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Annual Report for 2007 on the UK PAH Monitoring and Analysis Network

Report to the Department for Environment, Food and Rural Affairs, the Northern Ireland Department of Environment, the Scottish Government and the Welsh Assembly

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Executive summary

This report is the 2007 annual data report for the Polycyclic Aromatic Hydrocarbons (PAH) monitoring and Analysis network. AEA has, on behalf of the Department for Environment, Food and Rural Affairs (Defra) and the Devolved Administrations, provided concentration data for a number of PAH in the UK atmosphere for seventeen years. Since 1991 the number of sites monitoring for PAH has increased significantly. In 2007 the PAH monitoring network consisted of 31 PAH network sites with an additional six sites which ran as part of the Toxic Organic Micro-Pollutants monitoring network with extracts provided for analysis on a quarterly basis by Lancaster University. Sites monitoring for PAH are spread across the UK in locations ranging in nature from background to industrial. The aim of the PAH monitoring contract is to provide the public and government with air quality information, to provide information to support the development of national policy and assist in complying with the requirements of European Directive relating to PAH in ambient air.

Health Based Standards

Epidemiological studies have established a significant link between occupational exposure to PAH in workplace air and lung cancer. As a result both the EU and the UK have established health based Air Quality Standards and Objectives for PAH.

In 1999, the UK Expert Panel on Air Quality Standards (EPAQS, 1999) issued a report recommending a maximum annual average concentration for benzo[a]pyrene (BaP) in air of 0.25 ng/m^3. Exposure to this concentration of PAH would make the risk to human health insignificant. This value was adopted as an annual mean air quality objective to be met by 2010 in the UK.

In December 2004 the fourth Air Quality Daughter Directive was published relating to five pollutants including PAH (EU, 2004). The Directive set a target value of 1 ng/m^3 for PAH in terms of BaP collected in the PM_{10} fraction which should not be exceeded for three or more calendar years in five. It set out lower and upper assessment thresholds for BaP of 0.4 ng/m^3 and 0.6 ng/m^3 respectively. It also provides requirements for the monitoring of PAHs.

Network Operation

The Directive required that daily samples be taken of the BaP in particles of the PM_{10} size fraction in air. The Andersen samplers previously in use in the UK PAH network are not PM_{10} samplers and operated with a 14 day sample duration. It would not be cost effective to modify the equipment and to visit each monitoring site on each day. As a result Digitel DHA-80 samplers were purchased by Defra. These are PM10 samplers fitted with an automatic filter changer which enable daily PM10 samples to be taken. During 2006 and 2007, 31 Digitel air samplers were installed in industrial, urban-industrial urban rural and background locations in the UK. A further 2 samplers were installed at the two background monitoring sites at the end of 2007 along with deposition sampling equipment to form a Directive compliant PAH network.

Since installation there has been limited data loss due to sampler or motor failure. However the Digitel samplers are not without problems, a significant number of unscheduled visits have had to be undertaken due to motor failures, circuit board failures, communication problems and jamming of filter mechanisms. The Digitel samplers can be remotely monitored to identify if they are operational, this has enable sampler problems to be quickly identified and solutions sought.

Sources of PAH according the National Atmospheric Emissions Inventory

The National Atmospheric Emissions Inventory (NAEI) provides estimates of the emission of PAH for the UK. The main sources of emissions of BaP are thought to be:

- Residential, commercial and institutional combustion 48 %
- Agricultural and waste incineration 22 %
- Road transport 11 %

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- Combustion in industry 5 %
- Production processes (metals) 4 %
- Other sources accounted for 10 %

Measured Concentration of Benzo[a]pyrene

There are a number of monitoring sites that show concentrations consistently above or close to the UK Air Quality Objective of 0.25 ng/m^3 and two sites that have been, are at, or close to, the EU Target Value. It must be noted that there are a number of newly established Digitel monitoring sites that had not been operated for a full year at the end of 2007. Of the sites that were operating throughout the year, Derry Brandywell, Kinlochleven, Lisburn Dunmurry, Middlesbrough Longlands College, Port Talbot and Scunthorpe Town are consistently above or close to the UK Air Quality Objective.

The only sites where available annual means have been above the EU Directive Target Value are Scunthorpe Town and Kinlochleven, however the Kinlochleven site has not exceeded the Target Value since 2000 which was the year in which the aluminium smelter closed. Since then concentrations have been lower than the Target Value, although not consistently below the UK Objective. At the Scunthorpe Town the Digitel sampler shows exceedance of the target value in 2007 with a concentration of 1.2 ng/m^3, whereas the collocated Andersen sampler measured a value of 0.86 ng/m^3. If it is assumed that the ratio of the Digitel sampler to Andersen sampler measurements is representative then it is likely that the Scunthorpe Town site would have exceeded the EU Target Value in five out of the last six years.

Correlation Between Dibenzo[al]pyrene and Benzo[a]pyrene

To assess the relationship between the measured concentrations of dibenzo[al]pyrene and benzo[a]pyrene, the correlation between their reported concentrations has been plotted against each other for the Digitel sites for samples where both compounds are above their limits of detection.

There appears to be a significant relationship between the concentration of dibenzo[al]pyrene and benzo[a]pyrene. The relationship between dibenzo[al]pyrene and benzo[a]pyrene appears to be relatively constant between sites with different dominating sources with the ratio of dibenzo[al]pyrene : benzo[a]pyrene being 0.32 : 1 when data from all of the sites are taken together.

Recommendations:

- It is recommended that the PAH monitoring network should continue to comply with the 4th Daughter Directive and that all measurements and analyses are undertaken in accordance with the methods detailed in the relevant CEN Standards.
- It is recommended that the current size of the PAH monitoring network is maintained to ensure compliance with the Directive and to enable the trends in concentration of PAH to be determined and assessed. The scale of the current network should ensure that air concentrations in rural, urban, urban-traffic and industrial locations can continue to be measured so that concentrations can be compared to both the EU Target value (1 ng/m^3) and UK Air Quality Objective (0.25 ng/m^3).
- It is recommended that additional comparison between the Digitel and the Andersen sampling techniques is undertaken so that the relationship between the reported concentrations can be assessed further
- As a result of the high concentrations of PAH found at sites such as Lisburn, Ballymena and Derry, it is recommended that Defra considers undertaking additional monitoring in locations that do not have access to a natural gas supply and are associated with high solid fuel use.
- It is recommended that as a result of its high reported carcinogenicity measurement of dibenzo[al]pyrene at the sites be continued and refined. In light of this, literature searches should be carried out periodically to identify if there has been further research to reassess the carcinogenicity of individual PAH and to identify development in analytical methods.
- It is recommended that the close links between the National Atmospheric Emissions Inventory, the modelling teams Defra employ and the PAH monitoring network team are maintained to ensure that the network structure reflects the distribution of high PAH emission sources beyond urban and rural locations.

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1 Introduction

The Department for Environment, Food and Rural Affairs (Defra) and the Devolved Administrations (the Scottish Executive, the National Assembly of Wales and the Northern Ireland Department of the Environment) awarded the contract for the Polycyclic Aromatic Hydrocarbon Monitoring and Analysis Network: 2004-2007 to AEA in April 2004. The contract was subsequently extended until the end of March 2009. This report is the annual report for the 2007 data.

This annual report for the Polycyclic Aromatic Hydrocarbons Network includes:

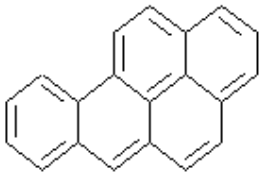
- A background to the Health Based Standards for PAH
- A summary of network operations including details of monitoring sites, equipment employed, details of site installations/removals, site calibration visits and equipment servicing and breakdowns
- Trends in estimated sources of PAH in the UK
- Review of annual mean and quarterly concentration
- Trends in annual measured PAH concentration data at all sites from 2000 to present date and comparison with Health Based Standards of the UK Air Quality Objective and requirements of the Fourth EC Air Quality Daughter Directive
- Assessment of the relationship between dibenzo[al]pyrene and benzo[a]pyrene measured by the Digitel sampling method

1.1 What are PAH

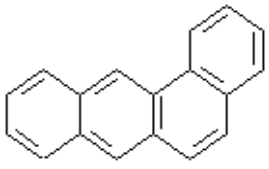
Polycyclic Aromatic Hydrocarbons (PAH) are organic compounds containing only carbon and hydrogen which are composed of two or more fused benzene rings in linear, cluster or angular arrangements. Hundreds of PAH compounds can be formed during incomplete combustion or pyrolysis of organic matter, during industrial processes and even through cooking and food processing. Some structures of specific PAH including benzo[a]pyrene (BaP) are shown below.

Figure 1: Structures of a number of PAH

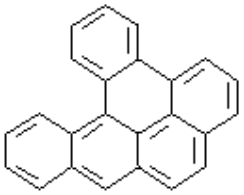
benzo[a]pyrene



benzo[a]anthracene



dibenzo[al]pyrene



2 Health Based Standards for PAH

Epidemiological studies have established a significant link between lung cancer and occupational exposure to PAH in the aluminium smelting industry and at coke works. The quantitative risk estimates arising from these studies, while uncertain, are of a magnitude, which suggests that PAH exposure at concentrations prevailing in ambient air may be a significant public health issue. BaP is often used as a marker for the carcinogenic risk of PAH in ambient air.

A number of PAH have been classified by the International Agency for Research on Cancer (IARC) as possible or probable human carcinogens. The PAH that have been classified by IARC as human carcinogens (Group 1), probable carcinogens (Group 2a) or possible carcinogens (Group 2b) are listed below. A recent IARC Working Group recommended changes in the assessment of certain PAHs to reflect increased evidence of their carcinogenicity.

Carcinogens (Group 1)
Benzo[a]pyrene[1]

Probable Carcinogens (Group 2a)
Cyclopenta[cd]pyrene[2]
Dibenzo[a,h]anthracene[2]

Possible Carcinogens: (Group 2b)

Benzo[a]anthracene	Benzo[b]fluoranthene
Benzo[c]phenanthrene[3]	Benzo[j]fluoranthene
Benzo[k]fluoranthene	Dibenzo[a,e]pyrene
Dibenzo[a,h]pyrene	Dibenzo[a,i]pyrene
Dibenzo[a,l]pyrene	Indeno[1,2,3-cd]pyrene
5-methyl chrysene	Naphthalene

[1] Overall evaluation upgraded from 2B to 1 based on mechanistic and other relevant data
[2] Overall evaluation upgraded from 2B to 2A based on mechanistic and other relevant data
[3] Overall evaluation upgraded from 3 to 2B based on mechanistic and other relevant data

With a number of PAH compounds considered as human carcinogens or probable/possible human carcinogens it is important to continue to limit and assess human exposure.

2.1.1 National Air Quality Objectives

The UK government continues to be at the forefront of protection of human health from pollutants in ambient air. To do this, the UK has set standards and objectives for a number of pollutants in ambient air. In 1999, the UK Expert Panel on Air Quality Standards (EPAQS, 1999) issued a report recommending a maximum annual average concentration for BaP in air of 0.25 ng/m^3. Exposure to this concentration of PAH would make the risk to human health insignificant. Following the publication of the EPAQS report, this value was adopted as an annual mean air quality objective to be met by 2010 in England, Northern Ireland, Scotland and Wales (Defra, 2007). In Northern Ireland, there were initial concerns about the achievability of this standard due to the significant use of solid fuel in the province, however after a consultation paper in 2004 the same objective of 0.25 ng/m^3 was adopted.

2.1.2 EU 4th Daughter Directive on PAH

In December 2004 the member states of the European Union agreed to publish the Fourth Air Quality Daughter Directive (4DD) relating to five pollutants including PAH (EU, 2004). The Directive set a target value of 1 ng/m^3 for PAH in terms of BaP collected in the PM_{10} fraction. It also set out lower and upper assessment thresholds for BaP of 0.4 ng/m^3 and 0.6 ng/m^3 respectively.

The most relevant requirements in the Fourth Air Quality Daughter Directive for PAH monitoring are;

1. measurements of BaP in any zone or agglomeration in which the lower assessment threshold is exceeded (the number of sites to reflect the population of the zone or agglomeration and whether the lower or the upper assessment threshold is exceeded.
2. measurements at least every 100,000 km^2 at background locations of air concentrations and deposition rates of further PAHs to include at least benzo[a]anthracene, benzo[b]fluoranthene, benzo[j]fluoranthene, benzo[k]fluoranthene, indeno[1,2,3-cd]pyrene, and dibenz[a,h]anthracene to be collocated with BaP measurements.
3. Measurements to be made by the reference method or an equivalent method which samples the PM_{10} fraction and is capable of providing a calendar year average
4. Twenty-four-hour sampling is required for the measurement of BaP and other polycyclic aromatic hydrocarbons in air.
5. Individual samples taken over a period of up to one month can be combined and analysed as a composite sample, provided the method ensures that the samples are stable for that period.
6. Deposition samples are recommended to be taken weekly or monthly.
7. The three congeners benzo[b]fluoranthene, benzo[j]fluoranthene, benzo[k]fluoranthene can be difficult to resolve analytically. In such cases they can be reported as a sum.
8. The following data quality objectives are provided as a guide to quality assurance; uncertainty for fixed measurements of PAH in air 50%, in deposition 70%, minimum data capture 90%, time coverage 33% for BaP concentration in air and 17% for other PAHs in air and deposition
9. The reference method for the measurement of benzo(a)pyrene concentrations in ambient air is currently being standardised by CEN and shall be based on manual PM10 sampling equivalent to EN 12341. In the absence of a CEN standard method, for BaP or the other PAH, Member States are allowed to use national standard methods or ISO methods such as ISO standard 12884. A Member State may also use any other methods which it can demonstrate give results equivalent to the above method.
10. The reference method for the sampling of deposited PAH shall be based on the exposition of cylindrical deposit gauges with standardised dimensions. In the absence of a CEN standardised method, Member States are allowed to use national standard methods.

As a result of these requirements and the development of the draft CEN standard which required a high volume flow rate sampler a number of decisions were taken;

1. A number of new sites were installed to comply with the number of sampling sites required by the Directive following an Article V assessment.
2. Additional samplers were installed at two background sites (Auchencorth Moss and Harwell) which were retained both particle and vapour phase PAHs. Deposition equipment was also installed at these sites.
3. New sampling equipment was required. The flow rate through the sampling head of the Andersen sampler is not high enough to comply with the PM10 requirement.
4. The Andersen sampler would require a manual filter change every day which would not be cost effective. An alternative sampler which met the requirements for flow in the CEN standard and provided automatic filter changing was required. Tests were necessary to show that the degradation in the sampler body was not significant between the end of the first filter change and the removal of the sample at the end of the 14 day capacity of the sampler under typical UK conditions.
5. The frequency of analysis would be increased from quarterly to calendar month. This required a change in the extraction approach
6. The existing analysis method provided data for the sum of benzo[b]fluoranthene, and benzo[j]fluoranthene and separately for benzo[k]fluoranthene. This analysis approach would be continued.
7. The network aims to achieve an uncertainty below 50%, data capture over 90% and time coverage of 100% for BaP in air and deposition and 33% for other PAHs in air .
8. While the CEN standard was unpublished the existing analytical method was used. Following the publication of the CEN standard in 2008, the 2008 samples will be analysed following it. The CEN method has not yet been designated by the European Union as the reference method.

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9. The deposition gauge used in the network follows is identical with the cylindrical deposit gauge used in the CEN validation trials.

Key results of these decisions were that; a significant number of new monitoring sites were required to be identified and installed and that a PM_{10} sampler capable of providing daily samples cost effectively was required.

The Andersen samplers in use in the network were replaced with Digitel DHA-80 samplers which had been demonstrated to be equivalent for PM_{10} sampling to the reference PM_{10} method. They also provided the ability to operate for up to 15 days with a 24 hour sampling period for each filter. A number of Digitel samplers fitted with PUF canisters were purchased for the longer list of PAHs and a number of deposition sampler sets for the background sites. The PUF samplers and deposition samplers were not operated during 2007.

3 Network Operation

The measurement of PAH has been undertaken by UK government funded networks since 1991. 2007 has been a year of significant change in the network. During this year the modified Andersen GPS-1 pesticides air samplers previously used were replaced with Digitel DHA-80 samplers.

3.1 Equipment Employed

3.1.1 Andersen GPS-1 Samplers

Prior to 2006 the equipment employed in the Polycyclic Aromatic Hydrocarbons Monitoring Network only slightly altered since 1991 with some improvements in the equipment to improve reliability. By the end of 2007 only two Andersen samplers were in operation in the PAH monitoring network. These were at the Harwell and Scunthorpe Town sites.

The samplers however continue to be in use in the Toxic Organic Micropollutants (TOMPs) network. Extracts from TOMPs network samples are analysed for PAHs under the PAH network. A picture of the Andersen GPS-1 sampler is shown in Figure 2 below. This sampler will only form a minimal part of the UK PAH monitoring network from 2008 onwards although it is understood that the Andersen GPS-1 will still be used in the Toxic Organic Micropollutants (TOMPs) network, which provides the PAH Network with samples for analysis of PAH.

Figure 2: Andersen GPS-1 Sampler

3.1.2 Digitel DHA-80 Filter only

The equipment employed in the UK PAH Monitoring Network complies with the CEN standard describing the measurement method for BaP, BS EN 15549: 2008 which was published in March 2008. Figure 3 below shows the Digitel DHA-80 air sampler.

All filters that meet the validity criteria of BS EN 12341, the PM_{10} sampling standard, have been submitted for analysis for PAH. The filters are extracted in solvent, the solvent is cleaned to remove other compounds and then analysed by gas chromatography and mass spectrometry to estimate the mass of each PAH present in the filters. The analytical results are used along with the volume of air that has been drawn through each filter to calculate the measured concentration (ng/m^3).

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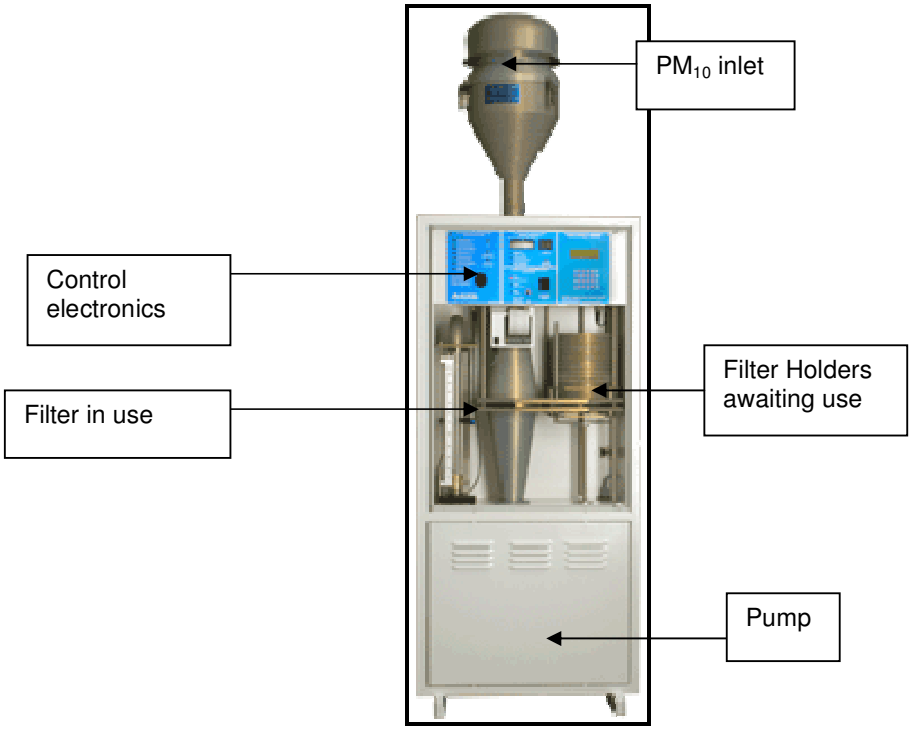
In 2007 the majority of the sites' filters were extracted on a monthly basis and analysed on a quarterly basis. In 2008 the filters will be extracted and analysed on a monthly basis.

Figure 3: Picture of a Digitel DHA-80 Sampler



3.1.3 Digitel DHA-80 Filter and Polyurethane Foam Adsorbent

The background monitoring sites at Auchencorth Moss and Harwell form part of the European Monitoring and Evaluation Programme (EMEP) super site network. They are also required for the Directive. At these sites in addition to the standard Digitel equipment described above additional Digitel samplers equipped with an accessory for vapour phase PAH sampling. After passing through the filter the sampled air is drawn through a glass chamber containing two pre-cleaned polyurethane foam adsorbents to trap vapour phase PAH. The sampler can be programmed manually to take up to 3 samples during unattended use for vapour phase PAH.

3.2 Site Locations

Figure 4 Location of Sites Measuring PAH during 2007/8

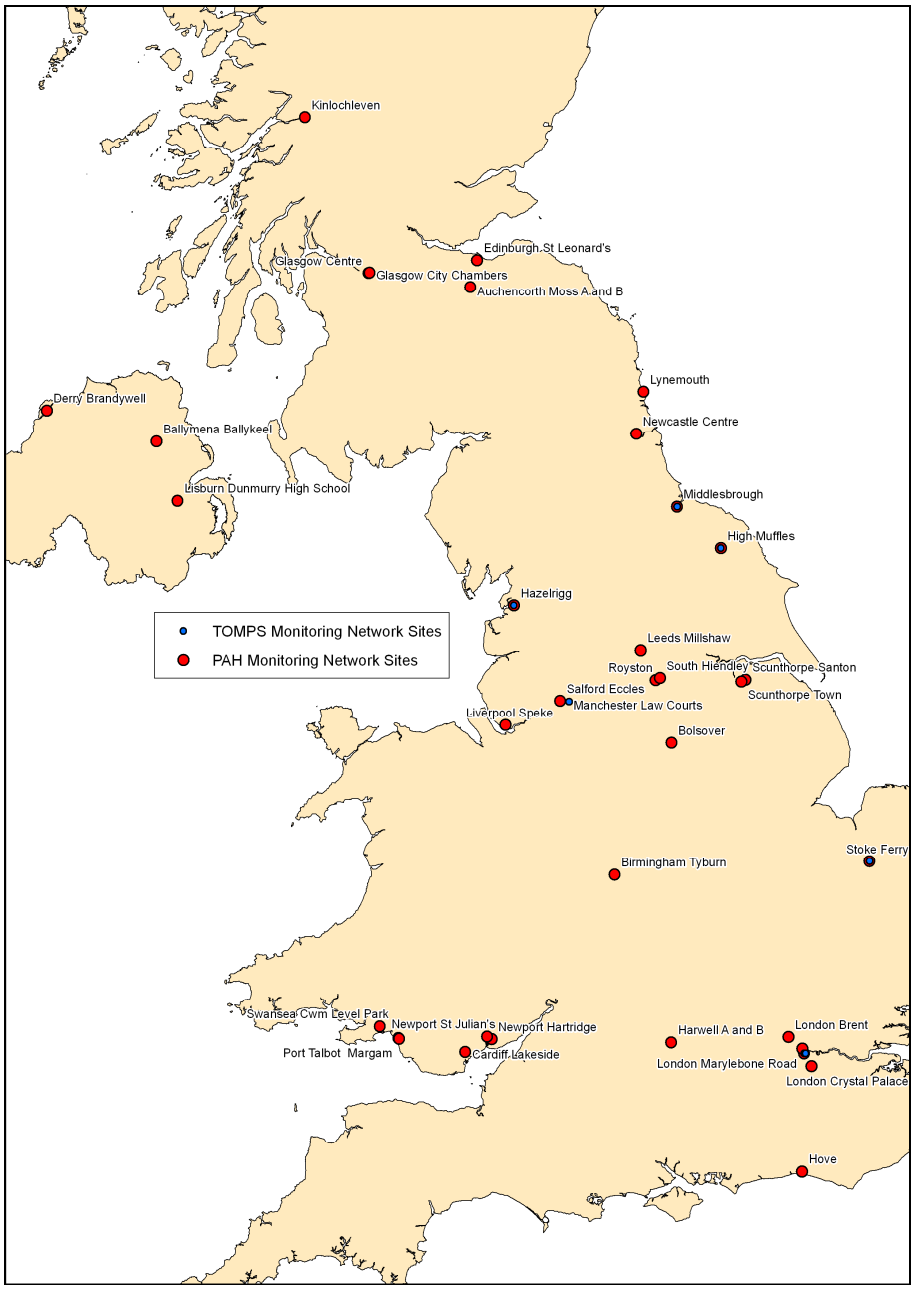


Figure 4 above shows the sites that were operating during 2007. There are a number of sites that were closed or changed location during 2007, these are detailed below:

PAH Monitoring Network:

- Glasgow City Chambers closed – the site moved to Glasgow Centre when the Digitel sampler installed to be at near ground level
- London 2 Ashdown House closed – the site moved to London Marylebone Road when the Digitel sampler installed to be collocated with AURN and other monitoring activities and to be near ground level

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- Newport Hartridge closed – the site moved to Newport St Julian's when the Digitel sampler was installed as Hartridge School is to be demolished and to be near ground level.
- Port Talbot Groeswen closed – the site moved to Port Talbot Margam as a result of redevelopment of the former hospital site.

TOMPs Monitoring Network

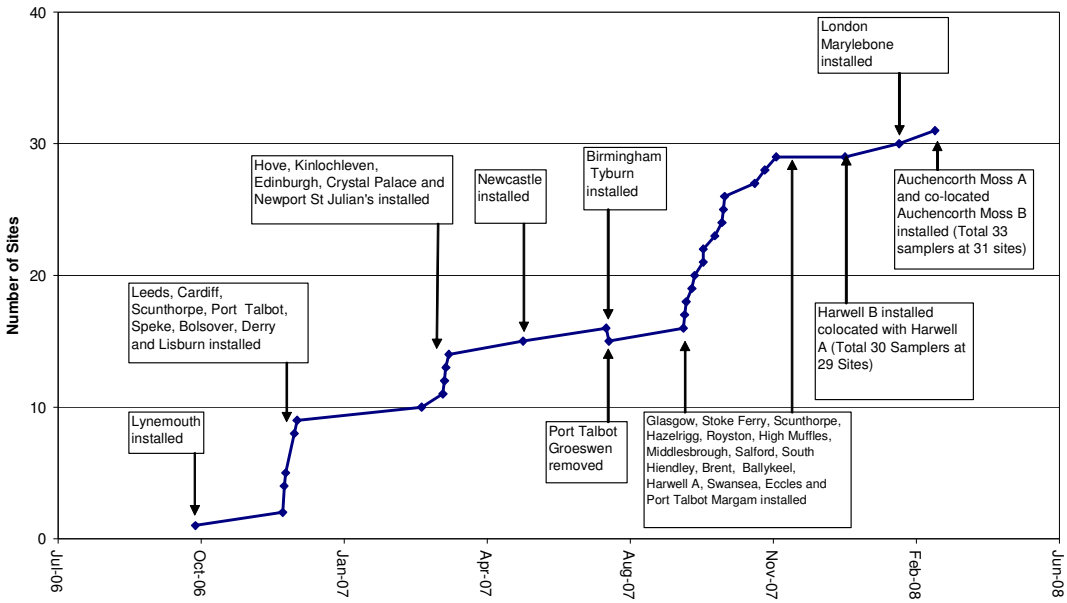
- Middlesbrough Longlands closed as a result of the planned demolition of the college
- London 2 Ashdown House closed - site moved to London Nobel House as the property occupiers were no longer prepared to allow the sampler to remain.

3.3 Digitel Sampler Installations

The number of monitoring sites in the PAH Monitoring Network has changed significantly since measurement of PAH began as part of a UK network in 1991. From later 2006 to early 2008 the Andersen samplers have been replaced with Digitel samplers. By the end of 2007 the only Andersen samplers operating as part of the PAH Monitoring Network were at Harwell and Scunthorpe Town. There were however a number of additional Andersen samplers operating as part of the TOMPs network during 2007; these were Hazelrigg, High Muffles, Manchester Law Courts, Middlesbrough Longlands College (closed Q4 2007), Stoke Ferry (closed end of 2007), and London Ashdown House.

Figure 5 shows that the number of operational sites has increased principally during the second half of 2007. Since October 2006 there has been a total of 33 Digitel DHA-80 PM_{10} samplers, including two PUF samplers, installed at 31 different monitoring sites in the UK.

Figure 5: Annotated plot showing number of Directive Compliant Sites in 2007-2008



The safety of subcontractors and employees working at network sites is a high priority for AEA, consequently an assessment of the requirements for working at height at the sites was undertaken prior to the operation of the Digitel samplers. It was concluded that barriers compliant with the Working at Heights Regulations would be required at sites where the sampler head were not accessible from ground level. These sites were: Glasgow Centre, Newcastle Centre, London Marylebone Road (barriers already present) and Scunthorpe Santon.

On installation of the samplers, the local site operators were given full training on the operation of the equipment. This training included highlighting any potential safety issues that the operators should be

aware of. The local site operators (usually Environmental Health Officers) were also provided with a laminated step-by-step instruction booklet including pictures that explained the actions required.

3.4 Site Calibration, Servicing and Breakdowns

3.4.1 Site Calibrations Digitel Samplers

All of the Digitel DHA-80 samplers were fully checked and calibrated on installation at the sites before entering into operation. In addition to this installation calibration, the sites were calibrated on a 6 monthly basis during 2007. Where possible, calibrations have been scheduled along with Automatic Urban and Rural Network (AURN) or Acid Deposition calibration visits. Over 100 Digitel sampler calibrations have been undertaken of the Digitel samplers.

3.4.2 Calibration of the Andersen Samplers

During 2007 only a relatively small number of Andersen samplers were operational in the PAH monitoring network. These were at the following sites: Glasgow City Chambers, London Ashdown House, London Brent and Scunthorpe Town. The Andersen samplers were calibrated on a minimum of a 12 monthly basis.

3.4.3 Electrical Testing and Site Servicing/Breakdowns

In an attempt to ensure the safety of the equipment, all equipment relating to the PAH monitoring network is electrically tested during each site visit where possible. A suitably qualified staff member tests all equipment every 12 months. If for any reason any equipment fails the electrical test and the reason for the failure cannot be identified and rectified during the site visit, the equipment is taken out of commission and replaced as soon as possible.

The pump motors on the Digitel samplers require less maintenance than the Andersen sampler however the samplers have not been without significant problems. A number of unscheduled visits have had to be undertaken due to motor failures, circuit board failures, communication problems and jamming mechanisms.

Digitel samplers have been replaced at Hazelrigg, Lisburn and Liverpool Speke sites when sampler issues needed to be resolved in the AEA service workshop. The replacement of samplers requires two members of staff due to the 60 kg weight of the samplers.

A number of motors have been replaced in the samplers. This is not usually due to the complete failure of the motors but as a result of local site operators highlighting that the motors were potentially becoming too noisy for local residents, which could lead to complaints. Where local site operators have highlighted the potential noise issues, members of the field teams working out of Harwell, Warrington or Glengarnock attended the site, made an assessment and if necessary replaced the motor.

There was an electrical problem that was associated with mains supply at the Birmingham site during early 2007 when the installation of the Digitel sampler was scheduled. It took some time for the problem to be rectified and appeared to be a result of an inadequate power supply to the installation. This delayed the installation until a reliable supply could be put into operation.

There were few problems with the limited number of Andersen samplers that remained in the network during 2007. The most common sampler problem was motor noise or failure.

4 Sources of PAH

The National Atmospheric Emissions Inventory (NAEI) provides estimates of the emission to the atmosphere of PAHs The inventory estimates the emissions of 16 PAH compounds, the US EPA 16, which includes BaP. As with all emissions inventories there is some uncertainty in the national emission estimates. As PAH emissions are not routinely measured from most industrial processes and emissions are dominated by non industrial sources the uncertainty of the PAH inventory is greater than for other pollutants for which the emissions from the major sources are extensively monitored.

