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TARAGO AIR QUALITY MONITORING REPORT APRIL 2020

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APRIL 2020

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CONTENTS

1. OVERVIEW

Ramboll Australia Pty Ltd (Ramboll) has been commissioned by John Holland Rail Pty Ltd (JHR) to implement and maintain an air quality monitoring program to inform air quality impacts resulting from retained lead containing ore within the Goulburn – Bombala rail corridor in the Tarago Area. Impacts from lead have been observed in the railway corridor and surrounding areas, likely from historical spillage associated with loading of ore at the site (Ramboll, 2019). The location is shown on **Figure 2-1**.

Lead is emitted to the air from both natural and anthropogenic sources. Measured concentrations in ambient air have greatly reduced nationally following the phase-out of leaded fuels from 2000 to 2002, where typically urban concentrations are now less than 10% of the air quality criteria (NEPC, 2001). Appendix A shows historic annual average lead concentration in Australian capital cities from 1981 to 2000, after which monitoring ceased in urban areas. Ambient lead remains a risk in areas where local point sources exist, such as metal smelting facilities, mining operations and waste incinerations. Inhalation and ingestion of lead at elevated levels can lead to a range of health impacts, including cancer, neurotoxicity and reproductive toxicity.

The focus of this air quality monitoring program is lead in particulate form, both for ambient airborne fractions and deposited dust. This program was commissioned during early April 2020 (1 to 7 April) in Tarago, NSW. This report comprises the first month of data collected during April 2020.

2. METHODOLOGY

2.1 Approach

The monitoring program consisted of three dust monitoring techniques and was interpreted using meteorological data collected by Department of Planning, Industry and Environment (DPIE) in Goulburn, approximately 38 km to the north-north-east.

The program is outlined in the following sections:

- Dust deposition and lead measured continuously throughout each month (Section 2.1.1)
- Total suspended particulates (TSP) and lead measured for a 24-hour period completed every one day in six days (Section 2.1.2).
- Particulates less than 10 microns in aerodynamic diameter (PM_{10}) and less than 2.5 microns measured continuously throughout each month ($PM_{2.5}$; Section 2.1.3)

Siting of all equipment was completed, as far as practicable, in accordance with the recommendations of *AS/NZS 3580.1.1 Guide to siting air monitoring equipment*. Locations of all equipment are shown in **Figure 2-1** and images of the monitoring equipment in-situ are shown in **Appendix B**.

2.1.1 Deposited dust and lead

Deposited dust is particulate matter that settles out of the air onto the ground or surfaces. It generally consists of larger, heavier particles from a local source and is considered a nuisance impact rather than a health concern. These particles generally contain a variety of components such as nitrates, sulphates, organic chemicals, metals, soil or dust particles and allergens.

For this study, sampling and analysis was conducted in accordance with the recommendations of *AS/NZS 3580.10.1 Determination of Particulate Matter – Deposited Matter – Gravimetric method*. Each gauge is installed to collect deposited matter in a glass bottle together with rainwater through a funnel over a period of 30 days +/- 2 days at a mounted height of approximately 2 m above ground surface. The samples are analysed for insoluble solids (including ash and combustible matter) and lead by inductively coupled plasma mass spectrometry (ICP-MS).

Four dust deposition gauges were placed to assess deposited dust and lead in residential areas east, west and south-east of the source area and at 106 Goulburn Street.

2.1.2 TSP and lead

TSP are solid particles and water droplets less than approximately 50 to 100 μm in aerodynamic diameter. This parameter is dominated by larger entrained particles which are generally considered a nuisance dust compared to finer particles such as PM_{10} and $PM_{2.5}$ which are known to be hazardous to human health. The Australian Standard to measure lead in particulates (*AS/NZS.9.15 Determination of suspended particulate matter – Particulate metals high or low volume sampler gravimetric collection – Inductively coupled plasma (ICP) spectrometric method)* requires measurement of the TSP fraction to analyse for lead content.

Sampling and analysis for this program has been conducted in accordance with the Australian Standard. Calibration has been completed by Ramboll, consistent with the Australian Standard and manufacturers recommendations. The program utilises a high-volume air sampler (Ecotech 3000) with a TSP head, that has a reported cut-point for particles of 50 μm diameter or less. The sampler draws a known volume of air across a pre-weighed filter for 24-hours. The filters are weighed following sampling to determine the weight of the particulate matter captured and further analysed for lead concentration using ICP-MS. To compare particulate lead to the air

quality annual standard, lead sampling must be carried out for a period of 24 hours at least every sixth day, the approach applied for this program.

