



ELF Farm Supplies

Annual Biofilter Testing

Elf Farm Supplies Pty Ltd

PO Box 615
Windsor NSW 2756

Prepared by:

SLR Consulting Australia

Tenancy 202 Submarine School, Sub Base Platypus
120 High Street, North Sydney NSW 2060

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Revision Record

Revision	Date	Prepared By	Checked By	Authorised By
TR01R01	28 August 2024	Ali Naghizadeh	Jason Shepherd	Ali Naghizadeh

Basis of Report

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1.0 Introduction

SLR Consulting Australia (SLR) was commissioned by Elf Farm Supplies (EFS) to conduct annual odour emission testing of the Biofilter Control System serving the EFS substrate facility located at 108 Mulgrave Road, Mulgrave NSW.

The purpose of the emission testing was to measure the odour concentration, emission rate and removal efficiency of the EFS biofilter and compare these against measurements taken in 2018 (as part of a site wide odour audit completed by SLR), which were subsequently adopted for the Odour Impact Assessment report prepared by The Odour Unit, dated 28 August 2015 (the OIA).

This report outlines the methodology and results of the biofilter odour monitoring. This report is limited to factual presentation of the monitoring data with minimal interpretation of results. This test report only includes the results from the locations nominated in **Section 1.1**.

1.1 Biofilter Testing Methodology

SLR conducted representative odour testing of the Biofilter in general accordance with:

- Australian Standards and New Zealand Standards (AS/NZS) 4323.4:2009 “*Stationary source emissions - Area source sampling - Flux chamber technique*”; and
- AS/NZS 4323.3:2001 “*Stationary source emissions – Determination of odour concentration by dynamic olfactometry*”; and
- AS4321.1:2021 (and NSW EPA method TM-2 (USEPA method M2)) “*Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)*”.

1.1.1 Biofilter Outlet Odour and Flow Testing

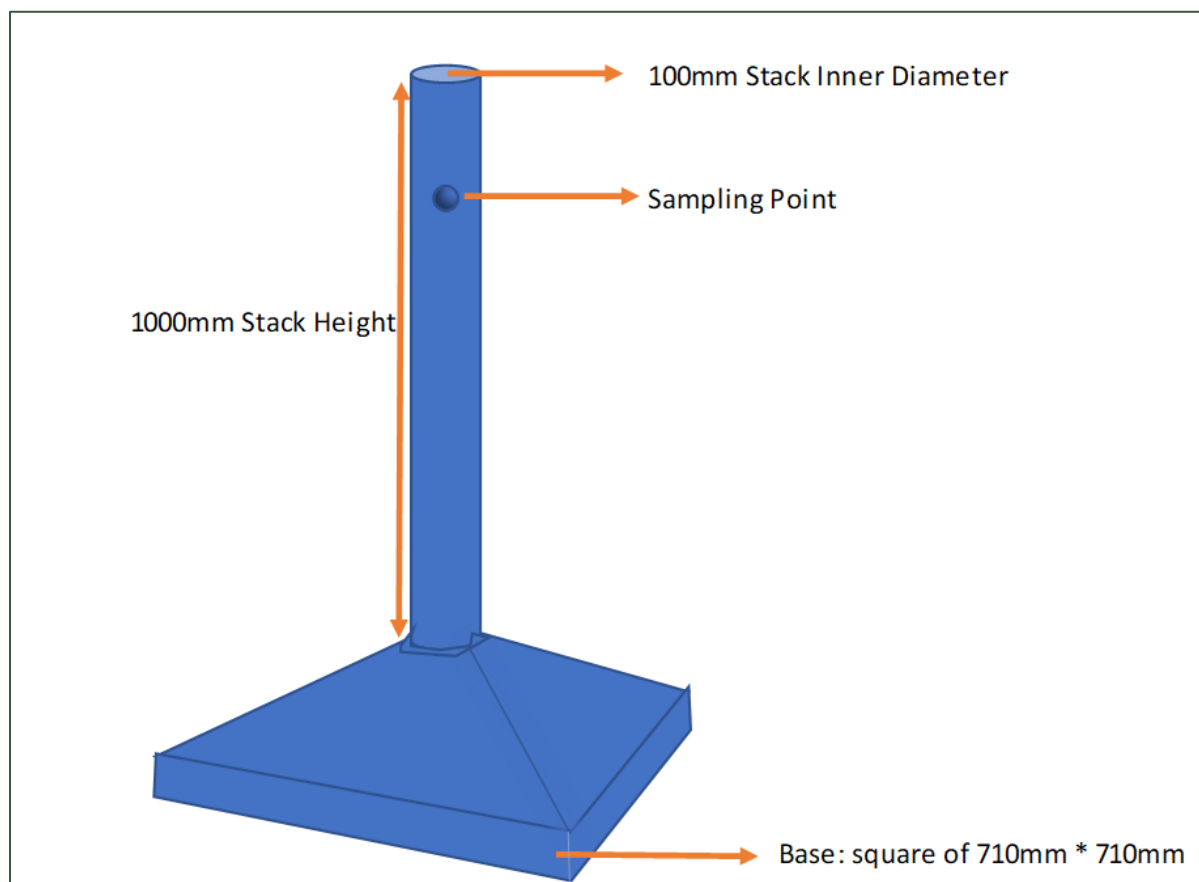
The AS/NZS 4323.4 flux chamber technique is typically used for non-aerated surfaces such as landfill sites, ponds etc. A flux chamber is placed on the surface and nitrogen supply sweep air is used to stimulate the odorous surface within the flux chamber from which an odour sample is collected. However, a biofilter system is aerated by a pressurised ventilation system. Therefore, SLR adopted the use of a Witches Hat hood (WHH) that do not require nitrogen sweep air to collect a representative odour sample. Refer to **Figure 1** for an illustration of the Witches Hat hoods being used on the EFS Biofilter bed. Refer to **Figure 2** for a schematic of the Witches Hat hood used. Air flow measurements were undertaken using an anemometer to directly read average velocity from the outlet of the witches hat hood from which the air flow rate from the hood stack was calculated.



