AEA

Air Pollution Forecasting Report:

Bonfire Night 2007

Report produced for the Department for Environment, Food and Rural Affairs, Scottish Government, Welsh Assembly Government and the DoE in Northern Ireland

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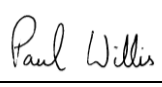
	Signature	
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Executive summary

This report examines the extent of PM_{10} pollution recorded by the UK Automatic Urban and Rural Monitoring Network (AURN) over the 2007 Bonfire Night celebrations. It covers the period Thursday 1st November to Saturday 10th November 2007. This year November 5th (Bonfire Night) was on a Monday.

Most of the large organised bonfire and fireworks celebrations occurred over the weekend preceding Bonfire Night, which also coincided with a large high pressure and extremely light winds over some parts of England.

Moderate, High and Very High Pollution due to PM_{10} Particulate Matter were recorded in many areas, in-line with the press notice issued by Defra on November 3rd following consultation with the AEA forecasting team.

Compared with previous years, concentrations of PM_{10} during the Bonfire Night period were relatively high. This was almost certainly due to the meterorological conditions at the time.

This year afforded the first opportunity to examine Bonfire Night measurements of both volatile and non-volatile PM_{10} from TEOM FDMS instruments. In all cases the majority of the PM_{10} was found to be in the non-volatile fraction.

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Appendices

1 PM_{10} Concentrations

During the weekend of the 3rd and 4th November 2007, Moderate, High and Very High running 24-hour mean PM_{10} levels were recorded according to the UK Air Pollution Index (See Appendix) at eleven, twelve and nine UK monitoring sites respectively.

Table1.1shows the maximum air pollution index for PM_{10} recorded on each day of the Bonfire Night period. Elevated levels were recorded in all regions of the UK.

Figures 1.1 to 1.8 show hourly concentrations of PM_{10} in each of the different regions of the UK. It can be seen that the highest concentrations occurred as follows:

- In the North West of England on the night of Saturday the 3rd of November.
- In the North East on Sunday the 4th, although there was a large peak on the previous evening as well.
- In London on Sunday the 4th November.
- In the Midlands on Saturday the 3rd.
- The South East had peaks on both nights.
- The South West of England and Wales were the only areas to record PM_{10} peaks on the night of the 5th November.
- Northern Ireland experienced the highest PM_{10} concentrations on the night of the 3rd.
- In Scotland, a peak is more difficult to define, Grangemouth has a large peak on the night of the 3rd November and Glasgow Centre has several peaks between the 4th and 7th November. Glasgow Kerbside has several peaks although the largest of these is on the 8th. The peaks shown for Glasgow Kerbside are all earlier in the day than for other monitoring sites which indicates they are more likely due to traffic than bonfires and fireworks. This kerbside site often shows higher PM_{10} levels due to congested traffic.

Table1.1 Maximum Air Pollution Index Each Day for AURN sites

Low	Moderate	High	Very High

Site Name	Site Designation	Site Location	Maximum Air Pollution Index on each day									
			Thur 1st	Fri 2nd	Sat 3rd	Sun 4th	Mon 5th	Tues 6th	Wed 7th	Thu 8th	Fri 9th	Sat 10th
Aberdeen	URBAN BACKGROUND	Scotland	2	2	2	3	3	2	2	1	1	1
Auchencorth Moss	RURAL	Scotland	1	1	1	1	2	2	1	1	1	1
Edinburgh St Leonards	URBAN BACKGROUND	Scotland	1	2	2	2	3	2	2	2	2	1
Glasgow Centre	URBAN CENTRE	Scotland	2	2	3	5	3	6	3	2	3	2
Glasgow Kerbside	KERBSIDE	Scotland	2	3	3	3	5	3	4	9	3	2
Grangemouth	URBAN INDUSTRIAL	Scotland	2	1	8	3	4	2	2	2	2	1
Inverness	ROADSIDE	Scotland	1	1	2	1	1	1	2	1	2	1
Hull Freetown	URBAN CENTRE	NE England	1	2	10	10	10	2	8	1	1	1
Leeds Centre	URBAN CENTRE	NE England	3	2	10	10	9	2	3	2	2	2
Middlesbrough	URBAN INDUSTRIAL	NE England	2	2	5	4	4	10	1	2	2	1
Newcastle Centre	URBAN CENTRE	NE England	1	1	2	3	2	2	1	1	1	1
Scunthorpe Town	URBAN INDUSTRIAL	NE England	2	2	8	10	9	2	2	2	2	2
Sheffield Centre	URBAN CENTRE	NE England	2	2	10	10	7	2	2	2	2	2
Stockton-on-Tees	ROADSIDE	NE England	2	4	5	3	3	3	2	2	2	2
Blackpool Marton	URBAN BACKGROUND	NW England	2	3	6	9	7	2	2	2	2	2
Bolton	URBAN BACKGROUND	NW England	2	2	10	10	6	5	2	2	2	2
Bury Roadside	ROADSIDE	NW England	3	2	10	10	7	3	2	2	2	2
Liverpool Speke	URBAN BACKGROUND	NW England	1	1	6	10	5	2	1	2	1	2
Manchester Piccadilly	URBAN CENTRE	NW England	2	2	10	10	10	4	4	2	2	2
Preston	URBAN BACKGROUND	NW England	2	8	10	10	7	3	2	2	2	2
Salford Eccles	URBAN INDUSTRIAL	NW England	2	2	10	10	6	3	2	2	2	2
Wirral Tranmere	URBAN BACKGROUND	NW England	1	1	3	10	3	2	3	2	2	2
Birmingham Centre	URBAN CENTRE	Midlands	1	2	10	10	10	2	2	2	2	1
Birmingham Tyburn	URBAN BACKGROUND	Midlands	2	6	10	10	8	3	2	3	4	2
Coventry Memorial Park	URBAN BACKGROUND	Midlands	2	3	9	10	5	2	1	2	1	1
Leamington Spa	URBAN BACKGROUND	Midlands	2	3	5	5	4	2	2	2	2	2
Leicester Centre	URBAN CENTRE	Midlands	2	3	10	10	7	2	1	2	2	1
Northampton	URBAN BACKGROUND	Midlands	2	3	7	10	4	3	1	1	2	2
Nottingham Centre	URBAN CENTRE	Midlands	7	3	10	10	6	2	2	2	2	2
Stoke-on-Trent Centre	URBAN CENTRE	Midlands	2	3	10	10	8	9	2	2	2	3
Cardiff Centre	URBAN CENTRE	Wales	2	2	7	7	6	2	2	2	2	2
Narberth	REMOTE	Wales	1	2	1	2	2	2	2	2	2	2
Port Talbot	URBAN INDUSTRIAL	Wales	2	2	2	3	5	2	2	2	2	2
Swansea Roadside	ROADSIDE	Wales	2	1	4	4	10	5	1	2	1	2
Wrexham	ROADSIDE	Wales	2	1	3	3	3	2	1	2	2	2
Belfast Centre	URBAN CENTRE	N Ireland	2	2	5	4	2	4	3	3	3	2
Derry	URBAN BACKGROUND	N Ireland	2	2	10	3	2	3	3	2	3	2
Lough Navar	REMOTE	N Ireland	1	2	2	2	2	2	2	2	2	2
Bristol St Paul's	URBAN BACKGROUND	SW England	2	7	8	10	10	2	2	1	1	2
Plymouth Centre	URBAN CENTRE	SW England	2	1	6	8	3	3	2	2	2	2
Harwell	RURAL	SE England	2	2	3	5	2	2	2	2	2	1
Norwich Centre	URBAN CENTRE	East Anglia	2	3	10	10	4	3	2	4	2	2
Portsmouth	URBAN BACKGROUND	SE England	3	3	10	9	3	3	3	2	2	2
Reading New Town	URBAN BACKGROUND	SE England	2	7	10	10	10	3	2	2	2	2
Rochester Stoke	RURAL	SE England	2	2	5	6	8	3	2	2	2	2
Southampton Centre	URBAN CENTRE	SE England	3	3	10	9	4	3	2	2	2	2
Southend-on-Sea	URBAN BACKGROUND	SE England	2	2	10	10	7	2	2	1	2	2
Thurrock	URBAN BACKGROUND	SE England	3	4	10	10	6	6	2	3	2	2
Camden Kerbside	KERBSIDE	London	3	6	6	10	10	4	2	2	3	2
Haringey Roadside	ROADSIDE	London	2	7	7	10	10	3	2	1	8	2
London Bexley	SUBURBAN	London	2	3	10	10	10	3	2	2	2	2
London Bloomsbury	URBAN CENTRE	London	3	3	3	7	10	2	2	2	4	2
London Harlington	AIRPORT	London	2	4	7	10	8	3	2	2	2	2
London Marylebone Roa	KERBSIDE	London	6	5	4	10	10	4	4	6	9	4
London N. Kensington	URBAN BACKGROUND	London	3	5	4	9	10	3	2	2	7	3

