

North Queensland Bulk Ports Corporation

McEwens Beach, Mky Northern and Southern Stations

Ambient Air Quality Monitoring

Validated Report

1st December – 31st December 2025

Report No: DAT23712

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Maintenance contract: MC950

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**North Queensland Bulk Ports - McEwens Beach,
Mky Northern and Southern Stations
Report No: DAT23712**



North Queensland Bulk Ports Corporation

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Executive Summary

North Queensland Bulk Ports Corporation has commissioned Acoem Australasia to conduct air quality monitoring, including McEwens Beach, and port of Mackay (Mky) Dust Monitoring Program at the Northern and Southern stations.

The McEwens Beach monitoring station, commissioned in March 2013, is currently comprised of a Solar BAM 1020 measuring PM₁₀ particulates. The Mky Northern and Southern stations, commissioned in July 2016, are equipped with E-Samplers. Both E-samplers were equipped to measure TSP until 12th June 2020 when the E-Sampler heads at both stations were changed to measuring PM₁₀.

This report presents the data collected from the McEwens Beach, Mky Northern and Southern stations for December 2025.

The PM₁₀ monthly data capture rate of PM₁₀ at McEwens Beach was 93.0%.

The PM₁₀ monthly data capture rate of PM₁₀ at Mky Northern was 100.0%.

The PM₁₀ monthly data capture rate of PM₁₀ at Mky Southern was 100.0%.

The PM₁₀ monthly average for McEwens was 10 µg/m³ with a standard deviation of 7 µg/m³.

The PM₁₀ monthly average for Mky Northern station was 12 µg/m³ with a standard deviation of 7 µg/m³.

The PM₁₀ monthly average for Mky Southern station was 11 µg/m³ with a standard deviation of 5 µg/m³.

1.0 Introduction

Acoem Australasia was commissioned by North Queensland Bulk Ports Corporation to provide monitoring and data reporting for McEwens Beach ambient air quality monitoring station and Mackay Dust Monitoring Program at Northern and Southern stations, located as detailed in Table 1. Acoem Australasia commenced data collection from the McEwens Beach station on the 4th (Solar E-Sampler PM_{2.5}) and 5th (Solar BAM PM₁₀) April 2013. The PM_{2.5} E-Sampler was decommissioned on the 3rd September 2020. Data collection from both Mky Northern and Southern stations was commenced on 20th July 2016.

The data presented in this report:

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

2.0 Monitoring and Data Collection

2.1 Siting Details

The NQBP air quality monitoring network consists of 3 ambient air quality monitoring stations. The stations' location and siting details are described below.

Table 1: NQBP Monitoring Site Locations

| Site Name | Geographical Coordinates | Height Above Sea Level (m) |
|---------------|-------------------------------------|----------------------------|
| McEwens Beach | 21° 14' 58.23" S, 149° 12' 23.84" E | 6m |
| Mky Northern | 21° 06' 4.18" S 149° 13' 26.10" E | 5m |
| Mky Southern | 21° 06' 24.7" S 149° 13' 28.20" E | 5m |

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Siting audits were conducted at McEwens, Mky Northern and Mky Southern on 25th February 2025, 2nd October 2025 and 2nd October 2025, respectively. This is to assess station siting against the guidelines and mandatory requirements of AS/NZS 3580.1.1:2016 “Methods for sampling and analysis of ambient air – guide to siting air monitoring equipment”. The siting of these stations does not conform with the guidelines in AS/NZS 3580.1.1:2016. Details are included in Section 2.3.1.

