

## Distribution of PCDD/F in the vicinity of the Hazardous Waste Incinerator at Schwabach

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### Abstract

The distribution of PCDD/F in the surrounding area of the Hazardous Waste Incinerator at Schwabach has been determined. The PCDD/F concentrations measured in soil, grass and lettuce samples are compared to modeling studies realized by the TÜV Bayern.

### Introduction

Polychlorinated dibenzo-p-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs) are ubiquitous in the environment (1). Waste incineration is one of the well-known PCDD/F sources.

In order to quantify the emission of PCDD/F from the Hazardous Waste Incinerator at Schwabach and the additional impact on the surroundings, PCDDs and PCDFs have been determined in the flue gas as well as in soil, grass and lettuce samples. The PCDD/F concentrations - expressed in 2,3,7,8 TCDD toxicity equivalents (TEQ) - in environmental samples will be compared with the immissions forecasted by modeling studies realized by the TÜV Bayern (2).

### PCDD and PCDF measurements

The PCDD/F concentration in the pure flue gas after purification in the electrostatic precipitator and flue gas scrubber was determined by the GfA, Münster-Roxel, to be about 2.91 ng TEQ/m<sup>3</sup> (ideal incineration conditions) to 11.31 ng TEQ/m<sup>3</sup> (unfavourable incineration conditions).

The soil and plant samples were taken, prepared, and analyzed by two different commercial laboratories, P1-18 by the GfA, Münster-Roxel (3); B1-10 by Ökometric GmbH Bayreuth (4).

The occurrence of PCDD/F in soil, grass and lettuce was determined at the down-wind-side (P1-12, B1-10) and at the weather-side (P13-15) of the chimney. The locations of the sampling sites are shown in figure 1.

Soil samples of 0-30 cm depth were cored with a drill pipe. At locations P 2, P6 and P13 additional samples of the soil surface (0-2 cm) were analyzed.

The 2, 3, 7, 8 TCDD toxicity equivalents (ng TEQ/kg dry weight, according to BGA) obtained are summarized in table 1.

### Modeling Study

The impact of PCDD/F on the surrounding area was calculated by the TÜV Bayern. The modeling study is based on the "TA-Luft". The relationship between emissions of primary pollutants and the resulting immissions is described by the Gaussian plume model. An area with a radius of 2.5 km around the chimney (plume height about 50 m) is divided into squares of 500 x 500 metres.

The deposition on each screen dot is calculated in correlating emission data and meteorological variables. The thus predicted impact of PCDD/F on the surrounding area is demonstrated in figure 2.

### Discussion

The PCDD/F concentrations determined in soil and grass vary from 0.2 - 8.8 ng TEQ/kg with a mean value of about (2.3 ± 2) ng TEQ/kg, in soil-surface samples PCDD/F vary from 3.7 - 20.7 ng TEQ/kg (P2.2, P6.2, P13.2).

According to the modeling study by the TÜV, the maximum impact of PCDD/F is predicted in the area about 500 - 750 m north east of the chimney where the sampling-sites P3, P4, P5, P6, B6, and P12 (+ P18) are located.

Compared with other samples there is no significant deviation from the average concentration (in TEQ). Generally there is no obvious correlation between the predicted immissions and PCDD/F content determined in soil and grass.

### References

- (1) C.C. Davis et al., Environ. Sci. Technol. 23, 1061 - 63 (1989)
- (2) Gutachterliche Stellungnahme zu Fragen des Immissionsschutzes, TÜV Bayern, München 1990
- (3) Bestimmung von PCDF und PCDD in Bodenproben und Nahrungspflanzen aus der Umgebung der Sondermüll-Entsorgungsanlage des ZVSMM in Schwabach; Gesellschaft für Arbeitsplatz- und Umweltanalytik GbR (GfA), D-4400 Münster-Roxel, 1990
- (4) Bestimmung von PCDF und PCDD in Boden- und Grasproben aus der Umgebung der Sondermüll-Entsorgungsanlage des ZVSMM in Schwabach; Ökometric GmbH, D 8580 Bayreuth, 1990

