LOWER HUNTER AIR QUALITY REVIEW OF AMBIENT AIR QUALITY DATA

MARCH 2013

NSW Environment Protection Authority

30 May 2013

Job Number 13010154

Prepared by

Todoroski Air Sciences Pty Ltd
Suite 2B, 14 Glen Street
Eastwood, NSW 2122
Phone: (02) 9874 2123
Fax: (02) 9874 2125
Email: info@airsciences.com.au

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March 2013

Author(s): Aleks Todoroski — Dan Kjellberg

Position: Director — Atmospheric Scientist

DOCUMENT CONTROL

Report Version	Date	Prepared by	Reviewed by
Preliminary. DRAFT - 001	07/05/2013	D. Kjellberg & A Todoroski	A. Todoroski
DRAFT - 002	09/05/2013	D. Kjellberg & A Todoroski	A. Todoroski
DRAFT - 003	13/05/2013	D. Kjellberg	A. Todoroski
FINAL – 001	27/05/2013	D. Kjellberg	A. Todoroski
FINAL – 002	30/05/2013	D. Kjellberg	

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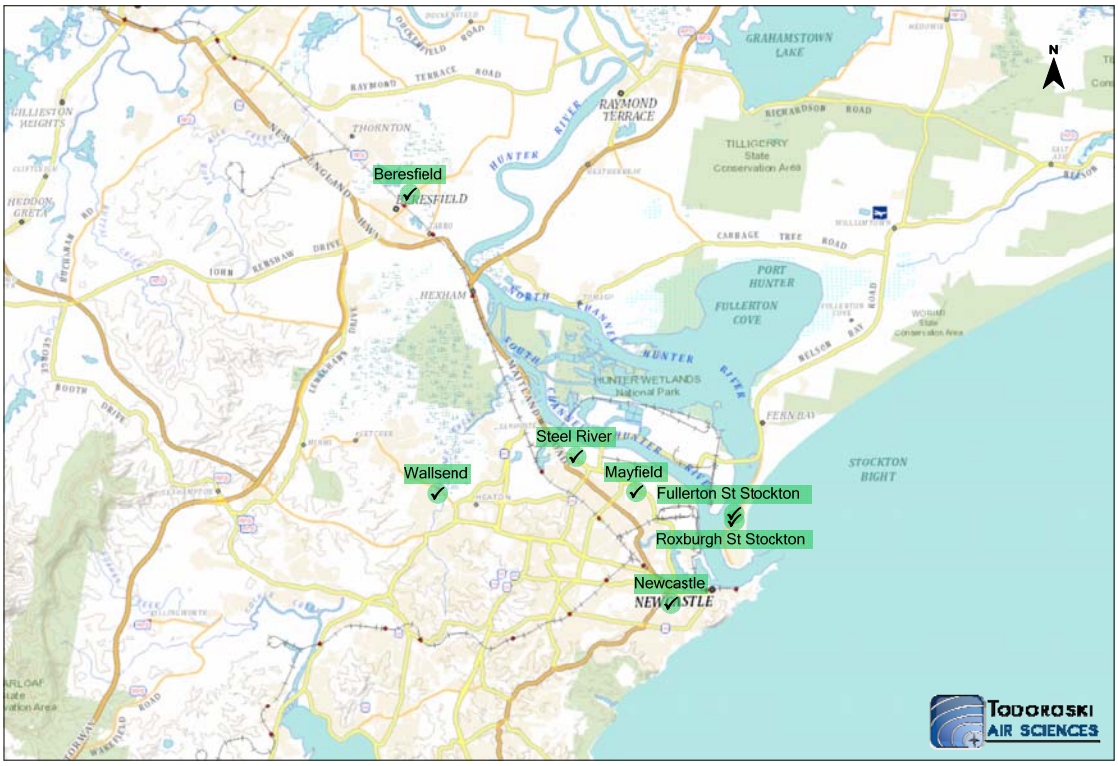
EXECUTIVE SUMMARY

This report has been prepared by Todoroski Air Sciences for the NSW Environment Protection Authority (NSW EPA) and presents ambient air quality monitoring data recorded in the Lower Hunter region for the month of March 2013. The results indicate that the air quality was generally very good to good in the Lower Hunter Region in March 2013.

The data summary (shown below) indicates that in March 2013, all of the air pollutant monitors recorded levels that were below the relevant criteria at all times. Further details are provided in the report. The full data are provided in the Appendices.

Lower Hunter Air Quality Pictorial Summary - March 2013



Lower Hunter Air Quality Tabular Summary - March 2013

	PM_{10} (µg/m^3)	$PM_{2.5}$ (µg/m^3)	SO_2 (µg/m^3)	NO_2 (µg/m^3)	SO_2 (µg/m^3)	NH_3 (ppm)
	24-hour average	24-hour average	24-hour average	1-hour average	1-hour average	1-hour average
	Air Quality Impact Criteria					
	50	25*	228	246	570	0.46
Wallsend	✓	✓	✓	✓	✓	-
Newcastle	✓	-	✓	✓	✓	-
Beresfield	✓	✓	✓	✓	✓	-
Fullerton St Stockton	✓	✓	-	✓	-	✓
Roxburgh St Stockton	-	-	-	✓	-	-
Fullerton St Stockton HVAS	✓	-	-	-	-	-
Steel River HVAS	✓	-	-	-	-	-
Mayfield HVAS	✓	-	-	-	-	-

✓ - All data below applicable criteria

× - At least one elevated level above applicable criteria

1 - Advisory reporting standard for $PM_{2.5}$ concentrations (refer to Section 5.1)

- - Not applicable

1 INTRODUCTION

This report has been prepared by Todoroski Air Sciences on behalf of the NSW EPA. It provides a summary and analysis of the available ambient air quality and meteorological data collected in the Lower Hunter region during March 2013.

2 PROJECT SCOPE

The following outlines the scope of work for this project.

- Provide a monthly report written in plain English to the NSW EPA summarising and analysing available air quality data and meteorological information.
- The report will be published on the EPA's website and will assess the available data recorded at: Beresfield, Wallsend, Newcastle, Mayfield, Steel River and Stockton.
- The aim is to provide a simplified report that is accessible and contains results that would be clearly understood by the general public.

The work is for a period of six months, starting with March 2013.

3 THE PURPOSE OF AMBIENT MONITORING

It is important to note that the data presented in this report is from both EPA and Industry monitoring sites. The EPA and the industry sites collect data for different purposes and this needs to be understood when comparing the data to the criteria.

EPA monitoring sites are specifically designed to measure the likely levels of pollutants that the general population in the area would experience, whereas industry monitoring sites are specifically designed to measure the maximum pollutant levels that may occur due to a particular industry.

Data from EPA sites can be compared with national air quality standards. Where the levels measured at EPA monitoring sites are above the national standards on a prolonged and consistent basis, this indicates that some investigation of the potential cause of the issue may be warranted to determine whether any action on a regional level would reduce or better manage the pollutant levels. In the case of PM_{10}, it is noted that the national standards permit five days annually above the criteria to allow for events like bushfires and dust storms.

Data from industry monitoring sites can be compared with EPA impact assessment criteria. Where the levels measured at industry monitoring sites are above the impact assessment criteria on a prolonged and consistent basis, this indicates that further investigation is warranted to determine whether industry is responsible, and if so whether action to reduce or better manage the pollutant can be taken.

Whether there is any harmful effect on an individual will depend on many additional factors, and not just on the measured level of a pollutant. These factors include the total exposure to the pollutant, individual circumstances (age, health, body mass, levels of pollutants at work), levels of other pollutants in the area, and many other factors.

Where pollutant levels are below the criteria generally, harm would not be expected to occur, but it does not follow that harm automatically occurs when pollutant levels are above the criteria.

The criteria serve to highlight potential issues with the levels of pollutants that may warrant more detailed examination. The criteria may also serve to prioritise action in various areas, for example areas with the highest pollutant levels and highest populations or highest exposure would be expected to receive priority action.

4 AIR QUALITY MONITORING SITES

Figure 4-1 and **Table 4-1** summarise the locations and recorded parameters of the air quality monitoring sites in the Lower Hunter in March 2013.

Figure 4-1: Monitoring site locations

Table 4-1: Monitoring sites

Monitoring Station	Type	Recorded Parameters	Recording Periods
Beresfield	NSW EPA site	PM_{10}, $PM_{2.5}$, NO_2, SO_2, WS, WD	Hourly/Daily
Wallsend	NSW EPA site	PM_{10}, $PM_{2.5}$, NO_2, SO_2, WS, WD	Hourly/Daily
Newcastle	NSW EPA site	PM_{10}, NO_2, SO_2, WS, WD	Hourly/Daily
Fullerton St, Stockton	Industry site	PM_{10}, $PM_{2.5}$, NO_2, NH_3, WS, WD	Hourly/Daily
Roxburgh St, Stockton	Industry site	NO_2	Hourly
Fullerton St, Stockton	Industry site	PM_{10} (HVAS)	Every 6th Day
Steel River	Industry site	PM_{10} (HVAS)	Every 6th Day
Mayfield	Industry site	PM_{10} (HVAS)	Every 6th Day

PM_{10} - Particulate matter < 10µm
$PM_{2.5}$ - Particulate matter < 2.5µm
NO_2 - Nitrogen dioxide
SO_2 – Sulfur dioxide
NH_3 - Ammonia
WS – Wind speed
WD - Wind direction
HVAS – High volume air sampler

5 AIR QUALITY CRITERIA

The sections below identify the key pollutants currently being monitored at the Lower Hunter air quality monitoring sites and the applicable air quality criteria.

5.1 Particulate matter

Particulate matter consists of particles of varying size and composition. The total mass of all particles suspended in air is defined as the Total Suspended Particulate matter (TSP). The upper size range for TSP is nominally taken to be 30 micrometres (µm) as in practice particles larger than 30 to 50µm will settle out of the atmosphere too quickly to be regarded as air pollutants.

The TSP is defined further into two sub-components. They are PM_{10} particles, particulate matter with aerodynamic diameters of 10µm or less, and $PM_{2.5}$, particulate matter with aerodynamic diameters of 2.5µm or less.

Table 5-1 summarises the air quality goals that are relevant to particulate pollutants as outlined in the NSW Environment Protection Agency (EPA) document "*Approved Methods for the Modelling and Assessment of Air Pollutants in NSW*" (**NSW DEC, 2005**).

Table 5-1: EPA air quality impact assessment criteria

Pollutant	Averaging Period	Criterion
Total suspended particulates (TSP)	Annual	90µg/m^3
Particulate Matter < 10µm (PM_{10})	Annual	30µg/m^3
	24-hour	50µg/m^3
Deposited dust	Annual	2g/m^2/month
		4g/m^2/month

Source: **NSW DEC, 2005**

5.1.1 $PM_{2.5}$ concentrations

The NSW EPA currently do not have impact assessment criteria for $PM_{2.5}$ concentrations, however the National Environment Protection Council (NEPC) has released a variation to the National Environment Protection Measure (NEPM) (**NEPC, 2003**) to include advisory reporting standards for $PM_{2.5}$ (see **Table 5-2**). As with the NEPM goals, the advisory reporting standards apply to the average, or general exposure of a population, rather than to "hot spot" locations such as industry monitoring sites.

Table 5-2: Advisory standard for $PM_{2.5}$ concentrations

Pollutant	Averaging Period	Concentration
Particulate Matter < 2.5µm ($PM_{2.5}$)	24-hour	25µg/m^3
	Annual	8µg/m^3

Source: **NEPC, 2003**

5.2 Other air pollutants

Nitrogen dioxide (NO_2) is reddish-brown in colour (at high concentrations) with a characteristic odour and can irritate the lungs and lower resistance to respiratory infections such as influenza. NO_2 belongs to a family of reactive gases called nitrogen oxides (NO_x). These gases form when fuel is burned at high temperatures, and mainly originates from motor vehicles, power generators and industrial boilers (**USEPA, 2013**). NO_x may also be generated by blasting activities. It is important to note that when formed, NO_2 is generally a small fraction of the total NO_x generated.

