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Dear Stephen

RE: Weekly NH_3 Monitoring Report 27 May – 30 June 2018

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. In November 2017, Photonic Innovations (PI) installed two NH_3 Sensors for comparison of the indoor and outdoor ammonia levels. The outdoor sensor has been out of service since 18 March 2018. PI have rectified connectivity issues and are planning on re-installation of the outdoor sensor in early July 2018.

Weekly summaries of the indoor emission results from monitoring between 27 May and 30 June are presented in this report. During this period the maximum NH_3 concentration detected by the indoor sensor was 3.3 ppm (Figure 1 and Table 1). Mean and median NH_3 concentrations during this period were also 1.9 ppm.

While the outdoor sensor was disconnected the indoor sensor was used as a proxy for maximum outdoor NH_3 concentrations. Typically, indoor concentrations have exceeded outdoor, especially during warm days for which a pronounced diurnal emission pattern is evident (Figure 1). During June it is likely that outdoor concentrations were acceptable as the average indoor concentration was 1.9 ppm, well below the consent condition limit of 5 ppm.

Daily (diurnal) variation in NH_3 concentration shows is a consistent pattern in the data. Specifically, NH3 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 NH3 concentration for this reporting period is displayed in Figure 1.

Table 1. Summary statistics for the indoor NH_3 sensor, 27 May – 30 June 2018. NH_3 measured in parts per million (ppm).

Date	27 May - 2 June	3 - 9 June	10 - 16 June	17 - 23 June	24 - 30 June
Mean	1.8	1.8	2.0	2.0	1.9
Standard deviation	0.4	0.4	0.5	0.5	0.5
Median	1.8	1.8	2.0	2.0	1.9
Minimum	0.6	0.6	0.7	0.6	0.2
Maximum	3.2	3.1	3.3	3.3	3.3

27 May – 2 June 2018

During this week, indoor NH_3 concentration showed consistent diurnal variation for most of the week. Maximum indoor concentration was 3.2 ppm for this period. Mean and median values were both 1.8 ppm. Although the outdoor sensor wasn't working, historically indoor concentrations have exceeded outdoor concentrations. As the indoor concentration was below the outdoor limit of 5 ppm, it is likely the outdoor emissions during this monitoring period were below the outdoor limit.

3 – 9 June 2018

During this week, indoor NH_3 concentration showed consistent diurnal variation for most of the week. Maximum indoor concentration was 3.1 ppm for this period. Mean and median values were both 1.8 ppm. As the indoor concentration was below the outdoor limit of 5 ppm, it is likely the outdoor emissions during this monitoring period were below the outdoor limit.

10 – 16 June 2018

During this week, indoor NH_3 concentration showed consistent diurnal variation for most of the week. Maximum indoor concentration was 3.3 ppm for this period. Mean and median values were both 2.0 ppm. As the indoor concentration was below the outdoor limit of 5 ppm, it is likely the outdoor emissions during this monitoring period were below the outdoor limit.

17 – 23 June 2018

During this week, indoor NH_3 concentration showed consistent diurnal variation for most of the week. Maximum indoor concentration was 3.3 ppm for this period. Mean and median values were both 2.0 ppm. As the indoor concentration was below the outdoor limit of 5 ppm, it is likely the outdoor emissions during this monitoring period were below the outdoor limit.

24 – 30 June 2018

During this week, indoor NH_3 concentration showed consistent diurnal variation for most of the week. Maximum indoor concentration was 3.3 ppm for this period. Mean and median values were both 1.9 ppm. As the indoor concentration was below the outdoor limit of 5 ppm, it is likely the outdoor emissions during this monitoring period were below the outdoor limit.

Summary

The outdoor sensor has been disconnected for maintenance since 18 March 2018 and installation is planned by PI for July 2018. During the five-week monitoring period (27 May – 30 June) indoor NH_3 concentrations were a maximum of 3.3 ppm, while mean and median concentrations were 1.9 ppm. These values are consistent with that expected in the current cool weather conditions and there are no signs of increased NH_3 gas activity during this period. Based on this data, temperature appears to be the most dominant control over NH_3 concentration.

