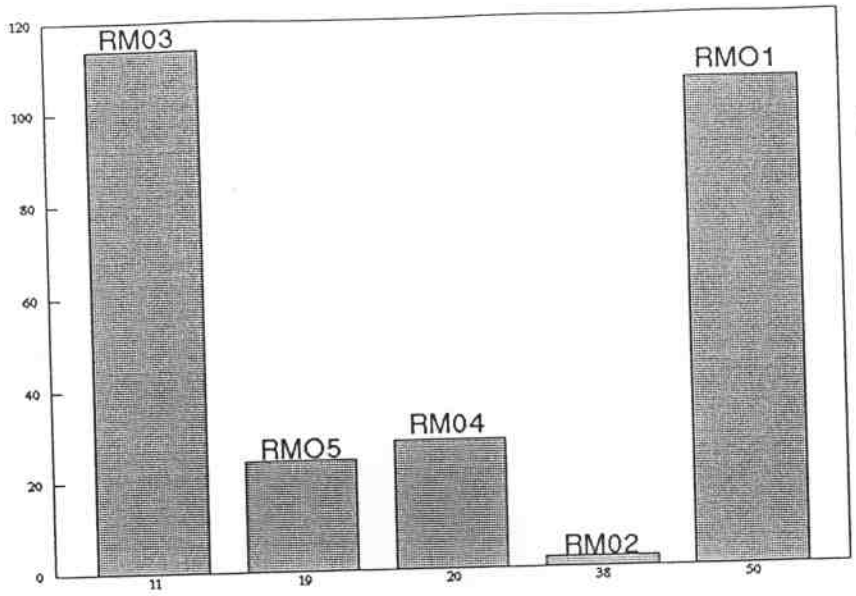
Table 2: Results of the 1991/92 Benzene Monitoring Programme (continued)

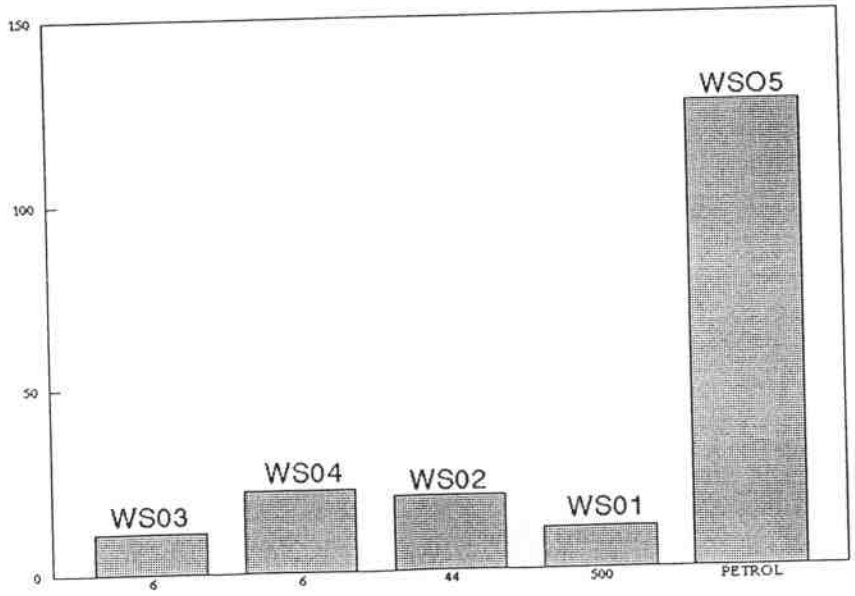
Borough	Site Code	Type	Dist From Road (M)	Average Benzene Concentrations $\mu g\ m^{-3}$					
RICHMOND				17.06.91-03.07.91	29.01.92-13.02.92	25.03.92-09.04.92			
	RM01	Background	50	4	309	6			
	RM02	Background	38	5	*	2			
	RM03	Roadside	11	3	318	21			
	RM04	Background	20	7	69	8			
	RM05	Background	19	5	56	10			
WANDSWORTH				27.06.91-11.07.91	30.09.91-14.10.91	09.01.92-23.01.92	28.04.92-12.05.92		
	WS01	Background	500	21	8	8	6		
	WS02	Background	44	7	44	17	12		
	WS03	Roadside	6	5	9	16	14		
	WS04	Roadside	6	5	26	25	30		
	WS05	Petrol Station	44	5	13	480	5		
WESTMINSTER				23.07.91-07.08.91	19.06.91-09.07.91	24.01.92-10.02.92	24.03.92-14.04.92		
	WM01	Background	12	2	4	78	6		
	WM03	Background	100	2	4	14	7		
	WM04	Background	20	18	7	301	10		
	WM05	Roadside	10	2	7	56	10		