Figure 1 Illustration of Witches Hat Hoods being used on EFS Biofilter Beds



Figure 2 Illustration of Witches Hat Hood Dimensions



In order to account for the emission variability that is typically associated with biofilters, SLR divided the Biofilter outlet into two beds, identifying these as the eastern bed and the western bed. These two beds service the two biofilter inlets (refer **Section 1.1.2**). SLR then further divided these two beds into evenly distributed rows (length and width).

The eastern bed had a surface area of approximately 1,500 square meters (m²). SLR divided this bed into six equal rows along its length and three equal rows along its width (approximately 10 m by 9 m grid cells). This resulted in a grid of 18 sample areas evenly distributed across the eastern biofilter bed from the centre of which samples could be collected.

The western bed has a surface area of approximately 1,278 m². SLR divided this bed into five equal rows along its length and three equal rows along its width (approximate 9 m by 9 m grid cells). This resulted in a total of 15 sample areas evenly distributed across the western biofilter bed from the centre of which samples could be collected.

EFS confirmed the total surface area of the Biofilter outlet bed is 2,778 m².

It is noted that at the time of the sampling, parts of the eastern and western beds were inactive as the bedding material was being replaced. The active area of the beds was measured as follows:

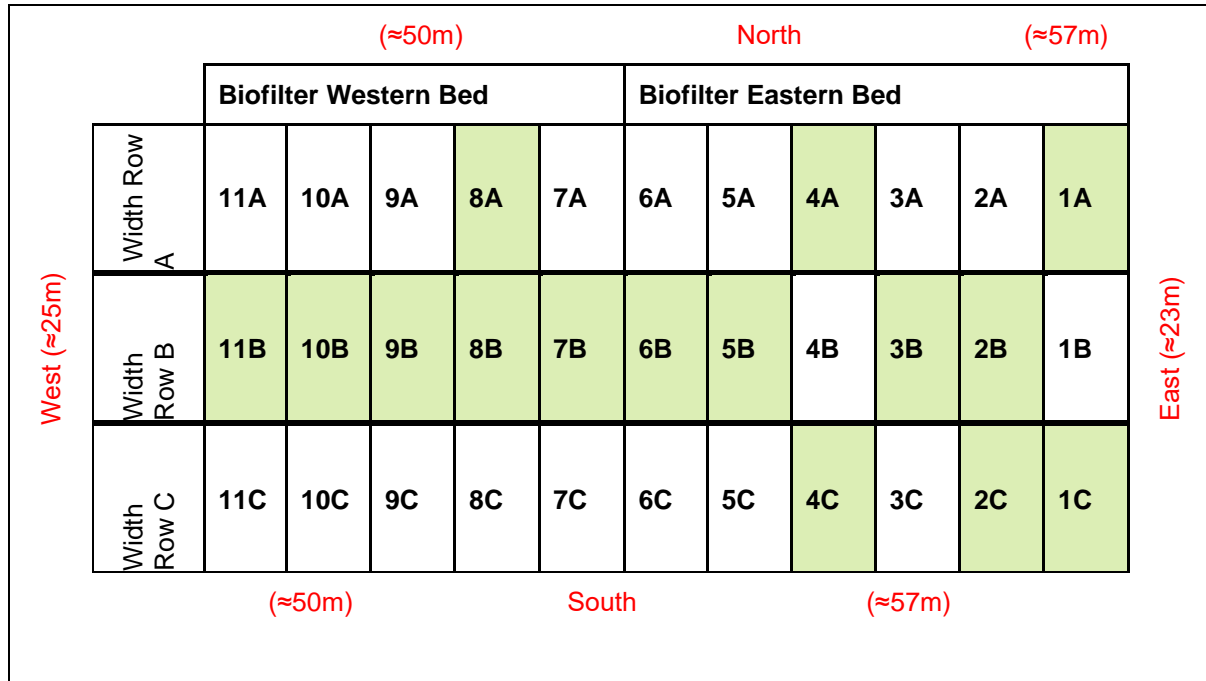
- eastern bed: approximately 23 m by 57 m
- western bed: approximately 25 m by 50 m

The number of sample points for each bed was kept consistent with sampling conducted as part of a site wide odour audit completed by SLR in 2018. The smaller active surface area resulted in a tighter grid (approximately 8 m by 8 for the eastern bed and 9 m by 9 for the Western bed).