The main sources of emissions of BaP and US-EPA 16 to air for the UK during 2006 according to the NAEI are given in Table 2 and Table 3 below:

Table 2: 2006 Emissions of Benzo[a]pyrene

Source Sector	Emission (kg)	Fraction of total (%)
Combustion in Industry	168	5
Road Transport	378	11
Residential/Commercial /Institutional Combustion	1724	48
Agricultural & Waste Incineration	795	22
Production Processes (metals)	134	4
Other	393	11
Total	3591	100

It is apparent from Table 2 that the majority of the UK anthropogenic emission of benzo[a]pyrene comes from residential, commercial and institutional combustion and agricultural and waste incineration, with around 70% of the total UK estimated emission coming from these sources

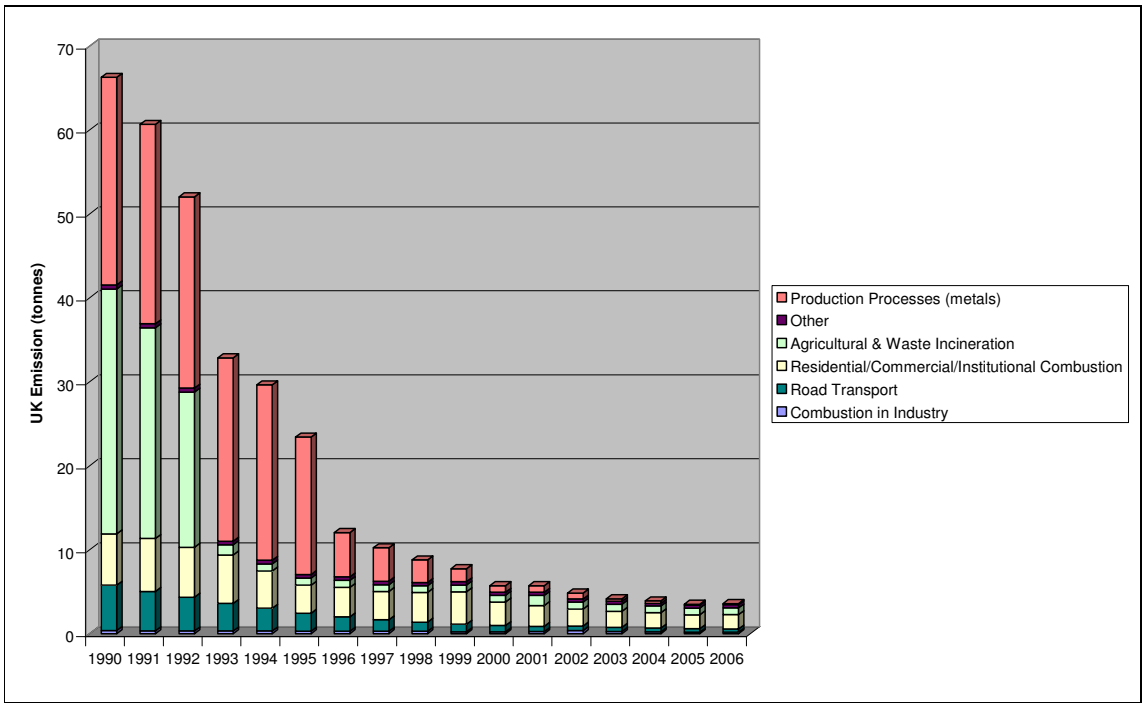
Table 3: 2006 Emissions of US-EPA 16

Source Sector	Emission (tonnes)	Fraction of total (%)
Combustion in Industry	62	5
Residential/Commercial /Institutional Combustion	273	23
Transport	750	62
Production Processes (metals)	4	0.3
Other	120	10
Total	1209	100

Table 3 shows estimated UK emission of the US-EPA 16 which indicates that the dominant source of the US-EPA 16 PAH is transport with an estimated 63% of the UK emission coming from this source. The total emission in terms of the US-EPA 16 is dominated by the emission of naphthalene.

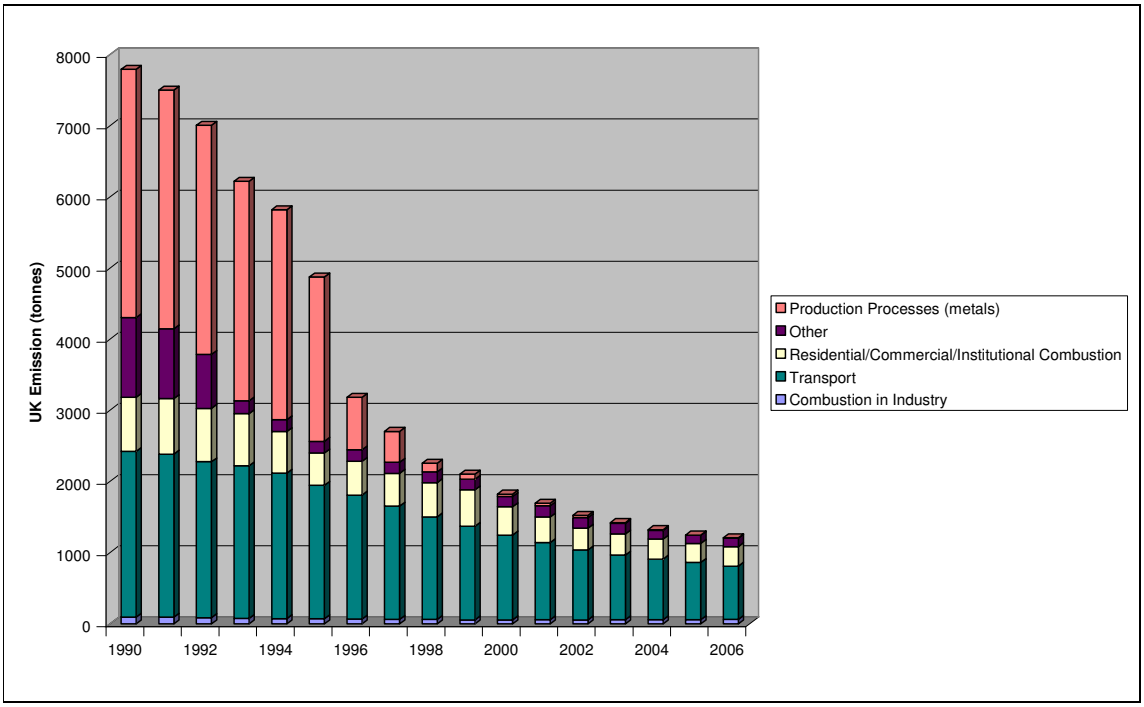
Figures 6 and 7 below show that there has been a decrease in the estimated emission from sources in the UK since 1990. The most significant decreases have been seen in the emission of BaP have been seen in the metals production and processing sector and agricultural waste burning, which have both been controlled by regulation. Residential, commercial and industrial combustion dominate the emission of b[a]p in the UK.

Figure 6: Estimated Emissions of Benzo[a]pyrene 1990-2006



The estimated emission of the US-EPA 16 PAH are shown in Figure 7. The chart shows that emission of PAH from the metal production and processing sector have decreased significantly with a slight decrease in the emissions from transport. The transport sector dominates the emission of the US-EPA 16 due to the emissions of naphthalene from transport sources.

Figure 7: Estimated Emissions of US-EPA 16 1990-2006


UK Emission (tonnes)
8000
7000
6000
5000
4000
3000
2000
1000
0
1990
1992
1994
1996
1998
2000
2002
2004
2006
Production Processes (metals)
Other
Residential/Commercial/Institutional Combustion
Transport
Combustion in Industry

5 PAH Measurement

5.1 PAH Retention during Sampling

The change in the measurement technique from the Andersen to the Digitel samplers has led to a change in the number of PAH that can be said to be representatively sampled. The Digitel samplers only collect those PAHs associated with particles in the PM10 size fraction which are caught by the filter plus some PAHs from the vapour phase that adsorb to the surface area of the filter or to the particles already caught on the filter. In contrast the Andersen samplers collect both the particle and vapour phase PAHs as they use a polyurethane foam adsorbent in addition to the filter. Hence the results from the Digitel samplers will only represent a fraction of the total of a particular PAHs present in the sampled air and in consequence if this fraction is small it will not be representative of the total present in air. This will be a function of the volatility of the individual PAH compound at the temperature of the filter, and the adsorptive relationship between the PAH compound and the particles present in a particular filter. However the results also represent other changes; such as to the size distribution of the particles entering the sampler head and that the filters are exposed to air for only 24 hours instead of 14 days.

In order to assess which PAHs were not principally associated with the particle phase and so the data reported was not representative of the air concentration a comparison was made between the results from collocated Digitel and Andersen samplers for the industrial site of Scunthorpe (Figure 8) and the rural sites of Hazelrigg, High Muffles and Stoke Ferry (Figure 9). The order of the PAHs in the figures is that of chromatographic retention time on the gas chromatograph which increases as a function of decreasing volatility.

Both Figure 8 and 9 show that there is a step change in the ratio of the concentrations at benzo[c]phenanthrene with the majority of the measurements of the more volatile PAH showing ratios below 0.4. It is surprising that the ratio for benzo[e]pyrene is so low at the rural sites compared to compounds of similar volatility but not at Scunthorpe.

It is considered that the PAH that can be reported as valid estimates of the air concentration are those from benzo[c]phenanthrene onwards, which includes all of the PAH that are required to be reported under the Directive. However because of the short term nature of the data available for this analysis, the limited number of sites and the lack of consistency between samples it is recommended that the comparison of methods should continue.
It is not proposed to correct the measured data by these ratios.

Figure 8: Ratio of PAH Concentrations measured by Digitel and Andersen Samplers at Scunthorpe

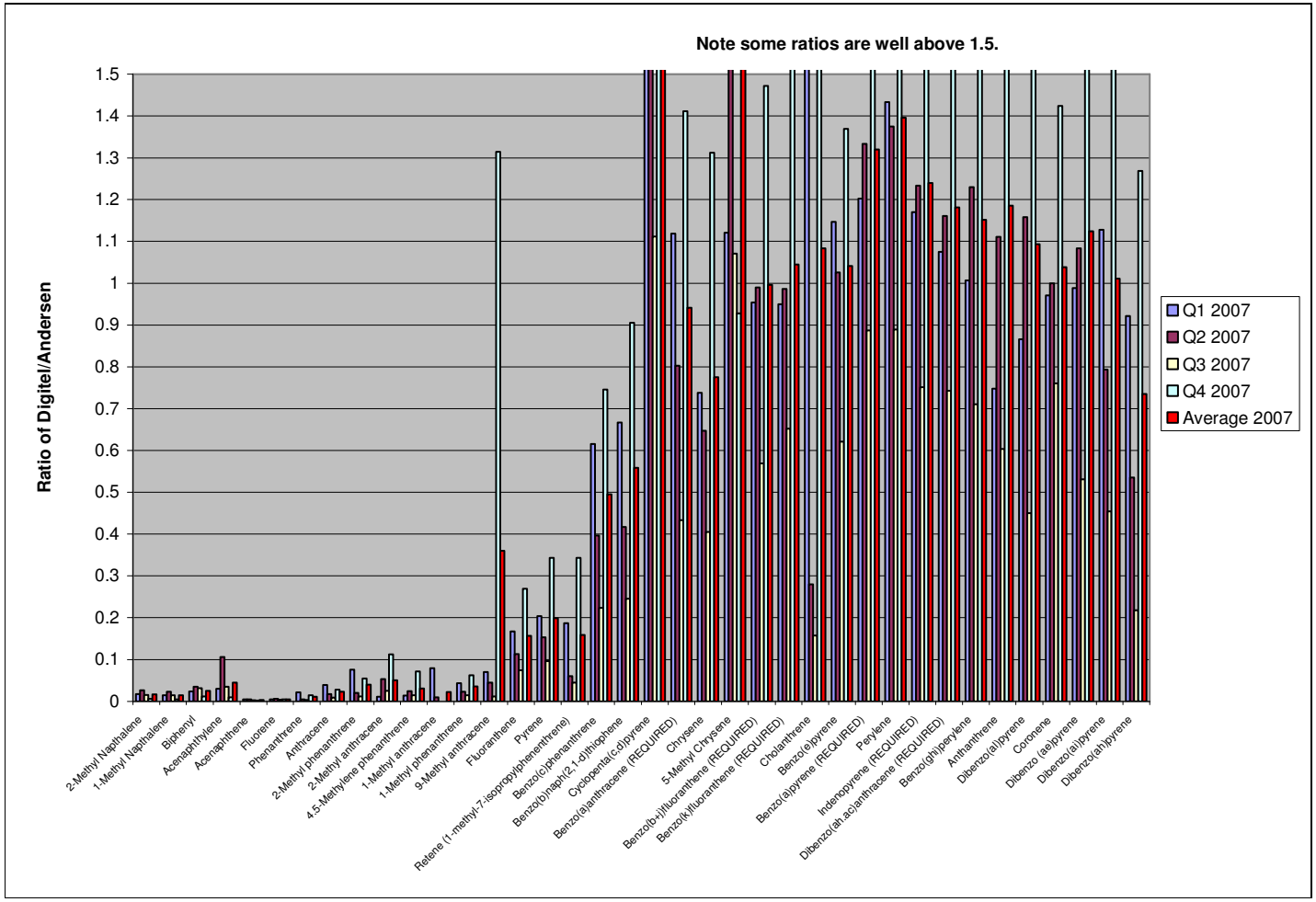
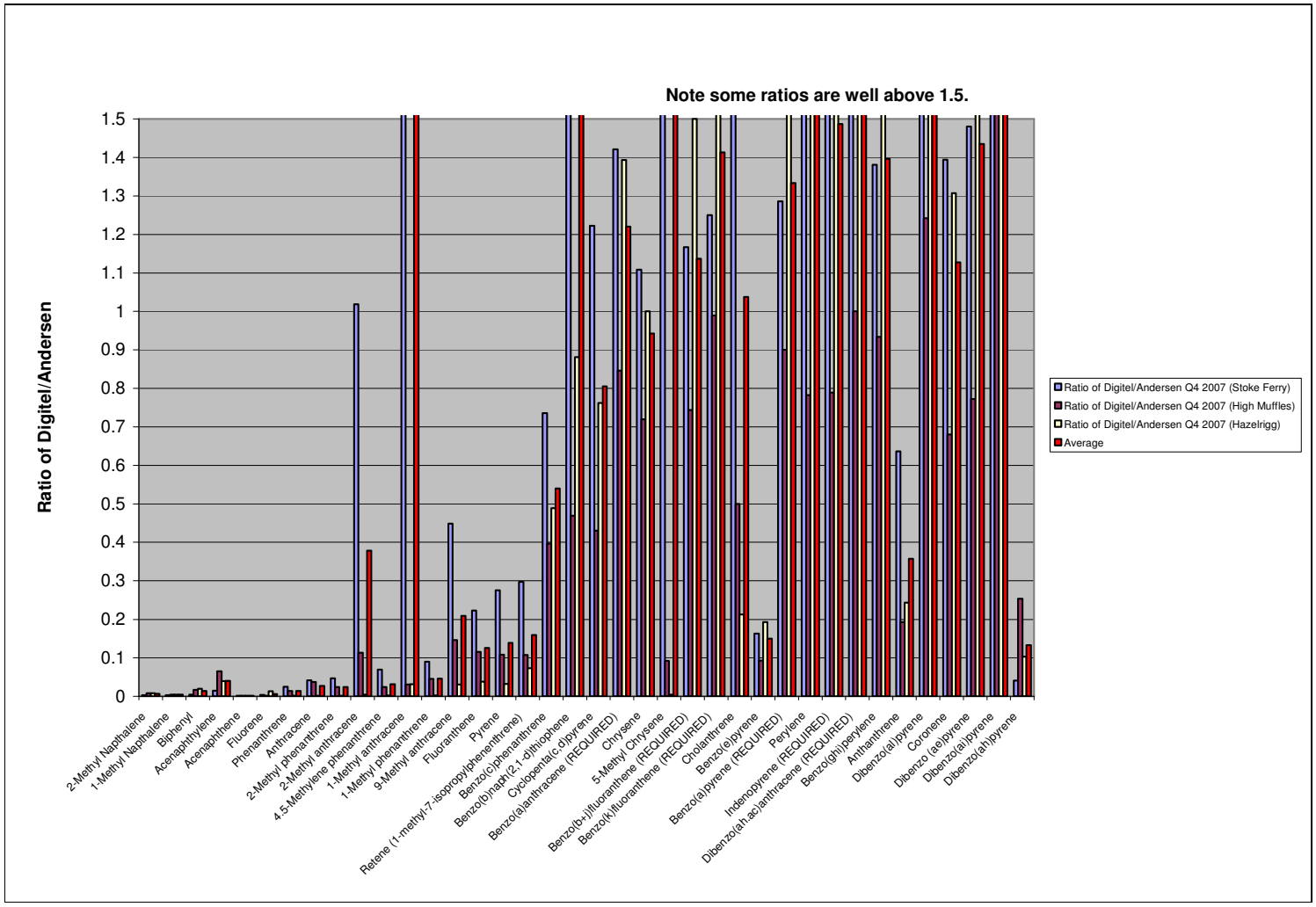


Figure 9: Ratio of PAH Concentrations measured by Digitel and Andersen Samplers at Rural Sites



5.2 Benzo[a]pyrene Measured Concentrations

Benzo[a]pyrene (BaP) is often used as a marker for the carcinogenic risk of polycyclic aromatic hydrocarbons and is the established measure of PAH concentrations in the for the UK Air Quality Objective and the EU Directive Target Value. This report therefore concentrates on measured concentrations of BaP in the UK PAH monitoring network. The data for all the measured PAH concentrations that are considered reportable are available via the Air Quality Archive (www.airquality.co.uk).

5.2.1 Comparison of Annual Measured Concentrations with Air Quality Objectives and Target Values in 2007

Table 4 shows the annual mean BaP concentration at all of the sites in the PAH monitoring network that were operating between 2000 and 2007. Concentrations in bold indicate that the value is above the UK Air Quality Objective of 0.25 ng/m^3 and bold and underlined figures indicate that the value is above the EU Directive Target Value of 1 ng/m^3.

Table 4: Annual Benzo[a]pyrene concentration 2000-2007 (ng/m^3)

	2000	2001	2002	2003	2004	2005	2006	2007
Ashington Andersen (Urb-Ind) Closed	0.17	0.2	0.17	0.17	0.16	0.16	0.12	
Belfast Clara Street Andersen (Urb)		0.37	0.13	0.08	0.15	0.27	0.14	
Birmingham East and Tyburn Andersen (Urb)		0.16	0.13	0.16	0.14	0.12	0.12	
Bolsover Andersen (ex-Ind)	0.25	**0.28**	0.24	**0.46**	0.22	0.23	0.12	
Bolsover Digitel (ex-Ind)								**0.32**
Cardiff Lakeside Primary School Andersen (Urb)				0.12	0.069	0.09	0.078	
Cardiff Lakeside Primary School Digitel (Urb)								0.1
Crystal Palace Parade Andersen (Urb-Road)		0.21	0.25	0.21	0.19	0.17	0.11	
Derry Brandywel Digitel (Urb)								**0.59**
Edinburgh St Leonards Andersen (Urb)				0.052	0.035	0.046	0.039	
Edinburgh St Leonards Digitel (Urb)								0.043
Glasgow City Chambers Andersen (Urb)	0.12	0.12	0.12	0.065	0.071	0.1	0.062	
Hazelrigg Andersen (Semi-Rur)	0.06	0.083	0.048	0.043	0.02	0.021	0.11	0.084
High Muffles Andersen (Rur)	0.04	0.05	0.043	0.045	0.026	0.025	0.037	0.051
Holyhead Andersen (Urb-Ind) Closed	0.11	0.15	0.19	0.13				
Hove Andersen (Urb)				0.1	0.094	0.099	0.073	
Hove Digitel (Urb)								0.19
Kinlochleven Andersen (Urb-ex-Ind)	**2.3**	**0.34**	**0.38**	0.21	**0.32**	**0.31**	0.23	
Kinlochleven Digitel (Urb-ex-Ind)								0.23
Leeds Millshaw Digitel (Urb)								**0.29**
Leeds Potternewton and Millshaw Andersen (Urb)		0.16	0.18	0.21	0.13	0.17	0.13	
Lisburn Dunmurry High School Andersen (Urb)	**0.93**	**0.96**	**0.66**	**0.95**	**0.62**	**0.61**	**0.44**	
Lisburn Dunmurry High School Digitel (Urb)								**0.6**
Liverpool Speke Andersen (Urb)		0.08	0.14	0.14	0.1	0.1	0.079	
Liverpool Speke Digitel (Urb)								0.17
London Ashdown House Andersen B (Urb)	0.077	0.075	0.081	0.096	0.054	0.088	0.03	0.12
London Brent Andersen (Urb)				0.14	0.095	0.11	0.12	0.086
London Romney House and Ashdown House (Urb)	0.14	0.14	0.13	0.12	0.076	0.081	0.11	0.076
Lynemouth Digitel (Urb-ind)								0.22
Manchester Law Courts Andersen (Urb)	0.24	**0.34**	0.17	0.24	0.11	0.097	0.14	0.083
Middlesbrough Longlands College Andersen (Urb-Ind)	**0.28**	**0.37**	0.21	0.24	0.14	0.18	**0.28**	**0.35**
Newcastle Centre Andersen (Urb)		0.11	0.12	0.16	0.064	0.084	0.09	
Newport Hartridge Comp Andersen (Urb-ex Ind)	**0.35**	**0.36**	0.19	0.11	0.1	0.1	0.08	
Port Talbot Groeswen and Margam Digitel (Urb-Ind)								**0.48**
Port Talbot Groeswen Andersen (Urb-Ind)	**0.59**	**0.4**	**0.34**	**0.47**	**0.29**	**0.41**	**0.29**	
Scunthorpe Cottage Beck & Town Andersen (Urb-Ind)	**1.2**	**0.34**	**1.4**	**1.3**	**0.5**	**0.95**	**0.76**	**0.86**
Scunthorpe Town Digitel (Urb-Ind)								**1.2**
Stoke Ferry Andersen (Rur)	0.087	0.09	0.083	0.08	0.043	0.06	0.14	0.062

Bold indicated above UK Air Quality Objective (0.25 ng/m^3)
Bold and underlined indicates above EU Target Value (1 ng/m^3)

It is apparent that there are a number of sites that are consistently above or close to the UK Air Quality Objective of 0.25 ng/m^3 and two sites that have been or are at or close to the EU Target Value. It

must be noted that there are a number of newly established Digitel monitoring sites that had not been in operation for a full year at the end of 2007. Of the sites which have annual means available Bolsover, Derry Brandywell, Kinlochleven, Lisburn Dunmurry High School, Middlesbrough Longlands College, Port Talbot Groeswen and Scunthorpe Town are consistently above or close to the UK Air Quality Objective. The only sites where available annual means are above the EU Directive Target Value are Scunthorpe Town and Kinlochleven however the Kinlochleven site has not exceeded the Target Value since 2000, when the primary aluminium production plant closed. The Scunthorpe Town Digitel sampling site shows exceedance of the target value in 2007 with a concentration of 1.2 ng/m^3 whereas the collocated Andersen sampler measured a value of 0.86 ng/m^3. If it is assumed that the ratio of the Digitel sampler to Andersen sampler is representative then it is likely that the Scunthorpe Town site would have been greater than the EU Target Value in five out of the last six years. The target value in the Directive is regarded as having been exceeded if the concentration is greater than 1 ng/m^3 in three out of five years.

The 2007 annual mean BaP concentrations have been displayed graphically as a percentage of the UK Air Quality Objective and EU Target Value. The figures show the Digitel and Andersen data separately, comparing them with the Objective and Target Value.

Figure 10 shows the concentrations at the Digitel monitoring sites as a percentage of the UK Air Quality Objective. It shows that of the sites where annual means were obtained in 2007 there were six sites that exceeded the UK Air Quality Objective with three sites that were over 200% of the Objective, one of which was almost 500% of the Objective.

Figure 10: Benzo[a]pyrene as a Percentage of the UK Air Quality Objective for Sites Using Digitel Air Samplers in 2007

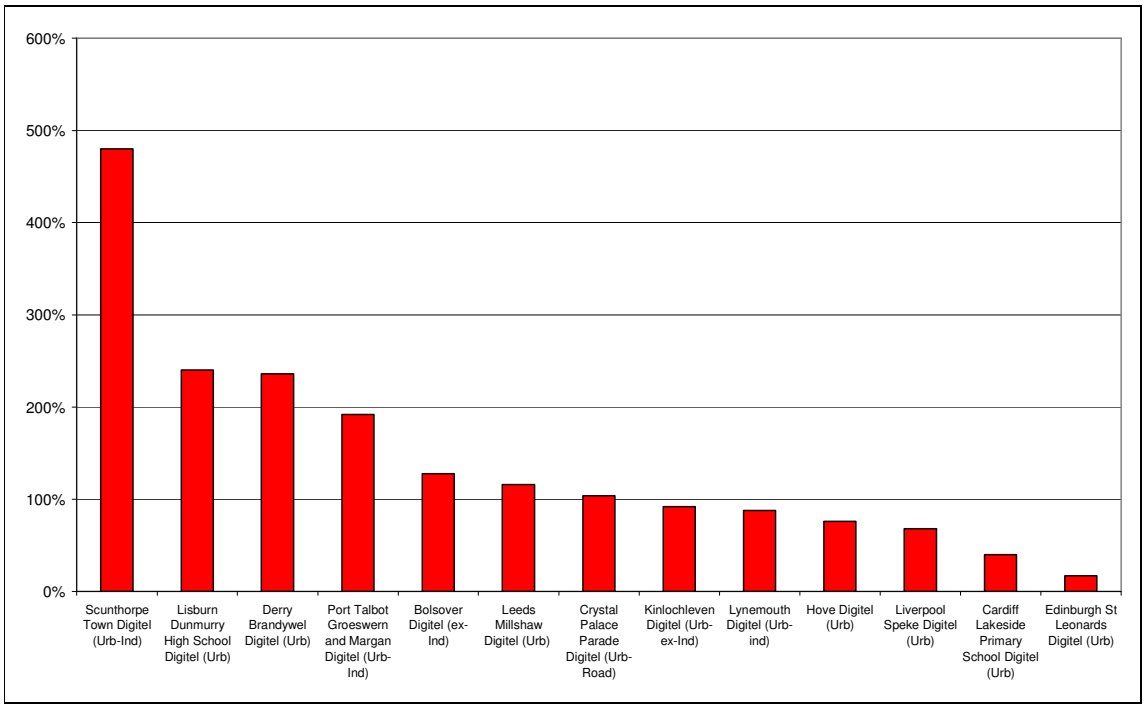
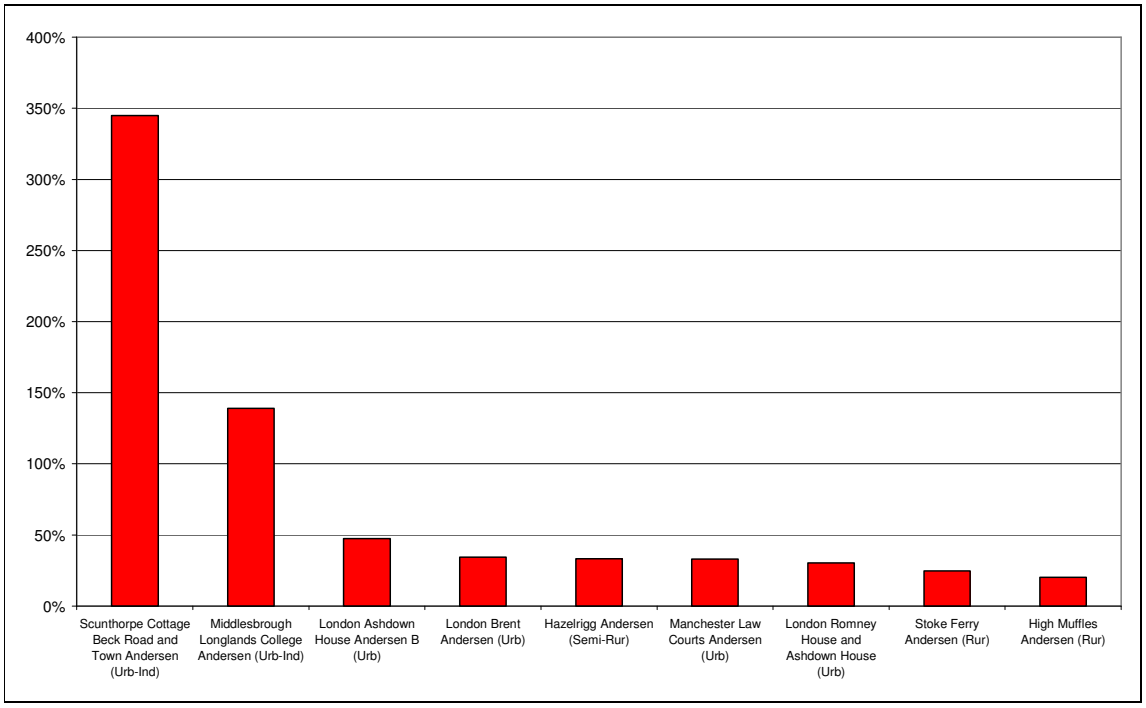


Figure 12 shows the concentrations at sites with the Andersen samplers that were operating for the full year in 2007 as a percentage of the UK Air Quality Objective. Of these sites only two sites exceeded the Objective, which were Scunthorpe Town and Middlesbrough. The other Andersen samplers that were operating a sufficient time to achieve an annual mean returned values that were all less than 50% of the Objective.

Figure 11: Benzo[a]pyrene as a Percentage of the UK Air Quality Objective for Sites Using Andersen Air Samplers in 2007



Figures 12 and 13 show the BaP concentrations as a percentage of the EU Target Value. Figure 12 clearly show that of the sites operating throughout the year, only Scunthorpe Town exceeded the Target Value. There were a number of sites that were installed during 2007 that were not operating for a sufficient length of time for an annual mean to be calculated.

