Ref: 17130
February 2018
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Gore District Council

RE: Weekly NH_3 Monitoring Report (Weeks 13 – 15)

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 13 – 15 of monitoring.

Figures 1-3 provide a graphical record of the weekly observations from the Mataura Mill monitoring sensors. We note that while the maximum NH_3 concentrations detected by the indoor sensor detected were up to 16 ppm the mean and median concentrations for weeks 13 - 15 of monitoring are **8.2** and **7.9** ppm, respectively. A low temperature period (1-7 February) disrupted the established pattern of diurnal variation in indoor NH_3 concentrations, however the pattern was re-established on the 8th.

The outdoor sensor detected daily exceedances of the 5 ppm limit with maximum recorded values of 11 ppm, however the mean and median values for this reporting period were **5.7** and **5.6**, respectively. The outdoor sensor continues to show weak diurnal correlation to temperature and humidity changes (Figure 3).

1 Week 13: 28 January – 3 February 2018

The thirteenth week of monitoring started with strong diurnal variation in both indoor and outdoor NH_3 levels (28-31 January), however the pattern changed on the 1st of February when daily peak ambient temperatures dipped below 20°C (coincident with Cyclone Fehi). The maximum indoor concentrations of 16 ppm were thus the highest for this reporting period as a result of temperatures not rising back to pre-cyclone levels. Mean and median values were 9.2 and 10.1 ppm respectively. The consented outdoor discharge limits were exceeded by both the mean and median values of 6.2 and 5.9 ppm respectively, with a maximum weekly value of 11 ppm.

Table 1. Summary statistics for Week 13 (28 January – 3 February 2018). AT - Ambient Temperature; AH - Ambient Humidity; NH3_OUT - outdoor sensor; NH3_IND - indoor sensor. *NH_3 measured in parts per million.*

WEEK 13	*AT (°C)*	*AH (%)*	*NH_3_OUT*	*NH_3_IND*
Mean	17.1	56.2	6.2	9.2
Standard error	0.1	0.3	0.1	0.1
Median	17.2	56.8	5.9	10.1
Mode	21.4	57.7	5.6	6.0
Minimum	12.0	**37.4**	3.2	4.0
Maximum	**22.1**	70.7	11.0	16.0
Confidence level (95.0%)	0.2	0.5	0.1	0.2

2 Week 14: 4 – 10 February 2018

In the fourteenth week of monitoring ammonia concentrations at both indoor and outdoor sensors remained low until the 8th of February, when the diurnal variation pattern re-established. Mean and median outdoor NH_3 concentrations were 5.4 and 5.5 ppm respectively, with a peak atmospheric concentration of 8.3 ppm. The indoor sensor showed five days of strong diurnal change in concentrations (Figure 2) with peaks at 13.4 ppm and a mean and median of 6.8 and 6.3 ppm respectively.

Table 2. Summary statistics for Week 14 (4 – 10 February 2018).

WEEK 14	*AT (°C)*	*AH (%)*	*NH3_OUT*	*NH3_IND*
Mean	14.1	58.7	5.4	6.8
Standard error	0.1	0.1	0.0	0.1
Median	14.0	58.9	5.5	6.3
Mode	14.0	55.2	5.6	4.5
Minimum	**11.3**	48.4	2.6	2.9
Maximum	17.1	66.7	8.3	13.4
Confidence level (95.0%)	0.1	0.3	0.1	0.2

3 Week 15: 11 – 17 February 2018

In week fifteen of monitoring, a weaker diurnal variation pattern in both indoor and outdoor NH_3 is noted compared to pre-Cyclone Fehi (28-31 January). Outdoor concentrations peaked at 9 ppm with a mean and median of 5.5 and 5.4 ppm respectively. The indoor sensor detected four significant diurnal swings in

indoor NH_3 concentrations (Figure 3) with a peak value of 14.1 ppm and mean and median of 8.6 and 8.2 ppm respectively.

Table 3. Summary statistics for Week 15 (11 – 17 February 2018).

