UPPER HUNTER MINING DIALOGUE

Upper Hunter Mining Dialogue

WEBINAR SERIES

MONITORING AIR QUALITY IN THE UPPER HUNTER AND THE 2024 UHMD AIR QUALITY REPORT

10 APRIL 2025

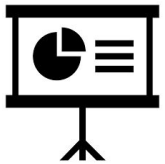
HOUSEKEEPING

Please keep your microphone muted and your camera off

The session is being recorded and will be uploaded on the Dialogue website

If you have any questions please type them into the chat function in Zoom.

Any questions that are not answered will be responded to following the session.



The presentation will be emailed out to all attendees after the session

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Upper Hunter Mining Dialogue

UPPER HUNTER MINING DIALOGUE

- Established in 2011 in response to increasing community concern about the cumulative impacts of mining
- Provides an opportunity for stakeholders to engage in meaningful and respectful discussions on important issues
- Provides a reliable source of information that builds trust between the mining industry and community
- Contribution to a healthy living environment and sustainable community in the Upper Hunter

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THE DIALOGUES 2025 KEY PRIORITIES

1. **ADDITIONAL ENGAGEMENT OPPORTUNITIES WITH THE COMMUNITY**
   Enhance community engagement on mining related issues through establishing a webinar series with presentations from subject matter experts.

2. **CONTINUED TRANSPARENT REPORTING OF ENVIRONMENTAL PROJECTS**
   Continue delivery of long term environmental projects including air quality monitoring, rehabilitation progress and water usage, to provide transparent data and accessible reporting to the community.

3. **POST MINING LAND USE CONSTRAINTS AND OPPORTUNITIES**
   Engage with stakeholders to identify the opportunities and constraints of post mining land use including hosting a field day for interested stakeholders.

4. **CONTINUED ENGAGEMENT ON IMPACTS AND BENEFITS OF MINING LOCALLY**
   Continue to engage with stakeholders on the local impacts and benefits of mining, including delivery of the School Mine Tours Program.

5. **ESTABLISH AND SUPPORT A YOUTH VOICE FOR THE DIALOGUE**
   Ensure that the voices and opinions of young people in the Upper Hunter are effectively represented in the Dialogue. Support the establishment of the Youth Advisory Group to begin integration of youth voices in the Dialogue working groups.

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Russ Francis

SENIOR CONSULTANT

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Overview of the webinar

- Introduction to air quality
- Air quality monitoring basics
- History of air quality monitoring in the Upper Hunter
- Historical context for the annual air quality review
- Summary of findings from the 2024 annual review – including the inclusion of 24-hour exceedance data

Introduction to air quality

Introduction to air quality

Air quality is…

A measure of the cleanliness of the surrounding air

Air pollution is

The build up of substances in air, in sufficient concentrations to cause measurable effects on humans, animals and vegetation

The atmosphere is a mixture of gases and particles emitted from both anthropogenic (human-generated) and natural (non-human) sources

Meteorology and dispersion

The quality of the air we breathe is dependent on:

- the **rate** that pollutants are emitted into the atmosphere
- the ability of the atmosphere to **disperse** these pollutants.

The movement and **dispersion** of air pollutants is dependent on:

- **wind, temperature, turbulence**
- changes in these elements caused by local topography.

Emission sources

Anthropogenic

Natural

Emission / concentration / exposure

Emission – is the release of a pollutant from a source

Concentration – is the amount of pollutant in the air

Exposure – is the concentration experienced at a receptor over time

Typical pollutants of concern

- Particulate matter (PM10 and PM2.5)
- Nitrogen dioxide (NO2)
- Sulfur dioxide (SO2)
- Carbon monoxide (CO)
- Ozone (O3)

Particulates – PM_{10} and $PM_{2.5}$

Particulate matter sources in the UH

- Coal mining
- Coal-fired power stations
- Domestic wood heating
- Agriculture
- Motor vehicles
- Non-road diesel equipment
- Planned burning and bushfires

High concentration scenarios (1)

- Prolonged periods of hot and dry conditions (drought)
- Build up of pollutants from multiple sources
- Windy conditions

High concentration scenarios (2)

- Cold mornings with very stable air
- Woodsmoke from domestic heating in population centres
- Temperature inversions trapping pollutants

Air quality monitoring basics

Air quality monitoring

Measuring air quality can help to identify causes, impacts and develop solutions to reduce it or regulate it.

To be able to manage air pollution it is necessary to understand the actual concentration of pollutants in the air.

Air quality monitoring network

The NSW Government operates an extensive ambient air quality monitoring network split across the following regions:

- Greater Sydney Metropolitan Region
- Upper Hunter
- Lower Hunter and the Central Coast
- Illawarra
- Regional and rural NSW

