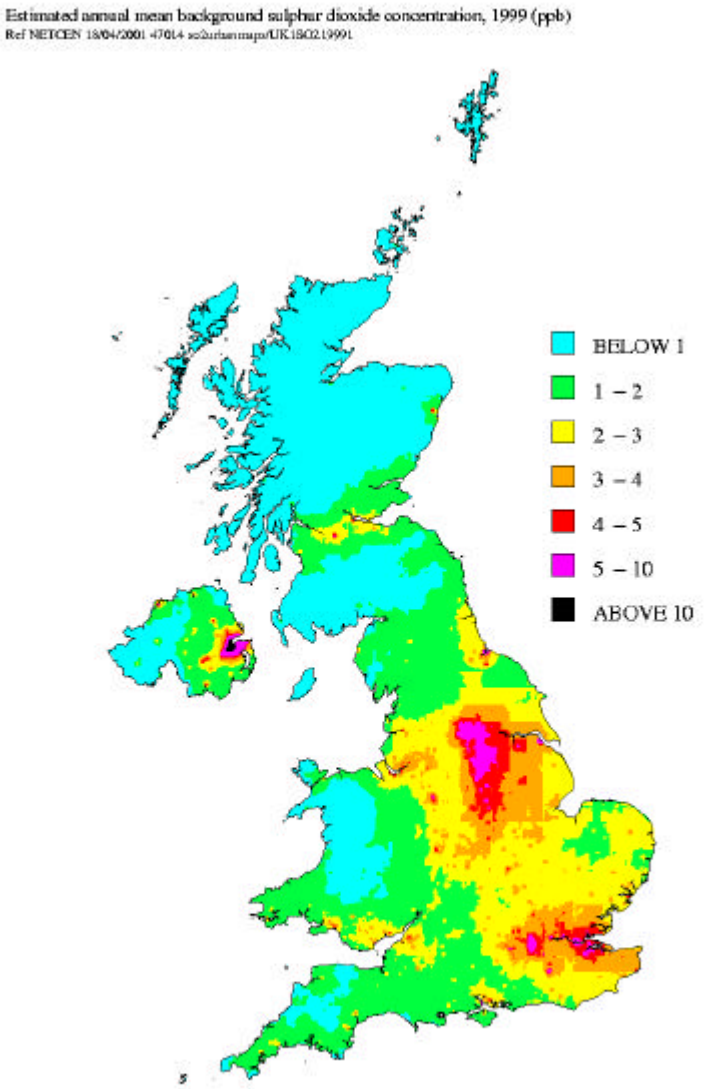
Rural Sulphur Dioxide Monitoring in the UK: 1999



July 2001

AEAT/ENV/R/0463 Issue 1

Rural Sulphur Dioxide Monitoring in the UK: 1999

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July 2001

Title	Rural Sulphur Dioxide Monitoring in the UK: 1999
Customer	CEH/DETR
Customer reference	TO 7078D1/*Acid Deposition Processes* (EPG 1/3/94).
Confidentiality, copyright and reproduction	
File reference	J:\EQ\Acidrain\SO2\SO21999\99SO2datareport_v3.doc
Report number	AEAT/ENV/R/0463
Report status	Issue 1

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Executive Summary

Sulphur deposition is known to have acidifying effects on freshwater, soils and vegetation. For these effects to be assessed the total sulphur deposition must be estimated from both its wet and dry deposition pathways. The Department of the Environment, Transport and the Regions has placed a contract with the Centre for Ecology and Hydrology at Edinburgh (CEH) on *Acid Deposition Processes* (EPG 1/3/94) to quantify *inter alia* the wet and dry deposition budgets of sulphur for the United Kingdom.

As part of this contract, AEA Technology was subcontracted to operate and manage the UK Rural Sulphur Dioxide Monitoring Network. This network provides monthly and annually-averaged concentrations of SO_2, which are subsequently used to produce concentration maps for the UK. The dry sulphur deposition across the UK is then derived by CEH by combining the sulphur dioxide (SO_2) concentration field with estimated deposition velocities.

This report provides a complete dataset of the 1999 measurements for all sites in the UK Rural Sulphur Dioxide Monitoring Network. The measurement data have already been provided to CEH for interpretation and further analysis as part of its programme of work under the Acid Deposition Processes contract.

Maps of the annual and monthly mean sulphur dioxide (SO_2) concentration fields have been derived for the UK. The spatial distribution of SO_2 is similar to that observed in previous years with the highest concentrations in the Yorkshire/Nottinghamshire and Thames estuary areas, where monitoring sites are located closer to the major UK SO_2 sources. The 1999 measurements show that SO_2 concentrations have continued to decline in rural areas, a trend which has been observed since the establishment of the network in the early 1990s. The trend for sites closest to emission sources is consistent with the reduction in UK SO_2 emissions calculated over this period.

The concentrations now being measured at some of the sites in the monitoring networks (*i.e.*, the UK Acid Deposition Monitoring networks and the UK Rural Sulphur Dioxide Monitoring network), especially the daily sites in remote areas, are at or below the Limit of Detection of the bubbler method. This will make it more difficult to determine reliable trends and could compromise the application of the monitoring data, for example, in identifying the cause of the non-linear response of ambient concentrations to change in emissions at such sites. A change in sampling method is required which will provide a lower Limit of Detection while retaining data integrity and consistency. A method intercomparison exercise was undertaken in collaboration with CEH at the Auchencorth Moss site near Edinburgh between September 1998 and May 1999 to evaluate potential replacement methods.

The measurements obtained and the subsequent analysis indicated that:

- the existing 8-port bubbler measurements were in excellent agreement with those from the UVF analyser;
- the weekly bubbler and the 'long inlet' denuder measurements showed the same temporal behaviour as observed by the UV-F instrument, although the absolute magnitudes were generally lower;

- the filter pack and 'short inlet' denuder measurements showed a near-perfect 1:1 correlation with the UV-F measurements for the limited set of samples considered;
- the diffusion tube measurements were in poor agreement with the UV-F measurements.

On the basis of the intercomparison exercise, the choice of methods to replace the bubbler method was limited to the denuder or the filter pack methods on the grounds of cost, improved sensitivity, method robustness, ease of operation and the quality of the measurements. For practical reasons, the bubbler method will be replaced with the filter pack method. The filter pack method will be introduced into the monitoring network from April 2001.

Contents

Appendices

1 Introduction

Sulphur deposition is known to have acidifying effects on freshwater, soils and vegetation. For these effects to be assessed the total sulphur deposition must be estimated from both its wet and dry deposition pathways. The Department of the Environment, Transport and the Regions has placed a contract with the Centre for Ecology and Hydrology at Edinburgh (CEH) on *Acid Deposition Processes* (EPG 1/3/94) to quantify *inter alia* the wet and dry deposition budgets of sulphur for the United Kingdom.

As part of this contract, AEA Technology was subcontracted to operate and manage the UK Rural Sulphur Dioxide Monitoring Network. This network provides monthly and annually-averaged concentrations of SO_2, which are subsequently used to produce concentration maps for the UK. The dry sulphur deposition across the UK is then derived by CEH by combining the sulphur dioxide (SO_2) concentration field with estimated deposition velocities.

This report provides a complete dataset of the 1999 measurements for all sites in the UK Rural Sulphur Dioxide Monitoring Network. The measurement data have already been provided to CEH for interpretation and further analysis as part of its programme of work under the Acid Deposition Processes contract. The format of this report follows that used to report the measurements made in previous years [Hasler and Downing, 1998; Hasler *et al.*, 2001; Hayman *et al.*, 2001].

The concentrations now being measured at some of the sites in the monitoring networks (*i.e.*, the UK Acid Deposition Monitoring networks and the UK Rural Sulphur Dioxide Monitoring network), especially the daily sites in remote areas, are at or below the Limit of Detection of the bubbler method. This will make it more difficult to determine reliable trends and could compromise the application of the monitoring data, for example, in identifying the cause of the non-linear response of ambient concentrations to change in emissions at such sites. A change in sampling method is required which will provide a lower Limit of Detection while retaining data integrity and consistency. An intercomparison exercise was undertaken in collaboration with CEH at the Auchencorth Moss site near Edinburgh between September 1998 and May 1999 to evaluate potential replacement methods. A summary of the intercomparison exercise and the results obtained is presented in Section 4 of this report. More details are provided in Hasler *et al.* [2000].

2 Network and Sampling Details

2.1 THE MONITORING SITES

In 1999, the Rural Sulphur Dioxide Monitoring Network comprised 29 sites at which concentrations of SO_2 were measured on a weekly basis and one site (Bush) at which daily measurements were made. Siting criteria and individual site assessment are given in Downing and Campbell [1995]. In general, all the monitoring sites are located in rural areas which are largely unaffected by local domestic and industrial sources.

The main focus of this report is to provide a summary of the measurements made in the Rural Sulphur Dioxide Monitoring Network in 1999 and to present the concentration field of SO_2 derived for the UK. The concentration field is however significantly improved by including data which have been obtained in other SO_2 monitoring networks. These include:

(i) The two bubbler sites funded by the National Assembly for Wales which are sampled weekly, and managed by NETCEN.

(ii) The fifteen continuous monitoring sites operated as part of the Joint Environment Programme (JEP) of the power generating companies. The sites are located in Yorkshire (8 sites) Nottinghamshire (2 sites) and the Thames Estuary (5 sites).

(iii) Six of the continuous monitoring sites from the Automatic Rural Network.

(iv) The two continuous monitoring sites operated by CEH at Sutton Bonnington and Auchencorth Moss.

The sampling sites and their locations are presented in Figure 1 and listed in Table 1.

2.2 SITE CHANGES WITHIN THE NETWORK IN 1999

The site at Garrary (5340) was relocated to Benniguinea (5343) in early August 1999 as the building housing the equipment at Garrary was required for another use. Benniguinea is about 5km to the south east of Garrary and is largely surrounded by coniferous forest.

As part of the intercomparison exercise held between September 1998 and June 1999 [Hasler *et al.*, 2000], daily and weekly bubblers were installed and operated at Auchencorth Moss (coded as 5341 and 5342 respectively), in addition to the existing UV-F automatic analyser.

2.3 THE SAMPLING TECHNIQUE

The hydrogen peroxide bubbler [Downing and Campbell, 1995] is used as the sampling technique within the Rural SO_2 Monitoring network. Air is drawn successively through a filter to remove any particulate matter (including particulate sulphate) and a hydrogen peroxide solution, where sulphur dioxide is absorbed and oxidised to sulphate. The sulphate concentration in the solution is determined by ion chromatography. The ambient concentration

Table 1 - Rural SO_2 Sampling Sites in the United Kingdom.

Site Code	Site Name	Easting	Northing	Network and Measurement Technique
5002	Eskdalemuir	3235	6030	UK Acid Deposition
5004	Stoke Ferry	5700	2988	Monitoring Networks
5006	Lough Navar	192	5212	- *8-port bubbler*
5007	Barcombe Mills	5437	1149	- *daily measurements*
5008	Yarner Wood	2786	789	
5009	High Muffles	4776	4939	
5010	Strathvaich Dam	2347	8750	
5011	Glen Dye	3642	7864	
5301	Brockhill 1	4002	2702	UK Rural SO_2 Monitoring
5303	Caenby 1	4993	3900	Network
5304	Camborne 1	1628	407	- *8-port bubbler*
5305	Camphill 1	2274	6546	- *single-port bubbler*
5306	Cardington 2 *(1)*	5082	2464	- *weekly measurements*
5308	Corpach 1	2054	7782	
5309	Cresselly 1	2064	2062	
5310	Etton 1	4980	4445	
5312	Husborne Crawley 1	4964	2361	
5313	Little Horkesley 1	5971	2312	
5314	Marshfield 1	3255	1830	
5315	Ratcliffe 13	4408	3278	
5316	Rockbourne 1	4116	1181	
5317	Wakefield 24	4352	4132	
5318	Waunfawr 1	2533	3607	
5319	Fort Augustus 2	2366	8091	
5320	Loch Leven 2	3159	6990	
5321	Redesdale 2	3833	5961	
5322	Hebden Bridge 2	4011	4327	
5323	Preston Montford 2	3432	3143	
5324	Bentra	1587	5459	
5325	Pitlochry	2918	7599	
5326	Bush	3246	6638	
5329	Cam Forest	1070	5785	
5330	Cwmystwyth	2774	2745	
5331	Rosemaund	3564	2476	
5333	Fairseat	5622	1615	
5338	Forsinain	2906	9486	
5339	Appleacre	3665	5208	
5340	Garrary	2531	5790	*Site relocated to Benniguinea*
5343	Benniguinea	2570	5772	*Site installed in August 1999*

Site Code	Site Name	Easting	Northing	Network and Measurement Technique
5334	Bylchau	2959	3596	Welsh Rural SO_2 Network
5335	Crai	2861	2183	- *8-port bubbler*
6002	Fleet Hall	5895	1893	JEP - Thames Estuary
6003	Hall Farm	5589	1848	- *UVF automatic analyser*
6004	Lower Shorne	5703	1728	
6005	Wingham	6243	1553	
6006	Wormdale	5858	1634	
6007	Carr Lane *(2)*	4672	4274	JEP - Yorkshire
6008	Hemingbrough *(3)*	4669	4298	- *UVF automatic analyser*
6009	Cliffe	4659	4336	
6010	North Duffield	4672	4373	*site closed in 1998*
6011	Wheldrake	4690	4448	*site closed in 1998*
6012	Dunnington	4674	4523	*site closed in 1998*
6013	Gateforth Hall	4557	4296	*site opened in 1998*
6014	North Featherstone	4427	4226	*site opened in 1998*
6015	North Howden	4769	4305	*site opened in 1998*
6016	Sherburn in Elmet	4494	4325	*site opened in 1998*
6017	Smeathalls Farm	4513	4252	*site opened in 1997*
6018	Temple Hirst	4625	4252	*site opened in 1997*
6019	Womersley	-	-	*site opened in 1999*
7001	Bottesford	4797	3376	JEP - Nottinghamshire
7002	Jenny Hurn	4816	3982	- *UVF automatic analyser*
8001	Ladybower	4164	3892	Automatic Rural Network
8002	Lullington Heath	5538	1016	- *UVF automatic analyser*
8003	Harwell	4474	1863	
8004	Narberth	2146	2127	
8005	Rochester	5831	1762	
8006	Wicken Fen	5564	2692	
9001	Sutton Bonnington	4505	3267	CEH
9002	Auchencorth Moss	3221	6562	- *UVF automatic analyser*

Notes (1) Site not used for mapping purposes (see text); (2) This JEP site was closed in 1999; (3) This JEP site was closed in 1998.

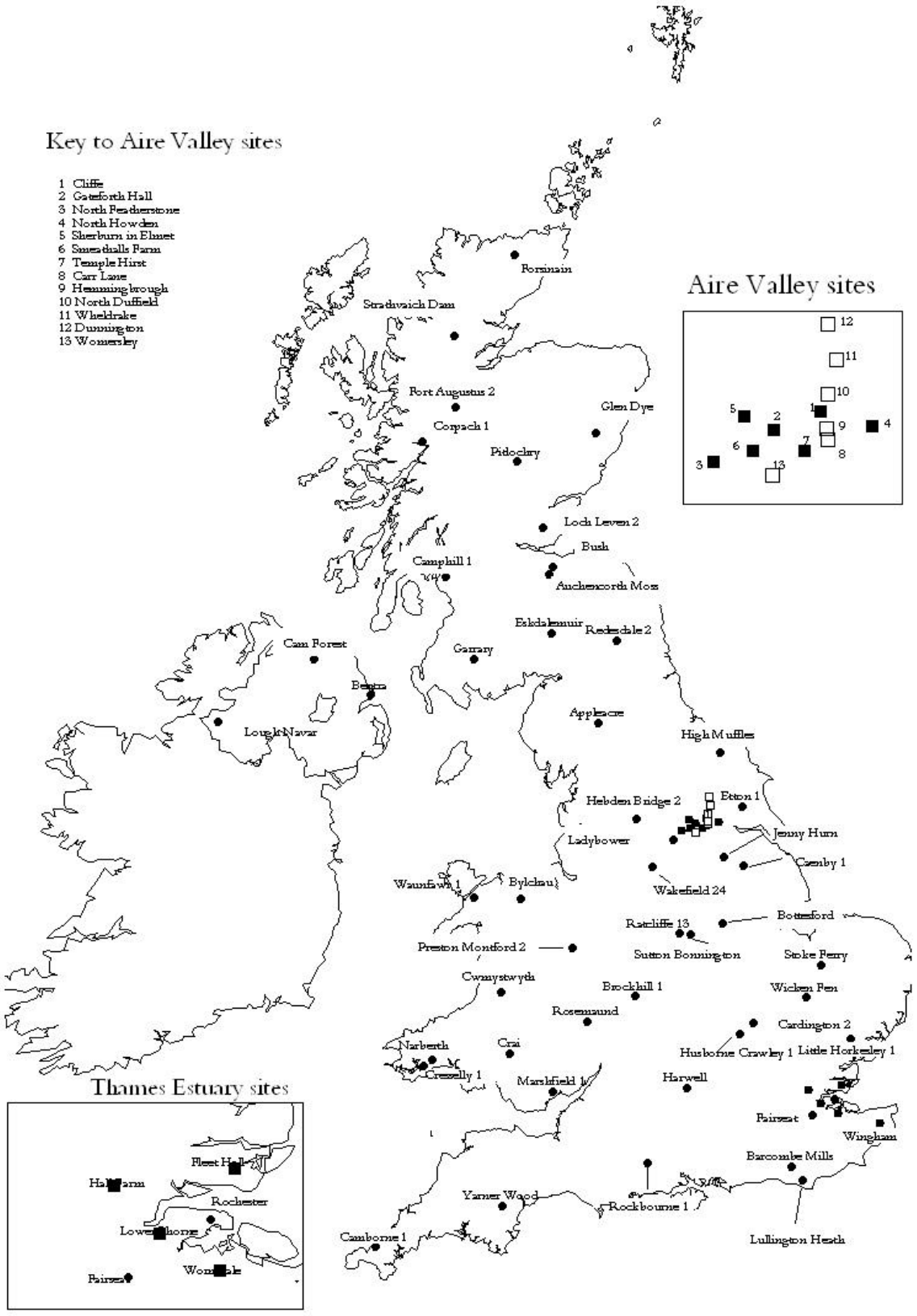


Figure 1 - Location of the Sites Used to Monitor and to Map SO_2 Concentrations (The sites which are operational are denoted using filled symbols. The sites which have been closed are denoted using open symbols).

of sulphur dioxide is derived from the concentration of sulphate determined analytically and the volumes of the air drawn through the bubbler during the sampling period and of the H_2O_2 solution.

There are three versions of the hydrogen peroxide bubbler used in the monitoring network:

- an 8-port bubbler is used at one site (Bush) and analysis of each daily sample is undertaken to give a daily measurement;
- an 8-port bubbler is used at 23 sites. The individual samples are bulked and a single analysis is undertaken to give a weekly measurement;
- a single-port bubbler is used at 6 sites. A single sample is collected and analysed to give a weekly measurement.

The single-port bubbler is used at the following 6 sites: Corpach (5308), Etton (5310), Marshfield (5314), Rockbourne (5316), Fort Augustus (5319) and Loch Leven (5320). The single-port bubbler was also operated in parallel with the 8-port bubblers located at Husborne Crawley (site codes: 5312 and 5336) and Ratcliffe (site codes: 5315 and 5337). The single-port bubbler measurements at both sites ceased in May 1998.

2.4 EQUIPMENT MAINTENANCE

Regular equipment maintenance is needed to maximise data capture and sample quality. The sites within the network are visited annually to ensure all equipment is operated within acceptable working limits. The Table shown in Appendix 1 summarises when the annual site maintenance and other visits occurred.

An air flow meter and pump are placed downstream of the bubbler units. The air flow rate can be affected by leaks upstream of the meter which tend to increase if the equipment is not regularly maintained. A well maintained bubbler unit has a leak rate between 3 and 5%, and all the bubbler units used within the network are operated within these limits. If a bubbler unit is found to have a leak rate greater than 5% the unit is modified to reduce the leak rate or replaced immediately.

The bubbler unit is based on a simple design with few moving parts. However, the motors within the sampling pumps occasionally fail. Consequently, the airflows at all sites are routinely monitored so that failing pumps can be identified and replaced before complete failure occurs. The sampling flowrate is maintained between 2 and 4 m^3 per day.

To ensure airflows are recorded accurately the airflow meters are calibrated at least once a year against a certified wet gas meter (standard meter). The accepted tolerance for bubbler meters is where their measured air volume is within 3% of that measured by the standard meter. If meters are found to fall outside this criteria they are withdrawn from use and replaced.

2.5 SENSITIVITY OF THE BUBBLER TECHNIQUE

The ion chromatograph used to determine the concentration of sulphate has an analytical limit of detection of 0.01 mg [SO_4^{2-} as S] per litre of solution. This implies that the bubbler method has an sensitivity of about 0.2 μg SO_2 as S m^{-3} or 0.15 ppb SO_2 for typical volumes of H_2O_2 solution

analysed and air flow rates used. In practice, the sensitivity will vary between 0.1-0.4 μg SO_2 as S m^{-3} (0.08-0.35 ppb SO_2), depending on the volumes of solution and air flow rates reported for individual samples. This range includes the affects of (a) seasonal variations in rates of evaporation which affect the volumes of solution and (b) progressive decline in equipment performance resulting in lower air flow rates (*e.g.*, failing pumps, increased leak rates).

Measurements are reported as below the limit of detection (shown as < x.y in the Data Tables of Appendix 2) if the analysis of the sample gave a result below the analytical limit of detection. In such cases, the analytical limit of detection was taken and combined with the volumes of solution and air flow rates reported for the sample to give an upper limit to the ambient concentration.

2.6 DATA CAPTURE

Annual and monthly mean concentrations are only calculated if the data capture exceeds 75%. There are a number of reasons why the concentrations cannot be determined for individual samples. These include:

Frequent	• The electricity supply is interrupted and the sample collected is not representative of that week's concentration. • A failure of the pump/meter/bubbler occurs.
Occasional	• The bubbler is switched off by the site operator when the site operator is unavailable. • A long sampling period occurs when the site operator is unavailable (2 weeks plus usually) which because of the lack of fluid reservoir is not representative of that sampling period (H_2O_2 falls below dreschel stems in bottles). • An error or mix-up is made by the site operator. • The sample solution partially or completely leaks during transit because the sample container lids were not secured effectively. The total sample volume is unknown and the concentration in air can not then be calculated. • The parcel is lost during transit.
Rare	• The sample is lost during analysis or sample registration. • Vandalism at the monitoring site may cause the sample to be lost.

As indicated in Section 2.2, the bubbler which had been sited at Garrary (5340) was relocated to Benniguinea (5343) in early August 1999. The building housing the equipment at Garrary was required for another use. The measurements from the two sites have been combined to give a single complete dataset.

A recurrent problem with a fluctuating power supply at the Fort Augustus site (site code 5319) affected the performance of the pump and resulted in frequent loss of data between January and September. Monthly mean concentrations could not be calculated for January, March, May, July and August. The low data capture precluded the determination of an annual mean concentration. The pressure drop on the inlet following the introduction of a new fan at the Bush site (site code 5326) caused intermittent suck back of the bubbler solution. No data were collected between the end of July and the middle of September when the problem was resolved.

3 Results and Discussion

The complete data set of measurements for 1999 for (i) the 30 sites in the Rural Sulphur Dioxide Monitoring Network, (ii) the 8 sites in the UK Acid Deposition Monitoring Networks and (iii) the two sites operated for the National Assembly of Wales are given in Appendix 2. The data for individual sites are also presented graphically in Appendix 3. Monthly mean concentrations have only been calculated when the data capture is greater than75% and these are also presented in the Tables and Figures of Appendices 2 and 3.

3.1 ANNUAL MEAN CONCENTRATIONS

Annual mean concentrations have been calculated for those sites where the data capture was greater than 75%, as shown in Table 2 for the sites listed in Table 1. The annual mean concentrations observed in 1999 were generally lower than those reported in 1997 and 1998 [Hasler *et al.*, 2001; Hayman *et al.*, 2001], which are also included in Table 2 for comparison.

The site at Garrary (5340) was relocated to Benniguinea (5343) in August 1999. The measurements from the two sites have been combined to give a single complete dataset. Annual mean concentrations were not calculated for the two bubblers operated at Auchencorth Moss as part of the Method Intercomparison exercise (code 5341 and 5342) as the bubblers were only operated for 8 months between September 1998 and June 1999.

As in 1998, the highest annual mean concentrations were again measured at the JEP sites in Yorkshire[1]. These and nearly all the other sites with annual mean concentrations above 2.5 ppb are influenced by nearby major SO_2 emission sources. The lowest annual mean concentrations were measured at Lough Navar (0.2 ppb) in Northern Ireland, Forsinain (0.3 ppb) and Strathvaich Dam (0.3 ppb) in Scotland. All of these sites are located in remote and less populated areas of the UK, away from the direct influence of SO_2 emission sources.

Table 3 presents the maximum concentrations for a selection of sites. Many of the maximum daily and weekly SO_2 concentrations were observed during the autumn and winter. There was clearly a period of elevated concentrations in December at High Muffles (Yorkshire), although the highest concentration of 8.5 ppb was significantly lower than the maximum concentration observed in 1998 (25.5 ppb). The maximum weekly concentrations reached 11.2 ppb at Etton and 8.7 ppb at Wakefield. Both sites are in Yorkshire. The remainder of the year showed generally low concentrations with no pronounced winter peak.

Lough Navar (Northern Ireland), Strathvaich Dam (Scotland) and Forsinain (Scotland) are remote sites and hence their maximum concentrations were much lower. The annual mean concentrations are comparable at the three sites: 0.2 ppb (Lough Navar), 0.3 ppb (Strathvaich Dam) and 0.3 ppb at Forsinain. However, higher maximum concentrations are observed at Lough Navar (1.2 ppb) as compared to Forsinain (0.7 ppb), which reflects the temporal

[1] The data for these sites have been provided on condition that neither the measurements made at the sites nor the statistics derived are explicitly reported. The company involved considers that the measurements have commercial value and that a third party could benefit through their inclusion in this report.

Table 2 - Annual Mean Concentrations of SO_2 at Rural Locations for 1997, 1998 and 1999

Site code	Site name	Annual Mean Concentration (ppb)		
		1997	1998	1999
5002	Eskdalemuir	0.5	0.4	0.4
5004	Stoke Ferry	1.4	1.5	1.1
5006	Lough Navar	0.3	0.2	0.2
5007	Barcombe Mills	1.0	0.8	0.7
5008	Yarner Wood	0.7	0.5	0.4
5009	High Muffles	1.7	1.3	0.7
5010	Strathvaich Dam	0.4	0.3	0.3
5011	Glen Dye	0.6	0.4	0.3
5301	Brockhill 1	1.8	1.1	0.8
5303	Caenby 1	2.5	3.0	2.4
5304	Camborne 1	0.9	0.7	0.6
5305	Camphill 1	1.2	0.5	0.7
5306	Cardington 2 (Note 1)	3.3	3.9	3.2
5308	Corpach 1	0.9	0.6	0.5
5309	Cresselly 1	1.2	0.8	0.7
5310	Etton 1	2.7	2.6	2.2
5312	Husborne Crawley 1	2.1	1.8	1.1
5313	Little Horkesley 1	2.1	1.7	1.2
5314	Marshfield 1	1.4	1.2	1.1
5315	Ratcliffe 13	2.8	2.5	2.0
5316	Rockbourne 1	1.2	0.9	0.6
5317	Wakefield 24	3.1	2.5	1.9
5318	Waunfawr 1	0.8	0.7	0.6
5319	Fort Augustus 2	0.3	0.5	-
5320	Loch Leven 2	-	1.4	1.3
5321	Redesdale 2	0.9	0.6	1.0
5322	Hebden Bridge 2	2.9	1.8	1.4
5323	Preston Montford 2	1.4	0.8	0.7
5324	Bentra	1.6	1.3	1.1
5325	Pitlochry	0.5	-	0.3
5326	Bush	1.4	1.0	0.9
5329	Cam Forest	0.6	0.4	0.4
5330	Cwmystwyth	1.1	0.8	0.6
5331	Rosemaund	1.0	1.0	0.8
5333	Fairseat	1.6	1.4	1.6
5338	Forsinain	0.2	0.3	0.3
5339	Appleacre	1.3	1.2	1.1
5340/5343	Garrary/Benniguinea	Note (2)	0.3	0.2
5334	Bylchau	1.0	0.7	0.4
5335	Crai	1.0	0.9	0.6
6002	Fleet Hall	(Note 3)	(Note 3)	(Note 3)
6003	Hall Farm, N	(Note 3)	(Note 3)	(Note 3)
6004	Lower Shorne	(Note 3)	(Note 3)	(Note 3)
6005	Wingham	(Note 3)	(Note 3)	(Note 3)
6006	Wormdale	(Note 3)	(Note 3)	(Note 3)
6007	Carr Lane	(Note 3)	(Note 3)	(Notes 3, 4)
6008	Hemingbrough	(Note 3)	(Notes 3, 4)	-
6009	Cliffe	(Note 3)	(Note 3)	(Note 3)
6010	North Duffield	(Note 3)	(Notes 3, 4)	-
6011	Wheldrake	(Note 3)	(Notes 3, 4)	-
6012	Dunnington	(Note 3)	(Notes 3, 4)	-
6013	Gateforth Hall	-	(Notes 3, 4)	(Note 3)
6014	North Featherstone	-	(Notes 3, 4)	(Note 3)
6015	North Howden	-	(Notes 3, 4)	(Note 3)
6016	Sherburn in Elmet	-	(Notes 3, 4)	(Note 3)
6017	Smeathalls Farm	-	(Notes 3, 4)	(Note 3)
6018	Temple Hirst	-	(Notes 3, 4)	(Note 3)
6019	Womersley	-	-	(Notes 3, 4)
7001	Bottesford	2.7	3.9	3.9
7002	Jenny Hurn	4.8	4.0	4.0
8001	Ladybower	3.7	2.7	1.8
8002	Lullington Heath	1.7	1.4	1.2
8003	Harwell	-	-	1.0
8004	Narberth	-	-	1.7
8005	Rochester	-	-	3.0
8006	Wicken Fen	-	-	1.0
9001	Sutton Bonnington	2.9	3.0	2.2
9002	Auchencorth Moss	0.7	0.6	0.5

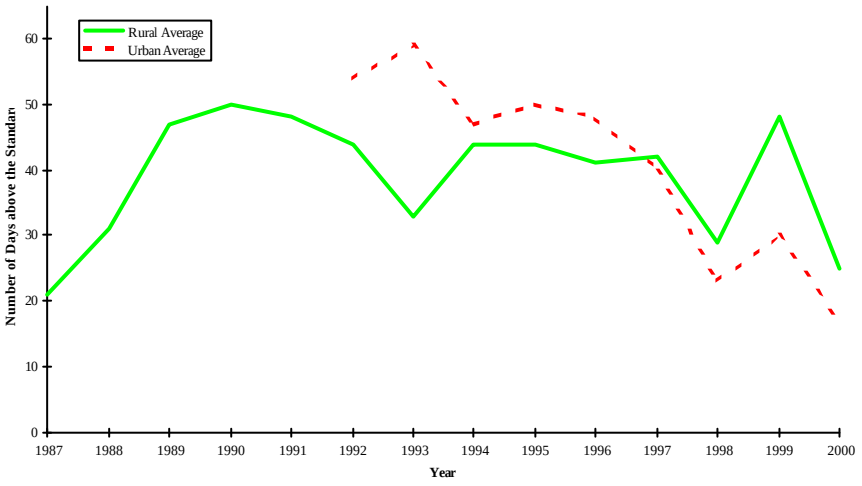
Notes (1) Site not used for mapping purposes (see text); (2) New site (less than 50% data capture); (3) The data for these sites have been provided solely for use in generating the SO_2 concentration map and on condition that neither the measurements made at the sites nor the statistics derived are explicitly reported; (4) JEP site was either opened or closed between 1997 and 1999.

Table 3 - Maximum Daily or Weekly SO_2 Concentrations at Selected Sites

Site	Day or week beginning	SO_2-S concentration in air (μgSm^{-3})	(ppb)
5006	20/05/99	1.6	1.2
Lough Navar	20/10/99	1.3	1.0
(daily)	23/08/99	1.2	0.9
	28/07/99	1.1	0.8
	24/08/99	1.1	0.8
5008	08/02/99	4.0	3.0
Yarner Wood	08/01/99	4.0	3.0
(daily)	09/11/99	3.8	2.9
	10/11/99	3.7	2.8
	19/11/99	3.4	2.6
5009	21/12/99	11.3	8.5
High Muffles	20/12/99	9.0	6.8
(daily)	21/09/99	6.1	4.6
	18/12/99	5.7	4.2
	22/12/99	5.6	4.2
	25/06/99	5.6	4.2
	04/11/99	5.3	4.0
	02/09/99	5.3	3.9
	19/12/99	4.9	3.7
	03/09/99	4.2	3.2
5301	19/11/99	3.6	2.7
Brockhill	05/11/99	3.0	2.3
(weekly)	12/11/99	2.4	1.8
	09/07/99	1.7	1.2
	17/12/99	1.5	1.1
5303	13/07/99	7.1	5.4
Caenby	29/06/99	6.3	4.8
(weekly)	26/01/99	5.6	4.2
	20/07/99	5.0	3.7
	15/06/99	5.0	3.7
5306	06/01/99	11.1	8.3
Cardington	20/01/99	8.3	6.3
(weekly)	10/02/99	7.9	5.9
	01/12/99	7.7	5.8
	17/03/99	7.2	5.4
5310	02/09/99	14.9	11.2
Etton	02/11/99	6.6	5.0
(weekly)	12/01/99	6.6	5.0
	20/01/99	6.5	4.9
	14/09/99	6.5	4.9
5317	28/04/99	11.5	8.7
Wakefield	07/07/99	5.9	4.4
(weekly)	20/01/99	4.7	3.5
	28/07/99	4.7	3.5
	31/03/99	4.3	3.2
5322	28/07/99	8.0	6.0
Hebden Bridge	18/08/99	6.1	4.6
(weekly)	13/10/99	6.1	4.5
	15/09/99	4.8	3.6
	28/04/99	4.3	3.2
5333	09/02/99	7.5	5.6
Fairseat	12/10/99	7.1	5.3
(weekly)	14/12/99	6.9	5.2
	06/07/99	5.6	4.2
	16/03/99	3.7	2.8
5338	27/07/99	0.9	0.7
Forsinain	11/05/99	0.7	0.5
(weekly)	05/04/99	0.7	0.5
	22/06/99	0.6	0.5
	15/06/99	0.6	0.5

resolution of sampling. Daily sampling is carried out at Lough Navar and therefore shorter term episodes of SO_2 are captured in the data set.

Overall, SO_2 concentrations in rural areas have decreased between 1997 and 1999. An indicator of air pollution based on the number of days that pollutant concentrations were above air quality standards, has been developed to give the general trend of air quality in the United Kingdom for both urban and rural environments (see DETR web-site: http://www.environment.detr.gov.uk/des/chap02/, and updated to include the 2000 data) , as shown in Figure 2 (upper panel). The indicator was higher in 1999 suggesting that this was a slightly poorer year for air pollution compared to 1997 and 1998. However, the indicator for rural air pollution is dominated by the number of exceedences of the ozone air quality standard. Although based on a limited number of sites where automatic monitoring is undertaken, there were no exceedences of the SO_2 air quality standard used as the indicator in 1999 compared to a single exceedence in 1997 and 1998. The lower panel of Figure 2 (taken from the DETR web-site) shows the downward trend in the number of exceedences observed at monitoring sites in urban locations.



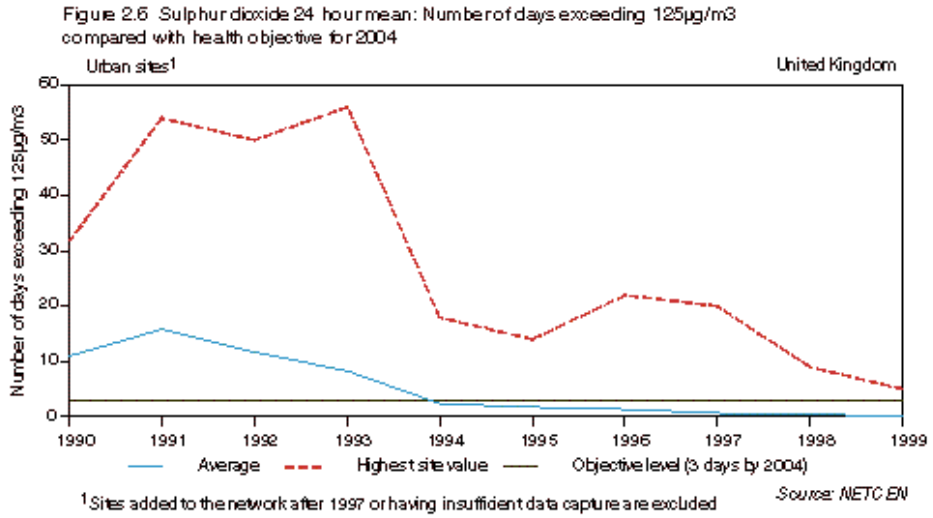


Figure 2 - Trends in the the Indicators of UK Urban and Rural Air Pollution (upper panel) and in the Number of Exceedences of the Air Quality Objective for Sulphur Dioxide (24-hour Mean) (lower panel).

Figure 3 presents both the monthly and running annual mean SO_2 concentrations measured at Eskdalemuir. This is used as an example to illustrate the substantial decline in SO_2 concentrations since the early 1980s. The average concentration at Eskdalemuir has decreased by a factor of ten since 1980 from 4.5 ppb to 0.4 ppb. The figure shows that the downward trend in the SO_2 concentrations follows the reduction in UK SO_2 emissions [Goodwin *et al*., 2001], at least in the early years.

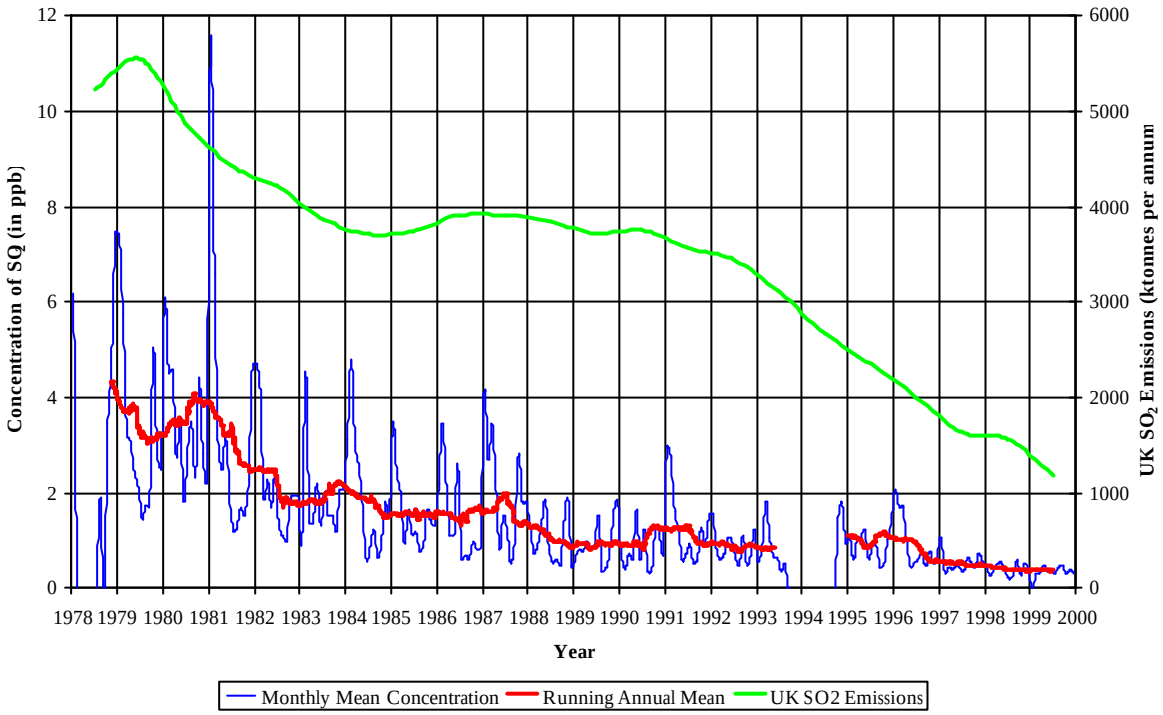


Figure 3 - Trends in the concentration of sulphur dioxide observed at Eskdalemuir since 1978 and in the annual UK emissions of sulphur dioxide.

