Ambient Air Quality Monitoring Report for Saldanha Bay and Vredenburg Sites

February 2024

Prepared for

Saldanha Bay Municipality

EXECUTIVE SUMMARY

This report covers data from the Saldanha Bay and Vredenburg Air Quality Monitoring stations which have been commissioned and operated throughout the Saldanha Bay Municipality Area by Argos Scientific Africa (Pty) Ltd since 2015.

This report covers activities during February 2024.

Data capture was 50% for O3 and 21% for NOx. Both analysers failed during February possibly associate with multiple load-shedding events. The O3 analyser was replaced early February and calibrated on site.

The O3 8hr. average RSA Standard was exceeded on the 14th February 2024 at the Saldanha Bay AQM site. No other standards were exceeded.

No data was collected from Vredenburg AQM station due to an air conditioner fault which is being attended to.

Meteorological data was not available due to the station conditions detailed above and vandalism that occurred earlier in 2024.

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REPORT DETAILS

Reference	AS1138\sbm\202402
Report Title	Ambient Air Quality Monitoring Report for Saldanha Bay and Vredenburg Sites : February 2024
Date Submitted	20 March 2024
Client	René Toesie Saldanha Bay Municipality Pick and Pay Centre VREDENBURG E-mail: rene.toesie@sbm.gov.za
Prepared by	G Ravenscroft Argos Scientific SA Unit 16 360 Business Park 8 Section Street Paarden Eiland Cape Town, 7405 Tel: +27 21 8343108
Signed	GRR
Technical signatory	Grant Ravenscroft Signed: 
Status	Final
Notice	

TABLE OF CONTENTS

1 INTRODUCTION AND BACKGROUND

1.1 SCOPE OF WORK

This project covers the communications, data processing and reporting for two Air Quality Monitoring (AQM) Stations in the Saldanha Bay Municipality Area. Argos Scientific's understanding of the scope of work is as follows:

- Establish 3G communications from ambient air quality monitoring station loggers (PC with Linux Operating System) via 2G/3G modem to a centralised server.
- Provide SIM cards for 2G/3G modems.
- Ensure communication support stations and server.
- Provide real-time access to raw data and validated data from SBM offices.
- Provide real-time downloading of raw data and validated data from SBM offices.
- Submission of monthly reports for each monitoring station, including data graphs, exceedance graphs, meteorology, analysis and station status.

1.2 PROJECT DESCRIPTION

This report evaluates data collected from the Saldanha Bay and Vredenburg Air Quality Monitoring Station. The Saldanha Bay station is located at 33° 0' 3.99" S, 17° 56' 41.68"E, to the north east of the town and the Vredenburg station is located at 32°54'6.20"S, 17°59'31.94"E, to the east of the town. These sites meet all the requirements as outlined in the US EPA's "Quality Assurance Handbook for Air Pollution Measurement Systems" and "SANS 1929" report.

Figure 1.2-1 Location of the Air Quality Monitoring Stations at Saldanha Bay & Vredenburg

2 GUIDELINES AND AIR QUALITY STANDARDS

The National Department of Environmental Affairs (DEA) standards for common pollutants as listed in the Government Gazette No.32816, published 24 February 2009, are listed in Table 2.1 below.

Table 1.2-1 National Ambient Air Quality Standards for SO_2, NO_2, O_3, PM-10 and PM2.5

Pollutant	SO_2	SO_2	NO_2	O_3	PM-10	PM-2.5
Period	10 minute	1 hour	1 hour	8 hour	1 day	1 day
RSA AQ Standard	191ppb	48ppb	106ppb	61ppb	75 µg/m^3	40 µg/m^3

3 METHODOLOGY

3.1 AMBIENT AIR QUALITY

Ambient concentrations of sulphur dioxide, oxides of nitrogen (NO, NO_2 and NO_X), ozone, and particulates less than 10 µm in diameter (PM-10) are measured at the Saldanha Bay monitoring site and Vredenburg monitoring site in accordance with the latest National Ambient Air Quality Standards (as above) and SANS standard methods. Levels of these pollutants are presented graphically and in table form in section 4 below.

3.2 DATA CAPTURE

Data is analysed for completeness against a required standard of 90% and presented in table form below.

Table 3.2-1 Percentage Data Capture for Ambient Air Quality Pollutants in February 2024 at Saldanha Site

Pollutant	SO_2	NO_2	O_3	PM-10	PM-2.5
% Capture	0%*	21%*	50%*	0%*	0%*

* Power / Analyser Fault – station shutdown

** Damaged reticulation.

Table 3.2-2 Percentage Data Capture for Ambient Air Quality Pollutants in February 2024 at Vredenburg Site

Pollutant	SO_2	NO_2	O_3	PM-10	PM-2.5
% Capture	0%*	0%*	0%*	0%**	0%**

* Analysers away for repairs or power / datalogger faults

** Air Conditioner Fault

4 RESULTS

4.1 AMBIENT AIR QUALITY TRENDS

A graphical summary of pollutants for February 2024 is provided in Figure 4.1.1– Figure 4.1.14 below. A tabulated summary of results is attached as Appendix 1.