Sulfur dioxide (SO_2) is a colourless, toxic gas with a pungent and irritating smell. It commonly arises in industrial emissions due to the sulfur content of the fuel. SO_2 can have impacts upon human health and the habitability of the environment for flora and fauna. SO_2 emissions are a precursor to acid rain, which can be an issue in the northern hemisphere; however it is not known to be an issue in NSW.

Ammonia (NH_3) is a colourless gas with a pungent smell familiar to most people because ammonia is used in smelling salts and household cleaners such as bleach and window cleaning products. It also occurs naturally in air, soil and water and is found in fertilisers. Ammonia is a corrosive substance and the main toxic effects are restricted to the sites of direct contact with ammonia (i.e., skin, eyes, respiratory tract). For example, if you spilled a bottle of concentrated ammonia on the floor, you would smell a strong ammonia odour; you might cough, and your eyes might water because of irritation. If you were exposed to very high levels of ammonia, you would experience more harmful

effects. For example, if you walked into a dense cloud of ammonia or if your skin comes in contact with concentrated ammonia, your skin, eyes, throat, or lungs may be severely burned **(ATSDR, 2004)**.

Table 5-3 summarises the air quality goals for NO_2, SO_2 and NH_3.

Table 5-3: Air quality impact assessment criteria for air toxics

Pollutant	Averaging period	Criterion
NO_2	1-hour	246µg/m^3
	Annual	62µg/m^3
SO_2	10-minute	712µg/m^3
	1-hour	570µg/m^3
	24-hour	228µg/m^3
	Annual	60µg/m^3
NH_3	1-hour	0.46ppm

Source: **NSW DEC, 2005**

5.3 Summary of applicable criteria for this assessment

The particulate and gaseous pollutants monitored in the Lower Hunter have air quality criteria which are averaged over short and long time periods. Annually averaged criteria require a full year of data.

As this report only looks at one month of ambient air quality data, the annually average criteria are not applicable. The SO_2 10-minute average criterion was not included as 10-minute monitoring data is not available. Therefore the criteria relevant to this assessment are those averaged over the shorter time periods (1-hour and 24-hours).

Table 5-4 summarises the applicable air quality criteria for this assessment.

Table 5-4: Air quality impact assessment criteria used in this assessment

Pollutant	Averaging Period	Type	Concentration
Particulate Matter < 10µm (PM_{10})	24-hour	Criterion	50µg/m^3
Particulate Matter < 2.5µm ($PM_{2.5}$)	24-hour	Advisory Reporting Standard	25µg/m^3
Nitrogen Dioxide (NO_2)	1-hour	Criterion	246µg/m^3
Sulfur Dioxide (SO_2)	1-hour	Criterion	570µg/m^3
	24-hour	Criterion	228µg/m^3
Ammonia (NH_3)	1-hour	Criterion	0.46ppm

6 METEOROLOGICAL MONITORING DATA

Representative wind speed and direction data have been obtained from the Beresfield, Wallsend, Newcastle and Stockton air quality monitoring stations. The data are presented as a series windroses. For an example of how to read a windrose, refer to **Figure A-1** in **Appendix A**.

Figure 6-1 presents the March 2013 windroses for Beresfield, Wallsend, Newcastle and Stockton.

The Beresfield weather station shows a higher proportion of northwest and west-northwest wind directions compared with Wallsend, Newcastle and Stockton. This is expected as the Beresfield monitoring station is located further in the Hunter Valley and is more likely to experience winds that blow up and down the Hunter Valley flows.

The predominant wind direction recorded at the Wallsend weather station was from the south-southwest direction at generally low wind speeds. This is an indicator of potential valley drainage

flows influenced by the local terrain features. Stronger winds occurred from the southeast quadrant and are similar to those experienced at Newcastle and Stockton.

The Newcastle weather station recorded strong winds from the southeast quadrant, with a predominant wind direction from the eastern wind directions.

The Stockton weather station recorded a predominant wind direction from the north-northeast and very few winds from the north. Both Stockton and Newcastle experienced overall higher wind speeds than at the Beresfield and Wallsend sites, as would be expected with a coastal location.

Figure 6-1 shows some differences between the distributions of winds at the four meteorological stations. The variation in localised winds is clear to see, however the four locations also display a similar underlying trend in the wind distribution patterns, with the common wind directions tending to occur from the southeast quadrant.

The predominance of generally on-shore south-easterly winds is an indicator that air pollutant levels can be expected to be low. It is also an indicator that airborne sea salt levels may be high, and may affect the measured particulate levels.

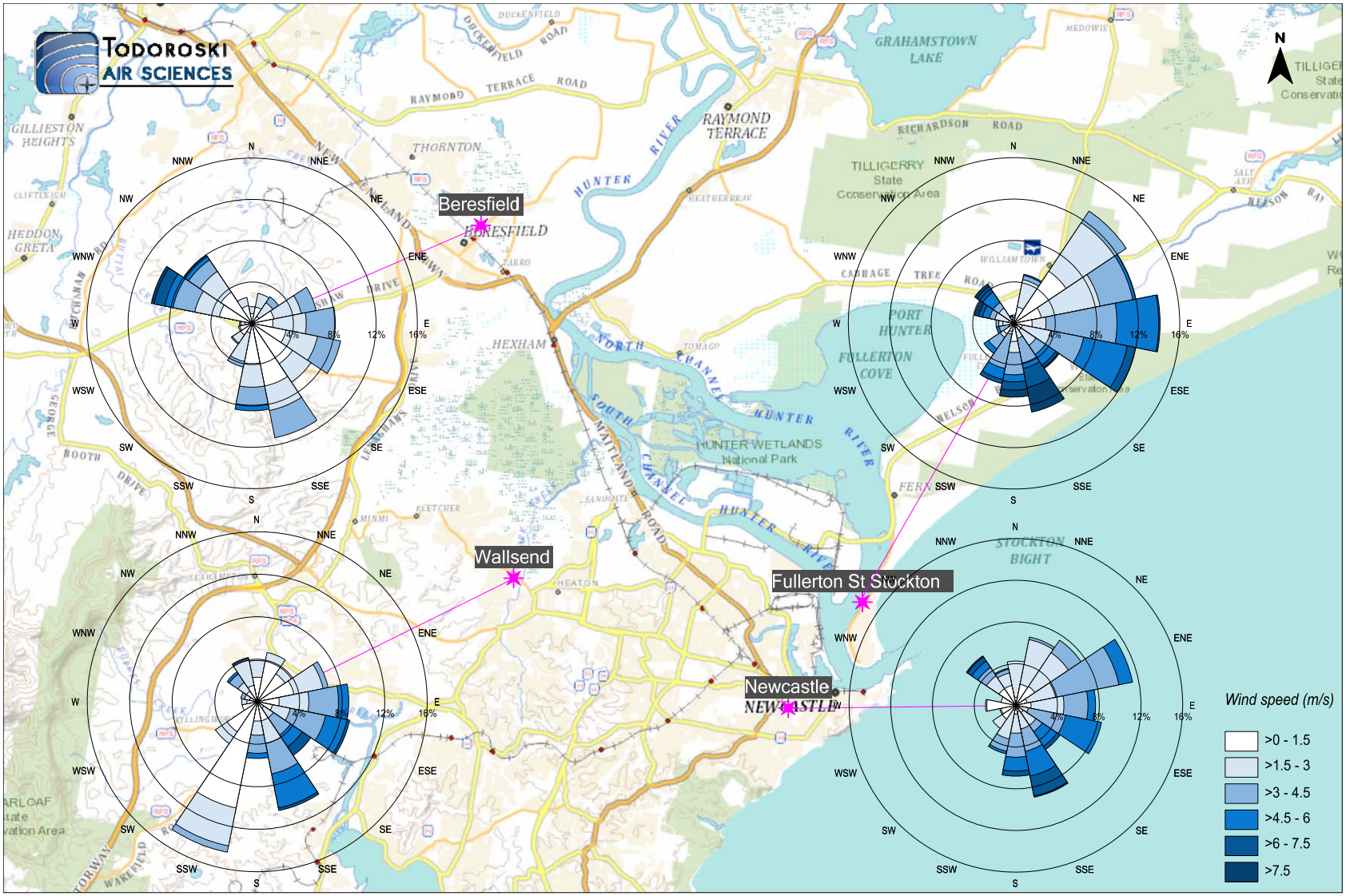


Figure 6-1: March Windroses - Beresfield, Wallsend, Newcastle and Stockton

7 AMBIENT AIR QUALITY MONITORING DATA

7.1 Preamble

The monitoring data in this report are presented in raw form as provided to Todoroski Air Sciences by the NSW EPA.

The Fullerton St Stockton monitoring site data included a note stating that:

- The data has undergone validation to remove erroneous data due to maintenance, instrument failures and nightly auto calibrations. Data gaps can be explained by this validation.
- The averaged data is based on a minimum of 75% data availability (i.e. a minimum of 75% of data is required to calculate an average for the time period, if below this, the cell will be blank)
- Data displayed on the www.stocktonairqualitymonitoring.com website has not undergone any validation, therefore there will be differences between the data in this report and the website at the time.

The 24-hour average data presented in this report have been averaged using the 1-hour average readings. Days which contain less than 75% data (less than 19 hours of 1-hour average data) have not been included in this report.

All of the monitoring data provided to Todoroski Air Sciences is presented in graphical format in **Appendix B** and tabulated format in **Appendix C**.

7.2 Analysis of Monitoring Data

Table 7-1 presents a summary of the maximum pollutant levels occurring during March 2013. The results indicate the ambient air concentration of all pollutants were below the relevant criteria during March 2013.

Table 7-1: Maximum pollutant levels - March 2013

Site	PM_{10} (µg/m^3)	$PM_{2.5}$ (µg/m^3)	SO_2 (µg/m^3)	NO_2 (µg/m^3)	SO_2 (µg/m^3)	NH_3 (ppm)
	24-hour average	24-hour average	24-hour average	1-hour average	1-hour average	1-hour average
	Air Quality Criteria					
	50	25*	228	246	570	0.46
Wallsend	24.7	9.6	8.8	33.8	52.4	-
Newcastle	32.7	-	9.9	58.3	41.9	-
Beresfield	33.8	12.3	9.9	48.9	62.9	-
Fullerton St, Stockton	36.6	14.0	-	47.1	-	0.28
Roxburgh St, Stockton	-	-	-	56.7	-	-
Fullerton St, Stockton HVAS	45.0	-	-	-	-	-
Steel River HVAS	26.0	-	-	-	-	-
Mayfield HVAS	26.0	-	-	-	-	-

* Advisory reporting standard for $PM_{2.5}$ concentrations (refer to Section 5.1)
- Not applicable

7.3 PM_{10}

Figure 7-1 presents all of the 24-hour average PM_{10} monitoring results recorded in the Lower Hunter Region in March 2013.

Relative to the Air Quality Index, as shown by the coloured bands in the figure, the data indicate that the levels of PM_{10} were mostly very good or good, with only three days of fair PM_{10} levels at a few monitors.

All data were below the applicable criteria on all days.

Figure B-1 to **Figure B-4** in **Appendix B** present the 1-hour average PM_{10} data in graphical form for each individual station. There is no criterion that applies to 1-hour average PM_{10} levels and these 1-hour results are not intended to be compared with the PM_{10} criterion. It is a normal occurrence, and it is expected that in the normal environment that 1-hour average PM_{10} levels will fluctuate more significantly than 24-hour average PM_{10} levels.

7.4 $PM_{2.5}$

Figure 7-2 presents all of the 24-hour average $PM_{2.5}$ monitoring data[1] recorded in the Lower Hunter region in March 2013.