TSP and lead were measured at 106 Goulburn Street identified as the nearest sensitive receptor to the source area.

2.1.3 Continuous PM_{10} and $PM_{2.5}$

PM_{10} refers to particles of less than 10 microns in aerodynamic diameter, and $PM_{2.5}$ to those of less than 2.5 microns. These size fractions can be drawn into the respiratory system and can cause serious health effects, such as lung disease, asthma, heart attacks, respiratory and cardiovascular disease. As with other fractions of particulate matter, particles consist of a multitude of constituents from a range of local and regional sources.

For this program a particle counter (QAMS DMP 7000) is maintained to understand how concentrations of particulate matter vary over finer temporal scales. Whilst the focus of the program is on lead concentrations, data from the particle counter provide a useful indication of concentrations over a day or week relative to prevailing meteorological conditions which can provide an indication of likely sources if needed. The instrument is configured to measure PM_{10} and $PM_{2.5}$ at 5-minute intervals over the course of the program.

2.2 Regional meteorological monitoring

The Department of Planning, Industry and Environment (DPIE) maintains a state-wide network of air quality monitoring stations, including one commissioned recently in late 2019 in Goulburn, NSW. The station measures meteorological parameters, of which wind speed, wind direction, temperature, humidity and rainfall are of interest to this program. One-hourly averaged data have been analysed to determine prevailing conditions.

DPIE do not monitor lead routinely as part of their state-wide air quality monitoring program.

2.3 Relevant air quality criteria

Air quality criteria relevant to the program are presented in **Table 2-1**.

Table 2-1: Air quality criteria relevant to JHR Tarago air quality monitoring program

Pollutant	Averaging period	Criteria	Source
Lead	Annual	0.5 µg/m³	NEPC (1998)
TSP	Annual	90 µg/m³	NHMRC (1996)
$PM_{2.5}$	24 hours	25 µg/m³	DoE (2016)
	Annual	8 µg/m³	DoE (2016)
PM_{10}	24 hours	50 µg/m³	DoE (2016)
	Annual	25 µg/m³	DoE (2016)
Deposited dust	Annual	4 g/m²/month	NERDDC (1988)

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Legend

- Site boundary
- Rail corridor
- Rail corridor fence
- Area of lead contamination within the rail corridor

Sampling locations

- Deposited dust and lead (from dust deposition guage)
- TSP and lead (from high volume air samper)
- Continuous PM10 and PM2.5 (from particle counter)
- Regional meteorological monitoring from DPIE Air quality monitoring station (see location inset)

Figure 2-1 | Tarago air quality monitoring locations

3. RESULTS

3.1 Deposited dust and lead

No lead was measured above the detection limit (0.01 µg) at the four monitoring locations during April 2020. Overall, all sites measured low deposited dust (insoluble solids) against the monthly goal of 4g/m²/month.

Table 3-1: Measured lead content in deposited dust and deposited dust at four properties around Tarago, NSW

Month	DDG1, Stewart St		DDG2, Station Masters Cottage		DDG3, Boyd St		DDG4, Mulwaree St	
	Lead (µg)	Insoluble solids (g/m2 /month)	Lead (µg)	Insoluble solids (g/m2 /month)	Lead (µg)	Insoluble solids (g/m2 /month)	Lead (µg)	Insoluble solids (g/m2 /month)
April (1-4-2020 to 30-4-2020)	<0.01	1.0	<0.01	0.7	<0.01	0.6	<0.01	0.4

Limit of reporting = 0.01 µg

3.2 TSP and lead

Lead was detected in each TSP sample collected during April 2020, however in all cases the concentration was below the annual average criteria for lead (**Figure 3-1**). Similarly, TSP measured during the period was below the annual average (**Figure 3-2**). Of note is that lead and TSP were not correlated during this period (**Figure 3-3**).

