2001. The odour perception characteristics of the panel within the presentation series for the samples were analogous to that for n-butanol calibration. Any deviation from the Australian standard is recorded in the 'Comments' section of this report.
Instrument Used	The Olfactometer used during this testing session was: AC'SCENT International Olfactometer
Measuring Range	The measuring range of the AC'SCENT International olfactometer is $13 \leq \chi \leq 64{,}281$ ou. If the measuring range was insufficient the odour samples will have been pre-diluted.
Environment	The measurements were performed in an air- and odour-conditioned room. The room temperature is maintained between ± 3°C.
Measuring Dates	The date of each measurement is specified with the results.
Instrument Precision	The precision of this instrument (expressed as repeatability) for a sensory calibration must be $r \leq 0.05$ in accordance with the Australian Standard AS/NZS4323.3:2001. AC'SCENT International Olfactometer: $r = 0.0080$ (March 2013) Compliance – Yes
Instrumental Accuracy	The accuracy of this instrument for a sensory calibration must be $A \leq 0.20$ in accordance with the Australian Standard AS/NZS4323.3:2001. AC'SCENT International Olfactometer: $A = 0.120$ (March 2013) Compliance – Yes
Lower Detection Limit (LDL)	The LDL for the AC'SCENT International Olfactometer has been determined to be 13 ou
Traceability	The measurements have been performed using standards for which the traceability to the national standard has been demonstrated. The assessors are individually selected to comply with fixed criteria and are monitored every session to keep within the limits of the standard. The results from the assessors are traceable to primary standards of n-butanol in nitrogen.

23 August 2013

Peter Stephenson
Managing Director

Odour Research Laboratories Australia

Odour Olfactometry Results – 5253/ORLA/03

Sample Location	Sample ID No.	Sampling Date & Time	ORLA Sample No.	Analysis Date & Time (Completed)	Panel Size	Valid ITEs	Sample Pre-Dilution	Sample Odour Concentration (ou) [1]	Sample Odour Concentration (ou) [2]	Odour Character & Hedonic Tone [^] [+]
Sample ID: Elf Stack R4	722920	20/08/2013 1753-1803	3732	21/08/2013 1138-1240	4	8	Nil	2,371	2,371	Fishy, decaying meat, garbage, earth, mulch, vinegar, swampy, offensive (-3.3)[^]
Sample ID: Elf Stack R5	722921	21/08/2013 0641-0651	3733	21/08/2013 1340-1435	4	8	Nil	3,099	3,099	Garbage, decay, fishy, sour, sharp rancid fishy, putrid, septic, garbage tip, yeasty, offensive with egg tones, (-4.3)[^]

Odour Research Laboratories Australia

Odour Panel Calibration Results – 5253/ORLA/03

Reference Odorant	ORLA Sample No.	Concentration of Reference Gas (ppm)	Reference Gas Measured Concentration (ou)	Panel Average Measured Concentration (ppb) [3]	Does this panel calibration measurement comply with AS/NZS4323.3:P2001 (Yes/No) [4]
n-butanol	3731	50.0	1,247	40.1	Yes

Comments: All samples were collected by Stephenson Environmental Management Australia and analysed by Odour Research Laboratories Australia at their Sydney Laboratory.

Notes from Odour Olfactometry Results:

[1] Sample Odour Concentration: as received in the bag

[2] Sample Odour Concentration: allowing for pre-dilution

[3] Panel Average Measured Concentration: indicates the sensitivity of the panel for the session completed

[4] Target Range for reference gas n-butanol is $20 \le \chi \le 80$ ppb and compliance with AS/NZ4323.3:2001 is based on the individuals rolling average and not on the panel average measured concentration. Panellist Rolling Average: PR = 38.2, GP = 57.4, SR = 47.3, TL = 36.4, PP = 46.3

^ denotes the Average Hedonic Tone: describes the pleasantness of the odour being presented where (+5) represents Very Pleasant, (0) represents Neutral and (-5) represents Very Unpleasant and has been derived from the panellist responses at the recognition threshold.

+ This value is not part of our NATA Scope of Accreditation and AS4323.3

--END OF TEST REPORT--

APPENDIX B – PART OF OEH EPL LICENCE

Environment Protection Licence

P1 Location of monitoring/discharge points and areas

P1.1 The following points referred to in the table below are identified in this licence for the purposes of monitoring and/or the setting of limits for the emission of pollutants to the air from the point.

Air

EPA identi-fication no.	Type of Monitoring Point	Type of Discharge Point	Location Description
1	Discharge to air Air emissions monitoring	Discharge to air Air emissions monitoring	Bioscrubber chimney labelled as "Chimney" on "Figure 5.2 - Plant Layout" and "Figure 5.5 - Stage 1 - Phase 1 Bioscrubber Detail" contained in the "Mulgrave Mushroom Substrate Plant Environmental Management Plan" dated August 2002.

3 Limit Conditions

L1 Pollution of waters

L1.1 Except as may be expressly provided in any other condition of this licence, the licensee must comply with section 120 of the Protection of the Environment Operations Act 1997.

L2 Concentration limits

L2.1 For each monitoring/discharge point or utilisation area specified in the table\s below (by a point number), the concentration of a pollutant discharged at that point, or applied to that area, must not exceed the concentration limits specified for that pollutant in the table.

L2.2 Where a pH quality limit is specified in the table, the specified percentage of samples must be within the specified ranges.

L2.3 To avoid any doubt, this condition does not authorise the pollution of waters by any pollutant other than those specified in the table\s.

L2.4 Air Concentration Limits

POINT 1

Pollutant	Units of measure	100 percentile concentration limit	Reference conditions	Oxygen correction	Averaging period
Odour	odour units per second	55400			

L2.5 For each monitoring/discharge point specified in the table(s) in L2 above (by a point number), the reference conditions and averaging period of a pollutant discharged at that point must be reported at the reference conditions and averaging period specified for that pollutant in the following table.

Section 55 Protection of the Environment Operations Act 1997

Environment Protection Licence

Licence - 6229

Pollutant	Reference Conditions	Duration	Averaging Period
Odour	dry, 293K, 101.3kPa	1 hour	Rolling annual

L3 Waste

L3.1 The licensee must not cause, permit or allow any waste to be received at the premises, except the wastes expressly referred to in the column titled "Waste" and meeting the definition, if any, in the column titled "Description" in the table below.
Any waste received at the premises must only be used for the activities referred to in relation to that waste in the column titled "Activity" in the table below.
Any waste received at the premises is subject to those limits or conditions, if any, referred to in relation to that waste contained in the column titled "Other Limits" in the table below.
This condition does not limit any other conditions in this licence.

Code	Waste	Description	Activity	Other Limits
NA	Chicken manure		Composting Waste storage	NA
NA	Feather meal		Composting Waste storage	NA
NA	Cotton seed meal		Composting Waste storage	NA
NA	Natural organic fibrous materials	As defined in Schedule 1 of the POEO Act, in force from time to time	Composting Waste storage	NA
NA	Horse stable bedding		Composting Waste storage	NA
NA	General or Specific exempted waste	Waste that meets all the conditions of a resource recovery exemption under Clause 51A of the Protection of the Environment Operations (Waste) Regulation 2005	As specified in each particular resource recovery exemption	NA
NA	Waste	Any waste received on site that is below licensing thresholds in Schedule 1 of the POEO Act, as in force from time to time	-	NA

L3.2 The licensee must ensure that the amount of excess compost that is stored at the premises does not exceed 150 tonnes at any one time.

APPENDIX C – EXHAUST GAS FLOW DATA

Glossary:

%	=	percent
^oC	=	Degrees Celsius
am^3/min	=	cubic metre of gas at actual conditions per minute
Normal Volume (m^3)	=	cubic metre at 0°C and 760 mm pressure and 1 atmosphere
am^3	=	cubic metre of gas at actual conditions
g/g mole	=	grams per gram mole
g/s	=	grams per second
hrs	=	hours
kg/m^3	=	kilograms per cubic metre
kPa	=	kilopascals
m^2	=	square metre
m/s	=	metre per second
m^3/min	=	cubic metre per minute at 0^0C and 1 atmosphere
m^3/sec	=	cubic metre per second at 0^0C and 1 atmosphere
mg	=	milligrams
$mg/\ m^3$	=	milligrams per cubic metre at 0^oC and 1 atmosphere
ou	=	odour units
$ou.m^3/s$	=	odour units cubic metre of gas at dry, 293 K and 101.3 kPa
K	=	degrees Kelvin
O_2	=	Oxygen

Abbreviations for names of SEMA staff who completed the either/and/or Sampling, Analysis and Checking

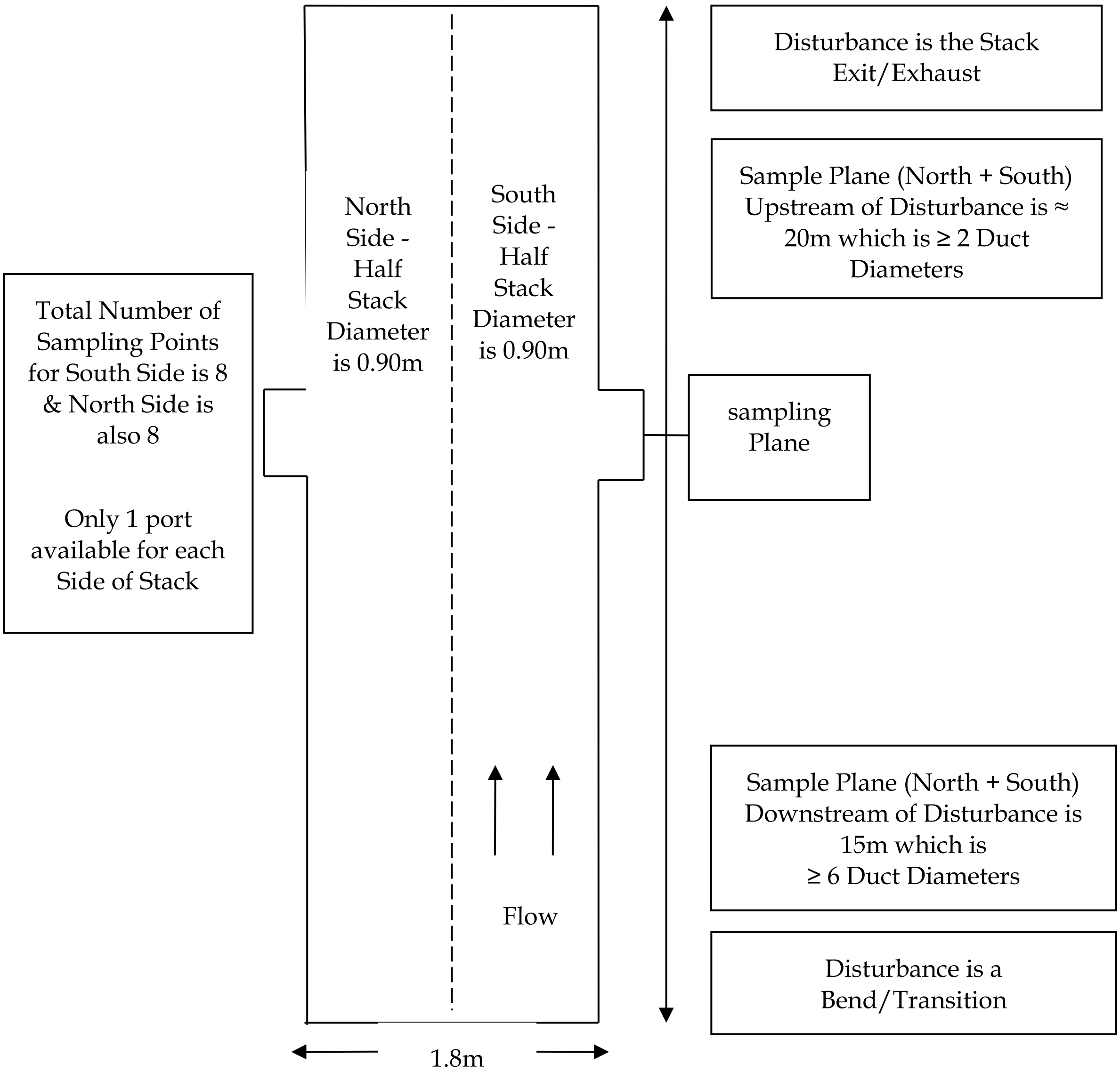
PWS	=	Peter W Stephenson
AN	=	Ali Naghizadeh

TABLE C - 1 EMISSION TEST RESULTS – FLOW AND ODOUR

Emission Test Results	Flow	Flow	Flow	Flow	Flow
Project Number	5253	5253	5253	5253	5253
Project Name	Elf Farm Bio-scrubber	Elf Farm Bio-scrubber	Elf Farm Bio-scrubber	Elf Farm Bio-scrubber	Elf Farm Bio-scrubber
Test Location	Stack	Stack	Stack	Stack	Stack
Date	15-Aug-13	16-Aug-13	19-Aug-13	20-Aug-13	21-Aug-13
Run	1	2	3	4	5
Analysis	Flow	Flow	Flow	Flow	Flow
Method	TM-1 & TM-2 & TM-22	TM-1 & TM-2 & TM-22	TM-1 & TM-2 & TM-22	TM-1 & TM-2 & TM-22	TM-1 & TM-2 & TM-22
Sample Start Time (hrs)	18:22	5:22	3:27	17:53	6:41
Sample Stop Time (hrs)	18:32	5:32	3:40	18:03	6:51
Inlet/Exhaust	Exhaust	Exhaust	Exhaust	Exhaust	Exhaust
Stack Temperature (^oC)	30.1	30.6	31.0	26.2	33.8
Stack Cross-Sectional area (m^2)	1.272	1.272	1.272	1.272	1.272
Average Stack Gas Velocity (m/s)	14.8	15.5	14.6	13.3	15.3
Actual Gas Flow Volume (am^3/min)	1,129	1,186	1,114	1,016	1,171
	Dry	Dry	Dry	Dry	Dry
Total Normal Gas Flow Volume (m^3/min)	893	873	932	898	874
Total Normal Gas Flow Volume (m^3/s)	14.9	14.6	15.5	15.0	14.6
Total Stack Pressure (kPa)	101.00	101.40	101.19	101.73	101.87
Moisture Content (% by volume)	11.9	18.2	6.7	3.5	16.6
Molecular Weight Dry Stack Gas (g/gmole)	28.836	28.836	28.836	28.836	28.836
Dry Gas Density (kg/m^3)	1.29	1.29	1.29	1.29	1.29
Oxygen (%)	20.9	20.9	20.9	20.9	20.9
Analysis	**Odour**	**Odour**	**Odour**	**Odour**	**Odour**
Method	AS4323.3	AS4323.3	AS4323.3	AS4323.3	AS4323.3
ORLA Number	3716	3717	3722	3732	3733
SEMA Number	722850	722851	722911	722920	722921
Sample Start Time (hrs)	18:22	5:22	3:27	17:53	6:41
Sample Finish Time (hrs)	18:32	5:32	3:40	18:03	6:51
Odour Concentration (As Received) (ou)	4,278	4,677	2,835	2,371	3,099
Odour Concentration (Final) (ou)	**4,278**	**4,677**	**2,835**	**2,371**	**3,099**
Normal MOER (As Received) (ou m^3/s)	63,645	68,071	44,060	35,496	45,123
Normal MOER (Final) (ou m^3/s)	**63,645**	**68,071**	**44,060**	**35,496**	**45,123**
Mass Odour Emission Rate Limit (ou m^3/s)	55,400	55,400	55,400	55,400	55,400
Sample Storage Period	2 days	2 days	2 days	2 days	2 days
Calculations entered by	AN	AN	AN	AN	AN
Calculations checked by	PWS	PWS	PWS	PWS	PWS

APPENDIX D – SAMPLE LOCATION

FIGURE D - 1 SAMPLE LOCATION



In the absence of cyclonic flow activity ideal sampling plane conditions will be found to exist at 6-8 duct diameters downstream and 2-3 duct diameters upstream from a flow disturbance. The sampling plane does meet this criterion.

The sample plane does meet gas profile for sampling. Therefore the sampling plane is satisfactory for testing and in compliance with AS4323.1

Stephenson

Environmental Management Australia

PRP U 2.1: ODOUR ASSESSMENT –

BALE WETTING, PRE-WET BUILDING & EXTERNAL LOADING CONVEYOR

ELF FARM PTY LTD

MULGRAVE, NSW

PROJECT NO.:	**5255/S22734/13**
DATES OF SURVEY:	**18 JULY, 19 & 21 AUGUST 2013**
DATE OF ISSUE:	**26 SEPTEMBER 2013**

Stephenson
Environmental Management Australia

Peter W Stephenson & Associates Pty Ltd
ACN 002 600 526 (Incorporated in NSW)
ABN 75 002 600 526

Newington Business Park
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E-Mail: info@stephensonenv.com.au

PRP U 2.1: ODOUR ASSESSMENT – BALE WETTING, PRE-WET BUILDING & EXTERNAL LOADING CONVEYOR

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P W STEPHENSON

A NAGHIZADEH

Table of Contents

Table of Tables

Table of Figures

Table of Tables Appendices

1 INTRODUCTION

Stephenson Environmental Management Australia (SEMA) was requested by Elf Farm Pty Ltd to assess the odour emissions from various locations at their composting facility located at Mulgrave, New South Wales (NSW).

The principal objectives of the tests were to measure odour emission concentrations from various locations to address the requirements of the Pollution Study and Reduction Program U 2.1 under the facility's Environment Protection Licence (EPL) No. 6229.

U 2.1 specifies that:

"By no later than 30 September 2013 the Licensee must submit to the EPA a report, prepared by a suitably qualified professional external consultant to include the following:

Bale Wetting Area
Sample and measure odour emission levels from the bale wetting area to identify issues effecting ground level concentrations.

Pre-Wet Building
Sample and measure the effectiveness of the Pre-Wet Building's foul air extraction system that directs air to the Bioscrubber system; and

External Loading Conveyor
Sample and measure the odour emission levels from the external conveyor."

The EPL was issued by the Environment Protection Authority (EPA) in accordance with the *Protection of the Environment Operations Act 1997*. The EPA is now incorporated into the Office of Heritage and Environment (OEH).

The emission parameters monitored in this survey were:

- Odour concentration
- Exhaust gas velocity, exhaust gas temperature, and hence discharge volume where practicable
- Odour Emission Rate (OER).

Odour emission testing was undertaken on 18 July, 19 August and 21 August 2013 at a nominated times during various phases of the new single batch seven (7) day composting cycle. Table 1-1 shows the scope of work carried out on the stack on the days of testing.

TABLE 1-1 ODOUR TESTING PROGRAM – BALE WETTING

Parameter	19/08/2013			
	Top of bales north	**Top of bales south**	**Bale wet leachate**	**Bale wet vapour escape**
Flow, temperature & moisture	✓	✓	✓	
Odour	Single flux hood sample	Single flux hood sample	Single flux hood sample	Single sample
Odour Emission Rate	✓	✓	✓	✓

TABLE 1-2 ODOUR TESTING PROGRAM – PHASE 1 BUILDING CONVEYOR SYSTEMS

Parameter	19/08/2013			
	External Conveyor	**External Conveyor**	**Internal Conveyor**	**Internal Conveyor**
Flow, temperature & moisture	✓	✓	✓	
Odour	Single sample	Single sample	Single sample	Single sample
Odour Emission Rate	✓	✓	✓	✓

TABLE 1-3 ODOUR TESTING PROGRAM – PRE-WET BUILDING EXTRACTION FANS

Parameter	21/08/2013		18/07/2013	
	Supply Fan Bunker 1	**Supply Fan Bunker 4**	**Pre-wet building on Blender operating platform**	**Inside Pre-wet building ground level**
Flow, temperature & moisture	✓	✓	✓	✓
Odour	Single sample	Single sample	Single sample	Single sample
Odour Emission Rate	✓	✓	✓	✓

1.1 ASSUMPTIONS

It is assumed that the previous dispersion modelling conducted for these fugitive emission sources and subsequent submissions to support the Part 3A Development Application for the plant upgrade will suffice. It is also assumed that any odour emission measurements made in the current study can be referenced to model emissions input files used in the dispersion modelling.

2 PRODUCTION CONDITIONS

The odour emission samples were collected with the composting plant operating under maximum transfer and blending processes of a normal seven-day cycle running. Table 2-1 summarises the operating conditions for the days of testing

TABLE 2-1 OPERATING CONDITIONS DURING ODOUR SAMPLING

Day	Sampling Time	Operating Conditions
18/07/2013	0700 - 0730	Pre-wet building during blending prior to transfer
19/08/2013	0450 - 0625	Bale wetting (saturated bales)
19/08/2013	1040 - 1140 1308 - 1350	External conveyor under full transfer load
19/08/2013	1144 - 1220 and 1354 - 1430	Internal conveyor transferring to individual tunnels/bunkers
21/08/2013	0850 - 0930	Pre-wet building extraction fans and Phase 1 bunker supply air fans operating under full load. Both buildings were in full operation with blending operations in both the Pre-wet shed and Phase 1 bunker blending.

2.1 OPERATING TIMES FOR EXTERNAL TRANSFER CONVEYOR

The current Phase 1 Bunker blending operations which require the use of transfer conveyor which is external to the Phase 1 building are presented in Table 2-2. The shaded areas in the Table show the scheduled hours of operation.

This table shows that the conveyor emissions occur for up to 31.5 hours in any one 168 hour seven day week. The majority of these 31.5 hours are in daylight when ventilation of emissions will be more efficient.

TABLE 2-2 CURRENT TYPICAL OPERATING TIMES FOR EXTERNAL TRANSFER CONVEYOR

	Mon	Tues	Wed	Thurs	Fri	Sat	Sun
0000 hrs							
0100 hrs							
0200 hrs							
0300 hrs							
0400 hrs							
0500 hrs							
0600 hrs							
0700 hrs							
0800 hrs							
0900 hrs							
1000 hrs							
1100 hrs		Note: Until 11:30 only					
1200 hrs							
1300 hrs							
1400 hrs							
1500 hrs							
1600 hrs							
1700 hrs							
1800 hrs							
1900 hrs							
2000 hrs							
2100 hrs							
2200 hrs							
2300 hrs							
2400 hrs							

Key:

= Operating times per week for External Transfer Conveyor

3 RESULTS AND DISCUSSION

3.1 EMISSION TEST RESULTS

The results of the emission tests are presented in Table 3-1. SEMA completed the odour sampling. SEMA is NATA accredited for the odour sampling, NATA accreditation number 15043.

Odour Research Laboratories Australia (ORLA) performed the odour analysis. ORLA is a division of Peter W Stephenson & Associates Pty Ltd and is NATA accredited to AS4323.3 for odour analysis, accreditation number 15043. ORLA is the first NATA accredited odour analysis laboratory in New South Wales. The Certificates of Analysis, Olfactometer Test Report No. 5254/ORLA/01 are presented in Appendix A of this report.

The odour emission sampling and olfactometric analysis was conducted in accordance with Australian Standard (AS) 4323.3. Refer to Section 5 of this report for further detail.

TABLE 3-1 SUMMARY ODOUR EMISSION CONCENTRATION RESULTS

Day	Thursday	Monday	Monday	Monday	Wednesday
Date	**18/07/2013**	**19/8/2013**	**19/8/2013**	**19/8/2013**	**21/8/2013**
Location	Pre-wet building	Bale wetting	External conveyor	Internal conveyor	Pre-wet building extraction fan
Sampling Time	0705 - 0715 0715 - 0725	0450 - 0625	0727 - 0813	0730 - 0814	0850 - 0910
SEMA Sample Nos.	722995 722996	722916 722917 722918 722919	722912 722914	722913 722915	722922 722923
ORLA Sample Nos.	3710 3711	3727 3728 3729 3730	3723 3725	3724 3726	3734 3735
Conc. (ou)	2371 3359	1161 2169 1984 1814	493 748	1270 1388	972 752

Key:
ou = odour unit
Conc. = concentration

3.2 ODOUR EMISSION RATES

The MOER for all samples were determined to establish compliance with the OEH EPL criteria.

The MOER can be calculated using the following formula:

MOER = velocity (m/s) x total surface or cross-sectional area (m^2) x odour concentration (ou)

Velocity = velocity of air in stack in metres per second as shown in Table 3-3

Total Surface Area of the Stack = Cross Sectional Area of the Stack in square metres (m^2).

Odour Concentration = As per Table 2-1 and Table 3-3.

The above formula calculates MOER based on actual conditions. However the Reference Conditions specifies for the MOER to be reported as dry, 293 degrees Kelvin (K) and 101.3 kilopascals (kPa).

SEMA has measured in parallel with sampling of odours the moisture content, temperature and pressure of the gas stream and corrected the MOER to the above reference conditions. The Mass Odour Emission Rates for the samples are shown in Table 3-3. Refer to Appendix C for detailed Exhaust Gas Flow Data Calculations.

3.3 ODOUR SAMPLING LOCATIONS

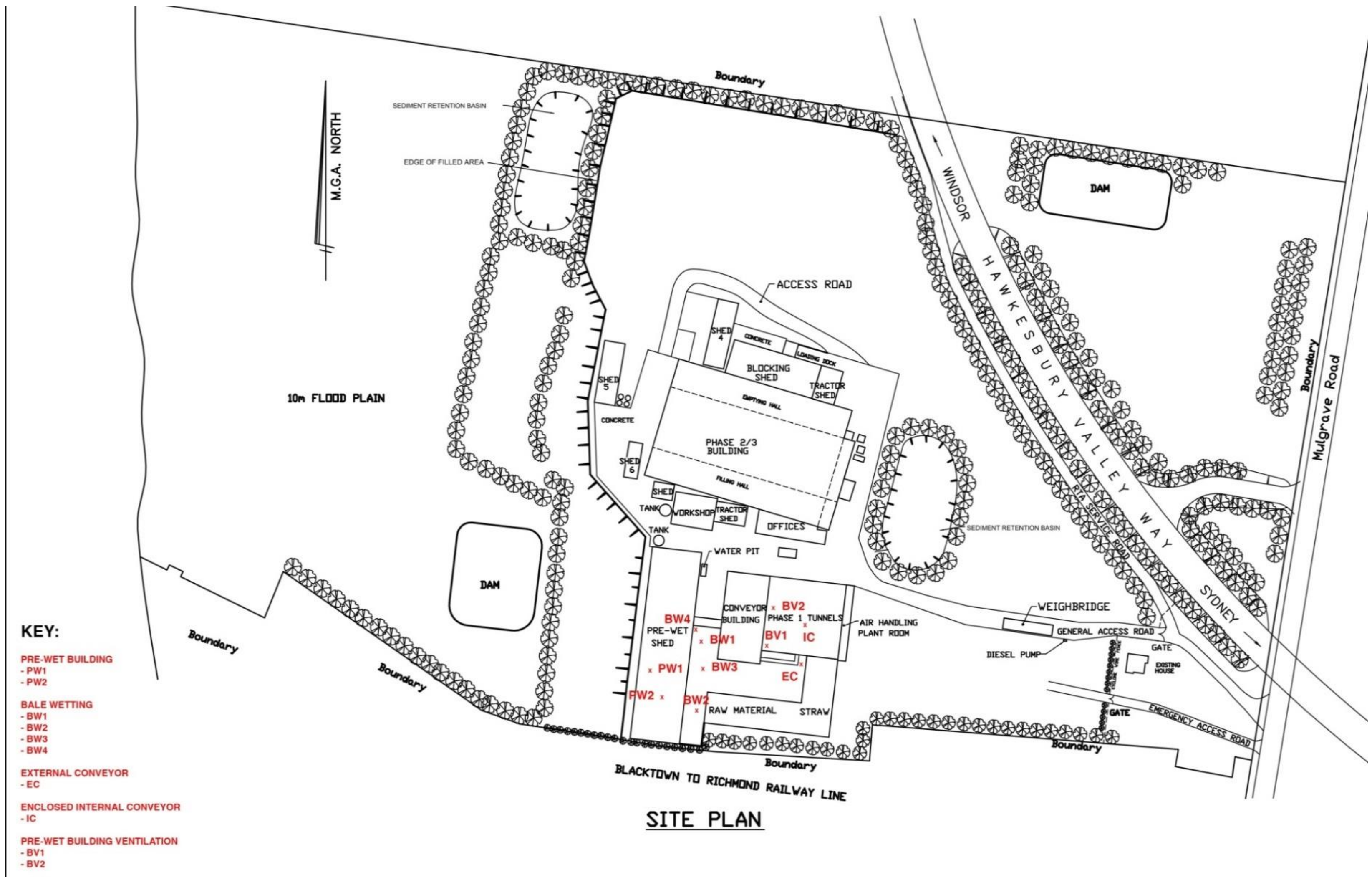
The odour sampling locations are referred to in Table 3.2 and diagramatically shown in Figure 3.1.

TABLE 3-2 ODOUR EMISSION RATES

Location	Pre-wet building (PW)		Bale wetting (BW)				Phase 1 Transfer to external conveyor (EC)		Phase 1 Transfer internal conveyor (IC)		Pre-wet building ventilation (BV)	
Day	**Thursday**		**Monday**				**Monday**		**Monday**		**Wednesday**	
Date	18/7/2013		19/8/2013				19/8/2013		19/8/2013		21/8/2013	
ORLA Sample No.	3710	3711	3727	3728	3729	3730	3723	3725	3724	3726	3734	3735
Time (hours)	0705 - 0715	0715 - 0725	0453	0520	0615	0542	0727	0802	0730	0745	0856	0850
Location	Blender	Floor	Top north	Top south	Leachate	Vapour	Transfer Point		Inside enclosure		Bunker 1	Bunker 4
Odour Conc. (ou)	2371	3359	1161	2169	1984	1814	493	748	1270	1388	972	752
Operating Conditions	Blending		3.5days	4days	4days	3.5 days	Full conveyor belt		Transferring		Fullspeed	Fullspeed
Gas Velocity (m/s)	Inside building		Flux hood (SOER) 0.746	1.399	1.278	0.3	Wind speed @ 1m/s		Inside		2.58	3.15
Stack Cross Sectional Area (m^2)	n/a		655	655	46	0.0025	53	53	n/a	n/a	0.75	0.75
MOER (ou.v/s)	Via pre-wet building ventilation		488	916	58.8	1.36	26,129	39,644	Via bunker and bioscrubber		1881	1777

Key:
n/a = not applicable
MOER = Mass Odour Emission Rate
ou.v/s = Odour Unit volumes per second
ou/s = Odour Units per second
m/s = meters per second
m^2 = square metres

FIGURE 3-1 SAMPLING LOCATIONS AT ELF FARM – JULY AND AUGUST 2013



4 CONCLUSIONS

From this odour emission sampling and olfactometry analysis survey, conducted on critical processes nominated in PRP U2.1 on various days during a typical scheduled single batch seven day composting cycle, the measured odour emission concentrations and mass odour emission rate (MOER) during normal operating conditions respectively were:

Bale Wetting

1161 to 2169 ou;

488 to 916 ou.m^3/s

Bale Wetting Leachate on paved area

1984 ou;

58.8 ou.m^3/s

External Transfer Conveyor

493 to 748 ou;

26,129 to 39,644 ou.m^3/s

Pre-Wet ventilation ducts

752 to 972 ou;

1777 to 1881 ou.m^3/s

Although the MOER's vary due to the different exposed surface areas and discharge exhaust gas flow volumes, the odour emission concentrations from all sources were of a similar order when experimental uncertainties for odour measurement are taken onto account.

The **Bale Wetting** process is conducted outside the buildings.

Similarly, the **External Transfer Conveyor** traverses between two buildings on the outside of those buildings. Although the odour emission concentration from this freshly blended compost was the lowest of the odour measurement program, the MOER was the highest by at least an order of magnitude. This MOER is derived from the exposed area of the compost on the open conveyor over time.

However, the conveyor is only operated for 31.5 hours per 168 hour week; 75% in daylight hours when the compost tunnels/bunkers are being blended. Therefore, the conveyor, although having the highest fugitive mass odour emission rate is not operated during the periods of calm and extremely stable overnight meteorological conditions that prevail in the Mulgrave area.

The **Internal Transfer Conveyor** is enclosed and all access doors to this conveyor housing now have automatic door closers, as specified in **PRP U1.2**, to minimise leakage of fugitive odour emissions. The design of this conveyor transfer system and the building itself direct odorous emissions within this conveyor building into the bunker into which the blended compost is being transferred. Therefore, odorous vapours are drawn into the bunker by the extraction fans connected to the bio-scrubber and discharged to atmosphere via the tall stack.

Odour in the **Pre-Wet building** appears to be generally contained within the building. This containment has been facilitated by the installation of hanging curtains in the upper section of the doorways, as specified in **PRP U 1.1**, to reduce the open area of the doorways when the doors are open.

The current **Pre-Wet building ventilation ducts** deliver odorous pre-wet air to the tunnel/bunkers in the Phase 1 building which, in turn, are discharged to atmosphere via the bio-scrubber and a tall stack. The odour emission concentration in these ventilation ducts was less than that measured in the Pre-Wet building itself. However, within experimental uncertainty and allowing for some ingress of dilution air in the upper head space of the Pre-Wet building, these in-duct odour concentrations appear representative.

4.1 RECOMMENDATIONS:

Therefore, it is recommended that the odour mitigation measures specified in **PRP U 1** be completed. In particular, **PRP U 1.3**, which requires the external transfer conveyor to be fitted with detachable covers. This **PRP U 1.3** is to be completed by 25 October 2013.

Additional works and assessment of the **Bio-scrubber** and **stack** emissions are required under **PRP U3.1** which are in progress and will be completed by the nominated 31 October 2013.

5 TEST METHODS

5.1 ODOUR

(Standards Association of Australia AS4323.3 &.4 and OEH NSW OM-7 & OM-8)

Samples were collected in 30L Nalophane sampling bags which are enclosed in airtight plastic containers.

Odorous gas for analysis was drawn through a Teflon (PTFE) sample probe. The gas then passes through a Teflon (PTFE) tube connected to the Nalophane sampling bag. The sampling pump is connected to the airtight plastic container to provide a sample gas flow-rate of approximately 0.5 – 1.5 litres per minute. After the required volume has been sampled, the pump is stopped and the bag sealed with a stainless steel valve.

Using a triangular forced choice olfactometer, the Nalophane bag of odour sample was dynamically diluted to various concentrations with dry odour free air.

The diluted sample was then presented to a panel of screened panellists as one of these airflows. The panellists then recorded if they could detect any odour and from which flow. The other two flows were discharging odour free air.

The odour is always presented to the panellists in ascending concentration; that is, from lower to higher concentration. The panellists are required at each dilution level to give a response as to what they are smelling from the flows (forced choice methodology). The response options for the panellists are:

'Guess'	Unable to determine which air flow contains the diluted odours
'Inkle'	Thinks that one of the flows may be different from the other two flows
'Detect' or 'Certain'	Is confident that one of the airflows smells different from the other two flows. Not necessarily able to say what the smell is.
'Recognise'	Thinks that one of the flows may be different from the other two flows and is able to: ▪ Assign a 'hedonic tone' (pleasantness scale number) to the odour ranging from –10 to 10 and/or ▪ Able to assign a character to the odour, as in 'it smells like …' *Note: that the Recognise level concentration and Hedonic Tone and Odour descriptors are obtained with the diluted odour, panellists are not exposed to the full strength odour.*

The percentage panel response and dilution levels used were then entered into a computer programme to determine the 50% panel response. This dilution level corresponds to the odour concentration of the sample.

Sampling and dilution lines are constructed from teflon, stainless or glass to prevent contamination of the sample.

The sampling and the dilution procedures used were in accordance with OEH NSW Methods OM-7 and OM-8 which are based on Standards Association of Australia, AS4323.3.

5.1.1 ODOUR PANEL SELECTION

Odour panellists must meet certain criteria to qualify as and remain panellists. Their average sensitivity to n-Butanol must be between 20 and 80 parts per billion (ppb) and their variability in response to n-Butanol must be within a certain range.

Panellists are tested against n-Butanol before every panel session to ensure they are in compliance.

Panellists should not suffer from respiratory complaints, nor should they eat or smoke or drink anything but water during the half hour preceding or during the test period and their person and clothing should be odour free and have not been exposed to an odorous environment before testing.

5.1.2 ODOUR TERMINOLOGY

The odour level is expressed in odour units and for mixed odours is analogous to concentration expressed in parts per billion. The odour detection level is defined as the ratio of *the volume that a sample of odorous gas would occupy when diluted to the threshold of detection of that odour* to *the volume of the sample*. In simpler terms, the ratio indicated the number of dilutions necessary to reduce the odour to its threshold of detection or odour detection threshold. This ratio is expressed in odour units or number of dilutions to detection threshold. For example, a value of 2,000 odour units would mean the volume of the initial sample of odorous gas would need to be diluted 2,000 times before the odour would just be detectable to the average human nose, that is, at the odour detection threshold.

5.2 EXHAUST GAS VELOCITY

(OEH NSW TM-2 and USEPA Method 12)

Velocity profiles were obtained across the stack utilising an Airflow Developments Ltd. S-type pitot tube and inclined manometer.

5.3 EXHAUST GAS TEMPERATURE

(OEH NSW TM- 2, 3 & 4 and USEPA Methods 2, 3 & 4)

The exhaust gas temperature was measured using a Digital thermometer (0-1200^{o}C) connected to a chromel/alumel (K-type) thermocouple probe.

5.4 ACCURACY (FLOW MEASUREMENT)

All results are quoted on a dry basis.

Appendix C of (British Standard) 893 presents a range of accuracies for various parts of the isokinetic sampling procedure including pressure, velocity, temperature and particulate sampling. At best, an accuracy of $\pm$ 10% can be expected.

For odour the ratio between two single measurements, performed on the same testing material in this laboratory under repeatability conditions, will not be larger than 2.65 in 95% of cases. (Source – AS/NZS 4323.3:2001 Appendix B Section B2).

APPENDIX A – CERTIFICATES OF ANALYSIS

Odour Research Laboratories Australia

A Division of Peter W. Stephenson & Associates Pty Ltd
ACN 002 600 526 (Incorporated in NSW)
ABN 75 002 600 526

Newington Business Park
Unit 7/2 Holker Street
Newington NSW 2127 Australia
Tel: (02) 9737 9991
Fax: (02) 9737 9993
E-Mail: pstephenson@orla.com.au

Olfactometry Test Report

	The measurement was commissioned by SEMA on behalf of:	
Client	Organisation:	Elf Farm Supplies
	Address:	108 Mulgrave Road, Mulgrave NSW 2756
	Contact:	Neil Cockerell
	Sampling Site:	Pre-Wet Facility
	Telephone:	02 4577 5000
	Email:	manager@elffarm.com.au
Project	ORLA Report Number:	5255/ORLA/01
	Project Manager:	Peter Stephenson
	Testing operator:	Ali Naghizadeh
	ORLA Sample number(s):	3710, 3711
	SEMA Sample number(s):	722795, 722796
Order	Analysis Requested:	Odour Analysis
	Order requested by:	SEMA on behalf of Elf Farm Supplies
	Date of order:	18 July 2013
	Order number:	3922
	Telephone:	02 9737 9991
	Signed by:	Ali Naghizadeh
	Order accepted by:	Ali Naghizadeh
Report	Date of issue:	19 July 2013

NATA accredited laboratory number 15043.

Accredited for Compliance with ISO/IEC 17025.

Investigated Item	Odour concentration in odour units 'ou' determined by Sensory odour concentration measurements, of an odour sample supplied in a sampling bag. All samples were received in good condition.
Analysis Method	The samples were analysed in accordance with AS/NZS4323.3:2001.
Identification	The odour sample bags were labelled individually. Each label recorded the testing laboratory, sample number, sampling location (or Identification) sampling date and time, dilution ratio (if dilution was used) and whether further chemical analysis was required.
Method	The odour concentration measurements were performed using dynamic olfactometry according to the Australian Standard 'Determination of Odour Concentration by Dynamic Olfactometry AS/NZS4323.3:2001. The odour perception characteristics of the panel within the presentation series for the samples were analogous to that for n-butanol calibration. Any deviation from the Australian standard is recorded in the 'Comments' section of this report.
Instrument Used	The Olfactometer used during this testing session was: AC'SCENT International Olfactometer
Measuring Range	The measuring range of the AC'SCENT International olfactometer is $13 \le \chi \le 64{,}281$ ou. If the measuring range was insufficient the odour samples will have been pre-diluted.
Environment	The measurements were performed in an air- and odour-conditioned room. The room temperature is maintained between ± 3°C.
Measuring Dates	The date of each measurement is specified with the results.
Instrument Precision	The precision of this instrument (expressed as repeatability) for a sensory calibration must be $r \le 0.05$ in accordance with the Australian Standard AS/NZS4323.3:2001. AC'SCENT International Olfactometer: $r = 0.0080$ (March 2013) Compliance – Yes
Instrumental Accuracy	The accuracy of this instrument for a sensory calibration must be $A \le 0.20$ in accordance with the Australian Standard AS/NZS4323.3:2001. AC'SCENT International Olfactometer: $A = 0.120$ (March 2013) Compliance – Yes
Lower Detection Limit (LDL)	The LDL for the AC'SCENT International Olfactometer has been determined to be 13 ou
Traceability	The measurements have been performed using standards for which the traceability to the national standard has been demonstrated. The assessors are individually selected to comply with fixed criteria and are monitored every session to keep within the limits of the standard. The results from the assessors are traceable to primary standards of n-butanol in nitrogen.

19 July 2013

Peter Stephenson
Managing Director

Odour Research Laboratories Australia

Odour Olfactometry Results – 5255/ORLA/01

Sample Location	Sample ID No.	Sampling Date & Time	ORLA Sample No.	Analysis Date & Time (Completed)	Panel Size	Valid ITEs	Sample Pre-Dilution	Sample Odour Concentration (ou) [1]	Sample Odour Concentration (ou) [2]	Odour Character & Hedonic Tone^ +
Sample ID: Blender Operator Platform	722795	18/07/2013 0705-0715	3710	18/07/2013 1103-1144	4	8	Nil	2,371	2,371	Fishy, earthy, fertiliser, sewer, rotting fish/garbage, Weet-Bix, Vegemite, meat (-4.5)^
Sample ID: Floor – Working Layer	722796	18/07/2013 0715-0725	3711	18/07/2013 1150-1228	4	8	Nil	3,359	3,359	Fishy, wet soil, wet fertiliser, rotting fish/garbage, yeasty, offensive, rotten eggs (-4.0)^

Odour Research Laboratories Australia

Odour Panel Calibration Results – 5255/ORLA/01

Reference Odorant	ORLA Sample No.	Concentration of Reference Gas (ppm)	Reference Gas Measured Concentration (ou)	Panel Average Measured Concentration (ppb) [3]	Does this panel calibration measurement comply with AS/NZS4323.3:P2001 (Yes/No) [4]
n-butanol	3709	50.0	1,161	43.0	Yes

Comments: All samples were collected by Stephenson Environmental Management Australia and analysed by Odour Research Laboratories Australia at their Sydney Laboratory.

Notes from Odour Olfactometry Results:

[1] Sample Odour Concentration: as received in the bag

[2] Sample Odour Concentration: allowing for pre-dilution

[3] Panel Average Measured Concentration: indicates the sensitivity of the panel for the session completed

[4] Target Range for reference gas n-butanol is $20 \leq \chi \leq 80$ ppb and compliance with AS/NZ4323.3:2001 is based on the individuals rolling average and not on the panel average measured concentration. Panellist Rolling Average: PR = 41.8, GP = 57.1, AP = 28.3, TL = 38.3

^ denotes the Average Hedonic Tone: describes the pleasantness of the odour being presented where (+5) represents Very Pleasant, (0) represents Neutral and (-5) represents Very Unpleasant and has been derived from the panellist responses at the recognition threshold.

+ This value is not part of our NATA Scope of Accreditation and AS4323.3

------------------------------END OF TEST REPORT------------------------------

Odour Research Laboratories Australia

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E-Mail: pstephenson@orla.com.au

Olfactometry Test Report

The measurement was commissioned by SEMA on behalf of:

Client	Organisation:	Elf Farm
	Address:	108 Mulgrave Road, Mulgrave NSW 2756
	Contact:	Neil Cockerell
	Sampling Site:	Internal and External Conveyor, Bale Wetting
	Telephone:	02 4577 5000
	Email:	manager@elffarm.com.au
Project	ORLA Report Number:	5255/ORLA/02
	Project Manager:	Peter Stephenson
	Testing operator:	Ali Naghizadeh
	ORLA Sample number(s):	3723 to 3730 inclusive
	SEMA Sample number(s):	722912 to 722919 inclusive
Order	Analysis Requested:	Odour Analysis
	Order requested by:	SEMA on behalf of Elf Farm Supplies
	Date of order:	19 August 2013
	Order number:	3953
	Telephone:	02 9737 9991
	Signed by:	Ali Naghizadeh
	Order accepted by:	Ali Naghizadeh
Report	Date of issue:	30 August 2013

NATA accredited laboratory number 15043.

Accredited for Compliance with ISO/IEC 17025.

Investigated Item	Odour concentration in odour units 'ou' determined by Sensory odour concentration measurements, of an odour sample supplied in a sampling bag. All samples were received in good condition.
Analysis Method	The samples were analysed in accordance with AS/NZS4323.3:2001.
Identification	The odour sample bags were labelled individually. Each label recorded the testing laboratory, sample number, sampling location (or Identification) sampling date and time, dilution ratio (if dilution was used) and whether further chemical analysis was required.
Method	The odour concentration measurements were performed using dynamic olfactometry according to the Australian Standard 'Determination of Odour Concentration by Dynamic Olfactometry AS/NZS4323.3:2001. The odour perception characteristics of the panel within the presentation series for the samples were analogous to that for n-butanol calibration. Any deviation from the Australian standard is recorded in the 'Comments' section of this report.
Instrument Used	The Olfactometer used during this testing session was: AC'SCENT International Olfactometer
Measuring Range	The measuring range of the AC'SCENT International olfactometer is $13 \leq \chi \leq 64{,}281$ ou. If the measuring range was insufficient the odour samples will have been pre-diluted.
Environment	The measurements were performed in an air- and odour-conditioned room. The room temperature is maintained between $\pm 3^{o}$C.
Measuring Dates	The date of each measurement is specified with the results.
Instrument Precision	The precision of this instrument (expressed as repeatability) for a sensory calibration must be $r \leq 0.05$ in accordance with the Australian Standard AS/NZS4323.3:2001. AC'SCENT International Olfactometer: $r = 0.0080$ (March 2013) Compliance – Yes
Instrumental Accuracy	The accuracy of this instrument for a sensory calibration must be $A \leq 0.20$ in accordance with the Australian Standard AS/NZS4323.3:2001. AC'SCENT International Olfactometer: $A = 0.120$ (March 2013) Compliance – Yes
Lower Detection Limit (LDL)	The LDL for the AC'SCENT International Olfactometer has been determined to be 13 ou
Traceability	The measurements have been performed using standards for which the traceability to the national standard has been demonstrated. The assessors are individually selected to comply with fixed criteria and are monitored every session to keep within the limits of the standard. The results from the assessors are traceable to primary standards of n-butanol in nitrogen.

30 August 2013

Peter Stephenson
Managing Director

Odour Research Laboratories Australia

Odour Olfactometry Results – 5255/ORLA/02

Sample Location	Sample ID No.	Sampling Date & Time	ORLA Sample No.	Analysis Date & Time (Completed)	Panel Size	Valid ITEs	Sample Pre-Dilution	Sample Odour Concentration (ou) 1	Sample Odour Concentration (ou) 2	Odour Character & Hedonic Tone^ +
Sample ID: External Conveyor R5	722912	19/08/2013 0727-0743	3723	19/08/2013 1042-1140	4	8	Nil	493	493	Ammonia, sour, stinky socks, sickly sweet, garbage, sickly brown sugar, yeast, bread tones, rotten garbage (-3.8)^
Sample ID: Internal Conveyor R6	722913	19/08/2013 0730-0745	3724	19/08/2013 1144-1220	4	8	Nil	1,270	1,270	Ammonia, mulch, garbage, yeast, bread tones, offensive, decaying fish, rotten garbage, cloves (-3.5)^
Sample ID: External Conveyor R7	722914	19/08/2013 0802-0813	3725	19/08/2013 1308-1350	4	8	Nil	748	748	Musty, sickly, slightly sweet, yeast, bread tones, sour, landfill, garbage, rotten garbage, rotten fish (-3.0)^
Sample ID: Internal Conveyor R8	722915	19/08/2013 0804-0814	3726	19/08/2013 1354-1429	4	8	Nil	1,388	1,388	Earth, mulch, fertiliser, ammonia, musty, sickly, slightly sweet, landfill, garbage, rotten garbage (-4.3)^

Odour Research Laboratories Australia

Odour Olfactometry Results – 5255/ORLA/02

Sample Location	Sample ID No.	Sampling Date & Time	ORLA Sample No.	Analysis Date & Time (Completed)	Panel Size	Valid ITEs	Sample Pre-Dilution	Sample Odour Concentration (ou) [1]	Sample Odour Concentration (ou) [2]	Odour Character & Hedonic Tone^ +
Sample ID: Bale Wet North 3.5d R1	722916	19/08/2013 0453-0503	3727	19/08/2013 1457-1528	4	8	Nil	1,161	1,161	Rotting garbage, tangy, sour, septic, fishy, sewerage, sweet, egg tones, burnt vegetables (-2.8)^
Sample ID: Bale Wet South 4d R2	722917	19/08/2013 0520-0532	3728	19/08/2013 1352-1608	4	8	Nil	2,169	2,169	Fishy, sewerage, feculent, sulphur, gas, sour, septic, rancid (-4.8)^
Sample ID: Bale Wet Leachate R3	722918	19/08/2013 0615-0625	3729	19/08/2013 1612-1648	4	8	Nil	1,984	1,984	Sewerage, gassy, feculent, sulphur, gas, nutty, septic (-2.8)^
Sample ID: Bale Wet Steam R4	722919	19/08/2013 0542-0551	3730	19/08/2013 1652-1725	4	8	Nil	1,814	1,814	Fishy, cereal, sharp, stale swamp water, yeasty, food factory, smoky, septic, sewer, sulphur (-3.0)^

Odour Research Laboratories Australia

Odour Panel Calibration Results – 5255/ORLA/02

Reference Odorant	ORLA Sample No.	Concentration of Reference Gas (ppm)	Reference Gas Measured Concentration (ou)	Panel Average Measured Concentration (ppb) [3]	Does this panel calibration measurement comply with AS/NZS4323.3:P2001 (Yes/No) [4]
n-butanol	3721	50.0	1,308	38.2	Yes

Comments: All samples were collected by Stephenson Environmental Management Australia and analysed by Odour Research Laboratories Australia at their Sydney Laboratory.

Notes from Odour Olfactometry Results:

[1] Sample Odour Concentration: as received in the bag

[2] Sample Odour Concentration: allowing for pre-dilution

[3] Panel Average Measured Concentration: indicates the sensitivity of the panel for the session completed

[4] Target Range for reference gas n-butanol is $20 \leq \chi \leq 80$ ppb and compliance with AS/NZ4323.3:2001 is based on the individuals rolling average and not on the panel average measured concentration. Panellist Rolling Average: PR = 40.0, GP = 60.0, SR = 45.4, TL = 38.1, PP = 44.4

^ denotes the Average Hedonic Tone: describes the pleasantness of the odour being presented where (+5) represents Very Pleasant, (0) represents Neutral and (-5) represents Very Unpleasant and has been derived from the panellist responses at the recognition threshold.

+ This value is not part of our NATA Scope of Accreditation and AS4323.3

-- END OF TEST REPORT --

Odour Research Laboratories Australia

A Division of Peter W. Stephenson & Associates Pty Ltd
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Fax: (02) 9737 9993
E-Mail: pstephenson@orla.com.au

Olfactometry Test Report

	The measurement was commissioned by SEMA on behalf of:	
Client	Organisation:	Elf Farm
	Address:	108 Mulgrave Road, Mulgrave NSW 2756
	Contact:	Neil Cockerell
	Sampling Site:	Supply Fan Bunker 1, Supply Fan Bunker 4
	Telephone:	02 4577 5000
	Email:	manager@elffarm.com.au
Project	ORLA Report Number:	5255/ORLA/03
	Project Manager:	Peter Stephenson
	Testing operator:	Ali Naghizadeh
	ORLA Sample number(s):	3734, 3735
	SEMA Sample number(s):	722922, 722923
Order	Analysis Requested:	Odour Analysis
	Order requested by:	SEMA on behalf of Elf Farm Supplies
	Date of order:	21 August 2013
	Order number:	3958
	Telephone:	02 9737 9991
	Signed by:	Ali Naghizadeh
	Order accepted by:	Ali Naghizadeh
Report	Date of issue:	30 August 2013

NATA accredited laboratory number 15043.

Accredited for Compliance with ISO/IEC 17025.

Investigated Item	Odour concentration in odour units 'ou' determined by Sensory odour concentration measurements, of an odour sample supplied in a sampling bag. All samples were received in good condition.
Analysis Method	The samples were analysed in accordance with AS/NZS4323.3:2001.
Identification	The odour sample bags were labelled individually. Each label recorded the testing laboratory, sample number, sampling location (or Identification) sampling date and time, dilution ratio (if dilution was used) and whether further chemical analysis was required.
Method	The odour concentration measurements were performed using dynamic olfactometry according to the Australian Standard 'Determination of Odour Concentration by Dynamic Olfactometry AS/NZS4323.3:2001. The odour perception characteristics of the panel within the presentation series for the samples were analogous to that for n-butanol calibration. Any deviation from the Australian standard is recorded in the 'Comments' section of this report.
Instrument Used	The Olfactometer used during this testing session was: AC'SCENT International Olfactometer
Measuring Range	The measuring range of the AC'SCENT International olfactometer is $13 \leq \chi \leq 64{,}281$ ou. If the measuring range was insufficient the odour samples will have been pre-diluted.
Environment	The measurements were performed in an air- and odour-conditioned room. The room temperature is maintained between ± 3°C.
Measuring Dates	The date of each measurement is specified with the results.
Instrument Precision	The precision of this instrument (expressed as repeatability) for a sensory calibration must be $r \leq 0.05$ in accordance with the Australian Standard AS/NZS4323.3:2001. AC'SCENT International Olfactometer: $r = 0.0080$ (March 2013) Compliance – Yes
Instrumental Accuracy	The accuracy of this instrument for a sensory calibration must be $A \leq 0.20$ in accordance with the Australian Standard AS/NZS4323.3:2001. AC'SCENT International Olfactometer: $A = 0.120$ (March 2013) Compliance – Yes
Lower Detection Limit (LDL)	The LDL for the AC'SCENT International Olfactometer has been determined to be 13 ou
Traceability	The measurements have been performed using standards for which the traceability to the national standard has been demonstrated. The assessors are individually selected to comply with fixed criteria and are monitored every session to keep within the limits of the standard. The results from the assessors are traceable to primary standards of n-butanol in nitrogen.

30 August 2013

Peter Stephenson
Managing Director

Odour Research Laboratories Australia

Odour Olfactometry Results – 5255/ORLA/03

Sample Location	Sample ID No.	Sampling Date & Time	ORLA Sample No.	Analysis Date & Time (Completed)	Panel Size	Valid ITEs	Sample Pre-Dilution	Sample Odour Concentration (ou) 1	Sample Odour Concentration (ou) 2	Odour Character & Hedonic Tone^ +
Sample ID: Supply Fan Bunker 1	3734	21/08/2013 0856-0906	722922	21/08/2013 1035-1103	4	8	Nil	972	972	Rotten garbage, decay, putrid, septic, sewer, decaying meat, offensive food process, fishy, rancid (-3.8)^
Sample ID: Supply Fan Bunker 4	3735	21/08/2013 0850-0900	722923	21/08/2013 1107-1135	4	8	Nil	752	752	Garbage, septic, ammonia, vinegar, rotten garbage, decay, putrid, sewer, decaying meat, fishy rancid, sweet, (-4.3)^

Odour Research Laboratories Australia

Odour Panel Calibration Results – 5255/ORLA/03

Reference Odorant	ORLA Sample No.	Concentration of Reference Gas (ppm)	Reference Gas Measured Concentration (ou)	Panel Average Measured Concentration (ppb) [3]	Does this panel calibration measurement comply with AS/NZS4323.3:P2001 (Yes/No) [4]
n-butanol	3731	50.0	1,247	40.1	Yes

Comments: All samples were collected by Stephenson Environmental Management Australia and analysed by Odour Research Laboratories Australia at their Sydney Laboratory.

Notes from Odour Olfactometry Results:

[1] Sample Odour Concentration: as received in the bag
[2] Sample Odour Concentration: allowing for pre-dilution
[3] Panel Average Measured Concentration: indicates the sensitivity of the panel for the session completed
[4] Target Range for reference gas n-butanol is $20 \leq \chi \leq 80$ ppb and compliance with AS/NZ4323.3:2001 is based on the individuals rolling average and not on the panel average measured concentration. Panellist Rolling Average: PP = 46.3, TL = 36.4, GP = 57.4, SR = 47.3
^ denotes the Average Hedonic Tone: describes the pleasantness of the odour being presented where (+5) represents Very Pleasant, (0) represents Neutral and (-5) represents Very Unpleasant and has been derived from the panellist responses at the recognition threshold.
+ This value is not part of our NATA Scope of Accreditation and AS4323.3

--END OF TEST REPORT--

APPENDIX B – EXHAUST GAS FLOW DATA

Glossary:

%	=	percent
^oC	=	Degrees Celsius
am^3/min	=	cubic metre of gas at actual conditions per minute
Normal Volume (m^3)	=	cubic metre at 0°C and 760 mm pressure and 1 atmosphere
am^3	=	cubic metre of gas at actual conditions
g/g mole	=	grams per gram mole
g/s	=	grams per second
hrs	=	hours
kg/m^3	=	kilograms per cubic metre
kPa	=	kilopascals
m^2	=	square metre
m/s	=	metre per second
m^3/min	=	cubic metre per minute at 0^0C and 1 atmosphere
m^3/sec	=	cubic metre per second at 0^0C and 1 atmosphere
mg	=	milligrams
mg/ m^3	=	milligrams per cubic metre at 0^oC and 1 atmosphere
ou	=	odour units
$ou.m^3/s$	=	odour units cubic metre of gas at dry, 293 ^oK and 101.3 kPa
^oK	=	degrees Kelvin
O_2	=	Oxygen

Abbreviations for names of SEMA staff who completed the either/and/or Sampling, Analysis and Checking

PWS	=	Peter W Stephenson
AN	=	Ali Naghizadeh
JW	=	Jay Weber

TABLE B- 1 EMISSION TEST RESULTS – FLOW AND ODOUR

Emission Test Results	Flow	Flow	Flow	
Project Number				
Project Name	Elf Farm	Elf Farm	Elf Farm	
Test Location				
Date				
Run				
Analysis				
Method				
Sample Start Time (hrs)				
Sample Stop Time (hrs)				
Inlet/Exhaust				
Stack Temperature (^oC)				
Stack Cross-Sectional area (m^2)				
Average Stack Gas Velocity (m/s)				
Actual Gas Flow Volume (am^3/min)				
Total Normal Gas Flow Volume (m^3/min)				
Total Normal Gas Flow Volume (m^3/s)				
Total Stack Pressure (kPa)				
Moisture Content (% by volume)				
Molecular Weight Dry Stack Gas (g/gmole)				
Dry Gas Density (kg/m^3)				
Oxygen (%)				
Analysis				
Method				
ORLA Number				
SEMA Number				
Sample Start Time (hrs)				
Sample Finish Time (hrs)				
Odour Concentration (As Received) (ou)				
Odour Concentration (Final) (ou)				
Normal MOER (As Received) (ou m^3/s)				
Normal MOER (Final) (ou m^3/s)				
Mass Odour Emission Rate Limit (ou m^3/s)				
Sample Storage Period				
Calculations entered by				
Calculations checked by				

APPENDIX C – SAMPLE LOCATION PHOTOGRAPHS

FIGURE C-1 BALE WETTING FLUX HOOD

FIGURE C-2 BALE WETTING LEACHATE SAMPLING

FIGURE C-3 BALE WETTING SPRAY BOOM IN OPERATION

FIGURE C-4 PHASE 1 TRANSFER CONVEYOR EXTERNAL TO BUILDING

FIGURE C-5 EXTERNAL CONVEYOR TRANSFER POINT

FIGURE C-6 EXTERNAL CONVEYOR TRANSFER POINT

FIGURE C-7 ODOUR SAMPLING PRE-WET EXTRACTION DUCT AT PHASE 1 BUNKER CONNECTION

FIGURE C-8 PHASE ONE BUILDING WORKING HALL IN FRONT OF BUNKERS

FIGURE C-9 PHASE ONE BUILDING INTERNAL TRANSFER CONVEYOR

Stephenson

Environmental Management Australia

PRP U 3.1: BIOSCRUBBER AND STACK ASSESSMENT

ELF FARM PTY LTD

MULGRAVE, NSW

PROJECT NO.:	5254/S22735/13
DATES OF SURVEY:	15, 16 & 19 AUGUST 2013
DATE OF ISSUE:	31 OCTOBER 2013

Stephenson

Environmental Management Australia

Peter W Stephenson & Associates Pty Ltd
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PRP U 3.1: BIOSCRUBBER AND STACK ASSESSMENT

ELF FARM PTY LTD

MULGRAVE, NSW

PROJECT NO.:	**5254/S22735/13**
DATES OF SURVEY:	**15, 16 & 19 AUGUST 2013**
DATE OF ISSUE:	**31 OCTOBER 2013**

P W STEPHENSON

A NAGHIZADEH

TABLE OF CONTENTS

TABLE OF TABLES

TABLE OF FIGURES

TABLE OF TABLES APPENDICES

1 INTRODUCTION

Stephenson Environmental Management Australia (SEMA) was requested by Elf Farm Pty Ltd to assess the odour emissions from the Bio-scrubber inlet and outlet stack at their composting facility located at Mulgrave, New South Wales (NSW).

The principal objective of these tests were to measure the performance of the Bio-scrubber system and stack to address the requirements of the Pollution Study and Reduction Program U 3.1 under the facility's Environment Protection Licence (EPL) No. 6229.

U 3.1 specifies that:

"By no later than 31 October 2013 the Licensee must submit to the EPA a report, prepared by a suitably qualified professional external consultant to include the following:

Bioscrubber and Stack

(a) Sample and measure the performance of the Bioscrubber system and stack; and

(b) Investigate the potential for increased loadings and/or optimisation of the Bioscrubber system and stack."

The EPL was issued by the Environment Protection Authority (EPA) in accordance with the *Protection of the Environment Operations Act 1997*. The EPA is now incorporated into the Office of Heritage and Environment (OEH).

The emission parameters monitored in this survey were:

- Odour concentration
- Stack inlet and outlet exhaust gas velocity, exhaust gas temperature, and hence discharge volume where practicable
- Odour Emission Rate (OER).

Odour emission testing was undertaken on 15, 16 and 19 August 2013 on the Bio-scrubber inlet duct and outlet stack.

Table 1-1 shows the scope of work carried out on the stack on the days of testing.

TABLE 1-1 ODOUR TESTING PROGRAM – BIOSCRUBBER INLET AND OUTLET

Parameter	Day 1		Day 2			Day 3
	Bioscrubber inlet@normal fan hertz	Bioscrubber outlet@normal fan hertz	Bioscrubber outlet north @ full fan hertz	Bioscrubber outlet south @ full fan hertz	Bioscrubber outlet@normal fan hertz	Bioscrubber outlet@normal fan hertz
Flow & temperature	✓	✓	✓	✓	✓	✓
Odour	Single sample	Single sample	Single sample	Single sample	Single sample	Single sample
Odour Emission Rate	✓	✓	✓	✓	✓	✓

2 PRODUCTION CONDITIONS

The odour emission samples were collected from the bio-scrubber inlet and outlet with the composting plant operating under normal conditions. However, fan speeds were run at higher than normal for some of the testing trials.

Production data is held by Elf Farm and available on request.

3 RESULTS AND DISCUSSION

3.1 EMISSION TEST RESULTS

The results of the emission tests are presented in Table 3-2. SEMA completed the odour sampling. SEMA is NATA accredited for the odour sampling, NATA accreditation number 15043.

Odour Research Laboratories Australia (ORLA) performed the odour analysis. ORLA is a division of Peter W Stephenson & Associates Pty Ltd and is NATA accredited to AS4323.3 for odour analysis, accreditation number 15043. ORLA is the first NATA accredited odour analysis laboratory in New South Wales.

The Certificates of Analysis, Olfactometry Test Report No. 5254/ORLA/01 are presented in Appendix A of this report.

The odour emission sampling and olfactometric analysis was conducted in accordance with Australian Standard (AS) 4323.3. Refer to Section 5 of this report for further detail.

3.2 ENVIRONMENT PROTECTION LICENCE NO. 6229

Table 3-2 summarises the odour emission limit for the tunnel composter stack at Elf Farm Supplies Pty Ltd under their EPL Licence No. 6229. The criterion is defined by the 100th percentile concentration limit as a Mass Odour Emission Rate (MOER) in Odour Units per second (ou/s) on a rolling annual average. A copy of the relevant section of this Licence is included in Appendix B.

TABLE 3-1 100TH PERCENTILE ODOUR EMISSION LIMIT

	EPA Licence Criteria
100th Percentile MOER Limit	55,400 ou/s
Averaging Period	Rolling annual

Key:
MOER = Mass odour emission rate
ou/s = Odour units per second which is a misnomer in EPA Licence 6229 (EPL) and should now read odour unit.cubic metres per second (ou.m^3/s)

3.3 ODOUR EMISSION RATES

The MOER for all samples were determined to establish compliance with the OEH EPL criteria.

The MOER can be calculated using the following formula:

MOER = velocity (m/s) x total surface or cross-sectional area (m^2) x odour concentration (ou)

Velocity = velocity of air in stack in metres per second as shown in Table 3-3
Total Surface Area of the Stack = Cross Sectional Area of the Stack in square metres (m^2).
Odour Concentration = As per Table 2-1 and Table 3-3.

The above formula calculates MOER based on actual conditions. However the Reference Conditions specifies for the MOER to be reported as dry, 293 degrees Kelvin (K) and 101.3 kilopascals (kPa).

SEMA has measured in parallel with sampling of odours the moisture content, temperature and pressure of the gas stream and corrected the MOER to the above reference conditions. The Mass Odour Emission Rates for the samples are shown in Table 3-3. Refer to Appendix C for detailed Exhaust Gas Flow Data Calculations.

3.4 ODOUR SAMPLE MEASUREMENT LOCATIONS

The odour sampling locations are itemised in Table 3.2 and illustrated on Figure 3.1.

FIGURE 3-1 SAMPLING LOCATIONS

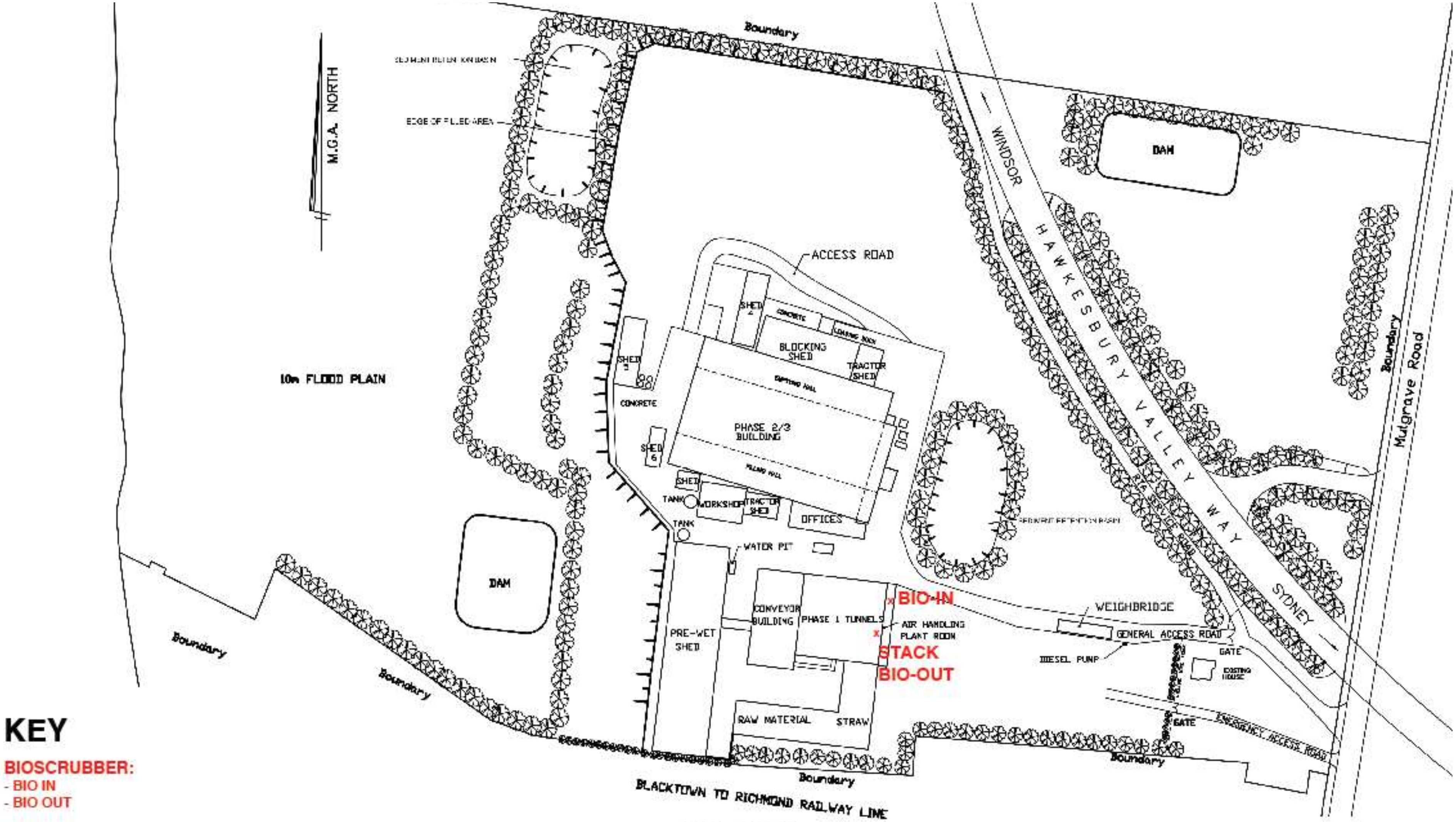

TABLE 3-2 ODOUR EMISSION RATES WITH VARIABLE FAN SPEEDS

Day	**Thursday**	**Thursday**	**Friday**	**Friday**	**Friday**	**Monday**
Date	**15/08/2013**	**15/08/2013**	**16/08/2013**	**16/08/2013**	**16/08/2013**	**19/08/2013**
SEMA Sample Nos.	722852	722850	722853	722854	722851	722911
ORLA Sample Nos.	3718	3716	3719	3720	3717	3722
Sampling Time	1815 - 1848	1822 - 1832	0635 - 0645	0637 - 0647	0522-0532	0327-0340
Location	Bio-scrubber Inlet	Bio-scrubber Outlet South	Bio-scrubber Outlet South	Bio-scrubber Outlet North	Bio-scrubber Outlet South	Bio-scrubber Outlet South
Odour Concentration (ou)	9120	4,278	3,099	2,835	4,677	2,835
Stack / Fan Setting	Normal Fan (2X25 Hz)	Normal Fan (2X25 Hz)	Full Fan (2X50 Hz)	Full Fan (2X50 Hz)	Normal Fan (2X25 Hz)	Normal Fan (2X25 Hz)
MOER (ou m3/s)	n/a	63,645	56,989	46,042	68,071	44,060
Mass Odour Emission Rate Limit (ou m3/s)	n/a	55,400	55,400	55,400	55,400	55,400

Key:
n/a = not applicable
MOER = Mass Odour Emission Rate
ou.v/s = Odour Unit volumes per second
Ou = odour unit
Hz = Hertz

4 CONCLUSIONS

From this odour emission sampling and olfactometry analysis survey, conducted on the Bio-scrubber under various process and fan operating conditions as required by PRP U3.1 on various days during a typical scheduled single batch composting cycle, the bio-scrubber odour removal efficiency was of the order of 50% to 70% during normal operating conditions.

Although the discharge MOER's vary due to the different phases of the compost cycle and discharge exhaust gas flow volumes, the odour collection efficiencies of the bio-scrubber remained in the above range.

From this odour emission sampling and olfactometric analysis conducted during stages of a typical composting cycle, the measured stack MOER's during normal operating conditions were in compliance with the EPL limit of 55,400 ou.m^3/s on an annual rolling average.

However, during this study, when ventilation operating conditions were increased from 2 fans at 25 Hz (Normal operating condition) with the exhaust gases being emitted from the South half of the stack only to 2 fans operating at 50 Hz with the exhaust exiting through both the North and South halves of the stack, the following was concluded:-

- Total exhaust gas volume increased
- Odour emission concentration decreased
- MOER for each half increased marginally because of increased gas flow volume
- Total MOER for the combined halves of stack exceeded the current EPL annual rolling average limit.

The MOERs for the individual North and South halves of the stack with full fan operation were 56,989 ou.m^3/s and 46,042 ou.m^3/s respectively. These results are marginally higher than the previous six monthly testing at the normal lower fan speeds but are still in compliance with the EPL limit of 55,400 ou.m^3/s on a rolling annual average.

However, the combined MOER serving both the North and South halves of the stack when fans are at full speed would exceed the EPL limit of 55,400 ou.m^3/s if the limit is considered as a maximum rather than an annual rolling average.

Therefore, it is concluded that the current bio-scrubber odour emission control system may be able to be upgraded or tuned to operate more efficiently. However, the bio-scrubber odour collection efficiency appears to be of the order of 70% at its optimum.

Similarly, the bio-scrubber is controlling the odour emission concentration at the higher fan speed but not the MOER.

To have an increased odour collection efficiency the system would need a major re-design to possibly include:

- the recirculation of exhaust gases back to under floor ventilation in the composting tunnels, and/or:
- increase the surface area within the bioscrubber so that the total number of microbes and the microbial growth rate of odour absorbing media within the bioscrubber could be further developed.

4.1 RECOMMENDATIONS:

Therefore, it is recommended that:

1. Six monthly stack odour emission performance test be continued;

2. Consider future layout of plant and approved development plans to incorporate odour management equipment with improved odour mitigation efficiencies. This most likely will involve engagement with international designers and consultants who have and are building modern composting plants around the world in close proximity to residential developments with proven reduction of odour impacts.

5 TEST METHODS

5.1 ODOUR

(Standards Association of Australia AS4323.3 &.4 and OEH NSW OM-7 & OM-8)

Samples were collected in 30L Nalophane sampling bags which are enclosed in airtight plastic containers.

Odorous gas for analysis was drawn through a Teflon (PTFE) sample probe. The gas then passes through a Teflon (PTFE) tube connected to the Nalophane sampling bag. The sampling pump is connected to the airtight plastic container to provide a sample gas flow-rate of approximately 0.5 – 1.5 litres per minute. After the required volume has been sampled, the pump is stopped and the bag sealed with a stainless steel valve.

Using a triangular forced choice olfactometer, the Nalophane bag of odour sample was dynamically diluted to various concentrations with dry odour free air.

The diluted sample was then presented to a panel of screened panellists as one of these airflows. The panellists then recorded if they could detect any odour and from which flow. The other two flows were discharging odour free air.

The odour is always presented to the panellists in ascending concentration; that is, from lower to higher concentration. The panellists are required at each dilution level to give a response as to what they are smelling from the flows (forced choice methodology). The response options for the panellists are:

'Guess'	Unable to determine which air flow contains the diluted odours
'Inkle'	Thinks that one of the flows may be different from the other two flows
'Detect' or 'Certain'	Is confident that one of the airflows smells different from the other two flows. Not necessarily able to say what the smell is.
'Recognise'	Thinks that one of the flows may be different from the other two flows and is able to: ▪ Assign a 'hedonic tone' (pleasantness scale number) to the odour ranging from –10 to 10 and/or ▪ Able to assign a character to the odour, as in 'it smells like …' *Note: that the Recognise level concentration and Hedonic Tone and Odour descriptors are obtained with the diluted odour, panellists are not exposed to the full strength odour.*

The percentage panel response and dilution levels used were then entered into a computer programme to determine the 50% panel response. This dilution level corresponds to the odour concentration of the sample.

Sampling and dilution lines are constructed from teflon, stainless or glass to prevent contamination of the sample.

The sampling and the dilution procedures used were in accordance with OEH NSW Methods OM-7 and OM-8 which are based on Standards Association of Australia, AS4323.3.

5.1.1 ODOUR PANEL SELECTION

Odour panellists must meet certain criteria to qualify as and remain panellists. Their average sensitivity to n-Butanol must be between 20 and 80 parts per billion (ppb) and their variability in response to n-Butanol must be within a certain range.

Panellists are tested against n-Butanol before every panel session to ensure they are in compliance.

Panellists should not suffer from respiratory complaints, nor should they eat or smoke or drink anything but water during the half hour preceding or during the test period and their person and clothing should be odour free and have not been exposed to an odorous environment before testing.

5.1.2 ODOUR TERMINOLOGY

The odour level is expressed in odour units and for mixed odours is analogous to concentration expressed in parts per billion. The odour detection level is defined as the ratio of *the volume that a sample of odorous gas would occupy when diluted to the threshold of detection of that odour* to *the volume of the sample*. In simpler terms, the ratio indicated the number of dilutions necessary to reduce the odour to its threshold of detection or odour detection threshold. This ratio is expressed in odour units or number of dilutions to detection threshold. For example, a value of 2,000 odour units would mean the volume of the initial sample of odorous gas would need to be diluted 2,000 times before the odour would just be detectable to the average human nose, that is, at the odour detection threshold.

5.2 EXHAUST GAS VELOCITY

(OEH NSW TM-2 and USEPA Method 12)

Velocity profiles were obtained across the stack utilising an Airflow Developments Ltd. S-type pitot tube and inclined manometer.

5.3 EXHAUST GAS TEMPERATURE

(OEH NSW TM- 2, 3 & 4 and USEPA Methods 2, 3 & 4)

The exhaust gas temperature was measured using a Digital thermometer (0-1200°C) connected to a chromel/alumel (K-type) thermocouple probe.

5.4 ACCURACY (FLOW MEASUREMENT)

All results are quoted on a dry basis.

Appendix C of (British Standard) 893 presents a range of accuracies for various parts of the isokinetic sampling procedure including pressure, velocity, temperature and particulate sampling. At best, an accuracy of ± 10% can be expected.

For odour the ratio between two single measurements, performed on the same testing material in this laboratory under repeatability conditions, will not be larger than 2.65 in 95% of cases. (Source – AS/NZS 4323.3:2001 Appendix B Section B2).

APPENDIX A – CERTIFICATES OF ANALYSIS

Odour Research Laboratories Australia

A Division of Peter W. Stephenson & Associates Pty Ltd
ACN 002 600 526 (incorporated in NSW)
ABN 75 002 600 526

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Unit 7/2 Holker Street
Newington NSW 2127 Australia
Tel: (02) 9737 9991
Fax: (02) 9737 9993
E-Mail: pstephenson@orla.com.au

Olfactometry Test Report

The measurement was commissioned by SEMA on behalf of:

Client	Organisation:	Elf Farm
	Address:	108 Mulgrave Road, Mulgrave NSW 2756
	Contact:	Neil Cockerell
	Sampling Site:	Bioscrubber Inlet and Outlet
	Telephone:	02 4577 5000
	Email:	manager@elffarm.com.au
Project	ORLA Report Number:	5254/ORLA/01
	Project Manager:	Peter Stephenson
	Testing operator:	Ali Naghizadeh
	ORLA Sample number(s):	3718, 3719, 3720
	SEMA Sample number(s):	722852, 722853, 722854
Order	Analysis Requested:	Odour Analysis
	Order requested by:	SEMA on behalf of Elf Farm Supplies
	Date of order:	16 Aug 2013
	Order number:	3951
	Telephone:	02 9737 9991
	Signed by:	Ali Naghizadeh
	Order accepted by:	Ali Naghizadeh
Report	Date of issue:	23 August 2013

NATA accredited laboratory number 15043.

Accredited for Compliance with ISO/IEC 17025.

Investigated Item	Odour concentration in odour units 'ou' determined by Sensory odour concentration measurements, of an odour sample supplied in a sampling bag. All samples were received in good condition.
Analysis Method	The samples were analysed in accordance with AS/NZS4323.3:2001.
Identification	The odour sample bags were labelled individually. Each label recorded the testing laboratory, sample number, sampling location (or Identification) sampling date and time, dilution ratio (if dilution was used) and whether further chemical analysis was required.
Method	The odour concentration measurements were performed using dynamic olfactometry according to the Australian Standard 'Determination of Odour Concentration by Dynamic Olfactometry AS/NZS4323.3:2001. The odour perception characteristics of the panel within the presentation series for the samples were analogous to that for n-butanol calibration. Any deviation from the Australian standard is recorded in the 'Comments' section of this report.
Instrument Used	The Olfactometer used during this testing session was: AC'SCENT International Olfactometer
Measuring Range	The measuring range of the AC'SCENT International olfactometer is $13 \leq \chi \leq 64{,}281$ ou. If the measuring range was insufficient the odour samples will have been pre-diluted.
Environment	The measurements were performed in an air- and odour-conditioned room. The room temperature is maintained between ± 3°C.
Measuring Dates	The date of each measurement is specified with the results.
Instrument Precision	The precision of this instrument (expressed as repeatability) for a sensory calibration must be $r \leq 0.05$ in accordance with the Australian Standard AS/NZS4323.3:2001. AC'SCENT International Olfactometer: $r = 0.0080$ (March 2013) Compliance – Yes
Instrumental Accuracy	The accuracy of this instrument for a sensory calibration must be $A \leq 0.20$ in accordance with the Australian Standard AS/NZS4323.3:2001. AC'SCENT International Olfactometer: $A = 0.120$ (March 2013) Compliance – Yes
Lower Detection Limit (LDL)	The LDL for the AC'SCENT International Olfactometer has been determined to be 13 ou
Traceability	The measurements have been performed using standards for which the traceability to the national standard has been demonstrated. The assessors are individually selected to comply with fixed criteria and are monitored every session to keep within the limits of the standard. The results from the assessors are traceable to primary standards of n-butanol in nitrogen.

23 August 2013

Peter Stephenson
Managing Director

Odour Research Laboratories Australia

Odour Olfactometry Results – 5254/ORLA/01

Sample Location	Sample ID No.	Sampling Date & Time	ORLA Sample No.	Analysis Date & Time (Completed)	Panel Size	Valid ITEs	Sample Pre-Dilution	Sample Odour Concentration (ou) [1]	Sample Odour Concentration (ou) [2]	Odour Character & Hedonic Tone [^ +]
Sample ID: Elf Bioscrubber Inlet	722852	15/08/2013 1815-1830	3718	16/08/2013 1442-1536	4	8	Nil	9,120	9,120	Fishy, swampy, garbage, ammonia, chicken faeces, yeast, offensive (-4.5)[^]
Sample ID: Elf Stack South Full Fan	722853	16/08/2013 0635-0645	3719	16/08/2013 1044-1132	4	8	Nil	3,099	3,099	Fishy, swampy, garbage, ammonia, tangy, sour or burnt milk, offensive, rotten garbage (-5.0)[^]
Sample ID: Elf Stack North Full Fan	722854	16/08/2013 0637-0647	3720	16/08/2013 1138-1216	4	8	Nil	2,835	2,835	Fishy, swampy, garbage, stinky feet, smoky milk, offensive, rotten garbage (-5.0)[^]

Odour Research Laboratories Australia

Odour Panel Calibration Results – 5254/ORLA/01

Reference Odorant	ORLA Sample No.	Concentration of Reference Gas (ppm)	Reference Gas Measured Concentration (ou)	Panel Average Measured Concentration (ppb) [3]	Does this panel calibration measurement comply with AS/NZS4323.3:P2001 (Yes/No) [4]
n-butanol	3715	50.0	1,062	47.1	Yes

Comments: All samples were collected by Stephenson Environmental Management Australia and analysed by Odour Research Laboratories Australia at their Sydney Laboratory.

Notes from Odour Olfactometry Results:

[1] Sample Odour Concentration: as received in the bag

[2] Sample Odour Concentration: allowing for pre-dilution

[3] Panel Average Measured Concentration: indicates the sensitivity of the panel for the session completed

[4] Target Range for reference gas n-butanol is $20 \leq \chi \leq 80$ ppb and compliance with AS/NZ4323.3:2001 is based on the individuals rolling average and not on the panel average measured concentration. Panellist Rolling Average: PR = 40.1, GP = 57.5, SS = 44.1, TL = 39.8, SR = 46.7

^ denotes the Average Hedonic Tone: describes the pleasantness of the odour being presented where (+5) represents Very Pleasant, (0) represents Neutral and (-5) represents Very Unpleasant and has been derived from the panellist responses at the recognition threshold.

+ This value is not part of our NATA Scope of Accreditation and AS4323.3

--END OF TEST REPORT--

Odour Research Laboratories Australia

A Division of Peter W. Stephenson & Associates Pty Ltd
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ABN 75 002 600 526

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Newington NSW 2127 Australia
Tel: (02) 9737 9991
Fax: (02) 9737 9993
E-Mail: pstephenson@orla.com.au

Olfactometry Test Report

	The measurement was commissioned by SEMA on behalf of:	
Client	Organisation:	Elf Farm
	Address:	108 Mulgrave Road, Mulgrave NSW 2756
	Contact:	Neil Cockerell
	Sampling Site:	Main Stack
	Telephone:	02 4577 5000
	Email:	manager@elffarm.com.au
Project	ORLA Report Number:	5253/ORLA/01
	Project Manager:	Peter Stephenson
	Testing operator:	Ali Naghizadeh
	ORLA Sample number(s):	3716, 3717
	SEMA Sample number(s):	722850, 722851
Order	Analysis Requested:	Odour Analysis
	Order requested by:	SEMA on behalf of Elf Farm
	Date of order:	16 Aug 2013
	Order number:	3950
	Telephone:	02 9737 9991
	Signed by:	Ali Naghizadeh
	Order accepted by:	Ali Naghizadeh
Report	Date of issue:	23 August 2013

NATA accredited laboratory number 15043.

Accredited for Compliance with ISO/IEC 17025.

Investigated Item	Odour concentration in odour units 'ou' determined by Sensory odour concentration measurements, of an odour sample supplied in a sampling bag. All samples were received in good condition.
Analysis Method	The samples were analysed in accordance with AS/NZS4323.3:2001.
Identification	The odour sample bags were labelled individually. Each label recorded the testing laboratory, sample number, sampling location (or Identification) sampling date and time, dilution ratio (if dilution was used) and whether further chemical analysis was required.
Method	The odour concentration measurements were performed using dynamic olfactometry according to the Australian Standard 'Determination of Odour Concentration by Dynamic Olfactometry AS/NZS4323.3:2001. The odour perception characteristics of the panel within the presentation series for the samples were analogous to that for n-butanol calibration. Any deviation from the Australian standard is recorded in the 'Comments' section of this report.
Instrument Used	The Olfactometer used during this testing session was: AC'SCENT International Olfactometer
Measuring Range	The measuring range of the AC'SCENT International olfactometer is $13 \leq \chi \leq 64{,}281$ ou. If the measuring range was insufficient the odour samples will have been pre-diluted.
Environment	The measurements were performed in an air- and odour-conditioned room. The room temperature is maintained between ± 3°C.
Measuring Dates	The date of each measurement is specified with the results.
Instrument Precision	The precision of this instrument (expressed as repeatability) for a sensory calibration must be $r \leq 0.05$ in accordance with the Australian Standard AS/NZS4323.3:2001. AC'SCENT International Olfactometer: $r = 0.0080$ (March 2013) Compliance - Yes
Instrumental Accuracy	The accuracy of this instrument for a sensory calibration must be $A \leq 0.20$ in accordance with the Australian Standard AS/NZS4323.3:2001. AC'SCENT International Olfactometer: $A = 0.120$ (March 2013) Compliance - Yes
Lower Detection Limit (LDL)	The LDL for the AC'SCENT International Olfactometer has been determined to be 13 ou
Traceability	The measurements have been performed using standards for which the traceability to the national standard has been demonstrated. The assessors are individually selected to comply with fixed criteria and are monitored every session to keep within the limits of the standard. The results from the assessors are traceable to primary standards of n-butanol in nitrogen.

23 August 2013

Peter Stephenson
Managing Director

Odour Research Laboratories Australia

Odour Olfactometry Results – 5253/ORLA/01

Sample Location	Sample ID No.	Sampling Date & Time	ORLA Sample No.	Analysis Date & Time (Completed)	Panel Size	Valid ITEs	Sample Pre-Dilution	Sample Odour Concentration (ou) [1]	Sample Odour Concentration (ou) [2]	Odour Character & Hedonic Tone[^ +]
Sample ID: Elf Stack R1	722850	15/08/2013 1822-1832	3716	16/08/2013 0945-1031	4	8	Nil	4,278	4,278	Fishy, swampy, garbage smoky, rotten garbage, burnt milk, putrid, offensive (-5.0)[^]
Sample ID: Elf Stack R2	722851	16/08/2013 0522-0532	3717	16/08/2013 1338-1424	4	8	Nil	4,677	4,677	Rotten, fishy, garbage, Ammonia, chicken faeces, dead fish (-4.8)[^]

Odour Research Laboratories Australia

Odour Panel Calibration Results – 5253/ORLA/01

Reference Odorant	ORLA Sample No.	Concentration of Reference Gas (ppm)	Reference Gas Measured Concentration (ou)	Panel Average Measured Concentration (ppb) [3]	Does this panel calibration measurement comply with AS/NZS4323.3:P2001 (Yes/No) [4]
n-butanol	3715	50.0	1,062	47.1	Yes

Comments: All samples were collected by Stephenson Environmental Management Australia and analysed by Odour Research Laboratories Australia at their Sydney Laboratory.

Notes from Odour Olfactometry Results:

[1] Sample Odour Concentration: as received in the bag

[2] Sample Odour Concentration: allowing for pre-dilution

[3] Panel Average Measured Concentration: indicates the sensitivity of the panel for the session completed

[4] Target Range for reference gas n-butanol is $20 \le \chi \le 80$ ppb and compliance with AS/NZ4323.3:2001 is based on the individuals rolling average and not on the panel average measured concentration. Panellist Rolling Average: PR = 40.1, GP = 57.5, SS = 44.1, TL = 39.8, SR = 46.7

^ denotes the Average Hedonic Tone: describes the pleasantness of the odour being presented where (+5) represents Very Pleasant, (0) represents Neutral and (-5) represents Very Unpleasant and has been derived from the panellist responses at the recognition threshold.

+ This value is not part of our NATA Scope of Accreditation and AS4323.3

---END OF TEST REPORT---

Odour Research Laboratories Australia

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E-Mail: pstephenson@orla.com.au

Olfactometry Test Report

The measurement was commissioned by SEMA on behalf of:

Client	Organisation:	Elf Farm
	Address:	108 Mulgrave Road, Mulgrave NSW 2756
	Contact:	Neil Cockerell
	Sampling Site:	Main Stack
	Telephone:	02 4577 5000
	Email:	manager@elffarm.com.au
Project	ORLA Report Number:	5253/ORLA/02
	Project Manager:	Peter Stephenson
	Testing operator:	Ali Naghizadeh
	ORLA Sample number(s):	3722
	SEMA Sample number(s):	722911
Order	Analysis Requested:	Odour Analysis
	Order requested by:	SEMA on behalf of Elf Farm
	Date of order:	19 Aug 2013
	Order number:	3952
	Telephone:	02 9737 9991
	Signed by:	Ali Naghizadeh
	Order accepted by:	Ali Naghizadeh
Report	Date of issue:	23 August 2013

NATA accredited laboratory number 15043.

Accredited for Compliance with ISO/IEC 17025.

Investigated Item	Odour concentration in odour units 'ou' determined by Sensory odour concentration measurements, of an odour sample supplied in a sampling bag. All samples were received in good condition.
Analysis Method	The samples were analysed in accordance with AS/NZS4323.3:2001.
Identification	The odour sample bags were labelled individually. Each label recorded the testing laboratory, sample number, sampling location (or Identification) sampling date and time, dilution ratio (if dilution was used) and whether further chemical analysis was required.
Method	The odour concentration measurements were performed using dynamic olfactometry according to the Australian Standard 'Determination of Odour Concentration by Dynamic Olfactometry AS/NZS4323.3:2001. The odour perception characteristics of the panel within the presentation series for the samples were analogous to that for n-butanol calibration. Any deviation from the Australian standard is recorded in the 'Comments' section of this report.
Instrument Used	The Olfactometer used during this testing session was: AC'SCENT International Olfactometer
Measuring Range	The measuring range of the AC'SCENT International olfactometer is $13 \leq \chi \leq 64{,}281$ ou. If the measuring range was insufficient the odour samples will have been pre-diluted.
Environment	The measurements were performed in an air- and odour-conditioned room. The room temperature is maintained between ± 3°C.
Measuring Dates	The date of each measurement is specified with the results.
Instrument Precision	The precision of this instrument (expressed as repeatability) for a sensory calibration must be $r \leq 0.05$ in accordance with the Australian Standard AS/NZS4323.3:2001. AC'SCENT International Olfactometer: $r = 0.0080$ (March 2013) Compliance – Yes
Instrumental Accuracy	The accuracy of this instrument for a sensory calibration must be $A \leq 0.20$ in accordance with the Australian Standard AS/NZS4323.3:2001. AC'SCENT International Olfactometer: $A = 0.120$ (March 2013) Compliance – Yes
Lower Detection Limit (LDL)	The LDL for the AC'SCENT International Olfactometer has been determined to be 13 ou
Traceability	The measurements have been performed using standards for which the traceability to the national standard has been demonstrated. The assessors are individually selected to comply with fixed criteria and are monitored every session to keep within the limits of the standard. The results from the assessors are traceable to primary standards of n-butanol in nitrogen.

23 August 2013

Peter Stephenson
Managing Director

Odour Research Laboratories Australia

Odour Olfactometry Results – 5253/ORLA/02

Sample Location	Sample ID No.	Sampling Date & Time	ORLA Sample No.	Analysis Date & Time (Completed)	Panel Size	Valid ITEs	Sample Pre-Dilution	Sample Odour Concentration (ou) [1]	Sample Odour Concentration (ou) [2]	Odour Character & Hedonic Tone [^ +]
Sample ID: Elf Stack R3	722911	19/08/2013 0327-0340	3722	19/08/2013 1003-1040	4	8	Nil	2,835	2,835	Manure, garbage, mulch, earth, tangy, sewerage, septic, rotten garbage, yeasty, dead mouse (-3.8)[*]

Odour Research Laboratories Australia

Odour Panel Calibration Results – 5253/ORLA/02

Reference Odorant	ORLA Sample No.	Concentration of Reference Gas (ppm)	Reference Gas Measured Concentration (ou)	Panel Average Measured Concentration (ppb) [3]	Does this panel calibration measurement comply with AS/NZS4323.3:P2001 (Yes/No) [4]
n-butanol	3721	50.0	1,308	38.2	Yes

Comments: All samples were collected by Stephenson Environmental Management Australia and analysed by Odour Research Laboratories Australia at their Sydney Laboratory.

Notes from Odour Olfactometry Results:

[1] Sample Odour Concentration: as received in the bag

[2] Sample Odour Concentration: allowing for pre-dilution

[3] Panel Average Measured Concentration: indicates the sensitivity of the panel for the session completed

[4] Target Range for reference gas n-butanol is $20 \leq \chi \leq 80$ ppb and compliance with AS/NZ4323.3:2001 is based on the individuals rolling average and not on the panel average measured concentration. Panellist Rolling Average: PR = 40.0, GP = 60.0, SR = 45.4, TL = 38.1, PP = 44.4

^ denotes the Average Hedonic Tone: describes the pleasantness of the odour being presented where (+5) represents Very Pleasant, (0) represents Neutral and (-5) represents Very Unpleasant and has been derived from the panellist responses at the recognition threshold.

+ This value is not part of our NATA Scope of Accreditation and AS4323.3

---END OF TEST REPORT---

APPENDIX B – EXHAUST GAS FLOW DATA

Glossary:

%	=	percent
^oC	=	Degrees Celsius
am^3/min	=	cubic metre of gas at actual conditions per minute
Normal Volume (m^3)	=	cubic metre at 0°C and 760 mm pressure and 1 atmosphere
am^3	=	cubic metre of gas at actual conditions
g/g mole	=	grams per gram mole
g/s	=	grams per second
hrs	=	hours
kg/m^3	=	kilograms per cubic metre
kPa	=	kilopascals
m^2	=	square metre
m/s	=	metre per second
m^3/min	=	cubic metre per minute at 0^0C and 1 atmosphere
m^3/sec	=	cubic metre per second at 0^0C and 1 atmosphere
mg	=	milligrams
mg/ m^3	=	milligrams per cubic metre at 0^oC and 1 atmosphere
ou	=	odour units
$ou.m^3/s$	=	odour units cubic metre of gas at dry, 293 ^oK and 101.3 kPa
O_2	=	Oxygen

Abbreviations for names of SEMA staff who completed the either/and/or Sampling, Analysis and Checking

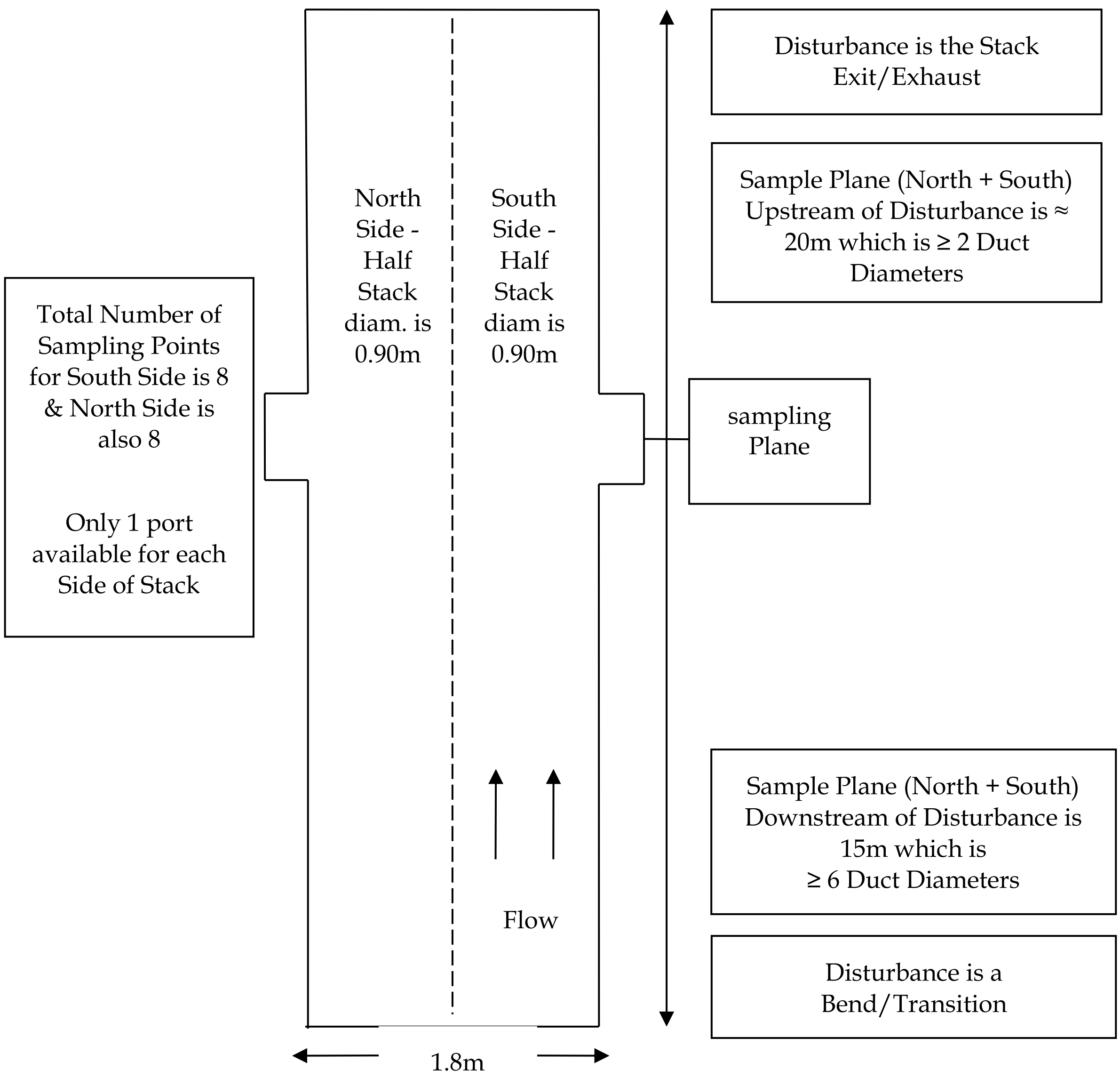
PWS	=	Peter W Stephenson
AN	=	Ali Naghizadeh

TABLE B- 1 EMISSION TEST RESULTS – FLOW AND ODOUR

Emission Test Results	Flow	Flow	Flow	Flow	Flow
Project Number	5254	5254	5254	5254	5254
Project Name	Elf Farm Bio-scrubber	Elf Farm Bio-scrubber	Elf Farm Bio-scrubber	Elf Farm Bio-scrubber	Elf Farm Bio-scrubber
Test Location	Stack - South	Stack - South	Stack - North	Stack - South	Stack - South
Date	15-Aug-13	16-Aug-13	16-Aug-13	16-Aug-13	19-Aug-13
Run	1	2	3	4	5
Analysis	Flow	Flow	Flow	Flow	Flow
Method	TM-1 & TM-2 & TM-22	TM-1 & TM-2 & TM-22	TM-1 & TM-2 & TM-22	TM-1 & TM-2 & TM-22	TM-1 & TM-2 & TM-22
Sample Start Time (hrs)	18:22	6:35	6:37	5:22	3:27
Sample Stop Time (hrs)	18:32	6:45	6:47	5:32	3:40
Inlet/Exhaust	Exhaust	Exhaust	Exhaust	Exhaust	Exhaust
Stack Temperature (^{o}C)	30.1	27.7	27.6	30.6	31.0
Stack Cross-Sectional area (m^2)	1.272	1.272	1.272	1.272	1.272
Average Stack Gas Velocity (m/s)	14.8	17.1	15.1	15.5	14.6
Actual Gas Flow Volume (am^3/min)	1,129	1,302	1,149	1,186	1,114
	Dry	Dry	Dry	Dry	Dry
Total Normal Gas Flow Volume (m^3/min)	893	1,103	974	873	932
Total Normal Gas Flow Volume (m^3/s)	14.9	18.4	16.2	14.6	15.5
Total Stack Pressure (kPa)	101.00	101.15	101.15	101.40	101.19
Molecular Weight Dry Stack Gas (g/gmole)	28.836	28.836	28.836	28.836	28.836
Dry Gas Density (kg/m^3)	1.29	1.29	1.29	1.29	1.29
Oxygen (%)	20.9	20.9	20.9	20.9	20.9
Analysis	**Odour**	**Odour**	**Odour**	**Odour**	**Odour**
Method	AS4323.3	AS4323.3	AS4323.3	AS4323.3	AS4323.3
ORLA Number	3716	3719	3720	3717	3722
SEMA Number	722850	722853	722854	722851	722911
Sample Start Time (hrs)	18:22	6:35	6:37	5:22	3:27
Sample Finish Time (hrs)	18:32	6:45	6:47	5:32	3:40
Odour Concentration (As Received) (ou)	4,278	3,099	2,835	4,677	2,835
Odour Concentration (Final) (ou)	**4,278**	**3,099**	**2,835**	**4,677**	**2,835**
Normal MOER (As Received) (ou m^3/s)	63,645	56,989	46,042	68,071	44,060
Normal MOER (Final) (ou m^3/s)	**63,645**	**56,989**	**46,042**	**68,071**	**44,060**
Sample Storage Period	2 days	2 days	2 days	2 days	2 days
Calculations entered by	AN	AN	AN	AN	AN
Calculations checked by	PWS	PWS	PWS	PWS	PWS

APPENDIX C – SAMPLE LOCATION

FIGURE C-1 SAMPLE LOCATION BIO-SCRUBBER STACK



In the absence of cyclonic flow activity ideal sampling plane conditions will be found to exist at 6-8 duct diameters downstream and 2-3 duct diameters upstream from a flow disturbance. The sampling plane does meet this criterion.

The sample plane does meet gas profile for sampling. Therefore the sampling plane is satisfactory for testing and in compliance with AS4323.1.

Stephenson

Environmental Management Australia

ODOUR EMISSION COMPLIANCE TEST

TUNNEL COMPOSTER BIO-SCRUBBER

ELF FARM SUPPLIES PTY LTD

MULGRAVE, NSW

PROJECT NO.:	5339/S23138/14
DATE OF SURVEY:	31 MARCH TO 4 APRIL 2014
DATE OF ISSUE:	8 APRIL 2014

Stephenson
Environmental Management Australia

Peter W Stephenson & Associates Pty Ltd
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ODOUR EMISSION COMPLIANCE TEST

TUNNEL COMPOSTER BIO-SCRUBBER

ELF FARM SUPPLIES PTY LTD

MULGRAVE, NSW

PROJECT NO.:	**5339/S23138/14**
DATE OF SURVEY:	**31 MARCH TO 4 APRIL 2014**
DATE OF ISSUE:	**8 APRIL 2014**

P W STEPHENSON

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TABLE OF CONTENTS

TABLE OF TABLES

TABLE OF TABLES APPENDICES

TABLE OF FIGURES APPENDICES

1 INTRODUCTION

Stephenson Environmental Management Australia (SEMA) was requested by Elf Farm Pty Ltd to assess the odour emissions from the stack serving the tunnel composters at their composting facility located at Mulgrave, New South Wales (NSW).

The principal objectives of the tests were to measure odour emission concentrations from the stack and to determine compliance of the odour emission with the facility's Environment Protection Licence (EPL) No. 6229. The EPL was issued by the Environment Protection Authority (EPA) in accordance with the *Protection of the Environment Operations Act 1997*. The EPA is now incorporated into the Office of Environment and Heritage (OEH).

The emission parameters monitored in this survey were:

- Odour concentration
- Stack exhaust gas velocity, exhaust gas temperature, and hence discharge volume
- Moisture
- Mass Odour Emission Rate (MOER).

Odour emission testing was undertaken between 31 March and 4 April 2014 at various times during a typical five (5) day composting cycle. Table 1-1 shows when testing was carried out on the stack.

TABLE 1-1 ODOUR TESTING PROGRAM

Day of the Week	Date	Time of the Day Sample was Taken	Number of Odour Samples Taken per Visit
Monday	31/03/2014	AM	1
Tuesday	01/04/2014	PM	1
Wednesday	02/04/2014	AM	1
Thursday	03/04/2014	PM	1
Friday	04/04/2014	AM	1

Note:

(1) The AM samples were taken between 3-5am and PM samples were taken between 5-6pm over a five day composting cycle period.

2 PRODUCTION CONDITIONS

The odour emission samples were collected with the composting plant operating under a normal five-day cycle running from Monday to Friday.

Elf Farm Supplies holds all relevant production records should they be required for review.

3 RESULTS AND DISCUSSION

3.1 EMISSION TEST RESULTS

The results of the emission tests are presented in Table 3-1. SEMA completed the odour sampling. SEMA is NATA accredited for the odour sampling, NATA accreditation number 15043.

Odour Research Laboratories Australia (ORLA) performed the odour analysis. ORLA is a division of Peter W Stephenson & Associates Pty Ltd and is NATA accredited to AS4323.3 for odour analysis, accreditation number 15043. ORLA is the first NATA accredited odour analysis laboratory in New South Wales.

The Certificates of Analysis, Olfactometer Test Reports No. 5339/ORLA/01, 5339/ORLA/02 and 5339/ORLA/03 are presented in Appendix A of this report.

The odour emission sampling and olfactometric analysis was conducted in accordance with Australian Standard (AS) 4323.3. Refer to Section 5 of this report for further detail.

