STRADEGY
Urban, Environmental & Strategic Planning

Job Ref: 17013

9 July 2019

Hawkes Bay Regional Council
Private Bag 6006
Napier 4142

Attn: Paul Barrett

APP-123602 I 174-176 BROOKVALE ROAD, HASTINGS I RESPONSE TO FURTHER INFORMATION

The following is our full response to your request for further information dated 29 May 2019.

1. ***Our s92 request of 26 January 2017 requested more information on the extraction system for the proposed Phase 1 bunker extended eaves/hoods. We asked for details of the air extraction volumes required to achieve fugitive emission capture rates that will lead to a significant reduction in off-site odour impacts.***

   As previously stated in my letter dated 30 August 2017, the Armatec information (provided 5 May 2017) did not fully provide the requested information. The AECOM review (16 May 2017) lists the information that is required, being extraction rates, capture velocities, and exhaust point location/design.

   This information is critical for showing that the proposed extended eave and increased extraction can be relied on to reduce fugitive odour. This was recognised by the odour experts in their joint witness statement (21 May 2019), which states (Item 4) that engineering information on the extraction and treatment system and how this proposed system will work should be provided prior to the hearing.

   Please provide the information outlined above.

Attachment 1 contains a response to this item prepared by Armatec.

2. ***Please clarify if new a biofilter(s) will be installed or if upgrades to the existing biofilter will be undertaken (or both). Please provide an overview of the biofilter design to be used, and identify key design criteria/standards, including design loading rates, bed depth/media, and operating temperature, moisture content and pH ranges. This information could be used to form consent condition requirements.***

The following has been provided by Tracy Freeman (Principal Air Quality Consultant, Air Quality Professionals Pty Ltd):

> *"The existing biofilter treats air ventilated from within the Phase 1 bunkers. Previous reports have considered the operation of this biofilter and found it to be working well for current air flows which were measured at a maximum of 4.1 m^3/s by Beca in 2011. AirQP (2016) recommended that no additional air should be treated by this biofilter at current size.*

The addition of a third Phase 1 bunker and further ventilation for the eaves over the ends of the bunkers will result in additional air flows to be treated by biofiltration, with Armatec estimating that an addition 5.0 m^3/s of air will require treatment. A new biofilter cell will be built adjacent to the existing biofilter to treat this air flow.

For this biofilter extension, the design airflow loading rate will be $50m^3/h$ per m^3 of biofilter media, and will use the same graded bark media design as the current, successfully operating biofilter which has a media depth of 1.75m (plus a base of 0.25m river gravel).

The existing biofilter and the new biofilter cell will both be operated with the following design ranges for temperature, moisture content and pH:

- *Inlet air temperature maximum normal operations 35 degC, with short excursions up to a maximum limit of 40 degC acceptable provided this occurs for a minority of the total time (say, less than 5%) and for durations of less than several hours.*
- *Bed pressure drop not to exceed 100 mm water-gauge*
- *Media moisture content maintained at 50 – 80 weight percent, dry bark basis*
- *Mean pH a minimum of 6.0 in the upper two-thirds layer of the bed (a lower pH may occur in the lower part of the bed), with lime to be added if the pH drops below 6.0."*

3. ***The expert joint witness statement discusses the need for the bale breaking mitigation measures to be implemented sooner than is currently proposed. Bale breaking and mixing occurs on Thursdays.***

   I have undertaken a review of records complaints using the Council's complaints database, up until 21 May 2019. It is recognised that Council officers have largely not responded to the complaints since late 2015. However, the data for the day of the week when complaints occur may be useful for helping to identify the processes that have the potential to generate odour effects. The data indicates that the number of complaints occurring on Thursday appeared relatively high in 2018.

   Please consider the results and comment on any process changes that could have resulted in an increase in odour generation on Thursday. Please reconsider and comment on the degree to which bale breaking is an odour source, and confirm if the mitigation methods and timing remain as currently proposed (after 200 tonnes production is reached), or if a specific timeframe for their introduction can be committed to.

