DEPARTMENT OF PLANNING, INDUSTRY & ENVIRONMENT

New South Wales Annual Compliance Summary Report 2018

National Environment Protection (Ambient Air Quality) Measure

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This summary report was prepared by Dr Leanne Graham and Dr Stephen White and reviewed by David Salter and Dr Ningbo Jiang.

The summary report is published in association with the New South Wales Annual Compliance Report 2018. The full report was prepared by Dr Leanne Graham, Dr Stephen White, Sean Watt, Dr Mahmudur Rahman and Dr Upma Dutt and reviewed by David Salter and Dr Ningbo Jiang.

Air pollution episode analyses published in association with these reports were prepared by Dr Lisa Tzu-Chi Chang, Dr Mahmudur Rahman, Dr Stephen White, Dr Upma Dutt, Sean Watt and Dr Leanne Graham and reviewed by Dr Ningbo Jiang, David Salter and Lori Warren.

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NSW Air Quality Compliance Summary 2018

This report presents a summary of the New South Wales Annual Compliance Report 2018 which assessed NSW air quality monitoring data in 2018 against standards and goals of the National Environment Protection (Ambient Air Quality Measure) (NEPM).

The summary report demonstrates that air quality in New South Wales complied with NEPM goals for all pollutants, except ozone and particles in 2018. However, ozone and particle levels met NEPM standards at monitoring stations on most days. As in previous years, events such as heatwaves, dust storms and hazard reduction burning contributed to ozone and particle pollution events.

The National Environment Protection (Ambient Air Quality) Measure

The National Environment Protection (Ambient Air Quality) Measure (NEPM) sets national standards and goals for air quality. The NEPM requires States and Territories to monitor and report annually on aspects of air quality, including:

- levels of air pollutants assessed against national standards and goals
- a description of the circumstances which led to exceedances of standards, including the influence of natural events and fire management on airborne particle matter, measured as PM_{10} and $PM_{2.5}$
- population exposures to $PM_{2.5}$.

Air quality monitoring by the NSW Government is conducted in accordance with the NEPM and the government's accreditation under by National Association of Testing Authorities (NATA).

In 2018, the air quality monitoring network designated for NEPM compliance reporting comprised 28 stations. This network is a part of the NSW Government's wider ambient air quality monitoring network, which comprised over 80 monitoring stations in 2018. The data are available on the NSW Department of Planning Industry and Environment website.

Significant weather and climate in 2018

- 2018 was the warmest year on record and the sixth-driest year in New South Wales.
- Rainfall was 40% below average, the lowest since 2002.
- Extreme heatwaves with record temperatures occurred in January, April and December.
- Drought conditions intensified and the frequency of dust storms increased throughout the year. December 2018 was the dustiest December since DustWatch records began in 2005.
- Thunderstorms brought above average rain to parts of the State from October to December. Thunderstorm activity also transported windblown dust from west to east across the State.

Sources:

New South Wales Annual Climate Summary 2019, Bureau of Meteorology

New South Wales DustWatch monthly reports 2018

Overview of air quality during 2018

The key air quality issues in 2018 were photochemical smog, as ozone, on hot, sunny days and particles, as PM_{10} and $PM_{2.5}$ (particles less than 10 and 2.5 micrometres diameter, respectively).

Air pollution levels were above NEPM standards on 78 days in 2018, compared to 44 days in 2017:

- 45 days were above the PM_{10} 24-hour standard only, compared to 17 days in 2017.
- 15 days were above the $PM_{2.5}$ 24-hour standard only, as in 2017.
- 11 days were above the PM_{10} and $PM_{2.5}$ 24-hour standards, compared to three days in 2017.
- Four days were above one or both ozone 1-hour and 4-hour standards only, compared to seven days in 2017.
- Three days were above either the ozone 1-hour or 4-hour standard and the PM_{10} 24-hour standard, compared to two days in 2017.