Figure 1.1 Hourly Measured PM_{10} Concentration in the North West of England

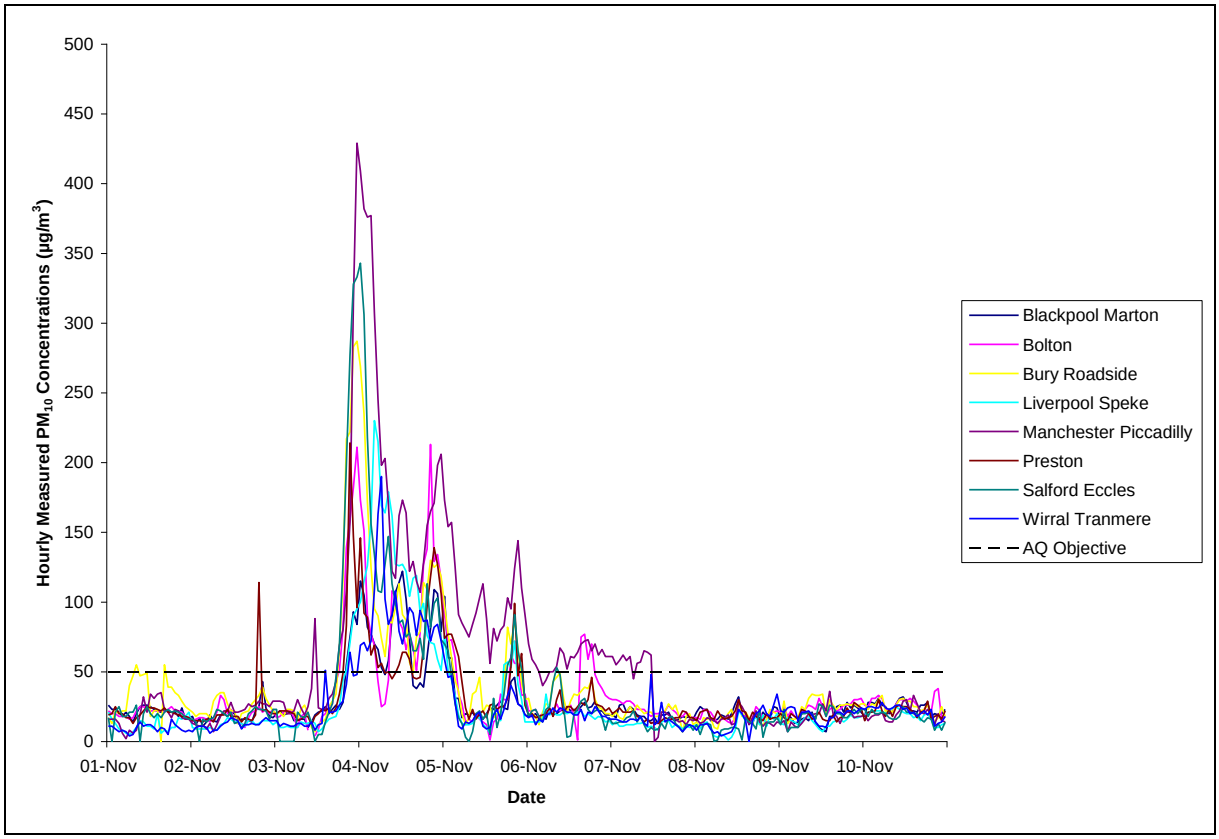


Figure 1.2 Hourly Measured PM_{10} Concentration in the North East of England

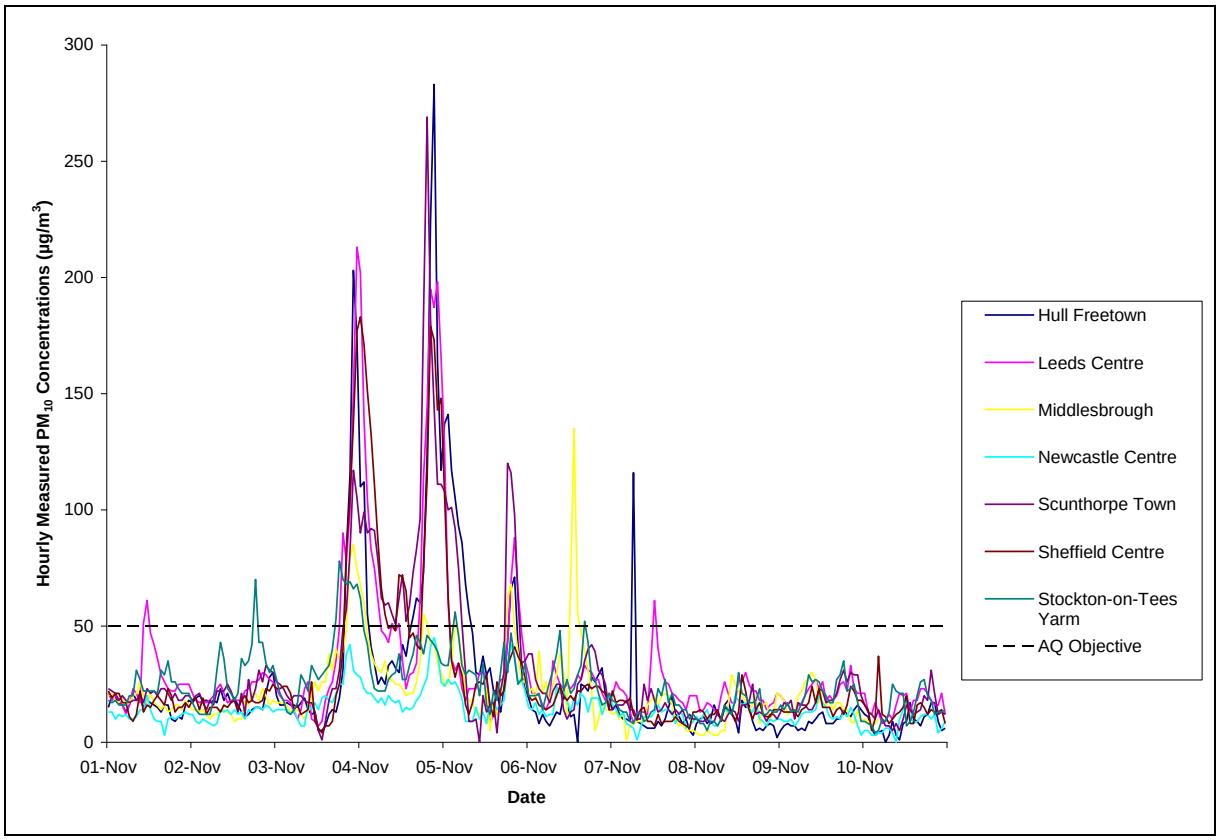


Figure 1.3 Hourly Measured PM_{10} Concentration in London

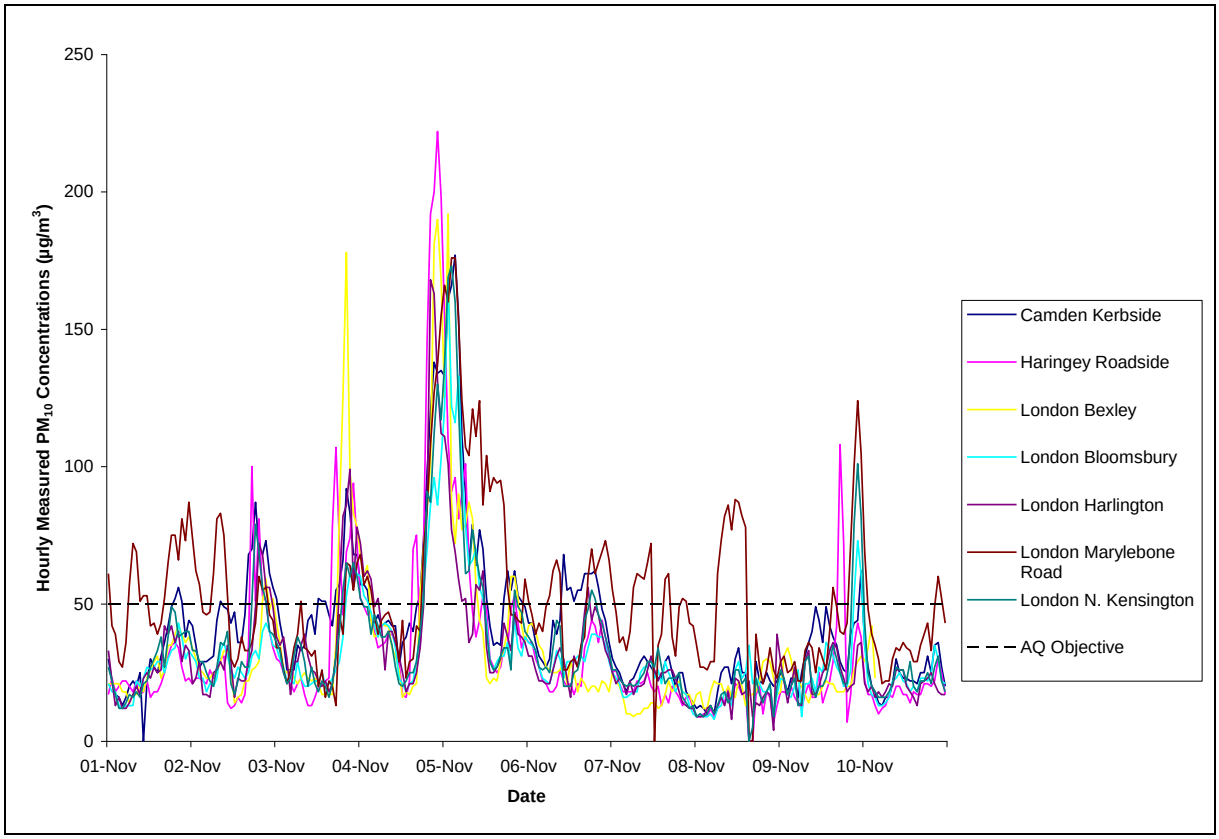


Figure 1.4 Hourly Measured PM_{10} Concentration in the Midlands

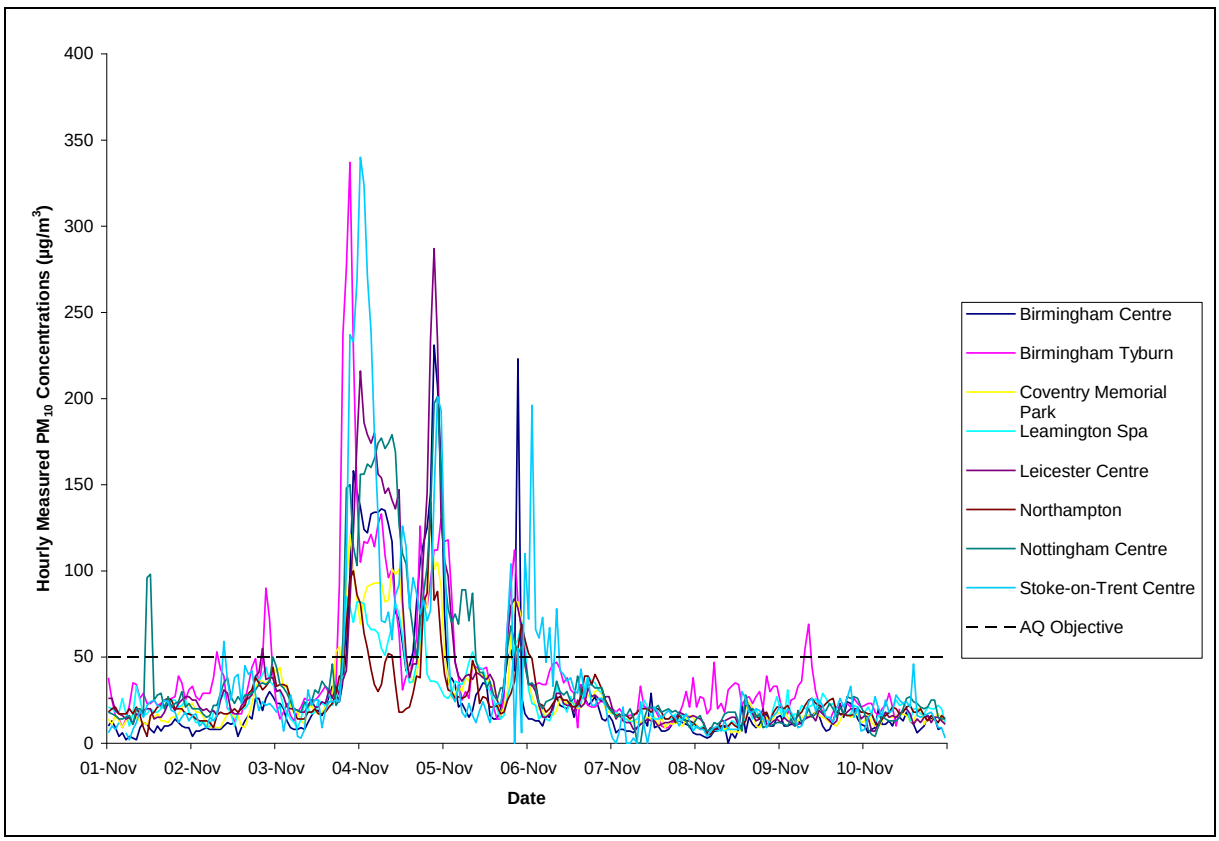


Figure 1.5 Hourly Measured PM_{10} Concentration in the South East of England and East Anglia

