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Air Pollution in the UK 2011 – Compliance Assessment Summary

A report prepared by AEA for Defra and the Devolved Administrations.

Title	Air Pollution in the UK 2011 – Compliance Assessment Summary
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Executive Summary

The UK is required to report air quality data on an annual basis under the following European Directives:

- The Council Directive on ambient air quality and cleaner air for Europe (2008/50/EC).
- The Fourth Daughter Directive 2004/107/EC under the Air Quality Framework Directive (1996/62/EC).

This document has been prepared to accompany and summarise the UK's 2011 submission on air quality to the EU Commission, presenting a summary of the UK's compliance with the above directives, based upon measurements from national air pollution monitoring networks and air pollution modelling. This includes details of the exceedances reported in 2011.

This document is an extract from a larger report, "Air Pollution in the UK 2011", which, in addition to the compliance summary also provides background information on the pollutants covered by these Directives and the UK's own Air Quality Strategy, their sources, effects, how they are measured and modelled in the UK, and details of their spatial distribution and changes over time.

These data are produced on behalf of Defra (the Department for Environment, Food and Rural Affairs) and the Devolved Administrations of Scotland, Wales and Northern Ireland.

The 2011 results can be summarised as follows:

- There were no exceedances of any EU limit values for SO_2.
- The UK exceeded the limit value for hourly mean nitrogen dioxide in three zones (out of the total of 43).
- The UK exceeded the limit value for annual mean nitrogen dioxide in 40 zones.
- Of these 40 zones, nine were covered by a time extension during 2011; in these cases, the limit value plus a margin of tolerance applied. Five of the nine zones were within the margin of tolerance. Therefore, the number of zones that exceeded the limit value for annual mean NO_2, plus margin of tolerance where applicable, was 35.
- One zone (Greater London Urban Area) exceeded the daily limit value for PM_{10} during the year, after subtraction of the contribution from natural sources. A time extension has been granted in respect of this zone and limit value and a margin of tolerance is in force. The limit value plus margin of tolerance was not exceeded in 2011.
- All zones met the limit value for annual mean concentration of PM_{10} particulate matter.
- All zones met the target value for annual mean concentration of $PM_{2.5}$ particulate matter, and the Stage 1 limit value, which comes into force in 2015. After subtraction of the natural contribution, two zones did not meet the Stage 2 limit value which must be met by 2020.
- Exceedances were reported for the long term ozone objective for human health in all 43 zones, and exceedances were reported for the long term ozone objective for vegetation in three zones.
- Two zones exceeded the target value for nickel in 2011, as was the case in years 2008 to 2010.
- Seven zones exceeded the target value for benzo[a]pyrene in 2011 (compared with eight in 2010).

Copies of previous annual submissions can be found on the Commission website: http://cdr.eionet.europa.eu/gb/eu/annualair. For more information on air quality in the UK visit the Defra website at www.defra.gov.uk/environment/quality/air/index.htm and the UK Air Quality websites at http://uk-air.defra.gov.uk, www.scottishairquality.co.uk, www.welshairquality.co.uk and www.airqualityni.co.uk.

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1 Introduction

All Member States of the European Union must comply with Directive 2008/50/EC on Ambient Air Quality and Cleaner Air for Europe[1] and the Fourth Air Quality Daughter Directive[2] (2004/107/EC). These Directives require all Member States, including the UK, to undertake air quality assessment, and to report the findings to the European Commission on an annual basis.

Directive 2008/50/EC was adopted in June 2008. This directive (referred to as the Air Quality Directive) substantially revised and merged four previous directives and one Decision:

- Directive 1996/62/EC on Ambient Air Quality Assessment and Management (the Framework Directive)[3], which established a framework under which the EU agreed air quality limit values for pollutants specified in a series of Daughter Directives.
- The First Daughter Directive[4] (1999/30/EC), which set limit values for sulphur dioxide, oxides of nitrogen, particulate matter as PM_{10}, and lead.
- The Second Daughter Directive[5] (2000/69/EC), which set limit values for carbon monoxide (CO) and benzene.
- The Third Daughter Directive[6] (or Ozone Directive, 2002/3/EC), which set target values for the protection of human health and vegetation.
- Council Decision 97/101/EC[7], which established a reciprocal exchange of air quality monitoring information and data, between the Member States.

The Fourth Daughter Directive, which covers the four metallic elements cadmium, arsenic, nickel and mercury together with polycyclic aromatic hydrocarbons (PAH), remains in force alongside the Air Quality Directive and is expected to be merged with the Air Quality Directive in the future.

The UK has statutory monitoring networks in place to meet the requirements of these Directives, with air quality modelling used to supplement the monitored data.

The results are submitted to the European Commission each year, in the form of a standard questionnaire which each Member State must complete. The UK's annual submission, together with those from previous years, can be found on the Commission website: http://cdr.eionet.europa.eu/gb/eu/annualair.

This document presents an assessment of the UK's compliance with the limit values, target values and long term objectives set out in the Air Quality Directive and the 4th Daughter Directive, and compares this with recent years. This is based upon the data submitted to the European Commission.

Links to the EU Directives on ambient air quality are provided on Defra's web pages at www.defra.gov.uk/environment/quality/air/air-quality/eu/. The Air Quality Directive itself can also be found at http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:152:0001:0044:EN:PDF.

Further information on air quality in the UK can be found on Defra's online UK Air Information Resource (UK-AIR), at http://uk-air.defra.gov.uk/.

