



WESTERN SYDNEY
UNIVERSITY



Blue Mountains and Lithgow Ambient Air Quality Monitoring

Autumn Report 2020
24 July 2020



Participating Organisations:

Blue Mountains City Council

Blue Mountains Conservation Society

Blue Mountains Union and Community

Doctors for the Environment

Environment Protection Authority

Lithgow Environment Group

Lithgow City Council

Nepean Blue Mountains Local Health District

Department of Planning, Industry and Environment

Western Sydney University

ACRONYMS

Acronym	Meaning
AM	Arithmetic Mean
AQM	Air Quality Monitoring
BMCC	Blue Mountains City Council
BMCS	Blue Mountains Conservations Society
BMUC	Blue Mountains Union and Community
CI95	95% Confidence Interval
CO	Carbon monoxide
DPIE	Department of Planning, Industry and Environment
EPA	Environment Protection Authority
GM	Geometric Mean
KOALA	Knowing Our Local Ambient Air Quality
LCC	Lithgow City Council
NBMLHD	Nepean Blue Mountains Local Health District
NEPM	National Environment Protection Measure
PM	Particulate matter
PM _{2.5}	Particles with a mass median aerodynamic diameter of 2.5µm
PM ₁₀	Particles with a mass median aerodynamic diameter of 10 µm
ppm	Parts per million
pphm	Part per hundred million
QUT	Queensland University of Technology
WSU	Western Sydney University

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1. BACKGROUND

The Blue Mountains and Lithgow Air Watch project is a 12-month community initiated research project supported by the NSW Environment Protection Authority (EPA) and the NSW Department of Planning, Industry and Environment (DPIE, formerly the Office of Environment and Heritage), as well as other local stakeholders.

The purpose of the project is to provide a better picture of air quality in the region and help inform future initiatives to protect air quality. This report presents the autumn findings from, 1st March to 31st May 2020.

2. RESULTS & DISCUSSION

Katoomba Compliance Monitoring Station

The autumn air quality monitoring was undertaken at the Katoomba compliance station between the 1st March and 31st May 2020. During this period, air quality in the region improved in comparison to summer 2019-2020 and complied with the air quality standards for both particulate and gaseous air pollutants. The NSW air quality standards are 50 µg/m³ (24-hour average) for PM₁₀, and 25 µg/m³ (24-hour average) for PM_{2.5} (DPIE, 2020a). Further detail is shown in Appendix A.

Figure 1: Comparison of Daily PM_{2.5} and PM₁₀ Averages from Katoomba Compliance Station, Autumn 2020