Relative to the Air Quality Index, as shown by the coloured bands in the figure, the data indicate that the levels of $PM_{2.5}$ were very good for more than 75% of the time and good for the rest of the time.

All data were below the applicable criteria on all days.

Figure B-5 to **Figure B-7** in **Appendix B** present the 1-hour average $PM_{2.5}$ data in graphical form for each individual station. There is no criterion that applies to 1-hour average $PM_{2.5}$ levels and these 1-hour results are not intended to be compared with the $PM_{2.5}$ criterion. It is a normal occurrence, and it is expected that in the normal environment that 1-hour average $PM_{2.5}$ levels will fluctuate more significantly than 24-hour average $PM_{2.5}$ levels.

7.5 Nitrogen dioxide NO_2

Figure 7-3 presents the 1-hour average NO_2 monitoring data recorded in the Lower Hunter region in March 2013.

Relative to the Air Quality Index, as shown by the coloured bands in the figure, the data indicate the NO_2 levels were very good all of the time at all of the monitors.

All data were below the applicable criterion on all days.

7.6 Sulfur dioxide SO_2

Figure 7-4 presents the 1-hour average SO_2 monitoring data recorded in the Lower Hunter region in March 2013.

Relative to the Air Quality Index, as shown by the coloured bands in the figure, the data indicate the SO_2 levels were very good all of the time at all of the monitors.

All data were below the applicable criterion on all days.

Figure B-8 to **Figure B-10** in **Appendix B** present the 24-hour average SO_2 data in graphical form for each individual station.

[1] We note the Wallsend, Beresfield and Fullerton St, Stockton sites recorded periods in which 1-hour average $PM_{2.5}$ levels which were higher than the 1-hour average PM_{10} levels. This is not an unusual occurrence and may arise due to the presence of volatile mater (which registers as a solid mass at first, but then evaporates, registering negative mass at a later time. This is a relatively common issue when there is wood heater smoke or bushfire smoke present in the air also.

7.7 Ammonia NH_3

Figure 7-5 presents the 1-hour average NH_3 monitoring data recorded in the Lower Hunter region in March 2013.

The data indicate that the measured levels of NH_3 were low and that all data recorded were below the 1-hour average NH_3 criterion level of 0.46ppm in March 2013.

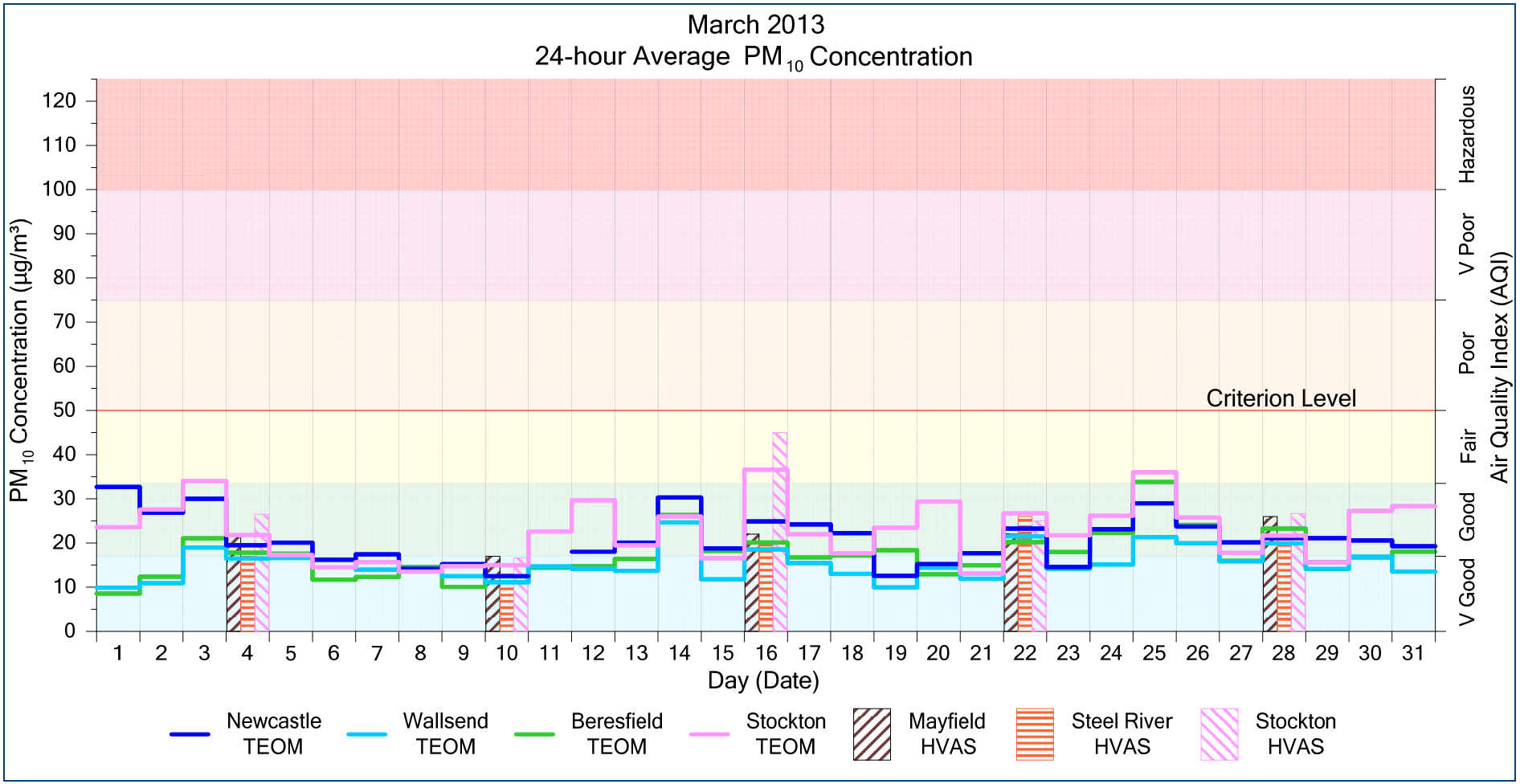


Figure 7-1: Lower Hunter 24-hour average PM_{10} levels – March 2013

All data recorded at the Lower Hunter monitoring sites were below the 24-hour average PM_{10} criterion level of 50µg/m^3 in March 2013. PM_{10} levels were very good or good for more than 90% of the time and were fair on three days at some locations.

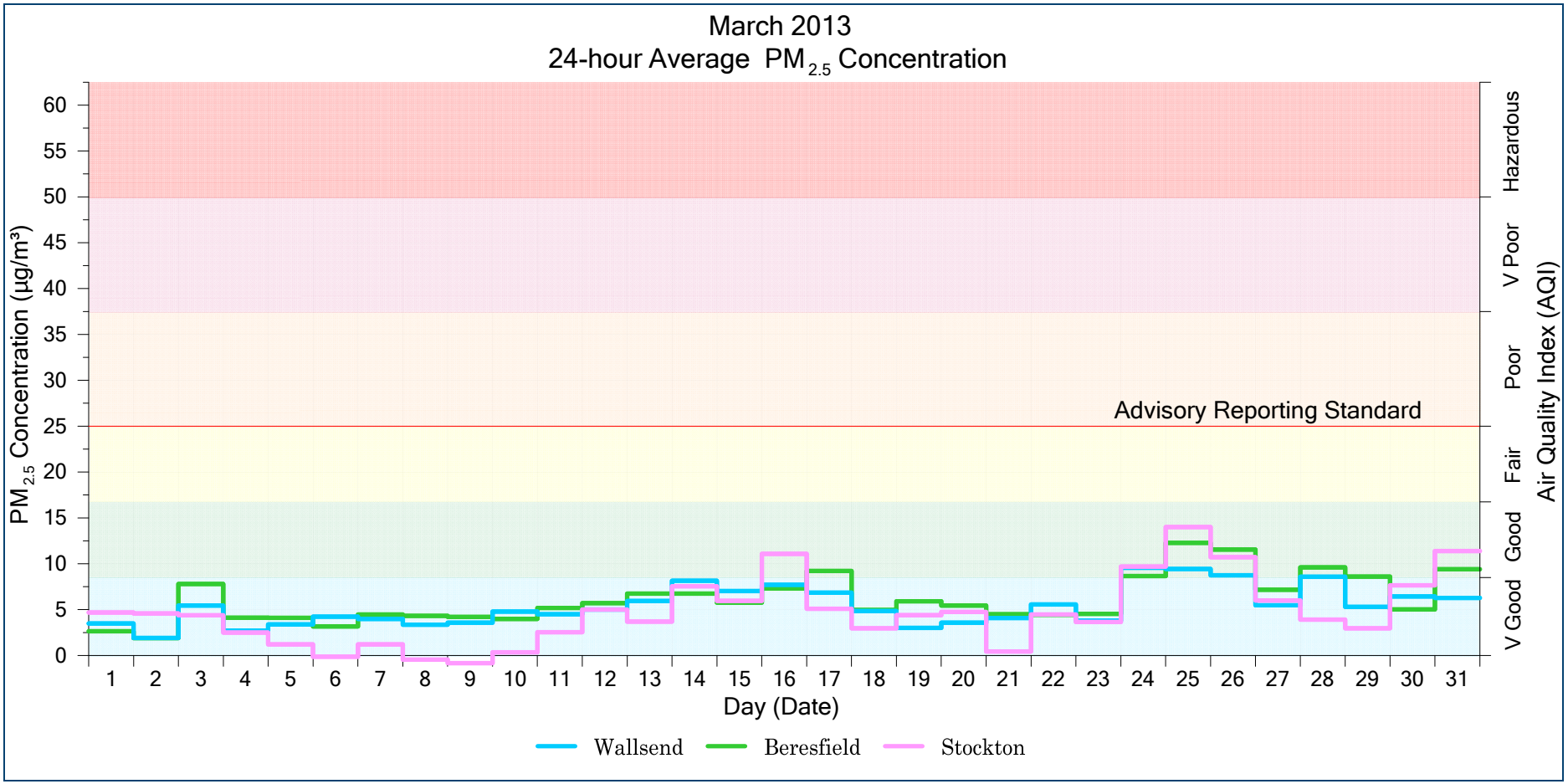


Figure 7-2: Lower Hunter 24-hour average $PM_{2.5}$ levels – March 2013

All data recorded at the Lower Hunter monitoring sites were below the 24-hour average $PM_{2.5}$ advisory reporting standard of 25µg/m^3 in March 2013. $PM_{2.5}$ levels at all monitors were very good for more than 75% of the time and good for the remainder of the time.