TABLE 3-1 ODOUR EMISSION CONCENTRATION RESULTS

Day of Week	**Monday**	**Tuesday**	**Wednesday**	**Thursday**	**Friday**
Date	31/03/2014	01/04/2014	02/04/2014	03/04/2014	04/04/2014
Time Sample Taken (hours)	03:33-03:48	17:25-17:40	04:51-05:08	17:35-17:50	04:25-04:40
SEMA Sample No.	723559	723560	723561	723587	723588
ORLA Sample No.	3920	3922	3923	3924	3925
Concentration (ou)	701	2,301	2,118	3,558	2,476

Key:
ou = odour unit

3.2 ENVIRONMENT PROTECTION LICENCE NO. 6229

Table 3-2 summarises the odour emission limit for the tunnel composter stack at Elf Farm Supplies Pty Ltd under their EPL Licence No. 6229. The criterion is defined by the 100th percentile concentration limit as a Mass Odour Emission Rate (MOER) in Odour Units per second (ou/s) on a rolling annual average. A copy of the relevant section of this Licence is included in Appendix B.

TABLE 3-2 100TH PERCENTILE ODOUR EMISSION LIMIT

	EPA Licence Criteria
100th Percentile MOER Limit	55,400 ou/s
Averaging Period	Rolling annual

Key:
MOER = Mass odour emission rate
ou/s = Odour units per second which is a misnomer in EPA Licence 6229 (EPL) and should now read odour units. cubic metres per second (ou.m^3/s)

3.3 ODOUR EMISSION RATES

The MOER for all samples was determined to establish compliance with the EPA/OEH EPL criteria.

The MOER can be calculated using the following formula:

MOER = velocity (m/s) x total area of the stack (m^2) x odour concentration (ou)

Velocity = velocity of air in stack in metres per second as shown in Table 3-3
Total Surface Area of the Stack = Cross Sectional Area of the Stack in square metres (m^2).
Odour Concentration = As per Table 2-1 and Table 3-3.

The above formula calculates MOER based on actual conditions. However the Reference Conditions specified that the MOER is to be reported as dry, 293 degrees Kelvin (K) and 101.3 kilopascals (kPa).

SEMA measured the moisture content, temperature and pressure of the exhaust gas stream, at the same time as the odour emissions were sampled. These measurements enabled the MOER to be corrected to the above reference conditions. The MOER for each of the samples is shown in Table 3-3. Refer to Appendix C for detailed Exhaust Gas Flow Data in table format.

TABLE 3-3 ODOUR EMISSION RATES OVER A TYPICAL FIVE DAY COMPOSTING CYCLE AUTUMN 2014

Day	Monday	Tuesday	Wednesday	Thursday	Friday	Average
Date	31/3/2014	1/4/2014	2/4/2014	3/4/2014	4/4/2014	
ORLA Sample No.	3920	3922	3923	3924	3925	
Time (hours)	03:33-03:48	17:25-17:40	04:51-05:08	17:35-17:50	04:25-04:40	
Odour Conc. (ou)	701	2,301	2,118	3,558	2,476	2,231
Stack Velocity (m/s)	14.2	14.4	14.7	14.5	15.7	14.7
Stack Cross Sectional Area (m^2)	1.272	1.272	1.272	1.272	1.272	1.272
MOER (ou.v/s)	10,846	35,924	33,750	57,077	41,048	35,729
EPL MOER Limit (ou/s) Annual Rolling Average	55,400	55,400	55,400	55,400	55,400	55,400

Key:

No.	=	Number
Conc.	=	concentration
*	=	Rolling annual averaging period
MOER	=	Mass Odour Emission Rate
m/s	=	metres per second
ou.v/s	=	Odour Unit volumes per second
m^2	=	square metres
ou/s	=	Odour Units per second

4 CONCLUSIONS

This odour emission survey was conducted over a typical five day composting cycle. The measured stack MOER's for the monitoring period were in the range of 10,846 ou.m^3/s to 57,077ou.m^3/s. The average MOER for the Autumn 2014 composting cycle, which was considered to be typical, was 35,729 ou.m^3/s.

Therefore, these MOER's comply with the EPA/OEH EPL No. 6229 Licence Criteria of 55,400 ou.m^3/s Rolling Annual Average.

5 TEST METHODS

5.1 ODOUR

(Standards Association of Australia AS4323.3 and OEH NSW OM-7)

Samples were collected in 30L Nalophane sampling bags which are enclosed in airtight plastic containers.

Odorous gas for analysis was drawn through a Teflon (PTFE) sample probe. The gas then passes through a Teflon (PTFE) tube connected to the Nalophane sampling bag. The sampling pump is connected to the airtight plastic container to provide a sample gas flow-rate of approximately 0.5 – 1.5 litres per minute. After the required volume has been sampled, the pump is stopped and the bag sealed with a stainless steel valve.

Using a triangular forced choice olfactometer, the Nalophane bag of odour sample was dynamically diluted to various concentrations with dry odour free air.

The diluted sample was then presented to a panel of screened panellists as one of these airflows. The panellists then recorded if they could detect any odour and from which flow. The other two flows were discharging odour free air.

The odour is always presented to the panellists in ascending concentration; that is, from lower to higher concentration. The panellists are required at each dilution level to give a response as to what they are smelling from the flows (forced choice methodology). The response options for the panellists are:

'Guess'	Unable to determine which air flow contains the diluted odours
'Inkle'	Thinks that one of the flows may be different from the other two flows
'Detect' or 'Certain'	Is confident that one of the airflows smells different from the other two flows. Not necessarily able to say what the smell is.
'Recognise'	Thinks that one of the flows may be different from the other two flows and is able to: ▪ Assign a 'hedonic tone' (pleasantness scale number) to the odour ranging from –10 to 10 and/or ▪ Able to assign a character to the odour, as in 'it smells like …' *Note: that the Recognise level concentration and Hedonic Tone and Odour descriptors are obtained with the diluted odour, panellists are not exposed to the full strength odour.*

The percentage panel response and dilution levels used were then entered into a computer programme to determine the 50% panel response. This dilution level corresponds to the odour concentration of the sample.

Sampling and dilution lines are constructed from teflon, stainless or glass to prevent contamination of the sample.

The sampling and the dilution procedures used were in accordance with OEH NSW Methods OM-7 and OM-8 which are based on Standards Association of Australia, AS4323.3.

5.1.1 ODOUR PANEL SELECTION

Odour panellists must meet certain criteria to qualify as and remain panellists. Their average sensitivity to n-Butanol must be between 20 and 80 parts per billion (ppb) and their variability in response to n-Butanol must be within a certain range.

Panellists are tested against n-Butanol before every panel session to ensure they are in compliance.

Panellists should not suffer from respiratory complaints, nor should they eat or smoke or drink anything but water during the half hour preceding or during the test period and their person and clothing should be odour free and have not been exposed to an odorous environment before testing.

5.1.2 ODOUR TERMINOLOGY

The odour level is expressed in odour units and for mixed odours is analogous to concentration expressed in parts per billion. The odour detection level is defined as the ratio of *the volume that a sample of odorous gas would occupy when diluted to the threshold of detection of that odour* to *the volume of the sample*. In simpler terms, the ratio indicated the number of dilutions necessary to reduce the odour to its threshold of detection or odour detection threshold. This ratio is expressed in odour units or number of dilutions to detection threshold. For example, a value of 2,000 odour units would mean the volume of the initial sample of odorous gas would need to be diluted 2,000 times before the odour would just be detectable to the average human nose, that is, at the odour detection threshold.

5.2 EXHAUST GAS VELOCITY

(OEH NSW TM-2 and USEPA Method 12)

Velocity profiles were obtained across the stack utilising an Airflow Developments Ltd. S-type pitot tube and digital manometer.

5.3 EXHAUST GAS TEMPERATURE

(OEH NSW TM- 2, 3 & 4 and USEPA Methods 2, 3 & 4)

The exhaust gas temperature was measured using a Digital thermometer (0-1200°C) connected to a chromel/alumel (K-type) thermocouple probe.

5.4 EXHAUST GAS MOISTURE CONTENT

(OEH NSW TM-22)

Moisture from the stack was collected in accordance with OEH NSW TM-22 sampling train. The collected moisture was weighed and calculated to a percentage of stack gas.

5.5 ACCURACY

All results are quoted on a dry basis.

Appendix C of (British Standard) 893 presents a range of accuracies for various parts of the isokinetic sampling procedure including pressure, velocity, temperature and particulate sampling. At best, an accuracy of ± 10% can be expected.

For odour the ratio between two single measurements, performed on the same testing material in this laboratory under repeatability conditions, will not be larger than 2.65 in 95% of cases. (Source – AS/NZS 4323.3:2001 Appendix B Section B2).

APPENDIX A – CERTIFICATES OF ANALYSIS

Odour Research Laboratories Australia

A Division of Peter W. Stephenson & Associates Pty Ltd
ACN 002 600 526 (Incorporated in NSW)
ABN 75 002 600 526

Newington Business Park
Unit 7/2 Holker Street
Newington NSW 2127 Australia
Tel: (02) 9737 9991
Fax: (02) 9737 9993
E-Mail: pstephenson@orla.com.au

Olfactometry Test Report

	The measurement was commissioned by SEMA on behalf of:	
Client	Organisation:	Elf Farm Supplies
	Address:	108 Mulgrave Road, Mulgrave NSW 2756
	Contact:	Neil Cockerell
	Sampling Site:	Main Stack
	Telephone:	02 4577 5000
	Email:	manager@elffarm.com.au
Project	ORLA Report Number:	5339/ORLA/01
	Project Manager:	Ali Naghizadeh
	Testing operator:	Peter Stephenson
	ORLA Sample number(s):	3920
	SEMA Sample number(s):	723559
Order	Analysis Requested:	Odour Analysis
	Order requested by:	SEMA on behalf of Elf Farm Supplies
	Date of order:	31 March 2014
	Order number:	4100
	Telephone:	02 9737 9991
	Signed by:	Peter Stephenson
	Order accepted by:	Peter Stephenson
Report	Date of issue:	04 April 2014

NATA accredited laboratory number 15043.

Accredited for Compliance with ISO/IEC 17025.

Investigated Item	Odour concentration in odour units 'ou' determined by Sensory odour concentration measurements, of an odour sample supplied in a sampling bag. All samples were received in good condition.
Analysis Method	The samples were analysed in accordance with AS/NZS4323.3:2001.
Identification	The odour sample bags were labelled individually. Each label recorded the testing laboratory, sample number, sampling location (or Identification) sampling date and time, dilution ratio (if dilution was used) and whether further chemical analysis was required.
Method	The odour concentration measurements were performed using dynamic olfactometry according to the Australian Standard 'Determination of Odour Concentration by Dynamic Olfactometry AS/NZS4323.3:2001. The odour perception characteristics of the panel within the presentation series for the samples were analogous to that for n-butanol calibration. Any deviation from the Australian standard is recorded in the 'Comments' section of this report.
Instrument Used	The Olfactometer used during this testing session was: AC'SCENT International Olfactometer
Measuring Range	The measuring range of the AC'SCENT International olfactometer is $13 \leq \chi \leq 72{,}444$ ou. If the measuring range was insufficient the odour samples will have been pre-diluted.
Environment	The measurements were performed in an air- and odour-conditioned room. The room temperature is maintained between ± 3^{o}C.
Measuring Dates	The date of each measurement is specified with the results.
Instrument Precision	The precision of this instrument (expressed as repeatability) for a sensory calibration must be $r \leq 0.05$ in accordance with the Australian Standard AS/NZS4323.3:2001. AC'SCENT International Olfactometer: $r = 0.0050$ (February 2014) Compliance – Yes
Instrumental Accuracy	The accuracy of this instrument for a sensory calibration must be $A \leq 0.20$ in accordance with the Australian Standard AS/NZS4323.3:2001. AC'SCENT International Olfactometer: $A = 0.068$ (February 2014) Compliance – Yes
Lower Detection Limit (LDL)	The LDL for the AC'SCENT International Olfactometer has been determined to be 13 ou
Traceability	The measurements have been performed using standards for which the traceability to the national standard has been demonstrated. The assessors are individually selected to comply with fixed criteria and are monitored every session to keep within the limits of the standard. The results from the assessors are traceable to primary standards of n-butanol in nitrogen.

04 April 2014

Peter Stephenson
Managing Director

Odour Research Laboratories Australia

Odour Olfactometry Results – 5339/ORLA/01

Sample Location	Sample ID No.	Sampling Date & Time	ORLA Sample No.	Analysis Date & Time (Completed)	Panel Size	Valid ITEs	Sample Pre-Dilution	Sample Odour Concentration (ou) [1]	Sample Odour Concentration (ou) [2]	Odour Character & Hedonic Tone [^ +]
Sample ID: Sample 1	723559	31/03/2014 03:33-03:48	3920	31/03/2014 14:00-14:30	5	10	Nil	701	701	Fishy, fertiliser, earthy, garbagy, rotting garbage, Bonox, rotting prawns (-3.4)[^]

Odour Research Laboratories Australia

Odour Panel Calibration Results – 5339/ORLA/01

Reference Odorant	ORLA Sample No.	Concentration of Reference Gas (ppm)	Reference Gas Measured Concentration (ou)	Panel Average Measured Concentration (ppb) [3]	Does this panel calibration measurement comply with AS/NZS4323.3:P2001 (Yes/No) [4]
n-butanol	3919	50.0	920	54.3	Yes

Comments: All samples were collected by Stephenson Environmental Management Australia and analysed by Odour Research Laboratories Australia at their Sydney Laboratory.

Notes from Odour Olfactometry Results:

[1] Sample Odour Concentration: as received in the bag

[2] Sample Odour Concentration: allowing for pre-dilution

[3] Panel Average Measured Concentration: indicates the sensitivity of the panel for the session completed

[4] Target Range for reference gas n-butanol is $20 \leq \chi \leq 80$ ppb and compliance with AS/NZ4323.3:2001 is based on the individuals rolling average and not on the panel average measured concentration. Panellist Rolling Average: SR = 56.3, PR = 44.2, TL = 38.6, MR = 53.7, PP = 53.2

^ denotes the Average Hedonic Tone: describes the pleasantness of the odour being presented where (+5) represents Very Pleasant, (0) represents Neutral and (-5) represents Very Unpleasant and has been derived from the panellist responses at the recognition threshold.

+ This value is not part of our NATA Scope of Accreditation and AS4323.3

--END OF TEST REPORT--

Odour Research Laboratories Australia

A Division of Peter W. Stephenson & Associates Pty Ltd
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Fax: (02) 9737 9993
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Olfactometry Test Report

The measurement was commissioned by SEMA on behalf of:

Client	Organisation:	Elf Farm Supplies
	Address:	108 Mulgrave Road, Mulgrave NSW 2756
	Contact:	Neil Cockerell
	Sampling Site:	Main Stack
	Telephone:	02 4577 5000
	Email:	manager@elffarm.com.au
Project	ORLA Report Number:	5339/ORLA/02
	Project Manager:	Ali Naghizadeh
	Testing operator:	Peter Stephenson
	ORLA Sample number(s):	3922, 3923
	SEMA Sample number(s):	723560, 723561
Order	Analysis Requested:	Odour Analysis
	Order requested by:	SEMA on behalf of Elf Farm Supplies
	Date of order:	02 April 2014
	Order number:	4101
	Telephone:	02 9737 9991
	Signed by:	Peter Stephenson
	Order accepted by:	Peter Stephenson
Report	Date of issue:	04 April 2014

NATA accredited laboratory number 15043.

Accredited for Compliance with ISO/IEC 17025.

Investigated Item	Odour concentration in odour units 'ou' determined by Sensory odour concentration measurements, of an odour sample supplied in a sampling bag. All samples were received in good condition.
Analysis Method	The samples were analysed in accordance with AS/NZS4323.3:2001.
Identification	The odour sample bags were labelled individually. Each label recorded the testing laboratory, sample number, sampling location (or Identification) sampling date and time, dilution ratio (if dilution was used) and whether further chemical analysis was required.
Method	The odour concentration measurements were performed using dynamic olfactometry according to the Australian Standard 'Determination of Odour Concentration by Dynamic Olfactometry AS/NZS4323.3:2001. The odour perception characteristics of the panel within the presentation series for the samples were analogous to that for n-butanol calibration. Any deviation from the Australian standard is recorded in the 'Comments' section of this report.
Instrument Used	The Olfactometer used during this testing session was: AC'SCENT International Olfactometer
Measuring Range	The measuring range of the AC'SCENT International olfactometer is $13 \leq \chi \leq 72{,}444$ ou. If the measuring range was insufficient the odour samples will have been pre-diluted.
Environment	The measurements were performed in an air- and odour-conditioned room. The room temperature is maintained between ± 3°C.
Measuring Dates	The date of each measurement is specified with the results.
Instrument Precision	The precision of this instrument (expressed as repeatability) for a sensory calibration must be $r \leq 0.05$ in accordance with the Australian Standard AS/NZS4323.3:2001. AC'SCENT International Olfactometer: $r = 0.0050$ (February 2014) Compliance – Yes
Instrumental Accuracy	The accuracy of this instrument for a sensory calibration must be $A \leq 0.20$ in accordance with the Australian Standard AS/NZS4323.3:2001. AC'SCENT International Olfactometer: $A = 0.068$ (February 2014) Compliance – Yes
Lower Detection Limit (LDL)	The LDL for the AC'SCENT International Olfactometer has been determined to be 13 ou
Traceability	The measurements have been performed using standards for which the traceability to the national standard has been demonstrated. The assessors are individually selected to comply with fixed criteria and are monitored every session to keep within the limits of the standard. The results from the assessors are traceable to primary standards of n-butanol in nitrogen.

04 April 2014

Peter Stephenson
Managing Director

Odour Research Laboratories Australia

Odour Olfactometry Results – 5339/ORLA/02

Sample Location	Sample ID No.	Sampling Date & Time	ORLA Sample No.	Analysis Date & Time (Completed)	Panel Size	Valid ITEs	Sample Pre-Dilution	Sample Odour Concentration (ou) 1	Sample Odour Concentration (ou) 2	Odour Character & Hedonic Tone ^ +
Sample ID: Sample 2	723560	01/04/2014 17:25-17:40	3922	02/04/2014 13:40-14:10	5	10	Nil	2,301	2,301	Sewerage, smelly socks, garbage, rotten fish, garbage tip (-3.6)^
Sample ID: Sample 3	723561	02/04/2014 04:51-05:08	3923	02/04/2014 14:15-14:40	5	10	Nil	2,118	2,118	Vegetable like, wheat, sewer odour, rotten fish, garbage tip (-3.0)^

Odour Research Laboratories Australia

Odour Panel Calibration Results – 5339/ORLA/02

Reference Odorant	ORLA Sample No.	Concentration of Reference Gas (ppm)	Reference Gas Measured Concentration (ou)	Panel Average Measured Concentration (ppb) [3]	Does this panel calibration measurement comply with AS/NZS4323.3:P2001 (Yes/No) [4]
n-butanol	3921	50.0	1,057	47.3	Yes

Comments: All samples were collected by Stephenson Environmental Management Australia and analysed by Odour Research Laboratories Australia at their Sydney Laboratory.

Notes from Odour Olfactometry Results:

[1] Sample Odour Concentration: as received in the bag

[2] Sample Odour Concentration: allowing for pre-dilution

[3] Panel Average Measured Concentration: indicates the sensitivity of the panel for the session completed

[4] Target Range for reference gas n-butanol is $20 \leq \chi \leq 80$ ppb and compliance with AS/NZ4323.3:2001 is based on the individuals rolling average and not on the panel average measured concentration. Panellist Rolling Average: SR = 53.8, PR = 44.4, TL = 40.5, MR = 51.3, PP = 58.3

^ denotes the Average Hedonic Tone: describes the pleasantness of the odour being presented where (+5) represents Very Pleasant, (0) represents Neutral and (-5) represents Very Unpleasant and has been derived from the panellist responses at the recognition threshold.

+ This value is not part of our NATA Scope of Accreditation and AS4323.3

------------------------------END OF TEST REPORT------------------------------

Odour Research Laboratories Australia

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Olfactometry Test Report

	The measurement was commissioned by SEMA on behalf of:	
Client	Organisation:	Elf Farm Supplies
	Address:	108 Mulgrave Road, Mulgrave NSW 2756
	Contact:	Neil Cockerell
	Sampling Site:	Main Stack
	Telephone:	02 4577 5000
	Email:	manager@elffarm.com.au
Project	ORLA Report Number:	5339/ORLA/03
	Project Manager:	Peter Stephenson
	Testing operator:	Ali Naghizadeh
	ORLA Sample number(s):	3924, 3925
	SEMA Sample number(s):	723587, 723588
Order	Analysis Requested:	Odour Analysis
	Order requested by:	SEMA on behalf of Elf Farm Supplies
	Date of order:	04 April 2014
	Order number:	4105
	Telephone:	02 9737 9991
	Signed by:	Peter Stephenson
	Order accepted by:	Ali Naghizadeh
Report	Date of issue:	04 April 2014

NATA accredited laboratory number 15043.

Accredited for Compliance with ISO/IEC 17025.

Investigated Item	Odour concentration in odour units 'ou' determined by Sensory odour concentration measurements, of an odour sample supplied in a sampling bag. All samples were received in good condition.
Analysis Method	The samples were analysed in accordance with AS/NZS4323.3:2001.
Identification	The odour sample bags were labelled individually. Each label recorded the testing laboratory, sample number, sampling location (or Identification) sampling date and time, dilution ratio (if dilution was used) and whether further chemical analysis was required.
Method	The odour concentration measurements were performed using dynamic olfactometry according to the Australian Standard 'Determination of Odour Concentration by Dynamic Olfactometry AS/NZS4323.3:2001. The odour perception characteristics of the panel within the presentation series for the samples were analogous to that for n-butanol calibration. Any deviation from the Australian standard is recorded in the 'Comments' section of this report.
Instrument Used	The Olfactometer used during this testing session was: AC'SCENT International Olfactometer
Measuring Range	The measuring range of the AC'SCENT International olfactometer is $13 \leq \chi \leq 72{,}444$ ou. If the measuring range was insufficient the odour samples will have been pre-diluted.
Environment	The measurements were performed in an air- and odour-conditioned room. The room temperature is maintained between ± 3°C.
Measuring Dates	The date of each measurement is specified with the results.
Instrument Precision	The precision of this instrument (expressed as repeatability) for a sensory calibration must be $r \leq 0.05$ in accordance with the Australian Standard AS/NZS4323.3:2001. AC'SCENT International Olfactometer: $r = 0.0050$ (February 2014) Compliance – Yes
Instrumental Accuracy	The accuracy of this instrument for a sensory calibration must be $A \leq 0.20$ in accordance with the Australian Standard AS/NZS4323.3:2001. AC'SCENT International Olfactometer: $A = 0.068$ (February 2014) Compliance – Yes
Lower Detection Limit (LDL)	The LDL for the AC'SCENT International Olfactometer has been determined to be 13 ou
Traceability	The measurements have been performed using standards for which the traceability to the national standard has been demonstrated. The assessors are individually selected to comply with fixed criteria and are monitored every session to keep within the limits of the standard. The results from the assessors are traceable to primary standards of n-butanol in nitrogen

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04 April 2014

Peter Stephenson
Managing Director

Odour Research Laboratories Australia

Odour Olfactometry Results – 5339/ORLA/03

Sample Location	Sample ID No.	Sampling Date & Time	ORLA Sample No.	Analysis Date & Time (Completed)	Panel Size	Valid ITEs	Sample Pre-Dilution	Sample Odour Concentration (ou) [1]	Sample Odour Concentration (ou) [2]	Odour Character & Hedonic Tone^ +
Sample ID: Sample 4	723587	03/04/2014 17:35-17:50	3924	04/04/2014 10:05-10:48	4	8	Nil	3,558	3,558	Fishy, burnt garbage, garbage, decay, Bonox (-3.8)^
Sample ID: Sample 5	723588	04/04/2014 04:25-04:40	3925	04/04/2014 10:54-11:33	4	8	Nil	2,476	2,476	Fishy, ammonia, smelly feet, garbage, decay, rotten garbage (-3.8)^

Odour Research Laboratories Australia

Odour Panel Calibration Results – 5339/ORLA/03

Reference Odorant	ORLA Sample No.	Concentration of Reference Gas (ppm)	Reference Gas Measured Concentration (ou)	Panel Average Measured Concentration (ppb) [3]	Does this panel calibration measurement comply with AS/NZS4323.3:P2001 (Yes/No) [4]
n-butanol	3926	50.0	1,047	47.7	Yes

Comments: All samples were collected by Stephenson Environmental Management Australia and analysed by Odour Research Laboratories Australia at their Sydney Laboratory.

Notes from Odour Olfactometry Results:

[1] Sample Odour Concentration: as received in the bag

[2] Sample Odour Concentration: allowing for pre-dilution

[3] Panel Average Measured Concentration: indicates the sensitivity of the panel for the session completed

[4] Target Range for reference gas n-butanol is $20 \leq \chi \leq 80$ ppb and compliance with AS/NZ4323.3:2001 is based on the individuals rolling average and not on the panel average measured concentration. Panellist Rolling Average: SR = 53.9, PR = 42.4, TL = 38.8, MR = 51.4, PP = 58.4

^ denotes the Average Hedonic Tone: describes the pleasantness of the odour being presented where (+5) represents Very Pleasant, (0) represents Neutral and (-5) represents Very Unpleasant and has been derived from the panellist responses at the recognition threshold.

+ This value is not part of our NATA Scope of Accreditation and AS4323.3

------------------------------END OF TEST REPORT------------------------------

APPENDIX B – PART OF OEH EPL LICENCE

Section 55 Protection of the Environment Operations Act 1997

Environment Protection Licence

Licence - 6229

NSW EPA

P1 Location of monitoring/discharge points and areas

P1.1 The following points referred to in the table below are identified in this licence for the purposes of monitoring and/or the setting of limits for the emission of pollutants to the air from the point.

Air

EPA identi-fication no.	Type of Monitoring Point	Type of Discharge Point	Location Description
1	Discharge to air Air emissions monitoring	Discharge to air Air emissions monitoring	Bioscrubber chimney labelled as "Chimney" on "Figure 5.2 - Plant Layout" and "Figure 5.5 - Stage 1 - Phase 1 Bioscrubber Detail" contained in the "Mulgrave Mushroom Substrate Plant Environmental Management Plan" dated August 2002.

3 Limit Conditions

L1 Pollution of waters

L1.1 Except as may be expressly provided in any other condition of this licence, the licensee must comply with section 120 of the Protection of the Environment Operations Act 1997.

L2 Concentration limits

L2.1 For each monitoring/discharge point or utilisation area specified in the table\s below (by a point number), the concentration of a pollutant discharged at that point, or applied to that area, must not exceed the concentration limits specified for that pollutant in the table.

L2.2 Where a pH quality limit is specified in the table, the specified percentage of samples must be within the specified ranges.

L2.3 To avoid any doubt, this condition does not authorise the pollution of waters by any pollutant other than those specified in the table\s.

L2.4 Air Concentration Limits

POINT 1

Pollutant	Units of measure	100 percentile concentration limit	Reference conditions	Oxygen correction	Averaging period
Odour	odour units per second	55400			

L2.5 For each monitoring/discharge point specified in the table(s) in L2 above (by a point number), the reference conditions and averaging period of a pollutant discharged at that point must be reported at the reference conditions and averaging period specified for that pollutant in the following table.

Section 55 Protection of the Environment Operations Act 1997

Environment Protection Licence

Licence - 6229

Pollutant	Reference Conditions	Duration	Averaging Period
Odour	dry, 293K, 101.3kPa	1 hour	Rolling annual

L3 Waste

L3.1 The licensee must not cause, permit or allow any waste to be received at the premises, except the wastes expressly referred to in the column titled "Waste" and meeting the definition, if any, in the column titled "Description" in the table below.

Any waste received at the premises must only be used for the activities referred to in relation to that waste in the column titled "Activity" in the table below.

Any waste received at the premises is subject to those limits or conditions, if any, referred to in relation to that waste contained in the column titled "Other Limits" in the table below.

This condition does not limit any other conditions in this licence.

Code	Waste	Description	Activity	Other Limits
NA	Chicken manure		Composting Waste storage	NA
NA	Feather meal		Composting Waste storage	NA
NA	Cotton seed meal		Composting Waste storage	NA
NA	Natural organic fibrous materials	As defined in Schedule 1 of the POEO Act, in force from time to time	Composting Waste storage	NA
NA	Horse stable bedding		Composting Waste storage	NA
NA	General or Specific exempted waste	Waste that meets all the conditions of a resource recovery exemption under Clause 51A of the Protection of the Environment Operations (Waste) Regulation 2005	As specified in each particular resource recovery exemption	NA
NA	Waste	Any waste received on site that is below licensing thresholds in Schedule 1 of the POEO Act, as in force from time to time	-	NA

L3.2 The licensee must ensure that the amount of excess compost that is stored at the premises does not exceed 150 tonnes at any one time.

APPENDIX C – EXHAUST GAS FLOW DATA

Glossary:

%	=	percent
^oC	=	Degrees Celsius
am^3/min	=	cubic metre of gas at actual conditions per minute
Normal Volume (m^3)	=	cubic metre at 0°C and 760 mm pressure and 1 atmosphere
am^3	=	cubic metre of gas at actual conditions
g/g mole	=	grams per gram mole
g/s	=	grams per second
hrs	=	hours
kg/m^3	=	kilograms per cubic metre
kPa	=	kilopascals
m^2	=	square metre
m/s	=	metre per second
m^3/min	=	cubic metre per minute at 0^0C and 1 atmosphere
m^3/sec	=	cubic metre per second at 0^0C and 1 atmosphere
mg	=	milligrams
mg/ m^3	=	milligrams per cubic metre at 0^oC and 1 atmosphere
ou	=	odour units
$ou.m^3/s$	=	odour units cubic metre of gas at dry, 293 K and 101.3 kPa
K	=	degrees Kelvin
O_2	=	Oxygen

Abbreviations for names of SEMA staff who completed the either/and/or Sampling, Analysis and Checking

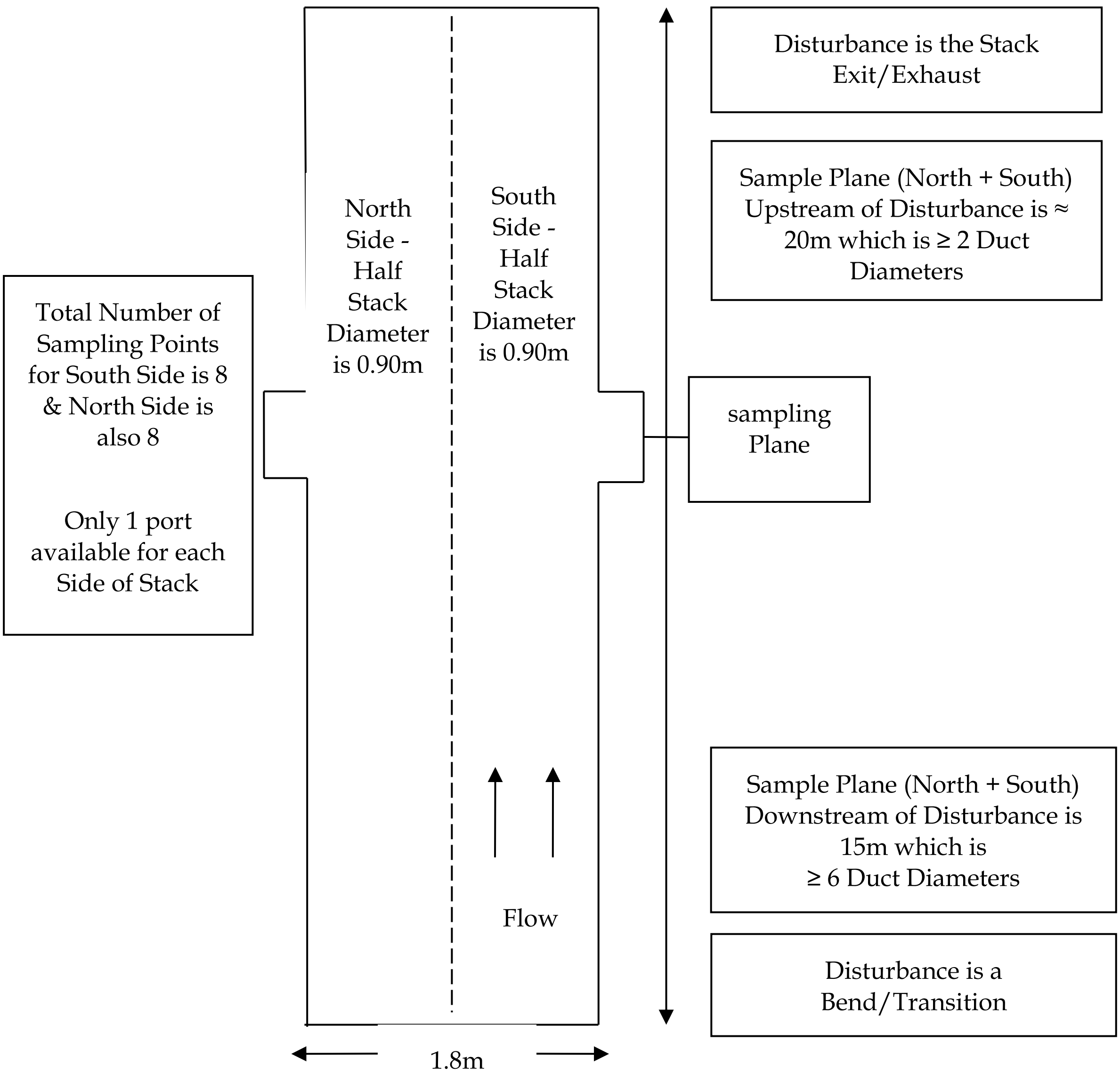
PWS	=	Peter Stephenson
AN	=	Ali Naghizadeh
AP	=	Alok Pradhan

TABLE C - 1 EMISSION TEST RESULTS – FLOW AND ODOUR

Emission Test Results	Flow	Flow	Flow	Flow	Flow
Project Number	5339	5339	5339	5339	5339
Project Name	Elf Farm Bio-scrubber	Elf Farm Bio-scrubber	Elf Farm Bio-scrubber	Elf Farm Bio-scrubber	Elf Farm Bio-scrubber
Test Location	Stack	Stack	Stack	Stack	Stack
Date	31-Mar-14	01-Apr-14	02-Apr-14	03-Apr-14	04-Apr-14
Run	1	2	3	4	5
Analysis	Flow	Flow	Flow	Flow	Flow
Method	TM-1 & TM-2 & TM-22	TM-1 & TM-2 & TM-22	TM-1 & TM-2 & TM-22	TM-1 & TM-2 & TM-22	TM-1 & TM-2 & TM-22
Sample Start Time (hrs)	3:33	17:25	4:51	17:35	4:25
Sample Stop Time (hrs)	3:48	17:40	5:08	17:50	4:40
Inlet/Exhaust	Exhaust	Exhaust	Exhaust	Exhaust	Exhaust
Stack Temperature (^oC)	35.2	36.6	36.4	36.1	36.7
Stack Cross-Sectional area (m^2)	1.272	1.272	1.272	1.272	1.272
Average Stack Gas Velocity (m/s)	14.2	14.4	14.7	14.5	15.7
Actual Gas Flow Volume (am^3/min)	1,083	1,098	1,124	1,105	1,198
	Dry	Dry	Dry	Dry	Dry
Total Normal Gas Flow Volume (m^3/min)	928	937	956	963	995
Total Normal Gas Flow Volume (m^3/s)	15.5	15.6	15.9	16.0	16.6
Total Stack Pressure (kPa)	102.31	101.81	101.90	101.50	101.50
Moisture Content (% by volume)	4.2	3.7	4.2	1.6	6.0
Molecular Weight Dry Stack Gas (g/gmole)	28.836	28.836	28.836	28.836	28.836
Dry Gas Density (kg/m^3)	1.29	1.29	1.29	1.29	1.29
Oxygen (%)	20.9	20.9	20.9	20.9	20.9
Analysis	**Odour**	**Odour**	**Odour**	**Odour**	**Odour**
Method	AS4323.3	AS4323.3	AS4323.3	AS4323.3	AS4323.3
ORLA Number	3920	3922	3923	3924	3925
SEMA Number	723559	723560	723561	723587	723588
Sample Start Time (hrs)	3:33	17:25	4:51	17:35	4:25
Sample Finish Time (hrs)	3:48	17:40	5:08	17:50	4:40
Odour Concentration (As Received) (ou)	701	2,301	2,118	3,558	2,476
Odour Concentration (Final) (ou)	**701**	**2,301**	**2,118**	**3,558**	**2,476**
	Dry	Dry	Dry	Dry	Dry
Normal MOER (As Received) (ou m^3/s)	10,846	35,924	33,750	57,077	41,048
Normal MOER (Final) (ou m^3/s)	**10,846**	**35,924**	**33,750**	**57,077**	**41,048**
Mass Odour Emission Rate Limit (ou m^3/s)	55,400	55,400	55,400	55,400	55,400
Sample Storage Period	2 days	2 days	2 day	2 days	2 days
Sampling conducted by	PWS	PWS	PWS	PWS	PWS
Calculations entered by	AP	AP	AP	AP	AP
Calculations checked by	AN	AN	AN	AN	AN

APPENDIX D – SAMPLE LOCATION

FIGURE D - 1 SAMPLE LOCATION



In the absence of cyclonic flow activity ideal sampling plane conditions will be found to exist at 6-8 duct diameters downstream and 2-3 duct diameters upstream from a flow disturbance. The sampling plane does meet this criterion.

The sample plane does meet gas profile for sampling. Therefore the sampling plane is satisfactory for testing and in compliance with AS4323.1

ELF FARM SUPPLIES PTY LTD

Technical Review and Assessment Audit

Mulgrave, NSW

Draft Report

June 2014

THE ODOUR UNIT PTY LTD

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Project Number: **N1952R**

Report Revision		
Report Version	**Date**	**Description**
Partial Draft report V1	29.05.2014	Partial draft report issued to client
Draft report V1	06.06.2014	Draft report issued to client for review
Final draft report	16.06.2014	Final draft issued
Report Preparation		
Report Prepared By: T.Schulz & M.Assal		**Approved By:** T Schulz
Report Title: Elf Farm Pty Ltd- Technical Review and Assessment Audit		

CONTENTS

1 INTRODUCTION

1.1 BACKGROUND

In March 2014 Elf Farm Supplies Pty Ltd (Elf Farm Supplies) engaged The Odour Unit Pty Ltd (TOU) to undertake a technical review and assessment audit (the audit) of the Elf Farm Supplies Composting Facility at Mulgrave, NSW (the facility). The audit was required by the New South Wales Environment Protection Authority (NSW EPA) as part of the facility's Environment Protection Licence (No. 6229).

1.2 AUDIT SCOPE OF WORKS

The scope of works for the audit is outlined in *Section U1.1 Part 2* of the *Pollution Studies and Reduction Programs* licence conditions, and is as follows:

A technical review and assessment of the phase 1 composting infrastructure and activities must be undertaken by a recognised independent odour control specialist agreed to in writing by the EPA with experience in the design and implementation of proven odour control technology. This review and assessment must include, but not necessarily be limited to:

A) An audit of each of the phase 1 composting activities and infrastructure to identify and assess all sources of odour with the potential to contribute to offensive odour beyond the boundary of the premises. This audit shall include, but not necessarily be limited to:

- *The bale wetting process and area;*
- *Process water collection pit and the second flush collection dam;*
- *Fugitive emissions from the phase 1 Pre-wet building including doors, walls and roof;*
- *Mixing and transfer of 'dry' materials into the Pre-wet building;*
- *Transfer of phase 1 compost from the Pre-wet building to the phase 1 transfer hall;*

- *Fugitive emissions from the phase 1 transfer hall including doors, wall and roof;*
- *Fugitive emissions from the phase 1 tunnel building external conveyor system; and*
- *Emissions from the bioscrubber and stack.*

B) Identification of odour mitigation measures proposed to address each of the sources identified in the audit in (2A). The reduction in odour must be quantitatively evaluated in accordance with methodology agreed to by the EPA. The assessment must quantitatively demonstrate how the combination of proposed measures will ensure offensive odours will not be emitted beyond the boundary of the premises.

This report documents the findings from the audit undertaken at the facility.

1.3 AUDIT METHODOLOGY

The findings from the audit are based on a number of inspections of the facility by TOU consultants, detailed discussions with management, a review of available reports and testing results from earlier odour studies, and experience and knowledge gained by TOU in the course of carrying out an earlier study for NSW EPA in 2013 (refer ***McGraths Hill, Mulgrave, Windsor Field Ambient Odour Assessment Study - Final Report, August 2013***), in which ambient odour levels in the Mulgrave/Windsor areas were determined. Significantly, that study included an inspection of the facility prior to a series of recent odour mitigation measures.

2 PROCESS OVERVIEW

The facility generates a mushroom substrate by utilising a five-stage composting process, all of which is undertaken on-site. The five key stages are as follows:

1. **Raw Materials Storage Shed Area and Bale Wetting:** storing and combining all ingredients ready for transport to the Pre-wet Shed. Bale wetting involves gradually adding water and pulsing fresh air through the straw bales to keep the material aerobic;
2. **Pre-Wetting**: the straw bales and the ingredients are blended in the Pre-wet Shed and re-blended a number of times whilst always adding water;
3. **Phase 1:** the material is processed through enclosed tunnels in which temperature, oxygen and moisture content are controlled and regulated;
4. **Phase 2:** material is transferred to clean tunnels where it is pasteurised and peak heated to remove any weed moulds or pests before spawning; and
5. **Phase 3**: mushroom spawn is added and grown through the substrate for a minimum of 2 weeks prior to Mushroom Farm delivery.

The first two stages of the composting process generate more odour than the latter stages and are therefore the focus of the audit.

2.1 RAW MATERIALS STORAGE SHED AREA

The raw materials storage shed area consists of several bay areas that store dry additive products including chicken manure, cotton seed, gypsum and other seasonal organic nitrogen sources. The ingredients are weighed and mixed together in calculated ratios in a semi-enclosed area, where the dry chicken manure is stored. The mixing is carried out by the Kuhn mixing machine. Once mixed, the material is conveyed by a front-end loader to the Pre-wet building where it is placed on top of the straw bales ready for bale breaking by the Thilot blending machine. A characteristic of the mixing of the raw materials is the odour generated during the preparation of the 'brew' which is a blend of the above materials. This occurs in the south-western corner of the shed. It is understood that during this preparation process the dry chicken manure is the dominant odour. The frequency and duration of this process is approximately 4 hours per week.

2.2 Bale Wetting Stage

The bale wetting stage involves the wetting of straw bales with process water (comprising predominately of water from the nearby creek) for several days (currently 4 days per week).

2.3 Pre-wet Stage

After bale wetting, the bales are transported by front-end loader into the Pre-wet shed and manually destringed. The brew is added and bale breaking occurs. Bale breaking is the mixing of the brew, that consists of chicken manure, gypsum, and other ingredients (prepared in the raw materials area, as discussed in **Section 2.1**). The mixed materials are left in a windrow-like stockpile. These windrow stockpiles are aerated from below, using a proprietary in-floor aeration system. Currently three full windrows can be constructed in the Pre-wet building.

The initial low temperature stage of the composting process occurs in the Pre-wet building. The building is fully enclosed, except for a (curtained) opening on the eastern-side through which a front-end loader transfers material to the Phase 1 Working Hall and two large (door) openings in the south-eastern and north eastern corners of the building. Extracted air from the Pre-wet building is directed to the bioscrubber through the Phase 1 Tunnel Building (see **Section 2.3** for details) before discharge through a tall stack. The ventilation rate is understood to be approximately 1 air exchange/hr.

2.4 Phase 1 Stage

The material transferred from the Pre-wet building is placed into a hopper mixer in the Phase 1 Working Hall. Material in the hopper mixer is conveyed into designated enclosed aerated tunnels via an inclined overhead conveyor, located external to the building. The material is deposited into the tunnels where the aeration rate and temperature are tightly controlled. The material in each tunnel is removed, deposited back into the hopper mixer and returned to another tunnel, to continue the Phase 1 process. Ventilation air from the Pre-wet building is passed through the Phase 1 tunnels with the subsequent waste air emissions from the tunnels treated by the existing bioscrubber, before stack discharge.

The facility currently has only one bioscrubber unit servicing all process operations.

3 AUDIT REVIEW AND FINDINGS

The following section is designed to systemically address *Part 2A* of the *Pollution Studies and Reduction Programs* as outlined in the Environment Protection Licence (No. 6229).

In an attempt to compare the odour emissions from each of the process operations in the Pre-wet and Phase 1 areas a ranking score of 1 to 5 has been assigned to the emission. This score is based on all information available to TOU, together with the collective observations of the TOU consultants. A score of 1 indicates relatively minor emissions with a low potential to impact adversely off site. A score of 5 suggests that this source has the potential to impact and mitigation should be considered, if not already happening. Two factors contribute to the assignment of the ranking score, namely the odour concentration of the emission and, more importantly, the odour emission rate (OER) of the emission. It is the OER that determines the extent to which the odour emission will travel off site.

3.1 THE BALE WETTING PROCESS AND AREA

The bale wetting process is undertaken in an outside area adjacent to the Pre-wet building. This process involves recirculating Pre-wet process/leachate water over a series of straw bales that are stacked up 3 (4’ x 4’) bales high. The process water is applied by a mobile spray irrigation system that moves above the bale wetting area. Process water that is not absorbed by the straw is collected at several drain points and directed to a common collection pit. The contents of the collection pit are aerated to promote aerobic conditions. Leachate from the Pre-wet building is also drained to this common collection pit. The bales in this area are aerated from beneath, using a similar in-slab forced-aeration system to that used in the Pre-wet building. The bales in this area are kept intact until moved into the Pre-wet building.

3.1.1 Odour generation potential

Odour testing data collected by Stephenson Environmental Management Australia (SEMA) in 2010, and documented in the PAE Holmes report ‘*Expansion of Substrate Facility*‘ in 2010, indicates a very low emission potential from the bale wetting operations, with a Specific Odour Emission Rate (SOER) of 0.078 ou.m^3.m^2/s and an overall Odour Emission Rate (OER) of 52.3 ou.m^3/s. Further testing carried out in August 2013 produced a higher but still modest emission rate of up to 916 ou.m^3/s (corresponding to an SOER of 1.4 ou.m^3.m^2/s). Even at this higher OER the likelihood of this odour being problematical beyond the site boundaries is considered low.

It is clear that the odour emissions from the bale wetting operation are related predominately to the quality and odour emission potential of the leachate used in the process. On the several occasions that TOU consultants have visited the plant and inspected the quality of leachate in the pit was high and the level of odour in the vicinity of the bale wetting operation in keeping with the above quantitative data. This was despite the presence of a visible plume rising from the bales.

Odour Emission Potential Score: **1-2**

4-5 if the leachate is highly odorous

3.2 PROCESS WATER COLLECTION PIT AND THE OVERFLOW COLLECTION DAM

As mentioned above, the Process Water Collection Pit collects water draining from the bale wetting area and the Pre-wet building. Make-up water for this pit is sourced from the existing bioscrubber which is constantly replenished with creek water. The incoming process water to the collection pit is screened before flowing into the collection pit. The pit contents are aerated at all times. It is understood that every fortnight the pit water is fully drained (onto the new straw bales) and settled sludge removed. The sludge is understood to be a small volume (equivalent to two wheelbarrows) and is spread onto the stable bedding in the stable bedding wetting area.

The overflow collection dam, also known at the facility as the process water overflow dam, receives runoff from the exposed process areas and process water collection pit overflow (normally occurring in the event of a rare rain event). The dam is located at the lower western section of the facility. The contents in the dam are not mechanically treated and is only used as an emergency storage dam. The facility aims to maintain a minimum volume of water in this dam.

3.2.1 Odour generation potential

The Process Water Collection Pit contents are, at times, likely to contain high levels of BOD and suspended solids, such that potential exists for the contents to putrefy if not managed well. During each of TOU's site visits the pit contents were a light brown in colour, indicating the absence of anaerobic conditions, and had a characteristic 'cattle pen' odour. This odour was slight, even at the edge of the pit.

Odour Emission Potential Score: **1-2**

3-4 if the leachate is highly odorous

The Second Flush Collection Dam appears to have low potential for causing adverse odour impacts. There were no signs that the dam contents were anything but aerobic or anoxic.

Odour Emission Potential Score: **1**

3.3 Fugitive Emissions From The Pre-wet Building Including Doors, Walls and Roof

As previously mentioned in **Section 2.1**, the operations that take place inside the Pre-wet building represent the initial low temperature stages of the composting process. It is widely accepted that the volatile compounds present in the compost mix will tend to be released early in the composting process, in this case exacerbated by the elevated temperatures that prevail. The odour within the building is gradually dominated by the presence of ammonia (NH_3), but other odorous compounds are evident once the odour dissipates or reduces to below the ammonia threshold value.

The Pre-wet building is fully enclosed, except for the loader entrance/exit opening and the main doorway at the north-eastern corner of the building. TOU have been advised that this doorway must be kept at least partially open (especially during warmer months), for Occupational Health & Safety (OH&S) reasons inside the building. For sound operational reasons the loader entrance/exit door must remain open when access is required, as does the corresponding entrance doorway to the Phase 1 Working Hall. Both of these doorways/openings in the Pre-wet building represent potential fugitive odour emission points. The warm emissions from the windrows inside the building were observed to be subject to thermal buoyancy, such that they tend to rise to the upper levels inside the building. The provision of tarps or similar in the upper section of the doorway would assist in retaining this buoyant air within the building

Section U1.1 of the current Environment Protection Licence for the plant requires certain repairs/modifications to the Pre-wet building, aimed at reducing fugitive odour releases. These are listed below, together with the status of each.

The licensee must undertake the following:

1. *Identify and seal the following fugitive odour emission points:*

A. *Pre-wet shed roofing (1m end section) before 30 April 2014*

STATUS: *Completed (understood to be read as the eastern roof section)*

B. Replace the Pre-wet shed western wall before 31 May 2014

***STATUS:** Completed*

C. Replace the Pre-wet shed roofing (1m end section) before 31 May 2014 ***STATUS:** See 1A. (understood to be read as the western roof section)*

3.3.1 Odour generation potential

This audit finds that the Pre-wet building is the dominant odour emission source at the facility which, if uncontained, would have significant potential to impact off-site. The above modification measures (see **Section 3.3**) to the Pre-wet building structure have clearly been successful in improving the containment of Pre-wet process odours. TOU has witnessed this first hand, as a result of experience gained during the NSW EPA 2013 Mulgrave/Windsor project. On that occasion it was clear that corrosion gaps in the metal wall-roof interfaces were enabling the outflows of odorous air, the extent of which can never be quantified. The recent repairs to the Pre-Wet building appear to have sealed the building as much as is practicable, and this audit finds that, little more can be done in this area. Several photos showing the recent repairs are presented in **Photos 3.1 & 3.2.**

Photo 3.1 - Repairs made to the Eastern wall of the Pre-wet building (**Date of Photo:** 29 May 2014)

Photo 3.2 – Repairs made to the western wall of the Pre-wet building
(**Date of Photo:** 29 May 2014)

The quantitative data available to TOU for odour generation within the Pre-wet building appears to be somewhat contradictory. SEMA-sourced data contained in the PAE Holmes 2010 report indicates that odours are generated within the building at a rate of 2,001 ou.m^3/s from each of the 2 ricks in operation at any time (4,002 ou.m^3/s in total). Because the 'air under' method of determining this OER does not take into account the odour emitted from the rick surface when aeration is not occurring, this audit considers that the above OER significantly underestimates the mass of odour generated by this source within the Pre-wet building. Using a different sampling technique, data collected by SEMA in August 2013, for broadly similar material to that in the ricks, but this time being conveyed on the Phase 1 external transfer conveyor to the tunnels, indicated an OER from this source of between 26,100 and 39,600 ou.m^3/s. Clearly there is a major discrepancy between these external conveyor results and those for the Pre-wet rick emissions. While it is likely that the external conveyor emissions in 2013 were over-estimated, this audit finds that the level of odour generated within (as distinct from emitted from) the Pre-wet building is likely to be substantially greater than that previously estimated. As a result of this finding this audit considers that the extent of the improvement in odour emissions arising from the recent improvements to the Pre-wet building cladding and roofing is far greater than is implied by the odour generation data contained in the 2010 study, which shows a maximum possible fugitive emission reduction of only 4,002 ou.m^3/s. While this hypothesis is difficult to prove, any significant reduction in odour emissions would appear to be consistent with a decrease in odour complaints which is understood to have occurred in recent months.

Odour Impact Potential Score: **5** (prior to building sealing)

4 currently

3.4 MIXING AND TRANSFER OF 'DRY' MATERIALS INTO THE PRE-WET BUILDING

The storage of chicken manure, cotton seeds and other dry ingredients in the open-but-roofed enclosures are considered to have low potential for off-site odour nuisance. While the loading or disturbance of these materials may give rise to sporadic odour emissions, any adverse impacts are considered to be relatively minor and of short duration.

The process at the facility requires that the individual raw materials are weighed and blended into what is known as the 'brew', which is transported by front-end loader into the Pre-wet building and mixed with the straw. The 'brew' process takes place in the south-western corner of the Raw Materials Shed. This audit finds that odours from this process can be detected off-site, albeit at relatively low intensities, and therefore are amenable to mitigation. The partially-enclosed process (open on one side) lends itself to partitioning or curtaining as noted in the facility's current OMP.

The mixing of this 'brew' with the straw bale material occurs inside the Pre-wet building, where it contributes to the overall level of odour. This emission is significant but part of the odour generated within the building and discussed below.

3.4.1 Odour generation potential

While the storage of the individual materials are considered to be relatively insignificant, the brew preparation process represents an odour source activity that can be curtailed by improved storage facilities and management.

Odour Impact Potential Score: 2

3.5 TRANSFER OF COMPOST FROM THE PRE-WET BUILDING TO THE PHASE 1 WORKING HALL

Pre-wet compost is transferred to the Phase 1 working hall by a front-end loader. This loader exits the Pre-wet building through a doorway/opening (no door is fitted) and traverses the short distance to a similar opening in the working hall. In doing so this loader exposes the material to the open atmosphere during the short trip across to the hall, albeit from a small exposed surface area in the loader bucket. The opening from the Pre-wet building is fitted with a tarp curtain, in order to minimise the area of the opening and hence fugitive odour releases from this source. TOU has experienced and designed this plastic strip method in waste transfer station applications and has confirmed with smoke testing that fugitive air outflows can be reduced using this approach. This audit finds that it would not be practicable to have doors on either opening. Full enclosure of the passage way between the two buildings may be a feasible option, if it can be demonstrated that this fugitive emission is more significant than this audit finds. It is understood that access is needed in the north and south through the tunnel for operational purposes. As such, curtains are fitted to all openings and closed during transfer.

3.5.1 Odour generation potential

While an obvious fugitive odour emission area, its relatively small scale is considered to result in relatively minor emissions, when compared to other sources. However any future upgrade or redesign of the Phase 1 plant should incorporate the full enclosure of this transfer operation.

Odour Impact Potential Score: 1

3.6 Fugitive Emissions From The Phase 1 Working Hall Including Doors, Wall and Roof

The Phase 1 working hall acts as a transition point for the Pre-wet compost, prior to loading onto the external conveyor. During this process a front-end loader brings material into the hall and loads it into a conveyor hopper and, in doing so odours are released into the hall as the material is disturbed. The SEMA 2013 testing referred to above demonstrates that this material is odorous. The working hall also receives Phase 1 compost as each of the tunnels is emptied and its contents mixed and reloaded into another tunnel midway through each batch. This partially-composted material has a far lower potential to generate odours than the Pre-wet compost. By similar logic, the more fully-composted Phase 1 product that is transferred from the Phase 1 building by a covered conveyor across to the Phase 2/3 building is considered less likely be a significant source of nuisance odour. This audit observed fugitive emissions from the Phase 1 building end of the conveyor which could be better contained by enclosing this area.

The ducting carrying the extracted air from the Pre-wet building passes through the hall en route to the bioscrubber unit, which is located between tunnels 2 and 3. No air from the bioscrubber is able to enter the hall. This airflow is relatively modest, compared to the enclosed volume of the Pre-wet building. Odour testing results suggest that the bioscrubber is capable of handling the current airflow while achieving the required level of odour removal. Any increase in airflow would improve air quality inside the Pre-wet building and may reduce the impact of any fugitive odour emissions.

The Phase 1 working hall forms part of the main Phase 1 building. It is equipped with 3 large openings/doorways. The first is the previously mentioned loader access opening. A second opening on the southern side of the hall is fitted with a door which is usually kept open during working hours. Fugitive ‘steamy’ emissions from this opening were apparent during at least one of the audit visits. A third opening on the northern side of the hall is also fitted with a door. This door is opened as required for maintenance, but is kept closed during operations. The current configuration of openings and doorways lends itself to the cross flow of air through and out of the hall, particularly under southerly winds. Consideration should be give to modifying operating practices such that the frequency and duration of opening the southern door is minimised.

The Phase 1 transfer hall was in the process of refurbishment of the external metal cladding during the audit, in a similar manner to that carried out on the Pre-wet building. This project was completed and replaced corroded sections at the wall/roof interface, along the western wall (see **Photo 3.3**). Clearly this measure will result in a decreased tendency for thermally-induced fugitive air releases at these locations.

Photo 3.3 – Repairs made to the western wall of the Phase 1 building working hall (**Date of Photo:** 29 May 2014)

Section U1.1 of the current Environment Protection Licence for the plant requires certain repairs/modifications to the Phase 1 building, aimed at reducing fugitive odour releases. These are listed below, together with the status of each.

The licensee must undertake the following:

1. *Identify and seal the following fugitive odour emission points:*

D. *Replace the phase 1 western wall before 30 April 2014*

STATUS: *Completed (see **Photo 3.3**)*

3.6.1 Odour generation potential

This audit finds that the Phase 1 transfer hall has been a significant source of odour emission. The refurbishment measures will greatly reduce the thermally induced emissions at the wall/roof interface, with the benefits from the work done already apparent. Apart from the intermittent low-grade odour generation scenario that occurs when tunnels are loaded/reloaded, the main odour source within the building will continue to be the movement of the front-end loader in the hall and the Pre-wet compost unloading into the transfer hopper at the southern end of the hall. However given the relatively small amount of material exposed during this process, the magnitude of the odour generated within the hall is almost certainly an order of magnitude or greater than that in the Pre-wet building. The potential for odour release from the hall will be greatest when the northern and/or southern doorways are open. TOU is satisfied that the facility manage and minimise the opening of the northern door well. The normal status of the southern door needs to be in the closed position.

The audit understands that the southern and eastern walls and eastern 1 metre roof section are next to be replaced on the Phase 1 working hall as part of the current maintenance program. This will continue to minimise leakage.

Odour Impact Potential Score: 3 (previously)

2 current

3.7 FUGITIVE EMISSIONS FROM THE PHASE 1 TUNNEL BUILDING EXTERNAL CONVEYOR SYSTEM

This conveyor transports compost material from a hopper within the Phase 1 transfer hall to a loading conveyor which runs laterally across the top of the Phase 1 tunnels. It runs external to the building to a point where it transfers into the tunnel loading conveyor. Within 5 metres of the transfer point the cell loading conveyor enters an enclosed conveyor room above the tunnel cells.

The external conveyor was identified as a source of odour emission by TOU during the previous NSW EPA Mulgrave/Windsor project in 2013. The SEMA odour testing study referred to in **Section 3.3** also identified this operation as a significant source, around the same time. It is understood that the facility was not aware of the magnitude of this emission until notified. As a result of this, the facility undertook works to cover the external conveyor, and this was carried out in October/November 2013 (see **Photo 3.4**)

Section U1.1 of the current Environment Protection Licence for the plant requires certain repairs/modifications to the Phase 1 building, aimed at reducing fugitive odour releases. These are listed below, together with the status of each.

The licensee must undertake the following:

1. *Identify and seal the following fugitive odour emission points:*

E. *Install a cover for the Phase 1 top moveable conveyor located at the northern end enclosure before 30 April 2014*

STATUS: *Completed*

Photo 3.4 – Covering of Phase 1 External Conveyer System
(**Date of Photo:** 29 May 2014)

3.7.1 Odour generation potential

The SEMA 2013 odour testing determined that odour was released from the previous uncovered conveyor at a rate up to 39,600 ou.m^3/s. Without the benefit of dispersion modelling it is not possible to project or quantify the ground level impacts from such an emission. However, the location of the conveyor beneath the roof height of the Phase 1 building, where it is susceptible to plume downwash effects and poor initial dispersion, suggests that this odour could at times travel well beyond the site boundaries.

The current conveyor configuration was assessed during this audit and found to still emit some visible fugitive emissions, albeit at an unquantifiable but greatly reduced rate of emission to that observed and quantified in 2013. While the extent to which the enclosure of the conveyor could be improved could not be determined during this audit, the objective of any ongoing odour mitigation program should include the capturing of the bulk of the odours generated along the length of the conveyor.

Odour Impact Potential Score: 5 (previously)

2-3 now

3.8 EMISSIONS FROM THE BIOSCRUBBER AND STACK

Data contained in the 2010 PAE Holmes report indicates that the bioscrubber treats the air supplied to it to odour concentrations of between 1,271 and 1,847 ou, based on three sets of testing results. The corresponding odour emission rates were 19,447 and 29,640 ou.m^3/s respectively. The current EPA licence for the facility requires the stack emission to be less than 55,400 ou.m^3/s. While the results of modelling of the stack emissions alone were not documented in that study report, the modelling of the overall site, including stack and fugitive emissions, did indicate full compliance with the EPA 2 ou odour performance criterion at the nearest sensitive receptor. This audit takes this finding as confirmation that the stack emissions, at the above odour emission levels, are unlikely to be causing adverse odour impacts off-site. Recent results in March 2014 indicated that the stack emission was less than the licence limit.

3.8.1 Odour generation potential

Based on the 2010 modelling projections the bioscrubber stack presents as a major odour emission source, similar in emission rate to that of the uncovered external conveyor, but a source with minor odour impact potential, by virtue of its elevated discharge point.

Odour Impact Potential Score: 1

4 ODOUR MITIGATION MEASURES

The following section is designed to systemically address Part 2B of the Pollution Studies and Reduction Programs as outlined in the Environment Protection Licence (No. 6229), as follows:

> *B) Identification of odour mitigation measures proposed to address each of the sources identified in the audit in (2A). The reduction in odour must be quantitatively evaluated in accordance with methodology agreed to by the EPA. The assessment must quantitatively demonstrate how the combination of proposed measures will ensure offensive odours will not be emitted beyond the boundary of the premises.*

As previously indicated in **Section 3**, the facility has carried out several mitigation measures since the NSW EPA 2013 Mulgrave/Windsor project. The audit has found that all repair works set out in the *Pollution Studies and Reduction Programs U1.1* have now been completed. While it is difficult to quantitatively assess the extent to which these improvement measures have been effective, it is clear from TOU's experience gained during the NSW EPA 2013 Mulgrave/Windsor project and observations in this audit that the completed measures have significantly reduced fugitive emissions from both the Pre-wet building and Phase 1 building area operations. Notwithstanding this, there are further measures that the facility can undertake to improve fugitive emissions from its operations. These have been described in the following section.

4.1 RAW MATERIALS STORAGE SHED

Whilst considered a low odour generation potential (see **Section 3.4.1**), this audit has found that the 'brew' process undertaken in the south-westerner corner of the Raw Materials Storage Shed can be occasionally detected off-site, and is therefore amendable to mitigation. It is therefore recommended that the provision of plastic strips or similar along the northern section of the Raw Materials Storage Shed be installed to contain odour/dust emissions from this area. It is understood that the facility has intended on undertaking this work already as per their current OMP.

- **Action:** Continue with the installation of plastic trips or similar along the northern section of the Raw Materials Storage Shed.

4.2 THE BALE WETTING PROCESS AND AREA & PROCESS WATER COLLECTION PIT

It is clear that odour emissions from the bale wetting operation are related predominately to the quality and odour emission potential of the process water applied during the bale wetting process. As such, it is important that the quality of the process water used in this process be regularly monitored. This can be achieved through daily olfactory inspections of the process water collection pit and the general bale wetting process areas. In the event that the contents of the process water collection pit is determined to be more odorous than that observed in this audit, the bale wetting operations should be postponed and only be resumed under favourable wind conditions and/or when an improved measure in quality is observed.

In addition, the process water collection pit contents should remain under continuous aeration at all times, independent of whether bale wetting operations are being undertaken (aeration is always running). The solid material from the collection pit screen should be removed daily and in a manner that does not give rise to problematical odour emissions. The audit understands that this is current practice at the facility.

- **Action:**
  - Daily olfactory inspections of the process water collection pit and general bale wetting process areas; and
  - The process water collection pit contents to remain under continuous aeration at all times, independent of bale wetting operating conditions.

4.3 PRE-WET BUILDING

Whilst a considerable amount of repair works have been recently carried out to the Pre-wet building through cladding and sheeting, the provision of plastic strips or similar in the upper sections of the main doorway at the north-eastern corner of the building would assist in retaining thermally buoyant air within the building, given that these openings must remain open for practical and OH&S reasons. This provision should also be applied to the south-eastern corner opening of the Pre-wet building.

- **Action:** Install plastic strips or similar in the upper section of the doorways at both the north-eastern and south-eastern corner of the Pre-wet building. It is understood that as of the issue of this audit report this work has already been completed.

4.4 PHASE 1 BUILDING AND WORKING HALL

As previously mentioned in **Section 3.6**, the Phase 1 working hall forms part of the main Phase 1 building. It is equipped with 3 large openings/doorways. The southern side of the working hall is fitted with a door which is usually kept open during working hours. Consideration should be given to modifying operating practices such that the frequency and duration of opening the southern door is minimised. This would reduce the potential for cross-flow of air through and out of the hall, particularly under southerly winds. In addition, any required/remaining cladding and sheeting works to the southern wall of the building and working hall should be completed as soon as practically possible. In addition, similar repairs to the Phase 1 eastern wall and roofing should be undertaken.

- **Action:** Continue cladding and sheeting repair works to the southern and eastern wall and 1 metre section (eastern) roofing of the Phase 1 building.

4.5 PHASE 1 TO PHASE 2 BUILDING TRANSFER CONVEYOR

In addition to the complete covering of the Phase 1 External Conveyor (see **Section 3.7**), the facility should also cover the Phase 1 Transfer Conveyor that is adjacent to the Phase 1 building northern wall. This conveyor is responsible for transferring finished Phase 1 product to the Phase 2 Building. As the finished product is still relatively active, and can therefore give rise to fugitive emissions, this audit considers that there would be benefits in covering this conveyor's transfer point, similarly to the Phase 1 External Conveyor.

- **Action:** Install/enclose Phase 1 Transfer Conveyor transfer point located next to the Phase 1 building northern wall. This should be carried out in a manner than attenuates fugitive odour emissions from this area.

4.6 FUTURE PLANS

The audit was advised by the facility that there are major future upgrades planned that will result in the full enclosure of all process operations. Whilst the exact details of these upgrades are yet to the be finalised, the audit was advised that the concept design of the upgrade involves the full enclosure of the Raw Materials Storage Shed, Pre-wet building, Phase 1 Building and Working Hall This site-wide enclosure will result in the full containment of all emissions at the facility.

The captured air emissions (both point source and ventilation) from the future-enclosure of process operations will be directed to a completely new odour control system (OCS) that will consist of a set of acid scrubbers for removal of high levels of NH_3 (expected to be in the range of 500-800+ parts per million) followed by a biofiltration system. The biofilter that will service the new facility is currently being designed with allowance for future extensions as required. The new area being prepared for this future work will permit a biofilter area size is understood to be adequate for handling the expected airflow loadings with contingency civil works to allow future expansion. The nominal design airflow will allow for negative pressure conditions to be achieved in all buildings and full enclosure and treatment of all emissions generated during the mushroom substrate composting process.

The acid scrubbers and biofilter-based OCS will reside in the south-western area of the facility. The audit has sighted a concept site layout for the upgrade plans. It is understood that civil works to prepare the ground for this planned upgrade has already begun. This was sighted during several TOU site visits in the audit. The completion date for this major upgrade is yet to be determined. It is understood that the project development will continue to be discussed directly with EPA.

This planned major upgrade should eliminate all fugitive emission sources from the facility under normal operating conditions, with only the treated emissions from the biofilter and the well-dispersed stack emissions leaving the site.

4.7 ODOUR MANAGEMENT PLAN

An Odour Management Plan (OMP) should be considered a 'live' document that is readily accessible to site personnel at all times. The OMP document should consider all aspects of monitoring, practices, and protocols adopted at a facility that are designed to attenuate odour emissions from process operations, specify the handling of any odour complaints and establish an open communication channel with the surrounding community.

The audit was supplied a copy of the facility's current OMP document which was completed by Todoroski Air Sciences (Todoroski) in April 2012 as part of the Project Approval for the expansion works at the time. The audit endorses the planned full enclosure of process operations at the facility as per the facility's current OMP. Whilst outside the scope of the audit, the OMP was reviewed by TOU and the following updates should be considered:

- The OMP should be a site-specific document that describes the existing process operations and practices at the facility. A process description section should be included that allows the basic details of the five key stages of the mushroom substrate composting process (similar in detail to **Section 2**);

- Outline and describe existing protocols, management practices and controls at the facility that are aimed at attenuating odour emissions. This should be specific to each key process area at the facility (i.e. Pre-wet building, Phase 1 Trans Hall, etc.);

- Outline and describe how any required maintenance work is carried out and include the measures taken by the facility to attenuate odour emissions during this period. This also should be specific to each key process area; and

- Reflect the major planned upgrade works to the facility as discussed in **Section 4.7**, once completed.

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REPORT SIGNATURE PAGE

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Odour Emission Compliance Test

Tunnel Composter Bio-Scrubber

ELF Farm Supplies Pty Ltd

Mulgrave, NSW

Project No.: 5433/S23456/14

Date of Survey: 3 to 9 December 2014

Date of Issue: 22 December 2014

Stephenson
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ODOUR EMISSION COMPLIANCE TEST

TUNNEL COMPOSTER BIO-SCRUBBER

ELF FARM SUPPLIES PTY LTD

MULGRAVE, NSW

PROJECT NO.: 5433/S23456/14

DATE OF SURVEY: 3 TO 9 DECEMBER 2014

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TABLE OF CONTENTS

TABLE OF TABLES

TABLE OF TABLES APPENDICES

TABLE OF FIGURES APPENDICES

1 INTRODUCTION

Stephenson Environmental Management Australia (SEMA) was requested by Elf Farm Pty Ltd to assess the odour emissions from the stack serving the tunnel composters at their composting facility located at Mulgrave, New South Wales (NSW).

The principal objectives of the tests were to measure odour emission concentrations from the stack and to determine compliance of the odour emission with the facility's Environment Protection Licence (EPL) No. 6229. The EPL was issued by the Environment Protection Authority (EPA) in accordance with the *Protection of the Environment Operations Act 1997*. The EPA is now incorporated into the Office of Environment and Heritage (OEH).

The emission parameters monitored in this survey were:

- Odour concentration
- Stack exhaust gas velocity, exhaust gas temperature, and hence discharge volume
- Moisture
- Mass Odour Emission Rate (MOER).

Odour emission testing was undertaken between 3 and 9 December 2014 at various times during a typical composting cycle. Table 1-1 shows when testing was carried out on the stack.

TABLE 1-1 ODOUR TESTING PROGRAM

Day of the Week	Date	Nominal Time for Sampling	Number of Odour Samples Taken per Visit
Wednesday	3/12/2014	2pm	1
Thursday	4/12/2014	3pm	1
Friday	5/12/2014	3am	1
Monday	8/12/2014	3am	1
Tuesday	9/12/2014	3am	1

2 PRODUCTION CONDITIONS

The odour emission samples were collected with the composting plant operating under a normal seven-day cycle running from Wednesday December 3 to Tuesday December 9, 2014.

Elf Farm Supplies holds all relevant production records should they be required for review.

3 RESULTS AND DISCUSSION

3.1 EMISSION TEST RESULTS

The results of the emission tests are presented in Table 3-1. SEMA completed the odour sampling. SEMA is NATA accredited for the odour sampling, NATA accreditation number 15043.

Odour Research Laboratories Australia (ORLA) performed the odour analysis. ORLA is a division of Peter W Stephenson & Associates Pty Ltd and is NATA accredited to AS4323.3 for odour analysis, accreditation number 15043. ORLA is the first NATA accredited odour analysis laboratory in New South Wales.

The Certificates of Analysis, Olfactometer Test Reports No. 5433/ORLA/01, 5433/ORLA/02, 5433/ORLA/03 and 5433/ORLA/04 are presented in Appendix A of this report.

The odour emission sampling and olfactometric analysis was conducted in accordance with Australian Standard (AS) 4323.3. Refer to Section 5 of this report for further detail.

TABLE 3-1 ODOUR EMISSION CONCENTRATION RESULTS

Day of Week	**Wednesday**	**Thursday**	**Friday**	**Monday**	**Tuesday**
Date	3/12/2014	4/12/2014	5/12/2014	8/12/2014	9/12/2014
Location	Bio-Scrubber Outlet Stack				
Time Sample Taken (hours)	1358-1409	1503-1515	0320-0341	0327-0338	0321-0331
SEMA Sample No.	724372	724373	724374	724375	724376
ORLA Sample No.	4134	4135	4136	4139	4141
Concentration (ou)	1,905	1,738	1,122	1,334	4,303

Key:
ou = odour unit

3.2 ENVIRONMENT PROTECTION LICENCE NO. 6229

Table 3-2 summarises the odour emission limit for the tunnel composter stack at Elf Farm Supplies Pty Ltd under their EPL Licence No. 6229. The criterion is defined by the 100th percentile concentration limit as a Mass Odour Emission Rate (MOER) in Odour Units per second (ou/s) on a rolling annual average. A copy of the relevant section of this Licence is included in Appendix B.

TABLE 3-2 100TH PERCENTILE ODOUR EMISSION LIMIT

	EPA Licence Criteria
100th Percentile MOER Limit	55,400 ou/s
Averaging Period	Rolling annual

Key:
MOER = Mass odour emission rate
ou/s = Odour units per second which is a misnomer in EPA Licence 6229 (EPL) and should now read odour units. cubic metres per second (ou.m^3/s)

3.3 ODOUR EMISSION RATES

The MOER for all samples was determined to establish compliance with the EPA/OEH EPL criteria.

The MOER can be calculated using the following formula:

MOER = velocity (m/s) x total area of the stack (m^2) x odour concentration (ou)

Velocity = velocity of air in stack in metres per second as shown in Table 3-3
Total Surface Area of the Stack = Cross Sectional Area of the Stack in square metres (m^2).
Odour Concentration = As per Table 2-1 and Table 3-3.

The above formula calculates MOER based on actual conditions. However the Reference Conditions specified that the MOER is to be reported as dry, 293 degrees Kelvin (K) and 101.3 kilopascals (kPa).

SEMA measured the moisture content, temperature and pressure of the exhaust gas stream, at the same time as the odour emissions were sampled. These measurements enabled the MOER to be corrected to the above reference conditions. The MOER for each of the samples is shown in Table 3-3. Refer to Appendix C for detailed Exhaust Gas Flow Data in table format.

TABLE 3-3 ODOUR EMISSION RATES OVER A TYPICAL COMPOSTING CYCLE – DECEMBER 2014

Day	**Wednesday**	**Thursday**	**Friday**	**Monday**	**Tuesday**	**Average**
Date	3/12/2014	4/12/2014	5/12/2014	8/12/2014	9/12/2014	
ORLA Sample No.	4134	4135	4136	4139	4141	
Time (hours)	1358-1409	1503-1515	0320-0341	0327-0338	0321-0331	
Odour Conc. (ou)	1,905	1,738	1,122	1,334	4,303	2,080
Stack Velocity (m/s)	16.5	17.0	18.6	14.9	14.1	16.2
Stack Cross Sectional Area (m^2)	1.272	1.272	1.272	1.272	1.272	1.272
MOER (ou.v/s)	**34,759**	**30,642**	**20,873**	**19,890**	**63,248**	**33,882**
EPL MOER Limit (ou/s) Annual Rolling Average	55,400	55,400	55,400	55,400	55,400	55,400

Key:
No. = Number
Conc. = concentration
* = Rolling annual averaging period
MOER = Mass Odour Emission Rate
m/s = metres per second
ou.v/s = Odour Unit volumes per second
m^2 = square metres
ou/s = Odour Units per second

4 CONCLUSIONS

This odour emission survey was conducted over a typical seven day composting cycle. The measured stack MOER's for the monitoring period were in the range of 19,890 ou.m^3/s to 63,248 ou.m^3/s. The average MOER for the December 2014 composting cycle, which was considered to be typical, was 33,882 ou.m^3/s.

Therefore, these MOER's comply with the EPA/OEH EPL No. 6229 Licence Criteria of 55,400 ou.m^3/s Rolling Annual Average.

5 TEST METHODS

5.1 ODOUR

(Standards Association of Australia AS4323.3 and OEH NSW OM-7)

Samples were collected in 30L Nalophane sampling bags which are enclosed in airtight plastic containers.

Odorous gas for analysis was drawn through a Teflon (PTFE) sample probe. The gas then passes through a Teflon (PTFE) tube connected to the Nalophane sampling bag. The sampling pump is connected to the airtight plastic container to provide a sample gas flow-rate of approximately 0.5 – 1.5 litres per minute. After the required volume has been sampled, the pump is stopped and the bag sealed with a stainless steel valve.

Using a triangular forced choice olfactometer, the Nalophane bag of odour sample was dynamically diluted to various concentrations with dry odour free air.

The diluted sample was then presented to a panel of screened panellists as one of these airflows. The panellists then recorded if they could detect any odour and from which flow. The other two flows were discharging odour free air.

The odour is always presented to the panellists in ascending concentration; that is, from lower to higher concentration. The panellists are required at each dilution level to give a response as to what they are smelling from the flows (forced choice methodology). The response options for the panellists are:

'Guess'	Unable to determine which air flow contains the diluted odours
'Inkle'	Thinks that one of the flows may be different from the other two flows
'Detect' or 'Certain'	Is confident that one of the airflows smells different from the other two flows. Not necessarily able to say what the smell is.
'Recognise'	Thinks that one of the flows may be different from the other two flows and is able to: ▪ Assign a 'hedonic tone' (pleasantness scale number) to the odour ranging from –10 to 10 and/or ▪ Able to assign a character to the odour, as in 'it smells like …' *Note: that the Recognise level concentration and Hedonic Tone and Odour descriptors are obtained with the diluted odour, panellists are not exposed to the full strength odour.*

The percentage panel response and dilution levels used were then entered into a computer programme to determine the 50% panel response. This dilution level corresponds to the odour concentration of the sample.

Sampling and dilution lines are constructed from teflon, stainless or glass to prevent contamination of the sample.

The sampling and the dilution procedures used were in accordance with OEH NSW Methods OM-7 and OM-8 which are based on Standards Association of Australia, AS4323.3.

5.1.1 ODOUR PANEL SELECTION

Odour panellists must meet certain criteria to qualify as and remain panellists. Their average sensitivity to n-Butanol must be between 20 and 80 parts per billion (ppb) and their variability in response to n-Butanol must be within a certain range.

Panellists are tested against n-Butanol before every panel session to ensure they are in compliance.

Panellists should not suffer from respiratory complaints, nor should they eat or smoke or drink anything but water during the half hour preceding or during the test period and their person and clothing should be odour free and have not been exposed to an odorous environment before testing.

5.1.2 ODOUR TERMINOLOGY

The odour level is expressed in odour units and for mixed odours is analogous to concentration expressed in parts per billion. The odour detection level is defined as the ratio of *the volume that a sample of odorous gas would occupy when diluted to the threshold of detection of that odour* to *the volume of the sample*. In simpler terms, the ratio indicated the number of dilutions necessary to reduce the odour to its threshold of detection or odour detection threshold. This ratio is expressed in odour units or number of dilutions to detection threshold. For example, a value of 2,000 odour units would mean the volume of the initial sample of odorous gas would need to be diluted 2,000 times before the odour would just be detectable to the average human nose, that is, at the odour detection threshold.

5.2 EXHAUST GAS VELOCITY

(OEH NSW TM-2 and USEPA Method 12)

Velocity profiles were obtained across the stack utilising an Airflow Developments Ltd. S-type pitot tube and digital manometer.

5.3 EXHAUST GAS TEMPERATURE

(OEH NSW TM- 2, 3 & 4 and USEPA Methods 2, 3 & 4)

The exhaust gas temperature was measured using a Digital thermometer (0-1200°C) connected to a chromel/alumel (K-type) thermocouple probe.

5.4 EXHAUST GAS MOISTURE CONTENT

(OEH NSW TM-22)

Moisture from the stack was collected in accordance with OEH NSW TM-22 sampling train. The collected moisture was weighed and calculated to a percentage of stack gas.

5.5 ACCURACY

All results are quoted on a dry basis.

Appendix C of (British Standard) 893 presents a range of accuracies for various parts of the isokinetic sampling procedure including pressure, velocity, temperature and particulate sampling. At best, an accuracy of ± 10% can be expected.

For odour the ratio between two single measurements, performed on the same testing material in this laboratory under repeatability conditions, will not be larger than 2.65 in 95% of cases. (Source – AS/NZS 4323.3:2001 Appendix B Section B2).

APPENDIX A – CERTIFICATES OF ANALYSIS

Odour Research Laboratories Australia

A Division of Peter W. Stephenson & Associates Pty Ltd
ACN 002 600 526 (Incorporated in NSW)
ABN 75 002 600 526

Newington Business Park
Unit 7/2 Holker Street
Newington NSW 2127 Australia
Tel: (02) 9737 9991
Fax: (02) 9737 9993
E-Mail: pstephenson@orla.com.au

Olfactometry Test Report

The measurement was commissioned by SEMA on behalf of:

Client	Organisation:	Elf Farm Supplies
	Address:	108 Mulgrave Road, Mulgrave NSW 2756
	Contact:	Neil Cockerell
	Sampling Site:	Main Stack
	Telephone:	02 4577 5000
	Email:	manager@elffarm.com.au
Project	ORLA Report Number:	5433/ORLA/01
	Project Manager:	Peter Stephenson
	Testing operator:	Peter Stephenson
	ORLA Sample number(s):	4134
	SEMA Sample number(s):	724372
Order	Analysis Requested:	Odour Analysis
	Order requested by:	SEMA on behalf of Elf Farm Supplies
	Date of order:	02 December 2014
	Order number:	4287
	Telephone:	02 9737 9991
	Signed by:	Peter Stephenson
	Order accepted by:	Peter Stephenson
Report	Date of issue:	12 December 2014

NATA accredited laboratory number 15043.

Accredited for Compliance with ISO/IEC 17025.

ODOUR CONCENTRATION MEASUREMENTS RESULTS 5433/ORLA/01

Investigated Item	Odour concentration in odour units 'ou' determined by Sensory odour concentration measurements, of an odour sample supplied in a sampling bag. All samples were received in good condition.
Analysis Method	The samples were analysed in accordance with AS/NZS4323.3:2001.
Identification	The odour sample bags were labelled individually. Each label recorded the testing laboratory, sample number, sampling location (or Identification) sampling date and time, dilution ratio (if dilution was used) and whether further chemical analysis was required.
Method	The odour concentration measurements were performed using dynamic olfactometry according to the Australian Standard 'Determination of Odour Concentration by Dynamic Olfactometry AS/NZS4323.3:2001. The odour perception characteristics of the panel within the presentation series for the samples were analogous to that for n-butanol calibration. Any deviation from the Australian standard is recorded in the 'Comments' section of this report.
Instrument Used	The Olfactometer used during this testing session was: AC'SCENT International Olfactometer
Measuring Range	The measuring range of the AC'SCENT International olfactometer is $13 \leq \chi \leq 72{,}444$ ou. If the measuring range was insufficient the odour samples will have been pre-diluted.
Environment	The measurements were performed in an air- and odour-conditioned room. The room temperature is maintained between ± 3°C.
Measuring Dates	The date of each measurement is specified with the results.
Instrument Precision	The precision of this instrument (expressed as repeatability) for a sensory calibration must be $r \leq 0.05$ in accordance with the Australian Standard AS/NZS4323.3:2001. AC'SCENT International Olfactometer: $r = 0.0050$ (February 2014) Compliance – Yes
Instrumental Accuracy	The accuracy of this instrument for a sensory calibration must be $A \leq 0.20$ in accordance with the Australian Standard AS/NZS4323.3:2001. AC'SCENT International Olfactometer: $A = 0.068$ (February 2014) Compliance – Yes
Lower Detection Limit (LDL)	The LDL for the AC'SCENT International Olfactometer has been determined to be 13 ou
Traceability	The measurements have been performed using standards for which the traceability to the national standard has been demonstrated. The assessors are individually selected to comply with fixed criteria and are monitored every session to keep within the limits of the standard. The results from the assessors are traceable to primary standards of n-butanol in nitrogen.

12 December 2014

Peter Stephenson
Managing Director

Odour Research Laboratories Australia

Odour Olfactometry Results – 5433/ORLA/01

Sample Location	Sample ID No.	Sampling Date & Time	ORLA Sample No.	Analysis Date & Time (Completed)	Panel Size	Valid ITEs	Sample Pre-Dilution	Sample Odour Concentration (ou) [1]	Sample Odour Concentration (ou) [2]	Odour Character & Hedonic Tone [^ +]
Sample ID: Stack Sample 1	724372	03/12/2014 1358-1409	4134	04/12/2014 1030-1055	4	8	Nil	1,905	1,905	Landfill leachate, earthy, musty, rotten fish, sewer, septic

Odour Research Laboratories Australia

Odour Panel Calibration Results – 5433/ORLA/01

Reference Odorant	ORLA Sample No.	Concentration of Reference Gas (ppm)	Reference Gas Measured Concentration (ou)	Panel Average Measured Concentration (ppb) [3]	Does this panel calibration measurement comply with AS/NZS4323.3:P2001 (Yes/No) [4]
n-butanol	4132	41	804	51.0	Yes

Comments: All samples were collected by Stephenson Environmental Management Australia and analysed by Odour Research Laboratories Australia at their Sydney Laboratory.

Notes from Odour Olfactometry Results:

[1] Sample Odour Concentration: as received in the bag

[2] Sample Odour Concentration: allowing for pre-dilution

[3] Panel Average Measured Concentration: indicates the sensitivity of the panel for the session completed

[4] Target Range for reference gas n-butanol is $20 \leq \chi \leq 80$ ppb and compliance with AS/NZ4323.3:2001 is based on the individuals rolling average and not on the panel average measured concentration. Panellist Rolling Average: SR = 47.1, TL = 41.0, DS = 31.5, PP = 49.1

^ denotes the Average Hedonic Tone: describes the pleasantness of the odour being presented where (+5) represents Very Pleasant, (0) represents Neutral and (-5) represents Very Unpleasant and has been derived from the panellist responses at the recognition threshold.

+ This value is not part of our NATA Scope of Accreditation and AS4323.3

--END OF TEST REPORT--

Odour Research Laboratories Australia

A Division of Peter W. Stephenson & Associates Pty Ltd
ACN 002 600 526 (Incorporated in NSW)
ABN 75 002 600 526

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Unit 7/2 Holker Street
Newington NSW 2127 Australia
Tel: (02) 9737 9991
Fax: (02) 9737 9993
E-Mail: pstephenson@orla.com.au

Olfactometry Test Report

	The measurement was commissioned by SEMA on behalf of:	
Client	Organisation:	Elf Farm Supplies
	Address:	108 Mulgrave Road, Mulgrave NSW 2756
	Contact:	Neil Cockerell
	Sampling Site:	Main Tunnel Bioscrubber Exhaust Stack
	Telephone:	02 4577 5000
	Email:	manager@elffarm.com.au
Project	ORLA Report Number:	5433/ORLA/02
	Project Manager:	Peter Stephenson
	Testing operator:	Peter Stephenson
	ORLA Sample number(s):	4135,4136
	SEMA Sample number(s):	724373, 724374
Order	Analysis Requested:	Odour Analysis
	Order requested by:	SEMA on behalf of Elf Farm Supplies
	Date of order:	05 December 2014
	Order number:	4288
	Telephone:	02 9737 9991
	Signed by:	Peter Stephenson
	Order accepted by:	Peter Stephenson
Report	Date of issue:	12 December 2014

NATA accredited laboratory number 15043.

Accredited for Compliance with ISO/IEC 17025.

Investigated Item	Odour concentration in odour units 'ou' determined by Sensory odour concentration measurements, of an odour sample supplied in a sampling bag. All samples were received in good condition.
Analysis Method	The samples were analysed in accordance with AS/NZS4323.3:2001.
Identification	The odour sample bags were labelled individually. Each label recorded the testing laboratory, sample number, sampling location (or Identification) sampling date and time, dilution ratio (if dilution was used) and whether further chemical analysis was required.
Method	The odour concentration measurements were performed using dynamic olfactometry according to the Australian Standard 'Determination of Odour Concentration by Dynamic Olfactometry AS/NZS4323.3:2001. The odour perception characteristics of the panel within the presentation series for the samples were analogous to that for n-butanol calibration. Any deviation from the Australian standard is recorded in the 'Comments' section of this report.
Instrument Used	The Olfactometer used during this testing session was: AC'SCENT International Olfactometer
Measuring Range	The measuring range of the AC'SCENT International olfactometer is $13 \leq \chi \leq 72{,}444$ ou. If the measuring range was insufficient the odour samples will have been pre-diluted.
Environment	The measurements were performed in an air- and odour-conditioned room. The room temperature is maintained between ± 3°C.
Measuring Dates	The date of each measurement is specified with the results.
Instrument Precision	The precision of this instrument (expressed as repeatability) for a sensory calibration must be $r \leq 0.05$ in accordance with the Australian Standard AS/NZS4323.3:2001. AC'SCENT International Olfactometer: $r = 0.0050$ (February 2014) Compliance – Yes
Instrumental Accuracy	The accuracy of this instrument for a sensory calibration must be $A \leq 0.20$ in accordance with the Australian Standard AS/NZS4323.3:2001. AC'SCENT International Olfactometer: $A = 0.068$ (February 2014) Compliance – Yes
Lower Detection Limit (LDL)	The LDL for the AC'SCENT International Olfactometer has been determined to be 13 ou
Traceability	The measurements have been performed using standards for which the traceability to the national standard has been demonstrated. The assessors are individually selected to comply with fixed criteria and are monitored every session to keep within the limits of the standard. The results from the assessors are traceable to primary standards of n-butanol in nitrogen.

12 December 2014

Peter Stephenson
Managing Director

Odour Research Laboratories Australia

Odour Olfactometry Results – 5433/ORLA/02

Sample Location	Sample ID No.	Sampling Date & Time	ORLA Sample No.	Analysis Date & Time (Completed)	Panel Size	Valid ITEs	Sample Pre-Dilution	Sample Odour Concentration (ou) 1	Sample Odour Concentration (ou) 2	Odour Character & Hedonic Tone^ +
Sample ID: Stack Sample 2	724373	04/12/2014 1503-1515	4135	05/12/2014 1005-1030	4	8	Nil	1,738	1,738	Landfill, putrid, manure, decay, septic, rotten food, smelly sandshoes, sewage, fishy (-3.5)^
Sample ID: Stack Sample 3	724374	05/12/2014 0320-0341	4136	05/12/2014 1035-1105	4	8	Nil	1,122	1,122	Musty, decay, mould, burnt, musty, rotten cooked vegetables, sewage, fishy (-3.0)^

Odour Research Laboratories Australia

Odour Panel Calibration Results – 5433/ORLA/02

Reference Odorant	ORLA Sample No.	Concentration of Reference Gas (ppm)	Reference Gas Measured Concentration (ou)	Panel Average Measured Concentration (ppb) [3]	Does this panel calibration measurement comply with AS/NZS4323.3:P2001 (Yes/No) [4]
n-butanol	4137	41	955	42.9	Yes

Comments: All samples were collected by Stephenson Environmental Management Australia and analysed by Odour Research Laboratories Australia at their Sydney Laboratory.

Notes from Odour Olfactometry Results:

[1] Sample Odour Concentration: as received in the bag

[2] Sample Odour Concentration: allowing for pre-dilution

[3] Panel Average Measured Concentration: indicates the sensitivity of the panel for the session completed

[4] Target Range for reference gas n-butanol is $20 \leq \chi \leq 80$ ppb and compliance with AS/NZ4323.3:2001 is based on the individuals rolling average and not on the panel average measured concentration. Panellist Rolling Average: PR = 42.7, TL = 39.2, DS = 31.1, AM = 33.6

^ denotes the Average Hedonic Tone: describes the pleasantness of the odour being presented where (+5) represents Very Pleasant, (0) represents Neutral and (-5) represents Very Unpleasant and has been derived from the panellist responses at the recognition threshold.

+ This value is not part of our NATA Scope of Accreditation and AS4323.3

----------END OF TEST REPORT----------

Odour Research Laboratories Australia

A Division of Peter W. Stephenson & Associates Pty Ltd
ACN 002 600 526 (Incorporated in NSW)
ABN 75 002 600 526

Newington Business Park
Unit 7/2 Holker Street
Newington NSW 2127 Australia
Tel: (02) 9737 9991
Fax: (02) 9737 9993
E-Mail: pstephenson@orla.com.au

Olfactometry Test Report

The measurement was commissioned by SEMA on behalf of:

Client	Organisation:	Elf Farm Supplies
	Address:	108 Mulgrave Road, Mulgrave NSW 2756
	Contact:	Neil Cockerell
	Sampling Site:	Main Stack
	Telephone:	02 4577 5000
	Email:	manager@elffarm.com.au
Project	ORLA Report Number:	5433/ORLA/03
	Project Manager:	Peter Stephenson
	Testing operator:	Peter Stephenson
	ORLA Sample number(s):	4139
	SEMA Sample number(s):	724375
Order	Analysis Requested:	Odour Analysis
	Order requested by:	SEMA on behalf of Elf Farm Supplies
	Date of order:	08 December 2014
	Order number:	4289
	Telephone:	02 9737 9991
	Signed by:	Peter Stephenson
	Order accepted by:	Peter Stephenson
Report	Date of issue:	12 December 2014

NATA accredited laboratory number 15043.

Accredited for Compliance with ISO/IEC 17025.

Investigated Item	Odour concentration in odour units 'ou' determined by Sensory odour concentration measurements, of an odour sample supplied in a sampling bag. All samples were received in good condition.
Analysis Method	The samples were analysed in accordance with AS/NZS4323.3:2001.
Identification	The odour sample bags were labelled individually. Each label recorded the testing laboratory, sample number, sampling location (or Identification) sampling date and time, dilution ratio (if dilution was used) and whether further chemical analysis was required.
Method	The odour concentration measurements were performed using dynamic olfactometry according to the Australian Standard 'Determination of Odour Concentration by Dynamic Olfactometry AS/NZS4323.3:2001. The odour perception characteristics of the panel within the presentation series for the samples were analogous to that for n-butanol calibration. Any deviation from the Australian standard is recorded in the 'Comments' section of this report.
Instrument Used	The Olfactometer used during this testing session was: AC'SCENT International Olfactometer
Measuring Range	The measuring range of the AC'SCENT International olfactometer is $13 \leq \chi \leq 72{,}444$ ou. If the measuring range was insufficient the odour samples will have been pre-diluted.
Environment	The measurements were performed in an air- and odour-conditioned room. The room temperature is maintained between ± 3°C.
Measuring Dates	The date of each measurement is specified with the results.
Instrument Precision	The precision of this instrument (expressed as repeatability) for a sensory calibration must be $r \leq 0.05$ in accordance with the Australian Standard AS/NZS4323.3:2001. AC'SCENT International Olfactometer: $r = 0.0050$ (February 2014) Compliance – Yes
Instrumental Accuracy	The accuracy of this instrument for a sensory calibration must be $A \leq 0.20$ in accordance with the Australian Standard AS/NZS4323.3:2001. AC'SCENT International Olfactometer: $A = 0.068$ (February 2014) Compliance – Yes
Lower Detection Limit (LDL)	The LDL for the AC'SCENT International Olfactometer has been determined to be 13 ou
Traceability	The measurements have been performed using standards for which the traceability to the national standard has been demonstrated. The assessors are individually selected to comply with fixed criteria and are monitored every session to keep within the limits of the standard. The results from the assessors are traceable to primary standards of n-butanol in nitrogen.

12 December 2014

Peter Stephenson
Managing Director

Odour Research Laboratories Australia

Odour Olfactometry Results – 5433/ORLA/03

Sample Location	Sample ID No.	Sampling Date & Time	ORLA Sample No.	Analysis Date & Time (Completed)	Panel Size	Valid ITEs	Sample Pre-Dilution	Sample Odour Concentration (ou) 1	Sample Odour Concentration (ou) 2	Odour Character & Hedonic Tone^ +
Sample ID: Stack Sample 4	724375	08/12/2014 0327-0338	4139	08/12/2014 1030-1100	4	8	Nil	1,334	1,334	Rotting vegetables, garbage, sulphur, vomit, earthy, swampy (-3.5)^

Odour Research Laboratories Australia

Odour Panel Calibration Results – 5433/ORLA/03

Reference Odorant	ORLA Sample No.	Concentration of Reference Gas (ppm)	Reference Gas Measured Concentration (ou)	Panel Average Measured Concentration (ppb) [3]	Does this panel calibration measurement comply with AS/NZS4323.3:P2001 (Yes/No) [4]
n-butanol	4138	41	944	43.4	Yes

Comments: All samples were collected by Stephenson Environmental Management Australia and analysed by Odour Research Laboratories Australia at their Sydney Laboratory.

Notes from Odour Olfactometry Results:

[1] Sample Odour Concentration: as received in the bag

[2] Sample Odour Concentration: allowing for pre-dilution

[3] Panel Average Measured Concentration: indicates the sensitivity of the panel for the session completed

[4] Target Range for reference gas n-butanol is $20 \leq \chi \leq 80$ ppb and compliance with AS/NZ4323.3:2001 is based on the individuals rolling average and not on the panel average measured concentration. Panellist Rolling Average: SR = 47.1, TL = 39.2, PR =42.7, DS = 31.1

^ denotes the Average Hedonic Tone: describes the pleasantness of the odour being presented where (+5) represents Very Pleasant, (0) represents Neutral and (-5) represents Very Unpleasant and has been derived from the panellist responses at the recognition threshold.

+ This value is not part of our NATA Scope of Accreditation and AS4323.3

--END OF TEST REPORT--

Odour Research Laboratories Australia

A Division of Peter W. Stephenson & Associates Pty Ltd
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ABN 75 002 600 526

Newington Business Park
Unit 7/2 Holker Street
Newington NSW 2127 Australia
Tel: (02) 9737 9991
Fax: (02) 9737 9993
E-Mail: pstephenson@orla.com.au

Olfactometry Test Report

The measurement was commissioned by SEMA on behalf of:

Client	Organisation:	Elf Farm Supplies
	Address:	108 Mulgrave Road, Mulgrave NSW 2756
	Contact:	Neil Cockerell
	Sampling Site:	Main Stack
	Telephone:	02 4577 5000
	Email:	manager@elffarm.com.au
Project	ORLA Report Number:	5433/ORLA/04
	Project Manager:	Peter Stephenson
	Testing operator:	Ali Naghizadeh
	ORLA Sample number(s):	4141
	SEMA Sample number(s):	724376
Order	Analysis Requested:	Odour Analysis
	Order requested by:	SEMA on behalf of Elf Farm Supplies
	Date of order:	09 December 2014
	Order number:	4290
	Telephone:	02 9737 9991
	Signed by:	Ali Naghizadeh
	Order accepted by:	Ali Naghizadeh
Report	Date of issue:	12 December 2014

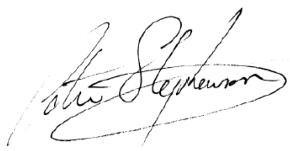
NATA accredited laboratory number 15043.

Accredited for Compliance with ISO/IEC 17025.

ODOUR CONCENTRATION MEASUREMENTS RESULTS 5433/ORLA/04

Investigated Item	Odour concentration in odour units 'ou' determined by Sensory odour concentration measurements, of an odour sample supplied in a sampling bag. All samples were received in good condition.
Analysis Method	The samples were analysed in accordance with AS/NZS4323.3:2001.
Identification	The odour sample bags were labelled individually. Each label recorded the testing laboratory, sample number, sampling location (or Identification) sampling date and time, dilution ratio (if dilution was used) and whether further chemical analysis was required.
Method	The odour concentration measurements were performed using dynamic olfactometry according to the Australian Standard 'Determination of Odour Concentration by Dynamic Olfactometry AS/NZS4323.3:2001. The odour perception characteristics of the panel within the presentation series for the samples were analogous to that for n-butanol calibration. Any deviation from the Australian standard is recorded in the 'Comments' section of this report.
Instrument Used	The Olfactometer used during this testing session was: AC'SCENT International Olfactometer
Measuring Range	The measuring range of the AC'SCENT International olfactometer is $13 \leq \chi \leq 72{,}444$ ou. If the measuring range was insufficient the odour samples will have been pre-diluted.
Environment	The measurements were performed in an air- and odour-conditioned room. The room temperature is maintained between ± 3°C.
Measuring Dates	The date of each measurement is specified with the results.
Instrument Precision	The precision of this instrument (expressed as repeatability) for a sensory calibration must be $r \leq 0.05$ in accordance with the Australian Standard AS/NZS4323.3:2001. AC'SCENT International Olfactometer: $r = 0.0050$ (February 2014) Compliance – Yes
Instrumental Accuracy	The accuracy of this instrument for a sensory calibration must be $A \leq 0.20$ in accordance with the Australian Standard AS/NZS4323.3:2001. AC'SCENT International Olfactometer: $A = 0.068$ (February 2014) Compliance – Yes
Lower Detection Limit (LDL)	The LDL for the AC'SCENT International Olfactometer has been determined to be 13 ou
Traceability	The measurements have been performed using standards for which the traceability to the national standard has been demonstrated. The assessors are individually selected to comply with fixed criteria and are monitored every session to keep within the limits of the standard. The results from the assessors are traceable to primary standards of n-butanol in nitrogen.

12 December 2014



Peter Stephenson
Managing Director

Odour Research Laboratories Australia

Odour Olfactometry Results – 5433/ORLA/04

Sample Location	Sample ID No.	Sampling Date & Time	ORLA Sample No.	Analysis Date & Time (Completed)	Panel Size	Valid ITEs	Sample Pre-Dilution	Sample Odour Concentration (ou) [1]	Sample Odour Concentration (ou) [2]	Odour Character & Hedonic Tone [^ +]
Sample ID: Stack Sample 5	724376	09/12/2014 0321-0331	4141	09/12/2014 0955-1029	4	8	Nil	4,303	4,303	Rotten egg gas, dead animal, rotting garbage, fish, rotting fish, earthy, dirty, smelly socks (-4.5)[^]

Odour Research Laboratories Australia

Odour Panel Calibration Results – 5433/ORLA/04

Reference Odorant	ORLA Sample No.	Concentration of Reference Gas (ppm)	Reference Gas Measured Concentration (ou)	Panel Average Measured Concentration (ppb) [3]	Does this panel calibration measurement comply with AS/NZS4323.3:P2001 (Yes/No) [4]
n-butanol	4140	41	1,122	36.5	Yes

Comments: All samples were collected by Stephenson Environmental Management Australia and analysed by Odour Research Laboratories Australia at their Sydney Laboratory.

Notes from Odour Olfactometry Results:

[1] Sample Odour Concentration: as received in the bag

[2] Sample Odour Concentration: allowing for pre-dilution

[3] Panel Average Measured Concentration: indicates the sensitivity of the panel for the session completed

[4] Target Range for reference gas n-butanol is $20 \leq \chi \leq 80$ ppb and compliance with AS/NZ4323.3:2001 is based on the individuals rolling average and not on the panel average measured concentration. Panellist Rolling Average: SR = 47.1, TL = 39.2, PR =40.8, DS = 32.5

^ denotes the Average Hedonic Tone: describes the pleasantness of the odour being presented where (+5) represents Very Pleasant, (0) represents Neutral and (-5) represents Very Unpleasant and has been derived from the panellist responses at the recognition threshold.

+ This value is not part of our NATA Scope of Accreditation and AS4323.3

----------END OF TEST REPORT----------

APPENDIX B – PART OF OEH EPL LICENCE

Section 55 Protection of the Environment Operations Act 1997

Environment Protection Licence

Licence - 6229

NSW EPA

P1 Location of monitoring/discharge points and areas

P1.1 The following points referred to in the table below are identified in this licence for the purposes of monitoring and/or the setting of limits for the emission of pollutants to the air from the point.

Air

EPA identi-fication no.	Type of Monitoring Point	Type of Discharge Point	Location Description
1	Discharge to air Air emissions monitoring	Discharge to air Air emissions monitoring	Bioscrubber chimney labelled as "Chimney" on "Figure 5.2 - Plant Layout" and "Figure 5.5 - Stage 1 - Phase 1 Bioscrubber Detail" contained in the "Mulgrave Mushroom Substrate Plant Environmental Management Plan" dated August 2002.

3 Limit Conditions

L1 Pollution of waters

L1.1 Except as may be expressly provided in any other condition of this licence, the licensee must comply with section 120 of the Protection of the Environment Operations Act 1997.

L2 Concentration limits

L2.1 For each monitoring/discharge point or utilisation area specified in the table\s below (by a point number), the concentration of a pollutant discharged at that point, or applied to that area, must not exceed the concentration limits specified for that pollutant in the table.

L2.2 Where a pH quality limit is specified in the table, the specified percentage of samples must be within the specified ranges.

L2.3 To avoid any doubt, this condition does not authorise the pollution of waters by any pollutant other than those specified in the table\s.

L2.4 Air Concentration Limits

POINT 1

Pollutant	Units of measure	100 percentile concentration limit	Reference conditions	Oxygen correction	Averaging period
Odour	odour units per second	55400			

L2.5 For each monitoring/discharge point specified in the table(s) in L2 above (by a point number), the reference conditions and averaging period of a pollutant discharged at that point must be reported at the reference conditions and averaging period specified for that pollutant in the following table.

Section 55 Protection of the Environment Operations Act 1997

Environment Protection Licence

Licence - 6229

NSW EPA

Pollutant	Reference Conditions	Duration	Averaging Period
Odour	dry, 293K, 101.3kPa	1 hour	Rolling annual

L3 Waste

L3.1 The licensee must not cause, permit or allow any waste to be received at the premises, except the wastes expressly referred to in the column titled "Waste" and meeting the definition, if any, in the column titled "Description" in the table below.

Any waste received at the premises must only be used for the activities referred to in relation to that waste in the column titled "Activity" in the table below.

Any waste received at the premises is subject to those limits or conditions, if any, referred to in relation to that waste contained in the column titled "Other Limits" in the table below.

This condition does not limit any other conditions in this licence.

Code	Waste	Description	Activity	Other Limits
NA	Chicken manure		Composting Waste storage	NA
NA	Feather meal		Composting Waste storage	NA
NA	Cotton seed meal		Composting Waste storage	NA
NA	Natural organic fibrous materials	As defined in Schedule 1 of the POEO Act, in force from time to time	Composting Waste storage	NA
NA	Horse stable bedding		Composting Waste storage	NA
NA	General or Specific exempted waste	Waste that meets all the conditions of a resource recovery exemption under Clause 51A of the Protection of the Environment Operations (Waste) Regulation 2005	As specified in each particular resource recovery exemption	NA
NA	Waste	Any waste received on site that is below licensing thresholds in Schedule 1 of the POEO Act, as in force from time to time	-	NA

L3.2 The licensee must ensure that the amount of excess compost that is stored at the premises does not exceed 150 tonnes at any one time.