The following has been provided by Tracy Freeman (Principal Air Quality Consultant, Air Quality Professionals Pty Ltd):

"There have been no specific process changes on a Thursday since the AirQP (2016) report was prepared.

The complaints distribution shown in the S92 letter isn't that different to what has previously been shown in the AirQP (2016) report. And with the absence of validation of complaints, we cannot understand the real impact of Thursday activities because we don't know how many of the complaints over the last few years would be considered verified.

It is not our conclusion that bale breaking is not an odour source. AirQP (2016) stated that "It is noted that bale break occurs on Thursdays, which is a less common day for odour complaints, so it is likely that the current bale breaking activity is not as significant as some of the other odour sources on the site."

In relation to the final point i.e. "*confirm if the mitigation methods and timing remain as currently proposed (after 200 tonnes production is reached), or if a specific timeframe for their introduction can be committed to",* an updated Table 4.2 - Proposed Upgrades and Best Practicable Option Analysis (from the application document) is provided in **Attachment 2**.

Among other amendments, it is now proposed to do away with the production based trigger for the bale breaking upgrades and commence the process for delivering these upon the issue of the consent. Based on the following, it is proposed to have the upgrades commissioned within 3 years of the granting of consent regardless of production levels. Furthermore, it is proposed reduce production levels leading up to the commissioning of this infrastructure from 200 tonnes per 7 day period to 160 tonnes per 7 day period:

- 2 – 4 months to confirm final design and specifications,
- 14 – 18 months to manufacture (offshore and subject to international demand/workload),
- 3 – 4 months to freight (we are advised that the kit is not a standard shipping container product, rather it comes as deck freight, so options are more limited,
- 4 – 6 months to assemble/construct on-site.

This is a total of 32 months, which with a 4 month contingency results in a total period of 36 months (3 years).

Other amendments include:

1. The overall production limit of 500 tonnes per 7 day period is to be reduced to 350 tonnes per 7 day period,
2. Processes to reduce odour from the bale wetting process will occur upon the issue of consent rather than at the 200 tonnes production based trigger,
3. Aspects of the Phase 1 to 2 transfer process will now commence immediately upon the issue of consent, which will act to reduce the extent of mixing and outside storage of compost much sooner – noting that the timeframes around other aspects of this process (and others) have been slightly lengthen to allow this staged upgrade approach and re-structured to exclude time associated with Hastings District Council's statutory processes (Building Consent) that are outside the control of the applicant,
4. Spent compost will now only be stored in the centre of the site, rather than also/potentially at the front of the site. This is expanded upon in relation to Item 4 below.

Overall, these amendments seek to introduce odour control upgrades sooner and provide certainty that regardless of production levels, all final upgrades will be undertaken within 3 years – meaning all upgrades are being actively pursued immediately upon the issue of the consent and progressively implemented according to the potential impact of the source within a 3 year period.

4. Several submitters have raised the issue of effects on water quality as a result of discharges associated with the production of compost. One submitter considers that the discharges to land of gypsum/chicken manure should also require consent. Others speculate that increased production will result in increased wastewater discharges, which in turn could have impacts on groundwater quality. The discharge of wastewater is already consented under DP100129La.

a) Please confirm if the proposed increased compost production is likely to increase the volume of wastewater discharged to land on the site, and if so, to what degree. Confirm

> ***if a change to the existing wastewater discharge consent is likely to be required in the future as a result of any increased production.***
>
> ***b)*** ***Confirm that the gypsum/chicken manure and spent compost will be stored in covered bunkers/silos with concrete floors, and that there will be no discharge to land as a result of leachate from this stored material into the ground, or via stormwater runoff.***

In terms of (a), I am advised by the applicant that increased production will in fact see greater (re)use of the washdown water and a reduction in the volume of wash water discharged to land under DP100129La. A change to the existing wastewater discharge consent is not expected to be necessary.

Turning to (b), the gypsum/chicken manure is/will be stored in a covered bunker/silo with a concrete floor. There will be no discharge to land as a result of leachate from this stored material into the ground, or via stormwater runoff.

