# *Latrobe Valley Air Monitoring Network*
# *Annual Summary for 2003*

*08/06/2004*

## Document Control

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| 1 | 06/04/04 | Remove re-iteration of statements and statistics in body of the report. Addition of TEOM data and statistics. | JM | JM | MAK | MAK |
| 2 | 08/06/04 | Table 3 – Remove reference to SEPP; Page 4, Nephelometer Cal'ns; page 7 Non-NEPM sites | JM | JM | MAK | MAK |
| 3 | 10/06/04 | Alterations to station location table | MK | MK | JN | JN |

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# FOREWORD

This report presents the annual air quality summary for the Latrobe Valley Air Monitoring Network (LVAMN) for the year 2003. The LVAMN consists of three air monitoring stations and an acoustic sounder operated by CWPPI on behalf of PowerWorks and two air monitoring stations operated on behalf of EPA Victoria.

The two EPA stations are performance monitoring stations for the purposes of the *State environment protection policy (Air Quality Management)*. Assessment of air quality against the goals set in the policy is undertaken at these performance monitoring stations.

The data reported has been determined in accordance with the following Australian Standards:

- AS 3580.5.1 - 1993 Methods for sampling and analysis of ambient air – Determination of oxides of nitrogen – Chemiluminescence method.
- AS 3580.4.1 - 1990 Methods for sampling and analysis of ambient air – Determination of sulfur dioxide – Direct-reading instrumental method.
- AS 3580.6.1 - 1990 Methods for sampling and analysis of ambient air – Determination of ozone – Direct-reading instrumental method.
- AS 3580.9.6 - 2003 Methods for sampling and analysis of ambient air – Determination of suspended particulate matter – $PM_{10}$ high volume sampler with size selective inlet – Gravimetric method.
- AS 3580.9.8 - 2001 Method for sampling and analysis of ambient air – Determination of suspended particulate matter – $PM_{10}$ continuous direct mass method using a tapered element oscillating microbalance, (TEOM) analyser.
- AS 2923 - 1987 Ambient air - guide for measurement of horizontal wind for air quality applications.

Determination of local visual distance (LVD) has been performed in accordance with EPA Victoria's designated method that is based on AS/NZS 3580.12.1:2001.

Note that LVD data is reported at an ambient temperature of 20$^{o}$C, and may require adjustment for comparison with data from other networks.

All requirements for instrument performance (measured as available data generated for the year) have been met.

The summary is therefore an accurate record of the state of the Latrobe Valley's air quality at this time.

All monitoring stations were operated and maintained by Connell Wagner PPI and the summaries for all stations were prepared from validated data sets stored on the central computer system housed in the organisation's offices at 1 Church Street, Traralgon.

Validated data has been provided to EPA for archiving, and is available from EPA on request.

John Marsiglio (EPA Victoria)
Chairman,
LVAMN Operations & Performance Review Committee

# LATROBE VALLEY AIR MONITORING NETWORK

# ANNUAL AIR QUALITY COMMENTARY 2003

## Summary

Annual air quality summaries and commentaries are presented for each air quality station in the Latrobe Valley Air Monitoring Network (LVAMN) for the year January 2003 to December 2003.

The highest measured values of sulfur dioxide ($SO_2$) in the Latrobe Valley can usually be attributed to power station emissions. The highest concentration measured in 2003 (0.23 ppm) was measured at Jeeralang Hill in the Strzelecki Ranges. While this exceeded the *State Environment Protection Policy (Ambient Air Quality)* ("SEPP") 1hr Environmental Quality Objective of 0.20 ppm (refer Table 2), it should be noted that evaluation of air quality against the policy Goal (allowing one exceedence of the Objective per year) is to be undertaken at performance monitoring stations located in urban or populated areas only. No other $SO_2$ measurements exceeded 0.20 ppm.

The highest 1hr $SO_2$ concentration measured on the floor of the Latrobe Valley during 2003 occurred at Traralgon on the 13 October. This concentration, 0.08 ppm, was attributed to power station emissions.

The highest nitric oxide (NO) concentration, 0.25 ppm, was measured at Traralgon on the 30 May. This was attributed to urban emissions (traffic, heating and cooking emissions) accumulating during calm stable conditions in the early evening. There is no SEPP Objective for NO levels.

The highest nitrogen dioxide ($NO_2$) concentration, 0.05 ppm measured at Traralgon on the 20 January, also originated from urban emissions during near calm stable conditions. This was well below the SEPP 1hr Objective for $NO_2$ of 0.12 ppm.

Particulate matter less than 10 microns in diameter ($PM_{10}$) is measured by two different methods, but all data is compared against the same Objective. The highest 24 hour average $PM_{10}$ concentration was 289 $\mu g/m^3$, measured at Moe during the North Eastern Victorian bushfires. Traralgon recorded 237 $\mu g/m^3$ on the same day. These values easily exceeded the SEPP 24h Objective of 50 $\mu g/m^3$. Exceedences of the Objective were also recorded at Jeeralang Hill and Rosedale South monitoring stations.

The SEPP 1hr Objective for Local Visual Distance (LVD) of 20 km was exceeded on 43 separate days during the year. The SEPP goal is that exceedences should occur on no more than 3 days per year per site. The most exceedence days recorded by a single station was 27 at Traralgon, which breached the SEPP goal. The Goal was also breached at Moe, with 22 exceedence days. The increased incidence of LVD breaches was attributed to the extensive North Eastern Victorian bushfires and extended fuel reduction burning. If the exceedence days due to these incidents are discounted, then the total number of exceedences for the Network is 29, which is comparable with recent years.

The highest 1hr average ozone ($O_3$) concentration for the year was 0.09 ppm, which occurred on the 20 January at Jeeralang Hill. This value did not exceed the SEPP 1hr Air Quality Objective of 0.10 ppm.

The highest 4hr rolling average $O_3$ concentration for the year, 0.09 ppm, also occurred at Jeeralang Hill on the 20 January. This measurement exceeded the SEPP rolling 4hr $O_3$ Objective of 0.08 ppm, but did not breach the Goal which allows one exceedence day per year.

# TABLE OF CONTENTS

# 1 INTRODUCTION

Annual summaries of air quality statistics and commentaries for the Latrobe Valley Air Monitoring Network (LVAMN) are presented for the period January to December 2003. All monitoring stations were operated and maintained by Connell Wagner PPI on behalf of PowerWorks and EPA Victoria. A list of all current LVAMN stations is given in Table 1 and their locations are shown in Figure 1.

The data reported have been determined in accordance with the following Australian Standards:

AS 3580.5.1 - 1993 Oxides of Nitrogen ($NO_X$, $NO_2$, and NO);
AS 3580.4.1 - 1990 Sulphur Dioxide ($SO_2$);
AS 3580.6.1 - 1990 Ozone ($O_3$);
AS 3580.9.6 - 2003 Suspended Particulate Matter ($PM_{10}$) Hi-Vol method;
AS 3580.9.8 - 2001 Suspended Particulate Matter ($PM_{10}$) TEOM method.

Determination of Local Visual Distance (LVD) has been undertaken in accordance with the Environment Protection Authority of Victoria designated method that is based on AS/NZS 3580.12.1:2001.

Table 2 shows the *State Environment Protection Policy (Ambient Air Quality)* ("SEPP") Environmental Quality Objectives and Goals for Victoria (Victoria, 1999). While the Objectives apply to all ambient air in Victoria, it should be noted that evaluation of air quality against the Goals is to be undertaken at performance monitoring stations located in urban or populated areas only. The Moe and Traralgon monitoring stations are performance monitoring stations.

The rural sites of Darnum North, Jeeralang Hill and Rosedale South serve as surveillance sites and measurements are used for air quality modelling, plume impact and other studies.

# 2 LVAMN OPERATIONS FOR 2003

## 2.1 Network Operations

Four air monitoring stations were in operation for the complete twelve months; these were Traralgon and Moe urban sites and Rosedale and Jeeralang Hill rural sites. Darnum North, a rural site, operated for six months only (January to March & October to December).

