AIMS

Report

Monthly AirGradient Monitoring

March 2026

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Document Approval

Action	Designation	Name	Date
Prepared	Assistant Consultant	Alicia Garnica	2026-04-17
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Note

This report has been finalised with the available information at the time of its compilation.

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1. INTRODUCTION

This monthly air quality report, prepared for the Richards Bay Clean Air Association (RBCAA), summarises AirGradient monitoring data for March 2026. It assesses particulate matter (PM), total volatile organic compound (TVOC) index values, nitrogen oxides (NO_x) index values and carbon dioxide (CO_2) concentrations measured by the RBCAA AirGradient screening network. The report highlights notable incidents, elevated short-term events and data-quality issues observed during the month. These monthly summaries support the identification of spatial and temporal patterns and help prioritise follow-up investigation where warranted.

RBCAA also publishes annual air quality reports summarising findings and longer-term trends over a complete calendar year. The annual reports provide stakeholders with an integrated view of regional air quality performance and support informed decision-making, policy development and environmental management. Consistent monitoring and reporting support transparency, ongoing environmental assessment and community awareness.

The RBCAA monitoring network comprises eleven (11) primary monitoring stations (Figure 1.1 and Table 1.1). Airport, Felixton Met and Meerensee are meteorological stations and do not operate continuous air-quality analysers. The network also includes a secondary screening network comprising 10 AirGradient monitors (Table 1.2).

Figure 1.1: RBCAA monitoring network.

Table 1.1: Primary monitoring network station coordinates.

Station	Latitude	Longitude	Elevation (m)
Airport	-28.738161	32.093332	33.99
Arboretum	-28.752377	32.062791	25.20
Brackenham	-28.731325	32.039059	56.28
CBD	-28.744693	32.054851	32.26
eSikhaleni	-28.865278	31.911679	14.54
Felixton	-28.829255	31.893636	56.59
Meerensee	-28.772104	32.101308	14.89
Felixton Met	-28.836487	31.892513	27.87
Harbour West	-28.787297	32.027133	7.36
Richardia	-28.762769	32.066068	19.96
Scorpio	-28.769694	32.034282	29.39

Table 1.2: Secondary screening network coordinates (AirGradient monitors).

Site	Latitude (°)	Longitude (°)	Elevation (m)	UTM Zone 36S X (m)	UTM Zone 36S Y (m)
Airport	-28.738161	32.093332	33.99	411467	6820686
Brackenham	-28.731325	32.039059	56.28	406161	6821402
CBD	-28.744693	32.054851	32.26	407715	6819933
Empangeni	-28.734970	31.896245	109.85	392217	6820877
eSikhaleni	-28.865278	31.911679	14.54	393857	6806453
Felixton	-28.829255	31.893636	56.59	392060	6810428
Harbour West	-28.787297	32.027133	7.36	405047	6815191
Meerensee	-28.772104	32.101308	14.89	412274	6816931
Mtunzini	-28.959335	31.743905	84.00	377603	6795870
Richardia	-28.762769	32.066068	19.96	408826	6817939

2. AIRGRADIENT MONITORING NETWORK

The AirGradient network was established in late 2023 as a co-location study to evaluate the comparability of particulate measurements against the primary monitoring network. It was subsequently expanded in support of an RBCAA objective to screen additional air-quality parameters. Initially, the network comprised two sites, Harbour West and Richardia, and monitored only particulates (PM_{10}, $PM_{2.5}$ and PM_1). In July 2024, the network was expanded to include Brackenham, CBD, eSikhaleni and Felixton, and all monitors were upgraded to measure total volatile organic compound (TVOC) index, nitrogen oxides (NO_x) index and carbon dioxide (CO_2). A further expansion in January and March 2026 added Airport, Empangeni, Meerensee and Mtunzini. The network now comprises 10 monitors across multiple sites.

AirGradient monitors are designed as accessible, lower-cost air-quality screening instruments. Their data are useful for identifying spatial patterns, short-term events and locations that may warrant follow-up, but they are not equivalent to reference-grade or regulatory-equivalent analysers.

- Accuracy and precision: Regulatory reference or equivalent analysers are subject to method approval, routine calibration and quality-assurance requirements for specific pollutants. AirGradient monitors use compact sensors, including optical particle counters for PM and non-dispersive infrared sensors for CO_2. These sensors are useful for indicative screening but are more sensitive to siting, environmental conditions, sensor drift and calibration uncertainty than reference instruments.
- Calibration and certification: Product certifications such as CE, FCC, RoHS and REACH relate primarily to product conformity and market access; they should not be interpreted as certification of equivalence to regulatory reference methods. Where AirGradient data are used for technical assessment, co-location, calibration checks and documented QA/QC procedures are required to define their uncertainty and fitness for use.
- Data application: The AirGradient network is therefore treated as a secondary screening network. The TVOC and NO_x outputs are reported as index values and are interpreted as relative indicators of short-term changes rather than pollutant-specific regulatory concentrations.
- Cost and accessibility: Because the monitors are lower-cost and easier to deploy than reference analysers, they can improve spatial coverage and help identify potential localised events, provided the limitations above are clearly recognised.

In summary, AirGradient monitors provide useful indicative information for non-regulatory screening, but the data should not be used as a substitute for approved reference or equivalent-method analyser data when assessing statutory compliance.

Station abbreviations used in figures and tables are Air = Airport, Brk = Brackenham, CBD = CBD, Emp = Empangeni, eSk = eSikhaleni, Flx = Felixton, HW = Harbour West, MS = Meerensee, Mtz = Mtunzini and Rch = Richardia.

3. PARTICULATE MONITORING

3.1. Data Completeness

	Air	Brk	CBD	Emp	eSk	Flx	HW	MS	Mtz	Rch
Jan 2026	-	99	***85***	-	97	100	100	100	***90***	100
Feb 2026	***77***	***84***	***77***	***59***	***87***	***89***	***90***	***90***	***89***	***89***
Mar 2026	96	97	99	***90***	***94***	99	99	98	***91***	99
Apr 2026	-	-	-	-	-	-	-	-	-	-
May 2026	-	-	-	-	-	-	-	-	-	-
Jun 2026	-	-	-	-	-	-	-	-	-	-
Jul 2026	-	-	-	-	-	-	-	-	-	-
Aug 2026	-	-	-	-	-	-	-	-	-	-
Sept 2026	-	-	-	-	-	-	-	-	-	-
Oct 2026	-	-	-	-	-	-	-	-	-	-
Nov 2026	-	-	-	-	-	-	-	-	-	-
Dec 2026	-	-	-	-	-	-	-	-	-	-

Missing Data (Particulates)

- *Emp, eSk, Mtz – Communication outages.*

3.2. Monthly

PM_{10} and $PM_{2.5}$ monthly average concentrations are shown in Figures 3.1 and 3.2. Comparisons to previous months are provided in Figures 3.3 and 3.4.

- March monthly PM_{10} averages were below the RSA annual standard and WHO annual guideline values shown for context; annual compliance cannot be assessed from a single monthly average.
- March monthly $PM_{2.5}$ averages were below the RSA annual standard value at all sites; eSikhaleni was above the WHO annual guideline value shown for context. This should be described as a contextual comparison, not a formal annual exceedance.

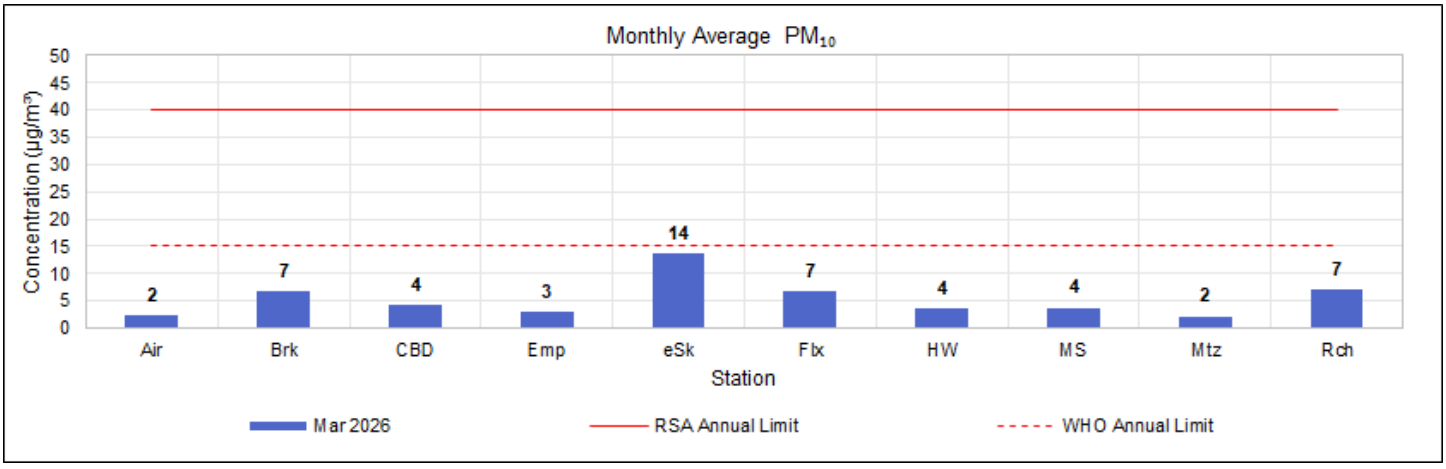


Figure 3.1: PM_{10} monthly concentration.

