20 July 2017

John Studdert
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PO Box 123
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Our ref: 2126310-21484
Your ref:

Dear John

Shoalhaven Starches Mod 11 and 12 Air Quality Assessment Response to EPA's email

Please find below our response to the issues raised by EPA in an email sent from Stefan Press to Brian Hanley and John Studdert on 30 June 2017. The email raised two primary issues and our response is outlined below.

1. Odour emissions data from monitoring period that gave peak total emissions selected for use in modelling

The EPA noted that the modelling undertaken used odour emissions data from the monitoring period that gave the peak total overall emissions (November 2016) from the premises as opposed to the use of the peak/max odour result of each individual source at the premises.

In response to this issue, both Peter and Evan advised that it was considered implausible that a scenario could arise when every source at the premises was emitting its maximum odour emission rate simultaneously. Evan also advised that the modelling had a high degree of conservatism built into it as it had assumed each source to be constantly emitting 24 hours a day, 7 days a week, 365 days a year when in some cases, such as the ethanol scrubber there was only an interim discharge of odorous air emissions to atmosphere.

As a result of these discussions, the EPA is now satisfied with the selection of the November 2016 data in the modelling and so the first issue has been resolved.

1.1 GHD response

GHD has noted the comment from EPA and no further assessment or response is required.

2. Source emissions variability

The second issue relates to the variability of source odour emissions. As we discussed, monitoring data in the monitoring period 2016-2017 is consistent with observations by the independent odour audit 2015-2016 (Northstar 2016), that the variability of odour emission rates at the premises is significant. All point sources in the monitoring period 2016-2017 have a factor of variation (max/min) greater than 2, except

the combined stack of boilers 5&6, which has a factor of variation of 1.7. Notably boiler 4, no. 3 gluten dryer, and the ethanol scrubber have factors of variation of 9.5, 10 and 6.8 respectively. The reason for the variability of these sources was not discussed or explored in the AQIA report.

As discussed, to address this second issue the EPA requires the undertaking of a site sensitivity analysis, including source apportionment for predicted ground level odour concentrations at each of the sensitive receiver locations (R1 – R4). As we discussed, this sensitivity analysis is to focus on the four highest mass odour emission sources at the premises (as currently constructed), being the combined stack of boilers 5&6, the pellet plant exhaust stack, no. 3 gluten dryer and no. 4 gluten dryer as well as the ethanol scrubber.

2.1 GHD response

GHD has undertaken additional dispersion modelling and analysis in order to conduct a site sensitivity analysis as requested by EPA. As discussed in the meeting on 28 June 2017, measured odour emissions do have variability, in some cases higher than a factor of two between the minimum and maximum results. While this is high, the variability in odour sampling and analysis is known and acknowledged by the EPA and in Australian Standards.

In Australia, odour concentrations are determined by following Australian and New Zealand Standard *AS/NZS 4323.3:2001, Stationary source emissions – Determination of odour concentration by dynamic olfactometry*. The criterion for repeatability requires that consecutive single measurements, performed on the same test material in one laboratory shall not differ by more than a factor of 3.0 in 95% of cases or expressed another way, a 95% confidence interval would range from 46% to 218% of a single measured value.

During the meeting with EPA, Peter Stephenson (Stephenson Environmental) also acknowledged that there is also error involved in taking the odour sample and flow rates. While this may be dependent on various factors, the combined error involved in odour sampling and olfactometry may explain the range of results in the sampled odour levels experienced at the site. The actual odour emissions experienced onsite is likely more constant, and a realistic value would potentially be an average of a larger dataset.