The parameters measured at each monitoring station are:

**Darnum North:** Ozone, Wind Speed, Wind Direction for the spring and summer (October to March) period only.

**Rosedale South:** Nitrogen Oxides, Sulphur Dioxide, Ozone, Local Visual Distance, Dry Bulb Temperature, Wet Bulb Temperature, Wind Speed, Wind Direction, Global Solar Radiation, Ultra-Violet Radiation and Inhalable Particles (HiVol $PM_{10}$ size selective inlet method).

**Jeeralang Hill:** Ozone, Sulphur Dioxide, Wind Speed, Wind Direction and Inhalable Particles (Hivol $PM_{10}$ size selective inlet method).

**Moe:** Nitrogen Oxides, Sulphur Dioxide, Ozone, Local Visual Distance, Dry Bulb Temperature, Wet Bulb Temperature, Wind Speed, Wind Direction and Inhalable Particles (TEOM continuous $PM_{10}$ method).

**Traralgon:** Nitrogen Oxides, Sulphur Dioxide, Ozone, Local Visual Distance, Dry Bulb Temperature, Wet Bulb Temperature, Wind Speed, Wind Direction and Global Solar Radiation and Inhalable Particles (TEOM continuous $PM_{10}$ method).

An acoustic sounder is located at "The Ridge" in Morwell at the southern end of the PowerWorks building. The sounder measures wind speed, wind direction and temperature at a range of heights to enable more accurate tracking of stack emissions and provides important data for the modelling of emissions and atmospheric dispersion.

The urban monitoring sites of Moe and Traralgon are regarded as "Performance Monitoring" sites and are equipped with continuous analysers in accordance with the NEPM measurement criteria.

A complete list of current LVAMN stations is shown in Table 1 and the locations of these stations are shown in Figure 1.

### 2.2 Network Performance

All monitoring equipment used in the LVAMN stations performed extremely well for the year. All parameters performed above the minimum requirement of 80% valid data capture. Very little "down time' was attributable to poor instrument performance. Data losses from power interruptions and air conditioner breakdowns (causing over temperature trips) were the most significant causes of lost data (refer to Table 7 for instrument performance details).

## 3 LATROBE VALLEY AIR QUALITY, 2003

The summary of air quality measurements for the Latrobe Valley Air Monitoring Network for the period January 2003 to December 2003 is shown in Table 3 and Table 4.

The highest values[1] measured in the Latrobe Valley for each year from September 1980 to December 2003 are shown in Tables 5a & 5b.

Measured concentrations are rounded to the nearest 0.01 ppm, 1 km or 1 $\mu g/m^3$ in accordance with the precision of the SEPP Environmental Quality Objectives.

### 3.1 Nitric oxide (NO)

Nitric oxide is discharged mainly from combustion processes. It is not considered to be harmful and it has no air quality objective. Its presence in air usually indicates the impact of a combustion source.

The highest concentrations of NO occur at township stations, which measure far higher concentrations of NO than do rural stations, often by a factor of 4 times or more. The highest

[1] The lowest values for local visual distance (LVD).

levels usually occur in near-calm conditions in the evening or early morning in winter when the local emissions from traffic, heating and cooking are not flushed away by the wind.

The two highest NO concentrations at Traralgon were 0.25 ppm on the 30 May, and 0.24 ppm on the 25 June. The two highest NO concentrations at Moe were 0.23 ppm on the 8 July, and 0.17 ppm on the 23 May. These urban measurements were characteristic of traffic, heating and cooking emissions accumulating during near calm stable conditions, and were consistent with previous years data.

The two highest NO concentrations measured at the rural Rosedale South station were 0.03 ppm on the 7 March and 0.03 ppm on the 28 January. As expected, these were considerably lower than at the urban Traralgon and Moe sites.

### 3.2 Nitrogen dioxide ($NO_2$)

$NO_2$ is largely formed in the atmosphere by the oxidation of NO emissions that originate from urban and industrial sources.

Historically the measured levels have been well below the SEPP 1hr Air Quality Objective, and the maximum concentration in 2003 (0.05 ppm at Traralgon on the 20 January) was similar to levels measured in previous years. This was again well below the SEPP 1hr Objective for $NO_2$ of 0.12 ppm.

The highest concentration measured at a rural site was 0.02 ppm at Rosedale South.

The highest annual average $NO_2$ concentration measured at either an urban or rural site during 2003 was 0.008 ppm at Traralgon, well below the SEPP objective of 0.03 ppm.

### 3.3 Sulfur dioxide ($SO_2$)

About 95% of all $SO_2$ in the Latrobe Valley originates from burning brown coal in power stations. The highest measured values on investigation can usually be attributed to the power stations.

The highest $SO_2$ concentration during 2003, 0.23 ppm measured at Jeeralang Hill on the 17 May 2003, was attributed to a plume strike from Loy Yang A and B Power Stations occurring under stable conditions during the early morning. The measurement is typical of maxima previously measured at Jeeralang Hill, with the exception of the extreme concentration measured in 2001.

While the SEPP Goal of less than 0.20 ppm for all but one day per year was not exceeded in 2003, concentrations of $SO_2$ measured at Jeeralang Hill exceeded 0.05 ppm on 23 days, 0.10 ppm on 7 days and the SEPP Environmental Quality Objective of 0.20 ppm on 1 day.

The highest $SO_2$ concentration measured on the Latrobe Valley floor was 0.08 ppm. This occurred at Traralgon on the 13 October and was attributed to power station emissions being convectively mixed to ground under unstable conditions. The second highest event was 0.06 ppm at Rosedale South on 14 December. This measurement was also attributed to power station plume impact. These measurements are typical of previous years' measurements at these sites.

The highest 24hr average concentration of $SO_2$ measured by the LVAMN was 0.02 ppm at Jeeralang Hill on the 17 May 2003. This value did not breach the SEPP 24hr Objective of 0.08 ppm. As expected, this event occurred on the same day as the highest 1hr concentration was measured, with the plume impact being evident for approximately 5 hours at the monitoring station.

The SEPP annual average concentration objective for $SO_2$ is 0.02 ppm and is not to be exceeded. The highest annual average concentration of $SO_2$ was 0.003 ppm, measured at Jeeralang Hill. This is well below the objective.

### 3.4 Ozone ($O_3$)

Photochemical pollution (the action of sunlight on a mixture of oxides of nitrogen and hydrocarbons) is responsible for most of the measured high levels of ozone in the Latrobe Valley. The SEPP 1hr Air Quality Objective of 0.10 ppm for ozone has been exceeded only once in the Latrobe Valley (0.11 ppm at Darnum North on the 6 February 1997). In 2003 the highest 1hr ozone concentration was 0.09 ppm, recorded at Jeeralang Hill on 20 January. This is a little higher than in most previous years (see Table 5b) but did not breach the Objective.

The highest rolling 4hr average $O_3$ concentration for 2003 was 0.09 ppm, also recorded at Jeeralang Hill on the 20 January. This is slightly higher than other annual maxima experienced in years since 1992 (see Table 5b) and breached the SEPP 4hr rolling average Objective of 0.08 ppm for the first time since 1997. This occurred during a period when bushfire smoke was prevalent in the area, and may have arisen from the oxidation of precursor pollutants generated within the smoke.

### 3.5 Visibility reducing particles (measured as LVD)

The SEPP Objective for visibility reducing particles is based on aesthetic considerations. The Objective is measured as local visual distance (which is degraded by airborne particles smaller than 2.5 μm in diameter) and states that the LVD should be at least 20 km. The Goal allows the Objective to be exceeded for no more than 3 days per year per site. The Goal has been breached at one or more sites every year since the commencement of the LVAMN. Low LVD measured at ground level has been found to occur in calm, stable conditions which cause accumulation of pollution from ground based sources (Joynt, 1988).

The SEPP Objective of 20 km was exceeded on 43 separate days during the year. The objective was breached at Moe on 22 days, at Traralgon on 27 days, and at the rural station, Rosedale South, on 19 days. Breaches occurred at all three stations on 11 days, and at two of three stations on 3 days, indicating widespread visibility degradation on these 14 days. The remaining 29 exceedences occurred at only one station on each given day, indicating a greater likelihood that these were due to local sources.