Figure 3 also suggests that the large seasonal variation, where higher concentrations are observed during cold winter months, are no longer apparent. Higher concentrations are expected during the winter period because of the relatively higher emissions at this time of the year, combined with poorer vertical dispersion of the emissions.

3.2 SPATIAL VARIATIONS

The geographical distribution of the annual mean SO_2 concentrations for 1999 is shown in Figure 4, as are the corresponding maps for 1997 and 1998. A geostatistical kriging method developed by Webster *et al*. [1991] is used to calculate the annual concentration map. Appendix 4 provides a summary of the kriging method and the parameters used. Monthly mean SO_2 concentration maps are presented in Appendix 5, and have been calculated using bi-linear interpolation, a description of which is given by UNIRAS [1988].

Cardington has an annual mean of 3.2 ppb compared to the nearby site at Husborne Crawley which has an annual mean of 1.1 ppb. As in earlier years, the Cardington data have not been used for mapping purposes because this site was originally established to determine the effect of specific factors which influenced local concentrations of SO_2 and not to determine regional patterns. The Cardington site is influenced by a local source. Downing and Campbell [1995]

showed that the exclusion of the Cardington data does not greatly influence the reliability of the maps since there are good representative sites nearby (Woburn originally and then Husborne Crawley on relocation).

The spatial distribution of the annual mean concentration of SO_2 in 1999 is similar to that observed in earlier years [Hasler and Downing, 1998; Hasler *et al.*, 2001; Hayman *et al.*, 2000], as shown in Figure 4. The highest concentrations were observed in the Yorkshire/ Nottinghamshire area and the Thames Estuary. The sites in these areas are located closest to major UK SO_2 sources.

Most of the sites in the Yorkshire/Nottinghamshire area and the Thames Estuary are JEP sites that employ UVF (ultraviolet fluorescence) continuous monitors, whereas the majority of the other sites across the UK use the hydrogen peroxide bubbler measurement technique. The method intercomparison exercise undertaken between September 1998 and June 1999 (see Section 4) showed that the 8-port bubbler method gave comparable measurements to those reported by a UV-F analyser. The performance of the single-port bubbler was poorer with SO_2 concentrations between 10% and 15% lower than those measured by the UV-F analyser. Downing and Campbell [1995] had previously shown that the single-port hydrogen peroxide bubblers measure SO_2 concentrations between 10% and 15% lower than UVF analysers. This could possibly explain some of the differences in the measurements between sites although it is much more likely that the high concentrations are a result of the proximity to emission sources.

It should be noted that the bubbler technique has a limit of detection in the region of 0.3 ppb and many of the concentrations measured at remote sites are at or below this threshold. Measurements, close to the limit of detection, will in consequence have greater inaccuracy.

The monthly mean concentration maps are presented in Appendix 5. The maps show that SO_2 concentrations were more elevated across the UK in winter months (January and February), although very few individual sites display a pronounced winter peak. The higher concentrations observed in the winter are generally a result of higher emissions combined with periods of poorer pollutant dispersion. Evidence of higher concentrations is also evident in March and September. The lowest concentrations across the UK were observed in the summer months (June and July) although very high monthly-averaged concentrations were measured at some of the JEP sites in Yorkshire. The close proximity of other JEP sites with lower concentrations offset these high values in the maps shown in Appendix 5.

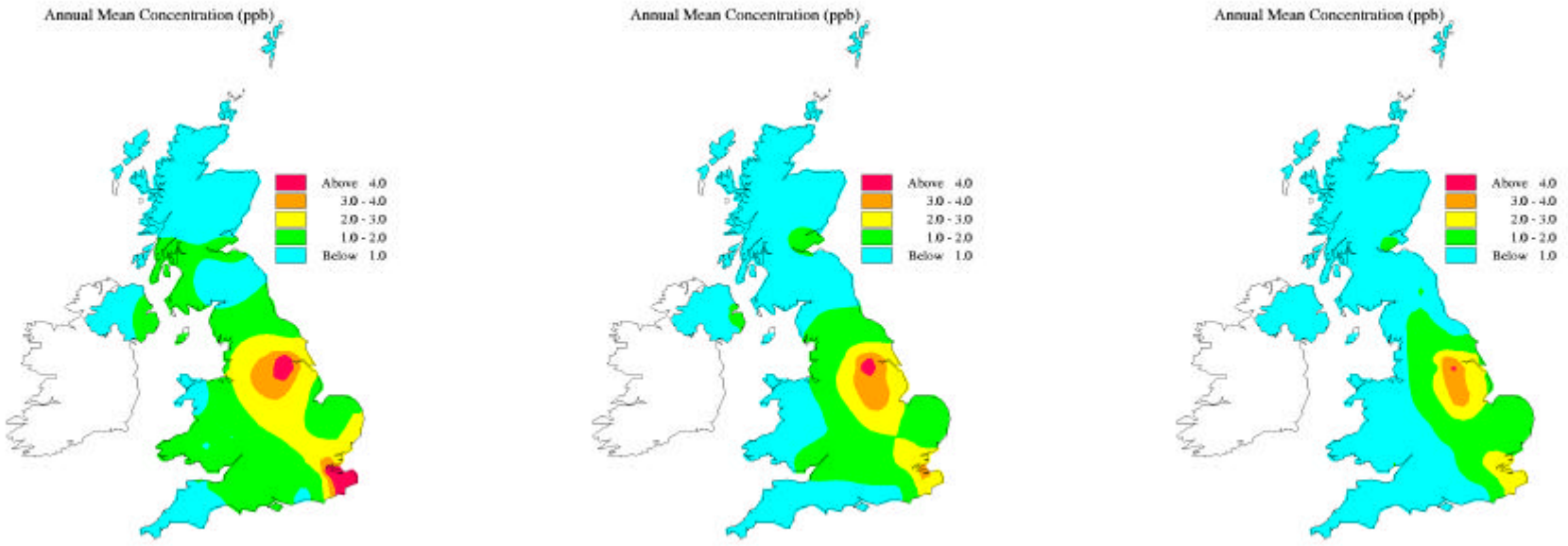
3.3 URBAN-ENHANCED MAP

The sites used to map the rural SO_2 concentration field are sited away from local sources of pollution so that they are representative of the region. The map of the rural SO_2 concentration field presented in Figure 4 shows that the concentrations observed are highest in those regions with major sources (*i.e.*, Yorkshire, Thames Estuary, *etc*). However, the maps produced using the rural concentration alone are not adequate to characterise fully the dry deposition to vegetation in the urban environment, or in rural locations that are on the fringes of urban areas. Hence, the deposition maps prepared using the rural concentration field alone would be biased towards low concentration areas and would underestimate the total SO_2 deposition field for the UK.

A simple methodology has been developed to estimate the correction needed [Stedman *et al.*, 2001a, 2001b]. The approach has been to take the difference in the urban SO_2 concentration (taken from automatic monitoring instruments in urban background locations) and the corresponding rural background and to correlate this with the local source strength of SO_2 obtained using a simple dispersion of the emissions from line and area sources (*i.e.*, excluding point sources) within a 35 km x 35 km area, weighted by distance and direction from the receptor. Data from 38, 51 and 50 automatic monitoring sites were used to prepare the maps for 1997, 1998 and 1999 respectively. The dispersion coefficients derived are then applied to the line and area sources in the National Atmospheric Emission Inventory to give the urban enhancement for each 1 km x 1km grid square covering the UK, as shown in Figure 5.

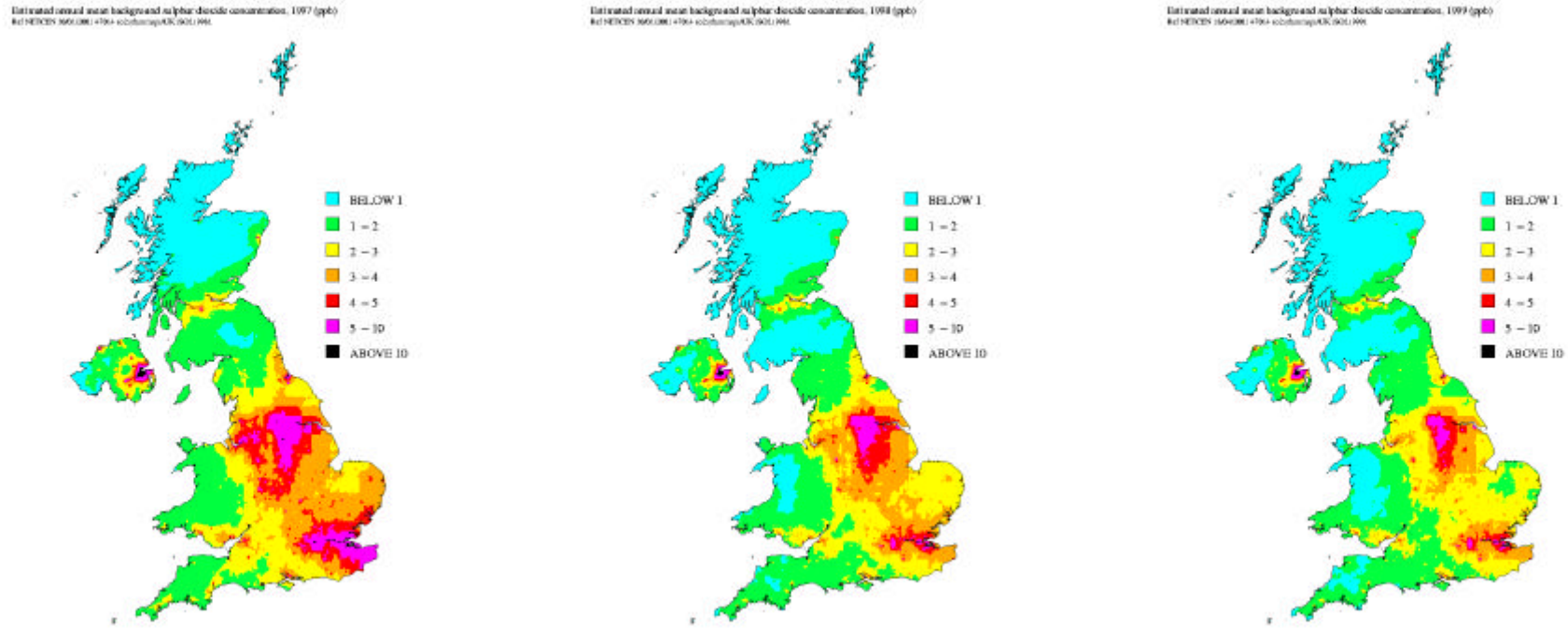
As the approach excludes the emissions from the major point sources, it is appropriate to include the JEP sites in the derivation of the base rural concentration field. However, sites such as Cardington which are unduly influenced by local sources should be excluded.

Monitoring data from 4 new sites (Harwell, Narberth, Rochester and Wicken Fen) have been used to produce the 1999 concentration maps shown in Figures 4 and 5. Figure 6 compares the concentration maps produced for the base rural and the urban-enhanced concentration fields with the data from these sites included and omitted. The most obvious difference between the maps is the area of higher concentration in West Wales caused by the inclusion of the Narberth site. The Harwell site provides a monitoring site in central England and extends the region of the 1-2 ppb contour slightly more to the west. The data from the Rochester and Wicken Fen sites make little difference to the maps, indicating that the measurements are consistent with those made at other sites in the area.



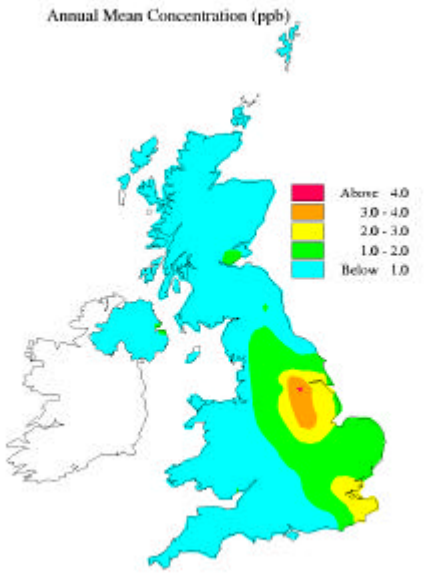
1997 1998 1999

Figure 4 - Maps of Rural SO_2 Concentrations (ppb) for 1997, 1998 and 1999

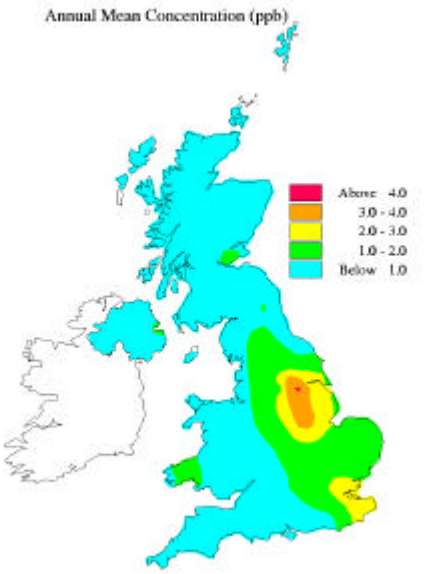


1997 1998 1999

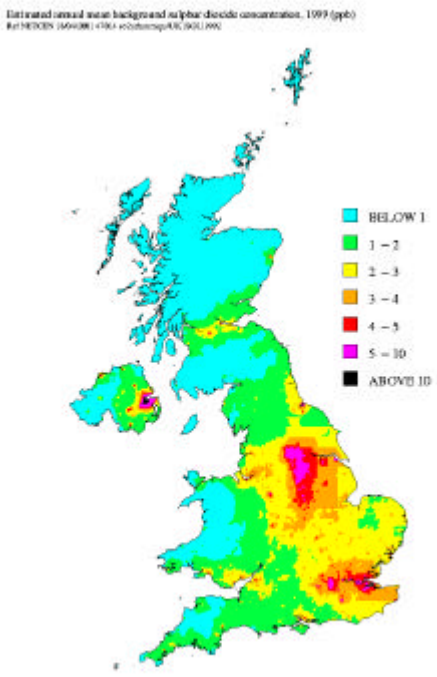
Figure 5 - Maps of Urban-enhanced SO_2 Concentrations (ppb) for 1997, 1998 and 1999



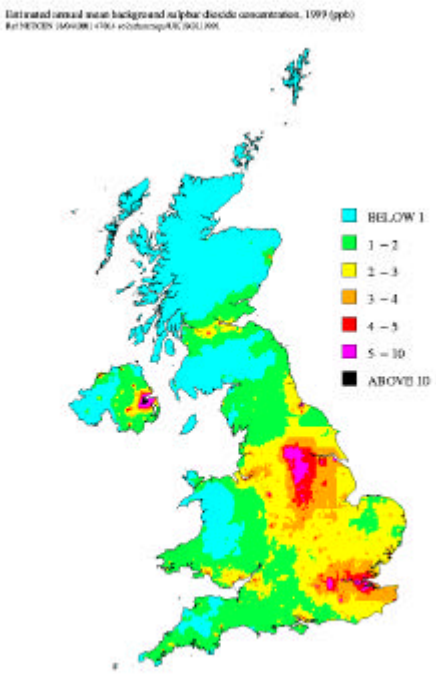
(a)



(b)



(c)



(d)

Figure 6 - Maps of the Base Rural (upper panels) and Urban-enhanced (lower panels) SO_2 Concentration Fields (ppb) in 1999 with (a, c) and without (b, d) the Data from the Automatic Monitoring Sites at Harwell, Narberth, Rochester and Wicken Fen.

4 Comparison of SO_2 Samplers

4.1 METHOD INTERCOMPARISON EXERCISE

4.1.1 Overview

The concentrations now being measured at some of the sites in the monitoring networks (*i.e.*, the UK Acid Deposition Monitoring networks and the UK Rural Sulphur Dioxide Monitoring network), especially the daily sites in remote areas, are at or below the Limit of Detection of the bubbler method. This will make it more difficult to determine reliable trends and could compromise the application of the monitoring data, for example, in identifying the cause of the non-linear response of ambient concentrations to change in emissions at such sites. A change in sampling method is required which will provide a lower Limit of Detection while retaining data integrity and consistency.

As part of the present project, an intercomparison exercise was undertaken in collaboration with CEH to evaluate potential replacement methods. The intercomparison was performed at the Auchencorth Moss site near Edinburgh between September 1998 and May 1999 using the following sampling methods:

- the existing hydrogen peroxide bubbler method using either 8 ports or a single port;
- two denuder methods (with long and short inlets)
- a filter-pack method;
- a diffusion tube method;

with an automatic UV-Fluorescence instrument taken to be the reference method. The 8-port bubbler provided daily measurements whilst the single-port bubbler was used to give weekly measurements. Because of issues concerning filter blanks, the filter pack method did not become operational until March 1999 and the intercomparison exercise was extended to May 1999. All the samplers were co-located and the samples collected from the non-automatic methods were analysed using ion chromatography according to well-established procedures.

More details of the intercomparison exercise are provided in Hasler *et al.* [2000].

4.1.2 Results

A graphical summary of the daily bubbler measurements, the weekly 'short-inlet' denuder and filter pack measurements and the daily-averaged UV fluoresecence measurements are shown in Figure 7a. The daily bubbler and UV-F measurements are in close agreement over the entire measurement period. The weekly filter pack measurements appear to follow the daily bubbler or UV-F measurements better than the 'long-inlet' denuder measurements, although the filter pack method was only operated for a limited period.

In Figure 7b, the 'long-inlet' denuder and filter pack measurements are compared with the weekly bubbler measurements and the daily bubbler and UV-F measurements averaged over the

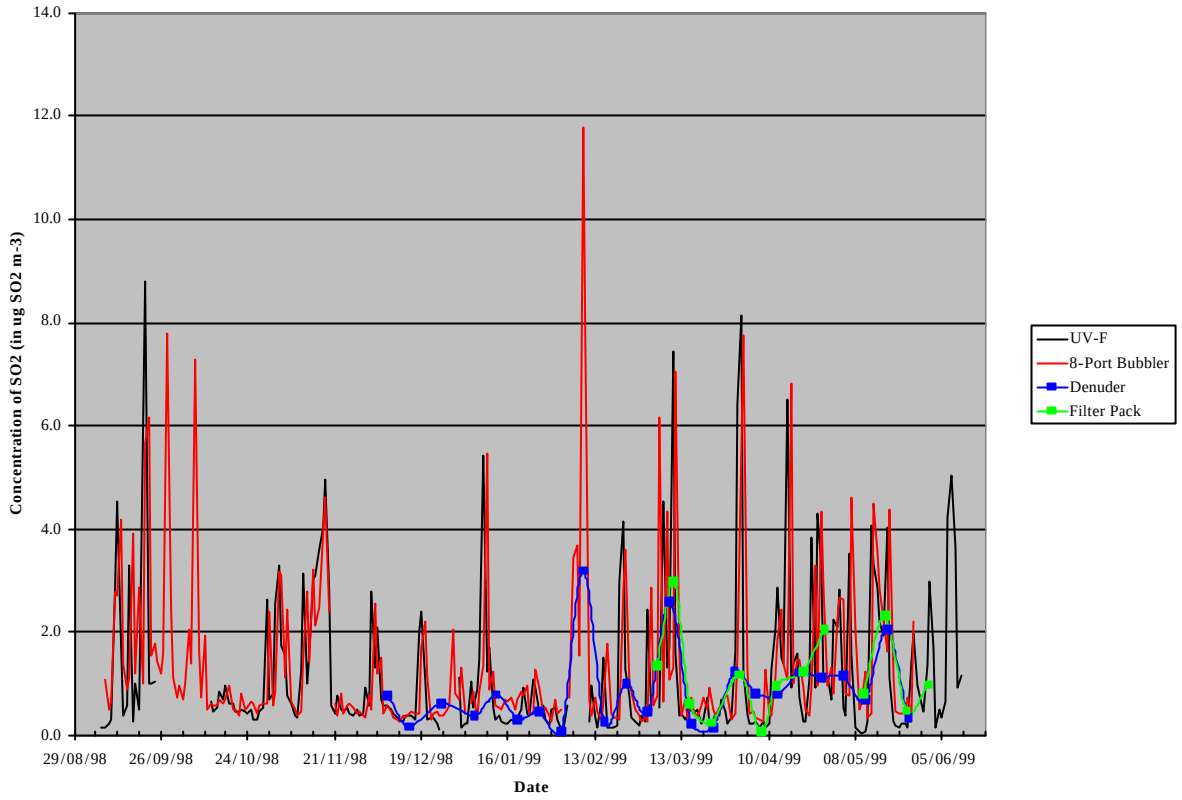


Figure 7a - A graphical summary of the daily bubbler, UV-F (daily average) and the weekly filter pack and weekly 'short-inlet' denuder measurements.

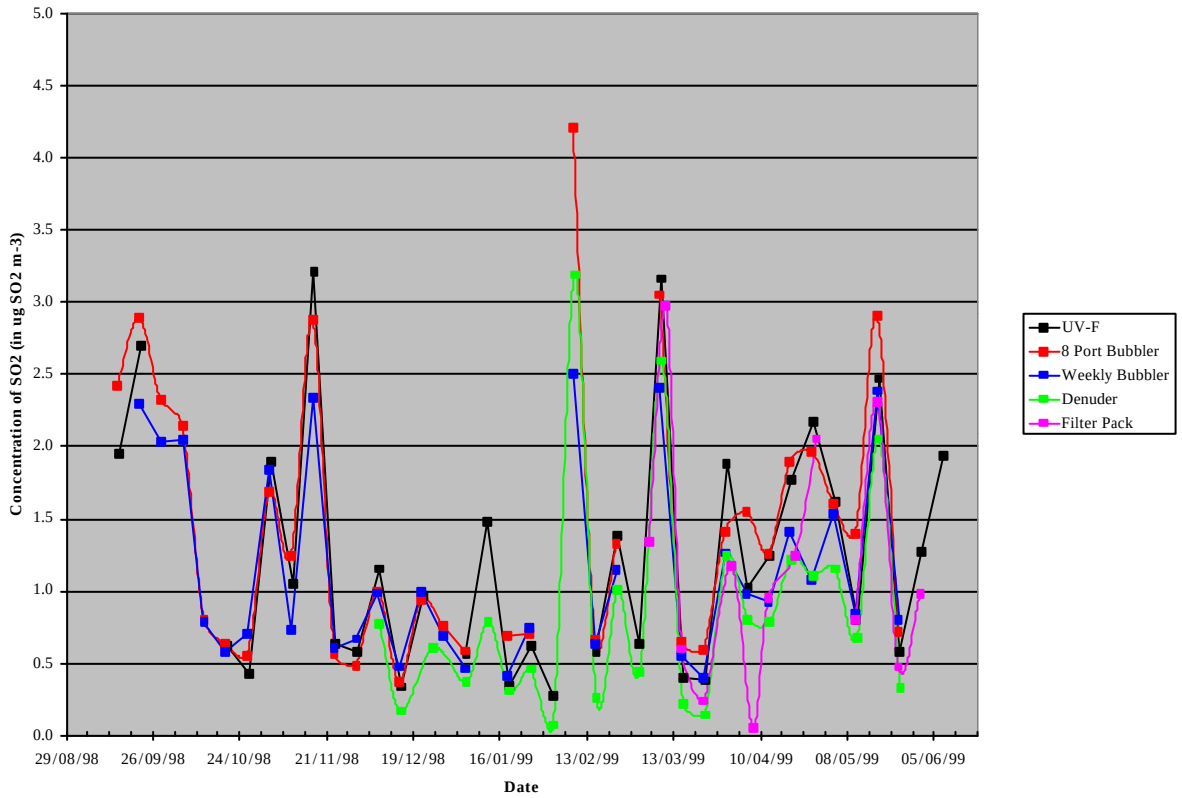


Figure 7b - A graphical summary of the two bubbler (weekly average), UV-F (weekly average) and the weekly filter pack and weekly 'short-inlet' denuder measurements.

same weekly sampling periods. Figure 7b shows more clearly the good correspondence between all the methods used. Although the 'long-inlet' denuder method reproduces the features observed in the UV-F or daily bubbler measurements, the absolute values are lower,often significantly. The filter pack method gives a better correspondence to the UV-F or daily bubbler measurements although this comparison is based on a limited set of measurements.

The monthly diffusion tube measurements have not been included on the above figures. The agreement was very poor with the diffusion tube method giving concentrations up to a factor of 2 larger than those determined using the the daily bubbler and UV-F methods.

The sampling methods were compared in turn to the UV Fluorescence and 8-port bubbler methods (Figures 8a-8e and 9a-9f). The hourly UVF and daily bubbler measurements were averaged, where necessary, over the same sampling periods as used for that sampler. Linear regression of the measurements from each method against the UV-F and 8-port bubbler methods was performed. The results are summarised in Table 4.

Table 4 - Summary of the Unweighted Linear Regression Analysis of the Sampler Measurements against the UV-F and 8-Port Bubbler Measurements

Method *vs.* UV-F	Linear Regression Coefficients		
	Slope	Intercept	R^2 Coefficient
8-Port Bubbler	0.872	0.239	0.907
Single Port Bubbler	0.712	0.220	0.880
Denuder - short inlet	0.938	0 (fixed)	0.900
Denuder - long inlet	0.770	-0.109	0.943
Filter Pack	0.990	-0.197	0.961
Diffusion Tube	-2.122	5.052	0.298

Method *vs.* 8-Port Bubbler	Linear Regression Coefficients		
	Slope	Intercept	R^2 Coefficient
UV-F	1.041	-0.140	0.907
Single Port Bubbler	0.689	0.200	0.885
Denuder - short inlet	0.818	-0.222	0.959
Filter Pack	0.938	-0.135	0.688
Diffusion Tube	1.549	1.855	0.065

There was very good agreement between the UV-F measurements and the 8-port bubbler measurements. While both the weekly bubbler and the 'long-inlet' denuder measurements show the same temporal behaviour as those made by the UV-F instrument, the absolute magnitudes are generally lower. The filter pack and 'short-inlet' denuder measurements give better agreement and show a near-perfect 1:1 correlation for the limited set of samples considered. Given the strong correlation between the UV-F measurements and the 8-Port bubbler measurements, the performance of the methods against the 8-Port bubbler shows the same general trends as their performance against the UV-F method. Thus, the weekly bubbler and the 'long-inlet' denuder measurements show the same temporal behaviour as those made by the 8-Port Bubbler but the absolute magnitudes are generally lower. The filter pack measurements give better agreement and show a very good 1:1 correlation.

Figure 8a - Comparison of the daily 8-port Bubbler measurements with the daily-averaged UV-F measurements

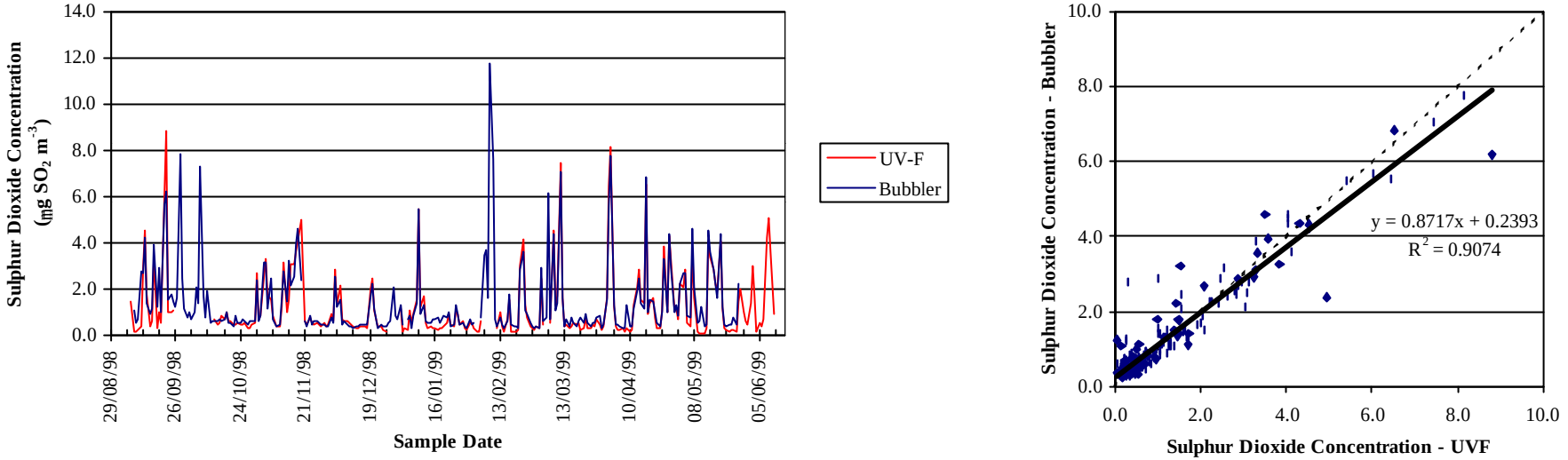


Figure 8b - Comparison of the weekly Single-port Bubbler measurements with the weekly-averaged UV-F measurements

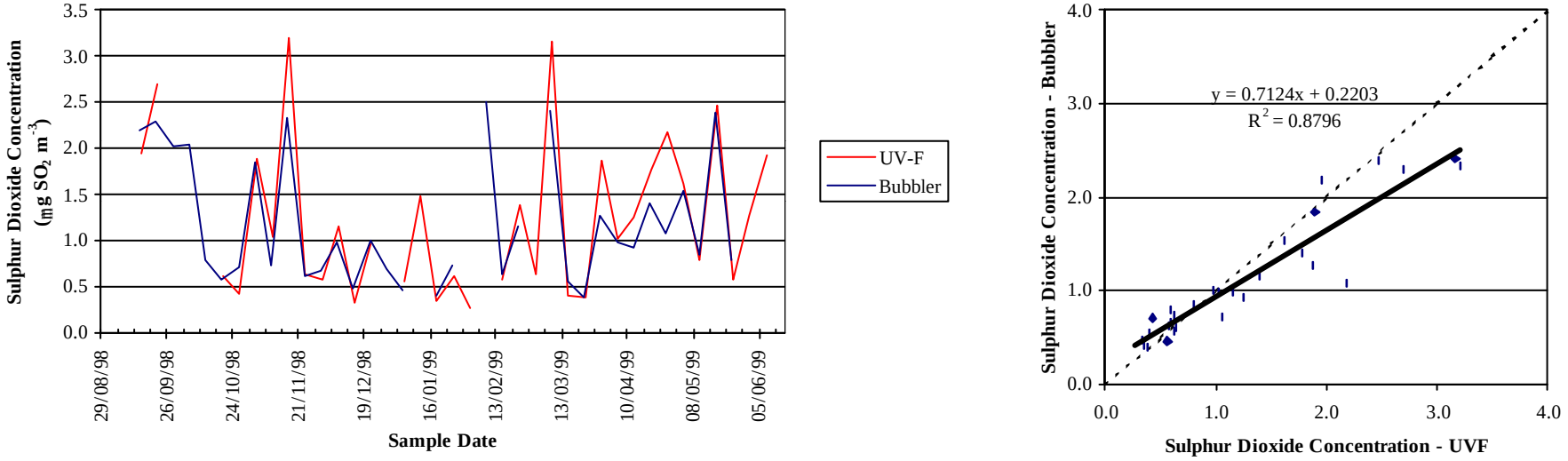


Figure 8c - Comparison of the weekly 'long-inlet' Denuder measurements with the weekly-averaged UV-F measurements

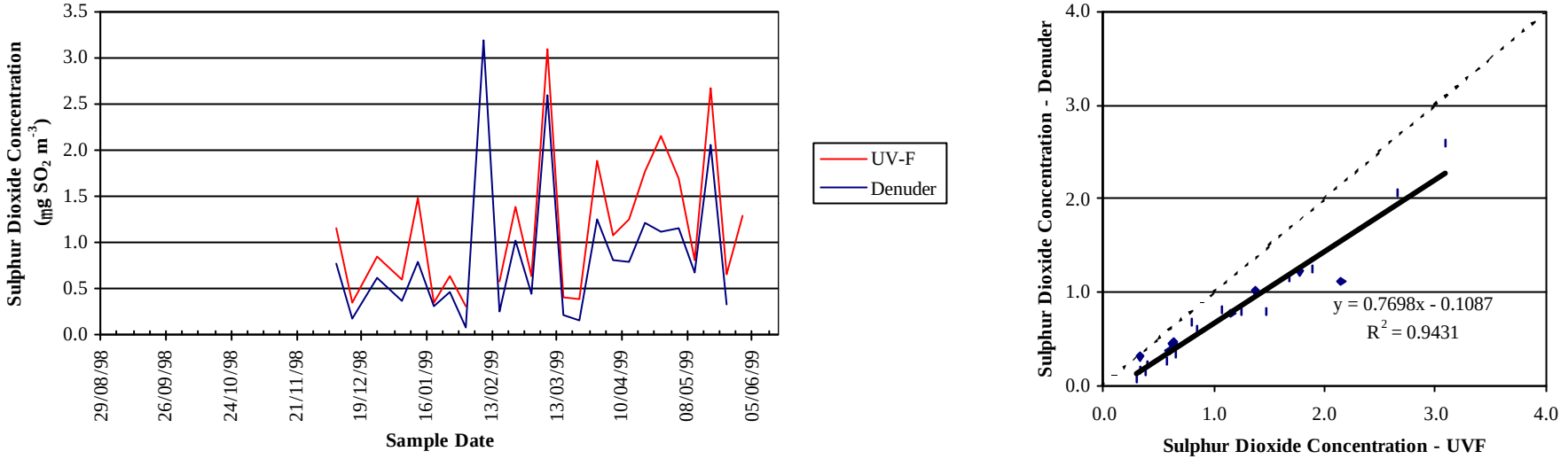


Figure 8d - Comparison of the weekly Filter Pack measurements with the weekly-averaged UV-F measurements

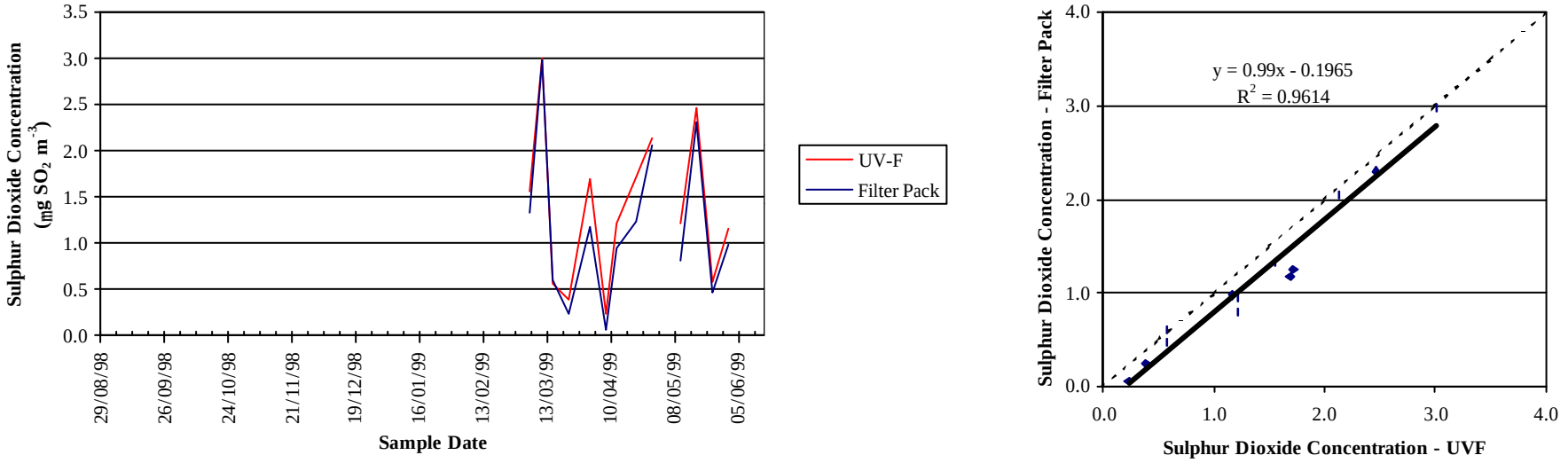


Figure 8e - Comparison of the monthly Diffusion Tube Measurements with the monthly-averaged UV-F Measurements

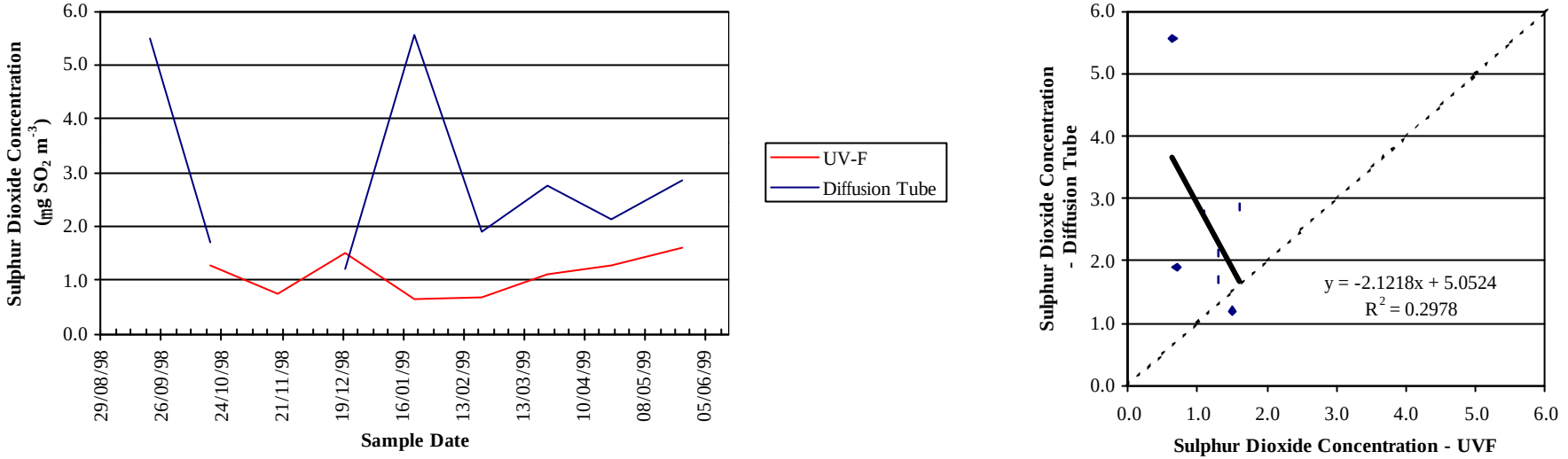


Figure 8f - Comparison of the weekly 'short-inlet' denuders with the daily-averaged UV-F measurements