APPENDIX C – EXHAUST GAS FLOW DATA

Glossary:

%	=	percent
^{o}C	=	Degrees Celsius
am^3/min	=	cubic metre of gas at actual conditions per minute
Normal Volume (m^3)	=	cubic metre at 0°C and 760 mm pressure and 1 atmosphere
am^3	=	cubic metre of gas at actual conditions
g/g mole	=	grams per gram mole
g/s	=	grams per second
hrs	=	hours
kg/m^3	=	kilograms per cubic metre
kPa	=	kilopascals
m^2	=	square metre
m/s	=	metre per second
m^3/min	=	cubic metre per minute at $0^{0}C$ and 1 atmosphere
m^3/sec	=	cubic metre per second at $0^{0}C$ and 1 atmosphere
mg	=	milligrams
mg/ m^3	=	milligrams per cubic metre at $0^{o}C$ and 1 atmosphere
ou	=	odour units
ou.m^3/s	=	odour units cubic metre of gas at dry, 293 K and 101.3 kPa
K	=	degrees Kelvin
O_2	=	Oxygen

Abbreviations for names of SEMA staff who completed the either/and/or Sampling, Analysis and Checking

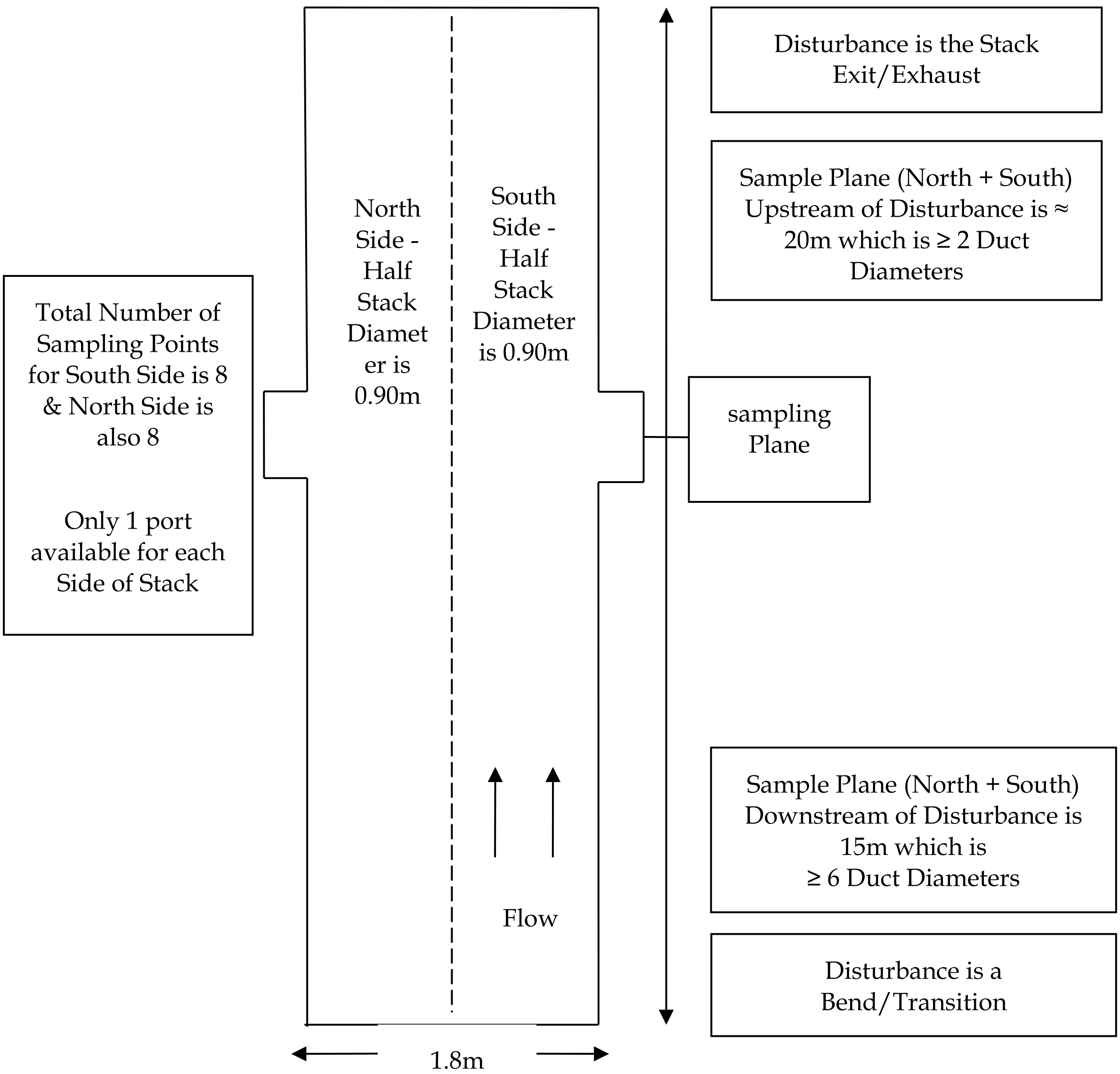
PWS	=	Peter Stephenson
AN	=	Ali Naghizadeh
AP	=	Alok Pradhan

TABLE C - 1 EMISSION TEST RESULTS – FLOW AND ODOUR

Emission Test Results	Flow	Flow	Flow	Flow	Flow
Project Number	5433	5433	5433	5433	5433
Project Name	Elf Farm Bio-scrubber	Elf Farm Bio-scrubber	Elf Farm Bio-scrubber	Elf Farm Bio-scrubber	Elf Farm Bio-scrubber
Test Location	Stack	Stack	Stack	Stack	Stack
Date	03/12/2014	04/12/2014	05/12/2014	08/12/2014	09/12/2014
Run	1	2	3	4	5
Analysis	Flow	Flow	Flow	Flow	Flow
Method	TM-1 & TM-2 & TM-22	TM-1 & TM-2 & TM-22	TM-1 & TM-2 & TM-22	TM-1 & TM-2 & TM-22	TM-1 & TM-2 & TM-22
Sample Start Time (hrs)	13:58	15:03	3:20	3:27	3:21
Sample Stop Time (hrs)	14:09	15:15	3:41	3:38	3:31
Inlet/Exhaust	Exhaust	Exhaust	Exhaust	Exhaust	Exhaust
Stack Temperature (^{o}C)	36.1	37.6	38.4	38.9	36.3
Average Stack Gas Velocity (m/s)	16.5	17.0	18.6	14.9	14.1
Actual Gas Flow Volume (am^3/min)	1,259	1,297	1,417	1,139	1,076
	Dry	Dry	Dry	Dry	Dry
Total Normal Gas Flow Volume (m^3/min)	1,095	1,058	1,116	895	882
Total Normal Gas Flow Volume (m^3/s)	18.25	17.63	18.60	14.92	14.70
Total Stack Pressure (kPa)	101.37	101.17	101.43	101.25	101.19
Moisture Content (% by volume)	1.6	7.1	10.2	10.3	7.1
Analysis	**Odour**	**Odour**	**Odour**	**Odour**	**Odour**
Method	AS4323.3	AS4323.3	AS4323.3	AS4323.3	AS4323.3
ORLA Number	4134	4135	4136	4139	4141
SEMA Number	724372	724373	724374	724375	724376
Analysis Start Time (hrs)	10:30	10:05	10:35	10:30	09:55
Analysis Finish Time (hrs)	10:55	10:30	11:05	11:00	10:29
Odour Concentration (Final) (ou)	**1,905**	**1,738**	**1,122**	**1,334**	**4,303**
Normal MOER (Final) (ou m^3/s)	**34,759**	**30,642**	**20,873**	**19,890**	**63,248**
Mass Odour Emission Rate Limit (ou m^3/s)	55,400	55,400	55,400	55,400	55,400
Sample Storage Period Sampling conducted by	PWS	PWS	PWS	PWS	PWS
Calculations entered by	AN	AN	AN	AN	AN
Calculations checked by	PWS	PWS	PWS	PWS	PWS

APPENDIX D – SAMPLE LOCATION

FIGURE D - 1 SAMPLE LOCATION



In the absence of cyclonic flow activity ideal sampling plane conditions will be found to exist at 6-8 duct diameters downstream and 2-3 duct diameters upstream from a flow disturbance. The sampling plane does meet this criterion.

The sample plane does meet gas profile for sampling. Therefore the sampling plane is satisfactory for testing and in compliance with AS4323.1

Stephenson

Environmental Management Australia

ODOUR EMISSION COMPLIANCE TEST - BIO-SCRUBBER

TUNNEL COMPOSTER

ELF FARM SUPPLIES PTY LTD

MULGRAVE, NSW

PROJECT NO.:	**5488/S23673/15**
DATE OF SURVEY:	**23 – 27 MARCH, 2015**
DATE OF ISSUE:	**27 MARCH 2015**

Stephenson
Environmental Management Australia

Peter W Stephenson & Associates Pty Ltd
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ODOUR EMISSION COMPLIANCE TEST - BIO-SCRUBBER

TUNNEL COMPOSTER

ELF FARM SUPPLIES PTY LTD

MULGRAVE, NSW

PROJECT NO.: 5488/S23673/15

DATE OF SURVEY: 23 – 27 MARCH, 2015

DATE OF ISSUE: 27 MARCH 2015

P W STEPHENSON

A NAGHIZADEH

A PRADHAN

TABLE OF CONTENTS

TABLE OF TABLES

TABLE OF TABLES APPENDICES

TABLE OF FIGURES APPENDICES

1 INTRODUCTION

Stephenson Environmental Management Australia (SEMA) was requested by Elf Farm Pty Ltd to assess the odour emissions from the stack serving the bio-scrubber installed on the tunnel composters at their composting facility located at Mulgrave, New South Wales (NSW).

The principal objectives of the tests were to measure odour emission concentrations from the stack and to determine compliance of the odour emission with the facility's Environment Protection Licence (EPL) No. 6229. The EPL was issued by the Environment Protection Authority (EPA) in accordance with the *Protection of the Environment Operations Act 1997*. The EPA is now incorporated into the Office of Environment and Heritage (OEH).

The emission parameters monitored in this survey were:

- Odour concentration
- Stack exhaust gas velocity, exhaust gas temperature, and hence discharge volume
- Moisture
- Mass Odour Emission Rate (MOER).

Odour emission testing was undertaken between 23rd and 27th March 2015 at various times during a typical composting cycle. Table 1-1 shows when testing was carried out on the stack.

TABLE 1-1 ODOUR TESTING PROGRAM

Day	Date	Nominal Sampling Time	Samples
Monday	23/3/2015	3am	1
Tuesday	24/3/2015	3am	1
Wednesday	25/3/2015	2pm	1
Thursday	26/3/2015	3am	1
Friday	27/3/2015	3am	1

2 PRODUCTION CONDITIONS

The odour emission samples were collected with the composting plant operating under a normal seven-day cycle which runs Wednesday to Tuesday each week. This odour emission compliance test commenced on Monday March 23 and was completed on Friday March 27, 2015. Thus, odour emission samples were collected from the latter part of the first cycle and the front half of the next cycle.

Elf Farm Supplies holds all relevant production records should they be required for review.

3 RESULTS AND DISCUSSION

3.1 EMISSION TEST RESULTS

The results of the emission tests are presented in Table 3-1. SEMA completed the odour sampling. SEMA is NATA accredited for the odour sampling, NATA accreditation number 15043.

Odour Research Laboratories Australia (ORLA) performed the odour analysis. ORLA is a division of Peter W Stephenson & Associates Pty Ltd and is NATA accredited to AS4323.3 and NSW EPA Approved Method OM-7 for odour analysis, accreditation number 15043. ORLA is the first NATA accredited odour analysis laboratory in New South Wales.

The Certificates of Analysis, Olfactometry Test Reports No. 5488/ORLA/01, 5488/ORLA/02, 5488/ORLA/03 and 5488/ORLA/04 are presented in Appendix A of this report.

The odour emission sampling and olfactometric analysis was conducted in accordance with Australian Standard (AS) 4323.3 and NSW EPA Approved Method OM-7. Refer to Section 5 of this report for further detail.

TABLE 3-1 ODOUR EMISSION CONCENTRATION RESULTS

Day of Week	Monday	Tuesday	Wednesday	Thursday	Friday
Date	23/3/2015	24/3/2015	25/3/2015	26/3/2015	27/3/2015
Location	Bio-Scrubber Outlet Stack				
Time Sample Taken (hours)	03:12-03:24	03:20-03:33	14:16-14:28	03:30-03:44	03:25-03:36
SEMA Sample No.	724618	724627	724642	724643	724644
ORLA Sample No.	4191	4193	4199	4200	4202
Concentration (ou)	**1,207**	**2,998**	**1,441**	**1,721**	**2,482**

Key:
ou = odour unit

3.2 ENVIRONMENT PROTECTION LICENCE NO. 6229

Table 3-2 summarises the odour emission limit for the tunnel composter stack at Elf Farm Supplies Pty Ltd under their EPL Licence No. 6229. The criterion is defined by the 100th percentile concentration limit as a Mass Odour Emission Rate (MOER) in Odour Units per second (ou/s) on a rolling annual average. A copy of the relevant section of this Licence is included in Appendix B.

TABLE 3-2 100TH PERCENTILE ODOUR EMISSION LIMIT

	EPA Licence Criteria
100th Percentile MOER Limit	55,400 ou/s
Averaging Period	Rolling annual

Key:
MOER = Mass odour emission rate
ou/s = Odour units per second which is a misnomer in EPA Licence 6229 (EPL) and should now read odour units. cubic metres per second (ou.m^3/s)

3.3 ODOUR EMISSION RATES

The MOER for all samples was determined to establish compliance with the EPA/OEH EPL criteria.

The MOER can be calculated using the following formula:

MOER = velocity (m/s) x total area of the stack (m^2) x odour concentration (ou)

Velocity = velocity of air in stack in metres per second as shown in Table 3-3

Total Surface Area of the Stack = Cross Sectional Area of the Stack in square metres (m^2).

Odour Concentration = As per Table 2-1 and Table 3-3.

The above formula calculates MOER based on actual conditions. However the Reference Conditions specified that the MOER is to be reported as dry, 293 degrees Kelvin (K) and 101.3 kilopascals (kPa).

SEMA measured the moisture content, temperature and pressure of the exhaust gas stream, at the same time as the odour emissions were sampled. These measurements enabled the MOER to be corrected to the above reference conditions. The MOER for each of the samples is shown in Table 3-3. Refer to Appendix C for detailed Exhaust Gas Flow Data in table format.

TABLE 3-3 ODOUR EMISSION RATES OVER A TYPICAL COMPOSTING CYCLE – MARCH 2015

Day	**Monday**	**Tuesday**	**Wednesday**	**Thursday**	**Friday**	**Average**
Date	23/3/2015	24/3/2015	25/3/2015	26/3/2015	27/3/2015	
ORLA Sample No.	4191	4193	4199	4200	4202	
Time (hours)	03:12-03:24	03:20-03:33	14:16-14:28	03:30-03:44	03:25-03:36	
Odour Conc. (ou)	1,207	2,998	1,441	1,721	2,482	1,970
Stack Velocity (m/s)	14.6	14.7	14.9	14.6	14.7	14.7
Stack Cross Sectional Area (m^2)	1.272	1.272	1.272	1.272	1.272	1.272
MOER (ou.v/s)	**19,130**	**47,226**	**24,209**	**28,280**	**41,354**	**32,040**
EPL MOER Limit (ou/s) Annual Rolling Average	55,400	55,400	55,400	55,400	55,400	55,400

Key:

No.	=	Number
Conc.	=	concentration
*	=	Rolling annual averaging period
MOER	=	Mass Odour Emission Rate
m/s	=	metres per second
ou.v/s	=	Odour Unit volumes per second
m^2	=	square metres
ou/s	=	Odour Units per second (unit misnomer. Refer to Table 3-2 for comment)

4 CONCLUSIONS

This March 2015 odour emission compliance survey was conducted over five representative phases of the typical composting cycle.

The measured stack MOER's for the five odour monitoring periods were in the range of 19,130 ou.m^3/s to 47,226 ou.m^3/s. The average MOER for the March 2015 composting cycle, which was considered to be typical, was 32,040 ou.m^3/s.

Therefore, these MOER's comply with the EPA/OEH EPL No. 6229 Licence Criteria of 55,400 ou.m^3/s Rolling Annual Average.

5 TEST METHODS

5.1 ODOUR

(Standards Association of Australia AS4323.3 and OEH NSW OM-7)

Samples were collected in 30L Nalophane sampling bags which are enclosed in airtight plastic containers.

Odorous gas for analysis was drawn through a Teflon (PTFE) sample probe. The gas then passes through a Teflon (PTFE) tube connected to the Nalophane sampling bag. The sampling pump is connected to the airtight plastic container to provide a sample gas flow-rate of approximately 0.5 – 1.5 litres per minute. After the required volume has been sampled, the pump is stopped and the bag sealed with a stainless steel valve.

Using a triangular forced choice olfactometer, the Nalophane bag of odour sample was dynamically diluted to various concentrations with dry odour free air.

The diluted sample was then presented to a panel of screened panellists as one of these airflows. The panellists then recorded if they could detect any odour and from which flow. The other two flows were discharging odour free air.

The odour is always presented to the panellists in ascending concentration; that is, from lower to higher concentration. The panellists are required at each dilution level to give a response as to what they are smelling from the flows (forced choice methodology). The response options for the panellists are:

'Guess'	Unable to determine which air flow contains the diluted odours
'Inkle'	Thinks that one of the flows may be different from the other two flows
'Detect' or 'Certain'	Is confident that one of the airflows smells different from the other two flows. Not necessarily able to say what the smell is.
'Recognise'	Thinks that one of the flows may be different from the other two flows and is able to: ▪ Assign a 'hedonic tone' (pleasantness scale number) to the odour ranging from –10 to 10 and/or ▪ Able to assign a character to the odour, as in 'it smells like …' *Note: that the Recognise level concentration and Hedonic Tone and Odour descriptors are obtained with the diluted odour, panellists are not exposed to the full strength odour.*

The percentage panel response and dilution levels used were then entered into a computer programme to determine the 50% panel response. This dilution level corresponds to the odour concentration of the sample.

Sampling and dilution lines are constructed from teflon, stainless or glass to prevent contamination of the sample.

The sampling and the dilution procedures used were in accordance with OEH NSW Methods OM-7 and OM-8 which are based on Standards Association of Australia, AS4323.3.

5.1.1 ODOUR PANEL SELECTION

Odour panellists must meet certain criteria to qualify as and remain panellists. Their average sensitivity to n-Butanol must be between 20 and 80 parts per billion (ppb) and their variability in response to n-Butanol must be within a certain range.

Panellists are tested against n-Butanol before every panel session to ensure they are in compliance.

Panellists should not suffer from respiratory complaints, nor should they eat or smoke or drink anything but water during the half hour preceding or during the test period and their person and clothing should be odour free and have not been exposed to an odorous environment before testing.

5.1.2 ODOUR TERMINOLOGY

The odour level is expressed in odour units and for mixed odours is analogous to concentration expressed in parts per billion. The odour detection level is defined as the ratio of *the volume that a sample of odorous gas would occupy when diluted to the threshold of detection of that odour* to *the volume of the sample*. In simpler terms, the ratio indicated the number of dilutions necessary to reduce the odour to its threshold of detection or odour detection threshold. This ratio is expressed in odour units or number of dilutions to detection threshold. For example, a value of 2,000 odour units would mean the volume of the initial sample of odorous gas would need to be diluted 2,000 times before the odour would just be detectable to the average human nose, that is, at the odour detection threshold.

5.2 EXHAUST GAS VELOCITY

(OEH NSW TM-2 and USEPA Method 12)

Velocity profiles were obtained across the stack utilising an Airflow Developments Ltd. S-type pitot tube and digital manometer.

5.3 EXHAUST GAS TEMPERATURE

(OEH NSW TM- 2, 3 & 4 and USEPA Methods 2, 3 & 4)

The exhaust gas temperature was measured using a Digital thermometer (0-1200^{o}C) connected to a chromel/alumel (K-type) thermocouple probe.

5.4 EXHAUST GAS MOISTURE CONTENT

(OEH NSW TM-22)

Moisture from the stack was collected in accordance with OEH NSW TM-22 sampling train. The collected moisture was weighed and calculated to a percentage of stack gas.

5.5 ACCURACY

All results are quoted on a dry basis.

Appendix C of (British Standard) 893 presents a range of accuracies for various parts of the isokinetic sampling procedure including pressure, velocity, temperature and particulate sampling. At best, an accuracy of $\pm$ 10% can be expected.

For odour the ratio between two single measurements, performed on the same testing material in this laboratory under repeatability conditions, will not be larger than 2.65 in 95% of cases. (Source – AS/NZS 4323.3:2001 Appendix B Section B2).

APPENDIX A – CERTIFICATES OF ANALYSIS

Odour Research Laboratories Australia

A Division of Peter W. Stephenson & Associates Pty Ltd
ACN 002 600 526 (Incorporated in NSW)
ABN 75 002 600 526

Newington Business Park
Unit 7/2 Holker Street
Newington NSW 2127 Australia
Tel: (02) 9737 9991
Fax: (02) 9737 9993
E-Mail: pstephenson@orla.com.au

Olfactometry Test Report

	The measurement was commissioned by SEMA on behalf of:	
Client	Organisation:	Elf Farm Supplies
	Address:	108 Mulgrave Road, Mulgrave NSW 2756
	Contact:	Mark Hengst
	Sampling Site:	Main Stack
	Telephone:	(02) 4577 5000
	Email:	mark@elffarm.com.au
Project	ORLA Report Number:	5488/ORLA/01
	Project Manager:	Peter Stephenson
	Testing operator:	Ali Naghizadeh
	ORLA Sample number(s):	4191
	SEMA Sample number(s):	724618
Order	Analysis Requested:	Odour Analysis
	Order requested by:	SEMA on behalf of Elf Farm Supplies
	Date of order:	23 March 2015
	Order number:	4350
	Telephone:	02 9737 9991
	Signed by:	Ali Naghizadeh
	Order accepted by:	Ali Naghizadeh
Report	Date of issue:	23 March 2015

NATA accredited laboratory number 15043.

Accredited for Compliance with ISO/IEC 17025.

ODOUR CONCENTRATION MEASUREMENTS RESULTS 5488/ORLA/01

Investigated Item	Odour concentration in odour units 'ou' determined by Sensory odour concentration measurements, of an odour sample supplied in a sampling bag. All samples were received in good condition.
Analysis Method	The samples were analysed in accordance with AS/NZS4323.3:2001.
Identification	The odour sample bags were labelled individually. Each label recorded the testing laboratory, sample number, sampling location (or Identification) sampling date and time, dilution ratio (if dilution was used) and whether further chemical analysis was required.
Method	The odour concentration measurements were performed using dynamic olfactometry according to the Australian Standard 'Determination of Odour Concentration by Dynamic Olfactometry AS/NZS4323.3:2001. The odour perception characteristics of the panel within the presentation series for the samples were analogous to that for n-butanol calibration. Any deviation from the Australian standard is recorded in the 'Comments' section of this report.
Instrument Used	The Olfactometer used during this testing session was: AC'SCENT International Olfactometer
Measuring Range	The measuring range of the AC'SCENT International olfactometer is $12 \leq \chi \leq 78{,}172$ ou. If the measuring range was insufficient the odour samples will have been pre-diluted.
Environment	The measurements were performed in an air- and odour-conditioned room. The room temperature is maintained between ± 3°C.
Measuring Dates	The date of each measurement is specified with the results.
Instrument Precision	The precision of this instrument (expressed as repeatability) for a sensory calibration must be $r \leq 0.05$ in accordance with the Australian Standard AS/NZS4323.3:2001. AC'SCENT International Olfactometer: $r = 0.0038$ (February 2015) Compliance – Yes
Instrumental Accuracy	The accuracy of this instrument for a sensory calibration must be $A \leq 0.20$ in accordance with the Australian Standard AS/NZS4323.3:2001. AC'SCENT International Olfactometer: $A = 0.097$ (February 2015) Compliance – Yes
Lower Detection Limit (LDL)	The LDL for the AC'SCENT International Olfactometer has been determined to be 12 ou
Traceability	The measurements have been performed using standards for which the traceability to the national standard has been demonstrated. The assessors are individually selected to comply with fixed criteria and are monitored every session to keep within the limits of the standard. The results from the assessors are traceable to primary standards of n-butanol in nitrogen.

23 March 2015

Peter Stephenson
Managing Director

Odour Research Laboratories Australia

Odour Olfactometry Results – 5488/ORLA/01

Sample Location	Sample ID No.	Sampling Date & Time	ORLA Sample No.	Analysis Date & Time (Completed)	Panel Size	Valid ITEs	Sample Pre-Dilution	Sample Odour Concentration (ou) 1	Sample Odour Concentration (ou) 2	Odour Character & Hedonic Tone^ +
Sample ID: Stack - Day 1	724618	23/03/2015 0312-0324	4191	23/03/2015 1028-1055	4	8	Nil	1,207	1,207	Rotting garbage, rancid, decay, earthy, musty, garbage, metallic, fishy, ammonia, smelly socks (-4.0)^

Odour Research Laboratories Australia

Odour Panel Calibration Results – 5488/ORLA/01

Reference Odorant	ORLA Sample No.	Concentration of Reference Gas (ppm)	Reference Gas Measured Concentration (ou)	Panel Average Measured Concentration (ppb) [3]	Does this panel calibration measurement comply with AS/NZS4323.3:P2001 (Yes/No) [4]
n-butanol	4190	41	935	43.9	Yes

Comments: All samples were collected by Stephenson Environmental Management Australia and analysed by Odour Research Laboratories Australia at their Sydney Laboratory.

Notes from Odour Olfactometry Results:

[1] Sample Odour Concentration: as received in the bag

[2] Sample Odour Concentration: allowing for pre-dilution

[3] Panel Average Measured Concentration: indicates the sensitivity of the panel for the session completed

[4] Target Range for reference gas n-butanol is $20 \leq \chi \leq 80$ ppb and compliance with AS/NZ4323.3:2001 is based on the individuals rolling average and not on the panel average measured concentration. Panellist Rolling Average: PR = 44.7, SR = 53.9, TL = 37.5, AP = 27.1

^ denotes the Average Hedonic Tone: describes the pleasantness of the odour being presented where (+5) represents Very Pleasant, (0) represents Neutral and (-5) represents Very Unpleasant and has been derived from the panellist responses at the recognition threshold.

+ This value is not part of our NATA Scope of Accreditation and AS4323.3

--END OF TEST REPORT--

Odour Research Laboratories Australia

A Division of Peter W. Stephenson & Associates Pty Ltd
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Fax: (02) 9737 9993
E-Mail: pstephenson@orla.com.au

Olfactometry Test Report

	The measurement was commissioned by SEMA on behalf of:	
Client	Organisation:	Elf Farm Supplies
	Address:	108 Mulgrave Road, Mulgrave NSW 2756
	Contact:	Mark Hengst
	Sampling Site:	Main Stack
	Telephone:	(02) 4577 5000
	Email:	mark@elffarm.com.au
Project	ORLA Report Number:	5488/ORLA/02
	Project Manager:	Peter Stephenson
	Testing operator:	Ali Naghizadeh
	ORLA Sample number(s):	4193
	SEMA Sample number(s):	724627
Order	Analysis Requested:	Odour Analysis
	Order requested by:	SEMA on behalf of Elf Farm Supplies
	Date of order:	24 March 2015
	Order number:	4351
	Telephone:	02 9737 9991
	Signed by:	Ali Naghizadeh
	Order accepted by:	Ali Naghizadeh
Report	Date of issue:	25 March 2015

NATA accredited laboratory number 15043.

Accredited for Compliance with ISO/IEC 17025.

Investigated Item	Odour concentration in odour units 'ou' determined by Sensory odour concentration measurements, of an odour sample supplied in a sampling bag. All samples were received in good condition.
Analysis Method	The samples were analysed in accordance with AS/NZS4323.3:2001.
Identification	The odour sample bags were labelled individually. Each label recorded the testing laboratory, sample number, sampling location (or Identification) sampling date and time, dilution ratio (if dilution was used) and whether further chemical analysis was required.
Method	The odour concentration measurements were performed using dynamic olfactometry according to the Australian Standard 'Determination of Odour Concentration by Dynamic Olfactometry AS/NZS4323.3:2001. The odour perception characteristics of the panel within the presentation series for the samples were analogous to that for n-butanol calibration. Any deviation from the Australian standard is recorded in the 'Comments' section of this report.
Instrument Used	The Olfactometer used during this testing session was: AC'SCENT International Olfactometer
Measuring Range	The measuring range of the AC'SCENT International olfactometer is $12 \leq \chi \leq 78{,}172$ ou. If the measuring range was insufficient the odour samples will have been pre-diluted.
Environment	The measurements were performed in an air- and odour-conditioned room. The room temperature is maintained between ± 3°C.
Measuring Dates	The date of each measurement is specified with the results.
Instrument Precision	The precision of this instrument (expressed as repeatability) for a sensory calibration must be $r \leq 0.05$ in accordance with the Australian Standard AS/NZS4323.3:2001. AC'SCENT International Olfactometer: $r = 0.0038$ (February 2015) Compliance – Yes
Instrumental Accuracy	The accuracy of this instrument for a sensory calibration must be $A \leq 0.20$ in accordance with the Australian Standard AS/NZS4323.3:2001. AC'SCENT International Olfactometer: $A = 0.097$ (February 2015) Compliance – Yes
Lower Detection Limit (LDL)	The LDL for the AC'SCENT International Olfactometer has been determined to be 12 ou
Traceability	The measurements have been performed using standards for which the traceability to the national standard has been demonstrated. The assessors are individually selected to comply with fixed criteria and are monitored every session to keep within the limits of the standard. The results from the assessors are traceable to primary standards of n-butanol in nitrogen.

25 March 2015

Peter Stephenson
Managing Director

Odour Research Laboratories Australia

Odour Olfactometry Results – 5488/ORLA/02

Sample Location	Sample ID No.	Sampling Date & Time	ORLA Sample No.	Analysis Date & Time (Completed)	Panel Size	Valid ITEs	Sample Pre-Dilution	Sample Odour Concentration (ou) 1	Sample Odour Concentration (ou) 2	Odour Character & Hedonic Tone^ +
Sample ID: Stack - Day 2	724627	24/03/2015 0320-0333	4193	24/03/2015 1135-1200	4	8	Nil	2,998	2,998	Fishy, sand eel sauce, rotting garbage, garbage, manure, grassy, swamp (-4.5)^

Odour Research Laboratories Australia

Odour Panel Calibration Results – 5488/ORLA/02

Reference Odorant	ORLA Sample No.	Concentration of Reference Gas (ppm)	Reference Gas Measured Concentration (ou)	Panel Average Measured Concentration (ppb) [3]	Does this panel calibration measurement comply with AS/NZS4323.3:P2001 (Yes/No) [4]
n-butanol	4192	41	1,333	30.8	Yes

Comments: All samples were collected by Stephenson Environmental Management Australia and analysed by Odour Research Laboratories Australia at their Sydney Laboratory.

Notes from Odour Olfactometry Results:

[1] Sample Odour Concentration: as received in the bag

[2] Sample Odour Concentration: allowing for pre-dilution

[3] Panel Average Measured Concentration: indicates the sensitivity of the panel for the session completed

[4] Target Range for reference gas n-butanol is $20 \le \chi \le 80$ ppb and compliance with AS/NZ4323.3:2001 is based on the individuals rolling average and not on the panel average measured concentration. Panellist Rolling Average: PR = 44.7, DS = 32.7, TL = 37.5, AP = 26.6

^ denotes the Average Hedonic Tone: describes the pleasantness of the odour being presented where (+5) represents Very Pleasant, (0) represents Neutral and (-5) represents Very Unpleasant and has been derived from the panellist responses at the recognition threshold.

+ This value is not part of our NATA Scope of Accreditation and AS4323.3

-- END OF TEST REPORT --

Odour Research Laboratories Australia

A Division of Peter W. Stephenson & Associates Pty Ltd
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Tel: (02) 9737 9991
Fax: (02) 9737 9993
E-Mail: pstephenson@orla.com.au

Olfactometry Test Report

The measurement was commissioned by SEMA on behalf of:

Client	Organisation:	Elf Farm Supplies
	Address:	108 Mulgrave Road, Mulgrave NSW 2756
	Contact:	Mark Hengst
	Sampling Site:	Main Stack
	Telephone:	(02) 4577 5000
	Email:	mark@elffarm.com.au
Project	ORLA Report Number:	5488/ORLA/03
	Project Manager:	Peter Stephenson
	Testing operator:	Ali Naghizadeh
	ORLA Sample number(s):	4199, 4200
	SEMA Sample number(s):	724642, 724643
Order	Analysis Requested:	Odour Analysis
	Order requested by:	SEMA on behalf of Elf Farm Supplies
	Date of order:	26 March 2015
	Order number:	4356
	Telephone:	02 9737 9991
	Signed by:	Ali Naghizadeh
	Order accepted by:	Ali Naghizadeh
Report	Date of issue:	26 March 2015

NATA accredited laboratory number 15043.

Accredited for Compliance with ISO/IEC 17025.

Investigated Item	Odour concentration in odour units 'ou' determined by Sensory odour concentration measurements, of an odour sample supplied in a sampling bag. All samples were received in good condition.
Analysis Method	The samples were analysed in accordance with AS/NZS4323.3:2001.
Identification	The odour sample bags were labelled individually. Each label recorded the testing laboratory, sample number, sampling location (or Identification) sampling date and time, dilution ratio (if dilution was used) and whether further chemical analysis was required.
Method	The odour concentration measurements were performed using dynamic olfactometry according to the Australian Standard 'Determination of Odour Concentration by Dynamic Olfactometry AS/NZS4323.3:2001. The odour perception characteristics of the panel within the presentation series for the samples were analogous to that for n-butanol calibration. Any deviation from the Australian standard is recorded in the 'Comments' section of this report.
Instrument Used	The Olfactometer used during this testing session was: AC'SCENT International Olfactometer
Measuring Range	The measuring range of the AC'SCENT International olfactometer is $12 \leq \chi \leq 78{,}172$ ou. If the measuring range was insufficient the odour samples will have been pre-diluted.
Environment	The measurements were performed in an air- and odour-conditioned room. The room temperature is maintained between ± 3°C.
Measuring Dates	The date of each measurement is specified with the results.
Instrument Precision	The precision of this instrument (expressed as repeatability) for a sensory calibration must be $r \leq 0.05$ in accordance with the Australian Standard AS/NZS4323.3:2001. AC'SCENT International Olfactometer: $r = 0.0038$ (February 2015) Compliance – Yes
Instrumental Accuracy	The accuracy of this instrument for a sensory calibration must be $A \leq 0.20$ in accordance with the Australian Standard AS/NZS4323.3:2001. AC'SCENT International Olfactometer: $A = 0.097$ (February 2015) Compliance – Yes
Lower Detection Limit (LDL)	The LDL for the AC'SCENT International Olfactometer has been determined to be 12 ou
Traceability	The measurements have been performed using standards for which the traceability to the national standard has been demonstrated. The assessors are individually selected to comply with fixed criteria and are monitored every session to keep within the limits of the standard. The results from the assessors are traceable to primary standards of n-butanol in nitrogen.

26 March 2015

Peter Stephenson
Managing Director

Odour Research Laboratories Australia

Odour Olfactometry Results – 5488/ORLA/03

Sample Location	Sample ID No.	Sampling Date & Time	ORLA Sample No.	Analysis Date & Time (Completed)	Panel Size	Valid ITEs	Sample Pre-Dilution	Sample Odour Concentration (ou) [1]	Sample Odour Concentration (ou) [2]	Odour Character & Hedonic Tone^ +
Sample ID: Stack - Day 3	724642	25/03/2015 1416-1428	4199	26/03/2015 1003-1030	4	8	Nil	1,441	1,441	Rotting garbage, rancid, fermented fish, fish sauce, earthy, garbage, smelly feet, rotten fish (-4.8)^
Sample ID: Stack - Day 4	724643	26/03/2015 0330-0344	4200	26/03/2015 1033-1100	4	8	Nil	1,721	1,721	Rotting garbage, rancid, fermented fish, fish sauce, earthy, old, mouldy, much, garbage, rotten fish (-4.3)^

Odour Research Laboratories Australia

Odour Panel Calibration Results – 5488/ORLA/03

Reference Odorant	ORLA Sample No.	Concentration of Reference Gas (ppm)	Reference Gas Measured Concentration (ou)	Panel Average Measured Concentration (ppb) [3]	Does this panel calibration measurement comply with AS/NZS4323.3:P2001 (Yes/No) [4]
n-butanol	4198	41	673	30.8	Yes

Comments: All samples were collected by Stephenson Environmental Management Australia and analysed by Odour Research Laboratories Australia at their Sydney Laboratory.

Notes from Odour Olfactometry Results:

[1] Sample Odour Concentration: as received in the bag
[2] Sample Odour Concentration: allowing for pre-dilution
[3] Panel Average Measured Concentration: indicates the sensitivity of the panel for the session completed
[4] Target Range for reference gas n-butanol is $20 \leq \chi \leq 80$ ppb and compliance with AS/NZ4323.3:2001 is based on the individuals rolling average and not on the panel average measured concentration. Panellist Rolling Average: PR = 44.7, DS = 34.3, TL = 41.0, SR = 53.9

^ denotes the Average Hedonic Tone: describes the pleasantness of the odour being presented where (+5) represents Very Pleasant, (0) represents Neutral and (-5) represents Very Unpleasant and has been derived from the panellist responses at the recognition threshold.

+ This value is not part of our NATA Scope of Accreditation and AS4323.3

--END OF TEST REPORT--

Odour Research Laboratories Australia

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Fax: (02) 9737 9993
E-Mail: pstephenson@orla.com.au

Olfactometry Test Report

	The measurement was commissioned by SEMA on behalf of:	
Client	Organisation:	Elf Farm Supplies
	Address:	108 Mulgrave Road, Mulgrave NSW 2756
	Contact:	Mark Hengst
	Sampling Site:	Main Stack
	Telephone:	(02) 4577 5000
	Email:	mark@elffarm.com.au
Project	ORLA Report Number:	5488/ORLA/04
	Project Manager:	Peter Stephenson
	Testing operator:	Ali Naghizadeh
	ORLA Sample number(s):	4202
	SEMA Sample number(s):	724644
Order	Analysis Requested:	Odour Analysis
	Order requested by:	SEMA on behalf of Elf Farm Supplies
	Date of order:	26 March 2015
	Order number:	4357
	Telephone:	02 9737 9991
	Signed by:	Ali Naghizadeh
	Order accepted by:	Ali Naghizadeh
Report	Date of issue:	27 March 2015

NATA accredited laboratory number 15043.

Accredited for Compliance with ISO/IEC 17025.

Investigated Item	Odour concentration in odour units 'ou' determined by Sensory odour concentration measurements, of an odour sample supplied in a sampling bag. All samples were received in good condition.
Analysis Method	The samples were analysed in accordance with AS/NZS4323.3:2001.
Identification	The odour sample bags were labelled individually. Each label recorded the testing laboratory, sample number, sampling location (or Identification) sampling date and time, dilution ratio (if dilution was used) and whether further chemical analysis was required.
Method	The odour concentration measurements were performed using dynamic olfactometry according to the Australian Standard 'Determination of Odour Concentration by Dynamic Olfactometry AS/NZS4323.3:2001. The odour perception characteristics of the panel within the presentation series for the samples were analogous to that for n-butanol calibration. Any deviation from the Australian standard is recorded in the 'Comments' section of this report.
Instrument Used	The Olfactometer used during this testing session was: AC'SCENT International Olfactometer
Measuring Range	The measuring range of the AC'SCENT International olfactometer is $12 \leq \chi \leq 78{,}172$ ou. If the measuring range was insufficient the odour samples will have been pre-diluted.
Environment	The measurements were performed in an air- and odour-conditioned room. The room temperature is maintained between $\pm 3^{o}$C.
Measuring Dates	The date of each measurement is specified with the results.
Instrument Precision	The precision of this instrument (expressed as repeatability) for a sensory calibration must be $r \leq 0.05$ in accordance with the Australian Standard AS/NZS4323.3:2001. AC'SCENT International Olfactometer: $r = 0.0038$ (February 2015) Compliance – Yes
Instrumental Accuracy	The accuracy of this instrument for a sensory calibration must be $A \leq 0.20$ in accordance with the Australian Standard AS/NZS4323.3:2001. AC'SCENT International Olfactometer: $A = 0.097$ (February 2015) Compliance – Yes
Lower Detection Limit (LDL)	The LDL for the AC'SCENT International Olfactometer has been determined to be 12 ou
Traceability	The measurements have been performed using standards for which the traceability to the national standard has been demonstrated. The assessors are individually selected to comply with fixed criteria and are monitored every session to keep within the limits of the standard. The results from the assessors are traceable to primary standards of n-butanol in nitrogen.

27 March 2015

Peter Stephenson
Managing Director

Odour Research Laboratories Australia

Odour Olfactometry Results – 5488/ORLA/04

Sample Location	Sample ID No.	Sampling Date & Time	ORLA Sample No.	Analysis Date & Time (Completed)	Panel Size	Valid ITEs	Sample Pre-Dilution	Sample Odour Concentration (ou) [1]	Sample Odour Concentration (ou) [2]	Odour Character & Hedonic Tone^ +
Sample ID: Stack - Day 5	724644	27/03/2015 0325-0336	4202	27/03/2015 1000-1025	4	8	Nil	2,482	2,482	Rotting garbage, musty, peat, swamp, ammonia, fishy, rotten egg gas, faeces (-3.3)^

Odour Research Laboratories Australia

Odour Panel Calibration Results – 5488/ORLA/04

Reference Odorant	ORLA Sample No.	Concentration of Reference Gas (ppm)	Reference Gas Measured Concentration (ou)	Panel Average Measured Concentration (ppb) [3]	Does this panel calibration measurement comply with AS/NZS4323.3:P2001 (Yes/No) [4]
n-butanol	4201	41	935	43.9	Yes

Comments: All samples were collected by Stephenson Environmental Management Australia and analysed by Odour Research Laboratories Australia at their Sydney Laboratory.

Notes from Odour Olfactometry Results:

[1] Sample Odour Concentration: as received in the bag

[2] Sample Odour Concentration: allowing for pre-dilution

[3] Panel Average Measured Concentration: indicates the sensitivity of the panel for the session completed

[4] Target Range for reference gas n-butanol is $20 \leq \chi \leq 80$ ppb and compliance with AS/NZ4323.3:2001 is based on the individuals rolling average and not on the panel average measured concentration. Panellist Rolling Average: PR = 44.7, JW = 35.3, TL = 42.9, PP = 46.9

^ denotes the Average Hedonic Tone: describes the pleasantness of the odour being presented where (+5) represents Very Pleasant, (0) represents Neutral and (-5) represents Very Unpleasant and has been derived from the panellist responses at the recognition threshold.

+ This value is not part of our NATA Scope of Accreditation and AS4323.3

-- END OF TEST REPORT --

APPENDIX B – PART OF OEH EPL LICENCE

Section 55 Protection of the Environment Operations Act 1997

Environment Protection Licence

Licence - 6229

P1 Location of monitoring/discharge points and areas

P1.1 The following points referred to in the table below are identified in this licence for the purposes of monitoring and/or the setting of limits for the emission of pollutants to the air from the point.

Air

EPA identi-fication no.	Type of Monitoring Point	Type of Discharge Point	Location Description
1	Discharge to air Air emissions monitoring	Discharge to air Air emissions monitoring	Bioscrubber chimney labelled as "Chimney" on "Figure 5.2 - Plant Layout" and "Figure 5.5 - Stage 1 - Phase 1 Bioscrubber Detail" contained in the "Mulgrave Mushroom Substrate Plant Environmental Management Plan" dated August 2002.

3 Limit Conditions

L1 Pollution of waters

L1.1 Except as may be expressly provided in any other condition of this licence, the licensee must comply with section 120 of the Protection of the Environment Operations Act 1997.

L2 Concentration limits

L2.1 For each monitoring/discharge point or utilisation area specified in the table\s below (by a point number), the concentration of a pollutant discharged at that point, or applied to that area, must not exceed the concentration limits specified for that pollutant in the table.

L2.2 Where a pH quality limit is specified in the table, the specified percentage of samples must be within the specified ranges.

L2.3 To avoid any doubt, this condition does not authorise the pollution of waters by any pollutant other than those specified in the table\s.

L2.4 Air Concentration Limits

POINT 1

Pollutant	Units of measure	100 percentile concentration limit	Reference conditions	Oxygen correction	Averaging period
Odour	odour units per second	55400			

L2.5 For each monitoring/discharge point specified in the table(s) in L2 above (by a point number), the reference conditions and averaging period of a pollutant discharged at that point must be reported at the reference conditions and averaging period specified for that pollutant in the following table.

Section 55 Protection of the Environment Operations Act 1997

Environment Protection Licence

Licence - 6229

Pollutant	Reference Conditions	Duration	Averaging Period
Odour	dry, 293K, 101.3kPa	1 hour	Rolling annual

L3 Waste

L3.1 The licensee must not cause, permit or allow any waste to be received at the premises, except the wastes expressly referred to in the column titled "Waste" and meeting the definition, if any, in the column titled "Description" in the table below.
Any waste received at the premises must only be used for the activities referred to in relation to that waste in the column titled "Activity" in the table below.
Any waste received at the premises is subject to those limits or conditions, if any, referred to in relation to that waste contained in the column titled "Other Limits" in the table below.
This condition does not limit any other conditions in this licence.

Code	Waste	Description	Activity	Other Limits
NA	Chicken manure		Composting Waste storage	NA
NA	Feather meal		Composting Waste storage	NA
NA	Cotton seed meal		Composting Waste storage	NA
NA	Natural organic fibrous materials	As defined in Schedule 1 of the POEO Act, in force from time to time	Composting Waste storage	NA
NA	Horse stable bedding		Composting Waste storage	NA
NA	General or Specific exempted waste	Waste that meets all the conditions of a resource recovery exemption under Clause 51A of the Protection of the Environment Operations (Waste) Regulation 2005	As specified in each particular resource recovery exemption	NA
NA	Waste	Any waste received on site that is below licensing thresholds in Schedule 1 of the POEO Act, as in force from time to time	-	NA

L3.2 The licensee must ensure that the amount of excess compost that is stored at the premises does not exceed 150 tonnes at any one time.

APPENDIX C – EXHAUST GAS FLOW DATA

Glossary:

%	=	percent
^{o}C	=	Degrees Celsius
am^3/min	=	cubic metre of gas at actual conditions per minute
Normal Volume (m^3)	=	cubic metre at 0°C and 760 mm pressure and 1 atmosphere
am^3	=	cubic metre of gas at actual conditions
g/g mole	=	grams per gram mole
g/s	=	grams per second
hrs	=	hours
kg/m^3	=	kilograms per cubic metre
kPa	=	kilopascals
m^2	=	square metre
m/s	=	metre per second
m^3/min	=	cubic metre per minute at 0^0C and 1 atmosphere
m^3/sec	=	cubic metre per second at 0^0C and 1 atmosphere
mg	=	milligrams
mg/ m^3	=	milligrams per cubic metre at 0^oC and 1 atmosphere
ou	=	odour units
ou.m^3/s	=	odour units cubic metre of gas at dry, 293 K and 101.3 kPa
K	=	degrees Kelvin
O_2	=	Oxygen

Abbreviations for names of SEMA staff who completed the either/and/or Sampling, Analysis and Checking

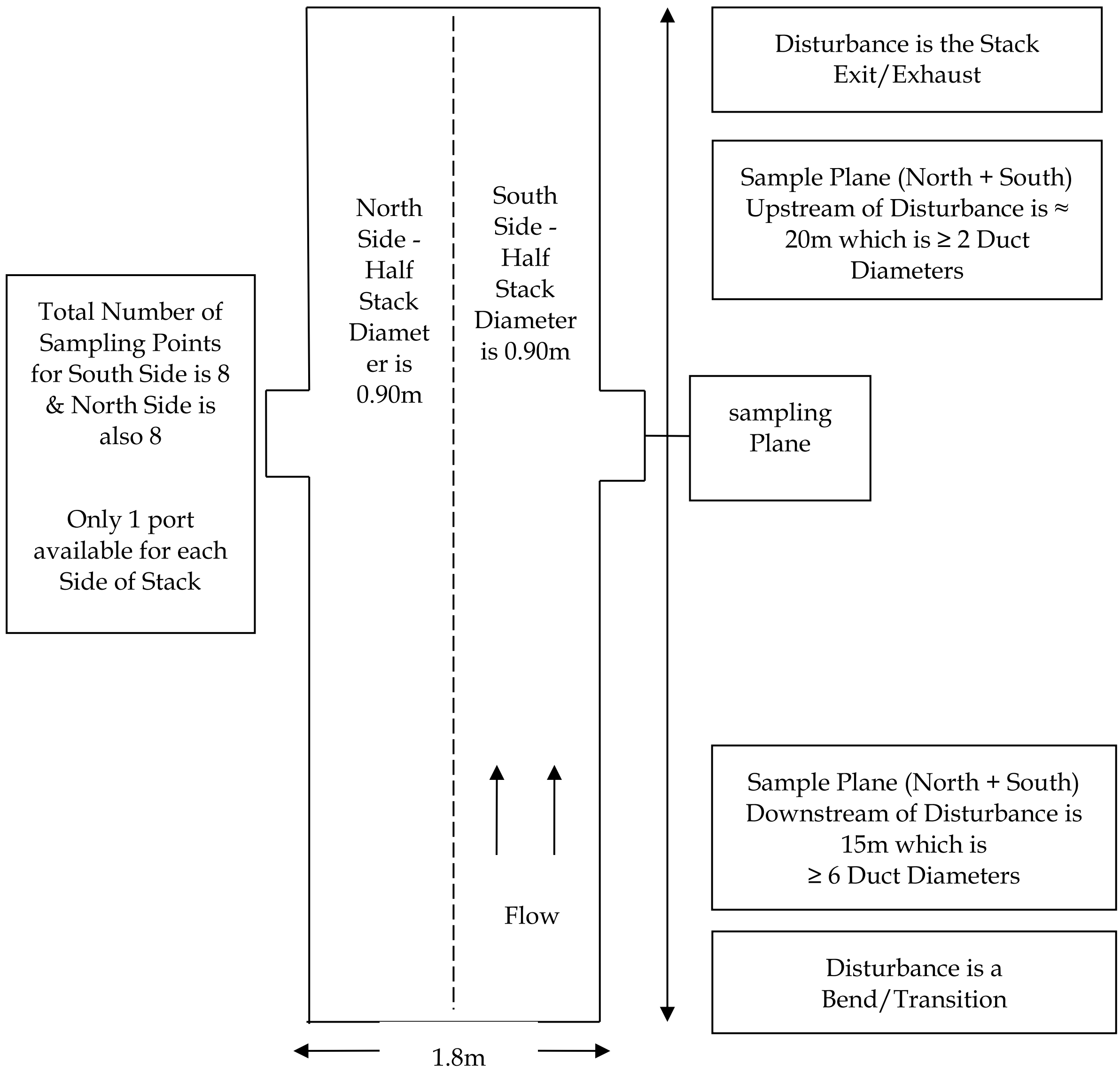
AN	=	Ali Naghizadeh
JW	=	Jay Weber

TABLE C - 1 EMISSION TEST RESULTS – FLOW AND ODOUR

Emission Test Results	Flow	Flow	Flow	Flow	Flow
Project Number	5488	5488	5488	5488	5488
Project Name	Elf Farm Bio-scrubber	Elf Farm Bio-scrubber	Elf Farm Bio-scrubber	Elf Farm Bio-scrubber	Elf Farm Bio-scrubber
Test Location	Stack	Stack	Stack	Stack	Stack
Date	23-Mar-15	24-Mar-15	25-Mar-15	26-Mar-15	27-Mar-15
Run	1	2	3	4	5
Sample Start Time (hrs)	3:12	3:20	14:16	3:30	3:25
Sample Stop Time (hrs)	3:24	3:33	14:28	3:44	3:36
Stack Temperature (^oC)	35.9	38.0	32.3	29.0	30.1
Average Stack Gas Velocity (m/s)	14.6	14.7	14.9	14.6	14.7
Actual Gas Flow Volume (am^3/min)	1,115	1,121	1,136	1,118	1,124
	Dry	Dry	Dry	Dry	Dry
Total Normal Gas Flow Volume (m^3/min)	951	945	1,008	986	1,000
Total Stack Pressure (kPa)	101.76	101.82	101.52	101.62	101.93
Moisture Content (% by volume)	3.9	4.5	0.9	2.7	1.8
Analysis	**Odour**	**Odour**	**Odour**	**Odour**	**Odour**
Method	AS4323.3	AS4323.3	AS4323.3	AS4323.3	AS4323.3
ORLA Number	4191	4193	4199	4200	4202
SEMA Number	724618	724627	724642	724643	724644
Sample Start Time (hrs)	3:12	3:20	14:16	3:30	3:25
Sample Finish Time (hrs)	3:24	3:33	14:28	3:44	3:36
Odour Concentration (Final) (ou)	**1,207**	**2,998**	**1,441**	**1,721**	**2,482**
Normal MOER (Final) (ou m^3/s)	**19,130**	**47,226**	**24,209**	**28,280**	**41,354**
Mass Odour Emission Rate Limit (ou m^3/s)	55,400	55,400	55,400	55,400	55,400
Sample Storage Period	2 days	2 days	2 days	2 days	2 days
Calculations entered by	AN	AN	AN	AN	AN
Calculations checked by	JW	JW	JW	JW	JW

APPENDIX D – SAMPLE LOCATION

FIGURE D - 1 SAMPLE LOCATION



In the absence of cyclonic flow activity ideal sampling plane conditions will be found to exist at 6-8 duct diameters downstream and 2-3 duct diameters upstream from a flow disturbance. The sampling plane does meet this criterion.

The sample plane does meet gas profile for sampling. Therefore the sampling plane is satisfactory for testing and in compliance with AS4323.1

Stephenson

Environmental Management Australia

ODOUR EMISSION COMPLIANCE TEST

TUNNEL COMPOSTER BIO-SCRUBBER

ELF FARM SUPPLIES PTY LTD

MULGRAVE, NSW

PROJECT NO.:	5553/S23893/15
DATE OF SURVEY:	18 TO 24 NOVEMBER 2015
DATE OF ISSUE:	27 NOVEMBER 2015

Stephenson
Environmental Management Australia

Peter W Stephenson & Associates Pty Ltd
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ODOUR EMISSION COMPLIANCE TEST

TUNNEL COMPOSTER BIO-SCRUBBER

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MULGRAVE, NSW

PROJECT NO.:	5553/S23893/15
DATE OF SURVEY:	18 TO 24 NOVEMBER 2015
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P W STEPHENSON

A NAGHIZADEH

A PRADHAN

TABLE OF CONTENTS

TABLE OF TABLES

TABLE OF TABLES APPENDICES

TABLE OF FIGURES APPENDICES

1 INTRODUCTION

Stephenson Environmental Management Australia (SEMA) was requested by Elf Farm Pty Ltd to assess the odour emissions from the stack serving the tunnel composters at their composting facility located at Mulgrave, New South Wales (NSW).

The principal objectives of the tests were to measure odour emission concentrations from the stack and to determine compliance of the odour emission with the facility's Environment Protection Licence (EPL) No. 6229. The EPL was issued by the Environment Protection Authority (EPA) in accordance with the *Protection of the Environment Operations Act 1997*. The EPA is now incorporated into the Office of Environment and Heritage (OEH).

The emission parameters monitored in this survey were:

- Odour concentration
- Stack exhaust gas velocity, exhaust gas temperature, and hence discharge volume
- Moisture
- Mass Odour Emission Rate (MOER).

Odour emission testing was undertaken between 18 and 24 November 2015 at various times during a typical composting cycle. Table 1-1 shows when testing was carried out on the stack.

TABLE 1-1 ODOUR TESTING PROGRAM

Day of the Week	Date	Time of the Day Sample was Taken	Number of Odour Samples Taken per Visit
Wednesday	18/11/2015	PM	1
Thursday	19/11/2015	AM	1
Friday	20/11/2015	AM	1
Monday	23/11/2015	AM	1
Tuesday	24/11/2015	AM	1

Note:

(1) The AM samples were taken between 2am - 4am and the PM sample was taken between 2 pm – 3 pm over the composting cycle period.

2 PRODUCTION CONDITIONS

The odour emission samples were collected with the composting plant operating under a normal seven-day cycle running from a Wednesday to a Tuesday.

Elf Farm Supplies holds all relevant production records should they be required for review.

3 RESULTS AND DISCUSSION

3.1 EMISSION TEST RESULTS

The results of the emission tests are presented in Table 3-1. SEMA completed the odour sampling. SEMA is NATA accredited for the odour sampling, NATA accreditation number 15043.

Odour Research Laboratories Australia (ORLA) performed the odour analysis. ORLA is a division of Peter W Stephenson & Associates Pty Ltd and is NATA accredited to AS4323.3 for odour analysis, accreditation number 15043. ORLA is the first NATA accredited odour analysis laboratory in New South Wales.

The Certificates of Analysis, Olfactometer Test Reports No. 5553/ORLA/01, 5553/ORLA/02, 5553/ORLA/03 and 5553/ORLA/04 are presented in Appendix A of this report.

The odour emission sampling and olfactometric analysis was conducted in accordance with Australian Standard (AS) 4323.3. Refer to Section 5 of this report for further detail.

TABLE 3-1 ODOUR EMISSION CONCENTRATION RESULTS

Day of Week	**Wednesday**	**Thursday**	**Friday**	**Monday**	**Tuesday**
Date	18/11/2015	19/11/2015	20/11/2015	23/11/2015	24/11/2015
Time Sample Taken (hours)	14:00-14:10	02:28-02:39	03:20-03:33	03:10-03:21	03:58-04:10
SEMA Sample No.	725178	725180	725181	725196	725204
ORLA Sample No.	4343	4345	4351	4353	4359
Concentration (ou)	1,900	2,300	3,000	2,100	5,800

Key:
ou = odour unit

3.2 ENVIRONMENT PROTECTION LICENCE NO. 6229

Table 3-2 summarises the odour emission limit for the tunnel composter stack at Elf Farm Supplies Pty Ltd under their EPL Licence No. 6229. The criterion is defined by the 100^{th} percentile concentration limit as a Mass Odour Emission Rate (MOER) in Odour Units per second (ou/s) on a rolling annual average. A copy of the relevant section of this Licence is included in Appendix B.

TABLE 3-2 100^{TH} PERCENTILE ODOUR EMISSION LIMIT

	EPA Licence Criteria
100^{th} Percentile MOER Limit	55,400 ou/s
Averaging Period	Rolling annual

Key:
MOER = Mass odour emission rate
ou/s = Odour units per second which is a misnomer in EPA Licence 6229 (EPL) and should now read odour units. cubic metres per second (ou.m^3/s)

3.3 ODOUR EMISSION RATES

The MOER for all samples was determined to establish compliance with the EPA/OEH EPL criteria.

The MOER can be calculated using the following formula:

MOER = velocity (m/s) x total area of the stack (m^2) x odour concentration (ou)

Velocity = velocity of air in stack in metres per second as shown in Table 3-3.
Total Surface Area of the Stack = Cross Sectional Area of the Stack in square metres (m^2).
Odour Concentration = As per Table 2-1 and Table 3-3.

The above formula calculates MOER based on actual conditions. However the Reference Conditions specified that the MOER is to be reported as dry, 293 degrees Kelvin (K) and 101.3 kilopascals (kPa).

SEMA measured the moisture content, temperature and pressure of the exhaust gas stream, at the same time as the odour emissions were sampled. These measurements enabled the MOER to be corrected to the above reference conditions. The MOER for each of the samples is shown in Table 3-3. Refer to Appendix C for detailed Exhaust Gas Flow Data in table format.

TABLE 3-3 ODOUR EMISSION RATES OVER A TYPICAL SEVEN DAY COMPOSTING CYCLE SPRING 2015

Day	**Wednesday**	**Thursday**	**Friday**	**Monday**	**Tuesday**	**Average**
Date	18/11/2015	19/11/2015	20/11/2015	23/11/2015	24/11/2015	
ORLA Sample No.	4343	4345	4351	4353	4359	
Time (hours)	14:00-14:10	02:28-02:39	03:20-03:33	03:10-03:21	03:58-04:10	
Odour Conc. (ou)	1,900	2,300	3,000	2,100	5,800	3,000
Stack Velocity (m/s)	16.5	14.7	14.7	15.0	14.8	15.1
Stack Cross Sectional Area (m^2)	1.27	1.27	1.27	1.27	1.27	1.27
MOER (ou.v/s)	34,000	38,000	48,000	34,000	92,000	49,000
EPL MOER Limit (ou/s) Annual Rolling Average	55,400	55,400	55,400	55,400	55,400	55,400

Key:

No.	=	Number
Conc.	=	concentration
*	=	Rolling annual averaging period
MOER	=	Mass Odour Emission Rate
m/s	=	metres per second
ou.v/s	=	Odour Unit volumes per second
m^2	=	square metres
ou/s	=	Odour Units per second

4 CONCLUSIONS

This odour emission survey was conducted over a typical seven day composting cycle. The measured stack MOER's for the monitoring period were in the range of 34,000 ou.m^3/s to 92,000 ou.m^3/s. The average MOER for the spring 2015 composting cycle, which was considered to be typical, was 49,000 ou.m^3/s.

Therefore, these MOER's comply with the EPA/OEH EPL No. 6229 Licence Criteria of 55,400 ou.m^3/s Rolling Annual Average.

5 TEST METHODS

5.1 ODOUR

(Standards Association of Australia AS4323.3 and OEH NSW OM-7)

Samples were collected in 30L Nalophane sampling bags which are enclosed in airtight plastic containers.

Odorous gas for analysis was drawn through a Teflon (PTFE) sample probe. The gas then passes through a Teflon (PTFE) tube connected to the Nalophane sampling bag. The sampling pump is connected to the airtight plastic container to provide a sample gas flow-rate of approximately 0.5 – 1.5 litres per minute. After the required volume has been sampled, the pump is stopped and the bag sealed with a stainless steel valve.

Using a triangular forced choice olfactometer, the Nalophane bag of odour sample was dynamically diluted to various concentrations with dry odour free air.

The diluted sample was then presented to a panel of screened panellists as one of these airflows. The panellists then recorded if they could detect any odour and from which flow. The other two flows were discharging odour free air.

The odour is always presented to the panellists in ascending concentration; that is, from lower to higher concentration. The panellists are required at each dilution level to give a response as to what they are smelling from the flows (forced choice methodology). The response options for the panellists are:

'Guess'	Unable to determine which air flow contains the diluted odours
'Inkle'	Thinks that one of the flows may be different from the other two flows
'Detect' or 'Certain'	Is confident that one of the airflows smells different from the other two flows. Not necessarily able to say what the smell is.
'Recognise'	Thinks that one of the flows may be different from the other two flows and is able to: ▪ Assign a 'hedonic tone' (pleasantness scale number) to the odour ranging from –10 to 10 and/or ▪ Able to assign a character to the odour, as in 'it smells like …' *Note: that the Recognise level concentration and Hedonic Tone and Odour descriptors are obtained with the diluted odour, panellists are not exposed to the full strength odour.*

The percentage panel response and dilution levels used were then entered into a computer programme to determine the 50% panel response. This dilution level corresponds to the odour concentration of the sample.

Sampling and dilution lines are constructed from teflon, stainless or glass to prevent contamination of the sample.

The sampling and the dilution procedures used were in accordance with OEH NSW Methods OM-7 and OM-8 which are based on Standards Association of Australia, AS4323.3.

5.1.1 ODOUR PANEL SELECTION

Odour panellists must meet certain criteria to qualify as and remain panellists. Their average sensitivity to n-Butanol must be between 20 and 80 parts per billion (ppb) and their variability in response to n-Butanol must be within a certain range.

Panellists are tested against n-Butanol before every panel session to ensure they are in compliance.

Panellists should not suffer from respiratory complaints, nor should they eat or smoke or drink anything but water during the half hour preceding or during the test period and their person and clothing should be odour free and have not been exposed to an odorous environment before testing.

5.1.2 ODOUR TERMINOLOGY

The odour level is expressed in odour units and for mixed odours is analogous to concentration expressed in parts per billion. The odour detection level is defined as the ratio of *the volume that a sample of odorous gas would occupy when diluted to the threshold of detection of that odour* to *the volume of the sample*. In simpler terms, the ratio indicated the number of dilutions necessary to reduce the odour to its threshold of detection or odour detection threshold. This ratio is expressed in odour units or number of dilutions to detection threshold. For example, a value of 2,000 odour units would mean the volume of the initial sample of odorous gas would need to be diluted 2,000 times before the odour would just be detectable to the average human nose, that is, at the odour detection threshold.

5.2 EXHAUST GAS VELOCITY

(OEH NSW TM-2 and USEPA Method 12)

Velocity profiles were obtained across the stack utilising an Airflow Developments Ltd. S-type pitot tube and digital manometer.

5.3 EXHAUST GAS TEMPERATURE

(OEH NSW TM- 2, 3 & 4 and USEPA Methods 2, 3 & 4)

The exhaust gas temperature was measured using a Digital thermometer (0-1200^{o}C) connected to a chromel/alumel (K-type) thermocouple probe.

5.4 EXHAUST GAS MOISTURE CONTENT

(OEH NSW TM-22)

Moisture from the stack was collected in accordance with OEH NSW TM-22 sampling train. The collected moisture was weighed and calculated to a percentage of stack gas.

5.5 ACCURACY

All results are quoted on a dry basis.

Appendix C of (British Standard) 893 presents a range of accuracies for various parts of the isokinetic sampling procedure including pressure, velocity, temperature and particulate sampling. At best, an accuracy of ± 10% can be expected.

For odour the ratio between two single measurements, performed on the same testing material in this laboratory under repeatability conditions, will not be larger than 2.65 in 95% of cases. (Source – AS/NZS 4323.3:2001 Appendix B Section B2).

APPENDIX A – CERTIFICATES OF ANALYSIS

Odour Research Laboratories Australia

A Division of Peter W. Stephenson & Associates Pty Ltd
ACN 002 600 526 (Incorporated in NSW)
ABN 75 002 600 526

Newington Business Park
Unit 7/2 Holker Street
Newington NSW 2127 Australia
Tel: (02) 9737 9991
Fax: (02) 9737 9993
E-Mail: pstephenson@orla.com.au

Olfactometry Test Report

	The measurement was commissioned by SEMA on behalf of:	
Client	Organisation:	Elf Farm Supplies
	Address:	108 Mulgrave Road, Mulgrave NSW 2756
	Contact:	Mark Hengst
	Sampling Site:	Bio-scrubber Inlet, Main Stack (Bio Out)
	Telephone:	(02) 4577 5000
	Email:	mark@elffarm.com.au
Project	ORLA Report Number:	5553/ORLA/01
	Project Manager:	Peter Stephenson
	Testing operator:	Ali Naghizadeh
	ORLA Sample number(s):	4343 to 4345 inclusive
	SEMA Sample number(s):	725178 to 725180 inclusive
Order	Analysis Requested:	Odour Analysis
	Order requested by:	SEMA on behalf of Elf Farm Supplies
	Date of order:	19 November 2015
	Order number:	4498
	Telephone:	02 9737 9991
	Signed by:	Ali Naghizadeh
	Order accepted by:	Ali Naghizadeh
Report	Date of issue:	24 November 2015

NATA accredited laboratory number 15043.

Accredited for Compliance with ISO/IEC 17025.

Investigated Item	Odour concentration in odour units 'ou' determined by Sensory odour concentration measurements, of an odour sample supplied in a sampling bag. All samples were received in good condition.
Analysis Method	The samples were analysed in accordance with AS/NZS4323.3:2001.
Identification	The odour sample bags were labelled individually. Each label recorded the testing laboratory, sample number, sampling location (or Identification) sampling date and time, dilution ratio (if dilution was used) and whether further chemical analysis was required.
Method	The odour concentration measurements were performed using dynamic olfactometry according to the Australian Standard 'Determination of Odour Concentration by Dynamic Olfactometry AS/NZS4323.3:2001. The odour perception characteristics of the panel within the presentation series for the samples were analogous to that for n-butanol calibration. Any deviation from the Australian standard is recorded in the 'Comments' section of this report.
Instrument Used	The Olfactometer used during this testing session was: AC'SCENT International Olfactometer
Measuring Range	The measuring range of the AC'SCENT International olfactometer is $12 \le \chi \le 78{,}172$ ou. If the measuring range was insufficient the odour samples will have been pre-diluted.
Environment	The measurements were performed in an air- and odour-conditioned room. The room temperature is maintained between ± 3°C.
Measuring Dates	The date of each measurement is specified with the results.
Instrument Precision	The precision of this instrument (expressed as repeatability) for a sensory calibration must be $r \le 0.05$ in accordance with the Australian Standard AS/NZS4323.3:2001. AC'SCENT International Olfactometer: $r = 0.0038$ (February 2015) Compliance – Yes
Instrumental Accuracy	The accuracy of this instrument for a sensory calibration must be $A \le 0.20$ in accordance with the Australian Standard AS/NZS4323.3:2001. AC'SCENT International Olfactometer: $A = 0.097$ (February 2015) Compliance – Yes
Lower Detection Limit (LDL)	The LDL for the AC'SCENT International Olfactometer has been determined to be 12 ou
Traceability	The measurements have been performed using standards for which the traceability to the national standard has been demonstrated. The assessors are individually selected to comply with fixed criteria and are monitored every session to keep within the limits of the standard. The results from the assessors are traceable to primary standards of n-butanol in nitrogen.

24 November 2015

Peter Stephenson
Managing Director

Odour Research Laboratories Australia

Odour Olfactometry Results – 5553/ORLA/01

Sample Location	Sample ID No.	Sampling Date & Time	ORLA Sample No.	Analysis Date & Time (Completed)	Panel Size	Valid ITEs	Sample Pre-Dilution	Sample Odour Concentration (ou) [1,*]	Sample Odour Concentration (ou) [2,*]	Odour Character & Hedonic Tone [^ +]
Sample ID: Stack - Day 1	725178	18/11/2015 14:10	4343	19/11/2015 10:30	4	8	Nil	1,900	1,900	Dead fish, raw meat, sewer, garbage tip, putrid, rancid, musty garbage, fish and garbage, waste (-4.3)^
Sample ID: Bio-scrubber Inlet	725179	18/11/2015 14:05	4344	19/11/2015 11:40	4	8	Nil	5,800	5,800	Decay, rotten meat, dead animal, fishy, sewer, garbage tip, putrid, rancid, musty, mouldy, ammonia, fish (-5.0)^
Sample ID: Stack - Day 2	725180	19/11/2015 02:39	4345	19/11/2015 11:05	4	8	Nil	2,300	2,300	Decay, rotten meat, rotten fish, sewer, garbage tip, putrid, rancid, fishy, fermented waste, fertiliser (-4.8)^

Odour Research Laboratories Australia

Odour Panel Calibration Results – 5553/ORLA/01

Reference Odorant	ORLA Sample No.	Concentration of Reference Gas (ppm)	Reference Gas Measured Concentration (ou)	Panel Average Measured Concentration (ppb) [3]	Does this panel calibration measurement comply with AS/NZS4323.3:P2001 (Yes/No) [4]
n-butanol	4342	41	903	45	Yes

Comments: All samples were collected by Stephenson Environmental Management Australia and analysed by Odour Research Laboratories Australia at their Sydney Laboratory.

Notes from Odour Olfactometry Results:

[1] Sample Odour Concentration: as received in the bag

[2] Sample Odour Concentration: allowing for pre-dilution

[3] Panel Average Measured Concentration: indicates the sensitivity of the panel for the session completed

[4] Target Range for reference gas n-butanol is $20 \leq \chi \leq 80$ ppb and compliance with AS/NZ4323.3:2001 is based on the individuals rolling average and not on the panel average measured concentration. Panellist Rolling Average: PR = 36, SR = 52, TL = 38, DS = 30, PRM = 37

* As of July 2015 all odour concentrations are reported in two significant figures as requested by NATA's Chemical Testing Accreditation Advisory Committee.

^ denotes the Average Hedonic Tone: describes the pleasantness of the odour being presented where (+5) represents Very Pleasant, (0) represents Neutral and (-5) represents Very Unpleasant and has been derived from the panellist responses at the recognition threshold.

+ This value is not part of our NATA Scope of Accreditation and AS4323.3

--END OF TEST REPORT--

Odour Research Laboratories Australia

A Division of Peter W. Stephenson & Associates Pty Ltd
ACN 002 600 526 (Incorporated in NSW)
ABN 75 002 600 526

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Unit 7/2 Holker Street
Newington NSW 2127 Australia
Tel: (02) 9737 9991
Fax: (02) 9737 9993
E-Mail: pstephenson@orla.com.au

Olfactometry Test Report

	The measurement was commissioned by SEMA on behalf of:	
Client	Organisation:	Elf Farm Supplies
	Address:	108 Mulgrave Road, Mulgrave NSW 2756
	Contact:	Mark Hengst
	Sampling Site:	Main Stack (Bio-scrubber Out)
	Telephone:	(02) 4577 5000
	Email:	mark@elffarm.com.au
Project	ORLA Report Number:	5553/ORLA/02
	Project Manager:	Peter Stephenson
	Testing operator:	Ali Naghizadeh
	ORLA Sample number(s):	4351
	SEMA Sample number(s):	725181
Order	Analysis Requested:	Odour Analysis
	Order requested by:	SEMA on behalf of Elf Farm Supplies
	Date of order:	19 November 2015
	Order number:	4498
	Telephone:	02 9737 9991
	Signed by:	Ali Naghizadeh
	Order accepted by:	Ali Naghizadeh
Report	Date of issue:	24 November 2015

NATA accredited laboratory number 15043.

Accredited for Compliance with ISO/IEC 17025.

Investigated Item	Odour concentration in odour units 'ou' determined by Sensory odour concentration measurements, of an odour sample supplied in a sampling bag. All samples were received in good condition.
Analysis Method	The samples were analysed in accordance with AS/NZS4323.3:2001.
Identification	The odour sample bags were labelled individually. Each label recorded the testing laboratory, sample number, sampling location (or Identification) sampling date and time, dilution ratio (if dilution was used) and whether further chemical analysis was required.
Method	The odour concentration measurements were performed using dynamic olfactometry according to the Australian Standard 'Determination of Odour Concentration by Dynamic Olfactometry AS/NZS4323.3:2001. The odour perception characteristics of the panel within the presentation series for the samples were analogous to that for n-butanol calibration. Any deviation from the Australian standard is recorded in the 'Comments' section of this report.
Instrument Used	The Olfactometer used during this testing session was: AC'SCENT International Olfactometer
Measuring Range	The measuring range of the AC'SCENT International olfactometer is $12 \leq \chi \leq 78{,}172$ ou. If the measuring range was insufficient the odour samples will have been pre-diluted.
Environment	The measurements were performed in an air- and odour-conditioned room. The room temperature is maintained between ± 3°C.
Measuring Dates	The date of each measurement is specified with the results.
Instrument Precision	The precision of this instrument (expressed as repeatability) for a sensory calibration must be $r \leq 0.05$ in accordance with the Australian Standard AS/NZS4323.3:2001. AC'SCENT International Olfactometer: $r = 0.0038$ (February 2015) Compliance – Yes
Instrumental Accuracy	The accuracy of this instrument for a sensory calibration must be $A \leq 0.20$ in accordance with the Australian Standard AS/NZS4323.3:2001. AC'SCENT International Olfactometer: $A = 0.097$ (February 2015) Compliance – Yes
Lower Detection Limit (LDL)	The LDL for the AC'SCENT International Olfactometer has been determined to be 12 ou
Traceability	The measurements have been performed using standards for which the traceability to the national standard has been demonstrated. The assessors are individually selected to comply with fixed criteria and are monitored every session to keep within the limits of the standard. The results from the assessors are traceable to primary standards of n-butanol in nitrogen.

24 November 2015

Peter Stephenson
Managing Director

Odour Research Laboratories Australia

Odour Olfactometry Results – 5553/ORLA/02

Sample Location	Sample ID No.	Sampling Date & Time	ORLA Sample No.	Analysis Date & Time (Completed)	Panel Size	Valid ITEs	Sample Pre-Dilution	Sample Odour Concentration (ou) 1,*	Sample Odour Concentration (ou) 2,*	Odour Character & Hedonic Tone^ +
Sample ID: Stack - Day 3	725181	20/11/2015 03:33	4351	20/11/2015 12:25	4	8	Nil	3,000	3,000	Decay, garbage, fishy, off cat food, chemically processed protein, dirt, tobacco, ammonia (-4.5)^

Odour Research Laboratories Australia

Odour Panel Calibration Results – 5553/ORLA/02

Reference Odorant	ORLA Sample No.	Concentration of Reference Gas (ppm)	Reference Gas Measured Concentration (ou)	Panel Average Measured Concentration (ppb) [3]	Does this panel calibration measurement comply with AS/NZS4323.3:P2001 (Yes/No) [4]
n-butanol	4346	41	1,000	40	Yes

Comments: All samples were collected by Stephenson Environmental Management Australia and analysed by Odour Research Laboratories Australia at their Sydney Laboratory.

Notes from Odour Olfactometry Results:

[1] Sample Odour Concentration: as received in the bag

[2] Sample Odour Concentration: allowing for pre-dilution

[3] Panel Average Measured Concentration: indicates the sensitivity of the panel for the session completed

[4] Target Range for reference gas n-butanol is $20 \leq \chi \leq 80$ ppb and compliance with AS/NZ4323.3:2001 is based on the individuals rolling average and not on the panel average measured concentration. Panellist Rolling Average: SR = 52, PR = 38, PRA = 34, TL = 38, DS = 30

* As of July 2015 all odour concentrations are reported in two significant figures as requested by NATA's Chemical Testing Accreditation Advisory Committee.

^ denotes the Average Hedonic Tone: describes the pleasantness of the odour being presented where (+5) represents Very Pleasant, (0) represents Neutral and (-5) represents Very Unpleasant and has been derived from the panellist responses at the recognition threshold.

+ This value is not part of our NATA Scope of Accreditation and AS4323.3

---END OF TEST REPORT---

Odour Research Laboratories Australia

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Unit 7/2 Holker Street
Newington NSW 2127 Australia
Tel: (02) 9737 9991
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Olfactometry Test Report

	The measurement was commissioned by SEMA on behalf of:	
Client	Organisation:	Elf Farm Supplies
	Address:	108 Mulgrave Road, Mulgrave NSW 2756
	Contact:	Mark Hengst
	Sampling Site:	Main Stack (Bio-scrubber Out)
	Telephone:	(02) 4577 5000
	Email:	mark@elffarm.com.au
Project	ORLA Report Number:	5553/ORLA/03
	Project Manager:	Peter Stephenson
	Testing operator:	Ali Naghizadeh
	ORLA Sample number(s):	4353
	SEMA Sample number(s):	725196
Order	Analysis Requested:	Odour Analysis
	Order requested by:	SEMA on behalf of Elf Farm Supplies
	Date of order:	19 November 2015
	Order number:	4498
	Telephone:	02 9737 9991
	Signed by:	Ali Naghizadeh
	Order accepted by:	Ali Naghizadeh
Report	Date of issue:	24 November 2015

NATA accredited laboratory number 15043.

Accredited for Compliance with ISO/IEC 17025.

Investigated Item	Odour concentration in odour units 'ou' determined by Sensory odour concentration measurements, of an odour sample supplied in a sampling bag. All samples were received in good condition.
Analysis Method	The samples were analysed in accordance with AS/NZS4323.3:2001.
Identification	The odour sample bags were labelled individually. Each label recorded the testing laboratory, sample number, sampling location (or Identification) sampling date and time, dilution ratio (if dilution was used) and whether further chemical analysis was required.
Method	The odour concentration measurements were performed using dynamic olfactometry according to the Australian Standard 'Determination of Odour Concentration by Dynamic Olfactometry AS/NZS4323.3:2001. The odour perception characteristics of the panel within the presentation series for the samples were analogous to that for n-butanol calibration. Any deviation from the Australian standard is recorded in the 'Comments' section of this report.
Instrument Used	The Olfactometer used during this testing session was: AC'SCENT International Olfactometer
Measuring Range	The measuring range of the AC'SCENT International olfactometer is $12 \leq \chi \leq 78{,}172$ ou. If the measuring range was insufficient the odour samples will have been pre-diluted.
Environment	The measurements were performed in an air- and odour-conditioned room. The room temperature is maintained between ± 3°C.
Measuring Dates	The date of each measurement is specified with the results.
Instrument Precision	The precision of this instrument (expressed as repeatability) for a sensory calibration must be $r \leq 0.05$ in accordance with the Australian Standard AS/NZS4323.3:2001. AC'SCENT International Olfactometer: $r = 0.0038$ (February 2015) Compliance – Yes
Instrumental Accuracy	The accuracy of this instrument for a sensory calibration must be $A \leq 0.20$ in accordance with the Australian Standard AS/NZS4323.3:2001. AC'SCENT International Olfactometer: $A = 0.097$ (February 2015) Compliance – Yes
Lower Detection Limit (LDL)	The LDL for the AC'SCENT International Olfactometer has been determined to be 12 ou
Traceability	The measurements have been performed using standards for which the traceability to the national standard has been demonstrated. The assessors are individually selected to comply with fixed criteria and are monitored every session to keep within the limits of the standard. The results from the assessors are traceable to primary standards of n-butanol in nitrogen.

24 November 2015

Peter Stephenson
Managing Director

Odour Research Laboratories Australia

Odour Olfactometry Results – 5553/ORLA/03

Sample Location	Sample ID No.	Sampling Date & Time	ORLA Sample No.	Analysis Date & Time (Completed)	Panel Size	Valid ITEs	Sample Pre-Dilution	Sample Odour Concentration (ou) 1,*	Sample Odour Concentration (ou) 2,*	Odour Character & Hedonic Tone^ +
Sample ID: Stack - Day 4	725196	23/11/2015 03:21	4353	23/11/2015 10:30	4	8	Nil	2,100	2,100	Ammonia, smelly socks, garbage, rancid, putrid, fermented soy bean (-4.5)^

Odour Research Laboratories Australia

Odour Panel Calibration Results – 5553/ORLA/03

Reference Odorant	ORLA Sample No.	Concentration of Reference Gas (ppm)	Reference Gas Measured Concentration (ou)	Panel Average Measured Concentration (ppb) [3]	Does this panel calibration measurement comply with AS/NZS4323.3:P2001 (Yes/No) [4]
n-butanol	4352	41	1,100	37	Yes

Comments: All samples were collected by Stephenson Environmental Management Australia and analysed by Odour Research Laboratories Australia at their Sydney Laboratory.

Notes from Odour Olfactometry Results:

[1] Sample Odour Concentration: as received in the bag

[2] Sample Odour Concentration: allowing for pre-dilution

[3] Panel Average Measured Concentration: indicates the sensitivity of the panel for the session completed

[4] Target Range for reference gas n-butanol is $20 \leq \chi \leq 80$ ppb and compliance with AS/NZ4323.3:2001 is based on the individuals rolling average and not on the panel average measured concentration. Panellist Rolling Average: SR = 52, PRA = 33, TL = 39, DS = 30

* As of July 2015 all odour concentrations are reported in two significant figures as requested by NATA's Chemical Testing Accreditation Advisory Committee.

^ denotes the Average Hedonic Tone: describes the pleasantness of the odour being presented where (+5) represents Very Pleasant, (0) represents Neutral and (-5) represents Very Unpleasant and has been derived from the panellist responses at the recognition threshold.

+ This value is not part of our NATA Scope of Accreditation and AS4323.3

--END OF TEST REPORT--

Odour Research Laboratories Australia

A Division of Peter W. Stephenson & Associates Pty Ltd
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Olfactometry Test Report

The measurement was commissioned by SEMA on behalf of:

Client	Organisation:	Elf Farm Supplies
	Address:	108 Mulgrave Road, Mulgrave NSW 2756
	Contact:	Mark Hengst
	Sampling Site:	Main Stack (Bio-scrubber Out)
	Telephone:	(02) 4577 5000
	Email:	mark@elffarm.com.au
Project	ORLA Report Number:	5553/ORLA/04
	Project Manager:	Peter Stephenson
	Testing operator:	Ali Naghizadeh
	ORLA Sample number(s):	4359
	SEMA Sample number(s):	725204
Order	Analysis Requested:	Odour Analysis
	Order requested by:	SEMA on behalf of Elf Farm Supplies
	Date of order:	19 November 2015
	Order number:	4498
	Telephone:	02 9737 9991
	Signed by:	Ali Naghizadeh
	Order accepted by:	Ali Naghizadeh
Report	Date of issue:	24 November 2015

NATA accredited laboratory number 15043.

Accredited for Compliance with ISO/IEC 17025.

NATA
WORLD RECOGNISED ACCREDITATION

Investigated Item	Odour concentration in odour units 'ou' determined by Sensory odour concentration measurements, of an odour sample supplied in a sampling bag. All samples were received in good condition.
Analysis Method	The samples were analysed in accordance with AS/NZS4323.3:2001.
Identification	The odour sample bags were labelled individually. Each label recorded the testing laboratory, sample number, sampling location (or Identification) sampling date and time, dilution ratio (if dilution was used) and whether further chemical analysis was required.
Method	The odour concentration measurements were performed using dynamic olfactometry according to the Australian Standard 'Determination of Odour Concentration by Dynamic Olfactometry AS/NZS4323.3:2001. The odour perception characteristics of the panel within the presentation series for the samples were analogous to that for n-butanol calibration. Any deviation from the Australian standard is recorded in the 'Comments' section of this report.
Instrument Used	The Olfactometer used during this testing session was: AC'SCENT International Olfactometer
Measuring Range	The measuring range of the AC'SCENT International olfactometer is $12 \leq \chi \leq 78{,}172$ ou. If the measuring range was insufficient the odour samples will have been pre-diluted.
Environment	The measurements were performed in an air- and odour-conditioned room. The room temperature is maintained between ± 3°C.
Measuring Dates	The date of each measurement is specified with the results.
Instrument Precision	The precision of this instrument (expressed as repeatability) for a sensory calibration must be $r \leq 0.05$ in accordance with the Australian Standard AS/NZS4323.3:2001. AC'SCENT International Olfactometer: $r = 0.0038$ (February 2015) Compliance – Yes
Instrumental Accuracy	The accuracy of this instrument for a sensory calibration must be $A \leq 0.20$ in accordance with the Australian Standard AS/NZS4323.3:2001. AC'SCENT International Olfactometer: $A = 0.097$ (February 2015) Compliance – Yes
Lower Detection Limit (LDL)	The LDL for the AC'SCENT International Olfactometer has been determined to be 12 ou
Traceability	The measurements have been performed using standards for which the traceability to the national standard has been demonstrated. The assessors are individually selected to comply with fixed criteria and are monitored every session to keep within the limits of the standard. The results from the assessors are traceable to primary standards of n-butanol in nitrogen.

24 November 2015

Peter Stephenson
Managing Director

Odour Research Laboratories Australia

Odour Olfactometry Results – 5553/ORLA/04

Sample Location	Sample ID No.	Sampling Date & Time	ORLA Sample No.	Analysis Date & Time (Completed)	Panel Size	Valid ITEs	Sample Pre-Dilution	Sample Odour Concentration (ou) 1,*	Sample Odour Concentration (ou) 2,*	Odour Character & Hedonic Tone^ +
Sample ID: Stack - Day 5	725204	24/11/2015 04:10	4359	24/11/2015 12:30	4	8	Nil	5,800	5,800	Dead fish, garbage, concentrated organic compost, metallic, septic, sewer, musty, mouldy, garbage (-5.0)^

Odour Research Laboratories Australia

Odour Panel Calibration Results – 5553/ORLA/04

Reference Odorant	ORLA Sample No.	Concentration of Reference Gas (ppm)	Reference Gas Measured Concentration (ou)	Panel Average Measured Concentration (ppb) [3]	Does this panel calibration measurement comply with AS/NZS4323.3:P2001 (Yes/No) [4]
n-butanol	4354	41	1,100	37	Yes

Comments: All samples were collected by Stephenson Environmental Management Australia and analysed by Odour Research Laboratories Australia at their Sydney Laboratory.

Notes from Odour Olfactometry Results:

[1] Sample Odour Concentration: as received in the bag

[2] Sample Odour Concentration: allowing for pre-dilution

[3] Panel Average Measured Concentration: indicates the sensitivity of the panel for the session completed

[4] Target Range for reference gas n-butanol is $20 \leq \chi \leq 80$ ppb and compliance with AS/NZ4323.3:2001 is based on the individuals rolling average and not on the panel average measured concentration. Panellist Rolling Average: SR = 52, PRA = 32, TL = 41, DS = 30

* As of July 2015 all odour concentrations are reported in two significant figures as requested by NATA's Chemical Testing Accreditation Advisory Committee.

^ denotes the Average Hedonic Tone: describes the pleasantness of the odour being presented where (+5) represents Very Pleasant, (0) represents Neutral and (-5) represents Very Unpleasant and has been derived from the panellist responses at the recognition threshold.

+ This value is not part of our NATA Scope of Accreditation and AS4323.3

--END OF TEST REPORT--

APPENDIX B – PART OF OEH EPL LICENCE

Section 55 Protection of the Environment Operations Act 1997

Environment Protection Licence

Licence - 6229

P1 Location of monitoring/discharge points and areas

P1.1 The following points referred to in the table below are identified in this licence for the purposes of monitoring and/or the setting of limits for the emission of pollutants to the air from the point.

Air

EPA identi-fication no.	Type of Monitoring Point	Type of Discharge Point	Location Description
1	Discharge to air Air emissions monitoring	Discharge to air Air emissions monitoring	Bioscrubber chimney labelled as "Chimney" on "Figure 5.2 - Plant Layout" and "Figure 5.5 - Stage 1 - Phase 1 Bioscrubber Detail" contained in the "Mulgrave Mushroom Substrate Plant Environmental Management Plan" dated August 2002.

3 Limit Conditions

L1 Pollution of waters

L1.1 Except as may be expressly provided in any other condition of this licence, the licensee must comply with section 120 of the Protection of the Environment Operations Act 1997.

L2 Concentration limits

L2.1 For each monitoring/discharge point or utilisation area specified in the table\s below (by a point number), the concentration of a pollutant discharged at that point, or applied to that area, must not exceed the concentration limits specified for that pollutant in the table.

L2.2 To avoid any doubt, this condition does not authorise the pollution of waters by any pollutant other than those specified in the table\s.

L2.3 Air Concentration Limits

POINT 1

Pollutant	Units of measure	100 percentile concentration limit	Reference conditions	Oxygen correction	Averaging period
Odour	odour units per second	55400			

L2.4 For each monitoring/discharge point specified in the table(s) in L2 above (by a point number), the reference conditions and averaging period of a pollutant discharged at that point must be reported at the reference conditions and averaging period specified for that pollutant in the following table.

Pollutant	Reference Conditions	Duration	Averaging Period

Environment Protection Authority - NSW
Licence version date: 7-Oct-2014
Page 7 of 21

Odour	dry, 293K, 101.3kPa	1 hour	Rolling annual

L3 Waste

L3.1 The licensee must not cause, permit or allow any waste to be received at the premises, except the wastes expressly referred to in the column titled "Waste" and meeting the definition, if any, in the column titled "Description" in the table below.
Any waste received at the premises must only be used for the activities referred to in relation to that waste in the column titled "Activity" in the table below.
Any waste received at the premises is subject to those limits or conditions, if any, referred to in relation to that waste contained in the column titled "Other Limits" in the table below.
This condition does not limit any other conditions in this licence.

Code	Waste	Description	Activity	Other Limits
NA	Chicken manure			NA
NA	Feather meal			NA
NA	Cotton seed meal			NA
NA	Natural organic fibrous materials			NA
NA	Horse stable bedding			NA
NA	General or Specific exempted waste			NA
NA	Waste			NA

L3.2 The licensee must ensure that the amount of excess compost that is stored at the premises does not exceed 150 tonnes at any one time.

L4 Noise limits

L4.1 Noise generated at the premises must not exceed the LAeq (15 minutes) noise limits presented in the table below:

Location	Day	Evening	Night
Most effected residence	44	44	39

L4.2 Noise from the premises is to be measured at the most affected point on or within the residential boundary or at the most affected point within 30m of the dwelling (rural situations) where the dwelling is more than 30m from boundary to determine compliance with the LAeq(15 minute) noise limits in condition L4.1.

Where it can be demonstrated that direct measurement of noise from the premises is impractical, the EPA may accept alternative means of determining compliance. See Chapter 11 of the NSW Industrial Noise Policy.

The modification factors presented in Section 4 of the NSW Industrial Noise Policy shall also be applied

APPENDIX C – EXHAUST GAS FLOW DATA

Glossary:

%	=	percent
^oC	=	Degrees Celsius
am^3/min	=	cubic metre of gas at actual conditions per minute
Normal Volume (m^3)	=	cubic metre at 0°C and 760 mm pressure and 1 atmosphere
am^3	=	cubic metre of gas at actual conditions
g/g mole	=	grams per gram mole
g/s	=	grams per second
hrs	=	hours
kg/m^3	=	kilograms per cubic metre
kPa	=	kilopascals
m^2	=	square metre
m/s	=	metre per second
m^3/min	=	cubic metre per minute at 0^0C and 1 atmosphere
m^3/sec	=	cubic metre per second at 0^0C and 1 atmosphere
mg	=	milligrams
$mg/\ m^3$	=	milligrams per cubic metre at 0^oC and 1 atmosphere
ou	=	odour units
$ou.m^3/s$	=	odour units cubic metre of gas at dry, 293 K and 101.3 kPa
K	=	degrees Kelvin
O_2	=	Oxygen

Abbreviations for names of SEMA staff who completed the either/and/or Sampling, Analysis and Checking

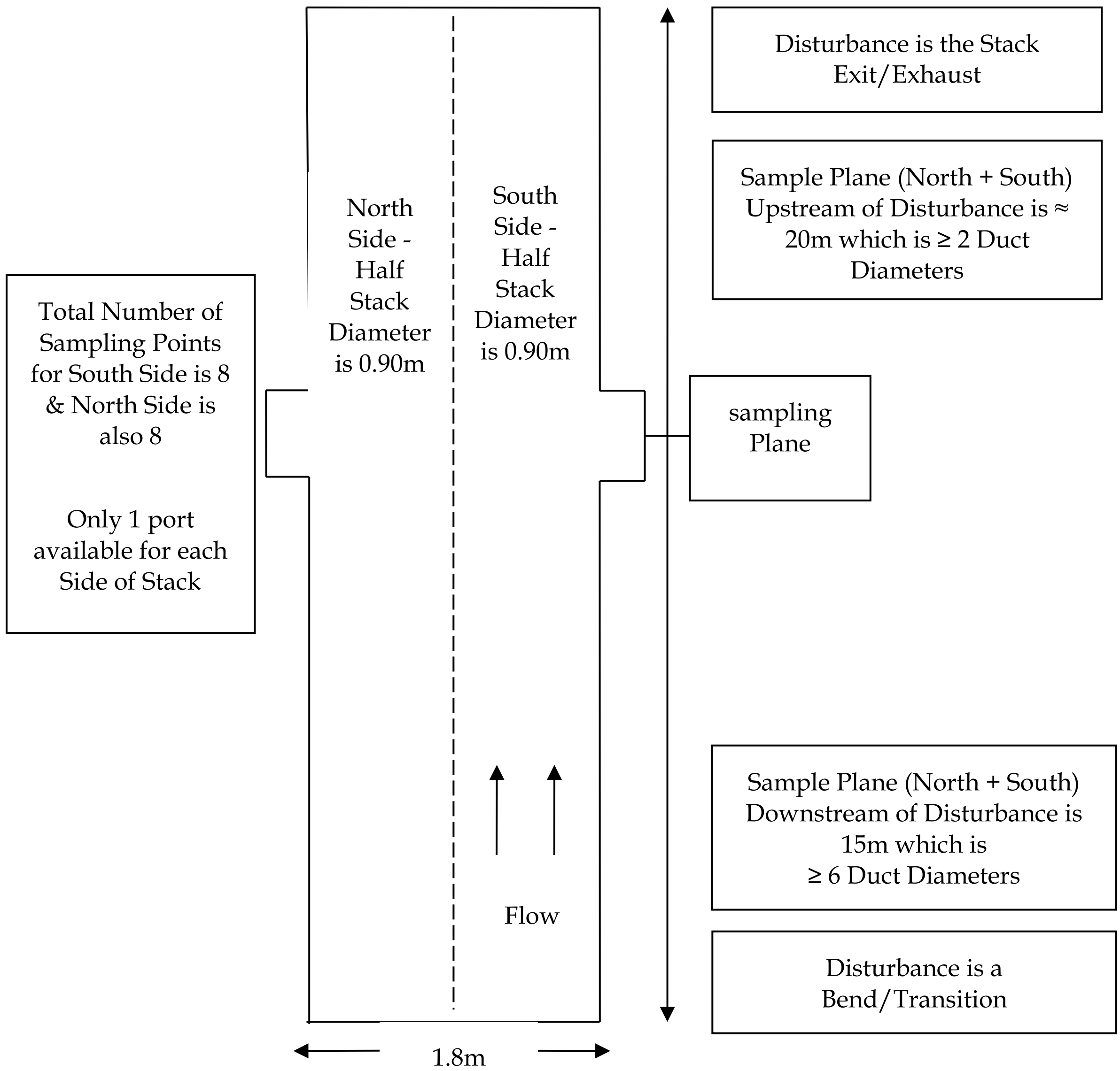
PWS	=	Peter Stephenson
AN	=	Ali Naghizadeh
AP	=	Alok Pradhan

TABLE C-1 EMISSION TEST RESULTS – FLOW AND ODOUR

Emission Test Results	Flow	Flow	Flow	Flow	Flow
Project Number	5553	5553	5553	5553	5553
Project Name	Elf Farm Bio-scrubber	Elf Farm Bio-scrubber	Elf Farm Bio-scrubber	Elf Farm Bio-scrubber	Elf Farm Bio-scrubber
Test Location	Stack	Stack	Stack	Stack	Stack
Date	18-Nov-15	19-Nov-15	20-Nov-15	23-Nov-15	24-Nov-15
Run	1	2	3	4	5
Sample Start Time (hrs)	13:40	2:15	3:05	2:53	3:45
Sample Stop Time (hrs)	14:20	2:55	3:45	3:33	4:25
Stack Temperature (^oC)	32.5	31.5	36.5	32.7	34.5
Average Stack Gas Velocity (m/s)	16.5	14.7	14.7	15.0	14.8
Actual Gas Flow Volume (am^3/min)	1,300	1,100	1,100	1,100	1,100
	Dry	Dry	Dry	Dry	Dry
Total Normal Gas Flow Volume (m^3/min)	1100	990	960	970	950
Total Stack Pressure (kPa)	100.9	101.2	101.1	101.0	101.5
Moisture Content (% by volume)	3.2	1.4	3.0	4.4	5.5
Analysis	**Odour**	**Odour**	**Odour**	**Odour**	**Odour**
Method	AS4323.3	AS4323.3	AS4323.3	AS4323.3	AS4323.3
ORLA Number	4343	4345	4351	4353	4359
SEMA Number	725178	725180	725181	725196	725204
Sample Start Time (hrs)	14:00	2:28	3:20	3:10	3:58
Sample Finish Time (hrs)	14:10	2:39	3:33	3:21	4:10
Odour Concentration (Final) (ou)	**1,900**	**2,300**	**3,000**	**2,100**	**5,800**
Normal MOER (Final) (ou m^3/s)	**34,000**	**38,000**	**48,000**	**34,000**	**92,000**
Mass Odour Emission Rate Limit (ou m^3/s)	55,400	55,400	55,400	55,400	55,400
Sample Storage Period	2 days	2 days	2 days	2 days	2 days
Calculations entered by	AP	AP	AN	AN	AN
Calculations checked by	AN	AN	AP	AP	AP

APPENDIX D – SAMPLE LOCATION

FIGURE D-1 SAMPLE LOCATION



In the absence of cyclonic flow activity ideal sampling plane conditions will be found to exist at 6-8 duct diameters downstream and 2-3 duct diameters upstream from a flow disturbance. The sampling plane does meet this criterion.

The sample plane does meet gas profile for sampling. Therefore the sampling plane is satisfactory for testing and in compliance with AS4323.1

Stephenson

Environmental Management Australia

ODOUR EMISSION COMPLIANCE TEST

TUNNEL COMPOSTER BIO-SCRUBBER

ELF FARM SUPPLIES PTY LTD

MULGRAVE, NSW

PROJECT NO.:	5652/S24158/16
DATE OF SURVEY:	4 TO 9 MAY 2016
DATE OF ISSUE:	12 MAY 2016

Stephenson
Environmental Management Australia

Peter W Stephenson & Associates Pty Ltd
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ODOUR EMISSION COMPLIANCE TEST

TUNNEL COMPOSTER BIO-SCRUBBER

ELF FARM SUPPLIES PTY LTD

MULGRAVE, NSW

PROJECT NO.:	**5652/S24158/16**
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DATE OF ISSUE:	**12 MAY 2016**

P W STEPHENSON

A NAGHIZADEH

A PRADHAN

TABLE OF CONTENTS

TABLE OF TABLES

TABLE OF TABLES APPENDICES

TABLE OF FIGURES APPENDICES

1 INTRODUCTION

Stephenson Environmental Management Australia (SEMA) was requested by Elf Farm Supplies Pty Ltd to assess the odour emissions from the stack serving the bio-scrubbing odour pollution control device treating the emissions from the tunnel composters at their composting facility located at Mulgrave, New South Wales (NSW).

The principal objectives of the tests were to measure odour emission concentrations from the stack and to determine compliance of the odour emission with the facility's Environment Protection Licence (EPL) No. 6229. The EPL was issued by the Environment Protection Authority (EPA) in accordance with the *Protection of the Environment Operations Act 1997*. The EPA is now incorporated into the Office of Environment and Heritage (OEH).

The emission parameters monitored in this survey were:

- Odour concentration
- Stack exhaust gas velocity, exhaust gas temperature, and hence discharge volume
- Moisture
- Mass Odour Emission Rate (MOER).

Odour emission testing was undertaken between 4 and 9 May 2016 at various times during a typical composting cycle. Table 1-1 shows when emission testing was carried out on the stack.

TABLE 1-1 ODOUR TESTING PROGRAM

Day of the Week	Date	Time of the Day Sample was Taken	Number of Odour Samples Taken per Visit
Wednesday	04/05/2016	PM	1
Thursday	05/05/2016	AM	1
Friday	06/05/2016	AM	1
Sunday	08/05/2016	AM	1
Monday	09/05/2016	AM	1

2 PRODUCTION CONDITIONS

The odour emission samples were collected with the composting plant operating under a normal cycle commencing on a Wednesday. Samples were taken on five separate days over a six day period.

Elf Farm Supplies holds all relevant production records should they be required for review.

3 RESULTS AND DISCUSSION

3.1 EMISSION TEST RESULTS

The results of the compliance emission tests are presented in Table 3-1. SEMA completed the odour sampling. SEMA is NATA accredited for the odour sampling, NATA accreditation number 15043.

Odour Research Laboratories Australia (ORLA) performed the odour analysis. ORLA is a division of Peter W Stephenson & Associates Pty Ltd and is NATA accredited to AS4323.3 for odour analysis, accreditation number 15043.

The Certificates of Analysis, Olfactometer Test Reports No. 5652/ORLA/01, 5652/ORLA/02 and 5652/ORLA/03 are presented in Appendix A of this report.

The odour emission sampling and olfactometric analysis was conducted in accordance with Australian Standard (AS) 4323.3. Refer to Section 5 of this report for further detail.

TABLE 3-1 ODOUR EMISSION CONCENTRATION RESULTS

Day of Week	**Wednesday**	**Thursday**	**Friday**	**Sunday**	**Monday**
Date	04/05/2016	05/05/2016	06/05/2016	08/05/2016	09/05/2016
Time Sample Taken (hours)	14:48	03:46	03:24	08:30	03:48
SEMA Sample No.	725446	725447	725449	725450	725451
ORLA Sample No.	4500	4501	4504	4506	4507
Concentration (ou)	**2,200**	**2,400**	**2,200**	**2,400**	**3,100**

Key:
ou = odour unit

3.2 ENVIRONMENT PROTECTION LICENCE NO. 6229

Table 3-2 summarises the odour emission limit for the tunnel composter stack at Elf Farm Supplies Pty Ltd under their EPL Licence No. 6229. The criterion is defined by the 100th percentile odour emission limit as a Mass Odour Emission Rate (MOER) in Odour Units per second (ou/s) on a rolling annual average. A copy of the relevant section of this Licence is included in Appendix B.

TABLE 3-2 100TH PERCENTILE ODOUR EMISSION LIMIT

	EPA Licence Criteria
100th Percentile MOER Limit	55,400 ou/s
Averaging Period	Rolling annual

Key:
MOER = Mass odour emission rate
ou/s = Odour units per second which is a misnomer in EPA Licence 6229 (EPL) and should now read odour units. cubic metres per second (ou.m^3/s)

3.3 ODOUR EMISSION RATES

The MOER for all samples was determined to establish compliance with the EPA/OEH EPL criteria.

The MOER can be calculated using the following formula:

MOER = velocity (m/s) x internal area of the stack (m^2) x odour concentration (ou)

Velocity = velocity of air in stack in metres per second as shown in Table 3-3.
Total Surface Area of the Stack = Cross Sectional Area of the Stack in square metres (m^2).
Odour Concentration = As per Table 2-1 and Table 3-3.

The above formula calculates MOER based on actual conditions. However the Reference Conditions specified that the MOER is to be reported as dry, 293 degrees Kelvin (K) and 101.3 kilopascals (kPa).

SEMA measured the moisture content, temperature and pressure of the exhaust gas stream, at the same time as the odour emissions were sampled. These measurements enabled the MOER to be corrected to the above reference conditions. The MOER for each of the samples is shown in Table 3-3. Refer to Appendix C for detailed Exhaust Gas Flow Data in table format.

TABLE 3-3 ODOUR EMISSION RATES OVER A TYPICAL SEVEN DAY COMPOSTING CYCLE AUTUMN 2016

Day	**Wednesday**	**Thursday**	**Friday**	**Sunday**	**Monday**	**Average**
Date	04/05/2016	05/05/2016	06/05/2016	08/05/2016	09/05/2016	
ORLA Sample No.	4500	4501	4504	4506	4507	
Time (hours)	14:48	03:46	03:24	08:30	03:48	
Odour Conc. (ou)	2,200	2,400	2,200	2,400	3,100	2,500
Stack Velocity (m/s)	14.8	15.5	15.5	15.6	15.9	15.5
Stack Cross Section Area (m^2)	1.3	1.3	1.3	1.3	1.3	1.3
MOER (ou.v/s)	37,000	42,000	39,000	41,000	52,000	42,000
EPL MOER Limit (ou/s) Annual Rolling Average	55,400	55,400	55,400	55,400	55,400	55,400

Key:

No.	=	Number
Conc.	=	concentration
*	=	Rolling annual averaging period
MOER	=	Mass Odour Emission Rate
m/s	=	metres per second
ou.v/s	=	Odour Unit volumes per second
m^2	=	square metres
ou/s	=	Odour Units per second

4 CONCLUSIONS

This odour emission survey was conducted over a typical composting cycle. The measured stack MOER's for the monitoring period were in the range of 37,000 ou.m^3/s to 52,000 ou.m^3/s. The average MOER for the autumn 2016 composting cycle, which was considered to be typical, was 42,000 ou.m^3/s.

Therefore, these MOER's comply with the EPA/OEH EPL No. 6229 Licence Criteria of 55,400 ou.m^3/s Rolling Annual Average.

5 TEST METHODS

5.1 ODOUR

(Standards Association of Australia AS4323.3 and OEH NSW OM-7)

Samples were collected in 30L Nalophane sampling bags which are enclosed in airtight plastic containers.

Odorous gas for analysis was drawn through a Teflon (PTFE) sample probe. The gas then passes through a Teflon (PTFE) tube connected to the Nalophane sampling bag. The sampling pump is connected to the airtight plastic container to provide a sample gas flow-rate of approximately 0.5 – 1.5 litres per minute. After the required volume has been sampled, the pump is stopped and the bag sealed with a stainless steel valve.

Using a triangular forced choice olfactometer, the Nalophane bag of odour sample was dynamically diluted to various concentrations with dry odour free air.

The diluted sample was then presented to a panel of screened panellists as one of these airflows. The panellists then recorded if they could detect any odour and from which flow. The other two flows were discharging odour free air.

The odour is always presented to the panellists in ascending concentration; that is, from lower to higher concentration. The panellists are required at each dilution level to give a response as to what they are smelling from the flows (forced choice methodology). The response options for the panellists are:

'Guess'	Unable to determine which air flow contains the diluted odours
'Inkle'	Thinks that one of the flows may be different from the other two flows
'Detect' or 'Certain'	Is confident that one of the airflows smells different from the other two flows. Not necessarily able to say what the smell is.
'Recognise'	Thinks that one of the flows may be different from the other two flows and is able to: ▪ Assign a 'hedonic tone' (pleasantness scale number) to the odour ranging from –10 to 10 and/or ▪ Able to assign a character to the odour, as in 'it smells like …' *Note: that the Recognise level concentration and Hedonic Tone and Odour descriptors are obtained with the diluted odour, panellists are not exposed to the full strength odour.*

The percentage panel response and dilution levels used were then entered into a computer programme to determine the 50% panel response. This dilution level corresponds to the odour concentration of the sample.

Sampling and dilution lines are constructed from teflon, stainless or glass to prevent contamination of the sample.

The sampling and the dilution procedures used were in accordance with OEH NSW Methods OM-7 and OM-8 which are based on Standards Association of Australia, AS4323.3.

