RICHARDS BAY CLEAN AIR ASSOCIATION

ANNUAL REPORT FOR THE PERIOD
June 2006 to May 2007

For Attention: Mr. Q. Hurt

Report Date: September 2007

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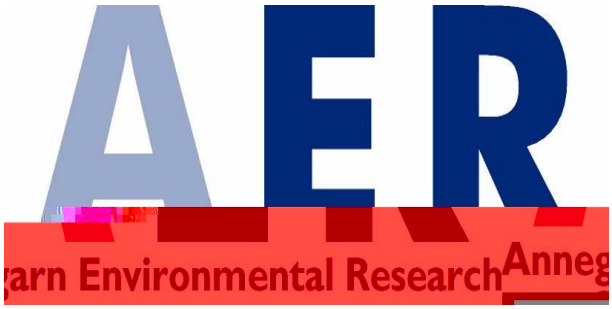
With regards

Harold Annegarn

Thandi Mfenqa



Report compiled and completed by H. Nuwarinda

Report No: AER 27.294_A_RBCAA

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ABBREVIATIONS

AER	Annegarn Environmental Research
SANS	South African National Standards
DME	Department of Minerals and Energy
EMPR	Environmental Management Programme Report
SAWS	South African Weather Service

1. EXECUTIVE SUMMARY

A network of fallout dust monitors has been operational at RBCAA since 18 May 2006. The network consists of 12 single bucket monitoring sites. This annual report presents dustfall monitoring data collected during the period June 2006 to May 2007. Dust deposition levels were evaluated based on the dustfall categories issued by the SANS 1929:2005 (South African National Standards), and periods and sites of INDUSTRIAL level (601 – 1200 mg/m^2/day), ACTION level (1 201 – 2400 mg/m^2/day) and ALERT THRESHOLD (>2400 mg/m^2/day) dustfall identified.

All dustfall monitoring sites during the sampling period did comply with the standard operating procedure with respect to the exposure time of the samples, that is, for the samples to be exposed for 30 ± 3 days except in December 2006 where samples were exposed two days longer than recommended period. An overall sample return of 91% was achieved during the period in review.

During the year in review, two incidents of ALERT dustfalls were recorded at Site 8 (Nseleni Municipal Office) and Site 5 (CBD) due to construction close to monitoring Sites and these results are regarded as isolated dustfalls. Dustfall achieved the INDUSTRIAL range three times at three Sites, namely; Alton South West in February 2007, Harbour West in October 2006 and Felixton Village in November 2006.The majority of dustfalls fell within RESIDENTIAL threshold and therefore the results are regarded as satisfactory.

For the annual average, two monitoring sites, Site 8 (Nseleni Municipal Office) and Site 5 (CBD) recorded an annual average well above the SANS Annual Target of 300 mg/m^2/day, due to isolated dustfall rates recorded during January and February 2007 respectively. Therefore the annual average dustfalls for the above sites were excluded. All remaining monitoring Sites showed annual average dustfalls within the RESIDENTIAL range and below the SANS Annual Target of 300 mg/m^2/day.

A synopsis of the frequency of occurrence of various categories of dustfall rates, based on samples collected for all sites and months, is given in the Figure 18. During the sampling period in review, there was a 94% occurrence of dustfalls that fell within the RESIDENTIAL range, with the remaining 2% falling in the INDUSTRIAL range and ALERT range. The ACTION range accounted for 1% of the dustfalls, while no data was recorded for 1 % on the time.

It is recommended that the current sampling Sites be retained for a further year to keep track of changes in dustfall rates and in activities in Richards Bay.

In conclusion, all sites recorded acceptable dustfall rates with the exception of Nseleni Municipal Office and CBD monitoring sites. All sites recorded dustfalls below the SANS Annual Target of 300 mg/m^2/day without the two Sites that recorded isolated high dustfalls during the period in review. The results were considered satisfactory as they will not result in community complaints or nuisance.

2. INTRODUCTION

Dust emissions can be separated into two broad categories: process sources and fugitive dust sources. Process source emissions are those associated with industrial operations that alter the chemical or physical characteristics of the feed material and are generally emitted from a stack. Fugitive dust sources are emissions of solid particles by the forces of wind or machinery acting on exposed material. Typical examples of fugitive dust sources include materials handling activities, vehicle entrainment of road dust and wind erosion of stockpiles and tailings impoundments. Particulates may contribute to visibility reduction, pose a threat to human health, or be a nuisance due to their soiling potential.

The main functions of dust monitoring in general include the quantification of the industries operation's contribution to dust deposition in the area, and the identification of possible problem areas. Dustfall monitoring is also useful in tracking progress of control measures and for demonstrating compliance with accepted air quality standards.

Results from the dust deposition monitoring network for the period June 2006 to May 2007 are presented in this report. Tabular and graphic summaries of the data are included.

Fluctuations in dustfall rates are a function of variations in the meteorological conditions of the site and/or changes in source characteristics. The meteorological characteristics of the site impact on the rate of emissions from fugitive sources and govern the dispersion and eventual removal of pollutants from the atmosphere. Fugitive dust emission rates are predominantly a function of the wind speed and the intensity and duration of the activity generating the dust (e.g. traffic volumes, extent of batch drop operations). Evaporation rates and precipitation levels also influence fugitive emission rates due to their impact on the moisture content of materials being handled or stored. The review of meteorological data, including wind speed and precipitation data is undertaken in the current study in order to assist in the analysis of dustfall rates recorded during the period.

Figure 1: Map of RBCAA monitoring site locations

3. GUIDELINES FOR DUSTFALL

The Standards South Africa has published a new set of dustfall standards (SANS 1929:2005). These standards have been used to evaluate the level of dust deposition and are stated in Table 1 and Table 2 below.

Table 1: Four-band scale evaluation criteria for dust deposition (SANS 1929:2005).

Band Number	Band Description Label	Dustfall rate (mg m^2 day , 30-day average)	Comment
1	Residential	D < 600	Permissible for residential and light commercial
2	Industrial	600 < D < 1 200	Permissible for heavy commercial and industrial
3	Action	1 200 < D < 2 400	Requires investigation and remediation if two sequential months lie in this band, or more than three occur in a year.
4	**Alert**	**2 400 < D**	**Immediate action and remediation required following the first incidence of dustfall rate being exceeded. Incident report to be submitted to relevant authority**.

Table 2 New dustfall standards, target, action and alert thresholds for dust deposition (SANS 1929:2005).

Level	Dustfall Rate ($mg/m^2/day$)	Permitted Frequency of Exceedances
Target	300	
Action residential	600	Three within any year, no two sequential months.
Action industrial	1 200	Three within any year not two sequential months.
Alert threshold	**2 400**	**None. First exceedance requires remediation and compulsory report to authorities.**

3.1 Margin of tolerance

An enterprise may submit a request to the authorities to operate within band 3 (action band), as specified in Table 1, for a limited period, provided that this is essential in terms of the practical operation of the enterprise (for example the final removal of a tailings deposit) and provided that an appropriate control technology is applied for the duration.

No margin of tolerance will be granted for operations that result in dustfall rates which fall within band 4 (alert band) as specified in Table 1.

3.2 Exceptions

Dustfalls that exceed the specified rates but that can be shown to be the result of some extreme weather or geological event shall be discounted for the purpose of enforcement and control. Such event might typically result in excessive dustfall rates across an entire metropolitan region, and not be localized to a particular operation. Natural seasonal variations, for example, the naturally windy months each year, will not be considered extreme events for this definition.

4. DUSTFALL MEASUREMENT METHOD

Dust fallout sampling measures the fallout of windblown settleable dust. Single bucket fallout monitors are deployed following the American Society for Testing and Materials standard method for collection and analysis of dustfall (ASTM D1739) (Egami *et al.*, 1989). This method employs a simple device consisting of a cylindrical container half-filled with de-ionised water exposed for one calendar month (30 days, ±3 days). The water is treated with an inorganic biocide to prevent algae growth in the buckets.

The bucket stand comprises a ring that is raised above the rim of the bucket to prevent contamination from perching birds. Once returned to the laboratory, the content of the bucket are filtered and the residue dried before the insoluble dust is weighed.

Figure 2 Single bucket monitoring unit, showing sampling bucket with bird ring and security clamp.

5. THE SAMPLING NETWORK AND OPERATIONAL ASPECTS

During the June 2006 to May 2007 sampling period, the monitoring network comprised of 12 single-bucket monitoring sites. All dustfall monitoring sites during the sampling period did comply with the standard operating procedure with respect to the exposure time of the samples, that is, for the samples to be exposed for 30 ± 3 days except in December 2006 where samples were exposed two days longer than recommended period.

Operational problems were experienced during June 2006 at Site 11 (Arboretum) where the bucket was stolen and in November 2006 at monitoring Site 5 (CBD, Municipal Offices) where the sample was contaminated. During February 2007, no data was recorded for Site 11 (Arboretum), the bucket was stolen. An overall sample return of 91% was achieved during the period in review.

Site descriptions and site numbers of the dust buckets and dates when sites were commissioned during the year in review are given in Table 3. Sampling dates and comments regarding the RBCAA monitoring network for the period June 2006 to May 2007 are summarised in Table 4.

Table 3 The RBCAA monitoring network: Site description and Site numbers.

Site description	Site number	Commission date
Brackenham	1	18 May 2006
SAPS Garage	2	18 May 2006
Alton South West	3	18 May 2006
Harbour West	4	18 May 2006
CBD(Municipal office)	5	18 May 2006
Scorpio	6	18 May 2006
Alton fire station	7	18 May 2006
Nseleni Municipal office	8	18 May 2006
Empangeni police station	9	18 May 2006
Felixton Village	10	18 May 2006
Arboretum	11	18 May 2006
Meerensee School	12	18 May 2006

Table 4 Sampling dates and comments for the RBCAA monitoring network for the period June 2006 to May 2007.

Sample month	Start and end date	Single Buckets	Number of Days
June 2006	18 May to 19 June 2006	92% sample recovery	32
July 2006	19 June to 21 July 2006	100% sample recovery	32
Aug 2006	21 July to 18 August 2006	100% sample recovery	28
Sept 2006	18 August to 19 September 2006	100% sample recovery	32
Oct 2006	19 September – 20 October 2006	100% sample recovery	31
Nov 2006	20 October – 17 November 2006	95% sample recovery	28
Dec 2006	17 November to 18 December 2006	100% sample recovery	31
Jan 2007	18 December 2006 to 22 January 2007	100% sample recovery	35*
Feb 2007	22 January to 20 February 2007	95% sample recovery	29
March 2007	20 February to 23 March 2007	100% sample recovery	31
April 2007	23 March to 23 April 2007	100% sample recovery	31
May 2007	23 April to 23 May 2007	100% sample recovery	30

COMMENT: * Results were flagged because samples exposed for a period longer by 2 days than recommended

6. PRESENTATION AND DISCUSSION OF DUSTFALL RESULTS

Dustfall results are presented in two formats to facilitate effective record keeping and aid data interpretation viz. tabulated dustfall figures and time plot graphs. Dustfall rates observed at each of the single-bucket sites, for the period June 2006 to May 2007, are presented in Table 5 (INDUSTRIAL, ACTION and ALERT dustfall rates are indicated in bold print).

Table 5 Dustfall rates from RBCAA single-bucket Sites for June 2006 to May 2007 (given in mg/m^2/day over a 30-day averaging period).

