Tonkin+Taylor

Job No: 1003371
7 October 2019

Environment Canterbury
PO Box 345
Christchurch 8140

Attention: Sean Mooney

Dear Sean

Tegel Foods Ltd Resource Consent Application CRC185584 - Response to PDP Review of Protein Recovery Odour Management System and Update to Proposed Ventilation Upgrade

Tegel Foods Ltd (Tegel) has lodged resource consent application CRC185584 with Environment Canterbury (ECan) to replace the existing resource consents for discharges to air from its chicken processing plant at 112 Carmen Road, Hornby. The discharges to air include discharges of odour from the Protein Recovery Plant (PRP) located at the rear (eastern end) of the site.

ECan engaged Pattle Delamore Partners Ltd (PDP) to provide a review of the design and likely effectiveness of Tegel's proposed upgrade to the PRP odour control system. This document provides a response on Tegel's behalf[1] to the conclusions and recommendations of PDP's review report, dated 12 June 2019.

Tegel has also modified its proposed upgrade of the PRP odour control system since the application was lodged to further increase the overall rate of ventilation from the PRP building to the biofilter and to provide additional direct extraction from odour sources within the PRP. This document also describes the modified upgrade proposal and updates to the assessment of air quality impacts of site emissions as a result.

1 Background

Given the external technical review of Tegel's application conducted previously, PDP's review brief was restricted to the proposed upgrade of the PRP odour control system and specifically to review the following:

- The proposed modifications to the PRP odour extraction and treatment system;
- The biofilter design review calculations, and assessment as to whether the proposed operation of the biofilter meets good practice; and
- An independent assessment of the proposed modifications as to the likely effectiveness of odour mitigation and treatment.

[1] In accordance to the variation dated 23/07/2019 to our original engagement dated 9 November 2017.

Tonkin & Taylor Ltd | 105 Carlton Gore Rd, Newmarket, Auckland 1023, New Zealand
PO Box 5271, Wellesley St, Auckland 1141 P +64-9-355 6000 F +64-9-307 0265 E akl@tonkintaylor.co.nz

The PDP review document drew the following conclusions:

1 *Key hot sources need to be included in point source extraction (such as the press and decanter);*

2 *The Applicant needs to provide details as to how the risk of human error will be avoided in over loading of the condenser ;*

3 *The Applicant needs to provide details to justify the proposed building air extraction rate, that is based on building air extraction volumes;*

4 *The Applicant needs to provide details to justify why odour management is not being provided for the bird receival area;*

5 *The Applicant needs to commit to maintaining the doors to the PRP to be closed at all times while the plant is operating;*

6 *The Applicant also needs to maintain the above biofilter operating limits.*

These conclusions are addressed in sequence in section 2 below.

The modifications to the PRP ventilation upgrade are described in section 3.1 and the updates to the assessment of environmental effects provided in the Air Quality Impact Assessment lodged with the application[2] are described in section 3.2

2 Response to biofilter review

2.1 Inclusion of additional point source extraction

Key hot sources need to be included in point source extraction (such as the press and decanter).

As noted above, the proposed upgrade to the PRP ventilation system has been modified. The modified extraction scheme described in section 3.1 includes direct extraction from the press and press auger screw as well as from the decanter. As such, we consider that all of the key hot sources will be included in point source extraction.

2.2 Measures to avoid overloading of condensers

The Applicant needs to provide details as to how the risk of human error will be avoided in over loading of the condenser.

Overloading of the condenser heat exchanger, which is used to remove the condensable component of exhaust from the cookers resulting from the simultaneous completion of multiple cookers, was identified as the cause of an odour incident in 2014. However, as noted in section 7.2 of the Air Quality Impact Assessment, automated staggering of cooking cycles was implemented in response to this incident, to avoid simultaneous completion of cookers. Tegel's "*South Island Engineering Protein Recovery Plant Manual*" states the following:

> *Multiple cookers are prevented from venting simultaneously via the cooker control programme in Scada. A cooker pressure cycle cannot be started if another cooker pressure cycle is already in progress. This results in the first cook completing the pressure cycle and associated temperature control step prior to another cooker starting its pressure cycle. This enforced delay ensures that no two cookers complete the first vent phase at the same time.*
>
> *The only exception to this process is when a cooker malfunctions and is over pressurised above the vessels safe operating limits. Inbuilt pressure relief valves will be activated to prevent a catastrophic failure of the vessel.*

[2] T+T. 2019. "Tegel Christchurch Poultry Processing Plant Discharges to Air - Air Quality Impact Assessment".