The majority of LVD breaches at Moe and Traralgon occurring during early morning or evening were due to local urban (household and traffic) emissions.

LVD exceedences at Rosedale South were investigated and the majority attributed to North Eastern Victoria bushfire activity and also fuel reduction burns conducted by the Department of Sustainability and Environment; these low LVD days also coincided with low LVD measurements at Moe and Traralgon and showed widespread visibility degradation.

### 3.6 Particulate matter less than 10 microns ($PM_{10}$)

$PM_{10}$ (particles less than 10μm) is a measure of inhalable particles that are generally larger than those causing visibility degradation. The Objective and Goal are based on human health considerations. In general, the highest concentrations of 24 hour $PM_{10}$ measured in the Latrobe Valley can be attributed to bushfires and burning off.

$PM_{10}$ is measured in two ways in the LVAMN. The urban stations at Moe and Traralgon use a continuous analyser known as a TEOM, which obtains measurements every hour of the year. 24-hour averages are calculated for each day. The rural stations at Rosedale South and Jeeralang Hill use high volume samplers which obtain a 24-hour average measurement on every sixth day.

The highest 24 hour average $PM_{10}$ concentration of 289 $\mu g/m^3$ was measured on the 19 March at Moe. Traralgon on the same day had a measurement of 237 $\mu g/m^3$. These high readings were attributed to the widespread smoke plume from the North Eastern Victorian bushfires. The $PM_{10}$ Objective was exceeded on 11 and 7 days respectively at Moe and Traralgon. This was the first full year of $PM_{10}$ measurements at Moe and Traralgon.

The highest $PM_{10}$ measurement at a rural station occurred at Jeeralang Hill, where a 24-hour average $PM_{10}$ concentration of 85 $\mu g/m^3$ was recorded on the 25 January. This was the only day that exceeded the SEPP Objective of 50$\mu g/m^3$, and the SEPP Goal of no more than 1 exceedence day per year for a one day in six sampling frequency was not breached.

Monthly and yearly average $PM_{10}$ concentrations for the LVAMN sites are given in Table 6. The highest annual concentration of $PM_{10}$ was 17.9 $\mu g/m^3$ measured at Moe. There is no SEPP Objective for the annual concentration, but this measured value is typical of previous years for the LVAMN sites.

### 3.7 Wind Roses

Annual wind roses are presented for all ambient air quality stations in the LVAMN on pages 19 through 23. Data are included for all hours of monitoring.

Note: Since Darnum North operates for only six months of the year, two wind roses are provided which cover the January to March and October to December periods of monitoring.

## 4 REFERENCES

LVAMN Network Database - WINCOLLECT - Validated data from January 2003 to December 2003.

LVAMN Annual Air Quality Commentary, January to December 2002, PPI Report PPI/2003/02.

Victoria. (1999). State Environment Protection Policy (Ambient Air Quality), Victoria Government Gazette S19, 9 February 1999. Amendments as per Victoria Government Gazette S240, 21 December 2001, page 48.

Information provided by the Department of Sustainability and Environment (DSE) on fuel reduction burning in the Gippsland Region during 2003.

| Station Number | Station Short Name | Station Name | Station Type | Station Start Date | Sampling Height (m agl) | Station Location | |
|---|---|---|---|---|---|---|---|
| | | | | | | Coordinates (mE) (mN) | Description |
| 1 | DN | Darnum North ** | AQR | 25/09/00 | 3 | 413400 5779000 | Nilma-Shady Creek Road, Approx 100m north of Halls and Porches Rd. |
| 12 | MO | Moe | AQU | 05/05/82 | 3 | 434900 5773400 | Vale St Oval, via South St, Moe |
| 13 | TR | Traralgon | AQU | 6/01/82 | 3 | 459200 5772300 | Kay St, Traralgon, adjacent to pool |
| 17 | RS | Rosedale South | AQR | 2/06/87 | 3 | 480500 5772200 | West of Willung Road, Rosedale South |
| 36 | JH | Jeeralang Hill | AQR | 1/09/96 | 3 | 454010 5755500 | 1km north of Jeeralang North Road (Thomson Road) |

Notes:
AQR - Air Quality Rural
AQU - Air Quality Urban
** Darnum North is operated for six months per year: Jan to March, October to December
Map reference is the National Topographic Map series 1:100,000 (Sheets 8121 Moe, 8221 Traralgon).
The sampling height of anemometers and wind direction sensors at air monitoring stations are 10m above ground level (agl) at rural sites and 15m above ground level at urban sites.

**Table 1: Latrobe Valley Air Monitoring Network Stations, 2003**

| Pollutant | Averaging Period | Environmental Quality Objectives [1] | Goal - Maximum Allowable Exceedences |
|---|---|---|---|
| Carbon monoxide | 8 hours* | 9.0 ppm | 1 day a year |
| Nitrogen dioxide | 1 hour<br>1 year | 0.12 ppm<br>0.03 ppm | 1 day a year<br>None |
| Photochemical oxidant (as ozone) | 1 hour<br>4 hours [2] | 0.10 ppm<br>0.08 ppm | 1 day a year<br>1 day a year |
| Sulphur dioxide | 1 hour<br>1 day<br>1 year | 0.20 ppm<br>0.08 ppm<br>0.02 ppm | 1 day a year<br>1 day a year<br>None |
| Lead | 1 year | 0.50 µg/m$^3$ | None |
| Particles as $PM_{10}$ | 1 day | 50 µg/m$^3$ | 5 days a year [3] |
| Visibility Reducing Particles | 1 hour | 20 km [4] | 3 days a year |

**Notes to table:**

1. Objectives are maximum concentrations in each case, except for visibility reducing particles which is a minimum visual distance.
2. Rolling averages based on consecutive 1 hour averages.
3. Five exceedences per year allowed for daily monitoring (equivalent to 1 exceedence per year where measurements are undertaken on a one day in six basis).
4. Minimum visual distance.

**Table 2. State Environment Protection Policy (Ambient Air Quality) - Environmental Quality Objectives and Goals**

***Important Note:***

The above air quality objectives apply to ambient air throughout Victoria, but the goals apply only at "performance monitoring stations" as defined in the SEPP. The urban sites of Moe and Traralgon are performance monitoring stations.

The rural sites of Darnum North, Jeeralang Hill and Rosedale South serve as surveillance sites and measurements are used for air quality modelling, plume impact and other studies.

| STATION | | | DN | MO | TR | RS | JH | SEPP |
|---|---|---|---|---|---|---|---|---|
| STATION NUMBER | | | 1 | 12 | 13 | 17 | 36 | Objectives |
| NUMBER OF MONTHS IN SERVICE | | | 6 (a) | 12 | 12 | 12 | 12 | and Goals |
| HOURS OF AVAILABLE DATA | NO | | N/A | 8195 | 8321 | 8288 | N/A | |
| | $NO_2$ | | N/A | 8195 | 8321 | 8288 | N/A | |
| (Total annual hours per parameter = 8760 hrs) | $SO_2$ | | N/A | 8277 | 8185 | 8289 | 8215 | |
| | $O_3$ | | 8031 | 8215 | 8201 | 8244 | 8044 | |
| | LVD | | N/A | 8318 | 8314 | 8289 | N/A | |
| MAXIMUM MEASURED CONCENTRATION | NO | (ppb) | N/A | 230 | 250 | 30 | N/A | |
| | $NO_2$ | (ppb) | N/A | 40 | 50 | 20 | N/A | |
| | $SO_2$ | (ppb) | N/A | 30 | 80 | 60 | 230 | |
| | $O_3$ | (ppb) | 80 | 80 | 80 | 80 | 90 | |
| MINIMUM MEASURED VISIBILITY | LVD | (km) | N/A | 2 | 3 | 2 | N/A | |
| SECOND HIGHEST DAILY MAXIMUM | NO | (ppb) | N/A | 170 | 240 | 30 | N/A | |
| | $NO_2$ | (ppb) | N/A | 30 | 40 | 20 | N/A | 120ppb (b) |
| | $SO_2$ | (ppb) | N/A | 30 | 60 | 50 | 150 | 200ppb (b) |
| | $O_3$ | (ppb) | 80 | 80 | 70 | 80 | 80 | 100ppb (b) |
| FOURTH LOWEST DAILY MINIMUM | LVD | (km) | N/A | 4 | 6 | 3 | N/A | 20km (c) |
| DAYS WITH VISIBILITY MINIMUM < 20 km | | | N/A | 22 | 27 | 19 | N/A | 3 days |

NOTES TO TABLE
(a) Darnum North is operated for six months per year: January to March and October to December.
(b) Not to be exceeded on more than one day in any one year.
(c) Not to be exceeded on more than three days in any one year.
General Note: Data have been rounded from units of ppb as used throughout the LVAMN to the nearest 10ppb where appropriate.

