

**Interim report
on the ambient SO₂ monitoring results from
the EPA station located at the CSIRO wharf
June 2017 – June 2018**

Air Section, EPA Tasmania, July 2018



The EPA Tasmania SO₂ monitoring station at the CSIRO wharf in Hobart (far right of the image) with *Sun Princess* - the first cruise ship which arrived in Hobart at the beginning of the 2017-2018 season. Photo taken on 10 October 2017.

Summary

To address public concerns about the potential impacts of emissions from cruise ships visiting the Hobart Port, EPA Tasmania installed an air quality monitoring station to continuously measure ambient levels of sulphur dioxide (SO₂) in the Hobart Port area. After a period of testing of the monitoring system the hourly and daily sulphur dioxide concentration measurements from the station were reported in real-time to the EPA website from autumn 2017. This report includes a brief analysis of the results of measurements of ambient concentrations of SO₂ during period of 13 months - from June 2017 to June 2018. During that time all ambient SO₂ concentration readings have been well below, less than 20 percent, of the relevant air quality national standards.

Monitoring ambient levels of SO₂ concentration

The atmospheric emissions of greatest concern from cruise ships while at berth in the Hobart Port are sulphur dioxide (SO₂) and oxides of nitrogen (NO_x).

As a first step towards addressing these concerns, in March 2017, EPA Tasmania installed a reference level monitoring station in the CSIRO wharf area in the Hobart Port to continuously measure ambient levels of sulphur dioxide. The position of the monitoring station was selected on the basis of preliminary air dispersion modelling results and accessibility of the site.

1 Equipment



The reference-level monitoring station installed on the CSIRO wharf area includes instruments for collecting SO₂ ambient concentration data and weather parameters. It comprises of the Teledyne T100 UV Fluorescence SO₂ Analyzer, T700 gas calibration unit, Davis Vantage Pro 2 weather station and Cybertec 3G modem.

The photograph shows the monitoring station after deployment at the CSIRO wharf last year.

Figure 1: The EPA Tasmania SO₂ reference monitoring station at the CSIRO wharf in Hobart. *Photo courtesy of Alex Bell.*

2 Data collected

The real-time 10-minute ambient measured SO₂ concentrations have been reported to the EPA Tasmania web site at: <http://epa.tas.gov.au/epa/air/monitoring-air-pollution/nepm-monitoring-information/hobart-port>.

A typical example of a SO₂ concentration web report is presented in Figure 2. The top panel shows unvalidated concentrations of sulphur dioxide (SO₂) measured each 10-minutes. Con-

centrations are reported in parts per billion (ppb) by volume. The lower panel shows meteorological data - wind speed and direction, and temperature. Wind direction data are given in degrees (north=0, east=90, etc.) but are divided by 10 to fit on the plot.