In terms of the spent compost, the application proposed that spent compost will be stored within either of the following areas:

1. On a concrete pad in the existing spent compost area located at the front of the site under a canopy to keep the spent compost dry – any remaining compost will be removed from the site within 7 days,
2. On a concrete pad in the centre of the site - any remaining compost will be removed from the site within 7 days.

It is now proposed that the spent compost will either:

1. Be stored on a 'now covered' concrete pad in the centre of the site – with any remaining compost being removed from the site within 7 days, or,
2. Removed from the site directly from the growing rooms.

In terms of option (1), the concrete pad will be covered so as to prevent the generation of any leachate produced by rainfall. We are advised that the spent compost is a dry substance and that it does not in itself produce leachate. In the event that option 1 is adopted, the covered structure will be constructed within 8 months of granting consent.

On that basis, there will be no discharge to land as a result of leachate from this stored material into the ground, or via stormwater runoff.

We trust the information provided is sufficient to satisfy the information request. Please do not hesitate to contact us if we can be of any further assistance.

Your Sincerely

Cameron Drury **BRP(HONs) MNZPI**
Principal Planner I Director
E cam@stradegy.co.nz
M 027 283 0017

Attachment 1

Armatec Response to Item 1

RESTRICTED

Extraction Prelim Design

for Bunkers

Te Mata Mushrooms

TO	**Michael Whittaker** Michael@tag.co.nz
FROM	**Bryan Holyoake** Chemical Engineer | Business Manager +64 21 440850 | bryan.holyoake@armatec.co.nz
DETAILS	**5th July 2019**; E3899;
OUTLINE	**DESIGN MEMO**

The extraction of the proposed bunker enclosure is based on the extraction design of the existing one with a dropped curtain eave.

Existing bunkers

The existing bunkers are 35m long x 13m wide = 450 m^2 area for 2 bunkers in total. Each bunker is approx. 35m x 6m each, by 5.5m high approx = 1155 m^3 airspace per bunker.

2x bunkers @ 1155 m^3 = 2310 m^3

Existing extraction rates are 3.5 to 4.1 m^3/s – which is treated by the biofilter alongside.

4.1 m^3/s = 246 m^3/min = 14,760 m^3/hr

This extraction rate has been shown to be effective in maintaining odour within the bunkers with the doors closed, even while air blowing (below the compost) is occurring. This extraction rate therefore on a per square metre basis is to be taken as the starting approach.

14,760 m^3/h / 2310 m^3 = 6.4 m^3/h per m^3 of bunker air.

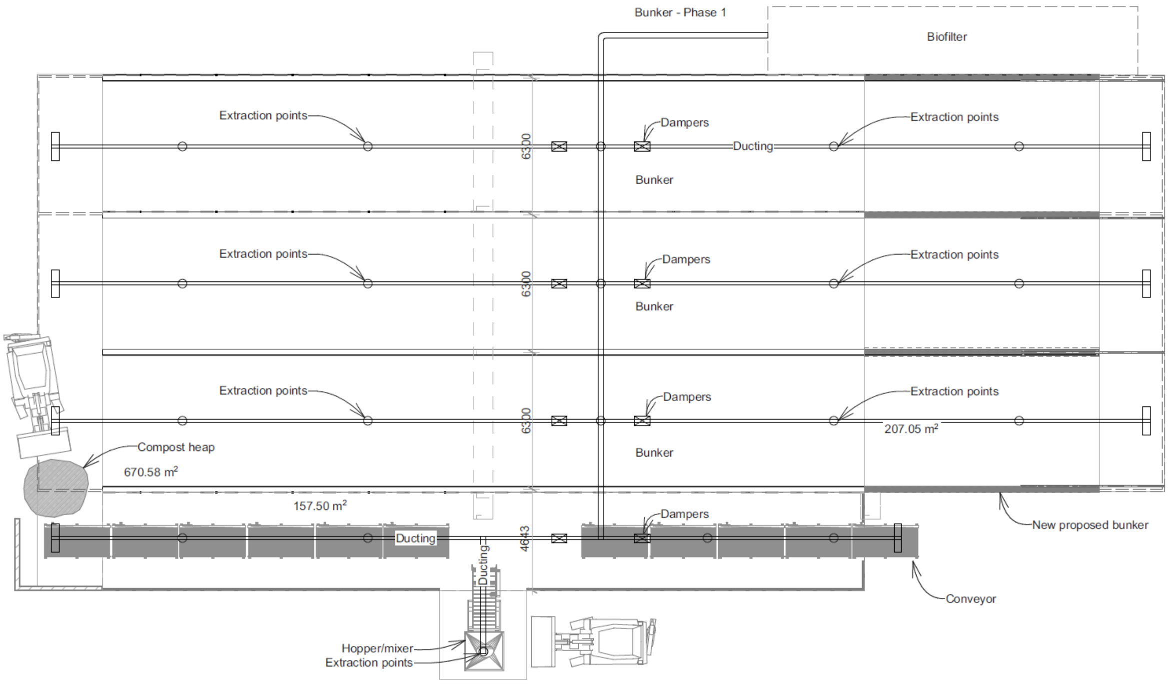
14,760 m3/h / 450 m^2 = 32.8 m^3/hr per m^2 of bunker.

