



environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

The Impact of Industrial Emissions on Ambient Air Quality – National Priority Areas

Air Quality Governance Lekgotla Session 2.2

Monday 12 October 2009

Emerald Casino - Vanderbijlpark

Dr. T.N. Mdluli

The Vaal Triangle Airshed PA Site Description



- Located in
 - Gauteng Province
 - Free State Province
- Main district metropolitans:
 - City of Johannesburg
 - Emfuleni Municipality
 - Midvaal Municipality
 - Metsimaholo Municipality
- Area – ~4,960 km²

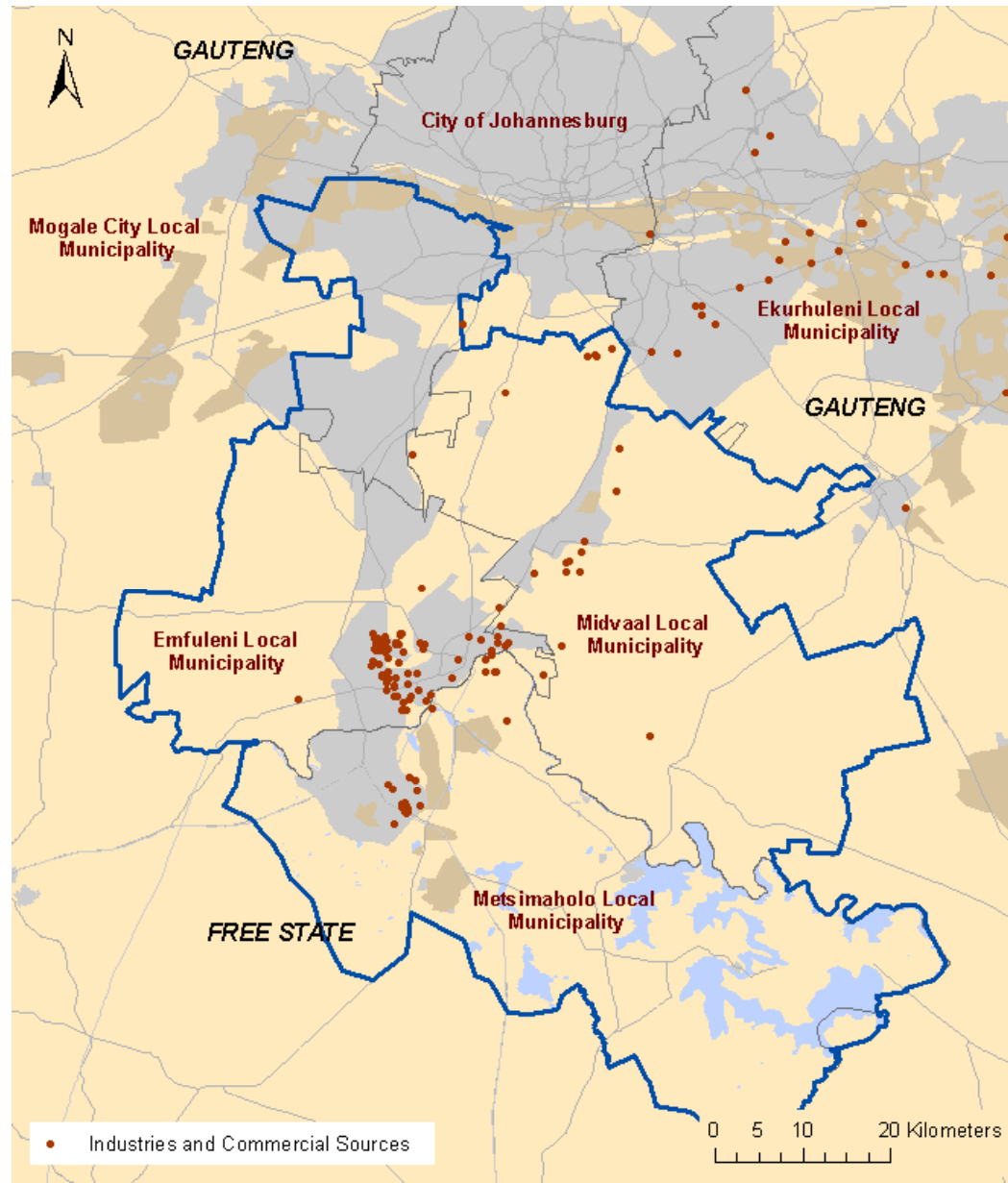
Sources of Emissions

Wide range of sources including:

- Industries (iron & steel, chemical, ferro-alloy etc.)
- Power generation (Lethabo)
- Household fuel burning
- Vehicle emissions (highways & main roads)
- Filling stations
- Brickworks
- Vehicle entrainment (unpaved roads)
- Waste disposal sites (domestic and hazardous)
- Water Treatment Works
- Boiler & incinerator operations
- Opencast mines & quarries
- Wind erosion from ash dumps
- Biomass burning
- Agricultural activity



Industrial Operations



environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

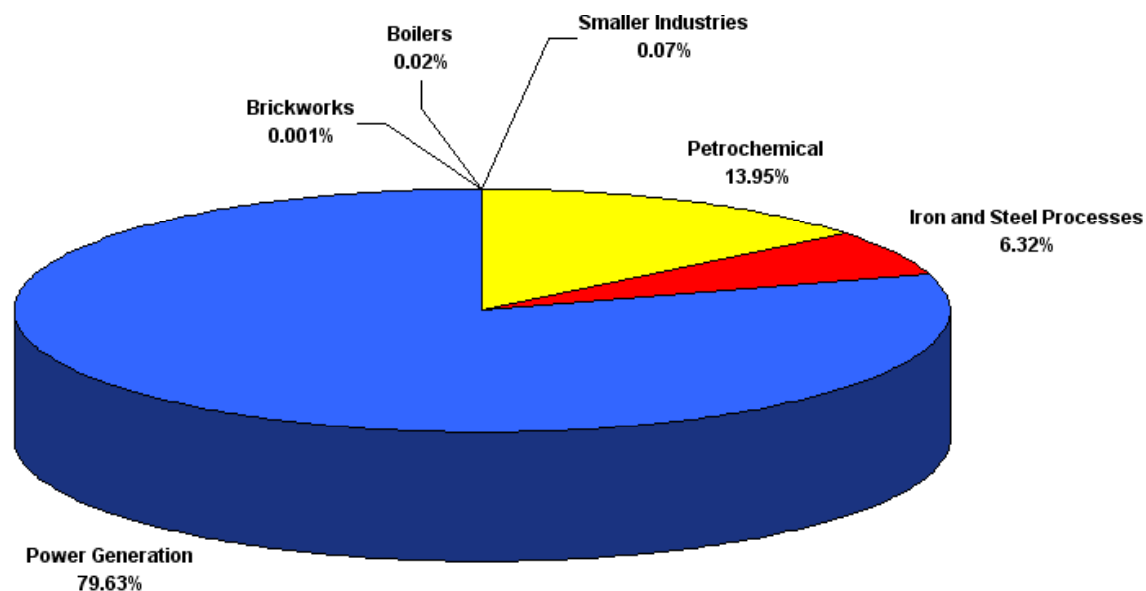
Mining Operations

- ◆ Mining operations represent potentially significant sources of fugitive dust emissions, with particulate emissions being the main pollutant of concern.
- ◆ Main mining operations in the VTAPA:
 - New Vaal Colliery;
 - Sigma Colliery;
 - Glen Douglas Dolomite Quarry.
- ◆ Fugitive dust emissions due to on-site mining operations are typically only of concern within 3km of the mine boundary



Industry and Mining Emissions (tpa)

Industry	SO2	NO	NO2	PM10
Ferroalloys	0.00	0.00	0.00	772.08
Mines	0.00	0.00	0.00	4554.23
Brickworks	2.02	0.53	0.06	431.11
Boilers	40.28	14.90	1.66	46.94
Smaller Industries	159.17	41.01	4.56	3000.62
Phosphate Fertilizer Process	0.00	84.01	9.33	394.78
Petrochemical	30125.94	13305.71	5838.42	3706.73
Iron and Steel Processes	13648.62	14740.85	125.99	11368.40
Power Generation	171929.00	76374.00	2390.00	5776.00

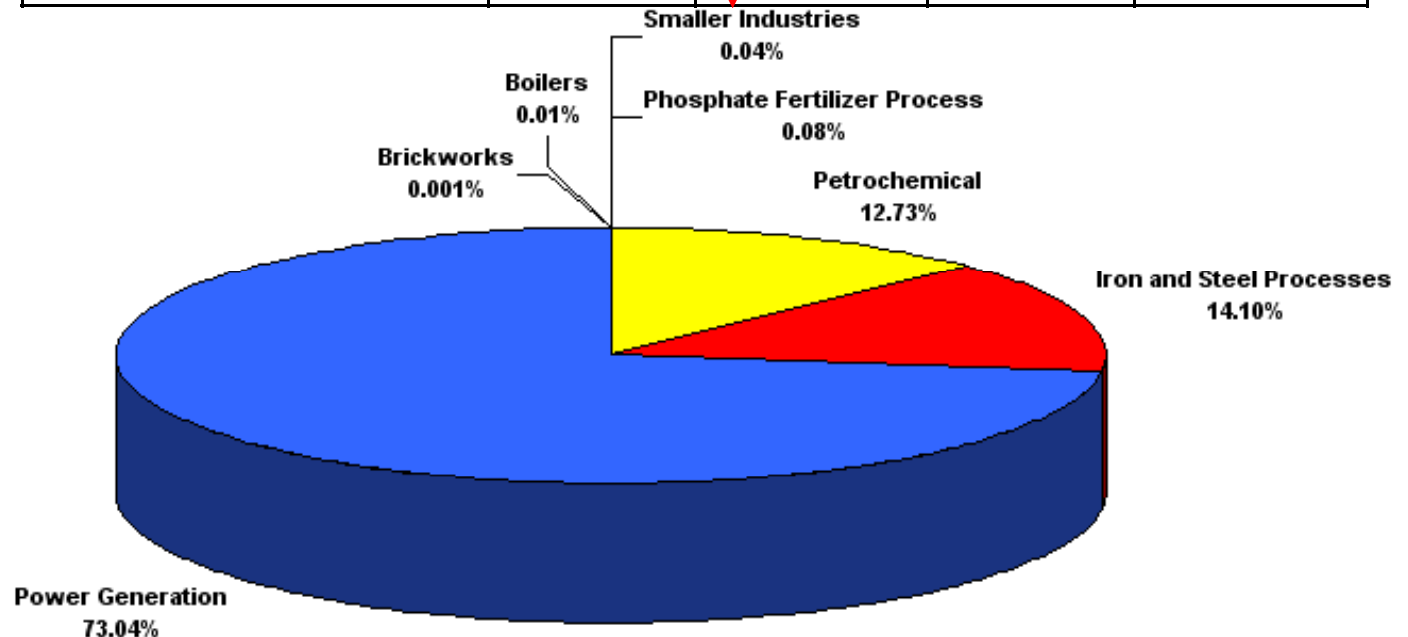


environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

Industry and Mining Emissions (tpa)