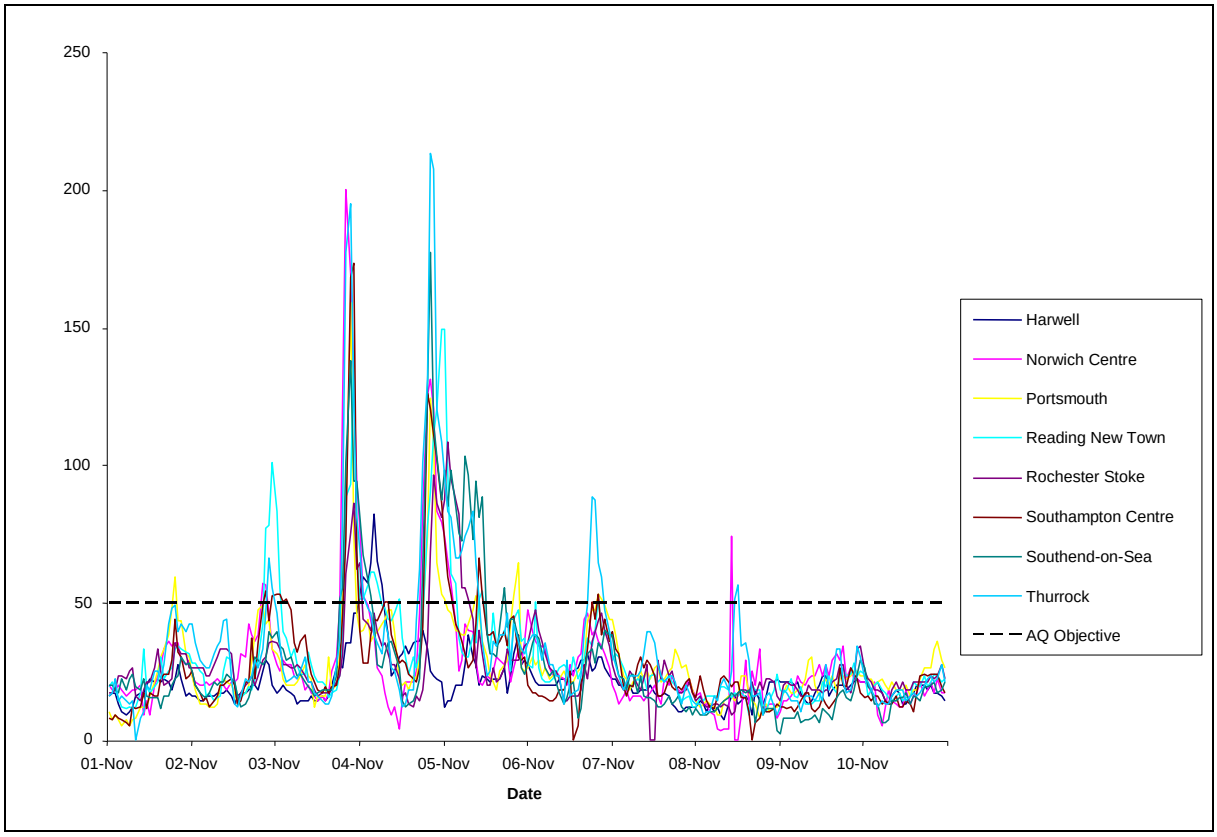


Figure 1.6 Hourly Measured PM_{10} Concentration in the South West of England and Wales

