E N V I R O N M E N T P R O T E C T I O N A U T H O R I T Y

South Australia's Air Quality 2004

Government of South Australia

EPA South Australia

South Australia's Air Quality—2004

December 2005

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Abbreviations

$\mu g/m^3$	micrograms per cubic metre
Air NEPM	National Environmental Protection (Ambient Air Quality) Measure
AQI	air quality index
EPA	Environment Protection Authority
PM_{10}	particles of less than 10 micrometres in diameter
$PM_{2.5}$	particles of less than 2.5 micrometres in diameter
ppm	parts per million
TEOM	tapered element oscillating microbalance
TSP	total suspended particles

OVERVIEW

Adelaide

The air in Adelaide was generally of good quality in 2004. The goals of the National Environmental Protection (Ambient Air Quality) Measure (the Air NEPM) were met for all pollutants when sufficient data was available to meet its reporting criteria.

The air quality index (AQI) for a region such as Adelaide is generated by calculating the index for each individual pollutant (the measured value for that pollutant expressed as a percentage of the standard set by the Air NEPM) for each monitoring site in the region. The highest of these indices is then taken to be the AQI for the particular monitoring site and the highest of the indices from all monitoring sites in the region is used as the AQI for the region. The categories of 'very good', 'good', 'fair', 'poor' and 'very poor' air quality indices are defined in Table 1.

Table 1: Definition of categories used in the air quality index

AQI category	Definition
Very good	the highest individual air quality parameter in the region is at most 33% of the Air NEPM standard
Good	the highest individual air quality parameter is at most 66% of the Air NEPM standard
Fair	the highest individual air quality parameter is between 66% and 99% of the Air NEPM standard
Poor	an Air NEPM standard has been exceeded
Very poor	the highest individual air quality parameter is at least 50% higher than the Air NEPM standard

In 2004, the air quality in Adelaide, as indicated by the AQI, was 'very good' 46% of the time, 'good' 47% of the time, 'fair' 6% of the time and 'poor' 1% of the time (Figure 1). This AQI was calculated using validated hourly air quality data from the Adelaide, Elizabeth, Kensington Gardens and Netley monitoring sites.

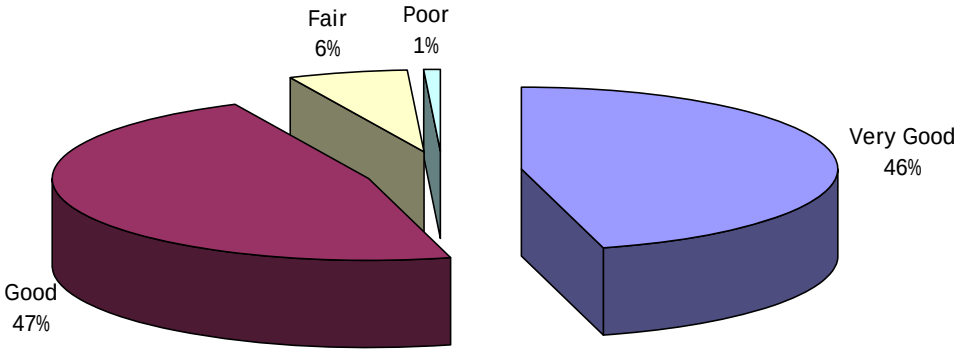


Figure 1: Air Quality Index for Adelaide, 2004

The occasions when the air quality was rated as 'fair' or 'poor' were caused by elevated levels of particulate matter, measured as particles of less than 10 micrometres in diameter (PM_{10}).

In 2004, the Air NEPM standard of 50 micrograms per cubic metre ($\mu g/m^3$) as a 24-hour average was exceeded once at the Elizabeth monitoring site, four times at the Gawler monitoring site, once at the Kensington Gardens monitoring site, three times at the Netley monitoring site and three times at the Northfield monitoring site. Since the goal of the Air NEPM is that the standard should not be exceeded more than five times per year, all of these sites met the NEPM goal.

Port Augusta

In Port Augusta, particulate matter, as PM_{10}, is measured by high-volume sampling on one day in six. Of the 56 samples taken in 2004, one sample (1.8%) exceeded the Air NEPM standard of 50 $\mu g/m^3$. This sample was taken on a day on which the DustWatch group reported a dust storm in South Australia.

Port Pirie

In 2004, the air quality in Port Pirie, as determined by the Air Quality Index, was 'very good' 54% of the time, 'good' 38% of the time, 'fair' 6% of the time, 'poor' 1% of the time and 'very poor' 1% of the time. Figure 2 illustrates these results using validated hourly air quality data from the monitoring site at Oliver Street, Port Pirie.

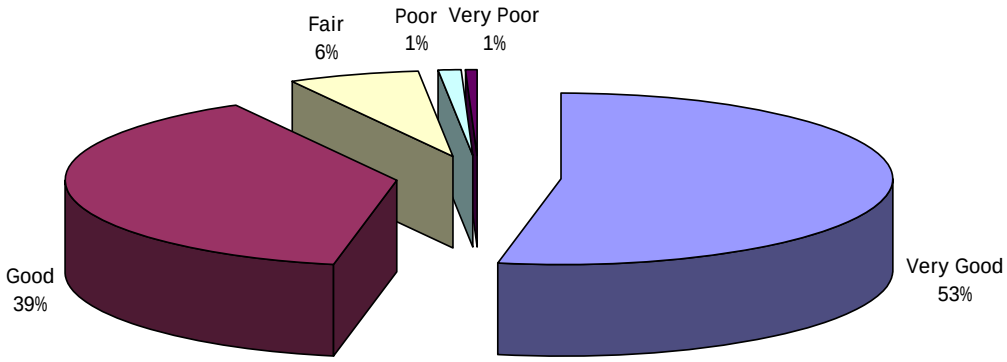


Figure 2: Air Quality Index for Port Pirie, 2004

In 2004, the annual average lead concentration was 0.63 $\mu g/m^3$ at the monitoring site in The Terrace and 0.59 $\mu g/m^3$ at the Oliver Street monitoring site. The airborne lead levels at these monitoring sites exceeded the Air NEPM standard, which specifies a maximum of 0.5 $\mu g/m^3$ as an annual average. At the Senate Road monitoring site, which is further away from the lead smelter than the other monitoring sites, the annual average lead concentration was 0.28 $\mu g/m^3$.

