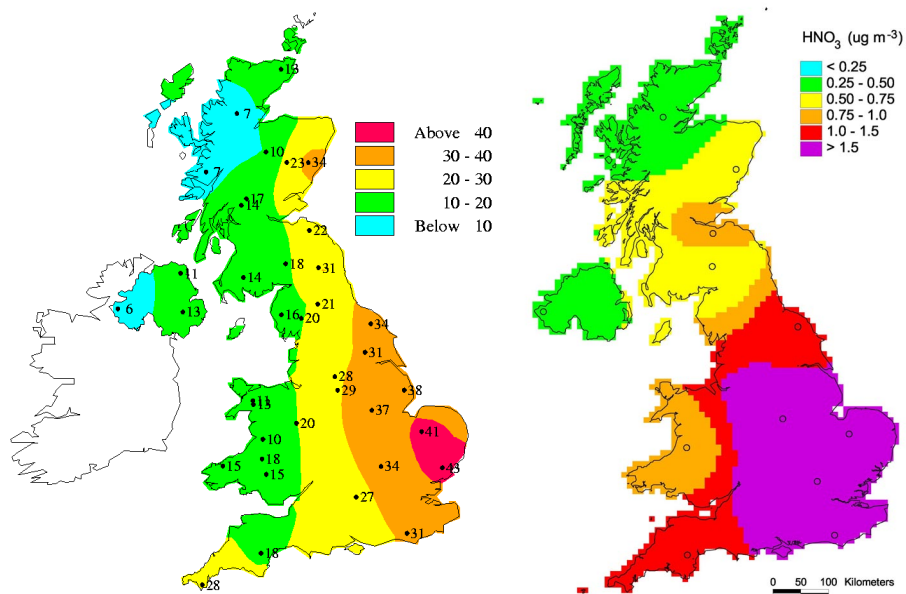


## Management and Operation of the UK Acid Deposition Monitoring Network: Data Summary for 2003

A report produced for the Department for Environment, Food and Rural Affairs, the Scottish Executive, the National Assembly for Wales and the Northern Ireland Department of the Environment



Maps of the Precipitation-weighted Concentration of Nitrate (in  $\mu\text{eq l}^{-1}$ )  
and of gaseous Nitric Acid (in  $\mu\text{g m}^{-3}$ ) for 2003

# **Management and Operation of the UK Acid Deposition Monitoring Network: Data Summary for 2003**

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# Executive Summary

This is the third annual data report prepared on the contract *Management and Operation of the UK Acid Deposition Monitoring Network* (EPG 1/3/193), let by the Department for Environment, Food and Rural Affairs (defra) and the Devolved Administrations (the Scottish Executive, the National Assembly for Wales and the Northern Ireland Department of the Environment). This data report contains a comprehensive summary of the measurements made in the network for the year 2003.

The Acid Deposition Monitoring network was established in 1986 to monitor the composition of precipitation and hence to provide information on deposition of acidifying compounds in the United Kingdom. The aims of the rainwater sampling programme are to provide (1) high quality data which can be used to identify trends with time and (2) information on the spatial distribution of acid deposition in the United Kingdom. In addition to the sampling of rainwater at the network sites, a range of other measurements are made which provide a more complete understanding of precipitation chemistry in the United Kingdom.

Following the retendering of the monitoring contract in 2001, significant changes were made to the measurement programme and the acid deposition sampling at the Jenny Hurn site in Lincolnshire was discontinued. These changes were effective from the commencement of the new contract in November 2001.

## **The 2003 Measurements**

The key highlights from the 2003 Measurements are:

- The 2003 measurements provided further confirmation of the spatial patterns in trends previously observed.
- Although the annual mean sulphur dioxide concentrations have decreased substantially at all sites from 1986, the concentrations were generally higher in 2003 than in recent years. For example, the annual mean at High Muffles has decreased from an annual mean concentration of  $7.3 \mu\text{g S m}^{-3}$  in 1987 to  $0.9 \mu\text{g S m}^{-3}$  in 2002 but was slightly higher in 2003 at  $1.2 \mu\text{g S m}^{-3}$  (no correction has been made for changes to the sampler).
- Elevated particulate sulphate concentrations were observed in August 2003 at several of the sites. This was associated with the major photochemical pollution episode present at that time across the southern half of England.
- Elevated nitrate particulate concentrations occurred during March 2003. Some of the highest monthly concentrations to date were recorded during this month - notably at Rothamsted ( $13.1 \mu\text{g NO}_3^- \text{m}^{-3}$ ), Yarner Wood ( $10.7 \mu\text{g NO}_3^- \text{m}^{-3}$ ) and Barcombe Mills ( $11.3 \mu\text{g NO}_3^- \text{m}^{-3}$ ). These high concentrations resulted from the air masses that had passed over the Low Countries and were significantly higher than the particulate nitrate concentrations observed during the August photochemical episode.
- The annual mean nitrogen dioxide concentrations in 2003 were comparable to or slightly higher than those measured in 2001 and 2002. This is consistent with the higher number of pollution episodes in 2003. The highest concentrations were observed in the Midlands and

southern England with an annual mean concentration of 12.3 ppb determined at Woburn. Nitrogen dioxide concentrations have declined, most noticeably at the relatively high concentration sites such as High Muffles, Stoke Ferry and Barcombe Mills.

- The Nitric Acid Monitoring network continues to provide new data on the behaviour of gaseous and aerosol species involved in transboundary and urban air pollution. The measurement data have been used to derive maps of the spatial distribution of gaseous nitric acid and hydrogen chloride in the UK and of the corresponding aerosol components - nitrate and chloride.

### **Use of the Measurement Data**

The UK network also forms part of the wider network of the European Monitoring and Evaluation Programme. Results from this network are used to underpin the modelling studies that form the basis of negotiation of UNECE Protocols for controlling the transboundary transport of acidifying pollutants.

The measurements made in the networks have been and continue to be key inputs into the expert reviews of our understanding of acid deposition provided formerly by the Review Group on Acid Rain and more recently by the National Expert Group on Transboundary Air Pollution (NEGTAP).

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APPENDIX 6	Geostatistics

# 1. Introduction

This is the third annual data report prepared on the contract *Management and Operation of the UK Acid Deposition Monitoring Network* (EPG 1/3/193), let by the Department for Environment, Food and Rural Affairs (defra) and the Devolved Administrations (the Scottish Executive, the National Assembly for Wales and the Northern Ireland Department of the Environment). This data report contains a comprehensive summary of the measurements made in the network for the year 2003.

The Acid Deposition Monitoring network was established in 1986 to monitor the composition of precipitation and hence to provide information on deposition of acidifying compounds in the United Kingdom. The aims of the rainwater sampling programme are to provide (1) high quality data which can be used to identify trends with time and (2) information on the spatial distribution of acid deposition in the United Kingdom. In addition to the sampling of rainwater at the network sites, a range of other measurements are made which provide a more complete understanding of precipitation chemistry in the United Kingdom. The measurements made and their interpretation for the calendar years from 1986 to 2002 have been presented previously [*e.g.* Campbell *et al.*, 1994, 1998; Vincent *et al.*, 1995, 1996, 1998; Hayman *et al.*, 2000, 2001c, 2001d, 2003a, 2004].

The measurements made in the networks have provided key inputs into the comprehensive reviews of our understanding of acid deposition undertaken by the Review Group on Acid Rain [RGAR, 1990; RGAR, 1997]. The third and fourth reports of RGAR covered the periods from 1986 to 1988 and from 1992 to 1994, respectively [RGAR, 1990; RGAR, 1997]. The results informed the deliberations of the National Expert Group on Transboundary Air Pollution (NEG-TAP) which the Department established in 1999 to advise on transboundary air pollution issues and specifically whether the reductions in the emissions of acidifying pollutants have been effective in promoting the recovery of ecosystems affected by acid deposition. A report was published by NEG-TAP in 2001 [NEG-TAP, 2001].

This annual data report is structured as follows:

- Section 2 describes the monitoring networks and the sampling techniques employed, together with the changes made to the network in 2003;
- Section 3 gives an overview of the results from the Acid Deposition Networks for 2003 and presents concentration maps for non-seasalt sulphate, nitrate, ammonium, hydrogen ion and nitrogen dioxide, together with the trends in all acidifying components measured as part of the acid rain monitoring programme;
- Section 4 describes the nitric acid monitoring network and the measurements made.

Summary tables of the bulk precipitation composition data for 2003 at the individual sites are presented in Appendix 1. Time series graphs for data collected since 1986 and seasonal variation plots are presented, together with details of the sites themselves. Appendix 2 presents all the annual concentrations at each site since 1986, together with the annual rainfall amounts determined using the bulk rain collector. The individual measurements of sulphur dioxide and particulate sulphate are provided in Appendix 3, together with the monthly and annual mean



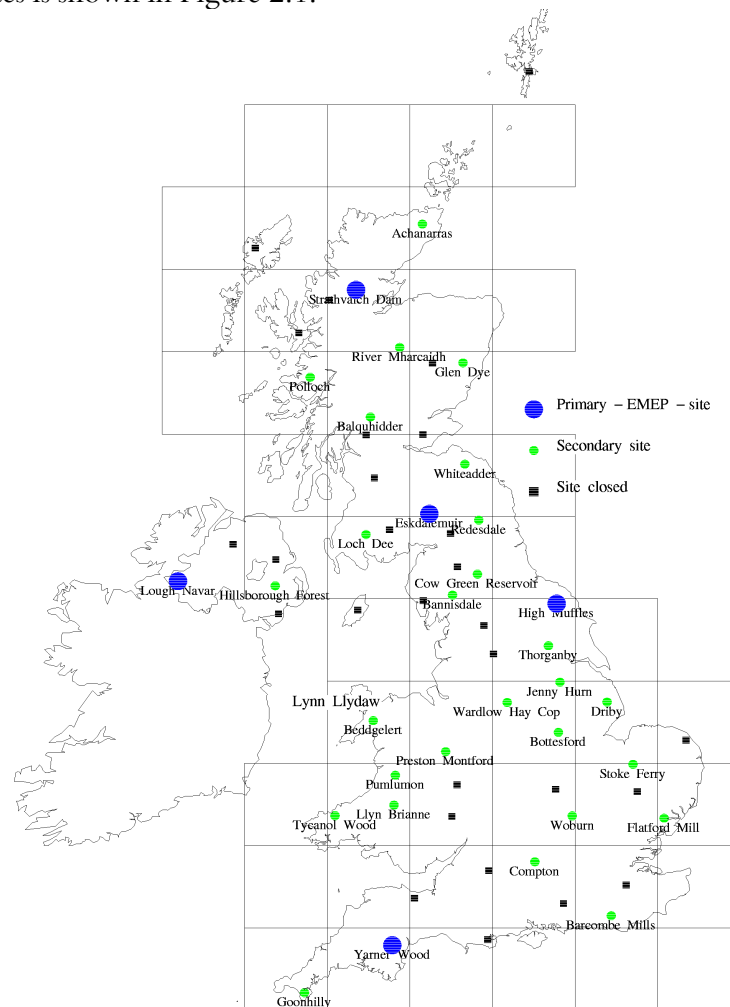
concentrations calculated for each site. Appendix 4 provides a summary of the nitrogen dioxide measurements, together with the annual mean concentrations calculated for each site. Appendix 5 provides a complete set of the measurements made in the HNO<sub>3</sub> Denuder Monitoring Network in 2003. Appendix 6 describes the geostatistical techniques that have been used to calculate the concentration maps in this report.

# 2. The Monitoring Programme

## 2.1 THE ACID DEPOSITION MONITORING NETWORK

### 2.1.1 Site Locations

The Acid Deposition Monitoring Network formerly comprised two monitoring networks in which rainwater samples were collected and analysed. The aim of the first network, known as the “Primary” network, was to provide high quality and high frequency data, which could be used to identify trends with time. The second network, the “Secondary” network, provided information on the spatial distribution of acid deposition in the UK. Originally there were 9 primary and 59 secondary sampling sites. Following recommendations from RGAR, both networks were reduced in size to the current 5 and 32 sites, respectively, in 1989. The spatial distribution of the sites is shown in Figure 2.1.



**Figure 2.1: Location of the Current Primary and Secondary Sampling Sites (Also presented are the locations of the sites no longer operating. The 100 km squares show how the sampling site coverage meets the original coverage objective.)**

In recent years, the distinction between the “Primary” and “Secondary” networks has become blurred with the changes to the monitoring programme.

Seven new sites were established in the early part of 1999 to monitor rainwater composition in ecologically sensitive locations. The locations of the sites are

- Lochnagar
- Scoat Tarn
- River Etherow
- Llyn Llagi
- Loch Chon/Tinker
- Beaghs Burn
- Crai Reservoir (Head of the Valleys)

The sites are shown in Figure 2.2.

The rainwater samples are collected on a fortnightly basis using bulk collectors.



**Figure 2.2: The New Bulk Rainwater Sites.**

### 2.1.2 The Sampling Programme

Following the retendering of the monitoring contract in 2001, significant changes were made to the measurement programme and the acid deposition sampling at the Jenny Hurn site in Lincolnshire was discontinued. These changes were effective from the commencement of the new contract in November 2001. The monitoring programme in 2003 comprised the measurement and determination of

- |                                    |  |
|------------------------------------|--|
| ➤ Precipitation Composition        | – Bulk rainwater sampling on a daily basis at Eskdalemuir    |
|                                    | – Bulk rainwater sampling on a fortnightly basis at 38 sites |
| ➤ Sulphur Dioxide                  | – Sampling on a fortnightly basis at 8 sites                 |
| ➤ Particulate Sulphate             | – Sampling on a daily basis at 5 sites                       |
| ➤ Nitrogen Dioxide                 | – Diffusion tube measurements on a monthly basis at 32 sites |
| ➤ Nitric Acid and Other Acid Gases | – Denuder measurements on a monthly basis at 12 sites        |

The sites in operation are listed together with the local operators who perform the sample changeovers in Table 2.1 and Table 2.2. The sampling techniques used to make these measurements are summarised in Section 2.2.

**Table 2.1: Network Sites and Measurements Made in 2003.**

Measurement:	Precipitation		NO <sub>2</sub>	SO <sub>2</sub>	Part. SO <sub>4</sub>	Denuder HNO <sub>3</sub> -NO <sub>3</sub>	
	<i>Frequency:</i>	<i>daily bulk</i>	<i>fortnightly bulk</i>	<i>monthly</i>	<i>fortnightly</i>	<i>daily</i>	<i>monthly</i>
<b>SITE:</b>							
Yarner Wood		✓ - 1	✓	✓ - 2	✓	✓	
Lough Navar		✓ - 1	✓	✓ - 2, 4	✓	✓ - 3	
High Muffles		✓ - 1	✓	✓ - 2	✓	✓ - 3	
Eskdalemuir	✓	✓ - 1	✓	✓ - 2	✓	✓ - 3	
Strathvaich Dam		✓ - 1	✓	✓ - 2, 4	✓ - 6	✓ - 3	
Barcombe Mills		✓ - 1	✓	✓ - 2	✓	✓ - 3	
Stoke Ferry		✓ - 1	✓	✓ - 2	✓ - 6	✓ - 3	
Glen Dye		✓ - 1	✓	✓ - 2	✓ - 6		
Goonhilly		✓ - 1	✓				
Compton		✓ - 1	✓				
Flatford Mill		✓ - 1	✓				
Woburn		✓ - 1	✓				
Tycanol Wood		✓ - 1	✓				
Llyn Brianne		✓ - 1	✓				
Pumlumon		✓ - 1	✓				
Preston Montford		✓ - 1	✓				
Bottesford		✓ - 1	✓				
Llyn Llydaw		✓ - 1	✓				
Wardlow Hay Cop		✓ - 1	✓				
Driby		✓ - 1	✓				
Jenny Hurn - 7							
Thornganby		✓ - 1	✓				
Bannisdale		✓ - 1	✓				
Hillsborough Forest		✓ - 1	✓				
Cow Green Reservoir		✓ - 1	✓				
Loch Dee		✓ - 1	✓				
Redesdale		✓ - 1	✓				
Whiteadder		✓ - 1	✓				
Balquhiddy		✓ - 1	✓				
Polloch		✓ - 1	✓				
Allt a' Mharcaidh		✓ - 1	✓				
Achanarras		✓ - 1	✓				
Crai Reservoir		✓					
Beaghs Burn		✓					
Loch Chon		✓					
Lochnagar		✓					
River Etherow		✓					
Scoat Tarn		✓					
Llyn Llagi		✓					

Notes (1) The sampling frequency of the bulk deposition monitoring was changed from weekly to fortnightly with effect from November 2001; (2) The daily bubbler measurement programme was replaced with a fortnightly filter-pack measurement programme during 2001; (3) A site in the CEH HNO<sub>3</sub> Denuder Monitoring Network (see Section 4); (4) This site, together with those at Bush, Cwmystwyth and Sutton Bonington, was used as an overlap site for the introduction of the filter-pack sampler; (5) The daily wet-only measurement was stopped with effect from November 2001; (6) The daily particulate sulphate measurements were stopped with effect from November 2001; (7) This site was closed with effect from November 2001.

**Table 2.2: Precipitation Composition Monitoring Sites, 2003 (those in bold are EMEP sites with the daily measurements made - wet-only sampling, sulphur dioxide and particulate sulphate - reported to EMEP).**

Site Code	Site Name	O.S. Reference	Altitude (m)	Operator
5003	Goonhilly	SW 723214	108	British Telecom
<b>5008</b>	<b>Yarner Wood</b>	<b>SX 786789</b>	<b>119</b>	<b>English Nature</b>
5007	Barcombe Mills	TQ 437149	10	South East Water plc
5129	Compton	SU 512804	105	AEA Technology plc
5154	Crai Reservoir	SN 288222	310	Welsh Water plc
5024	Flatford Mill	TM 077333	5	Field Studies Council
5127	Woburn	SP 964361	89	Rothamsted Experimental Station
5123	Tycanol Wood	SN 093364	205	Countryside Council for Wales
5124	Llyn Brianne	SN 822507	420	Environment Agency. Forest Enterprise
5150	Pumlumon	SN 823854	390	Centre for Ecology and Hydrology (Bangor)
5004	Stoke Ferry	TL 700988	15	Kings Lynn and West Norfolk Borough Council
5023	Preston Montford	SJ 432143	70	Field Studies Council
5121	Bottesford	SK 797376	32	PowerGen
5160	Llyn Llgi	SH 647483	490	CEH Bangor
5153	Llyn Llydaw	SH 556518	358	Countryside Council for Wales
5158	River Etherow	SK 125986	485	ENSIS
5120	Wardlow Hay Cop	SK 177739	350	English Nature
5136	Driby	TF 386744	47	Anglian Water
5118	Jenny Hum	SK 816986	4	PowerGen (see note 1)
5117	Thorganby	SE 676428	8	Selby District Council
<b>5009</b>	<b>High Muffles</b>	<b>SE 776939</b>	<b>267</b>	<b>Forest Enterprise</b> (see note 2)
5111	Bannisdale	NY 515043	265	CEH Windermere (see note 3)
5149	Hillsborough Forest	J 243577	120	Department of Agriculture and Rural Development (NI)
<b>5006</b>	<b>Lough Navar</b>	<b>H 065545</b>	<b>130</b>	<b>Forestry Service, Northern Ireland</b>
5113	Cow Green Reservoir	NY 817298	510	English Nature
5159	Scoat Tarn	NY 158103	595	ENSIS
5107	Loch Dee	NX 468779	230	Scottish Environment Protection Agency/Forest Enterprise
5155	Beaghs Burn	D 165283	250	Department of Agriculture and Rural Development (NI)
5109	Redesdale	NY 833954	240	ADAS
<b>5002</b>	<b>Eskdalemuir</b>	<b>NT 235030</b>	<b>259</b>	<b>Meteorological Office</b>
5106	Whiteadder	NT 664633	250	East of Scotland Water
5156	Loch Chon	NN 429084	150	Freshwater Fisheries Laboratory
5152	Balquhiddier 2	NN 545207	135	Mountain Environments
5151	Polloch	NM 792689	30	Forest Enterprise (see note 4)
5157	Loch Nagar	NO 252859	785	ENSIS
5011	Glen Dye	NO 642864	185	Scottish Environment Protection Agency;
5103	Allt a' Mharcaidh	NH 876052	274	Freshwater Fisheries Laboratory
<b>5010</b>	<b>Strathvaich Dam</b>	<b>NH 347750</b>	<b>270</b>	Clova Environmental Research and Testing Services
5140	Achanarras	ND 151550	98	Mrs J. Erridge

Notes (1) This site was closed in November 2001; (2) The site operator changed to Forestry Research at the end of 2001 following the retirement of the previous site operator; (3) David Rochelle took over as site operator from CEH Windermere with effect from November 2001. He had effectively been acting as the site operator; (4) Jim Kirby took over as site operator from Forest Enterprise with effect from November 2001. He had effectively been acting as the site operator.

## 2.2 SAMPLING TECHNIQUES

### 2.2.1 Precipitation Composition

Fortnightly precipitation samples were collected at 38 sites using bulk collectors based on the design of Hall [1986]. An assessment of the collection efficiency of the bulk collector is provided by Stone and Tily [1992]. For the two-year period 1986 to 1987, the bulk collector was found to have collection efficiencies, which ranged from 77% to 99% when compared to the 5-inch meteorological rain gauge.

To assess whether the switch from single week to fortnightly sampling had any effect on sampling performance an intercomparison exercise was initiated at the end of 2001 and is on-going. Preliminary results from this intercomparison were presented in the 2002 data report (using available results from the start of sampling to August 2003). These results showed excellent agreement between the samplers at Thorganby. Good agreement was observed at Eskdalemuir and rather poorer agreement at Lough Navar. The intercomparison is on going and the results will be presented formally when the single week samplers are finally withdrawn from use at the end of the 2004.

The previous measurements of precipitation composition at Eskdalemuir using a wet-only collector were discontinued in 2001.

### 2.2.2 Sulphur Dioxide and Particulate Sulphate

The concentrations of particulate sulphate and sulphur dioxide were previously determined using a single sampler – the eight-port hydrogen peroxide bubbler instrument (AGL, Hitchin). This sampler is still used to determine concentrations of particulate sulphate. Particulate sulphate is collected by drawing air through a Whatman 40 filter and the sulphate concentrations are determined by ion chromatography.

As the concentrations of sulphur dioxide measured at some of the sites in the Acid Deposition Monitoring and the related Rural Sulphur Dioxide Monitoring networks, especially the daily sites in remote areas, were at or below the Limit of Detection (LOD) of the bubbler method, a new sampling technique for sulphur dioxide has been introduced into the monitoring networks. Following a method intercomparison exercise undertaken in collaboration with CEH Edinburgh at the Auchencorth Moss site near Edinburgh between September 1998 and May 1999 [Hasler *et al.*, 2000], the filter-pack sampler was selected as the replacement method on the grounds of cost, improved sensitivity, method robustness, ease of operation and the quality of the measurements. The filter pack method samplers were introduced into the monitoring networks from April 2001.

The filter pack sampler consists of two filters in series, which are enclosed in an airtight holder. Air is drawn through the filter pack and sulphate aerosol particles are removed on the first filter. Sulphur dioxide is absorbed by the second filter, which has been previously washed with potassium carbonate and then impregnated with a glycerol/potassium hydroxide solution. It is quantitatively converted to solid potassium sulphite by reaction with the potassium hydroxide and oxidising species in the air convert the sulphite to sulphate during sampling. The sulphate on the exposed impregnated filter is extracted using water. The sulphate concentration in the

solution is determined using ion chromatography and this is converted into a gas-phase concentration of sulphur dioxide.

### 2.2.3 Nitrogen Dioxide

Diffusion tubes have been used to measure nitrogen dioxide concentrations. Tubes are mounted on the upright of the rain collector stand and are exposed for twelve four or five-week periods throughout each year.

### 2.2.4 Nitric Acid Denuder Technique

The denuder technique used to determine concentrations of nitric acid and other acid gases is described later in Section 4.

## 2.3 ANALYTICAL PROCEDURES

### 2.3.1 Sample Registration and Preparation

Due to the reduction in sampling frequency the number of samples received and analysed by the laboratory in 2003 was significantly less than previous years. Samples returned to AEA Technology were logged on a computerised sample register and their volumes recorded. Sample preparation and handling were carried out using standard operating procedures.

On receipt in the analytical laboratory rainwater samples were sub-sampled into polyethylene bottles (Nalgene). The pH and conductivity were recorded and the samples filtered through 1µm disposable filters to remove insoluble particulate material and micro-organisms that might compromise sample integrity before analysis. The samples were then stored at 4°C until analysis by ion chromatography. Samples were analysed for: sulphate, nitrate, chloride, phosphate, sodium, magnesium, calcium, potassium, pH and conductivity. Analysis was usually completed within one month.

### 2.3.2 Analysis

Samples were analysed using NAMAS accredited methods. All samples with exception of diffusion tubes are analysed using ion chromatography.

The rapid analysis of a large number of rainwater samples in which concentrations vary over several orders of magnitude is a complex task. To verify the analytical results, the ion balance,  $I$  (Equation 1), is calculated for each rainwater sample.

$$I = \left| \frac{2(\sum c - \sum a)}{\sum c + \sum a} \right| \quad (\text{Equation 1})$$

where  $\sum c$  = sum of cation concentrations in equivalents ( $\mu\text{eq l}^{-1}$ ) and  $\sum a$  = sum of anion concentrations in equivalents ( $\mu\text{eq l}^{-1}$ ). A correction is estimated for the concentration of bicarbonate in samples which have a pH greater than 5.5. Samples, which fall outside the criteria listed in Table 2.3, are submitted for reanalysis. The reanalysis is usually completed within four months of sampling.

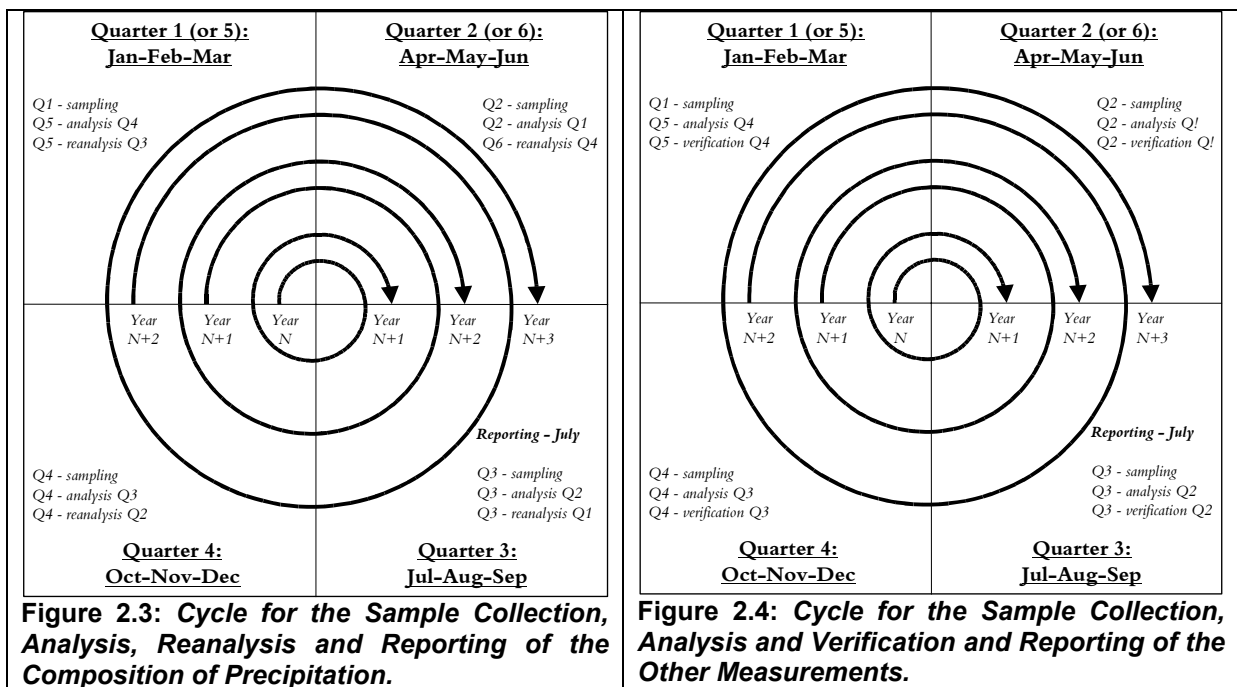
With the introduction of new ion chromatographs [see Hayman *et al.*, 2001d], less than 10% of the samples fail the criteria and would need to be reanalysed.

**Table 2.3: Ion Balance Criteria Used to Select Samples for Reanalysis.**

Ionic strength concentration range ( $\mu\text{eq l}^{-1}$ )	Samples are resubmitted when the ion difference (%) is:
Less than 50	> 60
50-100	> 30
Greater than 100	> 15

## 2.4 DATA REPORTING CYCLE

Sample collection, analysis, reanalysis and verification are continuous processes. Figure 2.3 and Figure 2.4 define the reporting cycles for the measurements made in the monitoring programme. Reanalysis is only undertaken for the composition of precipitation using the ion balance as the criterion. Simple data verification is undertaken for the other measurements. The cycles show that the measurements made in Year N would be available by July of Year N+1. Although the existing cycles approach this, it is intended to adhere to these reporting cycles more closely.





## 3. 2003 Measurements and Trends

### 3.1 DATA SUMMARY

The complete set of precipitation measurements made in the Acid Deposition Monitoring Network during 2003 is provided in the following appendices:

- Appendix 1 – Precipitation Composition from Weekly Bulk Collectors
- Appendix 2 – Annual Mean Precipitation-weighted Concentrations
- Appendix 3 – SO<sub>2</sub> and Particulate Sulphate Measurements and Statistics
- Appendix 4 – NO<sub>2</sub> Measurements and Statistics
- Appendix 5 – CEH HNO<sub>3</sub> Denuder Measurements and Statistics

Information is also provided in Appendix 1 about the site and the measurements made. Appendix 6 describes the geostatistical techniques that have been used to calculate the precipitation concentration maps in this report.

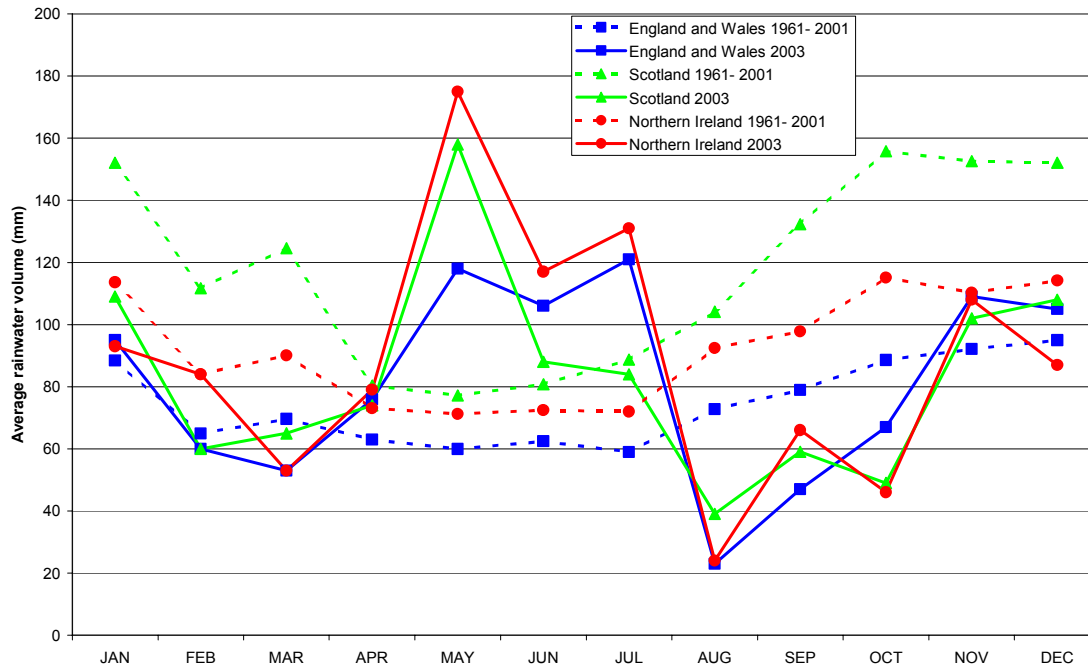
### 3.2 RAIN WATER VOLUMES IN 2003

Total rainwater volumes measured by the bulk collectors at network sites in 2003 were generally less than the long-term (1986–2002) average rainwater volumes. A slightly different picture was observed for the rainwater amounts measured by the Meteorological Office<sup>1</sup>. Average rainfall for England and Wales and Northern Ireland were slightly higher, 10 % and 4 %, respectively, than the long term (1961 to 2001) mean. However, rainwater volumes in Scotland were about 30 % less than the 30-year mean.

Figure 3.1 shows how the monthly rainfall data for 2003 determined by the Meteorological Office compares with the average rainfall amount for the 30 year mean. Scotland was drier than usual during the winter months but like Northern Ireland there was a lot more rain than usual in May 2003. August 2003 was a particularly dry month at all locations. During July and August 2003, temperatures were elevated and photochemical pollution episodes were observed during across the southern half of the UK.

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<sup>1</sup>(<http://www.metoffice.com/climate/uk/2003>) The data for England and Wales, Scotland and Northern Ireland were obtained by downloading the respective rainfall series on the web site. These measurements were obtained from available rain gauge data with allowances made for topographic, coastal and urban effects where relationships are found to exist.



**Figure 3.1: A comparison of Average Monthly Rainwater Volumes for 2003 and the Long-term Average (1961 to 2001) for England and Wales, Scotland and Northern Ireland.**

### 3.3 PRECIPITATION CHEMISTRY

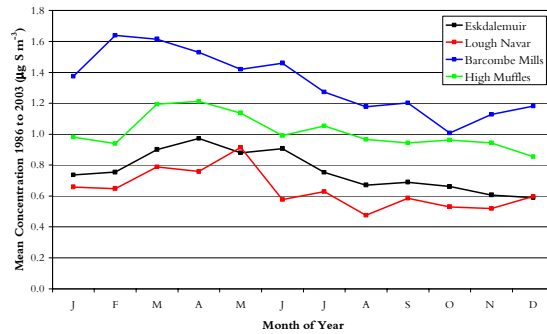
#### 3.3.1 The Measurements

The measurements of precipitation composition made using the bulk collectors are presented in Appendix 1. It should be noted that the tables in Appendix 1 contain all the analytical results obtained, including those samples affected by contamination by birdstrike. A phosphate concentration  $>0.01 \text{ mg P l}^{-1}$  (or  $>1.0 \text{ } \mu\text{eq l}^{-1}$ ) was taken as evidence of contamination. Although all these samples have been included in the tables, they were not included in the calculation of annual mean precipitation-weighted ion concentrations<sup>2</sup>. The mean annual rainfall and the precipitation-weighted mean annual concentrations of all ions for the period from 1986 to 2003 are also tabulated in Appendix 2. The rainfall totals presented in Appendix 2, Table 10 include all samples collected and are therefore sometimes higher than the totals used for the calculation of the annual mean concentrations.

Appendix 1 also contains two plots, which show (a) the trend in the annual precipitation-weighted mean concentrations for non-seasalt sulphate, nitrate, ammonium and hydrogen ion since the commencement of the site and (b) the trend in the annual rainfall and in the corresponding annual deposition of the four species. The trends shown in the two plots varies from site to site (Appendix 1), although in general annual precipitation-weighted mean non-seasalt sulphate and hydrogen ion concentrations have tended to decline whereas nitrate and ammonium have not changed much at all. A box has been included in Appendix 1, which contains a statistical summary of the trends of the four ions shown in the plots.

<sup>2</sup> Ion concentrations are conventionally reported as precipitation-weighted annual mean concentrations as rainfall is episodic and a few rainfall events can dominate the annual deposition. The wet deposition is then the precipitation-weighted annual mean concentration multiplied by the annual rainfall.

Previously, Appendix 1 also included a figure for each site, which showed the seasonal variation in the concentrations. The seasonal plots presented previously [see Hayman *et al.*, 2000, 2001c, d] clearly showed that the largest concentrations of both non-seasalt sulphate and nitrate occur in the period from April to June at most of the sites. This is partly a consequence of the seasonal variation of emissions and of the oxidising capacity of the atmosphere, as demonstrated by the seasonal variation observed in particulate sulphate. However, the variation in concentration of particulate sulphate concentration is much smaller than that of non-seasalt sulphate in precipitation. The concentrations of ions in precipitation are also affected by the seasonal variation in rainfall amount. The monthly mean rainfall amount tends to be smaller in early summer than in the rest of the year and the inverse correlation between rainfall amount and the concentrations of non-seasalt sulphate, nitrate, ammonium results in a corresponding opposite seasonal variation.



**Figure 3.2: Seasonal Variation in the Particulate Sulphate Concentration at 4 of the 5 Sites as Averages for the years 1986-2003.**

### 3.3.2 Concentration Maps for 2003

The spatial patterns of the annual mean precipitation-weighted concentration of acidity, non-sea sulphate, nitrate and ammonium are presented in Figure 3.3 to Figure 3.6 for the five most recent years. The parameters used in the interpolation are presented in Appendix 6. There are no hydrogen ion maps for 2000 as the acidity measurements were removed from the 2000 dataset.

The maps show that:

- the hydrogen ion concentration tends to be highest on the eastern sea board where the rainwater volume is smallest. Concentrations appear relatively constant over the three years shown.
- the highest concentrations continue to be measured in the source region.
- the nitrate concentrations are remarkably consistent throughout the five years. The trend, or lack of trend, in nitrate concentrations will be discussed in the next section.
- ammonium concentrations are highest in the areas of the United Kingdom where intensive livestock activity is highest.

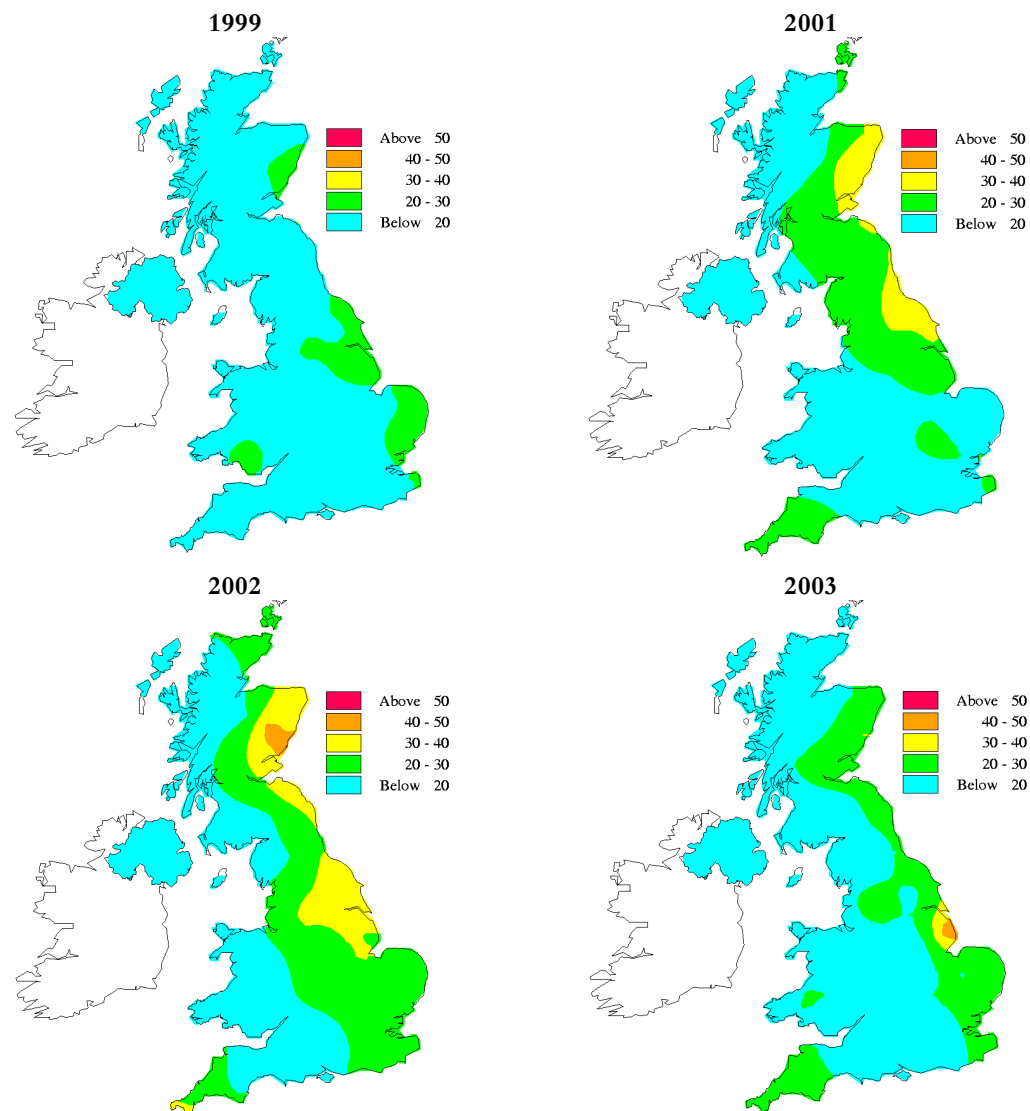


Figure 3.3: *Precipitation-weighted concentration maps of Acidity (in  $\mu\text{eq l}^{-1}$ ) for 1999-2003.*

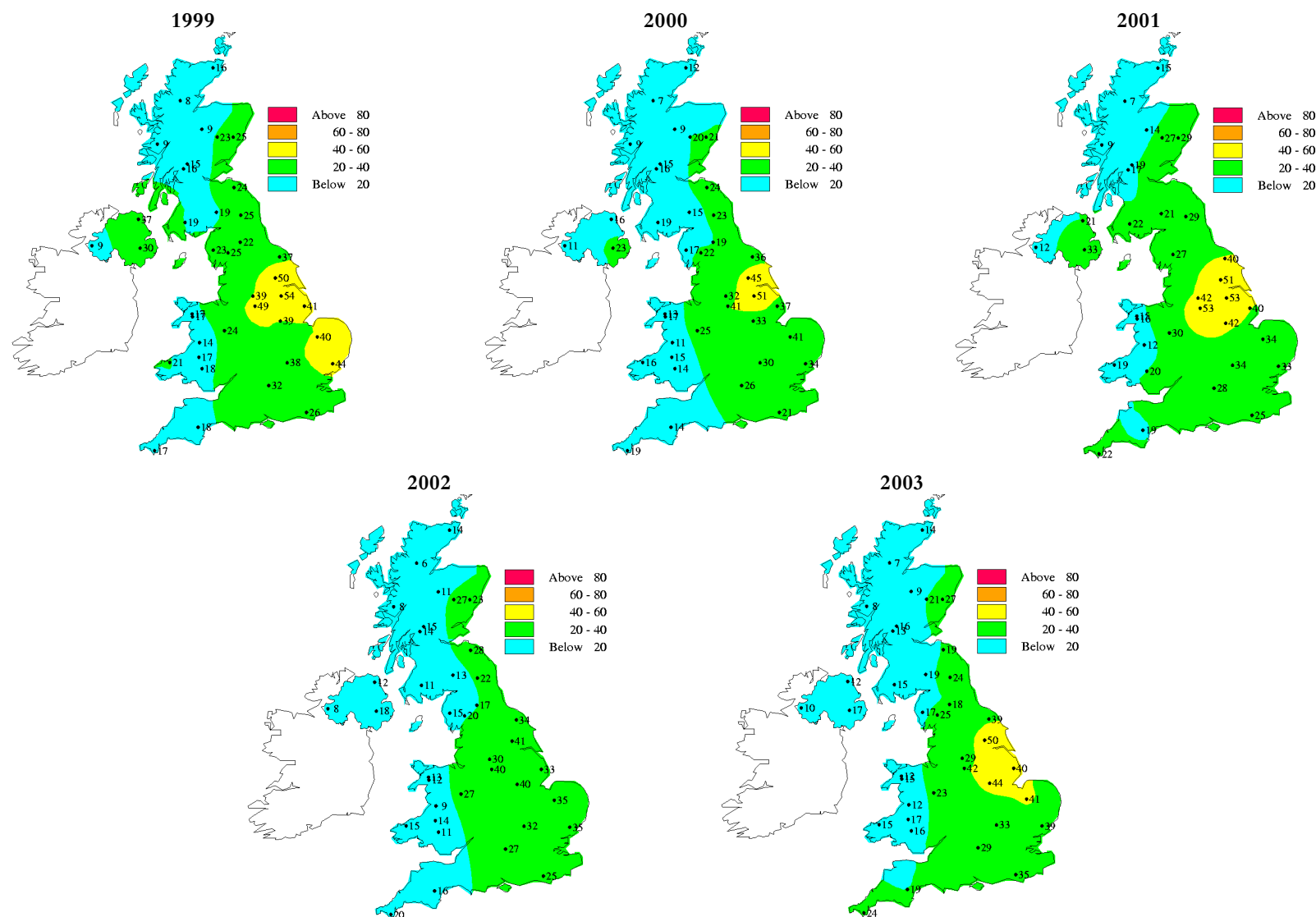


Figure 3.4: *Precipitation-weighted Concentration Maps of Non Seasalt Sulphate (in  $\mu\text{eq l}^{-1}$ ) for 1999-2003.*

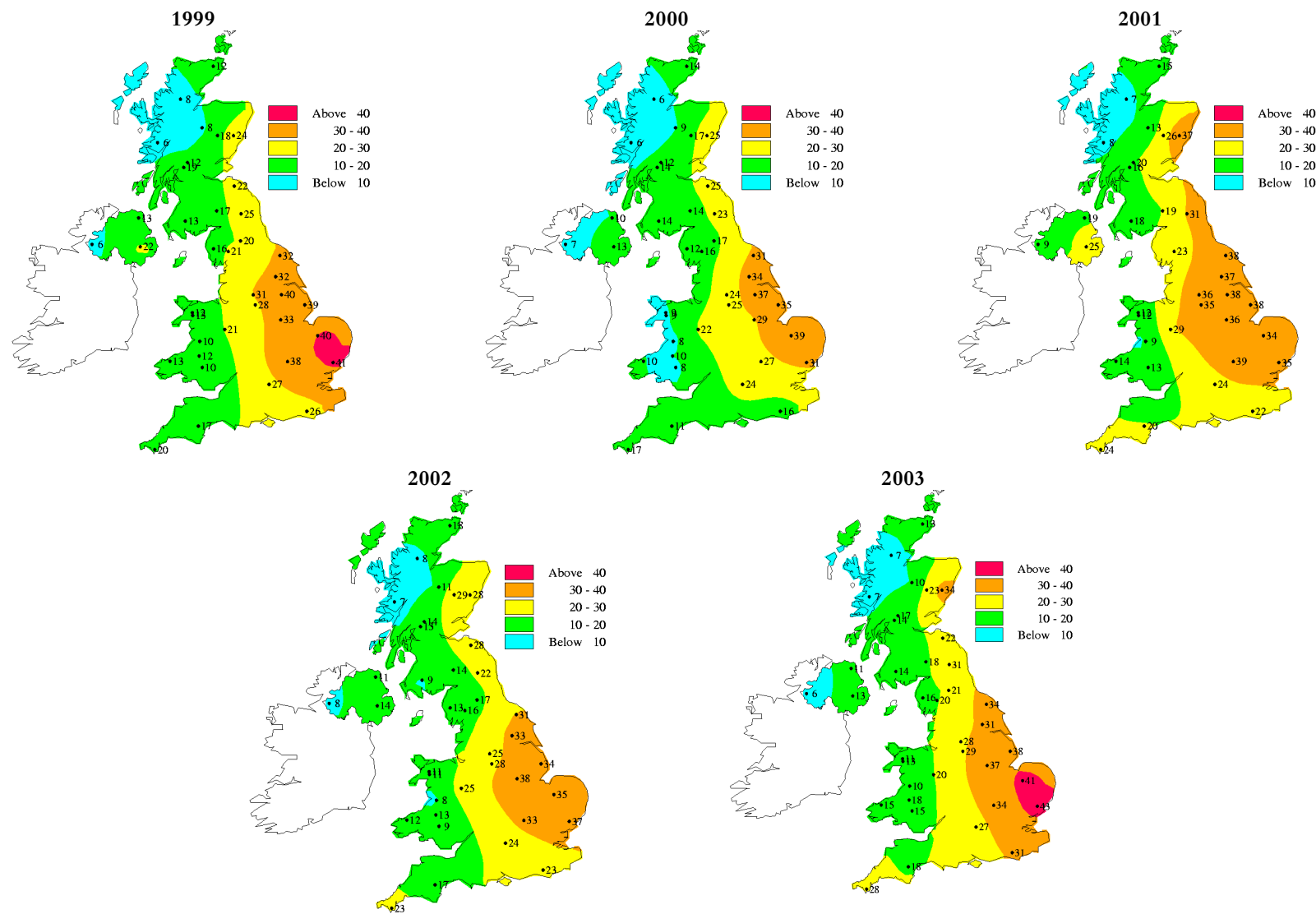


Figure 3.5: *Precipitation-weighted Concentration Maps of Nitrate (in  $\mu\text{eq } \Gamma^1$ ) for 1999-2003.*

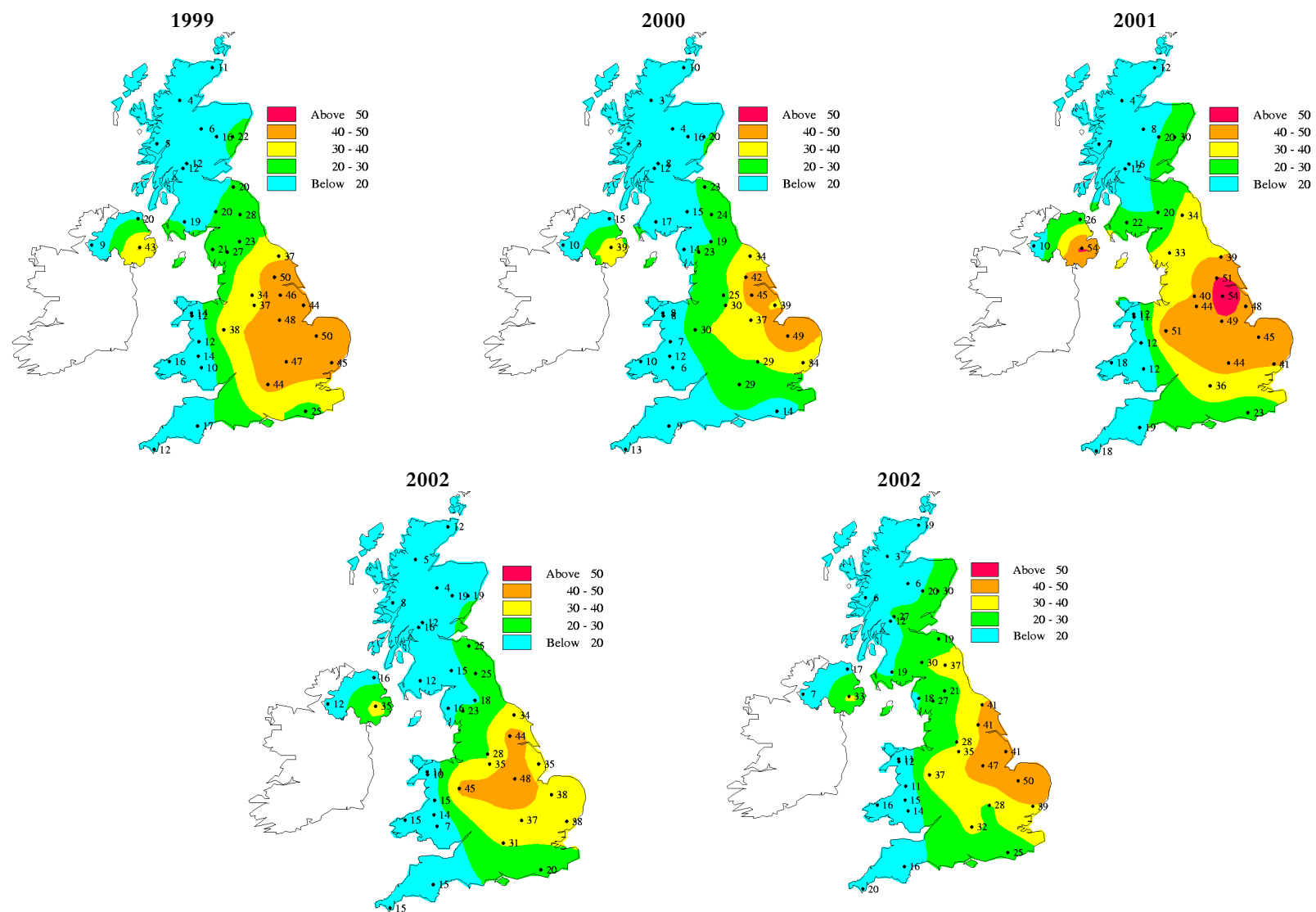


Figure 3.6: *Precipitation-weighted Concentration Maps of Ammonium (in  $\mu\text{eq } \Gamma^1$ ) for 1999-2003.*

### 3.3.3 Precipitation Chemistry Trends

Analysis of the data has been undertaken to quantify the significance of the trends. The concentration data have been analysed using a linear-least squares approach. The regression coefficient, or slope of the trend line, will have units of  $\mu\text{eq l}^{-1} \text{ year}^{-1}$ . Associated with the regression analysis is a parameter called the F statistic. The F statistic is a measure of how successfully the linear regression can account for the variation in the dataset. It is formally defined as the ratio of the variance due to regression, standardised by the respective degrees of freedom ( $MS_R$ ), to the variance about the regression also standardised by the respective degrees of freedom ( $MS_E$ ). The value of the F statistic can be compared to points on an appropriate F distribution curve. If the value is greater than a certain (critical F) value, it is assumed that a real, statistically significant, change in the concentration has occurred.

In the analysis presented below, a 5% significance level has been used. This means that there is a 5% chance that the trend is not significant. Further, the “strength” of the observed trend is quantified using multiples of the ratio of the calculated F statistic to the critical F value. These multiples (more or less arbitrarily defined) are presented in Table 3.1.

**Table 3.1: Strength of the Significance of the Trend.**

Ratio	Value of ratio	Symbol	Comment
F calculated/F critical	ratio < 1	-	No Significant trend
F calculated/F critical	1 < ratio < 2	+	Significant trend detected
F calculated/F critical	2 < ratio < 5	++	Moderate trend detected
F calculated/F critical	5 < ratio < 10	+++	Strong trend detected
F calculated/F critical	10 < ratio < 20	++++	Very strong trend detected
F calculated/F critical	ratio > 20	+++++	Exceptionally strong trend detected

Table 3.2 presents a summary of the trend analysis performed on the non-sea salt sulphate and nitrate concentrations measured at the sampling sites in the acid rain monitoring network. Sites that show a very strong trend are situated in relatively dry locations, often downwind of major sources. Values of “ $F_{\text{calculated}}/F_{\text{critical}}$ ” less than one indicate that no statistically significant trend can be detected. This most often occurs for sites which are in the more remote parts of the United Kingdom.



**Table 3.2: Summary of the Trend Analysis for nss-Sulphate and Nitrate Observed at the Acid Deposition Monitoring Network Sites and its Significance.**

Sampling site	Site Code	Sulphate			Nitrate		
		$\mu\text{eq l year}^{-1}$	% change year <sup>-1</sup>	Trend Status	$\mu\text{eq l year}^{-1}$	% change year <sup>-1</sup>	Trend Status
Achanarras	5140	-0.99	-3.36	++++	-0.38	-1.78	+
Allt a' Mharcaidh	5103	-0.74	-3.37	+++	0.02	0.22	-
Balquhidder	5152	-0.78	-2.64	++	0.02	0.15	-
Bannisdale	5111	-1.26	-2.77	+++	0.00	0.00	-
Barcombe Mills	5007	-1.39	-2.93	+++	-0.34	-1.19	-
Bottesford	5121	-3.74	-4.01	+++++	-0.58	-1.38	+
Compton	5129	-3.41	-4.24	++++	-0.93	-2.34	+++
Cow Green Reservoir	5113	-1.36	-3.24	++++	-0.21	-0.96	-
Driby	5136	-2.77	-3.41	++++	-0.58	-1.23	+
Eskdalemuir	5002	-0.98	-2.91	++++	-0.04	-0.22	-
Flatford Mill	5024	-2.78	-3.62	++++	-0.52	-1.17	-
Glen Dye	5011	-1.52	-2.96	++	-0.07	-0.22	-
Goonhilly	5003	-0.60	-1.99	+	0.13	0.63	-
High Muffles	5009	-2.58	-3.28	++++	-0.65	-1.48	++
Hillsborough Forest	5149	-1.93	-3.62	+++	-0.41	-1.71	-
Jenny Hurn	5118	-4.13	-3.77	++++	-0.54	-1.15	+
Llyn Brianne	5124	-0.85	-2.84	+++	-0.01	-0.07	-
Llyn Llydaw	5153	-1.37	-4.15	++	-0.20	-1.43	-
Loch Dee	5107	-1.07	-3.18	+++	-0.17	-1.01	-
Lough Navar	5006	-0.47	-2.52	+++	-0.04	-0.40	-
Polloch	5151	-0.87	-3.99	+++	-0.29	-2.58	+
Preston Montford	5024	-2.21	-3.55	++	-0.36	-1.19	-
Pumlumon	5150	-0.91	-3.45	+++	-0.26	-1.88	-
Redesdale	5109	-1.86	-3.42	+++	-0.24	-0.74	-
Stoke Ferry	5004	-2.98	-3.61	+++++	-0.65	-1.38	++
Strathvaich Dam	5010	-0.49	-3.21	++	-0.07	-0.82	-
Thorganby	5117	-3.10	-3.21	+++	-0.75	-1.64	++
Tycanol Wood	5123	-0.68	-2.43	+++	-0.02	-0.11	-
Wardlow Hay Cop	5121	-2.70	-3.05	++++	-0.19	-0.58	-
Whiteadder	5106	-1.64	-3.10	++	-0.36	-1.07	-
Woburn	5127	-3.09	-3.91	+++++	-0.42	-1.04	-
Yarner Wood	5008	-0.71	-2.38	++	0.01	0.06	-

Although the primary focus of the monitoring programme has been on the deposition of nitrate and non seasalt sulphate, there is increasing interest in the other components of rainwater, such as the base cations (Na, K, Mg and Ca).

### 3.4 SULPHUR DIOXIDE AND PARTICULATE SULPHATE

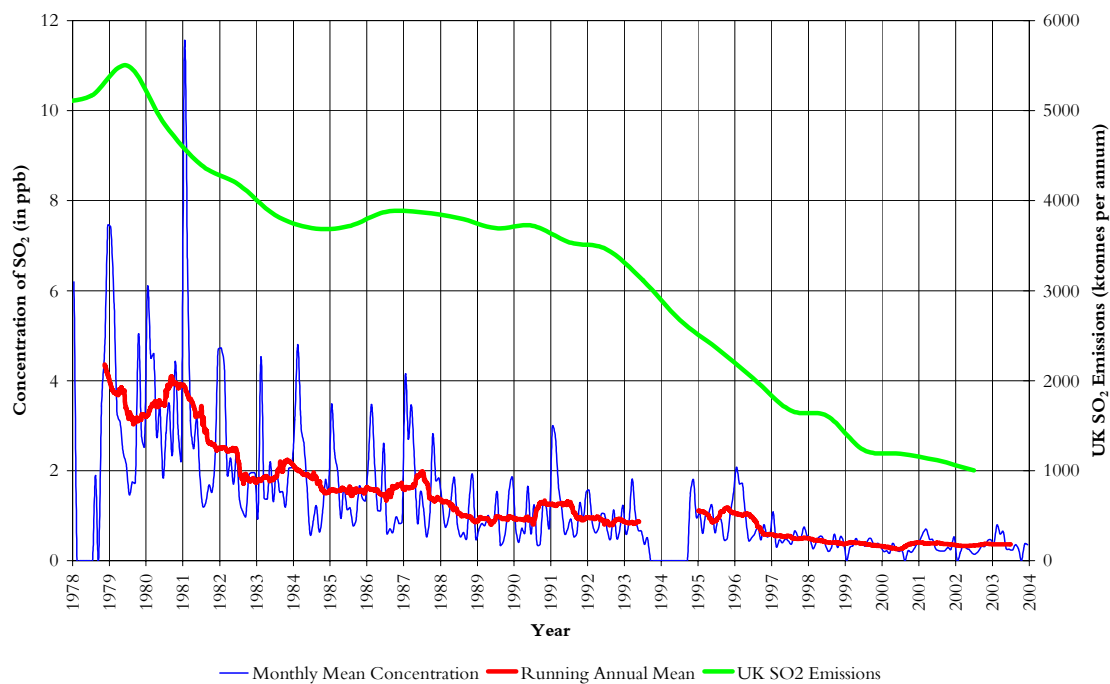
#### 3.4.1 The 2003 Measurements

A summary of the fortnightly measurements of sulphur dioxide and the daily measurements of particulate sulphate are presented in Appendices 3.1 and 3.2 respectively.

The measurement of sulphur dioxide concentrations is also made in the Rural SO<sub>2</sub> Monitoring Network which is covered by a separate DEFRA contract (*Acid Deposition Processes in the UK*, through a sub-contract from CEH Edinburgh). The mapping of the sulphur dioxide concentration is undertaken under that contract and is not discussed in this report. Data reports have been prepared for the years 1995 to 2000 by Vincent and Campbell [1996], Hasler and Downing [1998], Hasler *et al.* [2001], and Hayman *et al.* [2001a, b, 2003b], respectively.

### 3.4.2 Trends in Sulphur Dioxide

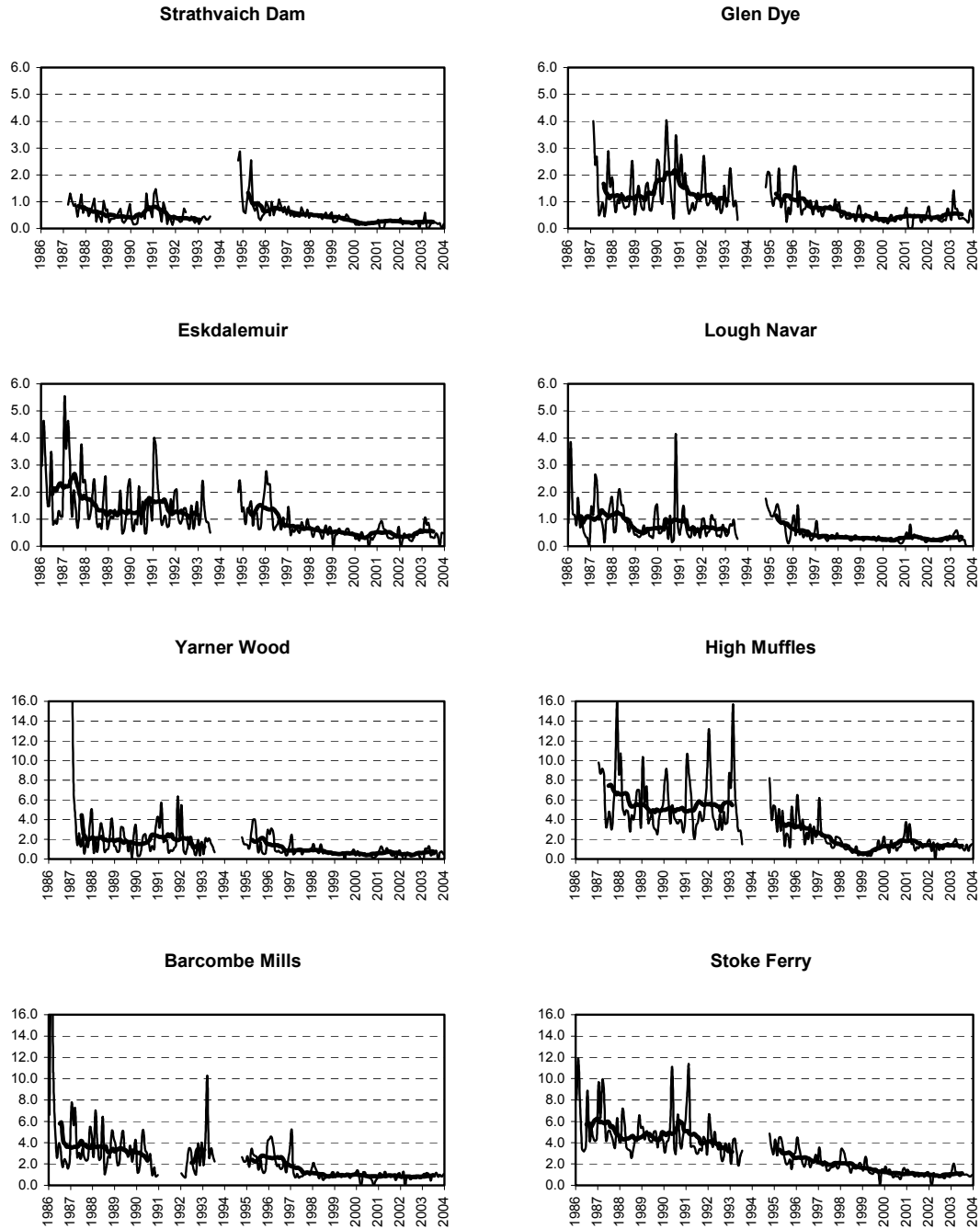
Figure 3.7 shows both the monthly mean concentrations and running annual mean concentrations of sulphur dioxide at Eskdalemuir. As reported previously, the largest change in the concentration occurred between 1980 and 1990, during which time the average concentration decreased by a factor of three from around 4.5 ppb to 1.5 ppb. From 1990 to 2002, the concentration has decreased by a similar factor of two to three, to 0.4 ppb. The figure shows that the downward trend in the SO<sub>2</sub> concentrations follows the reduction in UK SO<sub>2</sub> emissions [Dore *et al.*, 2003], at least in the early years.



**Figure 3.7: Trends in the concentration of sulphur dioxide observed at Eskdalemuir since 1978.**

Figure 3.7 also suggests that the large seasonal variations, 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.

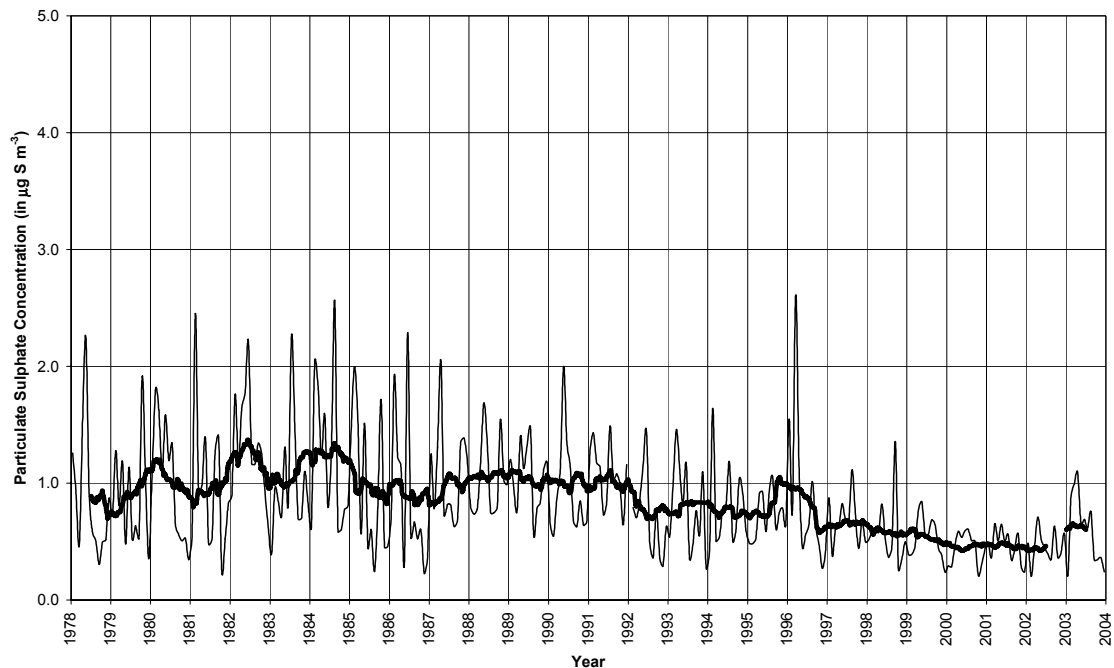
The monthly and running annual mean concentrations of sulphur dioxide measured at each of the primary sites are presented in Figure 3.8. The annual mean sulphur dioxide concentration has decreased substantially at all sites. For example, the annual mean at High Muffles has decreased from an annual mean concentration of 7.3  $\mu\text{g S m}^{-3}$  in 1987 to 1.2  $\mu\text{g S m}^{-3}$  in 2002 and 2003.



**Figure 3.8: Monthly and Running Annual Mean Concentrations of Sulphur Dioxide at the Daily Sites, 1986 to 2003 ( $\mu\text{g S m}^{-3}$ ).**

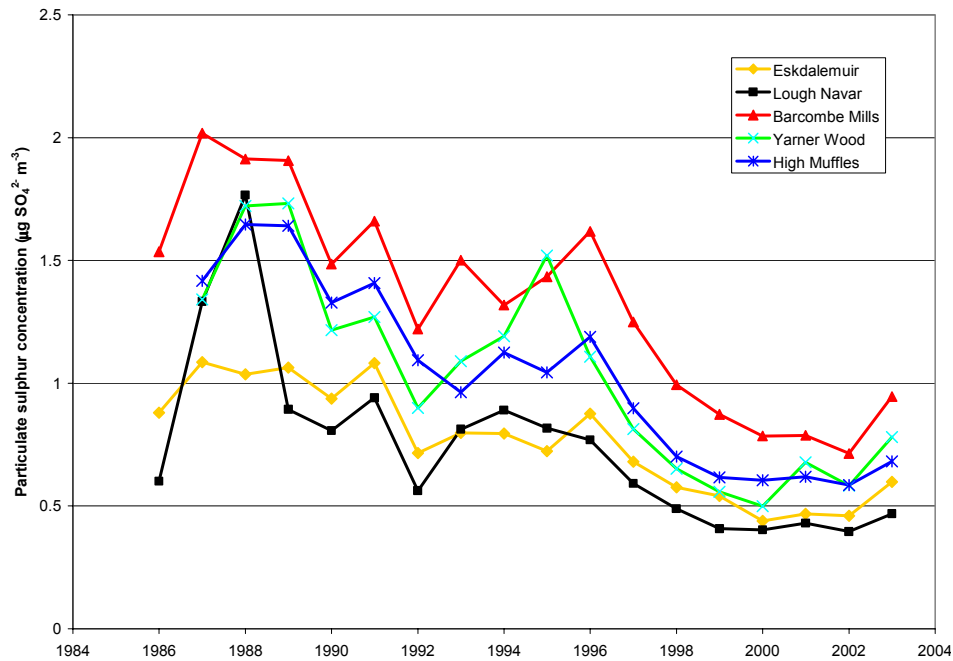
### 3.4.3 Trends in Particulate Sulphate

Figure 3.9 shows the monthly mean and running annual mean concentrations of particulate sulphate at Eskdalemuir. The decrease in the concentration of particulate sulphate is much less marked than that of sulphur dioxide. There is more variation around the running annual mean and there is an apparent increase in concentration from 1978 to 1984 followed by a decrease to 2003. Over the period from 1978 to 2003 the average concentration declined from around  $1.0 \mu\text{g} [\text{SO}_4 \text{ as S}] \text{ m}^{-3}$  to about  $0.6 \mu\text{g} [\text{SO}_4 \text{ as S}] \text{ m}^{-3}$  in 2003.



