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Latrobe Valley Air Monitoring Network

Ambient Air Quality Monitoring

Annual Report

1st July 2012 – 31st December 2012

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Forward

This report presents the annual air quality summary for the Latrobe Valley Air Monitoring Network (LVAMN) for the period 1st July to 31st December 2012. The LVAMN consists of two air quality monitoring stations and an acoustic sounder operated on behalf of PowerWorks. All three stations were operated and maintained by Ecotech's NATA accredited facility in Knoxfield, Victoria.

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

Data Collection Methods Used	Description of Method					
AS 3580.5.1:2011	Methods for sampling and analysis of ambient air. Method 5.1: Determination of oxides of nitrogen – Direct-reading instrumental method					
AS 3580.4.1:2008	Methods for sampling and analysis of ambient air. Method 4.1: Determination of sulfur dioxide – Direct reading instrumental method					
AS 3580.6.1:2011	Methods for sampling and analysis of ambient air. Method 6.1: Determination of ozone – Direct-reading instrumental method					
AS 3580.9.11:2008	Methods of sampling and analysis of ambient air. Method 9.3: Determination of suspended particulate matter – PM ₁₀ beta attenuation monitors					
AS 3580.12.1:2001 ¹	Methods for sampling and analysis of ambient air. Method 12: Determination of light scattering – Nephelometer Method					
AS 3580.14:2011 ²	Methods for sampling and analysis of ambient air. Method 14: Meteorological monitoring for ambient air quality monitoring applications					

¹ Determination of local visual distance (LVD) has been performed in accordance with EPA Victoria's designated method based on AS 3580.12.1:2001

² Jeeralang Hill does not meet all the requirements of this standard with regard to adequate distances from disturbances such as trees.

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Summary

Latrobe Valley Air Monitoring Network

Annual Air Quality Report 2012

Annual air quality summaries are presented below for the air quality monitoring stations comprising the Latrobe Valley Air Monitoring Network (LVAMN) for the period 1st July to 31st December 2012.

Network Monitoring Stations

Two air monitoring stations were in operation for the reporting period; these were Jeeralang Hill and Rosedale South rural sites.

Sulfur Dioxide

The highest 1hr average concentration for the reporting period was 0.318 ppm measured on 24 November 2012 at the Jeeralang Hill site. *The State Environment Protection Policy (Ambient Air Quality)* ("SEPP") 1hr Environmental Quality Objective is 0.20 ppm (refer Table 3). The SEPP 1hr Objective was exceeded at Jeeralang Hill on one occasion only during the reporting period, on 24 November as stated above.

The highest 1hr average SO_2 concentration measured at Rosedale South was 0.093 ppm on 21 December 2012.

Nitrogen Oxides

The highest 1hr average nitric oxide (NO) concentration for the reporting period was 0.029 ppm, measured on 21 December 2012 at the Rosedale South site. There is no SEPP Objective for nitric oxide.

The highest 1hr average nitrogen dioxide (NO₂) concentration was 0.064 ppm, measured on 7 September 2012 at the Rosedale South site. This was below the SEPP 1hr Objective for NO₂ of 0.12 ppm. Therefore the SEPP Objective was met for the reporting period.

Nitrogen oxides are not measured at the Jeeralang Hill site.

Particulate Matter

Particulate matter less than 10 microns in diameter (PM_{10}) is measured at both monitoring stations. There were no exceedences of the SEPP Objective of 50.0µg/m³, 24 hour average, during the reporting period. The highest 24hr average PM_{10} concentration was 25.7µg/m³ measured at

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Jeeralang Hill on 5 September 2012. The highest 24hr average PM_{10} concentration measured at the Rosedale South site was $21.7\mu g/m^3$ on 21 November 2012. The SEPP Objective was therefore met.

Local Visual Distance

The SEPP 1hr Objective for Local Visual Distance (LVD) of 20km was not exceeded during the reporting period. The minimum LVD measurement for the reporting period was 25km on 13 July 2012.

Ozone

The highest 1hr average ozone (O_3) concentration for the reporting period was 0.057ppm at Rosedale South site on 30 November 2012 The highest 1hr average ozone (O_3) concentration at the Jeeralang Hill site was 0.052ppm, which also occurred on 30 November 2012. There were therefore no exceedences of the SEPP 1hr Air Quality Objective of 0.10 ppm during the reporting period.

The highest 4hr rolling average O_3 concentration for the reporting period was 0.050ppm, measured at Rosedale South on 30 November 2012. The highest 4hr rolling average O_3 concentration at Jeeralang Hill was 0.049ppm on 30 November 2012. There were therefore no exceedences of the SEPP 4hr Air Quality Objective of 0.08ppm.

What is measured?