Therefore for the expanded bunkers, this per m^2 extraction rate can be applied.

Future bunker total extraction rates

The future bunker sizing is 53m x 19m = 1007m^2. Therefore the air extraction rate requirements are 1007 * 32.8 = 33,029 m^3/hr. This does not include the hoppers as discussed.

33,029 m^3/h = 550 m^3/min = 9.175 m^3/s



Future bunker ducting extraction position design

See previous Armatec (May 2017) with regards to the curtain and eave design approach.

As stated in the earlier report:

"PROPOSED EXTRACTION LOCATIONS

Currently there is a single, central duct extraction point on the bunkers – drawing air from the centre of the bunkers. This is effective for gas extraction and odour control during times when the doors are closed, but suboptimal during times when the doors are open. Therefore adjustments are planned for.

The planned extraction design is to have:

a. More extraction points along the ceiling of the bunker(s) for more equalised removal along the bunkers
b. Extraction points along the width of the bunker eave behind the curtain to optimise the extraction of the built-up hot gases during the times that the doors are open.
c. Increased controls on extraction rates at the provided points to better direct/prioritise the total extraction airflow to maximise gas capture prior to escape. For example, when a door is open, then controls will be adjusted so the maximum possible extraction rate is achieved in those bunkers near the openings to minimise gas escape."