**Figure 3.9: Trends in the particulate sulphate concentration observed at Eskdalemuir since 1978.**

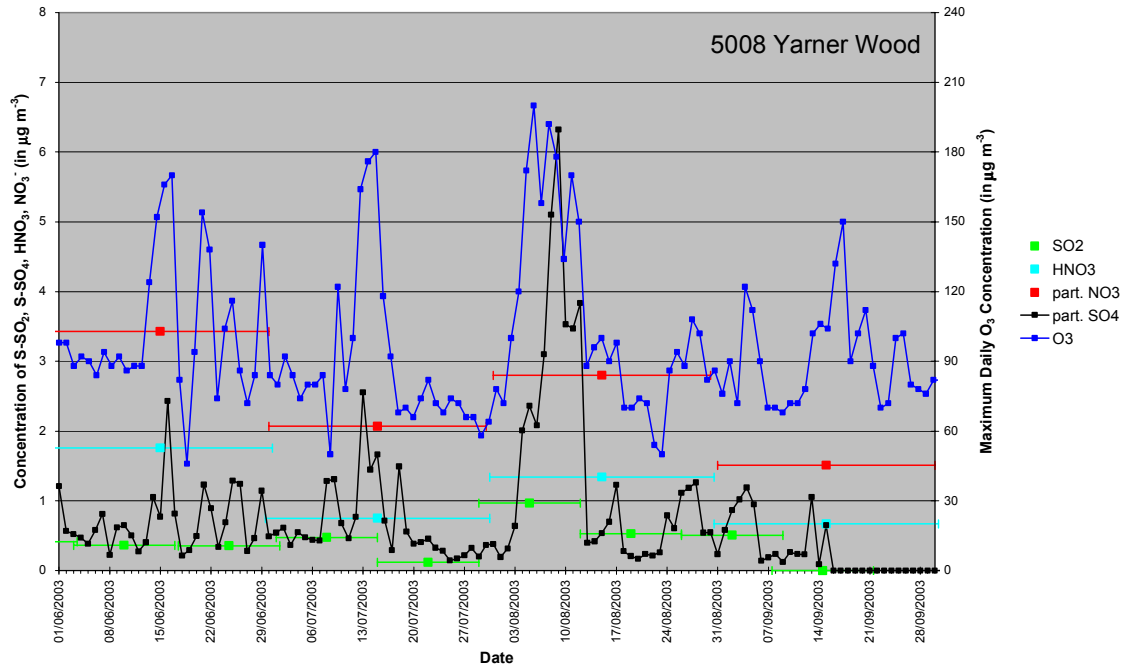
Since 2002 daily sulphate concentrations are measured at only five sites; measurements at Strathvaich Dam, Glen Dye and Stoke Ferry were discontinued in 2001. Figure 3.10 shows the annual mean concentration at the current sites. Concentrations were consistently highest at Barcombe Mills and lowest at Lough Navar, reflecting the proximity of these sites to the European mainland. The relative trends in concentration are somewhat regular. For example, the mean concentrations at each site decreased steadily until about 1992 then remained constant until about 1996 and then decreased rapidly until about 1999 and have remained more or less constant since then.



**Figure 3.10: Annual Mean Concentrations of Particulate Sulphate at the Daily Sites, 1986 to 2003 ( $\mu\text{g S m}^{-3}$ ).**

At a number of sites, elevated concentrations of particulate sulphate were observed during the photochemical pollution episode in August. This is most readily observed at Yarner Wood. Between 4<sup>th</sup> August 2003 and 11<sup>th</sup> August 2003 the ozone concentration did not drop below 130 ppb with the sulphate concentration peaking on the 9<sup>th</sup> August 2003 ( $6.32 \mu\text{g S-SO}_4^{2-} \text{m}^{-3}$ ). Figure 3.11 presents a number of gaseous and particulate concentrations measured throughout the summer of 2003. The higher concentrations of particulate sulphate are consistent with the elevated concentrations of other photochemical pollutants and the higher levels of photochemical activity. The highest sulphur dioxide concentrations ( $1.0 \mu\text{g S-SO}_2^{2-} \text{m}^{-3}$  as a fortnightly mean) for the summer period were also observed during the main ozone episode, which in part explains why the large sulphate concentration could occur.

Only at Yarner Wood was a comparable peak in concentration observed compared to those measured during the last major particulate episode in March 1996. At the four other sites, the concentrations were significantly lower. Table 3.3 presents the maximum sulphate particulate concentration measured at each of the five current monitoring sites for all years back until 1986. Also presented are the dates for which the maximum concentration was observed. Most of the maximum concentrations are observed to occur during the summer months.



**Figure 3.11 A Comparison of Gaseous and Particulate Concentrations measured at Yarnar Wood during the summer of 2003.**

**Table 3.3 Maximum daily sulphate ( $\mu\text{g S-SO}_4^{2-} \text{m}^{-3}$ ) concentrations for each year as measured at each of the five current sampling sites. Also presented are the dates on which the maximum concentration occurred.**

Site	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Eskdalemuir	10.49	8.34	5.83	6.48	8.45	6.11	5.56	5.61	3.63	3.61	7.72	3.49	3.98	3.01	2.10	2.49	2.40	3.93
	16-Jun	03-Apr	12-May	18-Jun	01-May	03-Sep	04-Sep	09-Jun	22-Feb	14-Oct	15-Mar	10-Aug	27-Sep	01-Apr	20-Dec	23-May	04-Apr	10-Aug
Lough Navar	11.25	7.36	7.25	8.39	5.87	5.81	3.96	3.94	4.5	3.98	7.85	3.82	4.33	2.43	2.64	3.29	3.39	2.53
	15-Feb	10-Mar	17-Oct	19-Jun	13-May	04-Feb	12-Jun	27-Apr	20-Feb	01-Aug	22-Mar	17-May	13-May	04-May	01-Jul	23-Mar	12-Sep	08-Aug
Barcombe Mills	16.04	12	21.36	8.6	5.82	6.97	5.05	8.59	5.7	4.5	10.1	7.24	4.30	3.12	3.07	2.62	2.55	4.91
	16-Feb	07-Jan	31-Mar	13-Jun	16-Jun	07-Feb	11-Apr	01-Nov	24-Jul	22-Aug	20-Mar	10-Jan	02-Dec	11-Sep	30-Jun	24-Aug	08-Dec	10-Aug
Yarnar Wood		7.28	8.59	11.38	6.7	8.55	5.23	5.95	4.99	8.17	6.93	4.5	4.72	2.71	3.15	3.68	3.26	6.32
		05-Nov	16-Oct	20-May	21-Apr	03-Sep	09-Apr	14-Apr	14-Oct	26-Apr	19-Mar	30-Jan	15-May	10-Sep	09-May	25-May	11-Apr	09-Aug
High Muffles		6.97	8.01	7.29	7.88	6.61	5.31	5.22	7.9	4.82	7.32	5.06	3.87	3.24	3.35	3.25	2.12	3.37
		07-Nov	07-Sep	29-Dec	10-Jul	02-Sep	28-Jun	02-Nov	03-Jul	03-May	15-Mar	18-May	24-Sep	06-Aug	09-May	17-Nov	14-Dec	26-Mar

### 3.5 NITROGEN DIOXIDE

#### 3.5.1 The 2003 Measurements

The nitrogen dioxide diffusion tube measurements made in 2003 are presented in Appendix 4. The determination of nitrogen dioxide at the rural locations in the acid rain network provides a key input to the mapping of nitrogen dioxide in the United Kingdom [Stedman, 1997].

#### 3.5.2 Trends in Nitrogen Dioxide

Figure 3.12 presents the annual average concentrations for nitrogen dioxide determined at 8 of the sites in the monitoring network between 1987 and 2003. The annual mean concentrations in 2003 were comparable to or slightly higher than those measured in 2001 and 2002. This is consistent with the higher number of pollution episodes in 2003.

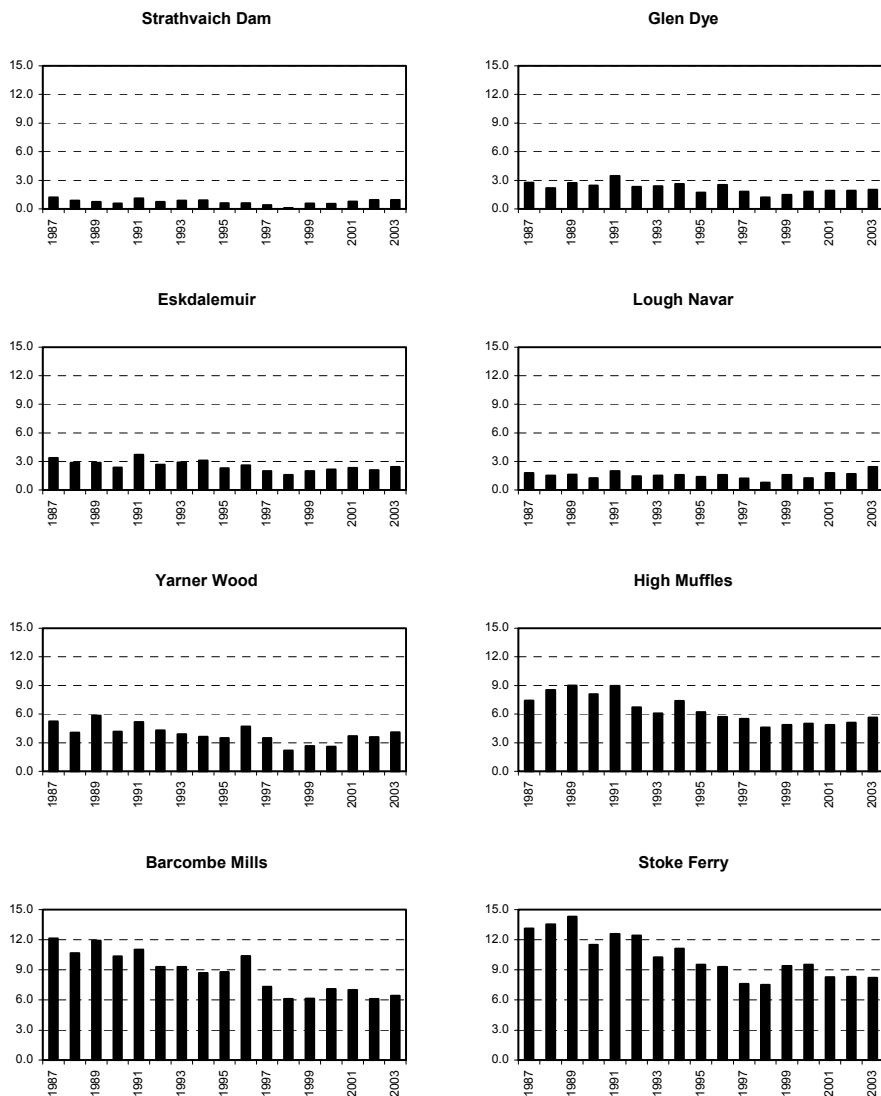


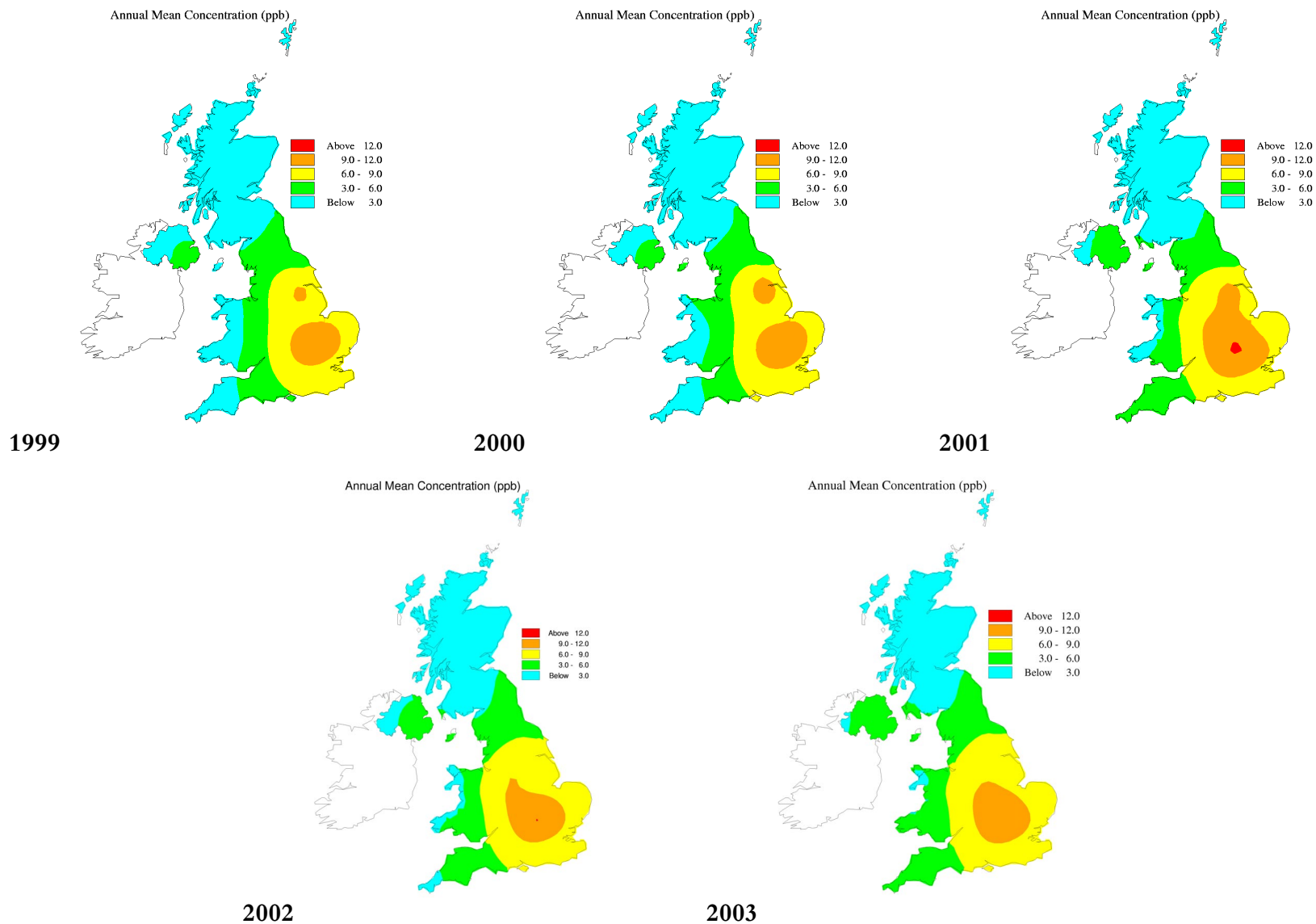
Figure 3.12: Annual average nitrogen dioxide concentration (ppb).

UK total emissions of nitrogen oxides have decreased since 1990 with the switch from coal to gas for power generation and the introduction of catalytic converters on petrol-engined vehicles. Given the relatively poor precision of the passive sampler method at low concentrations, the fall in nitrogen dioxide concentrations is most clearly observed at the relatively high concentration sites such as High Muffles, Stoke Ferry and Barcombe Mills, although lower concentration sites such as Yarnier Wood, Eskdalemuir and Glen Dye also show evidence of a decline.

### **3.5.3 Concentration Map**

The diffusion tube measurements have been used to produce a map of the rural nitrogen dioxide concentrations in the UK for 2003, as shown in Figure 3.13 (bottom right-hand panel). The highest concentrations were observed in the Midlands and southern England with an annual mean concentration of 12.3 ppb determined at Woburn in 2003. In the main, this reflects the proximity to the sampling sites of roads and other aspects of urbanisation. The same figure also shows the 1999 to 2002 maps for comparison. The maps show little difference in the spatial patterns between 1999 and 2003.





**Figure 3.13: Interpolated concentration maps of nitrogen dioxide (in ppb) for 1999-2003.**

## 4. Nitric Acid Monitoring Network

### 4.1 INTRODUCTION

The UK Nitric Acid Monitoring Network has been in operation since September 1999, providing data on nitric acid, particulate nitrate and other species as part of the UK acid deposition monitoring programme. In this section, the sampling methods and measurement data for 2003 are summarised and the measurements compared against previous years.

Nitric acid and related species are monitored on a monthly basis at 12 locations using the CEH DELTA denuder system, in an integrated fashion with the UK Ammonia Monitoring Network. The aim of these measurements is to explore spatial patterns, compare results with dispersion models, seasonality and contribute to national N deposition estimates.

A map of the sites in the monthly  $\text{HNO}_3$  monitoring network is shown in Figure 4.1.



**Figure 4.1: Map of 12 monitoring sites for  $\text{HNO}_3$ ,  $\text{NO}_3^-$  and related acid gas/particle measurements.**

### 4.2 METHOD AND DATA COLLECTION

The sampling train used in the CEH DELTA system is shown Figure 4.2.  $\text{HNO}_3$ ,  $\text{SO}_2$  and  $\text{HCl}$  are removed by the first set of  $\text{K}_2\text{CO}_3$ / glycerol coated denuders, and a second set of citric acid coated denuders removes  $\text{NH}_3$ . Two sets of filter packs at the end of the sampling train removes the aerosol components -  $\text{NO}_3^-$ ,  $\text{SO}_4^{2-}$ ,  $\text{Cl}^-$  and  $\text{NH}_4^+$ .

Returned samples are stored in a cold room at  $4^\circ\text{C}$  until analysis. For the denuders, 5 ml of 0.05 %  $\text{H}_2\text{O}_2$  is added to both the first and second denuders, while the initial uncoated short length of Teflon inlet is not extracted. (Tests have shown that  $<1\%$  of the total is captured in this portion.). Filters from the filter packs are also extracted in 0.05 %  $\text{H}_2\text{O}_2$ . Extracted aqueous samples from the denuders and filter packs are sent to Harwell Scientifics Ltd on a monthly basis for chemical analysis. Denuder sample extracts are analysed for  $\text{NO}_3^-$ ,  $\text{SO}_4^{2-}$  and  $\text{Cl}^-$  and filter sample extracts are analysed for  $\text{NO}_3^-$ ,  $\text{SO}_4^{2-}$ ,  $\text{Cl}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$  and  $\text{Ca}^{2+}$ .

The amount of a gas collected (Q) on a denuder due to air sampling is given by:

$$Q = (c_e - c_b) \star \nu \quad (1)$$

where  $c_e$  is the liquid concentration of an exposed tube,  $c_b$  is the liquid concentration of a blank tube and  $\nu$  is the liquid volume of the extraction solution. The air concentrations ( $\chi_a$ ) of the gas of interest is then determined as:

$$\chi_a = Q/V \quad (2)$$

where  $V$  is the effective volume of air sampled. For denuder samples this is found directly from the gas meter readings, and is typically 15 m<sup>3</sup> per month.

The use of two denuders in series allow for the determination of capture efficiency, by comparing the amounts of trace gas in both. An infinite series correction factor, based on the capture efficiency, is applied for trace gas not captured. The corrected air concentration of the gas ( $\chi_{a(\text{corrected})}$ ) is then determined as:

$$\chi_{a(\text{corrected})} = \chi_{a(\text{Denuder 1})} \star \frac{1}{[1 - (\chi_{a(\text{Denuder 2})} / \chi_{a(\text{Denuder 1})})]} \quad (3)$$

The absolute amount of the correction is added to the value for the acid gas, and subtracted from the aerosol value. At a typical capture efficiency of 90 % in the first denuder, the correction represents 1 % of the corrected air concentration. At 80 %, 75 % and 70 % capture, the correction amounts to 6 %, 11 % and 17 % of the total, respectively. Below 60 % capture efficiency, the correction amounts to greater than 50 % and should not be applied. The air concentration of the trace gas is then determined as:

(4)

## 4.3 NITRIC ACID NETWORK MEASUREMENTS

### 4.3.1 Denuder Capture Efficiency

The use of 2 glass denuders in series allows the capture efficiency of every sample to be assessed, by comparing the amount of HNO<sub>3</sub>/SO<sub>2</sub>/HCl in both tubes. A collection efficiency correction is applied to the measurement based on the capture efficiency. Where less than 75% of the total captured is recorded in the first denuder, data are marked as being less certain. The monthly averaged denuder capture efficiencies from the 12 monitoring sites for HNO<sub>3</sub>, SO<sub>2</sub> and HCl are shown in Figure 4.3. The quality control using a double denuder system confirms that the capture efficiency in the denuders is adequate and that the correction factors are small (typically ~ 1 %).

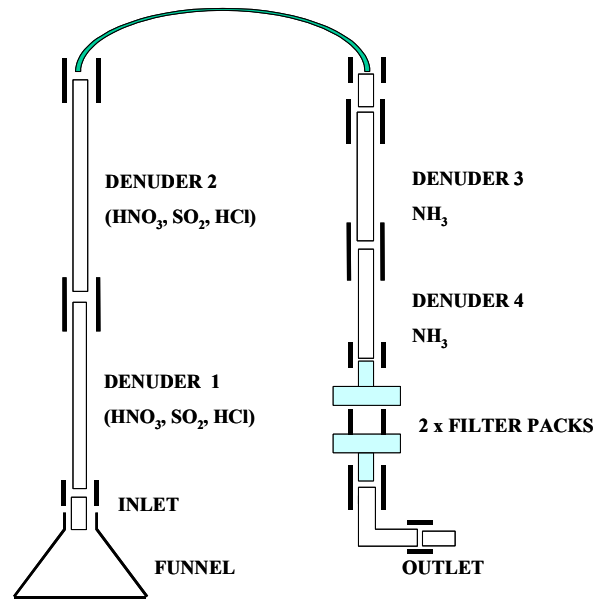
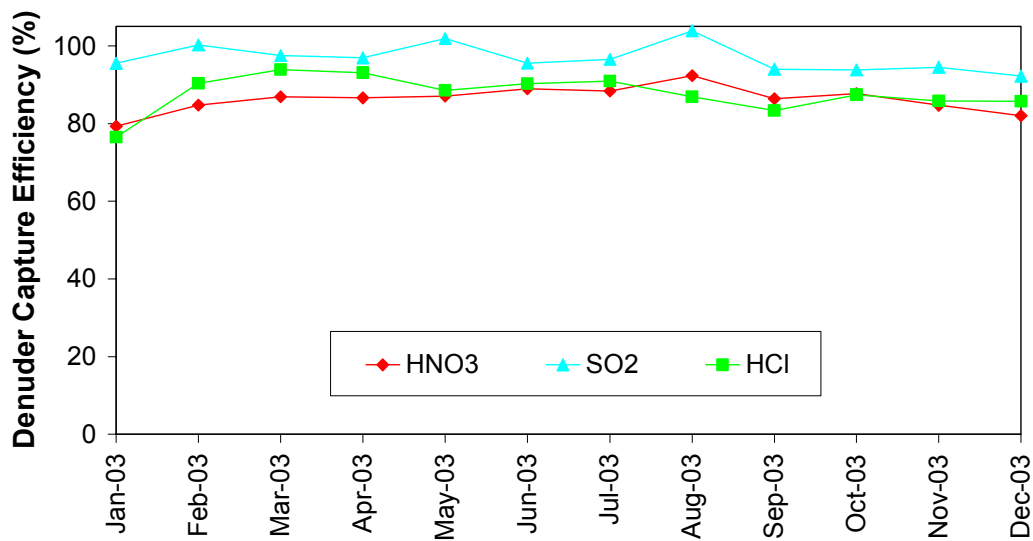


Figure 4.2: Sampling train for monthly air measurements.



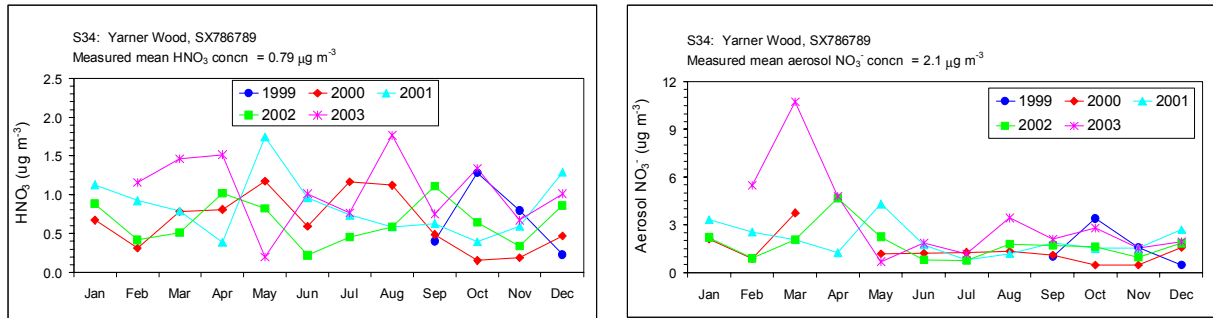
**Figure 4.3** Monthly mean denuder capture efficiency for  $\text{NH}_3$ ,  $\text{HNO}_3$ ,  $\text{SO}_2$  and  $\text{HCl}$  from the 12 monitoring sites (= amount in 1st Denuder / (Amounts captured in 1st + 2nd Denuders)\*100 %).

#### 4.3.2 The 2003 Measurements

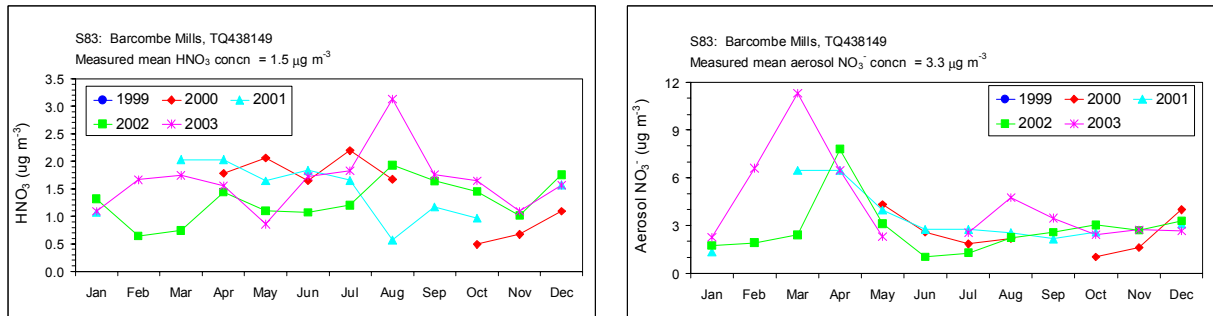
The monthly-averaged concentrations of gaseous nitric acid ( $\text{HNO}_3$ ) and particulate nitrate ( $\text{NO}_3^-$ ) determined at each site are shown in Figure 4.4. The individual plots illustrate that the concentrations of both species are reasonably stable at a monthly level, and have a weak seasonal variability. The annual cycle for  $\text{HNO}_3$  and  $\text{NO}_3^-$  has an observed maximum during late spring and early summer, which may be related to increased ozone concentrations during the season and an enhancement of  $\text{HNO}_3$  formation. During the winter months, low temperature and high humidity favour the formation of  $\text{NH}_4\text{NO}_3$  from the gas phase  $\text{NH}_3$  and  $\text{HNO}_3$ . Coupled to changes in boundary layer conditions, this produces the winter minimum in the cycle. The ratio of the concentrations of  $\text{HNO}_3$  and  $\text{NO}_3^-$  is similar throughout the year; fluctuations in the ratio are influenced by the loss of  $\text{HNO}_3$  due to dry deposition.

The graphs shown in Figure 4.4 illustrate the trends for  $\text{HNO}_3$  and  $\text{NO}_3^-$ . However, parallel measurements have been made for  $\text{HCl}$  and  $\text{Cl}^-$ ,  $\text{SO}_2$  and  $\text{SO}_4^{2-}$ , as well as base cations. The complete set of the monthly measurements of acidic trace gases, acidic aerosol and base cations made in 2003 can be found in Appendix 5.1.

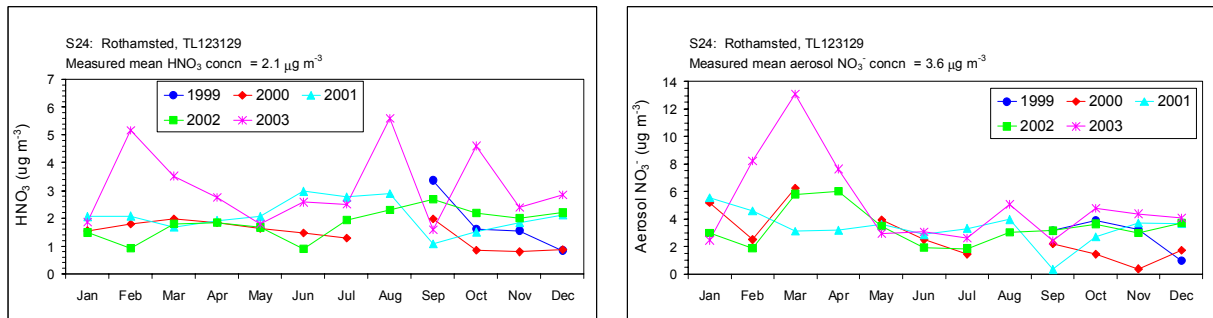
High particulate nitrate concentrations were observed during March 2003 - some of the highest monthly concentrations to date were recorded during this month - notably at Rothamsted ( $13.1 \mu\text{g NO}_3^- \text{ m}^{-3}$ ), Yarnar Wood ( $10.7 \mu\text{g NO}_3^- \text{ m}^{-3}$ ) and Barcombe Mills ( $11.3 \mu\text{g NO}_3^- \text{ m}^{-3}$ ). These high concentrations resulted from the air masses that had passed over the Low Countries and were significantly higher than the particulate nitrate concentrations observed during the August photochemical episode.



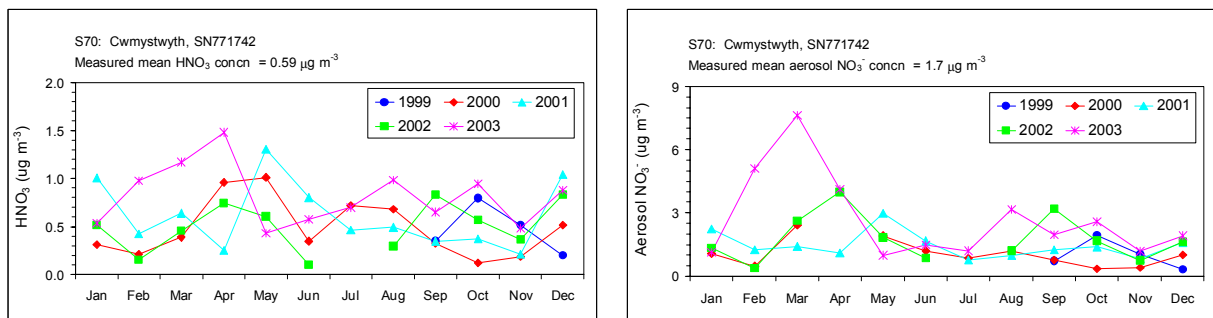
(a) Yarner Wood



(b) Barcombe Mills

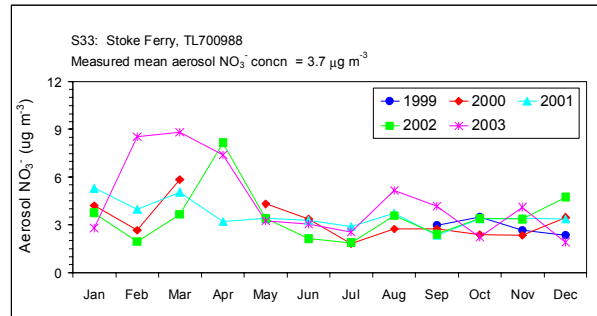
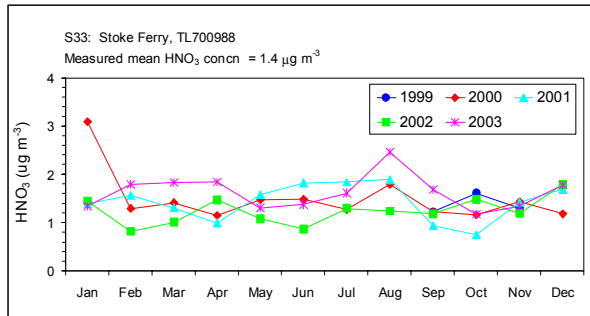


(c) Rothamsted

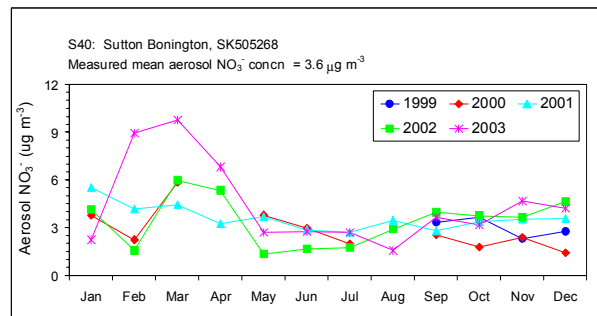
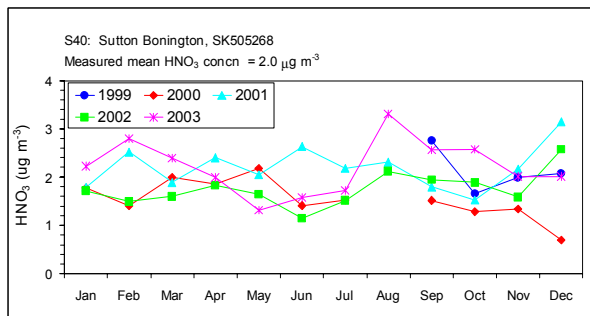


(d) Cwmystwyth

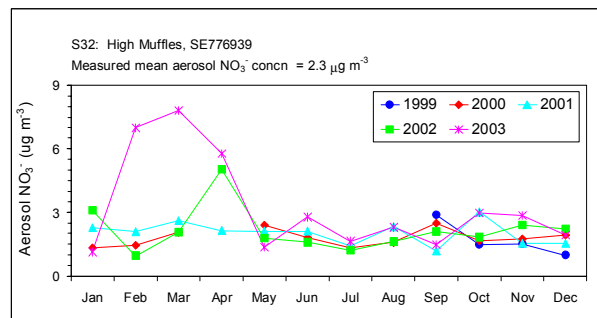
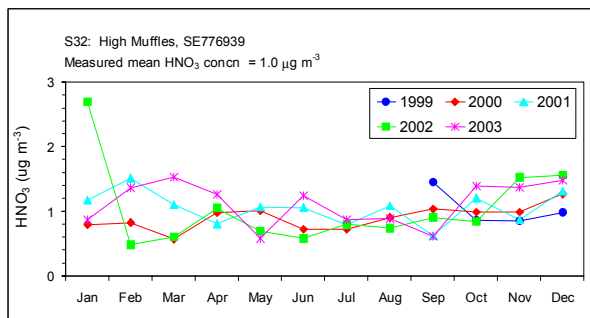
**Figure 4.4: Measurements of Gaseous  $\text{HNO}_3$  and aerosol  $\text{NO}_3^-$  made in the Nitric Acid Monitoring Network between September 1999 and June 2003.**



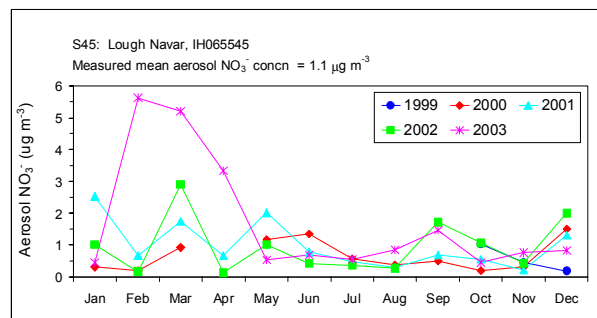
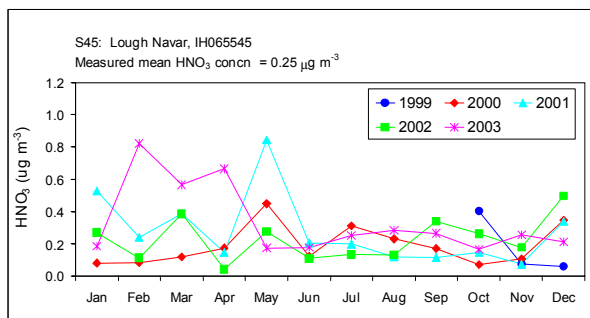
(e) Stoke Ferry



(f) Sutton Bonington

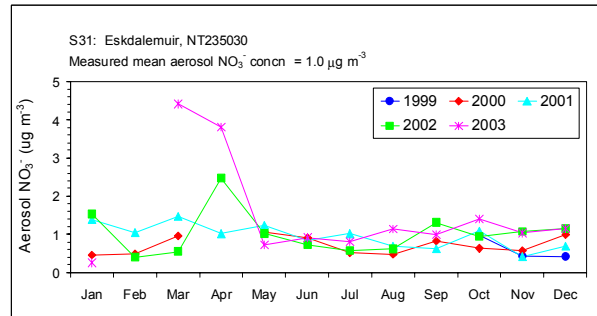
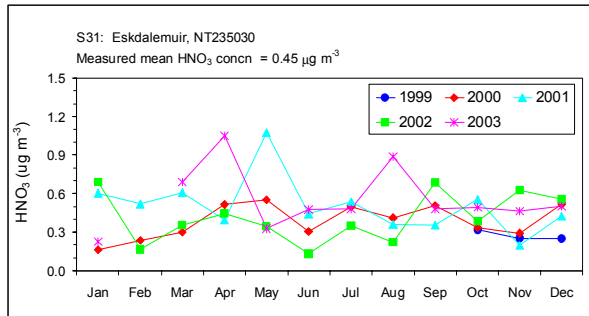


(g) High Muffles

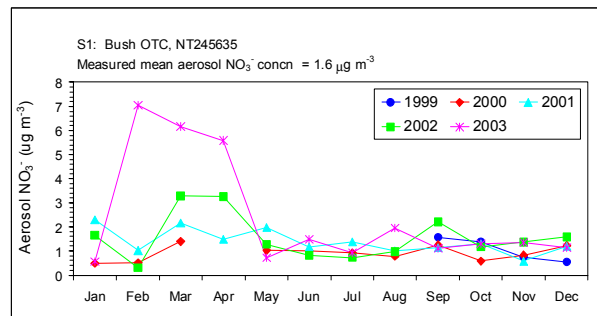
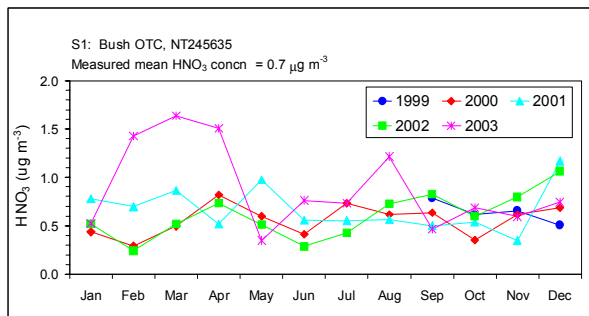


(h) Lough Navar

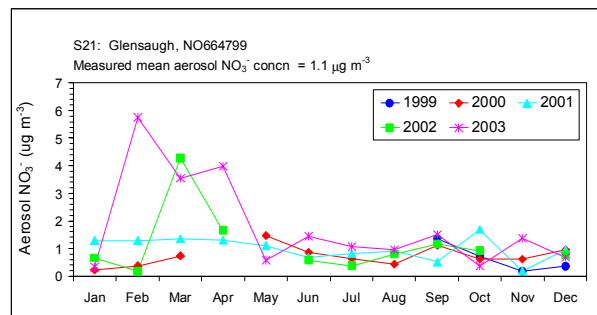
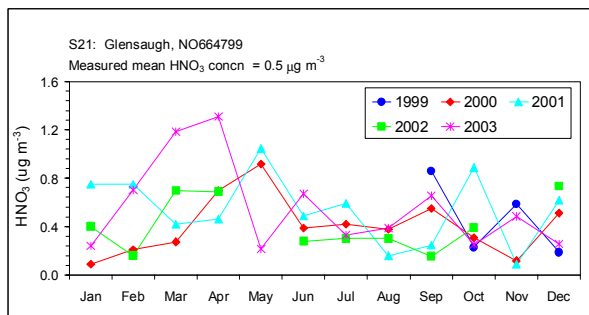
**Figure 4.4: Measurements of Gaseous HNO<sub>3</sub> and aerosol NO<sub>3</sub><sup>-</sup> made in the Nitric Acid Monitoring Network between September 1999 and June 2003. (cont)**



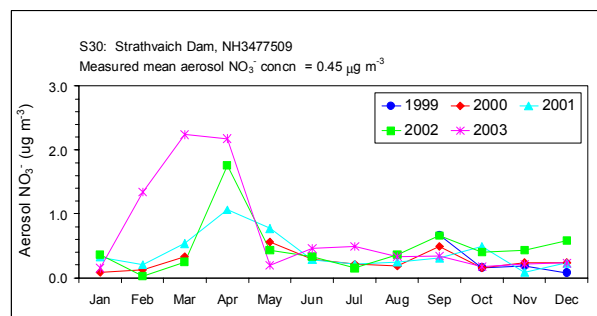
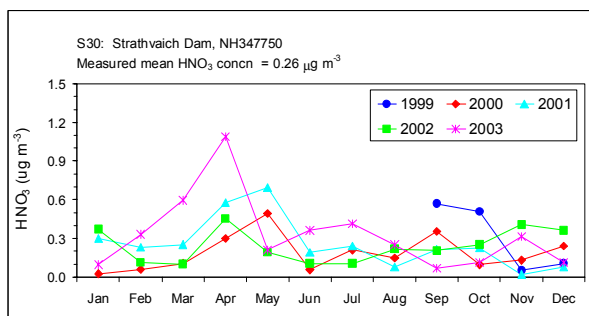
(i) Eskdalemuir



(j) Bush, near Edinburgh



(k) Glensaugh



(l) Strathvaich Dam

**Figure 4.4: Measurements of Gaseous HNO<sub>3</sub> and aerosol NO<sub>3</sub><sup>-</sup> made in the Nitric Acid Monitoring Network between September 1999 and June 2003. (continued)**

Statistical summaries of the measurements made in 2003 of the acid gas, and the acid and base cation aerosol components are given in Table 4.1, Table 4.2 and Table 4.3, respectively.

**Table 4.1: Summary of statistics for Monthly Measurements of Acidic Trace Gases in 2003 (Jan – Dec 2003).**

No.	Name	Nitric Acid: $\mu\text{g HNO}_3 \text{ m}^{-3}$						Sulphur Dioxide: $\mu\text{g SO}_2 \text{ m}^{-3}$						Hydrochloric acid: $\mu\text{g HCl m}^{-3}$					
		Mean	Min	Max	SD	CV (%)	N	Mean	Min	Max	SD	CV (%)	N	Mean	Min	Max	SD	CV (%)	N
1	Bush OTC	0.89	0.35	1.64	0.44	49.7	12	2.04	0.50	5.56	1.47	72.0	12	0.25	0.17	0.37	0.07	26.1	12
21	Glensaugh	0.56	0.22	1.31	0.37	66.2	12	0.75	0.04	2.01	0.66	88.5	12	0.37	0.08	1.29	0.37	99.5	12
24	Rothamsted	3.10	1.59	5.59	1.34	43.2	12	3.22	1.32	5.11	1.10	34.1	12	0.47	0.22	0.79	0.15	32.8	12
30	Strathvaich Dam	0.33	0.07	1.09	0.28	86.2	12	0.26	0.00	0.84	0.30	114.9	12	0.22	0.09	0.51	0.11	49.3	12
31	Eskdalemuir	0.55	0.23	1.05	0.24	43.0	11	0.80	0.32	1.80	0.44	55.3	11	0.26	0.08	0.71	0.17	64.5	11
32	High Muffles	1.12	0.57	1.53	0.34	30.3	12	2.91	1.01	5.00	1.19	40.9	12	0.27	0.20	0.39	0.06	22.7	12
33	Stoke Ferry	1.62	1.16	2.47	0.35	21.8	12	2.45	1.35	5.12	0.95	38.9	12	0.44	0.19	0.73	0.21	47.0	12
34	Yamer Wood	1.06	0.19	1.76	0.45	42.7	11	1.29	0.06	2.17	0.67	52.0	11	0.40	0.21	0.72	0.18	43.8	11
83	Barcombe Mills	1.64	0.86	3.13	0.56	34.5	12	2.07	1.28	3.03	0.56	27.1	12	0.39	0.22	0.84	0.18	47.1	12
40	Sutton Bonington	2.21	1.32	3.31	0.56	25.2	12	4.12	1.57	10.04	2.63	63.9	12	0.40	0.21	0.66	0.14	34.8	12
45	Lough Navar	0.34	0.17	0.82	0.22	65.8	12	0.39	0.03	1.10	0.33	84.2	12	0.13	0.07	0.21	0.05	37.1	12
70	Cwmystwyth	0.82	0.43	1.48	0.31	38.5	12	1.35	0.23	2.37	0.74	55.1	12	0.33	0.21	0.57	0.11	32.1	12

**Table 4.2: Summary of Statistics for Monthly Measurements of Acidic Aerosols in 2003 (Jan – Dec 2003).**

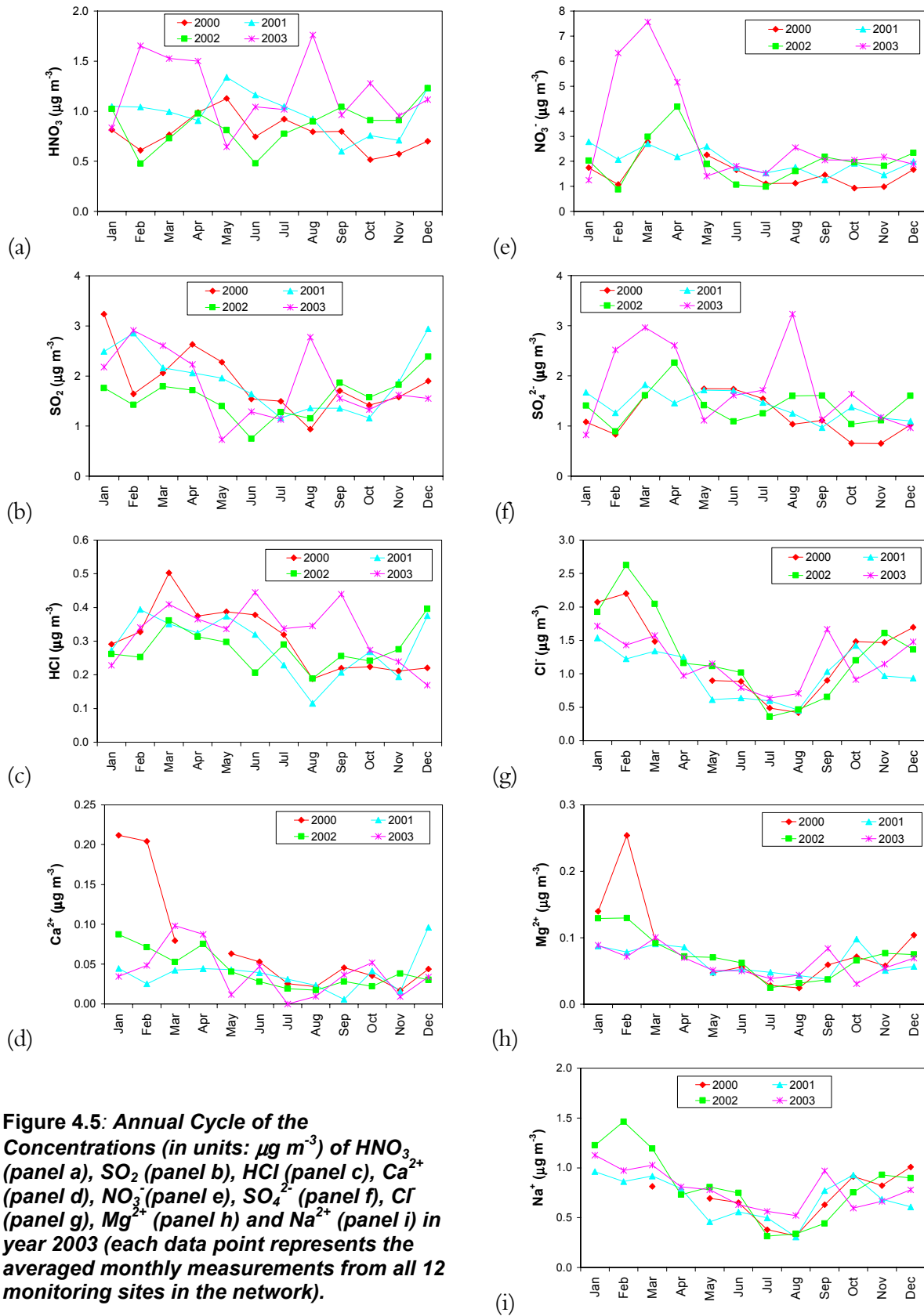
No.	Name	Nitrate: $\mu\text{g NO}_3^- \text{ m}^{-3}$						Sulphate: $\mu\text{g SO}_4^{2-} \text{ m}^{-3}$						Chloride: $\mu\text{g Cl}^- \text{ m}^{-3}$					
		Mean	Min	Max	SD	CV (%)	N	Mean	Min	Max	SD	CV (%)	N	Mean	Min	Max	SD	CV (%)	N
1	Bush OTC	2.45	0.56	7.05	2.35	96.2	12	1.54	0.46	2.86	0.95	61.7	12	0.98	0.53	1.31	0.22	22.4	12
21	Glensaugh	1.79	0.32	5.75	1.71	95.3	12	1.00	0.25	2.21	0.66	65.7	12	0.93	0.19	3.04	0.72	77.7	12
24	Rothamsted	5.06	2.42	13.12	3.18	62.8	12	2.73	1.09	6.36	1.53	56.1	12	1.25	0.50	2.67	0.59	46.9	12
30	Strathvaich Dam	0.69	0.15	2.24	0.78	111.8	12	0.82	0.31	1.99	0.52	63.2	12	0.91	0.32	1.42	0.34	37.3	12
31	Eskdalemuir	1.51	0.26	4.41	1.32	87.9	11	1.34	0.29	2.66	0.76	57.1	11	0.86	0.56	1.19	0.19	22.5	11
32	High Muffles	3.25	1.13	7.80	2.29	70.5	12	1.79	0.92	3.21	0.79	44.4	12	1.10	0.62	1.60	0.37	33.2	12
33	Stoke Ferry	4.49	1.90	8.82	2.45	54.7	12	2.28	0.68	5.15	1.15	50.4	12	1.07	0.50	2.20	0.58	54.1	12
34	Yamer Wood	3.31	0.68	10.74	2.87	86.8	11	2.16	0.87	5.21	1.35	62.6	11	1.65	0.66	2.91	0.76	45.9	11
83	Barcombe Mills	4.32	2.26	11.33	2.84	65.7	11	2.62	1.36	6.42	1.46	55.9	11	1.63	0.50	3.05	0.82	50.3	11
40	Sutton Bonington	4.42	1.54	9.78	2.68	60.6	12	2.30	1.32	3.88	0.78	34.1	12	1.35	0.28	2.82	0.78	58.0	12
45	Lough Navar	1.73	0.44	5.63	1.90	110.1	12	1.22	0.57	2.44	0.64	52.6	12	1.17	0.60	1.73	0.38	32.9	12
70	Cwmystwyth	2.70	0.99	7.63	2.02	74.9	12	1.78	0.83	4.02	0.97	54.4	12	1.30	0.49	1.90	0.39	29.9	12

**Table 4.3: Summary of Statistics for Monthly Measurements of Base Cations in 2003 (Jan – Dec 2003).**

No.	Name	Calcium: $\mu\text{g Ca}^{2+} \text{ m}^{-3}$						Magnesium: $\mu\text{g Mg}^{2+} \text{ m}^{-3}$						Sodium: $\mu\text{g Na}^+ \text{ m}^{-3}$					
		Mean	Min	Max	SD	CV (%)	N	Mean	Min	Max	SD	CV (%)	N	Mean	Min	Max	SD	CV (%)	N
1	Bush OTC	-0.05	-0.16	0.03	0.06	-127.3	12	0.02	0.00	0.04	0.01	61.3	12	0.64	0.47	0.77	0.11	16.9	12
21	Glensaugh	-0.17	-1.49	0.02	0.42	-248.9	12	0.04	-0.01	0.08	0.03	58.2	12	0.70	0.14	1.88	0.44	63.0	11
24	Rothamsted	0.05	-0.03	0.13	0.06	115.6	12	0.06	0.04	0.11	0.02	35.4	12	0.86	0.50	1.42	0.26	30.5	12
30	Strathvaich Dam	0.02	-0.04	0.14	0.05	192.3	12	0.05	0.03	0.08	0.02	32.7	12	0.62	0.37	0.83	0.17	26.6	12
31	Eskdalemuir	0.03	-0.08	0.13	0.05	167.5	12	0.05	0.02	0.08	0.02	41.4	11	0.65	0.42	0.99	0.19	29.3	11
32	High Muffles	0.04	-0.06	0.10	0.05	141.9	12	0.06	0.03	0.09	0.02	37.0	12	0.73	0.43	1.03	0.23	31.1	12
33	Stoke Ferry	0.06	-0.07	0.13	0.06	104.5	12	0.06	0.02	0.12	0.03	52.5	12	0.77	0.47	1.39	0.30	38.7	12
34	Yamer Wood	0.05	-0.03	0.15	0.05	99.9	12	0.08	0.04	0.17	0.04	42.2	11	1.05	0.51	1.63	0.35	33.4	11
83	Barcombe Mills	0.07	0.03	0.13	0.03	43.3	12	0.09	0.02	0.16	0.04	41.3	11	1.04	0.38	1.75	0.42	40.5	11
40	Sutton Bonington	0.08	-0.05	0.23	0.07	86.0	12	0.08	0.03	0.15	0.04	53.7	12	0.82	0.43	1.36	0.33	40.2	12
45	Lough Navar	0.06	0.01	0.11	0.04	69.0	12	0.07	0.02	0.11	0.03	41.6	12	0.75	0.36	1.13	0.24	31.3	12
70	Cwmystwyth	0.06	0.02	0.11	0.03	45.0	12	0.08	0.04	0.13	0.03	33.5	12	0.88	0.34	1.47	0.29	32.8	12

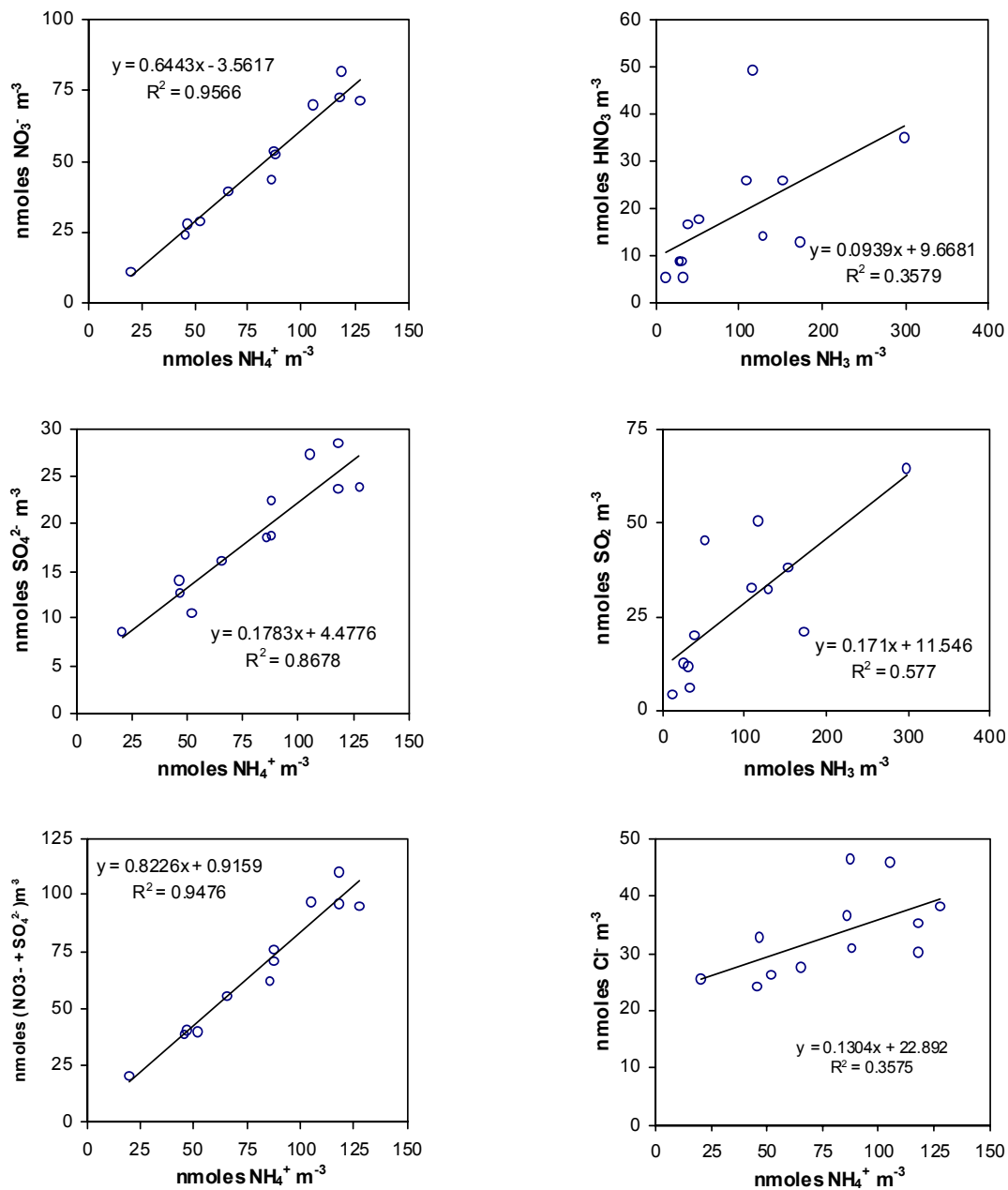


Figure 4.5 shows the annual cycle in the concentrations of the 3 gas-phase and the 6 aerosol components, as monthly network average concentrations, for the years 2000 through to 2003.



**Figure 4.5: Annual Cycle of the Concentrations (in units:  $\mu\text{g m}^{-3}$ ) of  $\text{HNO}_3$  (panel a),  $\text{SO}_2$  (panel b),  $\text{HCl}$  (panel c),  $\text{Ca}^{2+}$  (panel d),  $\text{NO}_3^-$  (panel e),  $\text{SO}_4^{2-}$  (panel f),  $\text{Cl}^-$  (panel g),  $\text{Mg}^{2+}$  (panel h) and  $\text{Na}^+$  (panel i) in year 2003 (each data point represents the averaged monthly measurements from all 12 monitoring sites in the network).**

Scatter plots of the concentration of gas and aerosol phases of the different components show that there are significant spatial correlations between the concentrations of the different pollutants (Figure 4.6)<sup>3</sup>.



**Figure 4.6: Scatter plots of showing the relationships between concentrations of  $\text{HNO}_3$ ,  $\text{SO}_2$ ,  $\text{NH}_3$ ,  $\text{NO}_3^-$ ,  $\text{SO}_4^{2-}$  and  $\text{NH}_4^+$  from the monthly measurements at 12 sites (units:  $\text{nmol m}^{-3}$ ).**

The comparison of the gas phase concentrations shows that there is more  $\text{NH}_3$  than either  $\text{SO}_2$  or  $\text{HNO}_3$  at these sites (on molar basis), while  $\text{SO}_2$  is in excess over  $\text{HNO}_3$ . The correlations are highest for the aerosol components. This reflects the longer residence time of these measurements leading to more representative sampling, as well as the close coupling between

<sup>3</sup> The  $\text{NH}_3$  and  $\text{NH}_4^+$  measurements are made under a separate contract *Ammonia Monitoring in the UK* (EPG 1/3/136), let by DEFRA to CEH Edinburgh. The measurements are reported under that contract, but are available from the CARA website at the address: <http://www.nbu.ac.uk/cara/UKNAMN/UKNAMN.htm>.

acidic and basic aerosol components. As with the gases, reduced nitrogen ( $\text{NH}_4^+$ ) is in molar excess over  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$ . However, aerosol  $\text{NO}_3^-$  is in molar excess over  $\text{SO}_4^{2-}$  and is even somewhat larger in terms of equivalents of  $\text{H}^+$ .

### 4.3.3 The 2003 Maps

Interpolated concentration fields for 2003 across the UK from the 12 monitoring sites are shown in Figure 4.7. A bilinear interpolation procedure was used to provide the mean concentration field at a grid resolution of 10 km x 10 km. The spatial distributions of  $\text{HNO}_3$  and  $\text{NO}_3^-$  are seen to be rather different to that of  $\text{HCl}$  and  $\text{Cl}^-$ . Both the nitrogen species are largest in central and south east England, with the lowest concentrations of  $\text{HNO}_3$  in Scotland and Northern Ireland.  $\text{HNO}_3$  is seen to be more spatially variable than  $\text{NO}_3^-$  aerosol, reflecting the long atmospheric residence time of the latter, although detail in the spatial concentration field is necessarily limited by measurements from 12 sites.

Figure 4.7 shows the distribution of annual mean  $\text{SO}_2$  concentrations for 2003. The largest annual concentrations of  $4.1 \mu\text{g m}^{-3}$  occurred at the Sutton Bonington site, derived from the DELTA measurements. It should be noted that a separate DEFRA network is dedicated to measurement of  $\text{SO}_2$  concentrations.  $\text{SO}_2$  concentrations generally decreased towards the West and North of the UK, with the lowest concentrations of  $< 0.5 \mu\text{g SO}_2 \text{ m}^{-3}$  in northern Scotland.  $\text{SO}_2$  is seen to be more spatially variable than  $\text{SO}_4^{2-}$  aerosol, reflecting the long atmospheric residence time of the latter.

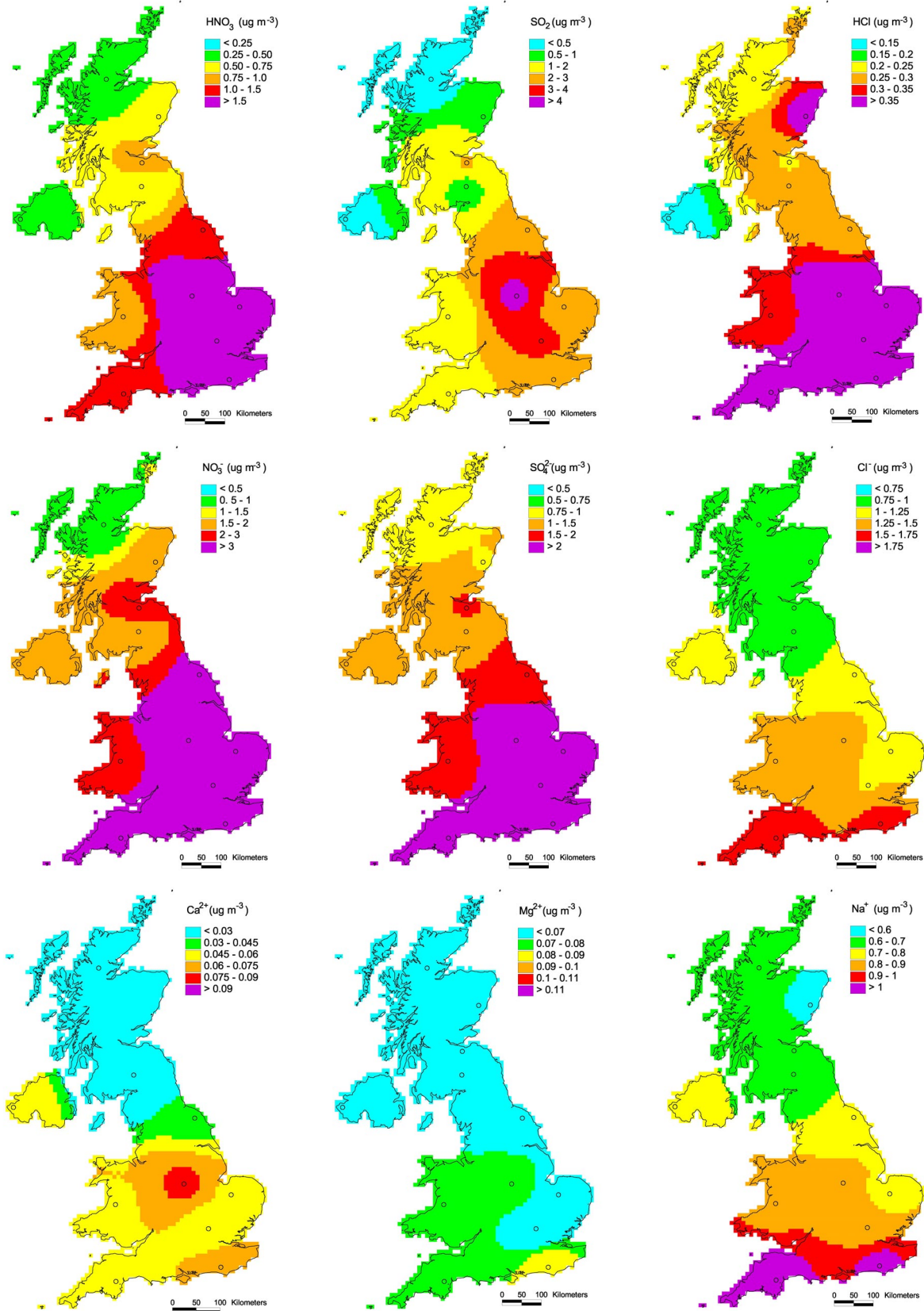
$\text{HCl}$  and  $\text{Cl}^-$  concentrations are largest in the south east and south west of England (Barcombe Mills, Yarner Wood) (see Figure 4.7). The distribution may reflect the dual contribution to atmospheric  $\text{Cl}^-$  from anthropogenic and marine sources. The highest  $\text{HCl}$  concentrations in the south may be derived from emission or reaction of sea salt with  $\text{HNO}_3$  to produce  $\text{HCl}$ . In contrast, the larger concentration of  $\text{Cl}^-$  in the south west probably reflects a marine contribution to the aerosol.

The concentrations of base cations vary greatly depending on the species – but concentrations tend to be highest in the southern parts of Britain (see Figure 4.7).

## 4.4 DISCUSSION

Monthly values from the 12 sites provided a basic estimate of the spatial variability of these components across the UK, as well as their main seasonal and inter-annual trends.

The main features of the spatial distribution in the pollutants measured are shown in the annual maps (Figure 4.7). It should be noted that the maps of the acid gas and aerosol concentrations shown in Figure 4.7 are constructed using bi-linear interpolation. This is because the number of sites is not sufficient to permit more sophisticated interpolation methods (e.g. krigging) and provides no estimate of uncertainty in the interpolation. It is clear, however, from the maps that each part of the country is fully dependent on only one point in the interpolation and that, while there is a high correlation between the pollutants measured at the sites, there are major differences in concentrations between all adjacent sites. It is clear therefore, that the present network of 12 sites is an absolute minimum and that an increase in site density would be warranted. Such an increase (e.g., to 20-30 sites) would allow interpolation uncertainties to be quantified and could also be expected to change the estimates of regional dry deposition



**Figure 4.7: Spatial patterns of the concentrations of HNO<sub>3</sub>, SO<sub>2</sub>, HCl and of aerosol NO<sub>3</sub><sup>-</sup>, SO<sub>4</sub><sup>2-</sup>, Cl<sup>-</sup>, Ca<sup>2+</sup>, Mg<sup>2+</sup> and Na<sup>+</sup> concentrations in the UK from the averaged monthly measurements (Jan-03 to Dec-03).**

budgets. For example, with the current UK dry deposition of  $\text{HNO}_3$  at  $\sim 60 \text{ kt N yr}^{-1}$  there could easily be errors of  $20 \text{ kt N yr}^{-1}$  due to use of only 12 sites in the present network.

The monthly site data provide information on the overall seasonal behaviour of the different pollutants. Figure 4.4 presents the monthly changes at each site, and after four full years of monitoring, the seasonal trends are clearly distinctive and replicated for each site. Figure 4.5 shows the average seasonal changes for 2000 to 2003 from all of the sites, and indicates more clearly the main differences for the pollutants.  $\text{HNO}_3$ ,  $\text{HCl}$  and  $\text{NO}_3^-$  have a maximum during late spring and early summer, which may reflect the importance of photochemical production processes. Conversely,  $\text{SO}_2$ ,  $\text{Na}^+$  and  $\text{Cl}^-$  have maxima during winter, reflecting the importance of combustion processes for  $\text{SO}_2$  and marine sources in winter for sea salt.

## 5. Other Activities

### 5.1 COMPARISON OF SINGLE WEEK VERSUS FORTNIGHTLY BULK RAINWATER SAMPLING

To assess whether the switch from single week to fortnightly sampling had any effect on sampling performance an intercomparison exercise was initiated at the end of 2001 and is on-going. Preliminary results from this intercomparison were presented in the 2002 data report (using available results from the start of sampling to August 2003, see Hayman *et al.*, 2004). The intercomparison is on going and the results will be presented formally when the single week samplers are finally withdrawn from use at the end of the 2004.

### 5.2 EMEP INTERCOMPARISONS

An important data quality assessment is organised annually by the Chemical Co-ordinating Centre (CCC) at the Norwegian Institute for Air Research (NILU). Each July samples are sent to about 36 analytical laboratories in Europe and about 25 other internationally recognised analytical laboratories. The intercomparison exercise is required as part of the EMEP Programme - such a fundamental check on analytical performance is essential if response to emission reductions can be observed consistently throughout Europe.

