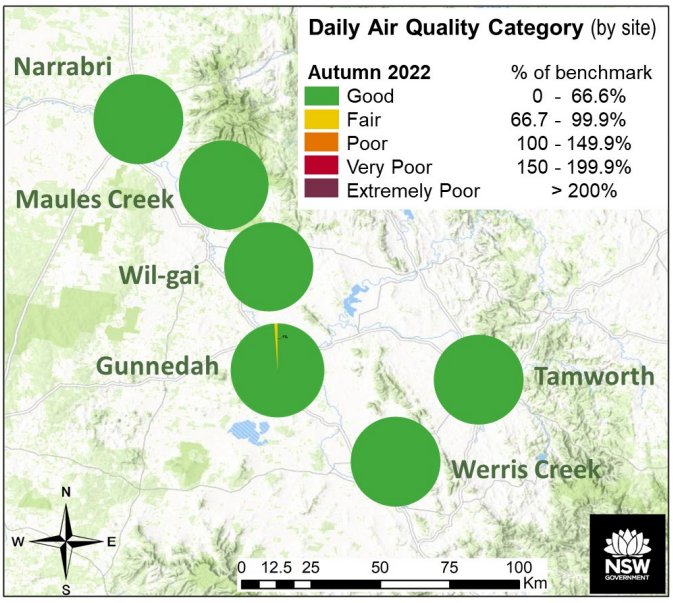
Air quality in the Namoi/North West Slopes Region

Air quality in the Namoi/North West Slopes region was always good during autumn 2022, and all stations met national benchmarks[1] on 100% of days (Figure 1). Prevailing conditions were of average to above-average rainfalls across most parts of the region. The resulting cooler temperatures, improved ground cover and reduced dust activity tended to sustain good air quality across the region.



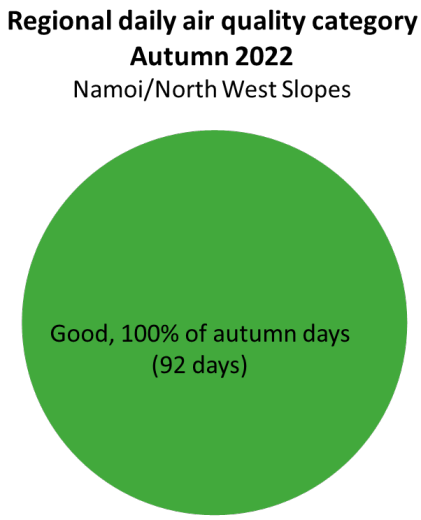


Figure 1 **Daily air quality categories at individual monitoring stations (left) and regional air quality in the Namoi/North West Slopes region (right)**

Air quality: summary statistics, autumn 2022

No days above the national benchmarks were recorded at any station during autumn 2022 (Table 1).

Table 1 **Number of days above each benchmark, by station, 1 March to 31 May 2022**

Station	PM10 daily benchmark [50 µg/m^3]	PM2.5 daily benchmark [25 µg/m^3]	NO_2 hourly benchmark[2] [8 pphm]	O_3 8-hourly benchmark[2] [6.5 pphm]
Gunnedah	0	0	0	0
Narrabri	0	0	-	-
Tamworth	0	0	0*	0*
Maules Creek	0	0	-	-
Werris Creek	0	0	-	-
Wil-gai	0	0	-	-

- = not monitored; µg/m^3 = micrograms per cubic metre, pphm = parts per hundred million by volume (i.e. parts of pollutant per hundred million parts of air); * = station did not meet the 75% data availability requirement for gaseous parameters as monitors were decommissioned on 13 May 2022, but would unlikely have exceeded the benchmark given the general trend of low concentrations across the region (Figure 2).

[1] The National Environment Protection (Ambient Air Quality) Measure (Air NEPM) sets national standards for common urban air pollutants. This report refers to the national standards as 'benchmarks' for reporting air quality.

[2] The National Environment Protection (Ambient Air Quality) Measure (Air NEPM) was updated on 18 May 2021 and includes the following changes relevant to this report: the 1-hour NO_2 standard was strengthened; the 1-hour and rolling 4-hour average O_3 standards were removed, and an 8-hour rolling average O_3 standard introduced.

Air quality: particle pollution autumn 2022

The time series of daily average particle concentrations shows PM10 levels well below the benchmark. No stations recorded PM10 concentrations above the benchmark during autumn 2022 (Figure 2).