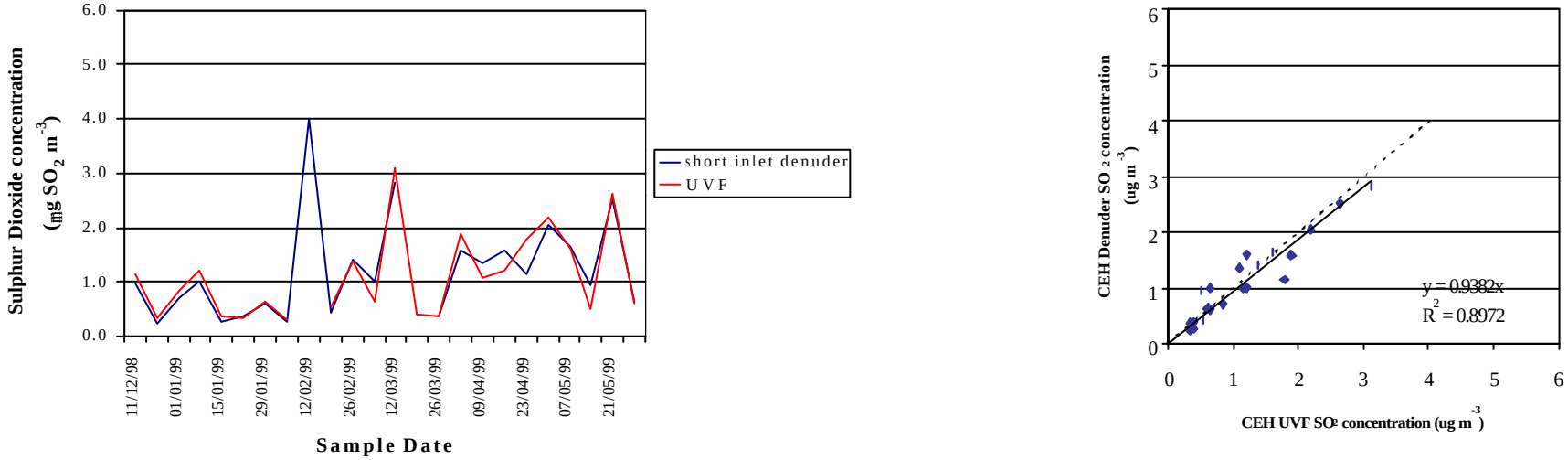


Figure 9a - Comparison of the daily-averaged UV-F measurements with the daily 8-port Bubbler measurements

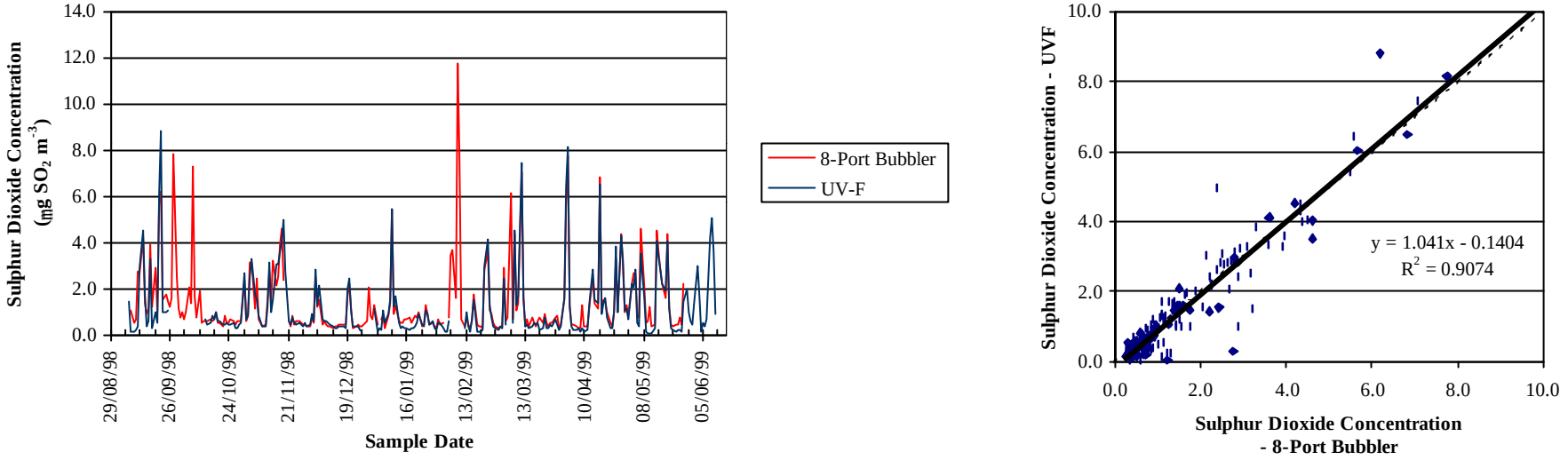


Figure 9b - Comparison of the weekly Single-port Bubbler measurements with the daily 8-port Bubbler measurements

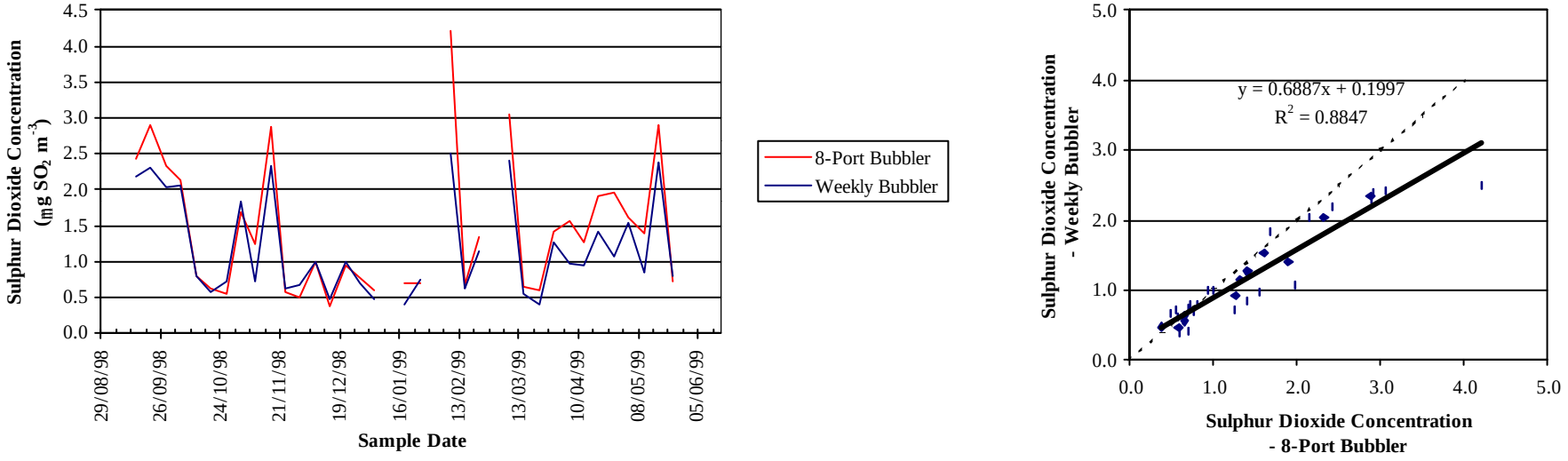


Figure 9c - Comparison of the weekly 'long-inlet' Denuder measurements with the weekly-averaged 8-port Bubbler measurements

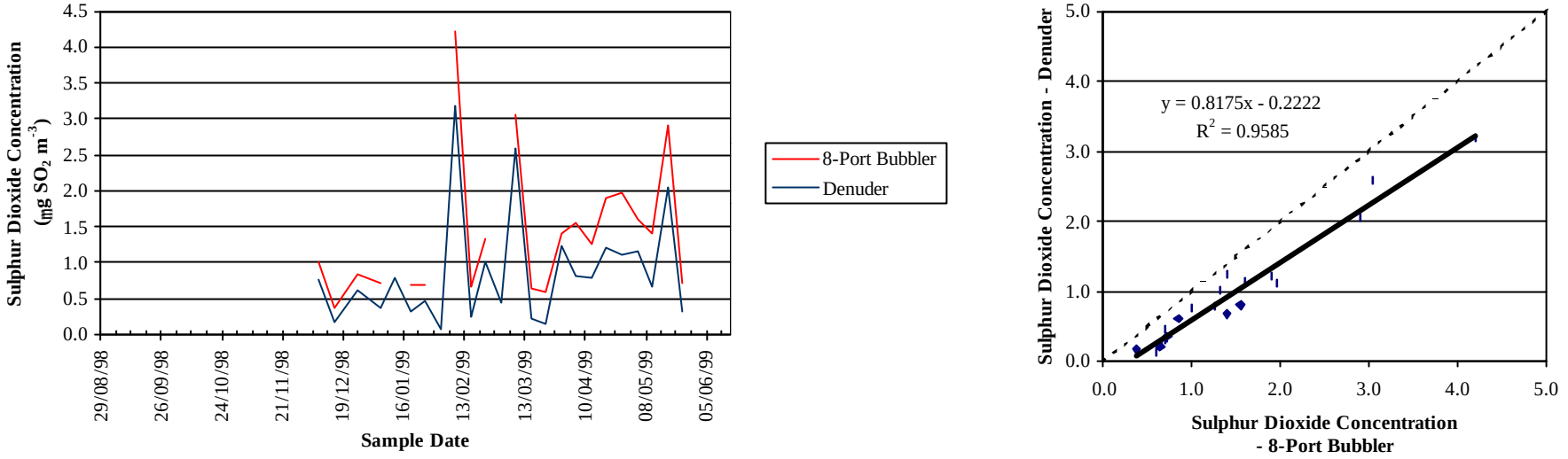


Figure 9d - Comparison of the weekly Filter Pack measurements with the weekly-averaged 8-port Bubbler measurements

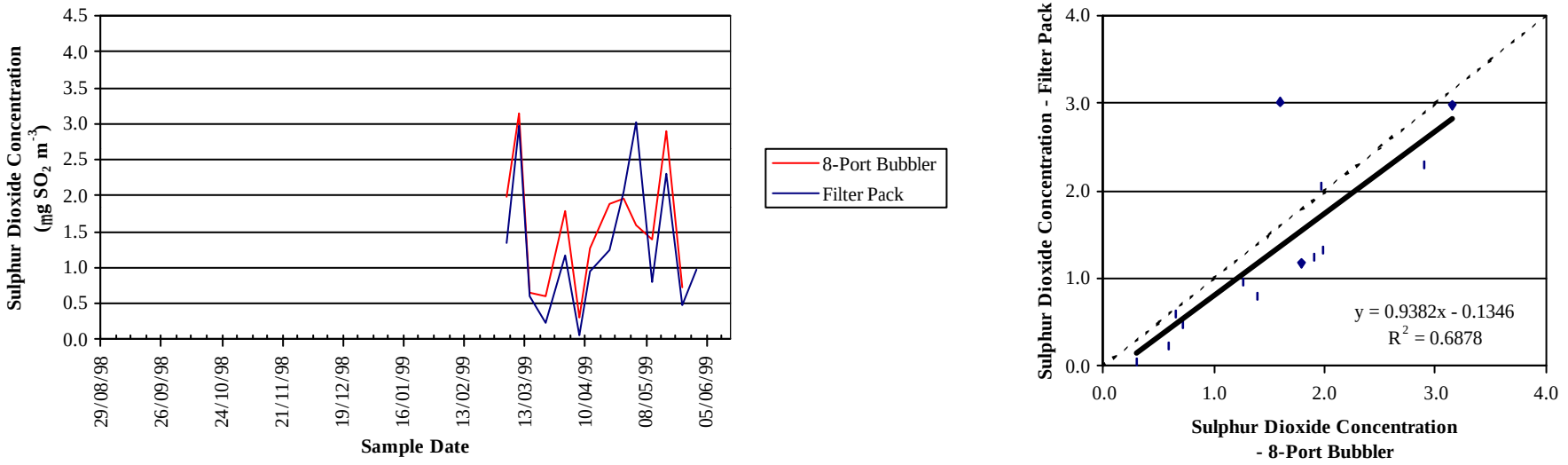
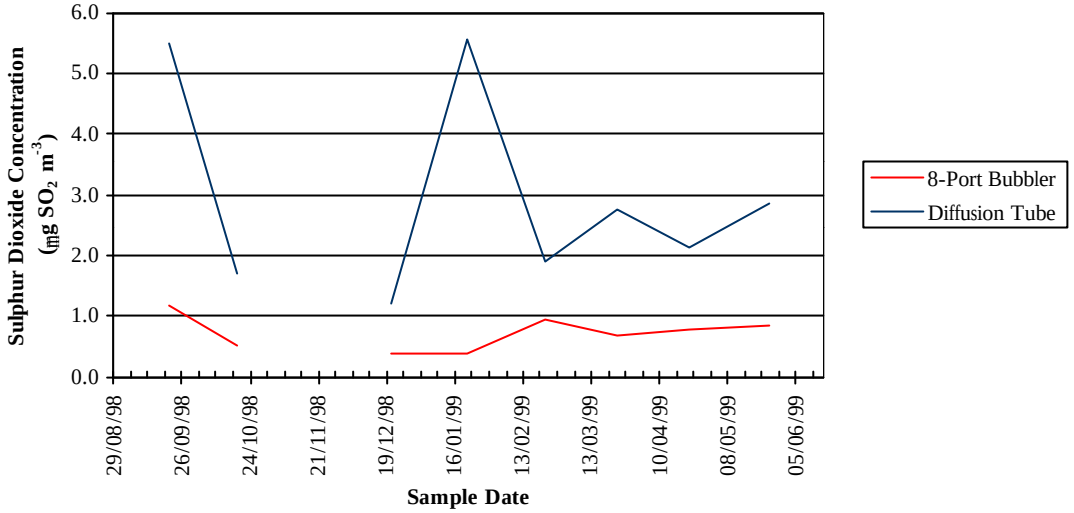
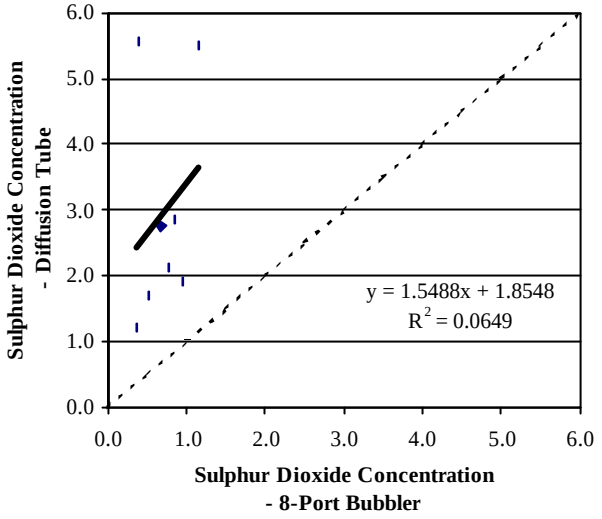


Figure 9e - Comparison of the monthly Diffusion Tube measurements with the monthly-averaged 8-port Bubbler measurements





4.1.3 Conclusions

The measurements obtained and the subsequent analysis have indicated that:

- *the 8-port bubbler measurements were in excellent agreement with the UV-F measurements*;
- *the weekly bubbler and the "long-inlet" denuder measurements showed the same temporal behaviour as observed by the UV-F instrument, although the absolute magnitudes were generally lower*;
- *the filter pack and 'short inlet' denuder measurements showed a near-perfect 1:1 correlation with the UV-F measurements for the limited set of samples considered*;
- *the diffusion tube measurements were in poor agreement with the UV-F measurements*.

Similar conclusions could be drawn when the comparison of the methods was made against the current 8-port bubbler method.

On the basis of the intercomparison exercise, the choice of methods to replace the bubbler method was limited to the denuder or the filter pack methods on the grounds of cost, improved sensitivity, method robustness, ease of operation and the quality of the measurements. For practical reasons, it has been decided to replace the bubbler method with the filter pack method and to make fortnightly measurements. The filter pack method will be introduced from April 2001 and will have the added advantage that a single method will be used to measure SO_2 concentrations throughout the networks.

4.2 COMPARISON OF SINGLE-PORT AND 8-PORT BUBBLERS

Between 1995 and 1998, concentrations of SO_2 were measured at the Husborne Crawley (site codes: 5312/5336) and Ratcliffe (site codes: 5315 and 5337) sites using both the weekly single-port and weekly 8-port bubblers. The two types of bubblers were operated in parallel at the Husborne Crawley site between July 1995 and May 1998, apart from a period in 1996 when the single-port measurements were suspended. Similarly, the two types of bubblers were operated at the Ratcliffe site without a break between September 1995 and May 1998.

Tables 5 and 6 provide a statistical summary of the measurements made at Husborne Crawley and Ratcliffe, respectively. The statistical data suggest that the two types of bubblers are giving comparable measurements at each site. In a report prepared by Vincent and Campbell [1996], summary statistics were included from commencement of the co-located measurements in 1995 to February 1996. These results are also summarised in Tables 5 and 6 for comparison. The authors stated that the agreement appeared to improve after the initial settling-in period which the above statistics cover.

Table 5 - Statistical Summary of the Weekly Measurements Made at Husborne Crawley and Ratcliffe

Husborne Crawley	July 95-February 96		July 95-May 98	
	8-port	Single-port	8-port	Single-port
# of samples	25	25	171	123
mean (ppb)	2.8	2.3	2.2	2.1
standard deviation (ppb)	1.1	1.1	1.3	1.2
min conc (ppb)	1.1	0.8	0.5	0.5
max conc (ppb)	4.6	4.8	7.5	5.7
median (ppb)	2.9	2.5	1.9	2.0

Table 6 - Statistical Summary of the Weekly Measurements Made at Ratcliffe

Ratcliffe	September 95-February 96		July 95-May 98	
	8-port	Single-port	8-port	Single-port
# of samples	13	13	164	127
mean (ppb)	2.9	3.2	3.0	3.1
standard deviation (ppb)	1.4	1.2	1.5	1.5
min conc (ppb)	1.7	2.0	1.0	0.8
max conc (ppb)	7.2	6.8	8.8	9.3
median (ppb)	2.5	2.8	2.5	2.7

Figures 10a and 10b compare the individual measurements made at the Husborne Crawley and Ratcliffe sites respectively over the complete measurement period. Figures 10c and 10d present the linear regression plots of the concentration measurements made using the weekly single-port bubbler against the weekly 8-port bubbler for the two sites. The linear regression analysis is shown below:

Husborne Crawley: $[SO_2]_{\text{single-port}} = 0.87\,[SO_2]_{\text{8-port}} + 0.12$ $(R^2 = 0.78)$

Ratcliffe: $[SO_2]_{\text{single-port}} = 0.91\,[SO_2]_{\text{8-port}} + 0.20$ $(R^2 = 0.76)$

The results of the analysis implies that the single-port bubbler underreads by between 9-13%. This is consistent with the 10-15% underread reported by Downing and Campbell [1995] and the results of the method intercomparison described in the previous section. It is possible that this is a result of moisture transfer into the bellows of the meter, affecting its performance and reading. The single-port bubbler uses a much larger single volume of H_2O_2 solution compared to the volumes of solution used in the individual bubblers of the 8-port bubbler.

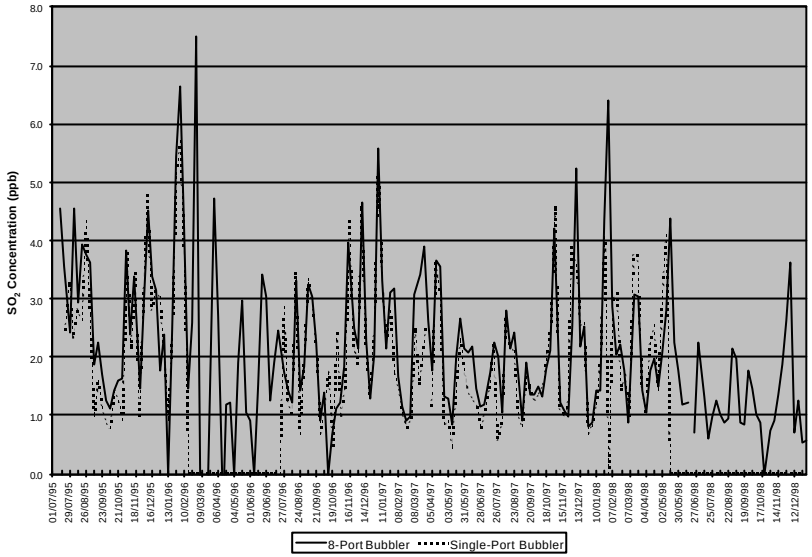


Figure 10a - The SO_2 Concentration Measurements made at Husborne Crawley.

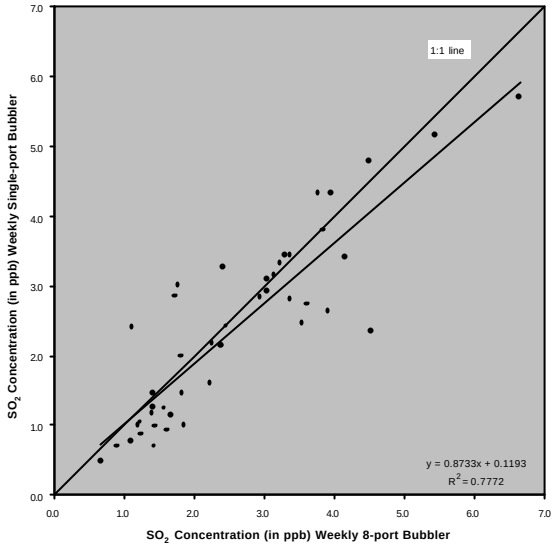


Figure 10c - Linear Regression of the Measurements.

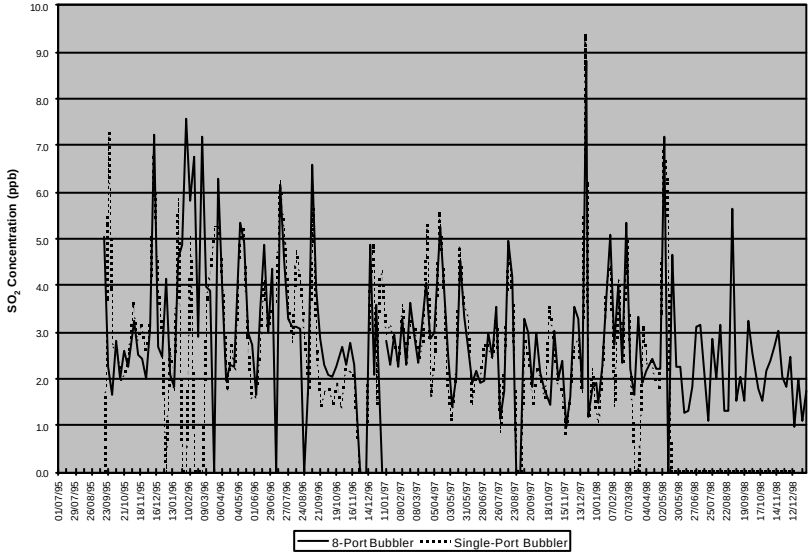


Figure 10b - The SO_2 Concentration Measurements made at Ratcliffe.

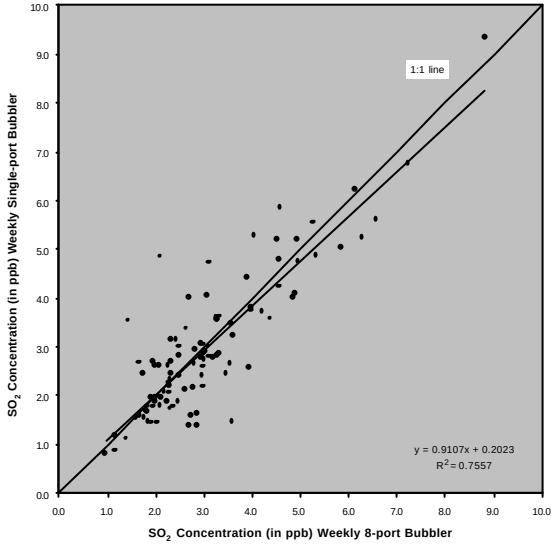


Figure 10d - Linear Regression of the Measurements.

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6 Acknowledgements

This work was funded by the National Environment Research Council as a subcontract to its contract (EPG1/3/54) with the Department of Environment Transport and Regions, and by the National Assembly for Wales under contract number PAE-22-01-037.

Thanks are due to PowerGen and Innogy for supplying data from the JEP Programme.

With special thanks to all the site operators whose commitment to the network has helped provide such a comprehensive and high quality data set.

We would also like to take this opportunity to thank Steve Baker (AEA Technology) for his contribution to the smooth operation of the monitoring networks. We wish him well in his new career.

Appendix 1

ANNUAL SITE MAINTENANCE AND OTHER SITE VISITS

Site Code	Site Name	Date of Annual Site Visit	Other Site Visits/Comments
5002	Eskdalemuir (1)	25/1/99	Replaced bubbler during site maintenance visit.
		1/8/99	Site maintenance visit.
5004	Stoke Ferry (1)	9/11/99	Site maintenance visit.
5006	Lough Navar (1)	14/10/99	Inlet replaced during site maintenance visit.
5007	Barcombe Mills (1)	16/2/99	Site maintenance visit.
		12/11/99	Replaced meter during site maintenance visit.
5008	Yarner Wood (1)	18/6/99	Valve replaced during site maintenance visit.
		15/7/99	Site maintenance visit.
5009	High Muffles (1)	22/6/99	Valve and inlet replaced during site maintenance visit.
		23/11/99	Meter replaced during site maintenance visit.
5010	Strathvaich Dam (1)	30/3/99	Site maintenance visit.
5011	Glen Dye (1)	28/7/99	Meter replaced during site maintenance visit.
5301	Brockhill 1	20/5/00	Valve replaced during site maintenance visit.
5303	Caenby 1	24/6/99	Annual site maintenance visit.
5304	Camborne 1	15/7/99	Annual site maintenance visit.
5305	Camphill 1	13/4/99	Replacement pump sent to site operator.
		12/7/99	Replacement meter sent to site operator.
		31/7/99	Bubbler replaced during annual site maintenance visit.
5306	Cardington 2	19/5/99	Annual site maintenance visit.
5308	Corpach 1	29/7/99	Annual site maintenance visit.
5309	Cresselly 1	16/6/99	Meter replaced duringannual site maintenance visit.
5310	Etton 1	24/11/99	Meter, inlet funnel & tubing replaced during annual site maintenance visit.
5312	Husborne Crawley 1	7/1/99	Emergency visit to replace valve.
		19/4/99	Emergency visit to replace bubbler.
		19/5/99	Emergency visit to replace meter and valve.
		5/10/99	Emergency visit to replace valve.
5313	Little Horkesley 1	10/11/99	Annual site maintenance visit.
5314	Marshfield 1	17/6/99	Inlet funnel and tubing replaced during annual site maintenance visit.
		29/9/99	Emergency visit to replace meter.
5315	Ratcliffe 13	20/5/99	Meter replaced during annual site maintenance visit.
5316	Rockbourne 1	21/4/99	Bubbler, inlet tubing & funnel replaced during annual site maintenance visit.
5317	Wakefield 24	4/8/99	Annual site maintenance visit.
5318	Waunfawr 1	18/8/99	Inlet funnel replaced during annual site maintenance visit.
5319	Fort Augustus 2	27/1/99	Annual site maintenance visit.
		30/3/99	Emergency visit to replace bubbler unit.
5320	Loch Leven 2	28/7/99	Meter, pump and inlet replaced during annual site maintenance visit.
5321	Redesdale 2	26/7/99	Identified need for new bubbler during annual site maintenance visit.
		14/9/99	Emergency visit to replace bubbler.
5322	Hebden Bridge 2	3/8/99	Annual site maintenance visit.
5323	Preston Montford 2	19/8/99	Meter replaced during annual site maintenance visit.
5324	Bentra	13/10/99	Funnel replaced during annual site maintenance visit.
5325	Pitlochry	26/1/99	Pump, inlet tubing & funnel replaced during annual site maintenance visit.
5326	Bush	27/7/99	Inlet replaced during annual site maintenance visit.
		15/9/99	Emergency visit to replace meter.
5329	Cam Forest	14/10/99	Funnel replaced during annual site maintenance visit.
5330	Cwmystwyth	17/8/99	Inlet tubing and funnel replaced during annual site maintenance visit.
5331	Rosemaund	16/7/99	Inlet tubing and funnel replaced during annual site maintenance visit.
5333	Fairseat	15/2/99	Emergency visit to replace meter.
		11/11/99	Bubbler replaced during annual site maintenance visit.
5338	Forsinain	25/1/00	Pump and inlet funnel replaced during annual site maintenance visit.
5339	Appleacre	22/6/99	Inlet funnel replaced during annual site maintenance visit.
5340	Garrary	2/8/99	Site closed and relocated to Benniguinea.
5343	Benniguinea	2/8/99	Site installed successfully.
5334	Bylchau	19/8/99	Meter replaced during annual site maintenance visit.
5335	Crai	15/6/99	Meter and inlet funnel replaced during annual site maintenance visit.
		29/9/99	Emergency visit to replace bubbler.

Note (1) These sites are operated as part of the UK Acid Deposition Monitoring Networks and are visited more frequently given the more extensive monitoring programmes undertaken at most of the sites.

Appendix 2

DAILY, WEEKLY AND MONTHLY SO_2 CONCENTRATIONS

National Environmental Technology Centre

Daily Sites Analysed:

5002 Eskdalemuir
5004 Stoke Ferry
5006 Lough Navar
5007 Barcombe Mills
5008 Yarner Wood
5009 High Muffles
5010 Strathvaich Dam
5011 Glen Dye
5326 Bush
5341 Auchencorth Moss

Variables Analysed	Units	Specified Variable Limit
sulphur dioxide as S	$\mu g\ m^{-3}$	1.000

Time Period Covered:

January 1999 - December 1999

National Environmental Technology Centre
Site: 5002 Eskdalemuir - Sulphur Dioxide as S (SO2 - S)
Concentration in air ($\mu g\ S\ m^{-3}$)

Daily measurements - Summary for January 1999 to December 1999

MONTH	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
DATE												
1 - 2	0.27	N	0.12	2.94	0.40	0.40	0.19	0.48	0.24	0.45	0.19	0.13
2 - 3	0.22	0.37	0.15	1.07	0.79	0.52	0.57	2.10	0.20	0.28	0.32	0.46
3 - 4	0.18	0.19	0.51	0.44	0.60	0.22	0.41	0.82	0.23	0.26	0.20	0.34
4 - 5	0.31	0.21	0.58	0.17	1.70	0.22	0.39	0.91	0.33	0.40	0.30	0.50
5 - 6	0.15	0.36	2.42	0.25	1.21	0.14	0.18	0.20	1.49	0.39	0.27	0.31
6 - 7	N	0.72	0.64	0.17	0.92	0.24	0.21	0.23	0.32	0.43	0.31	0.25
7 - 8	N	0.30	0.16	0.29	1.57	0.31	0.26	0.32	0.24	0.24	0.22	0.37
8 - 9	N	1.11	0.35	0.26	0.45	0.45	0.27	0.23	0.55	<0.11	0.27	0.16
9 - 10	N	1.18	0.19	0.25	0.19	0.29	N	0.31	0.30	0.13	0.38	<0.15
10 - 11	N	0.86	1.00	0.18	0.36	0.67	1.21	0.57	1.47	0.11	1.80	0.58
11 - 12	N	0.29	3.08	0.24	0.24	0.32	0.24	0.59	0.72	0.14	1.34	0.67
12 - 13	N	0.22	0.26	0.52	0.33	0.19	0.31	1.89	0.44	0.28	0.26	0.29
13 - 14	N	0.56	0.27	0.65	0.28	0.14	0.20	0.23	0.62	0.41	0.60	0.97
14 - 15	N	0.18	0.25	0.34	0.24	0.18	0.25	0.18	0.29	0.62	0.66	1.01
15 - 16	N	0.10	0.14	1.46	0.20	0.31	0.23	0.16	2.71	0.31	0.29	0.33
16 - 17	N	0.19	0.18	0.18	0.50	0.28	0.25	0.23	0.41	0.45	0.77	0.17
17 - 18	N	0.24	0.15	0.30	0.12	0.25	0.35	1.32	0.44	0.58	0.62	0.27
18 - 19	N	0.19	0.16	0.27	0.27	0.40	0.29	0.80	1.08	0.31	0.94	1.45
19 - 20	N	0.16	0.14	1.13	0.37	0.17	0.22	1.70	0.52	0.38	1.99	0.82
20 - 21	N	0.15	0.14	1.11	0.37	0.24	0.22	1.50	1.77	0.67	0.74	1.55
21 - 22	N	0.15	0.20	0.47	0.21	0.13	0.27	0.41	0.44	1.21	0.53	0.59
22 - 23	N	0.21	0.16	0.23	0.13	N	0.50	0.49	1.18	1.27	0.30	0.46
23 - 24	N	0.32	0.13	0.29	0.24	0.93	0.36	1.06	0.32	0.49	0.16	0.18
24 - 25	N	1.51	0.21	0.35	0.71	0.87	0.22	0.36	0.23	0.24	0.20	0.18
25 - 26	N	0.14	0.17	2.95	0.22	3.32	0.27	0.44	0.32	0.85	0.34	0.28
26 - 27	0.36	0.35	0.27	0.27	0.15	2.30	0.51	0.29	0.36	0.27	0.26	0.23
27 - 28	0.41	0.19	0.16	N	0.80	0.41	0.54	0.35	0.57	0.30	0.34	<0.12
28 - 29	0.95	0.22	0.28	0.31	0.59	0.38	0.35	0.30	0.87	0.19	0.29	0.21
29 - 30	1.05		0.33	1.02	0.26	0.62	0.35	0.35	0.43	0.77	0.38	0.21
30 - 31	0.38		0.25	0.92	0.19	0.27	1.60	0.29	0.24	0.30	0.15	0.21
31 - 1	N		0.48		0.39		1.55	0.27		0.14		0.11
Arithmetic Mean (3)	-	0.39	0.44	0.66	0.48	0.52	0.43	0.62	0.64	0.42	0.51	0.43
Standard Deviation (3)	-	0.36	0.65	0.73	0.40	0.68	0.37	0.54	0.57	0.29	0.46	0.38
Sample Size	10	27	31	29	31	29	30	31	30	31	30	31

Notes (1) N = no measurement; (2) Measurements preceded by < are below the Limit of Detection. The measurement has been included in the calculation of the statistical parameters at 50% of its value; (3) Statistical parameters calculated only if data capture is greater than 75%.

National Environmental Technology Centre
Site: 5004 Stoke Ferry - Sulphur Dioxide as S (SO2 - S)
Concentration in air ($\mu g\ S\ m^{-3}$)

Daily measurements - Summary for January 1999 to December 1999

MONTH	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
DATE												
1 - 2	1.38	4.01	0.74	2.91	2.97	0.53	0.81	1.49	3.05	1.02	0.93	1.30
2 - 3	0.88	2.81	0.72	1.28	1.25	0.66	0.77	2.10	2.22	0.54	0.69	0.29
3 - 4	1.39	1.30	0.61	0.56	1.13	0.50	0.71	2.13	1.02	0.53	1.20	1.56
4 - 5	0.78	1.13	2.86	0.57	1.08	0.62	0.56	1.12	1.43	1.11	1.76	2.97
5 - 6	0.94	2.63	2.79	0.52	1.51	0.52	0.37	0.75	0.76	N	1.40	0.85
6 - 7	2.14	0.76	2.81	0.60	0.81	0.73	1.25	0.59	1.43	N	1.70	0.70
7 - 8	1.03	4.17	2.33	0.86	1.30	0.53	1.72	0.75	0.98	N	1.59	0.63
8 - 9	2.21	4.59	1.10	4.97	0.52	2.14	2.76	0.66	1.29	N	2.27	0.86
9 - 10	0.78	3.54	1.58	1.05	1.04	1.26	0.47	N	0.42	N	1.60	1.45
10 - 11	0.57	4.34	3.36	0.81	0.61	1.17	0.53	1.01	1.24	N	<0.26	1.44
11 - 12	2.06	4.52	2.60	0.70	0.65	0.81	0.79	0.86	2.10	N	0.33	0.62
12 - 13	2.10	4.41	3.52	1.72	0.80	0.39	3.51	1.17	0.64	N	0.34	1.74
13 - 14	2.02	5.73	1.53	1.34	1.97	0.43	1.55	1.17	0.93	N	<0.29	2.08
14 - 15	0.74	2.17	0.84	1.97	1.43	1.52	2.26	0.77	1.23	N	2.98	1.70
15 - 16	1.39	1.94	0.87	1.25	0.40	0.98	1.57	0.57	1.36	N	2.72	2.67
16 - 17	0.99	3.67	1.67	1.00	0.59	2.11	0.83	0.99	0.53	N	1.50	1.69
17 - 18	0.76	3.44	1.41	1.22	0.70	1.66	1.01	0.90	0.57	N	2.65	1.58
18 - 19	0.28	2.16	5.23	0.57	1.01	1.11	0.98	0.79	0.99	N	1.32	N
19 - 20	0.76	1.43	2.51	0.57	2.14	1.07	0.68	7.19	1.36	2.11	2.28	N
20 - 21	0.81	3.17	1.98	0.93	1.86	0.60	0.61	1.00	0.91	1.92	4.56	N
21 - 22	0.50	1.45	0.90	1.16	0.83	3.23	0.70	1.02	0.51	0.95	2.22	N
22 - 23	1.87	<0.27	1.94	N	0.71	1.85	1.33	0.59	1.03	2.60	2.37	1.64
23 - 24	0.75	4.54	2.95	N	0.92	1.42	1.59	0.54	0.31	0.69	1.23	0.65
24 - 25	0.63	1.90	1.53	N	1.04	0.65	1.17	0.62	0.38	1.29	0.84	0.44
25 - 26	0.53	2.34	1.51	0.95	0.93	0.70	1.52	1.27	0.26	0.62	1.19	0.41
26 - 27	1.14	1.08	2.31	1.20	0.79	1.83	5.41	0.54	0.38	2.27	0.71	0.46
27 - 28	4.12	0.85	0.86	1.94	2.51	0.50	0.78	1.33	0.46	0.95	0.95	0.84
28 - 29	2.56	0.72	1.08	0.81	1.31	0.51	1.27	0.83	2.15	2.72	1.10	N
29 - 30	1.40		0.27	0.39	0.88	0.62	0.86	1.44	0.42	1.35	0.65	N
30 - 31	2.81		0.99	1.78	0.31	1.04	1.60	1.11	3.48	1.20	1.11	N
31 - 1	2.90		1.72		0.20		1.29	2.37		0.58		N
Arithmetic Mean (3)	1.39	2.68	1.84	1.25	1.10	1.06	1.33	1.25	1.13	-	1.48	1.24
Standard Deviation (3)	0.88	1.51	1.08	0.94	0.63	0.67	1.02	1.22	0.80	-	0.97	0.73
Sample Size	31	28	31	27	31	30	31	30	30	17	30	23

Notes (1) N = no measurement; (2) Measurements preceded by < are below the Limit of Detection. The measurement has been included in the calculation of the statistical parameters at 50% of its value; (3) Statistical parameters calculated only if data capture is greater than 75%.