At the Ellen Street monitoring site, located in an industrial area close to the lead smelter to evaluate industry performance, the annual average lead concentration was 3.91 $\mu g/m^3$.

The Oliver Street site further monitors the impact of the lead smelter by measuring concentrations of sulfur dioxide, generated during the processing of lead sulfide ores. The 0.08 parts per million (ppm) standard for the 24-hour average set by the Air NEPM for sulfur dioxide was not exceeded in 2004. However the 0.20 ppm standard set for the 1-hour average by the Air NEPM was exceeded on 31 days and 39 occasions. The Air NEPM sets a goal of not more than one day a year on which the standard may be exceeded.

Whyalla

In Whyalla, particulate matter pollution and the gaseous pollutants nitrogen dioxide, ozone and sulfur dioxide were monitored in 2004. For the gaseous pollutants, the air quality in Whyalla was predominantly very good.

It is not appropriate to calculate an air quality index for Whyalla in the same format as for Adelaide and Port Pirie because, in Whyalla, particulate matter pollution is not continuously monitored at the sites designated as performance monitoring sites for the Air NEPM.

At Civic Park towards the western end of Whyalla, the monitoring program for PM_{10} particulate matter had no samples exceeding the Air NEPM standard of 50 $\mu g/m^3$.

At the eastern end of Whyalla, there continues to be pollution by particulate matter from industrial sources.

A new monitoring site has been established at Walls Street, in a residential area at the eastern end of Whyalla, using a tapered element oscillating microbalance (TEOM) monitoring unit to continuously record particulate matter pollution levels. Of the 353 24-hour averages obtained in 2004, 15 (4%) exceeded 50 $\mu g/m^3$.

At the industrial monitoring site at Hummock Hill, where sampling is conducted once every three days, 23 (21%) of the 112 PM_{10} particulate matter measurements taken exceeded 50 $\mu g/m^3$.

AIR QUALITY ISSUES

Air quality monitoring in South Australia

The South Australian Environment Protection Authority (EPA) monitors air quality to protect the health and wellbeing of South Australians. Monitoring the concentration of pollutants in the air provides data to support the development of air quality management strategies and to evaluate the effectiveness of air quality and environmental management activities.

South Australia has enacted the 1998 *National Environmental Protection (Ambient Air Quality) Measure* (Air NEPM) as the required standard for seven common pollutants. It sets standards and goals for carbon monoxide, nitrogen dioxide, ozone, sulfur dioxide, lead and particles as PM_{10}. The Air NEPM was modified in 2004 to include an advisory reporting standard for particles smaller than 2.5 micrometres ($PM_{2.5}$).

The following statements on the health effects of these pollutants came from an appendix 'Health effects of criteria pollutants' in a report by the National Environmental Protection Council Risk Assessment Taskforce (2000).

Carbon monoxide

Carbon monoxide is a gas, generated by combustion processes, that is readily absorbed into the bloodstream. Exposure to carbon monoxide is associated with a range of health effects including increases in daily mortality and hospital admissions primarily for people with existing cardiovascular disease.

Nitrogen dioxide

The gas nitrogen dioxide is also generated by combustion processes. Exposure to nitrogen dioxide has been associated with increases in daily mortality, hospital admissions and emergency room attendances for cardiovascular and respiratory disease, increases in respiratory illness and symptoms, and decreases in lung function. The elderly, asthmatics, children and people with existing disease are particularly susceptible to the effects of nitrogen dioxide.

Ozone

Ozone is an oxidising gas, created by the interaction of sunlight, nitrogen oxide pollutants and volatile organic compounds in the atmosphere. Exposure to ozone has been associated with increases in daily mortality, increases in hospital admissions and emergency room visits (respiratory and cardiovascular disease), decreases in lung function, increases in symptoms of respiratory illness such as cough, phlegm and wheeze, and increases in bronchodilator usage. These effects are observed in sensitive sub-populations, although effects on lung function have been observed in the healthy normal population.

Sulfur dioxide

Sulfur dioxide is generated by the combustion of sulfur-containing fuels or by the processing of sulfide ores. Ambient levels of sulfur dioxide have been associated with increases in daily mortality, hospital admissions and emergency room attendances for respiratory and cardiovascular disease and respiratory symptoms and decreases in lung function. The high

correlation between ambient sulfur dioxide levels and other pollutants, especially particles, makes it difficult to confidently attribute the observed effects to sulfur dioxide alone.

Lead

Lead is a heavy metal pollutant, originating from industrial sources. Leaded fuel for motor vehicles was once the principal source but it has not been sold in Australia since late 2000. Some recent studies have indicated that adverse health effects, especially impairment of neural development and intellectual capacity leading to behavioural and learning difficulties, may be observed at blood lead levels lower than those previously considered to be safe. The effects of lead exposure during childhood have been shown to continue into later life, with mortality in adult life attributed to childhood lead poisoning. Lead exposure has also been associated with increased body mass index and short stature. Pre-term delivery, congenital abnormalities, growth stature and birth weight have all been identified as being affected by maternal blood lead levels. Associations between blood pressure and blood lead levels have also been observed, and may result in the longer term in increased mortality from stroke and myocardial infarction.