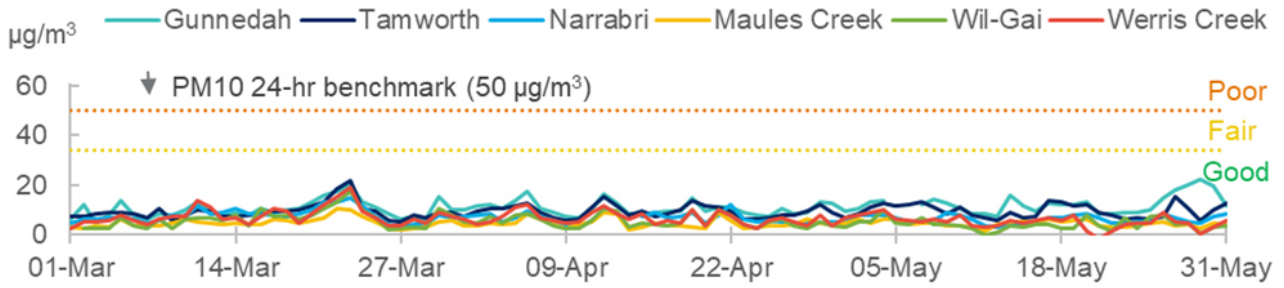


Figure 2 Daily average PM10 in autumn 2022, showing concentrations below the benchmark

Daily average PM2.5 levels were below the benchmark. No stations recorded PM2.5 concentrations above the benchmark during autumn 2022 (Figure 3). One peak observed in the 'fair category at Gunnedah in late May, was likely due to domestic woodsmoke heating.

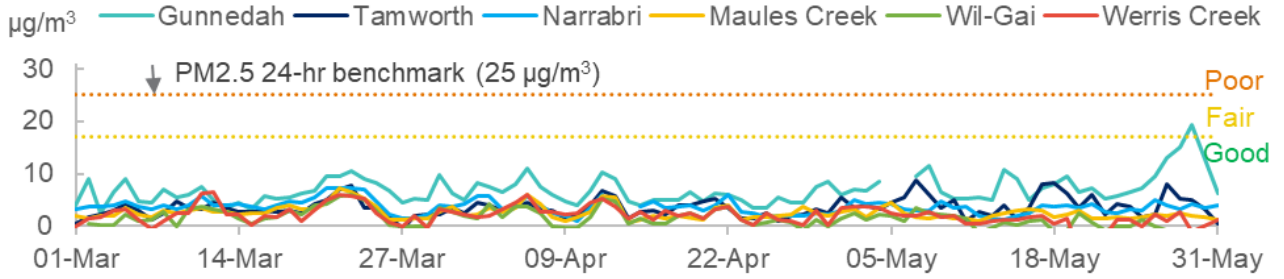


Figure 3 Daily average PM2.5 in autumn 2022, showing concentrations below the benchmark

Air quality: gaseous pollution autumn 2022

Figure 4 and Figure 5 show autumn 2022 trends at both stations[3] were characterised by broadly stable ozone and nitrogen dioxide concentrations, trailing well below the stricter O_3 and NO_2 standards[3, 4].

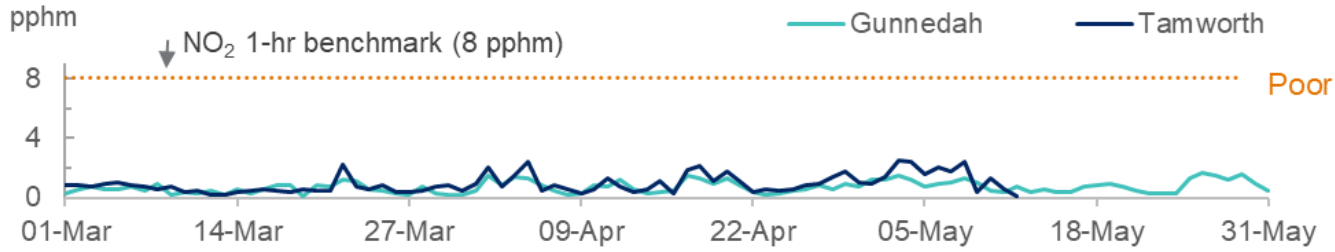


Figure 4 Ozone daily maximum 8-hour average concentrations at Gunnedah and Tamworth, during autumn 2022, showing levels below the benchmark

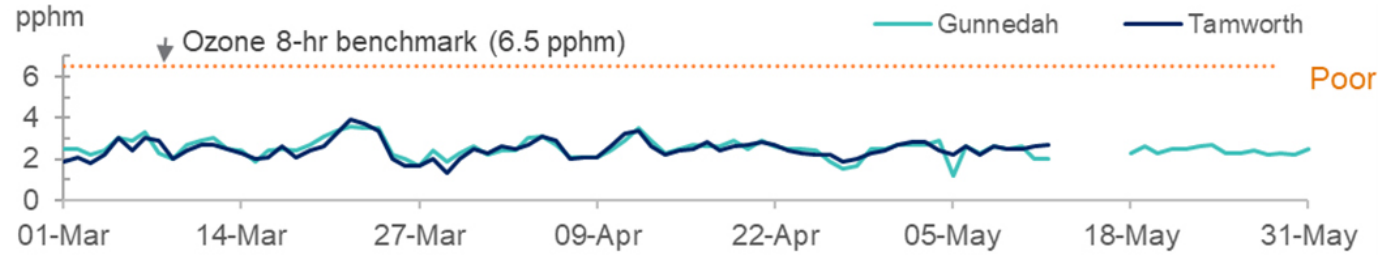


Figure 5 Nitrogen dioxide daily maximum 1-hour average concentrations at Gunnedah and Tamworth, during autumn 2022, showing levels below the benchmark

[3] Tamworth station gaseous monitors were decommissioned on 13 May 2022, but station would unlikely have exceeded the benchmark given the season and the general trend of low concentrations across the region.