Site No.	SITE 01	SITE 02	SITE 03	SITE 04	SITE 05	SITE 06	SITE 07	SITE 08	SITE 09	SITE 10	SITE 11	SITE 12
Date	Brackenham	SAPS Garage	Alton South West	Harbour West	CBD(Municipal office)	Scorpio	Alton fire station	Nseleni Municipal office	Empangeni police station	Felixton Village	Arboretum	Meerensee School
June 2006	68	30	121	147	47	159	84	194	48	90	ND**	36
July 2006	83	71	373	291	210	133	241	442	60	134	199	49
Aug 2006	258	114	86	453	189	177	352	101	511	99	167	498
Sep 2006	354	481	271	94	237	92	44	179	532	118	65	254
Oct 2006	177	232	180	**1113**	390	125	116	386	76	71	122	58
Nov 2006	152	117	83	56	ND*	20	343	580	27	**732**	84	335
Dec 2006	167	251	401	349	198	171	227	318	37	51	108	45
Jan 2007	130	261	64	74	**15159**	10	465	48	113	34	357	66
Feb 2007	98	88	**874**	381	275	132	59	**38865**	72	41	ND**	31
Mar 2007	208	203	322	172	420	211	227	409	88	72	267	94
April 2007	147	90	168	196	191	120	128	196	56	38	99	84
May 2007	158	118	244	197	245	172	194	390	132	89	153	142

COMMENT: ND* No Data, sample contaminated; ND** No Data, bucket stolen
Red font: High dustfalls due to construction near the sites.

6.1 Review of Dustfall rates on a Site-by Site basis

Site: Brackenham

At Site 01 (Brackenham), all dustfall rates during the sampling period fell within the RESIDENTIAL level. June 2006 recorded the lowest dustfall, with a rate of 68 mg/m^2/day, while September recorded the highest dustfall, with a rate of 354 mg/m^2/day.

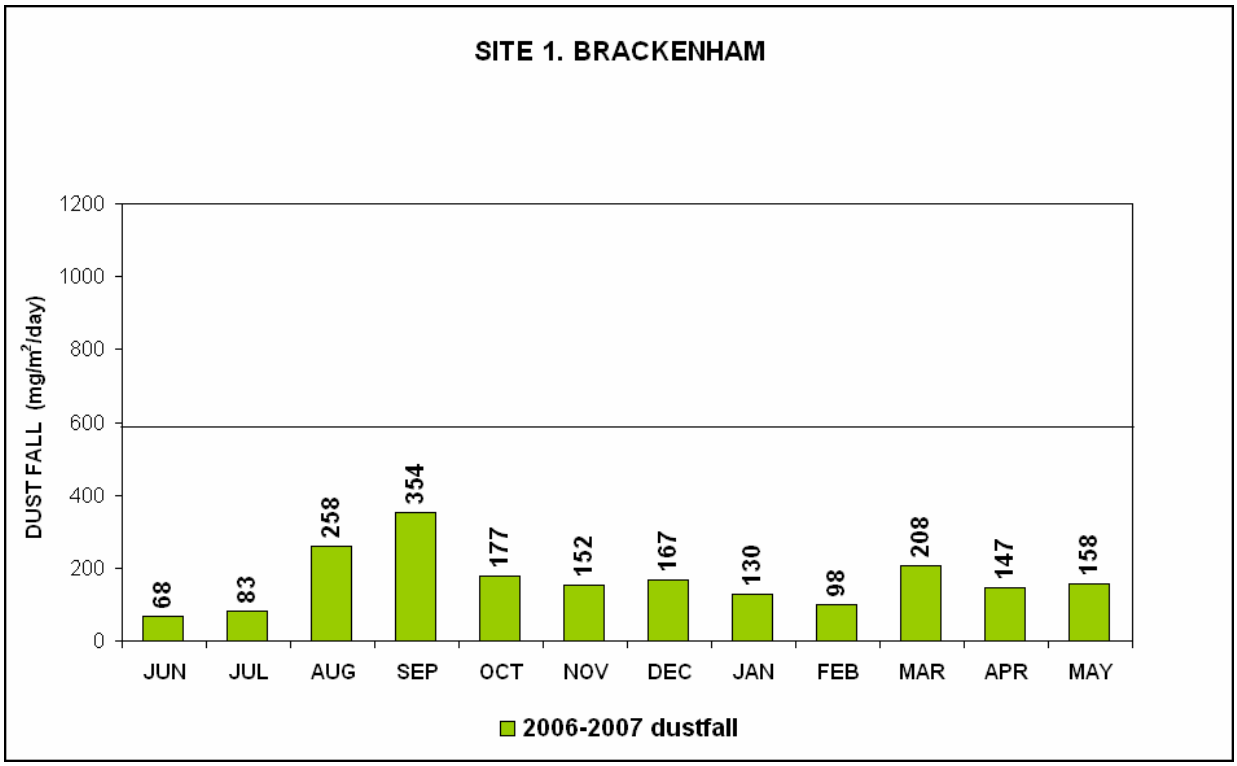


Figure 3 Dustfall rates at Site 01 (Brackenham) during the June 2006 to May 2007 period.

Site 2: SAPS Garage

All monitoring months recorded RESIDENTIAL range dustfall rate, with the monitoring month of September 2006 showing the highest dustfall rate of 481 mg/m^2/day.

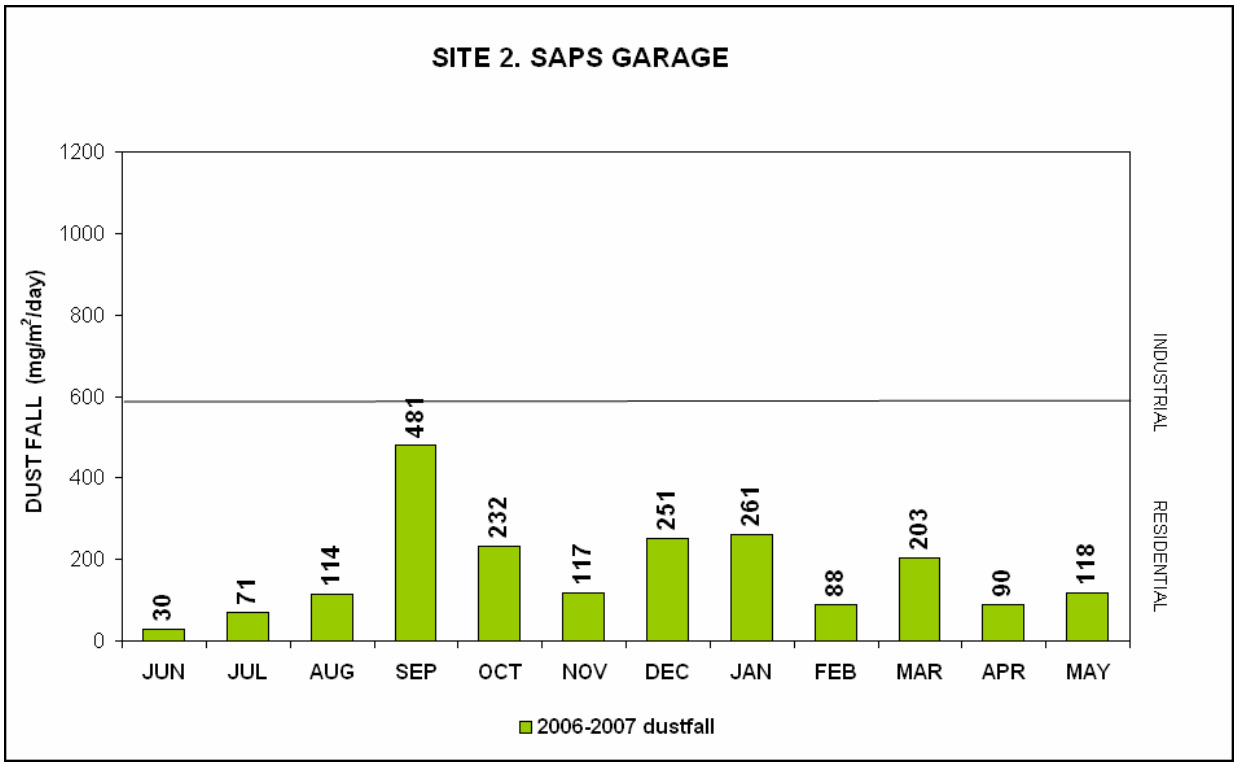


Figure 4 Dustfall rates at Site 02 (SAPS Garage) during the June 2006 to May 2007 period.

Site 3: Alton South West

One incident of INDUSTRIAL range dustfall rate was recorded during the monitoring month of February 2007, at a rate of **874** mg/m^2/day. All remaining monitoring months showed RESIDENTIAL range dustfall rates.

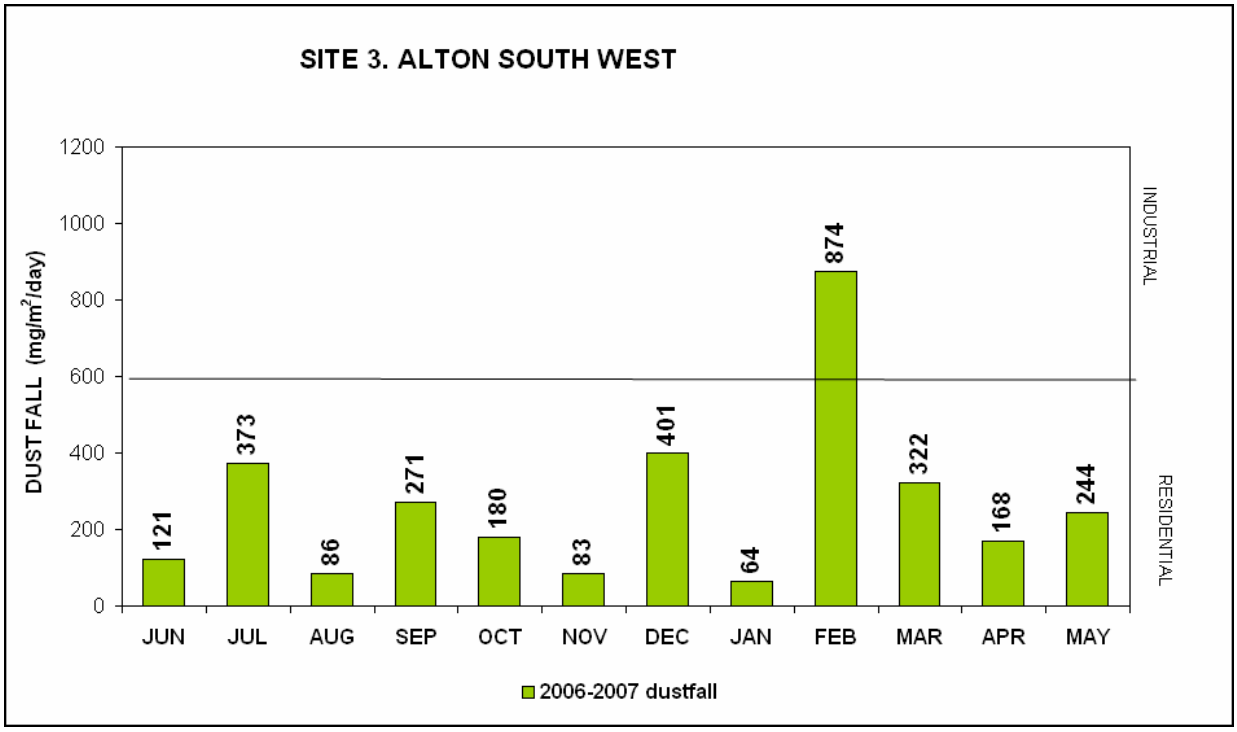


Figure 5 Dustfall rates at Site 03 (Alton South West) during the June 2006 to May 2007 period.

