

Port of Hay Point

Ambient Air, Noise and Weather Monitoring

Validated Report

1st March – 31st March 2023

Report No.: DAT19671

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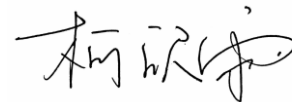
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Revision History			
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0	DAT19671	28/04/2023	Xinyu Ke

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1.0 Introduction

Acoem Australasia (Ecotech Pty Ltd) was commissioned by North Queensland Bulk Ports Corporation (NQBP), Dalrymple Bay Coal Terminal Pty Ltd (DBCT P/L) and BMA Hay Point Coal Terminal (HPCT) to provide monitoring and data reporting for the Port of Hay Point environmental monitoring program in Hay Point, Queensland. Acoem Australasia (Ecotech) commenced services under the ambient air quality monitoring program Contract SA294.2016 on the 1st of March 2017.

This report presents the data for March 2023.

The data presented in this report:

- Describes air quality measurements;
- Compares monitoring results;
- Has been quality assured.

1.1. Purpose of monitoring

This Ambient Air Monitoring Program has been established to proactively monitor ambient air, noise and meteorological conditions in the community surrounding the Port of Hay Point. The program consists of two control stations (C1 and C2), nine ambient air quality monitoring stations (P1, P2, P3, P4, S1, S2, S3, S5 and S6) and one rain gauge as described in Table 1.

Since the commencement of this monitoring program in 1993, Louisa Creek township has been identified as future strategic port land. NQBP have introduced a voluntary residential buy back scheme and taken steps to prevent residential re-intensification in zones immediately adjacent to the Port. Subsequently the monitoring station P2 is no longer in as populated residential location as when the program initially began.

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2.0 Monitoring and Data Collection

2.1. Siting Details

The Sites consist of two Control stations (C1 and C2), nine Residential ambient air quality monitoring stations (P1, P2, P3, P4, S1, S2, S3, S5 and S6) and one Rain Gauge. The stations' location and siting details are described in the following table and figures.

Table 1: Port of Hay Point Residential and Control Monitoring Sites Locations

Site Name	Geographical Coordinates	Height Above Sea Level (m)
C1 - Grasstree Beach (South)	21°21'54.71"S, 149°18'25.60"E	8
C2 - Grasstree Beach (North)	21°22'3.06"S, 149°18'27.19"E	10
P1 - Louisa Creek, Edmund Avenue (North)	21°16'21.43"S, 149°15'47.96"E	6
P2 - Louisa Creek, Edmund Avenue (South)	21°16'48.46"S, 149°16'34.64"E	10
P3 - Half Tide Car Park	21°17'45.34"S, 149°17'21.76"E	9
P4 - Salonika Beach	21°18'29.32"S, 149°17'33.64"E	12
S1 - Louisa Creek (North)	21°16'35.88"S, 149°16'14.42"E	1
S2 - Louisa Creek (South)	21°16'46.88"S, 149°16'29.00"E	4
S3 – Osborne's Residence	21°17'23.20"S, 149°16'10.05"E	15
S5 - Salonika Beach	21°18'11.60"S, 149°17'35.24"E	13
S6 - Half Tide Beach	21°17'56.83"S, 149°17'31.84"E	9
Rain Gauge	21°17'23.52"S, 149°17'17.41"E	7

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Figure 1: Port of Hay Point Residential, Rain Gauge and Control Monitoring Stations Location

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Figure 2: Detail of the Port of Hay Point Residential Stations Location and Rain Gauge

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2.2. Monitored Parameters

Table 2 details the parameters monitored and the instruments used at Port of Hay Point Residential and Control monitoring stations. Appendix 1 defines any abbreviated parameter names used throughout the report.

Sampling of all parameters is continuous, with the exception of Deposited dust. Deposited dust is captured over a one-month period and the sample bottles collected once a month.

For meteorological sensors, the elevation given in the table below is the height above ground level at the monitoring station.

Table 2: Parameters measured at the Port of Hay Point Residential and Control Monitoring Stations

Site Code	Parameter Measured	Instrument and Measurement Technique
C1, C2, S1, S2, S3, S5 and S6	Deposited Particulate Matter	Dust Deposition Gauge
P3	Deposited Particulate Matter	Dust Deposition Gauge
	PM ₁₀	Thermo – TEOM 1405 (Tapered Element Oscillating Microbalance)
	Wind Speed (Horizontal, elevation 10m)	Vaisala WXT520 Multi-sensor Weather Monitor
	Wind Direction (Elevation 10m)	Vaisala WXT520 Multi-sensor Weather Monitor
	Ambient Temperature (Elevation 10m)	Vaisala WXT520 Multi-sensor Weather Monitor
	Relative Humidity (Elevation 10m)	Vaisala WXT520 Multi-sensor Weather Monitor
	Noise	Class 1 Brüel & Kjær 2250 Sound Level Meter
P1, P2 and P4	Deposited Particulate Matter	Dust Deposition Gauge

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Site Code	Parameter Measured	Instrument and Measurement Technique
	PM ₁₀	Thermo – TEOM 1405 (Tapered Element Oscillating Microbalance)
	Wind Speed (horizontal, elevation 10m)	Gill Windsonic Op1
	Wind Direction (elevation 10m)	Gill Windsonic Op1
	Noise	Class 1 Brüel & Kjær 2250 Sound Level Meter
Rain Gauge	Rainfall	Hydrological Services tipping bucket rain gauge - Model TB3

Since the beginning of the project in March 2017 until the 9th of July 2018, the TEOMs at sites P1, P2, P3 and P4 were configured to measure TSP. After this date, measurements were changed to PM₁₀ due to updates to the Dalrymple Bay Coal Terminal Pty Ltd and Hay Point Environmental Authority Permit¹.

¹ Department of Environment and Heritage Protection Environmental Authority Permits EPPR00474413 and EPPR00504513.

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2.3. Data Collection Methods

Table 3 below shows the methods used for data collection.

Table 3: Methods

Parameter Measured	Data Collection Methods Used	Description of Method
Deposited Particulate Matter (<i>Sampling by Acoem Australasia (Ecotech)</i>)	AS/NZS 3580.10.1 2016	Methods for sampling and analysis of ambient air. Method 10.1: Determination of particulate matter—Deposited matter—Gravimetric method
Deposited Particulate Matter (<i>Analysis by SGS</i>)	AN502 (Sydney) /AN503	The mass deposition rate of deposited matter is calculated from the mass of solids obtained, the funnel cross-section area and the exposure period.
PM ₁₀ (TEOM)	AS/NZ 3580.9.8-2008	Methods for sampling and analysis of ambient air. Method 9.8: Determination of suspended particulate matter - PM ₁₀ continuous direct mass method using a tapered element oscillating microbalance analyser.
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
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 (<i>Sampling by external contractor</i>)	AS/NZS 3580.14 2014	Methods for sampling and analysis of ambient air. Method 14: Meteorological monitoring for ambient air quality monitoring applications. Rainfall by tipping bucket rain gauge
Noise (L _{eq} , L ₁₀ and L ₉₀) (<i>Analysis by Marshall Day Acoustics</i>)	DEHP Noise Measurement Manual (2013) and AS 1055.1: 1997	Acoustics - Description and measurement of environmental noise - Part 1: General procedures

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2.3.1. Data Acquisition

Data acquisition for continuously monitored parameters, with the exception of noise and rain, is performed using an Envista logger situated at each of the monitoring sites. Each logger is equipped with a 4G modem for remote data collection. The recorded data is remotely collected and transferred via FTP at 10-minute intervals (using Airodis™ version 5.2) and stored at Acoem Australasia (Ecotech) Environmental Reporting Services (ERS) department in Melbourne, Australia. Data samples are logged in 5-minute intervals.

2.3.2. Sampling and analysis for Rain

Rain sampling and analysis are conducted by an external contractor. The 5-minute data is sent monthly to Acoem Australasia (Ecotech) by Dalrymple Bay Coal Terminal Pty Ltd (DBCT P/L).

2.3.3. Sampling and analysis for Noise

Noise data samples are logged in 5-minute intervals. The data is downloaded monthly by Acoem Australasia (Ecotech) field service technicians and sent to Marshall Day Acoustics for analysis.