Figure 12: Benzo[a]pyrene as a Percentage of the EU Target Value for Sites Using Digitel Air Samplers in 2007

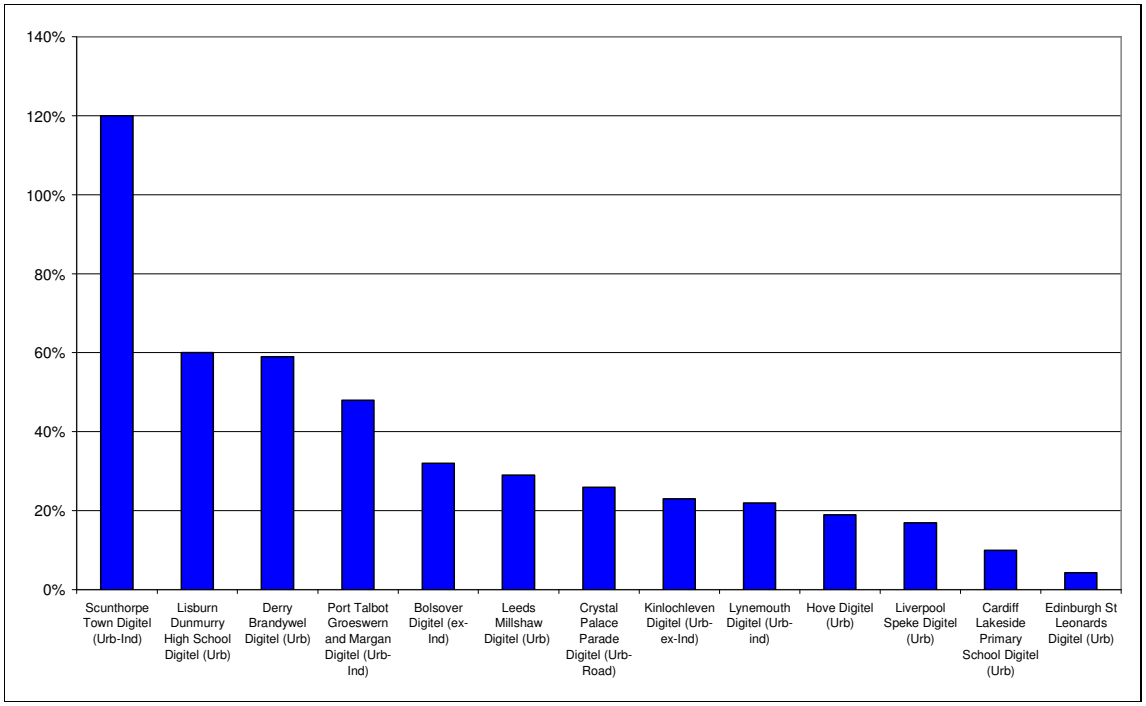
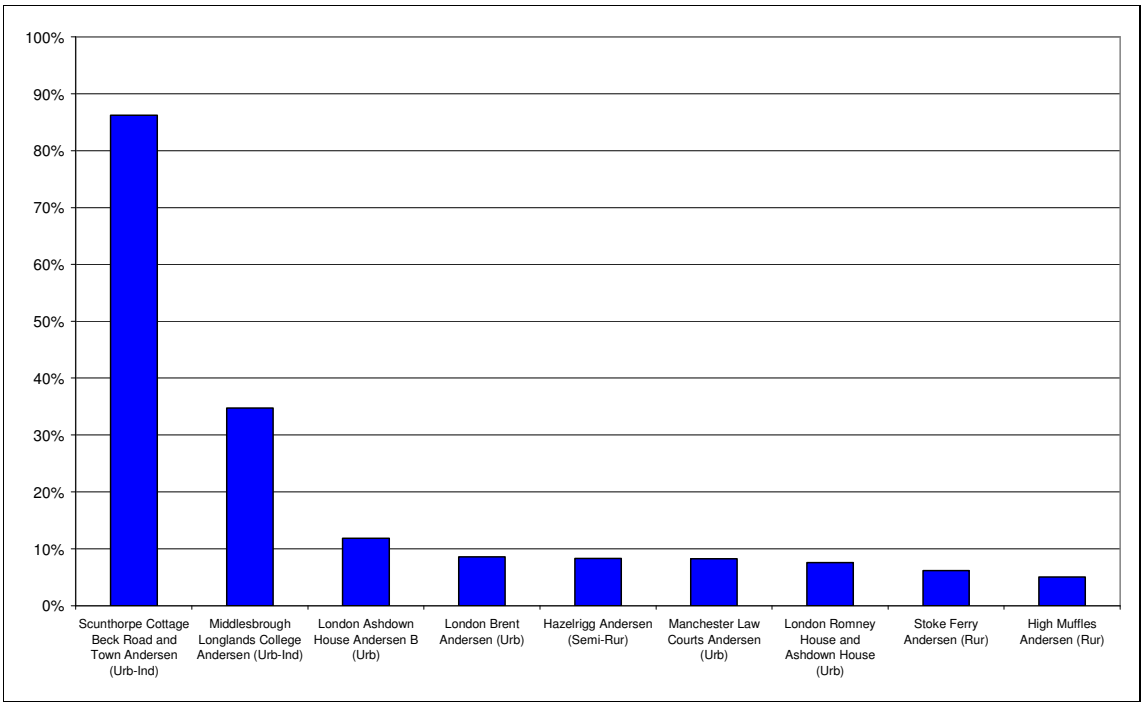


Figure 13 shows that none of the Andersen samplers exceeded the Target Value with only Scunthorpe Town close to exceeding this Target Value. It should however be noted that the Andersen samplers used in the network are not compliant with the CEN Standard as the flow rate is not constant they are not PM_{10} samplers, they have been operated 14 day sample durations rather than the 24 hours required by the directive and are capture the vapour phase PAHs in addition to those associated with particles. While the Andersen samplers could be operated in a approximately PM10 mode for daily samples they would not operate reliably and would require daily visits to change the filter.

Figure 13: Benzo[a]pyrene as a Percentage of the EU Target Value for Sites Using Andersen Air Samplers in 2007



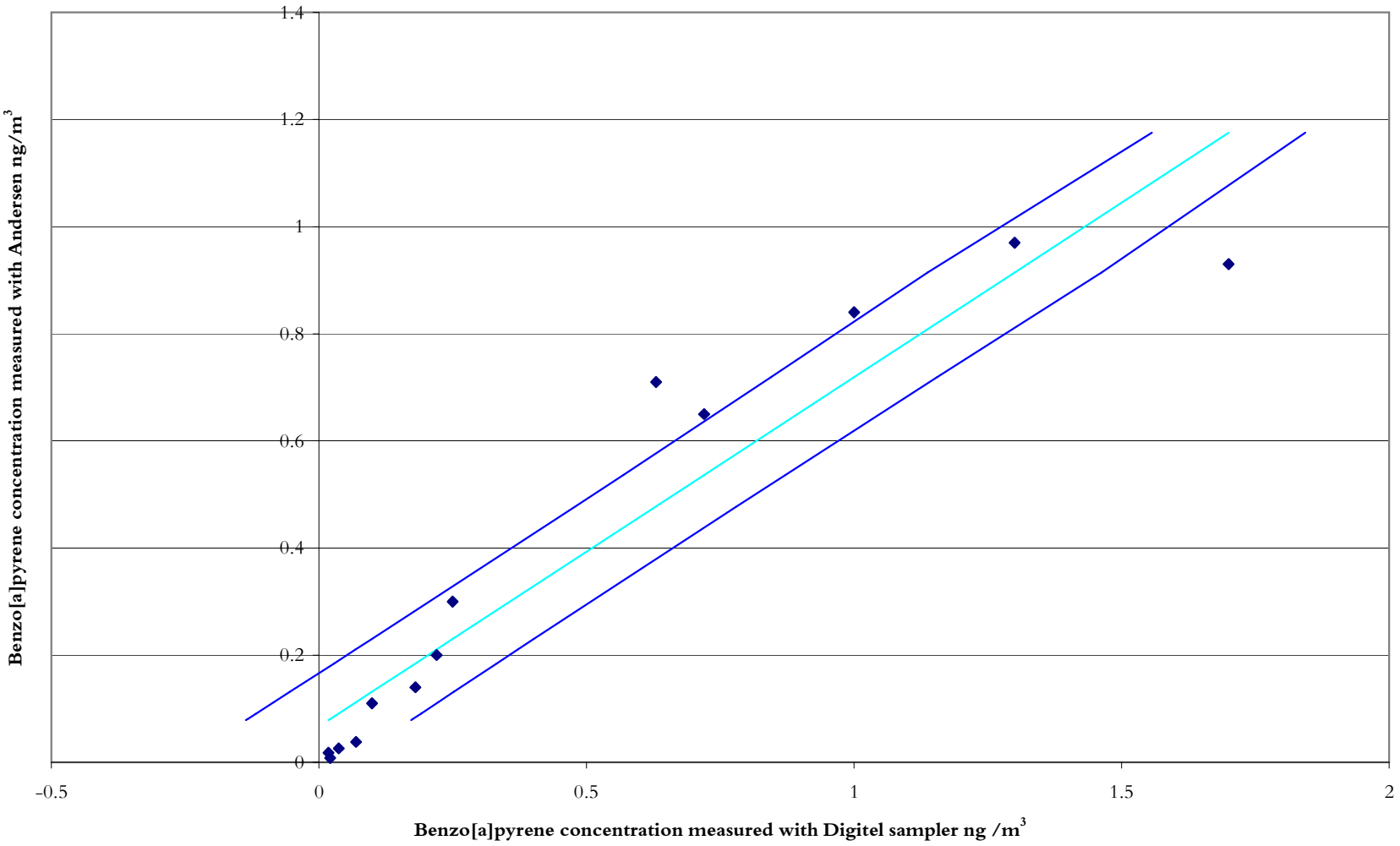
5.2.2 Quarterly Benzo[a]pyrene Concentrations During 2007

Table 5 contains the quarterly data from the Andersen and the Digitel samplers that were operating during 2007. The data shown in bold text are monitoring results from the Digitel samplers.

Table 5 shows that there are a number of monitoring sites at which Andersen and Digitel samplers are collocated. These are Harwell, Hazelrigg, High Muffles, Scunthorpe and Stoke Ferry,. The concentration reported from both sampling methods indicates that the Digitel sampler report higher concentration than the Andersen samplers, however this is not consistent (see Figure 14). This indicates that the relationship is not linear as the residuals indicate curvature in the data.

The comparison using data from the Scunthorpe site is the only case where the data is directly comparable with an identical analytical method and similar sampling periods). The comparison was operating for the whole of 2007 and shows that there is some variability in the difference in concentrations reported between quarters. The percentage difference between the Digitel and the Andersen at the Scunthorpe site varies significantly, being 11% lower in quarter 3 to 83% higher in quarter 4. The annual average difference between measured BaP concentration reported by the two samplers during 2007 at the Scunthorpe site is 34 %. The measured concentration from the Digitel sampler is the higher. The reasons for this difference may be due to the different periods of sampling with the Andersen samplers collecting material over the course of 2 weeks whereas the Digitel samplers collect material on a daily basis, hence there might be a greater potential for loss of the material collected by the Andersen sampler during the 2 week sampling period.

Figure 14: A Comparison of Benzo[a]pyrene concentrations measured with the Digitel and Andersen samplers
The linear regression line (with 95% confidence limits) is y = 0.652 (±0.050) x + 0.067 (±.0.036) r2 = 0.980 p <0.0001



It should be noted that in addition to the change in measurement technique from 2008 the analytical technique will change to comply with the CEN standard published in March 2008. These changes in measurement technique and analysis protocol may also affect the reported concentrations of PAH.

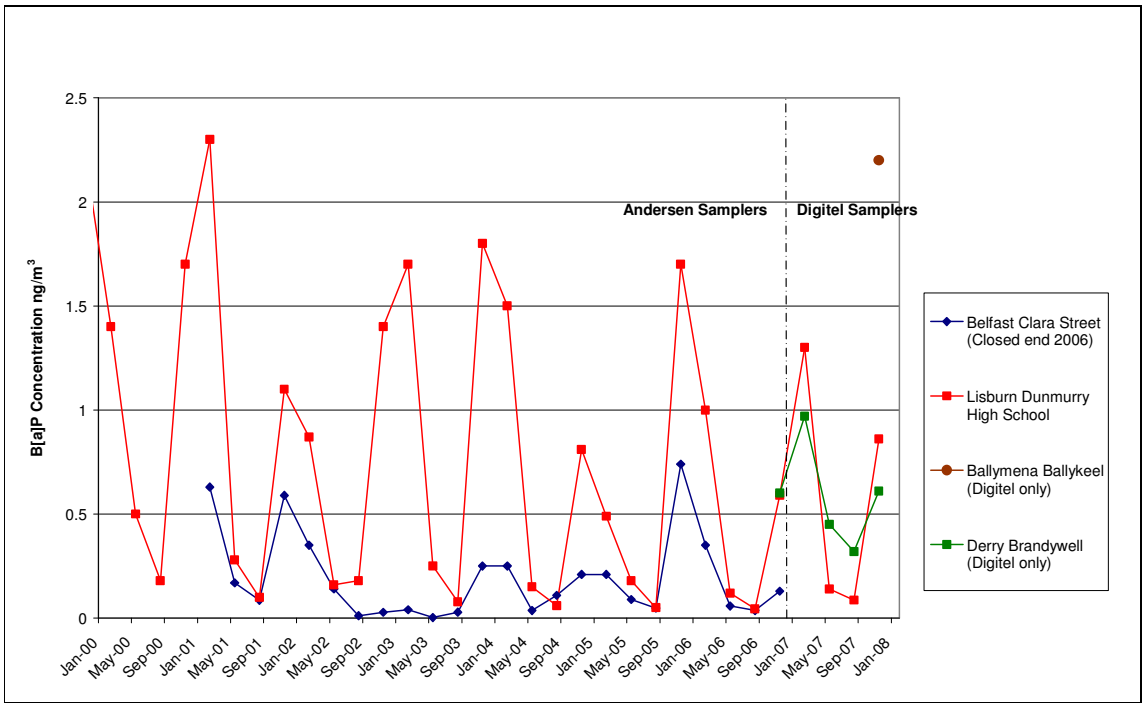
Table 5: Quarterly Benzo[a]pyrene concentration 2007 (ng/m^3)					
Site		Q1 2007	Q2 2007	Q3 2007	Q4 2007
Ballymena Ballykeel (Urb)	Digitel	**..**	**..**	**..**	**2.2**
Birmingham Tyburn (Urb)	Digitel	**..**	**..**	**0.059**	**0.44**
Bolsover (Ex-ind)	Digitel	**0.47**	**0.12**	**0.055**	**0.65**
Cardiff Lakeside Primary School (Urb)	Digitel	**0.17**	**0.066**	**0.023**	**0.16**
Crystal Palace Parade (Urb-roadside)	Digitel	**0.28**[(3)]	**0.13**	**0.14**	**0.49**
Derry Brandywell (Urb)	Digitel	**0.97**	**0.45**	**0.32**	**0.61**
Edinburgh St Leonard's (Urb)	Digitel	**0.015**	**0.02**	**0.016**	**0.12**
Glasgow Centre (Urb)	Digitel			**0.012**	**0.17**
Glasgow City Chambers (Urb)	Andersen	0.017	0.015	..	..
Harwell A (Back)	Digitel	..	..	..	**0.059 (Nov)** **0.16 (Dec)**
Hazelrigg (Rur)	Andersen	0.2	0.088	0.008	0.038
Hazelrigg (Semi-Rur)	Digitel	..	..	**0.021**[(3)]	**0.069**
High Muffles (Rur)	Andersen	0.047	<0.028	0.018	0.11
High Muffles (Rur)	Digitel			**0.018**[(3)]	**0.099**
Hove (Urb)	Digitel	**0.35**	**0.047**	**0.023**	**0.32**
Kinlochleven[2] (Ex-ind)	Digitel	**0.22**	**0.16**	**0.094**	**0.46**
Leeds Millshaw (Urb)	Digitel	**0.35**	**0.14**	**0.086**	**0.58**
Lisburn Dunmurry (Urb)	Digitel	**1.3**	**0.14**	**0.087**	**0.86**
London Ashdown House (Urb)	Andersen	0.084	0.032	0.037	0.15
London Brent (Urb)	Andersen	0.23	0.027	0.037	..
London Brent (Urb)	Digitel	..	..	..	**0.3**
Lynemouth[1] (Urb-ind)	Digitel	**0.33**	**0.15**	**0.082**	**0.31**
Manchester Law Courts (Urb)	Andersen	0.084	0.046	0.03	0.17
Middlesbrough (Urb-ind)	Digitel	..	..	**0.22**[(3)]	**0.25**
Middlesbrough Longlands College (Urb-ind)	Andersen	0.28	0.61	0.2	0.3
Newcastle Centre (Urb)	Digitel	..	**0.036**	**0.05**	**0.28**
Newport St Julian's School (Urb)	Digitel		**0.11**	**0.098**	**0.38**
Port Talbot Groeswen (Urb-ind)	Digitel	**0.42**	**0.89**	**0.26**	**..**
Port Talbot Margam (Urb-ind)	Digitel	..	**..**	**..**	**0.36**
Royston (Urb-ind)	Digitel	..	**..**	**3.3**[(3)]	**1.2**
Salford Eccles (Urb)	Digitel	..	**..**	**..**	**0.38**
Santon (Urb-ind)	Digitel	..	**..**	**2.7**[(3)]	**1.7**
Scunthorpe Town (Urb-ind)	Andersen	0.84	0.97	0.71	0.93
Scunthorpe Town (Urb-ind)	Digitel	**1**	**1.3**	**0.63**	**1.7**
South Hiendley (Urb-ind)	Digitel	**..**	**..**	**..**	**0.92**
Speke (Urb)	Digitel	**0.22**	**0.074**	**0.036**	**0.36**
Stoke Ferry (Rur)	Andersen	0.057	<0.023	0.026	0.14
Stoke Ferry (Rur)	Digitel	..	..	**0.037**[(3)]	**0.18**

Note: [1] Ashington was replaced by Lynemouth at the end of 2006.
[2] Kinlochleven was industrial until the Alcan smelter closed in 2000
[3] Digitel results from samples less than 1 month in duration

Back; background monitoring site
Ind; industrial monitoring site
Rur; rural monitoring site
Urb; urban monitoring site
Urb-Ind; urban –industrial monitoring site

AEA

Figure 15: Benzo[a]pyrene Concentrations at Northern Ireland Monitoring Site 2000-2007



The pronounced seasonal variation at the Derry Brandywell and Lisburn Dunmurry sites shown in Figure 15 is thought to be because of higher solid fuel use during winter for domestic heating. As these monitoring sites are not in smoke control areas it is expected that there will be significant emission of PAH during winter as a result of the use of non-smokeless solid fuels such as bituminous coal or wood for domestic heating. In the early part of this period natural gas was not available in Lisburn, however by the end of 2007 it is thought that the majority of the houses in the Seymour Hill estate in which the Lisburn Dunmurry site is located have natural gas primary heating. The seasonal variation is less apparent at the Belfast site. The Belfast area had introduced smoke control areas before the monitoring started and natural gas was available in central Belfast earlier than Lisburn.

It is apparent from a review of Table 5 that there are a number of the sites established towards the end of 2007 which showed high concentrations during the limited period of 2007 when they were operating and so have the potential for high annual mean concentrations in future. The sites that appear to have the potential of high annual mean BaP concentrations from the limited monitoring in 2007 are:

- Ballymena Ballykeel Q4: 2.2 ng/m^3
- Royston Q3: 3.3 ng/m^3 (less than 1 month sampling) and Q4: 1.2 ng/m^3
- Santon Q3: 2.7 ng/m^3 (less than 1 month sampling) and Q4: 1.7 ng/m^3
- South Hiendley Q4: 0.92 ng/m^3

The Ballymena Ballykeel site is a site that is located in a housing estate in an area of high solid fuel use and therefore this site may have high seasonal variability, however if the final quarter of 2007 is representative of an average winter quarter the annual concentration is likely to exceed the EU Target Value.

The available measurements from the industrial sites of Royston and Santon show relatively high concentrations that are above the EU target value. The Quarter 3 concentrations are particularly high for both sites, however the monitoring periods are less than one month and are not necessarily representative. The complete Quarter 4 concentrations are also higher than the EU Target Value.

These sites are affected by industrial emissions, which are not seasonal. The sites are likely to exceed the EU Target Value if concentrations found in 2007 are typical.

The BaP concentration in the final quarter of 2007 at South Hiendley site was found to be 0.92 ng/m^3 which is very close to the EU Target Value. Given that the site is affected by an industrial source it is possible that the annual concentration could exceed the EU Target Value.

5.2.3 Measured Annual Benzo[a]pyrene Concentrations

In this section the medium term trends in annual BaP concentration are assessed. The annual mean concentrations from 2000 onwards are plotted on five charts (Figures 16 to 21). These plots include the UK Air Quality Objective and where levels are close to limit values they also include the EU Target Value. It should be noted that the data reported is from both Andersen samplers and Digitel samplers and therefore due to the change in measurement technique attempting to interpret trends between the techniques is not advisable.

Figure 16: Comparison of Annual Benzo[a]pyrene concentrations with UK Air Quality Objective and EU Target Value (Urban and Urban Industrial Sites)

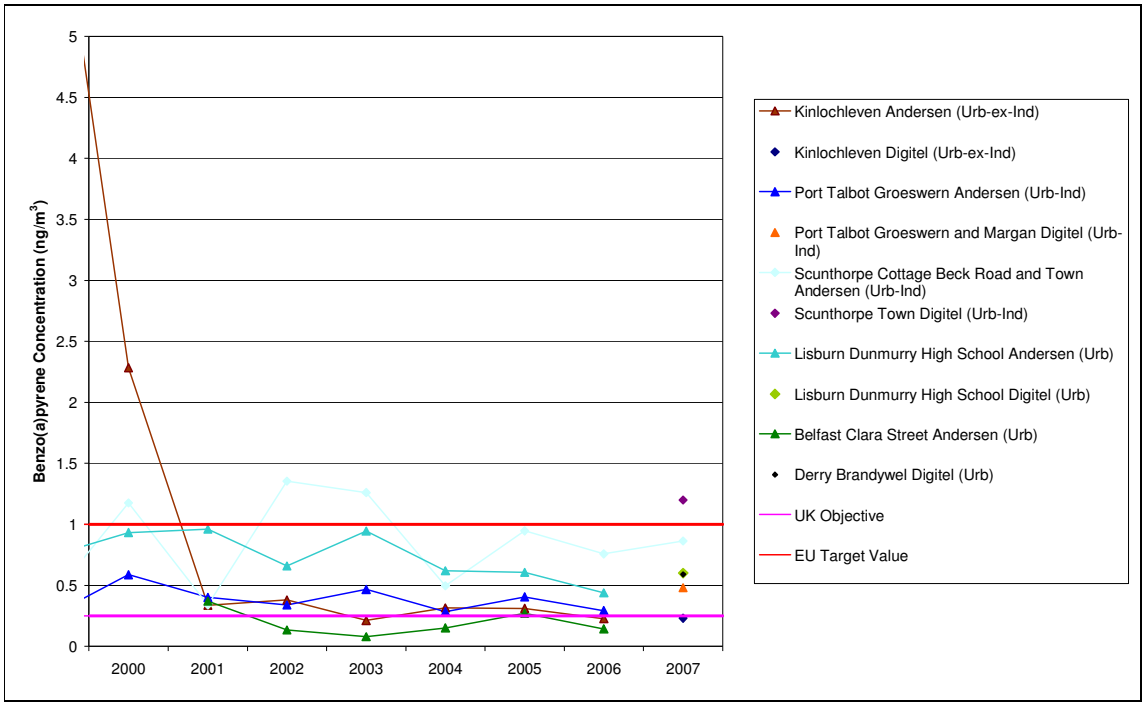


Figure 17: Comparison of Annual Benzo[a]pyrene concentrations with UK Air Quality Objective (Urban Industrial Sites)

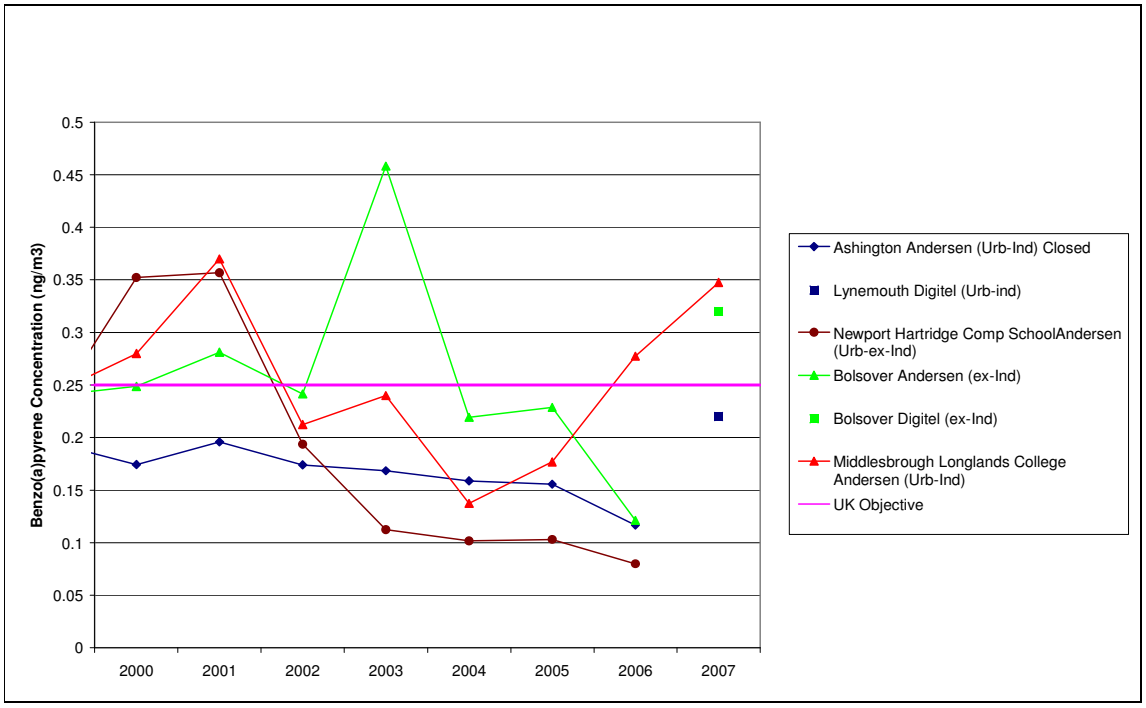


Figure 18: Comparison of Annual Benzo[a]pyrene concentrations with UK Air Quality Objective (Urban Sites)

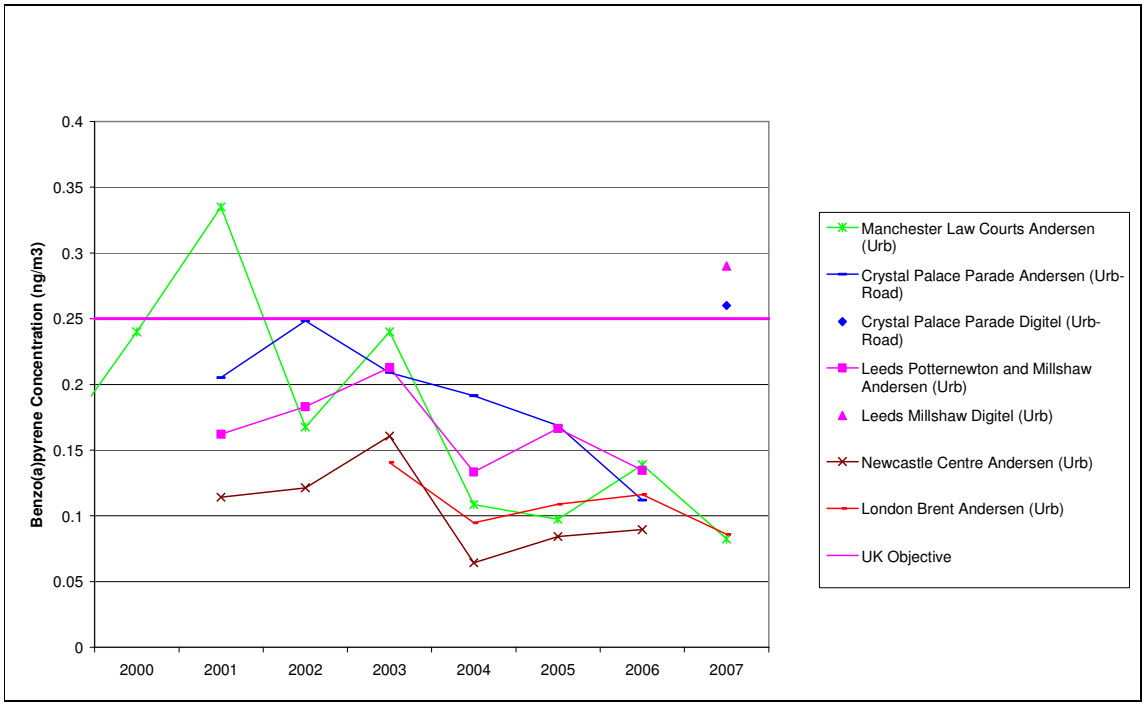


Figure 19: Comparison of Annual Benzo[a]pyrene concentrations with UK Air Quality Objective (Urban Sites)

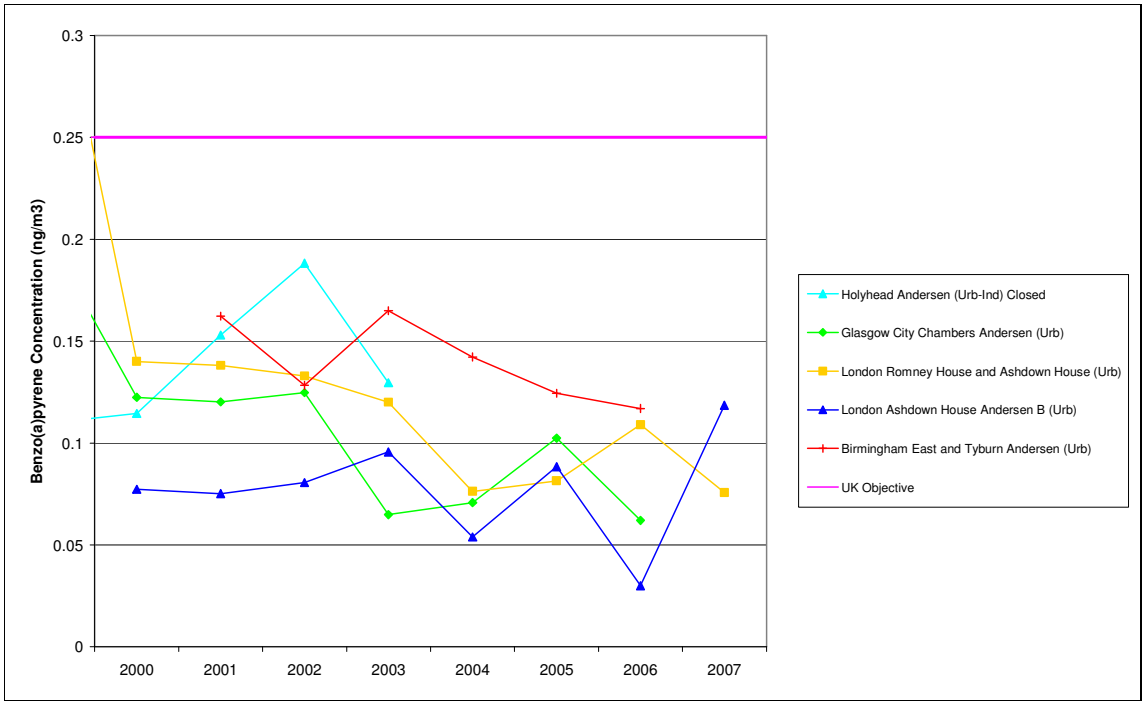


Figure 20: Comparison of Annual Benzo[a]pyrene concentrations with UK Air Quality Objective (Urban Sites)

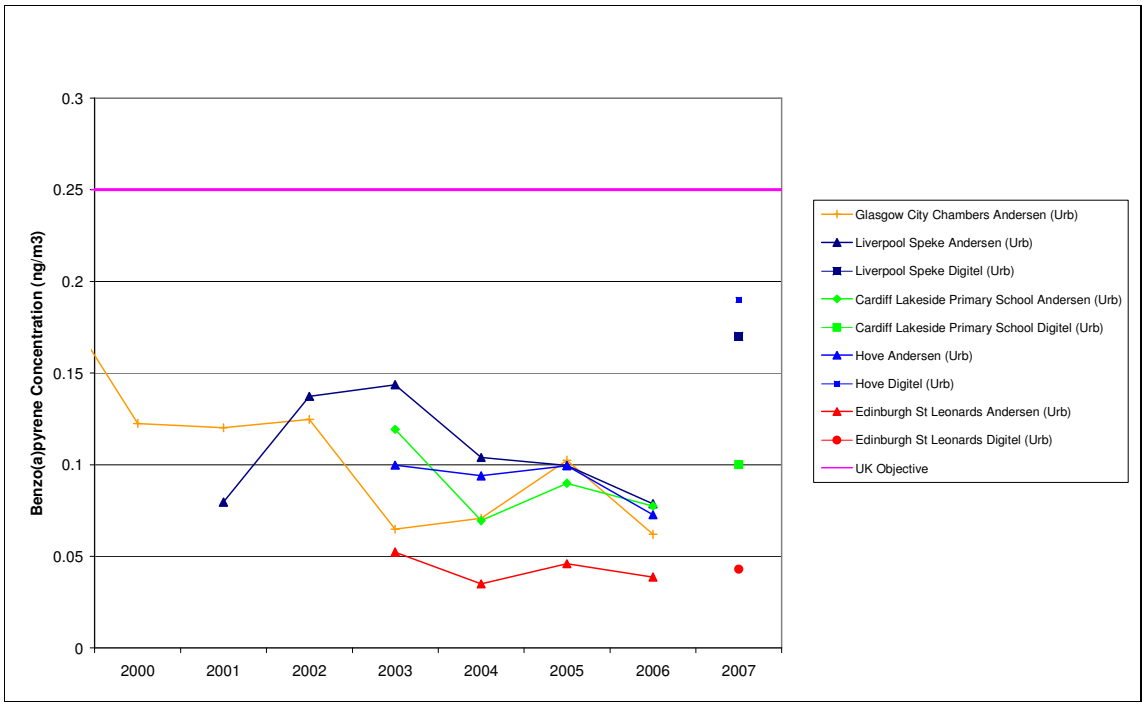
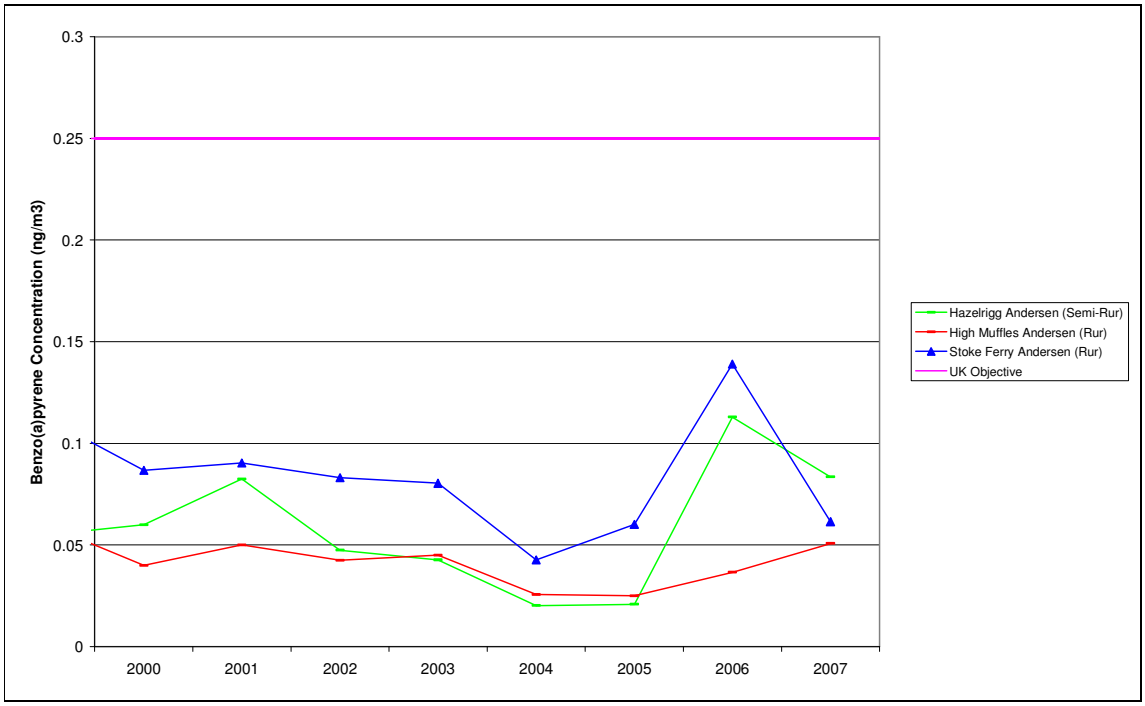


Figure 21: Comparison of Annual Benzo[a]pyrene concentrations with UK Air Quality Objective (Rural Sites)



There are only two sites which have annual average benzo[a]pyrene concentrations that exceeded the EU Target Value (1 ng/m^3) since 2000, these are the Andersen sampler at Kinlochleven in 2000, the Andersen sampler at Scunthorpe Town in 2000, 2002 and 2003 and the Digitel sampler at Scunthorpe Town in 2005. Both of these sites concentrations are shown in Figure 16.

Kinlochleven:
The Kinlochleven site was initially installed to monitor the air concentration around the primary aluminium smelter. It was closed in mid-2000. Since closure the levels of benzo[a]pyrene have dropped significantly however levels still remain higher than other rural locations. It is thought that the concentrations at the site have not reduced to that of the other rural sites as Kinlochleven is not on the natural gas grid and so there is significant use of solid fuel in the village for domestic heating and the surrounding 1000m mountains of the Glencoe and Mamore ranges lead to poor dispersion.

Scunthorpe Town:
The Scunthorpe PAH Monitoring site is affected by a local steel works and has the highest current annual average benzo[a]pyrene concentration of the UK monitoring network sites in 2007. Since 2002 the concentrations from the Andersen sampler appear to show a decline. If the Andersen and the Digitel benzo[a]pyrene concentration for 2007 are compared it is apparent that the Digitel sampler concentration is significantly higher than that of the Andersen sampler (1.2 ng/m^3 to 0.86 ng/m^3). As indicated previously, the reason for this difference may be due to the different periods of sampling with the Andersen samplers collecting material over the course of 2 weeks whereas the Digitel samplers collect material on a daily basis, hence there might be a greater potential for loss of the material collected by the Andersen sampler during the 2 week sampling period. Measurements in winter at Harwell with and without ozone scrubbers suggested a loss of perhaps 20% of the BaP concentration over a day. Extending those losses over the remaining 13 days of the Andersen samples suggests little of the BaP sampled during day 12 is still present in the sample when it is removed.

There are a number of sites that exceed the UK Air Quality Objective (0.25 ng/m^3). These are shown in Figure 16, Figure 17 and 18. Some of the more established sites are seen to frequently exceed the UK Air Quality Objective, these include the current and past Scunthorpe sites, Lisburn Dunmurry, the current and past Port Talbot sites, Kinlochleven and Middlesbrough. The sources that are thought to

contribute to the exceedance of the UK Objective which have not been mentioned above are domestic solid fuel use (Lisburn Dunmurry), steel works and associated coke ovens (Port Talbot and Middlesbrough). There are a number of other sites that have exceeded the UK Objective in the past such as Bolsover and Newport although both of the industrial processes at these sites are now closed.

The data from the Andersen samplers for the majority of the sites show a downward trend in benzo[a]pyrene concentration with the exception of the Middlesbrough and the London site. The Middlesbrough site appeared to have a downward trend between 2001 and 2004, however it shows an increasing trend from 2004 to 2007. The London site does not appear to show a significant trend.

The figures also show the annual mean concentration at the Digitel sites which appear to indicate an increase in concentration of benzo[a]pyrene after the change in measurement method.

5.3 Correlation between Benzo[a]pyrene and Dibenzo[al]pyrene

IARC regard dibenzo[al]pyrene as a more potent carcinogen than BaP. It is reported at lower concentrations than BaP; often at or below the analytical limit of detection. If the atmospheric concentrations of it do not correlate positively with BaP then the use of BaP as a marker for the health impacts of PAHs would be called into question. It is therefore important to identify whether the there is a consistent relationship between reported benzo[a]pyrene and dibenzo[al]pyrene concentrations in the atmosphere.

To assess the relationship between dibenzo[al]pyrene and benzo[a]pyrene their concentrations have been plotted against each other for the Digitel sites where both PAH are above detection limits. There is insufficient data for each of the sites to be assessed as many of the sites have been operating for less than one year therefore the data has been plotted to create charts for:

- All of the Digitel sites
- All of the Urban Sites
- All of the Urban Sites with one potential outlier removed
- Scunthorpe Town Site

Figure 22: Dibenzo[al]pyrene plotted against Benzo[a]pyrene all Digitel Sites

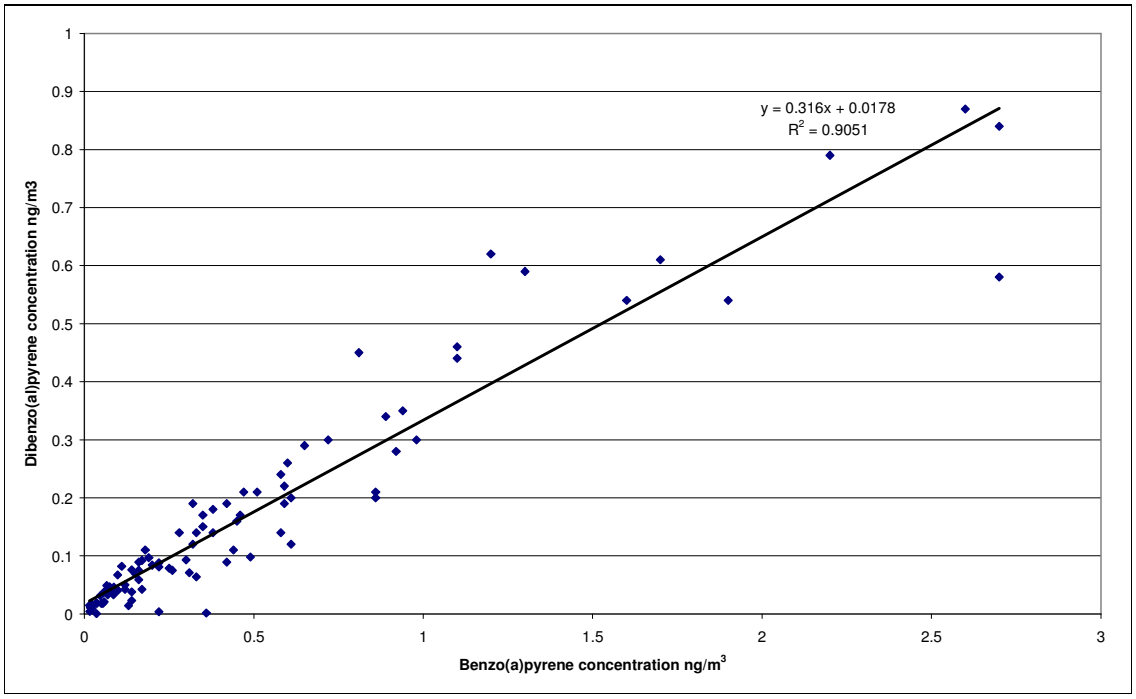


Figure 23: Dibenzo[al]pyrene plotted against Benzo[a]pyrene Urban Digitel sites

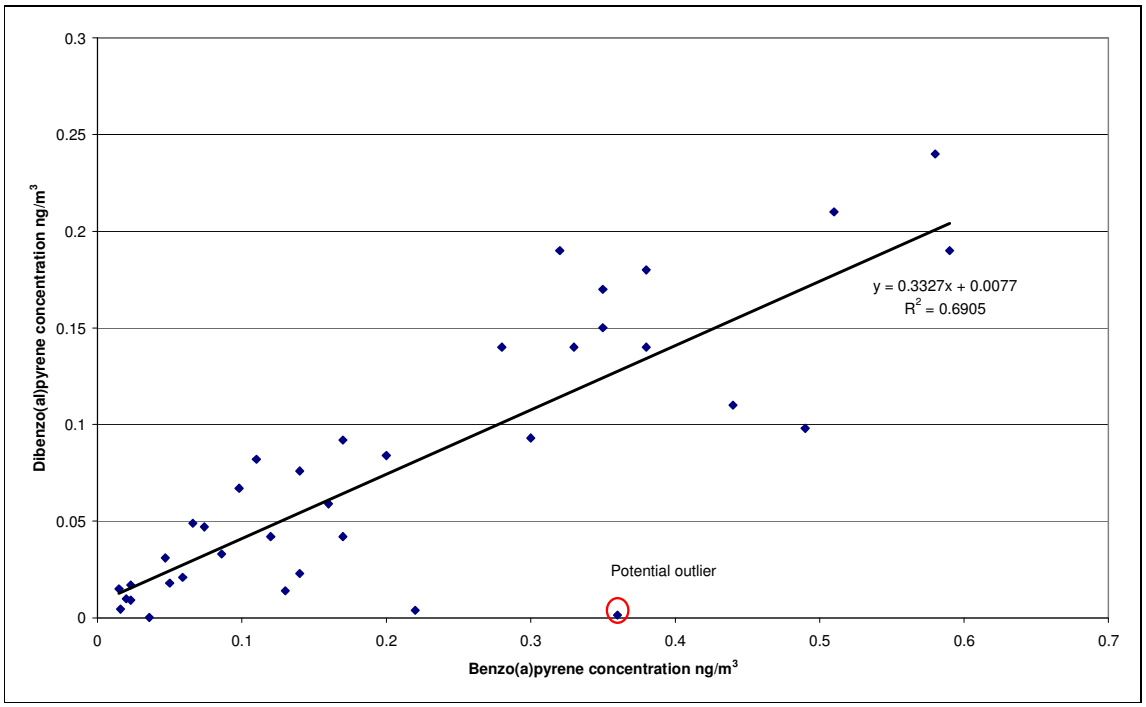


Figure 24: Dibenzo[al]pyrene plotted against Benzo[a]pyrene Urban Digitel sites with one potential outlier removed.

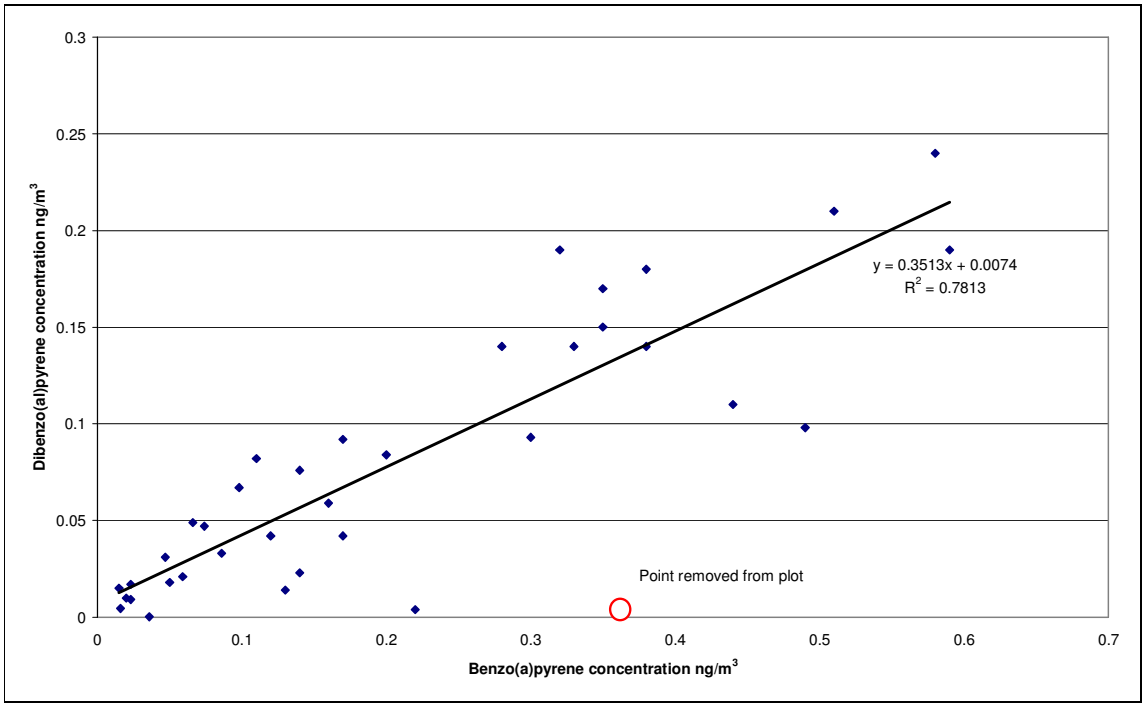


Figure 25: Dibenzo[al]pyrene plotted against Benzo[a]pyrene for Scunthorpe Digitel Sampler

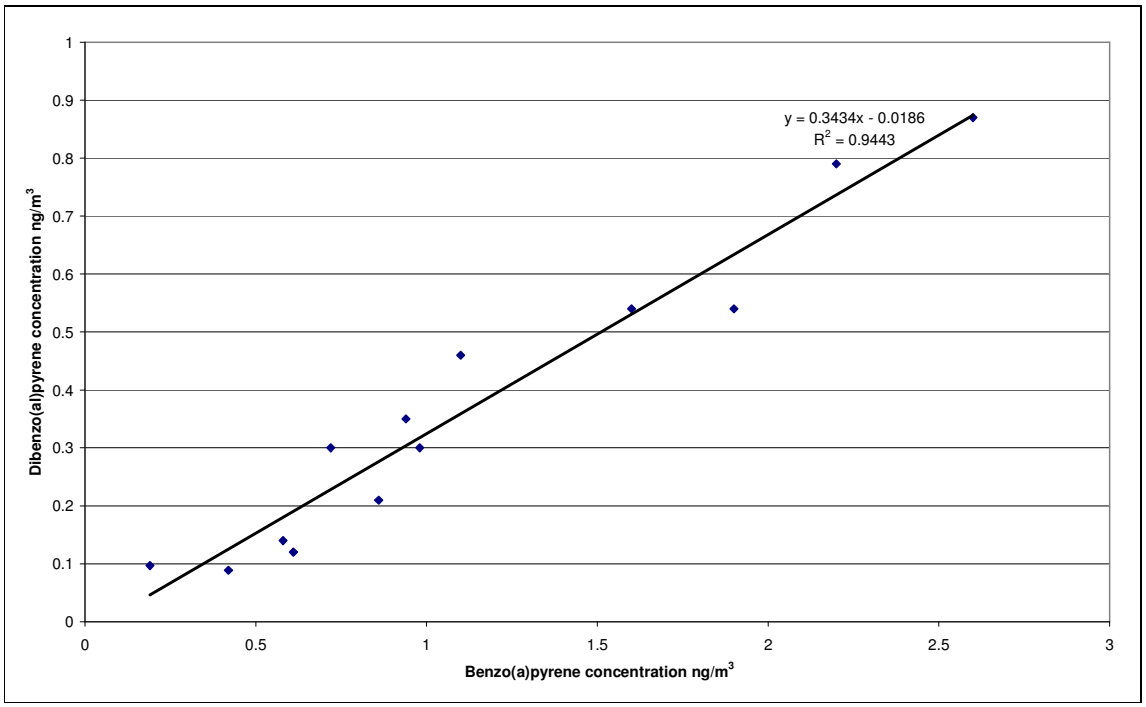


Figure 22 shows all of the Digitel measurement sites where both PAH are above detection limits. The plot appears to show a significant relationship between the concentration of dibenzo[al]pyrene and benzo[a]pyrene measured by the Digitel samplers for all of the sites when the plot is visually assessed and this is confirmed by the high value of the correlation coefficient (R^2) which is 0.91.

AEA

Figures 23 and 24 show the data plotted for just the urban sites. Figure 24 has had one point that could be considered an outlier removed. This outlier has a particularly low dibenzo[al]pyrene concentration which is considered unrepresentative of the Liverpool site. These figures appear to indicate that there is a relationship between dibenzo[al]pyrene and benzo[a]pyrene for the sites however the relationship does not appear to be as significant as for all of the sites which R^2 value of 0.69 and 0.78 (where one potential outlier has been removed).

Figure 25 shows just the data from the Scunthorpe Town site as an example of one of the longer running Digitel sites with a significant local source of PAHs which might have disturbed the correlation. This site appears to still have a significant relationship between dibenzo[al]pyrene and benzo[a]pyrene with an R^2 value of 0.94.

The slope of the relationship between the concentration of dibenzo[al]pyrene and benzo[a]pyrene appears to be relatively constant. The ratios from dibenzo[al]pyrene to benzo[a]pyrene when assessing all of the sites is 0.32 : 1 with the urban and industrial sites assessed having a corresponding relationship of 0.33-0.35 : 1. This analysis does not contradict the use of BaP as a marker for the carcinogenicity of PAHs in air.

6 Conclusions

This report represents the 2007 annual data report for the Polycyclic Aromatic Hydrocarbons (PAH) monitoring network contract (RMP 2334). AEA has, on behalf of the Department for Environment, Food and Rural Affairs (Defra) and the devolved administrations of the UK, provided concentration data for a number of PAH in the UK atmosphere for seventeen years. Monitoring for PAH via a monitoring network began in 1991 and since then the number of sites monitoring for PAH has increased significantly. In 2007 the PAH monitoring network consisted of 31 PAH network sites with an additional six sites which ran as part of the Toxic Organic Micro-pollutants monitoring network with extracts provided for analysis on a quarterly basis by the contractors. Sites monitoring for PAH are spread across the UK and are sited in locations ranging in nature from rural to industrial. The aim of the PAH monitoring contract is to provide the public and government with air quality information, to provide information to support the development of national policy and assist in complying with the requirements of European Directives relating to PAH.

PAH

This report presents the 2007 results from the network in addition to past data. It looks briefly at the long-term trends in air concentration of PAH, concentrating on benzo[a]pyrene.

Recommendations:

- It is recommended that the PAH monitoring network continues to comply with the 4th Daughter Directive and that all measurements and analyses are undertaken in accordance with the methods detailed in the CEN Standard.
- It is recommended that the current size of the PAH monitoring network is maintained to ensure compliance with the Directive and to enable the trends in concentration of PAH to be assessed. The scale of the current network should ensure that air concentrations in rural, urban, urban-traffic and industrial locations can continue to be measured so that concentrations can be compared to both the EU Target value (1 ng/m^3) and UK Air Quality Objective (0.25 ng/m^3).
- It is recommended that additional comparison between the Digitel and the Andersen sampling techniques is undertaken so that the relationship between the reported concentrations can be assessed further.
- It is recommended that Defra considerer undertaking additional monitoring in location of high solid fuel use in areas that do not have access to a gas main due to the high concentrations of PAH found at sites such as Lisburn, Ballymena and Derry.
- It is recommended that the measurement of dibenzo[al]pyrene is continued at the sites due to its high relative carcinogenicity according to researchers. In light of this, literature searches should be carried out periodically to identify if there is further research to reassess the carcinogenicity of individual PAH compounds.
- It is recommended that there continue to be close links between the National Atmospheric Emissions Inventory, the modelling teams Defra employ and the PAH monitoring network team to ensure that the network structure reflects the location of high PAH emission sources in addition to urban and rural locations.

Appendices

Appendix 1: 2006 and 2007 Digitel Sampler Monitoring data

Appendix 2: 2007 Andersen Sampler Monitoring data

Appendix 1

2006 and 2007 Digitel Sampler Monitoring data

PAH DIGITEL SITE: BALLYMENA BALLYKEEL ESTATE

Period Name	**Ballymena Q4 2007**
Start Date	01/11/2007
End Date	01/01/2008
Number of days sampling	61
Data coverage by collection time (%)	100%
Time coverage using collection time (%)	66%

Compound	**Calculated Concentrations ng m^{-3}**
Naphthalene	*0.034*
2-Methyl Napthalene	*0.014*
1-Methyl Napthalene	*0.0078*
Biphenyl	*< 0.014*
Acenaphthylene	*0.034*
Acenaphthene	*0.0037*
Fluorene	*0.037*
Phenanthrene	*0.71*
Anthracene	*0.21*
2-Methyl phenanthrene	*0.43*
2-Methyl anthracene	*0.39*
1-Methyl anthracene	*0.039*
1-Methyl phenanthrene	*0.37*
9-Methyl anthracene	*0.078*
4,5-Methylene phenanthrene	*0.53*
Fluoranthene	*1.8*
Pyrene	*2*
Retene (1-methyl-7-isopropylphenenthrene)	*0.2*
Benzo[c]phenanthrene	*0.55*
Benzo[a]anthracene	*3.2*
Chrysene	*3.4*
Cyclopenta[cd]pyrene	1.7
Benzo[b]naph(2,1-d)thiophene	< 0.000046
5-Methyl Chrysene	< 0.000069
Benzo[b]fluoranthene plus benzo[j]fluoranthene	3.7
Benzo[k]fluoranthene	1
Benzo[e]pyrene	1.3
Benzo[a]pyrene	**2.2**
Perylene	0.41
Indeno(1,2,3-cd)pyrene	1.7
Dibenzo[ah]anthracene plus dibenzo[ac]anthracene	0.41
Benzo[ghi]perylene	1.4
Anthanthrene	0.41
Dibenzo[al]pyrene	< 0.000023
Dibenzo[ae]pyrene	0.25
Dibenzo[ai]pyrene	0.12
Dibenzo[ah]pyrene	0.053
Coronene	0.37
Cholanthrene	0.059

Data in italics is for compounds retained very poorly by the sampling method

PAH DIGITEL SITE: BIRMINGHAM TYBURN

Period Name	Birmingham Q3 2007	Birmingham Q4 2007
Start Date	20/07/2007	01/10/2007
End Date	01/10/2007	01/01/2008
Number of days sampling	72	92
Data coverage by collection time (%)	99%	100%
Time coverage using collection time (%)	78%	100%
Compound	**Calculated Concentrations ng m^{-3}**	
Naphthalene	*0.023*	*0.047*
2-Methyl Napthalene	*0.014*	*0.033*
1-Methyl Napthalene	*0.0052*	*0.014*
Biphenyl	*0.0097*	*0.018*
Acenaphthylene	*0.0044*	*0.017*
Acenaphthene	*0.0013*	*0.003*
Fluorene	*0.0061*	*0.018*
Phenanthrene	*0.059*	*0.24*
Anthracene	*0.0076*	*0.033*
2-Methyl phenanthrene	*0.012*	*0.075*
2-Methyl anthracene	*0.021*	*0.13*
1-Methyl anthracene	*0.0071*	*0.04*
1-Methyl phenanthrene	*0.0071*	*0.033*
9-Methyl anthracene	*<0.000057*	*0.0021*
4,5-Methylene phenanthrene	*0.0017*	*0.009*
Fluoranthene	*0.082*	*0.35*
Pyrene	*0.073*	*0.36*
Retene (1-methyl-7-isopropylphenenthrene)	*<0.00095*	*0.0046*
Benzo[c]phenanthrene	*0.0013*	*0.01*
Benzo[a]anthracene	*0.063*	*0.5*
Chrysene	*0.13*	*0.73*
Cyclopenta[cd]pyrene	0.063	0.52
Benzo[b]naph(2,1-d)thiophene	0.0027	0.0099
5-Methyl Chrysene	0.0088	0.058
Benzo[b]fluoranthene plus benzo[j]fluoranthene	0.16	0.85
Benzo[k]fluoranthene	0.038	0.21
Benzo[e]pyrene	0.052	0.4
Benzo[a]pyrene	**0.059**	**0.44**
Perylene	0.012	0.085
Indeno(1,2,3-cd)pyrene	0.086	0.026
Dibenzo[ah]anthracene plus dibenzo[ac]anthracene	0.015	0.021
Benzo[ghi]perylene	0.094	0.52
Anthanthrene	0.0059	0.085
Dibenzo[al]pyrene	0.021	0.11
Dibenzo[ae]pyrene	0.019	0.078
Dibenzo[ai]pyrene	<0.015	0.073
Dibenzo[ah]pyrene	0.005	0.049
Coronene	0.031	0.26
Cholanthrene	0.0086	0.044

Data in italics is for compounds retained very poorly by the sampling method

AEA

PAH DIGITEL SITE: BOLSOVER

Period Name	Bolsover Q4 2006	Bolsover Q1 2007	Bolsover Q2 2007	Bolsover Q3 2007	Bolsover Q4 2007
Start Date	14/12/2006	01/01/2007	01/04/2007	01/07/2007	01/10/2007
End Date	01/01/2007	01/04/2007	01/07/2007	01/10/2007	01/01/2008
Number of days sampling	18	89	91	92	90
Data coverage by collection time (%)	100%	98%	100%	100%	97%
Time coverage using collection time (%)	20%	98%	100%	100%	97%
Compound					
Naphthalene	*0.0072*	*0.011*	*0.013*	*0.01*	*0.04*
2-Methyl Napthalene	*0.0054*	*0.009*	*0.0068*	*0.0064*	*0.013*
1-Methyl Napthalene	*<0.0031*	*0.004*	*0.0029*	*0.0024*	*0.0054*
Biphenyl	*<0.0078*	*0.0095*	*0.0059*	*0.0042*	*0.0087*
Acenaphthylene	*<0.016*	*0.0084*	*0.0036*	*0.0024*	*0.01*
Acenaphthene	*0.0012*	*0.0016*	*0.0012*	*0.00099*	*0.0015*
Fluorene	*0.018*	*0.009*	*0.0044*	*0.0031*	*0.011*
Phenanthrene	*0.4*	*0.16*	*0.049*	*0.028*	*0.033*
Anthracene	*0.04*	*0.022*	*0.0067*	*0.0039*	*0.033*
2-Methyl phenanthrene	*0.14*	*0.055*	*0.0094*	*0.007*	*0.059*
2-Methyl anthracene	*0.24*	*0.082*	*0.017*	*0.0099*	*0.096*
1-Methyl anthracene	*0.2*	*0.03*	*0.0047*	*0.0031*	*0.023*
1-Methyl phenanthrene	*0.17*	*0.024*	*0.0049*	*0.0022*	*0.028*
9-Methyl anthracene	*0.0012*	*0.0013*	*0.0012*	*<0.000045*	*0.002*
4,5-Methylene phenanthrene	*0.22*	*0.0082*	*0.0013*	*0.00084*	*0.0087*
Fluoranthene	*1*	*0.38*	*0.11*	*0.055*	*0.48*
Pyrene	*1*	*0.36*	*0.092*	*0.046*	*0.46*
Retene (1-methyl-7-isopropylphenenthrene)	*0.4*	*<0.00079*	*0.024*	*0.0075*	*0.0042*
Benzo[c]phenanthrene	*0.34*	*0.024*	*0.0049*	*0.0019*	*0.028*
Benzo[a]anthracene	*1.8*	*0.59*	*0.1*	*0.043*	*0.82*
Chrysene	*2.5*	*0.86*	*0.18*	*0.088*	*1.1*
Cyclopenta[cd]pyrene	0.71	0.62	0.1	0.043	0.87
Benzo[b]naph(2,1-d)thiophene	0.16	0.018	0.0077	0.0028	0.022
5-Methyl Chrysene	0.23	0.097	0.015	0.007	0.12
Benzo[b]fluoranthene plus benzo[j]fluoranthene	2.4	0.97	0.32	0.16	1.2
Benzo[k]fluoranthene	0.67	0.24	0.076	0.042	0.31
Benzo[e]pyrene	1.5	0.63	0.096	0.049	0.73
Benzo[a]pyrene	**1.1**	**0.47**	**0.12**	**0.055**	**0.65**
Perylene	0.2	0.082	0.021	0.011	0.11
Indeno(1,2,3-cd)pyrene	1.4	0.57	0.014	0.1	0.74
Dibenzo[ah]anthracene plus dibenzo[ac]anthracene	0.37	0.046	0.0099	0.028	0.056
Benzo[ghi]perylene	1.2	0.56	0.15	0.093	0.67
Anthanthrene	0.086	0.079	0.013	0.0055	0.13
Dibenzo[al]pyrene	0.44	0.21	0.05	0.018	0.29
Dibenzo[ae]pyrene	0.22	0.21	0.05	0.048	0.25
Dibenzo[ai]pyrene	0.055	0.059	0.012	<0.012	0.2
Dibenzo[ah]pyrene	0.0093	0.052	0.026	0.0087	0.073
Coronene	0.33	0.21	0.062	0.031	0.26
Cholanthrene	0.021	0.059	0.018	0.0088	0.068

Data in italics is for compounds retained very poorly by the sampling method

PAH DIGITEL SITE: LONDON BRENT

Period Name	**Brent Q4 2007**
Start Date	11/10/2007
End Date	01/01/2008
Number of days sampling	79
Data coverage by collection time (%)	95%
Time coverage using collection time (%)	85%

Compound	**Calculated Concentrations ng m^{-3}**
Naphthalene	*<0.0018*
2-Methyl Napthalene	*0.0059*
1-Methyl Napthalene	*0.0027*
Biphenyl	*<0.0036*
Acenaphthylene	*0.012*
Acenaphthene	*0.0023*
Fluorene	*0.02*
Phenanthrene	*0.27*
Anthracene	*0.025*
2-Methyl phenanthrene	*0.091*
2-Methyl anthracene	*0.0096*
1-Methyl anthracene	*0.0046*
1-Methyl phenanthrene	*0.055*
9-Methyl anthracene	*0.00052*
4,5-Methylene phenanthrene	*0.091*
Fluoranthene	*0.36*
Pyrene	*0.36*
Retene (1-methyl-7-isopropylphenenthrene)	*0.11*
Benzo[c]phenanthrene	*0.082*
Benzo[a]anthracene	*0.46*
Chrysene	*0.63*
Cyclopenta[cd]pyrene	0.36
Benzo[b]naph(2,1-d)thiophene	0.017
5-Methyl Chrysene	0.0016
Benzo[b]fluoranthene plus benzo[j]fluoranthene	0.86
Benzo[k]fluoranthene	0.21
Benzo[e]pyrene	2.3
Benzo[a]pyrene	**0.3**
Perylene	0.077
Indeno(1,2,3-cd)pyrene	0.52
Dibenzo[ah]anthracene plus dibenzo[ac]anthracene	0.084
Benzo[ghi]perylene	0.5
Anthanthrene	0.039
Dibenzo[al]pyrene	0.093
Dibenzo[ae]pyrene	0.079
Dibenzo[ai]pyrene	0.018
Dibenzo[ah]pyrene	0.0011
Coronene	0.23
Cholanthrene	0.03

Data in italics is for compounds retained very poorly by the sampling method

AEA

PAH DIGITEL SITE: CRYSTAL PALACE PARADE

Period Name	Bromley Q1 2007	Bromley Q2 2007	Bromley Q3 2007	Bromley Q4 2007
Start Date	30/03/2007	01/04/2007	01/07/2007	01/10/2007
End Date	01/04/2007	01/07/2007	01/10/2007	01/01/2008
Number of days sampling	2	85	87	92
Data coverage by collection time (%)	100%	91%	94%	100%
Time coverage using collection time (%)	2%	91%	94%	100%
Compound	**Calculated Concentrations ng m^{-3}**			
Naphthalene	*<0.14*	*0.078*	*0.088*	*0.086*
2-Methyl Napthalene	*0.038*	*0.035*	*0.048*	*0.049*
1-Methyl Napthalene	*<0.07*	*0.013*	*0.018*	*0.02*
Biphenyl	*0.13*	*0.017*	*0.023*	*0.026*
Acenaphthylene	*0.013*	*0.013*	*0.018*	*0.028*
Acenaphthene	*<0.021*	*0.003*	*0.0042*	*0.0046*
Fluorene	*<0.014*	*0.015*	*0.021*	*0.031*
Phenanthrene	*0.084*	*0.18*	*0.26*	*0.4*
Anthracene	*0.098*	*0.022*	*0.034*	*0.054*
2-Methyl phenanthrene	*0.03*	*0.052*	*0.074*	*0.11*
2-Methyl anthracene	*0.043*	*0.085*	*0.12*	*0.2*
1-Methyl anthracene	*0.011*	*0.017*	*0.034*	*0.052*
1-Methyl phenanthrene	*0.013*	*0.015*	*0.027*	*0.031*
9-Methyl anthracene	*0.0023*	*0.0037*	*0.00035*	*0.0004*
4,5-Methylene phenanthrene	*0.014*	*0.0062*	*0.0087*	*0.012*
Fluoranthene	*0.39*	*0.32*	*0.42*	*0.64*
Pyrene	*0.29*	*0.35*	*0.47*	*0.69*
Retene (1-methyl-7-isopropylphenenthrene)	*0.052*	*0.03*	*0.0059*	*0.0083*
Benzo[c]phenanthrene	*0.043*	*0.004*	*0.0042*	*0.013*
Benzo[a]anthracene	*0.07*	*0.42*	*0.24*	*0.63*
Chrysene	*0.24*	*0.35*	*0.4*	*0.9*
Cyclopenta[cd]pyrene	<0.049	0.2	0.24	0.64
Benzo[b]naph(2,1-d)thiophene	0.0059	0.0097	0.012	0.025
5-Methyl Chrysene	<0.007	0.025	0.027	0.069
Benzo[b]fluoranthene plus benzo[j]fluoranthene	0.33	0.4	0.35	1
Benzo[k]fluoranthene	<0.14	0.098	0.079	0.26
Benzo[e]pyrene	0.22	0.11	0.12	0.58
Benzo[a]pyrene	**0.28**	**0.13**	**0.14**	**0.49**
Perylene	0.077	0.027	0.029	0.095
Indeno(1,2,3-cd)pyrene	<0.28	0.23	0.16	0.63
Dibenzo[ah]anthracene plus dibenzo[ac]anthracene	<0.028	0.0048	0.0024	0.021
Benzo[ghi]perylene	<0.28	0.3	0.26	0.67
Anthanthrene	0.051	0.022	0.011	0.081
Dibenzo[al]pyrene	<0.35	0.014	0.023	0.098
Dibenzo[ae]pyrene	<0.14	0.043	0.018	0.067
Dibenzo[ai]pyrene	<0.56	<0.013	<0.013	0.052
Dibenzo[ah]pyrene	0.11	0.015	0.0069	0.054
Coronene	<0.56	0.11	0.066	0.29
Cholanthrene	0.013	0.022	0.021	0.055

Data in italics is for compounds retained very poorly by the sampling method

PAH DIGITEL SITE: CARDIFF LAKESIDE PRIMARY SCHOOL

Period Name	Cardiff Q4 2006	Cardiff 2 Q1 2007	Cardiff Q2 2007	Cardiff Q3 2007	Cardiff Q4 2007
Start Date	07/12/2006	01/01/2007	01/04/2007	01/07/2007	01/10/2007
End Date	01/01/2007	01/04/2007	01/07/2007	01/10/2007	01/01/2008
Number of days sampling	25	90	91	92	88
Data coverage by collection time (%)	100%	100%	99%	99%	95%
Time coverage using collection time (%)	27%	100%	99%	99%	95%
Compound					
Naphthalene	*0.0073*	*0.011*	*0.015*	*0.0068*	*0.011*
2-Methyl Napthalene	*0.005*	*<0.0046*	*0.0052*	*0.0032*	*0.005*
1-Methyl Napthalene	*<0.0022*	*0.0023*	*0.0024*	*0.0012*	*0.0021*
Biphenyl	*<0.0056*	*<0.0077*	*<0.0076*	*<0.003*	*<0.0032*
Acenaphthylene	*<0.011*	*0.0056*	*0.0037*	*0.0014*	*0.004*
Acenaphthene	*0.00084*	*0.0012*	*0.0011*	*0.00064*	*0.00076*
Fluorene	*0.0078*	*0.0066*	*0.0053*	*0.0035*	*0.0061*
Phenanthrene	*0.14*	*0.11*	*0.078*	*0.035*	*0.084*
Anthracene	*0.0095*	*0.0099*	*0.0043*	*0.0026*	*0.008*
2-Methyl phenanthrene	*0.032*	*0.036*	*0.023*	*0.011*	*0.026*
2-Methyl anthracene	*0.055*	*0.0046*	*0.00081*	*<0.00003*	*0.0035*
1-Methyl anthracene	*0.039*	*0.026*	*0.013*	*0.00012*	*0.0018*
1-Methyl phenanthrene	*0.034*	*0.022*	*0.011*	*0.005*	*0.016*
9-Methyl anthracene	*0.00012*	*0.00011*	*0.000055*	*<0.000014*	*0.000066*
4,5-Methylene phenanthrene	*0.051*	*0.039*	*0.024*	*0.0093*	*0.026*
Fluoranthene	*0.32*	*0.24*	*0.17*	*0.084*	*0.21*
Pyrene	*0.27*	*0.19*	*0.12*	*0.061*	*0.18*
Retene (1-methyl-7-isopropylphenenthrene)	*0.078*	*0.034*	*0.0063*	*0.0029*	*0.042*
Benzo[c]phenanthrene	*0.073*	*0.038*	*0.02*	*0.0081*	*0.04*
Benzo[a]anthracene	*0.33*	*0.19*	*0.084*	*0.04*	*0.24*
Chrysene	*0.54*	*0.28*	*0.15*	*0.081*	*0.32*
Cyclopenta[cd]pyrene	0.095	0.054	0.018	0.0071	0.096
Benzo[b]naph(2,1-d)thiophene	0.012	0.01	0.0053	0.0021	0.0088
5-Methyl Chrysene	0.038	0.025	0.0082	0.00014	0.00053
Benzo[b]fluoranthene plus benzo[j]fluoranthene	0.73	0.58	0.32	0.14	0.55
Benzo[k]fluoranthene	0.22	0.14	0.078	0.041	0.14
Benzo[e]pyrene	0.36	0.25	0.14	0.44	1.4
Benzo[a]pyrene	**0.2**	**0.17**	**0.066**	**0.023**	**0.16**
Perylene	0.045	0.039	0.015	0.0038	0.042
Indeno(1,2,3-cd)pyrene	0.46	0.33	0.18	0.058	0.29
Dibenzo[ah]anthracene plus dibenzo[ac]anthracene	0.056	0.057	0.031	0.01	0.048
Benzo[ghi]perylene	0.37	0.27	0.14	0.055	0.24
Anthanthrene	<0.000056	0.022	<0.000015	0.00033	0.018
Dibenzo[al]pyrene	0.084	0.092	0.049	0.0091	0.059
Dibenzo[ae]pyrene	0.037	0.039	0.018	0.014	0.04
Dibenzo[ai]pyrene	0.0043	0.011	0.004	0.0026	0.012
Dibenzo[ah]pyrene	<0.00045	0.00062	<0.000061	0.00023	0.0034
Coronene	0.12	0.1	0.047	0.014	0.077
Cholanthrene	0.0017	0.0076	0.0026	0.0015	0.016

Data in italics is for compounds retained very poorly by the sampling method

PAH DIGITEL SITE: DERRY BRANDYWELL

Period Name	Derry Q4 2006	Derry Q1 2007	Derry Q2 2007	Derry Q3 2007	Derry Q4 2007
Start Date	14/12/2006	01/01/2007	01/04/2007	01/07/2007	01/10/2007
End Date	01/01/2007	01/04/2007	01/07/2007	01/10/2007	01/01/2008
Number of days sampling	17	89	88	91	90
Data coverage by collection time (%)	94%	99%	97%	99%	96%
Time coverage using collection time (%)	18%	99%	97%	99%	96%
Compound					
Naphthalene	*0.021*	*0.03*	*0.038*	*0.018*	*0.03*
2-Methyl Napthalene	*0.011*	*0.01*	*0.012*	*0.006*	*0.012*
1-Methyl Napthalene	*0.0058*	*0.0053*	*0.0061*	*0.0027*	*0.0056*
Biphenyl	*<0.0082*	*<0.0094*	*<0.0094*	*<0.009*	*<0.0094*
Acenaphthylene	*<0.016*	*0.022*	*0.017*	*0.0071*	*0.015*
Acenaphthene	*0.002*	*0.0019*	*0.0017*	*0.00068*	*0.0015*
Fluorene	*0.018*	*0.02*	*0.012*	*0.0054*	*0.014*
Phenanthrene	*0.27*	*0.39*	*0.12*	*0.057*	*0.2*
Anthracene	*0.034*	*0.11*	*0.025*	*0.013*	*0.052*
2-Methyl phenanthrene	*0.099*	*0.22*	*0.06*	*0.027*	*0.11*
2-Methyl anthracene	*0.15*	*0.19*	*0.053*	*0.018*	*0.089*
1-Methyl anthracene	*0.16*	*0.016*	*0.0036*	*0.001*	*0.0064*
1-Methyl phenanthrene	*0.12*	*0.19*	*0.055*	*0.023*	*0.092*
9-Methyl anthracene	*0.0015*	*0.027*	*0.01*	*0.003*	*0.015*
4,5-Methylene phenanthrene	*0.14*	*0.25*	*0.078*	*0.035*	*0.13*
Fluoranthene	*0.71*	*0.88*	*0.27*	*0.15*	*0.5*
Pyrene	*0.72*	*0.93*	*0.31*	*0.18*	*0.53*
Retene (1-methyl-7-isopropylphenenthrene)	*0.12*	*0.095*	*0.024*	*0.015*	*0.058*
Benzo[c]phenanthrene	*0.22*	*0.22*	*0.074*	*0.045*	*0.13*
Benzo[a]anthracene	*1.2*	*1.4*	*0.49*	*0.32*	*0.84*
Chrysene	*1.2*	*1.5*	*0.49*	*0.32*	*0.78*
Cyclopenta[cd]pyrene	0.41	0.7	0.24	0.089	0.38
Benzo[b]naph(2,1-d)thiophene	0.042	0.064	0.03	0.017	0.041
5-Methyl Chrysene	0.16	<0.00091	0.0025	<0.000045	<0.000047
Benzo[b]fluoranthene plus benzo[j]fluoranthene	1.5	1.7	0.85	0.59	1.1
Benzo[k]fluoranthene	0.44	0.46	0.22	0.15	0.3
Benzo[e]pyrene	0.69	0.67	0.33	0.23	0.44
Benzo[a]pyrene	**0.6**	**0.97**	**0.45**	**0.32**	**0.61**
Perylene	0.11	0.17	0.086	0.06	0.11
Indeno(1,2,3-cd)pyrene	0.91	0.83	0.44	0.32	0.53
Dibenzo[ah]anthracene plus dibenzo[ac]anthracene	0.14	0.2	0.097	0.075	0.13
Benzo[ghi]perylene	0.6	0.74	0.39	0.27	0.5
Anthanthrene	0.026	0.17	0.074	0.045	0.1
Dibenzo[al]pyrene	0.26	<0.0025	0.16	0.12	0.2
Dibenzo[ae]pyrene	0.075	0.13	0.067	0.048	0.088
Dibenzo[ai]pyrene	0.028	0.048	0.024	0.017	0.028
Dibenzo[ah]pyrene	0.0056	0.025	0.0085	0.0066	0.015
Coronene	0.17	0.033	0.1	0.078	0.14
Cholanthrene	0.019	0.034	0.011	0.0075	0.013

Data in italics is for compounds retained very poorly by the sampling method

PAH DIGITEL SITE: EDINBURGH ST LEONARDS

Period Name	Edinburgh Q1 2007	Edinburgh Q2 2007	Edinburgh Q3 2007	Edinburgh Q4 2007
Start Date	29/03/2007	01/04/2007	01/07/2007	01/10/2007
End Date	01/04/2007	01/07/2007	01/10/2007	01/01/2008
Number of days sampling	3	91	92	85
Data coverage by collection time (%)	100%	100%	99%	92%
Time coverage using collection time (%)	3%	100%	99%	92%
Compound	**Calculated Concentrations ng m^{-3}**			
Naphthalene	*<0.14*	*0.018*	*0.0094*	*0.023*
2-Methyl Napthalene	*<0.14*	*0.0062*	*<0.0045*	*0.0078*
1-Methyl Napthalene	*<0.046*	*0.0023*	*<0.0015*	*0.0034*
Biphenyl	*<0.23*	*<0.0076*	*<0.0075*	*<0.0081*
Acenaphthylene	*0.0031*	*0.0029*	*0.0028*	*0.0063*
Acenaphthene	*<0.019*	*0.00068*	*<0.0006*	*0.001*
Fluorene	*<0.046*	*0.0033*	*0.003*	*0.0075*
Phenanthrene	*<0.14*	*0.048*	*0.043*	*0.1*
Anthracene	*0.056*	*0.0033*	*0.003*	*0.011*
2-Methyl phenanthrene	*<0.046*	*0.02*	*0.019*	*0.044*
2-Methyl anthracene	*0.012*	*0.00086*	*0.00064*	*0.0062*
1-Methyl anthracene	*0.011*	*0.011*	*0.01*	*0.033*
1-Methyl phenanthrene	*<0.037*	*0.0094*	*0.0088*	*0.026*
9-Methyl anthracene	*<0.0014*	*0.0001*	*0.000067*	*0.00034*
4,5-Methylene phenanthrene	*<0.093*	*0.02*	*0.019*	*0.046*
Fluoranthene	*0.11*	*0.064*	*0.049*	*0.15*
Pyrene	*0.088*	*0.064*	*0.054*	*0.15*
Retene (1-methyl-7-isopropylphenenthrene)	*<0.14*	*0.0064*	*<0.0045*	*0.028*
Benzo[c]phenanthrene	*0.012*	*0.011*	*0.0084*	*0.036*
Benzo[a]anthracene	*<0.037*	*0.035*	*0.028*	*0.16*
Chrysene	*0.07*	*0.067*	*0.052*	*0.23*
Cyclopenta[cd]pyrene	0.0046	0.0083	0.0082	0.07
Benzo[b]naph(2,1-d)thiophene	0.0017	0.0027	0.0022	0.009
5-Methyl Chrysene	0.0019	0.0079	0.0066	0.026
Benzo[b]fluoranthene plus benzo[j]fluoranthene	0.1	0.095	0.073	0.33
Benzo[k]fluoranthene	0.028	0.021	0.016	0.075
Benzo[e]pyrene	0.046	0.05	0.042	0.16
Benzo[a]pyrene	0.015	0.02	0.016	0.12
Perylene	0.0024	0.0048	0.0042	0.024
Indeno(1,2,3-cd)pyrene	0.051	0.056	0.036	0.18
Dibenzo[ah]anthracene plus dibenzo[ac]anthracene	0.0051	0.0079	0.0046	0.031
Benzo[ghi]perylene	0.065	0.061	0.046	0.2
Anthanthrene	<0.00046	<0.000015	<0.000015	0.0096
Dibenzo[al]pyrene	0.015	0.0099	0.0045	0.042
Dibenzo[ae]pyrene	0.0093	0.0047	0.0024	0.023
Dibenzo[ai]pyrene	<0.0014	0.00059	0.00025	0.023
Dibenzo[ah]pyrene	<0.0019	<0.000061	<0.00006	<0.000065
Coronene	0.025	0.027	0.018	0.094
Cholanthrene	0.0032	0.0012	0.00057	0.0029

Data in italics is for compounds retained very poorly by the sampling method

PAH DIGITEL SITE: GLASGOW CENTRE

Period Name	Glasgow Q3 2007	Glasgow Q4 2007
Start Date	12/09/2007	01/10/2007
End Date	01/10/2007	01/01/2008
Number of days sampling	19	91
Data coverage by collection time (%)	100%	98%
Time coverage using collection time (%)	21%	98%

Compound	Calculated Concentrations ng m^{-3}	
Naphthalene	*0.018*	*0.029*
2-Methyl Napthalene	*0.0042*	*0.017*
1-Methyl Napthalene	*<0.0015*	*0.0067*
Biphenyl	*<0.015*	*<0.0031*
Acenaphthylene	*0.0022*	*0.0081*
Acenaphthene	*<0.00044*	*0.0023*
Fluorene	*0.0047*	*0.012*
Phenanthrene	*0.05*	*0.15*
Anthracene	*0.0044*	*0.019*
2-Methyl phenanthrene	*0.023*	*0.06*
2-Methyl anthracene	*0.001*	*0.0082*
1-Methyl anthracene	*0.003*	*0.0039*
1-Methyl phenanthrene	*0.012*	*0.037*
9-Methyl anthracene	*<0.000066*	*0.00056*
4,5-Methylene phenanthrene	*0.021*	*0.064*
Fluoranthene	*0.11*	*0.22*
Pyrene	*0.11*	*0.23*
Retene (1-methyl-7-isopropylphenenthrene)	*0.011*	*0.047*
Benzo[c]phenanthrene	*0.015*	*0.054*
Benzo[a]anthracene	*0.053*	*0.34*
Chrysene	0.088	0.36
Cyclopenta[cd]pyrene	0.01	0.16
Benzo[b]naph(2,1-d)thiophene	0.0028	0.012
5-Methyl Chrysene	0.0003	0.0016
Benzo[b]fluoranthene plus benzo[j]fluoranthene	0.1	0.48
Benzo[k]fluoranthene	0.028	0.13
Benzo[e]pyrene	0.42	1.3
Benzo[a]pyrene	**0.012**	**0.17**
Perylene	<0.0022	0.047
Indeno(1,2,3-cd)pyrene	0.014	0.26
Dibenzo[ah]anthracene plus dibenzo[ac]anthracene	0.0023	0.047
Benzo[ghi]perylene	0.039	0.26
Anthanthrene	<0.00066	0.02
Dibenzo[al]pyrene	<0.0044	0.042
Dibenzo[ae]pyrene	<0.0036	0.026
Dibenzo[ai]pyrene	<0.00066	0.0091
Dibenzo[ah]pyrene	0.0019	0.0005
Coronene	<0.0073	0.09
Cholanthrene	0.0038	0.017

Data in italics is for compounds retained very poorly by the sampling method

PAH DIGITEL SITE: HARWELL A

Period Name	Harwell November 2007	Harwell December 2007
Start Date	08/11/2007	01/12/2007
End Date	01/12/2007	03/01/2008
Number of days sampling	23	33
Data coverage by collection time (%)	98%	100%
Time coverage using collection time (%)	75%	106%

Compound	Calculated Concentrations ng m^{-3}	
Naphthalene	*0.0086*	*0.0085*
2-Methyl Napthalene	*<0.0037*	*0.0031*
1-Methyl Napthalene	*<0.0025*	*0.0019*
Biphenyl	*<0.0062*	*<0.0042*
Acenaphthylene	*<0.012*	*<0.0085*
Acenaphthene	*0.00086*	*0.00089*
Fluorene	*0.0058*	*0.016*
Phenanthrene	*0.074*	*0.24*
Anthracene	*0.0062*	*0.017*
2-Methyl phenanthrene	*0.015*	*0.041*
2-Methyl anthracene	*0.027*	*0.063*
1-Methyl anthracene	*0.02*	*0.051*
1-Methyl phenanthrene	*0.016*	*0.042*
9-Methyl anthracene	*<0.00012*	*0.00024*
4,5-Methylene phenanthrene	*0.023*	*0.068*
Fluoranthene	*0.11*	*0.39*
Pyrene	*0.093*	*0.31*
Retene (1-methyl-7-isopropylphenenthrene)	*0.025*	*0.085*
Benzo[c]phenanthrene	*0.02*	*0.076*
Benzo[a]anthracene	*0.074*	*0.26*
Chrysene	*0.14*	*0.47*
Cyclopenta[cd]pyrene	0.031	0.089
Benzo[b]naph(2,1-d)thiophene	0.0068	0.017
5-Methyl Chrysene	0.012	0.032
Benzo[b]fluoranthene plus benzo[j]fluoranthene	0.29	0.76
Benzo[k]fluoranthene	0.068	0.17
Benzo[e]pyrene	0.13	0.33
Benzo[a]pyrene	**0.059**	**0.16**
Perylene	0.014	0.033
Indeno(1,2,3-cd)pyrene	0.19	0.47
Dibenzo[ah]anthracene plus dibenzo[ac]anthracene	0.024	0.059
Benzo[ghi]perylene	0.13	0.31
Anthanthrene	0.0039	<0.000042
Dibenzo[al]pyrene	0.038	0.089
Dibenzo[ae]pyrene	0.014	0.036
Dibenzo[ai]pyrene	0.0012	0.0039
Dibenzo[ah]pyrene	<0.00049	<0.00034
Coronene	0.045	0.11
Cholanthrene	0.0031	0.008

Data in italics is for compounds retained very poorly by the sampling method

PAH DIGITEL SITE: HAZELRIGG

Period Name	Hazelrigg Q3 2007	Hazelrigg Q4 2007
Start Date	18/09/2007	01/10/2007
End Date	01/10/2007	01/01/2008
Number of days sampling	13	92
Data coverage by collection time (%)	100%	100%
Time coverage using collection time (%)	14%	100%

Compound	Calculated Concentrations ng m^{-3}	
Naphthalene	*<0.032*	*0.013*
2-Methyl Napthalene	*<0.032*	*<0.0045*
1-Methyl Napthalene	*<0.011*	*0.0018*
Biphenyl	*<0.063*	*<0.009*
Acenaphthylene	*0.001*	*0.0033*
Acenaphthene	*<0.0042*	*<0.0006*
Fluorene	*<0.011*	*0.0034*
Phenanthrene	*<0.032*	*0.048*
Anthracene	*<0.0084*	*0.0046*
2-Methyl phenanthrene	*<0.011*	*0.015*
2-Methyl anthracene	*<0.0021*	*0.0022*
1-Methyl anthracene	*<0.00021*	*<0.00003*
1-Methyl phenanthrene	*<0.0084*	*0.012*
9-Methyl anthracene	*<0.00074*	*0.00016*
4,5-Methylene phenanthrene	*<0.011*	*0.016*
Fluoranthene	*0.025*	*0.1*
Pyrene	*0.022*	*0.09*
Retene (1-methyl-7-isopropylphenenthrene)	*<0.032*	*0.019*
Benzo[c]phenanthrene	*0.0036*	*0.022*
Benzo[a]anthracene	*0.019*	*0.085*
Chrysene	*0.039*	*0.14*
Cyclopenta[cd]pyrene	0.0037	0.016
Benzo[b]naph(2,1-d)thiophene	0.0011	0.0052
5-Methyl Chrysene	<0.00032	<0.000045
Benzo[b]fluoranthene plus benzo[j]fluoranthene	0.089	0.27
Benzo[k]fluoranthene	0.022	0.07
Benzo[e]pyrene	0.04	0.11
Benzo[a]pyrene	**0.021**	**0.069**
Perylene	0.0034	0.013
Indeno(1,2,3-cd)pyrene	0.043	0.13
Dibenzo[ah]anthracene plus dibenzo[ac]anthracene	0.0079	0.024
Benzo[ghi]perylene	0.053	0.12
Anthanthrene	0.0009	0.0019
Dibenzo[al]pyrene	0.014	0.033
Dibenzo[ae]pyrene	0.0068	0.016
Dibenzo[ai]pyrene	0.0012	0.0025
Dibenzo[ah]pyrene	<0.00021	0.00007
Coronene	0.023	0.034
Cholanthrene	0.0016	0.001

Data in italics is for compounds retained very poorly by the sampling method

PAH DIGITEL SITE: HAZELRIGG

Period Name	Hazelrigg Q3 2007	Hazelrigg Q4 2007
Start Date	18/09/2007	01/10/2007
End Date	01/10/2007	01/01/2008
Number of days sampling	13	92
Data coverage by collection time (%)	100%	100%
Time coverage using collection time (%)	14%	100%
Compound	Calculated Concentrations ng/m^3	
Naphthalene	*<0.032*	*0.013*
2-Methyl Napthalene	*<0.032*	*<0.0045*
1-Methyl Napthalene	*<0.011*	*0.0018*
Biphenyl	*<0.063*	*<0.009*
Acenaphthylene	*0.001*	*0.0033*
Acenaphthene	*<0.0042*	*<0.0006*
Fluorene	*<0.011*	*0.0034*
Phenanthrene	*<0.032*	*0.048*
Anthracene	*<0.0084*	*0.0046*
2-Methyl phenanthrene	*<0.011*	*0.015*
2-Methyl anthracene	*<0.0021*	*0.0022*
1-Methyl anthracene	*<0.00021*	*<0.00003*
1-Methyl phenanthrene	*<0.0084*	*0.012*
9-Methyl anthracene	*<0.00074*	*0.00016*
4,5-Methylene phenanthrene	*<0.011*	*0.016*
Fluoranthene	*0.025*	*0.1*
Pyrene	*0.022*	*0.09*
Retene (1-methyl-7-isopropylphenenthrene)	*<0.032*	*0.019*
Benzo[c]phenanthrene	*0.0036*	*0.022*
Benzo[a]anthracene	*0.019*	*0.085*
Chrysene	*0.039*	*0.14*
Cyclopenta[cd]pyrene	0.0037	0.016
Benzo[b]naph(2,1-d)thiophene	0.0011	0.0052
5-Methyl Chrysene	<0.00032	<0.000045
Benzo[b]fluoranthene plus benzo[j]fluoranthene	0.089	0.27
Benzo[k]fluoranthene	0.022	0.07
Benzo[e]pyrene	0.04	0.11
Benzo[a]pyrene	**0.021**	**0.069**
Perylene	0.0034	0.013
Indeno(1,2,3-cd)pyrene	0.043	0.13
Dibenzo[ah]anthracene plus dibenzo[ac]anthracene	0.0079	0.024
Benzo[ghi]perylene	0.053	0.12
Anthanthrene	0.0009	0.0019
Dibenzo[al]pyrene	0.014	0.033
Dibenzo[ae]pyrene	0.0068	0.016
Dibenzo[ai]pyrene	0.0012	0.0025
Dibenzo[ah]pyrene	<0.00021	0.00007
Coronene	0.023	0.034
Cholanthrene	0.0016	0.001

Data in italics is for compounds retained very poorly by the sampling method

PAH DIGITEL SITE: HIGH MUFFLES

Period Name	High Muffles Q3 2007	High Muffles Q4 2007
Start Date	26/09/2007	01/10/2007
End Date	01/10/2007	01/01/2008
Number of days sampling	5	90
Data coverage by collection time (%)	100%	98%
Time coverage using collection time (%)	5%	98%

Compound	Calculated Concentrations ng m^{-3}	
Naphthalene	*<0.082*	*0.012*
2-Methyl Napthalene	*<0.082*	*<0.0046*
1-Methyl Napthalene	*<0.027*	*<0.0015*
Biphenyl	*<0.16*	*<0.0092*
Acenaphthylene	*<0.0016*	*0.0041*
Acenaphthene	*<0.011*	*<0.00061*
Fluorene	*<0.027*	*0.0046*
Phenanthrene	*<0.082*	*0.067*
Anthracene	*<0.022*	*0.007*
2-Methyl phenanthrene	*<0.027*	*0.018*
2-Methyl anthracene	*<0.0055*	*0.0034*
1-Methyl anthracene	*<0.00055*	*<0.000031*
1-Methyl phenanthrene	*<0.022*	*0.015*
9-Methyl anthracene	*<0.0019*	*<0.00011*
4,5-Methylene phenanthrene	*<0.027*	*0.018*
Fluoranthene	*0.03*	*0.15*
Pyrene	*0.022*	*0.13*
Retene (1-methyl-7-isopropylphenenthrene)	*<0.082*	*0.014*
Benzo[c]phenanthrene	*0.0033*	*0.023*
Benzo[a]anthracene	*<0.019*	*0.11*
Chrysene	*0.033*	*0.18*
Cyclopenta[cd]pyrene	0.0033	0.028
Benzo[b]naph(2,1-d)thiophene	0.0013	0.0061
5-Methyl Chrysene	<0.00082	<0.000046
Benzo[b]fluoranthene plus benzo[j]fluoranthene	0.074	0.32
Benzo[k]fluoranthene	0.022	0.092
Benzo[e]pyrene	0.033	0.13
Benzo[a]pyrene	**0.018**	**0.099**
Perylene	0.0038	0.018
Indeno(1,2,3-cd)pyrene	0.041	0.15
Dibenzo[ah]anthracene plus dibenzo[ac]anthracene	0.0099	0.028
Benzo[ghi]perylene	0.044	0.14
Anthanthrene	0.00074	0.0058
Dibenzo[al]pyrene	0.011	0.041
Dibenzo[ae]pyrene	0.0093	0.017
Dibenzo[ai]pyrene	0.0044	0.0057
Dibenzo[ah]pyrene	0.0047	0.00076
Coronene	0.017	0.034
Cholanthrene	<0.00027	0.0014

Data in italics is for compounds retained very poorly by the sampling method

PAH DIGITEL SITE: HOVE

Period Name	Hove Q1 2007	Hove Q2 2007	Hove Q3 2007	Hove Q4 2007
Start Date	13/03/2007	01/04/2007	01/07/2007	04/10/2007
End Date	01/04/2007	01/07/2007	26/09/2007	01/01/2008
Number of days sampling	19	91	87	89
Data coverage by collection time (%)	100%	100%	100%	99%
Time coverage using collection time (%)	21%	100%	95%	96%
Compound	**Calculated Concentrations ng m^{-3}**			
Naphthalene	*0.011*	*0.0052*	*<0.0015*	*0.0082*
2-Methyl Napthalene	*0.0051*	*0.0025*	*0.0015*	*0.0049*
1-Methyl Napthalene	*0.0029*	*0.0012*	*0.00077*	*0.0027*
Biphenyl	*0.036*	*0.0068*	*0.0032*	*0.0098*
Acenaphthylene	*0.0093*	*0.0043*	*0.0032*	*0.012*
Acenaphthene	*0.0017*	*0.00099*	*0.00054*	*0.0012*
Fluorene	*0.014*	*0.005*	*0.0034*	*0.016*
Phenanthrene	*0.21*	*0.064*	*0.032*	*0.24*
Anthracene	*0.017*	*0.0079*	*0.0054*	*0.022*
2-Methyl phenanthrene	*0.055*	*0.018*	*0.0091*	*0.077*
2-Methyl anthracene	*0.0066*	*0.0024*	*0.0015*	*0.024*
1-Methyl anthracene	*<0.00029*	*<0.000059*	*<0.000062*	*<0.000063*
1-Methyl phenanthrene	*0.032*	*0.0096*	*0.0048*	*0.051*
9-Methyl anthracene	*0.00022*	*0.00024*	*0.00022*	*0.0014*
4,5-Methylene phenanthrene	*0.059*	*0.018*	*0.0099*	*0.09*
Fluoranthene	*0.43*	*0.11*	*0.039*	*0.28*
Pyrene	*0.35*	*0.085*	*0.025*	*0.22*
Retene (1-methyl-7-isopropylphenenthrene)	*0.086*	*0.013*	*0.002*	*0.043*
Benzo[c]phenanthrene	*0.12*	*0.014*	*0.0046*	*0.07*
Benzo[a]anthracene	*0.47*	*0.049*	*0.022*	*0.43*
Chrysene	*0.68*	*0.092*	*0.045*	*0.54*
Cyclopenta[cd]pyrene	0.12	0.018	0.0087	0.24
Benzo[b]naph(2,1-d)thiophene	0.02	0.004	0.0014	0.03
5-Methyl Chrysene	<0.00014	<0.00003	<0.000031	<0.000032
Benzo[b]fluoranthene plus benzo[j]fluoranthene	1.2	0.19	0.11	0.93
Benzo[k]fluoranthene	0.24	0.042	0.023	0.21
Benzo[e]pyrene	3.8	0.7	0.39	3.2
Benzo[a]pyrene	**0.35**	**0.047**	**0.023**	**0.32**
Perylene	0.061	0.0095	0.0049	0.065
Indeno(1,2,3-cd)pyrene	0.63	0.12	0.074	0.6
Dibenzo[ah]anthracene plus dibenzo[ac]anthracene	0.093	0.018	0.01	0.1
Benzo[ghi]perylene	0.5	0.11	0.06	0.49
Anthanthrene	0.033	0.0031	0.002	0.054
Dibenzo[al]pyrene	0.15	0.031	0.017	0.19
Dibenzo[ae]pyrene	0.079	0.015	0.0091	0.09
Dibenzo[ai]pyrene	0.018	0.0031	0.0015	0.025
Dibenzo[ah]pyrene	0.0024	0.00022	0.00011	0.0081
Coronene	0.17	0.047	0.029	0.19
Cholanthrene	0.0079	0.0015	0.0012	0.019

Data in italics is for compounds retained very poorly by the sampling method

PAH DIGITEL SITE: KINLOCHLEVEN

Period Name	Kinlochleven Q1 2007	Kinlochleven Q2 2007	Kinlochleven Q3 2007	Kinlochleven Q4 2007
Start Date	28/03/2007	01/04/2007	01/07/2007	01/10/2007
End Date	01/04/2007	01/07/2007	01/10/2007	01/01/2008
Number of days sampling	4	88	90	88
Data coverage by collection time (%)	100%	96%	98%	96%
Time coverage using collection time (%)	4%	96%	98%	96%
Compound		**Calculated Concentrations ng m^{-3}**		
Naphthalene	*<0.035*	*0.0027*	*<0.0015*	*0.004*
2-Methyl Napthalene	*<0.021*	*0.0012*	*<0.00093*	*0.0011*
1-Methyl Napthalene	*<0.014*	*0.0012*	*<0.00062*	*0.00078*
Biphenyl	*0.085*	*0.0038*	*<0.0031*	*0.0038*
Acenaphthylene	*0.0046*	*0.0033*	*0.0012*	*0.0049*
Acenaphthene	*0.0019*	*0.0035*	*0.00015*	*0.00063*
Fluorene	*0.0099*	*0.0071*	*0.0015*	*0.0078*
Phenanthrene	*0.099*	*0.11*	*0.013*	*0.12*
Anthracene	*0.0074*	*0.011*	*0.0029*	*0.046*
2-Methyl phenanthrene	*0.028*	*0.024*	*0.0068*	*0.075*
2-Methyl anthracene	*0.0049*	*0.0076*	*0.0043*	*0.098*
1-Methyl anthracene	*0.024*	*<0.000064*	*<0.000062*	*0.011*
1-Methyl phenanthrene	*0.019*	*0.015*	*0.0073*	*0.063*
9-Methyl anthracene	*<0.0011*	*0.00073*	*0.0002*	*0.0038*
4,5-Methylene phenanthrene	*0.029*	*0.029*	*0.01*	*0.11*
Fluoranthene	*0.25*	*0.17*	*0.043*	*0.35*
Pyrene	*0.2*	*0.12*	*0.037*	*0.3*
Retene (1-methyl-7-isopropylphenenthrene)	*0.021*	*0.0051*	*0.0036*	*0.024*
Benzo[c]phenanthrene	*0.053*	*0.024*	*0.012*	*0.076*
Benzo[a]anthracene	*0.21*	*0.17*	*0.08*	*0.62*
Chrysene	*0.33*	*0.17*	*0.063*	*0.46*
Cyclopenta[cd]pyrene	0.074	0.071	0.059	0.4
Benzo[b]naph(2,1-d)thiophene	0.0099	0.0098	0.0051	0.03
5-Methyl Chrysene	0.042	<0.000032	<0.000031	<0.000032
Benzo[b]fluoranthene plus benzo[j]fluoranthene	0.14	0.33	0.19	0.79
Benzo[k]fluoranthene	0.11	0.083	0.04	0.19
Benzo[e]pyrene	0.049	1.3	0.68	3
Benzo[a]pyrene	**0.22**	**0.16**	**0.094**	**0.46**
Perylene	0.17	0.032	0.019	0.081
Indeno(1,2,3-cd)pyrene	0.31	0.21	0.13	0.48
Dibenzo[ah]anthracene plus dibenzo[ac]anthracene	0.046	0.046	0.026	0.11
Benzo[ghi]perylene	0.26	0.16	0.11	0.43
Anthanthrene	0.0095	0.024	0.015	0.095
Dibenzo[al]pyrene	0.088	0.075	0.042	0.17
Dibenzo[ae]pyrene	0.039	0.038	0.02	0.087
Dibenzo[ai]pyrene	0.0085	0.012	0.0063	0.033
Dibenzo[ah]pyrene	<0.0007	0.0046	0.0034	0.025
Coronene	0.11	0.041	0.031	0.12
Cholanthrene	0.021	0.007	0.004	0.021

Data in italics is for compounds retained very poorly by the sampling method

PAH DIGITEL SITE: LEEDS MILLSHAW

Period Name	Leeds Q4 2006	Leeds Q1 2007	Leeds Q2 2007	Leeds Q3 2007	Leeds Q4 2007
Start Date	06/12/2006	03/01/2007	01/04/2007	01/07/2007	01/10/2007
End Date	01/01/2007	01/04/2007	01/07/2007	01/10/2007	01/01/2008
Number of days sampling	26	88	80	92	92
Data coverage by collection time (%)	100%	100%	88%	100%	100%
Time coverage using collection time (%)	28%	98%	88%	100%	100%
Compound	**Calculated Concentrations ng m^{-3}**				
Naphthalene	*0.025*	*0.014*	*0.016*	*0.018*	*0.015*
2-Methyl Napthalene	*0.019*	*0.0093*	*0.0084*	*0.0095*	*0.0094*
1-Methyl Napthalene	*0.0075*	*0.0039*	*0.0036*	*0.0037*	*0.0041*
Biphenyl	*0.016*	*0.012*	*0.014*	*0.015*	*0.0094*
Acenaphthylene	*<0.011*	*0.011*	*0.0076*	*0.0064*	*0.012*
Acenaphthene	*0.0031*	*0.0024*	*0.0024*	*0.0024*	*0.0021*
Fluorene	*0.025*	*0.017*	*0.014*	*0.012*	*0.023*
Phenanthrene	*0.37*	*0.24*	*0.15*	*0.14*	*0.27*
Anthracene	*0.033*	*0.028*	*0.015*	*0.011*	*0.052*
2-Methyl phenanthrene	*0.11*	*0.099*	*0.053*	*0.049*	*0.11*
2-Methyl anthracene	*0.19*	*0.015*	*0.005*	*0.0036*	*0.03*
1-Methyl anthracene	*0.11*	*<0.000063*	*<0.000069*	*<0.00006*	*<0.000061*
1-Methyl phenanthrene	*0.096*	*0.053*	*0.026*	*0.022*	*0.065*
9-Methyl anthracene	*0.0015*	*0.00013*	*<0.000052*	*<0.000045*	*0.00024*
4,5-Methylene phenanthrene	*0.17*	*0.098*	*0.052*	*0.046*	*0.12*
Fluoranthene	*0.69*	*0.44*	*0.28*	*0.21*	*0.5*
Pyrene	*0.75*	*0.42*	*0.24*	*0.18*	*0.44*
Retene (1-methyl-7-isopropylphenenthrene)	*0.23*	*0.098*	*0.028*	*0.021*	*0.1*
Benzo[c]phenanthrene	*0.24*	*0.11*	*0.04*	*0.03*	*0.12*
Benzo[a]anthracene	*0.91*	*0.47*	*0.17*	*0.12*	*0.76*
Chrysene	*1.3*	*0.6*	*0.28*	*0.18*	*0.82*
Cyclopenta[cd]pyrene	0.27	0.19	0.057	0.034	0.38
Benzo[b]naph(2,1-d)thiophene	0.045	0.024	0.01	0.0068	0.032
5-Methyl Chrysene	0.091	<0.000031	<0.000034	<0.00003	<0.00003
Benzo[b]fluoranthene plus benzo[j]fluoranthene	1.4	0.9	0.48	0.31	1.4
Benzo[k]fluoranthene	0.38	0.2	0.11	0.07	0.32
Benzo[e]pyrene	0.75	3.5	1.7	1.2	5.3
Benzo[a]pyrene	**0.51**	**0.35**	**0.14**	**0.086**	**0.58**
Perylene	0.11	0.068	0.031	0.018	0.12
Indeno(1,2,3-cd)pyrene	0.96	0.57	0.29	0.18	0.85
Dibenzo[ah]anthracene plus dibenzo[ac]anthracene	0.14	0.1	0.05	0.028	0.17
Benzo[ghi]perylene	0.8	0.49	0.24	0.16	0.72
Anthanthrene	0.01	0.05	0.013	0.0052	0.082
Dibenzo[al]pyrene	0.21	0.17	0.076	0.033	0.24
Dibenzo[ae]pyrene	0.085	0.088	0.04	0.019	0.14
Dibenzo[ai]pyrene	0.014	0.017	0.0077	0.0028	0.026
Dibenzo[ah]pyrene	<0.00043	0.0038	0.00058	0.000079	0.0047
Coronene	0.26	0.19	0.095	0.051	0.26
Cholanthrene	0.008	0.013	0.0038	0.0025	0.018

Data in italics is for compounds retained very poorly by the sampling method

AEA

PAH DIGITEL SITE: LISBURN DUNMURRAY HIGH SCHOOL

Period Name	Lisburn Q4 2006	Lisburn Q1 2007	Lisburn Q2 2007	Lisburn Q3 2007	Lisburn Q4 2007†
Start Date	14/12/2006	02/01/2007	01/04/2007	01/07/2007	01/10/2007
End Date	01/01/2007	01/04/2007	01/07/2007	01/10/2007	01/01/2008
Number of days sampling	14	69	91	90	92
Data coverage by collection time (%)	78%	77%	100%	98%	99%
Time coverage using collection time (%)	15%	76%	100%	98%	99%
Compound					
Naphthalene	*0.015*	*0.034*	*0.013*	*0.01*	*0.0089*
2-Methyl Napthalene	*0.009*	*0.014*	*0.0051*	*0.0047*	*0.0048*
1-Methyl Napthalene	*0.0049*	*0.0067*	*0.0023*	*0.002*	*0.0025*
Biphenyl	*<0.01*	*0.013*	*0.0067*	*0.008*	*0.031 - 0.0061*
Acenaphthylene	*0.032*	*0.016*	*0.0029*	*0.0017*	*0.0061 - 0.0063*
Acenaphthene	*0.0033*	*0.0014*	*0.00065*	*0.00054*	*0.004*
Fluorene	*0.055*	*0.014*	*0.0029*	*0.0024*	*0.0081*
Phenanthrene	*1.3*	*0.36*	*0.033*	*0.021*	*0.11*
Anthracene	*0.28*	*0.091*	*0.0044*	*0.0032*	*0.017*
2-Methyl phenanthrene	*0.52*	*0.24*	*0.014*	*0.0076*	*0.052 - 0.053*
2-Methyl anthracene	*0.8*	*0.19*	*0.0044*	*0.0015*	*0.022*
1-Methyl anthracene	*0.8*	*0.22*	*0.007*	*0.0046*	*0.062*
1-Methyl phenanthrene	*0.6*	*0.071*	*0.0068*	*0.0026*	*0.045- 0.046*
9-Methyl anthracene	*0.027*	*0.018*	*0.00057*	*0.00034*	*0.00063*
4,5-Methylene phenanthrene	*0.81*	*0.19*	*0.011*	*0.005*	*0.061 - 0.062*
Fluoranthene	*3.1*	*1.1*	*0.086*	*0.043*	*0.25*
Pyrene	*3.3*	*1.1*	*0.091*	*0.046*	*0.26 - 0.27*
Retene (1-methyl-7-isopropylphenenthrene)	*0.59*	*<0.22*	*0.02*	*0.0064*	*0.031-0.032*
Benzo[c]phenanthrene	*0.88*	*0.39*	*0.026*	*0.012*	*0.067 – 0.068*
Benzo[a]anthracene	*4.9*	*1.7*	*0.11*	*0.054*	*0.57*
Chrysene	*4.3*	*1.7*	*0.15*	*0.076*	*0.53*
Cyclopenta[cd]pyrene	3.7	1.3	0.06	0.032	0.35 - 0.36
Benzo[b]naph(2,1-d)thiophene	0.22	0.097	0.0092	0.0043	0.022
5-Methyl Chrysene	0.68	0.87	0.032	0.017	0.0026 – 0.0028
Benzo[b]fluoranthene plus benzo[j]fluoranthene	4.9	2	0.3	0.18	0.71 -0.72
Benzo[k]fluoranthene	1.2	0.57	0.079	0.049	0.2
Benzo[e]pyrene	2.2	0.88	0.15	0.095	1.8 - 1.9
Benzo[a]pyrene	**2.7**	**1.3**	**0.14**	**0.087**	**0.32 - 0.33**
Perylene	0.51	0.24	0.029	0.018	0.082 – 0.083
Indeno(1,2,3-cd)pyrene	3.3	1.1	0.17	0.11	0.45
Dibenzo[ah]anthracene plus dibenzo[ac]anthracene	0.58	0.26	0.036	0.023	0.094 - 0.095
Benzo[ghi]perylene	2.1	1	0.17	0.11	0.36
Anthanthrene	0.4	0.3	0.023	0.013	0.075 - 0.076
Dibenzo[al]pyrene	0.84	0.59	0.038	0.046	0.13
Dibenzo[ae]pyrene	0.32	0.2	0.023	<0.012	0.065
Dibenzo[ai]pyrene	0.18	0.2	0.011	<0.0061	0.036
Dibenzo[ah]pyrene	0.099	0.067	<0.006	<0.0061	0.013
Coronene	0.8	0.45	0.073	0.046	0.1
Cholanthrene	0.15	0.059	0.0053	0.0028	0.043

Data in italics is for compounds retained very poorly by the sampling method

†Q4 2007 is calculated from a number of individually analysed daily samples. Some analysis results were below the relevant detection limit and this leads to the range of results given.

PAH DIGITEL SITE: LYNEMOUTH

Period Name	Lynemouth Q4 2006	Lynemouth Q1 2007	Lynemouth Q2 2007	Lynemouth Q3 2007	Lynemouth Q4 2007
Start Date	06/10/2006	01/01/2007	01/04/2007	01/07/2007	01/10/2007
End Date	01/01/2007	01/04/2007	01/07/2007	01/10/2007	01/01/2008
Number of days sampling	75	68	71	92	92
Data coverage by collection time (%)	86%	75%	78%	98%	100%
Time coverage using collection time (%)	82%	75%	78%	98%	100%
Compound	**Calculated Concentrations ng m^{-3}**				
Naphthalene	*0.0095*	*0.0053*	*0.01*	*0.0056*	*0.011*
2-Methyl Napthalene	*0.007*	*<0.0041*	*0.0053*	*0.0032*	*0.0054*
1-Methyl Napthalene	*0.0038*	*<0.0016*	*0.0041*	*0.0022*	*0.0028*
Biphenyl	*0.013*	*<0.021*	*<0.02*	*<0.015*	*<0.015*
Acenaphthylene	*0.0073*	*0.0029*	*0.002*	*0.001*	*0.004*
Acenaphthene	*0.004*	*0.0016*	*0.0022*	*0.0015*	*0.0048*
Fluorene	*0.011*	*0.0045*	*0.0037*	*0.0023*	*0.0072*
Phenanthrene	*0.22*	*0.092*	*0.051*	*0.026*	*0.11*
Anthracene	*0.038*	*0.016*	*0.0077*	*0.0042*	*0.02*
2-Methyl phenanthrene	*0.12*	*0.047*	*0.013*	*0.0056*	*0.034*
2-Methyl anthracene	*0.055*	*0.021*	*0.0037*	*0.0015*	*0.017*
1-Methyl anthracene	*0.022*	*0.027*	*0.0082*	*0.0046*	*0.021*
1-Methyl phenanthrene	*0.09*	*0.014*	*0.011*	*0.0043*	*0.026*
9-Methyl anthracene	*0.0031*	*0.0027*	*0.00063*	*0.00022*	*0.0021*
4,5-Methylene phenanthrene	*0.079*	*0.035*	*0.012*	*0.0054*	*0.032*
Fluoranthene	*0.55*	*0.31*	*0.16*	*0.068*	*0.28*
Pyrene	*0.53*	*0.31*	*0.14*	*0.059*	*0.26*
Retene (1-methyl-7-isopropylphenenthrene)	*0.12*	*0.043*	*0.02*	*0.0062*	*0.049*
Benzo[c]phenanthrene	*0.13*	*0.074*	*0.026*	*0.011*	*0.069*
Benzo[a]anthracene	*0.92*	*0.47*	*0.16*	*0.071*	*0.41*
Chrysene	*0.95*	*0.7*	*0.29*	*0.13*	*0.57*
Cyclopenta[cd]pyrene	0.2	0.099	0.027	0.017	0.12
Benzo[b]naph(2,1-d)thiophene	0.092	0.049	0.017	0.0062	0.037
5-Methyl Chrysene	<0.000037	0.092	0.026	0.0097	0.055
Benzo[b]fluoranthene plus benzo[j]fluoranthene	1.2	0.8	0.45	0.28	0.66
Benzo[k]fluoranthene	0.29	0.19	0.11	0.063	0.17
Benzo[e]pyrene	0.77	0.45	0.24	0.14	0.34
Benzo[a]pyrene	**0.59**	**0.33**	**0.15**	**0.082**	**0.31**
Perylene	0.13	0.066	0.035	0.019	0.066
Indeno(1,2,3-cd)pyrene	0.68	0.31	0.17	0.099	0.29
Dibenzo[ah]anthracene plus dibenzo[ac]anthracene	0.2	0.1	0.047	0.026	0.087
Benzo[ghi]perylene	0.64	0.35	0.17	0.1	0.31
Anthanthrene	0.12	0.047	0.017	0.013	0.054
Dibenzo[al]pyrene	0.22	0.064	0.069	0.039	0.071
Dibenzo[ae]pyrene	0.18	0.07	0.029	0.015	0.068
Dibenzo[ai]pyrene	0.12	0.029	0.011	0.0062	0.028
Dibenzo[ah]pyrene	0.033	0.023	0.0082	0.0045	0.026
Coronene	0.16	0.11	0.053	0.031	0.11
Cholanthrene	0.02	0.008	0.0037	0.0022	0.0074

Data in italics is for compounds retained very poorly by the sampling method

PAH DIGITEL SITE: MIDDLESBROUGH

Period Name	Middlesbrough Q3 2007	Middlesbrough Q4 2007
Start Date	26/09/2007	01/10/2007
End Date	01/10/2007	01/01/2008
Number of days sampling	5	84
Data coverage by collection time (%)	100%	91%
Time coverage using collection time (%)	5%	91%
Compound	Calculated Concentrations ng m^{-3}	
Naphthalene	*<0.084*	*0.023*
2-Methyl Napthalene	*<0.084*	*0.012*
1-Methyl Napthalene	*<0.028*	*0.0055*
Biphenyl	*<0.17*	*<0.01*
Acenaphthylene	*0.0067*	*0.011*
Acenaphthene	*<0.011*	*0.0025*
Fluorene	*<0.028*	*0.012*
Phenanthrene	*<0.084*	*0.13*
Anthracene	*0.056*	*0.025*
2-Methyl phenanthrene	*<0.028*	*0.042*
2-Methyl anthracene	*<0.0056*	*0.012*
1-Methyl anthracene	*<0.00056*	*<0.000034*
1-Methyl phenanthrene	*<0.022*	*0.029*
9-Methyl anthracene	*<0.002*	*0.0016*
4,5-Methylene phenanthrene	*<0.028*	*0.045*
Fluoranthene	*0.23*	*0.23*
Pyrene	*0.18*	*0.22*
Retene (1-methyl-7-isopropylphenenthrene)	*<0.084*	*0.047*
Benzo[c]phenanthrene	*0.025*	*0.049*
Benzo[a]anthracene	*0.19*	*0.25*
Chrysene	*0.28*	*0.37*
Cyclopenta[cd]pyrene	0.017	0.096
Benzo[b]naph(2,1-d)thiophene	0.0078	0.014
5-Methyl Chrysene	<0.00084	<0.00005
Benzo[b]fluoranthene plus benzo[j]fluoranthene	0.67	0.6
Benzo[k]fluoranthene	0.23	0.16
Benzo[e]pyrene	0.31	0.27
Benzo[a]pyrene	**0.22**	**0.25**
Perylene	0.05	0.049
Indeno(1,2,3-cd)pyrene	0.33	0.3
Dibenzo[ah]anthracene plus dibenzo[ac]anthracene	0.067	0.062
Benzo[ghi]perylene	0.36	0.32
Anthanthrene	0.0086	0.022
Dibenzo[al]pyrene	0.081	0.079
Dibenzo[ae]pyrene	0.042	0.042
Dibenzo[ai]pyrene	0.0089	0.0079
Dibenzo[ah]pyrene	0.0012	0.0005
Coronene	0.12	0.11
Cholanthrene	0.0022	0.0064

Data in italics is for compounds retained very poorly by the sampling method

PAH DIGITEL SITE: NEWCASTLE CENTRE

Period Name	Newcastle Q2 2007	Newcastle Q3 2007	Newcastle Q4 2007
Start Date	23/05/2007	01/07/2007	01/10/2007
End Date	01/07/2007	01/10/2007	01/01/2008
Number of days sampling	39	92	92
Data coverage by collection time (%)	100%	100%	100%
Time coverage using collection time (%)	43%	100%	100%
Compound	**Calculated Concentrations ng m^{-3}**		
Naphthalene	*0.01*	*0.0095*	*0.017*
2-Methyl Napthalene	*0.0061*	*0.0092*	*0.01*
1-Methyl Napthalene	*0.0025*	*0.0038*	*0.0046*
Biphenyl	*0.019*	*0.015*	*0.014*
Acenaphthylene	*0.0039*	*0.0041*	*0.011*
Acenaphthene	*0.0013*	*0.0017*	*0.0025*
Fluorene	*0.0086*	*0.0074*	*0.017*
Phenanthrene	*0.1*	*0.086*	*0.2*
Anthracene	*0.0068*	*0.0068*	*0.021*
2-Methyl phenanthrene	*0.039*	*0.035*	*0.081*
2-Methyl anthracene	*0.0014*	*0.002*	*0.012*
1-Methyl anthracene	*<0.00014*	*<0.00006*	*<0.000061*
1-Methyl phenanthrene	*0.017*	*0.017*	*0.044*
9-Methyl anthracene	*0.00017*	*<0.000045*	*<0.000046*
4,5-Methylene phenanthrene	*0.039*	*0.035*	*0.081*
Fluoranthene	*0.17*	*0.13*	*0.31*
Pyrene	*0.13*	*0.11*	*0.29*
Retene (1-methyl-7-isopropylphenenthrene)	*0.01*	*0.011*	*0.067*
Benzo[c]phenanthrene	*0.019*	*0.018*	*0.069*
Benzo[a]anthracene	*0.057*	*0.071*	*0.37*
Chrysene	*0.12*	*0.12*	*0.51*
Cyclopenta[cd]pyrene	0.013	0.017	0.15
Benzo[b]naph(2,1-d)thiophene	0.0057	0.006	0.023
5-Methyl Chrysene	0.000071	<0.00003	<0.000031
Benzo[b]fluoranthene plus benzo[j]fluoranthene	0.19	0.18	0.78
Benzo[k]fluoranthene	0.043	0.041	0.17
Benzo[e]pyrene	0.75	0.8	2.9
Benzo[a]pyrene	**0.036**	**0.05**	**0.28**
Perylene	0.0082	0.012	0.055
Indeno(1,2,3-cd)pyrene	0.096	0.098	0.46
Dibenzo[ah]anthracene plus dibenzo[ac]anthracene	0.015	0.017	0.089
Benzo[ghi]perylene	0.093	0.098	0.4
Anthanthrene	0.0012	0.0027	0.034
Dibenzo[al]pyrene	0.019	0.018	0.14
Dibenzo[ae]pyrene	0.012	0.011	0.077
Dibenzo[ai]pyrene	0.00082	0.0015	0.014
Dibenzo[ah]pyrene	0.000096	0.000076	0.0015
Coronene	0.031	0.035	0.15
Cholanthrene	0.00093	0.0017	0.0092

Data in italics is for compounds retained very poorly by the sampling method

PAH DIGITEL SITE: NEWPORT ST JULIANS COMP SCHOOL

Period Name	Newport Q2 2007	Newport Q3 2007	Newport Q4 2007
Start Date	01/04/2007	01/07/2007	01/10/2007
End Date	01/07/2007	01/10/2007	01/01/2008
Number of days sampling	81	91	92
Data coverage by collection time (%)	89%	98%	100%
Time coverage using collection time (%)	89%	98%	100%
Compound	**Calculated Concentrations ng m^{-3}**		
Naphthalene	*0.022*	*0.013*	*0.037*
2-Methyl Napthalene	*0.013*	*0.0077*	*0.024*
1-Methyl Napthalene	*0.0052*	*0.0031*	*0.01*
Biphenyl	*0.017*	*0.013*	*0.024*
Acenaphthylene	*0.0053*	*0.0067*	*0.012*
Acenaphthene	*0.0024*	*0.0023*	*0.0052*
Fluorene	*0.01*	*0.0086*	*0.02*
Phenanthrene	*0.11*	*0.09*	*0.23*
Anthracene	*0.0081*	*0.01*	*0.026*
2-Methyl phenanthrene	*0.036*	*0.032*	*0.081*
2-Methyl anthracene	*0.0024*	*0.0028*	*0.014*
1-Methyl anthracene	*<0.000069*	*<0.000061*	*<0.000061*
1-Methyl phenanthrene	*0.016*	*0.014*	*0.044*
9-Methyl anthracene	*<0.000052*	*<0.000046*	*<0.000046*
4,5-Methylene phenanthrene	*0.034*	*0.031*	*0.082*
Fluoranthene	*0.24*	*0.21*	*0.4*
Pyrene	*0.17*	*0.17*	*0.35*
Retene (1-methyl-7-isopropylphenenthrene)	*0.026*	*0.011*	*0.12*
Benzo[c]phenanthrene	*0.029*	*0.025*	*0.093*
Benzo[a]anthracene	*0.13*	*0.14*	*0.47*
Chrysene	*0.22*	*0.21*	*0.58*
Cyclopenta[cd]pyrene	0.029	0.018	0.27
Benzo[b]naph(2,1-d)thiophene	0.0082	0.008	0.018
5-Methyl Chrysene	<0.000034	<0.000031	<0.00003
Benzo[b]fluoranthene plus benzo[j]fluoranthene	0.43	0.35	1
Benzo[k]fluoranthene	0.098	0.087	0.23
Benzo[e]pyrene	1.5	0.81	3.5
Benzo[a]pyrene	**0.11**	**0.098**	**0.38**
Perylene	0.022	0.025	0.072
Indeno(1,2,3-cd)pyrene	0.26	0.21	0.64
Dibenzo[ah]anthracene plus dibenzo[ac]anthracene	0.045	0.04	0.1
Benzo[ghi]perylene	0.19	0.17	0.49
Anthanthrene	0.0052	0.0047	0.052
Dibenzo[al]pyrene	0.082	0.067	0.18
Dibenzo[ae]pyrene	0.038	0.037	0.087
Dibenzo[ai]pyrene	0.0082	0.013	0.023
Dibenzo[ah]pyrene	0.00019	<0.000031	0.0024
Coronene	0.067	0.055	0.18
Cholanthrene	0.0026	0.017	0.044

Data in italics is for compounds retained very poorly by the sampling method

PAH DIGITEL SITE: PORT TALBOT GROSWERN

Period Name	Port Talbot Q4	Port Talbot Q1 2007	Port Talbot Q2 2007	Port Talbot Q3 2007
Start Date	08/12/2006	01/01/2007	01/04/2007	01/07/2007
End Date	01/01/2007	01/04/2007	01/07/2007	23/07/2007
Number of days sampling	24	90	88	22
Data coverage by collection time (%)	100%	98%	97%	100%
Time coverage using collection time (%)	26%	98%	97%	24%
Compound				
Naphthalene	*0.04*	*0.057*	*0.11*	*0.029*
2-Methyl Napthalene	*0.037*	*0.064*	*0.16*	*0.029*
1-Methyl Napthalene	*0.019*	*0.031*	*0.08*	*0.013*
Biphenyl	*0.012*	*0.02*	*0.055*	*0.018*
Acenaphthylene	*<0.012*	*0.01*	*0.019*	*<0.012*
Acenaphthene	*0.0023*	*0.0036*	*0.0013*	*0.0038*
Fluorene	*0.023*	*0.02*	*0.044*	*0.024*
Phenanthrene	*0.52*	*0.21*	*0.39*	*0.14*
Anthracene	*0.033*	*0.024*	*0.041*	*0.016*
2-Methyl phenanthrene	*0.12*	*0.058*	*0.12*	*0.034*
2-Methyl anthracene	*0.21*	*0.065*	*0.2*	*0.057*
1-Methyl anthracene	*0.11*	*0.03*	*0.044*	*0.032*
1-Methyl phenanthrene	*0.093*	*0.021*	*0.062*	*0.024*
9-Methyl anthracene	*0.00028*	*<0.000047*	*0.000061*	*0.0002*
4,5-Methylene phenanthrene	*0.19*	*0.007*	*0.014*	*0.051*
Fluoranthene	*2.1*	*0.65*	*1.3*	*0.3*
Pyrene	*1.5*	*0.48*	*0.95*	*0.22*
Retene (1-methyl-7-isopropylphenenthrene)	*0.057*	*0.0012*	*0.002*	*<0.0037*
Benzo[c]phenanthrene	*0.26*	*0.029*	*0.056*	*0.035*
Benzo[a]anthracene	*1.7*	*0.62*	*1.1*	*0.3*
Chrysene	*2.6*	*0.78*	*1.4*	*0.37*
Cyclopenta[cd]pyrene	0.17	0.64	1.2	0.047
Benzo[b]naph(2,1-d)thiophene	0.093	0.027	0.044	0.012
5-Methyl Chrysene	0.075	0.046	0.064	0.017
Benzo[b]fluoranthene plus benzo[j]fluoranthene	3.5	1.3	2	0.81
Benzo[k]fluoranthene	0.93	0.35	0.59	0.22
Benzo[e]pyrene	1.6	0.39	1	0.38
Benzo[a]pyrene	**0.81**	**0.42**	**0.89**	**0.26**
Perylene	0.28	0.12	0.22	0.075
Indeno(1,2,3-cd)pyrene	1.9	0.066	1.1	0.49
Dibenzo[ah]anthracene plus dibenzo[ac]anthracene	0.28	0.043	0.073	0.087
Benzo[ghi]perylene	1	0.5	0.7	0.29
Anthanthrene	<0.000058	0.069	0.13	0.022
Dibenzo[al]pyrene	0.45	0.19	0.34	0.075
Dibenzo[ae]pyrene	0.15	0.16	0.28	0.052
Dibenzo[ai]pyrene	0.058	0.13	0.19	0.016
Dibenzo[ah]pyrene	<0.00046	0.11	0.27	0.0005
Coronene	0.21	0.15	0.19	0.058
Cholanthrene	0.02	0.078	0.13	0.0055

