AFFCO IMLAY

ANNUAL AIR DISCHARGE MONITORING REPORT – 2020 / 2021

AFFCO IMLAY WANGANUI

AIR DISCHARGE PERMIT:- ATH-2007010926.01

MONITORING REPORT

1 MAY 2020 TO 30 APRIL 2021

COMPILED BY:
RICKY GOWAN – AFFCO IMLAY COMPLIANCE MANAGER

1.0 TABLE OF CONTENTS

2.0 INTRODUCTION

AFFCO New Zealand Limited was granted an 'Air Discharge Permit' for a term expiring on the 1st of July 2025. The 'Air Discharge Permit' encompasses the following:-

ATH-2007010926.01:- Discharge permit to discharge odour to air (associated activities on site); and

ATH-2017201595.00:- Discharge Permit to discharge contaminates to air (Gas Fired Boiler).

Under Condition 35 the Permit Holder must prepare an Annual Report summarising performance in relation to the discharges allowed under the above resource consents. The Annual Report must be provided to the Regulatory Manager of MWRC by the 1st of June each year from the commencement of the consent.

3.0 EXECUTIVE SUMMARY

Site:	AFFCO Imlay	**Date:**	May 2021
Scope:	Air Discharge Annual Monitoring Report 2021		
Author:	Ricky Gowan		

This Report covers the period from the 1st of May 2020 to the 30th of April 2021 and summarises odour control monitoring results as required in accordance with Condition 35 of Air Discharge Permit ATH-2007010926.01 and ATH-2017201595.00.

4.0 CONSENT CONDITION 35 SUMMARY

a. An update of any actions undertaken in accordance with Condition 3:-

The Permit Holder must undertake and complete the schedule of works as detailed in the titled **AFFCO Imlay Mitigation Table** provided to MWRC on the 16 November 2017 and attached to these conditions as **Schedule 1**. A written update on the progress of these works shall be provided to MWRC within six months of the commencement of this consent and thereafter an update to the schedule shall be included in the Annual Report required under **Condition 35.**
In the updates the Permit Holder shall:

a. Indicate which works have been completed;
b. Indicate why particular works have not been completed in the stated time periods;
c. Provide new timeframes for implementation of works.

All Schedule 1 items raised by Imlay Management and KupeTech have been completed.

b. Summary of Bio-Filter Performance - Condition 16 and Condition 31

The back pressure within the inlet duct to each bio-filter shall be continuously recorded:-

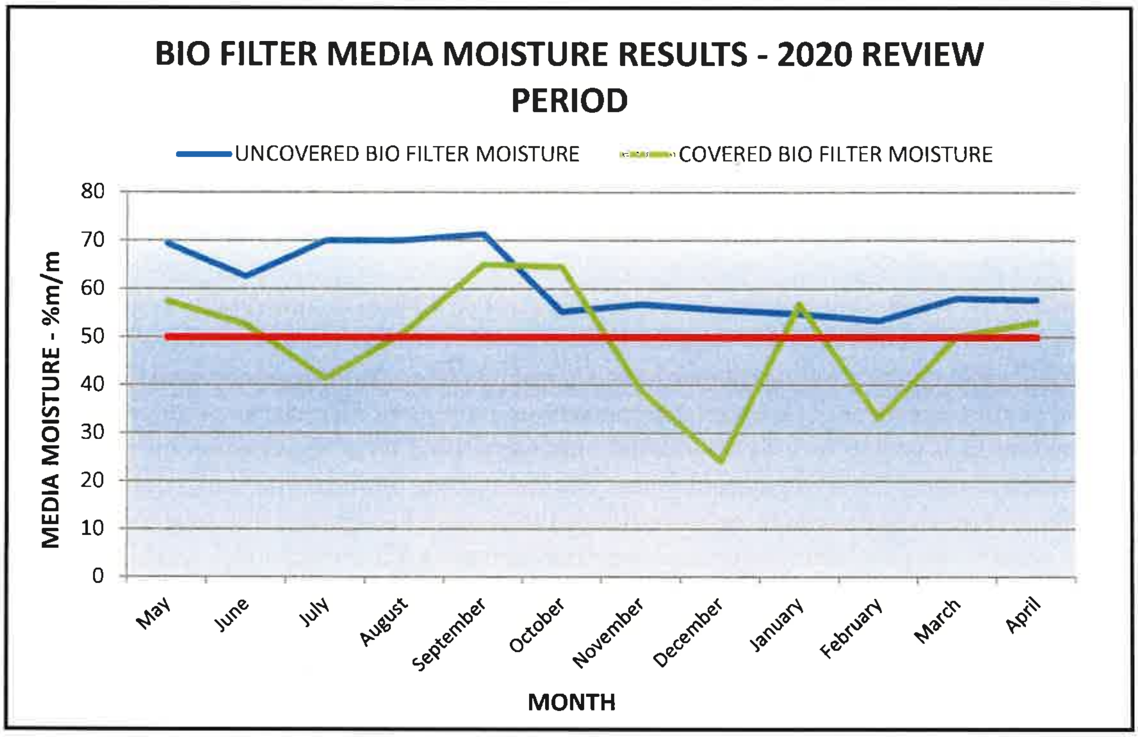
The back pressure of both covered and uncovered bio-filters are continuously recorded via the SCADA system. All recorded results in the report review period were compliant.

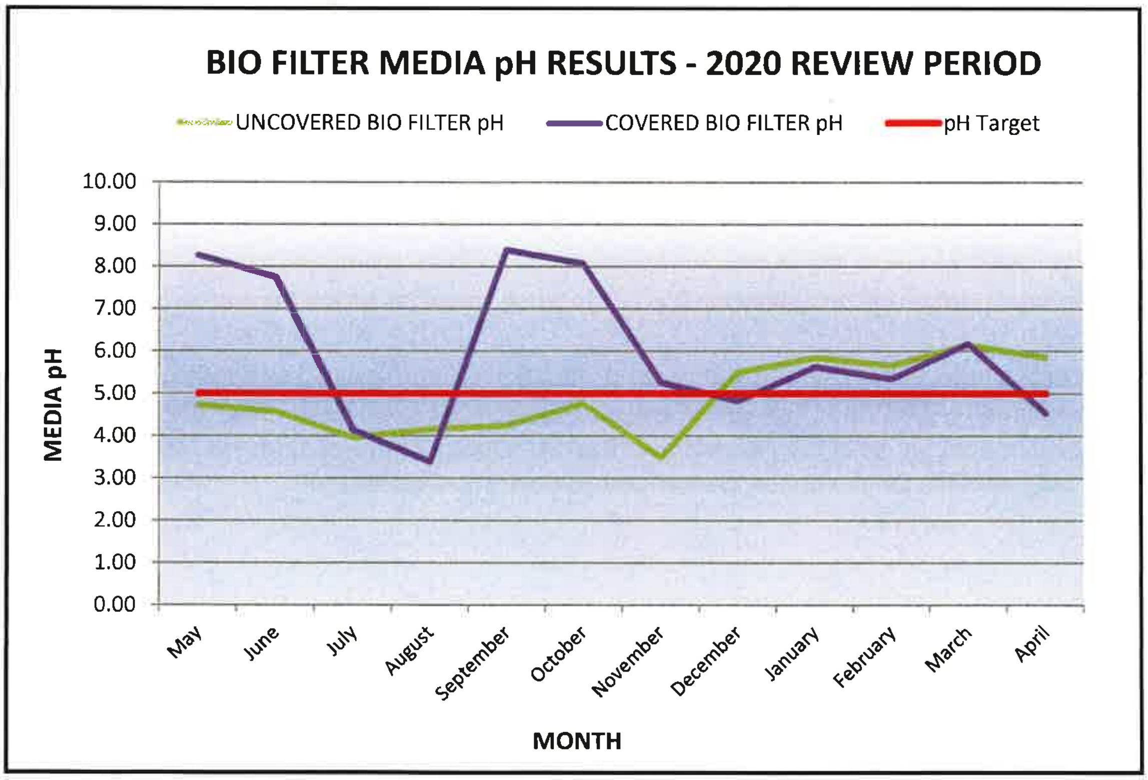
Daily manual back-pressure checks, visual inspection for moisture content, leakage and odour discharge:-

Daily inspections are performed whenever production is in progress. The above inspections are logged daily within the **'Air Odour Resource Consent Monitoring Checksheet – RMF 008'**. All daily monitoring records are held on file in the Rendering Office. **'Air Odour Resource Consent Monitoring Checksheet – RMF 008'** pdf files for the review period sent to Horizons electronically.

Moisture content and ph shall be monitored and recorded at least once a month from the commencement of this consent:-

Bio-Filter Moisture and pH Graphs for the report review period:-





John Vickerman - KupeTech – has stated in the 2021 KupeTech Annual Report that at present there are no issues with pH in both biofilter beds.

Monthly inspection and recording of bio-filter condition i.e. Weeds, compaction, pugging or fissures, commencing from the date of commencement of this permit;

'Air Odour Resource Consent Monitoring Checksheet – RMF 008' pdf files for the review period sent to Horizons electronically.

Annual measurements of the bio-filter inlet flows combined with vacuum monitoring results for duct connections to equipment.

Refer Appendix 3 for 2021 KupeTech Annual Report for inlet flows and vacuum monitoring results.

Condition 31. The Permit Holder shall, annually prior to 30 March, undertake an annual audit of the rendering plant's odour control systems that considers the effectiveness of the extraction, cooling and biofilter system and its overall performance in regards to controlling odour emissions. The audit should utilise all monitoring data (manual and continuous, complaint records, any independent odour assessments) as well as include downwind odour assessments of the operational rendering plant and ancillary activities. The audit should assess the state of the odour extraction, cooling and biofilter system and taken appropriate measurements and sample for analysis required to confirm the status these systems against their design and required operating parameters. Any analysis of samples shall be undertaken by an appropriately qualified testing laboratory and sampling undertaken as specified in the OMP. Accepted methods shall be used for measurement of media properties that are certified by the Regulatory Manager of MWRC.

The audit shall be undertaken by person(s) who is independent, appropriately qualified and experienced in the operation and maintenance of air extraction, cooling and biofilter systems.

Refer Appendix 3 – 2021 KupeTech Annual Report.

c. Copy of Log required by Condition 19

Visually check for any leaks of steamy odorous vapours from all enclosed process equipment and conveyors in rendering on a daily basis on days when the plant operates; and

Daily inspections are performed whenever production is in progress. The above inspections are logged daily within the **'Air Odour Resource Consent Monitoring Checksheet – RMF 008'**. All daily monitoring records are held on file in the Rendering Office. **'Air Odour Resource Consent Monitoring Checksheet – RMF 008'** pdf files for the review period sent to Horizons electronically.

Advise the MWRC Consents Monitoring Team of any maintenance work which may result in odour release to the atmosphere at least twelve (12) hours prior to the works commencing; and

Keep a log of the above checks details in (a) and (b).

There were no incidents of planned maintenance that could result in odours released into the atmosphere during the review period. Rendering **'Work Orders'** pdf files for the review period sent to Horizons electronically.

d. A copy of the process operating temperatures for the rendering and drying equipment log as required in Condition 20

The process operating temperatures for the rendering and drying equipment shall meet the following standards:

The rendering vessels shall be operated at the lowest temperature practicable, and in any event shall not be operated above 100°C; and

The meat and bone meal dryers shall be operated at the lowest temperature practicable, which is consistent with MPI (or any future replacement regulatory body with relevant functions) sterilisation requirements, and to prevent burning of meal. The temperature of the rendering vessels and dryers shall be continuously monitored and recorded. These records shall show the correct time and date. The records shall be made available to the Regulatory Manager of MWRC or of MWRC officers on request at any time. The records must also be supplied as part of the annual report required by Condition 35.

'Rendering' equipment, other than drying equipment, does not exceed 100^{0}C. Raw material is discharged into the Stord Bartz pre-heater (indirect steam heated cooker). The raw material is agitated and heated to a controlled discharge temperature set between 88^{0}C – 95^{0}C.

The Decanter Liquid Phase process will only activate when level and temperature limits are met – 1300mm and 95^{0}C respectively.

Dryer temperatures are validated to meet Non Heat Certification and Heat Certification Meat and Bone Meal. We are currently processing to Non Heat Certification Meat and Bone Meal standards which requires the dryers to be set at ≥123^{0}C. The dryers are programmed to stop discharging product if dryer temperatures fall below that set point of ≥123^{0}C. Dryer temperatures are monitored continuously via SCADA (history saved). Daily dryer temperature monitoring is performed by Rendering Staff and recorded onto the **'Imlay Rendering Shift Report – RMF 012'**.

'Imlay Rendering Shift Report – RMF 012' pdf files for the review period sent to Horizons electronically.

e. A summary of any notifications made to MWRC in accordance with Condition 28;

The Complaints Register for 2020 / 2021 Review period can be found in Appendix 1 of this report.

f. A copy of any notes recorded during the annual meeting of the CLG under Condition 22;

The Permit Holder shall provide co-ordination and administrative support for the Community Liaison Group (CLG) including a dedicated contact point at the site, provision of a meeting point and overseeing any administration associated with the group. The general purpose of the CLG shall be for the Consent Holder to inform the CLG of:

The odour generating activities being undertaken within the Imlay site;

The current odour management processes and procedures being used for those activities; and

Any proposed alterations to those activities, processes or procedures.

A Community Liaison Group Meeting was held on the 31st of March 2021. A copy of the minutes can be found in Appendix 5 of this report.

g. A summary of monthly odour surveys received and the outcome of any investigations and responses required by Condition 29;

29. The Permit Holder shall carry out monthly odour surveys around the boundary of the site, and shall record whether any odour attributable to AFFCO is discernible or not at each location. Monitoring shall occur when the rendering plant is fully operational. These boundary surveys shall be undertaken by the independent person identified in **Condition 7**. The methods and reporting shall be set out in the environmental management plan required by **Condition 4** that is certified by MWRC. The outcome of each monthly odour survey shall be recorded. The Permit Holder shall investigate the cause of any significant odour (intensity greater than two on the VDI 3940 intensity scale) detected during each survey, and implement any necessary remedial action within 48 hours of its detection. A record of each monthly odour survey and any remediation carried out shall be reported in the annual report required **by Condition 35**.

Monthly odour surveys are performed by an 'Independent person'. Amourguard has been contracted to provide that independent odour survey. There were no significant odour issues during those surveys.

Refer Appendix 2 for monthly surveys for the 2020 / 2021 review period.

h. Reporting undertaken as part of Condition 32 regarding the vacuum (pressure) at all enclosed equipment items;

32. The Permit Holder shall, annually **prior to 30 March**, measure and record the vacuum (pressure) at all enclosed equipment items that are extracted by the odour control systems as follows:

a. Pressure shall be measured in the head space of the equipment items that are targeted by the extraction systems. The measurements shall be undertaken by an independent appropriately qualified and experienced person following industry best practice for measurements of this type.

b. The Permit Holder shall prepare a report on the findings and critically analyse the results (including a comparison with historical data) and if required, make recommendations as to the adequacy of the extraction rates, whether pressures are sufficiently negative and whether additional sealing/enclosing of any rendering plant process area is needed to ensure adequate extraction and compliance with conditions of this consent.

This report must be submitted Regulatory Manager of MWRC as part of the annual reporting required by **Condition 35**.

Daily:-
Vacuum pressure checks of enclosed equipment is performed daily during processing. Records are logged onto **'Air Odour Resource Consent Monitoring Checksheet – RMF 008'**.

'Air Odour Resource Consent Monitoring Checksheet – RMF 008' pdf files for the review period sent to Horizons electronically.

Annually:-
KupeTech perform annual pressure checks as per Condition 32. Findings from that annual review can be found in the Appendix 3 of this report. Included in that audit report is an 'Action List' for remedial actions required on extraction systems. Refer Appendix 4 for the KupeTech Action List - 2021.

i. Records all instrument calibrations carried out on the rendering plant cooling and odour control equipment;

Fixed temperature probes located on plant cooling vessels are calibrated on a quarterly basis (in-house using a calibrated reference thermometer). Refer below to the latest calibration results.

FIXED PLANT THERMOMETERS

Serial / ID Number	Dept.	Description	Ice Point Reading	Ref. Therm.	Difference (+/-)	Steriliser Reading	Ref. Therm.	Difference (+/-)	Accept? (+/- 2.0°C)	Initial	Date of Calibration
SLAUGHTER FLOOR											
115194/1	Viscera Table	N/A	N/A	N/A	N/A	88.0	86.6	+1.4	✓	CW	30/04
304724	Brisket Cutter	N/A	N/A	N/A	N/A	88.0	86.5	+1.5	✓	CW	30/04
304724	Hock Cutter	N/A	N/A	N/A	N/A	88.0	89.3	0.3	✓	CW	30/04
3059223	Thumb Tool (West)	N/A	N/A	N/A	N/A	82.0	83.1	1.1	✓	CW	30/04
301074	Thumb Tool (East)	N/A	N/A	N/A	N/A	82.0	83.5	1.5	✓	CW	30/04
	Hot Water Wash	*Hot Water Wash currently not in use. Carcases washed using cold water.*									
RENDERING PLANT – (Handwash Water Temperature)											
304724	Dryer Condenser	41 0/41 5							✓	CW	30/04
300739	Odour Condensate	NOT WORKING - REPLACED - 316546							-	CW	30/04
304724	Dryer Condensate	40 0/41 0							✓	CW	30/04
312914	Odour Condenser	40 0/41 0							✓	CW	30/04
E006481	Rendering	Yokogawa	N/A	N/A	N/A	41 3	41 5	-0 2	✓	CW	30/04
301074	Dry-side Inlet Duct	20 0 / 42 0 HRT 1 - REPLACED - 316546							x	CW	30/04
301074	Dry-side Outlet Duct	42 0 / 41 5 HRT 2							✓	CW	30/04
304724	Wet-side Cooling Tower Outlet	STEM CORRODED – REPLACED - 316546							-	CW	30/04

NOTE:-
1. Fixed Plant thermometers are replaced if they require an adjustment which is greater than 2 deg C.
2. Fixed thermometers associated with the Rendering Department are to be calibrated in handwash water only.
3. All non conforming thermometers are to be replaced with new thermometers.

APPENDIX 1 –

Complaints Register and Trending

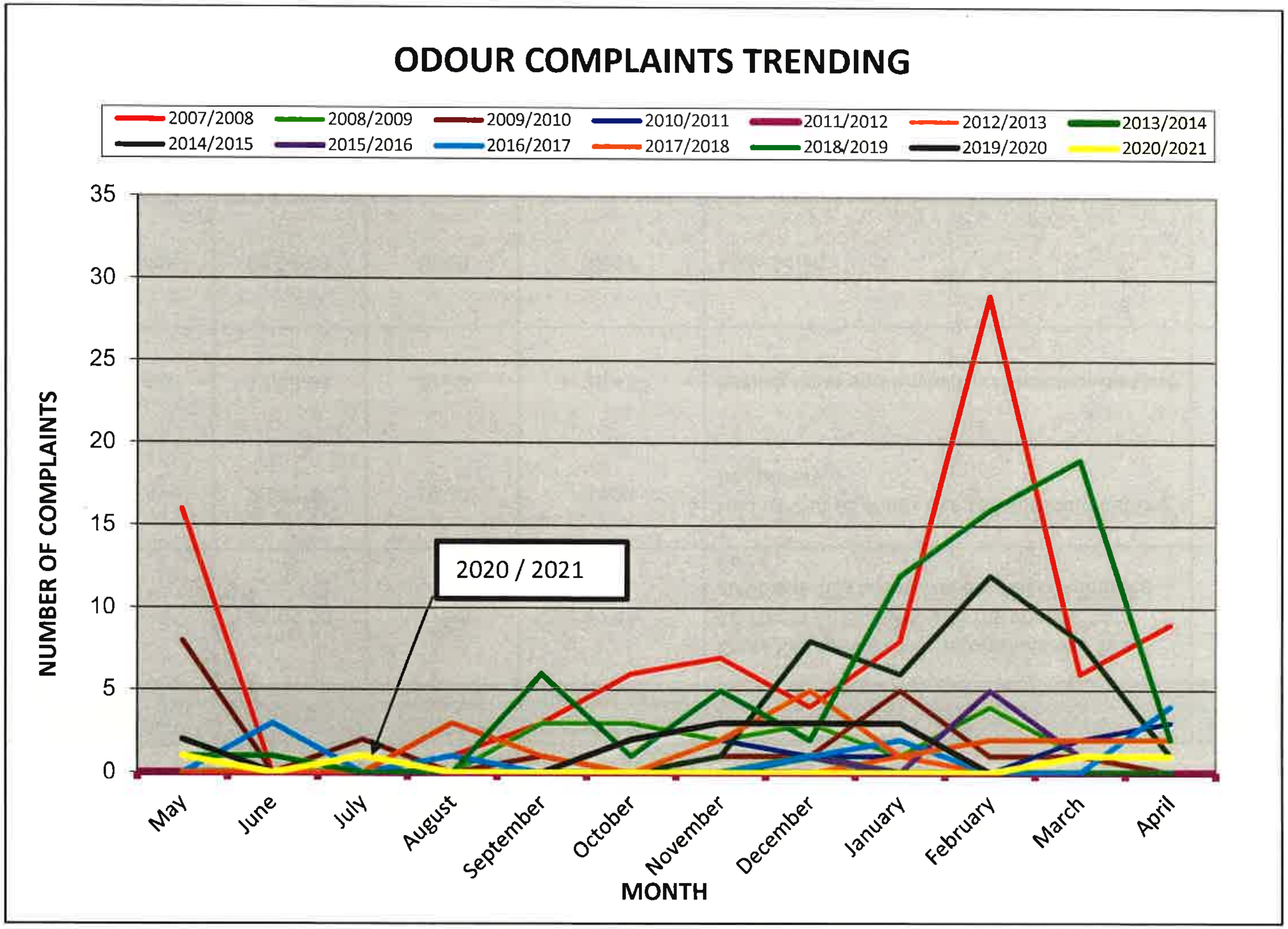
Complaints Register:-

ODOUR COMPLAINTS REGISTER 2020 - 2021

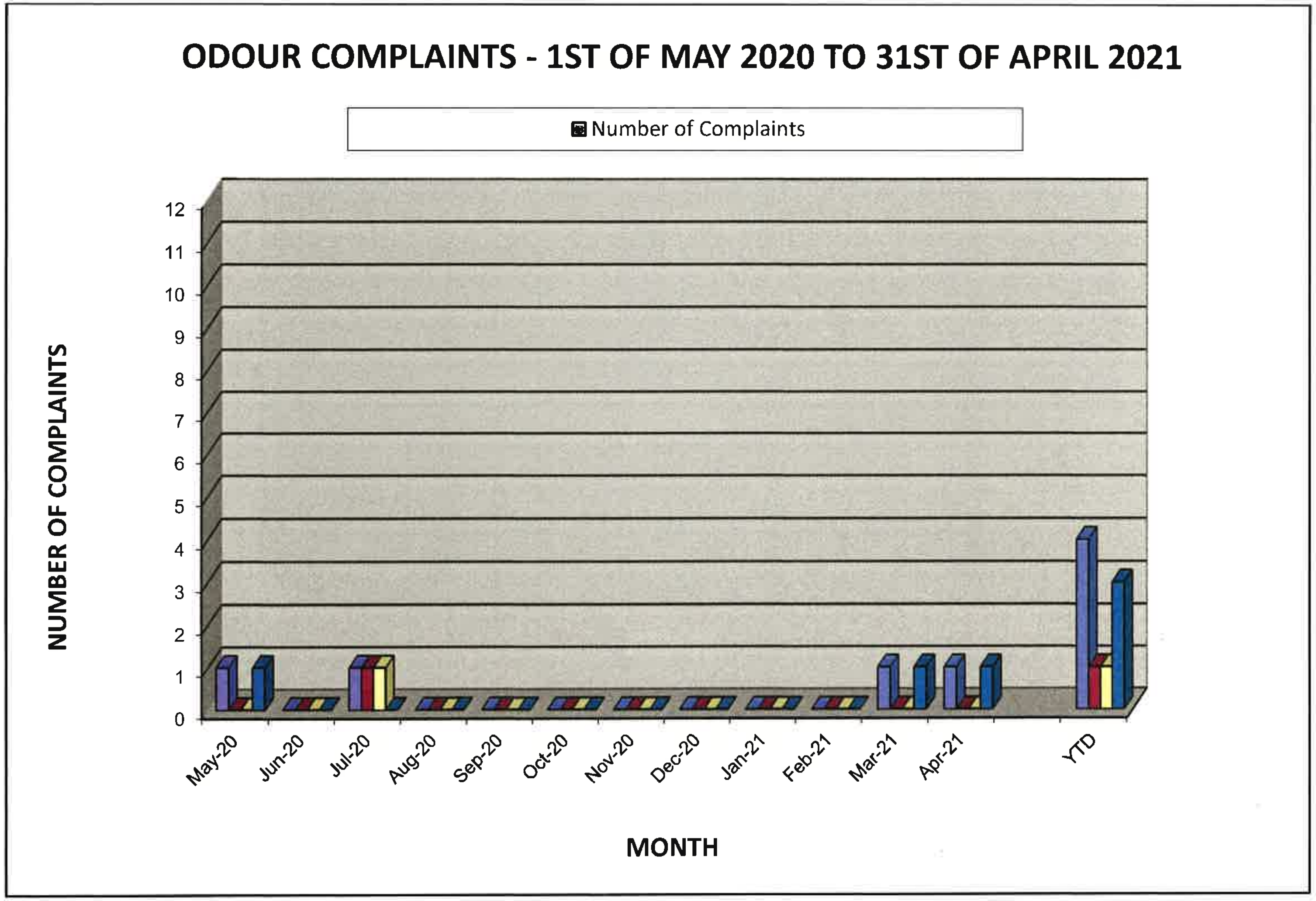
(Period from the 1st of May 2020 to 30th of April 2021)