2.3.4. Sampling and analysis for Deposited Dust

Deposited dust sampling is conducted by Acoem Australasia (Ecotech) field service technicians. Sample bottles are sent to SGS Cairns Environmental Laboratory for analysis. The laboratory is NATA accredited for compliance with ISO/IEC 17025:2005 (Acc. No. 2562, Site No.3146).

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2.4. Data Validation and Reporting

2.4.1. Validation

The Acoem Australasia (Ecotech) ERS department perform daily data checks on continuously monitored parameters (with the exception of noise and rainfall data) to ensure maximum data capture rates are maintained. Any equipment failures are communicated to the responsible field engineers for urgent rectification. Acoem Australasia (Ecotech) 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.

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

Note: Validation for noise data is performed by the subcontractor Marshall Day Acoustics.

2.4.2. Reporting

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

All averages are calculated from the five-minute data. Averages are based on a minimum of 75% valid readings within the averaging period. Where data capture is low for a particular parameter, summary values (e.g., monthly maximum and minimum) may be based on less than 75% valid samples.

The reader should use caution when interpreting these values as they may not be representative of conditions for the entire sample 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 averages are calculated based on calendar days.

Rain Reporting

Rain results are provided to Acoem Australasia (Ecotech) by Dalrymple Bay Coal Terminal Pty Ltd (DBCT P/L) and included in this report.

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Deposited Dust Reporting

Deposited dust results are provided to Acoem Australasia (Ecotech) by the SGS Cairns Environmental Laboratory and summarised within this report.

Noise Data Reporting

Noise levels results are provided to Acoem Australasia (Ecotech) by Marshall Day Acoustics and summarised within this report.

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.

In Table 7 on page 21, “South” describes the wind direction arc between the compass points of >60 degrees and <240 degrees. “North” describes wind direction arc between the compass points of >240 degrees and more <60 degrees.

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3.0 Air Quality Objectives

The air quality objectives monitored at the Port of Hay Point monitoring network sites are taken from the Dalrymple Bay Coal Terminal Pty Ltd and Hay Point Environmental Authority Permit².

The air quality objectives are shown in Table 4 below.

Table 4: Port of Hay Point Air Quality Objectives

Parameter	Time Period	Licence Limit	Units
Deposited Dust – Total Insoluble Solids	1 day: based on 1 month sampling	120 mg/m ² /day	mg/m ² /day
PM ₁₀	1 day	50 µg/m ³ – when generated by port activities and measured at any sensitive or commercial place	µg/m ³
L _{A90}	15 min	Day level (7am – 7pm) = 55 dB(A) Night level (7pm – 7am) = 53 dB(A)	dB(A)

² Department of Environment and Heritage Protection Environmental Authority Permits EPPR00474413 and EPPR00504513.

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4.0 Results

4.1. Data Capture

Data capture is based on 5-minute data and refers to the amount of available data collected during the report period. 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 validated 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 instrument readings since the start of the term assuming no maintenance, errors, loss of data or calibration.

Table 5 displays data capture statistics for the reporting period (March 2023). **Bold** values in the table indicate data capture below 90%.

Table 5: P1-P4 Data Capture for March 2023

Parameter	Data Capture (%)			
	P1	P2	P3	P4
PM ₁₀	99.7	97.0	99.6	99.3
WS and WD	99.9	99.9	99.8	99.9
AT ³			99.6	
RH			98.9	
Noise	72.0	88.0	94.0	80.0

The data capture for most of the parameters at sites P1, P2, P3 and P4 was above 90% for the reporting month except for the noise data at Site P1, P2 and P4 due to power interruption caused by on-site

³ AT and RH parameters are only measured at P3 station.

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electrical testing. The overall monthly percentage of data captured for the 11 Dust Deposition Gauges was 100.0%.

4.2. Complaints

There were two external contacts regarding noise received by the PoHP terminals during March 2023.

4.3. Air Quality Summary

4.3.1. 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' (green), 'Fair' (yellow), 'Poor' (orange), 'Very Poor' (red) or 'Extremely Poor' (dark red). Values greater than the air quality guideline will be appear as 'Poor', 'Very Poor' or 'Extremely Poor'.⁴

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

Table 6: Colour-coded Categories for Air Quality Categories

Not available	Good <50	Fair 50.1 - 100	Poor 100.1 - 200	Very Poor 200.1 - 600	Extremely Poor >600
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The PM₁₀ 1-hour average values for the reporting month in the stations P1, P2, P3 and P4 were assessed against the air quality category rating, and the pie chart on the next page presents the percentage of the days for which a specific air quality category was identified.

⁴ <https://www.qld.gov.au/environment/pollution/monitoring/air/air-monitoring/air-quality-categories>

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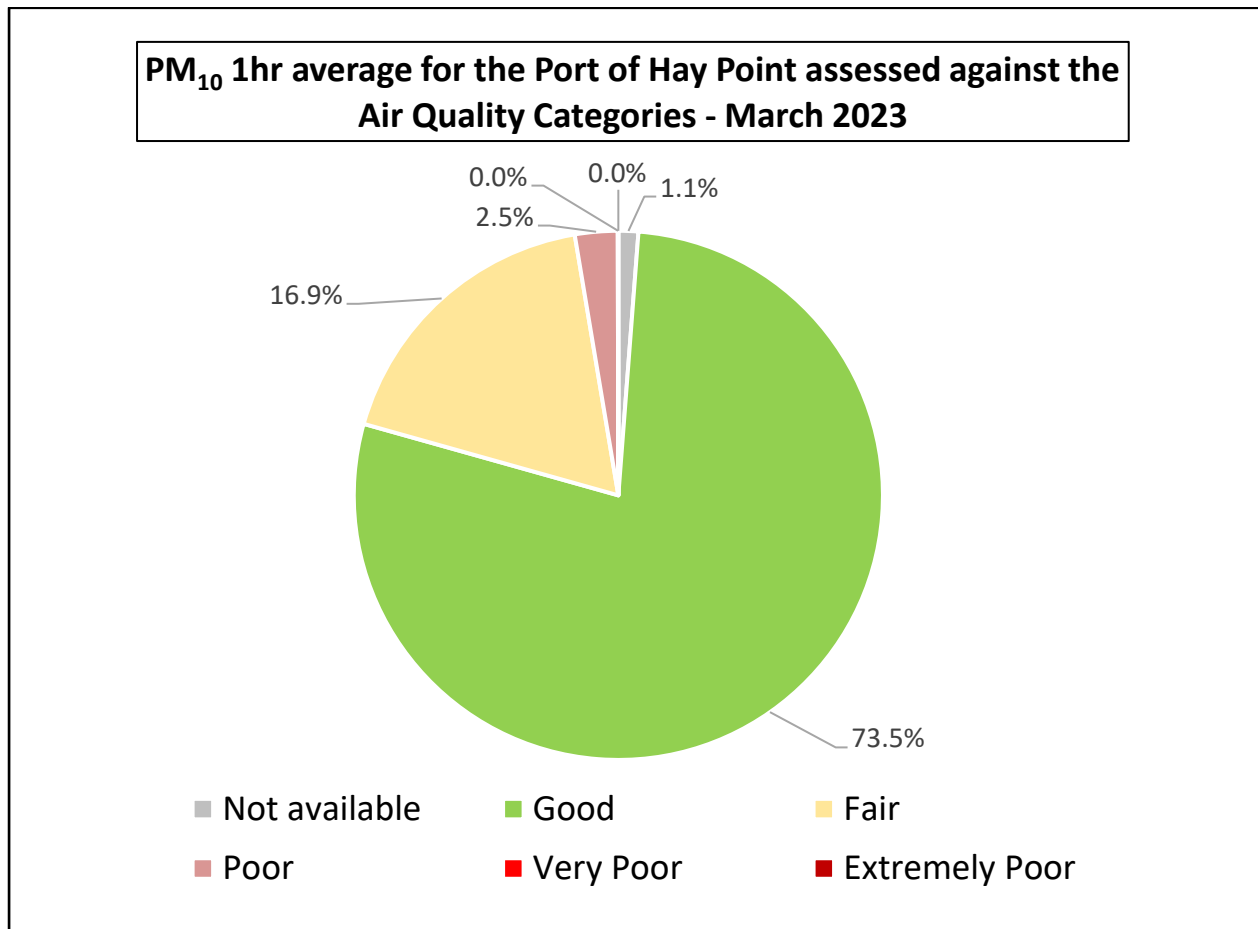


Figure 3: Hourly PM₁₀ Averages for the Port of Hay Point Assessed Against the Air Quality Index

The majority of the days during the reporting period (March 2023) presented Air Quality Index classified as Good (73.5%) or Fair (16.9%).

