AIR QUALITY MONITORING DATA REVIEW WILPINJONG 2025

Wilpinjong Coal Pty Ltd

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Air Quality Monitoring Data Review
Wilpinjong 2025

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1 INTRODUCTION

Todoroski Air Sciences has prepared this report for Wilpinjong Coal Pty Ltd (hereafter referred to as the Proponent). The report presents a review and analysis of the dust monitoring data recorded as part of the Wilpinjong Coal Mine (WCM) air quality monitoring network for the 2025 calendar period and includes a comparison between the measured dust levels and the modelled predictions for the "Year 2028" scenario per the *Air Quality and Greenhouse Gas Assessment Wilpinjong Extension Project* (**Todoroski Air Sciences, 2015**).

The modelled "Year 2028" is considered to be the most representative of mining activity occurring during the 2025 calendar period at the WCM.

2 PROJECT SETTING AND DESCRIPTION

The WCM is located in the Western Coalfields of New South Wales (NSW), approximately 40 kilometres (km) northeast of Mudgee and approximately 2.5km west-northwest of Wollar (see **Figure 2-1**). National Parks and reserves, agricultural activities and coal mining operations dominate the land use in the surrounding area.

The WCM is bounded by the Goulburn River National Park to the north, the Munghorn Gap Nature Reserve to the southwest and Moolarben Coal Operations (MCO) to the west. To the east and southeast of the mine, the land is predominantly zoned for agricultural use, along with areas of Crown Land.

The WCM ambient air quality monitors include High Volume Air Samplers (HVAS), Tapered Element Oscillating Microbalances (TEOMs) and deposited dust gauges. The location of the air quality monitors relative to WCM is presented in **Figure 2-1**. While the Wollar Village $PM_{2.5}$ monitor is listed as a compliance monitor in the AQMP, it is noted that the consent conditions do not include criteria for $PM_{2.5}$. It is also noted that although the DG4 is listed as a compliance monitor, there are no longer private residences in the vicinity of this monitor (refer to the property ownerships maps provided in **Appendix A**) and thus it may be more appropriate to use this monitor for management purposes.

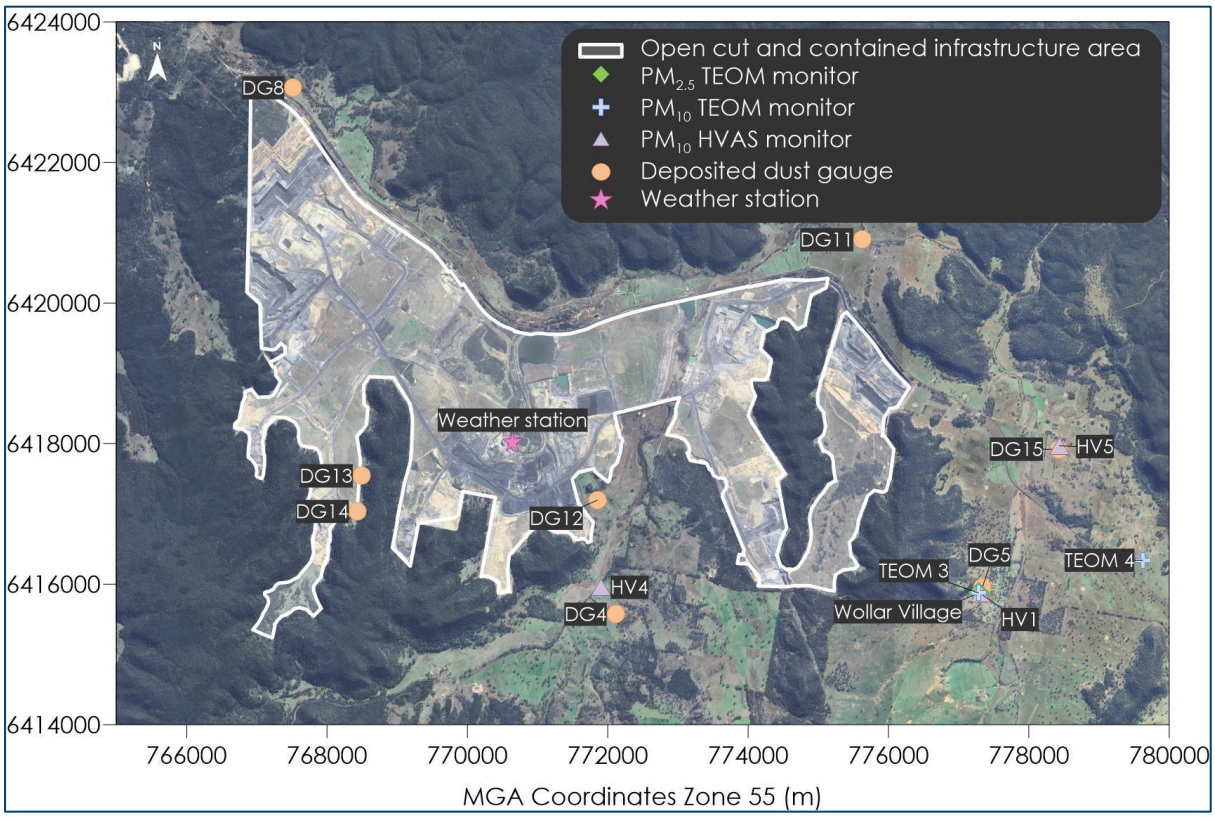

Figure 2-1: WCM setting and air quality monitoring network

Notes:

- Data from DG4, DG5, DG8, DG11, DG15, HV1, HV5, TEOM3, TEOM4 and Wollar Village (TEOM5 $PM_{2.5}$) are used for ***compliance monitoring*** against the Air Quality Assessment Criteria in accordance with Condition 17, Schedule 3 of SSD-6764;
- Data from HV4, DG12, DG13 and DG14 are used for management monitoring purposes.

3 AIR QUALITY CRITERIA

The sections below identify the key pollutants currently being monitored at the WCM air quality monitoring sites (refer to **Figure 2-1**) and the applicable air quality criteria.

3.1 Particulate Matter

Particulate matter consists of particles of varying size and composition. The total mass of all particles suspended in air is defined as the Total Suspended Particulate matter (TSP). The upper size range for TSP is nominally taken to be 30 micrometres (µm) as in practice particles larger than 30 to 50µm will settle out of the atmosphere too quickly to be regarded as air pollutants.

The TSP is defined further into two sub-components. They are PM_{10} particles, particulate matter with aerodynamic diameters of 10µm or less, and $PM_{2.5}$, particulate matter with aerodynamic diameters of 2.5µm or less.

Particulate matter, typically in the upper size range, that settles from the atmosphere and deposits on surfaces is characterised as deposited dust. The deposition of dust on surfaces may be considered a nuisance and can adversely affect the amenity of an area by soiling property in the vicinity.

3.1.1 Development Consent

Table 3-1 summarises the air quality goals that are relevant to particulate pollutants as outlined in the WCM Development Consent (SSD-6764).

The development consent outlines that the applicant shall ensure that all reasonable and feasible avoidance and mitigation measures are employed so that the particulate emissions generated by the operation do not exceed the criteria listed in **Table 3-1** at any residence on privately-owned land.

Table 3-1: Air quality criteria - SSD-6764

Pollutant	Averaging period	[d] Criterion	
Particulate Matter < 10µm (PM_{10})	Annual	[a] 30 µg/m³	
	24 hour	[a] 50 µg/m³	
Total suspended particulates (TSP)	Annual	[a] 90 µg/m³	
[c] Deposited Dust	Annual	[b] 2 g/m²/month	[a] 4 g/m²/month

Notes:

[a] Total impact (i.e. incremental increase in concentrations due to the development plus background concentrations due to other sources).

[b] Incremental impact (i.e. incremental increase in concentrations due to the development on its own).

[c] Deposited dust is to be assessed as insoluble solids as defined by Standards Australia, AS/NZS 3580.10.1:2003 Methods for Sampling and Analysis of Ambient Air – Determination of Particulate Matter – Deposited Matter – Gravimetric Method.

