Latrobe Valley Air Monitoring Network

Annual Summary for 2008

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FOREWORD

This report presents the annual air quality summary for the Latrobe Valley Air Monitoring Network (LVAMN) for the year 2008. The LVAMN consists of three air monitoring stations and an acoustic sounder operated on behalf of PowerWorks and two air monitoring stations operated on behalf of EPA Victoria. All of these stations were operated and maintained by Aurecon's NATA accredited facility in Morwell.

The two EPA stations are performance monitoring stations for the purposes of the *State environment protection policy (Ambient Air Quality)*. 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 [1] Ambient air - guide for measurement of horizontal wind for air quality applications.
- AS 3580.1.1 - 2008 Guide to siting of air monitoring equipment

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.

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.

The summaries for all stations were prepared from validated data sets stored on the central computer system housed in Aurecon's offices at 3 Lignite Court, Morwell, Victoria.

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

David Guy (EPA Victoria)
Convener
LVAMN Operations & Performance Review Committee

[1] The sites at Moe, Traralgon and Jeeralang Hill do not meet all the requirements of this standard with regard to adequate distances from disturbances such as trees.

LATROBE VALLEY AIR MONITORING NETWORK

ANNUAL AIR QUALITY COMMENTARY 2008

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 to December 2008.

The smoke from bushfires and fuel reduction burning had considerably less impact on regional air quality than in 2006 and 2007, in that fewer days of LVD or PM_{10} exceedences occurred.

The highest measured values of sulfur dioxide (SO_2) in the Latrobe Valley can usually be attributed to power station emissions. The highest 1hr average concentration in 2008 (0.334 ppm) was measured on 9 March at Jeeralang Hill in the Strzelecki Ranges. The *State Environment Protection Policy (Ambient Air Quality*) ("SEPP") 1hr Environmental Quality Objective of 0.20 ppm (refer Table 2) was exceeded at Jeeralang Hill on four occasions during the year.

The highest 1hr average SO_2 concentration measured on the floor of the Latrobe Valley was 0.170 ppm at Traralgon on 4 November. This event was attributed to power station emissions and is the highest measured concentration on record for an urban site.

The highest 1hr average nitric oxide (NO) concentration, 0.175 ppm, was measured at Traralgon on 30 April. 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 nitric oxide. The highest 1hr average nitrogen dioxide (NO_2) concentration, 0.046 ppm measured at Moe on 24 April, was attributed to planned burning activity in the northern ranges of the Latrobe Valley. 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 are compared against the same Objective of 50.0µg/m^3, 24-hour average. Several exceedences of the SEPP Objective occurred at Moe (6 days) and Traralgon (2 days). The highest 24 hour average PM_{10} concentration using TEOM[1] method was 90.9 µg/m^3, measured at Moe. The highest 24 hour average PM_{10} concentration measured at Traralgon using TEOM[1] method was 64.9µg/m^3 and the highest at Rosedale South (using a high volume sampler) was 36.2µg/m^3.

The SEPP 1hr Objective for Local Visual Distance (LVD) of 20 km was exceeded on 31 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 25 at Traralgon, which breached the SEPP goal. The Goal was also breached at Moe, with 9 exceedence days. Widespread LVD breaches were attributed mainly to fuel reduction burning. The total number of exceedences for the Network was 48, which is comparable to most recent years.

The highest 1hr average ozone (O_3) concentration for the year was 0.074 ppm, which occurred on 6 March at Jeeralang Hill. This value did not exceeded the SEPP 1hr Air Quality Objective of 0.10 ppm.

The highest 4hr rolling average O_3 concentration for the year, 0.061 ppm, occurred at Jeeralang Hill on 12 November. This measurement did not exceed the corresponding SEPP Objective of 0.08 ppm. The SEPP Goal was therefore met.

[1] Tapered element oscillating microbalance

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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 2008. All monitoring stations were operated and maintained by Aurecon 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;
AS 2923 - 1987	Measurement of horizontal wind for air quality applications.
AS 3580.1.1 – 2008	Guide to siting of air monitoring equipment

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 2008

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 South 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 as ozone concentrations are not a concern during the winter months.