As a result, simultaneous venting of cookers and overloading of the condensers is avoided through automated process control mechanisms.

2.3 Building ventilation rate

The existing and proposed ventilation and air change rates for the cooker and loading rooms of the PRP are described in Table 1.

Currently the ventilation is able to achieve an air change rate of more than 15 air changes an hour in the PRP building, in excess of the six to 12 air changes per hour recommended in the PRP review.

Ventilation is to be further increased to bring the air change rate of the internal PRP building rooms up to 25 changes/hour. The current ventilation rates and room air change ranges at the PRP are compared with corresponding values now proposed in Table 1.

Table 1: Current and proposed PRP room ventilation and air change rates

Parameter	Cooker room	Loading room	Offal bin enclosure
Room volume (m^3)	1,410	130	150
Current extraction rate (m^3/h)	26,640*		
Current air change rate (changes/h)	15.8*		
Proposed extraction rate (m^3/h)	35,250**	3,240***	2,160
Proposed air change rate (changes/h)	25	24.9	14.4

* Current individual source extraction rates and air change rates undetermined

** Cooker room extraction includes direct extraction from press/auger

*** Loading room extraction includes direct extraction from dewatering centrifuge

The American Conference of Governmental Industrial Hygienists (ACGIH) has noted in its industrial ventilation manual[3] that "*'air changes per hour' or 'air changes per minute' is a poor basis for ventilation criteria where environmental control of hazards, heat, and/or odors is required"*. The ACGIH recommends against the application of generic air change rates as design criteria for ventilation of industrial buildings housing processes requiring environmental control.

While application of generic air change criteria isn't appropriate in this case, the increase in air changes provided by the proposed increase in ventilation rates from the PRP, along with further direct extraction from PRP odour sources, should substantially improve odour capture at the PRP.

2.4 Odour from bird receival

The Applicant needs to provide details to justify why odour management is not being provided for the bird receival area.

The reference in the PDP review to odour management at the bird receipt area is outside of the scope of the review proposed by ECan and agreed to by Tegel. We also note that this conclusion appears to have been drawn without the benefit of a visit to the site and bird receipt area in question.

The bird receipt area is a reasonably large space of more than 1,000 m^2 in area. During the receipt period each day trucks regularly pass through the area to deliver collected birds. As a result, the area is difficult to enclose and treatment of ventilated air would likely require a biofilter of in the order of two to three times the size of the PRP biofilter.

[3] ACGIH. 2004. "Industrial Ventilation. A Manual of Recommended Practice"25th Edition.

Odour from the bird receipt area is generally of a low intensity. The hedonic tone of the bird/feather odour is less strongly negative than odour types associated with other activities at the site (e.g. rendering and wastewater odours). While odour from this area was detected at the closest downwind odour observation locations during the odour observation survey conducted around the site in 2017-2018, bird receipt odours were not detected further afield[4].

Given the large volume of air that would be required to be extracted and the low intensity of odour resulting from this activity, active extraction and treatment of air from the bird receipt area is not considered practicable.

Instead, management of odour at the bird receipt area focuses on regular sanitation and on minimising the duration of the transition of birds from receipt on-site through to processing. Horizontal fans also extract air from annex where bird crates are temporarily stored following delivery as illustrated Figure 1. These fans direct air into the site and way from the nearest (southern) boundary.