5.1.1 ODOUR PANEL SELECTION

Odour panellists must meet certain criteria to qualify as and remain panellists. Their average sensitivity to n-Butanol must be between 20 and 80 parts per billion (ppb) and their variability in response to n-Butanol must be within a certain range.

Panellists are tested against n-Butanol before every panel session to ensure they are in compliance.

Panellists should not suffer from respiratory complaints, nor should they eat or smoke or drink anything but water during the half hour preceding or during the test period and their person and clothing should be odour free and have not been exposed to an odorous environment before testing.

5.1.2 ODOUR TERMINOLOGY

The odour level is expressed in odour units and for mixed odours is analogous to concentration expressed in parts per billion. The odour detection level is defined as the ratio of *the volume that a sample of odorous gas would occupy when diluted to the threshold of detection of that odour* to *the volume of the sample*. In simpler terms, the ratio indicated the number of dilutions necessary to reduce the odour to its threshold of detection or odour detection threshold. This ratio is expressed in odour units or number of dilutions to detection threshold. For example, a value of 2,000 odour units would mean the volume of the initial sample of odorous gas would need to be diluted 2,000 times before the odour would just be detectable to the average human nose, that is, at the odour detection threshold.

5.2 EXHAUST GAS VELOCITY

(OEH NSW TM-2 and USEPA Method 12)

Velocity profiles were obtained across the stack utilising an Airflow Developments Ltd. S-type pitot tube and digital manometer.

5.3 EXHAUST GAS TEMPERATURE

(OEH NSW TM- 2, 3 & 4 and USEPA Methods 2, 3 & 4)

The exhaust gas temperature was measured using a Digital thermometer (0-1200^{o}C) connected to a chromel/alumel (K-type) thermocouple probe.

5.4 EXHAUST GAS MOISTURE CONTENT

(OEH NSW TM-22)

Moisture from the stack was collected in accordance with OEH NSW TM-22 sampling train. The collected moisture was weighed and calculated to a percentage of stack gas.

5.5 ACCURACY

All results are quoted on a dry basis.

Appendix C of (British Standard) 893 presents a range of accuracies for various parts of the isokinetic sampling procedure including pressure, velocity, temperature and particulate sampling. At best, an accuracy of $\pm$ 10% can be expected.

For odour the ratio between two single measurements, performed on the same testing material in this laboratory under repeatability conditions, will not be larger than 2.65 in 95% of cases. (Source – AS/NZS 4323.3:2001 Appendix B Section B2).

APPENDIX A – CERTIFICATES OF ANALYSIS

Odour Research Laboratories Australia

A Division of Peter W. Stephenson & Associates Pty Ltd
ACN 002 600 526 (Incorporated in NSW)
ABN 75 002 600 526

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Fax: (02) 9737 9993
E-Mail: pstephenson@orla.com.au

Olfactometry Test Report

The measurement was commissioned by SEMA on behalf of:

Client	Organisation:	Elf Farm Supplies
	Address:	108 Mulgrave Road, Mulgrave NSW 2756
	Contact:	Mark Hengst
	Sampling Site:	Main Stack (Bioscrubber Out)
	Telephone:	(02) 4577 5000
	Email:	mark@elffarm.com.au
Project	ORLA Report Number:	5652/ORLA/01
	Project Manager:	Peter Stephenson
	Testing operator:	Ali Naghizadeh
	ORLA Sample number(s):	4500, 4501
	SEMA Sample number(s):	725446, 725448
Order	Analysis Requested:	Odour Analysis
	Order requested by:	SEMA on behalf of Elf Farm Supplies
	Date of order:	05 May 2016
	Order number:	4563
	Telephone:	02 9737 9991
	Signed by:	Ali Naghizadeh
	Order accepted by:	Ali Naghizadeh
Report	Date of issue:	10 May 2016

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NATA accredited laboratory number 15043.

Accredited for Compliance with ISO/IEC 17025.

Investigated Item	Odour concentration in odour units 'ou' determined by Sensory odour concentration measurements, of an odour sample supplied in a sampling bag. All samples were received in good condition.
Analysis Method	The samples were analysed in accordance with AS/NZS4323.3:2001.
Identification	The odour sample bags were labelled individually. Each label recorded the testing laboratory, sample number, sampling location (or Identification) sampling date and time, dilution ratio (if dilution was used) and whether further chemical analysis was required.
Method	The odour concentration measurements were performed using dynamic olfactometry according to the Australian Standard 'Determination of Odour Concentration by Dynamic Olfactometry AS/NZS4323.3:2001. The odour perception characteristics of the panel within the presentation series for the samples were analogous to that for n-butanol calibration. Any deviation from the Australian standard is recorded in the 'Comments' section of this report.
Instrument Used	The Olfactometer used during this testing session was: AC'SCENT International Olfactometer
Measuring Range	The measuring range of the AC'SCENT International olfactometer is $12 \leq \chi \leq 76,000$ ou. If the measuring range was insufficient the odour samples will have been pre-diluted.
Environment	The measurements were performed in an air- and odour-conditioned room. The room temperature is maintained between ± 3°C.
Measuring Dates	The date of each measurement is specified with the results.
Instrument Precision	The precision of this instrument (expressed as repeatability) for a sensory calibration must be $r \leq 0.05$ in accordance with the Australian Standard AS/NZS4323.3:2001. AC'SCENT International Olfactometer: $r = 0.0054$ (February 2016) Compliance – Yes
Instrumental Accuracy	The accuracy of this instrument for a sensory calibration must be $A \leq 0.20$ in accordance with the Australian Standard AS/NZS4323.3:2001. AC'SCENT International Olfactometer: $A = 0.027$ (February 2016) Compliance – Yes
Lower Detection Limit (LDL)	The LDL for the AC'SCENT International Olfactometer has been determined to be 12 ou
Traceability	The measurements have been performed using standards for which the traceability to the national standard has been demonstrated. The assessors are individually selected to comply with fixed criteria and are monitored every session to keep within the limits of the standard. The results from the assessors are traceable to primary standards of n-butanol in nitrogen.

10 May 2016

Peter Stephenson
Managing Director

Odour Research Laboratories Australia

Odour Olfactometry Results – 5652/ORLA/01

Sample Location	Sample ID No.	Sampling Date & Time	ORLA Sample No.	Analysis Date & Time (Completed)	Panel Size	Valid ITEs	Sample Pre-Dilution	Sample Odour Concentration (ou) [1*]	Sample Odour Concentration (ou) [2*]	Odour Character & Hedonic Tone [^ +]
Sample ID: Stack Day 1	725446	04-05-2016 14:48	4500	05-05-2016 10:50	4	8	Nil	2,200	2,200	Amines, compost, sewer, septic, mushroom soup, swamp, rotting food (-3.0)[^]
Sample ID: Stack Day 2	725447	05-05-2016 03:46	4501	05-05-2016 11:15	4	8	Nil	2,400	2,400	Compost, seaweed, septic, mushroom soup, swamp, rotting food (-2.8)[^]

Odour Research Laboratories Australia

Odour Panel Calibration Results – 5652/ORLA/01

Reference Odorant	ORLA Sample No.	Concentration of Reference Gas (ppm)	Reference Gas Measured Concentration (ou)	Panel Average Measured Concentration (ppb) [3]	Does this panel calibration measurement comply with AS/NZS4323.3:P2001 (Yes/No) [4]
n-butanol	4499	52	980	53	Yes

Comments: All samples were collected by Stephenson Environmental Management Australia and analysed by Odour Research Laboratories Australia at their Sydney Laboratory.

Notes from Odour Olfactometry Results:

[1] Sample Odour Concentration: as received in the bag

[2] Sample Odour Concentration: allowing for pre-dilution

[3] Panel Average Measured Concentration: indicates the sensitivity of the panel for the session completed

[4] Target Range for reference gas n-butanol is $20 \le \chi \le 80$ ppb and compliance with AS/NZ4323.3:2001 is based on the individuals rolling average and not on the panel average measured concentration. Panellist Rolling Average: PR = 58, PRA = 34, JW = 47, PS = 44

^ denotes the Average Hedonic Tone: describes the pleasantness of the odour being presented where (+5) represents Very Pleasant, (0) represents Neutral and (-5) represents Very Unpleasant and has been derived from the panellist responses at the recognition threshold.

+ This value is not part of our NATA Scope of Accreditation and AS4323.3

--END OF TEST REPORT--

Odour Research Laboratories Australia

A Division of Peter W. Stephenson & Associates Pty Ltd
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Olfactometry Test Report

The measurement was commissioned by SEMA on behalf of:

Client	Organisation:	Elf Farm Supplies
	Address:	108 Mulgrave Road, Mulgrave NSW 2756
	Contact:	Mark Hengst
	Sampling Site:	Main Stack (Bioscrubber Out)
	Telephone:	(02) 4577 5000
	Email:	mark@elffarm.com.au
Project	ORLA Report Number:	5652/ORLA/02
	Project Manager:	Peter Stephenson
	Testing operator:	Ali Naghizadeh
	ORLA Sample number(s):	4504
	SEMA Sample number(s):	725449
Order	Analysis Requested:	Odour Analysis
	Order requested by:	SEMA on behalf of Elf Farm Supplies
	Date of order:	05 May 2016
	Order number:	4563
	Telephone:	02 9737 9991
	Signed by:	Ali Naghizadeh
	Order accepted by:	Ali Naghizadeh
Report	Date of issue:	10 May 2016

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Accredited for Compliance with ISO/IEC 17025.

NATA WORLD RECOGNISED ACCREDITATION

ODOUR CONCENTRATION MEASUREMENTS RESULTS 5652/ORLA/02

Investigated Item	Odour concentration in odour units 'ou' determined by Sensory odour concentration measurements, of an odour sample supplied in a sampling bag. All samples were received in good condition.
Analysis Method	The samples were analysed in accordance with AS/NZS4323.3:2001.
Identification	The odour sample bags were labelled individually. Each label recorded the testing laboratory, sample number, sampling location (or Identification) sampling date and time, dilution ratio (if dilution was used) and whether further chemical analysis was required.
Method	The odour concentration measurements were performed using dynamic olfactometry according to the Australian Standard 'Determination of Odour Concentration by Dynamic Olfactometry AS/NZS4323.3:2001. The odour perception characteristics of the panel within the presentation series for the samples were analogous to that for n-butanol calibration. Any deviation from the Australian standard is recorded in the 'Comments' section of this report.
Instrument Used	The Olfactometer used during this testing session was: AC'SCENT International Olfactometer
Measuring Range	The measuring range of the AC'SCENT International olfactometer is $12 \leq \chi \leq 76{,}000$ ou. If the measuring range was insufficient the odour samples will have been pre-diluted.
Environment	The measurements were performed in an air- and odour-conditioned room. The room temperature is maintained between ± 3°C.
Measuring Dates	The date of each measurement is specified with the results.
Instrument Precision	The precision of this instrument (expressed as repeatability) for a sensory calibration must be $r \leq 0.05$ in accordance with the Australian Standard AS/NZS4323.3:2001. AC'SCENT International Olfactometer: $r = 0.0054$ (February 2016) Compliance – Yes
Instrumental Accuracy	The accuracy of this instrument for a sensory calibration must be $A \leq 0.20$ in accordance with the Australian Standard AS/NZS4323.3:2001. AC'SCENT International Olfactometer: $A = 0.027$ (February 2016) Compliance – Yes
Lower Detection Limit (LDL)	The LDL for the AC'SCENT International Olfactometer has been determined to be 12 ou
Traceability	The measurements have been performed using standards for which the traceability to the national standard has been demonstrated. The assessors are individually selected to comply with fixed criteria and are monitored every session to keep within the limits of the standard. The results from the assessors are traceable to primary standards of n-butanol in nitrogen.

10 May 2016

Peter Stephenson
Managing Director

Odour Research Laboratories Australia

Odour Olfactometry Results – 5652/ORLA/02

Sample Location	Sample ID No.	Sampling Date & Time	ORLA Sample No.	Analysis Date & Time (Completed)	Panel Size	Valid ITEs	Sample Pre-Dilution	Sample Odour Concentration (ou) 1 *	Sample Odour Concentration (ou) 2 *	Odour Character & Hedonic Tone ^ +
Sample ID: Stack Day 3	725449	06-05-2016 03:24	4504	06-05-2016 11:30	4	8	Nil	2,200	2,200	Landfill, garbage, mangrove swamp, sulphurous, sour, putrid, septic, musty, mould, petrochemical, resin, spirits, rotting organic matter (-3.5)^

Odour Research Laboratories Australia

Odour Panel Calibration Results – 5652/ORLA/02

Reference Odorant	ORLA Sample No.	Concentration of Reference Gas (ppm)	Reference Gas Measured Concentration (ou)	Panel Average Measured Concentration (ppb) [3]	Does this panel calibration measurement comply with AS/NZS4323.3:P2001 (Yes/No) [4]
n-butanol	4503	52	820	63	Yes

Comments: All samples were collected by Stephenson Environmental Management Australia and analysed by Odour Research Laboratories Australia at their Sydney Laboratory.

Notes from Odour Olfactometry Results:

[1] Sample Odour Concentration: as received in the bag

[2] Sample Odour Concentration: allowing for pre-dilution

[3] Panel Average Measured Concentration: indicates the sensitivity of the panel for the session completed

[4] Target Range for reference gas n-butanol is $20 \leq \chi \leq 80$ ppb and compliance with AS/NZ4323.3:2001 is based on the individuals rolling average and not on the panel average measured concentration. Panellist Rolling Average: PR = 61, PRA = 34, TL = 57, GP = 67

^ denotes the Average Hedonic Tone: describes the pleasantness of the odour being presented where (+5) represents Very Pleasant, (0) represents Neutral and (-5) represents Very Unpleasant and has been derived from the panellist responses at the recognition threshold.

+ This value is not part of our NATA Scope of Accreditation and AS4323.3

--END OF TEST REPORT--

Odour Research Laboratories Australia

A Division of Peter W. Stephenson & Associates Pty Ltd
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Olfactometry Test Report

	The measurement was commissioned by SEMA on behalf of:	
Client	Organisation:	Elf Farm Supplies
	Address:	108 Mulgrave Road, Mulgrave NSW 2756
	Contact:	Mark Hengst
	Sampling Site:	Main Stack (Bioscrubber Out)
	Telephone:	(02) 4577 5000
	Email:	mark@elffarm.com.au
Project	ORLA Report Number:	5652/ORLA/03
	Project Manager:	Peter Stephenson
	Testing operator:	Ali Naghizadeh
	ORLA Sample number(s):	4506, 4507
	SEMA Sample number(s):	725450, 725451
Order	Analysis Requested:	Odour Analysis
	Order requested by:	SEMA on behalf of Elf Farm Supplies
	Date of order:	05 May 2016
	Order number:	4563
	Telephone:	02 9737 9991
	Signed by:	Ali Naghizadeh
	Order accepted by:	Ali Naghizadeh
Report	Date of issue:	10 May 2016

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NATA accredited laboratory number 15043.

Accredited for Compliance with ISO/IEC 17025.

ODOUR CONCENTRATION MEASUREMENTS RESULTS 5652/ORLA/03

Investigated Item	Odour concentration in odour units 'ou' determined by Sensory odour concentration measurements, of an odour sample supplied in a sampling bag. All samples were received in good condition.
Analysis Method	The samples were analysed in accordance with AS/NZS4323.3:2001.
Identification	The odour sample bags were labelled individually. Each label recorded the testing laboratory, sample number, sampling location (or Identification) sampling date and time, dilution ratio (if dilution was used) and whether further chemical analysis was required.
Method	The odour concentration measurements were performed using dynamic olfactometry according to the Australian Standard 'Determination of Odour Concentration by Dynamic Olfactometry AS/NZS4323.3:2001. The odour perception characteristics of the panel within the presentation series for the samples were analogous to that for n-butanol calibration. Any deviation from the Australian standard is recorded in the 'Comments' section of this report.
Instrument Used	The Olfactometer used during this testing session was: AC'SCENT International Olfactometer
Measuring Range	The measuring range of the AC'SCENT International olfactometer is $12 \leq \chi \leq 76{,}000$ ou. If the measuring range was insufficient the odour samples will have been pre-diluted.
Environment	The measurements were performed in an air- and odour-conditioned room. The room temperature is maintained between ± 3°C.
Measuring Dates	The date of each measurement is specified with the results.
Instrument Precision	The precision of this instrument (expressed as repeatability) for a sensory calibration must be $r \leq 0.05$ in accordance with the Australian Standard AS/NZS4323.3:2001. AC'SCENT International Olfactometer: $r = 0.0054$ (February 2016) Compliance – Yes
Instrumental Accuracy	The accuracy of this instrument for a sensory calibration must be $A \leq 0.20$ in accordance with the Australian Standard AS/NZS4323.3:2001. AC'SCENT International Olfactometer: $A = 0.027$ (February 2016) Compliance – Yes
Lower Detection Limit (LDL)	The LDL for the AC'SCENT International Olfactometer has been determined to be 12 ou
Traceability	The measurements have been performed using standards for which the traceability to the national standard has been demonstrated. The assessors are individually selected to comply with fixed criteria and are monitored every session to keep within the limits of the standard. The results from the assessors are traceable to primary standards of n-butanol in nitrogen.

10 May 2016

Peter Stephenson
Managing Director

Odour Research Laboratories Australia

Odour Olfactometry Results – 5652/ORLA/03

Sample Location	Sample ID No.	Sampling Date & Time	ORLA Sample No.	Analysis Date & Time (Completed)	Panel Size	Valid ITEs	Sample Pre-Dilution	Sample Odour Concentration (ou) 1 *	Sample Odour Concentration (ou) 2 *	Odour Character & Hedonic Tone ^ +
Sample ID: Stack Day 4	725450	08-05-2016 08:30	4506	09-05-2016 10:00	4	8	Nil	2,400	2,400	Decay, swampy, chemical, clay, dust, yeast, vegemite, brewery, garlic, solvent, resin, oil (-4.0)^
Sample ID: Stack Day 5	725451	09-05-2016 03:48	4507	09-05-2016 10:30	4	8	Nil	3,100	3,100	Garbage, swampy, chemical, rotten meat, decomposing garbage, garlic, vegemite, hessian (-3.8)^

Odour Research Laboratories Australia

Odour Panel Calibration Results – 5652/ORLA/03

Reference Odorant	ORLA Sample No.	Concentration of Reference Gas (ppm)	Reference Gas Measured Concentration (ou)	Panel Average Measured Concentration (ppb) [3]	Does this panel calibration measurement comply with AS/NZS4323.3:P2001 (Yes/No) [4]
n-butanol	4505	52	980	53	Yes

Comments: All samples were collected by Stephenson Environmental Management Australia and analysed by Odour Research Laboratories Australia at their Sydney Laboratory.

Notes from Odour Olfactometry Results:

[1] Sample Odour Concentration: as received in the bag

[2] Sample Odour Concentration: allowing for pre-dilution

[3] Panel Average Measured Concentration: indicates the sensitivity of the panel for the session completed

[4] Target Range for reference gas n-butanol is $20 \leq \chi \leq 80$ ppb and compliance with AS/NZ4323.3:2001 is based on the individuals rolling average and not on the panel average measured concentration. Panellist Rolling Average: PR = 62, PRA = 35, TL = 61, GP = 69

^ denotes the Average Hedonic Tone: describes the pleasantness of the odour being presented where (+5) represents Very Pleasant, (0) represents Neutral and (-5) represents Very Unpleasant and has been derived from the panellist responses at the recognition threshold.

+ This value is not part of our NATA Scope of Accreditation and AS4323.3

--END OF TEST REPORT--

APPENDIX B – PART OF OEH EPL LICENCE

Section 55 Protection of the Environment Operations Act 1997

Environment Protection Licence

Licence - 6229

P1 Location of monitoring/discharge points and areas

P1.1 The following points referred to in the table below are identified in this licence for the purposes of monitoring and/or the setting of limits for the emission of pollutants to the air from the point.

Air

EPA identi-fication no.	Type of Monitoring Point	Type of Discharge Point	Location Description
1	Discharge to air Air emissions monitoring	Discharge to air Air emissions monitoring	Bioscrubber chimney labelled as "Chimney" on "Figure 5.2 - Plant Layout" and "Figure 5.5 - Stage 1 - Phase 1 Bioscrubber Detail" contained in the "Mulgrave Mushroom Substrate Plant Environmental Management Plan" dated August 2002.

3 Limit Conditions

L1 Pollution of waters

L1.1 Except as may be expressly provided in any other condition of this licence, the licensee must comply with section 120 of the Protection of the Environment Operations Act 1997.

L2 Concentration limits

L2.1 For each monitoring/discharge point or utilisation area specified in the table\s below (by a point number), the concentration of a pollutant discharged at that point, or applied to that area, must not exceed the concentration limits specified for that pollutant in the table.

L2.2 To avoid any doubt, this condition does not authorise the pollution of waters by any pollutant other than those specified in the table\s.

L2.3 Air Concentration Limits

POINT 1

Pollutant	Units of measure	100 percentile concentration limit	Reference conditions	Oxygen correction	Averaging period
Odour	odour units per second	55400			

L2.4 For each monitoring/discharge point specified in the table(s) in L2 above (by a point number), the reference conditions and averaging period of a pollutant discharged at that point must be reported at the reference conditions and averaging period specified for that pollutant in the following table.

Pollutant	Reference Conditions	Duration	Averaging Period

Section 55 Protection of the Environment Operations Act 1997

Environment Protection Licence

Licence - 6229

Odour	dry, 293K, 101.3kPa	1 hour	Rolling annual

L3 Waste

L3.1 The licensee must not cause, permit or allow any waste to be received at the premises, except the wastes expressly referred to in the column titled "Waste" and meeting the definition, if any, in the column titled "Description" in the table below.
Any waste received at the premises must only be used for the activities referred to in relation to that waste in the column titled "Activity" in the table below.
Any waste received at the premises is subject to those limits or conditions, if any, referred to in relation to that waste contained in the column titled "Other Limits" in the table below.
This condition does not limit any other conditions in this licence.

Code	Waste	Description	Activity	Other Limits
NA	Chicken manure			NA
NA	Feather meal			NA
NA	Cotton seed meal			NA
NA	Natural organic fibrous materials			NA
NA	Horse stable bedding			NA
NA	General or Specific exempted waste			NA
NA	Waste			NA

L3.2 The licensee must ensure that the amount of excess compost that is stored at the premises does not exceed 150 tonnes at any one time.

L4 Noise limits

L4.1 Noise generated at the premises must not exceed the LAeq (15 minutes) noise limits presented in the table below:

Location	Day	Evening	Night
Most effected residence	44	44	39

L4.2 Noise from the premises is to be measured at the most affected point on or within the residential boundary or at the most affected point within 30m of the dwelling (rural situations) where the dwelling is more than 30m from boundary to determine compliance with the LAeq(15 minute) noise limits in condition L4.1.

Where it can be demonstrated that direct measurement of noise from the premises is impractical, the EPA may accept alternative means of determining compliance. See Chapter 11 of the NSW Industrial Noise Policy.

The modification factors presented in Section 4 of the NSW Industrial Noise Policy shall also be applied

APPENDIX C – EXHAUST GAS FLOW DATA

Glossary:

%	=	percent
^{o}C	=	Degrees Celsius
am^3/min	=	cubic metre of gas at actual conditions per minute
Normal Volume (m^3)	=	cubic metre at 0°C and 760 mm pressure and 1 atmosphere
am^3	=	cubic metre of gas at actual conditions
EPL	=	Environment Protection Licence No.6229
g/g mole	=	grams per gram mole
g/s	=	grams per second
hrs	=	hours
kg/m^3	=	kilograms per cubic metre
kPa	=	kilopascals
m^2	=	square metre
m/s	=	metre per second
m^3/min	=	cubic metre per minute at $0^{0}C$ and 1 atmosphere
m^3/sec	=	cubic metre per second at $0^{0}C$ and 1 atmosphere
mg	=	milligrams
mg/ m^3	=	milligrams per cubic metre at $0^{o}C$ and 1 atmosphere
ou	=	odour units
ou.m^3/s	=	odour units cubic metre of gas at dry, 293 K and 101.3 kPa
K	=	degrees Kelvin
O_2	=	Oxygen

Abbreviations for names of SEMA staff who completed the either/and/or Sampling, Analysis and Checking

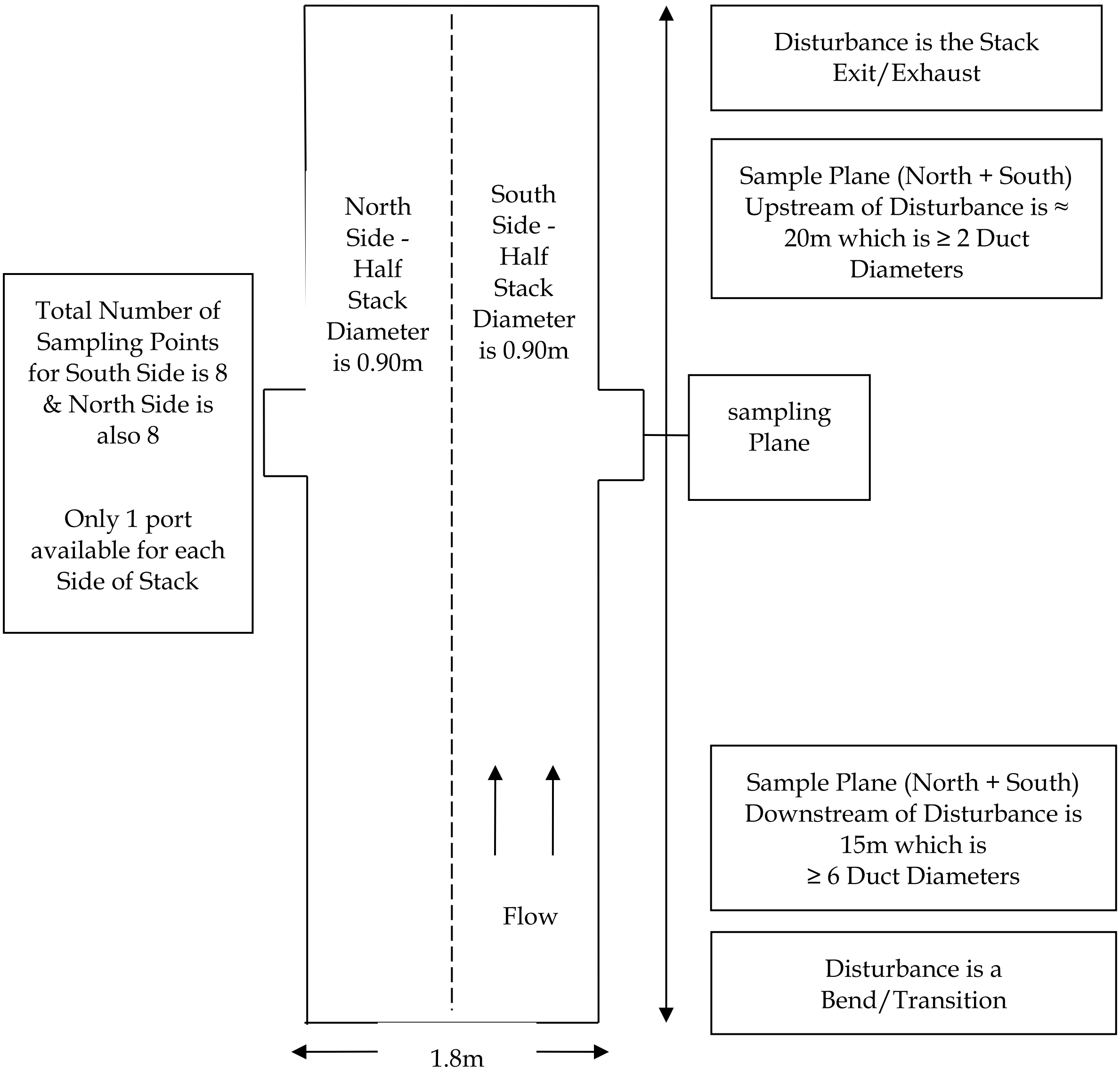
PWS	=	Peter Stephenson
AN	=	Ali Naghizadeh
AP	=	Alok Pradhan

TABLE C-1 EMISSION TEST RESULTS – FLOW AND ODOUR

Emission Test Results	Flow	Flow	Flow	Flow	Flow
Project Number	5652	5652	5652	5652	5652
Project Name	Elf Farm Bio-scrubber	Elf Farm Bio-scrubber	Elf Farm Bio-scrubber	Elf Farm Bio-scrubber	Elf Farm Bio-scrubber
Test Location	Stack	Stack	Stack	Stack	Stack
Date	04-May-16	05-May-16	06-May-16	08-May-16	09-May-16
Sample Start Time (hrs)	14:30	3:27	3:01	8:08	3:24
Sample Stop Time (hrs)	15:18	4:07	3:41	8:50	3:59
Stack Temperature (°C)	27.8	26.2	24.6	32.5	30.2
Average Stack Gas Velocity (m/s)	14.8	15.5	15.5	15.6	15.9
Actual Gas Flow Volume (am^3/min)	1,100	1,200	1,200	1,200	1,200
	Dry	Dry	Dry	Dry	Dry
Total Normal Gas Flow Volume (m^3/min)	1000	1100	1100	1000	1000
Total Stack Pressure (kPa)	100.8	101.4	101.8	101.3	100.1
Moisture Content (% by volume)	2.2	2.5	2.4	2.6	6.1
Analysis	**Odour**	**Odour**	**Odour**	**Odour**	**Odour**
Method	AS4323.3	AS4323.3	AS4323.3	AS4323.3	AS4323.3
ORLA Number	4500	4501	4504	4506	4507
SEMA Number	725446	725447	725449	725450	725451
Sample Start Time (hrs)	14:38	3:36	3:14	8:20	3:38
Sample Finish Time (hrs)	14:48	3:46	3:24	8:30	3:48
Odour Concentration (Final) (ou)	**2,200**	**2,400**	**2,200**	**2,400**	**3,100**
Normal MOER (Final) (ou m^3/s)	**37,000**	**42,000**	**39,000**	**41,000**	**52,000**
Mass Odour Emission Rate EPL Limit (ou m^3/s)	55,400	55,400	55,400	55,400	55,400
Sample Storage Period	2 days	2 days	2 days	2 days	2 days
Calculations entered by	AN	AN	AN	AN	AN
Calculations checked by	AP	AP	AP	AP	AP

APPENDIX D – SAMPLE LOCATION

FIGURE D-1 SAMPLE LOCATION



In the absence of cyclonic flow activity ideal sampling plane conditions will be found to exist at 6-8 duct diameters downstream and 2-3 duct diameters upstream from a flow disturbance. The sampling plane does meet this criterion.

The sample plane does meet gas profile for sampling. Therefore the sampling plane is satisfactory for testing and in compliance with AS4323.1

APPENDIX B –

ENVIRONMENTAL STUDY REPORTS

McGraths Hill, Mulgrave, Windsor
Field Ambient Odour Assessment Study

Prepared for the NSW Environment Protection Authority

McGraths Hill, Mulgrave, Windsor, NSW

Final Report

August 2013

THE ODOUR UNIT PTY LIMITED

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Project Number: N1893L.02

Report Preparation	
Report Prepared By: T.Schulz & J Schulz	**Approved By:** T. Schulz
Report Title: Prepared for the NSW EPA – McGraths Hill, Mulgrave, Windsor Field Ambient Odour Assessment	

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CONTENTS

FAOA MAP PLOTS, FIGURES, PHOTOS & TABLES

FAOA MAP PLOTS

FIGURES

PHOTOS

TABLES

APPENDICES

1 INTRODUCTION

In May 2013, NSW Environment Protection Authority (NSW EPA) engaged The Odour Unit Pty Ltd (TOU) to conduct a baseline regional odour assessment covering the McGraths Hill/Mulgrave/Windsor area of North Western Sydney. The request for this assessment was in response to community odour complaints and concerns over an extended period regarding the level of odours suspected to be originating from the activities undertaken in facilities within the McGraths Hill/Mulgrave/Windsor area. The facilities in the area that had been previously identified as being potential odour sources and were therefore covered in this assessment included:

- ELF Farm Pty Ltd
- South Windsor Sewage Treatment Plant
- McGraths Hill Sewage Treatment Plant

As will be discussed in this report, a number of other odour-generating industries were identified and their odour impacts quantified during the assessment, including a poultry broiler farm and a pet food plant.

It is understood that odour complaints received by EPA relating to the McGraths Hill/Mulgrave/Windsor area have generally identified a range of odour characteristics that make it difficult to link each complaint back to a particular odour source or activity. As a result, the objective of the study was to identify, with some certainty, the source of any odours that could be detectable during the assessment. A secondary objective was to identify, where possible, the likely process source within each plant of each type of odour that was detected, as a basis upon which future mitigation strategies could be developed and implemented. For this reason the FAOA surveys did not extend to determining the full extent of the odour impact area on each occasion odour was detected, and therefore did not always extend into the residential areas, once a clear indication of the odour and its likely source had been made closer to the plant. TOU understands that NSW EPA will use the information generated in this assessment in ongoing community and industry consultation, and to assist in prioritising odour mitigation efforts at those facilities where the need for improvement is identified.

The assessment commenced by the undertaking of a reconnaissance visit to the ELF Farm facility on 20 May 2013 by TOU's Managing Director, Terry Schulz, and one of the assessment team, in order to become familiar with the on-site production processes and to evaluate the nature and character of odours that could be generated at the facility. During this plant visit a senior EPA representative accompanied the TOU team. There was no need to familiarise the assessment team with the two sewage treatment plants as TOU has extensive experience with a wide range of similar plants and is familiar with the type of odours likely to be emitted. The reconnaissance visit was followed by a series of Field Ambient Odour Assessment (FAOA) surveys over a four week period, namely 27 May – 24 June 2013, with the intention of covering as many wind variations as possible. As will be explained, this was not able to be fully achieved.

The results presented in this study reflect the prevailing atmospheric conditions and the odour emission circumstances in the area during the undertaking of the FAOA surveys, and it should not be presumed that they would necessarily represent conditions or impacts prevailing at any other time.

This odour assessment report describes the FAOA methodology and presents and discusses the results for each the FAOA surveys conducted, before concluding with the main findings of the study. While suggestions are offered regarding possible odour mitigations options, further investigation will be needed to confirm the problematical odour sources before any detailed mitigation strategy can be finalised.

2 ASSESSMENT TIMELINE

2.1 ASSESSMENT PROGRAMME

Four FAOA surveys were intended to be carried out over a relatively short timeframe of 2-3 weeks, from the initial reconnaissance visit on 20 May. However the unseasonal near-calm wind conditions that prevailed for much of late-May and June required an extension of the study, in order to assess the ambient odours under higher wind conditions. Notwithstanding this extension, it was not possible to test under wind speeds of more than 5.8 m/s (21 km/hr) and the bulk of the surveys were under winds less than 2 m/s.

For the first four surveys two assessors were used for each survey conducted. For the subsequent three surveys one assessor was used. All four assessors are trained, highly experienced and calibrated for this type of work. For this reason, the use of one or two assessors for each survey is considered acceptable. The assessment team members included:

- Terry Schulz (TS);
- Wayne Westwood (WW);
- James Schulz (JS); and
- Alex Schulz (AS)

The schedule for the project is summarised in **Table 2.1**. In total, **7** surveys were carried out on **6** different occasions over the survey assessment period.

The surveys were often carried out at short notice, in response to wind conditions. No prior notice of the times or dates for the surveys was given to any party.

Table 2.1 – Assessment programme: May 2013 – June 2013			
FAOA Survey No.	**Date**	**Time (hrs)**	**Assessors**
-	20 May	Reconnaissance visit by TOU assessors	
1	27 May	1545 – 1752	TS & WW
2	29 May	1440 - 1632	JS & WW
3		1712 - 1845	JS & WW
4	3 June	1350 - 1548	JS & AS
5	13 June	1434 - 1710	JS
6	14 June	1402 - 1625	JS
7	24 June	1120 - 1415	JS

3 THE FACILITIES

3.1 ELF FARM

The Elf Farm plant prepares mushroom compost from its component ingredients and sells inoculated compost, ready for mushroom production. The facility is large by Australian standards. During the reconnaissance visit TOU were shown around the plant in a thorough manner, with all main processing activities inspected.

To the layman the plant consists of two sections, comprising the compost production activities in two older buildings (known as Phase 1) on the southern side of the site, and the more-recent mushroom compost tunnel building to the north of these buildings (Phase 2/3).

In the compost production area compost is produced from baled straw, chicken manure, cottonseed, recycled water and other materials. It consists of an open bale-wetting area, a semi enclosed storage area for the materials, an enclosed pre-wet building, where the compost process commences, and a fully enclosed tunnel-composting building. Emissions from the open bale-wetting area vent directly to atmosphere. TOU were advised by management that Elf Farm plans to enclose this area. The pre-wet building is fitted with a rudimentary extraction system that extracts air from within the building and directs it to the odour control bioscrubber. Initial observations by TOU suggest that this airflow may be inadequate for the size and design of the building. There is no likelihood of negative pressure conditions being achieved with the pre-wet building, under normal operation as the main opening to the building is open. Conditions within the building at the time of the TOU visit were very odorous, with ammonia the dominant odorant and an underlying chicken manure odour.

The composting tunnels in the older tunnel composting building are understood to be maintained under negative pressure conditions, with the extracted air treated in a bioscrubber and discharged to atmosphere through a tall stack. It is understood that the bioscrubber was designed and constructed 'in-house', based on a European design. A large compost conveyor conveys partially composted material to load the tunnels. This conveyor is mounted outside the tunnel composting building and can be seen to produce a steamy discharge to atmosphere, during the tunnel loading operations.

The second, more modern section of the plant is to the north of the site, and consists of a large tunnel-composting facility. In this building mushroom spawn material is added to the compost and further composting takes place, in a series of enclosed ‘tunnels’, under highly process-controlled conditions. The entire composting process is maintained under negative pressure conditions, with a steady bleed of composting air to the atmosphere, through roof vents. These vented emissions appear as steamy vapours emanating from the roof of the building. It was apparent to TOU during the site visit that the level of odour within the building was relatively low.

In total there are at least five types of air emissions from the Elf plant including:

- The elevated and treated stack emission;
- The fugitive emissions from the open bale wetting area;
- The fugitive emissions from the pre-wet building;
- The emissions from the exposed loading conveyor; and
- The steamy roof vent emissions from the mushroom tunnel-composting building.

3.2 SOUTH WINDSOR SEWAGE TREATMENT PLANT

The South Windsor Sewage Treatment Plant (South Windsor STP) is located at Fairey Rd, at the southern extremity of this study’s assessment area. It appears to be of relatively modern design, and based on the activated sludge treatment process. It was apparent from the front entrance to the plant that parts of it are equipped with an odour control system, with treated air discharging through a stack.

3.3 MCGRATHS HILL SEWAGE TREATMENT PLANT

The McGraths Hill Sewage Treatment Plant (McGraths Hills STP) is located on a site bordered by Mulgrave Rd and Windsor Rd. It was not inspected during this study and no details are available on its design or operation. It appears to be an older-style plant, using trickling filters rather than aeration tanks. The treated effluent discharges into an extensive pond and wetland system. The level of odour control at this plant is not known.

4 FIELD AMBIENT ODOUR ASSESSMENT METHODOLOGY

4.1 PREAMBLE

The undertaking of a FAOA survey by TOU is based on a truncated form of the German Standard VDI 3940 “Measurement of Odour Impact by Field Inspection”. This standard prescribes the methods by which field technicians (assessors) determine, define and document observed ground level odours and the manner in which the determination of these odours is defined in relation to odour character, frequency of odours observed and the odour intensity of those individual observations as a quantitative scale of measure.

With this method, the calibrated and experienced assessors conduct a single measurement at discrete measurement points (a grid defined within the surveyed odour plume) within a pre-determined assessment area downwind of the odour source(s). Each assessment area was selected on the basis of the prevailing wind condition as it related to the odour source being assessed. For the facilities under investigation, and given the mainly light wind conditions prevailing during the study, each assessment area tended to be 100-500 metres from each facility. There was one exception to this, for the survey on 24 June 2013, where the odour was detected more than 1,100 metres from the subject facility.

4.2 FAOA SURVEYS OBJECTIVE

In general, the objective of a survey was more about determining the intensity, character, and likely source of each odour detected, and less about defining the actual odour impact and the impact range. It is important to understand that it was not necessary for the odour to be present at problematic odour levels at either the assessment point or in neighbouring residential areas during the surveys for the assessment procedure to be successful, since the primary objective of the project was to identify those waste facilities with the potential to be a cause of a portion of the odour complaints received. As it happened, the relatively light winds encountered during the surveys resulted in clear indications of air and odour movement from several facilities into the community, due to the sensitivity of the assessment methodology, and the lack of overlapping or cumulative odours from adjacent facilities. It is reasonable to qualitatively extrapolate survey findings under light wind conditions to winds of stronger intensity, as it is to project what is likely to happen if odour emission rates from the waste facility sources were to be greater than those prevailing during the survey period.

4.3 FAOA SURVEY MEASUREMENTS METHODOLOGY

Each measurement event comprised the assessor(s) carrying out an olfactory assessment at a specific location. For those surveys with two assessors the results for the two were averaged. When plotted each grab measurement resulted in a single data point. Where no odours were detectable the measurement event was truncated to a 1-2-minute period. Where odour was present the assessment was extended to 2-5 minutes. This truncation was necessary to cover a reasonable amount of ground, given the extent of survey coverage, and focus mainly on those locations where odour was most likely to be prevalent. For surveys 5, 6 and 7 the assessment methodology was expanded to include more than a single assessment at key locations, with a series of assessments carried out every 10 seconds over a 5-minute period. The results of these longer assessments enabled any variation in odour intensity to be quantified and plotted.

For every single measurement the assessors determined the presence, character and intensity of any observed odours, and recorded the prevailing wind direction and speed.

The results of the surveys are tabulated in the FAOA log sheets (appended to this report) and summarised visually in a series of aerial plots of the assessment area. While the legend for each plot is given underneath the aerial photos, the colour within each plot circle represents the intensity of any odour present, while the coloured annulus around the circle shows the character of the odour present. For Surveys 5, 6 and 7 certain locations have a pie-chart showing variation in odour intensity.

4.4 SURVEYS ASSESSMENT PERIOD

The seven surveys were carried out from 27 May to 24 June 2013. All were carried out in the afternoon.

4.5 SURVEYS METEOROLOGICAL CONDITIONS

Ideally, FAOA surveys should be carried out over a range of meteorological conditions, from near-calm to moderate to strong wind speeds, and under differing wind directions. The result of each FAOA survey would then determine the impact range within that assessment area for that survey, and the overall finding represent a broader picture of possible adverse odour impacts.

Unfortunately, the relatively short duration of the project coincided with an unusually narrow range of wind speeds, although there was a reasonable range of wind directions available for assessment. The findings of this project are therefore restricted to the wind and weather conditions prevailing at the time of the assessment, and the nature and condition of the various processes and activities carried out at each of the facilities under investigation.

4.6 FAOA ODOUR KEY DESCRIPTORS

The odour sources at the facilities have their origins from the processes occurring at each individual facility. Based on TOU's experience, the reconnaissance visit and early FAOA fieldwork, key odour descriptors were allocated, as shown **Figure 4.1.**

ODOUR CHARACTERISATION

- Chicken Manure
- Earthy, Compost
- Meal
- Sewage, Musty
- Poultry

Figure 4.1 – Key odour descriptors used for the Mulgrave-Windsor Odour Assessment

The definition for each odour character presented in **Figure 4.1** is as follows:

- **A = Chicken manure:** refers to a chicken manure odour that was evident within and immediately outside the ELF plant. In this application it has a sour, unpleasant manure character;
- **B = Earthy/Compost:** refers to any odour having a matured compost character;
- **C = Meal**: refers to a characteristic animal meal feed product odour. This odour was evident immediately downwind of a pet food factory in Curtis Rd, McGraths Hill;
- **D = Sewage/Musty:** refers to any odour of obvious sewage origin; and
- **E = Poultry:** refers to the odour found in and around poultry production facilities. It is the smell of the birds themselves rather than that of the chicken manure.

4.7 ODOUR INTENSITY CATEGORIES

The observed off-site odours are quantified according to the German Standard VDI 3882 Part 1. The category scale for judging odour intensity in the field is a quantitative reference scale where assessors award one of the attributes in the **Table 4.1** to the assessor's odour impression.

Table 4.1 - VDI 3882 (Part 1) Odour Intensity Categories		
Odour Strength	**Intensity Rank (code)**	**TOU Interpretation (meaning)**
Not detectable	0	No odour detected
Very Weak	1	Odour recognised and where possible assigned to the odour source
Weak	2	Odour is weak but not yet distinct
Distinct	3	Odour is clearly distinct
Strong	4	Strong odour detectable
Very Strong	5	Very strong odour detectable
Extremely Strong	6	Extremely strong odour detectable

An odour is clearly recognised (category of intensity 1) when the odour quality can be clearly assigned.

4.8 Odour Intensity & Frequency Criterion

Although outside the scope of work for this project, and referring to the Odour Intensity Categories listed and described in **Table 4.1** above, a particular odour intensity level can often be linked to a possible odour impact from the facilities. This criterion, whether it is Category 2 (Weak) or Category 3 (Distinct), will be dependent upon the sensitivity of the receptor areas, the nature / offensiveness of the odours present and the frequency of exposure. Odour Intensity Category 1 (very weak) would rarely, if ever, correspond to adverse odour impacts.

4.9 Selection of Assessors

For the selection of assessors, as it relates to the VDI 3940 standard, the most important selection criterion is that the assessor must have a 'normal' sense of smell. This is defined in terms of odour sensitivity to the reference odorant compound n-butanol.

TOU specialises in, and stringently carries out Dynamic Olfactometry according to Australian Standard AS/NZS4323.3:2001. TOU performs assessor n-butanol calibrations before all olfactometry testing sessions in our laboratories, in addition to the required primary calibration where each assessor is calibrated against n-butanol from at least 10 dilution series collected on 3 different, non-consecutive days.

As a general rule, TOU's Sydney office undertakes dynamic olfactometry assessments within the range of 500 – 900 odour tests annually. As a consequence TOU's assessors are highly skilled for olfactory analyses. As part of TOU's laboratory olfactometry analyses, TOU also undertakes laboratory derived intensity assessments on individual odour samples where the assessors are exposed to laboratory conditions of odour intensity determination. Additionally, TOU also undertakes a large number of FAOA surveys each year, which exposes assessors to a variety of odour sources in the field.

For three of the seven surveys a single assessor, James Schulz, was used. James, as the Manager of the Sydney Olfactometry Laboratory, oversees all odour testing in that facility. He is experienced in the execution of FAOA surveys. Three other assessors were used, Terry Schulz, Alex Schulz and Wayne Westwood. Terry is the Principal of The Odour Unit and internationally recognised for his work in the odour field. Alex is the Sydney Office Olfactometrist, responsible for conducting the bulk of the olfactometry tests carried in the Sydney laboratory. Wayne is a contracted sub-consultant to the company who previously participated in a major FAOA study for EPA in western Sydney in 2012. Terry and Wayne carried out the reconnaissance visit on 20 May and the first assessment on 27 May 2013. James and Wayne carried out the second and third assessments on 29 May, with James and Alex carrying out the fourth on 3 June. Following that assessment a decision was made to extend the number of surveys from four to seven, using a single assessor only. TOU is satisfied that this move did not decrease the validity or findings of these assessments.

James and Alex did not attend the reconnaissance visit to the Elf Farm plant on 20 May 2013 with the other members of the team but were able to familiarise themselves with the odour characteristics of the emissions from that plant by near-field assessments immediately downwind of the Elf Farm site. Like the other assessors, they were both experienced and very familiar with the odours associated with sewage treatment plants.

4.10 RECORDING OF METEOROLOGICAL CONDITIONS

Meteorological conditions were recorded using a Kestrel 4500 Pock Weather Tracker Anemometer (see **Photo 4.1** for illustration of setup). At each measurement point on the maps, the team would setup the anemometer apparatus enabling for real-time measurement of local temperature, wind speed and direction at a measurement location point over each assessment measurement event. This was undertaken during every survey at each measurement point.

Photo 4.1 – Kestrel Anemometer apparatus in operation

There is a range of factors that determine wind direction and speed at a given point in time, and therefore the local wind condition experienced at particular MLPs may have differed slightly from the prevailing winds reported for the survey period by local meteorological stations. This has been discussed in **Section 5.2**.

5 INTERPRETATION OF RESULTS

5.1 FAOA MAP PLOT RESULT

Section 5 contains the findings of each of the FAOA surveys. The logsheets for each FAOA survey, showing the raw field data, are appended as **Appendix A.**

5.2 INTERPRETATION OF SURVEY FINDINGS

Each map plot result shown consists of several features. These are generally depicted on a pie chart and wind vane indicator on each map plot. The features include:

- **A measurement location point (MLP)**: these are strategic points on the map were designed to enable assessors to pursue upwind and downwind effects from the facilities;

- **Location wind conditions**: the local wind direction and speed at each MLP has been indicated by a yellow arrow. In the event a wind direction has not been indicated, the conditions at the time were calm (i.e. < 1 m/s) and wind direction was unable to be accurately determined. The recorded wind conditions at each MLP may have varied at the time of the assessment from the prevailing wind conditions that existed in the general Sydney precinct recorded by local meteorological stations. Given the complex meteorological dynamics that can occur arising (such as local terrain, topography, katabatic channelling and effects from natural and built environments) affecting wind direction and speed, the local wind conditions experienced at some MLP varied from the prevailing wind condition; and

- **Odour descriptors:** at each MLP where a measurement cycle was undertaken, key parameters were recorded in the event an odour was detected (methodology for this has been previously described in **Section 3**). The key descriptors shown on the maps includes the intensity of odour (how strong the smell was) based on the VDI 3882 German Odour Intensity Scale. In addition, the odour character was also recorded based on an odour character inventory developed by TOU to describe the range of odours encountered throughout the course of the surveys.

6 RESULTS

The following comments on results should be read in conjunction with their corresponding FAOA Map Plots. The likely source/s mentioned in these results is based on the odour character/s detected and position of the facilities relative to the wind direction i.e. whether the facility was upwind or downwind of a positive detection event.

6.1 FAOA SURVEY NO. 1 - 27 MAY 2013

FAOA Survey No. 1 was carried out on 27 May 2013 between 1545 hrs - 1752 hrs. The wind conditions at the time of this assessment session were calm to very light winds, tending predominately from the east. Local wind direction varied during the survey.

- There was an instance at MLPs 1 and 4 whereby a Very Weak intermittent Meal odour was detected. The likely source was identified as the Pet Food plant in Curtis Rd.

- At MLP 6 in Fairey Rd and MLPs 7, 9, 11 and 12 in Harris and James Meehan Streets Distinct to Strong odours were present on a continuous basis during the assessment period. The character of this odour was predominantly chicken manure with some compost undertones. These MLPs are to the north-west of the Elf Farm, and the odour was judged to be emanating from that facility. The level and unpleasant nature of this odour in a residential area was considered to be offensive, by the assessment team.

- Further along Fairey Rd to the south there were instances of Distinct to Strong poultry shed odours at MLPs 15 and 16. The odour detected was that of the live birds, rather than that of chicken manure/manure. These locations were close to the boundary of a broiler chicken farm. The absence of any measurable wind at these locations is thought to be the reason for the detection of the poultry shed odours at these locations.

- At MLP 17, at the front gate of the South Windsor Sewage Treatment Plant, a Weak sewage odour was detected.

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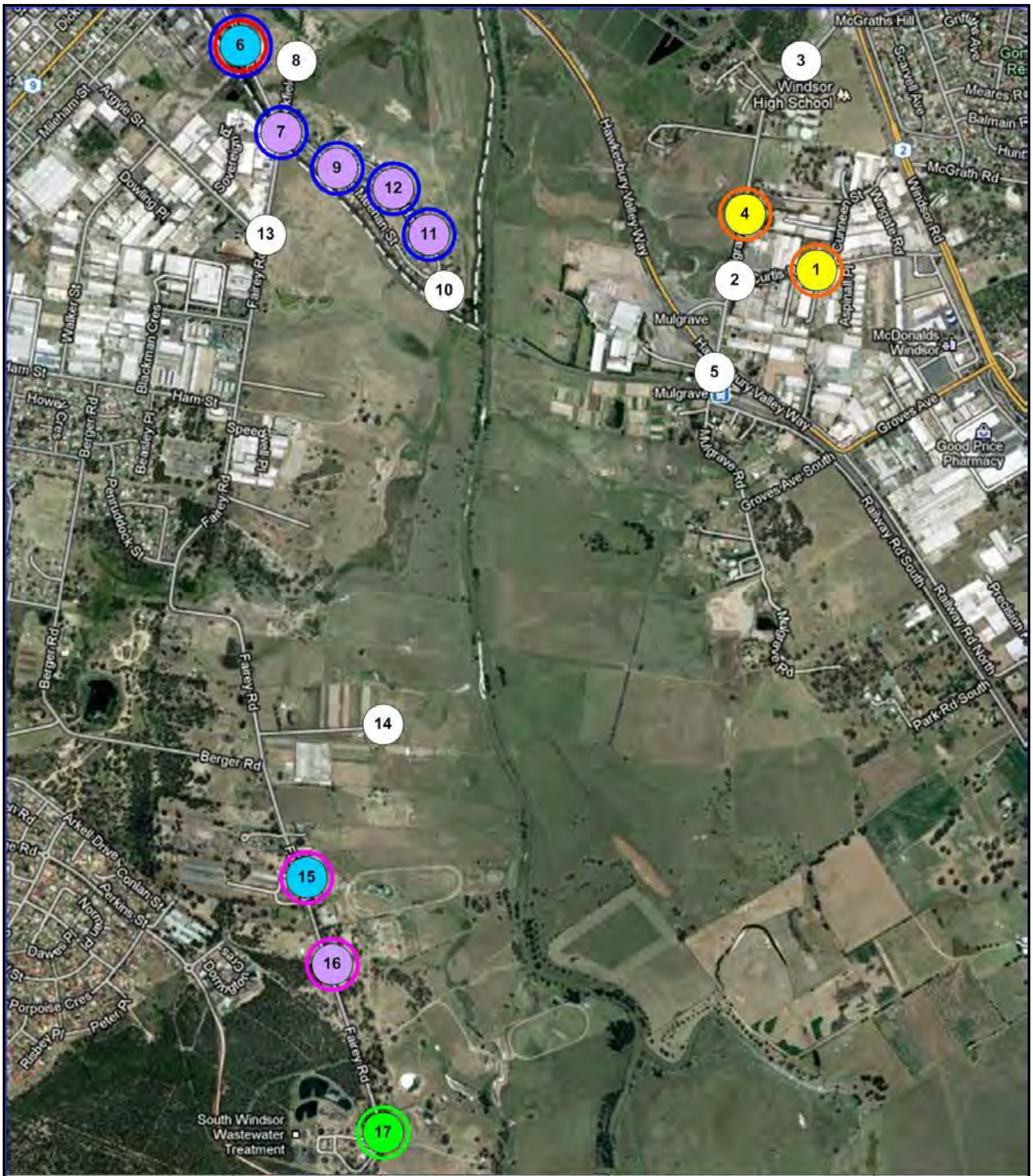

DESCRIPTION

Field Ambient Odour Assessment Survey
Modified German Standard VDI 3940

LEGEND

German Intensity Scale VDI3882

- 0 Not detectable
- 1 Very weak
- 2 Weak
- 3 Distinct
- 4 Strong
- 5 Very strong
- 6 Extremely strong

ODOUR CHARACTERISATION

- Chicken Manure
- Earthy, Compost
- Meal
- Sewage, Musty
- Poultry

CLIENT/PROJECT

NSW EPA
Mulgrave-Windsor Regional Field Ambient Odour Assessment

Date: 27/05/2013
Time: 1545 – 1752 hrs

N

LOCAL WEATHER CONDITIONS:
Calm conditions (0.1 – 0.5 m/s) with predominantly easterly winds

LOCAL WIND DIRECTION:

THE ODOUR UNIT

THE ODOUR UNIT PTY LTD
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www.odourunit.com.au

DRAWN BY	J. SCHULZ
CHECKED	M. ASSAL
APPROVED	T. SCHULZ

TITLE
FAOA Survey No.1 - Field Ambient Odour Assessment

Plot No.
N1893L_001
Revision: A

JOB No.
N1893L.02

FAOA Survey Map Plot 5.1 – FAOA Survey No.1: 27 May 2013

6.2 FAOA SURVEY NO. 2 – 29 MAY 2013

FAOA Survey No. 2 was carried out on 29 May 2013 between 1440 hrs – 1632 hrs. The wind conditions at the time of this assessment session were calm to very light winds, tending predominately from the south-west. Local wind direction varied during the survey.

- At MLP 2 on the corner of Mulgrave Rd and Curtis Rd a Distinct odour was present on a continuous basis during the assessment period. The character of this odour was a mixture of chicken manure and earthy/compost. This MLP is approximately 300m from the nearest Elf Farm building. The odour was judged to be clearly emanating from that facility.

- This odour was also detected on an intermittent basis at intensity level Weak in the industrial estate (MLP 5, Cunneen St).

- At MLP 3 in the industrial estate a Distinct but intermittent Meal odour was detected. The likely source was identified as the Pet Food plant in Curtis Rd.

- At MLP 8 at the junction of Harris and James Meehan Streets in the residential area to the west of the Elf plant, a Very Weak and intermittent ammonia odour was detected. The source of this odour could not be clearly determined.

- In Fairey Rd at MLP 11 a Strong and constant poultry shed and ammonia odour was detected, consistent with the location being close to the poultry broiler farm

- Similarly, at MLP 12, at the front gate of the South Windsor Sewage Treatment Plant, a Very Weak sewage odour was intermittently present.

DESCRIPTION	LEGEND	ODOUR CHARACTERISATION	CLIENT/PROJECT	
Field Ambient Odour Assessment Survey Modified German Standard VDI 3940	German Intensity Scale VDI3882 0 Not detectable 1 Very weak 2 Weak 3 Distinct 4 Strong 5 Very strong 6 Extremely strong	Chicken Manure Earthy, Compost Meal Ammonia Poultry	**NSW EPA** Mulgrave-Windsor Regional Field Ambient Odour Assessment **Date:** 29/05/2013 **Time:** 1440 – 1632 hrs	N **LOCAL WEATHER CONDITIONS:** Calm conditions (0.2 - 1 m/s) with predominantly south-westerly winds **LOCAL WIND DIRECTION:**

THE ODOUR UNIT PTY LTD Aust Tech Park, Locomotive Workshop, Suite 16012, 2 Locomotive Street, EVELEIGH, NSW 2015 Phone: (02) 9209 4420 Fax: (02) 9209 4421 info@odourunit.com.au www.odourunit.com.au	DRAWN BY	J. SCHULZ	**TITLE** **FAOA Survey No. 2** Field Ambient Odour Assessment	**Plot No.** N1893L_002 Revision: A	
	CHECKED	M. ASSAL		**JOB No.** N1893L.02	
	APPROVED	T. SCHULZ			

FAOA Survey Map Plot 5.2 – FAOA Survey No. 2: 29 May 2013

6.3 FAOA SURVEY NO. 3– 29 MAY 2013

FAOA Survey No. 3 was carried out on 29 May 2013 between 1712 hrs - 1845 hrs, which was 40 minutes after the completion of FAOA Survey No. 2. The same wind conditions prevailed, being calm to very light winds, tending predominately from the south-west. Local wind direction varied during the survey.

- Overall, there was less odour present in this survey than identified in FAOA #2.

- The odour previously detected at MLP 2, on the corner of Mulgrave Rd and Curtis Rd, was no longer present. Instead this same Chicken manure/Compost odour was detected at MLP 5 in Cunneen St, but at the Very Weak level and intermittently.

- At MLP 3 on the corner of Curtis and Cunneen Streets a Very Weak and intermittent Meal odour was detected. The likely source was again identified as the Pet Food plant in Curtis Rd.

- Towards the end of this survey, at MLP 14 in Mulgrave Rd, a constant and Distinct Compost odour was found to be present. This odour had none of the Chicken manure character found previously in the area, and was judged to have emanated from the Elf Farm, possibly the tunnel composting building.

- In Fairey Rd at MLP 11 a Strong and constant poultry shed and ammonia odour was again present, consistent with the location being close to the poultry broiler farm

- There was no odour at MLP 12, outside the front gate of the South Windsor Sewage Treatment Plant.

DESCRIPTION	LEGEND	ODOUR CHARACTERISATION	CLIENT/PROJECT
Field Ambient Odour Assessment Survey Modified German Standard VDI 3940	German Intensity Scale VDI3882 0 Not detectable 1 Very weak 2 Weak 3 Distinct 4 Strong 5 Very strong 6 Extremely strong	Chicken Manure Earthy, Compost Meal Ammonia Poultry	**NSW EPA** Mulgrave-Windsor Regional Field Ambient Odour Assessment **Date:** 29/05/2013 **Time:** 1712 - 1845

N

LOCAL WEATHER CONDITIONS: Calm conditions (0.2 - 1 m/s) with predominantly south-westerly winds

LOCAL WIND DIRECTION:

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www.odourunit.com.au

DRAWN BY	J. SCHULZ	**TITLE**	**Plot No.** N1893L_003
CHECKED	M. ASSAL	**FAOA Survey No. 3 -** Field Ambient Odour Assessment	
APPROVED	T. SCHULZ		**JOB No.** N1893L.02

FAOA Survey Map Plot 5.3 – FAOA Survey No. 3: 29 May 2013

6.4 FAOA SURVEY NO.4 – 3 JUNE 2013

FAOA Survey No. 4 was carried out on 3 June 2013. The wind conditions at the time of this assessment session were once again calm to very light winds, varying between south-west to easterly. Local wind direction often changed suddenly during the survey, with the result that swirling light winds were often present in the built-up areas.

- At MLP 3 on the corner of Curtis and Cunneen Streets a Distinct and constant Meal odour was detected. The likely source was again identified as the Pet Food plant in Curtis Rd.

- At MLPs 3 and 4, in Curtis and Cunneen Streets respectively, a mixed odour was detected constantly at Weak to Distinct levels. This odour was judged to consist of the Chicken manure Elf Farm odour combined with the Meal odour from the pet food factory. Approximately 90 minutes later the survey team returned to this area and found the same odour at MLP 13 in Mulgrave Rd. This odour was not pursued further than these locations.

- A transient similar odour was detected at MLP 8 at the junction of Harris and James Meehan Streets in the residential area to the west of the Elf plant, at intensity level Very Weak. The wind direction at that time was from the east. This odour was not considered to be significant.

- There was no odour at MLP 12, outside the front gate of the South Windsor Sewage Treatment Plant or at MLP 11, outside the broiler poultry farm in Fairey Rd.

FAOA Survey Map Plot 5.4 – FAOA Survey No. 4: 3 June 2013

6.5 FAOA SURVEY NO. 5 – 13 JUNE 2013

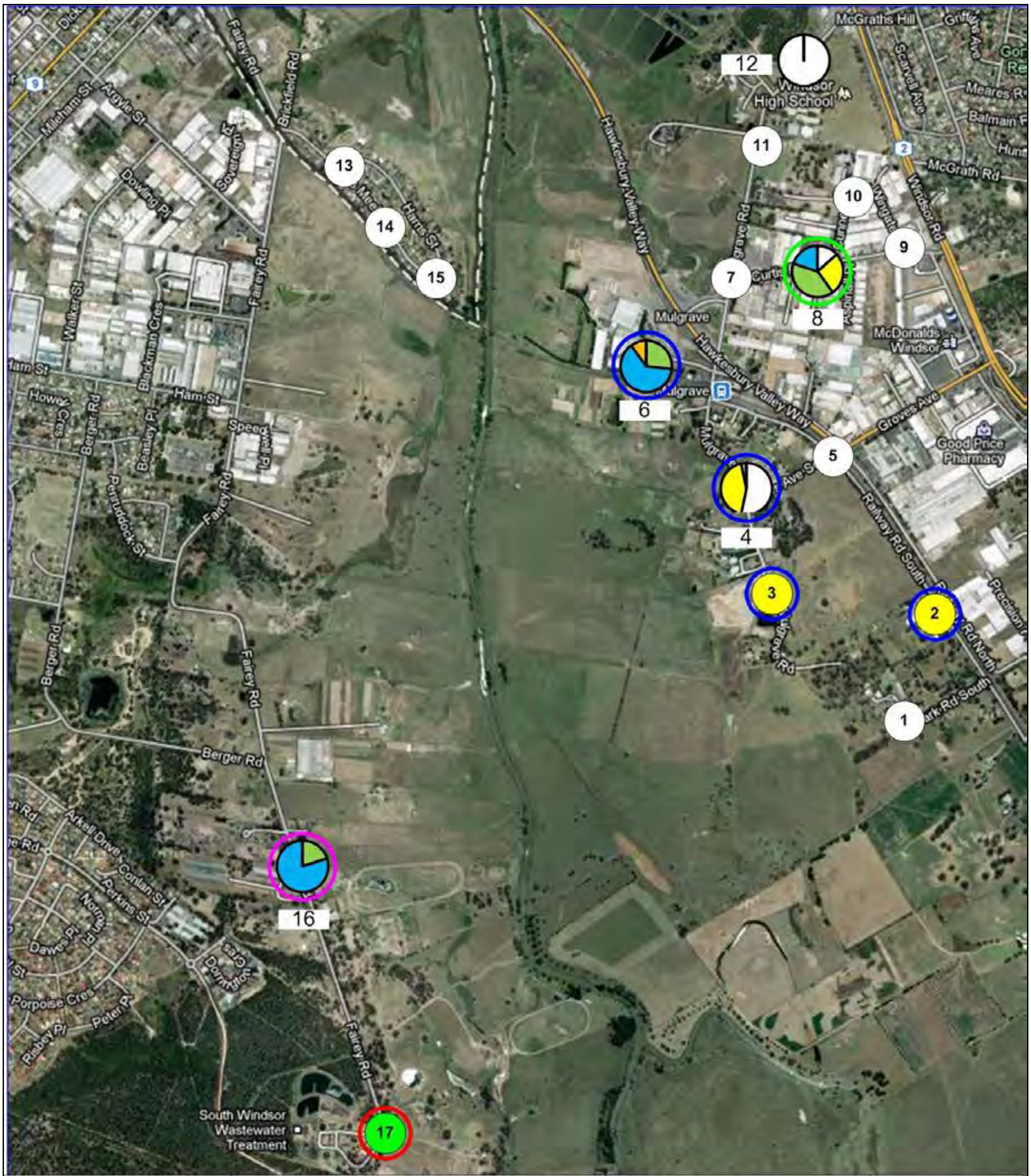
FAOA Survey No. 5 was carried out on 13 June 2013 between 1434 hrs - 1710 hrs. The wind conditions at the time of this assessment session were very light winds, from the north-west. Local wind direction was consistent for the duration of the survey. This was the first survey carried out under north-westerly winds. This was also the first survey in which 5-minute assessments were carried out at key locations

- This survey showed a clear pattern of increasing odour intensity and prevalence as the assessment locations approached the Elf Farm plant from the south-east. The dominant odour character was that of Chicken manure, judged to be emanating from the plant, with that odour detected as far out as MLP 2 in Railway Rd (Very Weak and intermittent).

- At MLP 4, near the junction of Groves Ave South and Mulgrave Rd, the odour was present for approximately 45% of the time, at levels Very Weak to Weak. It was not detectable at MLP 5, slightly to the east. At MLP 6, on the corner of Railway Rd South and Mulgrave Rd, the odour was continuous for the 5-minute assessment period, mostly at intensity score 4 (Strong).

- The pet food factory Meal odour was not detected during this survey. In its place, in Curtis Rd, an intermittent industrial odour was present, at levels from Very Weak to Distinct. This odour had a Chemical/Solvent/Metallic character. Its source could not be identified.

- As with previous surveys, the poultry farm was detected constantly, at levels up to Distinct, outside the farm in Fairey Rd at MLP 16. Similarly, there was a Weak Effluent/Mildew odour present at MLP 17, outside the front gate of the South Windsor Sewage Treatment Plant. While slightly different to previous odour characters determined at this location, this odour is considered to have originated at the plant.



DESCRIPTION

Field Ambient Odour Assessment Survey
Modified German Standard VDI 3940

LEGEND

German Intensity Scale VDI3882

- 0 Not detectable
- 1 Very weak
- 2 Weak
- 3 Distinct
- 4 Strong
- 5 Very strong
- 6 Extremely strong

ODOUR CHARACTERISATION

- Chicken Manure
- Earthy, Compost
- Meal
- Ammonia
- Poultry

CLIENT/PROJECT

NSW EPA
Mulgrave-Windsor Regional Field Ambient Odour Assessment

Date: 13/06/2013
Time: 1434 - 1710

N

LOCAL WEATHER CONDITIONS:

Light conditions (0.2 - 2 m/s) with north westerly winds

LOCAL WIND DIRECTION:

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DRAWN BY	J. SCHULZ
CHECKED	M. ASSAL
APPROVED	T. SCHULZ

TITLE

FAOA Survey No. 5
Field Ambient Odour Assessment

Plot No. N1893L_005

JOB No. N1893L.02

FAOA Survey Map Plot 5.5 – FAOA Survey No. 5: 13 June 2013

6.6 FAOA SURVEY NO. 6 – 14 JUNE 2013

FAOA Survey No. 6 was carried out on 14 June 2013 between 1402 hrs – 1605 hrs. The wind conditions at the time of this assessment session were light to moderate winds, mostly from the north-west. This survey was the only one carried out under winds stronger than 1 m/s.

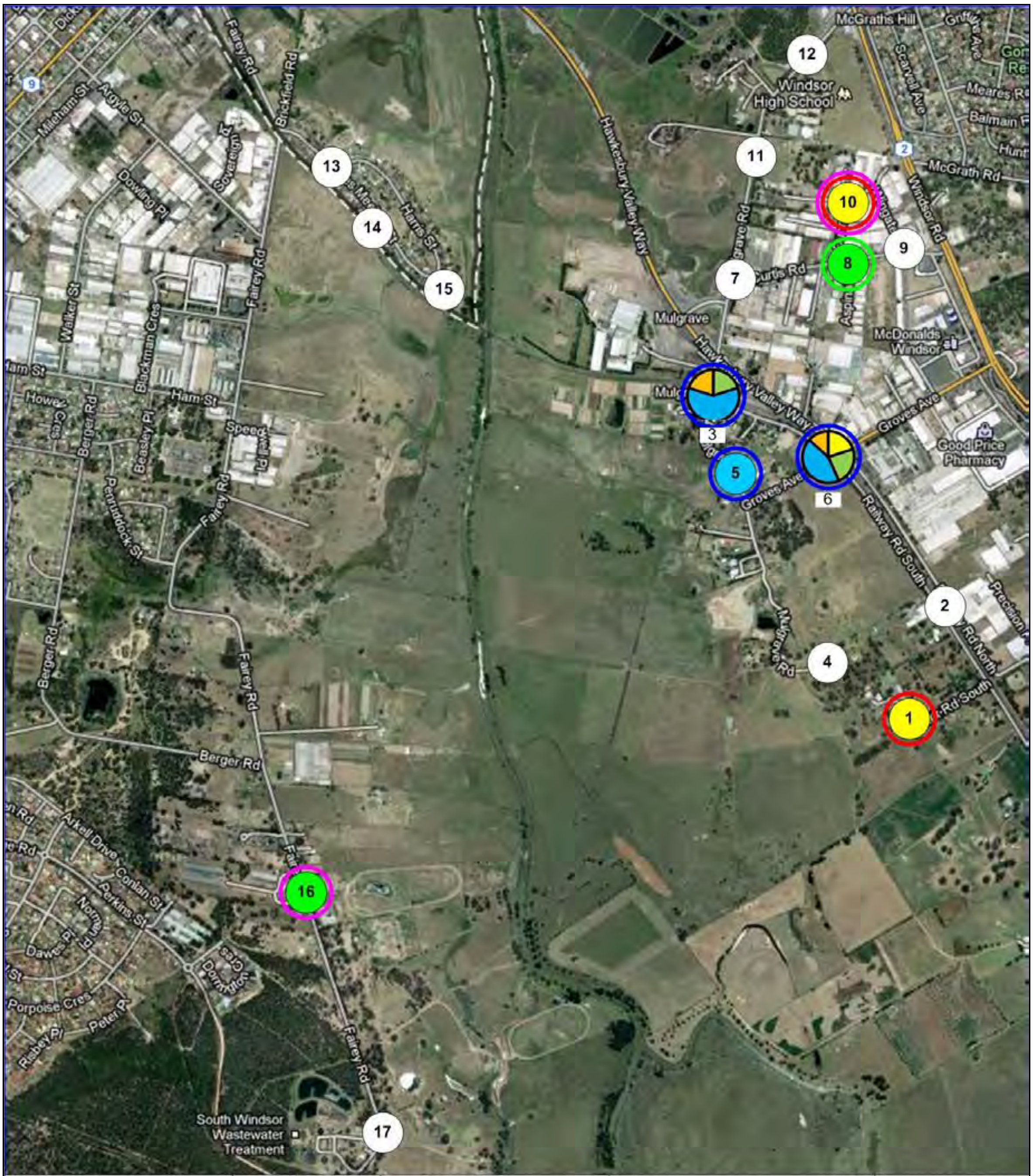
- At the northern end of the industrial estate a Very Weak and intermittent Poultry/Earthy/Compost odour was detected at MLP 10.Nearby, at MLP 8 the previously reported Chemical odour was detected, as a Resin/ Solvent odour. This also appeared to be localised in its impact.

- To the south-east of the Elf Farm plant at MLPs 3, 5 and 6 the characteristic Chicken manure odour was found to be present at intensity levels up to Distinct. This odour was continuous at MLP 6 near the junction of Groves Ave and Railway Rd North, approximately 600m from the Elf plant.

- The poultry farm in Fairey Rd was again detected on the roadway (MLP 16).

- An unknown intermittent and Very Weak Earthy/Compost odour was detected in Park Rd South (MLP 1). This odour appeared to be from a local source.

- The McGraths Hill STP was not detected during this survey at the downwind locations MLP 11 and MLP12.



DESCRIPTION	LEGEND	ODOUR CHARACTERISATION	CLIENT/PROJECT
Field Ambient Odour Assessment Survey Modified German Standard VDI 3940	German Intensity Scale VDI3882 0 Not detectable 1 Very weak 2 Weak 3 Distinct 4 Strong 5 Very strong 6 Extremely strong	Chicken Manure Earthy, Compost Meal Resin, Solvent Poultry	**NSW EPA** Mulgrave-Windsor Regional Field Ambient Odour Assessment **Date:** 14/06/2013 **Time:** 1402 - 1625

N

LOCAL WEATHER CONDITIONS:
Light - Moderate conditions (0.4 – 5.8 m/s) with north westerly winds

LOCAL WIND DIRECTION:

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		TITLE	
DRAWN BY	J. SCHULZ	**FAOA Survey No. 6** Field Ambient Odour Assessment	**Plot No.** N1893L_006
CHECKED	M. ASSAL		**JOB No.** N1893L.02
APPROVED	T. SCHULZ		

FAOA Survey Map Plot 5.6 – FAOA Survey No. 6: 14 June 2013

6.7 FAOA SURVEY NO. 7 - 24 JUNE 2013

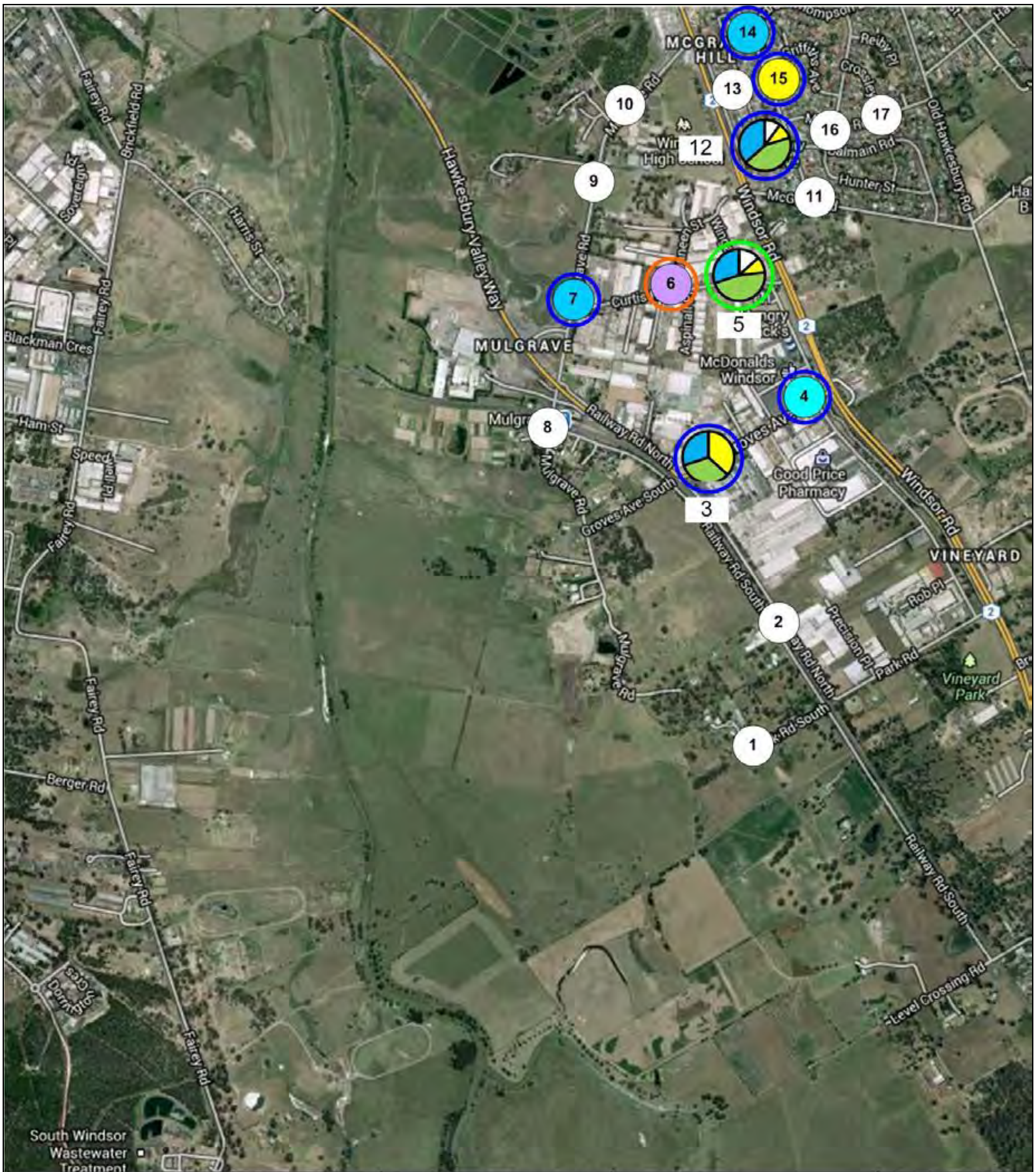
FAOA Survey No. 7 was carried out on 24 June 2013 between 1120 hrs – 1415 hrs. The wind conditions at the time of this assessment session were very light winds, swinging around from the north-east initially to the south-west. The latter part of this survey was the first carried out under consistent south-westerly winds. These winds directed any odours from the Elf Farm and pet food plants towards the McGraths Hill residential area.

- Given the consistent findings from the previous five surveys regarding the prevalence and intensity of odours from the South Windsor STP and the poultry farm in Fairey Rd, this survey focused only on the industrial estate and the McGraths Hill residential area.

- The pet food factory Meal odour was detected at the Strong intensity level in Curtis Rd during this survey (MLP 4) but nowhere else. It was not evident further to the east in Curtis Rd (MLP 5), suggesting that does not travel far from its source. The previously reported Chemical odour was present at this location, as a Resin odour, but also appeared to be localised in its impact.

- At MLP 3, near the junction of Groves Ave South and Railway Rd North, the Chicken manure odour was constantly present, under a north-westerly wind, at levels up to Distinct. This location is approximately 600m from the Elf plant. It was also detectable at a similar intensity at MLP 4, slightly to the east, more than 1,000m from the plant.

As the wind direction changed towards the south-west the same Chicken manure odour was tracked from near the Elf plant at MLP 7 (Distinct) to the corner of Red House Cr and Andrew Thompson Drive, McGraths Hill (MLP 14), a distance of approximately 1,100m from the Elf plant. While intermittent and at intensity Distinct at this location, this odour was also detected more consistently up to this level in the residential area at MLP 12, approximately 950m from the plant.



DESCRIPTION

Field Ambient Odour Assessment Survey
Modified German Standard VDI 3940

LEGEND

German Intensity Scale VDI3882

- 0 Not detectable
- 1 Very weak
- 2 Weak
- 3 Distinct
- 4 Strong
- 5 Very strong
- 6 Extremely strong

ODOUR CHARACTERISATION

- Chicken Manure
- Effluent, Mildew
- Meal
- Resin, Solvent
- Poultry

CLIENT/PROJECT

NSW EPA
Windsor-Mulgrave Regional Field Ambient Odour Assessment

Date: 24/06/2013
Time: 1120 - 1415

N

LOCAL WEATHER CONDITIONS:
Light conditions (0.2 – 1 m/s) with west-south westerly winds

LOCAL WIND DIRECTION:

THE ODOUR UNIT

THE ODOUR UNIT PTY LTD
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APPROVED	T. SCHULZ

TITLE

FAOA Survey No.7
Field Ambient Odour Assessment

Plot No.
N1893L_007

JOB No.
N1893L.02

FAOA Survey Map Plot 5.7 – FAOA Survey No. 7: 24 June 2013

7 DISCUSSION AND CONCLUSIONS

This study carried out a series of seven independent Field Ambient Odour Assessment surveys in the McGraths Hill/ Mulgrave/Windsor area of north-western Sydney. During the course of the study the primary focus of the field assessors was on the potentially odour-impacting industries in the area, these being the Elf Farm facility and the two Sewage Treatment Plants at South Windsor and McGraths Hill. It soon became apparent during the early surveys that other odour-generating industries were present in the assessment area, including a pet food manufacturing plant in Curtis St McGraths Hill, a Broiler poultry farm in Fairey Rd South Windsor, and at least one unknown source in the McGraths Hill industrial area producing a chemical/solvent/resin odour. The potential for each of these odour sources to impact adversely in the residential areas is discussed below.

In general, the findings from this study were clear and unambiguous, despite the prevalence of a relatively narrow range of wind speeds encountered by the assessment team. This was not considered to be a problem because odour impacts are often found to be worse under light wind conditions, due to the low dispersion and dilution of source odours in the atmosphere, in particular ground level or near-ground level emissions. Whilst it is not possible to definitively extrapolate the findings of this study to strong wind weather conditions, it is reasonable to believe that the problem industries identified in this study will also be problematic under stronger wind conditions.

The findings of this study, with respect to the individual industries are as follows:

<u>Elf Farm</u>

This plant was found to emit a range of odours, broadly described in this study as either ‘chicken manure’ or ‘earthy/compost’. The chicken manure odour was defined as having a sour, unpleasant manure character, rather than that of fresh chicken litter. The earthy/compost odour was defined as having a matured compost character. It is the judgement of TOU that the sources of the chicken manure odour are likely to be the compost preparation activities carried out in the open bale-wetting area, the pre-wet building and the external compost loading conveyor. Similarly, the earthy/compost odour was most likely emanating from the roof vents in the newer tunnel composting building.

With one exception, in FAOA Survey No. 3 on 29 May 2013, the earthy/compost odour was not detected, and on the occasion that it was, it was found to be present relatively close to the Elf Farm plant in Mulgrave Rd and no further distant. On this basis the tunnel composting building roof vents are not considered problematical, in the context of the history of odour nuisance in the area.

In contrast, the chicken manure odour originating in the older section of the plant was by far the dominant odour detected during all seven FAOA surveys. This odour was detected at intensities consistent with adverse odour impact (Distinct and above) in Harris and James Meehan Streets Windsor in FAOA Survey No. 1 on 27 May, and in the McGraths Hill residential area in FAOA Survey No. 7 on 24 June. During this final survey this odour was detected at this intensity up to 1,100 metres from the Elf Farm plant in the McGraths Hill area. In all other surveys the odour was present at different assessment locations and clearly identifiable as originating from the Elf Farm plant. Based on these findings it is considered that the chicken manure odour is most likely to be the source the odours responsible for a large proportion of the complaints in recent times.

The emission from the Bioscrubber Stack at the plant was not specifically assessed during this study and any odour testing results for this emission will need to be considered in any subsequent investigations. However, having regard to the height of this stack, the light wind conditions prevailing during this study and the proximity and longitudinal continuity of odours detected at ground level, this stack is unlikely to be the source of the odours detected during this study.

McGraths Hill STP

This plant was not detected at all during the study and is therefore most unlikely to be a problematical odour source in the McGraths Hill area, under normal operating conditions.

South Windsor STP

This plant was only detected at or near the entrance gate during the study and gave no indications that it would be the cause of adverse odour impacts in the South Windsor area, under normal operating conditions.

Fairey Rd Broiler Farm

This farm was found to be a consistent source of a poultry/bird odour on every occasion that it was assessed in a downwind position. The odour character was that of the birds themselves and easily distinguished by the assessment team from the chicken manure odour judged to be emanating from the Elf plant. While there was little evidence that the poultry odour would travel any substantial distance from the farm, it is noted that the nearest residences are less than 100m from the poultry sheds. It is possible that some of the odour complaints recorded in the area could be due to this farm.

Pet Food Plant, Curtis St McGraths Hill

This plant produces a characteristic 'mealy' odour similar to that of dried dog food and poultry feed mills. Its source was unambiguously the plant in Curtis St, McGraths Hill. It was detected on five of the seven surveys, up to intensity level Distinct. While not detected beyond the McGraths Hill industrial area, it is considered to have the potential to be detected in the McGraths Hill residential area.

8 PRELIMINARY MANAGEMENT PRACTICE REVIEW

This study has identified certain odour emissions from the Elf Farm plant that have the potential collectively or singly to cause odour impacts in the Windsor and McGraths Hill residential areas. While the development of an odour mitigation strategy for the plant is outside the scope of work for this study, it is possible to provide preliminary comments, based on TOU's experience, on how each of the odour source areas might be addressed. This is clearly not a definitive or optimised set of mitigation measures, but would serve as a basis for future discussion and consideration. These comments are given below.

<u>Bale Wetting Area Emissions</u>

This activity occurs in an open area between the Pre-wet building and the older Phase 1 tunnel composting building. The activity consists of wetting the straw bales with recycled water from several sources, including the bale-wetting process, the addition of various additives, including chicken manure, and the storage of these additive materials. The leachate from the bale-wetting process drains to a pit into which a larger quantity of non-odorous make-up water is added as required. This water is understood to be recycled during the week, after which it is discharged to the wastewater system. It is likely that the bale-wetting water gets progressively stronger as the week progresses. It is applied to the straw bales with a travelling spray-bar system mounted high above the bale area.

The entire bale wetting operation gives rise to odour emissions, though the leachate pit itself, the spray application of the potentially odorous leachate and the commencement of composting in the bales. It is understood that Elf Farm has plans to enclose the bale wetting area. In doing so odour emissions would certainly decrease but it is questionable whether full enclosure, foul air extraction and treatment will also be required.

<u>Pre-Wet Building</u>

This building is highly odorous, due to the initial composting that is taking place. While there were high levels of ammonia present during the site visit, this compound is rarely an odour problem and tends to mask other offensive odours that are also present. The building is enclosed but has a large opening/doorway required for multiple loader access events each day. This doorway is considered to provide an opportunity for fugitive odour release. The building is equipped with a foul air extraction system consisting of four flexible ducts that direct air to the Bioscrubber system. The size of these ducts appeared to be small, for the volume of the building, and unlikely to be effective in preventing fugitive odour emission from the building. Ideally, this building should be maintained under negative pressure and connected to an odour treatment unit, such as a biofilter, bioscrubber or chemical scrubber.

External Loading Conveyor

This conveyor transports freshly made and blended compost to the tunnel loading system on the roof of the old tunnel building. The material was observed to be hot and steaming during the site visit, and assumed to be odorous. The conveyor runs on the outside of the building and in uncovered. The extent to which it is a significant odour source needs to be determined. It may need to be fully enclosed and possibly connected to the odour Bioscrubber system.

The Bioscrubber

The Bioscrubber performance was briefly assessed during the site visit by sniffing the odour in an inspection port. It was found to have relatively low odour and free of the chicken manure odour found in the community. The performance of this system should be evaluated as part of any mitigation study, as it is a key element in the odour management system at the plant. Its potential for increased loadings and/or optimisation should also be assessed.

The Stack

The Bioscrubber stack is a vital and valuable element of the odour control system. Its potential for increased throughput should also be investigated.

The Tunnel Composting Building (Phase 2/3)

This newer facility was assessed during the site visit and found to represent best-practice in the areas of process control and design. Based on this finding, and the results of the FAOA survey, this facility requires no attention in the area of odour emission mitigation.

9 REPORT SIGNATURE PAGE

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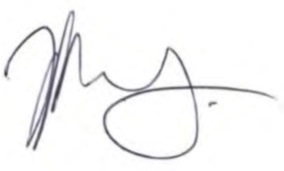

Terry Schulz
Managing Director
5 August 2013

McGraths Hill, Mulgrave, Windsor
Field Ambient Odour Assessment Study

Appendix A: FAOA FIELD LOGSHEETS

FAOA Survey No.	Date	Time (hrs)
1	27 May	1545 – 1752
2	29 May	1440 - 1632
3		1712 - 1845
4	3 June	1350 - 1548
5	13 June	1434 - 1710
6	14 June	1402 - 1625
7	24 June	1120 - 1415

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N1893L_001 - Field Ambient Odour Assessment Log Sheet

DATE: 27/05/2013 **ASSESSORS:** T. Schulz, W. Westwood **WEATHER CONDITIONS:** Calm/light conditions with easterly winds

FAOA Map Plot No. N1893L_001

GRID REF. POSITION	TIME (hrs)	WIND DIRECTION	WIND VELOCITY (m/s)	ODOUR PRESENT Y / N	ODOUR CHARACTER	VDI 3940 INTENSITY SCALE 0-6 (Peak value detected)	COMMENTS
1	1545	70^o	0.2	Y	Mealy	1	Intermittent odour detected
2	1547	147^o	0.4	N	-	0	-
3	1551	-	0	N	-	0	-
4	1558	102^o	0.2	Y	Mealy	1	Intermittent odour detected
5	1602	70^o	0.5	N	-	0	-
6	1642	95^o	0.3	Y	Chicken Manure, Compost	3	Constant odour detected
7	1645	95^o	0.2	Y	Chicken Manure	4	Constant odour detected

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DATE: 27/05/2013 ASSESSORS: T. Schulz, W. Westwood WEATHER CONDITIONS: Calm/light conditions with easterly winds

FAOA Map Plot No. N1893L_001

GRID REF. POSITION	TIME (hrs)	WIND DIRECTION	WIND VELOCITY (m/s)	ODOUR PRESENT Y / N	ODOUR CHARACTER	VDI 3940 INTENSITY SCALE 0-6 (Peak value detected)	COMMENTS
8	1650	75°	0.1	N	-	0	-
9	1652	75°	0.1	Y	Chicken Manure	4	Constant odour detected
10	1655	75°	0.1	N	-	0	-
11	1657	75°	0.1	Y	Chicken Manure	4	Constant odour detected
12	1700	75°	0.1	Y	Chicken Manure	4	Constant odour detected
13	1704	85°	0.1	N	-	0	-
14	1709	85°	0.1	N	-	0	-

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DATE: 27/05/2013 ASSESSORS: T. Schulz, W. Westwood WEATHER CONDITIONS: Calm/light conditions with easterly winds

FAOA Map Plot No. N1893L_001

GRID REF. POSITION	TIME (hrs)	WIND DIRECTION	WIND VELOCITY (m/s)	ODOUR PRESENT Y / N	ODOUR CHARACTER	VDI 3940 INTENSITY SCALE 0-6 (Peak value detected)	COMMENTS
15	1715	-	0	Y	Poultry	3	Constant odour detected
16	1718	-	0	Y	Poultry	4	Constant odour detected
17	1721	213°	0.1	Y	Sewage, Musty	2	Constant odour detected
18	1734	100°	0.1	Y	Chicken Manure	2	Constant odour detected Not shown on map (Crn Hawkesbury Valley Way & Macquarie St)
19	1740	100°	0.1	N	-	0	Not shown on map (Crn Windsor Rd & Pitt Town Rd)
20	1752	100°	0.1	N	-	0	Not shown on map (Crn Mulgrave Rd & Windsor Rd)

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N1893L_002 - Field Ambient Odour Assessment Log Sheet

DATE: 29/05/2013 **ASSESSORS:** J. Schulz, W. Westwood **WEATHER CONDITIONS:** Calm conditions with south westerly winds

FAOA Map Plot No. N1893L_002							
GRID REF. POSITION	**TIME (hrs)**	**WIND DIRECTION**	**WIND VELOCITY (m/s)**	**ODOUR PRESENT Y / N**	**ODOUR CHARACTER**	**VDI 3940 INTENSITY SCALE 0-6**	**COMMENTS**
1	1440	150^{o}	0 – 0.1	N	-	0	-
2	1446	250^{o}	0.5 – 1	Y	Chicken Manure, Earthy, Compost	3	Constant odour detected
3	1451	271^{o}	0 – 0.5	Y	Meal	3	Intermittent odour detected
4	1500	270^{o}	0 – 0.1	N	-	0	-
5	1504	248^{o}	0 – 0.3	Y	Chicken Manure, Earthy, Compost	2	Intermittent odour detected
6	1515	270^{o}	0 – 0.3	N	-	0	-
7	1519	273^{o}	0 – 0.2	N	-	0	-

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DATE: 29/05/2013 **ASSESSORS:** J. Schulz, W. Westwood **WEATHER CONDITIONS:** Calm conditions with south westerly winds

FAOA Map Plot No. N1893L_002

GRID REF. POSITION	TIME (hrs)	WIND DIRECTION	WIND VELOCITY (m/s)	ODOUR PRESENT Y / N	ODOUR CHARACTER	VDI 3940 INTENSITY SCALE 0-6	COMMENTS
8	1531	270°	0 – 0.2	Y	Ammonia	1	Intermittent odour detected
9	1537	275°	0 – 0.2	N	-	0	-
10	1543	255°	0 – 0.2	N	-	0	-
11	1550	255°	0 – 0.2	Y	Poultry	4	Constant odour detected
12	1555	273°	0 – 0.5	Y	Earthy, Compost	1	Intermittent odour detected
13	1606	341°	0.5 – 1	N	-	0	-
14	1618	244°	0 – 0.2	Y	Compost	1	Intermittent odour detected
15	1632	240°	0 – 0.2	N	-	0	-

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N1893L_003 - Field Ambient Odour Assessment Log Sheet

DATE: 29/05/2013 **ASSESSORS:** J. Schulz, W. Westwood **WEATHER CONDITIONS:** Calm conditions with south westerly winds

FAOA Map Plot No. N1893L_003							
GRID REF. POSITION	**TIME (hrs)**	**WIND DIRECTION**	**WIND VELOCITY (m/s)**	**ODOUR PRESENT Y / N**	**ODOUR CHARACTER**	**VDI 3940 INTENSITY SCALE 0-6**	**COMMENTS**
1	1712	42°	0 – 0.1	N	-	0	-
2	1720	238°	0 – 0.2	N	-	0	-
3	1725	231°	0 – 0.2	Y	Meal	1	Intermittent odour detected
4	1730	270°	0 – 0.2	N	-	0	-
5	1734	248°	0 – 0.2	Y	Chicken Manure, Earthy, Compost	1	Intermittent odour detected
6	1752	250°	0 – 0.2	N	-	0	-
7	1755	260°	0 – 0.2	N	-	0	-

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DATE: 29/05/2013 **ASSESSORS:** J. Schulz, W. Westwood **WEATHER CONDITIONS:** Calm conditions with south westerly winds

FAOA Map Plot No. N1893L_003

GRID REF. POSITION	TIME (hrs)	WIND DIRECTION	WIND VELOCITY (m/s)	ODOUR PRESENT Y / N	ODOUR CHARACTER	VDI 3940 INTENSITY SCALE 0-6	COMMENTS
8	1800	270^{o}	0 – 0.2	N	-	0	-
9	1805	265^{o}	0 – 0.2	N	-	0	-
10	1811	255^{o}	0 – 0.2	N	-	0	-
11	1815	270^{o}	0 – 0.2	Y	Poultry	3	Constant odour detected
12	1820	273^{o}	0 – 0.2	N	-	0	-
13	1830	250^{o}	0 – 0.2	N	-	0	-
14	1836	250^{o}	0 – 0.2	Y	Earthy, Compost	3	Constant odour detected
15	1845	240^{o}	0 – 0.2	N	-	0	-

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N1893L_004 - Field Ambient Odour Assessment Log Sheet

DATE: 03/06/2013 **ASSESSORS:** J. Schulz, A. Schulz **WEATHER CONDITIONS:** Light conditions with south westerly winds

FAOA Map Plot No. N1893L_004							
GRID REF. POSITION	TIME (hrs)	WIND DIRECTION	WIND VELOCITY (m/s)	ODOUR PRESENT Y / N	ODOUR CHARACTER	VDI 3940 INTENSITY SCALE 0-6	COMMENTS
1	1350	173°	1.5 – 2	N	-	0	-
2	1358	107°	0.2 – 0.7	Y	Compost, Musty	1	Intermittent odour detected
3	1405	110°	0.2 – 0.5	Y	Meal	3	Constant odour detected
4	1411	235°	0.2 – 0.5	Y	Chicken Manure, Meal	3	Constant odour detected
5	1422	192°	0.5 – 1	Y	Chicken Manure, Meal	2	Constant odour detected
6	1436	112°	0.3 – 0.5	N	-	0	-
7	1442	208°	0.5 – 1.2	N	-	0	-

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DATE: 03/06/2013 ASSESSORS: J. Schulz, A. Schulz WEATHER CONDITIONS: Light conditions with south westerly winds

FAOA Map Plot No. N1893L_004							
GRID REF. POSITION	**TIME (hrs)**	**WIND DIRECTION**	**WIND VELOCITY (m/s)**	**ODOUR PRESENT Y / N**	**ODOUR CHARACTER**	**VDI 3940 INTENSITY SCALE 0-6**	**COMMENTS**
8	1450	087°	0 – 0.2	Y	Chicken Manure, Compost	1	Intermittent odour detected <30 second event
9	1458	085°	0 – 0.2	N	-	0	-
10	1509	254°	0.5 – 1	N	-	0	-
11	1517	034°	0 – 0.2	N	-	0	-
12	1530	154°	0 – 0.2	N	-	0	-
13	1545	197°	0 – 0.1	Y	Chicken Manure, Meal	2	Constant odour detected
14	1548	190°	0 – 0.1	N	-	0	-

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N1893L_005 - Field Ambient Odour Assessment Log Sheet

DATE: 13/06/2013 **ASSESSORS:** J. Schulz **WEATHER CONDITIONS:** Calm / Light conditions with north westerly winds

FAOA Map Plot No. N1893L_005							
GRID REF. POSITION	TIME (hrs)	WIND DIRECTION	WIND VELOCITY (m/s)	ODOUR PRESENT Y / N	ODOUR CHARACTER	VDI 3940 INTENSITY SCALE 0-6 (Peak value detected)	COMMENTS
1	1434	287^o	0.5	N	-	0	-
2	1439	314^o	0.5	Y	Chicken Manure, Manure	1	Intermittent odour detected
3	1447	327^o	0.2	Y	Chicken Manure, Manure	1	Intermittent odour detected
4	1454	325^o	0.5	Y	Chicken Manure, Manure	2	Intermittent odour detected Intensity fluctuating between 1 – 2
5	1511	287^o	0.5	N	-	0	-
6	1515	296^o	0.5	Y	Chicken Manure, Manure	4	Constant odour detected Intensity fluctuating between 2 – 4
7	1528	335^o	1.1	N	-	0	-

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DATE: 13/06/2013 ASSESSORS: J. Schulz WEATHER CONDITIONS: Calm / Light conditions with north westerly winds

FAOA Map Plot No. N1893L_005

GRID REF. POSITION	TIME (hrs)	WIND DIRECTION	WIND VELOCITY (m/s)	ODOUR PRESENT Y / N	ODOUR CHARACTER	VDI 3940 INTENSITY SCALE 0-6 (Peak value detected)	COMMENTS
8	1534	309°	0.6	Y	Solvent, Metallic	3	Intermittent odour detected Intensity fluctuating between 1 – 3
9	1548	312°	0.2	N	-	0	-
10	1603	026°	2	N	-	0	-
11	1607	-	0	N	-	0	-
12	1614	-	0	N	-	0	-
13	1638	-	0	N	-	0	-
14	1642	-	0	N	-	0	-

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DATE: 13/06/2013 ASSESSORS: J. Schulz WEATHER CONDITIONS: Calm / Light conditions with north westerly winds

FAOA Map Plot No. N1893L_005

GRID REF. POSITION	TIME (hrs)	WIND DIRECTION	WIND VELOCITY (m/s)	ODOUR PRESENT Y / N	ODOUR CHARACTER	VDI 3940 INTENSITY SCALE 0-6 (Peak value detected)	COMMENTS
15	1652	284°	0.4	N	-	0	-
16	1703	277°	0.1	Y	Poultry	3	Constant odour detected Intensity fluctuating between 2 – 3
17	1710	274	0.3	Y	Treated effluent, Mildew	2	Constant odour detected

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N1893L_006 - Field Ambient Odour Assessment Log Sheet

DATE: 14/06/2013 ASSESSORS: J. Schulz WEATHER CONDITIONS: Light - moderate conditions with north westerly winds

FAOA Map Plot No. N1893L_006							
GRID REF. POSITION	TIME (hrs)	WIND DIRECTION	WIND VELOCITY (m/s)	ODOUR PRESENT Y / N	ODOUR CHARACTER	VDI 3940 INTENSITY SCALE 0-6 (Peak value detected)	COMMENTS
1	1402	300°	2.6	Y	Earthy, Compost	1	Intermittent odour detected
2	1413	306°	0.9	N	-	0	-
3	1422	298°	4.5	Y	Chicken Manure	4	Constant odour detected
4	1431	330°	3.2	N	-	0	-
5	1436	283°	3.0	Y	Chicken Manure	3	Intermittent odour detected
6	1443	314°	2.2	Y	Chicken Manure	4	Constant odour detected
7	1454	322°	3.6	N	-	0	-

DATE: 14/06/2013 ASSESSORS: J. Schulz WEATHER CONDITIONS: Light - moderate conditions with north westerly winds

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FAOA Map Plot No. N1893L_006

GRID REF. POSITION	TIME (hrs)	WIND DIRECTION	WIND VELOCITY (m/s)	ODOUR PRESENT Y / N	ODOUR CHARACTER	VDI 3940 INTENSITY SCALE 0-6 (Peak value detected)	COMMENTS
8	1502	300°	3.3	Y	Resin, Solvent	2	Constant odour detected
9	1516	315°	3.5	N	-	0	-
10	1521	355°	2.6	Y	Poultry, Earthy, Compost	1	Intermittent odour detected
11	1529	291°	5.8	N	-	0	-
12	1535	289°	1.3	N	-	0	-
13	1552	315°	2.0	N	-	0	-
14	1559	315°	1.6	N	-	0	-

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DATE: 14/06/2013 **ASSESSORS:** J. Schulz **WEATHER CONDITIONS:** Light - moderate conditions with north westerly winds

FAOA Map Plot No. N1893L_006

GRID REF. POSITION	TIME (hrs)	WIND DIRECTION	WIND VELOCITY (m/s)	ODOUR PRESENT Y / N	ODOUR CHARACTER	VDI 3940 INTENSITY SCALE 0-6 (Peak value detected)	COMMENTS
15	1607	315^{o}	1.9	N	-	0	-
16	1615	315^{o}	0.4	Y	Poultry	2	Intermittent odour detected
17	1625	315^{o}	1.3	N	-	0	-

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N1893L_007 - Field Ambient Odour Assessment Log Sheet

DATE: 24/06/2013 **ASSESSORS:** J. Schulz **WEATHER CONDITIONS:** Calm / Light conditions with west - south westerly winds

FAOA Map Plot No. N1893L_007

GRID REF. POSITION	TIME (hrs)	WIND DIRECTION	WIND VELOCITY (m/s)	ODOUR PRESENT Y / N	ODOUR CHARACTER	VDI 3940 INTENSITY SCALE 0-6 (Peak value detected)	COMMENTS
1	1120	NE	0.5	N	-	0	-
2	1130	NE	0.1	N	-	0	-
3	1218	W – NW	0.4	Y	Chicken Manure	3	Constant odour detected
4	1237	WNW	0.5	Y	Chicken Manure	3	Constant odour detected
5	1244	WNW	0.8	Y	Resin	3	Intermittent odour detected
6	1254	W	1.2	Y	Meal	4	Continuous odour detected
7	1305	W	1.0	Y	Chicken Manure	3	Intermittent odour detected

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ABN: 53 091 165 061

DATE: 24/06/2013 ASSESSORS: J. Schulz WEATHER CONDITIONS: Calm / Light conditions with west - south westerly winds

FAOA Map Plot No. N1893L_007

GRID REF. POSITION	TIME (hrs)	WIND DIRECTION	WIND VELOCITY (m/s)	ODOUR PRESENT Y / N	ODOUR CHARACTER	VDI 3940 INTENSITY SCALE 0-6 (Peak value detected)	COMMENTS
8	1312	W	1.0	N	-	0	-
9	1318	SW	2.2	N	-	0	-
10	1322	SW	0.6	N	-	0	-
11	1337	WSW	1.1	N	-	0	-
12	1345	SW	1.0	Y	Chicken Manure	3	Intermittent odour detected
13	1352	SW	1.0	N	-	0	-
14	1359	SW	0.8	Y	Chicken Manure	3	Intermittent odour detected

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FAOA Map Plot No. N1893L_007

GRID REF. POSITION	TIME (hrs)	WIND DIRECTION	WIND VELOCITY (m/s)	ODOUR PRESENT Y / N	ODOUR CHARACTER	VDI 3940 INTENSITY SCALE 0-6 (Peak value detected)	COMMENTS
15	1404	SW	0.8	Y	Chicken Manure	1	Intermittent odour detected
16	1409	SW	1.1	N	-	0	-
17	1415	SW	1.0	N	-	0	-

THE ODOUR UNIT

Elf Farm Supplies Pty Ltd

Mushroom Substrate Plant – Modification to Approved Expansion

Odour Impact Assessment

Mulgrave, NSW

Second Amended Final Report

August 2015

THE ODOUR UNIT PTY LTD

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Project Number: **N1952R**

Report Revision		
Report Version	**Date**	**Description**
Draft report	24.12.2014	Preliminary draft report issued to client
Draft Report #2	02.01.2015	Draft report issued for internal review
Draft Report #3	05.01.2015	Revised Draft report issued to client
Final Report	08.01.2015	Final report issued
Amended Final Report #1	20.02.2015	EPA requests addressed and issued to client
Amended Final Report #2	23.02.2015	Amended final report issued
Second Amended Final Report #1	28.08.2015	EPA requests addressed and issued to client
Report Preparation		
Report Prepared By: T.Schulz, M.Assal & S. Hayes		**Approved By**: T. Schulz
Report Title: Elf Farm Supplies Pty Ltd: Mushroom Substrate Plant – Modification to Approved Expansion Odour Impact Assessment		

CONTENTS

FIGURES, PHOTOS & TABLES

FIGURES

PHOTOS

TABLES

APPENDICES

1 INTRODUCTION

In September 2014 Elf Farm Supplies Pty Ltd (Elf Farm) engaged The Odour Unit Pty Ltd (TOU) to undertake an odour impact assessment for the modification to the approved expansion project of the mushroom substrate facility at Mulgrave, NSW (the Facility). The Department of Planning & Environment (DPE) project number for the proposed modifications to the approved expansion is 08_0255 MOD1.

1.1 PROJECT BACKGROUND

The original odour impact assessment for the approved expansion project was undertaken by PAE Holmes in a report titled *Air Quality Assessment Expansion of Substrate Facility* and dated 9 December 2010 (PAE Holmes, 2010). Since the approval, Elf Farm have identified and acquired new emissions technology specific for the mushroom compost industry that has superseded the existing technology currently employed at the Facility. This has resulted in the need for a modification of the approved expansion project.

