



URBAN INDUSTRIAL PARTICULATE MATTER

Are our exposure monitoring methods effective?

1. INTRODUCTION

- PM_{10} and $PM_{2.5}$ are recognised as key pollutants that negatively affect human health and life expectancy (WHO, 2002).
- PM_{10} and $PM_{2.5}$ are particulate matter with an aerodynamic diameter of 10 μm and 2.5 μm respectively.
- Dustfall is used as an air quality proxy in South Africa despite being known to be a poor PM_{10} exposure indicator. If dustfall rates are exceeded, an air quality officer can mandate that active PM monitoring take place (NEMAQA, 2004).
- Industrial and residential dustfall rate: 1200 $mg/m^2 \cdot day$ and 600 $mg/m^2 \cdot day$ respectively (NEMAQA, 2004).
- Dustfall is measured using crude ASTM D1739 method: a sampler bucket replaced every month.

Table 1: Annual average and 24-hour average WHO and SA legislative limits. Four 24-hour exceedances are allowed per year.

Standard	Annual average [$\mu g/m^3 \cdot year$]	24-hour average [$\mu g/m^3 \cdot 24h$]
World Health Organisation	20	50
South African legislation	40	75

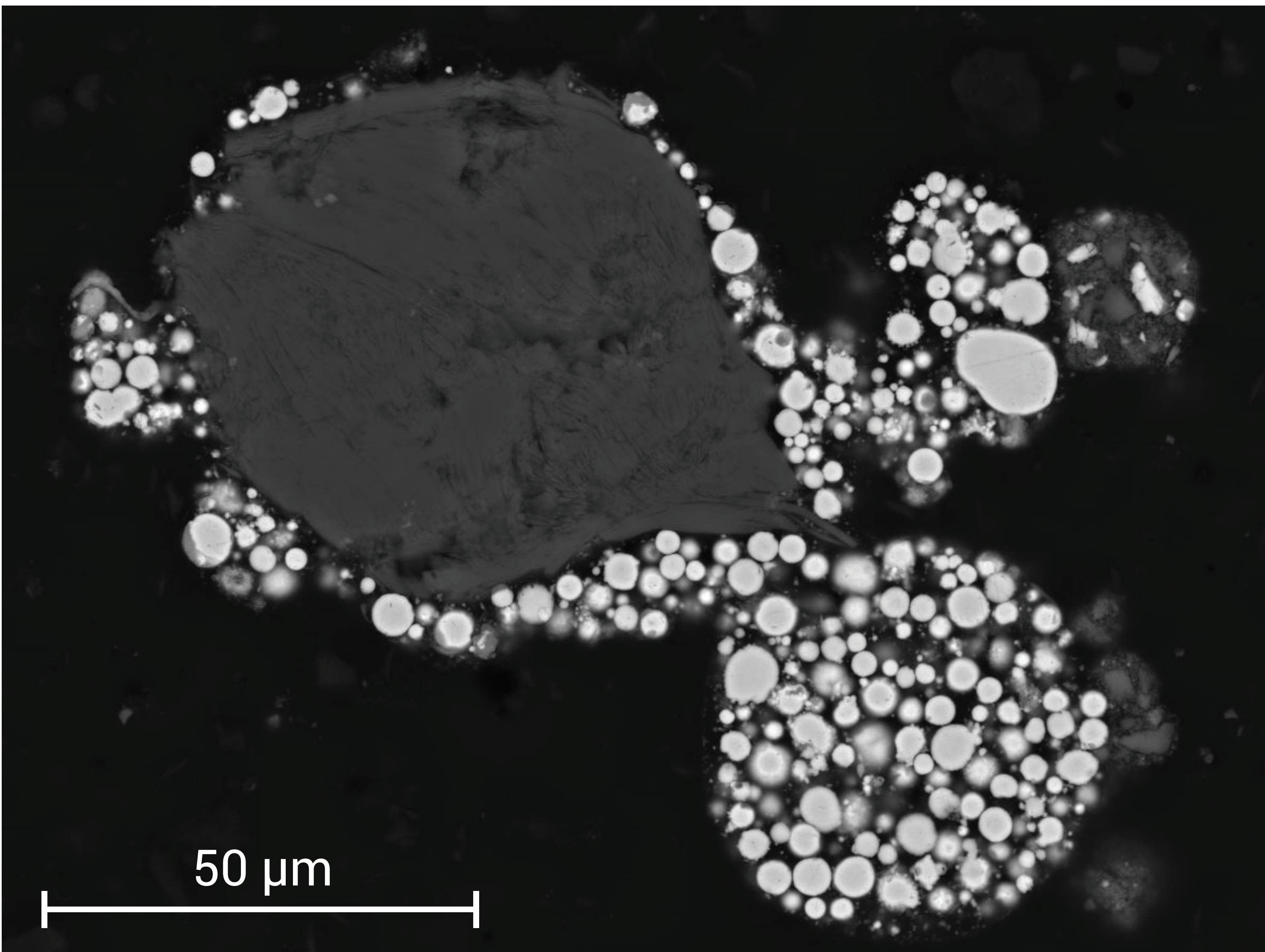


Figure 1: Zinc oxide cluster (bright circles) and silica shard (darker oval) BSE image captured in QEMSCAN analysis, scale shown.