Site 4: Harbour West

October 2006 was the only monitoring month during the period in review which recorded an incident of INDUSTRIAL range dustfall, with a rate of **1113** mg/m^2/day. All remaining monitoring months showed RESIDENTIAL range dustfalls.

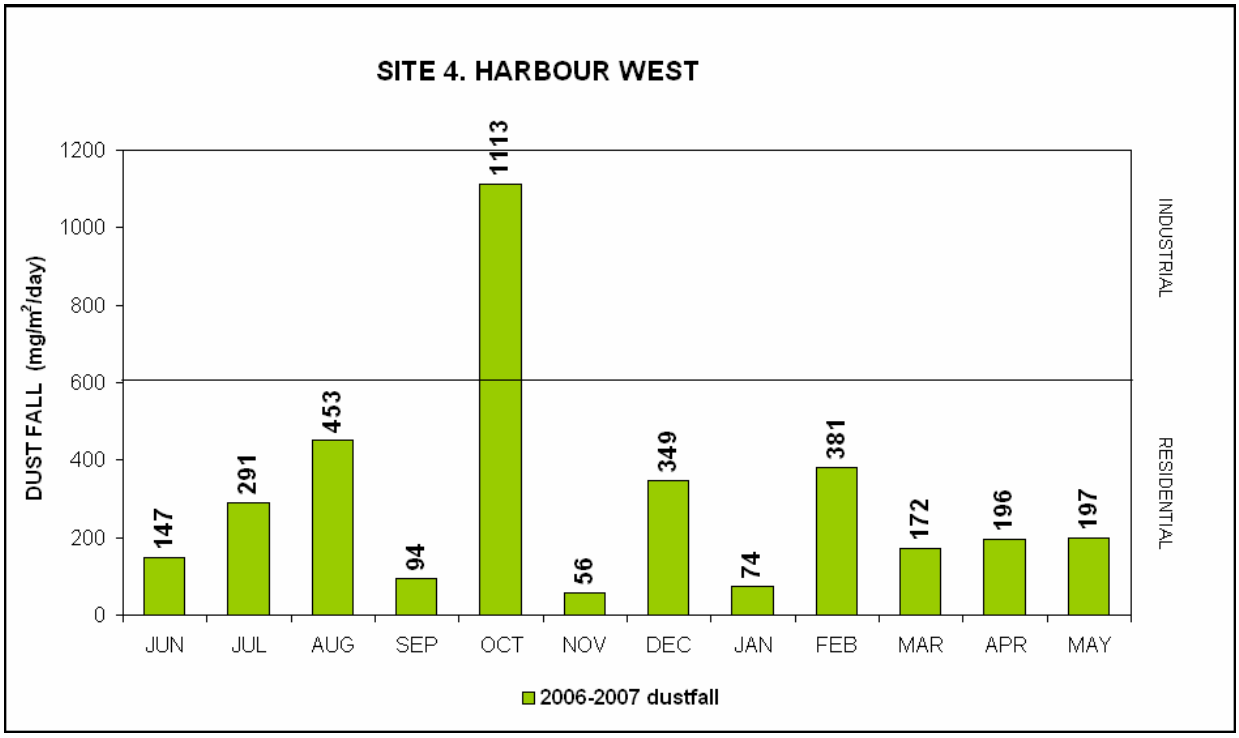


Figure 6 Dustfall rates at Site 04 (Harbour West) during the June 2006 to May 2007 period.

Site 5: CBD

During the period in review, January 2007 was the only month to record ALERT threshold dustfalls due to construction activities close to the site that created more dust, while in November 2006 no data was recorded as the sample was contaminated. All remaining monitoring months showed RESIDENTIAL range dustfalls.

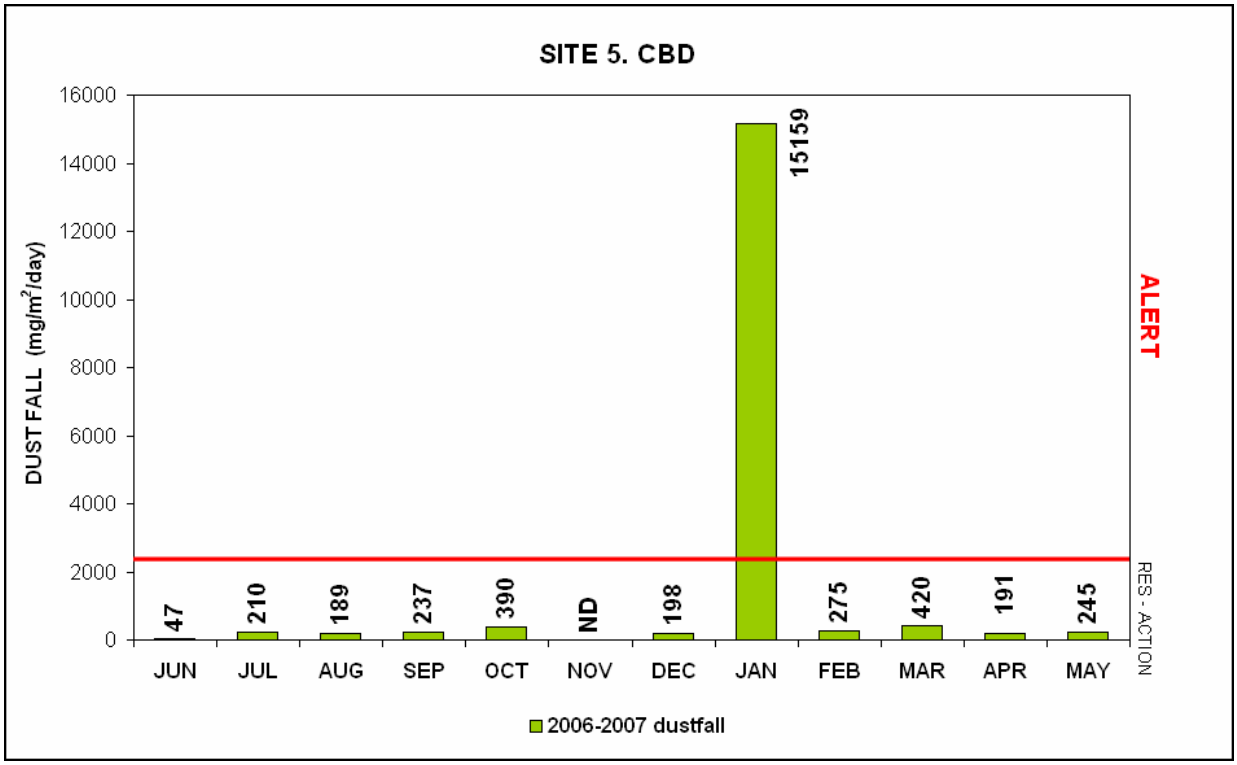


Figure 7 Dustfall rates at Site 05 (CBD) during the June 2006 to May 2007 period.

Site 6: Scorpio

All dustfalls during the period in review fell within the RESIDENTIAL range, with March 2007 recorded the highest dustfall rate of 211 mg/m^2/day.

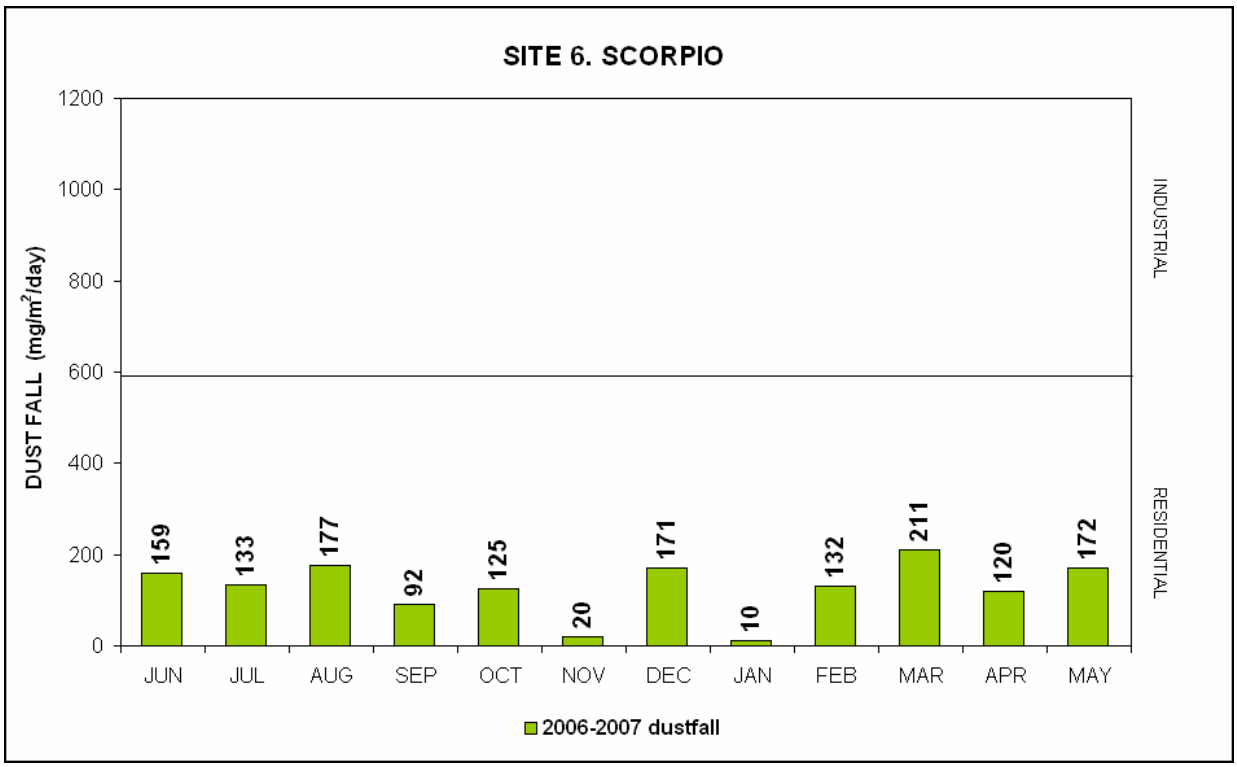


Figure 8 Dustfall rates at Site 06 (Scorpio) during the June 2006 to May 2007 period.

Site 7: Alton Fire Station

All dustfall rates during the period in review fell within the RESIDENTIAL range. January 2007 recorded the highest dustfall rate of 465 mg/m^2/day, while September 2006 recorded the lowest dustfall rate of 44 mg/m^2/day.

