Port Augusta Operations Pty. Ltd

Port Augusta Operations Ambient Monitoring Network

Ambient Air Quality Monitoring

Validated Report

1st September – 30th September 2026

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1.0 Introduction

Acoem Australasia (Ecotech Pty Ltd) was commissioned by Port Augusta Operations Pty. Ltd. to provide monitoring and data reporting for the Port Augusta Operations ambient air quality monitoring network, located as detailed in Table 1. Acoem commenced data collection from the monitoring stations on 01/02/2022.

This report presents the data for September 2026.

The data presented in this report:

- Describes air quality measurements;
- Compares monitoring results;
- Has been quality assured;
- Conforms with NATA accreditation requirements, where applicable.

2.0 Monitoring and Data Collection

2.1. Siting Details

The Port Augusta Operations air quality monitoring network consists of six ambient air quality monitoring stations. The station's location and siting details are described below.

Table 1: Port Augusta Operations Monitoring Site Locations

Stations	Geographical Coordinates	Height Above Sea Level (m)
Exactus BAM plus 1 (STN)	32°30'47.850"S, 137°50'16.679"E	34
Exactus BAM plus 2 (LMO)	32°30'35.867"S, 137°47'12.767"E	13
North E-Sampler	32°31'10.422"S, 137°47'33.311"E	10
East E-Sampler	32°31'46.577"S, 137°48'30.000"E	5
South E-Sampler	32°33'07.260"S, 137°48'30.882"E	8
Met Station	32°32'40.620"S, 137°47'41.280"E	18

The Port Augusta Operations stations are audited against the guidelines and mandatory requirements in the standards below, as relevant:

- AS/NZS 3580.1.1:2016 *"Methods for sampling and analysis of ambient air – guide to siting air monitoring equipment",*
- AS/NZS 3580.14:2014 *"Methods for sampling and analysis of ambient air – Meteorological monitoring for ambient air quality monitoring applications*".

Audit results, including deviations from the guidelines, are detailed in Table 2 below. Any non-conformances with the mandatory requirements of the above standards are detailed in section 2.3.1.

Table 2: Monitoring Station Siting Audit Against Standards

Stations	Audit date	Site classification	All guidelines met?	Deviation from guidelines
Exactus BAM plus 1 (STN)	10/07/2026	Neighbourhood	Partly	Nearby sheds
Exactus BAM plus 2 (LMO)	10/07/2026	Neighbourhood	Partly	Nearby EPA shelter
North E-Sampler	10/07/2026	Peak	Yes	N/A
East E-Sampler	10/07/2026	Peak	Yes	N/A
South E-Sampler	10/07/2026	Peak	Yes	N/A
Met Station	10/06/2026	N/A	Partly	Close to the sea



Figure 1: Port Augusta Operations Monitoring Station Locations

2.2. Monitored Parameters

Table 3 details the parameters monitored, and the instruments used at the Port Augusta Operations monitoring stations. Appendix 1 defines any abbreviated parameter names used throughout the report.

Sampling of all parameters is continuous.

Elevations in the table below are the height of the sensor (for meteorological sensors) or sample inlet (for particulate monitors) above ground level at the monitoring station.

Table 3: Parameters Measured at the Port Augusta Operations Monitoring Stations

Stations	Parameter Measured	Instrument and Measurement Technique	Elevation (m)
Exactus BAM 1 (STN) Exactus BAM plus 2 (LMO)	PM_{10}	Acoem Exactus BAM plus - Beta ray attenuation	2.3
North E-Sampler East E-Sampler South E-Sampler	PM_{10}	Met One E-Sampler – light scatter aerosol monitor	2.5
Met Station	Wind Speed (horizontal)	Gill Windsonic – ultrasonic	11.5
	Wind Direction	Gill Windsonic – ultrasonic	11.5
	Sigma	Calculation	-
	Ambient Temperature	Vaisala HMP155	10
	Relative Humidity	Vaisala HMP155	10
	Rain	Tipping Bucket	6.4

2.3. Data Collection Methods

Table 4 below shows the methods used for data collection. Any deviations from the stated methods are detailed in section 2.3.1.

Table 4: Methods

Parameter Measured	Data Collection Methods Used	Description of Method
PM_{10} (Exactus BAM plus)	AS/NZS 3580.9.11:2022	Methods of sampling and analysis of ambient air. Method 9.11: Determination of suspended particulate matter – PM_{10} beta attenuation monitors
PM_{10} (Met One E-Sampler)	Manufacturer's Instructions	Met One E-Sampler Operation Manual
Vector Wind Speed (Horizontal)	AS/NZS 3580.14:2014	Methods for sampling and analysis of ambient air. Method 14: Meteorological monitoring for ambient air quality monitoring applications
Vector Wind Direction	AS/NZS 3580.14:2014	Methods for sampling and analysis of ambient air. Method 14: Meteorological monitoring for ambient air quality monitoring applications
Sigma	AS/NZS 3580.14:2014	Methods for sampling and analysis of ambient air. Method 14: Meteorological monitoring for ambient air quality monitoring applications
Ambient Temperature	AS/NZS 3580.14:2014	Methods for sampling and analysis of ambient air. Method 14: Meteorological monitoring for ambient air quality monitoring applications
Relative Humidity	AS/NZS 3580.14:2014	Methods for sampling and analysis of ambient air. Method 14: Meteorological monitoring for ambient air quality monitoring applications
Rain	AS/NZS 3580.14:2014	Methods for sampling and analysis of ambient air. Method 14: Meteorological monitoring for ambient air quality monitoring applications

2.3.1. NATA Endorsement and Conformance with Standards

Unless stated below, parameters are monitored at the Port Augusta Operations monitoring stations according to the methods detailed in Table 4 above.

- Measurement of PM_{10} via E-Samplers is not covered by Acoem's NATA scope of accreditation.
- Siting of PM_{10} via Exactus BAM plus 1 (STN) and Exactus BAM plus 2 (LMO) does not fully meet the recommendations of standard *AS/NZS 3580.1.1:2016* due to the stations being located in close proximity to a shed and roadway.
- Siting of PM_{10} via Exactus BAM plus 2 (LMO) does not fully meet the recommendations of standard *AS/NZS 3580.1.1:2016* due to a nearby dirt track and Hivols located around 1.2m from the unit.
- The meteorological station is not maintained by *AS/NZS 3580.14:2014* according to the contract with the customer. Therefore, the parameters measured at the meteorological station are not compliant and are not covered by Acoem's NATA scope of accreditation.

2.3.2. Data Acquisition

Data acquisition is performed using a DataTaker DT800 Series data logger situated at the Met station, and direct link with the Met One E-Sampler and Exactus BAM plus instruments. Each logger is equipped with a 4G modem for remote data collection. The recorded data is remotely collected from the loggers on a daily basis (using Airodis™ version 5.2) and stored at Acoem's Environmental Reporting Services (ERS) department in Melbourne, Australia. Data samples are logged in 5-minute intervals for the Met station and E-Samplers, and 15-minute intervals for the Exactus BAM plus data. Unless otherwise specified, raw data will be retained for at least four years.

2.4. Data Validation and Reporting

2.4.1. Validation

The Acoem ERS department perform daily data checks to ensure maximum data capture rates are maintained. Any equipment failures are communicated to the responsible field engineers for urgent rectification. Acoem ERS maintains two distinct databases containing non-validated and validated data respectively.

The validated database is created by duplicating the non-validated database and then flagging data affected by instrument faults, calibrations, and other maintenance activities. The data validation software requires the analyst to supply a valid reason (e.g. backed by maintenance notes, calibration sheets etc.) in the database for flagging any data as invalid.

Details of all invalid or missing data are recorded in the Valid Data Exception Tables.

All data validation activities are undertaken in accordance with *AS/NZS 3580.19:2020 – Method 19: Ambient air quality data validation and reporting*, which specifies the procedures for checking, validating, documenting and reporting ambient air quality monitoring data to ensure it is technically defensible and suitable for regulatory and scientific use.

Validation is performed by the analyst, and the validation is reviewed. Graphs and tables are generated based on the validated 5-minute and 15-minute data as applicable.

2.4.2. Reporting

Data is reported in accordance with the requirements of *AS/NZS 3580.19:2020*¸ ensuring consistency, transparency and auditability of validated ambient air quality data. Details of the data contained in each Excel file are provided below.

The reported data are included in a Microsoft Excel format file named *"Port Augusta Operations Monthly Data Report September 2026.xlsx"*

The Excel file consists of 6 Excel worksheets:

1. Cover
2. 5 Minute Data
3. PM_{10}RT 15 Minute Data
4. 1 Hour Data
5. 24 Hour Data
6. Valid Data Exception Tables

The data contained in this report is based on Australian Central Standard Time.

All averages are calculated from the 5-minute or 15-minute data as appropriate. Averages are based on a minimum of 75% valid readings within the averaging period.

Averaging periods of eight hours or less are reported for the end of the period, i.e. the hourly average 02:00am is for the data collected from 1:00am to 2:00am. One-hour averages are calculated based on a clock hour. One day and one-year averages are calculated based on calendar days.

Wind Data Reporting

Wind speed and wind direction data associated with calm wind conditions are reported in accordance with the requirements of AS/NZS 3580.14-2014. Calm wind conditions are defined as wind speeds below the starting threshold of the wind speed / direction sensors. Sensor starting thresholds are given in Table 5 "Measurement Range".

3.0 Calibrations and Maintenance

3.1. Units and Uncertainties

The uncertainties for each parameter have been determined by the manufacturer's tolerance limits of the equipment's parameters, and by the data collection standard method.

The reported uncertainties are expanded uncertainties, calculated using coverage factors which give a level of confidence of approximately 95%.

Table 5: Units and Uncertainties

Parameter	Units	Resolution	Uncertainty[1]	Measurement Range
PM_{10} (Exactus BAM plus)	µg/m^3	1 µg/m³	24Hr: ± (5.5 % of reading + 4.0 µg/m³) (in range 0 - 100 µg/m³) Hr: ± (8 % of reading + 11.0 µg/m³) k factor of 2.0	0 to 10 mg/m³ LDL_{24hr} = 2 µg/m³ LDL_{hr} = 10 µg/m³
PM_{10} (E-Sampler)	µg/m^3	1 µg/m³	± 10% to gravimetric method	0 to 65 mg/m³
Vector Wind Speed	m/s	0.1 m/s	±0.4 m/s or 2.0% of reading, whichever is greater K factor of 2.0	0 m/s to 30 m/s
Vector Wind Direction	Deg	1 deg	±4 deg K factor of 2.0	0 deg to 360 deg Starting threshold: 0 m/s
Rain	mm	0.2 mm	± (9% of reading + 0.2 mm) K factor of 2.0	Rainfall rates of 0 to 80 mm/hr
Ambient Temperature	˚C	0.1˚C	± 0.6˚C K factor of 2.0	-10˚C to 50˚C
Relative Humidity	%	1%	± 6% K factor of 2.0	1-100%

[1] Uncertainties are calculated based on the full measurement range unless stated otherwise

3.2. Maintenance

3.2.1. Calibration & Maintenance Summary Tables

The last calibrations for the following parameters were performed on the indicated dates. Data supplied after this time is subject to further validation, to be performed at the next calibration cycle.

Note: Maintenance and calibration dates may differ, as calibrations may be less frequent than scheduled maintenance visits.

Tables 6 and 7 overleaf indicate when the particulate and meteorological equipment were last maintained / calibrated. Maintenance and calibration dates are for maintenance performed by Acoem.

“Calibration cycle” refers to the frequency of calibrations and intermediate calibration checks. The most frequent check or calibration is listed here.

Table 6: Port Augusta Operations PM_{10} Stations Maintenance Table

Station	Parameter	Date of Last Maintenance	Maintenance Type	Date of Last Calibration	Calibration Cycle
Exactus BAM plus 1 (STN)	PM_{10}	15/09/26	Non scheduled	10/06/26	2 Yearly
Exactus BAM plus 2 (LMO)	PM_{10}	10/09/26	Non scheduled	22/10/25	2 Yearly
North E-Sampler	PM_{10}	10/09/26	6 Monthly	08/07/26	2 Monthly
East E-Sampler	PM_{10}	10/09/26	6 Monthly	20/05/26	2 Monthly
South E-Sampler	PM_{10}	10/09/26	6 Monthly	08/07/26	2 Monthly

Table 7: Port Augusta Operations Met Station Maintenance Table

Parameter	Date of Last Maintenance	Maintenance Type	Date of Last Calibration	Calibration Cycle
Wind Speed[2]	10/09/26	Monthly	12/11/25	2 Yearly
Wind Direction[2]	10/09/26	Monthly	12/11/25	2 Yearly
AT	10/09/26	Monthly	10/06/26	6 Monthly
RH	10/09/26	Monthly	10/06/26	6 Monthly
Rain	10/09/26	Monthly	20/05/26	Yearly

[2] Wind sensor was NATA calibrated on 12/11/25 and installed on site on 14/01/26

4.0 Results

4.1. Data Capture

Valid data capture refers to the amount of valid data collected during the report period. It is based on 5 and 15-minute data, for all continuously monitored parameters.

The percentage of valid data captured is calculated using the following equation:

Valid Data capture = (Reported air quality data / Total data) x 100%

Where:

- Reported air quality data = Number of samples (instrument readings) which have been validated through a quality assured process and excludes all data errors, zero data collection due to calibration, equipment failures, planned and unplanned maintenance.
- Total data = Total number of samples (instrument readings) expected for the sampling period. Total data is calculated based on the same averaging period as "reported air quality data" and the duration of the corresponding report period. e.g. for 5-minute data collected over a month of 31 days, the total data would be equal to 12 (5-minute samples in an hour) x 24 (hours in a day) x 31 (days in a month) = 8928 samples.

Table 8 displays data capture statistics. **Bold** values in the table indicate data capture below 95%. Details of all invalid or missing data affecting data capture are included in the Valid Data Exception Tables for each station, under the tab "VDET" in the Excel File accompanying this report for each station and in section 5 of this report.

Table 8: Monthly Data Capture for Port Augusta Operations Monitoring Network

Station	Parameter	Data Capture (%)
Exactus BAM plus 1 (STN)	PM_{10}	**80.3**
Exactus BAM plus 2 (LMO)	PM_{10}	**67.0**
North E-Sampler	PM_{10}	99.7
East E-Sampler	PM_{10}	99.9
South E-Sampler	PM_{10}	99.9
Met	WS, WD, Sigma	100.0
Met	AT	100.0
Met	RH	100.0
Met	Rain	100.0

4.2. Graphic Representations

Validated 5-minute data for WS, WD, Sigma, AT, RH, Rain, PM_{10} (E-sampler) and 15-minute PM_{10} (Exactus BAM plus) were used to construct the following monthly graphic representations.

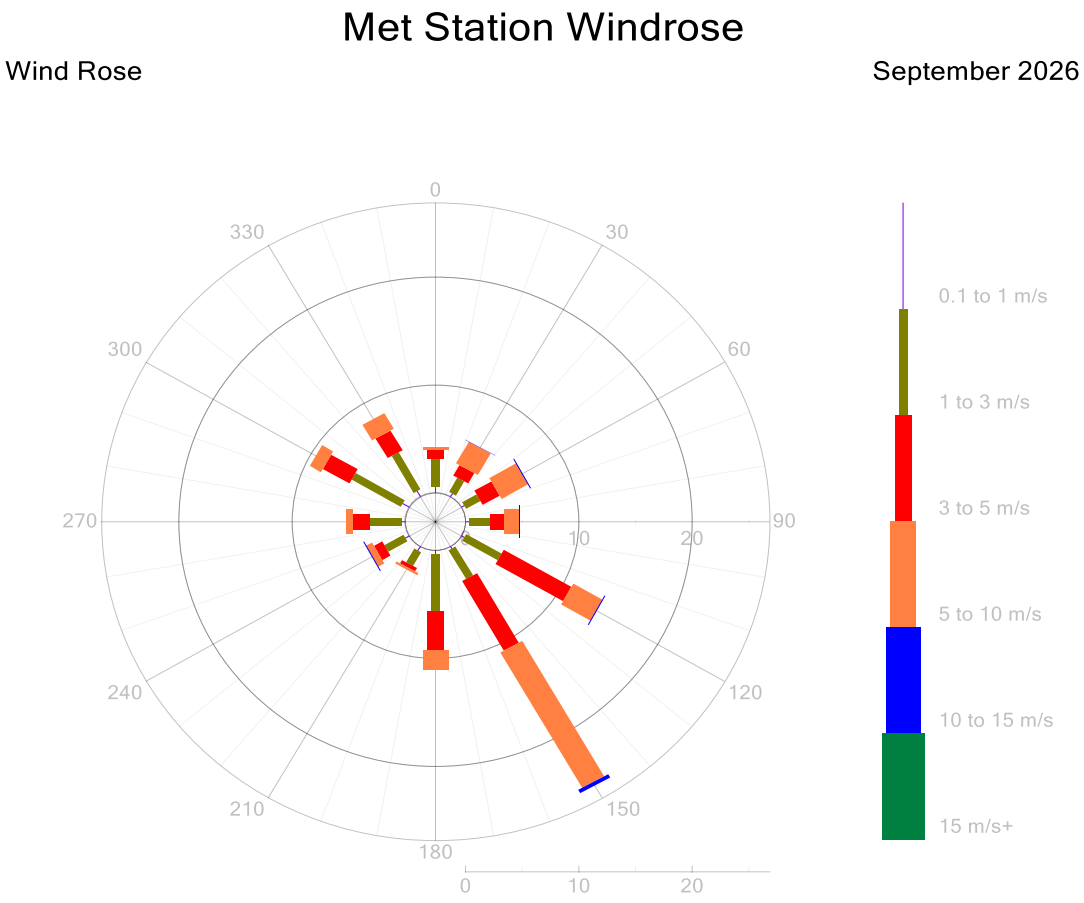

Figure 2: Met Station Wind Rose

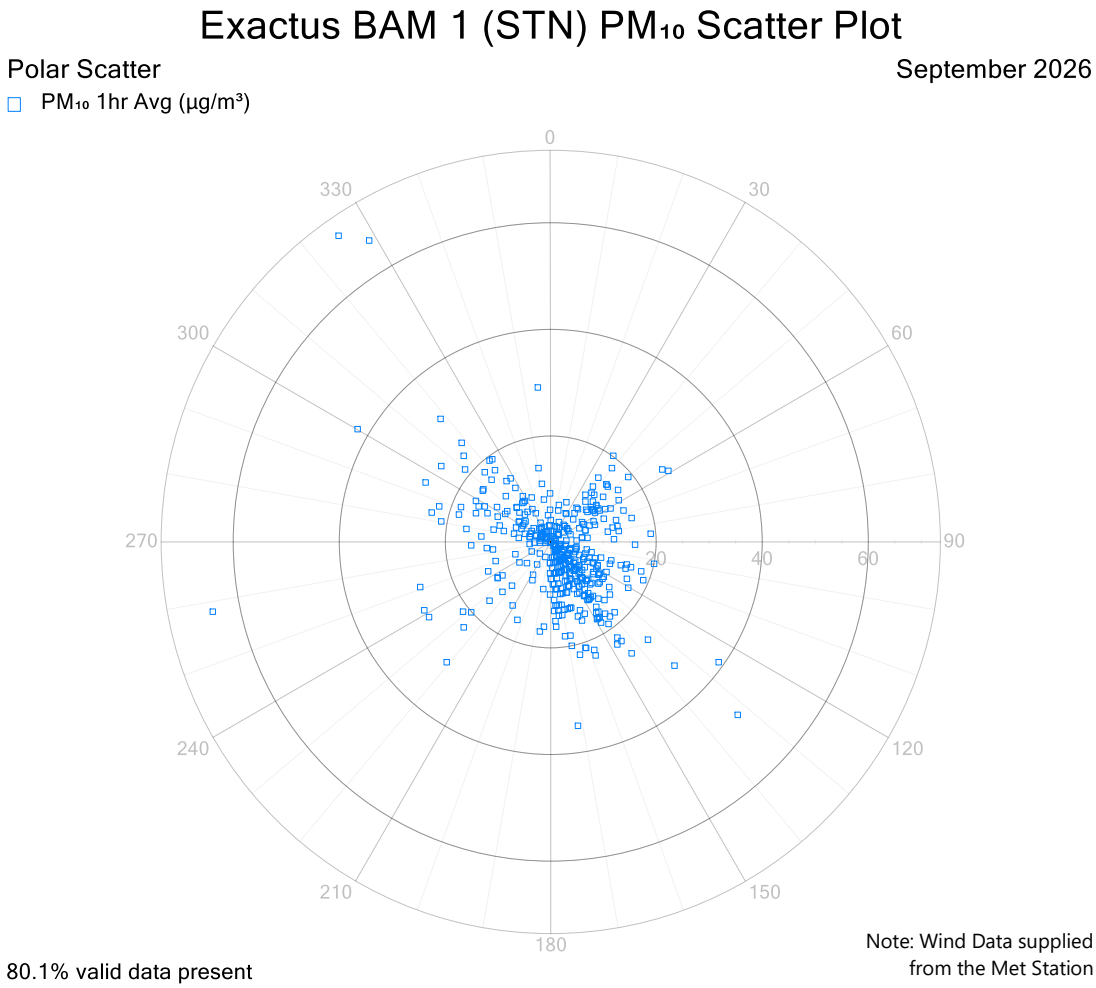

Figure 3: Exactus BAM plus 1 (STN) PM_{10} Scatter Plot 1-Hour Averages

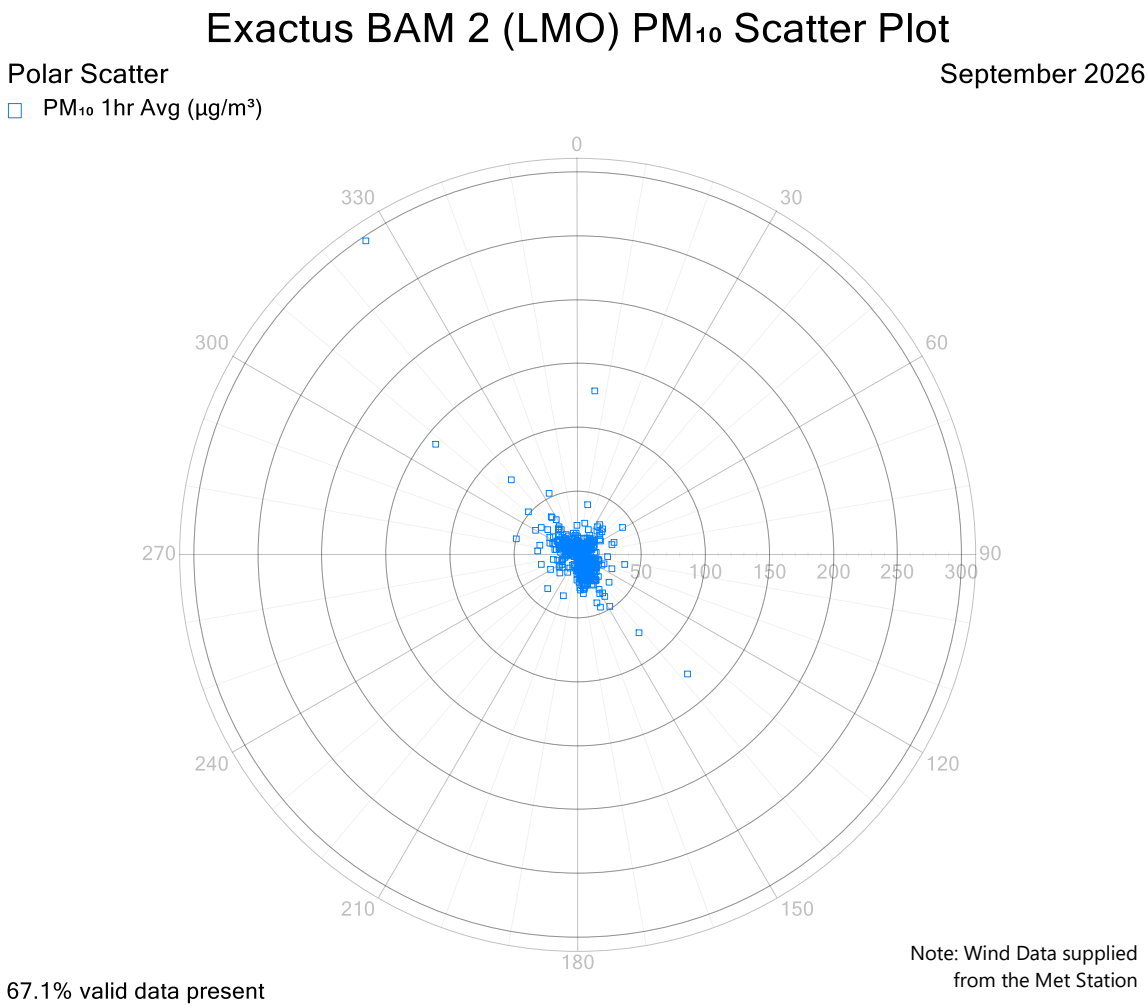

Figure 4: Exactus BAM plus 2 (LMO) PM_{10} Scatter Plot 1-Hour Averages

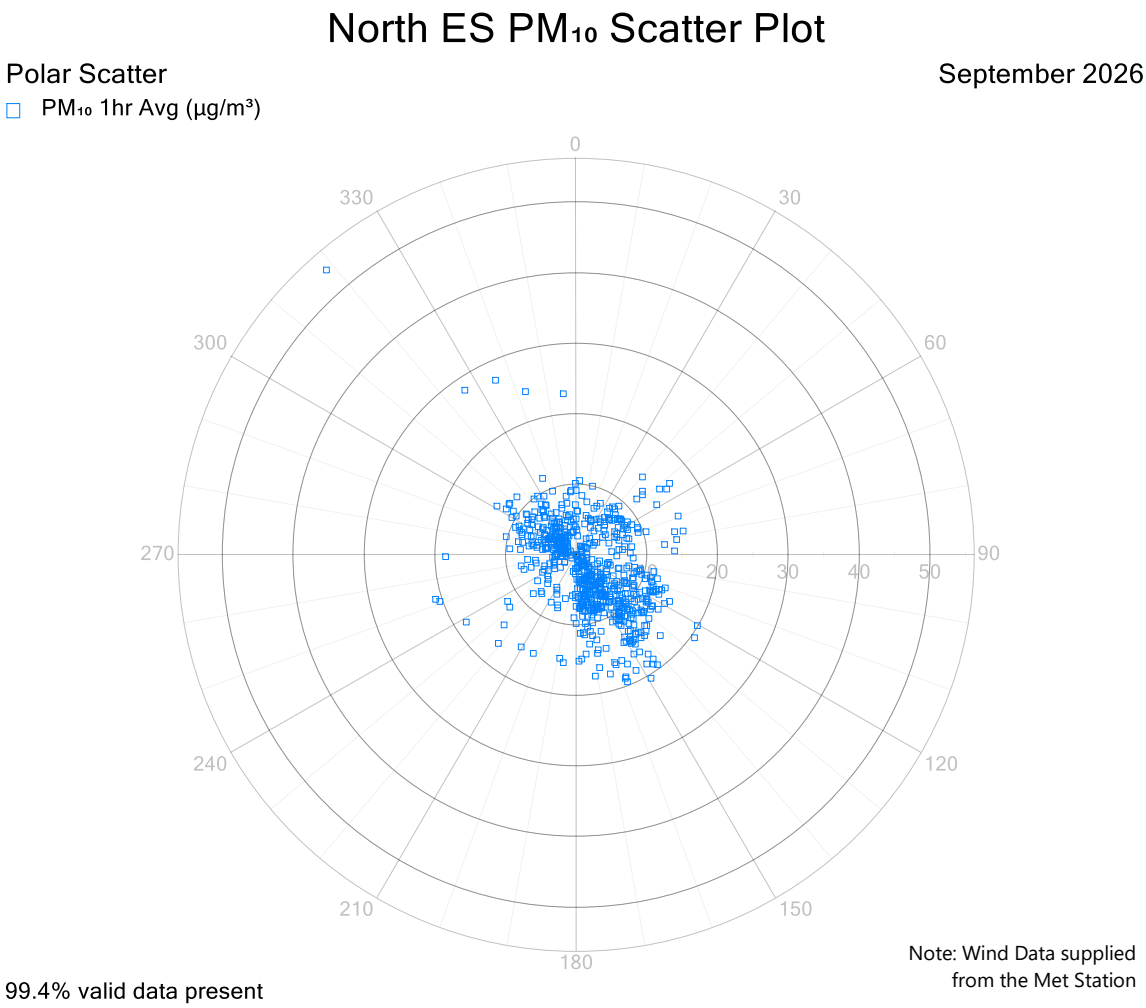

Figure 5: North E-Sampler PM_{10} Scatter Plot 1-Hour Averages

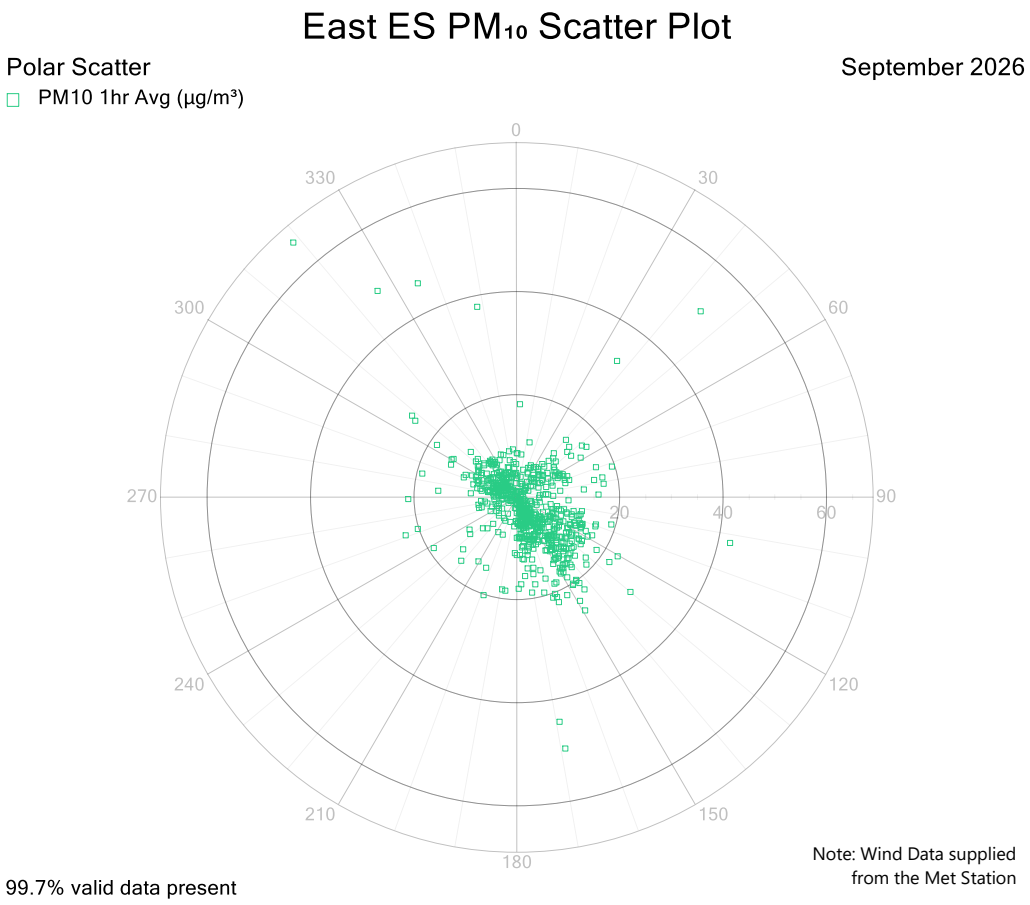

Figure 6: East E-Sampler PM_{10} Scatter Plot 1-Hour Averages

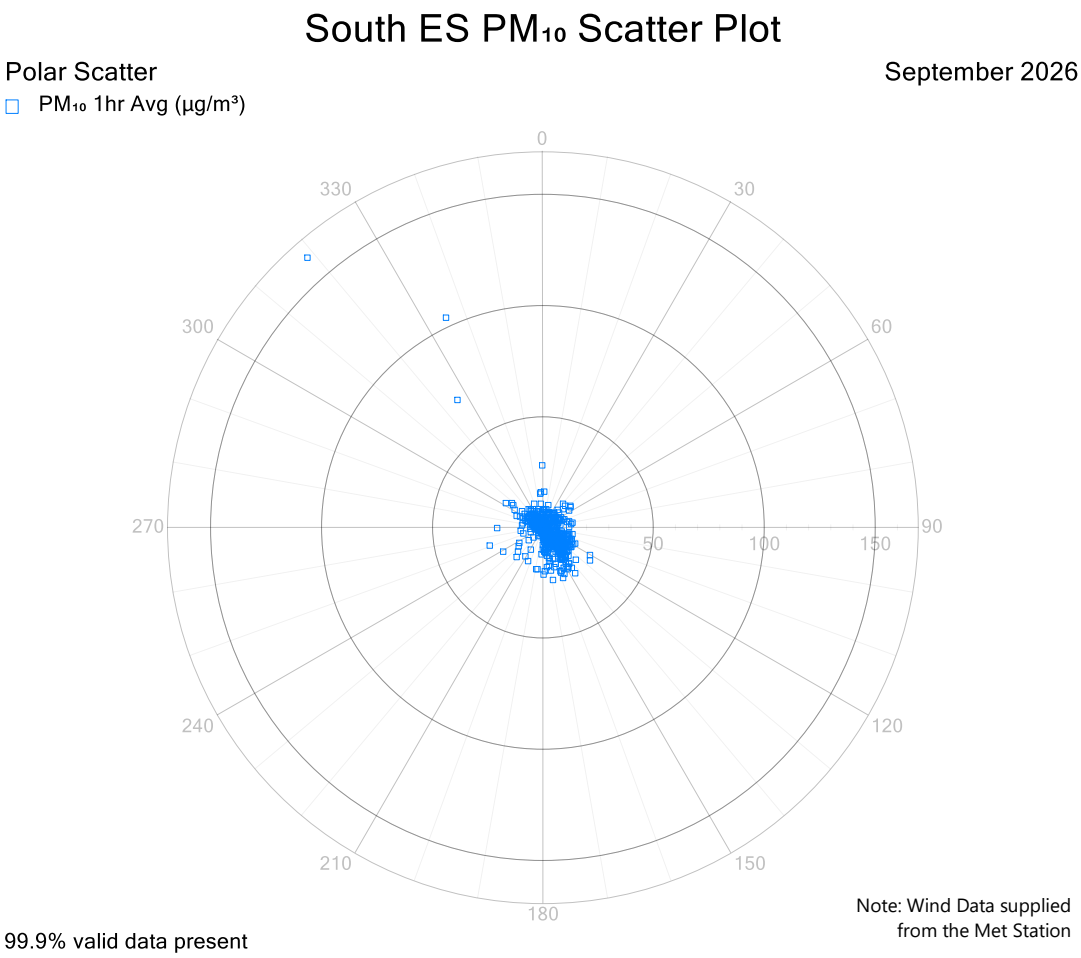

Figure 7: South E-Sampler PM_{10} Scatter Plot 1-Hour Averages

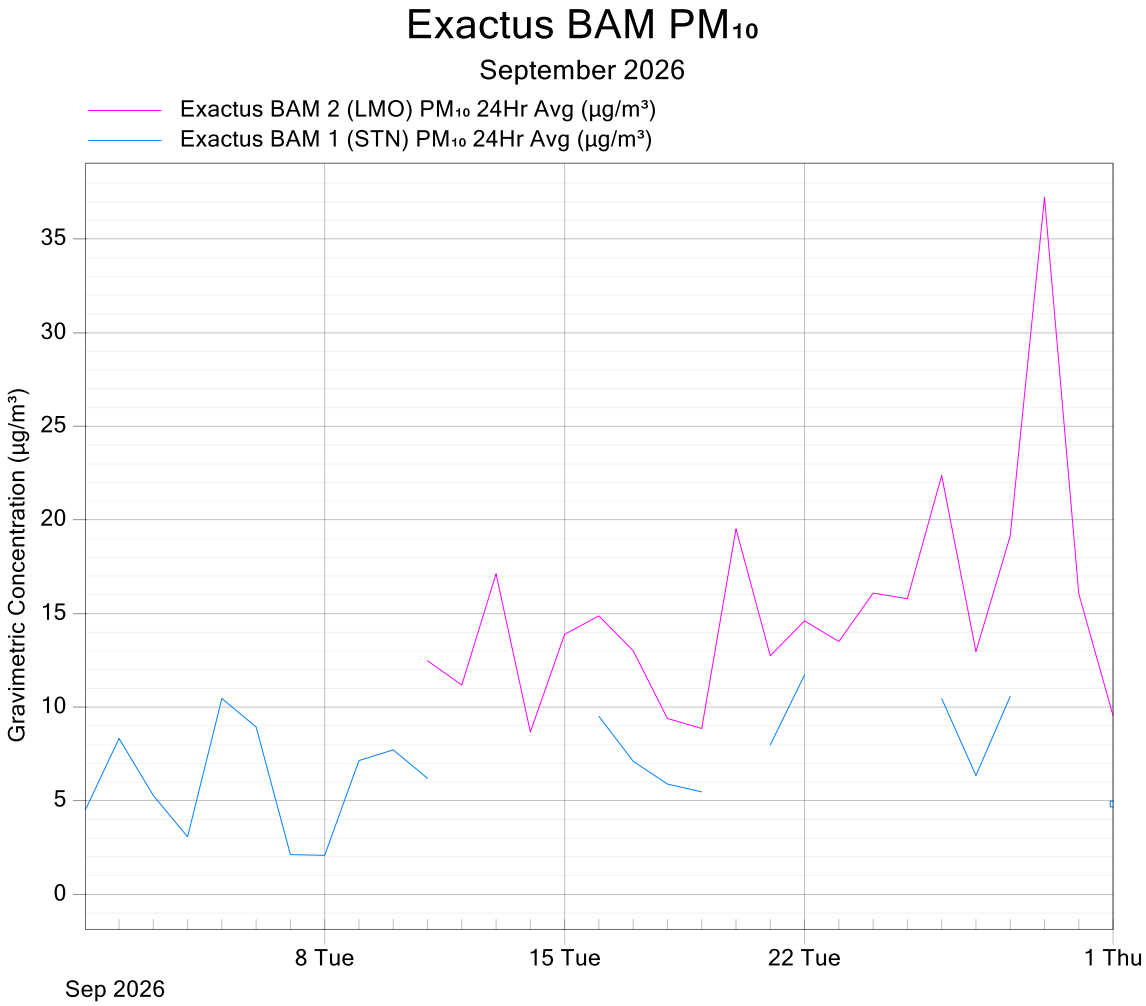

Figure 8: Exactus BAM plus 1 (STN) and 2 (LMO) PM_{10} 24-Hour Averages

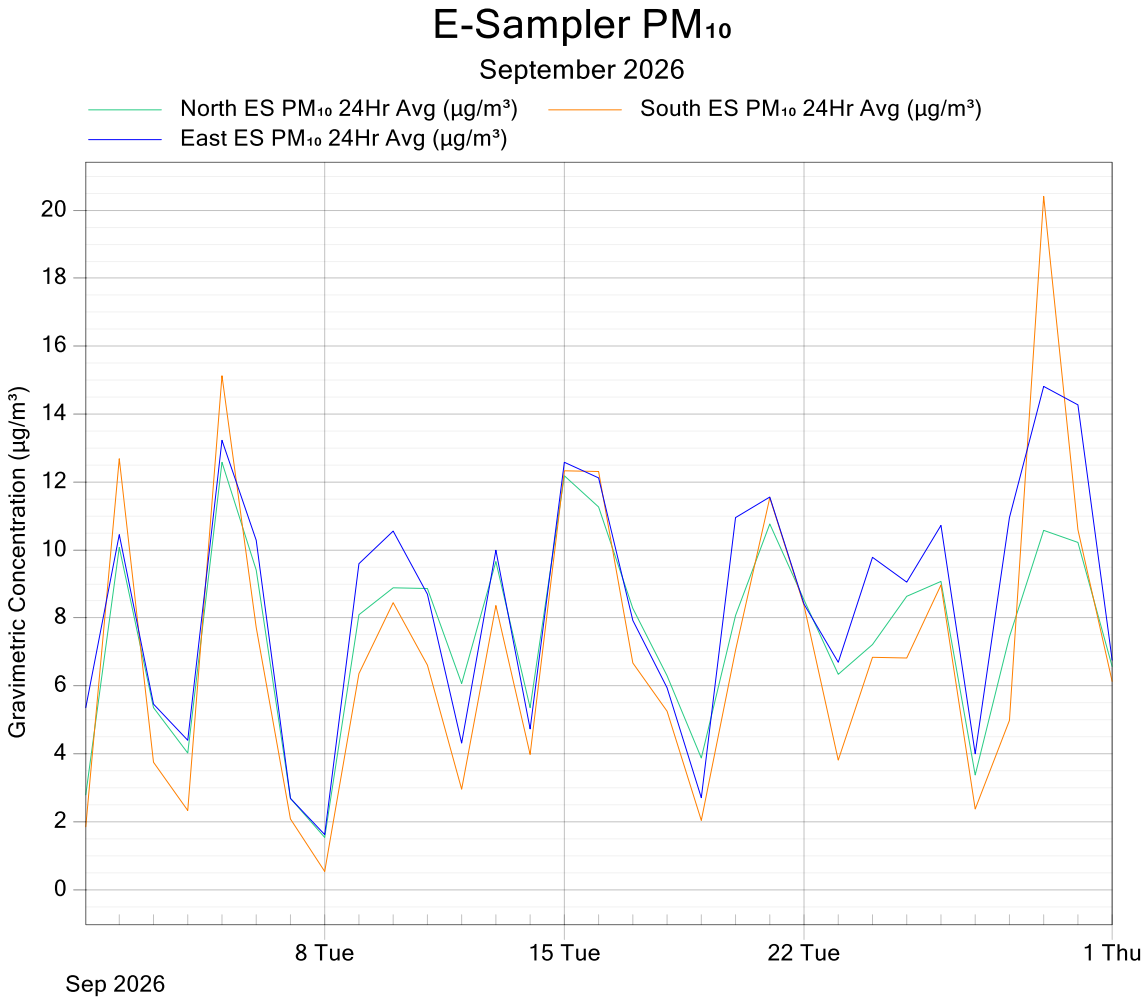

Figure 9: Port Augusta Operations E-Sampler Stations PM_{10} 24-Hour Averages

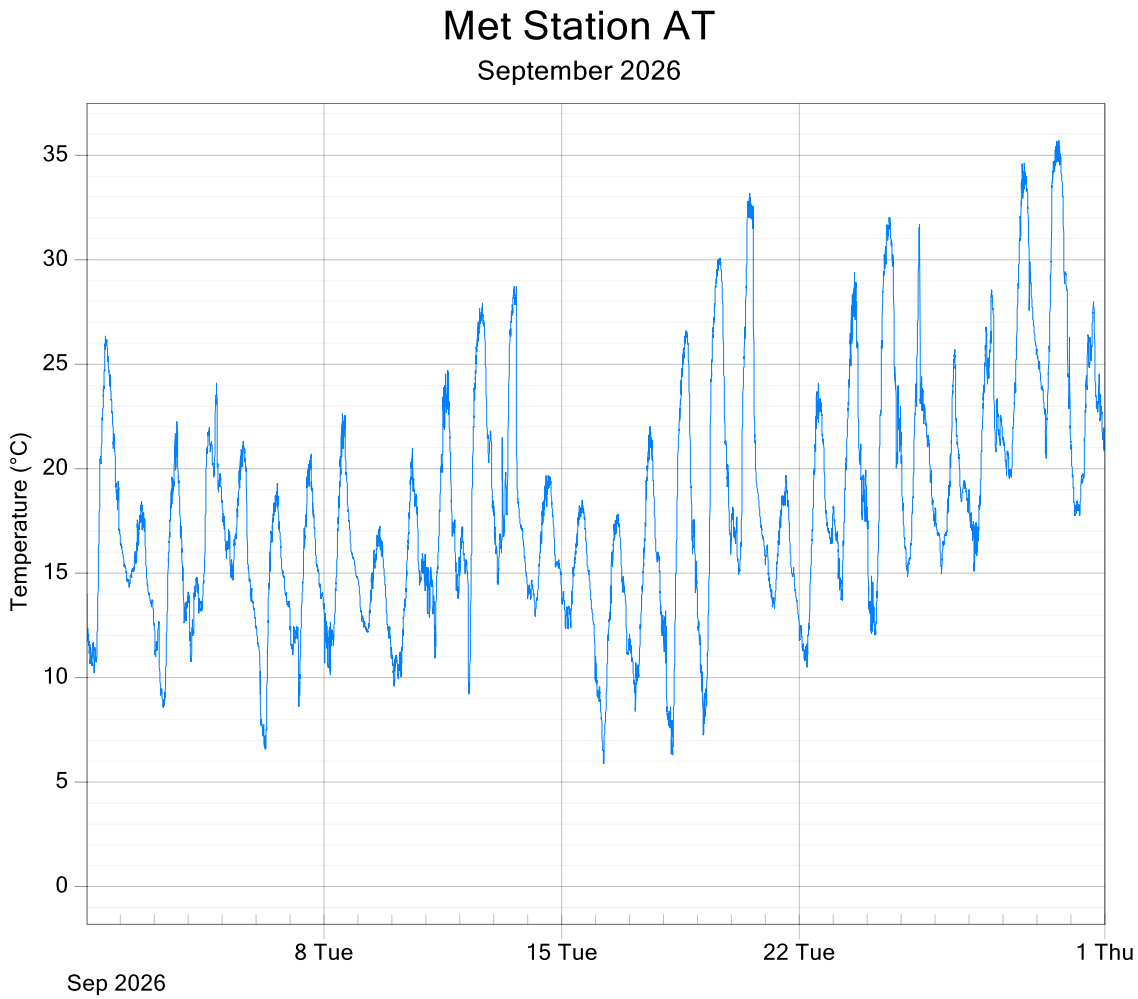

Figure 10: Met Station Ambient Temperature 5-Minute Averages

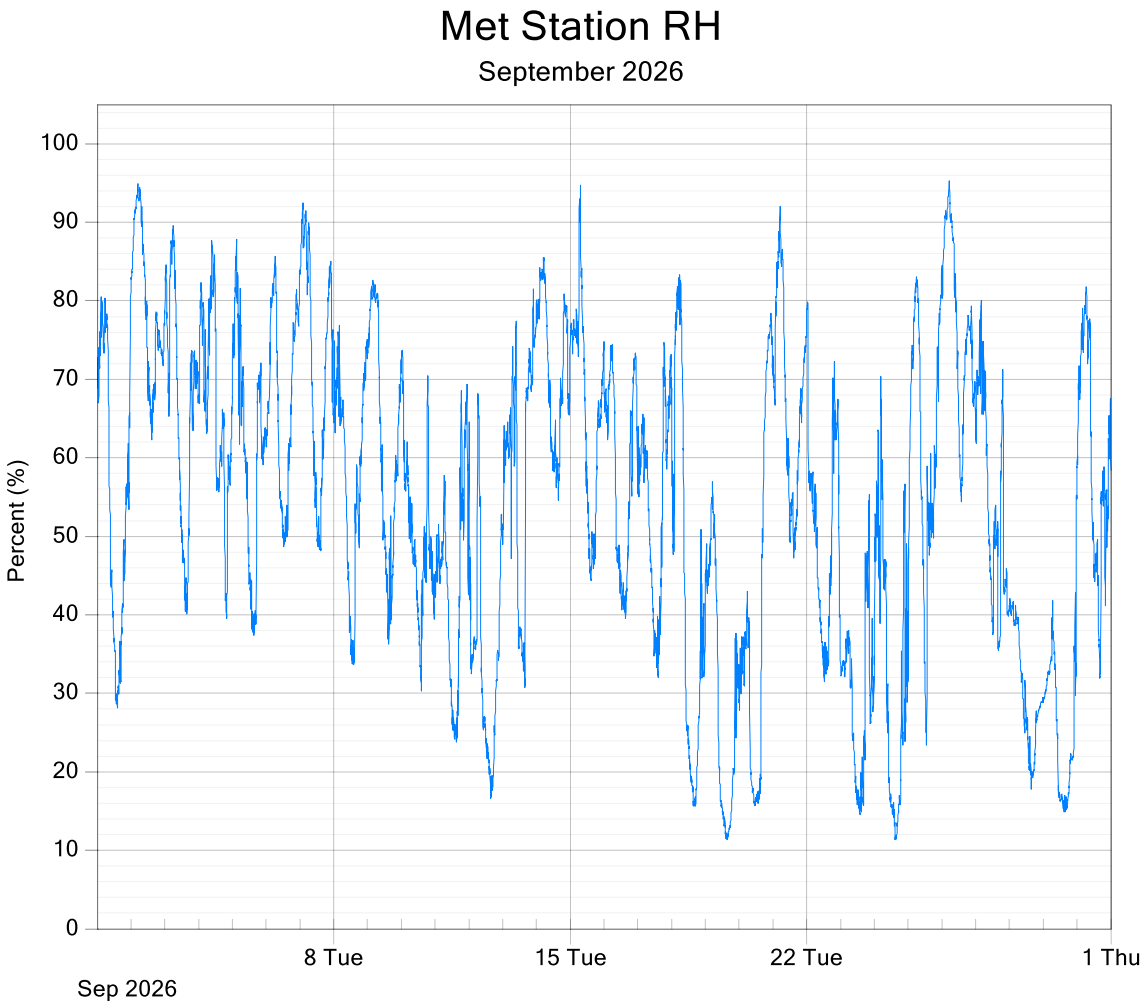

Figure 11: Met Station Relative Humidity 5-Minute Averages

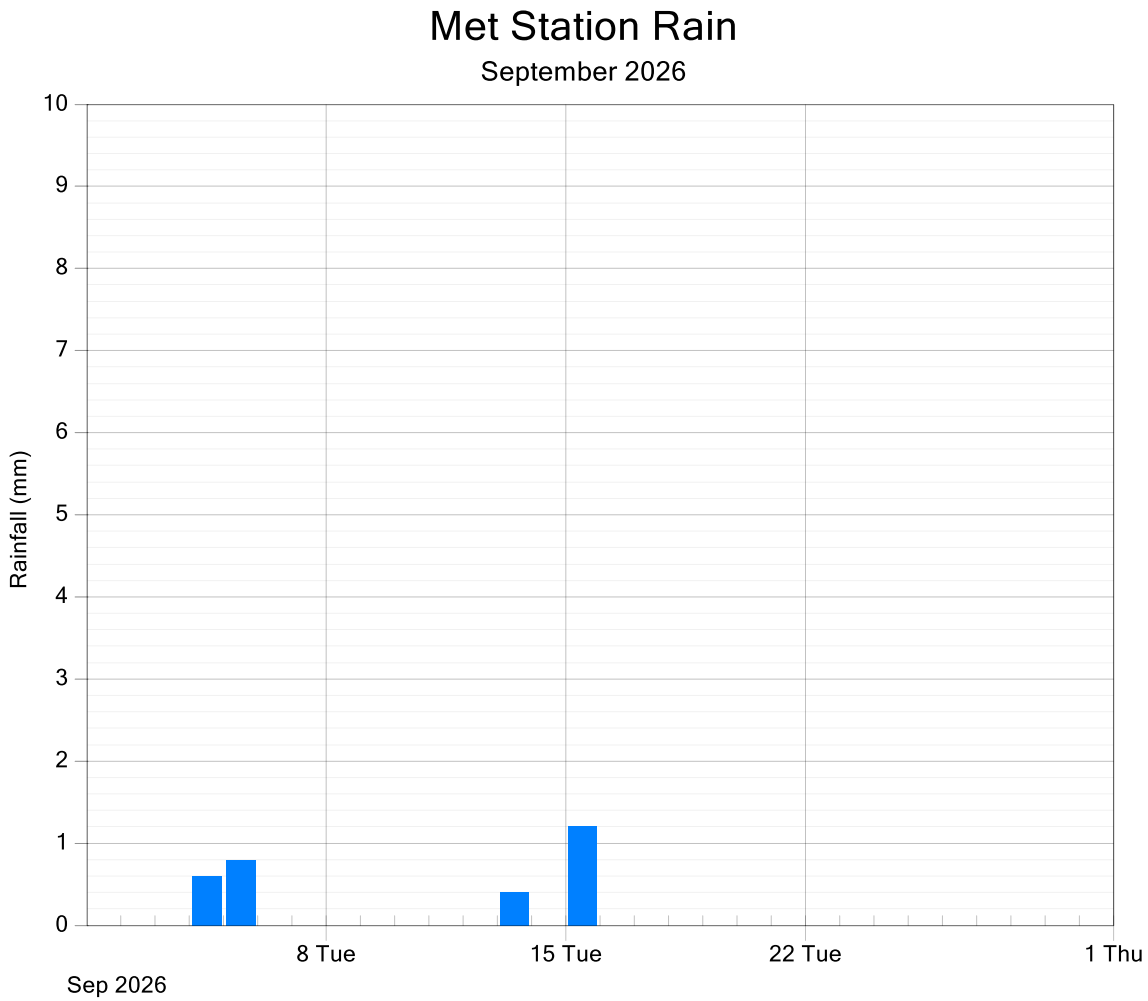

Figure 12: Met Station Rainfall 24-Hour Data

5.0 Valid Data Exception Tables

The tables below detail all changes made to the raw data set during the validation process. An explanation of reasons given in the table can be found in Appendix 2.

Table 9: Exactus BAM plus 1 (STN) Valid Data Exception Table

Start Date	End Date	Reason	Change Details	User Name	Change Date
08/09/26 18:00	25/09/26 01:45	Intermittent unrealistic negative readings out of instrument measurement range	PM_{10} RT, PM_{10}	RR	28/10/26
09/09/26 16:45	09/09/26 18:45	Scheduled 2 monthly maintenance and instrument stabilisation - Routine tasks performed	PM_{10} RT, PM_{10}	RR	28/10/26
12/09/26 13:30	30/09/26 06:45	Intermittent flow errors followed by stabilisation	PM_{10} RT, PM_{10}	RR	28/10/26
15/09/26 16:15	15/09/26 17:45	Non-scheduled maintenance - Remotely accessed instrument, investigated issue and performed restart	PM_{10} RT, PM_{10}	RR	28/10/26
22/09/26 13:00	22/09/26 15:45	Power outage followed by stabilisation	PM_{10} RT, PM_{10}	RR	28/10/26

Table 10: Exactus BAM plus 2 (LMO) Valid Data Exception Table

Start Date	End Date	Reason	Change Details	User Name	Change Date
01/09/26 00:00	09/09/26 14:15	Instrument fault – Unit found not operating properly	PM_{10} RT, PM_{10}	RR	28/10/26
09/09/26 14:30	09/09/26 17:00	Commissioning - Instrument unit swapped (Out ID: 16-1928, In ID: 18-1267) and zero filter installed	PM_{10} RT, PM_{10}	RR	28/10/26
09/09/26 17:15	10/09/26 13:00	Zero test in progress	PM_{10} RT, PM_{10}	RR	28/10/26
10/09/26 13:15	10/09/26 14:45	Non scheduled maintenance - Zero filter removed (Zero test passed)	PM_{10} RT, PM_{10}	RR	28/10/26
14/09/26 10:00	22/09/26 16:45	Intermittent power outages followed by stabilisation	PM_{10} RT, PM_{10}	RR	28/10/26
28/09/26 00:15	28/09/26 00:15	Sensor error	PM_{10} RT, PM_{10}	RR	28/10/26

Table 11: North E-Sampler Valid Data Exception Table

Start Date	End Date	Reason	Change Details	User Name	Change Date
02/09/26 12:30	10/09/26 00:40	Intermittent instrument fault - Flow error	PM_{10}	RR	28/10/26
10/09/26 12:05	10/09/26 12:35	Scheduled 6 monthly maintenance - Routine tasks performed	PM_{10}	RR	28/10/26

Table 12: East E-Sampler Valid Data Exception Table

Start Date	End Date	Reason	Change Details	User Name	Change Date
10/09/26 11:05	10/09/26 11:30	Scheduled 6 monthly maintenance - Routine tasks performed	PM_{10}	RR	28/10/26
18/09/26 06:35	18/09/26 06:55	Instrument fault - Flow error	PM_{10}	RR	28/10/26

Table 13: South E-Sampler Valid Data Exception Table

Start Date	End Date	Reason	Change Details	User Name	Change Date
10/09/26 10:20	10/09/26 10:55	Scheduled 6 monthly maintenance - Routine tasks performed	PM_{10}	RR	28/10/26

Table 14: Met Station Valid Data Exception Table

Start Date	End Date	Reason	Change Details	User Name	Change Date
10/09/26 09:35	10/09/26 09:40	Scheduled monthly maintenance - Routine tasks performed	Rain	RR	28/10/26

6.0 Report Summary

- Percentage availability of PM_{10} at North E-Sampler, East E-sampler and South E-Sampler was above 95% for the reporting month.
- Percentage availability of PM_{10} at Exactus BAM plus 1 (STN) was below 95% due to instrument fault.
- Percentage availability of PM_{10} at Exactus BAM plus 2 (LMO) stations was below 95% due to instrument fault.
- Percentage availability for all parameters at the Met station was above 95% for the reporting month.
- For more details regarding data exceptions, refer to Tables 9 -14.
- Some parameters do not conform to the standards. Refer to section 2.3.1 for more details.

---------- END OF REPORT ----------

Appendix 1 - Definitions & Abbreviations

°C	Degrees Celsius
µg/m³	Micrograms per cubic metre at standard temperature and pressure (0°C and 101.3 kPa)
AT	Ambient Temperature
calm	Wind conditions where the wind speed is below the operating range of the wind sensor
deg	Degrees (True North)
LDL	Lower Detectable Limit
m/s	Metres per second
PM_{10}	Particulate less than 10 microns in equivalent aerodynamic diameter
RH	Relative Humidity
$PM_{10}RT$	PM_{10} Realtime
Sigma	Sigma Theta is the standard deviation of the horizontal wind direction fluctuations over the averaging period.
WD	Vector Wind Direction
WS	Vector Wind Speed

Appendix 2 - Explanation of Exception Table

Automatic filter tape advance refers to the movement of the filter paper by the analyser to an un-used spot.

Automatic span/zero check. The E-Sampler is programmed to perform a zero calibration check whereby air is passed through filter element, removing particulates, before entering the sensor in the analyser. Data is invalidated when these checks occur.

Beta count failure refers to a fault in the functioning of the EBAM plus. A 1-minute beta count was less than the maximum acceptable counts during operation.

Calibration correction factor applied to data refers to an offset or multiplier applied to the data. This operation may be performed for a number of reasons including: (a) when a clear trend / drift outside the tolerance limit can be demonstrated by repeated operation precision checks, (b) when a correction is required on previously logged data due to a calibration check being outside the allowable tolerance

Commissioning refers to the initial setup and calibration of the instrument when it is first installed. For some instruments there may be a stabilisation period before normal operation commences.

Data affected by environmental conditions – wind speed / wind speed gust spike refers to when a one-off high reading occurs due to a natural occurrence such as a bird sitting on the wind sensor, or some other event causing the readings to spike.

Data transmission error refers to a period of time when the instrument could not transmit data. This may be due to interference, or a problem with the phone line or modem.

Equipment malfunction/instrument fault refers to a period of time when the instrument was not in the normal operating mode and did not measure a representative value of the existing conditions.

Gap in data/data not available refers to a period of time when either data has been lost or could not be collected.

Instrument Alarm refers to an alarm produced by the instrument. A range of alarms can be produced depending on how operation of the instrument is being affected.

Instrument out of service refers to a lack of data due to an instrument being shut down for repair, maintenance, or factory calibration.

Linear offset or multiplier refers to when an offset or multiplier has been applied between two points where the values of the offset or multiplier are different, and the correction is interpolated between the two points.

Logger error refers to when an error occurs, and instrument readings are not correctly recorded by the logger.

Maintenance refers to a period of time when the logger / instrument was switched off due to maintenance.

Power Interruption refers to no power to the station therefore no data was collected at this time.

Stabilisation following power interruption refers to the start-up period of an instrument after power has been restored.

Tape break refers to the breaking of the EBAM/BAM sample tape during operation.