Particulate matter

Particulate matter is measured as total suspended particles (TSP), as PM_{10} and as $PM_{2.5}$.

Unlike the other criteria pollutants, which are each a single substance, particles are a broad class of chemically and physically diverse substances. They are emitted from a wide range of sources including natural sources such as dusts and pollens. The biological effects of particles are determined by the:

- physical and chemical nature of the particles
- physics of deposition and distribution in the respiratory tract
- physiological responses to the presence of the particle.

The health effects of particles include increases in daily mortalities, hospital admissions and emergency room attendances, and exacerbation of respiratory symptoms and asthma. There is no conclusive evidence on the role of particle size in the response but it is thought that different sizes may be important for different health outcomes, for example $PM_{2.5}$ for mortality and PM_{10} for asthma.

How does EPA assess the air monitoring results?

The results of air quality monitoring in 2004 have been assessed against the standards and goals set in the Air NEPM (Table 2).

The standards are set as concentrations in ppm or as $\mu g/m^3$ against which air quality can be assessed. They are set at levels that protect human health and wellbeing, aesthetic enjoyment and local amenity.

The goals in the Air NEPM specify a maximum permissible number of days per year when the standards can be exceeded and a timeframe of 10 years (1998–2008) within which these goals must be met.

Table 2: Air NEPM standards and goals for pollutants other than particles as $PM_{2.5}$

Pollutant	Averaging period	Maximum concentration	10 years goal: maximum allowable exceedences
Carbon monoxide	8 hours	9.0 ppm	1 day a year
Nitrogen dioxide	1 hour	0.12 ppm	1 day a year
	1 year	0.03 ppm	None
Photochemical oxidants (as ozone)	1 hour	0.10 ppm	1 day a year
	4 hours	0.08 ppm	1 day a year
Sulfur dioxide	1 hour	0.20 ppm	1 day a year
	1 day	0.08 ppm	1 day a year
	1 year	0.02 ppm	None
Lead	1 year	0.50 $\mu g/m^3$	None
Particulate matter, as PM_{10}	1 day	50 $\mu g/m^3$	5 days a year

In addition to these goals, the Air NEPM has advisory reporting standards for particulate matter, as $PM_{2.5}$ (Table 3). The South Australian EPA uses the TEOM method to monitor particulate matter as $PM_{2.5}$. Values obtained by this method cannot be used for comparison with the advisory reporting standards until the equivalence of this method has been established and formally included in the Air NEPM.

Table 3: Air NEPM advisory reporting standards for particles as $PM_{2.5}$

Pollutant	Averaging period	Maximum concentration
Particulate matter, as $PM_{2.5}$	1 day	25 $\mu g/m^3$
	1 year	8 $\mu g/m^3$

Atmospheric monitoring over a number of years can indicate whether the air quality in a region is improving or deteriorating. Comparisons can be difficult because monitoring sites may be relocated from time to time.

Where does the EPA do its monitoring?

In 2004, the EPA conducted air quality monitoring at eight sites in the Adelaide airshed (Figure 3) and at nine sites in the Spencer Gulf airshed (Figure 4).

In Adelaide, monitoring was conducted at sites in Adelaide, Christies Beach, Elizabeth, Gawler, Kensington Gardens, Netley, Northfield and Osborne. Of these sites, Adelaide, Christies Beach, Elizabeth, Netley and Northfield were designated as performance monitoring sites for reporting compliance with the Air NEPM.

In the Spencer Gulf airshed, monitoring was conducted at Port Augusta (one site), Port Pirie (four sites, two designated as NEPM performance monitoring sites) and Whyalla (four sites, one designated as an NEPM performance monitoring site).