1.2 ASSESSMENT SCOPE OF WORKS

The scope of works for this study is to undertake an odour impact assessment that reflects the new emissions technology that will be employed for the approved expansion project and identify all future odour emission sources. The assessment scope of works includes:

- Identification of all future odour emission sources;
- Sampling and testing of all future odour emission sources (both at the interim and final stages of the modification works – discussed later in **Section 3**);
- The development of a site-specific odour emissions inventory;
- Procurement of a suitable meteorological data file representative of the Facility location including local terrain and prevailing meteorological conditions;
- Input of the site-specific odour emissions inventory data for the purposes of odour dispersion modelling using the CALPUFF modelling system; and
- Report on whether the modification to the approved expansion project is expected to comply with the applicable New South Wales Environment Protection authority (NSW EPA) Odour Performance Criterion (opc) guidelines.

1.3 APPROVED PLANNED EXPANSION PROJECT

As outlined in the original odour impact assessment report (PAE Holmes, 2010), the approved expansion involved three key construction stages as follows:

- ***Stage 1*** *– construction of a new straw bale storage shed as the production level is increased to 1,600 tonnes of Phase 1 product per week;*
- ***Stage 2*** *- construction of a second bale storage shed, a new bale wetting area with water recycling pit, a new Phase 2/3 building and an extension to the existing pre-wet shed with an additional bio-scrubber. All fugitive odour sources will be enclosed and odours arising from these sources will be processed by the bio-scrubbers. Production is designed to reach 2,400 tonnes of Phase 1 substrate per week; and*
- ***Stage 3*** *- further extension to the new Phase 2/3 building and an extension of the Phase 1 building, the capacity of the facility is proposed to reach a maximum of 3,200 tonnes of Phase 1 substrate per week.*

The chronology of the construction stages will continue to remain generally consistent with the approved expansion project, however, will require the following key proposed modifications:

- Full containment and emissions capture at key process areas and sources;
- Primary air treatment of all captured emissions by the proposed on-site Emissions Plant. The Emissions Plant will consist of six ammonia scrubbers operating in parallel. The key air containment that will be targeted by the scrubbers is ammonia gas (NH_3); and
- Secondary air treatment of all captured emissions by an open-bed Biofilter System. The Biofilter System will be downstream of the Emissions Plant.

The details of the proposed modification works to the approved expansion is discussed in **Section 2.2.**

1.4 REPORT REVISIONS

The original version of this report was issued on 8 January 2015 and submitted to DPE, as part of the Environmental Assessment (EA). Following a review by NSW EPA and the receipt of a number of comments and requests for further information the report was amended and re-issued on 23 February 2015 (the Amended Final Report).

On 1 May 2015 NSW EPA provided DPE with its submission to the EA advising of further concerns about odour issues. This was followed by a meeting with the proponent's consultants (TOU) and NSW EPA on 16 June 2015, and a subsequent letter to DPE dated 25 June 2015, requesting that the information sought in the 1 May 2015 letter be addressed in a consolidated revised report.

This Second Amended Final Report addresses each of the issues raised by NSW EPA. It contains responses to technical queries raised by NSW EPA as well as additional odour dispersion modelling covering scenarios beyond those covered in the original report.

2 PROCESS OPERATIONS

The process operations at the Facility involve a complex and dynamic operation that varies both spatially and temporary. The end product of the process is a mushroom substrate used for mushroom farming. The following sections aim to describe the existing process operations and how these operations will be impacted from the modification works to the approved expansion project.

2.1 EXISTING PROCESS OPERATIONS

The Facility produces a mushroom substrate by utilising a five-stage composting process, all of which is undertaken at the Facility. The five key stages are as follows:

1. **Raw Materials Storage Shed, Bale Wetting & Stable Bedding Areas:** storing and combining all ingredients ready for transport to the Pre-wet Shed (discussed in **Sections 2.1.1**). Bale wetting involves gradually adding water and pulsing fresh air through the straw bales to keep the material aerobic (discussed in **Section 2.1.2**). Similarly, the stable bedding material undergoes wetting and fresh air is pulsed through to keep the material aerobic (discussed in **Section 2.1.3**);
2. **Pre-Wetting**: the straw bales and the ingredients are blended in the Pre-wet Shed and re-blended a number of times whilst always adding recycled water (discussed in **Section 2.1.4**);
3. **Phase 1:** the material is processed in bunkers whereby temperature, oxygen and moisture conditions are controlled and regulated (discussed in **Section 2.1.5**);
4. **Phase 2:** material is transferred to clean tunnels where it is pasteurised and peak heated to remove any weed, moulds or pests before spawning (discussed in **Section 2.1.6**); and
5. **Phase 3**: mushroom spawn is added and grown through the substrate for a minimum of two weeks prior to mushroom farm delivery (also discussed in **Section 2.1.6.1**).

2.1.1 Raw Materials Storage Shed Area

The raw materials storage shed area consists of several bay areas that store dry additive products including chicken manure, cotton seed, gypsum and other seasonal organic nitrogen sources. The ingredients are weighed and mixed together in calculated ratios in a semi-enclosed area, where the dry chicken manure is stored. The mixing is carried out by the Kuhn mixing machine. Once mixed, the material is conveyed by a front-end loader to the Pre-wet Shed where it is placed on top of the straw bales ready for bale breaking by the Thilot blending machine. The mixing of the raw materials is known as the preparation of the 'brew' which is a blend of the above ingredients. This preparation process currently occurs in the south-western corner of the raw materials storage shed. The frequency and duration of this process is approximately four hours per week.

2.1.2 Bale Wetting Stage

The bale wetting stage involves the wetting of straw bales with process water (comprising predominately of water from the nearby creek) for several days (currently four days per week).

2.1.3 Stable Bedding Area

The stable bedding area is located in the north-eastern corner of the Pre-wet Building. The stable bedding material is wetted prior to transfer to the Pre-wet Shed and is placed as the final layer of a rick before the bale breaking process (see **Section 2.1.4** for details).

2.1.4 Pre-wet Shed

After bale wetting, the wetted bales are transported by front-end loader into the Pre-wet Shed and manually destringed. Whilst inside the Pre-wet Shed, the construction of a rick is undertaken. The process for constructing of a rick involves the breaking of bales and placement of brew and wetted stable bedding material. This essentially forms the construction of a three-layered rick which is, on average, 90 metres long, 2-3 metres wide and 6 metres high. Once the construction of a rick is complete, a Thilot blending machine is passed over each rick to mix and break all three layers of material. This process is known as bale breaking. Once the bale breaking process is complete, air is pulsed through each rick via a proprietary in-floor aeration system. Currently, three ricks are typical constructed in the Pre-wet Shed.

The initial low temperature stage of the mushroom composting process occurs in the Pre-wet Shed. The building is currently fully enclosed, except for a (curtained) opening on the eastern-side through which a front-end loader transfers material to the Phase 1 Working Hall and two large (door) openings in the south-eastern and north eastern corners of the building. Building ventilation air from the Pre-wet Shed is currently collected by four ducts, each with in-duct axial fans, and conveyed to the Bioscrubber System through the Phase 1 Bunkers for treatment (see **Sections 2.1.5 & 2.1.7** for details) before discharge via a tall stack (known as the Bioscrubber Stack).

2.1.5 Phase 1 Working Hall & Bunkers

The material transferred from the Pre-wet Shed is placed into a hopper mixer in the Phase 1 Working Hall. Material in the hopper mixer is conveyed into designated aerated bunkers via an inclined overhead conveyor, located external to the Phase 1 building. The material is deposited into the bunkers where the aeration rate and temperature are tightly controlled. Material in each filled bunker is removed, deposited back into the hopper mixer and returned to an available bunker, to continue the Phase 1 process. Once the Phase 1 process cycle is complete, material is transferred to the Phase 2/3 building via the Phase 1 to Phase 2 transfer conveyor located outside in the north-western corner area of the Phase 1 Working Hall Area.

Ventilation air from the Pre-wet Shed is passed through the Phase 1 bunkers with the subsequent exhaust air emissions from the bunkers treated by the existing Bioscrubber System before discharge via the Bioscrubber Stack.

2.1.6 Phase 2/3 Building

The existing Phase 2/3 Building consists of a working hall area and a total of twenty two tunnels. Once the Phase 1 process is complete, material is loaded into a second hopper mixer in the Phase 1 Working Hall and outgoing material placed onto a conveyor (known as the Phase 1 to Phase 2 Cross Conveyor) to the Phase 2/3 Working Hall Area. Once material arrives at the Phase 2/3 Working Hall, a series of conveyors transfer the material into a dedicated tunnel. During this process, the tunnel is fully vented for up to two hours until filling is complete. The exhaust air during this process stage is discharged via dedicated roof stacks on the current Phase 2/3 Building and is known as Tunnel Venting.

Material in the tunnels are kept constantly under aerobic conditions. This is achieved via an extensive airflow channel network. The quality of airflow is controlled by the Programmable Logic Controller (PLC) Supervisory which determines the volumes of recirculated air, make-up air and discharged air. The exhaust air is discharged via exhaust roof stacks that exist parallel to the tunnel venting exhaust roof stacks (i.e. the southern section of the Phase 2/3 building). Make-up air is drawn through filters in the Phase 2/3 Fan Room. Each tunnel has dedicated exhaust roof stacks and is capable of processing material through all Phase 2/3 stages.

The Phase 2/3 Building is kept under a slight positive pressure for quarantine reasons and tunnel conditions are monitored, automated and controlled via a PLC System. The Phase 2/3 process operations consist of several process stages (described in

Sections 2.1.6.1 & 2.1.6.2 respectively) with all stages automatically controlled by the PLC system.

2.1.6.1 Phase 2 Process Stages

The Phase 2 process cycle consists of the following stages:

- Tunnel Filling;
- Levelling;
- Warm-up Pasteurisation;
- Pasteurisation;
- Cool-down (conditioning); and
- Conditioning.

Once the Phase 2 process stages are complete, the tunnel will then enter into Phase 3.

2.1.6.2 Phase 3 Process Stages

The Phase 3 process cycle is characterised by the addition of mushroom spawn and consists of the following stages:

- Spawn Run 1;
- Spawn Run 2; and
- Cool-down (spawn/shipout).

Once the Phase 3 stages are complete, the fully processed product is shipped out either as a bulk product or packaged in twenty kilogram blocks.

2.1.7 Bioscrubber System

The existing Bioscrubber System services the Pre-wet and Phase 1 process operations only. Phase 2 and 3 exhaust air emissions are currently discharged untreated via roof stacks.

2.2 PROPOSED MODIFICATIONS

The proposed 7-week production cycle is depicted as a process flow schematic in **Figure 2.1** (**Dwg No.** 1952-001). **Figure 2.2** shows the proposed site layout. The proposed modifications to the approved expansion project entails the following elements:

1. Raw materials shed area will be contained within a new building enclosure;

2. The establishment of a Bale Wetting Building: the existing bale wetting area and associated process operations will shift from outdoors to indoors. The existing Pre-wet Shed Building will become the new Bale Wetting Building. This modification will be undertaken in two stages (discussed in **Section 7.1.2**);

3. Pre-wet process operations will shift from the existing Pre-wet Shed to newly constructed Pre-wet bunkers with a working hall area;

4. Phase 1 inclined and cross transfer conveyors operation will be contained;

5. Extension of the existing Phase 2/3 Building from twenty-two to twenty-five tunnels and the construction of a new Phase 2/3 building with twenty-five tunnels. This proposed modification will collectively provide up to fifty tunnels for Phase 2/3 process operations;

6. Air emissions generated at the Facility will be directed to an Emissions Plant and Biofilter System (see **Section 2.2.1**). Air emissions will be extracted from the following process areas and sources:

    a. Raw Material Shed Area;

    b. Bale Wetting Building;

    c. The new Pre-wet Bunkers and Working Hall Area;

    d. Phase 1 Working Hall Area;

    e. Phase 1 Bunkers; and

    f. Phase 2 Tunnels (existing and proposed): Only the initial stages of the Phase 2 discharge emissions will be directed to the Emissions Plant and Biofilter System. The latter Phase 2 stages and all of Phase 3 discharge emissions will be directed to dedicated tunnel exhaust roof stacks on the Phase 2/3 Buildings.

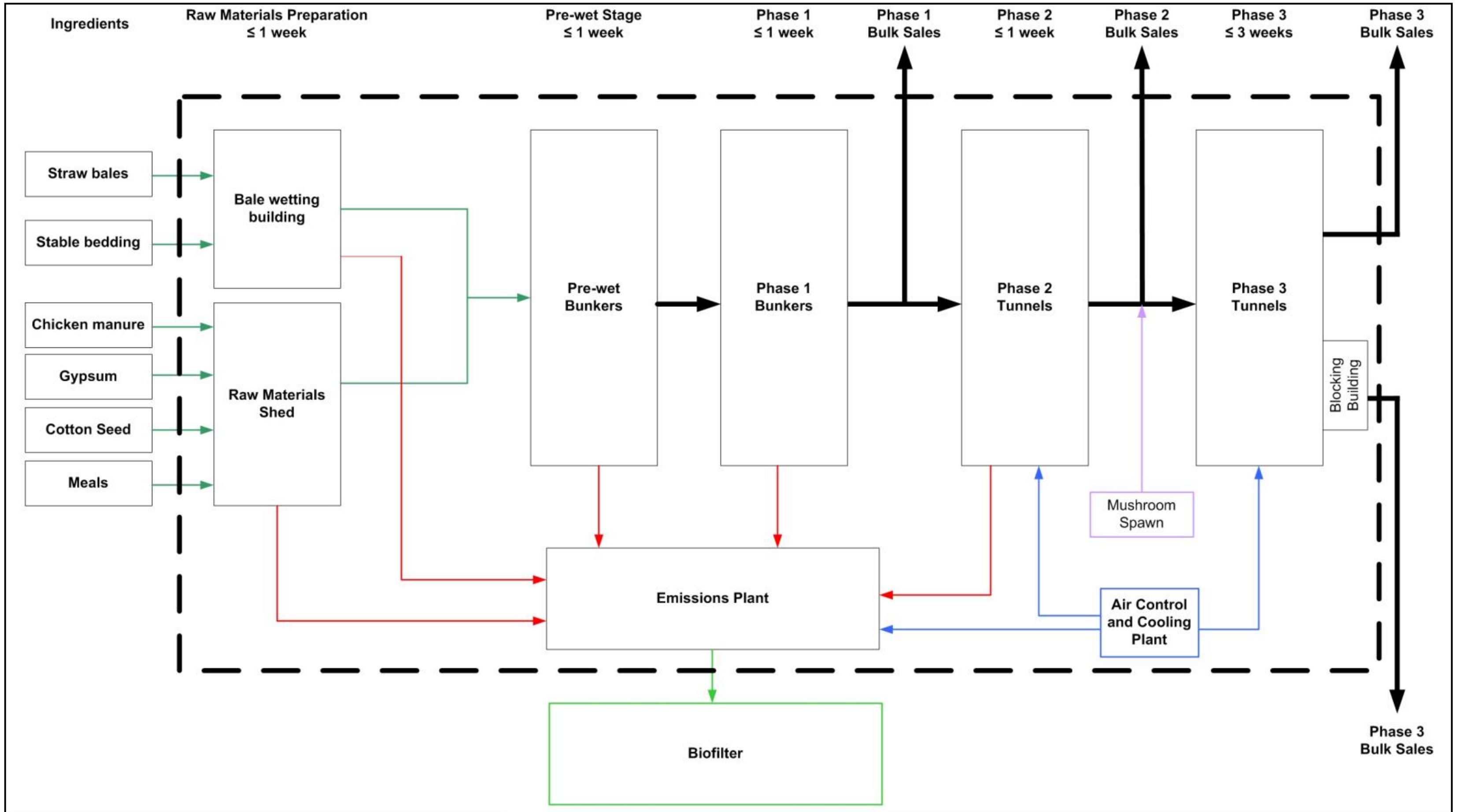
7. Future plans to increase on-site Phase 2/3 tunnel capacity to a total of fifty tunnels. This increase in tunnel numbers would necessitate the construction of a new Phase 2/3 building with twenty-five tunnels plus extending the existing Phase 2/3 building by three tunnels (currently there are twenty-two tunnels). The new Phase 2/3 building will be adjacent to the existing Phase 2/3 Building in the north-western corner of the Facility (see **Figure 2.2**);

8. The mothballing of the Bioscrubber System and stack; and

9. Provision for additional ammonia scrubbers and biofilter bed area. This may require an update to the odour dispersion modelling that has been undertaken in this odour impact assessment study and would be in conjunction with any future plant tonnage increase application to determine if additional emissions treatment capacity is required. This version of the report has considered the installation of two biofilter systems designed to treat all captured emissions from the Facility, as per NSW EPA's 1 May 2015 letter.

2.2.1 Emissions Plant and Biofilter System

The proposed modification works will be undertaken in a stage-wise approach consisting of two key stages as follows: an interim stage; and a final stage. This staged sequence is described in **Section 3**. As part of this approach, the construction and commissioning of the Emissions Plant and Biofilter System will be completed in the first instance as to manage odour emissions from existing process operations at the Facility. This would subsequently result in the existing Bioscrubber System becoming quiescent. Once in operation, the Emissions Plant and Biofilter System will then gradually receive emissions from the new source groups that will exist upon completion of the proposed modification works.



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Elf Farm Supplies Pty Ltd

Elf Farm Mushroom Substrate Plant, Mulgrave, NSW

7 Week Production Cycle Process Flow Schematic – Proposed Modification to Approved Expansion

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Figure 2.1 – 7 Week Production Cycle Process Flow Schematic: Proposed Modification to Approved Expansion

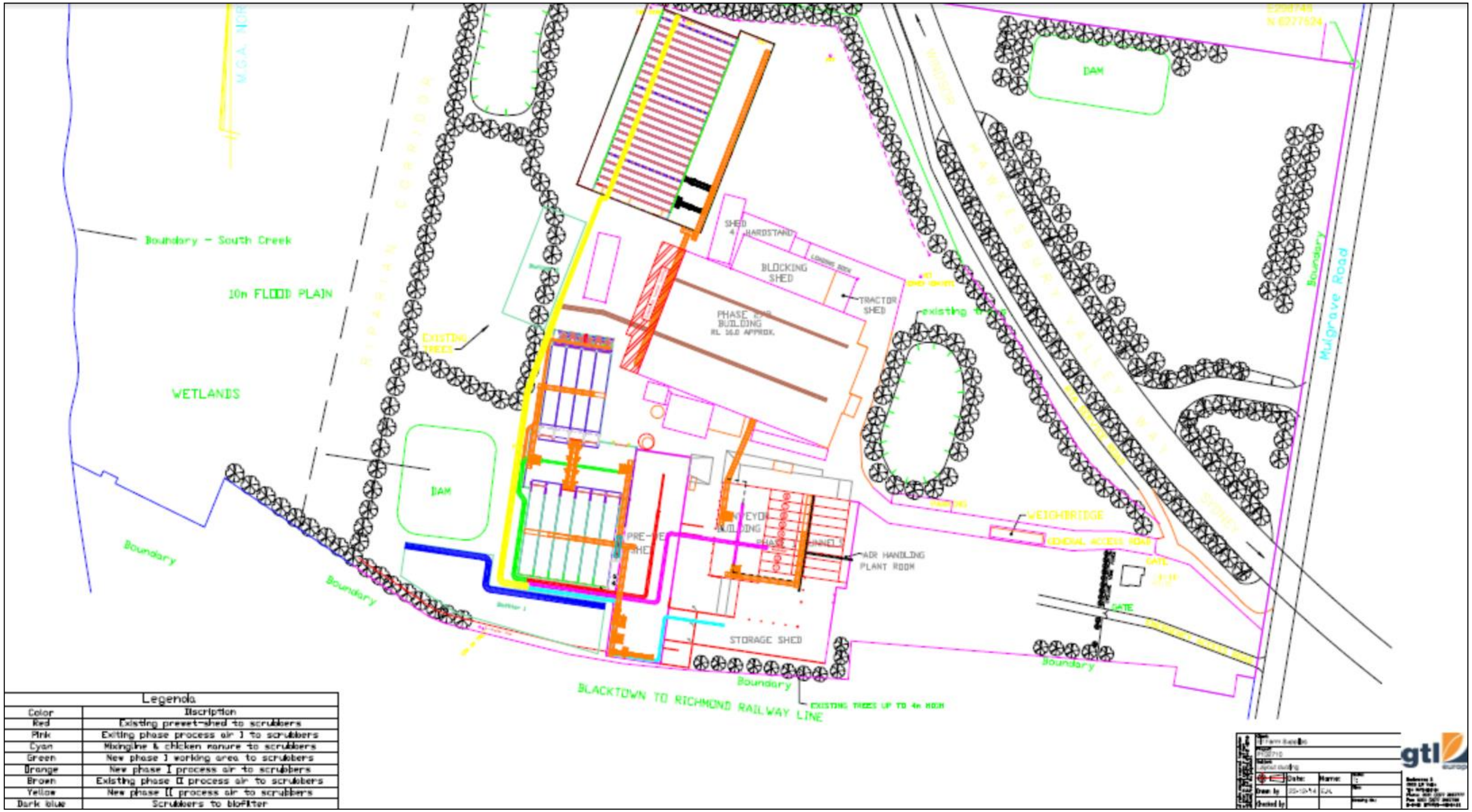


Figure 2.2 – Proposed layout of the Facility (valid as of 23 December 2014)

3 SAMPLING AND TESTING

As part of the proposed modifications to approved expansion project, TOU developed a site-wide odour emissions inventory. The objective of this inventory is to determine the odour emissions contribution from the various areas/sources that will exist at the Facility, both in the interim and final stages, and undertake odour dispersion modelling to assess the odour impact projection from those areas/sources.

The development of the odour emissions inventory required odour sampling and testing at the Facility over the period between August 2014 and November 2014 of all odour emission sources that will exist in the interim and final stages for the proposed modification works. Each modelled stage consists of the following key odour emission sources:

- Interim stage modelled odour emission sources:
    - Bale wetting area;
    - Stable bedding area;
    - Water recycle pit; and
    - Phase 2/3 process operations.
- Final stage modelled odour emission sources:
    - The later stages of Phase 2 and all of Phase 3 process operations (see **Section 3.2.13** for details) ; and
    - Biofilter system.

The sampling and testing undertaken at each of the above source groups is discussed in the following sections.

3.1 BALE WETTING & STABLE BEDDING AREAS

The bale wetting and stable bedding areas currently exist outdoors, immediately adjacent to the Pre-wet Shed. The sampling and testing in these areas consisted of:

- **Bale wetting area:** area source sampling of the straw bales during different stages of the bale wetting cycle. The sampling also accounted for aerating and non-aerating conditions; and
- **Stable bedding area:** area source sampling of wetted stable bedding.

Photo 3.1 & Photo 3.2 shows the sampling at the bale wetting area and stable bedding area on 27 & 29 October 2014 respectively.

Photo 3.1 – Area source sampling of wetted straw bales

Photo 3.2 – Area source sampling of wetted stable bedding material

3.1.1 Bale wetting & Stable Bedding Areas Odour Testing Results

The results of the odour sampling and testing of the Bale Wetting and Stable Bedding Areas are presented in **Table 3.1.**

Table 3.1 – Bale Wetting and Stable Bedding Areas: Odour concentration testing results		
Source description	**Odour concentration (ou)**	**Specific Odour Emission Rate (ou.m³/m²/s)**
Bale wetting area: Monday (aerating)	42,500	25.3
Bale wetting area: Monday (non-aerating)	39,000	23.9
Bale wetting area: Tuesday (aerating)	60,100	32.7
Bale wetting area: Tuesday (non-aerating)	77,900	39.9
Bale wetting area: Broken Bales (Wednesday: non-aerating)	13,800	9.31
Bale wetting area: Broken Bales (Wednesday: aerating)	6,320	3.56
Bale Wetting Area (Sunday: aerating)	2,900	1.80
Bale Wetting Area (Sunday: non-aerating)	2,900	1.80
Stable bedding area (Wednesday: non-aerating)	11,600	5.28
Stable bedding area (Wednesday: aerating)	16,400	6.33

The following emission rates were used for the purposes of odour dispersion modelling:

- **Bale Wetting Area:** worst-case emission rate of 20,909 ou.m^3/s based upon the mean value of Tuesday testing results and a maximum utilised area of 576 m^2; and
- **Stable Bedding Area**: odour emission rate of 575 ou.m^3/s based upon the mean value of testing results and a maximum utilised area of 99 m^2.

3.2 WATER RECYCLE PIT

The water recycle pit exists outdoors and adjacent to the stable bedding area. The sampling and testing of this source consisted of:

- **Water recycle pit:** area source sampling of the water recycle pit near the completion of the bale wetting cycle (i.e. on the Wednesday of a typical 7-day production cycle). The recycled water contents inside the pit is most concentrated and was therefore considered to have the highest odour emission potential at this point of the cycle (i.e. worst case emission).

Photo 3.3 shows sampling of the water recycle pit on 29 October 2014.

Photo 3.3 – Area source sampling of the water recycle pit

3.2.1 Water Recycle Pit Odour Testing Results

The result of the water recycle pit testing is contained in **Table 3.2.**

Table 3.2 – Water Recycle Pit: Odour concentration testing results

Source description	Odour concentration (ou)	Specific Odour Emission Rate (ou.m^3/m^2/s)
Water Recycle Pit (non-aerating)	156,000	98.8

3.3 PHASE 2/3 PROCESS OPERATIONS

As described in **Sections 2.1.6.1 & 2.1.6.2**, Phase 2/3 process operations consist of several key stages that occur over a typical 7-week production cycle. Over this cycle, process air can be both recirculated and discharged simultaneously. This is controlled by a series of automated damper control systems that are designed to optimise operating conditions in the tunnels. The process air that is discharged over a typical production cycle via the exhaust roof stacks was sampled in this assessment study for each key Phase 2/3 process stage.

3.3.1 Phase 2/3 Odour Testing Results

The time period over which a tunnel would enter each process stage of a typical Phase 2/3 cycle and the corresponding mean odour concentration result is summarised in **Table 3.3**. The odour concentration laboratory testing result sheets can be found in **Appendix A**. **Photo 3.4** shows the tunnel exhaust roof vents on the roof of the existing Phase 2/3 Building.

In combination with the Phase 2/3 airflow data matrix supplied by Elf Farm, the mean odour concentration data presented in **Table 3.3** was used for the development of an odour emissions inventory to represent all stages over a typical Phase 2/3 production cycle.

Table 3.3 – Phase 2/3 typical 7-day production cycle: Mean odour concentration testing results

Process Stage	Cycle time (hrs)	Mean odour concentration (ou)
Phase 2 process cycle		
Tunnel Venting	0-2	2,900
Levelling	2-18	5,090
Warm-up Pasteurisation	18-26	2,390
Pasteurisation	26-34	2,440
Cool-down (conditioning)	34-42	470
Conditioning #1	42-90	332
Conditioning #2	90-114	91
Cool-down (spawn)	114-148	43
Phase 3 process cycle		
Spawn run 1	148-334	118
Spawn run 2	334-652	152

Photo 3.4 – Existing tunnel exhaust roof stacks on the Phase 2/3 Building

3.3.2 Phase 2/3 Odour Emissions Trend Profile

In the context of the proposed modification works, Elf Farm intend on directing the emissions from the first 36 hours (i.e. from Tunnel Venting to the initial stages of the Cool-down Conditioning) to the Emissions Plant and Biofilter System. At the end of this time period, the exhaust airflow discharge (i.e. post-36 hour time period) will be directed to the roof exhaust stack for direct atmospheric discharge via dedicated roof stacks. This proposed operating regime will apply to both the extended and new Phase 2/3 Buildings. An analysis of the odour emissions trend over the Phase 2/3 7-day production cycle supports this proposed operating regime, which indicates that odour emissions gradually reduce during the first 36 hour time period and virtually stabilise after this time period. This trend is illustrated in **Figure 3.1 & Figure 3.2** over an entire production cycle and 7-day production cycle respectively. The odour emissions trend profile worksheet representing the entire Phase 2/3 process stages can be found in **Appendix D**.

It should be noted that the fresh air inlet airflows were used in the determination of all Phase 2/3 odour emission rates and are therefore considered to be conservative. In reality, a portion of the airflow is recirculated and the other portion discharged via the tunnel exhaust roof vents that exist on the Phase 2/3 Building. As previously mentioned in **Section 2.1.6,** this process is controlled by the PLC system which is designed to optimise operating conditions in the tunnels over the entire Phase 2/3 production cycle.

It should also be noted that the odour testing results in **Table 3.3** show that the odour concentration in the exhaust airflow discharge (i.e. post-36 hour time period) will average 150 ou (weighted). This is a low odour concentration for an elevated roof-vent emission. In comparison, the treated odours from the proposed biofilter system have been modelled at an odour concentration of 500 ou (see **Section 6.7.2**). The odour character of this roof vent emission will be neutral/mature mushroom compost. It is extremely unlikely that this emission would cause adverse odour impacts (see the modelling results in **Section 8**).

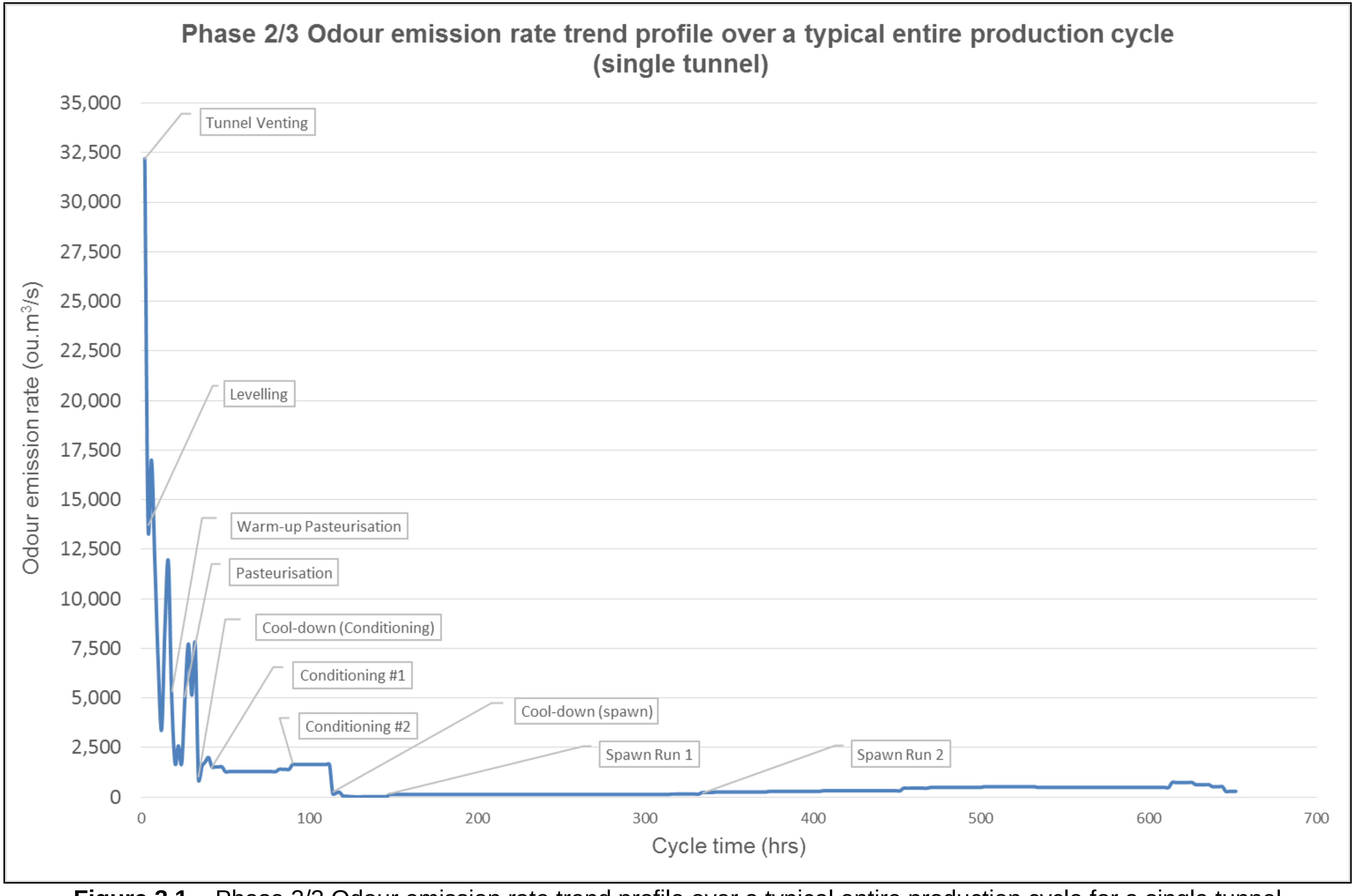


Figure 3.1 – Phase 2/3 Odour emission rate trend profile over a typical entire production cycle for a single tunnel

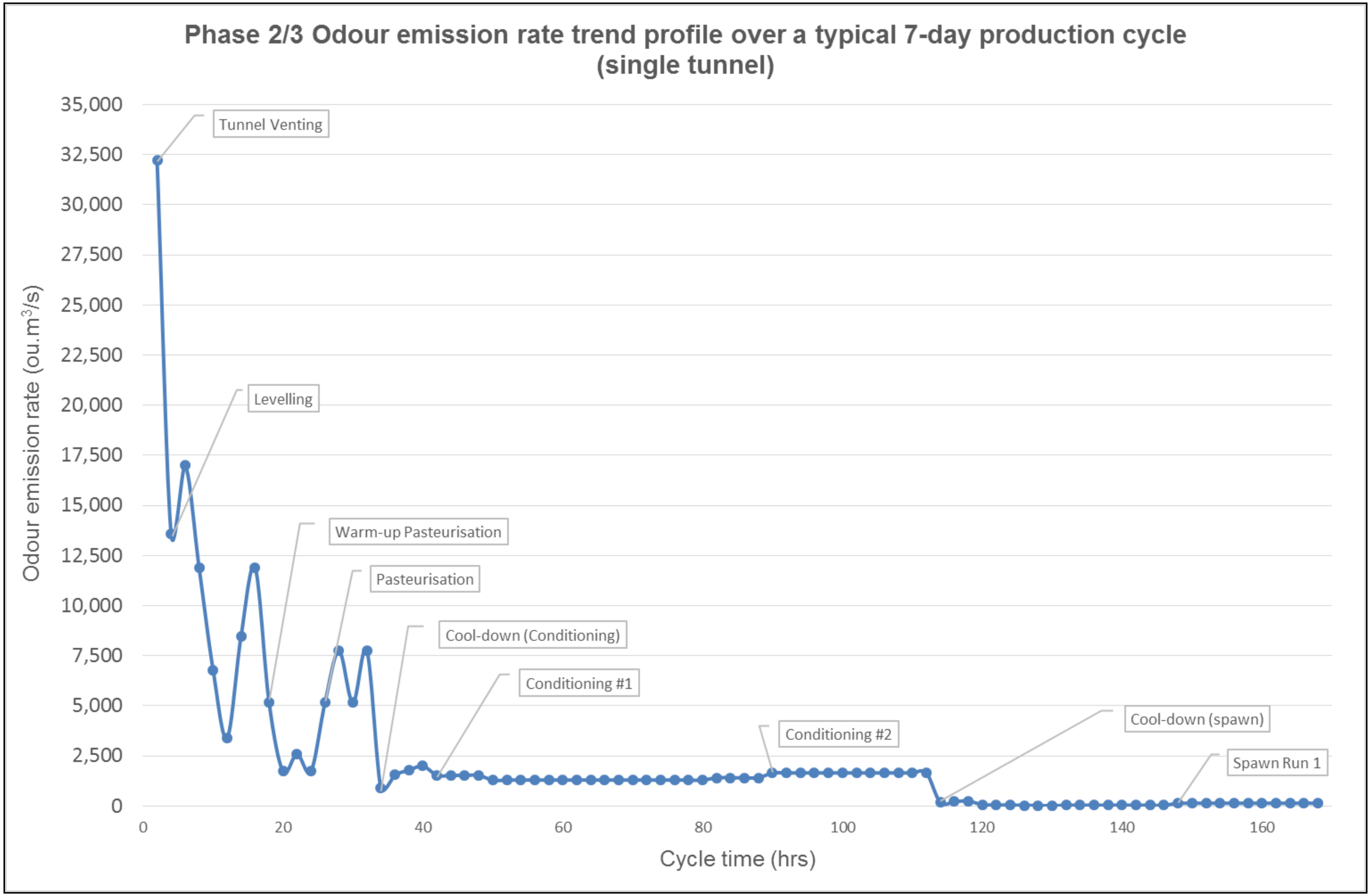


Figure 3.2 – Phase 2/3 Odour emission rate trend profile over a typical 7-day production cycle for a single tunnel

4 SAMPLING METHODOLOGIES

4.1 POINT SOURCE SAMPLING

The method used for collecting gas samples from the Phase 3 process emissions involved drawing the sample air through a polytetrafluoroethylene (PTFE) sampling tube into a single use, Nalophan sample bag. The bag was housed within a container (sampling drum) that was evacuated with a vacuum pump, and the sample collected by induced flow. The “lung method”, by which this sampling procedure is known, allowed the sample air to be collected without coming into contact with any potentially odourous material.

Figure 4.1 illustrates a schematic of the point source sampling method.

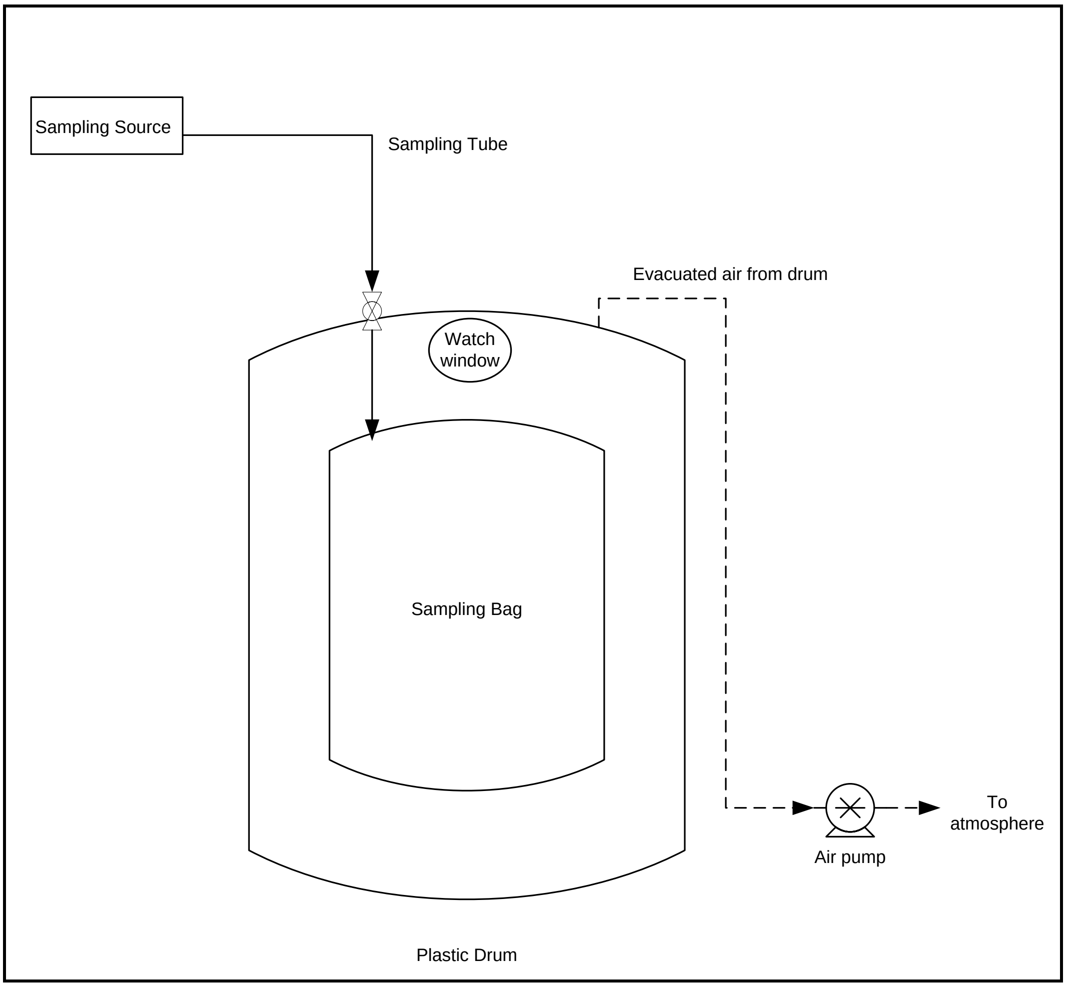


Figure 4.1 – Schematic of point source sampling

4.2 AREA SOURCE SAMPLING METHOD

The objective of the area source sampling programme was to collect representative samples at various locations at the Site, and included both solid and liquid surface area sources. The area source sampling is undertaken using an apparatus known as an isolation flux hood (IFH). All sampling using the IFH is carried out according to the method described in the United States Environment Protection Agency (US EPA) technical report '*EPA/600/8-86/008*'. This method is also defined in Australian Standard AS/NZS4323.4. TOU's IFH adheres to the design specifications, materials of construction and supporting equipment that the US EPA report '*EPA/600/8-86/008*' defines. **Table 4.1** summarises the design specifications of the IFH.

Once the IFH apparatus is set up for sample collection, dry nitrogen gas (N_2) is then introduced into the hood at a sweep rate of 5 litres per minute.

Table 4.1 - IFH design specifications

Parameter	Value
Diameter (m)	0.406
Surface Area (m^2)	0.13
Volume (L)	30*

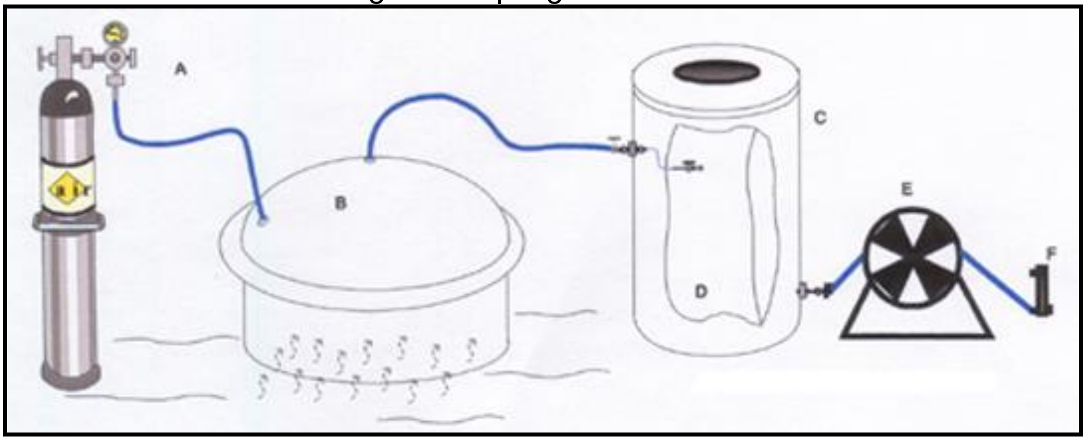
* When the skirt of the hood is immersed into the water or solid surface by the specified 25 millimetres

Area source samples are opened to the atmosphere resulting in wind being a major factor in the release of odorous pollutants from the surface and conveying the pollutant from the source to areas beyond the boundary of a site. The IFH system is designed to simulate the mass transfer of odorous pollutants into the atmosphere, resulting in a controlled and consistent sampling environment. This is achieved by the flux of dry nitrogen sweep gas into the IFH, as it is positioned on the solid or liquid surface. On a liquid surface this is achieved by floating the IFH within an inflated tyre inner tube. The nitrogen gas then transports the odour from the surface in a similar manner to the wind, albeit at a very low sweep velocity. This odorous air is then sampled for subsequent odour testing.

As the IFH has a constant 5 litres per minute inflow of nitrogen gas to it, the sampling chamber remains under very slight positive pressure (less than 2 Pa) and produces a net outflow through the vent on top of the IFH, therefore eliminating any chance of contamination with external air from the atmosphere. The IFH's volume of 30 litres and the 5 litres per minute nitrogen sweep rate results in a gas residence time of 6 minutes. The standard method prescribes a minimum of four air changes in order to achieve optimum purging and equilibrium in the hood, and hence a total of 24 minutes is allowed before sampling commences. The sample is then collected at a flow rate of approximately 2 litres per minute over a 5–10 minute period to obtain a 10–20 litre gas sample for analysis.

The method followed by for the area sampling in this project is depicted in the schematic of the sampling equipment shown in **Figure 4.2 & Figure 4.3**. The IFH is manufactured from acrylic resin to ensure it does not contribute to the odour sample. All other surfaces in contact with the sample are made from PTFE or stainless steel.

Figure 4.2 - Schematic Drawing of Sampling with the IFH

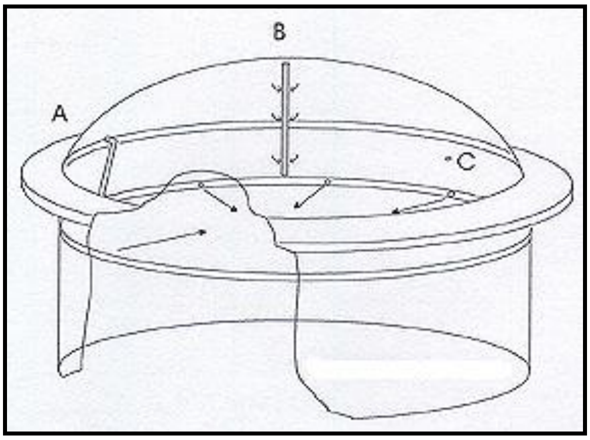


Source: Odortech - Odoflux IFH Manual

Key

A	Cylinder of medical air, nitrogen or any neutral gas.
B	IFH (detailed diagram shown in **Figure 4.3**)
C	Lung chamber (sampling drum)
D	Nalophan sampling bag
E	Sampling pump
F	Air flow meter

Figure 4.3 - Schematic of the IFH



Source: Odotech - Odoflux IFH Manual

Key

A	Inlet gas from gas cylinder.
B	Outlet to sample bag.
C	Additional gas outlet points for other sampling, or temperature and moisture monitoring.

The use of the IFH method enables a Specific Odour Emission Rate (SOER) to be calculated (ou.m^3/m^2/s). A SOER is a measure of odour released from a representative area unit. The SOER is multiplied by the area of the source to obtain an Odour Emission Rate (OER) (ou.m^3/s), or the total odour released from each source. This calculation is demonstrated in **Equation 4.1 & Equation 4.2** below.

$$SOER\ (ou.m^3 m^{-2} s^{-1}) = OC * \frac{Q}{A}$$ **Equation 4.1**

$$OER\ (ou.m^3 s^{-1}) = SOER * area\ of\ source\ unit\ (m^2)$$ **Equation 4.2**

where

OC = odour concentration of compound from air in the chamber (ou)
Q = sweep gas volumetric flow rate into chamber (m^3/s)
A = sample source total surface area (m^2)

All area source samples collected in this odour impact assessment were collected using the area source sampling method.

5 ODOUR CONCENTRATION MEASUREMENT METHOD

TOU's odour laboratory operates to the Australian Standard for odour measurement '*Determination of odour concentration by dynamic olfactometry'* (AS/NZS 4323.3:2001) which prescribes a method for sample analysis that provides quality assurance/quality control and ensures a high degree of confidence in the accuracy, repeatability and reproducibility of results.

The concentration of the gaseous odour samples were measured using a technique known as dynamic olfactometry. Dynamic olfactometry involves the repeated presentation of both a diluted gaseous odour sample and an odour-free air stream to a panel of qualified assessors through two adjacent ports on the olfactometer (known as the Odormat™). TOU utilises four to six trained assessors (or panellists) for sample analysis, with the results from four qualified panellists being the minimum allowed under the Australian Standard AS/NZS 4323.3:2001. For the odour testing in this project, four panelists were used.

The method for odour concentration analysis involves the odorous gas sample initially being diluted to the point where it cannot be detected by any member of the panel. The assessor's step- up to the olfactometer in turn, takes a sniff from each port, then choose which port contains the odour and enter their response. At each stage of the testing process, the concentration of the odorous gas is systematically increased (doubled) and re-presented to the panellist's. A round is completed when all assessors have correctly detected the presence of the odour with certainty. The odour is presented to the panel for three rounds and results taken from the latter two rounds, as stated in AS/NZS 4323.3:2001.

The results obtained give an odour measurement measured in terms of odour units (ou). One (1) ou is the concentration of odorous air that can be detected by 50% of members of an odour panel (persons chosen as representative of the average population sensitivity to odour). This process is defined within AS/NZS 4323.3:2001. The odour units can be subsequently multiplied by an emission rate or volumetric flow to obtain an Odour Emission Rate (ou.m^3/s) or a SOER (ou. m^3/m^2/s) for area source samples collected using the IFH method (described previously in **Section 4.2**).

5.1 ODOUR MEASUREMENT ACCURACY

The repeatability and odour measurement accuracy of the Odormat™ is determined by its deviation from statistically reference values specified in AS/NZS4323.3:2001. This includes calculation of instrumental repeatability (r), where r must be less than 0.477 to comply with the standard criterion for repeatability. Its accuracy (A) is also tested against the 95th percentile confidence interval, where A must be less than 0.217 to comply with the accuracy criterion as mentioned in the Standard.

The Odormat™ V05 was last calibrated in April 2014 and complied with all requirements set out in the AS/NZS4323.3:2001 (see **Appendix A** – Result sheets: *Repeatability and Accuracy*). The calibration gas used was 50 ppm n-butanol in nitrogen gas.

6 ODOUR MODELLING METHODOLOGY

6.1 NSW ODOUR CRITERIA AND DISPERSION MODEL GUIDELINES

Regulatory authority guidelines for odorous impacts of gaseous process emissions are not designed to satisfy a 'zero odour impact criteria', but rather to minimise the nuisance effect to acceptable levels of these emissions to a large range of odour sensitive receptors within the local community.

The odour impact assessment for this project has been carried out in accordance with the methods outlined by the documents:

- Environment Protection Authority, 2005. *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales*;
- Environment Protection Authority, 2006. *Technical Framework (and Notes): Assessment and Management of Odour from Stationary Sources in NSW;* and
- Barclay & Scire, 2011. *Generic Guidance and Optimum Model Settings for the CALPUFF Modeling System for Inclusion into the 'Approved Methods for the Modeling and Assessments of Air Pollutants in NSW, Australia'.*

The documents specify that the odour modelling for Level 3 impact assessments upon which this study has been conducted be based on the use of:

- 99.0th percentile dispersion model predictions;
- 1-hour averaging times with built–in peak-to-mean ratios to adjust the averaging time to a 1-second nose-response-time;
- Odour emission rates multiplied by the peak-to-mean ratios as outlined in **Table 6.1**;
- The near field distance, defined typically as 10 times the largest source dimension, either height or width; and
- The appropriate odour unit performance criterion, based on the population of the affected community in the vicinity of the development.

Table 6.1 - EPA peak-to-mean factors			
Source type	**Pasquill-Gifford stability class**	**Near-field P/M60***	**Far-field P/M60***
Area	A, B, C, D	2.5	2.3
	E, F	2.3	1.9
Line	A-F	6	6
Surface wake-free point	A, B, C	12	4
	D, E, F	25	7
Tall wake-free point	A, B, C	17	3
	D, E, F	35	6
Wake-affected point	A-F	2.3	2.3
Volume	A-F	2.3	2.3

* Ratio of peak 1-second average concentrations to mean 1-hour average concentrations
Source: Environment Protection Authority, 2005 – Table 6.1

The impact assessment criteria (IAC) for complex mixtures of odours are designed to include receptors with a range of sensitivities. Therefore a statistical approach is used to determine the acceptable ground level concentration of odour at the nearest sensitive receptor. This criterion is determined by the following equation (EPA, 2005, p. 37):

$$IAC = \frac{\log_{10}(p) - 4.5}{-0.6}$$

Equation 6.1

where,

IAC = Impact Assessment Criteria (ou)

***p* =** population

Based on **Equation 6.1**, **Table 6.2** outlines the odour performance criteria for six different affected population density categories. It states that higher odour concentrations are permitted in lower population density applications.

Table 6.2 - Odour Performance Criteria under Various Population Densities	
Population of affected community	**Odour performance criterion (ou)**
Urban Area (≥ ~2000)	2.0
~500	3.0
~125	4.0
~30	5.0
~10	6.0
Single rural residence (≤ ~2)	7.0

Source: NSW Environment Protection Authority, 2005 – Table 7.5

Receptors to the south-west, west, north-west and north-east of the site are considered urban. Receptors to east and south-east of the Mulgrave site are of semi-rural and industrial nature. The previous odour impact assessment had adopted the IAC of **2 ou** for the urban areas and **4 ou** to **7 ou** for the semi-rural and industrial areas "*as the population was sparser and in some instances only present during part of the day*" (PAE Holmes, 2010). TOU maintains that this approach should continue to be used, and in so doing based its interpretations of the modelling results in the Amended Final Report of 23 February 2015 on these IACs.

However, in response to EPA's 1 May 2015 requiring a single 2 ou IAC for <u>all</u> receptor locations the modelling results are now plotted as the 2 ou contour. It is however pointed out that the NSW EPA Guidelines clearly state that the reason for the higher IAC odour concentrations for less densely populated areas has more to do with the likelihood of the presence of above-average olfactory sensitive persons in larger populations than it does in people being more sensitive to a particular odour in the case of the Elf Farm situation, as is implied in the NSW EPA 1 May 2015 comments. For this reason a 4 ou to 7 ou IAC is still considered to be more appropriate for this modelling study.

6.2 ODOUR DISPERSION MODEL SELECTION

The odour dispersion modelling assessment was carried out using the CALPUFF System (Version 6.42). CALPUFF is a multi-layer, multi-species, non-steady-state puff dispersion model that is able to simulate the effects of time- and space-varying meteorological conditions on pollutant transport (Environment Protection Authority, 2005). CALMET is a meteorological model that produces three dimensional gridded wind and temperature fields to be fed into CALPUFF (Atmospheric Studies Group, 2011). The primary output from CALPUFF is hourly pollutant concentrations evaluated at gridded and/or discrete receptor locations. CALPOST processes the hourly pollutant concentration output to produce tables at each receptor and contour plots across the modelling domain. The result is a summary of pollutant concentrations at various time averages and percentiles or a tally of hours where a pollutant has exceed a pre-determined concentration (Atmospheric Studies Group, 2011). For further technical information about the CALPUFF modelling system refer to the document *CALPUFF Modeling System Version 6 User Instructions* (Atmospheric Studies Group, 2011).

The CALPUFF system can account for a variety of effects such as non-steady-state meteorological conditions, complex terrain, varying land uses, plume fumigation and low wind speed dispersion (EPA, 2005). CALPUFF is considered an appropriate dispersion model for impact assessment by EPA in their document - *Approved Methods and Guidance for the Modelling and Assessment of Air Pollutants in New South Wales* in one or more of the following applications:

- complex terrain, non-steady-state conditions,
- buoyant line plumes,
- coastal effects such as fumigation,
- high frequency of stable calm night-time conditions,
- high frequency of calm conditions, and
- inversion break-up fumigation conditions.

In the case of the Elf Farm odour impact assessment, CALPUFF was required in order to handle the complexity of surrounding terrain features. Also, the high incidence of calms and very light winds (60% annual frequency < 2.0 m/s) were likely to induce non-steady-state conditions such as accumulation of odour and/or downslope movement with drainage air flow.

For this study, the air contaminant was odour and ground level concentrations in odour units (ou) have been projected.

6.3 GEOPHYSICAL AND METEOROLOGICAL CONFIGURATION

A CALMET hybrid three-dimensional meteorological data file for Mulgrave, NSW was developed by pDs Consultancy that incorporated topography and land use over the domain area. The meteorological data file incorporated a 3 kilometre resolution 3D data tile prepared by The Air Pollution Model (TAPM) and two observed meteorological data sources including site-specific meteorological data supplied by Elf Farm and an Australian Bureau of Meteorology site. The year 2008 was selected in order to maintain consistency with the original odour impact assessment (PAE Holmes, 2010). The configurations are contained within the full meteorological dataset report provided in **Appendix B**.

6.4 GRIDDED RECEPTOR CONFIGURATION

The gridded receptors were configured as a Cartesian grid spaced at 50 m by 50 m intervals over a 5.0 km by 2.8 km computational domain. The gridded receptor values were based on the projected coordinate system *WGS 84 / UTM Zone 56S*. The contour plots derived from the receptor grid were overlaid on a geo-referenced Google Earth satellite image.

6.5 DISCRETE RECEPTOR CONFIGURATION

Discrete receptors used were placed in identical locations to those used in the original odour impact assessment (PAE Holmes, 2010) in order to maintain consistency. The nearest receptor locations at ground level are listed in **Table 6.3** and illustrated in **Figure 6.1**.

Table 6.3 - Discrete receptor locations

Sensitive Receptor	Easting (km)	Northing (km)
1	297.908	6277.456
2	297.920	6277.439
3	297.910	6277.399
4	297.888	6277.399
5	297.868	6277.420
6	297.863	6277.436
7	298.607	6277.090
8	298.711	6277.062
9	298.750	6277.071
10	298.772	6277.261
11	298.749	6277.138
12	298.833	6277.045
13	298.873	6277.024
14	298.893	6277.015
15	298.838	6276.901
16	298.906	6276.894
17	298.990	6276.947
18	298.798	6276.754
19	298.671	6276.768

Figure 6.1 - Discrete receptor locations (red = near-field, blue = far-field)

6.6 BUILDING PROFILE INPUT PROGRAM

All significant structures were incorporated into the Building Profile Input Program (BPIP) and modelled with the PRIME algorithm and is illustrated in **Figure 6.2** along with odour source (including future redundant) locations.

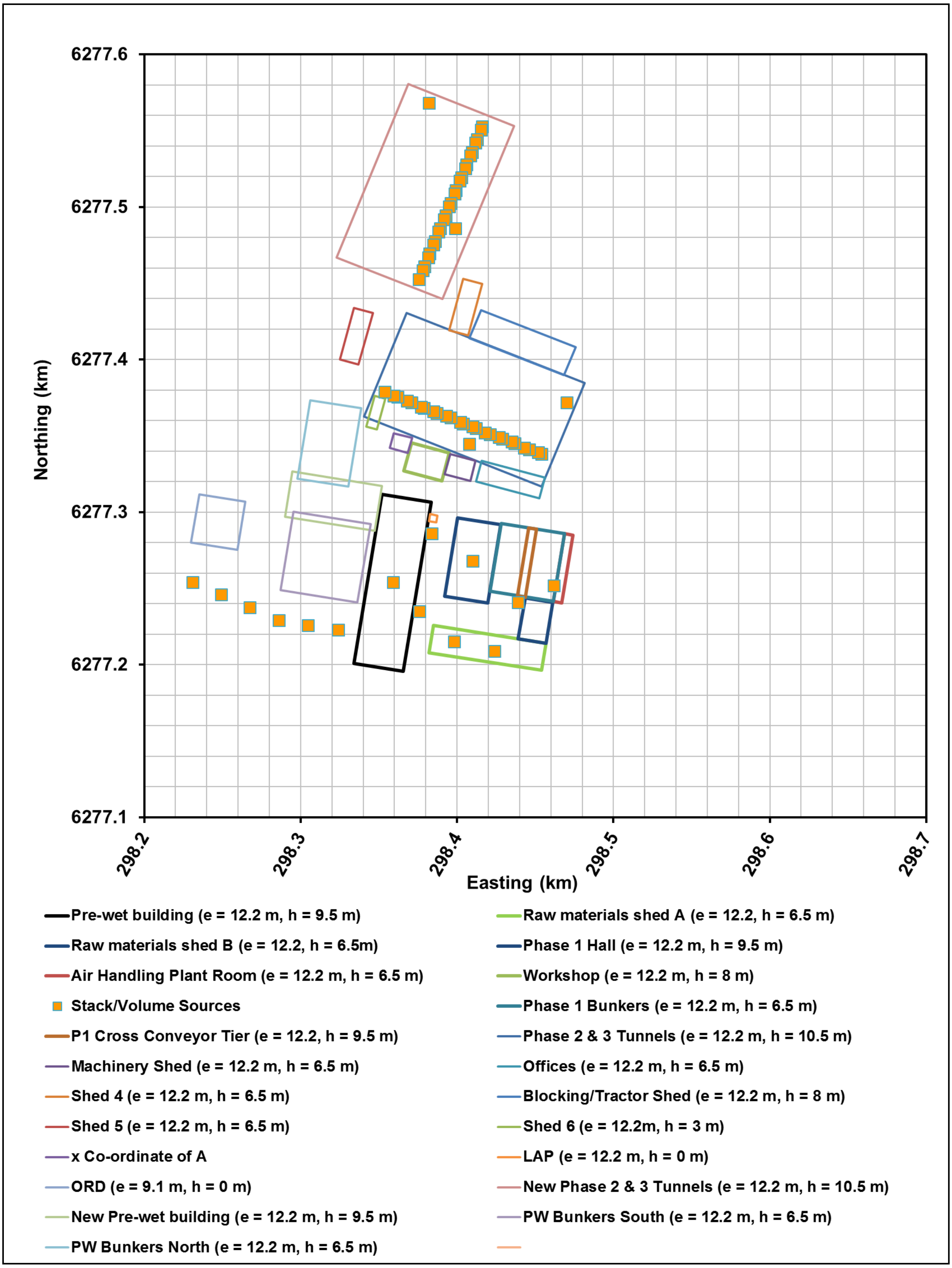


Figure 6.2 - BPIP Input and Odour Source Illustration

6.7 SOURCE ODOUR EMISSION RATES

The Facility operates in a complex manner, with respect to variations in odour generation over time periods within the batch production process, and also spatially across the site. To simplify the modelling a highly conservative approach was adopted whereby the worst odour emission day in the weekly process cycle, as determined in TOU odour emission inventory testing in 2014, was applied to each and every day of the year. In reality, odours are generated at varying rates and locations across the week.

This high level of conservatism in the modelling inputs should be taken into account when interpreting the results of the modelling.

Full odour source configurations and emission rate details are available in **Appendix C**.

6.7.1 Phase 2/3 Building Upgrade

Odour emission rates (OER) from the existing and proposed Phase 2/3 buildings were modelled with use of worst-case diurnal 24 hour snapshot calculated from the sampling, analysis and fan inlet design airflows. The Phase 2/3 process airflows were provided by Elf Farm in order to enable the determination of odour emission rates and can be found in **Appendix D**. The worst case 24 hour emissions snapshot from the Phase 2/3 exhaust roof stacks was determined to be during the Phase 2 process period, typically from Thursday 8 pm to Friday 8 pm (i.e. 66-88 hrs cycle time). This is the highest odour emission potential period when a full batch of eight tunnels within the existing building are in the Conditioning stage and when the batch contained within the proposed building has completed the Pasteurisation stage and entered the Cooldown stage in preparation for Conditioning (refer to **Section 3.2.1** for an outline of the various Phase 2/3 process stages). Concurrent to this period, the fifteen other tunnels are in later Phase 3 stage (i.e. spawn runs, cool-down and ship-out). The total maximum airflow from the post-36 hour Phase 3 roof vent emissions has been determined to be approximately 458,900 m^3/hr, at an estimated odour concentration of 150 ou.

As previously indicated, the worst case diurnal 24 hour snapshot was modelled every day of the year. This is highly conservative and it is probable to produce a higher result than if an arbitrarily varying emissions profile was used as input.

To represent the proposed modification upgrades it was assumed that the existing Phase 2/3 building emission sources are increased from twenty-two to twenty-five exhaust roof stacks and the construction of a new Phase 2/3 building with twenty-five exhaust roof stacks. This resulted in a total of fifty exhaust roof stacks modelled. The fan inlet design airflows for the existing Phase 2/3 Building will remain the same at 40,000 m^3/hr per tunnel and the new Phase 2/3 Building will have a new fan design airflow of 50,000 m^3/hr per tunnel. These are inlet fan conditions and therefore the derived odour emission rates are considered highly conservative (see **Section 3.2.12** for further details).

6.7.2 Proposed Biofilter System

The detailed design of the proposed biofilter has yet to be finalised. However the final design parameters for the biofilter have been selected. These are listed below as follows:

- **Design Airflow**: 390,000 m^3/hr (maximum, see below)
- **Layout:** Two cells, upflow, open discharge
- **Bed Area:** 2,800 m^2 total (1,300 m^2 and 1,500 m^2)
- **Bed Depth:** 1.7 m
- **Surface Loading:** 139 m^3/m^2/hr (maximum),
- **Residence Time:** 44 secs (minimum, Empty Bed Residence Time)
- **Inlet air temperature:** 36°C design (40°C maximum)
- **Expected performance:** Less than 1,000 ou

TOU has vast experience in the design of large biofilters and has reviewed the proposed design of both the biofilter and odour collection system and found it to be conservative and appropriate for the Elf Farm application. A significant feature of the design and operation of the biofilter system is that airflows will vary with the cyclic nature of the composting process, such that the biofilter will mostly operate at airflow loadings well below the above maximum design value.

A modelled performance level of 1,000 ou would represent an odour concentration that is not expected to be exceeded, even as the biofilter medium is nearing the end of its useful life. Mean treated odour levels of 500 ou or better are anticipated. It is expected that the treated air from the biofilter will have little or no inlet odour character.

For modelling purposes the proposed biofilter odour emission rate was originally estimated with the use of the above target performance concentration of 1,000 ou and maximum design extraction airflow of 450,000 m^3/hr, this being the best estimate of the airflow at the time. As shown above, this was revised downwards to 390,000 m^3/hr during the design stage, and the concentration reduced to 500 ou at NSW EPA's request (TOU meeting with NSW EPA on 16 June 2015). This emission was modelled as a constant emission rate. This assumes full containment and capture at all source groups except post-Pasteurisation Phase 2 and Phase 3 discharges. As a result of the above, the modelling projections for the biofilter emission are highly conservative.

The design maximum airflow to the biofilter has been based on the need to achieve an adequate level of negative pressure inside the processing areas, and maintain safe working conditions for operators. Actual air exchange rates will vary between 5 and 10 air changes per hour. At the lower end of this range working conditions for operators will still be more than adequate.

As will be shown, the modelling originally modelled the biofilter and post-36 hour Phase 2/3 emissions separately, on the basis that the two different odour characters in these streams will be detected separately, and not as a combined/hybrid odour. The NSW EPA 1 May 2015 letter response required that these two emissions be modelled together, on the basis that the TOU approach *"will not reflect receptor response in reality, as it is entirely feasible for a receptor to be adversely affected by the increased frequency of odour events due to two odour sources regardless of intensity and/or the synergistic effects of odour emissions of different character".* TOU disagrees with this logic on the simple basis that if two different odour emissions each satisfy the NSW EPA IAC criterion, and therefore not be problematical, there is no technical justification for considering their projected cumulative effects on the basis of the possible increased frequency of their detection.

Notwithstanding this position, this study has modelled the cumulative effects of the biofilter and post-36 hour Phase 2/3 emissions, as requested. The relevant odour contour plot is shown in **Figure 8.5**. The findings are discussed in **Section 9**.

Similarly, this study has extended its modelling assessment by modelling the full treatment of all odour emissions from the Facility, including the treated emissions from the post-36 hour Phase 2/3 roof vent emissions. This scenario would result in all emissions being directed to the emissions treatment system. Two scenarios were specifically requested by NSW EPA on 1 May 2015, with the second differing only by the use of a second biofilter, instead of the single biofilter being proposed. In reality the projected large maximum volume of air requiring treatment in this scenario (848,800 m^3/hr) would preclude the use of the single biofilter being proposed (2,800 m^2 bed area). For this reason the new modelling represents a combination scenario where this airflow is directed to an appropriately-sized biofilter.

As will be explained in **Section 9**, and independent of the modelling projections, TOU sees little merit in diverting 150 ou post-36 hour Phase 2/3 emissions to an extremely large biofilter that will effectively increase its odour concentration, to between 500 ou and 1000 ou, albeit under a potentially more benign odour character.

6.7.3 Interim Raw Materials and Recycled Water Handling Upgrade

For the interim upgrade, the stormwater overflow retention dam will only continue to be used by Elf Farm under conditions such as high rainfall periods and will be kept empty at all other times. Also, the chicken manure and brew mix sources are to be fully contained by a new building enclosure. The bale wetting area, stable bedding area and water recycle pit will remain unchanged in the interim stage. Worst-case OERs have been modelled for the bale wetting area, stable bedding area and water recycle pit.

6.7.4 Modelling of Transient Events

In its 1 May 2015 letter NSW EPA noted that the modelling did not include instances of short-term fugitive odour releases from the processing areas, as could occur when a door is opened for various processes. Odour dispersion modelling, using the CALPUFF model in the way in which it has been used in this study, is unable to project the consequences of short-term odour emissions, due to its frequency-based focus over a full year of emissions. In TOU's experience genuine short-term odour emissions (up to several minutes) do not typically result in adverse impacts. Longer term occasional emissions should be avoided, and are best managed by adherence to a well-prepared Odour Management Plan (OMP).

This OMP will be developed for the Facility, as part of the overall expansion project. The OMP will specify operation, monitoring and maintenance measures for the odour collection system (including the maintenance of negative pressure), the scrubbers and the biofilter. Those measures for the collection system will ensure that fugitive odour emissions are nil or minimal, and for the biofilter, optimum odour removal performance.

In the unlikely event of offensive odours leaving the Facility it will be possible to determine whether these emissions have been from the biofilter or a failure of the collection system to contain/prevent fugitive emissions. The OMP will document appropriate contingency measures.

TOU considers that it is extremely unlikely that adverse odour impacts would occur if the Facility and its Odour Control System (i.e. the Emissions Plant, Biofilter System, and associated collection system) are operated in accordance with the OMP.

6.7.5 Logging of Biofilter Operation

The performance and condition of the biofilter will be assessed and controlled in several ways. A key element will be the logging by the Supervisory Control and Data Acquisition (SCADA) system of inlet air condition parameters (temperature, relative humidity, ammonia etc.) to ensure that the air is in optimal condition for biofiltration. Biofilter back-pressure will also be logged, as this is a key indicator of potential bed moisture problems. The biofilter system will also be inspected on at least a daily basis to check treated air quality and adequate airflow distribution across the biofilter cells. Finally, independent biofilter system assessments will be carried out by a biofilter specialist, at frequencies that have yet to be finalised.

The performance of the ammonia scrubbers will be monitored via the plant's SCADA system. This will enable operators to check the condition of these units alongside routine checking of all other process conditions at the plant. The scrubbers themselves will be fitted with pH control to ensure optimum scrubbing performance.

A total of six scrubbers are proposed. This will provide a degree of redundancy in the event that one unit needs to be taken off line. The biofilter, being configured in two cells, will enable one cell to be taken off-line for maintenance and/or medium replacement (every 4-5 years). During this short period (estimate 5-7 days) airflows in the collection system can be managed to ensure that the biofilter capacity is not exceeded, while retaining negative pressure conditions where required. A total failure of the biofilter system is not a realistic scenario that requires consideration.

6.8 CALPUFF MODEL OPTIONS

CALPUFF default model options were set except for the following as recommended in *Table A*-4 contained and explained within Barclay & Scire (2011):

- Dispersion coefficients (MDISP) = dispersion coefficients from internally calculated sigma v, sigma w using micrometeorological variables (2);
- Probability Density Function used for dispersion under convective conditions (MPDF) = Yes (1); and
- Minimum turbulence velocities sigma v for each stability class over land and water (SVMIN) = 0.2 m/s for A, B, C, D, E, F (0.200, 0.200, … , 0.200).

Further model configurations including a truncated CALPUFF list file are available in **Appendix C.**

6.9 ODOUR DISPERSION MODELLING SCENARIOS

Four odour dispersion modelling scenarios were modelled focusing on the following source groups:

- **Scenario 1 - Existing Emissions (as of December 2014)**: This scenario consists of fugitive odour emissions (reduced) from the Pre-wet Building and the Phase 1 Hall, emissions from the Raw Materials Area, the Bale Wetting, the Stable Bedding Area, the Inclined Conveyor, the Water Recycle Pit, the Overflow Retention Dam, and all roof exhaust vents on the Phase 2/3 Building;

- **Scenario 2 - Interim Emissions & Biofilter System**: This scenario represents emissions following installation of the Biofilter System and Emissions Plant (Scrubbers), the Enclosure of the Raw Materials Area, and connection of pre-36 hour Phase 2/3 tunnel emissions). The modelled emissions consist of Bale Wetting, the Stable Bedding Area, the Water Recycle Pit, and the post-upgrade roof exhaust vents on the Phase 2/3 Building. The Overflow Retention Dam was not modelled as the new buildings will result in greatly reduced water flows to and emissions from this dam (see **Section 7.1.4** for more details). This scenario has been modelled with the Biofilter emissions at 500 ou mean target concentration performance with containment of all other emission areas and sources.
- **Scenario 3 (A & B) - Ultimate Emissions:** This scenario represents emissions following installation of the new tunnel buildings. The modelled emissions consist of only the cumulative result for the Biofilter System and post-upgrade of the Phase 2/3 Building roof exhaust vents emissions from the later stages (i.e. post-36 hours) of Phase 2 and all of Phase 3 from the roof exhaust vents from the extended and new Phase 2/3 Buildings contributions under this scenario. A total of fifty roof exhaust vents were modelled (i.e. twenty-five vents per building). The model represents the exhaust emissions of a worst-case 24 hour snapshot that was determined to total 26,625 ou.m^3/s (one hour average running over a 24 hour period). This scenario has been modelled with the Biofilter emissions at 500 ou mean target concentration performance with containment of all other emission areas and sources;
- **Scenario 4 (A, B & C)** – **Ultimate Emissions Biofilter System Only:** This scenario represents the diversion of all emissions from the later stage (i.e. post-36 hours) of Phase 2 and all of Phase 3 from the roof exhaust vents from the extended and new Phase 2/3 Buildings to a larger biofilter system. It also represents all other emissions directed to the Biofilter System as per Scenario 3.

7 ODOUR EMISSIONS INVENTORY

The odour emissions inventory developed for the Site is complex as emissions vary both spatially and temporary. However the modifications to the approved expansion project has simplified this inventory as virtually all emissions will be contained and directed to the Emissions Plant and Biofilter System in the final stage of the modification works.

The following sections outline the assumptions and characteristics of each future emission source group that was taken into consideration in deriving all modelled odour emission rates.

7.1 ODOUR EMISSION SOURCE GROUPS

Each source group has been discussed and, where applicable, removed as an odour emission source as a result of the proposed modification works. The details for this is discussed for each source group in the following sections.

7.1.1 Raw Materials Shed Area

The raw materials shed area will be contained within a building. This building will have airflow extraction. The extracted airflow emissions from this area will be directed to the Emissions Plant and Biofilter System before discharge to atmosphere.

The modelling assumes that fugitive emissions from this area will be negligible given that the process operations and raw materials in this area will be contained in the proposed modification works.

7.1.2 Recycled Water Handling Areas

The recycled water handing areas include: the existing bale wetting area; the existing stable bedding area; and the water recycle pit. The bale wetting and stable bedding process operations will shift from outdoors to indoors and be contained. The existing Pre-wet Shed building will become the new Bale Wetting Building and have airflow extraction. The extracted airflow emissions from this area will be directed to the Emissions Plant and Biofilter System before discharge to atmosphere.

The modification works for the bale wetting area will continue once the Emissions Plant and Biofilter System has been successfully constructed and commissioned. Therefore, two scenarios exist for this source group in the proposed modification works:

1. An interim scenario where the recycled water handling process operations will continue to operate under existing conditions. The odour emission rates selected for the interim scenario are identical to those derived from the odour

sampling and testing exercise conducted by TOU (see **Sections 3.1 & 3.2**); and

2. The final scenario where the recycled water handling process operations shift to the existing Pre-wet Shed building and is contained. A nominal air change in this building will be up to 5 air changes/hr. The modelling assumes that fugitive emissions from this area will be negligible given this airflow extraction rate proposed.

7.1.3 Pre-wet Process Operations

The Pre-wet process operations will shift from the existing Pre-wet Shed building to new dedicated bunkers and working hall area that will exist in the western area of the Facility adjacent to the Pre-wet Shed building. All bunkers will have full airflow extraction with exhaust air directed to the Emissions Plant and Biofilter System for emissions treatment prior to discharge to atmosphere. A portion of the air used in the bunkers will be recirculated with the remainder discharged. This will be controlled by the PLC system.

The new Pre-wet working hall area will be contained and have a nominal airflow extraction rate of up to 5 air changes/hr during operations. The extracted air will be directed to the Emissions Plant and Biofilter System.

The modelling assumes that fugitive emissions from the proposed Pre-wet bunker and working hall will be negligible.

7.1.4 Stormwater Dam

The Stormwater Dam has been considered in the **Scenario 1 - Existing Emissions** modelling but not in subsequent scenarios as the proposed building changes will result in greatly reduced and cleaner water inflows to the dam. In any case, the emissions from the dam are small in significance. The stormwater overflow retention dam is not included in **Scenario 1 – Existing Emissions** as advice from Elf Farm is that it will only be utilised under emergency conditions such as high rainfall periods and plant breakdowns and will be kept empty at all other times;

7.1.5 Phase 1 Process Operations

The Phase 1 inclined & cross transfer conveyors operation will be contained. The extracted airflow emissions from this area will be directed to the Emissions Plant and Biofilter System before discharge to atmosphere. A nominal air change in this building will be up to 5 air changes/hr during operations.

The modelling assumes that fugitive emissions from the Phase 1 process operations will be negligible.

7.1.6 Phase 2/3 Process Operations

All emissions generated during Phase 2/3 process operations (for both existing and proposed) will have the capacity to be directed to the proposed Emissions Plant and Biofilter System. However, based on the modelling results (see **Section 9**), it has been determined that only Phase 2 process emissions will need to be directed to the Emissions Plant and Biofilter System for treatment with Phase 3 emissions discharged directly via the dedicated exhaust roof stacks for the existing and proposed Phase 2/3 buildings. This is considered an optimal manner in which to operate given that the Phase 3 emissions are of a low odour concentration (150 ou), low odour emission rate and neutral odour character.

The modelling assumes that fifty tunnels will be in the latter stages of Phase 2 (i.e. cool-down conditioning) and Phase 3 as the worst case scenario and fugitive emissions from process operations at both Phase 2/3 Buildings will be negligible.

7.1.7 Biofilter System

The biofilter is a source with a clear outflow from its surface and has been modelled accordingly as a point source (albeit with a large area and low exit velocity). Buoyancy effects arising from the temperature of the treated air from the biofilter have been taken into account.

There is no plan to construct the second biofilter. It has been shown on the GTL layout drawing plan as an indication of how any future need for additional odour treatment might be accommodated. The first biofilter has been designed with a conservative loading, by Australian biofilter standards, based on the peak airflow rate from the collection system (390,000 m^3/hr). Due to process cycle variations this airflow rate will occur only for relatively short periods in the weekly production cycle. It is highly likely that, once the scrubber/biofilter system is commissioned, its reserve capacity will become apparent, to the extent that any additional airflows that may arise from a future plant expansion may be able to be accommodated in the first biofilter.

7.1.8 Bioscrubber System

The existing bioscrubber system and stack will be mothballed following the completion and commissioning of the proposed modification works. Therefore, the modelling has assumed that this will no longer be an odour emission source at the Facility and has been removed from the modelling.

7.2 ODOUR EMISSIONS INVENTORY TABLES

The odour emissions inventory tables can be found in **Appendix C**.

8 ODOUR MODELLING RESULTS

The following model plots represent the ground level odour concentration (ou, 99th percentile, 1 second average) for all source groups at the 2 ou IAC, as per NSW EPA requested in the 1 May 2015 letter response. This represents TOU's best estimate of worst-case emissions scenarios from Elf Farm. The odour impact results are therefore considered conservative. The odour modelling results are as follows:

- **Scenario 1 - Existing Emissions (as of December 2014)**: This scenario consists of fugitive odour emissions (reduced) from the Pre-wet Building and the Phase 1 Hall, emissions from the Raw Materials Area, the Bale Wetting, the Stable Bedding Area, the Inclined Conveyor, the Water Recycle Pit, the Overflow Retention Dam, and all roof exhaust vents on the Phase 2/3 Building (see **Figure 8.1**).
- **Scenario 2 - Interim Emissions & Biofilter System**: This scenario represents emissions following installation of the Biofilter System and Emissions Plant (Scrubbers), the Enclosure of the Raw Materials Area, and connection of pre-36 hour Phase 2/3 tunnel emissions). The modelled emissions consist of Bale Wetting, the Stable Bedding Area, the Water Recycle Pit, and the post-upgrade roof exhaust vents on the Phase 2/3 Building. The Overflow Retention Dam was not modelled as the new buildings will result in greatly reduced water flows to and emissions from this dam. This scenario has been modelled with the Biofilter emissions at 500 ou mean target concentration performance with containment of all other emission areas and sources (see **Figure 8.2**).
- **Scenario 3 (A & B) - Ultimate Emissions**: This scenario represents emissions following installation of the new tunnel buildings. The modelled emission consist only the emissions from the Biofilter System (390,000 m^3/hr) and post-36 hour Phase 2/3 Building upgrade roof vents (458,800 m^3/hr). The plotted resulted show each emission separately (**Scenario 3A - Figure 8.3**, as per the Amended Final Report), but also includes the projected cumulative result for the two emissions (**Scenario 3B - Figure 8.4**, as requested by NSW EPA on 1 May 2015). The cumulative result shown in **Scenario 3A** is the same modelling result shown in **Scenario 3B**. **Scenario 3B** shows the cumulative modelling results under the IAC as per NSW EPA guidelines.
- **Scenario 4 (A, B & C):** This scenario represents all of the emissions from the Biofilter and pre- and post-36 hour Phase 2/3 Building vent emissions, directed to a larger biofilter system. **Scenario 4A - Figure 8.5** depicts this combined airflow (848,800 m^3/hr) treated in a single large biofilter at the current planned location. **Scenarios 4B & 4C** depicts the same airflow treated in two separate biofilters (as requested by EPA on 1 May 2015) located where originally documented. The plotted resulted show each biofilter emissions separately (**Scenario 4B - Figures 8.6**), but also includes the projected cumulative result for the two biofilter emissions **Scenario 4C- Figure 8.7).** The cumulative result

shown in **Scenario 4B** is the same result shown in **Scenario 4C**. **Scenario 4C** shows the cumulative modelling results under the IAC as per NSW EPA guidelines.

Projected ground level odour concentrations (ou, 99%, 1 second average) at each modelled discrete receptor are available in **Table 8.1**. The applicable colour coding to distinguish between residential and semi-rural sensitive receptors shown in **Table 8.1** is as follows:

	Residential: Sensitive Receptors 1-6
	Semi-rural: Sensitive Receptors 7-19

Table 8.1 - Discrete receptor odour impact results (ou, 99%, 1-s)

Sensitive Receptor	Scenario 1 – Figure 8.1	Scenario 2 – Figure 8.2	Scenario 3			Scenario 4				IAC
			3A – Figure 8.3		3B – Figure 8.4: Cumulative	4A – Figure 8.5	4B – Figure 8.6		4C – Figure 8.7: Cumulative	
			Biofilter 1	Phase 2/3 (post-36 hours)			Biofilter 1	Biofilter 2		
1	28.4	11.8	1.6	1.5	2.0	2.3	1.6	1.6	2.3	2.0
2	30.3	12.6	1.6	1.5	1.9	2.4	1.6	1.7	2.4	2.0
3	32.4	13.4	1.6	1.4	1.9	2.4	1.6	1.8	2.3	2.0
4	31.3	12.5	1.5	1.4	1.9	2.3	1.5	1.7	2.2	2.0
5	28.8	11.5	1.5	1.4	1.8	2.2	1.5	1.6	2.2	2.0
6	27.3	11.1	1.4	1.4	1.8	2.2	1.4	1.5	2.1	2.0
7	81.9	40.2	2.8	2.3	3.5	5.0	2.8	1.7	3.6	2.0
8	58.3	27.8	2.1	1.7	2.8	3.5	2.1	1.5	3.0	2.0
9	52.0	24.1	2.0	1.6	2.7	3.3	2.0	1.4	2.8	2.0
10	50.7	23.2	1.6	1.7	2.5	2.7	1.6	1.6	2.6	2.0
11	55.8	26.6	2.1	1.7	2.7	3.2	2.1	1.5	2.8	2.0
12	37.4	17.6	1.7	1.4	2.4	2.7	1.7	1.2	2.5	2.0
13	32.6	14.9	1.5	1.3	2.3	2.5	1.5	1.1	2.3	2.0
14	30.3	13.8	1.4	1.3	2.2	2.4	1.4	1.0	2.2	2.0
15	31.7	14.3	1.3	1.3	2.0	1.9	1.3	0.9	2.0	2.0
16	27.1	12.5	1.2	1.2	1.9	1.8	1.2	0.9	1.9	2.0
17	23.3	10.9	1.3	1.2	2.0	1.9	1.3	0.9	2.0	2.0
18	26.3	11.8	1.2	1.4	2.0	1.8	1.2	0.9	1.9	2.0
19	33.9	16.3	1.2	1.5	2.2	1.9	1.2	1.1	2.1	2.0

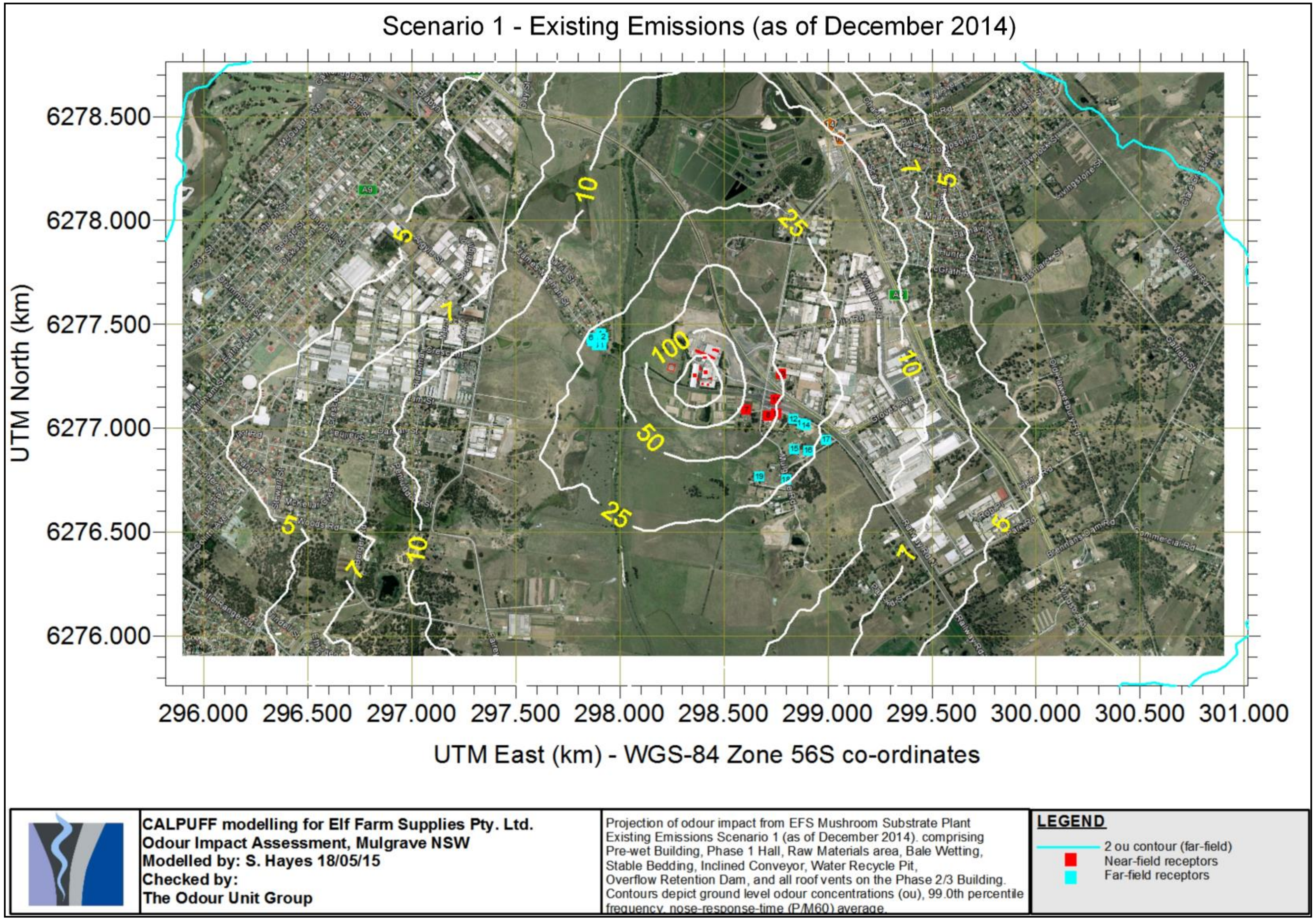


Figure 8.1 – Scenario 1 Existing Emissions (as of December 2014)

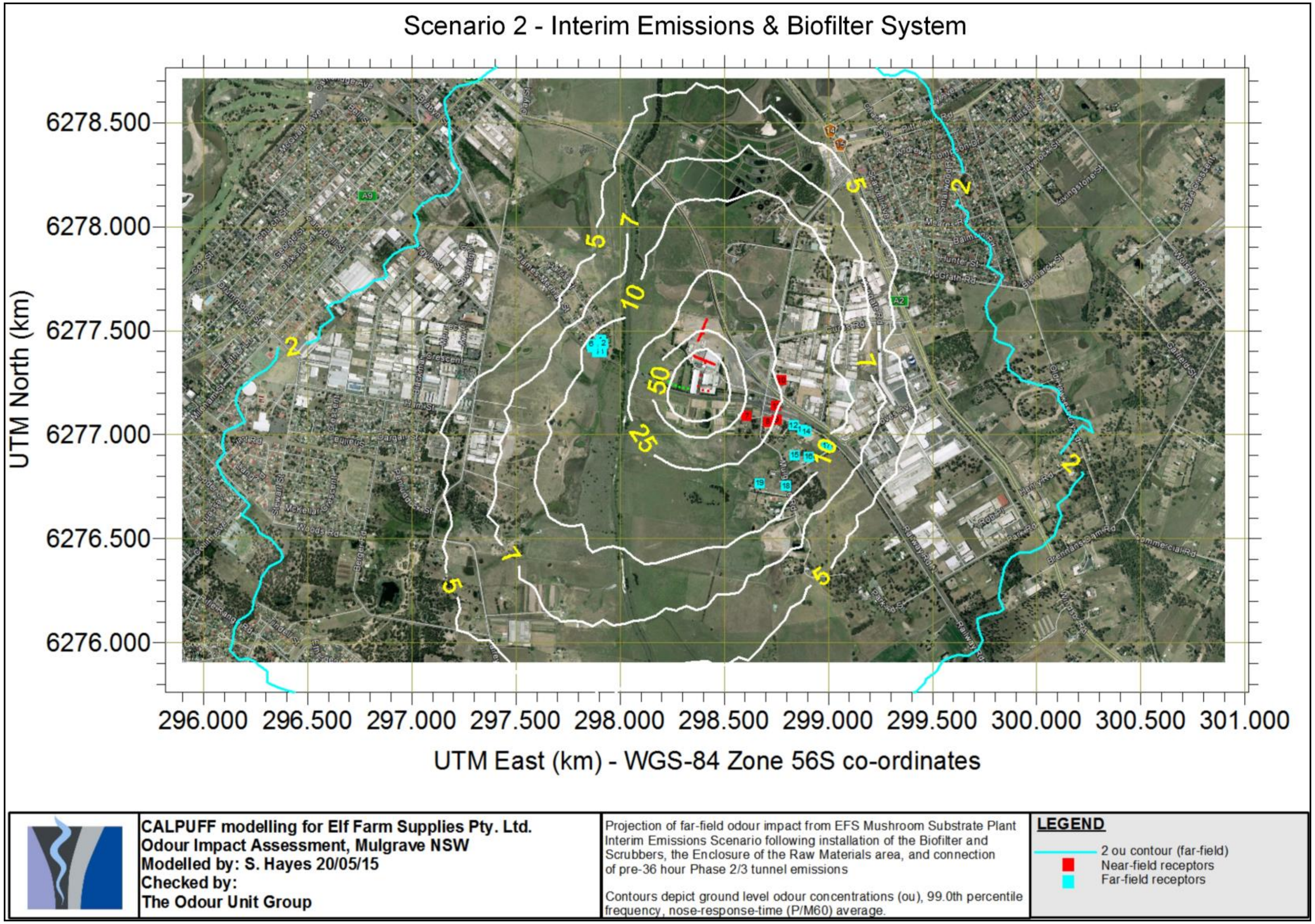


Figure 8.2 - Scenario 2 Interim Emissions & Biofilter System

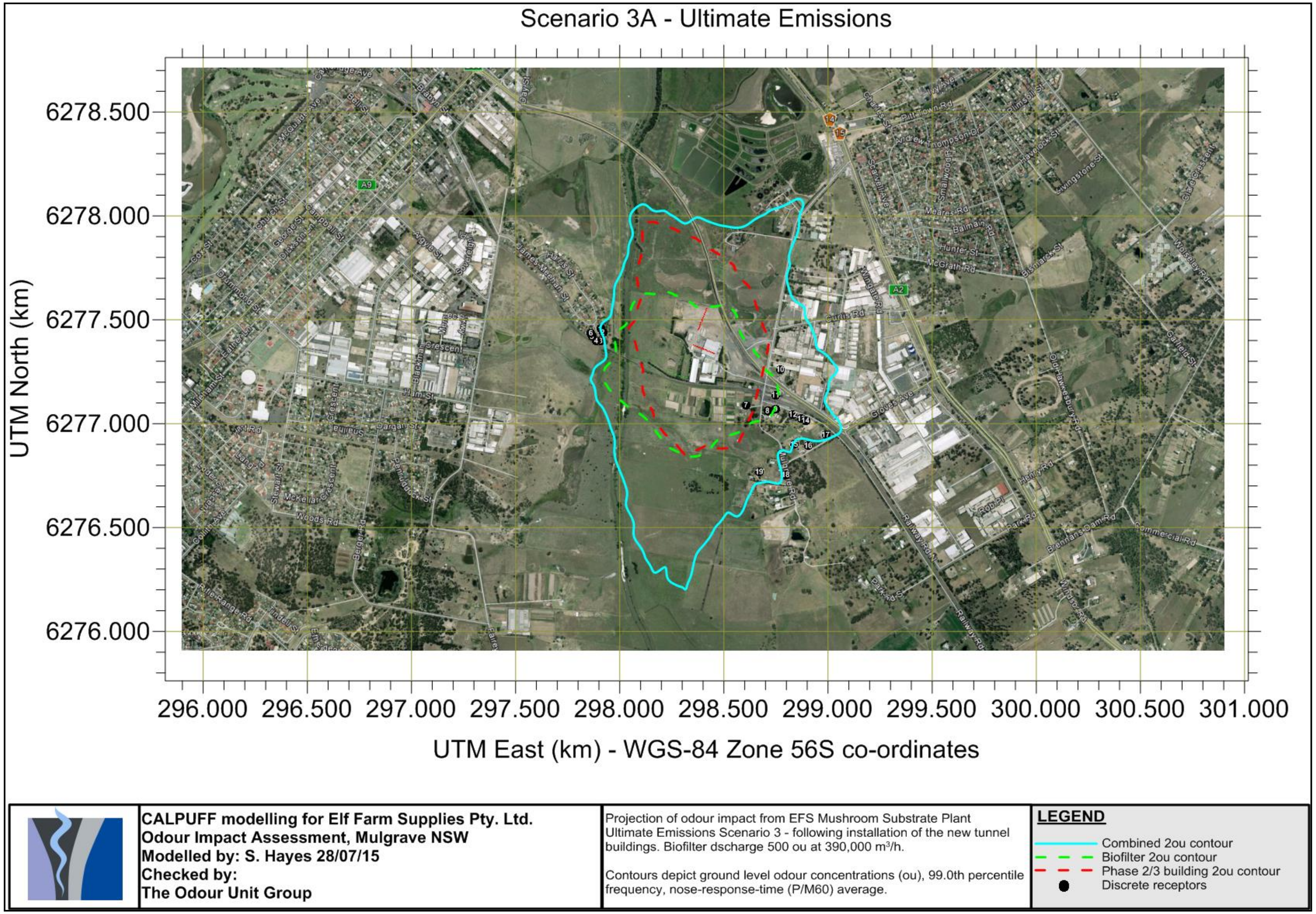
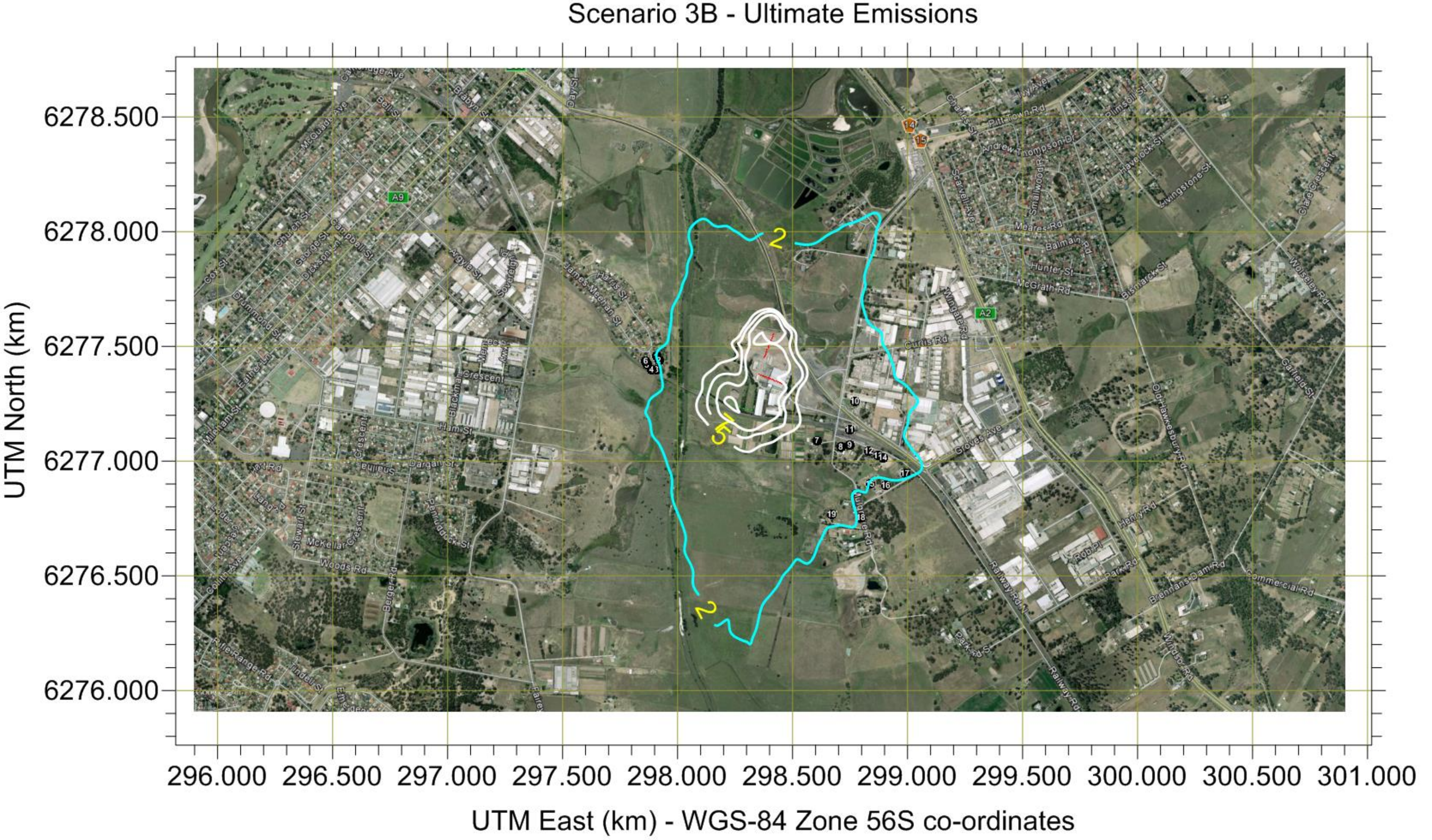


Figure 8.3 – Scenario 3A – Ultimate Emissions: Cumulative & individual source groups result at 2 ou IAC



	CALPUFF modelling for Elf Farm Supplies Pty. Ltd. **Odour Impact Assessment, Mulgrave NSW** **Modelled by: S. Hayes 28/07/15** **Checked by:** **The Odour Unit Group**	Projection of odour impact from EFS Mushroom Substrate Plant Ultimate Emissions Scenario 3 - following installation of the new tunnel buildings. Biofilter discharge 500 ou at 390,000 m³/h. Contours depict ground level odour concentrations (ou), 99.0th percentile frequency, nose-response-time (P/M60) average.	**LEGEND** 2 ou contour Discrete receptors

Figure 8.4 – Scenario 3B – Ultimate Emissions: Cumulative result as per NSW EPA guidelines IAC

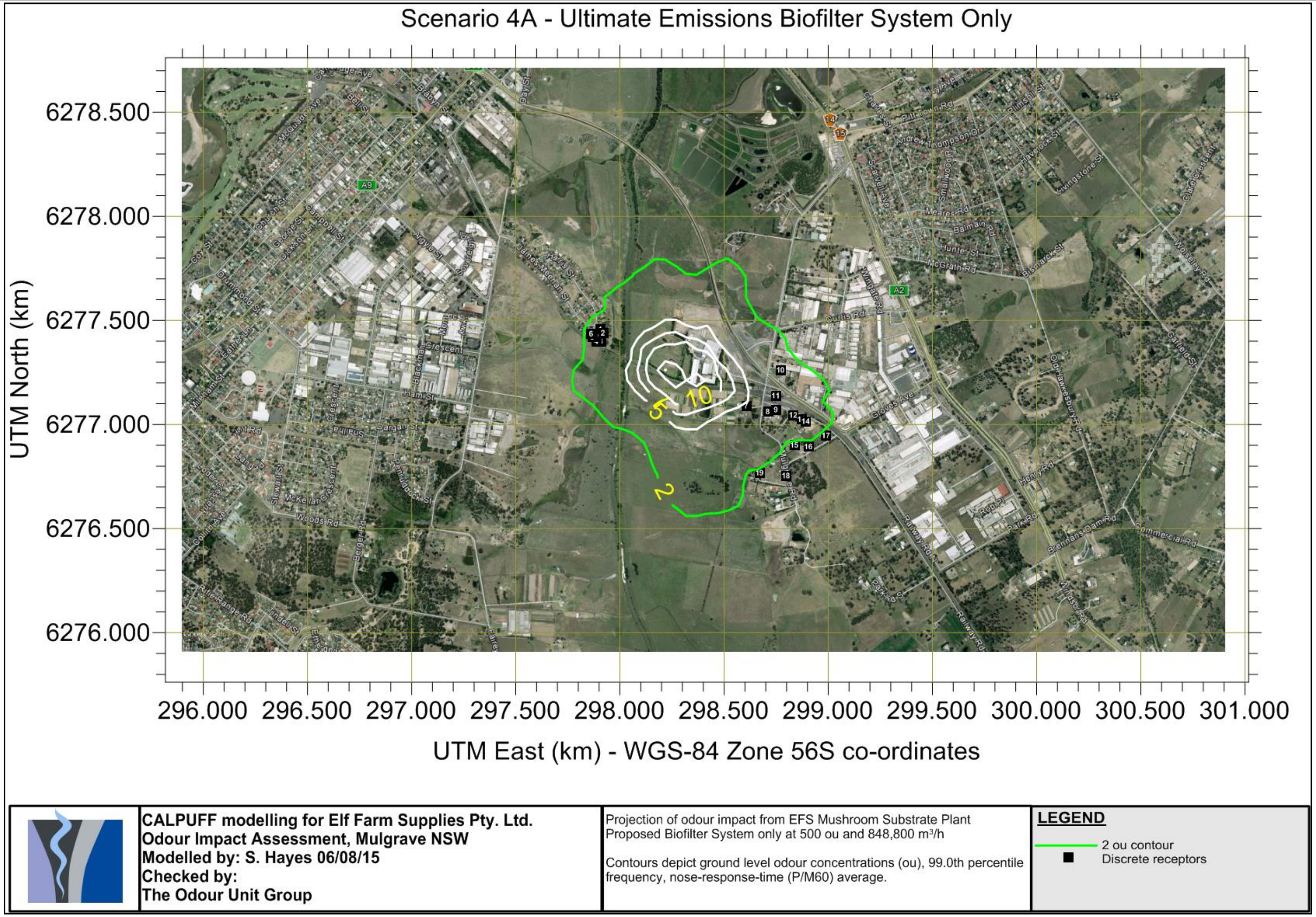
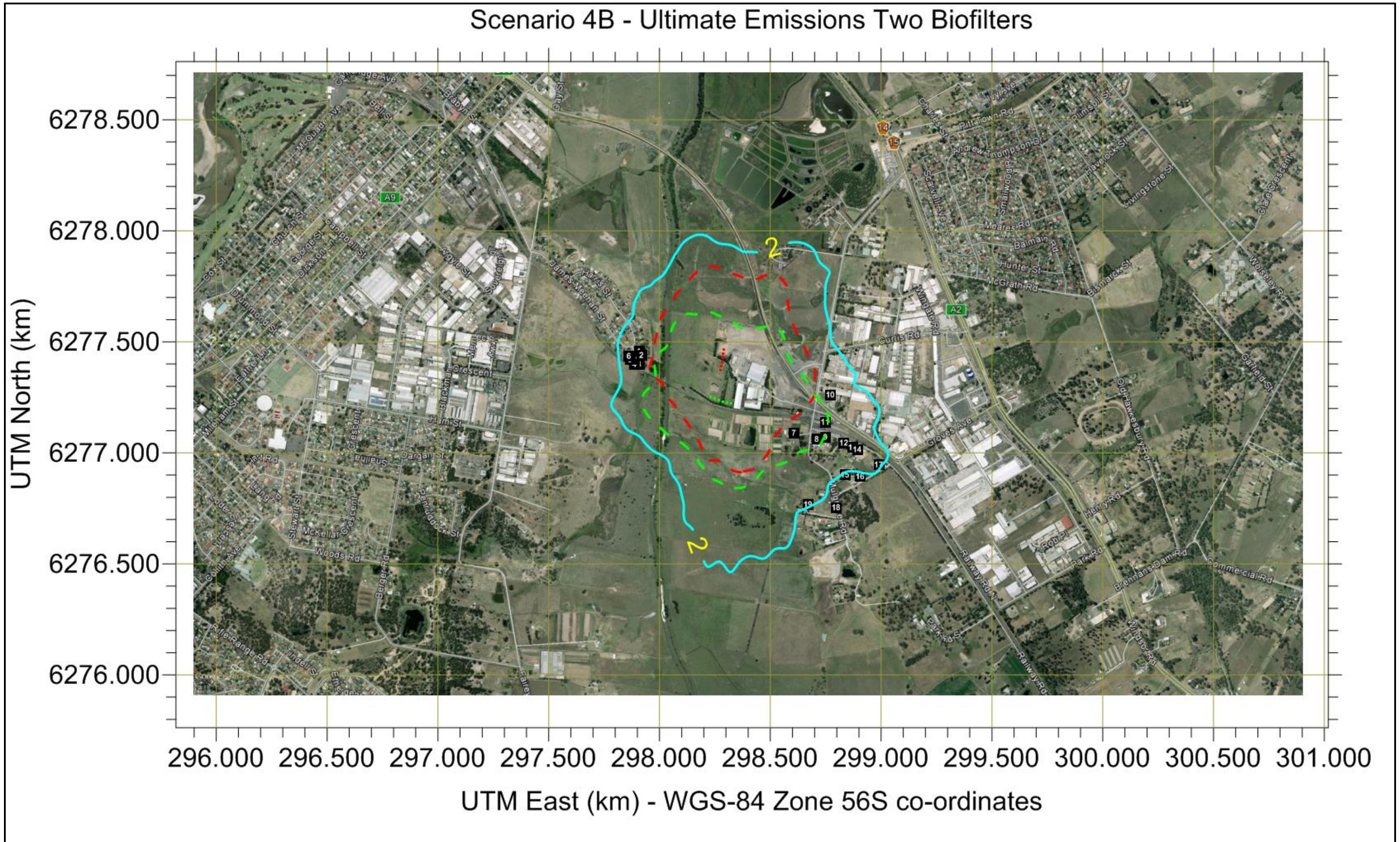


Figure 8.5 – Scenario 4A – Ultimate Emissions Biofilter System Only: Cumulative result at 2 ou IAC



CALPUFF modelling for Elf Farm Supplies Pty. Ltd.
Odour Impact Assessment, Mulgrave NSW
Modelled by: S. Hayes 12/08/15
Checked by:
The Odour Unit Group

Projection of odour impact from EFS Mushroom Substrate Plant Ultimate Emissions Scenario 3 - following installation of the new tunnel buildings with full capture. Two biofilter system discharge 500 ou at 848,800 m³/h

Contours depict ground level odour concentrations (ou), 99.0th percentile frequency, nose-response-time (P/M60) average.