Industry	SO2	NO	NO2	PM10
Ferroalloys	0.00	0.00	0.00	772.08
Mines	0.00	0.00	0.00	4554.23
Brickworks	2.02	0.53	0.06	431.11
Boilers	40.28	14.90	1.66	46.94
Smaller Industries	159.17	41.01	4.56	3000.62
Phosphate Fertilizer Process	0.00	84.01	9.33	394.78
Petrochemical	30125.94	13305.71	5838.42	3706.73
Iron and Steel Processes	13648.62	14740.85	125.99	11368.40

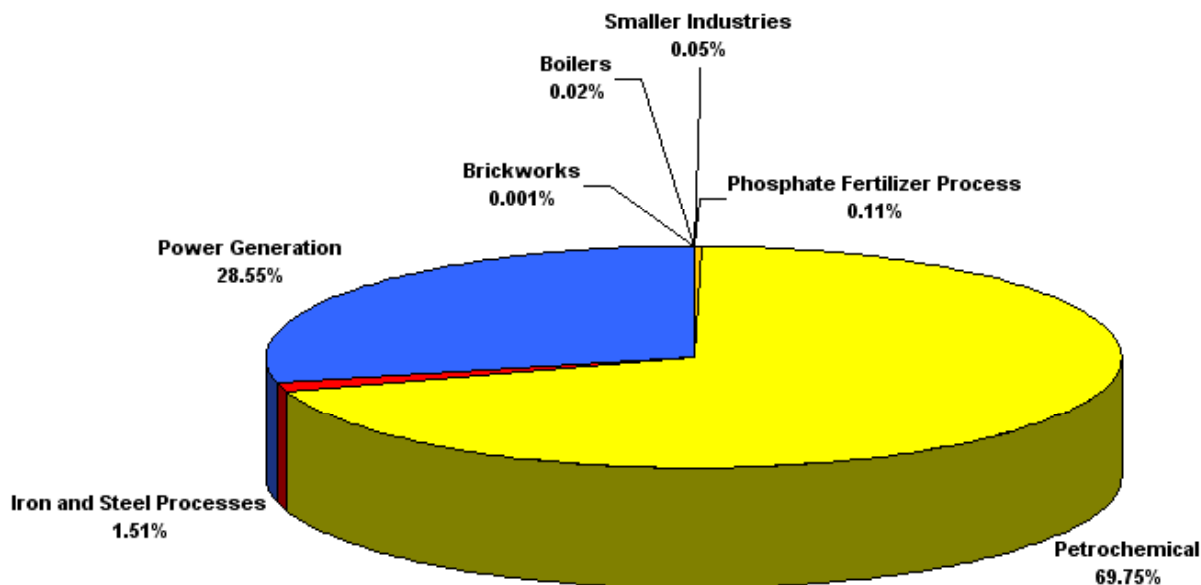


environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

Industry and Mining Emissions (tpa)

Industry	SO2	NO	NO2	PM10
Ferroalloys	0.00	0.00	0.00	772.08
Mines	0.00	0.00	0.00	4554.23
Brickworks	2.02	0.53	0.06	431.11
Boilers	40.28	14.90	1.66	46.94
Smaller Industries	159.17	41.01	4.56	3000.62
Phosphate Fertilizer Process	0.00	84.01	9.33	394.78
Petrochemical	30125.94	13305.71	5838.42	3706.73
Iron and Steel Processes	13648.62	14740.85	125.99	11368.40
Power Generation	171929.00	76374.00	2390.00	5776.00

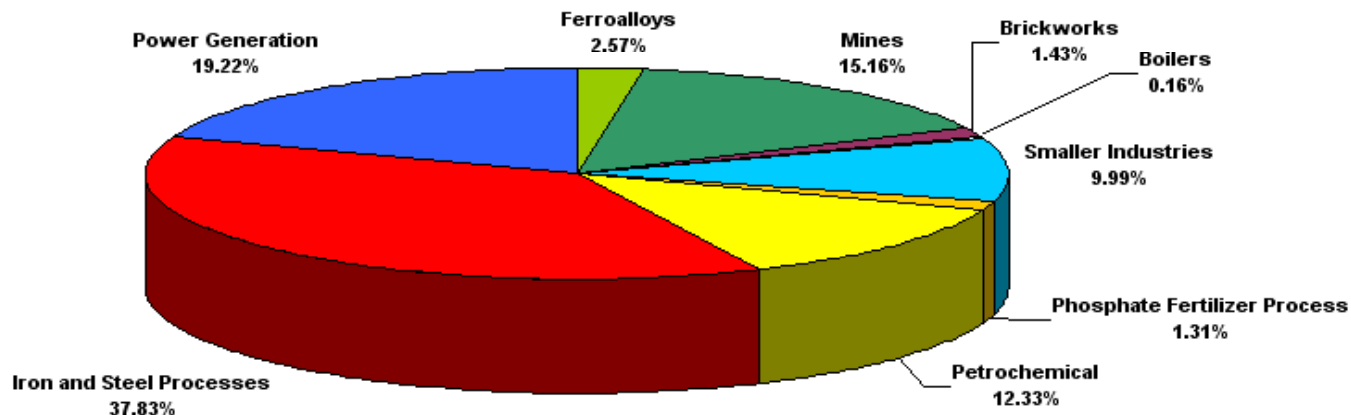


environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

Industry and Mining Emissions (tpa)

Industry	SO2	NO	NO2	PM10
Ferroalloys	0.00	0.00	0.00	772.08
Mines	0.00	0.00	0.00	4554.23
Brickworks	2.02	0.53	0.06	431.11
Boilers	40.28	14.90	1.66	46.94
Smaller Industries	159.17	41.01	4.56	3000.62
Phosphate Fertilizer Process	0.00	84.01	9.33	394.78
Petrochemical	30125.94	13305.71	5838.42	3706.73
Iron and Steel Processes	13648.62	14740.85	125.99	11368.40
Power Generation	171929.00	76374.00	2390.00	5776.00

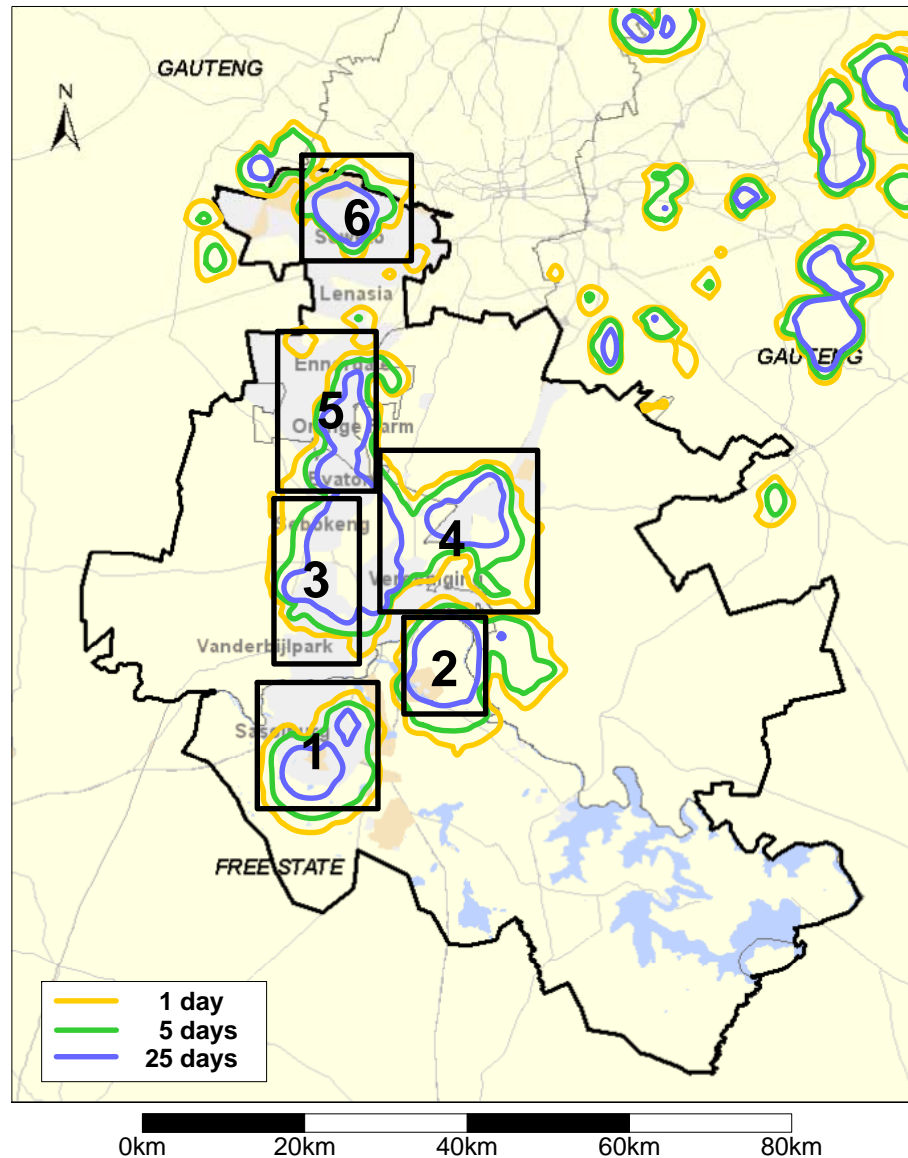


environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

“Hotspots”

