

## EXECUTIVE SUMMARY

This monthly report covers the ambient air quality data for December 2016 as monitored at KwaZamokuhle monitoring site.

The national ambient air quality for ozone 8-hourly limit of 61 ppb was exceeded thirteen times. There were two (2) exceedances of the national ambient air quality limits for SO<sub>2</sub> 10 minutes and there were no exceedances of the other national ambient air quality limits recorded during the monitoring period under review.

Both SO<sub>2</sub> and NO<sub>2</sub> ambient concentrations at KwaZamokuhle monitoring site are influenced by the combination of low-level sources and tall stack emitters. Ambient fine particulate matter concentrations indicate the influence of low-level source emissions at KwaZamokuhle, probably domestic burning.

Both PM<sub>2.5</sub> and PM<sub>10</sub> annual concentrations have exceeded their national annual limits of 20µg/m<sup>3</sup> and 40µg/m<sup>3</sup>, respectively. The numbers of exceedances recorded for SO<sub>2</sub>, PM<sub>2.5</sub> and PM<sub>10</sub> daily limits, and O<sub>3</sub> 8-hourly average in 2016 have exceeded their allowed number of exceedances per year. Therefore, there is non-compliance with the ambient PM<sub>10</sub>, PM<sub>2.5</sub> and O<sub>3</sub> national air quality standards for 2016. The annual mean concentrations of NO<sub>2</sub> and SO<sub>2</sub> have not exceeded their national annual limits of 21 ppb and 19 ppb, respectively, and the number of exceedances recorded for SO<sub>2</sub> hourly limit is well below the allowed number of exceedances per year. There were no exceedances recorded for the NO<sub>2</sub> hourly limit of 106 ppb for the entire 2016.

The dominant winds during the day were from north-east, east-north-east, east and north-north-west. The dominant winds during the night were east-north-east, east, east-south-east and north-east.

The overall percentage data recovered from the monitoring station during the reporting period was 94.3 % and station availability was 93.1%. NO<sub>x</sub> and PM<sub>2.5</sub> did not meet the SANAS requirement of 90% data recovery per parameter and data loss was due to ceased external pump and power down.

## DISCLAIMER

It is certified that the data presented is, to the best of our knowledge, a true copy of the specified record and for the times and places indicated thereon, as held on file at Research, Testing and Development Department (RT&D). The user assumes the entire risk related to the use of this data. In no event will S&I be liable to the user or to any third party for any direct, indirect, incidental, consequential, special or exemplary damages or profit resulting from any use or misuse of this data.

## 1. INTRODUCTION

The KwaZamokuhle monitoring station is equipped to continuously monitor ambient concentrations of sulphur dioxide (SO<sub>2</sub>), nitrogen oxides (NO, NO<sub>2</sub> and NO<sub>x</sub>), ozone (O<sub>3</sub>), fine particulate matter (FPM) of particulate size <10µm in diameter (PM<sub>10</sub>) and fine particulate matter (FPM) of particulate size <2.5µm in diameter (PM<sub>2.5</sub>). In addition, meteorological parameters of wind speed (WSP), wind direction (WDR), solar radiation (RAD), relative humidity (HUM), rainfall (RFL), pressure (PRS) and ambient temperature (TMP) are also recorded.

The monitoring site was established as part of a greater air quality offset pilot study. The objective of the pilot study is to test the effectiveness of the most promising household emission offset interventions identified during Eskom's pre-feasibility study. This includes identifying the possible improvement in ambient air quality resulting from emission reductions at a household level. Data measured at KwaZamokuhle will represent baseline and post intervention implementation ambient air quality.

## 2. SITE LOCATION

The KwaZamokuhle monitoring site is located in Hendrina about 22.5 km south-south-west of Arnot Power Station, 27.3 km east-south-east of Komati Power Station and 18.3 km south-east of Hendrina Power Station. (Co-ordinates: -26.138252, 29.738953)

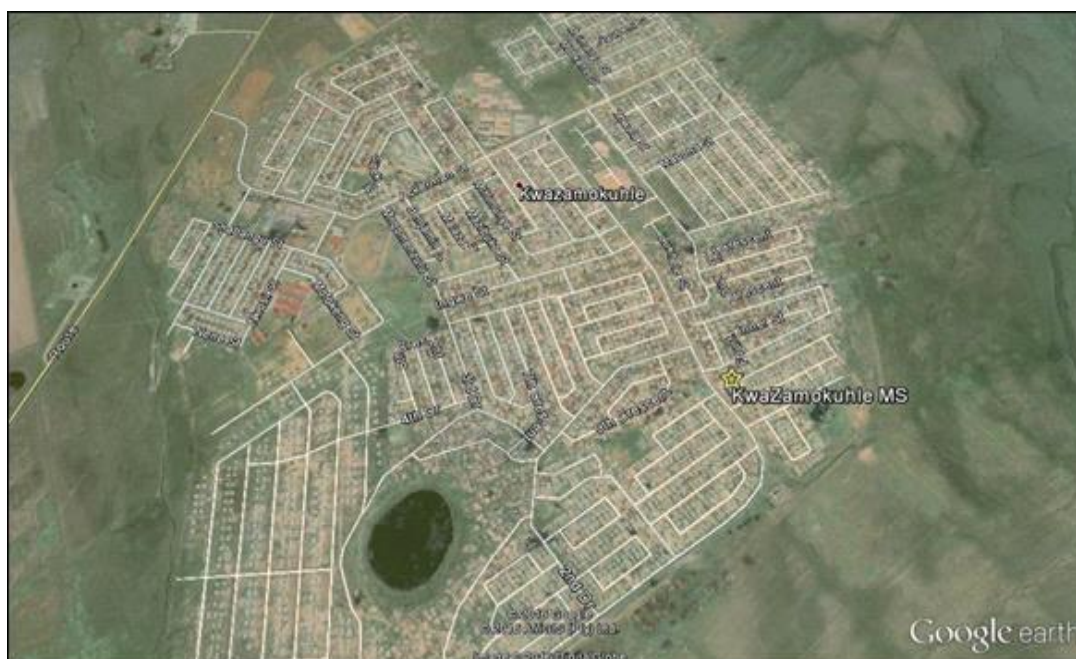


Figure 1: KwaZamokuhle air quality monitoring station in relation to Komati, Hendrina and Arnot power stations and Kwazamokuhle Township

### 3. DATA RECOVERY

Data was analysed for completeness against a required SANAS guideline of 90% per parameter monitored and is represented in Table 1 for the KwaZamokuhle monitoring site. All parameters met the SANAS guideline

Table1. Percentage data recovered per parameter for December 2016

NO	NO <sub>2</sub>	NO <sub>x</sub>	O <sub>3</sub>	PRS	RAD	RFL	SO <sub>2</sub>	TMP	WDR	WSP	WVL	PM <sub>2.5</sub>	PM <sub>10</sub>	HUM	Data Recovery	Station Avail
88.7	88.7	88.7	92	100	99.8	99.9	92.1	100	100	100	100	92.4	67.6	100	94.3	93.1

The overall percentage data recovered from the monitoring station during the reporting period was 94.3 % and station availability was 93.1%. NO<sub>x</sub> and PM<sub>2.5</sub> did not meet the SANAS requirement of 90% data recovery per parameter and data loss was due to ceased external pump and power down.

### 4. SUMMARY OF RESULTS FOR REPORTED PERIOD

The National Department of Environmental Affairs (DEA) has set the South African Ambient Air Quality Standards for the criteria pollutants as illustrated in Table 2.