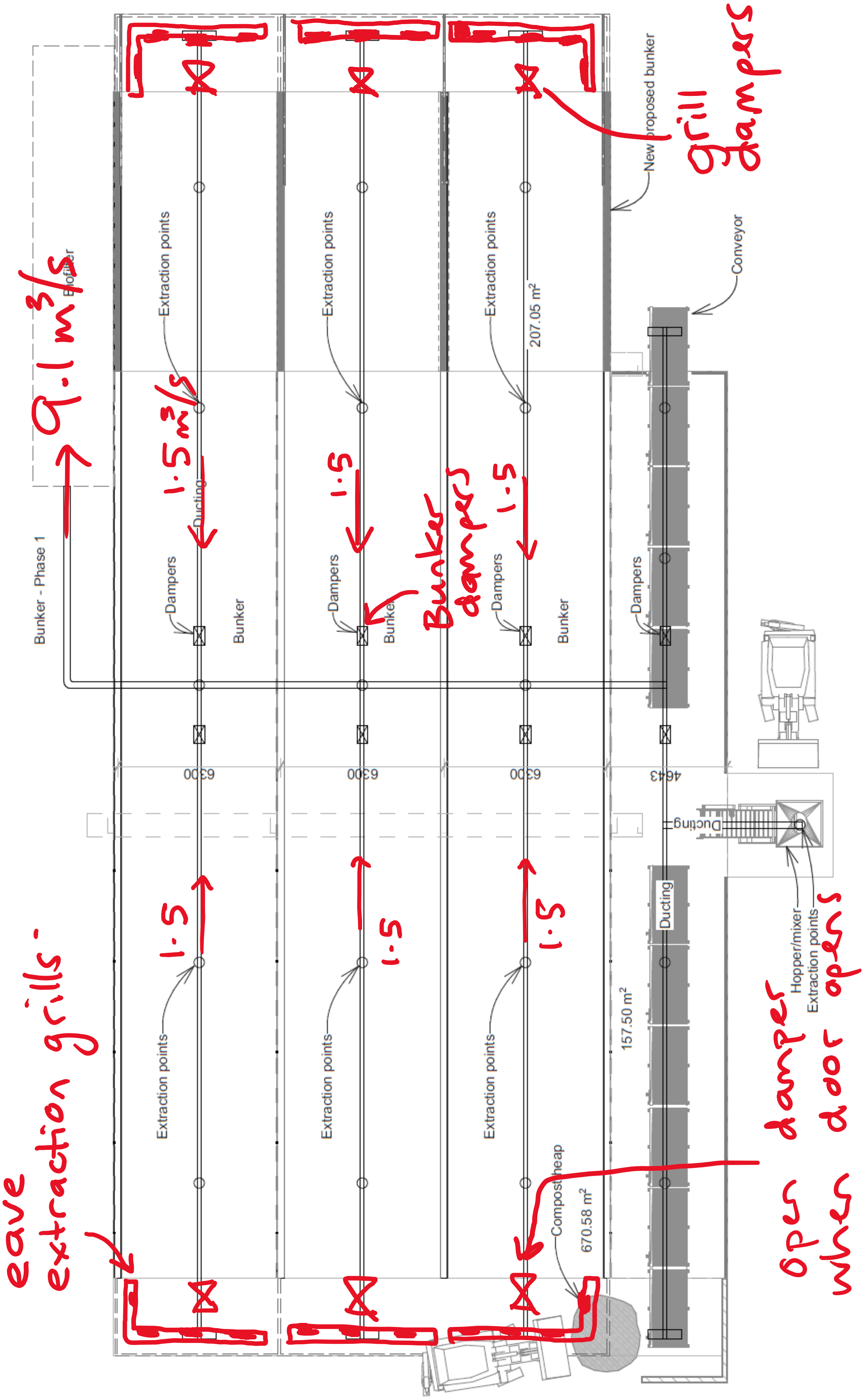
Duct extraction design is done in a way to enable appropriate extraction control. Therefore dampers play their part in appropriate balancing of the overall design following implementation.

The following page provides the design concept of the extraction positions around the bunkers and the door eaves. Grills will be on the extraction ducting around the complete perimeter of the eaves and drop curtains. This will give added protection when the doors are open. The grills will be on approx 500NB duct, with adjustable grills built in.