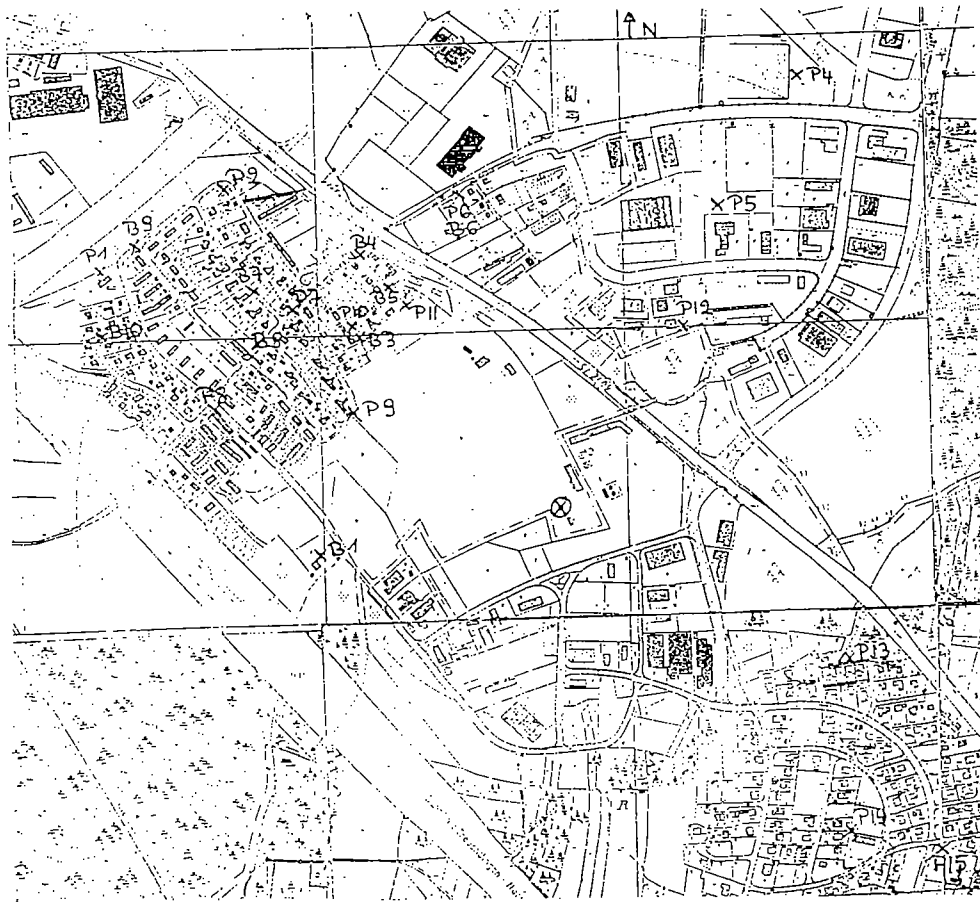


Figure 1:  
Location of the sam-  
pling sites in the  
surroundings of the  
HWI

⊗ chimney

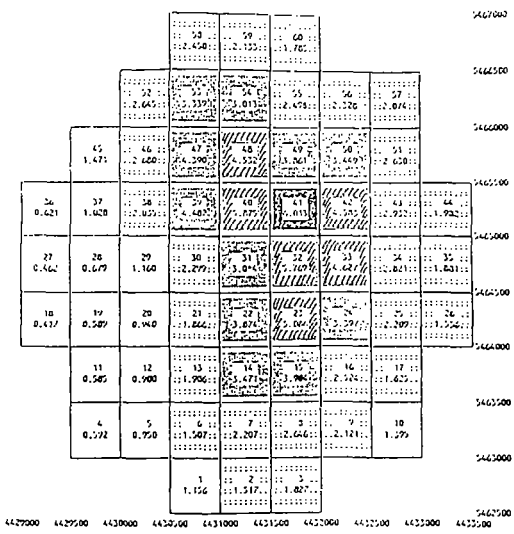


Figure 2: Predicted PM10/F deposition rate (PM10/F) calculated on urban air particulate matter (FPM (2))

maximum value: 6.01260 µg/m²/h \* (100%) \* = distance

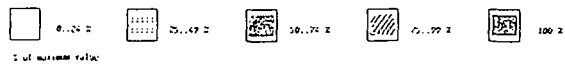


Table 1: 2, 3, 7, 8, TCDD toxicity equivalents in soil, grass and lettuce samples from the surroundings of the MC Schwabach (TEQ ng/kg dry weight, TEQ according to BGA standard)

location at a distance of:

sample	750 m					550 m					350 m from the chimney				
	P1	P2	P3	P4	P15	P5	P6	P7	P8	P14	P9	P10	P11	P12	P13
TEQ (ng/kg) soil (0-10cm)	2.2	4.3	0.2	1.5	1.1	0.2	4.1	1.7	1.1	1.1	2.1	2.3	3.1	0.6	4.4
TEQ (ng/kg) soil 0-2 cm		3.7	14.5												20.7
lettuce sample											P16	P17		P18	P19
TEQ (ng/kg)											0.5	1.0		1.3	2.4
sample	B10	B9					B6	B4	B7	B8		B1	B2	B3	B5
TEQ ng/kg soil	1.19	3.07					0.98	0.86	1.31	1.03		1.3	3.06	0.47	1.06
TEQ ng/kg grass	0.72	2.75					1.6	0.82	3.3	1.69		-	3.57	1.03	1.3