2 Definition of Zones

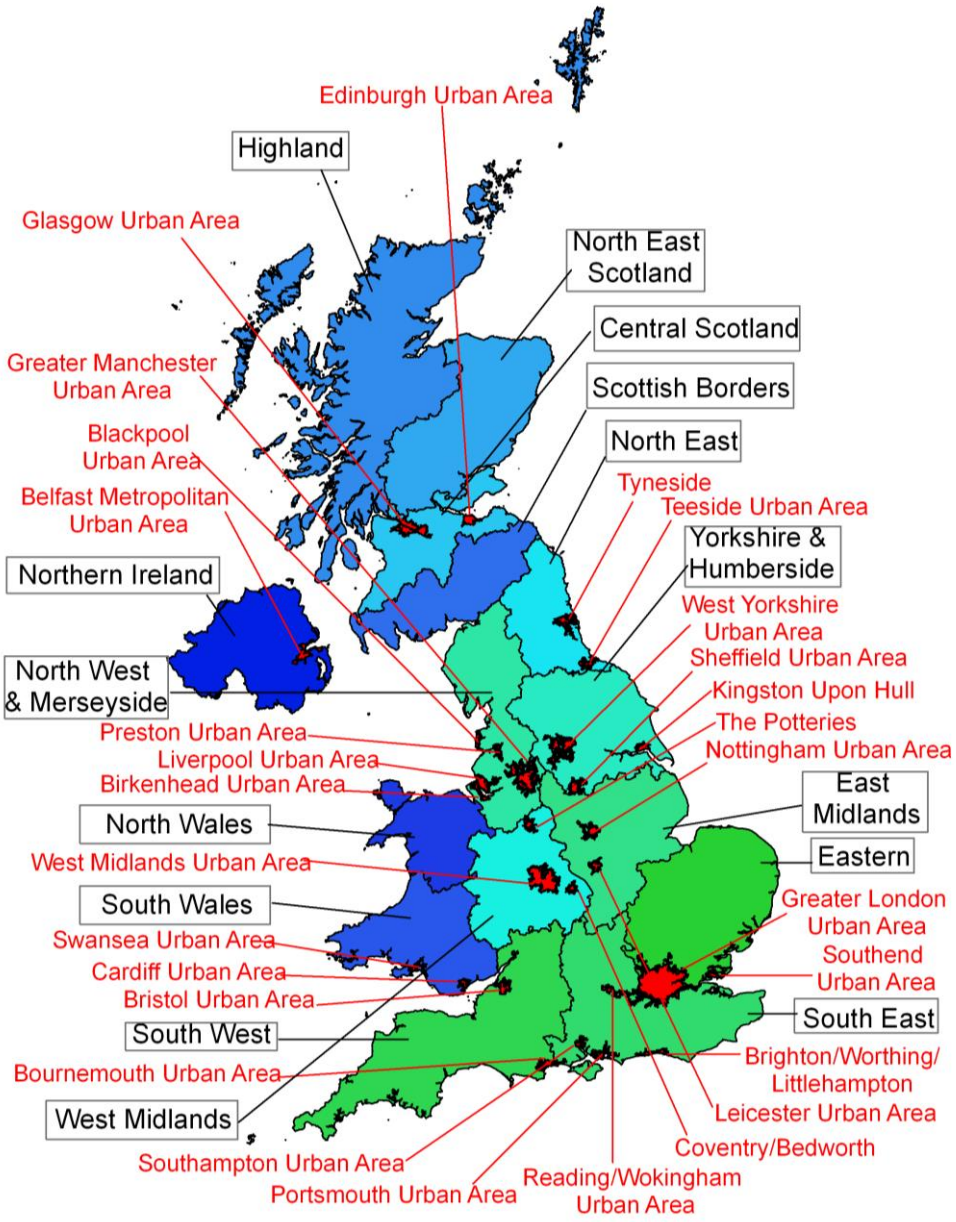
The UK is divided into 43 zones for air quality assessment. There are 28 agglomeration zones (large urban areas) and 15 non-agglomeration zones. Details are included in Form 2 of the Questionnaire (the annual compliance assessment report to the European Commission). Each zone is assigned an identification code. Zones are listed in Table 2-1 and shown in Figure 2-1.

Table 2-1 UK Zones and Agglomerations for Ambient Air Quality Reporting 2011

Zone	Zone code	Ag or Non-ag*
Greater London Urban Area	UK0001	Ag
West Midlands Urban Area	UK0002	Ag
Greater Manchester Urban Area	UK0003	Ag
West Yorkshire Urban Area	UK0004	Ag
Tyneside	UK0005	Ag
Liverpool Urban Area	UK0006	Ag
Sheffield Urban Area	UK0007	Ag
Nottingham Urban Area	UK0008	Ag
Bristol Urban Area	UK0009	Ag
Brighton/Worthing/Littlehampton	UK0010	Ag
Leicester Urban Area	UK0011	Ag
Portsmouth Urban Area	UK0012	Ag
Teesside Urban Area	UK0013	Ag
The Potteries	UK0014	Ag
Bournemouth Urban Area	UK0015	Ag
Reading/Wokingham Urban Area	UK0016	Ag
Coventry/Bedworth	UK0017	Ag
Kingston upon Hull	UK0018	Ag
Southampton Urban Area	UK0019	Ag
Birkenhead Urban Area	UK0020	Ag
Southend Urban Area	UK0021	Ag
Blackpool Urban Area	UK0022	Ag
Preston Urban Area	UK0023	Ag
Glasgow Urban Area	UK0024	Ag
Edinburgh Urban Area	UK0025	Ag
Cardiff Urban Area	UK0026	Ag
Swansea Urban Area	UK0027	Ag
Belfast Metropolitan Urban Area	UK0028	Ag
Eastern	UK0029	Non-ag
South West	UK0030	Non-ag
South East	UK0031	Non-ag
East Midlands	UK0032	Non-ag
North West & Merseyside	UK0033	Non-ag
Yorkshire & Humberside	UK0034	Non-ag
West Midlands	UK0035	Non-ag
North East	UK0036	Non-ag
Central Scotland	UK0037	Non-ag
North East Scotland	UK0038	Non-ag
Highland	UK0039	Non-ag
Scottish Borders	UK0040	Non-ag
South Wales	UK0041	Non-ag
North Wales	UK0042	Non-ag
Northern Ireland	UK0043	Non-ag

Ag = agglomeration zone, Non-ag = non-agglomeration zone

Figure 2-1 UK zones and agglomerations for ambient air quality reporting 2011



Agglomeration zones (red)
Non-agglomeration zones (blue/green)

3 Air Quality Assessment for 2011

The air quality assessment for each pollutant is derived from a combination of measured and modelled concentrations. Where both measurements and model results are available the assessment of compliance for each zone is based on the higher concentration of the two.

The results of the air quality assessment submitted to the European Commission are summarised in the tables below. The tables have been completed as follows:

- Where all measurements were within the relevant limit values in 2011, the table shows this as "OK".
- Where a margin of tolerance is applicable, if some or all measurements were above the limit value, but within the limit value plus margin of tolerance, the table shows this as "≤LV +MOT".
- In the above cases, where compliance was determined by modelling or supplementary assessment, this is indicated by "(m)" – i.e. "OK (m)" or "≤LV +MOT (m)" as appropriate.
- Where locations were identified as exceeding a limit value, limit value plus margin of tolerance, target value, long-term objective, this is identified as ">LV", ">LV+MOT", ">TV" or ">LTO" as applicable.
- Where an exceedance was determined by modelling or supplementary assessment, this is indicated by (m), as above.

Zones that complied with the relevant limit values, targets or long-term objectives are shaded blue, while those that did not are shaded red.

Where a time extension has been granted, and a margin of tolerance applies, zones that exceeded the relevant limit value but not the limit value plus margin of tolerance are shaded orange.

The abbreviation "n/a" (not applicable) means that an assessment is not relevant for this zone, such as for the NO_X vegetation critical level in agglomeration zones.

3.1 Directive 2008/50/EC on Ambient Air Quality and Cleaner Air for Europe

Sulphur dioxide: the results of the air quality assessment for sulphur dioxide are presented in Form 8a of the Questionnaire.

In 2011, all zones and agglomerations within the UK complied with the limit values for 1-hour mean and 24-hour mean SO_2 concentration, set for protection of human health.

All non-agglomeration zones within the UK also complied with the critical levels for annual mean and winter mean SO_2 concentration, set for protection of ecosystems. (These are not applicable to built-up areas).