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, Wind Speed, Wind Direction and Inhalable Particles (TEOM continuous PM_{10} method).

Traralgon: Nitrogen Oxides, Sulphur Dioxide, Ozone, Local Visual Distance, Dry Bulb Temperature, Wind Speed, Wind Direction 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[1] 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 individual minimum requirement of 80% valid data capture. 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 "LVAMN Air Quality Instrument Performance Statistics for 2008").

The NEPM requires 75% valid data capture for each parameter in each calendar quarter. This requirement was met at the Moe and Traralgon performance monitoring stations.

3 LATROBE VALLEY AIR QUALITY, 2008

The summary of air quality measurements for the Latrobe Valley Air Monitoring Network for the period January 2008 to December 2008 is shown in Table 3 and Table 4.

The highest values[2] measured in the Latrobe Valley for each year from September 1980 to December 2008 are shown in Tables 5a, 5b & 5c.

Measured concentrations are rounded to the nearest 0.001 ppm, 0.1 km or 0.1 $\mu g/m^3$ in accordance with reporting protocols agreed under the NEPM and with EPAV.

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[1] *National Environment Protection (Ambient Air Quality) Measure*

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

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. The highest 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 1hr average NO concentrations at Traralgon were 0.175 ppm on 30 April, and 0.161 ppm on 23 May. The two highest 1hr average NO concentrations at Moe were 0.172 ppm on 1 April, and 0.121 ppm on 30 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 1hr average NO concentrations measured at the rural Rosedale South station were 0.071 ppm on 27 October and 0.028 ppm on 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 1hr average concentration in 2008 (0.046 ppm at Moe on 24 April) was well below the SEPP 1hr Objective for NO_2 of 0.12 ppm. This maximum NO_2 was attributed to fuel reduction burning in the region.

The highest 1hr average concentration measured at a rural site was 0.021 ppm at Rosedale South on 11 January.

The highest annual average NO_2 concentration measured at either an urban or rural site during 2008 was 0.007 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 industrial sources. The highest values can usually be attributed to power station emissions.

The highest 1hr average SO_2 concentration during 2008, 0.334 ppm measured at Jeeralang Hill on 9 March 2008, was attributed to a plume strike from Loy Yang A and B Power Stations occurring under stable conditions during the early morning. A total of four exceedences occurred at Jeeralang Hill with levels of 213 ppb recorded on 16 January, 241 ppb on 15 March and 224 ppb on 30 November. Other elevated SO_2 concentrations at Jeeralang Hill, indicative of power station emission impacts, included measurements exceeding 0.100 ppm on 13 days and 0.05 ppm on 32 days. This is more severe than impacts recorded in most previous years but is indicative of impacts likely to occur along the northern slopes of the Strzelecki Ranges.

The SEPP Goal of less than 0.20 ppm for all but one day per year was met at the urban monitoring sites.

The highest 1hr average SO_2 concentration measured on the Latrobe Valley floor was 0.170 ppm. This occurred at Traralgon on 4 November and is the highest 1hr concentration ever measured on the valley floor. This was attributed to power station emissions being convectively mixed to ground level under unstable conditions (Delaney 2009 CALPUFF simulation). The second highest event was 0.064 ppm measured at Rosedale South on 16 October. This measurement was also attributed to power station plume impact.

The highest 24hr average concentration of SO_2 measured by the LVAMN was 0.033 ppm at Jeeralang Hill on 9 March 2008. While this value did not breach the SEPP 24hr Objective of 0.08 ppm, the plume impact was evident for approximately 12 hours at the monitoring station.

The SEPP Objective for the annual average concentration of SO_2 is 0.020 ppm and is not to be exceeded. The highest annual average concentration of SO_2 was 0.004 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.