FREQUENCY OF EXCEEDANCE OF DAILY PM₁₀ LIMIT OF 75 µg/m³
ALL CURRENT SOURCES

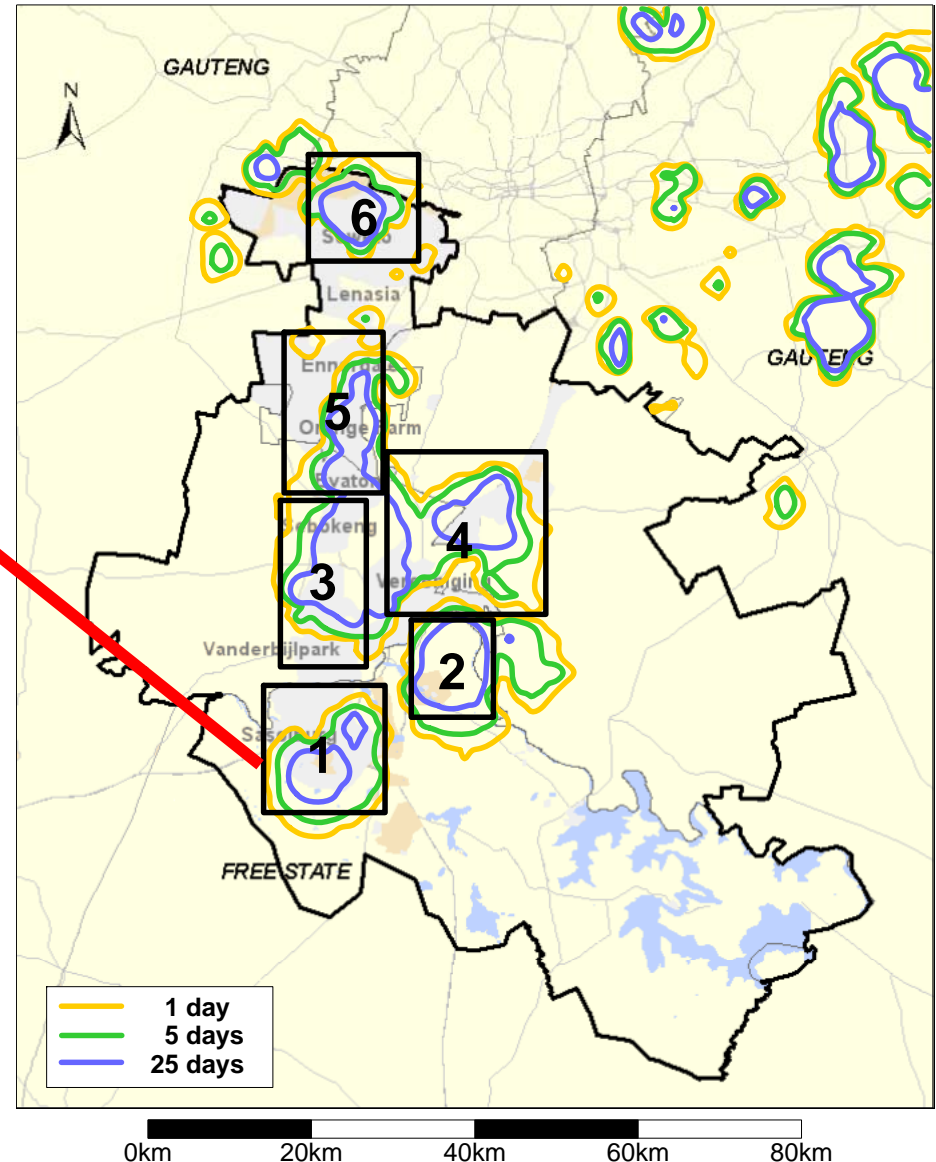


environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

“Hotspot” Zone 1

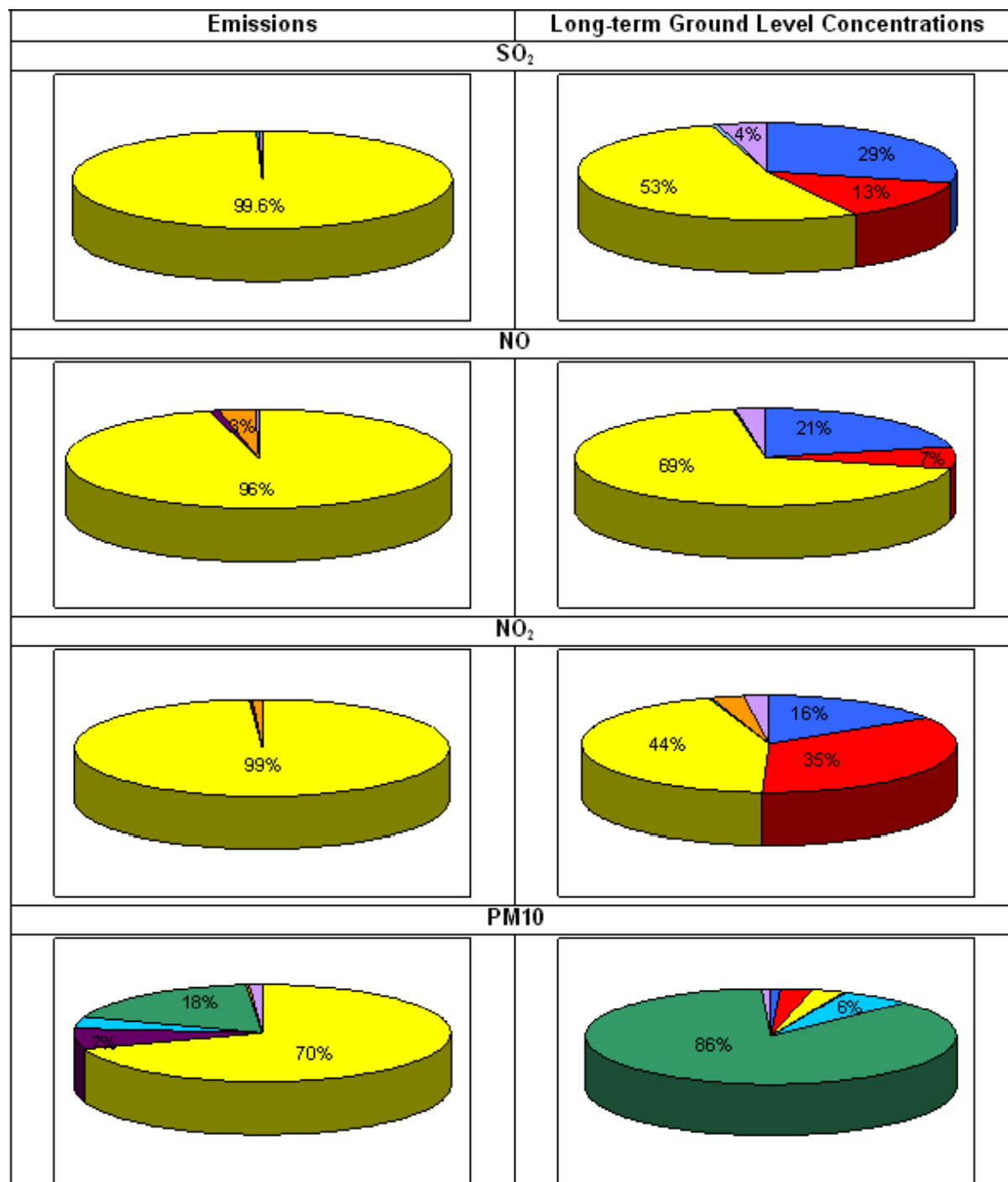
FREQUENCY OF EXCEEDANCE OF DAILY PM₁₀ LIMIT OF 75 µg/m³
ALL CURRENT SOURCES