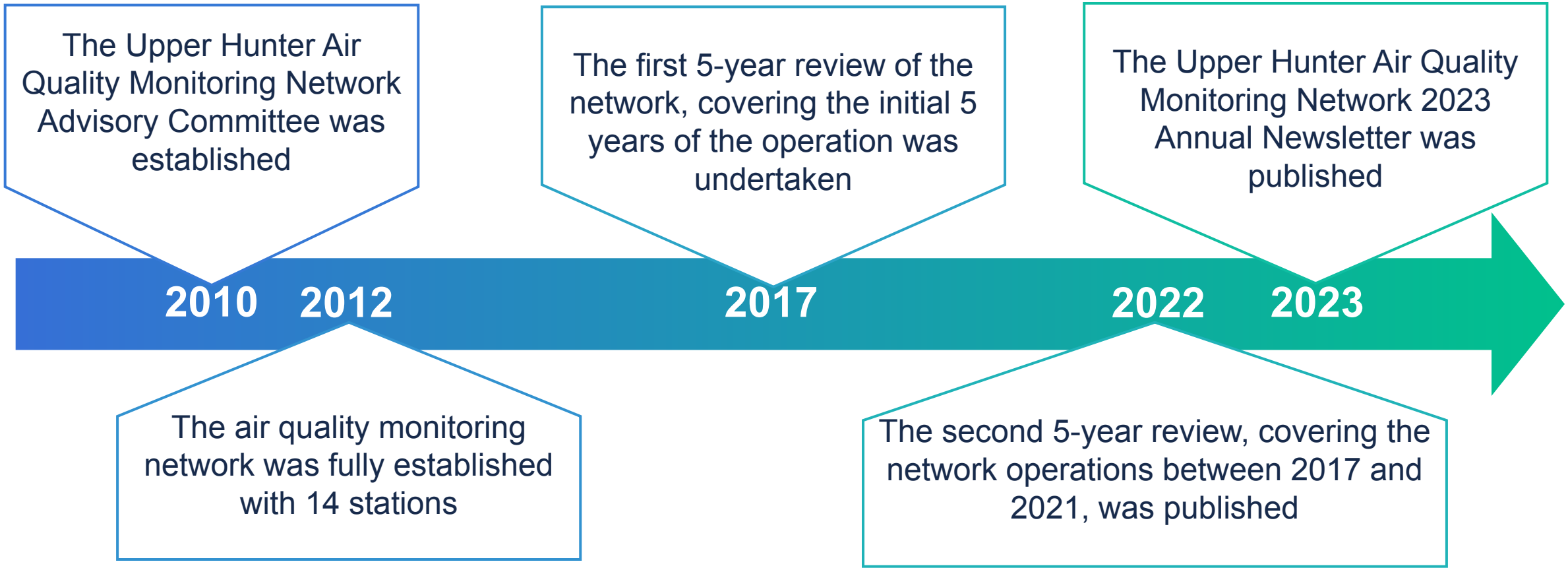
Air quality monitoring station

A typical monitoring station can include:

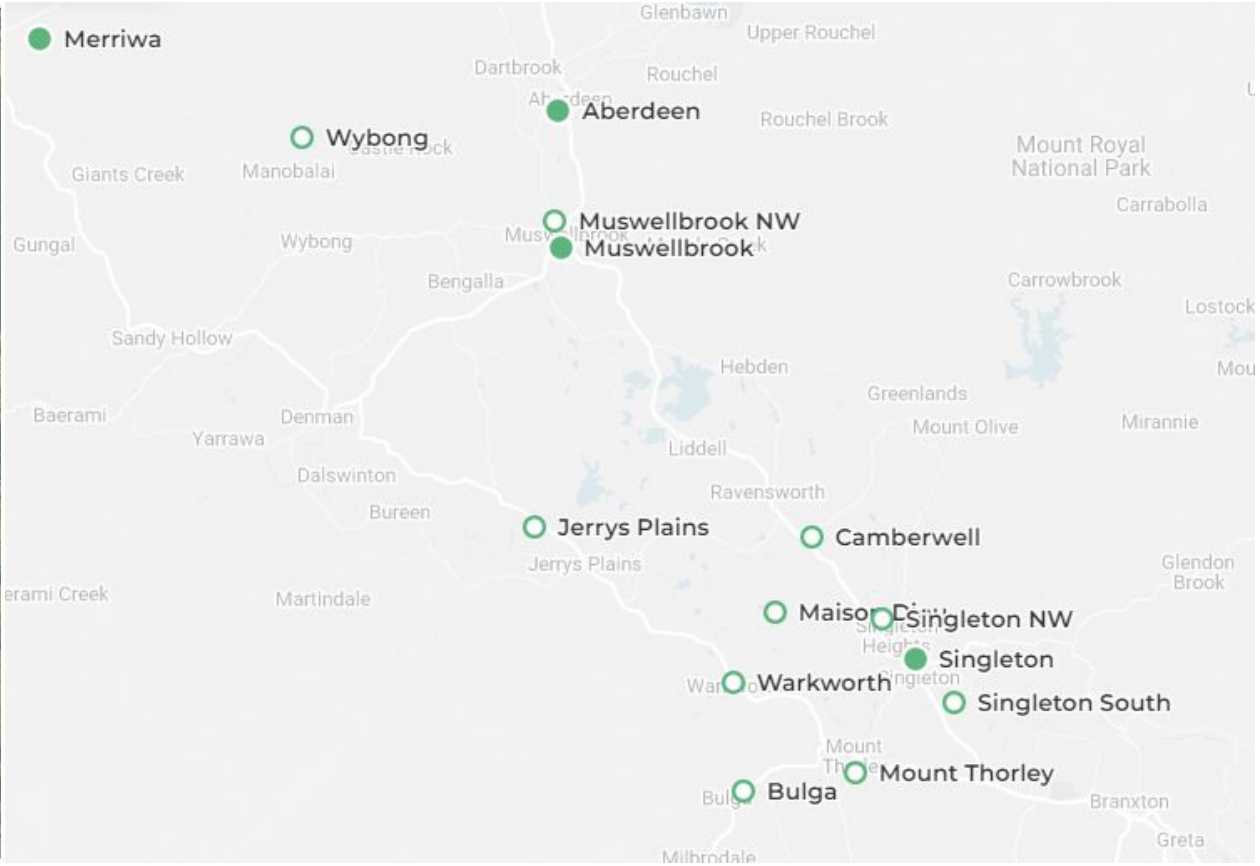
- Particulate matter (PM10 and PM2.5)
- Nitrogen dioxide (NO2)
- Sulfur dioxide (SO2)
- Carbon monoxide (CO)
- Ozone (O3)
- Meteorological monitoring of wind speed, wind direction, temperature and humidity

History of air quality (AQ) monitoring in the Upper Hunter (UH)

Timeline - AQ monitoring in the UH



Monitoring stations in the UH



Monitoring stations in the UH

Station groupings

Station groupings

Station type	Purpose	Stations
Larger populations	Monitoring air quality in the larger population centre	- Muswellbrook - Singleton - Aberdeen
Smaller communities	Monitoring air quality in the smaller communities	- Bulga - Camberwell - Jerrys Plains - Maison Dieu - Warkworth - Wybong
Diagnostic	Providing data that can help to diagnose the likely sources and movement of particles across the region as a whole; they do not provide information about air quality at population centres	- Mount Thorley - Muswellbrook NW - Singleton NW
Background	Provide background data; located at both ends of the valley they measure the quality of air entering and leaving the Upper Hunter Valley under predominant winds (south-easterlies and north-westerlies)	- Merriwa - Singleton South

Historical context for the annual air quality review

Timeline - Historical context

2018 – present

November 2018 – The Dialogue hosted their annual forum event. Requests to provide guidance to the Upper Hunter community on how to better understand and interpret air quality data.