[d] Excludes extraordinary events such as bushfires, prescribed burning, dust storms, sea fog, fire incidents, illegal activities or any other activity agreed to by the Secretary.

3.1.2 NEPM air quality standards

Table 3-2 summarises the air quality standards per the National Environment Protection (Ambient Air) Measure (NEPM) (**NEPC, 2021**). The NEPM standards were adopted by WCM for the assessment of $PM_{2.5}$.

Table 3-2: NEPM air quality standards

Pollutant	Averaging Period	Maximum concentration standard
Particles as PM_{10}	Annual	25 µg/m³
	24-hour	50 µg/m³
Particles as $PM_{2.5}$	Annual	8 µg/m³
	24-hour	25 µg/m³

3.1.3 NSW EPA impact assessment criteria

Table 3-3 summarises the current air quality goals that are relevant to particulate pollutants as outlined in the NSW Environment Protection Agency (EPA) document "*Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales*" (**NSW EPA, 2022**).

It should be noted the current NSW EPA air quality impact assessment criteria were updated after the Project was approved, and thus differ from the development consent criteria by adopting the NEPM standards for $PM_{2.5}$ and reducing the annual average PM_{10} criteria from a level of 30µg/m³ to 25µg/m³.

Table 3-3: NSW EPA air quality impact assessment criteria

Pollutant	Averaging Period	Impact [1]	Criterion
Total suspended particulates (TSP)	Annual	Total	90 µg/m³
Particulate Matter < 10µm (PM_{10})	Annual	Total	25 µg/m³
	24-hour	Total	50 µg/m³
Particulate Matter < 2.5µm ($PM_{2.5}$)	Annual	Total	8 µg/m³
	24-hour	Total	25 µg/m³
Deposited Dust [2]	Annual	Incremental	2 g/m²/month
		Total	4 g/m²/month

[1] At nearest existing or likely future off-site sensitive receptor

[2] Dust is assessed as insoluble solids as defined by AS 3580.10.1 – 1991 (AM-19)

Source: **NSW EPA, 2022**

3.1.4 Summary of applicable criteria for this assessment

Table 3-4 summarises the applicable air quality criteria for this assessment.

Table 3-4: Air quality impact assessment criteria used in this assessment

Pollutant	Averaging Period	Source	Concentration
Particulate Matter < 2.5µm ($PM_{2.5}$)	24-hour	EPA/NEPM	25µg/m³
	Annual Average	EPA/NEPM	8µg/m³
Particulate Matter < 10µm (PM_{10})	24-hour	Development consent	50µg/m³
	Annual Average	Development consent	30µg/m³
Total Suspended Particulates (TSP)	Annual Average	Development consent	90µg/m³
Deposited Dust	Annual Average	Development consent	4g/m²/month

4 METEOROLOGICAL DATA

Table 4-1 presents the total cumulative annual rainfall recorded by WCM from 2015 to 2025. Recorded total annual rainfall is presented graphically in **Figure 4-1**.

In 2025, 597.6 millimetres (mm) of rainfall was recorded. The data indicate that 2025 was a moderate rainfall year when compared to the long-term dataset.

Table 4-1: Total annual rainfall (mm)

Year	Total rainfall (mm)
2015	772.2
2016	817.0
2017	531.4
2018	487.8
2019	265.6
2020	915.8
2021	942.4
2022	998.2
2023	478.0
2024	768.4
2025	597.6

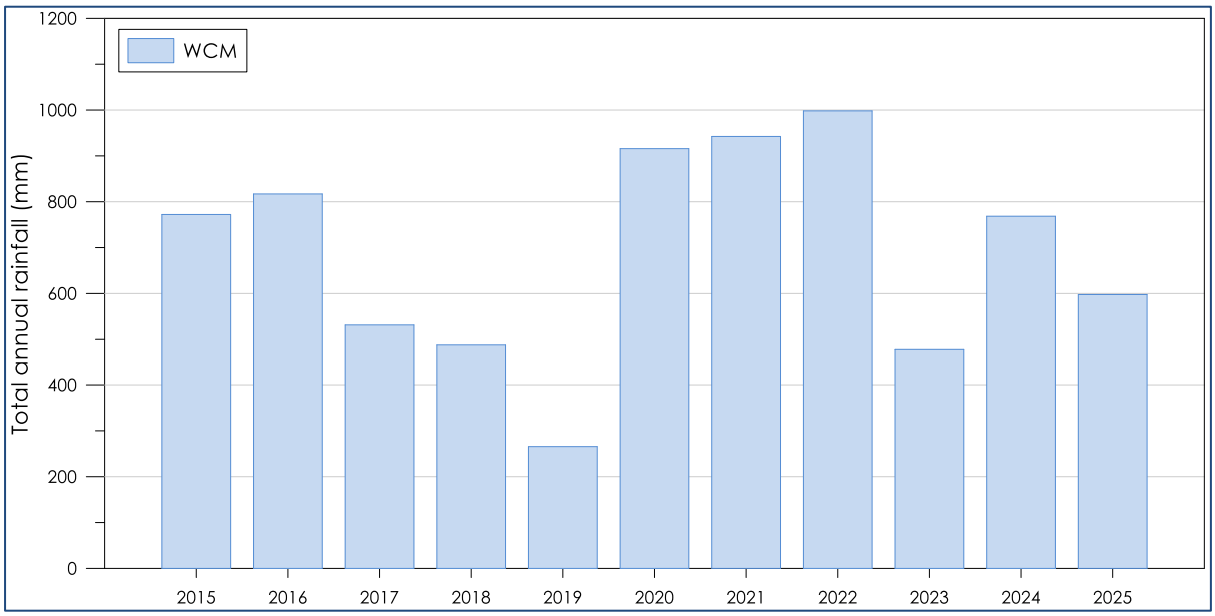

Figure 4-1: Total annual rainfall (mm)

Annual and seasonal windroses have been prepared from the available data collected at the WCM weather station for the 2025 period and are presented in **Figure 4-2**. It is noted that a minor technical issue was identified relating to the wind direction sensor which was not ideally aligned. This issue was rectified at the start of September 2025.

Analysis of the windroses shows that on an annual basis the predominant wind flows at the WCM weather station are from the east-northeast, which is expected considering the wider terrain features of the area. Few winds originate from the northwest and southeast quadrants. The summer wind distribution is similar to the annual distribution. In autumn, winds are from the east-northeast and

northeast are most frequent. During winter, winds are primarily from the southwest quadrant. In spring, winds are predominantly from the west.