In 2008 the highest 1hr ozone concentration was 0.074 ppm, recorded at Jeeralang Hill on 6 March. Other maxima recorded in the network were 0.066 ppm at Rosedale South, 0.064 ppm at Darnum North, 0.057 ppm at Moe and 0.061 ppm at Traralgon. The SEPP 1hr Air Quality Objective of 0.10 ppm for ozone was therefore met at all monitoring sites.

The highest rolling 4hr average O_3 concentration for 2008 was 0.061 ppm, recorded at Jeeralang Hill on 6 March. This measurement is below the SEPP Objective of 0.080 ppm. The SEPP Goal for 4hr ozone, was therefore met.

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 is that the Objective 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 mainly in calm, stable conditions which result in the accumulation of pollution from ground based sources (Joynt, 1988).

The SEPP Objective of 20 km was exceeded on 31 separate days during the year. The objective was breached at Moe on 9 days, at Traralgon on 25 days, and at the rural station, Rosedale South, on 14 days. Breaches occurred at all three stations on 6 days, and at two of three stations on 5 days, indicating widespread visibility degradation on these 11days. The remaining 20 exceedences occurred at only one station on each given day, indicating a greater likelihood that these were due to local sources.

Prescribed burning activities caused these impacts on 17 days over March, April and May. The remaining exceedences occurred at Moe and Traralgon during the evening or early morning and were due to local urban (household and traffic) emissions.

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[3], which obtains measurements every hour of the year. 24-hour averages are calculated for each day. Note that the 24hr average concentration values presented in this report have been adjusted for temperature to account for the loss of volatiles, in accordance with the standard method. Values presented in Table 6 have also been adjusted for temperature accordingly.

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 90.9 $\mu g/m^3$ was measured on 2 April at Moe. The highest 24 hour average at Traralgon, 64.9 $\mu g/m^3$ was measured on 25 April. The PM_{10} Objective was exceeded on 6 occasions at Moe and 2 occasions at Traralgon thereby breaching the SEPP Goal at both sites. Exceedences were attributed to planned burning activities and local dust disturbances during strong winds.

The highest PM_{10} measurement at a rural station occurred at Rosedale South, where a 24-hour average PM_{10} concentration of 36.2 $\mu g/m^3$ was caused by bushfire smoke on the 11 January. The 24hr SEPP Objective of 50.0$\mu g/m^3$ was therefore met at this rural site.

Monthly and yearly average PM_{10} concentrations for the LVAMN sites are given in Table 6. The highest annual concentration of PM_{10} was 19.0 $\mu g/m^3$ measured at Traralgon. There is no SEPP Objective for the annual concentration, but this measured value is slightly higher than in previous years for the LVAMN sites.

[3] Tapered element oscillating microbalance

4 REFERENCES

LVAMN Network Database - WINCOLLECT - Validated data from January 2008 to December 2008.

LVAMN Annual Air Quality Commentary, January to December 2007, CW Report No CWM/2008/03.

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 and bushfire activity in the Gippsland Region during 2008.

Joynt, R C, (1988). Airborne Particles in the Latrobe Valley. Clean Air. Vol 22. No4, November 1988.

Delaney, W (2009). CALPUFF simulation of SO_2 event at Traralgon on 4th November 2008.

Table 1: Latrobe Valley Air Monitoring Network Stations, 2008

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	11/05/79[%] 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)
37	PS	PowerWorks SODAR	AS	11/05/01	Multiple[@]	448550 5766390	South of PowerWorks building, Ridge Rd, Morwell

Notes:
AQR - Air Quality Rural
AQU - Air Quality Urban
AS - Acoustic Sounder
** Darnum North is operated for six months per year: January to March, October to December.
[%] Initial installation with complete instrument set as per Rosedale South.
[#] Commencement of six months per year operation with ozone measurement only.
[@] Measures at various pre-selected heights up to approx 1500metres.
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 is 10m above ground level (agl).