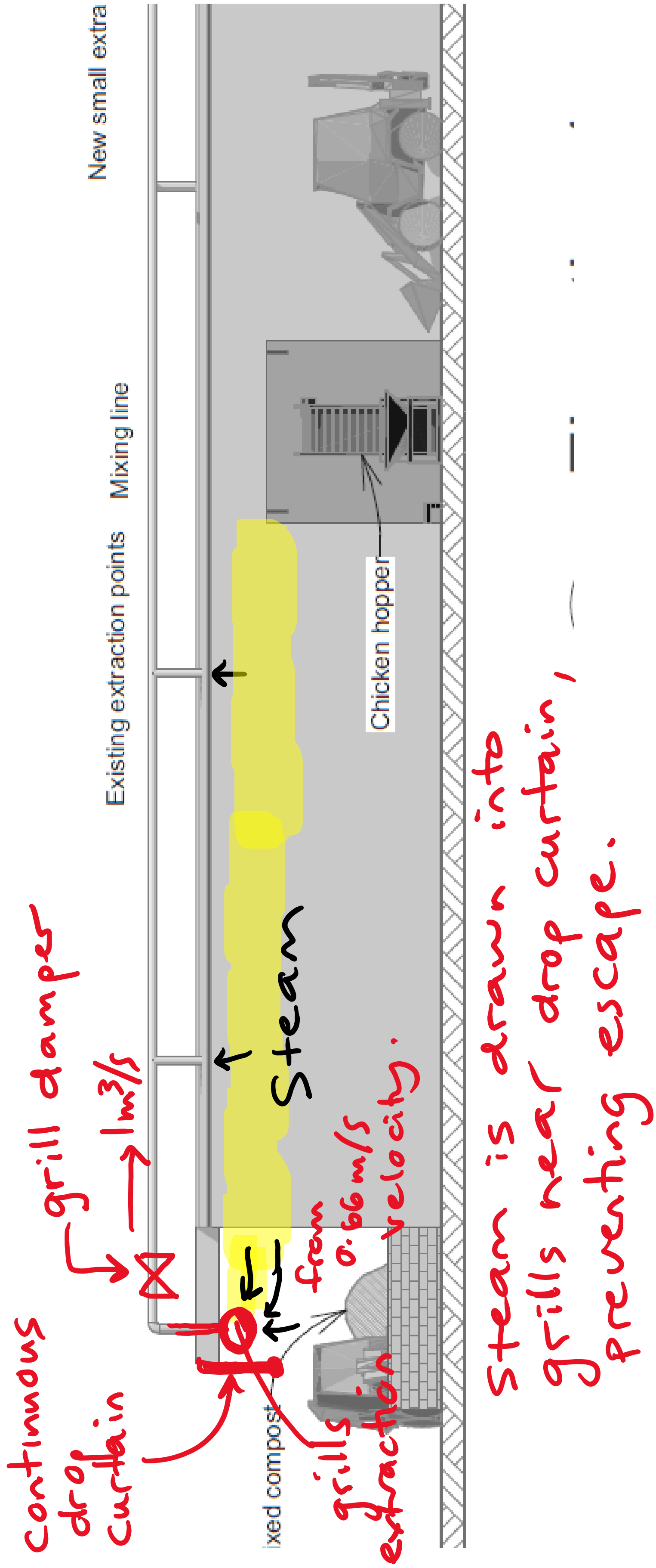
When the doors are closed, the grills will not be in operation. When a bunker is not in operation the bunker damper will be shut off, allowing additional airflow to come from other bunkers.

When the doors are open, per bunker, the "grill damper" controlling extraction from that grill will open, allowing air to be extracted from that point. The extraction rate will be up to $1m^3/s$ per bunker (with the remaining $0.5m^3/s$ being extracted from the rest of the bunker. The middle bunker has a 6m eave length. Therefore at 500mm height, over 3m, this is a 1.5m2 area, and this will pull at a rate of 1 m^3/s and 0.66 m/s velocity, although that could be increased up to 10m/s depending on the grill opening position.

RESTRICTED



Bunker - Phase 1
Biofilter
Extraction points
Ducting
Dampers
Bunker
6300
4643
207.05 m²
157.50 m²
670.58 m²
Compost heap
New proposed bunker
Conveyor
Hopper/mixer
Extraction points
9.1 m³/s
1.5 m³/s
1.5
Bunker dampers
grill dampers
eave extraction grills
open dampers when door opens


New small extra
Mixing line
Existing extraction points
Chicken hopper
ixed compost
grill damper
1m3/s
Steam
continuous drop curtain
grills extraction
from 0.66 m/s velocity.
Steam is drawn into grills near drop curtain, preventing escape.

Below are examples of grill design as part of a duct manifold. The sliding sections permits balancing of the grill size and extraction velocities and extraction areas to best suit the site conditions.