Refer to **Figure 3** for an illustration of the Biofilter outlet beds (as sampled) distributed into their grids.



Figure 3 Illustration of the Biofilter Outlet Distributed into 33 Grids



Notes: The image above does not represent actual layout.
Odour samples were collected from cells highlighted green

The temperature and surface velocity was measured for at the centre of each grid cell. The data was then assessed to determine if surface velocities measured for each north to south row were generally consistent with the average, or if there was evidence of breakthrough (high velocity) or blockage (low velocity). SLR considered surface velocities that differed by more than 20% from the average surface velocity measured to be *inconsistent*. Where a north to south row demonstrated an inconsistent result(s), SLR collected a single odour sample from that north to south row from the grid point with the highest surface velocity measured and a single odour sample from the grid point with the lowest surface velocity measured. For all north to south rows with consistent surface velocities, SLR collected single samples from the middle grids (Row B).

A total of 15 samples were collected from the Biofilter outlet. The sample locations are indicated in Figure 3.

The samples were analysed The Odour Unit (TOU), NATA accreditation No.17069 within the 30 hour from sample collection criterion as specified in AS/NZS 4323.3.

1.1.2 Biofilter Inlet Odour Testing

A 'lung method' was used to collect samples from the Biofilter inlet. in accordance with AS/NZS 4323.3:2001 "*Stationary source emissions – Determination of odour concentration by dynamic olfactometry*". The samples were analysed TOU within the 30 hours of collection. One sample was collected for the inlet into the eastern bed and one sample was collected for the inlet into the western bed."

A sample access point compliant with the requirements of AS/NZS 4323.1:2021 "*Stationary source emissions - Method 1: Selection of sampling positions*" was available for the western biofilter (see **Figure 4**), but not the eastern biofilter due to the design of the eastern bed.

For the western biofilter inlet, air flow measurements were undertaken and reported in accordance with AS4321.1:2021 (and NSW EPA method TM-2 (USEPA method M2))



“*Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)*”. The velocity profile was obtained across the ventilation duct from the western inlet utilising an S-Type pitot tube. Wet bulb and dry bulb temperature measurements were collected and used to estimate the gas stream moisture content.

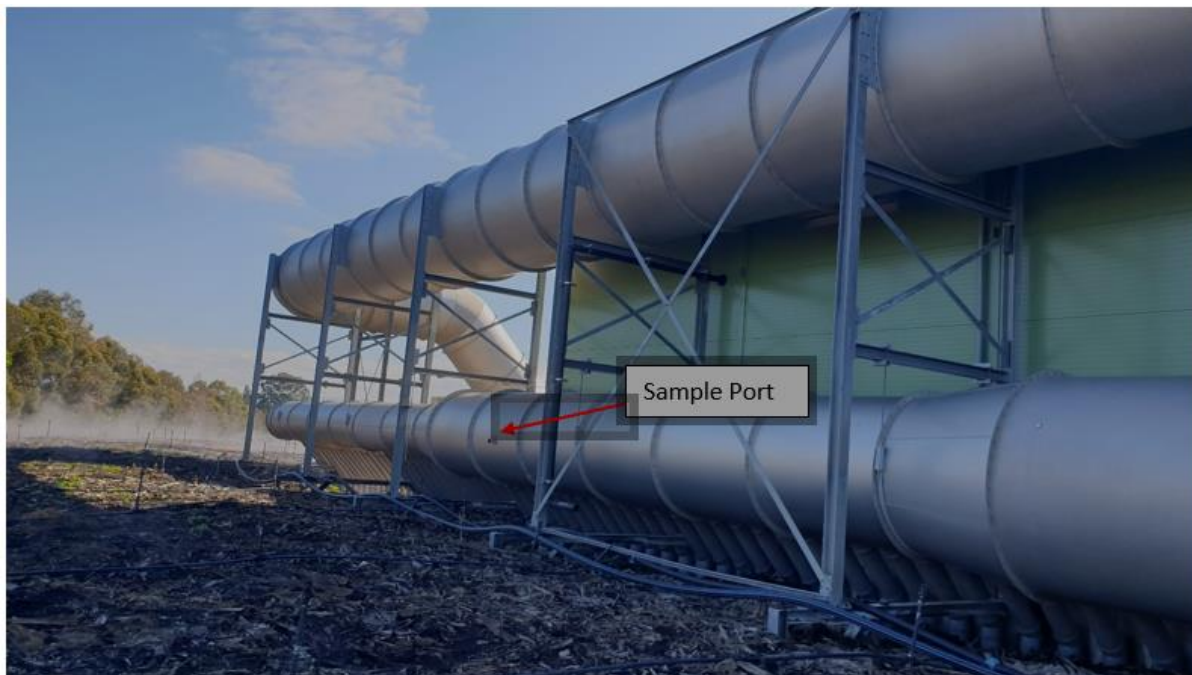
A sample point could not be installed on the eastern biofilter inlet and several sample access points would need to be installed along the aluminium ducting to each section of the eastern bed to be able to sample the total flow. Therefore, the odour sample for the eastern biofilter inlet was collected from a sample point installed approximately midway down the biofilter (see **Figure 5**). SLR assumed that the total air flow at the eastern biofilter inlet was equal to the total air flow at the eastern biofilter.

