Ref: 17130
November 2017
Stephen Parry
Gore District Council

RE: Weekly NH_3 Monitoring Report (Weeks 4 – 6)

In October 2017, GDC engaged e3scientific ltd to scope and assess the ammonia (NH_3) gas emissions from the Mataura Mill dross storage site as they seek to comply with their consent conditions that specify a limit of 5 ppm NH_3 discharged to air. In November Photonic Innovations (PI) installed two NH_3 Sensors for comparison of the indoor and outdoor ammonia levels. Below we present a summary of the results from weeks 4 – 6 of monitoring.

Figures 1-3 provide a record of the weekly observations from the Mataura Mill monitoring sensors. We note that while the indoor sensor picks up a modest amount of NH_3 (up to 16 ppm) the mean and median concentrations for weeks 4 - 6 of monitoring are 7.9 and 6.8 ppm, respectively. There is a strong diurnal variation in the indoor NH_3 concentrations as the day warms up.

The outdoor sensor failed a few times during this reporting period however it has been operating consistently since PI visited the site to confirm the validity of the outputs from the outdoor sensor. Since the sensor was been reset on the 7th of December, there have been a few exceedances of the 5 ppm limit. However, the mean and median values for this reporting period remain below the limit at 4.5 ppm and 3.4 ppm respectively. The outdoor sensor, shows that Week 6 was the first week during which exceedances in the 5 ppm threshold were detected, with a mean and median weekly value of 5.1 ppm. Considering the height of the outdoor sensor (3 m), it is probable that higher concentrations of NH_3 are venting through the roof of the warehouse in those places that are open to the air. Following the initial installation and testing phase, the two sensors appear to be effectively reporting the NH_3 conditions at Mataura. Venting of NH_3 through the roof of the warehouse maybe an important pathway of gaseous release.

1 Week 4: 26 November – 02 December 2017

The fourth week of monitoring shows some disturbed signals in the initial data record for the outdoor sensor, with a maximum value of 8 ppm but with an

average of 4 ppm, while the indoor sensor peaked around 15 ppm (Table 1) with an average of 8 ppm. The outdoor sensor failed for three days (28/11 – 30/11), however the indoor sensor continued to report data (Figure 1). PI will be re-evaluating the signal of the outdoor sensor next week.

Table 1. Summary statistics for Week 4 (26 November – 02 December 2017). AT - Ambient Temperature; AH - Ambient Humidity; NH3_OUT - outdoor sensor; NH3_IND - indoor sensor. *NH_3 measured in parts per million.*

WEEK 4	*AT (°C)*	*AH (%)*	*NH_3_OUT*	*NH_3_IND*
Mean	20.25	35.84	3.95	7.99
Standard error	0.06	0.14	0.03	0.08
Median	19.78	36.68	3.90	7.50
Mode	19.41	37.89	3.90	6.90
Minimum	18.72	24.44	1.30	4.70
Maximum	25.68	44.97	8.30	15.10
Confidence level (95.0%)	0.11	0.27	0.06	0.15

2 Week 5: 03 – 09 December 2017

In the fifth week of monitoring the indoor sensor continued to report a correlation between air temperature and NH_3 concentrations, indicative of a diurnal control with NH_3 increasing as the day warms up. The outdoor sensor was reactivated by Photonic Innovations on the 6/12. Overall mean and median for the outdoor NH_3 are 4.36 and 4.70 ppm despite the loss of monitoring services for short periods during this week.

Table 2. Summary statistics for Week 5 (03 – 09 December 2017).

WEEK 5	*AT (°C)*	*AH (%)*	*NH3_OUT*	*NH3_IND*
Mean	18.77	55.14	4.36	8.94
Standard error	0.09	0.49	0.06	0.09
Median	18.62	59.26	4.70	8.70
Mode	17.05	36.12	1.00	7.90
Minimum	15.03	33.49	1.00	4.00
Maximum	23.96	73.62	9.30	15.70
Confidence level (95.0%)	0.17	0.96	0.12	0.18

3 Week 6: 10 – 16 December 2017

In week six both sensors are recording, and no change has been seen in the outdoor sensors performance. The indoor sensor detected fewer temperature

related NH_3 events due to weaker (cooler) diurnal temperature variation for the first four days, however in the last two days a stronger diurnal variation is noted (Figure 3) and the NH_3 response is evident. The outdoor sensor concentrations remained between 3 and 7 ppm with an average of 5 ppm, and showed no correlation with the indoor sensor.