Particle exceedance events were classed as either exceptional events or non-exceptional events. Exceptional events are due to widespread dust storms and smoke from hazard reduction burning or bushfires. Non-exceptional events are due to local particle sources.

- Exceptional particle events occurred on 49 calendar days in 2018:
  - 29 days with widespread dust storms only
  - 20 days with hazard reduction burning and/or fire events.
- Non-exceptional particle events occurred at:
  - Wagga Wagga North, with 22 days due to local dust
  - Gunnedah with four days due to wood smoke
  - Kembla Grange with three days due to local dust
  - Albury with two days due to agricultural burning and one day due to local dust
  - Chullora with two days due to a local particle source
  - Liverpool with two days due to a local particle source
  - Oakdale with one day due to a local particle source.

Overview of compliance with NEPM standards and goals

Monitoring for lead (Pb) in New South Wales ceased in 2004 because ambient Pb concentrations fell to very low levels, following the introduction of unleaded motor fuel.

Gaseous pollutants

- All stations monitoring carbon monoxide (CO), nitrogen dioxide (NO_2) and sulfur dioxide (SO_2), with 75% data availability or higher, complied with NEPM standards and goals:
  - Carbon monoxide (10 stations)
  - Nitrogen dioxide (21 stations)
  - Sulfur dioxide (14 stations).
- 18 of 21 stations met the ozone 1-hour goal, 11 stations with no exceedances of the 1-hour standard of 10 parts per hundred million (pphm) and seven stations with one allowable exceedance day.
- 11 of 21 stations met the ozone 4-hour goal, nine stations with no exceedances of the 4-hour standard of 8 pphm and two stations with one allowable exceedance day.

- The performance against NEPM goals was not assessed at three of 23 stations that demonstrated less than 75% data availability for one or all gaseous pollutants in at least one three-month period (quarter).

Particle matter

- 21 of 26 stations met the PM_{10} 24-hour goal, with no exceedances of the 24-hour standard of 50 micrograms per cubic metre (µg/m^3), other than exceptional events.
- 25 of 26 stations met the PM_{10} annual goal, with annual average concentrations below the annual standard of 25.0 µg/m^3.
- 24 of 27 stations met the $PM_{2.5}$ 24-hour goal, with no exceedances of the 24-hour standard of 25.0 µg/m^3), other than exceptional events.
- 17 of 27 stations met the $PM_{2.5}$ annual goal, with annual average concentrations below the annual standard of 8.0 µg/m^3.
- The performance against NEPM goals was not assessed at two of 28 stations with less than 75% data availability for PM10 in any quarter, nor at one of 28 stations with less than 75% data availability for PM2.5 in at least one quarter.

Population exposure to particles as $PM_{2.5}$ in 2018

- The spatial population exposure to $PM_{2.5}$ in the NSW Greater Metropolitan Region in 2018 was greatest in the Sydney Central Business District and along inner Sydney transport corridors; and much lower in greater western Sydney, the Central Coast and Lower Hunter.
- In the Greater Sydney Region, the population-weighted average exposure of residents to $PM_{2.5}$ was 94% of the $PM_{2.5}$ annual standard. Compared with the previous five years, the results were similar in 2013–14 with 93%, and slightly higher in 2015–17 with 95–98%.
- In the NSW Greater Metropolitan Region, the population-weighted average exposure of residents to $PM_{2.5}$ in 2018 was 95% of the $PM_{2.5}$ annual standard. Compared with the previous five years, the result was similar in 2016 with 96% and higher than in 2013–15 and 2017 with 87–93%.

Data availability

In 2018, 24 of 28 monitoring stations demonstrated greater than 75% data availability. Four monitoring stations did not demonstrate 75% data availability, or higher in at least one quarter:

- Rozelle (CO, NO_2, Ozone, SO_2, PM_{10} and $PM_{2.5}$) due to recommissioning of the site.
- Gunnedah (Ozone and NO_2) due to later commissioning of gaseous pollutant monitoring.
- Prospect (SO_2) due to instrument fault and subsequent repair and maintenance.
- St Marys (PM_{10}) due to instrument fault.