Overall, the assertion that "odour management is not being provided" is incorrect and the approach to odour management at the bird receipt area is consistent with the approach at other poultry processing plants in New Zealand

Figure 1: Horizontal fans on north wall of the bird storage annex

[4] Refer Section 7.3 and Appendix F of the Air Quality Impact Assessment

2.5 Maintaining doors closed

Tegel has implemented procedures to ensure that doors of the PRP building remain closed when not in use for access/egress. The following is an excerpt from the PRP Engineering Manual:

> *Pedestrian and roller doors shall be kept closed at all times when not in use to prevent odour escape. Where practicable doors will be fitted with auto closing devices. Verification of this process will be via the Good Manufacturing Practices (GMP) audit completed by the Technical Team at the prescribed frequency and via observation from the department Team Leader during their general departmental management duties.*
>
> *If summer conditions cause excessive heat inside the processing area (exceeding 35°C for extended periods of time) which causes discomfort to the team, the Team leader will work with the EHS Manager or designate and suitable control measures agreed with the Team Leader.*

The increase in ventilation flowrates and air changes in the PRP building as well direct extraction from additional hot PRP sources will assist in maintaining comfortable conditions in the PRP.

2.6 Biofilter operating parameters

The PDP review proposes a series of limits for biofilter operating parameters. We agree that comparison of monitored biofilter operating parameters with specified criteria or thresholds can provide useful operational feedback to ensure treatment performance is maintained. The biofilter operating limits put forward in the PDP review document are discussed in Table 2.

Table 2: Consideration of the proposed biofilter operating limits

Biofilter/inlet flow parameter	PDP suggested requirement	Comment on suggested requirement
Temperature	<40°C	Reasonable control range if applied to the inlet flow to the biofilter.
Pressure drop	<100 mmAq (water)	The extraction upgrade system has been designed with an anticipated pressure drop of 1 kPa (102 mmAq), slightly above the proposed limit. An upper limit of 150 mmAq would provide for operation of the biofilter while still providing a useful indicator of elevated back pressure in this instance.
pH	5 - 9	Reasonable control range for pH of the bed media*.
Moisture content	30% - 70%	Reasonable control range if applied to moisture content of the biofilter bed media.*

*Bed media pH and moisture content is measured through lab analysis on a monthly basis

In summary, the suggested requirements for inlet air temperature, bed pH and bed moisture content are considered reasonable, however an upper limit of 150 mm of water (mmAq) is recommended for pressure drop over the biofilter.

3 Update to proposed activities and assessment of environmental effects

3.1 Modifications to PRP ventilation upgrade

As noted in section 2.3, the proposed upgrade of the PRP ventilation system has been modified to increase extraction capacity and incorporate further direct source extraction. The configuration of the upgrade ventilation system now proposed is illustrated in Figure 2.