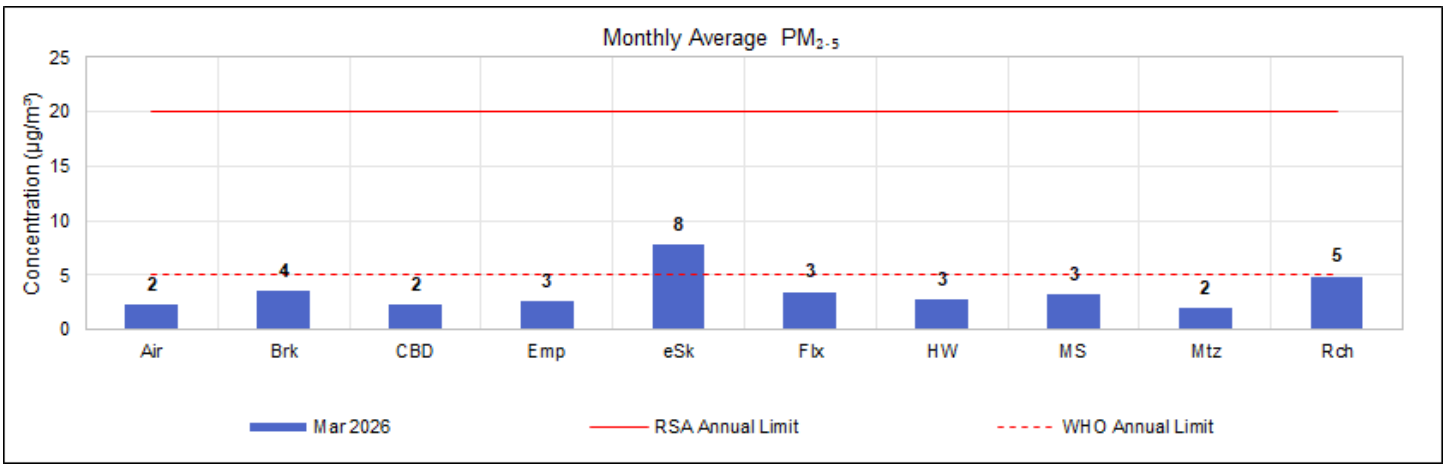


Figure 3.2: $PM_{2.5}$ monthly concentration.

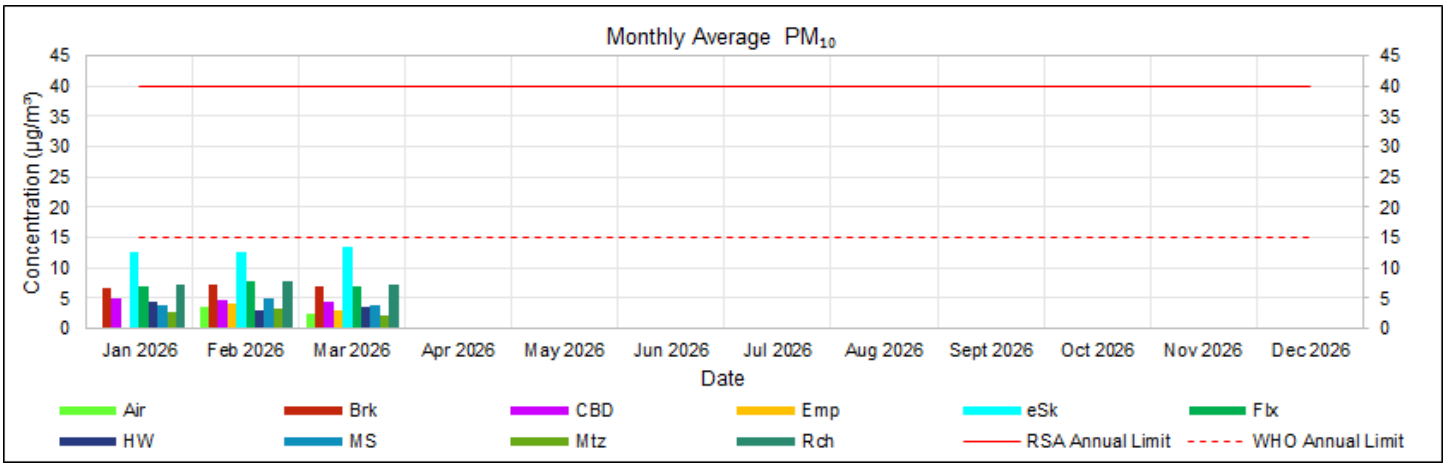


Figure 3.3: PM_{10} monthly comparison.

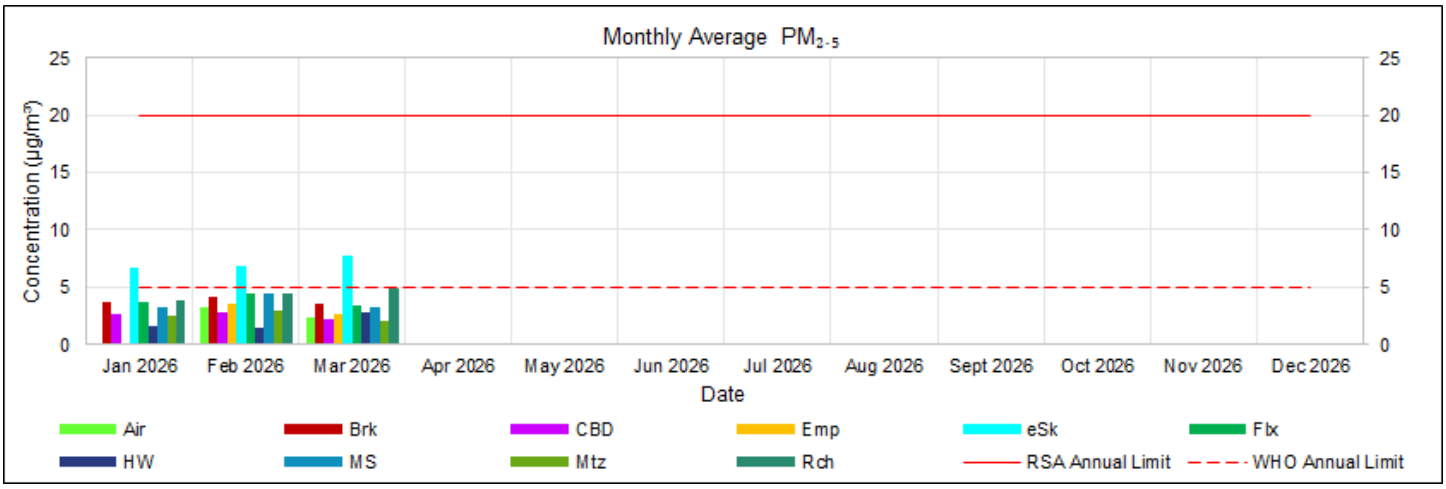


Figure 3.4: $PM_{2.5}$ monthly comparison.

3.3. Diurnal

PM diurnal concentrations are shown in Figures 3.5 and 3.6.

- PM_{10} diurnal concentrations remained below the RSA and WHO 24-hour reference levels shown on the plot.
- $PM_{2.5}$ diurnal concentrations remained below the RSA 24-hour reference level; eSikhaleni exceeded the WHO 24-hour reference level during parts of the diurnal profile. Calendar-day averages remain the appropriate basis for assessing daily guideline exceedances.

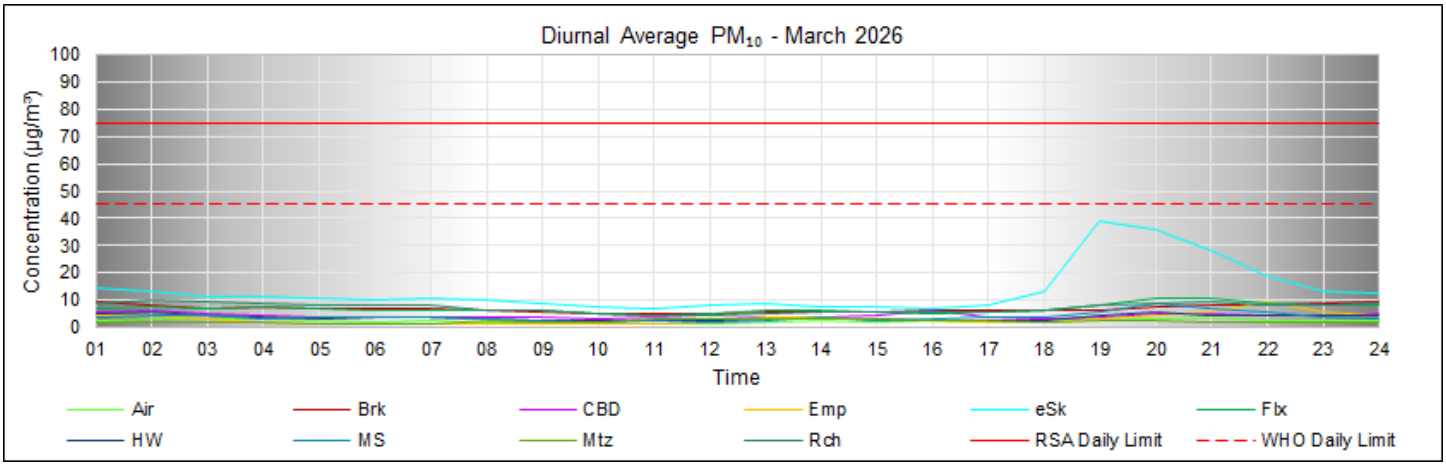


Figure 3.5: PM_{10} diurnal concentrations.

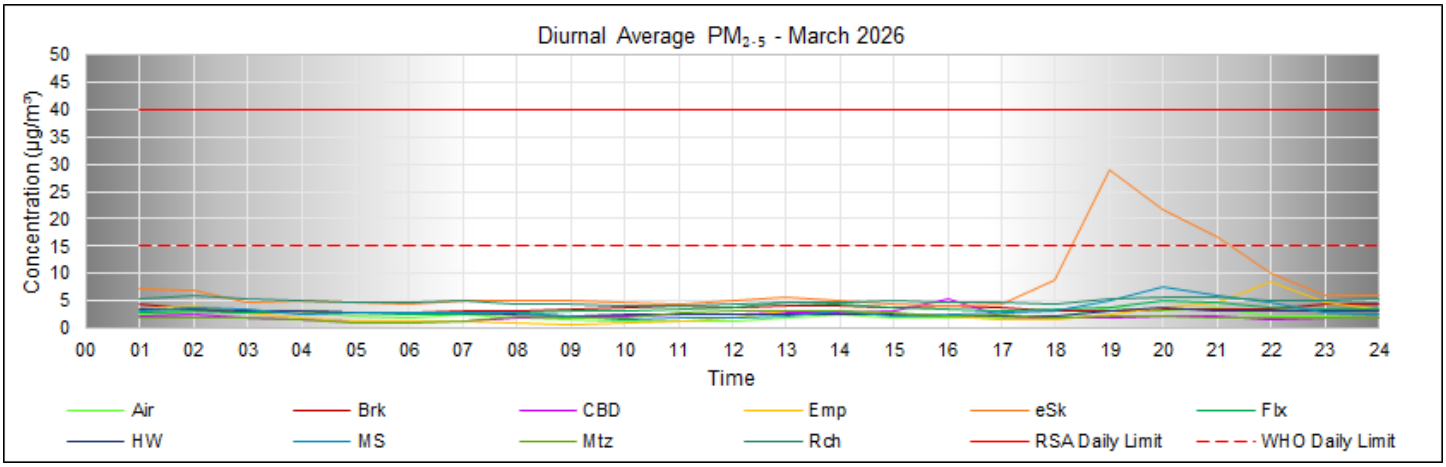


Figure 3.6: $PM_{2.5}$ diurnal concentrations.

3.4. Daily

PM daily concentrations are shown in Figures 3.7 and 3.8.

- Daily average PM_{10} remained below both the RSA 24-hour standard and the WHO 24-hour guideline.
- Daily average $PM_{2.5}$ remained below the RSA 24-hour standard; the WHO 24-hour guideline was exceeded at eSikhaleni and marginally at Empangeni.

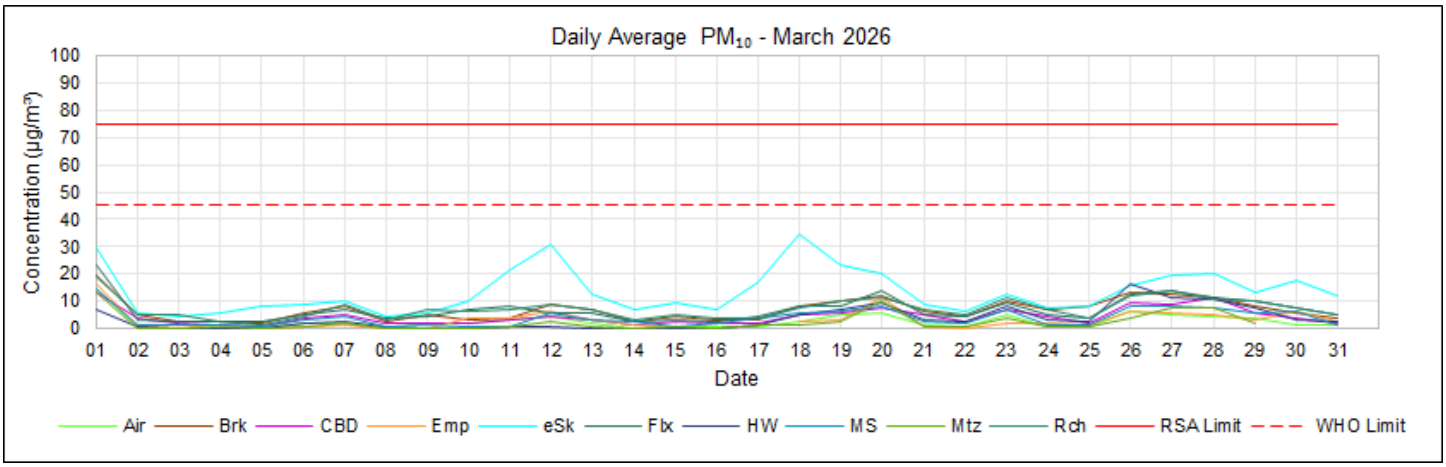


Figure 3.7: PM_{10} daily concentrations.

Missing Data (Particulates): Emp, eSk, Mtz – Communication outages.

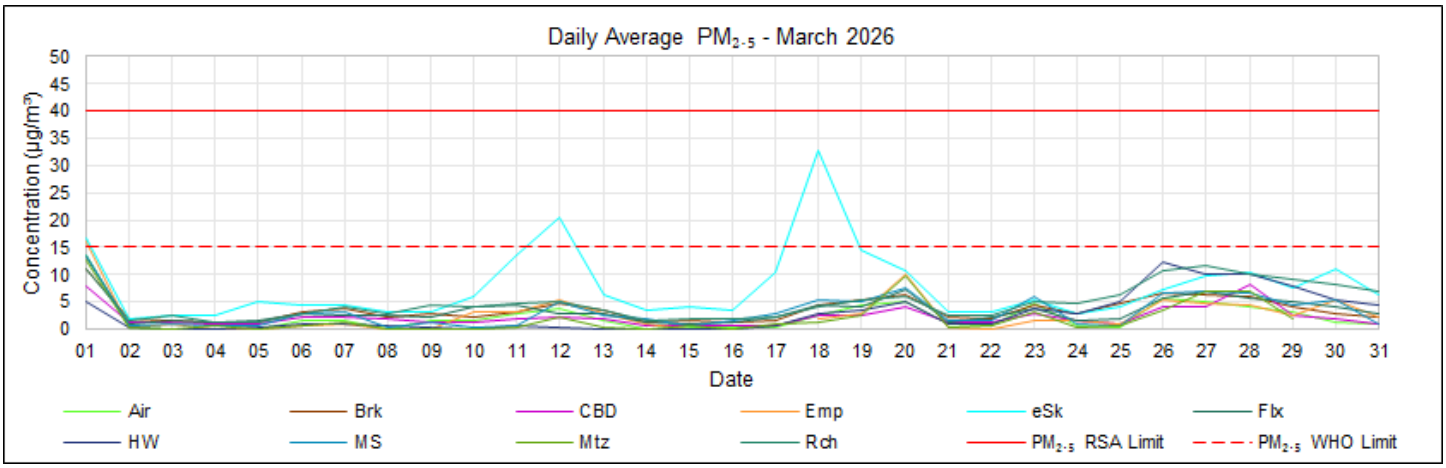


Figure 3.8: $PM_{2.5}$ daily concentrations.

Missing Data (Particulates): Emp, eSk, Mtz – Communication outages.

3.5. Conclusion

March 2026 particulate concentrations were generally low across the AirGradient network, with short-term $PM_{2.5}$ elevations at eSikhaleni and a marginal WHO 24-hour guideline exceedance at Empangeni. eSikhaleni recorded the highest monthly PM_{10} (14 µg/m³) and $PM_{2.5}$ (8 µg/m³) concentrations. The March monthly PM_{10} averages were below the RSA annual standard and WHO annual guideline values shown for context; annual compliance cannot be concluded from one month of data. The March monthly $PM_{2.5}$ average at eSikhaleni was above the WHO annual guideline value shown for context, while all sites remained below the RSA annual standard value. Daily average PM_{10} remained below the RSA and WHO 24-hour standards/guidelines. Daily average $PM_{2.5}$ remained below the RSA 24-hour standard but exceeded the WHO 24-hour guideline at eSikhaleni and marginally at Empangeni. Reported March data completeness was high across all stations (90–99%).

4. TOTAL VOLATILE ORGANIC COMPOUNDS MONITORING

Volatile organic compounds (VOCs) are organic chemicals that can evaporate at ambient temperatures. Outdoor VOCs may originate from industrial activities, combustion sources, vehicle exhaust and the use or storage of solvents and other chemical products. Health and environmental relevance depends strongly on the individual compound, concentration and exposure duration; therefore, a total VOC index should not be interpreted as a compound-specific health-risk metric. The AirGradient TVOC sensor does not identify individual compounds and reports a relative index rather than an absolute concentration. In this report, TVOC index data are used only as screening information to identify temporal changes and potential short-term events requiring follow-up.

4.1. Data Completeness

	Air	Brk	CBD	Emp	eSk	Flx	HW	MS	Mtz	Rch
Jan 2026	-	99	***84***	-	97	100	100	100	***90***	100
Feb 2026	***77***	***84***	***75***	***59***	***87***	***89***	***90***	***90***	***89***	***89***
Mar 2026	96	97	99	***90***	***94***	***92***	99	98	***91***	99
Apr 2026	-	-	-	-	-	-	-	-	-	-
May 2026	-	-	-	-	-	-	-	-	-	-
Jun 2026	-	-	-	-	-	-	-	-	-	-
Jul 2026	-	-	-	-	-	-	-	-	-	-
Aug 2026	-	-	-	-	-	-	-	-	-	-
Sept 2026	-	-	-	-	-	-	-	-	-	-
Oct 2026	-	-	-	-	-	-	-	-	-	-
Nov 2026	-	-	-	-	-	-	-	-	-	-
Dec 2026	-	-	-	-	-	-	-	-	-	-

Missing Data (TVOC)

- *Emp, eSk, Flx, Mtz – Communication outages.*

4.2. Monthly

TVOC monthly average index values are shown in Figure 4.1. Comparisons to previous months are also provided in Figure 4.2.

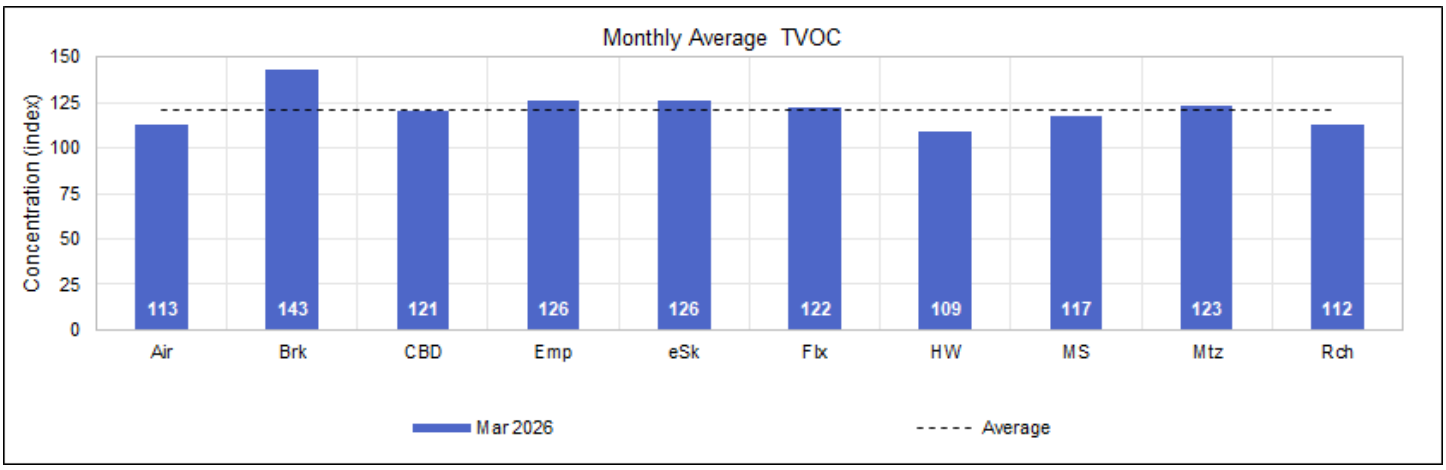


Figure 4.1: TVOC monthly index values.

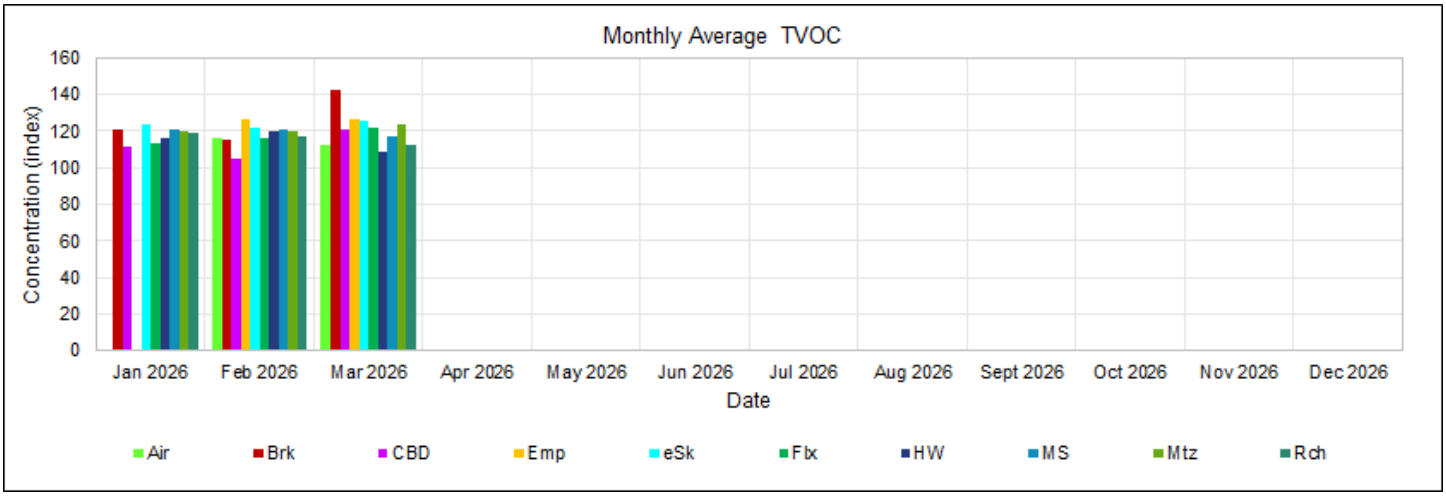


Figure 4.2: TVOC monthly index comparison.

4.3. Diurnal

TVOC diurnal index values are shown below (Figure 4.3).

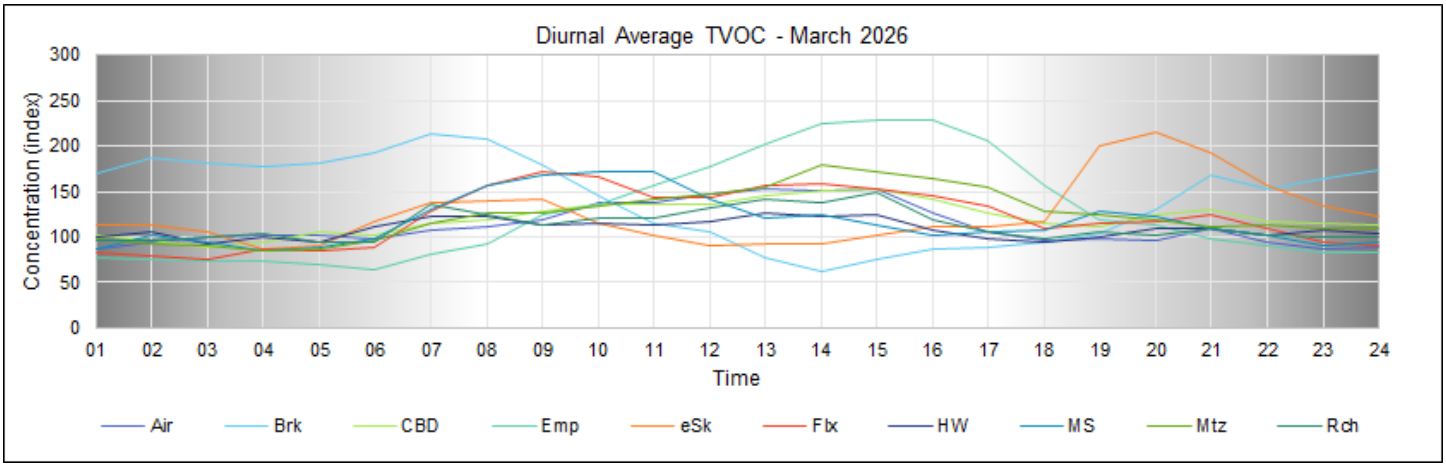


Figure 4.3: TVOC diurnal index values.

4.4. Daily

TVOC daily index values are shown below (Figure 4.4).

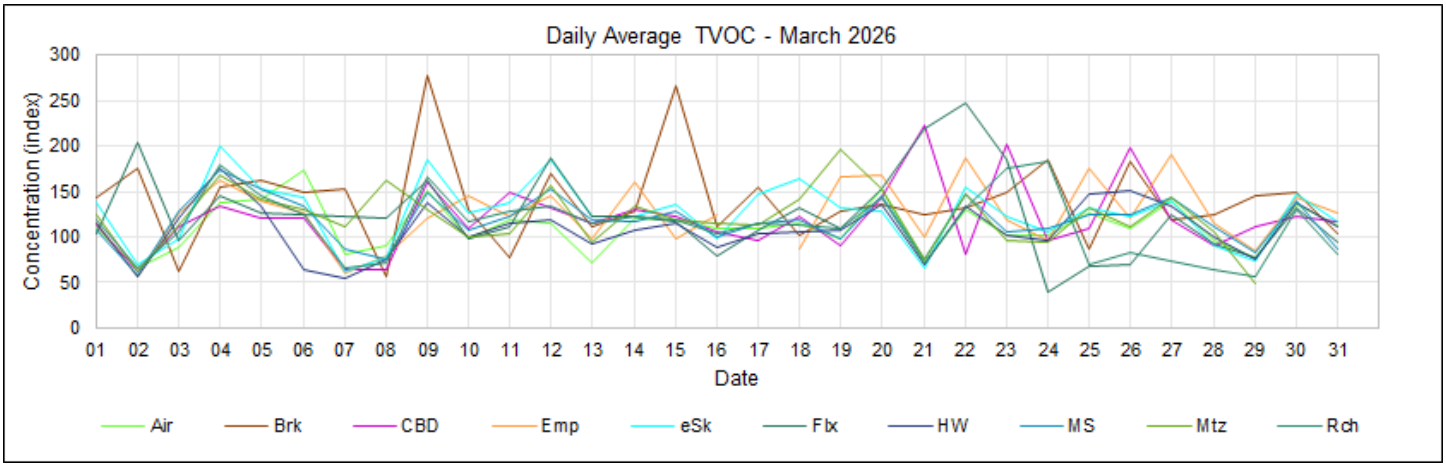


Figure 4.4: TVOC daily index values.

Missing Data (TVOC): Emp, eSk, Flx, Mtz – Communication outages.

4.5. Hourly

TVOC hourly index values are shown below (Figure 4.5).

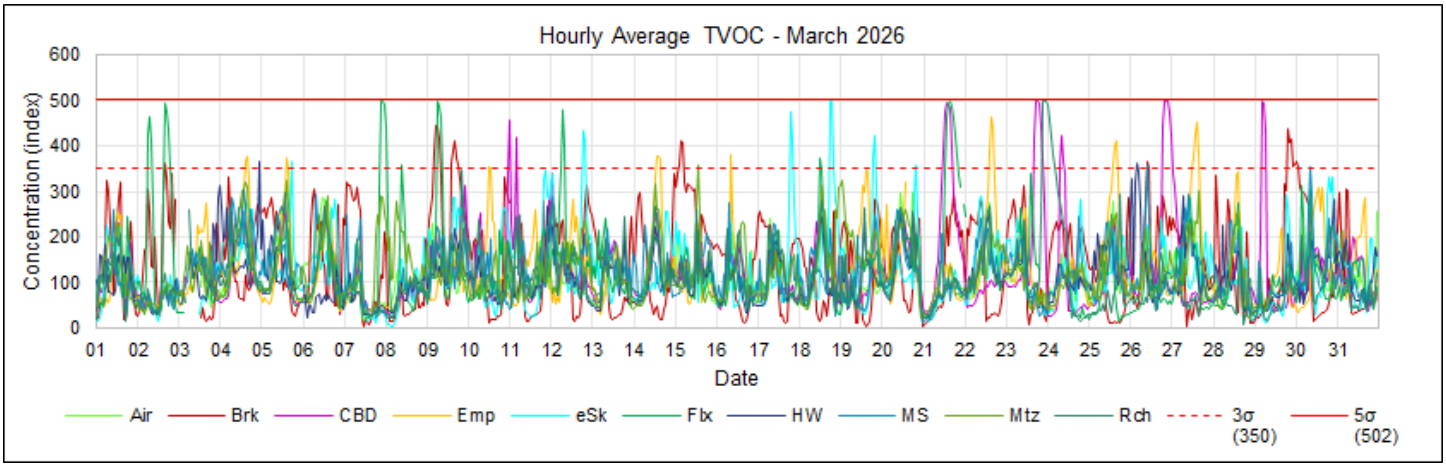


Figure 4.5: TVOC hourly index values.

Table 4.1: TVOC exceedances of the 3σ and 5σ limits.

Limit	Air	Brk	CBD	Emp	eSk	Flx	HW	MS	Mtz	Rch	Total
3σ	0	32	30	29	16	30	4	2	3	10	156
5σ	0	0	13	1	3	15	0	0	0	4	36

4.6. Conclusion

March 2026 TVOC monthly average index values ranged from 109 to 143. Brackenham recorded the highest monthly average index value, while Harbour West recorded the lowest. Diurnal and hourly data indicate intermittent short-term elevated index events rather than persistently elevated conditions. The highest numbers of reported 3σ exceedances were recorded at Brackenham (32), CBD and Felixton (30 each), and Empangeni (29). Reported 5σ exceedances were concentrated at Felixton (15) and CBD (13), with lower counts at Richardia (4), eSikhaleni (3) and Empangeni (1). Overall, March 2026 TVOC screening results indicate a relatively consistent baseline with isolated short-term elevated index events that may warrant local-source follow-up if they coincide with odour observations, complaints or relevant meteorological conditions.

5. NITROGEN OXIDES MONITORING

Nitrogen oxides (NO_x) are a group of reactive gases that primarily include nitric oxide (NO) and nitrogen dioxide (NO_2), generated mainly by high-temperature combustion from vehicles, power generation and industrial activities. NO_x contributes to the formation of ozone and secondary particulate matter and can affect respiratory health, particularly in susceptible populations. The AirGradient NO_x sensor reports a relative index rather than pollutant-specific NO or NO_2 concentrations. In this report, NO_x index data are used as screening information to identify short-term changes and potential events, not to assess compliance with ambient NO_2 standards.

5.1. Data Completeness

	Air	Brk	CBD	Emp	eSk	Flx	HW	MS	Mtz	Rch
Jan 2026	-	99	***84***	-	97	100	100	100	***90***	100
Feb 2026	***77***	***84***	***75***	***59***	***87***	***89***	***90***	***90***	***89***	***89***
Mar 2026	96	97	99	***90***	***94***	***92***	99	98	***91***	99
Apr 2026	-	-	-	-	-	-	-	-	-	-
May 2026	-	-	-	-	-	-	-	-	-	-
Jun 2026	-	-	-	-	-	-	-	-	-	-
Jul 2026	-	-	-	-	-	-	-	-	-	-
Aug 2026	-	-	-	-	-	-	-	-	-	-
Sept 2026	-	-	-	-	-	-	-	-	-	-
Oct 2026	-	-	-	-	-	-	-	-	-	-
Nov 2026	-	-	-	-	-	-	-	-	-	-
Dec 2026	-	-	-	-	-	-	-	-	-	-

Missing Data (NO_x)

- *Emp, eSk, Flx, Mtz – Communication outages.*

5.2. Monthly

NO_x monthly average index values are shown in Figure 5.1; comparisons to previous months are also provided in Figure 5.2.

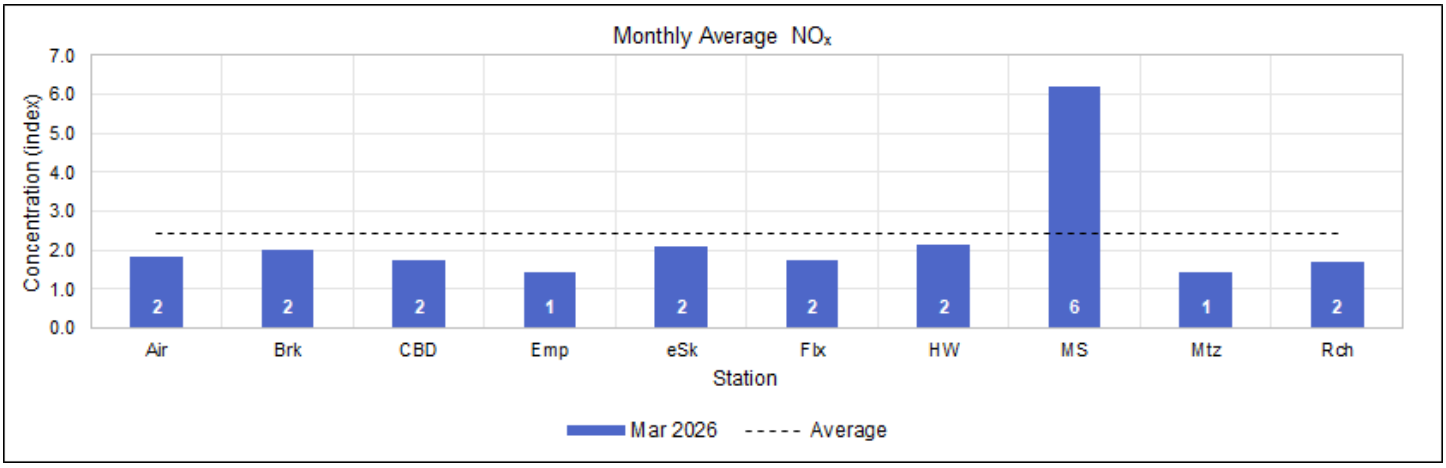


Figure 5.1: NO_x monthly index values.

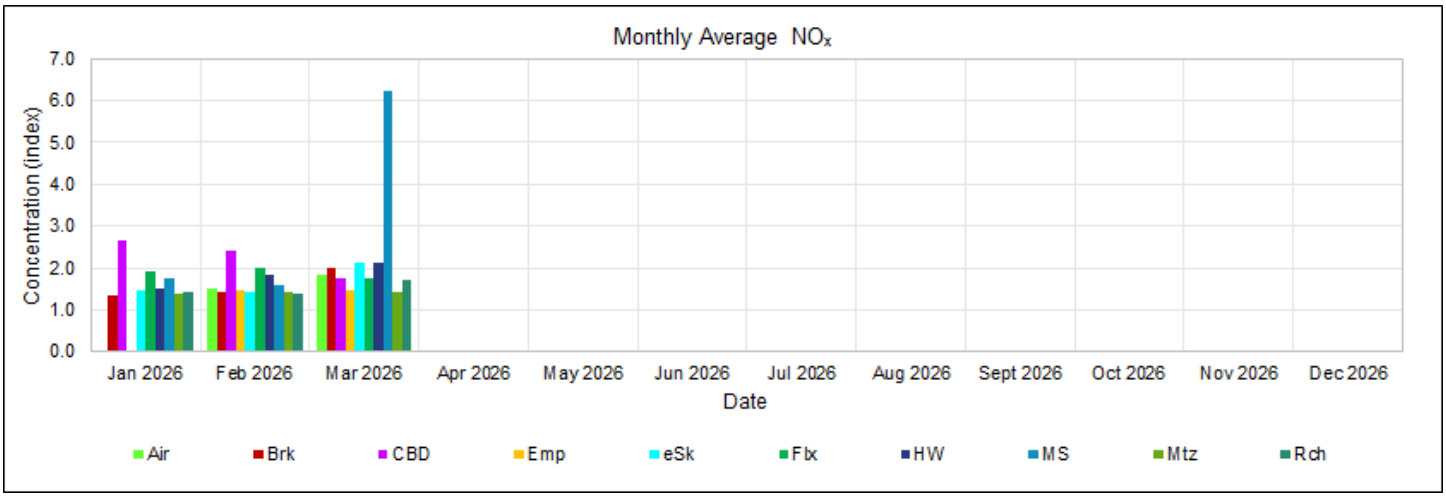


Figure 5.2: NO_x monthly comparison.

5.3. Diurnal

NO_x diurnal index values are shown below (Figure 5.3).

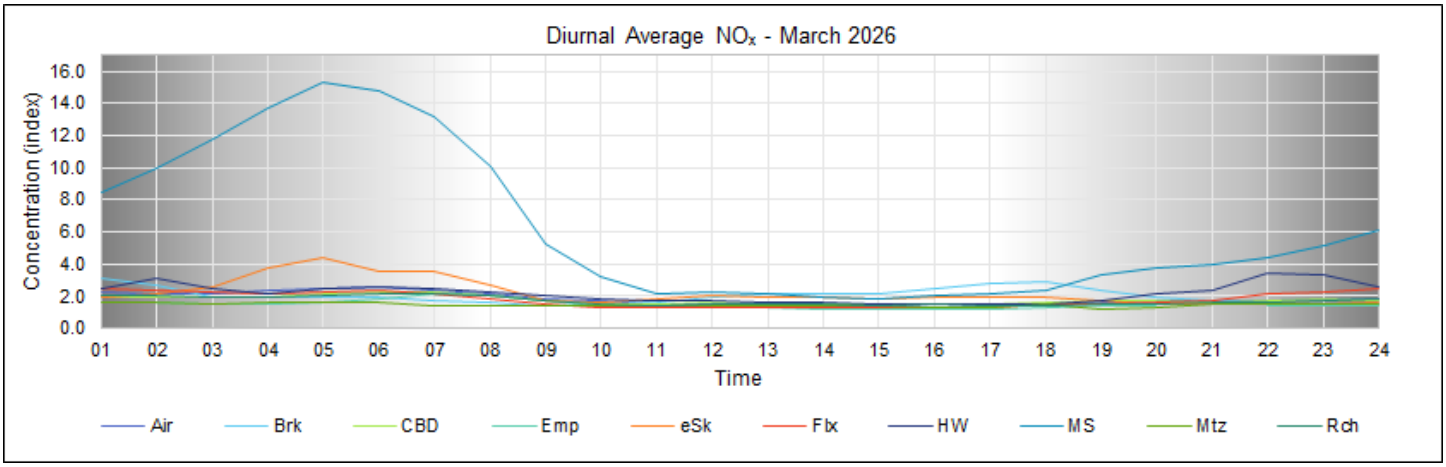


Figure 5.3: NO_x diurnal index values.

5.4. Daily

NO_x daily index values are shown below (Figure 5.4).

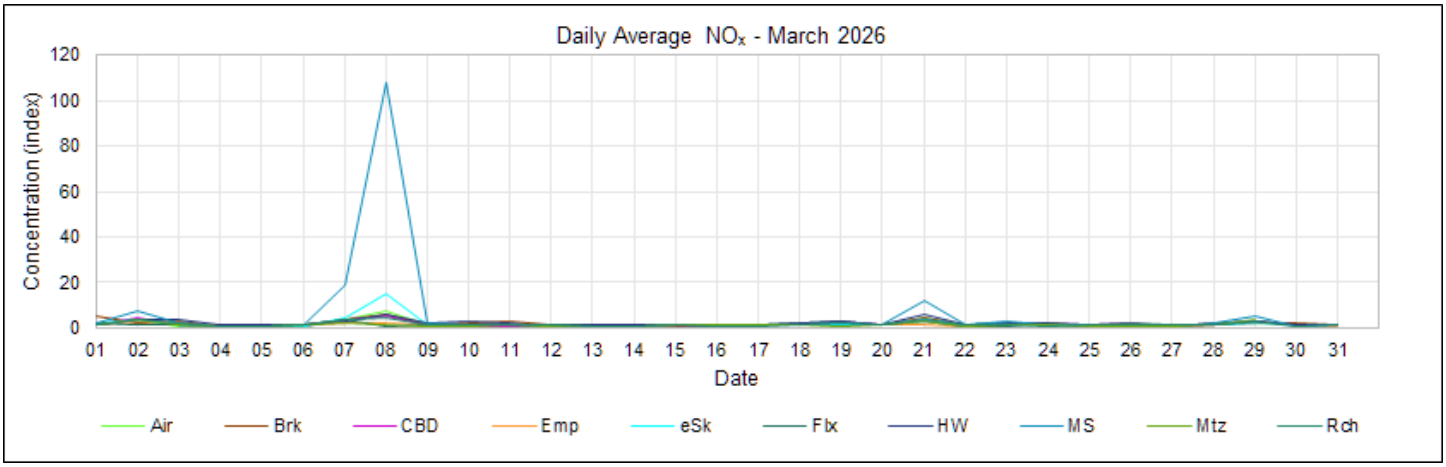


Figure 5.4: NO_x daily index values.

Missing Data (NO_x): Emp, eSk, Flx, Mtz – Communication outages.

5.5. Hourly

NO_x hourly index values are shown below (Figure 5.5).