environmental affairs

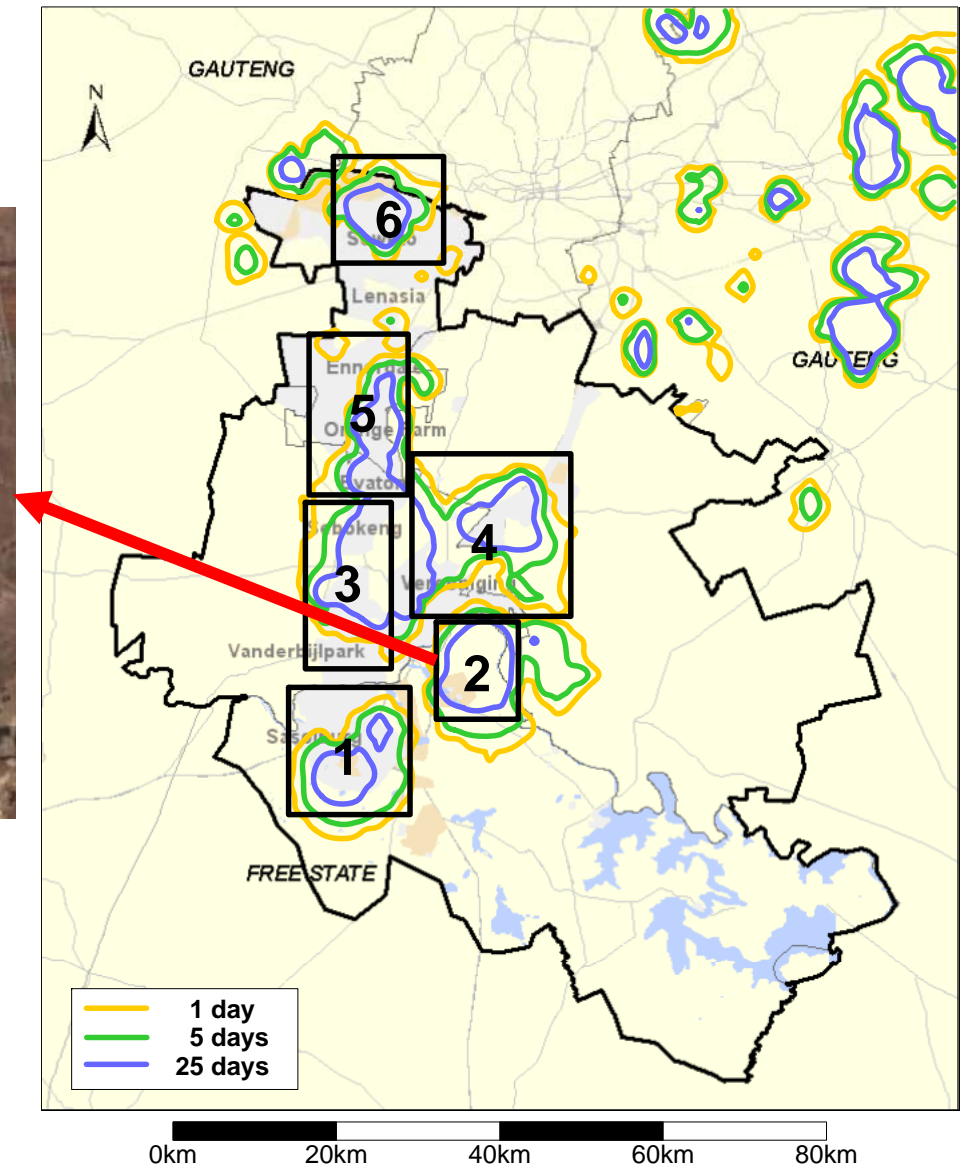
Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

Power Generation	
Iron and Steel Process	
Petrochemical Processes	
Ferroalloy Processes	
Phosphate Fertilizer Processes	
Smaller Industries	
Vehicles	
Mines	
Domestic Fuel Burning	



“Hotspot” Zone 2

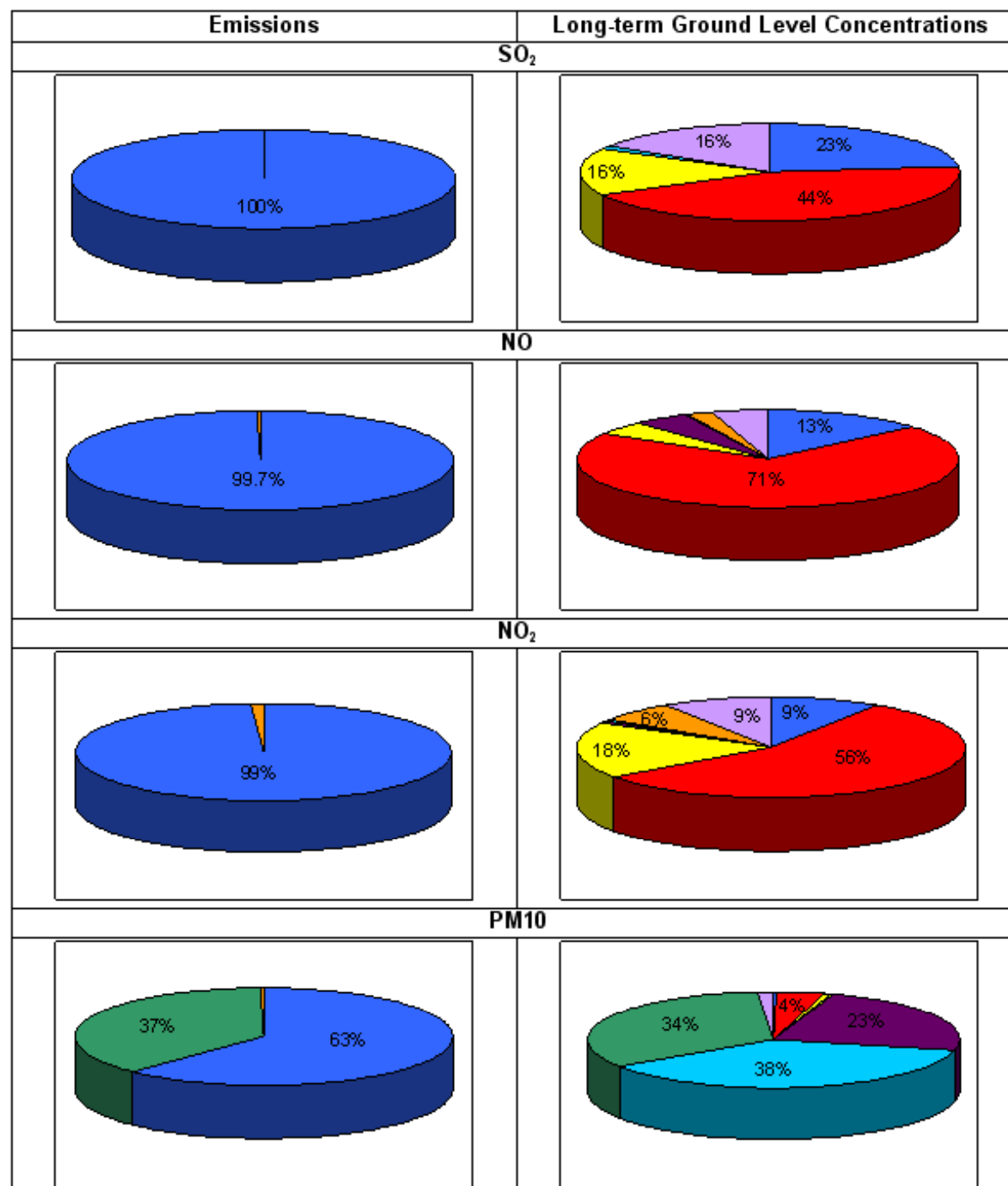
FREQUENCY OF EXCEEDANCE OF DAILY PM₁₀ LIMIT OF 75 µg/m³
ALL CURRENT SOURCES



environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

Power Generation	
Iron and Steel Process	
Petrochemical Processes	
Ferroalloy Processes	
Phosphate Fertilizer Processes	
Smaller Industries	
Vehicles	
Mines	
Domestic Fuel Burning	



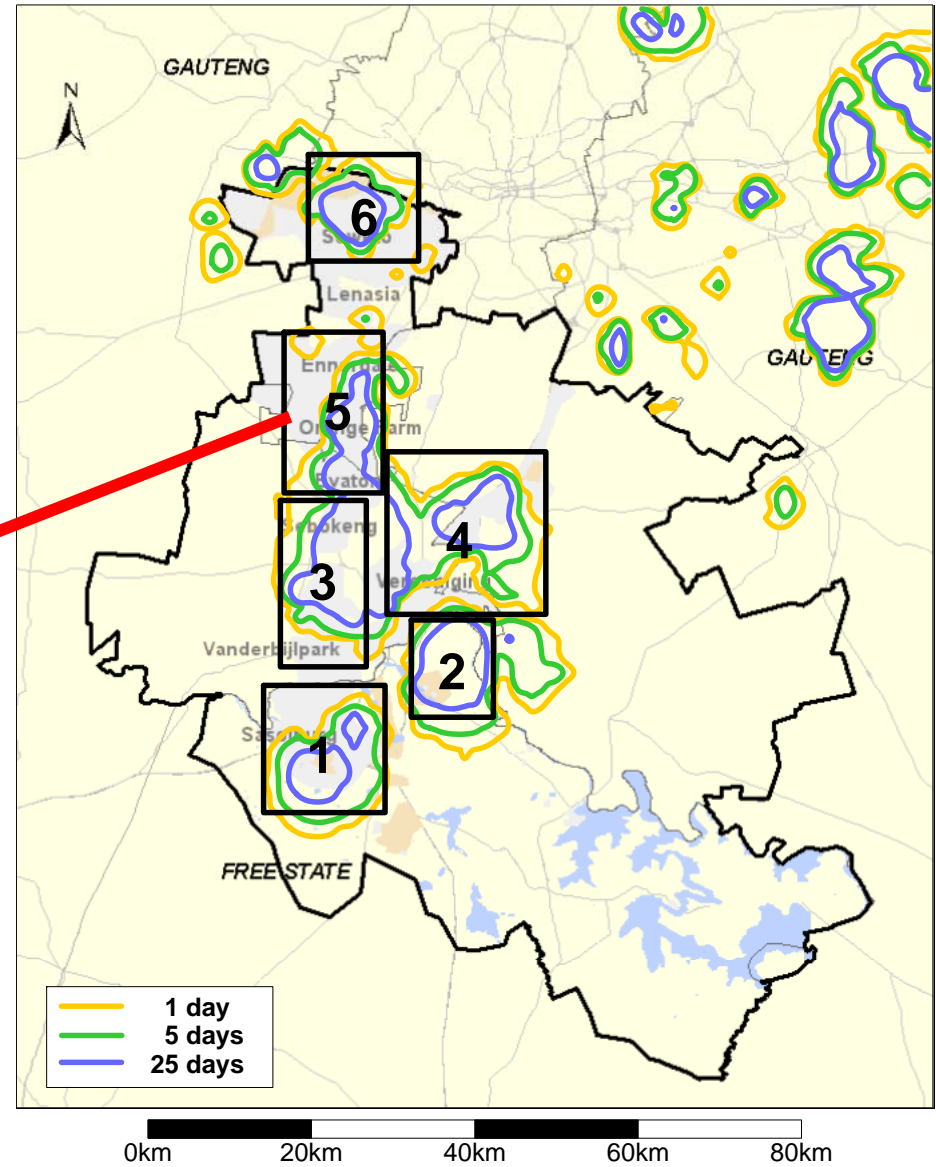
environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