Figure 4.1-1 Daily Mean Hourly SO2 Concentrations at Saldanha Bay in February 2024 (Analyser Faulty)

Station Re-located – Power installed February 2024 – Analyser faulty

Figure 4.1-2 Daily Maximum 10-minute SO_2 Concentrations at Saldanha Bay in February 2024 (Analyser Faulty)

Station Re-located – Power installed February 2024 – Analyser faulty

Figure 4.1-3 Daily Maximum NO_2 Concentrations at Saldanha Bay in February 2024

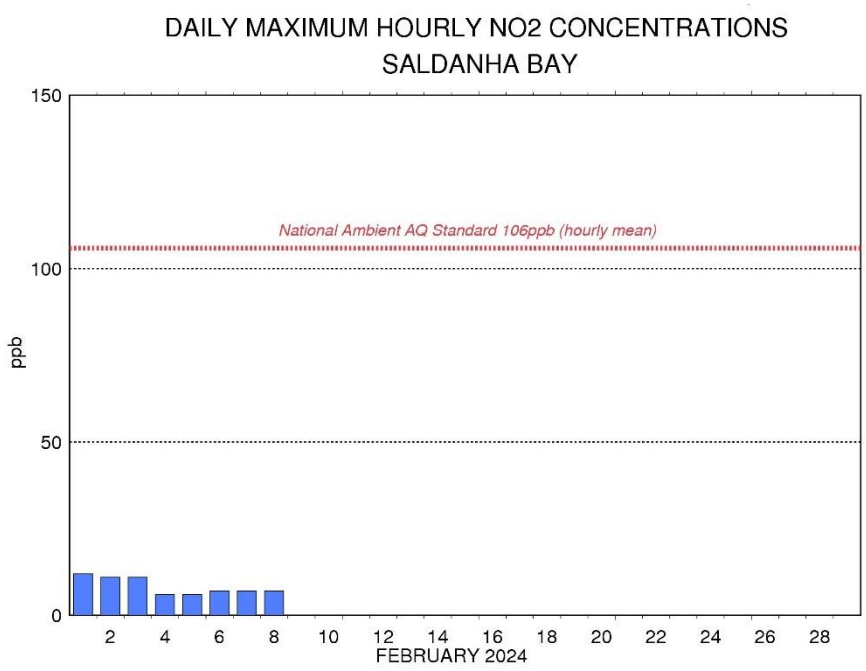

Figure 4.1-4 Daily Mean Hourly NO_x Concentrations at Saldanha Bay in February 2024

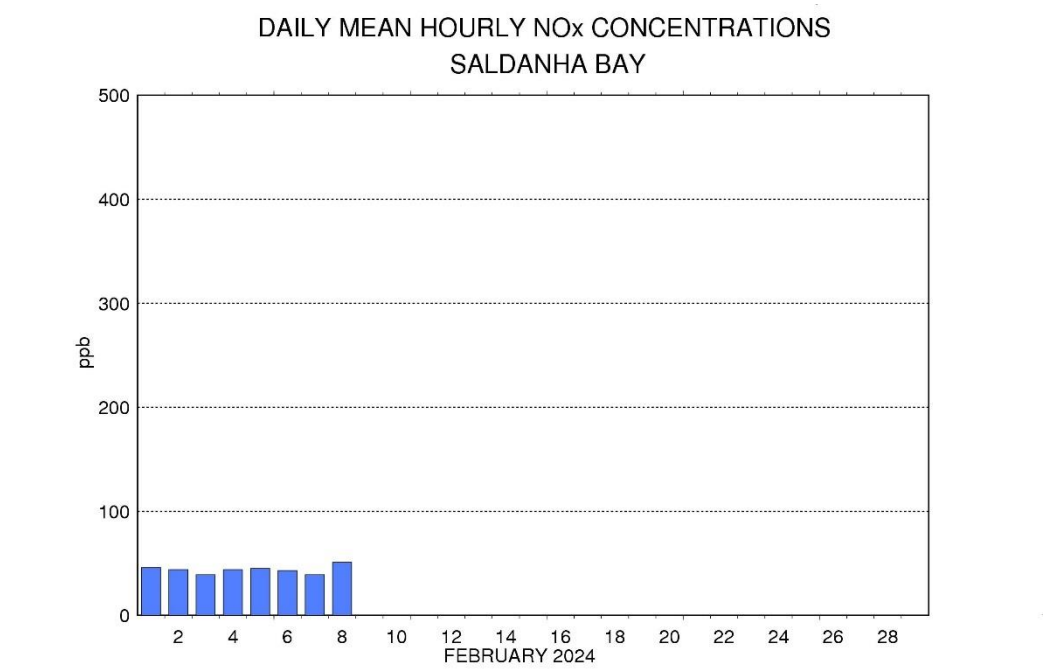

Figure 4.1-5 Daily Maximum Eight-hourly O_3 Concentrations at Saldanha Bay in February 2024