Air pollution episodes in 2018

In line with NEPM requirements, the NSW Government has published detailed analyses of typical NSW air pollution episodes when ozone and PM_{10} and $PM_{2.5}$ concentrations exceeded national standards in 2018.

Episode analyses of significant air pollution events in 2018 may be viewed and downloaded from the Department's website: Air pollution episodes in New South Wales.

Ozone pollution episode, summer 2018

Sydney experienced a summer ozone episode during 19–22 January 2018.

The four days,19–22 January, were very warm, with maximum temperatures between 34–41°C in western Sydney. The temperature and meteorology on these days were typical of summer ozone episodes observed in western Sydney. However, ozone exceedances were observed only on Friday 19 January and Monday 22 January and not during the intervening weekend.

Analysis attributed the pattern of maximum ozone levels during 19–22 January to two factors. Firstly, the lower traffic volume during the weekend mornings (20 and 21 January) lowered the amount of ozone precursors emitted into the atmosphere on these days. Consequently, maximum ozone levels were below national standards. Secondly, a bushfire in the Royal National Park on 22 January increased ozone precursor emissions and caused a more intense and widespread ozone exceedance event on this day.

$PM_{2.5}$ particle pollution episode, autumn 2018

Sydney experienced a typical poor air quality and reduced visibility event, due to hazard reduction burning in May 2018.

During 26–29 May 2018, $PM_{2.5}$ particle pollution concentrations at nine of 14 air quality monitoring stations in the Sydney region reached poor to hazardous levels on the NSW Air Quality Index (AQI). Visibility was reduced to poor to hazardous levels each day, for five to 15 hours. The event was associated with smoke from several hazard reduction burns (HRB) in bushland surrounding Sydney, to the north, north-east, west and south of the city. The HRB covered over 2500 hectares (ha) during 26–27 May and continued smouldering during 28–29 May 2018.

A strong high-pressure system over the Tasman Sea, with a broad ridge extending over New South Wales, favoured the formation of overnight and early morning temperature inversions in Sydney. Very light and variable winds during the day, and down-valley winds (westerlies), overnight and in the early morning, helped to transport smoke from HRB towards the city, reducing visibility and elevating $PM_{2.5}$ levels. The afternoon sea breezes (north to north-easterly winds) also transported smoke from HRB to the north and north-east of the city, contributing to the build-up of smoke. Under these calm conditions, smoke continued to elevate $PM_{2.5}$ concentrations, especially closer to the HRB in north-west Sydney during 26–29 May 2018. $PM_{2.5}$ levels were above the 24-hour national standard across the city, with most intense impacts on north-west Sydney. The passage of a cold front with stronger south-westerly winds assisted the dispersion of smoke on 30 May 2018.

PM_{10} particle pollution episode, spring 2018

New South Wales experienced a statewide air pollution event due to long-range transport of windblown dust in November 2018.

New South Wales recorded an increasing frequency of dust storms throughout 2018. The four-day dust event, during 20–23 November 2018, followed intensifying drought conditions and loss of ground cover across the State during 2018.

During 20–23 November 2018, 94% of monitoring stations in the NSW AQMN recorded daily PM_{10} concentrations above the national benchmark. Three dust plumes developed with the passage of the three cold fronts across the State, during 20–23 November 2018. Strong and gusty winds associated with these fronts entrained and transported dust from South Australia into western NSW and Victoria. Elevated PM_{10} levels were first observed by the NSW AQMN in the South West Slopes on 20 November 2018.

During 21–23 November 2018, daily PM_{10} concentrations reached beyond the benchmark in coastal regions and northern NSW. This dust event was one of the highest in terms of observed daily PM_{10} concentrations in the recent history of the NSW AQMN, since 2009.

Compliance with NEPM goals and standards, by region and station

Table 1 and Table 2 summarise the compliance of stations with goals and standards.