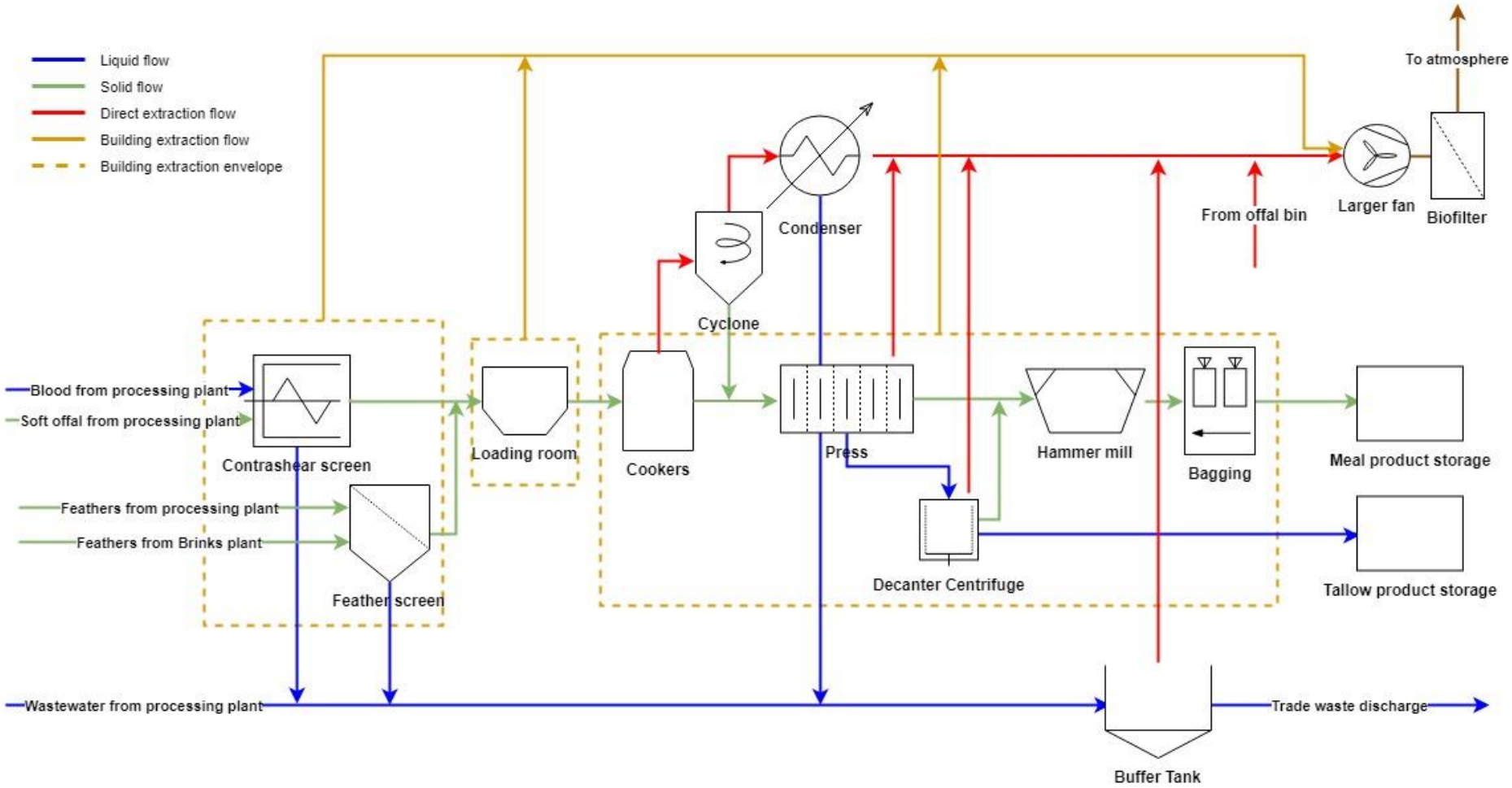

Figure2: Process flow diagram for by-products rendering, air extraction and wastewater conveyance activities at the PRP (revised upgrade configuration)

A larger fan will now be installed to replace the existing PRP extraction fan, capable of extracting air from the PRP at a rate of up to 12.6 m^3/s, and increase from the upgrade ventilation rate proposed in the AEE for this application of 9.3 m^3/s.

As well as increasing the building extraction from the cooker room, the ventilation upgrade now includes direct hood extraction from the press/meal auger and decanter centrifuge.

The rates of extraction from PRP rooms and odour sources now proposed are compared in Table 3 with the corresponding extraction rates of the existing ventilation configuration and the upgrade proposed in the AEE.

Table 3: Comparison extraction rates from PRP extraction sources –existing and previous and modified upgrade proposals

Extracted source	Extraction rate (m^3/s		
	Existing	Application proposal	Modified proposal
Cooker Room	7.4*	6.5	9.8 (includes direct extraction from press/auger)
Loading Room		0.9	0.9
Offal Bin Enclosure		0.6	0.6
Condenser/Heat Exchanger Direct Extraction		0.9	0.9 (includes direct extraction from decanter)
Effluent Tank Vent Direct Extraction	-	0.4	0.4
Total	**7.4**	**9.3**	**12.6**

*Current individual source extraction rates and air change rates undetermined, does not include direct extraction from press/auger or decanter

Whereas the previously proposed ventilation upgrade represented an increase in extraction capacity of 126% from the current capacity, the upgrade as now proposed will increase the extraction to 170% of the current capacity.

3.2 Update to assessment of air quality impacts

As noted in section 2.3, the proposed ventilation improvements should substantially improve odour capture at the PRP. Odour observations conducted in and around the site in 2017-2018 indicated that the most intense odour detected around the site resulted primarily from fugitive emissions escaping the PRP, which the improvements will better capture.