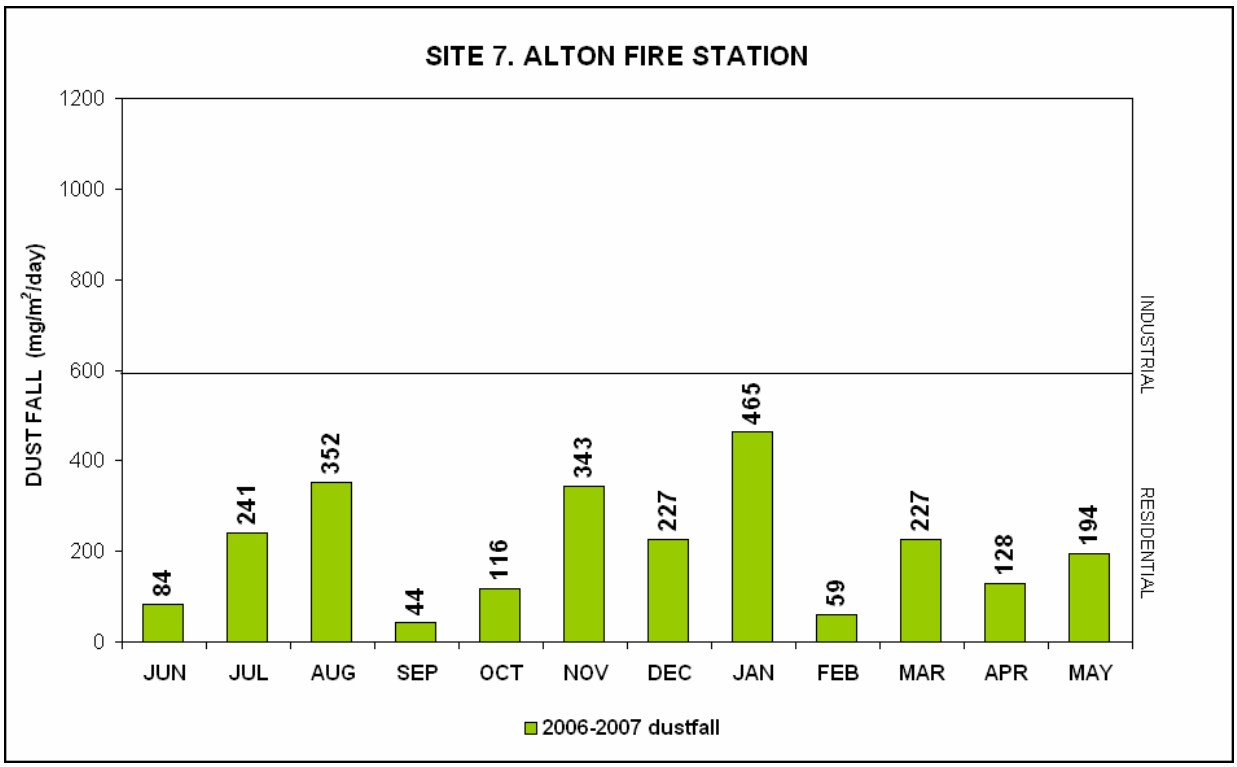


Figure 9 Dustfall rates at Site 07 (Alton Fire Station) during the June 2006 to May 2007 period.

Site 08: Nseleni Municipal Offices

February 2007 recorded the highest dustfall at a rate of **38865** mg/m^2/day, falling within the ALERT range. This was due to a lot of sand close to the site that created more dust. All remaining monitoring months recorded dustfalls that fell within the RESIDENTIAL range.

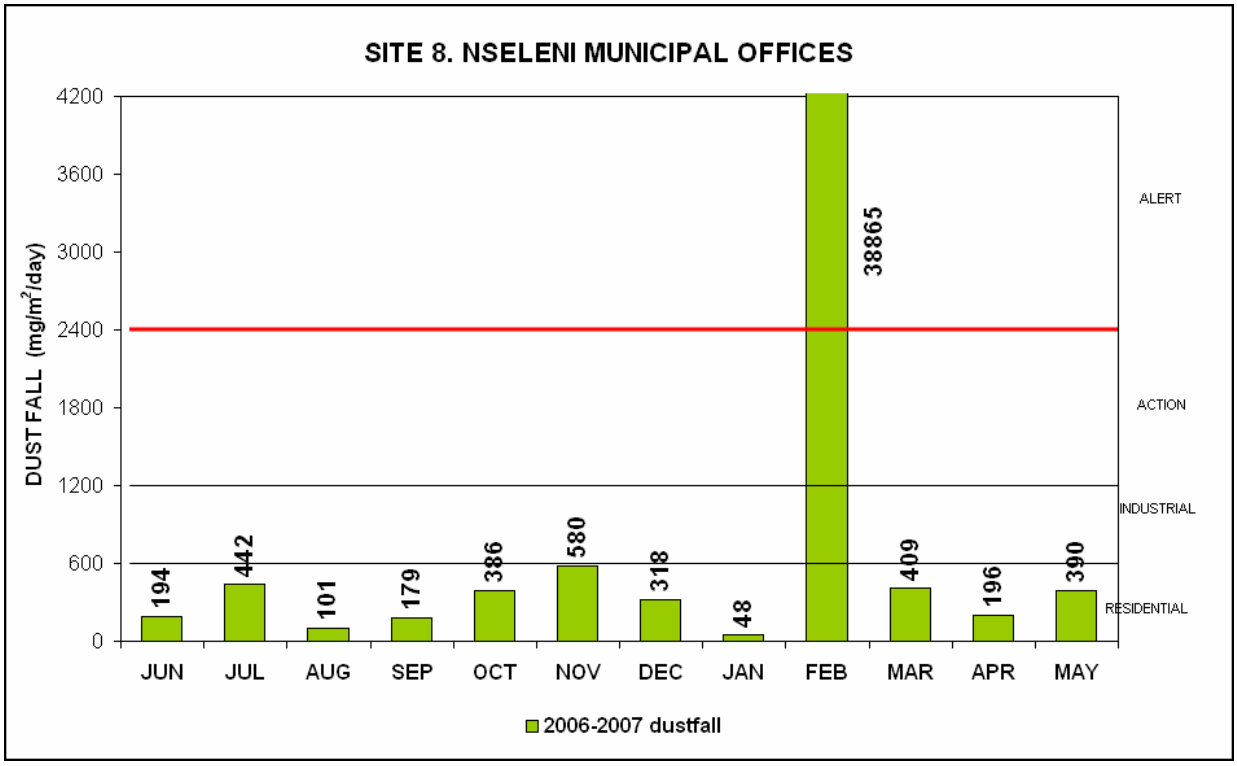


Figure 10 Dustfall rates at Site 08 (Nseleni Municipal Offices) during the June 2006 to May 2007 period.

Site 09: Empangeni Police Station

All dustfall rates during the period in review fell within the RESIDENTIAL range, with September 2006 recording the highest dustfall rate of 532 mg/m^2/day, while November 2006 recorded the lowest dustfall rate of 27 mg/m^2/day.

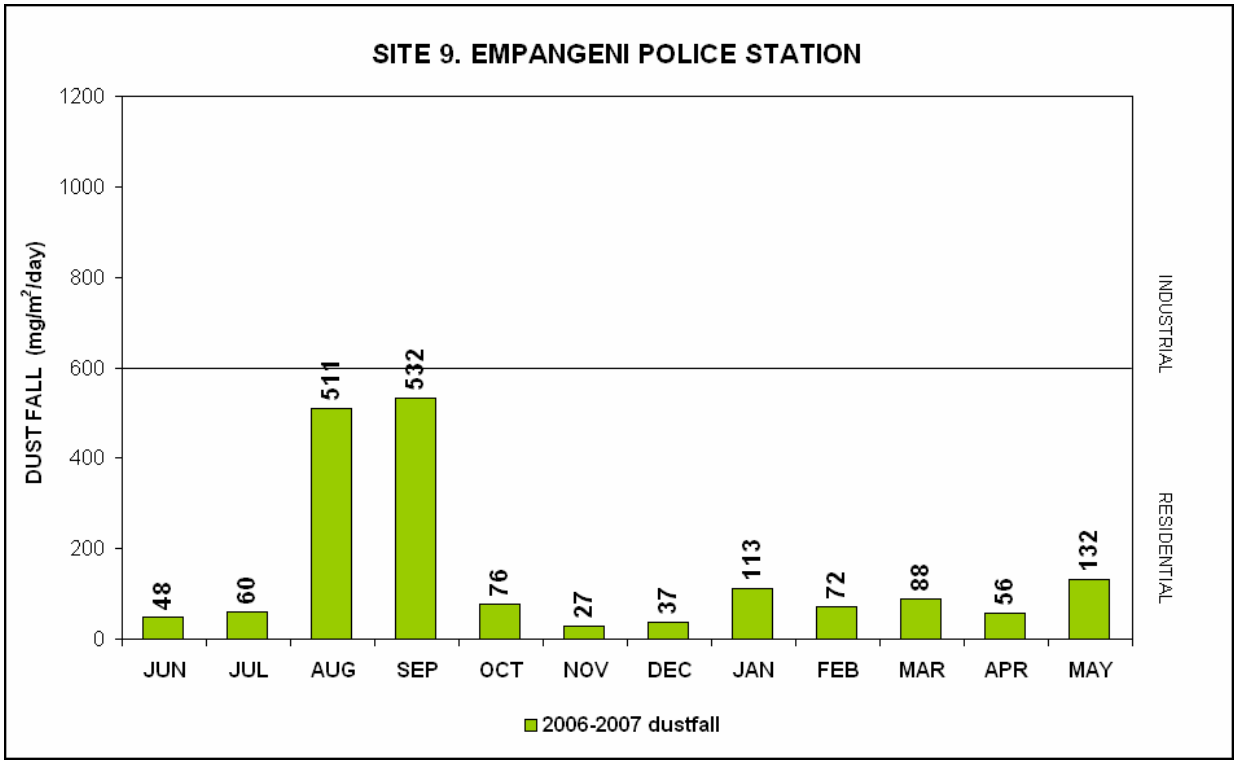


Figure 11 Dustfall rates at Site 09 (Empangeni Police Station) during the June 2006 to May 2007 period.

Site 10: Felixton Village

One incident of INDUSTRIAL range dustfall was observed during the monitoring month of November 2006, with a dustfallrate of **732** mg/m^2/day.
All remaining monitoring months showed RESIDENTIAL threshold dustfalls, with the lowest dustfall rate recorded during January 2007.