Nitrogen dioxide: the results of the air quality assessment for nitrogen dioxide for each zone are presented in Form 8b of the Questionnaire, and summarised in Table 3-1.

Three agglomeration zones - **Greater London Urban Area (UK0001), Glasgow Urban Area (UK0024)** and the **South East (UK0031)** had locations which exceeded the 1-hour limit value (200 µg m^{-3}) on more than the permitted 18 occasions during 2011.

The majority of zones and agglomerations in the UK had locations with measured or modelled annual mean NO_2 concentrations higher than the annual mean limit value (40 µg m^{-3}). This was the case in 40 out of the 43 zones. The following three zones ***met*** the annual mean limit value in 2011:

- Blackpool Urban Area (UK0022)
- Highland (UK0039)
- Scottish Borders (UK0040)

The UK has been granted a time extension for compliance with the NO_2 annual limit value in the following zones and agglomerations;

- Nottingham Urban Area,
- Leicester Urban Area,
- Portsmouth Urban Area,
- Reading/Wokingham Urban Area,
- Southend Urban Area,
- Edinburgh Urban Area,
- Cardiff Urban Area,
- Central Scotland zone, and
- North Wales zone.

This exemption applies until 1st January 2015 for all but Reading/Wokingham Urban Area, for which it applies until 1st January 2013. Article 2 of the Commission Decision of 26th June 2012 requires the UK to provide the Commission with data indicating that the concentration levels in these zones remain below the annual limit value plus the maximum margin of tolerance (60 µg m^{-3}) specified in Annex XI to Directive 2008/50/EC. The following zones exceeded the annual mean limit value, but were within the annual mean limit value plus margin of tolerance in 2011:

- Reading/Wokingham Urban Area,
- Southend Urban Area,
- Edinburgh Urban Area,
- Cardiff Urban Area, and
- Central Scotland.

All other 35 zones and agglomerations exceeded the annual mean limit value, or annual mean limit value plus margin of tolerance.

All non-agglomeration zones within the UK complied with the critical level for annual mean NO_X concentration, set for protection of vegetation.

Annual mean concentrations of NO_2 were typically lower in 2011 than in 2010. 2010 was a relatively high year for this pollutant; cold winter weather increased fuel use and therefore emissions.

PM_{10} Particulate matter: the results of the air quality assessment for PM_{10} for each zone are presented in Form 8c of the Questionnaire, and summarised in Table 3-2.

The UK has been granted a time extension for compliance with the 24-hour PM_{10} limit value in the Greater London Urban Area **(UK0001)**. This exemption applies for the period from 11th June 2008 to 10th June 2011. Article 2 of the Commission Decision of 11th March 2011 requires the UK to provide the Commission with data indicating that the concentration levels in this zone have remained below the daily limit value plus the maximum margin of tolerance specified in Annex XI to Directive 2008/50/EC (daily mean of 75 µg m^{-3}, not to be exceeded more than 35 times per calendar year). As a result, for the UK 2011 compliance assessment, the PM_{10} time extension decision for the Greater London Urban Area requires assessment against the maximum margin of tolerance (MOT) of 75 µg m^{-3} as a daily mean between 1st January 2011 and 10th June 2011 and the limit value (LV) of 50 µg m^{-3} as a daily mean between 11th June 2011 and 31st December 2011. In order to be compliant with the requirements of the time extension the total of these two numbers of exceedance days should not exceed 35.

The daily limit value was exceeded in this zone in 2011 but the Greater London Urban Area is classified as compliant due to the maximum MOT in place until 10th June - there were a total of 26 measured exceedances in 2011 (combining exceedances of 75 µg m^{-3} until 10th June and exceedances of 50 µg m^{-3} thereafter). **The daily limit value plus the maximum margin of tolerance was also not exceeded during the period from 11th June 2008 to 31st December 2008 nor in 2009, nor in 2010.**

Provision is made in EU legislation for Member States to subtract the PM_{10} contribution due to natural contributions (2008/50/EC Article 20), and this has been carried out where it is required.

Prior to the subtraction of natural sources, the West Midlands agglomeration exceeded the 24-hour PM_{10} limit value on more than 35 occasions in 2011: no time extension is in force for this zone. However, subtraction of the contribution from natural sources as is required by the Directive, reduced the number of exceedances from 37 to 31, which is within the permitted maximum.

All zones and agglomerations complied with the annual mean limit value of 40 µg m^{-3} for PM_{10}.

$PM_{2.5}$ Particulate matter: the results of the air quality assessment for $PM_{2.5}$ for each zone are presented in Form 9c of the Questionnaire, and summarised in Table 3-3. This table includes the target value (25 µg m^{-3} to be achieved by 1st Jan 2010) the Stage 1 limit value (25 µg m^{-3} to be achieved by 1st Jan 2015) and the Stage 2 limit value (20 µg m^{-3} to be achieved by 1st Jan 2020). All three apply to the calendar year mean.

Natural contributions have been removed from $PM_{2.5}$ exceedances listed in Table 3-3. Exceedance of limit values of $PM_{2.5}$ due to natural events (1999/30/EC Article 5(4)) or natural contributions (2008/50/EC Article 20) are as follows:

- The modelled exceedance of the Stage 2 limit value in zone UK0002 (West Midlands) is removed by the subtraction of the natural contribution (sea salt).
- The measured exceedances of the Stage 2 limit value in zone UK0001 (site: Marylebone Road, annual mean: 24 µg m^{-3}) and zone UK0024 (site: Glasgow Kerbside, annual mean: 22 µg m^{-3}) remain even if the natural contribution (sea salt) is subtracted.

Annual mean concentrations of $PM_{2.5}$ were within the target value of 25 µg m^{-3} in all zones and agglomerations. Under the Air Quality Directive, Member States will be required to achieve a national exposure reduction target for $PM_{2.5}$, over the period 2010 to 2020. This is based on the Average Exposure Indicator statistic. The Average Exposure Indicator (AEI) for the UK has been calculated as follows: the mean $PM_{2.5}$ concentration at appropriate UK background urban sites only was calculated for three consecutive calendar years 2009, 2010 and 2011. The values obtained were as follows:

- 2009: 13 µg m^{-3}
- 2010: 13 µg m^{-3}
- 2011: 14 µg m^{-3}.

The mean of these three values (to the nearest integer) is 13 µg m^{-3}. This is taken as the AEI for the reference year of 2010. The AEI for the reference year 2010 determines the National Exposure Reduction Target (NERT), to be achieved by 2020 (see Annex XIV of the Air Quality Directive). With a reference year AEI of 13 µg m^{-3}, the Air Quality Directive sets an exposure reduction target of 15%. The detailed methodology and results of this calculation are presented in Defra's technical report on UK air quality assessment.[8]

Carbon monoxide, benzene and lead: the results of the air quality assessment for lead, benzene and CO are presented in Forms 8d, 8e and 8f of the Questionnaire respectively. All zones or agglomerations were compliant with the limit values for these three pollutants in 2011.