[4] Air quality categories based on the updated national gaseous standards (or benchmarks) are not yet established. Hence these plots do not show any other air quality category other than 'poor' which are defined by benchmarks.

Seasonal weather and climate

Several areas of New South Wales recorded rainfall totals for autumn 2022 that were more than double the seasonal average[5]. Many inland areas located west of the Great Dividing Range, as well as areas over north-west parts of the state, recorded well above-average rainfall during April and May. This was due to the passage of low-pressure troughs producing rainfall over 2 to 5 times the monthly average. The generally high cloud cover conditions led to cooler than average days, while minimum temperatures at night were above average across the state.

Drought conditions and dust activity

Drought recovery continued during autumn 2022, with high soil moisture and average to above-average rainfalls across most parts of the Namoi/North West region (Figure 7), helping enhance ground cover. The NSW DPI Combined Drought Indicator (CDI) shows that 100% of New South Wales was in the Non-Drought category at the end of May 2022[6] (Figure 6), compared with 97% at the end of February 2022.

DustWatch[7] reported low levels of dust activity in the North West NSW region during autumn 2022. In addition to enhanced ground cover and wetter than average conditions, wind strength was very low from March to May 2022, with a 30% fall in hours of strong winds (>40km/h). In terms of hours of dust activity, Gunnedah recorded zero hours of dust activity.