The 22<sup>nd</sup> EMEP laboratory intercomparison is currently in progress with the analytical measurements made and submitted to EMEP. The results of the intercomparison will be reported in due course.

## 6. References

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We would like to acknowledge the dedication and contribution of the network manager Sandra Hasler (AEA Technology) who was involved in the monitoring programme until March 2003.

# Appendices

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# Appendix 1

## Bulk Precipitation Data, 2003

- 1.1 Fortnightly Measurements
- 1.2 Weekly Measurements

# Appendix 1.1: Bulk Precipitation Data, 2003 - Fortnightly Measurements

## Notes to Appendix 1.1

There are two pages of information for each site. The first includes site characteristics, time and seasonal trends; the second page presents individual concentrations for all samples collected (including those samples contaminated with bird strike). Also included are the Ordnance Survey co-ordinates, latitude and longitude and altitude of the site and the average rainfall for the 5 x 5 km square containing the site for the years 1941 to 1970.

Abbreviations for monitoring equipment, which also includes co-located sampling instrumentation, are given below:

- WOC Wet-only collector for daily measurement of rainfall composition
- DT Monthly diffusion tube. Measurement for nitrogen dioxide
- Daily SO<sub>2</sub> Daily measurements of SO<sub>2</sub> by hydrogen peroxide bubbler and of particulate sulphate on a Whatman 40 filter with ion chromatographic analysis
- Weekly SO<sub>2</sub> Weekly measurements of SO<sub>2</sub> by hydrogen peroxide bubbler with ion chromatographic analysis
- ozone Hourly measurements surface ozone
- SO<sub>2</sub> Hourly measurements of SO<sub>2</sub>
- NO<sub>x</sub> Hourly measurements of NO<sub>x</sub>
- HNO<sub>3</sub> Monthly measurements of nitric acid, sulphur dioxide, hydrogen chloride  
Denuder and acid and base aerosol components using the CEH DELTA samplers
- Met Meteorological measurements.
- UKAWMN Catchment monitored by the UK Acid Waters Monitoring Network.
- EMEP Daily data from this site are made available to EMEP

In the tables of data, a '-' indicates a missing value. A dry week is indicated by a complete row of '-'. Some weeks only have rainfall volumes reported; this is because no analyses were carried out on very low volume rainfall samples or on samples that were visibly contaminated. Individual ion concentrations or conductivities are missing for some low volume weeks, due to there being insufficient sample for complete analysis. A '< Value' indicates that the concentration was less than the detection limit of the analysis. Annual precipitation-weighted mean concentrations and rainfall total are included at the bottom of the table.

A phosphate concentration was also determined for each rainwater sample. A phosphate concentration > 0.1 mg P l<sup>-1</sup> (or > 9.7 µeq l<sup>-1</sup>) was taken as evidence of contamination by birds. Although all these samples have been included in the tables, they were not included in the calculation of annual means. The rainfall totals presented in Appendix 2, Table 10 include all samples collected and are therefore sometimes higher than the totals presented in this section.

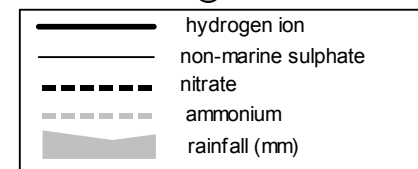
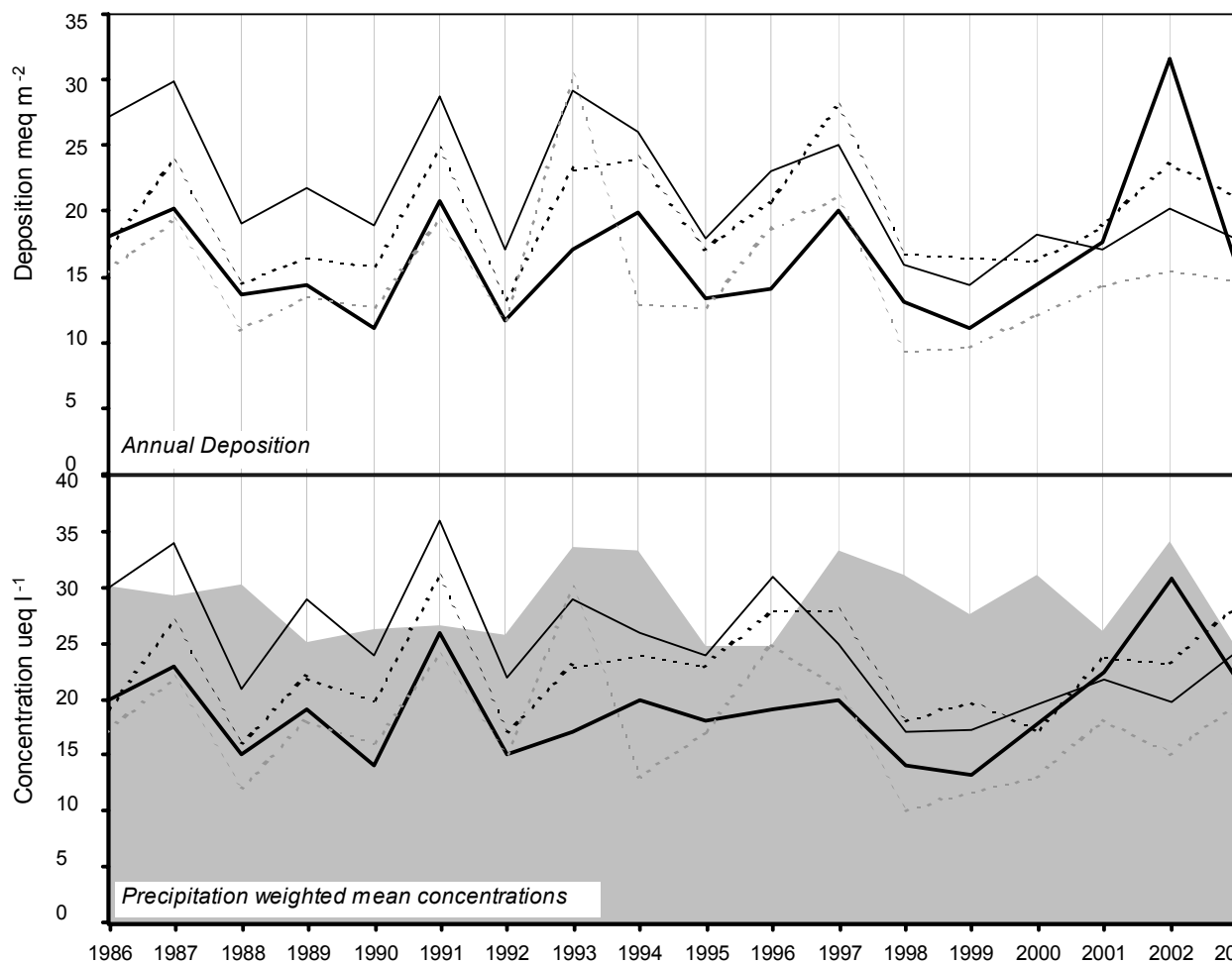
# Goonhilly

**2003** Site Code: **5003**  
 Easting: **1723**  
 Northing: **214**  
 Latitude: **50 02 54 N**  
 Longitude: **05 10 52 W**  
 Altitude (m): **108**  
 Rainfall (mm): **973**  
 [30 year mean 1940 - 1971]

Site Environment:  
**Open moorland, Satellite tracking station**

Other measurements:  
**DT**

Site Operator:  
**British Telecom**



long-term trends in concentration (+x = increase; -x = decrease)	
<i>hydrogen ion</i>	0.21 ueq/l (1.17 %/year): 17 years' data - No significant trend detected
<i>non-marine sulphate</i>	-0.60 ueq/l (-1.99 %/year): 18 years' data + Significant trend detected
<i>nitrate</i>	0.13 ueq/l (0.63 %/year): 18 years' data - No significant trend detected
<i>ammonium</i>	-0.15 ueq/l (-0.81 %/year): 18 years' data - No significant trend detected

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### 5003 Goonhilly

Sampling	pH	SO4	NO3	NH4	Na	Mg	Ca	Cl	K	PO4	nss-SO4	H	conductivity	rainfall
Start Date	End Date	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µS/cm)	(mm)
02/01/03	15/01/03	4.8	224.2	184.1	89.2	1431.9	307.3	96.2	1532.7	34.2	5.0	17.4	244.0	4.6
15/01/03	30/01/03	5.3	26.6	18.0	37.3	53.0	7.0	56.9	1.6	<1.0	20.2	4.9	16.0	60.8
30/01/03	18/02/03	4.8	45.3	10.5	5.1	315.8	66.3	13.2	333.6	7.7	<1.0	7.3	14.5	33.8
18/02/03	26/02/03	4.8	126.3	102.4	110.3	507.0	114.6	43.6	561.3	14.0	<1.0	65.3	14.8	116.6
26/02/03	12/03/03	5.1	46.7	13.1	10.7	270.7	59.1	21.0	301.3	5.7	<1.0	14.1	8.3	3.9
12/03/03	27/03/03	6.5	505.1	927.5	728.0	1816.0	395.5	375.8	1822.0	45.2	<1.0	286.3	0.3	2.6
27/03/03	10/04/03	5.7	144.4	214.5	236.9	334.5	74.1	74.8	340.3	8.7	<1.0	104.1	1.9	3.9
10/04/03	24/04/03	6.8	197.5	144.0	563.2	249.6	67.5	133.2	244.7	68.6	190.0	167.4	0.2	17.3
24/04/03	07/05/03	4.4	56.7	19.0	10.1	259.5	56.2	15.3	285.9	4.8	<1.0	25.4	38.0	20.6
07/05/03	21/05/03	4.4	44.3	15.2	5.7	165.3	35.9	13.4	181.4	3.2	<1.0	24.4	39.8	49.9
21/05/03	04/06/03	4.4	69.6	31.4	17.3	158.5	38.7	16.1	169.4	3.4	<1.0	50.5	41.7	19.5
04/06/03	23/04/03	4.3	66.3	38.8	12.8	172.8	40.2	29.4	178.6	3.8	<1.0	45.5	44.7	31.6
23/06/03	02/07/03	4.4	23.8	21.0	15.8	36.4	8.6	13.4	38.3	0.9	<1.0	19.4	39.8	42.7
02/07/03	18/07/03	4.4	52.3	48.8	41.3	26.3	8.3	29.0	21.3	1.7	<1.0	49.1	36.3	32.3
18/07/03	31/07/03	4.5	24.0	7.3	<0.7	114.3	24.3	6.3	123.6	2.3	<1.0	10.2	31.6	61.5
31/07/03	14/08/03	4.1	57.3	46.2	5.5	101.9	26.3	46.6	95.6	3.3	<1.0	45.0	75.9	4.4
14/08/03	26/08/03	5.6	108.5	84.0	164.6	182.7	39.0	20.7	182.2	27.1	84.3	86.5	2.3	18.3
26/08/03	10/09/03	6.2	44.5	34.6	162.1	78.0	13.5	5.6	84.3	21.5	30.2	35.1	0.7	30.6
10/09/03	03/10/03	7.4	218.0	135.3	1285.0	366.8	66.2	24.9	385.2	91.5	205.2	173.8	0.0	23.8
03/10/03	08/10/03	5.7	96.8	14.5	19.7	708.3	154.6	38.9	801.5	14.4	<1.0	11.5	2.1	9.5
08/10/03	22/10/03	4.5	187.7	243.6	162.5	868.7	184.5	75.8	945.5	19.8	<1.0	83.1	30.9	8.0
22/10/03	07/11/03	5.0	33.5	14.4	2.4	233.8	48.5	11.7	249.3	4.3	<1.0	5.3	9.3	68.4
07/11/03	19/11/03	-	-	-	-	-	-	-	-	-	-	-	-	0.0
19/11/03	05/12/03	4.8	41.6	19.7	5.4	176.1	36.8	7.9	185.0	4.0	<1.0	20.4	16.2	42.6
05/12/03	23/12/03	4.8	52.6	27.4	12.2	329.1	68.5	20.8	336.0	6.9	<1.0	13.0	16.6	46.6
23/12/03	31/12/03	5.8	53.6	11.2	0.4	299.7	61.2	30.1	327.2	11.6	<1.0	17.5	1.7	24.5
31/12/03	14/01/04	5.1	23.3	3.9	2.5	290.2	62.6	13.6	161.7	6.0	<1.0	-	8.1	69.4
Precipitation-weighted annual mean for site (samples containing phosphate are excluded)														Total rainfall
5003		47.2	28.5	19.8	222.8	47.8	18.7	221.8	5.1	-	24.2	21.8	44.3	742.7

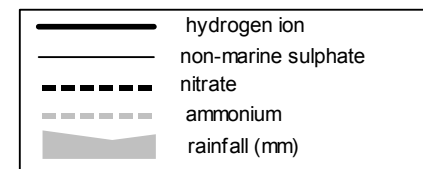
# Yarner Wood

**2003** Site Code: 5008  
 Easting: 2786  
 Northing: 789  
 Latitude: 50 35 48 N  
 Longitude: 03 42 56 W  
 Altitude (m): 119  
 Rainfall (mm): 1377  
 [30 year mean 1940 - 1971]

Site Environment:  
 Open moorland, nature reserve

Other measurements:  
 DT, Daily SO<sub>2</sub>, Daily SO<sub>4</sub>, HNO<sub>3</sub> Denuder, ozone, EMEP

Site Operator:  
 English Nature



long-term trends in concentration (+x = increase; -x = decrease)	
<i>hydrogen ion</i>	0.10 ueq/l (0.64 %/year): 17 years' data - No significant trend detected
<i>non-marine sulphate</i>	-0.71 ueq/l (-2.38 %/year): 18 years' data ++ Moderately strong trend detected
<i>nitrate</i>	0.01 ueq/l (0.06 %/year): 18 years' data - No significant trend detected
<i>ammonium</i>	-0.15 ueq/l (-0.71 %/year): 18 years' data - No significant trend detected

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### 5008 Yarner Wood

Sampling	pH	SO4	NO3	NH4	Na	Mg	Ca	Cl	K	PO4	nss-SO4	H	conductivity	rainfall	
Start Date	End Date	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µS/cm)	(mm)	
02/01/03	15/01/03	4.0	181.5	164.6	84.2	723.0	165.1	45.3	779.4	17.2	<1.0	94.4	100.0	168.0	3.1
15/01/03	29/01/03	4.8	31.0	8.0	8.6	188.7	40.9	8.8	217.5	3.9	<1.0	8.2	16.6	36.0	53.7
29/01/03	12/02/03	5.3	27.5	6.6	10.4	186.7	38.6	8.6	207.2	4.0	<1.0	5.0	5.6	32.0	48.7
12/02/03	26/02/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
26/02/03	12/03/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
12/03/03	25/03/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
25/03/03	08/04/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
08/04/03	22/04/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
22/04/03	05/05/03	4.5	35.6	23.1	26.9	67.5	15.6	8.8	80.5	1.5	<1.0	27.4	33.1	23.0	104.4
06/05/03	20/05/03	4.7	34.6	17.3	18.8	110.8	25.1	9.7	122.5	4.1	<1.0	21.3	20.9	28.0	31.0
20/05/03	04/06/03	4.5	63.0	44.3	23.6	87.7	23.3	32.2	87.1	4.0	<1.0	52.5	34.7	37.0	4.9
04/06/03	17/06/03	4.1	44.9	24.3	16.1	41.8	9.9	7.3	41.7	1.1	<1.0	39.9	87.1	26.0	30.3
17/06/03	01/07/03	6.1	70.4	69.2	104.9	41.5	12.2	40.3	40.8	3.3	<1.0	65.4	0.9	29.0	14.2
01/07/03	15/07/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.1
15/07/03	29/07/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
29/07/03	12/08/03	4.6	23.0	10.6	4.8	29.9	4.0	12.4	36.2	8.1	<1.0	19.4	26.9	21.0	2.5
12/08/03	26/08/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
26/08/03	09/09/03	5.6	35.6	48.9	69.2	33.1	10.0	20.1	29.2	1.2	9.6	31.7	2.8	20.0	5.4
09/09/03	22/09/03	6.7	75.8	48.9	260.3	203.7	38.4	32.9	184.4	24.8	79.6	51.3	0.2	68.0	6.1
22/09/03	21/10/03	4.7	177.2	211.1	163.7	339.1	76.1	60.8	231.6	10.1	<1.0	136.4	20.0	-	7.1
21/10/03	04/11/03	4.9	18.0	8.9	0.8	92.9	19.0	6.5	104.7	2.1	<1.0	6.9	12.9	20.0	79.9
04/11/03	18/11/03	4.3	64.7	42.8	36.0	238.5	52.5	17.3	266.6	5.6	<1.0	36.0	45.7	55.0	25.5
18/11/03	02/12/03	4.8	19.1	3.8	<0.7	41.9	9.4	3.5	42.7	1.2	<1.0	14.1	15.1	14.0	86.3
02/12/03	16/12/03	4.7	7.1	9.0	17.8	55.3	13.1	6.9	17.9	1.7	<1.0	0.4	21.9	20.0	18.3
16/12/03	30/12/03	4.8	28.9	12.4	11.4	137.9	31.2	7.6	165.4	3.2	<1.0	12.3	15.5	29.0	52.0
30/12/03	10/01/04	5.0	28.0	10.7	7.4	120.3	23.8	7.5	140.1	2.0	<1.0	13.5	10.5	21.0	94.0
Precipitation-weighted annual mean for site (samples containing phosphate are excluded)														Total rainfall	
5008			32.6	18.0	16.5	111.2	24.1	9.5	123.3	2.6	-	19.2	21.7	25.8	667.6

# Barcombe Mills

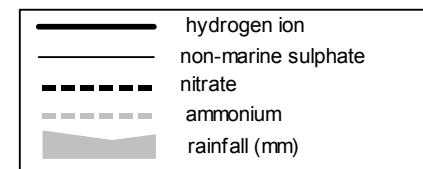
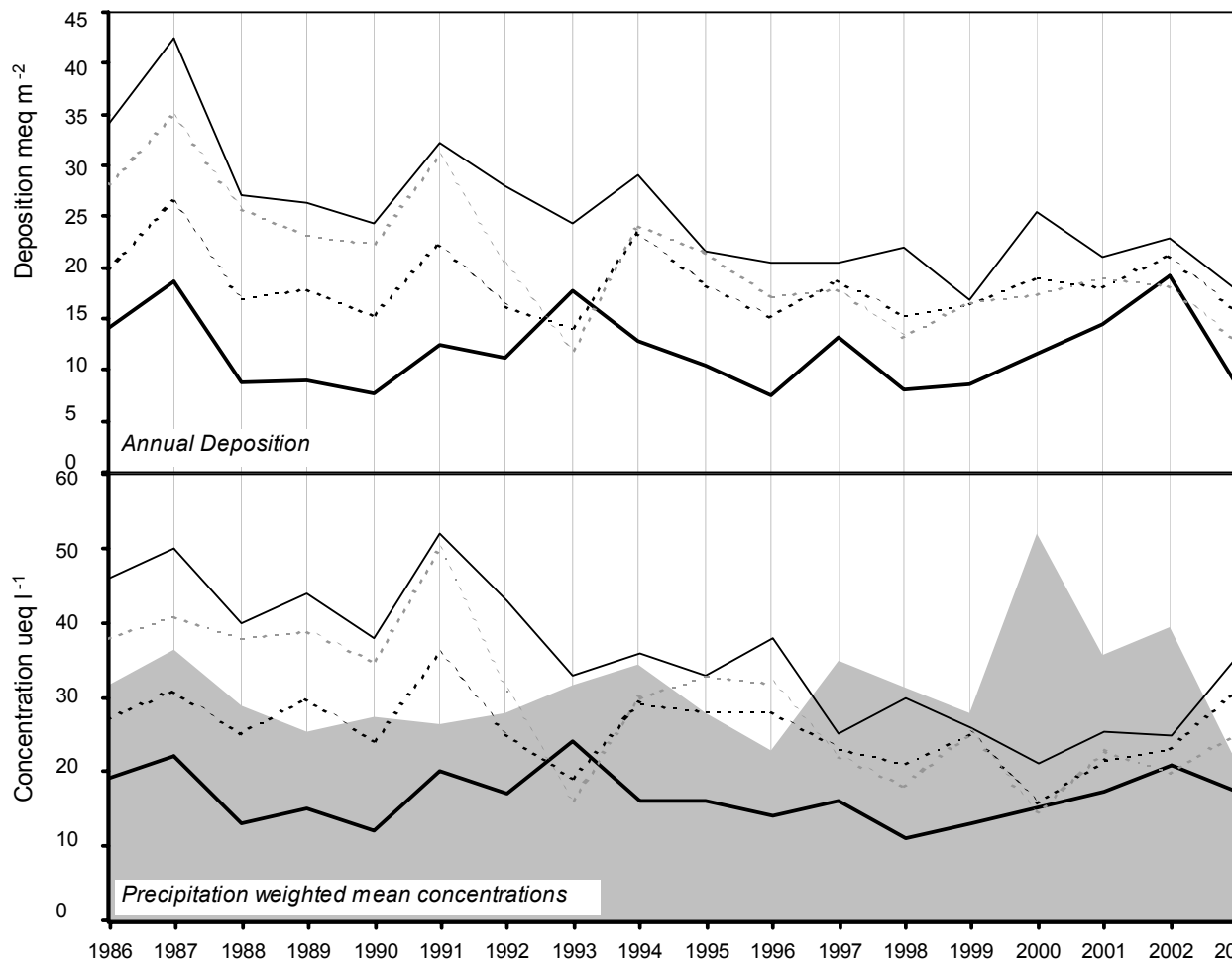
**2003**

Site Code: 5007  
 Easting: 5437  
 Northing: 1149  
 Latitude: 50 54 54 N  
 Longitude: 00 02 40 E  
 Altitude (m): 10  
 Rainfall (mm): 876  
 [30 year mean 1940 - 1971]

Site Environment:  
 Water pumping site

Other measurements:  
 DT, Daily SO<sub>2</sub>, Daily SO<sub>4</sub>, HNO<sub>3</sub> Denuder, EMEP

Site Operator:  
 South East Water plc



long-term trends in concentration (+x = increase; -x = decrease)	
<i>hydrogen ion</i>	-0.07 ueq/l (-0.39 %/year): 17 years' data - No significant trend detected
<i>non-marine sulphate</i>	-1.39 ueq/l (-2.93 %/year): 18 years' data +++ Strong trend detected
<i>nitrate</i>	-0.34 ueq/l (-1.19 %/year): 18 years' data - No significant trend detected
<i>ammonium</i>	-1.34 ueq/l (-3.28 %/year): 18 years' data ++ Moderately strong trend detected

ACID DEPOSITION DATA REPORT, 2003

**5007 Barcombe Mills**

Sampling	pH	SO4	NO3	NH4	Na	Mg	Ca	Cl	K	PO4	nss-SO4	H	conductivity	rainfall	
Start Date	End Date	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µS/cm)	(mm)	
14/01/03	28/01/03	4.6	37.8	15.1	17.9	174.5	38.4	10.7	215.4	4.1	<1.0	16.8	24.5	37.0	55.2
28/01/03	11/02/03	4.4	36.7	25.7	29.5	81.1	17.3	9.2	94.0	2.6	<1.0	27.0	38.0	26.0	22.2
11/02/03	25/02/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
25/02/03	11/03/03	6.0	62.4	35.0	46.6	135.0	29.9	49.0	148.5	4.8	<1.0	46.2	1.0	35.0	21.7
11/03/03	25/03/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
25/03/03	08/04/03	6.2	132.9	137.6	152.4	208.4	55.8	118.6	232.9	49.8	11.9	107.8	0.6	75.0	2.7
08/04/03	22/04/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
22/04/03	06/05/03	5.1	55.8	29.0	49.6	155.4	32.4	31.2	182.4	15.5	<1.0	37.1	8.5	38.0	21.6
06/05/03	20/05/03	6.5	71.0	21.5	295.5	82.1	14.4	19.1	87.5	23.9	43.8	61.2	0.3	72.0	16.5
20/05/03	02/06/03	4.5	49.7	62.8	48.2	41.4	13.6	26.0	46.9	5.0	<1.0	44.7	30.2	26.0	17.8
02/06/03	17/06/03	4.0	163.3	76.4	105.5	22.5	9.8	28.1	23.2	6.5	<1.0	160.5	100.0	60.0	8.0
17/06/03	30/06/03	6.2	123.1	133.1	191.8	70.5	26.6	113.6	81.4	16.8	13.7	114.6	0.6	59.0	9.7
30/06/03	15/07/03	5.3	181.1	149.2	213.5	64.5	27.5	70.0	75.4	34.6	20.5	173.3	5.2	71.0	2.4
15/07/03	29/07/03	5.6	93.4	45.2	13.3	46.8	21.5	45.1	62.8	58.9	<1.0	87.7	2.6	26.0	35.8
29/07/03	12/08/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
12/08/03	26/08/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
26/08/03	09/09/03	5.6	58.7	84.7	74.5	40.1	12.5	74.2	43.9	7.3	<1.0	53.9	2.8	29.0	18.4
09/09/03	24/09/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
24/09/03	15/10/03	5.5	124.5	122.0	107.7	147.5	45.6	96.1	209.7	67.0	12.8	106.8	3.0	66.0	5.4
15/10/03	29/10/03	4.9	52.6	53.3	23.8	140.2	34.8	41.7	171.2	10.8	11.3	35.7	11.5	34.0	16.9
29/10/03	12/11/03	5.0	54.6	23.8	12.2	238.3	50.8	23.1	284.1	10.5	<1.0	25.8	10.7	44.0	49.6
12/11/03	26/11/03	4.7	40.5	27.7	15.0	75.6	16.9	10.3	90.8	3.1	<1.0	31.4	20.9	24.0	94.0
26/11/03	10/12/03	4.6	61.8	40.0	29.9	277.3	61.7	16.7	359.1	6.8	<1.0	28.4	24.0	56.0	16.5
10/12/03	23/12/03	4.9	47.2	35.0	31.6	151.4	31.4	11.4	177.9	9.7	<1.0	29.0	12.6	34.0	25.0
23/12/03	07/01/04	5.0	35.0	16.0	14.2	163.1	34.9	11.2	192.2	5.3	<1.0	15.3	11.0	31.0	66.5
Precipitation-weighted annual mean for site (samples containing phosphate are excluded)														Total rainfall	
5007		51.1	31.1	25.5	130.8	29.6	21.3	156.9	10.2	-	35.3	17.3	32.9	505.7	

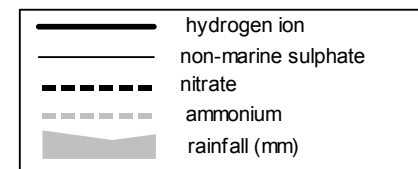
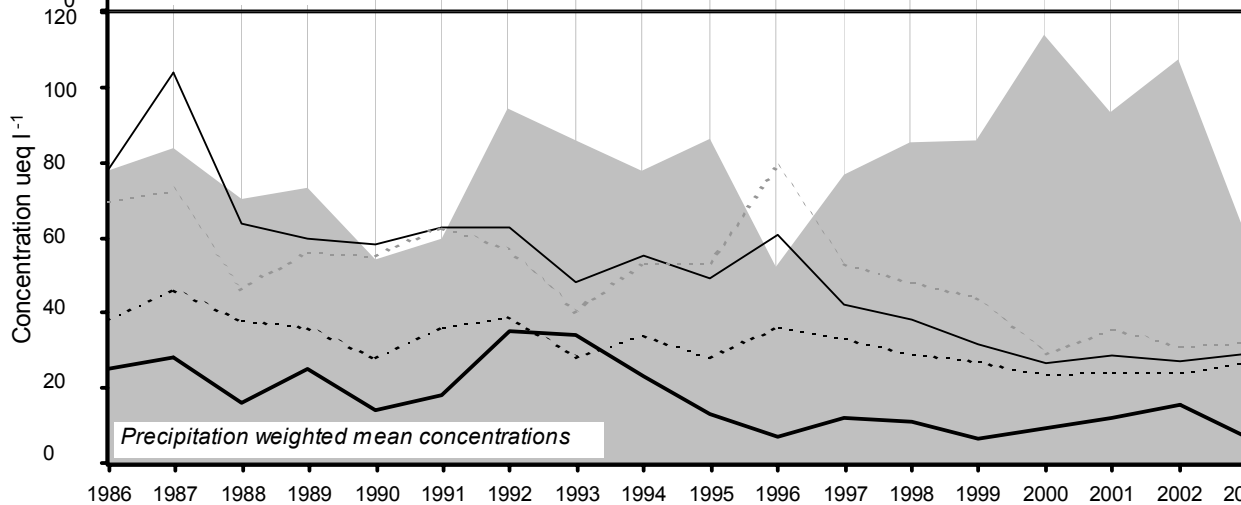
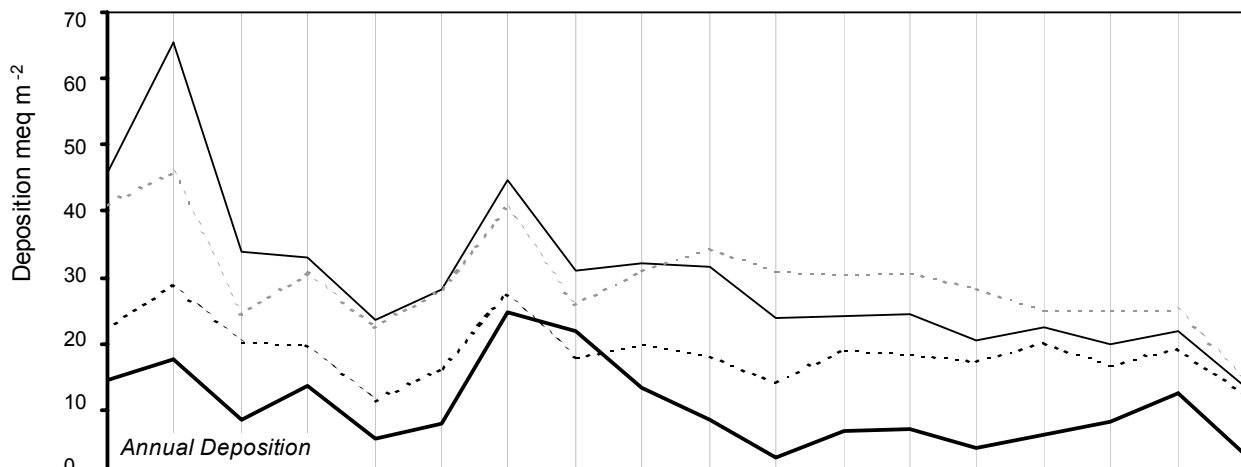
# Compton

**2003** Site Code: 5129  
 Easting: 4512  
 Northing: 1804  
 Latitude: 51 31 11 N  
 Longitude: 01 15 43 W  
 Altitude (m): 105  
 Rainfall (mm): 707  
 [30 year mean 1940 - 1971]

Site Environment:  
 Rough meadow, near pumping station

Other measurements:  
 DT

Site Operator:  
 AEA Technology plc



long-term trends in concentration (+x = increase; -x = decrease)	
<i>hydrogen ion</i>	-1.04 ueq/l (-3.96 %/year): 17 years' data + Significant trend detected
<i>non-marine sulphate</i>	-3.41 ueq/l (-4.24 %/year): 18 years' data ++++ Very strong trend detected
<i>nitrate</i>	-0.93 ueq/l (-2.34 %/year): 18 years' data +++ Strong trend detected
<i>ammonium</i>	-1.87 ueq/l (-2.79 %/year): 18 years' data ++ Moderately strong trend detected

Rainfall (mm)

ACID DEPOSITION DATA REPORT, 2003

### 5129 Compton

Sampling	pH	SO4	NO3	NH4	Na	Mg	Ca	Cl	K	PO4	nss-SO4	H	conductivity	rainfall	
Start Date	End Date	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µS/cm)	(mm)	
13/01/03	27/01/03	5.2	22.6	10.0	19.9	79.9	15.8	6.7	94.9	2.6	<1.0	13.0	6.8	19.0	35.4
27/01/03	14/02/03	5.4	27.3	12.8	27.4	75.0	14.2	14.3	79.0	2.2	<1.0	18.3	3.5	19.0	27.1
14/02/03	24/02/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
24/02/03	10/03/03	5.8	61.5	26.9	53.5	75.3	15.2	43.0	82.7	3.9	<1.0	52.4	1.7	25.0	23.5
10/03/03	24/03/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.2
24/03/03	08/04/03	6.4	63.7	50.7	85.6	70.1	19.4	111.2	78.2	6.5	<1.0	55.3	0.4	38.0	5.9
08/04/03	22/04/03	6.8	279.4	181.1	163.5	173.5	53.8	430.1	206.9	92.3	12.2	258.5	0.2	125.0	3.2
22/04/03	06/05/03	5.5	34.1	20.6	41.7	30.4	7.2	18.2	33.6	17.8	<1.0	30.4	3.2	17.0	32.7
06/05/03	19/05/03	5.9	37.0	31.0	43.3	45.3	12.0	39.7	48.3	7.2	<1.0	31.6	1.2	22.0	15.4
19/05/03	02/06/03	5.7	27.1	22.4	55.2	60.9	10.4	13.8	70.2	2.4	<1.0	19.8	1.9	20.0	19.2
02/06/03	16/06/03	5.6	31.8	20.7	36.3	18.0	5.2	17.2	11.8	5.3	<1.0	29.7	2.3	10.0	17.1
16/06/03	30/06/03	5.4	36.6	44.3	59.3	7.8	8.8	41.4	13.1	10.2	4.4	35.7	3.8	18.0	26.8
30/06/03	14/07/03	4.6	42.7	47.6	56.6	13.0	6.9	12.7	18.4	0.7	14.2	41.1	25.1	25.0	8.2
14/07/03	28/07/03	5.8	36.8	40.8	38.9	19.6	5.3	26.5	14.9	<0.3	<1.0	34.4	1.6	13.0	24.2
28/07/03	11/08/03	5.3	29.0	30.0	26.2	29.9	7.7	25.0	33.6	4.0	<1.0	25.4	4.7	15.0	3.5
11/08/03	26/08/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
26/08/03	10/09/03	6.1	74.5	82.3	77.7	41.3	12.5	94.5	44.4	3.8	<1.0	69.5	0.8	33.0	8.3
10/09/03	22/09/03	6.1	86.6	57.5	60.7	43.1	16.9	83.5	37.9	7.8	<1.0	81.4	0.9	31.0	1.2
22/09/03	23/10/03	6.4	73.6	67.1	4.3	75.1	23.4	161.9	107.7	3.5	<1.0	64.5	0.4	40.0	21.0
23/10/03	03/11/03	5.2	19.3	13.2	11.2	24.3	5.2	12.9	26.8	1.3	<1.0	16.4	6.0	10.0	35.3
03/11/03	19/11/03	5.0	88.7	40.9	71.8	212.5	47.7	31.0	236.3	5.6	<1.0	63.1	9.5	50.0	12.6
19/11/03	01/12/03	4.8	15.6	17.2	10.8	10.9	2.6	4.8	19.3	0.4	<1.0	14.3	16.6	12.0	86.7
01/12/03	15/12/03	5.0	25.9	22.3	25.1	20.6	6.0	7.1	28.6	1.2	<1.0	23.4	10.0	13.0	35.0
15/12/03	02/01/04	4.8	50.9	41.2	45.4	62.1	15.5	10.1	78.4	2.1	<1.0	43.5	17.4	25.0	23.2
Precipitation-weighted annual mean for site (samples containing phosphate are excluded)														Total rainfall	
5129		34.3	26.9	32.0	43.2	10.4	26.3	51.1	3.9	-	29.1	7.2	18.7	465.6	

# Crai Reservoir

**2003**

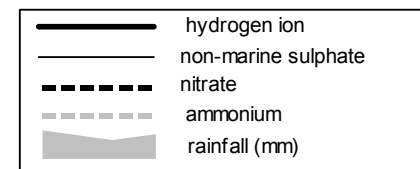
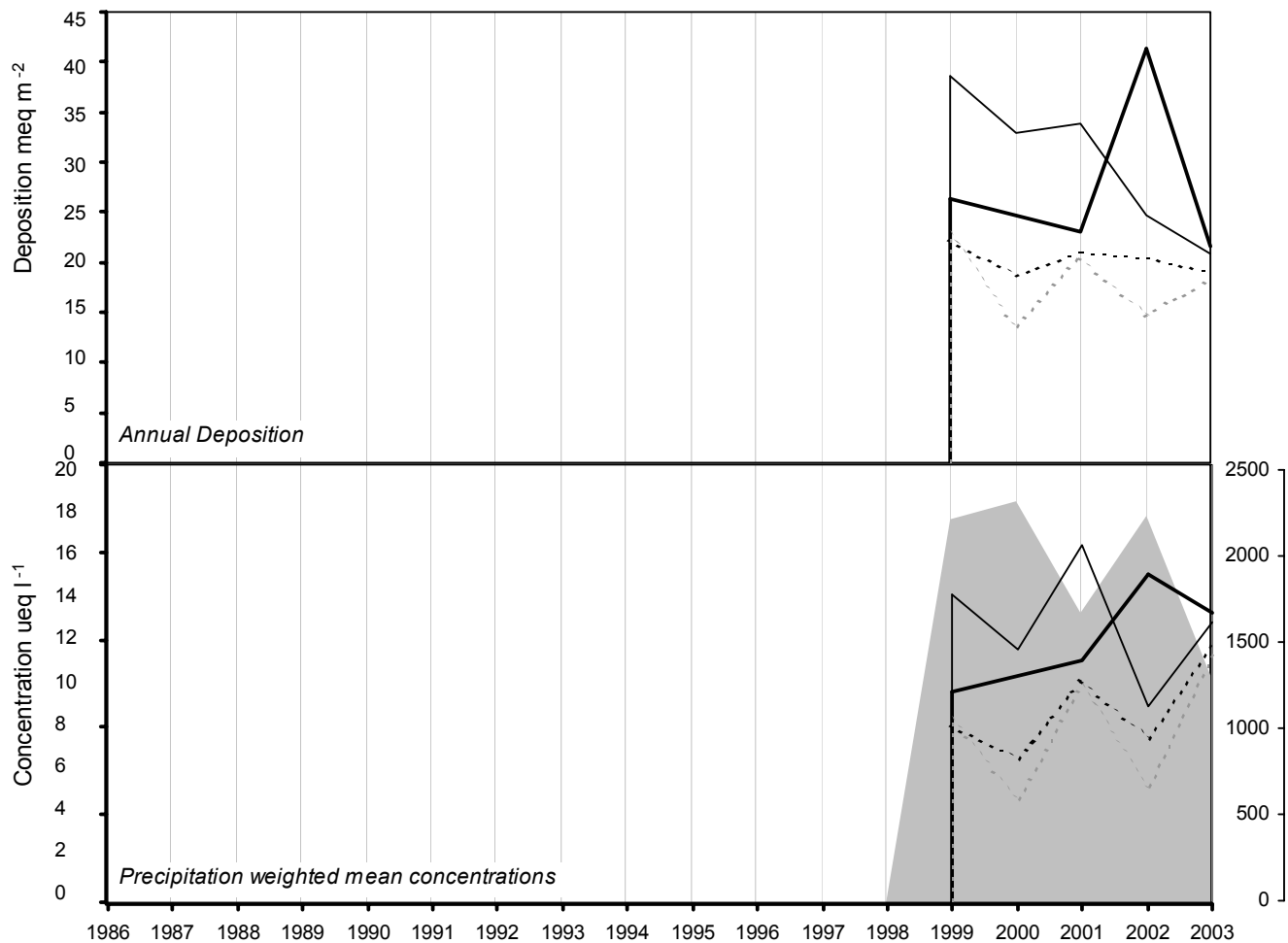
Site Code: 5154  
 Easting: 2882  
 Northing: 2219  
 Latitude: 51 53 25 N  
 Longitude: 03 37 10 W  
 Altitude (m): 310  
 Rainfall (mm): -

[30 year mean 1940 - 1971]

Site Environment:  
 Bank of Crai Reservoir in valley. Sheep grazing.

Other measurements:  
 Close to Rural SO2 site (5335)

Site Operator:  
 Welsh Water plc



long-term trends in concentration (+x = increase; -x = decrease)	
<i>hydrogen ion</i>	0.00 ueq/l (0.00 %/year): 4 years' data n/a Insufficient Data
<i>non-marine sulphate</i>	0.00 ueq/l (0.00 %/year): 4 years' data n/a Insufficient Data
<i>nitrate</i>	0.00 ueq/l (0.00 %/year): 4 years' data n/a Insufficient Data
<i>ammonium</i>	0.00 ueq/l (0.00 %/year): 4 years' data n/a Insufficient Data

ACID DEPOSITION DATA REPORT, 2003

### 5154 Crai Reservoir

Sampling	pH	SO4	NO3	NH4	Na	Mg	Ca	Cl	K	PO4	nss-SO4	H	conductivity	rainfall	
Start Date	End Date	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µS/cm)	(mm)	
03/01/03	20/01/03	4.5	28.9	13.9	11.0	106.9	23.8	6.3	120.8	2.4	<1.0	16.0	34.7	27.0	63.2
20/01/03	14/02/03	5.0	31.1	8.2	9.8	203.9	45.3	13.5	225.1	4.3	<1.0	6.5	11.0	35.0	120.6
14/02/03	28/02/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
28/02/03	14/03/03	4.7	27.8	6.9	3.1	126.9	27.8	9.2	144.4	3.1	<1.0	12.5	20.4	28.0	107.5
14/03/03	28/03/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.5
28/03/03	14/04/03	5.6	35.0	29.8	34.0	76.4	17.7	24.4	82.0	2.5	<1.0	25.8	2.5	21.0	21.1
14/04/03	25/04/03	6.1	74.7	102.1	135.9	38.4	10.8	44.7	32.8	4.6	<1.0	70.1	0.7	34.0	17.0
25/04/03	09/05/03	4.9	22.3	9.1	9.0	65.1	14.2	7.2	71.5	1.3	<1.0	14.4	12.9	18.0	137.7
09/05/03	23/05/03	4.7	27.9	7.6	5.7	94.8	20.7	6.5	107.5	1.8	<1.0	16.5	21.9	24.0	84.0
23/05/03	06/06/03	6.2	27.2	12.0	42.9	65.4	10.3	6.2	84.1	24.8	<1.0	19.3	0.6	21.0	23.3
06/06/03	20/06/03	4.4	42.0	13.8	16.1	61.6	13.7	6.8	67.7	3.9	<1.0	34.6	36.3	24.0	29.3
20/06/03	04/07/03	5.8	77.0	88.6	93.2	28.0	12.2	60.4	25.9	4.8	<1.0	73.7	1.8	29.0	10.7
04/07/03	18/07/03	4.3	83.8	92.1	59.9	19.5	11.5	39.3	15.1	3.4	<1.0	81.4	56.2	41.0	9.8
18/07/03	01/08/03	4.6	14.7	4.9	4.6	20.3	4.9	3.3	23.2	1.4	<1.0	12.2	25.7	11.0	143.3
01/08/03	15/08/03	5.4	181.2	215.4	194.6	45.6	35.9	184.8	24.3	19.0	33.9	175.8	3.7	63.0	2.1
15/08/03	03/09/03	4.6	66.7	88.2	78.7	39.4	14.9	38.9	39.5	3.1	<1.0	61.9	26.3	34.0	20.0
03/09/03	12/09/03	5.5	30.6	23.6	50.0	32.1	6.7	9.7	34.4	1.2	<1.0	26.8	3.1	15.0	15.2
12/09/03	29/09/03	5.0	49.6	26.5	30.5	100.1	24.5	18.8	109.8	3.2	<1.0	37.5	10.5	28.4	29.6
29/09/03	10/10/03	4.8	39.2	24.1	28.6	191.2	40.7	13.0	210.5	4.2	<1.0	16.1	14.1	38.0	38.0
10/10/03	24/10/03	4.8	68.8	99.6	123.1	114.0	31.6	46.9	122.3	8.8	<1.0	55.1	14.8	56.0	5.5
24/10/03	07/11/03	4.8	23.1	16.2	7.3	116.8	30.0	8.5	144.8	2.5	<1.0	9.1	15.1	24.0	115.9
07/11/03	21/11/03	5.0	39.5	7.5	5.0	258.7	56.1	16.4	274.2	5.8	<1.0	8.3	9.5	45.0	65.6
21/11/03	08/12/03	4.6	23.1	19.6	9.4	51.3	11.1	4.5	65.3	1.4	<1.0	16.9	23.4	22.0	65.3
08/12/03	19/12/03	5.1	5.1	3.0	1.5	10.0	3.9	2.9	11.7	1.1	<1.0	3.9	8.9	<10.0	67.3
19/12/03	02/01/03	5.1	24.9	6.5	5.6	119.4	24.4	5.3	150.6	2.5	<1.0	10.5	7.2	23.0	112.4
Precipitation-weighted annual mean for site (samples containing phosphate are excluded)														Total rainfall	
5154		28.1	14.6	14.0	100.6	22.7	10.0	114.5	3.0	-	16.0	16.5	24.5	1305.1	

# Flatford Mill

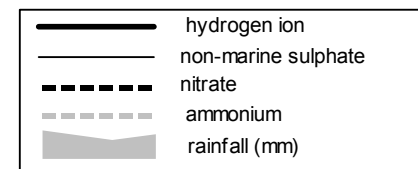
**2003**

Site Code: 5024  
 Easting: 6077  
 Northing: 2333  
 Latitude: 51 57 32 N  
 Longitude: 01 01 24 E  
 Altitude (m): 5  
 Rainfall (mm): 599  
 [30 year mean 1940 - 1971]

Site Environment:  
 Open meadow near River Stour

Other measurements:  
 DT

Site Operator:  
 Field Studies Council



long-term trends in concentration (+x = increase; -x = decrease)	
<i>hydrogen ion</i>	-1.01 ueq/l (-2.66 %/year): 17 years' data ++ Moderately strong trend detected
<i>non-marine sulphate</i>	-2.78 ueq/l (-3.62 %/year): 18 years' data ++++ Very strong trend detected
<i>nitrate</i>	-0.52 ueq/l (-1.17 %/year): 17 years' data - No significant trend detected
<i>ammonium</i>	-0.95 ueq/l (-1.80 %/year): 17 years' data + Significant trend detected

ACID DEPOSITION DATA REPORT, 2003



### 5024 Flatford Mill

Sampling	pH	SO4	NO3	NH4	Na	Mg	Ca	Cl	K	PO4	nss-SO4	H	conductivity	rainfall	
Start Date	End Date	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µS/cm)	(mm)	
14/01/03	28/01/03	4.6	40.4	29.5	32.6	126.1	26.1	10.9	140.5	3.5	<1.0	25.2	27.5	33.0	23.1
28/01/03	11/02/03	4.6	41.0	27.2	24.4	147.0	31.8	13.1	165.8	3.7	<1.0	23.3	26.3	36.0	19.6
11/02/03	25/02/03	4.6	89.5	94.1	88.4	126.3	28.6	47.4	133.3	5.5	<1.0	74.3	26.3	52.0	2.3
25/02/03	11/03/03	5.6	82.4	41.9	57.3	72.2	15.7	64.5	73.9	4.9	<1.0	73.7	2.6	29.0	14.4
11/03/03	25/03/03	-	-	-	-	-	-	-	-	-	-	-	-	-	7.2
25/03/03	08/04/03	6.0	59.3	40.6	76.3	69.8	14.2	42.3	72.0	4.3	<1.0	50.9	1.0	29.0	7.5
08/04/03	22/04/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
22/04/03	06/05/03	5.3	51.2	38.2	62.2	41.8	10.9	21.8	45.1	4.1	<1.0	46.1	5.0	21.0	22.7
06/05/03	21/05/03	5.3	53.7	49.6	74.3	52.5	13.1	25.2	57.9	4.7	<1.0	47.3	4.5	25.0	14.9
21/05/03	03/06/03	4.7	51.6	64.6	54.3	19.6	8.6	34.0	19.2	3.6	<1.0	49.2	21.4	24.0	11.5
03/06/03	18/06/03	4.2	103.2	100.1	9.4	21.8	17.8	89.1	27.8	18.1	<1.0	100.6	70.8	50.0	4.3
18/06/03	01/07/03	5.1	60.3	65.7	65.0	31.3	11.2	47.6	25.8	5.1	<1.0	56.5	8.5	24.0	21.6
01/07/03	15/07/03	3.7	116.7	125.0	8.3	25.3	9.3	30.2	29.6	1.2	<1.0	113.7	218.8	90.0	5.5
15/07/03	29/07/03	4.5	38.3	41.4	27.4	22.5	7.8	25.4	26.7	5.4	<1.0	35.6	34.7	19.0	30.6
29/07/03	12/08/03	5.1	56.2	60.8	91.8	9.9	3.1	29.4	14.7	8.3	<1.0	55.0	8.7	23.0	23.4
12/08/03	19/08/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
19/08/03	27/08/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
27/08/03	09/09/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.8
09/09/03	23/09/03	5.9	37.2	38.0	25.8	22.4	7.9	43.1	15.6	6.2	<1.0	34.5	1.3	15.0	12.3
23/09/03	07/10/03	5.3	65.6	84.1	66.5	83.2	18.9	41.3	82.2	9.0	<1.0	55.6	5.4	32.0	3.7
07/10/03	21/10/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
21/10/03	05/11/03	4.6	59.6	64.8	38.0	165.2	38.5	28.7	181.7	8.6	3.7	39.7	24.0	46.0	18.0
05/11/03	18/11/03	4.9	63.9	39.7	46.2	110.1	24.5	22.2	126.8	7.8	<1.0	50.7	12.9	32.0	8.6
18/11/03	02/12/03	4.6	24.7	23.7	16.3	28.4	6.1	4.4	39.0	2.1	<1.0	21.2	22.9	18.0	58.3
02/12/03	16/12/03	4.8	35.8	34.6	26.8	82.0	19.3	9.3	99.8	3.6	<1.0	25.9	16.6	25.0	16.2
16/12/03	30/12/03	4.6	31.9	32.1	22.8	56.1	14.4	7.3	70.9	2.4	<1.0	25.1	22.9	24.0	18.1
30/12/03	13/01/04	4.6	32.7	36.5	17.8	71.2	15.2	7.9	78.3	3.2	<1.0	24.1	28.2	25.0	27.5
Precipitation-weighted annual mean for site (samples containing phosphate are excluded)														Total rainfall	
5024		46.2	43.2	39.5	60.1	14.4	22.8	67.8	4.6	-	38.9	22.0	26.6	372.1	

# Woburn

**2003**

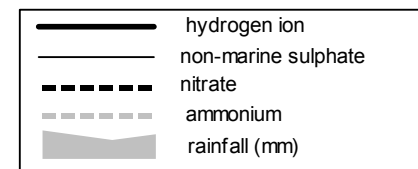
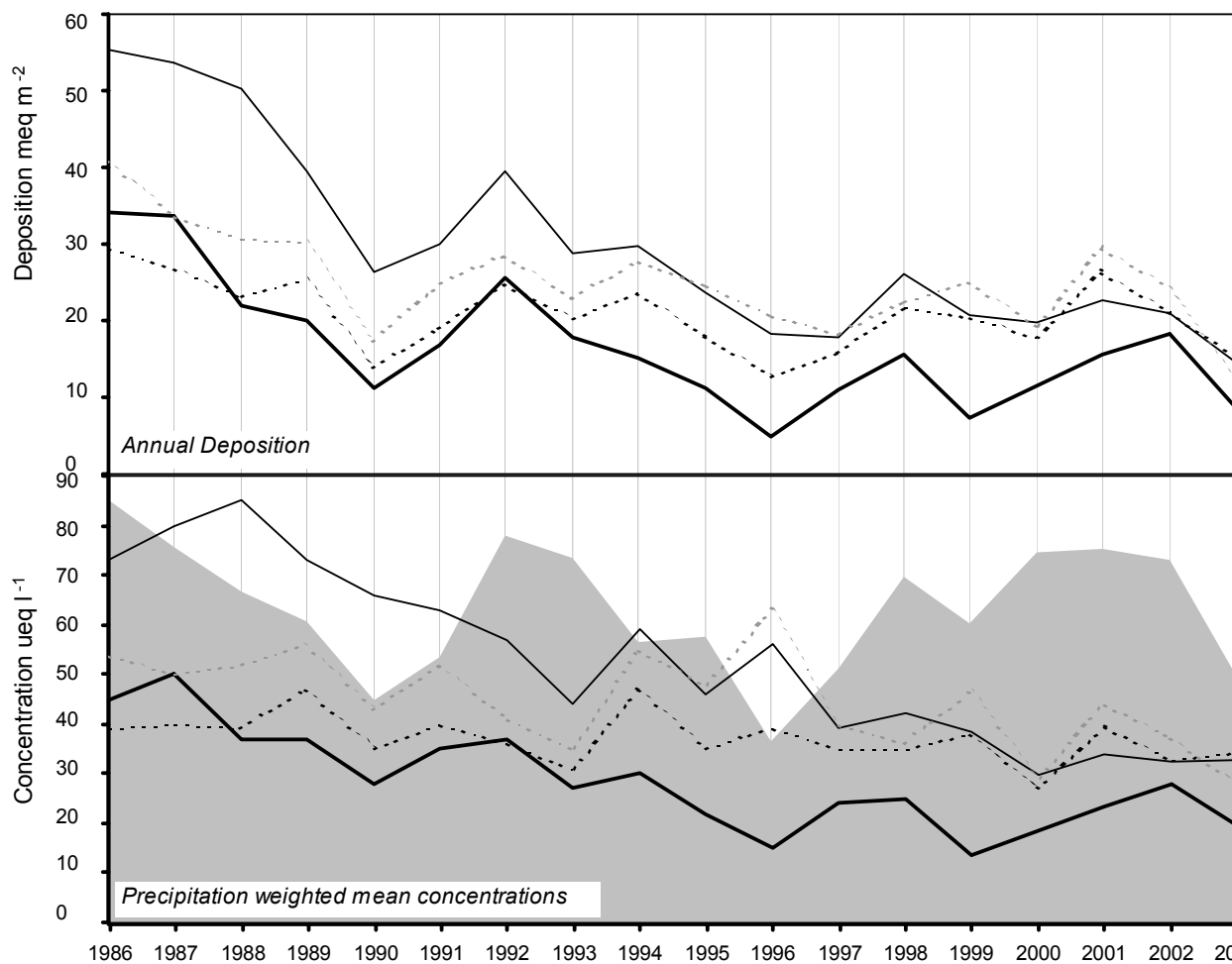
Site Code: 5127  
 Easting: 4964  
 Northing: 2361  
 Latitude: 52 00 52 N  
 Longitude: 00 35 43 W  
 Altitude (m): 89  
 Rainfall (mm): 646

[30 year mean 1940 - 1971]

Site Environment:  
**Pasture**

Other measurements:  
 DT, Weekly SO<sub>2</sub>, Met

Site Operator:  
**Rothamsted Experimental Station**



long-term trends in concentration (+x = increase; -x = decrease)	
<i>hydrogen ion</i>	-1.48 ueq/l (-3.58 %/year): 17 years' data +++ Strong trend detected
<i>non-marine sulphate</i>	-3.09 ueq/l (-3.91 %/year): 18 years' data ++++ Very strong trend detected
<i>nitrate</i>	-0.42 ueq/l (-1.04 %/year): 18 years' data - No significant trend detected
<i>ammonium</i>	-1.08 ueq/l (-1.99 %/year): 18 years' data + Significant trend detected

ACID DEPOSITION DATA REPORT, 2003

### 5127 Woburn

Sampling	pH	SO4	NO3	NH4	Na	Mg	Ca	Cl	K	PO4	nss-SO4	H	conductivity	rainfall	
Start Date	End Date	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µS/cm)	(mm)	
02/01/03	17/01/03	4.4	64.5	44.5	58.9	136.9	29.1	17.6	157.4	3.7	<1.0	48.0	42.7	45.0	6.2
17/01/03	31/01/03	4.6	19.5	13.9	15.9	57.6	12.2	5.4	69.0	1.8	<1.0	12.6	24.5	17.0	33.5
31/01/03	18/02/03	4.5	41.9	36.9	36.9	92.7	18.3	14.9	94.3	2.1	<1.0	30.8	32.4	31.0	15.1
18/02/03	28/02/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.4
28/02/03	13/03/03	5.9	62.1	35.4	33.9	99.8	20.3	62.3	103.3	3.1	<1.0	50.1	1.2	28.0	17.9
13/03/03	31/03/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.4
31/03/03	11/04/03	6.6	131.0	67.9	108.9	165.3	39.7	128.0	206.9	35.3	<1.0	111.0	0.2	62.0	3.5
11/04/03	25/04/03	6.6	300.5	253.2	275.1	147.8	53.8	400.6	144.4	18.0	6.5	282.7	0.2	100.0	2.2
25/04/03	09/05/03	5.3	28.1	18.3	26.6	27.9	7.3	15.6	32.7	<0.5	<1.0	24.7	5.1	13.0	24.8
09/05/03	29/05/03	4.5	39.5	25.0	27.2	46.4	10.5	13.8	51.4	<0.5	<1.0	33.9	33.1	24.0	40.6
29/05/03	10/06/03	4.7	59.1	83.2	32.2	9.6	4.9	21.4	31.5	1.5	<1.0	57.9	20.9	16.0	19.4
10/06/03	23/06/03	5.7	24.5	35.5	15.6	12.1	8.0	33.7	5.5	8.0	2.6	23.0	2.2	11.0	19.2
23/06/03	01/07/03	4.3	100.1	117.5	116.1	23.9	10.1	41.4	26.9	4.5	<1.0	97.3	49.0	46.0	9.8
01/07/03	18/07/03	5.5	69.1	51.8	110.4	12.9	5.5	24.7	16.5	7.2	14.9	67.5	2.9	23.0	20.2
18/07/03	05/08/03	4.8	20.9	19.5	21.9	11.4	3.4	10.2	12.3	1.1	<1.0	19.6	17.0	12.0	30.6
05/08/03	20/08/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
20/08/03	05/09/03	5.6	102.9	94.0	32.1	198.3	56.6	185.0	235.4	14.7	<1.0	79.0	2.5	61.0	3.0
05/09/03	09/09/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
09/09/03	25/09/03	5.3	34.7	31.9	22.6	15.1	4.5	29.7	12.4	5.2	<1.0	32.9	5.4	13.0	23.7
25/09/03	10/10/03	4.8	194.9	166.9	129.3	397.4	91.5	134.6	493.2	19.9	<1.0	147.1	17.8	107.0	4.0
10/10/03	29/10/03	4.8	93.7	75.4	43.0	163.3	39.9	71.6	176.2	5.0	<1.0	74.0	17.0	49.0	9.3
29/10/03	05/11/03	4.7	16.3	19.8	13.0	19.0	4.8	5.7	22.4	1.2	<1.0	14.0	20.4	13.0	17.0
05/11/03	19/11/03	5.0	52.3	34.8	47.4	131.7	27.0	21.2	146.8	5.4	<1.0	36.5	11.0	31.0	9.6
19/11/03	04/12/03	4.6	28.0	26.7	10.6	19.6	3.7	3.3	16.8	<0.5	<1.0	25.6	25.7	17.0	79.1
04/12/03	18/12/03	4.9	15.1	13.3	27.5	58.1	12.2	8.5	35.0	1.7	<1.0	8.1	13.2	19.0	21.4
18/12/03	05/01/04	4.7	25.1	24.1	20.6	38.7	7.7	5.8	34.6	1.6	<1.0	20.5	19.5	17.0	36.4
Precipitation-weighted annual mean for site (samples containing phosphate are excluded)														Total rainfall	
5127			38.7	34.2	28.0	47.7	11.1	21.4	50.7	2.6	-	32.9	19.6	21.5	447.5

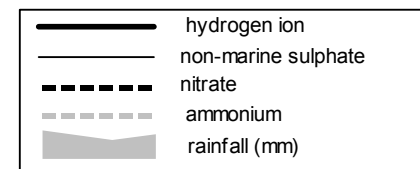
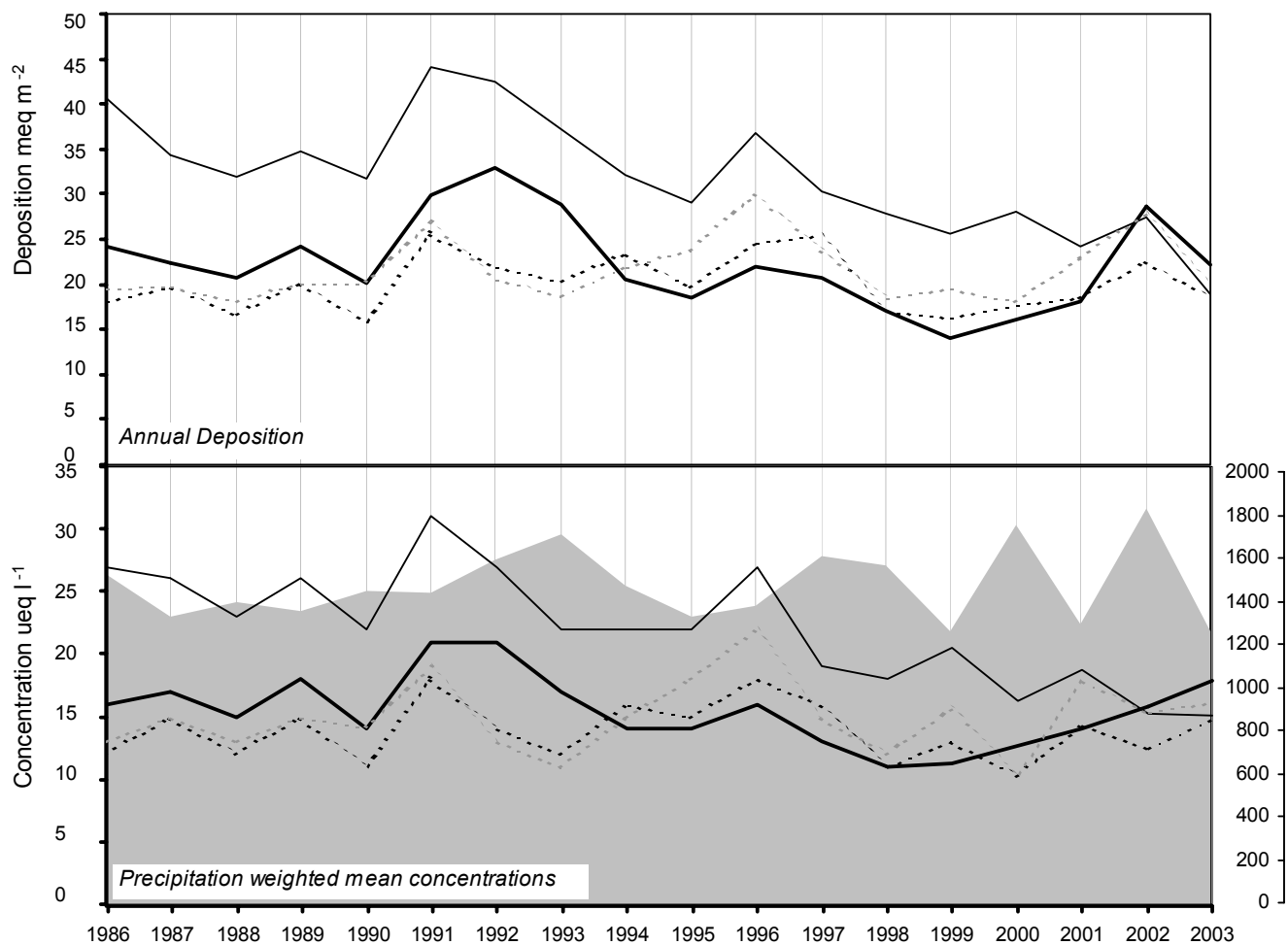
# Tycanol Wood

**2003** Site Code: 5123  
 Easting: 2093  
 Northing: 2364  
 Latitude: 51 59 34 N  
 Longitude: 04 46 41 W  
 Altitude (m): 205  
 Rainfall (mm): 1847  
 [30 year mean 1940 - 1971]

Site Environment:  
**Open moorland**

Other measurements:  
**DT**

Site Operator:  
**Countryside Council for Wales**



long-term trends in concentration (+x = increase; -x = decrease)	
<i>hydrogen ion</i>	-0.18 ueq/l (-1.04 %/year): 17 years' data - No significant trend detected
<i>non-marine sulphate</i>	-0.68 ueq/l (-2.43 %/year): 18 years' data +++ Strong trend detected
<i>nitrate</i>	-0.02 ueq/l (-0.11 %/year): 18 years' data - No significant trend detected
<i>ammonium</i>	0.09 ueq/l (0.60 %/year): 18 years' data - No significant trend detected

ACID DEPOSITION DATA REPORT, 2003

### 5123 Tycanol Wood

Sampling		pH	SO4	NO3	NH4	Na	Mg	Ca	Cl	K	PO4	nss-SO4	H	conductivity	rainfall
Start Date	End Date		(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µS/cm)	(mm)
01/01/03	15/01/03	4.3	38.7	18.7	18.7	168.2	38.0	7.6	191.9	4.1	<1.0	18.5	44.7	38.0	39.8
15/01/03	29/01/03	4.7	24.3	7.2	7.7	136.8	29.3	6.0	157.4	2.9	<1.0	7.8	21.9	27.0	56.7
29/01/03	12/02/03	5.4	25.6	8.3	15.2	135.2	26.3	10.3	143.4	5.4	<1.0	9.3	4.1	26.0	42.4
12/02/03	26/02/03	6.0	83.6	68.2	88.3	148.1	32.2	49.3	157.3	3.7	<1.0	65.7	1.0	42.0	20.7
26/02/03	12/03/03	4.8	33.5	6.9	7.8	189.4	40.3	10.9	207.7	3.5	<1.0	10.7	14.1	34.0	112.3
12/03/03	26/03/03	-	-	-	-	-	-	-	-	-	-	-	-	-	1.5
26/03/03	09/04/03	7.3	84.5	46.2	461.6	91.0	22.7	34.0	98.1	41.5	200.9	73.6	0.1	82.0	10.6
09/04/03	23/04/03	7.3	170.8	88.6	595.4	71.4	19.1	81.2	75.6	83.6	288.4	162.1	0.0	118.0	8.2
23/04/03	07/05/03	6.3	32.8	13.1	58.4	85.2	12.9	3.0	94.2	7.0	15.2	22.5	0.5	22.0	92.6
07/05/03	21/05/03	6.5	62.3	7.6	327.0	86.1	13.8	4.9	103.2	56.5	138.3	51.9	0.3	63.0	59.7
21/05/03	04/06/03	6.2	82.3	25.1	184.2	103.9	17.3	16.5	112.0	34.6	99.3	69.7	0.6	49.0	27.7
04/06/03	18/06/03	5.3	49.1	15.6	83.9	60.8	10.3	1.6	63.7	14.2	31.3	41.8	5.1	26.0	65.6
18/06/03	02/07/03	4.7	94.0	84.3	79.8	55.6	17.8	62.7	52.5	3.2	<1.0	87.3	20.0	36.0	10.0
02/07/03	16/07/03	4.6	96.9	88.0	62.6	64.0	17.3	66.3	62.8	4.9	<1.0	89.2	27.5	39.0	2.8
16/07/03	30/07/03	4.3	28.1	11.1	13.4	54.4	10.9	4.4	62.6	1.5	<1.0	21.6	53.7	19.0	128.9
30/07/03	13/08/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.1
13/08/03	27/08/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
27/08/03	10/09/03	4.8	18.5	18.4	21.8	59.6	10.8	17.8	62.9	1.5	<1.0	11.3	17.0	16.0	36.7
10/09/03	24/09/03	6.1	80.0	50.3	221.9	167.7	23.1	15.1	190.7	18.4	53.8	59.8	0.8	51.0	24.6
24/09/03	08/10/03	6.0	65.7	29.4	42.0	358.8	72.9	27.7	385.6	10.5	<1.0	22.5	1.0	65.0	10.9
08/10/03	22/10/03	5.0	39.4	46.9	34.9	119.9	26.4	20.4	148.3	3.1	<1.0	25.0	10.5	33.0	18.8
22/10/03	05/11/03	4.8	25.3	15.1	6.9	159.4	32.7	7.7	194.0	3.4	<1.0	6.1	14.8	32.0	79.3
05/11/03	19/11/03	4.8	57.0	21.6	22.4	334.7	71.7	15.6	382.7	7.1	<1.0	16.7	14.1	61.0	87.5
19/11/03	03/12/03	5.1	24.3	10.9	9.2	86.7	17.0	5.9	111.9	2.2	<1.0	13.9	7.4	19.0	73.9
03/12/03	17/12/03	5.2	13.7	13.9	13.3	27.4	7.0	4.6	32.2	1.2	<1.0	10.4	6.0	10.0	38.7
17/12/03	31/12/03	5.3	28.9	12.0	18.3	132.7	26.3	6.8	154.3	3.4	<1.0	12.9	5.5	25.0	109.8
31/12/03	14/01/04	5.3	26.6	3.8	5.9	173.6	34.2	6.2	194.1	3.1	<1.0	5.7	4.7	26.0	86.1
Precipitation-weighted annual mean for site (samples containing phosphate are excluded)															Total rainfall
5123			32.7	14.8	16.1	146.1	30.4	10.4	166.8	3.4	-	15.1	17.8	29.6	1245.9

