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**AIR QUALITY MONITORING MONTHLY REPORT  
DECEMBER 2009**

<b>REPORT REFERENCE</b>	<b>CMC122009</b>
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## 1. PURPOSE OF REPORT



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Monitoring data collected for the month of December 2009. Comparisons and graphs for all the monitoring stations and all meteorological data is available for Bothasig and Goodwood and is as appendix A in the report.

## 2. INTRODUCTION

This report covers analyser performance and guideline compliance for the following air quality monitoring sites in the City of Cape Town.

**ATLANTIS    BOTHASIG    FORESHORE    GOODWOOD    KHAYELITSHA    MOLTENO**  
**TABLE VIEW    WALLACEDENE**



Figure 1. Map of Air Quality Monitoring Network.

No data is reported in this report for the following stations;

Athlone as it is the audit station

City Hall, Killarney and Somerset stations are decommissioned.

The monitoring stations were strategically positioned to cover micro scale (City Hall, Foreshore), neighbourhood scale (Khayelitsha and Table View and Somerset West) and regional scale (Goodwood and Molteno). The different scales is presented in Table 1.

**Table 1. Classification of the City Air Quality Monitoring Sites.**

SPATIAL SETTING	CLASSIFICATION	EXAMPLES	CITY SITE
Micro Scale	0 – 100 m from source To characterize emissions from nearby source.	Vehicular emissions. Dust from construction.	City Hall Foreshore
Middle Scale	0.1- 0.5km from source Used to assess effects of control strategies and monitor air pollution episodes.	Industry wants to monitor impacts on air quality after installing scrubbers on stack.	Atlantis** Bellville South* Killarney Potsdam**
Neighbourhood	0.5 – 4km from source Suburban areas around urban centre. Population exposure to ambient air pollution.	Small emitters in a neighbourhood. Residential heating. Dust from congested traffic.	Khayelitsha Wallacedene
Urban	> 4km from source Charcterise conditions over an entire metropolitan area. Used to assess trends in citywide air quality	A mixture of particles from many sources. Conglomeration of emissions from many sources.	Bothasig Table View Somerset West*
Regional	Many kilometres from source. Characterize air in large homogeneous area. Background air quality.	Pollution generated in urban and industrial areas many kilometres away. Naturally occurring pollution.	Goodwood Molteno
Global	Characterize air pollution for entire globe.	Pollution transported between continents	none

\* Site decommissioned due to power problems

\*\* Site is managed on behalf of an external client

published on 24<sup>th</sup> of December 2009 however the City of guidelines in its State of the Environment Report (SOE). evaluated on a daily basis against both the SA standards and the European/UK guidelines. Episodes occur when these limits are exceeded. See Table 2 for the guideline limit values.

**Table 2. City of CT and SA Air Quality Standards for protection of human health.**

Pollutant	1-hr average $\mu\text{g}/\text{m}^3$		8-hr average $\mu\text{g}/\text{m}^3$		24-hr average $\mu\text{g}/\text{m}^3$		Annual average $\mu\text{g}/\text{m}^3$	
	UK/CT	SA	UK/CT	SA	UK/CT	SA	UK/CT	SA
SO <sub>2</sub> *	350	350	-	-	125	125	30	50
O <sub>3</sub>	-	200	98	120	-	-	18	-
CO	-	30	10 000	10 000	-	-	-	-
NO <sub>2</sub>	200	200	-	-	-	-	30	40
H <sub>2</sub> S	-	-	-	-	9	-	-	-
PM-10	-	-	-	-	50	120**	50	40
Benzene	-	-	-	-	-	-	5	5

\* 15-minute UK guideline = 266  $\mu\text{g}/\text{m}^3$

\*10-minute WHO guideline = 500  $\mu\text{g}/\text{m}^3$

\*\* 120  $\mu\text{g}/\text{m}^3$  from 24 Dec 2009 to 31 Dec 2014 and 75  $\mu\text{g}/\text{m}^3$  from 1 Jan 2015

Results from the monitoring stations showed that the UK PM-10 daily guidelines of 50 $\mu\text{g}/\text{m}^3$  were exceeded were exceeded on seven (7) days while the South African PM-10 daily guideline of 120 $\mu\text{g}/\text{m}^3$  was exceeded on 1 occasion during December 2009. (See Table 3 and 4 for details).

**Table 3. Number of UK daily Guideline transgressions versus number SA Standards daily transgressions for the month.**

Site	Number of UK Guideline transgressions (50 $\mu\text{g}/\text{m}^3$ )	Number of SA Standard transgressions (120 $\mu\text{g}/\text{m}^3$ )
Khayelitsha	7	1
Foreshore	2	0

The worst day was on the 13<sup>th</sup> when the daily average PM-10 concentrations reached 141 $\mu\text{g}/\text{m}^3$  in Khayelitsha. The diurnal plot of the PM-10 hourly means for this day as measured in Khayelitsha shows that the elevated PM-10 concentrations could be attributed to re-suspension of dust due to strong winds and from local emissions in the area surrounding the site. (Figure 2).