Attachment 2

Updated Table of Proposed Upgrades and Best Practicable Option Analysis

Proposed Upgrades and Best Practicable Option Analysis

Odour Source	Current Management/Mitigation	Current Practice Rating	Proposed Management/Mitigation	Implementation Date/Trigger	Upgraded Practice Rating	Amended Management/Mitigation	Implementation Date/Trigger	Upgraded Practice Rating
Bale wetting	• Drainage of recycled water back to storage pond • Recycled water stored in aerobic condition	Good Practice (given current site infrastructure)	• Bales spiking - recycled water is injected into the middle of the bales prior to laying the bales out for further wetting. This will: o Reduce the area required for bale wetting processes. • Pre-wetting over an aerated pad draining to the existing sump. This will: o Avoid the centre of the bails becoming anaerobic. o Minimise the footprint for bale wetting and recycled water drainage back to collection sumps. At full future production rates, the footprint for bale wetting will be similar to the current dimensions.	Upon increasing compost production to 200 tonnes	Best Practicable Option	• Bales dunking – submerge each bale into a chamber of recycled water prior to laying the bales. This will: o Reduce the area required for bale wetting processes. • Pre-wetting over an aerated pad draining to the existing sump. This will: o Avoid the centre of the bails becoming anaerobic. o Minimise the footprint for bale wetting and recycled water drainage back to collection sumps. At full future production rates, the footprint for bale wetting will be similar to the current dimensions.	Upon the issue of consent Within 3 years of consent being issued	Best Practicable Option
Chicken litter/gypsum storage and handling	• Mixed off site • Stored in a three-sided roofed bunker with a tarpaulin draped over the opening to keep the litter dry	Best Practice	None required		Best Practice			
Laying out bales and spreading chicken litter/gypsum mix on bales, then breaking and mixing bales and placing mix into bunker.	• Keeping the chicken litter/gypsum mix dry during storage • Storing recycled water in aerobic condition to reduce odour emissions from bales as they are opened and mixed	Good Practice (given current site infrastructure)	• Bale mixing and breaking using a bale breaker machine instead of laying out the chicken litter substrate over lines of bales. • The blending line (attached to the Phase 1 bunker) will be semi enclosed with a mixing hopper placed under an extended eave. An air extraction system within the blending line and eave will extract most of the odour from the blending line, eave and the immediate vicinity for filtration in the biofilter system. This will: o Speed up the mixing process - the duration per tonne of compost is expected to reduce about 4-fold o Reduce the potential odour footprint to the confines of a hopper as opposed to long lines of exposed bales. o Enable the blended inputs to be placed directly (via loader) into a Phase 1 bunker, again reducing the potential odour footprint/time of exposure due to avoiding rows of compost being laid out on the outdoor compost pad. o Remove odour from the extracted air via passage through the bio-filter.	Upon increasing compost production to 200 tonnes	Best Practicable Option		Within 3 years of consent being issued	Best Practicable Option

First and second turning of compost in Phase 1 bunkers	• Using a spare "half" bunker to enable direct bunker-to-bunker transfers without using an interim outdoor windrow	Good Practice (given current site infrastructure)	• Extend the length of existing bunkers by approximately 10m to contain the turning machine and turned compost within the bunker during the bunker to bunker transfer process, and construct a canopy over the extended bunker entrance containing additional air extraction to the biofilter to help capture odour that may escape the bunker while the door is open during the process. • Construct a third bunker long enough to contain the turning machine and turned compost, and construct a canopy over the new bunker entrance containing additional air extraction to the biofilter to help capture odour that may escape the bunker while the door is open during the process. • These measures will: o Enable the footprint of odour emissions from the mixing of compost to be fully retained within the bunkers o Capture most of the odours escaping from the bunker opening	Within 8 months of consent being issued Upon increasing compost production to 200 tonnes	Best Practicable Option		Apply for building consent within 4 months of the issue of consent and complete within 8 months of the granting of building consent Upon increasing compost production to 160 tonnes	Best Practicable Option
Removal of compost from Phase 1 bunkers, mixing and placement into Phase 2 tunnels	• Restriction of the process to one day per week	Good Practice (given current site infrastructure)	• Construct a new building to the west of the Phase 1 bunkers adjacent to the Phase 2 tunnels with a hopper underneath an extended eave alongside. The new building will incorporate loading of the turned compost into the Phase 2 tunnels. • This will allow the final turning and mixing processes to be undertaken in a semi enclosed environment. • The building and extended eave will be ventilated to a new biofilter with sufficient design capacity. • This will: o Eliminate the need for a temporary outdoor windrow for mixing and transfer of compost from Phase 1 and Phase 2, which is a significant current odour source. o Reduce the volume of compost exposed to the atmosphere i.e. compost will be retained within semi enclosed areas except when it is being transferred between the Phase 1 bunkers and the new hopper in a front end loader. o Speed up the process, enabling a later start thereby removing the potential for odour emissions early in the morning whilst meteorological	Within 8 months of consent being granted	Best Practicable Option/Best Practice	• Install new hopper and conveyor into Phase 2 Tunnel, • Cease emptying the phase 1 bunker and laying out a windrow of compost for transfer to the Phase 2 tunnels and commence loading the compost into hopper direct from the Phase 1 tunnel to, • Move this process to a Wednesday rather than a Tuesday in order to provide contingency time within normal operating hours • Construct a new building to the west of the Phase 1 bunkers adjacent to the Phase 2 tunnels with a hopper underneath an extended eave alongside. The new building will incorporate loading of the turned compost into the Phase 2 tunnels. • This will allow the final turning and mixing processes to be undertaken in a semi enclosed environment. • The building and extended eave will be ventilated to a new biofilter with sufficient design capacity. • This will: o Eliminate the need for a temporary outdoor windrow for mixing and transfer of compost from Phase 1 and Phase 2, which is a significant current odour source. o Reduce the volume of compost exposed to the	Complete Upon the issue of consent Upon the issue of consent Apply for building consent within 4 months of the issue of consent and complete within 8 months of the granting of building consent	Best Practicable Option/Best Practice