SLR is NATA accredited for the measurement of flow in accordance with AS4323.1:2021 and NSW EPA TM-2.

Figure 4 Illustration of Western Biofilter Inlet Sample Ports



Figure 5 Illustration of Eastern Biofilter Inlet Sample Port



2.0 Measurement of Uncertainty

Table 1 Provides the estimated measurement accuracy associated with the monitoring methods.

Table 1 Estimated Measurement Uncertainty

Parameter	Test Method	Uncertainty
Velocity	NSW EPA TM-2, AS 4323.1, USEPA Method 2	±5 %
	Anemometer measurements: AS/NZS 4323.4:2009 Stationary source emissions - Area source sampling - Flux chamber technique	±1.0% of reading ±4 ft/min (±0.02 m/s)
Temperature	NSW EPA TM-2, USEPA Method 2	±2°C
Moisture	Dry/wet bulb temperature	±25%
Odour	AS/NZS 4323.3:2001 Stationary source emissions – Determination of odour concentration by dynamic olfactometry	±50 - 124% (based upon a single determination)
	AS/NZS 4323.4:2009 Stationary source emissions - Area source sampling - Flux chamber technique	

3.0 Assessment Criteria

No assessment criteria were applicable to the measurements.



4.0 Deviations From the Method

There were no deviations to the specified test reference methodologies.

5.0 Reference Conditions

Volumetric flow rates are reported as actual and normalised (dry and referenced to 0°C and 101.3 kpa).

6.0 Sample Plane Requirements (West Biofilter Inlet)

Ideal sampling positions: In the absence of cyclonic flow activity ideal sampling plane conditions will be found to exit at 7-8 diameters downstream and 2-3 diameters upstream from a flow disturbance. However, in most cases, a suitable sampling plane will be in a position fitting the minimum criteria specified in Table 1 of AS/NZS 4323.1.

Non-Ideal sampling position: If the measurement near a bend is unavoidable, the sampling position shall be greater than one duct diameter upstream of the bend or greater than two duct diameters downstream of the bend. When the criteria in Table 1 of AS/NZS 4323.1 cannot be met, a greater number of sampling points shall be used in order to retain as much accuracy as is practicable.

7.0 Operating Conditions

The EFS substrate facility was considered to be operating under normal conditions.

8.0 Biofilter Odour Results

8.1 Biofilter Outlet Results

The Biofilter outlet was tested under normal operating conditions on Wednesday 3 July 2024 and Thursday 4 July 2024. These days are considered to represent the worst-case scenario in terms of odours being generated from the composting activities occurring on site. All samples were collected using the Witches Hat Hood method.

Refer to **Table 2** and **Table 3** for a summary of sampling times, temperature and air velocities measured within the Witches Hat hoods.

Refer to **Table 4** to Error! Reference source not found. for results of the odour concentrations measured for the eastern and western biofilter beds. Certificates of Analysis are provided in **Appendix A**

In summary, the maximum odour concentration measured was 832 odour units (ou) and the average odour concentration measured was 350 ou.

Error! Reference source not found. provides detailed results of the mass odour emission rates (MOER) per biofilter grid cell measured. The total MOER for the entire biofilter was 18,964 ou.m³/s. It is noted that MOERs presented in Error! Reference source not found. for each grid point have been calculated based on an area of 72 m² for the eastern bed samples and 83 m² for the western bed samples rather than the actual areas. This was to allow for grids that were not sampled. As such, the sum of all MOERs is representative of the whole biofilter rather than just those grid cells sampled.





Table 2 Summary of Biofilter Measured Results – Temperature and Air Velocities – 3 July 2024