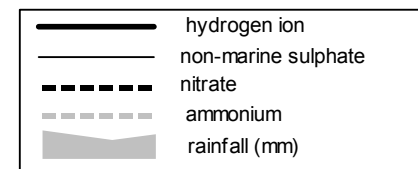
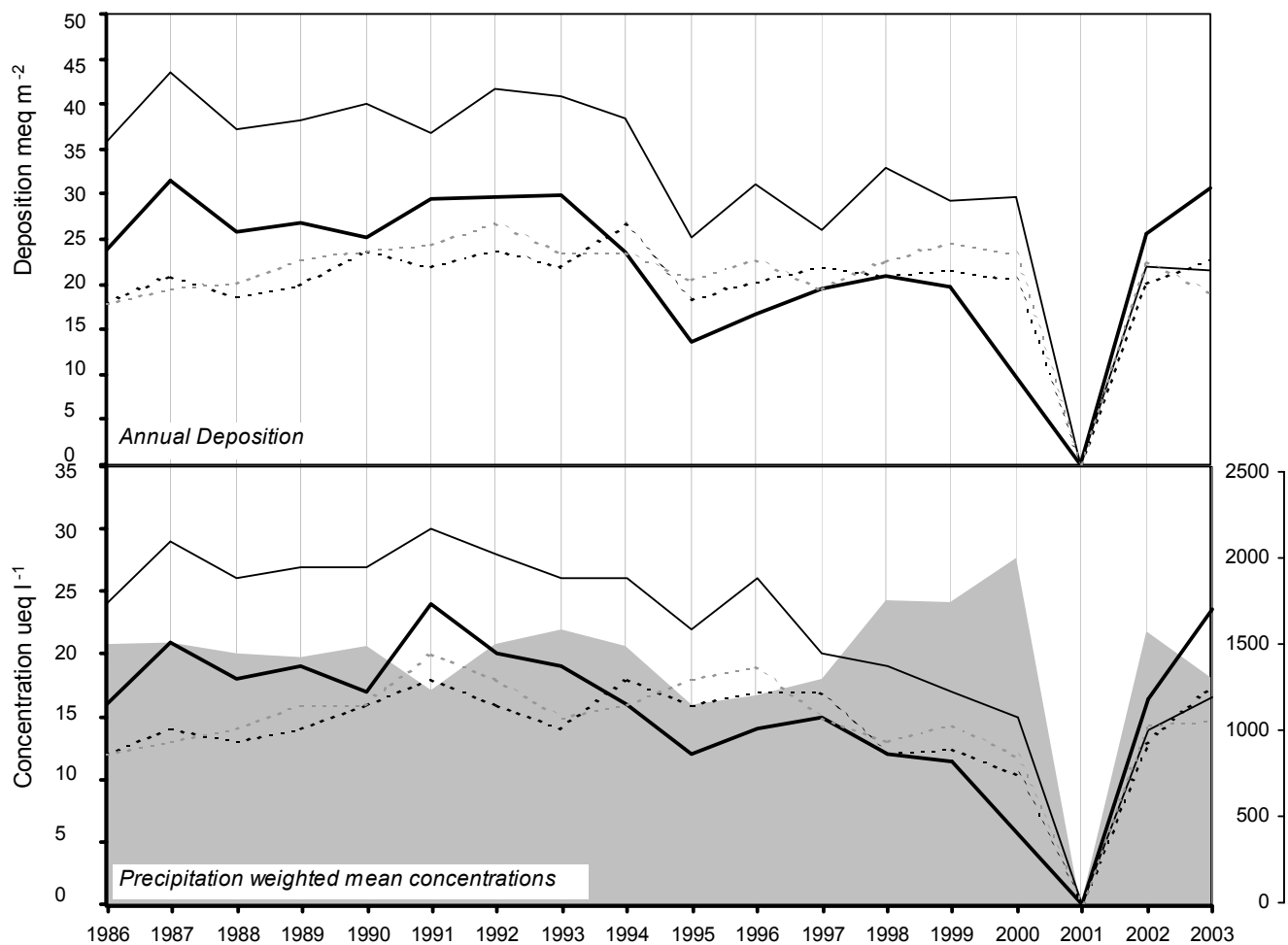
# Llyn Brienne

**2003** Site Code: 5124  
 Easting: 2807  
 Northing: 2492  
 Latitude: 52 07 32 N  
 Longitude: 03 44 34 W  
 Altitude (m): 372  
 Rainfall (mm): 1774  
 [30 year mean 1940 - 1971]

Site Environment:  
 Open moorland, upland hill farming

Other measurements:  
 DT, UKAWMN (nearby), Met

Site Operator:  
 Environment Agency



long-term trends in concentration (+x = increase; -x = decrease)	
<i>hydrogen ion</i>	-0.22 ueq/l (-1.17 %/year): 17 years' data - No significant trend detected
<i>non-marine sulphate</i>	-0.85 ueq/l (-2.84 %/year): 18 years' data +++ Strong trend detected
<i>nitrate</i>	-0.01 ueq/l (-0.07 %/year): 18 years' data - No significant trend detected
<i>ammonium</i>	-0.03 ueq/l (-0.20 %/year): 18 years' data - No significant trend detected

ACID DEPOSITION DATA REPORT, 2003

### 5124 Llyn Brianne

Sampling	pH	SO4	NO3	NH4	Na	Mg	Ca	Cl	K	PO4	nss-SO4	H	conductivity	rainfall	
Start Date	End Date	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µS/cm)	(mm)	
06/01/03	17/01/03	4.8	62.4	40.3	34.5	305.3	65.2	13.8	320.1	6.2	<1.0	25.6	14.1	57.0	18.3
17/01/03	31/01/03	4.7	37.1	8.7	8.4	261.4	57.4	11.1	299.4	5.2	<1.0	5.6	18.2	46.0	98.6
31/01/03	14/02/03	5.1	23.5	7.4	10.2	131.5	28.0	7.1	142.8	3.2	<1.0	7.7	7.4	26.0	49.7
14/02/03	26/02/03	5.3	133.7	204.1	123.0	329.2	73.9	107.7	320.4	7.2	<1.0	94.0	5.0	82.0	2.3
26/02/03	12/03/03	4.9	32.4	10.5	9.1	155.5	35.2	9.9	179.8	3.2	<1.0	13.7	13.5	32.0	110.7
12/03/03	26/03/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.9
26/03/03	09/04/03	5.9	28.2	38.4	35.8	77.3	16.1	29.7	74.1	2.6	<1.0	18.9	1.3	21.0	15.7
09/04/03	07/05/03	5.0	28.8	23.0	25.2	59.5	14.0	11.9	60.4	1.6	<1.0	21.6	9.1	17.0	138.7
07/05/03	21/05/03	4.5	28.0	6.9	3.7	111.7	24.1	9.6	127.4	1.6	<1.0	14.5	33.9	27.0	74.3
21/05/03	05/06/03	4.6	31.8	13.2	9.0	50.7	11.9	8.8	57.5	0.8	<1.0	25.7	27.5	21.0	52.9
05/06/03	18/06/03	4.5	33.6	13.5	12.2	58.2	12.0	6.6	62.8	1.2	<1.0	26.6	34.7	22.0	40.9
18/06/03	02/07/03	5.0	59.9	57.6	66.8	28.5	9.9	41.6	25.4	3.4	<1.0	56.5	9.3	24.0	20.5
02/07/03	16/07/03	-	-	-	-	-	-	-	-	-	-	-	-	-	1.4
16/07/03	30/07/03	4.1	17.0	11.5	12.5	23.3	5.4	4.1	27.1	0.8	<1.0	14.2	74.1	12.0	145.8
30/07/03	13/08/03	4.5	40.4	56.5	26.0	39.6	10.5	42.0	35.5	5.6	<1.0	35.6	32.4	24.0	9.8
13/08/03	27/08/03	5.7	63.0	48.6	75.8	92.3	21.1	40.0	96.5	2.2	<1.0	51.9	2.0	32.0	5.5
27/08/03	24/09/03	4.5	48.8	46.8	13.9	88.2	20.4	24.2	90.3	1.5	<1.0	38.1	32.4	34.0	52.0
24/09/03	08/10/03	5.0	39.8	15.6	12.0	203.3	42.3	14.6	242.9	4.3	<1.0	15.3	10.5	36.0	38.5
08/10/03	22/10/03	4.8	54.9	106.6	40.9	213.2	52.0	55.7	205.9	8.5	<1.0	29.3	16.6	57.0	12.7
22/10/03	05/11/03	4.9	17.4	12.0	20.2	77.7	15.1	4.7	89.4	1.5	<1.0	8.0	12.3	18.0	98.7
05/11/03	20/11/03	4.5	32.0	14.4	11.0	160.3	34.3	9.7	177.9	3.1	<1.0	12.7	30.2	31.0	89.8
20/11/03	04/12/03	4.8	17.0	14.4	5.4	42.8	10.4	4.2	53.7	2.1	<1.0	11.9	14.8	15.0	59.0
04/12/03	17/12/03	5.0	22.3	15.4	10.5	96.7	19.9	7.0	104.7	2.5	<1.0	10.6	9.1	20.0	55.5
17/12/03	05/01/04	5.0	30.7	12.2	9.6	139.1	29.3	7.1	175.2	2.9	<1.0	14.0	9.5	26.0	110.0
Precipitation-weighted annual mean for site (samples containing phosphate are excluded)														Total rainfall	
5124		29.9	17.5	14.7	110.8	24.2	10.8	125.2	2.5	-	16.6	23.5	25.6	1302.6	

# Pumlumon

**2003**

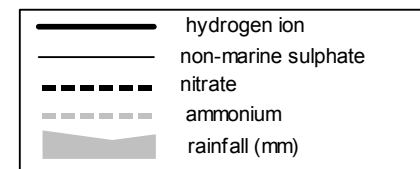
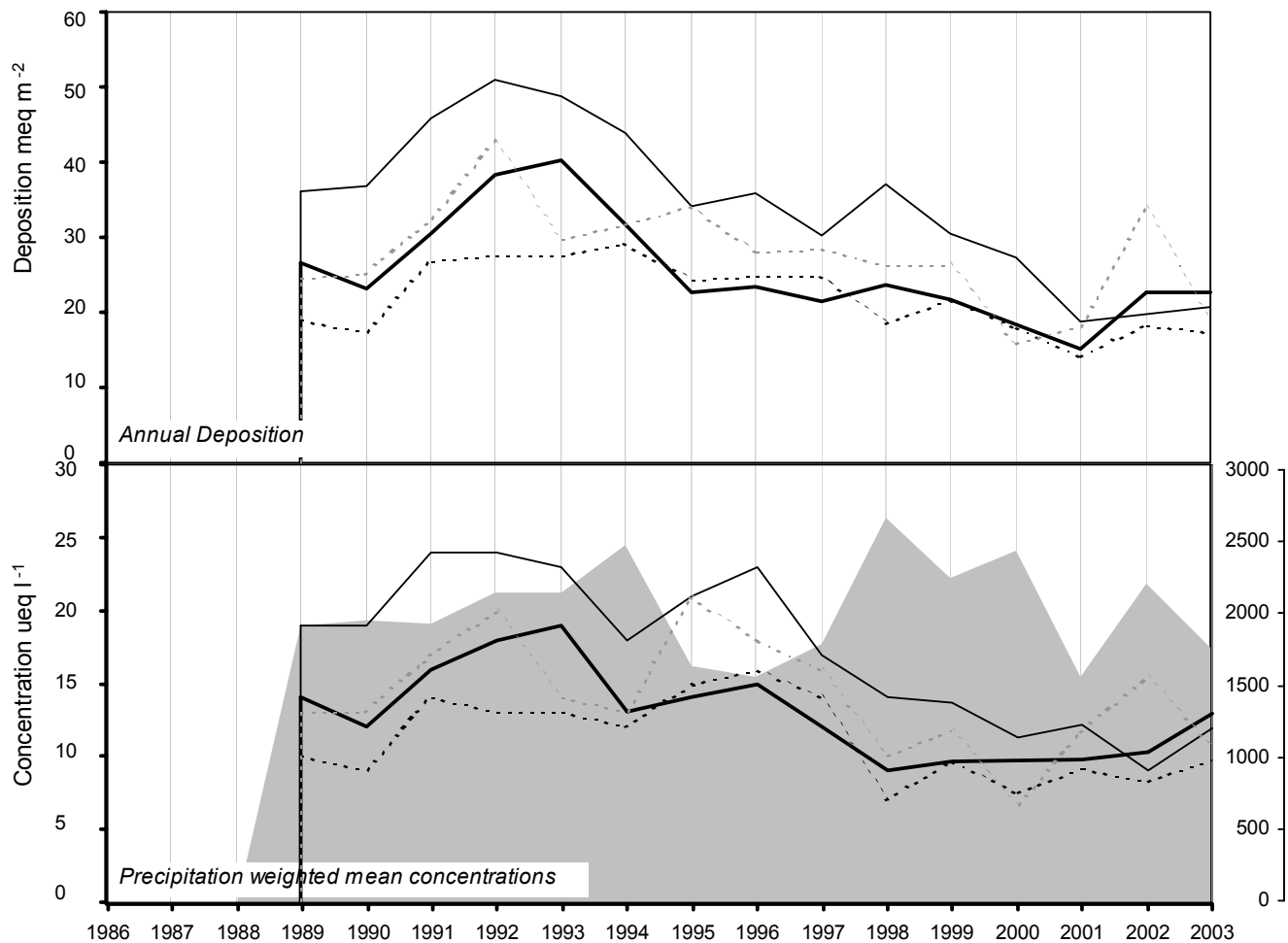
Site Code: 5150  
 Easting: 2823  
 Northing: 2854  
 Latitude: 52 27 13 N  
 Longitude: 03 43 56 W  
 Altitude (m): 390  
 Rainfall (mm): 2182

[30 year mean 1940 - 1971]

Site Environment:  
 Open moorland, upland hill farming

Other measurements:  
 DT, UKAWMN

Site Operator:  
 Centre for Ecology and Hydrology (Bangor)



long-term trends in concentration (+x = increase; -x = decrease)	
<i>hydrogen ion</i>	-0.40 ueq/l (-2.36 %/year): 14 years' data + Significant trend detected
<i>non-marine sulphate</i>	-0.91 ueq/l (-3.45 %/year): 15 years' data +++ Strong trend detected
<i>nitrate</i>	-0.26 ueq/l (-1.88 %/year): 15 years' data - No significant trend detected
<i>ammonium</i>	-0.35 ueq/l (-1.99 %/year): 15 years' data - No significant trend detected

ACID DEPOSITION DATA REPORT, 2003



### 5150 Pumlumon

Sampling	pH	SO4	NO3	NH4	Na	Mg	Ca	Cl	K	PO4	nss-SO4	H	conductivity	rainfall	
Start Date	End Date	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µS/cm)	(mm)	
07/01/03	14/01/03	4.9	36.4	18.8	20.6	175.2	38.2	9.5	190.4	3.7	<1.0	15.3	12.0	35.0	9.8
14/01/03	28/01/03	4.9	21.4	6.1	7.9	108.9	22.2	5.0	121.3	2.1	<1.0	8.3	12.9	22.0	108.1
28/01/03	11/02/03	5.0	35.3	5.5	8.5	238.7	52.0	18.6	276.3	5.1	<1.0	6.6	10.5	42.0	87.1
11/02/03	25/02/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
25/02/03	11/03/03	4.9	22.4	6.5	9.1	93.8	21.2	5.9	106.3	1.8	<1.0	11.1	11.7	21.0	123.2
11/03/03	25/03/03	6.9	163.7	171.1	286.7	524.2	130.3	56.1	526.9	45.6	<1.0	100.5	0.1	127.0	2.6
25/03/03	08/04/03	6.0	35.2	15.9	89.1	91.9	17.2	14.3	98.1	11.4	22.3	24.1	1.0	29.0	29.3
08/04/03	22/04/03	6.4	126.6	148.3	180.0	66.1	24.0	126.6	55.9	4.7	<1.0	118.6	0.4	55.0	6.7
22/04/03	06/05/03	5.8	21.1	10.7	45.8	44.8	5.9	2.1	47.8	5.3	12.5	15.7	1.5	15.0	93.1
06/05/03	20/05/03	5.0	29.7	7.6	25.0	101.9	18.9	6.5	111.6	8.0	<1.0	17.4	9.5	22.0	135.0
20/05/03	03/06/03	4.9	21.3	9.1	15.8	40.6	9.1	5.9	46.4	0.9	<1.0	16.4	11.2	14.0	93.5
03/06/03	17/06/03	5.8	38.8	16.3	56.6	48.9	10.5	7.0	52.6	10.1	19.3	32.9	1.8	19.0	19.5
01/07/03	14/07/03	4.4	83.5	44.2	59.1	41.8	12.1	20.8	35.7	1.8	<1.0	78.5	41.7	32.0	4.9
14/07/03	29/07/03	4.3	11.9	4.6	6.9	13.2	2.9	2.8	15.9	1.0	<1.0	10.3	53.7	<10.0	125.7
29/07/03	12/08/03	4.7	21.9	20.7	11.4	10.9	1.1	6.2	15.0	3.3	<1.0	20.6	22.4	12.0	27.2
12/08/03	26/08/03	5.8	29.3	14.7	76.4	47.9	6.3	7.4	53.0	10.1	19.3	23.5	1.7	22.0	26.3
26/08/03	09/09/03	6.3	41.9	31.0	111.9	14.5	8.2	6.8	17.6	14.2	51.1	40.2	0.5	28.0	15.0
09/09/03	23/09/03	5.4	23.1	14.3	13.3	61.2	11.2	13.1	59.6	4.2	<1.0	15.7	4.4	16.0	58.0
23/09/03	07/10/03	5.8	47.2	14.2	10.5	248.2	53.5	15.7	214.9	5.4	<1.0	17.3	1.5	45.0	52.0
07/10/03	21/10/03	5.0	28.8	29.3	22.6	85.2	18.4	11.9	101.7	2.7	<1.0	18.6	9.3	24.0	43.1
21/10/03	04/11/03	5.1	13.6	15.9	6.1	65.8	14.7	5.7	78.1	1.6	<1.0	5.7	8.5	16.0	116.1
04/11/03	18/11/03	5.2	28.8	8.9	9.1	168.0	33.5	7.6	182.0	3.3	<1.0	8.6	7.1	28.0	87.7
18/11/03	02/12/03	4.8	19.6	10.9	1.1	60.4	12.5	4.0	77.3	1.1	<1.0	12.3	17.8	18.0	92.5
02/12/03	16/12/03	5.2	9.0	5.2	2.5	27.4	6.6	2.4	35.2	0.7	<1.0	5.7	6.5	<10.0	136.7
16/12/03	30/12/03	5.2	20.5	6.1	7.8	92.2	19.2	5.2	114.5	2.8	<1.0	9.4	7.1	19.0	119.8
30/12/03	13/01/04	5.3	27.7	5.1	4.5	145.8	27.9	6.8	170.4	2.2	<1.0	10.2	5.2	23.0	139.0
Precipitation-weighted annual mean for site (samples containing phosphate are excluded)														Total rainfall	
5150		23.4	9.8	10.8	95.9	20.0	7.5	107.9	2.8	-	11.9	12.9	20.9	1751.9	

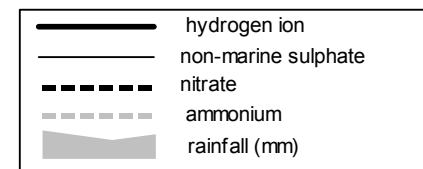
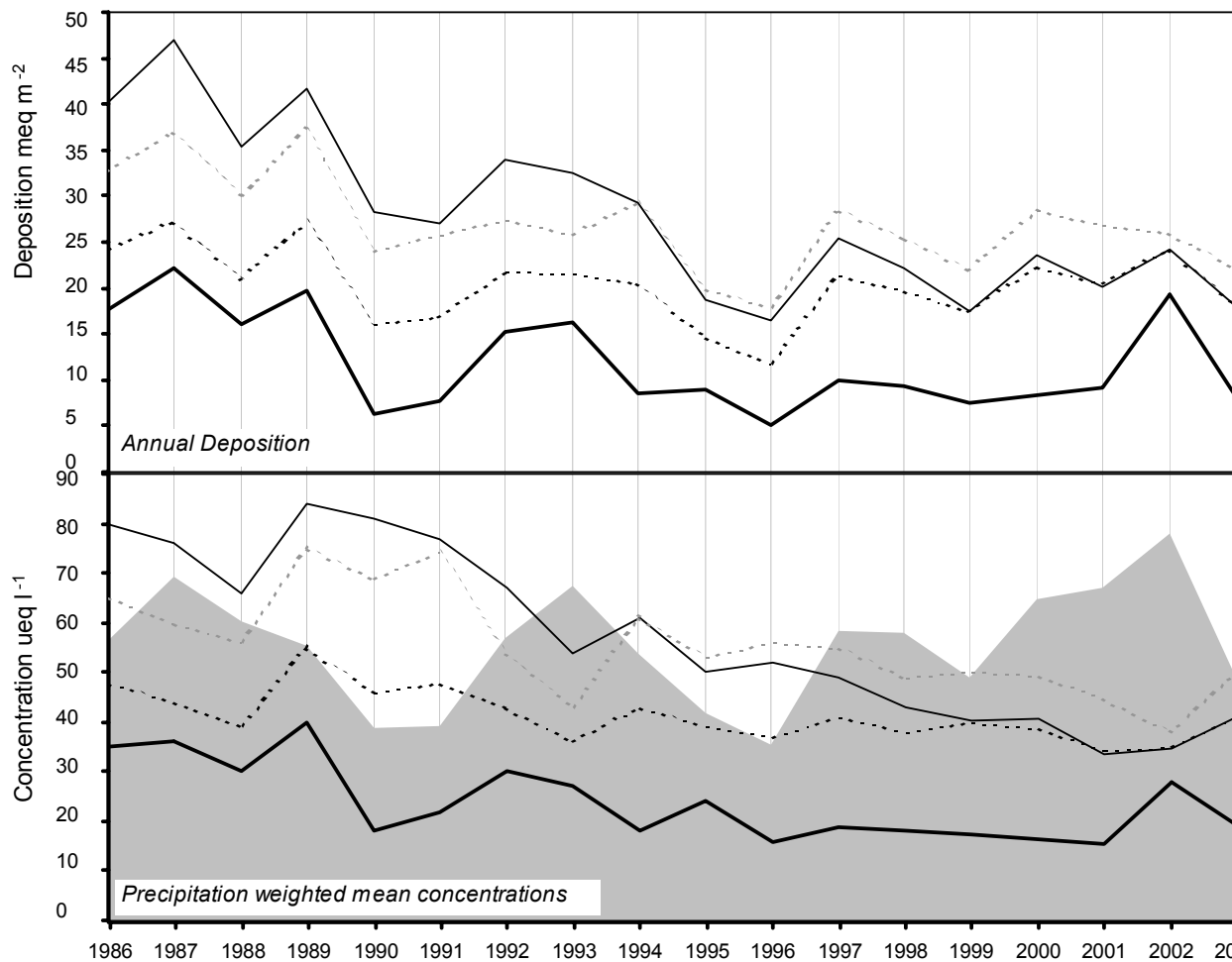
# Stoke Ferry

**2003** Site Code: **5004**  
 Easting: **5700**  
 Northing: **2988**  
 Latitude: **52 33 36 N**  
 Longitude: **00 30 29 E**  
 Altitude (m): **15**  
 Rainfall (mm): **629**  
 [30 year mean 1940 - 1971]

Site Environment:  
**Grassed land at water treatment works**

Other measurements:  
 DT, Daily SO<sub>2</sub>, Daily SO<sub>4</sub>, HNO<sub>3</sub> Denuder, WF, EMEP

Site Operator:  
**Kings Lynn and West Norfolk BC**



long-term trends in concentration (+x = increase; -x = decrease)	
<i>hydrogen ion</i>	-0.96 ueq/l (-3.00 %/year): 17 years' data ++ Moderately strong trend detected
<i>non-marine sulphate</i>	-2.98 ueq/l (-3.61 %/year): 18 years' data ++++ Very strong trend detected
<i>nitrate</i>	-0.65 ueq/l (-1.38 %/year): 18 years' data ++ Moderately strong trend detected
<i>ammonium</i>	-1.36 ueq/l (-2.02 %/year): 18 years' data ++ Moderately strong trend detected

ACID DEPOSITION DATA REPORT, 2003

### 5004 Stoke Ferry

Sampling	pH	SO4	NO3	NH4	Na	Mg	Ca	Cl	K	PO4	nss-SO4	H	conductivity	rainfall	
Start Date	End Date	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µS/cm)	(mm)	
02/01/03	14/01/03	4.4	65.7	36.1	57.1	150.0	31.7	9.3	172.5	4.4	<1.0	47.6	36.3	47.0	10.4
14/01/03	28/01/03	4.7	25.8	19.4	25.1	42.0	9.6	8.7	51.4	1.6	<1.0	20.8	21.9	17.0	29.8
28/01/03	11/02/03	4.6	59.1	27.3	36.1	228.3	48.5	17.8	256.9	5.0	<1.0	31.6	24.5	49.0	25.1
11/02/03	25/02/03	4.0	173.1	234.7	230.9	166.5	36.6	62.1	196.0	9.5	<1.0	153.0	109.6	112.0	2.1
25/02/03	11/03/03	5.8	84.5	55.7	63.8	51.6	12.4	76.9	52.8	2.8	<1.0	78.3	1.6	27.0	9.6
11/03/03	25/03/03	-	-	-	-	-	-	-	-	-	-	-	-	-	1.1
25/03/03	08/04/03	6.3	77.4	56.4	70.0	41.1	13.5	117.4	41.9	4.1	<1.0	72.5	0.5	33.0	3.8
08/04/03	23/04/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
23/04/03	06/05/03	5.7	44.9	36.7	65.2	21.5	5.8	33.3	23.4	0.6	<1.0	42.3	1.9	19.0	25.7
06/05/03	20/05/03	5.6	58.0	37.2	77.7	36.2	8.9	31.0	41.7	1.6	5.4	53.7	2.3	23.0	29.7
20/05/03	03/06/03	5.8	53.8	50.0	64.4	15.4	5.8	53.9	18.4	2.1	<1.0	52.0	1.7	21.0	17.8
03/06/03	18/06/03	4.8	43.0	48.8	68.7	6.3	3.6	21.7	8.2	1.6	<1.0	42.2	15.5	17.0	39.2
18/06/03	02/07/03	4.5	41.6	47.7	47.6	8.3	3.8	34.1	9.5	1.3	<1.0	40.6	30.9	34.0	47.1
02/07/03	15/07/03	3.8	148.9	87.3	71.6	10.1	6.0	17.3	20.4	1.0	<1.0	147.7	169.8	76.0	4.7
15/07/03	29/07/03	4.9	45.5	51.0	50.1	9.8	4.9	44.8	11.3	2.6	<1.0	44.3	12.9	18.0	31.3
29/07/03	12/08/03	4.4	27.3	28.9	23.3	5.5	<0.8	13.5	7.3	2.0	<1.0	26.6	39.8	14.0	16.0
12/08/03	26/08/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
26/08/03	09/09/03	4.8	138.8	169.2	137.5	171.2	40.1	241.1	212.5	17.3	10.4	118.2	16.6	84.0	3.8
09/09/03	23/09/03	6.1	54.7	55.8	55.7	24.2	18.1	90.8	28.4	2.4	<1.0	51.8	0.7	25.0	1.3
23/09/03	08/10/03	6.1	175.8	133.1	109.7	442.8	99.4	162.5	553.6	15.7	<1.0	122.5	0.8	105.0	4.1
08/10/03	21/10/03	4.7	153.6	216.2	105.4	1557.0	305.7	583.0	363.9	44.1	4.4	-	20.0	-	0.8
21/10/03	04/11/03	4.8	39.2	39.0	42.5	76.0	17.3	12.1	83.9	3.0	<1.0	30.1	17.8	26.0	34.9
04/11/03	19/11/03	5.0	88.4	49.2	82.4	151.0	34.2	29.0	172.7	4.8	<1.0	70.2	10.5	42.0	9.6
19/11/03	02/12/03	4.7	19.8	24.9	19.0	16.0	4.2	3.5	21.9	1.0	<1.0	17.8	21.9	14.0	35.1
02/12/03	16/12/03	5.0	41.0	30.5	42.4	66.9	13.7	9.6	75.7	2.2	<1.0	33.0	10.0	22.0	18.8
16/12/03	06/01/04	4.7	40.9	35.7	42.3	33.2	10.4	9.0	43.3	2.0	<1.0	36.9	18.2	21.0	37.7
Precipitation-weighted annual mean for site (samples containing phosphate are excluded)														Total rainfall	
5004		47.4	41.1	50.4	52.6	12.7	26.8	58.4	2.4	-	41.2	19.2	26.0	439.6	

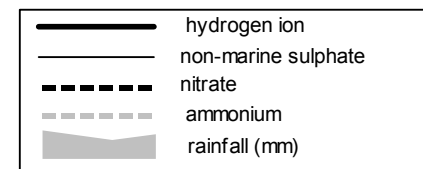
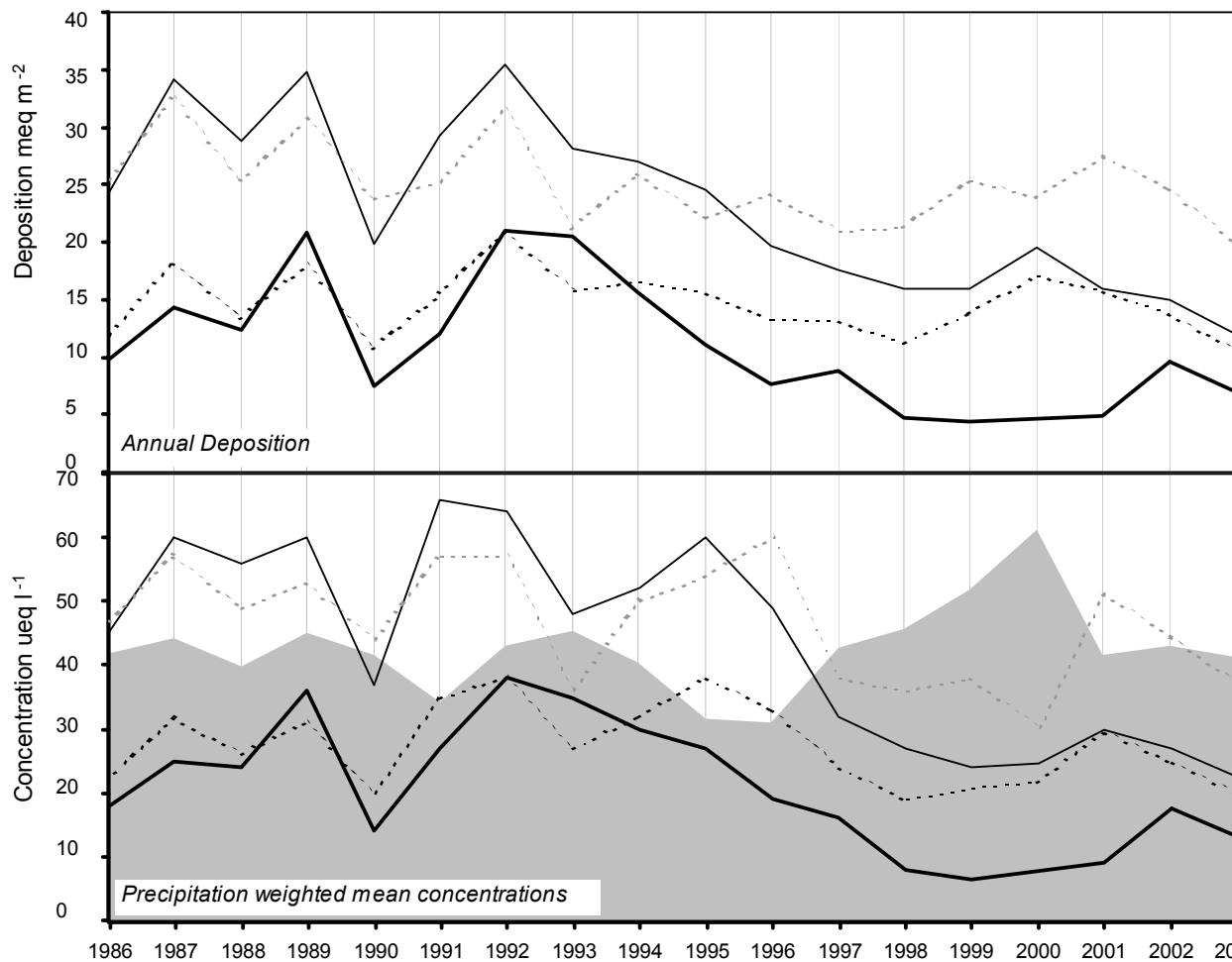
# Preston Montford

**2003** Site Code: **5023**  
 Easting: **3432**  
 Northing: **3143**  
 Latitude: **52 43 23 N**  
 Longitude: **02 50 17 W**  
 Altitude (m): **70**  
 Rainfall (mm): **695**  
 [30 year mean 1940 - 1971]

Site Environment:  
**Field adjacent to Study Centre**

Other measurements:  
**DT, Weekly SO<sub>2</sub>, Met**

Site Operator:  
**Field Studies Council**



long-term trends in concentration (+x = increase; -x = decrease)	
<i>hydrogen ion</i>	-1.01 ueq/l (-3.41 %/year): 17 years' data + Significant trend detected
<i>non-marine sulphate</i>	-2.21 ueq/l (-3.55 %/year): 18 years' data ++ Moderately strong trend detected
<i>nitrate</i>	-0.36 ueq/l (-1.19 %/year): 18 years' data - No significant trend detected
<i>ammonium</i>	-0.82 ueq/l (-1.52 %/year): 18 years' data + Significant trend detected

ACID DEPOSITION DATA REPORT, 2003

**5023 Preston Montford**

Sampling	pH	SO4	NO3	NH4	Na	Mg	Ca	Cl	K	PO4	nss-SO4	H	conductivity	rainfall	
Start Date	End Date	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µS/cm)	(mm)	
01/01/03	15/01/03	-	-	-	-	-	-	-	-	-	-	-	-	0.0	
15/01/03	29/01/03	-	-	-	-	-	-	-	-	-	-	-	-	1.6	
29/01/03	12/02/03	6.3	49.9	6.7	126.6	180.4	29.8	20.3	209.2	8.4	<1.0	28.2	0.6	48.0	17.3
12/02/03	26/02/03	-	-	-	-	-	-	-	-	-	-	-	-	0.0	
26/02/03	12/03/03	4.9	21.9	6.9	12.3	59.4	11.7	12.6	66.7	1.8	<1.0	14.7	11.2	16.0	34.2
12/03/03	26/03/03	-	-	-	-	-	-	-	-	-	-	-	-	0.3	
26/03/03	09/04/03	6.0	41.6	22.8	32.6	134.5	28.1	40.2	151.6	9.5	<1.0	25.4	0.9	32.0	3.1
09/04/03	23/04/03	6.5	168.5	152.1	218.2	56.7	28.3	174.0	62.8	7.1	<1.0	161.7	0.3	65.0	5.5
23/04/03	08/05/03	4.7	26.2	18.3	17.8	17.1	5.1	8.6	25.9	<0.5	<1.0	24.2	20.4	16.0	42.9
08/05/03	22/05/03	5.0	14.0	7.9	12.4	34.5	7.4	5.4	39.6	1.5	<1.0	9.8	9.1	11.0	51.3
22/05/03	04/06/03	6.3	13.5	5.9	142.2	24.7	2.8	3.2	26.4	11.3	6.9	10.5	0.5	18.0	20.2
04/06/03	18/06/03	7.0	90.4	24.9	5268.3	150.3	126.3	138.7	86.8	368.6	837.2	72.3	0.1	806.0	11.8
18/06/03	02/07/03	6.0	58.0	23.5	467.7	18.5	8.1	18.8	17.6	34.6	47.0	55.7	0.9	62.0	29.6
02/07/03	16/07/03	-	-	-	-	-	-	-	-	-	-	-	-	0.6	
16/07/03	30/07/03	4.8	18.6	19.0	31.0	2.5	1.2	5.0	4.3	1.3	<1.0	18.3	17.4	<10.0	98.0
30/07/03	14/08/03	-	-	-	-	-	-	-	-	-	-	-	-	1.2	
14/08/03	20/08/03	-	-	-	-	-	-	-	-	-	-	-	-	0.0	
20/08/03	03/09/03	4.2	63.5	53.0	54.1	12.9	6.3	23.1	17.9	2.6	<1.0	62.0	57.5	32.0	21.1
03/09/03	17/09/03	6.3	20.2	31.8	84.2	15.9	3.4	8.0	17.9	7.7	<1.0	18.3	0.5	18.0	5.5
17/09/03	01/10/03	6.2	4.6	1.1	34.5	25.2	6.1	20.0	<0.6	5.8	<1.0	1.6	0.7	14.0	7.2
01/10/03	15/10/03	6.2	64.0	13.3	<0.7	289.6	56.7	33.9	340.5	116.1	<1.0	29.2	0.6	66.0	5.6
15/10/03	29/10/03	4.7	49.3	53.9	42.3	51.2	14.8	25.1	73.2	4.5	<1.0	43.1	20.0	33.0	18.5
29/10/03	19/11/03	5.1	20.4	17.5	18.4	38.3	8.4	5.6	42.7	4.2	<1.0	15.8	7.9	13.0	45.3
19/11/03	03/12/03	4.8	33.5	32.9	34.5	26.3	6.2	4.9	40.9	2.0	<1.0	30.3	17.0	16.0	26.9
03/12/03	17/12/03	5.7	33.8	13.5	39.8	71.1	12.9	9.0	87.1	6.8	<1.0	25.2	2.1	19.0	16.7
17/12/03	31/12/03	5.7	23.7	6.8	13.3	57.0	11.1	3.7	310.7	3.2	22.4	16.8	2.1	13.0	31.1
31/12/03	14/01/04	5.7	26.3	10.5	20.0	111.7	18.6	7.7	131.5	3.6	<1.0	12.9	2.2	19.0	38.2
Precipitation-weighted annual mean for site (samples containing phosphate are excluded)														Total rainfall	
5023		27.9	19.9	37.3	44.0	9.2	11.4	52.6	4.6	-	22.6	13.1	18.2	533.8	

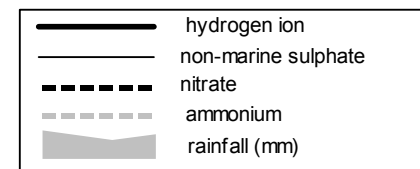
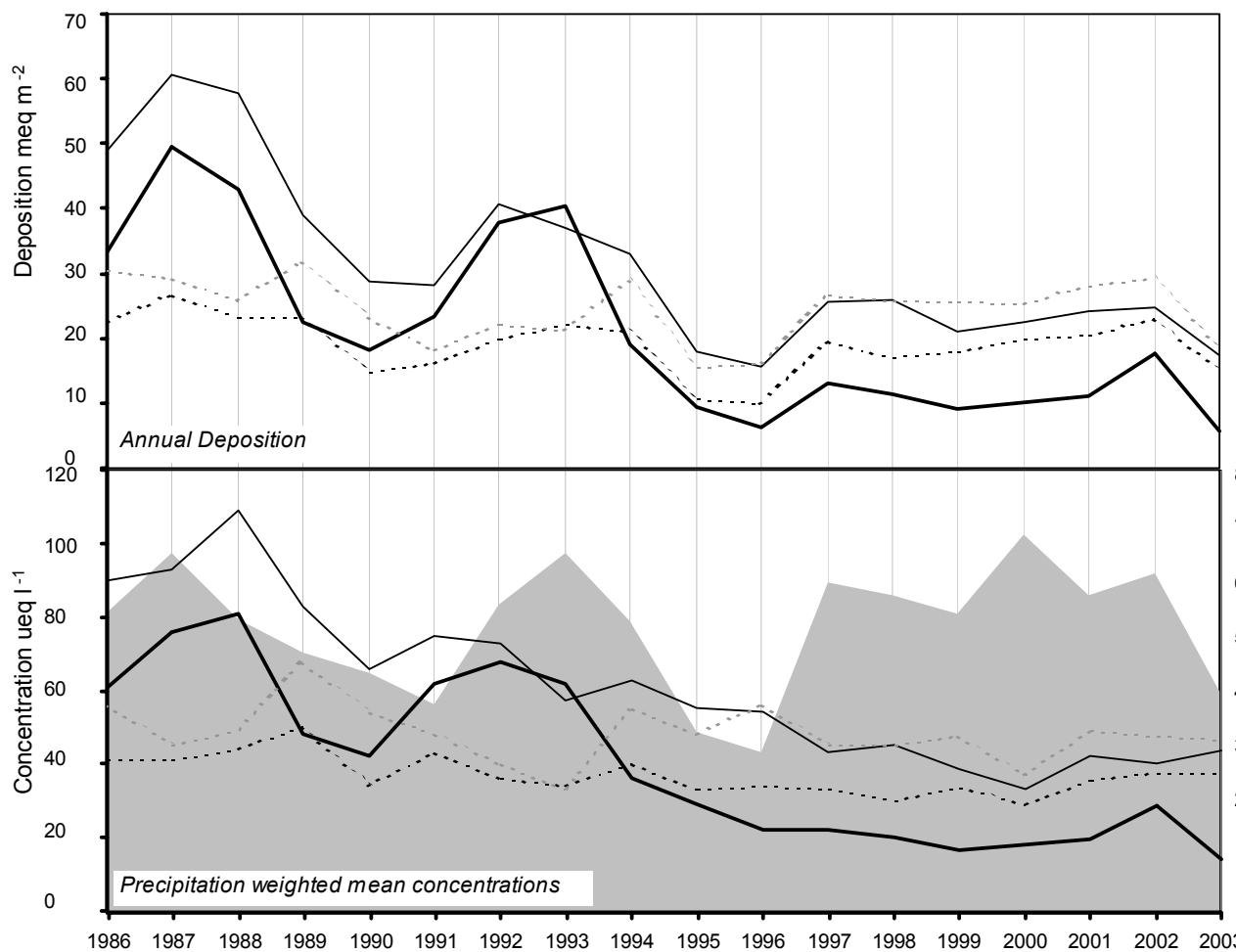
# Bottesford

**2003** Site Code: 5121  
 Easting: 4797  
 Northing: 3376  
 Latitude: 52 55 46 N  
 Longitude: 00 48 51 W  
 Altitude (m): 32  
 Rainfall (mm): 561  
 [30 year mean 1940 - 1971]

Site Environment:  
 Rural pasture

Other measurements:  
 DT, SO2 (PowerGen), ozone (PowerGen)

Site Operator:  
 PowerGen



long-term trends in concentration (+x = increase; -x = decrease)	
<i>hydrogen ion</i>	-3.60 ueq/l (-5.06 %/year): 17 years' data +++ Strong trend detected
<i>non-marine sulphate</i>	-3.74 ueq/l (-4.01 %/year): 18 years' data ++++ Very strong trend detected
<i>nitrate</i>	-0.58 ueq/l (-1.38 %/year): 18 years' data + Significant trend detected
<i>ammonium</i>	-0.46 ueq/l (-0.88 %/year): 18 years' data - No significant trend detected

ACID DEPOSITION DATA REPORT, 2003

**5121 Bottesford**

Sampling		pH	SO4	NO3	NH4	Na	Mg	Ca	Cl	K	PO4	nss-SO4	H	conductivity	rainfall
Start Date	End Date		(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µS/cm)	(mm)
03/01/03	13/01/03	4.3	95.5	38.0	63.9	276.2	53.2	27.6	333.4	6.1	<1.0	62.2	47.9	82.0	4.3
13/01/03	11/02/03	-	-	-	-	-	-	-	-	-	-	-	-	-	39.0
11/02/03	25/02/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
25/02/03	10/03/03	6.1	56.4	19.6	96.5	24.3	3.9	19.8	29.6	1.4	<1.0	53.5	0.9	20.0	18.7
10/03/03	08/04/03	6.4	215.9	110.3	185.1	228.3	60.2	182.8	257.8	16.9	<1.0	188.4	0.4	87.0	3.0
08/04/03	22/04/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
22/04/03	13/05/03	6.1	56.5	56.1	84.0	25.5	9.0	37.1	28.7	2.7	<1.0	53.4	0.8	23.0	21.3
13/05/03	20/05/03	5.6	33.1	20.5	42.2	32.2	8.0	19.6	39.3	2.4	<1.0	29.2	2.8	16.0	24.8
20/05/03	03/06/03	5.8	62.5	41.6	72.3	23.4	8.3	33.5	26.3	5.0	<1.0	59.7	1.6	20.0	9.3
03/06/03	17/06/03	5.1	27.2	24.8	33.0	14.4	4.4	9.5	9.6	2.0	<1.0	25.5	8.3	11.0	21.2
17/06/03	01/07/03	4.5	41.0	41.8	31.1	6.6	3.3	24.4	3.8	2.0	<1.0	40.2	33.1	21.0	46.7
01/07/03	22/07/03	4.3	87.2	87.8	37.9	23.4	10.4	52.1	15.9	12.0	<1.0	84.4	53.7	39.0	22.7
22/07/03	10/08/03	5.5	45.5	36.3	57.5	3.1	3.3	46.0	12.5	7.1	<1.0	45.1	3.2	18.0	31.3
10/08/03	27/08/03	4.5	221.6	230.3	229.5	20.5	29.7	222.5	29.1	11.8	<1.0	219.1	31.6	77.0	2.4
27/08/03	18/09/03	6.1	83.5	55.5	71.2	41.8	17.8	82.9	38.0	6.5	<1.0	78.4	0.9	31.0	4.3
18/09/03	07/10/03	5.4	73.6	45.8	34.4	151.6	36.2	65.3	172.0	6.3	<1.0	55.4	4.4	39.0	15.0
07/10/03	12/11/03	4.8	53.1	41.6	47.1	92.0	30.8	31.0	121.6	3.5	<1.0	42.0	15.1	30.0	32.5
12/11/03	25/11/03	4.8	36.3	21.5	49.4	25.9	8.7	12.4	26.4	1.7	<1.0	33.1	17.8	21.0	13.1
25/11/03	10/12/03	4.9	58.5	39.0	55.3	61.1	13.7	10.6	79.4	3.5	<1.0	51.1	11.2	23.0	18.7
10/12/03	23/12/03	5.1	19.3	10.8	14.1	8.7	3.6	4.3	15.5	1.1	<1.0	18.3	8.1	<10.0	39.1
23/12/03	13/01/04	5.0	23.9	21.5	24.9	52.9	9.5	5.7	57.9	1.4	<1.0	17.6	10.2	15.0	32.9
Precipitation-weighted annual mean for site (samples containing phosphate are excluded)															Total rainfall
5121			48.3	37.4	46.8	39.3	11.2	28.2	46.6	3.7	-	43.6	14.1	22.7	400.2

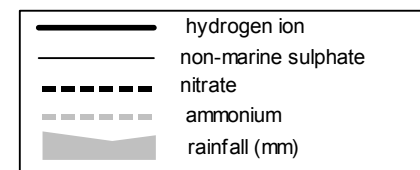
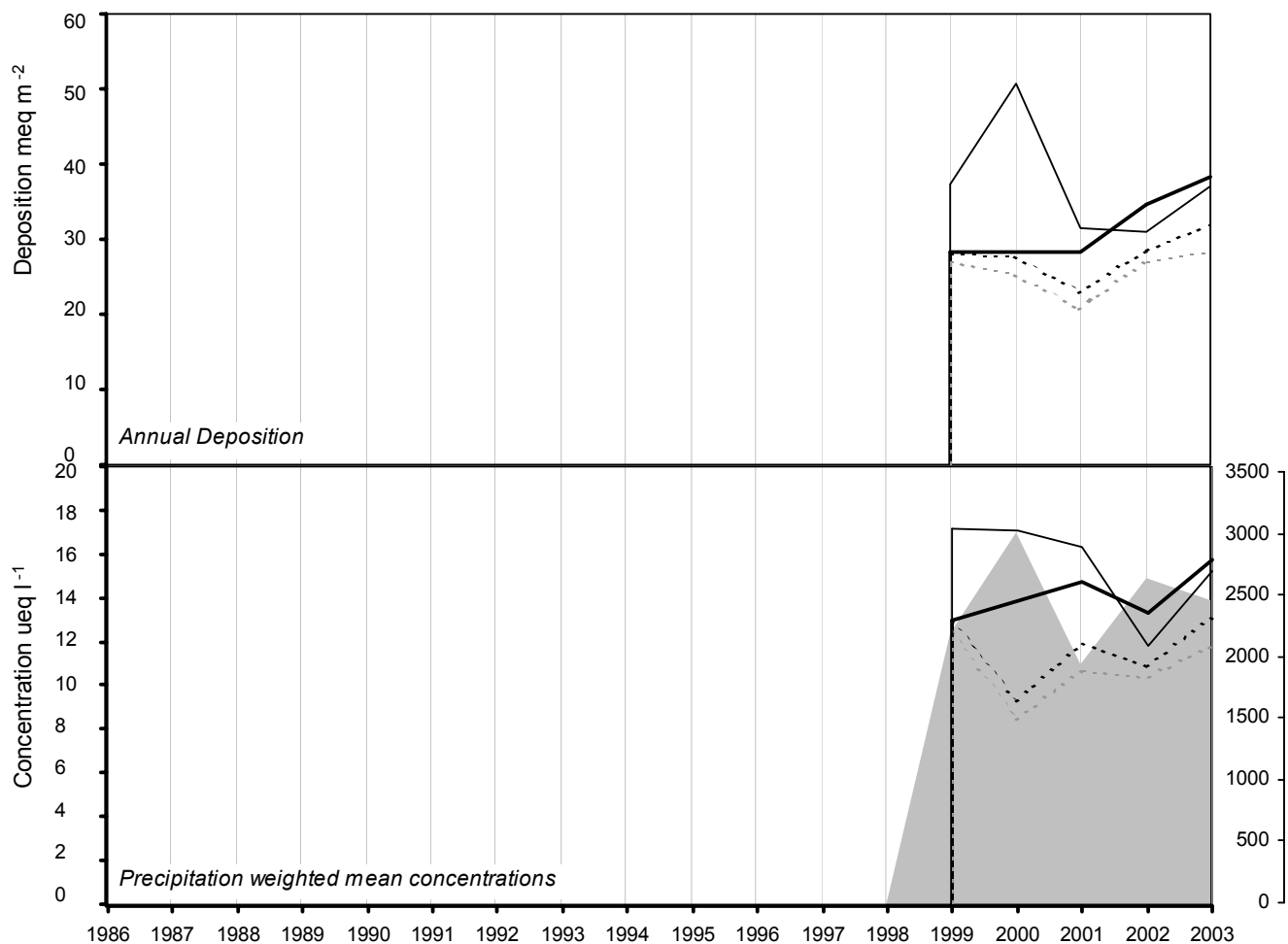
# Llyn Llgi

**2003** Site Code: 5160  
 Easting: 2647  
 Northing: 3483  
 Latitude: 53 01 48 N  
 Longitude: 04 01 82 W  
 Altitude (m): 380  
 Rainfall (mm): -  
 [30 year mean 1940 - 1971]

Site Environment:  
**Grassland and moorland**

Other measurements:  
**UKAWMN. Lakewater chemistry.**

Site Operator:  
**CEH Bangor**



long-term trends in concentration (+x = increase; -x = decrease)	
<i>hydrogen ion</i>	0.00 ueq/l (0.00 %/year): 4 years' data n/a Insufficient Data
<i>non-marine sulphate</i>	0.00 ueq/l (0.00 %/year): 4 years' data n/a Insufficient Data
<i>nitrate</i>	0.00 ueq/l (0.00 %/year): 4 years' data n/a Insufficient Data
<i>ammonium</i>	0.00 ueq/l (0.00 %/year): 4 years' data n/a Insufficient Data

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### 5160 Llyn Llgi

Sampling	pH	SO4	NO3	NH4	Na	Mg	Ca	Cl	K	PO4	nss-SO4	H	conductivity	rainfall	
Start Date	End Date	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µS/cm)	(mm)	
14/01/03	30/01/03	5.0	34.9	8.4	9.3	221.3	48.7	9.6	246.1	4.4	<1.0	8.2	10.0	39.0	188.0
30/01/03	10/02/03	4.9	18.8	7.5	9.1	84.4	16.8	4.5	92.9	1.6	<1.0	8.6	11.5	18.0	89.9
10/02/03	26/02/03	4.6	26.1	31.0	13.8	66.3	13.7	12.1	62.6	1.8	<1.0	18.1	24.5	21.0	29.5
26/02/03	11/03/03	4.8	31.8	7.0	8.9	170.0	37.7	8.6	193.0	3.4	<1.0	11.4	17.4	32.0	178.4
11/03/03	24/03/03	5.0	64.6	28.6	33.2	325.2	68.5	26.5	355.7	6.6	<1.0	25.4	10.5	58.0	3.4
24/03/03	07/04/03	5.2	36.6	24.2	28.1	154.2	30.1	21.6	165.9	3.7	<1.0	18.0	5.9	30.0	24.0
07/04/03	23/04/03	6.2	75.2	94.8	113.5	40.7	13.7	62.2	32.2	2.3	<1.0	70.3	0.6	32.0	12.5
23/04/03	06/05/03	4.7	18.4	10.8	10.4	48.1	9.9	3.9	51.5	1.3	<1.0	12.6	18.6	14.0	175.1
06/05/03	19/05/03	4.8	23.6	7.2	7.8	71.1	15.0	5.1	86.6	1.2	<1.0	15.1	17.0	19.0	115.8
19/05/03	02/06/03	4.6	20.7	9.2	11.4	56.5	11.5	6.3	60.4	1.0	<1.0	13.9	28.2	15.0	170.6
02/06/03	16/06/03	4.7	29.6	12.9	7.5	58.8	12.0	5.8	56.5	1.1	<1.0	22.5	20.9	18.0	50.9
16/06/03	30/06/03	4.4	30.0	22.0	25.2	40.2	10.3	14.1	42.3	1.7	<1.0	25.2	43.7	19.0	56.7
30/06/03	16/07/03	4.4	41.8	17.0	18.6	49.0	11.2	6.9	58.7	1.6	<1.0	35.9	36.3	23.0	19.7
16/07/03	28/07/03	4.7	26.7	18.9	18.0	38.6	7.9	5.7	38.5	0.5	<1.0	22.0	20.0	19.0	154.1
28/07/03	11/08/03	4.6	20.3	15.6	10.1	32.8	6.6	4.7	33.5	1.0	<1.0	16.4	22.9	15.0	73.1
11/08/03	26/08/03	5.7	47.8	36.9	88.1	127.9	22.3	15.1	138.7	6.8	<1.0	32.4	1.8	33.0	13.2
26/08/03	08/09/03	5.3	15.3	16.9	29.3	23.5	5.3	5.1	22.9	<0.5	<1.0	12.5	5.6	11.0	54.1
08/09/03	23/09/03	4.7	28.1	12.7	13.3	35.4	7.7	5.9	33.8	1.3	<1.0	23.9	21.4	14.0	198.0
23/09/03	06/10/03	4.8	24.5	17.0	8.4	96.2	19.6	7.6	95.5	1.9	<1.0	12.9	17.4	20.0	79.7
06/10/03	22/10/03	4.9	57.3	60.6	31.1	278.0	61.7	36.6	248.5	6.5	<1.0	23.8	12.0	59.0	25.3
22/10/03	03/11/03	5.0	19.2	14.4	5.3	121.8	25.8	5.8	146.1	2.4	<1.0	4.5	9.1	23.0	123.0
03/11/03	17/11/03	5.0	38.0	13.0	5.4	237.9	50.7	11.7	291.1	4.9	<1.0	9.4	10.5	41.0	87.2
17/11/03	25/11/03	5.1	28.7	10.8	8.8	93.8	18.6	4.3	135.2	2.1	<1.0	17.4	8.3	18.0	185.1
25/11/03	01/12/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
01/12/03	17/12/03	5.2	17.9	10.8	6.4	36.8	6.0	3.8	28.7	0.7	<1.0	13.5	6.9	<10.0	37.3
17/12/03	29/12/03	5.0	31.4	11.3	6.6	136.8	26.9	6.1	168.8	2.0	<1.0	14.9	9.5	25.0	115.3
29/12/03	12/01/04	5.2	26.0	9.2	5.8	105.3	19.8	4.0	119.2	1.8	<1.0	13.3	6.9	19.0	170.9
Precipitation-weighted annual mean for site (samples containing phosphate are excluded)														Total rainfall	
5160		27.2	13.1	11.8	99.0	20.8	7.2	112.6	2.1	-	15.2	15.8	22.0	2430.5	

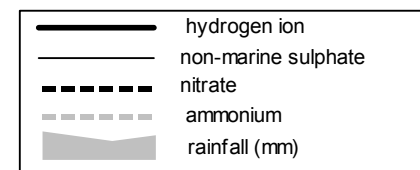
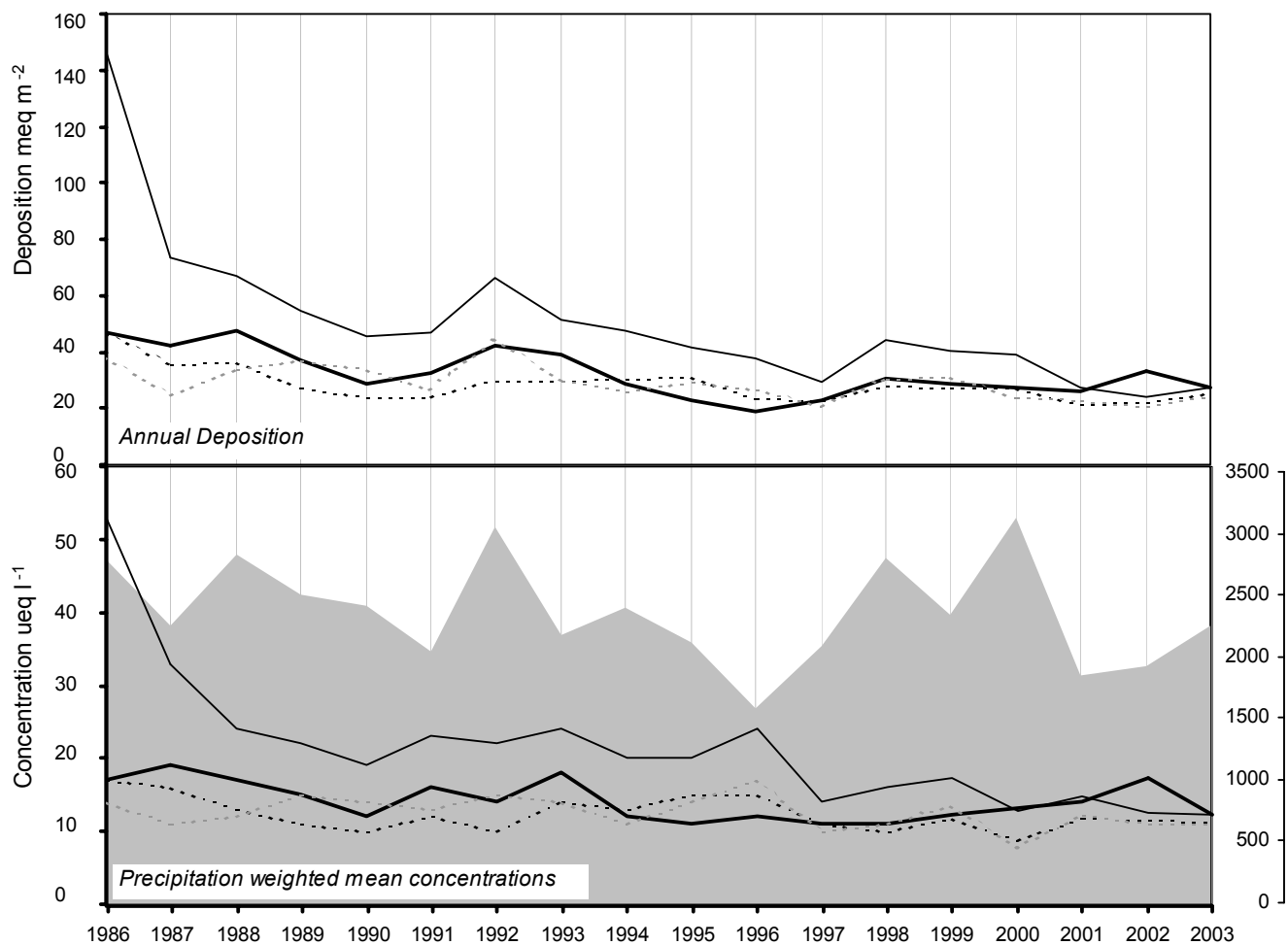
# Llyn Llydaw

**2003** Site Code: 5153  
 Easting: 2638  
 Northing: 3549  
 Latitude: 53 04 35 N  
 Longitude: 04 01 42 W  
 Altitude (m): 490  
 Rainfall (mm): 2417  
 [30 year mean 1940 - 1971]

Site Environment:  
**Very open moorland in Snowdon Horseshoe**

Other measurements:  
**DT**

Site Operator:  
**Countryside Council for Wales**



long-term trends in concentration (+x = increase; -x = decrease)	
<i>hydrogen ion</i>	-0.24 ueq/l (-1.51 %/year): 17 years' data - No significant trend detected
<i>non-marine sulphate</i>	-1.37 ueq/l (-4.15 %/year): 18 years' data ++ Moderately strong trend detected
<i>nitrate</i>	-0.20 ueq/l (-1.43 %/year): 18 years' data - No significant trend detected
<i>ammonium</i>	-0.16 ueq/l (-1.17 %/year): 18 years' data - No significant trend detected

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### 5153 Llyn Llydaw

Sampling	pH	SO4	NO3	NH4	Na	Mg	Ca	Cl	K	PO4	nss-SO4	H	conductivity	rainfall	
Start Date	End Date	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µS/cm)	(mm)	
01/01/03	15/01/03	4.6	21.5	12.4	9.5	96.3	19.9	5.1	104.2	2.1	<1.0	9.9	25.1	22.0	56.8
15/01/03	29/01/03	4.8	17.2	5.0	3.8	100.0	21.0	4.6	114.0	2.2	<1.0	5.1	14.1	20.0	112.7
29/01/03	12/02/03	5.0	17.3	5.1	6.4	101.3	21.7	4.5	106.5	2.1	<1.0	5.1	11.0	21.0	80.8
12/02/03	26/02/03	5.1	41.8	45.1	46.6	102.4	21.7	20.1	109.3	2.5	<1.0	29.5	8.3	28.0	12.9
26/02/03	12/03/03	5.0	22.2	8.1	10.1	111.6	22.5	12.1	123.7	2.1	<1.0	8.7	10.0	22.0	118.3
12/03/03	26/03/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
26/03/03	09/04/03	5.1	27.1	20.6	25.8	105.5	23.7	14.1	112.1	2.2	<1.0	14.4	8.5	24.0	18.8
09/04/03	23/04/03	6.7	123.6	128.8	178.8	52.7	18.4	108.9	45.5	3.0	<1.0	117.3	0.2	48.0	6.8
23/04/03	07/05/03	4.8	16.9	10.2	12.0	34.8	7.5	3.7	38.3	0.8	<1.0	12.7	14.1	12.0	200.4
07/05/03	21/05/03	4.8	19.0	5.0	6.2	81.0	17.5	6.4	90.0	1.7	<1.0	9.3	15.5	18.0	164.7
21/05/03	04/06/03	4.9	19.0	10.5	15.9	24.4	5.8	4.4	28.1	0.8	<1.0	16.1	12.9	11.0	103.3
04/06/03	18/06/03	4.8	28.7	12.5	13.8	34.9	7.1	4.3	33.3	0.6	<1.0	24.4	17.0	14.0	71.8
18/06/03	02/07/03	4.6	25.8	25.6	32.7	10.3	3.1	8.3	9.8	0.8	<1.0	24.6	22.9	13.0	49.7
02/07/03	16/07/03	5.6	121.9	69.0	286.1	85.1	7.2	2.9	88.8	14.2	44.2	111.6	2.5	-	1.7
16/07/03	30/07/03	4.9	18.7	9.5	11.9	35.1	6.5	4.7	34.9	0.8	<1.0	14.5	13.8	12.0	190.7
30/07/03	13/08/03	4.3	54.4	59.9	57.0	29.7	8.7	30.0	28.7	2.8	<1.0	50.8	55.0	24.0	21.1
13/08/03	27/08/03	5.7	24.5	19.3	44.3	42.4	6.7	8.0	45.2	4.0	<1.0	19.3	2.2	17.0	10.2
27/08/03	10/09/03	6.1	15.8	12.5	16.5	24.9	4.8	6.5	14.1	0.5	<1.0	12.8	0.9	11.0	101.4
10/09/03	24/09/03	5.0	16.7	10.6	12.4	33.7	7.1	3.5	38.8	0.9	<1.0	12.7	10.7	13.0	99.5
24/09/03	08/10/03	4.8	22.8	10.7	3.2	104.7	20.3	5.6	112.4	2.7	<1.0	10.2	15.8	22.0	77.8
08/10/03	22/10/03	4.4	92.9	87.4	48.4	125.3	29.9	47.7	110.4	3.8	<1.0	77.8	43.7	54.0	12.2
22/10/03	05/11/03	5.0	18.0	15.6	6.7	101.1	21.5	5.5	119.5	2.0	<1.0	5.9	10.0	21.0	127.5
05/11/03	19/11/03	4.9	31.0	13.9	12.6	140.5	29.1	7.4	163.3	2.9	<1.0	14.1	11.7	28.0	107.8
19/11/03	03/12/03	5.0	13.5	7.7	3.0	44.8	7.6	2.2	45.5	0.4	<1.0	8.1	9.5	12.0	169.4
03/12/03	17/12/03	5.2	10.3	7.9	5.9	35.8	7.2	3.9	33.3	1.4	<1.0	5.9	6.5	<10.0	95.3
17/12/03	31/12/03	5.0	19.3	8.1	5.7	72.9	15.6	5.0	91.5	1.8	<1.0	10.6	9.8	17.0	84.9
31/12/03	14/01/04	5.3	22.4	6.2	2.5	101.6	19.5	4.8	122.6	1.4	<1.0	10.2	4.7	17.0	141.7
Precipitation-weighted annual mean for site (samples containing phosphate are excluded)														Total rainfall	
5153		20.5	11.3	10.9	67.3	13.8	6.2	74.3	1.5	-	12.3	12.3	16.7	2238.1	

# River Etherow

**2003**

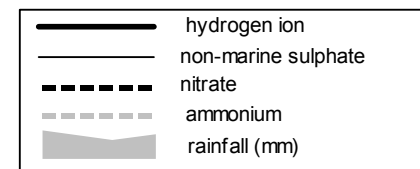
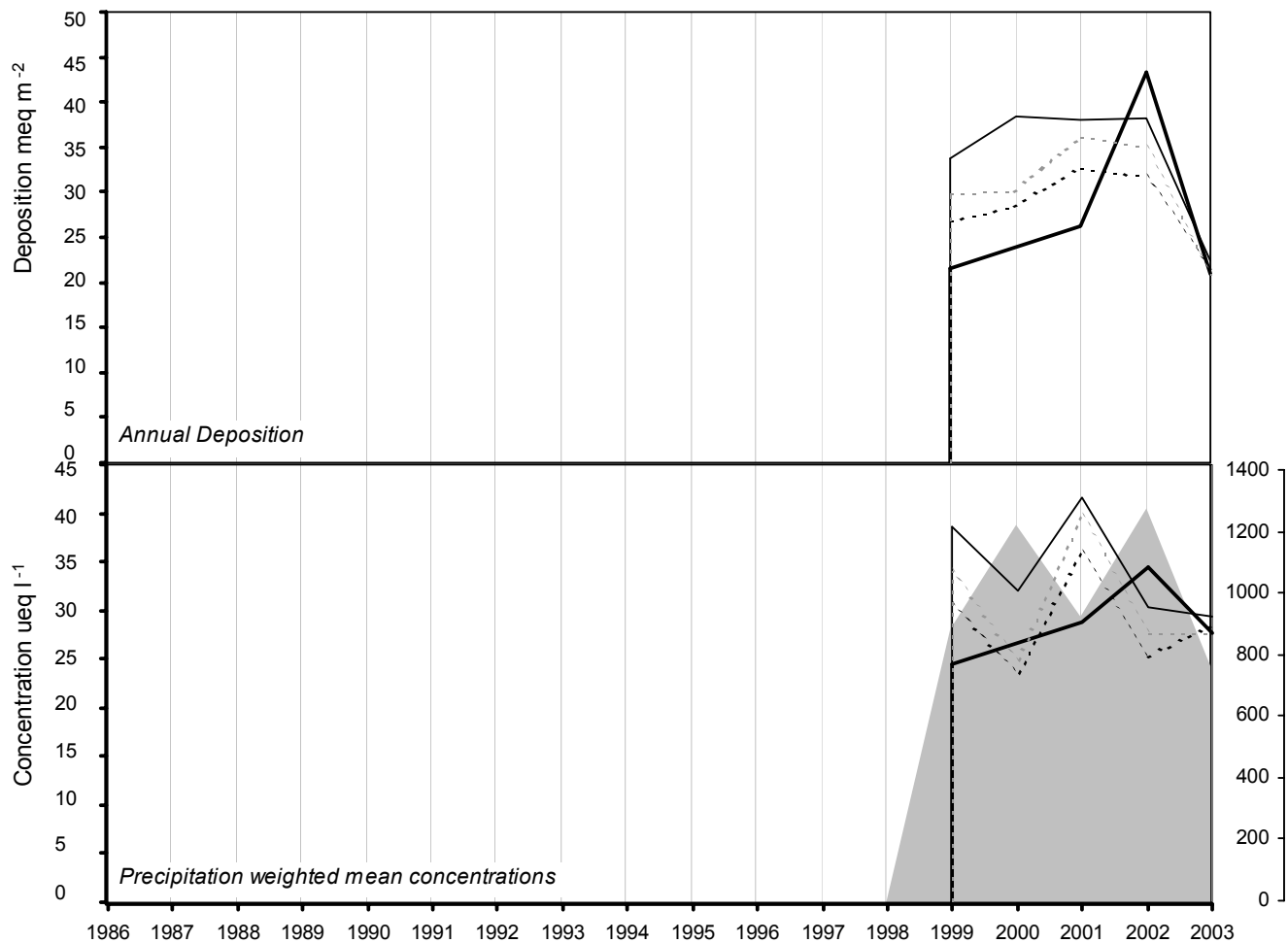
Site Code: 5158  
 Easting: 4125  
 Northing: 3986  
 Latitude: 53 48 39 N  
 Longitude: 01 81 31 W  
 Altitude (m): 485  
 Rainfall (mm): -

[30 year mean 1940 - 1971]

Site Environment:  
**Moorland**

Other measurements:  
**UKAWMN. Streamwater and soil chemistry**

Site Operator:  
**ENSIS**



long-term trends in concentration (+x = increase; -x = decrease)	
<i>hydrogen ion</i>	0.00 ueq/l (0.00 %/year): 4 years' data n/a Insufficient Data
<i>non-marine sulphate</i>	0.00 ueq/l (0.00 %/year): 4 years' data n/a Insufficient Data
<i>nitrate</i>	0.00 ueq/l (0.00 %/year): 4 years' data n/a Insufficient Data
<i>ammonium</i>	0.00 ueq/l (0.00 %/year): 4 years' data n/a Insufficient Data

