

# The Lancaster Environment Centre

## **Annual Report for 2006 on the UK Toxic Organic Micro-pollutants (TOMPs) Air Monitoring and Analysis Network**

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**Report to the Department for Environment, Food  
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Department of Environment, the Scottish  
Government and the Welsh Assembly**



## **Executive Summary.**

This report contains the 2006 ambient air concentration data for polychlorinated biphenyls (PCBs), polychlorinated-p-dioxins (PCDDs), polychlorinated dibenzofurans (PCDFs) from the Toxic Organic Micro-pollutants Monitoring Network (TOMPs) which is funded by the Department for Environment, Food and Rural Affairs (Defra) and the Devolved Administrations. In 2006, 37 PCBs congeners, 4 co-planar PCB congeners, 10 furans congeners and 7 dioxin congeners were the chemicals of interest for each sample. The TOMPs network includes sites in London, Manchester, Hazelrigg (Lancashire), High Muffles (North Yorkshire), Stoke Ferry (Norfolk) and Middlesbrough (North Yorkshire). The aim of the TOMPs network, which initiated in 1991, is to provide information on the ambient levels of organic pollutants in the UK through monitoring of air concentrations at six sites. The results and other related scientific work are used to inform policy development on exposure to persistent organic pollutants (POPs).

The TOMPs network provides data to inform the public of air quality, and information to support the development of policy to protect the environment. The specific aims of the TOMPs programme are:

- To identify sources of a range of POPs in the UKs atmosphere.
- To quantify sources that are regarded as potentially significant.
- To measure concentrations of TOMPs in ambient air in UK cities, in order to assess both human exposure and the relationship between source emissions and levels in the ambient atmosphere.

There are a number of international instruments aimed at reducing releases into the environment, such as the 1998 UN/ECE Protocol on Persistent Organic Pollutants made under the Convention on Long-Range Transboundary Air Pollution, and the Stockholm Convention (SC) on POPs. The TOMPs network provides valuable evidence for effectiveness of such agreements on the concentrations of a range of POPs in UK urban and rural ambient air.

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## 1. Introduction

Lancaster University (LU) has been involved in the TOMPs programme since its inception in 1990. LU currently manages the programme on behalf of Defra which operates six sites, three urban, two rural and one semi-rural. Atmospheric sampling is carried out at each site, collecting a biweekly sample which are bulked to provide quarterly data. These data are reported to Defra and published on the air quality data website [www.airquality.co.uk](http://www.airquality.co.uk). The other sites are maintained via sub-contracts; London AEA Energy and Environment, Auchencorth Centre for Ecology and Hydrology (CEH) and Weybourne University of East Anglia. The analytes currently quantified at Lancaster University are PCDD/Fs ('dioxins') and PCBs. PAHs are quantified and reported separately under another monitoring programme currently run by AEA Energy and Environment.

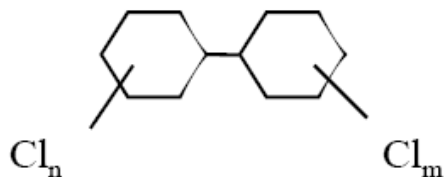
This annual report for polychlorinated biphenyls (PCBs) polychlorinated-p-dioxins (PCDDs), polychlorinated dibenzofurans (PCDFs) includes:

- Information on PCBs, PCDDs and PCDFs
- A summary of network operations including details of monitoring sites, equipment employed, details of site installations/removals, site calibration visits and equipment servicing and breakdowns
- A summary of the analytical procedure used to detect PCBs, PCDDs and PCDFs.
- Trends in estimated sources of PCBs, PCDDs and PCDFs in the UK
- Review of annual mean and quarterly concentration.

## 2. Background to PCBs, PCDDs and PCDFs.

PCBs were first synthesized in 1881 by Schmidt and Schulz but their commercial production only began in 1929 in USA (*Danse et al.*, 1997). They were marketed as mixed products under various trade names depending on the country where they were produced such as Aroclor (Monosanto, USA), Pheno-chlor and Clophen (Bayer, EU). Because of high chemical and thermal stability, electrical resistance, low or no flammability, PCBs had extensive applications. They have been used as dielectric fluids in capacitors and transformers, in plasticizers, adhesives, inks,

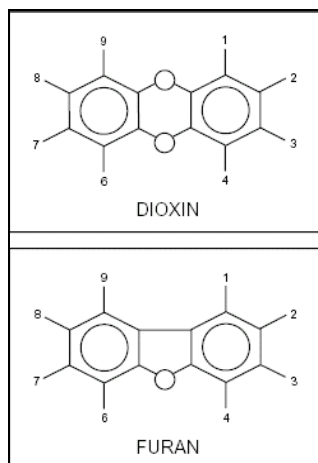
sealants and surface coatings (Eduljee, 1988; de Voogt and Brinkman, 1989; Harrad et al., 1994). Their basic structure is a biphenyl backbone with one to ten chlorine substituents and a general structure of  $C_{12}H_{10-n}Cl_n$  ( $n=1-10$ ) (Figure 2).



There are 209 different congeners with one to ten chlorines atoms attached. The International Council for the Exploration of the Seas (ICES) 7 PCB congeners generally reported in environmental samples are PCB 28 (2,4,4'-triPCB), PCB 52 (2,2',5,5'-tetraCB), PCB 101 (2,2',4,5,5'-pentaCB), PCB 118 (2,3',4,4',5-heptaCB), PCB 138 (2,2',3,4,4',5-heptaCB), PCB 153 (2,2',4,4',5,5'-heptaCB), PCB 180 (2,2',3,4,4',5,5'-heptaCB), although several dozen different congeners can be found in the environment.

Production of PCBs peaked in the 1960s in Europe and USA and terminated in the mid 1970s, when they were ultimately banned in the late 1970s/early 1980s (de Voogt and Brinkman, 1989). The most recent inventory of PCB production estimates the cumulative global production of PCBs at 1.3 million tonnes (Breivik et al., 2002). Approximately 97% of this has been used in the Northern Hemisphere, mostly between 30 °N and 60 °N (Breivik et al., 2002). Before the ban, PCBs had entered the environment through point and diffusive sources such as landfill sites, accidental releases/spillages via leaking during commercial use of electrical equipment and transformer and capacitor fires, incineration of PCB waste etc. (de Voogt and Brinkman, 1989; Danse et al., 1997). Current atmospheric levels of PCBs in the environment are due to on-going primary anthropogenic emissions (e.g. accidental release of products or materials containing PCBs), volatilization from environmental reservoirs which have previously received PCBs (e.g. sea and soil) or incidental formation of some congeners during combustion processes (Breivik et al., 2002).

The term Dioxin is commonly used to refer to a family of toxic chemicals that all share a similar chemical structure and a common mechanism of toxic action. This family includes seven of the polychlorinated dibenzo dioxins (PCDDs), ten of the polychlorinated dibenzo furans (PCDFs) and twelve of the polychlorinated biphenyls (PCBs). PCDDs and PCDFs are not commercial chemical products but are trace level unintentional byproducts of most forms of combustion and several industrial chemical processes. PCBs were produced commercially in large quantities until production was stopped in 1977. Dioxin levels in the environment have been declining since the early seventies and have been the subject of a number of federal and state regulations and clean-up actions; however, current exposures levels still remain a concern.



### 3. TOMPs sites operating in 2006

In 2006 the TOMPs programme operated 6 sites:

London	urban site established in 1991
Manchester	urban site established in 1991
Hazelrigg	semi-rural site established in 1992
High Muffles (North Yorkshire)	rural site established in 1999
Stoke Ferry	rural site established in 1997
Middlesbrough	urban site established in 1991

The sites consist of three urban locations in London (LON), Manchester (MAN), and Middlesbrough (MB), three rural-semi rural sites at High Muffles (HM, North Yorkshire), Stoke Ferry (SF) and at Hazelrigg (HR, Lancashire). At the rural and semirural sites, samplers are located away from major roads, whereas at the urban sites, samplers are located in the city centre on the roof of a building. The locations of the current samplers in the network are shown in Figure 1.



Figure 1. Locations of the sampling sites.

#### 4. Network sampling operations

The sampling modules for the Andersen GPS-1 sampler are prepared just prior to deployment which involves disassembling, inspecting and cleaning the modules. Modules are stored frozen in sealed bags prior to deployment. All parts of the modules that come into contact with the glass fibre filter (GF/A Whatman ) and polyurethane foam plugs (PUFs, Klaus Ziemer GmbH Langerwehe, Germany) are routinely solvent cleaned between each sample. In addition, the modules are fully disassembled and all parts thoroughly cleaned in solvent. The GF/As are pre-cleaned by baking out in a muffle furnace at 450 °C for 24 hours. They are then transferred to

aluminium foil packages (the aluminium foil has also been baked out) and stored sealed until they are used. PUFs and GF/As filters are regularly sent to AEAT, who manages the London site. The PUFs are prepared for all the sites from the same batches, by a rigorous pre-extraction procedure. This involved a soxhlet extraction in dichloromethane (DCM), with subsequent DCM removal in a solvent cleaned desiccator, maintained under vacuum. PUFs are also prepared to serve as field and laboratory blanks. The GF/As and PUFs are placed in the sampling modules using solvent cleaned stainless steel tongs and are exposed to the laboratory environment for the minimum amount of time possible.

The modules are changed every 14 days at all sites. In addition, sample information and temperature data are recorded, airflows adjusted, data loggers exchanged and preventative maintenance carried out when necessary. The time during which the sampler operates is recorded with a timer, and the flow rate determined using the flow venturi and MagnaHelic gauge. Each sampler is also fitted with a pressure transducer and a data logger that records the pressure drop during the sampling period, so that the sampling rate can be accurately determined. Log books are used to record sampling data at each site, but sampling data are also available electronically. The following are recorded routinely for each sample at each of the sites: start time, date, counter reading, MagnaHelic reading; stop time, date, counter reading, MagnaHelic reading; maximum, minimum and actual temperature (°C). Cross-checks are possible between the manually calculated air volume and the electronically calculated air volume. During each visit, the sampler, sampler platform and auxiliary pieces of equipment are checked for corrosion or breakages. A number of spare parts are routinely taken to each site and preventative or remedial maintenance carried out when necessary. Long life brushless motors are used to minimise samples lost through motor failures. A sampler calibration is performed once a year at each site.