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4.4. Graphic Representations

Validated 5-minute data for PM₁₀, Wind speed, Wind direction, AT, RH, Rainfall and Noise were used to construct the following monthly graphic representations and summary tables.

For PM₁₀, the licence limit is 50 µg/m³ for the 24-hour average measured downwind of site. If the wind is from the South, sites P1 and P2 are downwind of site. If the wind is from the North, sites P3 and P4 are downwind of site. The following graph and table summarise the wind direction and PM₁₀ results for the month compared to the licence limit. Values highlighted in red in the table indicate a PM₁₀ exceedance. Values shaded in dark grey indicate wind direction from the North.

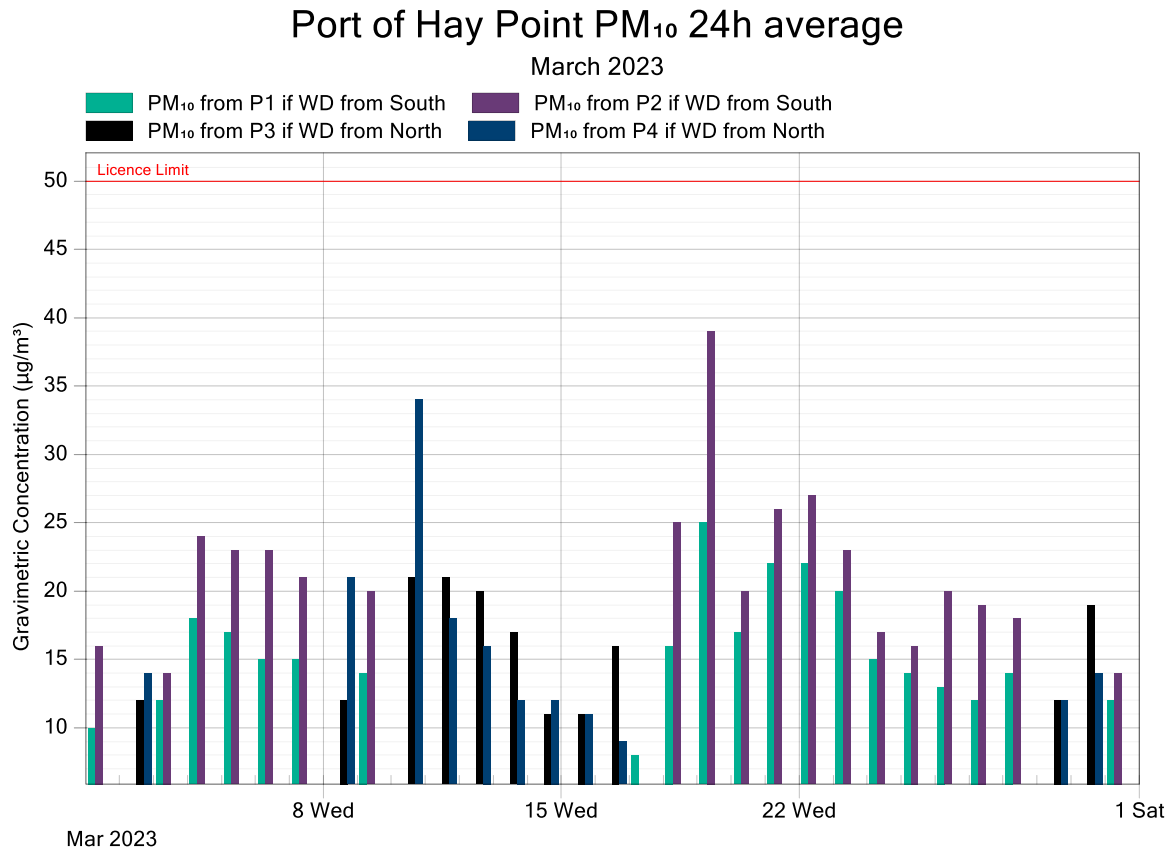


Figure 4: Port of Hay Point PM₁₀ 24-Hour Average Data Compared to the Licence Limit for March 2023

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Table 7: Port of Hay Point Wind Direction and PM₁₀ 24h Average Data for March 2023

Date	PM ₁₀ exceedence limit (µg/m ³)	Wind direction ⁵	P1 PM ₁₀ (µg/m ³)	P2 PM ₁₀ (µg/m ³)	P3 PM ₁₀ (µg/m ³)	P4 PM ₁₀ (µg/m ³)
1/03/2023	50.0	South	10	16	14	14
2/03/2023	50.0	North	13	11	12	14
3/03/2023	50.0	South	12	14	15	19
4/03/2023	50.0	South	18	24	19	31
5/03/2023	50.0	South	17	23	19	33
6/03/2023	50.0	South	15	23	17	31
7/03/2023	50.0	South	15	21	16	26
8/03/2023	50.0	North	11	16	12	21
9/03/2023	50.0	South	14	20	16	29
10/03/2023	50.0	North	18	27	21	34
11/03/2023	50.0	North	17	21	21	18
12/03/2023	50.0	North	16	18	20	16
13/03/2023	50.0	North	12	15	17	12
14/03/2023	50.0	North	9	11	11	12
15/03/2023	50.0	North	9	11	11	11
16/03/2023	50.0	North	7	8	16	9
17/03/2023	50.0	South	8	-	9	10
18/03/2023	50.0	South	16	25	19	32
19/03/2023	50.0	South	25	39	27	47
20/03/2023	50.0	South	17	20	20	34
21/03/2023	50.0	South	22	26	27	49
22/03/2023	50.0	South	22	27	28	52
23/03/2023	50.0	South	20	23	26	45
24/03/2023	50.0	South	15	17	19	35
25/03/2023	50.0	South	14	16	17	29
26/03/2023	50.0	South	13	20	15	25
27/03/2023	50.0	South	12	19	13	25
28/03/2023	50.0	South	14	18	12	17
29/03/2023	50.0	North	9	11	12	12
30/03/2023	50.0	North	11	16	19	14
31/03/2023	50.0	South	12	14	19	16

⁵ Wind compass direction from "South" is >60 degrees and <240 degrees

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The next graphs present the deposited dust results for the Total Insoluble Solids in comparison with the license limit for the reporting month⁶. The results are presented in two different graphs: one for the sites located to the North of the Terminal (S1, S2, S3, P1 and P2) and another for the sites located to the South of the Terminal (S5, S6, P3 and P4).

The Total Insoluble Solids are classified in 4 categories: organic matter (plant and animal material), fine dark particles (dark material), mineral fraction (light material) and other material such as plastics.

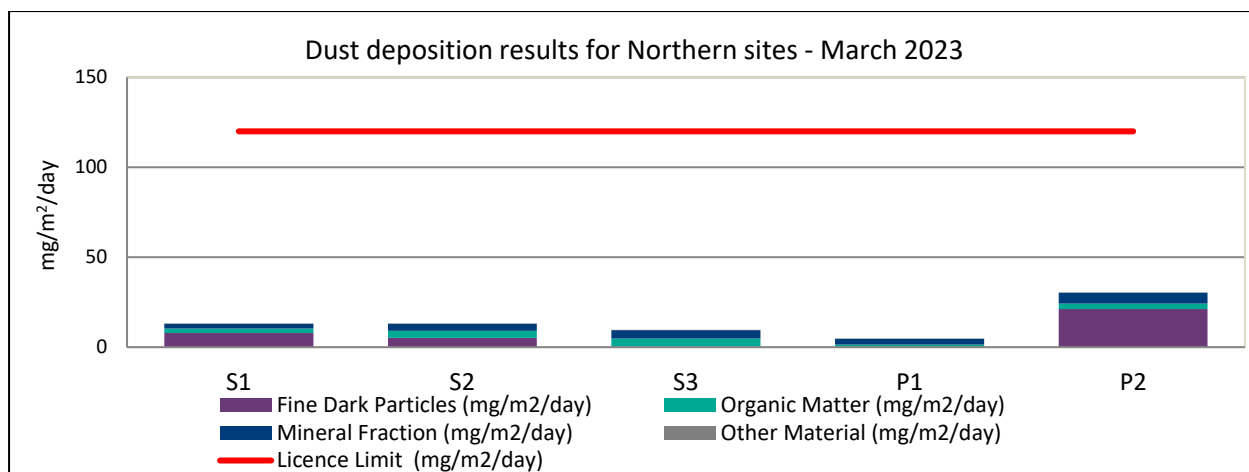


Figure 5: Dust Deposition Results for Northern Sites, March 2023

⁶ Dust deposition results were provided to Acoem by the SGS Cairns Environmental Laboratory.