Ozone: the results of the air quality assessment for ozone for each zone are presented in Form 9a of the Questionnaire, and summarised in Table 3-4.

For ozone, there is a target value based on the maximum daily 8-hour mean. There is also a long-term objective for protection of human health, based on the maximum daily 8-hour mean. All 43 zones and agglomerations were compliant with this target value. However, all 43 zones and agglomerations were above the long-term objective (LTO) for health.

There is also a target value based on the AOT40 statistic[1]. The AOT40 statistic (expressed in µg m^{-3} .hours) is the sum of the difference between hourly concentrations greater than 80 µg m^{-3} (= 40 ppb) and 80 µg m^{-3} over a given period using only the one-hour values measured between 0800 and 2000 Central European Time each day. All 43 zones and agglomerations met the target value based on the AOT40 statistic. There is also a long-term objective, for protection of vegetation, based on this statistic. Three zones were above the long-term objective for vegetation: **Greater London, Eastern and East Midlands.**

Table 3-1 Results of Air Quality Assessment for Nitrogen Dioxide in 2011

Zone	Zone code	NO_2 LV for health (1hr mean)	NO_2 LV for health (annual mean)	NOx critical level for vegetation (annual mean)
Greater London Urban Area	UK0001	>LV	>LV	n/a
West Midlands Urban Area	UK0002	OK	>LV	n/a
Greater Manchester Urban Area	UK0003	OK	>LV	n/a
West Yorkshire Urban Area	UK0004	OK	>LV	n/a
Tyneside	UK0005	OK	>LV (m)	n/a
Liverpool Urban Area	UK0006	OK	>LV (m)	n/a
Sheffield Urban Area	UK0007	OK	>LV (m)	n/a
Nottingham Urban Area *	UK0008	OK	>LV +MOT (m)	n/a
Bristol Urban Area	UK0009	OK	>LV (m)	n/a
Brighton/Worthing/Littlehampton	UK0010	OK (m)	>LV (m)	n/a
Leicester Urban Area *	UK0011	OK (m)	>LV +MOT (m)	n/a
Portsmouth Urban Area *	UK0012	OK	>LV +MOT (m)	n/a
Teesside Urban Area	UK0013	OK	>LV (m)	n/a
The Potteries	UK0014	OK	>LV (m)	n/a
Bournemouth Urban Area	UK0015	OK	>LV (m)	n/a
Reading/Wokingham Urban Area *	UK0016	OK	≤LV +MOT (m)	n/a
Coventry/Bedworth	UK0017	OK	>LV (m)	n/a
Kingston upon Hull	UK0018	OK	>LV (m)	n/a
Southampton Urban Area	UK0019	OK	>LV (m)	n/a
Birkenhead Urban Area	UK0020	OK	>LV (m)	n/a
Southend Urban Area *	UK0021	OK (m)	≤LV +MOT (m)	n/a
Blackpool Urban Area	UK0022	OK	OK	n/a
Preston Urban Area	UK0023	OK	>LV (m)	n/a
Glasgow Urban Area	UK0024	>LV	>LV	n/a
Edinburgh Urban Area *	UK0025	OK	≤LV +MOT (m)	n/a
Cardiff Urban Area *	UK0026	OK	≤LV +MOT (m)	n/a
Swansea Urban Area	UK0027	OK	>LV (m)	n/a
Belfast Urban Area	UK0028	OK	>LV (m)	n/a
Eastern	UK0029	OK	>LV (m)	OK
South West	UK0030	OK	>LV	OK
South East	UK0031	>LV	>LV	OK
East Midlands	UK0032	OK	>LV (m)	OK
North West & Merseyside	UK0033	OK	>LV (m)	OK (m)
Yorkshire & Humberside	UK0034	OK	>LV (m)	OK
West Midlands	UK0035	OK	>LV (m)	OK (m)
North East	UK0036	OK	>LV (m)	OK (m)
Central Scotland *	UK0037	OK	≤LV +MOT (m)	OK (m)
North East Scotland	UK0038	OK	>LV	OK (m)
Highland	UK0039	OK	OK	OK (m)
Scottish Borders	UK0040	OK	OK	OK
South Wales	UK0041	OK	>LV (m)	OK
North Wales *	UK0042	OK	>LV +MOT (m)	OK
Northern Ireland	UK0043	OK	>LV (m)	OK (m)

LV = limit value, MOT = margin of tolerance, (m) indicates that the compliance or exceedance was determined by modelling.
Asterisk (*) indicates a time extension granted.

Table 3-2 Results of Air Quality Assessment for PM_{10} in 2011 After Subtraction of Contribution from Natural Sources.

Zone	Zone code	PM_{10} LV (daily mean)	PM_{10} LV (annual mean)
Greater London Urban Area	UK0001	≤ LV +MOT	OK
West Midlands Urban Area	UK0002	OK (m)	OK
Greater Manchester Urban Area	UK0003	OK	OK
West Yorkshire Urban Area	UK0004	OK	OK
Tyneside	UK0005	OK	OK
Liverpool Urban Area	UK0006	OK	OK
Sheffield Urban Area	UK0007	OK	OK
Nottingham Urban Area	UK0008	OK	OK
Bristol Urban Area	UK0009	OK (m)	OK (m)
Brighton/Worthing/Littlehampton	UK0010	OK (m)	OK (m)
Leicester Urban Area	UK0011	OK	OK
Portsmouth Urban Area	UK0012	OK (m)	OK (m)
Teesside Urban Area	UK0013	OK	OK
The Potteries	UK0014	OK	OK
Bournemouth Urban Area	UK0015	OK (m)	OK (m)
Reading/Wokingham Urban Area	UK0016	OK	OK
Coventry/Bedworth	UK0017	OK (m)	OK (m)
Kingston upon Hull	UK0018	OK	OK
Southampton Urban Area	UK0019	OK	OK
Birkenhead Urban Area	UK0020	OK (m)	OK (m)
Southend Urban Area	UK0021	OK (m)	OK (m)
Blackpool Urban Area	UK0022	OK (m)	OK (m)
Preston Urban Area	UK0023	OK (m)	OK (m)
Glasgow Urban Area	UK0024	OK	OK
Edinburgh Urban Area	UK0025	OK	OK
Cardiff Urban Area	UK0026	OK (m)	OK (m)
Swansea Urban Area	UK0027	OK	OK
Belfast Urban Area	UK0028	OK (m)	OK (m)
Eastern	UK0029	OK	OK
South West	UK0030	OK	OK
South East	UK0031	OK	OK
East Midlands	UK0032	OK	OK
North West & Merseyside	UK0033	OK	OK
Yorkshire & Humberside	UK0034	OK	OK
West Midlands	UK0035	OK (m)	OK (m)
North East	UK0036	OK	OK
Central Scotland	UK0037	OK	OK
North East Scotland	UK0038	OK	OK
Highland	UK0039	OK	OK
Scottish Borders	UK0040	OK (m)	OK (m)
South Wales	UK0041	OK	OK
North Wales	UK0042	OK	OK
Northern Ireland	UK0043	OK	OK

**Note: The UK has been granted a time extension to achieve compliance with the daily mean limit value for PM_{10} in Greater London Urban Area. Consequently, the maximum margin of tolerance is in force for the duration of the extension.*

Prior to the subtraction of natural source contribution the West Midlands (UK0002) exceeded the daily mean limit value on more than the permitted 35 occasions: no time extension is in force. However, subtraction of the contribution from natural sources reduced the number of exceedances of this limit value from 37 to 31 which is within the permitted maximum. Natural sources have only been subtracted for zones UK0001 and UK0002 in this table.