LEGEND
Combined 2ou contour
Biofilter (south) 2ou contour
Biofilter (north) 2ou contour
Discrete receptors

Figure 8.6 – Scenario 4B – Ultimate Emissions Two Biofilters: Cumulative result & each biofilters at 2 ou IAC

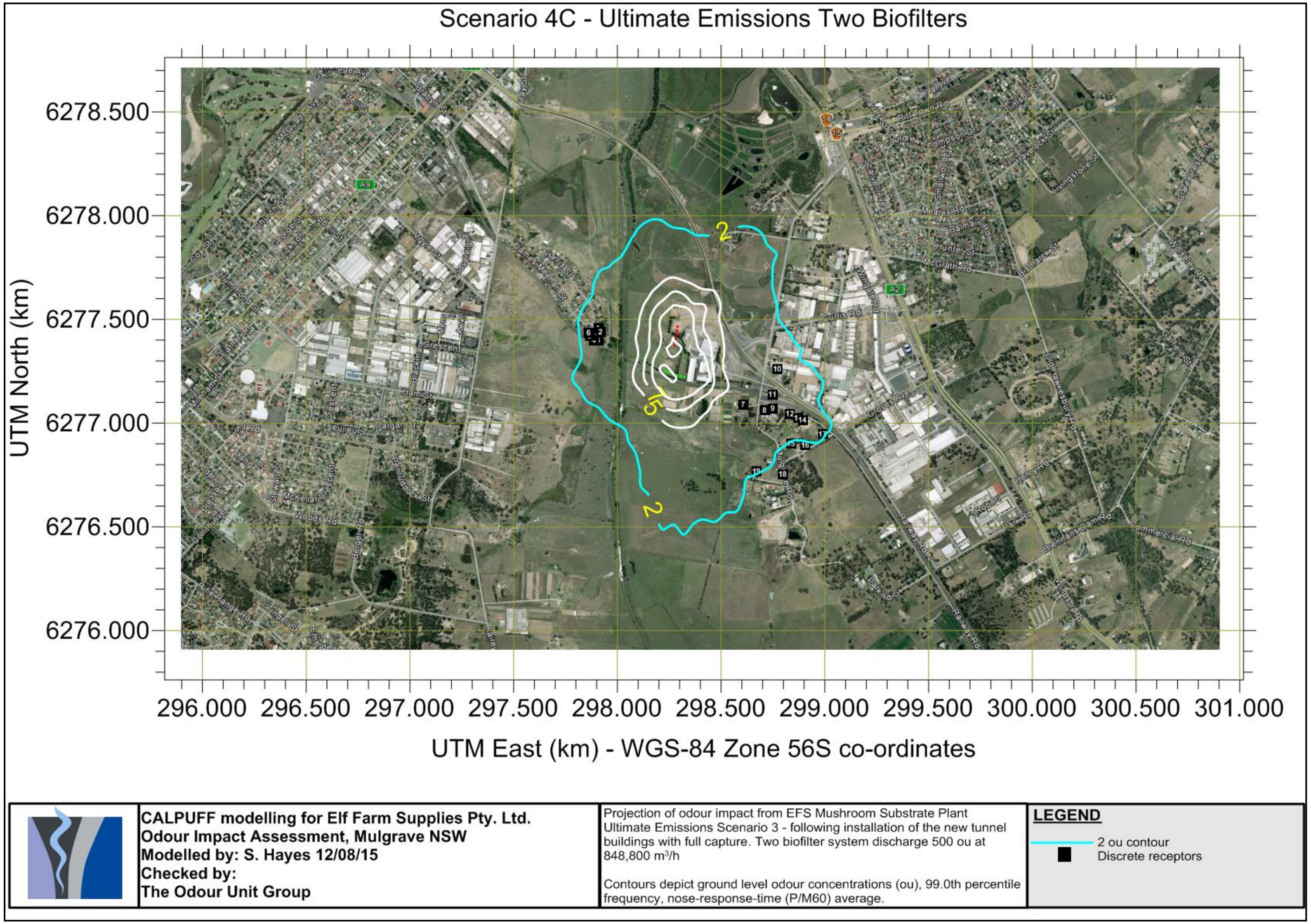


Figure 8.7 – Scenario 4C – Ultimate Emissions Two Biofilters: Cumulative result as per NSW EPA guidelines IAC

9 DISCUSSION OF MODELLING RESULTS

The following discusses the modelling results for the proposed modification works for each scenario including the interim and final stages. It is reiterated that the modelling projections are all based on very conservative, worst-case odour emissions data, and have been assessed against the EPA-preferred 2 ou IAC for all potentially sensitive receptors, regardless of location.

No allowance has been made in the interpretation of the modelling projections for the character of the odours present beyond the plant boundary. This is discussed in **Section 10** below.

9.1 SCENARIO 1 – EXISTING EMISSIONS (AS OF DECEMBER 2014)

This scenario is not representative of the proposed modification works, and was included in this study as per request by NSW EPA. As indicated in **Section 8**, this scenario consists of fugitive odour emissions (reduced) from the Pre-wet Building and the Phase 1 Hall, emissions from the Raw Materials Area, the Bale Wetting, the Stable Bedding Area, the Inclined Conveyor, the Water Recycle Pit, the Overflow Retention Dam, and all roof exhaust vents on the Phase 2/3 Building. It represents the Facility as of December 2014 without the proposed upgrade works. On this basis, it can be considered as a baseline to gauge the improvement to emissions from the Facility post-upgrade works.

9.2 SCENARIO 2– INTERIM EMISSIONS & BIOFILTER SYSTEM

In this scenario, projection of far-field odour impact from bale wetting area, stable bedding area and water recycle pit shows exceedance of the 2 ou odour performance criterion for the urban areas to the south-west, west, north-west and north-east of the Facility. In addition, there is exceedance of the 4 ou to 7 ou for the semi-rural and industrial areas to east and south-east of the Facility. This projection is at the interim stage before completion of the final modification works (i.e. full containment of these source groups). It should be noted that worst case odour emission rates have been modelled for the bale wetting area, stable bedding area and water recycle pit. Therefore, the projected odour impact is highly conservative and will vary throughout a typical 7-day production cycle where water recycle quality is known to vary (see odour emission data for bale wetting area in **Appendices A & C**).

9.3 SCENARIO 3 – ULTIMATE EMISSIONS

The odour impact projection for this scenario shows that a single biofilter treating all process emissions at a maximum design airflow of 390,000 m^3/hr and 500 ou mean target performance, with the exception of the post-36 hour Phase 2/3 emissions, will comply with the 2 ou IAC in all residential areas, with only marginal non-compliance at three semi-rural properties to the immediate south-east of the plant (green contour line

– see **Figure 8.3**). Compliance is also indicated in the industrial estate. Conversely, full compliance is shown with the more stringent 4 ou IAC that would normally apply to this type of semi-rural development (**Figure 8.4**).

A similar projection is indicated for the Phase 2/3 roof vent emissions (red contour line – see **Figure 8.3**). Full compliance is achieved at all residential and semi-rural areas, with the exception of one receptor (Receptor 7) where a very marginal non-compliance to the 2 ou IAC is projected (see **Table 8.1**).

For the combined cumulative effect scenario (blue contour line – **see Figure 8.4**), where these odour streams are considered as one, full compliance is indicated for the residential areas (Receptors 1 -6). Compliance is not indicated in a number of houses in the semi-rural area to the south-east, as is the case for the western section of the industrial estate. For the reasons given in this report TOU would not expect adverse odour impacts at these projected odour levels. As previously indicated, TOU does not favour the cumulative modelling of the two emission sources.

These minor non-compliances in this modelling scenario are considered unlikely to cause adverse impacts, given the conservatism in the modelling methodology and the neutral character of both odour streams.

9.4 SCENARIO 4 – ULTIMATE EMISSIONS BIOFILTER SYSTEM ONLY

Both of the modelled scenarios represent the collection and treatment of all process emissions in a very large biofilter system receiving a very large airflow (848,800 m^3/hr). Scenario 4A (**Figure 8.5**) depicts treatment in a single biofilter, while Scenario 4B & 4C splits the biofilter into two units set slightly apart (see **Figures 8.6 & 8.7**). The total area of the biofilter(s) would be more than double that of the largest biofilter in Australia.

The odour impact projections for both scenarios are very similar. They show a broadly similar level of marginal non-compliance to the cumulative result in Scenario 3 modelling projections at the semi-rural properties to the immediate south-east of the plant and in the industrial estate. Significantly, the modelling also indicates marginal non-compliance in the residential area to the west of the plant, suggesting a poorer outcome than Scenario 3, despite the full treatment of all emissions. TOU sees no real 'on-ground' advantage in the full treatment approach simulated in this scenario. To the contrary, the doubling of the biofilter area could result in a biofilter system that is fundamentally more difficult to operate, and therefore more prone to sub-optimal treatment performance.

10 CONCLUSION

In September 2014 Elf Farm Supplies Pty Ltd (Elf Farm) engaged The Odour Unit Pty Ltd (TOU) to undertake an odour impact assessment for the modification to the approved expansion project of the mushroom substrate facility at Mulgrave, NSW (the Facility). The Department of Planning & Environment (DPE) project number for the proposed modifications to the approved expansion is 08_0255 MOD1.

A site-wide odour emissions inventory was developed that is representative of conditions that will exist at the Elf Farm Mulgrave Mushroom Substrate Facility following the proposed modification works. The key features of the odour control system for the proposed modification are full containment and airflow extraction of all existing odour emission source groups and process operations. The exception to this is the stormwater overflow retention dam and the later stages of Phase 2 and all of Phase 3 exhaust emissions.

The stormwater overflow retention dam has not included been included in the ultimate stage scenarios as advice from Elf Farm is that it will continue only to be utilised under conditions such as high rainfall periods and will be kept empty at all other times. The post-36 hour Phase 2/3 emissions that are proposed to be discharged directly to atmosphere, without the need for treatment by the Biofilter System, have been tested in this study and shown to be one-fifth of the odour concentration of that expected from a fully-treated biofilter emission.

Overall, this study has shown that the odour control system proposed by Elf Farm, and modelled as Scenario 3, will result in fully compliant projected odour levels in the residential areas, even with the two different odour emissions sources (biofilter and Phase 2/3 roof vents) modelled as a cumulative emission. TOU does not favour the use of cumulative modelling in this instance, in the belief that the two different odour characters in the emissions will remain as discrete odours in the atmosphere. On this non-cumulative basis the modelling of Scenario 3 projects marginal non-compliance with the EPA-preferred 2 ou IAC in several houses in the semi-rural area to the immediate south-east of the plant, but full compliance with the more stringent 4 ou IAC that would normally apply to this type of semi-rural development.

Given this finding, and having regard to the highly conservative approach used in the modelling work, there would appear to be no justification for requiring Elf Farm to implement the total treatment odour control system modelled in Scenario 4, in either configuration (i.e. with single biofilter or two biofilters). The modelling projections for Scenario 4, where all air is directed to and treated in a biofilter system, show no substantial improvement to the marginal non-compliance in the Scenario 3 projections at these semi-rural properties to the immediate south-east of the Facility, and significantly an additional marginal non-compliance in the residential area to the west of the plant, that was not indicated in Scenario 3. Notwithstanding this finding, TOU considers that neither scenarios would result in adverse odour impacts in the residential areas, when taking into account the relatively neutral character of the odours emitted from the biofilter(s) and the post-36 hour Phase 2/3 roof vents.

Finally, this study has determined a need for a plant-wide Odour Management Plan (OMP) in order to facilitate the effective management of the processing facilities and the odour control system. This document would replace the existing OMP. The OMP would specify operation, monitoring and maintenance measures for the odour collection system, the scrubbers and the biofilter. Those measures for the collection system would ensure that fugitive odour emissions are nil or minimal, and for the biofilter, that optimum odour removal performance is achieved at all times.

In the unlikely event of offensive odours leaving the Facility the OMP would contain procedures to determine whether these emissions have been from the biofilter or a failure of the collection system to contain/prevent fugitive emissions. The OMP would document appropriate contingency measures to implement in such circumstances.

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REPORT SIGNATURE PAGE

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THE ODOUR UNIT

Elf Farm Supplies Pty Ltd

Mushroom Substrate Plant – Modification to Approved Expansion

Odour Impact Assessment

Mulgrave, NSW

Second Amended Final Appendices

THE ODOUR UNIT

Elf Farm Supplies Pty Ltd

Mushroom Substrate Plant – Modification to Approved Expansion

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APPENDIX A:

ODOUR CONCENTRATION LABORATORY TESTING RESULTS

THE ODOUR UNIT PTY LTD

THE ODOUR UNIT

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Internet: www.odourunit.com.au
ABN: 53 091 165 061

NATA
Accreditation Number: 14974

Odour Concentration Measurement Results

The measurement was commissioned by:

Organisation	Elf Farm Supplies Pty Ltd	Telephone	+61 2 4577 5000
Contact	Neil Cockerell	Facsimile	-
Sampling Site	Mulgrave, NSW	Email	manager@elffarm.com.au
Sampling Method	Drum & Pump	Sampling Team	TOU (J. Schulz, M. Assal)

Order details:

Order requested by	Neil Cockerell	Order accepted by	T.Schulz
Date of order	July 2014	TOU Project #	N1952R
Order number	Refer to correspondence	Project Manager	M. Assal
Signed by	Refer to correspondence	Testing operator	A. Schulz

Investigated Item	Odour concentration in odour units 'ou', determined by sensory odour concentration measurements, of an odour sample supplied in a sampling bag.
Identification	The odour sample bags were labelled individually. Each label recorded the testing laboratory, sample number, sampling location (or Identification), sampling date and time, dilution ratio (if dilution was used) and whether further chemical analysis was required.
Method	The odour concentration measurements were performed using dynamic olfactometry according to the Australian Standard 'Determination of Odour Concentration by Dynamic Olfactometry AS/NZS4323.3:2001. NATA accredited for compliance with ISO/IEC 17025. Any deviation from the Australian standard is recorded in the 'Comments' section of this report.
Measuring Range	The measuring range of the olfactometer is $2^2 \leq \chi \leq 2^{18}$ ou. If the measuring range was insufficient the odour samples will have been pre-diluted. The machine is not calibrated beyond dilution setting 2^{17}. This is specifically mentioned with the results.
Environment	The measurements were performed in an air- and odour-conditioned room. The room temperature is maintained between 22ºC and 25ºC.
Measuring Dates	The date of each measurement is specified with the results.
Instrument Used	The olfactometer used during this testing session was: ODORMAT SERIES V05
Instrumental Precision	The precision of this instrument (expressed as repeatability) for a sensory calibration must be $r \leq 0.477$ in accordance with the Australian Standard AS/NZS4323.3:2001. ODORMAT SERIES V05: $r = 0.2635$ (April 2014) Compliance – Yes
Instrumental Accuracy	The accuracy of this instrument for a sensory calibration must be $A \leq 0.217$ in accordance with the Australian Standard AS/NZS4323.3:2001. ODORMAT SERIES V05: $A = 0.1843$ (April 2014) Compliance – Yes
Lower Detection Limit (LDL)	The LDL for the olfactometer has been determined to be 16 ou (4 times the lowest dilution setting)
Traceability	The measurements have been performed using standards for which the traceability to the national standard has been demonstrated. The assessors are individually selected to comply with fixed criteria and are monitored in time to keep within the limits of the standard. The results from the assessors are traceable to primary standards of n-butanol in nitrogen.

Date: Thursday, 21 August 2014

Panel Roster Number: SYD20140813_069

J. Schulz
NSW Laboratory Coordinator

A. Schulz
Authorised Signatory

Odour Sample Measurement Results
Panel Roster Number: SYD20140813_069

Sample Location	TOU Sample ID	Sampling Date & Time	Analysis Date & Time	Panel Size	Valid ITEs	Nominal Sample Dilution	Actual Sample Dilution (Adjusted for Temperature)	Sample Odour Concentration (as received, in the bag) (ou)	Sample Odour Concentration (Final, allowing for dilution) (ou)	Specific Odour Emission Rate (ou.m^3/m^2/s)
2-1 Levelling (Tunnel 1)	SC14469	12/08/2014 1106hrs	13/08/2014 1128hrs	4	8	-	-	4,870	4,870	N/A
[redacted]										
8-1 Tunnel Venting (Tunnel 17)	SC14471	12/08/2014 1119hrs	13/08/2014 1232hrs	4	8	-	-	2,900	2,900	N/A
2-2 Levelling (Tunnel 3)	SC14472	12/08/2014 1113hrs	13/08/2014 1442hrs	4	8	-	-	5,310	5,310	N/A
[redacted]										

Note: The following are not covered by the NATA Accreditation issued to The Odour Unit Pty Ltd:

1. The collection of Isolation Flux Hood (IFH) samples and the calculation of the Specific Odour Emission Rate (SOER).
2. Final results that have been modified by the dilution factors where parties other than The Odour Unit Pty Ltd. have performed the dilution of samples.

Odour Panel Calibration Results

Reference Odorant	Reference Odorant Panel Roster Number	Concentration of Reference gas (ppb)	Panel Target Range for n-butanol (ppb)	Measured Concentration (ou)	Measured Panel Threshold (ppb)	Does this panel calibration measurement comply with AS/NZS4323.3:2001 (Yes / No)
n-butanol	SYD20140813_069	50,000	$20 \leq \chi \leq 80$	1,024	49	Yes

Comments None.

Disclaimer Parties, other than TOU, responsible for collecting odour samples hereby certify that they have voluntarily furnished these odour samples, appropriately collected and labelled, to The Odour Unit Pty Ltd for the purpose of odour testing. The collection of odour samples by parties other than The Odour Unit Pty Ltd relinquishes The Odour Unit Pty Ltd from all responsibility for the sample collection and any effects or actions that the results from the test(s) may have.

Note This report shall not be reproduced, except in full, without written approval of The Odour Unit Pty Ltd. Any attachments to this Report are not covered by the NATA Accreditation issued to The Odour Unit Pty Ltd.

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THE ODOUR UNIT PTY LTD

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Internet: www.odourunit.com.au
ABN: 53 091 165 061

Accreditation Number: 14974

Odour Concentration Measurement Results

The measurement was commissioned by:

Organisation	Elf Farm Supplies Pty Ltd	Telephone	+61 2 4577 5000
Contact	Neil Cockerell	Facsimile	-
Sampling Site	Mulgrave, NSW	Email	manager@elffarm.com.au
Sampling Method	Drum & Pump	Sampling Team	TOU (J. Schulz, M. Assal)

Order details:

Order requested by	Neil Cockerell	Order accepted by	T.Schulz
Date of order	July 2014	TOU Project #	N1952R
Order number	Refer to correspondence	Project Manager	M. Assal
Signed by	Refer to correspondence	Testing operator	A. Schulz

Investigated Item	Odour concentration in odour units 'ou', determined by sensory odour concentration measurements, of an odour sample supplied in a sampling bag.
Identification	The odour sample bags were labelled individually. Each label recorded the testing laboratory, sample number, sampling location (or Identification), sampling date and time, dilution ratio (if dilution was used) and whether further chemical analysis was required.
Method	The odour concentration measurements were performed using dynamic olfactometry according to the Australian Standard 'Determination of Odour Concentration by Dynamic Olfactometry AS/NZS4323.3:2001. NATA accredited for compliance with ISO/IEC 17025. Any deviation from the Australian standard is recorded in the 'Comments' section of this report.
Measuring Range	The measuring range of the olfactometer is $2^2 \leq \chi \leq 2^{18}$ ou. If the measuring range was insufficient the odour samples will have been pre-diluted. The machine is not calibrated beyond dilution setting 2^{17}. This is specifically mentioned with the results.
Environment	The measurements were performed in an air- and odour-conditioned room. The room temperature is maintained between 22ºC and 25ºC.
Measuring Dates	The date of each measurement is specified with the results.
Instrument Used	The olfactometer used during this testing session was: ODORMAT SERIES V05
Instrumental Precision	The precision of this instrument (expressed as repeatability) for a sensory calibration must be $r \leq 0.477$ in accordance with the Australian Standard AS/NZS4323.3:2001. ODORMAT SERIES V05: $r = 0.2635$ (April 2014) Compliance – Yes
Instrumental Accuracy	The accuracy of this instrument for a sensory calibration must be $A \leq 0.217$ in accordance with the Australian Standard AS/NZS4323.3:2001. ODORMAT SERIES V05: $A = 0.1843$ (April 2014) Compliance – Yes
Lower Detection Limit (LDL)	The LDL for the olfactometer has been determined to be 16 ou (4 times the lowest dilution setting)
Traceability	The measurements have been performed using standards for which the traceability to the national standard has been demonstrated. The assessors are individually selected to comply with fixed criteria and are monitored in time to keep within the limits of the standard. The results from the assessors are traceable to primary standards of n-butanol in nitrogen.

Date: Thursday, 21 August 2014

Panel Roster Number: SYD20140814_070

J. Schulz
NSW Laboratory Coordinator

A. Schulz
Authorised Signatory

Odour Sample Measurement Results
Panel Roster Number: SYD20140814_070

Sample Location	TOU Sample ID	Sampling Date & Time	Analysis Date & Time	Panel Size	Valid ITEs	Nominal Sample Dilution	Actual Sample Dilution (Adjusted for Temperature)	Sample Odour Concentration (as received, in the bag) (ou)	Sample Odour Concentration (Final, allowing for dilution) (ou)	Specific Odour Emission Rate (ou.m^3/m^2/s)
7A-1 Spawn Run 1 (Tunnel 4)	SC14477	13/08/2014 0919hrs	14/08/2014 1040hrs	4	8	-	-	118	118	N/A
4-2 Pasteurisation (Tunnel 3)	SC14478	13/08/2014 0933hrs	14/08/2014 1110hrs	4	8	-	-	2,660	2,660	N/A
4-1 Pasteurisation (Tunnel 2)	SC14479	13/08/2014 0941hrs	14/08/2014 0941hrs	4	8	-	-	2,230	2,230	N/A
3-2 Warm-up Pasteurisation (Tunnel 10)	SC14480	13/08/2014 0954hrs	14/08/2014 1218hrs	4	8	-	-	2,440	2,440	N/A
3-1 Warm-up Pasteurisation (Tunnel 1)	SC14481	13/08/2014 1000hrs	14/08/2014 1248hrs	4	8	-	-	2,350	2,350	N/A

Note: The following are not covered by the NATA Accreditation issued to The Odour Unit Pty Ltd:

1. The collection of Isolation Flux Hood (IFH) samples and the calculation of the Specific Odour Emission Rate (SOER).
2. Final results that have been modified by the dilution factors where parties other than The Odour Unit Pty Ltd. have performed the dilution of samples.

THE ODOUR UNIT PTY LTD

Accreditation Number: 14974

Odour Panel Calibration Results

Reference Odorant	Reference Odorant Panel Roster Number	Concentration of Reference gas (ppb)	Panel Target Range for n-butanol (ppb)	Measured Concentration (ou)	Measured Panel Threshold (ppb)	Does this panel calibration measurement comply with AS/NZS4323.3:2001 (Yes / No)
n-butanol	SYD20140814_070	50,000	$20 \leq \chi \leq 80$	1,024	49	Yes

Comments None.

Disclaimer Parties, other than TOU, responsible for collecting odour samples hereby certify that they have voluntarily furnished these odour samples, appropriately collected and labelled, to The Odour Unit Pty Ltd for the purpose of odour testing. The collection of odour samples by parties other than The Odour Unit Pty Ltd relinquishes The Odour Unit Pty Ltd from all responsibility for the sample collection and any effects or actions that the results from the test(s) may have.

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ABN: 53 091 165 061

Accreditation Number:
14974

Odour Concentration Measurement Results

The measurement was commissioned by:

Organisation	Elf Farm Supplies Pty Ltd	Telephone	+61 2 4577 5000
Contact	Neil Cockerell	Facsimile	-
Sampling Site	Mulgrave, NSW	Email	manager@elffarm.com.au
Sampling Method	Drum & Pump	Sampling Team	TOU (J. Schulz, M. Assal)

Order details:

Order requested by	Neil Cockerell	Order accepted by	T.Schulz
Date of order	July 2014	TOU Project #	N1952R
Order number	Refer to correspondence	Project Manager	M. Assal
Signed by	Refer to correspondence	Testing operator	A. Schulz

Investigated Item	Odour concentration in odour units 'ou', determined by sensory odour concentration measurements, of an odour sample supplied in a sampling bag.
Identification	The odour sample bags were labelled individually. Each label recorded the testing laboratory, sample number, sampling location (or Identification), sampling date and time, dilution ratio (if dilution was used) and whether further chemical analysis was required.
Method	The odour concentration measurements were performed using dynamic olfactometry according to the Australian Standard 'Determination of Odour Concentration by Dynamic Olfactometry AS/NZS4323.3:2001. NATA accredited for compliance with ISO/IEC 17025. Any deviation from the Australian standard is recorded in the 'Comments' section of this report.
Measuring Range	The measuring range of the olfactometer is $2^2 \leq \chi \leq 2^{18}$ ou. If the measuring range was insufficient the odour samples will have been pre-diluted. The machine is not calibrated beyond dilution setting 2^{17}. This is specifically mentioned with the results.
Environment	The measurements were performed in an air- and odour-conditioned room. The room temperature is maintained between 22ºC and 25ºC.
Measuring Dates	The date of each measurement is specified with the results.
Instrument Used	The olfactometer used during this testing session was: ODORMAT SERIES V05
Instrumental Precision	The precision of this instrument (expressed as repeatability) for a sensory calibration must be $r \leq 0.477$ in accordance with the Australian Standard AS/NZS4323.3:2001. ODORMAT SERIES V05: $r = 0.2635$ (April 2014) Compliance – Yes
Instrumental Accuracy	The accuracy of this instrument for a sensory calibration must be $A \leq 0.217$ in accordance with the Australian Standard AS/NZS4323.3:2001. ODORMAT SERIES V05: $A = 0.1843$ (April 2014) Compliance – Yes
Lower Detection Limit (LDL)	The LDL for the olfactometer has been determined to be 16 ou (4 times the lowest dilution setting)
Traceability	The measurements have been performed using standards for which the traceability to the national standard has been demonstrated. The assessors are individually selected to comply with fixed criteria and are monitored in time to keep within the limits of the standard. The results from the assessors are traceable to primary standards of n-butanol in nitrogen.

Date: Friday, 22 August 2014 Panel Roster Number: SYD20140815_071

J. Schulz
NSW Laboratory Coordinator

A. Schulz
Authorised Signatory

Odour Sample Measurement Results
Panel Roster Number: SYD20140815_071

Sample Location	TOU Sample ID	Sampling Date & Time	Analysis Date & Time	Panel Size	Valid ITEs	Nominal Sample Dilution	Actual Sample Dilution (Adjusted for Temperature)	Sample Odour Concentration (as received, in the bag) (ou)	Sample Odour Concentration (Final, allowing for dilution) (ou)	Specific Odour Emission Rate (ou.m^3/m^2/s)
5-1-1 Conditioning #1 (Tunnel 1)	SC14482	14/08/2014 1040hrs	15/08/2014 1033hrs	4	8	-	-	512	512	N/A
5-2-1 Conditioning #1 (Tunnel 3)	SC14483	14/08/2014 1013hrs	15/08/2014 1108hrs	4	8	-	-	431	431	N/A
7B-1 Spawn run 2 (Tunnel 8)	SC14484	14/08/2014 0950hrs	15/08/2014 1144hrs	4	8	-	-	152	152	N/A
5-1-2 Conditioning #2 (Tunnel 1)	SC14485	14/08/2014 0920hrs	15/08/2014 1244hrs	4	8	-	-	362	362	N/A
5-2-2 Conditioning #2 (Tunnel 3)	SC14486	14/08/2014 0934hrs	15/08/2014 1311hrs	4	8	-	-	304	304	N/A

Note: The following are not covered by the NATA Accreditation issued to The Odour Unit Pty Ltd:

1. The collection of Isolation Flux Hood (IFH) samples and the calculation of the Specific Odour Emission Rate (SOER).
2. Final results that have been modified by the dilution factors where parties other than The Odour Unit Pty Ltd. have performed the dilution of samples.

THE ODOUR UNIT PTY LTD

Accreditation Number: 14974

Odour Panel Calibration Results

Reference Odorant	Reference Odorant Panel Roster Number	Concentration of Reference gas (ppb)	Panel Target Range for n-butanol (ppb)	Measured Concentration (ou)	Measured Panel Threshold (ppb)	Does this panel calibration measurement comply with AS/NZS4323.3:2001 (Yes / No)
n-butanol	SYD20140815_071	50,000	$20 \leq \chi \leq 80$	1,024	49	Yes

Comments None.

Disclaimer Parties, other than TOU, responsible for collecting odour samples hereby certify that they have voluntarily furnished these odour samples, appropriately collected and labelled, to The Odour Unit Pty Ltd for the purpose of odour testing. The collection of odour samples by parties other than The Odour Unit Pty Ltd relinquishes The Odour Unit Pty Ltd from all responsibility for the sample collection and any effects or actions that the results from the test(s) may have.

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ABN: 53 091 165 061

NATA

Accreditation Number: 14974

Odour Concentration Measurement Results

The measurement was commissioned by:

Organisation	Elf Farm Supplies Pty Ltd	Telephone	+61 2 4577 5000
Contact	Neil Cockerell	Facsimile	-
Sampling Site	Mulgrave, NSW	Email	manager@elffarm.com.au
Sampling Method	Drum & Pump	Sampling Team	TOU (J. Schulz, M. Assal)

Order details:

Order requested by	Neil Cockerell	Order accepted by	T.Schulz
Date of order	July 2014	TOU Project #	N1952R
Order number	Refer to correspondence	Project Manager	M. Assal
Signed by	Refer to correspondence	Testing operator	A. Schulz

Investigated Item	Odour concentration in odour units 'ou', determined by sensory odour concentration measurements, of an odour sample supplied in a sampling bag.
Identification	The odour sample bags were labelled individually. Each label recorded the testing laboratory, sample number, sampling location (or Identification), sampling date and time, dilution ratio (if dilution was used) and whether further chemical analysis was required.
Method	The odour concentration measurements were performed using dynamic olfactometry according to the Australian Standard 'Determination of Odour Concentration by Dynamic Olfactometry AS/NZS4323.3:2001. NATA accredited for compliance with ISO/IEC 17025. Any deviation from the Australian standard is recorded in the 'Comments' section of this report.
Measuring Range	The measuring range of the olfactometer is $2^2 \leq \chi \leq 2^{18}$ ou. If the measuring range was insufficient the odour samples will have been pre-diluted. The machine is not calibrated beyond dilution setting 2^{17}. This is specifically mentioned with the results.
Environment	The measurements were performed in an air- and odour-conditioned room. The room temperature is maintained between 22ºC and 25ºC.
Measuring Dates	The date of each measurement is specified with the results.
Instrument Used	The olfactometer used during this testing session was: ODORMAT SERIES V05
Instrumental Precision	The precision of this instrument (expressed as repeatability) for a sensory calibration must be $r \leq 0.477$ in accordance with the Australian Standard AS/NZS4323.3:2001. ODORMAT SERIES V05: r = 0.2635 (April 2014) Compliance – Yes
Instrumental Accuracy	The accuracy of this instrument for a sensory calibration must be $A \leq 0.217$ in accordance with the Australian Standard AS/NZS4323.3:2001. ODORMAT SERIES V05: A = 0.1843 (April 2014) Compliance – Yes
Lower Detection Limit (LDL)	The LDL for the olfactometer has been determined to be 16 ou (4 times the lowest dilution setting)
Traceability	The measurements have been performed using standards for which the traceability to the national standard has been demonstrated. The assessors are individually selected to comply with fixed criteria and are monitored in time to keep within the limits of the standard. The results from the assessors are traceable to primary standards of n-butanol in nitrogen.

Date: Friday, 22 August 2014

Panel Roster Number: SYD20140817_072

J. Schulz
NSW Laboratory Coordinator

A. Schulz
Authorised Signatory

Odour Sample Measurement Results
Panel Roster Number: SYD20140817_072

Sample Location	TOU Sample ID	Sampling Date & Time	Analysis Date & Time	Panel Size	Valid ITEs	Nominal Sample Dilution	Actual Sample Dilution (Adjusted for Temperature)	Sample Odour Concentration (as received, in the bag) (ou)	Sample Odour Concentration (Final, allowing for dilution) (ou)	Specific Odour Emission Rate ($ou.m^3/m^2/s$)
5-1-3 Conditioning #3 (Tunnel 1)	SC14487	16/08/2014 0852hrs	17/08/2014 1251hrs	4	8	-	-	99	99	N/A
5-2-3 Conditioning #3 (Tunnel 3)	SC14488	16/08/2014 0910hrs	17/08/2014 1317hrs	4	8	-	-	83	83	N/A
6-2 Cooldown Spawn (Tunnel 3)	SC14489	17/08/2014 0903hrs	17/08/2014 1343hrs	4	8	-	-	41	41	N/A
6-1 Cooldown Spawn (Tunnel 1)	SC14490	17/08/2014 0915hrs	17/08/2014 1413hrs	4	8	-	-	45	45	N/A

Note: The following are not covered by the NATA Accreditation issued to The Odour Unit Pty Ltd:

1. The collection of Isolation Flux Hood (IFH) samples and the calculation of the Specific Odour Emission Rate (SOER).
2. Final results that have been modified by the dilution factors where parties other than The Odour Unit Pty Ltd. have performed the dilution of samples.

Odour Panel Calibration Results

Reference Odorant	Reference Odorant Panel Roster Number	Concentration of Reference gas (ppb)	Panel Target Range for n-butanol (ppb)	Measured Concentration (ou)	Measured Panel Threshold (ppb)	Does this panel calibration measurement comply with AS/NZS4323.3:2001 (Yes / No)
n-butanol	SYD20140815_071	50,000	$20 \leq \chi \leq 80$	1,024	49	Yes

Comments None.

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ABN: 53 091 165 061

NATA

Accreditation Number: 14974

Odour Concentration Measurement Results

The measurement was commissioned by:

Organisation	Elf Farm Supplies Pty Ltd	Telephone	+61 2 4577 5000
Contact	Neil Cockerell	Facsimile	-
Sampling Site	Mulgrave, NSW	Email	manager@elffarm.com.au
Sampling Method	AS4323.3/4	Sampling Team	TOU (M. Assal)

Order details:

Order requested by	Neil Cockerell	Order accepted by	T.Schulz
Date of order	October 2014	TOU Project #	N1952R
Order number	Refer to correspondence	Project Manager	M. Assal
Signed by	Refer to correspondence	Testing operator	D. Hepple

Investigated Item	Odour concentration in odour units 'ou', determined by sensory odour concentration measurements, of an odour sample supplied in a sampling bag.
Identification	The odour sample bags were labelled individually. Each label recorded the testing laboratory, sample number, sampling location (or Identification), sampling date and time, dilution ratio (if dilution was used) and whether further chemical analysis was required.
Method	The odour concentration measurements were performed using dynamic olfactometry according to the Australian Standard 'Determination of Odour Concentration by Dynamic Olfactometry AS/NZS4323.3:2001. NATA accredited for compliance with ISO/IEC 17025. Any deviation from the Australian standard is recorded in the 'Comments' section of this report.
Measuring Range	The measuring range of the olfactometer is $2^2 \leq \chi \leq 2^{18}$ ou. If the measuring range was insufficient the odour samples will have been pre-diluted. The machine is not calibrated beyond dilution setting 2^{17}. This is specifically mentioned with the results.
Environment	The measurements were performed in an air- and odour-conditioned room. The room temperature is maintained between 22ºC and 25ºC.
Measuring Dates	The date of each measurement is specified with the results.
Instrument Used	The olfactometer used during this testing session was: ODORMAT SERIES V05
Instrumental Precision	The precision of this instrument (expressed as repeatability) for a sensory calibration must be $r \leq 0.477$ in accordance with the Australian Standard AS/NZS4323.3:2001. ODORMAT SERIES V05: r = 0.2635 (April 2014) Compliance – Yes
Instrumental Accuracy	The accuracy of this instrument for a sensory calibration must be $A \leq 0.217$ in accordance with the Australian Standard AS/NZS4323.3:2001. ODORMAT SERIES V05: A = 0.1843 (April 2014) Compliance – Yes
Lower Detection Limit (LDL)	The LDL for the olfactometer has been determined to be 16 ou (4 times the lowest dilution setting)
Traceability	The measurements have been performed using standards for which the traceability to the national standard has been demonstrated. The assessors are individually selected to comply with fixed criteria and are monitored in time to keep within the limits of the standard. The results from the assessors are traceable to primary standards of n-butanol in nitrogen.

Date: Tuesday, 28 October 2014

Panel Roster Number: SYD20141028_092

J. Schulz
NSW Laboratory Coordinator

D. Hepple
Authorised Signatory

Odour Sample Measurement Results
Panel Roster Number: SYD20141028-092

Sample Location	TOU Sample ID	Sampling Date & Time	Analysis Date & Time	Panel Size	Valid ITEs	Nominal Sample Dilution	Actual Sample Dilution (Adjusted for Temperature)	Sample Odour Concentration (as received, in the bag) (ou)	Sample Odour Concentration (Final, allowing for dilution) (ou)	Specific Odour Emission Rate ($ou.m^3/m^2/s$)
[redacted]										

Note: The following are not covered by the NATA Accreditation issued to The Odour Unit Pty Ltd:

1. The collection of Isolation Flux Hood (IFH) samples and the calculation of the Specific Odour Emission Rate (SOER).
2. Final results that have been modified by the dilution factors where parties other than The Odour Unit Pty Ltd. have performed the dilution of samples.

Odour Sample Measurement Results
Panel Roster Number: SYD20141028_092

Sample Location	TOU Sample ID	Sampling Date & Time	Analysis Date & Time	Panel Size	Valid ITEs	Nominal Sample Dilution	Actual Sample Dilution (Adjusted for Temperature)	Sample Odour Concentration (as received, in the bag) (ou)	Sample Odour Concentration (Final, allowing for dilution) (ou)	Specific Odour Emission Rate (ou.m^3/m^2/s)
#9 – Bale Wetting Bed Area (Monday), Aerating	SC14648	27/10/2014 1402 hrs	28/10/2014 1419hrs	4	8	-	-	42,500	42,500	25.3
#10 – Bale Wetting Bed Area (Monday), Non-aerating	SC14649	27/10/2014 1443 hrs	28/10/2014 1452 hrs	4	8	-	-	39,000	39,000	23.9
[redacted]										

Note: The following are not covered by the NATA Accreditation issued to The Odour Unit Pty Ltd:

1. The collection of Isolation Flux Hood (IFH) samples and the calculation of the Specific Odour Emission Rate (SOER).
2. Final results that have been modified by the dilution factors where parties other than The Odour Unit Pty Ltd. have performed the dilution of samples.

Odour Panel Calibration Results

Reference Odorant	Reference Odorant Panel Roster Number	Concentration of Reference gas (ppb)	Panel Target Range for n-butanol (ppb)	Measured Concentration (ou)	Measured Panel Threshold (ppb)	Does this panel calibration measurement comply with AS/NZS4323.3:2001 (Yes / No)
n-butanol	SYD20141028_092	50,000	$20 \leq \chi \leq 80$	1,024	49	Yes

Comments None.

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NATA

Accreditation Number: 14974

Odour Concentration Measurement Results

The measurement was commissioned by:

Organisation	Elf Farm Supplies Pty Ltd	Telephone	+61 2 4577 5000
Contact	Neil Cockerell	Facsimile	-
Sampling Site	Mulgrave, NSW	Email	manager@elffarm.com.au
Sampling Method	AS4323.3/4	Sampling Team	TOU (M. Assal)

Order details:

Order requested by	Neil Cockerell	Order accepted by	T.Schulz
Date of order	October 2014	TOU Project #	N1952R
Order number	Refer to correspondence	Project Manager	M. Assal
Signed by	Refer to correspondence	Testing operator	D. Hepple

Investigated Item	Odour concentration in odour units 'ou', determined by sensory odour concentration measurements, of an odour sample supplied in a sampling bag.
Identification	The odour sample bags were labelled individually. Each label recorded the testing laboratory, sample number, sampling location (or Identification), sampling date and time, dilution ratio (if dilution was used) and whether further chemical analysis was required.
Method	The odour concentration measurements were performed using dynamic olfactometry according to the Australian Standard 'Determination of Odour Concentration by Dynamic Olfactometry AS/NZS4323.3:2001. NATA accredited for compliance with ISO/IEC 17025. Any deviation from the Australian standard is recorded in the 'Comments' section of this report.
Measuring Range	The measuring range of the olfactometer is $2^2 \leq \chi \leq 2^{18}$ ou. If the measuring range was insufficient the odour samples will have been pre-diluted. The machine is not calibrated beyond dilution setting 2^{17}. This is specifically mentioned with the results.
Environment	The measurements were performed in an air- and odour-conditioned room. The room temperature is maintained between 22ºC and 25ºC.
Measuring Dates	The date of each measurement is specified with the results.
Instrument Used	The olfactometer used during this testing session was: ODORMAT SERIES V05
Instrumental Precision	The precision of this instrument (expressed as repeatability) for a sensory calibration must be $r \leq 0.477$ in accordance with the Australian Standard AS/NZS4323.3:2001. ODORMAT SERIES V05: $r = 0.2635$ (April 2014) Compliance – Yes
Instrumental Accuracy	The accuracy of this instrument for a sensory calibration must be $A \leq 0.217$ in accordance with the Australian Standard AS/NZS4323.3:2001. ODORMAT SERIES V05: $A = 0.1843$ (April 2014) Compliance – Yes
Lower Detection Limit (LDL)	The LDL for the olfactometer has been determined to be 16 ou (4 times the lowest dilution setting)
Traceability	The measurements have been performed using standards for which the traceability to the national standard has been demonstrated. The assessors are individually selected to comply with fixed criteria and are monitored in time to keep within the limits of the standard. The results from the assessors are traceable to primary standards of n-butanol in nitrogen.

Date: Wednesday, 29 October 2014

Panel Roster Number: SYD20141029_093

D. A. Hepple.

J. Schulz
NSW Laboratory Coordinator

D. Hepple
Authorised Signatory

Odour Sample Measurement Results
Panel Roster Number: SYD20141029_093

Sample Location	TOU Sample ID	Sampling Date & Time	Analysis Date & Time	Panel Size	Valid ITEs	Nominal Sample Dilution	Actual Sample Dilution (Adjusted for Temperature)	Sample Odour Concentration (as received, in the bag) (ou)	Sample Odour Concentration (Final, allowing for dilution) (ou)	Specific Odour Emission Rate (ou.m^3/m^2/s)
#15 – Bale Wetting Area (Tuesday), Aerating, Saturated	SC14654	28/10/2014 1022 hrs	29/10/2014 1019 hrs	4	8	-	-	60,100	60,100	32.7
#16 – Bale Wetting Area (Tuesday), Non-aerating, Saturated	SC14655	28/10/2014 1058 hrs	29/10/2014 1046 hrs	4	8	-	-	77,900	77,900	39.9
[redacted]										

Note: The following are not covered by the NATA Accreditation issued to The Odour Unit Pty Ltd:

1. The collection of Isolation Flux Hood (IFH) samples and the calculation of the Specific Odour Emission Rate (SOER).
2. Final results that have been modified by the dilution factors where parties other than The Odour Unit Pty Ltd. have performed the dilution of samples.

Odour Sample Measurement Results
Panel Roster Number: SYD20141029_093

Sample Location	TOU Sample ID	Sampling Date & Time	Analysis Date & Time	Panel Size	Valid ITEs	Nominal Sample Dilution	Actual Sample Dilution (Adjusted for Temperature)	Sample Odour Concentration (as received, in the bag) (ou)	Sample Odour Concentration (Final, allowing for dilution) (ou)	Specific Odour Emission Rate (ou.m^3/m^2/s)
[redacted]										

Note: The following are not covered by the NATA Accreditation issued to The Odour Unit Pty Ltd:

1. The collection of Isolation Flux Hood (IFH) samples and the calculation of the Specific Odour Emission Rate (SOER).
2. Final results that have been modified by the dilution factors where parties other than The Odour Unit Pty Ltd. have performed the dilution of samples.

THE ODOUR UNIT PTY LTD

Accreditation Number: 14974

Odour Panel Calibration Results

Reference Odorant	Reference Odorant Panel Roster Number	Concentration of Reference gas (ppb)	Panel Target Range for n-butanol (ppb)	Measured Concentration (ou)	Measured Panel Threshold (ppb)	Does this panel calibration measurement comply with AS/NZS4323.3:2001 (Yes / No)
n-butanol	SYD20141029_093	50,000	$20 \leq \chi \leq 80$	861	58	Yes

Comments [redacted]

Disclaimer Parties, other than TOU, responsible for collecting odour samples hereby certify that they have voluntarily furnished these odour samples, appropriately collected and labelled, to The Odour Unit Pty Ltd for the purpose of odour testing. The collection of odour samples by parties other than The Odour Unit Pty Ltd relinquishes The Odour Unit Pty Ltd from all responsibility for the sample collection and any effects or actions that the results from the test(s) may have.

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THE ODOUR UNIT PTY LTD

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Email: info@odourunit.com.au
Internet: www.odourunit.com.au
ABN: 53 091 165 061

NATA

Accreditation Number: 14974

Odour Concentration Measurement Results

The measurement was commissioned by:

Organisation	Elf Farm Supplies Pty Ltd	Telephone	+61 2 4577 5000
Contact	Neil Cockerell	Facsimile	-
Sampling Site	Mulgrave, NSW	Email	manager@elffarm.com.au
Sampling Method	AS4323.3/4	Sampling Team	TOU (M. Assal)

Order details:

Order requested by	Neil Cockerell	Order accepted by	T.Schulz
Date of order	October 2014	TOU Project #	N1952R
Order number	Refer to correspondence	Project Manager	M. Assal
Signed by	Refer to correspondence	Testing operator	D. Hepple

Investigated Item	Odour concentration in odour units 'ou', determined by sensory odour concentration measurements, of an odour sample supplied in a sampling bag.
Identification	The odour sample bags were labelled individually. Each label recorded the testing laboratory, sample number, sampling location (or Identification), sampling date and time, dilution ratio (if dilution was used) and whether further chemical analysis was required.
Method	The odour concentration measurements were performed using dynamic olfactometry according to the Australian Standard 'Determination of Odour Concentration by Dynamic Olfactometry AS/NZS4323.3:2001. NATA accredited for compliance with ISO/IEC 17025. Any deviation from the Australian standard is recorded in the 'Comments' section of this report.
Measuring Range	The measuring range of the olfactometer is $2^2 \leq \chi \leq 2^{18}$ ou. If the measuring range was insufficient the odour samples will have been pre-diluted. The machine is not calibrated beyond dilution setting 2^{17}. This is specifically mentioned with the results.
Environment	The measurements were performed in an air- and odour-conditioned room. The room temperature is maintained between 22ºC and 25ºC.
Measuring Dates	The date of each measurement is specified with the results.
Instrument Used	The olfactometer used during this testing session was: ODORMAT SERIES V05
Instrumental Precision	The precision of this instrument (expressed as repeatability) for a sensory calibration must be $r \leq 0.477$ in accordance with the Australian Standard AS/NZS4323.3:2001. ODORMAT SERIES V05: $r = 0.2635$ (April 2014) Compliance – Yes
Instrumental Accuracy	The accuracy of this instrument for a sensory calibration must be $A \leq 0.217$ in accordance with the Australian Standard AS/NZS4323.3:2001. ODORMAT SERIES V05: $A = 0.1843$ (April 2014) Compliance – Yes
Lower Detection Limit (LDL)	The LDL for the olfactometer has been determined to be 16 ou (4 times the lowest dilution setting)
Traceability	The measurements have been performed using standards for which the traceability to the national standard has been demonstrated. The assessors are individually selected to comply with fixed criteria and are monitored in time to keep within the limits of the standard. The results from the assessors are traceable to primary standards of n-butanol in nitrogen.

Date: Thursday, 30 October 2014

Panel Roster Number: SYD20141030_094

D. A. Hpl.

J. Schulz
NSW Laboratory Coordinator

D. Hepple
Authorised Signatory

THE ODOUR UNIT PTY LTD

Accreditation Number: 14974

Odour Sample Measurement Results
Panel Roster Number: SYD20141030_094

Sample Location	TOU Sample ID	Sampling Date & Time	Analysis Date & Time	Panel Size	Valid ITEs	Nominal Sample Dilution	Actual Sample Dilution (Adjusted for Temperature)	Sample Odour Concentration (as received, in the bag) (ou)	Sample Odour Concentration (Final, allowing for dilution) (ou)	Specific Odour Emission Rate (ou.m^3/m^2/s)
#24 - Stable Bedding Area, Non-aerating	SC14665	29/10/2014 0830 hrs	30/10/2014 1015 hrs	4	8	-	-	11,600	11,600	5.28
#25 - Broken Wetted Bales, Non-aerating	SC14666	29/10/2014 0858 hrs	30/10/2014 1043 hrs	4	8	-	-	13,800	13,800	9.31
#26 - Stable Bedding Area, Aerating	SC14667	29/10/2014 0938 hrs	30/10/2014 1108 hrs	4	8	-	-	16,400	16,400	6.33
#27 - Broken Wetted Bales, Aerating	SC14668	29/10/2014 1008 hrs	30/10/2014 1134 hrs	4	8	-	-	6,320	6,320	3.56
#28 - Freshly Made Brew Mix	SC14669	29/10/2014 1102 hrs	30/10/2014 1157 hrs	4	8	-	-	17,900	17,900	11.2
#29 –Water Recycle Pit (Wed), Aeration Offline	SC14670	29/10/2014 1115 hrs	30/10/2014 1257 hrs	4	8	-	-	156,000	156,000	98.8
[redacted]										

Note: The following are not covered by the NATA Accreditation issued to The Odour Unit Pty Ltd:

1. The collection of Isolation Flux Hood (IFH) samples and the calculation of the Specific Odour Emission Rate (SOER).
2. Final results that have been modified by the dilution factors where parties other than The Odour Unit Pty Ltd. have performed the dilution of samples.

THE ODOUR UNIT PTY LTD

Accreditation Number: 14974

Odour Panel Calibration Results

Reference Odorant	Reference Odorant Panel Roster Number	Concentration of Reference gas (ppb)	Panel Target Range for n-butanol (ppb)	Measured Concentration (ou)	Measured Panel Threshold (ppb)	Does this panel calibration measurement comply with AS/NZS4323.3:2001 (Yes / No)
n-butanol	SYD20141030_094	50,000	$20 \leq \chi \leq 80$	861	58	Yes

Comments [redacted]

Disclaimer Parties, other than TOU, responsible for collecting odour samples hereby certify that they have voluntarily furnished these odour samples, appropriately collected and labelled, to The Odour Unit Pty Ltd for the purpose of odour testing. The collection of odour samples by parties other than The Odour Unit Pty Ltd relinquishes The Odour Unit Pty Ltd from all responsibility for the sample collection and any effects or actions that the results from the test(s) may have.

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Email: info@odourunit.com.au
Internet: www.odourunit.com.au
ABN: 53 091 165 061

NATA

Accreditation Number: 14974

Odour Concentration Measurement Results

The measurement was commissioned by:

Organisation	Elf Farm Supplies Pty Ltd	Telephone	+61 2 4577 5000
Contact	Neil Cockerell	Facsimile	-
Sampling Site	Mulgrave, NSW	Email	manager@elffarm.com.au
Sampling Method	AS4323.3/4	Sampling Team	TOU (M. Assal)

Order details:

Order requested by	Neil Cockerell	Order accepted by	T.Schulz
Date of order	October 2014	TOU Project #	N1952R
Order number	Refer to correspondence	Project Manager	M. Assal
Signed by	Refer to correspondence	Testing operator	D. Hepple

Investigated Item: Odour concentration in odour units 'ou', determined by sensory odour concentration measurements, of an odour sample supplied in a sampling bag.

Identification: The odour sample bags were labelled individually. Each label recorded the testing laboratory, sample number, sampling location (or Identification), sampling date and time, dilution ratio (if dilution was used) and whether further chemical analysis was required.

Method: The odour concentration measurements were performed using dynamic olfactometry according to the Australian Standard 'Determination of Odour Concentration by Dynamic Olfactometry AS/NZS4323.3:2001. NATA accredited for compliance with ISO/IEC 17025. Any deviation from the Australian standard is recorded in the 'Comments' section of this report.

Measuring Range: The measuring range of the olfactometer is $2^2 \leq \chi \leq 2^{18}$ ou. If the measuring range was insufficient the odour samples will have been pre-diluted. The machine is not calibrated beyond dilution setting 2^{17}. This is specifically mentioned with the results.

Environment: The measurements were performed in an air- and odour-conditioned room. The room temperature is maintained between 22ºC and 25ºC.

Measuring Dates: The date of each measurement is specified with the results.

Instrument Used: The olfactometer used during this testing session was:
ODORMAT SERIES V05

Instrumental Precision: The precision of this instrument (expressed as repeatability) for a sensory calibration must be $r \leq 0.477$ in accordance with the Australian Standard AS/NZS4323.3:2001.
ODORMAT SERIES V05: $r = 0.2635$ (April 2014) Compliance – Yes

Instrumental Accuracy: The accuracy of this instrument for a sensory calibration must be $A \leq 0.217$ in accordance with the Australian Standard AS/NZS4323.3:2001.
ODORMAT SERIES V05: $A = 0.1843$ (April 2014) Compliance – Yes

Lower Detection Limit (LDL): The LDL for the olfactometer has been determined to be 16 ou (4 times the lowest dilution setting)

Traceability: The measurements have been performed using standards for which the traceability to the national standard has been demonstrated. The assessors are individually selected to comply with fixed criteria and are monitored in time to keep within the limits of the standard. The results from the assessors are traceable to primary standards of n-butanol in nitrogen.

Date: Friday, 31 October 2014

Panel Roster Number: SYD20141031_095

J. Schulz
NSW Laboratory Coordinator

D. A. Hepple

D. Hepple
Authorised Signatory

Odour Sample Measurement Results
Panel Roster Number: SYD20141031_095

Sample Location	TOU Sample ID	Sampling Date & Time	Analysis Date & Time	Panel Size	Valid ITEs	Nominal Sample Dilution	Actual Sample Dilution (Adjusted for Temperature)	Sample Odour Concentration (as received, in the bag) (ou)	Sample Odour Concentration (Final, allowing for dilution) (ou)	Specific Odour Emission Rate (ou.m^3/m^2/s)
#30 – Chicken Manure, Composite of Odd and Even	SC14672	30/10/2014 0826 hrs	31/10/2014 1020 hrs	4	8	-	-	7,510	7,510	5.28
[redacted]										
#37 – Stormwater Overflow Retention Dam	SC14679	31/10/2014 1210 hrs	3110/2014 1413 hrs	4	8	-	-	11,600	11,600	7.48

Note: The following are not covered by the NATA Accreditation issued to The Odour Unit Pty Ltd:

1. The collection of Isolation Flux Hood (IFH) samples and the calculation of the Specific Odour Emission Rate (SOER).
2. Final results that have been modified by the dilution factors where parties other than The Odour Unit Pty Ltd. have performed the dilution of samples

Odour Panel Calibration Results

Reference Odorant	Reference Odorant Panel Roster Number	Concentration of Reference gas (ppb)	Panel Target Range for n-butanol (ppb)	Measured Concentration (ou)	Measured Panel Threshold (ppb)	Does this panel calibration measurement comply with AS/NZS4323.3:2001 (Yes / No)
n-butanol	SYD20141031_095	50,000	$20 \leq \chi \leq 80$	1,024	49	Yes

Comments None.

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Internet: www.odourunit.com.au
ABN: 53 091 165 061

NATA

Accreditation Number: 14974

Odour Concentration Measurement Results

The measurement was commissioned by:

Organisation	Elf Farm Supplies Pty Ltd	Telephone	+61 2 4577 5000
Contact	Neil Cockerell	Facsimile	-
Sampling Site	Mulgrave, NSW	Email	manager@elffarm.com.au
Sampling Method	AS4323.3/4	Sampling Team	TOU (M. Assal)

Order details:

Order requested by	Neil Cockerell	Order accepted by	M.Assal
Date of order	October 2014	TOU Project #	N1952R
Order number	Refer to correspondence	Project Manager	M. Assal
Signed by	Refer to correspondence	Testing operator	A. Schulz

Investigated Item	Odour concentration in odour units 'ou', determined by sensory odour concentration measurements, of an odour sample supplied in a sampling bag.
Identification	The odour sample bags were labelled individually. Each label recorded the testing laboratory, sample number, sampling location (or Identification), sampling date and time, dilution ratio (if dilution was used) and whether further chemical analysis was required.
Method	The odour concentration measurements were performed using dynamic olfactometry according to the Australian Standard 'Determination of Odour Concentration by Dynamic Olfactometry AS/NZS4323.3:2001. NATA accredited for compliance with ISO/IEC 17025. Any deviation from the Australian standard is recorded in the 'Comments' section of this report.
Measuring Range	The measuring range of the olfactometer is $2^2 \leq \chi \leq 2^{18}$ ou. If the measuring range was insufficient the odour samples will have been pre-diluted. The machine is not calibrated beyond dilution setting 2^{17}. This is specifically mentioned with the results.
Environment	The measurements were performed in an air- and odour-conditioned room. The room temperature is maintained between 22ºC and 25ºC.
Measuring Dates	The date of each measurement is specified with the results.
Instrument Used	The olfactometer used during this testing session was: ODORMAT SERIES V05
Instrumental Precision	The precision of this instrument (expressed as repeatability) for a sensory calibration must be $r \leq 0.477$ in accordance with the Australian Standard AS/NZS4323.3:2001. ODORMAT SERIES V05: $r = 0.2635$ (April 2014) Compliance – Yes
Instrumental Accuracy	The accuracy of this instrument for a sensory calibration must be $A \leq 0.217$ in accordance with the Australian Standard AS/NZS4323.3:2001. ODORMAT SERIES V05: $A = 0.1843$ (April 2014) Compliance – Yes
Lower Detection Limit (LDL)	The LDL for the olfactometer has been determined to be 16 ou (4 times the lowest dilution setting)
Traceability	The measurements have been performed using standards for which the traceability to the national standard has been demonstrated. The assessors are individually selected to comply with fixed criteria and are monitored in time to keep within the limits of the standard. The results from the assessors are traceable to primary standards of n-butanol in nitrogen.

Date: Monday, 24 November 2014

Panel Roster Number: SYD20141124_102

J. Schulz
NSW Laboratory Coordinator

D. Hepple
Authorised Signatory

Odour Sample Measurement Results
Panel Roster Number: SYD20141124_102

Sample Location	TOU Sample ID	Sampling Date & Time	Analysis Date & Time	Panel Size	Valid ITEs	Nominal Sample Dilution	Actual Sample Dilution (Adjusted for Temperature)	Sample Odour Concentration (as received, in the bag) (ou)	Sample Odour Concentration (Final, allowing for dilution) (ou)	Specific Odour Emission Rate (ou.m^3/m^2/s)
[redacted]										
Sample 3# - Bale wetting area (Sunday), Aerating	SC14723	23/11/2014 0855 hrs	24/11/2014 1159 hrs	4	8	-	-	2,900	2,900	1.80
Sample 4# - Bale wetting area (Sunday), Non-aerating	SC14724	23/11/2014 0939 hrs	24/11/2014 1230 hrs	4	8	-	-	2,900	2,900	1.80

Note: The following are not covered by the NATA Accreditation issued to The Odour Unit Pty Ltd:

1. The collection of Isolation Flux Hood (IFH) samples and the calculation of the Specific Odour Emission Rate (SOER).
2. Final results that have been modified by the dilution factors where parties other than The Odour Unit Pty Ltd. have performed the dilution of samples

Odour Panel Calibration Results

Reference Odorant	Reference Odorant Panel Roster Number	Concentration of Reference gas (ppb)	Panel Target Range for n-butanol (ppb)	Measured Concentration (ou)	Measured Panel Threshold (ppb)	Does this panel calibration measurement comply with AS/NZS4323.3:2001 (Yes / No)
n-butanol	SYD20141124_102	50,000	$20 \leq \chi \leq 80$	861	58	Yes

Comments None.

Disclaimer Parties, other than TOU, responsible for collecting odour samples hereby certify that they have voluntarily furnished these odour samples, appropriately collected and labelled, to The Odour Unit Pty Ltd for the purpose of odour testing. The collection of odour samples by parties other than The Odour Unit Pty Ltd relinquishes The Odour Unit Pty Ltd from all responsibility for the sample collection and any effects or actions that the results from the test(s) may have.

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Elf Farm Supplies Pty Ltd

Mushroom Substrate Plant – Modification to Approved Expansion

APPENDIX B:

PDS CONSULTANCY METEOROLOGICAL DATASET REPORT

Three Dimensional (3D) Meteorological data file for CALPUFF

Mulgrave(NSW)-2008

This file was exclusively compiled for **The Odour Unit** Pty Ltd By pDs Consultancy Service.

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pDs Consultancy
@1999-2014

pDs

Introduction

Non steady state PUFF model such as CALPUFF (Californian PUFF model) requires meteorological data, preferably hourly average for the entire modelling domain which is in question. Meteorological domain is usually bigger than the computational domain which is intended to use for dispersion modelling. There are several recommended options available to construct 3D meteorological data files. Selection of the suitable option is depending on the data availability.

Three modes available to run CALMET:

1. CALMET No-Observations (No-Obs) Mode. CALMET using gridded numerical model output (e.g., from the MM5, WRF, RAMS, RUC, or TAPM models). No surface, upper air or buoy observations are used in No-Obs mode.
2. CALMET Hybrid Mode. CALMET run using a combination of gridded numerical meteorological data supplemented by surface and optional overwater buoy data.
3. CALMET Observations-Only (Obs) Mode. – CALMET using observed surface and upper air data, plus optional buoy data.

pDs Consultancy has been engaged by **The Odour Unit(TOU)** to compile an 3D meteorological data file for a site at **Mulgrave** in New South Wales using site-specific meteorological data supplied by their client and other available meteorological data obtain from Australian Bureau of Meteorology (BoM). The year 2008 was used on TOU's request.

CONSTRUCTION OF GEOPHYSICAL DATA FILE :

Topography and land used over the area were examined and topography data with 90m resolution was used (Source :SRTM3-Global data). Map showing topography in 3D was prepared and preliminary QA/QC was done comparing it with Google maps.

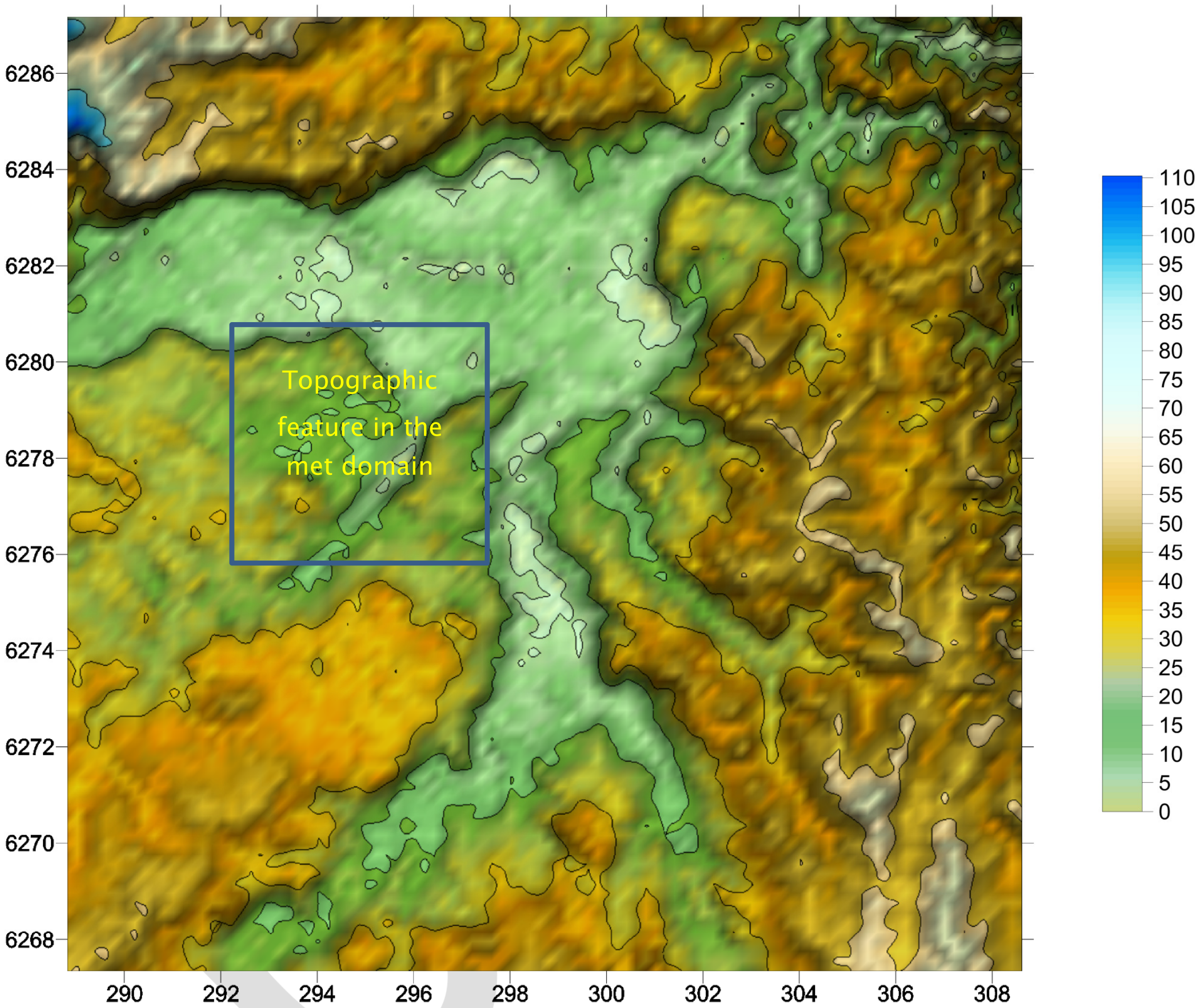


FIGURE 1: TOPOGRAPHY OVER THE METEOROLOGICAL DOMAIN

Global land cover data (Source :GLCC-Australia Pacific) with 900 m resolution was initially used and modified manually to match with real land-use over the area. Only three compatible land use categories were assigned (Built up, Range Land, Forest).

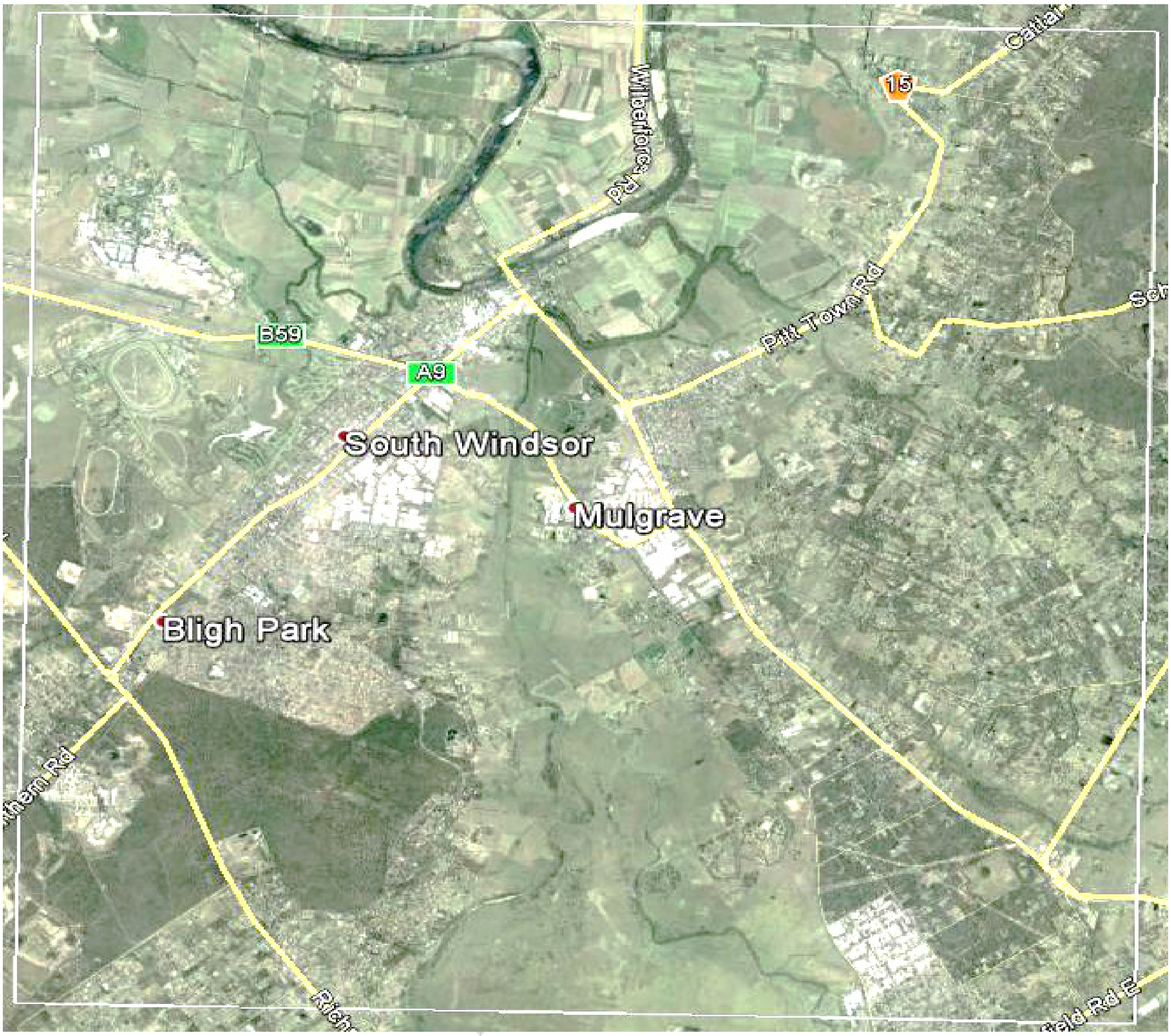


FIGURE 2: LAND USE OVER THE METEOROLOGICAL DOMAIN

Geophysical data file (GEO.Dat) was prepared based on above data sets (Topography and Land use) running TERREL for topography, CTGPROC for Land-use and MAKEGEO for final .geo file, pre-processors of CALPUFF modelling system.

In order to resolve near source terrain features, as well as to capture actual meteorological observations, 200 m grid resolution with 20KM by 20KM grid was used. The dominant scale of the terrain (TERRAD- radius of influence) was set to 1 KM.

INPUT METEOROLOGY

There were two meteorological data sources within the meteorological domain including the data at the site. Therefore we could use 'Hybrid" option available in CALMET-The meteorological module of CALPUFF modelling system.

CALMET was initialised with 3D data tile prepared running meteorological module of TAPM (CISIRO's The Air Pollution Model). Topography with 90m resolution and land use with ~1 Km resolution were used to prepare 3KM resolution 3D data tile. This will help resolve topography for some extent even with the 3KM resolution met-tile used for initialisation.

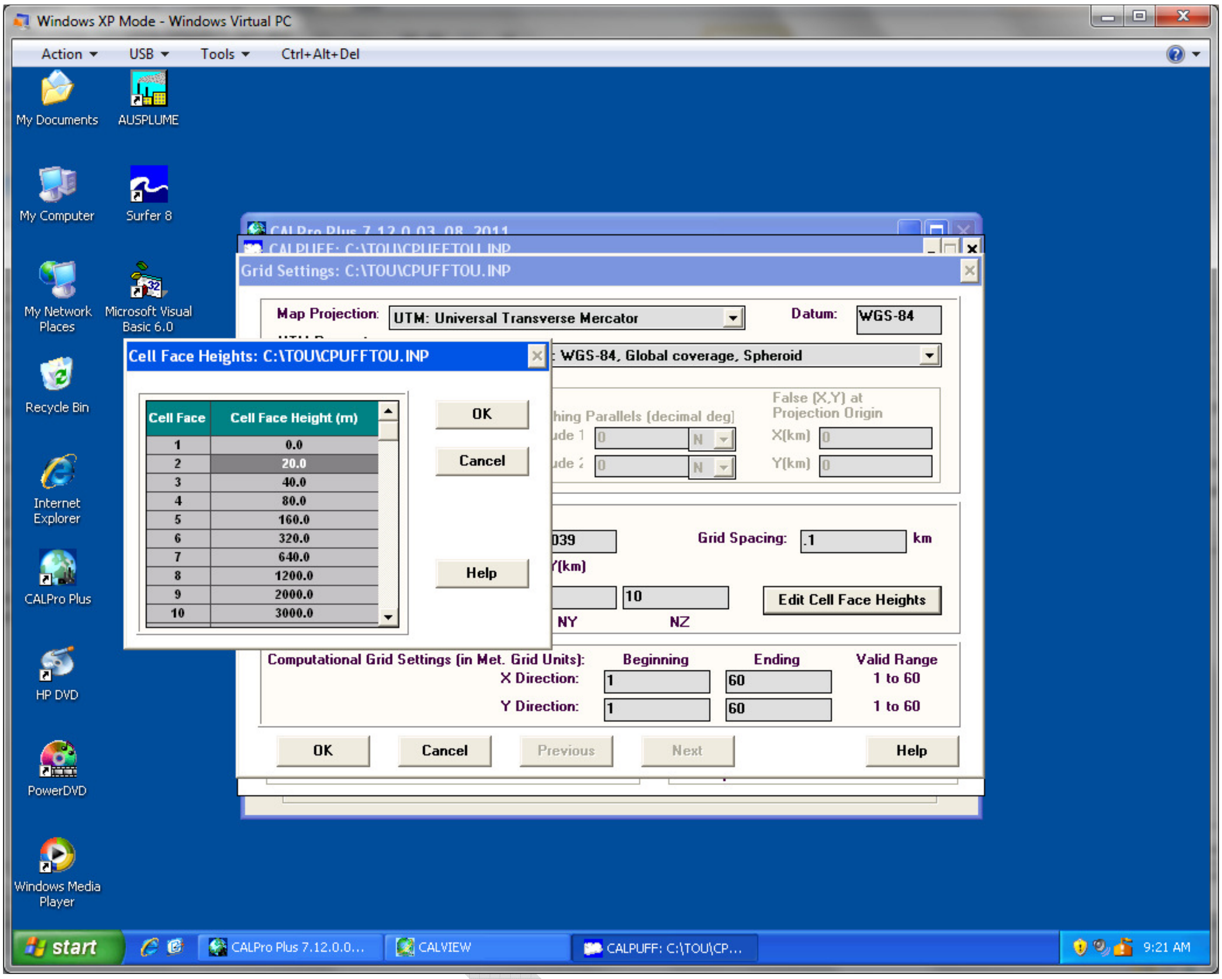
METEOROLOGICAL DOMAIN:

Meteorological domain was designed with 20 KM by 20 KM map extent with 200 m grid resolution in order to capture topography around the application site. Topographic features around the meteorological domain was captured in 3D meteorological data file which was used to initialise CALMET domain which is intended to use for near source modelling.

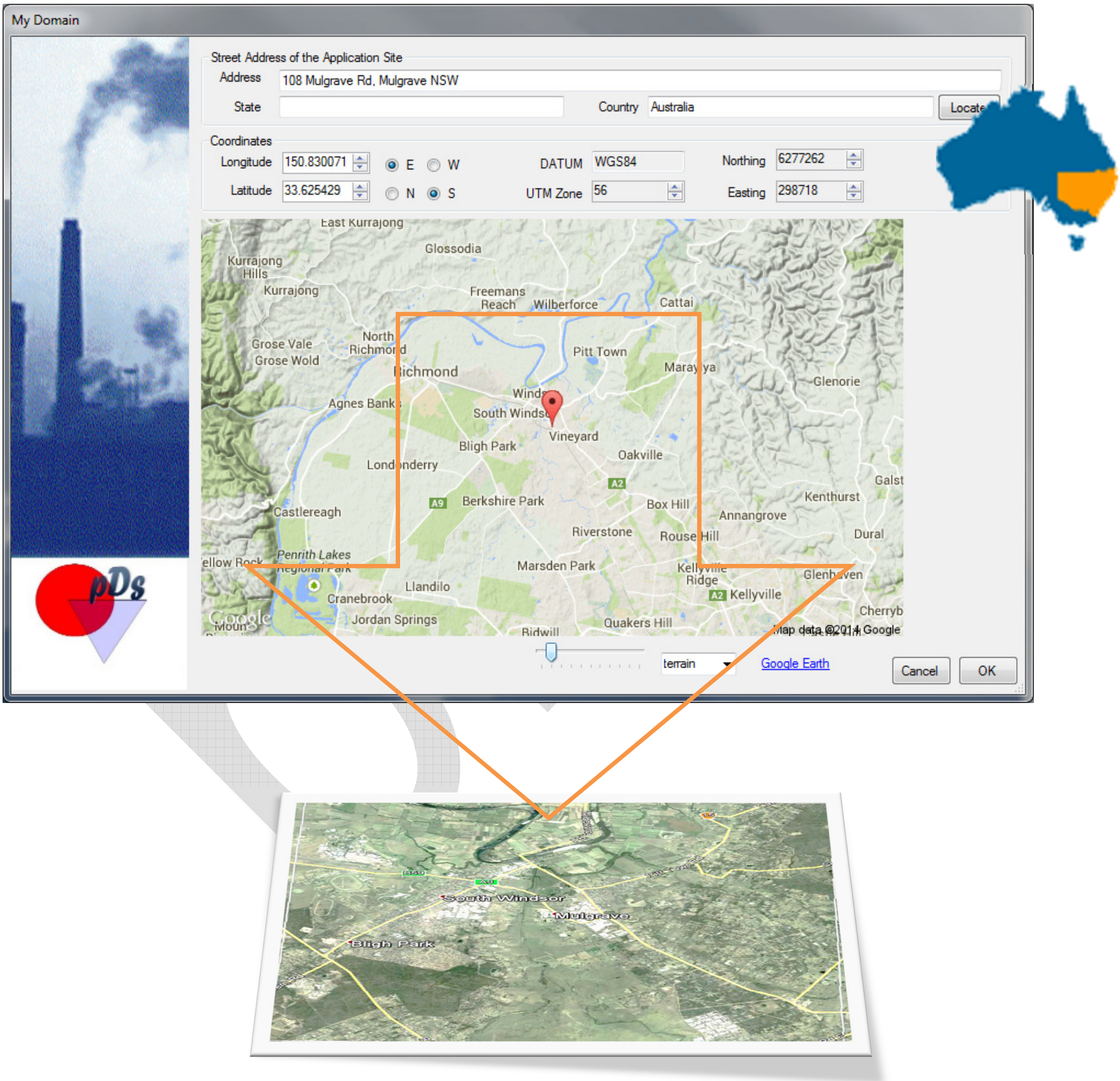
None of the observed data were biased in the modelling since there is not much confidence in the site-specific data. This helps CALMET's model physics to be dominant when deciding the flow pattern.

VERTICAL STRUCTURE

Eleven cell faeces were set up with 0,20,40,80,160,320……,4000m. Predictions were done at 10,30,60 etc..

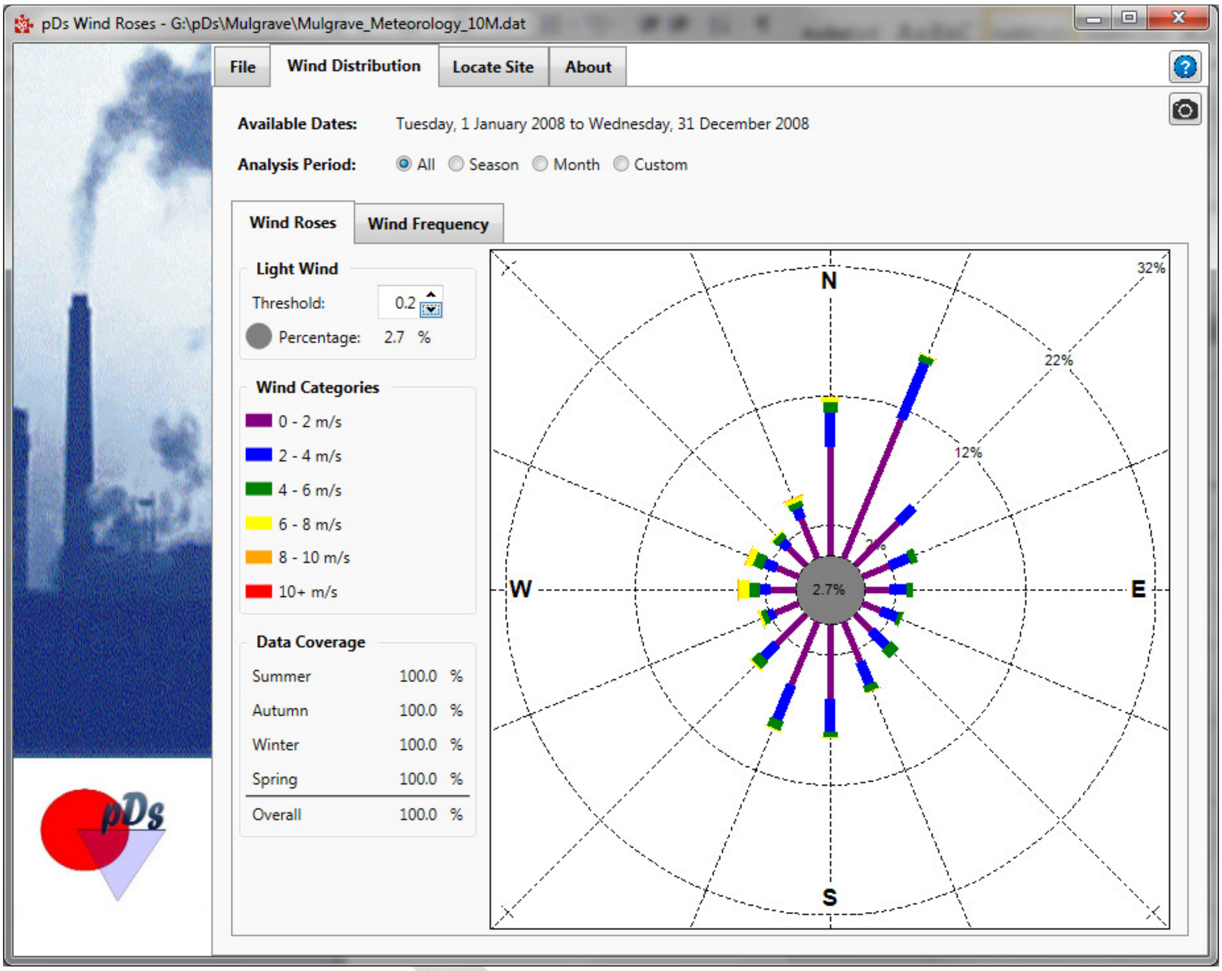


Location: Mulgrave, NSW

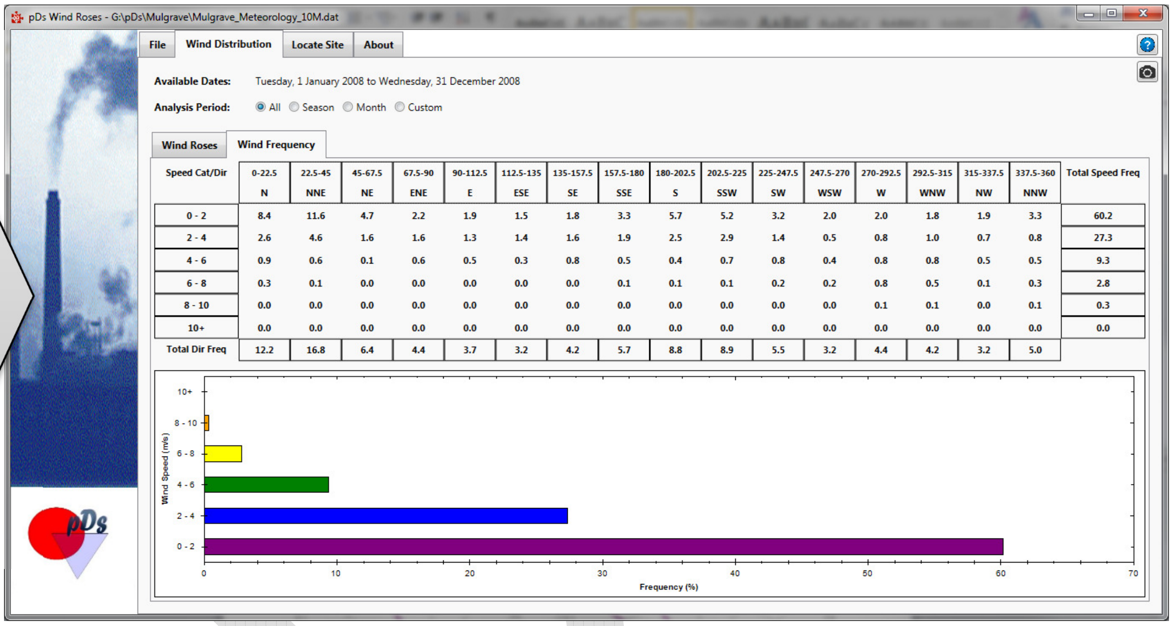


ANALYSIS OF THE SIMULATED DATA EXTRACTED FOR THE SITE IN QUESTION.

ANNUAL WINDROSES



Wind speed frequency

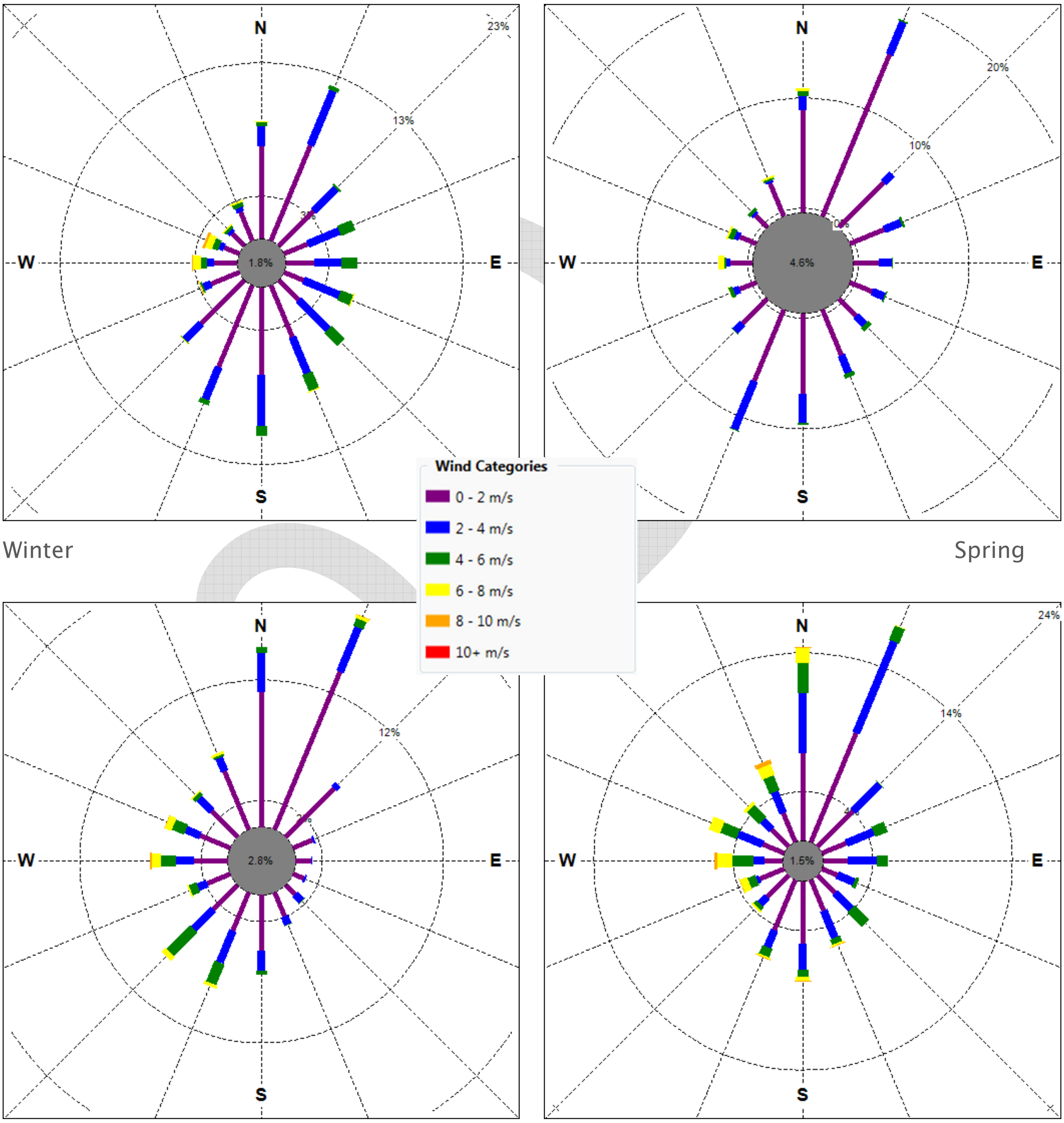


Speed Cat/Dir	0-22.5 N	22.5-45 NNE	45-67.5 NE	67.5-90 ENE	90-112.5 E	112.5-135 ESE	135-157.5 SE	157.5-180 SSE	180-202.5 S	202.5-225 SSW	225-247.5 SW	247.5-270 WSW	270-292.5 W	292.5-315 WNW	315-337.5 NW	337.5-360 NNW	Total Speed Freq
0 - 2	8.4	11.6	4.7	2.2	1.9	1.5	1.8	3.3	5.7	5.2	3.2	2.0	2.0	1.8	1.9	3.3	60.2
2 - 4	2.6	4.6	1.6	1.6	1.3	1.4	1.6	1.9	2.5	2.9	1.4	0.5	0.8	1.0	0.7	0.8	27.3
4 - 6	0.9	0.6	0.1	0.6	0.5	0.3	0.8	0.5	0.4	0.7	0.8	0.4	0.8	0.8	0.5	0.5	9.3
6 - 8	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.2	0.2	0.8	0.5	0.1	0.3	2.8
8 - 10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.3
10+	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Dir Freq	12.2	16.8	6.4	4.4	3.7	3.2	4.2	5.7	8.8	8.9	5.5	3.2	4.4	4.2	3.2	5.0	

Wind Speed frequency is showing that the intended modelling area experiences more light winds.

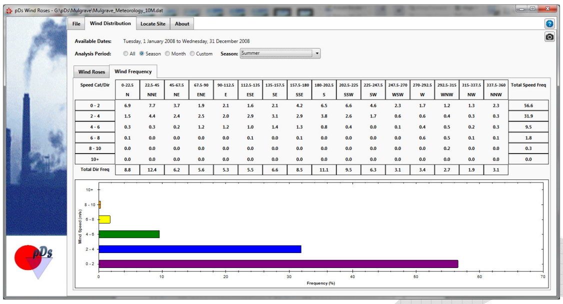
SEASONAL WINDROSES

Summer Autumn

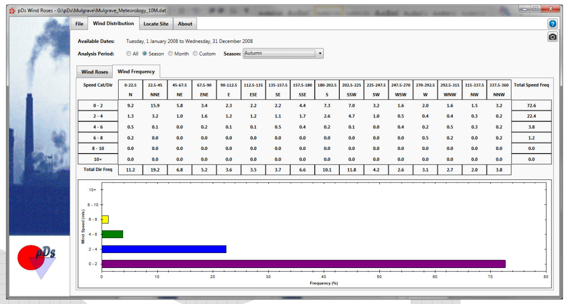


SEASONAL WIND SPEED FREQUENCY

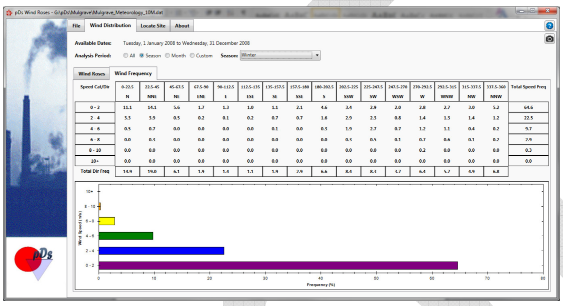
Summer



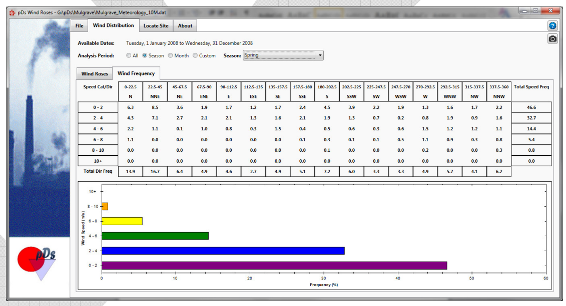
Autumn



Winter



Spring



DATA

Data Source

- Global Synoptic data for 2012 in .glo format, Source :CSIRO
- GLCC (Australia Pacific ~900m)
- Google Earth/Mapping
- SRTM3-gap filled

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Elf Farm Supplies Pty Ltd

Mushroom Substrate Plant – Modification to Approved Expansion

APPENDIX C:

CALPUFF MODELLING INPUT PARAMETERS AND CONFIGURATIONS

Point Sources

Source Description	Source ID	Vertice coordinates (km)	Stack Height (m)	Base Elevation (m)	Stack Diameter (m)	Exit Velocity (m/s)	Exit Temp (K)	Max Odour Emission Rate (ou.m^3/s)	Scaling Factors	Comments
P1 External Conveyor	P1Conv	298.439, 6277.241	6.50	12.2	1.84	1.00	307.15	37,100	2.3	VARIABLE - See 'P1 Ext Conveyor'!A1
Vent Tunnel 1	Vent01	298.470, 6277.372	10.50	12.2	1.35	7.7	298.2	32,222	2.3	See 'P2 P3 OER Calculations'!A1
Vent Tunnel 2	Vent02	298.466, 6277.374	10.50	12.2	1.35	7.7	298.2	32,222	2.3	See 'P2 P3 OER Calculations'!A1
Vent Tunnel 3	Vent03	298.462, 6277.375	10.50	12.2	1.35	7.7	298.2	32,222	2.3	See 'P2 P3 OER Calculations'!A1
Vent Tunnel 4	Vent04	298.547, 6277.377	10.50	12.2	1.35	7.7	298.2	32,222	2.3	See 'P2 P3 OER Calculations'!A1
Vent Tunnel 5	Vent05	298.453, 6277.379	10.50	12.2	1.35	7.7	298.2	32,222	2.3	See 'P2 P3 OER Calculations'!A1
Vent Tunnel 6	Vent06	298.449, 6277.380	10.50	12.2	1.35	7.7	298.2	32,222	2.3	See 'P2 P3 OER Calculations'!A1
Exhaust Tunnel 1	Exst01	298.454, 6277.338	10.50	12.2	1.35	1.5	318.0	VARIABLE	2.3	See 'P2 P3 OER Calculations'!A1
Exhaust Tunnel 2	Exst02	298.452, 6277.339	10.50	12.2	1.35	1.5	318.0	VARIABLE	2.3	See 'P2 P3 OER Calculations'!A1
Exhaust Tunnel 3	Exst03	298.446, 6277.341	10.50	12.2	1.35	1.6	319.7	VARIABLE	2.3	See 'P2 P3 OER Calculations'!A1
Exhaust Tunnel 4	Exst04	298.443, 6277.342	10.50	12.2	1.35	1.6	321.1	VARIABLE	2.3	See 'P2 P3 OER Calculations'!A1
Exhaust Tunnel 5	Exst05	298.437, 6277.345	10.50	12.2	1.35	1.7	322.2	VARIABLE	2.3	See 'P2 P3 OER Calculations'!A1
Exhaust Tunnel 6	Exst06	298.435, 6277.346	10.50	12.2	1.35	1.7	323.1	VARIABLE	2.3	See 'P2 P3 OER Calculations'!A1
Exhaust Tunnel 7	Exst07	298.429, 6277.348	10.50	12.2	1.35	1.2	323.8	VARIABLE	2.3	See 'P2 P3 OER Calculations'!A1
Exhaust Tunnel 8	Exst08	298.427, 6277.349	10.50	12.2	1.35	0.8	297.3	VARIABLE	2.3	See 'P2 P3 OER Calculations'!A1
Exhaust Tunnel 9	Exst09	298.421, 6277.351	10.50	12.2	1.35	0.8	297.3	VARIABLE	2.3	See 'P2 P3 OER Calculations'!A1
Exhaust Tunnel 10	Exst10	298.418, 6277.352	10.50	12.2	1.35	0.8	297.3	VARIABLE	2.3	See 'P2 P3 OER Calculations'!A1
Exhaust Tunnel 11	Exst11	298.412, 6277.355	10.50	12.2	1.35	0.8	297.3	VARIABLE	2.3	See 'P2 P3 OER Calculations'!A1
Exhaust Tunnel 12	Exst12	298.410, 6277.356	10.50	12.2	1.35	0.8	297.3	VARIABLE	2.3	See 'P2 P3 OER Calculations'!A1
Exhaust Tunnel 13	Exst13	298.404, 6277.358	10.50	12.2	1.35	1.1	296.1	VARIABLE	2.3	See 'P2 P3 OER Calculations'!A1
Exhaust Tunnel 14	Exst14	298.402, 6277.359	10.50	12.2	1.35	1.2	296.0	VARIABLE	2.3	See 'P2 P3 OER Calculations'!A1
Exhaust Tunnel 15	Exst15	298.396, 6277.362	10.50	12.2	1.35	1.2	296.0	VARIABLE	2.3	See 'P2 P3 OER Calculations'!A1
Exhaust Tunnel 16	Exst16	298.393, 6277.363	10.50	12.2	1.35	1.2	296.0	VARIABLE	2.3	See 'P2 P3 OER Calculations'!A1
Exhaust Tunnel 17	Exst17	298.387, 6277.365	10.50	12.2	1.35	1.2	296.0	VARIABLE	2.3	See 'P2 P3 OER Calculations'!A1
Exhaust Tunnel 18	Exst18	298.385, 6277.366	10.50	12.2	1.35	2.4	296.0	VARIABLE	2.3	See 'P2 P3 OER Calculations'!A1
Exhaust Tunnel 19	Exst19	298.379, 6277.368	10.50	12.2	1.35	2.4	296.0	VARIABLE	2.3	See 'P2 P3 OER Calculations'!A1
Exhaust Tunnel 20	Exst20	298.377, 6277.369	10.50	12.2	1.35	3.1	296.0	VARIABLE	2.3	See 'P2 P3 OER Calculations'!A1
Exhaust Tunnel 21	Exst21	298.371, 6277.372	10.50	12.2	1.35	3.1	296.0	VARIABLE	2.3	See 'P2 P3 OER Calculations'!A1
Exhaust Tunnel 22	Exst22	298.368, 6277.373	10.50	12.2	1.35	2.2	296.0	VARIABLE	2.3	See 'P2 P3 OER Calculations'!A1

Area Sources

Source Description	Source ID	Vertice coordinates (km)	Effective Height (m)	Base Elevation (m)	Initial Sigma Z (m)	Specific Odour Emission Rate (ou.m^3/m^2.s)	Area (m^2)	Odour Emission Rate (ou.m^3/s)	Scaling Factors	Comments
Leachate Aeration Pit	LAP	298.381, 6277.294 298.383, 6277.299 298.387, 6277.298 298.387, 6277.293	0.00	12.2	1.00	98.8	22	2,182	Stability Class Near-/Far-Field A - D = 2.5 / 2.3 E - F = 2.3 / 1.9	
Overflow Retention Dam	ORD	298.230, 6277.280 298.235, 6277.312 298.265, 6277.307 298.260, 6277.275	0.00	9.1	1.00	7.48	960	7,181	Stability Class Near-/Far-Field A - D = 2.5 / 2.3 E - F = 2.3 / 1.9	Interim mitigation measure is to take the dam offline (modelled as scenario 2C (near-field) & 2D (far-field)).