November 2020 – Air Quality Monitoring Data Analysis Project

December 2021 – Annual review for 2020

July 2023 – Annual review for 2021 and 2022

April 2024 – Annual review for 2023

October 2024 – Presentation at Community Forum with preliminary 2024 results

February 2025 – Annual review for 2024

Historical context – 2020

The Dialogue was seeking an analysis and interpretation of existing air quality monitoring network data, and the analysis was designed to answer two specific AQ questions:

1. Has the air quality in the UH changed since monitoring began?
2. Is the air quality in the UH measured at the monitoring stations different from air quality measured at other locations in NSW?

Historical context – 2020

The intent of this project was to provide:

- Accurate information to UH stakeholders about the air quality they are experiencing in easily understood terms
- Clarity and certainty to the UH air quality debate through an assessment and comparison of air quality measured at the Upper Hunter Monitoring Network to the air quality measured at other NSW regions

Historical context – 2021 onwards

The Annual Reviews have been conducted each year by Zephyr Environmental and continue to review and consider the questions posed in the original 2020 review.

Zephyr personnel have presented at two community forums, presenting the results form the Annual Reviews.

This year added in an analysis of 24-hour exceedance days.

Findings from the 2024 annual review

Annual and period average results

The aims here are to:

- Compare 2024 annual data with the ‘all years average’ data
- Compare UH with the rest of NSW
- Compare between the four UH station groupings

Annual and period average PM_{10}

Region / Group	Year												All years
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	
Central tablelands	15.1	14.6	13.4	13.3	14.1	18.8	27.4	17.0	11.4	8.7	12.5	12.6	14.9
Illawarra	16.9	17.1	16.2	17.4	18.0	20.1	22.5	19.1	15.3	13.2	16.9	18.2	17.6
Lower Hunter & Central Coast	20.2	18.2	21.7	22.0	22.9	25.2	29.1	22.3	19.2	17.6	20.9	20.9	21.7
North-west slopes	16.6	15.8	14.1	15.3	15.3	20.1	33.7	16.8	12.7	10.6	15.1	13.3	16.6
South-west slopes	10.0	18.3	17.3	17.9	18.2	23.6	29.4	21.7	16.0	12.4	15.5	19.5	18.3
Sydney east	17.9	17.3	16.8	17.2	18.3	20.2	23.6	19.2	15.9	13.5	16.1	17.0	17.7
Sydney north-west	17.5	16.6	15.1	17.0	17.0	20.3	24.9	18.7	15.7	11.9	17.8	16.3	17.4
Sydney south-west	16.3	16.0	14.8	15.6	16.1	18.9	23.3	17.2	13.8	11.1	15.2	15.3	16.1
UHAQMN - BG	17.6	16.8	15.1	15.8	16.8	21.1	29.3	19.0	14.1	12.6	16.8	16.0	17.6
UHAQMN - DG	23.2	21.1	19.1	20.4	22.2	29.0	34.9	21.7	16.7	14.6	21.9	19.2	22.0
UHAQMN - LP	21.1	20.1	17.9	18.0	20.0	24.5	31.3	20.3	16.2	14.5	18.8	17.1	20.0
UHAQMN - SC	21.4	20.1	17.7	18.6	20.7	25.4	33.4	21.2	16.4	14.2	21.3	19.6	20.8

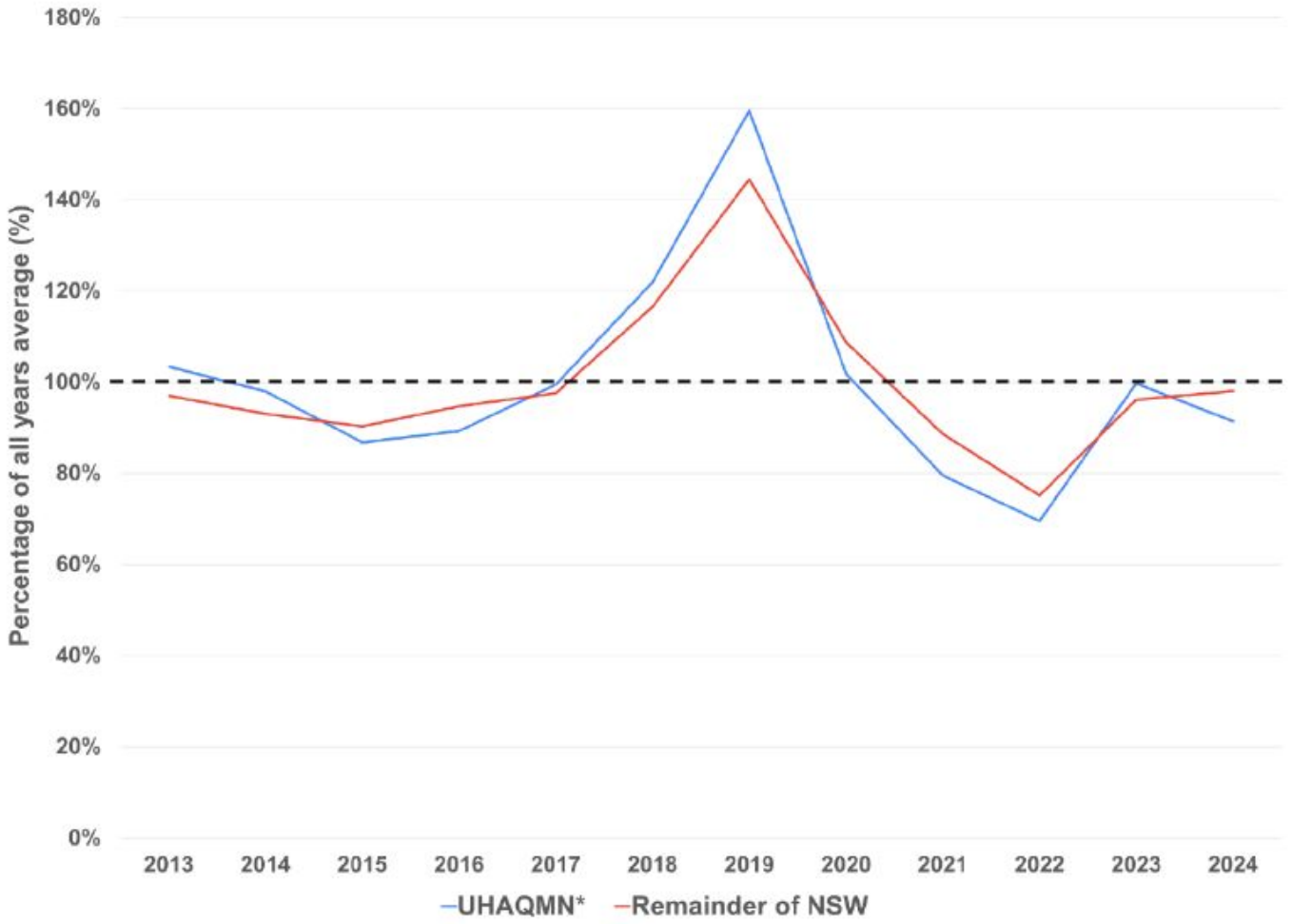
Note: UHAQMN – upper hunter air quality monitoring network, BG - background, DG – diagnostic, LP – larger populations, SC – smaller communities