			conditions place odour nuisance at greater risk.			atmosphere i.e. compost will be retained within semi enclosed areas except when it is being transferred between the Phase 1 bunkers and the new hopper in a front end loader. o Speed up the process, enabling a later start thereby removing the potential for odour emissions early in the morning whilst meteorological conditions place odour nuisance at greater risk.		
Phase 2 composting	• Passive ventilation of a portion of recirculated air to atmosphere from a vent on the roof of each tunnel	Best Practicable Option	Although not considered to be strictly necessary, vents from the tunnels will be ducted to the new biofilter servicing the conveyer and new building referred to above.	Within 8 months of consent being granted	Best Practice		Apply for building consent within 4 months of the issue of consent and complete within 8 months of the granting of building consent	Best Practice
Emptying of Phase 2 tunnels	None required		None required					
Stockpiling and removal of spent compost (after use for mushroom cultivation	• Removal of old, anaerobic stockpiled material from site • Introduction of practices for regular removal of spent compost from the site and reduction of stored volumes	Good Practice (given current site infrastructure)	• Spent compost will be stored within either of the following areas: o On a concrete pad in the existing spent compost area located at the front of the site under a canopy to keep the spent compost dry – any remaining compost will be removed from the site within 7 days, o On a concrete pad in the centre of the site - any remaining compost will be removed from the site within 7 days.	Within 8 months of consent being granted	Best practice	• Spent compost will either: o Be stored on a 'now covered' concrete pad in the centre of the site – with any remaining compost being removed from the site within 7 days, or, o Removed from the site directly from the growing rooms.	Within 8 months of consent being granted	Best practice
Recycled water drainage/collection	• Removal of intermediate sumps • Installation of new drainage channels in concrete pad	Best Practicable Option	None required - with previous upgrades completed the source is already well managed however it will be further improved through additional drainage channels and minimising the footprint of the bale wetting activity as outlined above.		Best practice			
Recycled water storage pond	• Continuous aeration to retain dissolved oxygen concentration of at least 1 mg/m³ • Continuous monitoring of dissolved oxygen and water temperature	Best practice	None required		Best practice			
Biofilter	• The biofilter design has been independently reviewed and found to be fit for current purpose • The biofilter temperature is continuously monitored • Biofilter backpressure, moisture and pH is intermittently monitored • The monitoring demonstrates that the biofilter is operating within normal parameters for optimum odour treatment efficiency	Best Practice	• Biofilter upgrades or new biofilters will be required when the proposed modifications are implemented to the: o Phase 1 composting system i.e. additional volumes of air will be extracted from the: - extended bunkers, - new third bunker,	As required in relation to the above	Best Practice			

			- new extraction points in the canopies over the entrances to the bunkers, - conveyer/static turning building, phase 2 tunnel entrance and phase 2 tunnel vents, o Bale breaking process i.e. new extraction points in the eves under which the blending line and mixing hopper will be located.					