Volume Sources

Source Description	Source ID	Vertice coordinates (km)	Effective Height (m)	Base Elevation (m)	Initial Sigma Y (m)	Initial Sigma Z (m)	Odour Emission Rate (ou.m^3.s)	Scaling Factors	Peak Odour Emission Rate	Comments
Chicken Manure	CMan	298.398, 6277.215	3.25	12.2	6.39	1.63	2,420	2.3	5,566	Constant
Brew Mix	Brew	298.424, 6277.209	3.25	12.2	6.39	1.63	706	2.3	1,624	6AM TO 3PM
Bale Wetting Area	BWA	298.376, 6277.235	2.00	12.2	6.77	1.00	20,909	2.3	48,090	Worst-case 24 hr snapshot
Stable Bedding Area	SBA	298.384, 6277.286	2.00	12.2	2.81	1.00	575	2.3	1,322	Worst-case 24 hr snapshot
Pre-wet Building (98% containment)	PreWet	298.359, 6277.254	0.00	12.2	0.00	0.00	14,900	2.3		See variable calculation table. Worst case 24 hour period for area.
Phase 1 Hall (after)	P1Hall	298.410, 6277.268	4.75	12.2	0.00	0.00	5,920	2.3		VARIABLE - See 'P1 Hall'!A1
P2 Transfer Conveyor Fugitives	P2xfer	298.408, 6277.345	5.25	12.2	0.00	0.00	111	2.3	255	2% Fugitive Emission, remainder captured by tunnel#1 venting (4PM to 6PM only)

Point Sources										
Source Description	Source ID	Vertice coordinates (km)	Stack Height (m)	Base Elevation (m)	Stack Diameter (m)	Exit Velocity (m/s)	Exit Temp (K)	Max Odour Emission Rate (ou.m^3/s)	Scaling Factors	Comments
Exhaust - Tunnel 01	Exst01	298.454, 6277.338	10.50	12.2	1.35	1.9	320.9	913	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Conditioning 1 Phase.
Exhaust - Tunnel 02	Exst02	298.452, 6277.339	10.50	12.2	1.35	1.9	320.9	913	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Conditioning 1 Phase.
Exhaust - Tunnel 03	Exst03	298.446, 6277.341	10.50	12.2	1.35	1.9	320.9	913	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Conditioning 1 Phase.
Exhaust - Tunnel 04	Exst04	298.443, 6277.342	10.50	12.2	1.35	1.9	320.9	913	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Conditioning 1 Phase.
Exhaust - Tunnel 05	Exst05	298.437, 6277.345	10.50	12.2	1.35	1.9	320.9	996	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Conditioning 1 Phase.
Exhaust - Tunnel 06	Exst06	298.435, 6277.346	10.50	12.2	1.35	1.9	320.9	996	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Conditioning 1 Phase.
Exhaust - Tunnel 07	Exst07	298.429, 6277.348	10.50	12.2	1.35	2.0	320.9	996	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Conditioning 1 Phase.
Exhaust - Tunnel 08	Exst08	298.427, 6277.349	10.50	12.2	1.35	2.0	320.9	996	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Conditioning 1 Phase.
Exhaust - Tunnel 09	Exst09	298.421, 6277.351	10.50	12.2	1.35	0.8	297.3	138	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Spawn Run 1 Phase.
Exhaust - Tunnel 10	Exst10	298.418, 6277.352	10.50	12.2	1.35	0.8	297.3	138	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Spawn Run 1 Phase.
Exhaust - Tunnel 11	Exst11	298.412, 6277.355	10.50	12.2	1.35	0.8	297.3	138	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Spawn Run 1 Phase.
Exhaust - Tunnel 12	Exst12	298.410, 6277.356	10.50	12.2	1.35	0.8	297.3	138	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Spawn Run 1 Phase.
Exhaust - Tunnel 13	Exst13	298.404, 6277.358	10.50	12.2	1.35	0.8	297.3	138	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Spawn Run 1 Phase.
Exhaust - Tunnel 14	Exst14	298.402, 6277.359	10.50	12.2	1.35	0.8	297.3	138	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Spawn Run 1 Phase.
Exhaust - Tunnel 15	Exst15	298.396, 6277.362	10.50	12.2	1.35	1.4	296.0	325	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Spawn Run 2 Phase.
Exhaust - Tunnel 16	Exst16	298.393, 6277.363	10.50	12.2	1.35	1.4	296.0	325	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Spawn Run 2 Phase.
Exhaust - Tunnel 17	Exst17	298.387, 6277.365	10.50	12.2	1.35	1.4	296.0	325	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Spawn Run 2 Phase.
Exhaust - Tunnel 18	Exst18	298.385, 6277.366	10.50	12.2	1.35	1.4	296.0	325	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Spawn Run 2 Phase.
Exhaust - Tunnel 19	Exst19	298.379, 6277.368	10.50	12.2	1.35	1.5	296.0	325	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Spawn Run 2 Phase.
Exhaust - Tunnel 20	Exst20	298.377, 6277.369	10.50	12.2	1.35	1.5	296.0	325	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Spawn Run 2 Phase.
Exhaust - Tunnel 21	Exst21	298.371, 6277.372	10.50	12.2	1.35	2.3	296.0	494	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Spawn Run 2 Phase.
Exhaust - Tunnel 22	Exst22	298.368, 6277.373	10.50	12.2	1.35	2.3	296.0	494	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Spawn Run 2 Phase.
Exhaust - Tunnel 23	Exst23	298.362, 6277.375	10.50	12.2	1.35	1.4	296.0	84	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Cooldown Shipout Phase.
Exhaust - Tunnel 24	Exst24	298.36, 6277.376	10.50	12.2	1.35	0.0	296.0	0	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Empty Tunnel.
Exhaust - Tunnel 25	Exst25	298.354, 6277.379	10.50	12.2	1.35	0.0	296.0	0	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Empty Tunnel.
Exhaust - Tunnel 26	Exst26	298.416, 6277.553	10.50	12.2	1.35	2.7	320.8	2,497	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Pasturisation > Cooldown (conditioning) > Conditioning 1 Phases.
Exhaust - Tunnel 27	Exst27	298.415, 6277.55	10.50	12.2	1.35	2.7	320.8	2,497	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Pasturisation > Cooldown (conditioning) > Conditioning 1 Phases.
Exhaust - Tunnel 28	Exst28	298.413, 6277.544	10.50	12.2	1.35	2.7	320.8	2,497	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Pasturisation > Cooldown (conditioning) > Conditioning 1 Phases.
Exhaust - Tunnel 29	Exst29	298.412, 6277.542	10.50	12.2	1.35	2.7	320.8	2,497	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Cooldown (conditioning) > Conditioning 1 Phases.
Exhaust - Tunnel 30	Exst30	298.409, 6277.536	10.50	12.2	1.35	2.8	320.8	2,497	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Cooldown (conditioning) > Conditioning 1 Phases.
Exhaust - Tunnel 31	Exst31	298.409, 6277.534	10.50	12.2	1.35	2.7	320.8	1,349	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Cooldown (conditioning) > Conditioning 1 Phases.
Exhaust - Tunnel 32	Exst32	298.406, 6277.528	10.50	12.2	1.35	2.6	320.8	1,349	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Cooldown (conditioning) > Conditioning 1 Phases.
Exhaust - Tunnel 33	Exst33	298.405, 6277.525	10.50	12.2	1.35	2.5	320.8	1,349	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Conditioning 1 Phase.
Exhaust - Tunnel 34	Exst34	298.403, 6277.519	10.50	12.2	1.35	1.0	297.3	172	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Spawn Run 1 Phase.
Exhaust - Tunnel 35	Exst35	298.402, 6277.517	10.50	12.2	1.35	1.0	297.3	172	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Spawn Run 1 Phase.
Exhaust - Tunnel 36	Exst36	298.399, 6277.511	10.50	12.2	1.35	1.0	297.3	172	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Spawn Run 1 Phase.
Exhaust - Tunnel 37	Exst37	298.398, 6277.509	10.50	12.2	1.35	1.0	297.3	172	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Spawn Run 1 Phase.
Exhaust - Tunnel 38	Exst38	298.396, 6277.503	10.50	12.2	1.35	1.0	297.3	172	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Spawn Run 1 Phase.
Exhaust - Tunnel 39	Exst39	298.395, 6277.5	10.50	12.2	1.35	1.0	297.3	172	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Spawn Run 1 Phase.
Exhaust - Tunnel 40	Exst40	298.393, 6277.494	10.50	12.2	1.35	1.6	296.0	369	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Spawn Run 2 Phase.
Exhaust - Tunnel 41	Exst41	298.389, 6277.486	10.50	12.2	1.35	1.7	296.0	369	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Spawn Run 2 Phase.
Exhaust - Tunnel 42	Exst42	298.388, 6277.484	10.50	12.2	1.35	1.7	296.0	369	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Spawn Run 2 Phase.
Exhaust - Tunnel 43	Exst43	298.386, 6277.478	10.50	12.2	1.35	1.7	296.0	369	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Spawn Run 2 Phase.
Exhaust - Tunnel 44	Exst44	298.385, 6277.475	10.50	12.2	1.35	1.7	296.0	369	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Spawn Run 2 Phase.
Exhaust - Tunnel 45	Exst45	298.383, 6277.469	10.50	12.2	1.35	1.7	296.0	369	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Spawn Run 2 Phase.
Exhaust - Tunnel 46	Exst46	298.382, 6277.467	10.50	12.2	1.35	2.8	296.0	618	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Spawn Run 2 Phase.
Exhaust - Tunnel 47	Exst47	298.379, 6277.461	10.50	12.2	1.35	2.8	296.0	618	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Spawn Run 2 Phase.
Exhaust - Tunnel 48	Exst48	298.378, 6277.459	10.50	12.2	1.35	4.0	296.0	263	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Cooldown Shipout Phase.
Exhaust - Tunnel 49	Exst49	298.378, 6277.459	10.50	12.2	1.35	1.7	296.0	105	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Cooldown Shipout Phase.
Exhaust - Tunnel 50	Exst50	298.376, 6277.453	10.50	12.2	1.35	1.7	296.0	105	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Cooldown Shipout Phase.
New Biofilter Section 1	BF01	298.324,6277.223	2.00	12.2	0.00	0.045	313.2	10,620	2.3	
New Biofilter Section 2	BF02	298.305,6277.226	2.00	12.2	0.00	0.045	313.2	10,620	2.3	
New Biofilter Section 3	BF03	298.286,6277.229	2.00	12.2	0.00	0.045	313.2	10,620	2.3	Based upon total biofilter system capacity of 450,000 m3/h and 2,778 m2 surface area at a nominal 500 ou discharge concentration.
New Biofilter Section 4	BF04	298.267,6277.237	2.00	12.2	0.00	0.045	313.2	10,620	2.3	
New Biofilter Section 5	BF05	298.249,6277.246	2.00	12.2	0.00	0.045	313.2	63,722	2.3	
New Biofilter Section 6	BF06	298.231,6277.254	2.00	12.2	0.00	0.045	313.2	0	2.3	
								32,971		

Area Sources										
Source Description	Source ID	Vertice coordinates (km)	Effective Height (m)	Base Elevation (m)	Initial Sigma Z (m)	Specific Odour Emission Rate (ou.m^3/m^2.s)	Area (m^2)	Odour Emission Rate (ou.m^3/s)	Scaling Factors	Comments
Water Recycle Pit	LAP	298.381, 6277.294 298.383, 6277.299 298.387, 6277.298 298.387, 6277.293	0.00	12.2	1.00	98.8	22	2,182	Stability Class Near-/Far-Field A - D = 2.5 / 2.3 E - F = 2.3 / 1.9	

Volume Sources										
Source Description	Source ID	Vertice coordinates (km)	Effective Height (m)	Base Elevation (m)	Initial Sigma Y (m)	Initial Sigma Z (m)	Odour Emission Rate (ou.m^3.s)	Scaling Factors		Comments
Bale Wetting Area	BWA	298.376, 6277.235	2.00	12.2	6.77	1.00	20,909	2.3		Worst-case 24 hr snapshot.
Stable Bedding Area	SBA	298.384, 6277.286	2.00	12.2	2.81	1.00	575	2.3		

Point Sources										
Source Description	Source ID	Vertice coordinates (km)	Stack Height (m)	Base Elevation (m)	Stack Diameter (m)	Exit Velocity (m/s)	Exit Temp (K)	Odour Emission Rate (ou.m^3/s)	Scaling Factors	Comments
New Biofilter Section 1	BF01	298.324,6277.223	2.00	12.2	24.28	0.039	313.2	9,028	2.3	Based upon total biofilter system capacity of 390,000 m3/h and 2,778 m2 surface area at a nominal 500 ou discharge concentration.
New Biofilter Section 2	BF02	298.305,6277.226	2.00	12.2	24.28	0.039	313.2	9,028	2.3	
New Biofilter Section 3	BF03	298.286,6277.229	2.00	12.2	24.28	0.039	313.2	9,028	2.3	
New Biofilter Section 4	BF04	298.267,6277.237	2.00	12.2	24.28	0.039	313.2	9,028	2.3	
New Biofilter Section 5	BF05	298.249,6277.246	2.00	12.2	24.28	0.039	313.2	9,028	2.3	
New Biofilter Section 6	BF06	298.231,6277.254	2.00	12.2	24.28	0.039	313.2	9,028	2.3	

Point Sources										
Source Description	**Source ID**	**Vertice coordinates (km)**	**Stack Height (m)**	**Base Elevation (m)**	**Stack Diameter (m)**	**Exit Velocity (m/s)**	**Exit Temp (K)**	**Odour Emission Rate (ou.m^3/s)**	**Scaling Factors**	**Comments**
New Biofilter Section 1	BF01	298.324,6277.223	2.00	12.2	24.28	0.085	313.2	19,648	2.3	Based upon total biofilter system capacity of 848,800 m3/h and 2,778 m2 surface area at a nominal 500 ou discharge concentration.
New Biofilter Section 2	BF02	298.305,6277.226	2.00	12.2	24.28	0.085	313.2	19,648	2.3	
New Biofilter Section 3	BF03	298.286,6277.229	2.00	12.2	24.28	0.085	313.2	19,648	2.3	
New Biofilter Section 4	BF04	298.267,6277.237	2.00	12.2	24.28	0.085	313.2	19,648	2.3	
New Biofilter Section 5	BF05	298.249,6277.246	2.00	12.2	24.28	0.085	313.2	19,648	2.3	
New Biofilter Section 6	BF06	298.231,6277.254	2.00	12.2	24.28	0.085	313.2	19,648	2.3	

Point Sources										
Source Description	Source ID	Vertice coordinates (km)	Stack Height (m)	Base Elevation (m)	Stack Diameter (m)	Exit Velocity (m/s)	Exit Temp (K)	Odour Emission Rate (ou.m^3/s)	Scaling Factors	Comments
New Biofilter Section 1	BF01	298.324,6277.223	2.00	12.2	24.28	0.039	313.2	9,028	2.3	Based upon total biofilter system capacity of 390,000 m3/h and 2,778 m2 surface area at a nominal 500 ou discharge concentration.
New Biofilter Section 2	BF02	298.305,6277.226	2.00	12.2	24.28	0.039	313.2	9,028	2.3	
New Biofilter Section 3	BF03	298.286,6277.229	2.00	12.2	24.28	0.039	313.2	9,028	2.3	
New Biofilter Section 4	BF04	298.267,6277.237	2.00	12.2	24.28	0.039	313.2	9,028	2.3	
New Biofilter Section 5	BF05	298.249,6277.246	2.00	12.2	24.28	0.039	313.2	9,028	2.3	
New Biofilter Section 6	BF06	298.231,6277.254	2.00	12.2	24.28	0.039	313.2	9,028	2.3	
New Biofilter Section 7	BF07	298.276,6277.371	2.00	12.2	59.47	0.046	313.2	10,620	2.3	Based upon total biofilter system capacity of 458,800 m3/h and 2,778 m2 surface area at a nominal 500 ou discharge concentration.
New Biofilter Section 8	BF08	298.279,6277.390	2.00	12.2	24.28	0.046	313.2	10,620	2.3	
New Biofilter Section 9	BF09	298.282,6277.409	2.00	12.2	24.28	0.046	313.2	10,620	2.3	
New Biofilter Section 10	BF10	298.285,6277.428	2.00	12.2	24.28	0.046	313.2	10,620	2.3	
New Biofilter Section 11	BF11	298.288,6277.447	2.00	12.2	24.28	0.046	313.2	10,620	2.3	
New Biofilter Section 12	BF12	298.291,6277.466	2.00	12.2	24.28	0.046	313.2	10,620	2.3	

Point Sources

Source Description	Source ID	Vertice coordinates (km)	Stack Height (m)	Base Elevation (m)	Stack Diameter (m)	Exit Velocity (m/s)	Exit Temp (K)	Max Odour Emission Rate (ou.m^3/s)	Scaling Factors	Comments
Exhaust - Tunnel 01	Exst01	298.454, 6277.338	10.50	12.2	1.35	1.9	320.9	913	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Conditioning 1 Phase.
Exhaust - Tunnel 02	Exst02	298.452, 6277.339	10.50	12.2	1.35	1.9	320.9	913	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Conditioning 1 Phase.
Exhaust - Tunnel 03	Exst03	298.446, 6277.341	10.50	12.2	1.35	1.9	320.9	913	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Conditioning 1 Phase.
Exhaust - Tunnel 04	Exst04	298.443, 6277.342	10.50	12.2	1.35	1.9	320.9	913	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Conditioning 1 Phase.
Exhaust - Tunnel 05	Exst05	298.437, 6277.345	10.50	12.2	1.35	1.9	320.9	996	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Conditioning 1 Phase.
Exhaust - Tunnel 06	Exst06	298.435, 6277.346	10.50	12.2	1.35	1.9	320.9	996	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Conditioning 1 Phase.
Exhaust - Tunnel 07	Exst07	298.429, 6277.348	10.50	12.2	1.35	2.0	320.9	996	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Conditioning 1 Phase.
Exhaust - Tunnel 08	Exst08	298.427, 6277.349	10.50	12.2	1.35	2.0	320.9	996	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Conditioning 1 Phase.
Exhaust - Tunnel 09	Exst09	298.421, 6277.351	10.50	12.2	1.35	0.8	297.3	138	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Spawn Run 1 Phase.
Exhaust - Tunnel 10	Exst10	298.418, 6277.352	10.50	12.2	1.35	0.8	297.3	138	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Spawn Run 1 Phase.
Exhaust - Tunnel 11	Exst11	298.412, 6277.355	10.50	12.2	1.35	0.8	297.3	138	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Spawn Run 1 Phase.
Exhaust - Tunnel 12	Exst12	298.410, 6277.356	10.50	12.2	1.35	0.8	297.3	138	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Spawn Run 1 Phase.
Exhaust - Tunnel 13	Exst13	298.404, 6277.358	10.50	12.2	1.35	0.8	297.3	138	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Spawn Run 1 Phase.
Exhaust - Tunnel 14	Exst14	298.402, 6277.359	10.50	12.2	1.35	0.8	297.3	138	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Spawn Run 1 Phase.
Exhaust - Tunnel 15	Exst15	298.396, 6277.362	10.50	12.2	1.35	1.4	296.0	325	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Spawn Run 2 Phase.
Exhaust - Tunnel 16	Exst16	298.393, 6277.363	10.50	12.2	1.35	1.4	296.0	325	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Spawn Run 2 Phase.
Exhaust - Tunnel 17	Exst17	298.387, 6277.365	10.50	12.2	1.35	1.4	296.0	325	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Spawn Run 2 Phase.
Exhaust - Tunnel 18	Exst18	298.385, 6277.366	10.50	12.2	1.35	1.4	296.0	325	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Spawn Run 2 Phase.
Exhaust - Tunnel 19	Exst19	298.379, 6277.368	10.50	12.2	1.35	1.5	296.0	325	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Spawn Run 2 Phase.
Exhaust - Tunnel 20	Exst20	298.377, 6277.369	10.50	12.2	1.35	1.5	296.0	325	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Spawn Run 2 Phase.
Exhaust - Tunnel 21	Exst21	298.371, 6277.372	10.50	12.2	1.35	2.3	296.0	494	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Spawn Run 2 Phase.
Exhaust - Tunnel 22	Exst22	298.368, 6277.373	10.50	12.2	1.35	2.3	296.0	494	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Spawn Run 2 Phase.
Exhaust - Tunnel 23	Exst23	298.362, 6277.375	10.50	12.2	1.35	1.4	296.0	84	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Cooldown Shipout Phase.
Exhaust - Tunnel 24	Exst24	298.36, 6277.376	10.50	12.2	1.35	0.0	296.0	0	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Empty Tunnel.
Exhaust - Tunnel 25	Exst25	298.354, 6277.379	10.50	12.2	1.35	0.0	296.0	0	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Empty Tunnel.
Exhaust - Tunnel 26	Exst26	298.416, 6277.553	10.50	12.2	1.35	2.7	320.8	2,497	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Pasturisation > Cooldown (conditioning) > Conditioning 1 Phases.
Exhaust - Tunnel 27	Exst27	298.415, 6277.55	10.50	12.2	1.35	2.7	320.8	2,497	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Pasturisation > Cooldown (conditioning) > Conditioning 1 Phases.
Exhaust - Tunnel 28	Exst28	298.413, 6277.544	10.50	12.2	1.35	2.7	320.8	2,497	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Pasturisation > Cooldown (conditioning) > Conditioning 1 Phases.
Exhaust - Tunnel 29	Exst29	298.412, 6277.542	10.50	12.2	1.35	2.7	320.8	2,497	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Cooldown (conditioning) > Conditioning 1 Phases.

Point Sources										
Source Description	**Source ID**	**Vertice coordinates (km)**	**Stack Height (m)**	**Base Elevation (m)**	**Stack Diameter (m)**	**Exit Velocity (m/s)**	**Exit Temp (K)**	**Max Odour Emission Rate (ou.m^3/s)**	**Scaling Factors**	**Comments**
Exhaust - Tunnel 30	Exst30	298.409, 6277.536	10.50	12.2	1.35	2.8	320.8	2,497	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Cooldown (conditioning) > Conditioning 1 Phases.
Exhaust - Tunnel 31	Exst31	298.409, 6277.534	10.50	12.2	1.35	2.7	320.8	1,349	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Cooldown (conditioning) > Conditioning 1 Phases.
Exhaust - Tunnel 32	Exst32	298.406, 6277.528	10.50	12.2	1.35	2.6	320.8	1,349	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Cooldown (conditioning) > Conditioning 1 Phases.
Exhaust - Tunnel 33	Exst33	298.405, 6277.525	10.50	12.2	1.35	2.5	320.8	1,349	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Conditioning 1 Phase.
Exhaust - Tunnel 34	Exst34	298.403, 6277.519	10.50	12.2	1.35	1.0	297.3	172	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Spawn Run 1 Phase.
Exhaust - Tunnel 35	Exst35	298.402, 6277.517	10.50	12.2	1.35	1.0	297.3	172	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Spawn Run 1 Phase.
Exhaust - Tunnel 36	Exst36	298.399, 6277.511	10.50	12.2	1.35	1.0	297.3	172	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Spawn Run 1 Phase.
Exhaust - Tunnel 37	Exst37	298.398, 6277.509	10.50	12.2	1.35	1.0	297.3	172	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Spawn Run 1 Phase.
Exhaust - Tunnel 38	Exst38	298.396, 6277.503	10.50	12.2	1.35	1.0	297.3	172	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Spawn Run 1 Phase.
Exhaust - Tunnel 39	Exst39	298.395, 6277.5	10.50	12.2	1.35	1.0	297.3	172	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Spawn Run 1 Phase.
Exhaust - Tunnel 40	Exst40	298.393, 6277.494	10.50	12.2	1.35	1.6	296.0	369	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Spawn Run 2 Phase.
Exhaust - Tunnel 41	Exst41	298.389, 6277.486	10.50	12.2	1.35	1.7	296.0	369	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Spawn Run 2 Phase.
Exhaust - Tunnel 42	Exst42	298.388, 6277.484	10.50	12.2	1.35	1.7	296.0	369	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Spawn Run 2 Phase.
Exhaust - Tunnel 43	Exst43	298.386, 6277.478	10.50	12.2	1.35	1.7	296.0	369	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Spawn Run 2 Phase.
Exhaust - Tunnel 44	Exst44	298.385, 6277.475	10.50	12.2	1.35	1.7	296.0	369	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Spawn Run 2 Phase.
Exhaust - Tunnel 45	Exst45	298.383, 6277.469	10.50	12.2	1.35	1.7	296.0	369	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Spawn Run 2 Phase.
Exhaust - Tunnel 46	Exst46	298.382, 6277.467	10.50	12.2	1.35	2.8	296.0	618	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Spawn Run 2 Phase.
Exhaust - Tunnel 47	Exst47	298.379, 6277.461	10.50	12.2	1.35	2.8	296.0	618	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Spawn Run 2 Phase.
Exhaust - Tunnel 48	Exst48	298.378, 6277.459	10.50	12.2	1.35	4.0	296.0	263	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Cooldown Shipout Phase.
Exhaust - Tunnel 49	Exst49	298.378, 6277.459	10.50	12.2	1.35	1.7	296.0	105	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Cooldown Shipout Phase.
Exhaust - Tunnel 50	Exst50	298.376, 6277.453	10.50	12.2	1.35	1.7	296.0	105	2.3	Worst-case 24 hour snapshot (Thu 8pm to Fri 8pm). Cooldown Shipout Phase.

Elf Farm Supplies Pty Ltd

Mushroom Substrate Plant – Modification to Approved Expansion

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APPENDIX D:

PHASE 2/3 ODOUR EMISSIONS TREND PROFILE WORKSHEET

Appendix D

Worksheet title: Phase 2/3 Odour emission trend profile for a single tunnel
Associated object ID: Figures 3.1 & 3.2

Cycle Time (hrs)	Fan inlet airflow (m^3/hr)	Fan inlet airflow (m^3/s)	Odour emission rate ($ou.m^3$/s)	Stage
2	40,000	11.1	32,200	Tunnel venting
4	9,600	2.7	13,600	Levelling
6	12,000	3.3	17,000	
8	8,400	2.3	11,900	
10	4,800	1.3	6,790	
12	2,400	0.7	3,390	
14	6,000	1.7	8,480	
16	8,400	2.3	11,900	
18	7,800	2.2	5,180	Warm-up Pasteurisation
20	2,600	0.7	1,730	
22	3,900	1.1	2,590	
24	2,600	0.7	1,730	
26	7,600	2.1	5,150	Pasteurisation
28	11,400	3.2	7,730	
30	7,600	2.1	5,150	
32	11,400	3.2	7,730	
34	6,800	1.9	888	Cool-down conditioning
36	11,900	3.3	1,550	
38	13,600	3.8	1,780	
40	15,300	4.3	2,000	
42	11,700	3.3	1,530	Conditioning 1
44	11,700	3.3	1,530	
46	11,700	3.3	1,530	
48	11,700	3.3	1,530	
50	9,900	2.8	1,290	
52	9,900	2.8	1,290	
54	9,900	2.8	1,290	
56	9,900	2.8	1,290	
58	9,900	2.8	1,290	
60	9,900	2.8	1,290	
62	9,900	2.8	1,290	
64	9,900	2.8	1,290	
66	9,900	2.8	1,290	
68	9,900	2.8	1,290	
70	9,900	2.8	1,290	
72	9,900	2.8	1,290	
74	9,900	2.8	1,290	
76	9,900	2.8	1,290	
78	9,900	2.8	1,290	
80	9,900	2.8	1,290	
82	10,800	3.0	1,410	
84	10,800	3.0	1,410	
86	10,800	3.0	1,410	
88	10,800	3.0	1,410	
90	12,600	3.5	1,650	Conditioning 2
92	12,600	3.5	1,650	
94	12,600	3.5	1,650	
96	12,600	3.5	1,650	
98	12,600	3.5	1,650	
100	12,600	3.5	1,650	
102	12,600	3.5	1,650	
104	12,600	3.5	1,650	
106	12,600	3.5	1,650	
108	12,600	3.5	1,650	
110	12,600	3.5	1,650	
112	12,600	3.5	1,650	
114	15,000	4.2	179	Cool-down spawn
116	18,000	5.0	215	
118	21,000	5.8	251	
120	5,500	1.5	66	
122	4,500	1.3	54	
124	3,500	1.0	42	
126	2,500	0.7	30	
128	1,500	0.4	18	
130	1,000	0.3	12	
132	1,000	0.3	33	
134	1,000	0.3	33	
136	1,000	0.3	33	
138	1,000	0.3	33	
140	1,000	0.3	33	
142	1,000	0.3	33	
144	1,000	0.3	33	
146	1,000	0.3	33	
148	4,200	1.2	138	Spawn Run 1
150	4,200	1.2	138	
152	4,200	1.2	138	
154	4,200	1.2	138	
156	4,200	1.2	138	
158	4,200	1.2	138	
160	4,200	1.2	138	
162	4,200	1.2	138	
164	4,200	1.2	138	
166	4,200	1.2	138	
168	4,200	1.2	138	
170	4,200	1.2	138	
172	4,200	1.2	138	
174	4,200	1.2	138	
176	4,200	1.2	138	
178	4,200	1.2	138	
180	4,200	1.2	138	
182	4,200	1.2	138	
184	4,200	1.2	138	
186	4,200	1.2	138	
188	4,200	1.2	138	
190	4,200	1.2	138	
192	4,200	1.2	138	
194	4,200	1.2	138	
196	4,200	1.2	138	
198	4,200	1.2	138	
200	4,200	1.2	138	
202	4,200	1.2	138	
204	4,200	1.2	138	
206	4,200	1.2	138	
208	4,200	1.2	138	
210	4,200	1.2	138	
212	4,200	1.2	138	
214	4,200	1.2	138	
216	4,200	1.2	138	
218	4,200	1.2	138	
220	4,200	1.2	138	
222	4,200	1.2	138	
224	4,200	1.2	138	
226	4,200	1.2	138	
228	4,200	1.2	138	
230	4,200	1.2	138	
232	4,200	1.2	138	
234	4,200	1.2	138	
236	4,200	1.2	138	
238	4,200	1.2	138	
240	4,200	1.2	138	
242	4,200	1.2	138	
244	4,200	1.2	138	
246	4,200	1.2	138	
248	4,200	1.2	138	
250	4,200	1.2	138	
252	4,200	1.2	138	
254	4,200	1.2	138	
256	4,200	1.2	138	
258	4,200	1.2	138	
260	4,200	1.2	138	
262	4,200	1.2	138	
264	4,200	1.2	138	
266	4,200	1.2	138	
268	4,200	1.2	138	
270	4,200	1.2	138	
272	4,200	1.2	138	
274	4,200	1.2	138	
276	4,200	1.2	138	
278	4,200	1.2	138	
280	4,200	1.2	138	
282	4,200	1.2	138	
284	4,200	1.2	138	
286	4,200	1.2	138	
288	4,200	1.2	138	
290	4,200	1.2	138	
292	4,200	1.2	138	
294	4,200	1.2	138	
296	4,200	1.2	138	
298	4,200	1.2	138	
300	4,200	1.2	138	
302	4,200	1.2	138	
304	4,200	1.2	138	
306	4,200	1.2	138	
308	4,200	1.2	138	
310	4,200	1.2	138	
312	4,200	1.2	138	
314	4,200	1.2	138	
316	4,800	1.3	157	
318	4,800	1.3	157	
320	4,800	1.3	157	
322	4,800	1.3	157	
324	4,800	1.3	157	
326	4,800	1.3	157	
328	4,800	1.3	157	
330	4,800	1.3	157	
332	4,800	1.3	157	
334	5,600	1.6	236	Spawn Run 2
336	5,600	1.6	236	
338	5,600	1.6	236	
340	5,600	1.6	236	
342	6,300	1.8	266	
344	6,300	1.8	266	
346	6,300	1.8	266	
348	6,300	1.8	266	
350	6,300	1.8	266	
352	6,300	1.8	266	
354	6,300	1.8	266	
356	6,300	1.8	266	
358	6,300	1.8	266	
360	6,300	1.8	266	
362	6,300	1.8	266	
364	6,300	1.8	266	
366	6,300	1.8	266	
368	6,300	1.8	266	
370	6,300	1.8	266	
372	6,300	1.8	266	
374	7,000	1.9	296	
376	7,000	1.9	296	
378	7,000	1.9	296	
380	7,000	1.9	296	
382	7,000	1.9	296	
384	7,000	1.9	296	
386	7,000	1.9	296	
388	7,000	1.9	296	
390	7,000	1.9	296	
392	7,000	1.9	296	
394	7,000	1.9	296	
396	7,000	1.9	296	
398	7,000	1.9	296	
400	7,000	1.9	296	
402	7,000	1.9	296	
404	7,000	1.9	296	
406	7,700	2.1	325	
408	7,700	2.1	325	
410	7,700	2.1	325	
412	7,700	2.1	325	
414	7,700	2.1	325	
416	7,700	2.1	325	
418	7,700	2.1	325	
420	7,700	2.1	325	
422	7,700	2.1	325	
424	7,700	2.1	325	
426	7,700	2.1	325	
428	7,700	2.1	325	
430	7,700	2.1	325	
432	7,700	2.1	325	
434	7,700	2.1	325	
436	7,700	2.1	325	
438	7,700	2.1	325	
440	7,700	2.1	325	
442	7,700	2.1	325	
444	7,700	2.1	325	
446	7,700	2.1	325	
448	7,700	2.1	325	
450	7,700	2.1	325	
452	7,700	2.1	325	
454	10,800	3.0	456	
456	10,800	3.0	456	
458	10,800	3.0	456	
460	10,800	3.0	456	
462	10,800	3.0	456	
464	10,800	3.0	456	
466	10,800	3.0	456	
468	10,800	3.0	456	
470	11,700	3.3	494	
472	11,700	3.3	494	
474	11,700	3.3	494	
476	11,700	3.3	494	
478	11,700	3.3	494	
480	11,700	3.3	494	
482	11,700	3.3	494	
484	11,700	3.3	494	
486	11,700	3.3	494	
488	11,700	3.3	494	
490	11,700	3.3	494	
492	11,700	3.3	494	
494	11,700	3.3	494	
496	11,700	3.3	494	
498	11,700	3.3	494	
500	11,700	3.3	494	
502	12,600	3.5	532	
504	12,600	3.5	532	
506	12,600	3.5	532	
508	12,600	3.5	532	
510	12,600	3.5	532	
512	12,600	3.5	532	
514	12,600	3.5	532	
516	12,600	3.5	532	
518	12,600	3.5	532	
520	12,600	3.5	532	
522	12,600	3.5	532	
524	12,600	3.5	532	
526	12,600	3.5	532	
528	12,600	3.5	532	
530	12,600	3.5	532	
532	12,600	3.5	532	
534	11,700	3.3	494	
536	11,700	3.3	494	
538	11,700	3.3	494	
540	11,700	3.3	494	
542	11,700	3.3	494	
544	11,700	3.3	494	
546	11,700	3.3	494	
548	11,700	3.3	494	
550	11,700	3.3	494	
552	11,700	3.3	494	
554	11,700	3.3	494	
556	11,700	3.3	494	
558	11,700	3.3	494	
560	11,700	3.3	494	
562	11,700	3.3	494	
564	11,700	3.3	494	
566	11,700	3.3	494	
568	11,700	3.3	494	
570	11,700	3.3	494	
572	11,700	3.3	494	
574	11,700	3.3	494	
576	11,700	3.3	494	
578	11,700	3.3	494	
580	11,700	3.3	494	
582	11,700	3.3	494	
584	11,700	3.3	494	
586	11,700	3.3	494	
588	11,700	3.3	494	
590	11,700	3.3	494	
592	11,700	3.3	494	
594	11,700	3.3	494	
596	11,700	3.3	494	
598	11,700	3.3	494	
600	11,700	3.3	494	
602	11,700	3.3	494	
604	11,700	3.3	494	
606	11,700	3.3	494	
608	11,700	3.3	494	
610	11,700	3.3	494	
612	11,700	3.3	494	
614	17,600	4.9	743	
616	17,600	4.9	743	
618	17,600	4.9	743	
620	17,600	4.9	743	
622	17,600	4.9	743	
624	17,600	4.9	743	
626	17,600	4.9	743	
628	15,000	4.2	633	
630	15,000	4.2	633	
632	15,000	4.2	633	
634	15,000	4.2	633	
636	15,000	4.2	633	
638	12,600	3.5	532	
640	12,600	3.5	532	
642	12,600	3.5	532	
644	12,600	3.5	532	
646	7,000	1.9	296	
648	7,000	1.9	296	
650	7,000	1.9	296	
652	7,000	1.9	296	

Mean odour concentration (ou)	Phase 2/3 Stage
2,900	Venting
5,090	Leveling
2,390	Warm-up Pasteurisation
2,440	Pasturisation
470	Cool-down (conditioning)
332	Conditioning #1
91	Conditioning #2
43	Cool-down spawn
118	Spawn Run 1
152	Spawn Run 2

90,000

	Cycle Time	Tunnel Fill Venting	Levelling 0-2	Levelling 2-4	Levelling 4-6	Levelling 6-8	Levelling 8-10	Levelling 10-12	Levelling 12-14	Warm Up 0-2	Warm Up 2-4	Warm Up 4-6	Warm Up 6-8	Pasteurisation 0-2	Pasteurisation 2-4	Pasteurisation 4-6	Pasteurisation 6-8	Cooldown Conditioning 0-2	Cooldown Conditioning 2-4	Cooldown Conditioning 4-6	Cooldown Conditioning 6-8	Conditioning 1a	Conditioning 1b	Conditioning 1c	Conditioning 2	Cooldown Spawn a 0-2	Cooldown Spawn a 2-4	Cooldown Spawn a 4-6	Cooldown Spawn b 0-2	Cooldown Spawn b 2-4	Cooldown Spawn b 4-6	Cooldown Spawn b 6-8	Cooldown Spawn b 8-10	Cooldown Spawn b 10-32	Spawn Run 1a	Spawn Run 1b	Spawn Run 2a	Spawn Run 2b	Spawn Run 2c	Spawn Run 2d	Spawn Run 2e	Spawn Run 2f	Spawn Run 2g	Spawn Run 2h	Cooldown Shipout a	Cooldown Shipout b	Cooldown Shipout c	Cooldown Shipout d	Total Exhaust Air Volume	Number of Tunnels in Process
	+2 hrs	100% Fan	40% FAD, 60% Fan	50% FAD, 60% Fan	35% FAD, 60% Fan	20% FAD, 60% Fan	10% FAD, 60% Fan	25% FAD, 60% Fan	35% FAD, 60% Fan	30% FAD, 65% Fan	10% FAD, 65% Fan	15% FAD, 65% Fan	10% FAD, 65% Fan	20% FAD, 95% Fan	30% FAD, 95% Fan	20% FAD, 95% Fan	30% FAD, 95% Fan	20% FAD, 85% Fan	35% FAD, 85% Fan	40% FAD, 85% Fan	45% FAD, 85% Fan	45% FAD, 65% Fan	45% FAD, 55% Fan	45% FAD, 60% Fan	45% FAD, 70% Fan	50% FAD, 75% Fan	60% FAD, 75% Fan	70% FAD, 75% Fan	55% FAD, 25% Fan	45% FAD, 25% Fan	35% FAD, 25% Fan	25% FAD, 25% Fan	15% FAD, 25% Fan	10% FAD, 25% Fan	30% FAD, 35% Fan	30% FAD, 40% Fan	35% FAD, 40% Fan	35% FAD, 45% Fan	35% FAD, 50% Fan	35% FAD, 55% Fan	45% FAD, 60% Fan	45% FAD, 65% Fan	45% FAD, 70% Fan	45% FAD, 65% Fan	55% FAD, 80% Fan	50% FAD, 75% Fan	45% FAD, 70% Fan	35% FAD, 50% Fan	m3/hr	/50
Tuesday 4am - 6am	2	40,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8,750	56,700	14,400	16,800	-	-	-	-	96,525	37,800	-	22,000	-	12,600	-	305,575	38
	4	40,000	9,600	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7,500	56,700	15,600	22,400	-	-	-	-	84,825	50,400	-	22,000	-	12,600	-	321,625	39
	6	40,000	9,600	12,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6,250	56,700	16,800	22,400	6,300	-	-	-	73,125	63,000	-	22,000	-	12,600	-	340,775	40
	8	40,000	9,600	12,000	8,400	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5,000	56,700	18,000	22,400	12,600	-	-	-	73,125	63,000	-	22,000	-	-	7,000	349,825	41
	10	40,000	9,600	12,000	8,400	4,800	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3,750	56,700	24,000	16,800	18,900	-	-	-	73,125	37,800	-	57,200	-	-	7,000	370,075	42
	12	40,000	9,600	12,000	8,400	4,800	2,400	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2,500	56,700	30,000	11,200	25,200	-	-	-	73,125	37,800	-	57,200	-	-	7,000	377,925	43
Tuesday 4pm - 6pm	14	40,000	9,600	12,000	8,400	4,800	2,400	6,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,250	56,700	36,000	5,600	31,500	-	-	-	73,125	37,800	-	57,200	-	-	7,000	389,375	44
	16	40,000	9,600	12,000	8,400	4,800	2,400	6,000	8,400	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	56,700	36,000	-	37,800	-	-	-	73,125	37,800	-	35,200	18,750	-	-	386,975	43
	18	-	9,600	12,000	8,400	4,800	2,400	6,000	8,400	7,800	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	56,700	36,000	-	37,800	-	-	-	73,125	37,800	-	35,200	18,750	-	-	354,775	43
	20	-	-	12,000	8,400	4,800	2,400	6,000	8,400	7,800	2,600	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	56,700	36,000	-	37,800	-	-	-	73,125	37,800	-	35,200	18,750	-	-	347,775	43
	22	-	-	-	8,400	4,800	2,400	6,000	8,400	7,800	2,600	3,900	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	56,700	30,000	7,000	37,800	-	-	-	58,500	53,550	-	35,200	18,750	-	-	341,800	43
	24	-	-	-	-	4,800	2,400	6,000	8,400	7,800	2,600	3,900	2,600	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	56,700	24,000	14,000	37,800	-	-	-	43,875	69,300	-	35,200	-	15,750	-	335,125	43
Wednesday 4am - 6am	26	50,000	-	-	-	-	2,400	6,000	8,400	7,800	2,600	3,900	2,600	7,600	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	56,700	18,000	21,000	37,800	-	-	-	29,250	85,050	-	-	30,000	15,750	-	384,850	44
	28	50,000	12,000	-	-	-	-	6,000	8,400	7,800	2,600	3,900	2,600	7,600	11,400	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	56,700	12,000	28,000	37,800	-	-	-	14,625	100,800	-	-	30,000	15,750	-	407,975	45
	30	50,000	12,000	15,000	-	-	-	-	8,400	7,800	2,600	3,900	2,600	7,600	11,400	7,600	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	56,700	6,000	28,000	45,675	-	-	-	-	78,750	35,100	-	30,000	15,750	-	424,875	46
	32	50,000	12,000	15,000	10,500	-	-	-	-	7,800	2,600	3,900	2,600	7,600	11,400	7,600	11,400	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	56,700	-	28,000	53,550	-	-	-	-	78,750	35,100	-	30,000	-	8,750	433,250	47
	34	50,000	12,000	15,000	10,500	6,000	-	-	-	-	2,600	3,900	2,600	7,600	11,400	7,600	11,400	6,800	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	56,700	-	21,000	61,425	-	-	-	-	47,250	23,400	61,600	-	25,200	8,750	452,725	48
	36	50,000	12,000	15,000	10,500	6,000	3,000	-	-	-	-	3,900	2,600	7,600	11,400	7,600	11,400	6,800	11,900	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	56,700	-	14,000	69,300	-	-	-	-	47,250	23,400	61,600	-	25,200	8,750	465,900	49
Wednesday 4pm - 6pm	38	50,000	12,000	15,000	10,500	6,000	3,000	7,500	-	-	-	-	2,600	7,600	11,400	7,600	11,400	6,800	11,900	13,600	-	-	-	-	-	-	-	-	-	-	-	-	-	-	56,700	-	7,000	70,875	7,000	-	-	-	47,250	23,400	61,600	-	25,200	8,750	484,675	50
	40	50,000	12,000	15,000	10,500	6,000	3,000	7,500	10,500	-	-	-	-	7,600	11,400	7,600	11,400	6,800	11,900	13,600	15,300	-	-	-	-	-	-	-	-	-	-	-	-	-	56,700	-	-	72,450	14,000	-	-	-	47,250	23,400	61,600	-	25,200	-	500,700	50
	42	-	12,000	15,000	10,500	6,000	3,000	7,500	10,500	9,750	-	-	-	-	11,400	7,600	11,400	6,800	11,900	13,600	15,300	11,700	-	-	-	-	-	-	-	-	-	-	-	-	56,700	-	-	66,150	21,000	-	-	-	47,250	23,400	61,600	-	-	14,000	454,050	50
	44	-	-	15,000	10,500	6,000	3,000	7,500	10,500	9,750	3,250	-	-	-	-	7,600	11,400	6,800	11,900	13,600	15,300	23,400	-	-	-	-	-	-	-	-	-	-	-	-	56,700	-	-	59,850	28,000	-	-	-	47,250	23,400	61,600	-	-	14,000	446,300	50
	46	-	-	-	10,500	6,000	3,000	7,500	10,500	9,750	3,250	4,875	-	-	-	-	11,400	6,800	11,900	13,600	15,300	35,100	-	-	-	-	-	-	-	-	-	-	-	-	56,700	-	-	53,550	35,000	-	-	-	47,250	23,400	61,600	-	-	14,000	440,975	50
	48	-	-	-	-	6,000	3,000	7,500	10,500	9,750	3,250	4,875	3,250	-	-	-	-	6,800	11,900	13,600	15,300	46,800	-	-	-	-	-	-	-	-	-	-	-	-	56,700	-	-	47,250	42,000	-	-	-	47,250	23,400	61,600	-	-	14,000	434,725	50
Thursday 4am - 6am	50	-	-	-	-	-	3,000	7,500	10,500	9,750	3,250	4,875	3,250	9,500	-	-	-	-	11,900	13,600	15,300	46,800	9,900	-	-	-	-	-	-	-	-	-	-	-	56,700	-	-	47,250	42,000	-	-	-	47,250	23,400	-	52,500	-	-	418,225	48
	52	-	-	-	-	-	-	7,500	10,500	9,750	3,250	4,875	3,250	9,500	14,250	-	-	-	-	13,600	15,300	46,800	19,800	-	-	-	-	-	-	-	-	-	-	-	56,700	-	-	47,250	42,000	-	-	-	47,250	23,400	-	52,500	-	-	427,475	48
	54	-	-	-	-	-	-	-	10,500	9,750	3,250	4,875	3,250	9,500	14,250	9,500	-	-	-	-	15,300	46,800	29,700	-	-	-	-	-	-	-	-	-	-	-	56,700	-	-	47,250	42,000	-	-	-	-	67,275	-	52,500	-	-	422,400	48
	56	-	-	-	-	-	-	-	-	9,750	3,250	4,875	3,250	9,500	14,250	9,500	14,250	-	-	-	-	46,800	39,600	-	-	-	-	-	-	-	-	-	-	-	56,700	-	-	47,250	42,000	-	-	-	-	67,275	-	52,500	-	-	420,750	48
	58	-	-	-	-	-	-	-	-	-	3,250	4,875	3,250	9,500	14,250	9,500	14,250	8,500	-	-	-	35,100	49,500	-	-	-	-	-	-	-	-	-	-	-	56,700	-	-	47,250	42,000	-	-	-	-	52,650	22,000	-	44,100	-	416,675	48
	60	-	-	-	-	-	-	-	-	-	-	4,875	3,250	9,500	14,250	9,500	14,250	8,500	14,875	-	-	23,400	59,400	-	-	-	-	-	-	-	-	-	-	-	56,700	-	-	47,250	42,000	-	-	-	-	52,650	22,000	-	44,100	-	426,500	48
Thursday 4pm - 6pm	62	-	-	-	-	-	-	-	-	-	-	-	3,250	9,500	14,250	9,500	14,250	8,500	14,875	17,000	-	11,700	69,300	-	-	-	-	-	-	-	-	-	-	-	56,700	-	-	39,375	50,750	-	-	-	-	52,650	22,000	-	44,100	-	437,700	48
	64	-	-	-	-	-	-	-	-	-	-	-	-	9,500	14,250	9,500	14,250	8,500	14,875	17,000	19,125	-	79,200	-	-	-	-	-	-	-	-	-	-	-	56,700	-	-	31,500	59,500	-	-	-	-	52,650	22,000	-	44,100	-	452,650	48
	66	-	-	-	-	-	-	-	-	-	-	-	-	-	14,250	9,500	14,250	8,500	14,875	17,000	19,125	14,625	79,200	-	-	-	-	-	-	-	-	-	-	-	56,700	-	-	23,625	68,250	-	-	-	-	52,650	22,000	-	-	24,500	439,050	48
	68	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9,500	14,250	8,500	14,875	17,000	19,125	29,250	79,200	-	-	-	-	-	-	-	-	-	-	-	56,700	-	-	15,750	77,000	-	-	-	-	52,650	22,000	-	-	24,500	440,300	48
	70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14,250	8,500	14,875	17,000	19,125	43,875	79,200	-	-	-	-	-	-	-	-	-	-	-	56,700	-	-	7,875	78,750	7,700	-	-	-	52,650	22,000	-	-	24,500	447,000	48
	72	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8,500	14,875	17,000	19,125	58,500	79,200	-	-	-	-	-	-	-	-	-	-	-	56,700	-	-	-	80,500	15,400	-	-	-	52,650	22,000	-	-	24,500	448,950	48
Friday 4am - 6am	74	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14,875	17,000	19,125	58,500	91,575	-	-	-	-	-	-	-	-	-	-	-	56,700	-	-	-	73,500	23,100	-	-	-	52,650	-	18,750	-	-	425,775	45
	76	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17,000	19,125	58,500	103,950	-	-	-	-	-	-	-	-	-	-	-	56,700	-	-	-	66,500	30,800	-	-	-	52,650	-	18,750	-	-	423,975	45
	78	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	19,125	58,500	116,325	-	-	-	-	-	-	-	-	-	-	-	56,700	-	-	-	59,500	38,500	-	-	-	52,650	-	18,750	-	-	420,050	45
	80	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	58,500	128,700	-	-	-	-	-	-	-	-	-	-	-	56,700	-	-	-	52,500	46,200	-	-	-	52,650	-	18,750	-	-	414,000	45
	82	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	43,875	131,175	10,800	-	-	-	-	-	-	-	-	-	-	56,700	-	-	-	52,500	46,200	-	-	-	52,650	-	-	15,750	-	409,650	45
	84	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	29,250	133,650	21,600	-	-	-	-	-	-	-	-	-	-	56,700	-	-	-	52,500	46,200	-	-	-	52,650	-	-	15,750	-	408,300	45
Friday 4pm - 6pm	86	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14,625	136,125	32,400	-	-	-	-	-	-	-	-	-	-	56,700	-	-	-	52,500	46,200	-	-	-	52,650	-	-	15,750	-	406,950	45
	88	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	138,600	43,200	-	-	-	-	-	-	-	-	-	-	56,700	-	-	-	52,500	46,200	-	-	-	52,650	-	-	15,750	-	405,600	45
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	128,700	43,200	12,600	-	-	-	-	-	-	-	-	-	56,700	-	-	-	52,500	46,200	-	-	-	52,650	-	-	-	8,750	401,300	45
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	118,800	43,200	25,200	-	-	-	-	-	-	-	-	-	56,700	-	-	-	52,500	46,200	-	-	-	52,650	-	-	-	8,750	404,000	45
	94	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	108,900	43,200	37,800	-	-	-	-	-	-	-	-	-	56,700	-	-	-	43,750	55,825	-	-	-	52,650	-	-	-	8,750	407,575	45
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	99,000	43,200	50,400	-	-	-	-	-	-	-	-	-	56,700	-	-	-	35,000	65,450	-	-	-	52,650	-	-	-	8,750	411,150	45
Saturday 4am - 6am	98	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	99,000	32,400	63,000	-	-	-	-	-	-	-	-	-	56,700	-	-	-	26,250	75,075	-	-	-	52,650	-	-	-	-	405,075	44
	100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	99,000	21,600	75,600	-	-	-	-	-	-	-	-	-	56,700	-	-	-	17,500	84,700	-	-	-	52,650	-	-	-	-	407,750	44
	102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	99,000	10,800	88,200	-	-	-	-	-	-	-	-	-	56,700	-	-	-	8,750	94,325	-	-	-	52,650	-	-	-	-	410,425	44
	104	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	99,000	-	100,800	-	-	-	-	-	-	-	-	-	56,700	-	-	-	-	103,950	-	-	-	52,650	-	-	-	-	413,100	44
	106	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	86,625	13,500	100,800	-	-	-	-	-	-	-	-	-	56,700	-	-	-	-	103,950	-	-	-	52,650	-	-	-	-	414,225	44
	108	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	74,250	27,000	100,800	-	-	-	-	-	-	-	-	-	56,700	-	-	-	-	103,950	-	-	-	52,650	-	-	-	-	415,350	44
Saturday 4pm - 6pm	110	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	61,875	40,500	100,800	-	-	-	-	-	-	-	-	-	56,700	-	-	-	-	103,950	-	-	-	29,250	35,200	-	-	-	428,275	44
	112	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	49,500	54,000	100,800	-	-	-	-	-	-	-	-	-	56,700	-	-	-	-	103,950	-	-	-	29,250	35,200	-	-	-	429,400	44
	114	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	37,125	54,000	103,950	15,000	-	-	-	-	-	-	-	-	56,700	-	-	-	-	103,950	-	-	-	29,250	35,200	-	-	-	435,175	44
	116	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	24,750	54,000	107,100	15,000	18,000	-	-	-	-	-	-	-	56,700	-	-	-	-	103,950	-	-	-	29,250	35,200	-	-	-	443,950	44
	118	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12,375	54,000	110,250	15,000	18,000	21,000	-	-	-	-	-	-	56,700	-	-	-	-	96,250	10,800	-	-	29,250	35,200	-	-	-	458,825	44
	120	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	54,000	113,400	15,000	18,000	21,000	5,500	-	-	-	-	-	56,700	-	-	-	-	88,550	21,600	-	-	29,250	35,200	-	-	-	458,200	44
Sunday 4am - 6am	122	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	40,500	116,550	15,000	18,000	21,000	5,500	4,500	-	-	-	-	56,700	-	-	-	-	80,850	32,400	-	-	29,250	-	30,000	-	-	450,250	44
	124	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	27,000	119,700	15,000	18,000	21,000	5,500	4,500	3,500	-	-	-	56,700	-	-	-	-	73,150	43,200	-	-	29,250	-	30,000	-	-	446,500	44
	126	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13,500	122,850	15,000	18,000	21,000	5,500	4,500	3,500	2,500	-	-	56,700	-	-	-	-	65,450	54,000	-	-	29,250	-	30,000	-	-	441,750	44
	128	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	126,000	15,000	18,000	21,000	5,500	4,500	3,500	2,500	1,500	-	56,700	-	-	-	-	57,750	64,800	-	-	29,250	-	30,000	-	-	436,000	44
	130	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	126,000	-	18,000	21,000	5,500	4,500	3,500	2,500	1,500	1,000	56,700	-	-	-	-	57,750	64,800	-	-	29,250	-	-	25,200	-	417,200	44
	132	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	126,000	-	-	21,000	5,500	4,500	3,500	2,500	1,500	2,000	56,700	-	-	-	-	57,750	64,800	-	-	29,250	-	-	25,200	-	400,200	44
Sunday 4pm - 6pm	134	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	126,000	-	-	-	5,500	4,500	3,500	2,500	1,500	3,000	56,700	-	-	-	-	57,750	54,000	11,700	-	-	44,000	-	25,200	-	395,850	44
	136	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	126,000	-	-	-	-	4,500	3,500	2,500	1,500	4,000	56,700	-	-	-	-	57,750	43,200	23,400	-	-	44,000	-	25,200	-	392,250	44
	138	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	110,250	18,750	-	-	-	-	3,500	2,500	1,500	5,000	56,700	-	-	-	-	57,750	32,400	35,100	-	-	44,000	-	-	14,000	381,450	44
	140	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	94,500	18,750	22,500	-	-	-	-	2,500	1,500	6,000	56,700	-	-	-	-	57,750	21,600	46,800	-	-	44,000	-	-	14,000	386,600	44
	142	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	78,750	18,750	22,500	26,250	-	-	-	-	1,500	7,000	56,700	-	-	-	-	48,125	24,300	58,500	-	-	44,000	-	-	14,000	400,375	44
	144	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	63,000	18,750	22,500	26,250	6,875	-	-	-	-	8,000	56,700	-	-	-	-	38,500	27,000	58,500	-	-	61,600	-	-	14,000	401,675	44
Monday 4am - 6am	146	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	47,250	18,750	22,500	26,250	6,875	5,625	-	-	-	7,000	56,700	-	-	-	-	28,875	40,500	58,500	-	-	17,600	37,500	-	-	373,925	42
	148	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	31,500	18,750	22,500	26,250	6,875	5,625	4,375	-	-	6,000	56,700	4,800	-	-	-	19,250	54,000	58,500	-	-	17,600	37,500	-	-	370,225	42
	150	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15,750	18,750	22,500	26,250	6,875	5,625	4,375	3,125	-	5,000	56,700	9,600	-	-	-	9,625	67,500	58,500	-	-	17,600	37,500	-	-	365,275	42
	152	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18,750	22,500	26,250	6,875	5,625	4,375	3,125	1,875	4,000	56,700	14,400	-	-	-	-	81,000	58,500	-	-	17,600	37,500	-	-	359,075	42
	154	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	22,500	26,250	6,875	5,625	4,375	3,125	1,875	4,250	56,700	19,200	-	-	-	-	81,000	58,500	-	-	17,600	-	31,500	-	339,375	42
	156	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	26,250	6,875	5,625	4,375	3,125	1,875	4,500	56,700	24,000	-	-	-	-	81,000	58,500	-	-	17,600	-	31,500	-	321,925	42
Monday 4pm - 6pm	158	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6,875	5,625	4,375	3,125	1,875	4,750	56,700	28,800	-	-	-	-	67,500	73,125	-	-	17,600	-	31,500	-	301,850	42
	160	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5,625	4,375	3,125	1,875	5,000	56,700	28,800	-	-	-	-	54,000	87,750	-	-	-	15,000	31,500	-	293,750	42
	162	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4,375	3,125	1,875	6,250	56,700	28,800	-	-	-	-	40,500	102,375	-	-	-	15,000	-	17,500	276,500	42
	164	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3,125	1,875	7,500	56,700	28,800	-	-	-	-	27,000	117,000	-	-	-	15,000	-	17,500	274,500	42
	166	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,875	8,750	56,700	24,000	5,600	-	-	-	13,500	119,925	12,600	-	-	15,000	-	17,500	275,450	42
	168	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10,000	56,700	19,200	11,200	-	-	-	-	108,225	25,200	-	22,000	-	12,600	17,500	282,625	42
Tuesday 4am - 6am		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		40

Contained discharge to biofilter

Worst case 24 hour snapshot

90,000

	Cycle Time	Tunnel Fill Venting	Levelling 0-2	Levelling 2-4	Levelling 4-6	Levelling 6-8	Levelling 8-10	Levelling 10-12	Levelling 12-14	Warm Up 0-2	Warm Up 2-4	Warm Up 4-6	Warm Up 6-8	Pasteurisation 0-2	Pasteurisation 2-4	Pasteurisation 4-6	Pasteurisation 6-8	Cooldown Conditioning 0-2	Cooldown Conditioning 2-4	Cooldown Conditioning 4-6	Cooldown Conditioning 6-8	Conditioning 1a	Conditioning 1b	Conditioning 1c	Conditioning 2	Cooldown Spawn a 0-2	Cooldown Spawn a 2-4	Cooldown Spawn a 4-6	Cooldown Spawn b 0-2	Cooldown Spawn b 2-4	Cooldown Spawn b 4-6	Cooldown Spawn b 6-8	Cooldown Spawn b 8-10	Cooldown Spawn b 10-32	Spawn Run 1a	Spawn Run 1b	Spawn Run 2a	Spawn Run 2b	Spawn Run 2c	Spawn Run 2d	Spawn Run 2e	Spawn Run 2f	Spawn Run 2g	Spawn Run 2h	Cooldown Shipout a	Cooldown Shipout b	Cooldown Shipout c	Cooldown Shipout d	Total OER	Number of Tunnels in Process	Running 24hr Avg OER
	+2 hrs	100% Fan	40% FAD, 60% Fan	50% FAD, 60% Fan	35% FAD, 60% Fan	20% FAD, 60% Fan	10% FAD, 60% Fan	25% FAD, 60% Fan	35% FAD, 60% Fan	30% FAD, 65% Fan	10% FAD, 65% Fan	15% FAD, 65% Fan	10% FAD, 65% Fan	20% FAD, 95% Fan	30% FAD, 95% Fan	20% FAD, 95% Fan	30% FAD, 95% Fan	20% FAD, 85% Fan	35% FAD, 85% Fan	40% FAD, 85% Fan	45% FAD, 85% Fan	45% FAD, 65% Fan	45% FAD, 55% Fan	45% FAD, 60% Fan	45% FAD, 70% Fan	50% FAD, 75% Fan	60% FAD, 75% Fan	70% FAD, 75% Fan	55% FAD, 25% Fan	45% FAD, 25% Fan	35% FAD, 25% Fan	25% FAD, 25% Fan	15% FAD, 25% Fan	10% FAD, 25% Fan	30% FAD, 35% Fan	30% FAD, 40% Fan	35% FAD, 40% Fan	35% FAD, 45% Fan	35% FAD, 50% Fan	35% FAD, 55% Fan	45% FAD, 60% Fan	45% FAD, 65% Fan	45% FAD, 70% Fan	45% FAD, 65% Fan	55% FAD, 80% Fan	50% FAD, 75% Fan	45% FAD, 70% Fan	35% FAD, 50% Fan	ou.m3/s	/50	ou.m3/s
Tuesday 4am - 6am	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	105	1,859	472	709	-	-	-	-	4,076	1,596	-	263	-	151	-	9,229	38	9,663
	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	90	1,859	511	946	-	-	-	-	3,582	2,128	-	263	-	151	-	9,528	39	9,614
	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	75	1,859	551	946	266	-	-	-	3,088	2,660	-	263	-	151	-	9,856	40	9,598
	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	60	1,859	590	946	532	-	-	-	3,088	2,660	-	263	-	-	84	10,080	41	9,605
	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	45	1,859	787	709	798	-	-	-	3,088	1,596	-	683	-	-	84	9,648	42	9,587
	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	1,859	983	473	1,064	-	-	-	3,088	1,596	-	683	-	-	84	9,859	43	9,596
Tuesday 4pm - 6pm	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15	1,859	1,180	236	1,330	-	-	-	3,088	1,596	-	683	-	-	84	10,070	44	9,632
	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,859	1,180	-	1,596	-	-	-	3,088	1,596	-	420	224	-	-	9,962	43	9,663
	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,859	1,180	-	1,596	-	-	-	3,088	1,596	-	420	224	-	-	9,962	43	9,709
	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,859	1,180	-	1,596	-	-	-	3,088	1,596	-	420	224	-	-	9,962	43	9,755
	22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,859	983	296	1,596	-	-	-	2,470	2,261	-	420	224	-	-	10,109	43	9,800
	24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,859	787	591	1,596	-	-	-	1,853	2,926	-	420	-	188	-	10,219	43	9,874
Wednesday 4am - 6am	26	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,859	590	887	1,596	-	-	-	1,235	3,591	-	-	358	188	-	10,304	44	9,963
	28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,859	393	1,182	1,596	-	-	-	618	4,256	-	-	358	188	-	10,450	45	10,040
	30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,859	197	1,182	1,929	-	-	-	-	3,325	1,482	-	358	188	-	10,519	46	10,095
	32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,859	-	1,182	2,261	-	-	-	-	3,325	1,482	-	358	-	105	10,572	47	10,136
	34	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	888	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,859	-	887	2,594	-	-	-	-	1,995	988	736	-	301	105	10,351	48	10,195
	36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	888	1,554	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,859	-	591	2,926	-	-	-	-	1,995	988	736	-	301	105	11,941	49	10,369
Wednesday 4pm - 6pm	38	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	888	1,554	1,776	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,859	-	296	2,993	296	-	-	-	1,995	988	736	-	301	105	13,783	50	10,678
	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	888	1,554	1,776	1,998	-	-	-	-	-	-	-	-	-	-	-	-	-	1,859	-	-	3,059	591	-	-	-	1,995	988	736	-	301	-	15,743	50	11,160
	42	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	888	1,554	1,776	1,998	1,079	-	-	-	-	-	-	-	-	-	-	-	-	1,859	-	-	2,793	887	-	-	-	1,995	988	736	-	-	167	16,718	50	11,723
	44	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	888	1,554	1,776	1,998	2,158	-	-	-	-	-	-	-	-	-	-	-	-	1,859	-	-	2,527	1,182	-	-	-	1,995	988	736	-	-	167	17,826	50	12,378
	46	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	888	1,554	1,776	1,998	3,237	-	-	-	-	-	-	-	-	-	-	-	-	1,859	-	-	2,261	1,478	-	-	-	1,995	988	736	-	-	167	18,935	50	13,113
	48	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	888	1,554	1,776	1,998	4,316	-	-	-	-	-	-	-	-	-	-	-	-	1,859	-	-	1,995	1,773	-	-	-	1,995	988	736	-	-	167	20,043	50	13,932
Thursday 4am - 6am	50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,554	1,776	1,998	4,316	913	-	-	-	-	-	-	-	-	-	-	-	1,859	-	-	1,995	1,773	-	-	-	1,995	988	-	627	-	-	19,793	48	14,723
	52	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,776	1,998	4,316	1,826	-	-	-	-	-	-	-	-	-	-	-	1,859	-	-	1,995	1,773	-	-	-	1,995	988	-	627	-	-	19,152	48	15,448
	54	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,998	4,316	2,739	-	-	-	-	-	-	-	-	-	-	-	1,859	-	-	1,995	1,773	-	-	-	-	2,841	-	627	-	-	18,147	48	16,084
	56	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4,316	3,652	-	-	-	-	-	-	-	-	-	-	-	1,859	-	-	1,995	1,773	-	-	-	-	2,841	-	627	-	-	17,062	48	16,624
	58	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,110	-	-	-	3,237	4,565	-	-	-	-	-	-	-	-	-	-	-	1,859	-	-	1,995	1,773	-	-	-	-	2,223	263	-	527	-	17,551	48	17,225
	60	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,110	1,942	-	-	2,158	5,478	-	-	-	-	-	-	-	-	-	-	-	1,859	-	-	1,995	1,773	-	-	-	-	2,223	263	-	527	-	19,327	48	17,840
Thursday 4pm - 6pm	62	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,110	1,942	2,219	-	1,079	6,391	-	-	-	-	-	-	-	-	-	-	-	1,859	-	-	1,663	2,143	-	-	-	-	2,223	263	-	527	-	21,417	48	18,476
	64	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,110	1,942	2,219	2,497	-	7,304	-	-	-	-	-	-	-	-	-	-	-	1,859	-	-	1,330	2,512	-	-	-	-	2,223	263	-	527	-	23,785	48	19,146
	66	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,110	1,942	2,219	2,497	1,349	7,304	-	-	-	-	-	-	-	-	-	-	-	1,859	-	-	998	2,882	-	-	-	-	2,223	263	-	-	293	24,937	48	19,831
	68	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,110	1,942	2,219	2,497	2,698	7,304	-	-	-	-	-	-	-	-	-	-	-	1,859	-	-	665	3,251	-	-	-	-	2,223	263	-	-	293	26,323	48	20,539
	70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,110	1,942	2,219	2,497	4,046	7,304	-	-	-	-	-	-	-	-	-	-	-	1,859	-	-	333	3,325	325	-	-	-	2,223	263	-	-	293	27,738	48	21,273
	72	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,110	1,942	2,219	2,497	5,395	7,304	-	-	-	-	-	-	-	-	-	-	-	1,859	-	-	-	3,399	650	-	-	-	2,223	263	-	-	293	29,153	48	22,032
Friday 4am - 6am	74	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,942	2,219	2,497	5,395	8,445	-	-	-	-	-	-	-	-	-	-	-	1,859	-	-	-	3,103	975	-	-	-	2,223	-	224	-	-	28,883	45	22,790
	76	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2,219	2,497	5,395	9,587	-	-	-	-	-	-	-	-	-	-	-	1,859	-	-	-	2,808	1,300	-	-	-	2,223	-	224	-	-	28,112	45	23,536
	78	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2,497	5,395	10,728	-	-	-	-	-	-	-	-	-	-	-	1,859	-	-	-	2,512	1,626	-	-	-	2,223	-	224	-	-	27,063	45	24,279
	80	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5,395	11,869	-	-	-	-	-	-	-	-	-	-	-	1,859	-	-	-	2,217	1,951	-	-	-	2,223	-	224	-	-	25,737	45	25,002
	82	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4,046	12,097	996	-	-	-	-	-	-	-	-	-	-	1,859	-	-	-	2,217	1,951	-	-	-	2,223	-	-	188	-	25,576	45	25,671
	84	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2,698	12,326	1,992	-	-	-	-	-	-	-	-	-	-	1,859	-	-	-	2,217	1,951	-	-	-	2,223	-	-	188	-	25,452	45	26,181
Friday 4pm - 6pm	86	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,349	12,554	2,988	-	-	-	-	-	-	-	-	-	-	1,859	-	-	-	2,217	1,951	-	-	-	2,223	-	-	188	-	25,327	45	26,507
	88	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12,782	3,984	-	-	-	-	-	-	-	-	-	-	1,859	-	-	-	2,217	1,951	-	-	-	2,223	-	-	188	-	25,203	45	26,625
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11,869	3,984	317	-	-	-	-	-	-	-	-	-	1,859	-	-	-	2,217	1,951	-	-	-	2,223	-	-	-	105	24,523	45	26,591
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10,956	3,984	634	-	-	-	-	-	-	-	-	-	1,859	-	-	-	2,217	1,951	-	-	-	2,223	-	-	-	105	23,928	45	26,391
	94	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10,043	3,984	951	-	-	-	-	-	-	-	-	-	1,859	-	-	-	1,847	2,357	-	-	-	2,223	-	-	-	105	23,369	45	26,027
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9,130	3,984	1,268	-	-	-	-	-	-	-	-	-	1,859	-	-	-	1,478	2,763	-	-	-	2,223	-	-	-	105	22,810	45	25,498
Saturday 4am - 6am	98	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9,130	2,988	1,586	-	-	-	-	-	-	-	-	-	1,859	-	-	-	1,108	3,170	-	-	-	2,223	-	-	-	-	22,063	44	24,930
	100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9,130	1,992	1,903	-	-	-	-	-	-	-	-	-	1,859	-	-	-	739	3,576	-	-	-	2,223	-	-	-	-	21,421	44	24,373
	102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9,130	996	2,220	-	-	-	-	-	-	-	-	-	1,859	-	-	-	369	3,983	-	-	-	2,223	-	-	-	-	20,779	44	23,849
	104	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9,130	-	2,537	-	-	-	-	-	-	-	-	-	1,859	-	-	-	-	4,389	-	-	-	2,223	-	-	-	-	20,137	44	23,382
	106	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7,989	1,245	2,537	-	-	-	-	-	-	-	-	-	1,859	-	-	-	-	4,389	-	-	-	2,223	-	-	-	-	20,241	44	22,938
	108	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6,848	2,490	2,537	-	-	-	-	-	-	-	-	-	1,859	-	-	-	-	4,389	-	-	-	2,223	-	-	-	-	20,345	44	22,512
Saturday 4pm - 6pm	110	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5,706	3,735	2,537	-	-	-	-	-	-	-	-	-	1,859	-	-	-	-	4,389	-	-	-	1,235	420	-	-	-	19,881	44	22,058
	112	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4,565	4,980	2,537	-	-	-	-	-	-	-	-	-	1,859	-	-	-	-	4,389	-	-	-	1,235	420	-	-	-	19,985	44	21,623
	114	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3,424	4,980	2,616	179	-	-	-	-	-	-	-	-	1,859	-	-	-	-	4,389	-	-	-	1,235	420	-	-	-	19,102	44	21,172
	116	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2,283	4,980	2,695	179	215	-	-	-	-	-	-	-	1,859	-	-	-	-	4,389	-	-	-	1,235	420	-	-	-	18,255	44	20,699
	118	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,141	4,980	2,775	179	215	251	-	-	-	-	-	-	1,859	-	-	-	-	4,064	456	-	-	1,235	420	-	-	-	17,575	44	20,216
	120	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4,980	2,854	179	215	251	66	-	-	-	-	-	1,859	-	-	-	-	3,739	912	-	-	1,235	420	-	-	-	16,709	44	19,708
Sunday 4am - 6am	122	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3,735	2,933	179	215	251	66	54	-	-	-	-	1,859	-	-	-	-	3,414	1,368	-	-	1,235	-	358	-	-	15,666	44	19,175
	124	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2,490	3,012	179	215	251	66	54	42	-	-	-	1,859	-	-	-	-	3,089	1,824	-	-	1,235	-	358	-	-	14,673	44	18,612
	126	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,245	3,092	179	215	251	66	54	42	30	-	-	1,859	-	-	-	-	2,763	2,280	-	-	1,235	-	358	-	-	13,668	44	18,020
	128	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3,171	179	215	251	66	54	42	30	18	-	1,859	-	-	-	-	2,438	2,736	-	-	1,235	-	358	-	-	12,651	44	17,396
	130	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3,171	-	215	251	66	54	42	30	18	12	1,859	-	-	-	-	2,438	2,736	-	-	1,235	-	-	301	-	12,427	44	16,745
	132	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3,171	-	-	251	66	54	42	30	18	24	1,859	-	-	-	-	2,438	2,736	-	-	1,235	-	-	301	-	12,224	44	16,068
Sunday 4pm - 6pm	134	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3,171	-	-	-	66	54	42	30	18	36	1,859	-	-	-	-	2,438	2,280	494	-	-	526	-	301	-	11,313	44	15,354
	136	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3,171	-	-	-	-	54	42	30	18	48	1,859	-	-	-	-	2,438	1,824	988	-	-	526	-	301	-	11,298	44	14,630
	138	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2,775	224	-	-	-	-	42	30	18	60	1,859	-	-	-	-	2,438	1,368	1,482	-	-	526	-	-	167	10,988	44	13,954
	140	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2,378	224	269	-	-	-	-	30	18	72	1,859	-	-	-	-	2,438	912	1,976	-	-	526	-	-	167	10,868	44	13,338
	142	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,982	224	269	314	-	-	-	-	18	84	1,859	-	-	-	-	2,032	1,026	2,470	-	-	526	-	-	167	10,969	44	12,788
	144	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,586	224	269	314	82	-	-	-	-	96	1,859	-	-	-	-	1,626	1,140	2,470	-	-	736	-	-	167	10,566	44	12,276
Monday 4am - 6am	146	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,189	224	269	314	82	67	-	-	-	84	1,859	-	-	-	-	1,219	1,710	2,470	-	-	210	448	-	-	10,144	42	11,816
	148	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	793	224	269	314	82	67	52	-	-	72	1,859	157	-	-	-	813	2,280	2,470	-	-	210	448	-	-	10,109	42	11,435
	150	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	396	224	269	314	82	67	52	37	-	60	1,859	315	-	-	-	406	2,850	2,470	-	-	210	448	-	-	10,059	42	11,135
	152	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	224	269	314	82	67	52	37	22	48	1,859	472	-	-	-	-	3,420	2,470	-	-	210	448	-	-	9,994	42	10,913
	154	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	269	314	82	67	52	37	22	51	1,859	629	-	-	-	-	3,420	2,470	-	-	210	-	376	-	9,859	42	10,699
	156	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	314	82	67	52	37	22	54	1,859	787	-	-	-	-	3,420	2,470	-	-	210	-	376	-	9,750	42	10,493
Monday 4pm - 6pm	158	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	82	67	52	37	22	57	1,859	944	-	-	-	-	2,850	3,088	-	-	210	-	376	-	9,644	42	10,354
	160	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	67	52	37	22	60	1,859	944	-	-	-	-	2,280	3,705	-	-	-	179	376	-	9,582	42	10,211
	162	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	52	37	22	75	1,859	944	-	-	-	-	1,710	4,323	-	-	-	179	-	209	9,410	42	10,080
	164	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	37	22	90	1,859	944	-	-	-	-	1,140	4,940	-	-	-	179	-	209	9,420	42	9,959
	166	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	22	105	1,859	787	236	-	-	-	570	5,064	532	-	-	179	-	209	9,562	42	9,842
	168	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	119	1,859	629	473	-	-	-	-	4,570	1,064	-	263	-	151	209	9,336	42	9,739
Tuesday 4am - 6am		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		40	

Contained discharge to biofilter

Worst case 24 hour snapshot

Tunnel discharges - Worst-case 24 hour snapshot of air flows (m^3/s)

Day	Hours	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	TOTAL
Thu	21, 22	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	1.2	1.2	1.2	1.2	1.2	1.2	1.9	1.9	1.9	1.9	1.9	1.9	3.3	3.3	1.9	0.0	0.0	49.1
	23, 24	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	1.2	1.2	1.2	1.2	1.2	1.2	1.9	1.9	1.9	1.9	1.9	1.9	3.3	3.3	1.9	0.0	0.0	49.1
Fri	1, 2	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	1.2	1.2	1.2	1.2	1.2	1.2	1.9	1.9	1.9	1.9	1.9	2.1	3.3	3.3	1.9	0.0	0.0	49.3
	3, 4	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	1.2	1.2	1.2	1.2	1.2	1.2	1.9	1.9	1.9	1.9	2.1	2.1	3.3	3.3	1.9	0.0	0.0	49.5
	5, 6	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	1.2	1.2	1.2	1.2	1.2	1.2	1.9	1.9	1.9	2.1	2.1	2.1	3.3	3.3	0.0	0.0	0.0	47.8
	7, 8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	1.2	1.2	1.2	1.2	1.2	1.2	1.9	1.9	2.1	2.1	2.1	2.1	3.3	3.3	0.0	0.0	0.0	47.9
	9, 10	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	1.2	1.2	1.2	1.2	1.2	1.2	1.9	2.1	2.1	2.1	2.1	2.1	3.3	3.3	0.0	0.0	0.0	48.1
	11, 12	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	1.2	1.2	1.2	1.2	1.2	1.2	2.1	2.1	2.1	2.1	2.1	2.1	3.3	3.3	0.0	0.0	0.0	48.3
	13, 14	2.8	2.8	2.8	2.8	2.8	2.8	2.8	3.0	1.2	1.2	1.2	1.2	1.2	1.2	2.1	2.1	2.1	2.1	2.1	2.1	3.3	3.3	0.0	0.0	0.0	48.6
	15, 16	2.8	2.8	2.8	2.8	2.8	2.8	3.0	3.0	1.2	1.2	1.2	1.2	1.2	1.2	2.1	2.1	2.1	2.1	2.1	2.1	3.3	3.3	0.0	0.0	0.0	48.8
	17, 18	2.8	2.8	2.8	2.8	2.8	3.0	3.0	3.0	1.2	1.2	1.2	1.2	1.2	1.2	2.1	2.1	2.1	2.1	2.1	2.1	3.3	3.3	0.0	0.0	0.0	49.1
	19, 20	2.8	2.8	2.8	2.8	3.0	3.0	3.0	3.0	1.2	1.2	1.2	1.2	1.2	1.2	2.1	2.1	2.1	2.1	2.1	2.1	3.3	3.3	0.0	0.0	0.0	49.3
Day	Hours	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	
Thu	21, 22	4.0	2.6	4.0	2.4	4.1	4.7	5.3	4.1	1.5	1.5	1.5	1.5	1.5	1.5	2.2	2.2	2.2	2.4	2.4	2.4	4.1	4.1	6.1	2.4	2.4	TOTAL
	23, 24	2.6	4.0	2.4	4.1	4.7	5.3	4.1	4.1	1.5	1.5	1.5	1.5	1.5	1.5	2.2	2.2	2.4	2.4	2.4	2.4	4.1	4.1	6.1	2.4	2.4	73.2
Fri	1, 2	4.0	2.4	4.1	4.7	5.3	4.1	4.1	4.1	1.5	1.5	1.5	1.5	1.5	1.5	2.2	2.4	2.4	2.4	2.4	2.4	4.1	4.1	6.1	2.4	2.4	74.9
	3, 4	2.4	4.1	4.7	5.3	4.1	4.1	4.1	4.1	1.5	1.5	1.5	1.5	1.5	1.5	2.4	2.4	2.4	2.4	2.4	2.4	4.1	4.1	6.1	2.4	2.4	75.2
	5, 6	4.1	4.7	5.3	4.1	4.1	4.1	4.1	3.4	1.5	1.5	1.5	1.5	1.5	1.5	2.4	2.4	2.4	2.4	2.4	2.4	4.1	4.1	5.2	0.0	0.0	70.5
	7, 8	4.7	5.3	4.1	4.1	4.1	4.1	3.4	3.4	1.5	1.5	1.5	1.5	1.5	1.5	2.4	2.4	2.4	2.4	2.4	2.4	4.1	4.1	5.2	0.0	0.0	69.8
	9, 10	5.3	4.1	4.1	4.1	4.1	3.4	3.4	3.4	1.5	1.5	1.5	1.5	1.5	1.5	2.4	2.4	2.4	2.4	2.4	2.4	4.1	4.1	5.2	0.0	0.0	68.5
	11, 12	4.1	4.1	4.1	4.1	3.4	3.4	3.4	3.4	1.5	1.5	1.5	1.5	1.5	1.5	2.4	2.4	2.4	2.4	2.4	2.4	4.1	4.1	5.2	0.0	0.0	66.7
	13, 14	4.1	4.1	4.1	3.4	3.4	3.4	3.4	3.4	1.5	1.5	1.5	1.5	1.5	1.5	2.4	2.4	2.4	2.4	2.4	2.4	4.1	4.1	4.4	0.0	0.0	65.2
	15, 16	4.1	4.1	3.4	3.4	3.4	3.4	3.4	3.4	1.5	1.5	1.5	1.5	1.5	1.5	2.4	2.4	2.4	2.4	2.4	2.4	4.1	4.1	4.4	0.0	0.0	64.6
	17, 18	4.1	3.4	3.4	3.4	3.4	3.4	3.4	3.4	1.5	1.5	1.5	1.5	1.5	1.5	2.4	2.4	2.4	2.4	2.4	2.4	4.1	4.1	4.4	0.0	0.0	64.0
	19, 20	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	1.5	1.5	1.5	1.5	1.5	1.5	2.4	2.4	2.4	2.4	2.4	2.4	4.1	4.1	4.4	0.0	0.0	63.3

ou	
0	Pasturisation (contained)
470	Cool-down (conditioning)
332	Conditioning 1
118	Spawn Run 1
152	Spawn Run 2
43	Cool-down (spawn/shipout)

Tunnel discharges - Worst-case 24 hour snapshot of odour emission rates (ou.m3/s)

Day	Hours	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Thu	21, 22	913	913	913	913	913	913	913	913	138	138	138	138	138	138	296	296	296	296	296	296	494	494	84	0	0
	23, 24	913	913	913	913	913	913	913	913	138	138	138	138	138	138	296	296	296	296	296	296	494	494	84	0	0
Fri	1, 2	913	913	913	913	913	913	913	913	138	138	138	138	138	138	296	296	296	296	296	325	494	494	84	0	0
	3, 4	913	913	913	913	913	913	913	913	138	138	138	138	138	138	296	296	296	296	325	325	494	494	84	0	0
	5, 6	913	913	913	913	913	913	913	913	138	138	138	138	138	138	296	296	296	325	325	325	494	494	0	0	0
	7, 8	913	913	913	913	913	913	913	913	138	138	138	138	138	138	296	296	325	325	325	325	494	494	0	0	0
	9, 10	913	913	913	913	913	913	913	913	138	138	138	138	138	138	296	325	325	325	325	325	494	494	0	0	0
	11, 12	913	913	913	913	913	913	913	913	138	138	138	138	138	138	325	325	325	325	325	325	494	494	0	0	0
	13, 14	913	913	913	913	913	913	913	996	138	138	138	138	138	138	325	325	325	325	325	325	494	494	0	0	0
	15, 16	913	913	913	913	913	913	996	996	138	138	138	138	138	138	325	325	325	325	325	325	494	494	0	0	0
	17, 18	913	913	913	913	913	996	996	996	138	138	138	138	138	138	325	325	325	325	325	325	494	494	0	0	0
	19, 20	913	913	913	913	996	996	996	996	138	138	138	138	138	138	325	325	325	325	325	325	494	494	0	0	0

Day	Hours	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
Thu	21, 22	0	0	0	1,110	1,942	2,219	2,497	1,349	172	172	172	172	172	172	333	333	333	369	369	369	618	618	263	105	105
	23, 24	0	0	1,110	1,942	2,219	2,497	1,349	1,349	172	172	172	172	172	172	333	333	369	369	369	369	618	618	263	105	105
Fri	1, 2	0	1,110	1,942	2,219	2,497	1,349	1,349	1,349	172	172	172	172	172	172	333	369	369	369	369	369	618	618	263	105	105
	3, 4	1,110	1,942	2,219	2,497	1,349	1,349	1,349	1,349	172	172	172	172	172	172	369	369	369	369	369	369	618	618	263	105	105
	5, 6	1,942	2,219	2,497	1,349	1,349	1,349	1,349	1,141	172	172	172	172	172	172	369	369	369	369	369	369	618	618	224	0	0
	7, 8	2,219	2,497	1,349	1,349	1,349	1,349	1,141	1,141	172	172	172	172	172	172	369	369	369	369	369	369	618	618	224	0	0
	9, 10	2,497	1,349	1,349	1,349	1,349	1,141	1,141	1,141	172	172	172	172	172	172	369	369	369	369	369	369	618	618	224	0	0
	11, 12	1,349	1,349	1,349	1,349	1,141	1,141	1,141	1,141	172	172	172	172	172	172	369	369	369	369	369	369	618	618	224	0	0
	13, 14	1,349	1,349	1,349	1,141	1,141	1,141	1,141	1,141	172	172	172	172	172	172	369	369	369	369	369	369	618	618	188	0	0
	15, 16	1,349	1,349	1,141	1,141	1,141	1,141	1,141	1,141	172	172	172	172	172	172	369	369	369	369	369	369	618	618	188	0	0
	17, 18	1,349	1,141	1,141	1,141	1,141	1,141	1,141	1,141	172	172	172	172	172	172	369	369	369	369	369	369	618	618	188	0	0
	19, 20	1,141	1,141	1,141	1,141	1,141	1,141	1,141	1,141	172	172	172	172	172	172	369	369	369	369	369	369	618	618	188	0	0

ou	
0	Pasturisation (contained)
470	Cool-down (conditioning)
332	Conditioning 1
118	Spawn Run 1
152	Spawn Run 2
43	Cool-down (spawn/shipout)

Day	Hours	TOTAL
Thu	21, 22	24,937
	23, 24	26,323
Fri	1, 2	27,738
	3, 4	29,153
	5, 6	28,883
	7, 8	28,112
	9, 10	27,063
	11, 12	25,737
	13, 14	25,576
	15, 16	25,452
	17, 18	25,327
	19, 20	25,203

ASSESSMENT REPORT

Elf Mushroom Farm and Substrate Plant Project
Modified Odour Management System
Section 75W Modification - MP 08_0225 MOD 1 and CP 08_0225 MOD 1

1. INTRODUCTION

1.1 Background

This report is an assessment of a request to modify the Project Approval and Concept Plan (MP 08_0225 MOD 1 and CP 08_0225 MOD 1) for a mushroom farm at Londonderry and substrate plant at Mulgrave in the Hawkesbury and Penrith local government areas, respectively. The request has been lodged by Elf Farm Supplies (the Proponent) pursuant to section 75W of the *Environmental Planning and Assessment Act 1979* (EP&A Act). It seeks to modify the approved odour management system at the substrate plant.

Elf Mushrooms and Elf Farm Supplies operate under the umbrella of the Tolson Group, a family owned company that has been producing mushrooms in the Western Sydney area for over 40 years. The Group currently operates three mushroom farms at Vineyard, Londonderry and Glossodia, a packing and distribution company (at its Vineyard mushroom farm) and a mushroom substrate plant at Mulgrave in the Hawkesbury local government area.

1.2 Subject Site operations

The substrate plant at Mulgrave has been in operation since 1981 under a number of consents issued by Hawkesbury City Council (Council) and more recently, an approval by the Minister for Planning 08_0255 granted on 11 January 2012. The Proponent is in the process of surrendering the Council consents in accordance with the Minister's approval. Mushroom substrate is the nutrient rich growing medium used by mushroom farms for growing mushrooms. Raw materials used in substrate manufacture include wheaten straw, water, poultry manure, other recycled agricultural products, gypsum and dry stable bedding. Mushroom substrate production takes approximately six weeks, as described in **Table 1** below.

Table 1: *Stages of mushroom substrate production*

Stage	Process description
1. Bale Wetting	Straw bales are sprayed with water in the bale wetting area for several days to remove the waxy layer and increase water content. Water draining from the bales is collected, filtered, aerated and re-circulated via the sprays.
2. Pre-Wet	The wet straw bales are laid out in rows in the pre-wet building and blended with raw materials and water.
3. Phase 1 Composting	The pre-wet material is placed into a Phase 1 tunnel (a concrete structure some 50 m long by 8 m wide). The material must remain above 75º Celsius for at least 90 hours to enable the process to reach completion. Part way through the process, the tunnel is emptied and the contents placed in the hopper where water is added uniformly and the mix returned by conveyor to an empty tunnel. The finished Phase 1 product is placed in the hopper so that the conveyor system

	can either load it to trucks for delivery as Phase 1 substrate or transfer it to the Phase 2/3 tunnel building for further processing.
4. Phase 2 Processing	Phase 2 is a pasteurisation process undertaken at high temperature on finished compost to kill unwanted spores and organisms.
5. Phase 3 Processing	Phase 3 is the initial growth of mushroom spawn from introduced mycelium, undertaken in controlled atmospheric conditions.

1.3 Site History

1.3.1 Concept Plan approval

On 11 January 2012, the Minister approved the Concept Plan for the expansion of the substrate plant. The Concept Plan approval facilitated the continued use of the site and its expansion as the relevant local environmental plan at the time of the approval (the *Hawkesbury Local Environment Plan 1989* (LEP 1989)) did not permit the substrate plant in the Rural Living zone.

The LEP 1989 has since been repealed and the portion of the Mulgrave site containing the substrate plant is now zoned Light Industrial IN2 in the *Hawkesbury Local Environmental Plan 2011* (LEP 2011) and is permissible with consent.

1.3.2 Project approval

On 11 January 2012, the Minister concurrently approved a project application for the staged expansion of the processing capacity of the substrate plant including:

- extension of the pre-wet building;
- two additional Phase 1 tunnels;
- two storage sheds for baled straw;
- a second bale wetting area;
- a second Phase 2/3 tunnel building containing 22 tunnels and a storage tunnel;
- a second bio-scrubber with chimney dedicated to treating air exhausted from the pre-wet building; and
- other alterations including a conveyer to transport the pre-wet material to the Phase 1 tunnels, access, parking and drainage systems (see **Figure 1**).

The project consists of 3 stages: the principal effect of stage 1 is to increase the approved production of Phase 1 substrate from 1,000 to 1,600 tonnes per week. Subsequent stages 2 and 3 enable the Proponent to update the factory and stage the increase in production to 2,400 and then 3,200 tonnes of Phase 1 substrate per week.

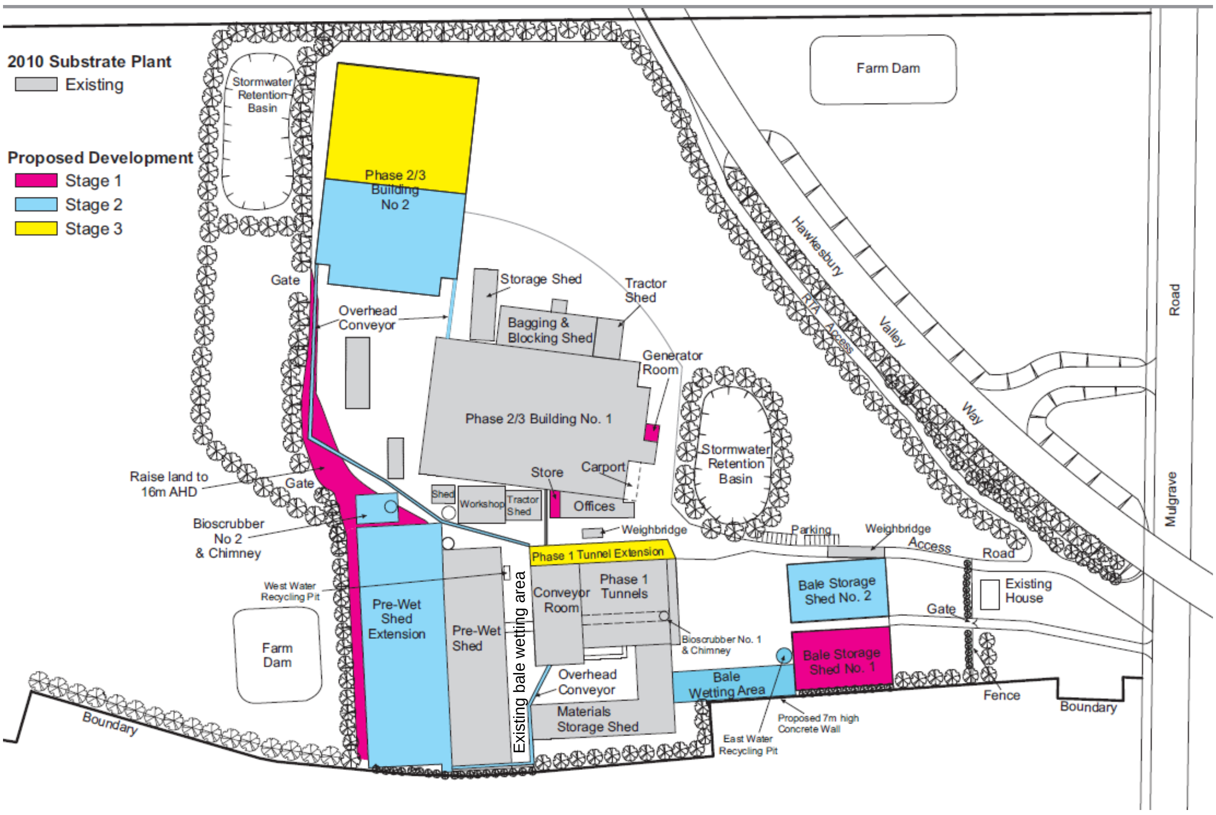


Figure 1: **Approved Project, Substrate Plant**

1.3.3 Odour management

One of the key issues identified in the original 2011 Ministerial assessment was odour. The production of mushroom substrate is known to be odourous and requires careful management to ensure offensive odours are not emitted off-site.

The closest residential areas are scattered houses in Mulgrave approximately 200 metres (m) to the south-west and a residential housing estate at Windsor approximately 400m to the west. Since operation commenced in 1981, the facility has received numerous odour complaints, however, the Proponent has attributed many of these to other land uses in the vicinity including the sewage treatment plant (see **Figure 2**).

Odour management was addressed by the Project Approval through a number of stringent conditions restricting the incremental increase in production of substrate until satisfactory performance had been demonstrated at each stage. This translated to the requirement to prepare and implement an odour management plan and undertake an independent odour audit prior to applying to the (then) Director-General for approval to increase production. Other identified odour management measures included:

- compliance with the emission limits contained in the EPL for the site;
- storage of the stable bedding in the expanded pre-wet shed extension building;
- complete enclosure of the chicken manure stockpile (if needed); and
- complete enclosure of the bale wetting area (if needed).

Under the existing operation, the main component of the odour management system is the bioscrubber no. 1, approved by Council as part of Council's original consents for the facility. Bioscrubber no. 2, which was approved as part of the Minister's approval (see **Figure 2**), has not been constructed.

On 10 April 2013, the Proponent sought approval to increase Phase 1 substrate production to 1,600 tonnes per week (stage 1) in accordance with the conditions of the Minister's approval. The Proponent completed all the requirements of the approval, including the independent odour audit and Odour Management Plan, to allow an increase in production and as such, the request was approved on 11 July 2013.

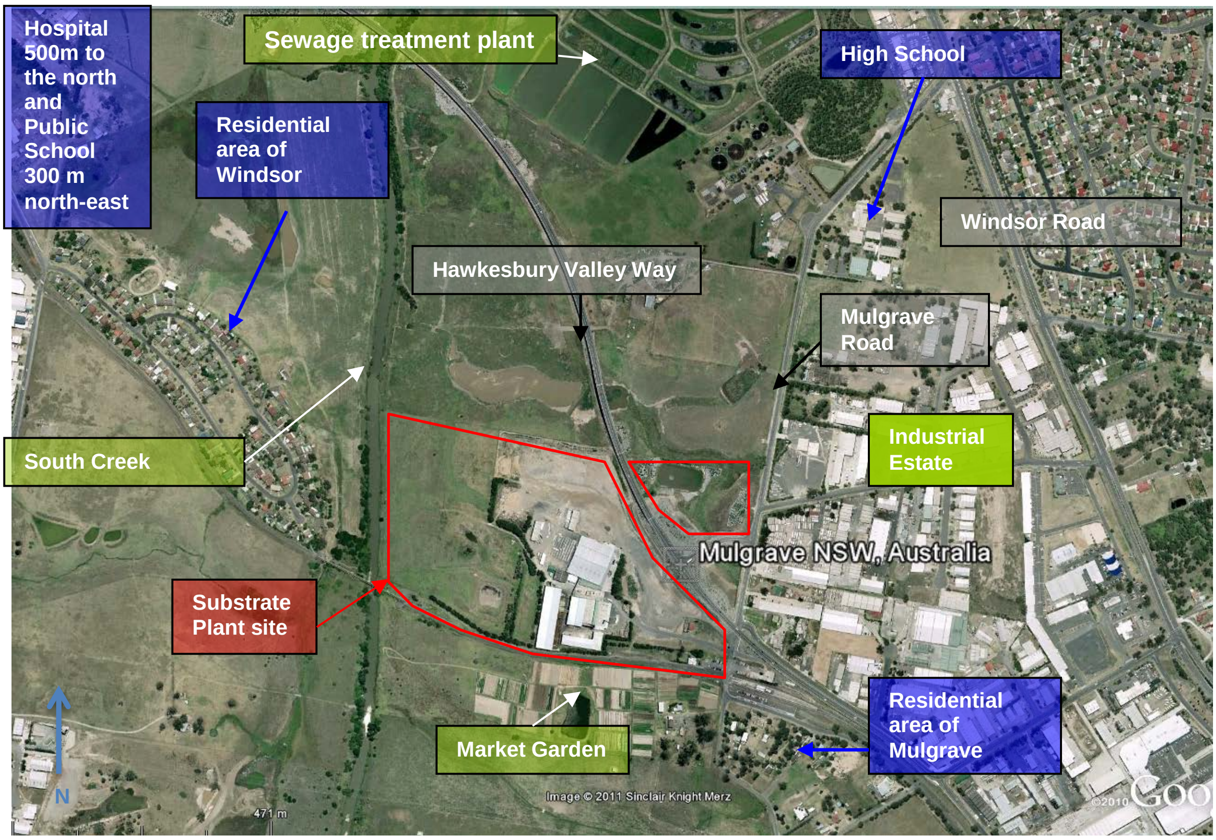


Figure 2: Site location

Although the Proponent advised that air samples taken from the bioscrubber no.1 chimney in accordance with the plant's EPL have demonstrated that the bioscrubber continues to operate in compliance with emission limits, a number of odour complaints have been made by the public. After a series of odour surveys in 2013 and 2014 as well as a report from an independent expert, the Environment Protection Authority (EPA) identified that the main source of odour was air escaping from non-treated sources (fugitive emissions) rather than through the bioscrubber chimney. To address this, the EPA placed three pollution reduction programs (PRPs) on Elf Farm Supplies' licence which required changes to be made to prevent fugitive emissions, including:

PRP 1

- identifying and sealing all potential fugitive odour emission points on the pre-wet building, Phase 1 building, Phase 2 and 3 building, manure storage building, and all external conveyors;

PRP 2

- ensuring negative pressure in pre-wet and Phase 1 buildings under all operating conditions and treatment of air discharges; and
- enclosing the activities of receiving, handling and storing manures, mixing the manure and wetted bale brew and treating emissions from these activities.

PRP 3

The third PRP required the establishment of a community consultative committee (CCC) for a period of two years and implementation of an odour complaints and feedback management system.

In response, the Proponent has undertaken a number of minor repairs to seal all potential fugitive odour emission points in conjunction with some operational procedure changes to address the first PRP. A CCC has been operating since December 2014 which addressed the third PRP.

In order to address the remaining PRP requirements, the Proponent has lodged this modification request to the Minister's approval.

2. PROPOSED MODIFICATION

As part of its commitment to monitor worldwide developments in controlling odour from substrate production, the Proponent has identified recent developments, particularly in Western Europe, which have demonstrated better odour management performance outcomes. These advancements include:

- pre-wet processing in tunnels which allows more effective odour management than using windrows in a large shed; and
- ammonia scrubbers and biofilter beds which are more effective at odour removal than a bioscrubber.

Following this and in response to the EPA's PRPs, on 27 February 2015, the Proponent lodged a modification request under Section 75W of the EP&A Act seeking to allow:

- the pre-wet phase of the operation to be undertaken in tunnels instead of in a pre-wet building;
- the installation of an emissions treatment plant comprising six ammonia scrubbers and a biofilter instead of the existing bioscrubber, and the approved second bioscrubber and chimney stack;
- an extension of both the existing Phase 2/3 building and the approved second Phase 2/3 building by approximately 10 m (increasing the number of tunnels from 22 to 25) to allow a longer residence time of substrate in Phase 2/3 processing; and
- the existing pre-wet shed to be used for bale wetting and stable bedding operations.

The effect of the modification would be to change the method of processing substrate in the pre-wet stage, improve the technology and capability of the odour management system and other minor operational changes to improve the quality of substrate produced.

The proposed changes would mean that, in the longer term, all process operations, including the transfer of compost material throughout the plant, would be undertaken in enclosed buildings and covered conveyors. However, the post 36 hour Phase 2/3 emissions would be vented directly to the atmosphere as the Proponent considers that these emissions are not odourous (see Section 5.2 for a more detailed discussion).

Further details about components of the proposed modification are described below.

2.1 Pre-wet composting

Currently, pre-wet material is stored in a large shed which is designed to be kept under negative pressure and emissions ducted to the bioscrubber. However, the Proponent advises that there have been operational and engineering challenges in maintaining this pressure.

As such, the Proponent now proposes to move the pre-wet composting into a new structure comprising a series of concrete tunnels. The structure would have similar characteristics to the existing Phase 1 tunnel structure on the site.

In particular, the new pre-wet structure would comprise 10 pre-wet tunnels, each 50 metres long and eight metres wide. The tunnels would be arranged in a bank of six at the southern end and four at the northern end of the structure. A working-hall would separate the banks of tunnels. At each end, a plant room would enclose machinery including ammonia scrubbers, tanks, fans and pumps. A four metre wide service corridor along the eastern side of the tunnel structure adjoining the existing pre-wet building would house a conveyor and miscellaneous rooms for storage and operations (see **Figure 3**).

2.2 Odour Emissions Plant

Primary air treatment would occur via six ammonia scrubbers operating in parallel, with the biofilter providing the secondary treatment.

The ammonia scrubbers, which would be located within the plant room at each end of the pre-wet tunnel structure, would treat and cool the exhaust air. Liquid would be continuously sprayed into the exhaust air stream passing through the biofilter. The liquid is acid dosed as required to maintain the correct pH to keep the ammonia in solution. Ammonium sulfate solution would be created as part of the neutralising reaction and would be recovered either for re-use in the composting process or sale as a fertiliser.

The biofilter, would replace both the existing bioscrubber and chimney and the not-yet-constructed second bio-stack and chimney. The biofilter would consist of a 2,800 m^2 open swimming pool type structure with concrete sides extending approximately two metres above ground level. Ductwork, partly above and partly below ground, would convey exhaust air from the pre-wet facility and distribute it across the base of the biofilter structure. The biofilter would be filled with organic material including shredded tree stumps, trunks and bark that have proven effective in removing odour from the exhaust air.

While the Proponent has identified the option of a second biofilter as a contingency measure, it does not form part of the proposed modification to the project approval.

The existing bioscrubber would be decommissioned and at this stage mothballed, following completion and commissioning of the works associated with the modification.

Figure 3 shows the footprint of the proposed pre-wet tunnel structure and biofilter.

Figure 3: Proposed Pre-wet Tunnel Structure and Biofilter (inset approved biofilter and pre-wet shed overlaid with proposed modification)

2.3 Phase 2/3 processing

The additional tunnels would allow a longer residence time for the substrate, being an additional day for Phase 2 (pasteurisation) and an additional three days for Phase 3 (initial mushroom spawn). The Proponent advised that additional processing time results in higher yield and improved quality of the mushrooms at the farms.

2.3 Additional minor modifications

The Proponent is seeking the following minor modifications to enable the above changes to operate effectively:

- rearrangement of approved conveyors and construction of additional conveyors see **Figure 4**;
- decommissioning of the bale wetting area and relocation of the bale wetting and the stable bedding area into the existing pre-wet shed. The approved second external bale wetting area and associated water recycling pit would not be constructed;
- enclosure of the raw materials storage area, fit-out with air extraction and connection to the existing pre-wet shed to allow loaders to transport chicken manure between buildings for blending internally;
- installation of a straw bale breaking line in the existing pre-wet shed (proposed bale wetting shed);
- installation of extraction ductwork to deliver all extracted air to the proposed biofilter;
- installation of cooling towers to regulate the exhaust air temperature in the ammonia scrubbers and recycle the heat energy back into the two working halls;
- an electrical switch room and generator room along the eastern wall of the new Phase 2/3 building;
- storage of up to 20 kilolitres of sulfuric acid in tanks;
- generation of ammonium sulfate for sale as a fertiliser;
- landscaping to restrict views from the west and from the Blacktown to Richmond railway line; and
- the ongoing use of the area of the proposed biofilter which has been filled to a depth of seven metres.

Construction would be undertaken in stages as shown in **Figure 4**. All components of the modification are expected to be constructed over a period of 18 months.

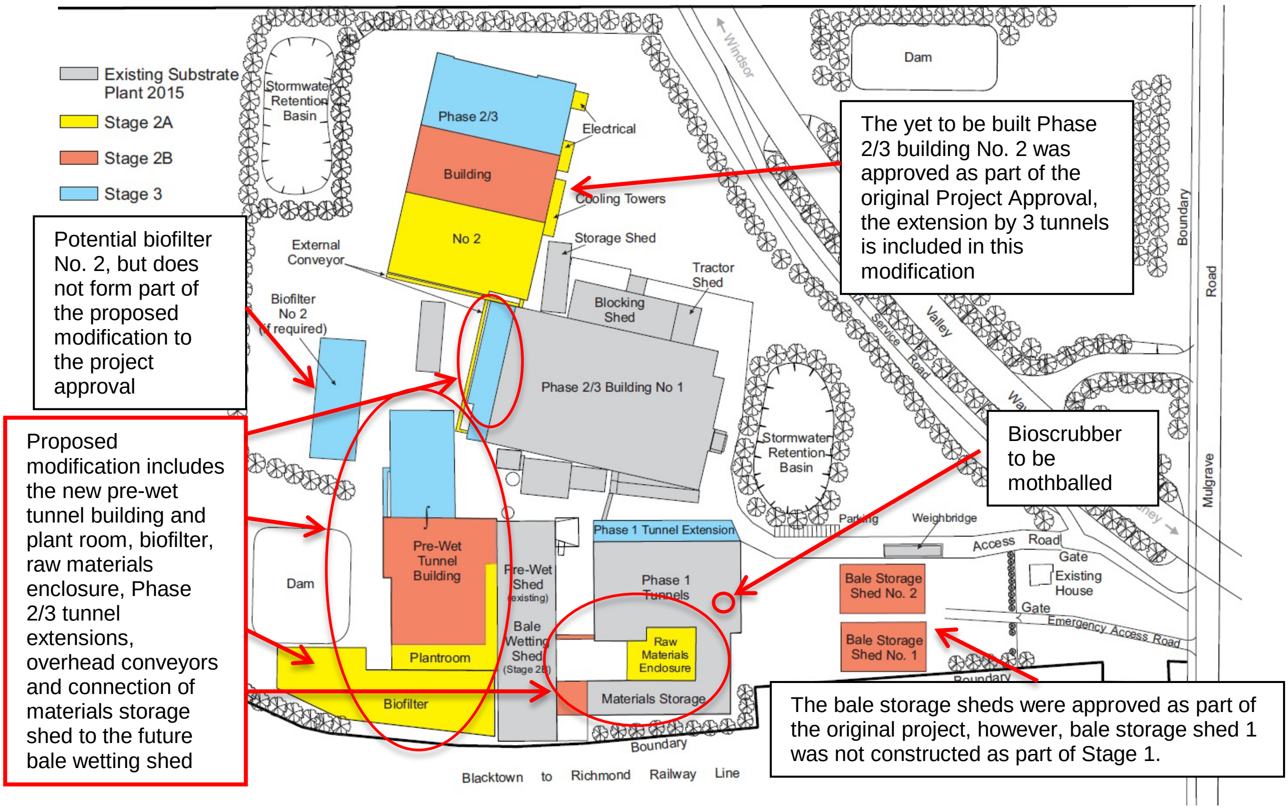


Figure 4: **Proposed modification**

2.4 Modification to the Concept Plan

Under the *Hawkesbury Local Environmental Plan 2012* (2012 LEP), the mushroom substrate site is zoned Light Industrial IN2 and substrate production is permissible with consent. However, the site of the proposed new biofilter is zoned RU4 Primary Production Small Lots (see **Figure 5**). Rural Industries are not permissible in the RU4 zone. As such, the Proponent is seeking to modify the Concept Plan approval to permit the use of the biofilter for substrate production in the RU4 zone.

The Proponent is also seeking to include a second biofilter in the footprint of the modification to the Concept Plan (see **Figure 4**). This biofilter would also be located in the RU4 zone. However, as the second biofilter is not included in the proposed modification to the project approval, construction and operation would require separate approval.

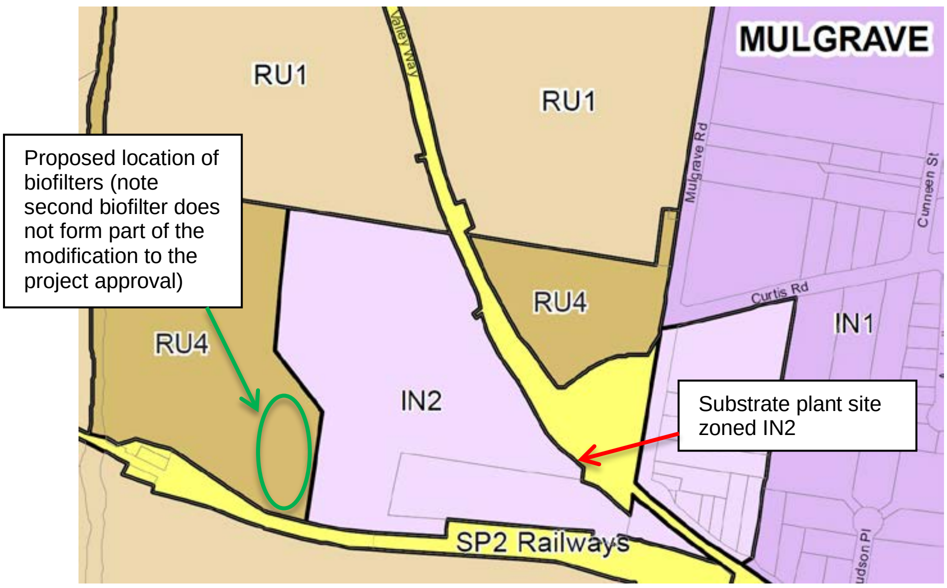


Figure 5: **Zoning Map**

3. STATUTORY CONTEXT

3.1 Modification request

The approval for the Mushroom Farm and Substrate Plant was granted under Part 3A of the EP&A Act. Although Part 3A was repealed on 1 October 2011, the project remains a 'transitional Part 3A project' under Schedule 6A of the EP&A Act. Consequently, the proposed modification is to be determined under section 75W of the Act.

Pursuant to section 75W(2) of the EP&A Act, the proponent may request the Minister to modify the concept plan and project approval. Any request is to be lodged with the Secretary and a copy of this modification request may be found at **Appendix A**.

Section 75W(3) of the EP&A Act also provides that the Secretary may notify the proponent of environmental assessment requirements (SEARs) with respect to the proposed modification. SEARs were issued on 20 October 2014.

Under Section 75W(4) of the EP&A Act, the Minister may modify the approval (with or without conditions) or disapprove the modification. The following report outlines the Department's assessment of the modification request and recommendation.

3.2 Approval Authority

On 14 September 2011, the Minister delegated the functions to determine section 75W modification requests to the Planning Assessment Commission (the Commission) where reportable political donation disclosures have been made under section 147 of the EP&A Act.

Under the Ministerial Delegation, the Commission can determine the s75W modification request as a reportable political donation disclosure statement was made by the Proponent.

4. CONSULTATION

Under Section 75W of the EP&A Act, the Department is not required to formally notify or exhibit the request. However, due to the potential public interest in the proposal, the Department exhibited the request from 26 March 2015 to 30 April 2015:

- on the Department's website;
- at the Department's information centre; and
- at Hawkesbury City Council's offices.

The Department advertised the public exhibition in the Rouse Hill Times and Hawkesbury Courier, and notified the Environment Protection Authority (EPA) and Council.

In addition, the Department also notified those people that made a submission on the original 2011 application.

During the exhibition period, the Department received six submissions on the proposal: four from the general public, one from the EPA and one from Hawkesbury City Council (see **Appendix B**). Neither Council nor the EPA objected to the request, however, all four general public submissions objected.

4.1 Public Authority Submissions

The **EPA** did not object to the proposal, however, it:

- advised that the information provided was insufficient to allow an adequate assessment of the environmental impacts of the proposal, particularly in relation to the odour impact assessment;

- requested the assessment be updated to use more stringent impact assessment criteria of 2 odour units (OU) for all receivers and to demonstrate that the risk of adverse odour impacts has been minimised; and
- sought clarification on the noise limits sought as part of the modification, noting there may be a non-compliance.

The Department requested that the Proponent address these issues as part of its Response to Submissions.

Council did not object to the proposal, however, it raised concerns over the lack of detail within the site plans making it difficult to assess visual impacts. It also noted that:
- permissibility issues can be addressed via the modification; and
- Fire and Rescue NSW might need to be involved with any future Construction Certificates as the development is subject to a number of alternative solutions to meet the requirements of the Building Code of Australia.

4.2 General Public Submissions

Four public submissions were received during the exhibition of the modification. All four objected to the proposal. Issues raised include concerns over:
- odour;
- the potential increase in production capacity;
- the use of 5 and 2 OU in the odour assessment rather than no odour beyond the boundary;
- permissibility;
- storage of sulfuric acid;
- the removal of the bioscrubber;
- existing night-time noise;
- potential breaches of occupational health and safety; and
- lack of information as to the success of similar operations elsewhere.

The Department has reviewed the concerns raised and is satisfied that:
- the project approval is staged, giving an ultimate production capacity limit of 3,200 tonnes of Phase 1 substrate per week. The modification is not seeking an increase in capacity. Any capacity increase sought by the Proponent would be in accordance with the conditions of the project approval;
- issues relating to permissibility have been addressed in Section 2.4;
- potential breaches of NSW Work Health and Safety legislation is a matter for SafeWork NSW and is outside the scope of this assessment. Notwithstanding, the Proponent has advised that the designed maximum airflow to the biofilter has been based on the requirement to achieve an adequate level of negative pressure inside the processing areas as well as to maintain safe working conditions for operators; and
- modelling has shown that the bioscrubber would not be required once the odour emission control plant is commissioned, however, it would be mothballed rather than removed.

4.3 Response to Submissions

The Proponent lodged a response to submissions report (RTS) on 29 August 2015 to address the issues raised by the EPA, Council and the public. The RTS included:
- an amended odour assessment which provided additional modelling scenarios to show existing baseline conditions, cumulative impacts as well as an assessment against the more stringent 2 OU assessment criteria;
- revised plans;
- scoping and design information for the biofilter;
- a revised Statement of Commitments; and
- aerial images and statistics for European substrate plants with biofilters.