WEEK 15	*AT (°C)*	*AH (%)*	*NH3_OUT*	*NH3_IND*
Mean	15.8	59.4	5.5	8.6
Standard error	0.0	0.2	0.0	0.1
Median	15.7	58.2	5.4	8.2
Mode	15.4	54.1	5.1	8.2
Minimum	13.3	48.8	2.6	5.8
Maximum	17.8	**72.1**	9.0	14.1
Confidence level (95.0%)	0.1	0.4	0.1	0.1

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

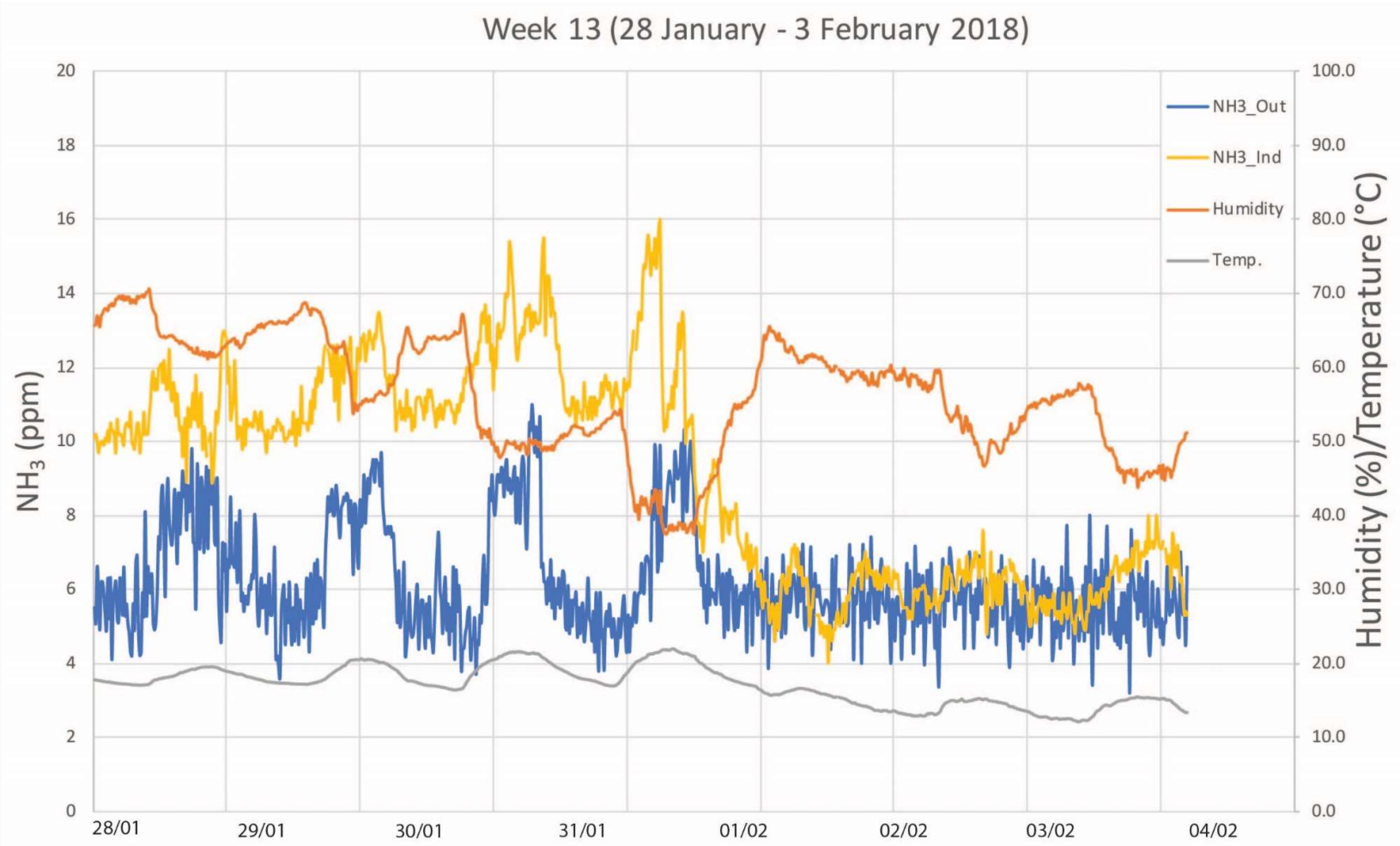

Figure 1. Week 13 of monitoring (28 January –3 February 2018). Both sensors remained connected. The diurnal swings of indoor NH_3 concentrations reduce significantly after the 1st as low temperatures are detected while Cyclone Fehi passed over the South Island.