**Table 3: Air Quality January 2003 to December 2003 - 1 Hour Averages**

| STATION | | | DN | MO | TR | RS | JH | SEPP |
|---|---|---|---|---|---|---|---|---|
| STATION NUMBER | | | 1 | 12 | 13 | 17 | 36 | Objectives |
| NUMBER OF MONTHS IN SERVICE | | | 6 (a) | 12 | 12 | 12 | 12 | and Goals |
| PERIODS OF AVAILABLE DATA | 24-HOUR NO | | N/A | 341 | 347 | 345 | N/A | |
| (e.g. 1 period = 24 hours and represents 75% | 24-HOUR $NO_2$ | | N/A | 341 | 347 | 345 | N/A | |
| or greater data capture for the period) | 24-HOUR $SO_2$ | | N/A | 345 | 341 | 345 | 335 | |
| | 24-HOUR $PM_{10}$ | | N/A | 357 | 361 | 61 | 60 | |
| | 4-HOUR $O_3$ (b) | | 4175 | 8563 | 8561 | 8368 | 8609 | |
| MAXIMUM MEASURED CONCENTRATION | 24-HOUR NO | (ppb) | N/A | 60 | 83 | 7 | N/A | |
| | 24-HOUR $NO_2$ | (ppb) | N/A | 16 | 17 | 9 | N/A | |
| | 24-HOUR $SO_2$ | (ppb) | N/A | 9 | 8 | 13 | 20 | |
| | 24-HOUR $PM_{10}$ | ($\mu g/m^3$) | N/A | 289 | 237 | 52 | 85 | |
| | 4-HOUR $O_3$ (b) | (ppb) | 75 | 71 | 66 | 72 | 87 | |
| SECOND HIGHEST DAILY MAXIMUM (c) | 24-HOUR NO | (ppb) | N/A | 56 | 66 | 6 | N/A | |
| | 24-HOUR $NO_2$ | (ppb) | N/A | 14 | 17 | 7 | N/A | |
| | 24-HOUR $SO_2$ | (ppb) | N/A | 7 | 6 | 11 | 20 | 80ppb (d) |
| | 4-HOUR $O_3$ (b) | (ppb) | 74 | 70 | 65 | 72 | 81 | 80ppb (d) |
| SECOND HIGHEST DAILY MAXIMUM (c) | 24-HOUR $PM_{10}$ | ($\mu g/m^3$) | N/A | N/A | N/A | 40 | 48 | $50\mu g/m^3$ (d,g) |
| SIXTH HIGHEST DAILY MAXIMUM (c) | 24-HOUR $PM_{10}$ | ($\mu g/m^3$) | N/A | 71 | 51 | N/A | N/A | $50\mu g/m^3$ (f) |
| DAYS WITH 4-HR $O_3$ MAXIMUM > 80ppb | | | 0 | 0 | 0 | 0 | 1 | 1 day |
| DAYS WITH $PM_{10}$ > 50 $\mu g/m^3$ | | | 0 | 11 | 7 | 1 | 1 | See note (e) |
| ANNUAL AVERAGE CONCENTRATION | NO | (ppb) | N/A | 6 | 9 | 1 | N/A | |
| | $NO_2$ | (ppb) | N/A | 7 | 8 | 3 | N/A | 30ppb (h) |
| | $SO_2$ | (ppb) | N/A | 1 | 2 | 2 | 3 | 20ppb (h) |
| | $PM_{10}$ | ($\mu g/m^3$) | N/A | 18 | 18 | 13 | 12 | |
| | $O_3$ | (ppb) | 22 | 16 | 14 | 19 | 24 | |

NOTES TO TABLE

(a) Darnum North is operated for six months per year: January to March and October to December.
(b) 4-hour rolling averages.
(c) Equal daily maxima counted separately.
(d) Not to be exceeded on more than one day in any year.
(e) No more than one day in any year at RS and JH, and no more than five days in any year at MO and TR.
(f) Not to be exceeded on more than five days in any year.
(g) One day in six operation.
(h) Never to be exceeded.

**Table 4: Air Quality January 2003 to December 2003 - Longer Term Averages**

| Year<br>Parameter | #1980<br>/81 | #1981<br>/82 | #1982<br>/83 | #1983<br>/84 | #1984<br>/85 | #1985<br>/86 | #1986<br>/87 | #1987<br>/88 | #1988<br>/89 | #1989<br>/90 | #1990<br>/91 | #1991<br>/92 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **NO (1h, ppm)** | 0.30 | 0.44 | 0.29 | 0.38 | 0.41 | 0.33 | 0.44 | 0.34 | 0.28 | 0.38 | 0.32 | 0.36 |
| **$NO_2$ (1h, ppm)** | 0.09 | 0.07 | 0.05 | 0.07 | 0.05 | 0.05 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.05 |
| Days>0.12ppm | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **$SO_2$ (1h, ppm)** | 0.05 | 0.06 | 0.05 | 0.05 | 0.04 | 0.07 | 0.09 | 0.15 | 0.08 | 0.09 | 0.07 | 0.08 |
| Days>0.20ppm | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **$O_3$ (1h, ppm)** | 0.08 | 0.09 | 0.10 | 0.08 | 0.08 | 0.07 | 0.10 | 0.08 | 0.07 | 0.08 | 0.06 | 0.06 |
| Days>0.10ppm | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **CO (1h, ppm)** | 4 | N/A | 5 | 8 | 8 | 6 | 9 | 8 | 5 | N/A | N/A | N/A |
| **LVD (1h, km)** | 4 | 5 | 4 | 4 | 4 | 6 | 5 | 8 | 7 | 5 | 5 | 6 |
| Days<20km | &47 | &80 | 47 | 42 | 38 | 36 | 49 | 32 | 14 | 35 | 32 | 44 |
| **$O_3$ (4h, ppm)** | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Days>0.08ppm | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| **$O_3$ (8h, ppm)** | 0.06 | 0.06 | 0.07 | 0.05 | 0.06 | 0.06 | 0.06 | 0.06 | 0.06 | 0.06 | 0.06 | 0.05 |
| Days>0.05ppm | 2 | 2 | 9 | 0 | 1 | 1 | 1 | 3 | 1 | 5 | 2 | 0 |
| **$PM_{10}$ (24h, µg/m$^3$)** * | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | 50 | 67 | 46 |
| Days>50µg/m$^3$ | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | 0 | 1 | 0 |
| **$PM_{10}$ (24h, µg/m$^3$)** + | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Days>50µg/m$^3$ | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |

& Incomplete data set during commissioning of the Leeds and Northrup logging system.
# Seasonal Year (September to August).
* High volume sampler method.
+ TEOM method (commenced Nov 2002).
N/A Not available.