ACID DEPOSITION DATA REPORT, 2003

### 5158 River Etherow

Sampling	pH	SO4	NO3	NH4	Na	Mg	Ca	Cl	K	PO4	nss-SO4	H	conductivity	rainfall	
Start Date	End Date	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µS/cm)	(mm)	
02/01/03	14/01/03	4.9	93.9	51.8	127.7	150.9	31.1	15.5	190.8	3.8	<1.0	75.7	11.5	49.0	12.4
14/01/03	27/01/03	4.4	34.6	19.3	25.8	76.1	16.7	8.5	93.3	2.1	<1.0	25.4	42.7	24.0	35.3
27/01/03	10/02/03	5.0	43.5	14.3	25.4	165.9	33.3	11.7	179.7	4.1	<1.0	23.5	10.2	35.0	22.5
10/02/03	26/02/03	4.4	120.8	109.2	101.3	191.7	43.9	65.7	218.5	5.1	<1.0	97.7	42.7	70.0	10.9
26/02/03	12/03/03	5.0	28.5	15.4	25.6	65.0	14.0	10.9	72.3	1.4	<1.0	20.7	11.0	19.0	50.2
12/03/03	25/03/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.2
25/03/03	09/04/03	5.8	31.2	47.8	43.1	69.5	17.7	38.8	67.4	1.6	<1.0	22.8	1.7	24.0	7.2
09/04/03	24/04/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
24/04/03	07/05/03	5.0	26.1	20.7	29.5	19.2	4.8	6.6	22.8	<0.5	<1.0	23.8	11.0	14.0	72.1
07/05/03	19/05/03	4.6	34.9	21.8	24.0	62.9	13.9	12.2	70.0	1.3	<1.0	27.4	27.5	23.0	32.0
19/05/03	03/06/03	4.8	23.6	9.0	5.9	31.4	5.6	5.5	23.8	<0.0	<1.0	19.8	14.5	11.0	24.3
03/06/03	16/06/03	4.7	29.9	19.9	10.8	27.3	5.9	14.5	18.8	0.2	<1.0	26.6	18.6	14.0	28.5
16/06/03	02/07/03	4.0	49.7	40.6	23.5	16.1	4.7	14.6	16.0	<0.5	<1.0	47.8	109.6	29.0	62.5
02/07/03	15/07/03	4.3	60.8	68.5	20.1	64.5	14.0	28.4	54.7	<0.2	<1.0	53.0	51.3	37.0	6.0
15/07/03	29/07/03	4.6	36.3	35.7	27.2	13.7	4.0	17.6	6.5	<2.4	<1.0	34.6	25.7	17.0	50.5
29/07/03	09/08/03	4.6	20.6	19.5	26.1	<0.4	0.3	2.6	4.2	<0.5	<1.0	20.6	24.5	13.0	20.2
09/08/03	26/08/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
26/08/03	09/09/03	4.1	155.3	135.8	86.1	72.0	22.8	78.0	73.0	2.4	<1.0	146.6	83.2	67.0	3.4
09/09/03	22/09/03	5.1	33.3	45.6	26.7	33.0	7.3	18.5	46.6	2.2	<1.0	29.3	7.4	15.0	14.5
22/09/03	08/10/03	5.7	101.3	97.5	71.1	400.5	85.5	60.1	484.2	15.2	<1.0	53.0	2.1	80.0	11.3
08/10/03	23/10/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
23/10/03	04/11/03	4.6	29.3	24.0	20.0	49.7	10.9	6.5	51.5	1.0	<1.0	23.3	24.5	22.0	50.2
04/11/03	18/11/03	4.6	44.9	41.2	40.6	83.9	19.1	13.1	98.0	2.3	<1.0	34.8	25.7	30.0	52.0
18/11/03	02/12/03	4.4	35.6	31.2	27.1	39.6	8.7	6.1	63.2	1.3	<1.0	30.8	40.7	26.0	52.2
02/12/03	16/12/03	4.6	29.5	25.3	17.3	65.7	16.5	6.6	81.3	1.9	<1.0	21.6	24.5	23.0	20.1
16/12/03	31/12/03	5.2	26.3	20.0	18.1	72.7	15.1	8.0	84.3	7.4	<1.0	17.5	6.8	19.0	36.6
31/12/03	16/01/04	5.1	27.6	12.7	16.7	109.5	21.0	7.7	120.6	3.7	<1.0	14.4	8.9	20.0	82.8
Precipitation-weighted annual mean for site (samples containing phosphate are excluded)														Total rainfall	
5158		37.1	28.5	27.7	63.9	13.8	12.3	72.6	2.2	-	29.4	27.7	23.6	757.9	

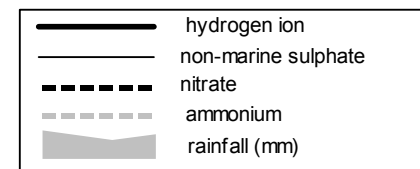
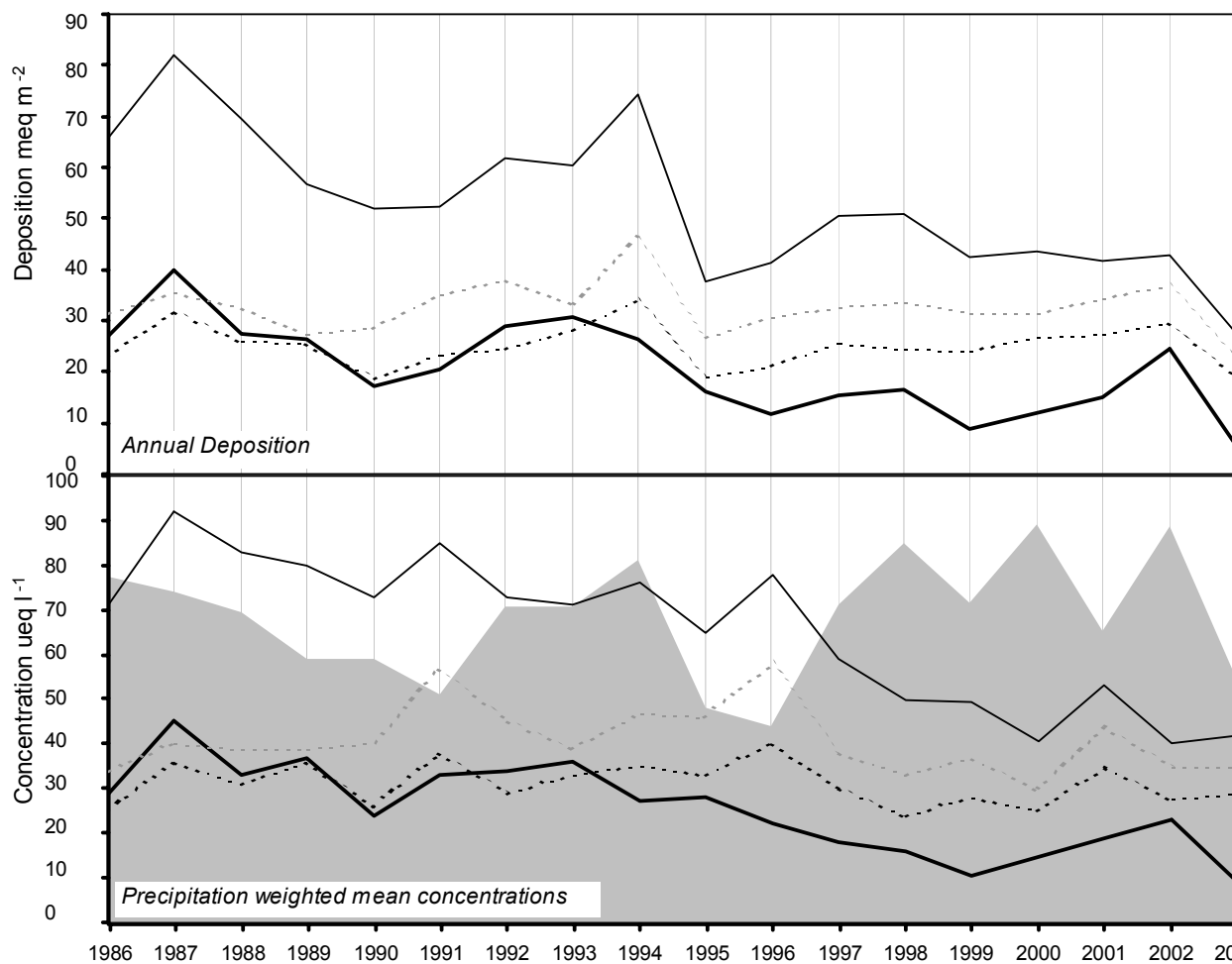
# Wardlow Hay Cop

**2003** Site Code: 5120  
 Easting: 4177  
 Northing: 3739  
 Latitude: 53 55 41 N  
 Longitude: 01 44 05 W  
 Altitude (m): 350  
 Rainfall (mm): 1081  
 [30 year mean 1940 - 1971]

Site Environment:  
**Open moorland**

Other measurements:  
**DT**

Site Operator:  
**English Nature**



long-term trends in concentration (+x = increase; -x = decrease)	
<i>hydrogen ion</i>	-1.48 ueq/l (-3.87 %/year): 17 years' data +++ Strong trend detected
<i>non-marine sulphate</i>	-2.70 ueq/l (-3.05 %/year): 18 years' data ++++ Very strong trend detected
<i>nitrate</i>	-0.19 ueq/l (-0.58 %/year): 18 years' data - No significant trend detected
<i>ammonium</i>	-0.29 ueq/l (-0.66 %/year): 18 years' data - No significant trend detected

ACID DEPOSITION DATA REPORT, 2003

### 5120 Wardlow Hay Cop

Sampling	pH	SO4	NO3	NH4	Na	Mg	Ca	Cl	K	PO4	nss-SO4	H	conductivity	rainfall	
Start Date	End Date	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µS/cm)	(mm)	
12/01/03	26/01/03	5.3	44.1	18.7	34.6	63.2	13.5	28.2	77.2	2.0	<1.0	36.5	5.2	21.0	34.5
26/01/03	09/02/03	6.1	71.5	12.7	32.3	290.7	59.9	61.8	333.5	7.1	<1.0	36.5	0.8	57.0	21.3
09/02/03	23/02/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
23/02/03	09/03/03	5.7	43.7	19.5	42.2	38.7	7.8	28.3	48.3	1.4	<1.0	39.0	2.0	17.0	33.4
09/03/03	23/03/03	5.5	86.9	24.7	54.8	218.0	47.0	47.1	237.3	5.1	<1.0	60.6	3.2	47.0	5.3
23/03/03	06/04/03	6.4	126.4	48.2	41.2	86.6	25.0	163.9	98.1	3.7	<1.0	116.0	0.4	41.0	6.9
06/04/03	20/04/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
20/04/03	04/05/03	5.6	44.9	31.5	45.6	17.8	6.3	38.2	19.1	0.9	<1.0	42.8	2.3	16.0	78.8
04/05/03	20/05/03	5.8	38.7	15.9	24.8	63.0	14.2	40.3	72.0	1.8	<1.0	31.1	1.8	20.0	48.2
20/05/03	01/06/03	5.0	29.9	12.0	18.1	16.8	3.8	20.5	20.4	2.6	<1.0	27.8	10.2	12.0	17.1
01/06/03	22/06/03	5.8	63.6	43.9	33.6	39.7	11.1	88.5	43.9	5.7	<1.0	58.8	1.5	25.0	17.6
22/06/03	29/06/03	4.8	53.1	56.9	45.3	12.3	6.2	50.5	11.7	2.0	<1.0	51.6	17.0	21.0	15.8
29/06/03	13/07/03	4.5	43.0	35.0	25.1	8.7	2.4	15.7	3.7	2.1	<1.0	41.9	34.7	21.0	56.8
13/07/03	27/07/03	5.1	51.4	46.2	35.4	13.4	5.7	45.5	8.0	3.6	<1.0	49.7	7.6	18.0	36.9
27/07/03	11/08/03	4.5	97.3	85.6	87.0	10.6	5.9	87.6	14.9	4.6	<1.0	96.0	29.5	33.0	18.3
11/08/03	25/08/03	6.4	130.7	71.8	126.5	41.5	15.4	197.1	44.7	10.6	8.3	125.7	0.4	58.0	4.9
25/08/03	07/09/03	4.4	196.1	124.4	95.2	61.3	22.5	181.9	82.9	4.5	<1.0	188.7	41.7	67.0	7.5
07/09/03	21/09/03	5.9	44.8	38.2	20.9	15.2	5.9	51.7	15.0	2.7	<1.0	43.0	1.3	15.0	11.0
21/09/03	05/10/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
05/10/03	19/10/03	5.9	119.6	28.6	26.0	456.1	92.5	115.8	512.2	13.0	<1.0	64.7	1.3	90.0	18.0
19/10/03	02/11/03	5.1	39.9	25.0	22.6	39.4	8.3	33.3	41.7	9.9	<1.0	35.2	7.4	16.0	41.7
02/11/03	16/11/03	4.8	61.4	43.3	52.3	88.5	20.5	33.9	109.1	2.3	<1.0	50.7	14.1	33.0	36.2
16/11/03	30/11/03	5.8	63.1	24.2	44.1	40.8	9.9	44.0	47.6	2.9	<1.0	58.2	1.7	23.0	13.8
30/11/03	14/12/03	4.9	14.6	7.5	19.1	84.4	19.6	15.2	35.8	2.5	<1.0	4.5	13.2	24.0	58.8
14/12/03	28/12/03	5.5	31.2	12.8	21.2	48.3	11.3	15.4	60.2	1.7	<1.0	25.4	3.4	15.0	37.1
28/12/03	11/01/04	5.7	42.7	15.9	27.5	109.9	20.1	15.9	140.3	2.4	<1.0	29.5	1.8	22.0	45.0
Precipitation-weighted annual mean for site (samples containing phosphate are excluded)														Total rainfall	
5120		50.0	28.9	34.9	66.7	15.2	40.3	71.6	3.3	-	42.0	9.0	24.7	664.7	

# Driby

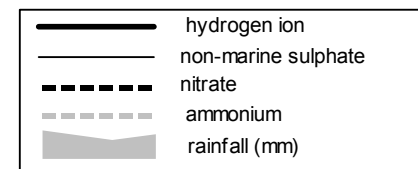
2003

Site Code: 5136  
 Easting: 5386  
 Northing: 3744  
 Latitude: 53 14 54 N  
 Longitude: 00 04 39 E  
 Altitude (m): 47  
 Rainfall (mm): 737  
 [30 year mean 1940 - 1971]

Site Environment:  
 Sheep pasture

Other measurements:  
 DT, Met

Site Operator:  
 Anglian Water Services Ltd



long-term trends in concentration (+x = increase; -x = decrease)	
<i>hydrogen ion</i>	-0.95 ueq/l (-2.20 %/year): 17 years' data + Significant trend detected
<i>non-marine sulphate</i>	-2.77 ueq/l (-3.41 %/year): 18 years' data ++++ Very strong trend detected
<i>nitrate</i>	-0.58 ueq/l (-1.23 %/year): 18 years' data + Significant trend detected
<i>ammonium</i>	-1.36 ueq/l (-2.14 %/year): 18 years' data ++ Moderately strong trend detected

ACID DEPOSITION DATA REPORT, 2003



**5136 Driby**

Sampling		pH	SO4	NO3	NH4	Na	Mg	Ca	Cl	K	PO4	nss-SO4	H	conductivity	rainfall
Start Date	End Date		(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µS/cm)	(mm)
01/01/03	15/01/03	4.3	58.5	29.9	19.7	212.0	47.9	15.1	246.5	5.0	<1.0	33.0	52.5	53.0	11.1
15/01/03	29/01/03	4.3	24.4	17.7	15.5	63.8	14.1	7.0	77.5	1.1	<1.0	16.7	44.7	20.0	40.5
29/01/03	12/02/03	4.8	81.5	31.5	44.8	379.7	83.1	25.6	428.9	7.7	<1.0	35.8	16.2	71.0	12.9
12/02/03	26/02/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.2
26/02/03	26/03/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.7
26/03/03	09/04/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
09/04/03	23/04/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
23/04/03	07/05/03	6.2	48.7	34.3	67.5	29.3	8.0	23.5	31.8	1.0	<1.0	45.1	0.7	18.0	38.5
07/05/03	21/05/03	5.1	40.7	31.1	61.5	27.6	7.8	12.5	32.5	0.6	<1.0	37.3	7.4	17.0	37.4
21/05/03	04/06/03	4.4	44.4	36.4	52.4	10.0	3.8	14.7	13.3	0.7	<1.0	43.2	38.9	20.0	28.1
04/06/03	18/06/03	4.1	57.4	62.9	60.7	13.1	6.6	25.5	17.1	2.7	<1.0	55.8	87.1	29.0	37.4
18/06/03	02/07/03	4.3	31.6	31.9	26.1	13.3	6.1	23.1	19.3	2.5	<1.0	30.0	50.1	19.0	68.2
02/07/03	30/07/03	3.8	60.1	54.3	22.0	16.5	7.8	36.3	23.5	4.6	<1.0	58.1	173.8	34.0	50.9
30/07/03	18/08/03	3.7	60.5	53.5	22.0	15.8	7.9	36.5	22.6	4.6	<1.0	58.6	190.5	34.0	12.5
18/08/03	28/08/03	5.9	140.7	66.8	145.7	32.6	13.2	102.1	81.0	6.7	<1.0	136.8	1.4	44.0	3.7
28/08/03	10/09/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
10/09/03	24/09/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
24/09/03	05/11/03	5.1	48.0	33.7	20.7	181.8	41.7	36.4	203.7	4.5	<1.0	26.1	7.6	40.0	65.4
05/11/03	19/11/03	6.3	99.8	54.3	201.4	149.4	23.0	21.7	172.0	16.8	<1.0	81.8	0.5	55.0	9.9
19/11/03	03/12/03	5.1	27.8	25.9	28.4	29.5	6.9	7.9	35.4	3.4	<1.0	24.3	7.9	15.0	3.2
03/12/03	17/12/03	4.9	45.2	35.7	41.3	70.2	14.4	10.6	95.9	5.8	<1.0	36.7	13.5	24.0	22.0
17/12/03	31/12/03	5.0	45.8	27.2	38.9	59.5	12.5	8.4	80.4	6.1	<1.0	38.6	9.5	21.0	13.2
31/12/03	14/01/04	4.7	45.4	37.7	42.4	79.2	16.1	8.1	79.8	3.4	<1.0	35.8	22.4	25.0	26.9
Precipitation-weighted annual mean for site (samples containing phosphate are excluded)															Total rainfall
5136			47.8	37.7	41.1	68.0	16.6	22.8	79.7	3.4	-	39.6	48.7	28.2	482.9

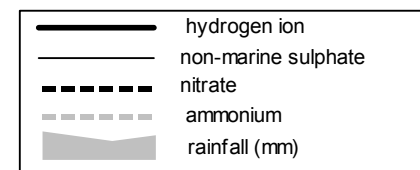
# Jenny Hurn

**2003** Site Code: 5118  
 Easting: 4816  
 Northing: 3986  
 Latitude: 53 28 39 N  
 Longitude: 00 46 13 W  
 Altitude (m): 4  
 Rainfall (mm): 563  
 [30 year mean 1940 - 1971]

Site Environment:  
 Open arable land

Other measurements:  
 DT, SO2 (PowerGen)

Site Operator:  
 PowerGen



long-term trends in concentration (+x = increase; -x = decrease)	
<i>hydrogen ion</i>	-3.92 ueq/l (-4.36 %/year): 15 years' data +++ Strong trend detected
<i>non-marine sulphate</i>	-4.13 ueq/l (-3.77 %/year): 16 years' data ++++ Very strong trend detected
<i>nitrate</i>	-0.54 ueq/l (-1.15 %/year): 16 years' data + Significant trend detected
<i>ammonium</i>	-0.52 ueq/l (-0.91 %/year): 16 years' data - No significant trend detected

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**5118 Jenny Hurn**

The measurement programme was discontinued in November 2001.

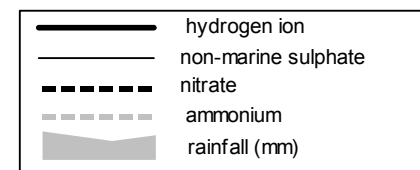
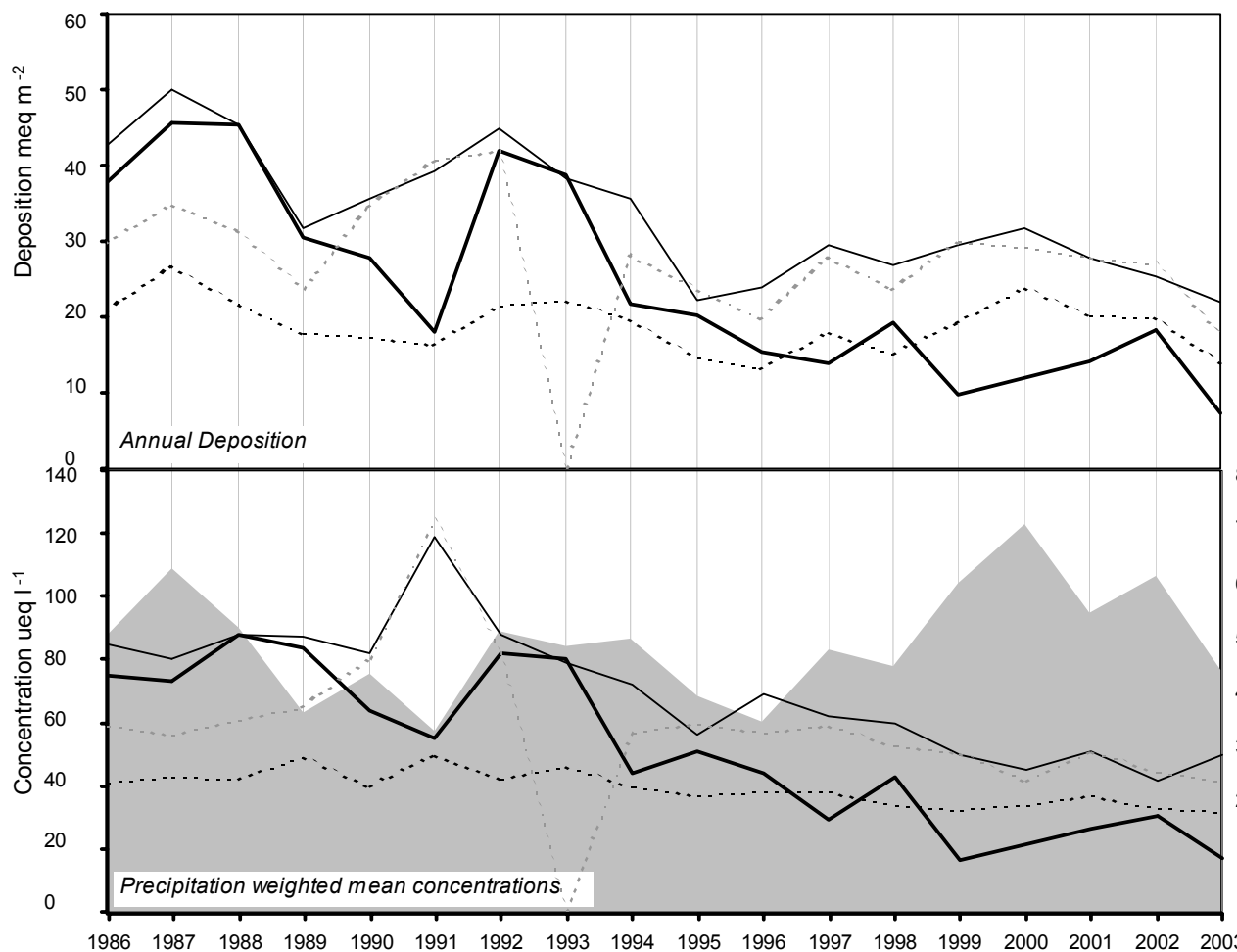
# Thorganby

**2003** Site Code: 5117  
 Easting: 4676  
 Northing: 4428  
 Latitude: 53 52 36 N  
 Longitude: 00 58 19 W  
 Altitude (m): 8  
 Rainfall (mm): 565  
 [30 year mean 1940 - 1971]

Site Environment:  
 Open meadow and arable land

Other measurements:  
 DT

Site Operator:  
 Selby District Council



long-term trends in concentration (+x = increase; -x = decrease)	
<i>hydrogen ion</i>	-4.04 ueq/l (-4.70 %/year): 17 years' data ++++ Very strong trend detected
<i>non-marine sulphate</i>	-3.10 ueq/l (-3.21 %/year): 18 years' data +++ Strong trend detected
<i>nitrate</i>	-0.75 ueq/l (-1.64 %/year): 16 years' data ++ Moderately strong trend detected
<i>ammonium</i>	-1.91 ueq/l (-2.50 %/year): 17 years' data + Significant trend detected

ACID DEPOSITION DATA REPORT, 2003

### 5117 Thorganby

Sampling	pH	SO4	NO3	NH4	Na	Mg	Ca	Cl	K	PO4	nss-SO4	H	conductivity	rainfall	
Start Date	End Date	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µS/cm)	(mm)	
02/01/03	15/01/03	-	-	-	-	-	-	-	-	-	-	-	-	1.2	
15/01/03	29/01/03	4.4	47.8	20.5	30.6	93.4	24.2	22.6	118.7	2.4	<1.0	36.6	38.0	29.0	28.7
29/01/03	12/02/03	-	-	-	-	-	-	-	-	-	-	-	-	15.3	
12/02/03	26/02/03	-	-	-	-	-	-	-	-	-	-	-	-	0.0	
26/02/03	12/03/03	5.8	96.8	37.3	83.2	66.3	22.1	70.2	94.3	4.0	<1.0	88.8	1.6	34.0	15.4
12/03/03	26/03/03	-	-	-	-	-	-	-	-	-	-	-	-	0.6	
26/03/03	09/04/03	-	-	-	-	-	-	-	-	-	-	-	-	0.0	
09/04/03	23/04/03	-	-	-	-	-	-	-	-	-	-	-	-	0.0	
23/04/03	07/05/03	5.7	54.5	24.7	60.9	11.4	6.2	23.9	17.8	1.2	<1.0	53.1	1.9	15.0	43.7
07/05/03	21/05/03	5.4	59.0	33.0	48.0	22.4	13.4	50.1	32.2	5.4	<1.0	56.3	3.7	21.0	24.9
21/05/03	04/06/03	5.8	101.1	50.9	163.9	14.2	11.5	54.4	30.2	16.9	62.0	99.4	1.4	39.0	19.9
04/06/03	18/06/03	4.7	69.1	41.0	5.8	11.7	16.0	86.3	20.2	6.1	<1.0	67.7	21.4	21.0	24.0
18/06/03	02/07/03	4.5	41.4	33.2	30.7	7.8	7.3	35.0	12.1	1.4	<1.0	40.4	32.4	17.0	63.5
02/07/03	16/07/03	5.1	45.2	3.5	11.1	10.5	6.6	30.4	13.2	0.8	<1.0	44.0	8.5	12.0	8.9
16/07/03	30/07/03	4.6	60.7	40.2	41.3	7.7	11.8	50.9	22.2	3.9	<1.0	59.8	24.5	21.0	29.0
30/07/03	13/08/03	6.4	240.8	206.9	282.2	47.0	38.5	195.1	38.5	54.6	90.8	235.2	0.4	99.0	4.1
13/08/03	27/08/03	5.0	232.7	197.6	224.3	264.7	78.6	259.0	272.0	32.7	14.3	200.8	10.7	116.0	2.1
27/08/03	10/09/03	6.1	46.8	42.8	28.8	44.6	16.3	63.8	32.0	8.7	<1.0	41.5	0.9	20.0	16.0
10/09/03	24/09/03	6.0	67.6	35.3	50.6	14.5	14.3	59.2	14.5	3.5	<1.0	65.9	1.0	21.0	16.3
24/09/03	08/10/03	-	-	-	-	-	-	-	-	-	-	-	-	0.0	
08/10/03	22/10/03	6.4	95.0	51.2	69.5	313.1	63.7	76.9	312.6	12.3	<1.0	57.3	0.4	74.0	6.0
22/10/03	05/11/03	4.7	40.0	35.9	41.7	85.8	19.9	13.6	120.8	2.7	<1.0	29.6	21.4	35.0	22.4
05/11/03	19/11/03	4.7	85.9	47.2	76.5	86.7	23.2	27.5	109.3	4.1	<1.0	75.4	18.6	36.0	12.6
19/11/03	03/12/03	6.6	85.7	33.1	306.2	31.2	1.8	1.2	48.0	48.3	145.0	81.9	0.3	41.0	31.2
03/12/03	17/12/03	4.8	60.0	18.9	51.3	65.8	14.2	12.4	92.1	3.4	<1.0	52.1	17.0	27.0	8.0
17/12/03	31/12/03	5.0	36.8	17.4	27.7	46.8	9.9	8.3	56.4	3.1	<1.0	31.1	11.0	17.0	20.9
31/12/03	14/01/04	4.8	41.9	26.8	36.5	50.6	11.3	10.7	57.1	1.8	<1.0	35.8	14.8	19.0	26.1
Precipitation-weighted annual mean for site (samples containing phosphate are excluded)														Total rainfall	
5117		54.3	31.5	40.8	39.6	14.0	37.4	50.7	3.2	-	49.5	16.8	22.5	440.8	

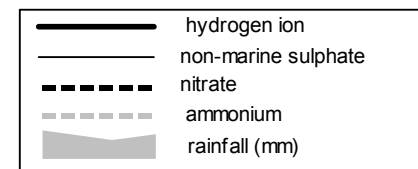
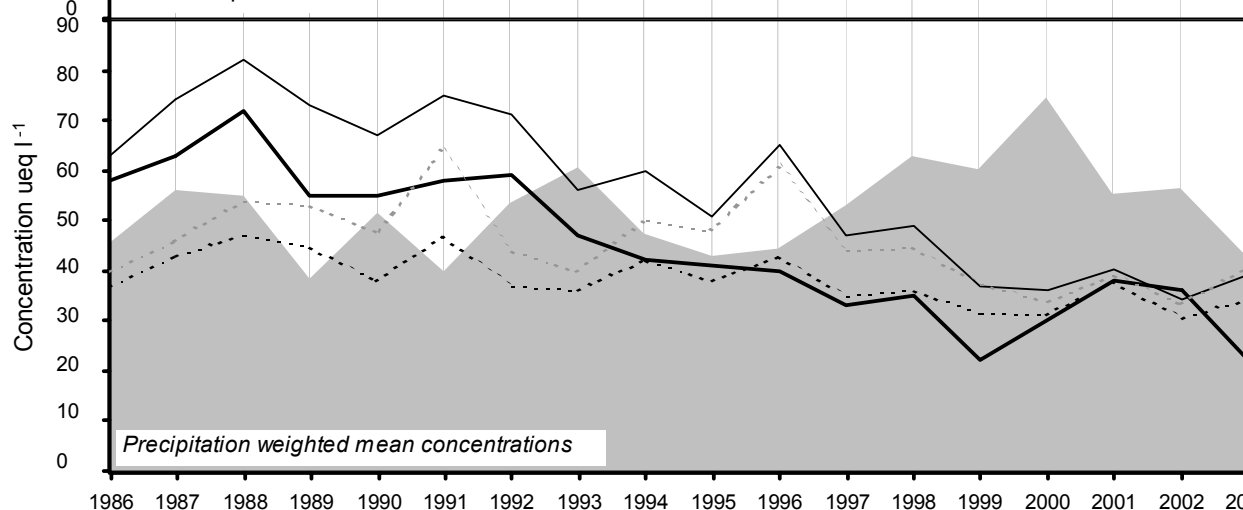
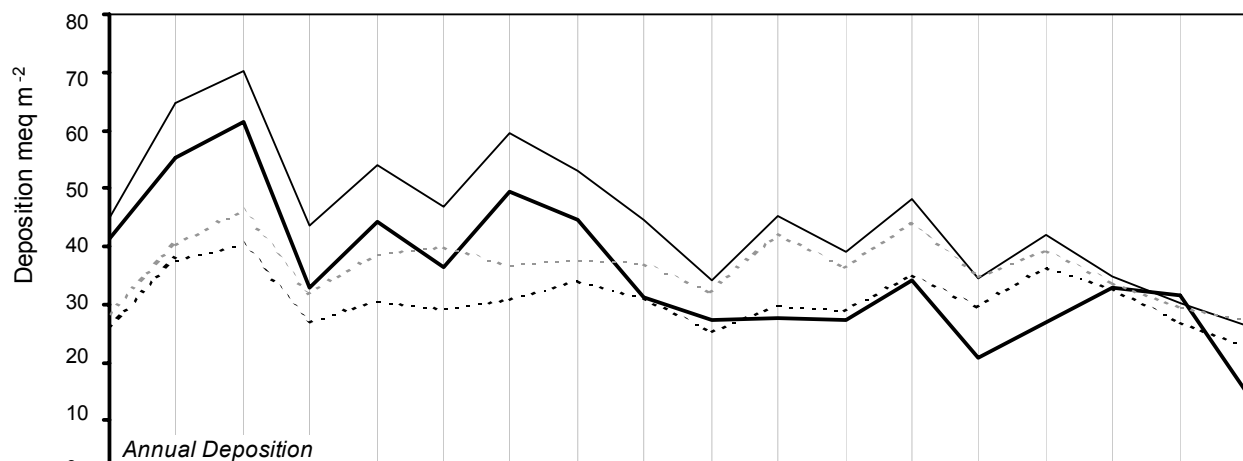
# High Muffles

**2003** Site Code: **5009**  
 Easting: **4776**  
 Northing: **4939**  
 Latitude: **54 20 05 N**  
 Longitude: **00 48 23 W**  
 Altitude (m): **267**  
 Rainfall (mm): **897**  
 [30 year mean 1940 - 1971]

Site Environment:  
**Forestry plantation**

Other measurements:  
**DT, Daily SO<sub>2</sub>, Daily SO<sub>4</sub>, HNO<sub>3</sub> Denuder, ozone, EMEP**

Site Operator:  
**Forest Enterprise**



long-term trends in concentration (+x = increase; -x = decrease)	
<i>hydrogen ion</i>	-2.39 ueq/l (-3.67 %/year): 17 years' data ++++ Very strong trend detected
<i>non-marine sulphate</i>	-2.58 ueq/l (-3.28 %/year): 18 years' data ++++ Very strong trend detected
<i>nitrate</i>	-0.65 ueq/l (-1.48 %/year): 18 years' data ++ Moderately strong trend detected
<i>ammonium</i>	-0.77 ueq/l (-1.48 %/year): 18 years' data + Significant trend detected

ACID DEPOSITION DATA REPORT, 2003

### 5009 High Muffles

Sampling	pH	SO4	NO3	NH4	Na	Mg	Ca	Cl	K	PO4	nss-SO4	H	conductivity	rainfall	
Start Date	End Date	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µS/cm)	(mm)	
01/01/03	15/01/03	4.6	33.5	13.8	9.7	155.0	34.9	7.3	177.1	3.8	<1.0	14.8	23.4	36.0	48.0
15/01/03	29/01/03	4.7	41.5	18.8	20.0	156.2	35.0	11.6	183.8	3.6	<1.0	22.7	22.4	37.0	49.2
29/01/03	12/02/03	4.6	82.2	29.4	40.2	427.9	96.6	23.6	492.1	10.4	<1.0	30.6	26.3	80.0	29.8
12/02/03	26/02/03	4.2	186.4	186.8	223.6	231.7	49.7	47.3	250.1	9.5	<1.0	158.4	63.1	99.0	2.9
26/02/03	12/03/03	4.7	61.9	36.6	66.5	114.9	25.8	15.0	135.9	3.4	<1.0	48.1	22.4	37.0	33.2
12/03/03	26/03/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.3
26/03/03	09/04/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.7
09/04/03	23/04/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
23/04/03	07/05/03	4.6	39.6	29.6	51.7	13.2	4.7	11.8	16.1	1.6	<1.0	38.0	26.9	16.0	52.3
07/05/03	21/05/03	4.7	48.7	35.6	53.2	19.2	5.8	12.3	24.8	1.3	<1.0	46.4	18.6	21.0	42.2
21/05/03	04/06/03	4.7	77.4	54.6	66.8	10.9	6.4	35.0	14.9	4.0	<1.0	76.0	21.9	26.0	27.8
04/06/03	18/06/03	5.1	92.3	73.1	80.5	19.9	9.2	78.5	19.5	3.2	<1.0	89.9	7.6	28.0	13.9
18/06/03	02/07/03	4.6	30.7	23.3	25.0	19.9	5.9	21.5	24.1	1.2	<1.0	28.3	25.7	14.0	23.5
02/07/03	16/07/03	4.4	80.4	39.3	47.2	48.2	13.1	17.1	48.4	5.5	<1.0	74.6	40.7	31.0	6.7
16/07/03	30/07/03	4.8	61.3	47.6	49.4	7.4	3.8	23.3	6.3	1.7	<1.0	60.4	14.8	25.0	35.1
30/07/03	13/08/03	4.9	130.6	109.0	137.6	13.9	7.8	81.9	15.8	6.5	<1.0	129.0	13.2	43.0	8.5
13/08/03	27/08/03	6.7	167.4	144.9	102.6	373.6	86.3	235.3	399.4	25.5	8.0	122.4	0.2	113.0	1.4
27/08/03	10/09/03	5.2	55.2	41.3	44.1	101.5	22.9	29.4	140.6	4.1	<1.0	42.9	6.0	28.0	24.3
10/09/03	24/09/03	4.5	54.4	37.1	46.3	8.3	3.4	17.6	5.8	1.2	<1.0	53.4	30.2	25.0	30.1
24/09/03	08/10/03	6.3	140.6	45.3	31.8	384.8	76.1	155.8	205.8	11.2	<1.0	94.2	0.5	82.0	6.2
08/10/03	22/10/03	6.2	65.7	46.3	18.3	315.2	63.6	79.7	233.0	8.9	<1.0	27.7	0.7	64.0	7.3
22/10/03	05/11/03	4.5	42.9	32.3	18.7	145.6	30.8	9.9	164.6	3.7	<1.0	25.4	31.6	45.0	53.8
05/11/03	19/11/03	4.6	65.2	53.7	74.1	79.0	18.7	15.0	95.0	3.9	<1.0	55.7	26.9	34.0	16.0
19/11/03	03/12/03	4.5	31.0	32.4	25.3	31.0	8.1	5.0	42.2	1.3	<1.0	27.3	30.2	20.0	60.8
03/12/03	17/12/03	4.7	41.8	34.7	47.1	59.3	14.8	6.9	83.9	2.3	<1.0	34.7	22.4	26.0	18.6
17/12/03	31/12/03	4.9	47.4	20.6	22.2	184.0	40.1	12.7	228.2	4.4	<1.0	25.3	12.0	37.0	37.0
31/12/03	14/01/04	4.7	26.7	17.2	38.8	78.5	17.5	7.4	49.6	2.5	<1.0	17.2	18.2	23.0	40.4
Precipitation-weighted annual mean for site (samples containing phosphate are excluded)														Total rainfall	
5009		51.1	34.1	40.6	98.1	22.6	19.0	109.7	3.3	-	39.3	22.4	32.3	669.9	

# Bannisdale

**2003**

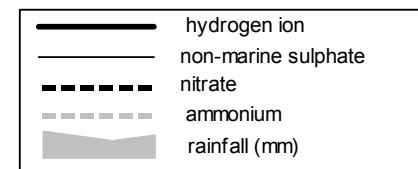
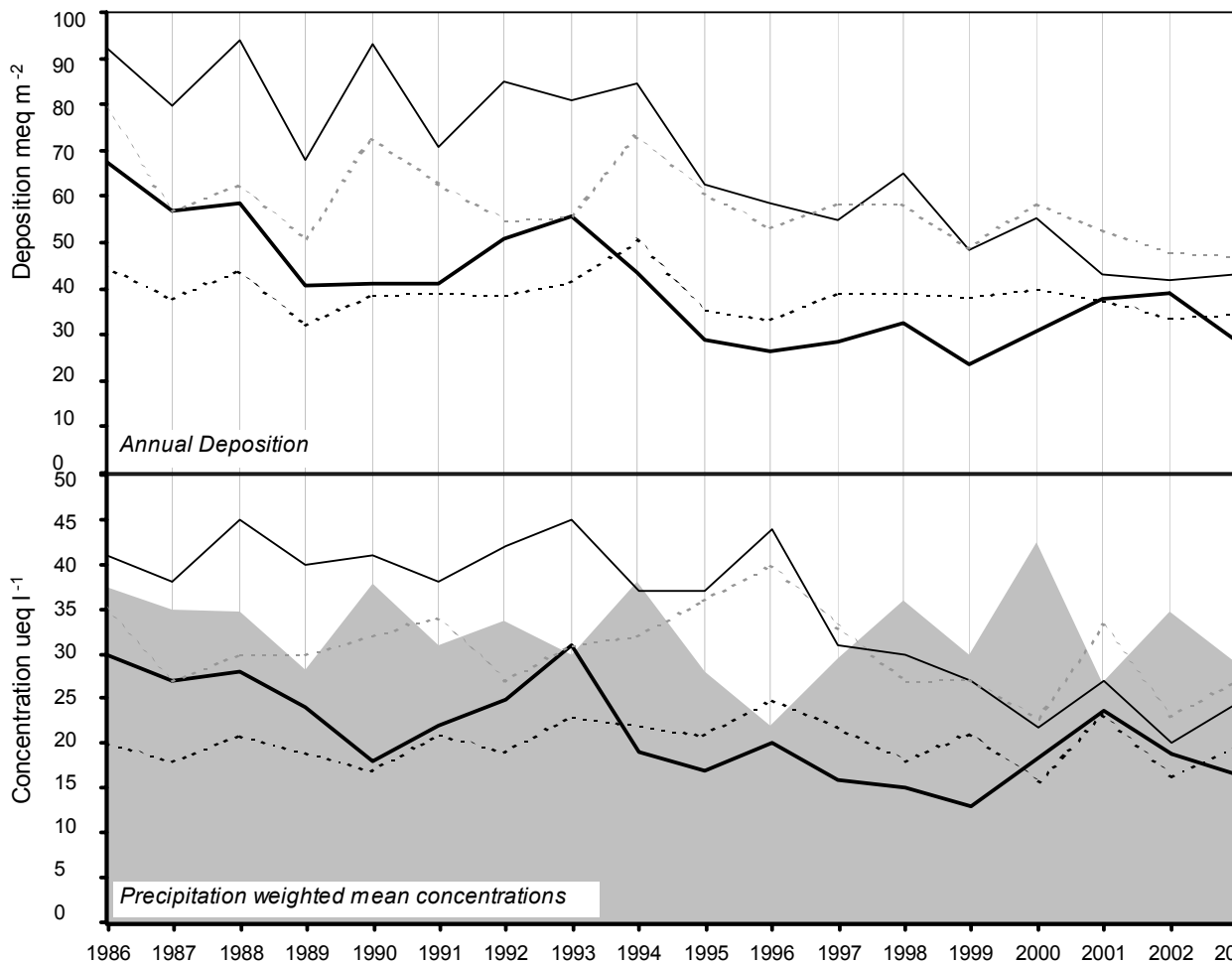
Site Code: 5111  
 Easting: 3515  
 Northing: 5043  
 Latitude: 54 25 54 N  
 Longitude: 02 44 52 W  
 Altitude (m): 265  
 Rainfall (mm): 1972

[30 year mean 1940 - 1971]

Site Environment:  
 Open moorland, sheep grazing

Other measurements:  
 DT

Site Operator:  
 CEH Windermere



long-term trends in concentration (+x = increase; -x = decrease)	
<i>hydrogen ion</i>	-0.68 ueq/l (-2.51 %/year): 17 years' data ++ Moderately strong trend detected
<i>non-marine sulphate</i>	-1.26 ueq/l (-2.77 %/year): 18 years' data +++ Strong trend detected
<i>nitrate</i>	0.00 ueq/l (0.00 %/year): 18 years' data - No significant trend detected
<i>ammonium</i>	-0.28 ueq/l (-0.85 %/year): 18 years' data - No significant trend detected

ACID DEPOSITION DATA REPORT, 2003



## 5111 Bannisdale

Sampling		pH	SO4	NO3	NH4	Na	Mg	Ca	Cl	K	PO4	nss-SO4	H	conductivity	rainfall
Start Date	End Date		(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µS/cm)	(mm)
01/01/03	15/01/03	5.0	42.6	18.0	38.1	132.3	27.8	7.7	146.7	2.8	<1.0	26.7	10.7	36.0	60.3
15/01/03	29/01/03	4.6	35.1	13.7	18.4	159.0	34.7	10.0	182.5	4.7	<1.0	16.0	26.3	33.0	105.4
29/01/03	12/02/03	4.7	29.2	15.2	19.7	110.7	23.9	7.5	127.3	2.4	<1.0	15.9	19.1	26.0	87.0
12/02/03	26/02/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
26/02/03	12/03/03	5.0	35.3	18.3	28.9	100.2	22.0	10.6	115.4	2.2	<1.0	23.2	11.0	25.0	124.6
12/03/03	26/03/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.2
26/03/03	09/04/03	5.7	40.5	22.1	43.0	119.1	23.3	27.4	126.3	3.3	<1.0	26.2	2.1	27.0	7.2
09/04/03	23/04/03	6.1	95.2	78.1	109.8	44.8	15.5	79.3	45.5	2.8	<1.0	89.8	0.8	34.0	19.3
23/04/03	07/05/03	4.5	28.9	19.6	31.6	31.9	6.6	4.3	35.5	0.8	<1.0	25.0	30.9	15.0	141.1
07/05/03	21/05/03	4.7	28.8	13.9	20.0	69.5	14.9	8.2	78.1	1.2	<1.0	20.4	20.4	20.0	102.1
21/05/03	04/06/03	5.0	60.5	35.4	43.4	111.7	21.9	27.9	118.3	11.6	<1.0	47.0	9.1	30.0	15.1
04/06/03	18/06/03	5.1	51.7	34.2	58.3	44.5	8.8	12.2	43.8	1.7	<1.0	46.3	8.5	19.0	27.4
18/06/03	02/07/03	4.2	42.0	30.4	28.1	11.8	4.0	17.1	13.1	2.0	<1.0	40.6	58.9	19.0	64.4
02/07/03	16/07/03	4.8	50.8	29.4	39.7	57.3	13.3	14.6	65.3	<0.2	<1.0	43.9	16.6	22.0	21.8
16/07/03	30/07/03	5.5	28.0	16.8	47.3	13.8	4.6	7.0	15.7	2.8	<1.0	26.3	3.0	13.0	120.9
30/07/03	13/08/03	6.0	119.5	76.5	126.3	63.6	17.2	62.1	67.0	10.8	<1.0	111.9	1.1	40.0	10.3
13/08/03	27/08/03	5.3	38.8	25.6	41.1	97.6	20.4	28.9	108.6	2.9	<1.0	27.0	5.0	27.0	20.3
27/08/03	10/09/03	5.8	30.2	28.9	39.8	43.5	11.8	30.3	48.2	2.2	<1.0	24.9	1.6	18.0	14.3
10/09/03	24/09/03	4.8	18.3	12.6	17.4	26.0	11.9	4.9	22.3	2.7	<1.0	15.2	17.4	10.0	71.6
24/09/03	08/10/03	4.6	31.8	18.0	17.5	113.6	30.0	10.6	132.3	3.1	<1.0	18.1	26.9	26.0	81.4
08/10/03	22/10/03	5.7	39.2	21.5	29.5	114.9	24.5	21.2	146.3	5.7	<1.0	25.3	2.2	28.0	25.1
22/10/03	05/11/03	4.8	37.3	13.8	7.9	93.3	19.7	26.2	104.5	3.4	<1.0	26.0	15.8	24.0	87.0
05/11/03	19/11/03	4.7	43.1	26.6	27.6	81.5	17.2	8.0	100.7	2.0	<1.0	33.3	21.9	22.0	89.9
19/11/03	03/12/03	5.1	23.5	15.6	14.3	26.1	5.9	3.4	39.7	0.9	<1.0	20.4	8.9	12.0	47.5
03/12/03	17/12/03	4.9	29.7	22.1	24.2	72.5	16.3	8.3	85.9	2.7	<1.0	21.0	11.7	21.0	134.9
17/12/03	31/12/03	5.2	18.5	12.7	11.9	33.5	8.9	8.3	41.2	1.5	<1.0	14.5	6.5	11.0	138.0
31/12/03	14/01/04	5.0	39.6	20.9	23.6	151.3	31.4	9.0	180.1	3.1	<1.0	21.4	10.0	29.0	138.9
Precipitation-weighted annual mean for site (samples containing phosphate are excluded)															Total rainfall
5111			33.9	19.8	26.9	77.5	17.5	11.3	89.7	2.5	-	24.6	16.6	21.7	1756.0

# Hillsborough Forest

**2003**

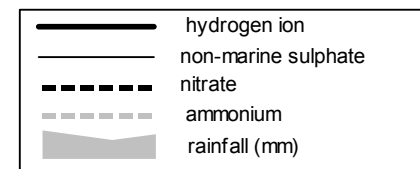
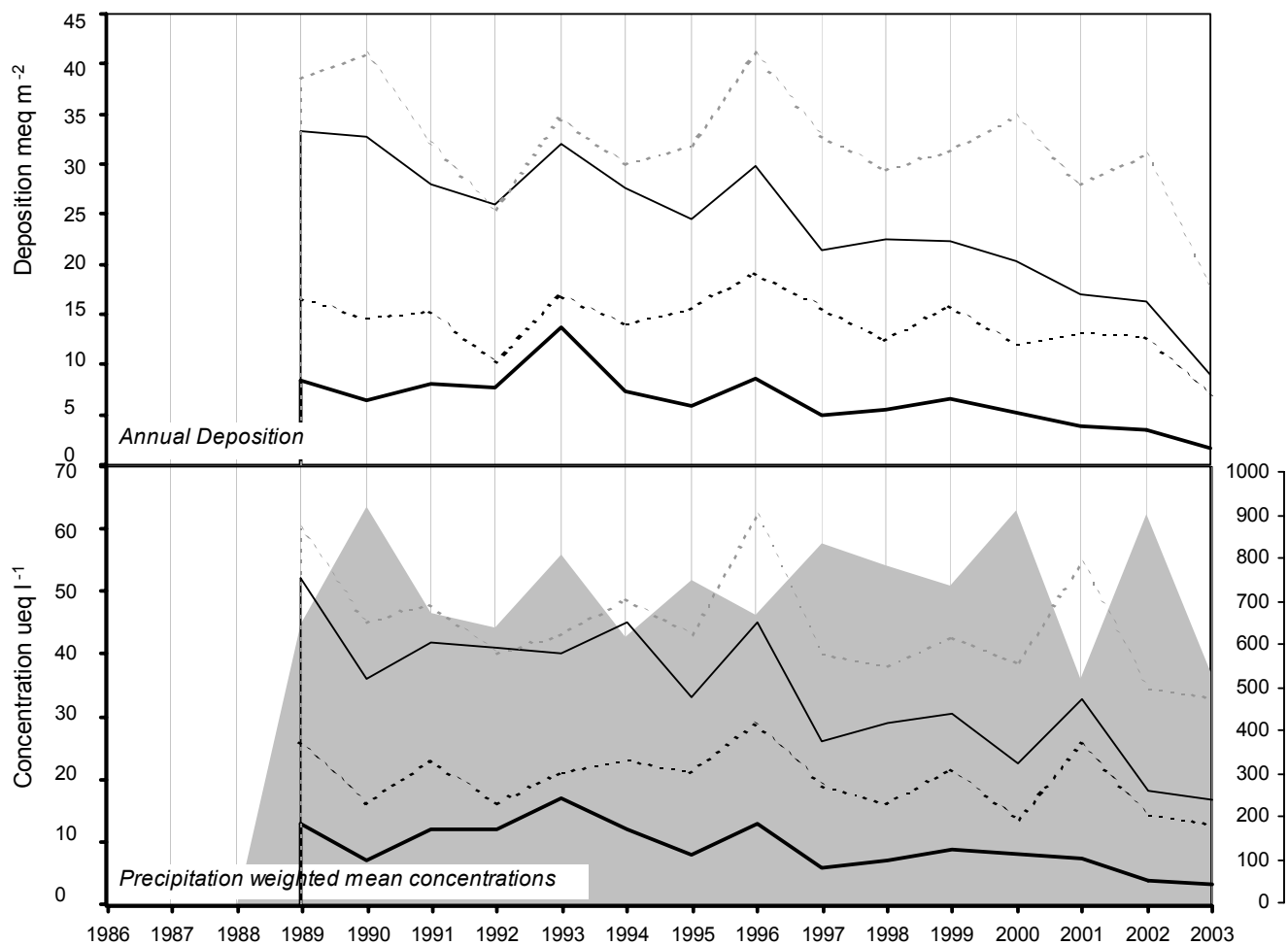
Site Code: 5149  
 Easting: 1349  
 Northing: 5156  
 Latitude: 54 27 09 N  
 Longitude: 06 05 03 W  
 Altitude (m): 120  
 Rainfall (mm): 863

[30 year mean 1940 - 1971]

Site Environment:  
 Open arable, cows graze in summer

Other measurements:  
 DT

Site Operator:  
 Department of Agriculture NI



long-term trends in concentration (+x = increase; -x = decrease)	
<i>hydrogen ion</i>	-0.60 ueq/l (-3.97 %/year): 14 years' data ++ Moderately strong trend detected
<i>non-marine sulphate</i>	-1.93 ueq/l (-3.62 %/year): 15 years' data +++ Strong trend detected
<i>nitrate</i>	-0.41 ueq/l (-1.71 %/year): 15 years' data - No significant trend detected
<i>ammonium</i>	-0.89 ueq/l (-1.66 %/year): 15 years' data - No significant trend detected

ACID DEPOSITION DATA REPORT, 2003

### 5149 Hillsborough Forest

Sampling		pH	SO4	NO3	NH4	Na	Mg	Ca	Cl	K	PO4	nss-SO4	H	conductivity	rainfall
Start Date	End Date		(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µS/cm)	(mm)
08/01/03	15/01/03	6.3	46.7	15.7	84.6	117.9	13.6	8.9	131.3	2.5	<1.0	32.5	0.4	34.0	3.1
15/01/03	29/01/03	5.6	27.9	3.1	19.2	184.6	36.8	8.4	213.6	3.7	<1.0	5.7	2.6	34.0	41.8
29/01/03	12/02/03	5.7	48.9	6.4	26.7	266.3	54.7	12.6	293.3	4.9	<1.0	16.8	2.2	47.0	22.0
12/02/03	26/02/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.4
26/02/03	10/03/03	5.8	17.8	6.6	23.8	65.6	12.4	5.0	72.8	1.5	<1.0	9.9	1.7	15.0	49.4
10/03/03	26/03/03	-	-	-	-	-	-	-	-	-	-	-	-	-	1.0
26/03/03	09/04/03	6.6	140.5	43.6	125.9	269.7	56.3	66.5	304.1	35.5	8.8	108.0	0.3	70.0	3.7
09/04/03	25/04/03	5.4	83.9	82.3	118.5	68.8	19.5	57.9	68.0	4.6	<1.0	75.6	4.3	33.0	2.2
25/04/03	07/05/03	5.7	20.1	11.6	32.6	38.3	6.5	3.9	43.9	1.0	<1.0	15.4	1.9	12.0	44.1
07/05/03	21/05/03	5.6	17.9	8.1	26.5	57.4	8.9	6.7	68.5	1.5	<1.0	11.0	2.5	14.0	34.9
21/05/03	04/06/03	5.7	17.8	15.2	35.0	29.5	5.5	4.7	35.3	0.6	<1.0	14.2	2.1	11.0	35.2
04/06/03	18/06/03	5.4	30.3	14.7	38.9	69.1	13.2	14.7	77.8	1.7	<1.0	22.0	4.3	19.0	20.6
18/06/03	02/07/03	4.7	28.9	25.5	38.8	20.0	5.3	9.1	22.5	1.2	<1.0	26.5	21.4	14.0	25.2
02/07/03	16/07/03	5.7	143.9	123.1	184.1	44.7	17.0	75.2	53.2	6.2	<1.0	138.5	2.2	49.0	3.3
16/07/03	30/07/03	5.7	20.6	16.3	44.9	18.0	3.3	4.8	21.2	1.5	<1.0	18.4	1.8	12.0	38.8
30/07/03	13/08/03	5.1	50.5	50.1	46.3	43.9	12.1	41.3	52.4	7.2	<1.0	45.2	8.3	24.0	6.2
13/08/03	27/08/03	6.3	26.5	23.8	84.1	31.1	4.2	10.1	35.5	2.2	<1.0	22.8	0.4	21.0	10.9
27/08/03	10/09/03	5.7	15.5	15.0	56.4	25.0	3.7	8.7	27.6	3.3	<1.0	12.5	2.2	13.0	19.3
10/09/03	24/09/03	6.2	29.0	18.8	44.8	80.9	11.1	15.8	142.9	10.3	<1.0	19.2	0.6	23.0	4.7
24/09/03	08/10/03	7.5	136.3	34.0	644.2	310.0	75.7	31.2	413.7	249.5	403.1	98.9	0.0	169.0	8.4
08/10/03	22/10/03	6.8	88.9	55.9	355.0	218.7	33.2	23.3	260.0	155.9	83.9	62.6	0.2	102.0	10.7
22/10/03	05/11/03	6.1	29.1	16.0	49.2	79.2	12.2	6.3	98.8	2.4	<1.0	19.5	0.8	20.0	7.0
05/11/03	19/11/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
19/11/03	03/12/03	5.4	16.5	8.6	21.3	29.9	6.5	4.6	35.9	1.0	<1.0	13.0	3.8	<10.0	35.6
03/12/03	17/12/03	5.7	32.6	17.8	35.8	95.0	17.9	8.1	109.6	3.0	<1.0	21.2	2.2	21.0	13.5
17/12/03	31/12/03	6.0	27.7	11.6	31.0	86.8	16.4	5.1	107.6	2.3	<1.0	17.2	1.0	20.0	36.1
31/12/03	14/01/04	5.8	21.1	4.0	7.7	82.0	14.1	5.1	93.6	1.4	<1.0	11.3	1.4	14.0	53.8
Precipitation-weighted annual mean for site (samples containing phosphate are excluded)															Total rainfall
5149			25.7	12.8	33.1	73.8	14.1	8.2	85.4	2.3	-	16.8	3.1	18.4	531.8

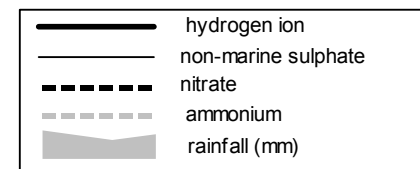
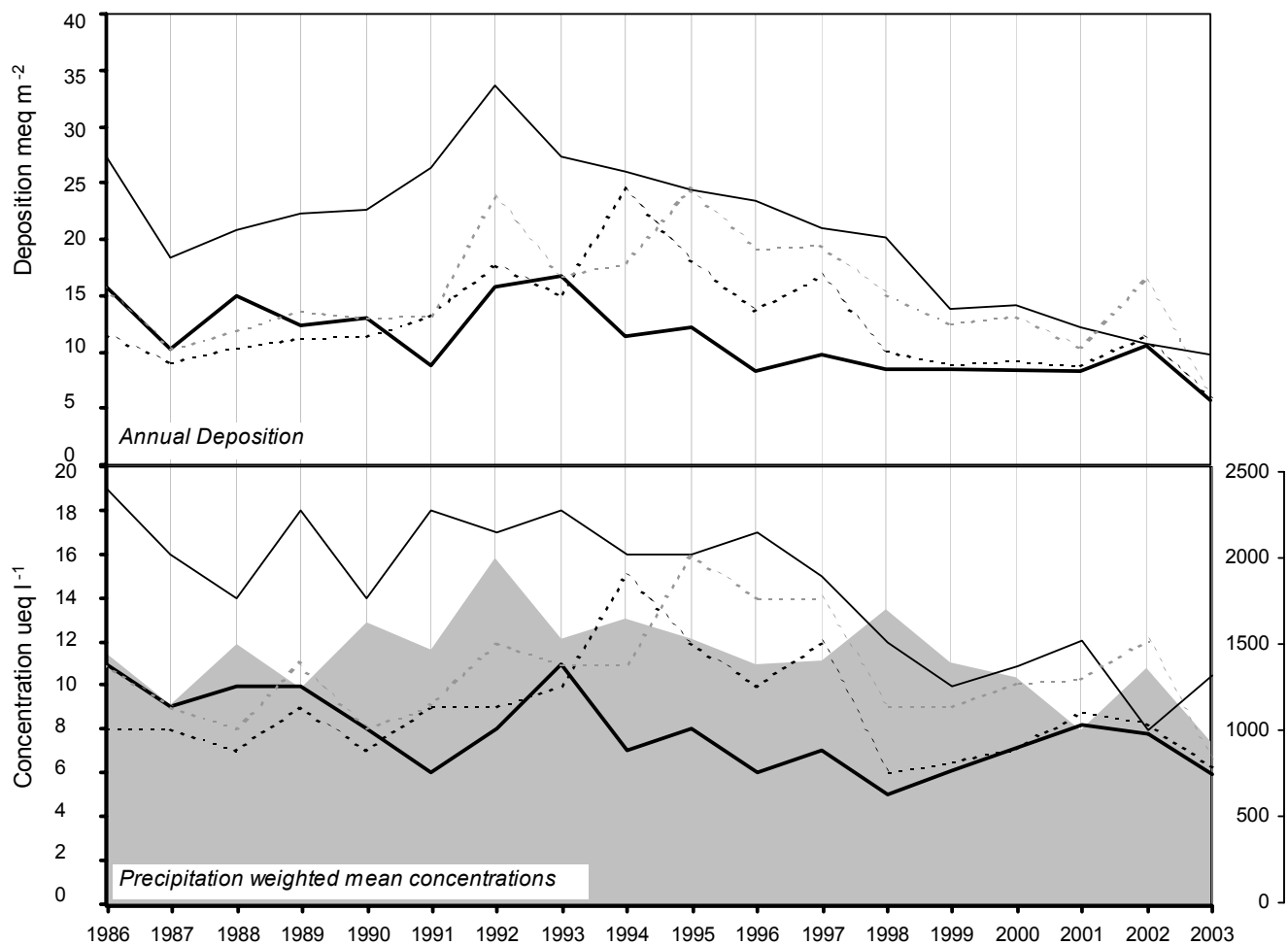
# Lough Navar

**2003** Site Code: **5006**  
 Easting: **192**  
 Northing: **5212**  
 Latitude: **54 26 20 N**  
 Longitude: **07 54 00 W**  
 Altitude (m): **130**  
 Rainfall (mm): **1412**  
*[30 year mean 1940 - 1971]*

Site Environment:  
**Clearing near Forestry Offices**

Other measurements:  
**DT, Daily SO<sub>2</sub>, Daily SO<sub>4</sub>, HNO<sub>3</sub> Denuder, ozone, EMEP**

Site Operator:  
**Forestry Service NI**



long-term trends in concentration (+x = increase; -x = decrease)	
<i>hydrogen ion</i>	-0.21 ueq/l (-2.22 %/year): 17 years' data ++ Moderately strong trend detected
<i>non-marine sulphate</i>	-0.47 ueq/l (-2.52 %/year): 18 years' data +++ Strong trend detected
<i>nitrate</i>	-0.04 ueq/l (-0.40 %/year): 18 years' data - No significant trend detected
<i>ammonium</i>	0.02 ueq/l (0.23 %/year): 18 years' data - No significant trend detected

ACID DEPOSITION DATA REPORT, 2003

### 5006 Lough Navar

Sampling	pH	SO4	NO3	NH4	Na	Mg	Ca	Cl	K	PO4	nss-SO4	H	conductivity	rainfall	
Start Date	End Date	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µS/cm)	(mm)	
13/01/03	27/01/03	-	-	-	-	-	-	-	-	-	-	-	-	0.0	
27/01/03	10/02/03	5.2	90.8	2.3	<0.7	767.0	171.2	32.5	883.6	16.1	<1.0	-	6.0	117.0	92.9
10/02/03	24/02/03	-	-	-	-	-	-	-	-	-	-	-	-	0.6	
24/02/03	10/03/03	5.3	16.3	11.4	20.3	69.4	14.3	6.2	81.1	1.6	<1.0	7.9	5.2	16.0	84.4
10/03/03	24/03/03	-	-	-	-	-	-	-	-	-	-	-	-	-	1.2
24/03/03	07/04/03	6.0	58.4	17.6	15.1	327.2	69.6	51.8	363.8	7.6	<1.0	19.0	0.9	58.0	18.8
07/04/03	21/04/03	6.5	90.3	121.6	163.7	61.7	17.3	88.1	56.6	4.8	<1.0	82.8	0.3	44.0	4.1
21/04/03	05/05/03	5.2	25.3	12.8	17.5	55.3	11.8	13.9	58.6	1.3	<1.0	18.6	7.1	15.0	64.0
05/05/03	19/05/03	5.3	19.5	5.5	2.8	132.5	28.3	9.8	148.9	2.7	<1.0	3.5	4.6	25.0	12.4
19/05/03	02/06/03	5.4	16.6	<0.7	1.0	88.7	18.6	9.7	101.3	1.9	<1.0	6.0	4.2	16.0	55.2
02/06/03	16/06/03	5.0	20.6	6.1	7.4	24.7	5.0	6.6	18.4	0.2	<1.0	17.6	10.0	<10.0	45.1
16/06/03	30/06/03	-	-	-	-	-	-	-	-	-	-	-	-	-	1.2
30/06/03	14/07/03	4.4	65.0	31.9	35.0	96.1	22.4	26.8	114.6	3.9	<1.0	53.4	36.3	36.0	13.0
14/07/03	28/07/03	4.8	21.2	12.2	11.4	25.6	6.5	14.0	28.8	0.9	<1.0	18.1	15.5	13.0	35.6
28/07/03	11/08/03	5.0	10.6	3.3	<0.7	10.1	<0.8	2.9	13.2	1.0	<1.0	9.4	9.8	<10.0	19.7
11/08/03	25/08/03	5.4	14.2	<0.7	2.3	51.3	12.2	19.2	57.9	1.7	<1.0	8.0	4.0	12.0	22.8
25/08/03	08/09/03	6.3	14.8	10.9	21.7	48.0	12.6	27.7	52.2	3.1	5.3	9.0	0.6	16.0	5.7
08/09/03	22/09/03	5.2	15.6	<0.7	<0.7	59.8	11.6	8.1	59.8	1.2	<1.0	8.4	6.3	13.0	51.7
22/09/03	06/10/03	5.2	55.5	7.4	5.5	409.5	86.5	24.4	433.3	10.5	<1.0	6.2	6.0	68.0	28.4
06/10/03	20/10/03	5.6	36.0	7.3	7.1	200.3	43.9	18.7	213.8	5.0	<1.0	11.9	2.6	37.0	30.0
20/10/03	03/11/03	5.4	21.2	4.0	4.1	141.5	28.1	9.0	159.1	3.5	<1.0	4.2	4.4	26.0	25.7
03/11/03	17/11/03	5.5	16.7	7.6	2.1	39.2	7.4	5.6	43.4	1.3	<1.0	12.0	3.0	<10.0	79.9
17/11/03	01/12/03	5.3	12.6	2.2	0.5	78.9	14.9	4.2	104.8	2.1	<1.0	3.1	4.9	15.0	63.9
01/12/03	15/12/03	5.5	36.9	10.6	8.7	209.9	41.4	17.7	253.1	7.3	<1.0	11.6	3.1	35.0	3.4
15/12/03	29/12/03	5.5	17.3	4.3	1.8	95.4	20.9	7.3	122.6	2.5	<1.0	5.9	3.1	17.0	78.3
29/12/03	12/01/04	5.2	32.8	<0.7	<0.7	223.2	45.4	10.6	250.3	4.6	<1.0	5.9	5.8	39.0	102.5
Precipitation-weighted annual mean for site (samples containing phosphate are excluded)														Total rainfall	
5006		30.1	6.4	6.7	172.9	37.1	13.4	196.9	4.0	-	10.4	6.0	31.1	940.6	

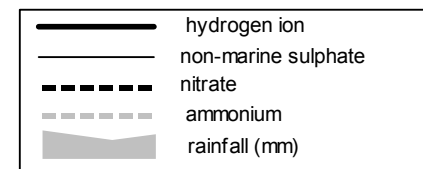
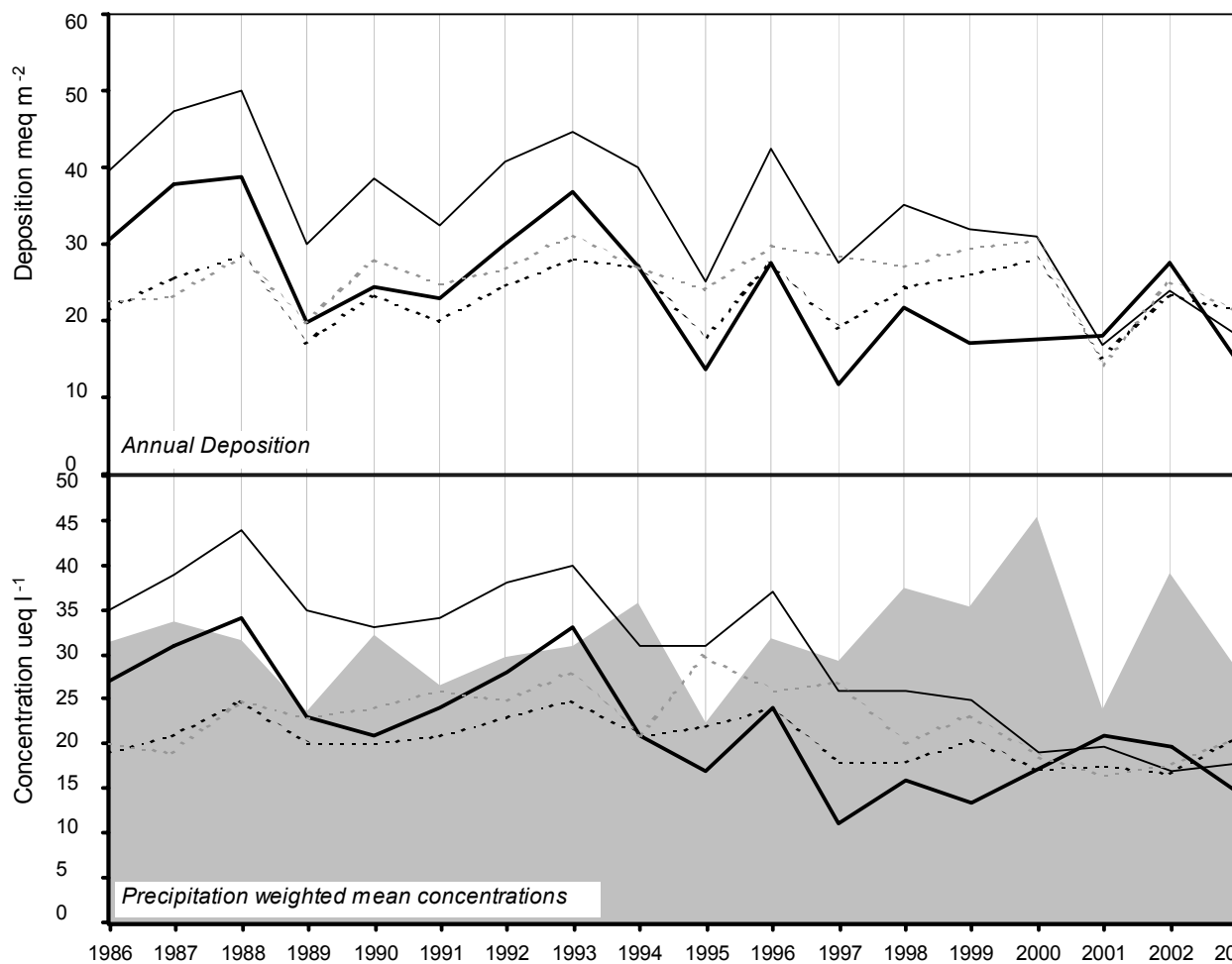
# Cow Green Reservoir