National Environmental Technology Centre
Site: 5006 Lough Navar - Sulphur Dioxide as S (SO2 - S)
Concentration in air ($\mu g\ S\ m^{-3}$)

Daily measurements - Summary for January 1999 to December 1999

MONTH	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
DATE												
1 - 2	<0.19	0.42	0.19	0.77	0.19	0.23	0.31	0.24	0.23	0.24	0.19	0.23
2 - 3	0.31	0.25	<0.14	0.23	0.27	0.58	0.25	0.28	0.28	0.19	0.21	0.20
3 - 4	0.20	0.23	0.25	0.27	0.34	0.23	0.11	0.31	0.14	0.23	1.00	0.24
4 - 5	0.20	<0.15	0.15	0.24	0.67	0.18	<0.15	0.43	0.17	0.19	0.46	0.28
5 - 6	0.18	0.25	0.22	0.17	0.26	0.22	0.31	0.27	0.32	0.22	0.15	0.11
6 - 7	0.39	0.20	<0.20	0.21	1.09	0.16	0.26	0.26	0.29	<0.16	0.18	0.24
7 - 8	0.16	0.18	<0.16	0.34	0.19	N	0.29	0.31	0.30	<0.15	0.19	0.20
8 - 9	0.17	0.24	0.17	0.29	0.22	0.24	0.54	0.32	0.25	0.14	<0.14	0.27
9 - 10	0.23	0.16	0.67	0.16	0.14	0.16	0.52	0.34	0.29	<0.19	0.15	0.28
10 - 11	0.35	0.20	0.47	<0.17	0.20	0.14	0.28	0.37	0.25	0.21	<0.14	0.14
11 - 12	0.93	0.22	0.67	<0.14	0.20	0.12	0.31	0.35	0.15	<0.14	0.19	0.33
12 - 13	0.44	0.19	0.17	0.27	0.13	<0.20	0.37	0.35	0.28	0.48	N	<0.14
13 - 14	0.46	0.25	0.22	0.30	0.23	0.14	0.22	0.21	0.17	0.15	0.27	0.21
14 - 15	0.53	0.24	0.35	0.25	0.19	0.27	0.12	0.13	0.26	0.31	0.17	0.16
15 - 16	0.54	0.24	0.32	0.30	0.21	0.36	0.28	0.24	0.20	0.70	<0.13	0.27
16 - 17	0.60	0.29	0.23	0.64	0.19	0.29	0.17	0.19	0.19	0.40	0.20	0.20
17 - 18	0.56	<0.16	0.45	0.40	0.23	0.32	0.13	0.21	0.20	0.64	0.24	0.17
18 - 19	0.38	<0.16	0.23	0.29	0.71	0.35	0.14	0.25	<0.14	1.01	0.29	0.20
19 - 20	0.19	0.15	0.22	0.40	0.38	0.29	0.15	0.21	0.13	1.04	0.26	0.20
20 - 21	0.24	0.21	0.29	0.26	1.60	0.30	0.14	0.37	0.26	1.34	0.28	0.26
21 - 22	0.21	0.23	0.18	0.28	0.19	0.32	0.13	0.35	0.16	0.86	0.18	0.24
22 - 23	0.86	0.16	0.15	0.34	0.16	0.29	<0.16	0.62	<0.13	0.48	0.32	0.15
23 - 24	0.26	<0.16	0.34	0.28	0.13	0.26	0.17	1.20	0.20	0.29	0.14	0.17
24 - 25	<0.16	0.23	0.32	0.28	0.13	0.27	0.17	1.11	0.13	0.15	0.15	0.12
25 - 26	0.32	0.21	0.23	0.24	0.21	0.41	0.20	0.17	<0.13	0.16	0.39	0.16
26 - 27	0.20	0.20	0.30	0.63	0.31	0.36	0.49	0.29	0.16	0.19	0.18	0.17
27 - 28	<0.17	0.24	0.35	0.56	0.33	0.55	0.55	0.18	0.25	N	0.35	0.24
28 - 29	<0.16	0.24	0.18	0.41	0.31	0.34	1.11	0.27	0.20	0.40	<0.14	0.24
29 - 30	0.16		0.21	0.18	0.20	0.13	1.02	<0.12	0.26	0.18	0.19	0.21
30 - 31	<0.15		0.23	0.16	0.27	0.24	0.98	0.30	<0.13	0.16	0.19	<0.13
31 - 1	0.18		0.25		0.23		0.45	0.24		0.38		0.15
Arithmetic Mean (3)	0.31	0.21	0.27	0.31	0.33	0.27	0.33	0.34	0.20	0.37	0.23	0.20
Standard Deviation (3)	0.22	0.07	0.14	0.16	0.31	0.12	0.27	0.24	0.08	0.32	0.17	0.06
Sample Size	31	28	31	30	31	29	31	31	30	30	29	31

Notes (1) N = no measurement; (2) Measurements preceded by < are below the Limit of Detection. The measurement has been included in the calculation of the statistical parameters at 50% of its value; (3) Statistical parameters calculated only if data capture is greater than 75%.

National Environmental Technology Centre
Site: 5007 Barcombe Mills - Sulphur Dioxide as S (SO2 - S)
Concentration in air ($\mu g\ S\ m^{-3}$)

Daily measurements - Summary for January 1999 to December 1999

MONTH	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
DATE												
1 - 2	0.34	4.13	0.18	0.74	1.48	1.47	0.44	2.11	0.95	0.30	0.45	1.21
2 - 3	0.30	1.31	0.41	0.86	1.18	0.56	0.43	1.66	1.05	0.32	0.44	0.87
3 - 4	0.23	0.49	0.39	0.51	1.87	0.61	0.98	0.74	0.90	0.29	<0.17	0.78
4 - 5	0.32	0.42	1.15	0.55	1.06	0.49	0.79	0.69	1.76	1.00	0.78	0.72
5 - 6	0.86	0.49	1.68	0.37	2.15	0.41	0.52	0.47	1.37	0.95	0.59	0.61
6 - 7	0.74	0.63	1.41	0.43	0.51	0.75	0.93	0.73	0.98	2.00	0.45	0.21
7 - 8	0.33	1.17	0.40	0.75	0.93	0.31	1.14	0.42	0.62	0.58	0.57	0.42
8 - 9	0.78	1.23	1.13	0.97	1.31	0.57	2.18	0.59	0.43	0.45	0.68	0.33
9 - 10	1.07	3.37	0.76	0.40	0.56	0.52	0.76	0.88	0.78	0.44	1.21	0.35
10 - 11	1.69	4.47	2.40	0.28	0.56	0.90	2.95	0.33	1.06	0.26	2.12	0.49
11 - 12	1.37	2.98	1.76	0.51	0.41	1.63	2.84	0.52	1.43	0.50	1.11	0.19
12 - 13	0.43	1.69	1.85	0.80	0.28	1.44	3.73	1.36	0.43	3.23	1.65	0.21
13 - 14	0.77	1.54	0.58	0.56	0.39	0.61	0.90	1.24	0.38	0.92	1.22	0.58
14 - 15	0.68	1.11	0.50	1.18	0.29	1.51	0.42	0.33	0.71	2.27	1.13	1.40
15 - 16	0.48	1.06	1.05	0.76	0.65	0.82	0.97	0.48	0.79	1.03	0.86	5.02
16 - 17	0.32	0.49	0.93	0.49	1.09	0.98	0.70	0.52	0.33	1.13	0.88	1.69
17 - 18	0.37	0.50	2.35	0.89	0.48	1.22	0.65	0.51	0.28	1.09	1.26	1.34
18 - 19	0.43	0.43	2.22	0.97	1.29	0.82	0.83	0.88	1.02	1.71	2.19	4.49
19 - 20	0.26	0.40	1.42	1.04	1.19	1.18	0.84	0.76	0.48	2.17	1.62	3.64
20 - 21	0.39	0.52	2.16	0.56	1.02	0.70	0.80	1.07	0.45	2.91	1.07	3.10
21 - 22	0.61	0.30	0.47	0.47	0.42	0.62	0.51	1.18	0.39	1.09	1.28	1.75
22 - 23	1.22	0.87	0.70	0.85	0.28	0.88	0.60	1.23	0.67	0.72	1.29	1.22
23 - 24	0.52	1.04	0.41	1.06	0.38	0.55	0.64	1.88	0.32	0.43	0.81	0.40
24 - 25	0.29	0.65	0.37	1.28	0.52	1.53	0.75	1.60	0.39	0.39	0.58	0.28
25 - 26	0.23	0.80	1.31	0.78	0.57	1.02	0.73	1.09	0.23	0.32	0.36	0.52
26 - 27	0.34	0.33	0.92	2.09	0.53	1.31	0.46	0.52	0.32	0.29	0.48	0.40
27 - 28	0.62	0.37	0.46	1.04	1.72	0.55	0.61	0.45	0.31	0.29	0.46	0.73
28 - 29	1.47	0.32	1.65	0.50	0.34	0.41	0.75	0.80	0.63	0.53	0.77	1.41
29 - 30	1.99		0.33	0.43	1.86	<0.17	1.13	1.46	0.29	0.85	1.60	0.91
30 - 31	1.37		0.66	0.76	0.49	0.64	1.63	0.68	0.49	0.63	0.57	0.41
31 - 1	2.35		1.23		0.39		1.79	1.29		0.38		0.74
Arithmetic Mean (3)	0.75	1.18	1.07	0.76	0.84	0.84	1.08	0.92	0.67	0.95	0.95	1.18
Standard Deviation (3)	0.56	1.15	0.67	0.36	0.54	0.41	0.81	0.48	0.39	0.80	0.52	1.24
Sample Size	31	28	31	30	31	30	31	31	30	31	30	31

Notes (1) N = no measurement; (2) Measurements preceded by < are below the Limit of Detection. The measurement has been included in the calculation of the statistical parameters at 50% of its value; (3) Statistical parameters calculated only if data capture is greater than 75%.

National Environmental Technology Centre
Site: 5008 Yarner Wood - Sulphur Dioxide as S (SO2 - S)
Concentration in air ($\mu g\ S\ m^{-3}$)

Daily measurements - Summary for January 1999 to December 1999

MONTH	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
DATE												
1 - 2	0.18	0.86	<0.13	1.50	0.33	N	0.43	0.42	0.43	0.19	0.19	0.27
2 - 3	0.12	0.69	0.11	0.37	0.88	N	0.83	0.42	0.92	<0.18	0.75	0.26
3 - 4	0.15	0.16	<0.11	0.18	1.73	N	0.37	0.39	1.00	0.21	0.20	0.26
4 - 5	0.24	0.22	0.20	0.20	2.90	N	0.36	0.80	1.17	0.20	0.50	0.27
5 - 6	0.66	0.19	0.21	0.13	1.62	N	0.36	0.41	1.56	0.85	0.29	0.29
6 - 7	0.47	0.19	<0.17	0.18	0.53	N	0.19	0.37	0.44	0.85	0.16	0.19
7 - 8	0.17	0.23	0.26	0.26	0.53	N	0.40	0.28	N	0.31	0.16	0.15
8 - 9	3.99	4.02	1.75	0.25	0.25	N	0.31	0.30	0.53	0.15	0.35	0.18
9 - 10	1.17	0.94	1.38	0.21	0.66	N	1.15	0.44	0.46	<0.14	3.81	0.13
10 - 11	N	0.36	1.33	0.17	0.22	N	0.93	N	1.61	0.21	3.72	0.20
11 - 12	N	0.22	2.38	0.14	0.43	N	1.26	0.35	0.47	0.29	1.27	0.15
12 - 13	1.82	0.92	0.25	0.25	0.19	N	0.71	0.77	0.52	0.55	1.67	0.12
13 - 14	N	1.08	0.18	0.14	0.18	N	0.36	0.26	0.34	1.56	0.76	0.28
14 - 15	0.15	0.20	0.23	0.85	0.59	N	0.25	0.21	0.37	2.96	1.80	0.81
15 - 16	N	0.24	0.31	0.21	0.42	N	0.36	0.23	N	2.08	0.51	0.49
16 - 17	0.19	N	N	0.43	0.99	N	0.31	0.23	0.24	1.06	0.43	0.32
17 - 18	0.16	0.15	0.30	1.78	0.37	N	0.38	N	0.36	1.18	0.39	0.28
18 - 19	<0.11	0.11	0.17	0.24	0.34	0.43	0.31	N	0.28	1.87	0.13	0.51
19 - 20	0.18	0.12	0.27	0.34	1.27	0.33	0.38	N	0.32	2.52	3.40	2.28
20 - 21	0.24	<0.17	0.21	0.20	0.23	0.50	0.24	0.80	0.21	1.51	3.32	0.65
21 - 22	0.23	0.18	0.19	0.26	0.15	0.57	0.40	0.86	0.37	0.62	1.62	0.32
22 - 23	0.56	0.20	0.11	0.34	0.14	N	0.29	0.75	0.32	0.29	0.38	0.17
23 - 24	0.54	0.28	N	0.19	0.15	0.31	0.45	1.59	0.21	0.23	0.20	0.15
24 - 25	0.26	N	N	0.36	0.21	1.35	0.47	0.56	0.20	0.15	0.25	0.20
25 - 26	0.23	0.24	0.21	0.33	<0.15	1.48	1.13	0.46	0.14	0.32	0.25	0.11
26 - 27	0.19	<0.12	0.15	0.82	N	1.08	1.13	0.47	0.27	0.22	0.34	0.15
27 - 28	0.24	0.13	0.38	0.60	N	0.27	0.79	N	0.26	0.44	0.48	0.29
28 - 29	0.17	0.17	0.50	0.88	N	0.39	0.63	0.33	0.25	0.29	0.70	0.34
29 - 30	0.34		0.18	2.95	N	0.40	0.92	0.51	N	0.77	0.66	0.35
30 - 31	0.87		0.19	1.51	N	0.34	1.54	0.38	0.20	0.28	0.32	0.20
31 - 1	0.95		0.52		N		0.55	0.62		0.19		0.21
Arithmetic Mean (3)	0.54	0.47	0.43	0.54	0.62	-	0.59	0.51	0.50	0.73	0.97	0.34
Standard Deviation (3)	0.80	0.78	0.57	0.63	0.66	-	0.36	0.29	0.40	0.77	1.13	0.39
Sample Size	27	26	28	30	25	12	31	26	27	31	30	31

Notes (1) N = no measurement; (2) Measurements preceded by < are below the Limit of Detection. The measurement has been included in the calculation of the statistical parameters at 50% of its value; (3) Statistical parameters calculated only if data capture is greater than 75%.

National Environmental Technology Centre
Site: 5009 High Muffles - Sulphur Dioxide as S (SO2 - S)
Concentration in air ($\mu g\ S\ m^{-3}$)

Daily measurements - Summary for January 1999 to December 1999

MONTH	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
DATE												
1 - 2	0.60	0.16	0.17	0.65	0.57	0.58	2.10	1.79	0.24	0.40	3.09	0.20
2 - 3	0.24	0.15	0.13	0.86	0.29	0.21	1.91	2.55	5.26	0.50	0.45	0.34
3 - 4	0.19	0.17	0.16	0.64	0.86	0.27	0.67	1.51	4.23	1.16	1.64	0.23
4 - 5	0.25	0.14	0.18	0.56	0.19	0.29	N	1.26	1.17	4.05	5.29	1.49
5 - 6	0.33	0.30	0.31	0.31	0.27	0.28	N	0.42	0.94	1.94	1.85	1.50
6 - 7	0.12	0.64	0.18	0.17	0.26	0.23	N	2.69	1.81	2.18	1.08	0.37
7 - 8	<0.09	0.64	0.15	0.39	0.56	0.24	N	0.21	1.08	0.52	0.42	0.51
8 - 9	0.14	1.09	0.13	0.32	0.20	0.26	0.98	0.24	0.55	0.24	2.41	3.06
9 - 10	0.26	2.12	0.17	0.29	0.41	0.33	0.44	0.21	4.01	0.14	1.72	0.74
10 - 11	0.59	2.16	0.16	0.27	0.49	0.41	0.50	0.97	2.15	0.28	0.39	0.89
11 - 12	0.57	0.52	0.34	0.30	0.33	0.25	0.49	1.01	1.87	0.20	0.22	0.73
12 - 13	1.40	0.74	0.54	0.36	0.18	0.20	0.73	0.70	0.44	0.37	0.18	0.60
13 - 14	0.16	0.74	0.19	0.22	0.24	0.30	1.14	1.56	2.39	1.13	0.57	2.50
14 - 15	0.65	0.40	0.19	0.28	0.15	0.44	0.42	0.23	1.60	0.66	0.22	1.65
15 - 16	0.16	0.46	0.40	0.22	0.25	0.97	0.27	0.22	0.58	0.27	0.94	1.71
16 - 17	0.21	0.26	0.21	0.14	0.25	0.44	0.32	0.22	2.27	0.48	1.33	0.53
17 - 18	0.23	0.26	0.20	0.16	0.18	0.40	0.68	1.71	1.90	0.39	3.56	2.91
18 - 19	0.68	0.32	0.14	0.60	0.21	0.38	0.84	0.37	0.85	0.32	1.88	5.66
19 - 20	0.46	0.21	0.46	0.23	0.54	0.29	4.02	0.45	0.61	0.69	0.83	4.90
20 - 21	0.33	0.15	0.13	0.30	0.54	0.33	0.68	0.90	1.02	1.38	1.39	9.03
21 - 22	0.13	0.21	0.11	1.71	0.19	0.57	0.29	0.97	6.10	0.97	1.25	11.35
22 - 23	0.26	0.39	0.23	0.49	0.15	0.32	0.44	0.41	2.58	2.42	1.02	5.62
23 - 24	0.72	0.68	0.19	0.75	0.16	1.43	0.26	0.31	3.66	1.55	2.51	3.31
24 - 25	0.47	0.32	0.28	0.70	0.13	2.35	N	0.33	1.21	0.24	1.97	1.45
25 - 26	0.20	0.39	0.30	0.37	0.20	5.57	0.68	1.16	0.69	0.74	1.78	0.58
26 - 27	0.28	0.17	0.12	0.24	0.24	2.64	0.34	0.57	1.03	0.51	1.72	0.27
27 - 28	0.15	0.15	0.20	0.17	0.70	0.75	0.40	0.50	1.36	0.99	2.42	2.74
28 - 29	0.54	0.14	1.14	0.33	0.32	0.71	0.25	0.37	2.50	0.27	2.38	1.88
29 - 30	0.30		0.50	0.24	0.20	0.87	N	1.78	1.29	3.99	0.63	1.84
30 - 31	0.22		0.53	0.23	0.17	0.65	0.62	0.30	0.60	1.83	0.43	0.72
31 - 1	0.15		1.38		0.58		0.95	0.25		2.83		0.94
Arithmetic Mean (3)	0.36	0.50	0.31	0.42	0.32	0.77	0.82	0.84	1.87	1.08	1.52	2.27
Standard Deviation (3)	0.27	0.52	0.29	0.31	0.19	1.08	0.81	0.70	1.47	1.06	1.14	2.62
Sample Size	31	28	31	30	31	30	25	31	30	31	30	31

Notes (1) N = no measurement; (2) Measurements preceded by < are below the Limit of Detection. The measurement has been included in the calculation of the statistical parameters at 50% of its value; (3) Statistical parameters calculated only if data capture is greater than 75%.

National Environmental Technology Centre
Site: 5010 Strathvaich Dam - Sulphur Dioxide as S (SO2 - S)
Concentration in air ($\mu g\ S\ m^{-3}$)

Daily measurements - Summary for January 1999 to December 1999

MONTH	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
DATE												
1 - 2	0.64	0.33	<0.34	1.37	0.32	0.29	0.52	1.01	0.30	0.44	<0.27	0.28
2 - 3	0.32	<0.33	<0.35	1.49	<0.30	0.25	0.50	1.20	<0.31	<0.28	<0.31	0.44
3 - 4	<0.35	<0.33	0.40	0.51	0.39	<0.24	0.51	0.74	0.39	<0.30	<0.28	0.21
4 - 5	0.40	<0.35	0.36	0.43	0.70	0.30	0.37	0.88	0.33	0.62	0.37	0.18
5 - 6	<0.35	<0.36	<0.34	0.46	0.42	0.28	0.46	0.59	0.46	<0.30	0.39	0.27
6 - 7	<0.35	<0.36	<0.33	0.38	0.42	0.28	0.41	0.52	0.31	<0.31	<0.30	0.40
7 - 8	<0.34	<0.37	<0.34	0.41	<0.32	<0.26	<0.31	0.41	0.35	<0.29	<0.30	<0.29
8 - 9	<0.35	<0.36	<0.32	0.37	<0.32	0.44	<0.31	0.34	0.34	<0.28	<0.28	0.75
9 - 10	<0.33	<0.35	0.36	0.47	<0.31	0.47	1.17	0.37	<0.29	0.38	<0.28	<0.30
10 - 11	<0.35	<0.32	0.46	0.34	<0.32	0.50	<0.32	0.38	0.46	<0.30	0.39	<0.27
11 - 12	<0.35	<0.33	0.72	0.43	0.55	0.59	0.30	0.44	<0.31	<0.30	<0.29	<0.27
12 - 13	<0.35	0.34	0.35	0.32	0.75	0.61	0.38	0.41	<0.29	<0.30	0.36	<0.30
13 - 14	<0.36	0.61	<0.32	0.42	0.45	0.50	<0.30	0.46	0.49	0.31	0.35	<0.28
14 - 15	<0.36	<0.33	0.35	0.52	0.34	0.69	<0.27	0.32	0.41	<0.30	0.50	<0.27
15 - 16	<0.37	<0.35	<0.33	0.43	0.39	0.53	<0.29	<0.33	1.92	<0.29	<0.29	<0.30
16 - 17	<0.36	<0.37	<0.33	0.42	0.49	0.46	<0.29	0.39	0.89	0.47	0.19	<0.30
17 - 18	<0.33	<0.34	0.39	0.66	<0.29	0.57	<0.30	0.69	0.34	<0.32	0.47	<0.28
18 - 19	0.58	<0.30	<0.35	0.49	0.31	0.47	<0.29	0.38	0.78	0.36	0.39	<0.27
19 - 20	<0.34	<0.34	<0.35	0.31	0.53	0.68	<0.30	0.39	0.54	0.31	0.49	<0.25
20 - 21	<0.35	0.42	<0.34	0.49	0.35	0.55	0.28	0.40	<0.33	0.52	0.26	1.24
21 - 22	<0.30	<0.34	<0.33	0.84	0.39	0.64	0.40	0.61	0.59	0.57	0.26	0.46
22 - 23	0.51	<0.34	0.34	0.31	<0.31	0.30	0.45	0.46	0.85	0.45	0.54	<0.29
23 - 24	<0.33	0.47	<0.33	<0.28	<0.31	<0.29	0.41	0.46	0.55	0.33	0.03	<0.30
24 - 25	<0.34	0.71	0.39	<0.28	0.36	<0.29	<0.32	0.50	0.53	0.30	0.23	<0.28
25 - 26	<0.33	<0.33	<0.33	0.58	0.36	0.63	0.44	0.40	<0.30	<0.33	0.51	<0.27
26 - 27	0.34	<0.32	<0.33	0.50	0.39	1.12	0.34	0.44	0.35	0.29	0.37	<0.27
27 - 28	<0.35	<0.34	<0.33	0.65	0.52	0.37	0.75	<0.30	0.33	<0.29	0.75	<0.26
28 - 29	<0.35	<0.35	<0.35	0.47	<0.31	<0.26	0.31	0.83	0.41	<0.29	0.23	<0.30
29 - 30	<0.35		<0.33	<0.32	<0.30	0.37	<0.31	0.43	0.30	<0.30	0.28	<0.28
30 - 31	0.34		<0.33	0.31	0.41	0.35	0.60	0.99	0.43	0.34	0.45	<0.29
31 - 1	<0.35		1.09		0.46		1.78	0.53		<0.28		<0.30
Arithmetic Mean (3)	0.23	0.24	0.28	0.49	0.35	0.43	0.39	0.53	0.45	0.26	0.30	0.24
Standard Deviation (3)	0.13	0.15	0.20	0.29	0.17	0.22	0.34	0.24	0.34	0.15	0.16	0.23
Sample Size	31	28	31	30	31	30	31	31	30	31	30	31

Notes (1) N = no measurement; (2) Measurements preceded by < are below the Limit of Detection. The measurement has been included in the calculation of the statistical parameters at 50% of its value; (3) Statistical parameters calculated only if data capture is greater than 75%.

National Environmental Technology Centre
Site: 5011 Glen Dye - Sulphur Dioxide as S (SO2 - S)
Concentration in air ($\mu g\ S\ m^{-3}$)

Daily measurements - Summary for January 1999 to December 1999

MONTH	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
DATE												
1 - 2	0.89	0.30	0.20	2.79	0.37	0.24	0.27	0.79	0.33	<0.21	0.42	0.23
2 - 3	0.42	0.27	0.56	0.57	0.41	0.49	0.20	1.17	0.31	0.24	<0.14	0.15
3 - 4	0.53	0.26	0.22	1.34	2.43	<0.19	0.17	0.29	0.32	<0.21	1.00	0.11
4 - 5	0.50	0.22	0.20	0.50	0.55	0.34	<0.17	0.51	0.62	0.23	1.18	0.18
5 - 6	0.29	0.22	<0.20	0.40	0.35	0.16	<0.17	0.59	1.51	<0.20	<0.20	0.25
6 - 7	<0.18	0.18	0.21	0.25	0.40	0.27	0.29	0.37	0.87	0.56	0.31	0.14
7 - 8	0.28	0.25	<0.18	0.15	0.21	0.22	0.29	0.23	0.50	<0.20	0.23	<0.22
8 - 9	0.18	0.26	0.30	0.19	0.18	0.28	0.30	0.68	1.13	<0.21	0.24	0.55
9 - 10	<0.18	0.34	0.45	0.21	0.47	<0.16	0.34	0.26	1.00	0.20	0.30	0.50
10 - 11	0.22	<0.18	1.09	0.17	0.80	<0.16	0.33	0.37	1.37	0.29	<0.21	0.22
11 - 12	0.86	0.17	4.27	<0.16	0.41	0.40	0.18	0.34	0.73	<0.17	0.42	<0.22
12 - 13	0.28	<0.18	0.96	0.20	0.18	0.17	0.93	0.63	0.30	0.25	0.19	<0.22
13 - 14	0.49	0.93	0.72	<0.18	0.39	<0.17	0.32	0.34	1.00	0.21	<0.20	<0.21
14 - 15	0.50	0.21	0.77	<0.17	0.35	<0.16	0.28	0.31	0.39	0.21	<0.21	0.27
15 - 16	0.41	<0.16	0.48	0.27	0.17	0.54	0.25	0.23	1.57	0.30	<0.21	<0.22
16 - 17	0.69	<0.16	0.29	0.18	0.21	0.38	0.27	0.46	0.34	0.25	0.31	<0.22
17 - 18	0.43	<0.16	0.24	0.21	0.25	0.46	0.25	1.34	0.42	0.49	0.30	<0.23
18 - 19	0.85	<0.16	0.18	0.18	0.26	0.19	0.46	0.36	0.44	0.24	0.31	0.23
19 - 20	0.19	<0.15	0.24	0.25	0.42	<0.17	0.60	0.34	0.20	0.23	0.22	<0.23
20 - 21	0.22	0.22	<0.18	0.23	0.84	<0.18	0.30	0.27	0.25	0.44	0.29	1.16
21 - 22	<0.18	0.16	0.39	1.45	0.34	<0.17	0.21	0.34	1.04	0.57	0.22	0.88
22 - 23	0.20	<0.17	0.26	0.64	0.27	0.31	<0.16	0.52	1.40	0.57	0.32	0.35
23 - 24	0.29	0.18	0.25	1.21	0.17	0.44	0.16	0.35	0.83	0.48	1.10	0.77
24 - 25	0.23	0.95	<0.18	0.63	0.20	1.02	0.15	0.34	0.42	0.44	0.21	0.24
25 - 26	<0.18	0.22	0.25	0.38	0.55	0.88	0.22	0.34	0.20	0.24	0.50	<0.20
26 - 27	0.31	0.27	<0.19	0.28	1.67	0.98	0.26	0.23	0.21	<0.18	0.26	<0.21
27 - 28	0.32	0.32	0.19	N	1.04	0.10	0.31	<0.18	0.22	<0.20	0.23	0.25
28 - 29	0.23	0.24	0.66	N	0.22	0.41	0.26	0.19	<0.20	0.33	0.20	<0.20
29 - 30	0.25		0.96	0.57	<0.18	0.26	0.28	0.57	0.27	0.61	0.68	<0.20
30 - 31	<0.15		0.35	0.35	0.56	<0.18	0.73	0.18	0.23	0.58	0.28	0.47
31 - 1	0.36		1.32		0.41		0.55	0.39		<0.21		0.54
Arithmetic Mean (3)	0.35	0.24	0.53	0.49	0.49	0.31	0.30	0.43	0.62	0.29	0.34	0.28
Standard Deviation (3)	0.23	0.21	0.76	0.58	0.48	0.26	0.18	0.27	0.44	0.17	0.29	0.26
Sample Size	31	28	31	28	31	30	31	31	30	31	30	31

Notes (1) N = no measurement; (2) Measurements preceded by < are below the Limit of Detection. The measurement has been included in the calculation of the statistical parameters at 50% of its value; (3) Statistical parameters calculated only if data capture is greater than 75%.

National Environmental Technology Centre
Site: 5326 Bush - Sulphur Dioxide as S (SO2 - S)
Concentration in air ($\mu g\ S\ m^{-3}$)

Daily measurements - Summary for January 1999 to December 1999

MONTH	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
DATE												
1 - 2	1.03	0.75	0.46	3.86	0.60	1.11	0.57	N	N	0.60	0.21	0.31
2 - 3	0.34	0.54	0.71	4.03	1.17	2.51	2.53	N	N	0.43	0.23	0.40
3 - 4	0.36	0.37	2.82	0.80	1.24	1.05	0.63	N	N	3.28	0.38	0.51
4 - 5	0.37	0.38	0.60	0.55	1.90	N	0.36	N	N	2.89	0.22	1.46
5 - 6	1.02	1.74	1.47	0.39	0.66	N	1.52	N	N	1.55	1.14	1.43
6 - 7	0.40	0.49	6.15	0.36	0.82	N	0.46	N	N	0.63	1.19	0.27
7 - 8	1.07	2.04	0.60	0.27	2.93	0.55	0.27	N	N	0.37	0.38	0.34
8 - 9	1.36	1.23	7.09	0.33	2.36	1.09	0.25	N	N	0.46	0.33	0.65
9 - 10	4.32	4.11	1.13	0.45	0.44	3.13	1.72	N	N	0.20	1.70	1.43
10 - 11	3.38	3.94	1.48	0.31	0.49	3.46	2.55	N	N	0.25	6.47	0.97
11 - 12	2.04	0.51	4.44	0.31	0.48	N	0.44	N	N	0.73	4.89	1.18
12 - 13	0.52	0.72	1.33	0.78	0.54	N	0.48	N	N	0.40	1.75	0.82
13 - 14	0.54	1.12	0.55	0.94	0.41	N	0.44	N	N	0.44	2.21	2.72
14 - 15	0.46	0.43	0.63	3.19	5.03	N	0.25	N	N	0.79	2.59	2.73
15 - 16	0.80	0.36	0.42	1.26	3.39	0.44	0.27	N	N	0.39	0.36	1.51
16 - 17	0.55	0.37	0.51	1.80	3.36	0.33	0.33	N	0.67	0.91	0.92	0.33
17 - 18	0.53	1.71	0.59	4.81	2.93	1.50	0.29	N	0.63	0.92	3.02	0.65
18 - 19	0.70	0.56	0.39	0.96	1.69	0.67	0.49	N	0.75	1.30	1.09	0.65
19 - 20	0.72	0.46	0.54	1.18	2.69	0.23	0.34	N	0.48	0.75	0.81	3.32
20 - 21	0.79	0.20	0.41	1.37	0.62	0.51	0.30	N	0.66	0.61	1.97	2.17
21 - 22	0.68	0.27	0.44	0.74	0.44	0.42	0.29	N	0.66	0.64	0.73	1.30
22 - 23	0.74	7.63	0.75	0.49	0.35	1.45	1.35	N	3.96	1.10	0.60	0.57
23 - 24	0.50	4.63	0.36	0.63	0.31	1.40	0.43	N	0.46	0.84	0.49	0.33
24 - 25	0.53	1.35	0.48	1.20	0.32	0.53	0.38	N	0.44	0.93	0.41	0.43
25 - 26	0.85	0.79	0.55	2.02	0.26	1.59	1.48	N	0.83	1.20	0.83	0.29
26 - 27	2.11	0.44	0.47	3.40	0.37	2.66	4.50	N	0.84	1.15	0.83	0.31
27 - 28	0.54	0.52	2.18	4.32	1.90	0.63	6.35	N	0.71	0.46	0.79	0.32
28 - 29	0.59	0.26	0.57	2.86	1.15	0.40	1.88	N	0.50	0.28	0.33	0.45
29 - 30	0.70		0.47	0.72	1.29	0.37	1.80	N	0.44	0.62	1.31	0.50
30 - 31	0.38		0.62	0.93	0.57	0.45	N	N	0.57	0.53	0.31	0.90
31 - 1	0.52		1.42		0.55		N	N		0.31		N
Arithmetic Mean (3)	0.95	1.35	1.31	1.51	1.33	1.15	1.14	-	-	0.84	1.28	0.98
Standard Deviation (3)	0.89	1.72	1.66	1.38	1.20	0.95	1.40	-	-	0.69	1.42	0.82
Sample Size	31	28	31	30	31	23	29	0	15	31	30	30

Notes (1) N = no measurement; (2) Measurements preceded by < are below the Limit of Detection. The measurement has been included in the calculation of the statistical parameters at 50% of its value; (3) Statistical parameters calculated only if data capture is greater than 75%.

National Environmental Technology Centre
Site: 5341 Auchencorth Moss - Sulphur Dioxide as S (SO2 - S)
Concentration in air ($\mu g\ S\ m^{-3}$)

Daily measurements - Summary for January 1999 to December 1999

MONTH	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
DATE												
1 - 2	0.65	0.21	0.17	2.78	0.41	0.70						
2 - 3	0.21	0.25	0.13	3.88	1.12	1.54						
3 - 4	<0.13	<0.14	1.44	0.65	1.33	0.89						
4 - 5	0.31	<0.16	0.29	0.21	1.32	0.82						
5 - 6	0.42	0.36	0.39	0.23	0.40	0.54						
6 - 7	0.15	1.71	3.07	0.17	0.37	0.38						
7 - 8	0.43	1.84	0.32	0.15	2.30	0.41						
8 - 9	0.67	0.78	2.16	0.14	1.03	1.79						
9 - 10	2.74	5.90	0.54	0.64	0.26	2.21						
10 - 11	0.44	3.82	0.67	0.18	0.30	1.72						
11 - 12	0.62	0.34	3.53	0.18	0.62							
12 - 13	0.29	0.18	0.80	0.56	0.17							
13 - 14	0.27	0.36	0.19	0.93	0.20							
14 - 15	0.25	0.22	0.34	1.22	2.25							
15 - 16	0.34	0.14	0.17	0.70	1.78							
16 - 17	0.33	0.30	0.36	0.55	1.43							
17 - 18	0.37	0.88	0.24	3.42	1.12							
18 - 19	0.25	0.22	0.17	0.49	0.82							
19 - 20	0.34	0.18	0.29	0.74	2.18							
20 - 21	0.42	0.17	0.37	0.73	0.58							
21 - 22	0.38	0.15	0.25	0.47	0.23							
22 - 23	0.47	1.39	0.46	0.25	0.20							
23 - 24	0.19	1.80	0.25	0.19	0.20							
24 - 25	0.20	0.53	0.20	0.47	0.20							
25 - 26	0.63	0.43	0.26	1.64	0.36							
26 - 27	0.46	0.24	0.26	0.48	0.21							
27 - 28	0.22	0.19	0.39	2.17	1.11							
28 - 29	0.27	0.12	0.39	1.45	1.16							
29 - 30	0.18		0.16	0.49	0.68							
30 - 31	0.14		0.21	0.66	0.42							
31 - 1	0.35		0.75		0.26							
Arithmetic Mean (3)	0.42	0.82	0.62	0.89	0.81	1.10						
Standard Deviation (3)	0.46	1.29	0.83	0.97	0.66	0.66						
Sample Size	31	28	31	30	31	10	0	0	0	0	0	0

Notes (1) N = no measurement; (2) Measurements preceded by < are below the Limit of Detection. The measurement has been included in the calculation of the statistical parameters at 50% of its value; (3) Statistical parameters calculated only if data capture is greater than 75%.

National Environmental Technology Centre

Weekly Sites Analysed:

5301 Brockhill 1
5303 Caenby 1
5304 Camborne 1
5305 Camphill 1
5306 Cardington 2
5308 Corpach 1
5309 Cresselly 1
5310 Etton 1
5312 Husborne Crawley 1
5313 Little Horkesley 1
5314 Marshfield 1
5315 Ratcliffe 13
5316 Rockbourne 1
5317 Wakefield 24
5318 Waunfawr 1
5319 Fort Augustus 2
5320 Loch Leven 2
5321 Redesdale 2
5322 Hebden Bridge 2
5323 Preston Montford 2
5324 Bentra
5325 Pitlochry
5329 Cam Forest
5330 Cwmystwyth
5331 Rosemaund
5333 Fairseat
5334 Bylchau
5335 Crai
5338 Forsinain
5339 Appleacre
5340 Garrary
5342 Auchencorth Moss
5343 Benniguinea

Variables Analysed	Units	Specified Variable Limit
sulphur dioxide as S	$\mu g\ m^{-3}$	1.000

Time Period Covered:

January 1999 - December 1999

National Environmental Technology Centre
Site: 5301 Brockhill 1 - Sulphur Dioxide as S (SO2 - S)
Concentration in air (μg S m^{-3})

Weekly measurements, collection-day - non standard
Summary for January 1999 to December 1999

MONTH	JAN		FEB		MAR		APR		MAY		JUN	
	Start End		Start End		Start End		Start End		Start End		Start End	
	31/12 - 08/01	0.46	29/01 - 05/02	0.61	25/02 - 05/03	0.46	01/04 - 09/04	0.60	30/04 - 07/05	0.92	04/06 - 11/06	0.68
	08/01 - 15/01	N	05/02 - 12/02	N	05/03 - 12/03	0.84	09/04 - 16/04	0.64	07/05 - 14/05	N	11/06 - 18/06	1.33
	15/01 - 22/01	N	12/02 - 19/02	0.57	12/03 - 19/03	0.75	16/04 - 23/04	0.61	14/05 - 20/05	0.79	18/06 - 28/06	1.25
	22/01 - 29/01	0.50	19/02 - 25/02	0.39	19/03 - 26/03	0.63	23/04 - 30/04	0.94	20/05 - 28/05	0.69	28/06 - 02/07	1.07
					26/03 - 01/04	0.68			28/05 - 04/06	0.99		
Arithmetic Mean		-		0.52		0.67		0.70		0.84		1.08
Standard Deviation		-		0.12		0.14		0.16		0.13		0.29
Valid Samples		2		3		5		4		4		4

MONTH	JUL		AUG		SEP		OCT		NOV		DEC	
	Start End		Start End		Start End		Start End		Start End		Start End	
	02/07 - 09/07	1.35	30/07 - 06/08	1.25	03/09 - 10/09	1.21	01/10 - 08/10	1.38	29/10 - 05/11	0.53	03/12 - 10/12	0.72
	09/07 - 16/07	1.65	06/08 - 13/08	1.14	10/09 - 17/09	1.32	08/10 - 15/10	1.19	05/11 - 12/11	3.02	10/12 - 17/12	1.40
	16/07 - 23/07	0.80	13/08 - 20/08	0.99	17/09 - 24/09	0.57	15/10 - 22/10	1.34	12/11 - 19/11	2.39	17/12 - 24/12	1.49
	23/07 - 30/07	0.77	20/08 - 27/08	1.46	24/09 - 01/10	0.58	22/10 - 29/10	0.52	19/11 - 26/11	3.63	24/12 - 07/01	0.50
			27/08 - 03/09	0.93					26/11 - 03/12	0.78		
Arithmetic Mean		1.14		1.15		0.92		1.11		2.07		1.03
Standard Deviation		0.43		0.21		0.40		0.40		1.37		0.49
Valid Samples		4		5		4		4		5		4

Notes (1) N = no measurement; (2) Measurements preceded by < are below the Limit of Detection. The measurement has been included in the calculation of the statistical parameters at 50% of its value; (3) Statistical parameters calculated only if data capture is greater than 75%.