The parameters measured at each monitoring station are:

Jeeralang Hill: Ozone, Sulphur Dioxide, Wind Speed, Wind Direction, Inhalable Particulates (PM₁₀)

Rosedale South: Nitrogen Oxides, Sulphur Dioxide, Ozone, Local Visual Distance, Dry Bulb Temperature, Wind Speed, Wind Direction, Global Solar Radiation, Ultra-Violet Radiation A, Inhalable Particulates (PM₁₀)

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

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1.0 Introduction

Annual summaries of air quality data for the Latrobe valley Air Monitoring Network (LVAMN) are presented for the period 1st July to 31st December 2012. All monitoring stations were operated and maintained by Ecotech on behalf of PowerWorks. 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:

Data Collection Methods Used	Description of Method				
AS 3580.5.1:2011	Methods for sampling and analysis of ambient air. Method 5.1: Determination of oxides of nitrogen – Direct-reading instrumental method				
AS 3580.4.1:2008	Methods for sampling and analysis of ambient air. Method 4.1: Determination of sulfur dioxide – Direct reading instrumental method				
AS 3580.6.1:2011	Methods for sampling and analysis of ambient air. Method 6.1: Determination of ozone – Direct-reading instrumental method				
AS 3580.9.11:2008	Methods of sampling and analysis of ambient air. Method 9.3: Determination of suspended particulate matter – PM ₁₀ beta attenuation monitors				
AS 3580.12.1:2001	Methods for sampling and analysis of ambient air. Method 12: Determination of light scattering – Nephelometer Method				
AS 3580.14:2011	Methods for sampling and analysis of ambient air. Method 14: Meteorological monitoring for ambient air quality monitoring applications				

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

Table 3 shows the *State Environment Protection Policy (Ambient Air Quality)* ("SEPP") Environmental Quality Objectives and Goals for Victoria (Victoria, 1981). 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, to which both Jeeralang Hill and Rosedale South do not conform. Both of these sites are classified as rural sites and are designed to serve as surveillance sites, with measurements to be used for air quality modeling, plume impact and other studies.

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2.0 LVAMN Operations for June – December 2012

2.1. Network operations

Two air monitoring stations were in operation for the reporting period. These were the Jeeralang Hill and Rosedale rural sites.

The parameters measured at each monitoring station are:

Jeeralang Hill: Ozone, Sulphur Dioxide, Wind Speed, Wind Direction, Inhalable Particulates (PM₁₀)

Rosedale South: Nitrogen Oxides, Sulphur Dioxide, Ozone, Local Visual Distance, Dry Bulb Temperature, Wind Speed, Wind Direction, Global Solar Radiation, Ultra-Violet Radiation A, Inhalable Particulates (PM₁₀)

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

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

Site Name	Geographical Coordinates	Height Above Sea Level (m)
Jeeralang Hill	38°20'45.17"S 146°28'29.35"E	510
Rosedale South	38°11'46.66"S 146°46'43.15"E	52
The Ridge	38°14'49.20"S 146°24'49.15"E	102

Table 1: LVAMN Monitoring Station Geographical Locations

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Figure 1: LVAMN Monitoring Station Locations Map

2.2. Network Performance

All monitoring equipment used in the LVAMN stations performed well for the reporting period. All parameters performed above the individual minimum requirement of 80% valid data capture. Data losses from power interruptions, instrument faults and the initial site handover and commissioning were the most significant causes of lost data. (Refer to Table 7 "LVAMN Air Quality Instrument Performance Statistics for July – December 2012").

The NEPM³ requires 75% valid data capture for each parameter in each calendar quarter. This requirement was met at both Jeeralang Hill and Rosedale South monitoring stations.

³ National Environment Protection (Ambient Air Quality) Measure

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3.0 Latrobe Valley Air Quality July to December 2012

The summary of air quality measurements for the Latrobe Valley Air Monitoring Network for the period July 2012 to December 2012 is shown in Table 4 and Table 5.

The highest values⁴ measured in the Latrobe Valley are shown in Table 4 and Table 5, except for Local Visual Distance where the lowest values are shown.

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

3.1. Nitric Oxide (NO)

The two highest 1hr-average NO concentrations at Rosedale South were 0.029 ppm on 21 December and 0.023 ppm on 31 December. There is no air quality Objective for nitric oxide.

Nitric oxide is not measured at the Jeeralang Hill site.

3.2. Nitrogen Dioxide (NO₂)

The highest 1hr average NO₂ concentration measured at Rosedale South was 0.064 ppm on 7 September. This was below the SEPP 1hr Objective of 0.120 ppm.

Nitrogen dioxide is not measured at the Jeeralang Hill site.

3.3. Sulfur Dioxide (SO₂)

The highest 1hr average SO_2 concentration measured at Jeeralang Hill was 0.318 ppm on 24 November. This exceeded the SEPP 1hr Objective of 0.200 ppm. This was the only exceedence recorded for SO_2 during the reporting period.