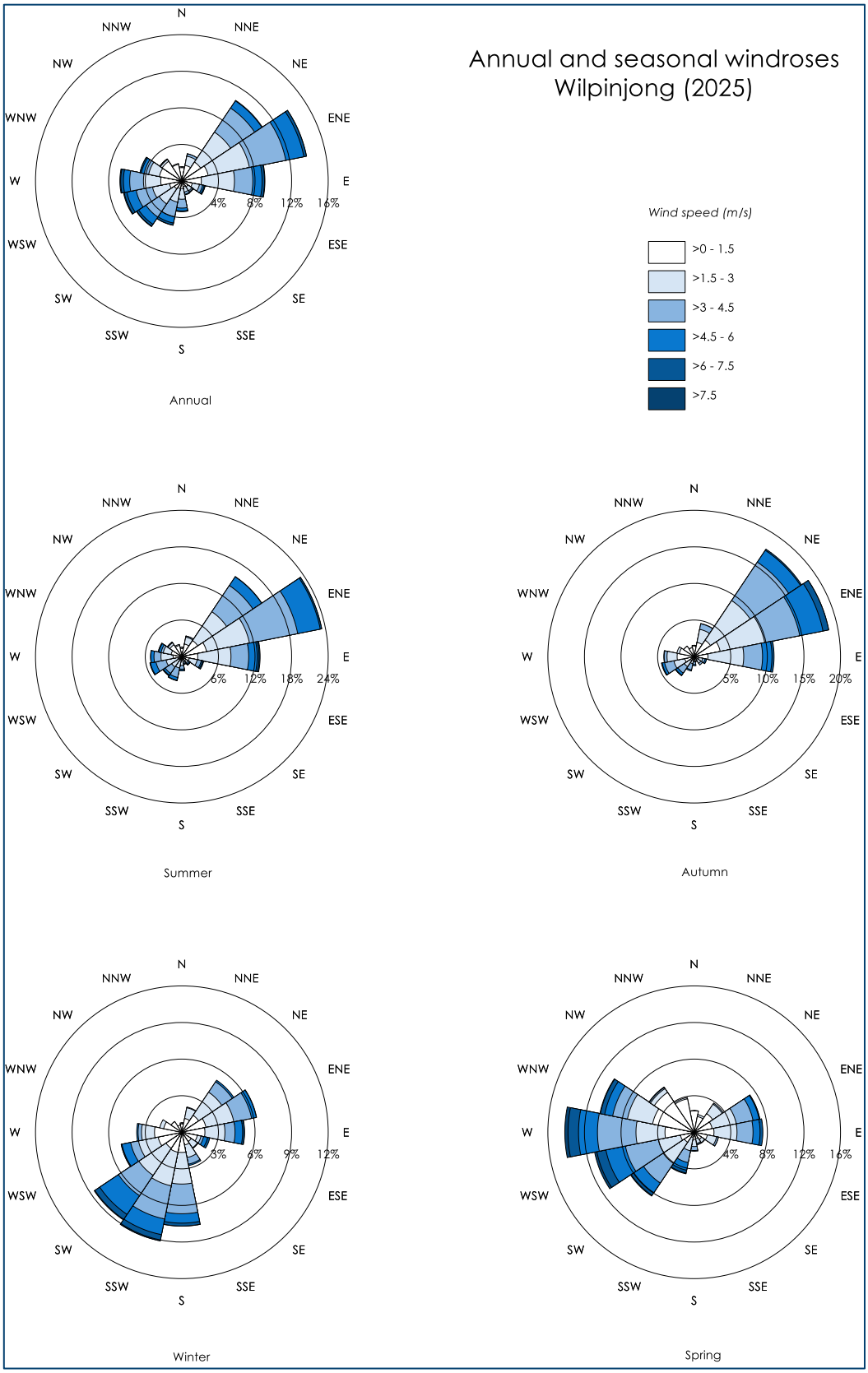

Figure 4-2: Annual and seasonal windroses for Wilpinjong (2025)

5 AIR QUALITY MONITORING DATA

This section reviews the available ambient monitoring data collected from the WCM ambient air quality monitoring network for the 2025 calendar period and compares it with the long-term data.

The main sources of particulate matter in the wider area of the WCM include active mining from coal mine operations, agricultural activities, emissions from local anthropogenic activities (such as motor vehicle exhaust, dust from dirt roads, and domestic wood heaters), hazard reduction burns and various other rural activities.

One extraordinary event day has been specifically identified for WCM in 2025. For the purpose of this assessment, 27/05/2025 is considered to be an extraordinary event day due to impacts from a regional dust storm.

5.1 $PM_{2.5}$ Monitoring

There are no specific $PM_{2.5}$ air quality impact assessment criteria in WCM Development Consent SSD-6764. WCM adopted the National Environmental Protection Measures (NEPM) standard for $PM_{2.5}$ in the WCM Air Quality Management Plan (AQMP). The data from monitoring $PM_{2.5}$ in the village of Wollar (previously known as TEOM 5) was established to determine if there is any correlation between the measured levels and WCM activities under applicable prevailing meteorological conditions.

A summary of the available $PM_{2.5}$ monitoring data is presented in **Table 5-1**. Recorded 24-hour average $PM_{2.5}$ concentrations in 2025 are presented graphically in **Figure 5-1**. The long-term 24-hour average $PM_{2.5}$ concentrations are presented in **Figure 5-2**.

The 2025 annual average $PM_{2.5}$ concentrations were below the relevant criterion of 8µg/m^3. The annual average $PM_{2.5}$ levels in 2025 are generally consistent with the levels in the previous years.

The 24-hour average $PM_{2.5}$ concentrations were below the NEPM standard of 25µg/m^3 during 2025.

It can be seen in **Figure 5-2** that the $PM_{2.5}$ levels during the 2019/2020 bushfire season are significantly elevated compared with the rest of the data.

Table 5-1: Summary of ambient $PM_{2.5}$ levels - Wollar Village

Year	Annual average (µg/m³)		Maximum 24-hour average (µg/m³)		No. days > NEPM standard (25µg/m³)	
2018	6.6		**35.6**		5	
2019	**15.2**	*6.8	**196.5**	*23.0	32	*0
2020	6.5	*4.9	**81.0**	*23.7	11	*0
2021	4.4	*4.1	**82.4**	*20.4	2	*0
2022	3.6		10.1		0	
2023	5.1		21.5		0	
2024	5.2	*5.0	**30.3**	*21.4	2	*0
2025	4.5	*4.5	15.3	*15.3	0	*0