2. OBJECTIVES OF STUDY

- Measure dustfall rates and PM_{10} concentrations on an urban industrial site in Cape Town.
- Determine the size, shape and mineralogy of dust on site to determine provenance and potential health effects.
- Determine suitability of two monitoring methods at showing ambient air quality where it is potentially compromised.

3. METHOD

- Measured dustfall rates using ASTM D1739 method and PM_{10} concentrations using EN12341 method.
- Size, shape and mineralogy of dust collected was analysed using computer controlled SEM-EDX.

4. RESULTS

- Two 24-hour PM_{10} limit exceedances recorded, no industrial dustfall rate exceedances recorded.
- Quartz, feldspar, micas, aluminosilicates, iron oxides and zinc oxides identified in dustfall samples.
- Less than 10% of area analysed from dustfall samples was PM_{10} , most PM_{10} was angular.

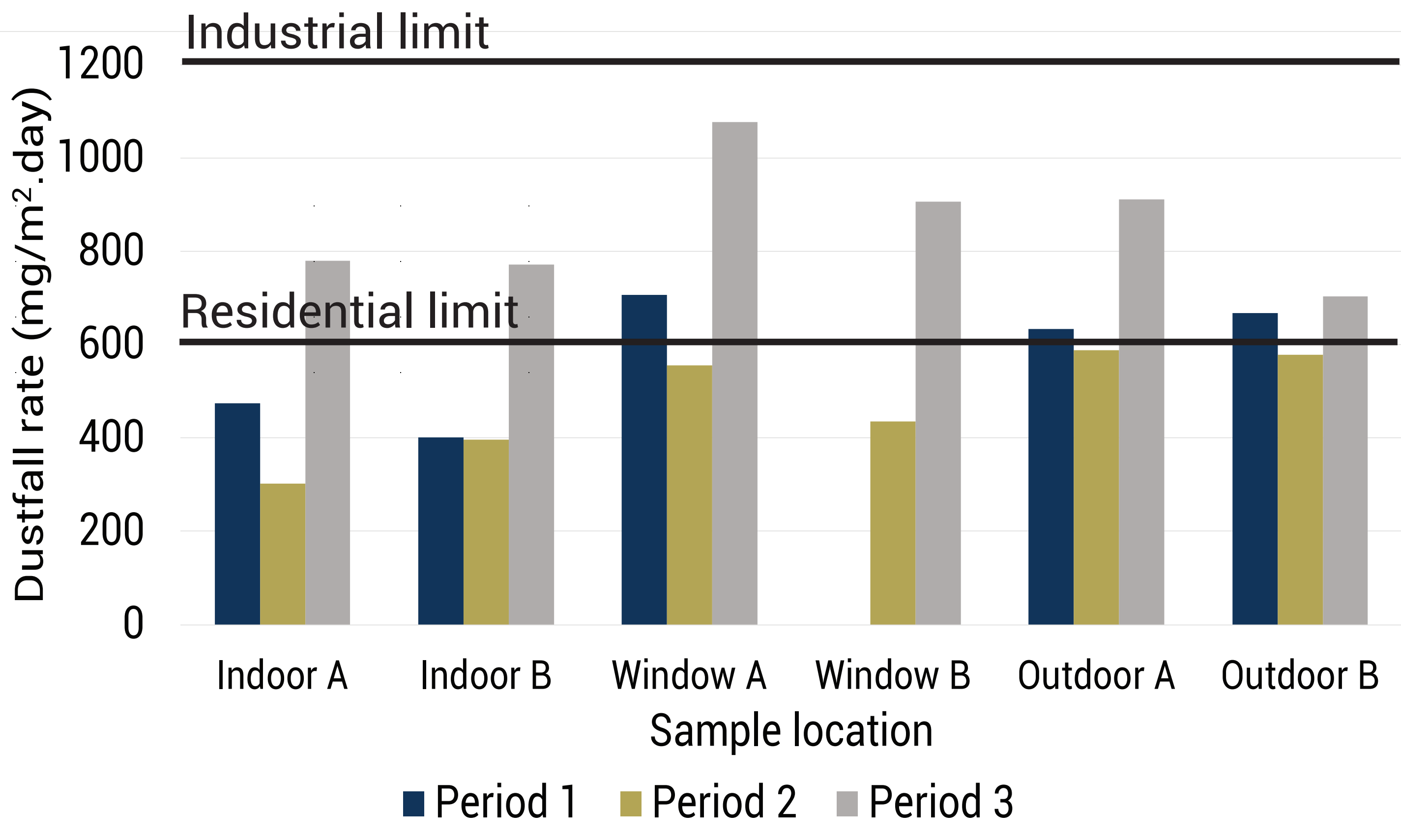


Figure 2: Dustfall rates sampled at three location on-site over six weeks. Each period represents two weeks.