**Table 5a: Air Quality Extremes and SEPP Objective Exceedences**

| Year<br>Parameter | [$]1992 | [@]1993 | [@]1994 | [@]1995 | [@]1996 | [@]1997 | [@]1998 | [@]1999 | [@]2000 | [@]2001 | [@]2002 | [@]2003 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **NO (1h, ppm)** | 0.16 | 0.37 | 0.22 | 0.25 | 0.30 | 0.36 | 0.29 | 0.31 | 0.28 | 0.26 | 0.28 | 0.25 |
| **$NO_2$ (1h, ppm)** | 0.03 | 0.05 | 0.04 | 0.04 | 0.04 | 0.04 | 0.05 | 0.05 | 0.05 | 0.04 | 0.04 | 0.05 |
| Days>0.12ppm | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **$SO_2$ (1h, ppm)** | 0.06 | 0.13 | 0.17 | 0.14 | 0.10 | 0.20 | 0.24 | 0.25 | 0.29 | 0.61 | 0.25 | 0.23 |
| Days>0.20ppm | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 4 | 1 | 1 |
| **$O_3$ (1h, ppm)** | 0.05 | 0.06 | 0.07 | 0.07 | 0.07 | 0.11 | 0.07 | 0.07 | 0.10 | 0.08 | 0.07 | 0.09 |
| Days>0.10ppm | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| **LVD (1h, km)** | 7 | 5 | 5 | 11 | 7 | 7 | 7 | 11 | 12 | 9 | 4 | 2 |
| Days<20km | 9 | 16 | 65 | 42 | 25 | 35 | 38 | 28 | 23 | 21 | 20 | 68 |
| **$O_3$ (4h, ppm)** | 0.04 | 0.05 | 0.07 | 0.06 | 0.05 | 0.09 | 0.06 | 0.07 | 0.06 | 0.08 | 0.06 | 0.09 |
| Days>0.08ppm | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| **$O_3$ (8h, ppm)** | 0.04 | 0.05 | 0.06 | 0.06 | 0.05 | 0.07 | 0.06 | 0.06 | 0.05 | 0.07 | N/A | N/A |
| Days>0.05ppm | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 0 | 3 | 3 | N/A | N/A |
| **$PM_{10}$ (24h, µg/m$^3$)** * | 22 | 79 | 58 | 31 | 63 | 55 | 88 | 50 | 36 | 39 | 42 | 85 |
| Days>50µg/m$^3$ | 0 | 1 | 1 | 0 | 1 | 1 | 4 | 0 | 0 | 0 | 0 | 1 |
| **$PM_{10}$ (24h, µg/m$^3$)** + | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | 42 | 289 |
| Days>50µg/m$^3$ | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | 0 | 18 |

[&] Incomplete data set during commissioning of the Leeds and Northrup logging system.
[$] September 1992 to December 1992.
[@] Calendar Year.
* High volume sampler method.
+ TEOM method (commenced Nov 2002).
N/A Not available.

**Table 5b: Air Quality Extremes and SEPP Objective Exceedences**

## Table 6: Inhalable Particulate Summary for 2003

*From January 2003 through December 2003*

$PM_{10}$ Monthly Averages in $\mu g/m^3$

| Month | JH | RS | MO | TR |
|---|---|---|---|---|
| January | 28.0 | 23.7 | 29.4 | 25.2 |
| February | 23.3 | 19.1 | 37.3 | 33.5 |
| March | 16.2 | 13.7 | 22.6 | 19.5 |
| April | 11.5 | 12.8 | 13.1 | 12.6 |
| May | 11.3 | 10.0 | 15.1 | 17.5 |
| June | 14.4 | 9.6 | 12.5 | 15.2 |
| July | 5.9 | 6.2 | 10.9 | 14.2 |
| August | 7.8 | 6.0 | 11.0 | 13.7 |
| September | 12.9 | 9.2 | 15.4 | 15.3 |
| October | 8.0 | 7.8 | 11.6 | 13.9 |
| November | 11.9 | 10.0 | 17.8 | 16.6 |
| December | 9.9 | 11.6 | 19.8 | 18.5 |
| **12 month average** | **13.4** | **11.7** | **17.9** | **17.8** |

| STATION | $NO_2$ | NO | $SO_2$ | $O_3$ | LVD | DBT | WBT | WS | WD | GLB | UVA | TEOM | $PM_{10}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Darnum [1] | | | | 92 | | | | 80 | 80 | | | | |
| Rosedale | 95 | 95 | 95 | 94 | 95 | 99 | 99 | 99 | 99 | 99 | 99 | | 100 |
| Jeeralang | | | 94 | 92 | | | | 98 | 98 | | | | 98 |
| Moe | 94 | 94 | 94 | 94 | 95 | 99 | 99 | 98 | 98 | | | 98 | |
| Traralgon | 95 | 95 | 93 | 94 | 95 | 100 | 99 | 96 | 96 | 100 | | 99 | |

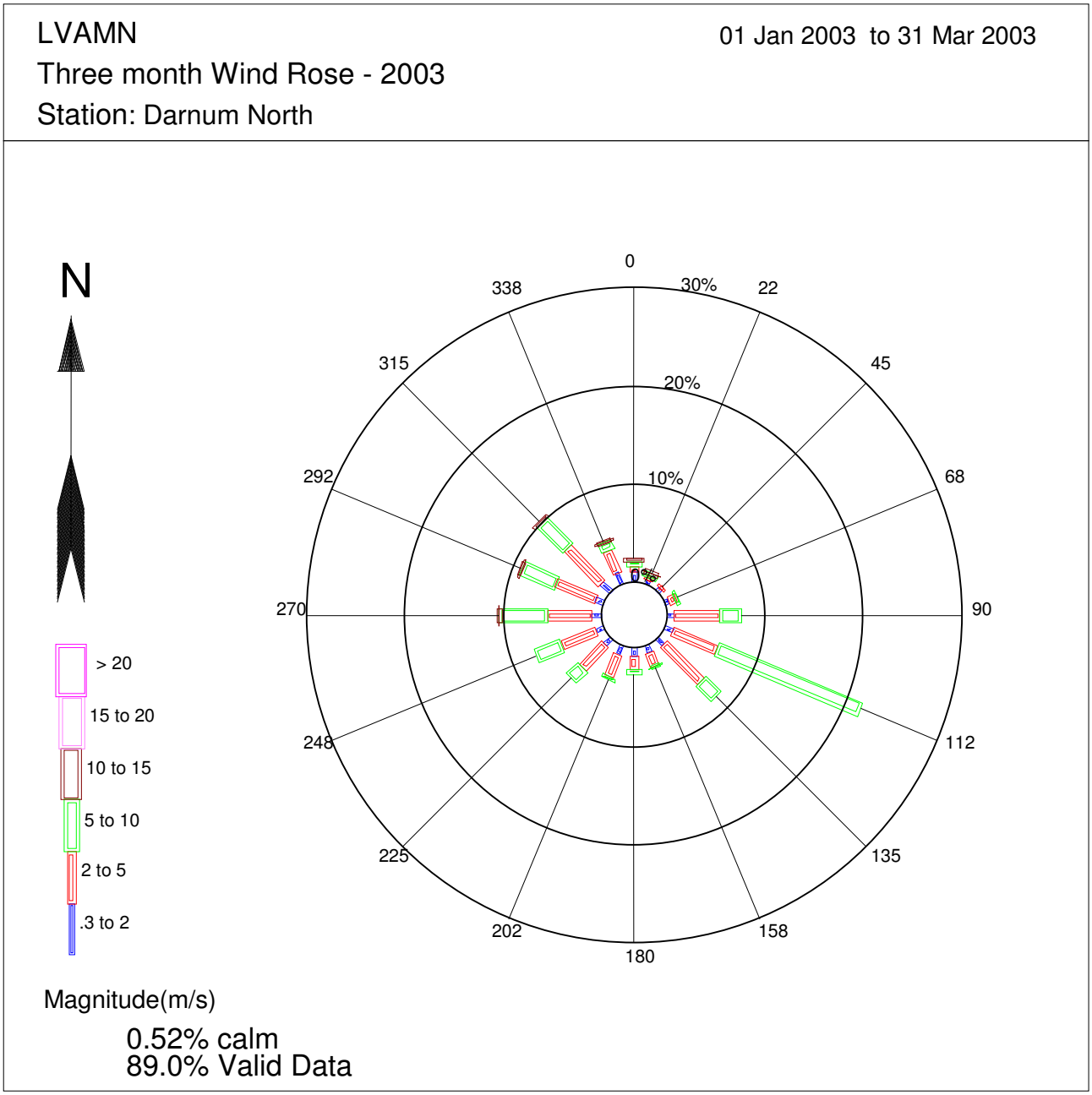
**Table 7: LVAMN Air Quality Instrument Performance Statistics for 2003**

The above table represents the percentage of instrument availability for the LVAMN. The figures disregard times when instruments are not measuring ambient air because of daily calibration requirements (usually 60 minutes daily for an air quality instrument).