Table 1 Summary of compliance with NEPM goals in by station and region, 2018

Count	Region/ monitoring station	Ozone 1-hour	Ozone 4-hour	PM_{10} 1-day	PM_{10} 1-year	$PM_{2.5}$ 1-day	$PM_{2.5}$ 1-year	NO_2 1-hour 1-year	CO 8-hour	SO_2 1-hour 1-day 1-year
	Sydney									
	Sydney East									
1	Chullora	C	C	C	C	N-C	N-C	C	C	C
2	Earlwood	C	C	C	C	C	C	C	--	--
3	Macquarie Park	C	C	C	C	C	C	C	C	C
4	Randwick	C	C	C	C	C	C	C	--	C
5	Rozelle	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Sydney North West									
6	Parramatta North	C	N-C	C	C	C	N-C	C	C	C
7	Prospect	C	N-C	C	C	C	N-C	C	C	ND
8	Richmond	C	N-C	C	C	C	N-C	C	--	C
9	St Marys	C	N-C	ND	ND	C	C	C	--	--
	Sydney South West									
10	Bargo	C	N-C	C	C	C	C	C	--	C
11	Bringelly	N-C	N-C	C	C	C	C	C	--	C

Count	Region/ monitoring station	Ozone 1-hour	Ozone 4-hour	PM_{10} 1-day	PM_{10} 1-year	$PM_{2.5}$ 1-day	$PM_{2.5}$ 1-year	NO_2 1-hour 1-year	CO 8-hour	SO_2 1-hour 1-day 1-year
12	Camden	N-C	N-C	C	C	C	C	C	C	--
13	Campbelltown West	N-C	N-C	C	C	C	N-C	C	C	C
14	Liverpool	C	N-C	N-C	C	C	N-C	C	C	--
15	Oakdale	C	N-C	N-C	C	C	C	C	-	-
	Illawarra									
16	Albion Park South	C	C	C	C	C	C	C	--	C
17	Kembla Grange	C	C	N-C	C	C	C	C	--	--
18	Wollongong	C	C	C	C	C	C	C	C	C
	Central Coast									
19	Wyong	C	C	C	C	C	C	C	C	C
	Lower Hunter									
20	Beresfield	C	C	C	C	C	N-C	C	--	C
21	Newcastle	C	C	C	C	C	C	C	C	C
22	Wallsend	C	C	C	C	C	C	C	--	C
	Regional NSW									
	Central Tablelands									
23	Bathurst	--	--	C	C	C	C	--	--	--
	North West Slopes									
24	Gunnedah	ND	ND	C	C	N-C	N-C	ND	--	--
25	Narrabri	--	--	C	C	C	C	--	--	--

Count	Region/ monitoring station	Ozone 1-hour	Ozone 4-hour	PM_{10} 1-day	PM_{10} 1-year	$PM_{2.5}$ 1-day	$PM_{2.5}$ 1-year	NO_2 1-hour 1-year	CO 8-hour	SO_2 1-hour 1-day 1-year
26	Tamworth	--	--	C	C	C	N-C	--	--	--
	South West Slopes									
27	Albury	--	--	N-C	C	N-C	C	--	--	--
28	Wagga Wagga North	--	--	N-C	N-C	C	N-C	--	--	--
	Number of stations meeting goal	18	11	23	25	24	17	21	10	14
	Number of stations not meeting goal	3	10	3	1	3	10	0	0	0
	Number of stations not demonstrating 75% data availability	2	2	2	2	1	1	2	1	2
	Total stations monitoring each pollutant	23	23	28	28	28	28	23	11	16

Notes

A station complies with the 1-day goal for particles, when either:
- all 1-day average concentrations are below the 1-day standard
- all days with 1-day average concentrations above the 1-day standard are related directly to bushfires, authorised hazard reduction burning or continental-scale windblown dust (exceptional events).