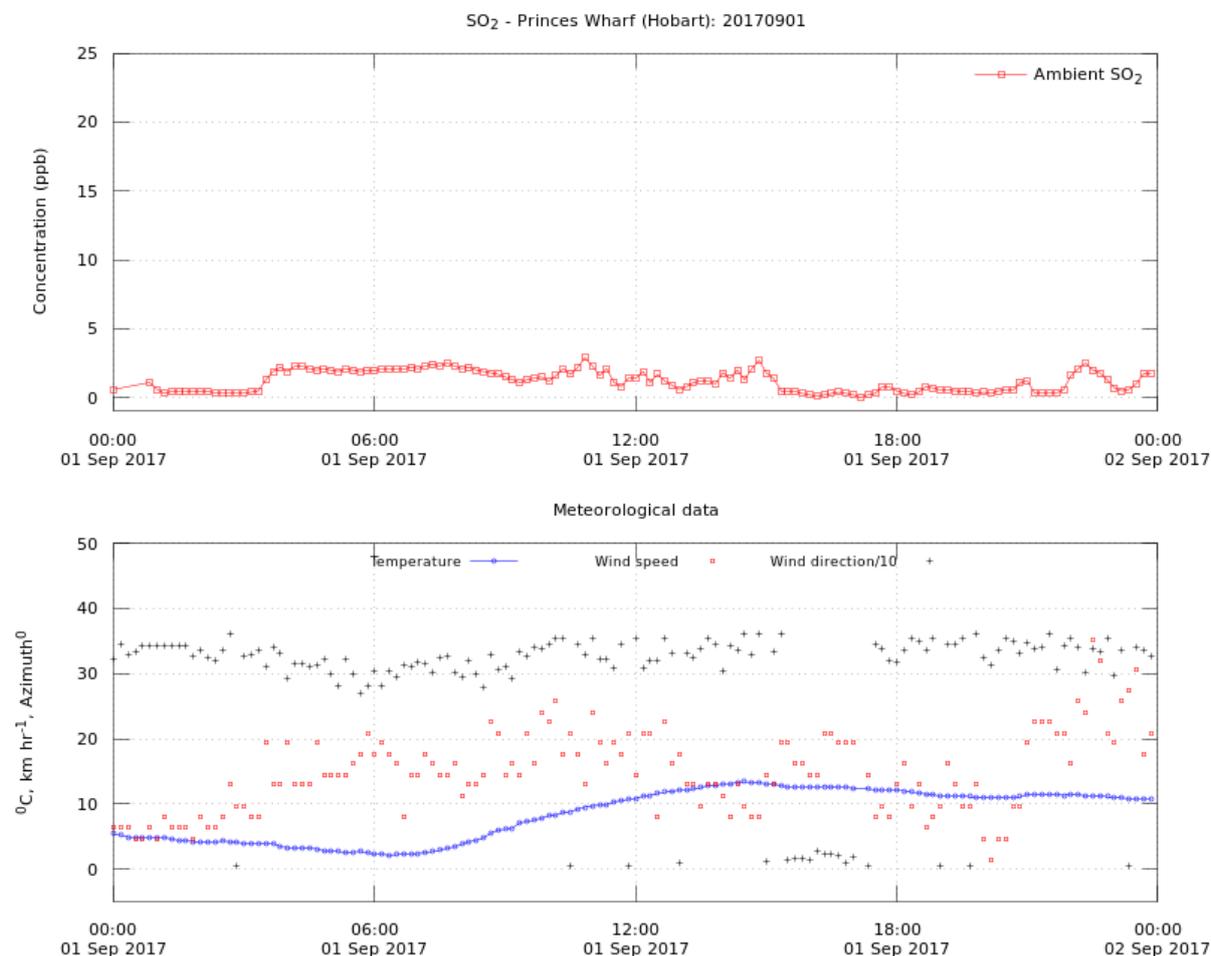


Figure 2: An example of real-time data plot (10-minute ambient measured SO₂ concentrations) from the Hobart Port station for one day. The data gap at the start of the day is due to the automatic calibration sequence which runs at this time.

A plot showing the most recent week-long interval of data from the Hobart Port station is also provided on the EPA web site. The plot contains panels with hour-averaged and day-averaged SO₂ concentrations presented on a scale that includes the relevant national air quality standards for hourly-averaged (200 ppb) and daily-averaged (80 ppb) SO₂ levels as well as the meteorological data. The real-time data presented on the EPA Tasmania web site have not been quality controlled or validated. The validated data will become available later via dedicated validated data-viewing page.

The data have been collected for more than a year now and include ambient concentration levels of SO₂ measured during the 2017-2018 cruise ship season in Tasmania. This interim report covers a period of 13 months from beginning of June 2017 to end of June 2018. This period equates to nearly 9,500 hours of measurements. In September 2017 the instrument was recalibrated to prepare it for SO₂ monitoring during the cruise ship season in Hobart.

3 Brief analysis of collected data

The 2017-2018 cruise ship season in Hobart spanned nearly six months from 10 October 2017 to 30 March 2018 i.e. exceeded 4100 hours. This is more than 40% of the monitoring time of ambient SO₂ levels covered in this report.

During the 2017-2018 cruise ship season nearly 60 cruise ships berthed at the Hobart Port, with about one third of them arriving in February 2018. The hourly averaged concentrations of SO₂ reported for the season did not exceed 6 ppb. It has to be noted that towards the end of February there was a power failure and the monitor did not register data for about 75 hours. Similar problems with loss of data appeared in December (over 50 hours) and in March (about 15 hours). In most cases the power outages arose after heavy rainfall. Also for two days (16 and 17 June 2018) the system failed calibration. Nevertheless, data were recorded and collected for over 96% of the cruise ship season.

Figure 3 presents hourly and daily averages of ambient concentrations levels of SO₂ recorded during February 2018 at the station located at the CSIRO wharf. The plot depicts the ambient levels of SO₂ concentrations during the busiest cruise ship visit month at the Hobart Port this season. The hourly averaged concentrations of SO₂ reported (marked as red squares on the graph) did not exceed 3% of the relevant air quality national standards.