Table 3. Summary statistics for Week 6 (10 - 16 December 2017).

WEEK 6	*AT (°C)*	*AH (%)*	*NH3_OUT*	*NH3_IND*
Mean	14.73	52.46	5.15	6.83
Standard error	0.05	0.20	0.03	0.06
Median	14.86	53.48	5.10	6.70
Mode	15.50	53.32	5.30	5.70
Minimum	11.25	39.66	3.40	4.10
Maximum	17.32	62.09	7.40	13.20
Confidence level (95.0%)	0.10	0.39	0.05	0.12

N.B

If you have any questions regarding the information provided in this letter, please contact Simon Bloomberg on 0274 526 941 or via email at simon.bloomberg@e3scientific.co.nz

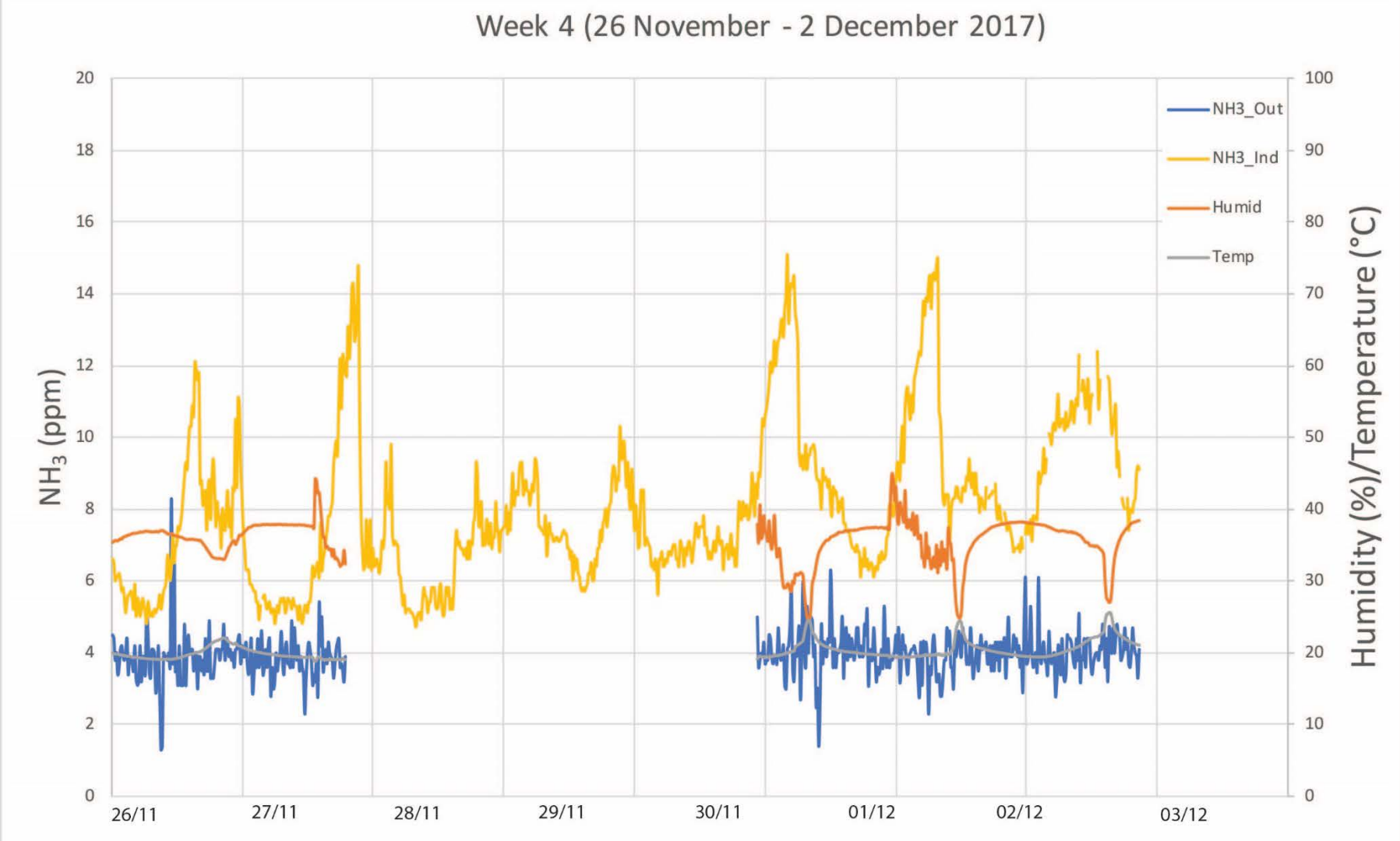

Figure 1. Week 4 of monitoring (26 November – 2 December 2017). The outdoor NH_3 and Temp./Humidity sensors failed for three days.

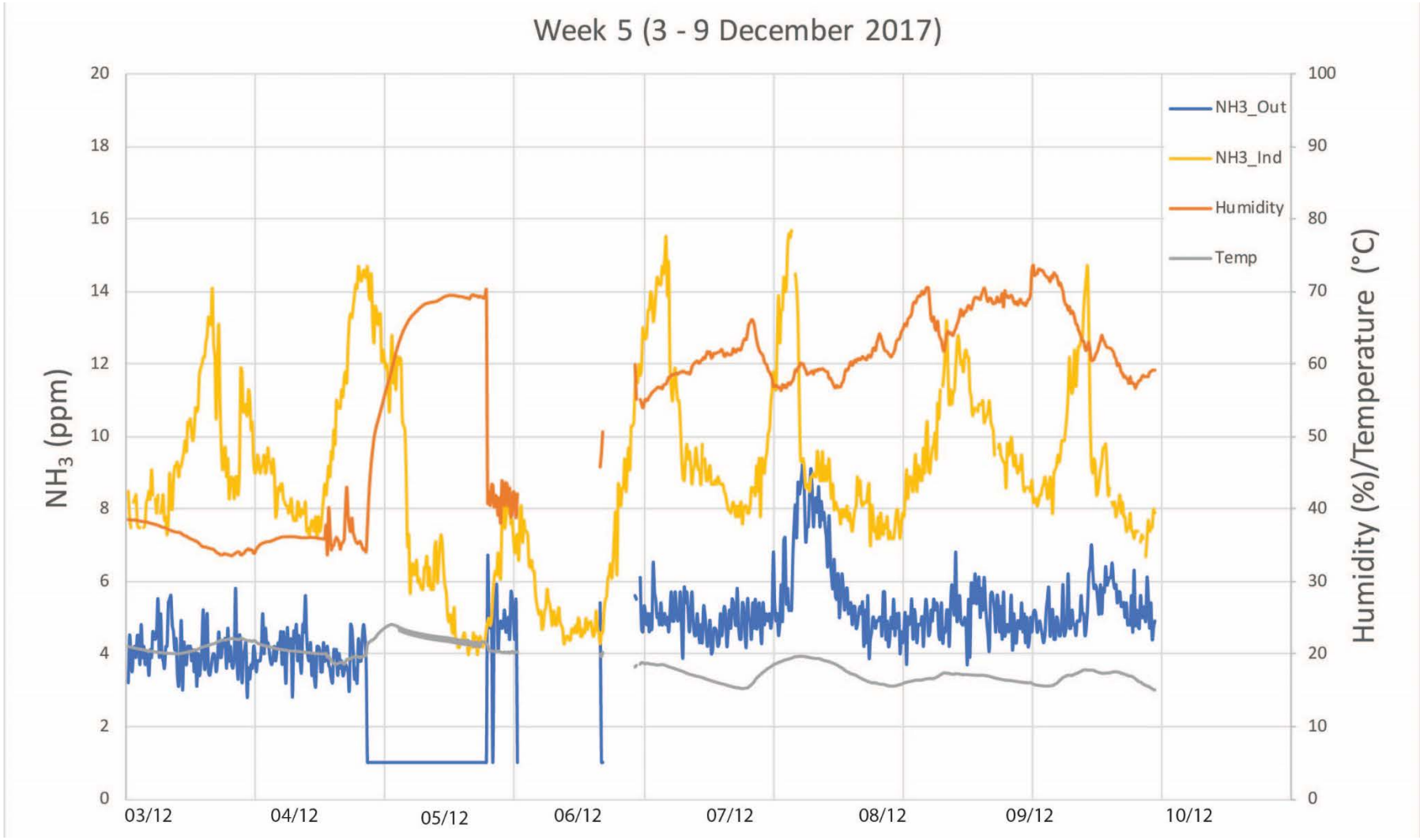

Figure 2. Week 5 of monitoring (03-09 December 2017). The outdoor sensor failed again for two days before being reset by Photonic innovations.