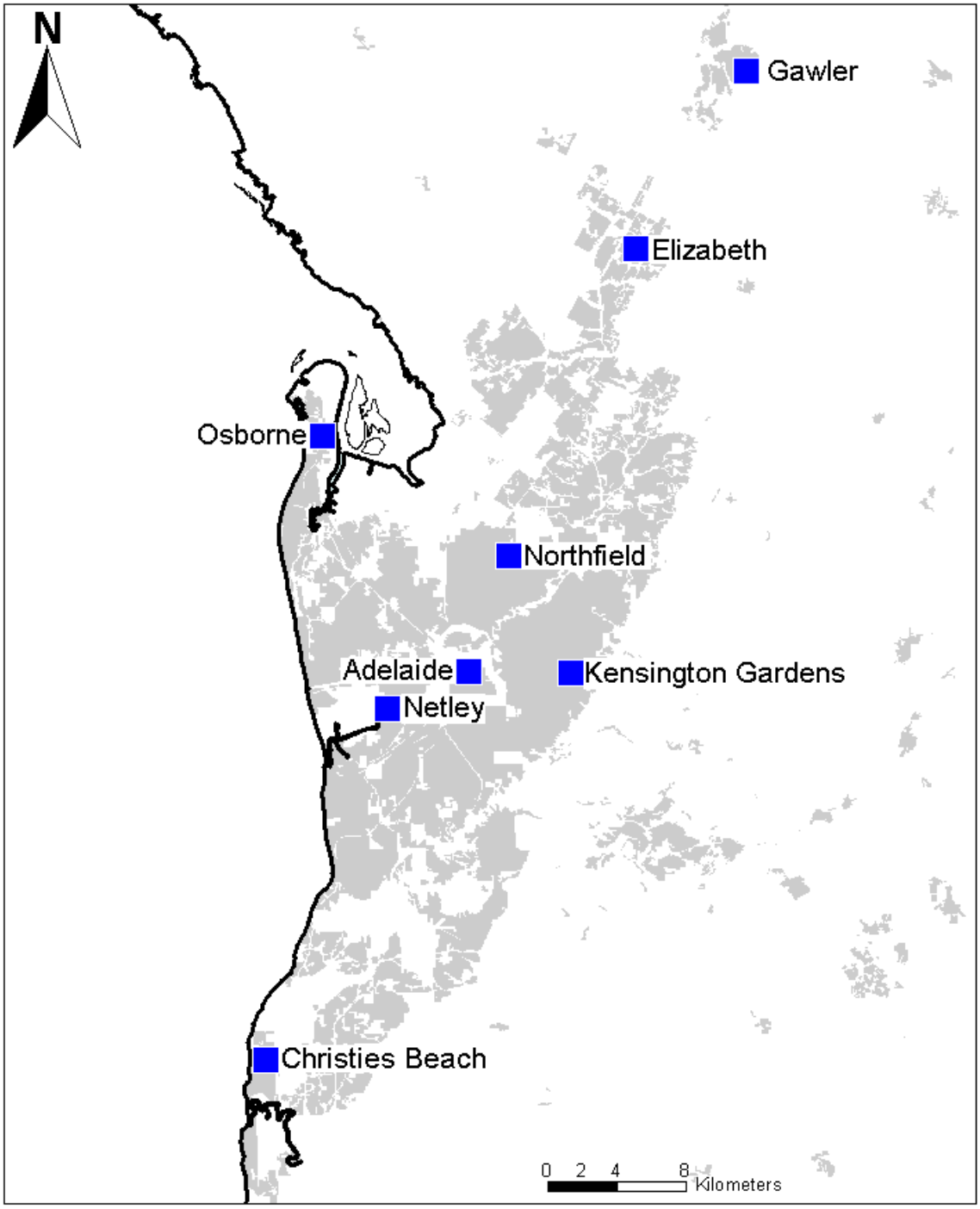
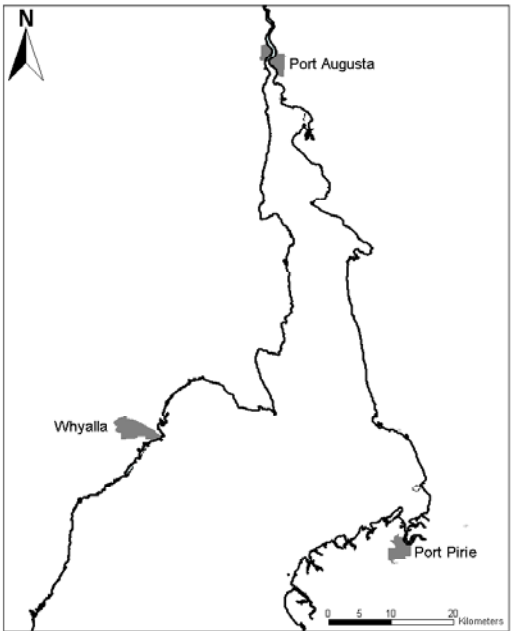
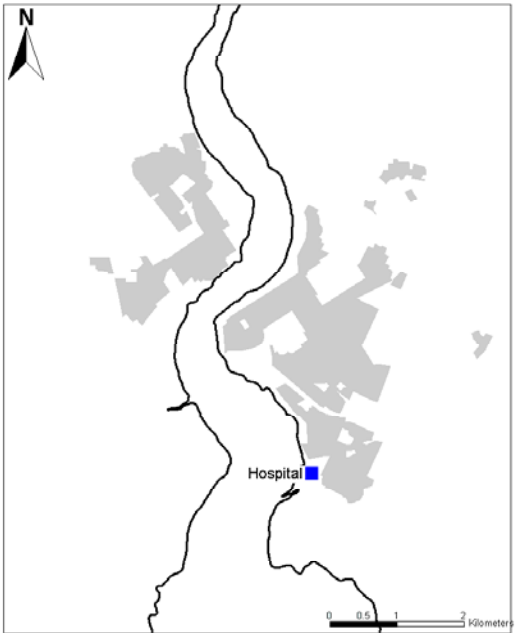


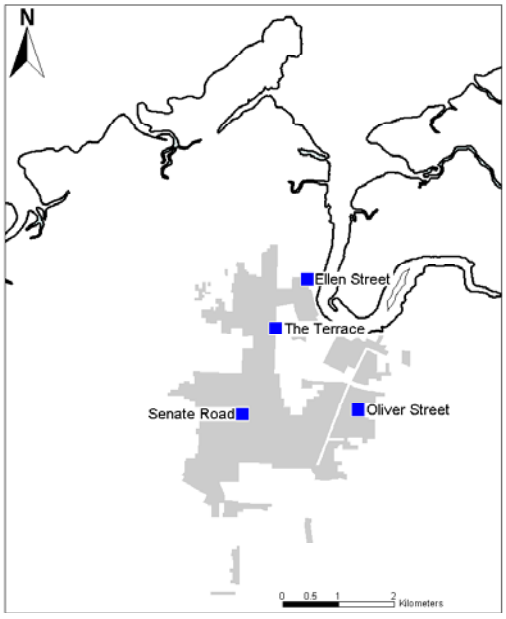
Figure 3: Air quality monitoring sites in the Adelaide airshed



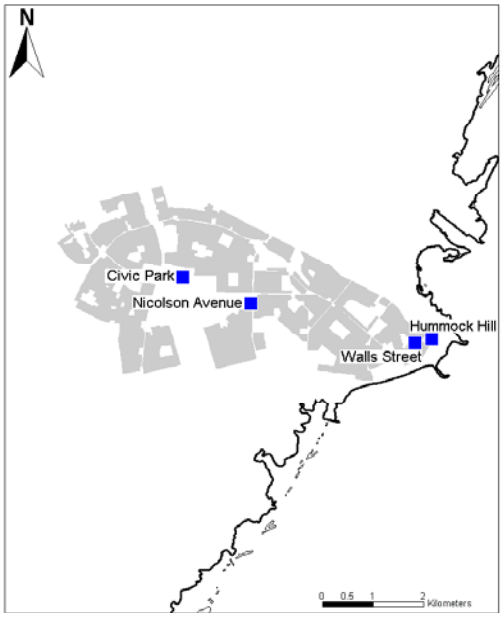
Cities in the Spencer Gulf airshed



Monitoring site in Port Augusta



Monitoring sites in Port Pirie



Monitoring sites in Whyalla

Figure 4: Air quality monitoring sites in the Spencer Gulf airshed

The EPA continued to review and extend the air quality monitoring program in 2004:

- 'Hot Spot' monitoring in a residential area of Birkenhead, Adelaide, provided background data on airborne particulate matter before a residential development began adjacent to an established industrial area.
- Monitoring was discontinued at the Christies Beach monitoring site in December, after the Port Stanvac refinery was decommissioned in July 2003.
- Monitoring for particulate matter, as PM_{10}, started at the Elizabeth monitoring site in May.
- Monitoring was discontinued at the Gawler monitoring site in October. It had been the base for a monitoring campaign for nitrogen dioxide and ozone since January 2002 and for particulate matter, as PM_{10}, since June 2002.
- The Kensington Gardens monitoring site was the base for a monitoring campaign for $PM_{2.5}$ particulate matter from June 2002 to March 2004, and for sulfur dioxide from August 2002 to January 2005.
- At the Nicolson Avenue monitoring site in Whyalla, monitoring campaigns began for ozone (14 January), and for nitrogen dioxide and sulfur dioxide (1 April).

Earlier ambient air quality monitoring data has been compiled in the EPA report *Ambient Air Quality Monitoring South Australia 1979–2003* (EPA 2004).

In June 2001, the EPA published the *Ambient Air Quality Monitoring Plan for South Australia* (EPA 2001) to ensure that ambient air quality monitoring in South Australia will be consistent with other states. A review of the monitoring plan, *South Australian Ambient Air Quality Monitoring Program—A Review,* was published in May 2005 (EPA 2005a).

These reports may be accessed at *www.epa.sa.gov.au/pub.html*.

SOUTH AUSTRALIA'S AIR QUALITY IN 2004

Table 4 summarises South Australia's performance against the air quality standards and goals of the Air NEPM at designated performance monitoring stations. The complete set of air quality monitoring data tables will be published on the EPA web site (EPA 2005b).

Table 4: Assessment of South Australian air quality

Station	Carbon monoxide	Nitrogen dioxide		Ozone		Sulfur dioxide			Lead	PM_{10}
	8 h	1 h	1 y	1h	4 h	1h	1d	1y	1 y	1 d
Adelaide airshed										
Adelaide[1]	0									
Christies Beach[2]						0	0			
Elizabeth[3]	0	0		0	0	0	0			1
Gawler[4]		0		0	0					4
Kensington Gardens		0		0	0	0	0			1
Netley		0		0	0					3
Northfield		0		0	0	0	0			
Spencer Gulf airshed										
Port Pirie: Oliver St		0		0	0	31	0			4
Port Pirie: Frank Green Park										
Whyalla: Civic Park[5]										0
Whyalla: Nicolson Avenue[6]		0		0	0	0	0			

Key:

0 Standard and goal met on all days

Insufficient data to assess performance

Exceeded standard but met goal

Pollutant not monitored at this site

Goal not met

Notes:
h: hour; d: day; y: year
The numbers in the table indicate the number of days on which the standard was not met.

Under the requirements of the Air NEPM, compliance with the goal can only be demonstrated if the data recovery rate for each quarter of the year is greater than 75%.

1. Data recovery rate less than 75% in fourth quarter: some data rejected when calibration procedures did not meet Australian Standards requirements.
2. Data recovery rate less than 75% in first quarter: data not collected during period when a component of the monitoring equipment was removed for servicing.
3. Insufficient data collected to demonstrate compliance with Air NEPM goals because monitoring for sulfur dioxide concluded 31 March 2004 and monitoring for PM_{10} began 31 May 2004.
4. Insufficient data collected to demonstrate compliance with Air NEPM goals because monitoring discontinued in October 2004.
5. Site uses high volume sampling with samples taken one day in three; data recovery rate does not meet Air NEPM requirements.
6. Insufficient data collected to demonstrate compliance with Air NEPM goals because monitoring began in early 2004 and a full set of data was not recorded for the first quarter.

Air quality in Adelaide

Summary

In 2004, the air quality in Adelaide, as indicated by the AQI, was predominantly good to very good. Recorded levels of carbon monoxide, nitrogen dioxide, ozone and sulfur dioxide were at all times within the Air NEPM standards. The main cause of fair to poor air quality in Adelaide was elevated levels of airborne particulate matter.

Carbon monoxide

Carbon monoxide monitoring at a site in Hindley Street in the Adelaide central business district since 1988, concluded in June 2005. Monitoring at an urban site in Elizabeth began in 2002. Levels of carbon monoxide are generally low at both sites. At the Hindley Street site, the Air NEPM standard (9.0 ppm for an 8-hour average) was last exceeded in 1997.

Nitrogen dioxide

In 2004, nitrogen dioxide was monitored at Elizabeth, Gawler, Kensington Gardens, Netley and Northfield. The Air NEPM standards for the 1-hour average and yearly average were not exceeded at these monitoring sites in the year.

Ozone

Ozone was monitored at Elizabeth, Kensington Gardens, Netley and Northfield in 2004. The Air NEPM standards for the 1-hour average and 4-hour average were not exceeded at any time at these monitoring sites in the year.

