Land and Water Science
90 Layard Street
Invercargill, 9810

Stephen Parry
Chief Executive
Gore District Council
PO Box 8
Gore, 9740

8th January 2021

Dear Stephen

RE: NH_3 Monitoring Report 1st December to 31st December 2020

Background

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) from May 2018. GDC require emission values to comply with consent conditions that specify a limit of 5 ppm NH_3 discharged to air.

In May 2017, Photonic Innovations (PI) installed two NH_3 sensors for comparison of the indoor and outdoor ammonia levels. Measurements were recorded continuously and reported as a 5-minute average for both the outdoor and indoor sensors. A dashboard to access this data is available in real time at http://35.213.230.53/d/CPQFoUvGz/gore-district-council?orgId=1&refresh=1m

December Summary

Weekly summaries of outdoor and indoor emission results from monitoring between 1 December and 31 December are presented in this report. During this period, the maximum NH_3 concentration detected by the outdoor sensor was 7.50 ppm (Figure 1 and Table 1). Maximum mean and median NH_3 concentrations during this period were 0.53 ppm and 0.40 ppm for the outdoor sensor. The maximum ammonia concentration remained below the consented amount of 5.00 ppm throughout December except for five exceedances following warm and calm days. Maximum mean and median NH_3 concentrations for the indoor sensor during this period were 3.78 ppm and 3.60 ppm.

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. Calm days also impact the maximum NH_3 concentrations due to the absence of air movement near the area being monitoring. The correlation between air temperature and NH_3 concentration for this reporting period is displayed in Figure 1.

Table 1. Summary statistics for the Outdoor NH3 sensor, 1 December – 31 December 2020. NH3 measured in parts per million (ppm).

Date	1-6 Dec	7-13 Dec	14-20 Dec	21-27 Dec	28-31 Dec
Mean	0.42	0.53	0.48	0.46	0.47
Std Dev	0.09	0.51	0.40	0.47	0.35
Median	0.40	0.40	0.40	0.40	0.40
Minimum	0.20	0.20	0.10	0.10	0.10
Maximum	0.70	5.60	3.80	7.50	5.50

Table 2. Summary statistics for the Indoor NH_3 sensor, 1 December – 31 December 2020. NH_3 measured in parts per million (ppm).

Date	1-6 Dec	7-13 Dec	14-20 Dec	21-27 Dec	28-31 Dec
Mean	2.69	2.93	3.44	2.95	3.78
Std Dev	0.72	1.21	1.22	1.06	1.13
Median	2.70	3.00	3.10	2.80	3.60
Minimum	1.30	0.70	1.00	0.90	1.30
Maximum	5.50	6.40	7.00	7.30	6.70

1 – 6 December 2020

Outdoor NH_3 concentration levels were relatively low with an increase in concentrations consistent with warmer temperatures near the end of the week. The maximum outdoor concentration was 0.70 ppm for this period. Outdoor mean and median values were 0.42 and 0.40 ppm, respectively.

Indoor NH_3 concentration levels recorded a mean of 2.69 ppm and a median of 2.70 ppm. The maximum indoor concentration was 5.50 ppm for this period.

7 – 13 December 2020

Outdoor NH_3 concentration levels reflected the increasing air temperatures this week with some higher concentrations being recorded after a few days of warm weather. The maximum outdoor concentration was 5.60 ppm for this period. Mean and median values were 0.53 ppm and 0.40 ppm respectively.

Indoor NH_3 concentration levels recorded a mean of 2.93 ppm and a median of 3.00 ppm. The maximum indoor concentration was 6.40 ppm for this period.

14 – 20 December 2020

Outdoor NH_3 concentration levels were initially elevated, followed by declining values when temperatures fell earlier in the week. The maximum outdoor concentration was 3.8 ppm for this period. Mean and median values were 0.48 and 0.40 ppm respectively.

Indoor NH_3 concentration levels recorded a mean of 3.44 ppm and a median of 3.10 ppm. The maximum indoor concentration was 7.00 ppm for this period.

21 – 27 December 2020

Outdoor NH_3 concentration levels were relatively consistent at lower concentrations until the end of the week when values increased in response to increasing air temperatures and calmer conditions. The maximum outdoor concentration was 7.50 ppm for this period. Mean and median values were 0.46 and 0.40 ppm respectively.

Indoor NH_3 concentration levels recorded a mean of 3.78 ppm and a median of 3.60 ppm. The maximum indoor concentration was 7.30 ppm for this period after air temperatures climbed during the week.