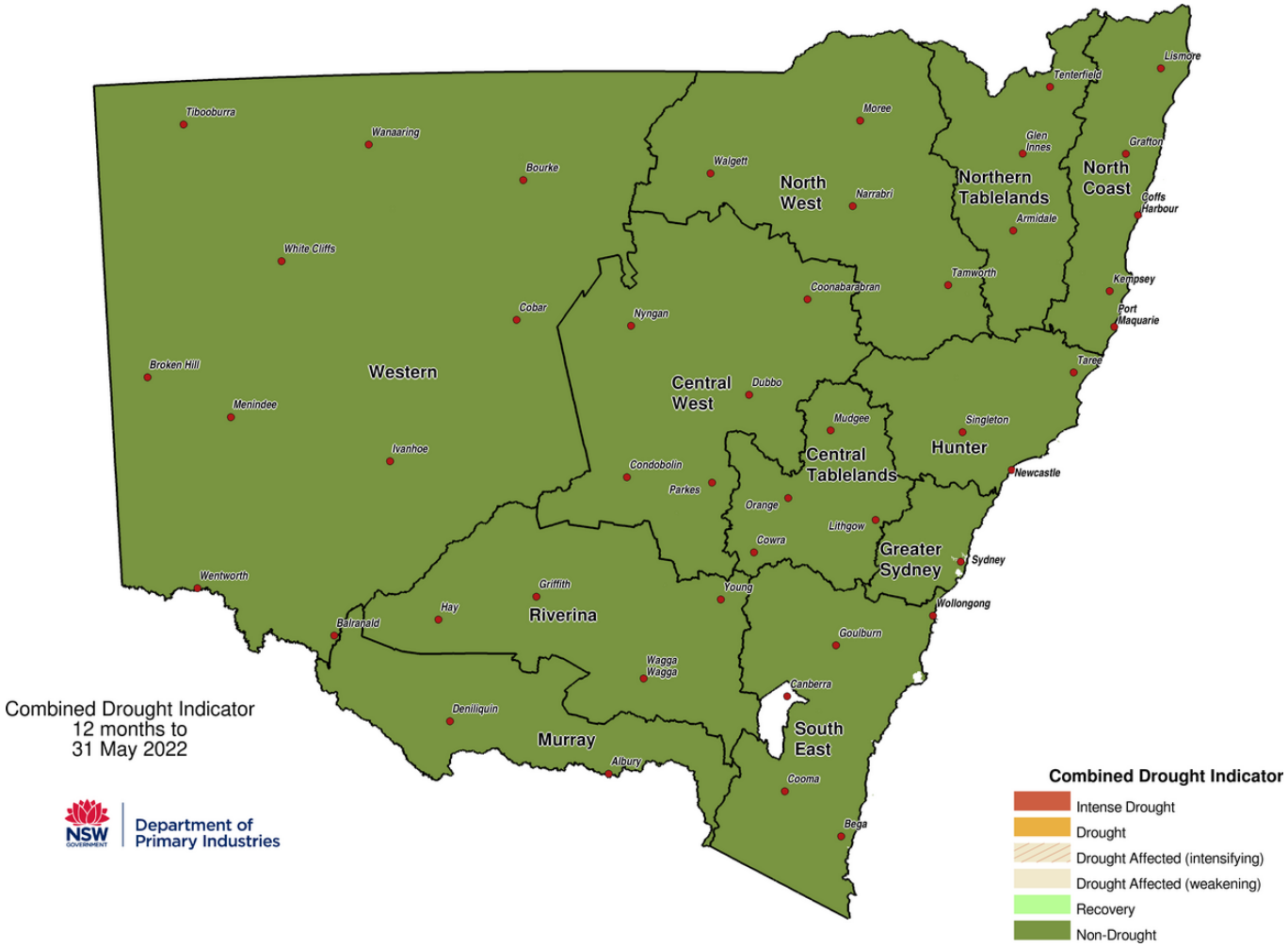


Figure 6 **NSW Combined Drought Indicator – 12 months to 31 May 2022, showing non-drought conditions across the Namoi/North West region and generally across the state**

[5] Seasonal Climate Summary for New South Wales in autumn 2022, Bureau of Meteorology, accessed July 2022.

[6] State Conditions and Drought: March 2022, April 2022 and May 2022, Department of Primary Industries, accessed July 2022.

[7] DustWatch Reports: March 2022, April 2022 and May 2022, Department of Planning and Environment, accessed July 2022.

Rainfall

Rainfall during autumn 2022 was ‘above average’ across most of the Namoi/North West Slopes region (Figure 7)[8]. Regional rainfall totals ranged between 100–200 millimetres (mm)[9]. Gunnedah Airport and Tamworth Airport stations had seasonal totals (182–206 mm) almost double their long-term autumn averages (102–112 mm)[5]. Compared to the recent three years, autumn 2022 totals were mostly above the same period in 2021, 2020 and 2019[9].