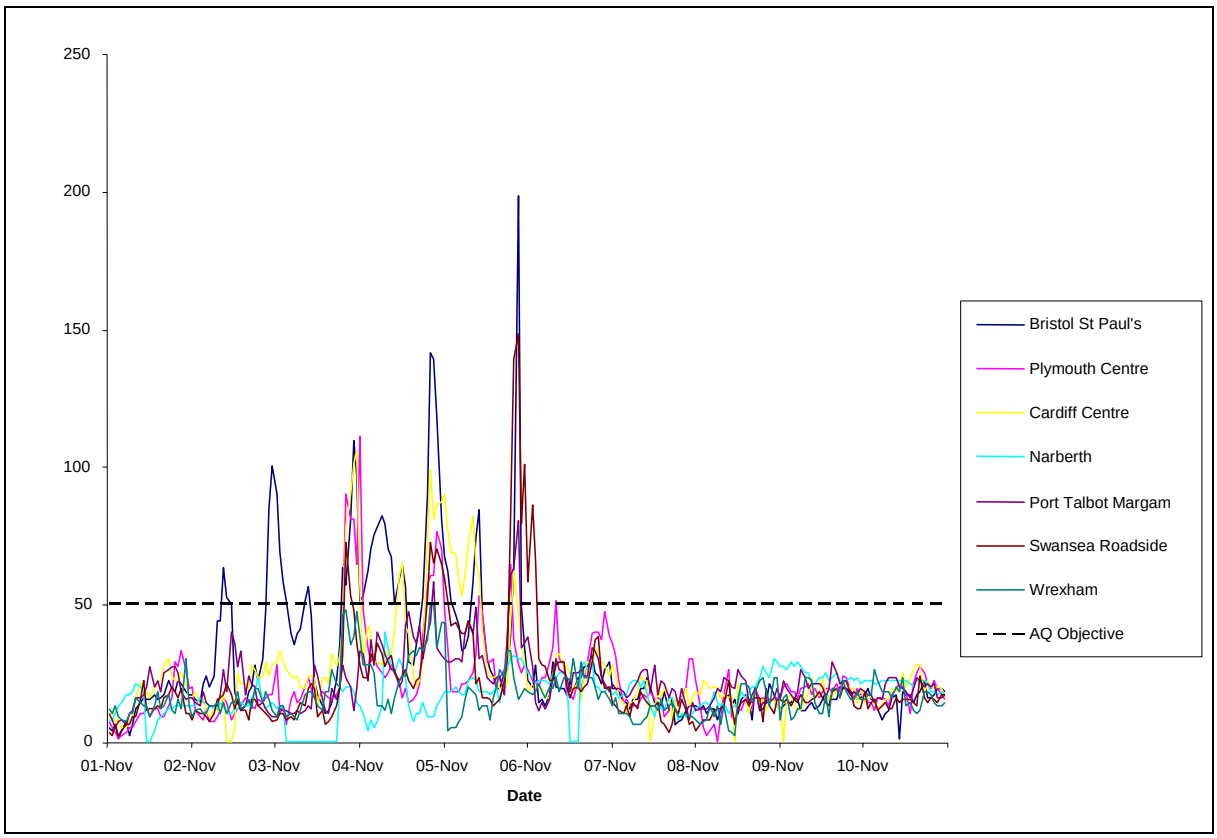


Figure 1.7 Hourly Measured PM_{10} Concentration in Northern Ireland

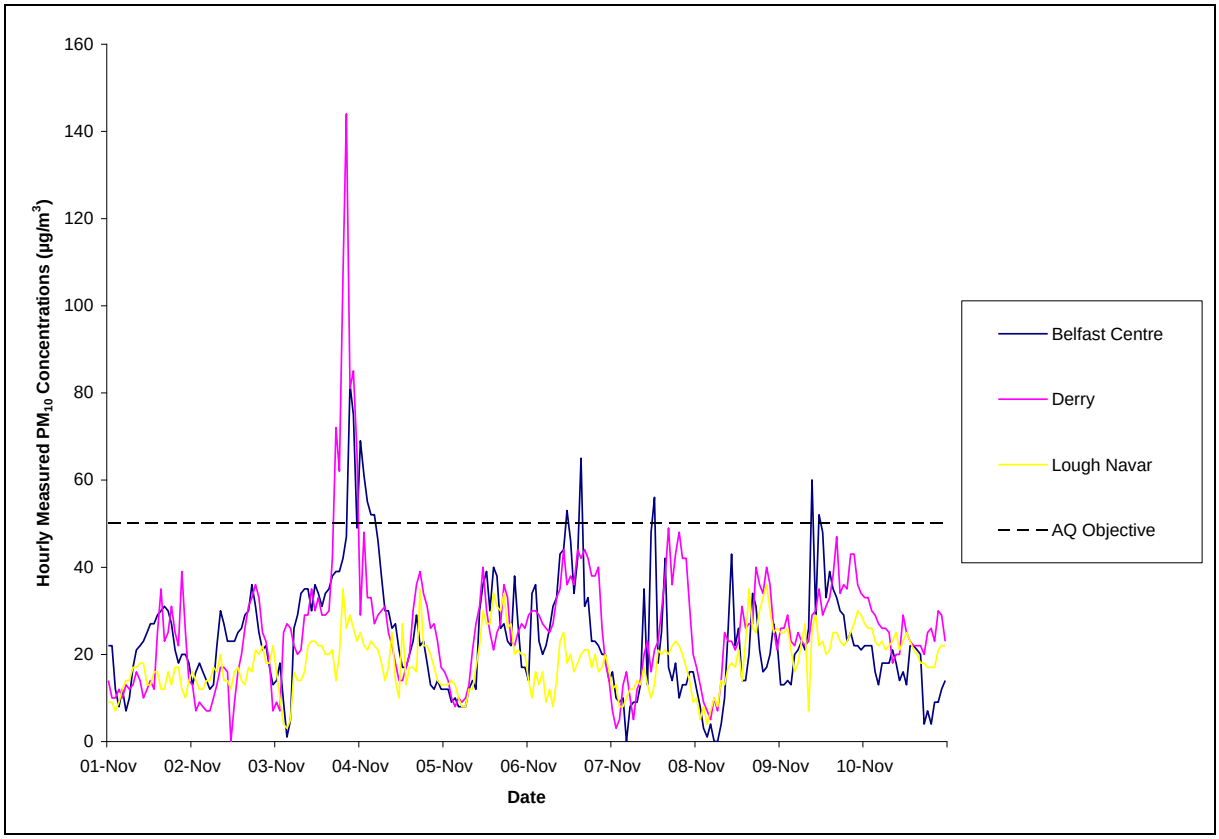
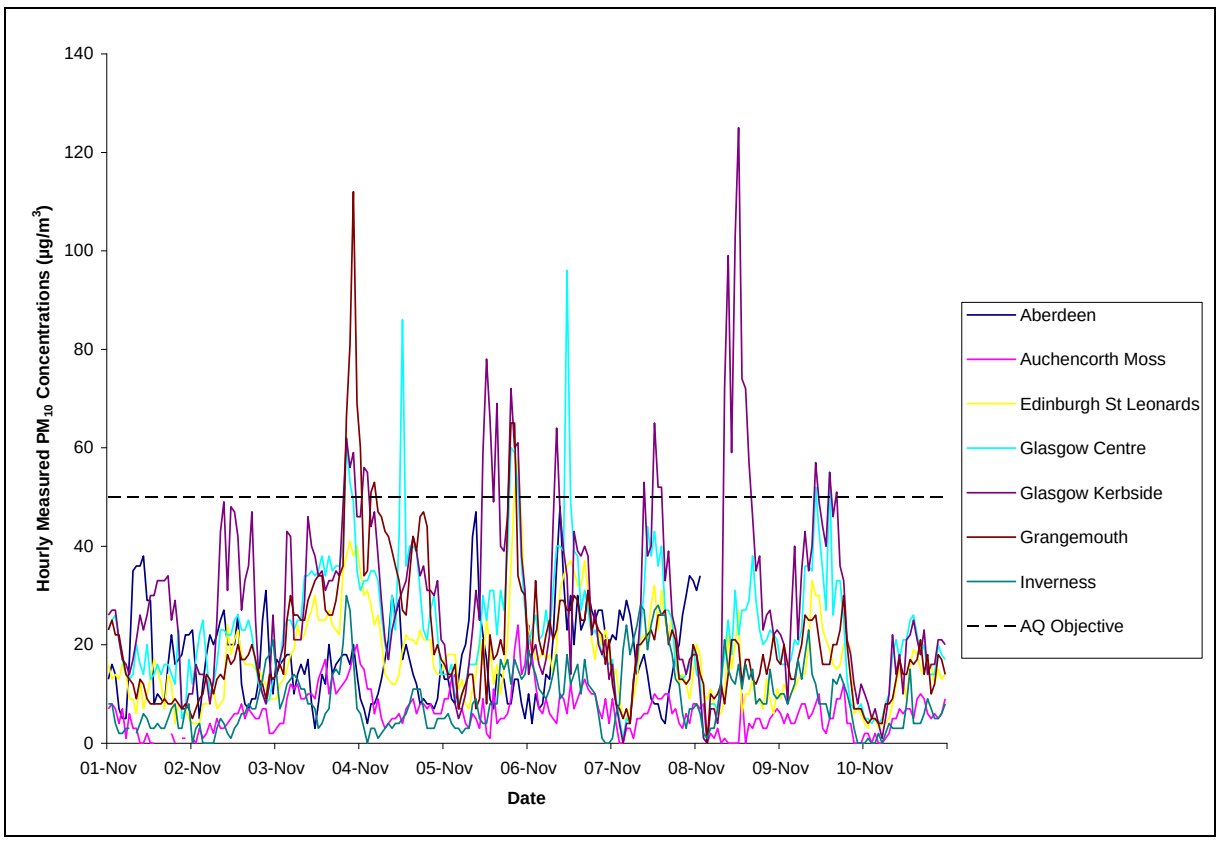


Figure 1.8 Hourly Measured PM_{10} Concentration in Scotland



Figures 1.9 and 1.10 show the split of the measured PM_{10} concentrations between