Figure 3-1: Measured 24-hour average lead concentration every one day in six since program commissioning

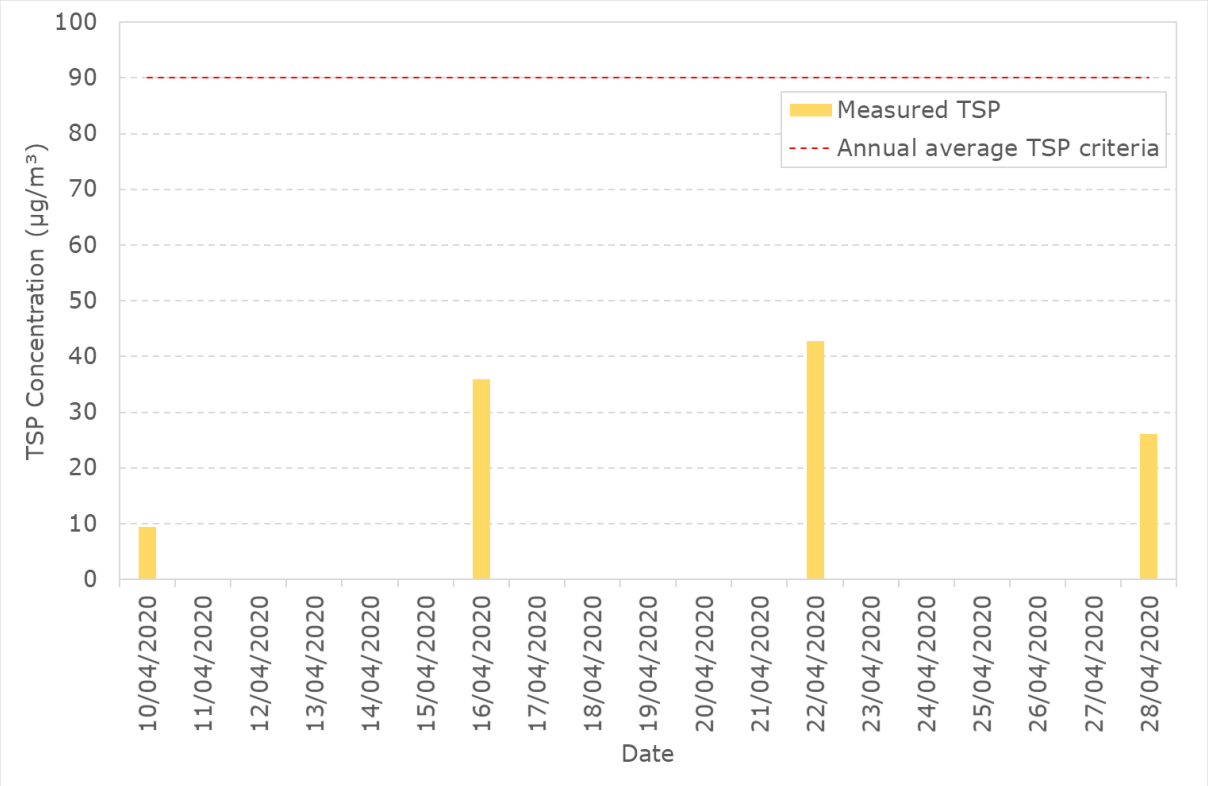

Figure 3-2: Measured 24-hour average TSP concentration every one day in six since program commissioning