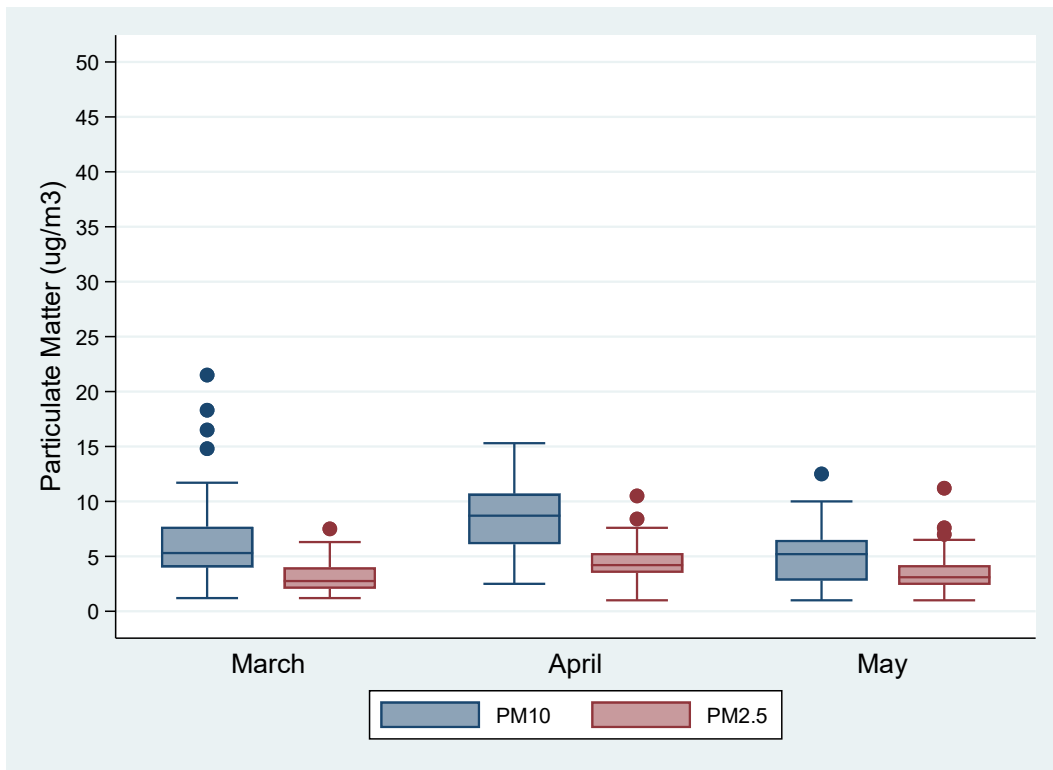
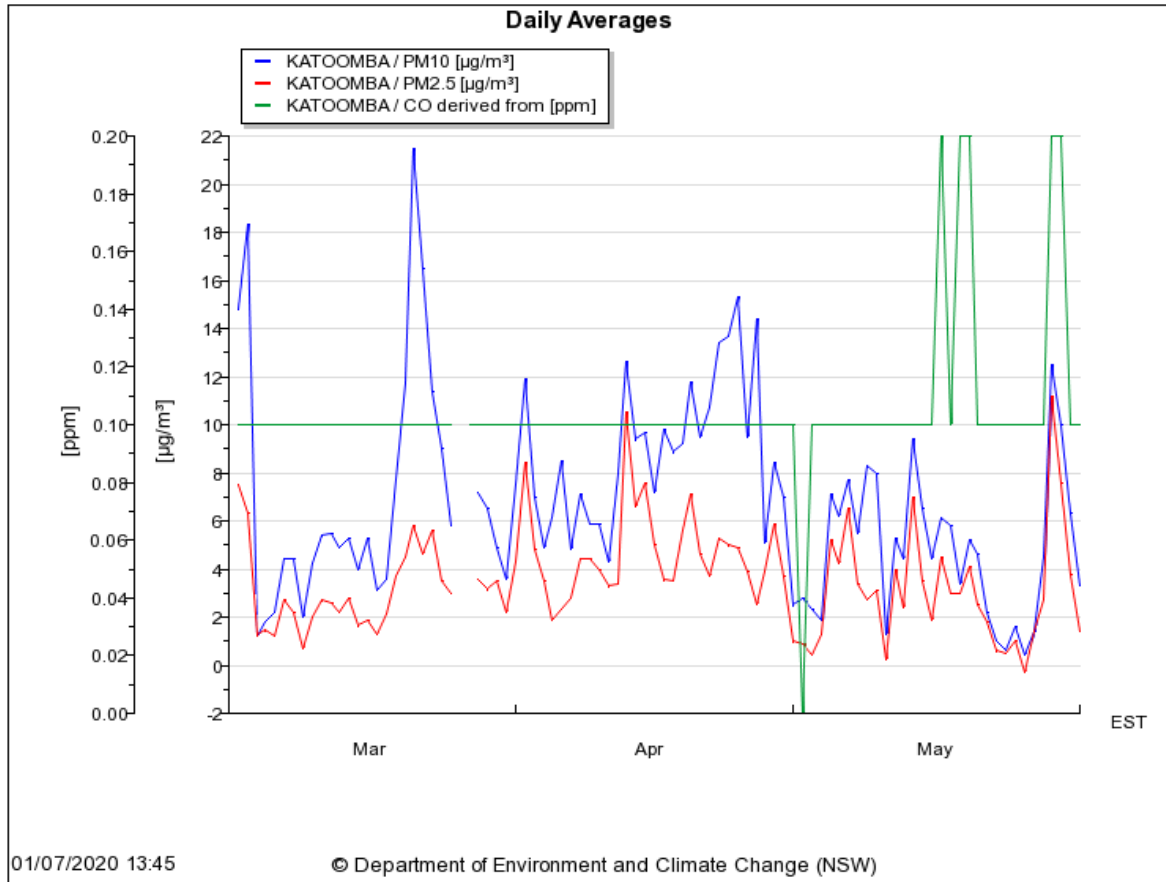


Figure 2: Daily Particulate and Carbon Monoxide Averages for Katoomba Compliance Station, 1st March to 31st May 2020 (DPIE 2020b)



The autumn 2020 carbon monoxide (CO) concentrations were significantly below the NSW air quality standard of 9 ppm (8-hour average). A peak rolling 8-hour average carbon monoxide of 0.3 ppm was recorded on the 29th May 2020 (Appendix 1). The concentrations observed trended with those for winter 2019, where CO ranged between 0.01 ppm and 0.5 ppm (rolling 8-hour average).