National Environmental Technology Centre
Site: 5303 Caenby 1 - Sulphur Dioxide as S (SO2 - S)
Concentration in air (μg S m^{-3})

Weekly measurements, collection-day - non standard
Summary for January 1999 to December 1999

MONTH	JAN		FEB		MAR		APR		MAY		JUN	
	Start End		Start End		Start End		Start End		Start End		Start End	
	05/01 - 12/01	4.09	02/02 - 09/02	4.09	03/03 - 09/03	2.92	30/03 - 06/04	2.23	04/05 - 11/05	1.14	01/06 - 08/06	2.04
	12/01 - 19/01	4.74	09/02 - 16/02	4.87	09/03 - 16/03	3.25	06/04 - 13/04	3.95	11/05 - 18/05	3.40	08/06 - 15/06	4.36
	19/01 - 26/01	3.31	16/02 - 23/02	3.43	16/03 - 23/03	3.02	13/04 - 20/04	3.08	18/05 - 24/05	3.76	15/06 - 22/06	4.98
	26/01 - 02/02	5.64	23/02 - 03/03	4.71	23/03 - 30/03	3.29	20/04 - 27/04	1.92	24/05 - 01/06	3.65	22/06 - 29/06	3.35
							27/04 - 04/05	3.11				
Arithmetic Mean		4.44		4.27		3.12		2.86		2.99		3.68
Standard Deviation		0.99		0.66		0.18		0.80		1.24		1.28
Valid Samples		4		4		4		5		4		4

MONTH	JUL		AUG		SEP		OCT		NOV		DEC	
	Start End		Start End		Start End		Start End		Start End		Start End	
	29/06 - 06/07	6.34	03/08 - 10/08	3.56	31/08 - 07/09	2.51	28/09 - 05/10	3.95	02/11 - 09/11	2.28	30/11 - 07/12	3.97
	06/07 - 13/07	3.97	10/08 - 17/08	3.98	07/09 - 14/09	2.93	05/10 - 12/10	3.66	09/11 - 16/11	1.66	07/12 - 14/12	2.63
	13/07 - 20/07	7.15	17/08 - 24/08	2.38	14/09 - 21/09	2.14	12/10 - 19/10	2.30	16/11 - 23/11	1.98	14/12 - 21/12	1.39
	20/07 - 27/07	4.99	24/08 - 31/08	3.80	21/09 - 28/09	2.10	19/10 - 26/10	1.61	23/11 - 30/11	1.72	21/12 - 28/12	1.09
	27/07 - 03/08	1.99					26/10 - 02/11	1.42			28/12 - 04/01	1.08
Arithmetic Mean		4.89		3.43		2.42		2.59		1.91		2.03
Standard Deviation		2.03		0.72		0.39		1.16		0.28		1.26
Valid Samples		5		4		4		5		4		5

Notes (1) N = no measurement; (2) Measurements preceded by < are below the Limit of Detection. The measurement has been included in the calculation of the statistical parameters at 50% of its value; (3) Statistical parameters calculated only if data capture is greater than 75%.

National Environmental Technology Centre
Site: 5304 Camborne 1 - Sulphur Dioxide as S (SO2 - S)
Concentration in air (μg S m^{-3})

Weekly measurements, collection-day - non standard
Summary for January 1999 to December 1999

MONTH	JAN		FEB		MAR		APR		MAY		JUN	
	Start End		Start End		Start End		Start End		Start End		Start End	
	04/01 - 11/01	0.90	01/02 - 08/02	0.84	01/03 - 08/03	0.46	29/03 - 05/04	0.64	03/05 - 10/05	1.02	31/05 - 07/06	0.80
	11/01 - 18/01	0.49	08/02 - 15/02	0.55	08/03 - 15/03	1.66	05/04 - 12/04	0.43	10/05 - 17/05	0.57	07/06 - 14/06	0.72
	18/01 - 25/01	0.77	15/02 - 22/02	0.41	15/03 - 22/03	0.69	12/04 - 19/04	0.58	17/05 - 24/05	0.65	14/06 - 21/06	0.64
	25/01 - 01/02	0.53	22/02 - 01/03	0.56	22/03 - 29/03	0.47	19/04 - 26/04	0.53	24/05 - 31/05	1.75	21/06 - 28/06	1.47
							26/04 - 03/05	0.89				
Arithmetic Mean		0.67		0.59		0.82		0.61		0.99		0.91
Standard Deviation		0.19		0.18		0.57		0.17		0.54		0.38
Valid Samples		4		4		4		5		4		4

MONTH	JUL		AUG		SEP		OCT		NOV		DEC	
	Start End		Start End		Start End		Start End		Start End		Start End	
	28/06 - 05/07	0.94	02/08 - 09/08	0.83	30/08 - 06/09	0.71	04/10 - 11/10	0.60	01/11 - 09/11	0.41	29/11 - 06/12	0.62
	05/07 - 12/07	1.26	09/08 - 16/08	0.68	06/09 - 13/09	0.54	11/10 - 18/10	1.25	09/11 - 15/11	1.82	06/12 - 13/12	0.49
	12/07 - 19/07	0.76	16/08 - 23/08	0.87	13/09 - 20/09	0.32	18/10 - 25/10	0.82	15/11 - 22/11	1.24	13/12 - 20/12	0.79
	19/07 - 26/07	0.61	23/08 - 30/08	0.67	20/09 - 27/09	0.42	25/10 - 01/11	0.51	22/11 - 29/11	0.66	20/12 - 27/12	0.66
	26/07 - 02/08	1.16			27/09 - 04/10	0.23					27/12 - 03/01	0.41
Arithmetic Mean		0.95		0.76		0.44		0.79		1.03		0.60
Standard Deviation		0.27		0.10		0.19		0.33		0.63		0.15
Valid Samples		5		4		5		4		4		5

Notes (1) N = no measurement; (2) Measurements preceded by < are below the Limit of Detection. The measurement has been included in the calculation of the statistical parameters at 50% of its value; (3) Statistical parameters calculated only if data capture is greater than 75%.

National Environmental Technology Centre
Site: 5305 Camphill 1 - Sulphur Dioxide as S (SO2 - S)
Concentration in air (μg S m^{-3})

Weekly measurements, collection-day - non standard
Summary for January 1999 to December 1999

MONTH	JAN		FEB		MAR		APR		MAY		JUN	
	Start End		Start End		Start End		Start End		Start End		Start End	
	31/12 - 07/01	N	04/02 - 11/02	N	04/03 - 11/03	1.45	01/04 - 06/04	N	29/04 - 06/05	1.77	03/06 - 10/06	0.67
	07/01 - 14/01	0.68	11/02 - 18/02	0.38	11/03 - 18/03	0.68	06/04 - 15/04	0.43	06/05 - 13/05	1.44	10/06 - 17/06	1.23
	14/01 - 21/01	0.56	18/02 - 25/02	0.52	18/03 - 25/03	0.40	15/04 - 22/04	N	13/05 - 20/05	3.45	17/06 - 24/06	1.65
	21/01 - 28/01	N	25/02 - 04/03	0.32	25/03 - 01/04	N	22/04 - 29/04	2.43	20/05 - 27/05	0.74		
	28/01 - 04/02	0.37							27/05 - 03/06	2.09		
Arithmetic Mean		-		0.41		0.84		-		1.90		1.18
Standard Deviation		-		0.10		0.54		-		1.00		0.49
Valid Samples		3		3		3		2		5		3

MONTH	JUL		AUG		SEP		OCT		NOV		DEC	
	Start End		Start End		Start End		Start End		Start End		Start End	
	24/06 - 22/07	N	29/07 - 05/08	3.75	02/09 - 09/09	0.69	30/09 - 07/10	0.54	04/11 - 11/11	0.43	02/12 - 09/12	0.25
	22/07 - 29/07	0.84	05/08 - 12/08	1.88	09/09 - 16/09	0.55	07/10 - 14/10	0.23	11/11 - 17/11	0.71	09/12 - 16/12	0.57
			12/08 - 19/08	N	16/09 - 23/09	1.04	14/10 - 21/10	0.75	17/11 - 25/11	0.63	16/12 - 23/12	0.78
			19/08 - 26/08	1.37	23/09 - 30/09	0.86	21/10 - 28/10	0.85	25/11 - 02/12	0.35	23/12 - 30/12	0.24
			26/08 - 02/09	0.25			28/10 - 04/11	0.31				
Arithmetic Mean		-		1.81		0.79		0.54		0.53		0.46
Standard Deviation		-		1.46		0.21		0.27		0.17		0.26
Valid Samples		1		4		4		5		4		4

Notes (1) N = no measurement; (2) Measurements preceded by < are below the Limit of Detection. The measurement has been included in the calculation of the statistical parameters at 50% of its value; (3) Statistical parameters calculated only if data capture is greater than 75%.

National Environmental Technology Centre
Site: 5306 Cardington 2 - Sulphur Dioxide as S (SO2 - S)
Concentration in air (μg S m^{-3})

Weekly measurements, collection-day - non standard
Summary for January 1999 to December 1999

MONTH	JAN		FEB		MAR		APR		MAY		JUN	
	Start End		Start End		Start End		Start End		Start End		Start End	
	30/12 - 06/01	2.27	03/02 - 10/02	6.88	03/03 - 10/03	5.14	31/03 - 07/04	4.47	28/04 - 05/05	2.78	03/06 - 09/06	N
	06/01 - 13/01	11.08	10/02 - 17/02	7.91	10/03 - 17/03	6.42	07/04 - 14/04	N	05/05 - 12/05	1.92	09/06 - 16/06	4.25
	13/01 - 20/01	5.22	17/02 - 25/02	6.81	17/03 - 24/03	7.19	14/04 - 21/04	3.96	12/05 - 19/05	2.46	16/06 - 23/06	3.80
	20/01 - 27/01	8.34	25/02 - 03/03	5.69	24/03 - 31/03	4.65	21/04 - 28/04	2.24	19/05 - 26/05	3.83	23/06 - 01/07	2.55
	27/01 - 03/02	N							26/05 - 03/06	1.18		
Arithmetic Mean		6.73		6.82		5.85		3.56		2.43		3.53
Standard Deviation		3.81		0.91		1.16		1.17		0.99		0.88
Valid Samples		4		4		4		3		5		3

MONTH	JUL		AUG		SEP		OCT		NOV		DEC	
	Start End		Start End		Start End		Start End		Start End		Start End	
	01/07 - 07/07	5.03	04/08 - 11/08	1.87	01/09 - 08/09	3.05	29/09 - 06/10	4.34	03/11 - 10/11	4.06	01/12 - 08/12	7.68
	07/07 - 14/07	3.15	11/08 - 18/08	2.44	08/09 - 15/09	1.71	06/10 - 13/10	6.46	10/11 - 17/11	2.61	08/12 - 15/12	6.13
	14/07 - 22/07	4.91	18/08 - 25/08	2.55	15/09 - 22/09	2.17	13/10 - 20/10	2.53	17/11 - 24/11	5.97	15/12 - 22/12	6.50
	22/07 - 28/07	3.36	25/08 - 01/09	4.20	22/09 - 29/09	1.83	20/10 - 27/10	2.75	24/11 - 01/12	3.08	22/12 - 29/12	4.60
	28/07 - 04/08	2.80					27/10 - 03/11	2.54				
Arithmetic Mean		3.85		2.76		2.19		3.72		3.93		6.23
Standard Deviation		1.04		1.00		0.61		1.71		1.49		1.27
Valid Samples		5		4		4		5		4		4

Notes (1) N = no measurement; (2) Measurements preceded by < are below the Limit of Detection. The measurement has been included in the calculation of the statistical parameters at 50% of its value; (3) Statistical parameters calculated only if data capture is greater than 75%.

National Environmental Technology Centre
Site: 5308 Corpach 1 - Sulphur Dioxide as S (SO2 - S)
Concentration in air (μg S m^{-3})

Weekly measurements, collection-day - non standard
Summary for January 1999 to December 1999

MONTH	JAN		FEB		MAR		APR		MAY		JUN	
	Start End		Start End		Start End		Start End		Start End		Start End	
	06/01 - 13/01	1.33	03/02 - 11/02	0.31	03/03 - 10/03	0.37	31/03 - 07/04	1.31	27/04 - 05/05	0.60	02/06 - 09/06	0.52
	13/01 - 20/01	0.27	11/02 - 17/02	0.31	10/03 - 17/03	0.37	07/04 - 14/04	<0.15	05/05 - 12/05	N	09/06 - 16/06	0.33
	20/01 - 27/01	0.21	17/02 - 24/02	0.25	17/03 - 24/03	0.27	14/04 - 21/04	0.87	12/05 - 20/05	N	16/06 - 23/06	0.60
	27/01 - 03/02	0.27	24/02 - 03/03	0.48	24/03 - 31/03	0.37	21/04 - 27/04	0.78	20/05 - 26/05	0.17	23/06 - 30/06	0.69
									26/05 - 02/06	N		
Arithmetic Mean		0.52		0.34		0.34		0.76		-		0.53
Standard Deviation		0.54		0.10		0.05		0.51		-		0.15
Valid Samples		4		4		4		4		2		4

MONTH	JUL		AUG		SEP		OCT		NOV		DEC	
	Start End		Start End		Start End		Start End		Start End		Start End	
	30/06 - 07/07	1.01	04/08 - 13/08	1.27	01/09 - 08/09	1.45	29/09 - 06/10	0.78	03/11 - 10/11	0.40	08/12 - 15/12	0.46
	07/07 - 14/07	0.71	13/08 - 18/08	0.62	08/09 - 15/09	0.50	06/10 - 12/10	0.28	10/11 - 17/11	0.73	15/12 - 22/12	0.37
	14/07 - 21/07	0.43	18/08 - 25/08	0.96	15/09 - 22/09	N	12/10 - 20/10	0.81	17/11 - 23/11	0.47	22/12 - 07/01	0.14
	21/07 - 28/07	0.58	25/08 - 01/09	N	22/09 - 29/09	1.13	20/10 - 27/10	0.68	23/11 - 08/12	0.12		
	28/07 - 04/08	2.11					27/10 - 03/11	0.25				
Arithmetic Mean		0.97		0.95		1.03		0.56		0.43		0.32
Standard Deviation		0.67		0.32		0.48		0.27		0.25		0.17
Valid Samples		5		3		3		5		4		3

Notes (1) N = no measurement; (2) Measurements preceded by < are below the Limit of Detection. The measurement has been included in the calculation of the statistical parameters at 50% of its value; (3) Statistical parameters calculated only if data capture is greater than 75%.

National Environmental Technology Centre
Site: 5309 Cresselly 1 - Sulphur Dioxide as S (SO2 - S)
Concentration in air (μg S m^{-3})

Weekly measurements, collection-day - non standard
Summary for January 1999 to December 1999

MONTH	JAN		FEB		MAR		APR		MAY		JUN	
	Start End		Start End		Start End		Start End		Start End		Start End	
	07/01 - 13/01	0.76	03/02 - 10/02	0.83	03/03 - 10/03	0.63	31/03 - 07/04	0.92	28/04 - 05/05	2.08	02/06 - 09/06	0.37
	13/01 - 20/01	0.44	10/02 - 17/02	0.73	10/03 - 17/03	1.29	07/04 - 14/04	0.58	05/05 - 12/05	0.64	09/06 - 16/06	0.83
	20/01 - 27/01	0.29	17/02 - 24/02	0.79	17/03 - 24/03	N	14/04 - 21/04	0.65	12/05 - 19/05	0.93	16/06 - 23/06	0.81
	27/01 - 03/02	0.78	24/02 - 03/03	0.46	24/03 - 31/03	0.56	21/04 - 28/04	1.03	19/05 - 26/05	0.85	23/06 - 30/06	1.20
									26/05 - 02/06	0.82		
Arithmetic Mean		0.57		0.70		0.83		0.79		1.07		0.80
Standard Deviation		0.24		0.17		0.40		0.21		0.58		0.34
Valid Samples		4		4		3		4		5		4

MONTH	JUL		AUG		SEP		OCT		NOV		DEC	
	Start End		Start End		Start End		Start End		Start End		Start End	
	30/06 - 07/07	1.03	04/08 - 11/08	0.94	01/09 - 08/09	1.55	29/09 - 06/10	0.58	03/11 - 10/11	0.46	01/12 - 08/12	0.64
	07/07 - 14/07	1.97	11/08 - 18/08	0.75	08/09 - 15/09	0.92	06/10 - 13/10	1.18	10/11 - 17/11	0.97	08/12 - 15/12	0.82
	14/07 - 21/07	0.88	18/08 - 25/08	1.54	15/09 - 22/09	0.52	13/10 - 20/10	2.31	17/11 - 24/11	0.88	15/12 - 22/12	0.74
	21/07 - 28/07	1.15	25/08 - 01/09	0.89	22/09 - 29/09	0.34	20/10 - 27/10	0.73	24/11 - 01/12	0.52	22/12 - 05/01	0.45
	28/07 - 04/08	1.19					27/10 - 03/11	0.66				
Arithmetic Mean		1.24		1.03		0.83		1.09		0.71		0.66
Standard Deviation		0.42		0.35		0.54		0.72		0.25		0.16
Valid Samples		5		4		4		5		4		4

Notes (1) N = no measurement; (2) Measurements preceded by < are below the Limit of Detection. The measurement has been included in the calculation of the statistical parameters at 50% of its value; (3) Statistical parameters calculated only if data capture is greater than 75%.

National Environmental Technology Centre
Site: 5310 Etton 1 - Sulphur Dioxide as S (SO2 - S)
Concentration in air (μg S m^{-3})

Weekly measurements, collection-day - non standard
Summary for January 1999 to December 1999

MONTH	JAN		FEB		MAR		APR		MAY		JUN	
	Start End		Start End		Start End		Start End		Start End		Start End	
	04/01 - 12/01	4.96	02/02 - 09/02	1.47	04/03 - 09/03	0.72	30/03 - 06/04	2.69	04/05 - 11/05	2.08	01/06 - 08/06	2.44
	12/01 - 20/01	6.60	09/02 - 16/02	3.78	09/03 - 16/03	3.35	06/04 - 13/04	0.69	11/05 - 18/05	2.06	08/06 - 15/06	1.47
	20/01 - 26/01	6.50	16/02 - 24/02	1.32	16/03 - 24/03	1.33	13/04 - 21/04	1.08	18/05 - 25/05	1.53	15/06 - 22/06	0.35
	26/01 - 02/02	2.26	24/02 - 04/03	0.12	24/03 - 30/03	2.03	21/04 - 27/04	3.66	25/05 - 01/06	2.33	22/06 - 29/06	3.51
							27/04 - 04/05	3.70				
Arithmetic Mean		5.08		1.67		1.86		2.36		2.00		1.94
Standard Deviation		2.02		1.53		1.13		1.42		0.34		1.35
Valid Samples		4		4		4		5		4		4

MONTH	JUL		AUG		SEP		OCT		NOV		DEC	
	Start End		Start End		Start End		Start End		Start End		Start End	
	29/06 - 06/07	1.31	03/08 - 10/08	1.24	02/09 - 07/09	14.88	28/09 - 05/10	5.45	02/11 - 09/11	6.61	30/11 - 07/12	2.35
	06/07 - 13/07	1.29	10/08 - 02/09	N	07/09 - 14/09	2.84	05/10 - 12/10	3.45	09/11 - 16/11	1.08	07/12 - 14/12	2.79
	13/07 - 19/07	1.99			14/09 - 21/09	6.48	12/10 - 19/10	1.36	16/11 - 23/11	0.87	14/12 - 21/12	2.76
	19/07 - 27/07	N			21/09 - 28/09	5.45	19/10 - 26/10	1.51	23/11 - 30/11	4.38	21/12 - 04/01	2.52
	27/07 - 03/08	0.83					26/10 - 02/11	3.21				
Arithmetic Mean		1.36		-		7.41		3.00		3.23		2.60
Standard Deviation		0.48		-		5.21		1.67		2.77		0.20
Valid Samples		4		1		4		5		4		4

Notes (1) N = no measurement; (2) Measurements preceded by < are below the Limit of Detection. The measurement has been included in the calculation of the statistical parameters at 50% of its value; (3) Statistical parameters calculated only if data capture is greater than 75%.

National Environmental Technology Centre
Site: 5312 Husborne Crawley 1 - Sulphur Dioxide as S (SO2 - S)
Concentration in air (μg S m^{-3})

Weekly measurements, collection-day - non standard
Summary for January 1999 to December 1999

MONTH	JAN		FEB		MAR		APR		MAY		JUN	
	Start End		Start End		Start End		Start End		Start End		Start End	
	29/12 - 05/01	0.78	02/02 - 09/02	2.20	02/03 - 09/03	2.63	30/03 - 19/04	N	04/05 - 11/05	0.84	01/06 - 08/06	0.54
	05/01 - 12/01	4.13	09/02 - 16/02	3.67	09/03 - 16/03	2.71	19/04 - 27/04	1.20	11/05 - 18/05	N	08/06 - 15/06	0.69
	12/01 - 19/01	1.24	16/02 - 23/02	1.13	16/03 - 23/03	3.36	27/04 - 04/05	2.51	18/05 - 25/05	0.50	15/06 - 22/06	0.76
	19/01 - 26/01	1.41	23/02 - 02/03	1.62	23/03 - 30/03	1.73			25/05 - 01/06	1.39	22/06 - 29/06	0.65
	26/01 - 02/02	2.98										
Arithmetic Mean		2.11		2.16		2.61		-		0.91		0.66
Standard Deviation		1.40		1.10		0.67		-		0.45		0.09
Valid Samples		5		4		4		2		3		4

MONTH	JUL		AUG		SEP		OCT		NOV		DEC	
	Start End		Start End		Start End		Start End		Start End		Start End	
	29/06 - 06/07	0.70	03/08 - 10/08	0.91	31/08 - 07/09	1.51	05/10 - 12/10	0.80	02/11 - 09/11	0.55	30/11 - 07/12	0.64
	06/07 - 13/07	1.27	10/08 - 17/08	0.51	07/09 - 05/10	N	12/10 - 19/10	0.99	09/11 - 16/11	1.67	07/12 - 14/12	0.59
	13/07 - 20/07	0.85	17/08 - 24/08	1.92			19/10 - 26/10	0.69	16/11 - 23/11	1.62	14/12 - 21/12	2.54
	20/07 - 27/07	1.12	24/08 - 31/08	0.91			26/10 - 02/11	0.50	23/11 - 30/11	0.71	21/12 - 28/12	0.53
	27/07 - 03/08	2.00									28/12 - 04/01	1.11
Arithmetic Mean		1.19		1.06		-		0.74		1.13		1.08
Standard Deviation		0.51		0.60		-		0.20		0.59		0.85
Valid Samples		5		4		1		4		4		5

Notes (1) N = no measurement; (2) Measurements preceded by < are below the Limit of Detection. The measurement has been included in the calculation of the statistical parameters at 50% of its value; (3) Statistical parameters calculated only if data capture is greater than 75%.

National Environmental Technology Centre
Site: 5313 Little Horkesley 1 - Sulphur Dioxide as S (SO2 - S)
Concentration in air ($\mu g\ S\ m^{-3}$)

Weekly measurements, collection-day - non standard
Summary for January 1999 to December 1999

MONTH	JAN		FEB		MAR		APR		MAY		JUN	
	Start End		Start End		Start End		Start End		Start End		Start End	
	30/12 - 06/01	1.50	03/02 - 10/02	2.37	03/03 - 11/03	1.35	31/03 - 06/04	1.20	28/04 - 05/05	1.72	02/06 - 09/06	0.92
	06/01 - 13/01	1.30	10/02 - 17/02	4.23	11/03 - 17/03	3.44	06/04 - 14/04	0.89	05/05 - 12/05	1.52	09/06 - 16/06	1.43
	13/01 - 20/01	1.43	17/02 - 24/02	1.40	17/03 - 24/03	1.84	14/04 - 21/04	2.43	12/05 - 19/05	0.79	16/06 - 23/06	1.55
	20/01 - 27/01	2.04	24/02 - 03/03	0.94	24/03 - 31/03	2.55	21/04 - 28/04	1.63	19/05 - 26/05	1.18	23/06 - 30/06	1.25
	27/01 - 03/02	2.46							26/05 - 02/06	1.61		
Arithmetic Mean		1.75		2.24		2.30		1.54		1.36		1.29
Standard Deviation		0.49		1.46		0.91		0.67		0.38		0.27
Valid Samples		5		4		4		4		5		4

MONTH	JUL		AUG		SEP		OCT		NOV		DEC	
	Start End		Start End		Start End		Start End		Start End		Start End	
	30/06 - 07/07	1.16	04/08 - 11/08	1.25	01/09 - 08/09	2.12	29/09 - 06/10	0.90	03/11 - 10/11	1.29	01/12 - 08/12	0.82
	07/07 - 14/07	1.73	11/08 - 18/08	1.24	08/09 - 17/09	1.85	06/10 - 13/10	2.27	10/11 - 17/11	2.64	08/12 - 15/12	1.10
	14/07 - 21/07	1.30	18/08 - 25/08	0.91	17/09 - 22/09	1.01	13/10 - 21/10	1.92	17/11 - 24/11	1.92	15/12 - 22/12	3.25
	21/07 - 28/07	0.96	25/08 - 01/09	1.32	22/09 - 29/09	1.55	21/10 - 27/10	2.42	24/11 - 01/12	1.40	22/12 - 05/01	0.73
	28/07 - 04/08	2.98					27/10 - 03/11	1.18				
Arithmetic Mean		1.63		1.18		1.63		1.74		1.81		1.47
Standard Deviation		0.81		0.19		0.48		0.67		0.62		1.19
Valid Samples		5		4		4		5		4		4

Notes (1) N = no measurement; (2) Measurements preceded by < are below the Limit of Detection. The measurement has been included in the calculation of the statistical parameters at 50% of its value; (3) Statistical parameters calculated only if data capture is greater than 75%.

National Environmental Technology Centre
Site: 5314 Marshfield 1 - Sulphur Dioxide as S (SO2 - S)
Concentration in air (μg S m^{-3})

Weekly measurements, collection-day - non standard
Summary for January 1999 to December 1999

MONTH	JAN		FEB		MAR		APR		MAY		JUN	
	Start End		Start End		Start End		Start End		Start End		Start End	
	30/12 - 05/01	0.53	02/02 - 09/02	1.34	02/03 - 09/03	1.29	30/03 - 08/04	0.75	04/05 - 11/05	1.05	01/06 - 08/06	0.84
	05/01 - 12/01	2.17	09/02 - 17/02	1.40	09/03 - 16/03	2.53	08/04 - 13/04	1.24	11/05 - 18/05	1.20	08/06 - 15/06	1.56
	12/01 - 19/01	2.15	17/02 - 23/02	0.78	16/03 - 23/03	1.04	13/04 - 20/04	1.15	18/05 - 25/05	0.93	15/06 - 22/06	1.02
	19/01 - 26/01	0.87	23/02 - 02/03	0.55	23/03 - 30/03	0.93	20/04 - 27/04	1.21	25/05 - 01/06	1.11	22/06 - 29/06	1.32
	26/01 - 02/02	1.38					27/04 - 04/05	2.69				
Arithmetic Mean		1.42		1.02		1.45		1.41		1.07		1.19
Standard Deviation		0.74		0.42		0.74		0.74		0.11		0.32
Valid Samples		5		4		4		5		4		4

MONTH	JUL		AUG		SEP		OCT		NOV		DEC	
	Start End		Start End		Start End		Start End		Start End		Start End	
	29/06 - 06/07	N	03/08 - 10/08	1.40	31/08 - 07/09	2.36	28/09 - 05/10	0.95	02/11 - 09/11	0.83	30/11 - 07/12	1.02
	06/07 - 13/07	2.71	10/08 - 17/08	2.08	07/09 - 14/09	1.25	05/10 - 12/10	1.39	09/11 - 16/11	3.05	07/12 - 14/12	0.61
	13/07 - 20/07	0.98	17/08 - 24/08	1.68	14/09 - 21/09	1.37	12/10 - 19/10	3.77	16/11 - 23/11	2.76	14/12 - 21/12	2.42
	20/07 - 27/07	1.83	24/08 - 31/08	0.69	21/09 - 28/09	1.01	19/10 - 26/10	1.00	23/11 - 30/11	0.89	21/12 - 04/01	0.53
	27/07 - 03/08	1.77					26/10 - 02/11	1.02				
Arithmetic Mean		1.82		1.46		1.50		1.63		1.88		1.14
Standard Deviation		0.71		0.59		0.60		1.21		1.19		0.88
Valid Samples		4		4		4		5		4		4

Notes (1) N = no measurement; (2) Measurements preceded by < are below the Limit of Detection. The measurement has been included in the calculation of the statistical parameters at 50% of its value; (3) Statistical parameters calculated only if data capture is greater than 75%.

National Environmental Technology Centre
Site: 5315 Ratcliffe 13 - Sulphur Dioxide as S (SO2 - S)
Concentration in air (μg S m^{-3})

Weekly measurements, collection-day - non standard
Summary for January 1999 to December 1999

MONTH	JAN		FEB		MAR		APR		MAY		JUN	
	Start End		Start End		Start End		Start End		Start End		Start End	
	31/12 - 07/01	2.31	04/02 - 11/02	3.79	04/03 - 11/03	3.51	01/04 - 08/04	1.69	29/04 - 06/05	3.42	03/06 - 17/06	N
	07/01 - 14/01	3.85	11/02 - 18/02	2.49	11/03 - 18/03	6.99	08/04 - 15/04	2.81	06/05 - 13/05	1.42	17/06 - 24/06	5.06
	14/01 - 21/01	2.54	18/02 - 25/02	3.74	18/03 - 25/03	3.10	15/04 - 22/04	2.49	13/05 - 21/05	4.28	24/06 - 01/07	4.71
	21/01 - 28/01	2.33	25/02 - 04/03	2.12	25/03 - 01/04	1.49	22/04 - 29/04	7.19	21/05 - 27/05	1.49		
	28/01 - 04/02	3.62							27/05 - 03/06	1.28		
Arithmetic Mean		2.93		3.04		3.77		3.54		2.38		-
Standard Deviation		0.75		0.86		2.31		2.48		1.38		-
Valid Samples		5		4		4		4		5		2

MONTH	JUL		AUG		SEP		OCT		NOV		DEC	
	Start End		Start End		Start End		Start End		Start End		Start End	
	01/07 - 08/07	3.06	29/07 - 05/08	2.60	02/09 - 09/09	2.30	30/09 - 07/10	1.70	04/11 - 11/11	<0.20	02/12 - 09/12	3.32
	08/07 - 15/07	4.51	05/08 - 12/08	2.59	09/09 - 16/09	3.27	07/10 - 14/10	1.88	11/11 - 18/11	2.56	09/12 - 16/12	1.85
	15/07 - 22/07	2.72	12/08 - 19/08	1.14	16/09 - 23/09	1.52	14/10 - 21/10	1.40	18/11 - 25/11	2.46	16/12 - 23/12	2.67
	22/07 - 29/07	2.53	19/08 - 26/08	1.30	23/09 - 30/09	0.73	21/10 - 28/10	1.07	25/11 - 02/12	2.24	23/12 - 30/12	0.74
			26/08 - 02/09	2.18			28/10 - 04/11	1.46				
Arithmetic Mean		3.20		1.96		1.95		1.50		1.84		2.14
Standard Deviation		0.90		0.70		1.08		0.31		1.17		1.11
Valid Samples		4		5		4		5		4		4

Notes (1) N = no measurement; (2) Measurements preceded by < are below the Limit of Detection. The measurement has been included in the calculation of the statistical parameters at 50% of its value; (3) Statistical parameters calculated only if data capture is greater than 75%.

National Environmental Technology Centre
Site: 5316 Rockbourne 1 - Sulphur Dioxide as S (SO2 - S)
Concentration in air (μg S m^{-3})

Weekly measurements, collection-day - non standard
Summary for January 1999 to December 1999

MONTH	JAN		FEB		MAR		APR		MAY		JUN	
	Start End		Start End		Start End		Start End		Start End		Start End	
	30/12 - 06/01	0.76	03/02 - 10/02	1.17	03/03 - 10/03	1.68	31/03 - 07/04	2.67	28/04 - 05/05	0.34	02/06 - 09/06	0.56
	06/01 - 13/01	1.45	10/02 - 17/02	0.37	10/03 - 17/03	1.78	07/04 - 14/04	1.06	05/05 - 12/05	0.94	09/06 - 16/06	0.65
	13/01 - 20/01	0.52	17/02 - 24/02	0.58	17/03 - 24/03	1.21	14/04 - 21/04	1.42	12/05 - 19/05	0.52	16/06 - 23/06	0.63
	20/01 - 27/01	0.48	24/02 - 03/03	0.48	24/03 - 31/03	1.11	21/04 - 28/04	0.70	19/05 - 26/05	0.91	23/06 - 30/06	0.83
	27/01 - 03/02	1.74							26/05 - 02/06	0.81		
Arithmetic Mean		0.99		0.65		1.44		1.46		0.70		0.67
Standard Deviation		0.57		0.36		0.33		0.86		0.27		0.12
Valid Samples		5		4		4		4		5		4

MONTH	JUL		AUG		SEP		OCT		NOV		DEC	
	Start End		Start End		Start End		Start End		Start End		Start End	
	30/06 - 07/07	0.65	28/07 - 05/08	N	01/09 - 08/09	1.10	29/09 - 06/10	0.30	03/11 - 10/11	0.51	01/12 - 08/12	0.71
	07/07 - 14/07	N	05/08 - 11/08	0.63	08/09 - 15/09	0.89	06/10 - 13/10	0.66	10/11 - 17/11	1.02	08/12 - 15/12	0.77
	14/07 - 21/07	0.43	11/08 - 18/08	0.54	15/09 - 22/09	0.23	13/10 - 20/10	2.14	17/11 - 24/11	1.27	15/12 - 22/12	1.19
	21/07 - 28/07	N	18/08 - 25/08	1.17	22/09 - 29/09	0.26	20/10 - 27/10	0.54	24/11 - 01/12	0.32	22/12 - 05/01	0.33
			25/08 - 01/09	0.58			27/10 - 03/11	0.25				
Arithmetic Mean		-		0.73		0.62		0.78		0.78		0.75
Standard Deviation		-		0.29		0.44		0.78		0.44		0.35
Valid Samples		2		4		4		5		4		4

Notes (1) N = no measurement; (2) Measurements preceded by < are below the Limit of Detection. The measurement has been included in the calculation of the statistical parameters at 50% of its value; (3) Statistical parameters calculated only if data capture is greater than 75%.

National Environmental Technology Centre
Site: 5317 Wakefield 24 - Sulphur Dioxide as S (SO2 - S)
Concentration in air ($\mu g\ S\ m^{-3}$)

Weekly measurements, collection-day - non standard
Summary for January 1999 to December 1999

MONTH	JAN		FEB		MAR		APR		MAY		JUN	
	Start End		Start End		Start End		Start End		Start End		Start End	
	30/12 - 06/01	3.04	03/02 - 10/02	1.20	03/03 - 10/03	1.53	31/03 - 07/04	4.33	28/04 - 05/05	11.54	02/06 - 09/06	1.45
	06/01 - 13/01	2.33	10/02 - 17/02	2.98	10/03 - 17/03	3.89	07/04 - 14/04	0.90	05/05 - 12/05	4.00	09/06 - 16/06	1.16
	13/01 - 20/01	1.82	17/02 - 24/02	1.10	17/03 - 24/03	1.06	14/04 - 21/04	3.87	12/05 - 19/05	3.63	16/06 - 23/06	1.56
	20/01 - 27/01	4.71	24/02 - 03/03	3.48	24/03 - 31/03	2.17	21/04 - 28/04	2.97	19/05 - 26/05	2.12	23/06 - 30/06	3.51
	27/01 - 03/02	4.01							26/05 - 02/06	2.51		
Arithmetic Mean		3.18		2.19		2.16		3.02		4.76		1.92
Standard Deviation		1.19		1.22		1.24		1.52		3.87		1.07
Valid Samples		5		4		4		4		5		4

MONTH	JUL		AUG		SEP		OCT		NOV		DEC	
	Start End		Start End		Start End		Start End		Start End		Start End	
	30/06 - 07/07	1.27	04/08 - 11/08	3.03	01/09 - 08/09	3.19	29/09 - 06/10	0.85	03/11 - 10/11	1.82	01/12 - 08/12	0.87
	07/07 - 14/07	5.89	11/08 - 18/08	2.14	08/09 - 15/09	2.29	06/10 - 13/10	1.34	10/11 - 17/11	1.21	08/12 - 15/12	1.52
	14/07 - 21/07	0.96	18/08 - 25/08	2.33	15/09 - 22/09	2.83	13/10 - 20/10	2.24	17/11 - 24/11	1.88	15/12 - 22/12	3.58
	21/07 - 28/07	3.49	25/08 - 01/09	0.87	22/09 - 29/09	1.50	20/10 - 27/10	2.13	24/11 - 01/12	1.86	22/12 - 29/12	1.64
	28/07 - 04/08	4.69					27/10 - 03/11	1.76				
Arithmetic Mean		3.26		2.09		2.45		1.66		1.69		1.90
Standard Deviation		2.14		0.90		0.73		0.58		0.32		1.17
Valid Samples		5		4		4		5		4		4

Notes (1) N = no measurement; (2) Measurements preceded by < are below the Limit of Detection. The measurement has been included in the calculation of the statistical parameters at 50% of its value; (3) Statistical parameters calculated only if data capture is greater than 75%.