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

Pollutant	Averaging Period	Environmental Quality Objectives [1]	Goal - Maximum Allowable Exceedences
Carbon monoxide	8 hours[2]	9.0 ppm	1 day a year
Nitrogen dioxide	1 hour 1 year	0.12ppm 0.03 ppm	1 day a year None
Photochemical oxidant (as ozone)	1 hour 4 hours [2]	0.10 ppm 0.08 ppm	1 day a year 1 day a year
Sulphur dioxide	1 hour 1 day 1 year	0.20 ppm 0.08 ppm 0.02 ppm	1 day a year 1 day a year 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.

Important Note:

The above air quality objectives apply to ambient air throughout Victoria.

The urban sites of Moe and Traralgon have been designated “performance monitoring sites” in accordance with the National Environment Protection Measure to monitor and assess the air quality in populated areas.

Rural air quality is monitored at the sites of Darnum North, Jeeralang Hill and Rosedale South. These sites also serve as surveillance sites and measurements are used for air quality modelling, plume impact and other studies.

Table 3: Air Quality January 2008 to December 2008 - 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
HOURS OF AVAILABLE DATA	NO		N/A	8375	8370	8047	N/A	
	NO_2		N/A	8375	8370	8048	N/A	
(Total annual hours per parameter = 8784 hrs)	SO_2		N/A	8350	8238	8262	7935	
	O_3		3753	8385	8376	8298	8193	
	LVD		N/A	8398	8393	8297	N/A	
	TEOM		N/A	8669	8726	N/A	N/A	
MAXIMUM MEASURED CONCENTRATION	NO	(ppb)	N/A	172	175	71	N/A	
	NO_2	(ppb)	N/A	46	39	21	N/A	
	SO_2	(ppb)	N/A	33	170	64	334	
	O_3	(ppb)	64	57	61	66	74	
MINIMUM MEASURED VISIBILITY	LVD	(km)	N/A	2.1	3.5	6.9	N/A	
SECOND HIGHEST DAILY MAXIMUM	NO	(ppb)	N/A	121	161	28	N/A	
	NO_2	(ppb)	N/A	31	38	20	N/A	120ppb (b)
	SO_2	(ppb)	N/A	32	59	56	241	200ppb (b)
	O_3	(ppb)	63	56	60	65	64	100ppb (b)
FOURTH LOWEST DAILY MINIMUM	LVD	(km)	N/A	8.7	6.9	8.6	N/A	20km (c)
DAYS WITH VISIBILITY MINIMUM < 20 km			N/A	9	25	14	N/A	3 days
DAYS WITH 1-HR O_3 MAXIMUM > 100ppb			0	0	0	0	0	1 day

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.

Table 4: Air Quality January 2008 to December 2008 - Longer Term 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	365	364	354	N/A	
(e.g. 1 period = 24 hours and represents 75%	24-HOUR NO_2		N/A	365	364	349	N/A	
or greater data capture for the period)	24-HOUR SO_2		N/A	363	358	359	341	
	24-HOUR O_3		160	366	366	362	355	
	24-HOUR PM_{10}		N/A	362	366	61	60	
	4-HOUR O_3 (b)		3916	8751	8711	8656	8523	
MAXIMUM MEASURED CONCENTRATION	24-HOUR NO	(ppb)	N/A	48	50	7	N/A	
	24-HOUR NO_2	(ppb)	N/A	16	19	7	N/A	
	24-HOUR SO_2	(ppb)	N/A	7	25	14	33	
	24-HOUR PM_{10}	($\mu g/m^3$)	N/A	90.9	64.9	36.2	31.0	
	4-HOUR O_3 (b)	(ppb)	58	56	53	58	61	
SECOND HIGHEST DAILY MAXIMUM (c)	24-HOUR NO	(ppb)	N/A	29	36	6	N/A	
	24-HOUR NO_2	(ppb)	N/A	13	14	7	N/A	
	24-HOUR SO_2	(ppb)	N/A	7	9	12	30	80ppb (d)
	4-HOUR O_3 (b)	(ppb)	57	52	53	57	61	80ppb (d)
SECOND HIGHEST DAILY MAXIMUM (c)	24-HOUR PM_{10}	($\mu g/m^3$)	N/A	N/A	N/A	33.4	25.6	$50\mu g/m^3$ (d,g)
SIXTH HIGHEST DAILY MAXIMUM (c)	24-HOUR PM_{10}	($\mu g/m^3$)	N/A	50.3	39.9	N/A	N/A	$50\mu g/m^3$ (f)
DAYS WITH 4-HR O_3 MAXIMUM > 80ppb			0	0	0	0	0	1 day
DAYS WITH PM_{10} > 50 $\mu g/m^3$			N/A	6	2	0	0	See note (e)
ANNUAL AVERAGE CONCENTRATION	NO	(ppb)	N/A	5	6	1	N/A	
	NO_2	(ppb)	N/A	6	7	2	N/A	30ppb (h)
	SO_2	(ppb)	N/A	1	2	3	4	20ppb (h)
	PM_{10}	($\mu g/m^3$)	N/A	17.9	19.0	13.0	10.5	
	O_3	(ppb)	20	13	14	18	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 5a: Air Quality Extremes and SEPP Objective Exceedences