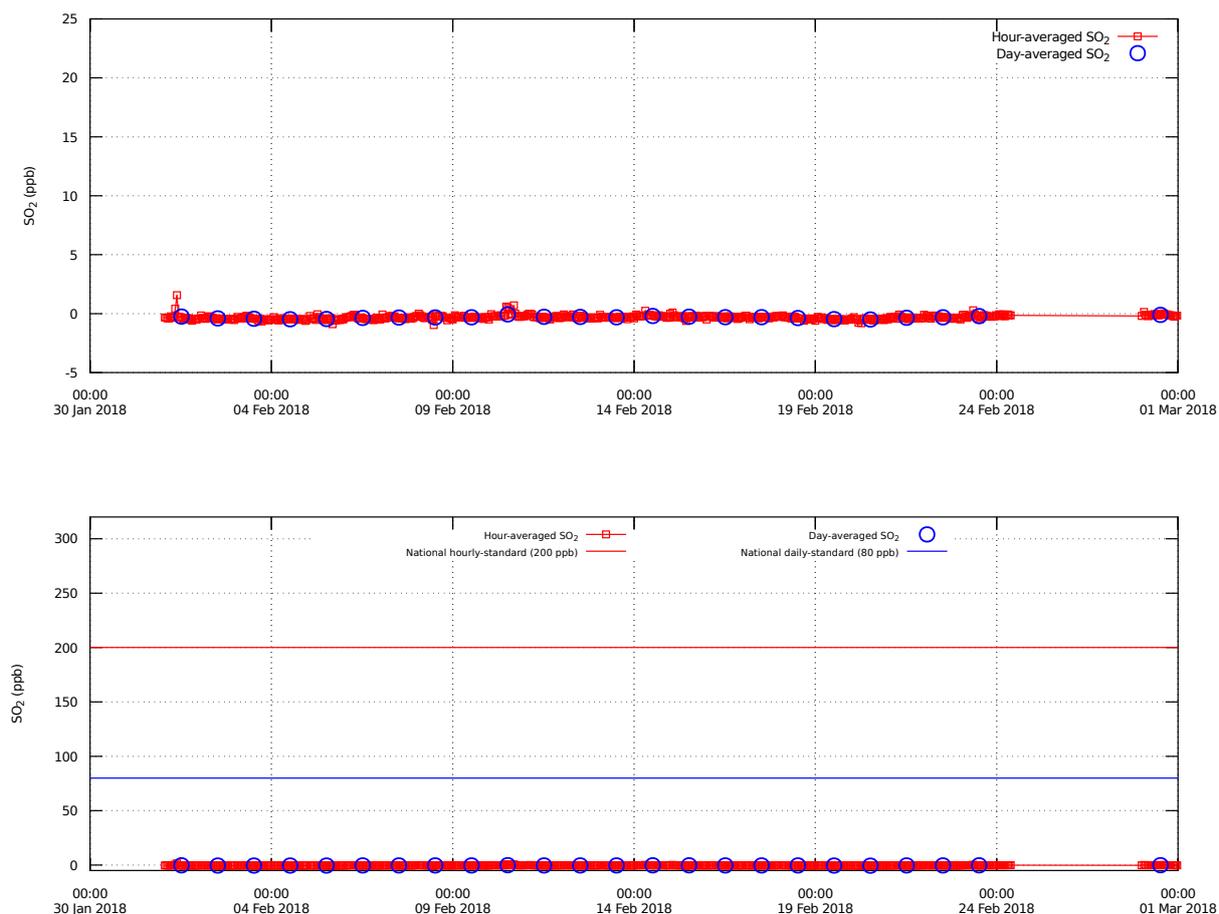


Figure 3: Hourly and daily averages of ambient levels of SO₂ concentrations recorded at the EPA station at the CSIRO wharf during February 2018.

The day-averaged concentrations of SO₂ are marked as blue circles on the upper panels of

Figures 3 and 4. The span of the vertical axes is 30 ppb with the maximum of 25 ppb of SO₂. The lower panels of these figures present the same data on a scale where national hourly and daily standards are marked as red (200 ppb) and blue (80 ppb) lines, respectively.

The highest values of ambient concentration of SO₂ which could be associated with a cruise ship visit were measured by this monitoring system on 17 June 2017. This date is outside of the cruise ship season at the Hobart Port. When *Pacific Jewel* berthed at the Hobart Port for two days in June 2017, ambient 1-hour average SO₂ concentration values over 20 ppb were recorded.