**2003** Site Code: 5113  
 Easting: 3817  
 Northing: 5298  
 Latitude: 54 39 46 N  
 Longitude: 02 17 01 W  
 Altitude (m): 510  
 Rainfall (mm): 2175  
 [30 year mean 1940 - 1971]

Site Environment:  
**Very open moorland**

Other measurements:  
**DT, Met**

Site Operator:  
**English Nature**



long-term trends in concentration (+x = increase; -x = decrease)	
<i>hydrogen ion</i>	-0.88 ueq/l (-3.00 %/year): 17 years' data ++ Moderately strong trend detected
<i>non-marine sulphate</i>	-1.36 ueq/l (-3.24 %/year): 18 years' data ++++ Very strong trend detected
<i>nitrate</i>	-0.21 ueq/l (-0.96 %/year): 18 years' data - No significant trend detected
<i>ammonium</i>	-0.21 ueq/l (-0.84 %/year): 18 years' data - No significant trend detected

ACID DEPOSITION DATA REPORT, 2003

### 5113 Cow Green Reservoir

Sampling	pH	SO4	NO3	NH4	Na	Mg	Ca	Cl	K	PO4	nss-SO4	H	conductivity	rainfall	
Start Date	End Date	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µS/cm)	(mm)	
06/01/03	17/01/03	5.1	36.4	12.6	31.4	183.0	37.2	9.0	201.9	3.7	<1.0	14.3	7.2	35.0	52.6
17/01/03	28/01/03	4.7	21.0	10.6	7.0	93.4	19.9	6.3	104.6	1.8	<1.0	9.7	19.1	22.0	69.9
28/01/03	11/02/03	5.2	24.9	16.4	24.1	103.4	20.7	7.4	113.1	2.9	<1.0	12.4	6.6	22.0	16.6
11/02/03	24/02/03	4.7	227.4	257.7	302.3	355.4	81.6	97.1	382.5	10.6	<1.0	184.6	20.0	-	1.6
24/02/03	14/03/03	5.1	32.6	14.8	21.7	144.5	29.6	14.4	159.1	2.8	<1.0	15.1	7.9	28.0	90.2
14/03/03	26/03/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
26/03/03	16/04/03	5.0	50.9	46.3	38.4	123.1	29.3	37.8	129.8	2.8	<1.0	36.0	10.2	33.0	15.5
16/04/03	25/04/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
25/04/03	09/05/03	4.8	26.7	19.8	26.8	46.4	9.3	5.8	51.1	0.9	<1.0	21.1	17.0	18.0	93.1
09/05/03	19/05/03	4.9	22.6	11.6	16.2	63.4	13.6	6.3	69.4	1.3	<1.0	15.0	13.2	17.0	70.6
19/05/03	02/06/03	5.0	24.1	16.0	22.2	75.3	15.2	7.6	86.6	1.4	<1.0	15.1	9.5	20.0	18.0
02/06/03	18/06/03	4.6	40.7	39.6	37.1	54.9	13.2	21.1	53.8	1.8	<1.0	34.1	26.3	22.0	30.9
18/06/03	02/07/03	4.3	29.5	24.9	19.8	24.7	6.6	12.6	26.0	0.7	<1.0	26.5	47.9	17.0	44.3
02/07/03	15/07/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.5
15/07/03	29/07/03	4.6	21.6	19.1	19.9	19.5	5.7	10.6	21.0	0.9	<1.0	19.3	24.0	14.0	52.7
29/07/03	11/08/03	4.6	30.3	48.7	28.9	28.4	6.9	25.5	21.8	2.7	<1.0	26.9	25.7	18.0	17.2
18/08/03	27/08/03	5.6	48.0	47.2	36.2	102.6	23.0	51.2	98.1	4.6	<1.0	35.6	2.6	29.0	8.1
27/08/03	18/09/03	5.5	89.8	139.5	85.1	176.7	45.6	92.5	165.6	5.5	<1.0	68.5	3.3	57.0	24.1
18/09/03	24/09/03	5.2	11.2	7.4	8.9	12.4	3.9	1.1	10.5	0.5	<1.0	9.7	6.6	8.0	55.3
24/09/03	13/10/03	5.2	18.6	13.7	15.6	102.1	19.3	8.4	105.8	2.2	<1.0	6.3	6.2	20.0	52.2
13/10/03	22/10/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
22/10/03	06/11/03	4.8	21.7	17.0	8.8	93.6	19.3	5.8	106.1	2.2	<1.0	10.4	14.5	23.0	67.8
06/11/03	21/11/03	4.9	19.0	18.4	15.8	30.0	8.6	6.3	35.0	1.4	<1.0	15.4	11.7	13.0	70.9
21/11/03	05/12/03	4.6	21.1	20.0	13.2	41.5	10.0	5.5	49.7	0.6	<1.0	16.1	23.4	18.0	55.8
05/12/03	15/12/03	4.9	6.5	6.8	18.5	54.6	11.6	4.0	22.5	1.3	<1.0	-	12.3	14.0	29.7
15/12/03	05/01/04	5.1	17.1	16.7	17.1	21.1	5.6	3.3	26.7	0.8	<1.0	14.6	7.8	11.0	95.6
Precipitation-weighted annual mean for site (samples containing phosphate are excluded)														Total rainfall	
5113		25.7	20.8	20.8	71.1	15.5	10.8	76.4	1.7	-	17.7	14.6	19.9	1033.1	

# Scoat Tarn

**2003**

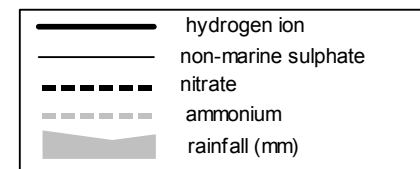
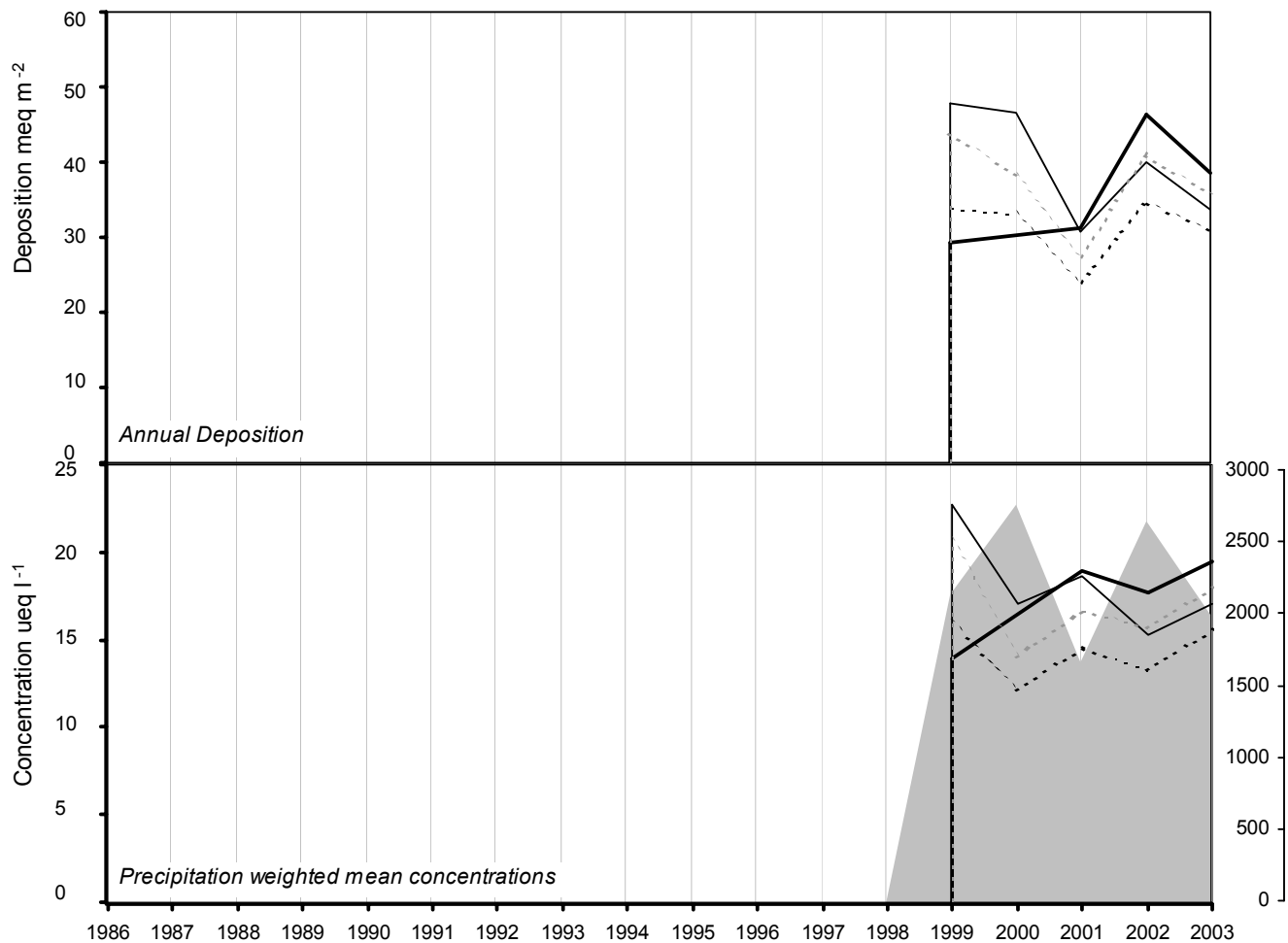
Site Code: 5159  
 Easting: 3158  
 Northing: 5103  
 Latitude: 54 48 10 N  
 Longitude: 03 30 10 W  
 Altitude (m): 595  
 Rainfall (mm): -

[30 year mean 1940 - 1971]

Site Environment:  
**Grassland**

Other measurements:  
**UKAWMN. Lakewater and soil chemistry**

Site Operator:  
**ENSIS**



long-term trends in concentration (+x = increase; -x = decrease)	
<i>hydrogen ion</i>	0.00 ueq/l (0.00 %/year): 4 years' data n/a Insufficient Data
<i>non-marine sulphate</i>	0.00 ueq/l (0.00 %/year): 4 years' data n/a Insufficient Data
<i>nitrate</i>	0.00 ueq/l (0.00 %/year): 4 years' data n/a Insufficient Data
<i>ammonium</i>	0.00 ueq/l (0.00 %/year): 0 years' data n/a Insufficient Data

ACID DEPOSITION DATA REPORT, 2003



### 5159 Scoat Tarn

Sampling	pH	SO4	NO3	NH4	Na	Mg	Ca	Cl	K	PO4	nss-SO4	H	conductivity	rainfall	
Start Date	End Date	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µS/cm)	(mm)	
04/01/03	15/01/03	5.2	35.0	11.4	30.2	141.4	28.5	5.8	160.6	3.1	<1.0	18.0	5.8	29.0	48.2
15/01/03	28/01/03	4.6	20.0	8.8	9.8	82.7	17.1	4.5	96.2	1.8	<1.0	10.1	25.1	19.0	148.6
28/01/03	11/02/03	4.8	16.0	10.7	11.0	37.9	7.9	2.5	45.8	0.9	<1.0	11.5	16.6	13.0	124.6
11/02/03	27/02/03	-	-	-	-	-	-	-	-	-	-	-	-	-	2.4
27/02/03	13/03/03	4.8	26.8	13.7	20.3	71.0	15.5	5.5	79.8	1.4	<1.0	18.3	17.8	20.0	134.0
13/03/03	26/03/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
26/03/03	10/04/03	5.2	61.5	41.2	61.4	160.5	33.7	28.9	174.1	5.0	<1.0	42.1	6.3	39.0	5.1
10/04/03	23/04/03	6.5	81.8	86.5	85.5	88.3	22.0	81.8	77.6	2.2	<1.0	71.2	0.3	38.0	13.3
23/04/03	08/05/03	4.6	26.2	15.1	17.8	45.0	9.9	5.4	48.9	1.0	<1.0	20.8	25.1	17.0	137.2
08/05/03	20/05/03	4.7	24.1	10.4	12.8	74.6	15.9	5.3	81.6	1.3	<1.0	15.1	19.1	20.0	79.6
20/05/03	04/06/03	4.6	21.3	11.8	13.4	35.2	8.9	5.6	40.5	1.1	<1.0	17.1	24.0	15.0	43.1
04/06/03	17/06/03	4.7	33.9	23.0	24.8	51.9	10.9	6.7	48.0	1.0	<1.0	27.7	19.5	18.0	54.7
17/06/03	01/07/03	4.2	28.9	33.8	39.0	17.7	4.6	7.2	17.9	0.7	<1.0	26.8	70.8	22.0	99.9
01/07/03	15/07/03	4.6	43.5	27.2	26.1	39.2	6.9	6.2	39.7	0.8	<1.0	38.8	25.1	20.0	48.7
15/07/03	01/08/03	4.5	17.2	11.2	18.9	18.9	4.0	3.3	20.9	0.8	<1.0	14.9	33.1	11.0	159.8
01/08/03	09/08/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
09/08/03	27/08/03	5.1	48.2	37.2	52.3	82.4	18.8	25.5	97.7	2.5	<1.0	38.2	8.3	27.0	56.2
27/08/03	09/09/03	5.0	20.5	19.4	18.0	38.3	8.1	6.9	45.8	<0.5	<1.0	15.9	10.0	14.0	27.8
09/09/03	23/09/03	5.5	18.2	14.0	13.4	31.7	4.8	5.9	27.5	3.6	<1.0	14.4	3.4	10.0	71.1
23/09/03	09/10/03	4.8	35.4	15.4	11.7	191.0	37.8	11.7	210.9	6.2	<1.0	12.4	15.1	36.0	97.4
09/10/03	24/10/03	5.9	29.5	9.8	28.8	143.6	24.9	7.7	179.8	3.6	<1.0	12.2	1.3	31.0	34.5
24/10/03	05/11/03	4.9	26.2	15.6	16.8	106.2	21.8	6.4	120.2	2.7	<1.0	13.4	11.5	22.0	77.2
05/11/03	18/11/03	4.9	23.0	16.8	16.5	68.1	13.4	5.2	74.2	1.6	<1.0	14.8	12.9	18.0	88.4
18/11/03	03/12/03	4.9	19.5	9.9	6.7	57.4	11.7	3.0	69.9	1.3	<1.0	12.6	12.3	15.0	191.3
03/12/03	17/12/03	4.9	18.9	15.2	12.0	54.8	12.2	3.4	63.0	1.4	<1.0	12.3	11.7	15.0	97.9
17/12/03	28/12/03	5.2	13.9	7.8	7.8	38.2	8.9	4.1	43.4	2.2	<1.0	9.3	7.1	11.0	7.0
28/12/03	17/01/04	5.0	30.7	13.0	13.9	145.9	29.1	6.3	169.5	3.2	<1.0	13.1	9.1	24.0	132.1
Precipitation-weighted annual mean for site (samples containing phosphate are excluded)															
5159		25.5	15.6	18.0	70.8	14.6	6.4	80.2	1.9	-	17.0	19.4	19.1	Total rainfall	1979.9

# Loch Dee

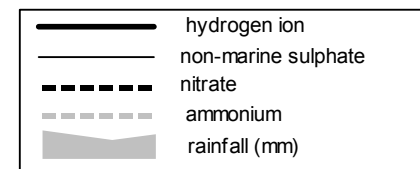
**2003**

Site Code: 5107  
 Easting: 2468  
 Northing: 5779  
 Latitude: 55 04 19 N  
 Longitude: 04 23 59 W  
 Altitude (m): 230  
 Rainfall (mm): 1949  
 [30 year mean 1940 - 1971]

Site Environment:  
**Open moorland**

Other measurements:  
**DT**

Site Operator:  
**SEPA; West Region**



long-term trends in concentration (+x = increase; -x = decrease)	
<i>hydrogen ion</i>	-0.56 ueq/l (-2.62 %/year): 17 years' data + Significant trend detected
<i>non-marine sulphate</i>	-1.07 ueq/l (-3.18 %/year): 18 years' data +++ Strong trend detected
<i>nitrate</i>	-0.17 ueq/l (-1.01 %/year): 18 years' data - No significant trend detected
<i>ammonium</i>	-0.49 ueq/l (-1.92 %/year): 18 years' data + Significant trend detected

ACID DEPOSITION DATA REPORT, 2003

**5107 Loch Dee**

Sampling		pH	SO4	NO3	NH4	Na	Mg	Ca	Cl	K	PO4	nss-SO4	H	conductivity	rainfall
Start Date	End Date		(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µS/cm)	(mm)
08/01/03	15/01/03	4.3	23.0	16.5	20.5	39.7	8.2	2.0	45.7	1.4	<1.0	18.3	46.8	17.0	132.8
08/02/03	12/02/03	5.1	20.9	6.1	10.7	122.8	25.9	5.2	130.0	2.5	<1.0	6.1	7.9	24.0	99.3
19/02/03	26/02/03	4.6	90.7	148.4	149.1	201.3	43.8	27.9	210.1	5.5	<1.0	66.4	24.5	66.0	4.8
26/02/03	12/03/03	4.8	22.6	13.1	18.3	71.3	15.7	6.3	80.1	1.6	<1.0	14.0	14.1	19.0	131.7
10/04/03	17/04/03	6.8	158.0	41.0	959.5	296.4	61.4	30.7	326.1	112.0	262.1	122.3	0.2	185.0	19.1
17/04/03	01/05/03	4.6	42.3	36.8	35.6	41.9	9.3	10.9	39.1	2.6	<1.0	37.3	27.5	22.0	65.3
01/05/03	15/05/03	6.6	72.1	11.0	494.8	106.6	22.7	6.3	122.6	50.2	139.8	59.3	0.3	99.0	109.0
15/05/03	27/05/03	6.0	13.4	11.0	54.7	38.3	3.8	1.8	42.6	2.8	<1.0	8.8	0.9	15.0	84.5
27/05/03	11/06/03	6.4	89.4	16.4	746.8	65.4	10.0	3.7	77.2	57.2	180.2	81.5	0.4	119.0	76.6
11/06/03	25/06/03	7.9	1128.2	4.7	9675.8	353.8	184.4	88.4	488.9	1175.6	3371.9	1085.5	0.0	1276.0	10.9
25/06/03	08/07/03	6.6	136.1	26.2	790.9	29.9	28.2	10.2	39.7	95.6	316.3	132.5	0.2	130.0	55.9
08/07/03	23/07/03	6.8	87.3	18.5	624.8	63.1	25.9	10.4	78.7	60.5	191.6	79.7	0.2	104.0	70.3
23/07/03	07/08/03	6.3	17.9	7.6	57.4	18.5	7.1	3.0	22.0	5.7	12.3	15.7	0.5	12.0	84.6
07/08/03	20/08/03	4.8	56.6	60.3	63.1	16.9	7.7	34.0	8.4	2.8	<1.0	54.6	17.0	24.0	17.8
20/08/03	03/09/03	6.1	32.4	6.9	71.3	29.5	5.4	2.4	29.2	5.9	59.2	28.9	0.9	20.0	40.5
23/09/03	30/09/03	7.8	221.8	18.3	2263.0	76.4	6.8	0.6	116.9	251.8	590.1	212.6	0.0	247.0	50.6
08/10/03	15/10/03	5.3	47.0	10.8	10.6	327.0	70.6	17.2	357.0	6.8	<1.0	7.6	5.6	54.0	85.7
15/10/03	27/10/03	5.1	44.8	31.0	31.4	104.4	23.7	15.2	128.4	5.0	<1.0	32.2	8.5	30.0	5.2
27/10/03	11/11/03	6.9	146.8	13.9	932.9	167.8	17.7	5.2	230.9	98.5	374.6	126.5	0.1	124.0	50.9
11/11/03	26/11/03	5.6	22.7	13.1	27.4	80.1	15.3	4.2	102.7	1.9	36.4	13.0	2.6	19.0	136.8
26/11/03	09/12/03	5.1	15.3	6.8	2.8	44.2	9.6	2.4	62.5	1.2	<1.0	10.0	7.6	11.0	133.9
09/12/03	08/01/04	5.3	25.2	10.0	10.5	98.5	18.2	4.7	116.6	1.5	<1.0	13.3	4.9	18.0	179.8
Precipitation-weighted annual mean for site (samples containing phosphate are excluded)															Total rainfall
5107			25.8	14.3	19.5	91.7	18.8	6.3	103.6	2.3	-	14.8	14.4	21.3	1646.1

# Beaghs Burn

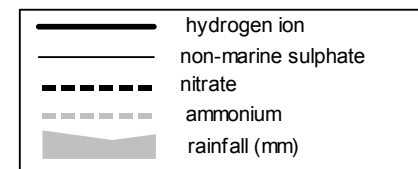
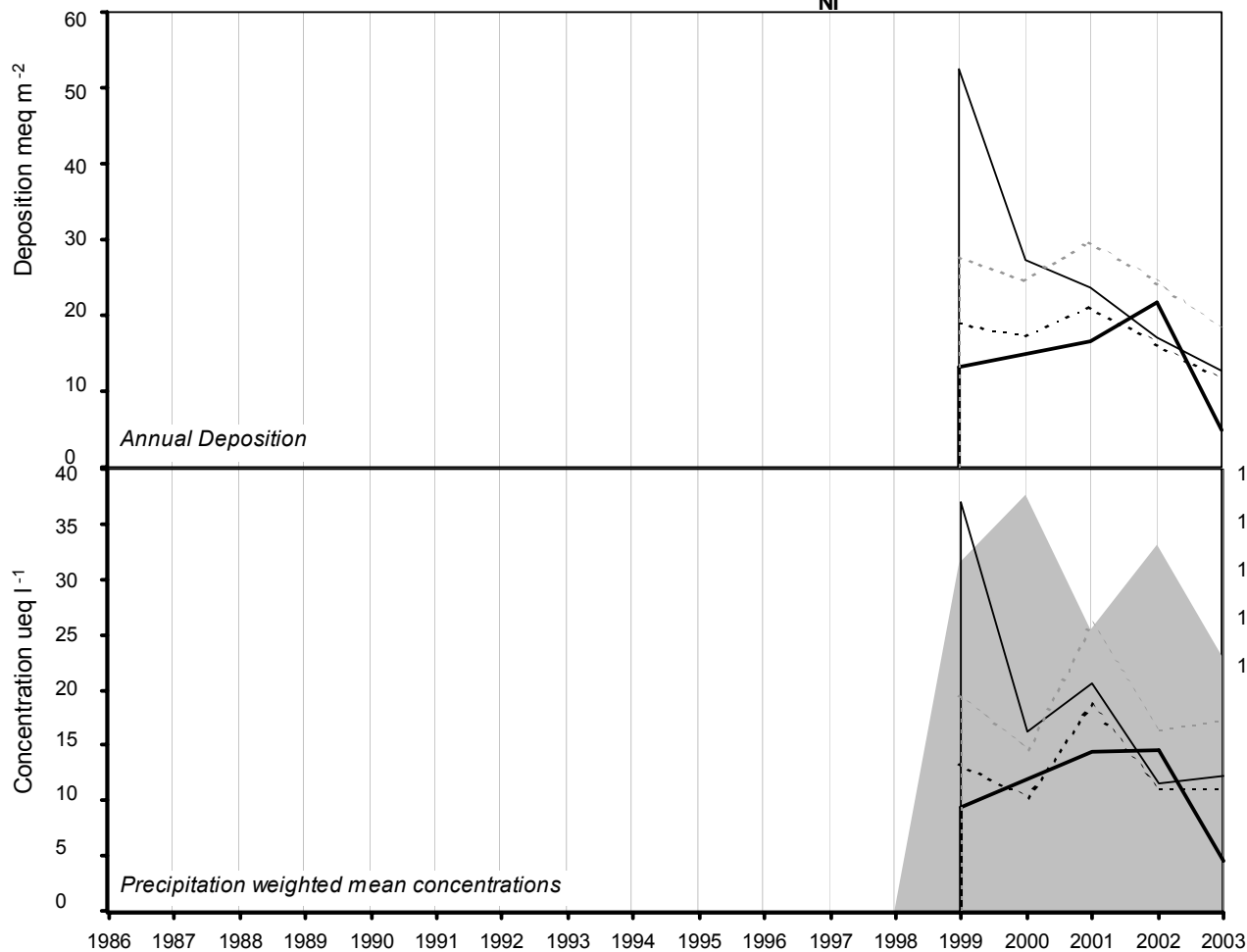
2003

Site Code: 5155  
 Easting: 1345  
 Northing: 5865  
 Latitude: 55 05 00 N  
 Longitude: 00 06 11 W  
 Altitude (m): 250  
 Rainfall (mm): -  
 [30 year mean 1940 - 1971]

Site Environment:  
 Turbary, open peat cutting.

Other measurements:  
 UKAWMN

Site Operator:  
 Department of Agriculture and Rural Development  
 NI



long-term trends in concentration (+x = increase; -x = decrease)	
<i>hydrogen ion</i>	0.00 ueq/l (0.00 %/year): 4 years' data n/a Insufficient Data
<i>non-marine sulphate</i>	0.00 ueq/l (0.00 %/year): 4 years' data n/a Insufficient Data
<i>nitrate</i>	0.00 ueq/l (0.00 %/year): 4 years' data n/a Insufficient Data
<i>ammonium</i>	0.00 ueq/l (0.00 %/year): 4 years' data n/a Insufficient Data

ACID DEPOSITION DATA REPORT, 2003

### 5155 Beaghs Burn

Sampling	pH	SO4	NO3	NH4	Na	Mg	Ca	Cl	K	PO4	nss-SO4	H	conductivity	rainfall	
Start Date	End Date	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µS/cm)	(mm)	
07/01/03	14/01/03	5.9	11.0	5.8	27.6	52.6	7.0	2.0	61.3	1.6	<1.0	4.7	1.3	14.0	14.1
14/01/03	28/01/03	5.3	52.9	3.5	11.0	403.1	88.1	16.7	460.8	8.2	<1.0	4.4	4.6	66.0	50.1
28/01/03	11/02/03	5.4	57.4	2.6	7.8	455.6	100.5	19.6	524.5	10.0	<1.0	2.6	3.7	73.0	52.8
11/02/03	25/02/03	4.4	349.3	435.0	316.7	1359.9	300.9	169.3	1429.1	32.0	<1.0	185.5	42.7	279.0	1.3
25/02/03	11/03/03	5.4	17.0	8.5	19.1	59.4	12.0	5.7	65.5	1.5	<1.0	9.8	3.5	14.0	65.0
11/03/03	24/03/03	5.6	37.3	15.0	21.6	234.5	48.3	16.1	250.4	5.0	<1.0	9.1	2.6	41.0	7.5
24/03/03	08/04/03	5.6	61.8	8.1	23.6	433.9	90.2	29.6	487.3	9.5	<1.0	9.5	2.5	73.0	18.1
08/04/03	24/04/03	5.7	89.8	88.7	97.6	80.9	22.2	66.7	71.4	3.3	<1.0	80.1	1.9	37.0	7.6
24/04/03	06/05/03	5.0	58.9	52.3	72.7	148.4	31.2	23.4	164.3	2.5	<1.0	41.0	10.0	40.0	4.5
06/05/03	20/05/03	5.5	21.0	9.4	17.9	106.6	21.5	6.7	118.6	2.1	<1.0	8.2	3.5	21.0	53.3
20/05/03	03/06/03	5.4	9.5	7.7	10.4	25.1	4.8	4.0	28.4	1.3	<1.0	6.5	3.9	<10.0	6.2
03/06/03	17/06/03	5.9	25.9	13.3	33.5	42.0	4.8	5.9	23.4	0.9	<1.0	20.8	1.3	10.0	35.0
17/06/03	01/07/03	-	-	-	-	-	-	-	-	-	-	-	-	-	42.0
02/07/03	17/07/03	5.3	50.5	28.7	66.3	54.2	10.7	14.5	58.3	3.7	<1.0	44.0	5.0	22.0	15.3
17/07/03	28/07/03	5.2	23.2	17.4	23.0	15.9	3.4	7.4	8.3	0.5	<1.0	21.3	6.6	10.0	46.6
28/07/03	12/08/03	5.3	22.8	20.0	34.6	21.6	3.2	10.3	25.8	1.6	<1.0	20.2	5.4	12.0	30.6
12/08/03	26/08/03	6.2	12.9	10.2	29.8	26.5	4.9	8.6	28.7	1.0	<1.0	9.7	0.6	10.0	26.7
26/08/03	09/09/03	5.2	29.5	24.2	32.1	58.4	16.9	14.9	64.5	1.5	<1.0	22.4	5.8	19.0	12.6
09/09/03	23/09/03	5.2	23.7	7.8	7.2	117.9	24.9	10.6	139.5	2.3	<1.0	9.5	6.0	24.0	62.0
23/09/03	07/10/03	5.9	89.8	7.6	28.2	385.1	75.0	152.7	799.3	11.1	<1.0	43.4	1.1	104.0	46.1
07/10/03	21/10/03	5.7	18.2	15.0	12.6	113.3	21.6	7.3	127.4	2.8	<1.0	4.5	2.2	23.0	51.0
21/10/03	07/11/03	5.7	22.1	13.4	5.8	183.7	37.7	7.9	212.3	3.6	<1.0	-	2.1	30.0	23.1
07/11/03	18/11/03	4.6	33.7	19.8	17.9	147.2	25.5	14.5	145.4	2.5	<1.0	16.0	23.4	28.0	59.3
18/11/03	02/12/03	5.6	11.4	4.6	9.1	58.4	8.6	1.5	62.0	0.7	<1.0	4.4	2.5	12.0	91.2
02/12/03	16/12/03	5.2	59.8	20.0	16.4	369.1	79.1	18.8	367.7	10.7	<1.0	15.3	6.8	65.0	25.8
16/12/03	30/12/03	5.6	24.7	3.8	6.0	154.9	32.5	6.8	197.6	3.7	<1.0	6.0	2.3	27.0	92.6
30/12/03	13/01/04	5.7	36.5	5.0	7.5	262.6	53.6	12.0	264.8	6.3	<1.0	4.8	2.2	37.0	103.3
Precipitation-weighted annual mean for site (samples containing phosphate are excluded)														Total rainfall	
5155		32.7	11.0	17.4	172.4	35.2	17.2	206.7	4.0	-	12.3	4.6	32.8	1043.7	

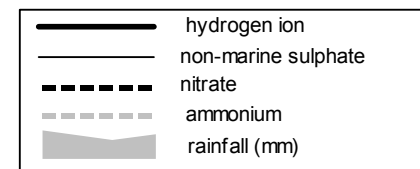
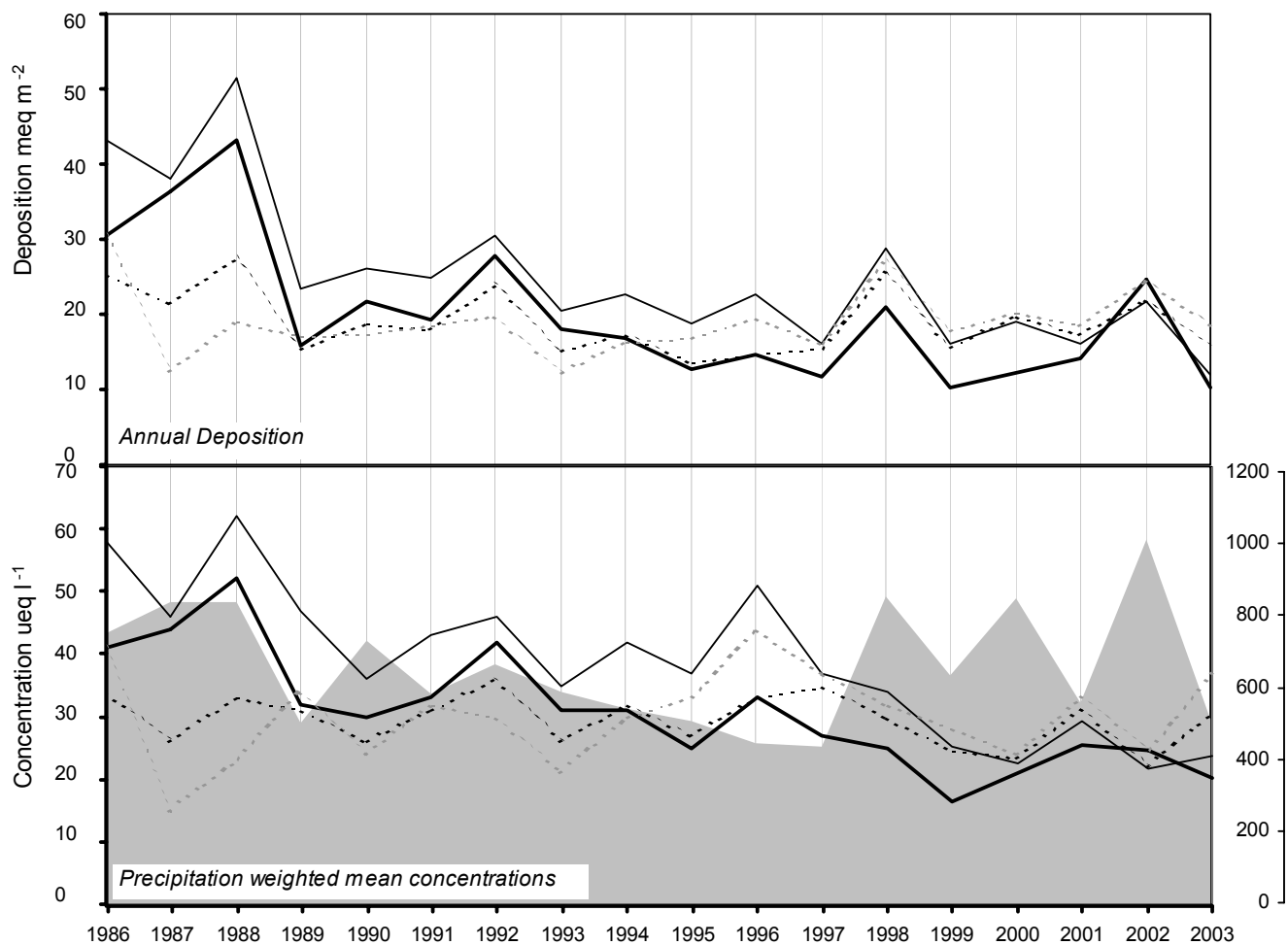
# Redesdale

**2003** Site Code: 5109  
 Easting: 3833  
 Northing: 5954  
 Latitude: 55 14 59 N  
 Longitude: 02 15 46 W  
 Altitude (m): 240  
 Rainfall (mm): 875  
 [30 year mean 1940 - 1971]

Site Environment:  
 Open moorland, very open sheep farming land

Other measurements:  
 DT

Site Operator:  
 ADAS Redesdale



long-term trends in concentration (+x = increase; -x = decrease)	
<i>hydrogen ion</i>	-1.38 ueq/l (-3.25 %/year): 17 years' data +++ Strong trend detected
<i>non-marine sulphate</i>	-1.86 ueq/l (-3.42 %/year): 18 years' data +++ Strong trend detected
<i>nitrate</i>	-0.24 ueq/l (-0.74 %/year): 18 years' data - No significant trend detected
<i>ammonium</i>	0.25 ueq/l (0.87 %/year): 18 years' data - No significant trend detected

ACID DEPOSITION DATA REPORT, 2003

**5109 Redesdale**

Sampling	pH	SO4	NO3	NH4	Na	Mg	Ca	Cl	K	PO4	nss-SO4	H	conductivity	rainfall	
Start Date	End Date	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µS/cm)	(mm)	
02/01/03	14/01/03	5.6	56.8	27.3	59.2	224.1	43.7	13.0	250.6	7.4	<1.0	29.8	2.6	45.0	2.6
14/01/03	28/01/03	-	-	-	-	-	-	-	-	-	-	-	-	-	3.8
28/01/03	11/02/03	5.2	27.8	17.2	25.5	113.0	24.5	10.4	128.3	2.6	<1.0	14.1	6.6	25.0	13.7
11/02/03	25/02/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
25/02/03	11/03/03	4.9	44.3	25.0	40.6	129.2	28.7	12.5	149.9	2.8	<1.0	28.7	11.5	32.0	33.5
11/03/03	25/03/03	6.0	39.9	13.6	53.5	145.5	25.0	9.8	164.9	3.2	<1.0	22.4	1.0	30.0	3.2
25/03/03	08/04/03	6.4	42.0	38.5	122.4	79.8	12.3	16.0	82.0	10.0	<1.0	32.4	0.4	32.0	5.9
08/04/03	22/04/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
22/04/03	06/05/03	4.3	29.4	32.7	43.5	20.7	5.1	6.7	24.4	<0.5	<1.0	27.0	46.8	17.0	56.5
06/05/03	20/05/03	5.2	20.9	15.3	27.7	44.4	9.7	5.1	50.3	1.0	<1.0	15.5	6.6	14.0	38.2
20/05/03	03/06/03	4.2	55.2	103.0	73.9	27.2	8.1	16.7	33.7	0.5	<1.0	51.9	66.1	46.0	21.0
03/06/03	17/06/03	4.7	32.4	32.5	34.4	32.9	8.0	9.5	36.6	1.4	<1.0	28.4	21.4	19.0	30.9
17/06/03	01/07/03	4.4	40.3	54.8	37.6	27.4	7.3	14.2	23.6	1.2	<1.0	37.0	41.7	26.0	23.6
01/07/03	15/07/03	5.3	109.3	77.5	130.9	89.2	23.8	28.8	103.5	11.6	<1.0	98.5	5.6	43.0	5.5
15/07/03	30/07/03	6.6	144.1	2.0	2505.5	298.5	63.0	81.7	683.5	228.4	307.7	108.1	0.3	390.0	27.7
30/07/03	12/08/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
12/08/03	26/08/03	4.5	10.9	10.7	330.9	200.8	39.7	58.7	17.2	51.0	<1.0	-	30.9	96.0	2.3
26/08/03	09/09/03	-	-	-	-	-	-	-	-	-	-	-	-	-	4.3
09/09/03	23/09/03	6.8	114.7	6.3	1047.2	79.9	38.5	13.3	62.8	424.4	709.0	105.1	0.2	201.0	26.2
23/09/03	07/10/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
07/10/03	21/10/03	6.3	90.8	70.1	116.0	400.5	74.0	37.7	137.9	25.1	<1.0	42.6	0.5	83.0	5.9
21/10/03	11/11/03	5.5	30.1	29.8	6.9	101.7	27.3	18.6	127.7	9.6	16.8	17.8	3.1	25.0	35.2
11/11/03	18/11/03	4.8	27.5	26.2	24.8	26.7	6.7	6.3	28.8	1.1	<1.0	24.3	15.1	16.0	17.2
18/11/03	02/12/03	4.8	24.2	28.7	19.5	48.5	11.1	5.1	62.6	1.1	<1.0	18.4	15.1	21.0	34.7
02/12/03	16/12/03	4.8	-	-	-	-	-	-	-	-	-	-	14.1	26.0	10.4
16/12/03	30/12/03	5.1	12.5	13.7	7.0	26.8	7.5	3.7	33.8	1.0	<1.0	9.3	8.1	10.0	44.8
30/12/03	13/01/04	5.1	22.3	18.2	21.3	90.0	16.3	4.1	99.4	1.9	<1.0	11.5	7.8	18.0	61.5
Precipitation-weighted annual mean for site (samples containing phosphate are excluded)															
5109		30.8	30.8	36.5	61.5	13.2	8.7	64.5	2.3	-	23.6	20.2	22.5	Total rainfall	508.6

# Eskdalemuir

**2003**

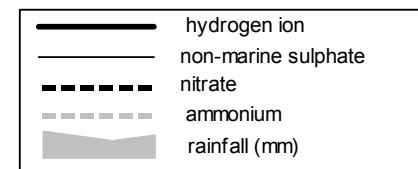
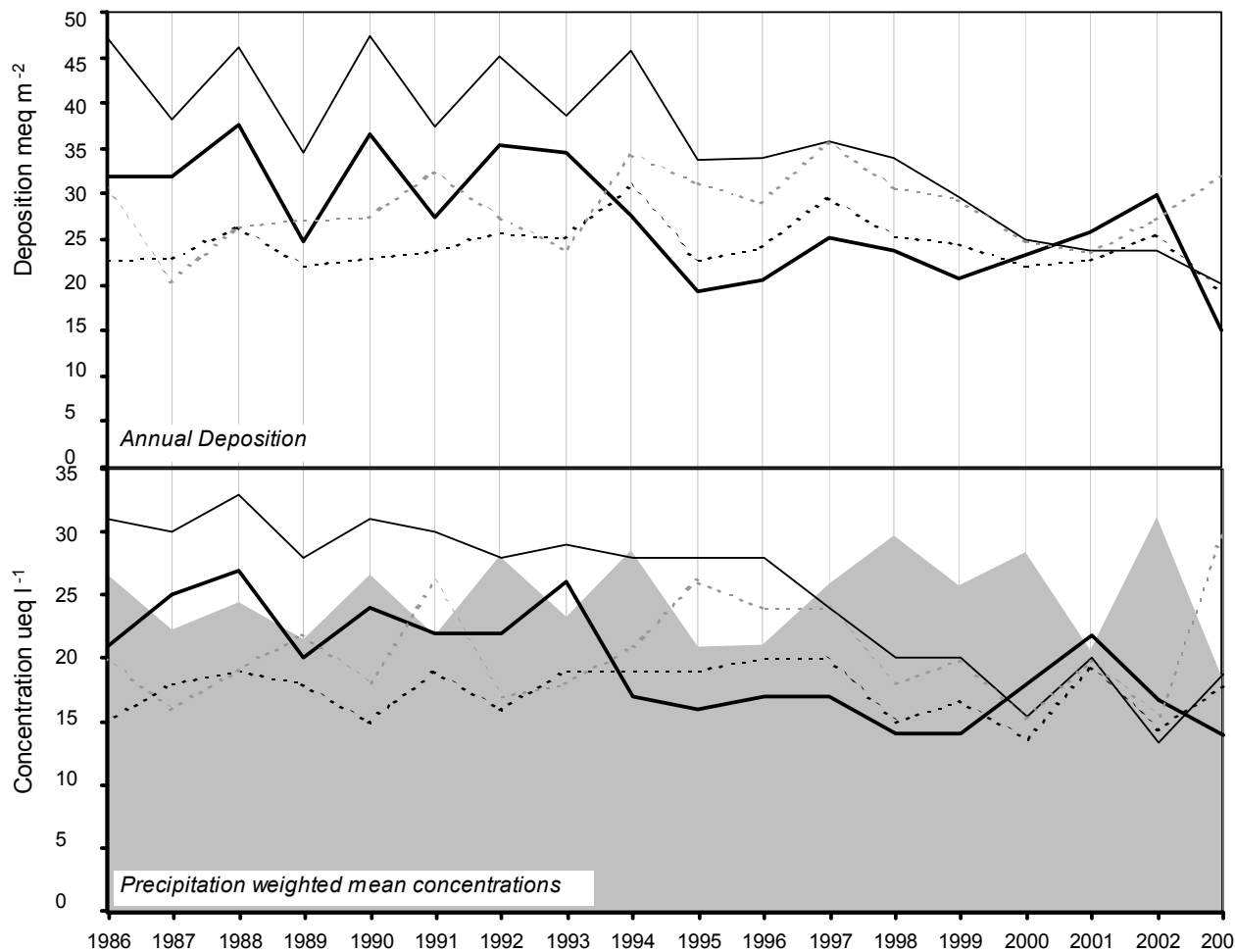
Site Code: 5002  
 Easting: 3235  
 Northing: 6030  
 Latitude: 55 18 54 N  
 Longitude: 03 12 20 W  
 Altitude (m): 259  
 Rainfall (mm): 1745

[30 year mean 1940 - 1971]

Site Environment:  
 Open moorland, Met Office Observatory

Other measurements:  
 WOC, DT, Daily SO<sub>2</sub>, Daily SO<sub>4</sub>, HNO<sub>3</sub> Denuder, ozone, Met, EMEP

Site Operator:  
 Meteorological Office



long-term trends in concentration (+x = increase; -x = decrease)	
<i>hydrogen ion</i>	-0.57 ueq/l (-2.33 %/year): 17 years' data ++ Moderately strong trend detected
<i>non-marine sulphate</i>	-0.98 ueq/l (-2.91 %/year): 18 years' data ++++ Very strong trend detected
<i>nitrate</i>	-0.04 ueq/l (-0.22 %/year): 18 years' data - No significant trend detected
<i>ammonium</i>	0.12 ueq/l (0.61 %/year): 18 years' data - No significant trend detected

ACID DEPOSITION DATA REPORT, 2003



**5002 Eskdalemuir**

Sampling	pH	SO4	NO3	NH4	Na	Mg	Ca	Cl	K	PO4	nss-SO4	H	conductivity	rainfall	
Start Date	End Date	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µS/cm)	(mm)	
01/01/03	15/01/03	5.2	26.9	13.8	30.6	107.5	21.3	5.2	123.2	2.4	<1.0	14.0	6.0	23.0	33.9
15/01/03	29/01/03	5.0	32.8	10.0	15.2	202.0	42.1	8.1	224.2	4.0	<1.0	8.4	11.0	36.0	58.5
29/01/03	12/02/03	4.9	17.6	13.2	17.2	67.1	13.8	3.7	68.7	1.5	<1.0	9.5	12.3	17.0	47.5
12/02/03	26/02/03	4.8	91.6	118.7	141.5	186.7	40.5	26.9	202.5	4.8	<1.0	69.2	15.5	58.0	3.7
26/02/03	12/03/03	5.2	29.2	18.0	28.8	102.6	22.4	8.4	116.4	2.5	<1.0	16.8	6.5	23.0	86.1
12/03/03	26/03/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
26/03/03	09/04/03	5.4	36.2	20.9	43.3	96.2	19.6	11.7	98.0	3.0	<1.0	24.6	4.2	23.0	16.8
09/04/03	23/04/03	7.6	224.3	149.8	699.4	79.3	32.3	186.2	72.3	54.5	120.0	214.8	0.0	172.0	4.4
23/04/03	07/05/03	6.0	24.6	17.0	163.4	36.9	8.0	3.7	73.2	16.7	<1.0	20.2	0.9	31.0	81.4
07/05/03	21/05/03	4.7	84.9	51.8	29.6	66.2	18.0	9.9	81.5	2.4	<1.0	77.0	18.2	19.0	50.0
21/05/03	04/06/03	6.8	96.3	25.6	420.7	53.1	8.3	5.3	47.9	53.9	255.4	89.9	0.1	69.0	15.2
04/06/03	18/06/03	4.8	27.6	19.0	21.6	50.6	10.7	6.2	56.4	1.2	<1.0	21.5	17.8	18.0	36.5
18/06/03	02/07/03	3.8	65.1	54.2	32.6	30.4	9.0	12.2	31.3	1.2	<1.0	61.4	147.9	40.0	15.5
02/07/03	16/07/03	4.1	33.4	18.3	23.4	14.6	3.9	4.0	18.2	0.9	<1.0	31.6	74.1	17.0	18.2
16/07/03	30/07/03	4.8	16.5	10.3	12.0	25.4	5.6	4.2	28.5	0.8	<1.0	13.5	16.2	12.0	111.7
30/07/03	13/08/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
13/08/03	27/08/03	4.7	17.4	16.3	18.4	21.1	5.6	11.5	21.4	<0.5	<1.0	14.8	19.5	13.0	21.4
27/08/03	10/09/03	5.0	14.8	15.8	21.1	20.9	4.1	7.0	17.6	2.1	<1.0	12.2	9.5	<10.0	14.9
10/09/03	24/09/03	4.7	30.7	30.6	31.2	47.7	9.8	7.8	52.4	1.8	<1.0	24.9	21.4	18.0	45.4
24/09/03	08/10/03	5.0	31.6	24.3	22.3	126.4	22.9	5.9	139.3	4.9	<1.0	16.4	9.8	27.0	22.9
08/10/03	22/10/03	5.4	19.8	11.1	9.6	80.4	16.8	10.6	97.3	1.9	<1.0	10.1	3.5	22.0	23.2
22/10/03	05/11/03	4.9	22.2	15.5	11.6	97.8	19.9	5.2	107.8	2.0	<1.0	10.4	13.8	23.0	43.5
05/11/03	19/11/03	5.1	33.1	23.0	22.7	62.6	12.7	7.2	63.6	4.4	<1.0	25.5	7.4	18.0	41.8
19/11/03	03/12/03	5.0	14.6	10.8	12.7	48.2	10.5	4.5	49.5	2.6	<1.0	8.8	11.0	13.0	103.9
03/12/03	17/12/03	4.8	25.0	28.4	19.0	88.5	19.1	5.8	101.5	1.8	<1.0	14.4	17.0	24.0	14.2
17/12/03	31/12/03	5.2	10.3	8.0	8.2	15.4	3.9	4.8	20.2	0.8	<1.0	8.5	5.9	<10.0	59.2
31/12/03	14/01/04	5.0	23.1	13.6	7.6	64.0	12.7	4.6	67.9	1.0	<1.0	15.3	10.0	14.0	99.7
Precipitation-weighted annual mean for site (samples containing phosphate are excluded)															
5002		26.8	17.9	30.0	66.3	14.1	6.2	75.7	3.1	-	18.8	14.0	19.5	Total rainfall	1069.6

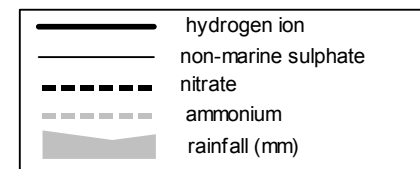
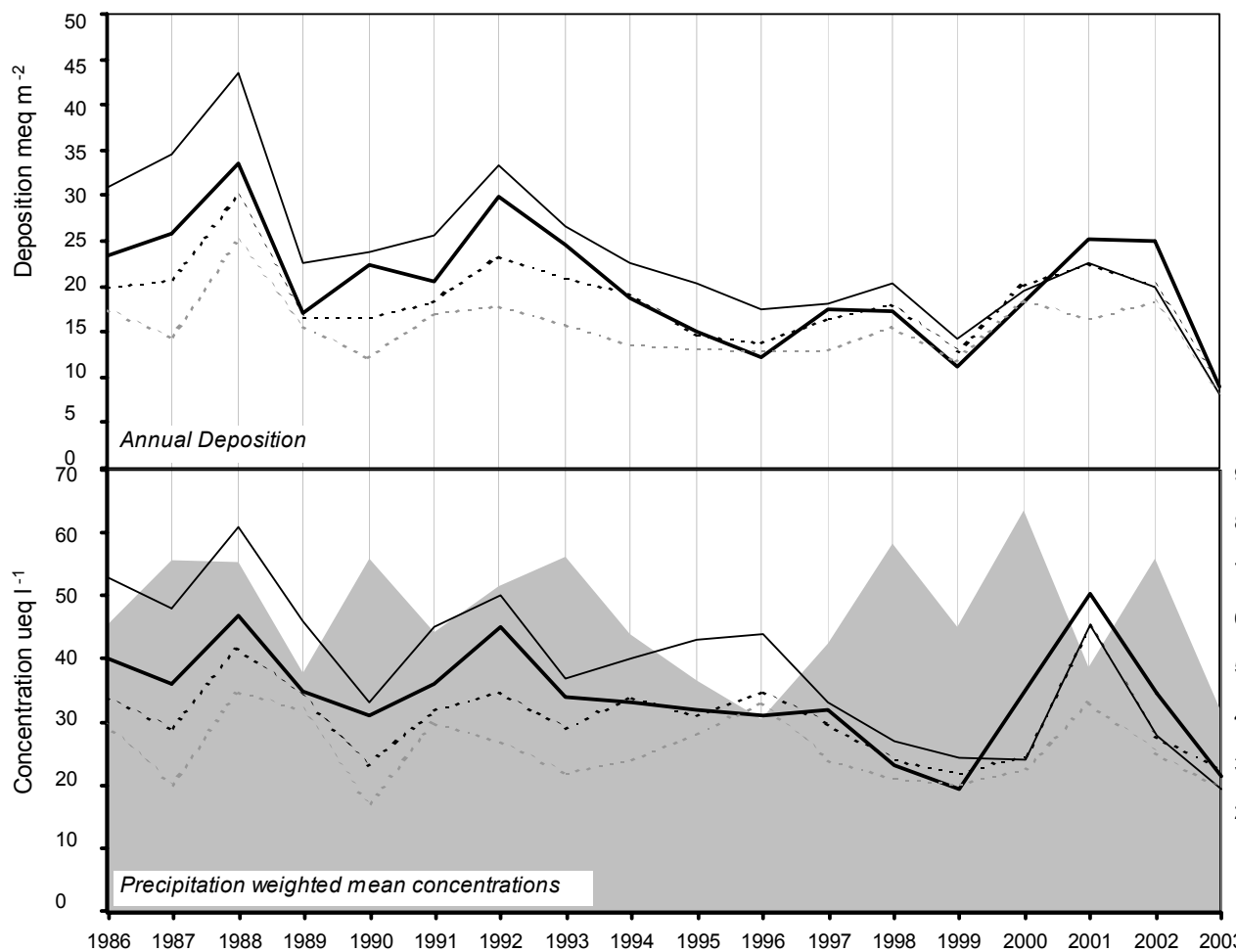
# Whiteadder

**2003** Site Code: 5106  
 Easting: 3664  
 Northing: 6633  
 Latitude: 55 51 42 N  
 Longitude: 03 32 13 W  
 Altitude (m): 250  
 Rainfall (mm): 1050  
 [30 year mean 1940 - 1971]

Site Environment:  
**Open moorland**

Other measurements:  
**DT**

Site Operator:  
**East of Scotland Water**



long-term trends in concentration (+x = increase; -x = decrease)	
<i>hydrogen ion</i>	-0.64 ueq/l (-1.62 %/year): 17 years' data - No significant trend detected
<i>non-marine sulphate</i>	-1.64 ueq/l (-3.10 %/year): 18 years' data ++ Moderately strong trend detected
<i>nitrate</i>	-0.36 ueq/l (-1.07 %/year): 18 years' data - No significant trend detected
<i>ammonium</i>	-0.25 ueq/l (-0.90 %/year): 18 years' data - No significant trend detected

ACID DEPOSITION DATA REPORT, 2003

### 5106 Whiteadder

Sampling		pH	SO4	NO3	NH4	Na	Mg	Ca	Cl	K	PO4	nss-SO4	H	conductivity	rainfall
Start Date	End Date		(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µS/cm)	(mm)
13/01/03	27/01/03	4.5	29.2	19.3	10.3	144.6	31.2	7.0	177.1	3.1	<1.0	11.8	33.1	35.0	42.0
27/01/03	10/02/03	-	-	-	-	-	-	-	-	-	-	-	-	-	4.0
10/02/03	24/02/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
24/02/03	10/03/03	4.7	57.1	50.4	67.3	94.7	18.9	14.9	99.3	4.1	<1.0	45.7	18.2	33.0	15.4
10/03/03	24/03/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.6
24/03/03	07/04/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.4
07/04/03	21/04/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
21/04/03	05/05/03	5.2	42.9	38.7	57.8	38.5	6.6	10.2	37.2	9.3	<1.0	38.2	6.2	19.0	5.3
05/05/03	12/05/03	4.8	62.6	3.1	<0.7	407.9	90.3	18.1	436.1	8.6	<1.0	13.4	17.0	75.0	25.0
12/05/03	02/06/03	4.4	31.1	30.6	25.8	33.7	7.7	4.5	37.4	1.4	<1.0	27.0	35.5	22.0	39.0
02/06/03	16/06/03	4.9	36.6	29.1	42.8	35.7	8.1	8.7	36.9	1.9	<1.0	32.3	11.7	19.0	7.7
16/06/03	30/06/03	4.3	86.3	85.8	81.9	31.4	14.0	22.2	25.7	7.2	70.6	82.5	49.0	41.0	12.2
30/06/03	17/07/03	4.0	219.1	172.8	149.8	230.2	56.5	39.0	225.3	11.2	<1.0	191.4	100.0	99.0	3.2
17/07/03	21/07/03	4.8	48.4	46.3	61.5	12.2	3.5	7.3	13.9	2.0	<1.0	46.9	17.0	23.0	13.0
21/07/03	04/08/03	4.7	23.2	17.2	29.2	11.3	2.7	4.5	12.9	1.1	<1.0	21.9	20.9	11.0	17.6
04/08/03	10/08/03	4.7	199.3	188.0	277.1	28.1	27.0	156.0	33.3	17.9	13.2	195.9	20.0	-	1.6
18/08/03	25/08/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
25/08/03	08/09/03	6.1	252.3	129.7	128.5	498.1	108.0	145.9	494.6	31.7	8.4	192.3	0.9	118.0	2.0
08/09/03	29/09/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
29/09/03	06/10/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
06/10/03	22/10/03	4.8	26.5	9.0	3.4	158.5	31.9	9.6	175.0	3.6	<1.0	7.4	14.5	29.0	88.5
27/10/03	06/11/03	4.7	24.7	20.5	12.9	81.2	17.6	8.4	95.9	8.5	3.8	14.9	21.9	25.0	15.5
06/11/03	17/11/03	4.2	86.9	84.5	69.1	146.0	32.4	19.0	172.7	4.0	<1.0	69.3	61.7	58.0	10.5
17/11/03	01/12/03	5.0	19.1	17.9	13.9	42.5	6.1	3.9	42.8	3.3	<1.0	14.0	9.3	15.0	20.3
01/12/03	15/12/03	4.3	57.6	62.3	27.0	236.4	52.5	14.0	263.5	5.6	<1.0	29.1	46.8	58.0	11.0
15/12/03	29/12/03	4.9	8.8	5.8	3.0	72.0	15.5	4.6	53.6	1.9	<1.0	0.2	11.7	16.0	59.5
29/12/03	12/01/04	4.8	27.8	23.2	26.0	56.4	11.3	4.2	53.5	2.2	<1.0	21.0	14.8	16.0	21.7
Precipitation-weighted annual mean for site (samples containing phosphate are excluded)															Total rainfall
5106			33.8	22.4	19.5	119.3	25.3	9.2	128.0	3.7	-	19.4	21.4	29.7	416.0

# Loch Chon

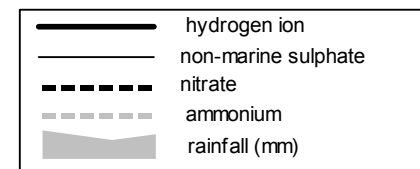
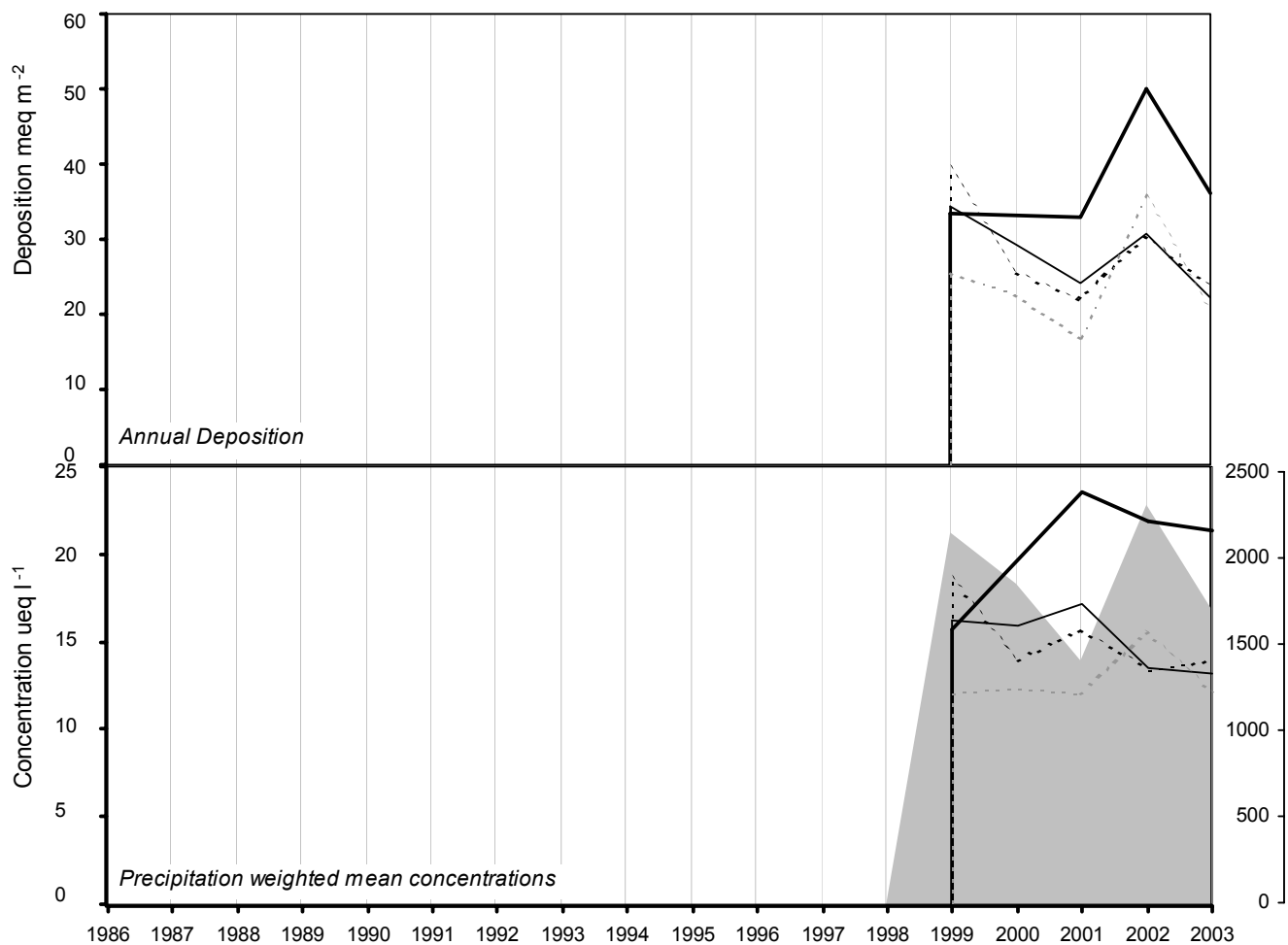
**2003**

Site Code: 5156  
 Easting: 2429  
 Northing: 7084  
 Latitude: 56 14 52 N  
 Longitude: 04 32 09 W  
 Altitude (m): 150  
 Rainfall (mm): -  
 [30 year mean 1940 - 1971]

Site Environment:  
**Moorland overlooking Loch Katrine**

Other measurements:  
**UKAWMN**

Site Operator:  
**Freshwater Fisheries Laboratory**



long-term trends in concentration (+x = increase; -x = decrease)	
<i>hydrogen ion</i>	0.00 ueq/l (0.00 %/year): 4 years' data n/a Insufficient Data
<i>non-marine sulphate</i>	0.00 ueq/l (0.00 %/year): 4 years' data n/a Insufficient Data
<i>nitrate</i>	0.00 ueq/l (0.00 %/year): 4 years' data n/a Insufficient Data
<i>ammonium</i>	0.00 ueq/l (0.00 %/year): 4 years' data n/a Insufficient Data

ACID DEPOSITION DATA REPORT, 2003

**5156 Loch Chon**

Sampling	pH	SO4	NO3	NH4	Na	Mg	Ca	Cl	K	PO4	nss-SO4	H	conductivity	rainfall	
Start Date	End Date	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µS/cm)	(mm)	
03/01/03	15/01/03	4.7	18.8	4.3	3.0	132.1	27.7	5.1	147.1	2.5	<1.0	2.9	21.4	25.0	53.1
15/01/03	29/01/03	4.7	34.8	5.3	4.8	242.6	53.2	10.2	282.2	4.8	<1.0	5.6	20.0	43.0	161.7
29/01/03	13/02/03	5.0	18.6	7.6	8.6	97.4	21.1	5.4	111.7	2.1	<1.0	6.8	9.5	20.0	67.9
13/02/03	26/02/03	4.4	80.8	103.2	97.2	100.4	19.2	18.4	94.3	4.5	<1.0	68.7	38.9	49.0	3.1
26/02/03	12/03/03	4.7	25.0	16.6	18.8	90.1	19.9	7.0	101.1	2.0	<1.0	14.2	18.6	23.0	143.8
12/03/03	26/03/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
26/03/03	09/04/03	4.9	23.3	10.1	15.1	90.3	19.1	10.1	106.9	2.0	<1.0	12.4	12.0	20.0	19.0
09/04/03	23/04/03	5.1	80.2	99.3	110.5	28.3	11.1	50.5	21.8	2.5	<1.0	76.8	8.7	31.0	16.7
23/04/03	07/05/03	5.8	31.4	16.4	57.4	31.2	4.3	1.3	34.2	6.8	15.4	27.6	1.5	15.0	142.7
07/05/03	21/05/03	4.7	27.0	20.3	16.1	74.0	16.4	6.1	83.9	1.3	<1.0	18.1	19.5	23.0	93.0
21/05/03	05/06/03	4.5	32.8	23.5	17.3	13.8	5.6	8.6	15.3	<0.5	<1.0	31.1	34.7	20.0	29.5
05/06/03	18/06/03	4.4	22.1	12.3	13.4	38.9	9.5	7.0	42.6	0.7	<1.0	17.4	35.5	15.0	58.7
18/06/03	02/07/03	3.8	71.3	48.8	24.3	68.5	16.3	11.2	76.0	1.2	<1.0	63.0	173.8	47.0	31.3
02/07/03	16/07/03	4.5	34.0	13.6	14.7	71.3	16.1	11.4	88.4	2.4	<1.0	25.4	29.5	25.0	18.4
16/07/03	30/07/03	4.6	13.5	8.3	11.1	11.9	3.0	2.8	14.4	0.5	<1.0	12.1	24.0	<10.0	73.9
30/07/03	13/08/03	4.5	50.7	49.9	68.3	29.0	6.8	18.1	35.0	2.8	<1.0	47.2	29.5	25.0	12.1
13/08/03	27/08/03	4.5	15.2	12.6	12.1	28.9	6.9	10.5	30.6	1.0	<1.0	11.7	29.5	13.0	24.0
27/08/03	10/09/03	5.0	12.5	14.9	19.0	25.8	5.1	6.0	26.2	0.8	<1.0	9.4	9.1	10.0	23.6
10/09/03	24/09/03	4.9	24.1	14.3	10.8	64.7	14.5	9.6	72.6	2.9	<1.0	16.3	12.3	18.0	36.8
24/09/03	09/10/03	5.0	22.0	9.4	1.2	131.5	24.9	4.8	143.4	2.5	<1.0	6.2	9.5	26.0	23.3
09/10/03	22/10/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
22/10/03	06/11/03	5.2	16.3	15.8	10.0	73.3	16.3	6.0	86.0	2.0	<1.0	7.4	7.1	16.0	64.4
06/11/03	19/11/03	4.4	20.3	19.9	10.9	27.6	5.1	6.0	29.0	2.0	<1.0	16.9	38.9	14.0	83.3
19/11/03	02/12/03	4.9	11.3	6.6	1.7	42.7	8.4	2.2	53.8	0.9	<1.0	6.2	11.2	13.0	124.9
02/12/03	17/12/03	4.4	36.4	34.5	30.5	61.2	12.6	5.4	61.5	1.5	<1.0	29.0	38.9	28.0	69.4
17/12/03	14/01/04	5.1	16.8	5.7	4.9	95.9	18.2	4.2	105.1	1.8	<1.0	5.3	7.9	16.0	321.5
Precipitation-weighted annual mean for site (samples containing phosphate are excluded)														Total rainfall	
5156		23.8	13.9	12.0	88.0	18.7	6.7	99.5	2.0	-	13.1	21.4	21.4	1696.0	