## **5. Extraction and clean-up procedures**

Preparation of the samples takes place in a laboratory with restricted access. All glassware is thoroughly solvent cleaned prior to use and where necessary baked out at 450 °C overnight following established procedures. Each sample (gas + particle) was spiked with a recovery standard of  $^{13}\text{C}_{12}$ -labeled PCB congeners ( $^{13}\text{C}_{12}$  PCB 28, 52, 101, 138, 153, 180, 209) and an isotope dilution/recovery standard containing  $^{13}\text{C}_{12}$ -labelled PCDD/Fs. Samples are individually



extracted in a Buchi extraction unit for 18 hours with hexane and 4 hours with toluene. PAHs, PCBs and tri, tetra and penta PCDD/Fs are extracted in the hexane fraction. The remaining PCDD/Fs are extracted in the toluene fraction. The extracts are concentrated using rota-evaporation and nitrogen-evaporation. The hexane and toluene fraction are combined for each sample and extracts pooled before purification to obtain quarterly data (Jan-March (Q1), April-June (Q2), July-Sept (Q3), and Oct-Dec (Q4)). The 6 or 7 hexane fractions (depending on the length of each quarter) of each quarter are then bulked together. The samples are transferred into a 250ml round bottom flask using hexane. If necessary this can then be rotary evaporated to 2ml for splitting. The toluene fractions are then bulked in the same way using hexane. Each quarter will consist of 6-7 two week samples, representing approximately 4500 m<sup>3</sup> of air. The hexane fraction (50 ml) is then split: 10% (5mL) is used for the PAHs analysis, 40% (20 mL) for the analysis and 50% (25 mL) is archived. The toluene fraction (50 mL) is also split: 10% (5mL) is discarded, 40% (20 mL) is analyzed and 50% (25 mL) is archived. The toluene and hexane fractions for archive are combined in the same vials. The same is done for the fractions (40%) that will be analyzed. The extracts are then eluted through a multilayer 20 mm id acid silica column containing a small layer of sodium sulphate, 1 g activated silica (Merck Silica 60), 2 g of basic silica (Merck Silica 60), 1 g of activated silica (Merck Silica 60, 4 g of acid silica (Merck Silica 60), 1 g activated silica and a small layer of sodium sulphate (all baked at 450°C overnight), followed by an acid digestion concentrated H<sub>2</sub>SO<sub>4</sub>, for 2 days and a second multicolumn. The extracts are eluted through gel permeation columns containing 6 g of Biobeads SX 3 and concentrated to 100 µL. Each sample is then fractionated with a basic alumina column to obtain three fractions. Fraction 1 contained PCBs, Fraction 2 contained co-planar PCBs and Fraction 3 contained PCDD/Fs. Fraction 1 containing PCBs is solvent exchanged to 160 µL of dodecane (for urban site) and 80 µL of dodecane (for the more remote sites) containing PCB 30 [<sup>13</sup>C<sub>12</sub>] PCB 141 and [<sup>13</sup>C<sub>12</sub>] PCB 208 as internal standards. The PCB fractions are analyzed by gas-chromatography mass spectrometry (GC-MS) with an EI+ source operating in selected ion mode (SIM). Details of the instruments, temperature programme and monitored ions are given elsewhere (*Thomas et al., 1998 and Gouin et al., 2002*). Thirty-seven PCB congeners are constantly measured in all samples, but only the following PCB congeners are reported: PCBs 28, 52, 90/101, 118, 138, 153/132 and 180. Some congeners co-elute and are hence reported as

a pair, for example, 153/132. Fractions 2 and 3 are solvent exchanged to 15 µL of nonane containing an injection standard of <sup>37</sup>Cl-labeled 2,3,7,8-TCDD was added to both the PCDD/F. Analysis is performed on a Micromass Autospec Ultima HR-MS operated at a resolution of at least 10,000. Dioxins, furans and co-planar PCBs are generally found in mixtures containing several kinds of dioxins and dioxin-like compounds, each having its own degree of toxicity. To express the overall toxicity of such a mixture as a single number, the concept of “Toxic Equivalents” (TEQ) has been developed. The concentration of co-planar PCBs and PCDD/Fs are expressed in units of fgTEQm<sup>-3</sup>. The concentration in fgm<sup>-3</sup> is multiplied by the WHO Toxic equivalency factors (TEF) to obtain the final concentration in fgTEQm<sup>-3</sup>.

QA/QC A number of steps are taken to obtain data that would allow an assessment of the accuracy and reliability of the data. Recoveries are monitored by quantifying 7 <sup>13</sup>C<sub>12</sub>-labelled PCBs standards and they ranged between 70-110%. Recoveries are monitored by quantifying 20 <sup>13</sup>C<sub>12</sub>-labelled PCDD/F isotope dilution standards, using the injection standard as an internal standard. The average recoveries ranged between 61 and 101%. The criteria for the quantification of analytes are a retention time found within 2s of the standard, isotope ratio found within 20% of standard and a signal to noise ratio of at least 3. Analytical blanks, consisting of solvent are included at a rate of one blank for every 12 samples. The method detection limit was calculated as 3 times the standard deviation of the concentrations found in the analytical blanks. If the concentrations in the blanks are below the instrumental detection limit, then the method detection limit is defined as equal to the instrumental detection limit. All results are blank corrected using the concentration of the field blanks. Field blanks are produced for each site and each quarter and they are used to calculate method detection limits (MDLs). When compounds are not detected in the field blanks, laboratory blanks produced for each quarter and are used to estimate MDLs.

## **6. Data storage.**

The data are reported to DEFRA and published on the UK air quality website ([www.airquality.co.uk](http://www.airquality.co.uk)). Archived samples for each year (50% of the samples) are stored in the freezer in the laboratory at Lancaster University. More information can be found at:

## 7. RESULTS FOR YEAR 2006

Table 1 contains information on the bulked air volume (in m<sup>3</sup>) and the number of samples bulked for each site and each quarter in 2004. The bulked air volume is obtained by summing the volume (in m<sup>3</sup>) obtained from each biweekly sample taken during the quarter (usually 6-7 samples, depending on the sampling schedule). The aim is to obtain an average volume of 500-700m<sup>3</sup> for every two week sampling period to avoid breakthrough of chemicals during sampling and to ensure the collection of a sufficient level of chemicals within the samples that can be analytically detected. Consequently, this leads to a total volume per quarter (bulked volume) of approximately 2500-5000 m<sup>3</sup> (see Table 1). Samplers at all sites were calibrated once a year in the period (April-June).

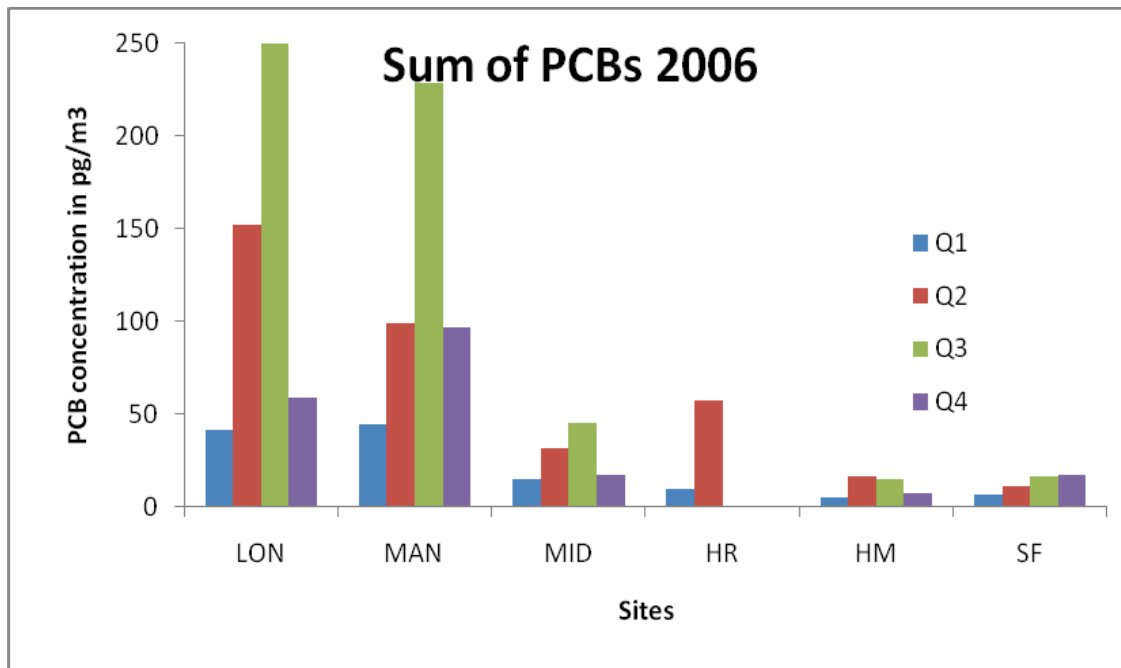
**Table 1.** Summary of the bulked air volumes and number of samples for each quarter at all sites in 2006.

		LON	MAN	MID	HM	SF	HR
<b>Bulked Air Volumes m<sup>3</sup></b>	<b>Q1</b>	4583	4444	4516	4581	5037	2849
<b>N<sub>o</sub> of samples</b>		7	6	6	6	7	6
<b>Bulked Air Volumes m<sup>3</sup></b>	<b>Q2</b>	4521	4684	4624	3926	4125	2609
<b>N<sub>o</sub> of samples</b>		6	6	6	6	6	6
<b>Bulked Air Volumes m<sup>3</sup></b>	<b>Q3</b>	3845	4499	5333	4449	4703	5404
<b>N<sub>o</sub> of samples</b>		6	6	6	6	6	6
<b>Bulked Air Volumes m<sup>3</sup></b>	<b>Q4</b>	5593	5334	5362	5547	4236	3905
<b>N<sub>o</sub> of samples</b>		7	7	7	7	7	7

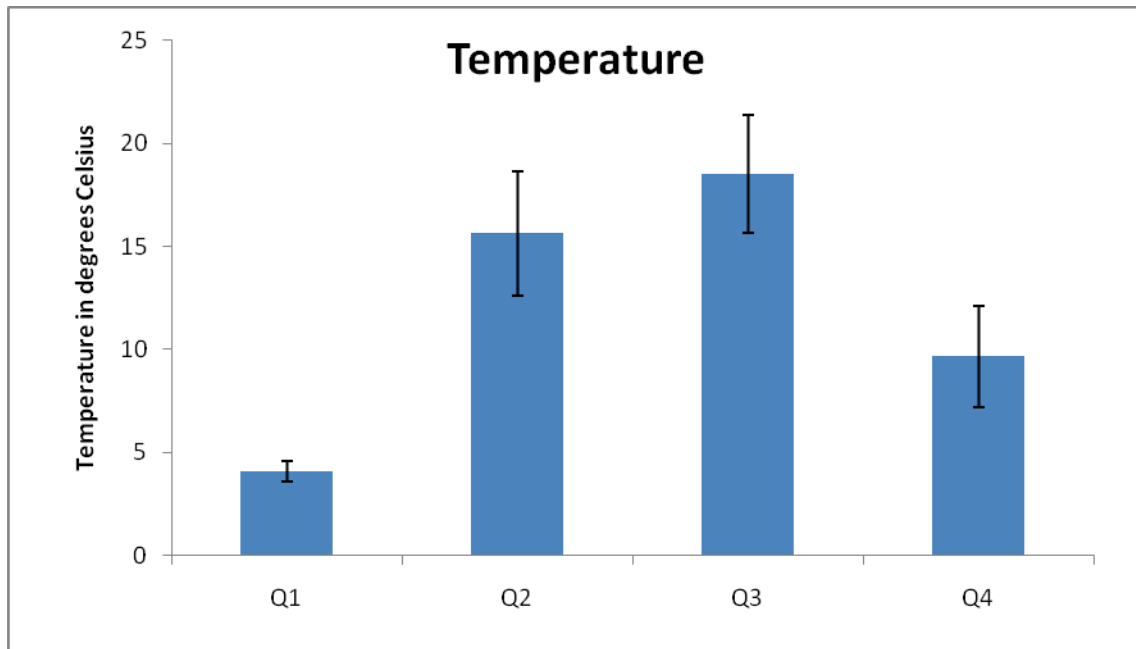
### PCBs

The measured concentrations in the two big cities, London and Manchester continue to be higher comparing to the remote ones (> 100 pg/m<sup>3</sup>). The average concentration in MID (27.3 pg/m<sup>3</sup>), although it is an urban area were far lower than in London and Manchester and slightly higher

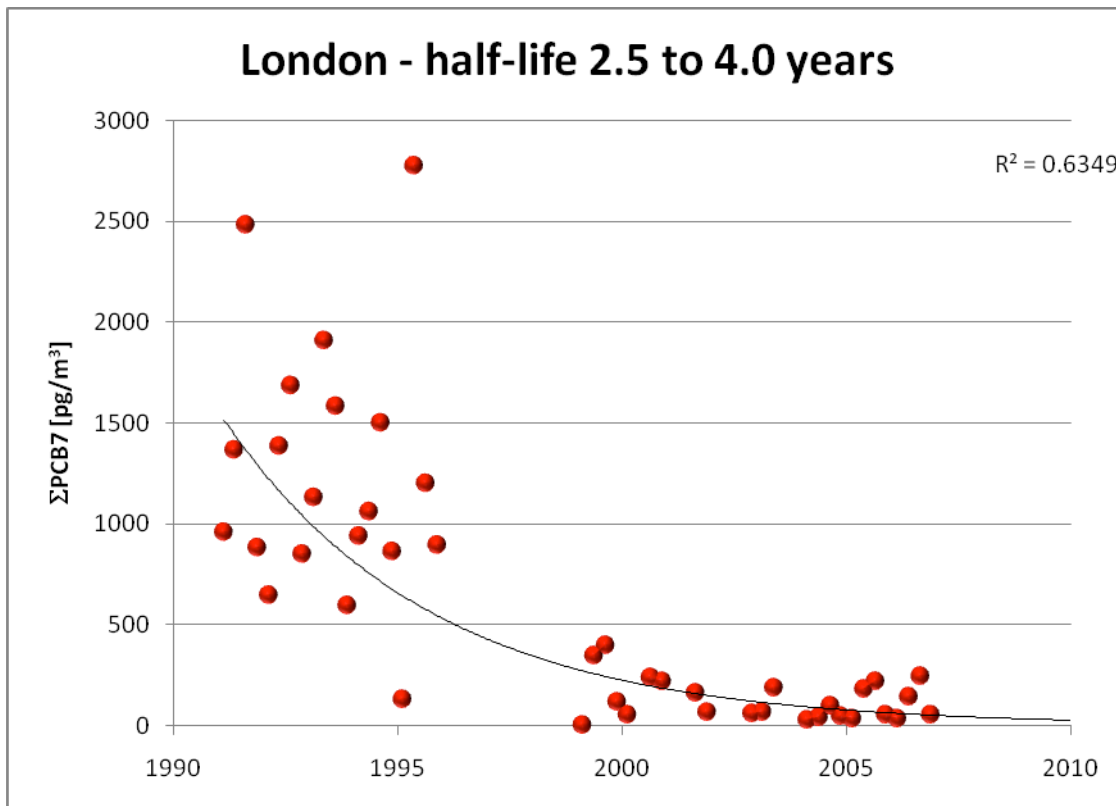
then in the three suburban - rural sites (~ tens of  $\text{pg}/\text{m}^3$ ). Middlesbrough has always displayed these range of PCB concentrations since 2004. The average PCB concentrations at all sites is statistically similar to those measured in 2005. In all sampling sites, the highest concentrations were observed during the second and the third quarters of the year, therefore the warmer period (Figure 2 and 3). Sample at Hazelrigg from Q3 and Q4 were impossible to quantify due to interferences caused by turmac work at the site. Interferences caused by turmac work at hazelrigg could not be removed by clean up methods from the samples of Q3 and Q4 2006 leading to instrumental analytical problems. Therefore, it was not possible to quantify PCBs in those samples.



**Figure 2.** Sum of PCB concentrations at all sites for all quarters in 2006.



**Figure 3.** Average temperature for all quarters in 2006.



**Figure 4a.**  $\Sigma_7$ PCB data for the London TOMPs site

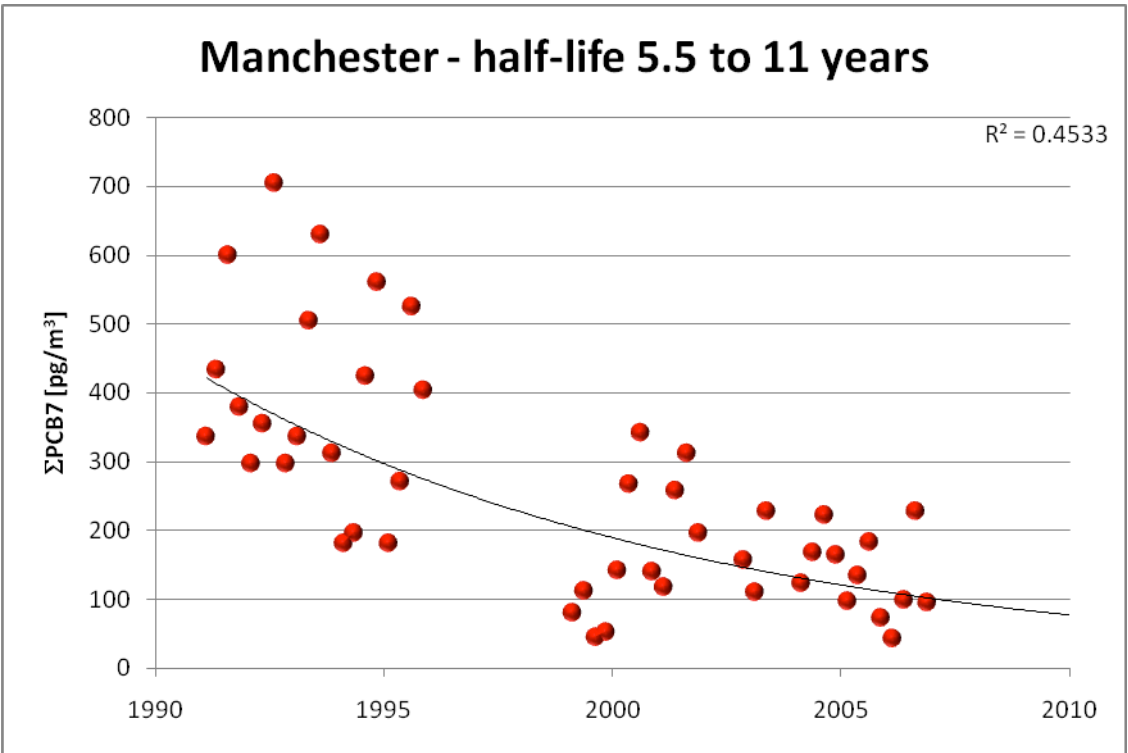


Figure 4b. Σ<sub>7</sub>PCB data for the Manchester TOMPs site

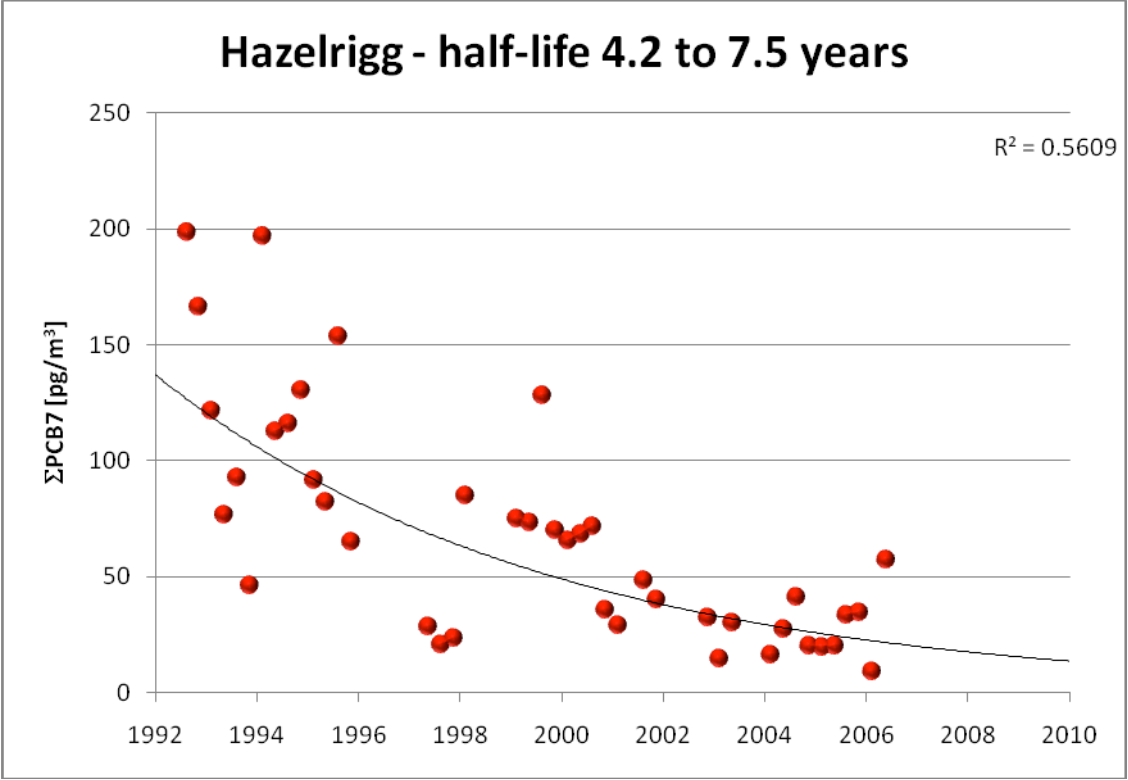
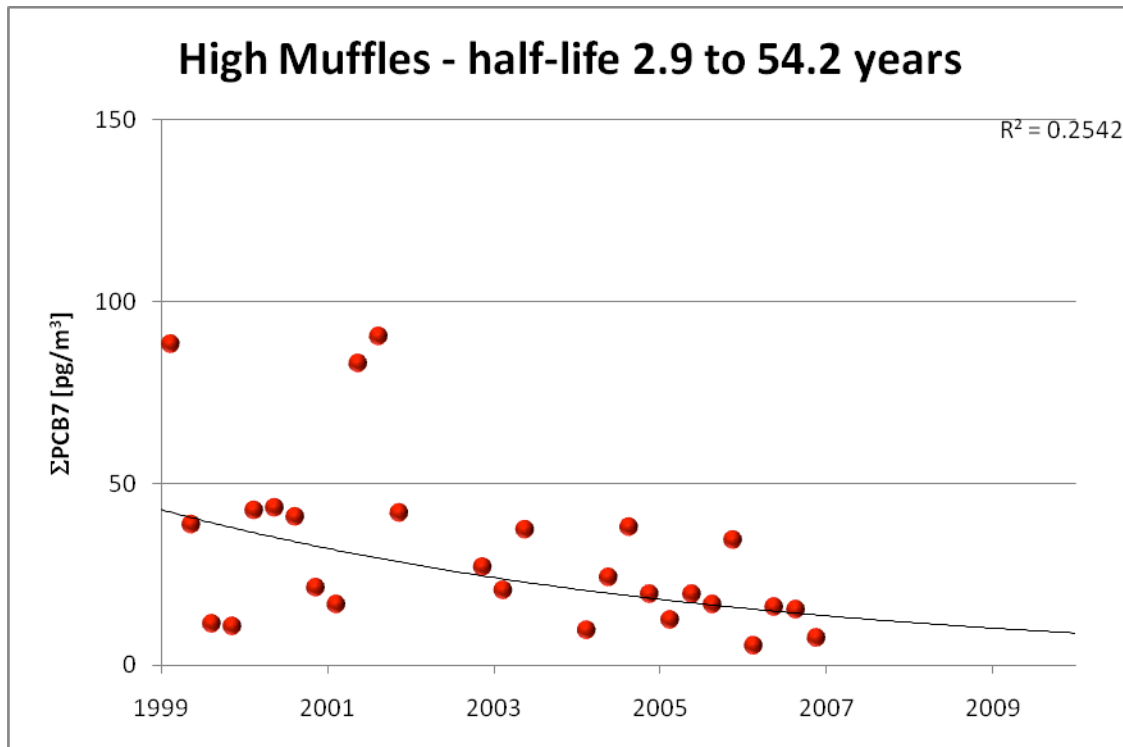


Figure 4c. Σ<sub>7</sub>PCB data for the Hazelrigg TOMPs site



**Figure 4d.**  $\Sigma_7\text{PCB}$  data for the High Muffles TOMPs site



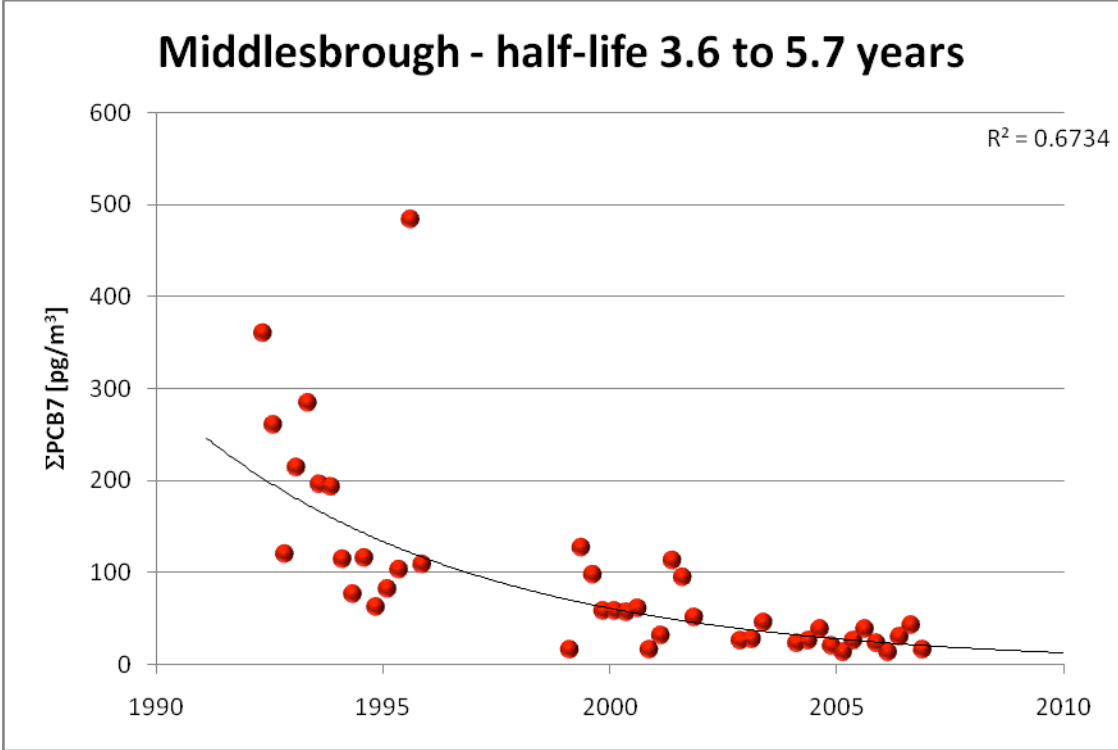
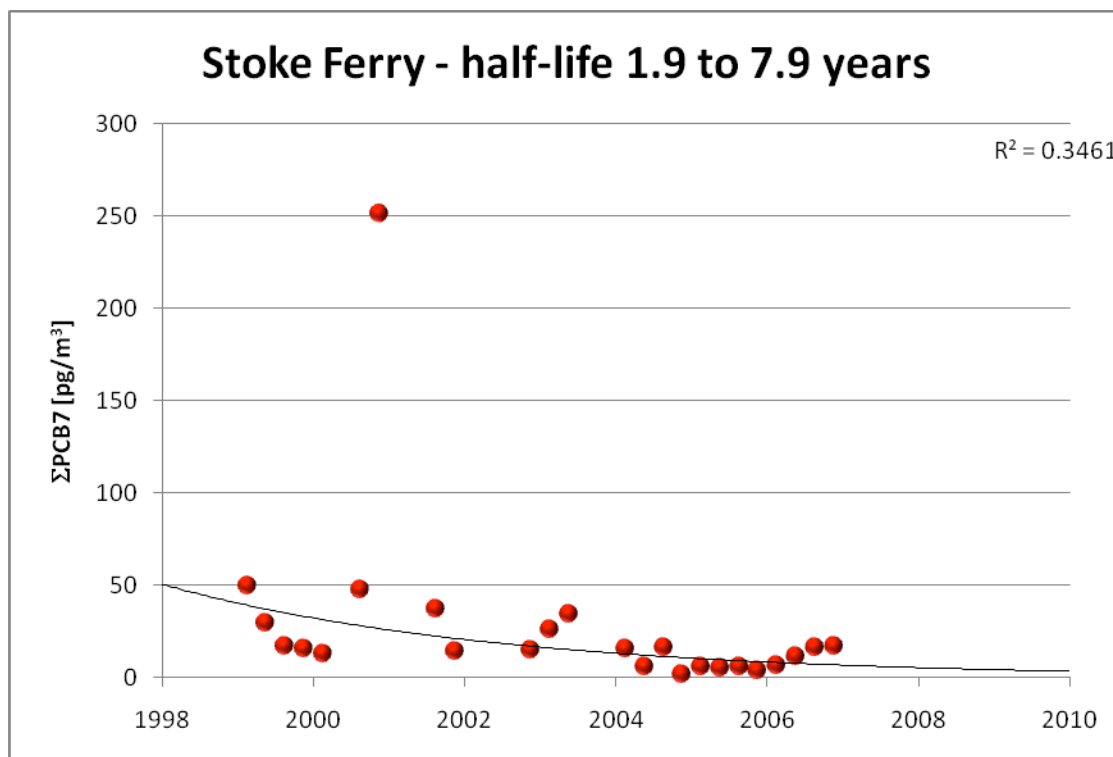


Figure 4e.  $\Sigma_7$ PCB data for the Middlesbrough TOMPs site



**Figure 4f.**  $\Sigma_7$ PCB data for the Stoke Ferry TOMPs site

The concentration of PCBs in the atmosphere is controlled by a range of factors. First and foremost the proximity of sources has an important influence. PCB sources are differentiated into primary and secondary sources. Primary sources of PCBs are mainly open systems where they were added to articles or preparations such as plasticisers, paints and oils among others. Considering the application pattern for PCBs in domestic environments, the primary sources are mostly found in areas with high population density. Emission from secondary sources describes the process of re-emission or re-volatilisation of PCBs from environmental compartments like soil and sediments. The elimination of PCBs from the atmosphere is controlled by processes like the chemical degradation by reaction with OH-radicals or physical elimination via adsorption to particles followed by deposition. For long-term measurements these processes can be considered constant at each sampling site.

The calculated half-lives cannot be considered significantly different between sites or between congeners. For the data set up to the end of 2006 the average half-life is 5.3 years with values spanning from 1.9 to 54.2 years. The observed half-lives for the rural sampling sites range from 1.9 – 7.9 years at Stoke Ferry, 2.9 - 54 years at High Muffles and 4.2 – 7.5 years at Hazelrigg. For the urban sites the ranges are 3.6 – 5.7 years at Middlesbrough, 5.5 - 11 years at Manchester and 2.5 – 4 years at London. No significant difference between the sites was observed. The PCB emission data contained in the NAEI broadly agrees with the time trends observed in the TOMPs datasets. Figure 4 shows a comparison between the PCB data provided by the NAEI and the Hazelrigg data for the  $\Sigma_7$ PCBs. This agreement holds for the other TOMPs datasets and suggests that the NAEI captures the main on-going PCB sources.

As an additional exercise, we estimated emissions over time around the three TOMPS urban/semi-rural sites (London, Manchester, Middlesbrough, Hazelrigg) from the *Breivik et al* inventory. In this the total emission for a given country are distributed on a longitude-latitude grid based on population density within the grid square. The area described by each grid square varies from 7300-7700 km<sup>2</sup> for the areas surrounding the TOMPS sites. For the correlations presented in Figure 4 the grid square and the subsequent emission data were chosen closest to the geographical position of the sampling site. For Stoke Ferry and High Muffles the data sets are not comprehensive enough to yield significant results.

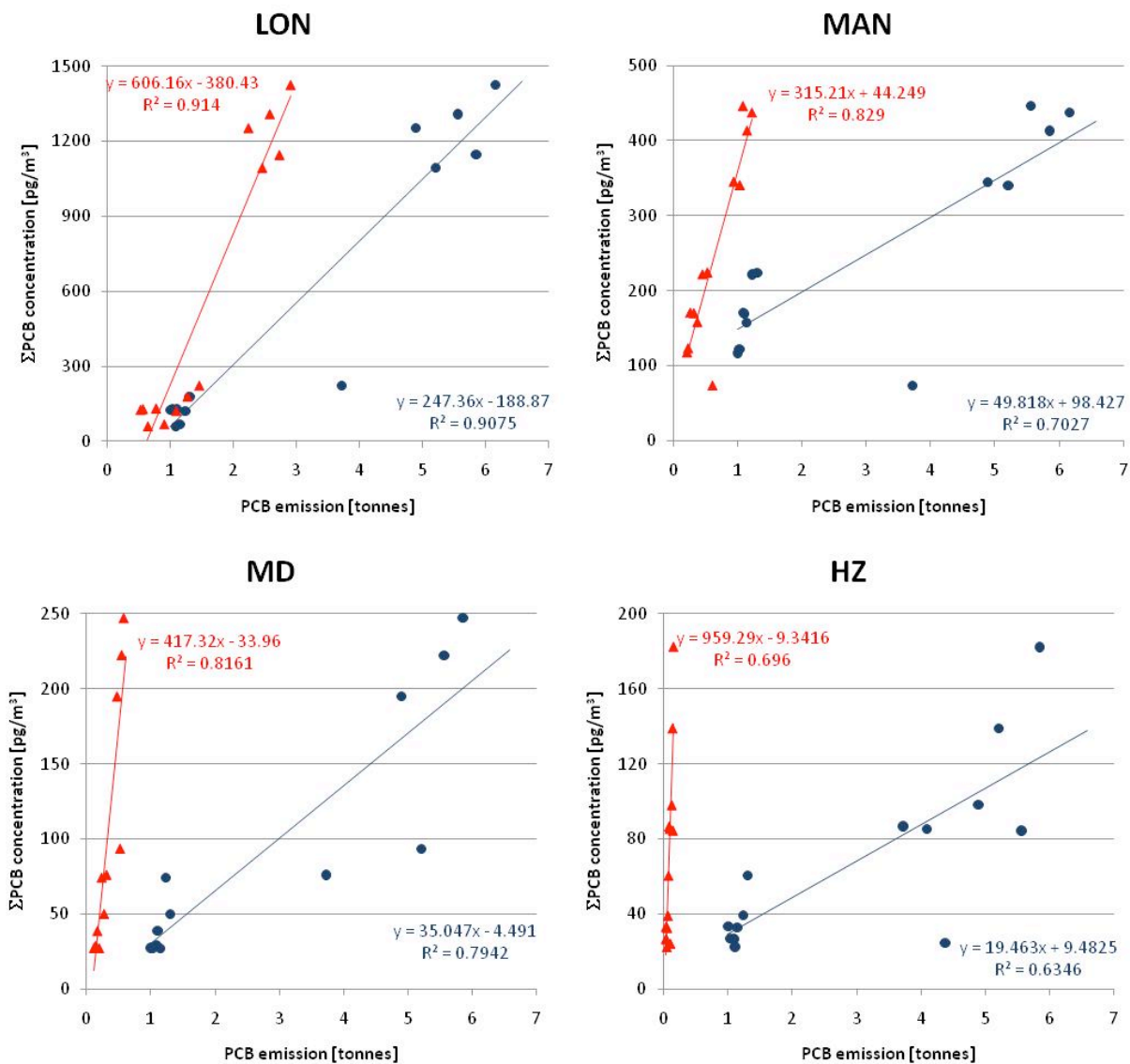


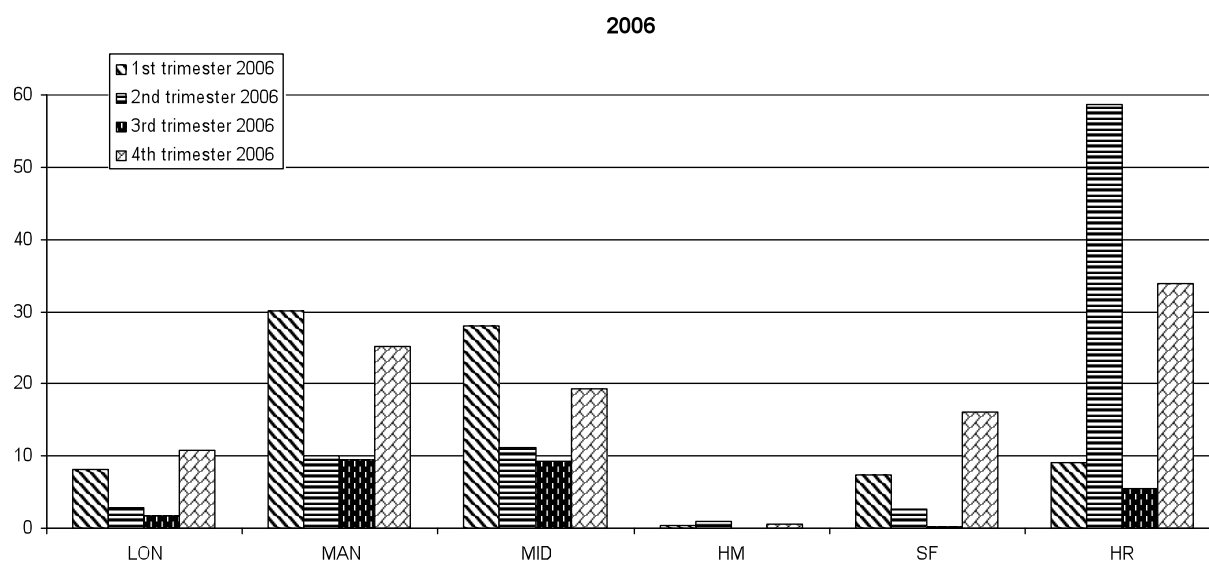
Figure 5. Correlation of observed PCB air concentrations<sup>o</sup> [ $\text{pg}/\text{m}^3$ ] to emission estimates [tonnes] for the sampling areas of London (LON), Manchester (MAN), Middlesbrough (MD) and Hazelrigg (HZ) (Breivik *et al.* 2007)<sup>o</sup> (▲) and to emission inventory estimates [tonnes] by the National Atmospheric Emissions Inventory (NAEI)<sup>oo</sup> for the whole of the UK (●)

<sup>o</sup> sum of PCB congeners 28, 52, 90/101, 118, 138, 153/132, 180

<sup>oo</sup> total sum of PCB congeners

## PCDD/Fs.

The measured PCDD/Fs concentrations were in general at very low levels (0.5 to 27 fg TEQ/m<sup>3</sup>), close to what are referred in literature as “background levels”. Contrarily to earlier years, the highest average concentrations are observed at a semirural-rural site (Hazelrigg), followed by Manchester and Middlesbrough (26.83, 18.69 and 16.95 fg TEQ/m<sup>3</sup>, respectively). The reason for the increased concentration of PCDD/Fs in HR should be some temporarily significant emission source. The different behaviour of HR can be seen also at the figure, where all the quarter values for all sites are depicted. It can be seen, that although in all sites, the highest concentrations are observed during the 1<sup>st</sup> and the 4<sup>th</sup> quarter, in HR the highest is in the second trimester. This is clearly because of a locally existing temporary source that caused increased emissions during the second quarter of 2006 and affected ofcourse the average value of 2006 for



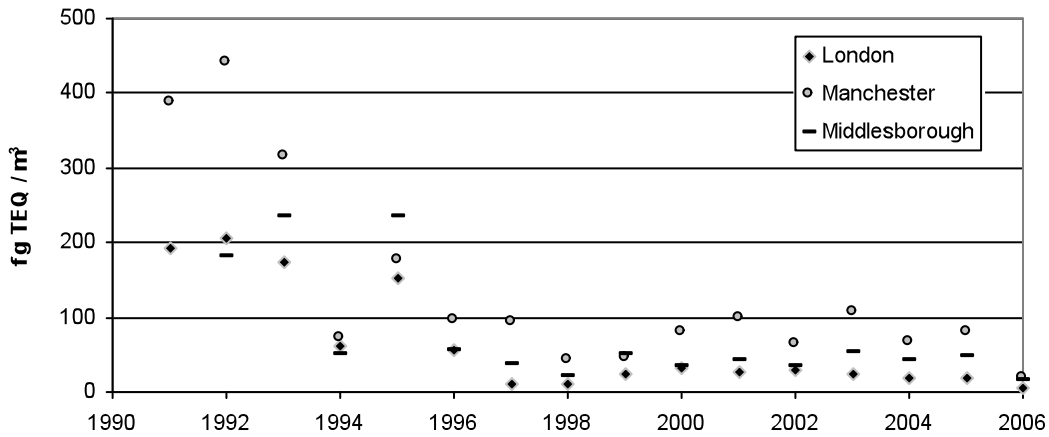
HR.

Figure 6: Seasonal variation of PCDD/Fs at the various sampling sites.

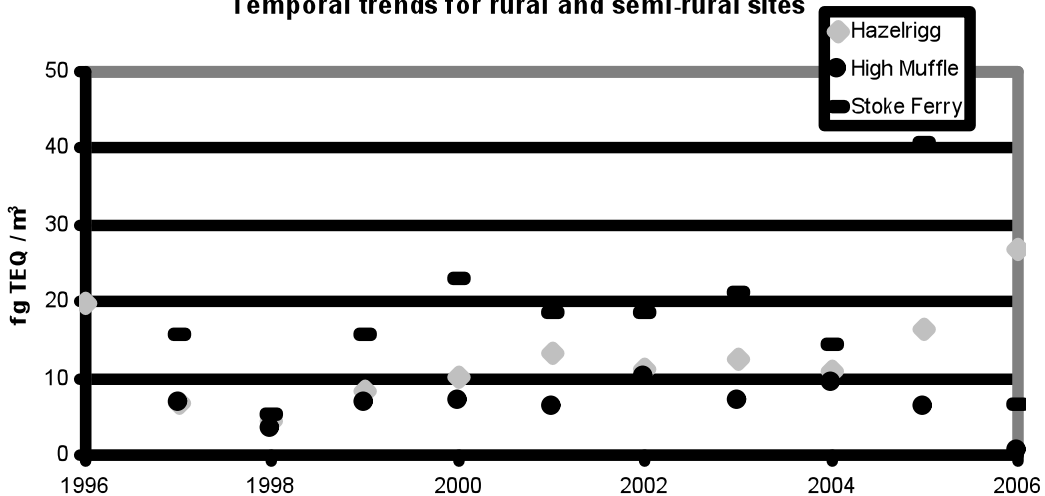
Comparing to the earlier years we see an important decline for all sites apart from HR. Especially for the three urban sites, the levels in 2006 are comparable to values that in literature are usually reported for semirural or rural areas. Another interesting thing is that London's

seasonal profile was totally different than it was in 2005. Thus Q1, Q4 are 3-4 times higher than Q2,Q3, whereas in 2005 all Q concentrations were similar.

### Temporal trends for urban sites



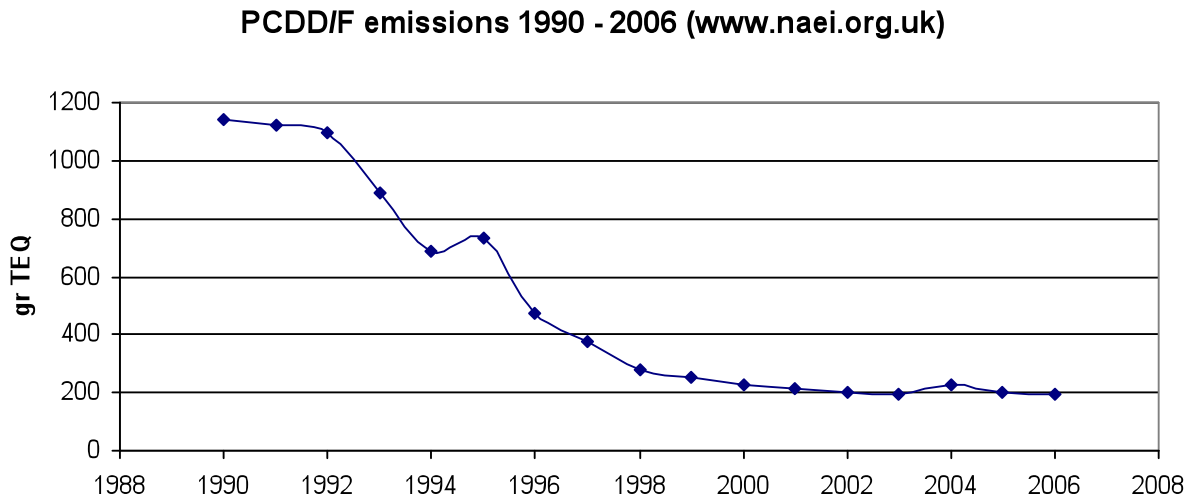
### Temporal trends for rural and semi-rural sites



**Figure 7.** Temporal trends at the urban and rural sites

As far as the emissions of PCDD/Fs are concerned, according to the National Atmospheric Emission Inventories (<https://www.naei.org.uk>) they were at the same levels as in 2005 (198.43 and 196,88 g TEQ, for 2005 and 2006, respectively). The fact that the declines or increases in the emissions are not directly depicted in the atmospheric concentrations means that other sources exist, or that the atmosphere of the UK is receiving pollution through air masses from other

countries, which are in significant enough to affect the occurrence of PCDD/Fs in the UK atmosphere.



**Figure 8.** PCDD/F emissions 1990-2004.



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## Appendix 1. PCDD/Fs and PCBs data.

### 1. Results from the London Site

<b>LONDON 2006</b>	<b>Q1.06</b>	<b>Q2.06</b>	<b>Q3.06</b>	<b>Q4.06</b>	<b>AVERAGE</b>
<b>DIOXINS &amp; FURANS</b>	<b>fgTEQ/m<sup>3</sup></b>	<b>fgTEQ/m<sup>3</sup></b>	<b>fgTEQ/m<sup>3</sup></b>	<b>fgTEQ/m<sup>3</sup></b>	<b>fgTEQ/m<sup>3</sup></b>
2,3,7,8-TCDF	1.45	0.96	0.66	1.05	1.03
1,2,3,7,8-PeCDF	nd	nd	nd	0.17	0.17
2,3,4,7,8-PeCDF	2.27	nd	nd	2.20	2.24
1,2,3,4,7,8-HxCDF	0.87	nd	nd	0.47	0.67
1,2,3,6,7,8-HxCDF	0.59	0.34	nd	0.44	0.46
2,3,4,6,7,8-HxCDF	0.71	0.41	0.48	0.54	0.53
1,2,3,7,8,9-HxCDF	nd	nd	nd	nd	nd
1,2,3,4,6,7,8-HpCDF	0.23	0.16	0.13	0.20	0.18
1,2,3,4,7,8,9-HpCDF	nd	nd	nd	nd	nd
OCDF	0.0016	0.0013	0.0006	0.0015	0.00
2,3,7,8-TCDD	nd	nd	nd	nd	nd
1,2,3,7,8-PeCDD	nd	nd	nd	2.90	2.90
1,2,3,4,7,8-HxCDD	nd	nd	nd	0.31	0.31
1,2,3,6,7,8-HxCDD	0.49	0.33	nd	0.64	0.49
1,2,3,4,7,8-HxCDD	0.96	0.37	nd	0.97	0.77
1,2,3,4,6,7,8-HpCDD	0.59	0.27	0.28	0.67	0.45
OCDD	0.02	0.01	0.09	0.19	0.08
<b>ΣTEQ dioxins and furans</b>	<b>8.17</b>	<b>2.85</b>	<b>1.65</b>	<b>10.76</b>	<b>5.86</b>

<b>COPLANAR PCBs</b>	<b>fg/m<sup>3</sup></b>	<b>fg/m<sup>3</sup></b>	<b>fg/m<sup>3</sup></b>	<b>fg/m<sup>3</sup></b>	<b>fg/m<sup>3</sup></b>
3,3',4,5-TetraCB	5.8	nd	nd	nd	1.20
3,3',4,4'-TetraCB	102	394	648	170	328.26
3,3',4,4',5-PentaCB	6.4	19	35	9.1	17.64
3,3',4,4',5,5'-HexaCB	nd	nd	nd	nd	nd

<b>LONDON 2006</b>	<b>Q1.06</b>	<b>Q2.06</b>	<b>Q3.06</b>	<b>Q4.06</b>	<b>Average</b>
<b>PCB/OC</b>	<b>pg/m<sup>3</sup></b>	<b>pg/m<sup>3</sup></b>	<b>pg/m<sup>3</sup></b>	<b>pg/m<sup>3</sup></b>	<b>pg/m<sup>3</sup></b>
<b>18</b>	9.1	35.4	50.7	20.1	<b>28.8</b>
<b>22</b>	3.5	11.6	20.5	4.6	<b>10.1</b>
<b>28</b>	9.3	34.1	51.3	15.0	<b>27.4</b>
<b>31</b>	9.3	34.4	61.9	16.7	<b>30.6</b>
<b>44</b>	5.9	21.8	33.7	7.4	<b>17.2</b>
<b>49</b>	4.5	16.3	25.3	11.2	<b>14.3</b>
<b>52</b>	10.4	38.3	57.8	12.0	<b>29.6</b>
<b>54</b>	0.02	0.07	0.10	<0.03	<b>0.1</b>
<b>70</b>	5.2	18.8	26.1	4.5	<b>13.7</b>
<b>74</b>	2.1	7.5	11.2	2.6	<b>5.9</b>
<b>87</b>	2.9	10.7	18.1	4.0	<b>8.9</b>
<b>95</b>	8.9	30.9	57.8	12.5	<b>27.5</b>
<b>99</b>	2.4	7.8	14.0	3.0	<b>6.8</b>
<b>104</b>	<0.04	<0.03	<0.04	<0.03	<b>&lt;0.03</b>
<b>105</b>	1.0	3.3	6.1	1.2	<b>2.9</b>
<b>110</b>	5.5	20.0	35.7	6.9	<b>17.0</b>
<b>114</b>	0.05	0.22	0.4	<0.03	<b>0.2</b>
<b>118</b>	2.9	10.2	17.7	3.7	<b>8.6</b>
<b>123</b>	0.31	1.2	1.5	0.28	<b>0.8</b>
<b>132</b>	1.3	5.1	8.1	1.2	<b>3.9</b>
<b>138</b>	3.8	13.6	24.0	5.4	<b>11.7</b>
<b>141</b>	1.0	3.9	6.6	1.4	<b>3.2</b>
<b>149</b>	6.0	23.4	40.6	7.6	<b>19.4</b>
<b>151</b>	2.7	10.3	17.8	3.1	<b>8.5</b>
<b>153</b>	4.8	17.9	33.2	8.7	<b>16.1</b>
<b>155</b>	0.01	0.01	0.02	<0.03	<b>&lt;0.03</b>
<b>156</b>	0.18	0.52	0.63	0.11	<b>0.4</b>
<b>157</b>	0.10	0.29	0.45	0.13	<b>0.2</b>
<b>158</b>	0.38	1.3	2.3	0.50	<b>1.1</b>
<b>167</b>	0.10	0.33	0.51	0.25	<b>0.3</b>
<b>170</b>	0.49	1.5	2.7	0.65	<b>1.3</b>
<b>174</b>	1.2	4.6	7.7	1.6	<b>3.8</b>
<b>180</b>	2.1	7.0	11.6	2.8	<b>5.9</b>
<b>183</b>	0.85	3.3	5.2	1.1	<b>2.6</b>
<b>187</b>	2.3	8.8	14.2	3.0	<b>7.1</b>
<b>188</b>	<0.04	<0.03	0.02	<0.03	<b>&lt;0.03</b>
<b>189</b>	<0.04	0.02	0.07	<0.03	<b>&lt;0.03</b>
<b>194</b>	0.26	0.81	1.2	0.35	<b>0.7</b>
<b>199</b>	0.12	0.45	0.73	0.17	<b>0.4</b>
<b>203</b>	0.56	1.9	3.2	0.8	<b>1.6</b>
<b>41/64</b>	4.0	13.7	28.2	7.1	<b>13.3</b>
<b>60/56</b>	2.4	8.2	13.2	1.7	<b>6.4</b>
<b>90/101</b>	8.7	30.6	55.9	11.1	<b>26.6</b>
<b>Σ<sub>7</sub>PCB</b>	41.9	151.7	251.4	58.7	126.0

<b>MANCHESTER 2006</b>	<b>Q1.06</b>	<b>Q2.06</b>	<b>Q3.06</b>	<b>Q4.06</b>	<b>AVERAGE</b>
<b>DIOXINS &amp; FURANS</b>	<b>fgTEQ/m3</b>	<b>fg TEQ/m3</b>	<b>fg TEQ/m3</b>	<b>fg TEQ/m3</b>	<b>fg TEQ/m3</b>
2,3,7,8-TCDF	4.12	2.04	2.27	3.07	2.88
1,2,3,7,8-PeCDF	0.44	0.22	0.19	0.42	0.32
2,3,4,7,8-PeCDF	8.74	3.52	2.69	7.87	5.71
1,2,3,4,7,8-HxCDF	1.92	0.72	0.85	1.83	1.33
1,2,3,6,7,8-HxCDF	1.84	0.69	0.84	1.53	1.23
2,3,4,6,7,8-HxCDF	2.22	0.92	1.11	2.05	1.57
1,2,3,7,8,9-HxCDF	nd	nd	nd	nd	nd
1,2,3,4,6,7,8-HpCDF	0.67	0.28	nd	0.62	0.52
1,2,3,4,7,8,9-HpCDF	0.09	0.04	0.10	0.07	0.07
OCDF	0.00	0.00	0.00	0.00	0.00
2,3,7,8-TCDD	nd	nd	nd	nd	nd
1,2,3,7,8-PeCDD	5.61	0.10	0.10	4.17	2.49
1,2,3,4,7,8-HxCDD	0.50	nd	nd	0.43	0.46
1,2,3,6,7,8-HxCDD	1.30	0.45	0.36	0.87	0.74
1,2,3,4,7,8-HxCDD	1.89	0.68	0.64	1.30	1.13
1,2,3,4,6,7,8-HpCDD	0.74	0.46	0.37	0.72	0.57
OCDD	0.02	0.02	0.16	0.18	0.10
<b>ΣTEQ dioxins and furans</b>	<b>30.10</b>	<b>10.13</b>	<b>9.69</b>	<b>25.13</b>	<b>18.76</b>

<b>COPLANAR PCBs</b>	<b>fg/m<sup>3</sup></b>	<b>fg/m<sup>3</sup></b>	<b>fg/m<sup>3</sup></b>	<b>fg/m<sup>3</sup></b>	<b>fg/m<sup>3</sup></b>
3,3',4,5-TetraCB	10	nd	nd	nd	10.02
3,3',4,4'-TetraCB	167	497	67	28	189.9
3,3',4,4',5-PentaCB	17	19	3852	2522	1602
3,3',4,4',5,5'-HexaCB	nd	nd	nd	nd	nd

<b>MANCHESTER 2006</b>	<b>Q1.06</b>	<b>Q2.06</b>	<b>Q3.06</b>	<b>Q4.06</b>	<b>AVERAGE</b>
<b>PCB/OC</b>	<b>pg/m<sup>3</sup></b>	<b>pg/m<sup>3</sup></b>	<b>pg/m<sup>3</sup></b>	<b>pg/m<sup>3</sup></b>	<b>pg/m<sup>3</sup></b>
18	8.7	32.9	71.4	38.3	37.8
22	4.4	10.3	23.1	9.0	11.7
28	10.0	26.4	51.2	22.1	27.4
31	9.6	24.7	68.8	26.9	32.5
44	6.7	14.9	34.5	11.1	16.8
49	4.6	10.4	22.7	13.5	12.8
52	12.1	28.9	65.9	24.1	32.7
54	0.02	0.06	0.14	0.09	0.1
70	6.7	13.6	23.9	6.9	12.8
74	2.6	4.9	9.1	3.0	4.9
87	4.0	7.9	19.3	7.5	9.7
95	10.9	22.4	60.3	26.3	30.0
99	3.0	6.0	13.6	5.5	7.0
104	<0.04	<0.03	<0.03	<0.03	<0.03
105	1.1	2.0	4.9	2.1	2.5
110	7.2	14.3	34.6	12.7	17.2
114	0.06	0.14	0.30	<0.03	0.2
118	3.5	6.9	15.7	6.1	8.1
123	0.27	0.55	1.1	0.48	0.6
132	1.4	2.8	6.9	3.5	3.7
138	3.6	6.6	18.0	8.3	9.1
141	0.8	1.6	4.2	2.1	2.2
149	5.0	10.0	26.7	11.9	13.4
151	1.9	3.7	10.3	4.6	5.1
153	3.6	6.9	18.0	9.3	9.5
155	0.01	0.01	0.02	<0.03	<0.03
156	0.21	0.30	0.63	0.26	0.3
157	0.06	0.10	0.23	0.10	0.1
158	0.38	0.70	1.8	0.7	0.9
167	0.12	0.15	0.52	0.21	0.2
170	0.38	0.57	1.4	1.5	1.0
174	0.70	1.3	3.5	2.3	1.9
180	1.1	1.8	5.2	4.4	3.1
183	0.43	0.8	2.1	1.4	1.2
187	1.0	1.9	5.1	3.4	2.9
188	<0.04	<0.03	<0.03	<0.03	<0.03
189	0.02	<0.03	0.06	<0.03	<0.03
194	0.15	0.17	0.56	0.80	0.4
199	0.04	0.09	0.25	0.20	0.1
203	0.25	0.36	1.1	1.1	0.7
41/64	4.1	8.2	23.0	7.8	10.8
60/56	3.1	5.7	9.1	2.3	5.1
90/101	10.6	21.4	54.0	22.3	27.1
<b>Σ<sub>7</sub>PCB</b>	44.6	99.0	228.1	96.5	117.0

<b>MIDDLESBROUGH 2006</b>	<b>Q1.06</b>	<b>Q2.06</b>	<b>Q3.06</b>	<b>Q4.06</b>	<b>AVERAGE</b>
<b>DIOXINS &amp; FURANS</b>	<b>fgTEQ/m<sup>3</sup></b>	<b>fgTEQ/m<sup>3</sup></b>	<b>fgTEQ/m<sup>3</sup></b>	<b>fgTEQ/m<sup>3</sup></b>	<b>fgTEQ/m<sup>3</sup></b>
2,3,7,8-TCDF	3.81	1.94	2.01	2.63	2.60
1,2,3,7,8-PeCDF	0.46	0.27	0.18	0.36	0.32
2,3,4,7,8-PeCDF	8.35	3.41	3.55	5.03	5.08
1,2,3,4,7,8-HxCDF	1.58	0.92	0.71	1.32	1.13
1,2,3,6,7,8-HxCDF	1.72	0.72	0.62	1.08	1.04
2,3,4,6,7,8-HxCDF	1.99	0.82	0.62	1.58	1.25
1,2,3,7,8,9-HxCDF	nd	nd	nd	nd	nd
1,2,3,4,6,7,8-HpCDF	0.58	0.29	0.30	0.48	0.41
1,2,3,4,7,8,9-HpCDF	0.07	0.03	0.10	0.07	0.07
OCDF	0.00	0.00	0.00	0.00	0.00
2,3,7,8-TCDD	nd	nd	nd	nd	nd
1,2,3,7,8-PeCDD	4.78	0.10	0.10	3.62	2.15
1,2,3,4,7,8-HxCDD	0.52	0.34	nd	0.35	0.41
1,2,3,6,7,8-HxCDD	1.29	0.64	0.45	0.84	0.81
1,2,3,4,7,8-HxCDD	1.74	1.10	0.33	1.07	1.06
1,2,3,4,6,7,8-HpCDD	1.17	0.73	0.31	0.69	0.72
OCDD	0.03	0.03	0.11	0.16	0.08
<b>ΣTEQ dioxins and furans</b>	<b>28.11</b>	<b>11.34</b>	<b>9.39</b>	<b>19.28</b>	<b>17.03</b>

<b>COPLANAR PCBs</b>	<b>fg/m<sup>3</sup></b>	<b>fg/m<sup>3</sup></b>	<b>fg/m<sup>3</sup></b>	<b>fg/m<sup>3</sup></b>	<b>fg/m<sup>3</sup></b>
3,3',4,5-TetraCB	10	nd	nd	nd	10.04
3,3',4,4'-TetraCB	140	290	255	121	201.44
3,3',4,4',5-PentaCB	11	8.8	8.7	8.6	9.14
3,3',4,4',5,5'-HexaCB	nd	nd	4.5	nd	1.12

<b>MIDDLESBROUGH 2006</b>	<b>Q1.06</b>	<b>Q2.06</b>	<b>Q3.06</b>	<b>Q4.06</b>	<b>AVERAGE</b>
PCB/OC	pg/m <sup>3</sup>	pg/m <sup>3</sup>	pg/m <sup>3</sup>	pg/m <sup>3</sup>	pg/m <sup>3</sup>
18	3.7	14.7	19.7	8.6	11.7
22	2.3	5.5	9.1	3.3	5.0
28	5.6	15.0	19.5	8.0	12.0
31	5.2	13.4	22.0	8.3	12.2
44	3.5	6.2	7.4	2.9	5.0
49	2.5	5.0	10.1	6.3	6.0
52	4.2	8.3	11.1	4.3	7.0
54	0.02	0.03	<0.03	<0.03	<0.03
70	3.1	5.4	5.7	2.0	4.1
74	1.6	2.6	3.2	1.5	2.2
87	0.76	1.4	2.7	1.0	1.4
95	2.3	4.2	7.5	2.6	4.1
99	1.0	1.3	2.1	0.8	1.3
104	<0.04	<0.04	<0.03	<0.03	<0.04
105	0.27	0.51	0.80	0.25	0.5
110	1.4	2.6	4.2	1.6	2.4
114	0.02	0.03	<0.03	<0.03	0.0
118	0.71	1.2	2.0	0.69	1.2
123	0.08	0.10	0.15	0.07	0.1
132	0.39	2.8	0.42	0.30	1.0
138	0.85	1.4	2.3	0.84	1.4
141	0.23	0.36	0.59	0.28	0.4
149	1.3	2.3	3.5	1.3	2.1
151	0.55	0.9	1.3	0.54	0.8
153	0.93	1.5	2.9	1.0	1.6
155	0.01	<0.04	<0.03	0.01	0.0
156	0.06	0.07	0.05	<0.03	0.1
157	0.02	0.03	<0.03	<0.03	<0.03
158	0.10	0.16	0.14	0.09	0.1
167	0.03	0.05	0.18	0.08	0.1
170	0.13	0.13	0.15	0.07	0.1
174	0.19	0.26	0.40	0.16	0.3
180	0.27	0.34	0.58	0.28	0.4
183	0.11	0.18	0.27	0.12	0.2
187	0.28	0.44	0.73	0.28	0.4
188	<0.04	<0.04	<0.03	<0.03	<0.04
189	0.01	0.02	<0.03	<0.03	<0.03
194	0.02	0.02	0.05	0.03	0.0
199	<0.04	0.01	0.02	0.01	<0.04
203	0.06	0.05	0.11	0.08	0.1
41/64	2.6	4.3	8.2	3.4	4.6
60/56	2.2	3.5	3.3	1.4	2.6
90/101	2.3	3.9	6.8	2.4	3.9
Σ <sub>7</sub> PCB	14.8	31.8	45.2	17.5	27.3

<b>STOKE FERRY 2006</b>	<b>Q1.06</b>	<b>Q2.06</b>	<b>Q3.06</b>	<b>Q4.06</b>	<b>AVERAGE</b>
<b>DIOXINS &amp; FURANS</b>	<b>fgTEQ/m<sup>3</sup></b>	<b>fgTEQ/m<sup>3</sup></b>	<b>fgTEQ/m<sup>3</sup></b>	<b>fgTEQ/m<sup>3</sup></b>	<b>fg TEQ/m<sup>3</sup></b>
2,3,7,8-TCDF	1.34	1.03	nd	2.05	1.10
1,2,3,7,8-PeCDF	0.16	nd	nd	0.36	0.13
2,3,4,7,8-PeCDF	2.44	nd	nd	7.17	2.40
1,2,3,4,7,8-HxCDF	0.57	0.58	nd	1.04	0.55
1,2,3,6,7,8-HxCDF	0.61	nd	nd	0.90	0.38
2,3,4,6,7,8-HxCDF	0.66	0.46	nd	1.15	0.57
1,2,3,7,8,9-HxCDF	nd	nd	nd	nd	0.00
1,2,3,4,6,7,8-HpCDF	0.20	0.19	0.059	0.30	0.19
1,2,3,4,7,8,9-HpCDF	nd	nd	nd	0.04	0.01
OCDF	0.00	0.00	nd	0.00	0.00
2,3,7,8-TCDD	nd	nd	nd	nd	0.00
1,2,3,7,8-PeCDD	nd	nd	nd	nd	0.00
1,2,3,4,7,8-HxCDD	nd	nd	nd	0.39	0.10
1,2,3,6,7,8-HxCDD	0.47	nd	nd	0.76	0.31
1,2,3,4,7,8-HxCDD	0.55	nd	nd	1.07	0.41
1,2,3,4,6,7,8-HpCDD	0.42	0.38	0.047	0.66	0.38
OCDD	0.01	0.02	0.025	0.19	0.06
<b>ΣTEQ dioxins and furans</b>	<b>7.45</b>	<b>2.66</b>	<b>0.13</b>	<b>16</b>	<b>6.58</b>

<b>COPLANAR PCBs</b>	<b>fg/m<sup>3</sup></b>	<b>fg/m<sup>3</sup></b>	<b>fg/m<sup>3</sup></b>	<b>fg/m<sup>3</sup></b>	<b>fg/m<sup>3</sup></b>
3,3',4,5-TetraCB	nd	nd	nd	nd	nd
3,3',4,4'-TetraCB	25	87	46	42	50.15
3,3',4,4',5-PentaCB	nd	4.7	nd	10	3.79
3,3',4,4',5,5'-HexaCB	nd	nd	nd	nd	nd



<b>STOKE FERRY 2006</b>	<b>Q1.06</b>	<b>Q2.06</b>	<b>Q3.06</b>	<b>Q4.06</b>	<b>AVERAGE</b>
PCB/OC	pg/m <sup>3</sup>	pg/m <sup>3</sup>	pg/m <sup>3</sup>	pg/m <sup>3</sup>	pg/m <sup>3</sup>
18	3.8	2.9	9.4	5.0	5.3
22	0.90	1.4	4.6	4.4	2.8
28	2.6	3.0	6.2	3.3	3.8
31	2.5	3.6	7.5	2.5	4.0
44	1.0	1.8	2.7	1.3	1.7
49	0.89	1.6	2.5	4.0	2.2
52	1.7	2.8	4.3	2.0	2.7
54	0.02	<0.02	0.02	<0.02	<0.02
70	0.73	1.6	1.1	0.41	0.9
74	0.37	0.74	0.56	0.39	0.5
87	0.31	0.67	0.81	0.44	0.6
95	1.0	2.0	2.9	2.3	2.1
99	0.34	0.60	0.64	0.47	0.5
104	<0.02	<0.02	<0.02	<0.02	<0.02
105	0.11	0.28	0.21	0.15	0.2
110	0.59	1.3	1.6	0.93	1.1
114	<0.02	0.0	<0.02	<0.02	0.0
118	0.32	0.68	0.67	0.46	0.5
123	0.03	0.08	0.08	0.16	0.1
132	0.17	0.37	0.36	1.00	0.5
138	0.49	1.1	1.1	2.6	1.3
141	0.10	0.26	0.23	0.68	0.3
149	0.59	1.5	1.8	2.9	1.7
151	0.22	0.61	0.73	1.2	0.7
153	0.50	1.30	1.2	3.0	1.5
155	0.01	0.01	<0.02	<0.02	<0.02
156	0.03	0.06	<0.02	0.09	0.1
157	0.01	0.04	<0.02	0.08	0.0
158	0.05	0.12	0.10	0.19	0.1
167	0.02	0.03	0.02	0.14	0.1
170	0.07	0.14	0.11	1.7	0.5
174	0.10	0.42	0.28	1.5	0.6
180	0.18	0.78	0.43	4.2	1.4
183	0.06	0.28	0.17	0.90	0.4
187	0.15	0.75	0.47	1.9	0.8
188	<0.02	<0.02	<0.02	<0.02	<0.02
189	<0.02	<0.02	<0.02	0.09	0.1
194	0.04	0.10	0.09	1.3	0.4
199	<0.02	0.06	0.02	0.12	0.1
203	0.05	0.33	0.15	1.2	0.4
41/64	0.71	1.3	2.4	2.0	1.6
60/56	0.41	1.0	0.65	0.27	0.6
90/101	0.95	2.0	2.5	2.1	1.9
Σ <sub>7</sub> PCB	6.8	11.6	16.4	17.7	13.1

<b>HIGH MUFFLES 2006</b>	<b>Q1.06</b>	<b>Q2.06</b>	<b>Q3.06</b>	<b>Q4.06</b>	<b>AVERAGE</b>
<b>DIOXINS &amp; FURANS</b>	<b>fgTEQ/m<sup>3</sup></b>	<b>fgTEQ/m<sup>3</sup></b>	<b>fgTEQ/m<sup>3</sup></b>	<b>fgTEQ/m<sup>3</sup></b>	<b>fgTEQ/m<sup>3</sup></b>
2,3,7,8-TCDF	nd	nd	nd	0.3155	0.08
1,2,3,7,8-PeCDF	nd	nd	nd	nd	nd
2,3,4,7,8-PeCDF	nd	nd	nd	nd	nd
1,2,3,4,7,8-HxCDF	nd	nd	nd	nd	nd
1,2,3,6,7,8-HxCDF	nd	nd	nd	nd	nd
2,3,4,6,7,8-HxCDF	nd	nd	nd	nd	nd
1,2,3,7,8,9-HxCDF	nd	nd	nd	nd	nd
1,2,3,4,6,7,8-HpCDF	0.10	0.05	nd	0.0803	0.06
1,2,3,4,7,8,9-HpCDF	nd	nd	nd	nd	nd
OCDF	0.00	0.00	nd	0.0005	0.00
2,3,7,8-TCDD	nd	nd	nd	nd	nd
1,2,3,7,8-PeCDD	nd	nd	nd	nd	nd
1,2,3,4,7,8-HxCDD	nd	nd	nd	nd	nd
1,2,3,6,7,8-HxCDD	nd	nd	nd	nd	nd
1,2,3,4,7,8-HxCDD	nd	0.42	nd	nd	0.11
1,2,3,4,6,7,8-HpCDD	0.22	0.41	0.0347	0.1263	0.20
OCDD	0.01	0.02	0.0509	0.0341	0.03
<b>ΣTEQ dioxins and furans</b>	<b>0.33</b>	<b>0.89</b>	<b>0.09</b>	<b>0.56</b>	<b>0.47</b>

<b>COPLANAR PCBs</b>	<b>fg/m<sup>3</sup></b>	<b>fg/m<sup>3</sup></b>	<b>fg/m<sup>3</sup></b>	<b>fg/m<sup>3</sup></b>	<b>fg/m<sup>3</sup></b>
3,3',4,5-TetraCB	nd	nd	nd	nd	nd
3,3',4,4'-TetraCB	54	194	150	62	115.22
3,3',4,4',5-PentaCB	nd	4.1	4.6	3.1	3.94
3,3',4,4',5,5'-HexaCB	nd	nd	nd	nd	nd

<b>HIGH MUFFLES 2006</b>	<b>Q1.06</b>	<b>Q2.06</b>	<b>Q3.06</b>	<b>Q4.06</b>	<b>AVERAGE</b>
<b>PCB/OC</b>	<b>pg/m<sup>3</sup></b>	<b>pg/m<sup>3</sup></b>	<b>pg/m<sup>3</sup></b>	<b>pg/m<sup>3</sup></b>	<b>pg/m<sup>3</sup></b>
18	0.98	7.1	5.0	4.3	<b>4.35</b>
22	1.0	3.5	11.0	5.9	<b>5.36</b>
28	2.0	7.8	9.1	4.9	<b>5.96</b>
31	1.7	6.8	6.4	3.7	<b>4.65</b>
44	1.2	3.3	2.3	1.5	<b>2.09</b>
49	0.92	2.6	2.8	3.5	<b>2.45</b>
52	1.3	4.0	2.9	0.10	<b>2.09</b>
54	<0.02	0.01	<0.02	<0.01	<b>&lt;0.02</b>
70	1.4	3.2	0.82	0.43	<b>1.47</b>
74	0.71	1.5	0.64	0.39	<b>0.82</b>
87	0.32	0.66	0.29	0.25	<b>0.38</b>
95	1.0	2.3	1.9	1.6	<b>1.70</b>
99	0.29	0.58	0.33	0.35	<b>0.39</b>
104	<0.02	<0.02	<0.02	<0.01	<b>&lt;0.02</b>
105	0.10	0.19	0.12	<0.01	<b>0.13</b>
110	0.57	1.2	0.76	0.55	<b>0.76</b>
114	<0.02	0.02	<0.02	<0.01	<b>0.02</b>
118	0.26	0.56	0.35	0.30	<b>0.37</b>
123	0.03	0.07	0.10	0.10	<b>0.08</b>
132	0.15	0.32	0.20	0.16	<b>0.21</b>
138	0.38	0.68	0.62	0.46	<b>0.54</b>
141	0.10	0.19	0.16	0.16	<b>0.15</b>
149	0.73	1.4	1.04	0.73	<b>0.98</b>
151	0.33	0.66	0.48	0.33	<b>0.45</b>
153	0.47	0.89	0.76	0.60	<b>0.68</b>
155	0.01	0.01	<0.02	<0.01	<b>0.01</b>
156	0.02	0.02	<0.02	<0.01	<b>0.02</b>
157	0.01	0.01	<0.02	<0.01	<b>0.01</b>
158	0.04	0.05	0.08	0.04	<b>0.05</b>
167	0.02	0.02	<0.02	<0.01	<b>0.02</b>
170	0.04	0.04	0.12	0.07	<b>0.07</b>
174	0.07	0.14	0.17	0.12	<b>0.13</b>
180	0.11	0.16	0.21	0.16	<b>0.16</b>
183	0.04	0.10	0.10	<0.01	<b>0.08</b>
187	0.12	0.25	0.27	0.17	<b>0.20</b>
188	<0.02	<0.02	<0.02	<0.01	<b>&lt;0.02</b>
189	<0.02	0.01	<0.02	<0.01	<b>0.01</b>
194	0.01	<0.02	<0.02	<0.01	<b>0.01</b>
199	<0.02	<0.02	<0.02	<0.01	<b>&lt;0.02</b>
203	0.02	0.02	0.04	<0.01	<b>0.03</b>
41/64	1.1	2.6	2.2	1.4	<b>1.81</b>
60/56	1.1	2.4	0.49	0.29	<b>1.06</b>
90/101	1.0	2.1	1.4	1.2	<b>1.41</b>
<b>Σ<sub>7</sub>PCB</b>	<b>5.6</b>	<b>16.2</b>	<b>15.4</b>	<b>7.7</b>	<b>11.2</b>

<b>HAZELRIGG 2006</b>	<b>Q1.06</b>	<b>Q2.06</b>	<b>Q3.06</b>	<b>Q4.06</b>	<b>AVERAGE</b>
<b>DIOXINS &amp; FURANS</b>	<b>fgTEQ/m<sup>3</sup></b>	<b>fgTEQ/m<sup>3</sup></b>	<b>fgTEQ/m<sup>3</sup></b>	<b>fgTEQ/m<sup>3</sup></b>	<b>fgTEQ/m<sup>3</sup></b>
2,3,7,8-TCDF	1.63	2.86	1.46	3.55	2.37
1,2,3,7,8-PeCDF	nd	0.47	nd	0.51	0.49
2,3,4,7,8-PeCDF	2.93	4.95	1.46	7.78	4.28
1,2,3,4,7,8-HxCDF	0.59	1.26	0.55	1.76	1.04
1,2,3,6,7,8-HxCDF	0.74	1.30	0.35	1.56	0.99
2,3,4,6,7,8-HxCDF	0.87	1.23	0.47	2.00	1.14
1,2,3,7,8,9-HxCDF	nd	nd	nd	nd	nd
1,2,3,4,6,7,8-HpCDF	0.23	0.52	0.19	0.63	0.39
1,2,3,4,7,8,9-HpCDF	nd	0.11	nd	0.08	0.10
OCDF	0.00	0.01	0.00	0.01	0.00
2,3,7,8-TCDD	nd	nd	nd	nd	nd
1,2,3,7,8-PeCDD	nd	17.74	nd	8.30	13.02
1,2,3,4,7,8-HxCDD	nd	4.07	nd	0.72	2.40
1,2,3,6,7,8-HxCDD	0.68	4.87	0.46	2.56	2.14
1,2,3,4,7,8-HxCDD	0.74	9.69	nd	2.52	4.32
1,2,3,4,6,7,8-HpCDD	0.71	9.18	0.43	1.51	2.96
OCDD	0.02	0.46	0.19	0.39	0.26
<b>ΣTEQ dioxins and furans</b>	<b>9.15</b>	<b>58.72</b>	<b>5.56</b>	<b>33.87</b>	<b>26.83</b>

<b>COPLANAR PCBs</b>	<b>fg/m<sup>3</sup></b>	<b>fg/m<sup>3</sup></b>	<b>fg/m<sup>3</sup></b>	<b>fg/m<sup>3</sup></b>	<b>fg/m<sup>3</sup></b>
3,3',4,5-TetraCB	5.8	nd	nd	nd	1.20
3,3',4,4'-TetraCB	91	835	314	273	378.10
3,3',4,4',5-PentaCB	5.6	16	10	110	35.55
3,3',4,4',5,5'-HexaCB	nd	nd	nd	nd	nd

<b>HAZELRIGG 2006</b>	<b>Q1.06</b>	<b>Q2.06</b>	<b>Q3.06</b>	<b>Q4.06</b>	<b>AVERAGE</b>
PCB/OC	pg/m <sup>3</sup>	pg/m <sup>3</sup>	pg/m <sup>3</sup>	pg/m <sup>3</sup>	pg/m <sup>3</sup>
18	2.0	12.7	N/A	N/A	7.4
22	1.9	8.2	N/A	N/A	5.1
28	4.0	21.5	N/A	N/A	12.7
31	3.6	17.1	N/A	N/A	10.3
44	1.9	9.7	N/A	N/A	5.8
49	1.6	7.5	N/A	N/A	4.5
52	2.3	14.3	N/A	N/A	8.3
54	<0.03	0.03	N/A	N/A	<0.03
70	1.9	9.7	N/A	N/A	5.8
74	1.0	4.5	N/A	N/A	2.8
87	0.41	3.2	N/A	N/A	1.8
95	1.5	8.8	N/A	N/A	5.2
99	0.43	2.7	N/A	N/A	1.6
104	<0.03	<0.03	N/A	N/A	<0.03
105	0.11	0.98	N/A	N/A	0.5
110	0.77	6.1	N/A	N/A	3.4
114	0.02	0.06	N/A	N/A	0.0
118	0.36	2.98	N/A	N/A	1.7
123	0.04	0.33	N/A	N/A	0.2
132	0.16	1.5	N/A	N/A	0.8
138	0.57	3.8	N/A	N/A	2.2
141	0.14	0.96	N/A	N/A	0.5
149	1.0	6.2	N/A	N/A	3.6
151	0.47	2.4	N/A	N/A	1.4
153	0.69	4.5	N/A	N/A	2.6
155	<0.03	0.04	N/A	N/A	0.0
156	0.02	0.15	N/A	N/A	0.1
157	0.02	0.05	N/A	N/A	0.0
158	0.05	0.38	N/A	N/A	0.2
167	0.01	0.09	N/A	N/A	0.1
170	0.07	0.26	N/A	N/A	0.2
174	0.10	0.73	N/A	N/A	0.4
180	0.14	0.89	N/A	N/A	0.5
183	0.07	0.50	N/A	N/A	0.3
187	0.21	1.2	N/A	N/A	0.7
188	<0.03	<0.03	N/A	N/A	<0.03
189	<0.03	0.02	N/A	N/A	<0.03
194	0.01	0.07	N/A	N/A	0.0
199	<0.03	0.03	N/A	N/A	<0.03
203	0.02	0.15	N/A	N/A	0.1
41/64	1.5	6.6	N/A	N/A	4.0
60/56	1.5	6.7	N/A	N/A	4.1
90/101	1.4	9.2	N/A	N/A	5.3
<b>Σ<sub>7</sub>PCB</b>	<b>9.5</b>	<b>57.2</b>	N/A	N/A	<b>33.3</b>

N/A= Impossible to quantify PCBs because of interferences due to the Turmac work at the site.