National Environmental Technology Centre
Site: 5318 Waunfawr 1 - Sulphur Dioxide as S (SO2 - S)
Concentration in air (μg S m^{-3})

Weekly measurements, collection-day - non standard
Summary for January 1999 to December 1999

MONTH	JAN		FEB		MAR		APR		MAY		JUN	
	Start End		Start End		Start End		Start End		Start End		Start End	
	04/01 - 13/01	0.67	03/02 - 10/02	0.71	03/03 - 10/03	0.63	31/03 - 07/04	0.55	28/04 - 05/05	1.78	02/06 - 09/06	0.61
	13/01 - 20/01	1.06	10/02 - 17/02	1.56	10/03 - 17/03	1.60	07/04 - 14/04	0.45	05/05 - 12/05	0.96	09/06 - 15/06	0.59
	20/01 - 27/01	0.91	17/02 - 24/02	0.85	17/03 - 24/03	0.76	14/04 - 21/04	1.04	12/05 - 19/05	1.56	15/06 - 23/06	0.66
	27/01 - 03/02	1.60	24/02 - 03/03	0.56	24/03 - 31/03	0.48	21/04 - 28/04	0.49	19/05 - 26/05	0.73	23/06 - 30/06	0.75
									26/05 - 02/06	0.68		
Arithmetic Mean		1.06		0.92		0.87		0.63		1.14		0.65
Standard Deviation		0.39		0.44		0.50		0.27		0.50		0.07
Valid Samples		4		4		4		4		5		4

MONTH	JUL		AUG		SEP		OCT		NOV		DEC	
	Start End		Start End		Start End		Start End		Start End		Start End	
	30/06 - 07/07	0.46	04/08 - 11/08	0.70	01/09 - 08/09	0.64	29/09 - 06/10	0.49	03/11 - 10/11	0.39	01/12 - 08/12	0.53
	07/07 - 14/07	1.04	11/08 - 18/08	0.74	08/09 - 15/09	0.59	06/10 - 13/10	0.79	10/11 - 17/11	1.09	08/12 - 15/12	0.43
	14/07 - 21/07	0.56	18/08 - 25/08	1.30	15/09 - 22/09	0.80	13/10 - 20/10	1.64	17/11 - 24/11	1.16	15/12 - 22/12	0.75
	21/07 - 28/07	1.40	25/08 - 01/09	0.62	22/09 - 29/09	0.34	20/10 - 27/10	1.10	24/11 - 01/12	0.68	22/12 - 05/01	0.52
	28/07 - 04/08	1.48					27/10 - 03/11	0.54				
Arithmetic Mean		0.99		0.84		0.59		0.91		0.83		0.56
Standard Deviation		0.47		0.31		0.19		0.47		0.36		0.13
Valid Samples		5		4		4		5		4		4

Notes (1) N = no measurement; (2) Measurements preceded by < are below the Limit of Detection. The measurement has been included in the calculation of the statistical parameters at 50% of its value; (3) Statistical parameters calculated only if data capture is greater than 75%.

National Environmental Technology Centre
Site: 5319 Fort Augustus 2 - Sulphur Dioxide as S (SO2 - S)
Concentration in air (μg S m^{-3})

Weekly measurements, collection-day - non standard
Summary for January 1999 to December 1999

MONTH	JAN		FEB		MAR		APR		MAY		JUN	
	Start - End		Start - End		Start - End		Start - End		Start - End		Start - End	
	21/12 - 21/01	N	01/02 - 08/02	0.53	01/03 - 08/03	N	30/03 - 06/04	0.37	04/05 - 10/05	0.30	01/06 - 07/06	0.16
	21/01 - 27/01	N	08/02 - 15/02	0.36	08/03 - 16/03	N	06/04 - 12/04	0.18	10/05 - 24/05	N	07/06 - 14/06	N
	27/01 - 01/02	N	15/02 - 23/02	N	16/03 - 22/03	N	12/04 - 19/04	0.28	24/05 - 01/06	0.20	14/06 - 21/06	<0.10
			23/02 - 01/03	1.10	22/03 - 30/03	N	19/04 - 26/04	0.38			21/06 - 29/06	0.37
							26/04 - 04/05	N				
Arithmetic Mean		-		0.66		-		0.30		-		0.19
Standard Deviation		-		0.39		-		0.09		-		0.16
Valid Samples		0		3		0		4		2		3

MONTH	JUL		AUG		SEP		OCT		NOV		DEC	
	Start - End		Start - End		Start - End		Start - End		Start - End		Start - End	
	29/06 - 05/07	N	29/07 - 09/08	N	13/09 - 21/09	0.52	04/10 - 11/10	<0.11	01/11 - 08/11	0.13	29/11 - 06/12	0.14
	05/07 - 12/07	0.28	09/08 - 13/09	N	21/09 - 27/09	0.24	11/10 - 18/10	0.14	08/11 - 15/11	<0.13	06/12 - 13/12	<0.12
	12/07 - 19/07	0.24			27/09 - 04/10	<0.11	18/10 - 26/10	0.09	15/11 - 22/11	<0.13	13/12 - 20/12	<0.08
	19/07 - 29/07	N					26/10 - 01/11	0.15	22/11 - 29/11	0.05	20/12 - 05/01	N
Arithmetic Mean		-		-		0.27		0.11		0.08		0.08
Standard Deviation		-		-		0.23		0.05		0.04		0.06
Valid Samples		2		0		3		4		4		3

Notes (1) N = no measurement; (2) Measurements preceded by < are below the Limit of Detection. The measurement has been included in the calculation of the statistical parameters at 50% of its value; (3) Statistical parameters calculated only if data capture is greater than 75%.

National Environmental Technology Centre
Site: 5320 Loch Leven 2 - Sulphur Dioxide as S (SO2 - S)
Concentration in air (μg S m^{-3})

Weekly measurements, collection-day - non standard
Summary for January 1999 to December 1999

MONTH	JAN		FEB		MAR		APR		MAY		JUN	
	Start End		Start End		Start End		Start End		Start End		Start End	
	29/12 - 04/01	3.82	02/02 - 08/02	1.84	01/03 - 08/03	0.61	29/03 - 08/04	2.36	03/05 - 10/05	1.45	31/05 - 08/06	1.10
	04/01 - 11/01	0.95	08/02 - 22/02	1.34	08/03 - 15/03	1.69	08/04 - 13/04	1.28	10/05 - 19/05	0.77	08/06 - 14/06	1.02
	11/01 - 18/01	2.17	22/02 - 01/03	2.59	15/03 - 22/03	0.90	13/04 - 19/04	0.98	19/05 - 27/05	1.36	14/06 - 21/06	1.22
	18/01 - 25/01	4.10			22/03 - 29/03	2.41	19/04 - 26/04	1.47	27/05 - 31/05	1.42	21/06 - 28/06	2.89
	25/01 - 02/02	1.12					26/04 - 03/05	1.73				
Arithmetic Mean		2.43		1.92		1.40		1.56		1.25		1.56
Standard Deviation		1.47		0.63		0.81		0.52		0.32		0.89
Valid Samples		5		3		4		5		4		4

MONTH	JUL		AUG		SEP		OCT		NOV		DEC	
	Start End		Start End		Start End		Start End		Start End		Start End	
	28/06 - 08/07	1.56	02/08 - 09/08	0.70	30/08 - 08/09	4.61	04/10 - 11/10	1.65	01/11 - 08/11	2.32	29/11 - 06/12	1.34
	08/07 - 12/07	1.89	09/08 - 16/08	1.15	08/09 - 15/09	2.30	11/10 - 18/10	1.31	08/11 - 15/11	0.91	06/12 - 13/12	1.69
	12/07 - 19/07	N	16/08 - 23/08	1.17	15/09 - 22/09	1.28	18/10 - 25/10	0.81	15/11 - 22/11	0.53	13/12 - 20/12	1.06
	19/07 - 26/07	1.01	23/08 - 30/08	N	22/09 - 27/09	1.46	25/10 - 01/11	1.76	22/11 - 29/11	3.89	20/12 - 27/12	2.49
	26/07 - 02/08	0.73			27/09 - 04/10	2.26					27/12 - 03/01	1.92
Arithmetic Mean		1.29		1.01		2.38		1.38		1.91		1.70
Standard Deviation		0.52		0.27		1.33		0.43		1.52		0.55
Valid Samples		4		3		5		4		4		5

Notes (1) N = no measurement; (2) Measurements preceded by < are below the Limit of Detection. The measurement has been included in the calculation of the statistical parameters at 50% of its value; (3) Statistical parameters calculated only if data capture is greater than 75%.

National Environmental Technology Centre
Site: 5321 Redesdale 2 - Sulphur Dioxide as S (SO2 - S)
Concentration in air (μg S m^{-3})

Weekly measurements, collection-day - non standard
Summary for January 1999 to December 1999

MONTH	JAN		FEB		MAR		APR		MAY		JUN	
	Start End		Start End		Start End		Start End		Start End		Start End	
	29/12 - 04/01	2.89	02/02 - 09/02	0.77	02/03 - 09/03	0.54	30/03 - 06/04	2.68	04/05 - 12/05	1.00	01/06 - 08/06	0.93
	04/01 - 12/01	0.44	09/02 - 16/02	1.38	09/03 - 16/03	1.70	06/04 - 13/04	0.72	12/05 - 18/05	N	08/06 - 15/06	1.31
	12/01 - 19/01	N	16/02 - 23/02	0.37	16/03 - 23/03	0.59	13/04 - 20/04	0.72	18/05 - 25/05	0.33	15/06 - 22/06	0.88
	19/01 - 26/01	1.97	23/02 - 02/03	2.29	23/03 - 30/03	1.27	20/04 - 27/04	2.55	25/05 - 01/06	N	22/06 - 29/06	2.00
	26/01 - 02/02	1.05					27/04 - 04/05	1.06				
Arithmetic Mean		1.59		1.20		1.03		1.54		-		1.28
Standard Deviation		1.07		0.84		0.56		0.99		-		0.52
Valid Samples		4		4		4		5		2		4

MONTH	JUL		AUG		SEP		OCT		NOV		DEC	
	Start End		Start End		Start End		Start End		Start End		Start End	
	29/06 - 06/07	2.00	03/08 - 10/08	0.61	31/08 - 07/09	1.11	28/09 - 05/10	1.75	02/11 - 09/11	1.45	30/11 - 07/12	1.59
	06/07 - 12/07	1.05	10/08 - 17/08	0.98	07/09 - 14/09	2.21	05/10 - 12/10	1.45	09/11 - 16/11	0.53	07/12 - 14/12	1.53
	12/07 - 20/07	1.09	17/08 - 24/08	0.78	14/09 - 21/09	1.78	12/10 - 19/10	1.05	16/11 - 23/11	0.49	14/12 - 21/12	1.15
	20/07 - 27/07	0.85	24/08 - 31/08	1.10	21/09 - 28/09	2.39	19/10 - 26/10	1.18	23/11 - 30/11	2.68	21/12 - 29/12	3.36
	27/07 - 03/08	1.26					26/10 - 02/11	2.89				
Arithmetic Mean		1.25		0.87		1.87		1.66		1.29		1.91
Standard Deviation		0.45		0.21		0.57		0.74		1.03		0.99
Valid Samples		5		4		4		5		4		4

Notes (1) N = no measurement; (2) Measurements preceded by < are below the Limit of Detection. The measurement has been included in the calculation of the statistical parameters at 50% of its value; (3) Statistical parameters calculated only if data capture is greater than 75%.

National Environmental Technology Centre
Site: 5322 Hebden Bridge 2 - Sulphur Dioxide as S (SO2 - S)
Concentration in air (μg S m^{-3})

Weekly measurements, collection-day - non standard
Summary for January 1999 to December 1999

MONTH	JAN		FEB		MAR		APR		MAY		JUN	
	Start End		Start End		Start End		Start End		Start End		Start End	
	30/12 - 06/01	1.10	03/02 - 10/02	0.73	03/03 - 10/03	0.59	31/03 - 07/04	2.01	28/04 - 05/05	4.33	02/06 - 09/06	0.85
	06/01 - 13/01	1.05	10/02 - 17/02	1.63	10/03 - 17/03	2.57	07/04 - 14/04	0.66	05/05 - 12/05	1.88	09/06 - 16/06	1.13
	13/01 - 20/01	1.22	17/02 - 24/02	0.60	17/03 - 24/03	0.82	14/04 - 21/04	1.64	12/05 - 19/05	1.37	16/06 - 23/06	1.01
	20/01 - 27/01	1.39	24/02 - 03/03	2.49	24/03 - 31/03	2.06	21/04 - 28/04	1.69	19/05 - 26/05	0.85	23/06 - 30/06	2.54
	27/01 - 03/02	1.21							26/05 - 02/06	1.86		
Arithmetic Mean		1.19		1.36		1.51		1.50		2.06		1.38
Standard Deviation		0.13		0.88		0.95		0.59		1.34		0.78
Valid Samples		5		4		4		4		5		4

MONTH	JUL		AUG		SEP		OCT		NOV		DEC	
	Start End		Start End		Start End		Start End		Start End		Start End	
	30/06 - 07/07	1.19	04/08 - 11/08	2.24	01/09 - 08/09	3.26	29/09 - 06/10	1.24	03/11 - 10/11	1.33	01/12 - 08/12	0.95
	07/07 - 14/07	2.03	11/08 - 18/08	2.60	08/09 - 15/09	2.23	06/10 - 13/10	1.65	10/11 - 17/11	0.96	08/12 - 15/12	1.03
	14/07 - 21/07	0.87	18/08 - 25/08	6.11	15/09 - 22/09	4.81	13/10 - 20/10	6.05	17/11 - 24/11	1.10	15/12 - 22/12	1.85
	21/07 - 28/07	0.63	25/08 - 01/09	1.70	22/09 - 29/09	1.57	20/10 - 27/10	1.71	24/11 - 01/12	1.31	22/12 - 29/12	0.96
	28/07 - 04/08	8.03					27/10 - 03/11	1.45				
Arithmetic Mean		2.55		3.16		2.97		2.42		1.17		1.20
Standard Deviation		3.11		2.00		1.41		2.04		0.17		0.43
Valid Samples		5		4		4		5		4		4

Notes (1) N = no measurement; (2) Measurements preceded by < are below the Limit of Detection. The measurement has been included in the calculation of the statistical parameters at 50% of its value; (3) Statistical parameters calculated only if data capture is greater than 75%.

National Environmental Technology Centre
Site: 5323 Preston Montford 2 - Sulphur Dioxide as S (SO2 - S)
Concentration in air (μg S m^{-3})

Weekly measurements, collection-day - non standard
Summary for January 1999 to December 1999

MONTH	JAN		FEB		MAR		APR		MAY		JUN	
	Start End		Start End		Start End		Start End		Start End		Start End	
	30/12 - 06/01	0.56	03/02 - 17/02	0.24	03/03 - 10/03	1.33	31/03 - 07/04	1.33	28/04 - 05/05	3.72	02/06 - 09/06	0.43
	06/01 - 13/01	0.32	17/02 - 24/02	0.30	10/03 - 17/03	1.42	07/04 - 14/04	0.35	05/05 - 12/05	1.62	09/06 - 16/06	0.29
	13/01 - 20/01	0.28	24/02 - 03/03	1.36	17/03 - 24/03	0.37	14/04 - 21/04	1.26	12/05 - 19/05	1.61	16/06 - 23/06	0.54
	20/01 - 27/01	0.28			24/03 - 31/03	0.39	21/04 - 28/04	1.53	19/05 - 26/05	1.29	23/06 - 30/06	1.05
	27/01 - 03/02	0.31							26/05 - 02/06	0.75		
Arithmetic Mean		0.35		0.63		0.88		1.12		1.80		0.58
Standard Deviation		0.12		0.63		0.58		0.53		1.13		0.33
Valid Samples		5		3		4		4		5		4

MONTH	JUL		AUG		SEP		OCT		NOV		DEC	
	Start End		Start End		Start End		Start End		Start End		Start End	
	30/06 - 07/07	0.36	04/08 - 11/08	1.22	01/09 - 08/09	1.19	29/09 - 06/10	<0.23	03/11 - 10/11	N	01/12 - 15/12	<0.25
	07/07 - 14/07	1.28	11/08 - 18/08	0.55	08/09 - 15/09	0.54	06/10 - 14/10	0.32	10/11 - 17/11	0.70	15/12 - 22/12	0.28
	14/07 - 21/07	0.38	18/08 - 25/08	1.85	15/09 - 23/09	0.31	14/10 - 20/10	4.13	17/11 - 24/11	0.96	22/12 - 05/01	0.23
	21/07 - 28/07	1.49	25/08 - 01/09	1.33	23/09 - 29/09	0.27	20/10 - 27/10	1.79	24/11 - 01/12	0.31		
	28/07 - 04/08	2.58					27/10 - 03/11	0.32				
Arithmetic Mean		1.22		1.24		0.58		1.33		0.66		0.21
Standard Deviation		0.92		0.53		0.43		1.70		0.33		0.08
Valid Samples		5		4		4		5		3		3

Notes (1) N = no measurement; (2) Measurements preceded by < are below the Limit of Detection. The measurement has been included in the calculation of the statistical parameters at 50% of its value; (3) Statistical parameters calculated only if data capture is greater than 75%.

National Environmental Technology Centre
Site: 5324 Bentra - Sulphur Dioxide as S (SO2 - S)
Concentration in air (μg S m^{-3})

Weekly measurements, collection-day - non standard
Summary for January 1999 to December 1999

MONTH	JAN		FEB		MAR		APR		MAY		JUN	
	Start End		Start End		Start End		Start End		Start End		Start End	
	29/12 - 06/01	1.57	02/02 - 09/02	N	02/03 - 09/03	1.17	30/03 - 07/04	1.51	04/05 - 11/05	1.19	01/06 - 08/06	N
	06/01 - 13/01	1.75	09/02 - 17/02	1.34	09/03 - 17/03	2.46	07/04 - 13/04	1.67	11/05 - 18/05	1.46	08/06 - 15/06	1.00
	13/01 - 19/01	2.44	17/02 - 23/02	0.89	17/03 - 23/03	0.85	13/04 - 20/04	0.96	18/05 - 26/05	1.30	15/06 - 23/06	1.40
	19/01 - 26/01	3.35	23/02 - 02/03	2.02	23/03 - 30/03	1.37	20/04 - 27/04	1.43	26/05 - 01/06	1.23	23/06 - 29/06	1.98
	26/01 - 02/02	2.39					27/04 - 04/05	1.28				
Arithmetic Mean		2.30		1.42		1.46		1.37		1.29		1.46
Standard Deviation		0.70		0.57		0.70		0.27		0.12		0.49
Valid Samples		5		3		4		5		4		3

MONTH	JUL		AUG		SEP		OCT		NOV		DEC	
	Start End		Start End		Start End		Start End		Start End		Start End	
	29/06 - 06/07	1.34	03/08 - 10/08	1.33	31/08 - 07/09	1.49	29/09 - 05/10	0.90	02/11 - 10/11	1.53	01/12 - 07/12	0.74
	06/07 - 14/07	1.30	10/08 - 17/08	1.66	07/09 - 14/09	1.54	05/10 - 12/10	1.50	10/11 - 16/11	2.01	07/12 - 14/12	1.47
	14/07 - 20/07	1.19	17/08 - 24/08	1.53	14/09 - 21/09	1.31	12/10 - 19/10	2.62	16/11 - 23/11	0.89	14/12 - 21/12	1.00
	20/07 - 27/07	0.84	24/08 - 31/08	1.46	21/09 - 29/09	1.12	19/10 - 26/10	1.25	23/11 - 01/12	2.88	21/12 - 29/12	0.60
	27/07 - 03/08	2.12					26/10 - 02/11	2.87				
Arithmetic Mean		1.36		1.50		1.37		1.83		1.83		0.95
Standard Deviation		0.47		0.14		0.19		0.87		0.84		0.39
Valid Samples		5		4		4		5		4		4

Notes (1) N = no measurement; (2) Measurements preceded by < are below the Limit of Detection. The measurement has been included in the calculation of the statistical parameters at 50% of its value; (3) Statistical parameters calculated only if data capture is greater than 75%.

National Environmental Technology Centre
Site: 5325 Pitlochry - Sulphur Dioxide as S (SO2 - S)
Concentration in air (μg S m^{-3})

Weekly measurements, collection-day - non standard
Summary for January 1999 to December 1999

MONTH	JAN		FEB		MAR		APR		MAY		JUN	
	Start End		Start End		Start End		Start End		Start End		Start End	
	31/12 - 07/01	N	04/02 - 11/02	N	04/03 - 11/03	0.48	01/04 - 09/04	0.63	29/04 - 07/05	0.40	03/06 - 11/06	0.22
	07/01 - 14/01	N	11/02 - 18/02	0.31	11/03 - 18/03	0.63	09/04 - 15/04	0.30	07/05 - 13/05	0.21	11/06 - 17/06	0.51
	14/01 - 21/01	N	18/02 - 25/02	0.37	18/03 - 25/03	0.29	15/04 - 22/04	0.42	13/05 - 21/05	N	17/06 - 24/06	0.31
	21/01 - 28/01	N	25/02 - 04/03	2.11	25/03 - 01/04	N	22/04 - 29/04	0.46	21/05 - 28/05	0.18	24/06 - 01/07	0.46
	28/01 - 04/02	0.37							28/05 - 03/06	0.27		
Arithmetic Mean		-		0.93		0.47		0.45		0.27		0.37
Standard Deviation		-		1.02		0.17		0.14		0.10		0.13
Valid Samples		1		3		3		4		4		4

MONTH	JUL		AUG		SEP		OCT		NOV		DEC	
	Start End		Start End		Start End		Start End		Start End		Start End	
	01/07 - 08/07	0.30	29/07 - 05/08	0.59	03/09 - 09/09	N	30/09 - 07/10	0.27	04/11 - 11/11	0.28	03/12 - 09/12	0.26
	08/07 - 15/07	0.29	05/08 - 12/08	0.42	09/09 - 16/09	0.61	07/10 - 14/10	0.30	11/11 - 18/11	0.36	09/12 - 16/12	0.28
	15/07 - 22/07	0.19	12/08 - 19/08	0.31	16/09 - 23/09	0.36	14/10 - 21/10	0.18	18/11 - 26/11	0.28	16/12 - 23/12	0.39
	22/07 - 29/07	0.32	19/08 - 26/08	0.34	23/09 - 30/09	0.25	21/10 - 28/10	0.26	26/11 - 03/12	0.11	23/12 - 30/12	<0.19
			26/08 - 03/09	0.25			28/10 - 04/11	0.20				
Arithmetic Mean		0.28		0.38		0.40		0.24		0.26		0.26
Standard Deviation		0.06		0.13		0.19		0.05		0.10		0.12
Valid Samples		4		5		3		5		4		4

Notes (1) N = no measurement; (2) Measurements preceded by < are below the Limit of Detection. The measurement has been included in the calculation of the statistical parameters at 50% of its value; (3) Statistical parameters calculated only if data capture is greater than 75%.

National Environmental Technology Centre
Site: 5329 Cam Forest - Sulphur Dioxide as S (SO2 - S)
Concentration in air (μg S m^{-3})

Weekly measurements, collection-day - non standard
Summary for January 1999 to December 1999

MONTH	JAN		FEB		MAR		APR		MAY		JUN	
	Start End		Start End		Start End		Start End		Start End		Start End	
	01/01 - 11/01	0.13	29/01 - 05/02	0.30	26/02 - 05/03	0.22	02/04 - 09/04	0.44	30/04 - 07/05	1.00	04/06 - 11/06	0.36
	11/01 - 15/01	1.59	05/02 - 12/02	0.47	05/03 - 12/03	0.50	09/04 - 16/04	0.35	07/05 - 14/05	0.25	11/06 - 18/06	0.37
	15/01 - 22/01	<0.20	12/02 - 19/02	0.25	12/03 - 19/03	0.27	16/04 - 23/04	0.84	14/05 - 21/05	0.47	18/06 - 25/06	0.48
	22/01 - 29/01	N	19/02 - 26/02	<0.22	19/03 - 26/03	<0.22	23/04 - 30/04	0.42	21/05 - 28/05	0.45	25/06 - 02/07	0.63
					26/03 - 02/04	0.61			28/05 - 04/06	0.66		
Arithmetic Mean		0.61		0.28		0.34		0.51		0.57		0.46
Standard Deviation		0.85		0.15		0.21		0.22		0.28		0.12
Valid Samples		3		4		5		4		5		4

MONTH	JUL		AUG		SEP		OCT		NOV		DEC	
	Start End		Start End		Start End		Start End		Start End		Start End	
	02/07 - 09/07	0.32	30/07 - 06/08	1.16	31/08 - 10/09	0.52	01/10 - 08/10	0.44	30/10 - 05/11	0.30	03/12 - 14/12	0.22
	09/07 - 16/07	0.36	06/08 - 13/08	0.70	10/09 - 17/09	0.44	08/10 - 15/10	0.36	05/11 - 15/11	0.42	14/12 - 17/12	0.54
	16/07 - 23/07	0.42	13/08 - 20/08	N	17/09 - 24/09	0.40	15/10 - 22/10	1.41	15/11 - 19/11	0.45	17/12 - 24/12	N
	23/07 - 30/07	0.75	20/08 - 31/08	0.81	24/09 - 01/10	0.38	22/10 - 30/10	0.36	19/11 - 26/11	0.18	24/12 - 31/12	0.21
									26/11 - 03/12	0.36		
Arithmetic Mean		0.46		0.89		0.43		0.64		0.34		0.33
Standard Deviation		0.20		0.24		0.06		0.51		0.10		0.19
Valid Samples		4		3		4		4		5		3

Notes (1) N = no measurement; (2) Measurements preceded by < are below the Limit of Detection. The measurement has been included in the calculation of the statistical parameters at 50% of its value; (3) Statistical parameters calculated only if data capture is greater than 75%.

National Environmental Technology Centre
Site: 5330 Cwmystwyth - Sulphur Dioxide as S (SO2 - S)
Concentration in air (μg S m^{-3})

Weekly measurements, collection-day - non standard
Summary for January 1999 to December 1999

MONTH	JAN		FEB		MAR		APR		MAY		JUN	
	Start End		Start End		Start End		Start End		Start End		Start End	
	30/12 - 14/01	N	29/01 - 08/02	0.33	04/03 - 11/03	1.05	31/03 - 07/04	0.70	04/05 - 14/05	0.91	27/05 - 09/06	0.69
	14/01 - 22/01	0.62	08/02 - 16/02	0.46	11/03 - 18/03	0.50	07/04 - 13/04	0.49	14/05 - 27/05	N	09/06 - 17/06	0.66
	22/01 - 29/01	0.56	16/02 - 23/02	0.91	18/03 - 26/03	0.22	13/04 - 20/04	0.36			17/06 - 22/06	1.10
			23/02 - 04/03	0.32	26/03 - 31/03	0.71	20/04 - 27/04	0.71			22/06 - 30/06	0.69
							27/04 - 04/05	4.52				
Arithmetic Mean		-		0.50		0.62		1.36		-		0.78
Standard Deviation		-		0.28		0.35		1.77		-		0.21
Valid Samples		2		4		4		5		1		4

MONTH	JUL		AUG		SEP		OCT		NOV		DEC	
	Start End		Start End		Start End		Start End		Start End		Start End	
	30/06 - 09/07	0.21	29/07 - 10/08	N	02/09 - 10/09	1.04	29/09 - 08/10	0.53	01/11 - 10/11	0.49	01/12 - 09/12	0.47
	09/07 - 22/07	0.70	10/08 - 17/08	0.69	10/09 - 21/09	N	08/10 - 15/10	0.66	10/11 - 17/11	1.86	09/12 - 16/12	0.63
	22/07 - 29/07	1.46	17/08 - 27/08	0.90	21/09 - 29/09	0.61	15/10 - 21/10	2.36	17/11 - 24/11	1.38	16/12 - 29/12	0.43
			27/08 - 02/09	0.94			21/10 - 01/11	0.62	24/11 - 01/12	0.95		
Arithmetic Mean		0.79		0.84		-		1.04		1.17		0.51
Standard Deviation		0.63		0.13		-		0.88		0.59		0.10
Valid Samples		3		3		2		4		4		3

Notes (1) N = no measurement; (2) Measurements preceded by < are below the Limit of Detection. The measurement has been included in the calculation of the statistical parameters at 50% of its value; (3) Statistical parameters calculated only if data capture is greater than 75%.

National Environmental Technology Centre
Site: 5331 Rosemaund - Sulphur Dioxide as S (SO2 - S)
Concentration in air (μg S m^{-3})

Weekly measurements, collection-day - non standard
Summary for January 1999 to December 1999

MONTH	JAN		FEB		MAR		APR		MAY		JUN	
	Start End		Start End		Start End		Start End		Start End		Start End	
	30/12 - 06/01	0.87	03/02 - 10/02	0.85	03/03 - 10/03	2.11	31/03 - 07/04	0.70	28/04 - 05/05	3.02	02/06 - 09/06	0.73
	06/01 - 13/01	1.23	10/02 - 17/02	0.60	10/03 - 17/03	1.27	07/04 - 14/04	0.45	05/05 - 12/05	3.28	09/06 - 16/06	N
	13/01 - 20/01	0.49	17/02 - 24/02	<0.28	17/03 - 24/03	N	14/04 - 21/04	1.02	12/05 - 19/05	2.19	16/06 - 24/06	0.83
	20/01 - 27/01	0.39	24/02 - 03/03	0.81	24/03 - 31/03	N	21/04 - 28/04	1.27	19/05 - 27/05	0.57	24/06 - 30/06	0.84
	27/01 - 03/02	0.34							27/05 - 02/06	1.25		
Arithmetic Mean		0.66		0.60		-		0.86		2.06		0.80
Standard Deviation		0.38		0.33		-		0.36		1.15		0.06
Valid Samples		5		4		2		4		5		3

MONTH	JUL		AUG		SEP		OCT		NOV		DEC	
	Start End		Start End		Start End		Start End		Start End		Start End	
	30/06 - 08/07	0.65	29/07 - 04/08	1.31	01/09 - 08/09	0.94	29/09 - 06/10	0.32	03/11 - 10/11	1.07	01/12 - 08/12	0.45
	08/07 - 15/07	2.85	04/08 - 11/08	0.96	08/09 - 16/09	0.74	06/10 - 13/10	0.71	10/11 - 17/11	2.10	08/12 - 15/12	<0.27
	15/07 - 21/07	0.88	11/08 - 19/08	0.63	16/09 - 22/09	0.66	13/10 - 20/10	1.34	17/11 - 24/11	1.56	15/12 - 23/12	0.62
	21/07 - 29/07	1.69	19/08 - 26/08	1.24	22/09 - 29/09	0.43	20/10 - 27/10	0.65	24/11 - 01/12	0.92	23/12 - 29/12	<0.37
			26/08 - 01/09	1.00			27/10 - 03/11	0.43				
Arithmetic Mean		1.52		1.03		0.69		0.69		1.41		0.35
Standard Deviation		1.00		0.27		0.21		0.40		0.54		0.23
Valid Samples		4		5		4		5		4		4

Notes (1) N = no measurement; (2) Measurements preceded by < are below the Limit of Detection. The measurement has been included in the calculation of the statistical parameters at 50% of its value; (3) Statistical parameters calculated only if data capture is greater than 75%.

National Environmental Technology Centre
Site: 5333 Fairseat - Sulphur Dioxide as S (SO2 - S)
Concentration in air (μg S m^{-3})

Weekly measurements, collection-day - non standard
Summary for January 1999 to December 1999

MONTH	JAN		FEB		MAR		APR		MAY		JUN	
	Start End		Start End		Start End		Start End		Start End		Start End	
	29/12 - 05/01	0.48	02/02 - 09/02	1.89	02/03 - 09/03	2.49	30/03 - 06/04	0.87	04/05 - 11/05	1.72	01/06 - 08/06	N
	05/01 - 12/01	2.01	09/02 - 16/02	7.47	09/03 - 16/03	2.56	06/04 - 13/04	0.99	11/05 - 18/05	2.69	08/06 - 15/06	1.76
	12/01 - 19/01	1.39	16/02 - 23/02	1.20	16/03 - 23/03	3.73	13/04 - 20/04	2.78	18/05 - 25/05	1.31	15/06 - 22/06	2.27
	19/01 - 26/01	1.68	23/02 - 02/03	1.20	23/03 - 30/03	1.69	20/04 - 27/04	2.23	25/05 - 01/06	1.93	22/06 - 29/06	2.00
	26/01 - 02/02	N					27/04 - 04/05	3.46				
Arithmetic Mean		1.39		2.94		2.61		2.07		1.91		2.01
Standard Deviation		0.66		3.04		0.84		1.12		0.58		0.25
Valid Samples		4		4		4		5		4		3

MONTH	JUL		AUG		SEP		OCT		NOV		DEC	
	Start End		Start End		Start End		Start End		Start End		Start End	
	29/06 - 06/07	0.93	03/08 - 10/08	0.85	31/08 - 07/09	2.95	28/09 - 05/10	N	29/10 - 04/11	0.66	30/11 - 07/12	1.07
	06/07 - 13/07	5.63	10/08 - 17/08	1.28	07/09 - 14/09	1.24	05/10 - 12/10	1.90	04/11 - 11/11	1.68	07/12 - 14/12	0.54
	13/07 - 20/07	1.57	17/08 - 24/08	1.40	14/09 - 21/09	0.91	12/10 - 19/10	7.08	11/11 - 16/11	2.99	14/12 - 21/12	6.91
	20/07 - 27/07	1.70	24/08 - 31/08	0.98	21/09 - 28/09	0.35	19/10 - 29/10	1.33	16/11 - 23/11	3.07	21/12 - 29/12	0.85
	27/07 - 03/08	3.21							23/11 - 30/11	0.97		
Arithmetic Mean		2.61		1.13		1.36		3.43		1.87		2.34
Standard Deviation		1.88		0.26		1.12		3.17		1.12		3.05
Valid Samples		5		4		4		3		5		4

Notes (1) N = no measurement; (2) Measurements preceded by < are below the Limit of Detection. The measurement has been included in the calculation of the statistical parameters at 50% of its value; (3) Statistical parameters calculated only if data capture is greater than 75%.

National Environmental Technology Centre
Site: 5334 Bylchau - Sulphur Dioxide as S (SO2 - S)
Concentration in air ($\mu g\ S\ m^{-3}$)

Weekly measurements, collection-day - non standard
Summary for January 1999 to December 1999

MONTH	JAN		FEB		MAR		APR		MAY		JUN	
	Start End		Start End		Start End		Start End		Start End		Start End	
	30/12 - 06/01	<0.19	04/02 - 10/02	0.35	03/03 - 10/03	0.54	30/03 - 07/04	0.49	28/04 - 05/05	1.67	02/06 - 09/06	0.25
	06/01 - 13/01	1.03	10/02 - 18/02	0.18	10/03 - 17/03	0.67	07/04 - 14/04	0.20	05/05 - 12/05	1.72	09/06 - 16/06	0.27
	13/01 - 20/01	<0.19	18/02 - 24/02	<0.21	17/03 - 24/03	<0.18	14/04 - 28/04	0.68	12/05 - 21/05	1.95	16/06 - 23/06	0.33
	20/01 - 27/01	0.20	24/02 - 03/03	0.29	24/03 - 30/03	<0.25			21/05 - 28/05	0.30	23/06 - 30/06	0.79
	27/01 - 04/02	<0.15							28/05 - 02/06	0.42		
Arithmetic Mean		0.30		0.23		0.36		0.45		1.21		0.41
Standard Deviation		0.41		0.11		0.29		0.24		0.79		0.25
Valid Samples		5		4		4		3		5		4

MONTH	JUL		AUG		SEP		OCT		NOV		DEC	
	Start End		Start End		Start End		Start End		Start End		Start End	
	30/06 - 07/07	0.23	04/08 - 12/08	0.72	01/09 - 08/09	0.94	29/09 - 06/10	0.25	03/11 - 10/11	0.19	08/12 - 15/12	0.27
	07/07 - 14/07	1.03	12/08 - 18/08	0.48	08/09 - 15/09	0.39	06/10 - 12/10	0.26	10/11 - 17/11	0.54	15/12 - 22/12	0.55
	14/07 - 21/07	0.25	18/08 - 25/08	1.52	15/09 - 22/09	0.56	12/10 - 20/10	1.47	17/11 - 08/12	0.32	22/12 - 29/12	0.25
	21/07 - 04/08	1.12	25/08 - 01/09	0.41	22/09 - 29/09	0.37	20/10 - 27/10	0.73				
							27/10 - 03/11	<0.19				
Arithmetic Mean		0.66		0.78		0.57		0.56		0.35		0.36
Standard Deviation		0.48		0.51		0.26		0.56		0.18		0.17
Valid Samples		4		4		4		5		3		3

Notes (1) N = no measurement; (2) Measurements preceded by < are below the Limit of Detection. The measurement has been included in the calculation of the statistical parameters at 50% of its value; (3) Statistical parameters calculated only if data capture is greater than 75%.

National Environmental Technology Centre
Site: 5335 Crai - Sulphur Dioxide as S (SO2 - S)
Concentration in air (μg S m^{-3})

Weekly measurements, collection-day - non standard
Summary for January 1999 to December 1999

MONTH	JAN		FEB		MAR		APR		MAY		JUN	
	Start End		Start End		Start End		Start End		Start End		Start End	
	31/12 - 08/01	0.97	29/01 - 05/02	0.90	26/02 - 05/03	0.28	06/04 - 09/04	0.49	30/04 - 07/05	1.64	04/06 - 14/06	N
	08/01 - 15/01	0.74	05/02 - 12/02	0.49	05/03 - 12/03	1.93	09/04 - 16/04	0.25	07/05 - 14/05	0.53	14/06 - 18/06	0.44
	15/01 - 22/01	0.61	12/02 - 19/02	1.22	12/03 - 19/03	0.96	16/04 - 23/04	0.69	14/05 - 21/05	1.52	18/06 - 25/06	0.49
	22/01 - 29/01	0.86	19/02 - 26/02	0.52	19/03 - 26/03	0.42	23/04 - 30/04	3.08	21/05 - 28/05	0.47	25/06 - 02/07	0.77
					26/03 - 06/04	N			28/05 - 04/06	0.40		
Arithmetic Mean		0.80		0.78		0.90		1.13		0.91		0.57
Standard Deviation		0.16		0.35		0.75		1.31		0.61		0.18
Valid Samples		4		4		4		4		5		3

MONTH	JUL		AUG		SEP		OCT		NOV		DEC	
	Start End		Start End		Start End		Start End		Start End		Start End	
	02/07 - 09/07	0.58	30/07 - 06/08	1.11	03/09 - 10/09	1.02	01/10 - 08/10	0.82	29/10 - 05/11	0.52	03/12 - 10/12	0.32
	09/07 - 16/07	1.80	06/08 - 13/08	0.80	10/09 - 17/09	0.72	08/10 - 15/10	1.16	05/11 - 12/11	1.06	10/12 - 17/12	0.47
	16/07 - 23/07	0.42	13/08 - 20/08	0.33	17/09 - 24/09	0.85	15/10 - 22/10	1.91	12/11 - 19/11	1.20	17/12 - 24/12	1.16
	23/07 - 30/07	0.44	20/08 - 27/08	0.87	24/09 - 01/10	0.34	22/10 - 29/10	0.82	19/11 - 26/11	1.22	24/12 - 30/12	0.31
			27/08 - 03/09	0.66					26/11 - 03/12	0.40		
Arithmetic Mean		0.81		0.75		0.73		1.18		0.88		0.56
Standard Deviation		0.66		0.29		0.29		0.51		0.39		0.40
Valid Samples		4		5		4		4		5		4

Notes (1) N = no measurement; (2) Measurements preceded by < are below the Limit of Detection. The measurement has been included in the calculation of the statistical parameters at 50% of its value; (3) Statistical parameters calculated only if data capture is greater than 75%.

National Environmental Technology Centre
Site: 5338 Forsinain - Sulphur Dioxide as S (SO2 - S)
Concentration in air (μg S m^{-3})

Weekly measurements, collection-day - non standard
Summary for January 1999 to December 1999

MONTH	JAN		FEB		MAR		APR		MAY		JUN	
	Start End		Start End		Start End		Start End		Start End		Start End	
	29/12 - 05/01	0.37	02/02 - 09/02	N	02/03 - 09/03	<0.22	31/03 - 05/04	0.16	04/05 - 11/05	0.27	01/06 - 08/06	0.42
	05/01 - 12/01	<0.23	09/02 - 16/02	<0.18	09/03 - 16/03	0.60	05/04 - 13/04	0.70	11/05 - 18/05	0.71	08/06 - 15/06	0.34
	12/01 - 19/01	0.36	16/02 - 23/02	<0.23	16/03 - 23/03	0.34	13/04 - 20/04	0.44	18/05 - 25/05	0.42	15/06 - 22/06	0.63
	19/01 - 26/01	<0.25	23/02 - 02/03	<0.31	23/03 - 31/03	0.25	20/04 - 27/04	0.23	25/05 - 01/06	0.34	22/06 - 29/06	0.65
	26/01 - 02/02	<0.24					27/04 - 04/05	0.29				
Arithmetic Mean		0.22		0.12		0.33		0.36		0.43		0.51
Standard Deviation		0.14		0.03		0.20		0.21		0.19		0.15
Valid Samples		5		3		4		5		4		4

MONTH	JUL		AUG		SEP		OCT		NOV		DEC	
	Start End		Start End		Start End		Start End		Start End		Start End	
	29/06 - 06/07	0.45	03/08 - 10/08	0.45	31/08 - 07/09	0.28	28/09 - 05/10	0.37	02/11 - 09/11	<0.23	30/11 - 07/12	0.39
	06/07 - 13/07	0.44	10/08 - 17/08	0.28	07/09 - 14/09	0.37	05/10 - 12/10	N	09/11 - 16/11	N	07/12 - 14/12	0.23
	13/07 - 20/07	0.36	17/08 - 24/08	0.42	14/09 - 21/09	0.24	12/10 - 19/10	<0.29	16/11 - 23/11	0.50	14/12 - 21/12	0.22
	20/07 - 27/07	0.39	24/08 - 31/08	0.26	21/09 - 28/09	0.28	19/10 - 26/10	0.36	23/11 - 30/11	0.46	21/12 - 28/12	<0.22
	27/07 - 03/08	0.91					26/10 - 02/11	0.24			28/12 - 04/01	<0.23
Arithmetic Mean		0.51		0.35		0.29		0.28		0.36		0.21
Standard Deviation		0.23		0.10		0.05		0.11		0.21		0.11
Valid Samples		5		4		4		4		3		5

Notes (1) N = no measurement; (2) Measurements preceded by < are below the Limit of Detection. The measurement has been included in the calculation of the statistical parameters at 50% of its value; (3) Statistical parameters calculated only if data capture is greater than 75%.

National Environmental Technology Centre
Site: 5339 Appleacre - Sulphur Dioxide as S (SO2 - S)
Concentration in air ($\mu g\ S\ m^{-3}$)

Weekly measurements, collection-day - non standard
Summary for January 1999 to December 1999

MONTH	JAN		FEB		MAR		APR		MAY		JUN	
	Start End		Start End		Start End		Start End		Start End		Start End	
	30/12 - 06/01	1.23	03/02 - 10/02	4.43	03/03 - 10/03	6.40	31/03 - 07/04	2.15	28/04 - 05/05	1.51	02/06 - 09/06	0.51
	06/01 - 13/01	2.77	10/02 - 17/02	2.70	10/03 - 17/03	1.99	07/04 - 14/04	2.24	05/05 - 12/05	1.21	09/06 - 16/06	0.51
	13/01 - 20/01	0.58	17/02 - 24/02	2.70	17/03 - 24/03	2.25	14/04 - 21/04	2.78	12/05 - 19/05	0.54	16/06 - 23/06	0.39
	20/01 - 27/01	1.58	24/02 - 03/03	1.64	24/03 - 31/03	1.48	21/04 - 28/04	2.71	19/05 - 26/05	0.47	23/06 - 30/06	1.44
	27/01 - 03/02	1.70							26/05 - 02/06	0.76		
Arithmetic Mean		1.57		2.87		3.03		2.47		0.89		0.71
Standard Deviation		0.80		1.15		2.27		0.32		0.45		0.49
Valid Samples		5		4		4		4		5		4

MONTH	JUL		AUG		SEP		OCT		NOV		DEC	
	Start End		Start End		Start End		Start End		Start End		Start End	
	30/06 - 07/07	0.43	04/08 - 11/08	0.65	01/09 - 08/09	0.70	29/09 - 06/10	0.91	03/11 - 10/11	0.96	01/12 - 08/12	1.45
	07/07 - 14/07	0.74	11/08 - 18/08	1.59	08/09 - 15/09	0.88	06/10 - 13/10	0.81	10/11 - 17/11	1.29	08/12 - 15/12	1.34
	14/07 - 21/07	0.23	18/08 - 25/08	0.90	15/09 - 22/09	1.71	13/10 - 20/10	0.76	17/11 - 24/11	1.60	15/12 - 22/12	1.71
	21/07 - 28/07	0.65	25/08 - 01/09	0.50	22/09 - 29/09	1.01	20/10 - 27/10	1.38	24/11 - 01/12	0.85	22/12 - 29/12	0.88
	28/07 - 04/08	1.28					27/10 - 03/11	0.73				
Arithmetic Mean		0.67		0.91		1.07		0.92		1.17		1.35
Standard Deviation		0.40		0.48		0.44		0.27		0.34		0.35
Valid Samples		5		4		4		5		4		4

Notes (1) N = no measurement; (2) Measurements preceded by < are below the Limit of Detection. The measurement has been included in the calculation of the statistical parameters at 50% of its value; (3) Statistical parameters calculated only if data capture is greater than 75%.

National Environmental Technology Centre
Site: 5340 Garrary - Sulphur Dioxide as S (SO2 - S)
Concentration in air (μg S m^{-3})

Weekly measurements, collection-day - non standard
Summary for January 1999 to December 1999

MONTH	JAN		FEB		MAR		APR		MAY		JUN	
	Start End		Start End		Start End		Start End		Start End		Start End	
	01/01 - 08/01	<0.14	29/01 - 05/02	0.16	26/02 - 05/03	0.13	02/04 - 09/04	0.27	30/04 - 07/05	0.41	04/06 - 11/06	0.28
	08/01 - 15/01	0.22	05/02 - 12/02	0.15	05/03 - 12/03	0.31	09/04 - 16/04	0.18	07/05 - 14/05	0.15	11/06 - 18/06	0.22
	15/01 - 22/01	<0.15	12/02 - 19/02	0.21	12/03 - 19/03	<0.15	16/04 - 23/04	0.41	14/05 - 21/05	0.28	18/06 - 25/06	0.25
	22/01 - 29/01	<0.15	19/02 - 22/02	N	19/03 - 26/03	0.25	23/04 - 30/04	0.37	21/05 - 28/05	0.25	25/06 - 02/07	0.43
			22/02 - 26/02	0.25	26/03 - 02/04	0.27			28/05 - 04/06	0.21		
Arithmetic Mean		0.11		0.19		0.21		0.31		0.26		0.30
Standard Deviation		0.08		0.05		0.10		0.10		0.10		0.09
Valid Samples		4		4		5		4		5		4

MONTH	JUL		AUG		SEP		OCT		NOV		DEC	
	Start End		Start End		Start End		Start End		Start End		Start End	
	02/07 - 09/07	0.29	30/07 - 06/08	0.50								
	09/07 - 16/07	0.35										
	16/07 - 23/07	0.20										
	23/07 - 30/07	0.26										
Arithmetic Mean		0.28		-		-		-		-		-
Standard Deviation		0.06		-		-		-		-		-
Valid Samples		4		1		0		0		0		0

Notes (1) N = no measurement; (2) Measurements preceded by < are below the Limit of Detection. The measurement has been included in the calculation of the statistical parameters at 50% of its value; (3) Statistical parameters calculated only if data capture is greater than 75%.

National Environmental Technology Centre
Site: 5342 Auchencorth Moss - Sulphur Dioxide as S (SO2 - S)
Concentration in air (μg S m^{-3})

Weekly measurements, collection-day - non standard
Summary for January 1999 to December 1999

MONTH	JAN		FEB		MAR		APR		MAY		JUN	
	Start End		Start End		Start End		Start End		Start End		Start End	
	01/01 - 08/01	0.23	29/01 - 05/02	<0.17	26/02 - 05/03	N	02/04 - 09/04	0.49	30/04 - 07/05	0.77	04/06 - 11/06	0.81
	08/01 - 15/01	N	05/02 - 12/02	1.25	05/03 - 12/03	1.21	09/04 - 16/04	0.47	07/05 - 14/05	0.42		
	15/01 - 22/01	0.21	12/02 - 19/02	0.32	12/03 - 19/03	0.28	16/04 - 23/04	0.71	14/05 - 21/05	1.19		
	22/01 - 29/01	0.37	19/02 - 26/02	0.58	19/03 - 26/03	0.20	23/04 - 30/04	0.54	21/05 - 28/05	0.40		
					26/03 - 02/04	0.63			28/05 - 04/06	0.53		
Arithmetic Mean	0.27		0.56		0.58		0.55		0.66		-	
Standard Deviation	0.09		0.50		0.46		0.11		0.33		-	
Valid Samples	3		4		4		4		5		1	

MONTH	JUL	AUG	SEP	OCT	NOV	DEC
	Start End	Start End	Start End	Start End	Start End	Start End
Arithmetic Mean	-	-	-	-	-	-
Standard Deviation	-	-	-	-	-	-
Valid Samples	0	0	0	0	0	0

Notes (1) N = no measurement; (2) Measurements preceded by < are below the Limit of Detection. The measurement has been included in the calculation of the statistical parameters at 50% of its value; (3) Statistical parameters calculated only if data capture is greater than 75%.

National Environmental Technology Centre
Site: 5343 Benniguinea - Sulphur Dioxide as S (SO2 - S)
Concentration in air (μg S m^{-3})

Weekly measurements, collection-day - non standard
Summary for January 1999 to December 1999

MONTH	JAN		FEB		MAR		APR		MAY		JUN	
	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End
Arithmetic Mean	-		-		-		-		-		-	
Standard Deviation	-		-		-		-		-		-	
Valid Samples	0		0		0		0		0		0	

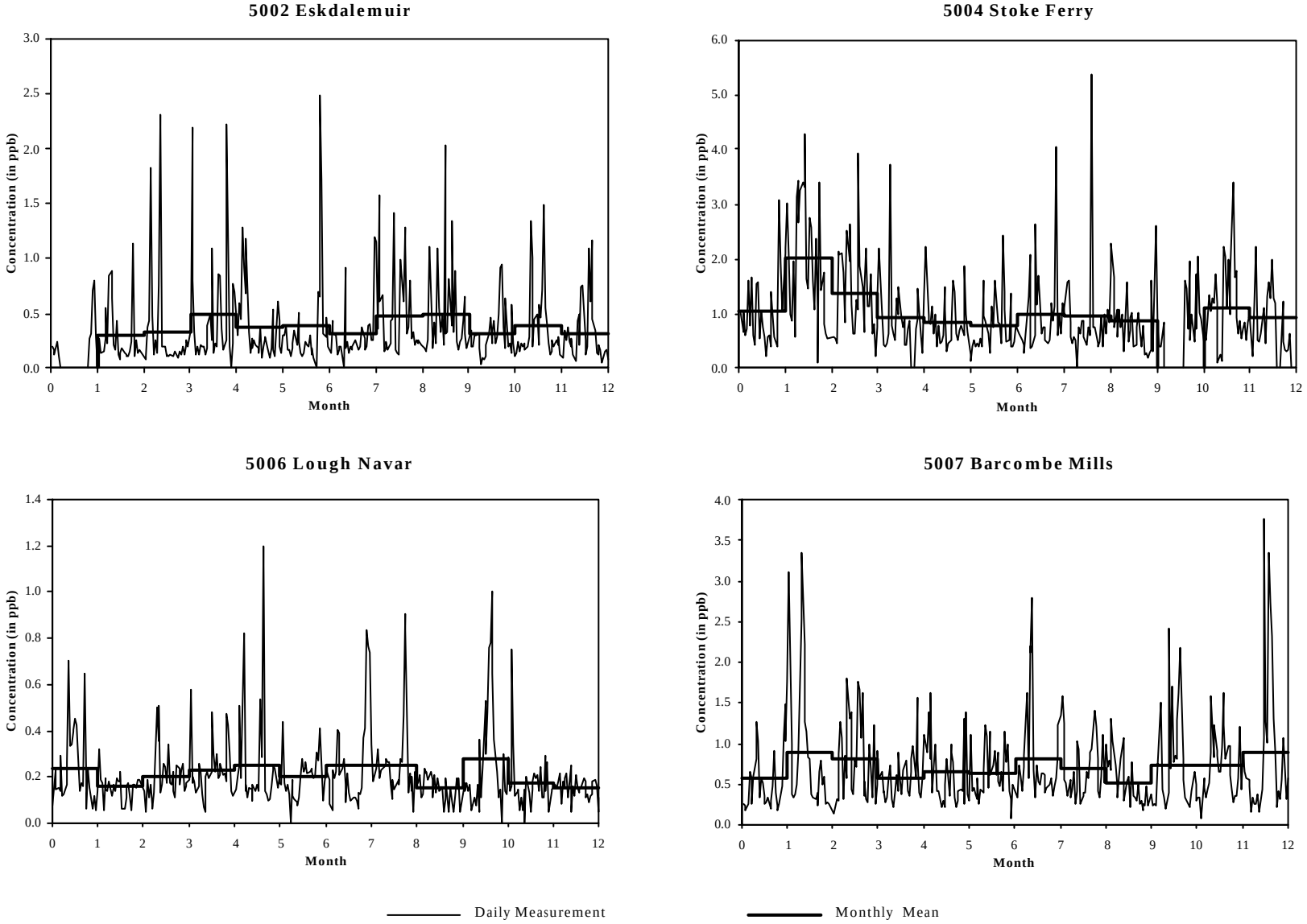
MONTH	JUL		AUG		SEP		OCT		NOV		DEC	
	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End
					03/09 - 10/09	2.34	01/10 - 08/10	0.17	29/10 - 05/11	0.30	03/12 - 10/12	0.18
			06/08 - 13/08	0.40	10/09 - 17/09	0.56	08/10 - 15/10	0.23	05/11 - 12/11	0.12	10/12 - 17/12	0.17
			13/08 - 20/08	0.34	17/09 - 24/09	0.33	15/10 - 22/10	0.37	12/11 - 17/11	0.31	17/12 - 24/12	0.25
			20/08 - 27/08	0.81	24/09 - 01/10	0.21	22/10 - 29/10	0.25	17/11 - 26/11	0.29	24/12 - 07/01	0.14
			27/08 - 03/09	0.68					26/11 - 03/12	0.17		
Arithmetic Mean	-		0.56		0.86		0.26		0.24		0.19	
Standard Deviation	-		0.22		1.00		0.08		0.09		0.05	
Valid Samples	0		4		4		4		5		4	

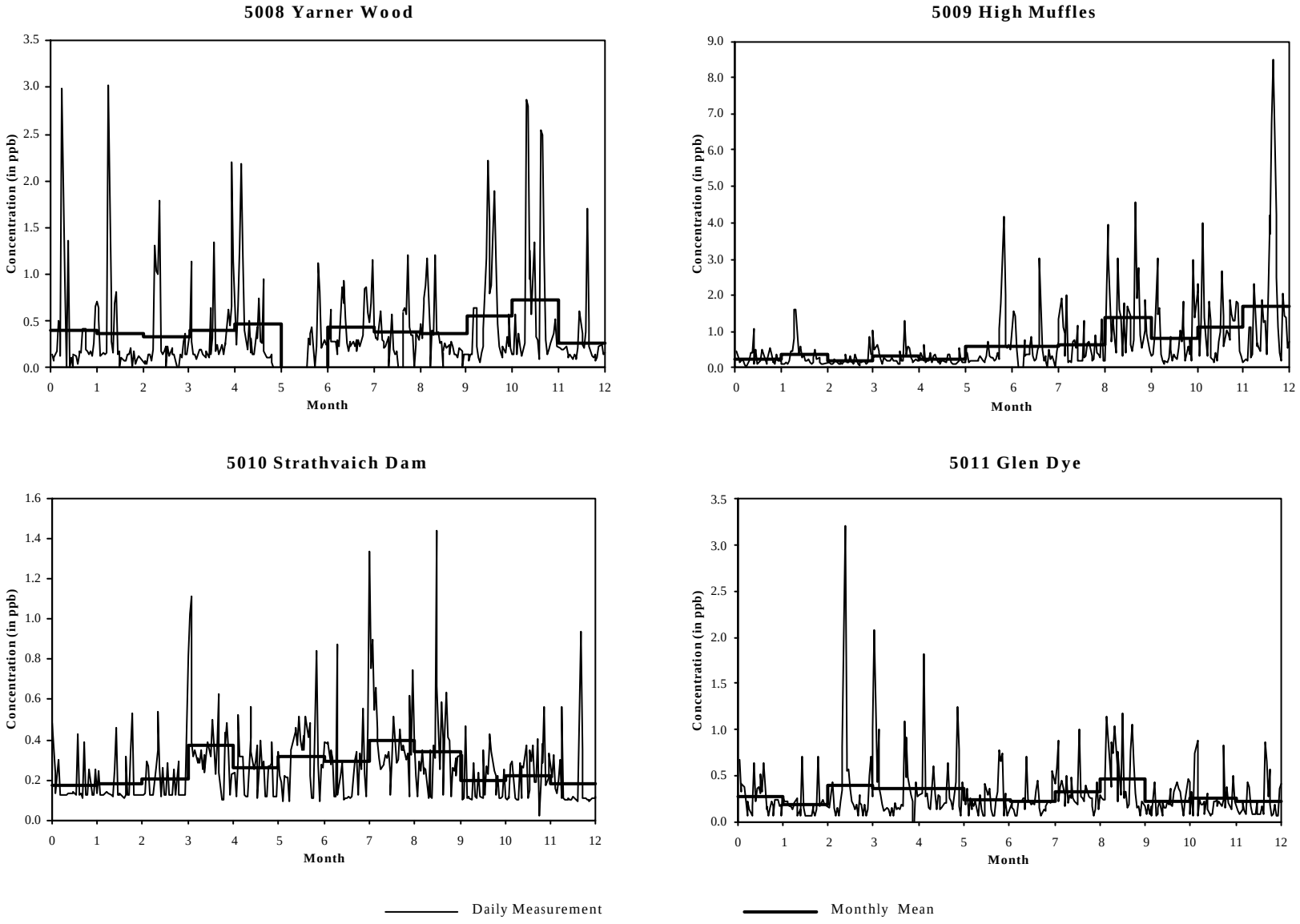
Notes (1) N = no measurement; (2) Measurements preceded by < are below the Limit of Detection. The measurement has been included in the calculation of the statistical parameters at 50% of its value; (3) Statistical parameters calculated only if data capture is greater than 75%.

Appendix 3

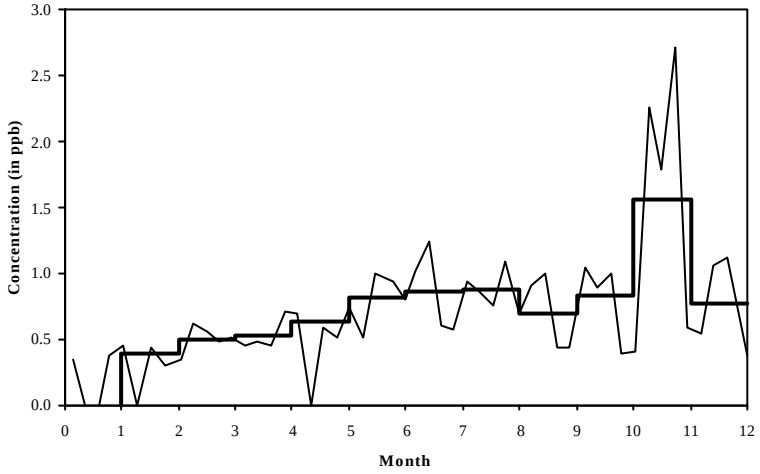
GRAPHS OF MEASURED AND MONTHLY MEAN SO_2 CONCENTRATIONS

Note: In the graphs that follow, the monthly-averaged concentration has been set to zero if the data capture was less than 75% for the month.

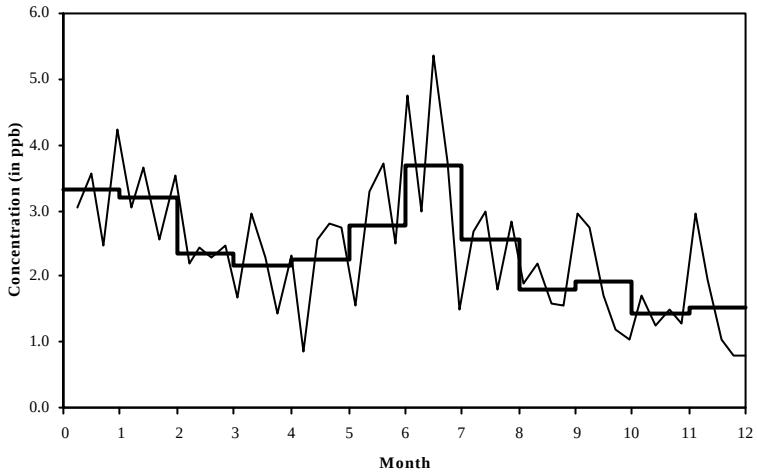

5002 Eskdalemuir
5004 Stoke Ferry
5006 Lough Navar
5007 Barcombe Mills
Concentration (in ppb)
Month
Daily Measurement
Monthly Mean


5008 Yarner Wood
Concentration (in ppb)
Month
5009 High Muffles
Concentration (in ppb)
Month
5010 Strathvaich Dam
Concentration (in ppb)
Month
5011 Glen Dye
Concentration (in ppb)
Month
Daily Measurement
Monthly Mean

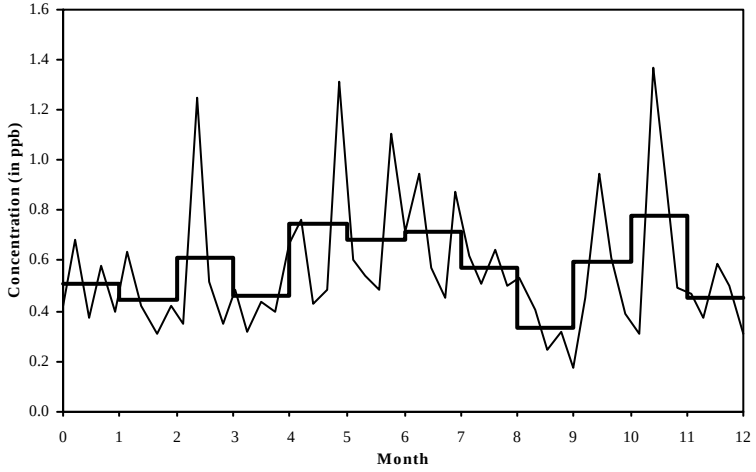
5301 Brockhill 1



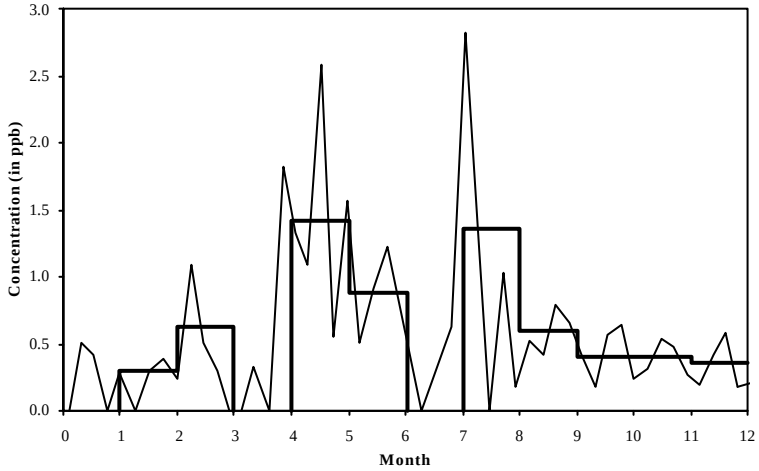
5303 Caenby 1



5304 Camborne 1

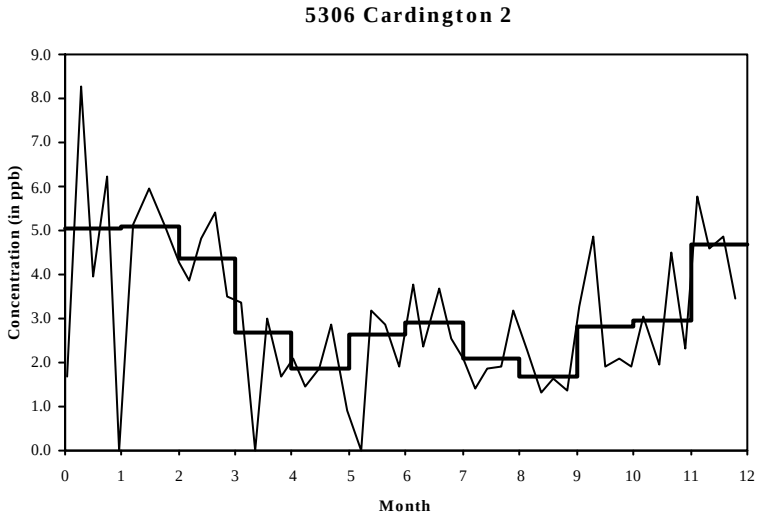


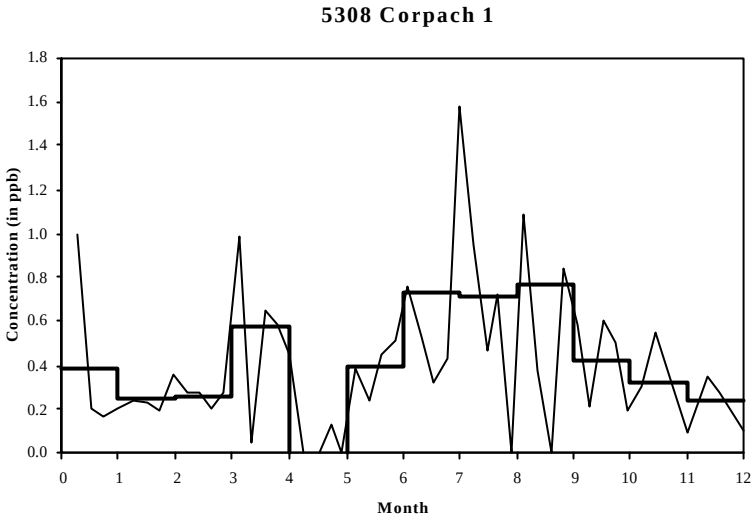
5305 Camphill 1

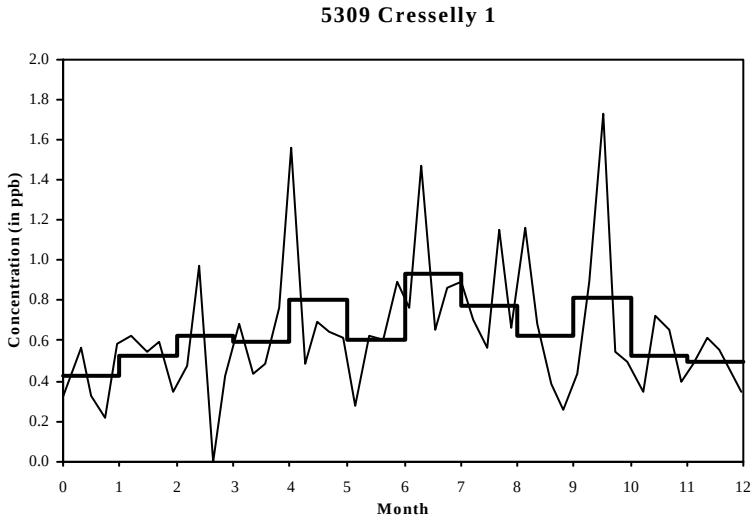


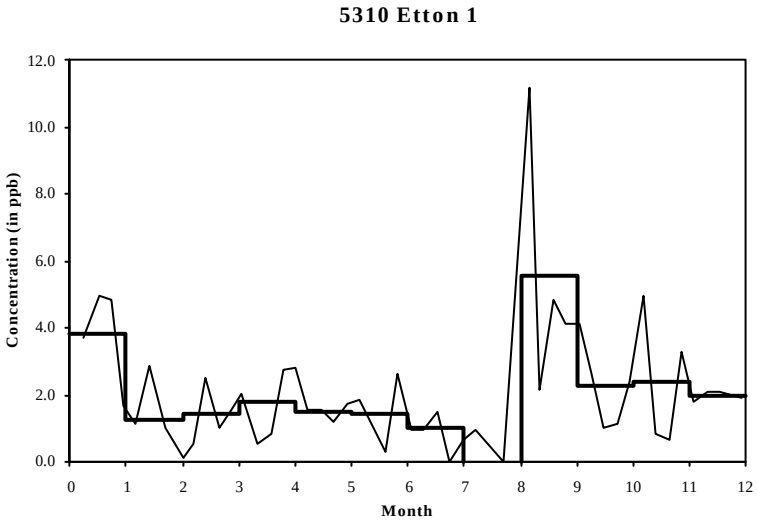
Weekly Measurement

Monthly Mean









Weekly Measurement

Monthly Mean

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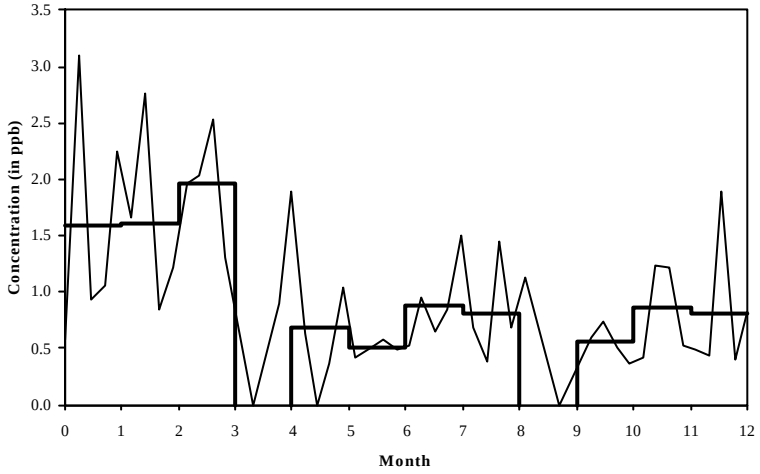
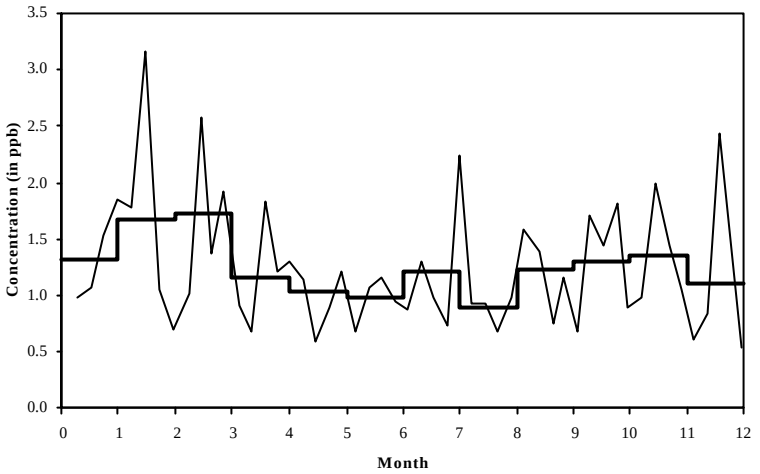
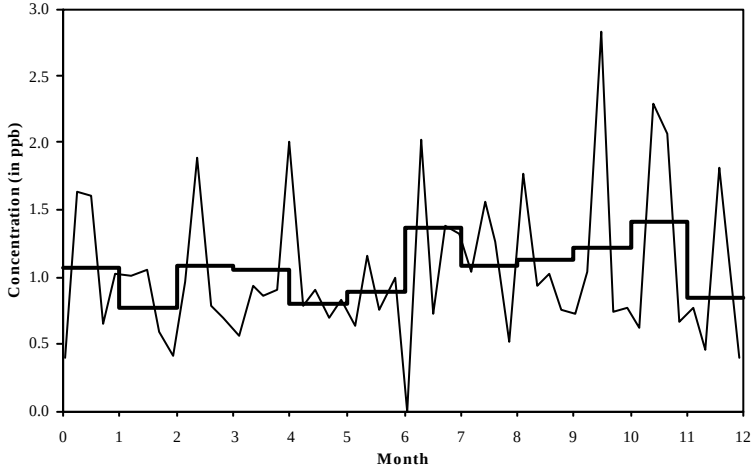


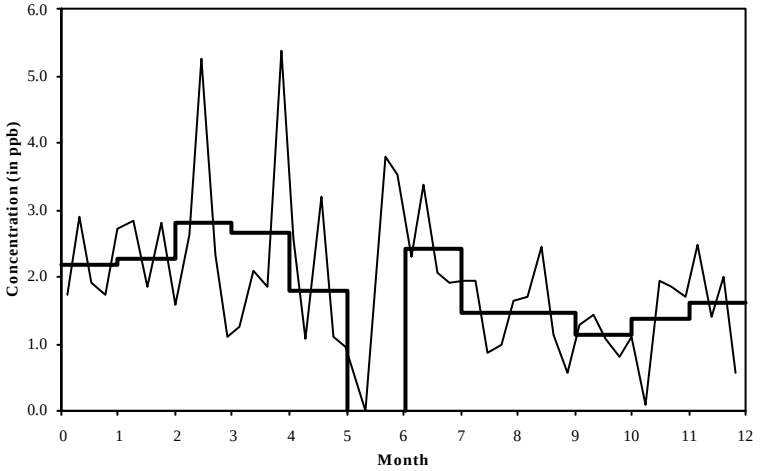
5313 Little Horkesley 1



5314 Marshfield 1

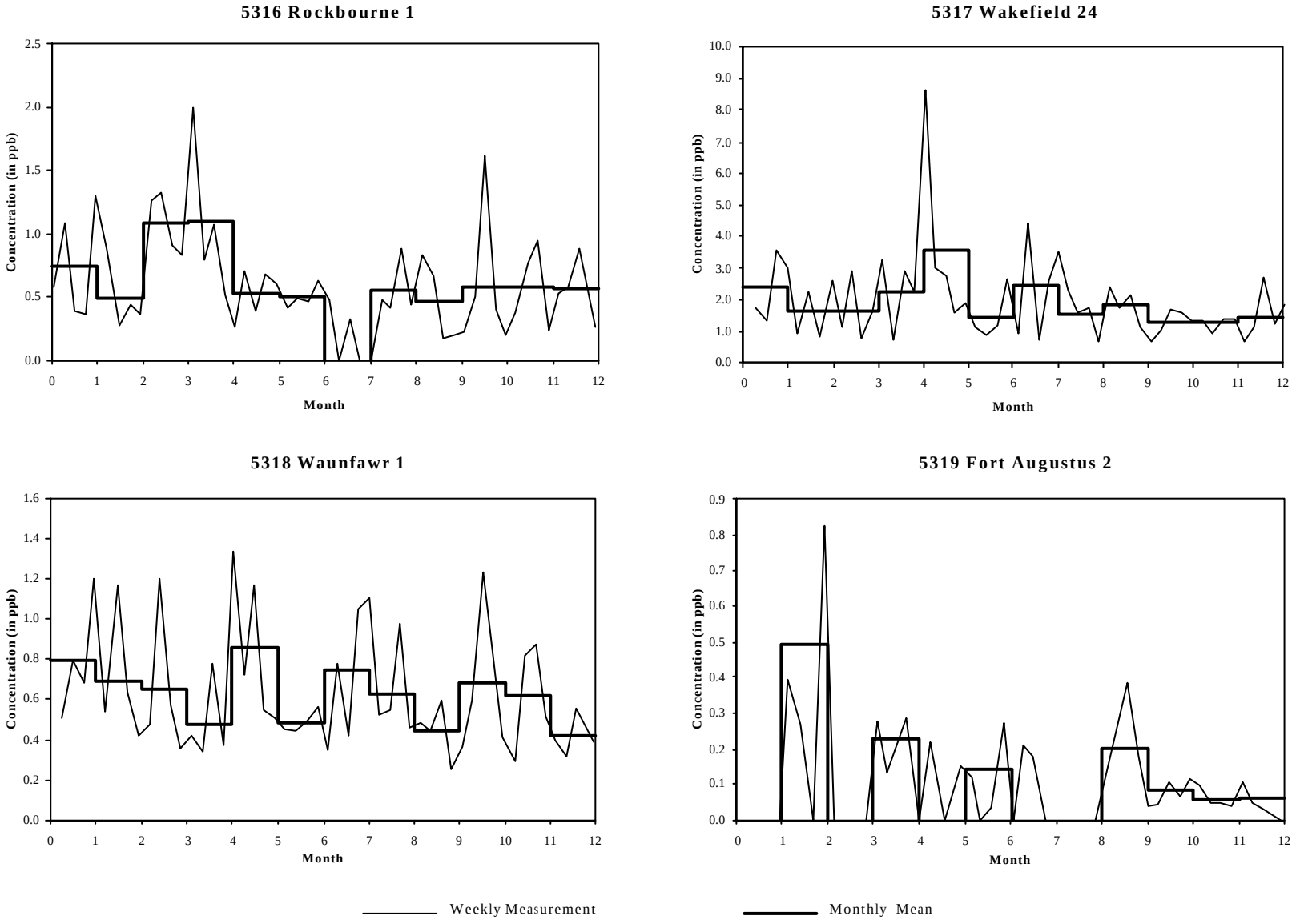


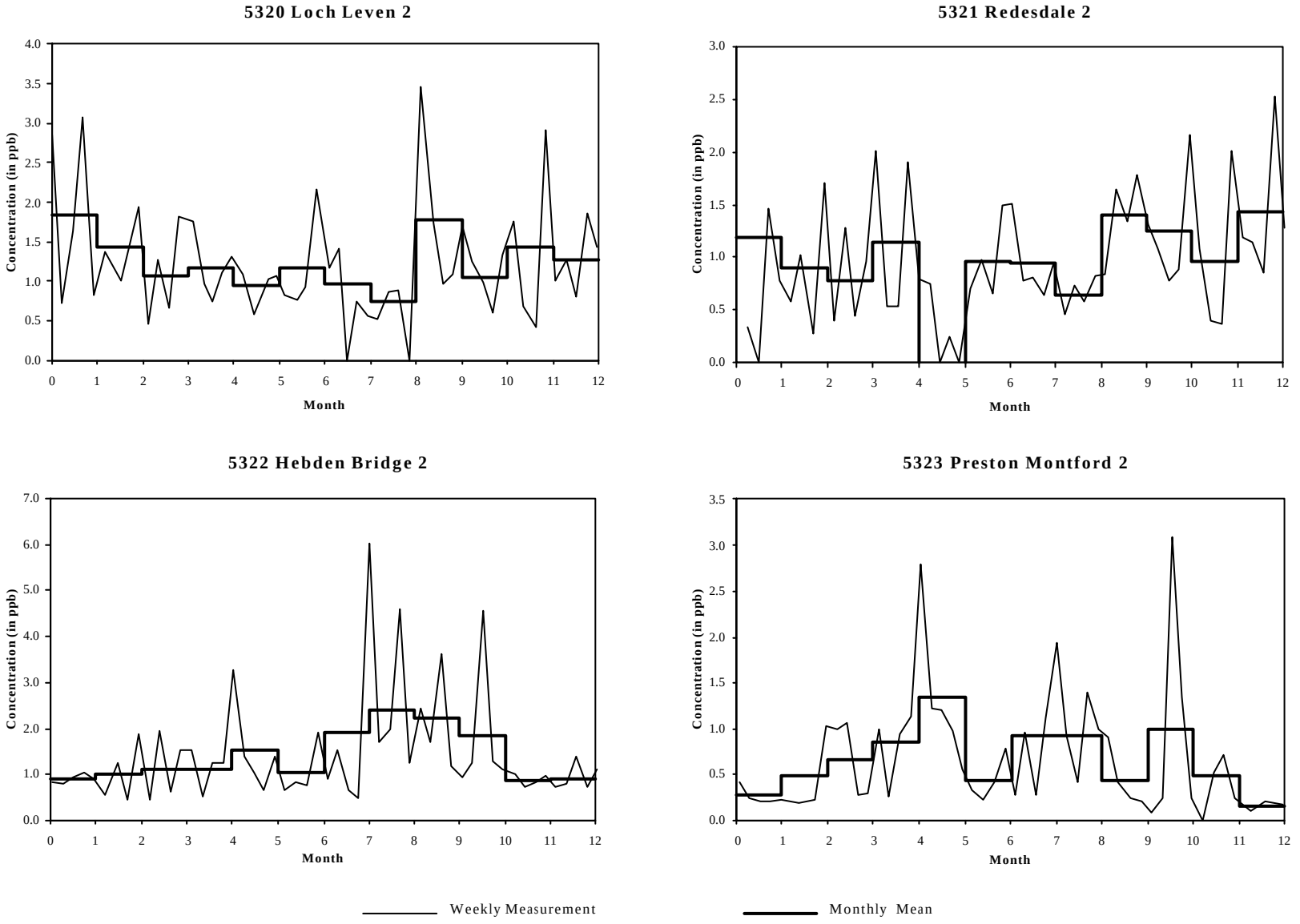
5315 Ratcliffe 13



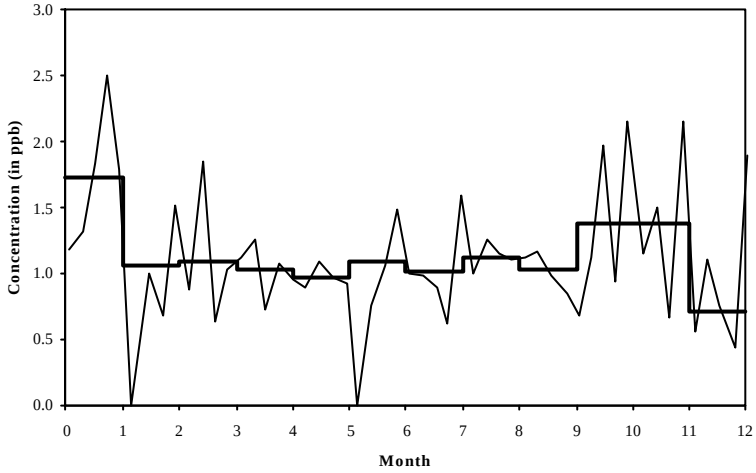
Weekly Measurement

Monthly Mean


5316 Rockbourne 1
5317 Wakefield 24
5318 Waunfawr 1
5319 Fort Augustus 2
Concentration (in ppb)
Month
Weekly Measurement
Monthly Mean


5320 Loch Leven 2
5321 Redesdale 2
5322 Hebden Bridge 2
5323 Preston Montford 2
Concentration (in ppb)
Month
Weekly Measurement
Monthly Mean

5324 Bentra



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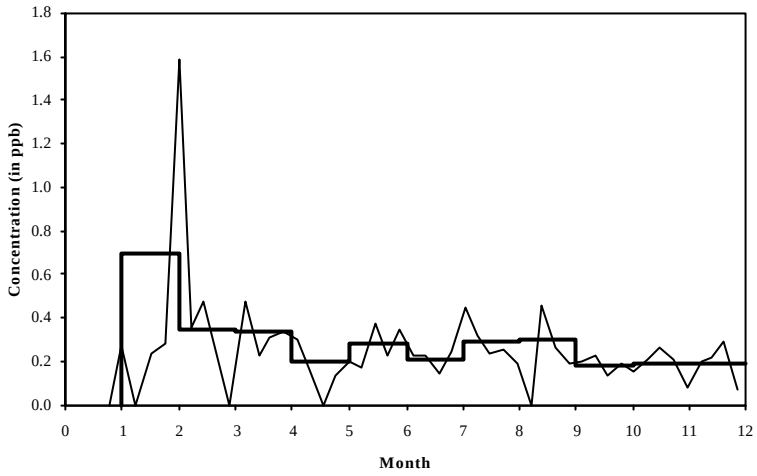

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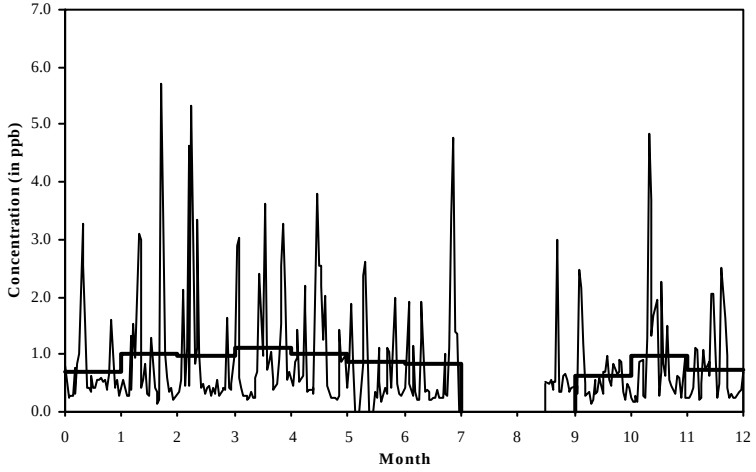
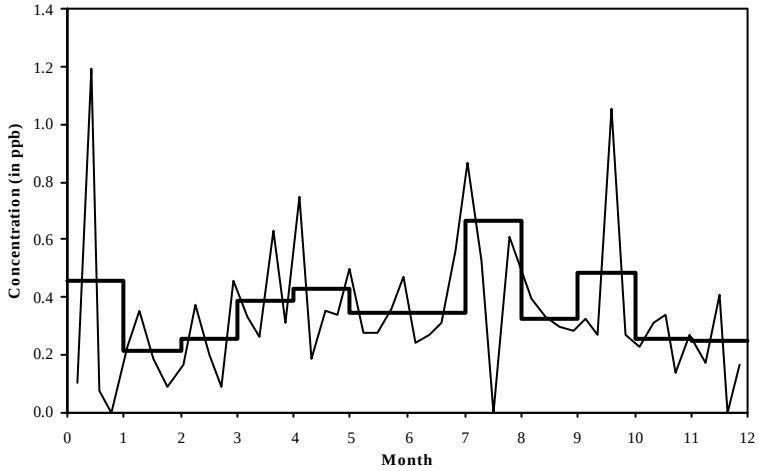
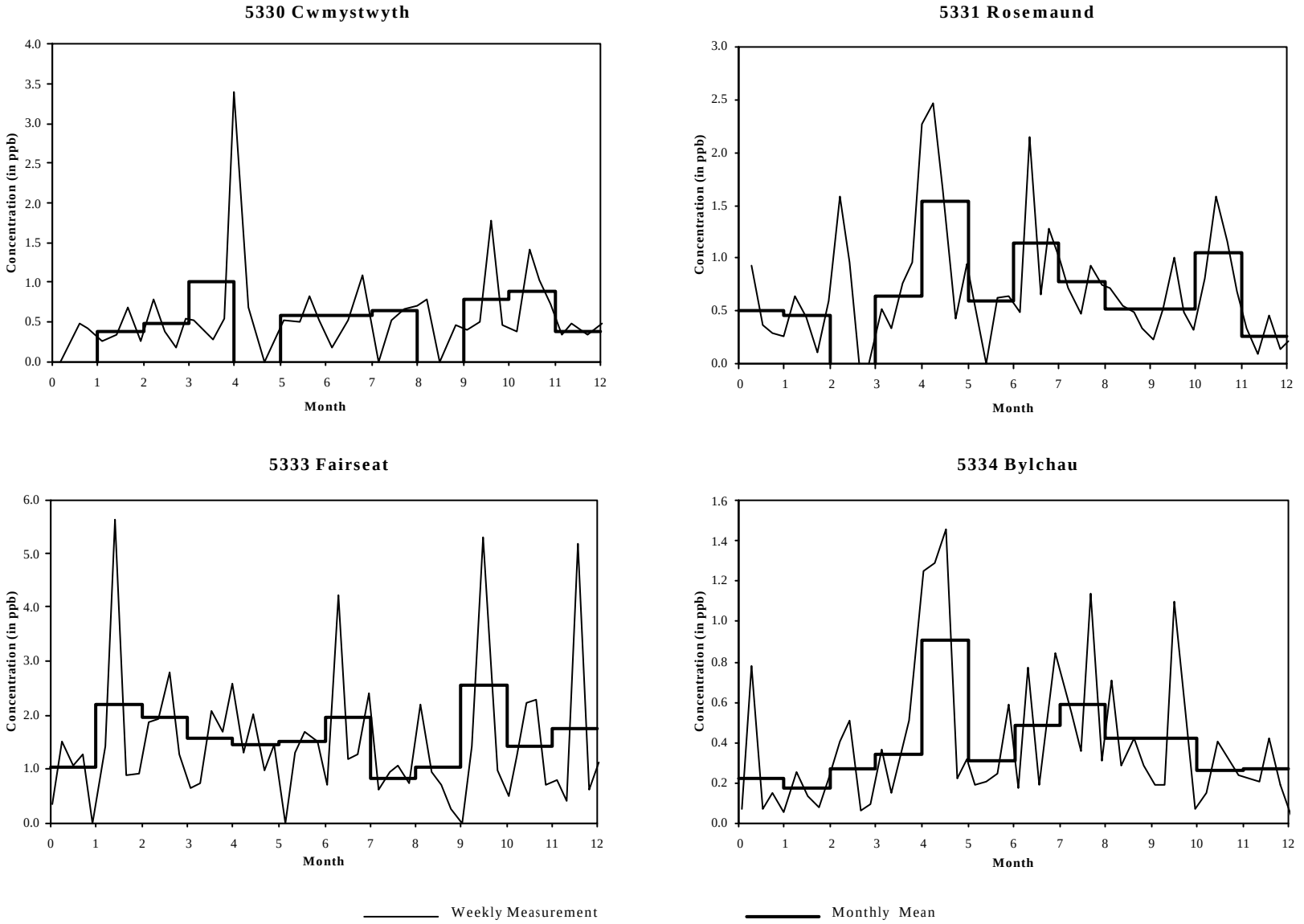


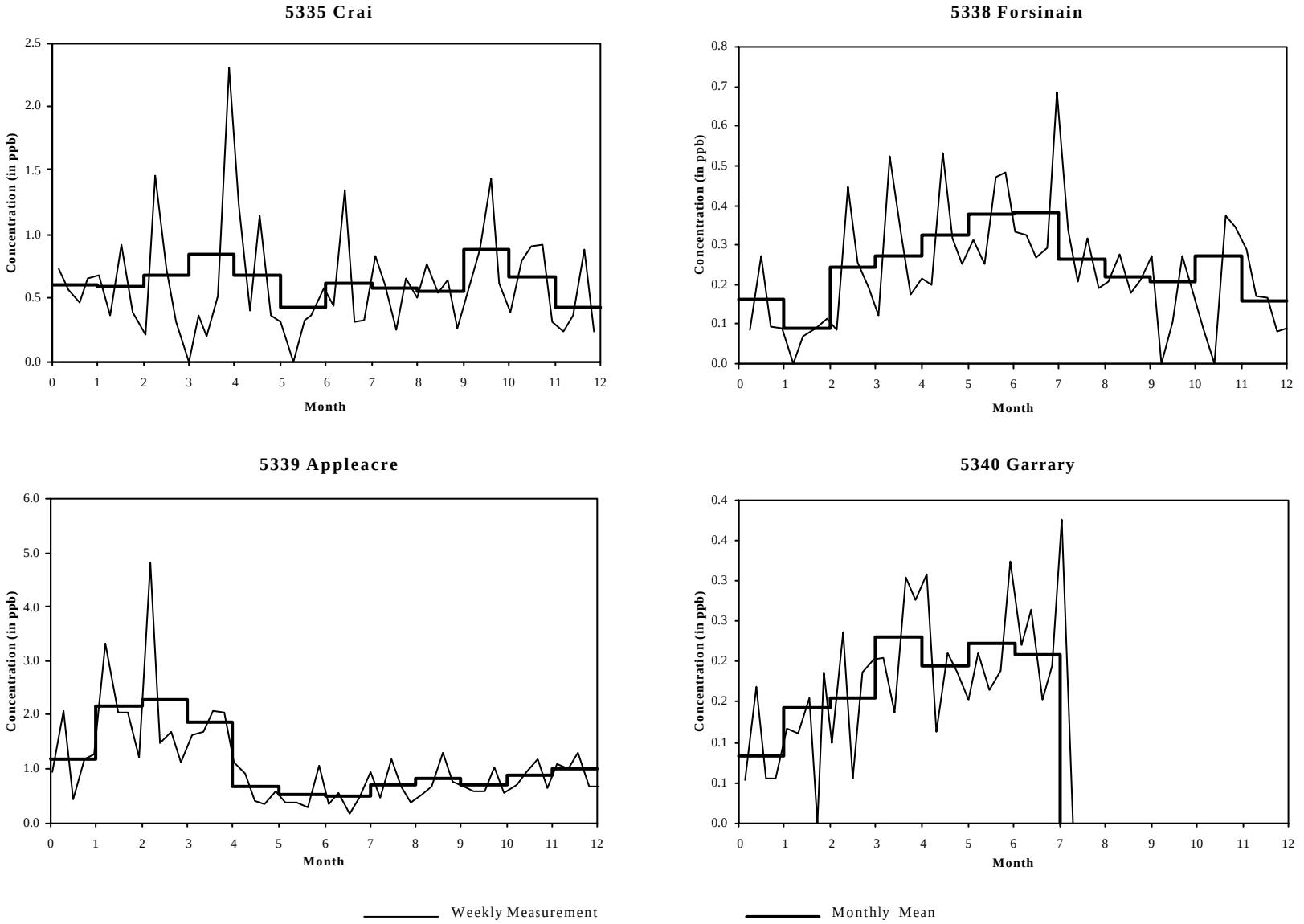
5329 Cam Forest



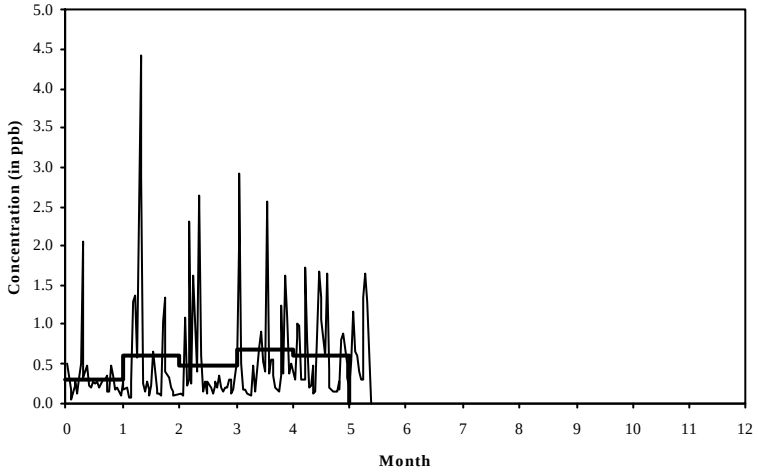
Daily or Weekly Measurement

Monthly Mean

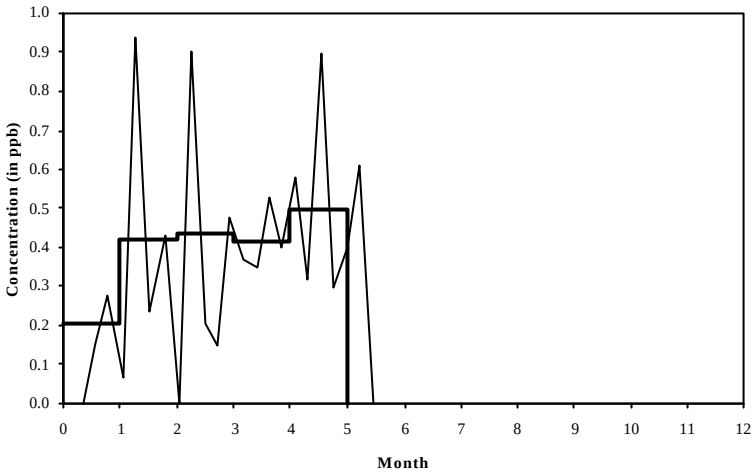

5330 Cwmystwyth
5331 Rosemaund
5333 Fairseat
5334 Bylchau
Concentration (in ppb)
Month
Weekly Measurement
Monthly Mean


5335 Crai
Concentration (in ppb)
Month
5338 Forsinain
Concentration (in ppb)
Month
5339 Appleacre
Concentration (in ppb)
Month
5340 Garrary
Concentration (in ppb)
Month
Weekly Measurement
Monthly Mean

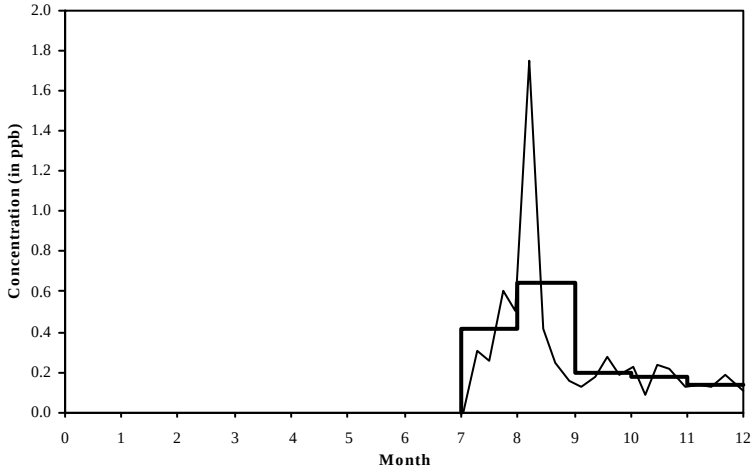
5341 Auchencorth Moss



5342 Auchencorth Moss



5343 Benniguinea



Daily or Weekly Measurement

Monthly Mean

Appendix 4

GEOSTATISTICS

GEOSTATISTICS

The use of geostatistics in the analysis of United Kingdom precipitation composition concentrations is described by Webster *et al*. (1991). A geostatistics analysis may also be made of UK sulphur dioxide concentrations. A brief discussion is reproduced here. In a geostatistical treatment of spatial variability the concentration of sulphur dioxide in ambient air, averaged over a time period of one year, is treated as a regionalised random variable. It is assumed that the values at the sites are drawn from the distribution of a random variable with a constant mean. The variance, however, depends on the separation of the sites. For example, within one 20 km grid square the variance would probably be smaller than within a 200 km square. The dependence of the variance on separation (usually termed the lag) is described by a quantity known as the semi-variance:

$$g(h) = \frac{1}{2}\frac{\Sigma(z_1 - z_2)^2}{n} \qquad 1$$

Where there are n pairs of data z_1, z_2 separated by a distance h. A plot of the semi-variance against lag is called a **variogram**.

It can be shown that the variogram function (usually termed the variogram model) must be selected from one of a few allowed forms, each of which has one or more variable parameters which must be fitted to the experimental data. Models that are allowed are:

Exponential

$$g(h) = c_0 + c_1(1 - e^{-\frac{h}{a}}) \qquad 2$$

Spherical

$$g(h) = c_0 + c_1(\frac{3}{2}\frac{h}{a} - \frac{1}{2}(\frac{h}{a})^3) \qquad 3$$

Linear

$$g(h) = c_0 + w h^q \qquad 4$$

The parameter c_0, known as the "nugget", is the residual variance for collocated measurements and is a result of measurement error or variability on a scale smaller than the separation of the measurement sites. The "range", "a", is a measure of the separation beyond which the measurements are uncorrelated, and the "sill", "c_0+c_1", is the maximum semi-variance. The linear model applies when the regionalised varia has an unlimited capacity for spatial dispersion. There is no sill and the parameter w is called the factor and q the exponent.

Once a variogram model has been found it can be used in an interpolation procedure known as kriging to produce contour maps from irregularly spaced data. In the kriging process the interpolated value is expressed as a linear combination of the measured data $l_1 z_1 + l_2 z_2 + \ldots$. Using the variogram model the variance of the interpolated estimate can be expressed in terms of

the l_i and this variance is then minimised subject to the constraint that the l_i sum to 1. The result is the best unbiased linear estimate in that it has the smallest error in the statistical sense. A further advantage of using kriging is that the interpolation variance is known for each interpolated estimate and this can be mapped along with the concentration to provide a measure of the reliability of the map.

An exponential model is fitted to the experimental points in the variogram for SO_2, using a sill of 3.5 ppb, a range of 225 km and a nugget of 0.4 ppb.

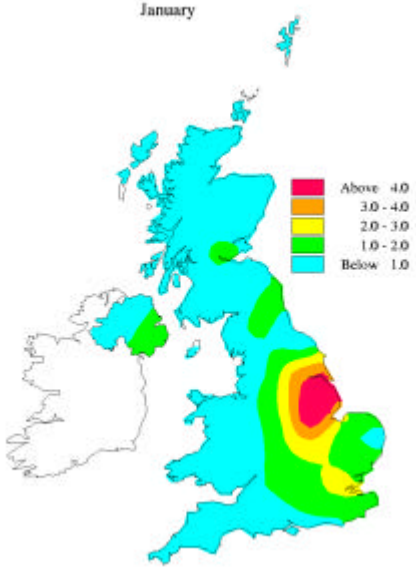
Appendix 5

MONTHLY MEAN SO_2 CONCENTRATION MAPS

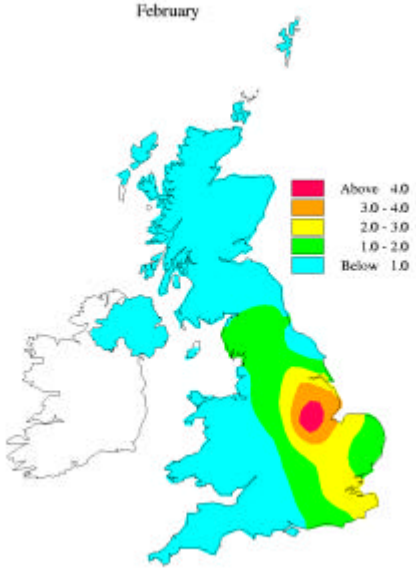
First Group of Maps - Monthly Mean SO_2 Concentration Maps (January-December) excluding the data from the automatic monitoring sites at Harwell, Narberth, Rochester and Wicken Fen.

Second Group of Maps - Monthly Mean SO_2 Concentration Maps (January-December) including the data from the automatic monitoring sites at Harwell, Narberth, Rochester and Wicken Fen.

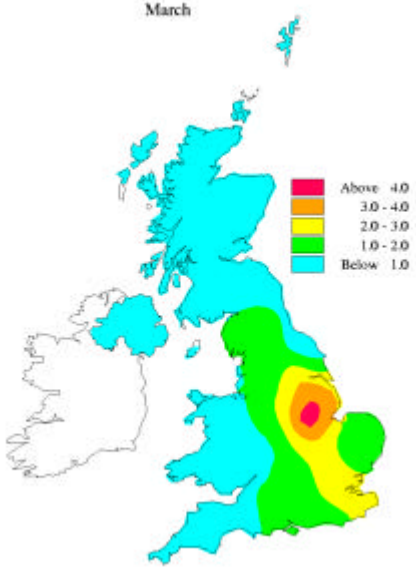
January



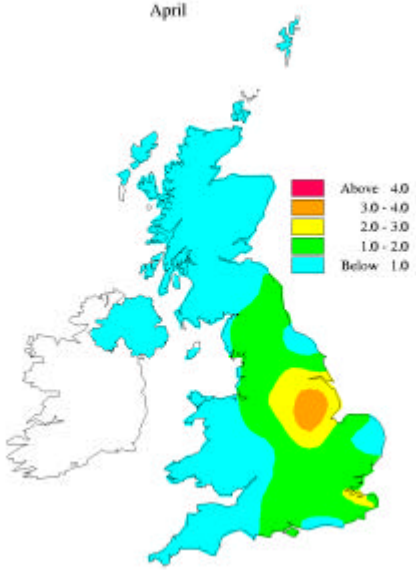
February



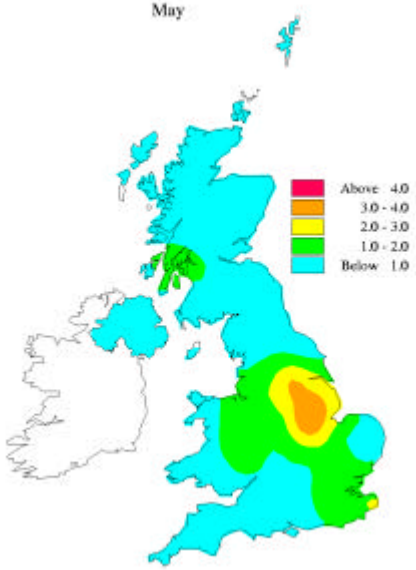
March



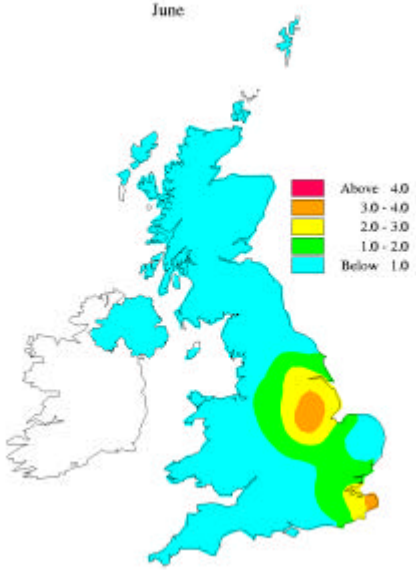
April

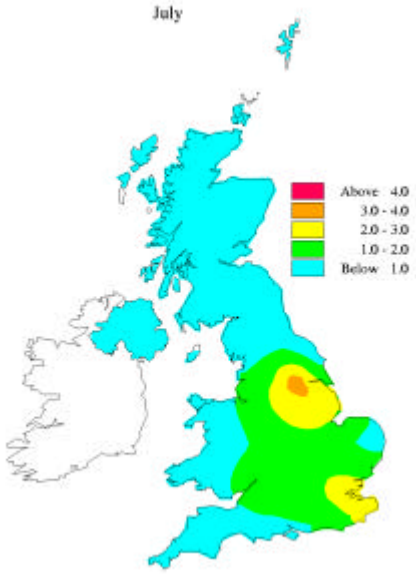


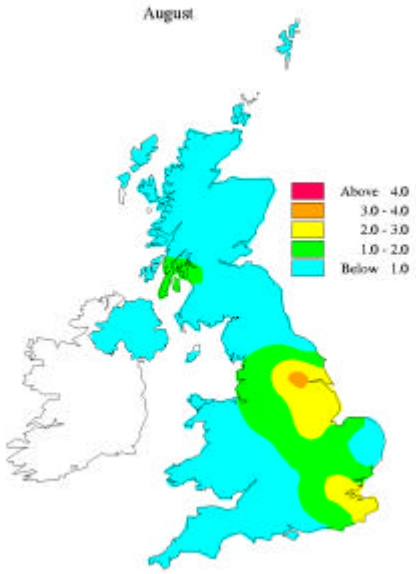
May

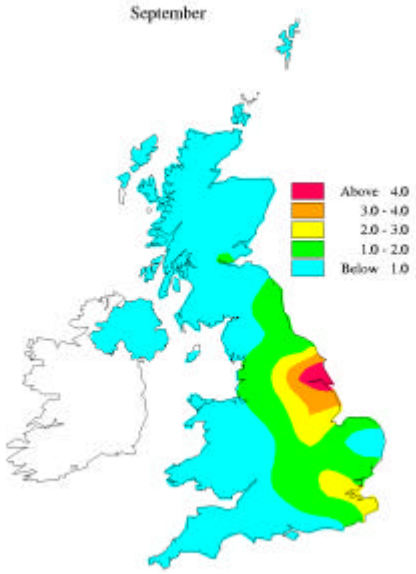


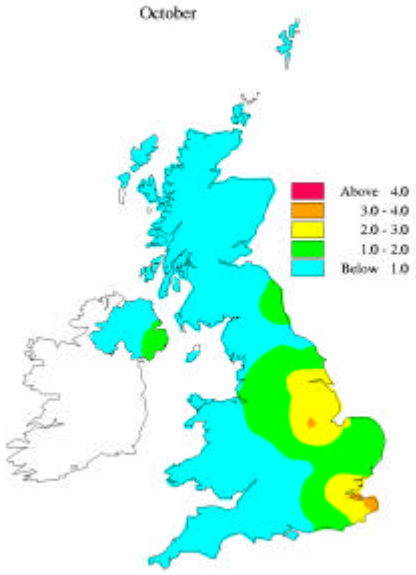
June

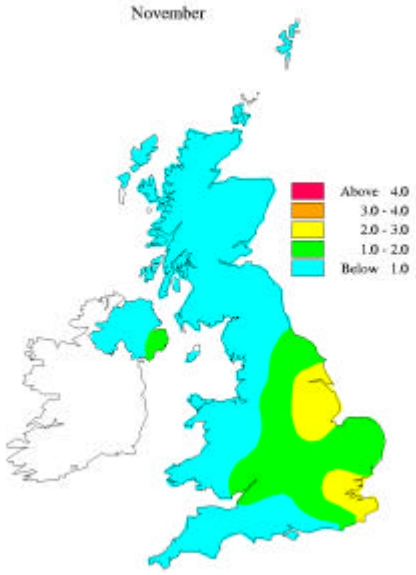


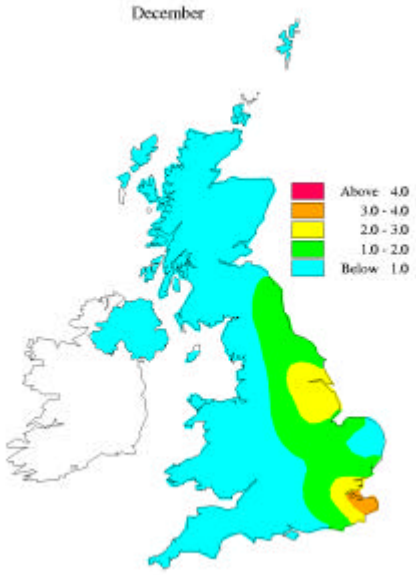

July
Above 4.0
3.0 - 4.0
2.0 - 3.0
1.0 - 2.0
Below 1.0


August
Above 4.0
3.0 - 4.0
2.0 - 3.0
1.0 - 2.0
Below 1.0

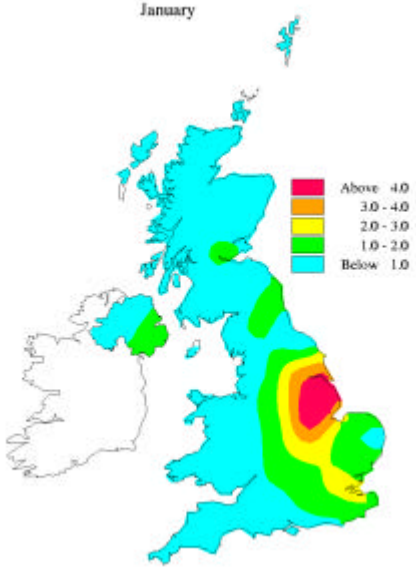

September
Above 4.0
3.0 - 4.0
2.0 - 3.0
1.0 - 2.0
Below 1.0


October
Above 4.0
3.0 - 4.0
2.0 - 3.0
1.0 - 2.0
Below 1.0


November
Above 4.0
3.0 - 4.0
2.0 - 3.0
1.0 - 2.0
Below 1.0


December
Above 4.0
3.0 - 4.0
2.0 - 3.0
1.0 - 2.0
Below 1.0

January



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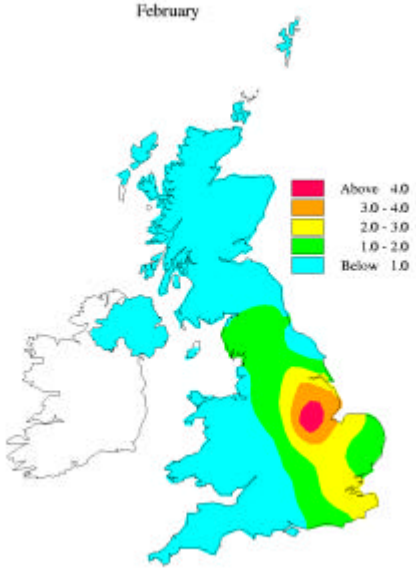
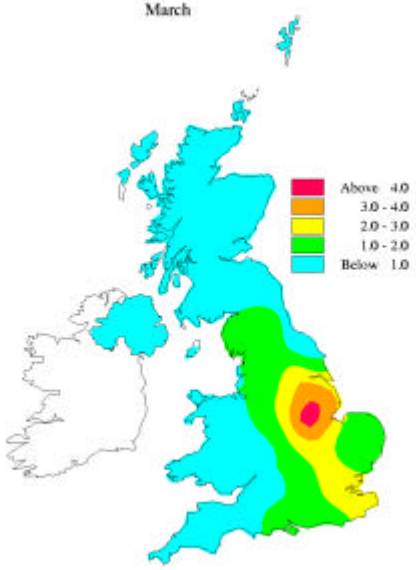
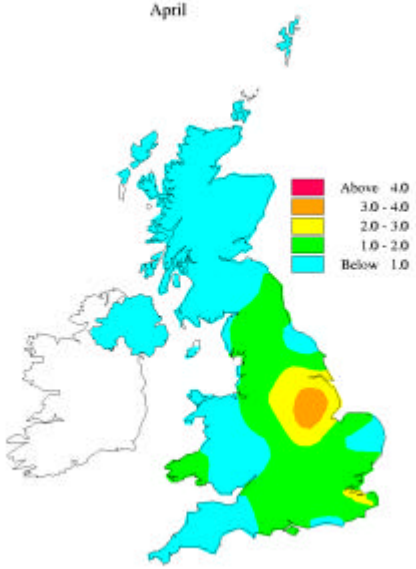


March



April



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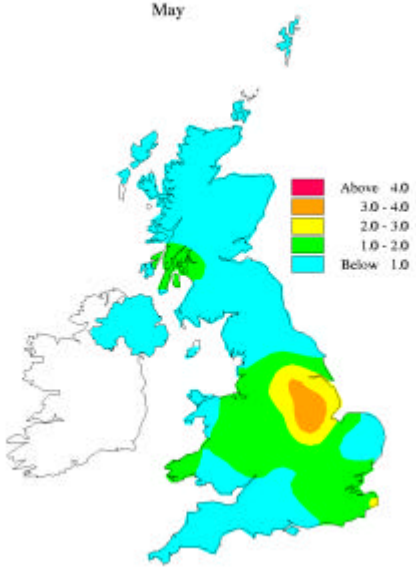

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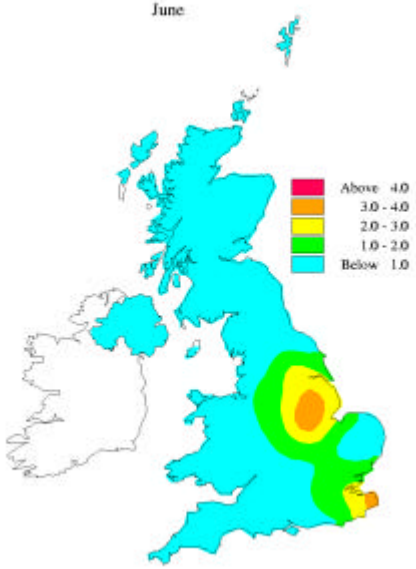

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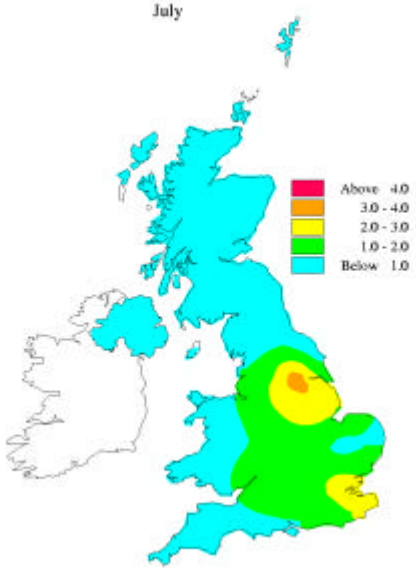

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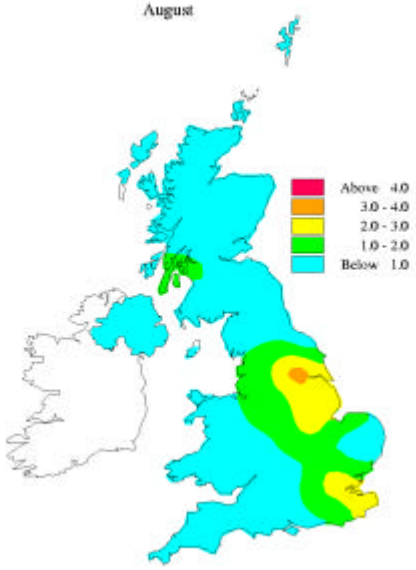

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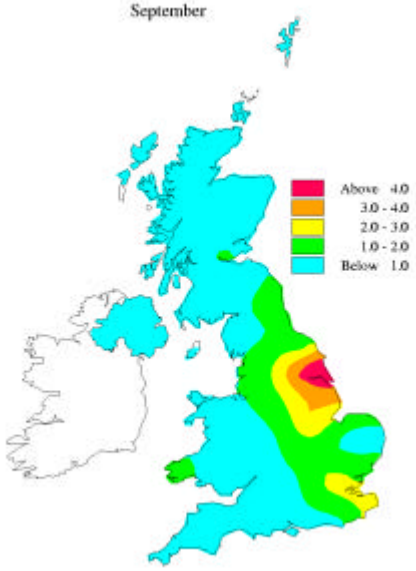

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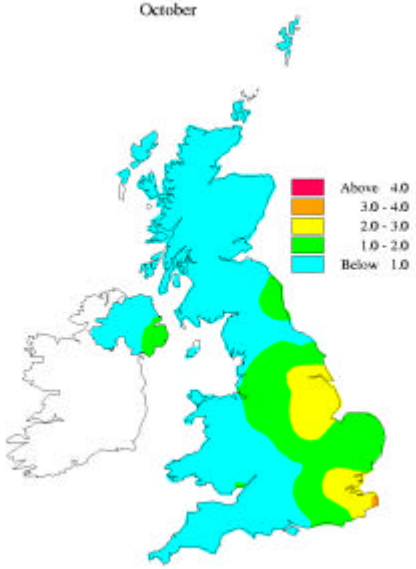
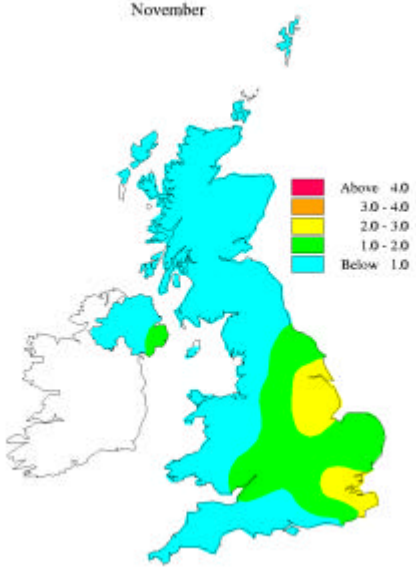


November



December