volatile and non-volatile fractions at sites with FDMS TEOM instruments.
They clearly show that the majority of PM_{10} from Bonfire Night activities is in the non-volatile fraction.

Figure 1.9 Selected PM_{10} volatile concentrations from FDMS TEOM monitors

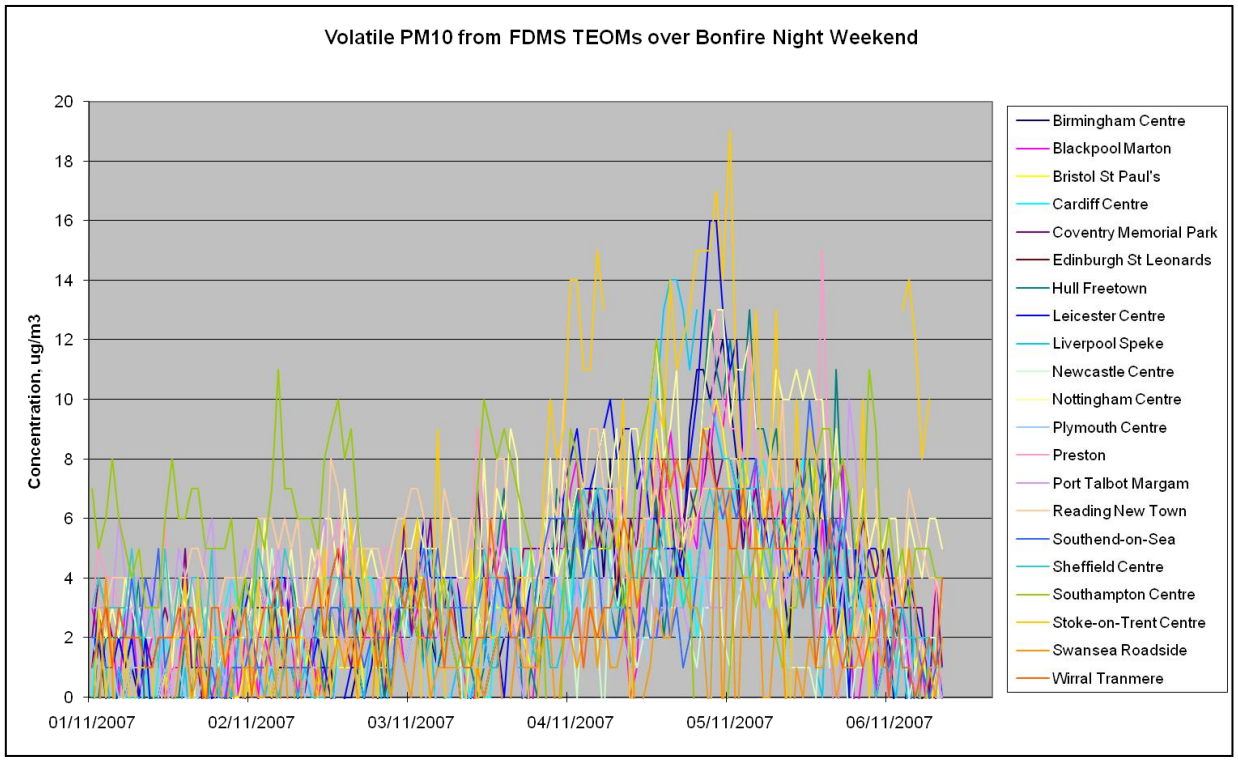
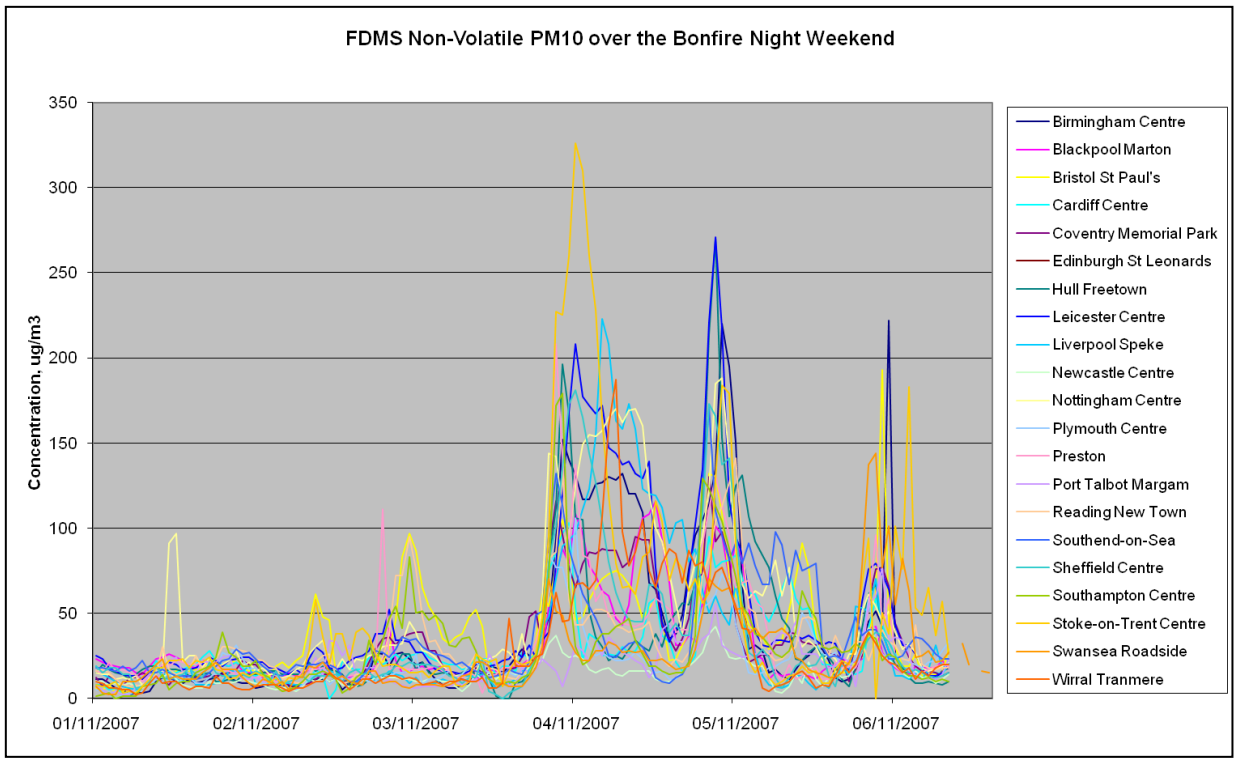