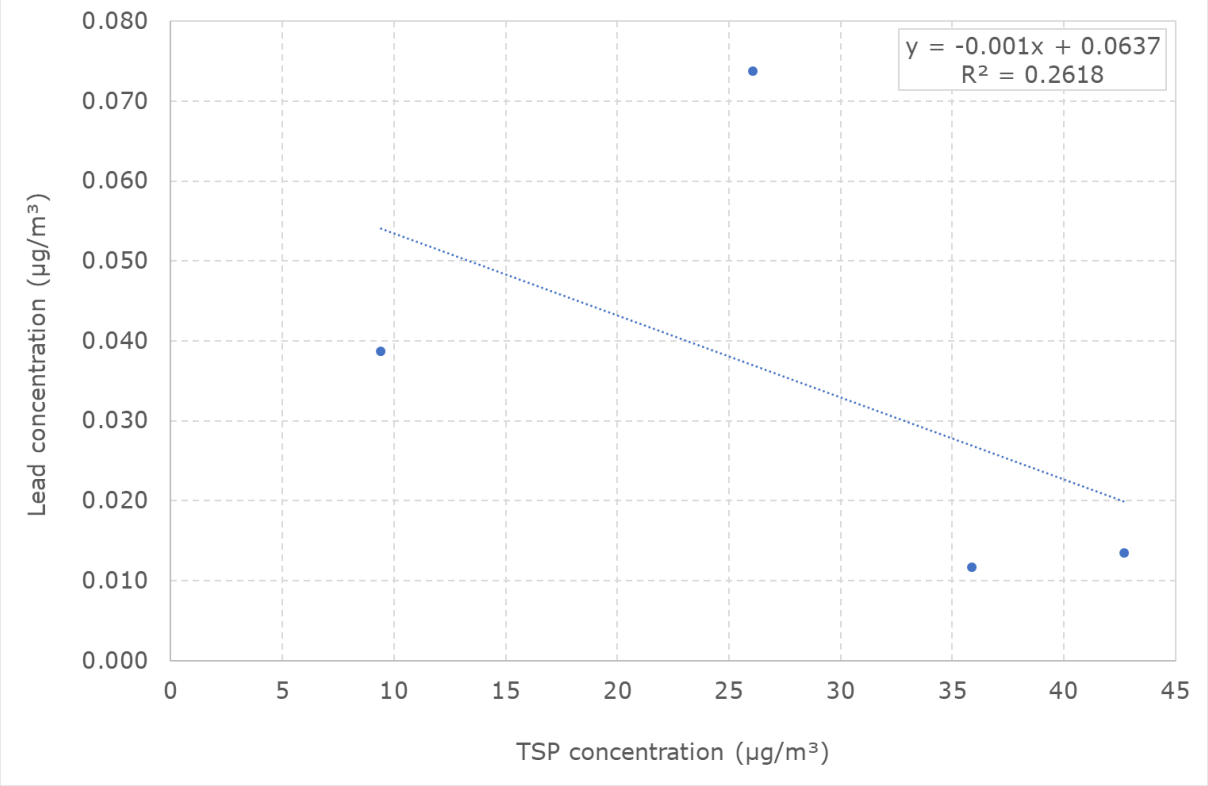

Figure 3-3: Correlation between TSP concentration and lead concentration from the same sample

Regional wind directions were similar for each of the four sampling days, where winds prevailed from east to north-east for some periods of the day and west to north-west in others. The monitoring location would be influenced from sources in the direction of the rail corridor under these conditions.

Wind speeds during the days where lead was higher (10 April and 28 April 2020) show a higher frequency of low wind conditions (**Figure 3-4**). Calm conditions have an important influence on pollutant dispersion in the atmosphere, where low wind speeds can concentrate pollutants near the source.