LV = limit value, MOT = margin of tolerance, (m) indicates that the compliance or exceedance was determined by modelling.

Table 3-3 Results of Air Quality Assessment for $PM_{2.5}$ in 2011 After Subtraction of Contribution from Natural Sources.

Zone	Zone code	$PM_{2.5}$ target value (annual mean)	$PM_{2.5}$ Stage 1 limit value (annual mean, for 1st Jan 2015)	$PM_{2.5}$ Stage 2 limit value (annual mean, for 1st Jan 2020)
Greater London Urban Area	UK0001	OK	OK	> LV
West Midlands Urban Area	UK0002	OK	OK	OK (m)
Greater Manchester Urban Area	UK0003	OK	OK	OK
West Yorkshire Urban Area	UK0004	OK	OK	OK
Tyneside	UK0005	OK	OK	OK
Liverpool Urban Area	UK0006	OK	OK	OK
Sheffield Urban Area	UK0007	OK	OK	OK
Nottingham Urban Area	UK0008	OK	OK	OK
Bristol Urban Area	UK0009	OK	OK	OK
Brighton/Worthing/Littlehampton	UK0010	OK	OK	OK
Leicester Urban Area	UK0011	OK	OK	OK
Portsmouth Urban Area	UK0012	OK	OK	OK
Teesside Urban Area	UK0013	OK	OK	OK
The Potteries	UK0014	OK	OK	OK
Bournemouth Urban Area	UK0015	OK	OK	OK
Reading/Wokingham Urban Area	UK0016	OK	OK	OK
Coventry/Bedworth	UK0017	OK (m)	OK (m)	OK (m)
Kingston upon Hull	UK0018	OK	OK	OK
Southampton Urban Area	UK0019	OK	OK	OK
Birkenhead Urban Area	UK0020	OK	OK	OK
Southend Urban Area	UK0021	OK (m)	OK (m)	OK (m)
Blackpool Urban Area	UK0022	OK (m)	OK (m)	OK (m)
Preston Urban Area	UK0023	OK	OK	OK
Glasgow Urban Area	UK0024	OK	OK	> LV
Edinburgh Urban Area	UK0025	OK	OK	OK
Cardiff Urban Area	UK0026	OK (m)	OK (m)	OK (m)
Swansea Urban Area	UK0027	OK	OK	OK
Belfast Urban Area	UK0028	OK	OK	OK
Eastern	UK0029	OK	OK	OK
South West	UK0030	OK	OK	OK
South East	UK0031	OK	OK	OK
East Midlands	UK0032	OK	OK	OK
North West & Merseyside	UK0033	OK	OK	OK
Yorkshire & Humberside	UK0034	OK (m)	OK (m)	OK (m)
West Midlands	UK0035	OK (m)	OK (m)	OK (m)
North East	UK0036	OK	OK	OK
Central Scotland	UK0037	OK	OK	OK
North East Scotland	UK0038	OK	OK	OK
Highland	UK0039	OK	OK	OK
Scottish Borders	UK0040	OK (m)	OK (m)	OK (m)
South Wales	UK0041	OK	OK	OK
North Wales	UK0042	OK	OK	OK
Northern Ireland	UK0043	OK (m)	OK (m)	OK (m)

Prior to subtraction of natural source contribution, the West Midlands Urban Area exceeded the Stage 2 limit value (to be met by 1st Jan 2020). Subtraction of natural $PM_{2.5}$ reduced the (modelled) annual mean $PM_{2.5}$ concentration to within the stage 2 limit value. Natural sources have only been subtracted for zones UK0001, UK0002 and UK0024 in this table.

LV = limit value, (m) indicates that the compliance or exceedance was determined by modelling.

Table 3-4 Results of Air Quality Assessment for Ozone in 2011

Zone	Zone code	O_3 TV and LTO for health (8hr mean)	O_3 TV and LTO for vegetation (AOT40)
Greater London Urban Area	UK0001	Met TV, >LTO	Met TV, >LTO
West Midlands Urban Area	UK0002	Met TV, >LTO	OK
Greater Manchester Urban Area	UK0003	Met TV, >LTO	OK
West Yorkshire Urban Area	UK0004	Met TV, >LTO (m)	OK
Tyneside	UK0005	Met TV, >LTO (m)	OK
Liverpool Urban Area	UK0006	Met TV, >LTO	OK
Sheffield Urban Area	UK0007	Met TV, >LTO (m)	OK
Nottingham Urban Area	UK0008	Met TV, >LTO (m)	OK
Bristol Urban Area	UK0009	Met TV, >LTO	OK
Brighton/Worthing/Littlehampton	UK0010	Met TV, >LTO	OK (m)
Leicester Urban Area	UK0011	Met TV, >LTO	OK
Portsmouth Urban Area	UK0012	Met TV, >LTO	OK
Teesside Urban Area	UK0013	Met TV, >LTO (m)	OK
The Potteries	UK0014	Met TV, >LTO	OK
Bournemouth Urban Area	UK0015	Met TV, >LTO	OK
Reading/Wokingham Urban Area	UK0016	Met TV, >LTO	OK
Coventry/Bedworth	UK0017	Met TV, >LTO	OK
Kingston upon Hull	UK0018	Met TV, >LTO (m)	OK
Southampton Urban Area	UK0019	Met TV, >LTO (m)	OK
Birkenhead Urban Area	UK0020	Met TV, >LTO	OK
Southend Urban Area	UK0021	Met TV, >LTO (m)	OK (m)
Blackpool Urban Area	UK0022	Met TV, >LTO	OK
Preston Urban Area	UK0023	Met TV, >LTO	OK
Glasgow Urban Area	UK0024	Met TV, >LTO (m)	OK
Edinburgh Urban Area	UK0025	Met TV, >LTO (m)	OK
Cardiff Urban Area	UK0026	Met TV, >LTO (m)	OK
Swansea Urban Area	UK0027	Met TV, >LTO	OK
Belfast Urban Area	UK0028	Met TV, >LTO (m)	OK
Eastern	UK0029	Met TV, >LTO	Met TV, >LTO
South West	UK0030	Met TV, >LTO	OK
South East	UK0031	Met TV, >LTO	OK
East Midlands	UK0032	Met TV, >LTO	Met TV, >LTO (m)
North West & Merseyside	UK0033	Met TV, >LTO	OK
Yorkshire & Humberside	UK0034	Met TV, >LTO	OK
West Midlands	UK0035	Met TV, >LTO	OK
North East	UK0036	Met TV, >LTO	OK
Central Scotland	UK0037	Met TV, >LTO	OK
North East Scotland	UK0038	Met TV, >LTO	OK
Highland	UK0039	Met TV, >LTO	OK
Scottish Borders	UK0040	Met TV, >LTO	OK
South Wales	UK0041	Met TV, >LTO	OK
North Wales	UK0042	Met TV, >LTO	OK
Northern Ireland	UK0043	Met TV, >LTO	OK

TV = target value, LTO = long-term objective. (m) indicates that the compliance or exceedance was determined by modelling.

Measured exceedances of limit values, target values, long term objectives, information thresholds and alert thresholds are also listed within the annual air quality assessment questionnaire. Summary statistics for the exceedances identified at specific monitoring sites are provided in Table 3-5 to Table 3-9.

Table 3-5 Measured Exceedances of the NO_2 Limit Value for Health (1 hour mean)

Site name	Zone code	Number of 1-hour exceedances of LV	Maximum 1-hour concentration ($\mu g\ m^{-3}$)
Camden Kerbside	UK0001	77	342
London Marylebone Road	UK0001	229	304
Glasgow Kerbside	UK0024	31	260
Oxford Centre Roadside	UK0031	35	279

Table 3-6 Measured Exceedances of the NO_2 Limit Value for Health (annual mean)

Site name	Zone code	Annual mean concentration ($\mu g\ m^{-3}$)
Camden Kerbside	UK0001	72
London Bloomsbury	UK0001	50
London Cromwell Road 2	UK0001	66
London Hillingdon	UK0001	55
London Marylebone Road	UK0001	97
London Westminster	UK0001	41
Tower Hamlets Roadside	UK0001	57
Birmingham Tyburn Roadside	UK0002	45
Manchester Piccadilly	UK0003	44
Leeds Headingley Kerbside	UK0004	44
Glasgow Kerbside	UK0024	72
Bath Roadside	UK0030	57
Oxford Centre Roadside	UK0031	61
Aberdeen Union Street Roadside	UK0038	44

Table 3-7 Measured Exceedances of the Ozone Information Threshold Value

Site name	Zone code	Number of 1-hour exceedances of alert threshold	Maximum 1-hour concentration ($\mu g\ m^{-3}$)
No exceedances	-	-	-

Table 3-8 Measured Exceedances of the Ozone Alert Threshold Value

Site name	Zone code	Number of 1-hour exceedances of information threshold	Maximum 1-hour concentration ($\mu g\ m^{-3}$)
No exceedances	-	-	-

Table 3-9 Measured Exceedances of the Ozone Long Term Objective for Health Protection

Site name	Zone code	Number of days with exceedances	Maximum 8-hour concentration ($\mu g\ m^{-3}$)
London Eltham	UK0001	3	127
London Harlington	UK0001	3	133
London N. Kensington	UK0001	6	138
London Teddington	UK0001	15	160
London Westminster	UK0001	1	122
Sandwell West Bromwich	UK0002	2	136
Liverpool Speke	UK0006	4	139
Bristol St Paul's	UK0009	2	128
Reading New Town	UK0016	3	133
Port Talbot Margam	UK0027	2	141
Sibton	UK0029	6	138
St Osyth	UK0029	1	122
Weybourne	UK0029	10	147
Wicken Fen	UK0029	3	153
Charlton Mackrell	UK0030	6	143
Yarner Wood	UK0030	4	148
Harwell	UK0031	3	138
Bottesford	UK0032	3	125
Ladybower	UK0032	4	131
Northampton	UK0032	9	153
Glazebury	UK0033	3	144
High Muffles	UK0034	5	166
Coventry Memorial Park	UK0017	3	121
Leamington Spa	UK0035	5	134
Leominster	UK0035	3	132
Auchencorth Moss	UK0037	2	125
Eskdalemuir	UK0040	2	148
Peebles	UK0040	2	141
Cwmbran	UK0041	1	124
London Haringey	UK0001	5	143
Manchester South	UK0003	4	144
Salford Eccles	UK0003	1	132
Brighton Preston Park	UK0010	7	146
Leicester Centre	UK0011	1	121
Portsmouth	UK0012	1	124
Stoke-on-Trent Centre	UK0014	1	124
Bournemouth	UK0015	3	132
Wirral Tranmere	UK0020	3	131
Blackpool Marton	UK0022	3	152
Preston	UK0023	1	137
Thurrock	UK0029	3	132
Canterbury	UK0031	6	140
Lullington Heath	UK0031	7	132
Rochester Stoke	UK0031	3	144
Wigan Centre	UK0033	4	143
Sunderland Silksworth	UK0036	2	128
Aberdeen	UK0038	2	131
Fort William	UK0039	2	158
Lerwick	UK0039	4	132
Strathvaich	UK0039	2	150
Narberth	UK0041	1	133
Aston Hill	UK0042	5	133
Mold	UK0042	1	123
Derry	UK0043	1	130
Lough Navar	UK0043	3	123

3.2 Fourth Daughter Directive 2004/107/EC

The results of the air quality assessment for arsenic (As), cadmium (Cd), nickel (Ni) and benzo[a]pyrene (B[a]P) for each zone are presented in Form 9b of the Questionnaire, and illustrated in Table 3-10.

All zones and agglomerations met the target values for arsenic and cadmium. Two zones (Swansea Urban Area and the South Wales zone) exceeded the target value for nickel. Concentrations of B[a]P were above the target value in seven zones (Teesside Urban Area, Swansea Urban Area, Belfast Urban Area, Yorkshire and Humberside, the North East, South Wales and Northern Ireland). All the remaining zones were compliant with the target value for B[a]P.

Table 3-10 Results of Air Quality Assessment for As, Cd, Ni and benzo[a]pyrene in 2011