Figure 4 presents the ambient level SO₂ concentrations measured by the monitoring station during June 2017 where elevated levels of SO₂ concentration can be identified.

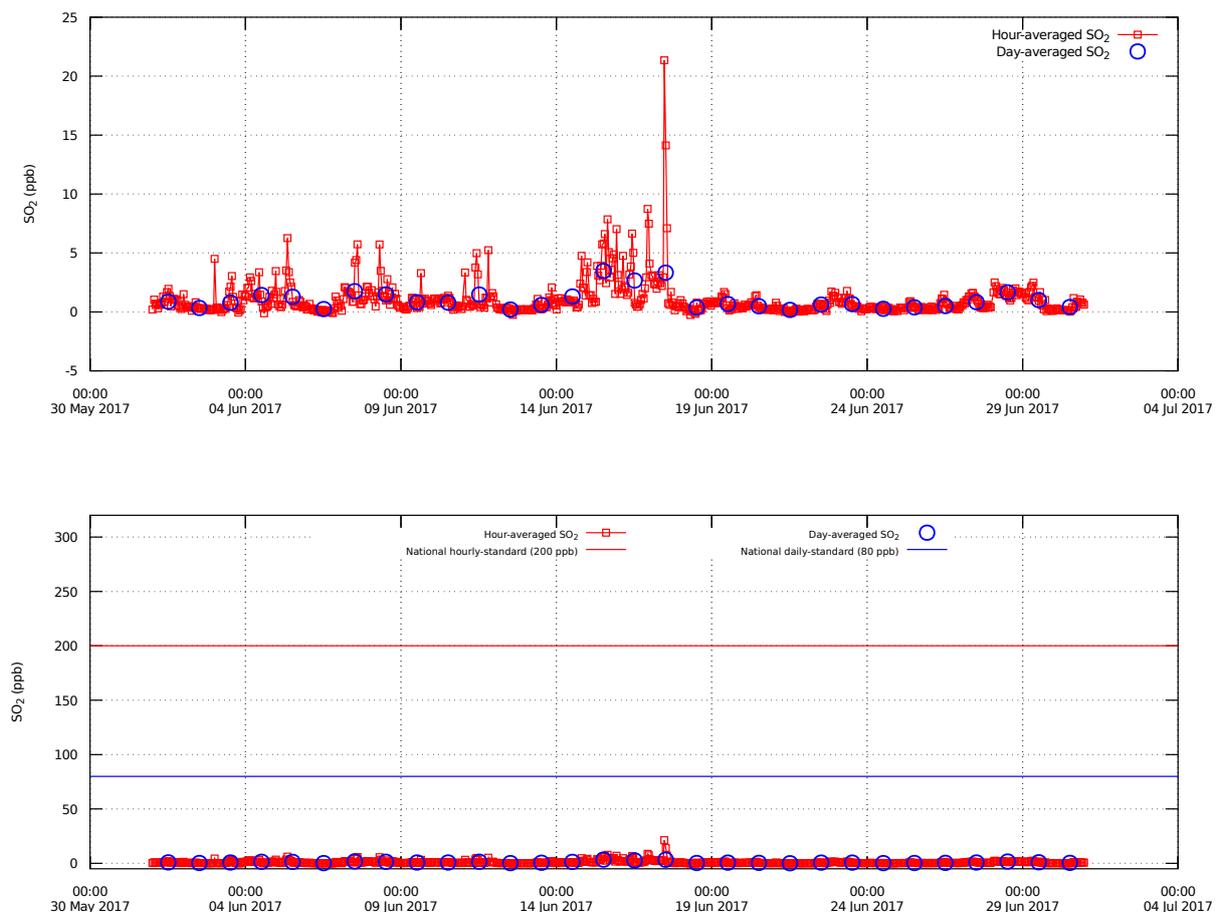


Figure 4: Ambient level SO₂ concentrations measured by the monitoring station during June 2017.

It should be noted that ambient concentrations of SO₂ higher than 20 ppb were recorded by the monitoring station in August 2017 when no cruise ship visited the Hobart Port.

An hourly-averaged SO₂ concentration above 30 ppb was measured on 22 August 2017 at 4 am. This is the highest concentration reported for the period of 13 months covered by this analysis. Such a level of SO₂ concentration represents about 16% of the hourly national air quality standard.

Some slightly elevated concentrations of SO₂ were also reported during the monitoring period. They appear to be associated with activities including shipping movement, taking place at the vicinity of the monitoring station. However the exact sources have not been identified.