Sulfur dioxide

In 2004, sulfur dioxide was monitored at Christies Beach, Elizabeth, Kensington Gardens and Northfield. The Christies Beach monitoring site was established in 1992 to monitor air quality in the vicinity of the Port Stanvac oil refinery, which was decommissioned in July 2003. That site was thus closed in December 2004. The Air NEPM standards for 1-hour average, 1-day average and yearly average were not exceeded at any time at these monitoring sites in the 2004 year.

Particulate matter, PM_{10}

In 2004, the TEOM method was used to monitor for particulate matter, as PM_{10}, at Kensington Gardens and Netley, and for part of the year at Elizabeth and Gawler.

In dry weather, Adelaide can be subjected to elevated levels of airborne dust carried from rural areas by strong winds. On a number of days at each of the sites the Air NEPM standard was exceeded (Table 4) but no site exceeded the Air NEPM goal which permits up to five days per year on which the standard may be exceeded.

PM_{10} was also monitored using high-volume sampling at Northfield, Netley and an industrial site in Osborne.

Particulate matter, $PM_{2.5}$

Monitoring for particulate matter, as $PM_{2.5}$, with TEOM at Netley and, for part of the year, at Kensington Gardens obtained values but they cannot be used for comparison with the advisory reporting standards until the equivalence of this method has been established and formally included in the Air NEPM.

The Air NEPM has advisory reporting standards of 25 $\mu g/m^3$ for the 24-hour average and 8 $\mu g/m^3$ for the yearly average. At the Kensington Gardens monitoring site in 2004, the annual average was 7.8 $\mu g/m^3$ and the peak 24-hour average was 15.9 $\mu g/m^3$. At the Netley monitoring site, the annual average was 8.2 $\mu g/m^3$ and the peak 24-hour average was 20.2 $\mu g/m^3$.

Total suspended particles

TSP were measured at Northfield and at an industrial site at Osborne using high volume sampling.

Lead

With the introduction of unleaded petrol in 1986 and the progressive increase in its use, ambient lead concentrations in Adelaide air had been falling steadily since monitoring began in the early 1990s. The main source of lead was eliminated when supply of leaded petrol was discontinued in October 2000 and ambient lead concentrations had fallen to negligible levels. Monitoring for airborne lead pollution in Adelaide ended in 2003.

Air quality in Port Augusta

In Port Augusta, particulate matter, as PM_{10}, is measured by high-volume sampling, one day in six, at a monitoring site located at the local hospital. Of the 56 samples taken in 2004, one sample (1.8%) exceeded the Air NEPM standard of 50 $\mu g/m^3$.

Air quality in Port Pirie

Summary

The major industry in Port Pirie is the lead smelter, which processes lead sulfide ores that give rise to lead and sulfur dioxide air pollution in the area.

The EPA and the Department of Health have measured lead levels and particulate matter levels in Port Pirie for many years. Currently, lead and particulate matter is monitored at four sites, located at Oliver Street, Port Pirie West Primary School in The Terrace, Frank Green Park in Senate Road, and Ellen Street. The Ellen Street site is an industrial monitoring site located near the boundary of the lead smelter.

Concentrations of airborne lead at some sites in Port Pirie continue to be measured at levels exceeding the 0.5 $\mu g/m^3$ standard for annual average set by the Air NEPM.

Monitoring for sulfur dioxide, nitrogen dioxide and ozone has been conducted at the Oliver Street monitoring site since June 2002. Nitrogen dioxide and ozone levels and the annual average and 24-hour average sulfur dioxide levels meet the standards and goals of the Air NEPM, but the one-hour standard set by the Air NEPM for sulfur dioxide was exceeded on 31 days in 2004.

Particulate matter, PM_{10}

In 2004, TEOM monitoring for particulate matter, as PM_{10}, was undertaken at the Oliver Street monitoring site in Port Pirie.

While the Air NEPM standard of 50 $\mu g/m^3$ for a 24-hour average was exceeded on four days during 2004, the Air NEPM goal was not exceeded as it permits up to five days per year on which the standard may be exceeded.

Particulate matter, as PM_{10}, is also monitored by high-volume sampling, one day in six, at the Oliver Street monitoring site. Of the 50 samples taken in 2004, two exceeded the Air NEPM standard of 50 $\mu g/m^3$ for a 24-hour sample.

Total suspended particles

TSP have been monitored by high-volume sampling, one day in six, at the four monitoring sites in Port Pirie, primarily to determine the airborne lead content of collected material.

Lead

Lead results are obtained by chemical analysis of the TSP high-volume samples.

In 2004, the annual average lead concentration was 0.63 $\mu g/m^3$ at The Terrace (Port Pirie West Primary School), 0.59 $\mu g/m^3$ at Oliver Street, and 0.28 $\mu g/m^3$ at Senate Road (Frank Green Park). Of these sites, only the Senate Road monitoring site had a one-year average lead concentration that complied with the Air NEPM standard. At the Ellen Street monitoring site, the annual average lead concentration was 3.91 $\mu g/m^3$. This site is located near the boundary of the lead smelter to supply data for evaluating industry performance rather than to demonstrate compliance with the Air NEPM standard; the data do show that the level of lead pollution decreases with distance from the smelter.

Sulfur dioxide

Sulfur dioxide is measured in Port Pirie at the Oliver Street monitoring site, where monitoring began in June 2002 as part of a NEPM campaign monitoring program.

The Air NEPM standards of 0.02 ppm for yearly average sulfur dioxide concentration and 0.08 ppm for 24-hourly average concentration were not exceeded at this monitoring site in 2004.

However, the Air NEPM standard of 0.20 ppm for the 1-hourly average sulfur dioxide concentration was exceeded on 31 days at this site during the year; it had been 21 days in the previous year. The exceedences all occurred in daylight hours between 8 am and 6 pm at the site. The Air NEPM sets a goal of not more than one day a year on which the standard may be exceeded.