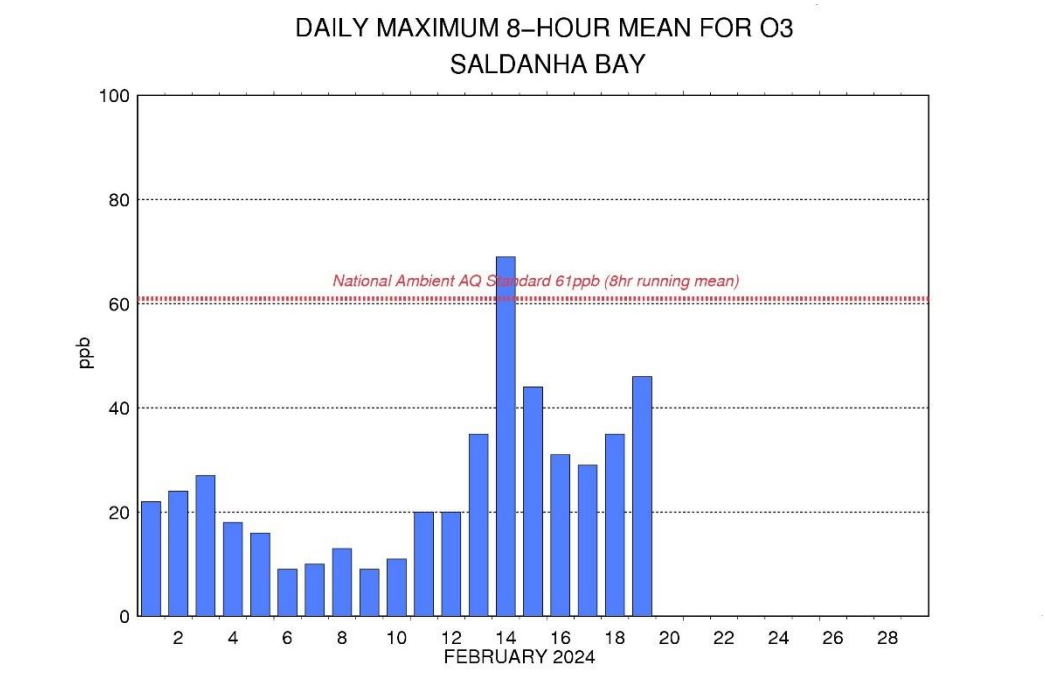

Figure 4.1-6 Daily Mean PM-10 Concentrations at Saldanha Bay in February 2024 (Analyser Faulty)

Station Re-located – Power installed February 2024

ARGOS Scientific

Figure 4.1-7 Daily Mean PM-2.5 Concentrations at Saldanha Bay in February 2024 (Analyser Faulty)

Station Re-located – Power installed February 2024

Figure 4.1-8 Daily Mean Hourly SO2 Concentrations at Vredenburg in February 2024

Analyser fault / insufficient data for statistical analysis

Figure 4.1-9 Daily Maximum 10-minute SO_2 Concentrations at Vredenburg in February 2024

Datalogger Fault

Figure 4.1-10 Daily Maximum NO_2 Concentrations at Vredenburg in February 2024

Datalogger Fault

Figure 4.1-11 Daily Mean Hourly NO_X Concentrations at Vredenburg in February 2024

Datalogger Fault

Figure 4.1-12 Daily Maximum Eight-hourly O_3 Concentrations at Vredenburg in February 2023

Datalogger Fault

4.2 COMPLIANCE

Table 4.2-1 Compliance with National Ambient Air Quality Standards at Saldanha Site

Pollutant	SO_2	NO_2	O_3	PM-10	PM-2.5
Period	10 minute	10 minute	10 minute	10 minute	10 minute
Standard	190.11 ppb	-	-	-	-
Exceedances	0	-	-	-	-
Period	1 hour	1 hour	1 hour	1 hour	1 hour
Standard	133.08	106.39	-	-	-
Exceedances	-	-	-	-	-
Period	1 day	1 day	8 hours	1 day	1 day
Standard	47.53	-	61.22	65µg/m^3	40µg/m^3
Exceedances	-	-	1	-	-

Table 4.2-2 Compliance with National Ambient Air Quality Standards at Vredenburg Site (No pollutants measured)

Pollutant	SO_2	NO_2	O_3	PM-10	PM-2.5
Period	10 minute	10 minute	10 minute	10 minute	10 minute
Standard	190.11 ppb	-	-	-	-
Exceedances	0	-	-	-	-
Period	1 hour	1 hour	1 hour	1 hour	1 hour
Standard	133.08	106.39	-	-	-
Exceedances	-	-	-	-	-
Period	1 day	1 day	8 hours	1 day	1 day
Standard	47.53	-	61.22	65µg/m^3	40µg/m^3
Exceedances	-	-	-	-	-

- Insufficient data

4.3 MEAN AND MAXIMUM CONCENTRATIONS

Table 4.3-1 Mean and Maximum Pollutant Concentrations during February 2024 at Saldanha Site (80% data capture required)

Pollutant	Period	SO_2	NO_2	O_3	PM-10	PM-2.5
Unit:		ppb			µg/m³	
Mean	Month	-*	-*	-*	-*	-*
Max.	1 hr	-*	-*	-*	-*	-*
Max	24 hr	-*	-*	-*	-*	-*

-* Insufficient data for statistics

Table 4.3-2 Mean and Maximum Pollutant Concentrations during February 2024 at Vredenburg Site (80% data capture required)

Pollutant	Period	SO_2	NO_2	O_3	PM-10	PM-2.5
Unit:		ppb			µg/m³	
Mean	Month	-*	-*	-*	-*	-*
Max.	1 hr	-*	-*	-*	--*	-*
Max	24 hr	-*	-*	-*	-*	-*

*** Insufficient data for statistics / station datalogger fault**

4.4 DIURNAL TRENDS

Diurnal trends of the ambient pollutants are only shown for those pollutants where overall data capture was above 50%, which is considered representative enough for providing an indication of diurnal trends.