2g



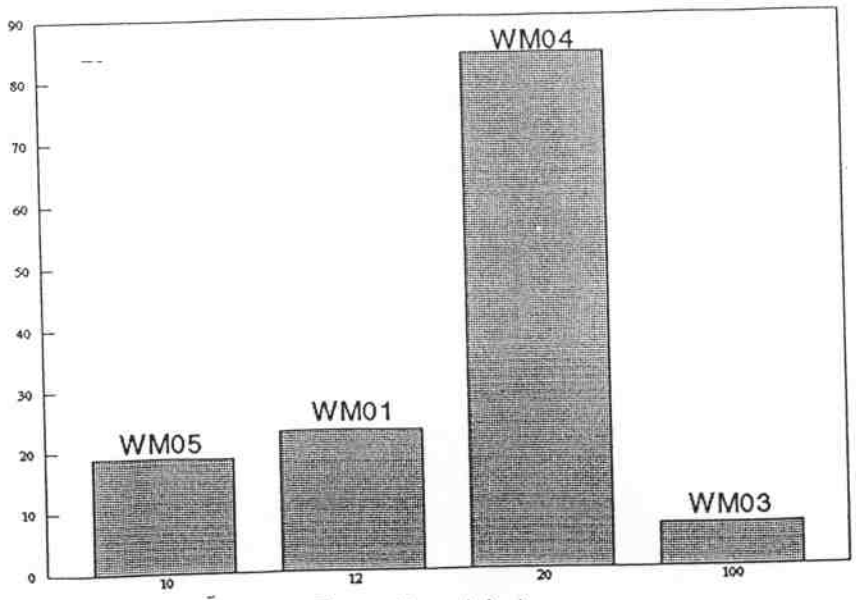
RICHMOND

2h



WANDSWORTH

2i



WESTMINSTER

Benzene Concentration (ug/m3)

Distance From Road (m)

9.0 SUMMARY AND CONCLUSIONS

9.1 During the 1991/92 Benzene Monitoring Programme levels of benzene were monitored at 43 sites across the Greater London Area. These sites included urban background locations, thus allowing the levels of benzene to which the general public are exposed for significant periods of time to be quantified. Monitoring sites also included roadside and petrol station locations, as motor vehicles are a major source of atmospheric benzene, with significant evaporative emissions resulting from the handling, distribution and storage of petrol. The inclusion of monitoring sites at these latter two locations allowed emissions of benzene from point sources to be quantified and the influence of these emissions on urban background concentrations to be assessed.

9.2 No air quality standards exist for benzene. The WHO states that no safe level can be recommended as benzene is a human carcinogen, and as such is strongly linked to the formation of cancer.

9.3 In the majority of boroughs, maximum benzene concentrations were recorded at roadside and petrol station locations. These results are consistent with road traffic and petrol being significant sources of atmospheric benzene. In several boroughs benzene concentrations declined sharply with distance from the nearest busiest road, further emphasising the importance of road traffic as a source of benzene. Ambient benzene levels are influenced by several factors, for example traffic flow, meteorological conditions and height of sampler. This partially explains why there appeared to be little influence of road traffic on benzene levels in at least two boroughs.

9.4 During the 1991/92 period, air quality in terms of benzene concentration was poorest in the Borough of Greenwich with the best air quality being recorded in the Royal Borough of Kingston upon Thames.

9.5 The levels of benzene recorded in this study are generally consistent with previous measurements made in the Greater London area and with concentrations recorded in other industrialised cities in Europe.

9.6 Using the WHO lifetime risk calculated for benzene it is estimated that exposure to the mean urban background concentration of 34 ug m^{-3} recorded in the 1991/92 survey would result in the occurrence of 13 new cases of cancer per year in the Greater London Area. Comparison with acceptable risk levels outlined by authoritative organisations indicates this incidence of new cancer cases is unacceptably high. However, these risk levels assume a linear dose/risk relationship derived from occupational exposure to very high benzene concentrations. This assumption may not be justified, therefore no firm conclusions can be made regarding effects of ambient benzene levels on human health.

9.7 There has been no legislation concerned specifically with the control of benzene emissions, but there have been several EC directives which aim to curb VOC emissions in general. However, it seems unlikely that urban benzene concentrations in the Greater London Area will fall to more acceptable levels in the short term, emphasising the need for continued monitoring in the future.

10. REFERENCES

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