Although fugitive odour release has been identified to result in odour around in the PRP, the degree of current odour loss in not able to be precisely quantified. The degree of improvement in odour capture is therefore also not able to be precisely quantified.

However, the ventilation upgrade, as currently proposed will have the following impacts:

- Direct extraction of the press/auger and decanter centrifuge will reduce the release of odour into the cooker room (where there is a potential for fugitive release);
- Improved ventilation rates from the cooker room will reduce the potential for fugitive release (as well as improve the quality of the indoor environment;

- Odorous air extracted via the upgraded ventilation system will be treated in the existing biofilter. Appendix B provides an update to the Biofilter Design Review provided in Appendix G of the Air Quality Impact Assessment. That review indicates that the biofilter is adequately sized to treat the increased extraction flow. Therefore provided the biofilter is operated, monitored and maintained appropriately captured odour emissions should be substantially reduced in terms of intensity and modified in character (to a less offensive earthy tone).

Although the improvement in odour emissions from the PRP is difficult to precisely quantify, the above factors indicate that there should be a substantial reduction in odour intensity and, importantly, an improvement of the character of captured PRP odour.

The modifications to the upgrade of the PPRP odour control system lend further weight to the conclusion of the Air Quality Impact Assessment that *with the modifications in place the nuisance effects on the adjacent properties are predicted to be mitigated to the extent that they are also less than minor.*

4 Closing remarks

Thank you for the opportunity to respond to conclusions and recommendations of the PDP review. We trust that there is now sufficient information available for you to continue processing the application. Please do not hesitate to contact Jason Pene if you require further clarification of any aspects of this letter.

5 Applicability

This report has been prepared for the exclusive use of our client Tegel Foods Ltd, with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose, or by any person other than our client, without our prior written agreement.

Tonkin & Taylor Ltd

Environmental and Engineering Consultants

Report prepared by:	Authorised for Tonkin & Taylor Ltd by:
	
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Jason Pene	Andrea Brabant
Senior Environmental Engineer	Project Director

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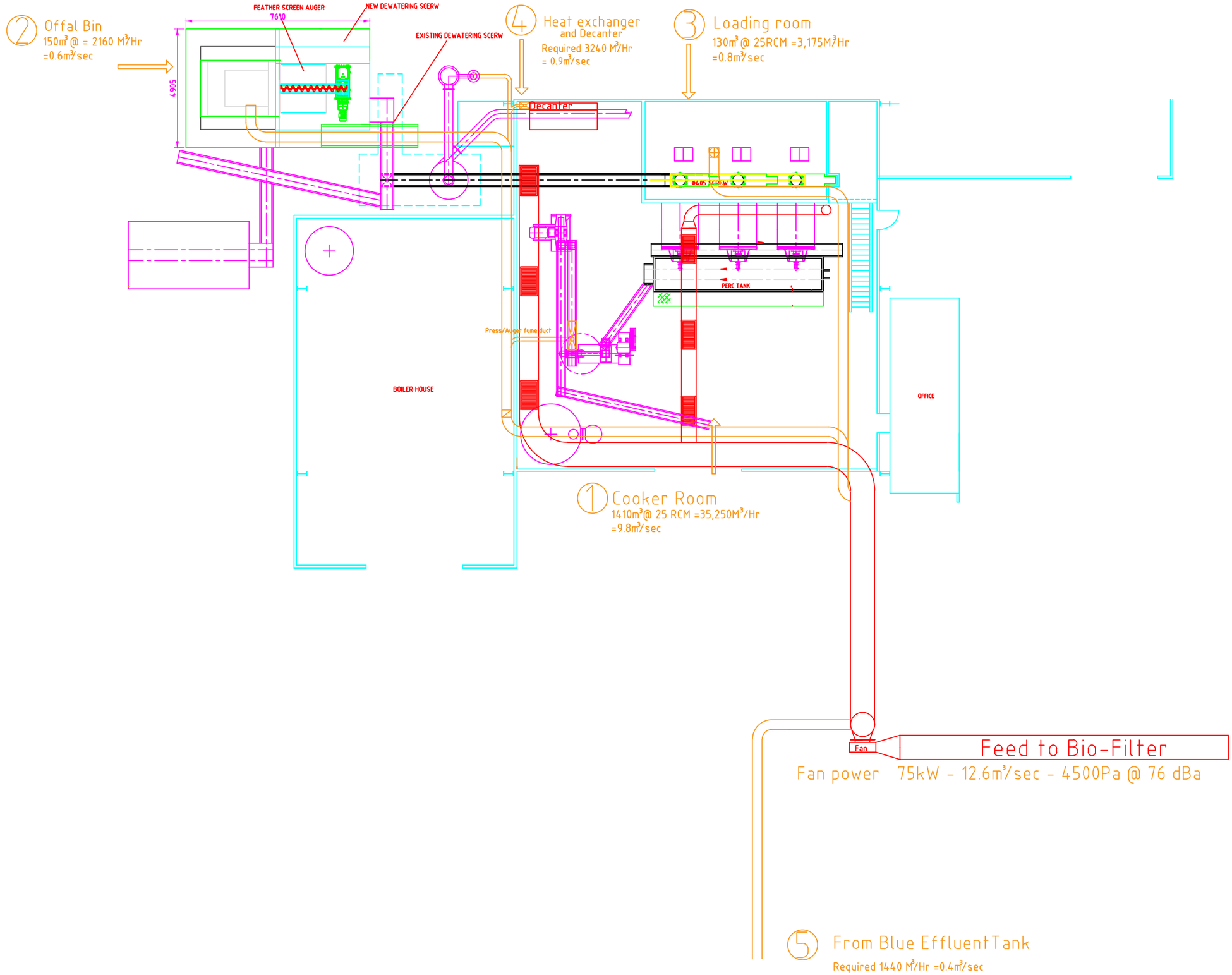
Appendix A: Updated PRP ventilation upgrade plan