		North											
		Biofilter Western Bed					Biofilter Eastern Bed						
Grid Identification	West	Row A	11A	10A	9A	8A	7A	6A	5A	4A	3A	2A	1A
Time of Measurement			8:20	8:43	8:47	9:10	9:12	9:26	9:41	9:44	10:00	10:02	10:19
Air Velocity (m/s)			1.0	1.1	1.1	1.1	1.3	1.4	1.4	0.5	1.1	0.9	0.8
Temp in WHH (°C, dry)		26.7	28.9	28.9	29.9	29.1	28.3	28.3	22.3	19.3	18.0	16.3	
Grid Identification		Row B	11B	10B	9B	8B	7B	6B	5B	4B	3B	2B	1B
Time of Measurement			8:27	8:39	8:50	9:07	9:14	9:28	9:39	9:51	9:57	10:04	10:15
Air Velocity (m/s)			1.0	1.3	1.2	0.9	1.4	1.4	1.3	0.8	1.2	0.8	1.2
Temp in WHH (°C, dry)		26.2	28.8	29	27.9	28.1	29.0	27.6	26.0	29.3	20.6	24.3	
Grid Identification		Row C	11C	10C	9C	8C	7C	6C	5C	4C	3C	2C	1C
Time of Measurement	8:30		8:34	8:58	9:03	9:20	9:31	9:37	9:53	9:55	10:07	10:11	
Air Velocity (m/s)	1.1		1.2	1.3	1.0	1.0	1.7	1.3	1.5	1.4	1.2	1.3	
Temp in WHH (°C, dry)	27.3	26.9	29.8	28.2	26	29.2	28.5	28.2	30.6	26.5	24.0		
		South											
Avg. Air Velocity (m/s)		1.0	1.2	1.2	1.0	1.2	1.5	1.3	0.9	1.2	1.0	1.1	
Avg. Air Velocity across Biofilter (m/s)		1.1											



Table 3 Summary of Biofilter Measured Results – Temperature and Air Velocities – 4 July 2024

		North											
		Biofilter Western Bed					Biofilter Eastern Bed						
Grid Identification	West	Row A	11A	10A	9A	8A	7A	6A	5A	4A	3A	2A	1A
Time of Measurement			9:35	9:20	9:17	9:03	9:01	8:43	8:33	8:31	8:18	8:18	7:55
Air Velocity (m/s)			1.7	1.4	1.5	1.1	1.2	1.2	1.1	0.4	0.7	0.7	0.4
Temp in WHH (°C, dry)		27.3	29.9	29.4	28.3	27.4	27.3	24.2	19.8	16.9	18.0	14.3	
Grid Identification		Row B	11B	10B	9B	8B	7B	6B	5B	4B	3B	2B	1B
Time of Measurement			9:34	9:23	9:14	9:07	8:59	8:41	8:36	8:29	8:21	8:10	8:01
Air Velocity (m/s)			1.5	1.5	1.4	0.7	1.6	1.5	0.8	1.0	1.2	0.8	1.2
Temp in WHH (°C, dry)		27.6	27.9	30.4	24.6	30.5	29.5	21.5	23.2	25.9	17.8	21.5	
Grid Identification		Row C	11C	10C	9C	8C	7C	6C	5C	4C	3C	2C	1C
Time of Measurement			9:30	9:26	9:12	9:09	8:55	8:39	8:38	8:26	8:24	9:06	8:03
Air Velocity (m/s)	1.8		1.5	1.4	0.8	1.2	1.6	1.3	1.4	1.6	1.3	1.2	
Temp in WHH (°C, dry)	25.8	26.3	30	25.2	24.3	30.2	26.3	24.8	30.8	20.2	22.4		
		South											
Avg. Air Velocity (m/s)		1.7	1.5	1.4	0.8	1.3	1.4	1.1	0.9	1.2	0.9	0.9	
Avg. Air Velocity across Biofilter (m/s)		1.2											



Table 4 Summary of Biofilter Outlet Results – Eastern Bed – 3 July 2024

Parameter	Sample 1A	Sample 1C	Sample 2B	Sample 2C	Sample 3B
SLR Sample No.	14542	14533	14534	14535	14536
Sample Start Time	03-07-2024 8:00	03-07-2024 11:15	03-07-2024 11:47	03-07-2024 11:47	03-07-2024 12:18
Sample Finish Time:	03-07-2024 8:12	03-07-2024 11:27	03-07-2024 11:57	03-07-2024 11:57	03-07-2024 12:30
NATA Laboratory I.D No.	SC24331	SC24332	SC24333	SC24334	SC24335
Analysis Date & Time Completed	04-07-2024 9:51	04-07-2024 10:22	04-07-2024 10:55	04-07-2024 11:22	04-07-2024 11:49
Sample Analysis Period in Compliance (≤30-hrs)	1.6	22.9	23.0	23.4	23.3
(D_{s WHH}) Sample Point WHH Stack Internal Diameter (mm)	100	100	100	100	100
(A_{s WHH}) Sample Plane Cross Sectional Area (m ²)	0.0079	0.0079	0.0079	0.0079	0.0079
(T_{s WHH}) Average Stack (Surface) Temperature (°C)	24.3	24.6	24.5	29.0	30.4
(P_{s WHH}) Average Stack / Surface Pressure (kPa)	103.2	103.2	103.2	103.2	103.2
(v_{s (WHH)}) Average Grid Stack Air Velocity (m/s)	0.80	1.58	1.16	1.20	1.32
(Q_{a WHH}) Actual Grid Flow Rate (m ³ /s)	0.0063	0.0124	0.0091	0.0094	0.0104
(D_{B WHH}) WHH Base Internal Diameter (mm)	801	801	801	801	801
(A_{B WHH}) WHH Base Cross Sectional Area (m ²)	0.504	0.504	0.504	0.504	0.504
(Q_{flux}) Actual Grid Surface Flux Velocity (m/s)	0.012	0.025	0.018	0.019	0.021
Odour Concentration (wet) (ou)	158	169	60	128	181
Odour Character	Water, musty	Water, musty	Water, musty, dirt	Water, musty	Water, musty, dirt