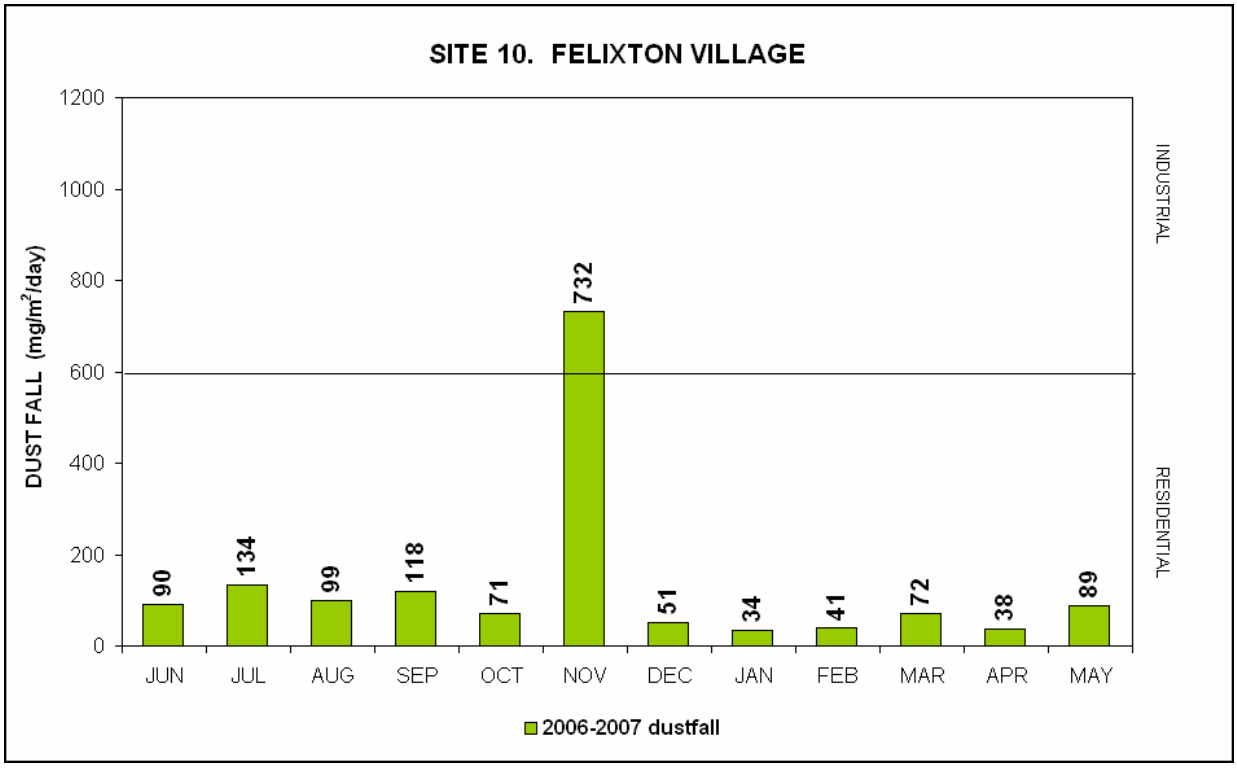


Figure 12 Dustfall rates at Site 10 (Felixton Village) during the June 2006 to May 2007 period.

Site 11: Arboretum

All dustfall rates during the period in review fell within the RESIDENTIAL range. January 2007 recorded the highest dustfall rate of 357 mg/m^2/da, while September 20 06 recorded the lowest dustfall rate of 65 mg/m^2/day. June 2006 and February 2007 recorded no data as the bucket was stolen.

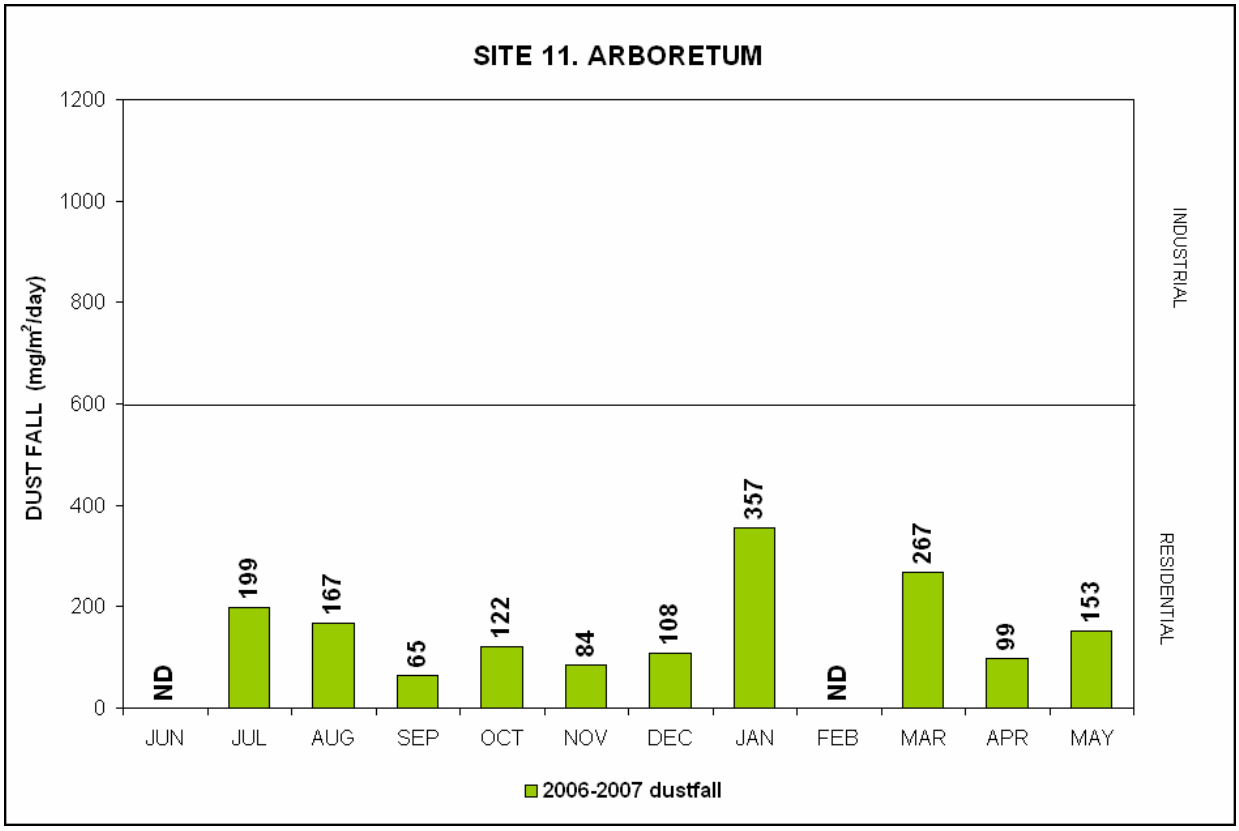


Figure 13 Dustfall rates at Site 11 (Arboretum) during the June 2006 to May 2007 period.

Site 12: Meerensee School

All dustfall rates during the period in review fell within the RESIDENTIAL range. August 2006 recorded the highest dustfall rate of 357 mg/m^2/day, while February 2007 recorded the lowest dustfall rate of 31 mg/m^2/day.

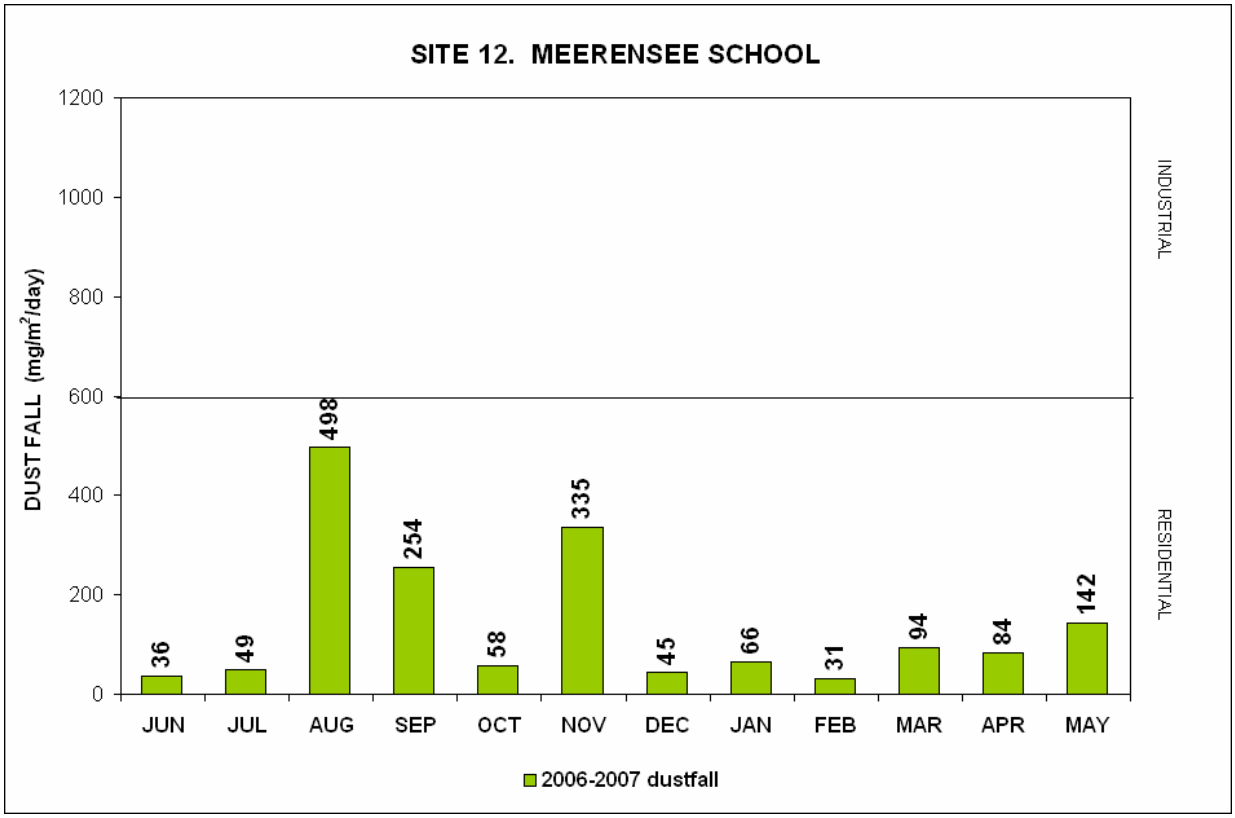


Figure 14 Dustfall rates at Site 12 (Meerensee School) during the June 2006 to May 2007 period.

6.2 Temporal Variations in Dustfall rates

A comparative time plot illustrating mean monthly, temporal-average dustfall rates for the June 2006 to May 2007 period in Figure 15. The averaging of dustfall rates across RBCAA single bucket sampling sites facilitates an easier analysis of the temporal trends in dustfall rates.

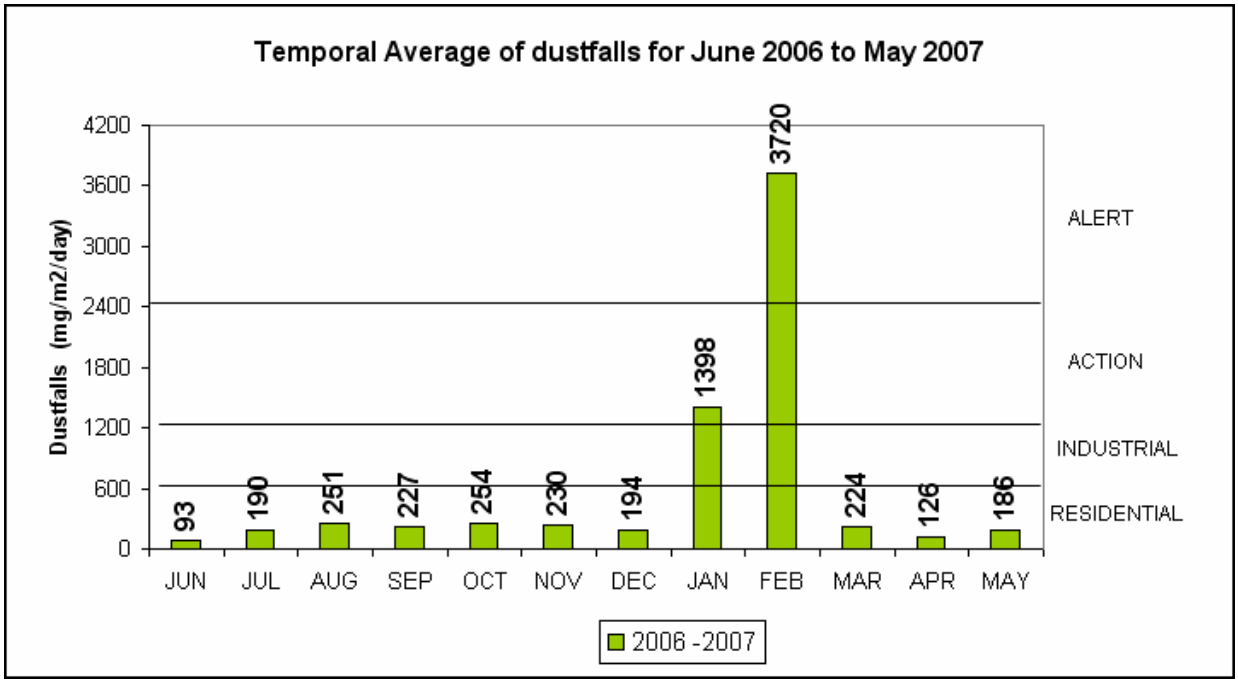


Figure 15 Temporal average-dustfall rates recorded during the June 2006 to May 2007.