* Excluding extraordinary events

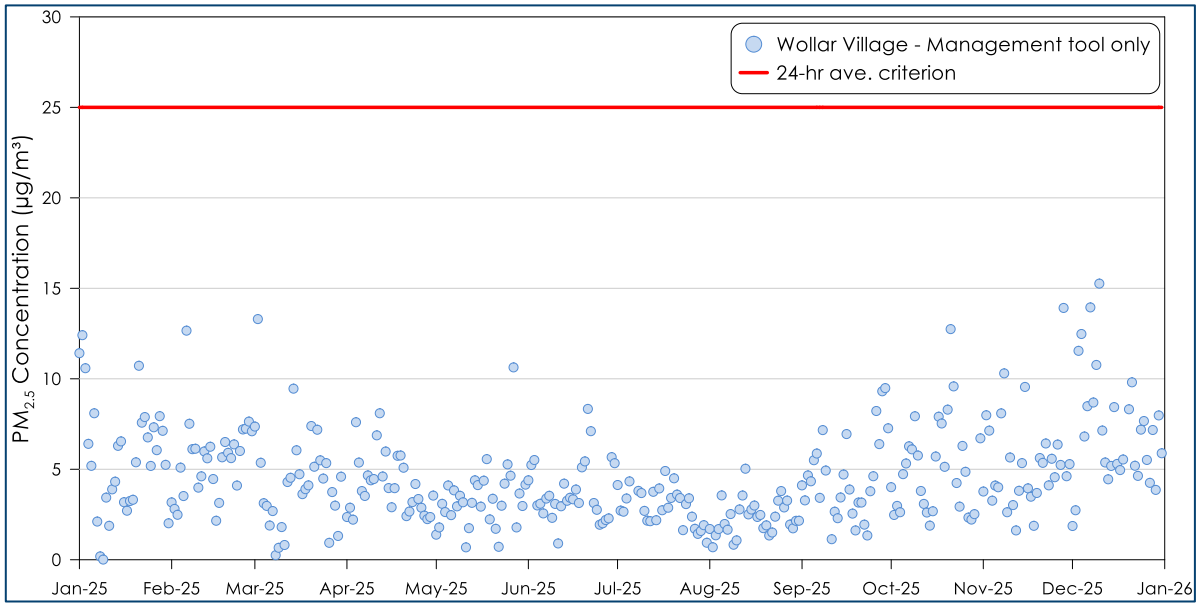

Figure 5-1: 24-hour average $PM_{2.5}$ concentrations at TEOM monitors 2025

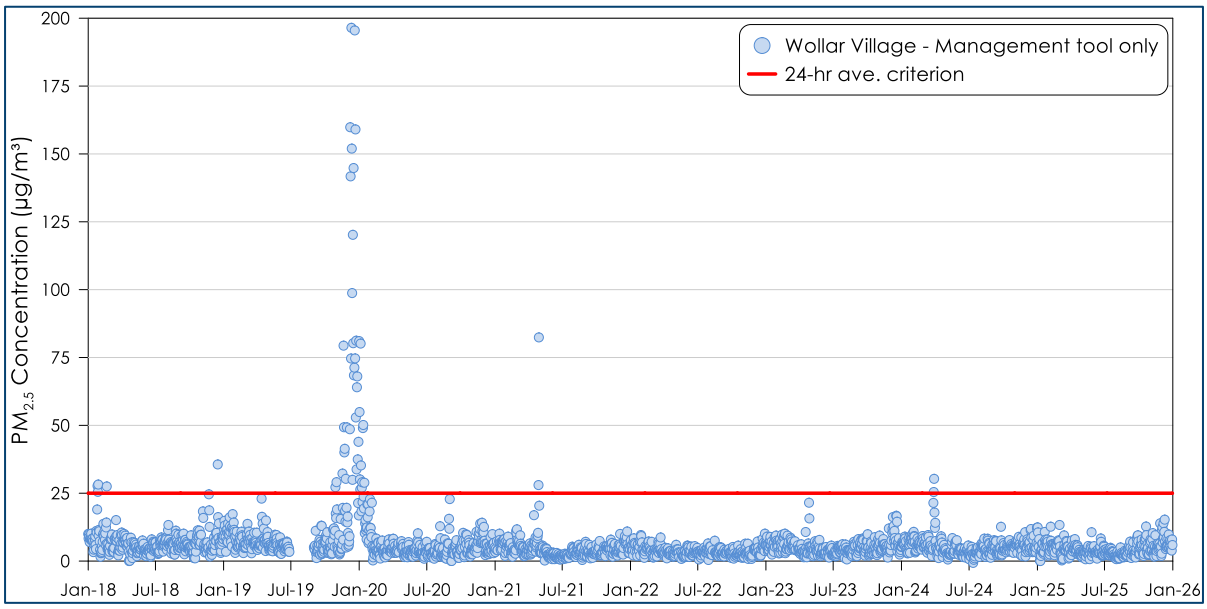

Figure 5-2: 24-hour average $PM_{2.5}$ concentrations at TEOM monitors 2018 to 2025

5.2 PM_{10} monitoring

A summary of the available PM_{10} monitoring data for the TEOMs and HVAS monitors is presented in **Table 5-2**. It is noted that HVAS monitors are run for a 24-hour period once every six days and thus the annual average levels are calculated from the HVAS run days (every sixth day) whereas the annual average levels for TEOM monitors are calculated over every day of the year.

Annual averages for the TEOM and HVAS monitors have been calculated during 2025. The 2025 annual average PM_{10} concentrations were below the relevant Consent criterion of 30µg/m³. The annual average PM_{10} levels in 2025 are generally consistent with previous years.

Recorded 24-hour average PM_{10} concentrations in 2025 are presented graphically in **Figure 5-3**.

The TEOM 3 monitor recorded one day with an elevated 24-hour average PM_{10} levels above 50µg/m^3. A widespread dust storm impacted PM_{10} levels across NSW on this day, and is thus considered to be an extraordinary event.

The 24-hour average PM_{10} concentrations excluding extraordinary events did not exceed the relevant criterion of 50µg/m^3 in 2025 at all monitoring locations.

Table 5-2: Summary of ambient PM_{10} levels

Year	Annual average PM_{10} (µg/m^3)										
	TEOM 3		TEOM 4		HV1		HV4		HV5		Criterion
2015	11.7		9.4		9.8		11.5		11.8		25 / 30
2016	10.2		11.3		9.8		11.7		13.9		25 / 30
2017	9.5		12.8		12.3		16.7		16.7		25 / 30
2018	14.4		18.0		19.7		24.1		25.0		25 / 30
2019	27.9	*14.6	**32.9**	*22.9	29.8	*16.1	**33.4**	*17.8	**37.1**	*23.8	25 / 30
2020	12.6	*9.2	19.6	*15.4	13.5	*11.6	18.7	*15.8	17.4	*15.9	25 / 30
2021	8.6	*8.3	11.9	*11.5	9.6		11.5		14.3		25 / 30
2022	7.5		9.0		7.0		8.5		9.5		25 / 30
2023	10.2		12.1		10.0		12.0		11.4		25 / 30
2024	9.8	*9.7	12.2	*12.1	11.0	*11.0	11.4	*11.4	11.3	*11.3	25 / 30
2025	9.2	*9.1	12.7	12.7*	11.0	*11.0	12.4	*12.4	11.2	*11.2	25 / 30
Year	**Maximum 24-hour average PM_{10} (µg/m^3) (No. of days > criterion)**										
	TEOM 3		**TEOM 4**		**HV1**		**HV4**		**HV5**		**Criterion**
2015	**78.5 (1)**		**77.3 (1)**		29.3		40		35.3		50
2016	34.4		**51.1 (1)**		23		25.2		34.2		50
2017	**52.2**		**50.9 (1)**		28.2		**69.1 (1)**		**55.4 (1)**		50
2018	**143.3 (5)**		**156.8 (11)**		**168 (3)**		**208 (2)**		**167 (5)**		50
2019	**242.8 (38)**	*40.1 (0)	**273.1 (64)**	***101.7 (12)**	**196.0 (8)**	*40.3 (0)	**207.0 (8)**	*38.0 (0)	**195.0 (12)**	***61.0 (4)**	50
2020	**331.0 (9)**	*33.5 (0)	**416.2 (16)**	***52.1 (1)**	**59.1 (1)**	28.6 (0)	**106.0 (3)**	**64.0 (1)**	**66.2 (1)**	38.7 (0)	50
2021	**86.6 (1)**	*25.1 (0)	**139.5 (1)**	*35.0 (0)	30.3		34.5		38.6		50
2022	22.9		22.3		18.9		26.2		24.8		50
2023	31.5		36.5		24.1		31.3		27.1		50
2024	35.2	*27.2	32.6	*32.6	31.5	*31.5	34.1	*34.1	32.4	*32.4	50
2025	**64.3 (1)**	*35.5	49.96	*49.96	24.0	*24.0	28.8	*28.8	26.8	*26.8	50

* Excluding extraordinary events

Long-term 24-hour average PM_{10} records for the TEOM and HVAS monitors are presented in **Figure 5-4** and **Figure 5-5** respectively.

Figure 5-4 and **Figure 5-5** follow similar trends and show that the PM_{10} levels during the 2019/2020 bushfire season are significantly elevated compared with the rest of the data.

The rolling annual average PM_{10} concentrations for the TEOM and HVAS monitors from 2016 to 2025 are presented in **Figure 5-6**.

The rolling annual average levels in **Figure 5-6** generally show a trend of increasing levels, with the monitors all showing a sudden increase in levels at the end of 2019 associated with the 2019/2020 NSW bushfires and a sharp drop towards the end of 2020 as the majority of the bushfire affected days are no longer included in the rolling annual average. The rolling annual average PM_{10} levels in 2025 are

generally consistent with the levels in 2016, are well below the bushfire impacted levels in 2019 and 2020 and are shown to be generally stable throughout the 2025 year.