Table 5 Summary of Biofilter Outlet Results – Eastern Bed – 3 July 2024 – Continued

Parameter	Sample 4A	Sample 4C	Sample 5B	Sample 6B
SLR Sample No.	14537	14538	14539	14540
Sample Start Time	03-07-2024 12:45	03-07-2024 12:45	03-07-2024 13:11	03-07-2024 13:11
Sample Finish Time:	03-07-2024 12:57	03-07-2024 12:57	03-07-2024 13:23	03-07-2024 13:23
NATA Laboratory I.D No.	SC24336	SC24337	SC24338	SC24339
Analysis Date & Time Completed	04-07-2024 13:11	04-07-2024 13:41	04-07-2024 14:17	04-07-2024 14:52
Sample Analysis Period in Compliance (≤30-hrs)	24.2	24.7	24.9	25.5
(D_{s WHH}) Sample Point WHH Stack Internal Diameter (mm)	100	100	100	100
(A_{s WHH}) Sample Plane Cross Sectional Area (m ²)	0.0079	0.0079	0.0079	0.0079
(T_{s WHH}) Average Stack (Surface) Temperature (°C)	21.8	31.8	29.0	33.4
(P_{s WHH}) Average Stack / Surface Pressure (kPa)	103.2	103.2	103.2	103.2
(v_{s (WHH)}) Average Grid Stack Air Velocity (m/s)	0.60	1.23	1.07	1.79
(Q_{a WHH}) Actual Grid Flow Rate (m ³ /s)	0.0047	0.0097	0.0084	0.0141
(D_{B WHH}) WHH Base Internal Diameter (mm)	801	801	801	801
(A_{B WHH}) WHH Base Cross Sectional Area (m ²)	0.504	0.504	0.504	0.504
(Q_{flux}) Actual Grid Surface Flux Velocity (m/s)	0.009	0.019	0.017	0.028
Odour Concentration (wet) (ou)	85	194	239	512
Odour Character	Water, musty, dirt	Water, musty	Earth, dirt	Sour, sewage



Table 6 Summary of Biofilter Outlet Results – Western Bed – 4 July 2024

Parameter	Sample 7B	Sample 8A	Sample 8B	Sample 9B	Sample 10B	Sample 11B
SLR Sample No.	14546	14547	14548	14545	14544	14543
Sample Start Time	04-07-2024 10:45	04-07-2024 11:20	04-07-2024 11:20	04-07-2024 10:45	04-07-2024 10:20	04-07-2024 10:20
Sample Finish Time:	04-07-2024 10:57	04-07-2024 11:32	04-07-2024 11:32	04-07-2024 10:57	04-07-2024 10:32	04-07-2024 10:32
NATA Laboratory I.D No.	SC24344	SC24345	SC24346	SC24343	SC24342	SC24341
Analysis Date & Time Completed	05-07-2024 13:15	05-07-2024 13:45	05-07-2024 14:28	05-07-2024 11:57	05-07-2024 11:23	05-07-2024 10:51
Sample Analysis Period in Compliance (≤30-hrs)	26.3	26.2	26.9	25.0	24.9	24.3
(D_{s WHH}) Sample Point WHH Stack Internal Diameter (mm)	100	100	100	100	100	100
(A_{s WHH}) Sample Plane Cross Sectional Area (m ²)	0.0079	0.0079	0.0079	0.0079	0.0079	0.0079
(T_{s WHH}) Average Stack (Surface) Temperature (°C)	30.0	31.0	24.3	24.8	31.7	30.0
(P_{s WHH}) Average Stack / Surface Pressure (kPa)	103.4	103.4	103.4	103.4	103.4	103.4
(V_{s (WHH)}) Average Grid Stack Air Velocity (m/s)	1.11	1.29	0.92	1.02	1.21	1.05
(Q_{a WHH}) Actual Grid Flow Rate (m ³ /s)	0.0087	0.0101	0.0072	0.0080	0.0095	0.0082
(D_{B WHH}) WHH Base Internal Diameter (mm)	801	801	801	801	801	801
(A_{B WHH}) WHH Base Cross Sectional Area (m ²)	0.504	0.504	0.504	0.504	0.504	0.504
(Q_{flux}) Actual Grid Surface Flux Velocity (m/s)	0.017	0.020	0.014	0.016	0.019	0.016
Odour Concentration (wet) (ou)	724	724	97	832	832	315
Odour Character	Cabbage	Cabbage	Cabbage	Cabbage, Ammonia	Cabbage, water	Cabbage, water