Figure 4.4-1 Diurnal Trend for Ambient Air Pollutants at Saldanha Bay in February 2024

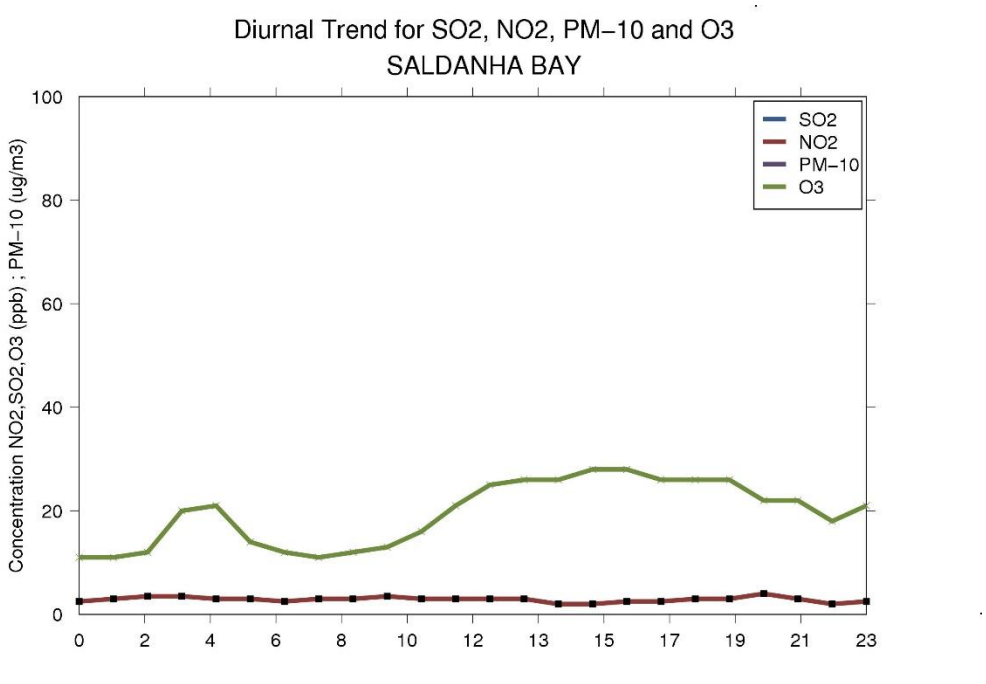

Figure 4.4-2 Diurnal Trend for Ambient Air Pollutants at Vredenburg in February 2024

-*no data available

4.5 WIND AND POLLUTION ROSES

The wind rose for Saldanha Bay for February 2024 is shown below.

Figure 4.5-1 Wind Rose for Saldanha Bay for February 2024

No data available

Figure 4.5-2 Wind Rose for Saldanha Bay for February 2024

No data available

5 CONCLUSIONS AND RECOMMENDATIONS

Information on data collection and compliance with standards are presented below and covers activities during February 2024.

- Data capture was 50% for O3 and 21% for NOx. Both analysers failed during February possibly associate with multiple load-shedding events. The O3 analyser was replaced early March and calibrated on site.
- No data was collected from Vredenburg AQM station due to an air conditioner fault which is being attended to.
- The O3 8hr. average RSA Standard was exceeded on the 14th February 2024 at the Saldanha Bay AQM site. No other standards were exceeded
- Meteorological data was not available due to the station conditions detailed above and vandalism that occurred earlier in 2024.

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APPENDIX 1: SUMMARY TABLE OF HOURLY MEANS (SALDANHA)

AS1138 APPENDIX 1: SALDANHA BAY AMBIENT AIR QUALITY DATA - FEBRUARY 2024

POLLUTANT: NITROGEN OXIDE **HOURLY MEAN CONCENTRATIONS - ppb**

Start Hr Day	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Mean	Max
1	3	3	6	3	3	3	-	-	35	2	2	2	2	2	-	-	40	1	1	2	2	2	-	-	**6**	**40**
2	37	2	3	2	3	3	3	4	3	3	2	3	3	2	-	-	41	1	2	1	2	2	-	-	**6**	**41**
3	34	2	2	2	3	3	-	-	33	1	2	2	2	2	2	2	2	2	2	2	2	3	2	3	**5**	**34**
4	2	2	3	2	2	2	-	-	35	2	2	2	2	2	-	-	40	1	2	2	3	2	2	2	**6**	**40**
5	3	2	2	3	2	3	2	2	2	2	2	2	-	-	40	1	2	2	2	2	-	-	41	1	**6**	**41**
6	3	4	11	6	3	3	3	4	3	3	2	2	2	2	3	2	-	-	-	-	-	-	40	3	**6**	**40**
7	3	5	4	4	-	-	34	7	4	2	3	3	3	2	2	2	-	-	-	-	-	-	-	-	**-**	**-**
8	-	-	-	-	-	-	34	4	3	2	2	2	-	-	48	1	2	2	-	-	-	-	-	-	**-**	**-**
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A1138 APPENDIX 1: SALDANHA BAY AMBIENT AIR QUALITY DATA - FEBRUARY 2024