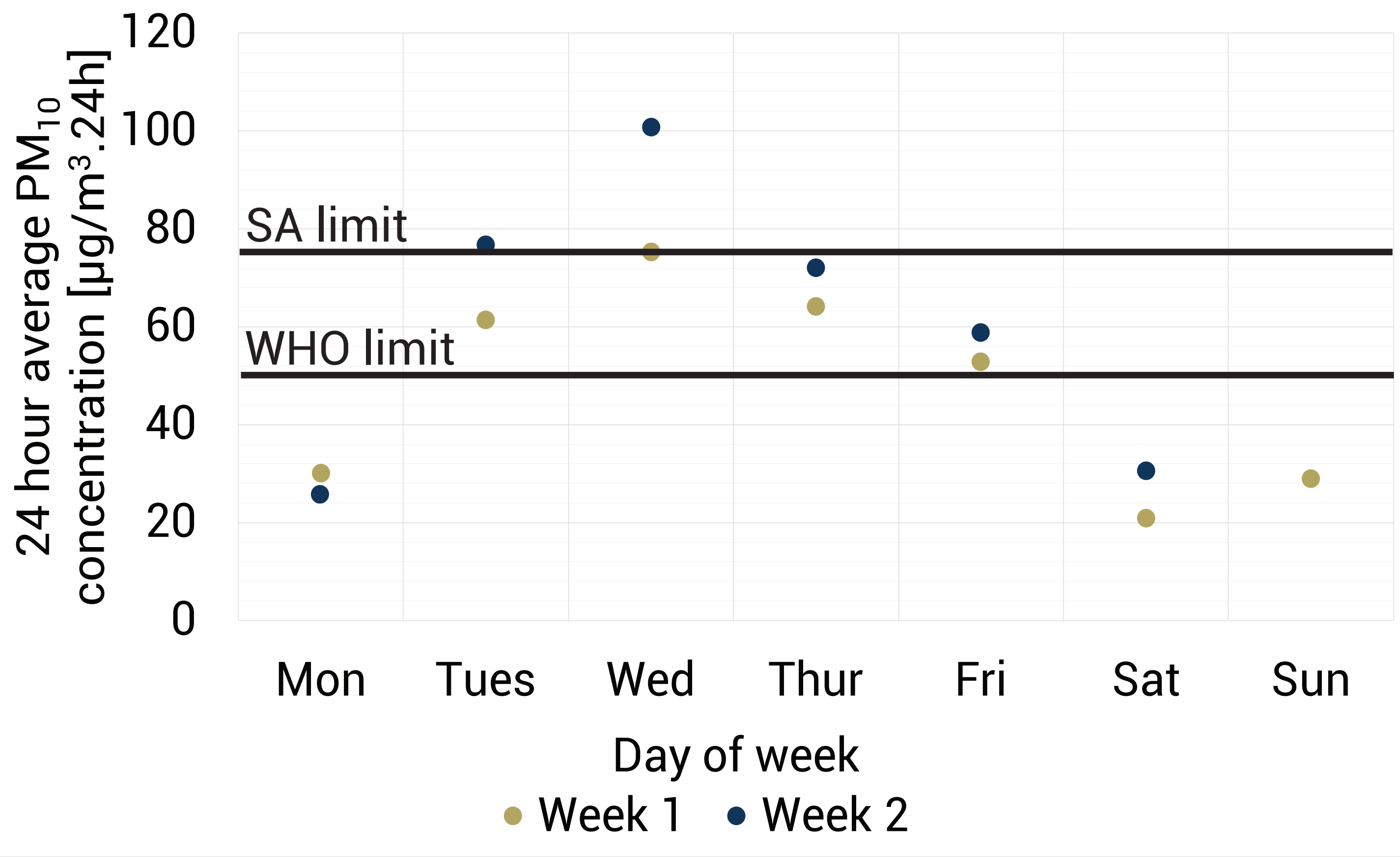


Figure 3: 24-hour average PM_{10} concentrations recorded over two weeks on-site.

5. CONCLUSIONS

- Differences in exceedances show dustfall monitoring method did not show potential compromised air quality.
- Both naturogenic and anthropomorphic dust sources identified. PM_{10} samplers are expensive to implement. New, low-cost dust sensor options should be investigated for this.

6. REFERENCES

Minister of Water and Environmental Affairs, 2004. Air Quality Act. Pretoria: Republic of South Africa.
WHO, 2002. World Health Report: 2002, Geneva: World Health Organisation.