2 Offal Bin
150m³ @ = 2160 M³/Hr
=0.6m³/sec
FEATHER SCREEN AUGER
7610
NEW DEWATERING SCERW
EXISTING DEWATERING SCERW
4905
4 Heat exchanger
and Decanter
Required 3240 M³/Hr
= 0.9m³/sec
3 Loading room
130m³ @ 25RCM =3,175M³/Hr
=0.8m³/sec
Decanter
Φ405 SCREW
PERC TANK
Press/Auger fume duct
BOILER HOUSE
OFFICE
1 Cooker Room
1410m³@ 25 RCM =35,250M³/Hr
=9.8m³/sec
Fan
Feed to Bio-Filter
Fan power 75kW - 12.6m³/sec - 4500Pa @ 76 dBa
5 From Blue EffluentTank
Required 1440 M³/Hr =0.4m³/sec

Appendix B: Update to biofilter design review calculations

Tegel Christchurch Processing Plant Updated Biofilter Design Parameters

Flows	Value	Unit	Comment
Existing airflow	7.4	m3/s	2017 Active Refrigeration design report
=	26640	m3/hour	
Proposed airflow	12.6	m3/s	Updated PRP ventilation upgrade plan
=	45360	m3/hour	
Bed Dimensions			
Beds	2		
Width	25	m	
Length	40	m	
Depth	0.9	m	
Total bed area	2000	m2	
Total bed volume	1800	m3	
Existing design parameters			
Gas volume to bed area ratio	13.32	m3/m2/h	Well below 50 m3/m2/h recommended by ARC
EBRT	243.2	s	Well above 30 s recommended by EPA Victoria
Proposed design parameters			
Gas volume to bed area ratio	22.68	m3/m2/h	Well below 50 m3/m2/h recommended by ARC
EBRT	142.9	s	Well above 30 s recommended by EPA Victoria
Guideline design parameters			
TP 152 Gas volume to bed area ratio	50	m3/m2/h	ARC TP 152*
Equivalent EBRT at 1m depth	72	s	ARC TP 152*
EBRT	30	s	EPA Victoria**

*Auckland Regional Council. 2002. "Assessing Discharges of Contaminants into Air - (Draft)". Technical Publication 152.
** EPA Victoria. 2017. "Selected scheduled premises prompt sheets". Publication 1659, Sheet D02 Rendering, Recommended biofilter design