One ALERT threshold dustfall rate was recorded during February 2007, while January 2007 showed an ACTION range dustfall rate. All remaining dustfall rates fell within the RESIDENTIAL range.

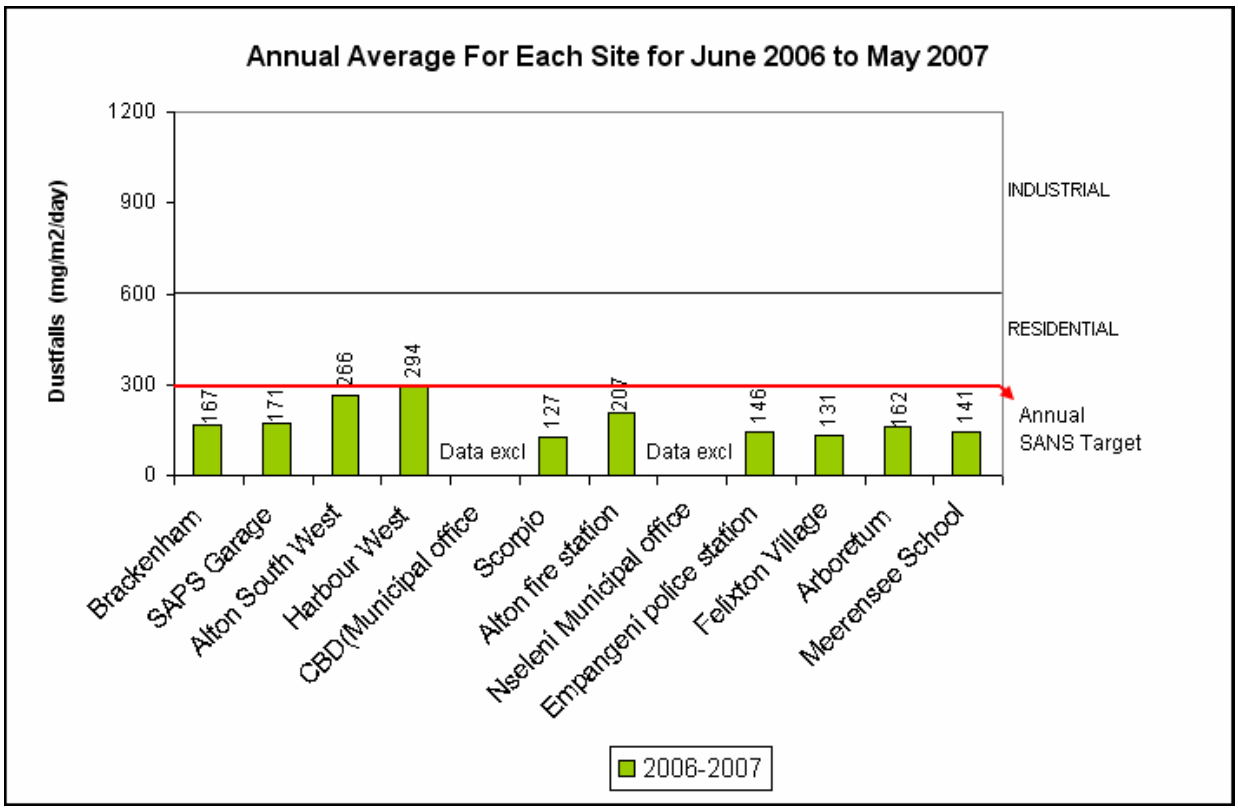


Figure 16 Annual-average dustfall rates recorded at each Site during the June to May 2006 period.

Two monitoring sites; namely; Site 8 (Nseleni Municipal Office) and Site 5 (CBD) recorded an annual average well above the SANS Annual Target of 300 mg/m^2/day due to isolated dustfall rates recorded during January and February 2007 respectively. As a result, Site 8 (Nseleni Municipal Office) and Site 5 (CBD) annual average dustfalls were excluded in the network as it cannot be used for comparison purposes. All the remaining monitoring sites showed annual average dustfall rates within the RESIDENTIAL range, and below the SANS Annual Target of 300 mg/m^2/day.

7 REGIONAL CLIMATE AND ANALYSIS OF METEOROLOGICAL DATA

The wind field and the intensity and frequency of occurrence of precipitation represent the most important meteorological parameters influencing the emission, dispersion and deposition of fugitive dust. Sufficient meteorological data were available for the RBCAA to provide a good understanding of the surface wind field and local rainfall patterns. Hourly average wind data and precipitation data were obtained from the Richards Bay SAWS weather station.

7.1. Surface Wind Field

The erosion and vertical dispersion of dust is a function of the wind field. The wind speed determines the dust generation potential, the distance of downwind transport, and the rate of dilution of pollutants. The generation of mechanical turbulence is similarly a function of the wind speed, in combination with the surface roughness. Period average and monthly wind roses for RB SAWS monitoring station are illustrated in Figures 17 and 18 respectively.

Wind roses comprise 16 spokes which represent the directions from which winds blew during the period. The colours reflected the different categories of wind speeds; the orange, for example, representing winds of 4 m/s to 8 m/s. The circles provide information regarding the frequency of occurrence of wind speed and direction categories. For the current wind roses, each dotted circle represents a 3% frequency of occurrence.

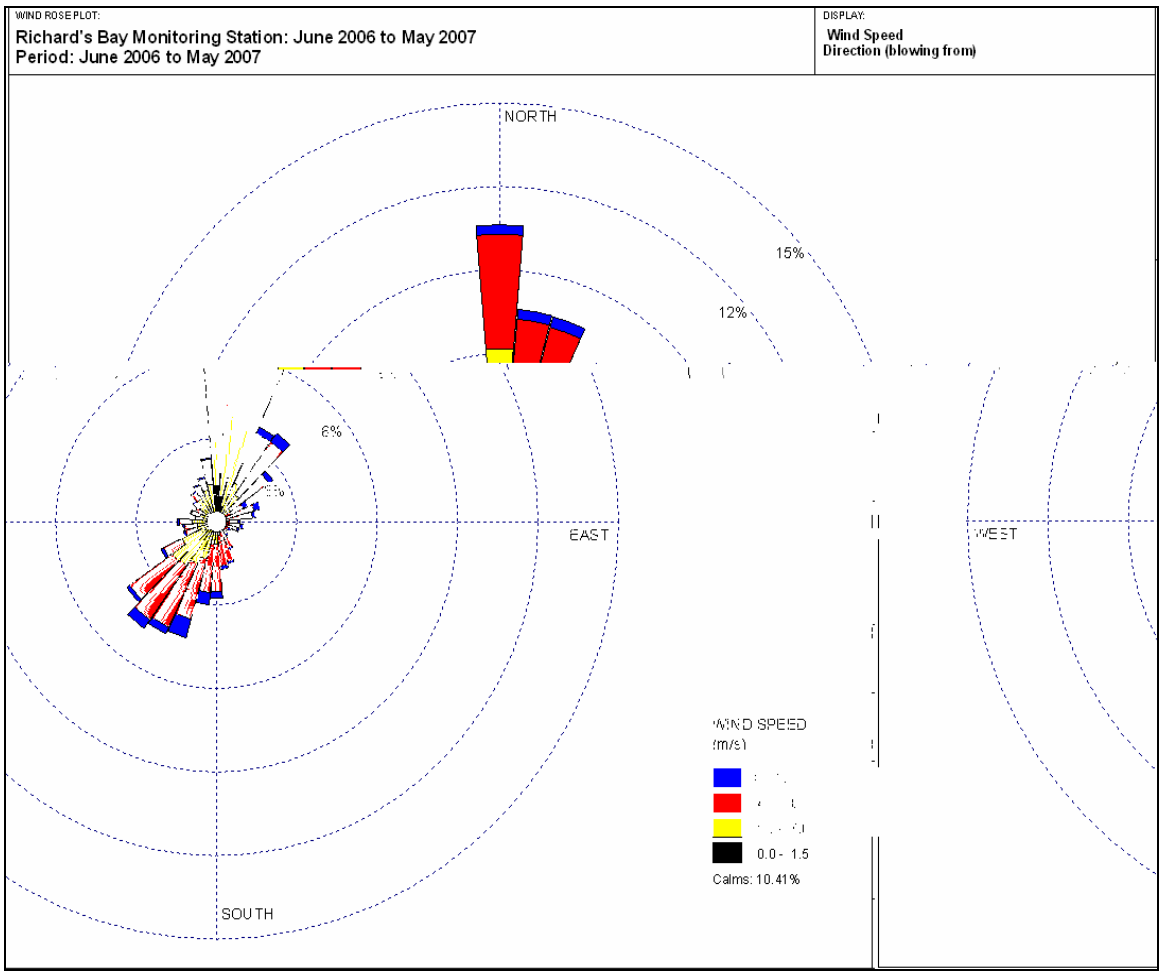
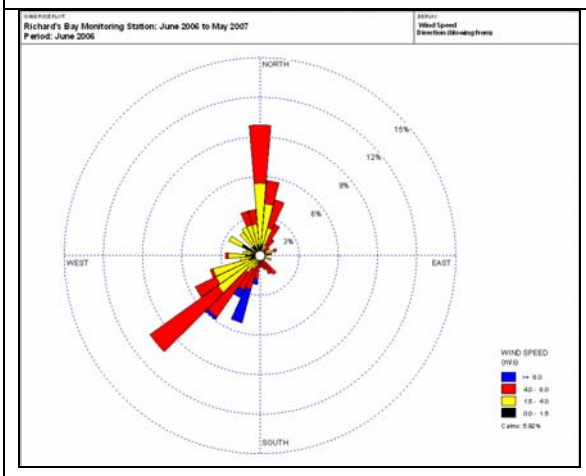
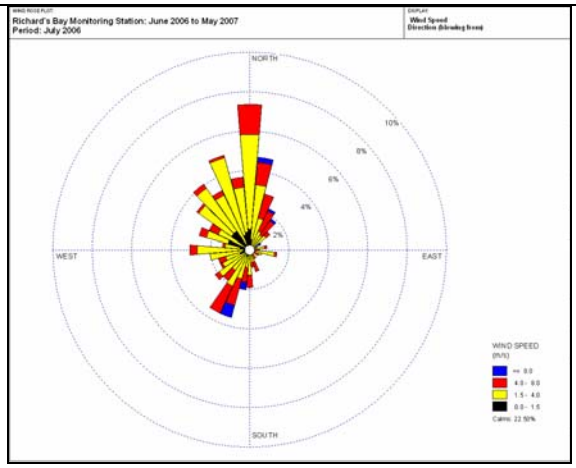


Figure 17: Overall wind rose for RB SAWS monitoring station for the period June 2006 to May 2007.