Year Parameter	[#]1980 /81	[#]1981 /82	[#]1982 /83	[#]1983 /84	[#]1984 /85	[#]1985 /86	[#]1986 /87	[#]1987 /88	[#]1988 /89	[#]1989 /90	[#]1990 /91	[#]1991 /92	[$]1992
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	0.16
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	0.03
Days>0.12ppm	0	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	0.06
Days>0.20ppm	0	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	0.05
Days>0.10ppm	0	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	N/A
LVD (1h, km)	4	5	4	4	4	6	5	8	7	5	5	6	7
Days<20km	[&]47	[&]80	47	42	38	36	49	32	14	35	32	44	9
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	0.04
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	0
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	0.04
Days>0.05ppm	2	2	9	0	1	1	1	3	1	5	2	0	0
PM_{10} (24h, $\mu g/m^3$) [*]	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	50	67	46	22
Days>50$\mu g/m^3$	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0	1	0	0
PM_{10} (24h, $\mu g/m^3$) [+]	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Days>50$\mu g/m^3$	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

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

Table 5b: Air Quality Extremes and SEPP Objective Exceedences

Year Parameter	@1993	@1994	@1995	@1996	@1997	@1998	@1999	@2000	@2001	@2002	@2003	@2004	@2005	@2006	@2007
NO (1h, ppm)	0.37	0.22	0.25	0.30	0.36	0.29	0.31	0.28	0.26	0.28	0.25	0.26	0.225	0.208	0.269
NO_2 (1h, ppm)	0.05	0.04	0.04	0.04	0.04	0.05	0.05	0.05	0.04	0.04	0.05	0.04	0.040	0.058	0.038
^Days>0.12ppm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SO_2 (1h, ppm)	0.13	0.17	0.14	0.10	0.20	0.24	0.25	0.29	0.61	0.25	0.23	0.35	0.297	0.272	0.195
^Days>0.20ppm	0	0	0	0	0	1	1	0	4	1	1	5	1	2	0
O_3 (1h, ppm)	0.06	0.07	0.07	0.07	0.11	0.07	0.07	0.10	0.08	0.07	0.09	0.07	0.067	0.138	0.099
^Days>0.10ppm	0	0	0	0	1	0	0	0	0	0	0	0	0	3	0
LVD (1h, km)	5	5	11	7	7	7	11	12	9	4	2	4	4.4	0.5	0.5
^Days<20km	16	65	42	25	35	38	31#	27#	31#	26#	43#	20#	30	47	47
O_3 (4h, ppm)	0.05	0.07	0.06	0.05	0.09	0.06	0.07	0.06	0.08	0.06	0.09	0.06	0.06	0.124	0.09
^Days>0.08ppm	0	0	0	0	1	0	0	0	0	0	1	0	0	3	2
O_3 (8h, ppm)	0.05	0.06	0.06	0.05	0.07	0.06	0.06	0.05	0.07	N/A	N/A	N/A	N/A	N/A	N/A
^Days>0.05ppm	0	2	1	0	3	3	1	1	1	N/A	N/A	N/A	N/A	N/A	N/A
PM_{10} (24h, $\mu g/m^3$) *	79	58	31	63	55	88	50	36	39	42	85	34	32.8	69.3	60.1
^Days>50$\mu g/m^3$	1	1	0	1	1	4	0	0	0	0	1	0	0	1	1
PM_{10} (24h, $\mu g/m^3$) +	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	42	289	57	44.9	254.0	151.2
^Days>50$\mu g/m^3$	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0	11	1	0	15	14