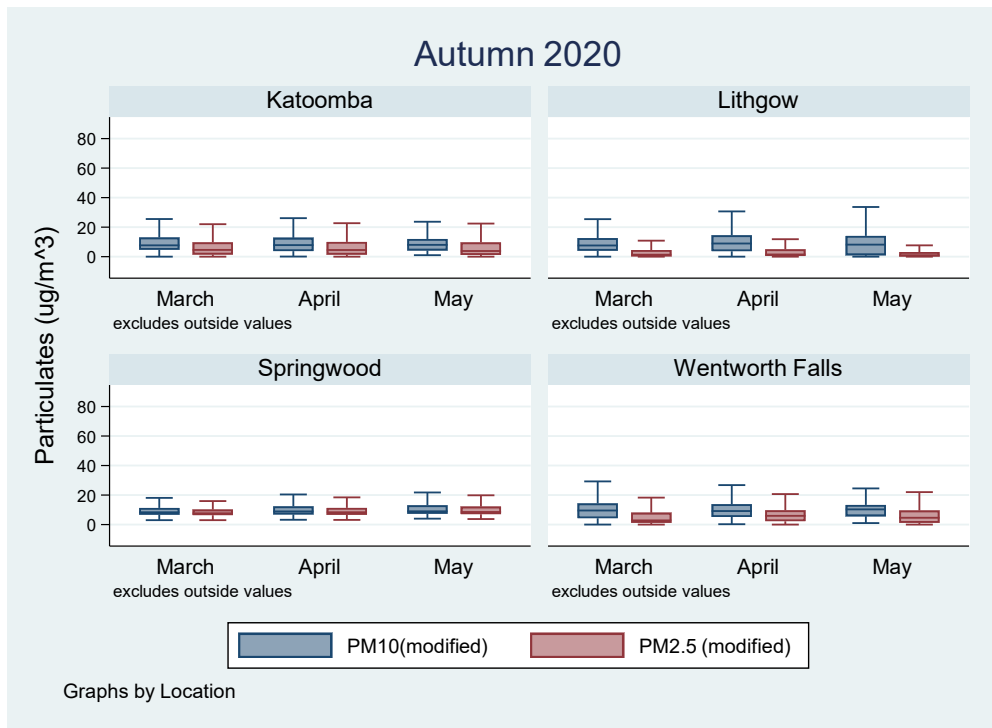
The readings for other air quality indicators including nitrogen oxide (NO), nitrogen dioxide (NO₂), sulphur dioxide (SO₂) and hourly ozone (O₃) were within air quality standards. The results for gas and particulate pollutants can be found in Appendix A.

KOALA Low Cost Sensor Particulate Data

Low cost air quality sensors, known as KOALAs (Knowing Our Ambient Local Air-Quality) are located at Katoomba, Lithgow, Springwood and Wentworth Falls. Similar to the compliance station, hourly airborne concentrations of fine (PM_{2.5}) and coarse (PM₁₀) particulates were significantly lower in autumn 2020 when compared to the summer 2019-2020 bushfire period.

During autumn, hourly particulate concentrations returned to similar concentrations observed during winter and early spring 2019 (Appendix B), with no significant difference in particulates concentrations recorded across all sites.

Figure 3: Comparison of Monthly Particulate Concentrations by Township, 1st March to 31st May 2020