Table 2: South African National Ambient Air Quality Standards

Pollutant	Averaging Period	Concentration	Allowed Frequency of Exceedances
NO <sub>2</sub>	1 hour	106 ppb	88
	1 year	21 ppb	0
SO <sub>2</sub>	10 minute average	191 ppb	526
	1 hour	134 ppb	88
	24 hours	48 ppb	4
	1 year	19 ppb	0
O <sub>3</sub>	8 hours (running ave)	61 ppb	11
PM <sub>10</sub>	24 hours	75 µg/m <sup>3</sup>	4
	1 year	40 µg/m <sup>3</sup>	0
PM <sub>2.5</sub>	24 hours	40 µg/m <sup>3</sup>	0
		<sup>(1)</sup> 25 µg/m <sup>3</sup>	0
	1 year	20 µg/m <sup>3</sup>	0
		<sup>(1)</sup> 15 µg/m <sup>3</sup>	0

<sup>(1)</sup>Compliance required by 1 January 2030

Table 3 is a summary report presenting highest mean concentrations and the number of exceedances of the respective National Ambient Air Quality Standards as monitored at KwaZamokuhle during the November 2016 monitoring period.

Table 3: Summary report

Pollutant	Highest Hourly Mean	No of Hourly National Limit Exceedances	Highest Daily Mean	No of Daily National Limit Exceedances	No of 8hr Moving Average Limit	Highest 10min Mean	No of 10min National Limit Exceedances
PM <sub>2.5</sub> (µg/m <sup>3</sup> )	162.8		36.1	0		270.9	
PM <sub>10</sub> (µg/m <sup>3</sup> )	226.4		63.8	0		376.2	
NO (ppb)	76.8		12.9			180.1	
NO <sub>2</sub> (ppb)	32.7	0	14.6			41.7	
NO <sub>x</sub> (ppb)	86.2		22.8			191	
O <sub>3</sub> (ppb)	105.3		48		13	112.5	
SO <sub>2</sub> (ppb)	97.8	0	19.5	0		203.9	2
TMP (°C)	31.8		23.5			32.1	
WSP (m/s)	11.4		5.5			14.1	
WVL (m/s)	10.9		5.4			13.6	

The national ambient air quality for ozone 8-hourly limit of 61 ppb was exceeded thirteen times. There were two (2) exceedances of the national ambient air quality limits for SO<sub>2</sub> 10 minutes and there were no exceedances of the other national ambient air quality limits recorded during the monitoring period under review.

## 5. METEOROLOGICAL OBSERVATIONS

The distribution of wind direction and wind speed for daytime and night-time hours for the reporting period are summarised on polar diagrams in Figure 2. The centre of the wind rose depicts the position of the air quality-monitoring site. The positions of the spokes in the polar diagram represent directions from which the wind was blowing. The length of the segment indicates the percentage of the time the wind blew from that direction and the speed in the various categories are denoted by colours and width.

The dominant winds during the day were from north-east, east-north-east, east and north-north-west. The dominant winds during the night were east-north-east, east, east-south-east and north-east.

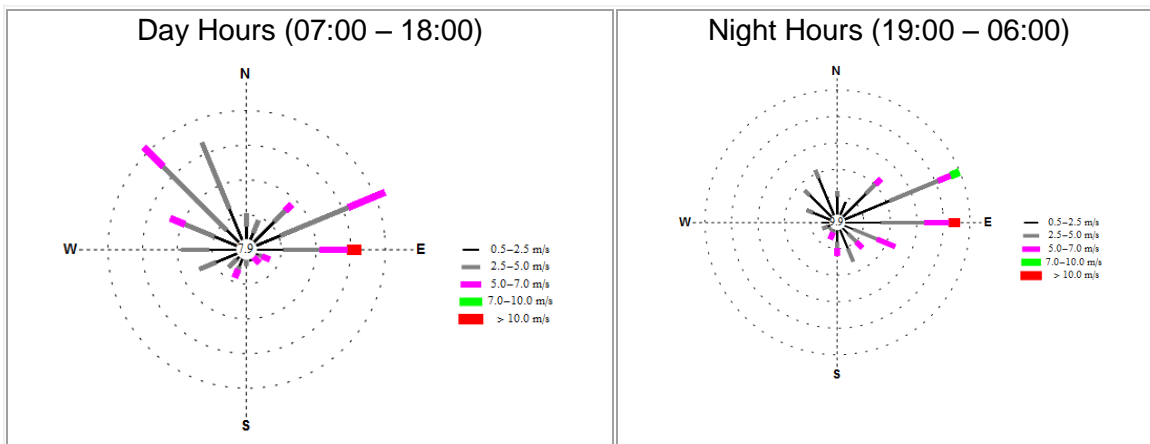


Figure 2: Wind profile at KwaZamokuhle monitoring site

## 6. DISCUSSION OF POLLUTANTS

Emissions of primary pollutants such as PM<sub>10</sub>, SO<sub>2</sub>, and NO<sub>x</sub> from low level sources such as domestic combustion and motor vehicles are expected to impact at ground level more significantly during the evening and early morning hours as a result of temperature inversion. Emissions of such pollutants from tall stacks (power stations and other industries), are expected to have a more significant impact at ground level during the day between 09:00 and 16:00, due to atmospheric turbulence influences.

### 6.1. SULPHUR DIOXIDE (SO<sub>2</sub>).

#### 6.1.1. Source Identification by SO<sub>2</sub> Hourly Diurnal Variations.

Figure 3 shows SO<sub>2</sub> concentrations increasing from the morning. The concentrations continue to rise throughout the afternoon and showing peaks at 04:00 in the morning, 12:00 during the day and 20h00 in the evening. The morning and evening peaks are from low-level sources, probably domestic coal burning, and peak in the afternoon is an indicative of tall stack sources.

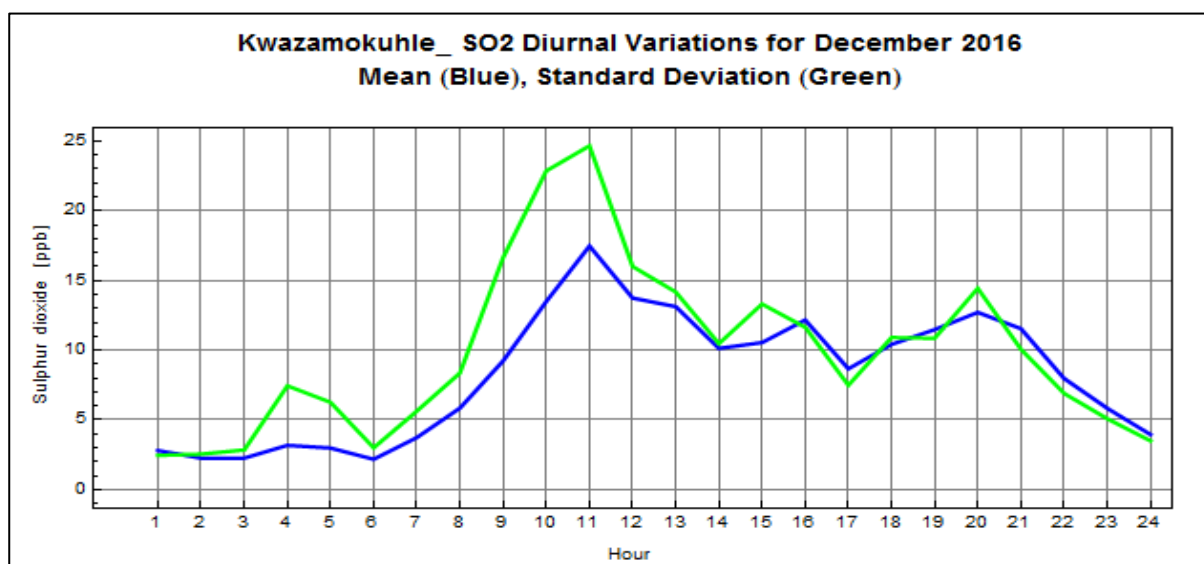


Figure 3: Diurnal variation of SO<sub>2</sub> hourly at KwaZamokuhle for December 2016

#### 6.1.2 Sulphur Dioxide Hourly Event Roses

There were two (2) exceedances of the national ambient air quality limits for SO<sub>2</sub> 10 minutes and no exceedances of national ambient air quality limit for SO<sub>2</sub> hourly. Figure 4 shows the SO<sub>2</sub> hourly mean 98<sup>th</sup> percentile event roses during day and night times. During the daytime the SO<sub>2</sub> hourly mean sector concentrations above 57.38 ppb (Table 5) were recorded in the north-east and west, sectors. The hourly mean sector concentrations above 29.53 ppb (Table 6) during the night-time were recorded north, west-north-west and north-north-west sectors.