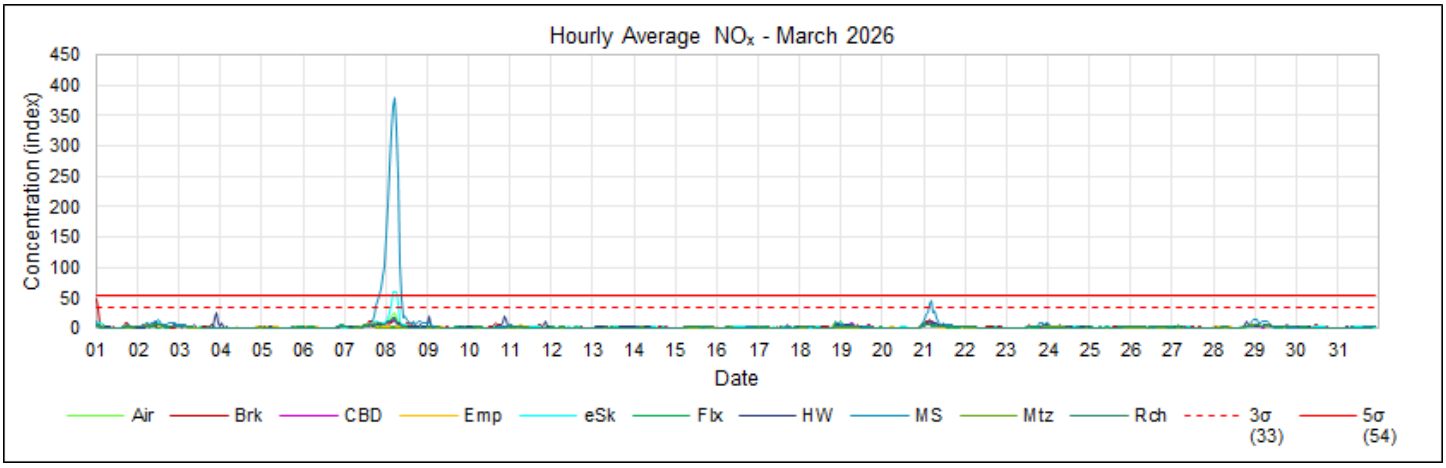


Figure 5.5: NO_x hourly index values.

Table 5.1: NO_x exceedances of the 3σ and 5σ limits.

Limit	Air	Brk	CBD	Emp	eSk	Flx	HW	MS	Mtz	Rch	Total
3σ	13	15	7	0	16	7	20	67	1	6	152
5σ	5	6	2	0	7	0	8	33	0	3	64

5.6. Conclusion

NO_x monthly average index values remained low at most sites during March 2026, with Meerensee recording the highest monthly average index value. The diurnal profile was dominated by an early-morning elevation at Meerensee, rather than a sustained network-wide increase. Short-term elevated index events were evident in the hourly data and, based on the reported exceedance table, were most frequent at Meerensee, which recorded 67 3σ and 33 5σ exceedances. Harbour West recorded 20 3σ and 8 5σ exceedances, followed by eSikhaleni (16 and 7), Brackenham (15 and 6), and Airport (13 and 5). CBD and Felixton recorded comparatively fewer reported 3σ exceedances (7 each), and Empangeni recorded none. Overall, March 2026 NO_x screening results were characterised by low monthly average index values at most sites, with intermittent site-specific elevated index events dominated by Meerensee rather than sustained elevated conditions.

6. CARBON DIOXIDE MONITORING

Carbon dioxide (CO_2) is reported in parts per million (ppm). In this report, CO_2 data are used as indicative local concentration measurements to identify relative build-up events and spatial differences across the AirGradient network. Because outdoor CO_2 varies with local sources, vegetation, atmospheric mixing and sensor accuracy, small differences around the background reference line should not be over-interpreted.

6.1. Data Completeness

	Air	Brk	CBD	Emp	eSk	Flx	HW	MS	Mtz	Rch
Jan 2026	-	99	***85***	-	97	100	***0***	100	***90***	100
Feb 2026	***77***	***84***	***77***	***59***	***87***	***89***	***90***	***90***	***89***	***89***
Mar 2026	96	97	99	***90***	***94***	99	99	98	***91***	99
Apr 2026	-	-	-	-	-	-	-	-	-	-
May 2026	-	-	-	-	-	-	-	-	-	-
Jun 2026	-	-	-	-	-	-	-	-	-	-
Jul 2026	-	-	-	-	-	-	-	-	-	-
Aug 2026	-	-	-	-	-	-	-	-	-	-
Sept 2026	-	-	-	-	-	-	-	-	-	-
Oct 2026	-	-	-	-	-	-	-	-	-	-
Nov 2026	-	-	-	-	-	-	-	-	-	-
Dec 2026	-	-	-	-	-	-	-	-	-	-

Missing Data (CO_2)

- *Emp, eSk, Mtz – Communication outages.*

6.2. Monthly

CO_2 monthly average concentrations are shown in Figure 6.1; comparisons to previous months are also provided (Figure 6.2).

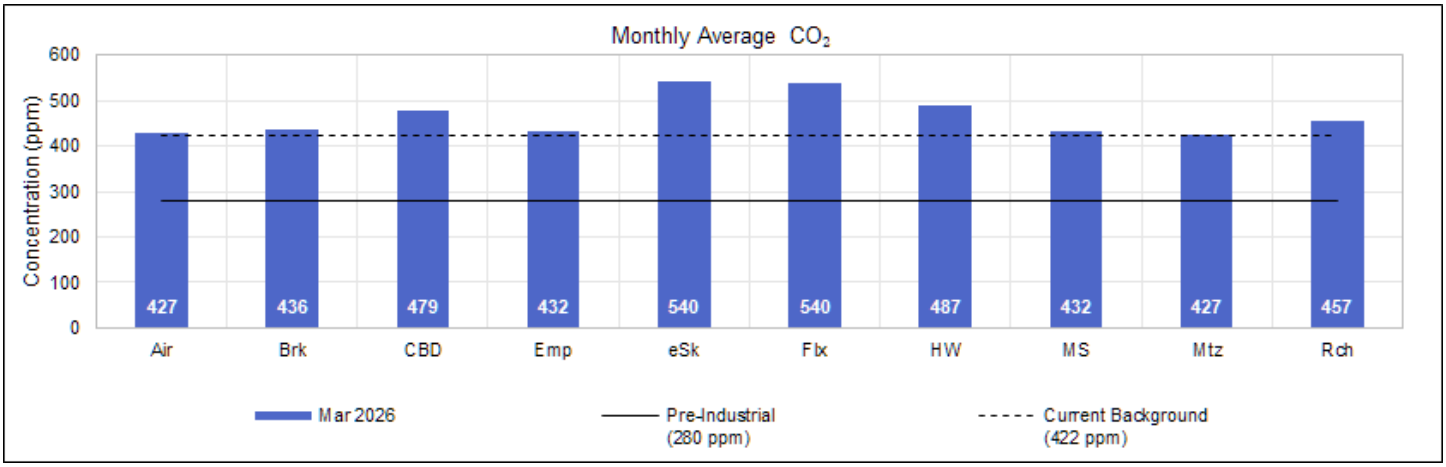


Figure 6.1: CO_2 monthly concentration.

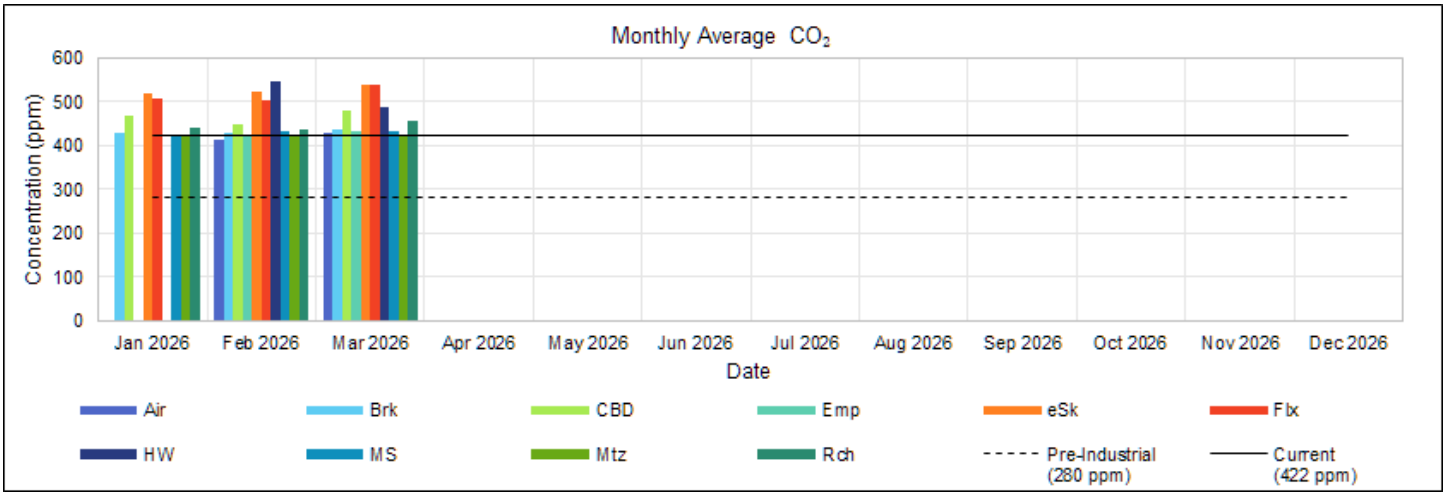


Figure 6.2: CO_2 monthly comparison.

6.3. Diurnal

CO_2 diurnal concentrations are shown below (Figure 6.3).

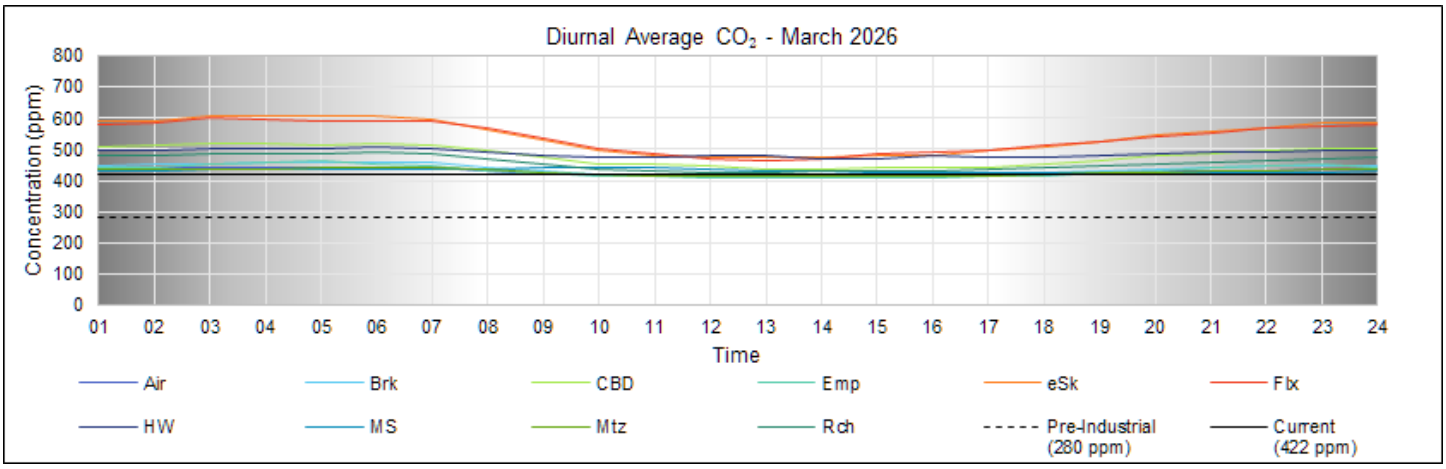


Figure 6.3: CO_2 diurnal concentrations.

6.4. Daily

CO_2 daily concentrations are shown below (Figure 6.4).

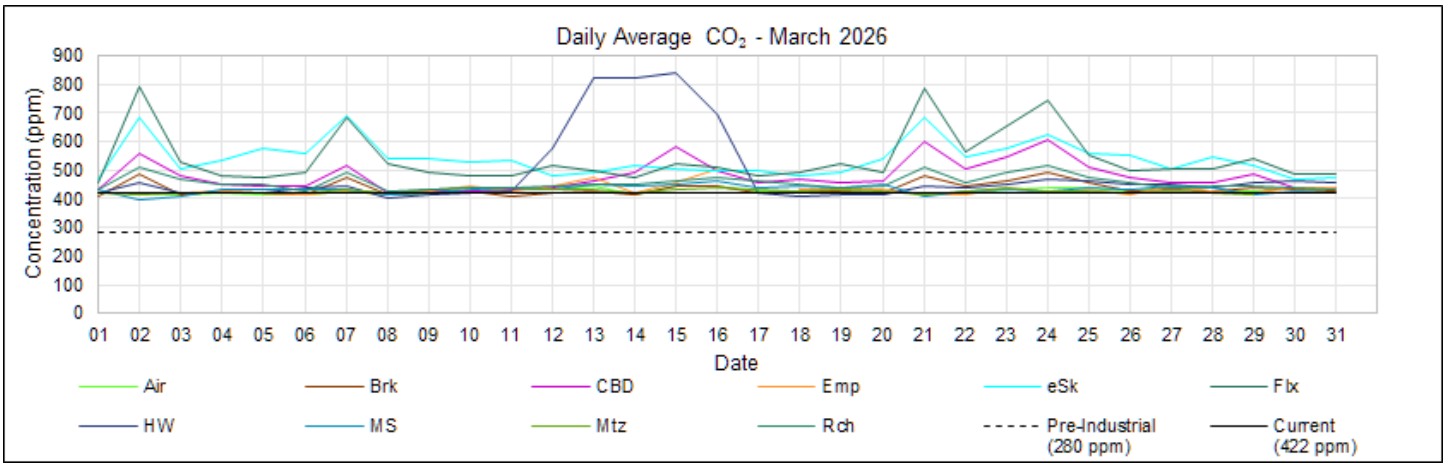


Figure 6.4: CO_2 daily concentrations.

Missing Data (CO_2): Emp, eSk, Mtz – Communication outages.

6.5. Hourly

CO_2 hourly concentrations are shown below (Figure 6.5).

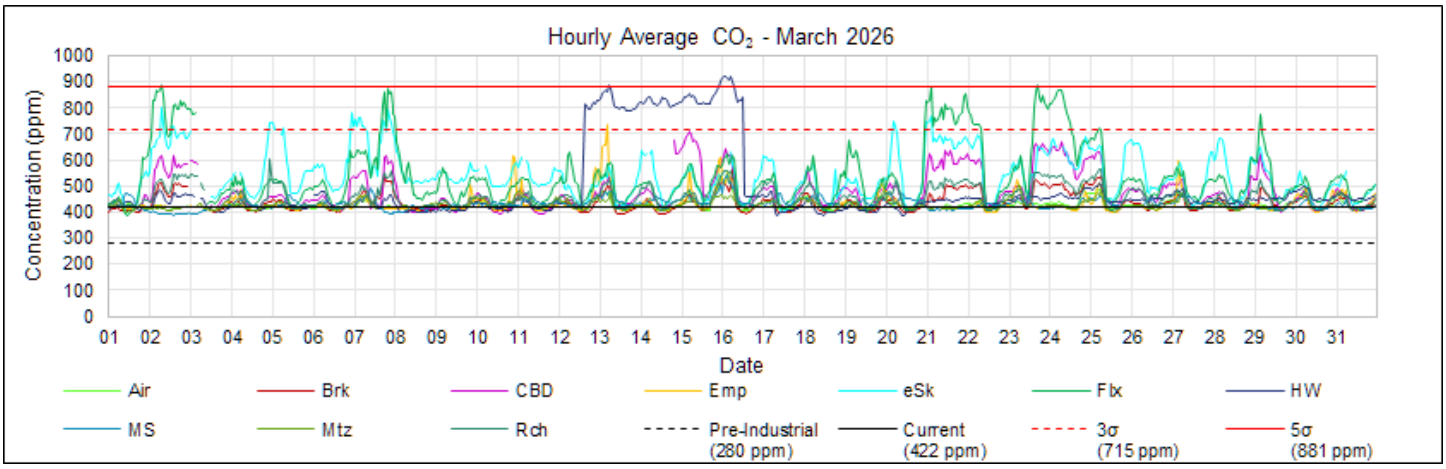


Figure 6.5: CO_2 hourly concentrations.

Table 6.1: CO_2 exceedances of the 3σ and 5σ limits.

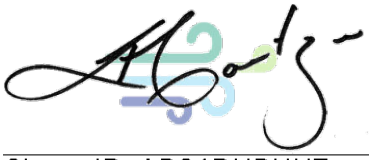
Limit	Air	Brk	CBD	Emp	eSk	Flx	HW	MS	Mtz	Rch	Total
3σ	0	0	0	1	29	92	94	0	0	0	216
5σ	0	0	0	0	0	3	11	0	0	0	14

6.6. Conclusion

CO_2 monthly average concentrations ranged from 427 to 540 ppm during March 2026. eSikhaleni and Felixton recorded the highest monthly averages (approximately 540 ppm), followed by Harbour West (487 ppm). Airport, Empangeni, Meerensee and Mtunzini were close to the current-background reference line shown in the monthly plot; small differences around that line should be interpreted in the context of sensor uncertainty. Short-term elevated events were concentrated at Harbour West (94 reported 3σ and 11 reported 5σ exceedances) and Felixton (92 reported 3σ and 3 reported 5σ exceedances), with smaller numbers of reported 3σ exceedances at eSikhaleni (29) and Empangeni (1). Overall, March 2026 CO_2 results indicate localised short-term build-up events superimposed on the monthly background, particularly at Harbour West and Felixton.

7. ACKNOWLEDGEMENT

Air Impact Measurement Specialists compiled this report for the Richards Bay Clean Air Association; contributors include Alicia Garnica and François Nel.



Signer ID: ABS1DHBUH7...

Lance Coetzee
Director

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