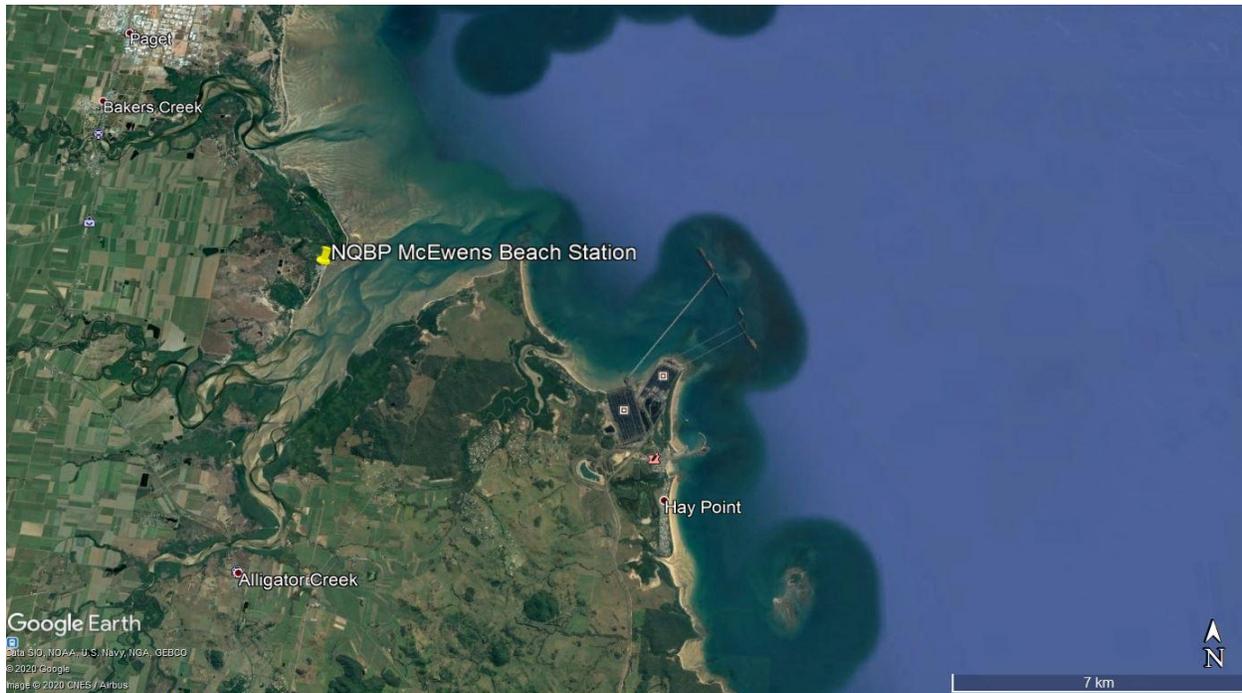


Figure 1: McEwens Beach Monitoring Station Location

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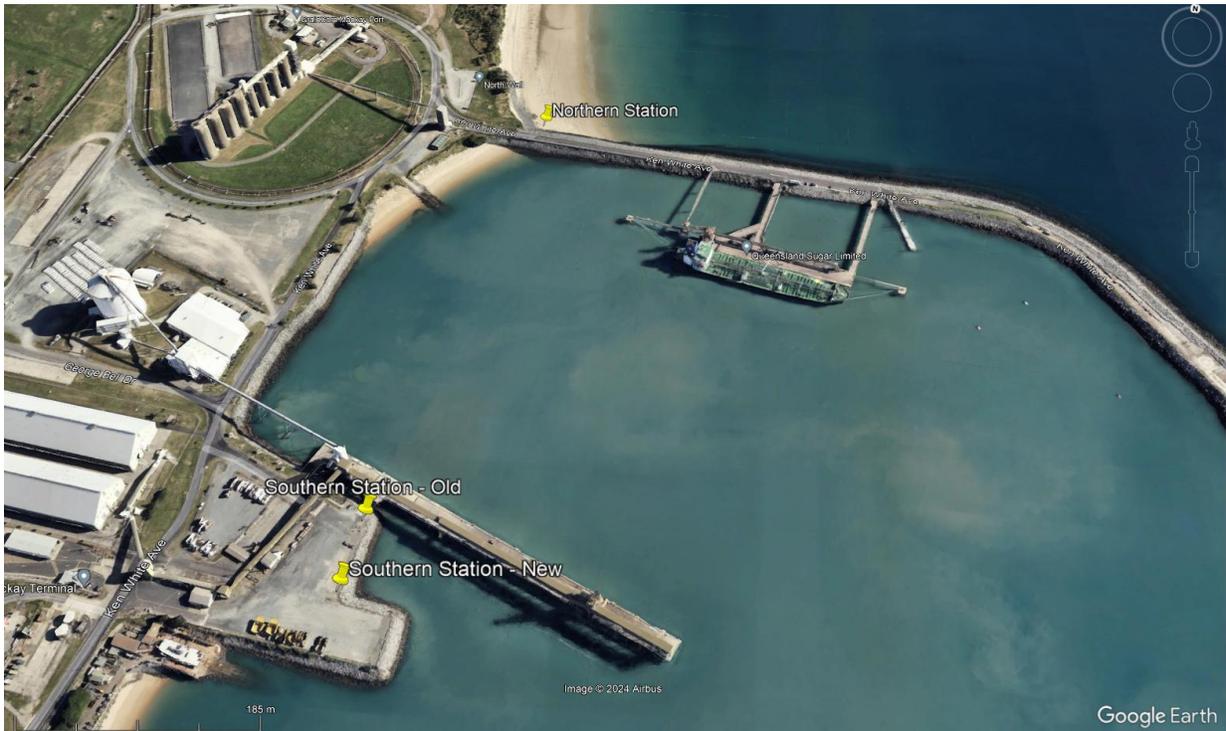


Figure 2: Mky Northern and Southern Monitoring Stations Location

2.2 Monitored Parameters

Table 2 below details the parameters monitored and the instruments used at the McEwens Beach, Mky Southern and Mky Northern stations. Appendix 1 defines any abbreviated parameter names used throughout the report.

Table 2: Parameters Measured at NQBP Monitoring Stations

| Site Name | Parameter Measured | Instrument and Measurement Technique |
|---------------|--------------------|---|
| McEwens Beach | PM ₁₀ | Met One BAM 1020 – Beta ray attenuation |
| Mky Northern | PM ₁₀ | Met One E-Sampler – light scatter aerosol monitor |
| Mky Southern | PM ₁₀ | Met One E-Sampler – light scatter aerosol monitor |

2.3 Data Collection Methods

Table 3 shows the methods used for data collection.

Table 3: Methods

| Parameter Measured | Data Collection Methods Used | Description of Method |
|---------------------------------|---------------------------------------|--|
| PM ₁₀ (BAM 1020) | 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 (E-Sampler) | Met One E-Sampler Operation Manual | Met One E-Sampler Operation Manual |

2.3.1 Conformance with Standards

Unless stated below, parameters are monitored at NQBP stations according to the methods detailed in Table 3 above.

- The Met One E-Sampler particulate monitor used at Mky Northern and Southern is classified as a non-compliant instrument under the relevant Australian Standards (e.g. AS/NZS 3580 series) for regulatory particle monitoring.
- The siting of McEwens Beach station does not conform with all the recommendations of the guidelines AS/NZS 3580.1.1:2016 due to trees and/or buildings in the area that may restrict the airflow in the vicinity of the sample inlet or alter the pollutant concentrations via adsorption or absorption.
- The siting of Mky Northern station does not conform with the guidelines in AS/NZS 3580.1.1:2016 due to it being located 2 meters away from a fence and road located less than 5m south of E-Sampler.
- The siting of Mky Southern station does not conform with the guidelines in AS/NZS 3580.1.1:2016 due to Port Road being located 6 meters west of the monitor, although traffic volume is very low as the site is within a secure port facility.