During daytime, the SO<sub>2</sub> 10-minutes limit exceedances were recorded in north-west sector. The KwaZamokuhle Township is located from north to south and Hendrina power station is located in the north-west sectors of the monitoring site and this could have shown impact on the quality of the air around the monitoring site. Local SO<sub>2</sub> emissions from domestic coal burning probably make the greatest contribution to SO<sub>2</sub> levels in KwaZamokuhle. During the nighttime, the highest 98<sup>th</sup> percentile concentrations above 29.51 ppb were recorded from north, south, west-south-west, west, west-north-west, north-west and north-north-west sectors.

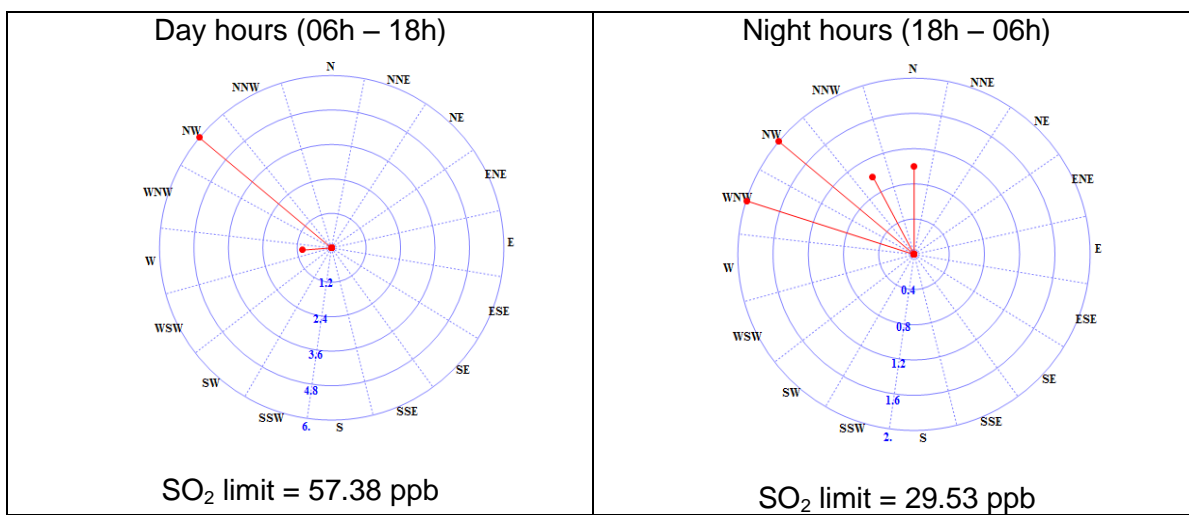


Figure 4: SO<sub>2</sub> hourly limit for exceedance roses for December 2016

Table 5: SO<sub>2</sub> day-time hourly mean 98<sup>th</sup> percentile for event table

Dir.	N	NNE	NE	ENE	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
Eve	0		6	0	0	0	0	0	0	0	0	1	0	0	0
%	0		85.71	0	0	0	0	0	0	0	0	14.29	0	0	0

Table 6: SO<sub>2</sub> night-time hourly mean 98<sup>th</sup> percentile for event table

Dir.	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
Eve	1	0	0	0	0	0	0	0	0	0	0	0	0	2	2	1
%	16.67	0	0	0	0	0	0	0	0	0	0	0	0	33.33	33.33	16.67

## 6.2. Nitrogen Dioxide (NO<sub>2</sub>)

### 6.2.1. Source identification by NO<sub>2</sub> diurnal variations

The diurnal variation indicates NO<sub>2</sub> concentrations reaching minor peaks at 07:00 and 11:00 in the morning and afternoon, and then concentrations increase throughout the afternoon with a peak at 16:00 and a maximum peak at 21:00 in the evening as indicated by Figure 5 below. The concentration peaks observed in the morning and evenings are associated with influence from low-level sources like domestic burning and vehicles and the peak observed in the afternoon is influenced by tall stack emissions.

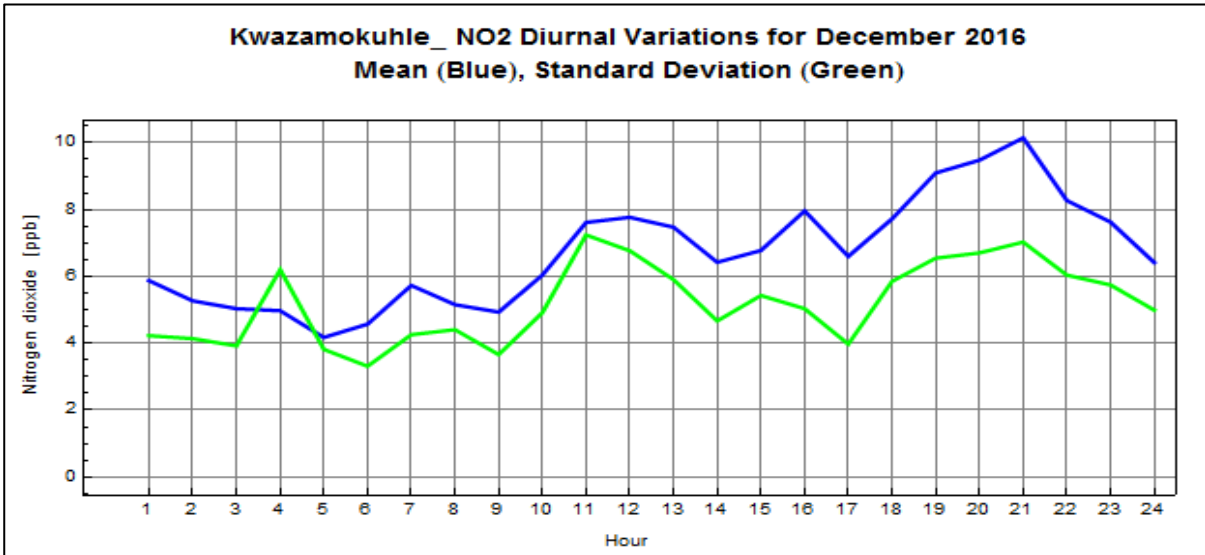


Figure 5: Diurnal variation of NO<sub>2</sub> hourly at KwaZamokuhle for December 2016

### 6.2.2 Nitrogen dioxide hourly event roses (98<sup>th</sup> percentile)

There were no exceedances of the NO<sub>2</sub> hourly limit of 106 ppb. Figure 6 shows the 98<sup>th</sup> percentile event roses indicating the sectors where highest hourly concentrations were coming from during the day and night. During the daytime the highest hourly mean concentrations above 21.34 ppb (Table 7) was recorded in west-north-west sector. The hourly mean concentrations above 20.37 ppb (Table 8) during the night-time were recorded in the north, west-north-west, north-west and north-north-west sectors. KwaZamokuhle Township is located from north to south and Hendrina power station is located in the north-west sectors of the monitoring site and this could have shown impact on the quality of the air around the monitoring site.