28 – 31 December 2020

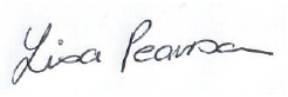
Outdoor NH_3 concentration levels contained some higher concentrations consistent with warmer air temperatures and light winds. The maximum outdoor concentration was 5.50 ppm for this period. Mean and median values were 0.47 and 0.40 ppm respectively.

Indoor NH_3 concentration levels recorded a mean of 3.78 ppm and a median of 3.60 ppm. The maximum indoor concentration was 6.70 ppm for this period.

Summary

During the monitoring period (1 Dec – 31 Dec 2020) Outdoor NH_3 concentrations reached a maximum of 7.5 ppm, while maximum mean and median concentrations were 0.53 and 0.40 ppm respectively. The outdoor sensor exceeded the consent condition of 5.00 ppm on five occasions in December during days that experienced warm and calm conditions. Overall, temperature continues to be the most dominant control over NH_3 concentration.

Kind regards



Dianne Elliotte
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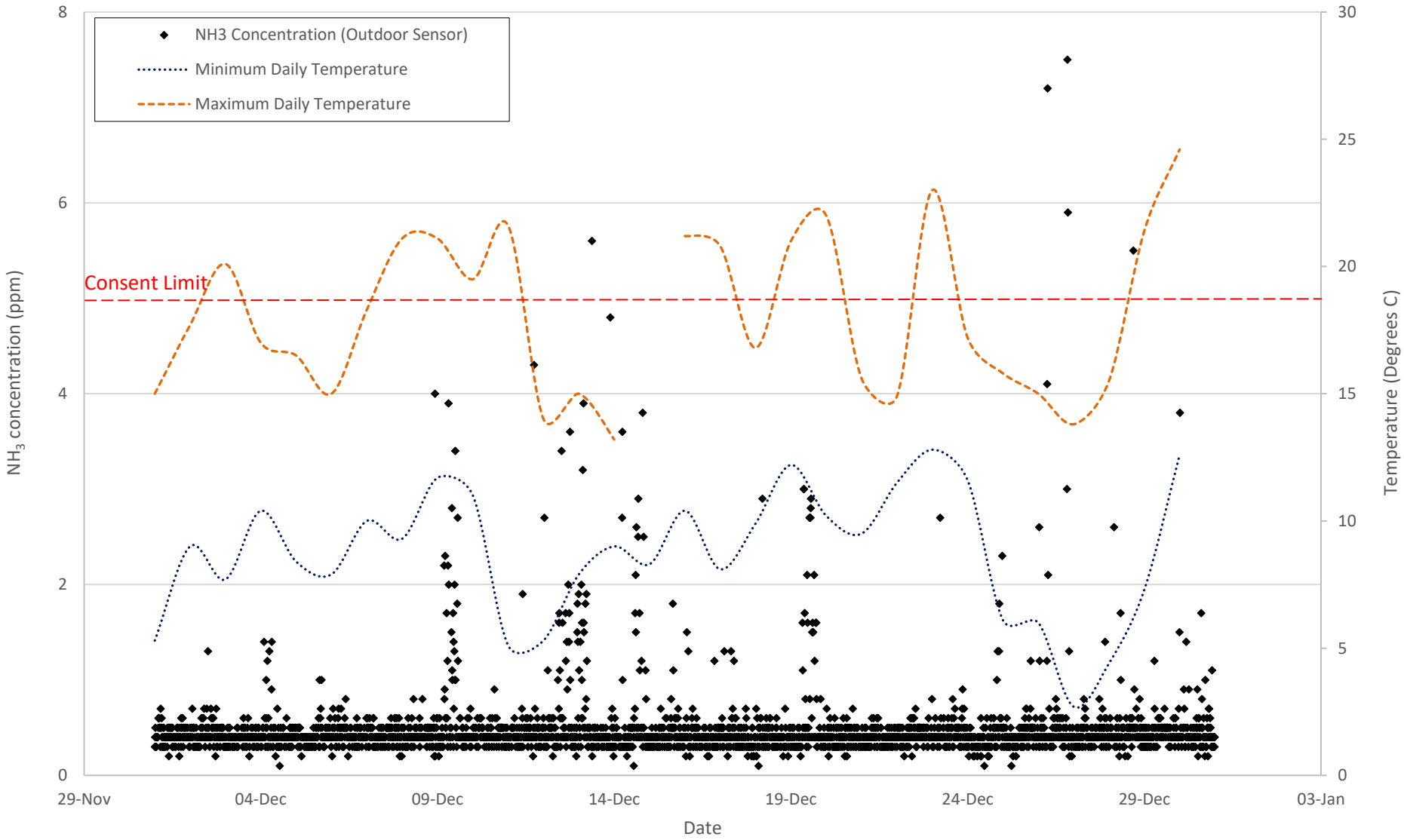

Figure 1: Continuous outdoor NH_3 concentration, minimum and maximum daily temperature. Temperature data is sourced from NIWA climate station AWS Gore 5778.

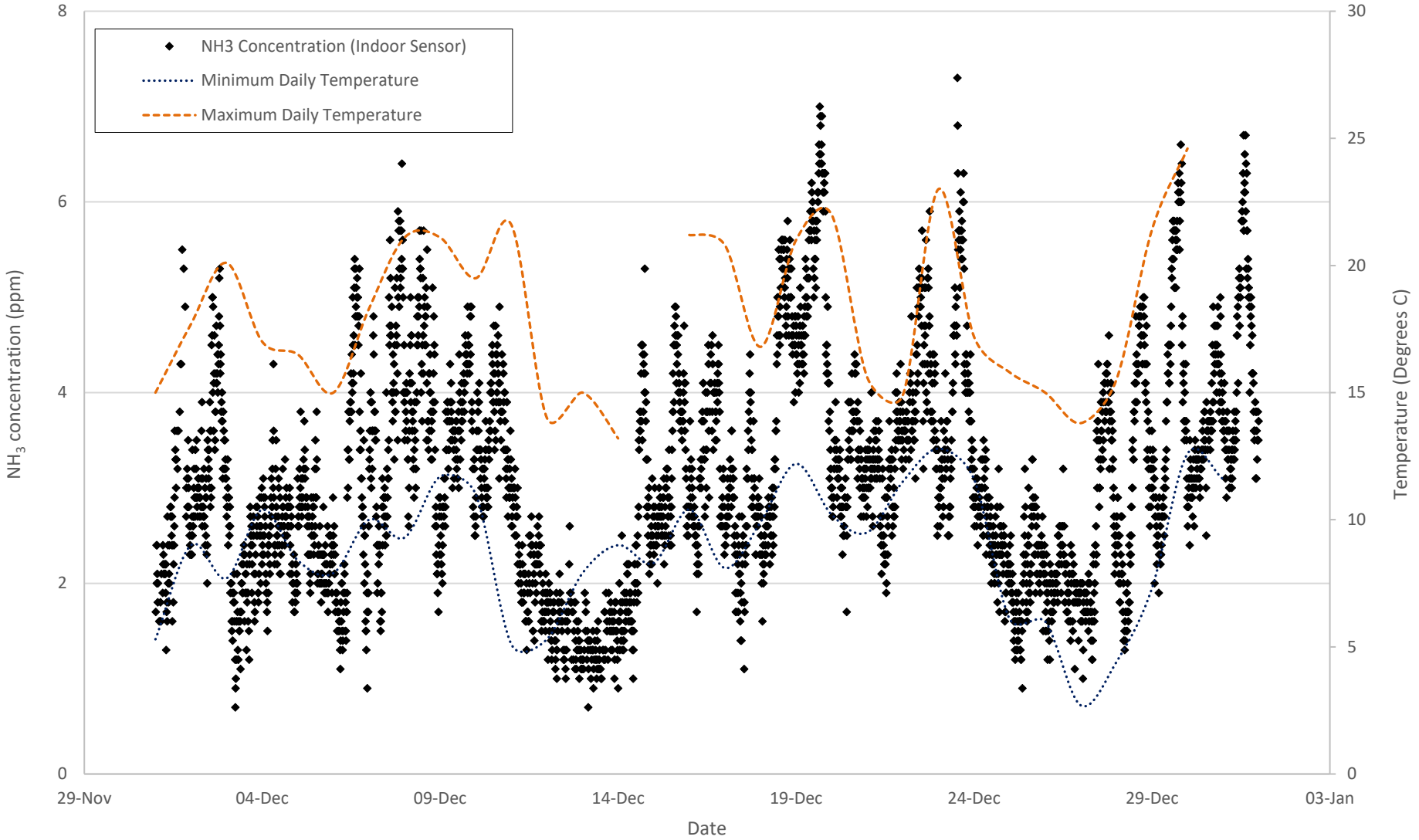

Figure 2: Continuous indoor NH_3 concentration, minimum and maximum daily temperature. Temperature data is sourced from NIWA climate station AWS Gore 5778.