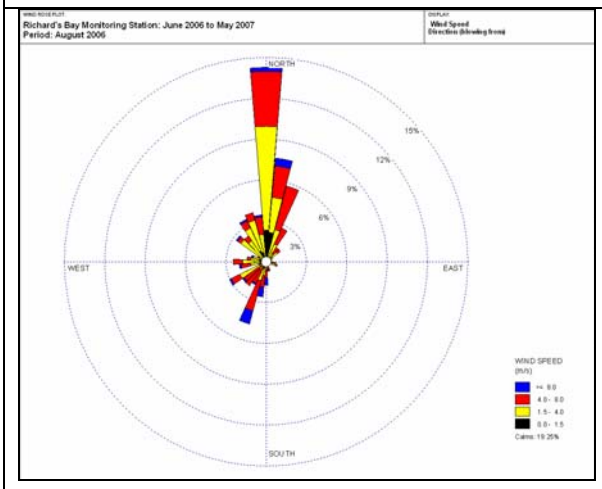
June 2006



July 2006



August 2006



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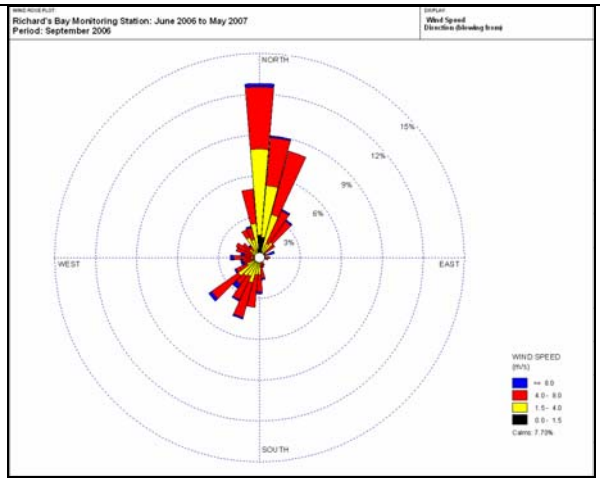
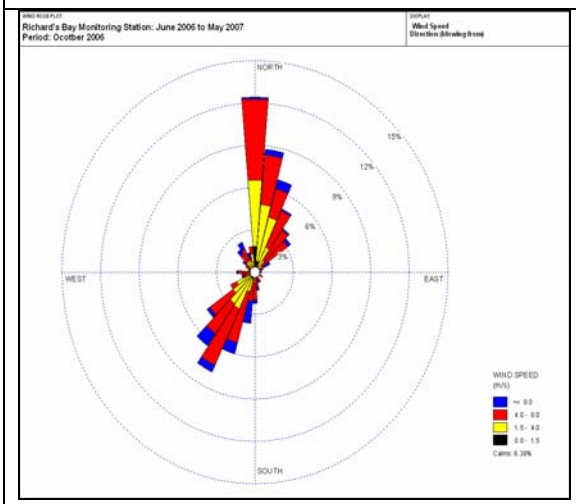
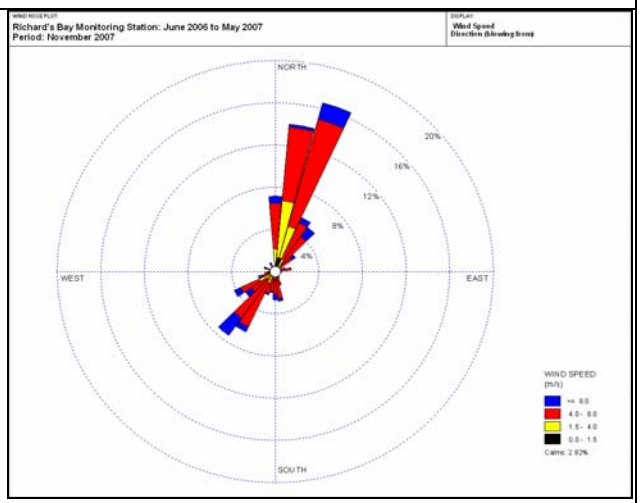


October 2006



November 2006



December 2006

January 2007

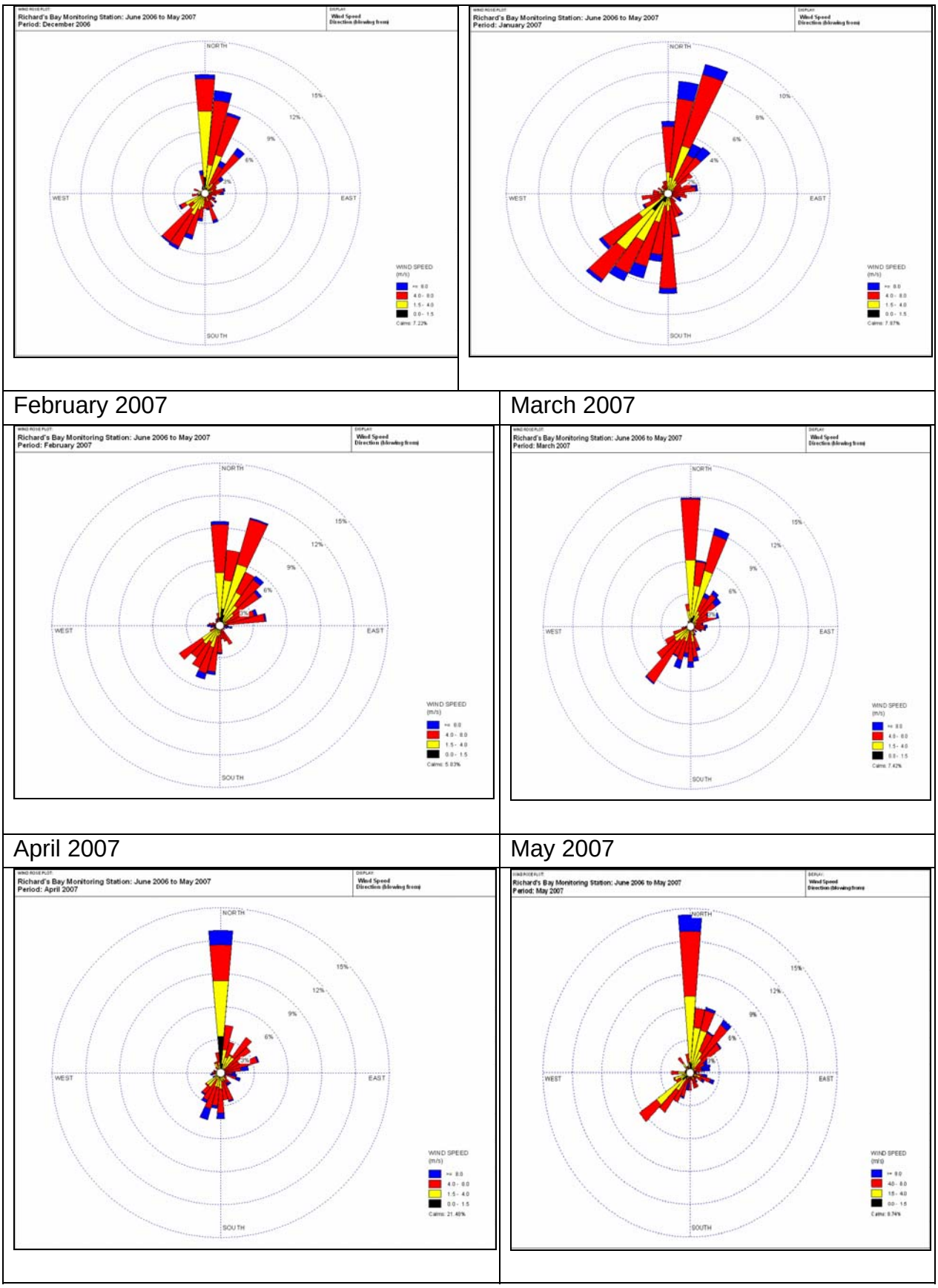


Figure 18. Monthly wind roses for RB SAWS monitoring station for the period June 2006 to May 2007.

During the period in review, the winds blew predominantly from the Northerly and North-north-easterly direction, with secondary wind from the South–south westerly direction. Approximately 43.8% of the overall wind fell within the 4.0 to 8.0 m/s wind speed class, followed by 33% within the 1.5 to 4.0 m/s class. Strong gusts of wind claimed 6.1% of the total wind during the period in review.

7.2. Precipitation

Precipitation is important to air pollution studies since it represents an effective removal mechanism of atmospheric pollutants and inhibits dust generation potentials. Rainfall data were obtained from the South African Weather Service, Richard's Bay Weather Station, for the period under review. The total amount of rainfall experienced during the sampling period, compared with the long-term average, is illustrated in Figure 19.

During the June 2006 to May 2007 period, 923 mm of rain, was recorded to have fallen at the Richard's Bay Weather Station. The highest rainfall was experienced during April 2007 with a total of 188.4 mm, while October 2006 showed the highest number of rainfall days. May 2007 was the only month where there was no rainfall.

Table 6 Rainfall data recorded during the sampling period.

Period	**Total Rainfall (mm)**	**Number of Rain-days**
JUNE 2006	55	6
JULY 2006	7	1
AUGUST 2006	90	10
SEPTEMBER 2006	29	6
OCTOBER 2006	125	16
NOVEMBER 2006	150	13
DECEMBER 2006	76	12
JANUARY 2007	141.2	13
FEBRUARY 2007	32.8	9
MARCH 2007	28	10
APRIL 2007	188.4	10
MAY 2007	0	0
Period (June 2006 – May 2007)	923	106