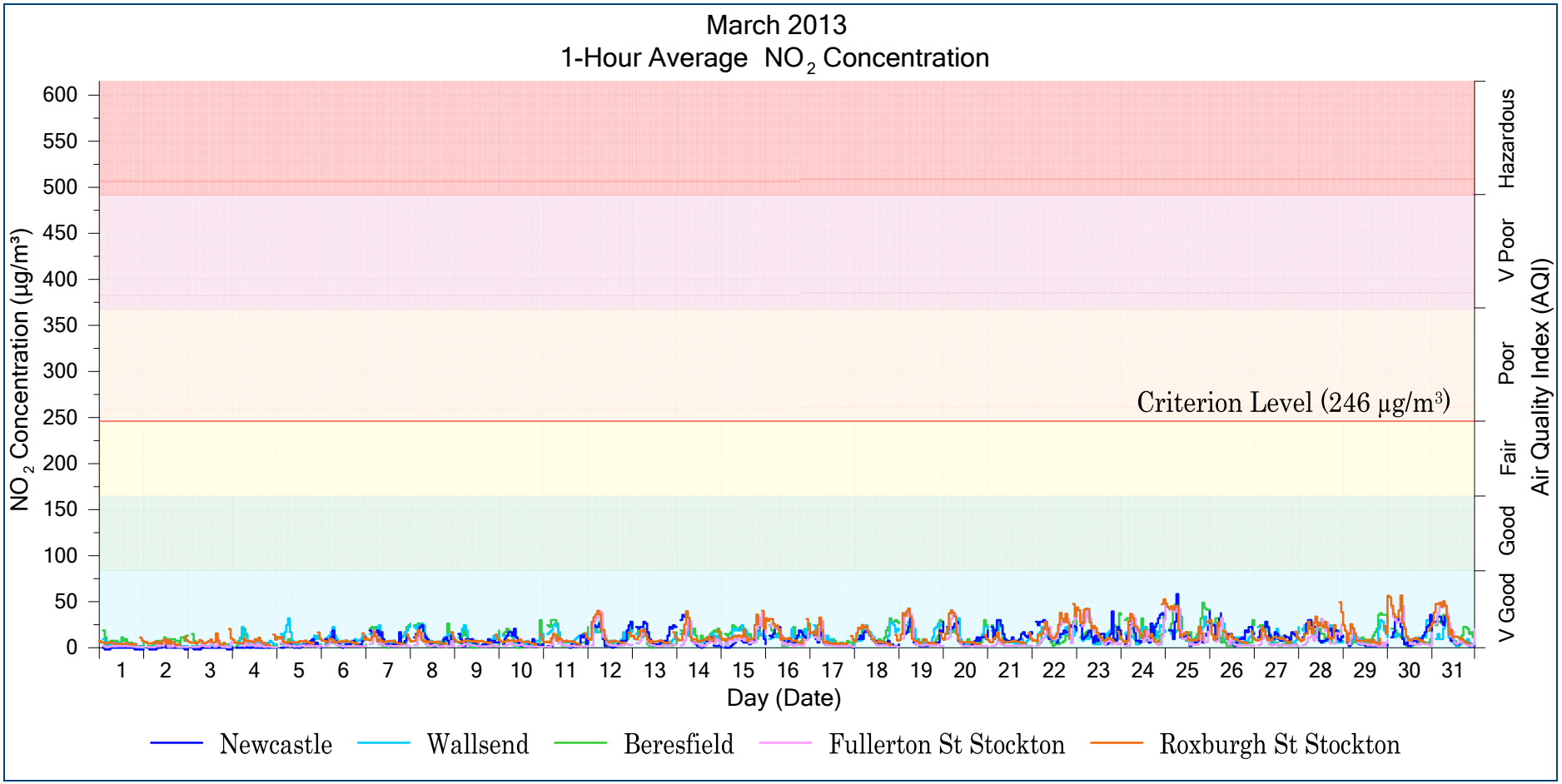


Figure 7-3: Lower Hunter 1-hour average NO_2 levels – March 2013

All data recorded at the Lower Hunter monitoring sites were below the 1-hour average NO_2 criterion level of 246µg/m^3 in March 2013. Measured levels of NO_2 were very good at all monitors at all times.

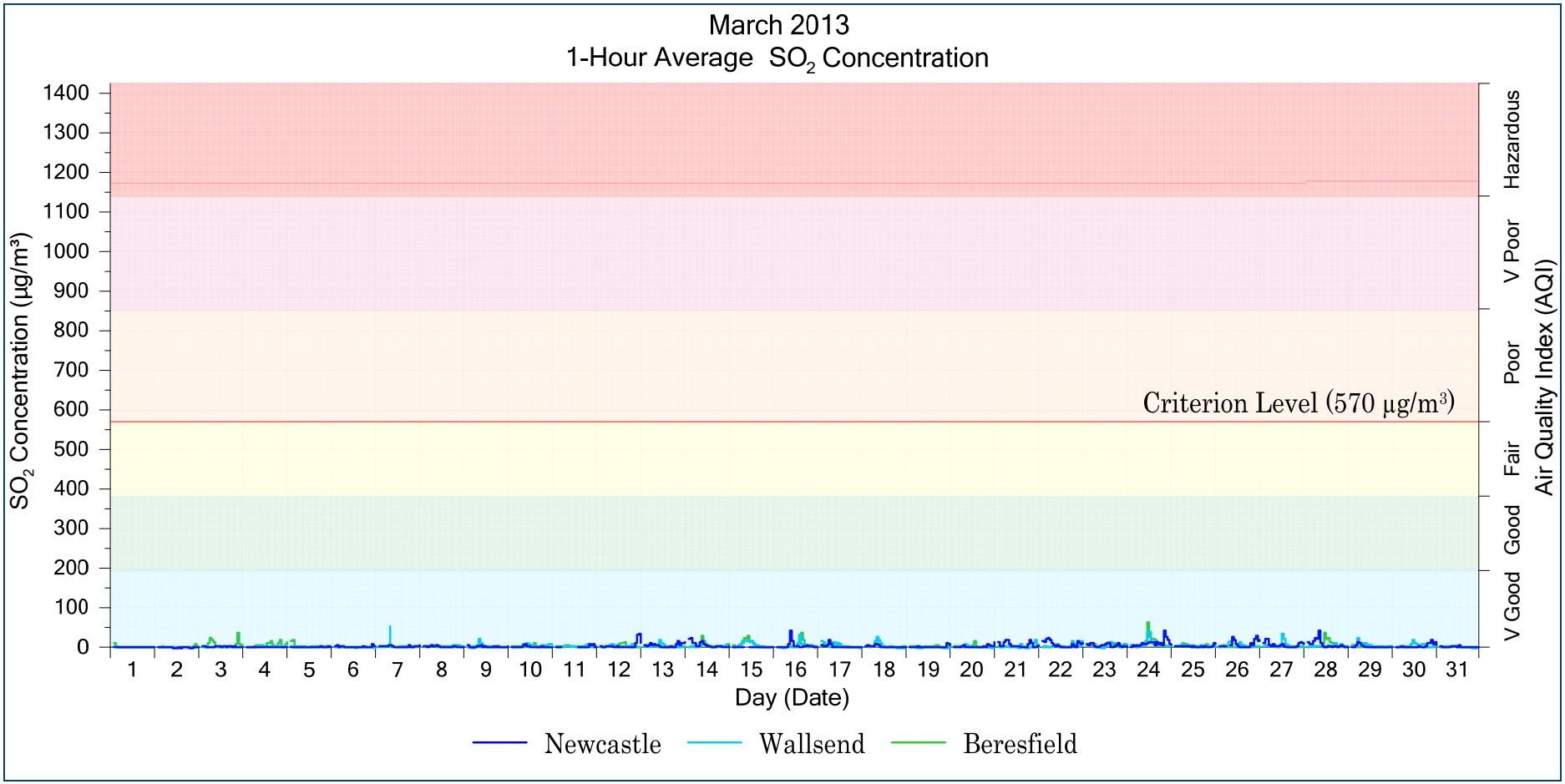


Figure 7-4: Lower Hunter 1-hour average SO_2 levels – March 2013

All data recorded at the Lower Hunter monitoring sites were below the 1-hour average SO_2 criterion level of 570µg/m^3 in March 2013. Measured levels of SO_2 were very good at all monitors at all times.

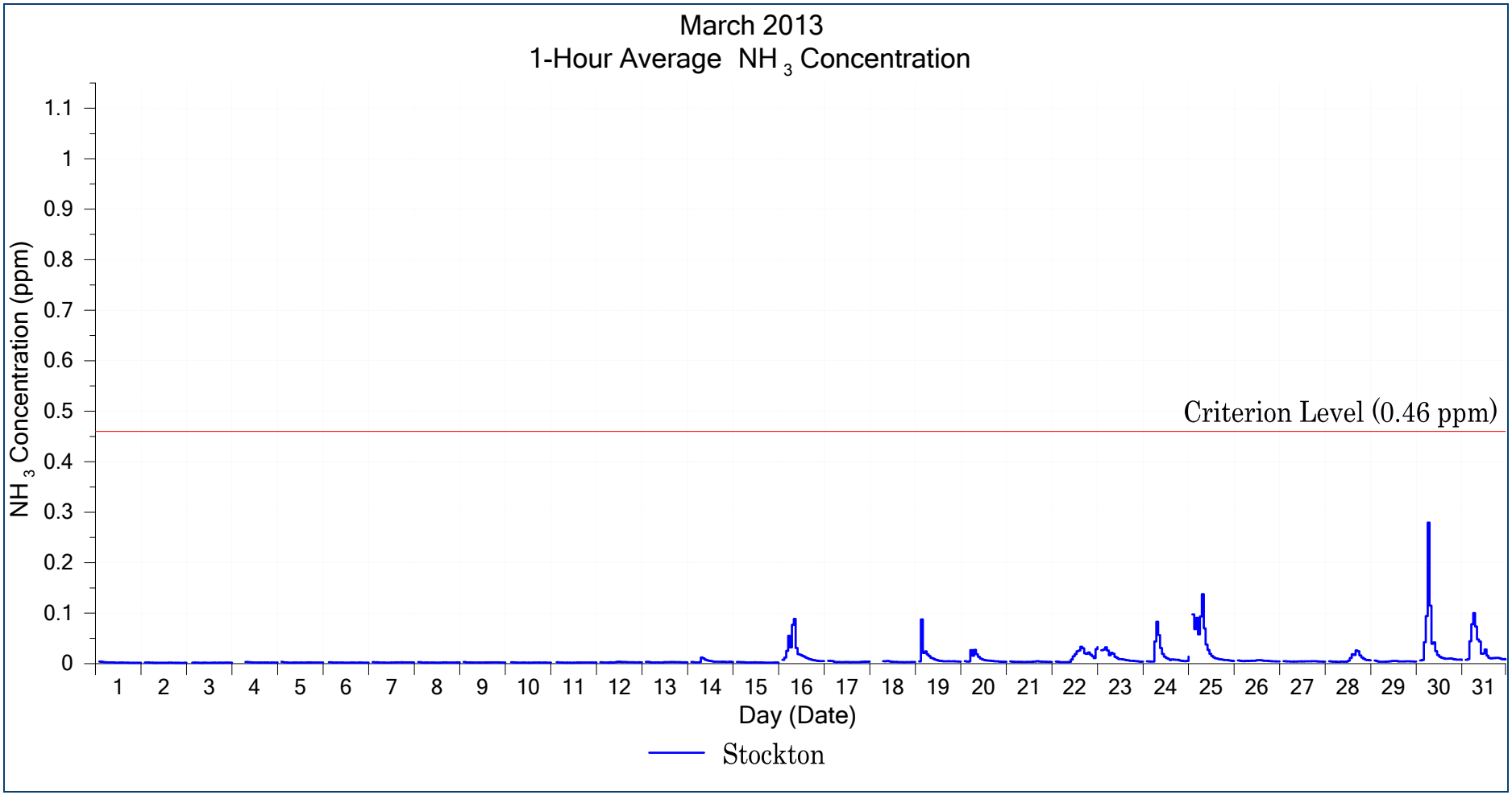


Figure 7-5: Lower Hunter 1-hour average NH_3 levels – March 2013

All data recorded were below a 1-hour average NH_3 criterion level of 0.46ppm in March 2013.

8 ANALYSIS OF ELEVATED POLLUTANT LEVELS

There were no levels above the assessment criteria during March 2013.

9 CONCLUSIONS

The results indicate that all monitoring stations recorded low levels of air pollution, which were below the applicable criteria at all times.

Relative to the Air Quality Index:

- The measured levels of NO_2 and SO_2 were very good at all monitors at all times;
- The measured levels of $PM_{2.5}$ at all monitors were very good for more than 75% of the time and good for the remainder of the time;
- The measured PM_{10} levels were very good or good for more than 90% of the time and were fair on three days at some locations.

The measured levels of NH_3 were low and were below the criterion at all times.

On this basis it can be concluded that the air quality in the Lower Hunter in March 2013 was generally very good to good at all monitors at all times.

10 REFERENCES

ATSDR (2004)
"Public Health Statement for Ammonia", Agency for Toxic Substances and Disease Registry September 2004.

NEPC (2003)
"Variation to the National Environment Protection (Ambient Air Quality) Measure for Particles as $PM_{2.5}$", National Environment Protection Council, May 2003.