2.3.2 Data Acquisition

At McEwens Beach station, data acquisition is conducted using a Met One BAM 1020 instrument. At Mackay Northern and Southern stations, E-Samplers are used for data acquisition. Each instrument is equipped with a 4G modem to enable remote data collection. The recorded data are collected daily via Airodis™ version 5.2.4 and stored at Acoem Australasia's Environmental Reporting Services (ERS) department in Melbourne, Australia.

- **BAM 1020:** Data are logged in hourly intervals.
- **E-Samplers:** Data are logged in 5-minute intervals.

Unless otherwise specified, raw data are retained for a minimum of four years.

2.4 Data Validation and Reporting

2.4.1 Validation

The Acoem Australasia ERS department performs 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 Australasia 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.

Validation is performed by the Acoem Australasia ERS operator, and the validation is reviewed. All data is checked and graphs and reports are generated based on the hourly data for BAM 1020 and the verified five-minute data for E-Samplers.

2.4.2 Reporting

The reported data is in a Microsoft Excel format file named *“NQBP Monthly Data Report December 2025.xlsx.”*

The Excel file consists of six worksheets:

1. Cover
2. 5 Minute Data Averages
3. 15 Minute Data Averages
4. 1 Hour Data Averages
5. 24 Hour Data Averages
6. Valid Data Exception Tables

The data contained in these reports is based on Australian Eastern Standard Time. Data is for all parameters measured continuously.

For BAM 1020, all averages are calculated from hourly data, while for E-Samplers, all averages are calculated from the five-minute data. 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.

3.0 Target Maximum Exceedance

The air quality goals for pollutants monitored at McEwens Beach Station monitoring network site are based on the Australian National Environmental Council (NEPC) Ambient Air Quality NEPM. The target maximum exceedance is shown in Table 4 below.

Table 4: Target Maximum Exceedance at McEwens Beach Station

| Parameter | Time Period | Exceedance Level | Units | Maximum Allowable Exceedance* |
|------------------|-------------|------------------|-------------------|-------------------------------|
| PM ₁₀ | 1 day | 50 | µg/m ³ | None |
| PM ₁₀ | 1 year | 25 | µg/m ³ | None |

*Maximum allowable exceedance is a target. The site is not under operational control or formal compliance limits.

Note:

Exceptional events are excluded from this standard. As per the Ambient Air Quality NEPM, **Exceptional event** means a fire or dust occurrence that adversely affects air quality at a particular location, and causes an exceedance of 1-day average standards in excess of normal historical fluctuations and background levels, and is directly related to: bushfire; jurisdiction authorised hazard reduction burning; or continental scale windblown dust.

Acoem Australasia will include any valid data identified as being associated with an exceptional event in all report tables and graphic representations. However, 1-day averages associated with exceptional events will not be counted as exceedance of the Air Quality standard.

The measurement uncertainty (as outlined in Table 5) is not considered when assessing exceedance of the air quality goals. Exceedance are only reported for above goal values based on the decimal places reported.

4.0 Calibrations and Maintenance

4.1 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.²

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 (BAM 1020) | µg/m ³ | 1 µg/m ³ | 24Hr: ± (5.5 % of reading + 4.0 µg/m ³) (in range 0 - 100 µg/m ³) Hr: ± (8 % of reading + 8.0 µg/m ³) k factor of 2.0 | 0 to 1000 µg/m ³ LDL _{24hr} = 1.0µg/m ³ LDL _{hr} = 4.8µg/m ³ |
| PM ₁₀ (E-Sampler) | µg/m ³ | 1 µg/m ³ | ± 10% to gravimetric method ² | 0 to 65 mg/m ³ |

¹ Uncertainties may not be calculated based on the full measurement range.

² Manufacturer's stated accuracy for nephelometer when calibrated for local particulate type.

4.2 Maintenance

4.2.1 Maintenance Notes

4.2.1.1 McEwens Beach station

- Scheduled yearly maintenance was carried out in the month of December 2025. Instrument calibration checks were performed, and BAM 1020 was replaced.

4.2.1.2 Mky Northern station

- There was no scheduled maintenance performed in December 2025.

4.2.1.3 Mky Southern station

- Scheduled 3-monthly maintenance was carried out in the month of December 2025. Instrument calibration check was performed.

4.2.2 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 verification, 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.

Table 6 to Table 8 indicate when the particulate equipment was last maintained /calibrated.

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

Table 6: McEwens Beach Maintenance Table

| Parameter | Date of Last Maintenance | Maintenance Type | Date of Last Calibration | Calibration Cycle |
|---------------------------------------|--------------------------|------------------|--------------------------|-------------------|
| PM ₁₀ (Out ID: 13-0333) | 01/12/2025 | 6-Monthly | 25/08/2025 | Yearly |
| PM ₁₀ (In ID: FN15514) | 03/12/2025 | Commissioning | 03/12/2025 | Yearly |

Table 7: Mky Northern Maintenance Table

| Parameter | Date of Last Maintenance | Maintenance Type | Date of Last Calibration | Calibration Cycle |
|------------------|--------------------------|------------------|--------------------------|-------------------|
| PM ₁₀ | 02/10/2025 | 2-Monthly | 02/10/2025 | 2-Monthly |

Table 8: Mky Southern Maintenance Table

| Parameter | Date of Last Maintenance | Maintenance Type | Date of Last Calibration | Calibration Cycle |
|------------------|--------------------------|------------------|--------------------------|-------------------|
| PM ₁₀ | 03/12/2025 | 3-Monthly | 03/12/2025 | 2-Monthly |

5.0 Results

5.1 Data Capture

Data capture refers to the amount of available data collected during the report period. BAM 1020 data capture at McEwens station is based on 1-hour averages. E-Samplers at Mky Northern and Southern stations are calculated from 5-minute data.