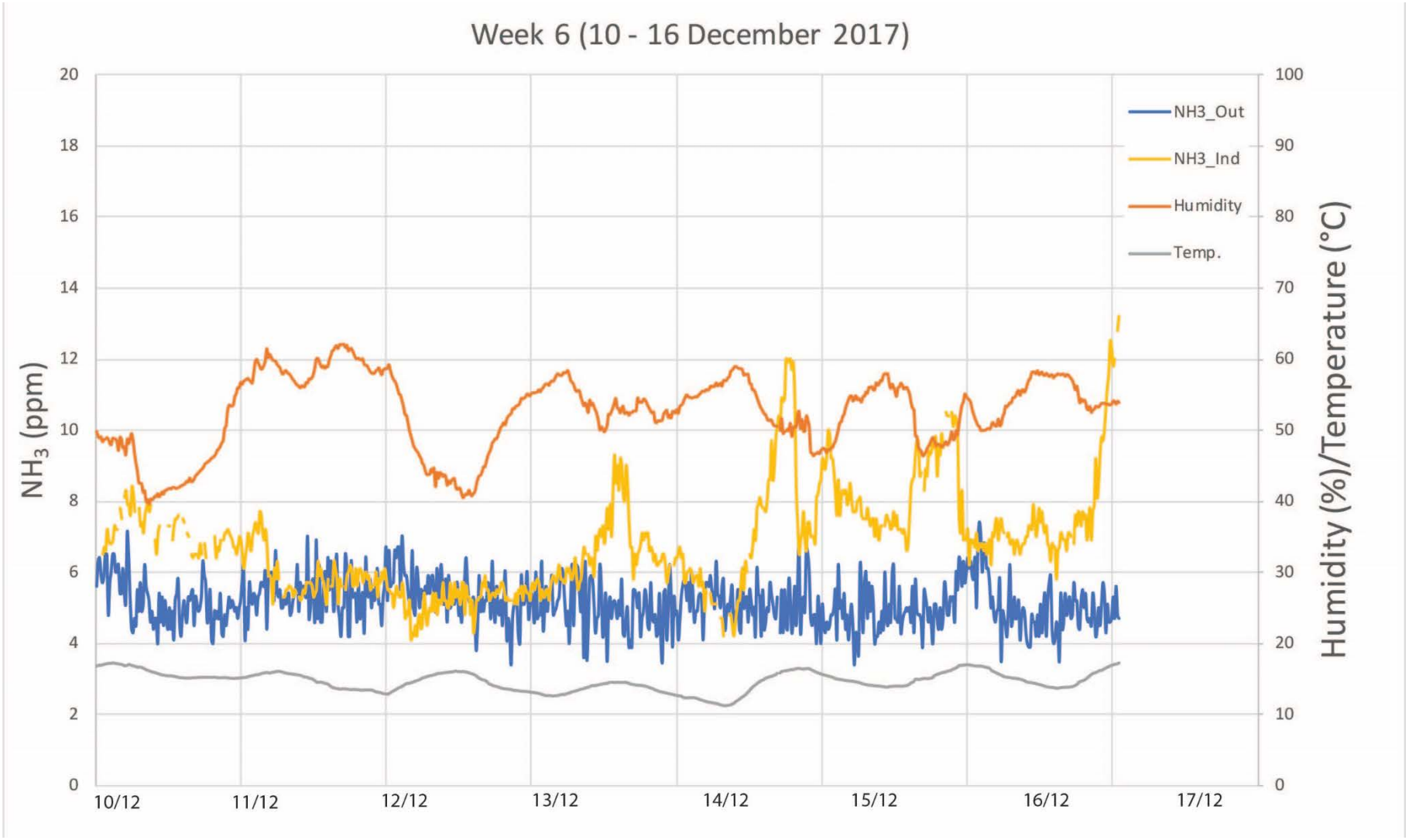

Figure 3. Week 6 of monitoring (10 -16 December 2017). This week both sensors worked continuously.