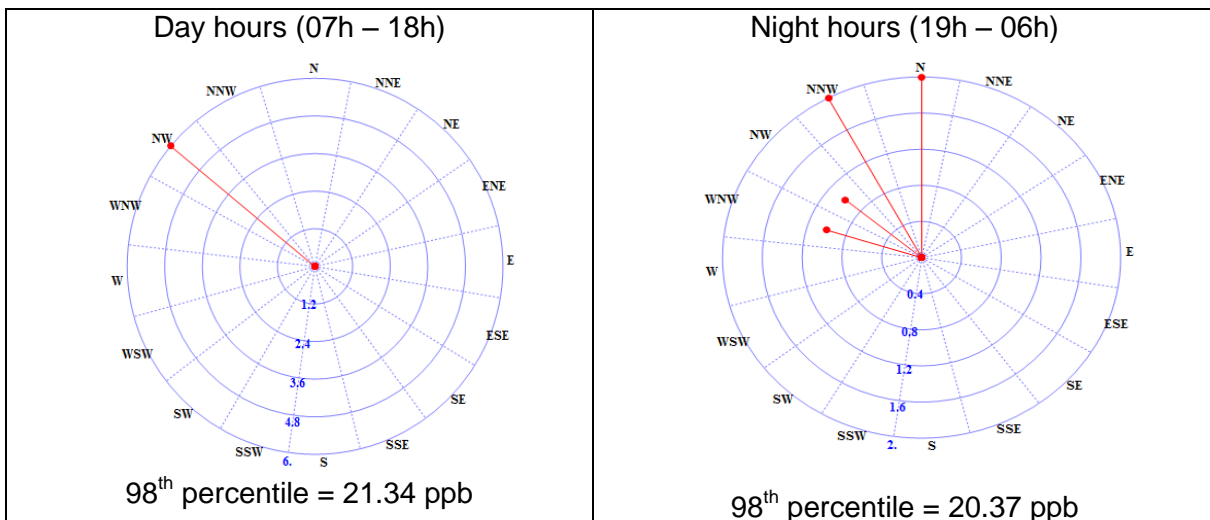


Figure 6: NO<sub>2</sub> hourly mean 98<sup>th</sup> percentile event roses during day and night times

Table 7: NO<sub>2</sub> day time hourly mean 98<sup>th</sup> percentile event table

Dir.	N	NNE	NE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
Eve	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0
%	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0

Table 8: NO<sub>2</sub> night-time hourly mean 98<sup>th</sup> percentile event table

Dir	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
Eve	2	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2
%	33.33	0	0	0	0	0	0	0	0	0	0	0	0	16.67	16.67	33.33

### 6.3. Fine Particulate Matter (PM<sub>10</sub> and PM<sub>2.5</sub>).

#### 6.3.1. Source identification by PM<sub>10</sub> and PM<sub>2.5</sub> diurnal variations.

The PM<sub>2.5</sub> and PM<sub>10</sub> diurnal variations (Figures 7 and 8) display a similar pattern indicative of low-level emission sources on the ambient concentrations. Two distinct peaks are evident at 08:00 in the morning and 20:00 in the evening. These peaks are typical of emissions from low-level sources, probably domestic fuel combustion in KwaZamokhule. Concentrations remained low throughout the day.

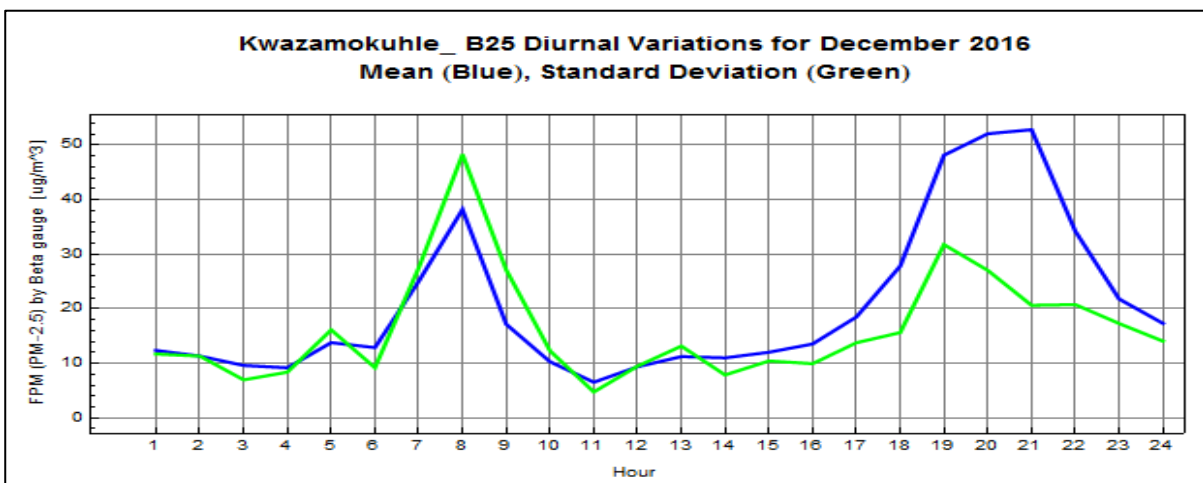


Figure 7: Diurnal variation of PM<sub>2.5</sub> concentrations at KwaZamokuhle for December 2016



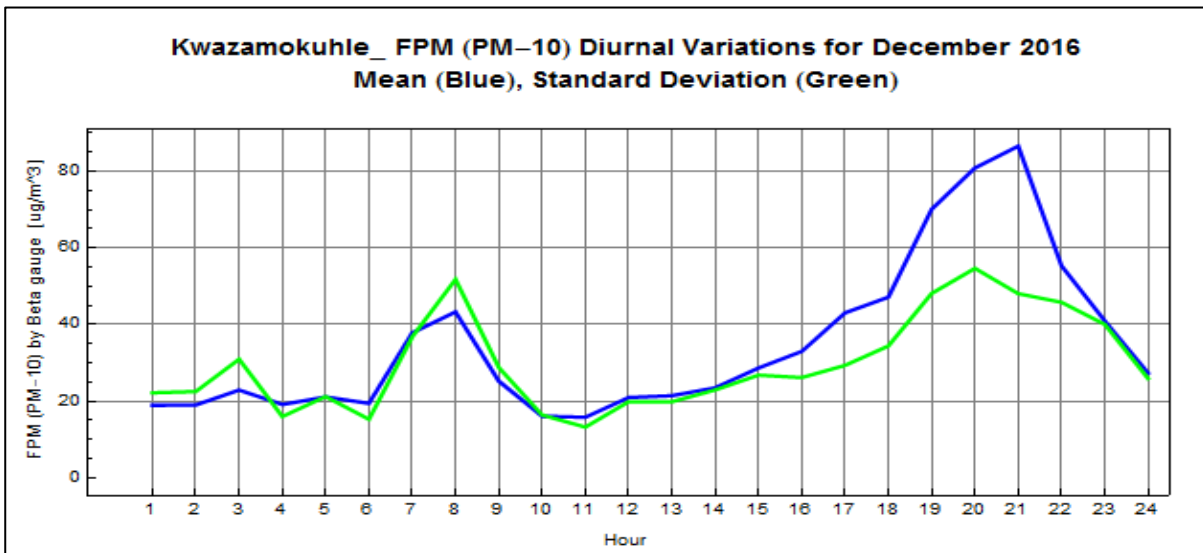


Figure 8: Diurnal variation of PM<sub>10</sub> concentrations at KwaZamokuhle for December 2016

6.3.2 Particulate fine matter hourly 98<sup>th</sup> percentile event roses. As there are no national hourly PM standards, the hourly mean 98<sup>th</sup> percentile daytime and night-time event roses are presented to identify the wind sectors from which the highest hourly concentrations were derived from during the monitoring period.