In order to determine what potential impacts are if the maximum odour levels are modelled for the key identified odour sources, GHD conducted additional dispersion modelling focusing on the stack of boilers 5&6, the pellet plant exhaust stack, no. 3 gluten dryer and no. 4 gluten dryer as well as the ethanol scrubber. In the Revised odour and air quality assessment for Modification 11 and 12 (GHD, May 2017), GHD used emissions from the November quarter in the modelling, as it represented the peak quarter in terms of total odour emission over the year. This quarter coincided with the maximum odour emissions for pellet plant exhaust stack (PPES), no. 3 gluten dryer (S03) and no. 4 gluten dryer (SO5). Results of additional modelling are shown in Table 1. The mitigation scenario referenced in the table is S03 (GD No.3) at 65º & S05 (G.D. No.4) at 45º duct angles, as previously assessed (GHD, May 2017).

Including the maximum measured odour levels over the year for the boilers 5&6 (BOILR5) increases odour levels by up to 0.1 OU at R1 and R2 in the mitigation scenario, and there is no predicted increase for the unmitigated scenario. Results for the mitigation scenario are below the EPA criterion at all four receivers.

Including the maximum measured odour levels over the year for the ethanol scrubber (ERESC), increases odour levels by up to 0.4 OU at R1 in the mitigation scenario, and 0.3 OU for the unmitigated scenario. Results for the mitigation scenario are below the EPA criterion at all four receivers.

Results show that, even if the additional odour from the boilers 5 &6 and the ethanol scrubber occurred at the same time, predicted odour levels would be below the criteria at all receivers. It is considered unlikely this would ever happen though.

Table 1 Predicted odour concentrations with maximum source odour levels included

Location	EPA Criterion	ALL SOURCES (MOD 12 AQIA Report) Highest Quarter emissions 2016-17		EPA Request - Use maximum emission for the nominated sources below during 2016-17 year (modelled with all other sources - cumulative impact)									
				PPES[1]		S03[1]		BOILR5		S05[1]		ERESC	
Mitigation (Mit)[2]		No mitigation (Base Case)	Mit 1	No Mit	Mit 1	No Mit	Mit 1	No Mit	Mit 1	No Mit	Mit 1	No Mit	Mit 1
R1 Bomaderry	6	5.3	3.2	5.3	3.2	5.3	3.2	5.3	3.3	5.3	3.2	5.6	3.6
R2 Nth Nowra	3	3.1	2.4	3.1	2.4	3.1	2.4	3.1	2.5	3.1	2.4	3.2	2.5
R3 Nowra	5	6.3	4.0	6.3	4.0	6.3	4.0	6.3	4.0	6.3	4.0	6.6	4.2
R4 Terara	5	5.9	3.7	5.9	3.7	5.9	3.7	5.9	3.7	5.9	3.7	6.1	4.0

[1] No change from base case- PPES, S03 and S05 max occurs in November quarter so original modelling already at maximum

[2] S03 (GD No.3) at 65º & S05 (G.D. No.4) at 45º duct angles - So S03 modelled at 9.95 m/s and S05 modelled at 11.72 m/s

The site sensitivity analysis should also include analysis/details of reasonable and feasibility mitigation measures for each of these highest mass odour emission sources. As discussed, the EPA's expectation is that such mitigation measures will only be required to be implement where necessary (i.e. to achieve compliance with the 2009 approved odour base case). However the identification of mitigation measures will likely provide further evidence to the EPA that should odour from these sources become problematic in future that this can then be appropriately managed by Shoalhaven Starches.

Based on the latest modelling results, the scenario above (mitigation 1) reduces the predicted odour levels below the EPA criteria and the 2009 approved odour base case (base case is above the criteria at R3 and R4). Predicted odour levels with key odour sources included at their maximum measured level over the year also are below the EPA criteria. Although additional odour mitigation is not currently needed in order to comply with the EPA criteria, the following odour mitigation can be assessed in the future as part of Manildra's ongoing commitment to managing odour.

- Pellet plant exhaust stack – review design to check if the velocity of the exhaust can be increased to assist dispersion into the atmosphere.
- Boiler – install an additional fan to increase the velocity of exhaust
- No. 3 gluten dryer and no. 4 gluten dryer – no additional mitigation is currently recommended
- Ethanol scrubber – next quarter of odour sampling, it is recommended that additional monitoring of this source be undertaken to gain a better appreciation of flow rates. This may include longer term flow monitoring and multiple odour samples.