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

$$\text{Data capture} = (\text{Reported air quality data} / \text{Total data}) \times 100\%$$

Where:

- Reported air quality data = Number of instrument readings which have been verified through a quality assured process and excludes all data errors, zero data collection due to calibration, failures and 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 9 below displays data capture statistics for December 2025. **Bold** values in the table indicate data capture below 95%.

Table 9: Monthly Data Capture for NQBP stations

| Station | Parameter | Data Capture (%) |
|---------------|------------------|------------------|
| McEwens Beach | PM ₁₀ | 93.0 |
| Mky Northern | PM ₁₀ | 100.0 |
| Mky Southern | PM ₁₀ | 100.0 |

5.2 Air Quality Summary

Table 10 below presents some statistical parameters for McEwens Beach, Mky Northern and Southern stations. The standard deviation of McEwens Beach is calculated based on the hourly averaged data. The standard deviation of Mky Northern and Southern is calculated based on the 5-minute averaged data.

Table 10: General Statistics

| Station | Parameter | Time Period | Average ($\mu\text{g}/\text{m}^3$) | Standard Deviation ($\mu\text{g}/\text{m}^3$) |
|---------------|------------------|-------------|--------------------------------------|---|
| McEwens Beach | PM ₁₀ | 1 month | 10 | 7 |
| Mky Northern | PM ₁₀ | 1 month | 12 | 7 |
| Mky Southern | PM ₁₀ | 1 month | 11 | 5 |

Table 11 below summarises any exceedance of the air quality goals of McEwens Beach detailed in Table 4.

Table 11: Exceedance Recorded for McEwens Beach Station

| Parameter | Time Period | Value of Exceedance ($\mu\text{g}/\text{m}^3$) | Date of Exceedance |
|------------------|-------------|--|--------------------|
| PM ₁₀ | 24 Hour | - | - |

5.2.1 Air Quality Categories

Air quality categories rather than an air quality index have been adopted to align with a Nationally consistent method of reporting of air quality data.

Each air quality measurement from a monitoring station is assigned an air quality category rating based on comparison of the measurement value against the relevant air quality guideline. Five colour-coded air quality categories are used, being 'Good' (Blue), 'Fair' (Green), 'Poor' (Purple), 'Very Poor' (Red) or 'Extremely Poor' (Black). Values greater than the air quality guideline will be appear as 'Poor', 'Very Poor' or 'Extremely Poor'.

The Air Quality Categories rating is based on 1-hour averages values.³

Table 12: Colour-coded Categories for Air Quality Categories⁴

| | | | | | |
|---------------|-------------|----------------|-------------------|------------------------|------------------------|
| Not available | Good <50 | Fair 50-100 | Poor 100.1-200 | Very poor 200.1-600 | Extremely poor >600 |
|---------------|-------------|----------------|-------------------|------------------------|------------------------|

The PM₁₀ 1-hour average values for the reporting month at the Mky Northern and Southern stations were assessed against the air quality category rating, and the pie chart on the next pages presents the percentage of the time for which a specific air quality category was identified.

³ <https://www.qld.gov.au/environment/management/monitoring/air/air-monitoring/air-quality-categories>

⁴ Colour scheme and pie chart type has been changed to reflect the website of North Queensland Bulk Ports Corporation.