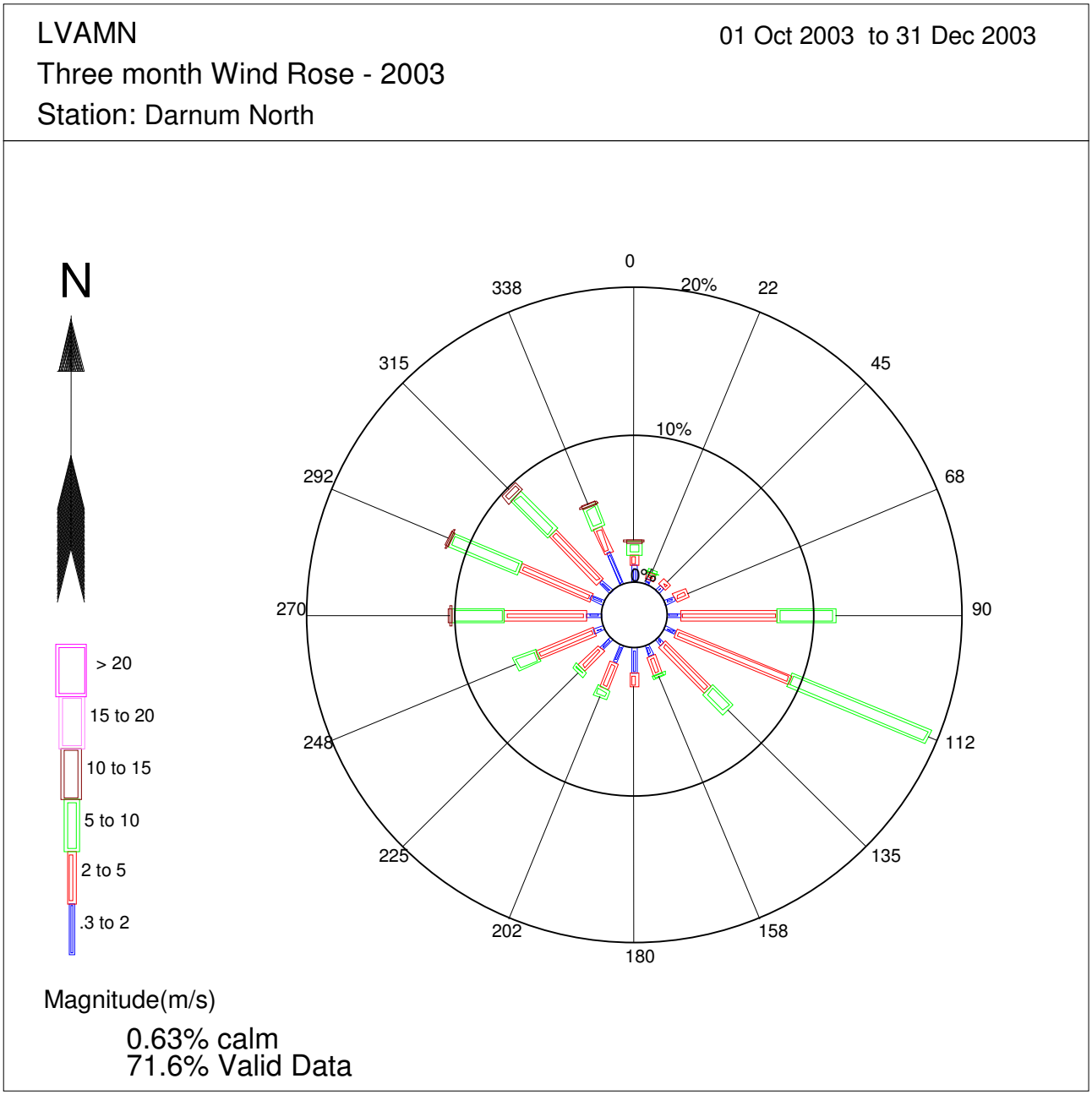
1. Darnum North was operated only from 1 January to 31 March and from 1 October to 31 December.

Note: Target for instrument performance is 80% valid data capture per parameter per calendar year.

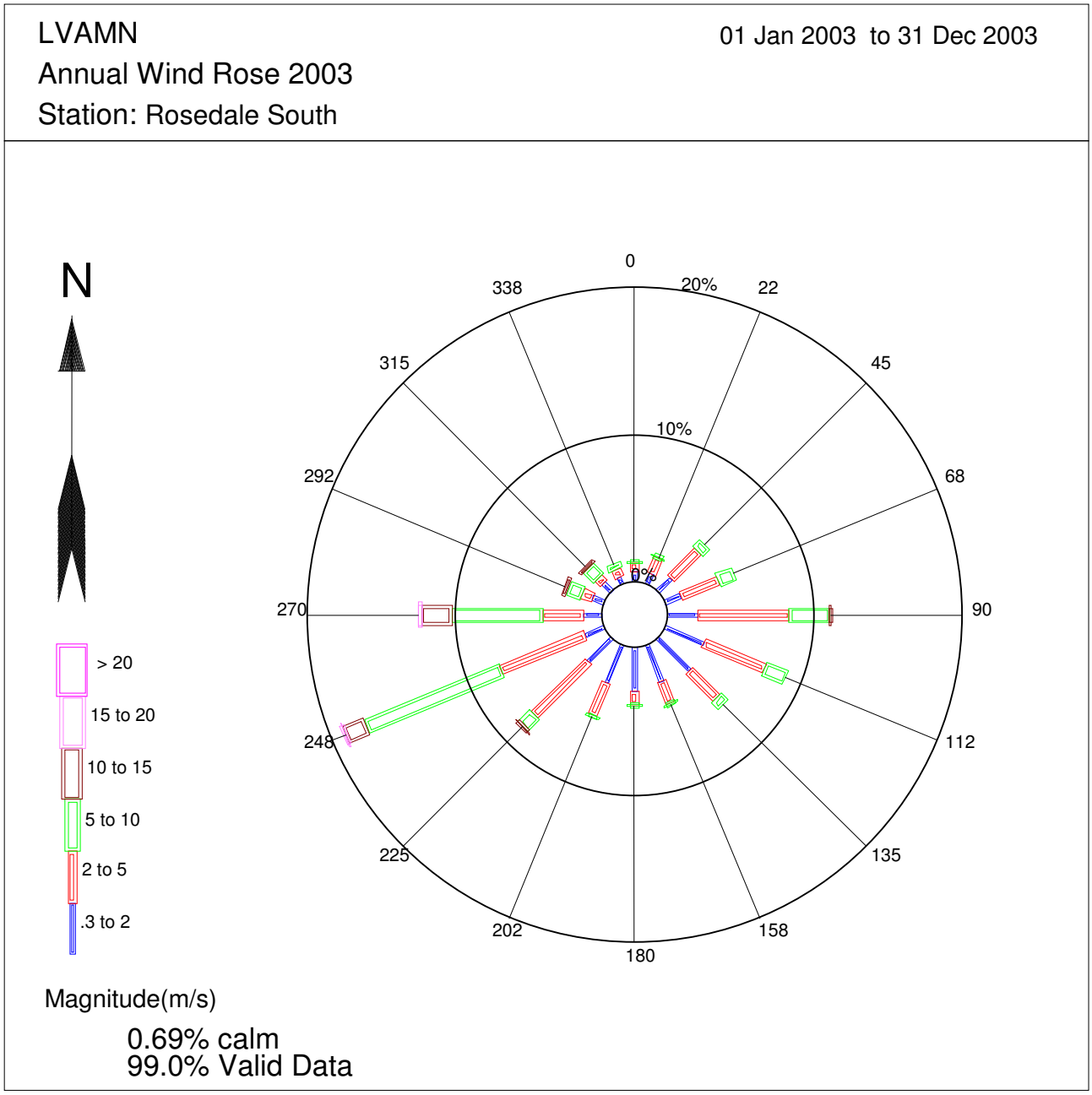
## 6.1 DARNUM NORTH WIND ROSE – 1 January to 31 March 2003