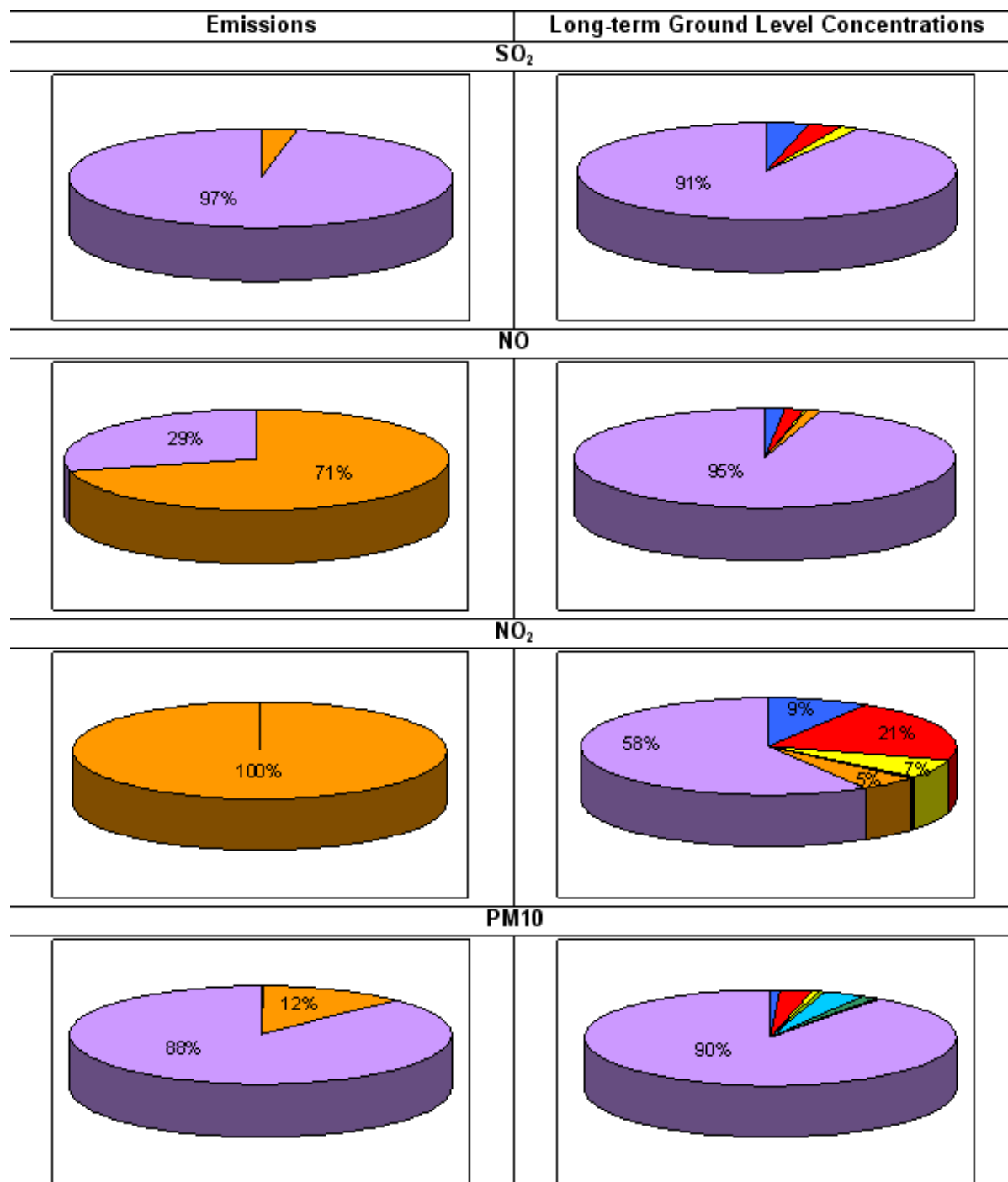
“Hotspot” Zone 5



FREQUENCY OF EXCEEDANCE OF DAILY PM₁₀ LIMIT OF 75 µg/m³
ALL CURRENT SOURCES



Power Generation	
Iron and Steel Process	
Petrochemical Processes	
Ferroalloy Processes	
Phosphate Fertilizer Processes	
Smaller Industries	
Vehicles	
Mines	
Domestic Fuel Burning	



environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

Conclusions

Particulate (PM10) concentrations

- **Elevated over most areas of the VTAPA, particularly in residential areas where domestic coal burning is occurring and areas neighbouring major industrial operations.**

Sulphur dioxide (SO2) concentrations

- **Generally below the VTAPA air quality objectives in both the residential and industrial stations, although exceedances were recorded on several occasions at Jabavu and Orange Farm and in Sasolburg.**



Conclusions

Nitrogen dioxide (NO₂) concentrations

- **Low in the VTAPA, although a seasonal signature is observed in NO₂ concentrations. Nitrogen dioxide concentrations have a regional impact within the Vaal Triangle.**

Carbon monoxide (CO) concentrations

- **Not considered to be significant in the VTAPA.**

Ozone (O₃) concentrations

- **Elevated in areas surrounding major industrial operations with exceedances of the one-hour average target recorded on numerous occasions. Ozone concentrations measured at Makalu are representative of known background concentrations in South Africa.**



Highveld Priority Area: Site Description



Located in:

- Gauteng Province
- Mpumalanga Province

Main District
Metropolitans:

- Ekurhuleni Metro
- Sedibeng DM
- Gert Sibande DM
- Nkangala DM

Area: 31 108 km²



environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

Ambient Air Quality Monitoring Site Locations and Pollutants

		NO ₂	O ₃	PM ₁₀	SO ₂
Emalahleni LM	Kendal 2	✓	✓		✓
Govan Mbeki LM	Bosjesspruit				✓
	Club	✓	✓	✓	✓
	Elandsfontein	✓	✓	✓	✓
	Langverwacht	✓		✓	✓
	Leandra				✓
Pixley Ka Seme LM	Amersfoort		✓		
	Majuba 1				✓
	Majuba 2				✓
	Verkykkop	✓	✓	✓	✓
Steve Tshwete LM	Columbus			✓	
	Komati 2			✓	✓
Msukaligwa LM	Camden	✓	✓	✓	✓



environmental affairs

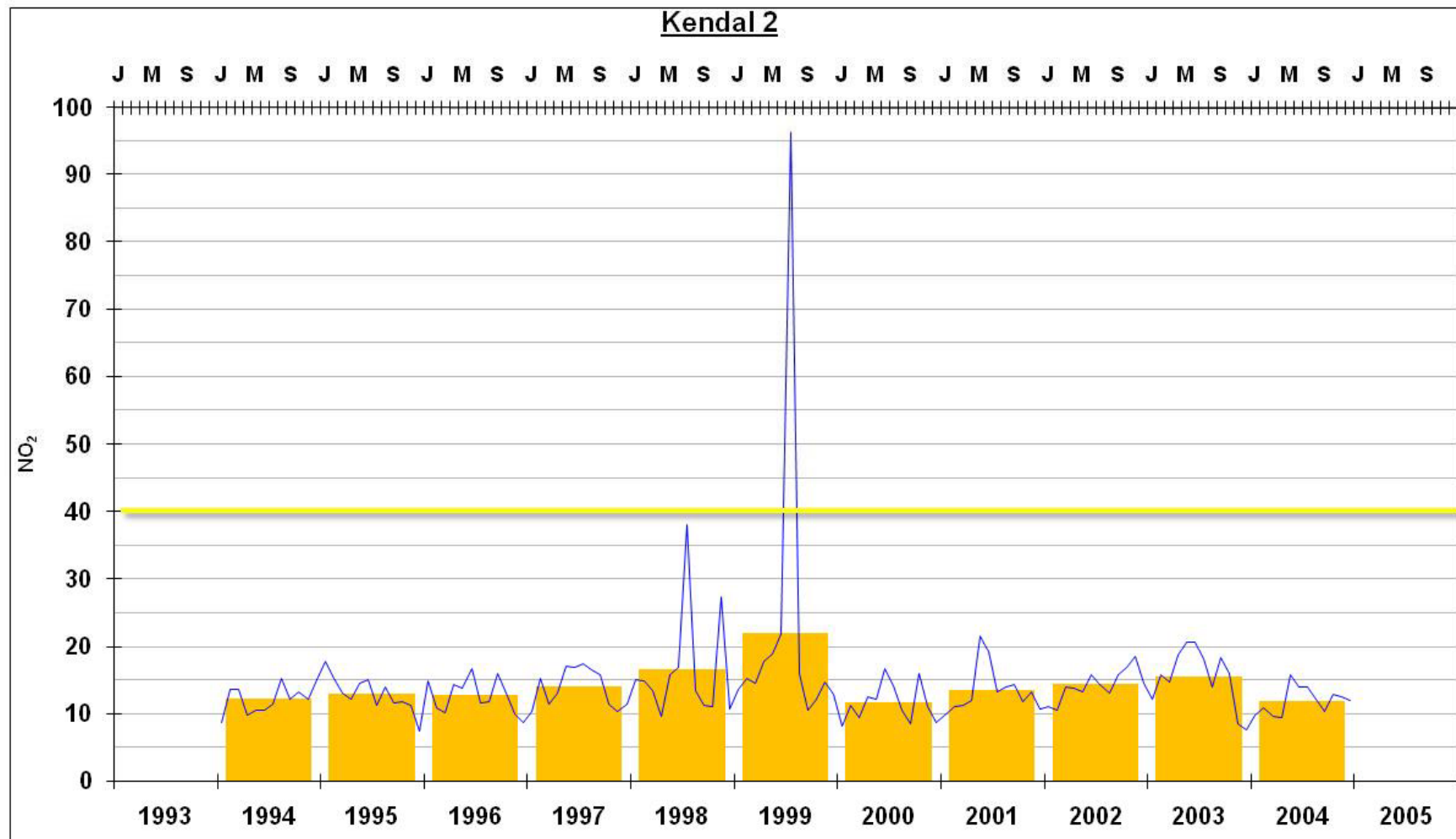
Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