Figures 5 and 6 show daily average sulfur dioxide levels and daily maximum one-hourly average levels at the Oliver Street monitoring site. The heavy line marks the Air NEPM standard.

Nitrogen dioxide

Nitrogen dioxide is measured in Port Pirie at the Oliver Street monitoring site, where monitoring began in June 2002 as part of a NEPM campaign monitoring program.

Data collected at the Oliver Street monitoring site met Air NEPM reporting requirements. Air NEPM standards were not exceeded at this monitoring site in the 2004 year.

Ozone

Ozone is measured in Port Pirie at the Oliver Street monitoring site, where monitoring began in June 2002 as part of a NEPM campaign monitoring program.

Data collected at the Oliver Street monitoring site met Air NEPM reporting requirements. Air NEPM standards were not exceeded at this site in the 2004 year.

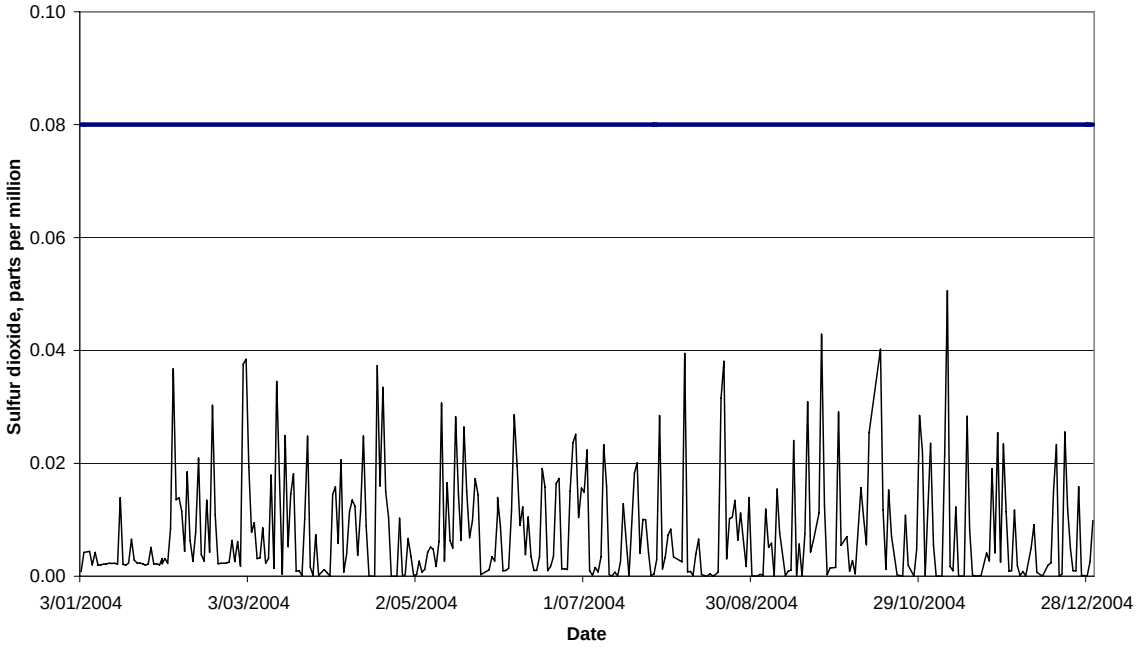


Figure 5: Sulfur dioxide, daily averages, Oliver Street, Port Pirie, 2004

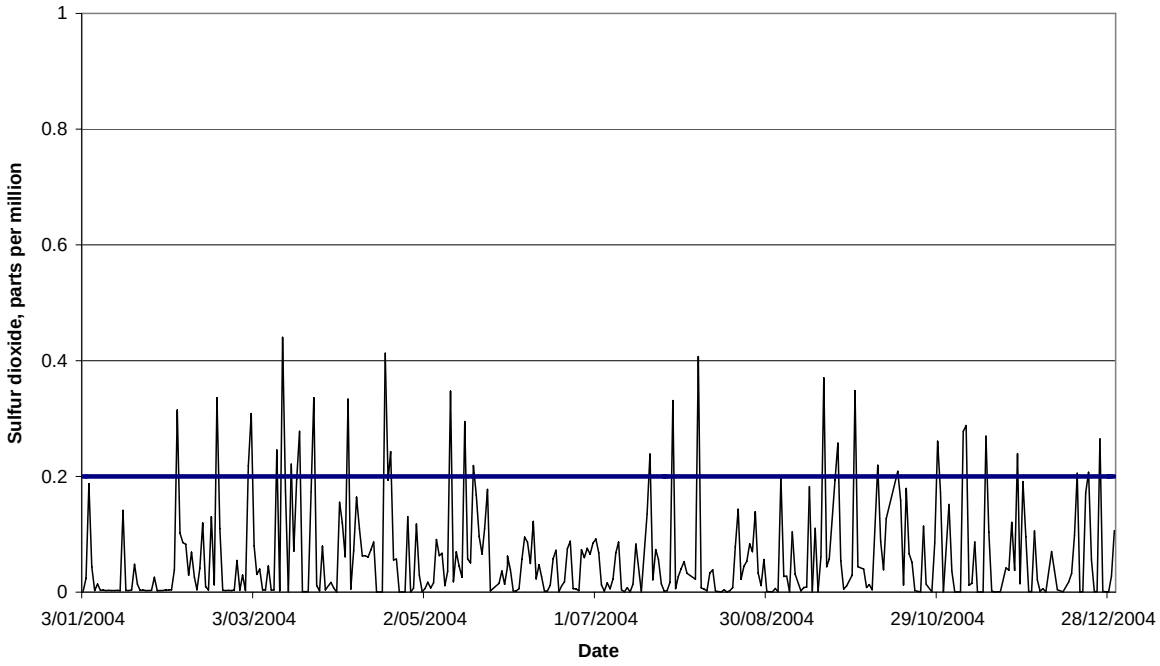


Figure 6: Sulfur dioxide, daily maximum 1-hour averages, Oliver Street, Port Pirie, 2004

Air quality in Whyalla

Summary

The major industry in Whyalla covers the activities of iron ore pelletising, metal smelting and ore transport along a railway system.