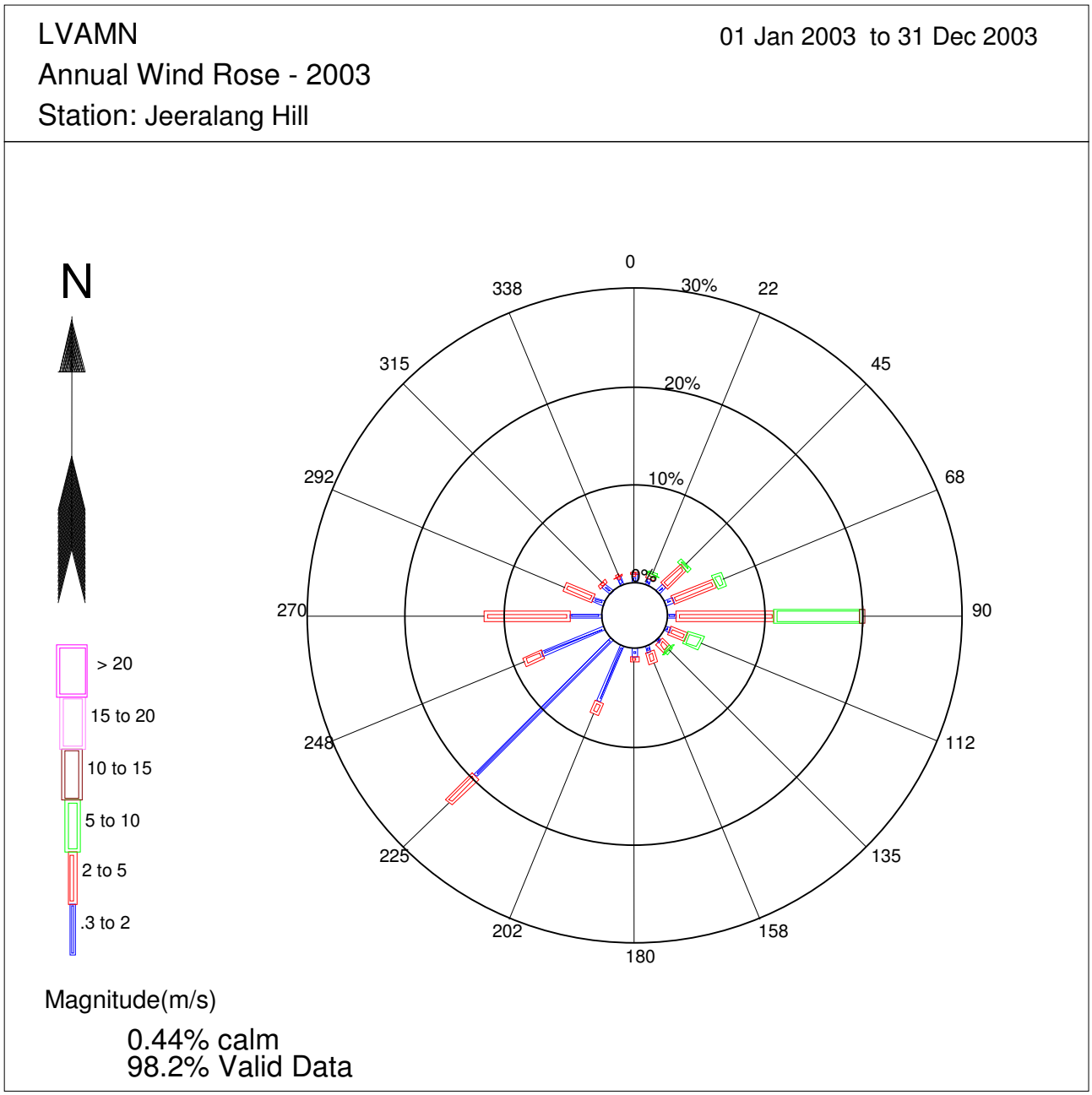
## 6.2 DARNUM NORTH WIND ROSE – 1 October to 31 December 2003



## 6.3 ROSEDALE SOUTH WIND ROSE – 1 January to 31 December 2003



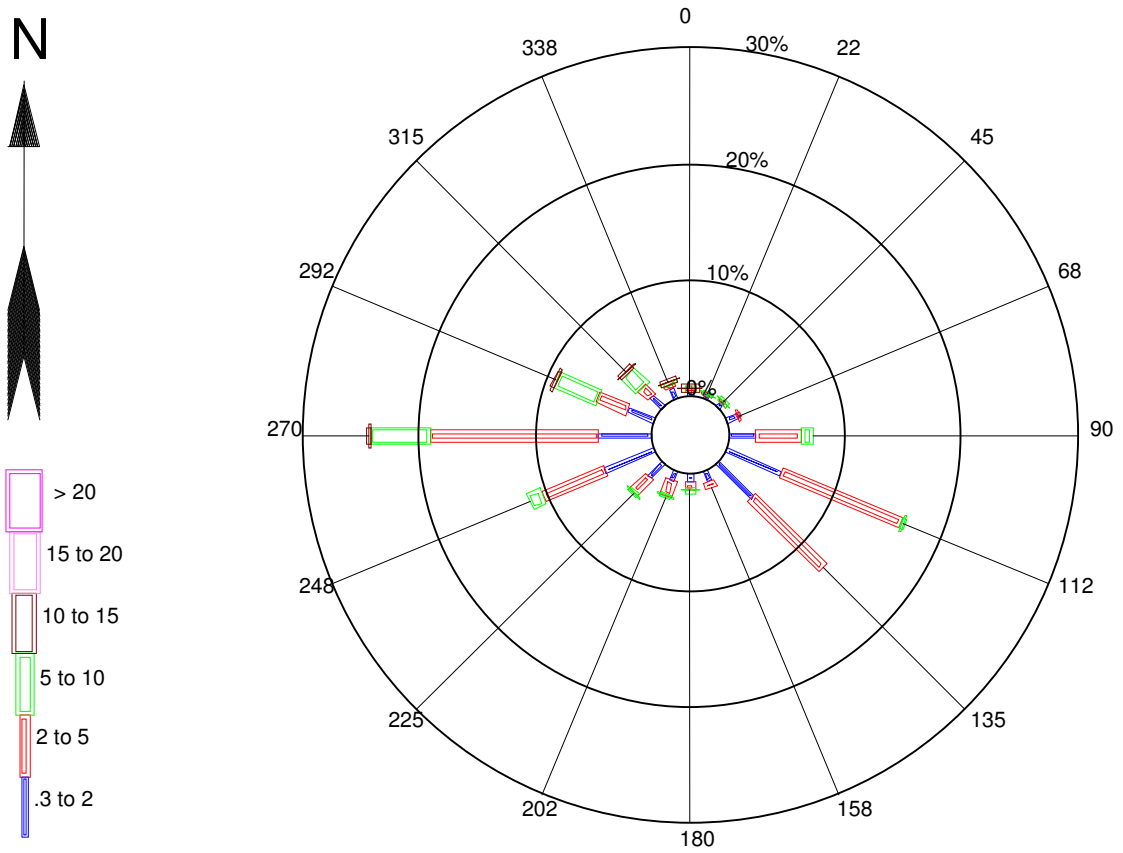
## 6.4 JEERALANG HILL WIND ROSE – 1 January to 31 December 2003