While the EPA is open as to how this sensitivity analysis is to be ultimately presented, it would be beneficially if the source apportionment individually grouped each of the abovementioned odour sources as well as collectively grouping all other/remaining odour sources at the premises. This will allow the EPA to assess with more confidence the predicted odour impacts at each of the sensitive receiver sites, including the likely effectiveness of proposed mitigation measures that can be implemented at the premises.

I trust that this information is of assistance and we look forward to again meeting on 20 July 2017 in relation to this matter.

Source apportionment of all sources for the base case and mitigation scenario (S03 (GD No.3) at 65º & S05 (G.D. No.4) at 45º duct angles) are provided in **Attachment A** and **Attachment B**. Source apportionment for the scenario with the ethanol scrubber modelled at the maximum measured level is also provided in **Attachment C**.

3. Conclusion

GHD has undertaken additional modelling and assessment to understand which odour sources onsite are contributing to odour impacts at nearby receivers. The key odour sources in this assessment are boilers 5&6, the pellet plant exhaust stack, no. 3 gluten dryer and no. 4 gluten dryer as well as the ethanol scrubber. Odour sampling has shown these sources to have significant variation in odour concentrations over four sampling events. Previous modelling by GHD (May 2017) included the results

from the quarter with the maximum measured odour levels, but did not assess the maximum measured odour level of each individual source. The previously modelled scenario modelled the No. 3 gluten dryer and no. 4 gluten dryer and pellet stacker exhaust at maximum but not the boiler or ethanol scrubber. Additional analysis in Section 2 found that even with the boiler and ethanol scrubber modelled at the maximum measured odour concentration, the predicted ground level odour concentrations at nearby sensitive receivers complies with the EPA odour criteria.

The odour mitigation previously assessed by GHD (S03 (GD No.3) at 65º & S05 (G.D. No.4) at 45º duct angles) is predicted to decrease odour levels significantly. EPA has requested that feasible additional odour mitigation be investigated for the highest mass odour emission sources. GHD has provided a list of odour mitigation options to be assessed by Manildra in the future.

Based on the assessment in accordance with the NSW EPA's Approved Methods, GHD finds the proposed Modification 11 and 12 (when assessed cumulatively with all significant odours onsite) to be acceptable from an air quality perspective.

Regards
GHD Pty Ltd

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Attachment A – Base case source apportionment

Attachment B – Base case (mitigation 1) source apportionment

Attachment C – Base case with maximum ERESC and mitigation 1: Source apportionment

Attachment A – Base case source apportionment

Base case source apportionment

Base case	R1	R2	R3	R4
Sum	**5.3**	**3.1**	**6.3**	**5.9**
PPES	0.00	0.00	0.00	0.00
ERESC	0.15	0.04	0.02	0.00
FERM	0.18	0.04	0.03	0.00
SD5	0.00	0.00	0.00	0.00
GD6	0.00	0.00	0.00	0.00
S18	0.01	0.03	0.04	0.06
S19	0.01	0.03	0.04	0.06
S02	0.20	0.10	0.11	0.22
S04	0.08	0.03	0.04	0.09
S01	0.13	0.09	0.09	0.18
S05	0.83	0.42	0.41	1.12
S03	1.62	1.00	1.25	2.54
GD7	0.00	0.00	0.00	0.00
BOILR5	0.00	0.00	0.00	0.00
YP45	0.08	0.01	0.03	0.02
GRT	0.28	0.05	0.15	0.07
VCD	0.00	0.00	0.00	0.00
DDG19	0.00	0.00	0.00	0.00
DDG46	0.00	0.00	0.00	0.00
D6	0.07	0.01	0.02	0.02
D2	0.15	0.02	0.05	0.05
E13	0.06	0.02	0.05	0.04
E10	0.01	0.00	0.01	0.01
E22	0.00	0.00	0.00	0.00
A4	0.00	0.01	0.00	0.02
A5	0.00	0.00	0.00	0.00
A6	0.00	0.01	0.00	0.01