Colour Coding by Percentile

0% (min.)	10%	20%	30%	40%	50% (median)	60%	70%	80%	90%	100% (max.)

Note: colour coding is applied to annual data by region (horizontally), whereas 'All years' colour coding is applied vertically, to allow comparison of data between regions.

PM_{10} variability



Annual and period average $PM_{2.5}$

Region / Group	Year												All years
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	
Illawarra	7.7	7.0	7.0	7.3	6.9	7.1	11.1	7.2	5.3	4.3	5.3	5.7	6.8
Lower Hunter & Central Coast	7.5	7.0	7.5	7.8	7.7	8.2	17.3	7.6	6.3	5.5	6.8	6.5	8.0
South-west slopes	7.9	7.5	7.6	7.4	8.1	8.4	11.3	10.9	6.3	5.3	6.6	7.4	7.9
Sydney east	8.2	8.4	8.3	8.1	8.4	8.2	16.5	8.0	6.9	5.2	7.1	6.6	8.3
Sydney north-west	8.3	6.7	8.0	8.3	7.4	8.3	20.5	8.2	6.9	5.1	7.1	6.9	8.5
Sydney south-west	8.0	7.5	7.4	7.6	7.8	8.7	18.9	7.9	7.0	5.0	6.8	6.1	8.2
UHAQMN - LP	8.7	8.8	8.2	8.2	8.8	8.8	18.0	8.9	6.8	5.7	7.1	7.3	8.8
UHAQMN - SC	8.2	7.8	7.2	7.5	7.4	8.4	17.3	7.5	5.7	4.8	6.1	5.9	7.8

Note: UHAQMN – upper hunter air quality monitoring network, LP – larger populations, SC – smaller communities