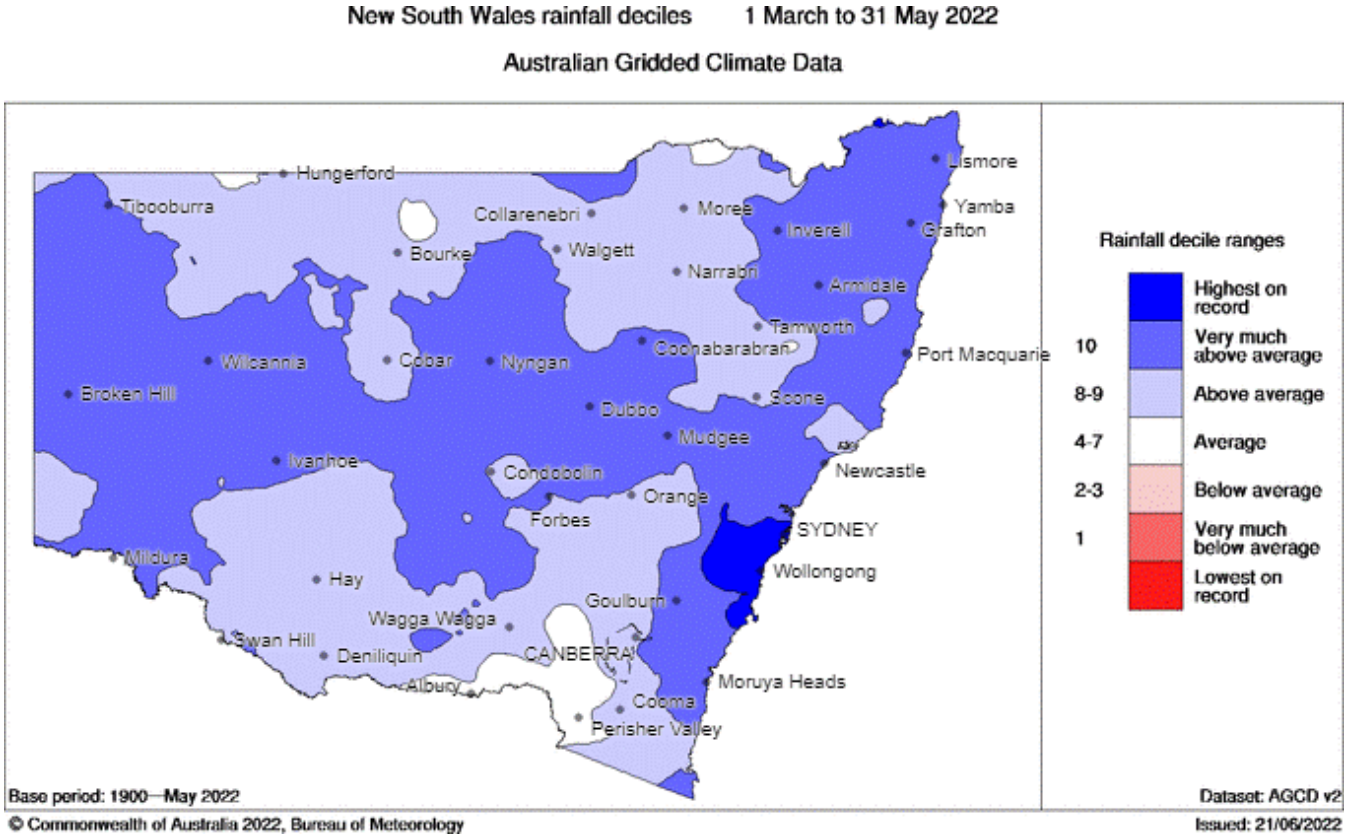


Figure 7 NSW rainfall deciles for autumn, 1 March to 31 May 2022, showing above-average rainfall in the Namoi/North West Slopes region

Temperature

The region's maximum (daytime) temperatures were generally average to below average (Figure 8)[9] due to high cloud cover associated with rainfall activity. Figure 9 shows that maximum temperatures at Gunnedah air quality monitoring station ranged from 13.8 to 32.4 ºC, with an average maximum temperature of 23.9 ºC. The average daytime temperature at the Gunnedah airport weather station was about 2 ºC lower than the long-term autumn average (26.1 ºC)[10]. Meanwhile, minimum (night-time) temperatures were warmer than average due to enhanced cloud cover limiting night-time cooling. Minimum temperatures ranged from 2.9 to 21.4 ºC, with an average minimum temperature of 13.8 ºC, about 3 ºC above the long-term autumn average (10.6 ºC)[11].

A higher frequency of rainfall days was evident when comparing observations at Gunnedah airport weather station, which recorded 28 days during autumn 2022[12], where only 11 days of autumn rainfall

[8] Decile maps for three months to 31 May 2022 for NSW: temperature (maximum and minimum) and rainfall, Bureau of Meteorology, accessed July 2022.

[9] Regional autumn 2022 rainfall totals and 1-year to 3-year differences, Bureau of Meteorology, accessed July 2022.

[10] Gunnedah Airport summary climate statistics, Bureau of Meteorology, accessed July 2022.

[11] These results report minimum and maximum temperatures at the Gunnedah air quality monitoring station compared with the long-term averages recorded at the Bureau of Meteorology’s weather station at the Gunnedah airport.

[12] Gunnedah, NSW - Daily Weather Observations (bom.gov.au), accessed July 2022.

were observed historically. The Gunnedah air quality monitoring station recorded 22 days of rainfall (above 1 mm) in autumn 2022 (Figure 9)[13], comparable to the Gunnedah airport weather station.