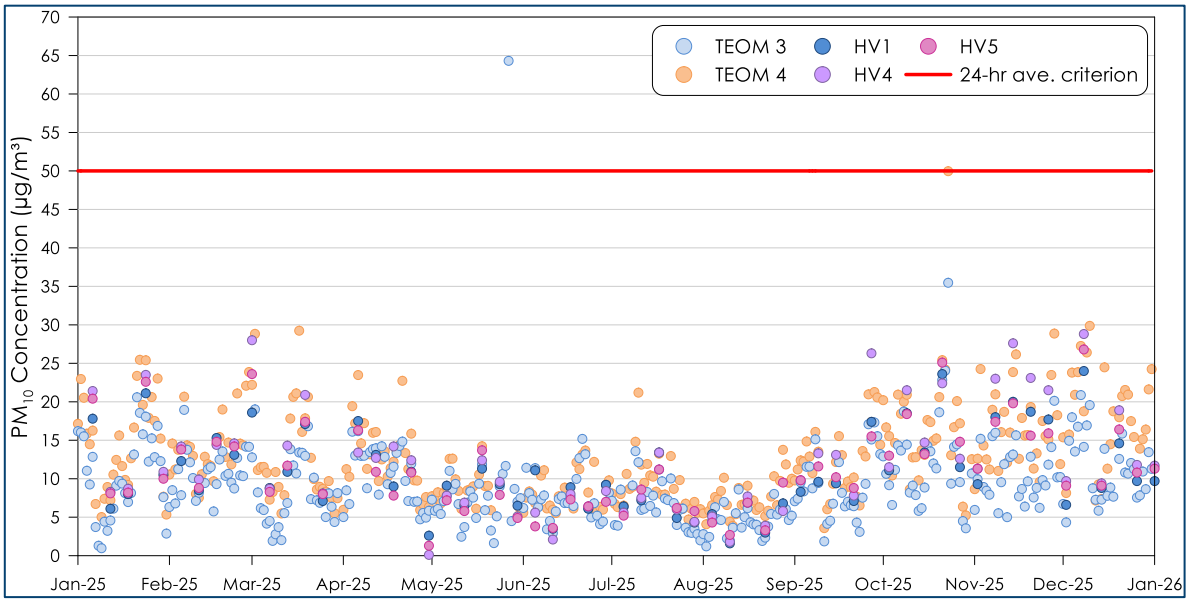

Figure 5-3: 24-hour average PM_{10} concentrations at TEOM and HVAS monitors 2025

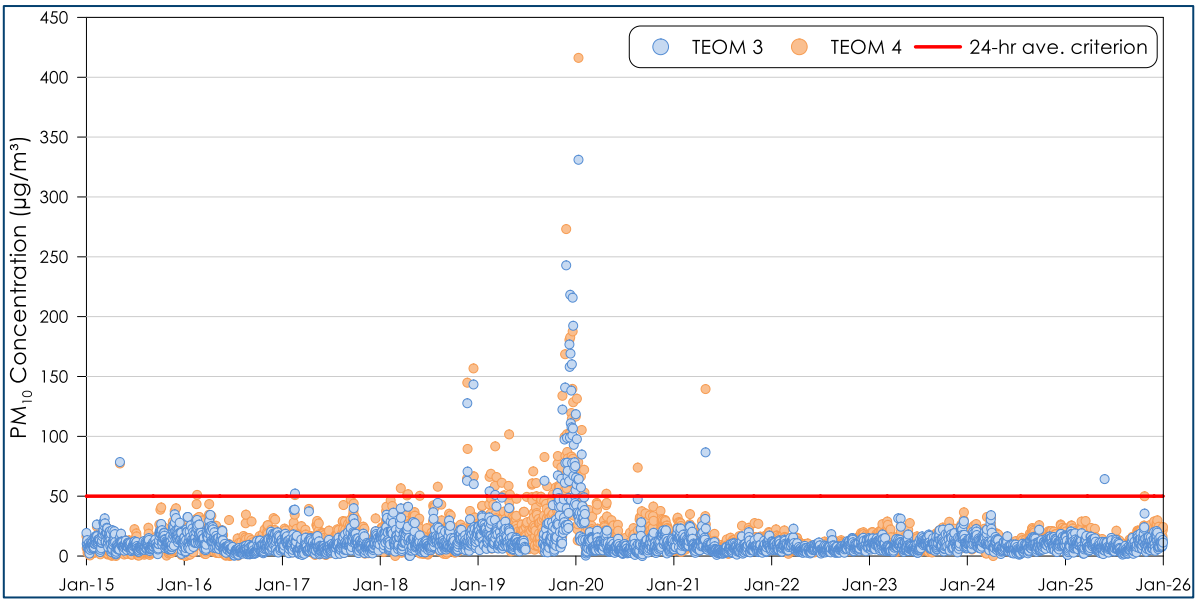

Figure 5-4: 24-hour average PM_{10} concentrations at TEOM monitors 2015 to 2025

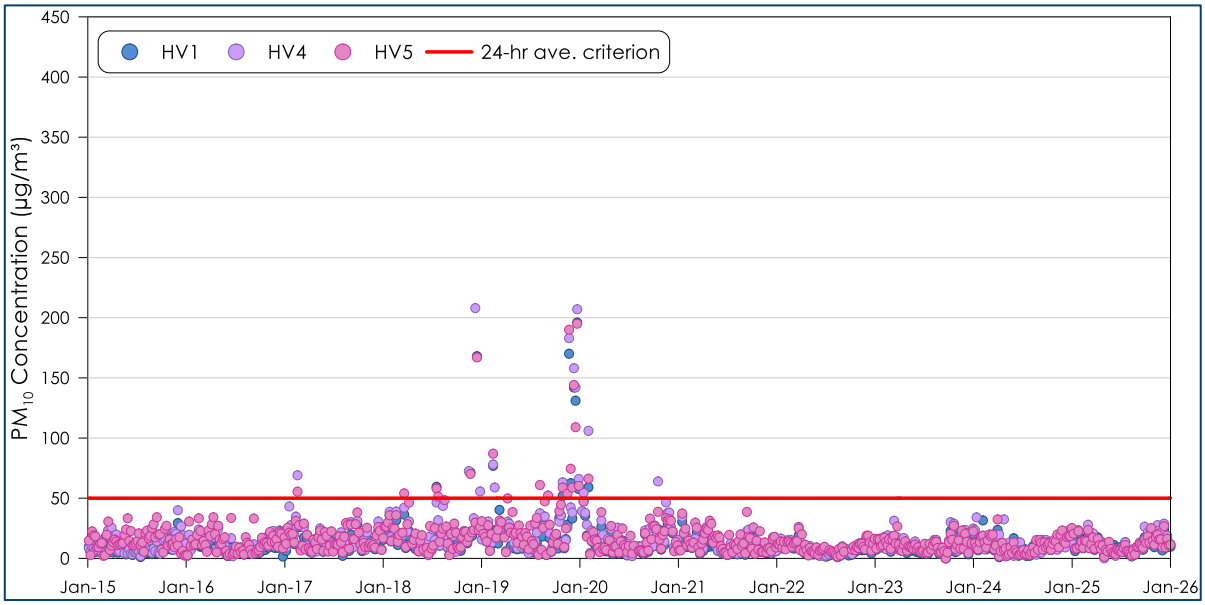

Figure 5-5: 24-hour average PM_{10} concentrations at HVAS monitors 2015 to 2025

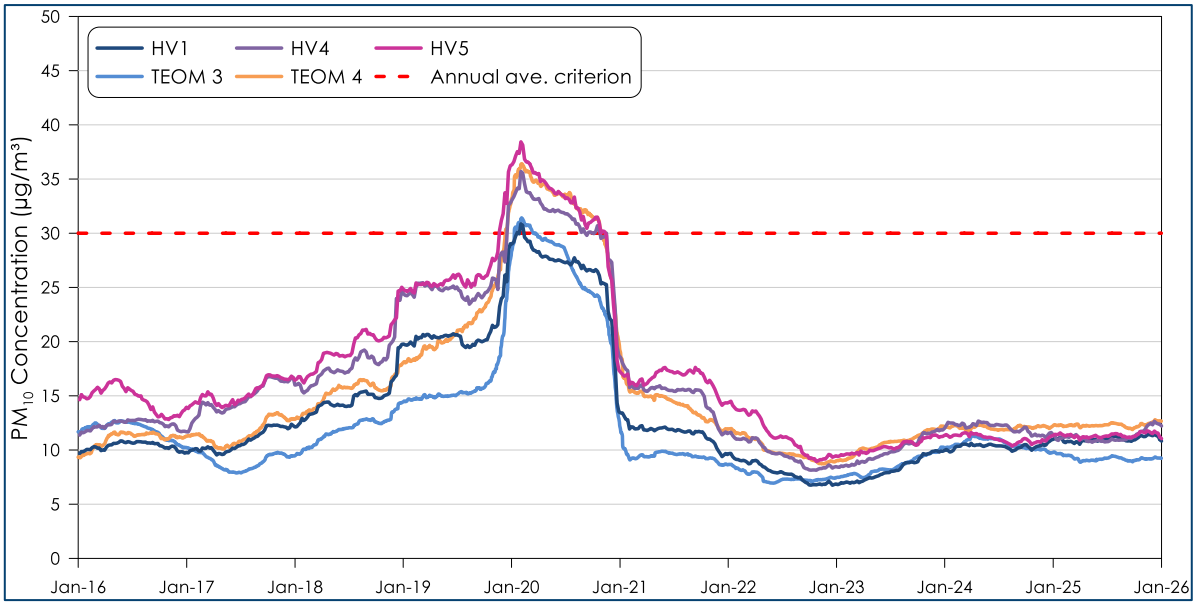

Figure 5-6: Rolling annual average PM_{10} concentrations at TEOM and HVAS monitors

