

# 30/06/2018 PM<sub>2.5</sub> Exceedance Report

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# 1 BACKGROUND

In accordance with the Waterview Connection BOI Operational Air Quality Conditions, the NZTA is required to undertake ambient air quality monitoring in real time to monitor potential effects associated with the operation of the ventilation system from the tunnels. Ambient monitoring includes fine particulates (PM<sub>10</sub> and PM<sub>2.5</sub>) and nitrogen dioxide. Results are to be compared with the relevant National Environmental Standards for air quality and/or the Auckland Regional Air Quality Targets.

The location of the ambient monitoring stations is shown in Appendix A.

Condition OA.5 requires that if the monitoring shows that concentrations of contaminants in ambient air at the monitoring locations exceeds the relevant standards, then the NZTA shall undertake an investigation into the cause of the exceedance and report this to the Peer Review Panel and the Major Infrastructure Team Manager, Auckland Council.

On the 30<sup>th</sup> June 2018, both North and South stations registered a daily average of 27.00 µg/m<sup>3</sup> and 26.38 µg/m<sup>3</sup> respectively for PM<sub>2.5</sub>, exceeding the 25 µg/m<sup>3</sup> limit set in the Regional Air Quality targets.

# 2 DATA ANALYSIS

The relevant data is included in Appendix B and includes:

- Waterview daily summary report 30/06/2018 of Hourly and daily averages of NO<sub>2</sub>, PM<sub>2.5</sub> and PM<sub>10</sub>.
- Waterview daily summary report 02/07/2018 of Hourly and daily averages of NO<sub>2</sub>, PM<sub>2.5</sub> and PM<sub>10</sub>.
- Graphs of Hourly PM<sub>2.5</sub> vs Temperature vs Traffic Volumes.

Analysis of the data shows that the PM<sub>2.5</sub> hourly concentrations above the limit of 25 µg/m<sup>3</sup> happened before 4am and after 10pm, when the traffic inside both the Southbound and Northbound Tunnels was very low, under 900 vehicles/hour in the evening and 200 vehicles/hour in the morning. The exceedance also coincided with the temperatures dropping below 5°C in the North and 4°C in the South.

These conditions are very similar to the PM<sub>2.5</sub> exceedance in the first month of operation on the 16<sup>th</sup> July 2017.

The NO<sub>2</sub> concentrations, following the traffic data, don't show any relevant increase during the periods of high PM<sub>2.5</sub> concentrations.

There was very little wind on the night, like that of the previous 3 days, so wind speed and direction don't seem to be relevant factors.

The period from the night of the 26<sup>th</sup> June to the morning of the 1<sup>st</sup> July (5 nights), registered the lowest temperatures so far for the winter, reaching temperatures as low as 0°C. This, combined with the fact that the PM<sub>2.5</sub> concentration kept increasing while the traffic numbers were very low, indicates that tunnel traffic is not the cause for the exceedance.

The graphs of hourly concentrations for PM<sub>2.5</sub> vs Temperature vs Traffic from the 26<sup>th</sup> June to the 1<sup>st</sup> July indicate the conditions and relationships of the PM<sub>2.5</sub> increases and the minimal effect of the tunnel traffic. The night time temperatures from the start of the 26<sup>th</sup> June 2018 were significantly colder as can

be seen in the NORTH and SOUTH PM<sub>2.5</sub> ( $\mu\text{g}/\text{m}^3$ ) HOURLY CONCENTRATION VS TEMPERATURE graph with a corresponding increase in the PM<sub>2.5</sub> as the temperature decreases.

In Appendix B the Waterview daily summary report 02/07/2018 shows the increased daily average of PM<sub>2.5</sub> from Wednesday the 27<sup>th</sup> June with PM<sub>2.5</sub> nearing the exceedance limit from the effect of the colder nights.

After the exceedance on the 30<sup>th</sup> June 2018 the night time temperature increased and the daily average of PM<sub>2.5</sub> returned to normal levels.

### 3 CONCLUSION

The most probable cause for the PM<sub>2.5</sub> concentration exceedance registered on the 30<sup>th</sup> June 2018 is domestic smoke and general pollution, similar to the elevated levels seen during the baseline monitoring prior to the tunnel opening, as shown in Appendix C and from the report of the exceedance on the 16/07/2017.

The days the 27<sup>th</sup> and 28<sup>th</sup> June 2018 showed both stations registering a daily average of greater than 22  $\mu\text{g}/\text{m}^3$ , getting close to the limit as these nights were cooler.

The NO<sub>2</sub> pollution roses indicate that the main source of NO<sub>2</sub> is traffic emissions. The PM<sub>10</sub> and PM<sub>2.5</sub> pollution roses indicate that the main sources are domestic heating emissions in addition to traffic emissions.

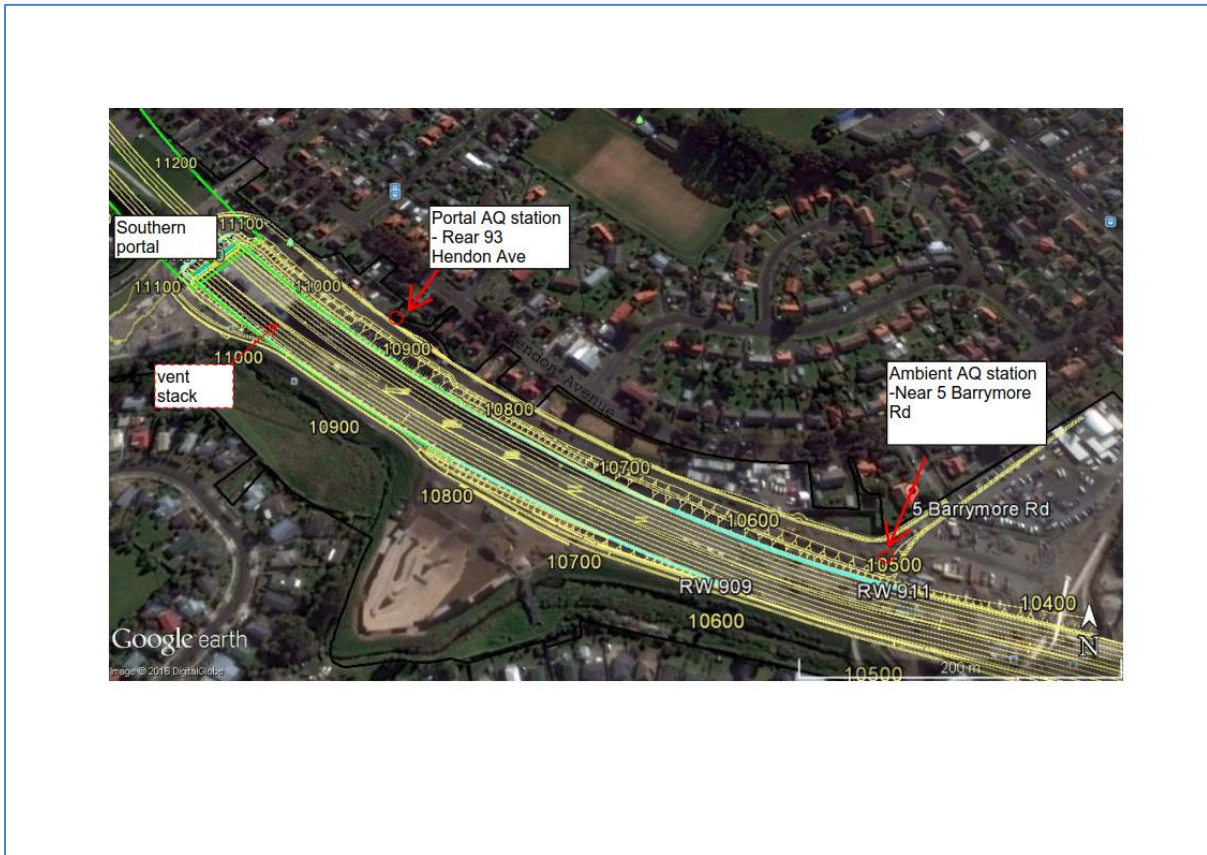
It is also recognised that domestic heating emissions will tend to occur predominantly in the cooler months and general pollution from Auckland City has an effect as with the cooler nights there is usually less wind and an inversion layer forms that is unable to disperse the pollution.

# APPENDIX A

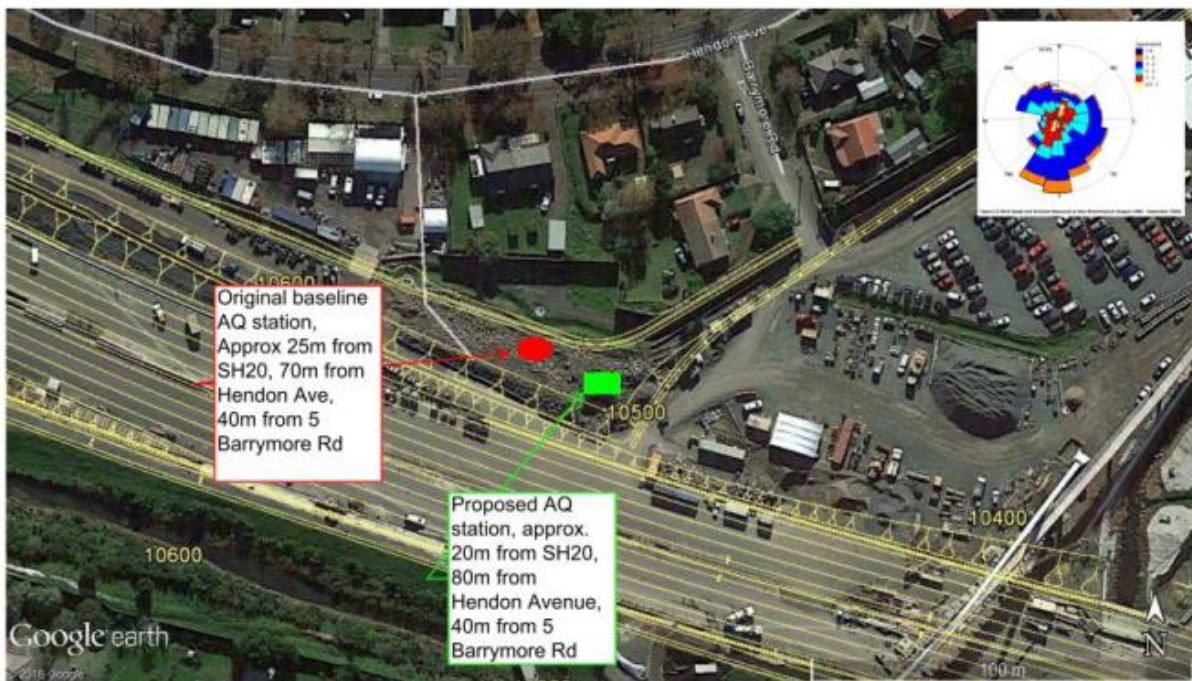
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## Air Quality Monitoring Stations

# AIR QUALITY MONITORING STATIONS



*Location of portal and southern Air Quality monitoring stations*



*Location of southern Air Quality monitoring station*



Location of northern Air Quality monitoring station

## APPENDIX B

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Waterview daily summary report 30/06/2018

Waterview daily summary report 02/07/2018

Graphs PM<sub>2.5</sub> vs Temperature vs Traffic



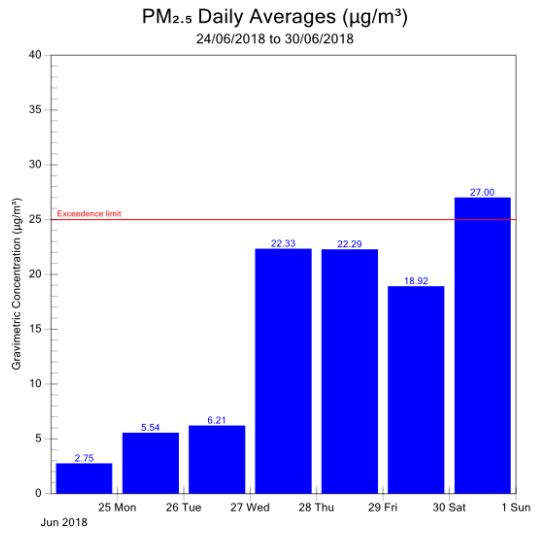
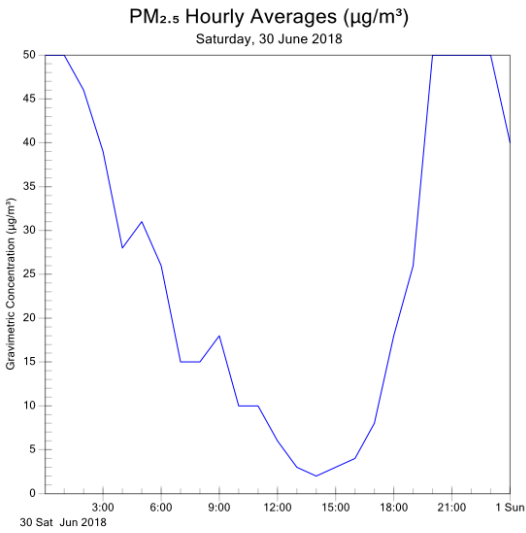
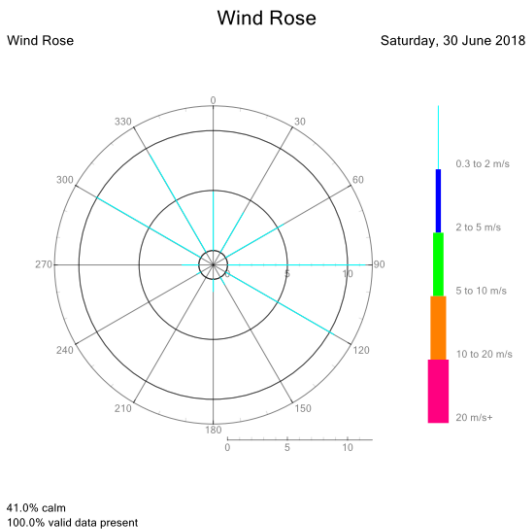
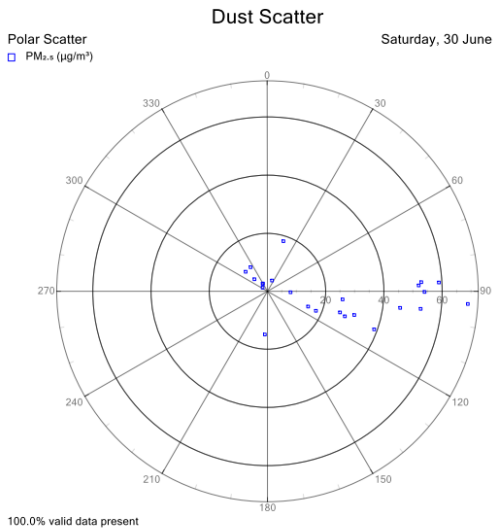
# WATERVIEW DAILY SUMMARY REPORT 30/06/2018