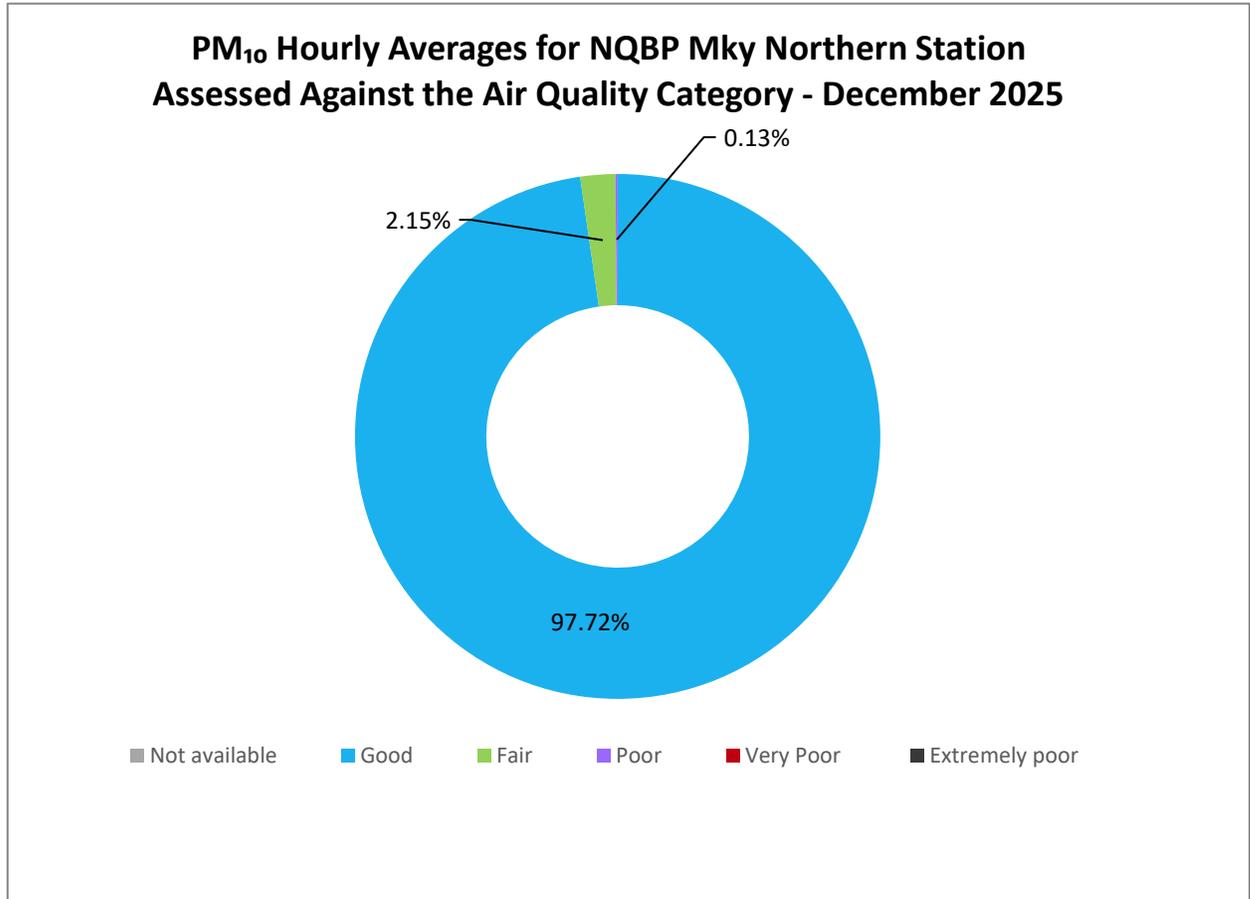


Figure 3: Hourly PM₁₀ Averages for NQBP Mky Northern Station Assessed Against the Air Quality Categories

97.72% of days during the reporting period presented by the Air Quality Category are classified as Good, 2.15% days are classified as Fair, 0.00% days are classified as Not available, 0.13% of days are classified as Poor, 0.00% of days are classified as Very Poor and 0.00% are classified as Extremely Poor.

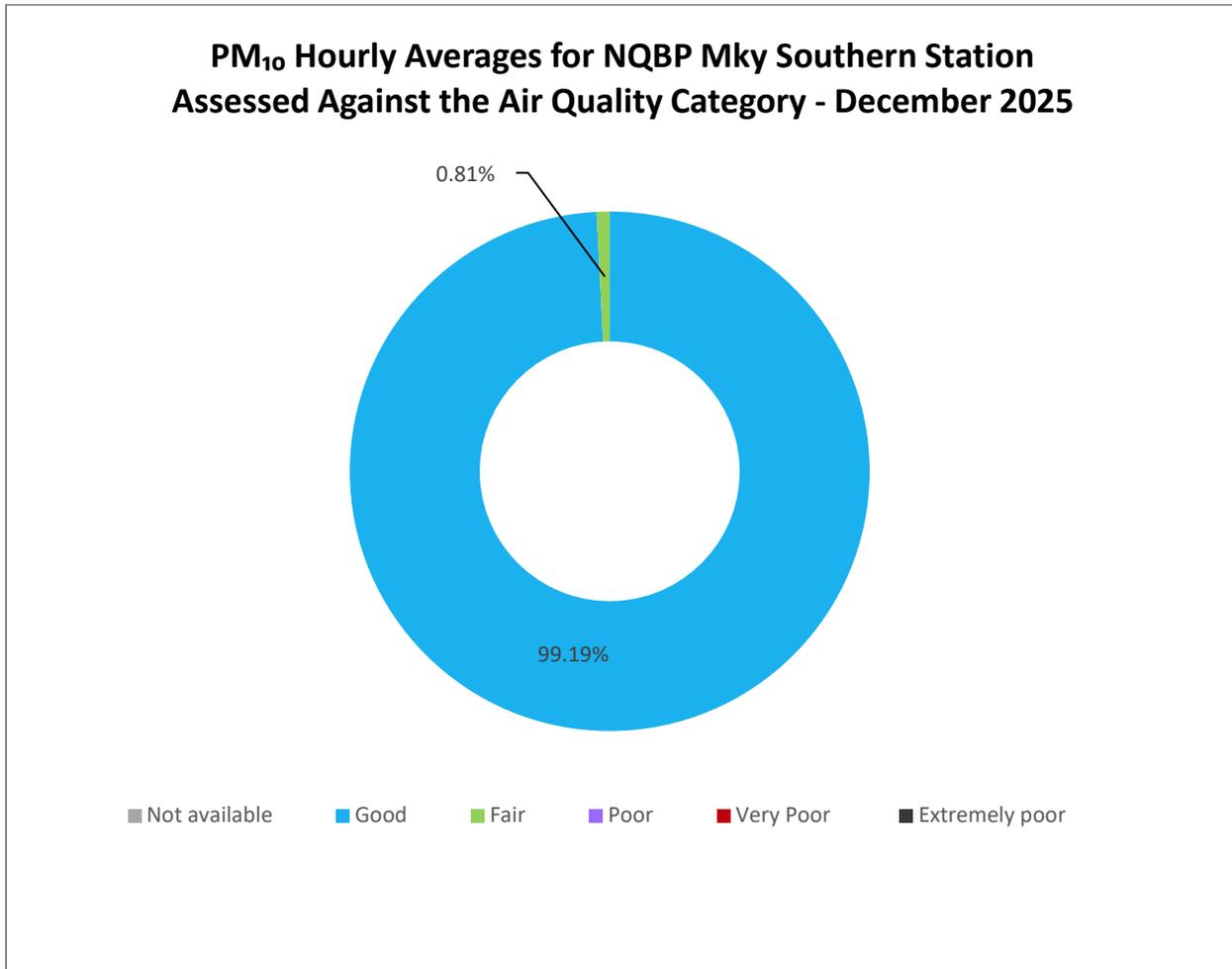


Figure 4: Hourly PM₁₀ Averages for NQBP Mky Southern Station Assessed Against the Air Quality Categories

99.19% of days during the reporting period presented by the Air Quality Category are classified as Good, 0.00% of days are classified as Not available, 0.81% of days are classified as Fair, 0.00% of days are classified as Poor, 0.00% of days are classified as Very Poor and 0.00% of days are classified as Extremely Poor.

5.3 Tabulated Data

Table 13 details the daily averages for PM₁₀ measured at Southern and Northern stations.

Table 13: NQBP Stations Data Table

| Date | McEwens Beach PM ₁₀ (µg/m ³) | Mky Northern PM ₁₀ (µg/m ³) | Mky Southern PM ₁₀ (µg/m ³) |
|------------|--|---|---|
| 1/12/2025 | - | 10 | 10 |
| 2/12/2025 | - | 12 | 10 |
| 3/12/2025 | - | 17 | 15 |
| 4/12/2025 | 20 | 13 | 15 |
| 5/12/2025 | 13 | 8 | 10 |
| 6/12/2025 | 10 | 8 | 9 |
| 7/12/2025 | 9 | 8 | 10 |
| 8/12/2025 | 7 | 11 | 13 |
| 9/12/2025 | 10 | 13 | 10 |
| 10/12/2025 | 13 | 14 | 10 |
| 11/12/2025 | 11 | 12 | 9 |
| 12/12/2025 | 9 | 9 | 8 |
| 13/12/2025 | 6 | 7 | 8 |
| 14/12/2025 | 7 | 8 | 8 |
| 15/12/2025 | 8 | 8 | 10 |
| 16/12/2025 | 6 | 11 | 9 |
| 17/12/2025 | 13 | 16 | 15 |
| 18/12/2025 | 12 | 16 | 15 |
| 19/12/2025 | 9 | 17 | 11 |
| 20/12/2025 | 10 | 12 | 10 |
| 21/12/2025 | 6 | 13 | 12 |
| 22/12/2025 | 6 | 11 | 11 |
| 23/12/2025 | 7 | 12 | 12 |
| 24/12/2025 | 5 | 13 | 14 |
| 25/12/2025 | 2 | 7 | 8 |
| 26/12/2025 | 0 | 2 | 3 |
| 27/12/2025 | 11 | 9 | 10 |
| 28/12/2025 | 16 | 17 | 16 |
| 29/12/2025 | 17 | 19 | 16 |
| 30/12/2025 | 21 | 17 | 15 |
| 31/12/2025 | 18 | 15 | 13 |

5.4 Graphic Representations

Validated PM₁₀ data was used to construct the following monthly graphic representations.