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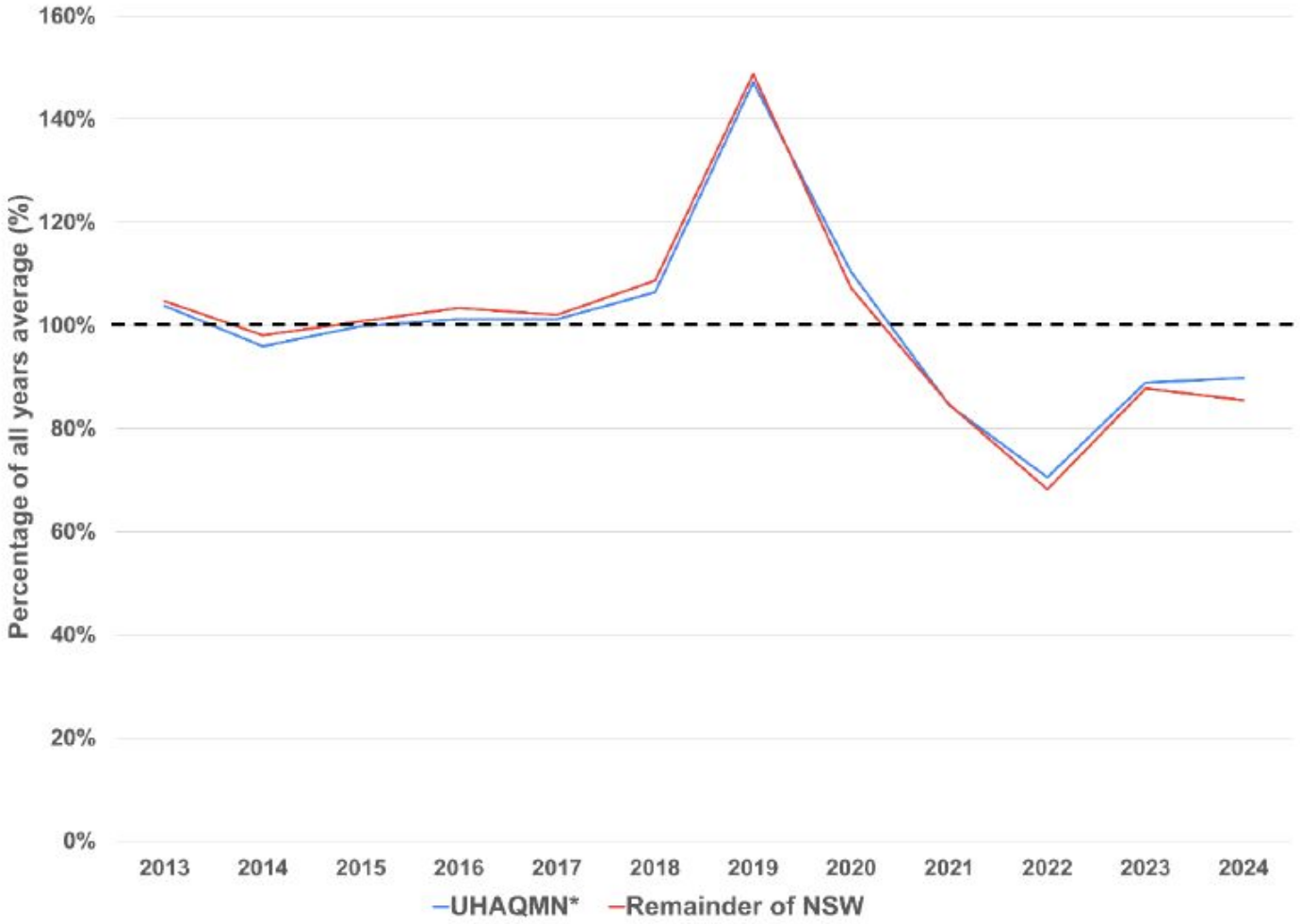
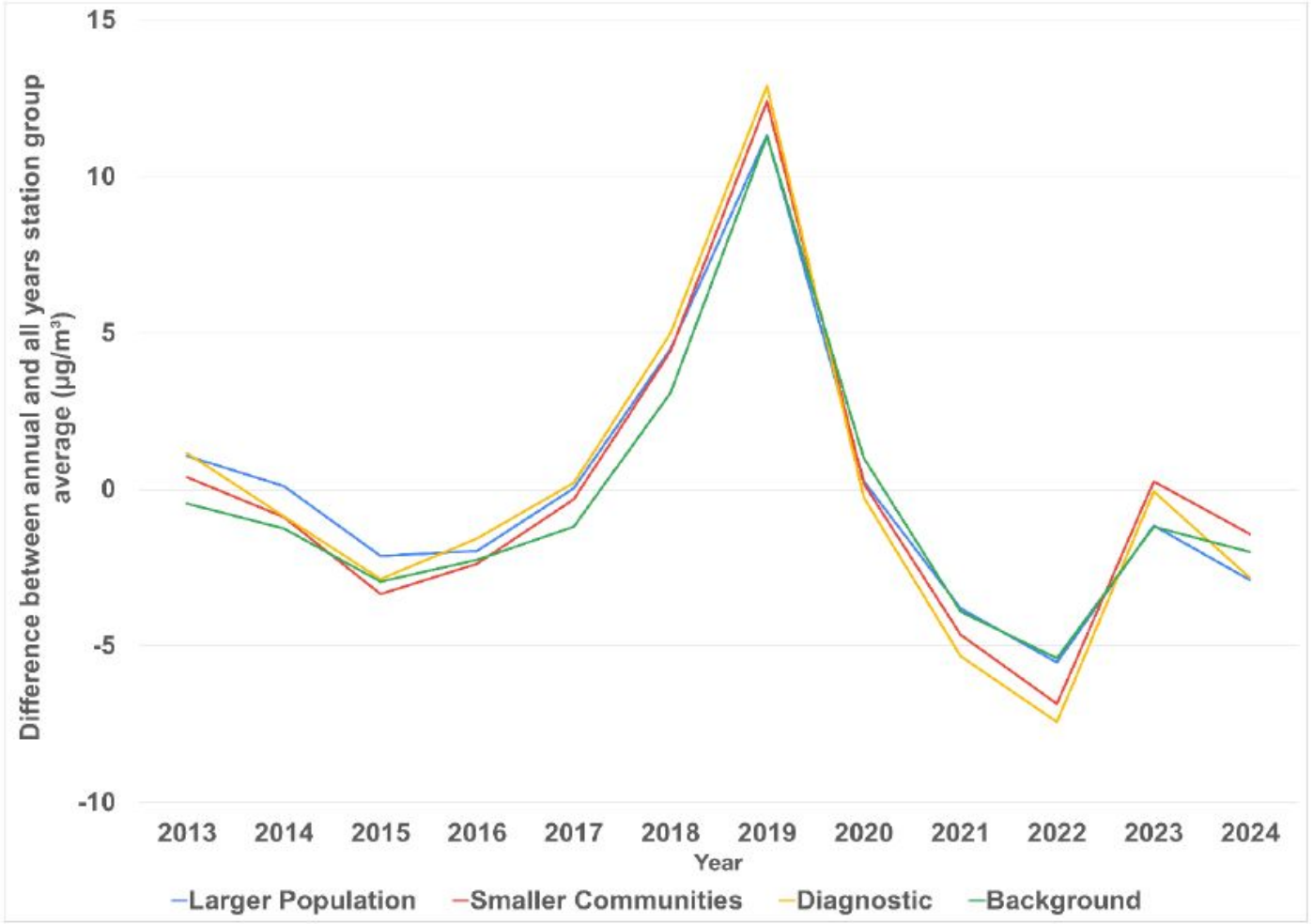
$PM_{2.5}$ variability