Table 7 Summary of Biofilter Mass Odour Emission Rates – 5 July and 6 July 2023

Location	(Q _{flux}) Actual Grid Surface Flux Velocity (m/s)	Odour Concentration (wet) (ou)	(SOER) Surface Odour Emission Rate (wet) (ou.m/s)	Biofilter Grid Cross Sectional Area (m ²)	Flow through Biofilter during Sampling (m ³ /hr)	(MOER) Mass Odour Emission Rate per Section (wet) (ou.m ³ /s)	OIA ¹ MOER Modelled Operations (ou.m ³ /s)
Sample 1A	0.012	158	2.0	72.2	3,240	141	NA
Sample 1C	0.025	169	4.2	72.2	6,400	300	NA
Sample 2B	0.018	60	1.1	72.2	4,700	78	NA
Sample 2C	0.019	128	2.4	72.2	4,860	171	NA
Sample 3B	0.021	181	3.7	72.2	5,340	267	NA
Sample 4A	0.009	85	0.8	72.2	2,430	57	NA
Sample 4C	0.019	194	3.7	72.2	4,980	267	NA
Sample 5B	0.017	239	4.0	72.2	4,330	285	NA
Sample 6B	0.028	512	14.3	72.2	7,250	1,030	NA
Sample 7B	0.017	724	12.5	82.7	5,140	1,030	NA
Sample 8A	0.020	724	14.6	82.7	5,980	1,200	NA
Sample 8B	0.014	97	1.4	82.7	4,260	114	NA
Sample 9B	0.016	832	13.2	82.7	4,730	1,090	NA
Sample 10B	0.019	832	15.7	82.7	5,610	1,290	NA
Sample 11B	0.016	315	5.2	82.7	4,870	426	NA
Total (scaled)	--	--	--	2,540	163,535	18,067	NA

|

¹ Odour Impact Assessment prepared by The Odour Unit dated 28 August 2015



8.2 Biofilter Inlet Results

The biofilter inlets were measured on Wednesday 3 July 2024 and Thursday 4 July 2024 in parallel with the biofilter outlet testing. Refer to **Table 8** for a detailed summary of the biofilter inlet measured results. The Certificates of Analysis is provided in **Appendix A**.

Table 8 Summary of Biofilter Inlet Results – 5 and 6 July 2023

Parameter	East	West
SLR Sample No.	14541	14549
Sample Start Time	03-07-2024 12:20	04-07-2024 12:53
Sample Finish Time:	03-07-2024 12:32	04-07-2024 13:07
NATA Laboratory I.D No.	SC24340	SC24347
Analysis Date & Time Completed	04-07-2024 15:28	05-07-2024 15:00
Sample Analysis Period in Compliance (≤ 30 -hrs)	26.9	25.9
(A_s) Sample Plane Cross Sectional Area (m ²)	--	4.5
(T_s) Average Stack Temperature (°C)	35.6	34.9
(P_s) Average Stack Pressure (kPa)	--	103.5
(Q_a) Actual Flow Rate (m ³ /hr)	--	73,400
Flow Rate through Biofilter Outlet during Sampling (m ³ /hr)	85,100 ¹	93,100
Odour Concentration (wet) (ou)	7,640	17,700
Mass Odour Emission Rate (MOER) (ou.m³/s)	186,100	360,900
Odour Character	ammonia, chicken feathers	rubber, ammonia
1 denotes that SLR have assumed that Biofilter Inlet total air flow is equal to Biofilter Outlet due to no suitable access points being available to conduct air velocity measurements for the Eastern Biofilter Inlet.		

8.3 Biofilter Efficiency Results

The efficiency of the western biofilter (for which a suitable sampling port for the measurement of air velocity is available) were assessed through the comparison of inlet versus outlet MOERs as follows:

$$\frac{\text{Inlet MOER (358,383 ou.m}^3\text{/s)} - \text{Outlet MOER (12,926 ou.m}^3\text{/s)}}{\text{Inlet MOER (358,383 ou.m}^3\text{/s)}}$$

Result $\geq 95\%$ efficiency

For the eastern biofilter, in the absence of a suitable sample point compliant with the requirements of AS 4323.1, efficiency calculations were assessed using the odour concentrations measured and assuming the flows through the biofilter inlet and outlet are similar.



The efficiency of the Eastern Biofilter has been calculated as follows:

$$\frac{\text{Inlet Conc.}(7640 \text{ ou}) - \text{Average Outlet Conc.}(192 \text{ ou})}{\text{Inlet Conc.}(7,640 \text{ ou})}$$

Result \geq 95% efficiency

Alternatively:

$$\frac{\text{Inlet MOER } (186,100 \text{ ou.m}^3/\text{s}) - \text{Outlet MOER } (5,220 \text{ ou.m}^3/\text{s})}{\text{Inlet MOER } (186,078 \text{ ou.m}^3/\text{s})}$$

Result \geq 95% efficiency.

9.0 Summary and Comparison against OIA and Previous Measurements

Table 9 presents a comparison of odour concentrations and emission rates collected as part of this study and compares these against those assumed by the OIA and collected annually since 2018. In summary:

- The measured biofilter outlet odour emission rates (based on measured concentrations and flow through the biofilter) are 67% lower than those assumed by the OIA.
- Peak biofilter outlet odour emissions rates are estimated to be 20% lower than those assumed by the OIA.
- The average biofilter outlet odour concentration measured is 350 ou which is 30% lower than the odour concentration assumed by the OIA.
- The average biofilter odour removal efficiency is greater than 95%.