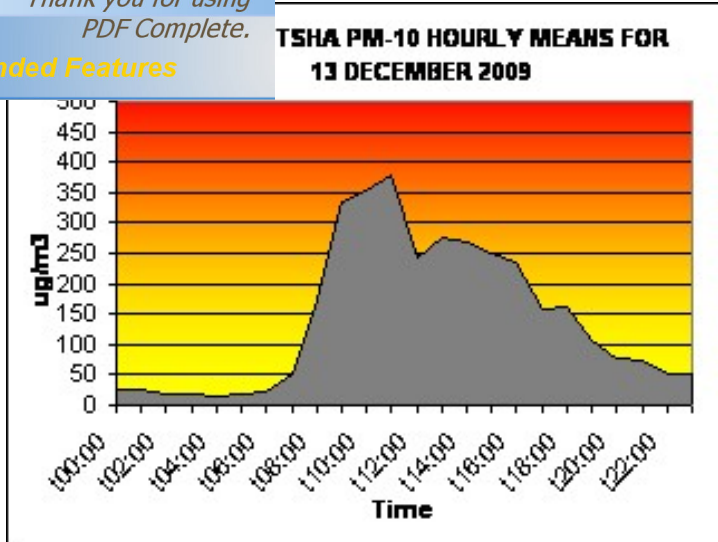


Figure 2. Khayelitsha diurnal PM-10 plot (daily average PM-10 = 141µg/m)

More details of specific air pollution episodes are available on the internet at: <http://www.capetown.gov.za/airqual>

Table 4. Guideline transgressions/ Episodes for the month and reported according to the UK colour banding system into moderate, high and very high with possible reasons


		LOCATION	GUIDELINE VALUE (µg/m³)	G PERIOD	VALUE (µg/m³)	REASON
<b>Dec</b>						
<b>01/12</b>	PM10	KHAYELITSHA	50	24hr	56	7
<b>02/12</b>	PM10	KHAYELITSHA	50	24hr	55	6,7
<b>04/12</b>	PM10	KHAYELITSHA	50	24hr	66	6,7
<b>05/12</b>	PM10	KHAYELITSHA	50	24hr	52	1,7
<b>06/12</b>	PM10	KHAYELITSHA	50	24hr	54	1,4

PM10	FORESHORE	50	24hr	53	1,4
PM10	FORESHORE	50	24hr	53	1,4
PM10	FORESHORE	50	24hr	141	6,7
PM10	FORESHORE	50	24hr	81	6,7

### Key to the UK banding

Moderate (>50 and <74 µg/m<sup>3</sup>) 

High (>50 and <74 µg/m<sup>3</sup>) 

Very High (>100 µg/m<sup>3</sup>) 

### Key to possible reasons for pollution:

1. **Inversion** -Temperature inversions resulted in secondary elevated air pollution concentrations.
2. **Domestic fire** - Household wood-fires used for heating influenced PM-10 levels.
3. **Nearby Industries** - The plume from the Industries influenced SO<sub>2</sub> levels at the site.
4. **Build-up** - A build-up of air pollution from the previous day contributed to elevated pollution levels.
5. **Smog** - Hot and stable atmospheric conditions favourable to photochemical smog.
6. **Re-circulation** - Re-circulation of dust resulted in elevated levels.
7. **Local emission** - Emissions from local sources.
8. **Re-suspension** - Wind blown dust
9. **Specific emissions** - Emissions from building operations in close proximity to monitoring station.

## 4. METEOROLOGICAL OBSERVATIONS

Wind roses and hourly average data for Bothasig are included in Appendix A. Data logging problems at Goodwood, Atlantis and Tableview.

## 5. DATA RECOVERY AND ANALYSER STATUS



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the US EPA requirements of 80% for the review period and all analysers are US EPA approved and are run in accordance to the requirements as specified in the SANAS TR07-02 standard.

**Table 5. Data availability for October 2009.**

SITE LOCATION	% DATA RETRIEVAL
Atlantis	74 % for NOx as instrument.
Athlone	SANAS Accredited Site; only used for calibrating and repairing instruments
Bothasig	100 % for SO <sub>2</sub> . No H <sub>2</sub> S results as a result of a pump failure.
Bellville South	0 % site decommissioned.
City Hall	0 % site decommissioned.
Foreshore	100 % for PM-10 and VOC's.
Goodwood	100 % for all pollutants monitored.
Khayelitsha	93 % for PM-10
Killarney	0 % site decommissioned.
Molteno Reservoir	100 % for ozone.
Somerset West	0 % site decommissioned.
Table View	100 % for SO <sub>2</sub> and H <sub>2</sub> S. NOx at C&M for repairs. (There is no PM-10 analyser).
Wallacedene	100 % for all pollutants monitored.

Table 5 gives a summary of the different monitoring stations with details on maintenance, calibrations and instrument status.

**Table 6. Summary of maintenance and calibration of analysers\***

SITE LOCATION	
Atlantis	Re-commissioned NOx analyser and calibrated.
Bothasig	2 weekly calibration check for SO <sub>2</sub> , H <sub>2</sub> S and NOx analyser next calibration is due January 2010.
Bellville South	Station to be commissioned soon; waiting step ladder to enter monitoring station easily.
City Hall	The site is inactive due to broken inlet, awaiting quote for new inlet system.
Foreshore	PM-10 analyser filter changed and flow checks performed. VOC analyser calibration performed in December 2009.
Goodwood	2 weekly calibration checks of NOx, SO <sub>2</sub> on schedule. PM-10 flow checks and filter checks performed. CO analyser not connected to data logger.
Khayelitsha	PM-10 filter changed and flow checks performed.
Killarney	Site relocated to Chevron parking area. Awaiting electricity cabling before re-commissioning site.
MOLTENO RESERVOIR	SOMERSET WEST OZONE ANALYSER AT MOLTENO NEXT CALIBRATION DUE IN JANUARY 2010
Somerset West	All analysers off due to power problems at site. O <sub>3</sub> analyser transferred to Molteno in October.
Table View	2 weekly calibration checks performed. PM-10 broken. NOx at C&M for repairs.
Wallacedene	2 weekly calibrations performed. O <sub>3</sub> analyser faulty, needs UV filter. Data logger can't communicate with CO analyser and therefore not connected to it.

monitored at the various stations are summarised in Table 5.  
tation trends at the various monitoring stations. All hourly  
ned as appendixes.