@ Calendar Year.
* High volume sampler method.
+ TEOM method (commenced Nov 2002).
# Exceedences adjusted to account for change in calibration reference temperature
^ Number of days when the relevant SEPP objective was exceeded at one or more monitoring stations.
N/A Not available.

Table 5c: Air Quality Extremes and SEPP Objective Exceedences

Year Parameter	[@] 2008
NO (1h, ppm)	0.175
NO_2 (1h, ppm)	0.046
^Days>0.12ppm	0
SO_2 (1h, ppm)	0.334
^Days>0.20ppm	4
O_3 (1h, ppm)	0.074
^Days>0.10ppm	0
LVD (1h, km)	2.1
^Days<20km	31
O_3 (4h, ppm)	0.061
^Days>0.08ppm	0
O_3 (8h, ppm)	N/A
^Days>0.05ppm	N/A
PM_{10} (24h, $\mu g/m^3$) *	36.2
^Days>50$\mu g/m^3$	0
PM_{10} (24h, $\mu g/m^3$) +	90.9
^Days>50$\mu g/m^3$	6

[@] Calendar Year.
* High volume sampler method.
+ TEOM method (commenced Nov 2002).
# Exceedences adjusted to account for change in calibration reference temperature
^ Number of days when the relevant SEPP objective was exceeded at one or more monitoring stations.
N/A Not available.

Table 6: Inhalable Particulate Summary for 2008

From January 2008 through December 2008

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

Month	JH	RS	MO[1]	TR[1]
January	23.1	18.3	21.8	22.5
February	9.4[2]	8.4	16.9	14.8
March	17.0	15.8	25.1	23.0
April	12.0	8.7	26.9	24.1
May	10.9	9.4	14.9	20.7
June	10.1	7.9	15.0	17.5
July	7.9	4.4	13.7	19.9
August	8.8	5.0	11.9	14.5
September	10.1	12.8	17.2	18.9
October	18.5	14.0	19.9	19.9
November	15.8	11.6	16.0	15.6
December	11.4	8.2	14.9	16.0
12 month average	**13.0**	**10.5**	**17.9**	**19.0**

[1] Moe & Traralgon PM_{10} data have been adjusted for temperature to account for loss of volatiles – hence TEOM data can be directly compared with high volume sampler data from Rosedale South and Jeeralang Hill.

[2] Average of four 24 hour samples only at Jeeralang Hill.