NO₂

- Low concentrations across Highveld
- Secunda and Ogies areas have elevated levels



NO₂



environmental affairs

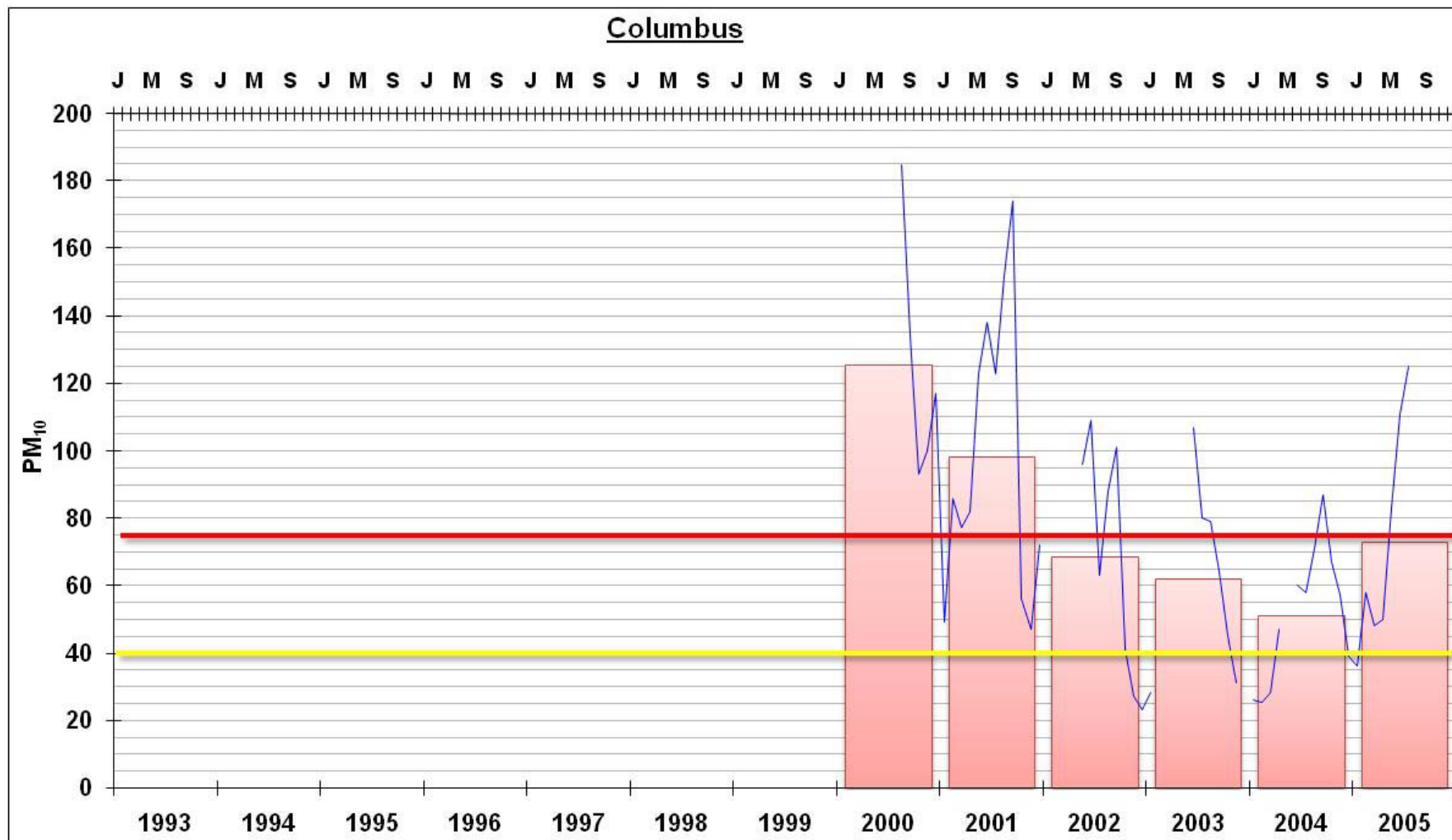
Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

PM₁₀

- Annual & daily compliance issues across the HPA
 - Annual: Middelburg, Elandsfontein, also Secunda areas
 - Daily: all HPA sites except Volksrust area
- Seasonal trend – winter peak