**Table 7. Monthly means ( $\mu\text{g}/\text{m}^3$ ) for pollutants monitored at monitoring stations.**

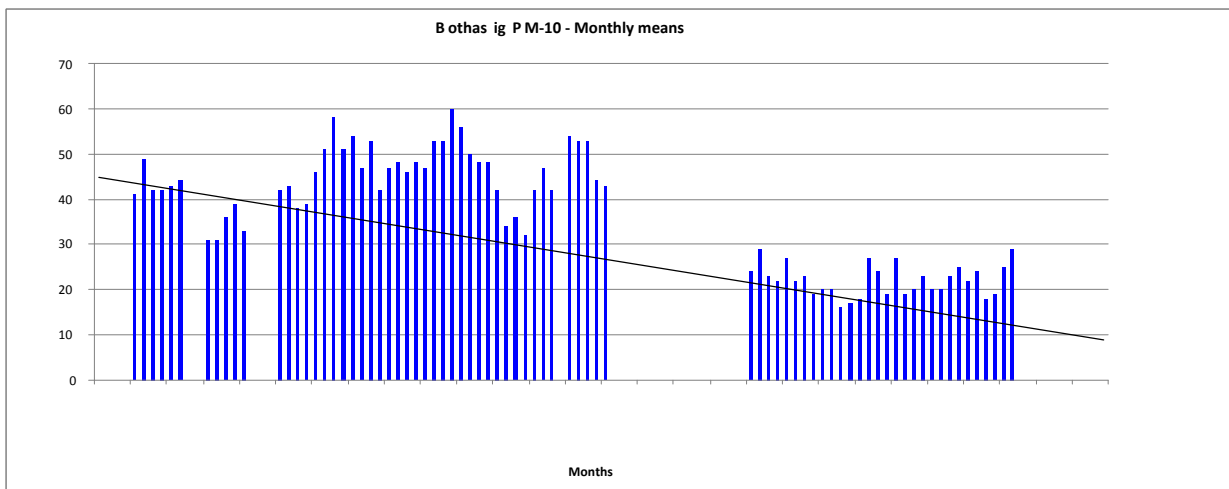
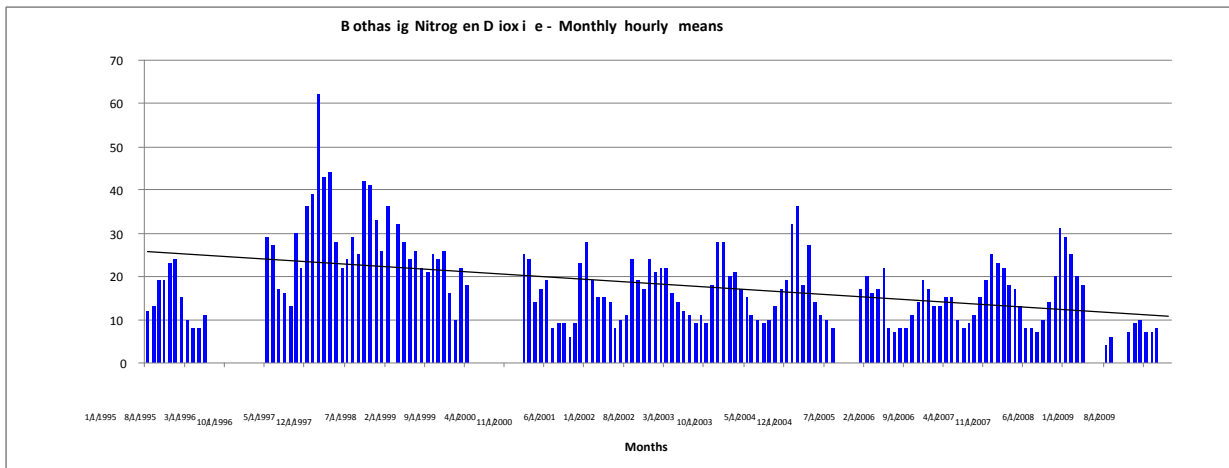
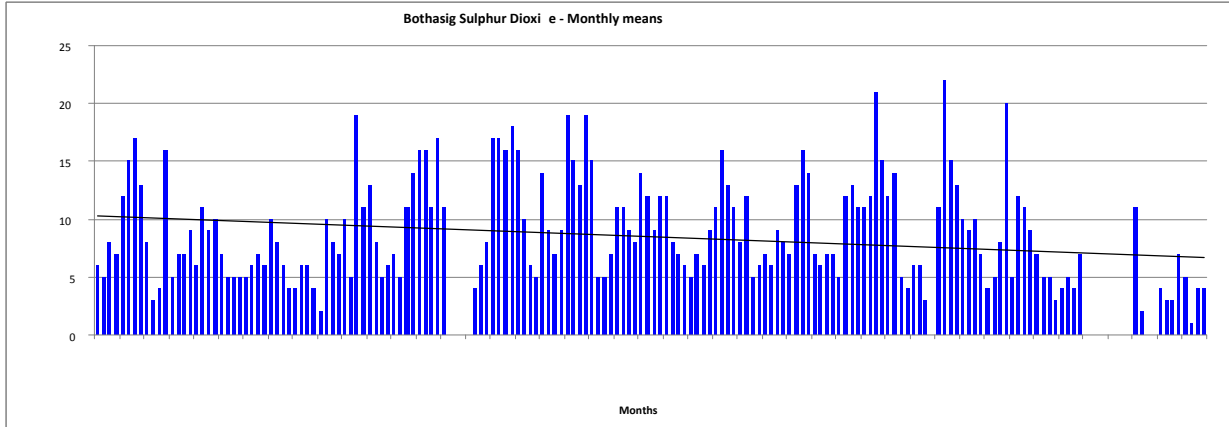
CITY SITE	SO <sub>2</sub>	NO	NO <sub>2</sub>	NO <sub>x</sub>	PM-10	CO	O <sub>3</sub>
UK Guideline ( $\mu\text{g}/\text{m}^3$ )	20	-	40	-	50	-	-
SA standrds ( $\mu\text{g}/\text{m}^3$ )	No monthly standard	-	No monthly standard	-	No monthly standard	-	-
Atlantis	-	8	7	10	-	-	-
Bellville South	ND	-	-	-	ND	-	-
Bothasig	4	x	x	x	-	-	-
City Hall	ND	ND	ND	ND	-	ND	-
Foreshore	-	-	-	-	30	-	-
Goodwood	4	7	12	17	24	NV	NV
Khayelitsha	-	-	-	-	37	-	-
Killarney	ND	ND	ND	ND	ND	-	-
Molteno	-	-	-	-	-	-	37
Somerset West	ND	ND	ND	ND	ND	-	ND
Table View	18	N/V	N/V	N/V	N/V	-	-
Wallacedene	2	53	8	57	25	NV	NV