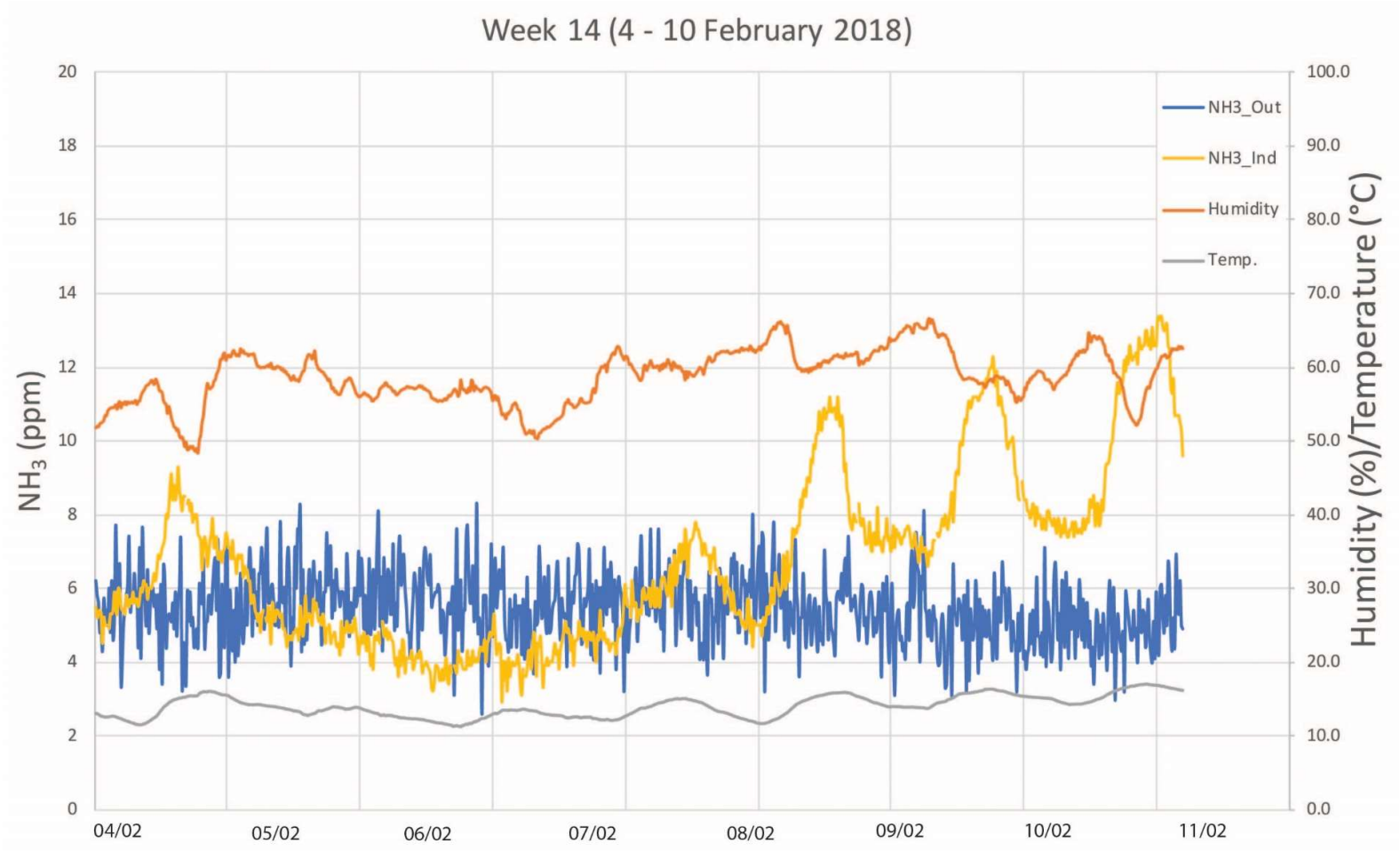

Figure 2. Week 14 of monitoring (4 – 10 February 2018). Both sensor remained connected. The low temperatures and lack of diurnal related changes continued until the 7th. Later in the week the pattern of diurnal NH_3 concentration changes was re-established.