The highest 1hr average SO_2 concentration measured at Rosedale South was 0.093 ppm on 21 December.

⁴ The lowest values for local visual distance (LVD)

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The highest 24hr average SO_2 concentration measured during the reporting period was 0.038 recorded on 24 November at Jeeralang Hill. This measurement did not exceed the SEPP 24hr Objective of 0.080 ppm.

3.4. Ozone (O₃)

The highest 1hr average O₃ concentration measured at Jeeralang Hill was 0.069 ppm on 26 February.

The highest 1hr average O_3 concentration measured at Rosedale South was 0.069 ppm on 26 February.

The highest rolling 4hr average O_3 concentration was 0.050 ppm, measured at Rosedale South on 30 NJovember. This measurement did not exceed the SEPP Objective of 0.080 ppm.

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 2.5µm 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 lowest LVD measurement recorded was 25 km on 13 July 2012.

The SEPP Objective of 20 km was not exceeded during the reporting period.

3.6. Particulate matter less than 10 microns (PM₁₀)

 PM_{10} (particles less than $10\mu m$) 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.

The highest 24 hour average PM_{10} concentration of 25.7µg/m³ was measured at Jeeralang Hill on 5 September.

The highest 24 hour average PM_{10} concentration measured at Rosedale South was 21.7µg/m³ on 21 November.

Monthly average PM_{10} concentrations for the LVAMN sites are given in Table 6. The highest monthly concentration was $14.1 \mu g/m^3$ measured at Jeeralang Hill. There is no SEPP Objective for monthly concentration.

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4.0 References

Aurecon. LVAMN Annual Summary for 2011, Report No. ARM-2012-002 Issue date 4 April 2012

LVAMN Database - Airodis[™] Version 5.0 – Validated data from 1st July 2012 to 31st December 2012

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

Wendt, C & Walsh, S. Use of nephelometery as a long term measure of particle pollution. 14th IUAPPA World Congress, Brisbane, Australia, 2007.

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5.0 Tables

Table 2: Latrobe Valley Air Monitoring Network Stations July – December 2012

LVAMN	LVAMN			Ctation	Sampling	Station Location			
Station Number	Station Short Name	Station Name	Type	Start Date	Height (m agl)	Coordinates		Description	
17	RS	Rosedale South	AQR	02/06/87	3	38°11′46.66″S	146°46'43.15"E	West of Willung Road, Rosedale South	
36	ΗL	Jeeralang Hill	AQR	01/09/96	3	38°20′45.17″S	146°46'43.15"E	1km north of Jeeralang North Road (Thomson Road)	
37	PS	PowerWorks SODAR (The Ridge)	AS	11/05/01	Multiple [@]	38°14'49.20"S	146°24'49.15"E	South of PowerWorks building, Ridge Rd, Morwell	

Notes:

AQR – Air Quality Rural

AS – Acoustic Sounder

[@] Measures at various pre-selected heights up to approx. 1500 meters.

The sampling height of anemometers and wind direction sensors at air monitoring stations is 10m above ground level (agl)

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Table 3: State Environmental Protection Policy (SEPP) Air Quality Objectives

State Environment Protection Policy (Ambient Air Quality)

Relevant Environmental Quality Objectives and Goals

Pollutant	Averaging Period	Environmental Quality Objectives ¹	Goal – Maximum Allowable Exceedences	
Nitrogon diovido	1 hour	0.12 ppm	1 day a year	
Nitrogen dioxide	1 year	0.03 ppm	None	
Photochamical avidant (ac azona)	1 hour	0.10 ppm	1 day a year	
Photochemical oxidant (as ozone)	4 hours ²	0.08 ppm	1 day a year	
	1 hour	0.20 ppm	1 day a year	
Sulphur dioxide	1 day	0.08 ppm	1 day a year	
	1 year	0.02 ppm	None	
Particles as PM ₁₀	1 day	50 μg/m ³	5 days a year ³	
Visibility Reducing Particles (LVD)	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 using high volume samplers).

⁴ Minimum visual distance.

Important Note:

The above air quality objectives apply to ambient air throughout 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, to which both Jeeralang Hill and Rosedale South do not conform. Both of these sites are classified as rural sites and are designed to serve as surveillance sites, with measurements to be used for air quality modeling, plume impact and other studies.