Figure 9 shows the PM<sub>2.5</sub> hourly mean 98<sup>th</sup> percentile event roses during day and night times. During the daytime the PM<sub>2.5</sub> hourly mean sector concentrations above 99.78µg/m<sup>3</sup> (Table 9) were recorded in the east, south-south-east, west-north-west and north-north-west sectors. The hourly mean sector concentrations above 90.15µg/m<sup>3</sup> (Table 10) during the night-time were recorded in north-east, east-north-east, west-north-west and north-north-west sectors.

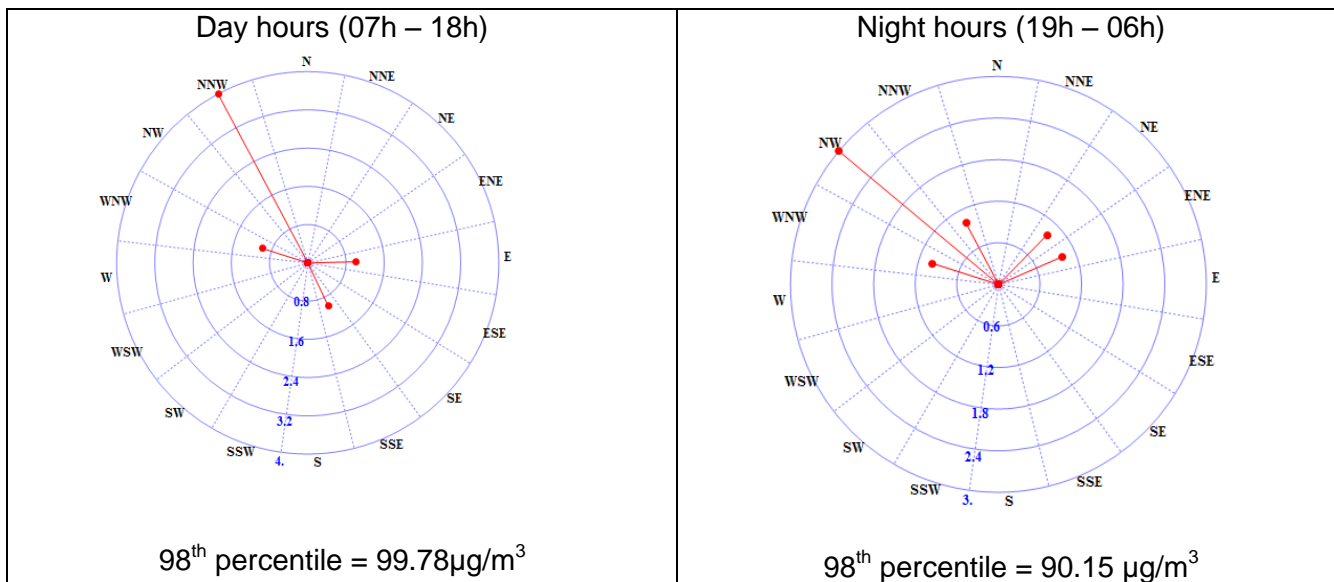


Figure 9: PM<sub>2.5</sub> hourly mean 98<sup>th</sup> percentile event roses during day and night times

Table 9: PM<sub>2.5</sub> daytime hourly mean 98<sup>th</sup> percentile event table

Dir	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
Eve	0	0	0	0	1	0	0	1	0	0	0	0	0	1	0	4
%	0	0	0	0	14.29	0	0	14.29	0	0	0	0	0	14.29	0	57.14

Table 10: PM<sub>2.5</sub> night time hourly mean 98<sup>th</sup> percentile event table

Dir	N	NNE	NE	E	ENE	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
Eve	0	0	1	0	1	0	9	0	0	0	0	0	0	1	3	1
%	0	0	14.29	0	14.29	0	9	0	0	0	0	0	0	14.29	42.86	14.29

Figure 10 shows the PM<sub>10</sub> hourly mean 98<sup>th</sup> percentile event roses during day and night times. PM<sub>10</sub> hourly mean sector concentrations above 121.64 µg/m<sup>3</sup> (Table 11) were recorded north, west-south-west, west-north-west, north-west and north-north-west sectors. During the night, the hourly mean concentrations above 159.22µg/m<sup>3</sup> (Table 12) were recorded in the north, north-east, west-north-west and north-west sectors. Domestic burning in KwaZamokuhle is probably the largest source of PM<sub>10</sub>.

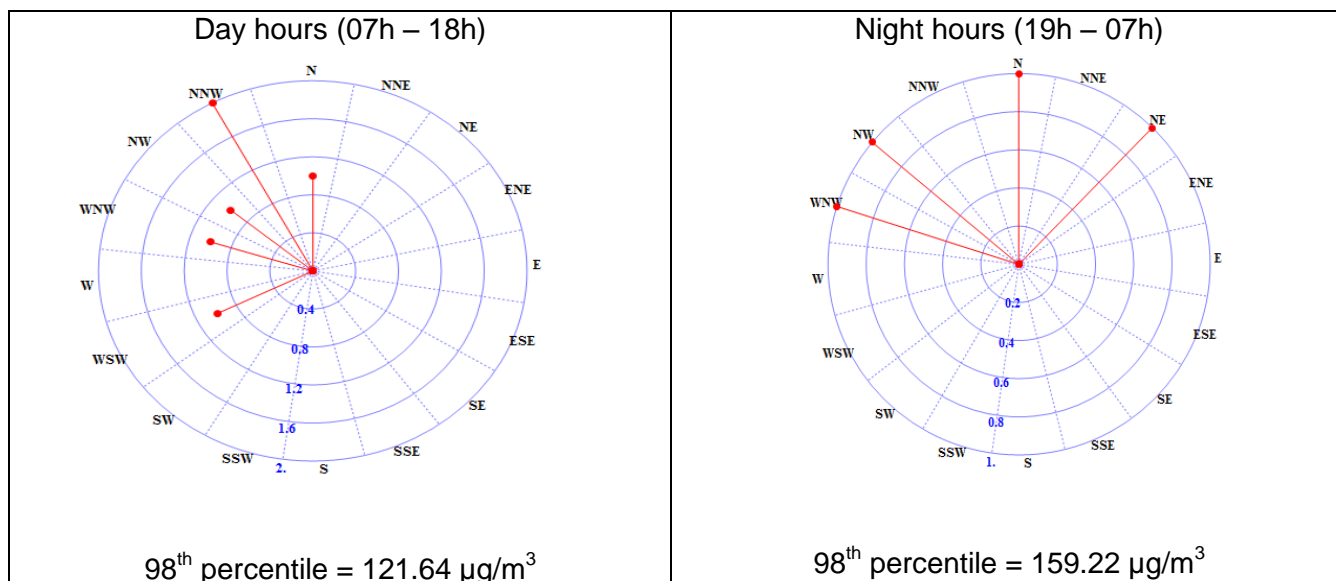


Figure 10: PM<sub>10</sub> hourly mean 98<sup>th</sup> percentile event roses during day and night times

Table 11: PM<sub>10</sub> daytime hourly mean 98<sup>th</sup> percentile event table

Dir	N	NNE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
Eve	1	0	0	0	0	0	0	0	0	0	1	0	1	1	2
%	16.67	0	0	0	0	0	0	0	0	0	16.67	0	16.67	16.67	33.33

Table 12: PM<sub>10</sub> night time hourly mean 98<sup>th</sup> percentile event table

Dir	N	NNE	NE	E	ENE	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
Eve	1	0	1	0	0	0	0	0	0	0	0	0	0	1	1	0
%	25	0	25	0	0	0	0	0	0	0	0	0	0	25	25	0

#### 6.4. OZONE (O<sub>3</sub>)

##### 6.4.1. Source identification by O<sub>3</sub> diurnal variations

The O<sub>3</sub> hourly mean diurnal variations show low concentrations in the morning with an increase from 07:00 in the morning due to the break of the inversion layer when the sun goes up. The concentrations increase throughout the day as a result of photochemical reaction, peaking at 17:00 before decaying rapidly due to the lack of sunlight during the night-time period shown in Figure 11. The ozone 8-hourly average was exceeded thirteen times.