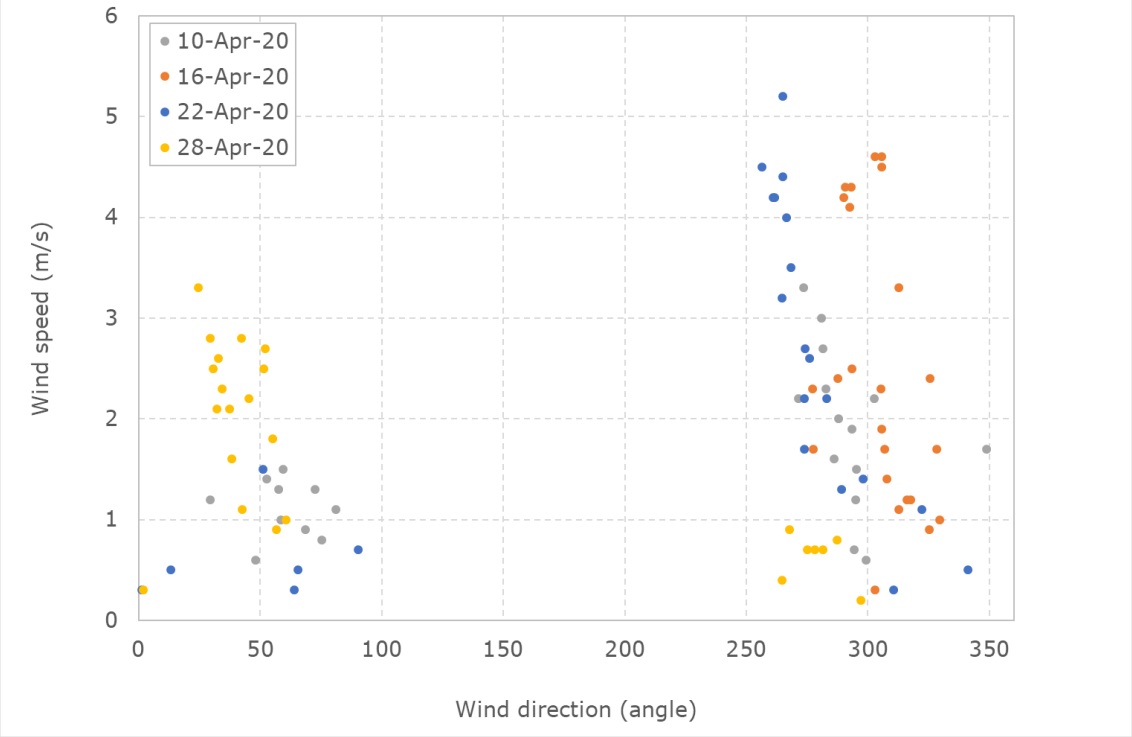

Figure 3-4: Hourly average regional wind speed and direction measured during days TSP was measured, during April 2020

3.3 Continuous PM_{10} and $PM_{2.5}$

All PM_{10} and $PM_{2.5}$ 24-hour average concentrations were below the air quality criteria for sampling during April (Figure 3-5). There was no evident correlation between these particulate size fractions and lead measured from TSP during April. On days when lead was slightly elevated compared to other samples (10 April and 28 April 2020), PM_{10} concentrations were characterised by higher concentrations during the early morning (1 am to 3 am) which coincided with periods of low wind speeds.

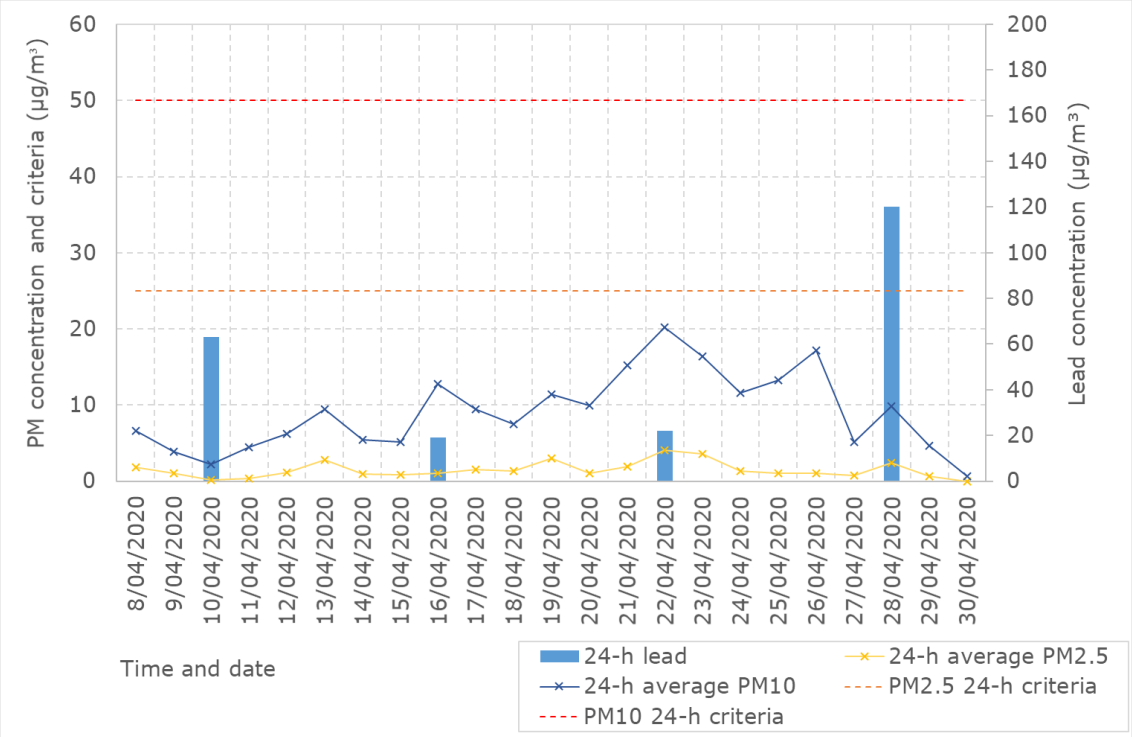

Figure 3-5: PM_{10} and $PM_{2.5}$ 24-hour average measured during April against the air quality criteria compared to measured lead concentrations from TSP