The iron ore pelletising plant is located close to the eastern end of Whyalla and the monitoring sites at Hummock Hill and Walls Street show that particulate pollution from these industrial sources continues to be a problem in that area.

Sulfur dioxide, nitrogen dioxide and ozone have been monitored at a site in Nicolson Avenue since early 2004.

Particulate matter, PM_{10}

Particulate matter is monitored at three sites in Whyalla. At Hummock Hill, close to the pelletising plant, and at Civic Park, both PM_{10} and TSP are monitored by high-volume sampling. At Walls Street, a TEOM unit measures PM_{10}.

The Civic Park monitoring site is used to monitor background levels of particulate matter. Monitoring began at this site on 10 October 2001. In 2004, none of the samples taken at the site exceeded the Air NEPM standard of 50 $\mu g/m^3$.

The new monitoring site at Walls Street, in a residential area at the eastern end of Whyalla, uses a TEOM monitoring unit to continuously record particulate matter pollution levels. This site was relocated approximately six metres due north on 29 June 2004. Of the 354 24-hour averages obtained in 2004, 15 (4%) exceeded 50 $\mu g/m^3$.

Monitoring at Hummock Hill began in 1990 to study the concentrations of dust near the pelletising plant. The site was relocated to its current position on 12 May 2000. Of the 112 PM_{10} particulate matter samples taken in 2004, 23 (21%) exceeded 50 $\mu g/m^3$.

Total suspended particles

TSP have been measured at Civic Park and Hummock Hill since 1989. The site at Hummock Hill was relocated on 12 May 2000, and the frequency of sampling was increased from one day in six to one day in three from 8 May 2002.

Sulfur dioxide

Sulfur dioxide is measured in Whyalla at the Nicolson Avenue monitoring site, where monitoring began in March 2004 as part of a NEPM campaign monitoring program.

Since full data was not recorded for the first quarter of the year, compliance with the Air NEPM goals was not met. However, Air NEPM standards were not exceeded at this site during the monitoring period of the year.

Nitrogen dioxide

Nitrogen dioxide is measured in Whyalla at the Nicolson Avenue monitoring site, where monitoring began in January 2004 as part of a NEPM campaign monitoring program.

Since full data was not recorded for the first quarter of the year, compliance with the Air NEPM goals was not met. However, Air NEPM standards were not exceeded at this site during the monitoring period of the year.

Ozone

Ozone is measured in Whyalla at the Nicolson Avenue monitoring site, where monitoring began in January 2004 as part of a NEPM campaign monitoring program.

Since full data was not recorded for the first quarter of the year, compliance with the Air NEPM goals was not met. However, Air NEPM standards were not exceeded at this site during the monitoring period of the year.

IMPROVING SOUTH AUSTRALIA'S AIR QUALITY

Ambient air quality monitoring in the 2004 year by the EPA has demonstrated generally good air quality in South Australia, but there are several continuing issues.

- In Adelaide, the AQI, calculated from data from the network of ambient air quality monitoring stations, indicates that air quality is generally good to very good.
- In Port Pirie, there are air quality problems caused by lead and sulfur dioxide emissions from the local lead smelter.
- In the eastern areas of Whyalla, particulate pollution from the local steelworks is a continuing problem.

The ongoing EPA 'hot spot' program monitors in areas of interest and concern where the existing network of ambient air quality monitoring stations does not provide sufficient coverage. The program deals with localised air quality issues (e.g. concerns about odours or particulate pollution) that may occur in residential areas adjacent to industrial areas. Reports from this program are published on the EPA web site— <*www.epa.sa.gov.au/pub.html*>.

The EPA also contributes to improving air quality by:

- developing capabilities for air quality modelling to supplement the ambient air quality monitoring capabilities, including the development of a forecasting model for air quality in conjunction with the Bureau of Meteorology and CSIRO Marine and Atmospheric Research
- being part of the development, establishment and review of the National Environment Protection Measures for air quality
- conducting a desktop survey as required by the National Environment Protection (Air Toxics) Measure.

The EPA strategy for airborne emissions from industrial sites is to seek the minimisation of emissions to air by either reduction or destruction of the pollutants contained in the exhaust air. For example, the use of regenerative thermal oxidisers can eliminate volatile organic compounds from exhaust streams and are increasingly being used by industry.

Where it is appropriate to minimise airborne pollutants, the EPA considers the broader effects of the pollutants using, for example, its guidelines for managing nitrogen oxides and for design ground level concentrations. The EPA is keeping up to date with changes both in Australia and overseas, and is currently updating guidelines for design ground level concentrations.

The EPA is reviewing the guidelines for odour management and will, as part of this review, consider if the current trend to consider the character of odour emissions can usefully be applied in the South Australian context.

RELATED PUBLICATIONS

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www.epa.sa.gov.au/pdfs/airnepm.pdf

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www.epa.sa.gov.au/pdfs/aq_report.pdf

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——in press, *South Australia's Air Quality, 2004: Air Quality Monitoring Data Tables*, EPA, Adelaide

——in press, *Air monitoring report 2004: compliance with the National Environment Protection (Ambient Air Quality) Measure*, EPA, Adelaide.

National Environmental Protection Council 2000, *National Environment Protection (Ambient Air Quality) Measure: Report of the Risk Assessment Taskforce.*
www.ephc.gov.au/pdf/Air_Quality_NEPM/RATF/RATF_Appendix4.pdf