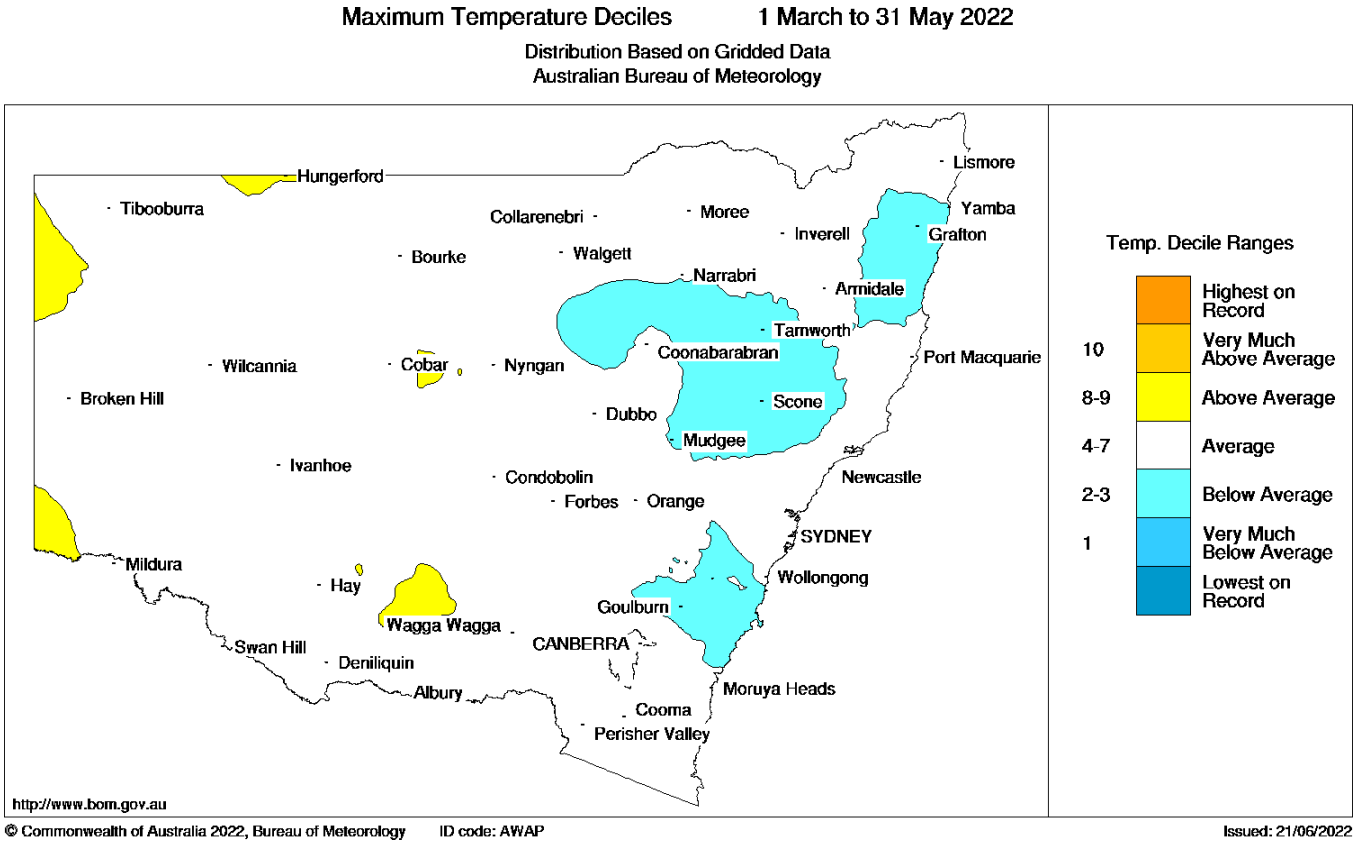


Figure 8 **NSW maximum temperature deciles, showing near average maximum temperatures in the North West Slopes region during autumn, 1 March to 31 May 2022**

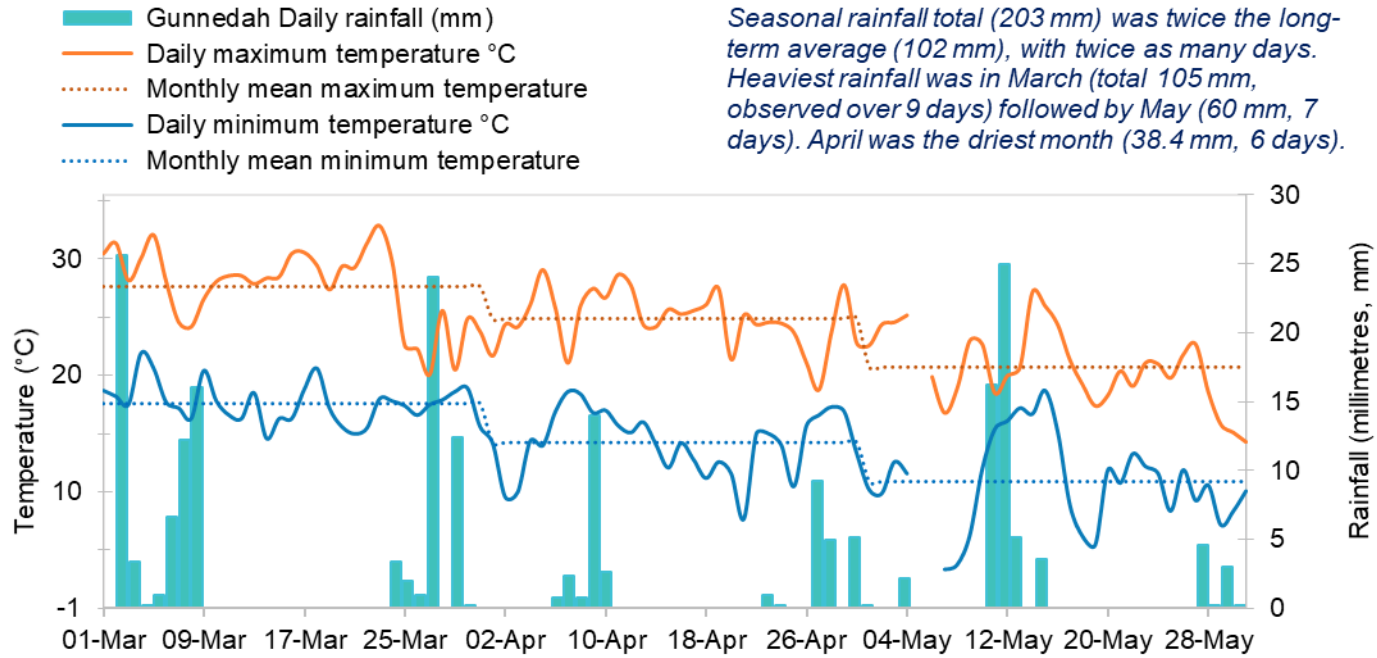


Figure 9 **Gunnedah meteorology conditions, showing rainfall days and seasonal maximum and minimum temperatures during autumn, 1 March to 31 May 2022**

[13] DPE observations at Gunnedah air quality monitoring station. These data are not NATA accredited.