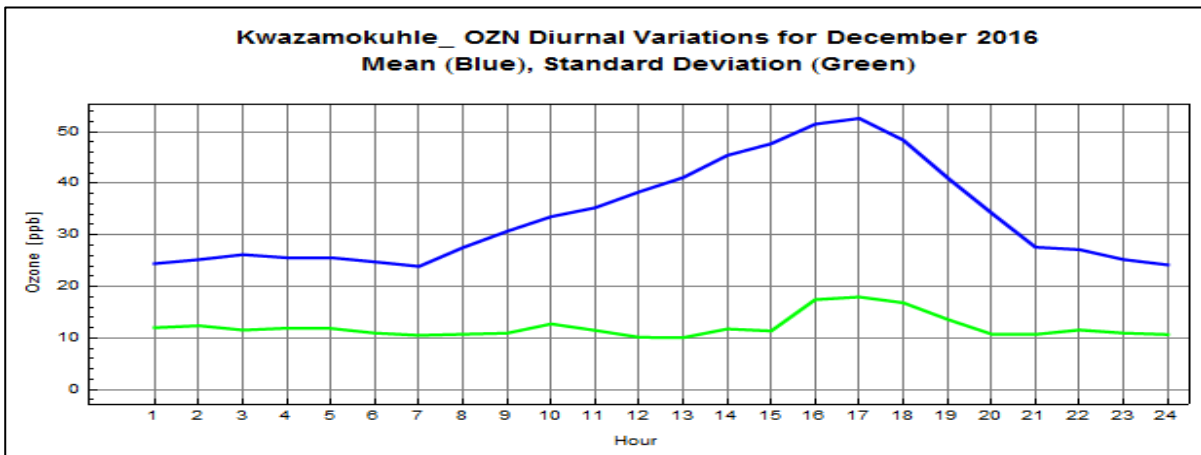


Figure 11: Diurnal variation of Ozone concentrations at KwaZamokuhle for December 2016

## 7. MONTHLY MEANS FOR THE CURRENT CALENDAR YEAR

### 7.1. TRENDS OVER THE REPORTING PERIOD (Jan 2015 – December 2016)

Time series graphs for each pollutant with respect to the national ambient limits are represented from the beginning of each month for the reporting period or since inception of the monitors. The resultant period may vary for each analyser, depending on when it was installed.

Figures 12 - 16 show seasonal trends where high concentrations were recorded from May to August 2015 (winter season) and low concentrations are also recorded from January – April 2016 (summer season) and May 2016 the winter season has started and we observe high concentrations for the parameters monitored at the site. Gaps in the data are as a result of the analysers being out of service due to faults experienced, tripping of circuit breakers and incoming power interruptions. There is no distinct trend observed on the O<sub>3</sub> 8hourly moving average monthly concentrations during the 2015 and 2016 monitoring period, though there has been an increase on the O<sub>3</sub> concentrations levels from September – December 2016 (Figure 17).