Comparison of trends

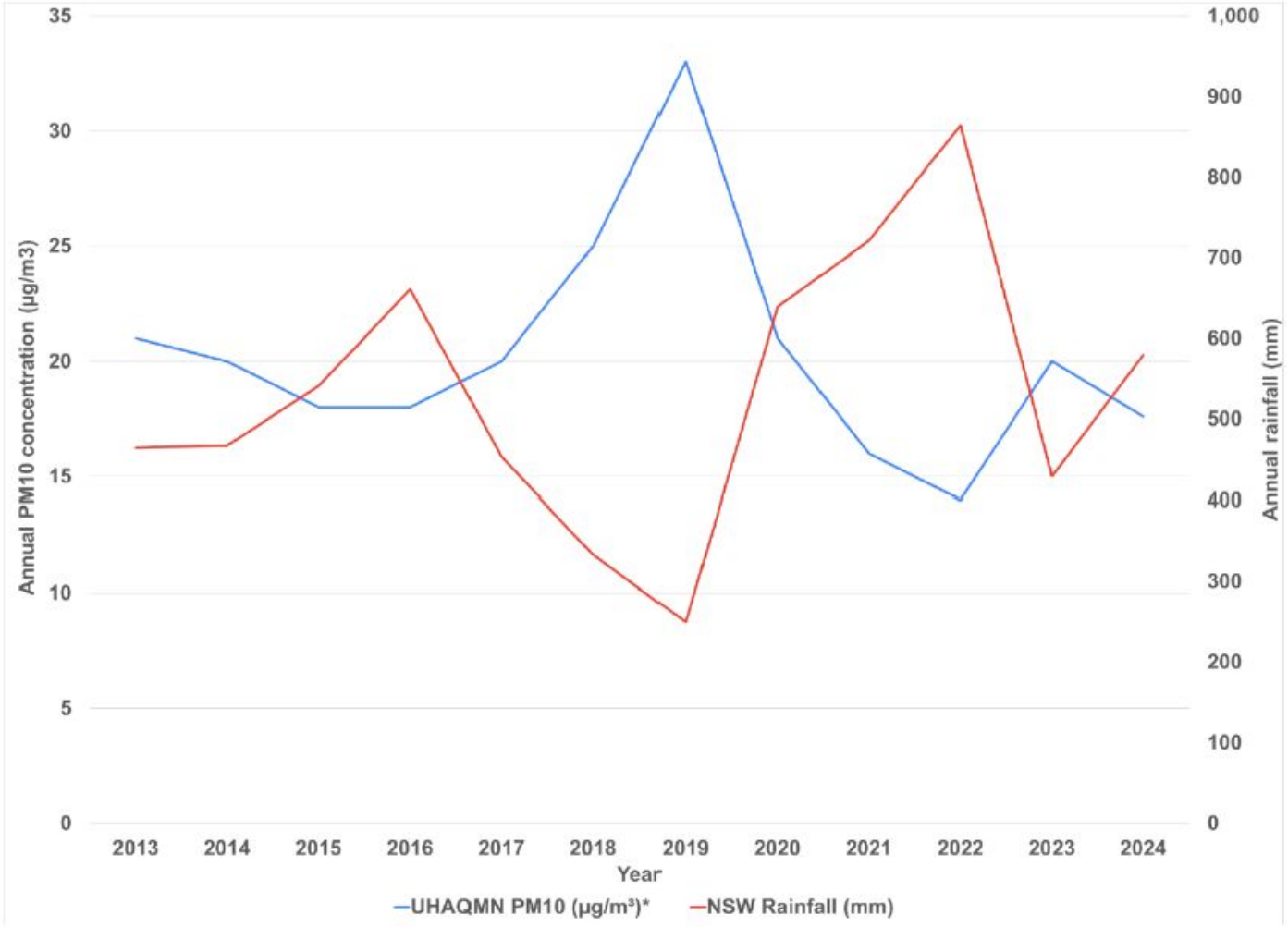


Meteorology / coal production

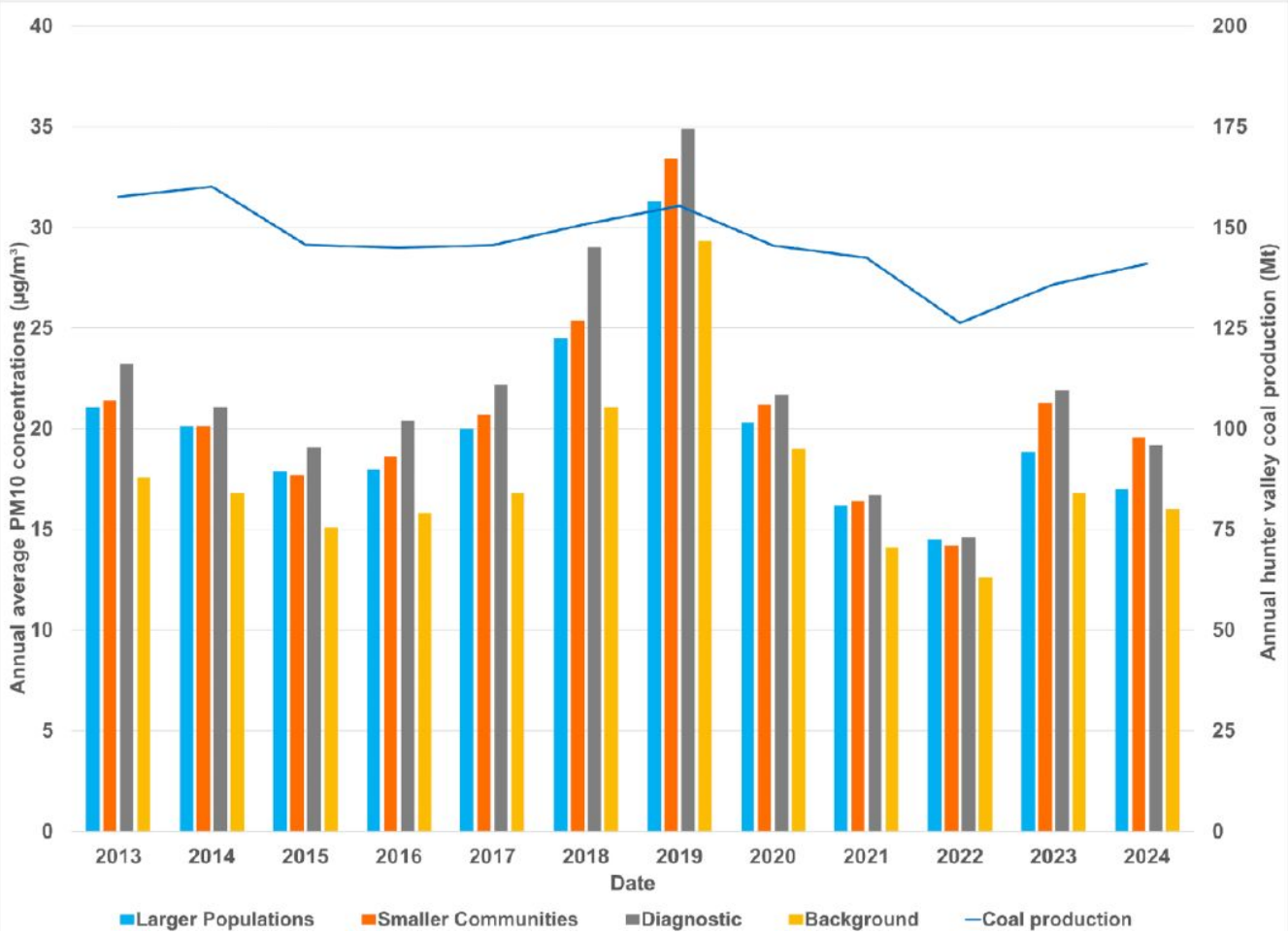
The aims here are to:

- Compare annual rainfall data with annual average PM10 concentrations
- Compare annual Hunter Valley coal production with annual average PM10 concentrations

Rainfall vs PM_{10} concentrations



Hunter Valley coal production vs UH annual average PM_{10} concentrations



Exceedance days

The 2024 annual review returned to reviewing total exceedance days across the UH and the rest of NSW.

This has been completed to understand the short-term peaks in PM10, where these are located and the frequency that these are above NSW EPA criteria.

PM10 exceedance data

Region / Group	Year												All years
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	
Central tablelands	3	0	2	0	0	8	40	14	0	0	2	0	6
Illawarra	4	0	0	2	2	6	17	13	0	0	3	1	4
Lower Hunter & Central Coast	3	1	12	9	11	20	39	14	4	5	8	7	11
North-west slopes	0	1	1	1	2	9	52	8	0	0	0	0	6
South-west slopes	9	10	5	9	5	21	44	22	4	0	1	5	11
Sydney east	3	0	1	1	1	5	19	8	0	0	1	0	3
Sydney north-west	4	0	1	3	1	8	26	10	1	0	0	0	4
Sydney south-west	3	0	1	3	2	6	25	9	2	0	2	0	4
UHAQMN - BG	3	2	2	0	1	8	46	12	1	0	1	1	6
UHAQMN - DG	18	3	4	3	11	22	63	14	2	0	9	4	13
UHAQMN - LP	5	1	2	0	3	10	50	11	0	0	1	0	7
UHAQMN - SC	15	6	4	2	8	19	60	15	2	0	10	7	12

Note: UHAQMN – upper hunter air quality monitoring network, BG - background, DG – diagnostic, LP – larger populations, SC – smaller communities