PM₁₀

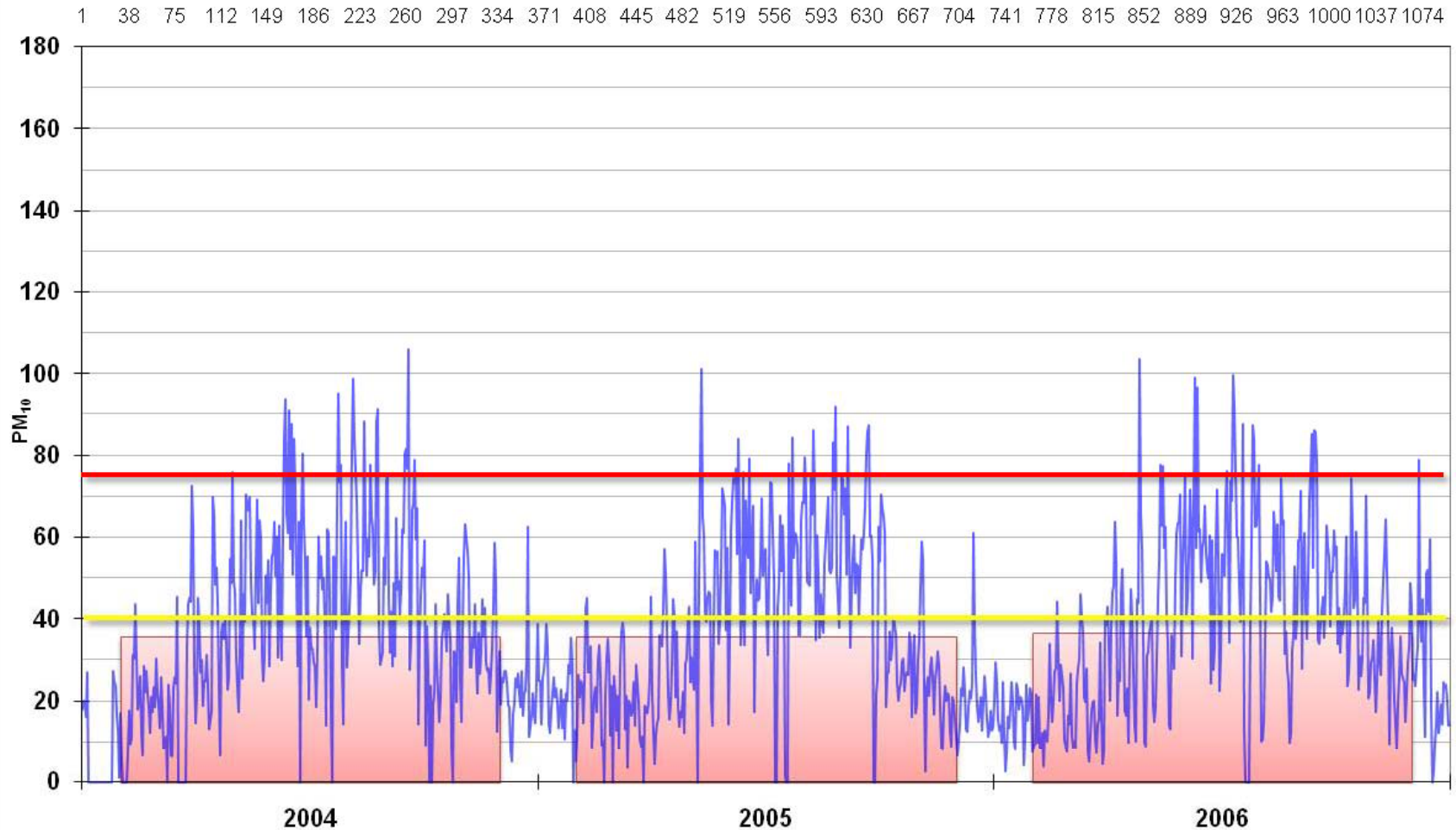


environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

PM₁₀

Langverwacht



SO₂

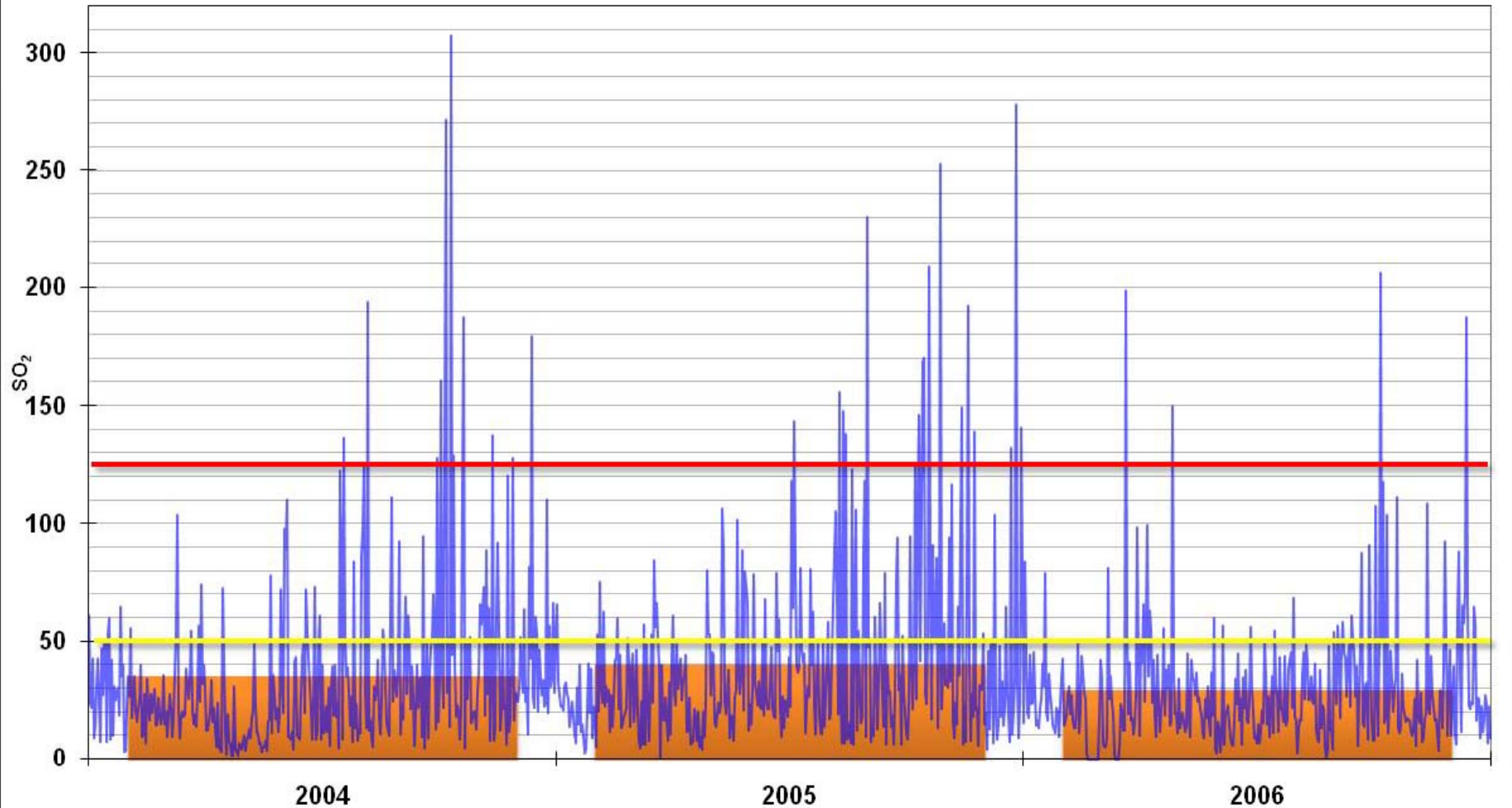
- Daily & hourly compliance issues
 - Daily: Ogies, also Secunda, Elandsfontein, Leandra & Volksrust areas
 - Hourly: Ogies, also Leandra, Volksrust & Secunda
- Diurnal trends of exceedances show industrial, and low-level burning, or combination



SO₂

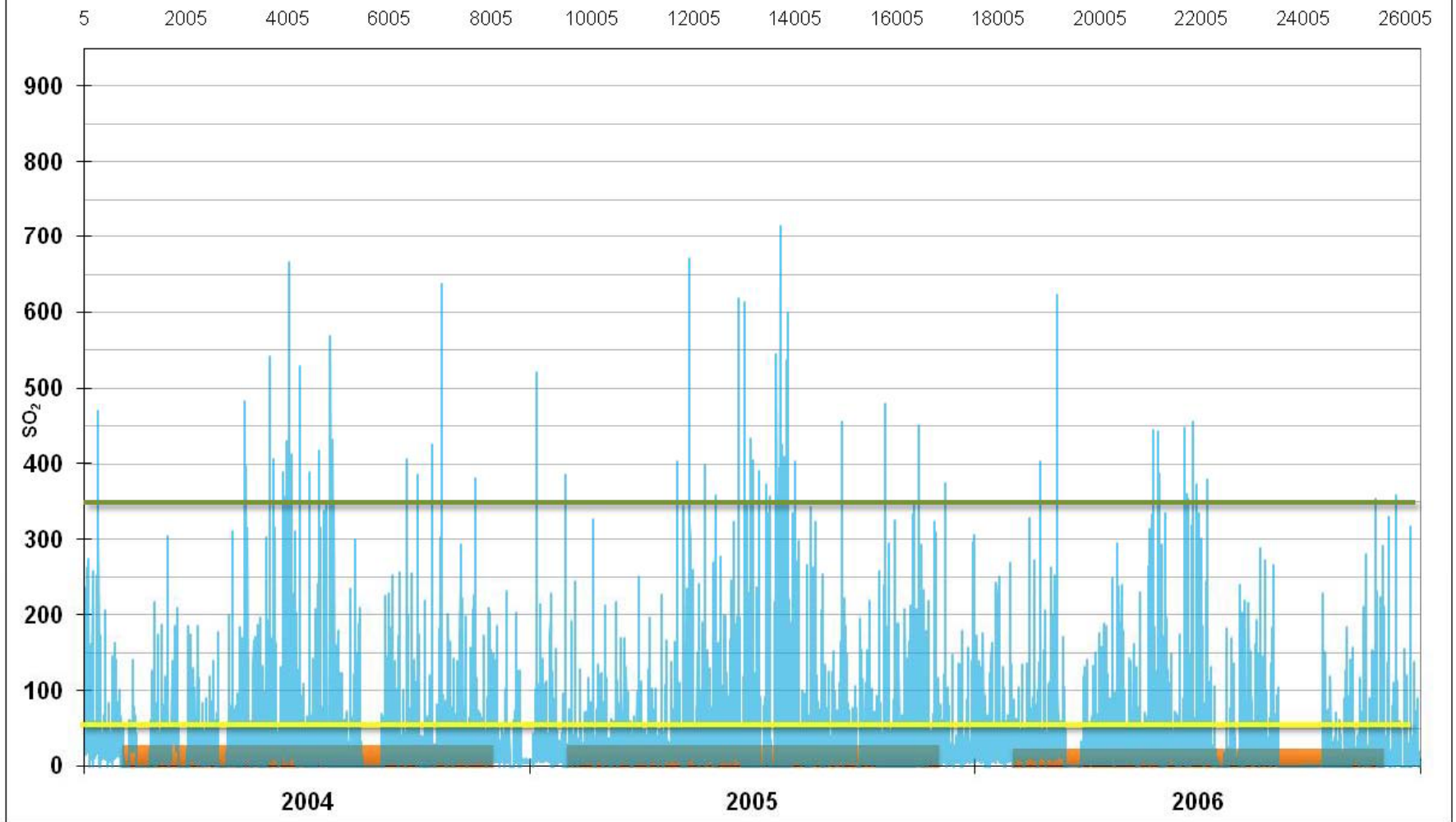
Kendal 2

5 42 79 116 153 190 227 264 301 338 375 412 449 486 523 560 597 634 671 708 745 782 819 856 893 930 967 1004 1041 1078