POLLUTANT: NITROGEN DIOXIDE **HOURLY MEAN CONCENTRATIONS - ppb**

Start Hr / Day	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Mean	Max
1	7	10	12	10	8	6	-	-	5	11	8	8	7	7	-	-	6	7	7	7	7	8	-	-	**8**	**12**
2	4	6	6	8	6	7	8	8	9	11	8	8	8	7	-	-	4	5	7	6	7	6	-	-	**7**	**11**
3	5	7	7	7	6	6	-	-	5	7	7	8	7	6	5	5	5	5	5	8	11	7	6	6	**6**	**11**
4	5	5	5	6	5	5	-	-	3	5	5	5	5	5	-	-	5	4	5	4	5	5	5	5	**5**	**6**
5	5	5	6	6	5	5	5	5	6	6	6	5	-	-	4	4	4	4	5	4	-	-	4	6	**5**	**6**
6	6	5	7	6	5	5	5	5	6	5	5	4	4	5	5	4	-	-	-	-	-	-	3	4	**5**	**7**
7	4	5	4	4	-	-	5	7	6	5	5	5	4	4	4	4	-	-	-	-	-	-	-	-	**-**	**-**
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AS1138 APPENDIX 1: SALDANHA BAY AMBIENT AIR QUALITY DATA - FEBRUARY 2024

POLLUTANT: OXIDES OF NITROGEN **HOURLY MEAN CONCENTRATIONS - ppb**

Start Hr / Day	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Mean	Max
1	9	13	18	12	11	9	-	-	40	13	9	9	9	9	-	-	46	8	9	9	9	10	-	-	**14**	**46**
2	41	8	9	10	9	10	11	12	12	15	11	11	10	9	-	-	44	6	9	8	9	9	-	-	**13**	**44**
3	39	9	9	9	8	9	-	-	38	8	9	9	9	8	8	7	7	7	7	10	13	9	8	8	**11**	**39**
4	8	7	8	8	8	7	-	-	39	7	7	7	7	7	-	-	44	6	6	7	7	7	7	7	**11**	**44**
5	7	8	8	8	8	8	7	8	8	9	8	8	-	-	45	5	6	6	7	6	-	-	45	7	**11**	**45**
6	9	9	18	12	8	8	8	10	9	8	7	7	7	7	7	7	-	-	-	-	-	-	43	7	**11**	**43**
7	7	10	8	8	-	-	39	14	10	7	8	7	7	7	6	7	-	-	-	-	-	-	-	-	**-**	**-**
8	-	-	-	-	-	-	38	11	9	8	7	7	-	-	51	6	6	6	-	-	-	-	-	-	**-**	**-**
9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**-**	**-**
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11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**-**	**-**
12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**-**	**-**
13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**-**	**-**
14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**-**	**-**
15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**-**	**-**
16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**-**	**-**
17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**-**	**-**
18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**-**	**-**
19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**-**	**-**
20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**-**	**-**
21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**-**	**-**
22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**-**	**-**
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Mean	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	
Max	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

AS1138 APPENDIX 1: SALDANHA BAY AMBIENT AIR QUALITY DATA - FEBRUARY 2024

POLLUTANT: OZONE **HOURLY MEAN CONCENTRATIONS - ppb**

Start Hr Day	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Mean	Max
1	10	6	5	6	6	7	-	-	5	10	15	22	26	25	-	-	21	24	26	22	14	14	-	-	**15**	**26**
2	7	7	6	6	4	4	5	4	6	7	12	16	21	24	-	-	25	27	27	26	23	23	-	-	**14**	**27**
3	10	7	9	10	9	8	-	-	10	12	15	19	22	19	22	26	33	33	34	27	17	15	13	12	**17**	**34**
4	14	18	20	20	22	19	-	-	14	14	15	16	15	15	-	-	12	11	10	10	9	10	10	10	**14**	**22**
5	9	11	9	10	10	9	9	9	13	12	11	11	-	-	15	17	18	20	19	17	-	-	8	7	**12**	**20**
6	5	4	4	5	6	5	5	6	6	8	9	9	10	11	10	11	-	-	-	-	-	-	5	5	**7**	**11**
7	5	5	5	5	-	-	4	5	7	8	8	9	10	11	12	11	-	-	-	-	-	-	-	-	**-**	**-**
8	-	-	-	-	-	-	5	5	7	9	12	12	-	-	16	17	18	17	-	-	-	-	-	-	**-**	**-**
9	-	-	-	-	4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**-**	**-**
10	-	-	-	-	8	9	8	9	11	13	-	-	-	-	-	-	-	-	-	-	-	-	11	12	**-**	**-**
11	12	12	-	-	-	-	6	7	9	11	-	-	21	20	20	23	21	22	-	-	14	16	12	9	**-**	**-**
12	5	5	-	-	7	9	9	10	13	15	-	-	-	-	26	25	25	25	-	-	14	13	10	13	**-**	**-**
13	-	-	11	11	11	10	8	8	-	-	13	19	20	21	23	25	-	-	19	20	22	32	33	46	**20**	**46**
14	-	-	8	42	40	37	38	34	-	-	30	60	60	66	59	56	-	-	31	56	65	50	49	81	**48**	**81**
15	-	-	14	100	138	31	20	12	17	18	18	20	21	22	22	23	-	-	18	18	17	16	17	17	**29**	**138**
16	-	-	14	17	17	16	13	11	-	-	15	21	24	29	30	47	46	30	24	22	20	20	20	19	**23**	**47**
17	16	16	16	16	17	16	15	16	18	21	23	26	28	29	29	30	30	29	30	26	26	28	26	24	**23**	**30**
18	22	23	22	21	20	20	19	17	19	20	23	30	35	37	37	38	35	35	31	28	23	21	-	-	**26**	**38**
19	14	17	18	18	17	17	17	17	18	22	25	32	36	40	44	46	46	45	45	45	-	-	-	-	**29**	**46**
20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**-**	**-**
21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**-**	**-**
22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**-**	**-**
23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**-**	**-**
24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**-**	**-**
25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**-**	**-**
26	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**-**	**-**
27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**-**	**-**
28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**-**	**-**
29																									**-**	**-**
Mean	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	
Max	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