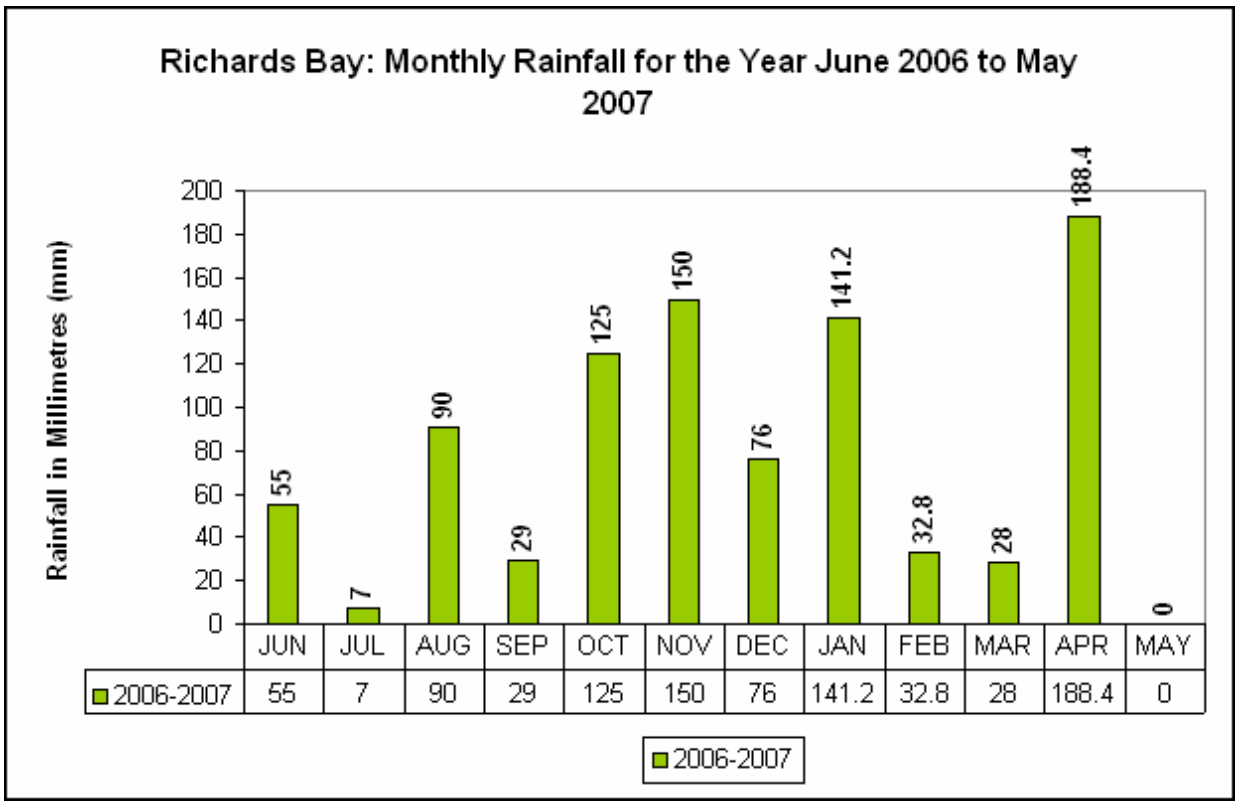


Figure 19: Comparison of monthly rainfall figures for the June 2006 to May 2007 recorded at the SAWS Richard's Bay Weather Station.

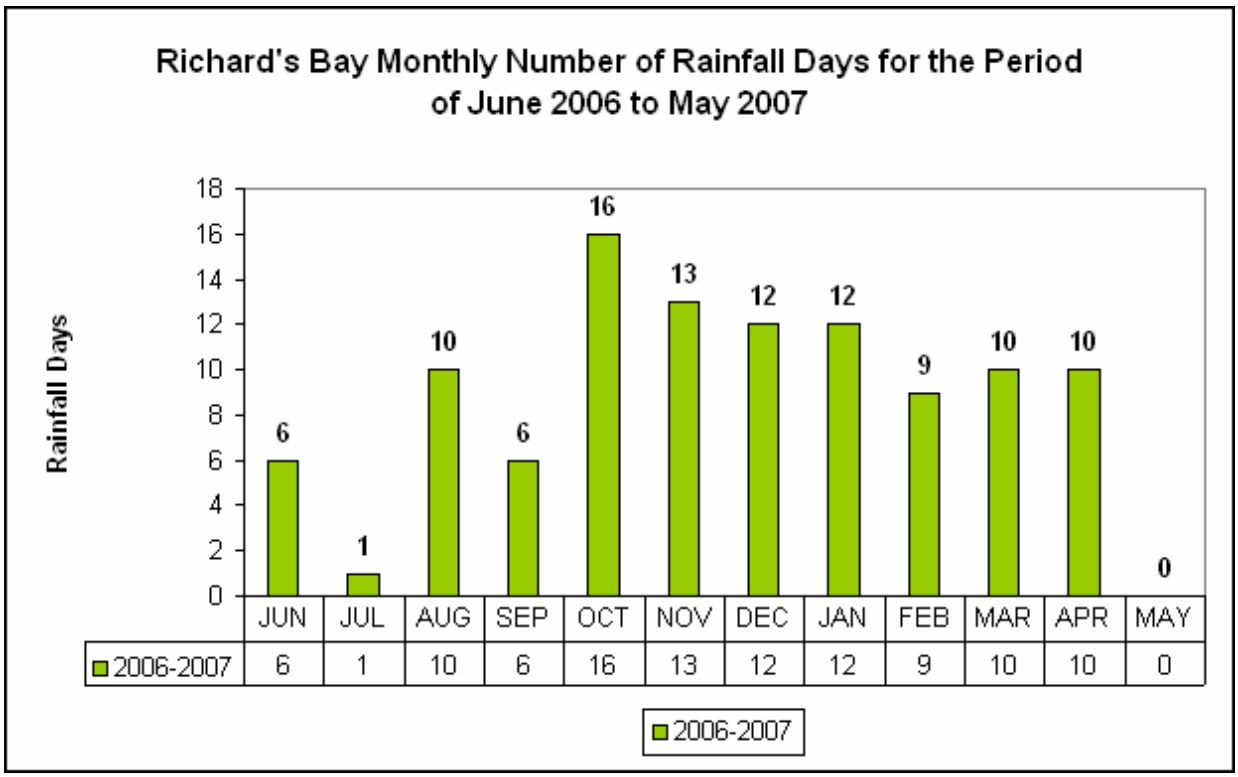


Figure 20: Comparison of monthly rainfall days for the June 2006 to May 2007 recorded at the SAWS Richard's Bay Weather Station.

8 CLASSIFICATION OF RESULTS

Results obtained from the twelve single-bucket dust-monitoring network at RBCAA for the period June 2006 to May 2007 have been presented in the report.

A synopsis of the frequency of occurrence of various categories of dustfall rates, based on samples collected for all sites and months, is given in the Figure 21. During the sampling period in review, 94% occurrence of dustfalls fell within RESIDENTIAL range, with 2% fell in the INDUSTRIAL range and ALERT range respectively. The ACTION range accounted for 1% of the dustfalls, while no data was recorded for 1 % of the time.

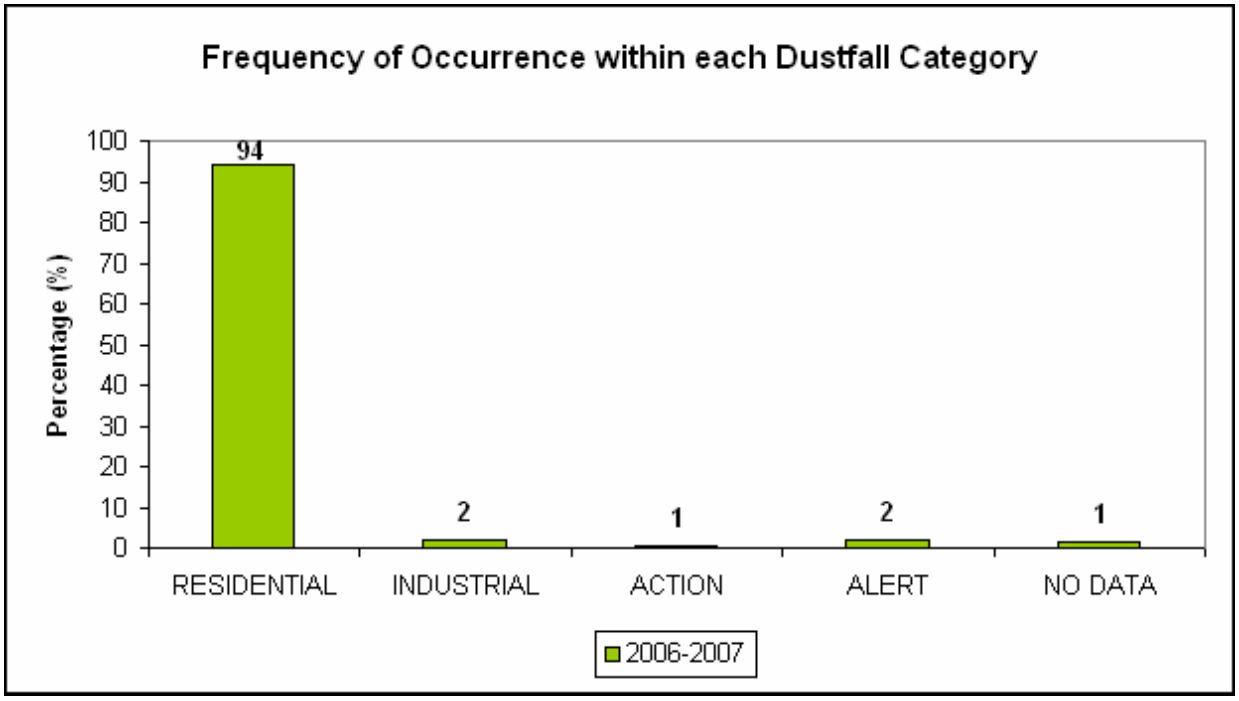


Figure 21. Synopsis of frequency of occurrence of RESIDENTIAL, INDUSTRIAL, ACTION and ALERT for single bucket dustfall during the June 2006 to May 2007 period.

9 COMMENTS AND RECOMMENDATIONS

The results obtained from the twelve single bucket dust-monitoring network situated around RBCAA were presented and discussed for the period June 2006 to May 2007.

All dustfall monitoring sites during the sampling period did comply with the standard operating procedure with respect to the exposure time of the samples, that is, for the samples to be exposed for 30 ± 3 days except in December 2006 where samples were exposed two days longer than recommended period.

Operational problems were experienced during June 2006 at Site 11 (Arboretum) where the bucket was stolen and in November 2006 at monitoring Site 5 (CBD) where the sample was contaminated. During February 2007, no data was recorded for Site 11 (Arboretum), the bucket was stolen. An overall sample return of 91% was achieved during the period in review.

During the year in review, two incidents of ALERT dustfalls were recorded at Site 8 (Nseleni Municipal Office) and Site 5 (CBD) due to construction close to monitoring sites and these results are regarded as isolated dustfalls. Dustfall achieved the INDUSTRIAL range three times at three Sites, namely; Alton South West in February 2007, Harbour West in October 2006 and Felixton Village in November 2006.The majority of dustfalls fell within RESIDENTIAL threshold and therefore the results are regarded as satisfactory.

The annual average at monitoring Sites, Site 8 (Nseleni Municipal Office) and Site 5 (CBD) recorded dustfall rates well above the SANS Annual Target of 300 mg/m^2/day due to isolated episodes, therefore the results cannot be used for comparison purposes. All the remaining monitoring Sites showed annual average dustfall rates within the RESIDENTIAL range, and below the SANS Annual Target of 300 mg/m^2/day.

It is recommended that the current sampling Sites be retained for a further year to keep track of changes in dustfall rates.

In conclusion, all sites recorded acceptable dustfall rates with the exception of Nseleni Municipal Office and CBD monitoring sites. All sites recorded dustfalls below the SANS Annual Target of 300 mg/m^2/day without the two Sites that recorded isolated high dustfalls during the period in review. The results were considered satisfactory as they will not result in community complaints or nuisance.

10. REFERENCES

Egami R I, Watson J G, Rogers C F, Ruby M G, Rood M J, and Chow J C (1989). Particle fallout container measurement of dustfall from the atmosphere, in Lodge JP (Ed), Methods of Air Sampling and Analysis, 3rd Edition, Lewis Publishers Inc., Michigan, pp. 440-445.


Nseleni Municipal Offices
Brackenham
Saps Garage
Empangeni Police Station
Arboretum
CBD
Alton Fire Station
Scorpio
Alton South
Meerensee School
Harbour West
Felixton Village
N
W
E
S
© 2006 Europa Technologies
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© 2005 Google
Pointer 28°45'44.94" S 31°59'51.91" E elev 116 ft
Streaming 100%
Eye alt 16.40 mi