Base case	R1	R2	R3	R4
A7	0.01	0.01	0.00	0.03
C4	0.05	0.02	0.03	0.06
C18	0.02	0.00	0.02	0.01
C1	0.04	0.02	0.05	0.04
S07	0.12	0.07	0.16	0.16
S08	0.02	0.01	0.03	0.02
S06	0.01	0.00	0.01	0.01
S13A	0.02	0.00	0.04	0.02
S13B	0.02	0.00	0.04	0.02
S12	0.01	0.00	0.03	0.02
S20	0.02	0.01	0.02	0.03
PPS1	0.01	0.00	0.00	0.00
PPS2	0.00	0.00	0.00	0.00
PPM1	0.01	0.00	0.01	0.00
PPM2	0.02	0.00	0.01	0.00
PPM3	0.02	0.00	0.01	0.01
PPL1	0.01	0.00	0.00	0.00
PPL2	0.01	0.00	0.00	0.00
FMP1	0.00	0.00	0.00	0.01
FMP2	0.00	0.00	0.00	0.01
SST	0.01	0.00	0.00	0.00
E7	0.06	0.01	0.02	0.02
B7	0.11	0.02	0.08	0.07
BOILR4	0.00	0.09	0.00	0.01
SDR5	0.10	0.07	0.13	0.17
FMBA	0.00	0.00	0.01	0.01
FMBB	0.00	0.00	0.01	0.01
FMBC	0.00	0.00	0.01	0.01
FMBD	0.00	0.00	0.00	0.01
FMBE	0.00	0.00	0.01	0.01

Base case	R1	R2	R3	R4
FMBF	0.00	0.00	0.01	0.01
FMBG	0.00	0.00	0.00	0.00
FMBH	0.00	0.00	0.01	0.01
FMBI	0.00	0.00	0.01	0.01
FMBM	0.00	0.00	0.00	0.01
PMFS	0.00	0.00	0.00	0.01
PO1	0.00	0.00	0.00	0.00
PO2	0.00	0.01	0.01	0.00
PO3	0.00	0.00	0.00	0.00
SOBAS	0.00	0.00	0.01	0.00
P05	0.00	0.00	0.00	0.00
P06	0.00	0.01	0.02	0.00
BIO1	0.00	0.04	0.15	0.02
BIO2	0.00	0.03	0.11	0.01
MBR	0.00	0.00	0.00	0.00
BIO3	0.00	0.11	0.36	0.02
BIO4	0.00	0.16	0.50	0.03
F18	0.60	0.06	0.52	0.17
DDG36	0.02	0.06	0.46	0.05
DDG34	0.01	0.03	0.22	0.03
DDG35	0.01	0.03	0.22	0.02
PPF	0.03	0.26	0.62	0.16

Attachment B – Base case (mitigation 1) source apportionment

Base case (mitigation 1) source apportionment

Base case (Mitigation 1)	R1	R2	R3	R4
Sum	**3.2**	**2.4**	**4.0**	**3.7**
PPES	0.77	0.02	0.00	0.01
ERESC	0.01	0.05	0.01	0.00
FERM	0.01	0.07	0.02	0.00
SD5	0.10	0.00	0.03	0.00
GD6	0.18	0.00	0.01	0.01
S18	0.02	0.01	0.06	0.03
S19	0.02	0.02	0.06	0.03
S02	0.05	0.15	0.19	0.10
S04	0.02	0.06	0.07	0.04
S01	0.05	0.06	0.14	0.08
S05	0.31	0.00	0.01	0.12
S03	0.77	0.05	1.11	0.79
GD7	0.11	0.00	0.11	0.00
BOILR5	0.17	0.00	0.00	0.00
YP45	0.01	0.03	0.01	0.00
GRT	0.02	0.09	0.06	0.03
VCD	0.00	0.00	0.00	0.00
DDG19	0.00	0.00	0.00	0.00
DDG46	0.00	0.00	0.00	0.00
D6	0.00	0.02	0.01	0.01
D2	0.01	0.04	0.03	0.01
E13	0.01	0.03	0.05	0.02
E10	0.00	0.01	0.01	0.00
E22	0.00	0.00	0.00	0.00
A4	0.01	0.00	0.01	0.01
A5	0.00	0.00	0.00	0.00
A6	0.00	0.00	0.01	0.01

Base case (Mitigation 1)	R1	R2	R3	R4
A7	0.01	0.01	0.02	0.02
C4	0.01	0.04	0.05	0.02
C18	0.00	0.01	0.01	0.00
C1	0.01	0.03	0.04	0.02
S07	0.04	0.12	0.16	0.09
S08	0.01	0.02	0.02	0.01
S06	0.00	0.01	0.01	0.01
S13A	0.00	0.01	0.02	0.01
S13B	0.00	0.01	0.02	0.01
S12	0.00	0.01	0.01	0.01
S20	0.01	0.02	0.03	0.02
PPS1	0.00	0.00	0.00	0.00
PPS2	0.00	0.00	0.00	0.00
PPM1	0.00	0.00	0.00	0.00
PPM2	0.00	0.00	0.00	0.00
PPM3	0.00	0.00	0.00	0.00
PPL1	0.00	0.00	0.00	0.00
PPL2	0.00	0.00	0.00	0.00
FMP1	0.00	0.00	0.00	0.00
FMP2	0.00	0.00	0.01	0.01
SST	0.00	0.00	0.01	0.00
E7	0.00	0.02	0.01	0.00
B7	0.01	0.06	0.08	0.03
BOILR4	0.05	0.06	0.01	0.08
SDR5	0.05	0.13	0.17	0.10
FMBA	0.01	0.00	0.00	0.01
FMBB	0.01	0.00	0.01	0.02
FMBC	0.01	0.00	0.01	0.02
FMBD	0.00	0.00	0.00	0.00

Base case (Mitigation 1)	R1	R2	R3	R4
FMBE	0.01	0.00	0.01	0.01
FMBF	0.01	0.00	0.01	0.01
FMBG	0.00	0.00	0.00	0.00
FMBH	0.00	0.00	0.00	0.00
FMBI	0.00	0.00	0.00	0.00
FMBM	0.00	0.00	0.01	0.01
PMFS	0.00	0.00	0.01	0.01
PO1	0.00	0.00	0.00	0.00
PO2	0.00	0.02	0.00	0.00
PO3	0.00	0.00	0.00	0.00
SOBAS	0.00	0.01	0.00	0.00
P05	0.00	0.00	0.00	0.00
P06	0.00	0.01	0.00	0.00
BIO1	0.01	0.05	0.11	0.11
BIO2	0.01	0.04	0.06	0.07
MBR	0.00	0.00	0.00	0.00
BIO3	0.03	0.12	0.15	0.24
BIO4	0.04	0.16	0.14	0.31
F18	0.01	0.16	0.17	0.23
DDG36	0.05	0.14	0.20	0.26
DDG34	0.02	0.07	0.02	0.13
DDG35	0.02	0.07	0.10	0.13
PPF	0.10	0.25	0.29	0.35

Attachment C – Base case with maximum ERESC and mitigation 1: Source apportionment