AS1138 APPENDIX 1: SALDANHA BAY AMBIENT AIR QUALITY DATA - FEBRUARY 2024

POLLUTANT: OZONE **EIGHT-HOURLY MEAN CONCENTRATIONS - ppb**

Start Hr / Day	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Mean	Max
1	7	8	10	12	14	16	-	-	18	21	22	22	21	19	-	-	17	15	13	10	8	7	-	-	**14**	**22**
2	5	5	5	6	7	9	12	14	17	20	22	24	24	23	-	-	21	19	17	15	12	11	-	-	**14**	**24**
3	10	10	12	13	14	16	-	-	18	21	24	26	27	26	26	25	23	20	19	17	16	17	17	17	**19**	**27**
4	18	18	17	17	16	15	-	-	14	13	13	12	12	11	-	-	10	10	10	10	10	10	10	10	**13**	**18**
5	10	10	10	10	10	11	12	13	14	15	16	15	-	-	15	14	12	10	8	7	-	-	5	5	**11**	**16**
6	5	5	6	6	7	7	8	9	9	9	9	8	8	7	6	6	-	-	-	-	-	-	5	5	**7**	**9**
7	6	6	6	7	-	-	8	9	10	9	9	9	9	9	9	10	-	-	-	-	-	-	-	-	**-**	**-**
8	-	-	-	-	-	-	10	12	13	13	12	12	-	-	12	11	10	9	-	-	-	-	-	-	**-**	**-**
9	-	-	-	-	8	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**-**	**-**
10	-	-	-	-	10	10	11	10	10	10	-	-	-	-	-	-	-	-	-	-	-	-	10	11	**-**	**-**
11	12	13	-	-	-	-	15	17	18	19	-	-	20	19	17	15	13	11	-	-	10	9	8	8	**-**	**-**
12	9	12	-	-	14	17	19	19	20	19	-	-	-	-	19	17	16	14	-	-	12	11	10	11	**-**	**-**
13	-	-	11	13	14	15	17	18	-	-	20	21	23	24	28	26	-	-	28	30	32	34	35	34	**24**	**35**
14	-	-	36	43	46	48	50	50	-	-	52	57	56	54	56	50	-	-	56	69	66	60	56	52	**53**	**69**
15	-	-	44	44	34	20	19	19	20	20	20	20	20	19	18	18	-	-	17	17	16	16	15	15	**22**	**44**
16	-	-	16	17	18	20	24	28	-	-	30	31	31	31	30	29	25	21	20	19	18	17	17	16	**23**	**31**
17	16	16	17	18	19	20	22	24	26	27	28	29	29	29	28	28	27	26	26	24	24	23	22	21	**24**	**29**
18	20	20	20	20	21	23	25	27	30	32	34	35	34	33	31	28	26	23	21	20	18	17	-	-	**25**	**35**
19	17	17	18	19	21	23	26	29	33	36	39	42	46	-	-	-	-	-	-	-	-	-	-	-	**-**	**-**
20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**-**	**-**
21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**-**	**-**
22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**-**	**-**
23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**-**	**-**
24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**-**	**-**
25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**-**	**-**
26	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**-**	**-**
27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**-**	**-**
28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**-**	**-**
29																									**-**	**-**
Mean	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	
Max	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

APPENDIX 2: SUMMARY TABLE OF HOURLY MEANS (VREDENBURG)

No data available due to aircon fault.