NSW DEC (2005)
“Approved Methods for the Modelling and Assessment of Air Pollutants in NSW”, Department of Environment and Conservation (NSW), August 2005.

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Health Effects of Pollution, United States Environmental Protection Agency website, <http://www.epa.gov/region07/air/quality/health.htm>, accessed May 2013.

Appendix A

How to read a windrose

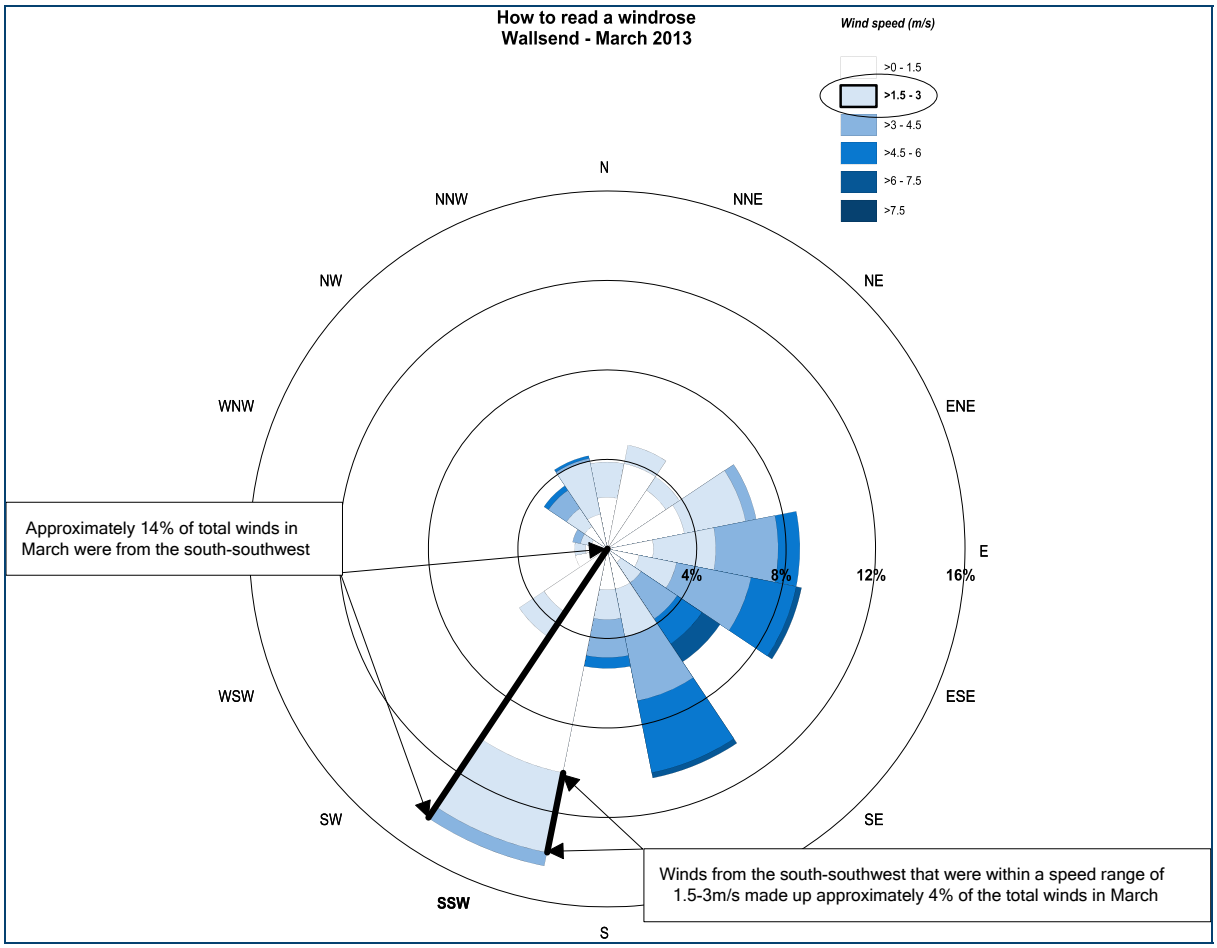

Figure A-1: How to read a windrose

Appendix B

Monitoring Data (Graphical)