4. SUMMARY

No lead was detected in deposited dust above the limit of reporting during April at the four measured locations around Tarago, NSW. Lead was detected in all four 24-hour TSP samples, but in all cases the concentration was well below the annual average criterion. All 24-hour PM_{10} and $PM_{2.5}$ averages were below the 24-hour air quality criteria during April and there was no evident correlation with these parameters and lead concentrations from TSP.

Initial observations suggest the measured lead occurred during calm and low wind speed conditions. Further air quality monitoring is ongoing to assess impacts of broader weather conditions on entrainment of contaminated soil to air.

5. LIMITATIONS

This document is issued in confidence to John Holland Rail for the purposes of assessing air quality impacts from lead containing ore within the Goulburn – Bombala rail corridor in the Tarago Area. It should not be used for any other purpose.

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6. REFERENCES

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APPENDIX 1
HISTORIC LEAD CONCENTRATIONS AROUND AUSTRALIA (NEPC, 2001)

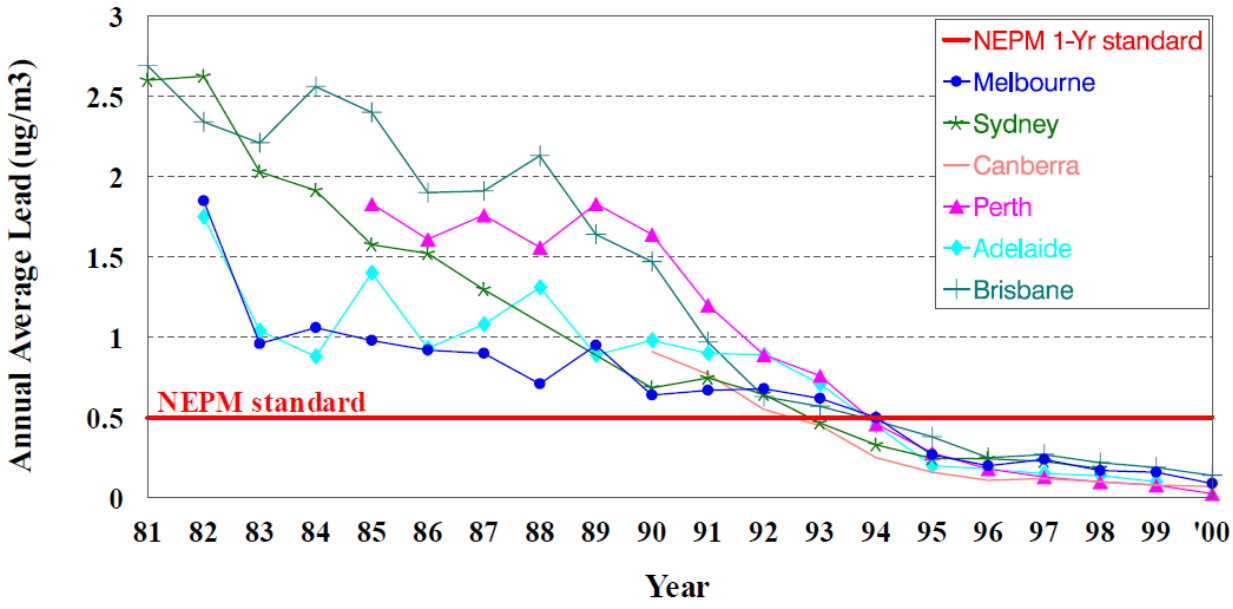

Figure: Annual lead concentrations in Australian Capital Cities, 1981-2000 (NEPC, 2001)

APPENDIX 2
IMAGES OF AIR QUALITY MONITORING INSTRUMENTS IN-SITU

Figure: Dust deposition gauge (DDG2), particle counter and high-volume air sampler at Station Masters Cottage, 106 Goulburn St, Tarago NSW

Figure: Dust deposition gauge DDG1, 18 Stewart St, Tarago NSW; DDG3, Boyd St, Tarago NSW and DDG4, 96 Mulwaree St, Tarago NSW