Data in italics is for compounds retained very poorly by the sampling method

PAH DIGITEL SITE: PORT TALBOT MARGAM

Period Name	Port Talbot 2 Margam Q4 2007
Start Date	09/10/2007
End Date	01/01/2008
Number of days sampling	84
Data coverage by collection time (%)	100%
Time coverage using collection time (%)	91%

Compound	Calculated Concentrations ng m^{-3}
Naphthalene	*0.028*
2-Methyl Napthalene	*0.028*
1-Methyl Napthalene	*0.014*
Biphenyl	*0.016*
Acenaphthylene	*0.0075*
Acenaphthene	*0.002*
Fluorene	*0.011*
Phenanthrene	*0.15*
Anthracene	*0.02*
2-Methyl phenanthrene	*0.061*
2-Methyl anthracene	*0.01*
1-Methyl anthracene	*0.03*
1-Methyl phenanthrene	*0.023*
9-Methyl anthracene	*0.00076*
4,5-Methylene phenanthrene	*0.041*
Fluoranthene	*0.53*
Pyrene	*0.43*
Retene (1-methyl-7-isopropylphenenthrene)	*0.046*
Benzo[c]phenanthrene	*0.076*
Benzo[a]anthracene	*0.45*
Chrysene	*0.6*
Cyclopenta[cd]pyrene	0.11
Benzo[b]naph(2,1-d)thiophene	0.022
5-Methyl Chrysene	0.043
Benzo[b]fluoranthene plus benzo[j]fluoranthene	1
Benzo[k]fluoranthene	0.3
Benzo[e]pyrene	0.43
Benzo[a]pyrene	**0.36**
Perylene	0.1
Indeno(1,2,3-cd)pyrene	0.48
Dibenzo[ah]anthracene plus dibenzo[ac]anthracene	0.098
Benzo[ghi]perylene	0.38
Anthanthrene	0.045
Dibenzo[al]pyrene	0.088
Dibenzo[ae]pyrene	0.07
Dibenzo[ai]pyrene	0.033
Dibenzo[ah]pyrene	0.025
Coronene	0.14
Cholanthrene	0.014

Data in italics is for compounds retained very poorly by the sampling method

PAH DIGITEL SITE: ROYSTON

Period Name	Royston Q3 2007	Royston Q4 2007
Start Date	20/09/2007	01/10/2007
End Date	01/10/2007	01/01/2008
Number of days sampling	10	91
Data coverage by collection time (%)	91%	99%
Time coverage using collection time (%)	11%	99%
Compound	Calculated Concentrations ng m^{-3}	
Naphthalene	*0.19*	*0.0065*
2-Methyl Napthalene	*0.21*	*0.0084*
1-Methyl Napthalene	*0.1*	*0.0043*
Biphenyl	*0.15*	*0.012*
Acenaphthylene	*0.063*	*0.014*
Acenaphthene	*0.14*	*0.0068*
Fluorene	*0.18*	*0.033*
Phenanthrene	*1.1*	*0.4*
Anthracene	*0.15*	*0.082*
2-Methyl phenanthrene	*0.43*	*0.18*
2-Methyl anthracene	*0.088*	*0.067*
1-Methyl anthracene	*<0.00055*	*<0.000061*
1-Methyl phenanthrene	*0.26*	*0.12*
9-Methyl anthracene	*0.0006*	*0.0014*
4,5-Methylene phenanthrene	*0.45*	*0.2*
Fluoranthene	*2.3*	*1.1*
Pyrene	*2.3*	*1.1*
Retene (1-methyl-7-isopropylphenenthrene)	*1.8*	*0.78*
Benzo[c]phenanthrene	*0.78*	*0.4*
Benzo[a]anthracene	*4,5*	*2*
Chrysene	*4.9*	*1.8*
Cyclopenta[cd]pyrene	1.5	0.81
Benzo[b]naph(2,1-d)thiophene	0.22	0.1
5-Methyl Chrysene	<0.00027	<0.00003
Benzo[b]fluoranthene plus benzo[j]fluoranthene	8.6	2.6
Benzo[k]fluoranthene	1.9	0.59
Benzo[e]pyrene	34	9.9
Benzo[a]pyrene	**3.3**	**1.2**
Perylene	0.74	0.21
Indeno(1,2,3-cd)pyrene	5.1	1.5
Dibenzo[ah]anthracene plus dibenzo[ac]anthracene	1.2	0.4
Benzo[ghi]perylene	4.1	1.2
Anthanthrene	0.33	0.17
Dibenzo[al]pyrene	<0.0011	0.62
Dibenzo[ae]pyrene	0.97	0.33
Dibenzo[ai]pyrene	0.25	0.09
Dibenzo[ah]pyrene	0.021	0.024
Coronene	1.1	0.37
Cholanthrene	0.13	0.065

Data in italics is for compounds retained very poorly by the sampling method

PAH DIGITEL SITE: SALFORD ECCLES

Period Name	**Eccles Q4 2007**
Start Date	04/10/2007
End Date	31/12/2007
Number of days sampling	80
Data coverage by collection time (%)	91%
Time coverage using collection time (%)	87%

Compound	**Calculated Concentrations ng m^{-3}**
Naphthalene	*0.021*
2-Methyl Napthalene	*0.014*
1-Methyl Napthalene	*0.0059*
Biphenyl	*0.011*
Acenaphthylene	*0.012*
Acenaphthene	*0.003*
Fluorene	*0.019*
Phenanthrene	*0.28*
Anthracene	*0.035*
2-Methyl phenanthrene	*0.073*
2-Methyl anthracene	*0.13*
1-Methyl anthracene	*0.08*
1-Methyl phenanthrene	*0.064*
9-Methyl anthracene	*0.00057*
4,5-Methylene phenanthrene	*0.11*
Fluoranthene	*0.35*
Pyrene	*0.35*
Retene (1-methyl-7-isopropylphenenthrene)	*0.13*
Benzo[c]phenanthrene	*0.099*
Benzo[a]anthracene	*0.49*
Chrysene	*0.68*
Cyclopenta[cd]pyrene	0.37
Benzo[b]naph(2,1-d)thiophene	0.023
5-Methyl Chrysene	0.061
Benzo[b]fluoranthene plus benzo[j]fluoranthene	0.89
Benzo[k]fluoranthene	0.21
Benzo[e]pyrene	0.44
Benzo[a]pyrene	**0.38**
Perylene	0.073
Indeno(1,2,3-cd)pyrene	0.63
Dibenzo[ah]anthracene plus dibenzo[ac]anthracene	0.091
Benzo[ghi]perylene	0.47
Anthanthrene	0.077
Dibenzo[al]pyrene	0.14
Dibenzo[ae]pyrene	0.057
Dibenzo[ai]pyrene	0.021
Dibenzo[ah]pyrene	0.0021
Coronene	0.17
Cholanthrene	0.014

Data in italics is for compounds retained very poorly by the sampling method

PAH DIGITEL SITE: SCUNTHORPE SANTON

Period Name	Santon Q3 2007	Santon Q4 2007
Start Date	14/09/2007	01/10/2007
End Date	01/10/2007	01/01/2008
Number of days sampling	17	92
Data coverage by collection time (%)	92%	100%
Time coverage using collection time (%)	17%	100%
Compound	**Calculated Concentrations ng m^{-3}**	
Naphthalene	*0.33*	*0.17*
2-Methyl Napthalene	*0.2*	*0.11*
1-Methyl Napthalene	*0.088*	*0.049*
Biphenyl	*0.088*	*0.04*
Acenaphthylene	*0.05*	*0.037*
Acenaphthene	*0.027*	*0.015*
Fluorene	*0.083*	*0.055*
Phenanthrene	*0.65*	*0.5*
Anthracene	*0.13*	*0.11*
2-Methyl phenanthrene	*0.29*	*0.23*
2-Methyl anthracene	*0.056*	*0.061*
1-Methyl anthracene	*0.077*	*0.064*
1-Methyl phenanthrene	*0.088*	*0.062*
9-Methyl anthracene	*0.0031*	*0.0029*
4,5-Methylene phenanthrene	*0.23*	*0.17*
Fluoranthene	*3*	*1.8*
Pyrene	*2.4*	*1.5*
Retene (1-methyl-7-isopropylphenenthrene)	*0.023*	*0.091*
Benzo[c]phenanthrene	*0.35*	*0.26*
Benzo[a]anthracene	*2.9*	*2.1*
Chrysene	*3.4*	*2.4*
Cyclopenta[cd]pyrene	0.49	0.56
Benzo[b]naph(2,1-d)thiophene	0.13	0.096
5-Methyl Chrysene	0.19	0.15
Benzo[b]fluoranthene plus benzo[j]fluoranthene	6.1	3.7
Benzo[k]fluoranthene	1.9	1.1
Benzo[e]pyrene	2.8	1.7
Benzo[a]pyrene	**2.7**	**1.7**
Perylene	0.87	0.58
Indeno(1,2,3-cd)pyrene	2.8	2
Dibenzo[ah]anthracene plus dibenzo[ac]anthracene	0.72	0.46
Benzo[ghi]perylene	2.4	1.5
Anthanthrene	0.47	0.35
Dibenzo[al]pyrene	0.58	0.61
Dibenzo[ae]pyrene	0.55	0.41
Dibenzo[ai]pyrene	0.26	0.33
Dibenzo[ah]pyrene	0.31	0.1
Coronene	0.8	0.55
Cholanthrene	0.077	0.067

Data in italics is for compounds retained very poorly by the sampling method

PAH DIGITEL SITE: SCUNTHORPE TOWN

Period Name	Scunthorpe Q4 2006	Scunthorpe Jan 2007	Scunthorpe Feb 2007	Scunthorpe Mar 2007	Scunthorpe Apr 2007	Scunthorpe May 2007	Scunthorpe June 2007
Start Date	07/12/2006	01/01/2007	01/02/2007	01/03/2007	01/04/2007	01/05/2007	01/06/2007
End Date	01/01/2007	01/02/2007	01/03/2007	01/04/2007	01/05/2007	01/06/2007	01/07/2007
Number of days sampling	25	31	28	31	30	31	30
Data coverage by collection time (%)	100%	100%	100%	100%	100%	100%	100%
Time coverage using collection time (%)	27%	100%	100%	100%	100%	100%	100%
Compound							
Naphthalene	*0.022*	*0.022*	*0.074*	*0.08*	*0.12*	*0.071*	*0.079*
2-Methyl Napthalene	*0.012*	*<0.013*	*0.031*	*0.029*	*0.046*	*0.038*	*0.043*
1-Methyl Napthalene	*0.0052*	*<0.0045*	*0.015*	*0.014*	*0.019*	*0.016*	*0.019*
Biphenyl	*0.0083*	*<0.022*	*<0.025*	*<0.022*	*<0.023*	*0.032*	*0.024*
Acenaphthylene	*0.013*	*0.0085*	*0.039*	*0.029*	*0.033*	*0.012*	*0.025*
Acenaphthene	*0.0032*	*<0.0018*	*0.0094*	*0.0071*	*0.01*	*0.0062*	*0.0088*
Fluorene	*0.023*	*0.0071*	*0.049*	*0.039*	*0.043*	*0.021*	*0.039*
Phenanthrene	*0.33*	*0.098*	*1.1*	*0.49*	*0.42*	*0.2*	*0.39*
Anthracene	*0.055*	*0.018*	*0.23*	*0.08*	*0.12*	*0.049*	*0.1*
2-Methyl phenanthrene	*0.095*	*0.039*	*0.36*	*0.17*	*0.17*	*0.093*	*0.2*
2-Methyl anthracene	*0.16*	*0.0073*	*0.079*	*0.024*	*0.029*	*0.015*	*0.055*
1-Methyl anthracene	*0.11*	*0.029*	*0.23*	*0.1*	*0.11*	*0.0067*	*<0.00018*
1-Methyl phenanthrene	*0.095*	*0.02*	*0.19*	*0.076*	*0.078*	*0.044*	*0.092*
9-Methyl anthracene	*0.00072*	*0.0011*	*0.0015*	*0.00076*	*0.00074*	*0.00058*	*0.002*
4,5-Methylene phenanthrene	*0.14*	*0.041*	*0.37*	*0.17*	*0.18*	*0.071*	*0.17*
Fluoranthene	*0.78*	*0.32*	*3.1*	*1.6*	*1.8*	*0.98*	*2.3*
Pyrene	*0.72*	*0.26*	*2.4*	*1.2*	*1.3*	*0.71*	*1.8*
Retene (1-methyl-7-isopropylphenenthrene)	*0.19*	*0.035*	*0.22*	*0.042*	*0.018*	*0.013*	*0.016*
Benzo[c]phenanthrene	*0.22*	*0.051*	*0.37*	*0.17*	*0.19*	*0.093*	*0.3*
Benzo[a]anthracene	*1.2*	*0.3*	*3*	*1.4*	*1.6*	*0.76*	*2.7*
Chrysene	*1.5*	*0.51*	*3.3*	*1.5*	*1.6*	*0.76*	*2.3*
Cyclopenta[cd]pyrene	0.5	0.049	0.69	0.31	0.31	0.15	0.69
Benzo[b]naph(2,1-d)thiophene	0.072	0.018	0.12	0.058	0.069	0.036	0.12
5-Methyl Chrysene	0.13	0.032	0.16	0.067	0.074	<0.000089	<0.000092
Benzo[b]fluoranthene plus benzo[j]fluoranthene	1.9	0.64	4.2	2.6	3.1	1.6	5.1
Benzo[k]fluoranthene	0.42	0.17	1.2	0.71	0.88	0.49	1.5
Benzo[e]pyrene	0.95	0.34	1.9	1.2	1.3	0.71	2.3
Benzo[a]pyrene	**0.72**	**0.19**	**1.9**	**0.94**	**1.1**	**0.58**	**2.2**
Perylene	0.15	0.053	0.54	0.31	0.33	0.2	0.79
Indeno(1,2,3-cd)pyrene	1.2	0.36	2.1	1.4	1.6	0.85	3.1
Dibenzo[ah]anthracene plus dibenzo[ac]anthracene	0.22	0.074	0.44	0.26	0.33	0.15	0.6
Benzo[ghi]perylene	0.89	0.32	1.6	0.98	1.1	0.58	1.9
Anthanthrene	0.12	0.011	0.29	0.058	0.14	0.11	0.55
Dibenzo[al]pyrene	0.3	0.097	0.54	0.35	0.46	0.14	0.79
Dibenzo[ae]pyrene	0.14	0.044	0.31	0.18	0.2	0.2	0.51
Dibenzo[ai]pyrene	0.061	0.0098	0.2	0.071	0.088	0.076	0.55
Dibenzo[ah]pyrene	0.046	0.001	0.018	0.0067	0.0069	<0.0027	0.045
Coronene	0.28	0.087	0.4	0.27	0.26	0.13	0.6
Cholanthrene	0.022	0.0062	0.064	0.024	0.035	0.016	0.1

Data in italics is for compounds retained very poorly by the sampling method

PAH DIGITEL SITE: SCUNTHORPE TOWN continued…

Period Name	Scunthorpe July 2007	Scunthorpe Aug 2007	Scunthorpe Sept 2007	Scunthorpe Oct 2007	Scunthorpe Nov 2007	Scunthorpe Dec 2007
Start Date	01/07/2007	01/08/2007	01/09/2007	01/10/2007	02/11/2007	02/12/2007
End Date	01/08/2007	01/09/2007	01/10/2007	02/11/2007	02/12/2007	02/01/2008
Number of days sampling	31	31	30	32	30	31
Data coverage by collection time (%)	99%	100%	98%	100%	100%	100%
Time coverage using collection time (%)	99%	100%	98%	103%	100%	100%
Compound						
Naphthalene	*0.044*	*0.042*	*0.046*	*0.13*	*0.065*	*0.099*
2-Methyl Napthalene	*0.021*	*0.025*	*0.029*	*0.074*	*0.038*	*0.031*
1-Methyl Napthalene	*0.0099*	*0.011*	*0.013*	*0.032*	*0.018*	*0.014*
Biphenyl	*0.026*	*<0.018*	*0.022*	*0.033*	*0.032*	*0.024*
Acenaphthylene	*0.009*	*0.0093*	*0.012*	*0.03*	*0.021*	*0.037*
Acenaphthene	*0.0041*	*0.0042*	*0.0051*	*0.016*	*0.0079*	*0.0063*
Fluorene	*0.014*	*0.013*	*0.016*	*0.048*	*0.027*	*0.036*
Phenanthrene	*0.14*	*0.11*	*0.18*	*0.56*	*0.34*	*0.63*
Anthracene	*0.03*	*0.031*	*0.043*	*0.13*	*0.065*	*0.15*
2-Methyl phenanthrene	*0.081*	*0.043*	*0.084*	*0.34*	*0.14*	*0.25*
2-Methyl anthracene	*0.018*	*0.0084*	*0.017*	*0.1*	*0.051*	*0.095*
1-Methyl anthracene	*<0.00018*	*<0.00018*	*<0.00019*	*<0.00017*	*<0.00019*	*<0.00018*
1-Methyl phenanthrene	*0.042*	*0.022*	*0.043*	*0.16*	*0.084*	*0.13*
9-Methyl anthracene	*<0.000045*	*0.00035*	*0.0007*	*0.0013*	*0.0019*	*0.0039*
4,5-Methylene phenanthrene	*0.059*	*0.027*	*0.066*	*0.27*	*0.12*	*0.21*
Fluoranthene	*0.86*	*0.49*	*0.89*	*3*	*0.98*	*2*
Pyrene	*0.68*	*0.39*	*0.66*	*2.3*	*0.84*	*1.6*
Retene (1-methyl-7-isopropylphenenthrene)	*0.018*	*0.008*	*0.014*	*0.048*	*0.74*	*0.16*
Benzo[c]phenanthrene	*0.11*	*0.062*	*0.089*	*0.38*	*0.17*	*0.3*
Benzo[a]anthracene	*1.1*	*0.49*	*0.75*	*3.6*	*1.2*	*2.4*
Chrysene	*0.95*	*0.49*	*0.75*	*3*	*1.1*	*2.2*
Cyclopenta[cd]pyrene	0.22	0.097	0.15	0.82	0.56	0.81
Benzo[b]naph(2,1-d)thiophene	0.045	0.025	0.033	0.15	0.056	0.12
5-Methyl Chrysene	<0.00009	<0.000089	<0.000094	<0.000087	<0.000093	<0.00009
Benzo[b]fluoranthene plus benzo[j]fluoranthene	1.9	0.97	1.4	5.2	2	3.4
Benzo[k]fluoranthene	0.59	0.31	0.43	1.6	0.56	0.99
Benzo[e]pyrene	0.9	0.49	0.66	2.4	0.93	1.6
Benzo[a]pyrene	**0.86**	**0.42**	**0.61**	**2.6**	**0.98**	**1.6**
Perylene	0.3	0.14	0.2	0.87	0.27	0.5
Indeno(1,2,3-cd)pyrene	1.1	0.58	0.8	3.1	1.3	2.1
Dibenzo[ah]anthracene plus dibenzo[ac]anthracene	0.23	0.11	0.15	0.65	0.24	0.42
Benzo[ghi]perylene	0.72	0.39	0.51	2	0.88	1.4
Anthanthrene	0.17	0.062	0.094	0.74	0.2	0.36
Dibenzo[al]pyrene	0.21	0.089	0.12	0.87	0.3	0.54
Dibenzo[ae]pyrene	0.2	0.084	0.13	0.61	0.23	0.41
Dibenzo[ai]pyrene	0.14	0.066	0.094	0.65	0.18	0.32
Dibenzo[ah]pyrene	0.0095	<0.0027	0.0061	0.061	0.026	0.05
Coronene	0.24	0.14	0.19	0.56	0.4	0.45
Cholanthrene	0.029	0.015	0.022	0.13	0.036	0.063

Data in italics is for compounds retained very poorly by the sampling method

PAH DIGITEL SITE: SOUTH HIENDLEY

Period Name	Sth Hiendley Q4 2007
Start Date	10/10/2007
End Date	01/01/2008
Number of days sampling	75
Data coverage by collection time (%)	89%
Time coverage using collection time (%)	80%

Compound	Calculated Concentrations ng/m^3
Naphthalene	*0.036*
2-Methyl Napthalene	*0.019*
1-Methyl Napthalene	*0.0094*
Biphenyl	*0.016*
Acenaphthylene	*0.013*
Acenaphthene	*0.0039*
Fluorene	*0.015*
Phenanthrene	*0.28*
Anthracene	*0.058*
2-Methyl phenanthrene	*0.12*
2-Methyl anthracene	*0.055*
1-Methyl anthracene	*0.066*
1-Methyl phenanthrene	*0.038*
9-Methyl anthracene	*0.0038*
4,5-Methylene phenanthrene	*0.088*
Fluoranthene	*0.85*
Pyrene	*0.79*
Retene (1-methyl-7-isopropylphenenthrene)	*0.3*
Benzo[c]phenanthrene	*0.24*
Benzo[a]anthracene	*1.1*
Chrysene	*1.4*
Cyclopenta[cd]pyrene	0.51
Benzo[b]naph(2,1-d)thiophene	0.068
5-Methyl Chrysene	0.15
Benzo[b]fluoranthene plus benzo[j]fluoranthene	1.8
Benzo[k]fluoranthene	0.51
Benzo[e]pyrene	0.86
Benzo[a]pyrene	**0.92**
Perylene	0.19
Indeno(1,2,3-cd)pyrene	0.92
Dibenzo[ah]anthracene plus dibenzo[ac]anthracene	0.23
Benzo[ghi]perylene	0.85
Anthanthrene	0.15
Dibenzo[al]pyrene	0.28
Dibenzo[ae]pyrene	0.21
Dibenzo[ai]pyrene	0.11
Dibenzo[ah]pyrene	0.06
Coronene	0.34
Cholanthrene	0.038

Data in italics is for compounds retained very poorly by the sampling method

PAH DIGITEL SITE: LIVERPOOL SPEKE

Period Name	Speke Q4 2006	Speke Q1 2007	Speke Q2 2007
Start Date	15/12/2006	01/01/2007	31/03/2007
End Date	01/01/2007	31/03/2007	30/06/2007
Number of days sampling	16	89	91
Data coverage by collection time (%)	94%	100%	100%
Time coverage using collection time (%)	17%	99%	100%
Compound			
Naphthalene	*0.0096*	*0.0042*	*0.0078*
2-Methyl Napthalene	*0.0058*	*0.0047*	*0.0035*
1-Methyl Napthalene	*<0.0035*	*0.0022*	*0.0017*
Biphenyl	*<0.0087*	*0.0084*	*0.0062*
Acenaphthylene	*<0.017*	*0.0064*	*0.0036*
Acenaphthene	*0.0014*	*0.0014*	*0.0013*
Fluorene	*0.017*	*0.0087*	*0.0071*
Phenanthrene	*0.27*	*0.13*	*0.077*
Anthracene	*0.044*	*0.014*	*0.0075*
2-Methyl phenanthrene	*0.076*	*0.048*	*0.023*
2-Methyl anthracene	*0.13*	*0.009*	*0.0023*
1-Methyl anthracene	*0.11*	*0.0047*	*0.00095*
1-Methyl phenanthrene	*0.096*	*0.033*	*0.012*
9-Methyl anthracene	*0.00056*	*0.000087*	*<0.000045*
4,5-Methylene phenanthrene	*0.11*	*0.053*	*0.024*
Fluoranthene	*0.52*	*0.25*	*0.14*
Pyrene	*0.52*	*0.25*	*0.11*
Retene (1-methyl-7-isopropylphenenthrene)	*0.1*	*0.064*	*0.0095*
Benzo[c]phenanthrene	*0.17*	*0.062*	*0.02*
Benzo[a]anthracene	*0.85*	*0.3*	*0.081*
Chrysene	*0.96*	*0.41*	*0.14*
Cyclopenta[cd]pyrene	0.48	0.099	0.027
Benzo[b]naph(2,1-d)thiophene	0.045	0.017	0.0057
5-Methyl Chrysene	0.12	<0.0002	0.00003
Benzo[b]fluoranthene plus benzo[j]fluoranthene	1.3	0.62	0.3
Benzo[k]fluoranthene	0.38	0.15	0.069
Benzo[e]pyrene	0.66	2.3	1.1
Benzo[a]pyrene	**0.59**	**0.22**	**0.074**
Perylene	0.1	0.039	0.015
Indeno(1,2,3-cd)pyrene	0.84	0.41	0.2
Dibenzo[ah]anthracene plus dibenzo[ac]anthracene	0.12	0.069	0.027
Benzo[ghi]perylene	0.66	0.34	0.17
Anthanthrene	0.047	0.025	0.0051
Dibenzo[al]pyrene	0.19	0.0039	0.047
Dibenzo[ae]pyrene	0.079	0.053	0.023
Dibenzo[ai]pyrene	0.022	0.015	0.0054
Dibenzo[ah]pyrene	0.0047	0.0022	0.00014
Coronene	0.23	0.13	0.06
Cholanthrene	0.015	0.0073	0.0014

Data in italics is for compounds retained very poorly by the sampling method

PAH DIGITEL SITE: LIVERPOOL SPEKE continued…

Period Name	Speke Q3 2007	Speke Q4 2007
Start Date	30/06/2007	30/09/2007
End Date	30/09/2007	01/01/2008
Number of days sampling	92	93
Data coverage by collection time (%)	100%	100%
Time coverage using collection time (%)	100%	101%
Compound		
Naphthalene	*0.01*	*<0.018*
2-Methyl Napthalene	*0.0064*	*<0.012*
1-Methyl Napthalene	*0.0027*	*<0.0051*
Biphenyl	*0.012*	*<0.016*
Acenaphthylene	*0.0027*	*<0.01*
Acenaphthene	*0.0012*	*<0.0022*
Fluorene	*0.0048*	*<0.014*
Phenanthrene	*0.049*	*<0.18*
Anthracene	*0.0036*	*<0.021*
2-Methyl phenanthrene	*0.018*	*0.067*
2-Methyl anthracene	*0.00098*	*0.015*
1-Methyl anthracene	*0.00022*	*0.0017*
1-Methyl phenanthrene	*0.0084*	*<0.04*
9-Methyl anthracene	*<0.000045*	*<0.000045*
4,5-Methylene phenanthrene	*0.018*	*<0.069*
Fluoranthene	*0.063*	*0.32*
Pyrene	*0.057*	*0.31*
Retene (1-methyl-7-isopropylphenenthrene)	*0.0067*	*<0.088*
Benzo[c]phenanthrene	*0.0093*	*0.084*
Benzo[a]anthracene	*0.04*	*0.45*
Chrysene	*0.075*	*0.54*
Cyclopenta[cd]pyrene	0.012	0.21
Benzo[b]naph(2,1-d)thiophene	0.0028	0.022
5-Methyl Chrysene	0.000067	0.0003
Benzo[b]fluoranthene plus benzo[j]fluoranthene	0.16	0.99
Benzo[k]fluoranthene	0.036	0.22
Benzo[e]pyrene	0.75	3.7
Benzo[a]pyrene	**0.036**	**0.36**
Perylene	0.0076	0.067
Indeno(1,2,3-cd)pyrene	0.13	0.63
Dibenzo[ah]anthracene plus dibenzo[ac]anthracene	0.014	0.11
Benzo[ghi]perylene	0.15	0.5
Anthanthrene	0.0019	<0.045
Dibenzo[al]pyrene	0.00018	0.0014
Dibenzo[ae]pyrene	0.013	0.093
Dibenzo[ai]pyrene	0.0011	<0.021
Dibenzo[ah]pyrene	0.0018	<0.0036
Coronene	0.072	0.19
Cholanthrene	0.00067	<0.012

Data in italics is for compounds retained very poorly by the sampling method

PAH DIGITEL SITE: STOKE FERRY

Period Name	Stoke Ferry Q3 2007	Stoke Ferry Q4 2007
Start Date	13/09/2007	01/10/2007
End Date	01/10/2007	01/01/2008
Number of days sampling	18	92
Data coverage by collection time (%)	100%	100%
Time coverage using collection time (%)	20%	100%
Compound	Calculated Concentrations ng/m^3	
Naphthalene	*<0.0054*	*0.0067*
2-Methyl Napthalene	*<0.0046*	*0.0044*
1-Methyl Napthalene	*<0.0031*	*0.0024*
Biphenyl	*<0.0077*	*0.0035*
Acenaphthylene	*<0.015*	*0.0044*
Acenaphthene	*<0.00077*	*0.0011*
Fluorene	*0.0028*	*0.009*
Phenanthrene	*0.029*	*0.15*
Anthracene	*0.0051*	*0.013*
2-Methyl phenanthrene	*0.0055*	*0.037*
2-Methyl anthracene	*0.0092*	*0.055*
1-Methyl anthracene	*0.0058*	*0.046*
1-Methyl phenanthrene	*0.0048*	*0.038*
9-Methyl anthracene	*<0.00015*	*0.00026*
4,5-Methylene phenanthrene	*<0.015*	*0.055*
Fluoranthene	*0.057*	*0.29*
Pyrene	*0.043*	*0.24*
Retene (1-methyl-7-isopropylphenenthrene)	*0.01*	*0.11*
Benzo[c]phenanthrene	*0.0076*	*0.064*
Benzo[a]anthracene	*0.032*	*0.27*
Chrysene	*0.056*	*0.41*
Cyclopenta[cd]pyrene	0.0075	*0.099*
Benzo[b]naph(2,1-d)thiophene	0.0025	0.017
5-Methyl Chrysene	0.0037	0.037
Benzo[b]fluoranthene plus benzo[j]fluoranthene	0.13	0.7
Benzo[k]fluoranthene	0.04	0.15
Benzo[e]pyrene	0.066	0.31
Benzo[a]pyrene	**0.037**	**0.18**
Perylene	0.0068	0.037
Indeno(1,2,3-cd)pyrene	0.076	0.44
Dibenzo[ah]anthracene plus dibenzo[ac]anthracene	0.01	0.064
Benzo[ghi]perylene	0.058	0.29
Anthanthrene	<0.000077	0.021
Dibenzo[al]pyrene	0.018	0.11
Dibenzo[ae]pyrene	0.0085	0.037
Dibenzo[ai]pyrene	0.0011	0.012
Dibenzo[ah]pyrene	<0.00061	<0.00012
Coronene	0.015	0.099
Cholanthrene	0.0011	0.0084

Data in italics is for compounds retained very poorly by the sampling method

PAH DIGITEL SITE: SWANSEA CWM LEVEL PARK

Period Name	Swansea Q4 2007
Start Date	16/11/2007
End Date	31/12/2007
Number of days sampling	46
Data coverage by collection time (%)	102%
Time coverage using collection time (%)	50%

Compound	**Calculated Concentrations ng/m^3**
Naphthalene	*0.039*
2-Methyl Napthalene	*0.022*
1-Methyl Napthalene	*0.0091*
Biphenyl	*<0.018*
Acenaphthylene	*0.015*
Acenaphthene	*0.0036*
Fluorene	*0.018*
Phenanthrene	*0.24*
Anthracene	*0.028*
2-Methyl phenanthrene	*0.076*
2-Methyl anthracene	*0.013*
1-Methyl anthracene	*<0.000061*
1-Methyl phenanthrene	*0.046*
9-Methyl anthracene	*0.00088*
4,5-Methylene phenanthrene	*0.079*
Fluoranthene	*0.49*
Pyrene	*0.43*
Retene (1-methyl-7-isopropylphenenthrene)	*0.058*
Benzo[c]phenanthrene	*0.088*
Benzo[a]anthracene	*0.46*
Chrysene	*0.61*
Cyclopenta[cd]pyrene	0.14
Benzo[b]naph(2,1-d)thiophene	0.021
5-Methyl Chrysene	<0.000091
Benzo[b]fluoranthene plus benzo[j]fluoranthene	0.94
Benzo[k]fluoranthene	0.25
Benzo[e]pyrene	0.36
Benzo[a]pyrene	**0.33**
Perylene	0.07
Indeno(1,2,3-cd)pyrene	0.43
Dibenzo[ah]anthracene plus dibenzo[ac]anthracene	0.085
Benzo[ghi]perylene	0.43
Anthanthrene	0.029
Dibenzo[al]pyrene	0.14
Dibenzo[ae]pyrene	0.067
Dibenzo[ai]pyrene	0.024
Dibenzo[ah]pyrene	0.0014
Coronene	0.15
Cholanthrene	0.0067