Wind

Winds across the North West Slopes region generally align with the south-east to north-west direction of the Namoi and Peel River valleys[14]. In a typical pattern for the region during autumn months, prevailing winds in autumn 2022 were generally light to moderate south easterlies (Figure 10). Tamworth and Gunnedah had some influence from other sectors, while at Narrabri the south easterlies dominated, though winds were stronger than at other locations.

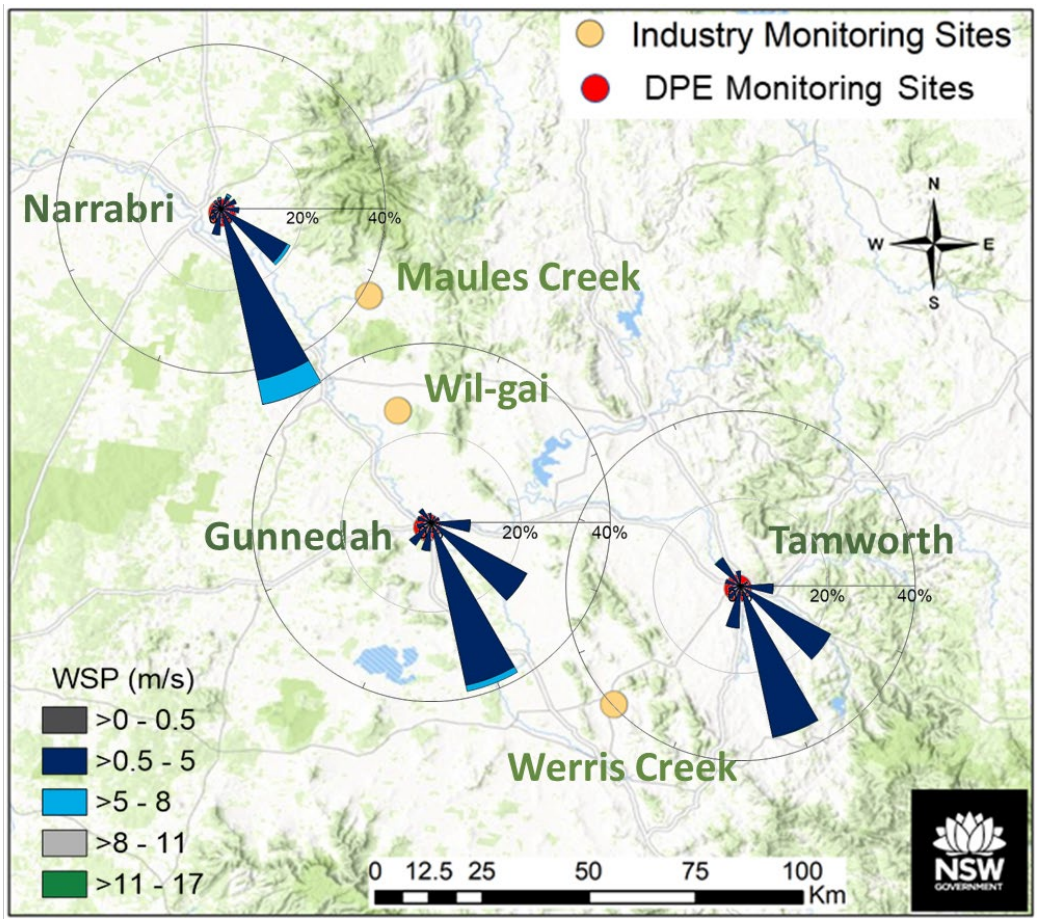


Figure 10 Wind rose map[15] for the Namoi/North West Slopes during autumn 2022

[14] The Namoi River flows north-west, through Gunnedah and Narrabri. The Peel River flows north-west through Tamworth, joining the Namoi River near Gunnedah.

[15] Wind roses show wind direction and speed at a location. The length of each bar around the circle shows the percentage of time that the wind blows from each direction. The colours along the bars indicate the wind speed categories.

Pollution roses from hourly particle data

Figure 11 shows the pollution roses[16] for the three regional centres Narrabri, Gunnedah, and Tamworth, during autumn 2022. The highest levels of hourly PM10 and hourly PM2.5 were predominantly associated with south easterly winds at all stations. Tamworth, as well as Gunnedah, had some influence from the north-west sector. At Gunnedah, elevated particles were also associated with the south westerlies.