Figure 1.10 Selected PM_{10} non-volatile concentrations from FDMS TEOM monitors



2 Air Quality Standard Exceedences

Table 2.1 below shows the number of exceedences of the 50 µg/m^3 daily air quality standard recorded over this period at each of the UK AURN Monitoring Sites.

These figures are all Gravimetric Equivalent, including corrected data for BAM and old TEOM instruments.

Table 2.1 Air Quality Standard Exceedences

FDMS TEOMs BAMs Old TEOMs

Site	Environment	Number of days	Maximum Daily Mean (Corrected)
London Marylebone Road	KERBSIDE	4	103
Birmingham Tyburn	URBAN BACKGROUND	3	93
Manchester Piccadilly	URBAN CENTRE	3	204
Bury Roadside	ROADSIDE	2	111
Camden Kerbside	KERBSIDE	2	80
Haringey Roadside	ROADSIDE	2	73
Hull Freetown	URBAN CENTRE	2	77
Leicester Centre	URBAN CENTRE	2	143
London Bexley	SUBURBAN	2	62
London N. Kensington	URBAN BACKGROUND	2	70
Nottingham Centre	URBAN CENTRE	2	137
Salford Eccles	URBAN INDUSTRIAL	2	122
Scunthorpe Town	URBAN INDUSTRIAL	2	97
Southend-on-Sea	URBAN BACKGROUND	2	65
Stoke-on-Trent Centre	URBAN CENTRE	2	137
Thurrock	URBAN BACKGROUND	2	63
Birmingham Centre	URBAN CENTRE	1	115
Blackpool Marton	URBAN BACKGROUND	1	78
Bolton	URBAN BACKGROUND	1	96
Bristol St Paul's	URBAN BACKGROUND	1	70
Coventry Memorial Park	URBAN BACKGROUND	1	81
Leamington Spa	URBAN BACKGROUND	1	57
Leeds Centre	URBAN CENTRE	1	90
Liverpool Speke	URBAN BACKGROUND	1	123
London Bloomsbury	URBAN CENTRE	1	64
London Harlington	AIRPORT	1	59
Northampton	URBAN BACKGROUND	1	52
Preston	URBAN BACKGROUND	1	75
Reading New Town	URBAN BACKGROUND	1	61
Sheffield Centre	URBAN CENTRE	1	97
Wirral Tranmere	URBAN BACKGROUND	1	92
Aberdeen	URBAN BACKGROUND	0	17
Auchencorth Moss PM10	REMOTE	0	11
Belfast Centre	URBAN CENTRE	0	34
Cardiff Centre	URBAN CENTRE	0	49
Derry	URBAN BACKGROUND	0	44
Edinburgh St Leonards	URBAN BACKGROUND	0	25
Glasgow Centre	URBAN CENTRE	0	33
Glasgow Kerbside	KERBSIDE	0	37

Grangemouth	URBAN INDUSTRIAL	0	38
Harwell	RURAL	0	40
Inverness PM10	ROADSIDE	0	12
Lough Navar	REMOTE	0	20
Middlesbrough	URBAN INDUSTRIAL	0	35
Narberth	REMOTE	0	21
Newcastle Centre	URBAN CENTRE	0	22
Norwich Centre	URBAN CENTRE	0	48
Plymouth Centre	URBAN CENTRE	0	34
Port Talbot Margam	URBAN INDUSTRIAL	0	35
Portsmouth	URBAN BACKGROUND	0	45
Rochester Stoke	RURAL	0	45
Southampton Centre	URBAN CENTRE	0	50
Stockton-on-Tees Yarm	ROADSIDE	0	37
Swansea Roadside	ROADSIDE	0	47
Wrexham PM10	ROADSIDE	0	28

Network Summary

Date		Maximum daily.	No of Sites Exceeding
01/11/2007	Thursday	55	1
02/11/2007	Friday	51	1
03/11/2007	Saturday	82	5
04/11/2007	Sunday	204	29
05/11/2007	Monday	103	14

The figures show that for the first two days of November 2007 London Marylebone Road was the only site exceeding the daily standard, no doubt related mainly to traffic emissions rather than bonfires or fireworks. More widespread exceedences were recorded over the weekend across the UK with by far the most recorded on Sunday the 4th. There were no exceedences of the 50 µg/m^3 air quality standard in Scotland, Wales or Northern Ireland despite some evidence of short term peaks in the data over the weekend, as presented in Figures 1.6 to 1.8.

Table 2.2 overleaf presents a similar analysis of the number of instances in each of the Moderate, High and Very High air quality bands, using the proposed COMEAP thresholds for including TEOM FDMS and BAM data with the conventional TEOM results. The results show that there were 6 sites (including 4 FDMS) which reported Very High PM_{10} concentrations, and a further 7 sites (including 3 FDMS) where High PM_{10} concentrations were reported.

Table 2.2 Air Quality Bandings Analysis

FDMS TEOMs | BAMs | Old TEOMs

Site	Environment	Maximum 24-hour Running Mean (Corrected)	Very High Band Exceedences	Days	High Band Exceedences	Days	Moderate Band Exceedences	Days
Manchester Piccadilly	URBAN CENTRE	218	34	2	13	2	2	2
Salford Eccles	URBAN INDUSTRIAL	155	15	1	11	2	8	2
Stoke-on-Trent Centre	URBAN CENTRE	146	12	1	13	2	13	2
Nottingham Centre	URBAN CENTRE	137	9	2	18	2	16	2
Leicester Centre	URBAN CENTRE	145	7	2	18	2	17	2
Bury Roadside	ROADSIDE	132	3	1	19	2	16	3
Aberdeen	URBAN BACKGROUND	14	0	0	0	0	0	0
Auchencorth Moss PM10	RURAL	13	0	0	0	0	0	0
Belfast Centre	URBAN CENTRE	45	0	0	0	0	0	0
Birmingham Centre	URBAN CENTRE	116	0	0	14	2	23	2
Birmingham Tyburn	URBAN BACKGROUND	123	0	0	17	1	25	3
Blackpool Marton	URBAN BACKGROUND	78	0	0	0	0	21	2
Bolton	URBAN BACKGROUND	102	0	0	5	1	31	2
Bristol St Paul's	URBAN BACKGROUND	71	0	0	0	0	15	2
Camden Kerbside	KERBSIDE	97	0	0	0	0	24	1
Cardiff Centre	URBAN CENTRE	62	0	0	0	0	0	0
Coventry Memorial Park	URBAN BACKGROUND	82	0	0	0	0	24	2
Derry	URBAN BACKGROUND	48	0	0	0	0	0	0
Edinburgh St Leonards	URBAN BACKGROUND	29	0	0	0	0	0	0
Glasgow Centre	URBAN CENTRE	38	0	0	0	0	0	0
Glasgow Kerbside	KERBSIDE	41	0	0	0	0	0	0
Grangemouth	URBAN INDUSTRIAL	48	0	0	0	0	0	0
Haringey Roadside	ROADSIDE	95	0	0	0	0	25	2
Harwell	RURAL	43	0	0	0	0	0	0
Hull Freetown	URBAN CENTRE	93	0	0	0	0	28	2
Inverness PM10	ROADSIDE	13	0	0	0	0	0	0

Leamington Spa	URBAN BACKGROUND	64	0	0	0	0	0	0
Leeds Centre	URBAN CENTRE	92	0	0	0	0	37	2
Liverpool Speke	URBAN BACKGROUND	127	0	0	19	2	10	2
London Bexley	SUBURBAN	64	0	0	0	0	23	1
London Bloomsbury	URBAN CENTRE	59	0	0	0	0	20	1
London Harlington	AIRPORT	53	0	0	0	0	14	1
London Marylebone Road	KERBSIDE	91	0	0	15	1	20	2
London N. Kensington	URBAN BACKGROUND	64	0	0	0	0	22	1
Lough Navar	REMOTE	17	0	0	0	0	0	0
Middlesbrough	URBAN INDUSTRIAL	41	0	0	0	0	0	0
Narberth	REMOTE	21	0	0	0	0	0	0
Newcastle Centre	URBAN CENTRE	23	0	0	0	0	0	0
Northampton	URBAN BACKGROUND	54	0	0	0	0	0	0
Norwich Centre	URBAN CENTRE	55	0	0	0	0	0	0
Plymouth Centre	URBAN CENTRE	39	0	0	0	0	0	0
Port Talbot Margam	URBAN INDUSTRIAL	36	0	0	0	0	0	0
Portsmouth	URBAN BACKGROUND	47	0	0	0	0	0	0
Preston	URBAN BACKGROUND	78	0	0	0	0	26	2
Reading New Town	URBAN BACKGROUND	64	0	0	0	0	4	1
Rochester Stoke	RURAL	54	0	0	0	0	0	0
Scunthorpe Town	URBAN INDUSTRIAL	98	0	0	5	1	25	2
Sheffield Centre	URBAN CENTRE	98	0	0	4	1	28	2
Southampton Centre	URBAN CENTRE	57	0	0	0	0	0	0
Southend-on-Sea	URBAN BACKGROUND	81	0	0	0	0	17	1
Stockton-on-Tees Yarm	ROADSIDE	43	0	0	0	0	0	0
Swansea Roadside	ROADSIDE	49	0	0	0	0	0	0
Thurrock	URBAN BACKGROUND	81	0	0	0	0	20	1
Wirral Tranmere	URBAN BACKGROUND	92	0	0	0	0	23	2
Wrexham PM10	ROADSIDE	28	0	0	0	0	0	0

3 Meteorological Conditions

Figures 3.1 to 3.6 are surface pressure charts for Friday 2nd to Wednesday 7th November. The highest PM_{10} concentrations occurred at midnight of the 4th November (the night of Saturday the 3rd) in the Northwest, the Midlands and Northern Ireland. Peaks were identified at midnight on the 5th November (the night of Sunday the 4th) in the North East and London.

The synoptic charts show that at midnight on the 4th a large high pressure system was centred over the north of England coninciding with the highest concentrations of PM_{10} in the North West, Midlands and Northern Ireland. This also conincides with the lowest wind speeds in these areas.

Table 3.1 below also presents summary meteorological data showing lowest windspeeds were recorded in northern England on November 4th, continuing on into the early hours of November 5th in more southern areas. By midday on November 5th a strong south-westerly airflow was established over the UK leading to more favourable dispersion of smoke from any remaining celebrations.

Table 3.1 Recorded Wind Speeds and Directions

Weather Station	Region	04/11/2007 00:00		04/11/2007 12:00		05/11/2007 00:00		05/11/2007 12:00		06/11/2007 00:00		06/11/2007 12:00	
		Wind Speed (kn)	Wind Direction	Wind Speed (kn)	Wind Direction	Wind Speed (kn)	Wind Direction	Wind Speed (kn)	Wind Direction	Wind Speed (kn)	Wind Direction	Wind Speed (kn)	Wind Direction
Bingley	North East	1	W	3	W	7	SW	15	SW	7	W	8	W
Coleshill	Midlands	1	NE	4	S	2	S	8	SW	6	W	8	NW
Edinburgh Gogar	Scotland	1	S	4	SW	9	SW	15	W	10	W	13	W
Filton	South West	7	NE	4	SE	0	-	9	SW	6	NW	5	NW
Heathrow	London	3	NW	5	E	3	N	9	SW	7	W	9	NW
St. Athan	Wales	4	NW	5	E	2	N	16	SW	6	W	7	NW
Woodford	North West	0	-	3	SW	4	W	8	SW	5	NW	10	NW
Belfast	Northern Ireland	2	SE	3	SW	7	SW	10	W	6	W	7	W