Nº	NAME	ADDRESS	DATE	TIME REPORTED	TIME OF INVESTIGATION	COMMENTS	SUBSTANTIATED (Ours)	UNSUBSTANTIATED
1	Mr & Mrs Lawson	16a Bignell Street	05.05.20	12:20	12:30	Email Received from the complainant:- It is 12.20 pm on 6th May and the stink is atrocious. It is noted you are not running the fan.		✓
2	Mrs Jennings	101a Gonville Ave	28.07.20	14:20	14:31	Had to shut all winds due to bad odour coming from Imlay.	✓	
3	Sandy Black	71 Bignell Street	17.03.21	20:25	20:46	Rotting meat and faty with chemical undertone		✓
4	Lonia Sarniak	7 Saunders Place	08.04.21	18:00	18:17	Farm Smell		✓

Odour Complaint Trending History to Date:-



Odour Complaint Outcomes:-



Odour Complaints by Surrounding Streets:-

APPENDIX 2 –

Monthly Survey Reports

ODOUR MEASUREMENT RECORD SHEET (FIDOL SYSTEM)

DATE:- 23-6-20   ASSESSORS NAME:- Wayne Watson

REASON FOR INVESTIGATION:- (✓ applicable)   COMPLAINT [ ]   ODOUR SURVEY [✓]

INITIAL IMPRESSIONS:-

TIME OF INITIAL IMPRESSION:-	
ODOUR INTENSITY:-	
CHARACTER:-	
GENERAL HEDONIC TONE:-	
PLUME WIDTH (if known]:-	

START TIME:- 1030

		Intensity	Character/notes
1st min	0	0	
	10	0	
	20	0	
	30	0	
	40	0	
	50	0	
2nd min	0	0	
	10	0	
	20	0	
	30	0	
	40	0	
	50	0	
3rd min	0	0	
	10	0	
	20	0	
	30	0	
	40	0	
	50	0	
4th min	0	0	
	10	0	
	20	0	
	30	0	
	40	0	
	50	0	
5th min	0	0	
	10	0	
	20	0	
	30	0	
	40	0	
	50	0	

		Intensity	Character/notes
6th min	0	0	
	10	0	
	20	0	
	30	0	
	40	0	
	50	0	
7th min	0	0	
	10	0	
	20	0	
	30	0	
	40	0	
	50	0	
8th min	0	0	
	10	0	
	20	0	
	30	0	
	40	0	
	50	0	
9th min	0	0	
	10	0	
	20	0	
	30	0	
	40	0	
	50	0	
10th min	0	0	
	10	0	
	20	0	
	30	0	
	40	0	
	50	0	

Scale of Intensity

6	Extremely strong
5	Very strong
4	Strong
3	Distinct
2	Weak
1	Very weak
0	No odour

Weather Data (see over)

Wind direction:-
Wind velocity:-
Cloud cover:-
Temperature:-

General Hedonic Tone

	-4 Extremely unpleasant
	-3
	-2
	-1
	0 Neutral
	1
	2
	3
	4 Extremely pleasant

Based on your assessment on this occasion, which of the following applies:-

- [✓] *I did not detect any odour*
- [ ] *I did detect odour and consider it would not be objectionable at any location for any duration or frequency*
- [ ] *I did detect odour and consider it would not be objectionable. UNLESS it became continuous*
- [ ] *I did detect odour and consider it would be objectionable if it occurred on a regular or frequent basis*
- [ ] *I did detect odour and consider it would be objectionable even if in periods of short duration*

FINAL CHECKLIST:-

- [ ] *Upwind assessment completed. If not, detail reason:-*
- [ ] *Aerial photo showing location of assessment attached*
- [ ] *Are there potential witness statements to obtain:- YES / NO*

REMARKS:-

AFFCO IMLAY

RMF 001

ODOUR MEASUREMENT RECORD SHEET (FIDOL SYSTEM)

ISSUE DATE:- March 2013

DATE:- 20-7-20

ASSESSORS NAME:- Wayne Watson

REASON FOR INVESTIGATION:- (✓ applicable)

COMPLAINT [ ]

ODOUR SURVEY [✓]

INITIAL IMPRESSIONS:-

TIME OF INITIAL IMPRESSION:-

ODOUR INTENSITY:-

CHARACTER:-

GENERAL HEDONIC TONE:-

PLUME WIDTH (if known):-

START TIME:- 1245

Location	Minute	Sec	Intensity	Character/notes
	1st min	0		
		10	0	
Belgowrie		20	0	
		30	0	
		40	0	
		50	0	
	2nd min	0	0	
		10	0	
Woodworth St		20	0	
		30		
		40	0	
		50	0	
	3rd min	0	0	
		10	0	
Inhaw Place		20	0	
		30	0	
		40	0	
		50	0	
	4th min	0	0	
		10	0	
Beach Rd		20	0	
		30	0	
		40	0	
		50	0	
	5th min	0	0	
		10	0	
		20	0	
Karoro		30	0	
		40	0	
		50	0	

Location	Minute	Sec	Intensity	Character/notes
	6th min	0	0	
		10	0	
Prince St		20	0	
		30	0	
		40	0	
		50	0	
	7th min	0	0	
		10	0	
Prince St Bignal St		20	0	
		30	0	
		40	0	
		50	0	
	8th min	0	0	
		10	0	
Bignal 16		20	0	
		30	0	
		40	0	
		50	0	
	9th min	0	0	
		10	0	
Grey St		20	0	
		30	0	
		40	0	
		50	0	
	10th min	0	0	
		10	0	
Kings Ave		20	0	
		30	0	
		40	0	
		50	0	

Scale of Intensity

- 6 Extremely strong
- 5 Very strong
- 4 Strong
- 3 Distinct
- 2 Weak
- 1 Very weak
- 0 No odour

Weather Data (see over)

Wind direction:-

Wind velocity:-

Cloud cover:-

Temperature:-

General Hedonic Tone

- -4 Extremely unpleasant
- -3
- -2
- -1
- 0 Neutral
- 1
- 2
- 3
- 4 Extremely pleasant

Based on your assessment on this *occasion, which of the following applies:-*

- [✓] *I did not detect any odour*
- [ ] *I did detect odour and consider it would not be objectionable at any location for any duration or frequency*
- [ ] *I did detect odour and consider it would not be objectionable, UNLESS it became continuous*
- [ ] *I did detect odour and consider it would be objectionable if it occurred on a regular or frequent basis*
- [ ] *I did detect odour and consider it would be objectionable even if in periods of short duration*

FINAL CHECKLIST:-

- [ ] *Upwind assessment completed – if not, detail reason:*
- [ ] *Aerial photo showing location of assessment attached*
- [ ] *Are there potential witness statements to obtain: YES / NO*

REMARKS:-

ODOUR MEASUREMENT RECORD SHEET (FIDOL SYSTEM)

DATE:- 21-8-20

ASSESSORS NAME:- Wayne Watson

REASON FOR INVESTIGATION:- (✓ applicable)

COMPLAINT ☐ ODOUR SURVEY ✓

INITIAL IMPRESSIONS:-

TIME OF INITIAL IMPRESSION:-

ODOUR INTENSITY:-

CHARACTER:-

GENERAL HEDONIC TONE:-

PLUME WIDTH (if known):-

START TIME:- 1530

		Intensity	Character/notes	
1st min	0	0		
	10	0		
	20	0		Bulgawina
	30	0		
	40	0		
	50	0		
2nd min	0	0		
	10	0		
	20	0		Wordsworth
	30	0		
	40	0		
	50	0		
3rd min	0	0		
	10	0		
	20	0		Heads
	30	0		
	40	0		
	50	0		
4th min	0	0		
	10	0		
	20	0		Beach Rd
	30	0		
	40	0		
	50	0		
5th min	0	0		
	10	0		
	20	0		
	30	0		Karoro
	40	0		
	50	0		

		Intensity	Character/notes	
6th min	0	0		
	10	0		
	20	0		Prince
	30	0		
	40	0		
	50	0		
7th min	0	0		
	10	0		
	20	0		Bignol
	30	0		
	40	0		
	50	0		
8th min	0	0		
	10	0		
	20	0		Bignol
	30	0		
	40	0		
	50	0		
9th min	0	0		
	10	0		
	20	0		Gunn
	30	0		
	40	0		
	50	0		
10th min	0	0		
	10	0		
	20	0		Kings
	30	0		
	40	0		
	50	0		

Scale of Intensity

6	Extremely strong
5	Very strong
4	Strong
3	Distinct
2	Weak
1	Very weak
0	No odour

Weather Data (see over)

Wind direction:-
Wind velocity:-
Cloud cover:-
Temperature:-

General Hedonic Tone

-4 Extremely unpleasant
-3
-2
-1
0 Neutral
1
2
3
4 Extremely pleasant

Based on your assessment on this occasion, which of the following applies:-

- ✓ *I did not detect any odour*
- ☐ *I did detect odour and consider it would not be objectionable at any location for any duration or frequency*
- ☐ *I did detect odour and consider it would not be objectionable. UNLESS it became continuous*
- ☐ *I did detect odour and consider it would be objectionable if it occurred on a regular or frequent basis*
- ☐ *I did detect odour and consider it would be objectionable even if in periods of short duration*

FINAL CHECKLIST:-

- ☐ *Upwind assessment completed. If not, detail reason:-* ______
- ☐ *Aerial photo showing location of assessment attached*
- ☐ *Are there potential witness statements to obtain:- YES / NO*

REMARKS:-

ODOUR MEASUREMENT RECORD SHEET (FIDOL SYSTEM)

DATE:- 14-9-20

ASSESSORS NAME:- Wayne Watson

REASON FOR INVESTIGATION:- (✓ applicable) COMPLAINT [ ] ODOUR SURVEY [✓]

INITIAL IMPRESSIONS:-

TIME OF INITIAL IMPRESSION:-

ODOUR INTENSITY:-

CHARACTER:-

GENERAL HEDONIC TONE:-

PLUME WIDTH (if known):-

START TIME:- 1015

Location	Min	Sec	Intensity	Character/notes
Head Rd	1st min	0	0	
		10	0	
		20	0	
		30	0	
		40	0	
		50	0	
Leamington St	2nd min	0	0	
		10	0	
		20	0	Smoke
		30	0	Smell only
		40	0	
		50	0	
Ikaroa Rd	3rd min	0	3	
		10	3	
		20	3	
		30	4	
		40	3	
		50	4	
Prince St	4th min	0	0	
		10	0	
		20	0	
		30	0	
		40	0	
		50	0	
Bignol St	5th min	0	0	
		10	0	
		20	0	
		30	0	
		40	0	
		50	0	
Bignol St	6th min	0	0	
		10	0	
		20	0	
		30	0	
		40	0	
		50	0	
Gunn St	7th min	0	0	
		10	0	
		20	0	
		30	0	
		40	0	
		50	0	
Bolquhuil Av	8th min	0	0	
		10	0	
		20	0	
		30	0	
		40	0	
		50	0	
Wordworth	9th min	0	0	
		10	0	
		20	0	
		30	0	
		40	0	
		50	0	
Bedford Ave	10th min	0	0	
		10	0	
		20	0	
		30	0	
		40	0	
		50	0	

Scale of Intensity

6	Extremely strong
5	Very strong
4	Strong
3	Distinct
2	Weak
1	Very weak
0	No odour

Weather Data (see over)

Wind direction:-
Wind velocity:-
Cloud cover:-
Temperature:-

General Hedonic Tone

	-4 Extremely unpleasant
	-3
	-2
	-1
	0 Neutral
	1
	2
	3
	4 Extremely pleasant

Based on your assessment on this occasion, which of the following applies:-

- [ ] *I did not detect any odour*
- [✓] *I did detect odour and consider it would not be objectionable at any location for any duration or frequency*
- [ ] *I did detect odour and consider it would not be objectionable. UNLESS it became continuous*
- [ ] *I did detect odour and consider it would be objectionable if it occurred on a regular or frequent basis*
- [ ] *I did detect odour and consider it would be objectionable even if in periods of short duration*

FINAL CHECKLIST:-

- [ ] *Upwind assessment completed. If not, detail reason:-*
- [ ] *Aerial photo showing location of assessment attached*
- [ ] *Are there potential witness statements to obtain:- YES / NO*

REMARKS:-

AFFCO IMLAY

RMF 001

ISSUE DATE:- March 2018

ODOUR MEASUREMENT RECORD SHEET (FIDOL SYSTEM)

DATE:- 22-10-20

ASSESSORS NAME:- Wayne Watson

REASON FOR INVESTIGATION:- (✓ applicable)

COMPLAINT [ ]

ODOUR SURVEY [✓]

INITIAL IMPRESSIONS:-

TIME OF INITIAL IMPRESSION:-

ODOUR INTENSITY:-

CHARACTER:-

GENERAL HEDONIC TONE:-

PLUME WIDTH (if known):-

START TIME:- 0905

Location	Minute	Seconds	Intensity	Character/notes
Balgownie	1st min	0	0	
		10	0	
		20	0	
		30	0	
		40	0	
		50	0	
Wordsworth	2nd min	0	0	
		10	0	
		20	0	
		30	0	
		40	0	
		50	0	
Heads Rd	3rd min	0	0	
		10	0	
		20	0	
		30	0	
		40	0	
		50	0	
Beach Rd	4th min	0	1	
		10	1	
		20	0	
		30	0	
		40	0	
		50	1	
Karoro	5th min	0	2	
		10	1	
		20	1	
		30	1	
		40	0	
		50	0	
Prince St	6th min	0	0	
		10	0	
		20	0	
		30	0	
		40	0	
		50	0	
Bignell St	7th min	0	0	
		10	0	
		20	0	
		30	0	
		40	0	
		50	0	
Bignell St	8th min	0	0	
		10	0	
		20	0	
		30	0	
		40	0	
		50	0	
Sounders	9th min	0	0	
		10	0	
		20	0	
		30	0	
		40	0	
		50	0	
Gunn St	10th min	0	0	
		10	0	
		20	0	
		30	0	
		40	0	
		50	0	

Scale of Intensity

6	Extremely strong
5	Very strong
4	Strong
3	Distinct
2	Weak
1	Very weak
0	No odour

Weather Data (see over)

Wind direction:-
Wind velocity:-
Cloud cover:-
Temperature:-

General Hedonic Tone

	-4 Extremely unpleasant
	-3
	-2
	-1
	0 Neutral
	1
	2
	3
	4 Extremely pleasant

Based on your assessment on this occasion, which of the following applies:-

- [ ] *I did not detect any odour*
- [✓] *I did detect odour and consider it would not be objectionable at any location for any duration or frequency*
- [ ] *I did detect odour and consider it would not be objectionable. UNLESS it became continuous*
- [ ] *I did detect odour and consider it would be objectionable if it occurred on a regular or frequent basis*
- [ ] *I did detect odour and consider it would be objectionable even if in periods of short duration*

FINAL CHECKLIST:-

- [ ] *Upwind assessment completed. If not, detail reason:-*
- [ ] *Aerial photo showing location of assessment attached*
- [ ] *Are there potential witness statements to obtain:- YES / NO*

REMARKS:-

ODOUR MEASUREMENT RECORD SHEET (FIDOL SYSTEM)

DATE:- 20-11-20 **ASSESSORS NAME:-** Wayne Watson

REASON FOR INVESTIGATION:- (✓ applicable) **COMPLAINT** [ ] **ODOUR SURVEY** [✓]

INITIAL IMPRESSIONS:-		**CHARACTER:-**	
TIME OF INITIAL IMPRESSION:-		**GENERAL HEDONIC TONE:-**	
ODOUR INTENSITY:-		**PLUME WIDTH (if known):-**	

START TIME:- 1123

Location	Minute	Second	Intensity	Character/notes
Belgowan Av	1st min	0	0	
		10	0	
		20	0	
		30	|	
		40	|	
		50	0	
Wordsworth	2nd min	0	0	
		10	0	
		20	0	
		30	0	
		40	0	
		50	0	
King Av	3rd min	0	0	
		10	0	
		20	0	
		30	0	
		40	0	
		50	0	
Hinds Rd	4th min	0	0	
		10	0	
		20	0	
		30	0	
		40	0	
		50	0	
Korere Rd	5th min	0	0	
		10	|	
		20	0	
		30	0	
		40	0	
		50	0	
Beaumont's Ave	6th min	0	0	
		10	0	
		20	0	
		30	0	
		40	|	
		50	|	
Bignel	7th min	0	0	
		10	0	
		20	0	
		30	0	
		40	0	
		50	0	
Bignel	8th min	0	0	
		10	0	
		20	0	
		30	0	
		40	0	
		50	0	
Gunn	9th min	0	0	
		10	0	
		20	0	
		30	0	
		40	0	
		50	0	
Kings Ave	10th min	0	0	
		10	0	
		20	0	
		30	0	
		40	0	
		50	0	

Scale of Intensity

6	Extremely strong
5	Very strong
4	Strong
3	Distinct
2	Weak
1	Very weak
0	No odour

Weather Data (see over)

Wind direction:-
Wind velocity:-
Cloud cover:-
Temperature:-

General Hedonic Tone

-4 Extremely unpleasant
-3
-2
-1
0 Neutral
1
2
3
4 Extremely pleasant

Based on your assessment on this occasion, which of the following applies:-

- [ ] *I did not detect any odour*
- [✓] *I did detect odour and consider it would not be objectionable at any location for any duration or frequency*
- [ ] *I did detect odour and consider it would not be objectionable. UNLESS it became continuous*
- [ ] *I did detect odour and consider it would be objectionable if it occurred on a regular or frequent basis*
- [ ] *I did detect odour and consider it would be objectionable even if in periods of short duration*

FINAL CHECKLIST:-

- [ ] *Upwind assessment completed. If not, detail reason:-* ______
- [ ] *Aerial photo showing location of assessment attached*
- [ ] *Are there potential witness statements to obtain:- YES / NO*

REMARKS:-

ODOUR MEASUREMENT RECORD SHEET (FIDOL SYSTEM)

DATE:- 11/12/20 **ASSESSORS NAME:-** Kristi Townsend

REASON FOR INVESTIGATION:- (✓ applicable) **COMPLAINT** [ ] **ODOUR SURVEY** [✓]

INITIAL IMPRESSIONS:-

TIME OF INITIAL IMPRESSION:-		CHARACTER:-	
ODOUR INTENSITY:-		GENERAL HEDONIC TONE:-	
		PLUME WIDTH (if known):-	

START TIME:- 1545

Minute	Sec	Intensity	Character/notes
1st min	0	0	Beach Rd
	10	0	
	20	0	
	30	0	
	40	0	
	50	0	
2nd min	0	0	
	10	0	
	20	0	
	30	0	
	40	0	
	50	0	
3rd min	0	0	
	10	0	
	20	0	
	30	0	
	40	0	
	50	0	
4th min	0	0	
	10	0	
	20	0	
	30	0	
	40	0	
	50	0	
5th min	0	0	Balgownie
	10	0	
	20	0	
	30	0	
	40	0	
	50	0	

Minute	Sec	Intensity	Character/notes
6th min	0	0	Heads Rd.
	10	0	
	20	0	
	30	0	
	40	0	
	50	0	
7th min	0	0	
	10	0	
	20	0	
	30	0	
	40	0	
	50	0	
8th min	0	0	Wordsworth
	10	0	
	20	0	
	30	0	
	40	0	
	50	0	
9th min	0	0	
	10	0	
	20	0	
	30	0	
	40	0	
	50	0	
10th min	0	0	
	10	0	
	20	0	
	30	0	
	40	0	
	50	0	

Scale of Intensity

6	Extremely strong
5	Very strong
4	Strong
3	Distinct
2	Weak
1	Very weak
0	No odour

Weather Data (see over)

Wind direction:-	
Wind velocity:-	
Cloud cover:-	
Temperature:-	

General Hedonic Tone

	-4 Extremely unpleasant
	-3
	-2
	-1
	0 Neutral
	1
	2
	3
	4 Extremely pleasant

Based on your assessment on this occasion, which of the following applies:-

- [✓] *I did not detect any odour*
- [ ] *I did detect odour and consider it would not be objectionable at any location for any duration or frequency*
- [ ] *I did detect odour and consider it would not be objectionable. UNLESS it became continuous*
- [ ] *I did detect odour and consider it would be objectionable if it occurred on a regular or frequent basis*
- [ ] *I did detect odour and consider it would be objectionable even if in periods of short duration*

FINAL CHECKLIST:-

- [ ] *Upwind assessment completed. If not, detail reason:-* ______
- [ ] *Aerial photo showing location of assessment attached*
- [ ] *Are there potential witness statements to obtain:- YES / NO*

REMARKS:-

AFFCO IMLAY

RMF 001

ODOUR MEASUREMENT RECORD SHEET (FIDOL SYSTEM)

ISSUE DATE:- March 2018

DATE:- 18/1/21

ASSESSORS NAME:- Wayne Watson

REASON FOR INVESTIGATION:- (✓ applicable)

COMPLAINT [ ]

ODOUR SURVEY [✓]

INITIAL IMPRESSIONS:-

TIME OF INITIAL IMPRESSION:-

ODOUR INTENSITY:-

CHARACTER:-

GENERAL HEDONIC TONE:-

PLUME WIDTH (if known):-

START TIME:- 0958

Location	Minute	Seconds	Intensity	Character/notes
[illegible]	1st min	0	0	
		10	0	
		20	0	
		30	0	
		40	0	
		50	0	
Wallwork	2nd min	0	0	
		10	2	not Affco
		20	2	
		30	2	from milk
		40	3	plant.
		50	2	
Heads Rd	3rd min	0	0	
		10	0	
		20	0	
		30	0	
		40	0	
		50	0	
Beach Rd	4th min	0	0	
		10	0	
		20	0	
		30	0	
		40	0	
		50	0	
Kororo Rd	5th min	0	1	
		10	1	
		20	1	
		30	1	
		40	1	
		50	1	

Location	Minute	Seconds	Intensity	Character/notes
Prince St	6th min	0	0	
		10	0	
		20	0	
		30	0	
		40	0	
		50	0	
Bignell	7th min	0	0	
		10	0	
		20	0	
		30	0	
		40	0	
		50	0	
Bignell	8th min	0	0	
		10	0	
		20	0	
		30	0	
		40	0	
		50	0	
Abbott St	9th min	0	0	
		10	0	
		20	0	
		30	0	
		40	0	
		50	0	
Gunn St	10th min	0	0	
		10	0	
		20	0	
		30	0	
		40	0	
		50	0	

Scale of Intensity

6	Extremely strong
5	Very strong
4	Strong
3	Distinct
2	Weak
1	Very weak
0	No odour

Weather Data (see over)

Wind direction:-
Wind velocity:-
Cloud cover:-
Temperature:-

General Hedonic Tone

-4 Extremely unpleasant
-3
-2
-1
0 Neutral
1
2
3
4 Extremely pleasant

Based on your assessment on this occasion, which of the following applies:-

- [ ] *I did not detect any odour*
- [✓] *I did detect odour and consider it would not be objectionable at any location for any duration or frequency*
- [ ] *I did detect odour and consider it would not be objectionable. UNLESS it became continuous*
- [ ] *I did detect odour and consider it would be objectionable if it occurred on a regular or frequent basis*
- [ ] *I did detect odour and consider it would be objectionable even if in periods of short duration*

FINAL CHECKLIST:-

- [ ] *Upwind assessment completed. If not, detail reason:-*
- [ ] *Aerial photo showing location of assessment attached*
- [ ] *Are there potential witness statements to obtain:- YES / NO*

REMARKS:-

AFFCO IMLAY

ISSUE DATE:- March 2018

ODOUR MEASUREMENT RECORD SHEET (FIDOL-SYSTEM)

RMF 001

DATE:- 16-2-21

ASSESSORS NAME:- Wayne Watson

REASON FOR INVESTIGATION:- (✓ applicable)

COMPLAINT [ ]   ODOUR SURVEY [✓]

INITIAL IMPRESSIONS:-

TIME OF INITIAL IMPRESSION:-	
ODOUR INTENSITY:-	
CHARACTER:-	
GENERAL HEDONIC TONE:-	
PLUME WIDTH (if known):-	

START TIME:- 1210

Location	Minute	Seconds	Intensity	Character/notes
L Dowie	1st min	0	0	
		10	0	
		20	0	
		30	0	
		40	0	
		50	0	
Balgowan	2nd min	0	0	
		10	0	
		20	0	
		30	0	
		40	0	
		50	0	
Heads Rd	3rd min	0	0	
		10	0	
		20	0	
		30	0	
		40	0	
		50	0	
Lemington	4th min	0	0	
		10	1	
		20	1	
		30	2	
		40	2	
		50	2	
Karoro	5th min	0	0	
		10	0	
		20	0	
		30	0	
		40	0	
		50	0	
Prince	6th min	0	0	
		10	0	
		20	0	
		30	0	
		40	0	
		50	0	
Bignel	7th min	0	0	
		10	0	
		20	0	
		30	0	
		40	0	
		50	0	
Bignel	8th min	0	0	
		10	0	
		20	0	
		30	0	
		40	0	
		50	0	
Saunders Pl	9th min	0	0	
		10	0	
		20	0	
		30	0	
		40	0	
		50	0	
Gunn St	10th min	0	0	
		10	0	
		20	0	
		30	0	
		40	0	
		50	0	

Scale of Intensity

6	Extremely strong
5	Very strong
4	Strong
3	Distinct
2	Weak
1	Very weak
0	No odour

Weather Data (see over)

Wind direction:-
Wind velocity:-
Cloud cover:-
Temperature:-

General Hedonic Tone

	-4 Extremely unpleasant
	-3
	-2
	-1
	0 Neutral
	1
	2
	3
	4 Extremely pleasant

Based on your assessment on this occasion, which of the following applies:-

- [ ] *I did not detect any odour*
- [✓] *I did detect odour and consider it would not be objectionable at any location for any duration or frequency*
- [ ] *I did detect odour and consider it would not be objectionable. UNLESS it became continuous*
- [ ] *I did detect odour and consider it would be objectionable if it occurred on a regular or frequent basis*
- [ ] *I did detect odour and consider it would be objectionable even if in periods of short duration*

FINAL CHECKLIST:-

- [ ] *Upwind assessment completed. If not, detail reason:-*
- [ ] *Aerial photo showing location of assessment attached*
- [ ] *Are there potential witness statements to obtain:- YES / NO*

REMARKS:-

ODOUR MEASUREMENT RECORD SHEET (FIDOL SYSTEM)

DATE:- 11/03/21 **ASSESSORS NAME:-** KRISTI TOWNSEND

REASON FOR INVESTIGATION:- (✓ applicable) **COMPLAINT** [ ] **ODOUR SURVEY** [✓]

INITIAL IMPRESSIONS:- **CHARACTER:-**

TIME OF INITIAL IMPRESSION:- **GENERAL HEDONIC TONE:-**

ODOUR INTENSITY:- **PLUME WIDTH (if known):-**

START TIME:- 1340

		Intensity	Character/notes
1st min	0	0	Heads Road Balgownie Ave
	10	0	
	20	0	
	30	0	
	40	0	
	50	0	
2nd min	0	0	
	10	0	
	20	0	
	30	0	
	40	0	
	50	0	
3rd min	0	0	
	10	0	
	20	0	
	30	0	
	40	0	
	50	0	
4th min	0	0	
	10	0	
	20	0	
	30	0	
	40	0	
	50	0	
5th min	0	0	
	10	0	
	20	0	
	30	0	
	40	0	
	50	0	

		Intensity	Character/notes
6th min	0	0	Heads Rd
	10	0	
	20	0	
	30	0	
	40	0	
	50	0	
7th min	0	0	
	10	0	
	20	0	
	30	0	
	40	0	
	50	0	
8th min	0	/	Beach Rd
	10	/	
	20	/	
	30	/	
	40	/	
	50	/	
9th min	0	/	
	10	/	
	20	/	
	30	/	
	40	/	
	50	/	
10th min	0	/	
	10	/	
	20	/	
	30	/	
	40	/	
	50	/	

Scale of Intensity
- 6 Extremely strong
- 5 Very strong
- 4 Strong
- 3 Distinct
- 2 Weak
- 1 Very weak
- 0 No odour

Weather Data (see over)
- Wind direction:-
- Wind velocity:-
- Cloud cover:-
- Temperature:-

General Hedonic Tone
- -4 Extremely unpleasant
- -3
- -2
- -1
- 0 Neutral
- 1
- 2
- 3
- 4 Extremely pleasant

Based on your assessment on this occasion, which of the following applies:-
- *I did not detect any odour*
- *I did detect odour and consider it would not be objectionable at any location for any duration or frequency*
- *I did detect odour and consider it would not be objectionable UNLESS it became continuous*
- *I did detect odour and consider it would be objectionable if it occurred on a regular or frequent basis*
- *I did detect odour and consider it would be objectionable even if in periods of short duration*

FINAL CHECKLIST:-
- *Upwind assessment completed If not, detail reason:-*
- *Aerial photo showing location of assessment attached*
- *Are there potential witness statements to obtain:- YES / NO*

REMARKS:-

ODOUR MEASUREMENT RECORD SHEET (FIDOL SYSTEM)

…E:- 09.04.21

ASSESSORS NAME:- Kristi Townsend

…EASON FOR INVESTIGATION:- (✓ applicable)

COMPLAINT [ ] ODOUR SURVEY [✓]

…IAL IMPRESSIONS:-

CHARACTER:-

…E OF INITIAL IMPRESSION:- 1030

GENERAL HEDONIC TONE:-

ODOUR INTENSITY:-

PLUME WIDTH (if known):-

…RT TIME:-

Minute	Seconds	Intensity	Character/notes
…in	0	[illegible] 0	
	10	0	
	20	0	
	30	0	
	40	0	
	50	0	
…in	0	0	
	10	0	
	20	0	
	30	0	
	40	0	
	50	0	
…in	0		
	10	/	
	20	/	
	30	/	
	40	/	
	50	/	
…in	0	/	
	10	/	
	20	0	
	30	0	
	40	0	
	50	0	
…in	0	0	
	10	0	
	20	0	
	30	0	
	40	0	
	50	0	

Minute	Seconds	Intensity	Character/notes
6th min (Heads Rd)	0	/	
	10	/	
	20	/	
	30	/	
	40	/	
	50	/	
7th min	0	0	
	10	0	
	20	0	
	30	0	
	40	0	
	50	0	
8th min (Beach Rd)	0	0	
	10	0	
	20	0	
	30	0	
	40	/	
	50	/	
9th min (Beach Rd)	0	/	
	10	/	
	20	/	
	30	/	
	40	0	
	50	0	
10th min	0	0	
	10	0	
	20	0	
	30	0	
	40	0	
	50		

Scale of Intensity

6 Extremely strong
5 Very strong
4 Strong
3 Distinct
2 Weak
1 Very weak
0 No odour

Weather Data (see over)

Wind direction:-

Wind velocity:-

Cloud cover:-

Temperature:-

General Hedonic Tone

-4 Extremely unpleasant
-3
-2
-1
0 Neutral
1
2
3
4 Extremely pleasant

…d on your assessment on this occasion, which of the following applies:-

- *I did not detect any odour*
- *I did detect odour and consider it would not be objectionable at any location for any duration or frequency*
- *I did detect odour and consider it would not be objectionable, UNLESS it became continuous*
- *I did detect odour and consider it would be objectionable if it occurred on a regular or frequent basis*
- *I did detect odour and consider it would be objectionable even if in periods of short duration*

…L CHECKLIST:-

- *Upwind assessment completed. If not, detail reason:-*
- *Aerial photo showing location of assessment attached*
- *Are there potential witness statements to obtain:- YES / NO*

…ARKS:-

APPENDIX 3 –

KupeTech Annual Report - 2021

AFFCO Imlay Whanganui Rendering Plant

Audit of Odour Control Systems

AFFCO New Zealand Ltd

Reference: A235620

Revision: 1

2021-03-30

KupeTech

Document Control Record

Document prepared by:

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Document Control

Report Title	Biofilter Inspection
Project Number	A235620
File Path	E:\Kupe\AFFCO\235620 2021 Report Rev 0
Client	AFFCO New Zealand Ltd
Client Contact	Ricky Gowan

Rev	**Date**	**Rev Details**	**Author**	**Reviewer**	**Approver**
0	27 March 2021		J Vickerman Mech Engineer		J Vickerman Director
1	30 March 2021	Review	J Vickerman	B McHardy Process Engineer	J Vickerman

Approval			
Author signature	JVickerman	Approver signature	JVickerman
Name	J Vickerman	Name	J Vickerman

Contents

Appendix

Imlay Rendering Plant Biofilter Systems Inspection

This report summarises results from inspection of the Rendering Plant odour extraction and biofilter systems at the Imlay meat processing works on 15 to 18 February 2021 and includes some results from air flow balancing work done 24 to 26 November 2020.

1. Background

Under the Resource Consent to AFFCO New Zealand Limited (AFFCO) for the discharge of contaminants into air there is a Condition 31 which says:

> *The Permit Holder shall, annually ... undertake an annual audit of the rendering plant's odour control systems that considers the effectiveness of the extraction, cooling and biofilter system and its overall performance in regards to controlling odour emissions. The audit should utilise all monitoring data (manual and continuous, complaint records, any independent odour assessments) as well as include downwind odour assessments of the operational rendering plant and ancillary activities. The audit should assess the state of the odour extraction, cooling and biofilter system and taken appropriate measurements and sample for analysis required to confirm the status these systems against their design and required operating parameters. Any analysis of samples shall be undertaken by an appropriately qualified testing laboratory and sampling undertaken as specified in the OMP. Accepted methods shall be used for measurement of media properties that are certified by the Regulatory Manager of MWRC. [Manawatu Whanganui Regional Council].*
>
> *The audit shall be undertaken by person(s) who is independent, appropriately qualified and experienced in the operation and maintenance of air extraction, cooling and biofilter systems.*

There is also a Consent Condition 32 which says:

> *The Permit Holder shall, annually ... measure and record the vacuum (pressure) at all enclosed equipment items that are extracted by the odour control systems as follows:*
>
> a. *Pressure shall be measured in the head space of the equipment items that are targeted by the extraction systems. The measurements shall be undertaken by an independent appropriately qualified and experienced person following industry best practice for measurements of this type.*
>
> b. *The Permit Holder shall prepare a report on the findings and critically analyse the results (including a comparison with historical data) and if required, make recommendations as to the adequacy of the extraction rates, whether pressures are sufficiently negative and whether additional sealing/enclosing of any rendering plant process area is needed to ensure adequate extraction and compliance with conditions of this consent.*

This report presents the results of investigation, inspection and measurement carried out to meet the above objectives.

2. Recent Inspections

The last inspection and report at Imlay prior to 15 February 2021 was on 3 April 2020. (Minor Revision 1 was issued 15 April 2021).

3. Figures and Tables in the Appendix

In Figures 1, 2 and 3 numbers in balloons have been given for identification of the extraction point locations referred to in this report.

Figure 1 provides a schematic of the wet side point source extractions.

Figure 2 provides a schematic of the dry area point source extractions.

Figure 3 provides a schematic of the outside dry side, wet side and drier air extraction systems feeding the biofilters. Typical air flows (A) ranging from 1,000 to 31,000 m^3/h, static pressures in Pascals (Pa) and temperatures in degrees centigrade (°C) are given in a few locations. Tags for some instruments in the DCS / SCADA system are also given for reporting reference.

Fig 4a provides a key for symbols used in Figs 1 to 3.

Fig 4b provides a diagram of the bed pressure test port locations on the uncovered biofilter.

Figs 5A, 5B and 5C provide logged temperature data of air extracted from the preheater and the air downstream after mixing with air from the inside storage bin.

Table 1 in the Appendix summarises the measured data for the Drier to Covered Biofilter in Fig 3.

Table 2 in the Appendix summarises measured data for the Wet Side to Uncovered Biofilter in Fig 3.

Table 3 in the Appendix summarises the point source extraction measurements.

Table 4 in the Appendix gives a snapshot of the building internal temperatures and humidity.

Table 5 in the Appendix provides an overview of historical measured data since 2015 for comparison. Earlier data does exist but note that process equipment changes have occurred so comparison over many years may not be comparing like for like. In particular, biofilter media has changed, an evaporator was introduced into the drier extracted airstream, the covered biofilter fan was changed and from 2019 biofilter airflow measuring instrument and locations have changed to be compliant with ISO 10780. In relation to airflow measurements, testing has become more complicated but so far has indicated only minor difference between new and old and less than annual variations.

Table 6 has the list of issues for improvement or corrective action arising from the 2020 report with further comment and added items.

4. System Description

With reference to Figure 1:

a) Air in the factory Wet Side is drawn into air extraction ducting at locations where process equipment is known to emit adverse odour. Sufficient air extraction at these locations prevents odour transfer to the working environment. The point source extraction system (PSES) is widely accepted as an energy efficient effective method for containing fugitive odours and providing a safe working environment in a low temperature rendering plant (LTRP). Numbers in balloons refer to vacuum measurement locations used with the AFFCO Air Odour Resource Consent Monitoring Checksheet (RMF 008). Further ports used in the annual measurement have also been numbered. An "f" suffix after the number indicates it is an airflow measuring port but other ports of or larger than a 15mm BSP thread socket (BS21 Rp or ISO 7/1 Rp) can also be used for flow measurement. A 't' suffix indicates above a slide valve; 'b' below a slide valve; 'n' north; 's' south; 'e' east; and 'w' west. Note some numbering may be different to that used in the 2020 report e.g., 13 was interchanged with 8 in installation of fat uneraseable sheet metal laser cut labels on the ducts to aid permanent identification of a vacuum measuring port.

b) Air is also extracted from driers feed conveyor head space and the driers discharge conveyor headspace on the Dry Side.

With reference to Figure 2:

c) Factory air on the Dry Side is extracted at what has earlier been called the "Dust Filter" but is merely a coarse screen covering flow control louvres at the intake. The extraction duct also collects head space air from the Ground and Unground Meal Bins along the way before exiting the building, then on the outside combining with reception bin air and entering the scrubber as shown in Fig 3.

d) Vapour from the driers is conveyed in a separate line to the trash vessel outside. Although the extracted vapours are at slightly less than atmospheric pressure they can sometimes be slightly superheated above 100°C.

With reference to Figure 3:

e) Dry Side air passes through a packed bed spray tower (Dryside Air Scrubber in Fig 3) to a common induced draught fan 14.1 (was previously known as ID1) which discharges into the uncovered biofilter. The primary function of the spray tower is to remove dust particles and protect the biofilter from clogging. Cooling and humidification are other benefits. Air extraction from the outside raw material reception bin (point source 1); the underground conveyor stairwell; and the feed conveyor (point source 21) is also combined with the inflow to the scrubber.

f) Wet Side air and vapour is cooled in the Wet Side heat exchangers HX1, HX2 and HX3 and some water is removed. The Wet Side gas then passes to the common 14.1 fan which discharges into the uncovered biofilter.

g) Drier gas and vapour pass through the Drier Trash Vessel which removes entrained water and trash, then to a stickwater waste heat evaporator where heat from the drier gas transfers to the stickwater. The cooled Drier gases and non-condensable gases extracted from the evaporator by the vacuum pump then pass through two heat exchangers (Gardiner HX and Potter HX) which further cool the gas and vapour and remove condensed water from the gas stream. After cooling and water removal the Drier gas passes to fan 9.3 (formerly known as ID2) and then discharges to the covered biofilter.

h) Water in the Dry Side Air Scrubber (previously called the Dry Process heat exchanger) is recirculated by a pump (14.2) with a small make up water flow.

5. Process Measurements

The biofilter gas and vapour systems temperatures and gas velocities were measured by calibrated thermocouple (also in some cases a calibrated Pt-100 thermal sensor), ISO10780 compliant pitot tube and micro-anemometer (Schiltknecht MiniAir20 Micro) by removing plugs and inserting instruments at:

- Two 32 NB measurement ports (27) located 33m downstream from fan 9.3 (Fig 3).
- The gas ductwork inlet to the Dry Side Air scrubber (26) at a temperature gauge port adjacent instrument HRT1 (Fig 3).
- The gas ductwork outlet from the scrubber measured at the thermometer port (28) beside HRT2 upstream of the flow restricting louvre adjacent the 14.1 fan (Fig 3).
- The gas outlet ductwork from Wet Side Heat Exchangers HX1, HX2 and HX3 (24), prior to the connection with ductwork from the Dry Process scrubber and prior to the 14.1 fan (Fig 3).
- The gas outlet duct from the 14.1 fan at two 50 NB ports (25) 13m downstream of the fan (Fig 3).
- Static pressure measurements made at five locations around the uncovered biofilter distributor ducting ends as shown in Fig 4b, (E, F, G, H, J).
- Temperature and pH measurement of the biofilter media in samples taken from the quadrants at 150 mm depth.
- Flow measurement ports in reception bin and feed conveyor air extraction ducting (22, 21,1 Fig 3).

- Flow measurement ports in the wet area at inside raw material bin (2), preheater (3) press feed conveyor (7b), press (8, 8s,8t), press–decanter solids conveyor (8c, 12, 12w) and separator feed tank air extraction ducting (14f), (Fig 1).
- Flow measurement ports in the dry area at drier feed conveyor (11), drier discharge conveyor (15), ground meal bin (31) and unground meal bin (32). (Figs1 and 2).
- In some cases where flow measuring ports were not available, air flow through screens into the equipment was measured: dryside air intake louvre (30), preheater discharge (4), drainer conveyor screen (6) and reception conveyor stairwell (part of 1).

6. Comments on Flowrates, Pressure and Temperatures

Tables 1 and 2 show the results of flowrate and temperature measurements taken over four days in February 2021 which were characterised by warm summer temperatures and moderate to light south to south-west winds. With some measurements data obtained during duct balancing work carried out in November 2020 has also been included.

From the data in Tables 1 and 2:

6.1 Covered Biofilter Airflow

The air flow to the covered biofilter was 1200 - 1600 m^3/h or 1.4 – 1.9 tonnes/hour (tph) which was higher than that found in 2020 but not as high as it has often historically been.

Following installation of the evaporator in 2015 - 2016 the flow to the covered biofilter from fan 9.3 was reduced (to limit drier vapour vacuum at the evaporator to 200 Pa) to aid evaporator operation. The fan 9.3 was then also replaced with one having a different characteristic. This is why the flow to the covered biofilter changed between 2016 and 2018 in the Table 5 historical data.

Both driers were operating normally and the drier vapour duct vacuum at point 33 was consistently between 72 - 76 Pa. In 2019 it was found that the vacuum at point 33 could fall as low as 22 Pa without causing drier puffing. On 17 Feb 2021 power to the plant had to be shut down due to a damaged power supply pole needing replacement. Airflow to the covered biofilter following the incident was quite unstable, believed due to unsettled evaporator vacuum control and level control. Air flow to the biofilter drops when the evaporator circulation pump is stopped due to low liquid level – this greatly reduces heat removal from the drier extracted air stream resulting in choked flow, drier puffing and higher air temperature to the biofiliter. Then when the evaporator circulation pump is operating again the evaporator vacuum pump down can add significant air flow to the covered biofilter airstream. It is thought the two higher flows measured on 18/02/21 were a short-term aberration but either way the capacity of the covered biofilter was not exceeded.

6.2 Uncovered Biofilter Airflow

The air flow to the uncovered biofilter was 26,000 – 29,000 m^3/h or 30 – 33 tph and was based on measurements made on two different days at the measuring ports 13 m downstream of fan 14.1. Each flow measurement required a total of ten dynamic pressure measurements and ten static pressure measurements, made in two radial directions at right angles to each other, with a pitot tube, all compliant with ISO 10780. In addition, measurements were made with a micro-anemometer inserted into the duct. One difficulty with all measurements is that the flow to the biofilter is not constant and in the time taken to get the 20 measurements some of the earlier measurements will have changed. The micro-anemometer gives faster measurement of air velocity and enables velocity measurement in small ducts. One measurement made in Nov 2020 was uncharacteristically high and has not been included in the average flow result. Possible causes of the flow variation are opening/closing of the reception bin cover and bursts of heated vapour (mainly steam) pushed into the extracted air from the preheater under light or varying load. (Discussed later in relation to Figs 5A to 5C). Another issue was the significant leak discovered at the fan 14.1 outlet (Photo 101). The measured air flow to the uncovered biofilter is 3000 – 4000 m^3/h less than the sum of the air streams to the fan – the airflow at the leak (caused by loss of fasteners at the bottom seal clamping bar) could easily account for the flow difference.

The measured flow is less than that found in 2019 and Feb 2020. When allowance is made for the leak it is expected that the flow would be much the same as 2019 and 2020. By current practice the earlier higher flows (prior to 2019) in relation to biofilter volume would be regarded as too high. The significant difference with flows prior to 2019 appears mainly due to change in test method – the previous flow measuring port used was closer to fan 14.1; only one radial direction could be sampled; there was significant variation in velocity across the duct; and a different averaging method is now used. Some reduction may have come from restriction of the point source extractions where the flow has been too high but generally flow reduction at one point source is compensated by other source extractions benefitting. The present flowrate (with allowance for the leak) is optimal. The measured average total airflow to the biofilter of 27,600 m^3/h plus an estimated 4,000 m^3/h for the air leak at the fan would bring the total flow close to the recommended guideline of Table 4 in the Air Discharge Consent application. Louvre settings immediately upstream of the fan have the ability to alter this flowrate but the louvre setting to a large extent will have been determined by the fan characteristic. It is <u>not</u> recommended that any changes be made to the louvres until a full view of all extractions is known with confidence and add up to the total flow.

From Figure 3 and Table 2 it can be seen that an estimated total flow (allowing for the leak) of around 32,000 m^3/h is made up of 12,000 m^3/h wet side air and vapour and 19,800 m^3/h dry side air (36 tph made up of 14 tph of wet side air and vapour and 22 tph of Dry Side Air). Of the dry side air: 7,200 m^3/h comes from the reception bin and feed conveyor; 10,600 m^3/h comes from the dry-side air intake (30 Fig 2); 1,100 m^3/h comes from the ground meal bin (31) and 900 m^3/h comes from the unground meal bin (30). The air flow from the scrubber to the Uncovered Biofilter is reduced due to cooling. The wet side vapour flow is much the same as in 2019. The new measuring ports installed since the 2019 inspection have been of assistance in resolving variations in flow and limitations of the earlier measuring ports, giving a better balance than has often been the case in the past.

Measurement of air flow into the scrubber in Table 2 (F) has carried uncertainty in the past due to measurement having to be made crosswise at the inlet bend. Close upstream to the bend is a tee where air from the reception bin and feed conveyor enters the dry-side duct off-centre likely causing turbulent (swirling) flow in this part of the duct. As the ISO 10780 L-type pitot tube has the static pressure measuring ports at a different location to the nose – the static pressure ports are likely getting some velocity head from the turbulence.

As part of the 2019 action plan a new port 23 (Fig 3) was installed in the large duct from the dry area where the air flow is steady, but the port does not have a permanent or temporary small working area platform nearby from which flow measurements can be made. Piping had been extended from port 23 to enable a static pressure measurement at ground level but this does not allow flow measurement.

In the recent testing it was found that a new portable work platform being used gave access to the thermometer port beside HRT2 which was able to be used to measure air flow from the scrubber. The measured flow in Table 2 (G) gives a result consistent with the inflow. Further measurement will give greater certainty.

It is noted that AFFCO did make a good effort to seal the stainless-steel transition section between the fan 14.1 outlet and the concrete pipe. From an outside view the issues stem from the poor design of the transition section:

- The tail end is mis-matched in diameter with the outside of the concrete pipe. The tail end diameter is a rough match for the concrete pipe bore but an additional welded cylindrical skirt at the tail end aligning with the concrete pipe would enable easier sealing with the rubber strip and tensioned bands.

- The fan volute to transition section sealing appears to rely on clamping bars holding the rubber strip against the fan and transition section casings except the fasteners for the clamp bars rely on being tapped into the casings because there is no way of applying nuts and holding them from inside the casing without removal of the whole fan or a concrete pipe section. The fan is big enough to require serious fastening but not so big as to need flanged bolted joints. It seems likely that the casing thickness for tapped fasteners is too thin to withstand the fretting that inevitably comes from fan vibration – the old open holes in the top clamping bar with new bolts beside the holes suggests this is not a new issue.

This detail is mentioned because it is recognised that the issue is not an easy fix. It is critical for odour control that positive pressure ducting downstream of the fan does not leak. Having to shut down the plant to fix such a leak can also be difficult when processing capacity is critical. It is fortunate that the present leak cannot be sensed beyond around 50m downwind but a greater leak would not be so confined. It is recommended that serious consideration be given to a robust solution.

6.3 Covered Biofilter Media

It is noted part of Consent condition 31 says "*Any analysis of samples shall be undertaken by an appropriately qualified testing laboratory and sampling undertaken as specified in the OMP. Accepted methods shall be used for measurement of media properties that are certified by the Regulatory Manager of MWRC.*" As part of the AFFCO OMP samples have been taken on a monthly basis and tested in an appropriately qualified testing laboratory - AFFCO have separately reported on the biofilter moisture content and pH. As commented in earlier reports some of the results have been quite variable. As part of the audit an independent check of the media moisture content and pH was made. Results are given in Tables 1 and 2. On 18 Feb 2021 five separate samples were taken at random locations from different quadrants and middle of the uncovered biofilter and four separate samples from the covered biofilter. Particular care was taken to ensure surface dry bark was scooped clear and then each sample was gathered from 150 mm depth relative to the un-scooped surface and sealed in a snap lock bag. Multiple moisture and pH tests were then made on the gathered samples.

It is noted that all of the moisture test results (Table 1 (C)) were above the moisture target and consistent with each other – a little drier in the north-west quadrant. It is also noted that 21 mm of rain had fallen on 15-16 Feb, but this would not have affected the covered biofilter. The AFFCO Feb result for the covered biofilter media moisture is inconsistent with the audit results – the covered biofilter media moisture content of 33.2% m/m is surprisingly low. It is questioned whether the sample could have included dry surface material, large pieces of bark or stone which should have been rejected or perhaps the sample had been taken before the rain on 15-16 Feb. There were no issues with biofilter media moisture content at the time of inspection.

In 2019 and 2020 comment was made on the variation of the pH test results including an observation that pH changes in a biofilter bed occur slowly and that the monthly rise and fall pattern seen in the qualified lab test results was unusual. Particular care was taken with the pH testing of the 2021 samples and the results in Tables 1 and 2 were surprisingly consistent. Use of indicator strips and a Hanna 2-point calibrated membrane pH meter gave consistent repeatable results.

As the media being tested consisted of recently renewed bark getting enough smaller particulate material aside from large pieces of bark was not easy so double the sample size and water was used i.e., 20g sub-samples were taken and mixed with 100g of demin water, stirred for 60s and allowed to settle. The clarified water was then transferred to test tubes, allowed to further settle (giving around 3h total settling time), then the pH was measured. This gave good depth for pH measurement with consistent stable results.

The results from the audit check are broadly consistent with the AFFCO external lab results for Feb 2021 as the uncovered biofilter media lab result of around 1pH lower could well have been due to the samples having been taken from a greater depth. For the covered biofilter, the average of the audit results corresponds with the lab result. What is of interest is that the audit results show the pH of the covered biofilter south-west and south-east quadrants to be significantly lower than the northern side. This may be due to older bark on the south side compared to newer bark on the northern side. No issues are seen with media pH as it was at the time of inspection.

It is noted from the external lab testing that the covered biofilter media testing gave a pH around 8 in May, September and October 2020. This is a concern and earlier audit testing had also found a similar pH on one occasion with ammonia being sensed. It is not a current issue and it has not been established whether the higher pH was associated with caustic cleaning related to the evaporator or the production of ammonia. From experience, while biofilters can convert ammonia to nitrate (nitrosomonas NH_4^+ to NO_2^- and nitrobacteria NO_2^- to NO_3^-) the amount that can be handled is limited and should be kept below 100 ppmv. High pH is a concern but a pH as low as 4 is unlikely to be a problem.

At present there are no issues with pH in both biofilter beds. From the odour assessment both biofilters were working well and the covered biofilter was performing better than can ever be recalled. Particular care needs to be taken to ensure that all samples of biofilter media taken for pH and moisture testing are done at a constant level e.g., 100 to 150 mm below the surface with media above first scooped out of the way to avoid any getting into the sample.

The air loading on the biofilter of 10 m^3/h of air per m^3 of media is well below the Consent Application Table 4 guideline maximum of 35 m^3/h of air per m^3 for soil-bark beds.

Last winter the media depth was increased to around 0.65 m with new soil-bark. The bed pressure drop is now 17 – 22 Pa and indications are that this has caused the air being treated to be more evenly distributed within the bed.

Temperatures in the bed at 200mm depth ranged between 24 and 27°C with 9 of 12 results being between 26.0 and 27.0°C. Examination of the SCADA record for temperature transmitter HRT14 at entry to the biofilter shows a tendency for the temperature to rise steadily during the processing day and level out which indicates good control.

There have been occasions when there has been an issue with the evaporator when the stickwater level goes too low causing the circulation pump to be automatically shut down. When this happens the air flow to the covered biofilter can rise to 45°C for around 20 minutes. This happened on one occasion while the flow was being measured. Temperature measurement of the biofilter bed after the event showed little detectable difference, if any, in the temperatures that had earlier been measured. It was noted though that the air stream at the higher temperature was noticeably more tar-like sticky – hand washing with warm water and heavy-duty liquid soap including pumice took a lot of effort to remove the film in contrast to what is needed with the air at lower temperatures. This indicates that when such events happen deposition of the tar-like material is likely be occurring in the distribution tubes with potential for blockage.

In Table 1 (C), the right-hand row of bed temperatures (east side) includes the two lowest temperature results – these are more likely due to distributor flow configuration rather than incremental blockage.

The following points are noted:

a) When the biofilter was built the airflow was three times what it is now. Later installation of the evaporator has significantly reduced the biofilter loading (from around 30 m^3 air/h per m^3 of media to around 10 at present).

b) Compared to many other biofilters, the AFFCO biofilters have a large surface area for the treated airflow (5 m^3/h air per m^2 of covered biofilter surface and 24 m^3/h per m^2 of uncovered biofilter surface – others are known in the range 60 to 90).

c) Bed pressure drop is primarily determined by bed cross-section area (depth to a lesser extent) hence the AFFCO biofilters have low pressure drop compared with many others.

The covered biofilter is within its design and operating parameters and is currently in good condition.

6.4 Uncovered Biofilter Media

As with the covered biofilter AFFCO has had bed samples tested on a monthly basis for moisture and pH. In audit check testing, the moisture content measurements in the uncovered biofilter ranged from 58 to 63% moisture w/w wet basis which is within the guideline and is consistent with the AFFCO monthly test.

Temperatures measured in the bed ranged from 25°C to 29°C and met the consent guidelines. Eleven of the twelve measurements were within 25 to 27°C – the twelfth area in the south-east corner that was higher also exhibited higher bed pressure drop of 56Pa at the measuring Port E. This twelfth area is closest to the fan but based on the 2009 piping design detail it is not obvious why slightly higher temperature (indicative of higher flow) and higher bed pressure drop would occur at this location. Underground detail of the bed pressure monitoring port E is unknown. It is proposed that this be further investigated. Examination of the SCADA system temperature transmitter HRT14 data shows that air going to the biofilter builds up daily to a controlled plateau well within the guidelines.

Following the 2020 report the depth of bark media in the uncovered biofilter bed was increased with addition of new bark to give a depth around 0.7m. This depth with the average measured flowrate of 27,600 m^3/h air gives a current biofilter loading of 31 m^3/h of air per m^3 of media but allowance should be made for the leak at the fan. Without the leak it is anticipated that the flow would be around 32,000 m^3/h giving a biofilter loading of 35 m^3/h of air per m^3 of media, corresponding to what was recommended in the Consent application.

The media pH in quadrant samples and centre, all taken at 100 - 150mm depth, were found to range between 6.4 and 6.6. As discussed in 6.3 above the use of 20g sub-samples mixed with 100g of demin water gave stable repeatable results with the membrane pH meter. Given that new bark was added last winter the narrow range of pH results is no surprise. The AFFCO Feb lab test sample was about 1pH lower but that could have been simply due to the sample having been taken lower down in the bed. There is no issue with the current bed pH.

The air static pressure at the test point downstream of the 14.1 fan is around the same as last year at 512 Pa. Increased pressure drop that would come from increased bed depth has been offset by lower pressure drop due to lower air flow. Bed pressure drop at the four biofilter manometer points F, G, H, J (Table 2, identified in Fig 4b) ranged from 15 to 31 Pa which is much the same as last year and is still low compared to many biofilters. As mentioned above point E is higher at 56 Pa but is still low. In 2017 when all the biofilter media was replaced two vent tubes K and L were installed, apparently to indicate when bed pressure drop gets too high by venting air. There was no observable flow from these and when sealed off the respective pressures at the vent tube ports were 26 and 20Pa.

7. Point Source Extraction System (PSES)

The point source extraction system (PSES) is widely accepted as an energy efficient effective method for containing fugitive odours and providing a safe working environment in a low temperature rendering plant (LTRP). Complementary to the PSES is cooling of the extracted air, then passage through the uncovered biofilter to remove odour prior to discharge to atmosphere.

As in section 6.2 above, with reference to Table 2, the total airflow going to the uncovered biofilter was found to be around 32,000 m^3/h. Table 3 of the Resource Consent application listed concentrated odour sources in the LTRP (other than the drier vapour) with recommended design extraction air flows for each. The total of the recommended point source design flows was 17,450 m^3/h which is well below the total air flow to the biofilter.

The optimal actual operating rate for each point source extraction is determined by the minimum required to contain the process emission and this should be well below the recommended design flow. Too much hot air extracted is unnecessary energy lost but also material being processed can be carried into the ducting such as fine solids and fat aerosol which can eventually block the ducting.

One obvious test for whether process emissions are being contained is whether any steamy discharges can be seen around equipment handling hot matter. Another is whether there is vacuum in the extraction ducting headspace close to connection with the equipment.

In the new consent application, a useful guideline was advanced for indicating that the PSES was likely to be working effectively if a minimum vacuum of 100 Pa g was maintained at ducting connections to equipment. Hence AFFCO developed the Air Odour Resource Consent Monitoring Checksheet RMF 008 where in Section 1 fourteen wetside odour extraction monitoring points were adopted for achieving a target of ≥ 100 Pa vacuum in order to comply with Consent Conditions 18a; 19a; 19c. Similarly, in Section 2 for five Dry Side monitoring points. Fig 1 illustrates the location of the wetside points and includes two dry side points because they are connected to the wetside extraction duct. Fig 2 illustrates the dryside monitoring points. Note the 20 and 30 series numbers do not exist on the RMF 008 checksheet but have been provided for identification of the points in this report. As in Table 3 there have been 15 wetside monitoring points but more numbers have now been provided in Fig 1 corresponding to installed ports or other measurement locations. In the past some confusion had arisen around port numbering due to indelible pen marking being readily dissolved by fat. The current lasercut sheetmetal numbers have removed any ambiguity. Photographs of the ports have been included in the Appendix to aid identification.

Some boxes on the checksheets are filled in daily and others only on a particular day of the week. As reported in 2019, issues were seen around what was being recorded and whether an accurate indication of the extraction was being conveyed. Following this, AFFCO purchased a more accurate, reliable and easier to read differential pressure monitoring meter and has been steadily working to improve what is able to be monitored.

Vacuum at the AFFCO monitoring points for this report were measured using a calibrated Kane differential pressure meter, model 3500-1. The results are given in Table 3 in the Appendix.

The 100 Pa target vacuum was a good starting guide but, in many cases, was not able to be achieved or resulted in too much air extraction. As air velocity in a duct increases the static pressure drops i.e., vacuum increases. Slide valves in the duct can result in high velocity air to one side of the duct and low on the other, giving a misleading indication of the average static pressure at a measuring port. Flow measurement (by velocity measurement) is helpful because flow upstream of a slide valve will be the same as that downstream even though the static pressures are different. Also, in cases where there is little pressure differential such as through a screen, velocity measurement establishes that air is being extracted and how much.

The following comments are made in relation to the vacuum measuring ports:

a) **Test Port Size:** Some of the ducts where vacuum is to be measured are not accessible from ground or walkway and have extended tubing to enable measurement. In 2019 the 6mm diameter tubing used for the extension tended to block. In 2019/2020 AFFCO increased the size of the extension lines to 8mm. Most of the ports have used 90° swivel elbow fittings which still readily block and can't simply be cleared by pushing a straight rod through the port. Most of the swivel ports were found to be blocked. Where possible some were removed and cleaned out, others were not able to be accessed. In some cases, an alternative such as an open rivet hole was able to be used for static measurement using a small diameter probe.

b) **Location of Test Ports:** Some of the original vacuum test ports were located downstream of flow adjusting slide valves (Ports 5, 6, 7, 8, and Ground Meal Bin (west)). Consent condition 32 required the pressure (i.e., vacuum relative to ambient) to be measured in the head space of the equipment targeted by the extraction systems. Occasionally the pressure downstream of a slide valve might be similar to that upstream (i.e., the equipment head space) but in most cases the downstream pressure is very different. Also, the downstream vacuum can be very good such as 434 Pa at Port 15 on the drier discharge conveyor extraction duct yet the headspace in the conveyor at the extraction duct entry was only 10 – 15 Pa. Adjustment of the slide valve had no effect because the duct upstream of the slide valve was blocked.

   In a few cases it is not practical to locate a vacuum measuring port upstream of the slide valve due to proximity of the slide valve to the equipment; a very port clogging location; or near an open hatch where the vacuum is too low to give a consistent result. In the latter case measurement of extraction air velocity through the hatch gives a better indication of the extraction. In some cases, just a single small hole e.g., an old open 3.5mm diameter rivet hole in a duct or a 6.5mm hole in a conveyor top plate can be used to measure the static pressure.

   As the conditions at each extraction point are different the means to provide adequate extraction also varies.

c) **Outside Reception Bin and Feed Conveyor (Ports 1, 21, 22):** On average around 5700 m^3/h of air was extracted from the reception bin; 360 m^3/h from the feed conveyor stairwell and 1140 m^3/h from the feed conveyor giving a total at Port 22 of 7200 m^3/h which then combines with the dry-area air going to the scrubber. These flows are similar to those measured in Feb 2020 except the flow into the reception bin then with the cover closed was a little lower at 5200 m^3/h. This likely falls within the normal variation of the bin cover being opened and closed. Vacuum in the bin head space cannot be reliably measured because it is so low but static pressure at Port 1 around 180 Pa gives a good indication that the extraction is working normally with low risk of fugitive emission.

d) **Inside Raw Material Bin (Port 2)**: The hatch is normally left open during processing. Of 950 m^3/h drawn from the bin head space past Port 2 approximately 550 m^3/h is drawn through the hatch and 400 m^3/h from the bin feed conveyor. Vacuum at Port 2 around 50 Pa indicates normal working. The Port 2 flow is close to the recommended design flow of 1000 m^3/h.

e) **Preheater (Ports 3, 3a):** Prior to the Resource Consent application in 2017 the extraction duct from the preheater was 100 mm diameter. The Consent application included a recommendation that this duct be enlarged. The duct was enlarged to 250 mm diameter without a flow adjustment valve in the leg. The resulting extraction flow of hot vapour was too high, so a slide valve was installed in the leg to limit the flow.

   On two earlier occasions after the duct had been enlarged, flow measurement at Port 2 found hot air being extracted from the top of the inside raw material bin. Further investigation at the time then only found the normal cool temperatures and the source of the hot air was not found.

   In 2020 flow balancing work the flow was limited to 950 m^3/h which is close to the recommended design flow of 1000 m^3/h. The 950 m^3/h is an appropriate balance in providing good extraction with no puffing from the preheater inlet conveyor under normal steady heavy load, but not so high that excess hot air and steam is extracted. In the balancing work it was discovered that when the preheater was operating under no load or light varying load, steam could puff back to the preheater conveyor inlet. Solids discharging from the preheater outlet were also very hot with vapour emission back out from the screen leading to the Port 4 extraction duct. At times when this emission of steam was occurring the preheater steam control valve in the SCADA system was often showing 0% open. In the balancing work it was considered whether the extracted air flow should be increased to cover all situations rather than the normal steady heavy load situation i.e., waste a lot of heat overall for short term emission events. It is now apparent that the earlier unexplained heat in the inside ground material bin likely came from these light varying load emissions, where steam flow from the preheater into the extraction duct was so high that apart from being drawn towards the biofilter, it was also back flowing through the duct to the inside ground material bin.

After the recent balancing work limiting the preheater air extraction flow to 950 m^3/h there was no indication of any backflow to the inside bin, but to further investigate what was happening the temperature of the air extracted from the preheater (at Port 3, photo 105) and the downstream temperature of air when combined with that from the inside bin (at 'Chnl 2 temperature logging location' marked in photo 105) was simultaneously logged at 20s intervals. Results for the normal steady heavy throughput condition are shown in Fig 5A. Results for the varying light throughput condition are shown in Fig 5B. In the varying light throughput run the two highest peaks at Port 3 reached 99.22 and 99.86°C respectively whereas the max heavy load peak was only 89°C (it is noted that the heavy load monitoring period shown should have been much longer like the one for varying light load, but it was a preliminary investigation and already late in the day - the heavy load pattern illustrated in Fig 5A had been like that for hours prior.) Atmospheric pressure at the time of the varying light load measurement was 101.5 kPa and taking account of slight vacuum in the duct and slight building under pressure, the saturated steam temperature at 101.44 kPa would have been 99.99°C hence the 'air' being extracted at these peaks would have been almost entirely steam.

Fig 5C was produced from the logged data by plotting the difference in temperature at the two measuring points against the combined stream downstream temperature. The linear trend line of these plotted points shows that with increasing downstream temperature, the difference in temperature measured at the two points increases. If the steam from the preheater was building up to the extent that it was back flowing to the ground material bin, the difference in temperature would decrease with increasing temperature and eventually both measurements would be the same. Hence there is a high level of confidence that no back flow to the ground material bin is occurring as it had been prior to the flow adjustment. A further point is that with the peak temperature events the air flow to the biofilter increases. Unlike the choking effect of drier steam in the evaporator when there is no circulating stickwater to condense it, with the preheater steam it does condense by transferring heat to downstream air drawn into the extraction duct along the way. The steam which is drawn into the extraction duct from the preheater disappears as it heats further air along the duct allowing more air to be drawn in under the differential pressure conditions.

Explanation for the high temperature peaks under no load or light varying load can be attributed to the steam control valve. The function of a control valve is to regulate fluid flow in response to some sensed condition. It is standard practice not to rely on any control valve as a shut off valve. Some control valves when new do seal well when closed but wear is inevitable and it is expected that all will leak to some extent when closed. In an industrial situation where the load is constant (i.e., control valve always open between 10 - 70%) there is rarely an issue. When control relies on having the steam valve fully closed for a period (e.g., as with plate heat exchangers) an auto-shutoff valve is provided in series in addition to

the manual shutoff valve to ensure the steam flow ceases when the control system output calls for it to cease.
As recorded in Table 3 vacuum measured at Port 3 should normally be 55 – 65 Pa but as explained above, varying light load in the preheater can cause variation.

f) **Preheater Discharge (Port 4):** The vacuum measuring port is shown in photo 106 and photo 124 shows the open screen below port 4. Air is drawn in through the screen as solids discharge from the preheater behind. Current air flowrate through the screen is 800 m^3/h and is sufficient to capture vapour from preheater discharging material except an occasional peak no load or low load event referred to in e) above. As there is no formal pressure measuring port below the slide valve an open screw hole (shown in photo 124) was used to measure the 18 – 19 Pa static pressure in the head space. At Port 4 <u>above</u> the slide valve, the swivel Pneufit fitting was blocked. Once cleaned out the fitting gave a vacuum of 234 Pa. (Static vacuum at the duct centre was 370 Pa.) The measured air flow is double the 400 m^3/h recommended in the Consent application but is being retained to capture the occasional no load, light varying steam emission referred to in e) above.

g) **Blood Decanter (Port 5):** See photo 107. As reported in 2019 and 2020 significant steamy discharge occurs from the conveyor under the blood decanter. It appears there is inadequate head space in the conveyor under the decanter to allow air at the conveyor discharge points to be drawn in and along to the 150 mm diameter extraction duct leg. The added leg of 76mm dairy tube was plainly an attempt to capture vapour from the conveyor east exit but is too small for the vapour flow. It is recognised that the decanted blood conveyor may not be able to be modified due to the nature of the blood and that the previously mentioned raiseable hood for extraction would not be simple given the need to frequently move bins in and out. There are various options around the issue. It is assumed they are being considered. In the meantime, fortunately, there does not seem to be any significant adverse odour associated with the steam emission.

At the time of inspection, the Pneufit fitting at Port 5 on the extraction duct was blocked and could not be accessed for cleaning. When cleaned out it is expected that the vacuum measured at the end of the extension tube would be 170 – 180 Pa.

h) **Drainer Conveyor (Port 6)**: See photos 109 and 124. Port 6 is located above the slide valve and the small hole (6b) in the side of the conveyor headspace extraction box has been used to measure vacuum below the slide valve. The air flow in the duct of Port 6 largely comes from air being drawn in the 'Drainer Conveyor Inlet Screen' labelled in photo 124. The headspace vacuum at 6b was 104 – 106 Pa and at Port 6 was 194- 196 Pa. In the absence of a flow measuring port in the duct the air flow in was measured at the screen shown in photo 124 and found to be 1100 m^3/h. This is well above the recommended 200 m^3/h but is needed to capture vapour below the screen at the feed end of the conveyor when the preheater discharged material is hot.

i) **Drainer Conveyor to Press Conveyor (Port 7)**: See photos 110 and 109. The Pneufit fitting at Port 6 was blocked and could not be safely reached for cleaning but a rivet hole about 260 mm above the slide valve was used instead and gave a vacuum of 460 Pa. The hatch shown in photo 109 is normally open during processing. Behind the hatch cover is Port 7b seen in photo 110 with the hatch closed. Air flow measured at Port 7b was 350 m^3/h with the hatch open and 330 m^3/h with the hatch closed but flow in through the open hatch cover was measured at 3x this flow hence some of the flow through the open hatch could be part of that drawn into the Port 6 duct. Vacuum at port 7b (i.e., the headspace of the press feed conveyor feed box) was 78 Pa with the hatch closed and 24 Pa with the hatch open.

j) **Press Feed Conveyor (Top End, Port 13):** Vacuum above the slide valve is measured by tube extension (See photo 117). The vacuum was 120 – 140 Pa. It is not known what the vacuum in the head space below the slide valve is and there is no easy way of measuring it other than by extension tube but there are no immediate concerns in relation to the headspace vacuum.

k) **Tallow Separator Discharge Chambers 3x (Port 9) and Decanter Solids Discharge Conveyor (Port 12):** Port 12 is seen in photo 116 and Port 9 in photo 112. Port 12 is above the slide valve to the decanter solids discharge conveyor below. New port 12w has been provided to enable consistent measurement of vacuum head space in the decanter solids conveyor. As illustrated in Fig 1 the extraction duct from the separator discharge chambers (port 9) is connected to the same duct port 12 is in and up to the air extraction manifold above. The swivel Pneufit fitting at Port 9 was found blocked. When cleaned out the vacuum was typically 25- 55 Pa. Depending on what the separators are doing there can be quite a bit of variation. Vacuum at port 12w was 50 – 65 Pa; above the slide valve at port 12 was 220 – 230 Pa. The measured air flow past port 12 was 150- 200 m^3/h but in preliminary fluid flow modelling using the known data, it should be higher given the duct size and the static pressures. The recommended flow in the consent application for the decanter solids conveyor was 800 m^3/h but this also includes flow in duct 12e. The current extraction is adequate but greater flow from the decanter solids conveyor is required and this can probably be provided through duct 12e. The adjustment to be made is complicated by the separator extractions and more measurement and calculation needs to be done to clarify what is happening.

l) **Decanters Liquid Discharge Screen Box (Port 10):** On the monitoring Checksheet RMF008 port 10 was listed as the "Sub-manifold to Decanter and Separators" but it has never been located. It seems it was removed when the decanters were replaced. Instead, air extraction from the decanter liquid screen box, upstream of being pumped to the separator feed tank, was measured. As this has no small hole in the 76 mm diameter air extraction line for vacuum measurement, the air velocity entering the duct was measured and gave 120 m^3/h. Blocking off the duct gave a static pressure of 500 Pa – indicative of the static pressure in the 650 mm diameter duct that the branch is connected to.

m) **Drier Feed Conveyor (Port 11):** The new flow measurement and pressure monitoring port 11 is marked in Photo 115. A tube extends from the tube fitting enabling the static pressure to be measured at ground level. The audit measurements were made direct at the port. Air flow was found to be 850 m^3/h and static vacuum at the port was 116 Pa - vacuum at the end of the tube extension should be at least 100 Pa. In Photo 115 a corroded slot can be seen in the extraction box mounting flange. This hole was used to establish vacuum in the conveyor headspace around 20 Pa. A 6.5 mm hole like that for port 6b seen in photo 108 would be helpful to consistently measure headspace vacuum. If the corroded slot is occasionally used to establish whether solids are moving or not, a simple hinging flap could still provide that function while most of the time blocking around 250 m^3/h of air that is being drawn into the slot.

n) **Press (Port 8):** See Fig 1 and photos 112 and 113. There are multiple air extraction ports associated with the press: **8, 8c, 8s and 8t** some of which are new since the last report. Together the port data gives a view of what is happening in the three extraction ducts. In regular monitoring the static vacuum at Port 8 is all that is needed to indicate adequate extraction. Also, any sign of steamy vapour not being captured at the press open side would indicate something is not working as it should be. The press is operated with the east side covers open to quickly see any developing blockage and to keep the screen and casing clean and fresh during operation. The press entry feed hopper was also modified (including an added 100 mm dia air extraction duct as seen behind port 8 in photo 113 and in Fig 1). The vacuum of 40 - 80 Pa at port 8s (the press headspace) is now higher than it has been. Photo 111 shows a valve and tailpiece as installed at Port location 8. An instruction must have been misunderstood because it is important that the port is perpendicular to the duct – not at 45° as false readings will be obtained. The plugged port above marked 'port 8' in photo 111 is the one that was used for the static pressure and flow measurement, but it required standing on top of the press to access it. A new square oriented port installed at the valve and tailpiece location would enable static pressure measurement to be made without having to climb onto the press.

Static vacuum at Port 8 was 400 Pa and the flowrate was 2000 m^3/h. Static vacuum at port 8t was 440 Pa and at port 8c was 530 Pa. These two ducts combine and then join the manifold as shown in Fig 1. Measured flow at 8t was 1090 m^3/h and 200 m^3/h at 8c. Flow at 8s was found to be 1300 m^3/h indicating that flow from the feed box (by difference between 8 and 8s) would be 700 m^3/h. This is the first time that all the flows associated with the press have been quantified and further measurement will confirm the results. In the consent application the recommended press and entry hopper flow was 1000 m^3/h but a press open on one side was not envisaged then. After the press side was opened, air flow measurement was made along the side of the press to establish that vapour was being captured into the extraction system. Since then balancing work on other equipment has improved the vacuum at the higher level manifold with consequent increase in flow from the press ducts. More air than needed being drawn in at the press in the interim has not been an issue because the excess will be mainly wet-side low temperature ambient air. It is now evident that the press extracted air flows can likely be reduced (by adjustment of the slide valves) and that the flow at 8c can be increased to draw more air from the press-decanter solids conveyor.

o) **Decanter and Separator Liquid Feed Tanks (Port 14):** See photo 118 and Fig 1. Flow measuring port 14f has been installed in the air extraction Y-leg to the separator feed tank. The legs to both tanks have a butterfly valve at entry to each duct which are set at 45°. Vacuum measurement ports in both legs were reading the same so it has been assumed that the measured flow at 14f indicates a similar flow in the decanter tank leg. Total flow in both legs is determined by the slide valve above where the legs join. Flow measured on 13 Feb 2020 was 1800 m^3/h in each leg and temperature in the decanter feed tank frequently reaches boiling. The recommended flow in the consent application was 300 m^3/h for each tank. Following balancing adjustment, the air flow is now 350 m^3/h. The static vacuum at Port 14 is 23 Pa. This is capturing tank headspace emissions and has improved the extractions downstream during processing.

p) **Drier meal discharge conveyor duct (15):** In 2019 the duct had been disconnected from the conveyor and an airflow into the duct was measured at 500 m^3/h. With reconnection, Port 15 (photo 119) was added. Recent flow measurement gave only 50 m^3/h. Static vacuum at Port 15 was 435 Pa but as best could be ascertained the vacuum in the conveyor head space was only 15 Pa (a small hole in the duct transition box like 6b in photo 108 would have helped). Complete removal of the valve slide made no difference to the flow and pressures hence it is concluded that there is a bridge of meal across the top of the duct transition box below the slide valve. This is not seen as a major issue as air in the conveyor will be drawn to extraction in the unground meal bin. In hindsight this blockage is likely not the first time so ease of clearing it might be considered in disassembly/reassembly.

q) **Dry-side Air Intake (30):** Unlike 2019 when the intake was found significantly blocked, the screen was relatively clean. Air extraction was measured at 10,600 m^3/h and vacuum at port 30 was 58 Pa. Flow recommended in the consent application was 5,000 m^3/h, but with the building roof fan ventilation system no longer being used - to aid negative pressure in the processing areas – the higher air extraction to the biofilter is needed. Table 4 provides a snapshot of what the building working environment was on 17 Feb 2021. The majority of the temperatures were remarkably similar to those measured on 12 Feb 2020 given in the previous report. Control room and office temperatures are now more even and likely to be more comfortable.

r) **Ground Meal Bin Port 31:** See photo120. This port is located downstream of the slide valve in one of two extraction ducts from the ground meal bin. Static vacuum at the port was 19 Pa. The Pneufit fitting in the port was blocked and when removed for cleaning it was found that the flow measuring instrument could just be inserted and this gave a flow of 550 m^3/h. Assuming that the slide valve in the other leg is similarly set the total extraction flow would be 1100 m^3/h. Therefore measurements can be done in the future to provide more certainty around the result and better estimate flow in the other duct.

s) **Unground Meal Bin Port 32:** See photo 121. When the port was first installed it was likely required to measure vacuum in the bin headspace which will only give a vacuum around 1 to 4 Pa. Flow measurement gives a better indication of the extraction at low vacuum but the inclination of the port and distance below the slide valve makes this difficult. The ideal would be to have a flow measuring plugged 20mm BSP socket (like that shown for port 8t in photo 113) mounted on the duct above the slide valve, square to the centreline of the duct and aligned with the slide movement. In Table 6 Issue 2021-8 it has been suggested that the surplus angled port from the Port 8 location might be able to be reused here, but a socket on a straight length of duct downstream of the slide valve would be best for flow measurement.

In Summary:

- The Imlay LTRP is predominantly achieving effective point source extraction. The odour producing processing steps are carried out in equipment built to draw in surrounding air which is then drawn through the extraction system ducting, discharging through the biofilter.
- Material (offal and bone) received for processing is being processed as soon as possible while fresh, to minimise odour production. This necessitates being able to readily monitor the movement of material during processing, equipment stopping and starting and keeping equipment clean inside and out. Hence covers at critical observation locations which could be closed to aid performance of the PSES are kept open. While having a cover or hatch open carries risk of odour release into the factory airspace; the risk of odour production from blockage and late detection of equipment breakdown or malfunction is also significant. Some current standard operating practice is likely different to what had originally been envisaged. From what was seen of current operations a good balance is being achieved and the cleanliness of the processing areas is excellent.
- It is evident that air inside the factory has a different quality to that outside. There is equipment that can't be practically enclosed like the transfer of material to transportable bins, drains and the sump but the fugitive vapours from these are being indirectly captured by the extraction system and controlled by good housekeeping.
- With the open hatches in the conveyors and the press side open, the vacuum measured at some monitoring points is low, but this does not automatically mean the air extraction from the equipment is inadequate. It is movement of air inwards that provides a barrier to air getting out. Air movement in is determined by difference in pressure between locations and obstructions along the way. The test is whether there is enough air being drawn into openings in the equipment shell to prevent odour getting out. Openings that do not serve a particular purpose should be closed. What is sufficient air varies from point source to point source. Some extractions can be local in their effect while the effect of others extends far through multiple equipment items. All the air flows drawn into different extraction ducts

should ultimately add up to what goes through the biofilter (with allowance for changes in density e.g., due to temperature). When all the air flows add up (along with some that may have to be inferred), the vacuum at a particular location in any duct can be determined and the values will vary widely. The utility of vacuum measurement is that it is simple and quick, hence the port vacuums given in Table 3 are a good indicator for quickly establishing whether something is working properly.

- When there is be an issue with some measured value e.g., due to a partially blocked duct, knowing what is expected and what is measured can be very helpful in identifying problems. A good overview of what is measured is close to being achieved. What is expected from modelling is a puzzle that is still being pieced together but good progress is being made.

The Imlay Odour Management Plan along with recorded data and the Consent Monitoring Checksheet RMF008 is comprehensive and well drafted to demonstrate compliance. While the point source monitoring target of ≥100Pa vacuum in the Checksheet was adopted to ensure compliance, in many cases this degree of vacuum is not achievable and, in some cases, it would be too much. As seen in Table 3 there can also be a big difference between vacuum in the equipment headspace and vacuum downstream of a slide valve. The key thing is to measure and record what is observed without concern for whether the vacuum is too low as the criteria is whether the adverse odour is being captured by the extraction system. Also operating the plant effectively to minimise the escape of vapours and odours has a major contribution to achieving compliance with the Odour Management Plan.

An offer has been made in Table 6 Issue 2021-12 to suggest changes in OMP 002 to 006 and the RMF 008 Checksheet.

The efforts of the leadership and operators' teamwork to eliminate or minimise the adverse odours in the Rendering Plant are acknowledged. Some further balancing work will complement this effort.

8. Independent downwind odour assessment

On 15 February 2021 with wind light south and fine summer weather, an odour assessment was made mid to late afternoon and rechecked on the following three days morning and evening. At no time was any distinctive rendering plant odour sensed outside the boundary of the Imlay site. Within the site, traverses were made north of the biofilters across the extent of the rendering plant and beyond and along the lane between the biofilters and the rendering plant.

The only adverse odour sensed was very localised:

a) At the downwind northwest corner of the covered biofilter a slight dry meal odour was recognized. An assessment on Intensity and Hedonic tone rated it I = 2; H = -1. Moving downwind (north-west) from the corner the odour could no longer be detected at 4 to 5 m. The sump was well sealed with only the faintest hint of leakage. This performance of the biofilter is the best witnessed over many years.
b) Distinct wet-area odour was sensed along the north side of the processing building in the vicinity of the covered biofilter. This was traced to a significant leak at the outlet seal of the uncovered biofilter fan 14.1. This odour could no longer be sensed at 40 to 50m downwind from the fan. (Although the wind was from the south-east, downwind from the fan was more to the west due to air flow along the north side of the rendering plant building).
c) No trace of any wet-side odour could be sensed along the full downwind north side of the uncovered biofilter nor at any location on the biofilter.
d) The stickwater drain beside the evaporator occasionally had some odour which could only be sensed directly above the drain.

e) Weak ovine odour with an unpleasant (perhaps amine) note was sensed coming from liquor in the Save-All. In contrast the material from the rotary screen into the open top skip had no distinct odour and was predominantly grass stalk with small distributed fat globules.

f) At the west gate very strong ovine urine/faecal odour was sensed while a large truck and trailer was being washed down. This odour disappeared within minutes of the truck departure.

On the days following the initial assessment no new odours were sensed in addition to those above.

9. Operation of the LTRP under negative pressure:

With light to moderate wind on the south side of the building the pressure in the dry area was typically 6 to 10 Pa negative relative to air outside on the north side of the building.

The Wet Area frequently had a door open and was less negative than the dry area. Often there was a measurable air flow (4m/s, 270 m^3/h) between the wet-area and dry area where the solids conveyor penetrates the dividing wall. No adverse odour could be sensed around the building due to the minimal negative pressure in the wet-area, it was only the leak from the fan 14.1 that was readily sensed.

10. SCADA Issues

The SCADA logged consent related data for the past year has been briefly reviewed. Logged temperature peaks in air going to the covered biofilter has already been commented on above when the stickwater level in the evaporator has gone too low or too high causing the circulation pump to stop. As noted, the short-term temperature peaks to 45°C had little measurable effect in the biofilter bed but are better not occurring.

Temperature instruments in the SCADA system showed good correspondence with the test instruments. Overall, the SCADA system appeared to be working well.

11. Action Points

A summary of the 2020 residual action points with comment and further action points for consideration arising out of the 2021 audit are given in Table 6 in the Appendix.

12. Conclusions

12.1 The increased depth of the covered and uncovered biofilter beds has improved the even distribution of air in the beds with little consequent increase in bed pressure drop. The increased depth has also reduced the biofilter loadings to or below that recommended in the consent application. Meal odour can only be sensed within around 5m downwind of the covered biofilter and this is the best it has been for years. No adverse odour could previously be sensed from the uncovered biofilter and that continues.

12.2 Table 3 provides normal vacuum values for ports in the OMP RMF008 monitoring checksheet.

12.3 Air extraction balancing work done during the year has reduced the high air extraction flows from the preheater, the decanter feed tank 2.11 and the separator feed tank 2.15 while still containing vapour in equipment head space. This in turn has increased the vacuum at other points giving more scope for adjustment. Air flows are mostly in line with those recommended in the consent application except for the press which operates with one side open. These flows are high, and it is proposed they now be reduced to near the minimum needed while the air extraction from the press-decanter solids conveyor through slide valve 12e is increased. A better balance has been achieved in the PSES and further improvement is anticipated.

12.4 An unfortunate leak at fan 14.1 has resulted in the uncovered biofilter not being loaded as much as it normally would be. There is uncertainty around the magnitude of the leak, but it is anticipated that when fixed the airflow to the biofilter will be around what has been recommended in the consent application.

12.5 From the balancing work it was discovered steam can be fed into the preheater air extraction duct when the preheater has no load or light varying load. This is thought to be due to leakage through the steam control valve when 0% open.

12.6 Exemplary teamwork around an objective of keeping the wet and dry processing areas clean and fresh and processing received material as soon as possible is acknowledged. Minimising production of unpleasant odour is playing a significant part in the good odour control currently being achieved.

12.7 Ceasing use of the wall and roof fans to ventilate the building workspace is greatly assisting achievement of marginally negative pressure in the building under varying wind conditions. Although openings in the building walls remain, odour is being contained inside the building. Unneeded openings in the building walls should continue to be eliminated and doors kept closed as much as practicable especially in south to west wind conditions.

12.8 At the time of the consent application there was no air extraction from the outside reception bin. Now around 20% of the airflow to the uncovered biofilter (7,200 m^3/h) is being drawn from the reception bin and feed conveyor. If there is no evidence of adverse odour being emitted when the bin lid is closed consideration could be given whether this extraction rate could be reduced.

13. Independent person qualification and experience:

John Vickerman has a NZ Certificate in Mechanical Engineering and is Registered Engineering Associate No. 3980 under the Engineering Associates Registration Act 1961. Study to the 3rd Professional year for a Bachelor of Engineering was made in Chemical and Materials Engineering at Auckland University in the late 1960's. Process engineering work experience began at that time in the pulp mill at Kinleith and then in the Department of Scientific and Industrial Research Chemical Engineering section. Around 1999 to 2004 operating and design experience was gained in fish rendering at NZ Fish Products. Since then he has worked under contract to Process Developments in Lower Hutt, which later merged with Connell Wagner which later became Aurecon NZ Ltd. This latter work has included investigation, design and monitoring of odour control systems in fish rendering, meat rendering, mushroom growing media composting and municipal green waste composting. In one case before the Environment Court, through work with Connell Wagner, John Vickerman was asked to provide details of odour control system design for scrutiny by other parties. Process Developments, Connell Wagner and Aurecon were contracted to do monitoring at AFFCO Imlay, in which John has done the monitoring work for around 12 years. There was a recent change in Aurecon policy (driven from Australia) preventing the AFFCO work continuing however John has continued to do the work through Kupe Technologies Ltd. John still does work for Aurecon NZ as a Senior Mechanical Engineer.

Bruce McHardy has a Bachelor of Engineering Degree in Chemical and Materials Engineering from Auckland University.
He worked as a graduate engineer at Imperial Chemical Industries NZ for five years on the design, construction and installation of new plants for Wood Panel Resins, Water Gel Explosives and a Pharmaceutical Disinfectant.
He then moved to production supervision and spent 23 years in Operational management in the Wood Resins, Paint Resins, Solvent Adhesives and Paint manufacturing industries.
After a period of running his own business he has been employed at Aurecon Engineering Consultants for thirteen years as a Process Engineer working on a diverse range of projects.

Appendix

Figures

Tables

Photographs

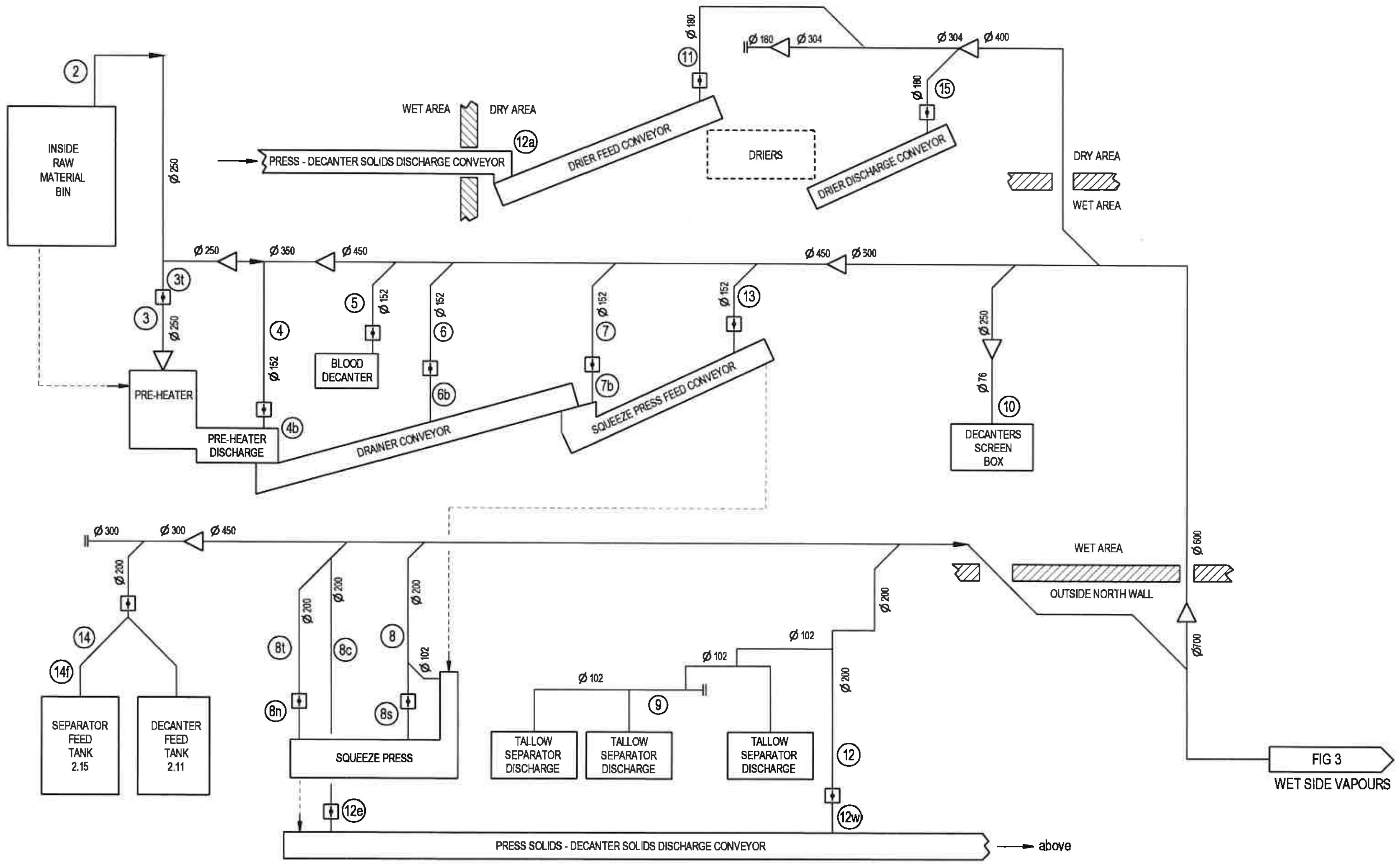


Fig 1. Wet Area Point Source Extractions at AFFCO Imlay Plant Feb 2021

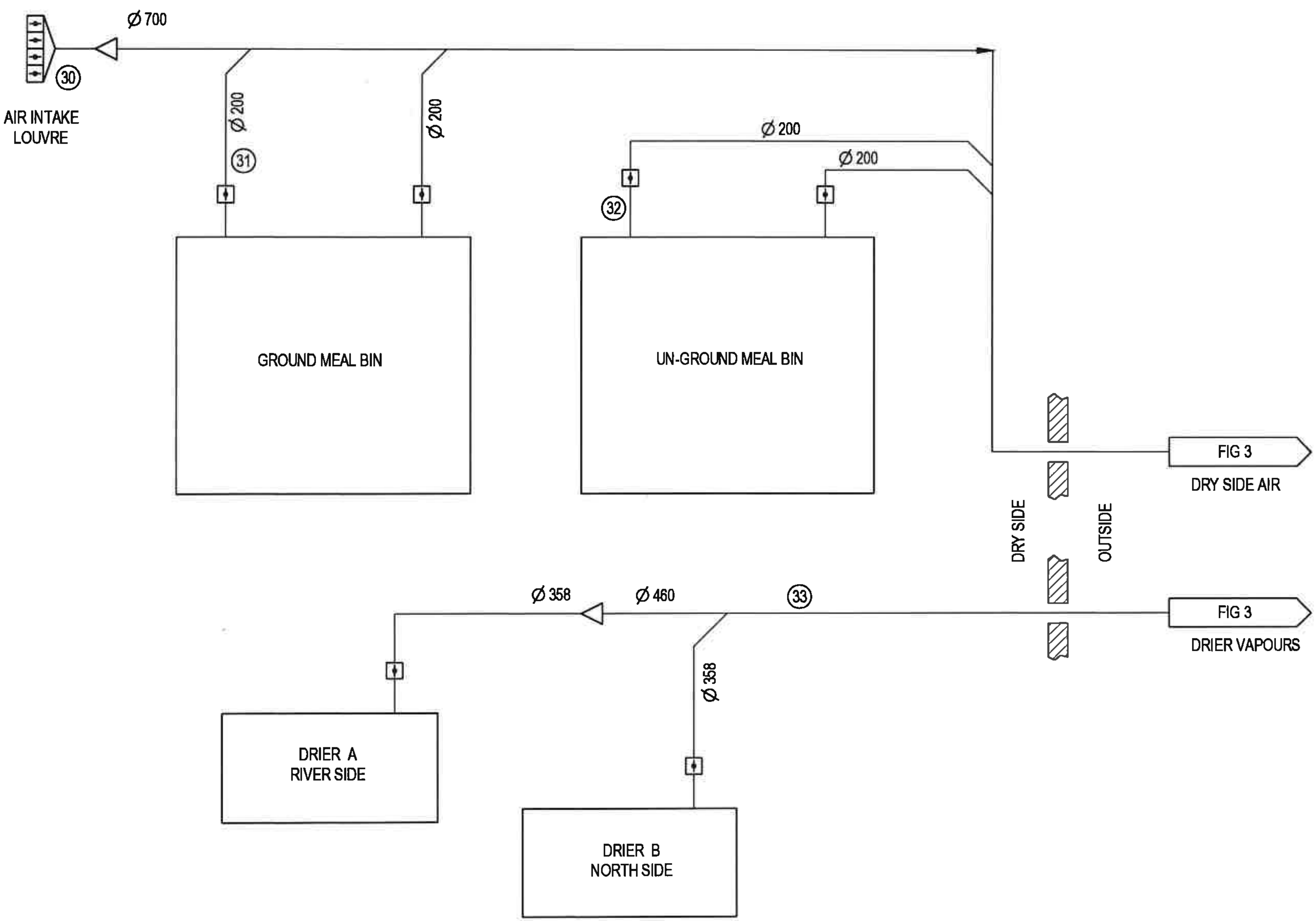


Fig 2. Dry Area Point Source Extractions at AFFCO Imlay Plant Feb 2021

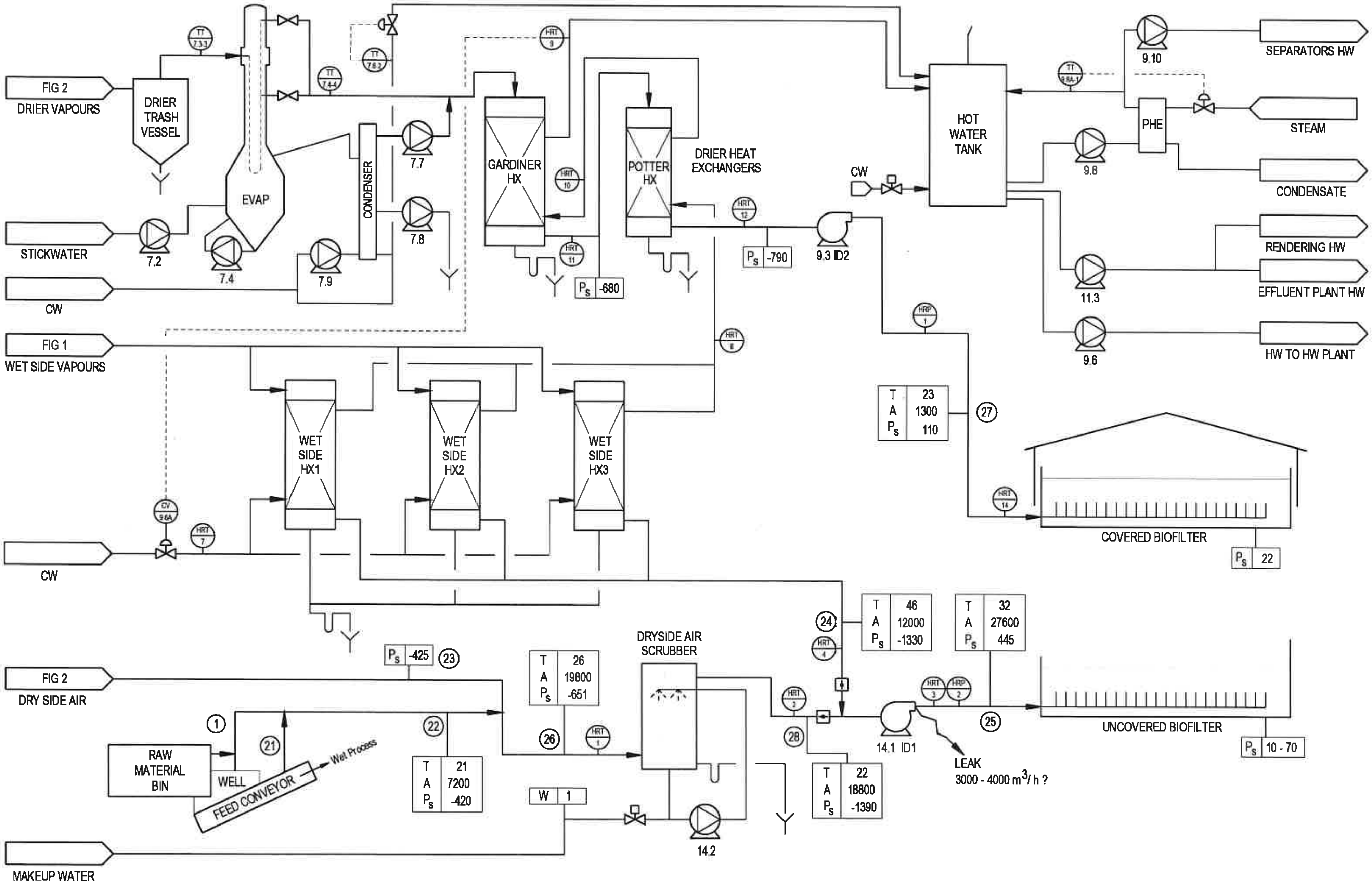


Fig 3. Biofilter Systems at AFFCO Imlay Plant Feb 2021

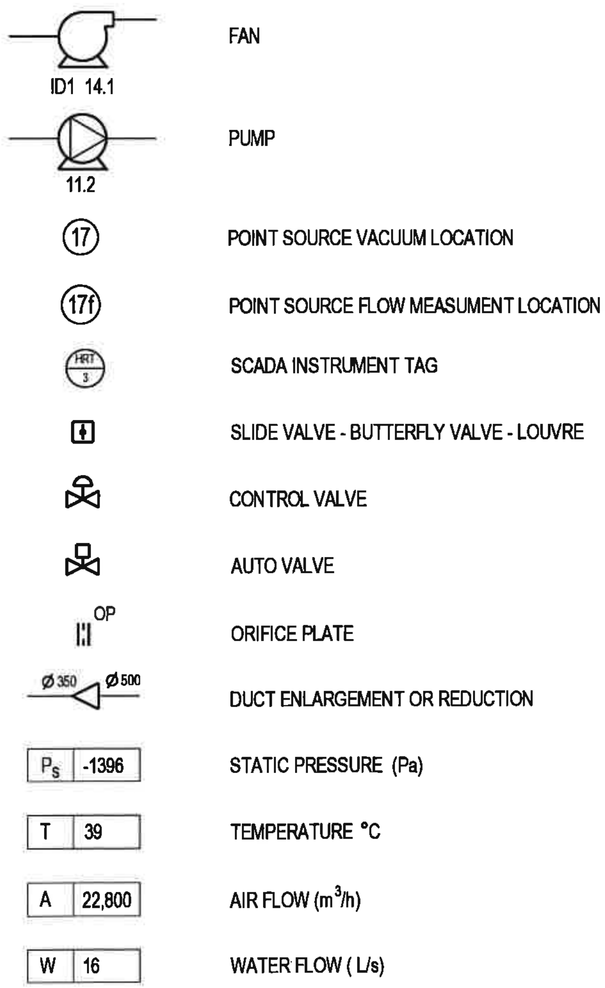


Fig 4a. Key to Symbols used in Figures 1 to 3

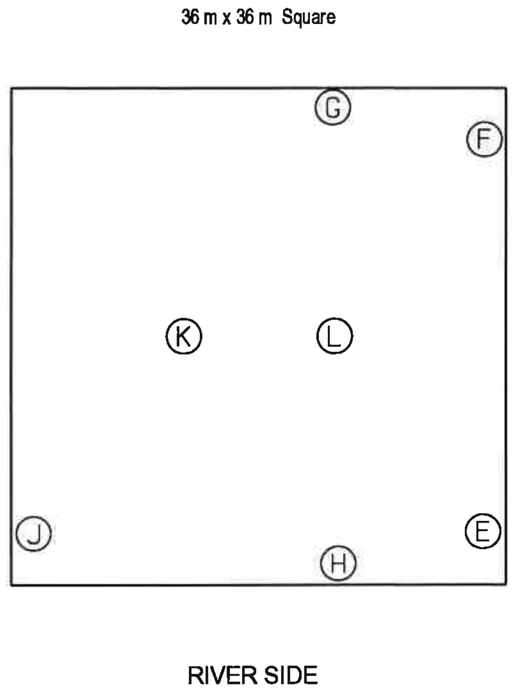


Fig 4b. Uncovered Biofilter Test Port Locations

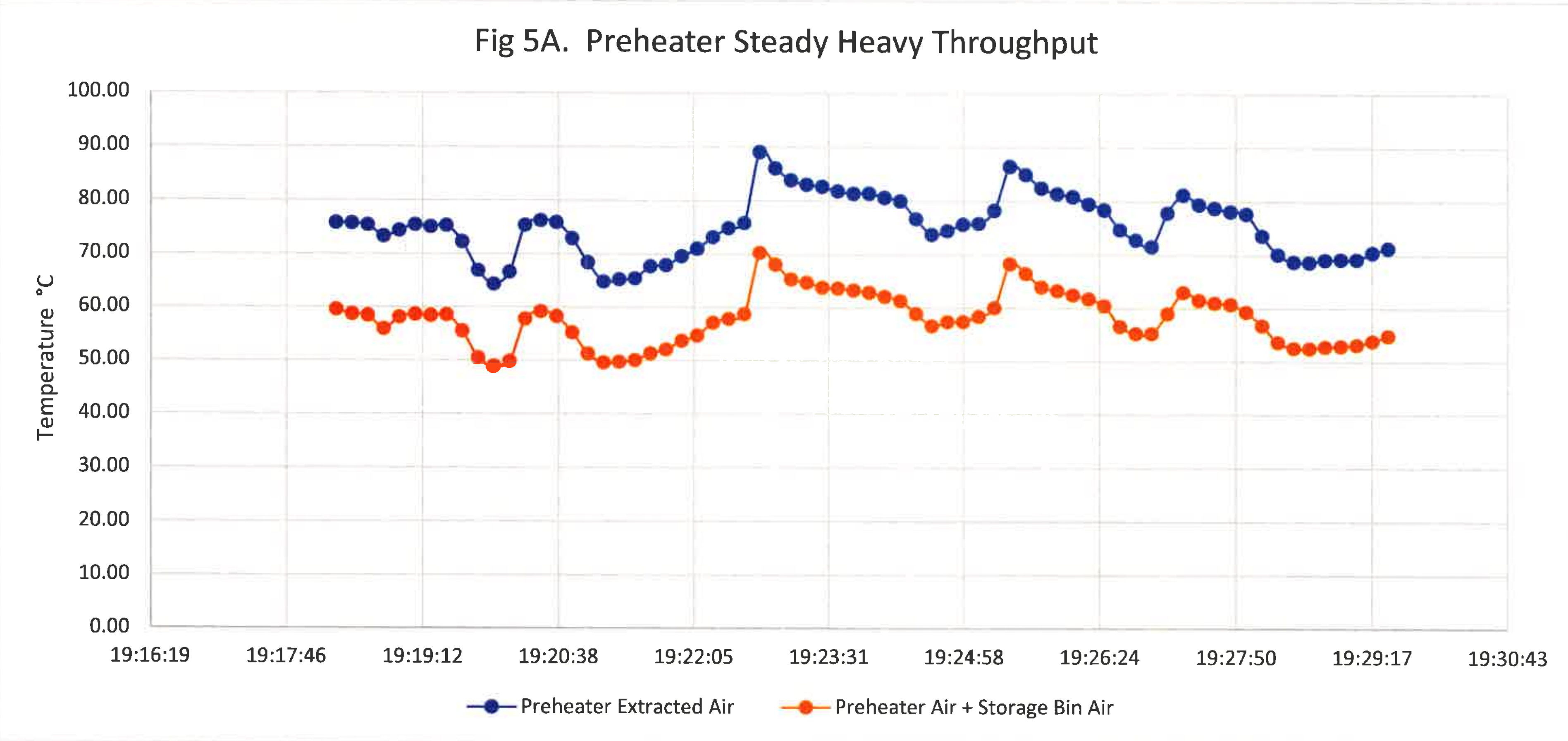


Fig 5A. Preheater Steady Heavy Throughput
Temperature °C
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
19:16:19
19:17:46
19:19:12
19:20:38
19:22:05
19:23:31
19:24:58
19:26:24
19:27:50
19:29:17
19:30:43
Preheater Extracted Air
Preheater Air + Storage Bin Air

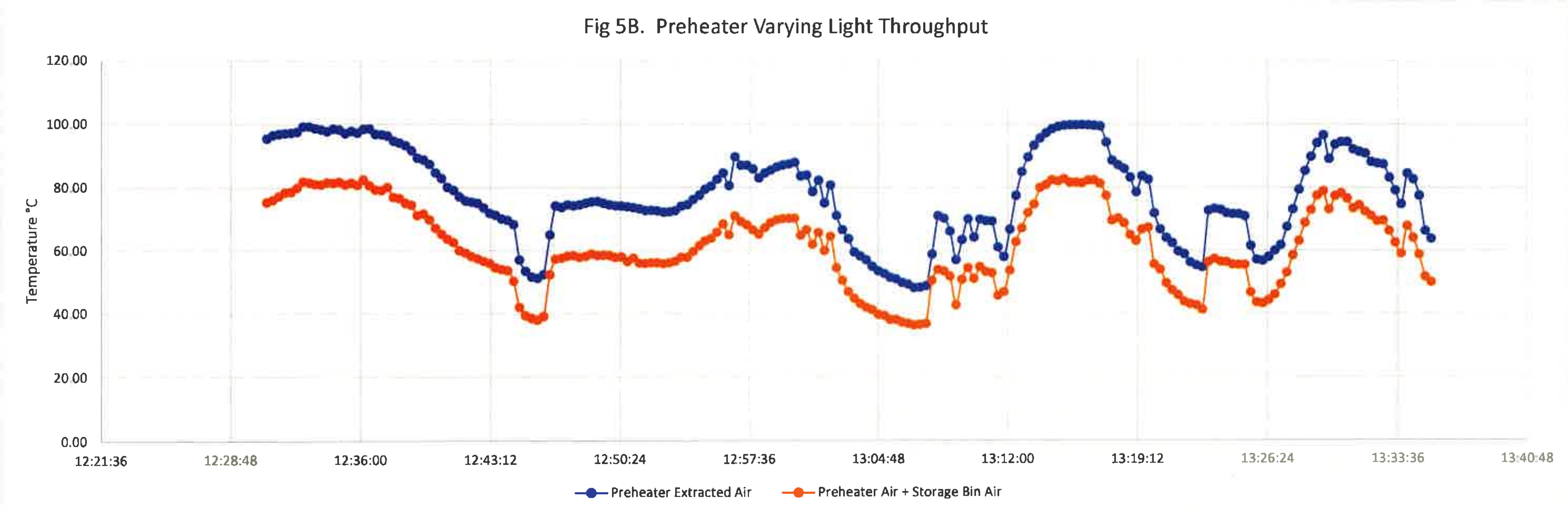


Fig 5B. Preheater Varying Light Throughput
Temperature °C
120.00
100.00
80.00
60.00
40.00
20.00
0.00
12:21:36
12:28:48
12:36:00
12:43:12
12:50:24
12:57:36
13:04:48
13:12:00
13:19:12
13:26:24
13:33:36
13:40:48
Preheater Extracted Air
Preheater Air + Storage Bin Air

Fig 5C. Preheater Light Load dT v Combined Stream °C

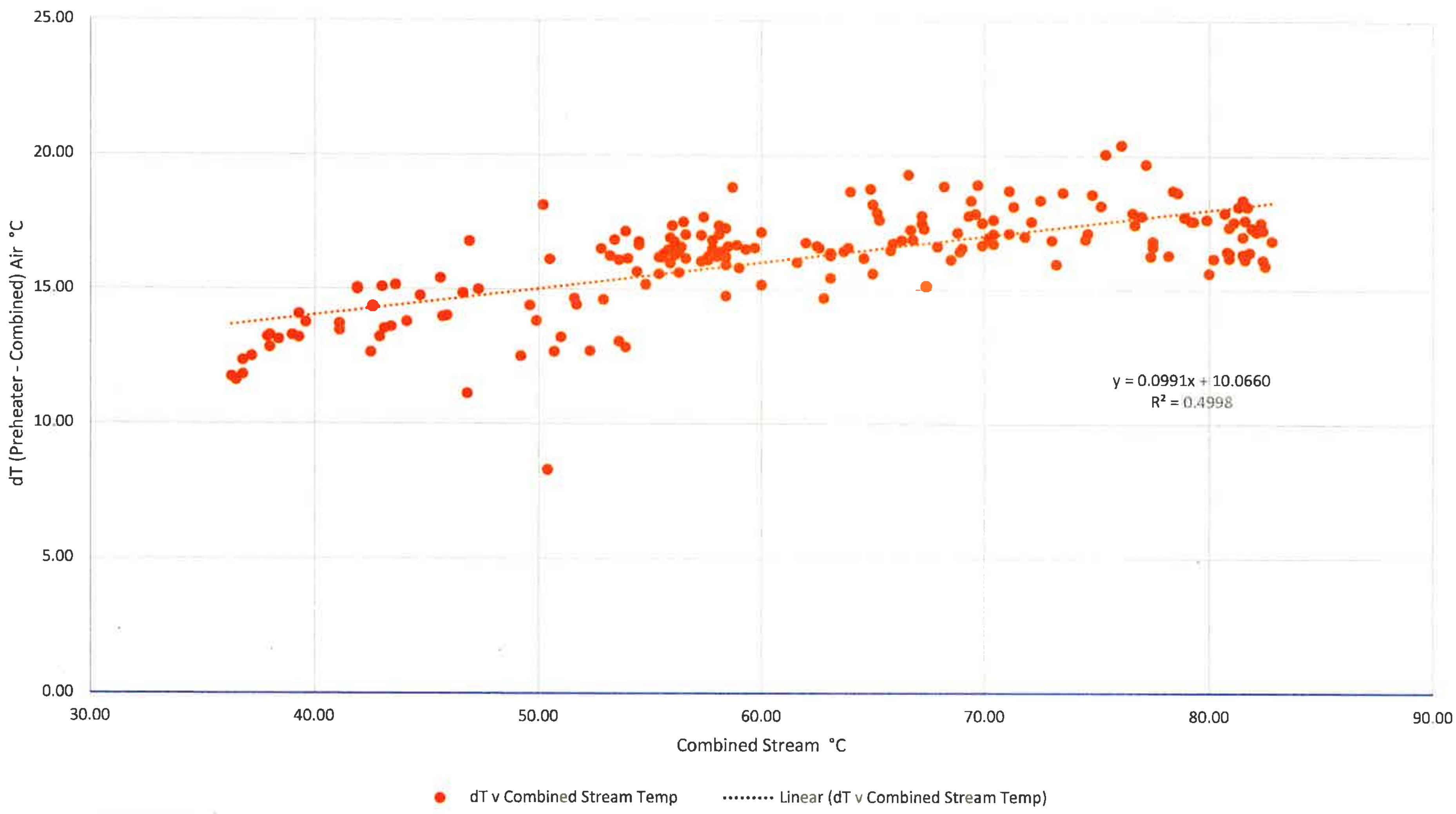


Table 1: AFFCO Imlay - Covered Biofilter

Performance Assessment	24-Nov-20		18-Feb-21	

A Ambient Conditions

	24-Nov-20		18-Feb-21	
On site temperatures (open air)	19 to 20	°C	15 to 19	°C
Humidity (site open air)	60	%RH	50 to 60	%RH
Atmospheric pressure	101.2	kPa	103.3	kPa
Wind	Light NE		Moderate SE to S	
	3	m/s	4 to 5	m/s
Occasional wind gust			7	m/s

B Measured Air Flow to Covered Biofilter

At 32NB measuring ports (location 27 in Fig 3) and according to ISO 10780

Test Sheet Ref		Duct Diameter mm	Static Head Pa	Dynamic Head pitot Pa	Air °C	Manometer Water °C	Barometric Pressure kPa	Pitot Coefficient	Duct Moist Air Density kg/m³	Air Velocity m/s	Air Flow m³/h	Air Flow kg/s	Air Flow tph
201102	24/11/20	302	109		23.4		101.2		1.18	5.1	1,315	0.43	1.5
21005	18/02/21	302	80	25	38.9	19	103.3	0.98	1.13	6.4	1,663	0.52	1.9
21005	18/02/21	302	105		39.8		103.3		1.12	5.1	1,315	0.41	1.5
21005	18/02/21	302	79		37.4		103.3		1.11	5.0	1,289	0.40	1.4
21005	18/02/21	302	79	23	37.4		103.3	0.98	1.11	6.2	1,591	0.49	1.8
											1,435		

Measurement was with both driers and evaporator operating

C Covered Biofilter Characteristics

Length (E-W)	16.0 m
Width (N-S)	13.2 m
Av media depth	0.65 m
Media bed area	211 m²
Media volume	137 m³

Media Moisture Analysis

%w/w (wet basis)

NW		NE
52.1		56.2
55.5		55.2
SW	*River Side*	SE

Media Temperature

°C at 200 mm depth

NW		NE
26.9	26.7	27.4
26.7	26.6	26.0
26.4	26.8	25.5
26.1	27.0	24.1
SW	*River Side*	SE

Media pH

NW	6.65 - 6.67	6.31 - 6.39	NE
SW	5.04 - 5.09	4.94 - 5.28	SE

D Biofilter Loading

10 m³/h air per m³ media (based on average of all measured airflows above)

E Duct Static Pressure

9.3 (ID2) Fan Inlet static head	-425 Pa
9.3 (ID2) Fan Outlet static head	100 to 110 Pa
Biofilter end manhole static head	17 - 22 Pa

Table 2: AFFCO Imlay - Uncovered Biofilter

Performance Assessment	23-Nov-20		24-Nov-20		16-Feb-21		18-Feb-21	
A Ambient Conditions								
On site temperatures (open air)	15 to 16	°C	16 to 17	°C	14 to 16	°C	15 to 19	°C
Humidity (site open air)	50 to 60	%RH	60	%RH	50 to 60	%RH	50 to 60	%RH
Atmospheric pressure	101.3	kPa	101	kPa	102.5	kPa	103.3	kPa
Wind	Moderate SW		Light SE		Moderate SE		Moderate SE to S	
	4 to 5	m/s	2 to 3	m/s	5 to 8	m/s	4 to 5	m/s
Occasional wind gust	7	m/s			12	m/s	7	m/s

B Measured Air Flow to Uncovered Biofilter

At 50NB measuring ports 13m downstream of fan 14.1 (location 25 in Fig 3) and according to ISO 10780

Test Sheet Ref		Duct Diameter mm	Static Head Pa	Dynamic Head pitot Pa	Air °C	Manometer Water °C	Barometric Pressure kPa	Pitot Coefficient	Duct Moist Air Density kg/m^3	Air Velocity m/s	Air Flow m^3/h	Air Flow kg/s	Air Flow tph
201101	23/11/20	898	444	213	33.5	16	101.3	0.98	1.13	18.8	42,876	13.51	48.6
201101	23/11/20	898	375-514		33.3	22	101.3		1.14	12.2	27,817	8.77	31.6
201101	23/11/20	898	375-514		32.2	22	101.3		1.14	11.8	26,905	8.52	30.7
21004	18/02/21	898	512	86	29.2	22	103.3	0.98	1.13	11.7	26,781	8.43	30.3
21004	18/02/21	898	512		26.6	23	103.3		1.13	12.7	28,957	9.11	32.8

C Uncovered Biofilter Characteristics

Length	36.0 m
Width	35.7 m
Av media depth	0.70 m
Media bed area	1285 m^2
Media volume	900 m^3

Media Moisture Analysis

%w/w (wet basis)

NW				NE
	63.4		58.0	
		59.9		
	59.9		60.7	
SW		River Side		SE

Media Temperature

°C at 200 mm depth

NW	27.4	26.8	24.7	24.9	NE
	26.9	25.8	26.0	25.6	
SW	26.1	26.3	26.0	29.3	SE
		River Side			

Media pH

NW	6.48 - 6.56		6.46 - 6.52	NE
		6.39 - 6.42		
SW	6.46 - 6.50		6.45 - 6.60	SE

Samples for moisture and pH analysis taken 18/02/21 1130h

Table 2 continued: AFFCO Imlay - Uncovered Biofilter

D **Biofilter Loading** 31 m^3/h air per m^3 media (based on average of the four consistent airflows measured above)

E **Measured Air flow from Wet Process Heat Exchangers** (Location 24 in Fig 3)

Test Sheet Ref		Duct Size W x H mm		Static Head Pa	Dynamic Head pitot Pa	Air °C	Barometric Pressure kPa	Pitot Coefficient	Duct Moist Air Density kg/m^3	Air Velocity m/s	Air Flow m^3/h	Air Flow kg/s	Air Flow tph
201103	24/11/20	645	790	-1330		45.6	101.0		1.05	7.2	13,208	3.85	13.9
21002	16/02/21	645	790	-1445		39.9	101.5		1.08	7.2	13,208	3.97	14.3
21002	16/02/21	645	790	-1445	108	39.9	101.5	0.98	1.08	13.6	25,027	7.53	27.1
21002	16/02/21	645	790	-1440		40.0	101.5		1.08	7.1	13,024	3.91	14.1

F **Measured Air Flow into Dry Gas Scrubber** (Location 26 in Fig 3)

Test Sheet Ref		Duct Diameter mm	Static Head Pa	Dynamic Head pitot Pa	Air °C	RH %	Barometric Pressure kPa	Pitot Coefficient	Duct Moist Air Density kg/m^3	Air Velocity m/s	Air Flow m^3/h	Air Flow kg/s	Air Flow tph
201103	24/11/20	702	-651		26.3	31	101.0	0.98	1.16	12.7	17,696	5.72	20.6
21001	16/02/21	702	-647		27.2	35	101.5		1.16	13.8	19,229	6.22	22.4
21001	16/02/21	702	-647	152	27.2	38	101.5	0.98	1.16	15.8	22,002	7.11	25.6
21001	16/02/21	702	-647		27.2	35	101.5		1.16	13.4	18,671	6.04	21.7
21001	16/02/21	702	-647		27.2	35	101.5		1.16	14.0	19,507	6.31	22.7

Measurement issues with ISO 10780 pitot tube. Static head too high (should be around -560 Pa from nearby independent measurement). Likely due to tee close upstream and inlet bend to scrubber directing airflow unevenly resulting in higher measured flow without compensation from lower flow areas unable to be measured due to lack of cross port.

Table 2 continued: AFFCO Imlay - Uncovered Biofilter

G **Measured Air flow from Gas Scrubber** (Location 28 in Fig 3)

Test Sheet Ref		Duct Size W x H mm		Static Head Pa	Dynamic Head pitot Pa	Air °C	Barometric Pressure kPa	Pitot Coefficient	Duct Moist Air Density kg/m³	Air Velocity m/s	Air Flow m³/h	Air Flow kg/s	Air Flow tph
21003	16/02/21	645	790	-1393	53	22.3	101.5	0.98	1.17	9.3	17,027	5.53	19.9
21003	16/02/21	645	790	-1393		22.3	101.5		1.17	11.3	20,728	6.73	24.2

H **Measured Air Flow from Outside Raw Material Bin and Feed Conveyor** (Location 22 in Fig 3)

Test Sheet Ref		Duct Size W x H mm		Static Head Pa	Dynamic Head pitot Pa	Air °C	Barometric Pressure kPa	Pitot Coefficient	Duct Moist Air Density kg/m³	Air Velocity m/s	Air Flow m³/h	Air Flow kg/s	Air Flow tph
201103	24/11/20	400	400	-422	123	21.3	101.0	0.98	1.18	14.1	8,112	2.66	9.6
201103	24/11/20	400	400	-436		21.3	101.0		1.18	12.4	7,142	2.34	8.4
21001	16/02/21	400	400	-412	64	21.9	101.5	0.98	1.18	10.1	5,843	1.92	6.9
21001	16/02/21	400	400	-412		21.9	101.5		1.18	13.9	8,006	2.63	9.5

J **Measured Air Flow from Raw Material Feed Conveyor** (Location 21 in Fig 3)

Test Sheet Ref		Duct Diameter mm	Static Head Pa	Dynamic Head pitot Pa	Air °C	Manometer Water °C	Barometric Pressure kPa	Pitot Coefficient	Duct Moist Air Density kg/m³	Air Velocity m/s	Air Flow m³/h	Air Flow kg/s	Air Flow tph
B201126	26/11/20	200	-168		21.8		100.6		1.18	9.3	1,052	0.34	1.2
B201126	26/11/20	200	-168		21.8		100.6		1.18	9.5	1,074	0.35	1.3
B210218	18/02/21	200	-167		20.4		103.3		1.18	11.3	1,278	0.42	1.5
B210218	18/02/21	200	-167		20.4		103.3		1.18	11.0	1,244	0.41	1.5

K **Static Pressures**

	Pa
ID1 Fan Inlet static head	-1520 to -1570
ID1 Fan Outlet static head	510 to 520
Biofilter H branch end static head	16
Biofilter J branch end static head	31
Biofilter G branch end static head	15
Biofilter F branch end static head	28
Biofilter E branch end static head	56

Table 3: AFFCO Imlay - Point Source Extraction Vacuum Measurement

Port	RMF008 Port	Location	Vacuum (Pa) Nov 2020	Vacuum (Pa) Feb 2021	Flowrate (m^3/h)
1	✓	Outside raw material bin	154 to 158	184	5400 to 5800 (Note 1)
21		Feed conveyor from raw material bin	168	167	1040 to 1240
22		Raw material bin + feed conveyor	422	412	5800 to 8100 (Note 2)
2	✓	Duct from inside ground raw material bin	42	50	920 to 950
3t		Pre-heater, above slide valve	245	365 to 375	
3	✓	Pre-heater, below slide valve	45	55	940 - 960 (Note 4)
4	✓	Pre-heater discharge	(Note 5)	370 to 380	1000 (Note 5)
4b		Pre-heater discharge, below slide valve		18 to 19 (Note 6)	1000 (Note 5)
5	✓	Blood decanter	165 to 170	Blocked Port	
6	✓	Drainer conveyor, above slide valve	126	194 to 196	1100 (Note 7)
6b		Drainer conveyor, below slide valve	36	104 to 108	1100 (Note 7)
7	✓	Press Feed Conveyor, above slide valve	167 (likely was blocked)	460	330 - 350 (Note 8)
7b		Press Feed Conveyor, below slide valve	80	70 to 80 (24 hatch open)	330 - 350 (Note 8)
8	✓	Press, feed end above slide valve	258	400 (Note 9)	2000 (Note 10)
8c		Press, discharge conveyor above slide valve	430 to 433	525 to 540	170 to 200
8s		Press, feed end below slide valve	27	40 to 80	1180 to 1480
8t		Press tail end above slide valve	214 to 225	415 to 465	1090
9	✓	Tallow separator discharge chambers 3x	25 to 35	25 to 55	
10		Decanters liquid discharge screen box	7.2 m/s	7.4 m/s	120 (Note 11)
11	✓	Drier feed conveyor	103	116	860 (Note 12)
12	✓	Press-Decanter solids discharge conveyor	190 to 215	220 to 230	170 (Note 13)
12w		Press-Decanter solids discharge conveyor	23 to 27	50 to 65 (Note 14)	150 to 200
13	✓	Press Feed Conveyor, above slide valve	120	120 to 140	
14	✓	Decanter + separator liquid feed tanks	19	23	350 x 2 (Note 15)
15	✓	Drier meal discharge conveyor duct	352	430 (duct blocked)	60 (Note 16)
30	✓	Dryside air intake	69	58	9,900
31	✓	Ground meal bin	21	19	450 x 2 (Note 17)
32		Unground meal bin	0	4	400 x 2 (Note 18)
33	✓	Drier Vapour Duct	24 to 28	72 to 76 (Note 19)	

Table 3 Notes on Following Page

Table 3: Continued

NOTES:

1 Flowrate measured directly at port 1. Flow varies depending on whether bin cover is open or closed and how well the retractable lid aligns with the bin when closed. Port 1 airflow includes air drawn in (220 to 460 m3/h) from the stairwell surrounding the feed conveyor.

2 Total flow from reception bin, feed conveyor and conveyor well measured upstream of combining with air from the dry-side, prior to entering the scubber. (Location 22 in Fig 3). If extended static pressure port is used to measure static pressure indicated vacuum is only 350 - 360 Pa.

3 Bin hatch normally open, drawing in air from near wet area ceiling. Air flow into bin hatch 420 - 680 m^3/h. Air extracted from bin 910 - 950 m^3/h hence 300 - 500 m^3/h likely being drawn up bin feed conveyor from grinder.

4 Airflow from preheater has been restricted to give a flowrate around 950 m^3/h. Hot vapour from preheater may briefly backup into feed conveyor at 55-65 Pa when feed commenced after pre-heated no load or varying light load. No backup at other times like under full load. See Figs 5A and 5B for datalogged temperatures.

5 Vacuum above slide valve. Port 4 Pneufit fitting found blocked in Feb 2020 hence 35-40 Pa vacuum measured in Nov 2020 not quoted because error obvious. Extraction air flow drawn in through screens measured. (See photo 124). Air flow through preheater discharge screen 820 m3/h. Air extracted in Port 4 duct air assumed to be 90% through preheater discharge screen and 10% up from drainer conveyor screen below - hence total air flow through Port 4 duct estimated to be 1000 m3/h.

6 Air flow was measured through open screen. In absence of a vacuum port below the slide valve, the vacuum 18-19 Pa was measured by inserting a probe through the missing box fastener hole shown in Photo 124.

7 Port 6 duct air intake down from top of conveyor (see photo 109). All air flow assumed to be drawn in through drainer conveyor screen shown in Photo 124 - screen has near zero inward air velocity at bottom end to 1.1 m/s at upper end giving a total airflow through the screen of 1100 m3/h back towards top of conveyor. Slide valve in port 6 duct has no further adjustment available to increase the airflow. Some airflow in the Port 6 duct may also be being drawn from the Press Feed Conveyor feed box shown in Photo 109 which will be additional to the airflow given.

8 Port 7 duct air extraction mostly occurrs with feed box hatch open (see photo 109). Fitting in Port 7 is blocked but an old rivet hole 260 mm above slide valve was able to be used for static pressure measurement. Port 7b (Photo 110) was able to be used for flow and pressure measurement below the slide valve. Airflow in Port 7 duct was around 330 m3/h with hatch closed and 350 m3/h with hatch open - had anticipated a larger difference in flows.

9 Port 8 static pressure measured at socket on top of duct oriented perpendicular to centreline of duct because port labelled '8' on side of duct is inclined and gives a false reading i.e. 358 Pa vacuum due to included velocity head from air flow. (See Issue 2021-7 in Table 6).

10 Nov 2020 airflow at 258 Pa vacuum was 1750 m3/h.

11 Original port 10 removed when decanter centrifuges were replaced. Air velocity 7.4 m/s into duct at back of decanters iquid discharge screen box measured to give flowrate. With duct blocked off static vacuum rose to 502 Pa - indicative of static pressure in Ø650 duct above at the branch.

Table 3: Notes Continued

12 Measured at new Port 11 (see photo 115) . This extraction duct draws air from the driers feed cross-conveyor - both driers were operating and there is headspace for air to be extracted from the south end. From previous air flow measurement prior to installation of the duct port 11 air was being drawn from the cross conveyor between driers with practically none being drawn up from press-decanter solids conveyor discharge location.

13 Extracted air from decanter solids conveyor goes to same manifold that separators extracted air does (see Fig 1). An objective is to draw more air from the solids conveyor through adjustment of slide valve below port 12 (to increase vacuum at the end of the conveyor located in the dry-area) but need better understanding of the varying conditions in the separator extraction boxes first. Slide valve (12 Fig 3) is currently open to where vacuum is barely achieved at end of conveyor. With the new flow measuring ports at the press (measuring ports 8c, 8 and 8t) it is apparent that adjustment of slide valve at 12e is unlikely to achieve this (i.e. because it is too close to the open sided press and will just draw more air from the press rather than the other end of the solids conveyor where more extraction is wanted) hence adjustment at the slide valve above 12w is next best option without getting into installation of a further extraction line to the conveyor in the west .

14 Vacuum can be quite unstable. Typical is 59 to 65 Pa but it can range between 50 and 120 Pa.

15 Measured air flow from each of the decanter and separator liquid feed tanks was initially around 750 m3/h at 110 Pa vacuum. Slide valve for both tank streams was partially closed to give 19 Pa vacuum. Measured flow for each tank was then 310 m3/h. Slide valve was then opened a little to 26 Pa which gave 350 m^3/h for each tank and sufficient to capture all vapour from the open extraction connection sleeve when decanter feed tank 2.11 was boiling.

16 Airflow should be around 500 m3/h. Probe inserted in small hole in conveyor lid indicated 15 Pa vacuum. Slide valve removal and reinsertion made no difference hence conclusion is that meal is bridging the upper part of the extraction inlet transition box below the slide valve.

17 Was able to remove port fitting and insert flowmeter which indicated a flow in the duct of 550 m3/h. There are two air extraction ducts from the bin each with a slide valve but only one duct has the access port - hence it is assumed the total flow is 2x the one measured but this may not be the case.

18 Only port available for flow measurement was port 32 (Photo 121). Measured flow indicative because flowmeter could not be inserted to be perpendicular to the centreline of the duct above. Bin has two extraction ducts so assumption is made that total bin air extraction is 450 x 2 m3/h.

19 Both driers operating. Vacuum measuring port is on an extension tube from the duct above. Measurement at the duct direct gives a vacuum of 95 to 103 Pa.

Table 4: Building Environment

Measured on 17/02/21 between 1530 h and 1600 h

Outdoor conditions south of building 20.3°C, 38% RH, moderate SE wind 6 - [illegible]

Location Inside Building	°C	Relative Humidity (RH) %
Dry Area		
Walkway between driers	36.7	26.7
Ground level (west of driers)	33.9	28.7
Ground level (east of driers)	33.5	26.8
Top of steps by sifters	34.4	25.2
NE corner finished meal bin walkway	35.6	24.9
N side walkway by finished meal bin	35.8	24.1
NW corner finished meal bin walkway	35.9	24.4
Air intake dry-side	36.2	22.7
S side walkway finished meal bin	36.2	23.3
Top of steps by finished meal bin	35.8	24.4
Offices		
Control room air inlet	19.5	46.8
Lunch room at air inlet	19.1	44.9
Lunch room stove/fridge mid-height	20.0	45.2
Office	19.4	47.5
Wet Area		
Walkway above blood tanks	28.8	53.4
Walkway day bin N side W	29.0	49.3
Walkway day bin N side E	29.1	47.0
Day bin hatch (air in)	29.2	48.9
Mid-level walkway by pre-heater	29.1	48.8
Above preheater feed conveyor	29.1	49.1
Bottom of steps by preheater	27.5	52.5
By blood tanks roller door	26.7	46.8
By workshop door	26.9	50.4
Separator floor	29.6	48.0
Separator floor by press	29.0	44.5
By decanters stickwater screen box	32.2	84.1
By sump door	25.2	43.2

Table 5: AFFCO Imlay - Rendering Plant Historical Air Extraction Data

	2015	2016	2018	2019	2020	2021
Drier Vapours						
Fan 9.3 (ID2) inlet static pressure (Pa)	-3923	-3864	-569	-490	-485	-425
Fan 9.3 (ID2) outlet static pressure (Pa)	127	226	108	80	82	105
Fan 9.3 (ID2) outlet air temperature (°C)	23	20	16	23	29	35
Covered Biofilter inlet total pressure (Pa)	78	59	NP	6	3	20
Flow to Covered Biofilter (m^3/h)	1,600	2,400	1700	1080	1000	1400
Mass flow to Covered Biofilter (tonnes/h)	1.9	2.9	2.1	1.2	1.2	1.6
Biofilter Loading (m^3/h air per m^3 media)	19	28	20	12	11	10
Non-Drier Vapours						
Dry Side Air						
Scrubber Inlet Static Pressure (Pa)	-775	-971	-1059	-710	-560	-647
Scrubber Inlet Temperature (°C)	32	31	29	26	36	27
Inflow to Scrubber (m^3/h)	22,800	22,300	23,500	23,700	19,000	19,000
Including Reception Bin + Feed Conveyor (m^3/h)					6,800	7,200
Mass flow to Scrubber (tonnes/h)	26.6	25.2	27.4	27.2	21.4	22.6
Wet Side Vapours from HX1 - HX3						
Static pressure (Pa)	-1226	-1451	-1559	-1380	-1400	-1420
Temperature (°C)	46	44	21	46	44	41
Flow (m^3/h)	19,400	19,200	15,900	14,300	12,000	13,100
Mass flow (tonnes/h)	20.3	20.3	16.9	15.3	12.7	14.1
Uncovered Biofilter						
Fan 14.1 (ID1) outlet static pressure (Pa)	441	314	196	320	525	478
Air temperature to Uncovered Biofilter (°C)	34	35	19	32	37	31
Flow to Uncovered Biofilter (m^3/h)	41,800	41,400	39,900	33,200	31,000	27,600
Mass flow to Uncovered Biofilter (tonnes/h)	46	46	47	38	34	32
Biofilter Loading (m^3/h air per m^3 media)	59	59	57	52	53	31

Table 6. Summary of Issues and Potential Solutions from 2020 and 2021

A: Review of 2020 Open Items *[Comments in italics are current comments]*

No	Item	Issue	Comment
2020-7	Vacuum Measurement	Existing Dwyer Magnehelic gauge being used is sensitive to orientation and not easily read. It is recommended that a Kane 3500-1 differential pressure meter be purchased from Teltherm Instruments. All extraction system air pressures are within instrument range of ± 8000Pa. Training to keep in range and only using (-) sensing tube for differential pressure measurement will give reliable reading and good life.	Kane 3500-1 meter purchased. Instructions were missing but are now held. *[Training and use of the instrument in the context of the OMP are ongoing.]*
2020-9	Scrubber Air Flow Measurement	Temperature gauge port on inlet bend currently used but error is likely due to flow variation at bend. Two 20BSP capped ports at right angles upstream of the outside raw material bin entry duct would greatly assist flow measurement. A small length of walkway at higher level giving access to both outside raw material bin extraction duct and dryside duct for flow measurement would solve issues 8 and 9. If this was done the flow measuring port in the raw material bin extraction air duct would be put in the top side of the duct.	New ports 22 and 23 were installed. 22 used for total flow measurement from raw material bin. 23 only used for static pressure measurement due to access difficulty. *[New portable work platform has enabled access to a port downstream of scubber for flow measurement. So far this has confirmed accuracy of the scrubber inlet flow measurements - hence there is no longer immediate need for a further right-angled capped port at the scrubber inlet - which even if installed would still not have been a good location due to the bend.]*
2020-11	Dry Area Air Intake Louvre	Screen needs cleaning monthly or more often if air meal dust loading is high.	*[Screen found in good clean condition.]*
2020-15	Unground Meal Conveyor from Driers	Currently no air extraction from entire drier meal discharge conveyor because vacuum in unground meal bin is too low. If currently disconnected duct (15, Fig 1) is not connected because conveyor access is needed at connection location then the duct should be repositioned to connect with the conveyor head space further downstream. It may be more appropriate to install a new Ø150 extraction duct from conveyor to Dry Area air duct nearer the Unground Meal bin.	Former extraction duct reconnected to conveyor. A 6.5mm hole in the side of the air extraction connection box on the conveyor is needed *[like Port 6b hole in current report photo 108]* for vacuum measurement in the box. *[Another issue has arisen - see current Issue 2021-4 in the list below.]*
2020-16	pH sampling and test method	Monthly results from qualified lab testing are too variable. There is either a problem with the sampling or test method or both. Further investigation needed.	See comment in section 6.3. KupeTech willing to follow up and clarify the issues. *[Investigation done and commented on in current report]*
2020-17	Covered Biofilter media depth	Bark-soil bed depth is less than the recommended guideline. With sensed break through of meal odour, the depth should be increased by 150mm to 200mm to minimise this.	See report section 6.3. Unlikely that meal odour would be eliminated. Current worst odour not able to be sensed at site boundaries. *[Depth has been increased giving a very good result, commented on in current report].*
2020-18	Wet Side Extraction Air Temperature	Temperature has crept up and little margin to biofilter max temperature remains at daily peak. Require an accessible plugged 20 BSP flow measuring ports installed in extraction ducts with hot emissions to accurately and repeatably determine the minimum extraction flow necessary to contain the emissions.	New ports 3f and 14f (Fig 1) installed. Flow measurement has enabled hot emissions to be reduced. Scope for further reduction but require flow measurement on other hot sources e.g. section 7(k) and (n). *[Significant progress has been made and is commented on in the current report]* .
2020-19	Fan 14.1 Discharge Duct Sealing	Stainless steel discharge duct from fan 14.1 frequently leaks at junction with concrete pipe due to inability of flexible sealant to cope with vibration. A circumferential sealing skirt secured with tensioned bands each side of the joint is needed to provide a more permanent seal.	New rubber skirt installed but need to regularly check for sealing. See section 6.2 page 8. *[An issue has arisen with the rebuilt seal. See Issue 2021-1 in the list below.]*
2020-21	Liquid phase tanks	Extraction vacuum is so high too much vapour is being removed. A working slide valve in the common leg is needed to reduce the vacuum in the tank headspace or alternatively some additional extraction air could be drawn from the sump, breaker and MD belt area nearby to moderate the vacuum.	Flow significantly reduced by adjustment of slide valve above 'Y' leg. See report section 7 (o). Flow of 750 m3/h in each leg still too high. Will be reduced together with adjustment of other hot sources. [*Airflow from separator feed tank 2.15 has been reduced to 320m3/h in balancing and still sufficient to extract vapour from decanter feed tank 2.11 when boiling*].
2020-22	Blood Decanter	Air extraction is inadequate to collect vapour emissions. Either the conveyor is too small i.e. not enough headspace for vapour transport along the screw to the larger extraction duct, or the 76 mm diameter dairy tube duct needs to be increased in size. Size of conveyor may be determined by specific blood properties requiring the conveyor to be small.	See 7 (g) page 13. Extraction inadequate. If existing decanter conveyor is to be retained a raisable hood with flexible duct connection to the extraction system appears to be one solution. *[Unresolved practical issue around significant emission of steam into wet-area airspace but not a significant emitter of adverse odour].*
2020-24	Drier Feed Conveyor	Patch corroded slot admitting air beside the extraction air intake at the top of the conveyor, but leave a 16mm diameter hole for flow measurement.	Corroded slot still used for air flow and vacuum measurement. *[New port 11 installed and used to measure flow - photo 115 in current report. See new issue 2021-5]*
2020-25	Flow measurement platform for wet area big ducts	Platform with ladder access and flow measuring ports where big wet area ducts penetrate north wall would be helpful but does not look practical given the congested piping in the area.	The photo 113 to AFFCO (in 2019) identified locations for new ports 18 and 19 except these are now shown as 20f and 19f in the photo and Fig 1. Difficulty of installing ladder and small platform recognised. New flow ports as in items 35 to 37 below would be of more immediate benefit for balancing flows and are more accessible. *[Access to high level large ducts difficult to solve but other new flow measurement ports are providing helpful data reducing the uncertainty around what cannot be accessed.]*
2020-26	Wet Process Heat Exchangers	Top air chamber should be inspected for clear ducting and tubes. Capped ports on top of the three cover plates are seized and need freeing to enable pressure measurement.	Still to be done. See section 11 (c). Check of baffles in top plenum chamber to ensure inlet air is not short circuiting to the outlet. *[Not yet checked - no indication of malfunction - but do want to measure pressure.]*

Table 6 Continued

2020-28	Uncovered biofilter loading	PDP recommended action: Increase uncovered biofilter bed depth to reduce the loading to 35 m^3 air/h per m^3 bed media.	See report section 11 (a). Increased depth of bed recommended but no evidence of existing bed not working. *[Replenished biofilter media has reduced loading to around that recommended].*
2020-30	Air cooling heat exchangers HX1 to HX3	PDP recommended action: Investigate causes of heat exchanger inefficiencies.	Still to be done. See Item 26 and report section 11 (c). Need to check baffles in top plenum chamber to make sure inlet air is not short circuiting to the outlet. *[Not clear that exchangers as-built are under-performing - water flow is intermittent due to HRT9 control sensing downstream of the Gardiner heat exchanger 9.6.]*
2020-31	Raw material reception	PDP recommended action: Install an enclosed raw material receival hall with building air extraction.	See report section 11 (d). *[Current operation of raw material reception bin with air extraction to the biofilter has not created odour issues.]*
2020-32	Building air extraction	PDP recommended action: Install [increase] building air extraction and/or improve building cladding to maintain a negative pressure in the rendering building.	See report section 11 (e). *[Incremental improvements being made. Current operating practice has not created odour issues.]*
2020-34	Save-All odour reduction	PDP recommeded action: Investigate options and implement mitigation measures to reduce odours from the Save-alls	Investigation open on extent and duration of odour from Save-alls. Not the issue that it was. *[Minor adverse odour sensed from liquor in Save-alls in 15/2/21 survey but became indetectable 15-20m downwind still within site boundaries. No unpleasant odour from contrashear solids.]*
2020-36	Press flow measuring ports	New type ports (see photo 101) needed at locations 13f, 17f and 18f in Fig 1. See report section 7 (n) on page 14.	*[Ports for flow and static pressure measurement have been installed. Note installation of some sheetmetal cut port identification numbers for the ports did not correspond to numbers earlier used in the RMF008 checksheet and reporting e.g interchange of 8 and 13. Numbers in Fig 1 of this report correspond to the plant new identification numbers.]*
2020-37	Separators - solids conveyor flow measuring ports	New type port (see photo 101) needed at locations 12f and 16f in Fig 1. See report section 7 (k) on page 14.	*[Comment same as for 2020-36]*

B: 2021 Issues

No	Item	Issue	Comment
2021-1	Fan 14.1 Discharge Duct Sealing	Previous perished seal was replaced but bolts securing bottom seal clamping bar have worked loose from fan vibration resulting in a segment shaped opening between duct and seal - see photo 101.	Not an easy permanent fix due to inevitable vibration from fan and need for more secure bolting. Temporary beams top and bottom with ties each side might reduce gap but better internal design for clamping (with the inevitable extended shutdown needed) makes this a likely winter maintenance task.
2021-2	Fan 14.1 Discharge Duct Sealing	In replacement of the former perished seal two new holes appear to have been drilled and tapped for new bolts. The old bolt holes remain open with a steady stream of air coming from each. See photo 102. Any leaks in piping between the fan and biofilter need to be sealed if readily possible. Leaks though small have a cumulative effect in what odour can be sensed and the fewer the better.	Seal any old unused bolt holes.
2021-3	Fan 14.1 Discharge transition duct crack sealing	See photo 103. The crack is currently well sealed but likely to open with ongoing fan vibration. Require ongoing vigilance for leaks between fan and biofilter.	
2021-4	Driers Discharge Conveyor air extraction duct entry box	See photo 119. Pressure and flow measurements indicate that a bridge of meal must be almost completely blocking the duct below the slide valve. Removal and replacement of the slide valve makes no difference.	This may have been an issue in the past as it would explain why this extraction duct has been disconnected at times. Absence of extraction air at this location is not viewed as a significant source of odour as air in the conveyor is still likely to be drawn to the unground meal bin. Clearance of the blockage and a largely closed slide valve (to keep the air velocity in the transition box low) is recommended until further flow measurement and slide valve adjustment made.
2021-5	Driers Feed Conveyor Air Extraction Duct	See photo 115. Corroded opening at base of air extraction intake box below the slide valve.	Can the opening be closed? Is the corroded slot used to check whether solids are moving in the conveyor or not? If so can a hinging flap cover the opening? Desirable to maintain slightly more vacuum in conveyor air space if possible mainly relating to what is happening at the bottom (upstream end) of the conveyor.
2021-6	Solids Discharge Conveyor press - decanters	See photo 122. Open slot draws in 130 m3/h air. A 2020 photo of the same equipment does not have the gap. Has the conveyor cover plate been inintentionally assembled in the wrong position? Is this slot used to view movement of solids in conveyor? Can the slot be covered?	An objective is to increase vacuum in the conveyor but constraints on further slide valve adjustment at 12e and 12w are still being investigated. In the meantime any elimination of un-needed openings in the conveyor covers will help.
2021-7	Vacuum Port 8 socket orientation	See photo 111. An action misunderstood! The socket in which the valve and bush is mounted needs to be perpendicular to the centreline of the duct because false static pressure readings will be obtained and change with varying air flow in the duct.	The socket and plug on top of the duct labelled 'Port 8' in white is suitable for flow measurement and static pressure measurement but not as accessible as the location where the valve is. Inclined socket could be removed and hole blanked off or replaced with square oriented socket and backing plate. See also issue 2021-8 below.

Table 6 Continued

2021-8	Vacuum Port 32 socket orientation	See photo 121. Vacuum measuring port 32 not perpendicular to the centreline of the duct above.	Was an original port when vacuum monitoring was introduced. Acceptable operating vacuum is low and repeatable measurement not easily attained due to inevitable dust in the port. Measurement of air velocity entering the extraction duct is far more helpful for air flow adjustment but the port needs to be perpendicular (approx) to the airflow. The surplus angled port 8 (Issue 2021-8) might be able to be relocated (with reducing bush and tailpiece but not the valve) higher up on the intake box (photo 121), on one of the adjacent box sides with the socket aligned with the direction of slide valve movement (i.e. not the side of the existing port 32 or its opposite side). See report 7(s) on page 18.
2021-9	Decanter Feed Tank 2.11 Air Extraction Pipe	See photo 125: Extraction pipe does not align with tank extraction port leaving open gaps drawing in air from outside the tank.	Having gaps in the ducting drawing in air is not necessarily an issue in itself. In this case the air extraction is sufficient to capture all vapour at the tank extraction port when liquid in the tank is boiling (the worst case) yet vapour gets emitted from the instrument well (seen background left in photo 118). Air drawn in at the gaps appears to be displacing vapour that would otherwise be drawn from the tank. This may not be the case if the instrument well headspace is separated from the tank headspace. Whether there is operating need for the air gaps or it is simply a problem of pipe misalignment should be explained.
2021-10	Press west side cover panel	See photo 123: Cover panel has warped and rubber tie too weak to hold panel closed.	Other (east) side of press is operated with no panels closing the side but air extraction is sufficient to capture press vapours. Although the panel in the photo covers the same airspace (surrounding the press screw) some emission is occurring through the gap seen in the photo. A new rubber tie and fully closing door would assist containment of adverse odour.
2021-11	Wet-side air cooling heat exchangers HX1 - HX3	Following on from previous issues 2020-26 and 2020-30 a check of the top plenum of the exchangers is still to be made. Measurement of static pressure at the top of the exchangers is still wanted so capped ports need to be free to be opened for measurement.	
2021-12	Odour Management Plan OMP Proceedures OMP 002 to 006 and RMF008	Following Issue 1 in March 2018 some details need revision arising from developing knowledge and practical working of some aspects.	Kupetech offers to suggest changes for consideration.

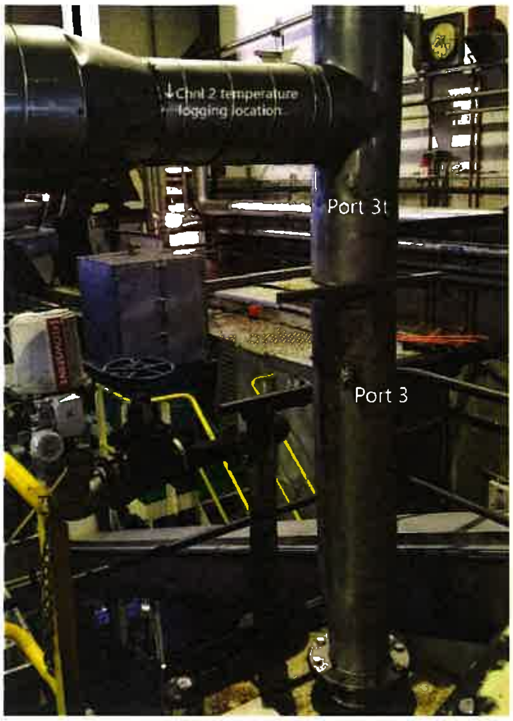
Photographs

101: Fan 14.1 outlet transition duct seal leak

102: Fan 14.1 unsealed old open bolt holes

103: Fan 14.1 outlet transition duct cracking

104: Vacuum Port 2 – Inside Bin



105: Port 3 – Preheater Air Extraction Duct

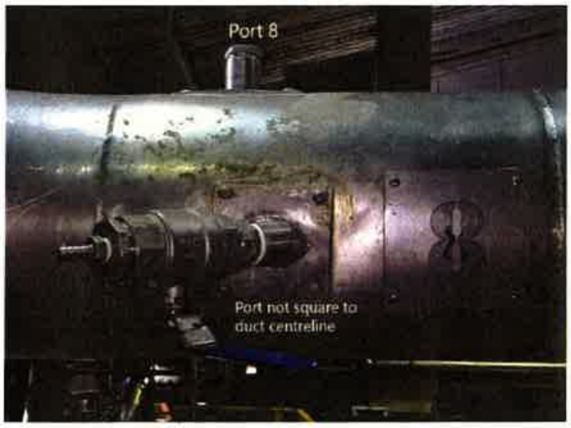
106: Port 4 – Preheater Discharge

107: Port 5 – Blood Centrifuge

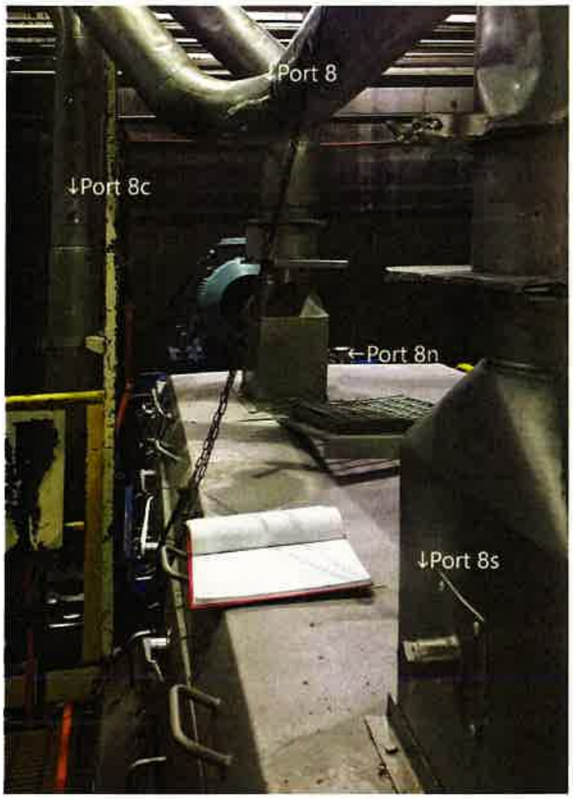
108: Port 6b – Drainer Conveyor

109: Ports 6 and 7

110: Ports 7 and 7b

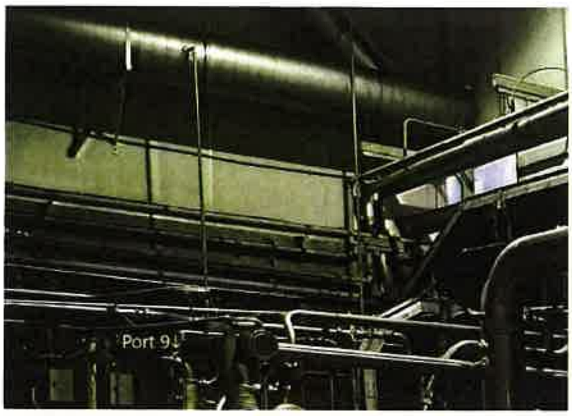


111: Port 8



112: Ports 8s – 8n -8c and 8

113: Port 8t

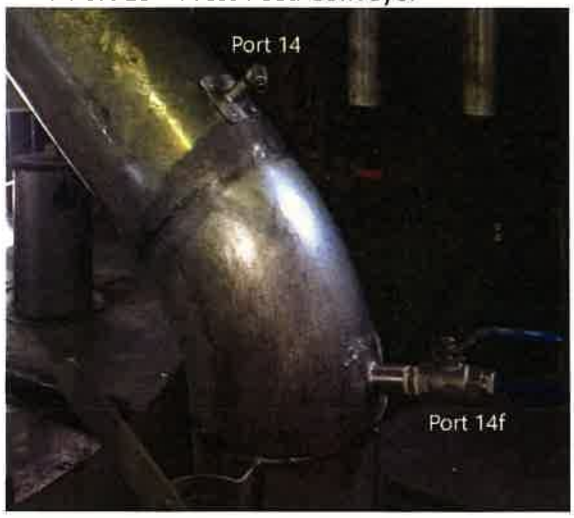


114: Port 9

115: Port 11 – Inlet conveyor to Driers

116: Ports 12 and 12w

117: Port 13 – Press Feed Conveyor

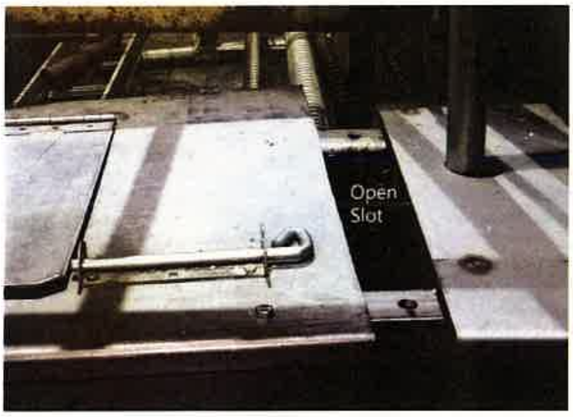


118: Port 14 – Separator Feed Tank 2.15

119: Port 15 - Driers Discharge Conveyor

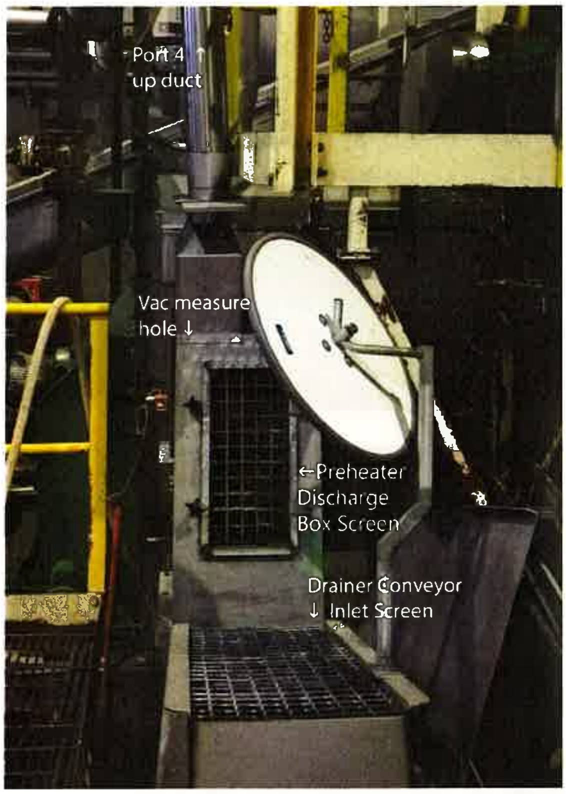
120: Ports 30 and 31 – Dryside Extraction Louvre

121: Port 32 -Unground Meal Bin

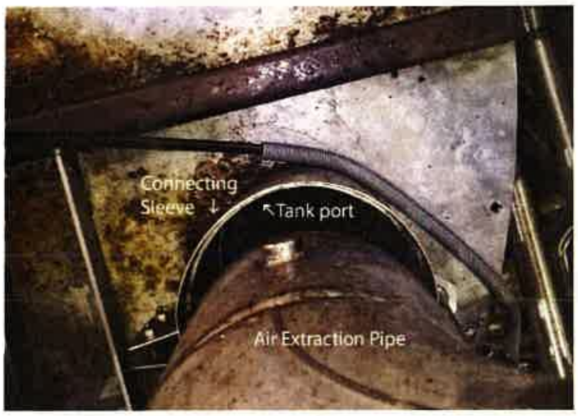


122: Solids conveyor press-decanters

123: Press cover panel – west side



124: Preheater outlet box and drainer conveyor feed end extraction air inlets

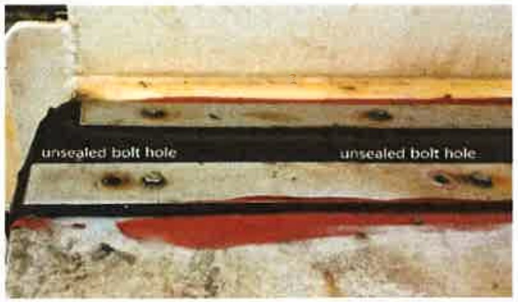


125: Decanter Feed Tank 2.11 air extraction duct

APPENDIX 4 –

KupeTech Action List - 2021

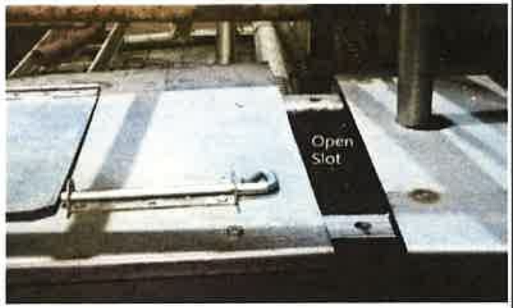
ODOUR CONTROL SYSTEMS - 2021 ACTION LIST

No	Item	Issue	Photo	Comments	Actions Taken
2021-1	Fan 14.1 Discharge Duct Sealing	Previous perished seal was replaced but bolts securing bottom seal clamping bar have worked loose from fan vibration resulting in a segment shaped opening between duct and seal - see photo 101.		Not an easy permanent fix due to inevitable vibration from fan and need for more secure bolting. Temporary beams top and bottom with ties each side might reduce gap but better internal design for clamping (with the inevitable extended shutdown needed) makes this a likely winter maintenance task.	*Completed March 2021*
2021-2	Fan 14.1 Discharge Duct Sealing	In replacement of the former perished seal two new holes appear to have been drilled and tapped for new bolts. The old bolt holes remain open with a steady stream of air coming from each. See photo 102. Any leaks in piping between the fan and biofilter need to be sealed if readily possible. Leaks though small have a cumulative effect in what odour can be sensed and the fewer the better.		Seal any old unused bolt holes.	*Completed March 2021*

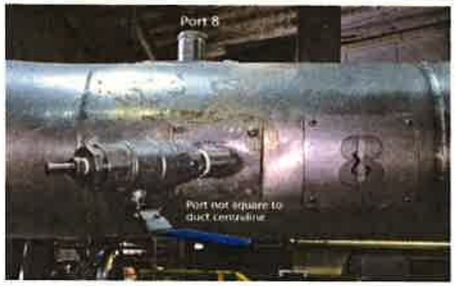
ODOUR CONTROL SYSTEMS - 2021 ACTION LIST

No	Item	Issue	Photo	Comments	Actions Taken
2021-3	Fan 14.1 Discharge transition duct crack sealing	See photo 103. The crack is currently well sealed but likely to open with ongoing fan vibration. Ongoing vigilance for leaks between fan and biofilter is needed.			*Supervisor - Mike Rennie - advised to monitor during daily monitoring checks. Completed March 2021*
2021-4	Driers Discharge Conveyor air extraction duct entry box	See photo 119. Pressure and flow measurements indicate that a bridge of meal must be almost completely blocking the duct below the slide valve. Removal and replacement of the slide valve makes no difference.		This may have been an issue in the past as it would explain why this extraction duct has been disconnected at times. Absence of extraction air at this location is not viewed as a significant source of odour as air in the conveyor is still likely to be drawn to the unground meal bin. Clearance of the blockage and a largely closed slide valve (to keep the air velocity in the transition box low) is recommended until further flow measurement and slide valve adjustment made.	*Supervisor - Mike Rennie - advised to clean chute. Target date for cleaning 17.05.21*

ODOUR CONTROL SYSTEMS - 2021 ACTION LIST

No	Item	Issue	Photo	Comments	Actions Taken
2021-5	Driers Feed Conveyor Air Extraction Duct	See photo 115. Corroded opening at base of air extraction intake box below the slide valve.		Can the opening be closed? Is the corroded slot used to check whether solids are moving in the conveyor or not? If so can a hinging flap cover the opening? Desirable to maintain slightly more vacuum in conveyor air space if possible mainly relating to what is happening at the bottom (upstream end) of the conveyor.	***Completed 29.04.21***
2021-6	Solids Discharge Conveyor press - decanters	See photo 122. Open slot draws in 130 m3/h air. A 2020 photo of the same equipment does not have the gap. Has the conveyor cover plate been intentionally assembled in the wrong position? Is this slot used to view movement of solids in conveyor? Can the slot be covered?		An objective is to increase vacuum in the conveyor but constraints on further slide valve adjustment at 12e and 12w are still being investigated. In the meantime any elimination of un-needed openings in the conveyor covers will help.	***Completed 29.04.21***

ODOUR CONTROL SYSTEMS - 2021 ACTION LIST

No	Item	Issue	Photo	Comments	Actions Taken
2021-7	Vacuum Port 8 socket orientation	See photo 111. An action misunderstood! The socket in which the valve and bush is mounted needs to be perpendicular to the centreline of the duct because false static pressure readings will be obtained and change with varying air flow in the duct.		The socket and plug on top of the duct labelled 'Port 8' in white is suitable for flow measurement and static pressure measurement but not as accessible as the location where the valve is. Inclined socket could be removed and hole blanked off or replaced with square oriented socket and backing plate. See also issue 2021-8 below.	***Completed 29.04.21***
2021-8	Vacuum Port 32 socket orientation	See photo 121. Vacuum measuring port 32 not perpendicular to the centreline of the duct above.		Was an original port when vacuum monitoring was introduced. Acceptable operating vacuum is low and repeatable measurement not easily attained due to inevitable dust in the port. Measurement of air velocity entering the extraction duct is far more helpful for air flow adjustment but the port needs to be perpendicular (approx) to the airflow. The surplus angled port 8 (Issue 2021-8) might be able to be relocated (with reducing bush and tailpiece but not the valve) higher up on the intake box (photo 121), on one of the adjacent box sides with the socket aligned with the direction of slide valve movement (i.e. not the side of the existing port 32 or its opposite side). See report 7(s) on page 18.	***Completed 29.04.21***

ODOUR CONTROL SYSTEMS - 2021 ACTION LIST

No	Item	Issue	Photo	Comments	Actions Taken
2021-9	Decanter Feed Tank 2.11 Air Extraction Pipe	See photo 125: Extraction pipe does not align with tank extraction port leaving open gaps drawing in air from outside the tank.		Having gaps in the ducting drawing in air is not necessarily an issue in itself. In this case the air extraction is sufficient to capture all vapour at the tank extraction port when liquid in the tank is boiling (the worst case) yet vapour gets emitted from the instrument well (seen background left in photo 118). Air drawn in at the gaps appears to be displacing vapour that would otherwise be drawn from the tank. This may not be the case if the instrument well headspace is separated from the tank headspace. Whether there is operating need for the air gaps or it is simply a problem of pipe should be explained.	***Completed 29.04.21***
2021-10	Press west side cover panel	See photo 123: Cover panel has warped and rubber tie too weak to hold panel closed.		Other (east) side of press is operated with no panels closing the side but air extraction is sufficient to capture press vapours. Although the panel in the photo covers the same airspace (surrounding the press screw) some emission is occurring through the gap seen in the photo. A new rubber tie and fully closing door would assist containment of adverse odour.	***Working order issued. Target Date for completion:- 30.05.21***

ODOUR CONTROL SYSTEMS - 2021 ACTION LIST

No	Item	Issue	Photo	Comments	Actions Taken
2021-11	Wet-side air cooling heat exchangers HX1 - HX3	Following on from previous issues 2020-26 and 2020-30 a check of the top plenum of the exchangers is still to be made. Measurement of static pressure at the top of the exchangers is still wanted so capped ports need to be free to be opened for measurement.			***Maintenance Planning Co-ordinator - Jason Bardell - advised. Target Date for completion:- 31.07.21.***
2021-12	Odour Management Plan - Procedures OMP 002 to 006 and Checksheet RMF 008	Following Issue 1 in March 2018 some details need revision arising from developing knowledge and practical working of some aspects.		Kupetech offers to suggest changes for consideration.	*RG to contact JV to ascertain what changes are required.*

APPENDIX 5 –

Community Liaison Group Minutes

AFFCO IMLAY

COMMUNITY LIAISON GROUP MEETING – MARCH 2021

Date of Meeting: **31.03.21**

Present: **Dean Tucker (AFFCO Operations Manager); David Berry (Imlay Plant Manager); Ricky Gowan (Imlay Compliance Manager); Caleb Smith (Horizons); Stephen Bryson; Lonia Sarniak; Barbara Allan; Graham Pearson.**

Apologies :-

ACTIONS AGREED:

Subject	**Action**
Topics of Discussion and Agreed Actions	**Meeting Agenda:-** • CLG Meeting Odour Performance Review; • 2019 CLG Meeting Minutes; • Odour Complaint Registers for 2019 / 2020 and 2020 / 2021 periods; • Odour Complaint Trending; • Points of Interest; • Contributing Factors. Minutes:- Tabled Odour Performance Review document and discussed content. Barbara Allen highlighted that the associated minutes were not the most recent minutes. It was stated that the attached minutes were from the previous scheduled annual CLG Meeting and not the special meeting minutes held in August 2019. A question was asked in regards to the odour investigation process. Caleb Smith (Horizons) explained Horizons procedures when a complaint is lodged and how communication with AFFCO Imlay representatives is carried out. Caleb also explained how the FIDOL assessment system worked in relation to assessing odour complaints. Ricky Gowan (AFFCO Imlay) described AFFCO Imlays response procedures. Graham Pearson requested that 'Time of Complaint' and 'Investigation Time' be added to the Complaints Register. Ricky Gowan (AFFCO Imlay) agreed to do this. Barbara Allen suggested that a summary of performance be displayed on AFFCO's website detailing positive results for annual reporting periods. This will be actioned in the form of annual Odour Performance Review documents being uploaded onto the website. Stephen Bryson and Lonia Sarniak raised the issue of Open Country odours. They wanted to know the process for lodging Open Country odours. Caleb Smith (Horizons) passed on advice and actions to take for lodging such complaints. Meeting closed 18:45. Thanks to all those who attended.