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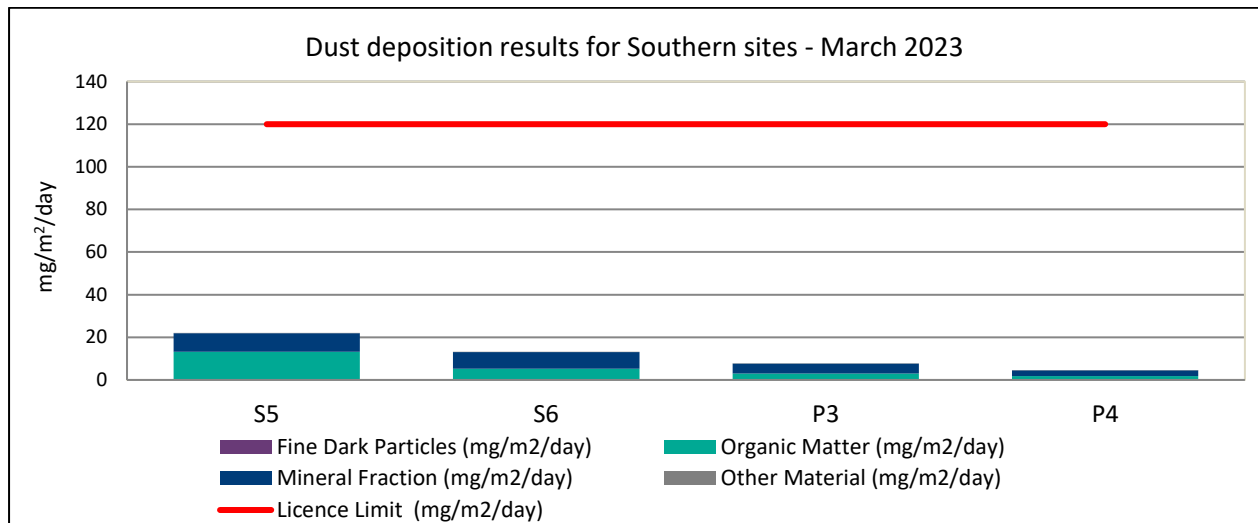


Figure 6: Dust Deposition Results for Southern Sites, March 2023

Total Insoluble Solids concentration for sites P1, P2, P3 and P4 was below the license limit. During March 2023, the prevailing wind direction was from the South (64.5% of the days).

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Table 8 provides a summary of the average L_{A90} values recorded at sites P1, P2, P3 and P4 during the reporting month. Result summaries and interpretations below are those provided by Marshall Day Acoustics.

Table 8: Noise Levels (L_{A90}) Measured at P1, P2, P3 and P4 for March 2023

Location	L_{A90} dB Average 12hr Level*	Standard deviation	Range
P1 Day	41	3.1	32 – 57
P1 Night	42	3.2	34 – 51
P2 Day	49	3.1	39 – 57
P2 Night	50	3.3	39 – 58
P3 Day	47	2.0	43 – 55
P3 Night	47	2.3	43 – 55
P4 Day	47	4.1	40 – 60
P4 Night	48	4.0	42 - 59

*Average of L_{A90} , 15 min for the day and evening periods

Note: The recorded noise levels include extraneous noise and weather-related events, and are not pure component sound levels.

The average L_{A90} sound pressure levels at all monitoring locations (including adverse weather and other extraneous noise sources) were below the corresponding target noise levels or the Day and Night periods.

Sound levels measured throughout March 2023 at monitoring locations P1, P2, P3 and P4 have been plotted in Figures 7 to Figure 10 respectively.

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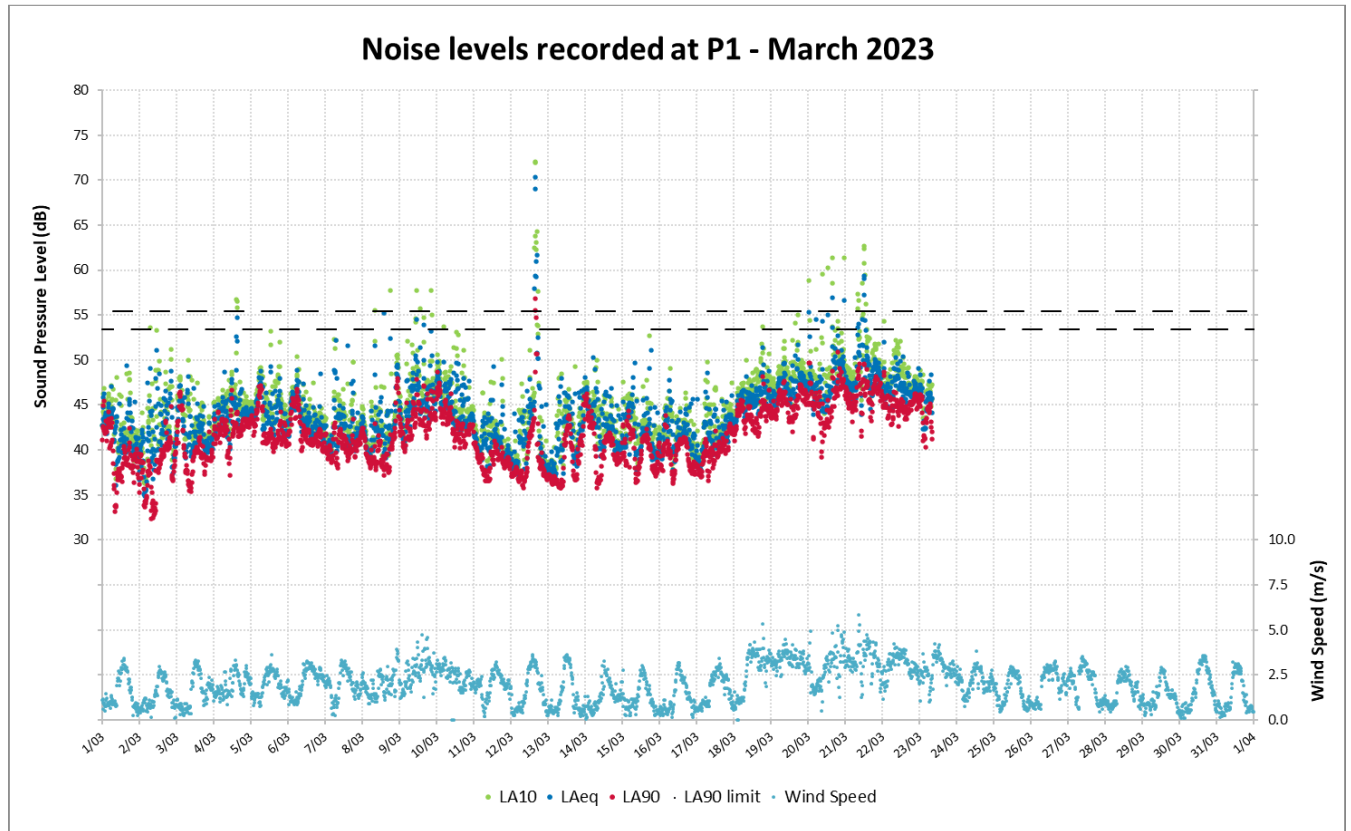