An station does not comply with the 1-day goal when 1-day averages above the 1-day standard are related to a local particle sources (non-exceptional events).
An air quality monitoring station complies with a 1-year goal when the annual average concentration is below the 1-year standard for the respective air pollutant.
C - compliant with goal
N-C - non-compliant with goal
'--' - not monitored, ND – performance against the goal not assessed as data availability was less than 75% in one or more three-month period

Table 2 Number of days exceeding NEPM standards including exceptional and non-exceptional particle events, by region and station, 2018

Count	Region/ monitoring station	Ozone 1-hour	Ozone 4-hour	PM_{10} non-exceptional event	PM_{10} exceptional	$PM_{2.5}$ non-exceptional event	$PM_{2.5}$ exceptional event	NO_2 1-hour 1-year	CO 8-hour	SO_2 1-hour 1-day 1-year
	Sydney									
	Sydney East									
1	Chullora	0	1	0	7	1	2	0	0	0
2	Earlwood	0	0	0	5	0	1	0	--	--
3	Macquarie Park	0	0	0	4	0	3	0	0	0
4	Randwick	0	0	0	5	0	1	0	--	0
5	Rozelle	0	0	0	2	0	0	0	0	0
	Sydney North West									
6	Parramatta North	1	2	0	8	0	4	0	0	0
7	Prospect	1	2	0	8	0	4	0	0	0
8	Richmond	1	2	0	8	0	4	0	--	0
9	St Marys	1	2	0	2	0	3	0	--	--
	Sydney South West									
10	Bargo	1	2	0	4	0	2	0	--	0
11	Bringelly	2	4	0	8	0	4	0	--	0
12	Camden	2	4	0	6	0	2	0	0	0
13	Campbelltown West	3	4	0	3	0	2	0	0	0
14	Liverpool	1	3	2	11	0	8	0	0	0
15	Oakdale	0	2	1	4	0	2	0	–	--

Count	Region/ monitoring station	Ozone 1-hour	Ozone 4-hour	PM_{10} non-exceptional event	PM_{10} exceptional	$PM_{2.5}$ non-exceptional event	$PM_{2.5}$ exceptional event	NO_2 1-hour 1-year	CO 8-hour	SO_2 1-hour 1-day 1-year
	Illawarra									
16	Albion Park South	0	0	0	2	0	1	0	--	0
17	Kembla Grange	0	0	3	7	0	0	0	--	--
18	Wollongong	0	0	0	5	0	3	0	0	0
	Central Coast									
19	Wyong	0	0	0	6	0	0	0	0	0
	Lower Hunter									
20	Beresfield	1	1	0	8	0	0	0	--	0
21	Newcastle	0	0	0	8	0	0	0	0	0
22	Wallsend	0	0	0	5	0	0	0	--	0
	Regional NSW									
	Central Tablelands									
23	Bathurst	--	--	0	8	0	2	--	--	--
	North West Slopes									
24	Gunnedah	0	0	0	10	4	1	0	--	--
25	Narrabri	--	--	0	10	0	1	--	--	--
26	Tamworth	--	--	0	9	0	0	--	--	--
	South West Slopes									
27	Albury	--	--	1	6	2	0	--	--	--

Count	Region/ monitoring station	Ozone 1-hour	Ozone 4-hour	PM_{10} non-exceptional event	PM_{10} exceptional	$PM_{2.5}$ non-exceptional event	$PM_{2.5}$ exceptional event	NO_2 1-hour 1-year	CO 8-hour	SO_2 1-hour 1-day 1-year
28	Wagga Wagga North	--	--	22	12	0	0	--	--	--
	Number of stations with no exceedance days	13	11	22	5	25	10	23	10	14
	Number of stations with one exceedance day	7	2	2	0	1	6	0	0	0
	Number of stations with more than one exceedance day	3	10	3	23	2	12	0	0	0
	Total stations monitoring each pollutant	23	23	28	28	28	28	23	11	16

‘—’ - not monitored