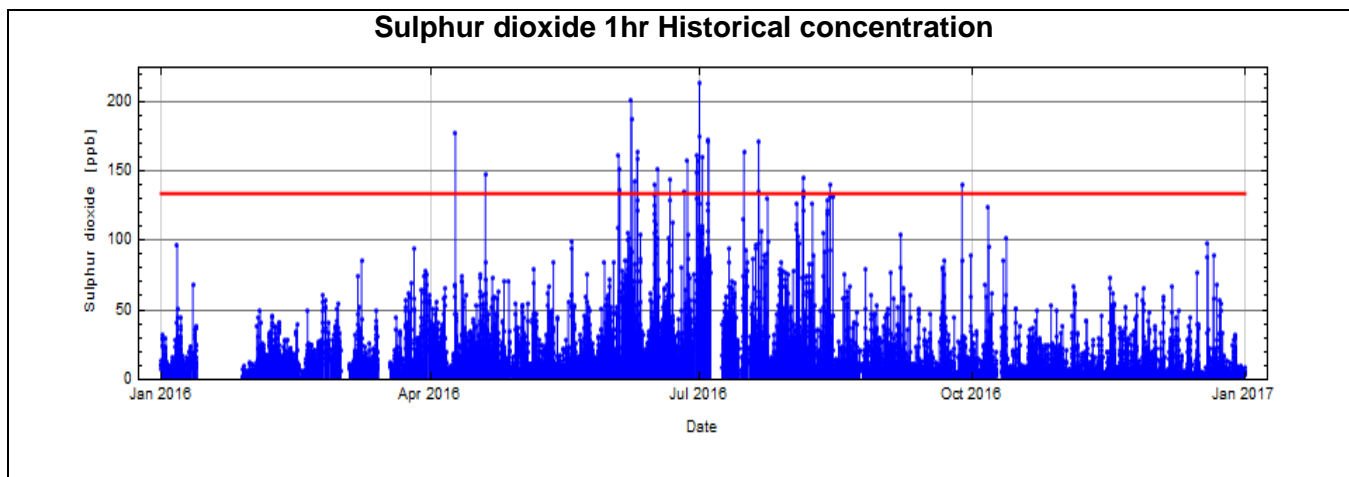


Figure 12: SO<sub>2</sub> 1hr mean concentration

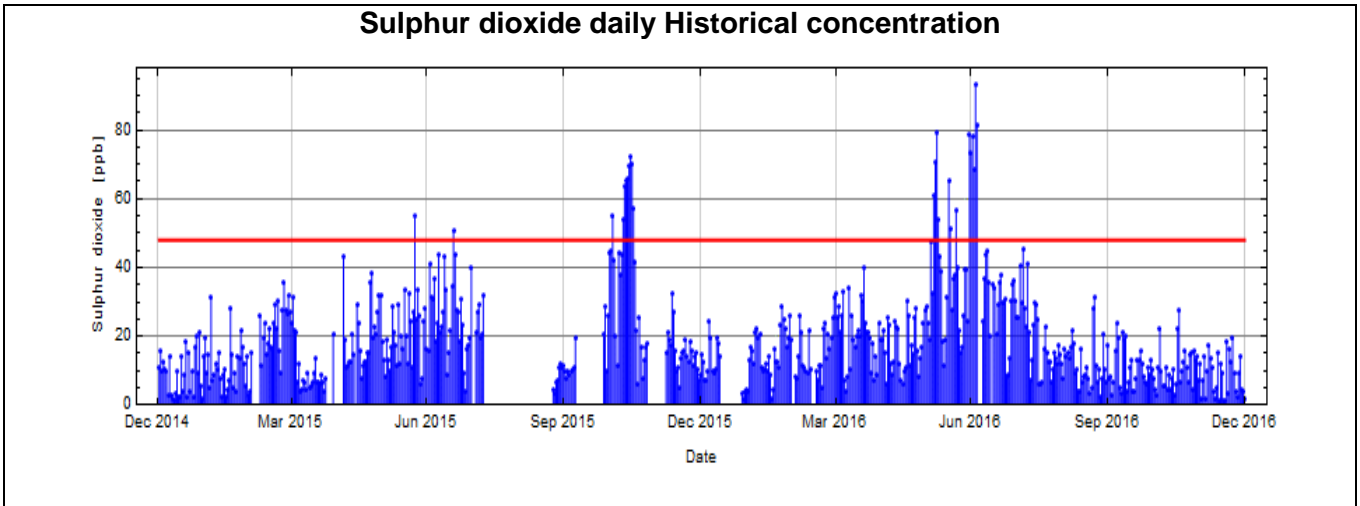


Figure 13: SO<sub>2</sub> daily monthly concentrations

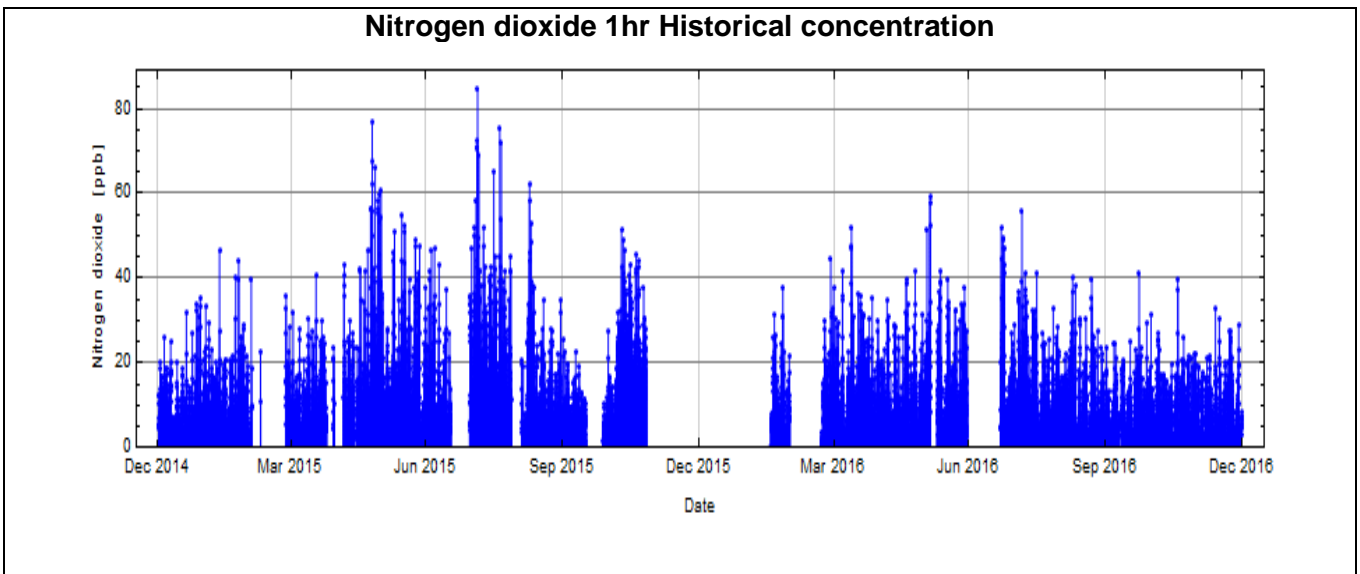


Figure 14: NO<sub>2</sub> 1hr monthly concentration

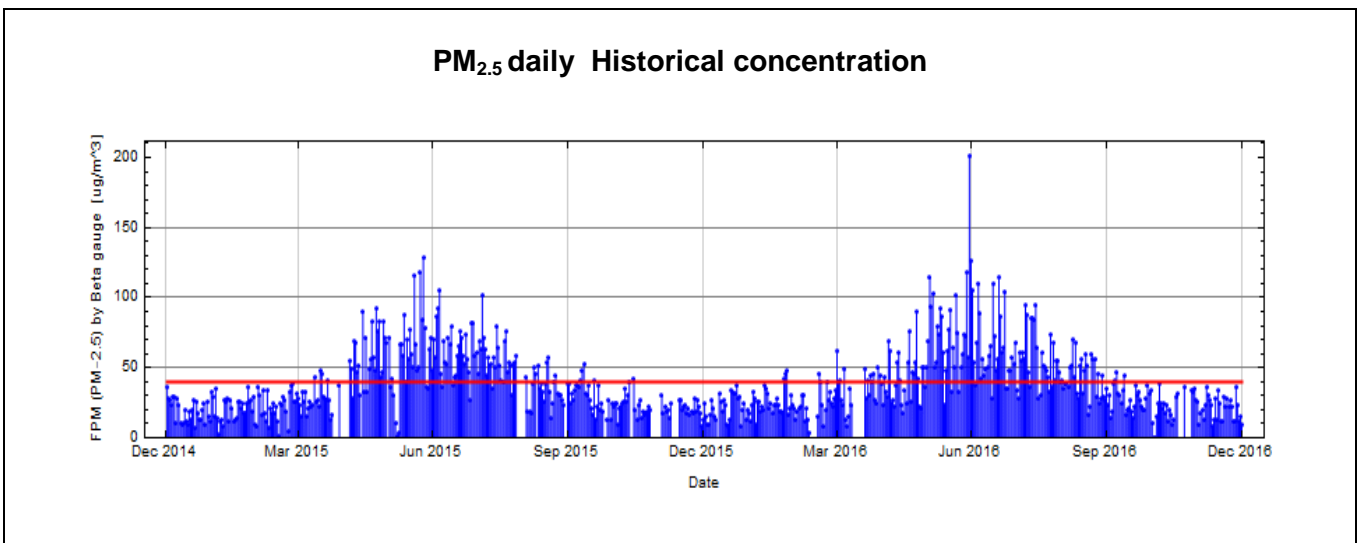


Figure 15: PM<sub>2.5</sub> daily monthly concentration

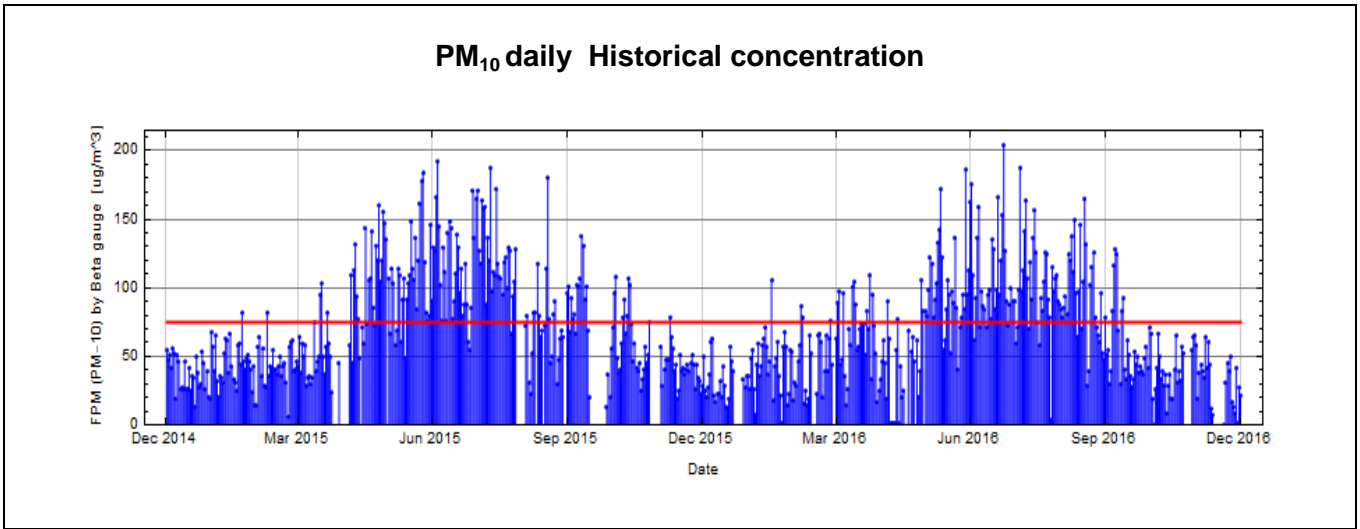


Figure 16: PM<sub>10</sub> daily monthly concentrations

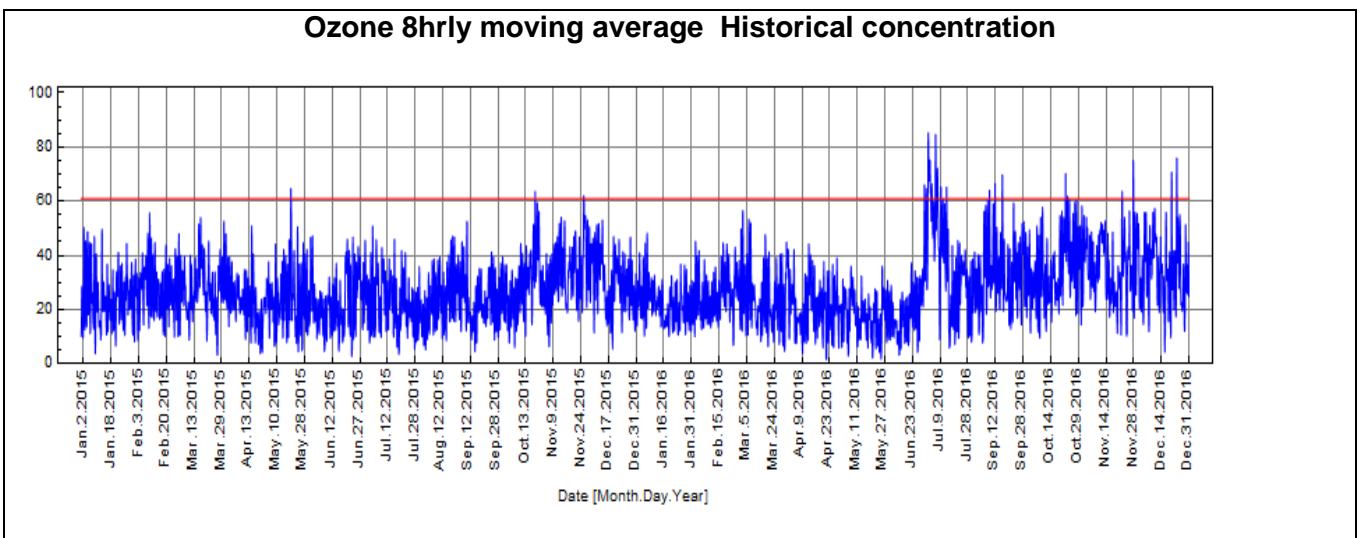


Figure 17: O<sub>3</sub> 8hrs moving average

Table 13: Monthly means for the calendar year 2016

Parameter measured	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ave
PM <sub>2.5</sub> (µg/m <sup>3</sup> )	21	25	26	33	42	72	64	57	42	27	21	21	37
PM <sub>10</sub> (µg/m <sup>3</sup> )	33	44	48	67	43	100	108	106	94	58	38	35	64
NO <sub>2</sub> (ppb)		8	10	10	8	11	12	9	7	6	7	7	9
O <sub>3</sub> (ppb)	22	26	24	20	17	19	38	23	34	34	36	34	27
SO <sub>2</sub> (ppb)	11	14	16	21	17	40	38	19	12	11	11	8	18

Both PM<sub>2.5</sub> and PM<sub>10</sub> annual concentrations have exceeded their national annual limits of 20µg/m<sup>3</sup> and 40µg/m<sup>3</sup>, respectively. The annual mean concentrations of NO<sub>2</sub> and SO<sub>2</sub> have not exceeded their national annual limits of 21 ppb and 19 ppb, respectively.

Table 14: Number of exceedances of the National Ambient Air Quality Limits

Period	SO <sub>2</sub> hourly	SO <sub>2</sub> 10-minutes	SO <sub>2</sub> daily	NO <sub>2</sub> hourly	PM <sub>10</sub> daily	PM <sub>2.5</sub> daily	O <sub>3</sub> 8-Hourly
Jan	0	0	0	0	0	0	0
Feb	0	0	0	0	1	2	0
March	0	0	0	0	3	2	0
April	2	3	0	0	9	8	0
May	0	0	0	0	5	16	0
June	18	21	9	0	25	27	3
July	6	9	6	0	26	26	81
August	3	8	0	0	26	24	0
September	1	1	0	0	21	15	13
October	0	0	0	0	6	3	7
November	0	0	0	0	0	0	9
December	0	2	0	0	0	0	13
<b>Total</b>	<b>30</b>	<b>44</b>	<b>15</b>	<b>0</b>	<b>122</b>	<b>123</b>	<b>126</b>
Allowed no of exceedances	88	526	4	88	4	4	11

The numbers of exceedances recorded for SO<sub>2</sub>, PM<sub>2.5</sub> and PM<sub>10</sub> daily limits, and O<sub>3</sub> 8-hourly average in 2016 have exceeded their allowed number of exceedances per year. Therefore, there is non-compliance with the ambient PM<sub>10</sub>, PM<sub>2.5</sub> and O<sub>3</sub> national air quality standards for 2016. The number of exceedances recorded for SO<sub>2</sub> hourly limit is well below the allowed number of exceedances per year. There were no exceedances recorded for the NO<sub>2</sub> hourly limit of 106 ppb for the entire 2016.