## Waterview North Non-Validated Daily Summary Report PM<sub>2.5</sub> (µg/m<sup>3</sup>)

Date	Daily Average
30/06/2018	27

Maximum (Hourly)	69
Hour ending	22:00

Minimum (Hourly)	2
Hour ending	15:00



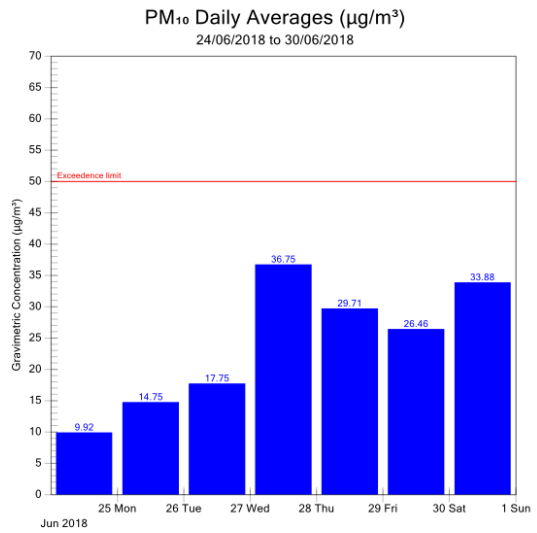
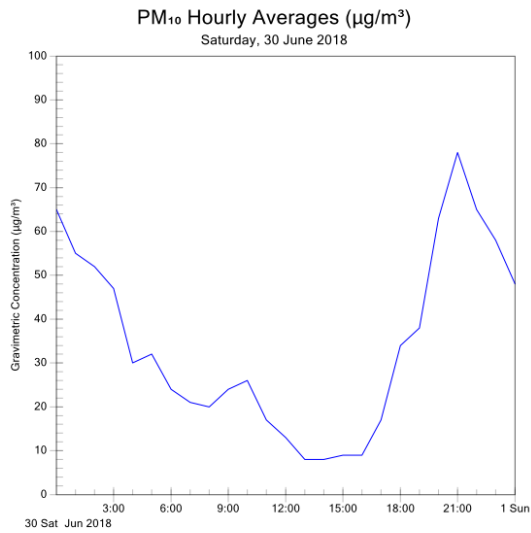
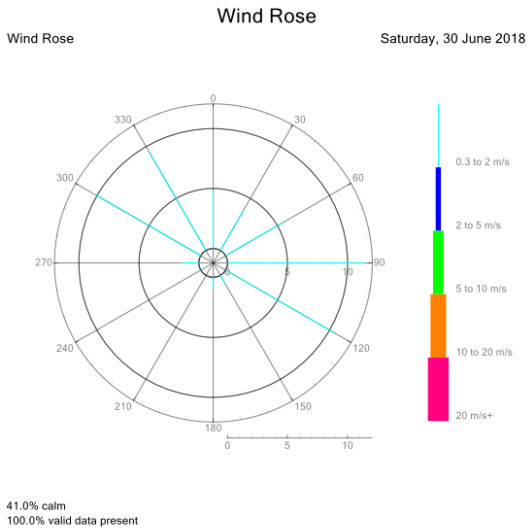
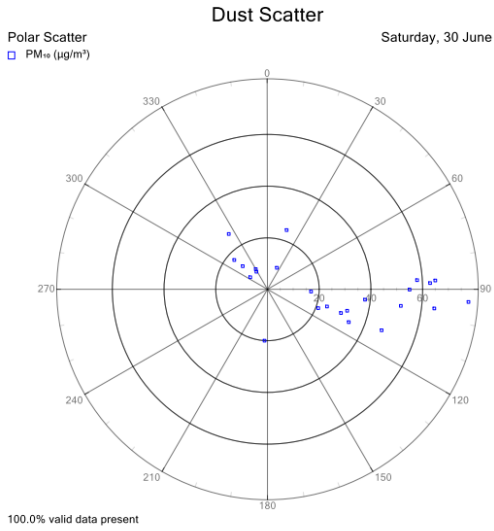
**Note: The data presented in this report has not been validated and is subject to change in the monthly validated report. All dates/times used in this report are NZST.**

## Waterview North Non-Validated Daily Summary Report PM<sub>10</sub> (µg/m<sup>3</sup>)

Date	Daily Average
30/06/2018	34

Maximum (Hourly)	78
Hour ending	22:00

Minimum (Hourly)	8
Hour ending	14:00



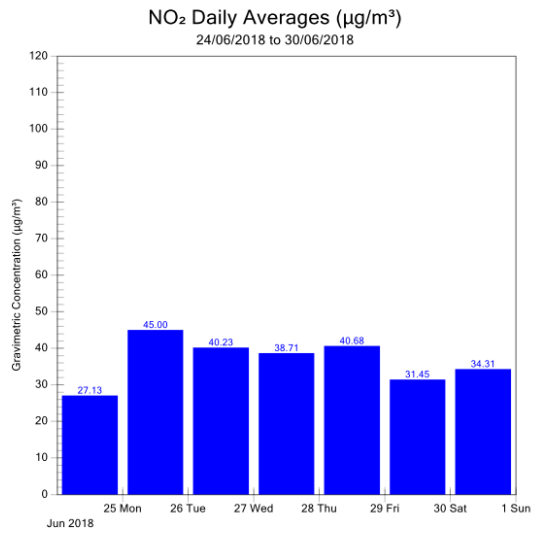
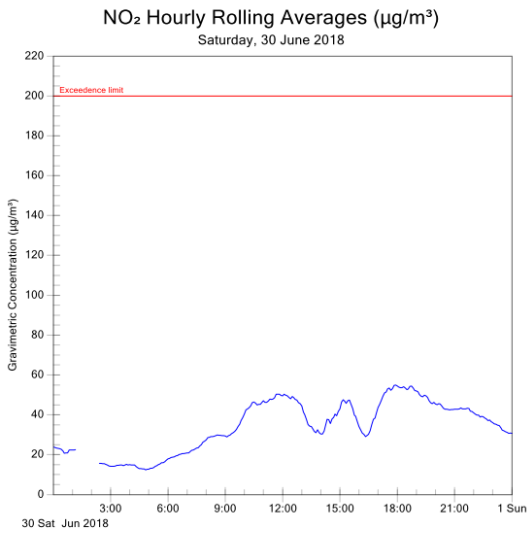
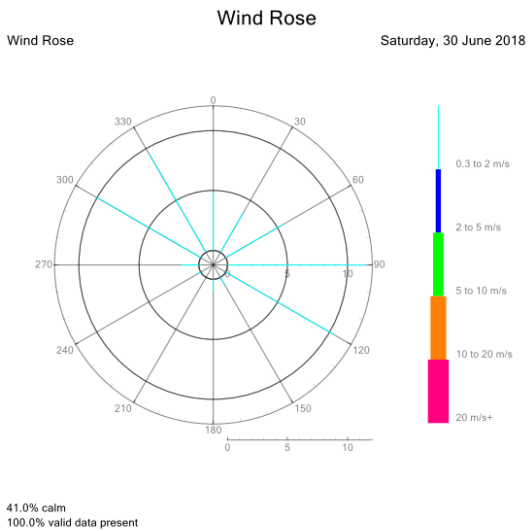
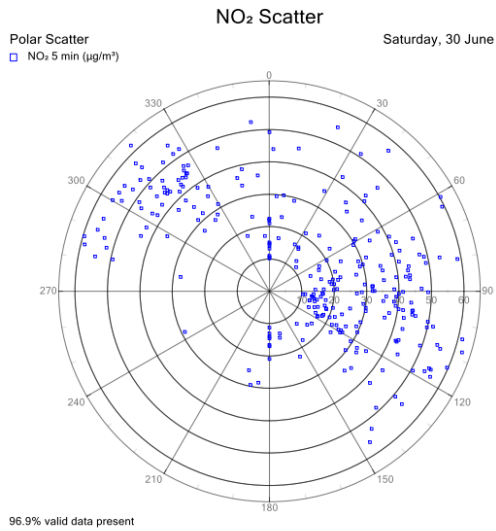
**Note: The data presented in this report has not been validated and is subject to change in the monthly validated report. All dates/times used in this report are NZST.**

## Waterview North Non-Validated Daily Summary Report NO<sub>2</sub> (µg/m<sup>3</sup>)

Date	Daily Average
30/06/2018	34.3

Maximum (Hourly)	62.4
Hour ending	18:00

Minimum (Hourly)	12.6
Hour ending	05:00



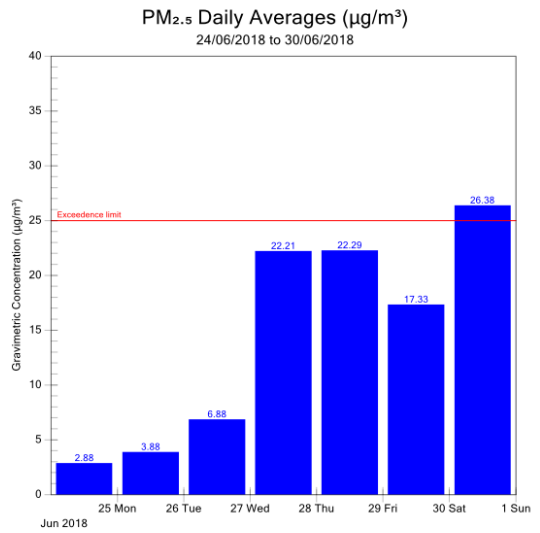
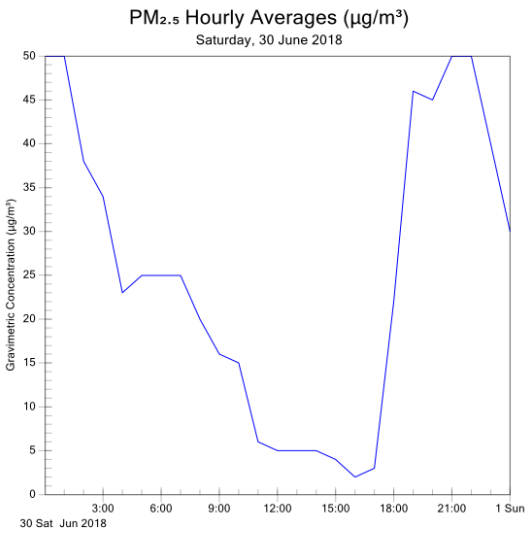
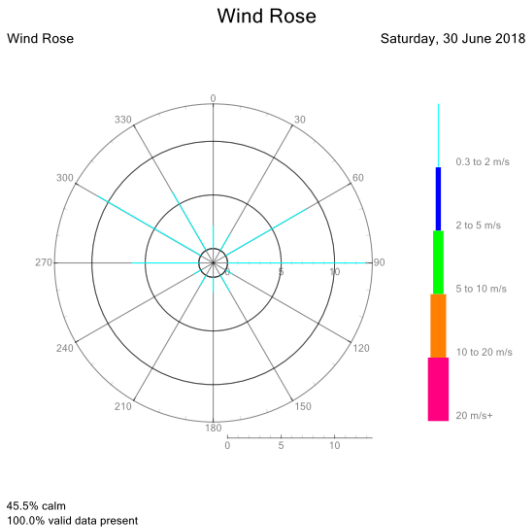
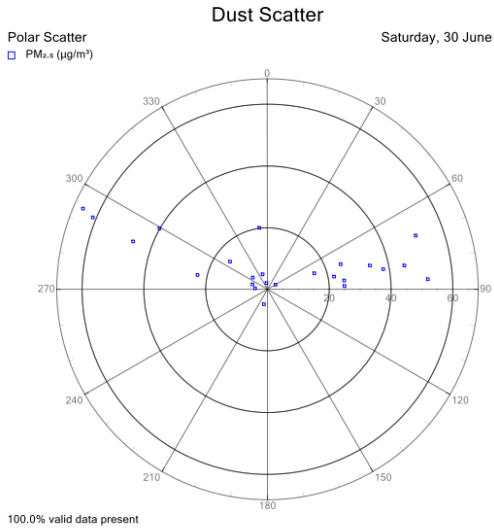
**Note: The data presented in this report has not been validated and is subject to change in the monthly validated report. All dates/times used in this report are NZST.**

## Waterview South Non-Validated Daily Summary Report PM<sub>2.5</sub> (µg/m<sup>3</sup>)

Date	Daily Average
30/06/2018	26

Maximum (Hourly)	65
Hour ending	23:00

Minimum (Hourly)	2
Hour ending	17:00



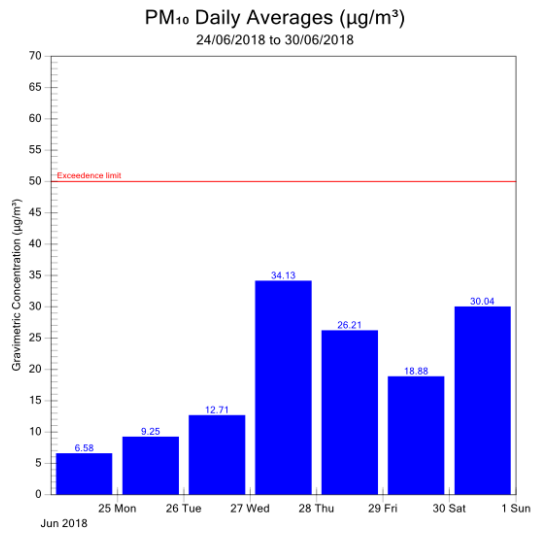
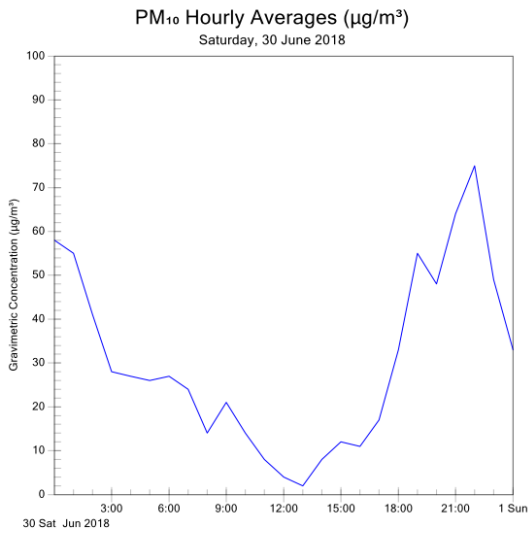
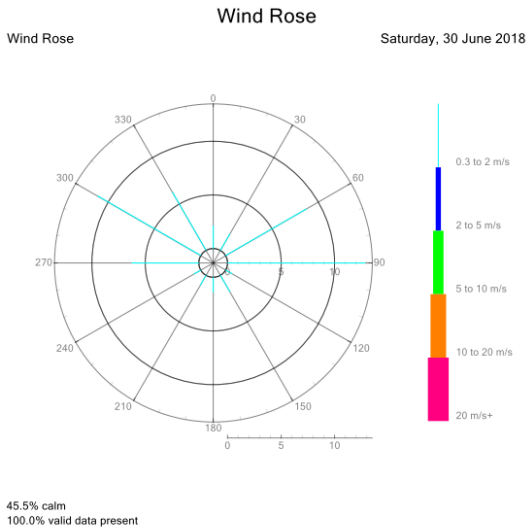
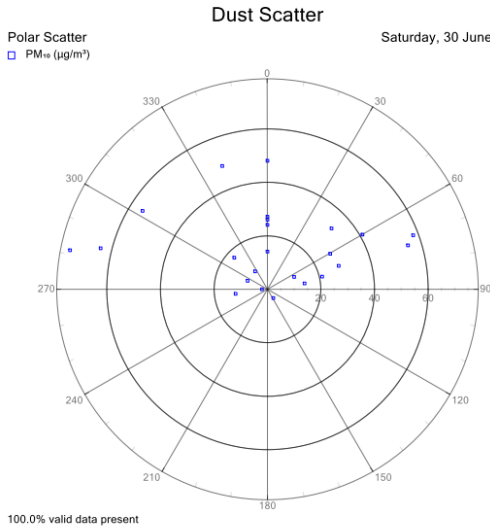
**Note: The data presented in this report has not been validated and is subject to change in the monthly validated report. All dates/times used in this report are NZST.**

## Waterview South Non-Validated Daily Summary Report PM<sub>10</sub> (µg/m<sup>3</sup>)

Date	Daily Average
30/06/2018	30

Maximum (Hourly)	75
Hour ending	23:00

Minimum (Hourly)	2
Hour ending	14:00



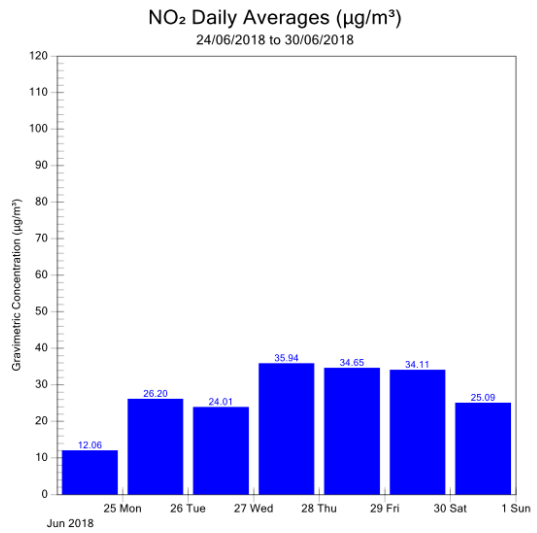
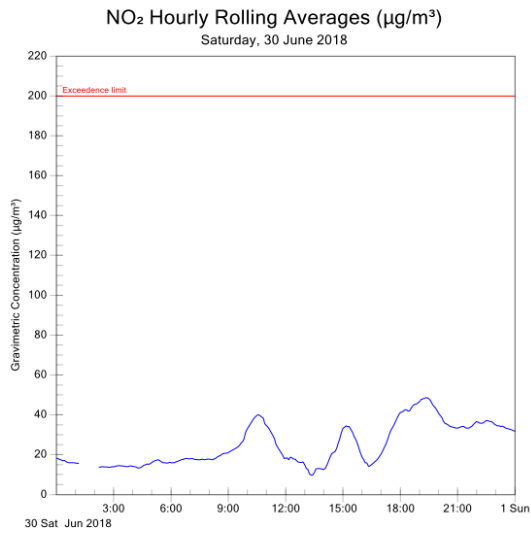
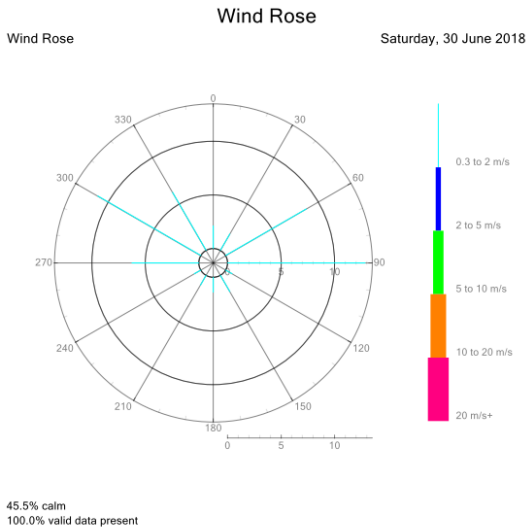
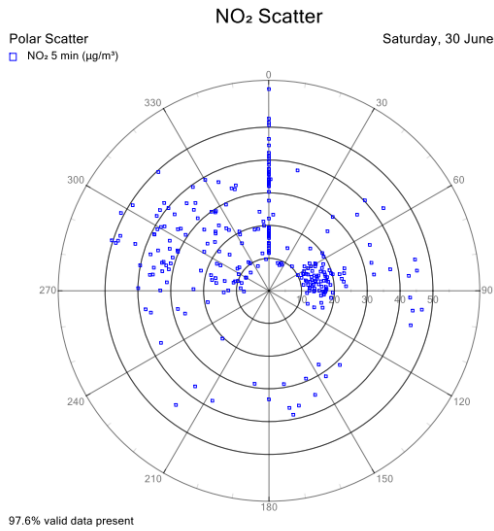
**Note: The data presented in this report has not been validated and is subject to change in the monthly validated report. All dates/times used in this report are NZST.**

## Waterview South Non-Validated Daily Summary Report NO<sub>2</sub> (µg/m<sup>3</sup>)

Date	Daily Average
30/06/2018	25.1

Maximum (Hourly)	61.6
Hour ending	10:00

Minimum (Hourly)	12.8
Hour ending	14:00



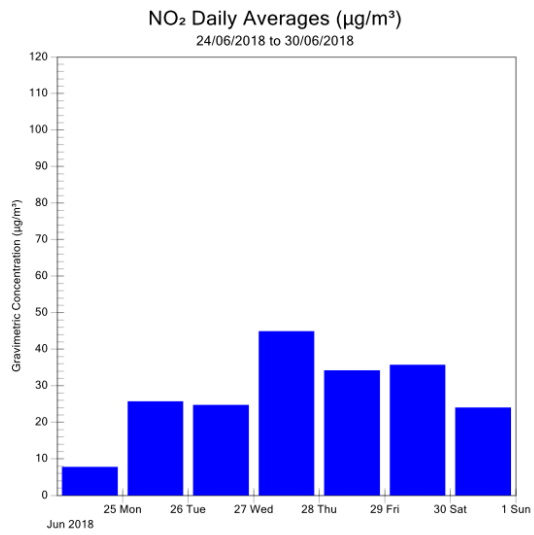
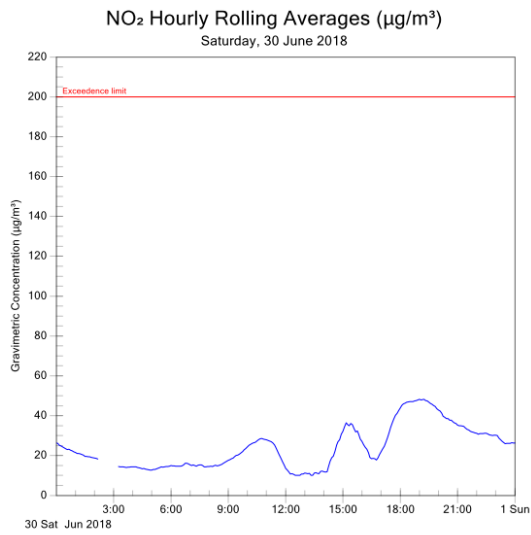
**Note: The data presented in this report has not been validated and is subject to change in the monthly validated report. All dates/times used in this report are NZST.**

## Waterview Portal Non-Validated Daily Summary Report NO<sub>2</sub> (µg/m<sup>3</sup>)

Date	Daily Average
30/06/2018	24.1

Maximum (Hourly)	50.0
Hour ending	20:00

Minimum (Hourly)	10.8
Hour ending	13:00



**Note: The data presented in this report has not been validated and is subject to change in the monthly validated report. All dates/times used in this report are NZST.**

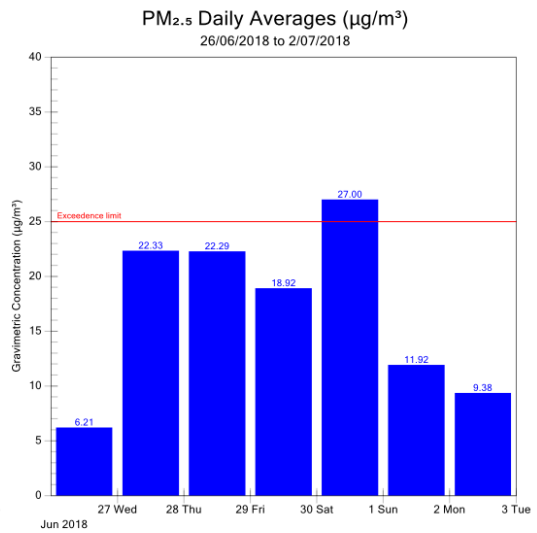
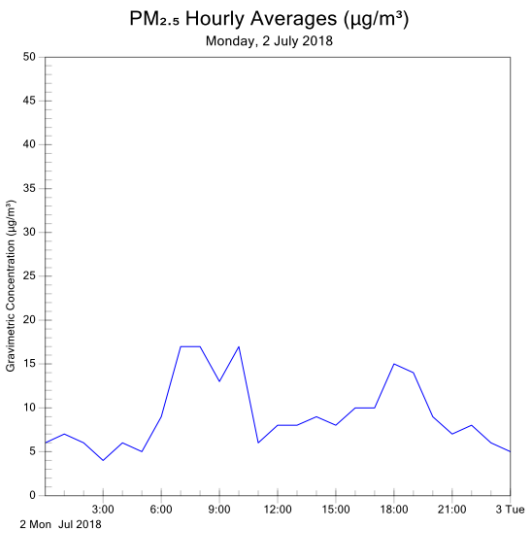
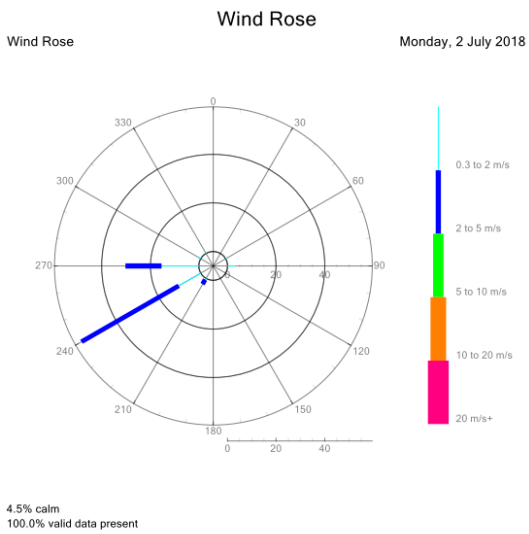
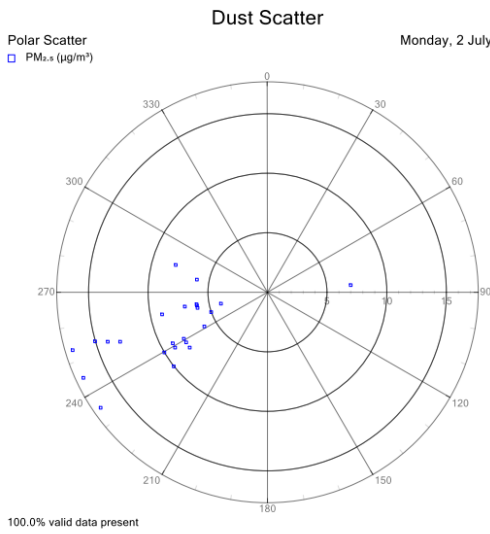
# WATERVIEW DAILY SUMMARY REPORT 02/07/2018

## Waterview North Non-Validated Daily Summary Report PM<sub>2.5</sub> (µg/m<sup>3</sup>)

Date	Daily Average
2/07/2018	9

Maximum (Hourly)	17
Hour ending	08:00

Minimum (Hourly)	4
Hour ending	04:00



**Note: The data presented in this report has not been validated and is subject to change in the monthly validated report. All dates/times used in this report are NZST.**

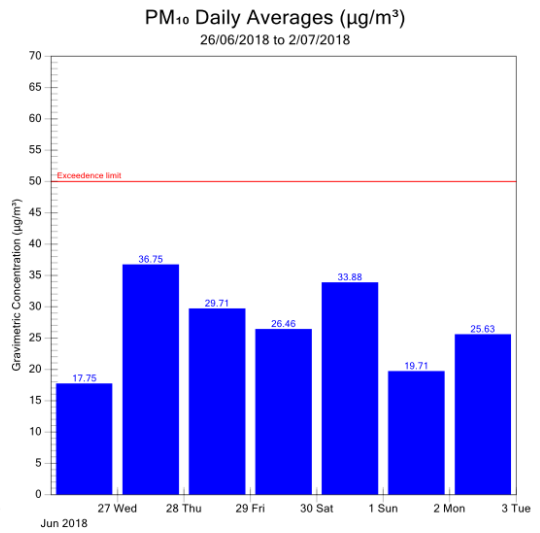
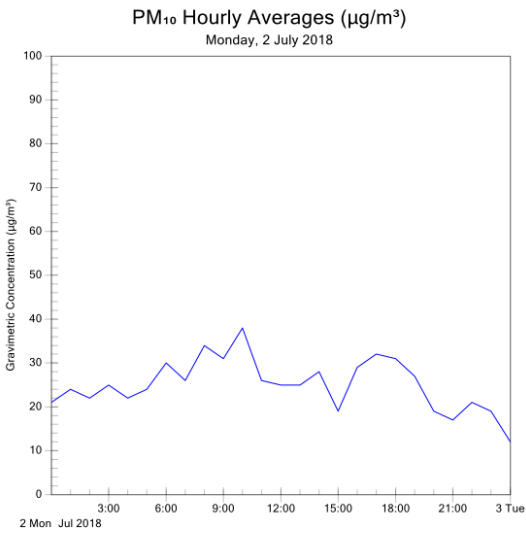
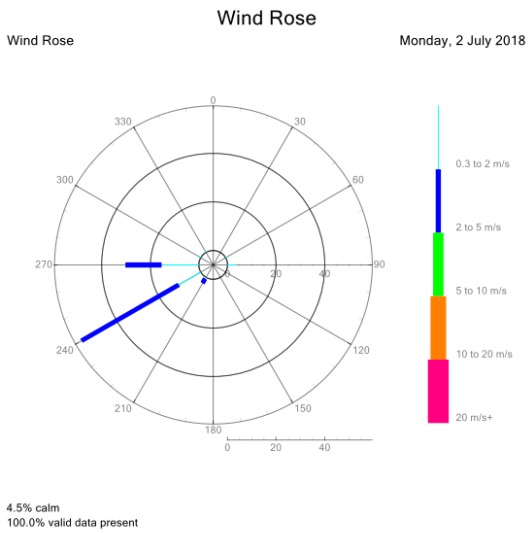
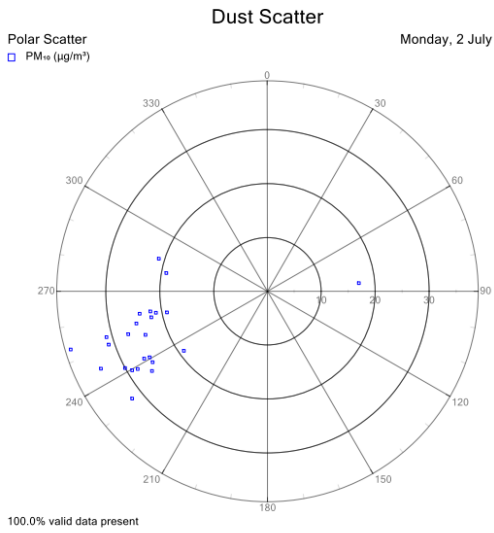


## Waterview North Non-Validated Daily Summary Report PM<sub>10</sub> (µg/m<sup>3</sup>)

Date	Daily Average
2/07/2018	26

Maximum (Hourly)	38
Hour ending	11:00

Minimum (Hourly)	17
Hour ending	22:00



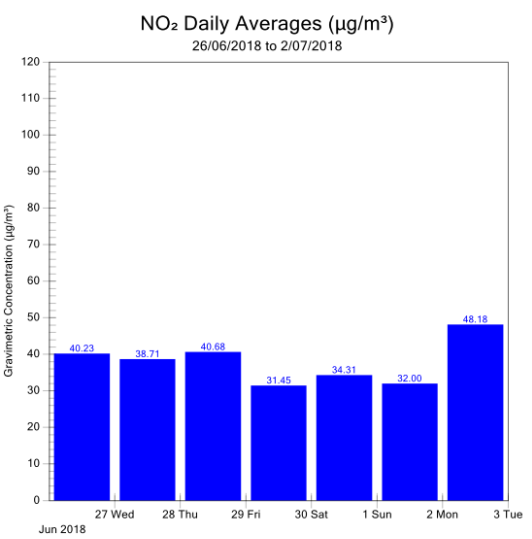
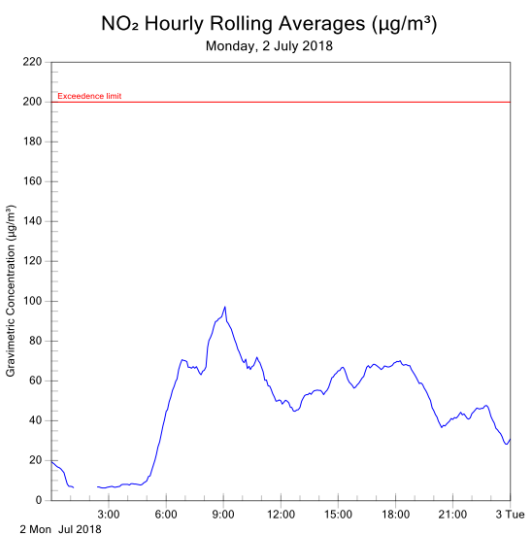
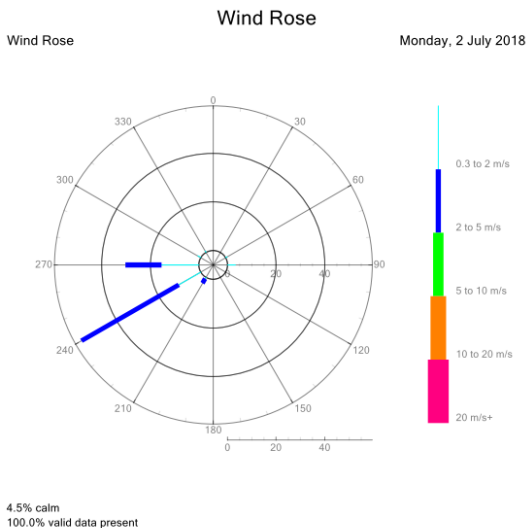
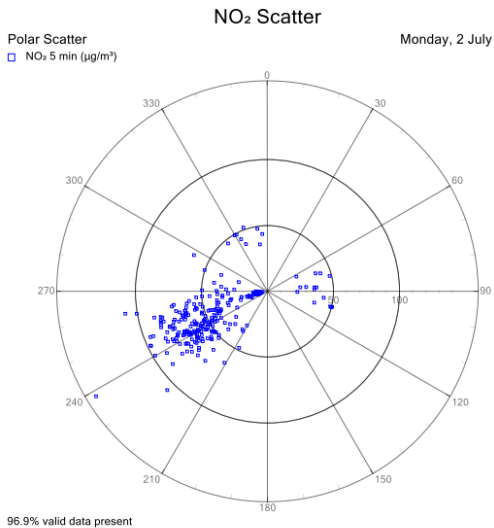
**Note: The data presented in this report has not been validated and is subject to change in the monthly validated report. All dates/times used in this report are NZST.**

## Waterview North Non-Validated Daily Summary Report NO<sub>2</sub> (µg/m<sup>3</sup>)

Date	Daily Average
2/07/2018	48.2

Maximum (Hourly)	152.1
Hour ending	09:00

Minimum (Hourly)	6.7
Hour ending	03:00



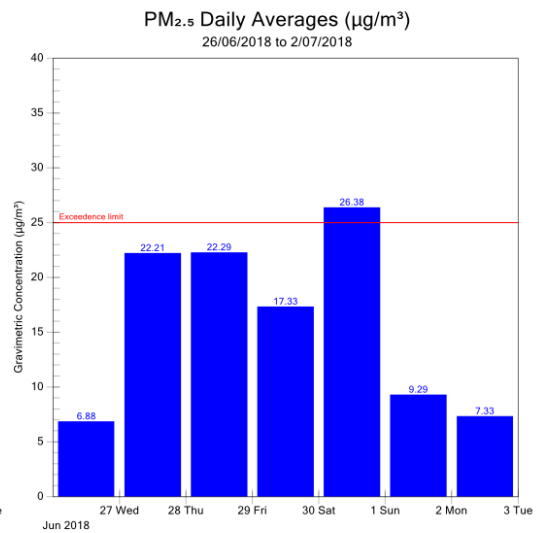
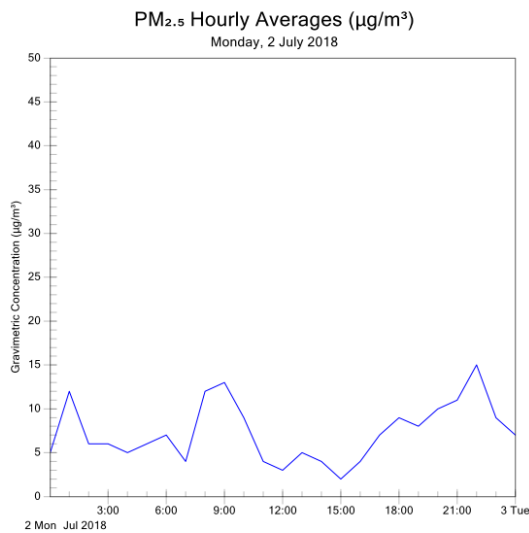
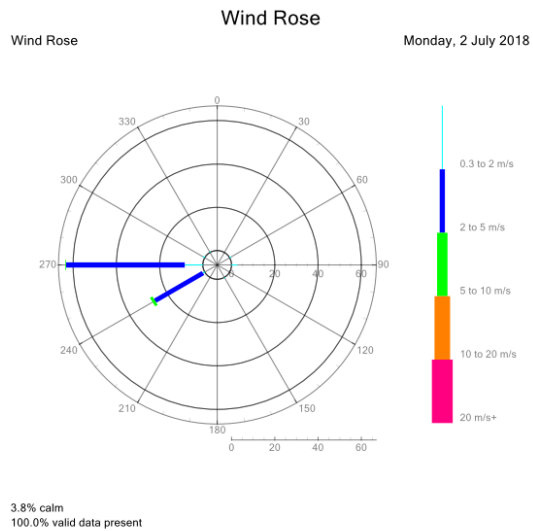
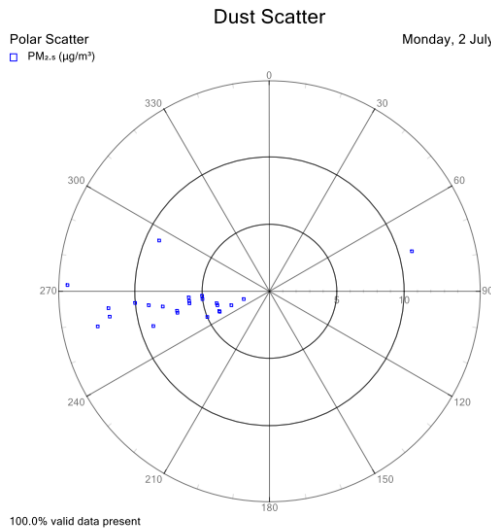
**Note: The data presented in this report has not been validated and is subject to change in the monthly validated report. All dates/times used in this report are NZST.**

## Waterview South Non-Validated Daily Summary Report PM<sub>2.5</sub> (µg/m<sup>3</sup>)

Date	Daily Average
2/07/2018	7

Maximum (Hourly)	15
Hour ending	23:00

Minimum (Hourly)	2
Hour ending	16:00



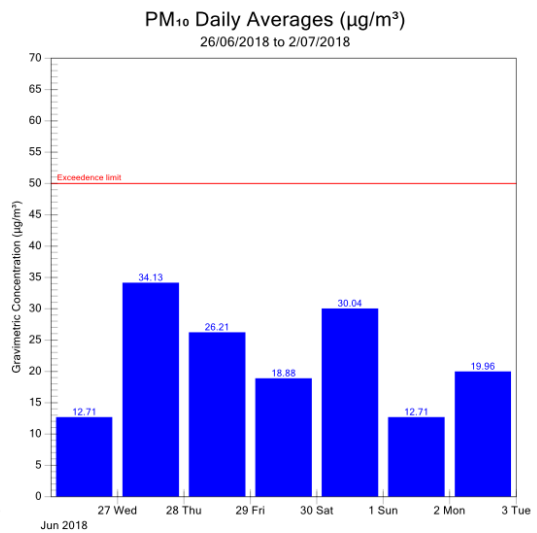
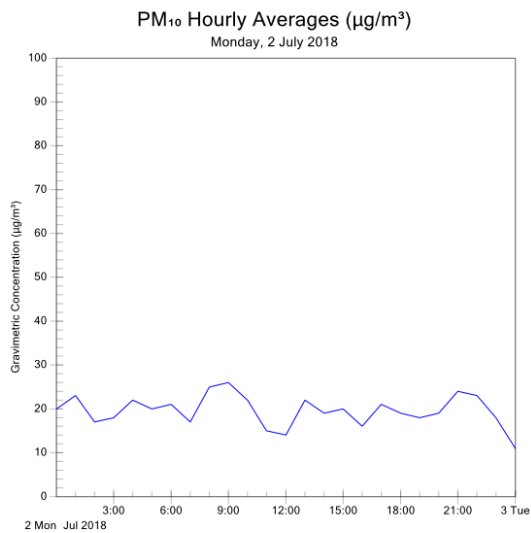
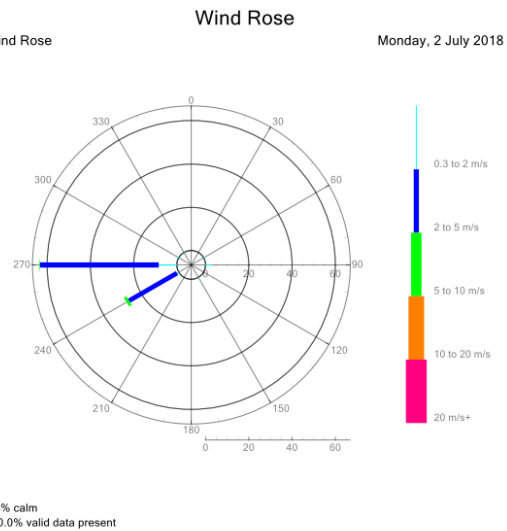
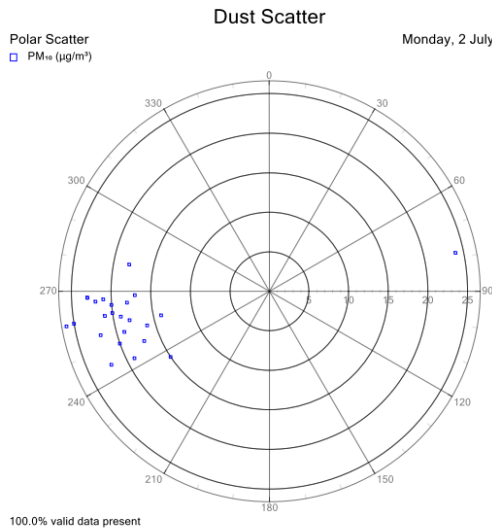
**Note: The data presented in this report has not been validated and is subject to change in the monthly validated report. All dates/times used in this report are NZST.**

## Waterview South Non-Validated Daily Summary Report PM<sub>10</sub> (µg/m<sup>3</sup>)

Date	Daily Average
2/07/2018	20

Maximum (Hourly)	26
Hour ending	10:00

Minimum (Hourly)	14
Hour ending	13:00



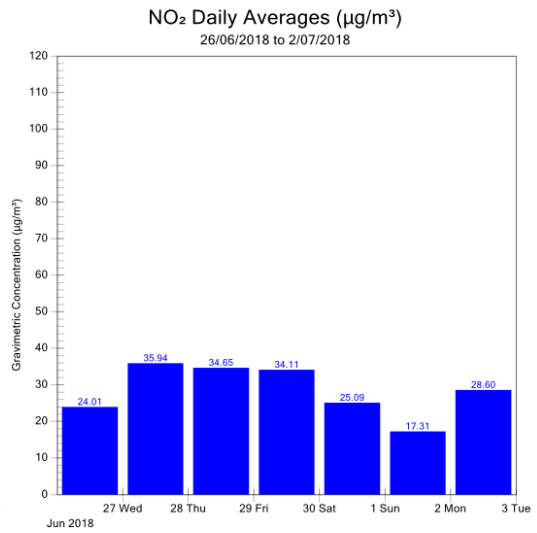
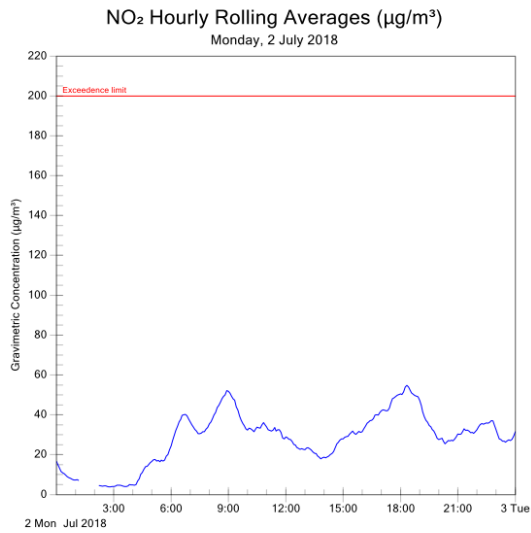
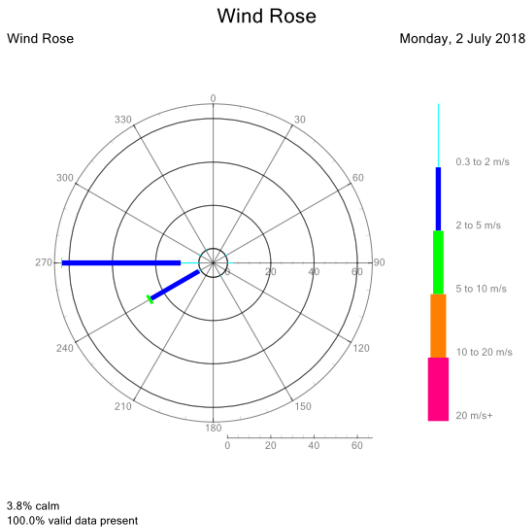
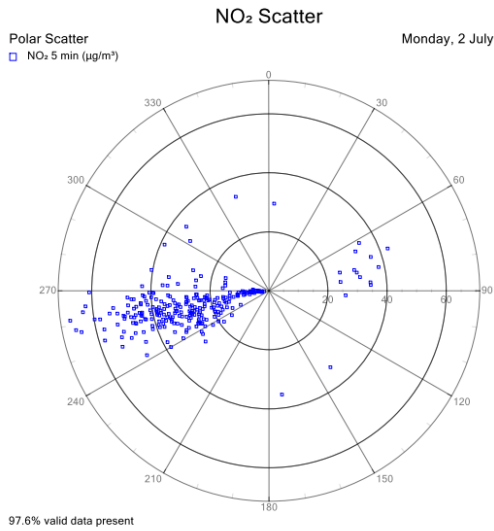
**Note: The data presented in this report has not been validated and is subject to change in the monthly validated report. All dates/times used in this report are NZST.**

## Waterview South Non-Validated Daily Summary Report NO<sub>2</sub> (µg/m<sup>3</sup>)

Date	Daily Average
2/07/2018	28.6

Maximum (Hourly)	67.9
Hour ending	19:00

Minimum (Hourly)	3.9
Hour ending	03:00



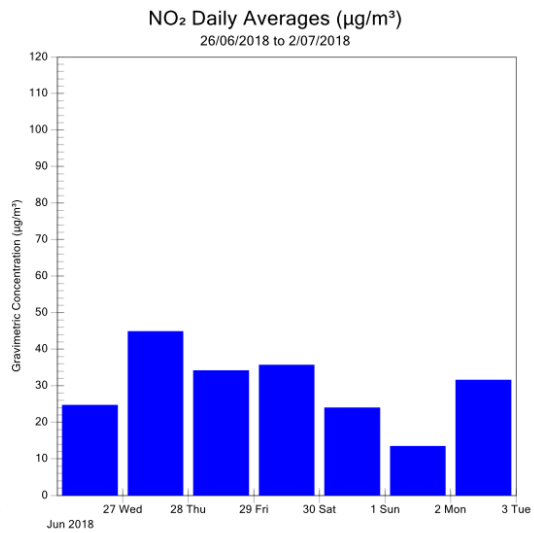
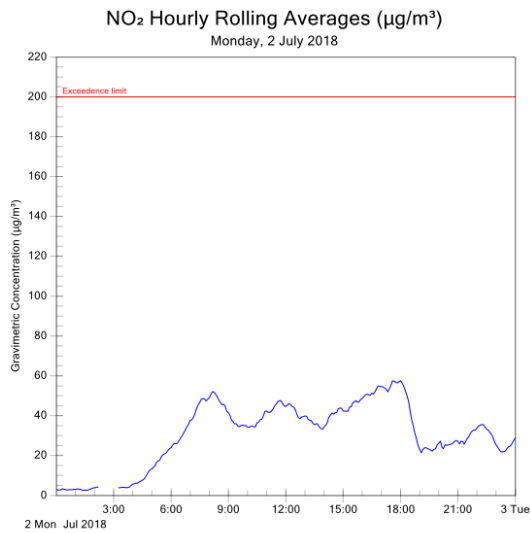
**Note: The data presented in this report has not been validated and is subject to change in the monthly validated report. All dates/times used in this report are NZST.**

## Waterview Portal Non-Validated Daily Summary Report NO<sub>2</sub> (µg/m<sup>3</sup>)

Date	Daily Average
2/07/2018	31.7

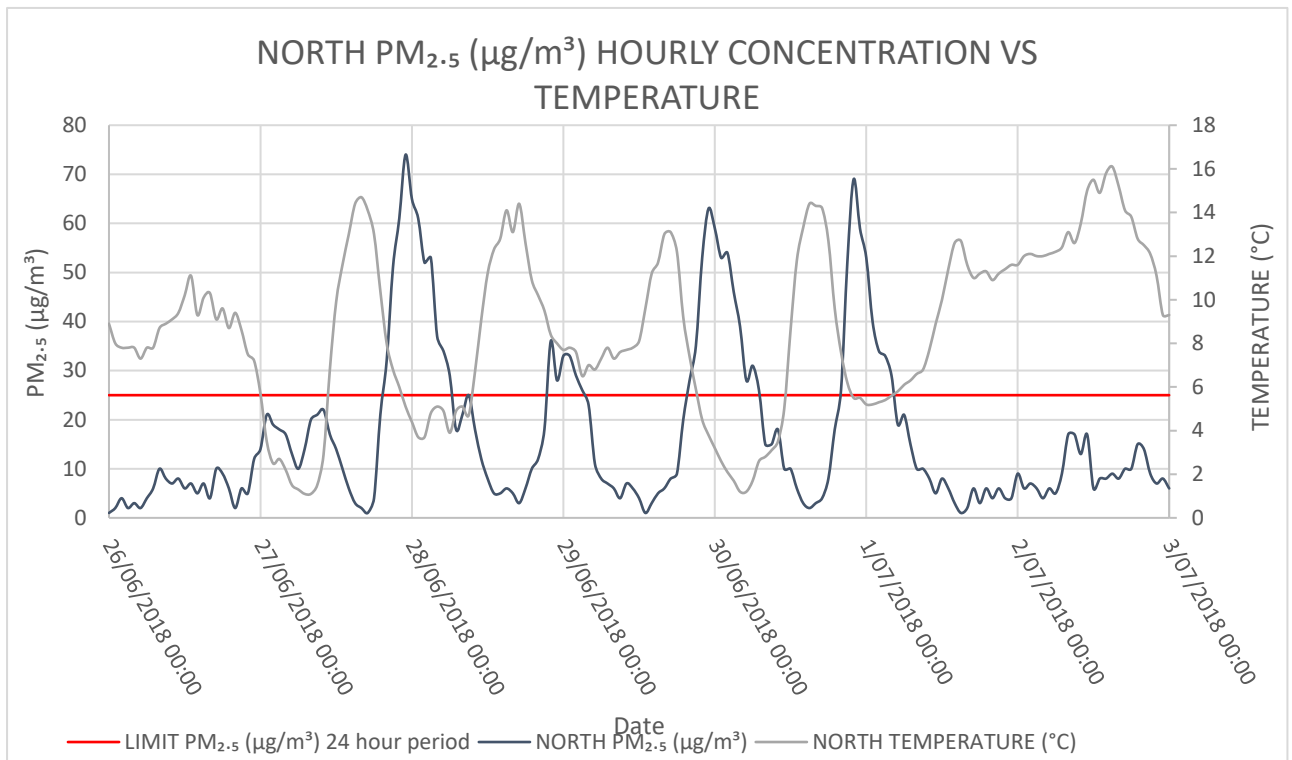
Maximum (Hourly)	79.5
Hour ending	18:00

Minimum (Hourly)	3.0
Hour ending	01:00



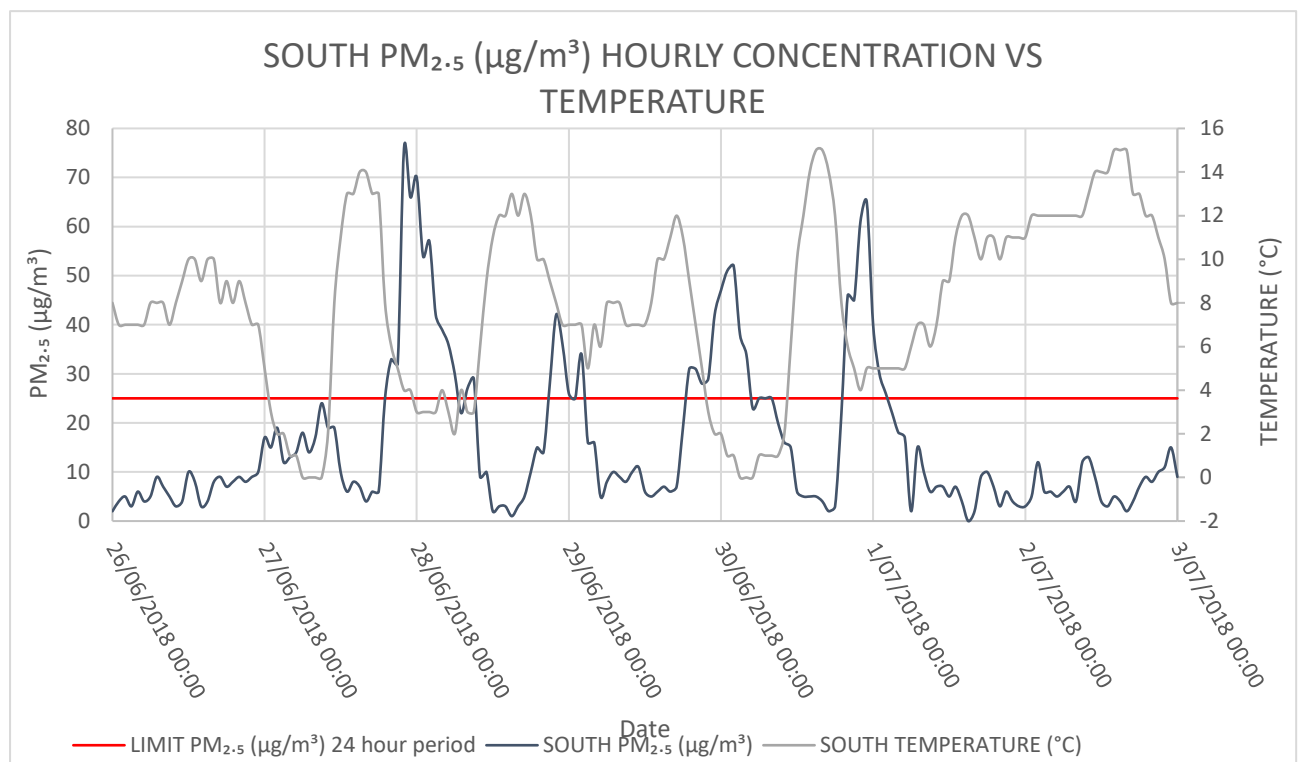
**Note: The data presented in this report has not been validated and is subject to change in the monthly validated report. All dates/times used in this report are NZST.**

## GRAPHS PM<sub>2.5</sub> VS TEMPERATURE VS TRAFFIC



**North Station 24 Hour Average**

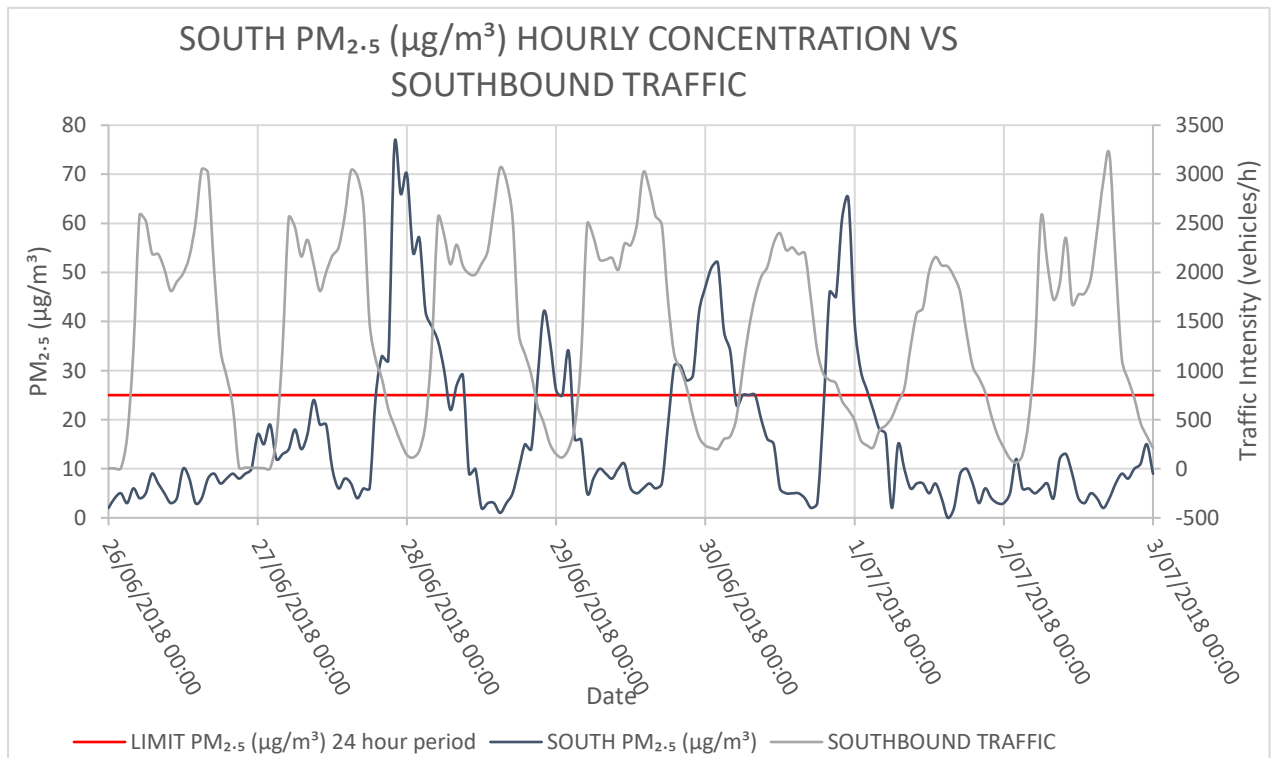
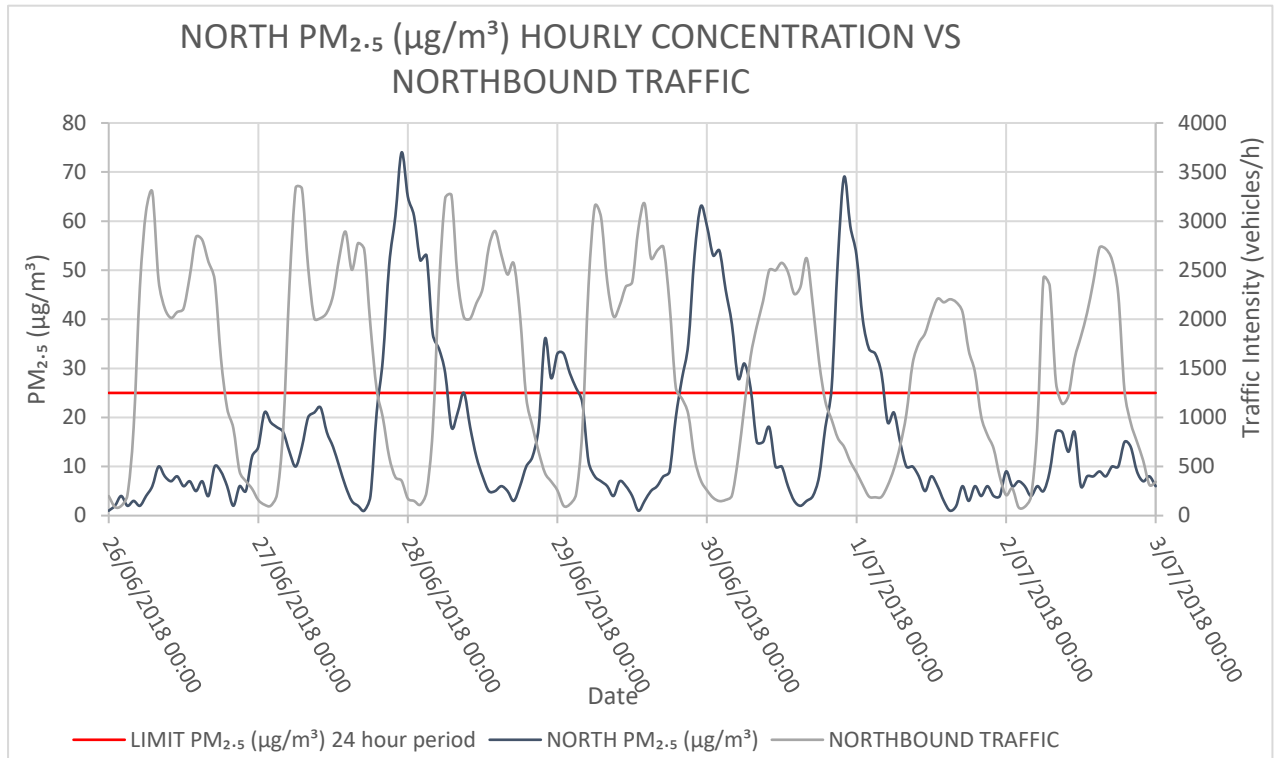
Date	PM <sub>2.5</sub> (µg/m <sup>3</sup> )	PM <sub>10</sub> (µg/m <sup>3</sup> )	WS (m/s)	WD (°)
26/06/2018	6	18	1.4	225
27/06/2018	22	37	0.3	181
28/06/2018	22	30	0.1	199
29/06/2018	19	26	0.5	164
30/06/2018	27	34	0.2	9
1/07/2018	12	20	0.5	335
2/07/2018	9	26	2.1	247

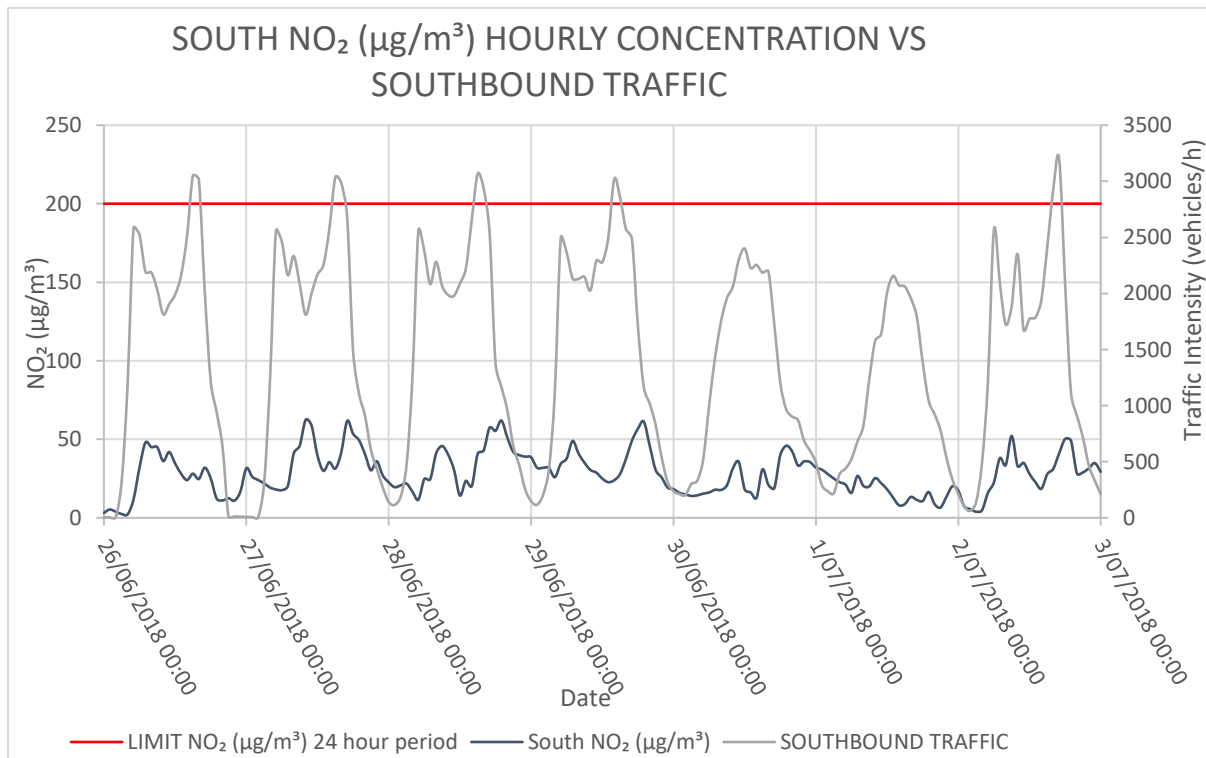
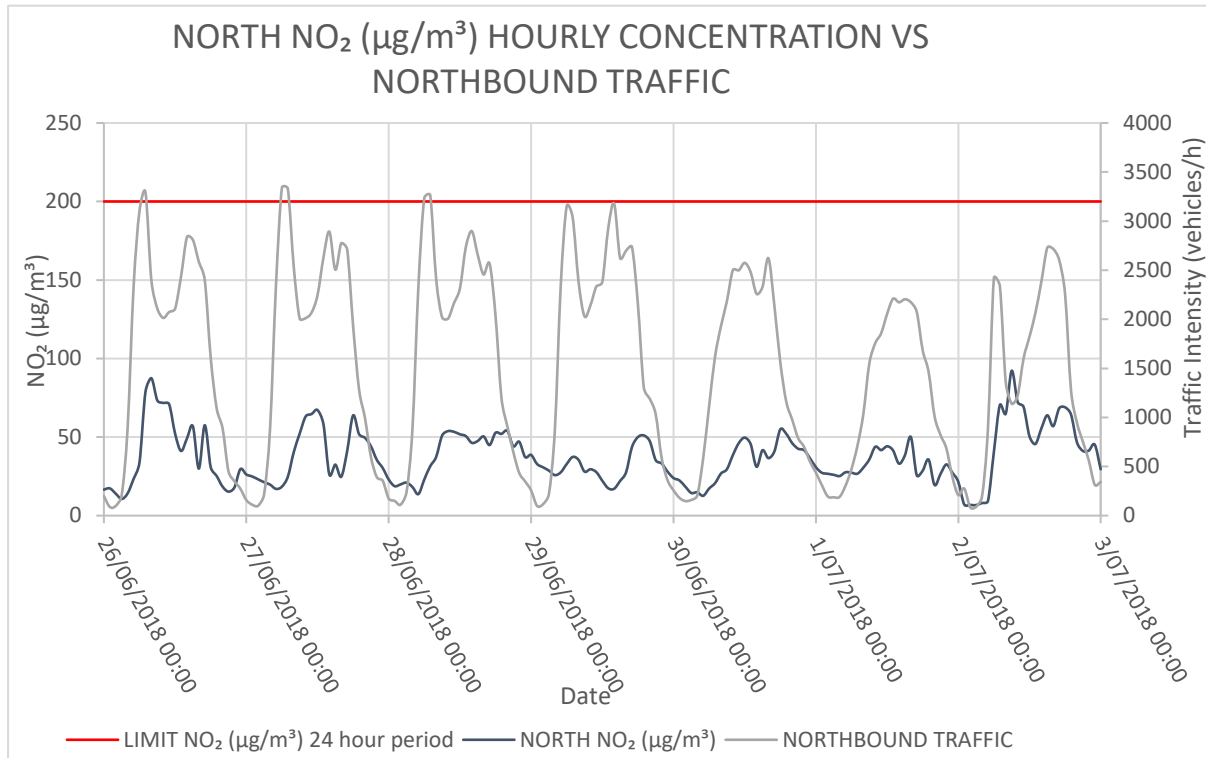


### South Station 24 Hour Average

Date	PM <sub>2.5</sub> (µg/m <sup>3</sup> )	PM <sub>10</sub> (µg/m <sup>3</sup> )	WS (m/s)	WD (°)
26/06/2018	7	13	1.6	242
27/06/2018	22	34	0.2	174
28/06/2018	22	26	0.2	252
29/06/2018	17	19	0.6	146
30/06/2018	26	30	0.1	1
1/07/2018	9	13	0.8	306
2/07/2018	7	20	2.9	258







## APPENDIX C

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Baseline data prior to tunnel opening 27/06/2017

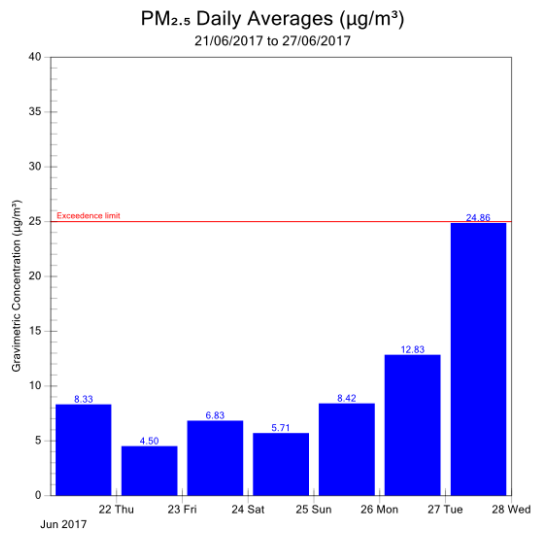
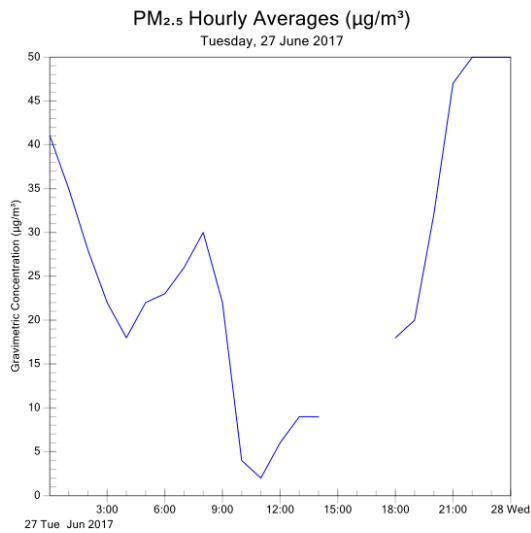
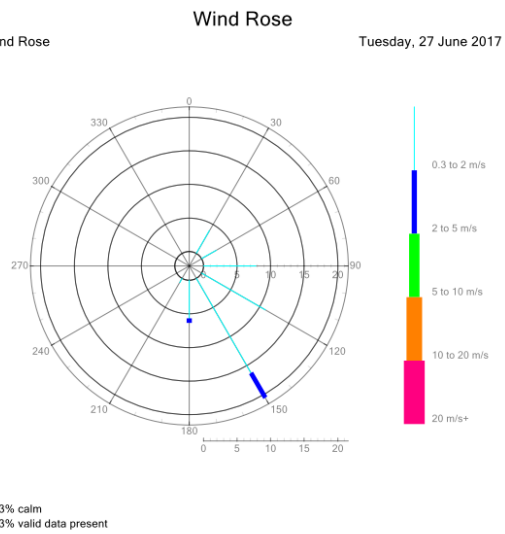
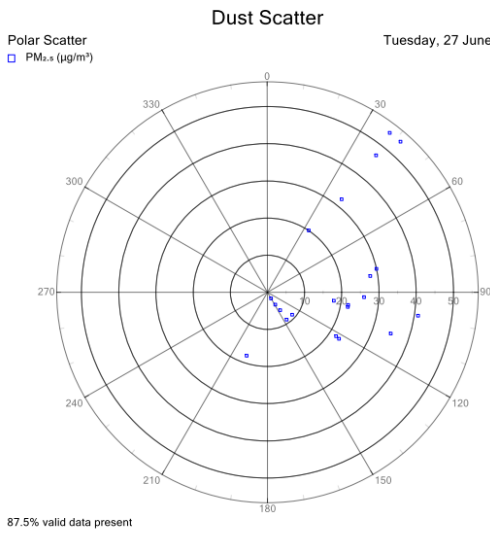
# BASELINE DATA PRIOR TO TUNNEL OPENING 27/06/2017

## Waterview North Non-Validated Daily Summary Report PM<sub>2.5</sub> (µg/m<sup>3</sup>)

Date	Daily Average
27/06/2017	25

Maximum (Hourly)	54
Hour ending	23:00

Minimum (Hourly)	2
Hour ending	12:00



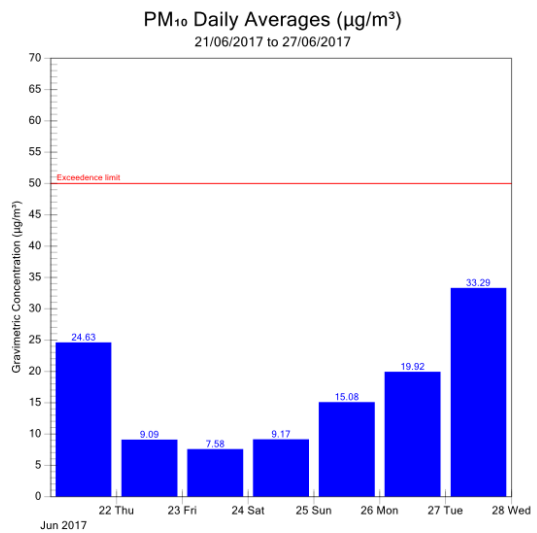
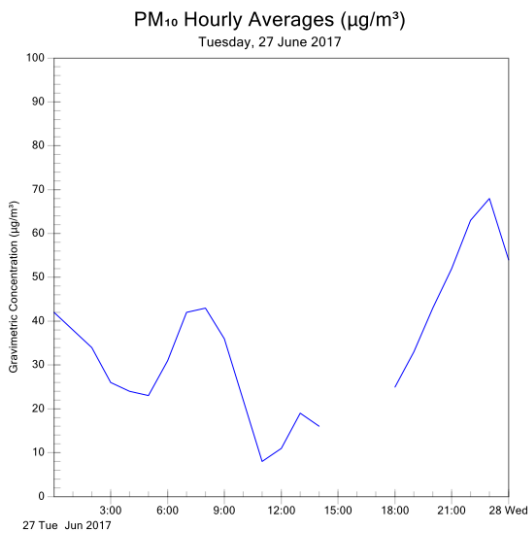
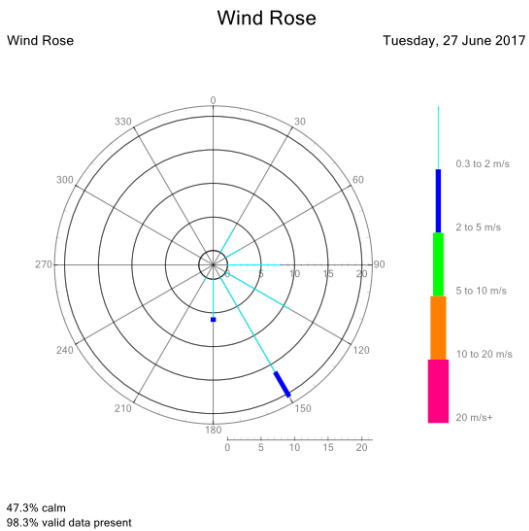
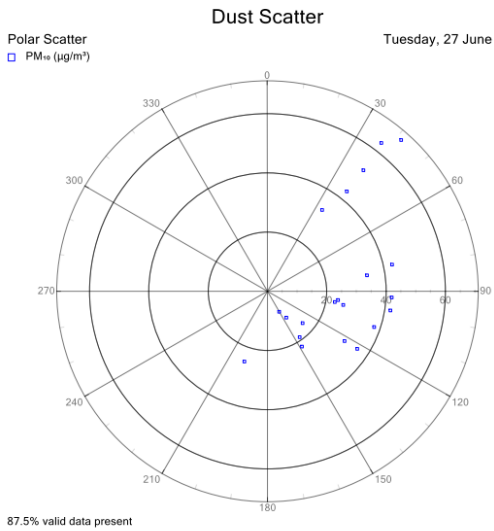
**Note: The data presented in this report has not been validated and is subject to change in the monthly validated report.  
All dates/times used in this report are NZST.**

## Waterview North Non-Validated Daily Summary Report PM<sub>10</sub> (µg/m<sup>3</sup>)

Date	Daily Average
27/06/2017	33

Maximum (Hourly)	68
Hour ending	00:00

Minimum (Hourly)	8
Hour ending	12:00



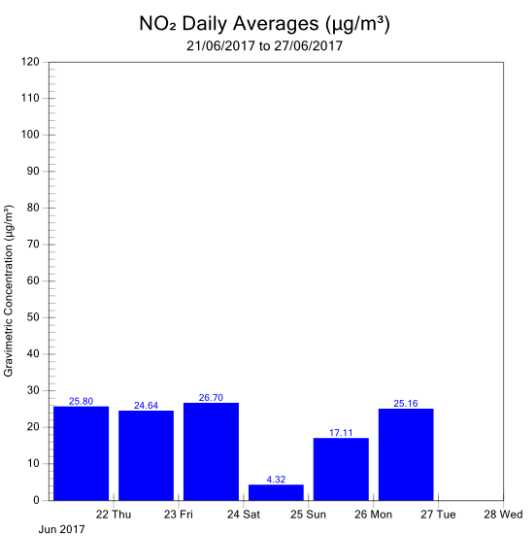
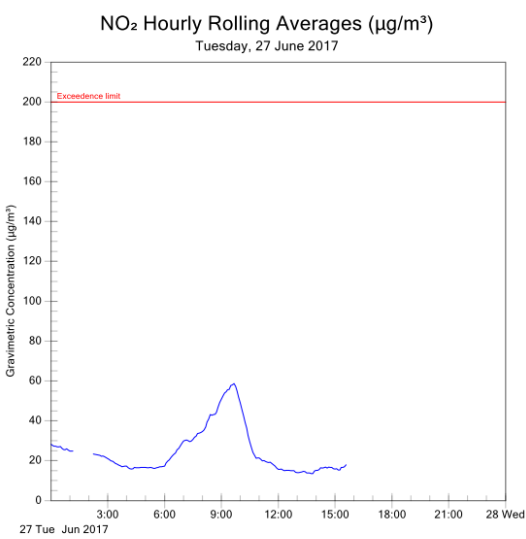
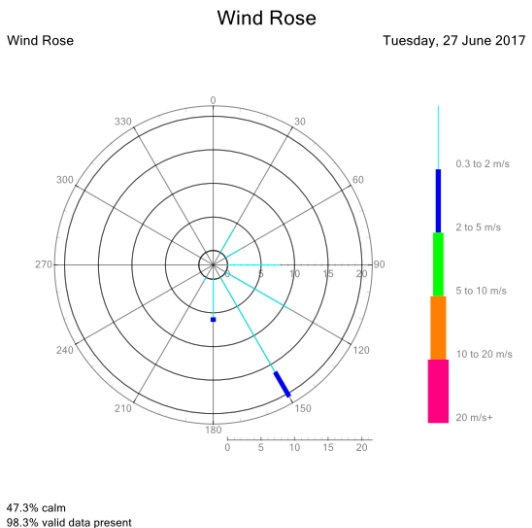
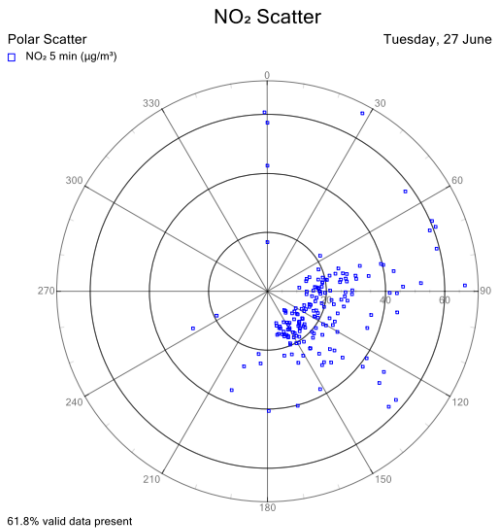
**Note: The data presented in this report has not been validated and is subject to change in the monthly validated report. All dates/times used in this report are NZST.**

## Waterview North Non-Validated Daily Summary Report NO<sub>2</sub> (µg/m<sup>3</sup>)

Date	Daily Average
27/06/2017	

Maximum (Hourly)	68.4
Hour ending	09:00

Minimum (Hourly)	14.2
Hour ending	13:00



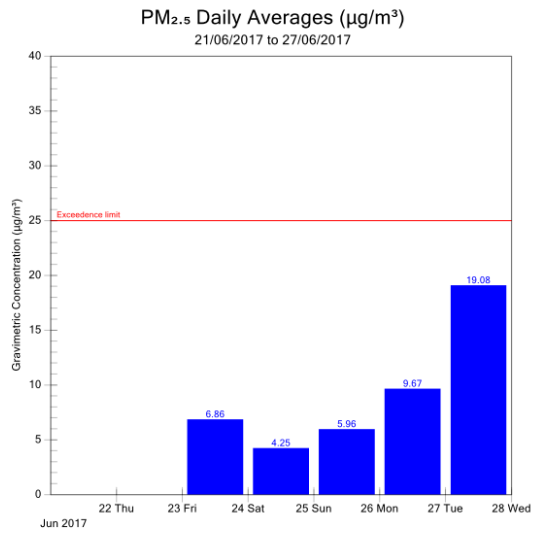
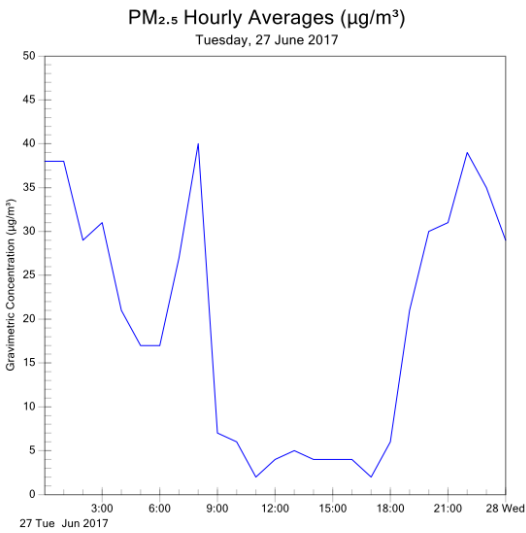
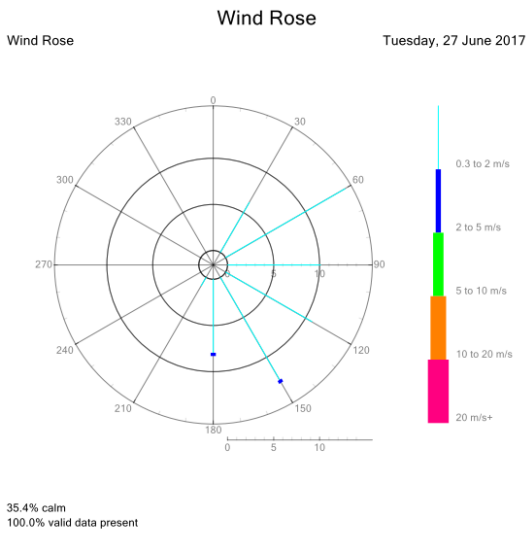
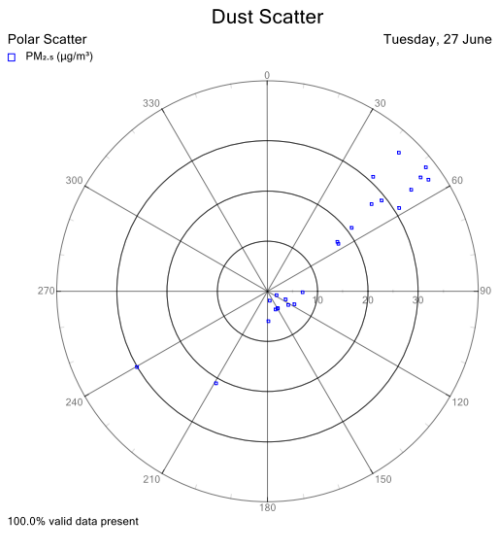
**Note: The data presented in this report has not been validated and is subject to change in the monthly validated report. All dates/times used in this report are NZST.**

## Waterview South Non-Validated Daily Summary Report PM<sub>2.5</sub> (µg/m<sup>3</sup>)

Date	Daily Average
27/06/2017	19

Maximum (Hourly)	40
Hour ending	09:00

Minimum (Hourly)	2
Hour ending	12:00



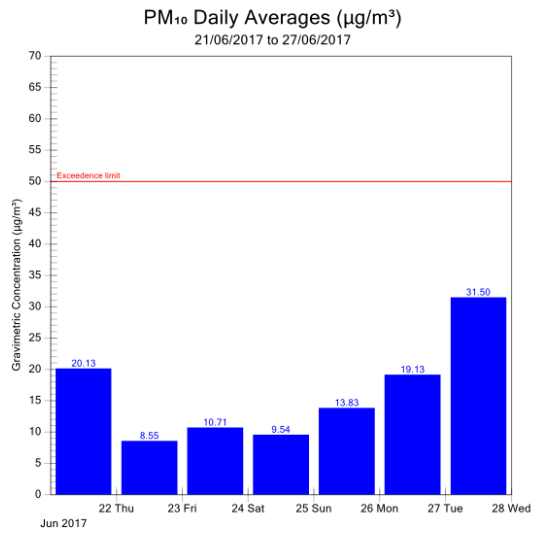
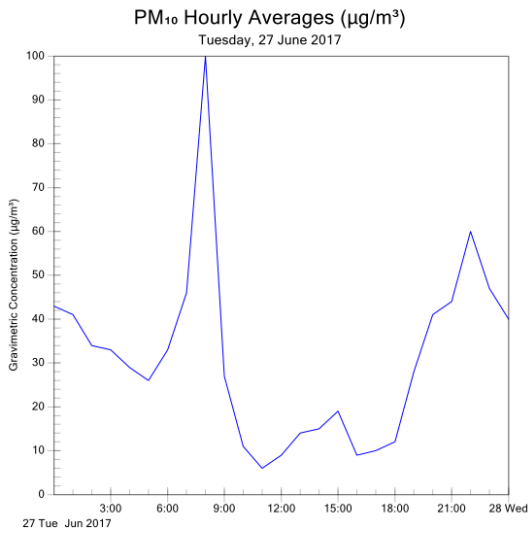
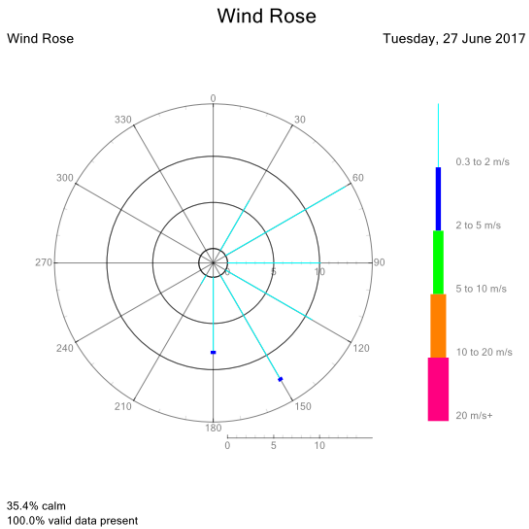
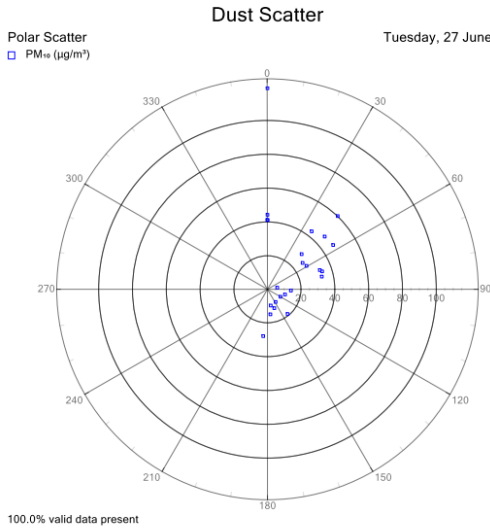
**Note: The data presented in this report has not been validated and is subject to change in the monthly validated report. All dates/times used in this report are NZST.**

## Waterview South Non-Validated Daily Summary Report PM<sub>10</sub> (µg/m<sup>3</sup>)

Date	Daily Average
27/06/2017	32

Maximum (Hourly)	119
Hour ending	09:00

Minimum (Hourly)	6
Hour ending	12:00



**Note: The data presented in this report has not been validated and is subject to change in the monthly validated report. All dates/times used in this report are NZST.**

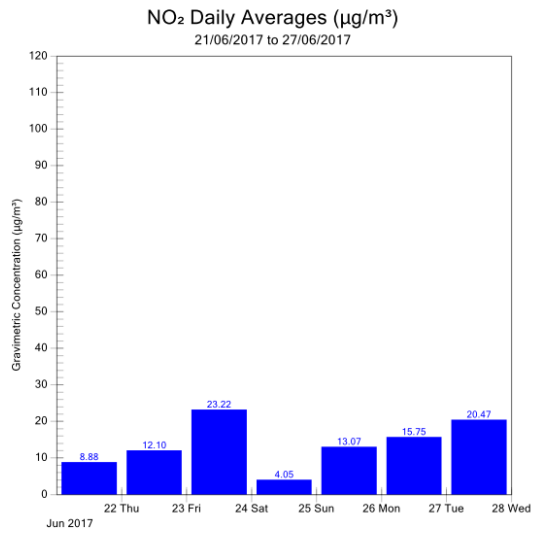
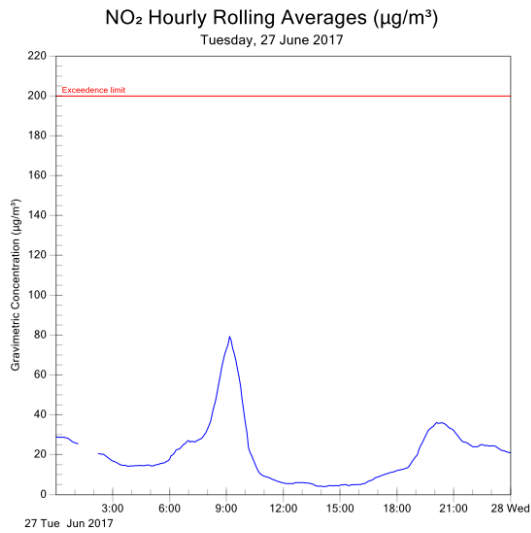
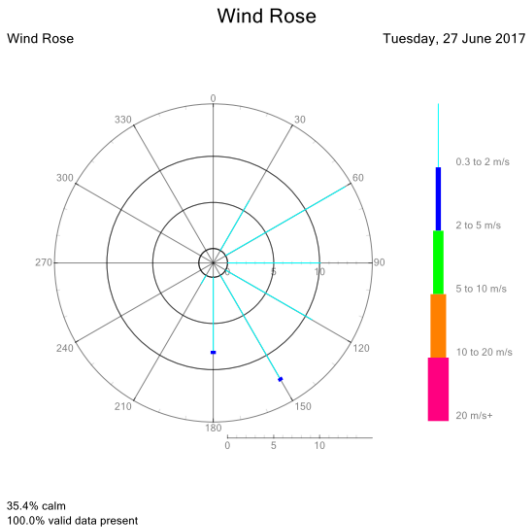
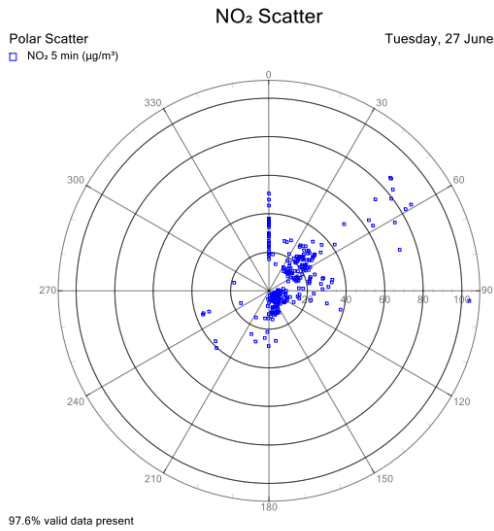


## Waterview South Non-Validated Daily Summary Report NO<sub>2</sub> (µg/m<sup>3</sup>)

Date	Daily Average
27/06/2017	20.5

Maximum (Hourly)	104.1
Hour ending	10:00

Minimum (Hourly)	4.1
Hour ending	14:00



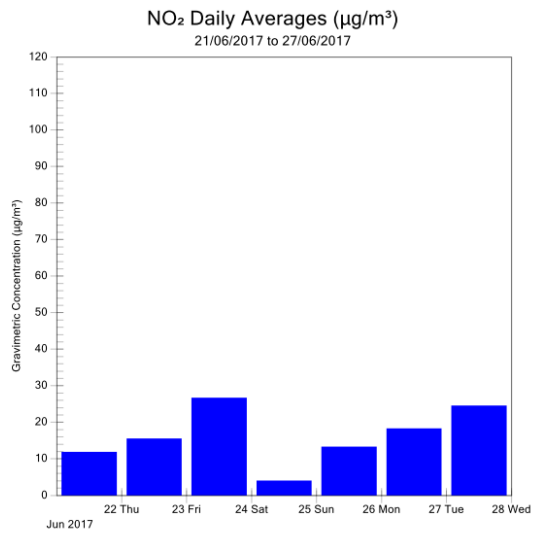
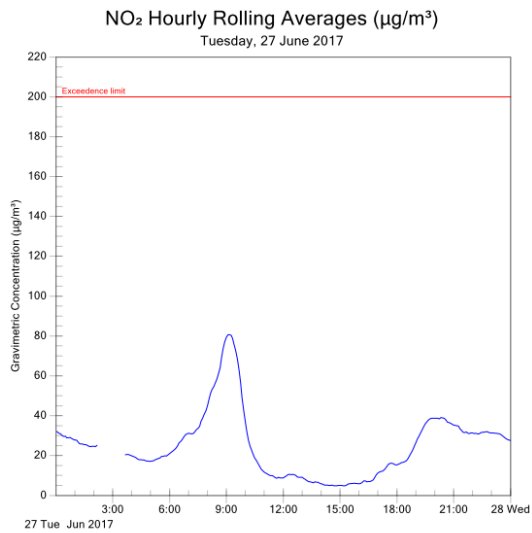
**Note: The data presented in this report has not been validated and is subject to change in the monthly validated report. All dates/times used in this report are NZST.**

## Waterview Portal Non-Validated Daily Summary Report NO<sub>2</sub> (µg/m<sup>3</sup>)

Date	Daily Average
27/06/2017	24.6

Maximum (Hourly)	111.4
Hour ending	09:00

Minimum (Hourly)	5.0
Hour ending	15:00



**Note: The data presented in this report has not been validated and is subject to change in the monthly validated report. All dates/times used in this report are NZST.**