Zone	Zone code	As TV	Cd TV	Ni TV	B[a]P TV
Greater London Urban Area	UK0001	OK	OK	OK	OK
West Midlands Urban Area	UK0002	OK	OK	OK	OK
Greater Manchester Urban Area	UK0003	OK	OK	OK	OK
West Yorkshire Urban Area	UK0004	OK (m)	OK (m)	OK (m)	OK
Tyneside	UK0005	OK (m)	OK (m)	OK (m)	OK
Liverpool Urban Area	UK0006	OK (m)	OK (m)	OK (m)	OK
Sheffield Urban Area	UK0007	OK	OK	OK	OK (m)
Nottingham Urban Area	UK0008	OK (m)	OK (m)	OK (m)	OK (m)
Bristol Urban Area	UK0009	OK (m)	OK (m)	OK (m)	OK (m)
Brighton/Worthing/Littlehampton	UK0010	OK (m)	OK (m)	OK (m)	OK
Leicester Urban Area	UK0011	OK (m)	OK (m)	OK (m)	OK (m)
Portsmouth Urban Area	UK0012	OK (m)	OK (m)	OK (m)	OK (m)
Teesside Urban Area	UK0013	OK	OK	OK	> TV (m)
The Potteries	UK0014	OK (m)	OK (m)	OK (m)	OK (m)
Bournemouth Urban Area	UK0015	OK (m)	OK (m)	OK (m)	OK (m)
Reading/Wokingham Urban Area	UK0016	OK (m)	OK (m)	OK (m)	OK (m)
Coventry/Bedworth	UK0017	OK (m)	OK (m)	OK (m)	OK (m)
Kingston upon Hull	UK0018	OK (m)	OK (m)	OK (m)	OK (m)
Southampton Urban Area	UK0019	OK (m)	OK (m)	OK (m)	OK (m)
Birkenhead Urban Area	UK0020	OK (m)	OK (m)	OK (m)	OK (m)
Southend Urban Area	UK0021	OK (m)	OK (m)	OK (m)	OK (m)
Blackpool Urban Area	UK0022	OK (m)	OK (m)	OK (m)	OK (m)
Preston Urban Area	UK0023	OK (m)	OK (m)	OK (m)	OK (m)
Glasgow Urban Area	UK0024	OK	OK	OK	OK
Edinburgh Urban Area	UK0025	OK (m)	OK (m)	OK (m)	OK
Cardiff Urban Area	UK0026	OK	OK	OK	OK
Swansea Urban Area	UK0027	OK	OK	> TV	> TV (m)
Belfast Urban Area	UK0028	OK	OK	OK	> TV (m)
Eastern	UK0029	OK	OK	OK	OK
South West	UK0030	OK	OK	OK	OK (m)
South East	UK0031	OK	OK	OK	OK
East Midlands	UK0032	OK (m)	OK (m)	OK (m)	OK
North West & Merseyside	UK0033	OK	OK	OK	OK
Yorkshire & Humberside	UK0034	OK	OK	OK	> TV
West Midlands	UK0035	OK (m)	OK (m)	OK (m)	OK (m)
North East	UK0036	OK	OK	OK	> TV (m)
Central Scotland	UK0037	OK	OK	OK	OK
North East Scotland	UK0038	OK	OK	OK	OK (m)
Highland	UK0039	OK (m)	OK (m)	OK (m)	OK
Scottish Borders	UK0040	OK	OK	OK	OK (m)
South Wales	UK0041	OK	OK	> TV (m)	> TV (m)
North Wales	UK0042	OK (m)	OK (m)	OK (m)	OK (m)
Northern Ireland	UK0043	OK (m)	OK (m)	OK (m)	> TV

TV = Target Value, (m) indicates that the compliance or exceedance was determined by modelling.

4 Comparison with Previous Years

Table 4-1 to Table 4-6 summarise the results of the air quality assessment for 2011 and provide a comparison with the results of the assessments carried out in previous years. In Table 4-2, "n/a" (not applicable) indicates that there was no applicable margin of tolerance for the specified year.

Table 4-1 (Part 1 of 2) Exceedances of Limit Values for Ambient Air Quality Directive (1st and 2nd Daughter Directives prior to 2008)

Pollut-ant	Averag-ing time	2011	2010	2009	2008	2007	2006	2005	2004	2003	2002	2001
SO_2	1-hour	None	None	None	None	None	1 zone modelled (Eastern)	1 zone modelled (Eastern)	1 zone modelled (Eastern)	1 zone modelled (Eastern)	None	None
SO_2	24-hour[i]	None	None	None	None	None	1 zone modelled (Eastern)	1 zone modelled (Eastern)	None	1 zone modelled (Eastern)	None	1 Zone measured (Belfast Urban Area)
SO_2	Annual[ii]	None	None	None	None	None	None	None	None	None	None	None
SO_2	Winter[ii]	None	None	None	None	None	None	None	None	None	None	not assessed
NO_2	1-hour[iii]	3 zones measured (London, Glasgow, South East)	3 zones measured (London, Teesside, Glasgow)	2 zones measured (London, Glasgow)	3 zones measured (London, Glasgow, NE Scotland)	2 zones measured (London, Glasgow)	1 zone measured (Greater London Urban Area)	2 zones measured (London, Bristol)	1 zone measured (Greater London Urban Area)	3 zones measured (London, Glasgow, South East)	1 zone measured (Glasgow Urban Area)	4 zones measured
NO_2	Annual[i]	40 zones (8 measured, + 32 modelled)	40 zones (11 measured + 29 modelled)	40 zones (9 measured + 31 modelled)	40 zones (10 measured + 30 modelled)	41 zones (8 measured + 33 modelled)	39 zones (7 measured + 32 modelled)	38 zones (8 measured + 30 modelled)	39 zones (9 measured + 30 modelled)	42 zones (10 measured + 32 modelled)	36 zones (6 measured + 30 modelled)	38 zones (6 measured + 32 modelled)
NO_x	Annual[ii]	None	None	None	None	None	None	None	None	None	None	None

[i] No MOT defined except where a time extension has been granted, LV + MOT = LV
[ii] Applies to vegetation and ecosystem areas only. Critical Levels are already in force, no MOT.
[iii] No modelling for 1-hour LV.

Table 4-1 is continued on next page.

Table 4-1 (Part 2 of 2) Exceedances of Limit Values for Ambient Air Quality Directive (1st and 2nd Daughter Directives prior to 2008)

Pollut-ant	Averag-ing time	2011	2010	2009	2008	2007	2006	2005	2004	2003	2002	2001
PM_{10}	Daily	1 (modelled, after subtraction of natural contrib.: time ext. granted.)	1 (modelled, after subtraction of natural contrib.: time ext. granted.)	3 zones (1 measured + 2 modelled) *1 zone modelled after subtraction of natural contribution*	2 zones (1 measured + 1 modelled) *1 zone measured after subtraction of natural contribution*	6 zones (3 measured + 3 modelled)	30 zones (5 measured + 25 modelled)	29 zones (3 measured + 26 modelled)	27 zones (2 measured + 25 modelled)	33 zones (10 measured + 23 modelled)	18 zones (1 measured + 17 modelled)	26 zones (5 measured + 21 modelled)
PM_{10}	Annual	None	None	None	None	1 zone measured (Greater London Urban Area)	2 zones (1 measured + 1 modelled)	4 zones (1 measured + 3 modelled)	2 zones (1 measured, London + 1 modelled, West Midlands Urban Area)	15 zones (1 measured + 14 modelled)	2 zones (Greater London Urban Area measured, Eastern modelled)	2 zones (London measured, Manchester modelled)
Lead	Annual	None	None	None	None	None	None	None	None	None	None	None
Benz-ene	Annual	None	None	None	None	None	1 zone modelled (Yorkshire & H'side)	2 zones modelled (Yorkshire & H'side, Central Scotland)	None	1 zone modelled (Greater London Urban Area)	not assessed	not assessed
CO	8-hour	None	None	None	None	None	None	None	None	None	not assessed	not assessed

The UK has been compliant with the limit values for both lead and CO since 2003, and for benzene since 2007.