Data in italics is for compounds retained very poorly by the sampling method

Appendix 2

2007 Andersen Sampler Monitoring data

PAH ANDERSEN SITE: LONDON BRENT

Period Name	London Brent Q1 2007	London Brent Q2 2007	London Brent Q3 2007	London Brent Q4 2007
Compound	**Calculated Concentrations ng m^{-3}**			
Naphthalene				
2-Methyl Napthalene	3.2	0.32	0.33	0.35
1-Methyl Napthalene	1.7	0.18	0.19	0.19
Biphenyl	2.5	0.37	0.28	0.25
Acenaphthylene	0.74	0.041	0.075	0.083
Acenaphthene	1.8	0.24	0.39	0.2
Fluorene	5.2	0.84	0.84	1.2
Phenanthrene	9.4	8.2	9.6	8.4
Anthracene	0.55	0.15	0.18	0.35
2-Methyl phenanthrene	1.5	1.9	2.3	1.6
2-Methyl anthracene	0.039	0.038	0.07	0.063
1-Methyl anthracene	1.1	1.7	2	1.1
1-Methyl phenanthrene	0.9	1.1	1.3	0.89
9-Methyl anthracene	0.11	< 0.00026	< 0.00033	< 0.0016
4,5-Methylene phenanthrene	0.52	0.4	0.51	0.48
Fluoranthene	1.6	1.1	1.6	1.3
Pyrene	0.9	0.58	0.78	0.79
Retene (1-methyl-7-isopropylphenenthrene)	0.42	0.27	0.31	0.3
Benzo[c]phenanthrene	0.048	0.03	0.033	0.032
Benzo[a]anthracene	0.17	0.045	0.057	0.074
Chrysene	0.35	0.11	0.11	0.17
Cyclopenta[cd]pyrene	0.039	0.011	0.013	0.019
Benzo[b]naph(2,1-d)thiophene	0.026	0.0075	0.0094	0.0063
5-Methyl Chrysene	0.0032	0.000087	0.00011	0.00053
Benzo[b]fluoranthene plus benzo[j]fluoranthene	0.58	0.11	0.14	0.18
Benzo[k]fluoranthene	0.2	0.027	0.033	0.053
Benzo[e]pyrene	0.24	0.051	0.065	0.1
Benzo[a]pyrene	0.23	0.027	0.037	0.05
Perylene	0.048	0.006	0.009	0.011
Indeno(1,2,3-cd)pyrene	0.58	0.05	0.07	0.084
Dibenzo[ah]anthracene plus dibenzo[ac]anthracene	0.13	0.0073	0.01	0.016
Benzo[ghi]perylene	0.35	0.045	0.059	0.095
Anthanthrene	0.055	0.0024	0.0053	0.0053
Dibenzo[al]pyrene	0.29	0.008	0.0077	0.026
Dibenzo[ae]pyrene	0.94	0.023	0.029	0.079
Dibenzo[ai]pyrene	0.58	0.013	0.022	0.11
Dibenzo[ah]pyrene	0.58	0.01	0.0071	0.13
Coronene	0.74	0.032	0.04	0.11
Cholanthrene	0.23	0.0061	0.0078	0.037

PAH ANDERSEN SITE: GLASGOW CITY CHAMBERS

Period Name	Glasgow City Chambers Q1 2007	Glasgow City Chambers Q2 2007	Glasgow City Chambers Q3 2007	Glasgow City Chambers Q4 2007
Compound		**Calculated Concentrations ng m^{-3}**		
Naphthalene				
2-Methyl Napthalene		0.83	0.56	
1-Methyl Napthalene	Sampler	0.45	0.32	
Biphenyl	failure	0.49	0.46	
Acenaphthylene		0.049	0.15	
Acenaphthene		0.27	0.35	
Fluorene		0.84	0.85	
Phenanthrene		8.5	8.2	
Anthracene		0.27	0.36	
2-Methyl phenanthrene		1.1	1.5	
2-Methyl anthracene		0.012	0.04	
1-Methyl anthracene		0.73	1	
1-Methyl phenanthrene		0.55	0.77	
9-Methyl anthracene		< 0.0004	< 0.00038	
4,5-Methylene phenanthrene		0.33	0.41	
Fluoranthene		0.85	0.86	
Pyrene		0.77	0.96	
Retene (1-methyl-7-isopropylphenenthrene)		0.16	0.19	
Benzo[c]phenanthrene		0.021	0.019	
Benzo[a]anthracene		0.027	0.029	
Chrysene		0.065	0.06	
Cyclopenta[cd]pyrene		0.006	0.0085	
Benzo[b]naph(2,1-d)thiophene		0.0035	0.0041	
5-Methyl Chrysene		0.00013	0.00013	
Benzo[b]fluoranthene plus benzo[j]fluoranthene		0.06	0.07	
Benzo[k]fluoranthene		0.015	0.017	
Benzo[e]pyrene		0.029	0.035	
Benzo[a]pyrene		0.017	0.015	
Perylene		0.0032	0.0038	
Indeno(1,2,3-cd)pyrene		0.025	0.031	
Dibenzo[ah]anthracene plus dibenzo[ac]anthracene		0.0052	0.0044	
Benzo[ghi]perylene		0.036	0.047	
Anthanthrene		0.002	0.0013	
Dibenzo[al]pyrene		0.0069	0.0061	
Dibenzo[ae]pyrene		0.024	0.017	
Dibenzo[ai]pyrene		0.017	0.012	
Dibenzo[ah]pyrene		0.015	0.0078	
Coronene		0.04	0.037	
Cholanthrene		< 0.0094	< 0.009	

PAH ANDERSEN SITE: HARWELL

Period Name	Harwell Q4 2007
Compound	
Naphthalene	
2-Methyl Napthalene	0.32
1-Methyl Napthalene	0.2
Biphenyl	0.31
Acenaphthylene	0.07
Acenaphthene	0.57
Fluorene	1.4
Phenanthrene	4.2
Anthracene	0.14
2-Methyl phenanthrene	0.46
2-Methyl anthracene	0.66
1-Methyl anthracene	0.45
1-Methyl phenanthrene	0.34
9-Methyl anthracene	< 0.00028
4,5-Methylene phenanthrene	0.56
Fluoranthene	0.74
Pyrene	0.45
Retene (1-methyl-7-isopropylphenenthrene)	0.18
Benzo[c]phenanthrene	0.043
Benzo[a]anthracene	0.1
Chrysene	0.24
Cyclopenta[cd]pyrene	0.035
Benzo[b]naph(2,1-d)thiophene	0.009
5-Methyl Chrysene	0.012
Benzo[b]fluoranthene plus benzo[j]fluoranthene	0.29
Benzo[k]fluoranthene	0.073
Benzo[e]pyrene	0.13
Benzo[a]pyrene	0.07
Perylene	0.013
Indeno(1,2,3-cd)pyrene	0.18
Dibenzo[ah]anthracene plus dibenzo[ac]anthracene	0.021
Benzo[ghi]perylene	0.12
Anthanthrene	0.0065
Dibenzo[al]pyrene	0.038
Dibenzo[ae]pyrene	0.013
Dibenzo[ai]pyrene	0.0017
Dibenzo[ah]pyrene	< 1.1
Coronene	0.039
Cholanthrene	< 0.0021

PAH ANDERSEN SITE : HAZELRIGG

Period Name	Hazelrigg Q1 2007	Hazelrigg Q2 2007	Hazelrigg Q3 2007	Hazelrigg Q4 2007
Compound	**Calculated Concentrations ng m^{-3}**			
Naphthalene				
2-Methyl Napthalene	0.3	0.37	0.19	0.59
1-Methyl Napthalene	0.18	0.19	0.11	0.38
Biphenyl	< 0.25	0.47	0.13	0.45
Acenaphthylene	0.045	0.056	0.025	0.083
Acenaphthene	0.24	0.36	0.23	0.52
Fluorene	1.2	1.9	1.2	0.26
Phenanthrene	45	180	71	28
Anthracene	3.2	16	6.3	2.2
2-Methyl phenanthrene	13	86	23	7.3
2-Methyl anthracene	0.96	7.3	2.1	0.47
1-Methyl anthracene	7.7	37	< 0.00077	< 0.00094
1-Methyl phenanthrene	7.2	60	14	4.5
9-Methyl anthracene	0.024	1.2	0.19	0.0052
4,5-Methylene phenanthrene	4.2	41	21	7.3
Fluoranthene	5.7	11	5.7	2.6
Pyrene	5.7	13	7.3	2.8
Retene (1-methyl-7-isopropylphenenthrene)	0.57	0.69	0.31	0.26
Benzo[c]phenanthrene	0.19	0.14	0.036	0.045
Benzo[a]anthracene	0.27	0.15	0.027	0.061
Chrysene	0.72	0.39	0.061	0.14
Cyclopenta[cd]pyrene	0.085	0.03	0.0057	0.021
Benzo[b]naph(2,1-d)thiophene	0.037	0.027	0.0065	0.0059
5-Methyl Chrysene	0.05	0.016	< 0.00038	0.0092
Benzo[b]fluoranthene plus benzo[j]fluoranthene	0.72	0.28	0.036	0.18
Benzo[k]fluoranthene	0.18	0.073	0.0059	0.035
Benzo[e]pyrene	0.3	0.12	0.15	0.57
Benzo[a]pyrene	0.2	0.088	0.008	0.038
Perylene	0.027	< 0.019	< 0.0017	0.0064
Indeno(1,2,3-cd)pyrene	0.3	0.12	0.016	0.068
Dibenzo[ah]anthracene plus dibenzo[ac]anthracene	0.047	0.017	0.0027	0.011
Benzo[ghi]perylene	0.27	0.11	0.017	0.064
Anthanthrene	0.032	< 0.013	0.0019	0.0078
Dibenzo[al]pyrene	0.1	0.041	0.004	0.012
Dibenzo[ae]pyrene	< 0.075	< 0.056	0.0023	0.0078
Dibenzo[ai]pyrene	< 0.075	< 0.056	< 0.00057	0.0014
Dibenzo[ah]pyrene	< 0.025	< 0.019	< 0.00038	0.00068
Coronene	0.11	< 0.037	0.0073	0.026
Cholanthrene	< 0.0015	< 0.0011	0.0014	0.0047

PAH ANDERSEN SITE : HIGH MUFFLES

Period Name	High Muffles Q1 2007	High Muffles Q2 2007	High Muffles Q3 2007	High Muffles Q4 2007
Compound	**Calculated Concentrations ng m^{-3}**			
Naphthalene				
2-Methyl Napthalene	0.35	0.65	0.26	0.55
1-Methyl Napthalene	0.2	0.34	0.15	0.33
Biphenyl	0.32	0.84	0.19	0.55
Acenaphthylene	0.022	0.036	0.02	0.063
Acenaphthene	0.22	0.62	0.2	0.4
Fluorene	1.3	3.6	1.2	2.4
Phenanthrene	2.7	9.5	3.9	4.8
Anthracene	0.047	0.42	0.26	0.19
2-Methyl phenanthrene	0.39	1.9	0.91	0.73
2-Methyl anthracene	0.36	0.1	0.0037	0.03
1-Methyl anthracene	0.29	0.73	< 0.00086	< 0.001
1-Methyl phenanthrene	0.2	0.39	0.39	0.33
9-Methyl anthracene	0.074	0.48	0.0052	< 0.00075
4,5-Methylene phenanthrene	0.22	0.48	0.97	0.75
Fluoranthene	0.78	0.62	0.67	1.3
Pyrene	0.44	1.2	0.52	1.2
Retene (1-methyl-7-isopropylphenenthrene)	0.057	0.065	0.1	0.13
Benzo[c]phenanthrene	0.032	0.013	0.013	0.058
Benzo[a]anthracene	0.042	< 0.02	0.028	0.13
Chrysene	0.14	0.056	0.058	0.25
Cyclopenta[cd]pyrene	0.022	0.0081	0.0073	0.065
Benzo[b]naph(2,1-d)thiophene	0.0062	0.002	0.0026	0.013
5-Methyl Chrysene	0.02	< 0.0022	< 0.00043	< 0.0005
Benzo[b]fluoranthene plus benzo[j]fluoranthene	0.14	< 0.056	0.063	0.43
Benzo[k]fluoranthene	0.027	< 0.011	0.014	0.093
Benzo[e]pyrene	0.062	0.027	0.24	1.4
Benzo[a]pyrene	0.047	< 0.028	0.018	0.11
Perylene	< 0.025	< 0.028	0.003	0.023
Indeno(1,2,3-cd)pyrene	0.057	< 0.028	0.028	0.19
Dibenzo[ah]anthracene plus dibenzo[ac]anthracene	< 0.025	< 0.014	0.0052	0.028
Benzo[ghi]perylene	< 0.074	< 0.056	0.026	0.15
Anthanthrene	< 0.074	< 0.02	0.0043	0.03
Dibenzo[al]pyrene	< 0.025	< 0.028	< 0.0017	0.033
Dibenzo[ae]pyrene	< 0.074	< 0.084	0.0061	0.022
Dibenzo[ai]pyrene	< 0.074	< 0.084	0.0011	< 0.00075
Dibenzo[ah]pyrene	< 0.025	< 0.028	< 0.00043	0.003
Coronene	< 0.049	< 0.056	0.01	0.05
Cholanthrene	< 0.0015	< 0.0017	0.0021	0.0028

PAH ANDERSEN SITE: LONDON ASHDOWN HOUSE 2A

Period Name	London 2A Ashdown House Q1 2007	London 2A Ashdown House Q2 2007	London 2A Ashdown House Q3 2007	London 2A Ashdown House Q4 2007
Compound		**Calculated Concentrations ng m^{-3}**		
Naphthalene				
2-Methyl Napthalene	2.5	0.74	0.63	0.97
1-Methyl Napthalene	1.5	0.42	0.37	0.61
Biphenyl	1.4	0.44	0.51	0.73
Acenaphthylene	0.4	0.086	0.26	0.64
Acenaphthene	1	0.36	0.63	0.62
Fluorene	3.8	1.5	2.1	3.3
Phenanthrene	13	11	15	9.5
Anthracene	0.65	0.31	0.51	0.59
2-Methyl phenanthrene	2.5	2.3	3.3	1.9
2-Methyl anthracene	0.12	0.05	0.1	0.13
1-Methyl anthracene	1.1	0.57	< 0.00094	< 0.00069
1-Methyl phenanthrene	0.88	0.63	1.6	0.99
9-Methyl anthracene	0.33	0.48	1.8	0.42
4,5-Methylene phenanthrene	0.83	0.63	3.3	1.9
Fluoranthene	1.9	1.9	3	2.1
Pyrene	1.5	1.3	2.2	1.7
Retene (1-methyl-7-isopropylphenenthrene)	0.4	0.34	0.61	0.52
Benzo[c]phenanthrene	0.063	0.031	0.04	0.085
Benzo[a]anthracene	0.1	0.04	0.063	0.21
Chrysene	0.29	0.14	0.13	0.38
Cyclopenta[cd]pyrene	0.019	0.0069	0.015	0.066
Benzo[b]naph(2,1-d)thiophene	0.012	0.0052	0.012	0.013
5-Methyl Chrysene	0.015	0.005	0.011	< 0.00035
Benzo[b]fluoranthene plus benzo[j]fluoranthene	0.27	0.11	0.14	0.52
Benzo[k]fluoranthene	0.27	0.021	0.03	0.11
Benzo[e]pyrene	0.15	0.055	0.61	2.1
Benzo[a]pyrene	0.084	0.032	0.037	0.15
Perylene	< 0.021	< 0.019	0.0063	0.026
Indeno(1,2,3-cd)pyrene	0.1	0.042	0.075	0.26
Dibenzo[ah]anthracene plus dibenzo[ac]anthracene	0.013	< 0.0095	0.0077	0.03
Benzo[ghi]perylene	0.14	0.051	0.084	0.28
Anthanthrene	< 0.015	< 0.013	0.0065	0.028
Dibenzo[al]pyrene	< 0.021	< 0.019	0.0037	0.019
Dibenzo[ae]pyrene	< 0.063	< 0.057	0.0056	0.021
Dibenzo[ai]pyrene	< 0.063	< 0.057	0.00086	0.0024
Dibenzo[ah]pyrene	< 0.021	< 0.019	< 0.00047	0.0004
Coronene	0.042	< 0.038	0.035	0.099
Cholanthrene	0.0048	< 0.0011	< 0.0007	0.0033

PAH ANDERSEN SITE : LONDON ASHDOWN HOUSE 2B

Period Name	London 2B Ashdown House Q1 2007	London 2B Ashdown House Q2 2007	London 2B Ashdown House Q3 2007	London 2B Ashdown House Q4 2007
Compound		**Calculated Concentrations ng m^{-3}**		
Naphthalene				
2-Methyl Napthalene	4.1	0.81	0.59	2.4
1-Methyl Napthalene	2.5	0.46	0.35	1.3
Biphenyl	1.8	0.42	0.38	1.5
Acenaphthylene	0.54	0.071	0.11	0.98
Acenaphthene	1.2	0.37	0.38	0.91
Fluorene	3.8	1.5	1.3	4.7
Phenanthrene	11	12	22	27
Anthracene	0.58	0.34	1.1	1.9
2-Methyl phenanthrene	2.3	4.1	18	20
2-Methyl anthracene	0.043	0.086	0.62	1
1-Methyl anthracene	1.7	3.4	17	19
1-Methyl phenanthrene	1.3	2	9.7	11
9-Methyl anthracene	0.0056	< 0.00051	0.38	0.28
4,5-Methylene phenanthrene	0.59	0.51	0.73	1.3
Fluoranthene	1.8	1.5	1.8	1.8
Pyrene	1.3	1	1.7	1.9
Retene (1-methyl-7-isopropylphenenthrene)	0.34	0.3	0.7	0.81
Benzo[c]phenanthrene	0.076	0.032	0.035	0.088
Benzo[a]anthracene	0.2	0.047	0.053	0.22
Chrysene	0.45	0.11	0.11	0.35
Cyclopenta[cd]pyrene	0.065	0.011	0.016	0.096
Benzo[b]naph(2,1-d)thiophene	0.023	0.0083	0.016	0.024
5-Methyl Chrysene	0.0047	< 0.00017	< 0.00018	< 0.00017
Benzo[b]fluoranthene plus benzo[j]fluoranthene	0.54	0.12	0.12	0.52
Benzo[k]fluoranthene	0.18	0.035	0.031	0.15
Benzo[e]pyrene	0.25	0.054	0.057	0.27
Benzo[a]pyrene	0.23	0.039	0.035	0.17
Perylene	0.076	0.01	0.0088	0.036
Indeno(1,2,3-cd)pyrene	0.22	0.052	0.053	0.27
Dibenzo[ah]anthracene plus dibenzo[ac]anthracene	0.12	0.013	0.0099	0.041
Benzo[ghi]perylene	0.31	0.057	0.06	0.29
Anthanthrene	0.072	0.0064	0.007	0.042
Dibenzo[al]pyrene	0.27	0.022	0.02	0.025
Dibenzo[ae]pyrene	0.41	0.037	0.035	0.069
Dibenzo[ai]pyrene	0.31	0.027	0.027	0.042
Dibenzo[ah]pyrene	0.38	0.049	0.048	0.029
Coronene	0.41	0.049	0.049	0.16
Cholanthrene	< 0.13	< 0.012	< 0.013	< 0.012

PAH ANDERSEN SITE : MANCHESTER LAW COURTS

Period Name	Manchester Law Courts Q1 2007	Manchester Law Courts Q2 2007	Manchester Law Courts Q3 2007	Manchester Law Courts Q4 2007
Compound		**Calculated Concentrations ng m^{-3}**		
Naphthalene				
2-Methyl Napthalene	5.4	1.8	0.3	1.2
1-Methyl Napthalene	3.1	1	0.19	0.7
Biphenyl	1.9	0.99	0.32	0.91
Acenaphthylene	0.49	0.14	0.1	0.29
Acenaphthene	1.4	0.99	0.55	0.79
Fluorene	4.9	3.2	1.9	4.1
Phenanthrene	19	18	13	13
Anthracene	0.61	0.38	0.53	0.79
2-Methyl phenanthrene	5.9	5.3	4.4	3.4
2-Methyl anthracene	0.17	0.55	0.093	0.15
1-Methyl anthracene	3.1	2.1	< 0.0007	< 0.00091
1-Methyl phenanthrene	3.1	2.7	2.3	1.8
9-Methyl anthracene	0.95	1.6	2.3	0.88
4,5-Methylene phenanthrene	1.5	1	4.4	3.4
Fluoranthene	2.5	2.3	2.5	2.5
Pyrene	2	1.9	2.1	2.2
Retene (1-methyl-7-isopropylphenenthrene)	0.51	0.59	0.76	0.79
Benzo[c]phenanthrene	0.09	0.042	0.035	0.14
Benzo[a]anthracene	0.11	0.046	0.055	0.29
Chrysene	0.38	0.19	0.12	0.54
Cyclopenta[cd]pyrene	0.031	0.012	0.0099	0.072
Benzo[b]naph(2,1-d)thiophene	0.019	0.011	0.0092	0.022
5-Methyl Chrysene	0.023	0.0093	0.0079	< 0.00045
Benzo[b]fluoranthene plus benzo[j]fluoranthene	0.38	0.16	0.13	0.82
Benzo[k]fluoranthene	0.36	0.16	0.028	0.17
Benzo[e]pyrene	0.18	0.074	0.55	2.7
Benzo[a]pyrene	0.084	0.046	0.03	0.17
Perylene	< 0.026	< 0.019	0.0053	0.027
Indeno(1,2,3-cd)pyrene	0.13	0.057	0.069	0.36
Dibenzo[ah]anthracene plus dibenzo[ac]anthracene	0.017	< 0.0095	0.0088	0.054
Benzo[ghi]perylene	0.16	0.063	0.074	0.34
Anthanthrene	< 0.018	0.015	0.0049	0.032
Dibenzo[al]pyrene	0.028	< 0.019	0.0086	0.041
Dibenzo[ae]pyrene	< 0.077	< 0.057	0.0058	0.034
Dibenzo[ai]pyrene	< 0.077	< 0.057	0.0012	0.0052
Dibenzo[ah]pyrene	< 0.026	< 0.019	< 0.00035	0.0013
Coronene	0.054	< 0.038	0.032	0.12
Cholanthrene	< 0.0015	< 0.0011	0.0058	0.0059

PAH ANDERSEN SITE : MIDDLESBROUGH LONGLANDS COLLEGE

Period Name	Middlesbrough Longlands College Q1 2007	Middlesbrough Longlands College Q2 2007	Middlesbrough Longlands College Q3 2007	Middlesbrough Longlands College Q4 2007
Compound		**Calculated Concentrations ng m^{-3}**		
Naphthalene				
2-Methyl Napthalene	2.6	2.3	1.5	3
1-Methyl Napthalene	1.3	1	0.81	1.7
Biphenyl	2.4	1.4	1.2	1.9
Acenaphthylene	0.28	0.21	0.42	1
Acenaphthene	4.1	2.5	3.9	3.2
Fluorene	9	8.7	6.8	8.1
Phenanthrene	20	48	25	18
Anthracene	1.1	1.7	0.87	1.2
2-Methyl phenanthrene	2.2	3.9	2.4	2
2-Methyl anthracene	0.077	0.065	0.035	0.14
1-Methyl anthracene	0.74	0.96	< 0.0013	< 0.0015
1-Methyl phenanthrene	0.78	1.1	1	1
9-Methyl anthracene	0.16	0.18	< 0.00097	< 0.0011
4,5-Methylene phenanthrene	1.3	2.7	2.4	2
Fluoranthene	4.1	12	0.55	4.1
Pyrene	2.3	6.1	2.5	2.5
Retene (1-methyl-7-isopropylphenenthrene)	0.52	0.37	0.32	0.63
Benzo[c]phenanthrene	0.17	0.32	0.12	0.18
Benzo[a]anthracene	0.31	0.61	0.29	0.48
Chrysene	0.86	1.8	0.61	0.81
Cyclopenta[cd]pyrene	0.1	0.15	0.058	0.15
Benzo[b]naph(2,1-d)thiophene	0.037	0.093	0.035	0.035
5-Methyl Chrysene	0.037	0.031	< 0.00064	< 0.00074
Benzo[b]fluoranthene plus benzo[j]fluoranthene	0.93	1.7	0.77	1.1
Benzo[k]fluoranthene	0.9	0.43	0.17	0.24
Benzo[e]pyrene	0.45	0.74	2.6	4.1
Benzo[a]pyrene	0.28	0.61	0.2	0.3
Perylene	0.045	0.16	0.039	0.048
Indeno(1,2,3-cd)pyrene	0.35	0.65	0.32	0.48
Dibenzo[ah]anthracene plus dibenzo[ac]anthracene	0.06	0.11	0.055	0.085
Benzo[ghi]perylene	0.37	0.61	0.29	0.48
Anthanthrene	0.037	0.1	0.042	0.063
Dibenzo[al]pyrene	0.11	0.21	0.052	0.044
Dibenzo[ae]pyrene	< 0.11	< 0.13	0.042	0.055
Dibenzo[ai]pyrene	< 0.11	< 0.13	0.0081	0.0092
Dibenzo[ah]pyrene	< 0.037	< 0.044	0.0023	0.0032
Coronene	0.12	0.17	0.081	0.15
Cholanthrene	< 0.0022	0.066	0.0015	0.0059

PAH ANDERSEN SITE : SCUNTHORPE TOWN

Period Name	Scunthorpe Town Q1 2007	Scunthorpe Town Q2 2007	Scunthorpe Town Q3 2007	Scunthorpe Town Q4 2007
Compound	**Calculated Concentrations ng m^{-3}**			
Naphthalene				
2-Methyl Napthalene	1.4	1.6	1.6	7.6
1-Methyl Napthalene	0.79	0.78	0.79	4.1
Biphenyl	0.97	0.76	0.7	2.6
Acenaphthylene	0.86	0.22	0.29	3
Acenaphthene	1.4	1.6	2.1	5.4
Fluorene	7.6	5.7	3.6	8.9
Phenanthrene	26	69	43	34
Anthracene	2.8	5.3	4	4.1
2-Methyl phenanthrene	2.5	7.9	5.9	4.5
2-Methyl anthracene	3.4	0.62	0.58	0.73
1-Methyl anthracene	1.5	3.9	3.4	2.2
1-Methyl phenanthrene	2.2	3.1	2.5	2
9-Methyl anthracene	0.016	0.025	0.032	0.0018
4,5-Methylene phenanthrene	14	5.8	3.6	2.8
Fluoranthene	10	15	10	7.4
Pyrene	6.3	8.3	6	4.6
Retene (1-methyl-7-isopropylphenenthrene)	0.53	0.26	0.3	0.92
Benzo[c]phenanthrene	0.32	0.49	0.39	0.38
Benzo[a]anthracene	1.4	2.1	1.8	1.7
Chrysene	2.4	2.4	1.8	1.6
Cyclopenta[cd]pyrene	0.14	0.22	0.14	0.33
Benzo[b]naph(2,1-d)thiophene	0.098	0.18	0.14	0.12
5-Methyl Chrysene	0.077	0.000088	0.000085	0.000097
Benzo[b]fluoranthene plus benzo[j]fluoranthene	2.6	3.3	2.5	2.4
Benzo[k]fluoranthene	0.73	0.97	0.68	0.66
Benzo[e]pyrene	1	1.4	1.1	1.2
Benzo[a]pyrene	0.84	0.97	0.71	0.93
Perylene	0.21	0.32	0.24	0.29
Indeno(1,2,3-cd)pyrene	1.1	1.5	1.1	1.2
Dibenzo[ah]anthracene plus dibenzo[ac]anthracene	0.24	0.31	0.22	0.25
Benzo[ghi]perylene	0.96	0.97	0.76	0.86
Anthanthrene	0.16	0.24	0.18	0.19
Dibenzo[al]pyrene	0.38	0.4	0.31	0.3
Dibenzo[ae]pyrene	0.18	0.28	0.26	0.22
Dibenzo[ai]pyrene	0.083	0.3	0.22	0.23
Dibenzo[ah]pyrene	0.0093	0.034	0.028	0.036
Coronene	0.26	0.33	0.25	0.33
Cholanthrene	0.019	0.18	0.14	0.034

PAH ANDERSEN SITE : STOKE FERRY

Period Name	Stoke Ferry Q1 2007	Stoke Ferry Q2 2007	Stoke Ferry Q3 2007	Stoke Ferry Q4 2007
Compound	**Calculated Concentrations ng m^{-3}**			
Naphthalene				
2-Methyl Napthalene	1.1	0.62	1.1	1.4
1-Methyl Napthalene	0.65	0.37	0.58	0.83
Biphenyl	0.7	0.3	0.36	0.89
Acenaphthylene	0.055	0.021	0.041	0.29
Acenaphthene	0.39	0.25	0.49	0.81
Fluorene	2	1.1	1.7	2.5
Phenanthrene	5.2	4.2	6.4	6
Anthracene	0.17	0.067	0.14	0.31
2-Methyl phenanthrene	0.7	0.62	1.1	0.79
2-Methyl anthracene	0.015	0.028	< 0.00021	0.054
1-Methyl anthracene	0.31	0.25	< 0.00085	< 0.00077
1-Methyl phenanthrene	0.26	0.3	0.45	0.42
9-Methyl anthracene	0.14	0.097	< 0.00064	< 0.00058
4,5-Methylene phenanthrene	0.34	0.23	1.1	0.79
Fluoranthene	0.98	0.58	0.96	1.3
Pyrene	0.54	0.3	0.56	0.87
Retene (1-methyl-7-isopropylphenenthrene)	0.2	0.17	0.21	0.37
Benzo[c]phenanthrene	0.05	0.019	0.032	0.087
Benzo[a]anthracene	0.055	< 0.016	0.034	0.19
Chrysene	0.21	0.074	0.081	0.37
Cyclopenta[cd]pyrene	0.025	0.0025	0.0081	0.081
Benzo[b]naph(2,1-d)thiophene	0.0086	0.0028	0.0053	0.0017
5-Methyl Chrysene	0.0076	< 0.019	< 0.00043	< 0.00039
Benzo[b]fluoranthene plus benzo[j]fluoranthene	0.21	< 0.046	0.096	0.6
Benzo[k]fluoranthene	0.029	< 0.0093	0.019	0.12
Benzo[e]pyrene	0.099	< 0.019	0.34	1.9
Benzo[a]pyrene	0.057	< 0.023	0.026	0.14
Perylene	< 0.026	< 0.023	0.0036	0.021
Indeno(1,2,3-cd)pyrene	0.065	< 0.023	0.043	0.25
Dibenzo[ah]anthracene plus dibenzo[ac]anthracene	< 0.013	< 0.012	0.0068	0.039
Benzo[ghi]perylene	0.081	< 0.046	0.041	0.21
Anthanthrene	< 0.018	< 0.016	0.0058	0.033
Dibenzo[al]pyrene	< 0.026	< 0.023	0.0081	0.029
Dibenzo[ae]pyrene	< 0.078	< 0.069	0.0058	0.025
Dibenzo[ai]pyrene	< 0.078	< 0.069	0.0011	0.0033
Dibenzo[ah]pyrene	< 0.026	< 0.023	0.0006	0.0029
Coronene	< 0.052	< 0.046	0.013	0.071
Cholanthrene	< 0.0016	< 0.0014	0.0028	0.0035

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