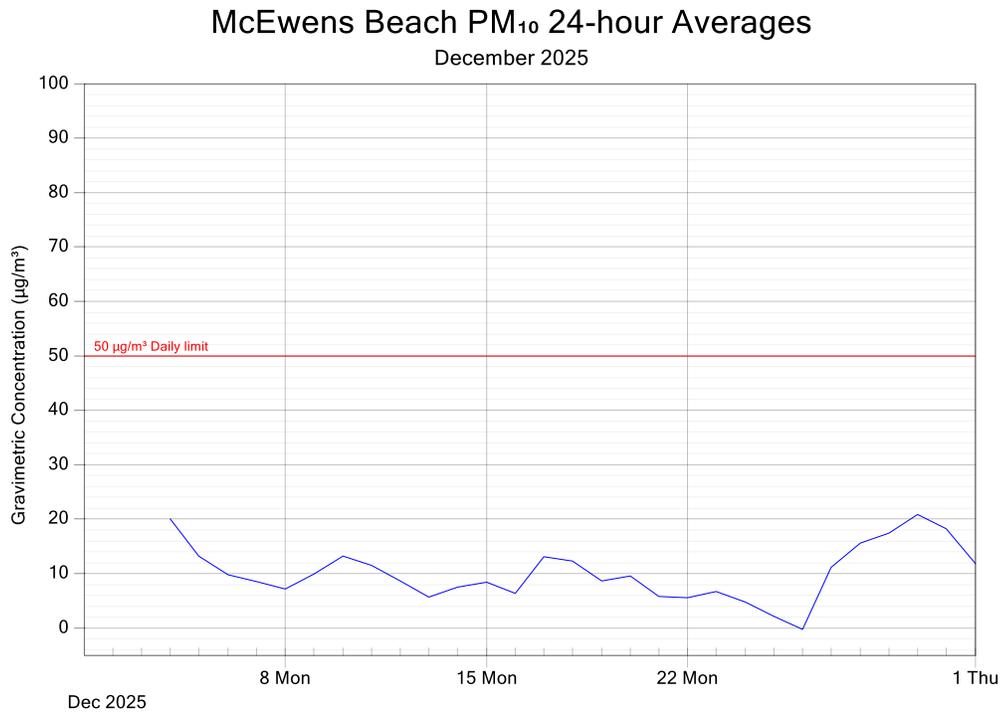


Figure 5: McEwens Beach Station PM₁₀ 24-hour Averages

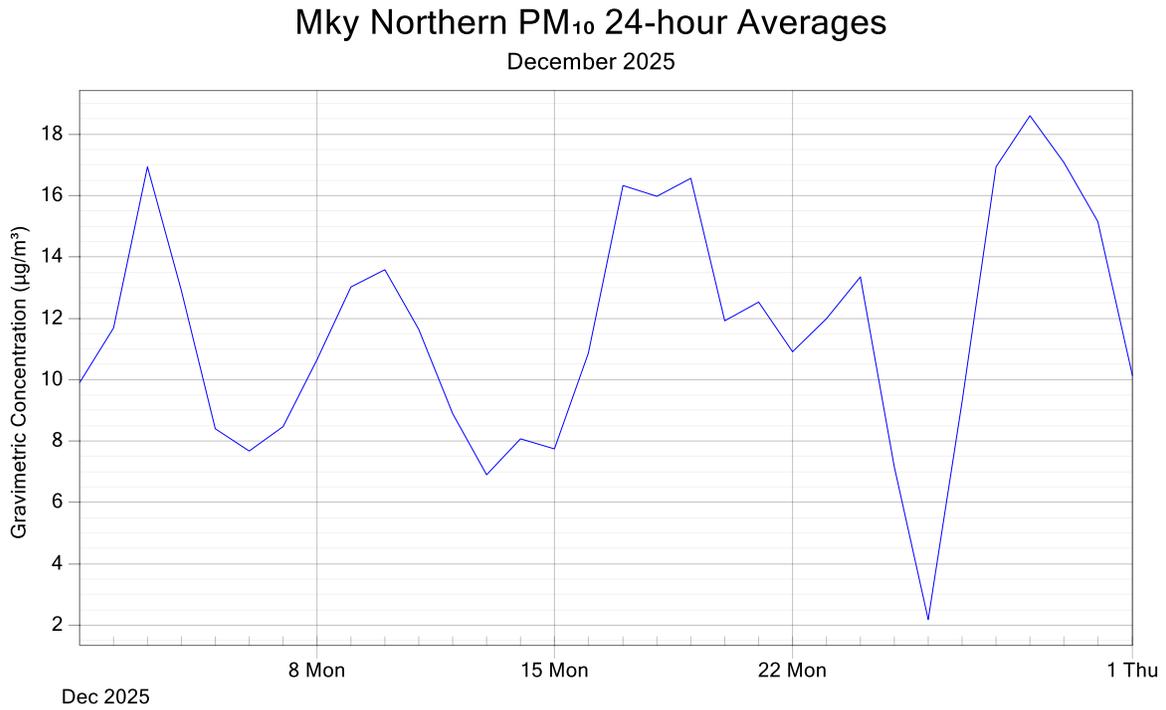


Figure 6: Mky Northern Station PM₁₀ 24-hour Averages

Mky Southern PM₁₀ 24-hour Averages

December 2025

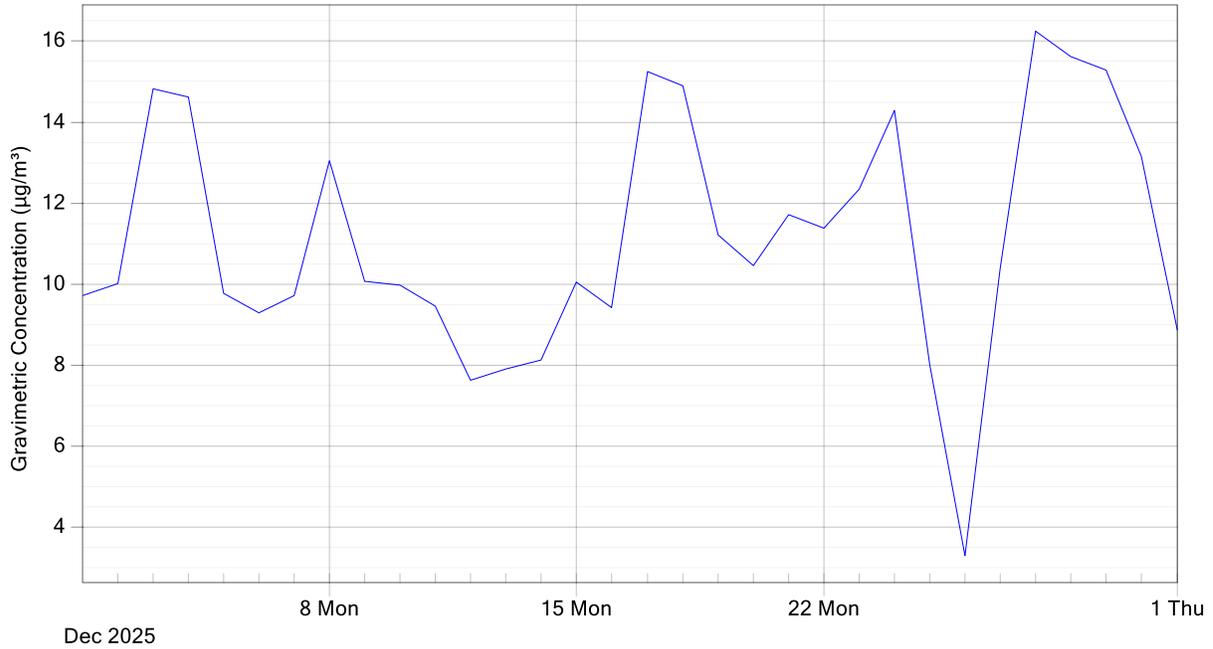


Figure 7: Mky Southern Station PM₁₀ 24-hour Averages

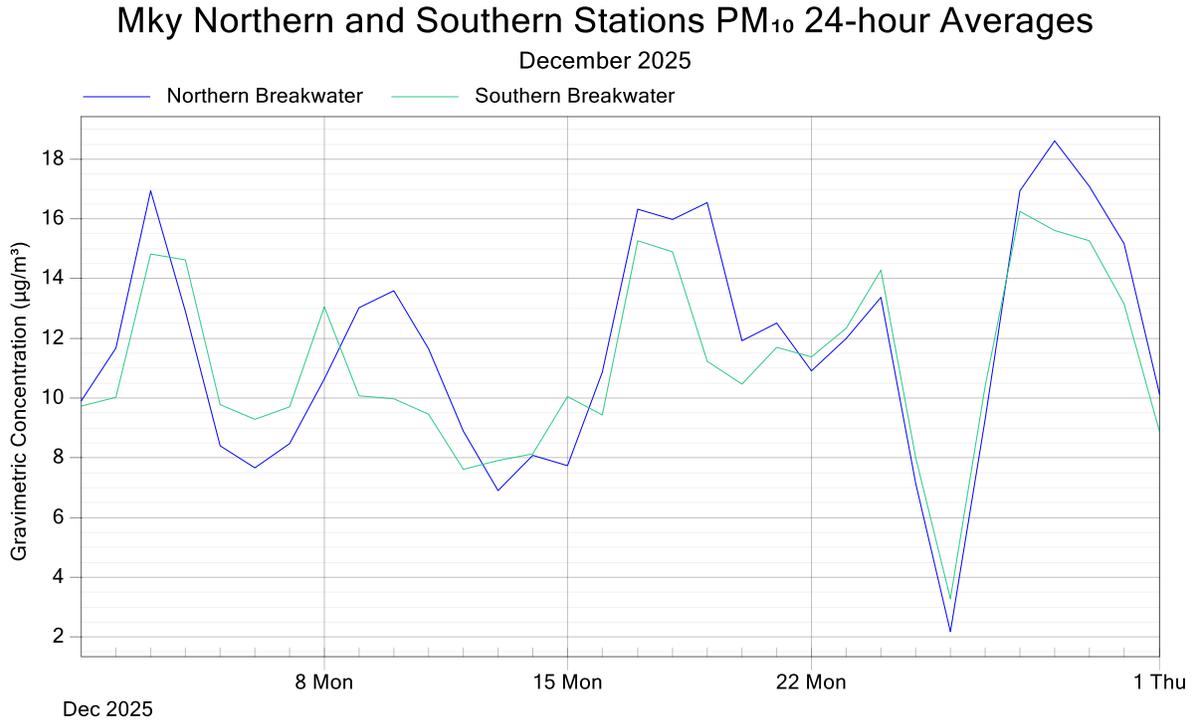


Figure 8: Mky Northern and Mky Southern Stations PM₁₀ 24-hour Averages Comparison

6.0 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 14: McEwens Beach BAM 1020 Valid Data Exception Table

| Start Date | End Date | Reason | Change Details | User Name | Change Date |
|---------------------|---------------------|--|------------------|-----------|-------------|
| 01/12/2025 13:00 | 01/12/2025 18:00 | Scheduled yearly maintenance - instrument calibration checks and BAM 1020 replaced (IN ID: FN15514, OUT ID: 13-0333) | PM ₁₀ | EW | 28/01/2026 |
| 01/12/2025 19:00 | 03/12/2025 15:00 | Scheduled yearly maintenance - zero test run | PM ₁₀ | EW | 28/01/2026 |
| 03/12/2025 16:00 | 03/12/2025 16:00 | Scheduled yearly maintenance - zero filter removed | PM ₁₀ | EW | 28/01/2026 |

Table 15: Mky Northern E-Sampler Valid Data Exception Table

| Start Date | End Date | Reason | Change Details | User Name | Change Date |
|---------------------|---------------------|--------------------------------------|------------------|-----------|-------------|