Table 4-2 Exceedances of Limit Values plus Margins Of Tolerance (where applicable) for Ambient Air Quality Directive (1st and 2nd Daughter Directives prior to 2008). (This table only shows limit values that have been exceeded during 2001-2011).

Pollutant	Averaging time	2011	2010	2009	2008	2007	2006	2005	2004	2003	2002	2001
SO_2	1-hour	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1 zone modelled (Eastern)	1 zone modelled (Eastern)	None	None
SO_2	24-hour	n/a	n/a	n/a	n/a	n/a	n/a	n/a	None	1 zone modelled (Eastern)	None	1 zone measured (Belfast Urban Area)
NO_2	1-hour[i]	n/a	n/a	2 zones measured (London, Glasgow)	2 zones measured (London, Glasgow)	1 zone measured (Greater London Urban Area)	1 zone measured (Greater London Urban Area)	1 zone measured (Greater London Urban Area)	1 zone measured (Greater London Urban Area)	1 zone measured (Greater London Urban Area)	None	None
NO_2	Annual	4, all modelled (MOT in place due to TEN).	n/a	40 zones (9 measured + 31 modelled)	40 zones (7 measured + 33 modelled)	39 zones (6 measured + 33 modelled)	38 zones (6 measured + 32 modelled)	35 zones (6 measured + 29 modelled)	34 zones (6 measured + 28 modelled)	35 zones (5 measured + 30 modelled)	19 Zones (5 measured + 14 modelled)	21 Zones (4 measured + 17 modelled)
PM_{10}	Daily	None	None	None	None	None	None	None	19 zones (1 measured + 18 modelled)	18 zones (2 measured + 16 modelled)	1 zone modelled (Greater London Urban Area)	1 zone modelled (Greater London Urban Area)
PM_{10}	Annual	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1 zone modelled (Gr. London Urban Area)	10 zones (1 measured + 9 modelled)	1 zone modelled (Gr. London Urban Area)	1 zone modelled (Gr.London Urban Area)
Benzene	Annual	n/a	n/a	None	None	None	None	None	None	None	not assessed	not assessed

[i] No modelling for 1-hour LV

Table 4-3 Ambient Air Quality Directive (3rd Daughter Directive prior to 2008) Target Values

Pollutant	Averaging time	2011	2010	2009	2008	2007	2006	2005	2004
O_3	8-hour	None	None	None	1 zone measured (Eastern)	None	None	None	None
O_3	AOT40	None	None	None	None	None	None	None	None

Table 4-4 Ambient Air Quality Directive (3rd Daughter Directive prior to 2008) Long Term Objectives

Pollutant	Averaging time	2011	2010	2009	2008	2007	2006	2005	2004
O_3	8-hour	43 zones (31 measured + 12 modelled)	41 zones (19 measured + 22 modelled)	39 zones (25 measured + 14 modelled)	43 zones (35 measured + 8 modelled)	41 zones (24 measured + 17 modelled)	43 zones (41 measured + 2 modelled)	37 zones (22 measured + 15 modelled)	43 zones (36 measured + 7 modelled)
O_3	AOT40	3 zones (2 measured + 1 modelled)	6 zones (3 measured + 3 modelled)	10 zones (8 measured + 2 modelled)	41 zones (25 measured + 16 modelled)	3 zones (1 measured + 2 modelled)	41 zones (32 measured + 9 modelled)	16 zones (9 measured + 7 modelled)	7 zones (5 measured + 2 modelled)

Table 4-5 4th Daughter Directive Target Values

Pollutant	Averaging time	2011	2010	2009	2008	2007
As	Annual	None	None	None	None	None
Cd	Annual	None	None	None	None	None
Ni	Annual	2 zones, 1 measured 1 modelled (Swansea, S Wales)	2 zones modelled (Swansea, S Wales)	2 zones modelled (Swansea, S Wales)	2 zones modelled (Swansea, S Wales, measured at non-network site, so reported as m)	1 zone (Swansea Urban area, measured but low data capture, so reported as m)
B[a]P	Annual	7 zones (2 measured; Yorkshire & Humberside, N Ireland, + 5 modelled; Teesside, Swansea, Belfast, North East, South Wales)	8 zones, (2 zones measured: Yorkshire & Humberside, N Ireland + 6 zones modelled; Teesside, Belfast, W Midlands, North East, S Wales, N Wales.)	6 zones, (2 zones measured Yorkshire & Humberside, N Ireland + 4 zones modelled Teesside, Swansea, North East, S Wales)	6 zones, (3 zones measured Yorkshire & Humberside, Teesside, N Ireland + 3 zones modelled Swansea, S Wales, Belfast)	1 zone measured (Yorkshire & Humberside)

Table 4-6 Ambient Air Quality Directive Target Value for $PM_{2.5}$

Pollutant	Averaging time	2011	2010	2009
$PM_{2.5}$	Annual	None	None	None

References

[1] European Parliament and Council of the European Union (2008) "*Council Directive on ambient air quality and cleaner air for Europe (2008/50/EC)".* [online]. Available at http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32008L0050:EN:NOT (Accessed 31 July 2012)

[2] European Parliament and Council of the European Union (2004) "*Directive 2004/107/EC of the European Parliament and of the Council of 15 December 2004 relating to arsenic, cadmium, mercury, nickel and polycyclic aromatic hydrocarbons in ambient air"*. [online]. Available at http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32004L0107:EN:NOT, (Accessed 31 Jul 2012)

[3] European Parliament and Council of the European Union (1996) "*Directive 96/62/EC on Ambient Air Quality Assessment and Management"*. [online]. Available at http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31996L0062:EN:NOT (Accessed 31 July 2012)

[4] European Parliament and Council of the European Union (1999) "*Council Directive 1999/30/EC of 22 April 1999 relating to limit values for sulphur dioxide, nitrogen dioxide and oxides of nitrogen, particulate matter and lead in ambient air".* [online]. Available at http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31999L0030:EN:NOT (Accessed 31 July 2012)

[5] European Parliament and Council of the European Union (2000) "*Directive 2000/69/EC of the European Parliament and of the Council of 16 November 2000 relating to limit values for benzene and carbon monoxide in ambient air".* [online]. Available at http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32000L0069:EN:NOT (Accessed 31 July 2012)

[6] European Parliament and Council of the European Union (2002) "*Directive 2002/3/EC of the European Parliament and of the Council of 12 February 2002 relating to ozone in ambient air".* [online]. Available at http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32002L0003:EN:NOT (Accessed 31 July 2012)

[7] European Parliament and Council of the European Union (1997) "*Council Decision 97/101/EC"*. [online]. Available at http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31997D0101:EN:NOT (Accessed 18 Jul 2012).

[8] Brookes, D. M. et al., (in preparation) *"Technical report on UK supplementary assessment under the Air Quality Directive (2008/50/EC), the Air Quality Framework Directive (96/62/EC) and Fourth Daughter Directive (2004/107/EC) for 2011"*. AEA report number AEA/ENV/R/3316. (To be made available on UK-AIR at http://uk-air.defra.gov.uk/library)