APPENDIX 3: MONITORING METHODOLOGIES

1. CONTINUOUS REAL TIME MONITORS

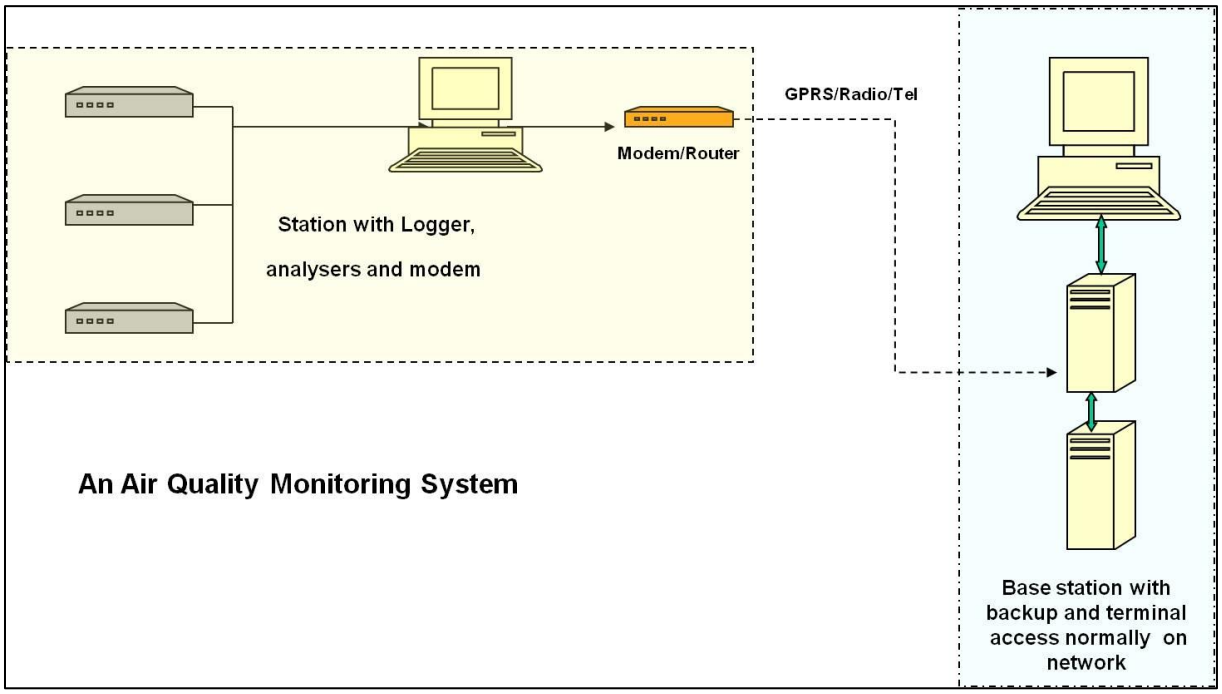
Continuous real-time monitors are used to measure real-time concentrations of gases. These are usually one part of an AQMS and often are remote in location and need to be connected in a network as per Figure A below. Such a system would have the following as a minimum requirement:

- Environmental enclosure
- Inlet manifold
- Analysers
- Calibration
- Meteorological instrumentation
- Data acquisition
- Data reporting
- Communication
- Housekeeping (log book, shelter check sheet, instruments data sheets)

In particular the monitoring station would have the following basic components:

- Monitoring station design
  - Housing
  - Air inlet system
  - Monitoring instrumentation
  - Calibration of monitors
  - Logging devices

Figure A. A Typical Air Quality Monitoring System Design



- Monitoring Methods

This section gives an overview of the methods employed in the continuous monitoring of ambient compounds.

1.1 CO/CO_2

CO and CO_2 are monitored continuously by non-dispersive infrared photometry.

The non-dispersive infrared photometry process is based upon the absorption of infrared light by CO or CO_2.

1.2 NO_X

Oxides of nitrogen are measured continuously by the principle of chemiluninescence.

The air sample is split into two pathways; one to measure NO and the other to measure total NO_X. The intensity of light is measured with a photomultiplier to obtain the concentration of NO. To obtain NO_2 the sample gas is passed through a moly converter.

Measurement is the sum of NO_2 and NO, expressed as NO_X.

1.3 SO_2/H_2S

SO_2 and H_2S are monitored continuously by pulsed fluorescence.

In this method, air is drawn through a chamber where it is irradiated with pulses of ultra-violet (UV) light. Any SO_2 in the sample is excited to a higher energy level and upon returning to its original state, light or fluorescence is released. The amount of fluorescence measured is proportional to the SO_2 concentration.

1.4 O_3

O_3 is monitored continuously using ultra-violet (UV) light absorption.

The sampled air is exposed to UV light which is absorbed by the O_3. The amount of UV light absorbed is proportional to the amount of O_3 in the sample; that is, the more UV light is absorbed, the greater the amount of O3 in the sample.

1.5 PM-10 and PM-2.5

Particulate matter is monitored continuously and intermittently. The Tapered Element Oscillating Microbalance (TEOM) is the most widely used and continuous PM-10 (or PM-2.5) monitor.

The TEOM draws an air sample through an inlet system that aerodynamically separates particles of a specified diameter. The air sample then passes through a filter that is attached to a tapered element in the mass transducer. This tapered element vibrates at its natural frequency. As particles are deposited onto the filter, the oscillating frequency changes in proportion to the amount of mass deposited.

1.6 Meteorological Parameters

Meteorological parameters such as wind direction, wind speed, temperature, relative humidity, solar radiation and atmospheric pressure are monitored in order to assist in identifying the sources of elevated concentration events or episodes.

2. Quality Control Requirements

Quality control of the monitored data is important to verify that the data reported is accurate and of a low uncertainty. Each monitoring station or passive monitoring site should be treated as if it were a laboratory. A laboratory is defined as “A place equipped for testing and analysis” or “A place providing the opportunity for observation in a field of study”.