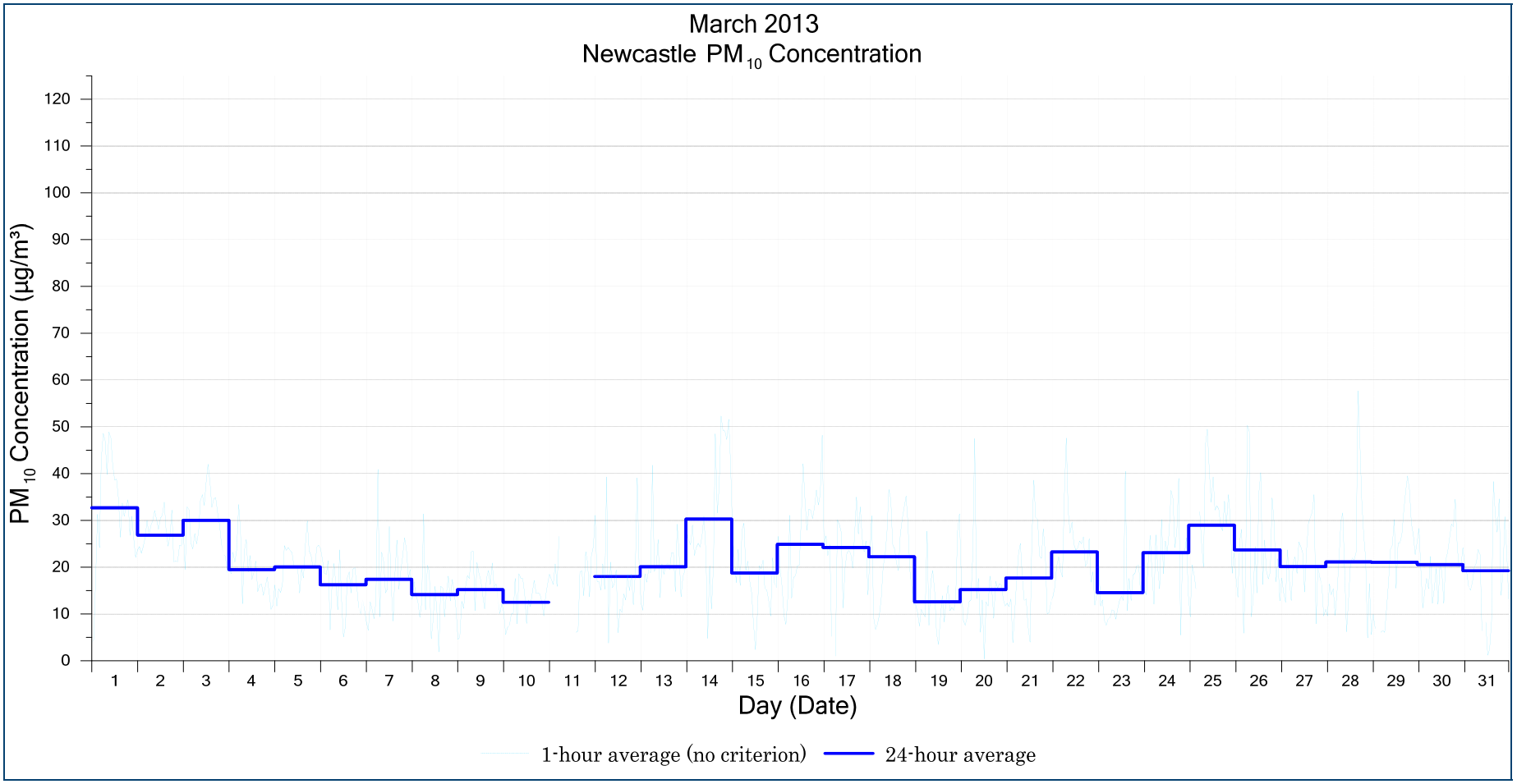

Figure B-1: Newcastle PM_{10} concentration - March

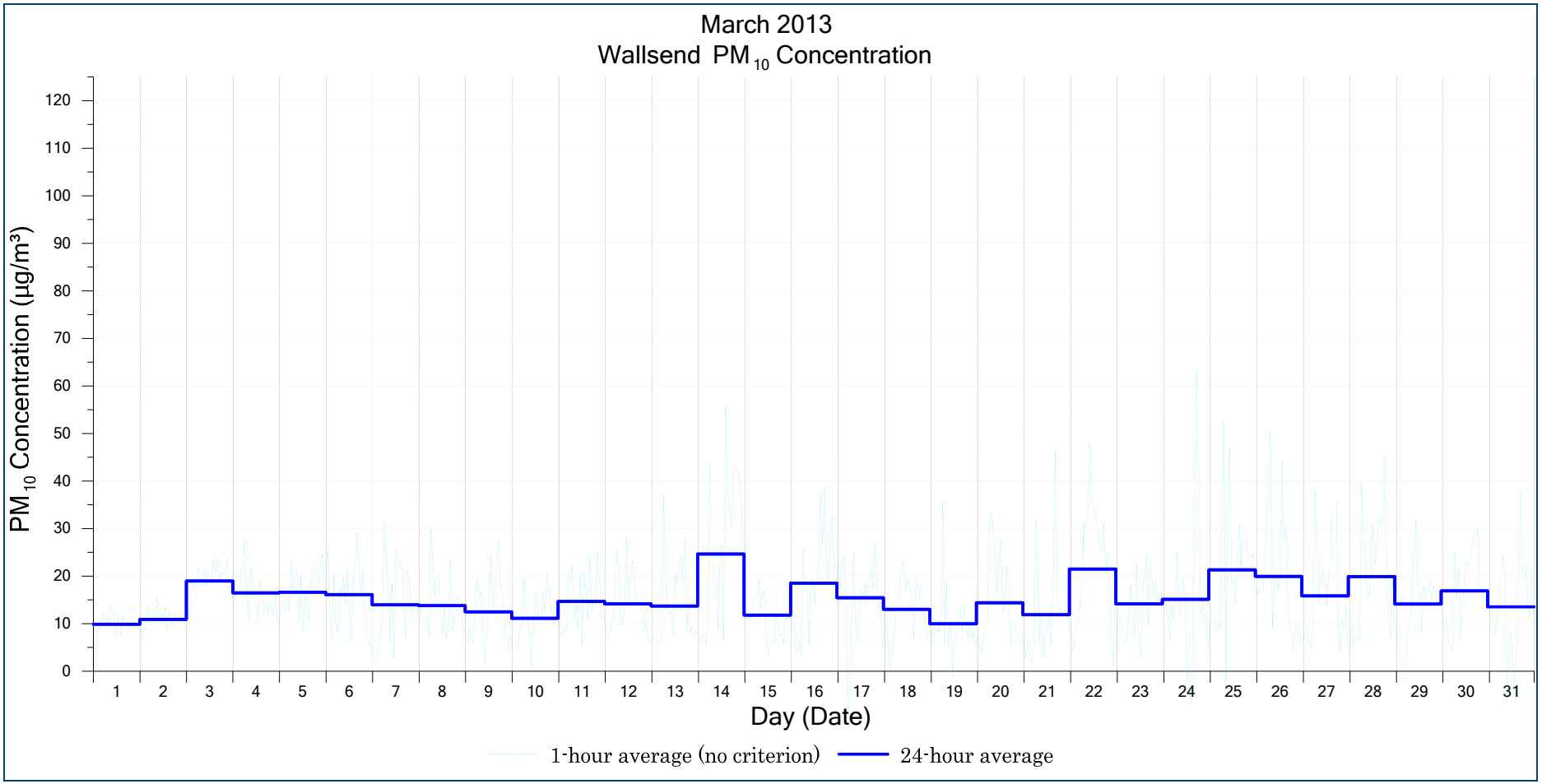

Figure B-2: Wallsend PM_{10} concentration - March

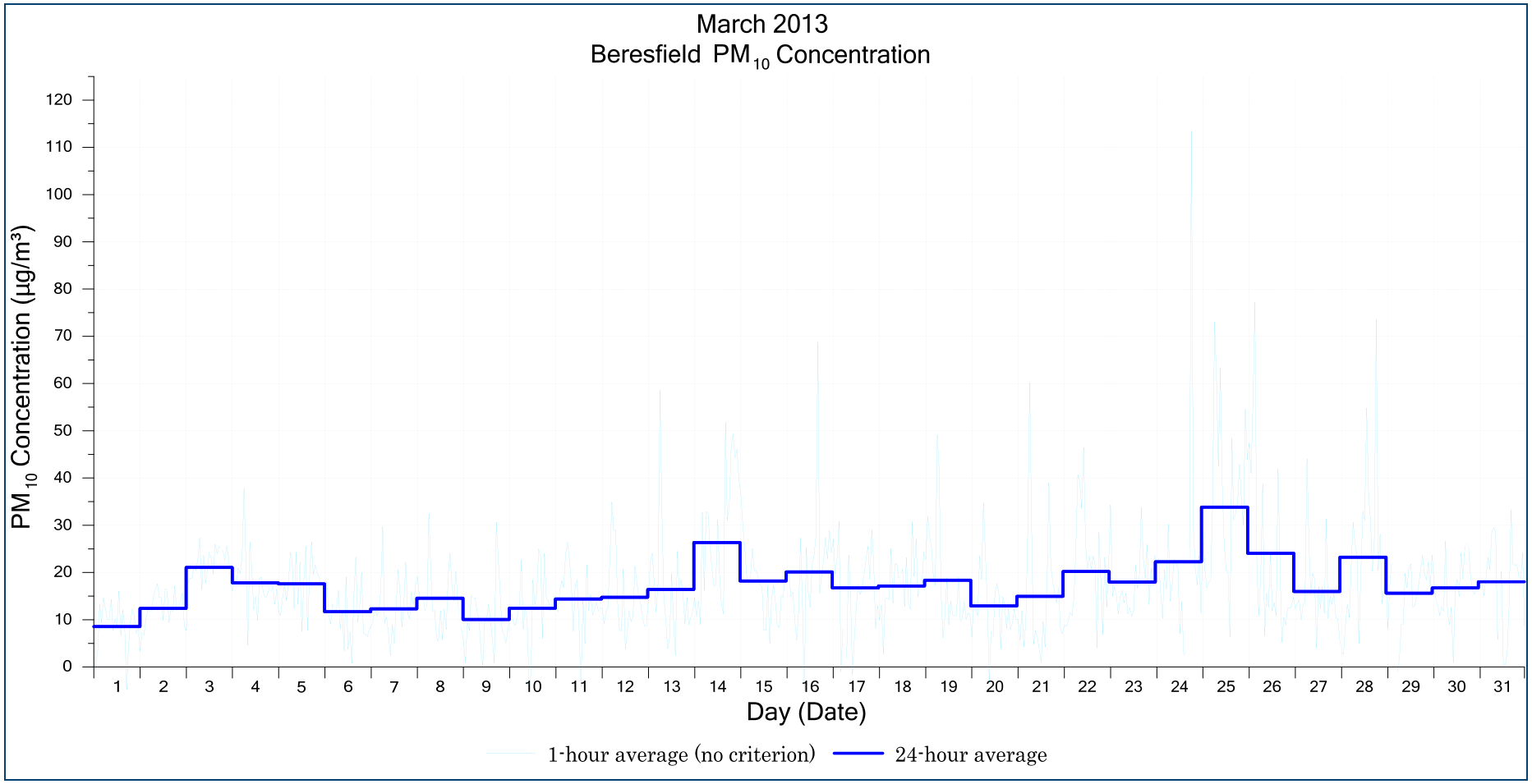

Figure B-3: Beresfield PM_{10} concentration - March

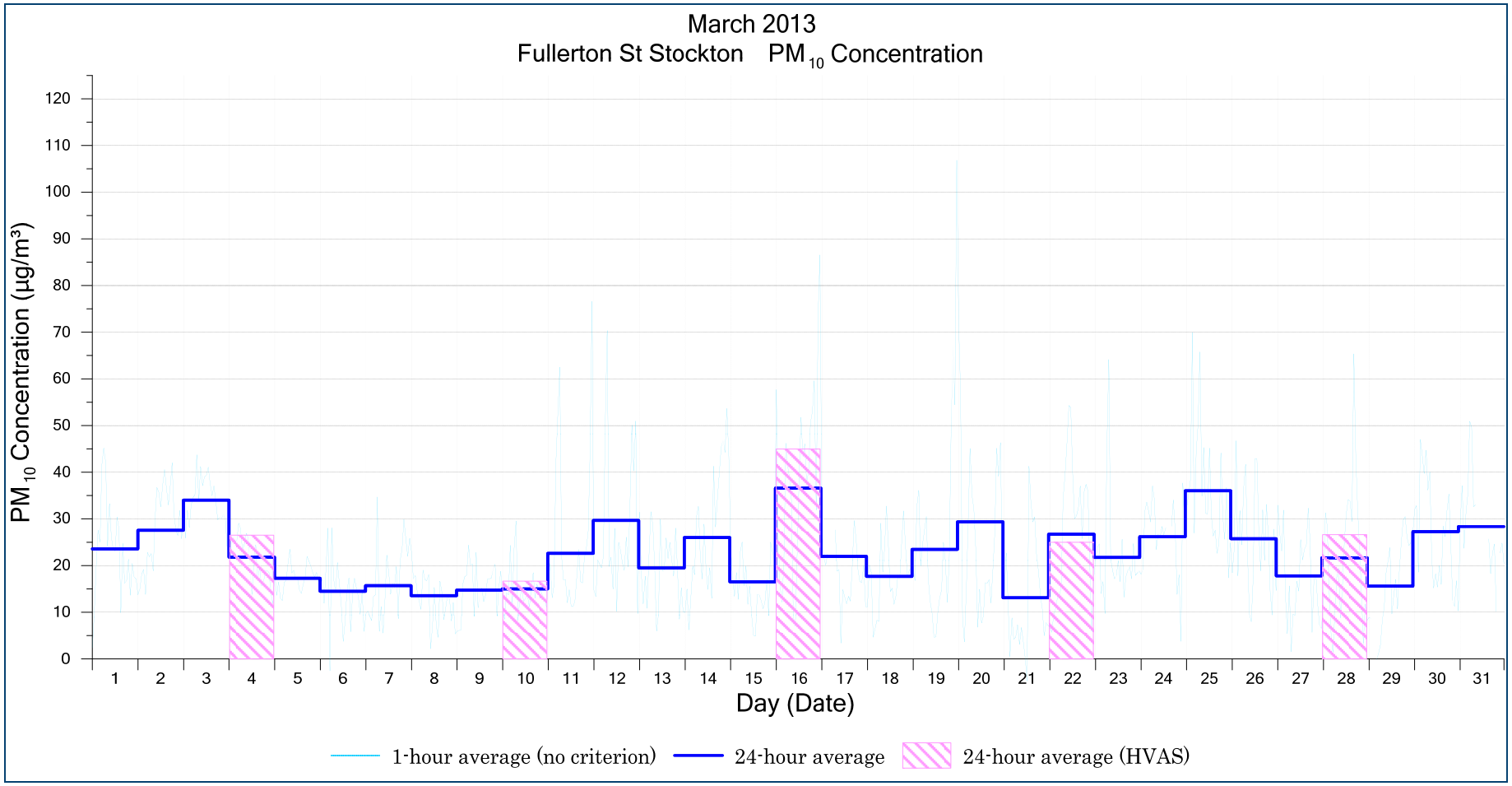

Figure B-4: Stockton PM_{10} concentration - March

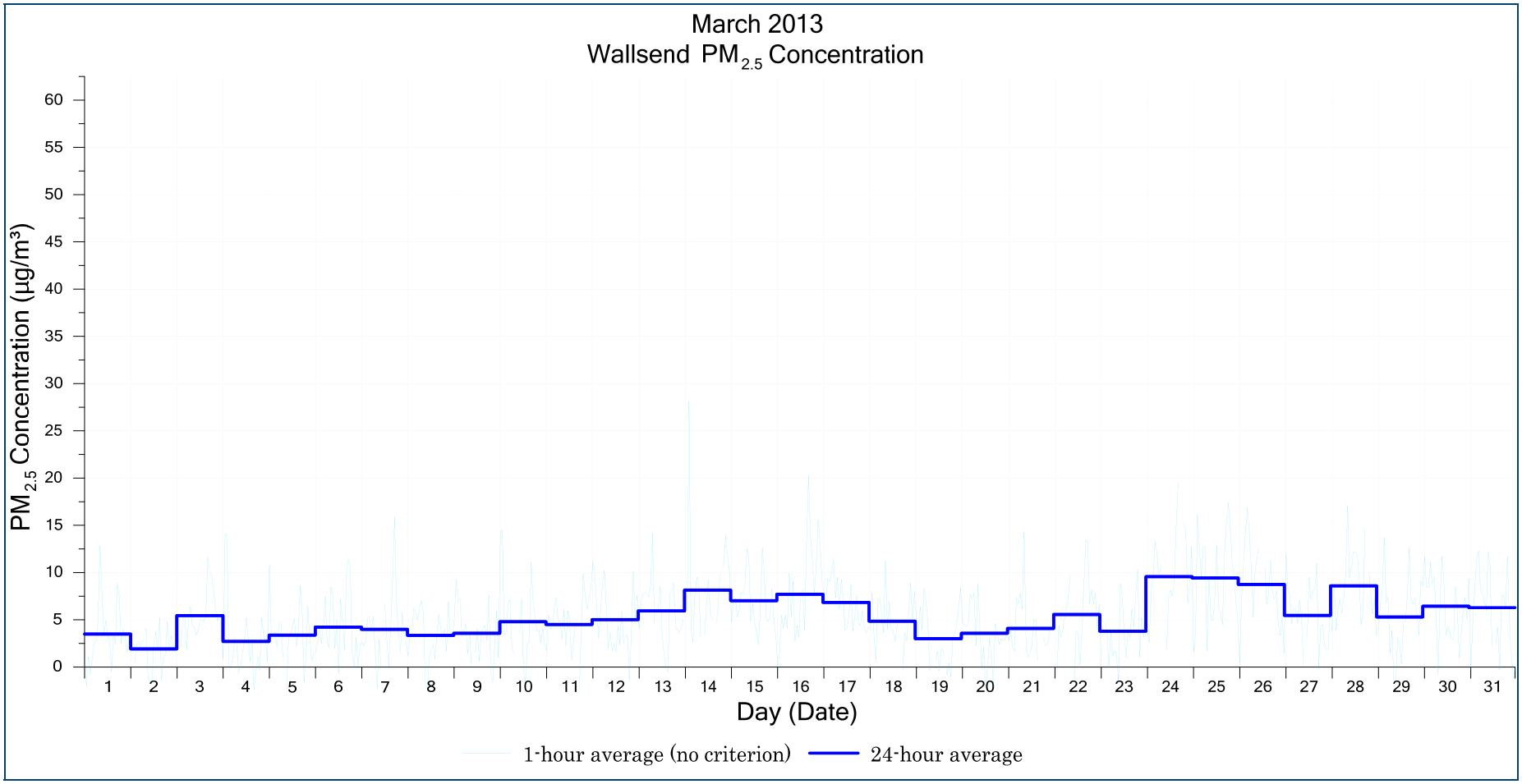

Figure B-5: Wallsend $PM_{2.5}$ concentration - March

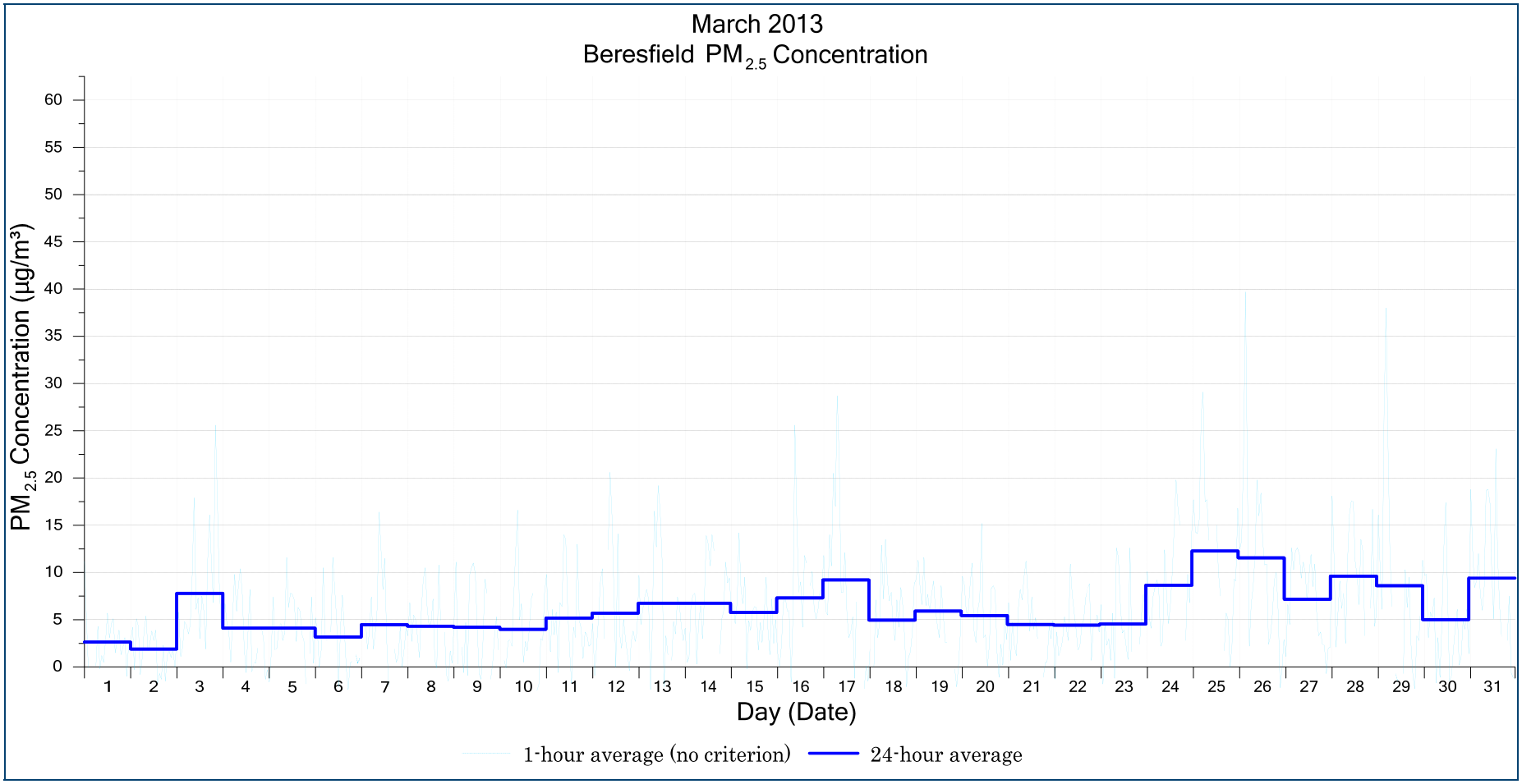

Figure B-6: Beresfield $PM_{2.5}$ concentration - March

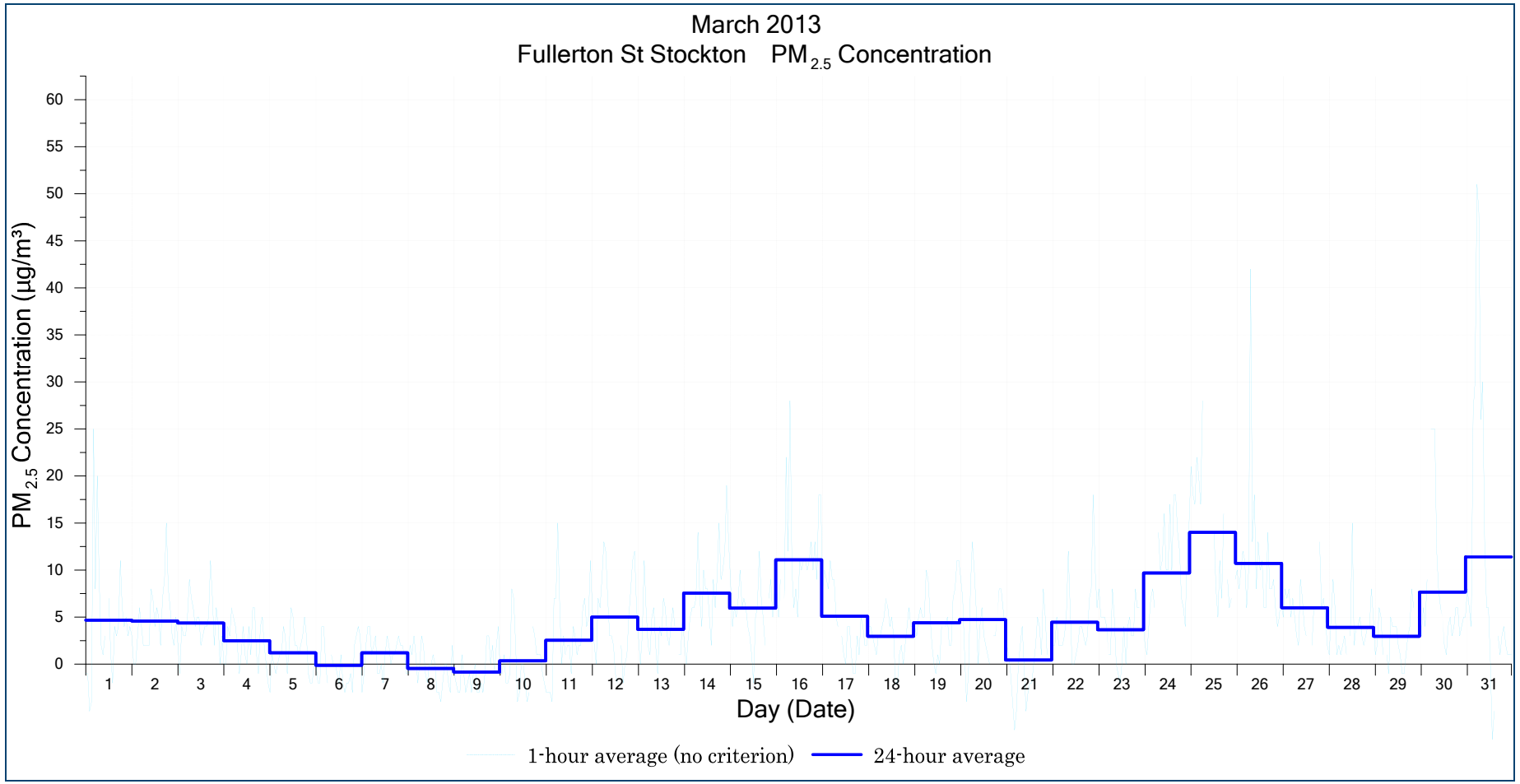

Figure B-7: Stockton $PM_{2.5}$ concentration - March

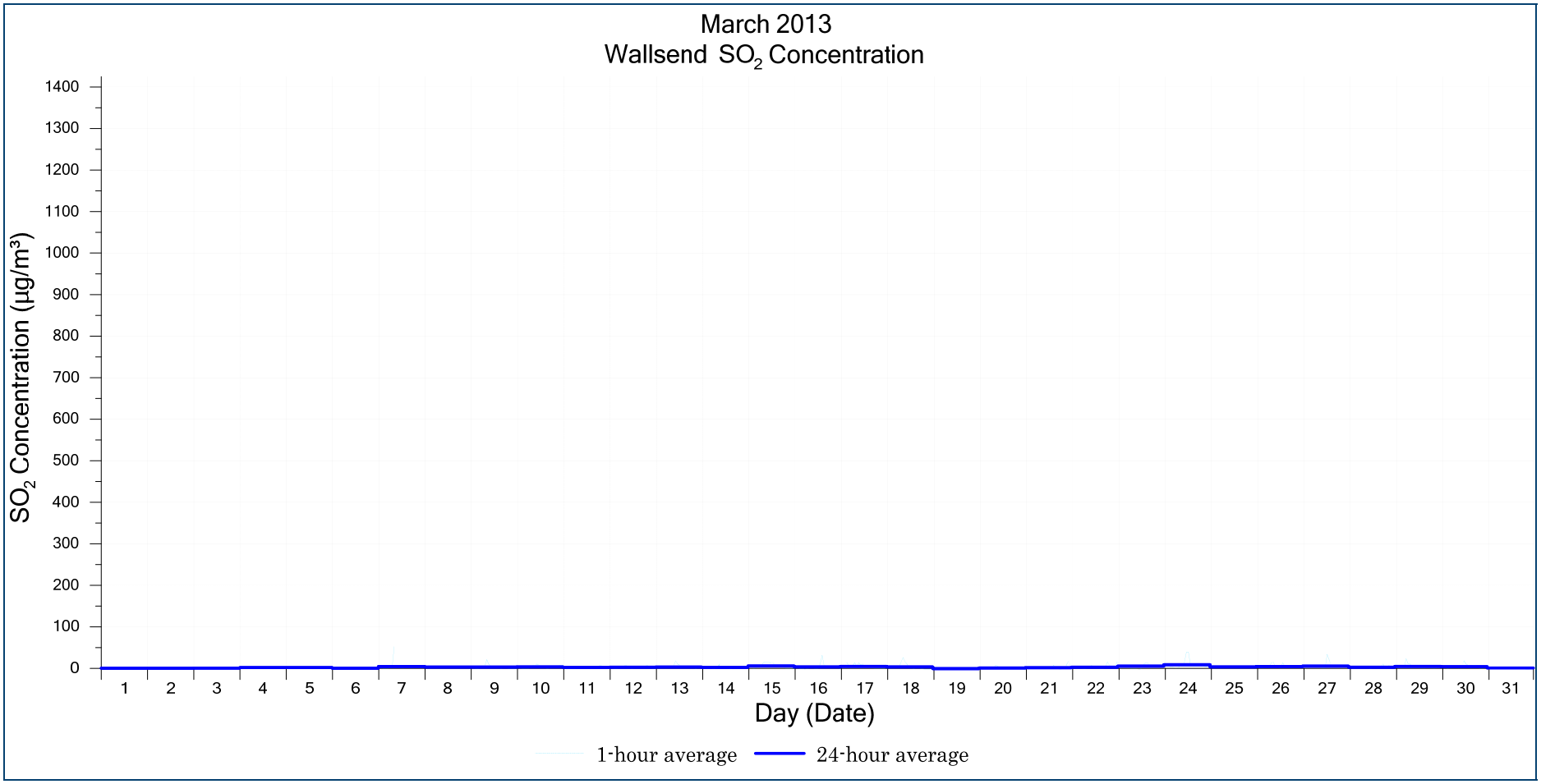

Figure B-8: Wallsend SO_2 concentration - March

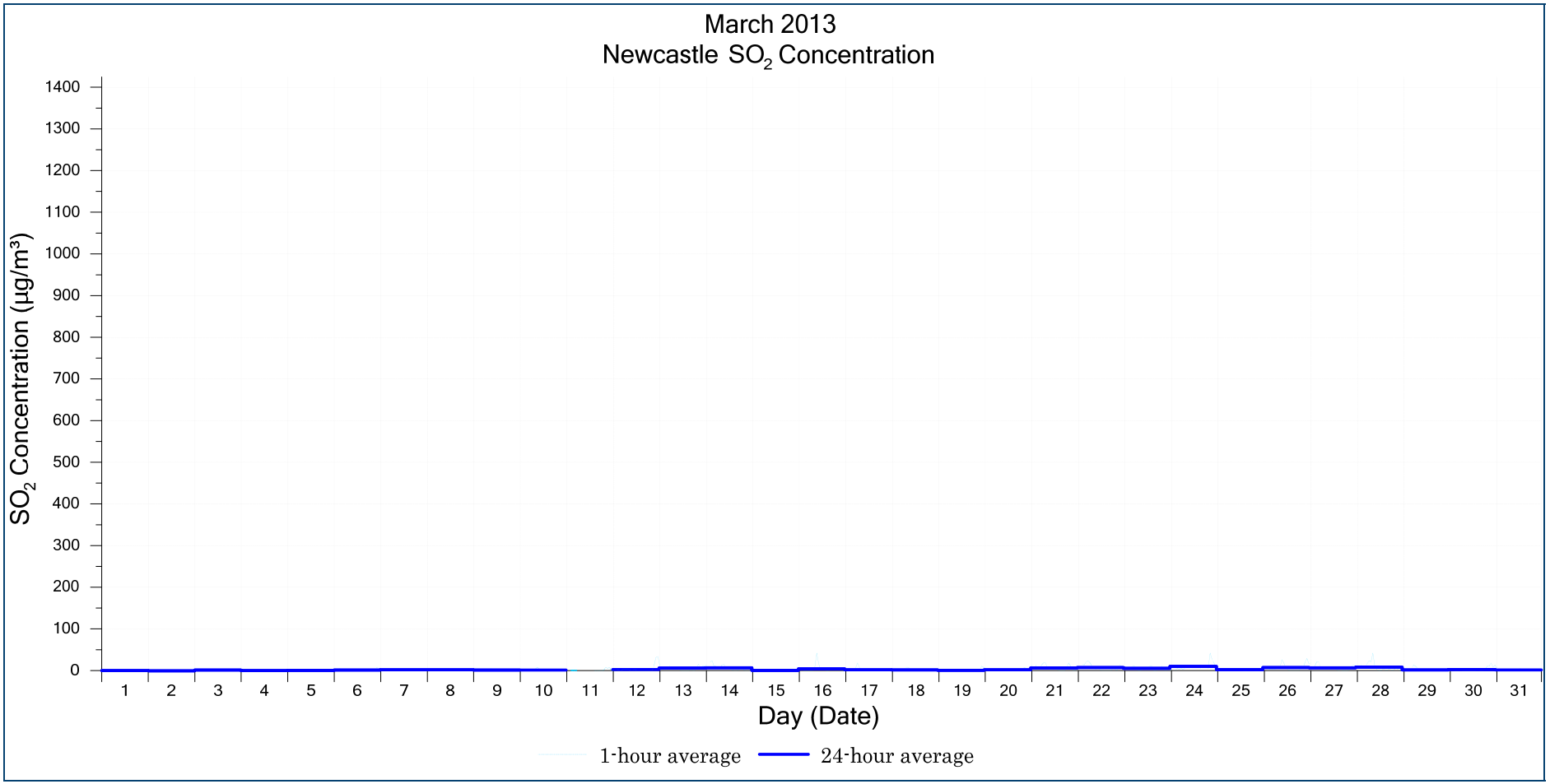

Figure B-9: Newcastle SO_2 concentration - March

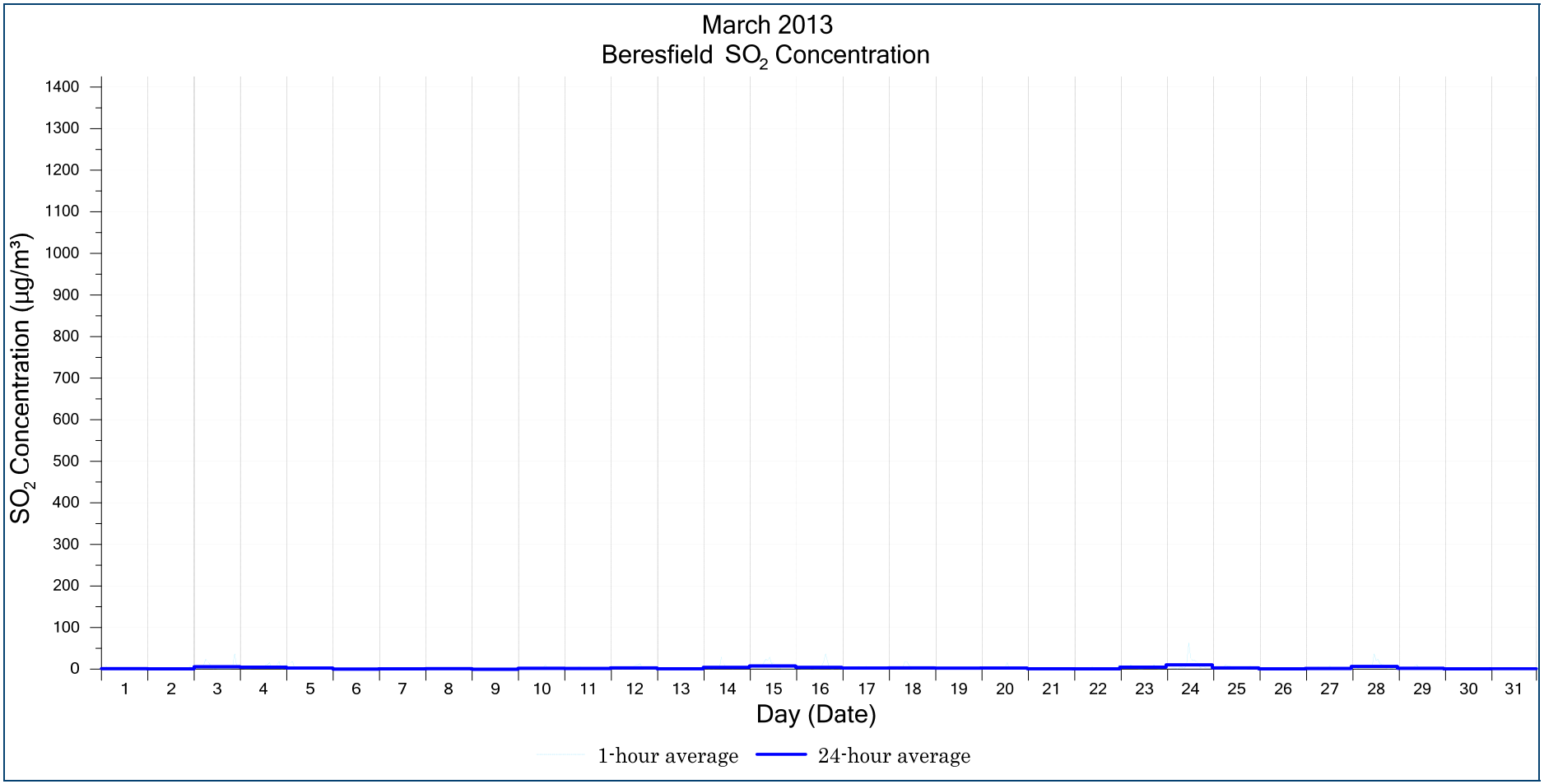

Figure B-10: Beresfield SO_2 concentration - March

Appendix C

Monitoring Data (Tabulated)

Table C-1: March 24-hour average monitoring data