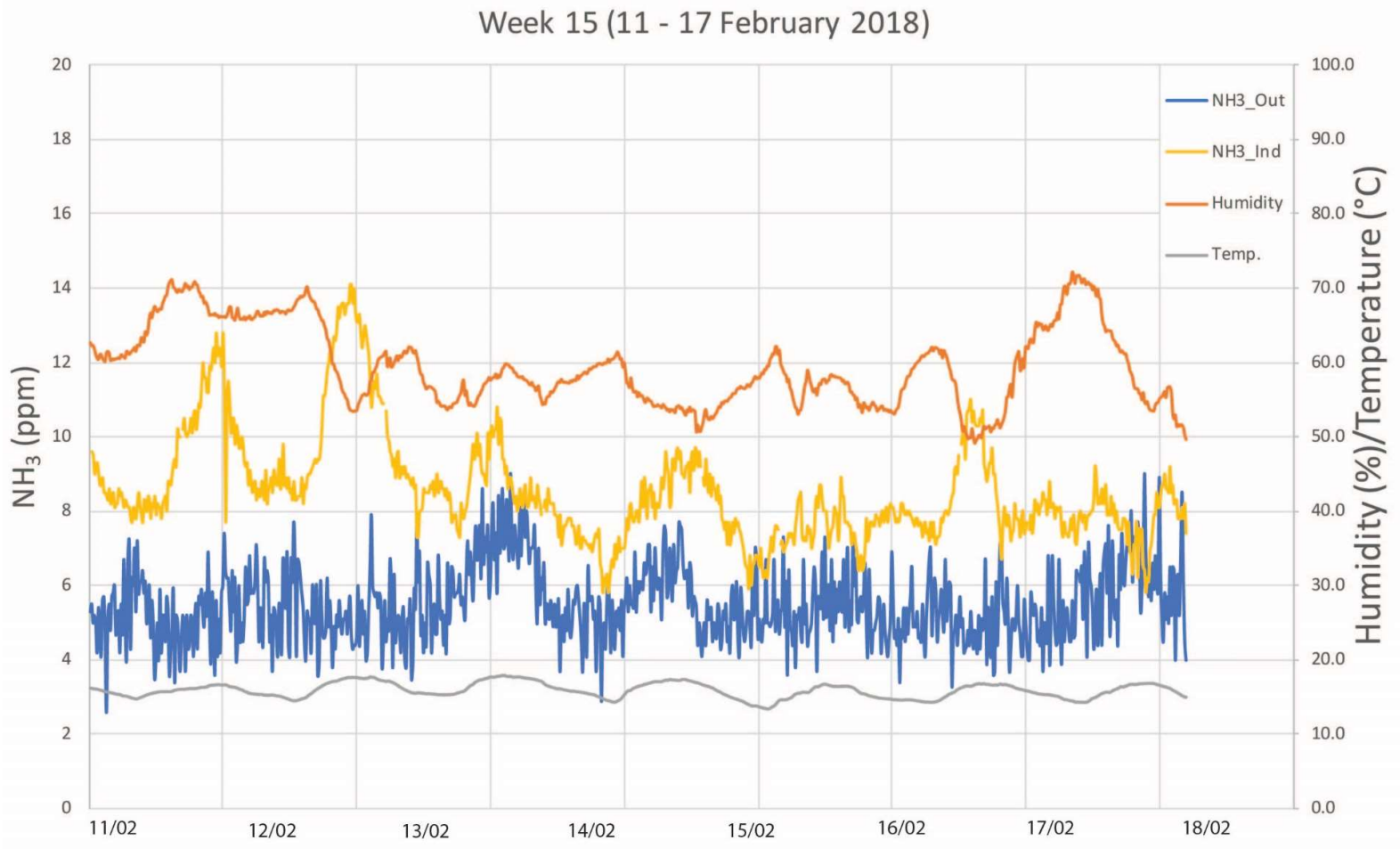

Figure 3. Week 15 of monitoring (11 – 17 February 2018). Both sensors remained connected during this week. Large diurnal swings in temperature and NH_3 levels continued to be detected by both indoor and outdoor sensors