5.3 Deposited dust

Table 5-3 presents the annual average deposited dust levels for all WCM deposited dust gauges during 2025. Monitors DG4, DG5, DG8, DG11 and DG15 are compliance monitors for assessment against the Air Quality Assessment Criteria in accordance with Condition 17, Schedule 3 of SSD-6764. **Figure 5-7** presents the monthly deposited dust levels at the compliance monitoring locations during 2025.

When the measured cumulative annual average deposited dust level at a compliance monitors is below the criterion of 4g/m^2/month it is generally inferred that compliance with Condition 17, Schedule 3 of SSD-6764 is achieved. If the cumulative criterion is exceeded, the applicant would need to show

compliance with the maximum (incremental) increase in the deposited dust level of 2g/m^2/month due to the project alone activities.

Currently, the nearest privately owned residence to the DG4 monitor is located over 5km away in the Wollar Village (refer to the property ownerships maps provided in **Appendix A**) and thus the DG4 monitor is no longer considered to be representative of dust levels at privately owned residences. As such, it may be more appropriate to use DG4 as a management monitor rather than a compliance monitor.

DG12, DG13 and DG14 are used for management purposes to monitor dust levels at heritage sites located near mining activities. Dust monitoring of heritage sites occurs within 1km of mining activities.

The results in **Table 5-3** indicate that deposited dust levels are below the relevant cumulative criterion of 4g/m^2/month at relevant compliance monitors in 2025 and thus it is considered that compliance with Condition 17, Schedule 3 of SSD-6764 is achieved.

Table 5-3: Summary of deposited dust annual average levels (g/m^2/month)

Year	DG4	DG5	DG8	DG11	DG12	DG13	DG14	DG15
2015	1.1	0.9	1.2	2.3	3.6	**7.5**	1.4	0.9
2016	0.7	1.3	1.1	**4.6**	2.5	**33.8**	**4.8**	1.6
2017	1.3	1.4	1.9	1.8	3.7	**10.5**	**26.3**	1.2
2018	3.2	2.0	1.7	2.2	**5.2**	**4.1**	**6.6**	1.3
2019	**5.3**	2.7	2.3	3.1	**5.9**	3.3	**5.5**	1.6
2020	1.7	1.9	2.9	2.3	**4.1**	2.6	3.8	1.7
2021	2.9	1.7	1.1	1.7	3.0	1.4	1.5	1.0
2022	3.3	0.7	1.1	0.9	1.9	1.7	1.3	0.9
2023	1.6	0.8	1.3	2.7	2.8	1.6	1.4	1.3
2024	0.8	0.6	1.2	1.6	1.7	1.2	1.9	0.8
2025	1.2	0.8	1.5	1.1	2.2	1.3	1.8	1.1

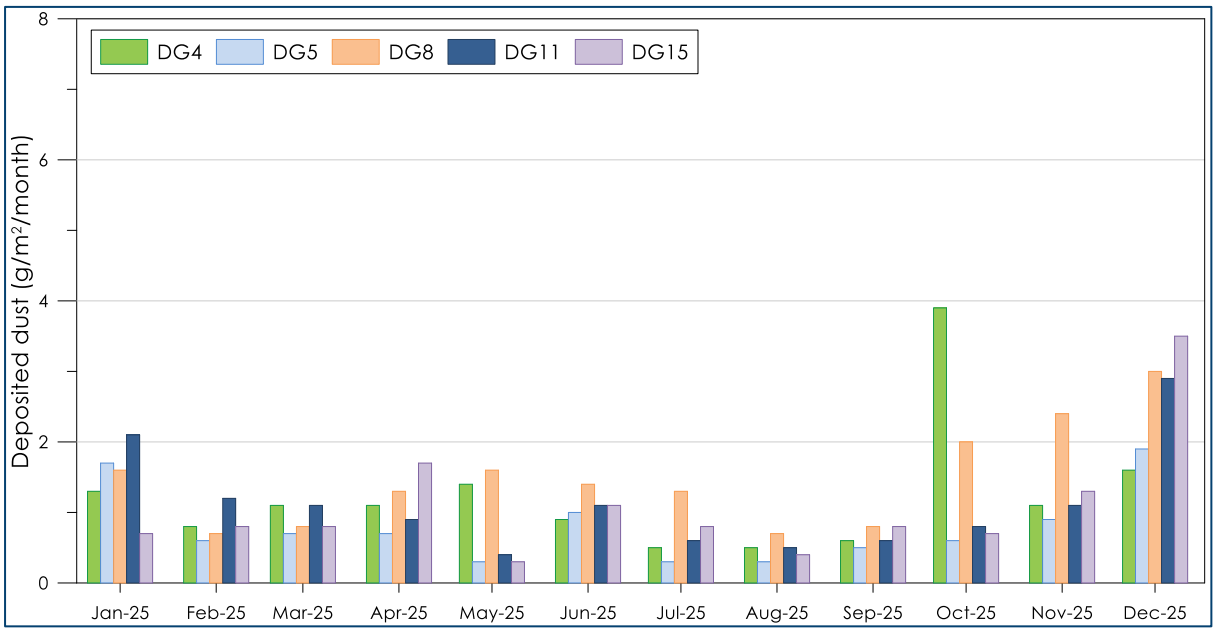

Figure 5-7: Monthly average deposited dust levels

6 COMPARISON BETWEEN MEASURED DATA AND MODELLED RESULTS

Monitoring data collected as part of the WCM ambient air quality monitoring network during 2025 was compared with modelling predictions for the "Year 2028" per the *Air Quality and Greenhouse Gas Assessment Wilpinjong Extension Project* (**Todoroski Air Sciences, 2015**).

Note that while the "Year 2028" modelling scenario appears to be the most representative for the actual operations in 2025, the mine plan has changed since the dispersion modelling was undertaken. Notable differences to the mine plan include that Cumbo Creek is no longer going to be mined, and the two active faces in Pit 8 (south and north) are heading towards each other to converge in the future, rather than mining the valley north to south.

6.1 Annual average $PM_{2.5}$

Figure 6-1 presents an overlay of the measured 2025 annual average $PM_{2.5}$ data over the dispersion modelling predictions for "Year 2028". The measured result is well below the annual average criterion of 8µg/m^3 and is typical of a small village in NSW.

The measured level at the Wollar Village is slightly higher than the modelled results by approximately 0.9µg/m^3. The $PM_{2.5}$ monitor would be influenced by non-modelled local $PM_{2.5}$ sources such as combustion engines, transport movements and various human activities.

The modelling does not account for excess dust from the human activities in the village. The difference between the measured and modelled results is consistent with the difference in $PM_{2.5}$ levels measured in small populated areas and those outside of the populated areas and near mines in the Hunter Valley.