Both the EPA and the Department sought further information from the Proponent regarding this response, including further information on the operation of the biofilter and management of odour and the placement of fill in the location of the proposed biofilter. All outstanding information was provided on 25 January 2016.

The EPA advised it was satisfied that the modification could be approved subject to a number of stringent conditions, primarily relating to the operation of the biofilter and management of odour. The EPA also confirmed it was satisfied that noise from the modified plant would be acceptable.

The EPA's recommended conditions included requirements to:

- maintain and operate the site to minimise the emission of dust;
- carry out odour generating activities on the premises within fully enclosed processing areas;
- engage an independent odour control specialist to review the design of the odour emissions plant and to certify that the 'as built' odour emissions plant has been constructed in accordance with the final detailed design;
- operate and maintain the odour emissions plant in accordance with the manufacturer's specifications, the facility's odour management plan, and as required to maintain effective emission control efficiency of the system to achieve no offensive odour;
- prepare and implement an updated Odour Management Plan;
- construct new structures to prevent corrosion from the internal atmosphere; and
- amend the existing conditions such that there is no increase in throughput until odour control works are validated and approved by EPA.

Two further public submissions were received in response to the RTS report and raised concerns over the following:

- the efficiency of the biofilter, impact of odour from the biofilter and need to discharge through a stack;
- venting of the post 36 hour Phase 2 and 3 emissions;
- handling of sulfuric acid;
- potential health impacts of air emissions, including impacts from the chemical constituents of the air emissions;
- concerns over the potential lag between installation and operation;
- failure to include the hospital and school as receptors in the odour modelling;
- identified exceedances of 2 OU;
- lack of information about the impact of short-term fugitive emissions; and
- lack of discussion on the success of biofilters in Europe.

The Department has reviewed the concerns raised and notes that:

- the Proponent has advised that if approved, the new plant would be constructed and commissioned as soon as possible;
- offensive odours can cause non-specific symptoms such as headaches, nausea and mood alteration which may be associated with the current operation of the substrate plant. As the modification is predicted to achieve a 90% reduction in existing emissions, the aforementioned health impacts are unlikely to exist following the odour management system upgrade;
- the EPA has advised the Department that it is satisfied with the Proponent's assessment of short-term emissions and that the Proponent has installed fast shut opening and closing doors. Short-term fugitive emissions from the opening of doors are unlikely to contribute to odour emissions;
- both the Department and the EPA carefully considered the Proponent's detailed modelling and assessment report which showed that the modification would generally comply with the most stringent odour criteria; and
- **Figure 6** shows that under Scenario 3 (the proposal), emissions at both the school and the hospital would comply with the 2 OU criteria as required by the EPA's *Technical framework*.

All other outstanding issues are discussed in **Section 5** below.

5. CONSIDERATION

During its assessment of the merits of the proposed modification, the Department has reviewed the following:

- environmental assessment and the Director-General's environmental assessment report of the original application;
- existing conditions of approval;
- the EA supporting the proposed modification (Appendix B);
- submissions (Appendix C);
- RTS;
- relevant environmental planning instruments, policies and guidelines; and
- requirements of the Act, including the objects of the Act.

5.1 Modification to the Concept Plan

The modification request seeks to amend the Concept Plan to permit the use of two biofilters in the RU4 zone. Impacts associated with the use of the first biofilter are assessed below, whereas the second biofilter does not form part of the proposed modification to the project approval and will require separate approval at a later date. **Figure 4** shows the location of both biofilters.

Based on the information below, the Department is satisfied that the modification to the Concept Plan is appropriate and the site is capable of having a second biofilter, should the need arise.

5.2 Odour

To assess the impact of odour as a result of the proposed modification, the Proponent engaged The Odour Unit which undertook a detailed odour impact assessment in accordance with the EPA's *Approved Methods for the Modelling and Assessment of Air pollutants in New South Wales 2005* and *Technical framework: assessment and management of odour from stationary sources in NSW (2006)* (Technical Framework). All submissions received during the public exhibition of the modification raised concerns with the current odour emissions from the site, with some submissions questioning the likelihood of success of the proposed technology and others wanting to ensure that the new plant is operated appropriately. The EPA's submission also sought further information, including additional modelling to enable a full assessment of the potential environmental impacts of the modification to be undertaken.

To address these concerns, the Proponent submitted a further odour impact assessment as part of the RTS report. This assessment took a conservative approach assuming a worst case scenario whereby the plant is operating at full capacity and the odour emission from the most odourous day was assumed for every day of the week. Several scenarios were then modelled using the computer based dispersion model CALPUFF to predict ground level odour concentrations from four scenarios at 19 sensitive receivers (see **Figure 6**) including:

- Scenario 1, the base case (current situation at December 2014),
- Scenario 2, an interim phase which would occur after the commissioning of the odour control infrastructure but before the construction of the pre-wet building (Scenario 2 would operate for approximately 18 months);
- Scenario 3, which includes all of the proposed modifications. Scenario 3 models two scenarios being odour from each source (the biofilter and the Phase 2/3 roof vents) modelled separately (3A) and cumulatively (3B); and
- Scenario 4, treatment of all sources of emissions including the post 36 hour Phase 2/3 emissions. This scenario was modelled at the request of the EPA to ensure that all feasible measures to control odour had been identified and assessed. It does not form part of the proposed modification.

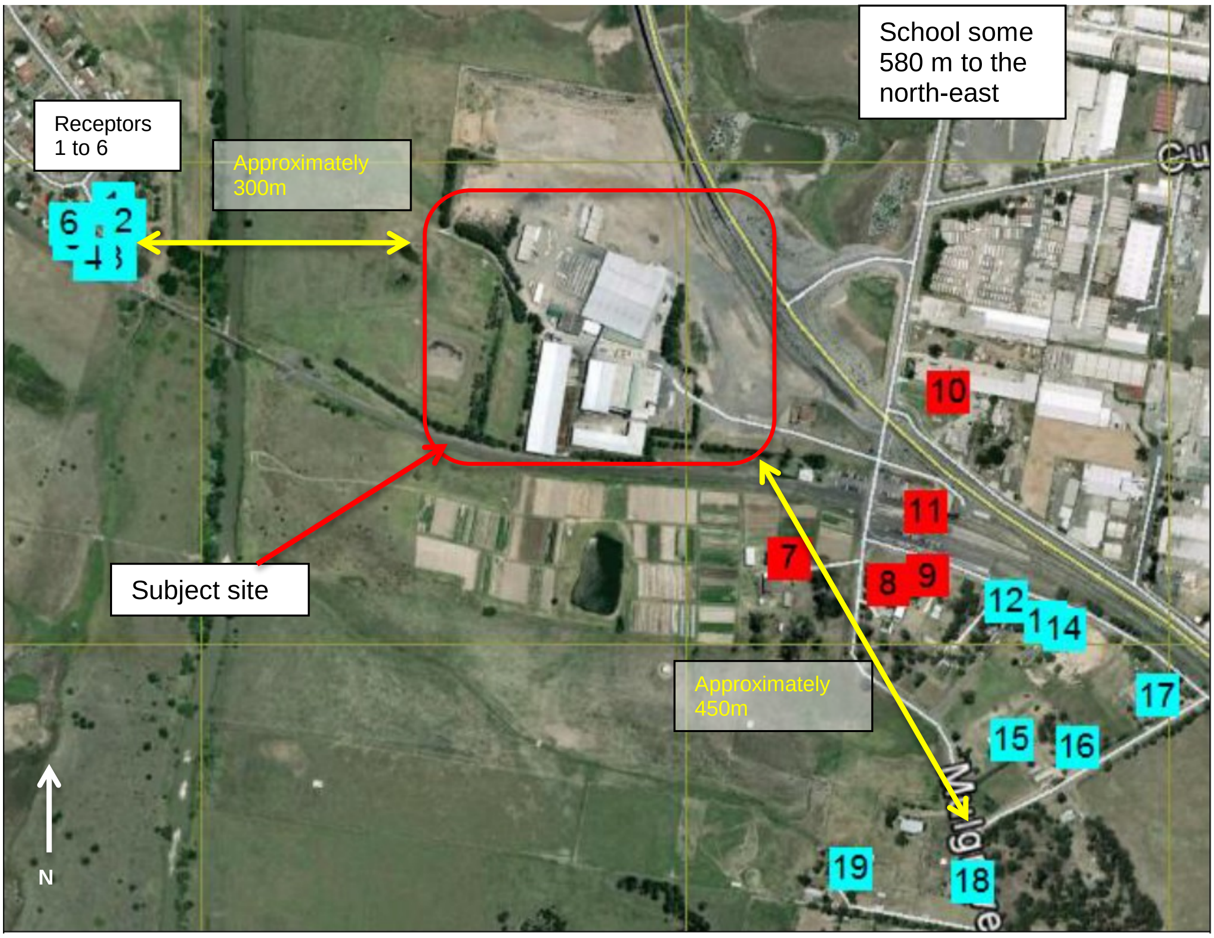


Figure 6: Location of nearest sensitive receivers (near field receivers in red, far field in blue)

The key findings of the odour modelling showed that:

- Scenario 1, the facility is emitting odour at a level that would potentially cause offensive odour, that is, up to 81.9 OU at the nearest sensitive receptor. This is largely due to fugitive emissions as discussed in **Section 1.3.3**;
- Scenario 2, the interim scenario also has the potential to cause offensive odours, however, the model shows that it would be at least half that of what is currently occurring (40.2 OU);
- Scenario 3, with the full implementation of the works associated with the modification and when considering both odour sources together (Scenario 3B), a criterion of 2 OU could be met at the residential receivers (1 to 6) with minor non-compliance of up to 1.5 OU at the semi-rural receivers (7 to 14 and 19) (see **Figure 7**); and
- Scenario 4, with treatment of all emissions, the facility shows similar predictions as was modelled for Scenario 3, however there may potentially be increased odour predictions at residential receivers 1 to 6.

The Proponent has continued to argue that the construction of Scenario 4 whereby all emissions are treated (including Post 36 hour Phase 2/3 emissions), is not warranted given the most odourous parts of the Phase 2 and 3 processing is the first 36 hours of Phase 2 and after this, the odour gradually reduces and stabilises. Furthermore, the results of the modelling show a similar, if not worse outcome (between Scenarios 3B and 4) in certain cases for the nearest sensitive receivers. The Proponent also argued that the two odour sources should be considered separately as they are distinct odours and people will perceive them separately. The Department's consideration of the results and the Proponent's arguments are discussed below.

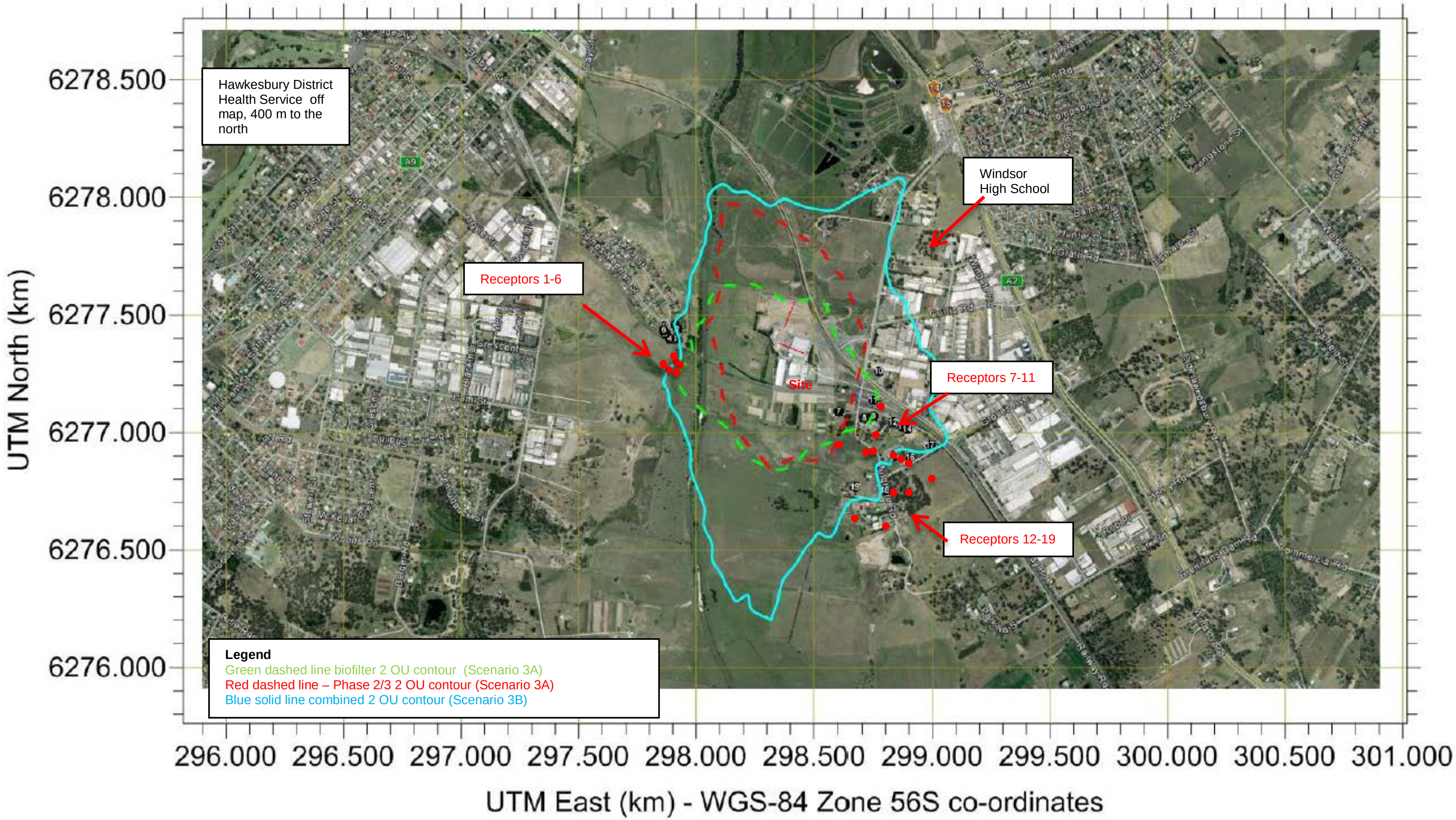


Figure 7: Scenario 3 modelling results

Consideration

The EPA's Technical Framework provides a range of odour assessment criteria based on population densities. The 2012 odour assessment for the project adopted 2 and 7 OU as the assessment criteria based on different land uses in the vicinity of the facility. However, given the history of complaints with the site, and with a view to providing greater certainty that the modified facility would not generate offensive odours beyond the premises once the modification works are complete, the EPA requested that the Proponent adopt the more conservative 2 OU at all receptors in its modelling. The Department considered this to be an appropriate approach.

Whilst the Department received a submission requesting that the facility be required to stop emitting any odour beyond its own boundaries, this is not considered to be an appropriate outcome based on the EPA's policy. In particular, the EPA's Technical Framework states that an odour assessment criterion of 7 OU is likely to represent the level below which 'offensive' odours should not occur for an individual with a standard sensitivity. As shown in the results above, the Proponent predicted that it could achieve the 7 OU and generally the 2 OU at all nearest receivers. In particular, the odour criterion of 2 OU is predicted to be met at both Windsor High School and the Hawkesbury District Health Service (see **Figure 7**).

In considering the results of the odour modelling undertaken as part of this modification, the Department notes that there is the potential for off-site odour impacts to occur under the current operating conditions with the model predicting well in excess of 2 OU at sensitive receptors. Complaints and compliance associated with the current facility are the subject of a separate process being managed by the EPA, in its role administering the POEO Act, and the Department.

For the results of the modelling undertaken for the proposed modification works (Scenario 3A and 3B), the Department is satisfied that the two odour sources (the biofilter and Post 36 hour Phase 2/3 emissions) should be considered cumulatively rather than as separate sources. This is because it is feasible for a receptor to be adversely affected by the increased frequency of odour events due to two odour sources regardless of intensity and/or the synergistic effects of odour emissions of different character. The Department is satisfied that the minor exceedances of the 2 OU criterion are negligible and are unlikely to be perceived or translate to the emission of offensive odour once the works associated with the modification are constructed. This is particularly due to the conservative nature of the odour assessment undertaken by the Proponent.

For the final scenario modelled (Scenario 4), whilst the Department and EPA agree that the capture of all emissions is not required at this time, the EPA does highlight the importance of designing and constructing the facility with the capability of incorporating other contingency measures, should the need arise. Accordingly, the Department recommends that the Proponent prepare a revised Odour Management Plan to detail contingency measures that could be implemented should there be any further odour issues at the site, including the treatment of the post 36 hour Phase 2/3 emissions through the biofilter.

With respect to community concerns regarding the technology proposed and the likelihood of its success, the Department notes that similar systems are in use and operating successfully in other types of developments in Western Sydney including SITA's Advanced Waste Treatment Facility (SAWT) at Kemps Creek and Global Renewables UR-3R waste facility at Eastern Creek. The EPA has requested that if the modification is approved, the Proponent be required to engage an independent odour expert to demonstrate that the detailed design of the odour emissions plant has capacity to meet the performance criteria predicted in the odour assessment. The Department agrees with this approach and recommends this be incorporated into the modified conditions of approval.

Conclusion

The Department acknowledges the concerns raised in the community regarding odour emissions from the existing facility which have largely emanated from fugitive sources, such as poorly sealed buildings. This modification aims to address odour issues through improvements in technology and other operational aspects of the facility.

The Department is satisfied that the assessment has shown that implementation of the works associated with the modification would significantly reduce the odour emissions from the facility by up to 90% when operating at full capacity and would enable compliance with its licence and the project approval. The modification would result in significant improvements and would ensure that all significant sources of odour are captured and treated. While there would be some minor exceedances of 2 OU, it is unlikely these would be detectable. The EPA concurs with this conclusion.

To further address the concerns of the community and ensure the continued implementation of best practice technology, monitoring and management at the site, the Department has recommended a range of additional conditions to strengthen the existing approval. These conditions reflect the recommendations of the EPA and include the following requirements:

- all new buildings to be constructed using non-corrosive materials to ensure seals are kept intact and minimise the potential for fugitive emissions;
- the Proponent to engage an independent odour specialist to:
  - ensure the detailed design of the odour emissions plant has capacity to meet the predicted performance criteria;
  - certify the 'as built' odour emissions plant is in accordance with the final detailed design;
  - undertake odour audits within 6 weeks of commissioning of the odour emissions plant, after six months of operation of the odour emissions plant, prior to seeking approval to increase production and at other times required by the Secretary; and
- preparation of a revised Odour Management Plan to include an odour monitoring program, details of best practice management of odour at the site, triggers for taking remedial and contingency action and the details of those contingency actions such as directing the post 36 hour Phase 2/3 emissions through the ammonia scrubbers and biofilter; and enclosing the west water recycle pit;
- an annual review of the environmental performance of the facility; and
- a biennial independent environmental audit of the performance of the facility.

In recognition that the interim scenario (Scenario 2) might result in the emission of offensive odours, the Department has also recommended a condition requiring completion of the works associated with the modification as quickly as possible, being within two years from the date of approval. The Department has also recommended that the Proponent prepare and implement a comprehensive Community Consultation Strategy which includes the development of a website to inform the community of the progress of the construction works as well as the site's ongoing operations including the results of any audits and all approved management plans.

Overall, the Department is satisfied that the existing and recommended conditions will provide for a comprehensive and robust system to manage the operation of the facility into the future with a greater focus on community consultation and engagement. The revised odour management plan and regular auditing of the facility at key milestones and throughout the life of the facility will ensure that any issues are addressed promptly. The EPA have also identified it is satisfied with the recommended conditions.

The Department's assessment concludes that the proposed design modifications, operational odour control measures and the existing and modified conditions would be adequate for ensuring that odour emissions from the modified Substrate Plant site would not adversely impact off-site receptors.

5.3 Other Issues

A number of other issues were considered as a result of the modification request. These are discussed in **Table 2**.

Table 2: *Assessment of Modification*

<table>
<tr><th>Issue</th><th>Assessment</th><th>Recommendation</th></tr>
<tr>
<td>Noise</td>
<td>
<u>Noise limits</u>

The project approval contains noise limits based on the predictions made in the original Environmental Assessment and the EPA's licence.
Due to the proposed design changes, the modification request included revised modelling. The revised modelling predicts that the modification may result in a slight increase in the noise emissions, see Table 3, however, it would continue to comply with the project specific noise levels (PSNL) derived under the EPA's Industrial Noise Policy at the nearest residential receivers.
The EPA raised no concerns over the change to noise limits and have advised that it will amend the licence to reflect the revised levels. In addition to the requested changes, the EPA recommended an increase to the day time noise limits for R1 and R3-R5 to reflect the PSNL. The EPA also recommended a reduction to the night time noise limit for R3 (see Table 3) to reflect the predictions contained within the revised modelling.

Table 3 – Proposed Noise Limits (proposed increase/decrease in brackets)
<table>
<tr><th>Receiver/Location</th><th>Day /Evening
$L_{Aeq(15\ minute)}$</th><th>Night
$L_{Aeq(15\ minute)}$</th></tr>
<tr><td>R1 – 46 Mulgrave Road, Mulgrave</td><td>43 (+1)</td><td>43 (+1)</td></tr>
<tr><td>R2 – Mulgrave Industrial area</td><td>42</td><td>42</td></tr>
<tr><td>R3 – 2 Railway Road, Mulgrave</td><td>42</td><td>37 (-5)</td></tr>
<tr><td>R4 – 126 Mulgrave Road</td><td>44</td><td>41 (+2)</td></tr>
<tr><td>R5 – Chisholm Place, South Windsor</td><td>44</td><td>42 (+3)</td></tr>
</table>

The Department's assessment concludes that the minor increase in noise levels is acceptable given that the operation of the facility would still comply with the PSNL. However, the Department has not made the EPA's recommended changes to the day time limits since the Proponent's noise assessment predicted that the site can achieve the more stringent limits at these receivers during the day. While the Proponent did not seek changes to the night time noise limit for R3, the Department agrees that a reduction in the limit, to reflect the predictions in the assessment, is in line with best practice. As such, the Department has recommended that the night time noise limit for R3 be changed from 42 to 37dB(A).

One submission raised concerns over night time noise from the existing operations.
Although the Department is satisfied that noise impacts from the modification would be minimal, to ensure that the modified facility operates as predicted, the Department recommends that the Proponent revise the Noise Management Plan to include the modification and a revised monitoring protocol. The revised protocol should include a noise audit of the facility once the works

</td>
<td>
The Department recommends that the Proponent:

Update the Noise Management Plan to reflect the modification and a revised noise protocol that includes a noise audit to be undertaken within three months from the commissioning of the works associated with of the modification.
provide the Secretary details of the noise barrier/management measures which includes any modelling required to demonstrate that it would be as effective as the concrete wall.

</td>
</tr>
</table>

Issue	Assessment	Recommendation
	associated with the modification are complete. Any identified exceedances would be rectified in accordance with the recommendations in the audit. • The Department has also recommended that the Proponent prepare annual reports on the environmental performance of the facility as well as undertake biennial independent environmental audits. These recommended conditions would ensure that the modified facility operates as predicted for the life of the project. <u>Noise wall</u> • The project approval contains a requirement to construct a noise wall prior to the commencement of stage 1 construction works. This has not been completed as the bale storage shed, the main component of stage one construction works, has not been constructed. • The Proponent is now seeking to modify this condition to allow the installation of other noise mitigation measures with the same or greater effect. • The Department considers this request to be appropriate provided the Proponent demonstrates that any proposed structure and/or other mitigation measures are as effective as the wall. The Department has therefore recommended conditions requiring the Proponent to provide further details of the noise management measures prior to commencement of construction of Stage 2B. • With the implementation of the existing and recommended conditions, the Department concludes that noise impacts as a result of the modification would be negligible.	
Stormwater Management	• The site's approved stormwater management regime is complex. However, all process water is fully consumed in the substrate production. • Rainfall from the dirty operational areas drains to the west water recycle pit which is sized to capture the first 10mm of rainfall and, the remainder flows to the western dam. Water in the western dam is either reused in the substrate production or irrigated on the property. • The Proponent noted that the modification would not alter the site's overall stormwater management regime. However, there would be some minor amendments including: o a reduction in the west water recycling pit's catchment; o the approved second bale wetting area and associated water pit would not be required; o water from the proposed biofilter would be directed to the west water recycle pit, or the western dam in large storm events; and o roof area would increase slightly. • The Department notes that the EPA is investigating a pollution incident from the western dam which occurred on 21 May 2015 where leachate was discharged to South/Wianamatta Creek. • The Proponent has committed to manage the operation to prevent discharge of process water from the site in future and to maximise use of collected and recycled water. • The EPA raised no concerns in relation to water and considers that modification would reduce the risk of further pollution incidents associated with the dam. • Given the minor changes mentioned above, the Department recommends a condition requiring the Operational Stormwater Management Plan be updated to reflect the modified elements. • The Department supports the Proponent's commitment to operate the western dam empty of process water unless during an emergency for example, a plant breakdown or high rainfall event and has reflected this in its recommended conditions. • Overall, the Department's assessment has concluded that potential impacts to water would reduce as a result of the modification.	The Department recommends that the Proponent: • update the Stormwater Management Plan to reflect the modification; and • operate the western dam empty of process water unless during an emergency such as heavy rainfall or plant breakdown.

Issue	Assessment	Recommendation
Flooding	• The site is located within the South Creek floodplain, the majority of the site has been filled to AHD 16 metres in accordance with a number of Council approvals (DA 218/90, 218/90, M1538/00 and 0571/06) and the project approval. • The modification requires an additional 12,000 m^3 of fill to build the platform for the biofilter. The Proponent has advised that it has already placed this fill in the proposed biofilter footprint (along with additional fill for landscaping). The fill covers an area of 0.16 hectares at a depth ranging from 0 m to 9 m. • In terms of the placement of fill, the Department is currently investigating the matter and will take any necessary action in accordance with its compliance policy. • The Proponent has advised that the actual area of fill required by the project is less than anticipated by the original environmental assessment. As such, according to the Proponent's consultant, WMA Water, the modified area of fill would be less than that originally approved and would therefore have no impact on flood levels beyond that originally assessed and approved. • WMA has also advised that given the placement of the fill in the lee of the railway embankment, it would not impede flood flows from South Creek. • Council raised no issues in relation to flood impacts. • Given the above, the Department concluded that there would be negligible impacts on flooding as a result of the modification and recommends the continued use of the fill be accepted. Erosion and sediment control measures in relation to the fill are discussed below. • Notwithstanding, the Department recommends that the fill placed for landscaping along the western boundary does not form part of this approval and has recommended a condition to this effect.	The Department recommends a condition stating that nothing in this approval permits the construction of the landscaped mound along the Substrate Plant's site western boundary identified in the letter from WMA Water dated 21 January 2016.
Hazards	<u>SEPP 33</u> • The proposed new acid scrubbers require sulfuric acid. • The modification would require the storage of some 20,000 litres of sulfuric acid which is a corrosive substance, classified under the Dangerous Good Code (class 8). • The quantity of sulfuric acid to be stored is above the threshold quantities listed in *Applying SEPP 33* 2011 and as such, the development is potentially hazardous. • The Proponent did not address *State Environmental Planning Policy 33 (Hazardous and Offensive Development)* in its assessment. • Notwithstanding, the Proponent recognised that there are some hazard issues in relation to the storage of Dangerous Goods and has committed to store and handle the material in accordance with the relevant Australian Standard. • On consideration of the characteristics of the material (corrosive with a negligible likelihood of offsite health risks and some potential environmental impacts if not managed appropriately), as well as the relatively small quantities to be stored on site, the Department concluded that this approach is appropriate. • The Department has therefore recommended a condition requiring the storage and handling of sulfuric acid in accordance with *AS 3780-2008 The Storage and Handling of Corrosive Substances.* <u>BCA</u> • Council noted that the site is subject to a number of alternative solutions to meet the fire safety requirements of the Building Code of Australia and the Fire and Rescue NSW may need to be consulted. • The Department recommends that any alternative solution developed to meet the performance requirements of the BCA is designed in consultation with Fire and Rescue NSW.	The Department recommends that the Proponent: • stores and handles sulfuric acid in accordance with *AS 3780-2008 The Storage and Handling of Corrosive Substances;* and • ensures that any alternative solution to the Building Code of Australia, in relation to fire safety, is designed in in consultation with Fire and Rescue NSW.

Issue	Assessment	Recommendation
Visual	• The layout and height of the proposed structures would be similar to the approved structures, with the exception of the biofilter which would extend some 64 metres further east. • The Proponent has advised that finishes including materials and colours would be the same as those already constructed on site. • Council raised concerns over the conceptual nature of the structure's design which did not enable a full visual assessment. • Given the similar nature of the proposed buildings to the approved, the Department concludes that visual impacts would not change beyond those already assessed and approved. • Notwithstanding, to provide additional mitigation, the Department has recommended a condition requiring the Proponent to prepare and implement a landscape plan in consultation with Council. The landscaping is to be established prior to the commencement of operation of the works associated with the modification and within three months following construction of the biofilter.	The Department recommends that the Proponent: • prepare a Landscape Plan for the site in consultation with Council; and • establish landscaping around the site of the biofilter as soon as practicable.
Erosion and sediment control	• There is potential for erosion from the additional area of fill in the location of the proposed biofilter. • Although already placed, the Department has recommended a condition requiring the Proponent to ensure that earthworks associated with the biofilter pad does not act as a source of sedimentation. In addition, the Proponent shall landscape the batters within one week of the commencement of construction.	The Department recommends that the Proponent: • ensure that earthworks associated with the biofilter pad does not act as a source of sedimentation; and • stabilise the area of fill associated with the biofilter within one week of the commencement of construction.
Administrative errors	• Condition 4 of Schedule 5 (revision of plans and programs) has a reference to Conditions 4 and 6 of Schedule 6. These conditions do not exist. • Therefore, the Department recommends that Condition 4 of Schedule 5 is updated to refer to the correct conditions.	The condition is recommended to be updated to refer to the correct conditions, being conditions 3, 5 and new condition 3A of Schedule 5.

6. CONCLUSION

The Department has assessed the merits of the proposal in accordance with the requirements of the EP&A Act. This assessment has found that the proposed modification would have negligible impacts beyond those originally assessed and approved. The Department considers that any impacts can be managed by the existing and modified conditions of approval.

The Department acknowledges the concerns raised in the community regarding odour emissions from the existing facility which have largely emanated from fugitive sources, such as poorly sealed buildings. The facility has been the subject of three Pollution Reduction Programs imposed by the EPA to address odour impacts. Whilst some of these requirements have been implemented, this modification attempts to address the balance of the requirements whilst also incorporating technology improvements to reduce the odour impact.

The Department has carefully assessed the modification, in consultation with the EPA, to ensure that it appropriately addresses operational performance issues at the facility. The Department's assessment concludes that the modification would improve the odour performance of the facility by up to 90%. However, the Department has recommended a range of stringent conditions to strengthen the existing approval. The conditions would require the Proponent to:

- engage an independent odour specialist to ensure the detailed design of the odour emissions plant has capacity to meet the predicted performance criteria;
- engage an independent odour specialist to certify the 'as built' odour emissions plant is in accordance with the final detailed design;
- undertake odour auditing of the facility at key milestones of the development to identify if the plant is working as anticipated;
- where necessary, implement any additional measures to reduce odour;
- prepare a revised Odour Management Plan, including an odour monitoring program, details of best practice management of odour at the site, triggers for taking remedial and contingency action and the details of those contingency actions; and
- implement a community consultation program to keep the community informed of the ongoing operation of the facility and the proposed modification works.

The Department's assessment of other issues associated with the proposal concluded that the proposed modification would not alter the environmental outcomes or would result in an improvement, such as for water quality.

The EPA has indicated that with the implementation of the recommended conditions, it is satisfied with the proposed modification and can issue an amended EPL.

Overall, the Department is satisfied that the existing and recommended conditions will provide for a comprehensive and robust system to manage the operation of the facility into the future with a greater focus on community consultation and engagement. Consequently, the Department considers the proposed modification should be approved, subject to amendments to the existing conditions of approval, as set out in the recommended modifying instruments at **Appendix C**.

7. RECOMMENDATION

It is RECOMMENDED that the Planning Assessment Commission:

a) **consider** the findings and recommendations of this report;
b) **approve** the proposed modifications under Section 75W of the Act; and
c) **sign** the attached modifying instruments (in **Appendix C**).

Endorsed:

C. Ritchie

Chris Ritchie 19/2/16
Director
Industry Assessments

A Sargeant

Anthea Sargeant 19/2/16
Executive Director
Key Sites and Industry Assessments

APPENDIX A – PROPONENT'S REQUESTS AND RESPONSE TO SUBMISSIONS REPORT

http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=6702
and http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=6969

APPENDIX B – SUBMISSIONS

http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=6702
and http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=6969

APPENDIX C –RECOMMENDED MODIFYING INSTRUMENTS

Modification of Minister's Approval

Section 75W of the *Environmental Planning and Assessment Act 1979*

As delegate for the Minister for Planning under delegation executed on 14 September 2011, the Planning Assessment Commission of NSW (the Commission) modifies the project approval referred to in Schedule 1, subject to the conditions in Schedule 2.

Member of the Commission

Sydney 2016

SCHEDULE 1

Project Approval:	MP 08_0255 granted by the Minister for Planning on 11 January 2012
For the following:	Elf Substrate Plant and Elf Mushroom Farm Project
On land comprising:	**Substrate Plant Site** Lot 14 DP 1138749 and part Lot 13 DP 1138749 108 Mulgrave Road, Mulgrave **Mushroom Farm Site Land** Lot 138 DP 752037, 521 The Northern Road, Londonderry
Modification Number:	MP 08_0255 MOD 1
Modification:	The modification relates to the Substrate Plant site only and includes: • a new odour management system in the form of a biofilter and six ammonia scrubbers; • an additional 6 phase 2/3 tunnels; and • the continued use of fill associated with the biofilter pad.

SCHEDULE 2

This approval is modified as follows:

In the definitions table:

1. Deleting the definition for Department, Director-General, EPA, Minister and Project and inserting the following definitions in alphabetical order:

Department	Department of Planning and Environment or its successors in title
EPA	Environment Protection Authority
Minister	Minister for Planning
Secretary	Secretary of the Department of Planning and Environment, or nominee
Project	development described in the EA as modified by MOD 1

2. Inserting the following definitions in alphabetical order:

MOD 1	The modification as described in the Environmental Assessment, titled *Mushroom Substrate Plant Modification to Approved Project Environmental Assessment* dated February 2015, prepared by Perram and Partners, the letter Response to Submissions titled *Mushroom Substrate Plant, Mulgrave Application to Modify Project Approval and Concept Plan Approval (08_0255 MOD 1)*, dated 29 August 2015, prepared by Perram and Partners and the *Assessment of Biofilter Filling* dated 17 December 2015, including the letter by WMA Water dated 21 January 2016, prepared by Perram and Partners
Noise Wall	As described in the EA
Odour emissions plant	Ammonia scrubbers and biofilter as described in MOD 1

In Schedules 2, 3 and 4:

3. Deleting all instances of the word Director-General and replacing with the word Secretary.

4. Deleting all instances of the word OEH and replacing with the word EPA except in Conditions 20 and 21 of Schedule 4.

5. Deleting Condition 2(d) of Schedule 2 and replacing with a new Condition 2(d):

   2(d) MOD 1.

6. Replacing Condition 7(2)b) of Schedule 2 with the following new Condition 7(2)b):

   7(2)b) an independent audit of the site operating in this range has been prepared and submitted in accordance with Condition 5(c) of Schedule 3.

   Production of up to 2,400 tonnes of phase 1 substrate a week may not occur until the Proponent has received the written approval of the Secretary.

7. Replacing Condition 7(3)b) of Schedule 2 with the following new Condition 7(3)b):

   7(3)b) an independent audit of the site operating in this range has been prepared and submitted in accordance with Condition 5(c) of Schedule 3.

   Production of up to a maximum of 3,200 tonnes of phase 1 substrate a week may not occur until the Proponent has received the written approval of the Secretary.

8. Inserting the following new Condition 7(4)d) after Condition 7(4)c) of Schedule 2:

7(4)d) consider EPA advice regarding compliance with the POEO Act.

9. Inserting the following new Condition 7A after Condition 7 of Schedule 2:

7A Unless otherwise agreed in writing by the Secretary, the Proponent shall ensure that the work associated with MOD 1, with the exception of the additional Phase 2/3 tunnels and the pre-wet tunnels to be constructed as part of Stage 3 (as identified on the plan in Appendix 2), has been constructed and is operating within two years from the date of the approval of MOD 1.

10. Inserting the following new Condition 7B after Condition 7A of Schedule 2:

7B Nothing in this approval permits the construction of the landscaped mound along the Substrate Plant site's western boundary identified in the letter from WMA Water dated 21 January 2016.

11. Inserting the following new Condition 11A after Condition 11 of Schedule 2:

11A The Proponent shall ensure that any structures which require a relevant alternative solution developed to meet the performance requirements of the BCA shall be designed in consultation with Fire and Rescue NSW.

12. Inserting the following new Condition 1A after Condition 1 of Schedule 3:

1A The Proponent shall update the CEMP required by Condition 1 of Schedule 3 to include the works associated with MOD 1. The updated plan shall be submitted to and approved by the Secretary prior to the commencement of any construction works associated with MOD 1.

The revised CEMP shall be implemented throughout the construction works.

13. Deletion of Condition 3 of Schedule 3.

14. Inserting the following new Condition 3 after Condition 2 of Schedule 3:

Odour Emissions Plant Design and Construction

3 Prior to the commencement of construction of the works associated with MOD 1, the Proponent shall commission and pay the full cost of an independent odour specialist to review the detailed design of the odour emissions plant and assess its capacity to meet the performance criteria within the Environmental Assessment for MOD 1. The review shall:

(a) be provided to the Secretary and the EPA within two weeks of finalisation of the review; and

(b) be endorsed by the Secretary in consultation with the EPA prior to the commencement of construction of the works associated with MOD 1.

Should the review not certify that the odour emissions plant has the capacity to meet the performance criteria within the Environmental Assessment for MOD 1, then the Proponent shall undertake additional design to meet the criteria, to the satisfaction of the Secretary within the timeframe specified by the Secretary. The additional design is to be endorsed by the independent odour specialist.

15. Inserting the following new Condition 3A after condition 3 of Schedule 3:

3A The Proponent shall construct the odour emissions plant in accordance with the final design endorsed by the independent odour specialist required by Condition 3.

16. Insert the following new condition 3B after condition 3A Schedule 3:

3B Prior to the commencement of operation of the odour emissions plant, the Proponent shall commission and pay the full cost of an independent odour specialist to certify that the 'as constructed' odour emissions plant has been undertaken in accordance with the final detailed design with reference to the Environmental Assessment for MOD 1 and the outcomes of Condition 3 of Schedule 3.

A copy of the certification is to be provided to the Secretary and the EPA within one week of its finalisation.

17. Inserting the following new Condition 3C after Condition 3B of Schedule 3:

3C The Proponent shall implement all reasonable and feasible measures to ensure that all new structures are constructed to prevent corrosion from the atmosphere contained within those structures.

18. Inserting the following new Conditions 4A and 4B after Condition 4 of Schedule 3:

4A The Proponent shall update the Odour Management Plan for the Substrate Plant site, in consultation with the EPA, to the satisfaction of the Secretary. This plan is to update the plan approved under Condition 4 of Schedule 3 and shall:

(a) be prepared a suitably independent, qualified and experienced expert whose appointment has been endorsed by the Secretary;
(b) be submitted to the Secretary for approval within one month of the date of endorsement by the Secretary of the odour emissions plant design as required under Condition 3(a) of the approval;
(c) identify of all major sources of odour;
(d) include management measures to ensure no offensive odours from the Substrate Plant site;
(e) include procedures for the monitoring of odour emissions, in accordance with the requirements of the *Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales* and any requirements of the EPA. The odour monitoring program shall include, but not be limited to:
    i. results of the complaints handling system; and
    ii. system and performance review for continuous improvement;
(f) include odour management performance parameters that are consistent with the manufacturers' performance guarantees provided for the biofilter and scrubbers;
(g) include measures to prevent and/or mitigate fugitive emissions;
(h) include triggers for remedial and contingency action; and
(i) include contingency measures in the event of failure of any component of the odour emissions plant and biofilter system or identification of fugitive emissions from the facility. Contingency measures shall include enclosing the West Water Recycle pit and treating the post 36 hour emissions from the Phase 2/3 building via the ammonium scrubbers and biofilter.

4B The approved updated Plan (as revised and approved by the Secretary from time to time), shall be implemented for the life of the Project as soon as written endorsement by the Secretary is received.

19. Replacing Condition 5 of Schedule 3 with the following:

Odour Emissions and Biofilter Control System Audit

5 The Proponent shall undertake an Odour Emissions and Biofilter Control System Audit to quantify the odour abatement efficiency of the odour emissions plant and assess the effectiveness of all other odour controls on the Substrate Plant site:

(a) within six weeks of the commissioning of the biofilter;
(b) within six weeks of the decommissioning of the bioscrubber;
(c) prior to the commencement of each increase in production, in accordance with Conditions 7(2) and 7(3) of Schedule 2;
(d) and as directed by the Secretary;
(e) each audit required under (a) to (d) inclusive, shall:
   i. be undertaken and prepared by a suitably qualified, experienced and independent expert whose appointment has been endorsed by the Secretary;
   ii. be prepared in consultation with the EPA;
   iii. report on the results of the source emissions sampling and analysis undertaken in accordance with the Odour Management Plan (required by Condition 4A of Schedule 3) or as otherwise agreed to in writing by the EPA;
   iv. review the Proponent's production data (that are relevant to the audit) and complaints record;
   v. review any complaints received during the relevant period;
   vi. determine whether the Project is complying with condition 2 of Schedule 3; and, if necessary;
   vii. recommend whether any additional management works and/or management practices are required to ensure no offensive odours from the Substrate Plant site.

20. Inserting the following new Condition 6A after condition 6 of Schedule 3:

6A Two months after the completion of the audits required under Conditions 5 (a) and 5(b) of Schedule 3, the Proponent shall submit to the satisfaction of the Secretary, a report verifying that any actions identified in the audit have been implemented.

21. Replacing Condition 11 of Schedule 3 with the following Condition 11:

11 The Proponent shall ensure that all dangerous goods and hazardous substances are stored and handled on the Substrate Plant site in accordance with the Dangerous Goods Code and *AS 1940-2004: The storage and handling of flammable and combustible liquids* and *AS 3780-2008 The Storage and Handling of Corrosive Substances.*

22. Inserting the following new Conditions 16A and 16B after Condition 16 of Schedule 3:

16A The Proponent shall ensure that the earthworks associated with the biofilter pad do not act as a source of sedimentation. The Proponent shall stabilise the area of fill associated with the biofilter within one week of the approval of MOD 1.

16B Prior to the commencement of construction of the biofilter, the Proponent shall submit to the Secretary, details demonstrating that the earthworks in the area of the biofilter have been:

(a) undertaken in accordance with AS 3798; and
(b) compacted to 98% Standard dry density ratio (AS1289 E4.1).

23. Inserting the following Condition 17A after Condition 17 of Schedule 3:

17A The Proponent shall prepare an updated Water Management Plan for the Substrate Plant site required by Condition 17 of Schedule 3 to include the works associated with MOD 1. The plan shall be submitted to the Secretary for approval prior to the commencement of operation of MOD 1.

Operation of works associated with MOD 1 shall not commence until the Proponent has received written approval of the plan. The approved Plan shall be implemented for the life of the Project.

24. Inserting the following Condition 17B after Condition 17A of Schedule 3:

17B The Proponent shall ensure that the western dam at the Substrate Plant site (identified on the plan in Appendix 2 of this approval) does not receive process water.

Notes: The dam may receive water from direct rainfall, area runoff and groundwater and during times of emergency.

25. Inserting the following Condition 17C after Condition 17B of Schedule 3:

17C Notwithstanding Condition 17B of Schedule 3, in the event of an emergency such as a high rainfall event or plant breakdown, the Proponent may use the western dam. Notification of any emergency use of the dam shall be provided to the Secretary in writing within 7 days of the emergency.

26. Replacing Condition 19 of Schedule 3 with the following:

19 The Proponent shall ensure that the operational noise generated by the Substrate Plant site does not exceed the criteria in Table 2.

Table 2: Operational Noise impact assessment criteria dB(A)

Receiver/Location	**Day /Evening** $L_{Aeq(15\ minute)}$	**Night** $L_{Aeq(15\ minute)}$
R1 – 46 Mulgrave Road, Mulgrave	43	43
R2 – Mulgrave Industrial area	42	42
R3 – 2 Railway Road, Mulgrave	42	*37*
R4 – 126 Mulgrave Road	44	41
R5 – Chisholm Place, South Windsor	44	42

Noise generated by the Project is to be measured in accordance with the relevant procedures and exemptions (including certain meteorological conditions) of the NSW Industrial Noise Policy.

27. Replacing Condition 21 of Schedule 3 with the following:

21 The Proponent shall construct the 7 m high noise wall adjacent to the southern side of the bale storage shed or implement ‘other noise mitigation measures’ with the same or greater effect, prior to commencement of stage 2B construction works.

Should ‘other noise mitigation measures’ be implemented, the Proponent shall demonstrate, to the satisfaction of the Secretary, that the chosen measures will be as effective as modelled for the noise wall. Construction of Stage 2B cannot commence unless the Proponent has received the Secretary’s approval for the ‘other noise mitigation measures’.

28. Inserting the following new Conditions 22A and 22B after Condition 21 of Schedule 3:

22A The Proponent shall update the Noise Management Plan for the Substrate Plant site, to the satisfaction of the Secretary. This plan is to update the plan approved under Condition 22 of Schedule 3 and shall include:

(c) the works associated with MOD 1; and

(d) a revised monitoring protocol for evaluating compliance with the noise impact assessment criteria in this approval once all construction works associated with MOD 1 are complete.

22B Operation of works associated with MOD 1 shall not commence until the Proponent has received the Secretary's written approval of the plan**.** The approved Plan (as revised and approved by the Secretary from time to time), shall be implemented for the life of the Project as soon as written endorsement by the Secretary is received.

29. Inserting the following new Conditions 24A and 24B after Condition 24 of Schedule 3:

24A The Proponent shall prepare a Landscape Management Plan for the Substrate Plant site. The plan shall:

(a) be prepared in consultation with Council;

(b) identify screen planting to minimise visual impacts of the site, particularly the new biofilter; and

(c) be approved by the Secretary prior to the commencement of construction of the works associated with MOD 1.

24B The landscaping around the site of the new biofilter required under MOD 1 shall be installed within three months following the completion of the construction of the biofilter. All other landscaping shall be installed prior to the commencement of operation of the works associated with MOD 1.

30. Replacing Condition 3 of Schedule 5 with the following:

3 By the end of September 2016, and annually thereafter, unless otherwise agreed by the Secretary, the Proponent shall review the environmental performance of the Project to the satisfaction of the Secretary. This review must.

(a) describe the operations that were carried out during the reporting period;

(b) analyse the monitoring results and complaints records of the Project during the reporting period, which includes a comparison of these results against the:

i. relevant statutory requirements, limits or performance measures/ criteria;

ii. monitoring results of previous years; and

iii. relevant predictions in the EA;

(c) identify any non-compliance during the reporting period, and describe what actions were (or are being) taken to ensure compliance;

(d) identify any trends in the monitoring data over the life of the Project; and

(e) describe what measure(s) will be implemented during the next reporting period to improve the environmental performance of the Project.

31. Inserting the following Condition 3A after Condition 3 of Schedule 5

Independent Environmental Audit

3A Within six months of the approval of MOD 1, and every two years thereafter, unless otherwise agreed by the Secretary, the Proponent shall commission and pay the full cost of an Independent Environmental Audit of the Project. This audit must:

(a) be conducted by suitably qualified, experienced and independent team of experts (including an odour expert), whose appointment has been endorsed by the Secretary;
(b) include consultation with the relevant agencies;
(c) include a full odour audit of the Project, taking into consideration the relevant technical guidelines and any odour complaints made since the previous audit;
(d) assess the environmental performance of the project and assess whether it is complying with the relevant requirements in this approval and any other licenses and approvals that apply to the project, (including any assessment, plan or program required under these approvals);
(e) review the adequacy of strategies, plans or programs required under these approvals; and, if appropriate;
(f) recommend measures or actions to improve the environmental performance of the project, and/or any assessment, plan or program required under these approvals.

Within six weeks of the completing of this audit, or as otherwise agreed by the Secretary, the Proponent shall submit a copy of the audit report to the Secretary, together with its response to any recommendations contained in the audit report.

32. Replacing Condition 4 of Schedule 5 with the following:

4 Within three months of the submission of an:
(a) incident report under condition 5 of schedule 5;
(b) review under condition 3 of schedule 5, and
(c) audit under condition 3A of Schedule 5,

the Proponent shall review, and if necessary revise the plans and programs required under this approval to the satisfaction of the Secretary.

Note: This is to ensure the plans and programs are updated on a regular basis, and incorporate any recommended measures to improve the environmental performance of the Project.

33. Inserting the following new Conditions 6 and 7 after Condition 5 of Schedule 5:

Access to Information

6 The Proponent shall prepare a Community Consultation Strategy for the Substrate Plant site to address existing and future operations at the Substrate Plant site, including construction of works associated with MOD 1. This Plan shall:
(a) be submitted to the satisfaction of the Secretary within one month from the approval of MOD 1;
(b) include procedures for updating the community on the general operation of the site as well as the progress of any construction works; including
  i. a newsletter for the local community which details the:
    - construction activities and the expected duration of works;
    - a general summary of the environmental management to be implemented; and
    - telephone number for taking complaints or enquiries in relation to the activities;
  ii. the website required by Condition 7 of Schedule 5; and
  iii. public meetings;
(c) describe the distribution area for the newsletter (at a minimum all residents within 2 km from the site boundary), prepared in consultation with Council; and

(d) include procedures for handling and monitoring all complaints received; and detail what management and/or contingency actions will be taken if complaints are received.

7 The approved Strategy (as revised and approved by the Secretary from time to time), shall be implemented for the life of the Project as soon as written endorsement by the Secretary is received.

34. Inserting the following Condition 8 after Condition 7 of Schedule 5

8 Within three months from the date of the approval of MOD 1, the Proponent shall make the following information (unless commercially sensitive) freely available on a publicly accessible website, as it is progressively required under the approval:

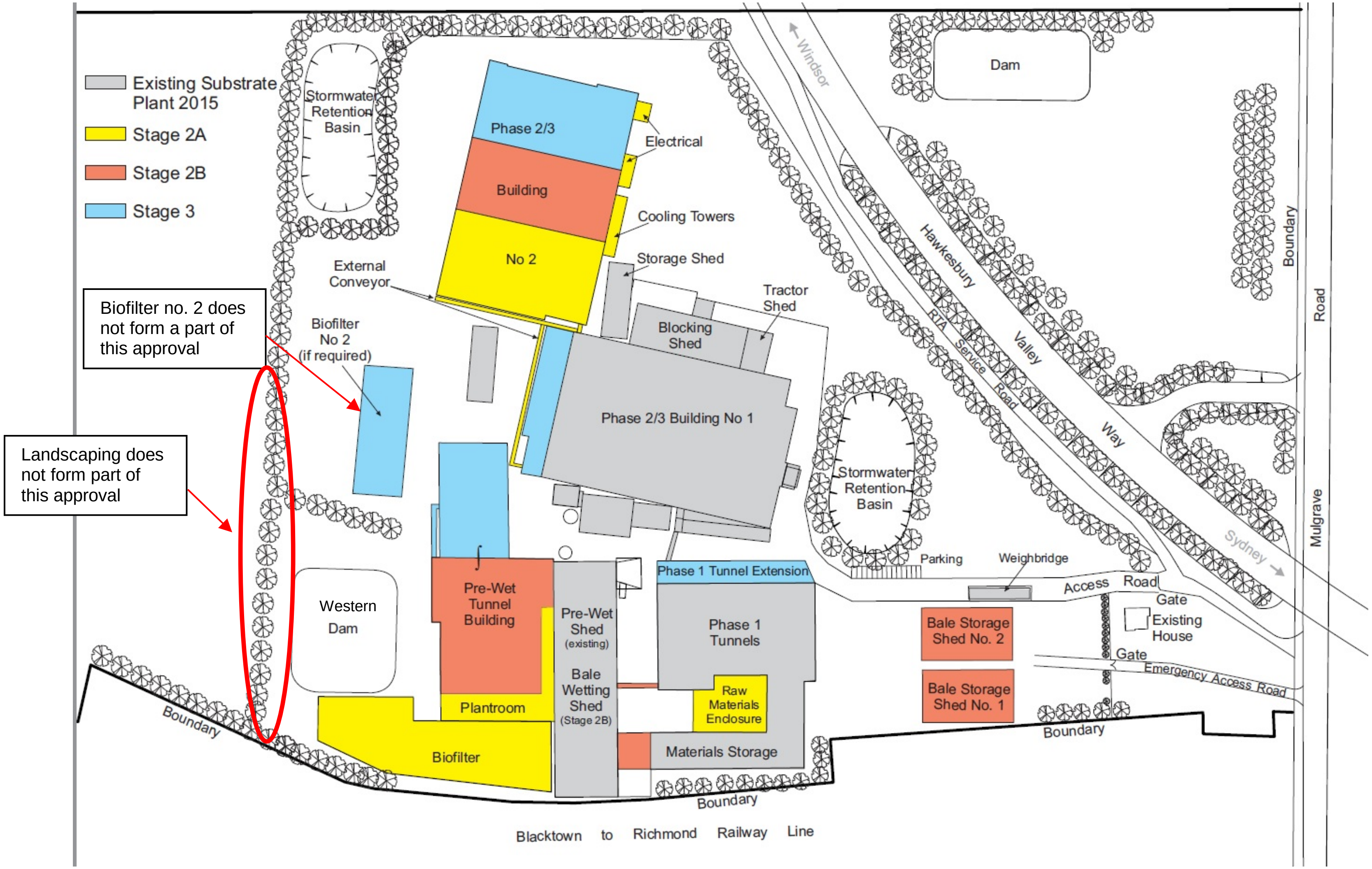
(a) all current statutory approvals, including this approval and any modifications to it;
(b) plans and programs required under this approval;
(c) technical analysis/reports of monitoring results, which have been reported in accordance with the various plans and programs approved under the conditions of this approval;
(d) a complaints register, which is to be updated on a monthly basis;
(e) a copy of any review as required under Condition 3 of Schedule 5 (over the last five years);
(f) updates on the progress of the construction works associated with MOD 1; and
(g) any other material as required by the Secretary.

35. Replacing Appendix 1 with the Proponent's revised statement of commitments dated 22 May 2015 as shown in Appendix 1.

36. Replacing Appendix 2 with the revised Substrate Plant Site Layout and Stages as shown in Appendix 2.

APPENDIX 1
PROPONENT'S STATEMENT OF COMMITMENTS

APPENDIX 2
SUBSTRATE PLANT SITE LAYOUT and STAGES



MUSHROOM SUBSTRATE PLANT, MULGRAVE APPLICATION TO MODIFY APPROVALS FOR PROJECT AND CONCEPT PLAN (08_0255 MOD 1) REVISED STATEMENT OF COMMITMENTS

The statement of commitments previously submitted by the applicant and included in the project approval has been reviewed and amended to include revised wording for items 3.6, 4.4, 4.5, 4.6 and 4.7. These changes are necessary for consistency with the proposed modification, including revised odour management system and noise assessment.

1. *Mushroom Farm - Construction*

Outcome	Commitment		Timing
Environmental management	1.1	Prepare and subsequently implement an environmental management plan for construction, consistent with this environmental assessment and conditions of approval.	Prior to issue of construction certificate
	1.2	Identify and clearly mark vegetation to be retained.	Prior to construction
	1.3	Instruct all construction personnel of the requirements for environmental management on the site.	Prior to and during construction
Minimise soil erosion and sediment deposition	1.4	Implement erosion and sediment controls consistent with the erosion and sediment control plan and keep in place with adequate maintenance until work is complete or they are no longer required.	Prior to commencement of earthworks and thereafter as long as necessary
	1.5	Progressively rehabilitate areas disturbed during construction with grass or landscaping as designed	During construction
Control nuisance dust	1.6	Implement dust mitigation measures as follows: • restrict vehicles to a defined route within the site; • limit vehicle speeds on unsealed surfaces; • maintain haul routes for fill trucks in a damp state; • apply temporary stabilisation to any exposed surface that is unlikely to be further disturbed for a period of one month or longer; and • rehabilitate finished surfaces as soon as possible to limit wind-generated dust.	During construction
Minimise construction noise	1.7	Implement construction noise mitigation measures as follows. • Construct the northern acoustic mound as early as practicable in the construction program; • adopt construction practices recommended by DECCW for best management and best available technology economically achievable; • select construction plant and equipment having regard to controlling noise emissions, including reversing alarm noise;	During construction

Outcome		Commitment	Timing
		• reduce operating speeds of equipment where practical and switch off idle plant when not in active use; • arrange vehicular access to work areas to allow for forward vehicle travel, minimising reversing or manoeuvring wherever possible; • provide site induction and personnel/ contractor training in correct use of plant and equipment to minimise noise; • develop and implement a program to inspect and maintain mobile plant to ensure noise performance criteria are met; • comply with the standard construction hours of working; • establish a noise complaints procedure with contact phone number and logging and response protocols; and • review the use of mobile plant reversing alarms including altering work practices and/or replacing with less intrusive devices where practicable.	
Manage construction traffic	1.8	Prepare in consultation with the RTA and implement a traffic management plan for construction, including signs warning traffic on The Northern Road of the heavy vehicle entry.	Prior to commencement of construction work.
	1.9	Construct the intersection of the site access road and The Northern Road to Type AU in accordance with the RTA *Road Design Guide*	Prior to issue of occupation certificate
Minimise visual impact	1.10	Implement the following measures to reduce visual impact: • select external building finishes and colours to reduce glare and minimise visual obtrusiveness. • construct and landscape the mound along The Northern Road frontage and the northern site boundary as soon as possible after site activities commence; • plant a mixture of semi-advanced trees, shrubs and groundcover on the mound to achieve early coverage and height enhancement; • maintain and nurture the landscaping on the mound with appropriate mulching, frequent watering at first and frequent inspections to correct any wind or animal damage and to replace failed plantings; • plant additional trees in the south eastern corner of the site to further restrict diagonal views from northbound vehicles on The Northern Road; • plant additional trees in the southern section of the site to further restrict views from the adjoining residence to the south towards the development area; • during each stage of the development, when the frame of the main building or building extension has been erected, undertake a visual assessment from The Northern Road and with the agreement of	During construction and prior to issue of occupation certificate

Outcome		Commitment	Timing
		owners, from adjoining properties. Where it is practicable to reduce visual impact: • plant additional screening vegetation in strategic locations on the property, such as in the southern area, to further reduce visibility from The Northern Road and the residence to the south; • offer to residents on properties to the north to plant screening vegetation on their properties at locations agreed with them and if the offer is accepted, undertake the plantings for the residents to maintain; • during construction, minimise the area of physical disturbance to the land at any one time and revegetate any disturbed areas visible from beyond the site that are not required as hardstand.	
Protect cultural heritage	1.11	Implement the following protocols as required: • should any Aboriginal object be identified during construction, work should cease and notification given to the NSW OEH, a qualified archaeologist and Aboriginal representatives of the Deerubbin LALC. The archaeologist is to develop an appropriate mitigation or management strategy in consultation with OEH and DLALC and the EMP is to be amended accordingly; • should skeletal remains be discovered, cease work at the location and report the find to the police. If the remains prove to be of Aboriginal origin advise DECCW, a qualified archaeologist and Aboriginal representatives of the Deerubbin LALC.	During construction
Protect flora and fauna	1.12	Implement flora and fauna protection measures as follows: • avoid removing remnant trees wherever possible; • install temporary fencing to protect woodland remnants when undertaking construction work in the immediate vicinity that does not require disturbance of the woodland; • collect stormwater from the development in dams rather than directing it into woodland areas; • plant local native species from the Castlereagh Woodlands along The Northern Road frontage and elsewhere for landscaping to enhance the remnant of this community. A suitable species list has been provided. • manage the rural property during construction to maintain pasture and suppress weeds; • separately fence the groupings of threatened species located in the asset protection zone west of the spent substrate store and avoid disturbance to the fenced areas.	Prior to and during construction

2. *Mushroom Farm - Operation*

Outcome		Commitment	Timing
Environmental management	2.1	Prepare and subsequently implement an environmental management plan for operation consistent with this EA and conditions of approval.	Prior to issue of occupation certificate for each stage
Minimise operational noise	2.2	Operate the farm in a manner to maintain noise levels at nearby sensitive receptors within DECCW criteria.	During operation
	2.3	Implement operational noise mitigation measures as follows: • undertake detailed design of buildings and structures to meet specified noise attenuation criteria as indicated in Table 10 of the mushroom farm noise assessment report; • select mechanical plant and equipment to meet sound power levels and/or acoustic performance indicated in Table 10 of the noise assessment report (see below); • construct a noise mound along the northern boundary with finished level at least 2.5 metres above the floor level of the main building; • construct a noise mound along the eastern boundary with finished level at least 2.5 metres above existing ground level; • modify moving floor substrate trucks to incorporate acoustic enclosures for trailer motors and residential grade mufflers to achieve a minimum 3 dB(A) noise reduction and result in a sound power level in the order of Lw100 dB(A); • maintain truck airbrake release discharge noise levels to Lw115 dB(A) or less; • require trucks to operate on the access roads at speeds not exceeding 20 kph; • fit “quacker” reversing alarms to mobile plant where practicable; and • incorporate the noise management protocols within the environmental management plan for the site.	During operation
Avoid offensive odour	2.4	Implement odour controls as follows: • keep spent substrate retained on the site for refining under cover to prevent further wetting during rainfall; • turn and blend spent substrate from time to time to assist aeration; • remove collected solids from pit filters each week using a telescopic loader; and • manage and maintain the wash down water recycling system to prevent odour generation. • include in the environmental management plan a procedure for recording and responding to any complaints that may be received pertaining to operation of the facility	During operation

Outcome		Commitment	Timing
Effectively manage operational water	2.5	Manage the operation to prevent discharge of process water from the site and to maximise use of collected and recycled water.	During operation
	2.6	Adequately maintain the sewage treatment plant to ensure satisfactory operation.	During operation
	2.7	Adequately maintain the wash down water recycling system to ensure satisfactory operation.	During operation
	2.8	Maintain 100% ground cover over parts of the site not subject to building work or operations.	During operation
	2.9	Maintain perimeter mounds so that rainfall runoff will continue to flow to natural drainage without ponding.	During operation
Protect flora and fauna	3.0	Continue to suppress weeds on the development site and protect remaining trees.	During operation
Bushfire Protection	3.1	Implement the following measures to minimise bushfire risk: • establish and maintain a defendable space of 10 metres to the west, north and south of each building. The defendable space is to be a clear area with unimpeded access for fire fighting; • on sides of the spent substrate store where there is no concrete apron, include a three-metre hardstand area as part of the defendable space; • provide a static water supply (water tank, not dependent upon electricity for pumping) to supplement the reticulated supply; • use non-combustible external cladding to the main building; • provide ember protection to the spent substrate store in the form of drencher sprays to keep the contents damp during a bushfire event; • design the structures to have concrete floors, steel roof cladding, non-combustible flashing at roof intersections with no gaps and non-combustible gutters and downpipes; • fit steel mesh screens to all windows and personnel doors on the northern and western elevations; • maintain an asset protection zone for 24 metres to the north, east and western aspects of the buildings with shrub layer managed so as not to exceed five tonnes per hectare. Existing trees do not require removal, but branches should not come within five metres; • provide a reticulated water supply compliant with relevant standards capable of providing emergency supply for fire fighting; • provide a rubber fire hose of minimum diameter 18 millimetres capable of reaching all elevations of all buildings;	During operation

Outcome		Commitment	Timing
		• maintain vehicle access to the site in compliance with the standard and fire brigade access to the northern and western asset protection zones; • develop and adopt an emergency bushfire plan.	
Monitor performance	3.2	Continue to monitor operations as specified in the environment management plan	During operation

3. *Substrate Plant - Construction*

Outcome		Commitment	Timing
Environmental management	3.1	Prepare and subsequently implement an environmental management plan for construction, or modify the existing EMP, consistent with this EA and conditions of approval.	Prior to issue of construction certificate
	3.2	Instruct all construction personnel of the requirements for environmental management on the site.	Prior to and during construction
Minimise soil erosion and sediment deposition	3.3	Implement erosion and sediment controls consistent with the erosion and sediment control plan and keep in place with adequate maintenance until work is complete or they are no longer required.	Prior to commencement of earthworks and thereafter as long as necessary
	3.4	Progressively rehabilitate areas disturbed during construction with landscaping or hardstand as designed	During construction
Control nuisance dust	3.5	Implement the following dust mitigation measures: • limit vehicle speeds on unsealed surfaces; • maintain unsealed haul routes for fill trucks in a damp state; and • rehabilitate finished surfaces as soon as possible either with landscaping or hardstand, according to intended use.	During construction
Minimise construction noise	3.6	Implement construction noise mitigation measures as follows: • avoid operating the bulldozer and compactor simultaneously during filling operations; • when concrete pours are taking place, locate concrete trucks and pumps in a manner that will maximise screening to residential properties to the south and west; • construct the southern boundary wall or provide alternative noise attenuation in this location as early as practicable in the construction program; • adopt construction practices recommended by DECCW for best management and best available technology economically achievable; • select construction plant and equipment having regard to controlling noise emissions, including reversing alarm noise;	During construction

Outcome		Commitment	Timing
		• where practicable schedule the noisiest activities to occur during parts of the day when ambient noise levels are higher; • undertake audits at receiver locations to monitor noise from site construction; • establish a noise complaints procedure with contact phone number and logging and response protocols; • undertake construction activities in accordance with AS 2436:1981, *Guide to Noise Control on Construction, Maintenance and Demolition Sites*, with all equipment demonstrating compliance with the noise levels recommended in the standard.	
Manage construction traffic	3.7	Maintain the intersection of the site access road and Mulgrave Road in a safe condition suitable for heavy construction traffic including vehicles delivering fill.	During construction
Minimise visual impact	3.8	Implement measures to reduce visual impact of the development as follows: • commence screen planting around the periphery of the extended platform area as early as possible during the project; • during construction, minimise the area of physical disturbance to the land at any one time and revegetate any disturbed areas visible from beyond the site that are not required as hardstand; • mulch fill batters as soon as possible after completion and maintain them to achieve total vegetation cover; • continue to maintain previous landscaping and screen planting on the site to maximise screening of the plant; • incorporate building materials of the same colour and texture as used in the existing plant, which minimise glare and visual obtrusiveness.	During construction
Protect cultural heritage	3.9	Implement the following protocols as required: • should any Aboriginal object be identified during construction, work should cease and notification given to DECCW, a qualified archaeologist and Aboriginal representatives of the Deerubbin LALC. The archaeologist is to develop an appropriate mitigation or management strategy in consultation with OEH and DLALC and the EMP is to be amended accordingly; • should skeletal remains be discovered, cease work at the location and report the find to the police. If the remains prove to be of Aboriginal origin advise DECCW, a qualified archaeologist and Aboriginal representatives of the Deerubbin LALC.	During construction
Protect flora and fauna	3.10	Suppress weeds on the construction site and protect existing landscape planting that is to be retained.	During construction

4. *Substrate Plant - Operation*

Outcome		Commitment	Timing
Environmental management	4.1	Prepare and subsequently implement an environmental management plan for operation, or modify the existing EMP, consistent with this EA and conditions of approval.	Prior to issue of occupation certificate for each stage
Production limit	4.2	Maintain average weekly production of Phase 1 substrate within upper limits as follows: • Stage 1 1600 tonnes • Stage 2 2400 tonnes • Stage 3 3,200 tonnes	During operation
Minimise operational noise	4.3	Operate the plant in a manner to maintain noise levels at nearby sensitive receptors within DECCW criteria.	During operation
	4.4	Implement the following noise mitigation measures: • undertake detailed design of buildings and structures to meet requirements specified in section 7.4 of the substrate plant noise assessment report and where relevant, the assumptions in the acoustic review for modification 1, as follows: – Building walls (materials storage shed and bale breaking area) shall consist of concrete to a height of 2 metres above FFL followed by galvanised steel frame and galvanised wall/roof sheeting nominally 0.6 mm BMT and a minimum of Rw22; – Fan plant rooms for new pre-wet processing tunnels to south (Tunnels 1-6) and north (Tunnels 7-10) constructed with concrete walls (min Rw50) and composite roof/ceiling OR in situ concrete (min Rw40) – Penetration of fan rooms to be reviewed by acoustic consultant and appropriately detailed to avoid de=rating the structure; – New processing tunnels to be of concrete construction; – Construction materials of working hall between processing tunnels (1-6 and 7-10) typically concrete wall construction nominal installed noise reduction in the order of 40 dB (min Rw46) and composite roof/ceiling nominal installed noise reduction in the order of 25 dB (Rw31); – Proposed external fans identified on current design drawings (No 41, 42, 43, 44, 52, 53, 66, 67, and 68) to incorporate inlet/discharge attenuators; – Fan room intake for new Phase 2/3 building (Fan No 110-134 inclusive, 25 fans) subject to acoustic review; – Internal walls and roof of tunnels within phase 2/3 building precast or cast in situ concrete and/or hebel panels/blocks;	During operation

Outcome		Commitment	Timing
		– Building wall cladding (Phase 2/3 building) consisting of insulated colorbond sandwich panels consistent with existing Phase 2/3 building proving a nominal installed noise reduction in the order of 23 dB(A) (Rw28 or greater). – Building roof cladding consisting of sheet metal (min 0.42 BMT) over fibreglass building blanket and medium duty thermofoil or similar and insulated colorbond sandwich panel (ceiling) consistent with existing Phase 2/3 tunnel building providing a nominal installed noise reduction in the order of 28 dB(A) (Rw34 or greater). – Final details of building designs subject to acoustic review prior to final specification – Final design/tender specification to be reviewed by an acoustic consultant; • select mechanical plant and equipment to meet acoustic performance and where relevant, sound power levels and/or acoustic performance in Table 10 of the acoustic assessment report for the substrate plant (see below); • require trucks to operate on the access roads at speeds not exceeding 20 kph; • fit “quacker” reversing alarms to mobile plant where practicable; and • incorporate noise management protocols within the environmental management plan for the site.	
Avoid offensive odour	4.5	Design, build, operate and maintain the plant in a manner: • that does not cause offensive odour; • that restricts odour emissions to remain within limits specified in the environment protection licence.	During operation
	4.6	Continue to implement existing odour controls at the plant except where superseded by the modified proposal: • under-cover storage for raw materials to keep them dry; • fully enclosed processing areas for all potentially odour-generating activities; • air-under system in the pre-wet and Phase 1 tunnels to improve aeration of composting material; • automatic control system for fans to maintain optimum air supply and extraction; • enclosed conveyor transport for tunnel loading, dispatch loading and transfer to Phase 2/3 tunnels;	During operation

Outcome		Commitment	Timing
		• a monitoring system to detect any faults or operational anomalies and immediately send an alarm to the Duty Manager at any time of day.	
	4.7	Implement the following additional odour control measures: • construct the approved second emissions treatment plant to a new design incorporating ammonia scrubbers and biofilters, instead of constructing a second bioscrubber and second chimney; • install ductwork to convey extracted air from the current Phase 1 and pre-wet operating areas of the site and deliver it to the new emissions treatment plant; • enclose the raw materials courtyard to contain chicken manure dust and enable controlled air extraction from this area; • install exhaust ductwork from both the existing and future Phase 2/3 buildings; • provide an enclosed conveyor from the pre-wet building to the Phase 1 tunnel building replacing the vehicle passageway to speed up the material transfer process and reduce the potential for fugitive emissions from this operation; • provide controlled air extraction from all external conveyors.	
Effectively manage operational water	4.8	Manage the operation to prevent discharge of process water from the site and to maximise use of collected and recycled water.	During operation
Improve runoff water quality	4.9	Implement and maintain the stormwater modifications recommended in the stormwater management plan , including orifice plates, reed bed and bio-basin.	During construction and operation
Minimise visual impact	4.10	Continue to manage the landscaped areas to ensure the vegetation screen remains effective.	During operation
Protect flora and fauna	4.11	Continue to suppress weeds on the development site and protect remaining trees.	During construction
Monitor and report performance	4.12	Continue to monitor operations and report results as specified in the environment management plan	During operation

Table 10 of the mushroom farm noise assessment report

Table 10: Plant/Equipment Sound Power Levels L_{Aeq} re: 10^{-12} Watts

Plant Description	Sound Power Level								
	dB(A)	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
Truck (moving)	101	98	102	101	97	94	94	91	80
Truck (idle)	91	88	92	91	87	84	84	81	70
Refrigerated Truck (SB310 refrig. unit)	93	90	94	93	89	86	86	83	72
JCB Telescopic Handler	105	109	99	99	100	101	99	95	93
Nufab Compost Turner	93	93	94	93	90	88	84	80	75
Head Filling Activities (truck engine, filling machine & peat loading)	103	113	107	95	100	94	96	92	85
Cooling Towers x2 (each) (AquaCool MSS 187LS3)	99	91	87	88	90	95	93	87	84
Compressors x 5 (total) (PowerPax TT400)	93	82	82	85	85	89	86	79	83
Steam Generator (ST302l)	99	89	89	94	94	96	93	87	82
Humidification Boiler (Saacke SR1000/PAG10A)	90	104	101	94	85	79	76	72	64
Plant Room (space averaged) [1]	95	84	84	87	87	91	88	81	85
North Air Intake [2]	85	74	74	77	77	81	78	71	75
Roof Air Discharge [2]	85	74	74	77	77	81	78	71	75
AHU Ridge Vents [3]	63	66	62	60	61	59	51	46	40

Note: 1 All fixed plant in purpose designed plant room resulting in space averaged SPL of 95dB(A)
2 Noise attenuation incorporated into plant room to result in source noise level of Lw85dB(A) for intake / discharge
3 AHU would be installed wholly within roof space. Source noise level based on Lw57 at discharge for AHU connected via ducted vents comprising a total of 74 vents, adjusted for 18 ridge top source points. AHU are ducted and could incorporate insulated ducting if required prior to discharge to meet specified limits.

Table 10 of the Substrate plant Noise assessment report

Table 10: External Plant/Equipment Sound Power Levels L_{Aeq} re: 10^{-12} Watts

Plant Description	**Sound Power Level**								
	dB(A)	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
Super Chill Condensers EWK-D680 (x6)	83	79	81	81	78	75	73	76	72
Compressor Room (external door) x2	80	79	75	77	76	76	70	69	63
Bioscrubber 2 Fans – each (x2)	107	-	106	104	107	100	98	92	-
Conveyor Drive – New Phase 3 (E-W)	80	72	74	72	77	76	72	63	55
Conveyor Belt – New Phase 3 (E-W)	70*	75	75	70	70	63	59	52	43
Conveyor Drive – New Phase 3 (N-S)	80	72	74	72	77	76	72	63	55
Conveyor Belt – New Phase 3 (N-S)	70*	75	75	70	70	63	59	52	43
Conveyor Drive – Pre Wet	80	72	74	72	77	76	72	63	55
Conveyor Belt – Pre Wet	70*	75	75	70	70	63	59	52	43
FEL – Volvo L90E	102	115	104	100	98	99	92	92	87
FEL – Volvo L150E	105	120	104	103	102	99	97	95	91
FEL – Komatsu WA320	104	114	102	100	102	99	96	93	86
Traymaster Blender	110	109	110	109	108	104	102	99	96
Pre-Wet Shed (average in shed)	85	84	85	84	83	79	77	74	71
Truck (moving)	101	98	102	101	97	94	94	91	80
Loading Activities (Phase 2/3 average in loading hall)	86	81	84	85	85	81	78	73	65
Loading Activities (Phase 2/3 external facade)	63	66	68	63	61	60	49	43	37

* sound power level per metre of conveyor

Modification of Minister's Approval

Section 75W of the *Environmental Planning & Assessment Act 1979*

As delegate for the Minister for Planning under delegation executed on 14 September 2011, the Planning Assessment Commission of NSW (the Commission) modifies the concept plan approval referred to in Schedule 1, subject to the conditions in Schedule 2.

Member of the Commission

Sydney 2016

SCHEDULE 1

Concept Plan Approval:	CP 08_0255 granted by the Minister for Planning on 11 January 2012
For the following:	**Elf Mushroom Farm and Substrate Plant Project** including: • Construction and operation of a mushroom farm with the capacity to produce up to 220 tonnes of mushrooms per week; and • Construction and operation of an extension to a substrate plant with the capacity to produce 3,200 tonnes of Phase 1 substrate per week**.**
On land comprising:	Lot 14 DP 1138749 and part lot 1138749, 108 Mulgrave Road, Mulgrave and Lot 138 DP 752037 521 The Northern Road, Londonderry
Modification Number:	CP 08_0255 MOD 1
Modification:	Updating the site layout and permitting two biofilters on the Substrate Plant site

SCHEDULE 2

The Concept Plan is modified as follows:

1. In Schedule 2, delete Condition 2d) and insert the following new conditions 2d) and 2e):

   2d) the Environmental Assessment, titled Mushroom Substrate Plant Modification to Approved Project Environmental Assessment dated February 2015, prepared by Perram and Partners, the letter Response to Submissions titled Mushroom Substrate Plant, Mulgrave Application to Modify Project Approval and Concept Plan Approval (08_0255 MOD 1), dated 29 August 2015, prepared by Perram and Partners and the Assessment of Biofilter Filling dated 17 December 2015, prepared by Perram and Partners

   2e) the terms of this approval

2. Insert a new Appendix 1 after Condition 2 of Schedule 2 which contains the revised Substrate Plant Site Layout and Stages.

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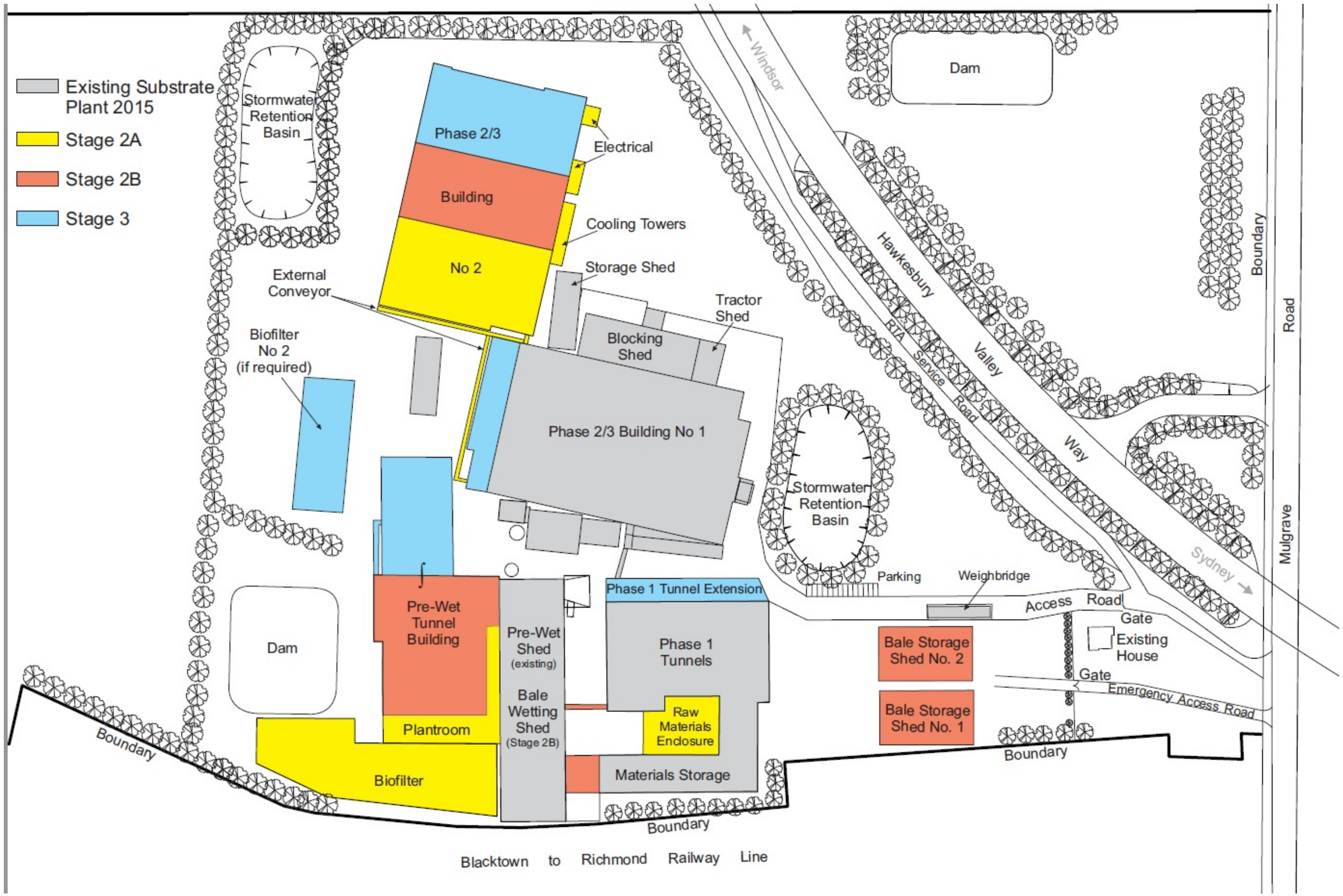
Appendix 1

SUBSTRATE PLANT SITE LAYOUT and STAGES



14 March 2016

Determination Report

NSW Planning Assessment Commission Determination Report
Elf Mushroom Farm & Substrate Plant Modifications (CP 08_0255 and MP 08_0255 Mod 1)

1. INTRODUCTION

Elf Farm Supplies Pty Ltd (the Proponent) has submitted an application to modify its existing Project Approval and Concept Plan for a mushroom farm at Londonderry and substrate plant at Mulgrave.

The proposed modification would primarily involve upgrades to the existing odour management system at the substrate plant, which would allow the development to operate in accordance with the Pollution Reduction Programs (PRPs) imposed by the Environment Protection Authority (EPA) on its Environmental Protection Licence (EPL).

The existing mushroom farm and substrate plant are located north-west of Sydney within the Hawkesbury and Penrith local government areas, respectively. The substrate plant has been in operation since 1981.

2. PROPOSAL

The proposal is principally associated with the replacement of the existing pre-wet processing phase and the enhancement of the odour management system (utilising a bio-filter) at the existing substrate plant.

The proposal would include the following modifications:
- Replacement of the existing method of odour management used, which entailed an open mixing shed during the pre-wet phase, with a tunnel processing system; and
- The installation of an emissions treatment plant comprising six ammonia scrubbers and a bio-filter as a replacement for the existing bio-scrubber, and the approved second bio-scrubber and chimney stack.

The modifications would also require the following ancillary works:
- An extension of both the existing Phase 2/3 building and the approved second Phase 2/3 building by approximately 10 metres to allow a longer residence time of substrate in Phase 2/3 processing; and
- The existing pre-wet shed to be used for bale wetting and stable bedding operations.

3. DELEGATION TO THE COMMISSION

The proposal has been referred to the Commission for determination under the terms of the Ministerial delegation dated 14 September 2011 because political donations were disclosed in a submission received during the exhibition period of the application.

COMMISSION SECRETARIAT
Level 13, 301 George Street SYDNEY, NSW 2000
GPO BOX 3415, SYDNEY, NSW 2001
TELEPHONE (02) 9383 2100 FAX (02) 9299 9835
pac@pac.nsw.gov.au

Ms Lynelle Briggs AO, Chair of the Commission, appointed Mr Gordon Kirkby to determine the application.

4. DEPARTMENT'S ASSESSMENT REPORT

The Department's Assessment Report identified odour management as the key issue, however it also addressed a range of other issues that were raised in submissions from the public.

The Department's Assessment Report concluded that the modification would provide for a robust and comprehensive system to manage the development into the future, and recommended approval subject to existing and modified conditions.

5. SUBMISSIONS

The Commission notes that the Department received six public submissions, including four from the general public and two from public authorities. The Commission also received correspondence from three members of the public during the determination process.

In particular, the Commission received a letter from the Environmental Defender's Office on behalf of one of the previous objectors requesting that the Commission hold a public meeting on the proposed modification. A further request for a public meeting was also received from another member of the public. The Commission is not required to hold a public meeting and does not consider it to be necessary for this modification application, which aims to improve environmental performance and does not involve any increase in production.

6. COMMISSION'S CONSIDERATION

On the basis of the information available to the Commission, including the Department's Assessment Report, the Environmental Assessment (EA), the Response to Submissions, submissions to the Department, and correspondence from the public to the Commission, the following matters were considered:

- Odour impacts and the proposed changes to the odour management system; and
- Other issues, including water impacts, noise impacts and potential hazards.

6.1 Odour

The submissions to the Department and the correspondence to the Commission have raised a number of concerns relating to odour impacts from the substrate plant. In particular, concerns were raised about the proposed technology and whether it would be successful in achieving the desired odour outcomes.

Odour Impact Assessment

The EA included an Odour Impact Assessment prepared by The Odour Unit. In response to comments from EPA, the Applicant subsequently provided a revised Odour Impact Assessment in the Response to Submissions, which was also prepared by The Odour Unit.

The revised Odour Impact Assessment includes a quantitative air quality impact assessment in accordance with the EPA's *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales 2005* (the Approved Methods) and the *Technical framework: assessment and management of odour from stationary sources in NSW 2006* (the Technical Framework). The odour impact modelling in the revised Odour Impact Assessment was compiled on the basis of 4 scenarios modelled at 19 sensitive receivers.

Predicted odour impacts

The Technical Framework provides a range of odour assessment criteria based on population densities, however the EPA requested that the Proponent adopt the more conservative criterion at all receivers in its modelling.

The Commission notes that under the current operating conditions, there is the potential for off-site odour impacts well in excess of the more conservative criterion. In contrast, only minor exceedances of the criterion are predicted to occur if the works associated with the proposed modification are constructed. The Commission also notes that both the Department and EPA have confirmed that these exceedances are unlikely to be detectable.

Overall, it is predicted that the implementation of the proposed modifications would result in the reduction of up to 90% of odour emissions from the facility when operating at full capacity. The Commission is satisfied that even with the application of the more conservative criterion in the Technical Framework, only negligible to minor exceedances are likely to occur. This would be a significant improvement on the current situation at sensitive receivers in the vicinity of the development.

Proposed technology

The proposed modification includes the introduction of tunnels as a component of the pre-wet processing phase, which is designed to enable more effective odour management and treatment of air discharges, as opposed to the previous approach using windows within a large shed structure.

The Department has noted that similar systems have had recent success in other developments in the Western Sydney area, including SITA's Advanced Water Treatment Facility at Kemps Creek and Global Renewables UR-3R waste facility at Eastern Creek. The Commission is satisfied that the proposed technology is likely to have a positive effect on odour management at the facility.

Recommended conditions

The Commission recognises that ongoing compliance with the odour criteria would rely on the continued adoption of best practice in the management and operation of the substrate plant.

In that regard, the Commission notes that Department has accepted EPA's recommendation to require, prior to commencement of construction, the Proponent to engage an independent odour expert to demonstrate that the substrate plant has capacity to meet the performance criteria predicted in the Odour Impact Assessment. The independent odour expert would be required to undertake odour audits within six weeks of commissioning of the odour emissions plant and after six months of operation of the plant. The Proponent would also be required to implement any additional management or mitigation measures identified in the audit process and submit a verification report to the Secretary to this effect.

The Commission also notes the Department's other recommendations for additional conditions of approval to ensure appropriate management of the facility, including a revised Odour Management Plan, an annual review of the environmental performance of the facility and a biennial independent environmental audit. In addition, the Department has recommended a condition of approval requiring completion of the works within two years from the date of approval, and the implementation of a comprehensive Community Consultation Strategy to inform the community of the progress of the construction works.

The Commission is satisfied that the Department's recommended additional conditions of approval would establish a robust and comprehensive framework to ensure appropriate management and mitigation of odour impacts.

6.2 Other Issues

Water impacts
The stormwater system for the substrate plant provides for roof water runoff from various structures on the site to South Creek or farm dams. Surface water from non-operational areas of the site is collected in retention basins and also diverted to farm dams.

The Commission notes that the Department has included a recommended condition approval requiring a revised Stormwater Management Plan to reflect the modified works and also to ensure the release of water from the western dam is only during times of emergency. Consequently, the Commission is satisfied that the potential impacts to water would be adequately managed.

The Commission also notes that the site is located within the South Creek floodplain. The substrate plant is currently operating on land that is filled to provide a working platform above the one in 100 year flood level.

The Department has recommended a condition that requires no works to be permitted to the landscaped embankment on the western boundary of the site as part of this approval. The Commission supports the Departments inclusion of this condition and is satisfied that it would adequately manage flood impacts.

Noise Impacts
The Commission observes that the existing substrate plant and the equipment associated with the proposed modification include fans and pumps, which can result in noise emissions.

The proposed modification includes changes to the method of production from an open mixing shed to enclosed processing within tunnels, which may result in a slight increase in noise emissions. Notwithstanding, the Commission is satisfied that the noise emissions would continue to comply with the project specific noise levels.

Hazards
The Commission notes that the processing of mushroom substrate includes the use of sulphuric acid to maintain the correct pH to retain the ammonia in solution. This material would be stored within tanks for use in the ammonia scrubbers. The Commission is satisfied that continued best practice would enable the safe storage and handling of this material.

5 COMMISSION'S DETERMINATION

The Commission has carefully considered all the information available to it including the Department's Assessment Report, the Environmental Assessment, the Response to Submissions, submissions to the Department of Planning and Environment, and correspondence from members of the public to the Commission.

The Commission notes that the proposed modifications to the existing substrate plant are in response to the EPA's Pollution Reduction Program which seeks to enhance the odour management system and thereby further mitigate impacts on the surrounding area.

The Commission supports the Department's recommendation that the application be approved, subject to the recommended conditions.

Gordon Kirkby
Commission Member (Chair)

Modification of Minister's Approval

Section 75W of the *Environmental Planning and Assessment Act 1979*

As delegate for the Minister for Planning under delegation executed on 14 September 2011, the Planning Assessment Commission of NSW (the Commission) modifies the project approval referred to in Schedule 1, subject to the conditions in Schedule 2.

Member of the Commission

Sydney Monday 14 March 2016

SCHEDULE 1

Project Approval:	MP 08_0255 granted by the Minister for Planning on 11 January 2012
For the following:	Elf Substrate Plant and Elf Mushroom Farm Project
On land comprising:	**Substrate Plant Site** Lot 14 DP 1138749 and part Lot 13 DP 1138749 108 Mulgrave Road, Mulgrave **Mushroom Farm Site Land** Lot 138 DP 752037, 521 The Northern Road, Londonderry
Modification Number:	MP 08_0255 MOD 1
Modification:	The modification relates to the Substrate Plant site only and includes: • a new odour management system in the form of a biofilter and six ammonia scrubbers; • an additional 6 phase 2/3 tunnels; and • the continued use of fill associated with the biofilter pad.

SCHEDULE 2

This approval is modified as follows:

In the definitions table:

1. Deleting the definition for Department, Director-General, EPA, Minister and Project and inserting the following definitions in alphabetical order:

Department	Department of Planning and Environment or its successors in title
EPA	Environment Protection Authority
Minister	Minister for Planning
Secretary	Secretary of the Department of Planning and Environment, or nominee
Project	development described in the EA as modified by MOD 1

2. Inserting the following definitions in alphabetical order:

MOD 1	The modification as described in the Environmental Assessment, titled *Mushroom Substrate Plant Modification to Approved Project Environmental Assessment* dated February 2015, prepared by Perram and Partners, the letter Response to Submissions titled *Mushroom Substrate Plant, Mulgrave Application to Modify Project Approval and Concept Plan Approval (08_0255 MOD 1)*, dated 29 August 2015, prepared by Perram and Partners and the *Assessment of Biofilter Filling* dated 17 December 2015, including the letter by WMA Water dated 21 January 2016, prepared by Perram and Partners
Noise Wall	As described in the EA
Odour emissions plant	Ammonia scrubbers and biofilter as described in MOD 1

In Schedules 2, 3 and 4:

3. Deleting all instances of the word Director-General and replacing with the word Secretary.

4. Deleting all instances of the word OEH and replacing with the word EPA except in Conditions 20 and 21 of Schedule 4.

5. Deleting Condition 2(d) of Schedule 2 and replacing with a new Condition 2(d):

   2(d) MOD 1.

6. Replacing Condition 7(2)b) of Schedule 2 with the following new Condition 7(2)b):

   7(2)b) an independent audit of the site operating in this range has been prepared and submitted in accordance with Condition 5(c) of Schedule 3.

   Production of up to 2,400 tonnes of phase 1 substrate a week may not occur until the Proponent has received the written approval of the Secretary.

7. Replacing Condition 7(3)b) of Schedule 2 with the following new Condition 7(3)b):

   7(3)b) an independent audit of the site operating in this range has been prepared and submitted in accordance with Condition 5(c) of Schedule 3.

   Production of up to a maximum of 3,200 tonnes of phase 1 substrate a week may not occur until the Proponent has received the written approval of the Secretary.

8. Inserting the following new Condition 7(4)d) after Condition 7(4)c) of Schedule 2:

7(4)d) consider EPA advice regarding compliance with the POEO Act.

9. Inserting the following new Condition 7A after Condition 7 of Schedule 2:

7A Unless otherwise agreed in writing by the Secretary, the Proponent shall ensure that the work associated with MOD 1, with the exception of the additional Phase 2/3 tunnels and the pre-wet tunnels to be constructed as part of Stage 3 (as identified on the plan in Appendix 2), has been constructed and is operating within two years from the date of the approval of MOD 1.

10. Inserting the following new Condition 7B after Condition 7A of Schedule 2:

7B Nothing in this approval permits the construction of the landscaped mound along the Substrate Plant site's western boundary identified in the letter from WMA Water dated 21 January 2016.

11. Inserting the following new Condition 11A after Condition 11 of Schedule 2:

11A The Proponent shall ensure that any structures which require a relevant alternative solution developed to meet the performance requirements of the BCA shall be designed in consultation with Fire and Rescue NSW.

12. Inserting the following new Condition 1A after Condition 1 of Schedule 3:

1A The Proponent shall update the CEMP required by Condition 1 of Schedule 3 to include the works associated with MOD 1. The updated plan shall be submitted to and approved by the Secretary prior to the commencement of any construction works associated with MOD 1.

The revised CEMP shall be implemented throughout the construction works.

13. Deletion of Condition 3 of Schedule 3.

14. Inserting the following new Condition 3 after Condition 2 of Schedule 3:

Odour Emissions Plant Design and Construction

3 Prior to the commencement of construction of the works associated with MOD 1, the Proponent shall commission and pay the full cost of an independent odour specialist to review the detailed design of the odour emissions plant and assess its capacity to meet the performance criteria within the Environmental Assessment for MOD 1. The review shall:

(a) be provided to the Secretary and the EPA within two weeks of finalisation of the review; and

(b) be endorsed by the Secretary in consultation with the EPA prior to the commencement of construction of the works associated with MOD 1.

Should the review not certify that the odour emissions plant has the capacity to meet the performance criteria within the Environmental Assessment for MOD 1, then the Proponent shall undertake additional design to meet the criteria, to the satisfaction of the Secretary within the timeframe specified by the Secretary. The additional design is to be endorsed by the independent odour specialist.

15. Inserting the following new Condition 3A after condition 3 of Schedule 3:

3A The Proponent shall construct the odour emissions plant in accordance with the final design endorsed by the independent odour specialist required by Condition 3.

16. Insert the following new condition 3B after condition 3A Schedule 3:

3B Prior to the commencement of operation of the odour emissions plant, the Proponent shall commission and pay the full cost of an independent odour specialist to certify that the 'as constructed' odour emissions plant has been undertaken in accordance with the final detailed design with reference to the Environmental Assessment for MOD 1 and the outcomes of Condition 3 of Schedule 3.

A copy of the certification is to be provided to the Secretary and the EPA within one week of its finalisation.

17. Inserting the following new Condition 3C after Condition 3B of Schedule 3:

3C The Proponent shall implement all reasonable and feasible measures to ensure that all new structures are constructed to prevent corrosion from the atmosphere contained within those structures.

18. Inserting the following new Conditions 4A and 4B after Condition 4 of Schedule 3:

4A The Proponent shall update the Odour Management Plan for the Substrate Plant site, in consultation with the EPA, to the satisfaction of the Secretary. This plan is to update the plan approved under Condition 4 of Schedule 3 and shall:

(a) be prepared a suitably independent, qualified and experienced expert whose appointment has been endorsed by the Secretary;
(b) be submitted to the Secretary for approval within one month of the date of endorsement by the Secretary of the odour emissions plant design as required under Condition 3(a) of the approval;
(c) identify of all major sources of odour;
(d) include management measures to ensure no offensive odours from the Substrate Plant site;
(e) include procedures for the monitoring of odour emissions, in accordance with the requirements of the *Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales* and any requirements of the EPA. The odour monitoring program shall include, but not be limited to:
    i. results of the complaints handling system; and
    ii. system and performance review for continuous improvement;
(f) include odour management performance parameters that are consistent with the manufacturers' performance guarantees provided for the biofilter and scrubbers;
(g) include measures to prevent and/or mitigate fugitive emissions;
(h) include triggers for remedial and contingency action; and
(i) include contingency measures in the event of failure of any component of the odour emissions plant and biofilter system or identification of fugitive emissions from the facility. Contingency measures shall include enclosing the West Water Recycle pit and treating the post 36 hour emissions from the Phase 2/3 building via the ammonium scrubbers and biofilter.

4B The approved updated Plan (as revised and approved by the Secretary from time to time), shall be implemented for the life of the Project as soon as written endorsement by the Secretary is received.

19. Replacing Condition 5 of Schedule 3 with the following:

Odour Emissions and Biofilter Control System Audit

5 The Proponent shall undertake an Odour Emissions and Biofilter Control System Audit to quantify the odour abatement efficiency of the odour emissions plant and assess the effectiveness of all other odour controls on the Substrate Plant site:
(a) within six weeks of the commissioning of the biofilter;
(b) within six weeks of the decommissioning of the bioscrubber;
(c) prior to the commencement of each increase in production, in accordance with Conditions 7(2) and 7(3) of Schedule 2;
(d) and as directed by the Secretary;
(e) each audit required under (a) to (d) inclusive, shall:
i. be undertaken and prepared by a suitably qualified, experienced and independent expert whose appointment has been endorsed by the Secretary;
ii. be prepared in consultation with the EPA;
iii. report on the results of the source emissions sampling and analysis undertaken in accordance with the Odour Management Plan (required by Condition 4A of Schedule 3) or as otherwise agreed to in writing by the EPA;
iv. review the Proponent's production data (that are relevant to the audit) and complaints record;
v. review any complaints received during the relevant period;
vi. determine whether the Project is complying with condition 2 of Schedule 3; and, if necessary;
vii. recommend whether any additional management works and/or management practices are required to ensure no offensive odours from the Substrate Plant site.

20. Inserting the following new Condition 6A after condition 6 of Schedule 3:

6A Two months after the completion of the audits required under Conditions 5 (a) and 5(b) of Schedule 3, the Proponent shall submit to the satisfaction of the Secretary, a report verifying that any actions identified in the audit have been implemented.

21. Replacing Condition 11 of Schedule 3 with the following Condition 11:

11 The Proponent shall ensure that all dangerous goods and hazardous substances are stored and handled on the Substrate Plant site in accordance with the Dangerous Goods Code and *AS 1940-2004: The storage and handling of flammable and combustible liquids* and *AS 3780-2008 The Storage and Handling of Corrosive Substances.*

22. Inserting the following new Conditions 16A and 16B after Condition 16 of Schedule 3:

16A The Proponent shall ensure that the earthworks associated with the biofilter pad do not act as a source of sedimentation. The Proponent shall stabilise the area of fill associated with the biofilter within one week of the approval of MOD 1.

16B Prior to the commencement of construction of the biofilter, the Proponent shall submit to the Secretary, details demonstrating that the earthworks in the area of the biofilter have been:
(a) undertaken in accordance with AS 3798; and
(b) compacted to 98% Standard dry density ratio (AS1289 E4.1).

23. Inserting the following Condition 17A after Condition 17 of Schedule 3:

17A The Proponent shall prepare an updated Water Management Plan for the Substrate Plant site required by Condition 17 of Schedule 3 to include the works associated with MOD 1. The plan shall be submitted to the Secretary for approval prior to the commencement of operation of MOD 1.

Operation of works associated with MOD 1 shall not commence until the Proponent has received written approval of the plan. The approved Plan shall be implemented for the life of the Project.

24. Inserting the following Condition 17B after Condition 17A of Schedule 3:

17B The Proponent shall ensure that the western dam at the Substrate Plant site (identified on the plan in Appendix 2 of this approval) does not receive process water.

Notes: The dam may receive water from direct rainfall, area runoff and groundwater and during times of emergency.

25. Inserting the following Condition 17C after Condition 17B of Schedule 3:

17C Notwithstanding Condition 17B of Schedule 3, in the event of an emergency such as a high rainfall event or plant breakdown, the Proponent may use the western dam. Notification of any emergency use of the dam shall be provided to the Secretary in writing within 7 days of the emergency.

26. Replacing Condition 19 of Schedule 3 with the following:

19 The Proponent shall ensure that the operational noise generated by the Substrate Plant site does not exceed the criteria in Table 2.

Table 2: Operational Noise impact assessment criteria dB(A)

Receiver/Location	**Day /Evening** $L_{Aeq(15\ minute)}$	**Night** $L_{Aeq(15\ minute)}$
R1 – 46 Mulgrave Road, Mulgrave	43	43
R2 – Mulgrave Industrial area	42	42
R3 – 2 Railway Road, Mulgrave	42	*37*
R4 – 126 Mulgrave Road	44	41
R5 – Chisholm Place, South Windsor	44	42

Noise generated by the Project is to be measured in accordance with the relevant procedures and exemptions (including certain meteorological conditions) of the NSW Industrial Noise Policy.

27. Replacing Condition 21 of Schedule 3 with the following:

21 The Proponent shall construct the 7 m high noise wall adjacent to the southern side of the bale storage shed or implement ‘other noise mitigation measures’ with the same or greater effect, prior to commencement of stage 2B construction works.

Should ‘other noise mitigation measures’ be implemented, the Proponent shall demonstrate, to the satisfaction of the Secretary, that the chosen measures will be as effective as modelled for the noise wall. Construction of Stage 2B cannot commence unless the Proponent has received the Secretary’s approval for the ‘other noise mitigation measures’.

28. Inserting the following new Conditions 22A and 22B after Condition 21 of Schedule 3:

22A The Proponent shall update the Noise Management Plan for the Substrate Plant site, to the satisfaction of the Secretary. This plan is to update the plan approved under Condition 22 of Schedule 3 and shall include:
(c) the works associated with MOD 1; and
(d) a revised monitoring protocol for evaluating compliance with the noise impact assessment criteria in this approval once all construction works associated with MOD 1 are complete.

22B Operation of works associated with MOD 1 shall not commence until the Proponent has received the Secretary's written approval of the plan. The approved Plan (as revised and approved by the Secretary from time to time), shall be implemented for the life of the Project as soon as written endorsement by the Secretary is received.

29. Inserting the following new Conditions 24A and 24B after Condition 24 of Schedule 3:

24A The Proponent shall prepare a Landscape Management Plan for the Substrate Plant site. The plan shall:
(a) be prepared in consultation with Council;
(b) identify screen planting to minimise visual impacts of the site, particularly the new biofilter; and
(c) be approved by the Secretary prior to the commencement of construction of the works associated with MOD 1.

24B The landscaping around the site of the new biofilter required under MOD 1 shall be installed within three months following the completion of the construction of the biofilter. All other landscaping shall be installed prior to the commencement of operation of the works associated with MOD 1.

30. Replacing Condition 3 of Schedule 5 with the following:

3 By the end of September 2016, and annually thereafter, unless otherwise agreed by the Secretary, the Proponent shall review the environmental performance of the Project to the satisfaction of the Secretary. This review must.
(a) describe the operations that were carried out during the reporting period;
(b) analyse the monitoring results and complaints records of the Project during the reporting period, which includes a comparison of these results against the:
i. relevant statutory requirements, limits or performance measures/ criteria;
ii. monitoring results of previous years; and
iii. relevant predictions in the EA;
(c) identify any non-compliance during the reporting period, and describe what actions were (or are being) taken to ensure compliance;
(d) identify any trends in the monitoring data over the life of the Project; and
(e) describe what measure(s) will be implemented during the next reporting period to improve the environmental performance of the Project.

31. Inserting the following Condition 3A after Condition 3 of Schedule 5

Independent Environmental Audit

3A Within six months of the approval of MOD 1, and every two years thereafter, unless otherwise agreed by the Secretary, the Proponent shall commission and pay the full cost of an Independent Environmental Audit of the Project. This audit must:

(a) be conducted by suitably qualified, experienced and independent team of experts (including an odour expert), whose appointment has been endorsed by the Secretary;
(b) include consultation with the relevant agencies;
(c) include a full odour audit of the Project, taking into consideration the relevant technical guidelines and any odour complaints made since the previous audit;
(d) assess the environmental performance of the project and assess whether it is complying with the relevant requirements in this approval and any other licenses and approvals that apply to the project, (including any assessment, plan or program required under these approvals);
(e) review the adequacy of strategies, plans or programs required under these approvals; and, if appropriate;
(f) recommend measures or actions to improve the environmental performance of the project, and/or any assessment, plan or program required under these approvals.

Within six weeks of the completing of this audit, or as otherwise agreed by the Secretary, the Proponent shall submit a copy of the audit report to the Secretary, together with its response to any recommendations contained in the audit report.

32. Replacing Condition 4 of Schedule 5 with the following:

4 Within three months of the submission of an:
(a) incident report under condition 5 of schedule 5;
(b) review under condition 3 of schedule 5, and
(c) audit under condition 3A of Schedule 5,

the Proponent shall review, and if necessary revise the plans and programs required under this approval to the satisfaction of the Secretary.

Note: This is to ensure the plans and programs are updated on a regular basis, and incorporate any recommended measures to improve the environmental performance of the Project.

33. Inserting the following new Conditions 6 and 7 after Condition 5 of Schedule 5:

Access to Information

6 The Proponent shall prepare a Community Consultation Strategy for the Substrate Plant site to address existing and future operations at the Substrate Plant site, including construction of works associated with MOD 1. This Plan shall:
(a) be submitted to the satisfaction of the Secretary within one month from the approval of MOD 1;
(b) include procedures for updating the community on the general operation of the site as well as the progress of any construction works; including
i. a newsletter for the local community which details the:
- construction activities and the expected duration of works;
- a general summary of the environmental management to be implemented; and
- telephone number for taking complaints or enquiries in relation to the activities;

ii. the website required by Condition 7 of Schedule 5; and
iii. public meetings;
(c) describe the distribution area for the newsletter (at a minimum all residents within 2 km from the site boundary), prepared in consultation with Council; and

(d) include procedures for handling and monitoring all complaints received; and detail what management and/or contingency actions will be taken if complaints are received.

7 The approved Strategy (as revised and approved by the Secretary from time to time), shall be implemented for the life of the Project as soon as written endorsement by the Secretary is received.

34. Inserting the following Condition 8 after Condition 7 of Schedule 5

8 Within three months from the date of the approval of MOD 1, the Proponent shall make the following information (unless commercially sensitive) freely available on a publicly accessible website, as it is progressively required under the approval:

(a) all current statutory approvals, including this approval and any modifications to it;
(b) plans and programs required under this approval;
(c) technical analysis/reports of monitoring results, which have been reported in accordance with the various plans and programs approved under the conditions of this approval;
(d) a complaints register, which is to be updated on a monthly basis;
(e) a copy of any review as required under Condition 3 of Schedule 5 (over the last five years);
(f) updates on the progress of the construction works associated with MOD 1; and
(g) any other material as required by the Secretary.

35. Replacing Appendix 1 with the Proponent's revised statement of commitments dated 22 May 2015 as shown in Appendix 1.

36. Replacing Appendix 2 with the revised Substrate Plant Site Layout and Stages as shown in Appendix 2.

APPENDIX 1
PROPONENT'S STATEMENT OF COMMITMENTS

APPENDIX 2
SUBSTRATE PLANT SITE LAYOUT and STAGES