\*\* All values rounded to last significant figure.

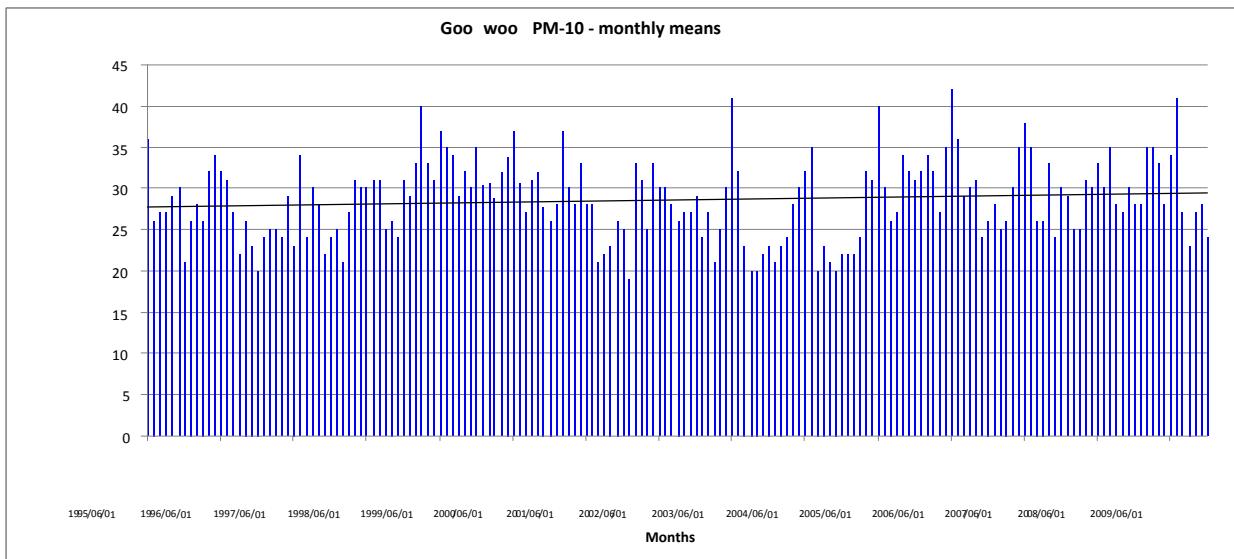
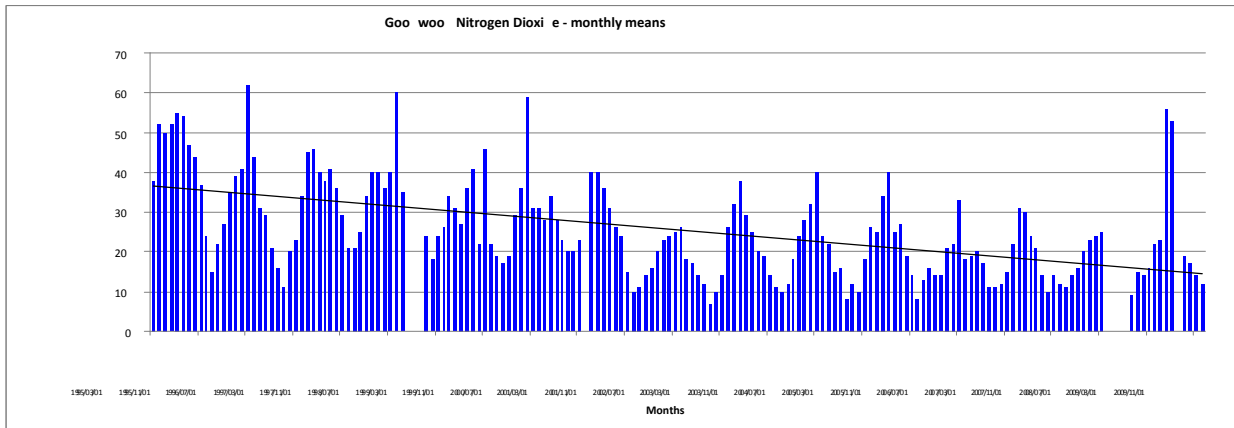
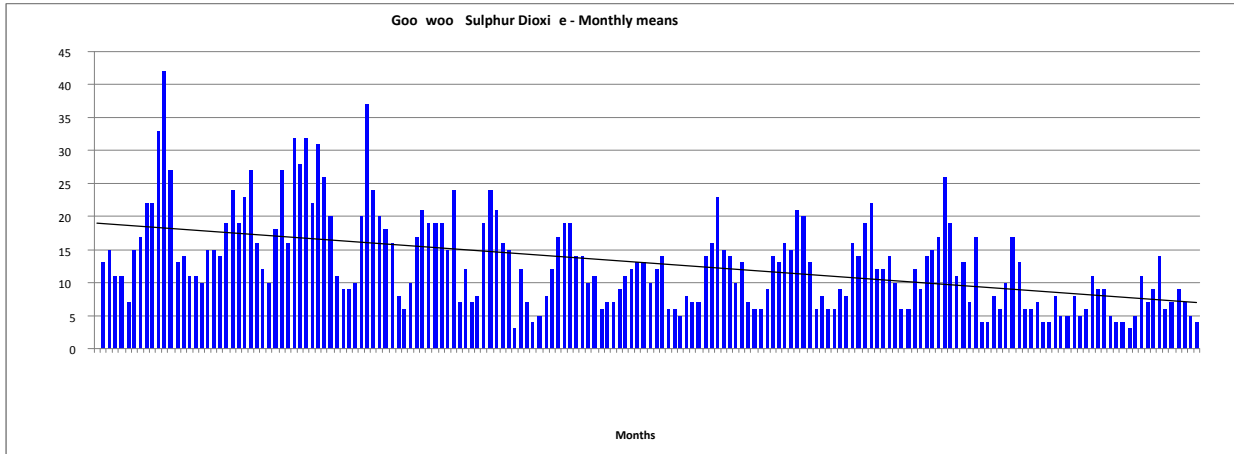
NV – No value due to analyser fault      ND – No data due to site being off.