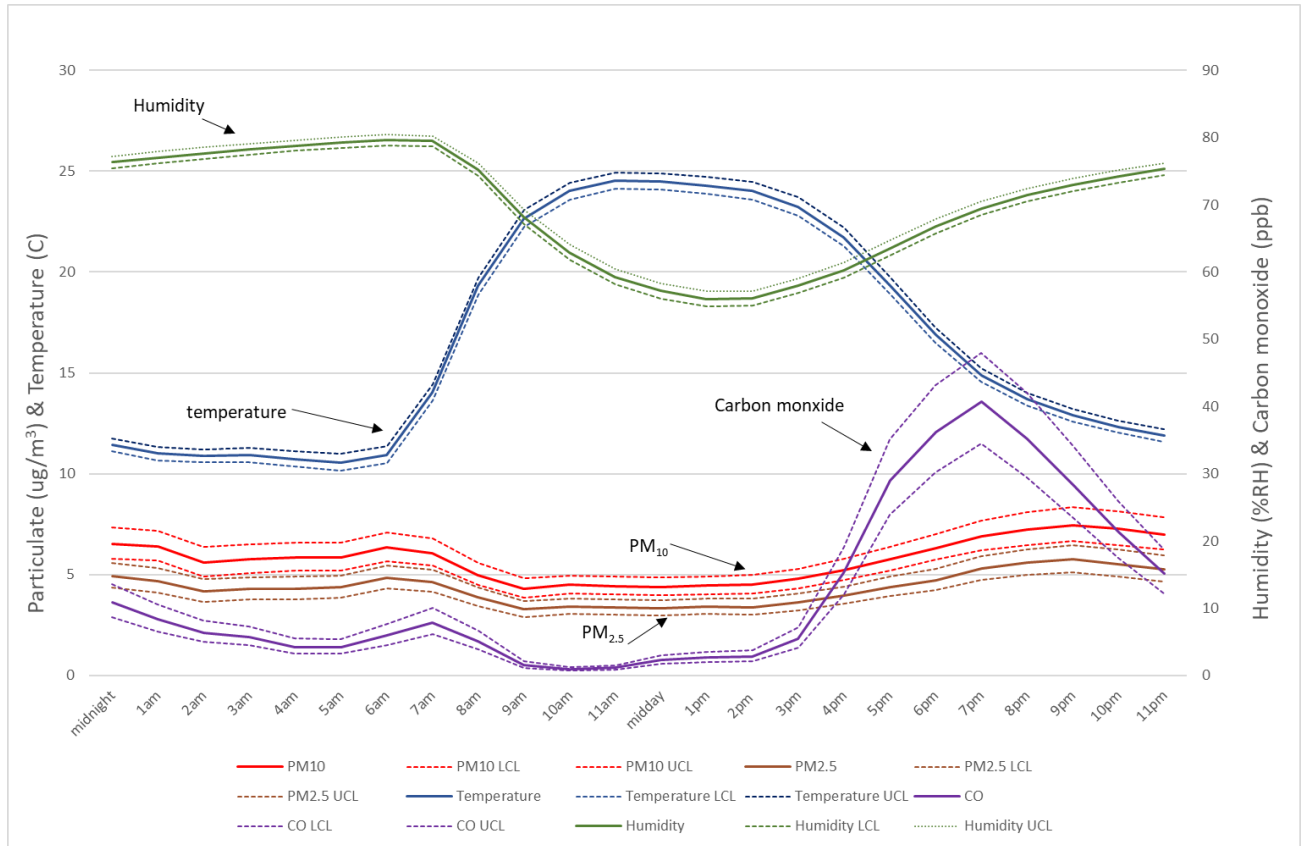


The KOALA at Wentworth Falls Pots malfunctioned during the autumn period, with no data available between the 1st and 13th March 2020. The KOALA at Dillinger’s Nursery Wentworth Falls was replaced in late March 2020 due to insect infestation and sensor malfunction.

The PM₁₀ and PM_{2.5} data was modified by transforming any measurement over 500 µg/m³ to a maximum value of 500 µg/m³, the upper limit of detection for the KOALAs. This was required because although the sensor may have recorded higher values during pollution events, they exceeded the upper limit of detection of the instrument. Therefore, the reading is considered out of range.

Similar to winter and spring 2019, a bimodal peak is evident when observing hourly carbon monoxide measurement across all sites for Autumn 2020 (Figure 4), albeit less pronounced in comparison to the winter 2019 peak (Appendix C). The first small peak occurs around 7am, which a much larger peak in the evening around 7pm. Further observation across all seasonal periods will be needed to investigate the potential sources associated with these peaks.

Figure 4: Hourly Fluctuations in PM₁₀, PM_{2.5} and CO averaged across all KOALAs for 1st March to 31st May 2020

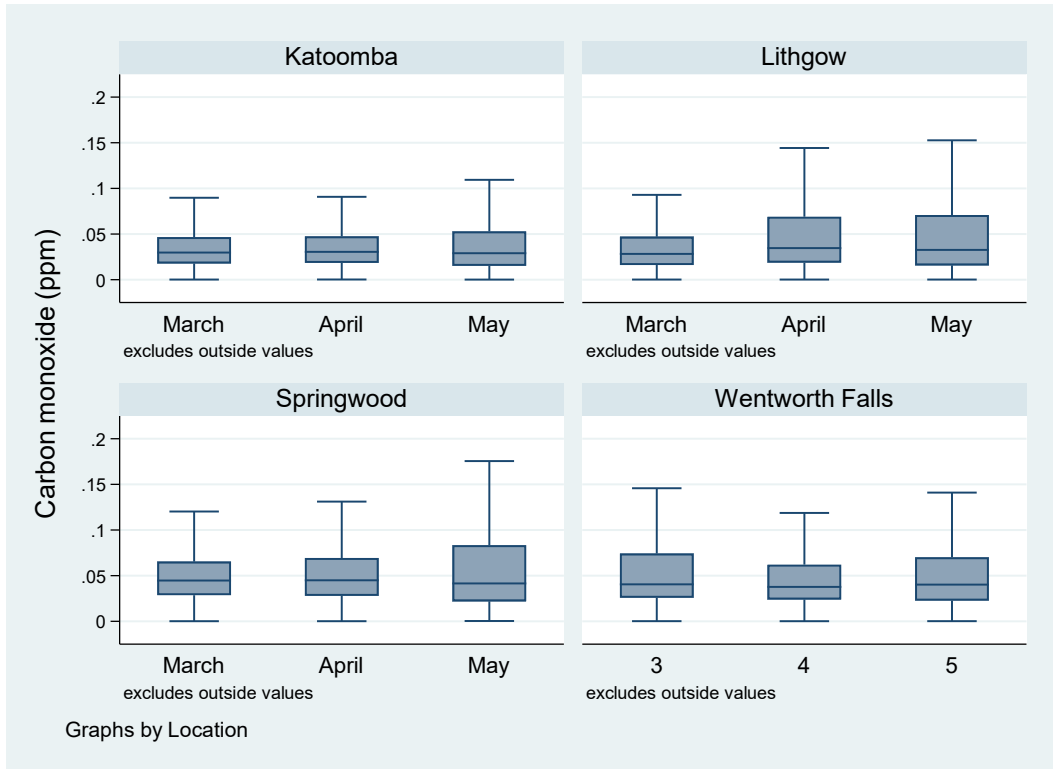


Please note that the data presented has not been adjusted for the effects of sensor variability, temperature or humidity.

KOALA Low-cost Sensor Carbon Monoxide Data

The hourly CO concentrations for autumn 2020 were very low and at the limit of detection for the sensors (Figure 5), returning to similar concentrations observed during winter and spring 2019. Minor increases in CO were observed for May 2020 in Springwood, and for April and May 2020 in Lithgow. Outside values, also referred to as outliers, have been omitted to improve legibility of the graph.

Figure 5: Comparison of Hourly Carbon Monoxide Readings Location and Month, 1st March to 31st May 2020.



3. INTERIM FINDINGS

Air quality in the Blue Mountains and Lithgow improved significantly during the autumn 2020 period with concentrations of gaseous and particulate air pollutants returning to similar concentrations and trends observed during winter and early spring 2019.

4. REFERENCES

DPIE (2020a). Standards and goals for measuring air pollution, NSW Government. Available: <https://www.environment.nsw.gov.au/topics/air/understanding-air-quality-data/standards-and-goals>

DPIE (2020b). Air Quality Data Services. NSW Government. Available: <https://www.dpie.nsw.gov.au/air-quality/air-quality-data-services>

Appendix A: DPIE Compliance Station Results – Autumn 2020

Table A1: Comparison of Air Quality Data for the Katoomba DPIE Compliance Station, Autumn 2020,

Station	PM ₁₀ 24 hour average (µg/m ³)	PM _{2.5} 24 hour average (µg/m ³)	CO 8 hour rolling average (ppm)	NO 1 hour average (pphm)	NO ₂ 1 hour average (pphm) *	O ₃ 1 hour average (pphm)	SO ₂ 1 hour average (pphm) *
Katoomba							
<i>March</i>							
Average (median) n=	7.0 (5.3) n=29	3.1 (2.7) n=29	0.11 (0.10) n=730	0.04 (0) n=675	0.16 (0.10) n=675	2.1 (1.9) n=652	0.01 (0) n=675
Geometric mean (GSD n=)	5.6 (2.0) n=29	2.7 (1.7) n=29	0.11 (1.2) n=730	NA [^]	0.16 (1.9) n=533	2.0 (1.4) 652	NA [^]
Minimum to maximum	1.2-21.5	0.7 – 7.5	<0.10-0.20	0-0.7	0-1.7	0.5-4.8	0-0.6
% above guideline	0%	0%	0%	-	0%	0%	0%
<i>April</i>							
Average (median) n=	8.7 (8.5) n=31	4.6 (4.2) n=30	0.11 (0.10) n=712	0.02 (0) n=672	0.12 (0.10) n=672	2.4 (2.4) n=686	0.03 (0) n=672
Geometric mean (GSD n=)	8.1 (1.5) n=31	4.2 (1.6) n=30	0.11 (1.2) n=693	NA [^]	0.18 (1.9) n=348	2.4 (1.2) n=686	NA [^]
Minimum to maximum	2.5-15.3	1.0-10.5	<0.10-0.20	0-0.5	0-3.0	0.4-4.0	0-2.5
% above guideline	0%	0%	0%	-	0%	0%	0%
<i>May</i>							
Average (median) n=	4.8 (4.6) n=31	3.2 (2.9) n=30	0.11 (0.10) n=744	0.04 (0) n=711	0.16 (0.10) n=712	2.2 (2.3) n=666	0.02 (0) n=712
Geometric mean (GSD n=)	3.7 (2.3) n=31	2.3 (2.5) n=30	0.12 (1.3) n=713	NA [^]	0.18 (2.0) n=481	2.2 (1.9) n=666	NA [^]
Minimum to maximum	0.4-12.5	0.2-11.2	<0.10-0.30	0-0.3	0-1.9	0.4-3.1	0-1.9
% above guideline	0%	0%	0%	-	0%	0%	0%
NSW Air Quality Standard	50 (µg/m ³)	25 (µg/m ³)	9 (ppm)	-	0.12 (ppm)	10.0 (pphm)*	0.20 (ppm)

* to convert to ppm divide by 100

[^]too many null values to calculate geometric mean (GSD)

Appendix B: KOALA Particulate Data Box Plots (Winter 2019 – Summer 2019-2020)

Figure B1: Koala Particulate Data Box Plots Winter 2019

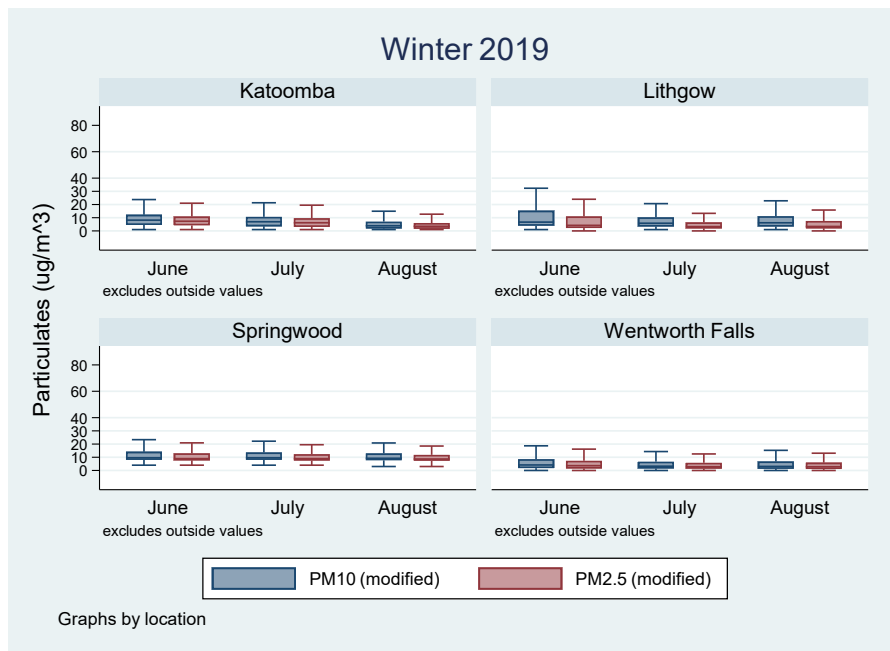


Figure B2: Koala Particulate Data Box Plots Spring 2019

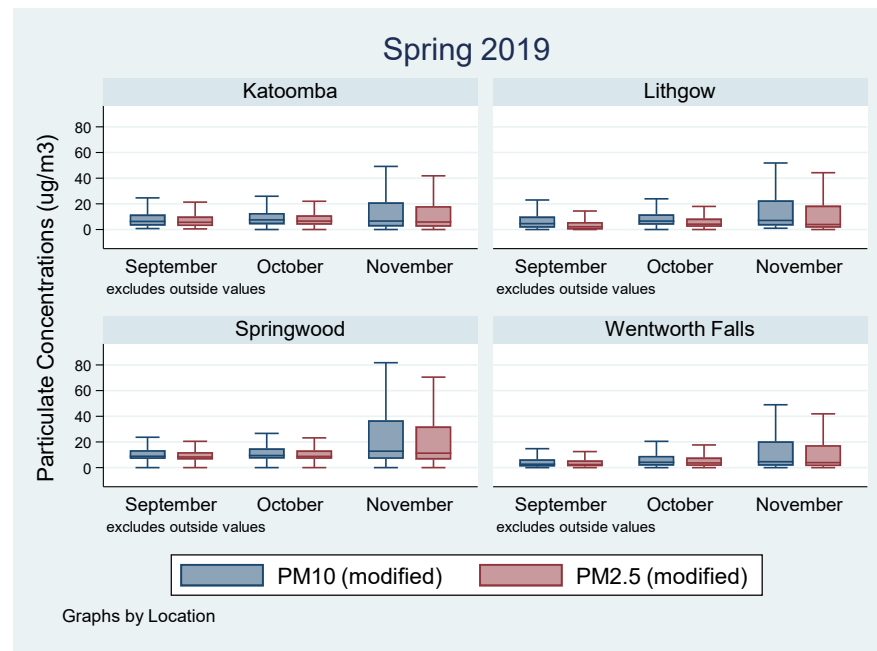
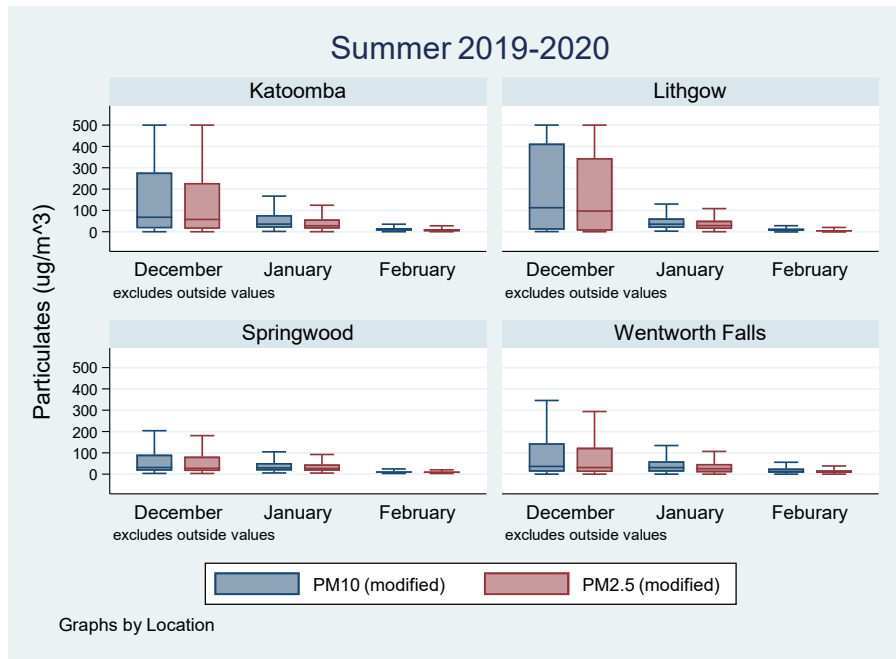


Figure B3: Koala Particulate Data Box Plots Summer 2019-2020



Appendix C: KOALA Hourly Fluctuations for PM₁₀, PM_{2.5} and CO averaged across all site. (Winter 2019 – Summer 2020)

Figure C1: KOALA Hourly Fluctuations for PM₁₀, PM_{2.5} and CO averaged across all site Winter 2019

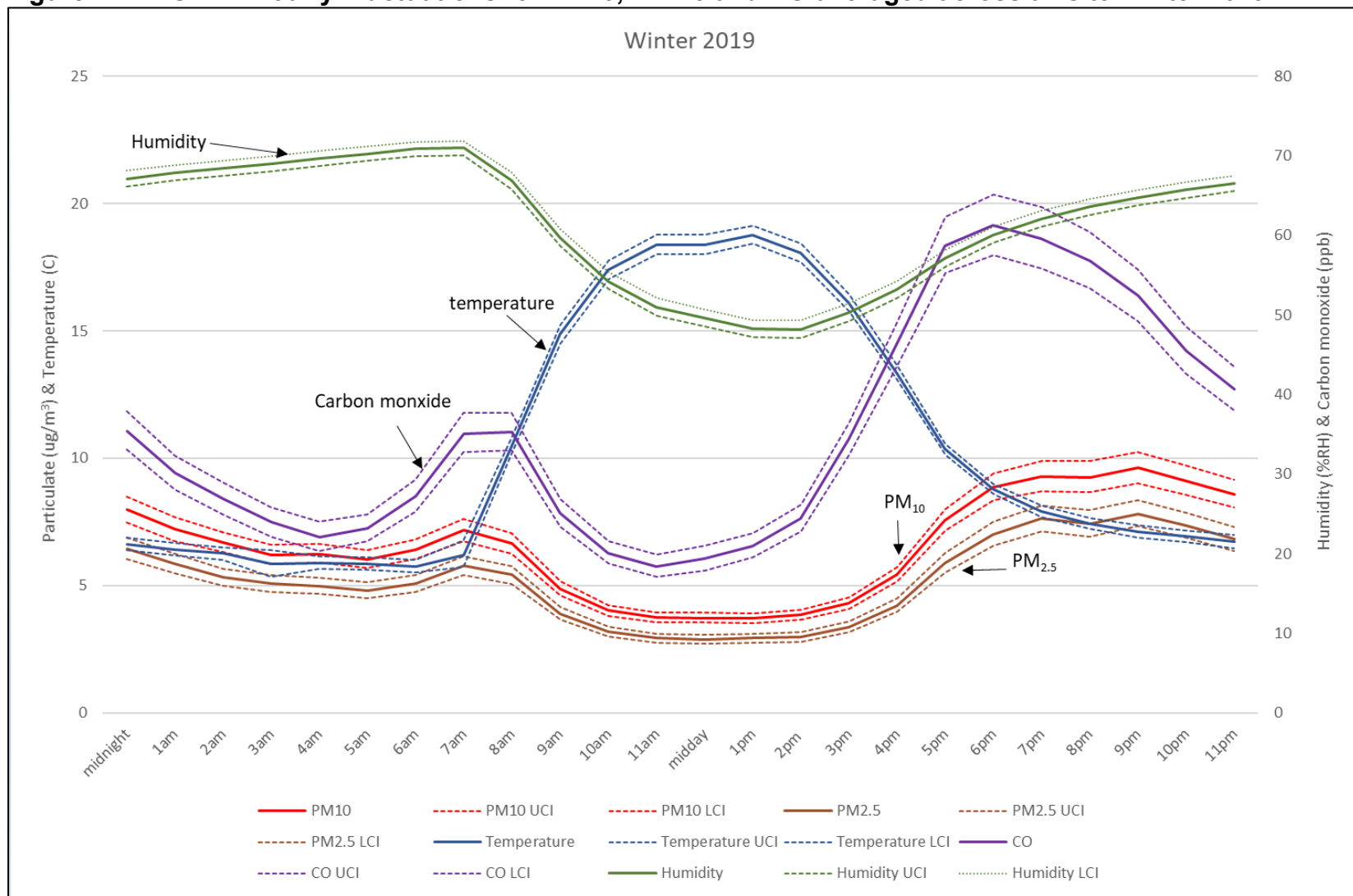


Figure C2: KOALA Hourly Fluctuations for PM10, PM2.5 and CO averaged across all site Spring 2019

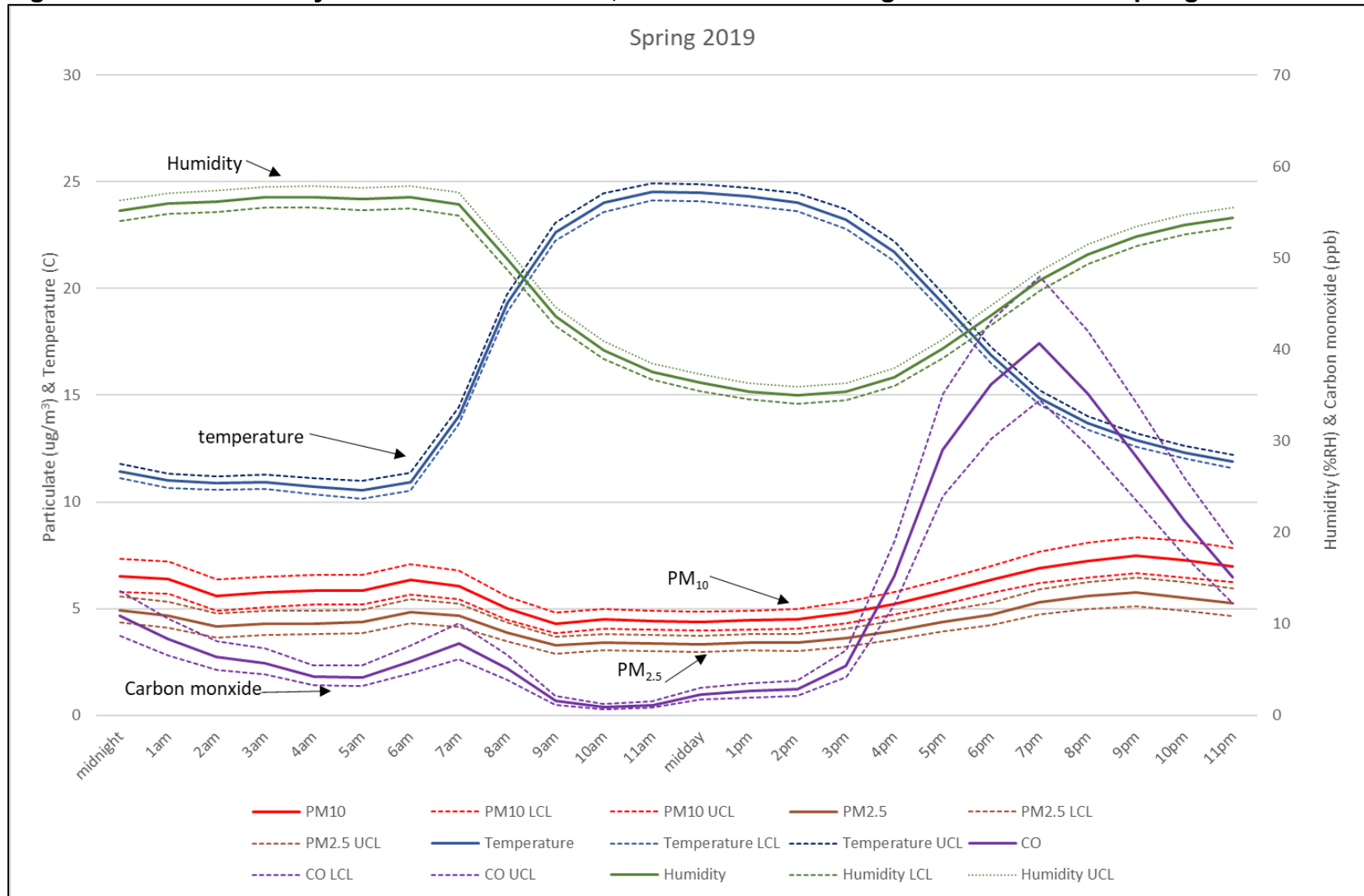


Figure C3: KOALA Hourly Fluctuations for PM10, PM2.5 and CO averaged across all site Summer 2019-2020