Figure 7: Noise Levels Recorded at P1 for March 2023

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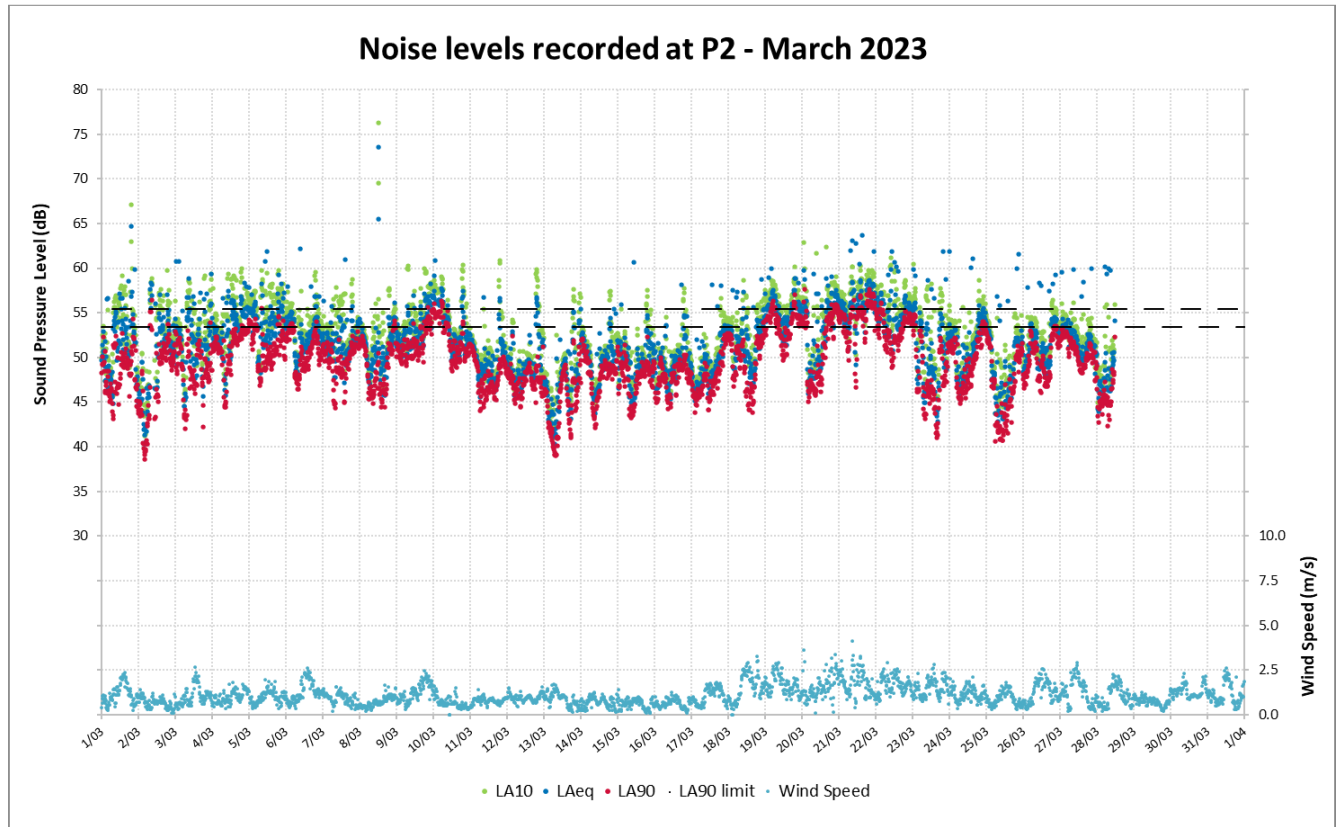


Figure 8: Noise Levels Recorded at P2 for March 2023

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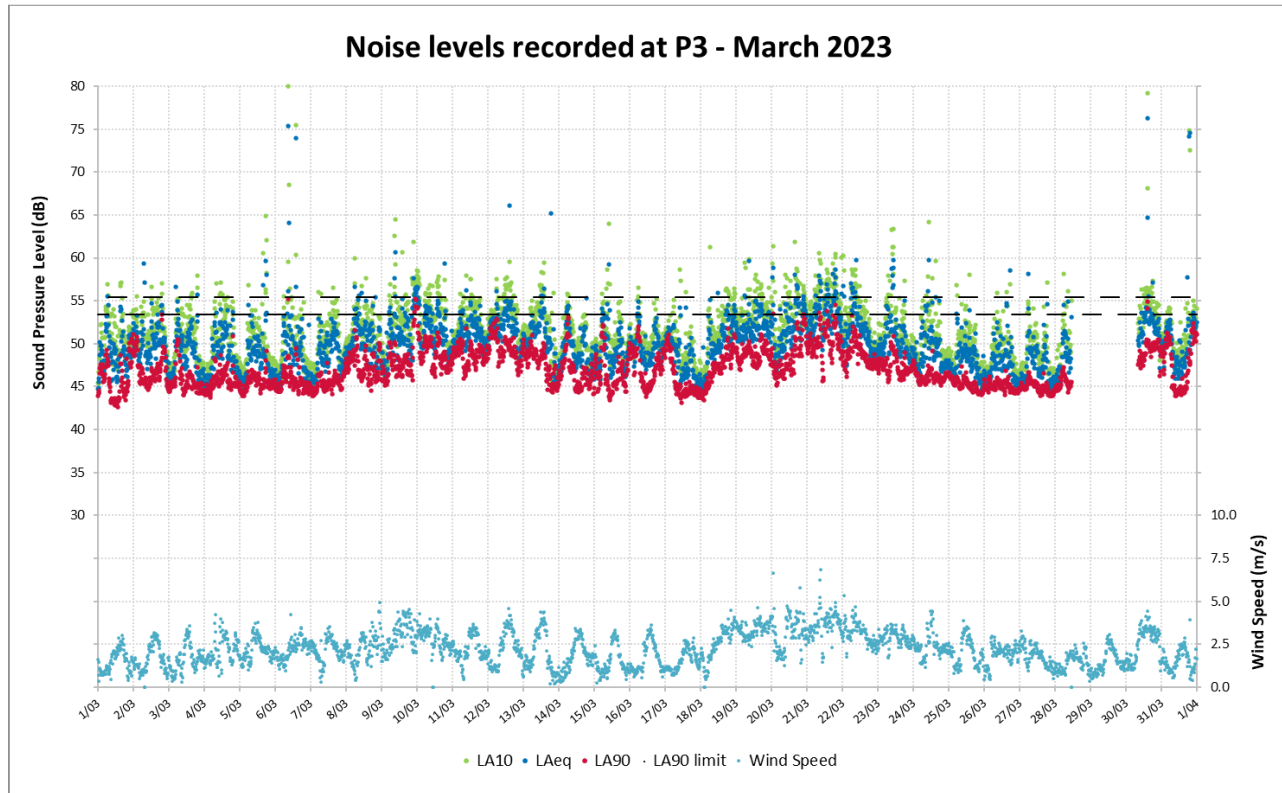