### Monthly average SA standards for NO<sub>2</sub>, SO<sub>2</sub> or PM-10)

Monitoring commenced during 1995. Below are trend graphs to show the monthly averages for the pollutants measured since 1995 to present. PM-10 monitoring at Bothasig stopped during June 2003. All pollutants show a downward trend.

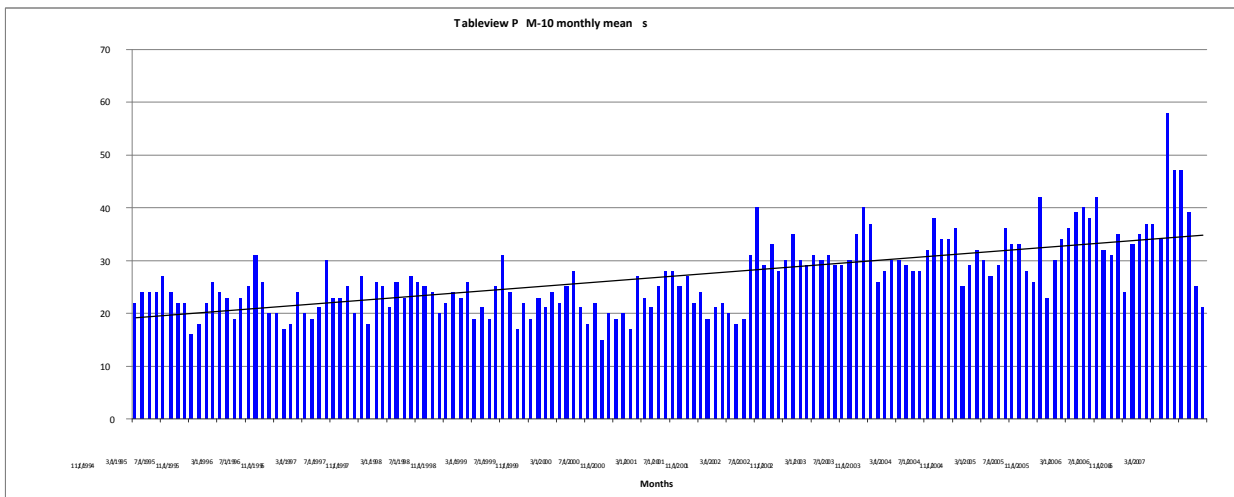
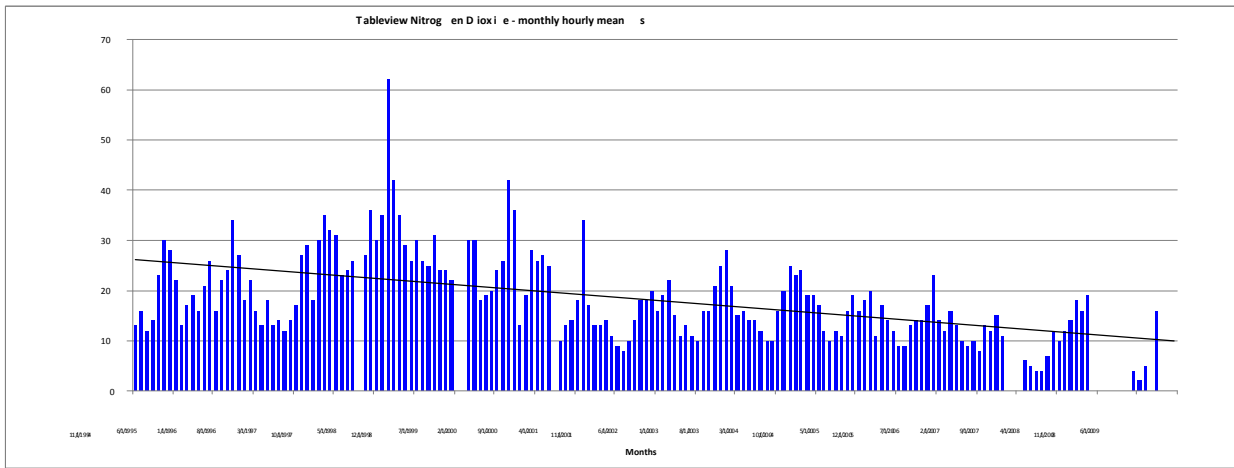
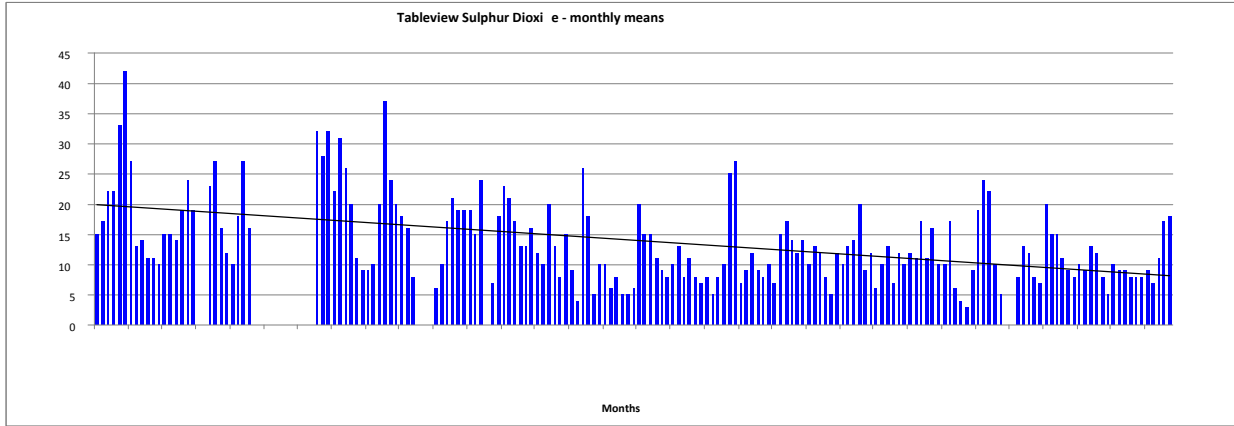


g 1993 while NO<sub>2</sub> and PM-10 started during 1995. Below  
ges for the pollutants measured since the start to present.  
end while PM-10 has a slight upward trend.