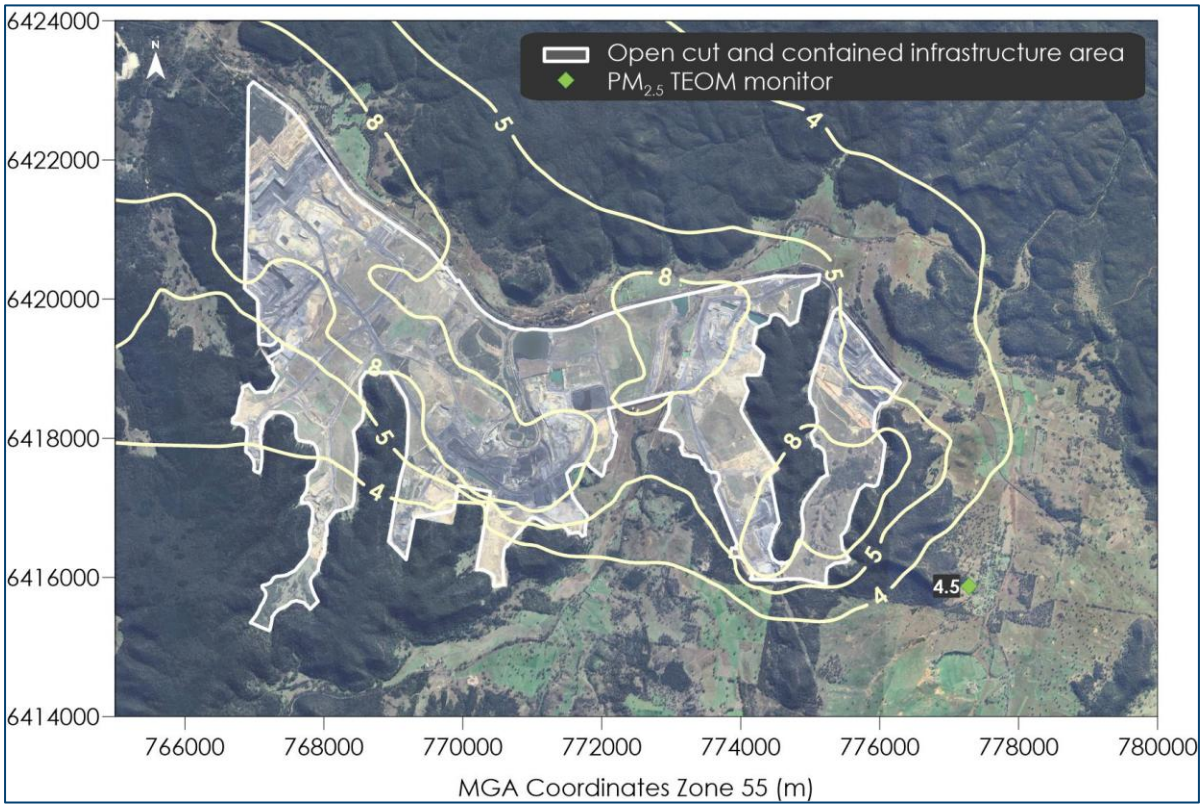

Figure 6-1: Annual average $PM_{2.5}$ monitoring data for 2025 superimposed over the predicted $PM_{2.5}$ annual average modelling contour ("Year 2028" WCM plus other mines and background)

6.2 Annual average PM_{10}

Figure 6-2 presents the measured 2025 annual average PM_{10} data superimposed over the dispersion modelling contours for the "Year 2028". The measured and predicted data in the figure include dust levels from WCM and other sources.

Figure 6-2 shows that the annual average PM_{10} measured levels in 2025 are generally 1.8 to 6.2µg/m^3 lower than the model predictions.

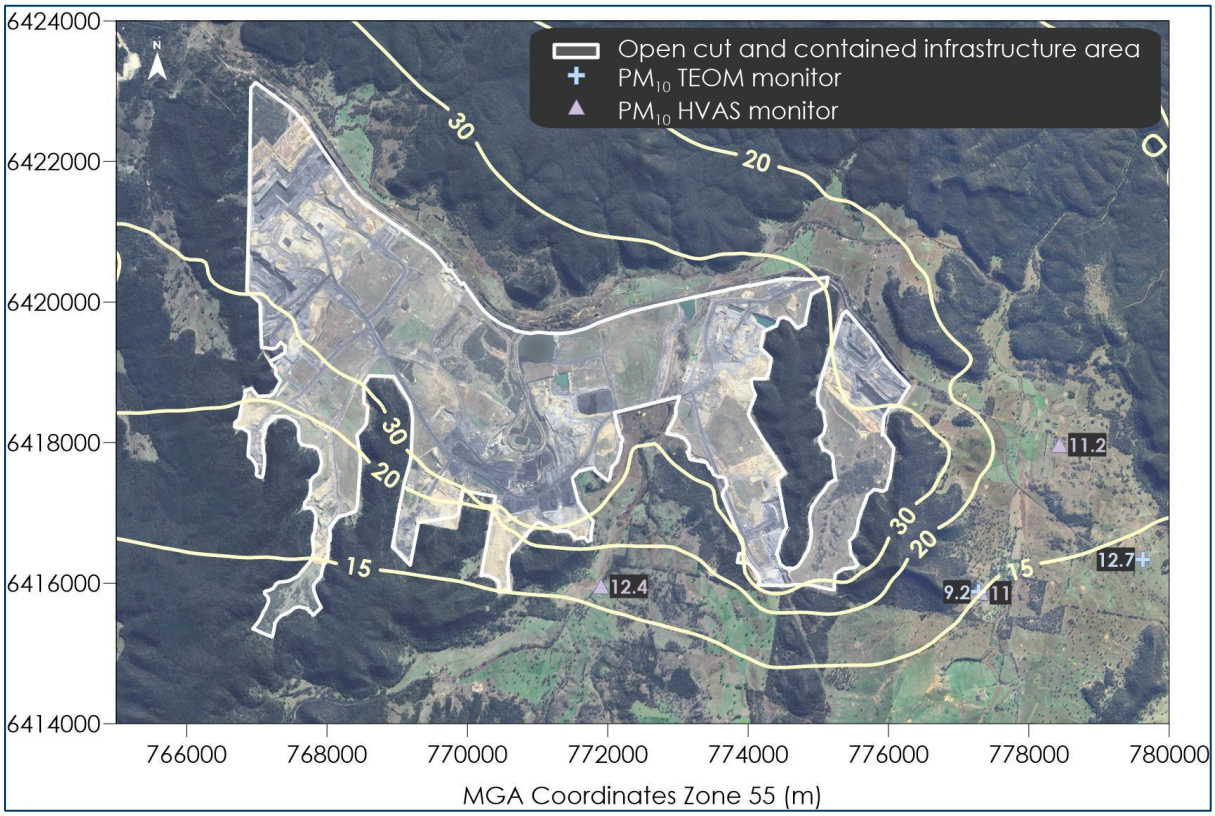

Figure 6-2: Annual average PM_{10} monitoring data for 2025 superimposed over the predicted PM_{10} annual average modelling contour ("Year 2028" WCM plus other mines and background)

6.3 Annual average deposited dust

Figure 6-3 presents an overlay of the measured 2025 annual average deposited dust levels over the dispersion modelling contours for "Year 2028".

The annual average measured levels in 2025 are generally well aligned with the modelled predictions and are generally 0.0 to 1.5 g/m^2/month lower than the model predictions with the exception of DG12 and DG14 which recorded levels approximately 0.3g/m^2/month and 0.5 g/m^2/month respectively higher than the model predictions. We note that deposited dust gauge readings can be significantly influenced by very local sources, and this cannot be reasonably factored into any modelling.

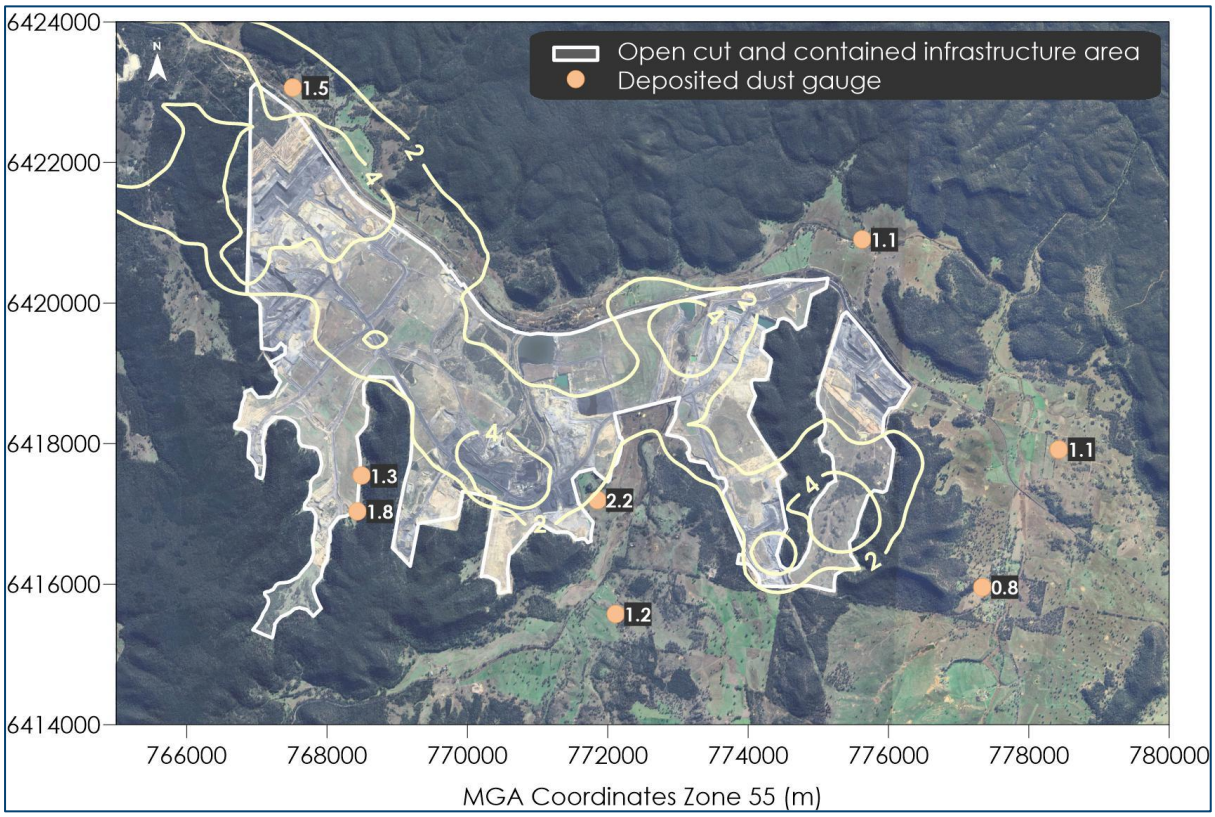

Figure 6-3: Annual average deposited dust monitoring data for 2025 superimposed over the predicted deposited dust annual average modelling contour ("Year 2028" WCM plus other mines and background)

7 SUMMARY AND CONCLUSIONS

This report has analysed the monitoring data recorded at the WCM for the 2025 calendar period and provides a comparison between the measured dust levels with the modelled predictions for the "Year 2028" scenario per the *Air Quality and Greenhouse Gas Assessment Wilpinjong Extension Project* (**Todoroski Air Sciences, 2015**).

The analysis shows that the annual average levels in 2025 were below the relevant criteria.

The data indicate that there was generally reasonable agreement between the annual average modelling predictions and the measured results in 2025.

8 REFERENCES

NEPC (2021)

"National Environment Protection (Ambient Air Quality) Measure", National Environment Protection Council, May 2021.

NSW EPA (2022)

"Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales", NSW Environment Protection Authority, August 2022.

Peabody Energy (2022)

"Air Quality Management Plan WI-ENV-MNP-0004", Peabody Energy, June 2022.

Todoroski Air Sciences (2015)

"Air Quality and Greenhouse Gas Assessment Wilpinjong Extension Project", prepared for Wilpinjong Coal Pty Ltd by Todoroski Air Sciences, November 2015.

Appendix A: Property ownership maps

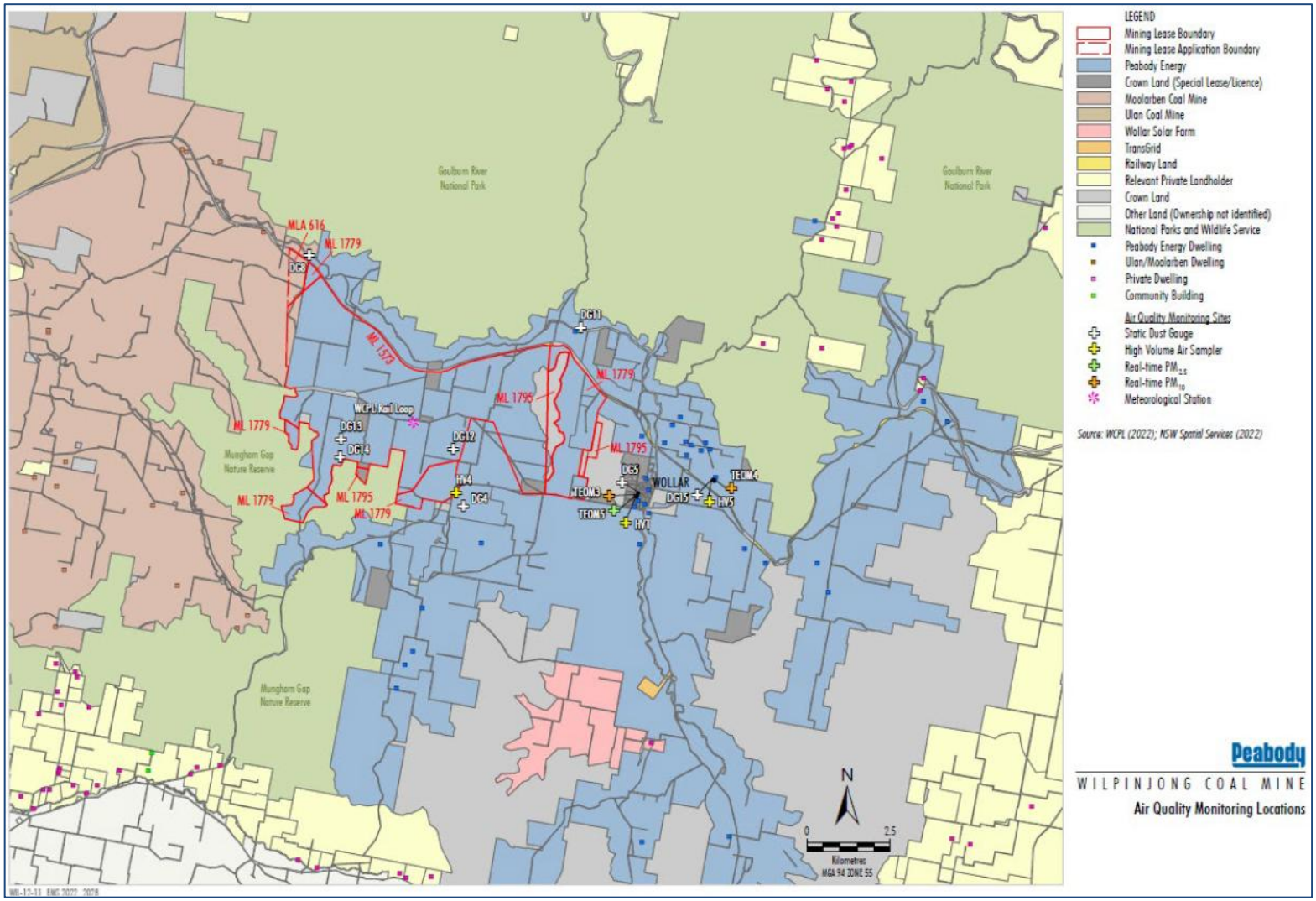

Figure A-1: Property ownership in relation to the air quality monitoring network (Source: Peabody Energy, 2022)

Figure A-2: Property ownership in relation to the air quality monitoring network – Wollar Village (Source: Peabody Energy, 2022)