It must be noted that it has been stated by DEA that only air quality data that is accredited will be accepted by DEA. The definition for accreditation is “the procedure by which an authoritative body gives formal recognition that a body is competent to carry out specific tasks”. In order to be accredited a sampling method must have:

- A recognised methodology that competence can be measured against
- A quality system
- Have been audited by a certification body

A relevant quality system for air quality measurements according to SANAS is ISO 17025. This system provides guidance to laboratories on essential elements for both:

- Quality management
- Technical requirements for the proper operation of a testing laboratory

3. Instrument Calibration and Frequency

This section covers the calibration of continuous air quality monitors. The basic requirements based on the US EPA Red Book are:

- Each analyser must have a dynamic calibration every three months
- This type of calibration must also be carried out on installation, after any repair, if tolerances of zero/ span are not met and if the analyser is relocated
- Zero and span calibration every two weeks
- Zero check every other week

4. Data Acquisition Requirements

This section also refers to an AQMS based on continuous monitoring from a monitoring station and to the data logging system:

The data logger must:

- Be verified annually
- Output from the analysers must be recorded
- Generate hourly mean concentrations
- Be able to scan at 30 second intervals with a minimum scan period of 1 hour and store this data
- Collect at least 40 minutes of uninterrupted data per hour for a valid average
- Use calculations verified by a statistician

5. SITE SELECTION

The following quote is noteworthy when considering the location of sites: *"Irrespective of how well a monitoring station is run, if it is not sited correctly data collected will have little value"*

As was mentioned earlier sites are selected for one of the following reasons:

- To judge compliance with air quality standards
- To activate emergency control procedures for episodes
- To observe pollution trends throughout a region
- To provide a database for research.

When selecting monitoring sites the following must be considered:

- **Economic**: Resources must be available for the expensive instrumentation, data retrieval and evaluation, maintenance and quality assurance and reporting of data
- **Security**: Problems can arise in this regard that make a site unsuitable when standard measures are taken into account
- **Logistics:** Planning, staffing, procurement procedures, training, communications, safety, task scheduling
- **Atmospheric conditions:**
    - Variability of air pollutants and their transport (effects of buildings, terrain and heat sources)
    - Dispersion factors – wind speed, wind direction, atmospheric stability
- **Topography**: Transport and diffusion of air pollutants are complicated by topographical features such as valleys or hills
- **Pollutant consideration:** A sampling site for one pollutant may or may not be suitable for other pollutants
    - For example, monitoring ozone close to primary NO emissions would not provide accurate pollutant information
- The final placement once a monitoring site has been selected depends on the presence of physical obstructions, accessibility and availability of utilities.
- **Obstructions** such as trees and buildings significantly affect the air flow over the monitoring station and the placement should expose the station to the general air flow of the area to prevent sampling bias.
- **Major roads** can produce bias and sites should be 15-60m away unless there are specific requirements for roadway monitoring. Typically sites would be between 3m and 15m away in this case.

6. DATA MANAGEMENT

All monitoring stations produce data that may be used for various reasons as outlined above. The following should be noted when dealing with this monitoring data and systems should be designed to accommodate the following:

- A copy of the raw data must always be available
- A record must be kept of any adjustments made
- All multiplication factors/ algorithms/ manipulations on the data must be recorded and reported
- Data must be kept for a minimum of 3 years
- When data is reported the temperature and pressure at which the analyser was last calibrated must be indicated on the test report

The following points must be considered when preparing a monitoring plan:

- Local authority responsible for monitoring
- Check to see if Province has information about your area
- Check to see whether DEA has information about your area (SAAQIS)
- Do screening study to see which pollutants if any are of concern
- SANS 1929 lets you make management decisions on whether costly continuous monitoring is needed
- If so focus on quality control, reporting 80% or more of available data
- Use data to manage improvements in air quality

APPENDIX 4: QUALITY ASSURANCE STATEMENT

Site visits were conducted on numerous occasions during the month to attend to faults associated with load-shedding, communications issues and power trips. Special attention was focused on station maintenance and resolving the power trips and pump faults detailed above as well as station stability.

Communication issues were resolved mid-month but are still intermittent and may be SIM related.The Vredenburg AQM site has an air conditioner fault which is in the process of being attended to. The Q3 SANAS calibrations took place late August 2023 and Saldanha Q1 calibrations were conducted on the O3 analyser.

All analyser that could be calibrated were within EPA requirements and gave a linear response to calibration gas.

Recent QA/QC Checks met requirements for all operational analysers.

Data Point Conc. (Saldanha)	**Expected**	**Recorded**	**Error**	**Requirement / Comment**
SO2 (400ppb) Q3 2023	400ppb	256ppb	-36%	±15% (Failed – Adjusted)
1	400ppb	400ppb	0%	Passed
2	301ppb	302ppb	<1%	Passed
3	202ppb	203ppb	<1%	Passed
4	103ppb	101ppb	-1.9%	Passed
5	0ppb	2ppb	-	Passed
NO (400ppb) Q3 2023	400ppb	398ppb	<1%	±15% (Passed – Good, no adjust)
2	301ppb	300ppb	<1%	Passed
3	202ppb	197ppb	-2.5%	Passed
4	102ppb	98ppb	-3.9%	Passed
5	0ppb	-1ppb	-	Passed
O3 (400ppb) Q1 2024	400ppb	420ppb	+4.8%	±15% (Passed Not Adjusted)
1	400ppb	420ppb	+5%	Passed
2	301ppb	313ppb	+3.9%	Passed
3	202ppb	212ppb	+4.9%	Passed
4	103ppb	109ppb	+5.8%	Passed
5	0ppb	0.8ppb	-	Passed

*Permeation tube expired. Power Trips

The SO_2, NO_2 and O_3 concentrations reported are determined by a United States Environmental Protection Agency (US EPA) equivalent method (EQSA-0495-100, RFNA-1194-099 and EQOA-0992-087 respectively).

---------- End of Report ----------