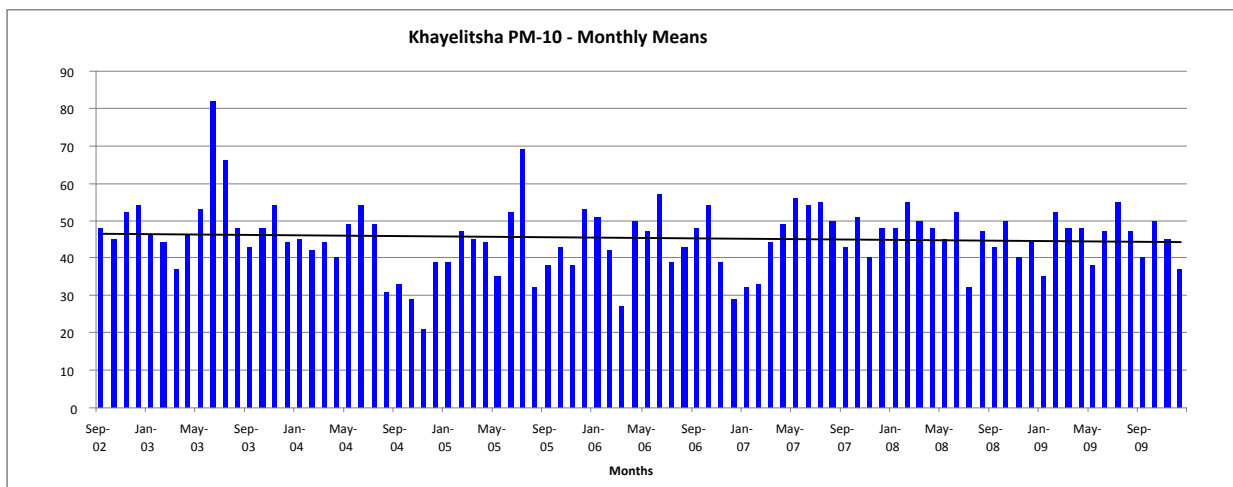
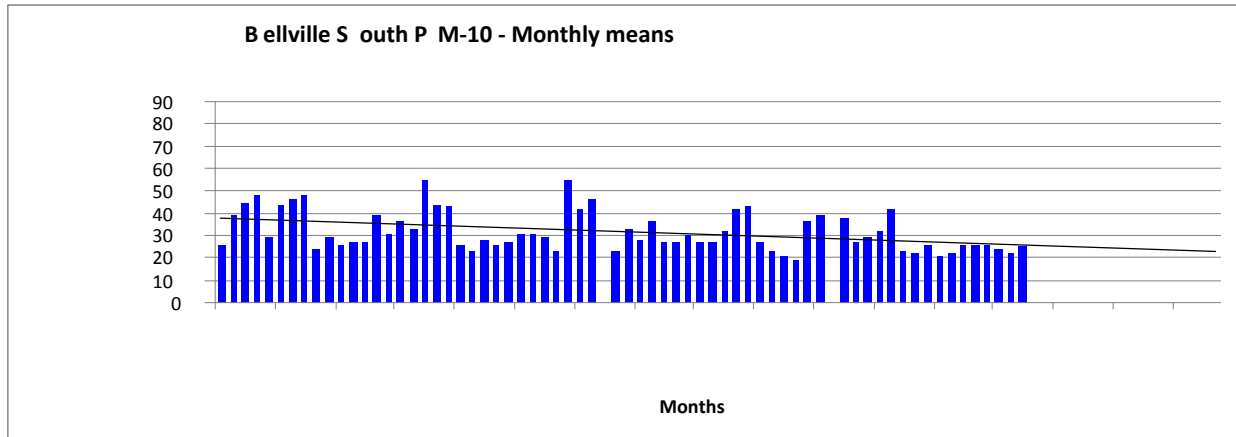
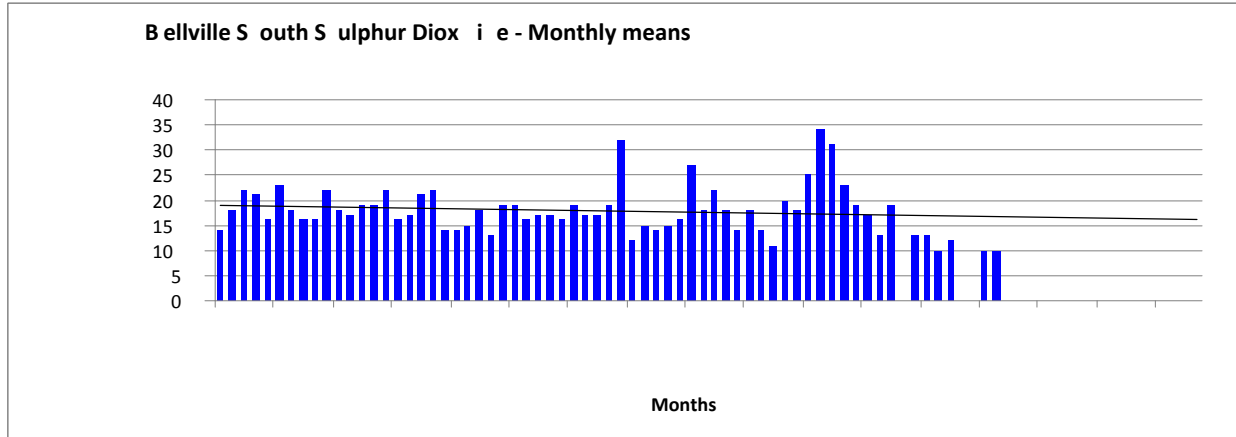
g 1993 while NO<sub>2</sub> and PM-10 started during 1994. Below  
ges for the pollutants measured since the start to present.

NO<sub>2</sub> and SO<sub>2</sub> generally show a downward trend while PM-10 has an upward trend.