Table 7: LVAMN Air Quality Instrument Performance Statistics for 2008

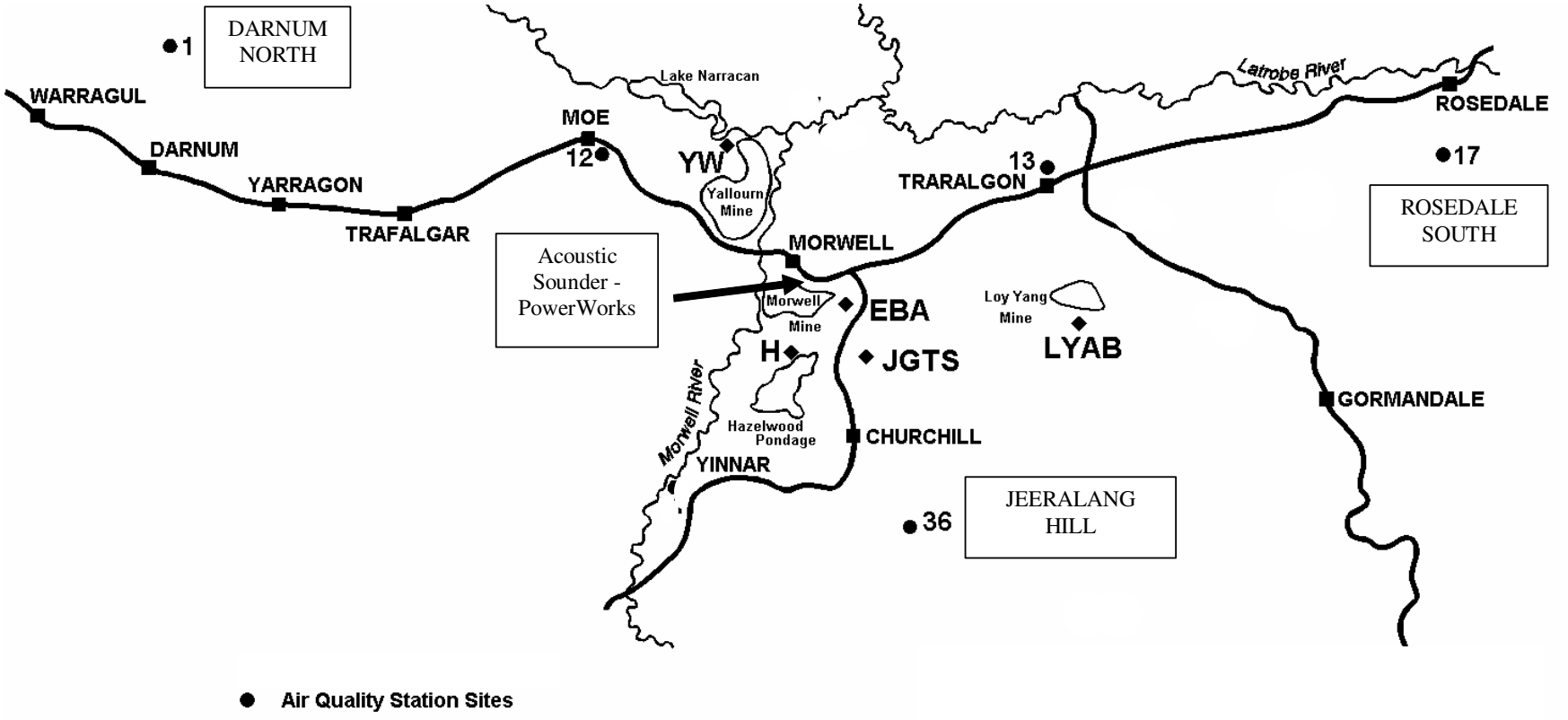
STATION	NO_2	NO	SO_2	O_3	LVD	DBT	WS	WD	GLB	UVA	TEOM	PM_{10}
Darnum [1]				85			95	95				
Rosedale	92	92	94	94	94	99	99	99	99	99		100
Jeeralang			90	93			100	100				97
Moe	95	95	95	95	96	100	100	100			99	
Traralgon	95	95	94	95	96	100	100	100			99	

The above table represents the percentage of validated data capture for the LVAMN. The maximum achievable data capture for the calibrated parameters NO_2, NO, SO_2, O_3 and LVD is 96%, because 1 hour per day is spent in calibration mode.

1. Darnum North was operated only from 1 January to 31 March and from 1 October to 31 December and the reported percentages relate to this period.

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

Figure 1: Latrobe Valley Air Monitoring Network 2008



Major power station sources

YW – Yallourn W
EBA – Energy Brix
H – Hazelwood
JGTS –Jeeralang (Gas Turbine Station)
LYAB – Loy Yang A, Loy Yang B