Date	PM_{10} (TEOM) (µg/m^3)				$PM_{2.5}$ (µg/m^3)			SO_2 (µg/m^3)		
	Wallsend	Newcastle	Beresfield	Fullerton St Stockton	Wallsend	Beresfield	Fullerton St Stockton	Wallsend	Newcastle	Beresfield
1/03/2013	9.9	32.7	8.6	23.6	3.5	2.6	4.7	0.4	0.0	1.3
2/03/2013	10.9	26.9	12.4	27.5	1.9	1.9	4.6	0.1	-0.7	0.5
3/03/2013	19.0	30.0	21.1	34.0	5.5	7.8	4.4	0.6	1.1	5.7
4/03/2013	16.5	19.5	17.8	21.8	2.7	4.1	2.5	1.7	0.0	4.8
5/03/2013	16.6	20.1	17.6	17.3	3.4	4.1	1.2	1.9	0.2	2.5
6/03/2013	16.1	16.2	11.7	14.5	4.2	3.2	-0.1	0.2	1.0	0.0
7/03/2013	14.0	17.4	12.3	15.7	4.0	4.5	1.2	4.2	1.8	0.7
8/03/2013	13.8	14.2	14.6	13.5	3.4	4.3	-0.5	3.2	1.7	1.3
9/03/2013	12.5	15.2	10.1	14.7	3.6	4.2	-0.8	3.0	1.0	-0.2
10/03/2013	11.1	12.5	12.4	15.0	4.8	4.0	0.3	3.3	1.0	1.7
11/03/2013	14.7		14.4	22.6	4.5	5.2	2.5	2.5		1.6
12/03/2013	14.2	18.0	14.8	29.7	5.0	5.7	5.0	2.6	2.5	3.1
13/03/2013	13.7	20.1	16.4	19.5	5.9	6.7	3.7	3.0	5.9	0.8
14/03/2013	24.7	30.3	26.3	26.0	8.1	6.8	7.5	2.4	6.5	4.1
15/03/2013	11.8	18.8	18.2	16.5	7.0	5.8	6.0	5.5	0.1	7.4
16/03/2013	18.5	24.9	20.1	36.6	7.7	7.3	11.1	3.4	4.0	4.1