| 03/12/2025 15:05 | 03/12/2025 15:05 | Instrument fault - flow out of range | PM ₁₀ | EW | 28/01/2026 |

Table 16: Mky Southern E-Sampler Valid Data Exception Table

| Start Date | End Date | Reason | Change Details | User Name | Change Date |
|---------------------|---------------------|--|------------------|-----------|-------------|
| 03/12/2025 14:50 | 03/12/2025 14:55 | Scheduled 3-monthly maintenance - instrument calibration check and subsequent instrument stabilisation | PM ₁₀ | EW | 28/01/2026 |

7.0 Report Summary

- The PM₁₀ data capture was below 95% for McEwens Beach station in the reporting month due to BAM 1020 replaced.
- The PM₁₀ data capture was above 95% for Mky Northern and Southern stations in the reporting month.
- The PM₁₀ monthly average for McEwens Beach station was 10 µg/m³ with a standard deviation of 7 µg/m³.
- The PM₁₀ monthly average for Mky Northern station was 12 µg/m³ with a standard deviation of 7 µg/m³.
- The PM₁₀ monthly average for Mky Southern station was 11 µg/m³ with a standard deviation of 5 µg/m³.

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

Appendix 1 - Definitions & Abbreviations

| | |
|--------------------------|---|
| $\mu\text{g}/\text{m}^3$ | Micrograms per cubic metre at standard temperature and pressure (0°C and 101.3 kPa) |
| LDL | Lower Detectable Limit |
| PM ₁₀ | Particulates less than 10 microns equivalent in aerodynamic diameter |

Appendix 2 - Explanation of Exception Table

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.