http://www.metoffice.gov.uk/education/archive/uk/

Figure 3.1 Met Office Surface Pressure Chart: 00 UTC Friday 2nd November

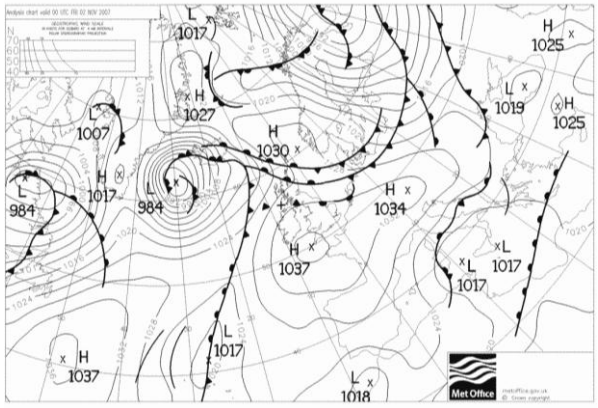


Figure 3.2 Met Office Surface Pressure Chart: 00 UTC Saturday 3rd November

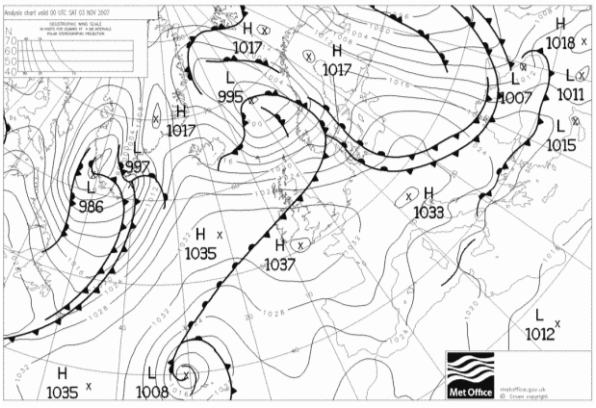


Figure 3.3 Met Office Surface Pressure Chart: 00 UTC Sunday 4th November

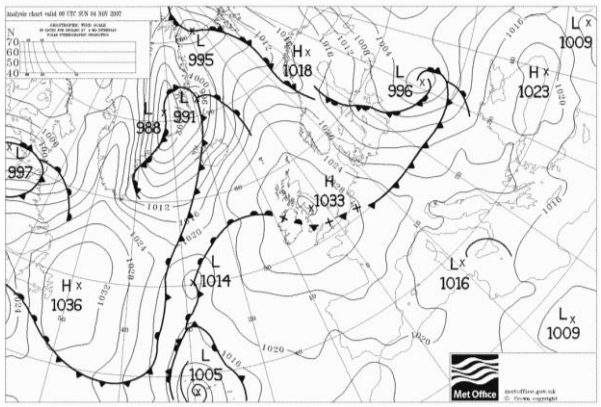


Figure 3.4 Met Office Surface Pressure Chart: 00 UTC Monday 5th November

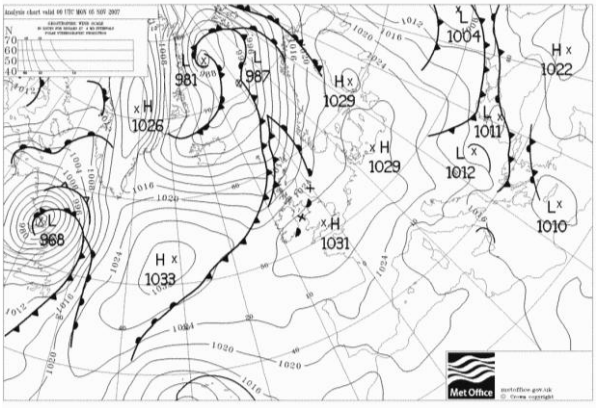


Figure 3.5 Met Office Surface Pressure Chart: 00 UTC Tuesday 6th November

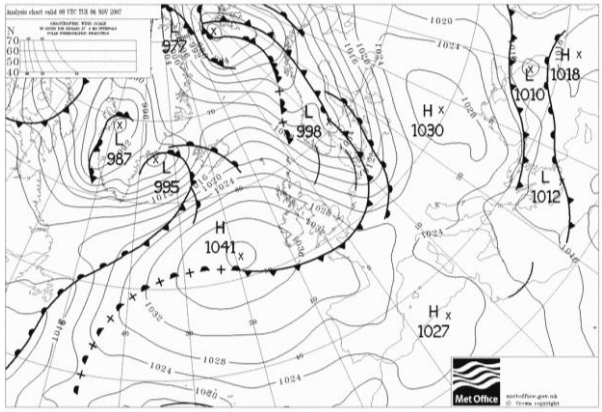
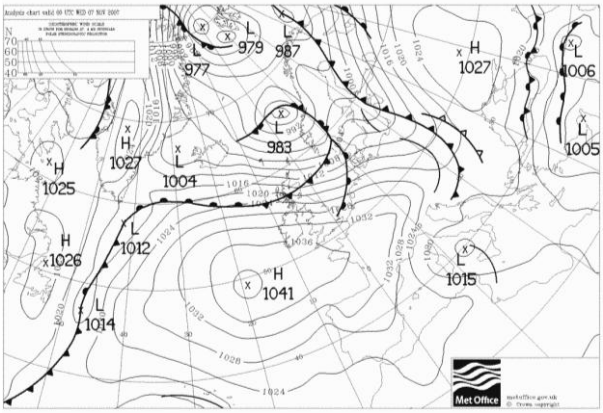


Figure 3.6 Met Office Surface Pressure Chart: 00 UTC Wednesday 7th November



4 Conclusions

Early November 2007 saw the biggest increase in measured UK PM_{10} concentrations due to Bonfire Night celebrations for many years.

For the first two days of November London Marylebone Road was the only site in the AURN exceeding the daily air quality standard for PM_{10}, but this is almost certainly due to road traffic emissions rather than bonfires or fireworks.

During the weekend of the 3rd and 4th November 2007, Moderate, High and Very High running 24-hour mean PM_{10} levels were recorded at eleven, twelve and nine UK AURN monitoring sites respectively. There were also widespread exceedences of the 50 µg/m^3 daily air quality standard across most regions of England.

In Scotland, Wales or Northern Ireland there were no exceedences of the 50 µg/m^3 daily air quality standard despite some evidence of short term peaks in the data.

Analysis of data from FDMS TEOM monitors shows that the majority of the PM_{10} from Bonfire Night activities is in the non-volatile fraction.

Analysis of the the synoptic meteorological charts shows that a high pressure system was centred over northern England from late on Saturday November 3rd. Lowest windspeeds were recorded in northern England on November 4th, coinciding with the highest measured pollutant concentrations.

The high pressure centre moved southwards over the weekend, so that the lowest windspeeds and further peaks in PM_{10} concentrations were recorded in southern areas on November 5th. By midday on November 5th a strong south-westerly airflow was established over the northern UK leading to more favourable dispersion of smoke from any remaining celebrations in these areas.

The magnitude, extent and duration of this PM_{10} episode can therefore be attributed directly to the stable meteorology over the Bonfire Night period of November 2007.

Despite the relative infrequency of these events in recent years it can be concluded that Bonfire Night may still cause a significant air quality problem under certain conditions. From analysis of the November 2007 elevated pollution period it is concluded that these conditions are when the meteorology is characterised by a stable high pressure situation, and especiallly when November 5th falls on or close to a weekend.

APPENDIX – THE UK AIR POLLUTION INDEX

Old Banding	Index	Ozone 8-hourly/ Hourly mean		Nitrogen Dioxide Hourly Mean		Sulphur Dioxide 15-Minute Mean		Carbon Monoxide 8-Hour Mean		PM_{10} Particles 24-Hour Mean
		μgm^{-3}	ppb	μgm^{-3}	ppb	μgm^{-3}	ppb	mgm^{-3}	ppm	gravimetric μgm^{-3}
LOW										
	1	0-32	0-16	0-95	0-49	0-88	0-32	0-3.8	0.0-3.2	0-21
	2	33-66	17-32	96-190	50-99	89-176	33-66	3.9-7.6	3.3-6.6	22-42
	3	67-99	33-49	191-286	100-149	177-265	67-99	7.7-11.5	6.7-9.9	43-64
MODERATE										
	4	100-126	50-62	287-381	150-199	266-354	100-132	11.6-13.4	10.0-11.5	65-74
	5	127-152	63-76	382–477	200-249	355-442	133-166	13.5-15.4	11.6-13.2	75-86
	6	153-179	77-89	478-572	250-299	443-531	167-199	15.5-17.3	13.3-14.9	87-96
HIGH										
	7	180-239	90-119	573-635	300-332	532-708	200-266	17.4-19.2	15.0-16.5	97-107
	8	240-299	120-149	636-700	333-366	709-886	267-332	19.3-21.2	16.6-18.2	108-118
	9	300-359	150-179	701-763	367-399	887-1063	333-399	21.3-23.1	18.3-19.9	119-129
VERY HIGH										
	10	$\geq$ 360 μgm^{-3}	$\geq$ 180 ppb	$\geq$ 764 μgm^{-3}	$\geq$ 400 ppb	$\geq$1064 μgm^{-3}	$\geq$ 400 ppb	$\geq$ 23.2 mgm^{-3}	$\geq$ 20 ppm	$\geq$ 130 μgm^{-3}

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