Figure 9: Noise Levels Recorded at P3 for March 2023

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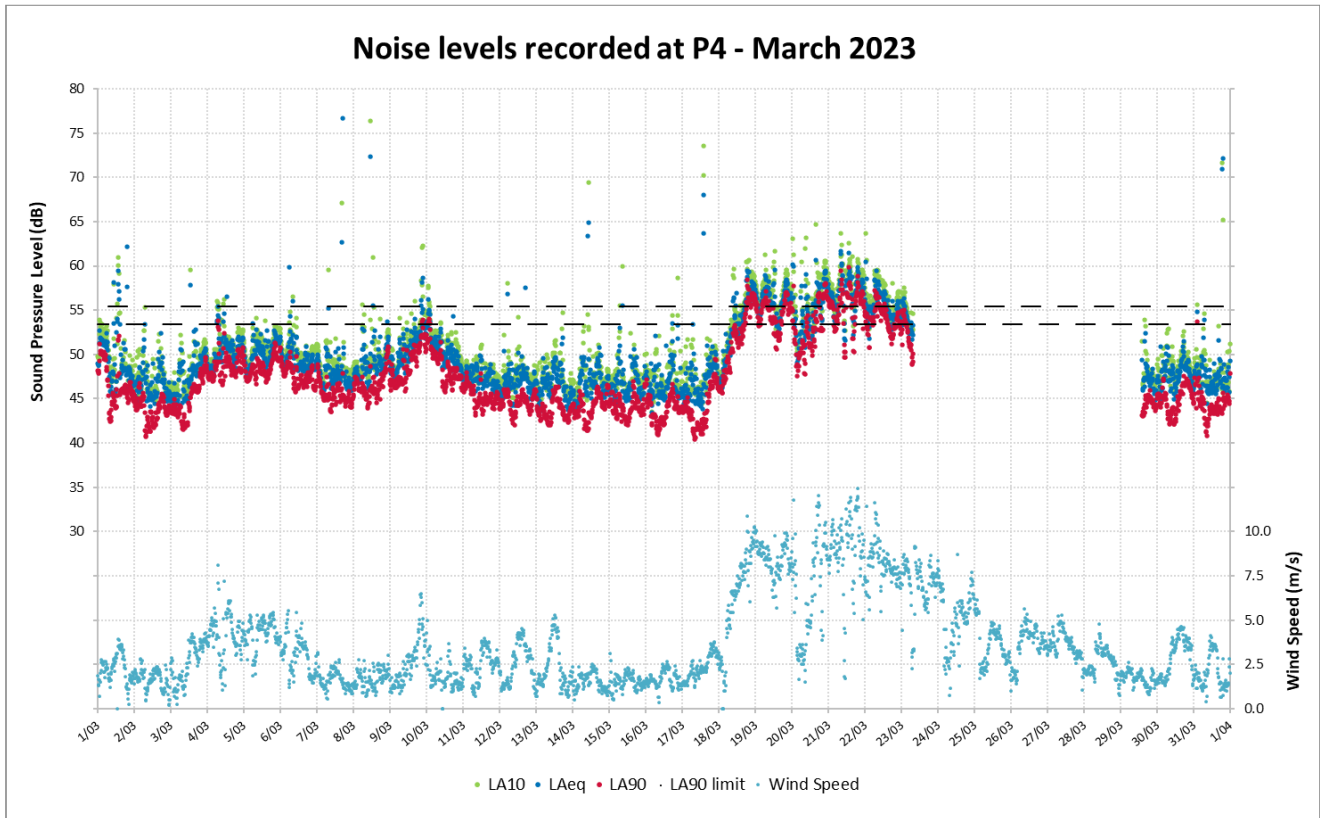