Max ERESC (Mitigation 1)	R1	R2	R3	R4
Sum	**3.6**	**2.5**	**4.2**	**4.0**
PPES	0.00	0.40	0.02	0.00
ERESC	0.55	0.06	0.29	0.05
FERM	0.07	0.01	0.03	0.01
SD5	0.00	0.03	0.00	0.00
GD6	0.00	0.03	0.00	0.00
S18	0.05	0.01	0.03	0.06
S19	0.06	0.01	0.04	0.07
S02	0.32	0.03	0.12	0.21
S04	0.12	0.01	0.04	0.08
S01	0.25	0.03	0.05	0.19
S05	0.00	0.14	0.00	0.00
S03	0.31	0.31	0.00	1.35
GD7	0.00	0.06	0.00	0.00
BOILR5	0.00	0.15	0.00	0.00
YP45	0.06	0.00	0.02	0.01
GRT	0.24	0.01	0.05	0.06
VCD	0.00	0.00	0.00	0.00
DDG19	0.00	0.00	0.00	0.00
DDG46	0.00	0.00	0.00	0.00
D6	0.05	0.00	0.02	0.01
D2	0.11	0.01	0.04	0.03
E13	0.07	0.01	0.03	0.03
E10	0.01	0.00	0.00	0.01
E22	0.01	0.00	0.00	0.00
A4	0.01	0.00	0.00	0.02
A5	0.00	0.00	0.00	0.00
A6	0.01	0.00	0.00	0.01
A7	0.02	0.01	0.02	0.03

Max ERESC (Mitigation 1)	R1	R2	R3	R4
C4	0.07	0.01	0.03	0.05
C18	0.01	0.00	0.01	0.00
C1	0.05	0.01	0.02	0.04
S07	0.21	0.02	0.12	0.15
S08	0.03	0.00	0.02	0.02
S06	0.01	0.00	0.01	0.01
S13A	0.02	0.00	0.01	0.01
S13B	0.02	0.00	0.01	0.01
S12	0.02	0.00	0.01	0.01
S20	0.03	0.00	0.03	0.02
PPS1	0.00	0.00	0.00	0.00
PPS2	0.00	0.00	0.00	0.00
PPM1	0.01	0.00	0.01	0.01
PPM2	0.01	0.00	0.01	0.01
PPM3	0.01	0.00	0.01	0.01
PPL1	0.00	0.00	0.00	0.00
PPL2	0.00	0.00	0.00	0.00
FMP1	0.01	0.00	0.00	0.01
FMP2	0.01	0.00	0.00	0.01
SST	0.01	0.00	0.00	0.00
E7	0.04	0.00	0.01	0.01
B7	0.11	0.02	0.05	0.05
BOILR4	0.01	0.02	0.17	0.00
SDR5	0.18	0.03	0.12	0.17
FMBA	0.01	0.00	0.00	0.01
FMBB	0.02	0.01	0.00	0.02
FMBC	0.02	0.01	0.00	0.02
FMBD	0.01	0.00	0.00	0.01
FMBE	0.01	0.00	0.00	0.01

Max ERESC (Mitigation 1)	R1	R2	R3	R4
FMBF	0.01	0.00	0.00	0.01
FMBG	0.01	0.00	0.00	0.01
FMBH	0.01	0.00	0.00	0.01
FMBI	0.01	0.00	0.00	0.01
FMBM	0.00	0.00	0.01	0.01
PMFS	0.00	0.00	0.01	0.01
PO1	0.00	0.00	0.00	0.00
PO2	0.00	0.00	0.00	0.00
PO3	0.00	0.00	0.00	0.00
SOBAS	0.00	0.00	0.00	0.00
P05	0.00	0.00	0.00	0.00
P06	0.00	0.00	0.00	0.00
BIO1	0.00	0.13	0.15	0.04
BIO2	0.00	0.08	0.11	0.03
MBR	0.00	0.00	0.00	0.00
BIO3	0.00	0.28	0.33	0.08
BIO4	0.00	0.38	0.46	0.10
F18	0.31	0.02	0.17	0.18
DDG36	0.00	0.04	0.41	0.12
DDG34	0.00	0.02	0.12	0.07
DDG35	0.00	0.02	0.20	0.06
PPF	0.00	0.08	0.74	0.35