Based on the above, the biofilter is considered to be performing satisfactory on the day of monitoring.

Table 9 Summary of Biofilter results and Comparison against OIA and Previous Measurements

Year	Average Flow through Biofilter during Sampling (m ³ /hr)	Average Odour Concentration (wet) (ou)	Total Biofilter MOER (wet) (ou.m ³ /s)	Average Biofilter Efficiency	Maximum Flow through Biofilter (m ³ /hr)	Maximum Estimated Biofilter MOER (wet) (ou.m ³ /s)	Change Compared to OIA (%)
OIA		500			390,000	54,168	
2018	204,610	165	9,482	> 95%	390,000	18,073	-67%
2020	189,717	150	8,767	> 95%	402,000	18,576	-66%
2021	193,070	82	4,578	> 95%	402,000	9,533	-82%
2022	233,506	183	11,752	> 95%	402,000	20,231	-63%
2023	122,178	171	7,360	> 95%	402,000	24,215	-55%
2024	166,971	350	18,067	> 95%	402,000	43,498	-20%



10.0 Feedback

At SLR, we are committed to delivering professional quality service to our clients. We are constantly looking for ways to improve the quality of our deliverables and our service to our clients. Client feedback is a valuable tool in helping us prioritise services and resources according to our client needs.

To achieve this, your feedback on the team's performance, deliverables and service are valuable and SLR welcome all feedback via <https://www.slrconsulting.com/en/feedback>. We recognise the value of your time and we will make a \$10 donation to our 2023 Charity Partner - Lifeline, for every completed form.





Appendix A Certificate of Analysis

ELF Farm Supplies

Annual Biofilter Testing

Elf Farm Supplies Pty Ltd

SLR Project No.: 610.031984.00001

28 August 2024

Appendix B Equipment and Calibration Details

ELF Farm Supplies

Annual Biofilter Testing

Elf Farm Supplies Pty Ltd

SLR Project No.: 610.031984.00001

28 August 2024



Table B1 summarises the equipment details for the equipment need to complete the testing.

Table B-1

Equipment Type	SLR Asset Number	Manufacturer and Model	Calibration Due Date
Pitot Tube	5076	NA	03-04-2027
Anemometer	5000	TSI Velocicalc – Air Velocity Meter – Model 5725	24-04-2025
Manometer	2815	Dwyer series 475 Mark III digital manometer	07-07-2024
Thermometer (digital)	5085	FLUKE thermometer 53/54 II B	12-10-2024
Thermocouple	5090	FLUKE thermocouple	12-10-2024
Thermocouple	5092	FLUKE thermocouple	12-10-2024
Timepiece - AQ	5082	Apple - Iphone	NA
Measuring Tape	1960	Craft Right	24-05-2028
Witches Hats	NA	Client owned	NA
Odour drum	1622	NA	Inspected
Odour drum	1623	NA	Inspected
Air pump	2775	SKC-Aircheck	20-03-2025
Air pump	2776	SKC-Aircheck	20-05-2025
Drycal	5005	Mesa Labs	13-06-2025



Appendix C Sampling Plane Records and Measurements


ELF Farm Supplies


Annual Biofilter Testing

Elf Farm Supplies Pty Ltd

SLR Project No.: 610.031984.00001

28 August 2024

Description	Results	Measurement Point Pictures
Location	West Inlet	
Date	04-07-2024	
Sampling time	12:55-13:44	
Test method	NSW EPA TM-2, AS 4323.1	
Duct diameter	2.4 m	
Upstream requirements		
Type of disturbance	Bend	
Distance from disturbance	8 m	
Number of duct diameters	3.3D	
Ideal minimum distance criterion	2D	
Number of diameters less than ideal	1D	
Sampling Factor	1	
Downstream requirements		
Type of disturbance	Connection	
Distance from disturbance	12 m	
Number of duct diameters	5D	
Ideal minimum distance criterion	6D	
Number of diameters less than ideal	1D	
AS 4323.1 compliance	Compliant, Non-Ideal Sampling Plane	
Sampling Factor	1.05	
Number of sampling points for manual isokinetic sampling		
Minimum number of sampling traverse	2	
Minimum number of access holes	2	
Minimum number of sampling points	2	
Total number of sampling points	24	
Measurements		
Actual volumetric flow	20 m ³ /s	
Normal volumetric flow	18 m ³ /s	
Average velocity	4.5 m/s	

Description	Results	Measurement Point Pictures
Average Temperature	34.9 °C	
Dry temperature	34.9 °C	
Wet temperature	33.5°C	
Moisture content	4.4%	
Static pressure	1.0 kpa	
Total absolute stack pressure	103.5 kpa	
BOM ambient pressure	103.4 kpa	
Additional notes	None	
Testing officer	Danny Echeverri	