Figure 10: Noise Levels Recorded at P4 for March 2023

Residential and Control Monitoring Stations

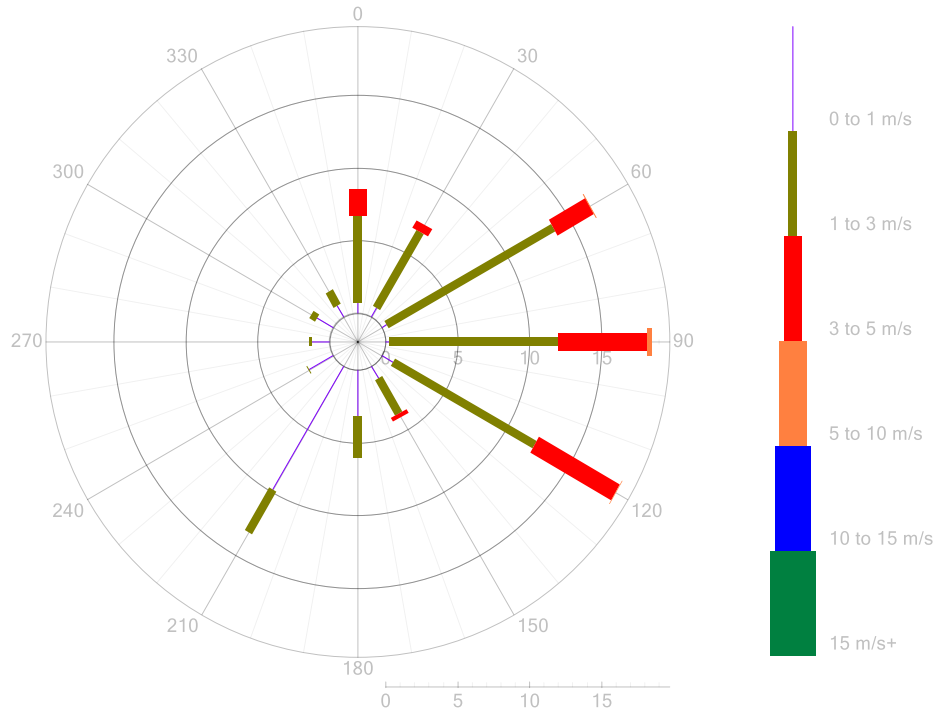
Report No: DAT19671

Port of Hay Point

Wind Rose - P1 Louisa Creek Edmund Ave North

Wind Rose

March 2023



99.9% valid data present

Figure 11: P1 Wind Rose 5-Minute Data for March 2023

Residential and Control Monitoring Stations

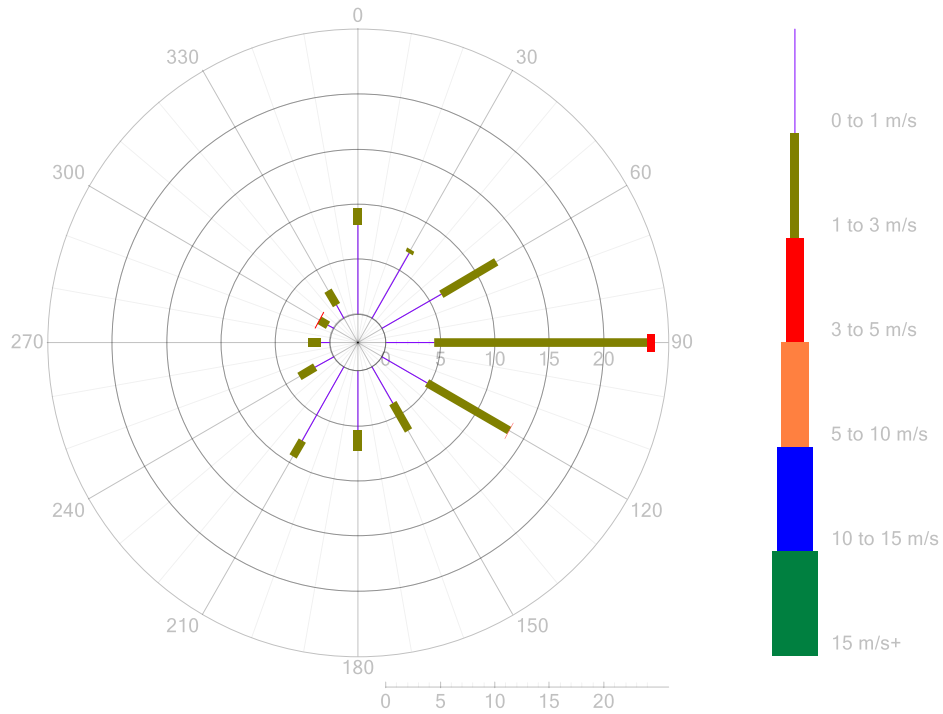
Report No: DAT19671

Port of Hay Point

Wind Rose - P2 Louisa Creek Edmund Ave South

Wind Rose

March 2023



99.9% valid data present

Figure 12: P2 Wind Rose 5-Minute Data for March 2023

Residential and Control Monitoring Stations

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Port of Hay Point

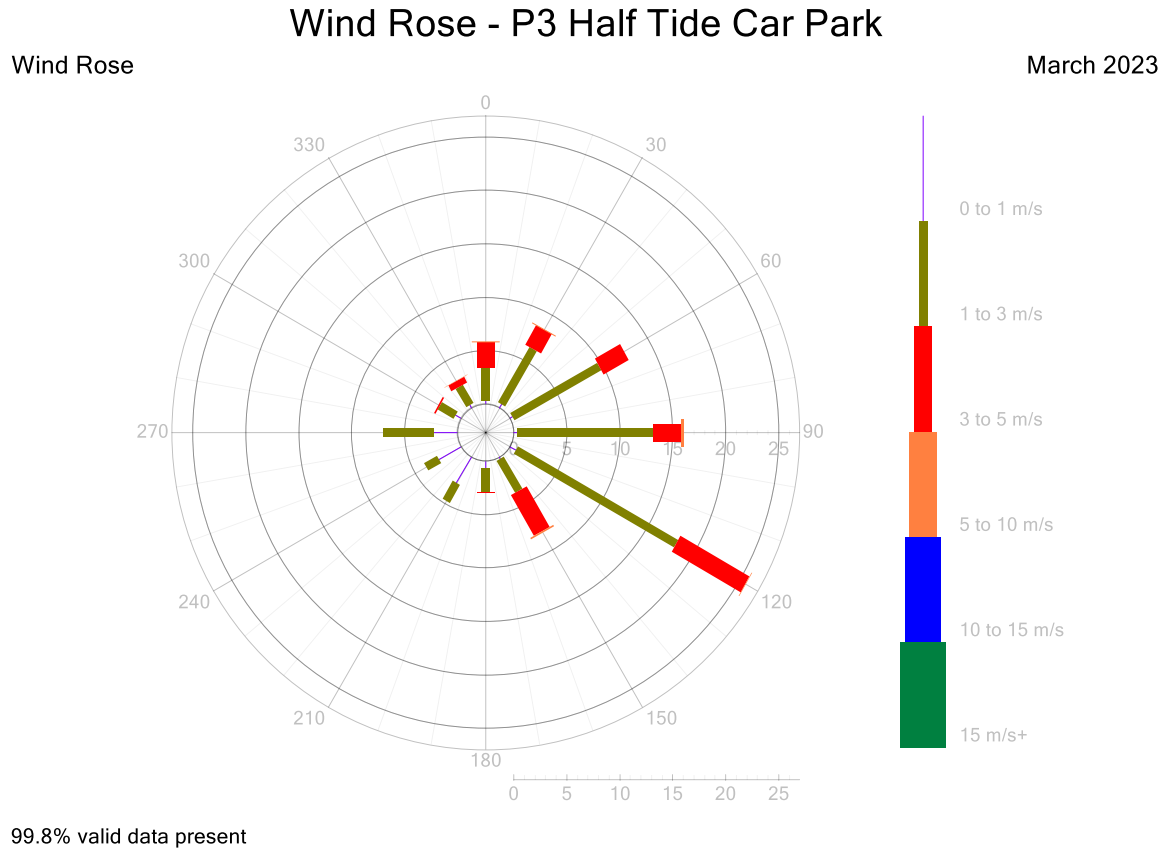


Figure 13: P3 Wind Rose 5-Minute Data for March 2023

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Port of Hay Point

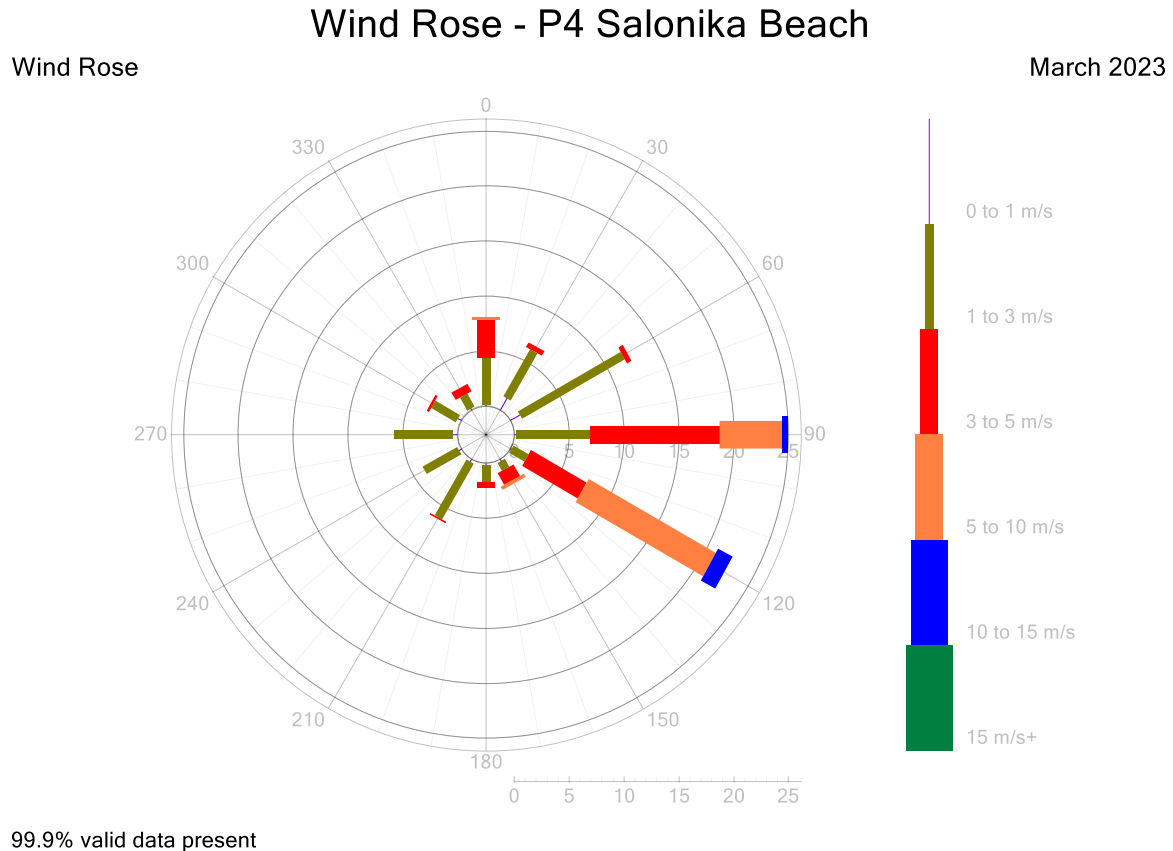


Figure 14: P4 Wind Rose 5-Minute Data for March 2023

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Port of Hay Point

Ambient Temperature 5-Minute Averages - P3 Half Tide Car Park

March 2023

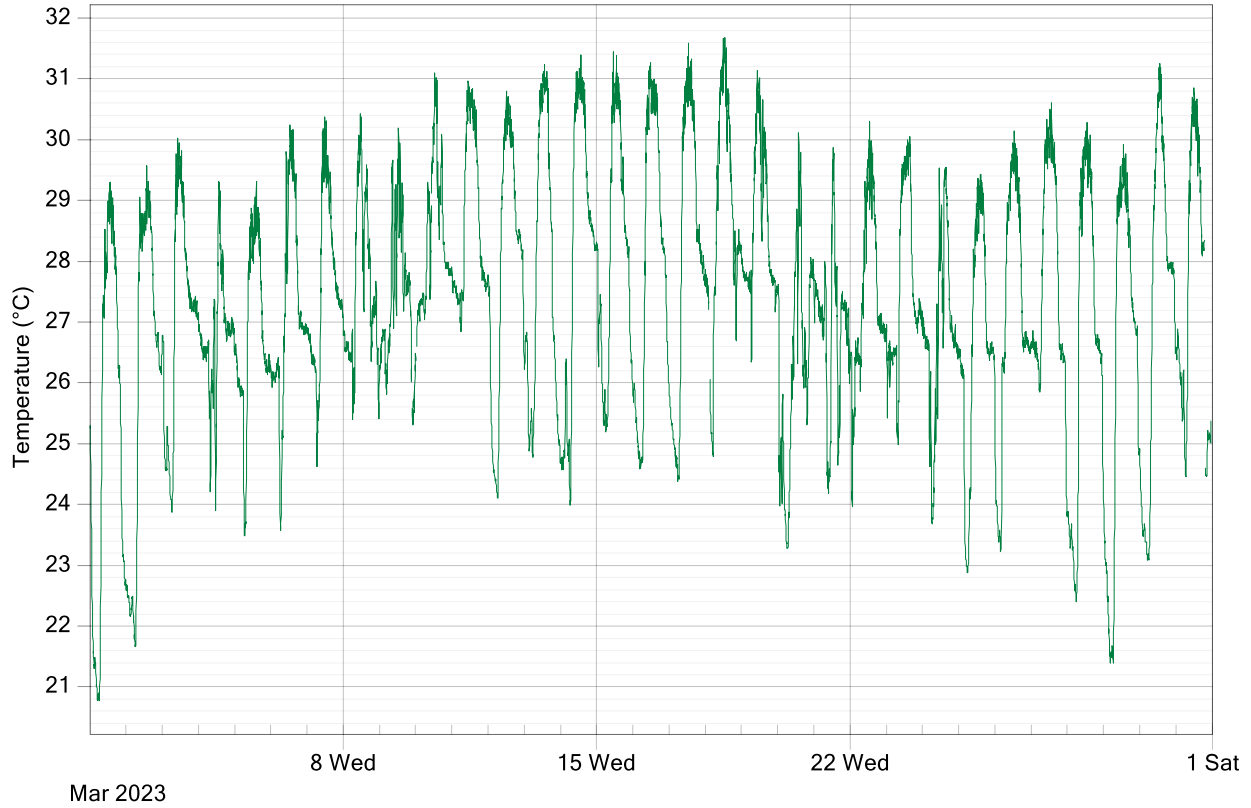


Figure 15: Port of Hay Point AT 5-Minute Averages Data for March 2023