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STATION			RS	JH	
LVAMN STATION NUMBER			17	36	SEPP Objectives
NUMBER OF MONTHS IN SERVICE			6	6	and Goals
HOURS OF AVAILABLE DATA	NO		3854	N/A	
	NO ₂		3854	N/A	
(Total annual hours per parameter = 8760 hrs)	SO ₂		3977	4022	
	O ₃		4173	3949	
	LVD		4181	N/A	
	PM ₁₀		4354	3836	
MAXIMUM MEASURED CONCENTRATION	NO	(ppb)	29	N/A	
	NO ₂	(ppb)	64	N/A	
	SO ₂	(ppb)	93	318	
	O ₃	(ppb)	57	52	
MINIMUM MEASURED VISIBILITY	LVD	(km)	25.1	N/A	
SECOND HIGHEST DAILY MAXIMUM	NO	(ppb)	23	N/A	
	NO ₂	(ppb)	34	N/A	120 ppb (a)
	SO ₂	(ppb)	74	192	200 ppb (a)
	O ₃	(ppb)	49	50	100 ppb (a)
FOURTH LOWEST DAILY MINIMUM	LVD	(km)	42.3	N/A	20 km (b)
DAYS WITH VISIBILITY MINIMUM < 20 km			0	N/A	3 days
DAYS WITH 1-HR Ω_2 MAXIMUM > 100 nph			0	0	1 day

Table 4: Air Quality July 2012 to December 2012 – 1 Hour Averages

Notes to table:

- (a) Not to be exceeded on more than one day in any one year.
- (b) Not to be exceeded on more than three days in any one year.

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STATION			RS	JH	SEPP Objectives
LVAMN STATION NUMBER			17	36	and Goals
NUMBER OF MONTHS SERVICE			6	6	
PERIODS OF AVAILABLE DATA	24-HOUR NO		164	N/A	
(e.g. 1 period = 24 hours and represents 75% or greater data capture for	24-HOUR NO ₂		164	N/A	
the period)	24-HOUR SO ₂		172	171	
	24-HOUR O_3		181	167	
	24-HOUR PM ₁₀		182	154	
	4-HOUR O_3 (a)		184	167	
MAXIMUM MEASURED CONCENTRATION	24-HOUR NO	(ppb)	6	N/A	
	24-HOUR NO ₂	(ppb)	11	N/A	
	24-HOUR SO ₂	(ppb)	15	38	
	24-HOUR PM ₁₀	(µg/m³)	21.7	25.7	
	4-HOUR O₃ (a)	(ppb)	34	42	
SECOND HIGHEST DAILY MAXIMUM (b)	24-HOUR NO	(ppb)	5	N/A	
	24-HOUR NO ₂	(ppb)	5	N/A	
	24-HOUR SO ₂	(ppb)	12	20	80 ppb (c)
	4-HOUR O ₃ (b)	(ppb)	27	36	80 ppb (c)
SECOND HIGHEST DAILY MAXIMUM (b)	24-HOUR PM ₁₀	(µg/m³)	18.8	23.3	50 μg/m³ (c,f)
SIXTH HIGHEST DAILY MAXIMUM (b)	24-HOUR PM ₁₀	(µg/m³)	17.7	20.0	50 μg/m³ (e)
DAYS WITH 4-HR O₃ MAXIMUM > 80 ppb			0	0	1 day
DAYS WITH $PM_{10} > 50 \ \mu g/m^3$			0	0	See note (d)
6-MONTH AVERAGE CONCENTRATION	NO	(ppb)	1	N/A	
	NO ₂	(ppb)	2	N/A	30 ppb (g)
	SO ₂	(ppb)	12	3	20 ppb (g)
	PM ₁₀	(µg/m³)	8.5	9.9	
	O ₃	(ppb)	18	24	

Table 5: Air Quality July 2012 to December 2012 – Longer Term Averages

Notes to Table 5 on following page

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Notes to Table 5:

- (a) 4-hour rolling averages.
- (b) Equal daily maxima counted separately.
- (c) Not to be exceeded on more than one day in any year.
- (d) Not more than one day in any year.
- (e) Not to be exceeded on more than five days in any year.
- (f) One day in six operation.
- (g) Never to be exceeded.

Table 6: Inhalable	Particulate	Summary for	July 201	12 to D	ecember	2012
	i ai ticulate	Summary 101	July 20.		CCCIIIDCI	2012

1	, . , . , . , . , , , , , , , , , , , ,	
Month	Jeeralang Hill	Rosedale South
Jan		
Feb		
Mar		
Apr		
May		
Jun		
Jul	6.0	4.2
Aug	6.1	5.8
Sep	9.6	8.4
Oct	10.7	10.2
Nov	11.8	10.7
Dec	14.1	11.4
6-month average	9.9	8.5

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

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Table 7: Air Quality Instrument Performance Statistics for July 2012 to December 2012

STATION	NO ₂	NO	SO ₂	O ₃	LVD	DBT	WS	WD	GLB	UVA	PM ₁₀
Rosedale South	87	87	90	95	95	99	94	94	96	93	99
Jeeralang Hill			91	89			93	93			87

The above table represents the percentage of 1 hour average validated data capture for the LVAMN. The maximum achievable data capture for the calibrated parameters NO₂, NO, SO₂, O₃ and LVD is 96%, because 1 hour per day is spent in calibration mode.

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

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