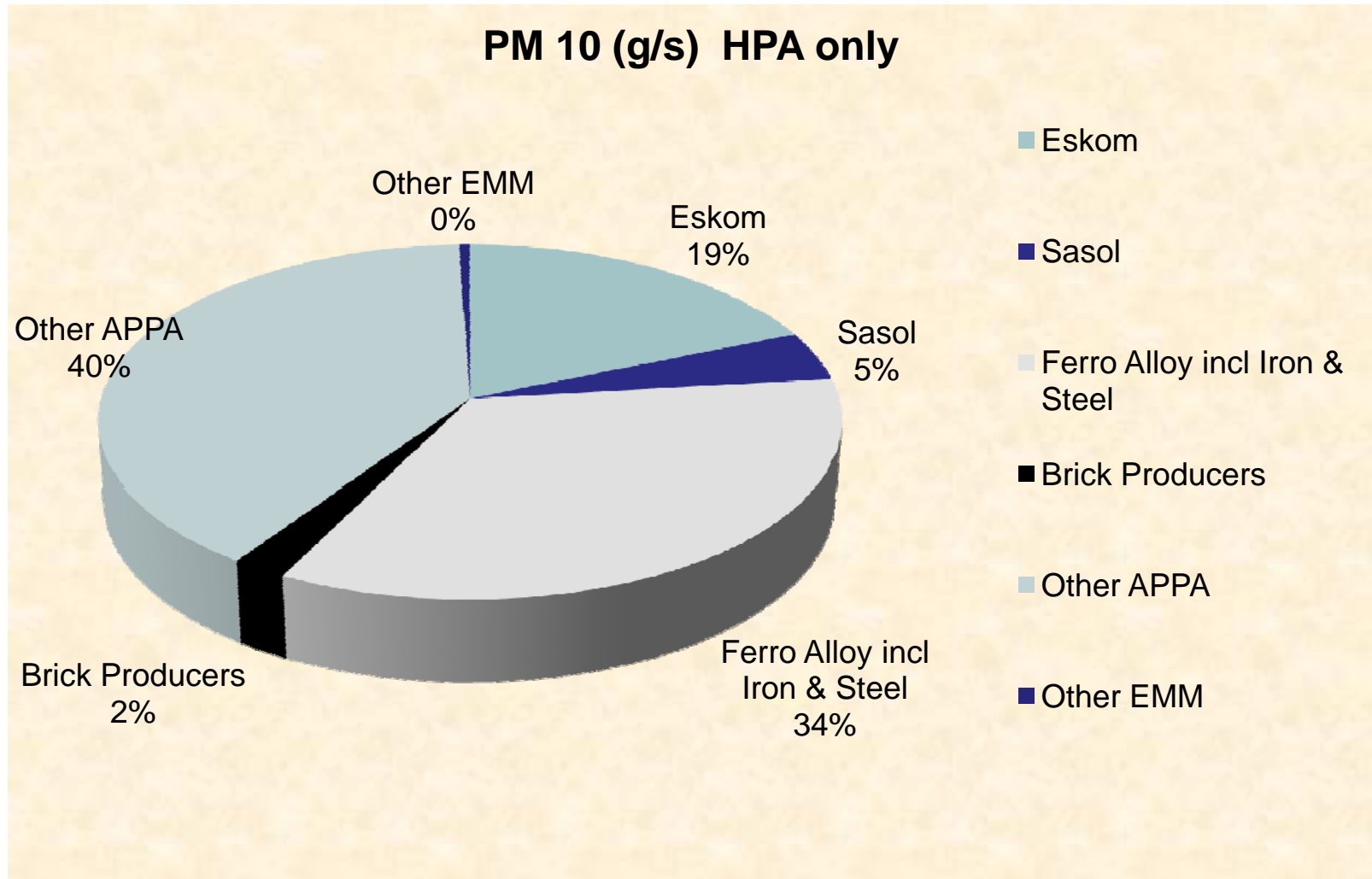


SO₂

Langverwacht



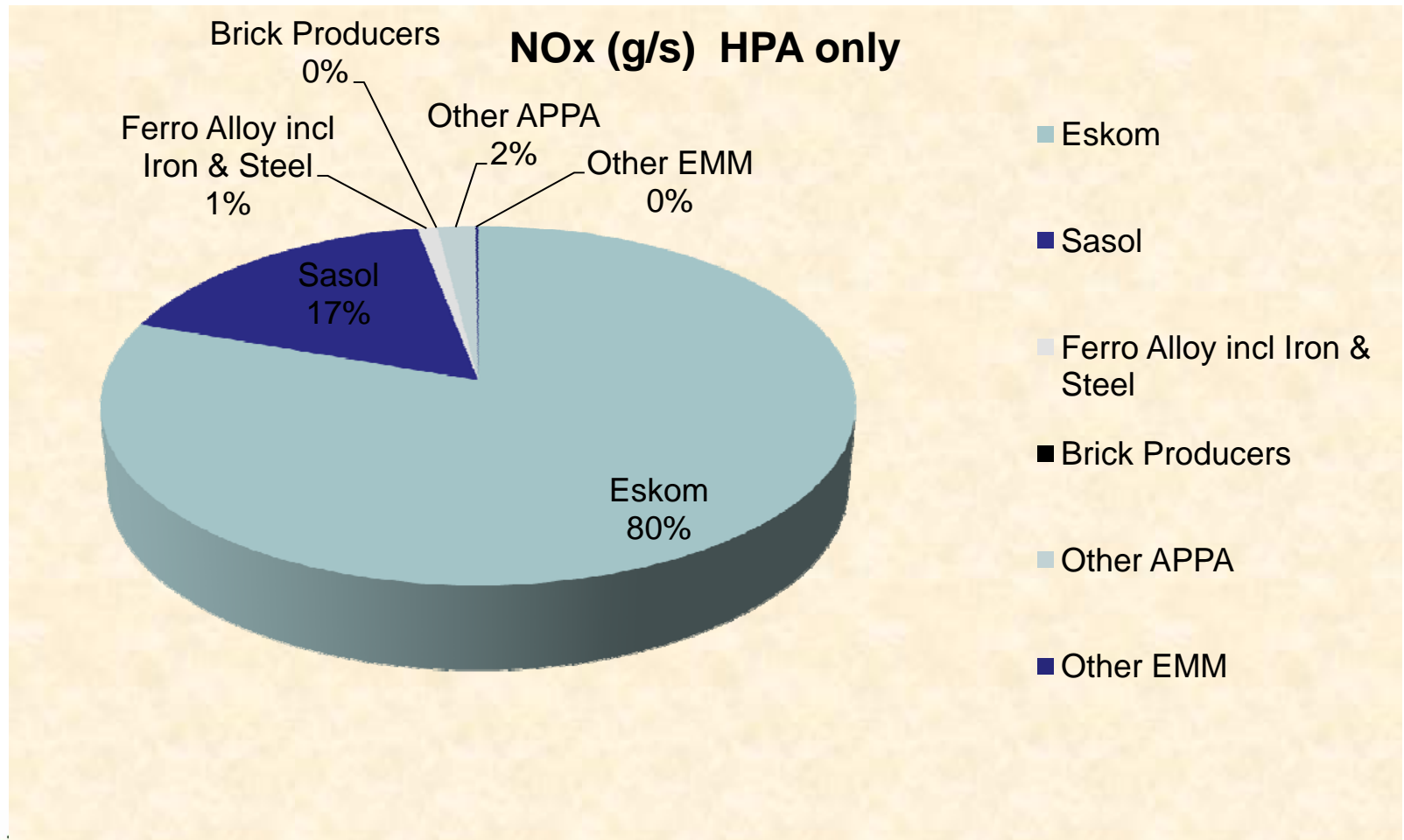
Industrial Source apportionment PM10 (g/s)



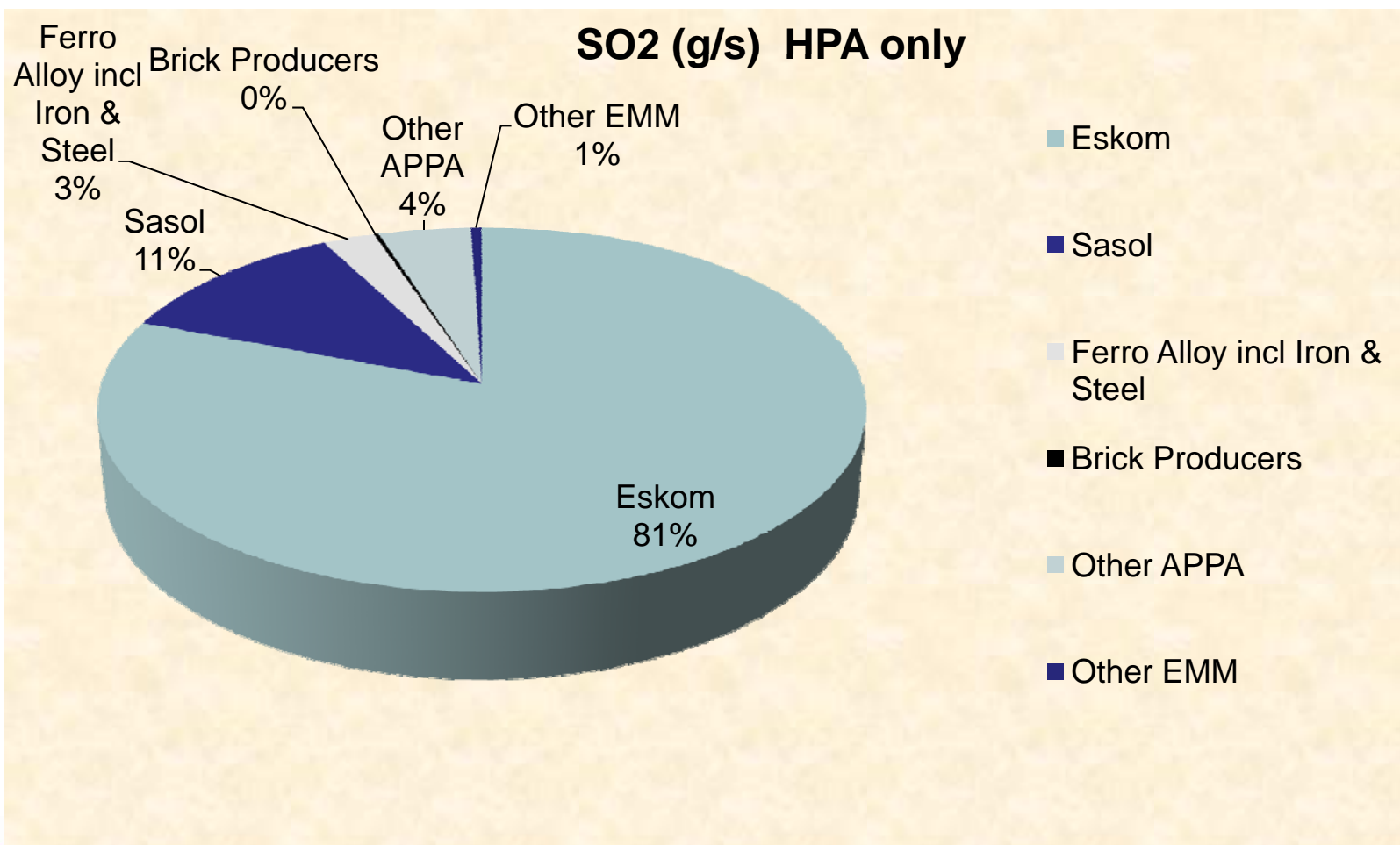
environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

Source apportionment Nox (g/s)



Source Apportionment SO₂ (g/s)



Summary

- Capacity
 - Limited to NO₂, O₃, PM₁₀, SO₂
 - Industrial and power generation focused siting
- Seasonal trends required for O₃, PM₁₀
- Coverage needs in Witbank, Middelburg, Delmas & Lekwa



Summary (2)

- Other studies
 - Elevated benzene in places on the HPA
 - Modelled ambient Hg: very low concentrations
 - Regional O₃: elevated across Highveld, maximum's well removed from source areas



THANK YOU



environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA