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Land and Water Science
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4 February 2019

Dear Stephen

RE: Weekly NH_3 Monitoring Report 01 – 31 January 2019

In April 2018 Gore District Council (GDC) engaged Land and Water Science to conduct continuous monitoring of ammonia (NH_3) gas emissions from the Mataura Mill dross storage site (121 Kana Street, Mataura). GDC require emission values to comply with consent conditions that specify a limit of 5 ppm NH_3 discharged to air. There are two NH_3 sensors that have been installed at the Mataura Mill dross storage site for comparison of the indoor and outdoor ammonia levels. The outdoor sensor was out of service between 18 March – 11 July 2018, during this time only the daily indoor NH_3 concentrations were reported on. Photonic Innovations, who installed the sensors have since rectified connectivity issues and the sensor has been re-installed. Measurements are reported for both the outdoor and indoor sensors for the month of January 2019.

Weekly summaries of the indoor and outdoor emission results from monitoring between 01 January and 31 January are presented in this report. During this period the maximum NH_3 concentration detected by the indoor sensor was 11.8 ppm (Figure 1 and Table 1) and 9.2 ppm for the outdoor sensor (Figure 2 and Table 2). Mean and median NH_3 concentrations during this period were 7.2 and 6.9 ppm for the indoor sensor and 0.9 and 0.8 ppm for the outdoor sensor. The maximum ammonia concentration for both the indoor and outdoor sensors exceeded the consented amount of 5 ppm. An increase in NH_3 concentration is expected during the summer months due to higher air temperatures.

Daily (diurnal) variation in NH_3 concentration shows a consistent pattern in the data. Specifically, NH_3 concentration is strongly correlated with air temperature, reaching maximum values as air temperatures peak during the day and minimum values at night when air temperatures are at their lowest. Although diurnal variation is evident in the data, average air temperature is a greater control over the absolute concentration with maximum concentrations recorded during the warmest months of the year and minimum concentrations recorded during the coolest months of the year. The correlation between air temperature and NH_3 concentration for this reporting period is displayed in Figure 1 and Figure 2.

Table 1. Summary statistics for the indoor NH_3 sensor, 01 January – 31 January 2018. NH_3 measured in parts per million (ppm).

Date	01-05 Jan	06 - 12 Jan	13 - 19 Jan	20 - 26 Jan	27 - 31 Jan
Mean	5.3	4.6	5.8	3.7	7.2
Standard deviation	2.6	1.8	1.2	1.0	1.7
Median	4.3	4.1	5.6	3.6	6.9
Minimum	1.5	1.8	3.5	1.8	4.2
Maximum	11.7	11.8	9.1	6.7	11.6

Table 2. Summary statistics for the outdoor NH_3 sensor, 01 January – 31 January 2018. NH_3 measured in parts per million (ppm).

Date	01-05 Jan	06 - 12 Jan	13 - 19 Jan	20 - 26 Jan	27 - 31 Jan
Mean	0.7	0.7	0.7	0.7	0.9
Standard deviation	0.5	0.5	0.4	0.4	0.5
Median	0.6	0.6	0.6	0.6	0.8
Minimum	0.3	0.3	0.3	0.3	0.4
Maximum	5.3	9.2	4.8	5.6	5.4

01 – 05 January 2019

During this week, indoor NH_3 concentration exhibited a pattern of diurnal variation for most of the week. Maximum indoor concentration was 11.7 ppm for this period. Mean and median values were 5.3 and 4.3 ppm. The outdoor NH_3 concentration levels showed consistent variation for most of the week with higher concentrations consistent with warmer temperatures. Maximum outdoor concentration was 5.3 ppm for this period. Mean and Median values were 0.7 and 0.6 ppm.

06 – 12 January 2019

During this week, indoor NH_3 concentration exhibited a pattern of diurnal variation for most of the week. Maximum indoor concentration was 11.8 ppm for this period. Mean and median values were 4.6 and 4.1 ppm. The outdoor NH_3 concentration levels showed consistent variation for most of the week with higher concentrations consistent with warmer temperatures. Maximum outdoor concentration was 9.2 ppm for this period. Mean and Median values were 0.7 and 0.6 ppm.

13 – 19 January 2019

During this week, indoor NH_3 concentration exhibited a pattern of diurnal variation for most of the week. Maximum indoor concentration was 9.1 ppm for this period. Mean and median values were 5.8 and 5.6 ppm. The outdoor NH_3 concentration levels showed consistent variation for most of the week with higher concentrations consistent with warmer temperatures. Maximum outdoor concentration was 4.8 ppm for this period. Mean and Median values were 0.7 and 0.6 ppm.

20 – 26 January 2019

During this week, indoor NH_3 concentration exhibited a pattern of diurnal variation for most of the week. Maximum indoor concentration was 6.7 ppm for this period. Mean and median values were 3.7 and 3.6 ppm. The outdoor NH_3 concentration levels showed consistent variation for

most of the week with higher concentrations consistent with warmer temperatures. Maximum outdoor concentration was 5.6 ppm for this period. Mean and Median values were 0.7 and 0.6 ppm.

27 – 31 January 2019

During these two days, indoor NH_3 concentration exhibited a pattern of diurnal variation for most of the week. Maximum indoor concentration was 11.6 ppm for this period. Mean and median values were 7.2 and 6.9 ppm. The outdoor NH_3 concentration levels showed consistent variation for most of the week with higher concentrations consistent with warmer temperatures. Maximum outdoor concentration was 5.4 ppm for this period. Mean and Median values were 0.9 and 0.8 ppm.

Summary

During the monitoring period (01 – 31 January) indoor NH_3 concentrations reached a maximum of 11.8 ppm, while mean and median concentrations were 7.2 and 6.9 ppm. These values are consistent with that expected of warmer weather conditions. Outdoor concentrations reached a maximum of 9.2 ppm, while mean and median concentrations were at 0.9 and 0.8 ppm. The higher values of NH_3 concentrations were recorded on days with higher maximum temperatures. Based on this data, temperature continues to be the most dominant control over NH_3 concentration.

Kind regards

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Land and Water Science Ltd

Dr Clint Rissmann
Director
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For public access to the real-time data go to: ***http://35.189.3.224:3000/login***
Log in email: gcc@photonicinJanations.com and use the **password:** Pa5%w

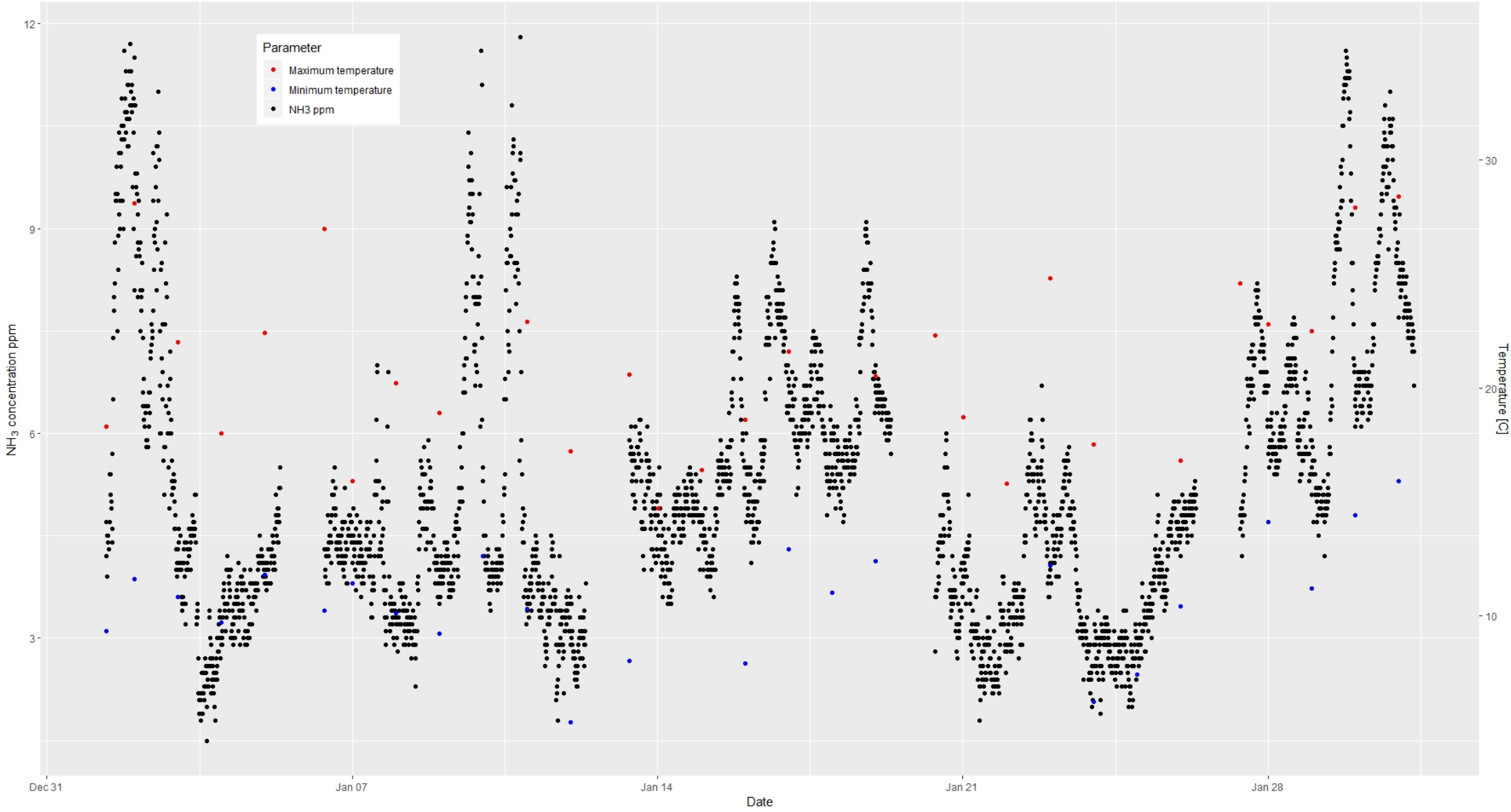

Figure 1: Continuous indoor NH_3 concentration, maximum daily temperature

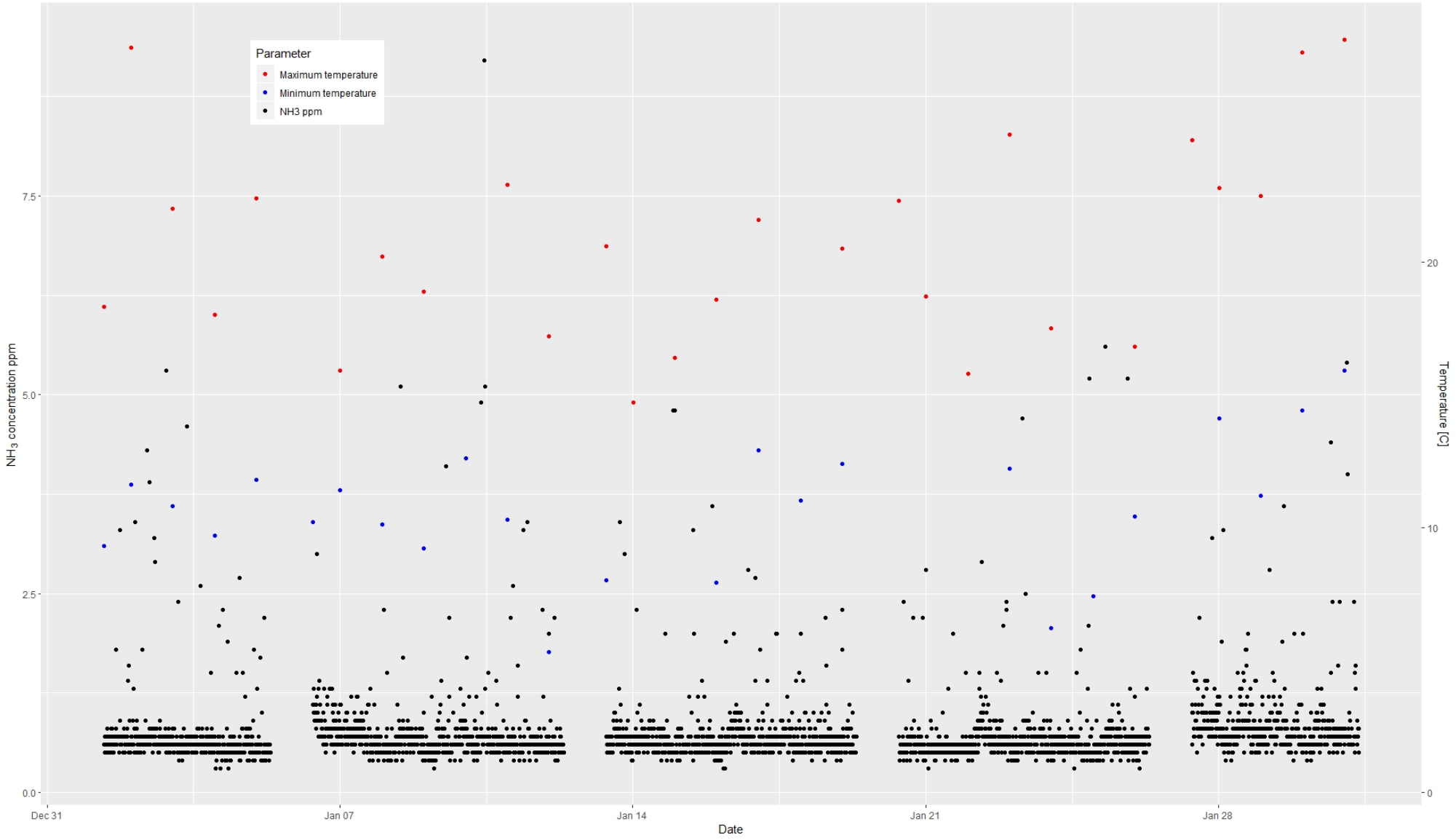

Figure 2: Continuous outdoor NH_3 concentration, maximum daily temperature