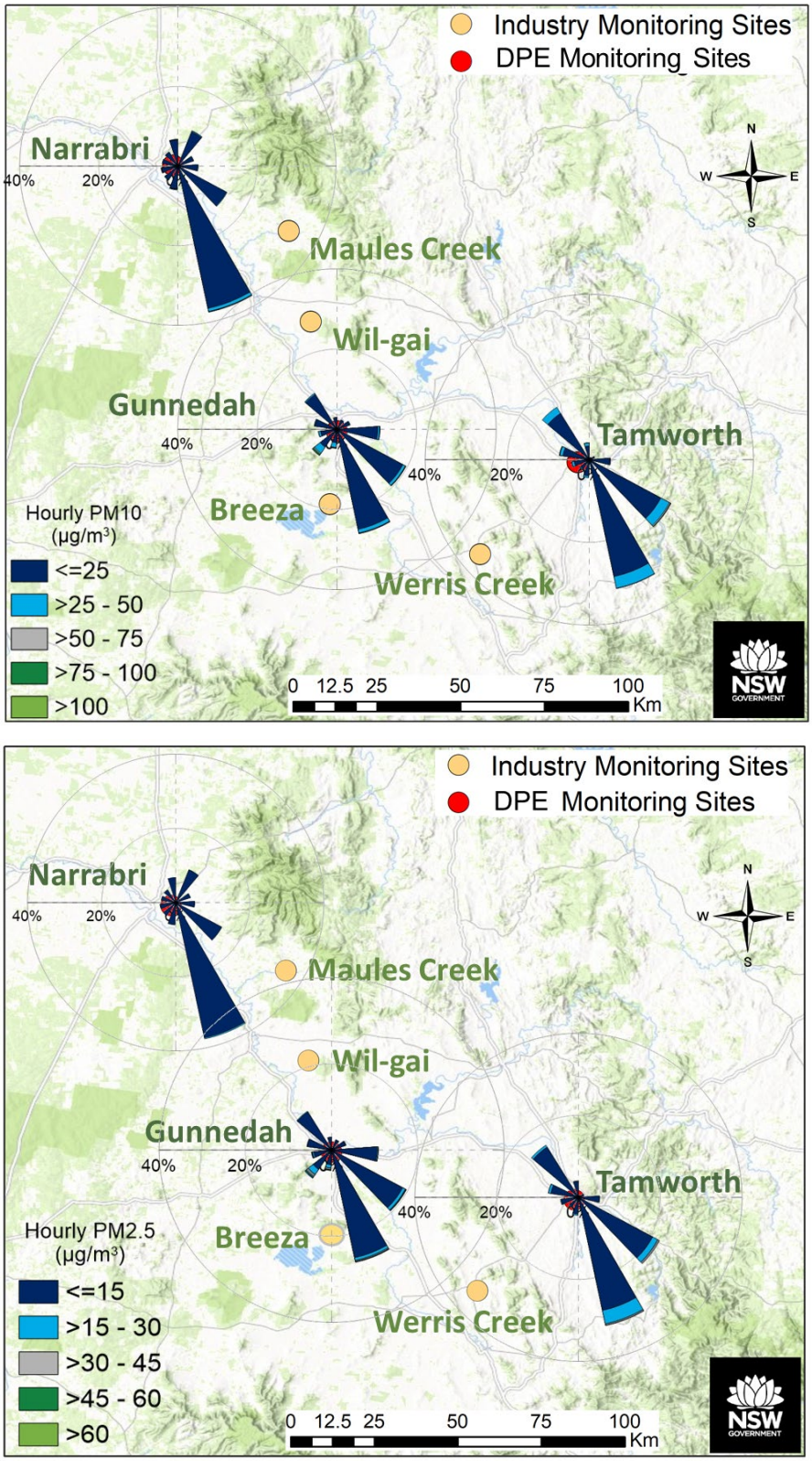


Figure 11 Pollution roses for hourly PM10 (top) and PM2.5 (bottom) in autumn 2022

[16] Pollution roses show the wind direction and particle levels at a location. The length of each bar around the circle shows the percentage of time the wind blows from each direction. The colours along the bars indicate the concentration of particle levels.

Online performance of monitoring stations

The target performance for air quality monitoring at the Department of Planning and Environment stations is at least 95% data availability for all criteria pollutants and meteorological parameters. The maximum online time attainable for gases, NO_2 and O_3, is 96% due to daily calibrations.

Table 2 presents online performance of monitoring stations at Gunnedah, Narrabri and Tamworth, from 1 March to 31 May 2022:

- all stations met online target for PM10 and PM2.5 monitoring
- all stations met online targets for monitoring meteorology
- all stations met online targets for NO_2 and O_3 monitoring.

Table 2 Online performance (%) from 1 March to 31 May 2022

Station	Particles PM10 daily	Particles PM2.5 daily	Gases NO_2 hourly	Gases O_3 hourly	Meteorology wind hourly
Gunnedah	97.8	97.8	93.2	88.0	98.4
Narrabri	97.8	97.8	-	-	99.5
Tamworth	100	100	75.2	75.2	99.7

'-' not monitored

Reduced online times were due to:

- Gunnedah: O_3 data loss due to the combination of data logger issues and instrument being offline following pump failure.
- Tamworth: NO_2 and O_3 monitors were decommissioned on 13 May 2022, marking the end of a summer monitoring campaign spanning 2 seasons (November 2020 to March 2022).

This report was prepared by Dr Upma Dutt and reviewed by David Salter.

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