## 6.5 MOE WIND ROSE – 1 January to December 2003

LVAMN
Annual Wind Rose - 2003
Station: Moe

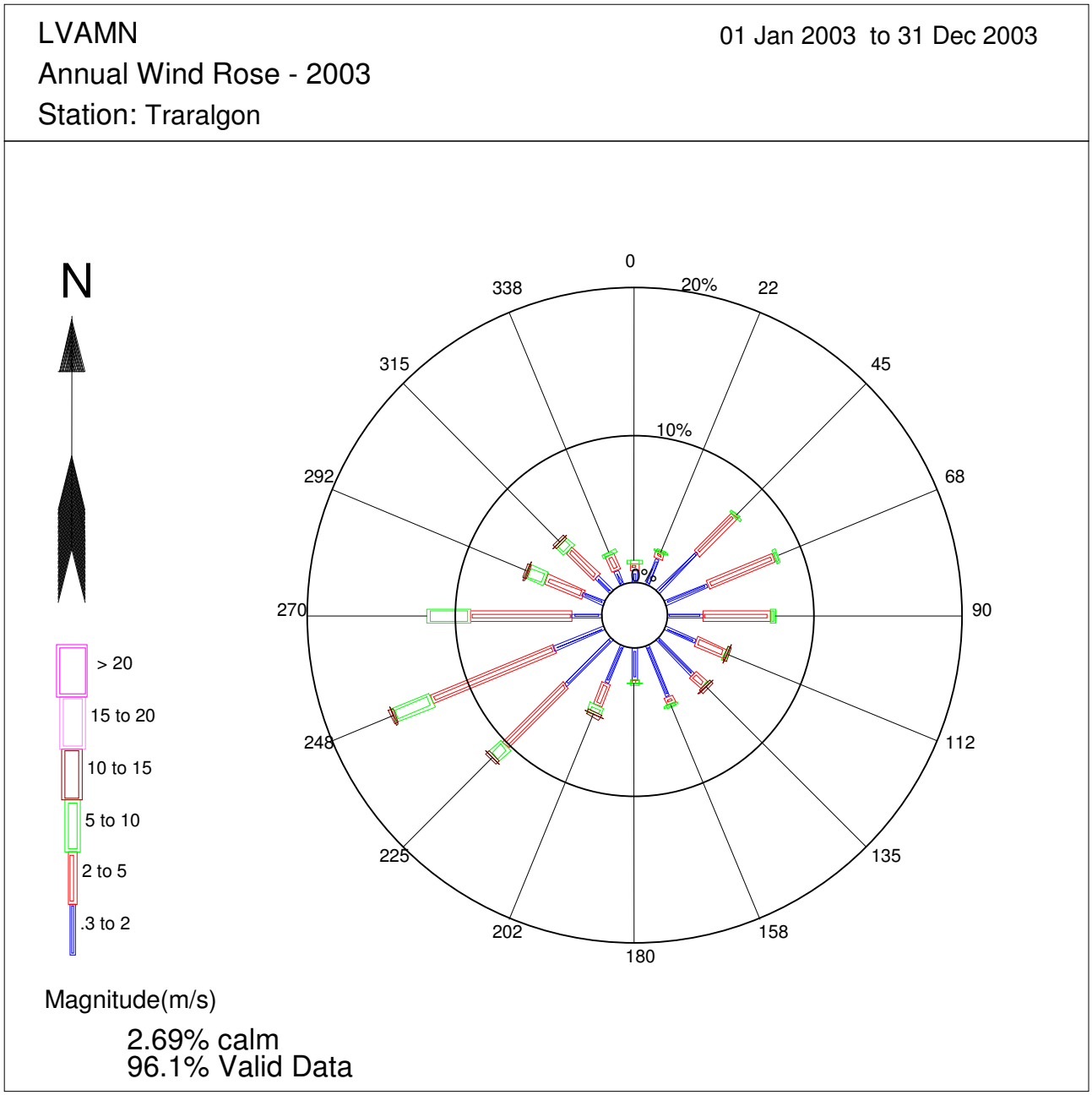
01 Jan 2003 to 31 Dec 2003

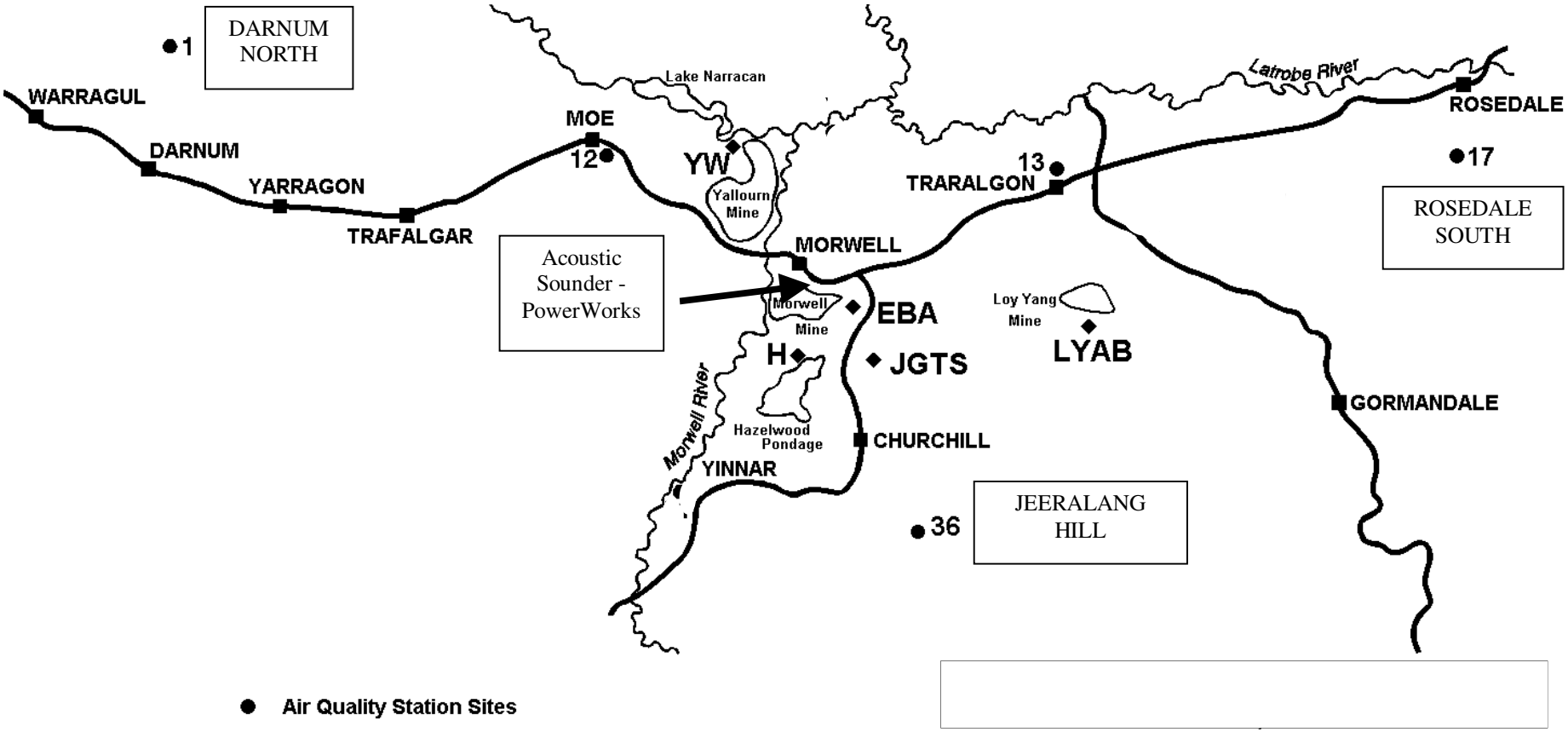



Magnitude(m/s)

3.57% calm
98.1% Valid Data

## 6.6 TRARALGON WIND ROSE – 1 January to December 2003






## Major sources

**YW – Yallourn Energy**
**EBA – Energy Brix Australia**
**H – Hazelwood Power**
**JGTS – AES Jeeralang (Gas Turbine Station)**
**LYAB – Loy Yang Power, Edison Mission**

**Figure 1: Latrobe Valley Air Monitoring Network 2003**