## 8. CONCLUSION

The national ambient air quality for ozone 8-hourly limit of 61 ppb was exceeded thirteen times. There were two (2) exceedances of the national ambient air quality limits for SO<sub>2</sub> 10 minutes and there were no exceedances of the other national ambient air quality limits recorded during the monitoring period under review.

Both SO<sub>2</sub> and NO<sub>2</sub> ambient concentrations at KwaZamokuhle monitoring site are influenced by the combination of low-level sources and tall stack emitters. Ambient fine particulate matter concentrations indicate the influence of low-level source emissions at KwaZamokuhle, probably domestic burning.

Both PM<sub>2.5</sub> and PM<sub>10</sub> annual concentrations have exceeded their national annual limits of 20µg/m<sup>3</sup> and 40µg/m<sup>3</sup>, respectively. The numbers of exceedances recorded for SO<sub>2</sub>, PM<sub>2.5</sub> and PM<sub>10</sub> daily limits, and O<sub>3</sub> 8-hourly average in 2016 have exceeded their allowed number of exceedances per year. Therefore, there is non-compliance with the ambient PM<sub>10</sub>, PM<sub>2.5</sub> and O<sub>3</sub> national air quality standards for 2016. The annual mean concentrations of NO<sub>2</sub> and SO<sub>2</sub> have not exceeded their national annual limits of 21 ppb and 19 ppb, respectively, and the number of exceedances recorded for SO<sub>2</sub> hourly limit is well below the allowed number of exceedances per year. There were no exceedances recorded for the NO<sub>2</sub> hourly limit of 106 ppb for the entire 2016.

The dominant winds during the day were from north-east, east-north-east, east and north-north-west. The dominant winds during the night were east-north-east, east, east-south-east and north-east.



## 10. ABBREVIATIONS

µg/m <sup>3</sup>	Microgram per cubic meter
DEA	Department of Environmental Affairs
deg	Degree
deg C	Degree Celsius
E	East
ENE	East-north-east
ESE	East-south-east
FPM	Fine particulate matter
HUM	Humidity
m/s	Meters per second
MWP	Megawatt Park
N	North
NE	North-east
NNE	North-north-east
NNW	North-north-west
NO <sub>1</sub>	Nitric oxide
NO <sub>2</sub>	Nitrogen dioxide
NO <sub>x</sub>	Oxides of nitrogen
NW	North-west
Ozn/O <sub>3</sub>	Ozone
PM- <sub>10</sub>	Particulate matter < 10 microns in diameter
PM- <sub>2.5</sub>	Particulate matter < 2.5 microns in diameter
ppb	Parts per billion
ppm	Parts per million
PRS	Pressure
RAD	Solar Radiation
RFL	Rain Fall
RT&D	Research, Testing and Development
S	South
SANAS	South African National Accreditation System
SE	South-east
SGT	Sigma theta
SO <sub>2</sub>	Sulphur Dioxide
SSE	South-south-east
SSW	South-south-west
SW	South-west
TMP	Ambient temperature
W	West
WDR	Wind direction from true North



WNW	West-north-west
WSP	Wind speed
WSW	West-south-west
WVL	Wind velocity