Kind regards,

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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@photonicinnovations.com and use the **password:** Pa5%w0rd

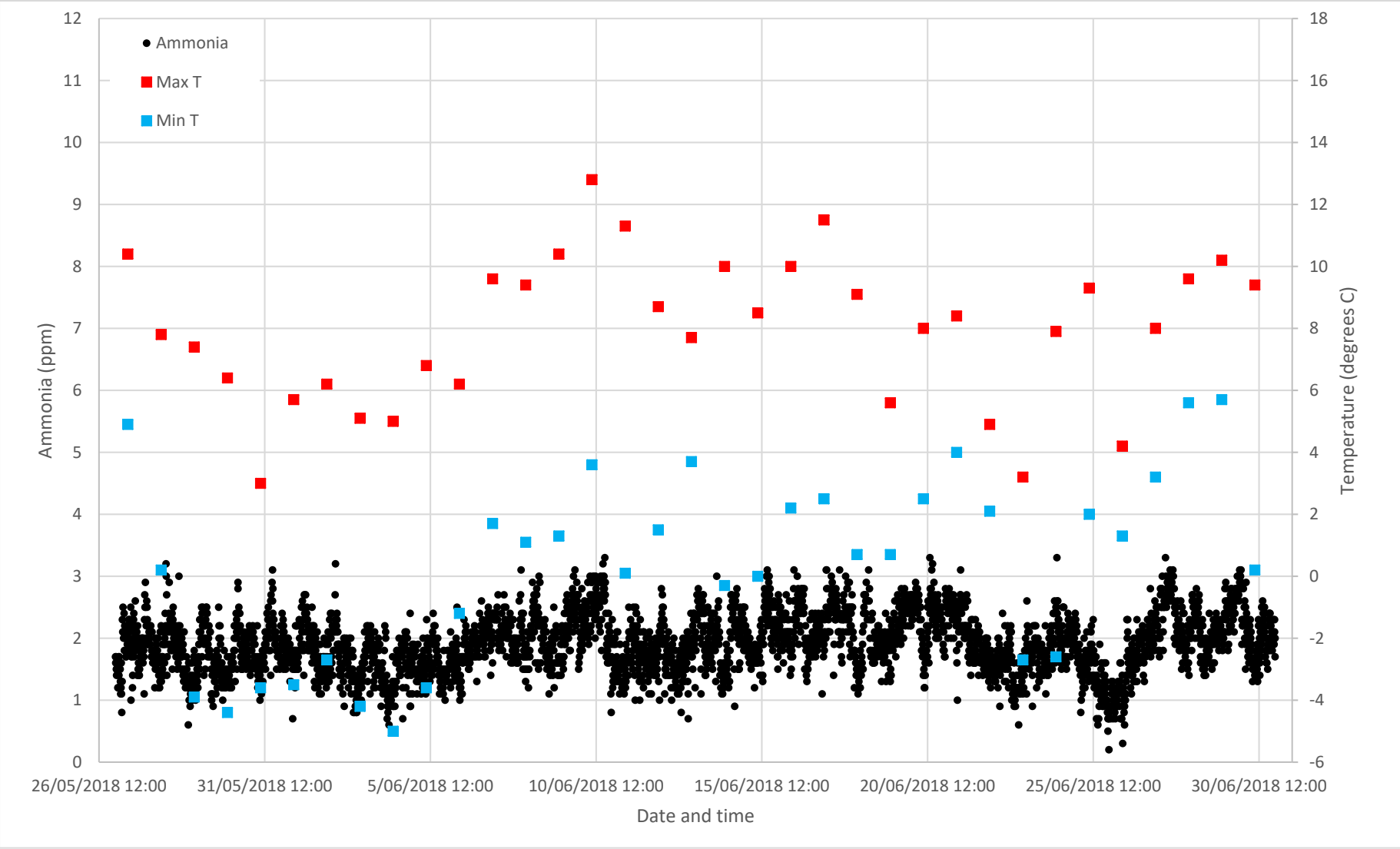

Figure 1: Continuous indoor NH_3 concentration, maximum daily temperature and minimum daily temperature, for the period 27 May – 30 June 2018.