Residential and Control Monitoring Stations

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Port of Hay Point

Relative Humidity 5-Minute Averages - P3 Half Tide Car Park
March 2023

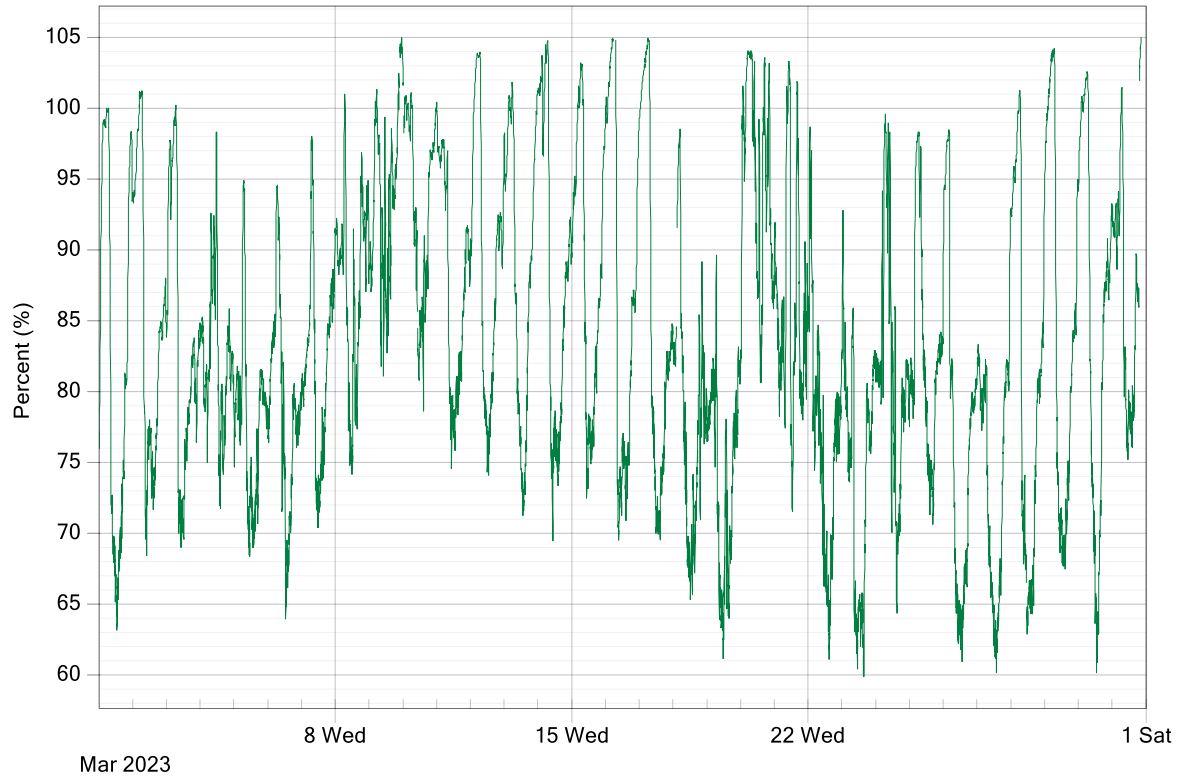


Figure 16: Port of Hay Point RH 5-Minute Averages Data for March 2023

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Port of Hay Point

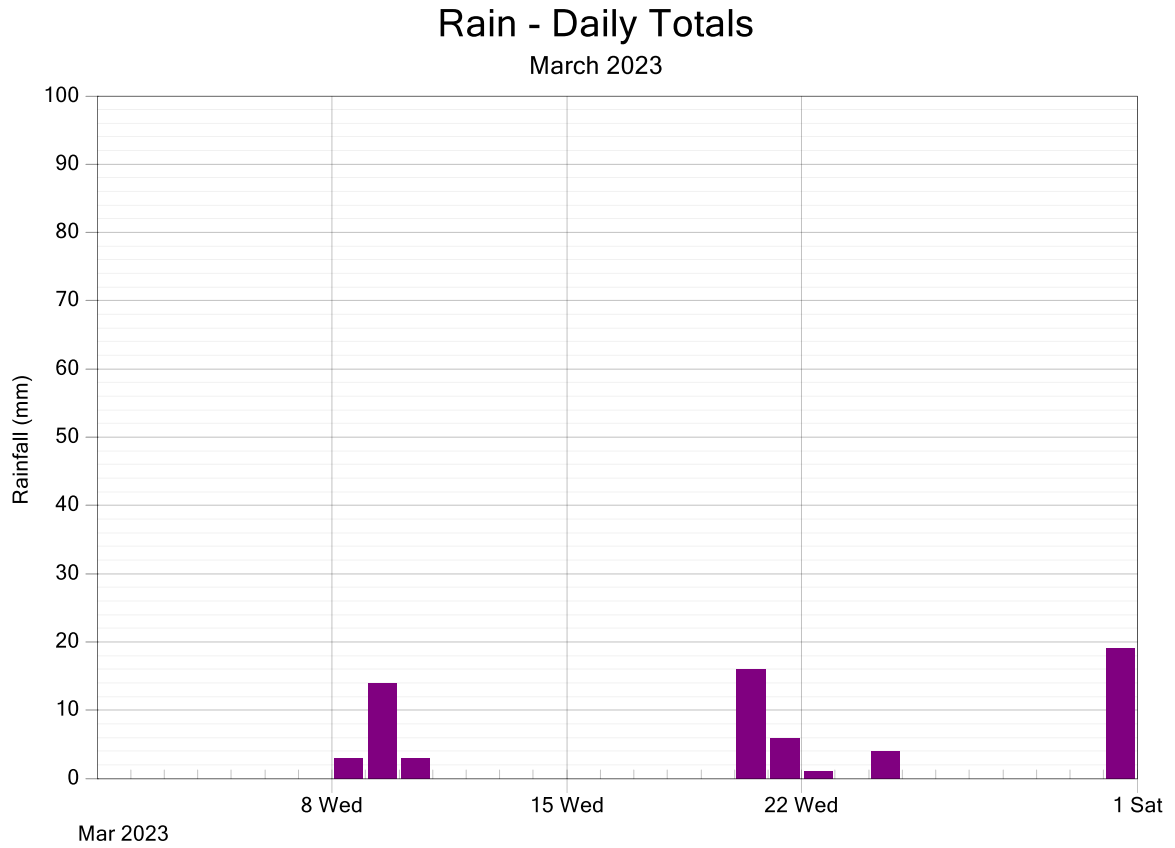


Figure 17: Port of Hay Point Rain Daily Totals for March 2023

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

Residential and Control Monitoring Stations

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Port of Hay Point

Appendix 1 - Definitions & Abbreviations

°C	Degrees Celsius
µg/m ³	Micrograms per cubic meter at standard temperature and pressure (0°C and 101.3 kPa)
AT	Ambient Temperature
atm	Atmosphere
calm	Wind conditions where the wind speed is below the operating range of the wind sensor
dBa	A-weighted decibels
deg	Degrees (True North)
m/s	Meters per second
mg/m ²	Milligrams per square meter
PM ₁₀	Particulate less than 10 microns in equivalent aerodynamic diameter
RH	Relative Humidity
TSP	Total suspended particulates
WD	Vector Wind Direction
WS	Vector Wind Speed