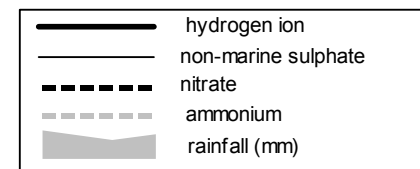
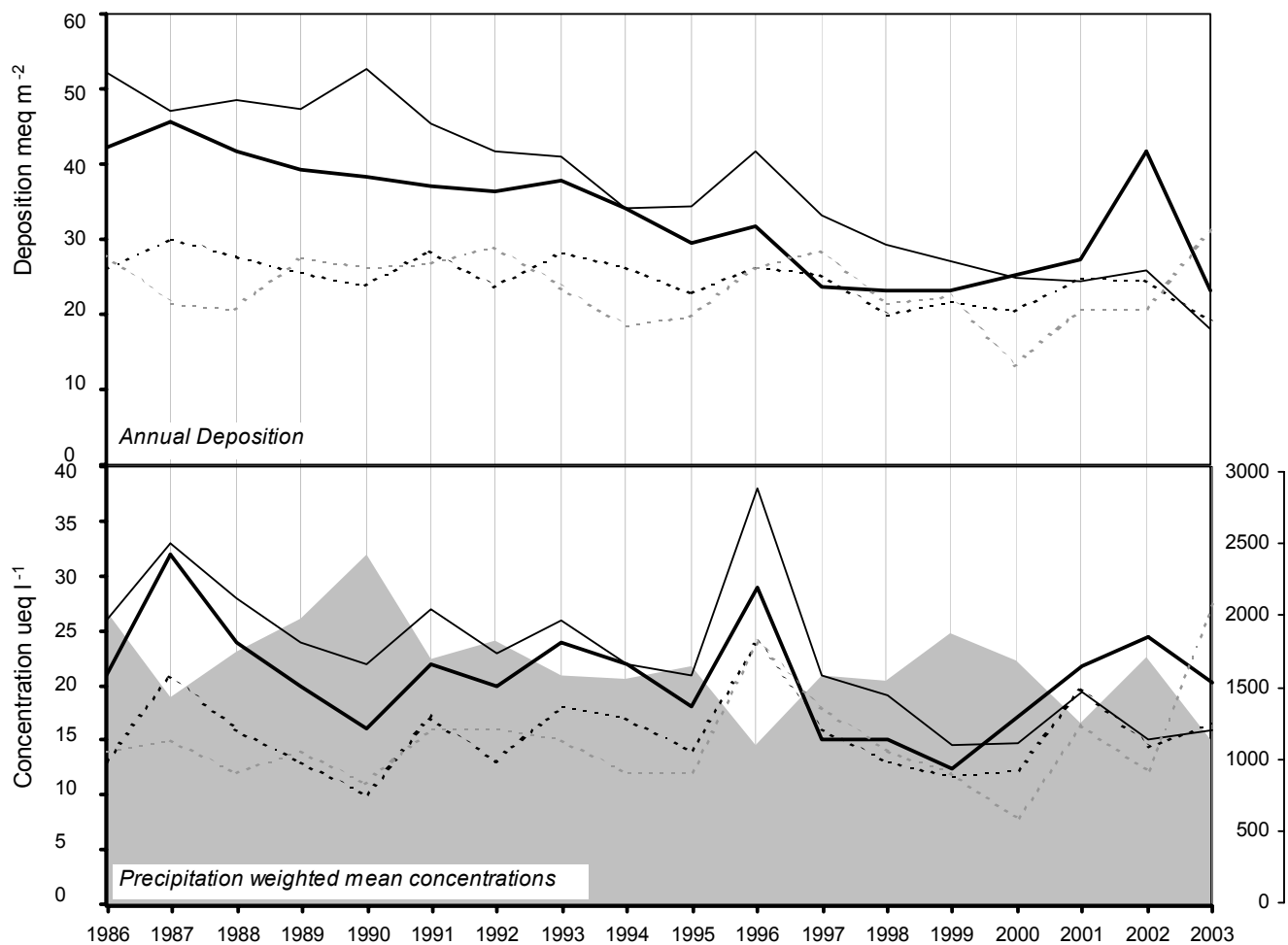
# Balquhiddar

**2003** Site Code: 5152  
 Easting: 2521  
 Northing: 7206  
 Latitude: 56 21 17 N  
 Longitude: 04 23 38 W  
 Altitude (m): 135  
 Rainfall (mm): 2245  
 [30 year mean 1940 - 1971]

Site Environment:  
 Open sheep pasture at loch-side

Other measurements:  
 DT, Met

Site Operator:  
 Institute of Hydrology



long-term trends in concentration (+x = increase; -x = decrease)	
<i>hydrogen ion</i>	-0.26 ueq/l (-1.14 %/year): 17 years' data - No significant trend detected
<i>non-marine sulphate</i>	-0.78 ueq/l (-2.64 %/year): 18 years' data ++ Moderately strong trend detected
<i>nitrate</i>	0.02 ueq/l (0.15 %/year): 18 years' data - No significant trend detected
<i>ammonium</i>	0.21 ueq/l (1.62 %/year): 18 years' data - No significant trend detected

ACID DEPOSITION DATA REPORT, 2003

## 5152 Balquhiddy 2

Sampling	pH	SO4	NO3	NH4	Na	Mg	Ca	Cl	K	PO4	nss-SO4	H	conductivity	rainfall	
Start Date	End Date	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µS/cm)	(mm)	
13/01/03	27/01/03	6.3	36.8	6.4	112.3	267.9	44.6	8.8	343.8	9.6	<1.0	4.6	0.5	57.0	143.8
27/01/03	10/02/03	5.2	18.2	7.3	7.2	113.5	22.6	8.3	125.7	2.6	<1.0	4.6	6.0	21.0	14.8
09/02/03	23/02/03	4.8	30.0	36.9	31.7	61.5	12.6	7.9	65.5	2.1	<1.0	22.6	14.5	22.0	14.6
23/02/03	11/03/03	4.7	27.4	21.7	22.3	99.5	22.0	8.3	114.2	2.2	<1.0	15.4	21.4	24.0	71.6
11/03/03	24/03/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
24/03/03	07/04/03	5.2	26.4	10.2	21.4	108.2	21.0	11.8	114.6	2.3	<1.0	13.4	6.8	22.0	22.0
07/04/03	20/04/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
20/04/03	05/05/03	4.2	29.3	22.6	23.2	16.2	4.2	4.1	19.7	<0.5	<1.0	27.3	58.9	19.0	121.6
05/05/03	27/05/03	4.8	24.1	15.8	11.3	58.1	10.9	7.4	54.8	3.1	<1.0	17.2	15.8	15.0	80.2
03/06/03	16/06/03	4.5	28.7	19.1	24.4	32.3	6.9	2.1	36.0	1.6	<1.0	24.8	33.9	18.0	26.6
16/06/03	29/06/03	4.1	60.9	58.5	25.2	32.3	8.2	13.3	25.6	1.1	<1.0	57.0	85.1	43.0	39.7
29/06/03	14/07/03	4.6	34.5	21.6	17.8	41.6	12.2	11.6	53.6	6.6	<1.0	29.4	24.5	22.0	20.2
14/07/03	28/07/03	4.8	27.4	20.7	15.3	22.7	5.2	10.3	16.1	2.1	<1.0	24.6	15.5	15.0	24.7
28/07/03	11/08/03	-	-	-	-	-	-	-	-	-	-	-	-	-	2.9
11/08/03	24/08/03	6.2	22.7	13.5	138.2	19.2	6.1	1.1	22.5	20.9	36.5	20.4	0.6	29.0	25.1
24/08/03	05/09/03	7.3	49.4	29.8	395.3	23.6	4.6	1.3	33.8	53.6	104.0	46.5	0.1	69.0	11.4
05/09/03	22/09/03	-	-	-	-	-	-	-	-	-	-	-	-	-	2.7
22/09/03	06/10/03	4.9	26.8	20.7	16.5	82.5	17.3	8.8	87.7	4.3	<1.0	16.9	11.7	22.0	11.1
06/10/03	19/10/03	5.2	35.3	16.6	7.0	198.7	42.7	11.2	217.6	4.8	<1.0	11.4	7.1	35.0	17.7
19/10/03	02/11/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
02/11/03	18/11/03	4.6	28.9	28.7	17.3	125.0	26.3	7.0	46.6	2.6	<1.0	13.8	22.9	21.0	75.5
18/11/03	30/11/03	5.1	10.4	7.7	4.8	22.6	6.5	3.5	28.2	1.5	<1.0	7.6	8.3	<10.0	116.4
30/11/03	14/12/03	4.5	33.7	33.6	26.9	40.1	11.1	4.9	49.8	1.4	<1.0	28.8	32.4	24.0	49.4
14/12/03	26/12/03	5.2	5.2	4.1	1.2	8.2	3.0	1.7	14.2	0.8	<1.0	4.2	6.5	<10.0	68.7
26/12/03	11/01/04	5.1	27.9	8.8	7.8	135.1	26.3	7.2	150.6	2.8	<1.0	11.7	8.9	24.0	176.7
Precipitation-weighted annual mean for site (samples containing phosphate are excluded)														Total rainfall	
5152		27.3	16.6	27.3	94.7	18.6	6.7	104.9	3.1	-	15.9	20.3	24.9	1137.6	

# Polloch

**2003**

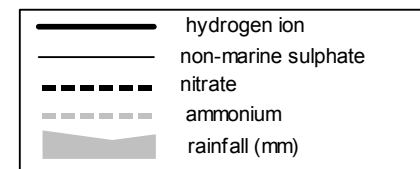
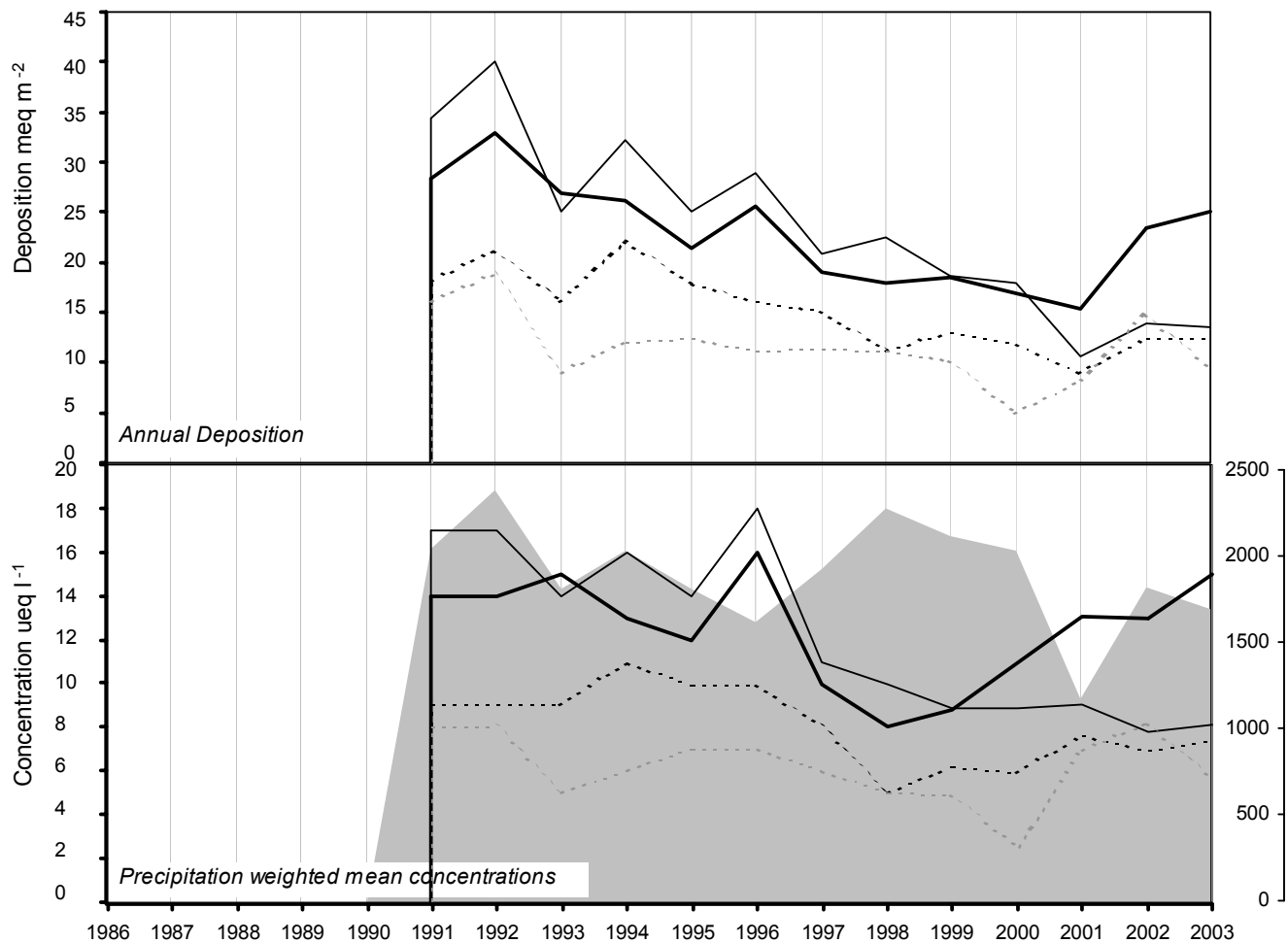
Site Code: 5151  
 Easting: 1792  
 Northing: 7689  
 Latitude: 56 45 34 N  
 Longitude: 05 36 46 W  
 Altitude (m): 30  
 Rainfall (mm): 2170

[30 year mean 1940 - 1971]

Site Environment:  
 Open moorland, in forest area

Other measurements:  
 DT, UKAWMN

Site Operator:  
 Forest Enterprise



long-term trends in concentration (+x = increase; -x = decrease)	
<i>hydrogen ion</i>	-0.13 ueq/l (-0.93 %/year): 12 years' data - No significant trend detected
<i>non-marine sulphate</i>	-0.87 ueq/l (-3.99 %/year): 13 years' data +++ Strong trend detected
<i>nitrate</i>	-0.29 ueq/l (-2.58 %/year): 13 years' data + Significant trend detected
<i>ammonium</i>	-0.12 ueq/l (-1.63 %/year): 13 years' data - No significant trend detected

ACID DEPOSITION DATA REPORT, 2003



**5151 Polloch**

Sampling	pH	SO4	NO3	NH4	Na	Mg	Ca	Cl	K	PO4	nss-SO4	H	conductivity	rainfall	
Start Date	End Date	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µS/cm)	(mm)	
14/01/03	28/01/03	5.0	45.9	3.1	2.4	374.2	80.4	14.8	421.5	7.7	<1.0	0.8	10.2	61.0	147.1
28/01/03	11/02/03	5.5	41.8	3.5	7.2	338.0	72.7	15.6	381.7	6.8	<1.0	1.1	3.5	55.0	74.3
11/02/03	25/02/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
25/02/03	11/03/03	4.8	19.8	11.7	11.6	96.9	20.7	7.2	110.3	1.9	<1.0	8.2	15.8	20.0	85.7
11/03/03	25/03/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.4
25/03/03	07/04/03	5.0	70.0	15.8	17.0	502.0	109.1	31.6	563.1	10.0	<1.0	9.6	9.3	85.0	20.1
07/04/03	22/04/03	6.0	72.1	90.1	85.8	28.2	12.3	66.4	15.2	3.3	<1.0	68.7	0.9	28.0	5.9
22/04/03	06/05/03	4.7	17.6	10.8	9.2	50.0	10.1	4.0	55.3	0.7	<1.0	11.6	18.6	16.0	54.9
06/05/03	20/05/03	4.8	19.8	4.2	2.4	132.8	29.3	6.9	149.6	2.5	<1.0	3.8	14.8	25.0	135.3
20/05/03	03/06/03	-	-	-	-	-	-	-	-	-	-	-	-	-	3.2
03/06/03	17/06/03	4.7	30.0	11.9	11.7	45.5	9.9	5.8	42.9	0.6	<1.0	24.5	18.2	16.0	46.7
17/06/03	01/07/03	-	-	-	-	-	-	-	-	-	-	-	-	-	1.8
01/07/03	15/07/03	4.3	24.5	8.2	9.5	55.4	11.1	3.1	66.6	1.4	<1.0	17.9	55.0	20.0	40.6
15/07/03	29/07/03	4.4	14.7	9.1	6.9	13.8	3.6	4.0	16.1	0.6	<1.0	13.0	41.7	10.0	102.4
29/07/03	13/08/03	4.3	30.4	14.6	19.2	70.9	13.9	8.5	84.6	2.7	<1.0	21.9	50.1	21.0	23.2
13/08/03	26/08/03	4.8	19.3	9.1	5.5	73.9	14.9	6.6	76.5	2.2	<1.0	10.4	15.5	18.0	41.8
26/08/03	09/09/03	4.5	17.9	18.9	16.2	58.6	13.6	10.2	66.0	1.3	<1.0	10.8	30.9	20.0	22.4
09/09/03	23/09/03	5.2	13.9	5.6	2.6	49.9	10.0	6.7	48.0	0.9	<1.0	7.9	6.6	12.0	36.5
23/09/03	07/10/03	5.2	24.7	1.1	<0.7	320.3	68.6	12.8	222.7	6.4	<1.0	-	6.3	53.0	81.0
07/10/03	21/10/03	5.3	22.3	<0.7	<0.7	184.3	34.6	19.1	216.2	3.9	<1.0	0.1	4.8	32.0	56.3
21/10/03	04/11/03	5.1	9.1	2.8	<0.7	64.5	12.0	3.9	70.1	1.6	<1.0	1.4	8.1	12.0	55.4
04/11/03	18/11/03	4.8	26.8	21.0	12.2	77.0	17.4	5.6	86.7	1.8	<1.0	17.6	17.8	22.0	96.1
18/11/03	02/12/03	5.1	13.5	1.9	<0.7	86.4	16.3	3.4	117.3	1.6	<1.0	3.1	7.2	17.0	129.3
02/12/03	16/12/03	4.7	31.9	15.4	6.9	171.5	36.6	8.5	196.7	3.9	<1.0	11.2	19.1	34.0	53.6
16/12/03	30/12/03	-	-	-	-	-	-	-	-	-	-	-	-	-	163.7
30/12/03	13/01/04	5.2	31.1	5.1	2.1	197.6	40.4	8.7	223.8	3.8	<1.0	7.3	6.2	31.0	197.8
Precipitation-weighted annual mean for site (samples containing phosphate are excluded)														Total rainfall	
5151		26.1	7.5	5.7	159.2	33.6	8.9	173.7	3.3	-	8.1	15.0	29.6	1675.5	

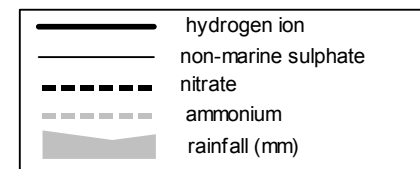
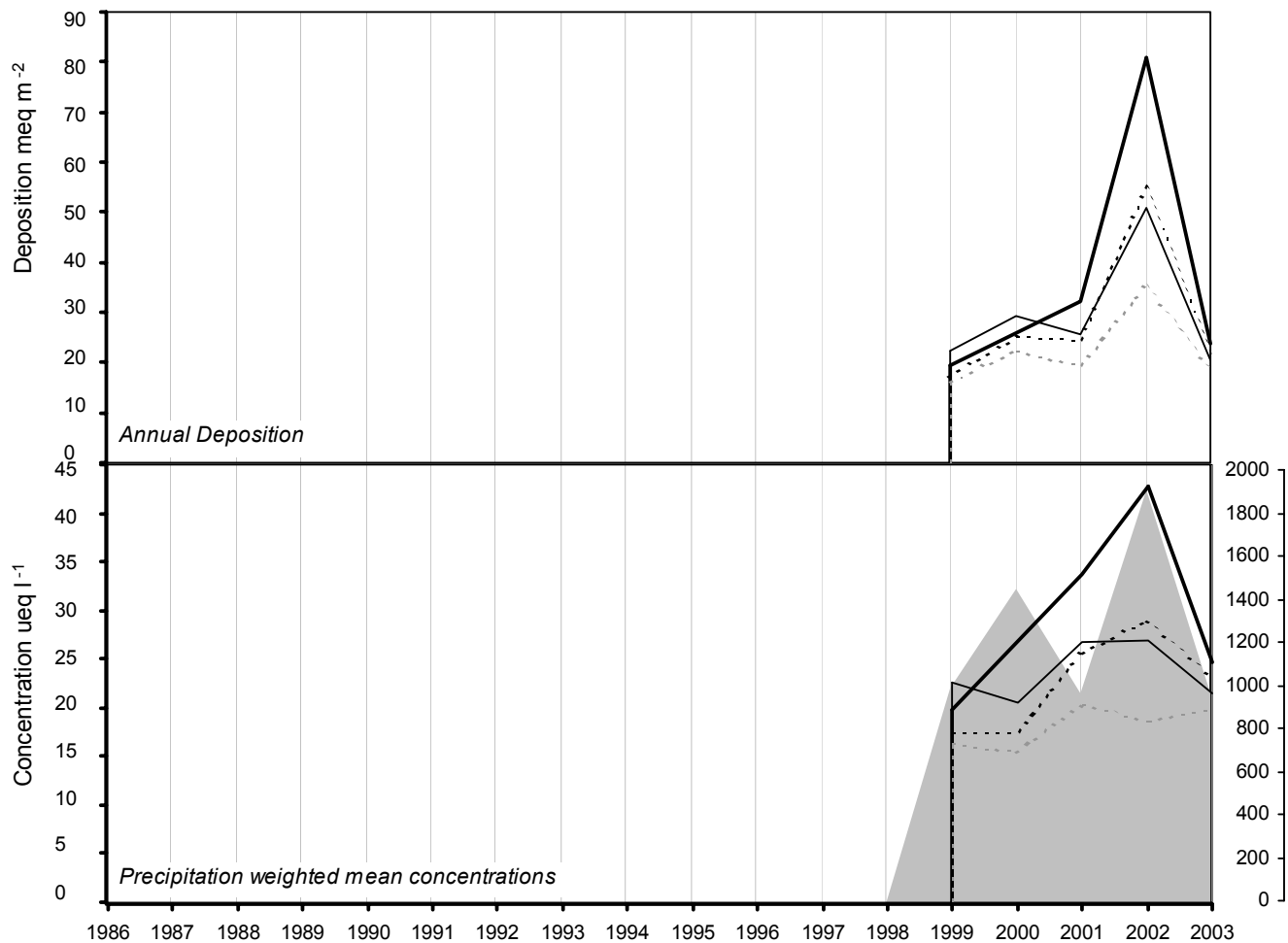
# Lochnagar

**2003** Site Code: 5157  
 Easting: 3252  
 Northing: 7859  
 Latitude: 56 57 29N  
 Longitude: 03 13 51 W  
 Altitude (m): 785  
 Rainfall (mm): -  
 [30 year mean 1940 - 1971]

Site Environment:  
 Heathland 60% and bare ground 40%

Other measurements:  
 UKAWMN. Automatic weather station

Site Operator:  
 ENSIS



long-term trends in concentration (+x = increase; -x = decrease)	
<i>hydrogen ion</i>	0.00 ueq/l (0.00 %/year): 4 years' data n/a Insufficient Data
<i>non-marine sulphate</i>	0.00 ueq/l (0.00 %/year): 4 years' data n/a Insufficient Data
<i>nitrate</i>	0.00 ueq/l (0.00 %/year): 4 years' data n/a Insufficient Data
<i>ammonium</i>	0.00 ueq/l (0.00 %/year): 4 years' data n/a Insufficient Data

ACID DEPOSITION DATA REPORT, 2003

### 5157 Lochnagar

Sampling	pH	SO4	NO3	NH4	Na	Mg	Ca	Cl	K	PO4	nss-SO4	H	conductivity	rainfall	
Start Date	End Date	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µS/cm)	(mm)	
01/01/03	14/01/03	6.1	37.2	21.3	8.6	202.1	26.1	22.0	182.7	19.7	<1.0	12.9	0.7	40.0	7.1
14/01/03	12/02/03	4.8	17.2	7.0	4.2	97.0	21.6	5.4	113.4	1.9	<1.0	5.5	17.4	20.0	107.7
12/02/03	26/02/03	4.0	222.7	460.5	436.5	376.0	84.1	31.1	373.4	10.0	<1.0	177.4	109.6	165.0	6.8
26/02/03	12/03/03	4.4	31.1	28.9	27.3	50.1	11.4	4.3	60.8	1.4	<1.0	25.1	41.7	24.0	97.5
12/03/03	26/03/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
26/03/03	09/04/03	5.1	17.1	12.7	15.1	45.0	9.4	9.0	51.8	0.6	<1.0	11.7	7.2	13.0	6.3
09/04/03	23/04/03	5.9	82.0	101.3	134.2	42.2	10.9	40.6	30.6	2.4	<1.0	77.0	1.1	33.0	18.8
23/04/03	07/05/03	4.8	22.2	12.0	14.6	13.7	3.6	2.4	17.0	<0.5	<1.0	20.6	17.4	13.0	127.5
07/05/03	21/05/03	4.7	16.9	10.1	9.0	23.1	5.2	2.5	26.9	<0.5	<1.0	14.1	19.5	12.0	103.3
21/05/03	04/06/03	4.5	37.8	36.9	24.0	17.7	6.3	18.0	17.7	1.7	<1.0	35.7	31.6	20.0	6.1
04/06/03	19/06/03	4.7	35.2	24.4	29.0	24.3	5.7	4.2	25.0	0.7	<1.0	32.3	18.6	18.0	19.8
19/06/03	02/07/03	4.5	42.2	38.7	34.0	49.1	11.4	9.2	49.7	1.3	<1.0	36.3	29.5	25.0	12.8
02/07/03	16/07/03	4.6	23.1	11.4	14.8	7.8	2.0	2.5	10.7	<0.5	<1.0	22.1	25.1	12.0	20.0
16/07/03	30/07/03	4.3	29.3	15.4	19.2	6.5	2.4	3.3	8.6	<0.5	<1.0	28.5	47.9	16.0	42.7
30/07/03	13/08/03	4.1	47.2	44.0	42.8	14.0	3.6	21.0	11.6	2.1	<1.0	45.5	72.4	21.0	25.5
13/08/03	27/08/03	4.5	26.6	27.1	18.9	25.0	6.8	10.2	31.3	1.1	<1.0	23.6	34.7	14.0	12.4
27/08/03	10/09/03	4.8	19.0	13.1	17.7	51.1	10.9	9.8	52.1	1.2	<1.0	12.9	14.8	16.0	30.1
10/09/03	24/09/03	4.9	21.9	19.9	5.6	45.8	10.3	8.0	80.9	1.1	<1.0	16.4	13.8	16.0	21.8
24/09/03	08/10/03	4.9	18.6	6.8	<0.7	75.5	15.3	10.9	79.1	0.6	<1.0	9.5	12.3	19.0	23.9
08/10/03	23/10/03	4.7	44.0	31.4	8.3	240.4	52.1	11.0	219.8	5.1	<1.0	15.1	18.2	51.0	17.6
23/10/03	05/11/03	4.8	25.8	14.0	10.9	86.7	17.5	5.5	94.7	1.9	<1.0	15.3	15.8	22.0	27.0
05/11/03	19/11/03	4.4	35.6	36.9	25.9	31.5	7.0	4.8	34.9	1.2	<1.0	31.8	36.3	24.0	96.8
19/11/03	03/12/03	4.9	14.8	14.1	2.8	16.7	3.0	1.0	17.6	<0.1	<1.0	12.7	13.8	10.0	90.8
03/12/03	17/12/03	-	-	-	-	-	-	-	-	-	-	-	-	-	6.3
17/12/03	03/01/04	5.1	6.4	4.6	2.3	16.3	5.0	2.8	21.6	1.1	<1.0	4.4	7.6	<10.0	30.2
Precipitation-weighted annual mean for site (samples containing phosphate are excluded)														Total rainfall	
5157		26.8	22.9	20.0	45.0	9.9	5.9	50.0	1.3	-	21.4	24.7	19.1	958.9	

# Glen Dye

**2003**

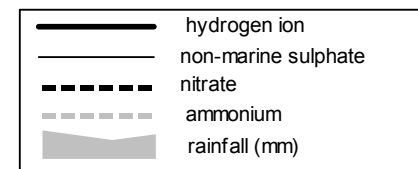
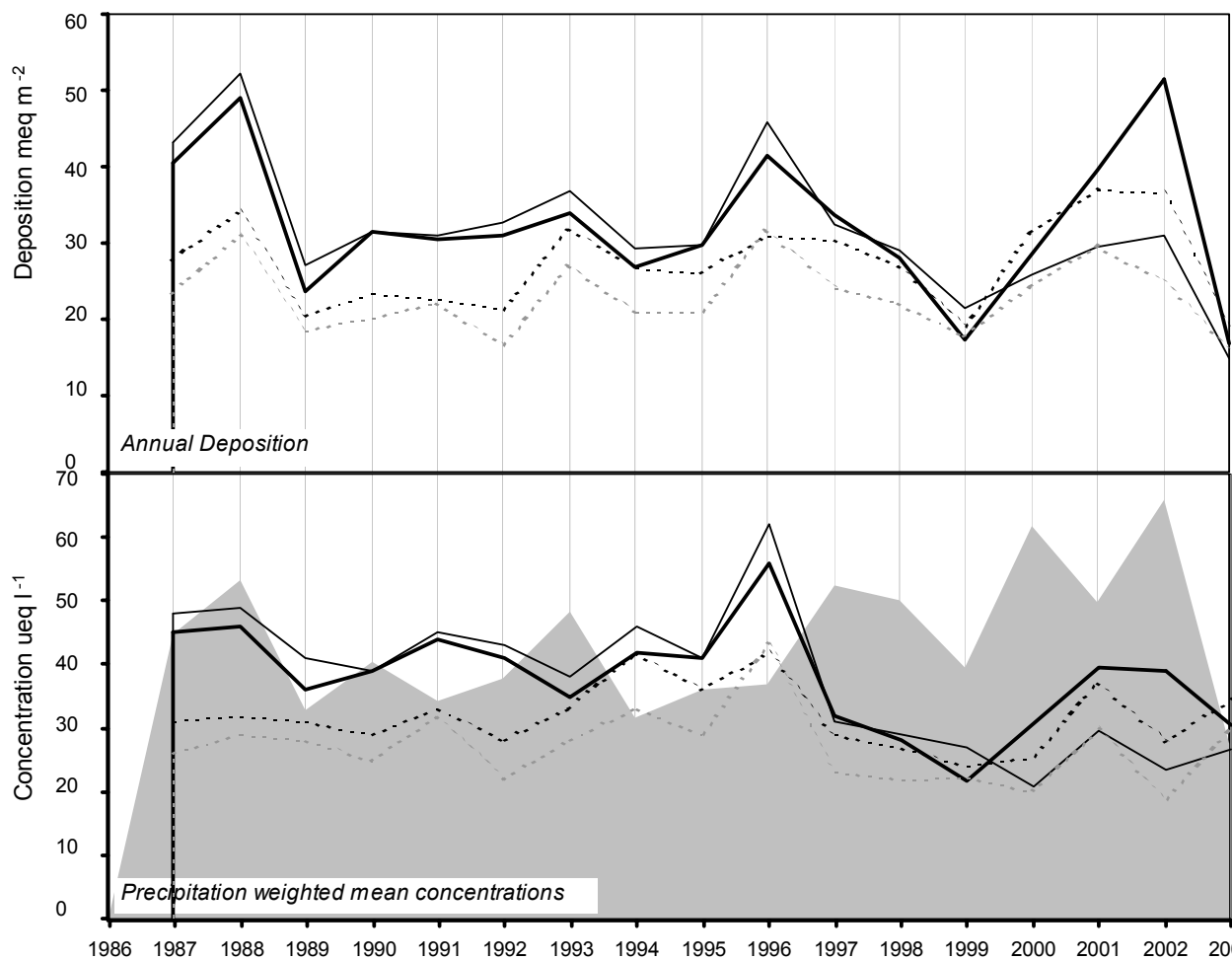
Site Code: 5011  
 Easting: 3642  
 Northing: 7864  
 Latitude: 56 58 03 N  
 Longitude: 02 35 20 W  
 Altitude (m): 185  
 Rainfall (mm): 1311

[30 year mean 1940 - 1971]

Site Environment:  
 Open moorland

Other measurements:  
 DT, Daily SO<sub>2</sub>, Daily SO<sub>4</sub>, EMEP

Site Operator:  
 SEPA; North Region



long-term trends in concentration (+x = increase; -x = decrease)	
<i>hydrogen ion</i>	-0.70 ueq/l (-1.57 %/year): 16 years' data - No significant trend detected
<i>non-marine sulphate</i>	-1.52 ueq/l (-2.96 %/year): 17 years' data ++ Moderately strong trend detected
<i>nitrate</i>	-0.07 ueq/l (-0.22 %/year): 17 years' data - No significant trend detected
<i>ammonium</i>	-0.24 ueq/l (-0.81 %/year): 17 years' data - No significant trend detected

ACID DEPOSITION DATA REPORT, 2003

**5011 Glen Dye**

Sampling	pH	SO4	NO3	NH4	Na	Mg	Ca	Cl	K	PO4	nss-SO4	H	conductivity	rainfall	
Start Date	End Date	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µS/cm)	(mm)	
04/01/03	14/01/03	5.0	23.5	19.5	19.8	126.3	25.5	7.8	140.2	2.5	<1.0	8.3	10.7	26.0	4.3
14/01/03	27/01/03	4.7	19.3	11.3	9.0	56.2	12.5	4.7	67.2	1.5	<1.0	12.6	22.4	18.0	54.6
27/01/03	11/02/03	5.1	51.2	8.2	7.8	375.4	84.4	16.8	388.0	8.0	<1.0	6.0	8.7	64.0	13.3
11/02/03	25/02/03	4.1	178.7	424.0	383.5	419.5	94.7	44.8	412.5	11.2	<1.0	128.1	83.2	150.0	2.9
25/02/03	11/03/03	4.2	48.5	63.4	56.8	58.3	13.8	7.3	88.6	1.5	<1.0	41.5	66.1	34.0	38.7
11/03/03	25/03/03	5.3	17.7	8.8	23.8	93.7	16.3	17.1	101.5	6.6	<1.0	6.4	5.0	-	1.1
25/03/03	08/04/03	4.9	62.5	57.7	29.6	316.4	81.0	46.5	337.0	7.3	<1.0	24.4	11.5	62.0	2.7
08/04/03	22/04/03	5.2	64.3	86.5	115.3	31.4	14.6	32.2	26.0	2.7	<1.0	60.5	6.8	27.0	27.3
22/04/03	06/05/03	4.4	30.8	27.1	21.7	46.2	10.1	7.6	49.8	1.1	<1.0	25.2	38.0	24.0	73.6
07/05/03	20/05/03	4.4	26.4	23.7	18.0	41.3	10.1	4.6	45.3	1.1	<1.0	21.4	37.2	21.0	51.8
20/05/03	03/06/03	5.1	8.2	8.3	8.9	5.9	1.7	2.1	6.0	2.2	<1.0	7.5	8.5	<10.0	20.2
03/06/03	17/06/03	4.2	76.3	88.9	68.3	53.3	14.0	17.2	47.6	2.4	<1.0	69.9	60.3	43.0	14.0
17/06/03	01/07/03	4.2	113.0	125.3	74.3	144.3	36.7	39.8	121.1	6.1	<1.0	95.6	63.1	64.0	4.1
01/07/03	15/07/03	4.2	58.4	42.1	36.4	22.5	9.4	25.5	19.0	3.2	<1.0	55.7	66.1	30.0	2.4
15/07/03	29/07/03	4.2	40.4	36.5	42.8	19.7	6.2	9.3	22.3	2.5	<1.0	38.0	61.7	20.0	16.6
29/07/03	12/08/03	4.5	59.4	68.9	40.7	19.9	6.9	38.8	18.1	6.1	<1.0	57.0	32.4	30.0	6.0
12/08/03	26/08/03	4.9	31.4	32.7	28.4	33.1	9.3	21.7	35.3	2.4	<1.0	27.4	13.2	19.0	8.0
26/08/03	09/09/03	5.8	26.5	18.6	30.2	96.3	20.1	13.0	105.5	3.0	<1.0	14.9	1.7	24.0	8.8
09/09/03	24/09/03	5.1	11.5	8.9	2.3	21.5	5.2	4.6	12.3	0.9	<1.0	8.9	8.5	9.0	14.8
24/09/03	07/10/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
07/10/03	29/10/03	4.3	64.4	63.3	22.9	243.6	57.0	15.1	261.1	6.6	<1.0	35.1	55.0	66.0	7.5
21/10/03	04/11/03	5.1	23.1	10.2	5.3	109.8	21.9	5.0	129.3	2.7	<1.0	9.9	8.5	23.0	29.0
04/11/03	20/11/03	4.4	60.4	46.7	42.5	116.8	27.1	8.9	133.6	3.3	<1.0	46.3	36.3	42.0	3.6
20/11/03	01/12/03	4.6	20.5	20.7	10.5	34.2	6.7	2.4	42.5	0.9	<1.0	16.4	24.5	19.0	48.2
01/12/03	16/12/03	4.3	26.8	32.6	28.2	231.0	51.9	14.9	119.8	5.6	<1.0	-	49.0	57.0	9.8
16/12/03	29/12/03	-	-	-	-	-	-	-	-	-	-	-	-	-	23.0
29/12/03	14/01/04	4.6	37.9	32.2	24.8	87.3	17.7	17.0	94.4	1.7	<1.0	27.4	24.5	26.0	67.5
Precipitation-weighted annual mean for site (samples containing phosphate are excluded)														Total rainfall	
5011		34.9	34.5	29.7	71.7	16.4	10.7	76.8	2.1	-	26.7	30.4	26.7	553.9	

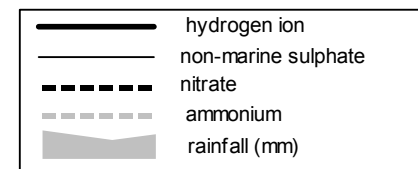
# Allt a' Mharcaidh

**2003** Site Code: **5103**  
 Easting: **2876**  
 Northing: **8052**  
 Latitude: **57 07 27 N**  
 Longitude: **03 51 24 W**  
 Altitude (m): **274**  
 Rainfall (mm): **1221**  
 [30 year mean 1940 - 1971]

Site Environment:  
**Moorland, in forestry SW Cairngorms**

Other measurements:  
**DT, UKAWMN**

Site Operator:  
**Freshwater Fisheries Laboratory**



long-term trends in concentration (+x = increase; -x = decrease)	
<i>hydrogen ion</i>	-0.42 ueq/l (-2.04 %/year): 17 years' data ++ Moderately strong trend detected
<i>non-marine sulphate</i>	-0.74 ueq/l (-3.37 %/year): 18 years' data +++ Strong trend detected
<i>nitrate</i>	0.02 ueq/l (0.22 %/year): 18 years' data - No significant trend detected
<i>ammonium</i>	-0.04 ueq/l (-0.73 %/year): 18 years' data - No significant trend detected

ACID DEPOSITION DATA REPORT, 2003

**5103 Allt a ' Mharcaidh**

Sampling	pH	SO4	NO3	NH4	Na	Mg	Ca	Cl	K	PO4	nss-SO4	H	conductivity	rainfall	
Start Date	End Date	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µS/cm)	(mm)	
13/01/03	27/01/03	4.9	34.4	4.0	2.7	269.6	56.5	11.3	338.2	5.3	<1.0	1.9	11.2	45.0	44.4
27/01/03	10/02/03	5.2	32.8	2.0	<0.7	291.4	61.4	12.5	318.1	5.5	<1.0	-	7.1	46.0	25.0
10/02/03	24/02/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
24/02/03	10/03/03	4.7	9.4	11.9	2.9	29.9	5.5	2.5	35.8	<0.5	<1.0	5.8	21.9	11.0	40.5
10/03/03	24/03/03	5.4	11.8	<0.7	2.0	91.2	17.8	7.8	99.7	1.2	<1.0	0.8	4.4	16.0	9.6
24/03/03	07/04/03	5.2	20.0	13.8	10.1	78.7	17.4	11.0	83.6	1.7	<1.0	10.5	6.3	17.0	9.0
07/04/03	21/04/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
21/04/03	05/05/03	4.7	12.0	15.1	16.1	4.7	2.7	4.7	5.8	<0.5	<1.0	11.4	20.4	<10.0	41.5
05/05/03	19/05/03	4.8	12.3	8.6	<0.7	35.1	8.0	4.5	39.0	0.6	<1.0	8.0	17.4	14.0	22.2
19/05/03	02/06/03	4.9	8.7	6.7	1.2	10.6	2.9	2.7	11.0	2.2	<1.0	7.5	13.2	<10.0	21.8
02/06/03	16/06/03	4.6	19.9	14.0	21.4	16.1	4.2	2.5	17.2	0.5	<1.0	18.0	24.5	12.0	28.5
16/06/03	30/06/03	4.5	32.0	37.9	25.2	29.6	8.7	17.8	30.9	1.5	<1.0	28.5	32.4	22.0	7.0
30/06/03	14/07/03	4.5	49.6	41.2	27.6	50.8	12.6	14.8	52.2	2.8	<1.0	43.5	33.9	29.0	8.7
14/07/03	28/07/03	4.6	20.6	14.0	11.9	4.9	2.8	7.7	5.4	1.5	<1.0	20.0	24.0	13.0	2.6
28/07/03	11/08/03	4.6	39.2	48.6	42.1	12.7	5.5	15.7	14.6	2.2	<1.0	37.6	24.5	22.0	4.8
11/08/03	25/08/03	4.9	13.0	12.3	2.7	22.3	7.9	8.6	21.1	1.1	<1.0	10.3	12.6	12.0	6.9
25/08/03	08/09/03	4.9	12.4	8.7	7.4	57.2	12.9	6.3	62.6	1.3	<1.0	5.5	11.2	15.0	17.7
08/09/03	23/09/03	6.3	39.1	7.1	161.4	29.1	4.0	1.9	27.7	15.1	81.5	35.6	0.5	26.0	21.2
23/09/03	07/10/03	5.1	19.1	3.0	<0.7	121.8	21.1	4.8	133.5	1.7	<1.0	4.4	8.3	23.0	23.2
07/10/03	21/10/03	4.7	34.9	11.8	2.0	225.9	48.7	11.4	246.5	4.9	<1.0	7.7	20.4	46.0	9.5
21/10/03	04/11/03	5.0	8.0	6.3	<0.7	32.0	6.5	2.2	36.3	1.3	<1.0	4.1	9.5	<10.0	34.5
04/11/03	18/11/03	4.6	34.0	38.4	25.8	28.7	8.2	16.5	26.4	1.3	6.8	30.6	28.2	23.0	11.4
18/11/03	02/12/03	5.2	7.8	7.3	<0.7	19.9	1.9	0.7	21.3	<0.1	<1.0	5.4	6.8	<10.0	36.9
02/12/03	16/12/03	5.4	9.7	7.6	4.5	25.5	6.4	4.0	32.9	0.7	<1.0	6.6	4.3	<10.0	6.1
16/12/03	30/12/03	5.2	8.4	1.8	<0.7	45.1	9.5	2.8	54.6	1.0	<1.0	2.9	6.3	10.0	49.2
30/12/03	14/01/04	5.1	9.7	6.0	0.2	47.6	7.2	1.6	46.1	0.3	<1.0	3.9	8.5	<10.0	14.0
Precipitation-weighted annual mean for site (samples containing phosphate are excluded)														Total rainfall	
5103		17.0	9.8	6.2	75.3	15.8	5.7	86.9	1.7	-	8.5	13.9	18.4	495.9	

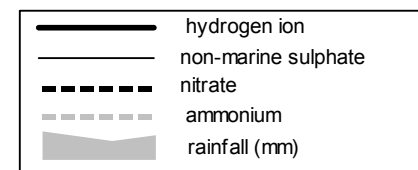
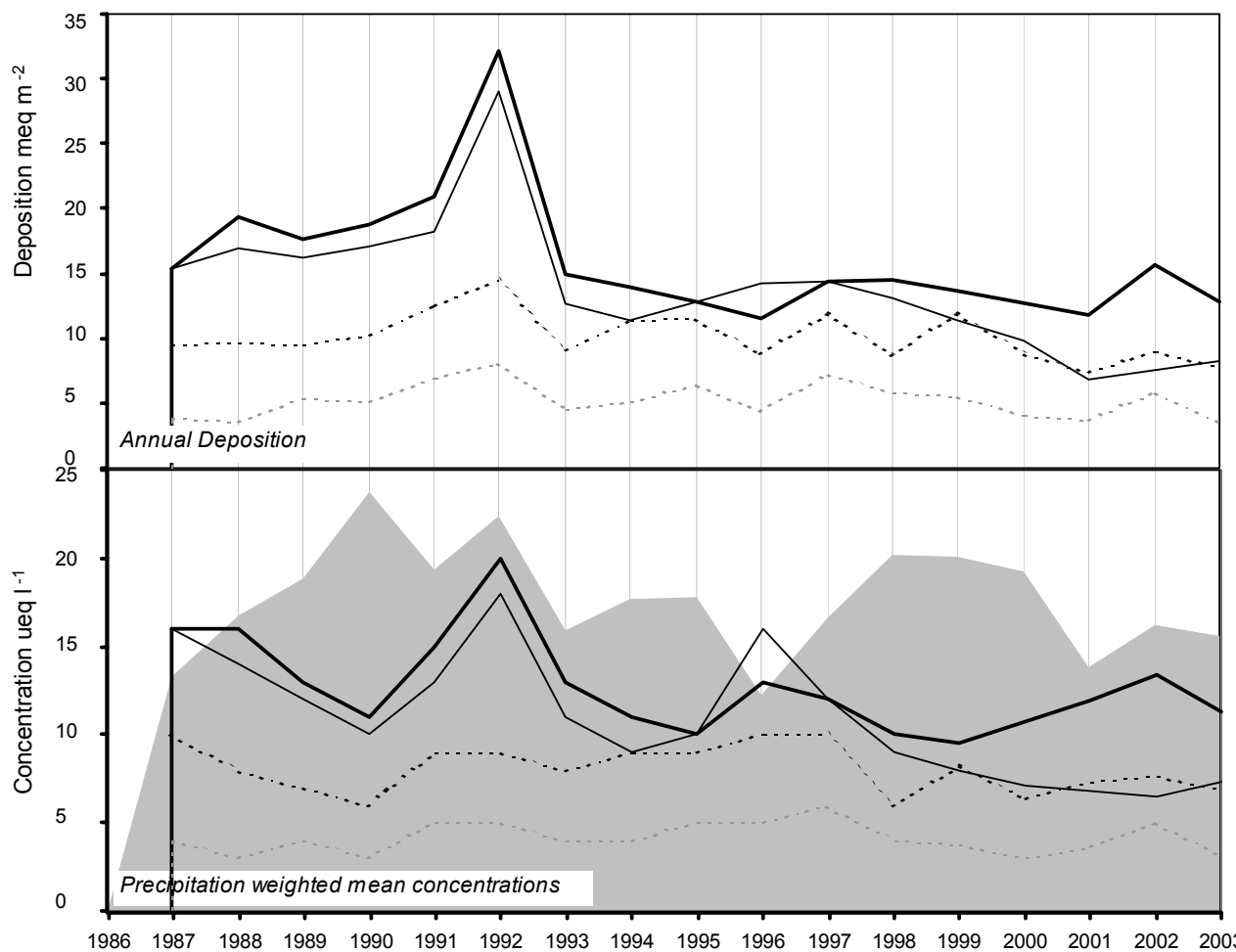
# Strathvaich Dam

**2003** Site Code: 5010  
 Easting: 2347  
 Northing: 8750  
 Latitude: 57 44 04 N  
 Longitude: 04 46 36 W  
 Altitude (m): 270  
 Rainfall (mm): 1576  
 [30 year mean 1940 - 1971]

Site Environment:  
 Open moorland, deer

Other measurements:  
 DT, Daily SO<sub>2</sub>, Daily SO<sub>4</sub>, HNO<sub>3</sub> Denuder, NO<sub>x</sub>, SO<sub>2</sub>,  
 ozone, EMEP

Site Operator:  
 SEPA; North Region



long-term trends in concentration (+x = increase; -x = decrease)	
<i>hydrogen ion</i>	-0.28 ueq/l (-1.80 %/year): 16 years' data + Significant trend detected
<i>non-marine sulphate</i>	-0.49 ueq/l (-3.21 %/year): 17 years' data ++ Moderately strong trend detected
<i>nitrate</i>	-0.07 ueq/l (-0.82 %/year): 17 years' data - No significant trend detected
<i>ammonium</i>	0.01 ueq/l (0.16 %/year): 17 years' data - No significant trend detected

ACID DEPOSITION DATA REPORT, 2003



### 5010 Strathvaich Dam

Sampling	pH	SO4	NO3	NH4	Na	Mg	Ca	Cl	K	PO4	nss-SO4	H	conductivity	rainfall	
Start Date	End Date	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µS/cm)	(mm)	
12/01/03	28/01/03	5.1	64.8	2.0	<0.7	550.2	121.2	22.1	610.8	11.2	<1.0	-	8.9	87.0	173.1
28/01/03	09/02/03	5.2	58.3	<0.7	<0.7	485.1	106.7	19.7	555.5	9.7	<1.0	-	6.0	76.0	46.5
09/02/03	26/02/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
26/02/03	08/03/03	5.0	20.2	16.3	4.3	117.4	25.7	12.6	135.3	2.1	<1.0	6.0	10.0	25.0	13.2
08/03/03	23/03/03	5.1	14.4	3.4	1.0	112.8	23.5	5.7	125.6	1.9	<1.0	0.8	7.4	20.0	43.4
23/03/03	06/04/03	5.1	39.7	9.4	6.7	300.5	64.4	14.9	328.7	5.9	<1.0	3.5	8.5	49.0	28.0
06/04/03	20/04/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
20/04/03	03/05/03	4.5	16.2	20.9	22.3	8.2	2.7	6.3	10.8	<0.5	<1.0	15.2	28.8	10.0	72.5
03/05/03	17/05/03	5.0	13.1	7.7	4.2	79.8	13.6	4.9	87.2	12.1	<1.0	3.5	10.7	16.0	81.4
17/05/03	01/06/03	4.6	15.6	12.5	4.2	19.1	4.9	4.3	21.6	<0.5	<1.0	13.3	23.4	13.0	20.3
01/06/03	15/06/03	4.6	43.2	16.7	17.4	75.1	18.6	8.9	76.2	1.8	<1.0	34.2	22.9	25.0	11.6
15/06/03	01/07/03	4.7	22.0	9.0	3.7	83.6	16.3	5.8	85.4	2.7	<1.0	11.9	20.4	20.0	49.0
01/07/03	13/07/03	4.7	17.3	6.6	0.7	41.0	8.6	4.0	49.6	0.8	<1.0	12.3	21.9	16.0	19.3
13/07/03	27/07/03	4.6	10.2	7.8	4.8	4.2	2.0	4.7	5.0	0.6	<1.0	9.7	28.2	<10.0	26.6
27/07/03	10/08/03	4.8	30.0	19.1	15.8	76.4	16.2	9.1	86.8	2.3	<1.0	20.8	17.8	24.0	8.9
10/08/03	23/08/03	4.8	11.9	7.0	3.2	46.1	12.0	6.0	49.5	0.9	<1.0	6.4	17.4	13.0	31.5
23/08/03	07/09/03	5.1	20.9	6.5	2.5	109.0	22.6	8.1	118.6	2.1	5.8	7.7	8.9	23.0	11.1
07/09/03	23/09/03	5.2	15.9	1.9	<0.7	88.7	16.8	7.2	92.4	1.7	<1.0	5.2	6.9	18.0	44.7
23/09/03	06/10/03	4.9	30.5	<0.7	<0.7	241.1	50.2	10.7	256.4	4.6	<1.0	1.5	11.2	41.0	65.8
06/10/03	19/10/03	5.2	97.0	4.8	<0.7	1914.0	169.8	31.4	2243.7	17.9	<1.0	-	5.9	124.0	32.1
19/10/03	01/11/03	5.4	11.6	14.5	<0.7	92.5	18.7	3.7	101.0	1.8	<1.0	0.4	4.3	17.0	38.8
01/11/03	29/11/03	5.1	21.1	13.7	0.1	52.6	10.7	3.1	66.8	1.7	<1.0	14.7	8.9	25.0	95.1
29/11/03	13/12/03	5.0	13.6	10.5	1.8	47.5	9.8	4.0	58.6	1.6	<1.0	7.8	10.7	11.0	46.3
13/12/03	29/12/03	5.4	14.8	1.6	<0.7	111.7	22.8	5.3	130.3	3.2	<1.0	1.3	4.0	19.0	78.7
29/12/03	12/01/04	5.2	24.4	3.1	1.7	171.5	34.8	8.3	180.6	3.7	<1.0	3.7	5.8	27.0	90.8
Precipitation-weighted annual mean for site (samples containing phosphate are excluded)														Total rainfall	
5010			30.0	7.0	3.3	235.5	43.6	10.0	264.7	5.2	-	7.3	11.3	36.5	1128.8

# Achanarras

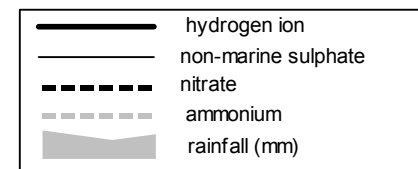
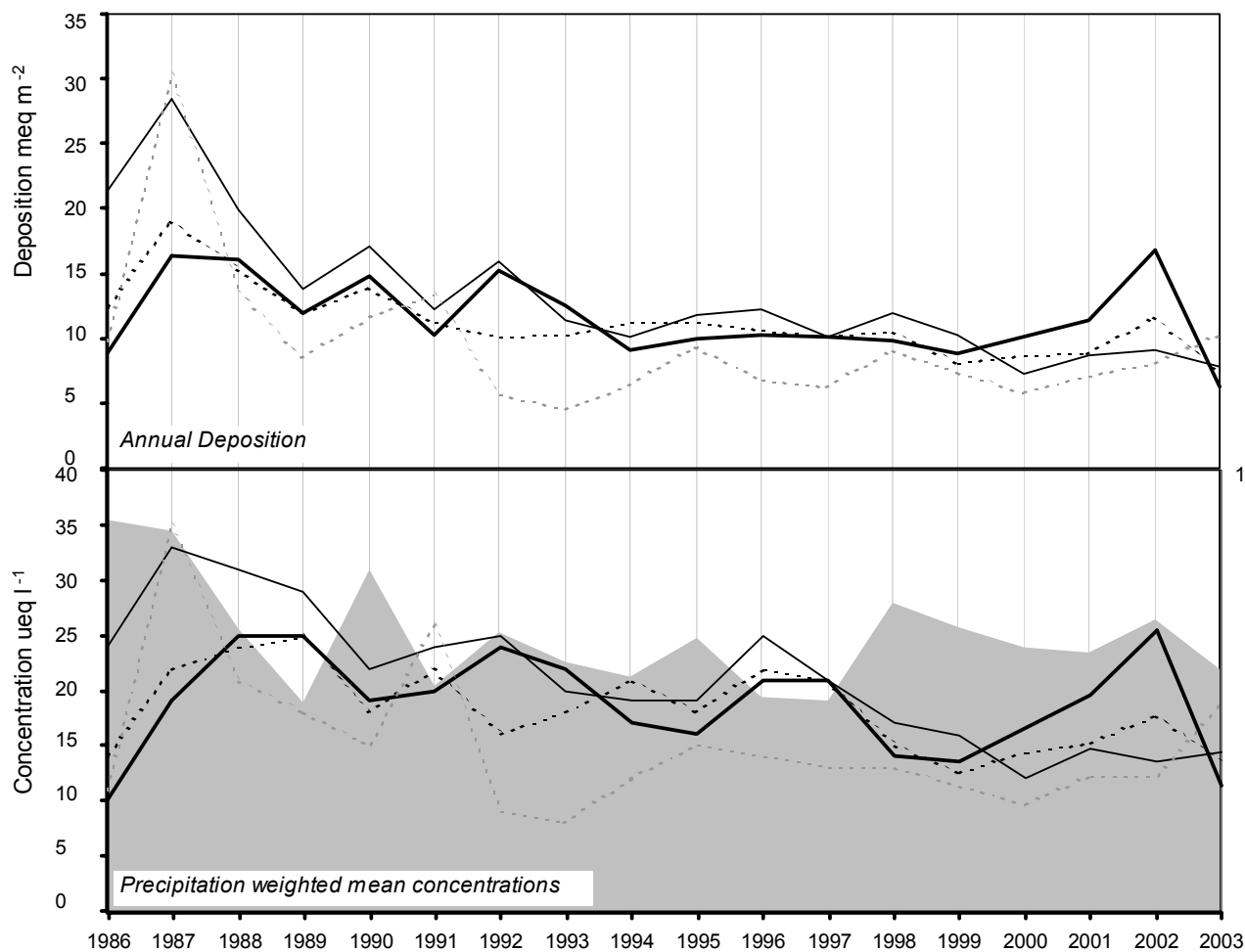
2003

Site Code: 5140  
 Easting: 3151  
 Northing: 9550  
 Latitude: 58 28 31 N  
 Longitude: 03 27 21 W  
 Altitude (m): 98  
 Rainfall (mm): 973  
 [30 year mean 1940 - 1971]

Site Environment:  
 Open moorland, farm pastures

Other measurements:  
 DT

Site Operator:  
 Mrs. J Erridge



long-term trends in concentration (+x = increase; -x = decrease)	
<i>hydrogen ion</i>	-0.14 ueq/l (-0.70 %/year): 17 years' data - No significant trend detected
<i>non-marine sulphate</i>	-0.99 ueq/l (-3.36 %/year): 18 years' data ++++ Very strong trend detected
<i>nitrate</i>	-0.38 ueq/l (-1.78 %/year): 18 years' data + Significant trend detected
<i>ammonium</i>	-0.51 ueq/l (-2.62 %/year): 18 years' data - No significant trend detected

ACID DEPOSITION DATA REPORT, 2003

**5140 Achanarras**

Sampling	pH	SO4	NO3	NH4	Na	Mg	Ca	Cl	K	PO4	nss-SO4	H	conductivity	rainfall	
Start Date	End Date	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µS/cm)	(mm)	
01/01/03	15/01/03	4.7	30.0	6.9	7.1	194.7	42.6	8.3	220.9	3.6	<1.0	6.5	18.6	38.0	21.9
15/01/03	29/01/03	4.7	72.2	4.6	<0.7	607.7	133.8	24.8	681.5	11.8	<1.0	-	18.2	99.0	57.7
29/01/03	12/02/03	6.3	142.4	3.3	8.7	1096.8	221.3	75.1	1149.8	55.1	<1.0	10.2	0.5	181.0	4.0
12/02/03	26/02/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
26/02/03	12/03/03	-	-	-	-	-	-	-	-	-	-	-	-	-	4.0
12/03/03	26/03/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.4
26/03/03	09/04/03	5.1	147.7	35.8	38.3	962.8	194.2	60.2	1118.0	19.8	<1.0	31.7	7.8	161.0	3.9
09/04/03	23/04/03	4.3	93.8	102.2	86.0	157.8	37.6	30.4	164.1	3.0	<1.0	74.7	56.2	60.0	11.9
23/04/03	07/05/03	5.6	33.4	15.8	45.8	106.7	20.2	6.8	118.3	4.8	9.0	20.5	2.6	26.0	60.2
07/05/03	21/05/03	5.8	101.5	12.1	181.3	275.8	42.0	17.7	245.7	60.3	255.4	68.3	1.5	72.0	34.8
21/05/03	04/06/03	7.3	123.4	2.5	496.1	66.3	40.3	12.2	74.3	132.3	84.9	115.4	0.1	117.0	4.5
04/06/03	18/06/03	5.8	30.3	5.8	18.0	47.9	9.8	17.6	49.9	4.2	<1.0	24.6	1.6	15.0	27.4
18/06/03	02/07/03	4.2	65.9	42.0	27.1	137.6	30.3	14.4	150.3	5.7	<1.0	49.3	64.6	48.0	12.7
02/07/03	16/07/03	5.0	32.2	0.6	<0.7	121.1	28.7	19.2	143.0	7.9	<1.0	17.7	10.0	<10.0	4.3
16/07/03	30/07/03	6.3	35.1	17.8	68.0	37.0	6.6	8.6	35.1	7.7	20.0	30.7	0.6	19.0	20.5
30/07/03	13/08/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.6
13/08/03	27/08/03	4.5	45.0	10.6	244.1	163.9	28.8	10.4	160.4	46.5	63.9	25.2	33.1	71.0	24.9
27/08/03	10/09/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
10/09/03	24/09/03	5.9	53.4	15.4	15.9	345.0	71.7	38.0	379.2	7.5	<1.0	11.8	1.2	60.0	16.3
24/09/03	08/10/03	5.4	127.4	<0.7	<0.7	1094.3	233.0	49.9	1199.6	22.7	<1.0	-	3.6	174.0	37.2
08/10/03	22/10/03	5.1	39.6	14.7	2.2	316.5	66.6	14.1	423.3	6.9	<1.0	1.5	8.3	54.0	46.1
22/10/03	05/11/03	6.1	43.4	20.8	108.9	296.5	46.2	8.0	299.0	10.4	<1.0	7.7	0.9	55.0	27.1
05/11/03	26/11/03	4.6	33.2	31.6	9.5	151.9	32.3	8.0	172.3	3.0	<1.0	14.9	26.3	39.0	15.3
26/11/03	03/12/03	4.9	13.1	10.1	3.6	56.1	11.5	7.2	71.3	5.5	<1.0	6.4	11.7	14.0	13.8
03/12/03	17/12/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
17/12/03	31/12/03	5.3	36.8	3.6	<0.7	267.7	56.2	13.1	288.1	5.9	<1.0	4.6	4.7	42.0	70.1
31/12/03	14/01/04	4.7	34.8	10.6	3.4	201.7	43.5	11.3	219.5	4.3	<1.0	10.5	18.6	42.0	28.9
Precipitation-weighted annual mean for site (samples containing phosphate are excluded)														Total rainfall	
5140		51.9	13.4	18.9	340.1	71.4	18.5	380.8	8.4	-	14.3	11.4	60.2	548.5	

# Appendix 1.2: Bulk Precipitation Data, 2003 - Weekly Measurements

Weekly measurements were continued at the following 3 sites:

- 5006 Lough Navar (designated as site 5161 for differentiation from the fortnightly measurements)
- 5002 Eskdalemuir (designated as site 5162 for differentiation from the fortnightly measurements)
- 5117 Thorganby (designated as site 5163 for differentiation from the fortnightly measurements)

### 5161 Lough Navar

Sampling	pH	SO4	NO3	NH4	Na	Mg	Ca	Cl	K	PO4	nss-SO4	H	conductivity	rainfall	
Start Date	End Date	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µS/cm)	(mm)	
06/01/03	13/01/03	-	-	-	-	-	-	-	-	-	-	-	-	2.1	
13/01/03	20/01/03	5.0	22.8	2.8	6.4	178.7	37.6	7.8	204.1	4.3	<1.0	1.3	10.7	32.0	47.5
20/01/03	27/01/03	5.0	28.2	4.1	5.0	194.7	39.1	11.5	216.2	5.0	<1.0	4.7	9.5	34.0	12.0
27/01/03	03/02/03	5.3	107.0	2.5	<0.7	921.7	205.4	40.0	1043.8	20.4	<1.0	-	4.9	145.0	69.7
03/02/03	10/02/03	6.1	19.0	4.3	10.1	116.8	18.2	9.7	130.3	11.1	<1.0	5.0	0.9	22.0	3.1
10/02/03	17/02/03	5.6	14.3	7.0	14.9	72.1	12.9	6.5	74.1	1.7	<1.0	5.6	2.8	15.0	4.4
17/02/03	24/02/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
24/02/03	03/03/03	5.8	14.0	19.6	35.0	17.7	3.2	4.6	21.6	0.6	<1.0	11.9	1.5	<10.0	25.5
03/03/03	10/03/03	5.0	18.1	2.9	6.0	111.6	23.7	6.9	125.9	2.5	<1.0	4.7	9.1	20.0	43.3
10/03/03	17/03/03	-	-	-	-	-	-	-	-	-	-	-	-	-	1.3
17/03/03	24/03/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
24/03/03	31/03/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.3
31/03/03	07/04/03	5.8	51.8	7.3	10.6	363.7	75.0	30.4	405.4	9.4	<1.0	8.0	1.6	62.0	2.5
07/04/03	14/04/03	6.1	39.8	59.7	76.7	31.2	8.3	35.9	28.1	4.1	<1.0	36.0	0.8	22.0	6.7
14/04/03	21/04/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
21/04/03	28/04/03	5.8	32.1	17.8	27.0	39.2	8.3	18.3	41.9	1.8	<1.0	27.4	1.4	13.0	4.1
28/04/03	05/05/03	5.8	15.8	4.7	<0.7	86.8	14.2	16.0	86.4	2.0	<1.0	5.3	1.7	17.0	4.2
05/05/03	12/05/03	5.7	31.8	2.4	7.6	228.0	46.1	16.5	252.1	5.1	<1.0	4.3	1.9	38.0	3.6
12/05/03	19/05/03	5.3	12.9	5.8	4.2	68.3	14.4	6.9	75.3	1.9	<1.0	4.7	5.6	14.0	48.4
19/05/03	26/05/03	5.1	14.5	3.8	0.6	91.4	18.1	5.4	101.5	2.0	<1.0	3.5	7.2	18.0	52.3
26/05/03	02/06/03	6.0	30.1	15.5	18.7	33.6	9.8	31.1	40.0	4.4	<1.0	26.0	1.1	14.0	6.4
02/06/03	09/06/03	5.1	20.9	7.1	11.6	19.2	3.6	5.5	10.2	1.0	<1.0	18.6	7.6	<10.0	24.6
09/06/03	16/06/03	5.0	18.1	1.5	0.6	26.4	4.9	5.6	19.4	0.8	<1.0	14.9	9.1	<10.0	28.9
16/06/03	23/06/03	5.3	37.7	8.1	9.3	119.9	25.8	23.9	132.8	4.0	<1.0	23.3	5.0	26.0	8.3
23/06/03	30/06/03	6.0	11.4	7.1	14.3	16.8	4.8	26.2	19.3	1.4	<1.0	9.3	1.0	<10.0	8.5
30/06/03	07/07/03	4.8	52.7	29.3	31.8	25.1	9.3	32.9	28.6	3.2	<1.0	49.6	17.8	21.0	6.2
07/07/03	14/07/03	4.7	60.9	28.6	41.7	140.8	31.0	27.8	168.8	5.1	<1.0	43.9	20.9	38.0	7.1
14/07/03	21/07/03	5.1	37.3	30.0	32.8	29.7	7.3	18.2	37.9	2.5	<1.0	33.7	8.9	17.0	16.6
21/07/03	28/07/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
28/07/03	04/08/03	4.6	8.2	2.8	4.3	5.8	<0.8	1.0	8.5	<0.5	<1.0	7.5	23.4	<10.0	27.7
04/08/03	11/08/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
11/08/03	18/08/03	5.6	19.7	14.8	11.1	21.7	7.0	40.3	23.9	2.0	<1.0	17.1	2.7	12.0	6.3
18/08/03	25/08/03	5.2	14.2	1.6	1.6	67.3	15.1	14.5	77.5	1.8	<1.0	6.1	7.1	16.0	14.0
25/08/03	01/09/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.1
01/09/03	08/09/03	5.8	9.9	8.6	5.1	26.9	8.3	23.0	31.0	<0.5	<1.0	6.6	1.4	<10.0	9.1
08/09/03	15/09/03	5.2	17.8	3.3	1.4	70.5	14.3	7.9	67.7	1.1	<1.0	9.3	7.1	15.0	24.1
15/09/03	22/09/03	5.3	12.0	4.7	8.4	42.6	7.1	7.9	47.6	1.3	<1.0	6.9	4.8	10.0	12.8
22/09/03	29/09/03	5.9	43.3	38.1	24.4	17.3	5.4	47.5	23.2	2.8	<1.0	41.2	1.3	15.0	6.9
29/09/03	06/10/03	5.8	69.9	8.1	5.0	522.4	109.9	32.7	676.1	12.1	<1.0	7.0	1.7	85.0	6.6
06/10/03	13/10/03	4.9	34.6	11.8	5.7	197.0	42.6	11.5	220.3	4.7	<1.0	10.9	11.5	35.0	49.2
13/10/03	20/10/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
20/10/03	27/10/03	6.1	42.3	14.0	23.4	186.8	31.3	39.5	214.0	13.4	<1.0	19.8	0.8	43.0	2.3
27/10/03	03/11/03	5.3	22.3	3.1	<0.7	23.0	4.2	1.1	149.6	14.2	<1.0	19.5	5.0	23.0	24.5
03/11/03	10/11/03	5.5	51.2	44.1	43.4	130.0	29.8	33.9	160.2	4.7	<1.0	35.5	3.0	33.0	8.3
10/11/03	17/11/03	5.4	9.9	4.1	3.6	28.0	5.2	4.1	29.9	0.7	<1.0	6.5	4.1	<10.0	55.1
17/11/03	24/11/03	5.8	11.4	3.4	4.6	56.3	9.2	5.8	65.9	3.0	<1.0	4.6	1.6	11.0	19.4
24/11/03	01/12/03	5.3	12.3	1.4	<0.7	77.8	14.7	4.3	96.5	1.8	<1.0	2.9	4.9	18.0	48.2
01/12/03	08/12/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.2
08/12/03	15/12/03	5.4	30.4	7.9	2.6	182.3	37.2	12.4	217.2	5.5	<1.0	8.4	3.7	31.0	19.5
15/12/03	22/12/03	5.4	16.0	6.6	4.5	79.5	16.4	8.2	99.4	2.7	<1.0	6.4	4.1	16.0	35.7
22/12/03	29/12/03	5.5	15.6	1.8	1.0	110.6	22.3	8.5	128.6	2.9	<1.0	2.3	3.1	19.0	38.3
29/12/03	05/01/04	5.4	26.2	2.5	1.6	185.6	38.3	8.2	213.3	4.0	<1.0	3.8	4.2	30.0	46.3
Precipitation-weighted annual mean for site (samples containing phosphate are excluded)														Total rainfall	
5161		27.4	6.8	7.0	158.2	33.8	12.2	183.3	4.4	-	9.4	6.5	29.8	892.3	