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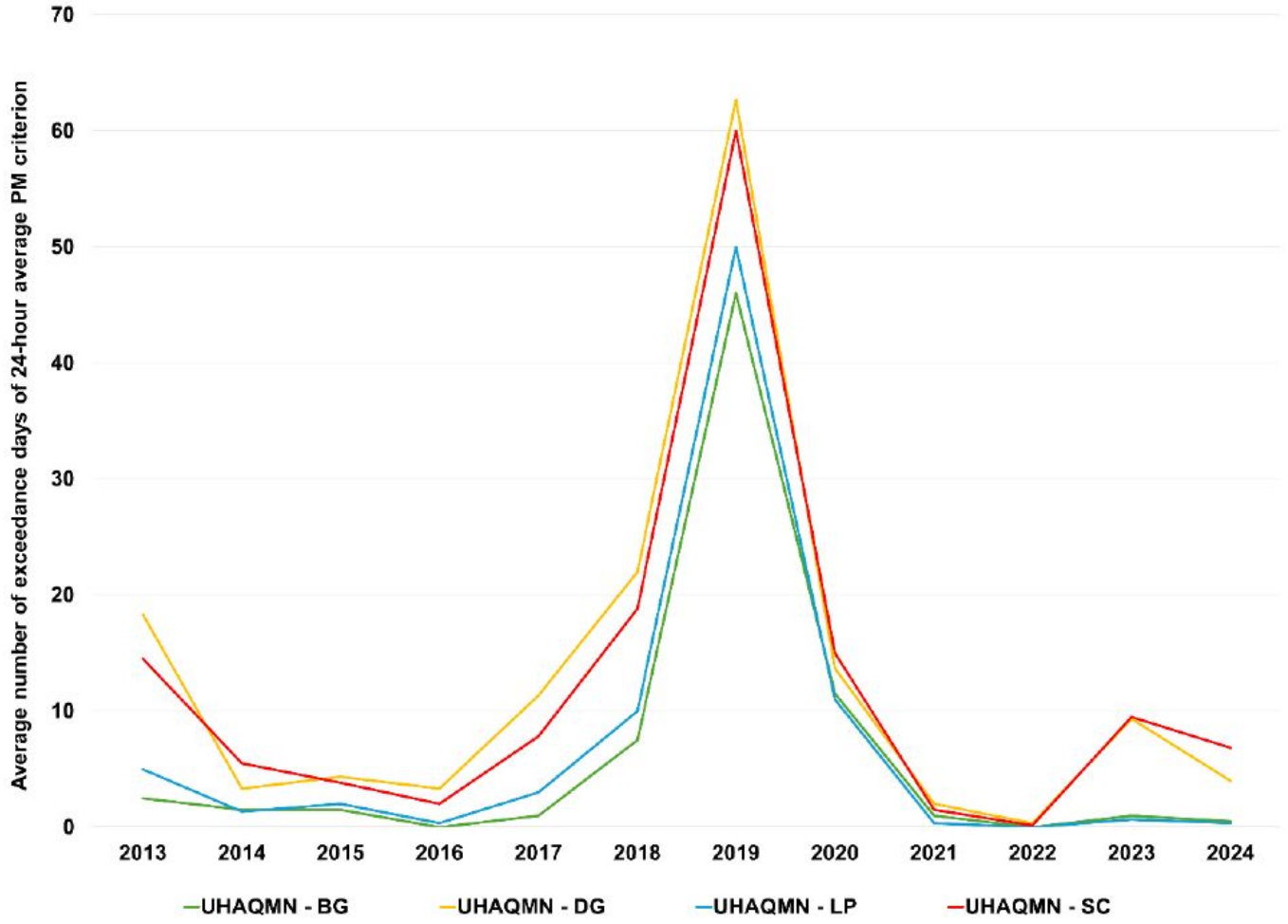
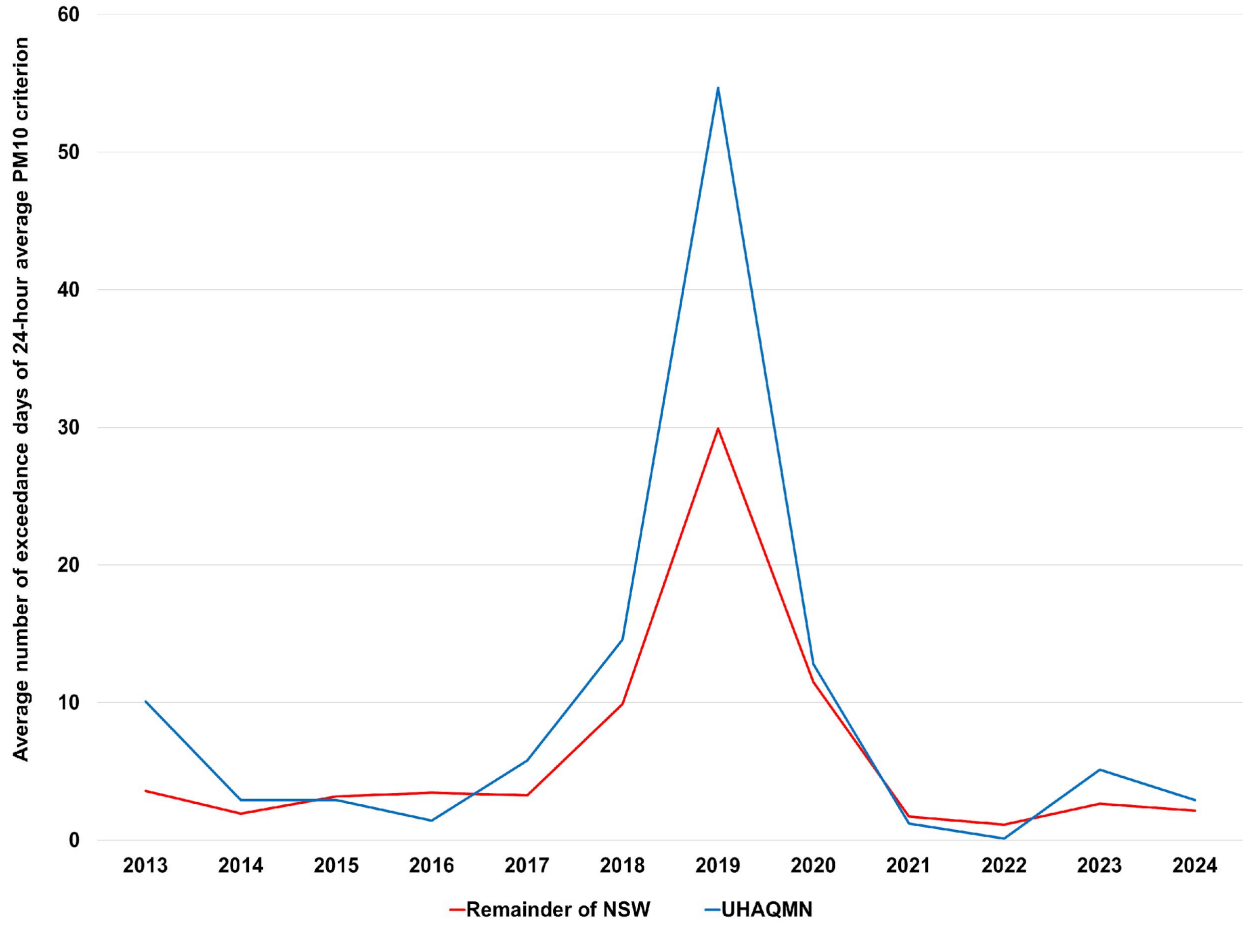
PM10 exceedance data



PM10 exceedance data



Summary

- Overall:
  - The 2024 results are consistent with 2023
  - The changes in PM_{10} concentrations within the Upper Hunter are generally consistent with changes in PM_{10} concentrations experienced across the rest of NSW
  - The changes in PM_{10} concentrations across the Upper Hunter are associated with regional conditions and are indicative of a minimal change in contribution from local emission sources inclusive of mining

Summary

- For rainfall:
  - There continues to be a negative correlation between rainfall and particulate matter concentrations across the Upper Hunter

- For coal production:
  - The annual fluctuations in PM_{10} are anticipated to be related to meteorological conditions (ambient temperatures and the amount of rainfall) rather than changing coal production

Summary

- Exceedance days:
  - For CY2024, all locations recorded exceedance days below the ‘all years’ average.
  - A comparison of the number of exceedance days at the grouped UHAQMN stations for 2013 to 2024 shows that these grouped locations show generally the same trend.
  - A comparison of the average number of exceedance days of the 24-hour average PM10 criterion for the ‘Remainder of NSW’ and ‘UHAQMN’ shows that these grouped locations show generally the same trend, regardless of the location.

Questions?

Please type any questions you have in the Chat function in Zoom

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