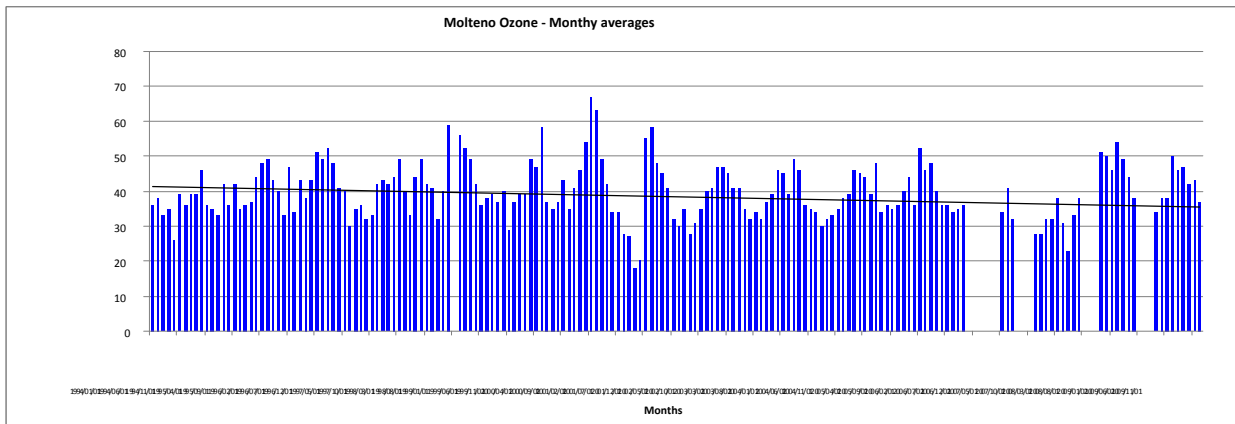
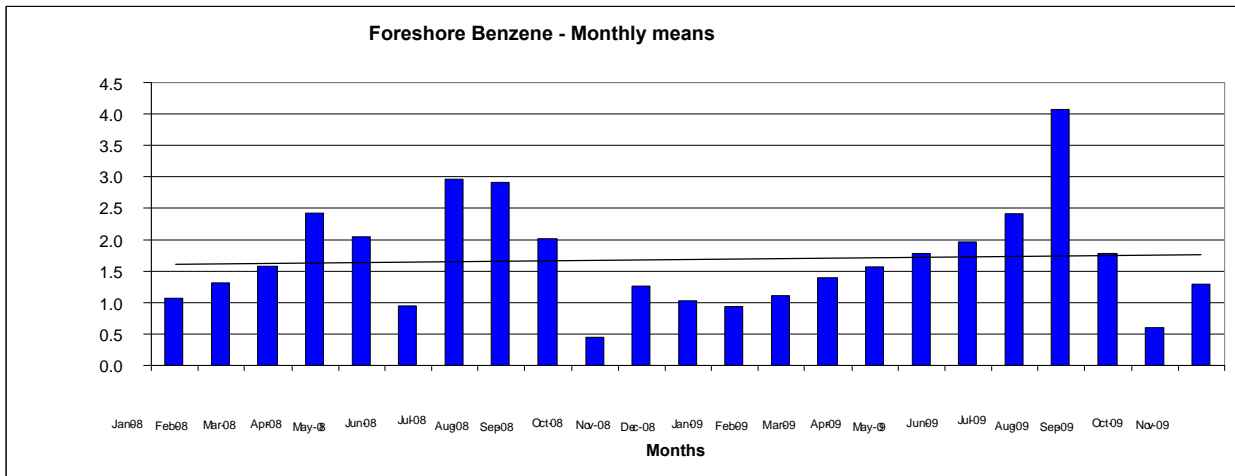
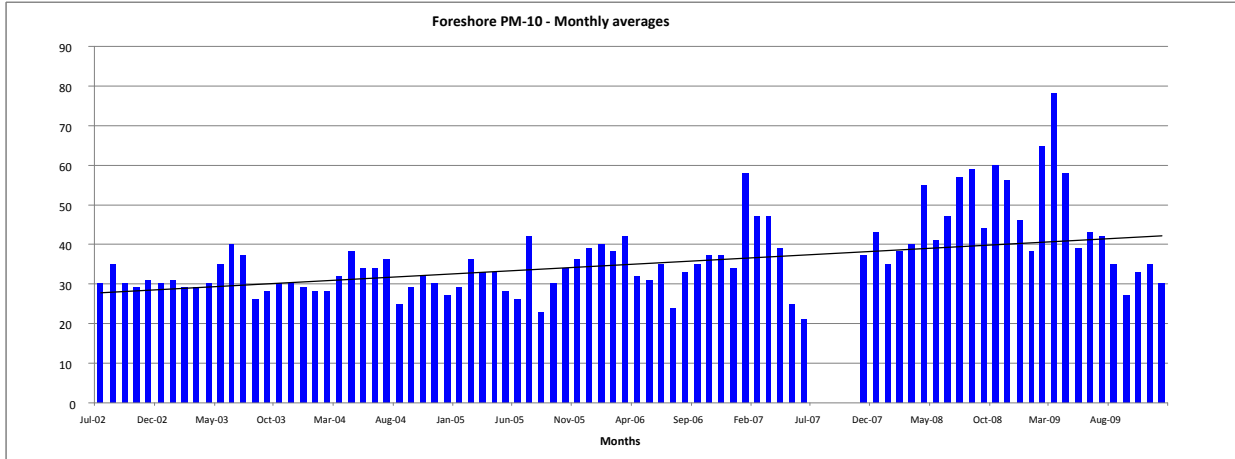


enced during 2003 while PM-10 monitoring in Khayelitsha  
(site C). Below are trend graphs to show the monthly  
they started to present. There is a slight downward trend

for all the three pollutants.



Monitoring commenced during 2002 with the sampler situated in the Foreshore towards the end of 2007 and VOC monitoring at Molteno started during 1994. Below are trend graphs to show the monthly averages for the pollutants measured since they started to present. There is a slight upward trend for PM-10 and benzene and a downward trend for ozone.



European/UK guidelines in its State of the Environment  
November 2009 the SA ambient Air Quality Standards were  
promulgated. All the monitoring results presented in this report are compared to the UK guidelines as  
well as to the SA standards.

**According to the UK PM-10 daily guideline the PM-10 levels were exceeded on seven days during December and thus reported as episode days. When compared to the daily SA guideline the PM-10 concentrations only exceeded the guideline on one day. On the 13<sup>th</sup> of December the PM-10 levels at Khayelitsha exceeded the 100 µg/m<sup>3</sup> limit for the UK colour banding system and thus reported as a very high exceeding or red day. This concentration value also exceeded the New SA Standard of 125 µg/m<sup>3</sup>.**

Cape Town has a typical Mediterranean climate and therefore during the wet winter months there are often days when stable atmospheric conditions occur that are combined with temperature inversions. During these days the pollution from the day to day activities are concentrated below the inversion layer and is often visible as a brown haze. During the dry windy summer days elevated PM-10 levels are measured due to wind blown dust.

During December the prominent wind direction was from a southerly direction. The strong wind speeds causes wind blown dust resulting in elevated PM-10 levels at the sites as measured.

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End of Report

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