Figure 5 depicts the ambient levels of SO₂ concentration measured by the monitoring station during August 2017.

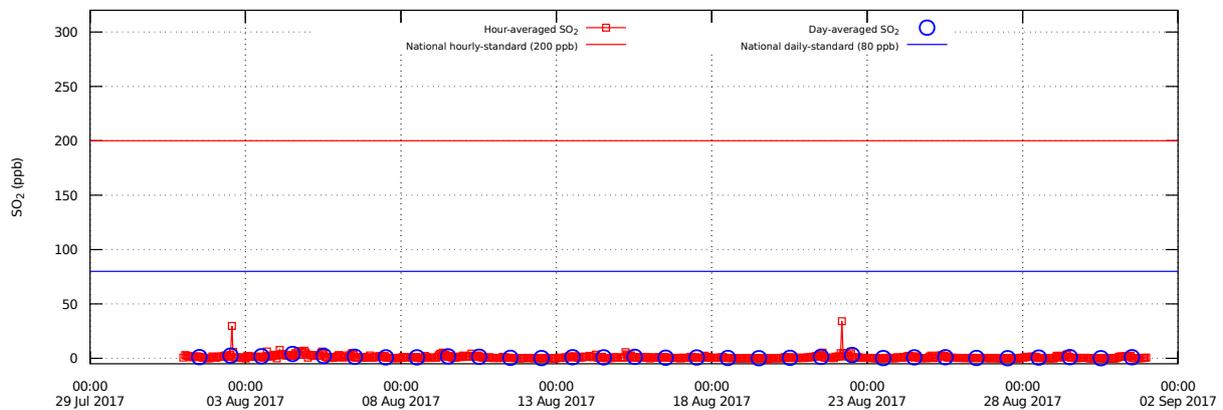
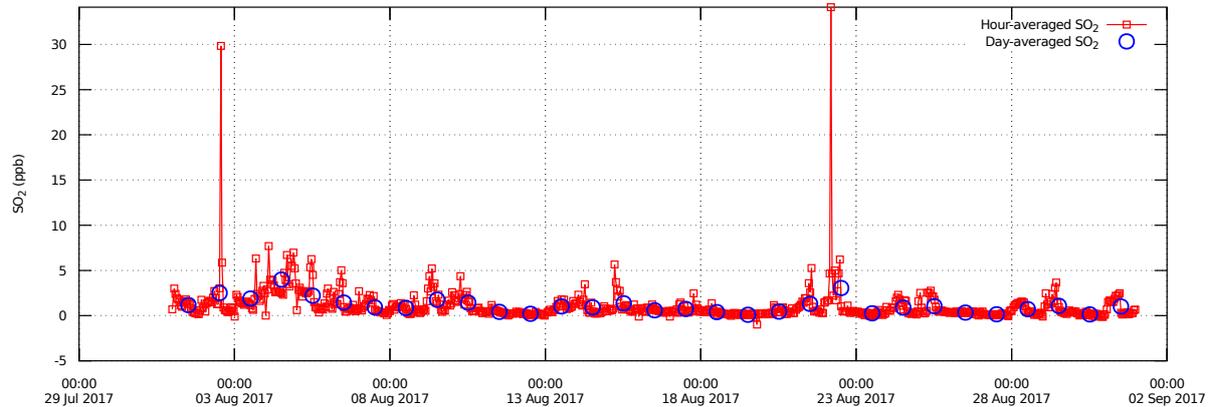


Figure 5: Ambient level SO₂ concentrations measured by the monitoring station during August 2017.

4 Conclusion

The ambient concentration levels of SO₂ measured by the EPA Tasmania SO₂ monitoring system, located on the CSIRO wharf area, were usually well below relevant national and international ambient air quality standards. Some slightly elevated concentrations of SO₂ have been observed and reported. They appear to be associated with activities including shipping movement, taking place at the vicinity of the monitoring station. The highest hour-averaged concentration levels of SO₂ measured by the EPA Tasmania SO₂ monitoring station were about 16% of the national air quality standards and were recorded outside of the cruise ship season.

5 Acknowledgements

A big thank you all colleagues who set up, operated and processed data from this monitoring station.

Very special thanks to Dr John Innis who collated the data for the purpose of this report and

prepared all monthly graphs.

CSIRO Marine and Atmosphere flagship is thanked for access to the site on their wharf.

Report compiled by E. Chelkowska, 29 July 2018.