17/03/2013	15.4	24.2	16.7	22.0	6.8	9.2	5.1	4.8	1.8	2.6
18/03/2013	13.0	22.2	17.2	17.7	4.9	5.0	3.0	3.4	1.6	3.0
19/03/2013	10.0	12.6	18.4	23.5	3.0	5.9	4.4	-0.8	0.6	2.1
20/03/2013	14.4	15.2	12.9	29.4	3.6	5.4	4.7	0.8	1.7	2.4
21/03/2013	11.9	17.7	14.9	13.1	4.1	4.5	0.4	1.4	6.2	0.8
22/03/2013	21.5	23.3	20.2	26.7	5.6	4.4	4.5	2.7	7.1	0.7
23/03/2013	14.2	14.6	18.0	21.8	3.8	4.5	3.7	5.4	5.2	4.7
24/03/2013	15.1	23.1	22.3	26.2	9.6	8.7	9.7	8.8	9.9	9.9
25/03/2013	21.3	29.0	33.8	36.0	9.4	12.3	14.0	3.4	2.1	3.2
26/03/2013	19.9	23.7	24.1	25.8	8.7	11.5	10.7	4.4	7.1	0.5
27/03/2013	15.9	20.1	16.0	17.8	5.5	7.2	6.0	5.4	6.6	1.6
28/03/2013	19.9	21.1	23.2	21.7	8.6	9.6	3.9	2.8	8.0	6.4
29/03/2013	14.1	21.1	15.6	15.6	5.3	8.6	3.0	4.7	1.6	1.7
30/03/2013	16.9	20.6	16.7	27.3	6.4	5.0	7.7	4.0	2.4	0.7
31/03/2013	13.5	19.3	18.0	28.4	6.3	9.4	11.4	0.7	1.5	0.9

Table C-2: March 24-hour average HVAS monitoring data

Date	PM_{10} (HVAS) (µg/m^3)		
	Steel River	Mayfield	Fullerton St Stockton
4/03/2013	17.0	22.0	26.5
10/03/2013	13.0	17.0	16.6
16/03/2013	20.0	22.0	45.0
22/03/2013	26.0	22.0	25.0
28/03/2013	21.0	26.0	26.6