### 5162 Eskdalemuir

Sampling	pH	SO4	NO3	NH4	Na	Mg	Ca	Cl	K	PO4	nss-SO4	H	conductivity	rainfall	
Start Date	End Date	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µS/cm)	(mm)	
01/01/03	08/01/03	4.7	18.3	18.1	11.0	71.9	15.7	5.3	81.6	2.0	<1.0	9.6	21.4	22.0	12.8
08/01/03	15/01/03	5.5	30.6	11.4	39.6	124.9	23.0	6.2	142.7	2.5	<1.0	15.6	3.2	27.0	16.1
15/01/03	22/01/03	4.8	32.6	13.7	14.0	189.8	40.6	8.3	216.0	4.0	<1.0	9.7	17.0	37.0	41.4
22/01/03	29/01/03	5.2	30.0	7.3	20.8	190.9	37.5	7.8	210.9	4.1	<1.0	7.0	7.1	34.0	40.9
29/01/03	05/02/03	5.2	21.4	7.2	12.4	126.6	26.8	6.2	142.1	2.8	<1.0	6.1	6.2	24.0	13.5
05/02/03	12/02/03	4.8	17.4	18.4	20.1	35.1	6.9	2.9	40.7	1.3	<1.0	13.1	15.5	14.0	28.3
12/02/03	19/02/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.5
19/02/03	26/02/03	5.3	92.0	116.3	151.3	200.1	43.2	28.7	219.3	5.1	<1.0	67.9	5.2	58.0	2.9
26/02/03	05/03/03	5.2	26.1	24.6	37.5	41.3	8.3	8.7	47.2	1.4	<1.0	21.1	6.6	15.0	48.5
05/03/03	12/03/03	5.2	34.7	10.1	18.6	183.5	40.3	9.5	213.8	4.0	<1.0	12.6	6.6	35.0	32.1
12/03/03	19/03/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
19/03/03	26/03/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
26/03/03	02/04/03	5.5	35.5	21.3	43.0	92.2	18.2	10.5	95.5	2.2	<1.0	24.4	3.0	22.0	14.7
02/04/03	09/04/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
09/04/03	16/04/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
16/04/03	23/04/03	7.0	120.2	115.0	173.4	59.3	19.1	92.0	53.3	5.4	<1.0	113.0	0.1	48.0	3.5
23/04/03	30/04/03	5.5	34.0	19.5	63.9	33.1	5.7	2.4	38.8	6.1	19.3	30.1	3.2	17.0	47.4
30/04/03	07/05/03	5.8	39.8	15.8	150.5	33.8	6.8	5.3	40.6	20.9	62.6	35.8	1.8	31.0	46.1
07/05/03	14/05/03	6.1	26.4	10.5	70.6	116.2	19.1	8.7	133.6	3.2	<1.0	12.4	0.8	29.0	16.0
14/05/03	21/05/03	6.8	65.5	24.4	644.4	48.6	12.6	4.3	46.7	151.7	168.2	59.7	0.2	107.0	29.6
21/05/03	28/05/03	7.1	226.4	<0.7	3105.7	123.0	61.2	24.8	124.4	220.4	630.2	211.6	0.1	430.0	12.9
28/05/03	04/06/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.6
04/06/03	11/06/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
11/06/03	18/06/03	6.6	53.9	22.0	482.9	41.9	17.4	9.3	52.6	32.5	96.1	48.8	0.2	72.0	10.3
18/06/03	25/06/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.3
25/06/03	02/07/03	4.2	68.1	67.7	43.1	22.6	6.9	13.4	14.4	2.3	<1.0	65.3	70.8	38.0	15.0
02/07/03	09/07/03	4.4	39.1	24.9	8.5	40.6	13.1	13.8	44.9	4.7	<1.0	34.2	39.8	25.0	3.7
09/07/03	16/07/03	5.5	36.3	20.6	29.8	24.1	1.9	10.6	16.0	11.7	<1.0	33.4	3.0	12.0	13.0
16/07/03	23/07/03	4.7	22.9	16.1	24.8	36.6	8.6	6.2	40.6	1.5	<1.0	18.5	20.0	15.0	47.0
23/07/03	30/07/03	4.7	12.3	7.0	9.9	16.2	3.2	3.1	17.2	0.9	<1.0	10.4	20.4	<10.0	53.0
30/07/03	06/08/03	5.2	11.2	7.0	14.2	20.1	1.9	3.5	20.0	6.6	<1.0	8.8	7.1	<10.0	16.7
06/08/03	13/08/03	4.7	285.2	353.4	198.6	127.9	72.1	313.4	83.0	35.1	9.7	269.8	20.0	-	0.9
13/08/03	20/08/03	5.5	36.1	41.8	60.9	34.4	8.2	13.1	34.7	2.5	<1.0	31.9	3.0	19.0	7.0
20/08/03	27/08/03	5.3	11.8	9.0	24.6	15.6	3.5	4.6	16.0	<0.5	<1.0	9.9	4.5	<10.0	6.2
27/08/03	03/09/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
03/09/03	10/09/03	4.9	14.1	14.5	3.1	4.0	0.9	1.4	17.9	<0.5	<1.0	13.6	12.0	<10.0	14.1
10/09/03	17/09/03	6.2	44.3	52.0	58.0	86.4	20.3	11.4	89.5	2.0	<1.0	33.9	0.7	33.0	6.1
17/09/03	24/09/03	4.8	24.0	19.0	20.4	32.7	8.3	5.9	31.4	1.7	<1.0	20.1	15.1	13.0	35.6
24/09/03	01/10/03	5.1	30.5	41.3	42.2	49.5	11.1	8.2	44.9	2.9	<1.0	24.5	7.6	20.0	10.8
01/10/03	08/10/03	5.2	30.6	7.4	7.9	170.8	34.0	6.3	190.1	4.3	<1.0	10.0	6.9	31.0	16.0
08/10/03	15/10/03	5.2	17.7	6.2	7.5	75.6	16.2	5.7	101.8	1.9	<1.0	8.6	6.6	17.0	12.4
15/10/03	22/10/03	5.2	16.5	10.4	8.7	80.1	17.7	10.2	108.1	2.1	<1.0	6.9	6.9	21.0	8.5
22/10/03	29/10/03	5.0	33.7	19.7	36.3	66.8	12.4	6.1	77.4	1.6	<1.0	25.6	10.2	22.0	3.7
29/10/03	05/11/03	4.8	25.2	17.0	8.7	99.2	21.8	5.1	121.9	2.0	<1.0	13.3	15.1	24.0	33.1
05/11/03	12/11/03	4.4	63.2	78.9	49.8	101.8	26.2	21.9	125.8	4.1	<1.0	51.0	41.7	45.0	9.4
12/11/03	19/11/03	4.8	20.0	12.3	19.6	40.6	8.2	3.6	48.4	0.7	<1.0	15.1	16.2	14.0	29.6
19/11/03	26/11/03	4.9	20.4	16.7	14.3	60.3	12.6	4.7	64.7	1.6	<1.0	13.2	11.5	18.0	16.6
26/11/03	03/12/03	5.1	18.0	12.3	8.2	48.2	7.0	1.9	57.7	3.5	<1.0	12.2	8.5	13.0	76.5
03/12/03	10/12/03	4.2	120.4	149.9	141.9	358.8	77.9	27.6	369.4	8.2	<1.0	77.2	67.6	95.0	1.5
10/12/03	17/12/03	4.8	17.0	20.7	15.1	65.9	14.2	4.9	96.4	1.0	<1.0	9.1	15.8	19.0	28.8
17/12/03	24/12/03	4.9	13.8	14.9	9.5	12.4	3.9	2.7	17.9	0.7	<1.0	12.3	12.9	11.0	33.7
24/12/03	03/12/03	5.6	7.5	2.9	5.9	16.5	3.4	2.6	20.1	1.2	<1.0	5.5	2.3	<10.0	41.6
31/12/03	07/01/04	4.9	24.1	19.5	17.4	46.5	11.0	4.3	60.9	1.5	<1.0	18.5	13.8	17.0	42.1
Precipitation-weighted annual mean for site (samples containing phosphate are excluded)														Total rainfall	
5162		24.4	17.3	21.0	70.1	14.5	6.3	80.9	2.4	-	16.0	12.7	19.8	1000.7	

### 5163 Thorganby

Sampling	pH	SO4	NO3	NH4	Na	Mg	Ca	Cl	K	PO4	nss-SO4	H	conductivity	rainfall	
Start Date	End Date	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µeq/l)	(µS/cm)	(mm)	
02/01/03	08/01/03	4.9	38.5	25.9	35.1	110.5	23.4	8.4	126.6	3.0	<1.0	25.2	13.8	31.0	5.3
08/01/03	15/01/03	5.7	124.1	38.8	137.5	201.2	38.8	21.0	231.5	5.0	<1.0	99.9	2.2	55.0	1.9
15/01/03	22/01/03	4.4	42.2	20.7	25.1	55.1	18.7	20.1	77.6	1.5	<1.0	35.6	41.7	26.0	22.4
22/01/03	29/01/03	5.3	41.1	15.5	26.7	117.4	25.8	18.9	134.8	4.1	<1.0	26.9	5.2	26.0	6.5
29/01/03	05/02/03	5.4	44.2	13.8	31.8	180.4	34.8	27.2	220.6	7.2	<1.0	22.4	3.5	38.0	4.9
05/02/03	12/02/03	4.5	43.2	20.0	31.2	16.8	5.4	15.0	31.3	1.7	<1.0	41.1	31.6	24.0	11.0
12/02/03	19/02/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
19/02/03	26/02/03	4.7	552.9	87.1	371.7	317.2	81.2	330.9	415.5	13.0	<1.0	514.7	20.0	-	1.1
26/02/03	05/03/03	5.1	110.1	43.4	103.8	25.2	14.1	61.1	51.4	1.6	<1.0	107.1	8.7	31.0	11.3
05/03/03	12/03/03	6.4	72.7	23.1	58.1	114.1	29.4	97.5	149.2	9.1	<1.0	59.0	0.4	39.0	5.4
12/03/03	19/03/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.1
19/03/03	26/03/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
26/03/03	02/04/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
02/04/03	09/04/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
09/04/03	16/04/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
16/04/03	23/04/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
23/04/03	30/04/03	5.5	47.7	22.6	66.2	8.7	3.8	14.2	13.4	1.0	<1.0	46.6	3.1	15.0	30.9
30/04/03	07/05/03	5.9	55.4	26.9	51.1	12.3	8.5	39.0	22.5	0.9	<1.0	53.9	1.2	17.0	13.4
07/05/03	14/05/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.5
14/05/03	21/05/03	4.6	54.4	32.7	53.3	14.4	8.0	23.0	22.2	1.8	<1.0	52.6	24.0	20.0	21.1
21/05/03	28/05/03	5.2	51.8	33.1	55.3	6.4	7.2	34.0	14.5	2.2	<1.0	51.0	6.3	17.0	12.0
28/05/03	04/06/03	6.6	96.2	87.1	209.7	6.6	17.5	98.6	19.5	14.3	<1.0	95.4	0.3	52.0	7.0
04/06/03	11/06/03	5.1	56.0	31.9	48.6	7.8	10.3	45.9	11.9	2.0	<1.0	55.1	8.9	18.0	21.1
11/06/03	18/06/03	6.1	222.4	128.8	30.8	65.5	64.0	328.2	87.8	48.8	<1.0	214.5	0.9	68.0	1.2
18/06/03	25/06/03	6.1	72.8	59.7	90.2	23.6	17.1	77.7	29.7	4.0	<1.0	70.0	0.8	30.0	10.5
25/06/03	02/07/03	4.2	35.1	28.2	23.7	4.7	3.4	12.9	8.4	1.3	<1.0	34.6	67.6	18.0	51.4
02/07/03	09/07/03	4.3	28.2	22.0	12.9	2.5	2.1	9.7	4.9	0.6	<1.0	27.9	44.7	19.0	9.7
09/07/03	16/07/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
16/07/03	23/07/03	4.9	87.9	82.2	61.0	14.5	15.0	69.7	26.2	6.4	<1.0	86.2	13.8	31.0	10.0
23/07/03	30/07/03	4.8	44.2	19.6	31.3	6.3	5.8	22.1	10.1	2.4	<1.0	43.5	14.8	15.0	19.5
30/07/03	06/08/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
06/08/03	13/08/03	5.6	189.1	170.5	214.8	13.5	20.1	141.0	18.1	12.4	<1.0	187.4	2.8	58.0	3.7
13/08/03	20/08/03	6.1	112.1	149.4	171.5	109.7	30.7	125.1	117.3	17.3	<1.0	98.9	0.8	61.0	1.5
20/08/03	27/08/03	6.2	99.8	62.4	286.2	126.5	27.7	93.0	144.0	7.0	7.1	84.5	0.6	73.0	2.2
27/08/03	03/09/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.7
03/09/03	10/09/03	5.2	39.9	40.8	49.4	10.9	10.6	48.2	20.6	2.7	<1.0	38.6	6.9	16.0	15.2
10/09/03	17/09/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
17/09/03	24/09/03	5.1	62.1	32.4	54.5	10.4	7.8	29.8	17.8	4.1	<1.0	60.9	8.9	19.0	15.4
24/09/03	01/10/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
01/10/03	08/10/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
08/10/03	15/10/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
15/10/03	22/10/03	6.4	92.0	44.8	67.4	288.7	60.7	67.4	302.1	7.9	<1.0	57.2	0.4	68.0	5.6
22/10/03	29/10/03	4.5	31.5	27.7	27.5	42.8	11.6	12.6	70.1	1.4	<1.0	26.3	29.5	29.0	14.4
29/10/03	05/11/03	4.4	55.7	46.1	53.9	140.2	32.5	17.8	175.1	5.1	<1.0	38.9	43.7	40.0	8.7
05/11/03	12/11/03	5.3	145.9	113.1	126.3	157.5	45.0	75.9	206.4	5.6	<1.0	126.9	4.8	57.0	4.6
12/11/03	19/11/03	5.0	43.2	17.9	41.2	45.2	12.7	14.5	49.0	3.2	<1.0	37.7	9.3	21.0	8.9
19/11/03	26/11/03	7.0	227.5	117.9	1235.3	152.4	27.0	21.9	170.9	247.8	686.9	209.1	0.1	176.0	16.2
26/11/03	03/12/03	4.9	38.8	34.3	40.1	30.1	6.5	10.7	32.1	1.5	<1.0	35.2	13.5	19.0	15.6
03/12/03	10/12/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.1
10/12/03	17/12/03	4.6	30.9	17.8	26.4	24.2	7.3	7.7	44.2	0.7	<1.0	28.0	24.0	19.0	8.7
17/12/03	24/12/03	4.9	23.9	13.9	20.1	31.1	8.4	6.5	37.5	2.2	<1.0	20.2	13.5	14.0	18.0
24/12/03	31/12/03	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
31/12/03	07/01/04	4.6	39.8	32.7	34.1	15.0	5.3	7.5	24.8	1.8	<1.0	38.0	27.5	22.0	11.5
Precipitation-weighted annual mean for site (samples containing phosphate are excluded)														Total rainfall	
5163		54.0	34.0	51.6	34.0	12.0	31.3	45.4	2.9	-	49.9	21.6	23.8	429.6	

# Appendix 2

## Tables of Annual Mean Concentrations and Total Rainfall, 1986 to 2003

Notes to Tables A.2.1 to A.2.10:

- (1) The monitoring programme in 2001 was severely affected by the outbreak of Foot and Mouth disease which prevented access to the sampling sites. The evaluation of the rainfall volumes indicates that the rainfall collected at the high rainfall sites is likely to be understated [see Hayman *et al.* (2003a)].
- (2) Annual mean precipitation-weighted concentrations for 2001 have not been included for the Cow Green Reservoir (5113), Llyn Brianne (5124), Scoat Tarn (5159) and Whiteadder (5106) sites as sampling was suspended for more than 5 months of 2001.



**Table A.2.1 - Precipitation-weighted Annual Mean Acidity, 1986 to 2003 ( $\mu\text{eq l}^{-1}$ )**

Year	Precipitation-weighted Annual Mean Acidity ( $\mu\text{eq l}^{-1}$ )																	
	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Goonhilly	20	23	15	19	14	26	15	17	20	18	19	20	14	13	-	22	31	22
Yarner Wood	17	20	14	20	13	17	18	17	18	15	18	18	12	14	-	23	17	22
Barcombe Mills	19	22	13	15	12	20	17	24	16	16	14	16	11	13	-	17	21	17
Compton	25	28	16	25	14	18	35	34	23	13	7	12	11	7	-	12	15	7
Crai Reservoir	-	-	-	-	-	-	-	-	-	-	-	-	-	12	-	14	19	17
Flatford Mill	33	43	35	35	27	43	36	25	27	30	25	26	25	27	-	20	24	22
Woburn	45	50	37	37	28	35	37	27	30	22	15	24	25	14	-	23	28	20
Tycanol Wood	16	17	15	18	14	21	21	17	14	14	16	13	11	11	-	14	16	18
Llyn Brianne	16	21	18	19	17	24	20	19	16	12	14	15	12	11	-	-	16	24
Pumlumon	-	-	-	14	12	16	18	19	13	14	15	12	9	10	-	10	10	13
Stoke Ferry	35	36	30	40	18	22	30	27	18	24	16	19	18	17	-	15	28	19
Preston Montford	18	25	24	36	14	27	38	35	30	27	19	16	8	7	-	9	17	13
Bottesford	61	76	81	48	42	62	68	62	36	29	22	22	20	17	-	19	29	14
Llyn Llagi	-	-	-	-	-	-	-	-	-	-	-	-	-	13	-	15	13	16
Beddgelert	17	19	17	15	12	16	14	18	12	11	12	-	-	-	-	-	-	-
Llyn Llydaw	-	-	-	-	-	-	-	-	-	-	-	11	11	12	-	14	17	12
Wardlow Hay Cop	29	45	33	37	24	33	34	36	27	28	22	18	16	10	-	19	23	9
Driby	42	43	42	47	41	41	45	35	36	37	18	22	34	21	-	23	29	49
Jenny Hurn	89	100	85	63	53	80	81	67	39	58	54	55	45	33	-	31	-	-
River Etherow	-	-	-	-	-	-	-	-	-	-	-	-	-	25	-	29	34	28
Thorganby	75	73	88	84	64	55	82	80	44	51	44	29	43	16	-	26	30	17
High Muffles	58	63	72	55	55	58	59	47	42	41	40	33	35	22	-	38	36	22
Bannisdale	30	27	28	24	18	22	25	31	19	17	20	16	15	13	-	24	19	17
Scoat Tam	-	-	-	-	-	-	-	-	-	-	-	-	-	14	-	-	18	19
Hillsborough Forest	-	-	-	13	7	12	12	17	12	8	13	6	7	9	-	7	4	3
Lough Navar	11	9	10	10	8	6	8	11	7	8	6	7	5	6	-	8	8	6
Cow Green Reservoir	27	31	34	23	21	24	28	33	21	17	24	11	16	13	-	-	20	15
Loch Dee	29	23	19	15	15	19	17	22	15	13	19	11	10	12	-	19	13	14
Beaghs Burn	-	-	-	-	-	-	-	-	-	-	-	-	-	9	-	14	15	5
Redesdale	41	44	52	32	30	33	42	31	31	25	33	27	25	16	-	26	25	20
Eskdalemuir	21	25	27	20	24	22	22	26	17	16	17	17	14	14	-	22	17	14
Whiteadder	40	36	47	35	31	36	45	34	33	32	31	32	23	19	-	-	35	21
Loch Chon	-	-	-	-	-	-	-	-	-	-	-	-	-	16	-	24	22	21
Balquhidder	21	32	24	20	16	22	20	24	22	18	29	15	15	12	-	22	24	20
Polloch	-	-	-	-	-	14	14	15	13	12	16	10	8	9	-	13	13	15
Loch Nagar	-	-	-	-	-	-	-	-	-	-	-	-	-	20	-	34	43	25
Glen Dye	-	45	46	36	39	44	41	35	42	41	56	32	28	22	-	40	39	30
Allt a' Mharcaidh	22	22	21	20	18	17	17	17	18	16	19	16	11	10	-	17	19	14
Strathvaich Dam	-	16	16	13	11	15	20	13	11	10	13	12	10	10	-	12	13	11
Achanarras	10	19	25	25	19	20	24	22	17	16	21	21	14	14	-	20	25	11

**Table A.2.2 - Precipitation-weighted Annual Mean Non-marine Sulphate, 1986 to 2003 ( $\mu\text{eq l}^{-1}$ )**

Year	Precipitation-weighted Annual Mean non-seasalt Sulphate Concentration ( $\mu\text{eq l}^{-1}$ )																		
	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	
Goonhilly	30	34	21	29	24	36	22	29	26	24	31	25	17	17	20	22	20	24	
Yarner Wood	27	37	22	27	19	28	25	28	28	24	33	27	18	18	14	19	16	19	
Barcombe Mills	46	50	40	44	38	52	43	33	36	33	38	25	30	26	21	25	25	35	
Compton	78	104	64	60	58	63	63	48	55	49	61	42	38	32	26	28	27	29	
Crai Reservoir	-	-	-	-	-	-	-	-	-	-	-	-	-	18	14	20	11	16	
Flatford Mill	90	71	67	80	58	71	53	41	50	52	52	41	43	45	34	33	35	39	
Woburn	73	80	85	73	66	63	57	44	59	46	56	39	42	38	30	34	32	33	
Tycanol Wood	27	26	23	26	22	31	27	22	22	22	27	19	18	21	16	19	15	15	
Llyn Brianne	24	29	26	27	27	30	28	26	26	22	26	20	19	17	15	-	14	17	
Pumlumon	-	-	-	19	19	24	24	23	18	21	23	17	14	14	11	12	10	12	
Stoke Ferry	80	76	66	84	81	77	67	54	61	50	52	49	43	40	41	34	35	41	
Preston Montford	45	60	56	60	37	66	64	48	52	60	49	32	27	24	25	30	27	23	
Bottesford	90	93	109	83	66	75	73	57	63	55	54	43	45	39	33	42	40	44	
Llyn Llagi	-	-	-	-	-	-	-	-	-	-	-	-	-	17	17	16	12	15	
Beddgelert	53	33	24	22	19	23	22	24	20	20	24	-	-	-	-	-	-	-	
Llyn Llydaw	-	-	-	-	-	-	-	-	-	-	-	14	16	17	13	15	13	12	
Wardlow Hay Cop	71	92	83	80	73	85	73	71	76	65	78	59	50	49	41	53	40	42	
Driby	69	74	77	79	80	78	65	49	62	70	49	42	53	41	37	40	33	40	
Jenny Hurn	110	106	121	98	89	83	77	60	80	65	81	58	70	54	51	53	-	-	
River Etherow	-	-	-	-	-	-	-	-	-	-	-	-	-	39	32	42	30	29	
Thorganby	85	80	88	87	82	119	88	79	72	56	69	62	60	50	45	51	41	50	
High Muffles	63	74	82	73	67	75	71	56	60	51	65	47	49	37	36	40	34	39	
Bannisdale	41	38	45	40	41	38	42	45	37	37	44	31	30	27	22	27	20	25	
Scoat Tam	-	-	-	-	-	-	-	-	-	-	-	-	-	23	17	-	15	17	
Hillsborough Forest	-	-	-	52	36	42	41	40	45	33	45	26	29	31	23	33	18	17	
Lough Navar	19	16	14	18	14	18	17	18	16	16	17	15	12	10	11	12	8	10	
Cow Green Reservoir	35	39	44	35	33	34	38	40	31	31	37	26	26	25	19	-	17	18	
Loch Dee	32	35	36	24	26	28	27	28	25	24	36	18	19	19	19	22	11	15	
Beaghs Burn	-	-	-	-	-	-	-	-	-	-	-	-	-	37	16	21	12	12	
Redesdale	58	46	62	47	36	43	46	35	42	37	51	37	34	25	23	29	22	24	
Eskdalemuir	31	30	33	28	31	30	28	29	28	28	28	24	20	20	15	21	13	19	
Whiteadder	53	48	61	46	33	45	50	37	40	43	44	33	27	24	24	-	28	19	
Loch Chon	-	-	-	-	-	-	-	-	-	-	-	-	-	16	16	17	14	13	
Balquhidder	26	33	28	24	22	27	23	26	22	21	38	21	19	15	15	19	15	16	
Polloch	-	-	-	-	-	17	17	14	16	14	18	11	10	9	9	9	8	8	
Loch Nagar	-	-	-	-	-	-	-	-	-	-	-	-	-	23	20	27	27	21	
Glen Dye	-	48	49	41	39	45	43	38	46	41	62	31	29	27	21	29	23	27	
Allt a' Mharcaidh	24	24	20	19	15	16	16	16	18	14	23	13	11	10	10	14	11	9	
Strathvaich Dam	-	16	14	12	10	13	18	11	9	10	16	12	9	8	7	7	7	7	
Achanarras	24	33	31	29	22	24	25	20	19	19	25	21	17	16	12	15	14	14	

**Table A.2.3 - Precipitation-weighted Annual Mean Nitrate, 1986 to 2003 ( $\mu\text{eq l}^{-1}$ )**

Year	Precipitation-weighted Annual Mean Nitrate Concentration ( $\mu\text{eq l}^{-1}$ )																		
	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	
Goonhilly	19	27	16	22	20	31	17	23	24	23	28	28	18	20	17	24	23	28	
Yarner Wood	16	24	14	18	13	19	16	20	25	21	31	27	14	17	11	20	17	18	
Barcombe Mills	27	31	25	30	24	36	25	19	29	28	28	23	21	25	16	22	23	31	
Compton	38	46	38	36	28	36	39	28	34	28	36	33	29	27	24	24	24	27	
Crai Reservoir	-	-	-	-	-	-	-	-	-	-	-	-	-	10	8	13	9	15	
Flatford Mill	39	45	43	56	38	44	40	30	37	39	38	36	39	41	32	35	37	43	
Woburn	39	40	39	47	35	40	36	31	47	35	39	35	35	38	27	39	33	34	
Tycanol Wood	12	15	12	15	11	18	14	12	16	15	18	16	11	13	10	14	12	15	
Llyn Brianne	12	14	13	14	16	18	16	14	18	16	17	17	12	13	10	-	13	18	
Pumlumon	-	-	-	10	9	14	13	13	12	15	16	14	7	10	8	9	8	10	
Stoke Ferry	48	44	39	55	46	48	43	36	43	39	37	41	38	40	39	34	35	41	
Preston Montford	22	32	26	31	20	35	38	27	32	38	33	24	19	21	22	29	25	20	
Bottesford	41	41	44	50	34	43	36	34	40	33	34	33	30	33	29	36	38	37	
Llyn Llagi	-	-	-	-	-	-	-	-	-	-	-	-	-	13	9	12	11	13	
Beddgelert	17	16	13	11	10	12	10	14	13	15	15	-	-	-	-	-	-	-	
Llyn Llydaw	-	-	-	-	-	-	-	-	-	-	-	11	10	12	9	12	11	11	
Wardlow Hay Cop	25	36	31	36	26	38	29	33	35	33	40	30	24	28	25	35	28	29	
Driby	39	44	47	48	46	50	46	38	49	50	39	40	45	39	35	38	34	38	
Jenny Hurn	44	48	44	51	43	45	42	33	47	42	45	38	45	40	37	38	-	-	
River Etherow	-	-	-	-	-	-	-	-	-	-	-	-	-	31	24	36	25	28	
Thorganby	41	43	42	49	40	50	42	46	40	37	38	38	34	32	34	37	33	31	
High Muffles	37	43	47	45	38	47	37	36	42	38	43	35	36	32	31	38	31	34	
Bannisdale	20	18	21	19	17	21	19	23	22	21	25	22	18	21	16	23	16	20	
Scoat Tam	-	-	-	-	-	-	-	-	-	-	-	-	-	16	12	-	13	16	
Hillsborough Forest	-	-	-	26	16	23	16	21	23	21	29	19	16	22	13	25	14	13	
Lough Navar	8	8	7	9	7	9	9	10	15	12	10	12	6	7	7	9	8	6	
Cow Green Reservoir	19	21	25	20	20	21	23	25	21	22	24	18	18	20	17	-	17	21	
Loch Dee	14	19	18	14	14	16	15	19	18	16	22	14	13	13	14	18	9	14	
Beaghs Burn	-	-	-	-	-	-	-	-	-	-	-	-	-	13	10	19	11	11	
Redesdale	34	26	33	31	26	31	36	26	32	27	33	35	30	25	23	31	22	31	
Eskdalemuir	15	18	19	18	15	19	16	19	19	19	20	20	15	17	14	19	14	18	
Whiteadder	34	29	42	34	23	32	35	29	34	31	35	30	24	22	25	-	28	22	
Loch Chon	-	-	-	-	-	-	-	-	-	-	-	-	-	19	14	16	13	14	
Balquhidder	13	21	16	13	10	17	13	18	17	14	24	16	13	12	12	20	14	17	
Polloch	-	-	-	-	-	9	9	9	11	10	10	8	5	6	6	8	7	7	
Loch Nagar	-	-	-	-	-	-	-	-	-	-	-	-	-	18	17	26	29	23	
Glen Dye	-	31	32	31	29	33	28	33	42	36	42	29	27	24	26	37	28	34	
Allt a' Mharcaidh	10	12	10	10	9	10	8	7	15	11	14	11	9	8	9	13	11	10	
Strathvaich Dam	-	10	8	7	6	9	9	8	9	9	10	10	6	8	6	7	8	7	
Achanarras	14	22	24	25	18	22	16	18	21	18	22	21	15	13	14	15	18	13	

**Table A.2.4 - Precipitation-weighted Annual Mean Ammonium, 1986 to 2003 ( $\mu\text{eq l}^{-1}$ )**

Year	Precipitation-weighted Annual Mean Ammonium Concentration ( $\mu\text{eq l}^{-1}$ )																		
	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	
Goonhilly	17	22	12	18	16	24	15	30	13	17	25	21	10	12	13	18	15	20	
Yarner Wood	15	28	14	19	13	22	17	23	25	20	37	26	14	17	9	19	15	16	
Barcombe Mills	38	41	38	39	35	50	31	16	30	33	32	22	18	25	14	23	20	25	
Compton	70	73	46	56	55	63	57	40	53	53	79	53	48	44	29	36	31	32	
Crai Reservoir	-	-	-	-	-	-	-	-	-	-	-	-	-	10	6	12	7	14	
Flatford Mill	-	50	49	66	44	59	40	31	40	48	49	38	43	45	34	41	38	39	
Woburn	54	50	52	56	43	52	41	35	55	48	63	40	36	47	29	44	37	28	
Tycanol Wood	13	15	13	15	14	19	13	11	15	18	22	15	12	16	10	18	15	16	
Llyn Brianne	12	13	14	16	16	20	18	15	16	18	19	15	13	14	12	-	14	15	
Pumlumon	-	-	-	13	13	17	20	14	13	21	18	16	10	12	7	12	15	11	
Stoke Ferry	65	60	56	75	69	74	54	43	61	53	56	55	49	50	49	45	38	50	
Preston Montford	47	57	49	53	44	57	57	36	50	54	60	38	36	38	30	51	45	37	
Bottesford	56	45	49	68	54	48	40	33	55	48	56	45	45	48	37	49	48	47	
Llyn Llagi	-	-	-	-	-	-	-	-	-	-	-	-	-	12	8	11	10	12	
Beddgelert	14	11	12	15	14	13	15	14	11	14	17	-	-	-	-	-	-	-	
Llyn Llydaw	-	-	-	-	-	-	-	-	-	-	-	10	11	14	8	12	11	11	
Wardlow Hay Cop	34	40	39	39	40	57	45	39	47	46	58	38	33	37	30	44	35	35	
Driby	53	60	64	53	67	76	55	42	48	64	54	49	49	44	39	48	35	41	
Jenny Hurn	64	51	53	64	64	65	45	28	55	50	66	53	61	46	45	55	-	-	
River Etherow	-	-	-	-	-	-	-	-	-	-	-	-	-	34	25	40	28	28	
Thorganby	59	56	61	65	80	124	82	-	57	60	57	59	53	50	42	51	44	41	
High Muffles	40	46	54	53	48	64	44	40	50	48	61	44	45	37	34	39	34	41	
Bannisdale	35	27	30	30	32	34	27	31	32	36	40	33	27	27	23	33	23	27	
Scoat Tam	-	-	-	-	-	-	-	-	-	-	-	-	-	21	14	-	16	18	
Hillsborough Forest	-	-	-	60	45	48	40	43	49	43	62	40	38	43	39	54	35	33	
Lough Navar	11	9	8	11	8	9	12	11	11	16	14	14	9	9	10	10	12	7	
Cow Green Reservoir	20	19	25	23	24	26	25	28	21	30	26	27	20	23	19	-	18	21	
Loch Dee	21	34	21	20	21	24	28	21	23	19	27	17	17	19	17	22	12	19	
Beaghs Burn	-	-	-	-	-	-	-	-	-	-	-	-	-	20	15	26	16	17	
Redesdale	41	15	23	34	24	32	30	21	30	33	44	37	32	28	24	34	25	37	
Eskdalemuir	20	16	19	22	18	26	17	18	21	26	24	24	18	20	15	20	15	30	
Whiteadder	30	20	35	32	17	30	27	22	24	28	33	24	21	20	23	-	25	19	
Loch Chon	-	-	-	-	-	-	-	-	-	-	-	-	-	12	12	12	16	12	
Balquhidder	14	15	12	14	11	16	16	15	12	12	24	18	14	12	8	16	12	27	
Polloch	-	-	-	-	-	8	8	5	6	7	7	6	5	5	3	7	8	6	
Loch Nagar	-	-	-	-	-	-	-	-	-	-	-	-	-	16	16	20	19	20	
Glen Dye	-	26	29	28	25	32	22	28	33	29	43	23	22	22	20	30	19	30	
Allt a' Mharcaidh	6	10	3	7	5	5	4	4	8	5	7	5	5	6	4	8	4	6	
Strathvaich Dam	-	4	3	4	3	5	5	4	4	5	5	6	4	4	3	4	5	3	
Achanarras	11	35	21	18	15	26	9	8	12	15	14	13	13	11	10	12	12	19	

**Table A.2.5 - Precipitation-weighted Annual Mean Sodium, 1986 to 2003 ( $\mu\text{eq l}^{-1}$ )**

Year	Precipitation-weighted Annual Mean Sodium Concentration ( $\mu\text{eq l}^{-1}$ )																	
	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Goonhilly	264	206	212	276	506	327	238	227	265	270	313	284	292	292	299	225	283	223
Yarner Wood	98	125	150	166	245	140	104	101	123	128	127	118	127	88	104	91	204	111
Barcombe Mills	186	255	153	204	359	137	128	98	147	176	195	164	154	173	199	91	203	131
Compton	54	67	70	84	129	71	40	55	64	64	76	77	58	55	45	37	62	43
Crai Reservoir	-	-	-	-	-	-	-	-	-	-	-	-	-	96	103	79	122	101
Flatford Mill	99	60	54	79	79	70	57	54	73	79	76	60	59	49	63	49	67	60
Woburn	71	65	50	60	87	54	28	41	56	51	61	58	36	46	34	31	41	48
Tycanol Wood	116	90	104	232	232	163	120	119	164	157	146	159	145	151	144	103	166	146
Llyn Brianne	94	68	83	112	152	111	72	97	90	84	94	96	90	103	90	-	116	111
Pumlumon	-	-	-	104	141	102	72	69	73	79	81	113	95	85	93	69	136	96
Stoke Ferry	74	49	50	58	84	75	57	53	54	46	71	55	56	55	44	60	37	53
Preston Montford	86	38	86	39	100	164	38	66	58	64	35	80	40	54	33	31	53	44
Bottesford	82	35	59	47	62	54	35	35	39	49	58	27	33	39	25	29	41	39
Llyn Llagi	-	-	-	-	-	-	-	-	-	-	-	-	-	110	90	75	116	99
Beddgelert	126	75	122	134	193	162	95	111	98	129	97	-	-	-	-	-	-	67
Llyn Llydaw	-	-	-	-	-	-	-	-	-	-	-	107	88	104	70	72	82	-
Wardlow Hay Cop	71	52	90	57	140	131	57	95	94	66	82	60	65	70	40	50	58	67
Driby	95	53	64	98	91	103	67	70	83	100	121	58	77	65	62	74	79	68
Jenny Hurn	97	47	80	68	104	55	37	47	53	54	73	36	61	51	30	39	-	-
River Etherow	-	-	-	-	-	-	-	-	-	-	-	-	-	60	46	47	65	64
Thorganby	74	50	52	69	90	96	50	51	52	51	59	45	67	53	33	43	35	40
High Muffles	61	63	67	95	83	103	78	111	88	113	153	82	106	76	61	76	57	98
Bannisdale	122	62	133	116	161	182	91	106	95	129	95	156	101	131	76	73	88	78
Scoat Tam	-	-	-	-	-	-	-	-	-	-	-	-	-	85	71	-	76	71
Hillsborough Forest	-	-	-	89	140	107	72	87	125	108	107	78	97	90	90	70	65	74
Lough Navar	248	102	317	139	261	192	133	187	174	125	116	131	136	171	152	98	151	173
Cow Green Reservoir	74	40	69	76	90	84	74	72	77	93	91	99	89	100	55	-	73	71
Loch Dee	116	54	136	132	147	123	86	79	92	106	91	109	91	124	101	56	103	92
Beaghs Burn	-	-	-	-	-	-	-	-	-	-	-	-	-	171	150	128	139	172
Redesdale	114	44	66	91	67	80	59	73	76	75	93	55	65	65	50	45	59	62
Eskdalemuir	86	37	62	81	86	2	53	63	77	88	63	66	76	102	61	85	63	66
Whiteadder	112	53	83	92	78	59	79	103	120	100	121	93	80	86	93	-	81	119
Loch Chon	-	-	-	-	-	-	-	-	-	-	-	-	-	112	69	71	128	88
Balquhidder	122	45	59	110	100	89	61	145	120	71	122	87	81	123	83	59	84	95
Polloch	-	-	-	-	-	213	118	204	155	168	148	127	161	195	150	139	234	159
Loch Nagar	-	-	-	-	-	-	-	-	-	-	-	-	-	39	33	35	76	45
Glen Dye	-	52	73	83	81	78	65	86	108	98	121	112	91	83	71	77	89	72
Allt a' Mharcaidh	90	37	45	88	62	46	57	143	92	57	66	70	65	83	63	40	44	75
Strathvaich Dam	-	83	109	126	174	147	121	212	154	102	130	116	122	180	153	95	105	235
Achanarras	231	145	217	277	212	235	186	224	217	169	219	167	202	249	251	186	216	340

**Table A.2.6 - Precipitation-weighted Annual Mean Magnesium, 1986 to 2003 ( $\mu\text{eq l}^{-1}$ )**

Year	Precipitation-weighted Annual Mean Magnesium Concentration ( $\mu\text{eq l}^{-1}$ )																		
	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	
Goonhilly	61	48	49	63	19	77	57	54	64	73	86	82	87	93	73	50	63	48	
Yarner Wood	23	30	35	38	58	32	26	28	33	38	37	35	41	37	24	20	45	24	
Barcombe Mills	44	62	35	49	85	34	33	28	40	48	58	48	48	57	47	21	46	30	
Compton	13	19	21	21	31	18	11	15	18	20	25	26	26	27	11	8	14	10	
Crai Reservoir	-	-	-	-	-	-	-	-	-	-	-	-	-	40	24	19	27	23	
Flatford Mill	32	17	16	23	22	19	15	15	18	20	21	17	20	18	16	12	16	14	
Woburn	9	11	13	18	24	14	9	12	15	15	18	18	13	19	8	8	10	11	
Tycanol Wood	27	21	24	53	54	39	29	31	43	45	43	45	48	54	32	22	36	30	
Llyn Brianne	21	16	20	27	36	27	19	26	25	24	29	27	32	41	20	-	25	24	
Pumlumon	-	-	-	24	32	23	19	20	23	25	25	33	35	37	21	15	29	20	
Stoke Ferry	20	12	13	16	23	18	16	15	16	12	21	16	19	22	11	14	9	13	
Preston Montford	21	11	22	11	24	43	11	18	20	42	15	25	25	27	9	7	11	9	
Bottesford	26	11	18	16	18	16	11	10	12	14	16	10	14	17	6	8	11	11	
Llyn Llagi	-	-	-	-	-	-	-	-	-	-	-	-	-	40	21	16	25	21	
Beddgelert	29	18	26	31	44	37	24	29	28	37	31	-	-	-	-	-	-	14	
Llyn Llydaw	-	-	-	-	-	-	-	-	-	-	-	32	33	41	16	16	18	-	
Wardlow Hay Cop	18	15	25	17	35	32	15	25	27	18	24	18	23	27	9	12	14	15	
Driby	24	14	18	27	27	26	18	22	22	26	34	18	23	24	15	17	19	17	
Jenny Hurn	36	16	30	25	35	21	14	16	22	19	24	13	22	20	10	13	-	-	
River Etherow	-	-	-	-	-	-	-	-	-	-	-	-	-	21	11	11	15	14	
Thorganby	22	16	17	23	27	31	16	15	19	15	19	16	23	27	10	13	12	14	
High Muffles	15	17	19	23	29	27	19	30	23	29	39	21	30	26	15	18	13	23	
Bannisdale	29	15	33	27	38	43	23	27	27	35	27	41	32	48	18	16	18	18	
Scoat Tam	-	-	-	-	-	-	-	-	-	-	-	-	-	32	16	-	16	15	
Hillsborough Forest	-	-	-	21	31	24	20	25	36	34	29	27	42	38	21	15	14	14	
Lough Navar	57	24	80	32	60	47	34	48	48	38	37	40	53	63	43	21	32	37	
Cow Green Reservoir	17	10	17	18	22	20	19	19	22	25	25	29	29	41	13	-	16	16	
Loch Dee	29	12	31	31	35	29	22	22	25	31	28	34	35	48	27	12	22	19	
Beaghs Burn	-	-	-	-	-	-	-	-	-	-	-	-	-	64	46	28	30	35	
Redesdale	26	12	19	23	18	19	15	20	21	21	27	17	21	27	13	10	13	13	
Eskdalemuir	20	9	15	20	21	25	14	17	22	26	20	20	30	41	16	14	13	14	
Whiteadder	26	13	22	23	20	15	19	26	33	26	31	26	25	33	22	-	18	25	
Loch Chon	-	-	-	-	-	-	-	-	-	-	-	-	-	40	16	16	28	19	
Balquhidder	29	11	14	26	24	21	16	37	31	22	33	24	28	52	18	13	18	19	
Polloch	-	-	-	-	-	48	30	52	40	46	41	37	54	68	35	29	50	34	
Loch Nagar	-	-	-	-	-	-	-	-	-	-	-	-	-	17	8	8	17	10	
Glen Dye	-	12	18	21	21	19	16	22	26	25	30	28	26	29	16	18	20	16	
Allt a' Mharcaidh	21	8	12	20	15	11	14	35	24	16	20	19	23	36	17	9	10	16	
Strathvaich Dam	-	20	25	28	39	32	31	51	42	31	40	33	42	69	40	20	22	44	
Achanarras	55	37	46	64	49	54	46	56	58	45	59	43	61	83	57	41	47	71	

**Table A.2.7 - Precipitation-weighted Annual Mean Calcium, 1986 to 2003 ( $\mu\text{eq l}^{-1}$ )**

Year	Precipitation-weighted Annual Mean Calcium Concentration ( $\mu\text{eq l}^{-1}$ )																	
	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Goonhilly	16	15	14	18	31	22	18	18	19	24	23	21	27	31	20	14	15	19
Yarner Wood	11	15	12	13	17	15	12	13	18	18	16	16	20	22	10	8	13	9
Barcombe Mills	20	29	22	30	33	32	22	20	28	29	37	25	49	43	20	16	23	21
Compton	23	51	33	22	32	30	23	20	34	41	55	34	61	36	15	13	14	26
Crai Reservoir	-	-	-	-	-	-	-	-	-	-	-	-	-	18	8	17	8	10
Flatford Mill	33	21	27	37	29	24	18	21	25	21	22	18	26	26	16	13	17	23
Woburn	23	30	38	28	32	24	19	18	24	21	34	23	28	33	11	12	13	21
Tycanol Wood	12	9	9	31	17	13	11	10	14	17	16	15	19	26	10	9	9	10
Llyn Brianne	7	8	9	10	15	10	10	10	12	12	12	11	17	19	7	-	8	11
Pumlumon	-	-	-	7	11	11	9	7	9	12	10	12	14	17	7	6	7	7
Stoke Ferry	31	22	24	28	45	33	32	25	30	22	35	34	33	39	16	16	16	27
Preston Montford	14	19	19	14	14	37	18	17	24	76	28	18	34	28	9	10	9	11
Bottesford	36	33	50	33	23	29	19	17	23	29	25	21	31	31	10	14	14	28
Llyn Llagi	-	-	-	-	-	-	-	-	-	-	-	-	-	16	9	6	7	7
Beddgelert	9	10	13	9	12	11	11	11	14	18	13	-	-	-	-	-	-	6
Llyn Llydaw	-	-	-	-	-	-	-	-	-	-	-	11	14	16	6	6	6	-
Wardlow Hay Cop	47	59	56	55	75	57	55	52	64	55	69	64	89	92	28	39	27	40
Driby	18	19	27	34	33	27	18	19	28	35	30	21	26	26	12	14	17	23
Jenny Hurn	56	45	73	48	50	39	27	26	60	31	35	23	44	38	19	21	-	-
River Etherow	-	-	-	-	-	-	-	-	-	-	-	-	-	22	10	14	9	12
Thorganby	25	25	30	37	35	67	27	24	67	29	32	33	53	57	18	29	18	37
High Muffles	13	21	23	27	20	23	21	19	25	26	23	21	20	28	10	14	12	19
Bannisdale	13	12	14	13	15	16	15	14	16	17	16	17	20	28	8	8	8	11
Scoat Tam	-	-	-	-	-	-	-	-	-	-	-	-	-	16	7	-	5	6
Hillsborough Forest	-	-	-	13	14	17	16	15	24	25	24	21	36	34	11	11	8	8
Lough Navar	17	10	21	12	18	25	19	24	27	26	25	23	29	33	15	11	10	13
Cow Green Reservoir	7	8	12	12	13	11	13	12	13	16	14	13	16	23	7	-	7	11
Loch Dee	10	9	11	9	11	10	11	9	11	14	10	12	23	19	10	5	5	6
Beaghs Burn	-	-	-	-	-	-	-	-	-	-	-	-	-	61	37	8	7	17
Redesdale	12	10	20	18	11	14	13	10	18	13	16	13	13	19	8	7	6	9
Eskdalemuir	7	5	8	21	8	10	8	9	14	13	8	10	17	17	6	6	4	6
Whiteadder	14	14	20	16	11	13	12	12	18	19	15	13	14	19	9	-	8	9
Loch Chon	-	-	-	-	-	-	-	-	-	-	-	-	-	13	5	6	7	7
Balquhidder	8	5	6	9	8	11	8	11	10	9	10	9	16	19	7	6	6	7
Polloch	-	-	-	-	-	16	13	13	14	13	12	11	20	24	9	7	11	9
Loch Nagar	-	-	-	-	-	-	-	-	-	-	-	-	-	10	4	5	5	6
Glen Dye	-	7	10	11	9	9	10	10	12	10	10	10	10	15	6	6	6	11
Allt a' Mharcaidh	10	8	7	8	7	6	9	11	12	7	11	9	13	17	6	5	4	6
Strathvaich Dam	-	7	7	8	13	9	10	13	14	11	15	11	16	20	11	6	5	10
Achanarras	16	15	20	20	21	17	17	18	18	17	18	15	20	28	14	11	12	18

**Table A.2.8 - Precipitation-weighted Annual Mean Chloride, 1986 to 2003 ( $\mu\text{eq l}^{-1}$ )**

Year	Precipitation-weighted Annual Mean Chloride Concentration ( $\mu\text{eq l}^{-1}$ )																	
	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Goonhilly	311	242	253	322	595	373	265	255	296	313	368	320	324	325	353	266	320	222
Yarner Wood	118	152	180	190	291	160	122	116	139	147	149	133	143	98	124	108	230	123
Barcombe Mills	226	310	186	252	427	161	156	115	166	202	230	187	180	195	237	111	235	157
Compton	54	92	94	110	159	89	54	73	74	81	91	89	68	64	55	45	75	51
Crai Reservoir	-	-	-	-	-	-	-	-	-	-	-	-	-	116	125	94	139	115
Flatford Mill	109	80	70	99	95	88	71	67	79	95	90	68	69	57	76	58	77	68
Woburn	82	82	61	75	109	69	38	50	64	61	66	64	41	52	40	36	48	51
Tycanol Wood	141	109	123	266	268	190	135	135	178	184	171	178	162	170	173	121	187	167
Llyn Brianne	107	83	99	131	178	129	81	109	100	95	107	106	101	117	106	-	131	125
Pumlumon	-	-	-	124	165	118	83	76	83	91	95	127	108	97	110	80	152	108
Stoke Ferry	95	65	66	73	101	90	72	63	62	57	86	62	63	62	52	71	44	58
Preston Montford	109	56	114	59	123	203	50	83	72	84	46	94	47	63	42	37	64	53
Bottesford	115	58	100	78	97	85	62	63	55	67	74	37	42	43	32	37	51	47
Llyn Llagi	-	-	-	-	-	-	-	-	-	-	-	-	-	124	106	87	132	113
Beddgelert	154	83	137	156	225	185	107	128	105	149	112	-	-	-	-	-	-	-
Llyn Llydaw	-	-	-	-	-	-	-	-	-	-	-	120	99	120	85	84	95	74
Wardlow Hay Cop	99	85	131	84	183	163	78	121	113	87	104	74	78	80	50	59	69	72
Driby	128	76	90	126	135	123	88	84	98	125	144	69	90	78	75	87	91	80
Jenny Hurn	169	99	151	123	170	124	86	84	83	99	111	72	89	68	47	57	-	-
River Etherow	-	-	-	-	-	-	-	-	-	-	-	-	-	69	57	55	76	73
Thorganby	140	102	121	139	166	180	123	106	96	96	90	64	107	73	49	59	49	51
High Muffles	89	96	106	131	146	140	110	139	108	146	187	98	126	88	73	92	68	110
Bannisdale	148	75	168	141	193	213	107	124	109	151	113	178	114	149	88	85	100	90
Scoat Tam	-	-	-	-	-	-	-	-	-	-	-	-	-	95	83	-	87	80
Hillsborough Forest	-	-	-	106	165	123	84	102	140	130	123	89	110	102	106	83	78	85
Lough Navar	293	125	409	166	298	222	153	215	191	144	135	150	155	188	179	118	172	197
Cow Green Reservoir	91	52	85	91	107	98	86	84	89	108	105	117	100	113	66	-	83	76
Loch Dee	152	66	159	159	173	144	96	89	106	121	106	123	102	138	120	65	121	104
Beaghs Burn	-	-	-	-	-	-	-	-	-	-	-	-	-	194	178	151	158	207
Redesdale	133	54	84	112	83	97	72	92	86	89	108	62	74	73	60	54	69	64
Eskdalemuir	105	47	76	97	103	118	65	71	85	101	74	74	87	113	73	98	73	76
Whiteadder	129	64	100	110	93	69	93	117	132	115	139	104	91	97	112	-	93	128
Loch Chon	-	-	-	-	-	-	-	-	-	-	-	-	-	129	82	82	146	100
Balquhidder	146	58	70	131	125	104	70	166	135	83	146	100	92	140	98	69	97	105
Polloch	-	-	-	-	-	249	135	226	169	191	176	143	183	226	180	163	275	174
Loch Nagar	-	-	-	-	-	-	-	-	-	-	-	-	-	43	39	41	85	50
Glen Dye	-	64	86	98	98	91	78	102	124	115	146	124	103	93	83	94	102	77
Allt a' Mharcaidh	104	39	52	104	72	53	65	158	99	66	76	82	75	93	73	46	51	87
Strathvaich Dam	-	101	129	148	207	168	138	227	169	116	149	131	138	202	179	114	118	265
Achanarras	280	174	253	317	251	272	209	255	245	195	246	189	225	280	302	220	244	381



**Table A.2.9 - Precipitation-weighted Annual Mean Sulphate, 1986 to 2003 ( $\mu\text{eq l}^{-1}$ )**

Year	Precipitation-weighted Annual Mean Sulphate Concentration ( $\mu\text{eq l}^{-1}$ )																	
	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Goonhilly	61	59	47	63	85	75	50	57	58	56	69	59	53	51	56	49	54	47
Yarner Wood	39	52	40	47	49	44	38	40	43	39	48	41	34	28	27	30	40	33
Barcombe Mills	68	80	58	68	82	68	58	45	54	54	61	45	48	47	45	36	49	51
Compton	84	112	72	70	73	71	67	55	63	57	70	51	45	38	32	33	35	34
Crai Reservoir	-	-	-	-	-	-	-	-	-	-	-	-	-	29	27	30	26	28
Flatford Mill	102	78	73	89	67	79	59	48	58	62	61	48	50	50	42	39	43	46
Woburn	82	86	91	81	76	70	60	49	66	52	63	46	46	44	34	38	37	39
Tycanol Wood	41	37	36	54	50	51	41	37	42	40	45	38	36	39	34	31	35	33
Llyn Brianne	36	37	36	40	46	43	36	38	37	32	38	31	30	29	26	-	28	30
Pumlumon	-	-	-	32	35	34	32	31	27	30	33	31	26	23	22	20	25	23
Stoke Ferry	89	82	72	91	91	86	74	60	68	56	61	55	49	47	46	41	39	47
Preston Montford	56	65	66	65	49	85	69	56	59	68	53	42	31	31	29	33	33	28
Bottesford	100	98	116	89	73	82	77	62	67	61	61	47	49	43	36	46	45	48
Llyn Llagi	-	-	-	-	-	-	-	-	-	-	-	-	-	30	28	25	26	27
Beddgelert	61	39	39	38	42	43	34	38	32	35	35	-	-	-	-	-	-	-
Llyn Llydaw	-	-	-	-	-	-	-	-	-	-	-	27	27	30	21	23	23	20
Wardlow Hay Cop	80	98	94	86	90	100	80	83	87	73	88	66	58	58	45	59	47	50
Driby	80	80	85	91	91	90	73	58	72	82	64	49	62	49	45	49	43	48
Jenny Hurn	121	112	130	107	101	90	81	66	86	72	90	62	78	60	55	57	-	-
River Etherow	-	-	-	-	-	-	-	-	-	-	-	-	-	46	38	47	38	37
Thorganby	94	86	94	96	93	126	94	85	78	62	76	68	69	56	49	56	46	54
High Muffles	70	82	90	85	77	87	80	69	70	65	83	57	62	46	44	50	41	51
Bannisdale	56	45	61	54	60	60	53	57	48	53	55	50	42	39	31	36	31	34
Scoat Tam	-	-	-	-	-	-	-	-	-	-	-	-	-	33	26	-	24	26
Hillsborough Forest	-	-	-	62	53	55	50	51	60	46	58	36	41	41	34	41	26	26
Lough Navar	48	28	34	34	46	41	33	40	37	31	31	31	28	30	29	24	26	30
Cow Green Reservoir	44	43	53	44	44	44	47	49	40	43	48	38	36	34	26	-	26	26
Loch Dee	47	41	52	39	43	42	37	38	36	37	47	31	29	34	31	29	23	26
Beaghs Burn	-	-	-	-	-	-	-	-	-	-	-	-	-	58	34	36	28	33
Redesdale	72	51	70	58	44	52	53	44	51	46	63	44	42	33	28	35	29	31
Eskdalemuir	41	35	41	38	42	43	34	37	38	38	36	32	30	31	23	28	21	27
Whiteadder	66	55	72	58	42	52	59	49	54	55	58	44	37	35	35	-	38	34
Loch Chon	-	-	-	-	-	-	-	-	-	-	-	-	-	26	24	26	29	24
Balquhidder	41	39	35	37	34	38	31	43	38	30	52	31	29	29	25	26	25	27
Polloch	-	-	-	-	-	42	31	39	34	33	36	26	30	32	27	26	36	26
Loch Nagar	-	-	-	-	-	-	-	-	-	-	-	-	-	27	24	31	36	27
Glen Dye	-	54	58	51	49	54	51	48	60	53	76	44	40	35	30	39	34	35
Allt a' Mharcaidh	35	29	26	29	23	22	23	32	29	21	31	22	19	19	17	19	16	17
Strathvaich Dam	-	26	27	27	31	30	33	35	28	22	32	26	24	26	26	18	19	30
Achanarras	52	50	57	63	48	52	47	47	45	40	51	41	41	46	42	37	40	52

**Table A.2.10 - Annual volume of Rain Samples collected in the Acid Deposition Monitoring Network\*, 1986 to 2003 (mm)**

Year	Annual Rainfall (mm)																	
	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001 †	2002	2003
Goonhilly	907	879	910	753	790	800	776	1008	999	744	743	1000	936	831	935	787	1025	743
Yarner Wood	1150	1015	1123	1131	1174	1058	1049	1398	1333	1135	1007	1218	1383	1106	1315	1025	1342	668
Barcombe Mills	740	849	678	597	639	620	653	738	806	652	539	818	733	655	1215	834	923	506
Compton	586	629	530	550	407	449	709	644	586	647	392	576	642	644	856	701	805	466
Crai Reservoir	-	-	-	-	-	-	-	-	-	-	-	-	-	2190	2292	1659	2207	1305
Flatford Mill	528	660	532	392	393	362	510	518	438	335	231	409	493	546	613	615	586	372
Woburn	758	672	592	540	400	478	694	655	505	515	328	456	620	537	663	670	651	448
Tycanol Wood	1508	1318	1385	1340	1437	1422	1572	1692	1460	1320	1366	1589	1547	1246	1735	1288	1808	1246
Llyn Brianne	1491	1497	1434	1417	1483	1224	1488	1573	1474	1143	1195	1296	1737	1725	1984	-	1567	1303
Pumlumon	-	-	-	1896	1936	1908	2129	2123	2445	1622	1554	1780	2641	2230	2411	1547	2193	1752
Stoke Ferry	503	617	537	495	348	350	508	601	479	375	318	519	517	435	577	597	694	440
Preston Montford	539	570	514	580	538	443	554	585	520	409	403	550	590	666	789	536	554	534
Bottesford	545	651	531	469	434	377	557	651	526	327	289	596	573	540	682	572	614	400
Llyn Llagi	-	-	-	-	-	-	-	-	-	-	-	-	-	2177	2979	1925	2608	2431
Beddgelert	2758	2231	2794	2480	2394	2028	3013	2152	2375	2097	747	-	-	-	-	-	-	-
Llyn Llydaw	-	-	-	-	-	-	-	-	-	-	827	2068	2777	2313	3086	1831	1916	2238
Wardlow Hay Cop	928	889	837	708	711	617	849	852	977	581	530	853	1018	860	1068	786	1066	665
Driby	702	685	605	457	473	398	676	636	513	375	415	578	620	598	616	598	568	483
Jenny Hurn	518	652	409	443	351	354	505	546	452	460	301	423	530	554	610	512	-	-
River Etherow	-	-	-	-	-	-	-	-	-	-	-	-	-	876	1205	914	1261	758
Thorganby	503	625	516	364	434	329	511	485	496	395	348	477	448	597	703	543	609	441
High Muffles	711	875	855	599	806	626	836	947	740	670	693	827	980	936	1160	861	879	670
Bannisdale	2249	2101	2091	1699	2270	1857	2027	1794	2290	1690	1328	1771	2167	1798	2552	1607	2082	1756
Scoat Tarn	-	-	-	-	-	-	-	-	-	-	-	-	-	2110	2727	-	2618	1980
Hillsborough Forest	-	-	-	642	909	668	635	802	614	742	662	824	777	730	900	515	894	532
Lough Navar	1439	1144	1492	1242	1617	1459	1977	1517	1631	1521	1373	1395	1686	1383	1297	1004	1358	941
Cow Green Reservoir	1129	1216	1138	858	1165	957	1073	1118	1293	807	1149	1058	1353	1275	1633	-	1411	1033
Loch Dee	2373	2311	2619	2001	2574	2196	2659	1950	2393	2036	1928	2269	2473	2373	-	1266	2055	1646
Beaghs Burn	-	-	-	-	-	-	-	-	-	-	-	-	-	1417	1695	1148	1494	1044
Redesdale	745	828	832	499	724	581	662	585	541	507	444	437	843	632	842	553	1002	509
Eskdalemuir	1523	1275	1396	1236	1528	1248	1609	1330	1631	1202	1211	1487	1700	1479	1628	1180	1780	1070
Whiteadder	584	718	712	489	721	569	665	722	566	473	395	546	750	583	817	-	722	416
Loch Chon	-	-	-	-	-	-	-	-	-	-	-	-	-	2123	1838	1399	2278	1696
Balquhidder	2008	1428	1736	1967	2398	1683	1814	1575	1547	1637	1096	1579	1540	1863	1674	1254	1704	1138
Polloch	-	-	-	-	-	2021	2355	1790	2012	1788	1606	1904	2250	2099	2011	1171	1800	1675
Loch Nagar	-	-	-	-	-	-	-	-	-	-	-	-	-	987	1436	957	1885	959
Glen Dye	-	898	1067	659	809	691	758	969	637	724	740	1049	1005	792	1238	998	1320	554
Allt a' Mharcaidh	777	664	761	638	907	729	757	826	714	678	477	601	846	874	895	593	786	496
Strathvaich Dam	-	959	1205	1357	1713	1396	1609	1147	1272	1282	885	1200	1458	1444	1384	996	1173	1129
Achanarras	889	864	642	476	776	512	635	567	535	622	488	478	700	646	598	586	663	548

\* All samples including those with phosphate contamination; † The sampling programme at many of the sites in 2001 was interrupted by the outbreak of Foot and Mouth disease.

# Appendix 3

## Sulphur Data, 2003

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A4.1	Sulphur Dioxide
A4.2	Particulate Sulphate

# **Appendix 3.1**

## **Sulphur Dioxide Data, 2003**

Monthly and Annual Mean Concentrations of Sulphur Dioxide in 2003  
Concentration in Air ( $\mu\text{g SO}_2$  [as S]  $\text{m}^{-3}$ )

Site	Jan -1	Feb -1	Mar -1	Apr -1	May -1	Jun -1	Jul -1	Aug -1	Sep -1	Oct -1	Nov -1	Dec -1	Annual Mean -1
Eskdalemuir -2	0.37	0.92	0.65	0.73	0.22	0.20	0.18	0.33	0.22	-	0.36	0.34	0.41
Stoke Ferry -2	1.21	1.88	1.08	1.02	0.75	0.80	0.92	0.85	0.88	0.78	0.70	0.86	0.97
Lough Navar -2	0.16	0.30	0.40	0.43	0.06	0.10	0.10	0.08	-	-	-	-	-
Barcombe Mills -2	0.89	0.92	1.01	0.85	0.30	0.90	0.67	1.02	0.64	0.86	0.69	0.93	0.81
Yarner Wood -2	-	0.90	0.88	1.12	0.23	0.37	0.36	0.68	-	0.48	0.59	0.32	0.60
High Muffles -2	1.27	1.58	1.88	1.40	0.98	1.04	0.93	0.73	1.32	0.68	1.23	1.39	1.20
Strathvaich Dam -2	0.04	0.44	-	-	0.03	0.10	0.09	0.07	0.03	0.06	-	0.04	0.11
Glen Dye -2	0.21	1.28	0.61	0.60	0.25	0.24	0.26	0.22	0.17	0.09	0.55	0.29	0.40

Notes: - indicates that no average was determined as the data capture was less than 75%; (1) The monthly and annual mean concentrations have been calculated as time-weighted averages of the fortnightly filter-pack measurements. No correction has been made to the filter-pack measurements although the measurement overlap programme suggests that the filter-pack sampler has an offset of about  $-0.13 \mu\text{g SO}_2$  [as S]  $\text{m}^{-3}$ ; compared to the  $\text{H}_2\text{O}_2$  bubbler; (2) The filter-pack samplers were installed on the following dates:

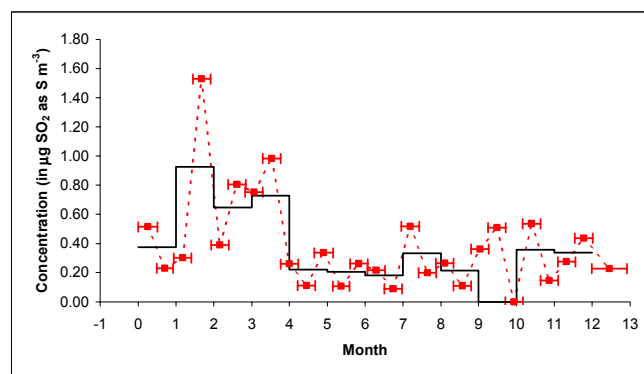
Site	Installation Date	Site	Installation Date	Site	Installation Date	Installation Date	Date
- Eskdalemuir	24 <sup>th</sup> May 2001	- Stoke Ferry	10 <sup>th</sup> May 2001	- Lough Navar	24 <sup>th</sup> April 2001	- Barcombe Mills	10 <sup>th</sup> May 2001
- Yarner Wood	16 <sup>th</sup> July 2001	- High Muffles	21 <sup>st</sup> May 2001	- Strathvaich Dam	19 <sup>th</sup> June 2001	- Glen Dye	20 <sup>th</sup> June 2001

National Environmental Technology Centre  
 Sulphur Dioxide Concentration in Air ( $\mu\text{g SO}_2$  as  $\text{S m}^{-3}$ )

Site: 5002 Eskdalemuir

Fortnightly measurements, collection-day - non standard  
 Summary for January 2003 to December 2003

Start Date	End Date	Duration	Concentration
01-Jan-2003	- 16-Jan-2003	15	0.52
16-Jan-2003	- 29-Jan-2003	13	0.23
29-Jan-2003	- 12-Feb-2003	14	0.30
12-Feb-2003	- 26-Feb-2003	14	1.53
26-Feb-2003	- 12-Mar-2003	14	0.39
12-Mar-2003	- 26-Mar-2003	14	0.81
26-Mar-2003	- 09-Apr-2003	14	0.75
09-Apr-2003	- 23-Apr-2003	14	0.98
23-Apr-2003	- 07-May-2003	14	0.26
07-May-2003	- 21-May-2003	14	0.11
21-May-2003	- 05-Jun-2003	15	0.34
05-Jun-2003	- 18-Jun-2003	13	0.11
18-Jun-2003	- 02-Jul-2003	14	0.26
02-Jul-2003	- 16-Jul-2003	14	0.22
16-Jul-2003	- 30-Jul-2003	14	0.09
30-Jul-2003	- 13-Aug-2003	14	0.52
13-Aug-2003	- 27-Aug-2003	14	0.20
27-Aug-2003	- 10-Sep-2003	14	0.27
10-Sep-2003	- 24-Sep-2003	14	0.11
24-Sep-2003	- 08-Oct-2003	14	0.36
08-Oct-2003	- 22-Oct-2003	14	0.51
22-Oct-2003	- 05-Nov-2003	14	N
05-Nov-2003	- 19-Nov-2003	14	0.54
19-Nov-2003	- 03-Dec-2003	14	0.15
03-Dec-2003	- 17-Dec-2003	14	0.28
17-Dec-2003	- 31-Dec-2003	14	0.44
31-Dec-2003	- 28-Jan-2004	28	0.23



Annual Mean Concentration	=	0.41
Data Capture	=	96.2%

Notes:

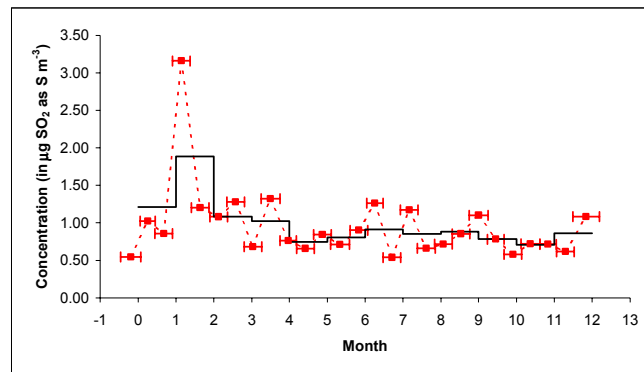
- (1) N = no or non valid measurement;
- (2) Measurements preceded by < are below the Limit of Detection.  
 included in the calculation of the statistical parameters at 50% of its value
- (3) Statistical parameters calculated only if data capture is greater than 75%.

National Environmental Technology Centre  
 Sulphur Dioxide Concentration in Air ( $\mu\text{g SO}_2$  as  $\text{S m}^{-3}$ )

Site: 5004 Stoke Ferry

Fortnightly measurements, collection-day - non standard  
 Summary for January 2003 to December 2003

Start Date	End Date	Duration	Concentration
17-Dec-2002	- 02-Jan-2003	16	0.55
02-Jan-2003	- 14-Jan-2003	12	1.02
14-Jan-2003	- 28-Jan-2003	14	0.86
28-Jan-2003	- 11-Feb-2003	14	3.16
11-Feb-2003	- 25-Feb-2003	14	1.20
25-Feb-2003	- 11-Mar-2003	14	1.08
11-Mar-2003	- 25-Mar-2003	14	1.28
25-Mar-2003	- 08-Apr-2003	14	0.68
08-Apr-2003	- 23-Apr-2003	15	1.32
23-Apr-2003	- 06-May-2003	13	0.76
06-May-2003	- 20-May-2003	14	0.66
20-May-2003	- 03-Jun-2003	14	0.85
03-Jun-2003	- 18-Jun-2003	15	0.71
18-Jun-2003	- 02-Jul-2003	14	0.90
02-Jul-2003	- 15-Jul-2003	13	1.26
15-Jul-2003	- 29-Jul-2003	14	0.54
29-Jul-2003	- 12-Aug-2003	14	1.17
12-Aug-2003	- 26-Aug-2003	14	0.66
26-Aug-2003	- 09-Sep-2003	14	0.72
09-Sep-2003	- 23-Sep-2003	14	0.86
23-Sep-2003	- 08-Oct-2003	15	1.10
08-Oct-2003	- 21-Oct-2003	13	0.78
21-Oct-2003	- 04-Nov-2003	14	0.58
04-Nov-2003	- 19-Nov-2003	15	0.72
19-Nov-2003	- 02-Dec-2003	13	0.72
02-Dec-2003	- 16-Dec-2003	14	0.62
16-Dec-2003	- 06-Jan-2004	21	1.08



Annual Mean Concentration = 0.97  
 Data Capture = 100.0%

Notes:

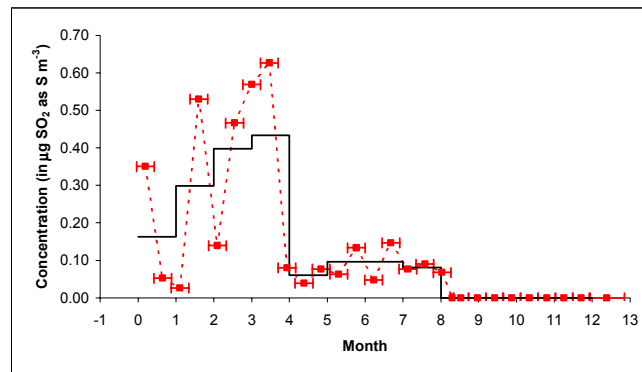
- (1) N = no or non valid measurement;
- (2) Measurements preceded by < are below the Limit of Detection.  
 included in the calculation of the statistical parameters at 50% of its value
- (3) Statistical parameters calculated only if data capture is greater than 75%.

National Environmental Technology Centre  
 Sulphur Dioxide Concentration in Air ( $\mu\text{g SO}_2$  as  $\text{S m}^{-3}$ )

Site: 5006 Lough Navar

Fortnightly measurements, collection-day - non standard  
 Summary for January 2003 to December 2003

Start Date	End Date	Duration	Concentration
30-Dec-2002	- 13-Jan-2003	14	0.35
13-Jan-2003	- 27-Jan-2003	14	0.05
27-Jan-2003	- 10-Feb-2003	14	0.03
10-Feb-2003	- 24-Feb-2003	14	0.53
24-Feb-2003	- 10-Mar-2003	14	0.14
10-Mar-2003	- 24-Mar-2003	14	0.47
24-Mar-2003	- 07-Apr-2003	14	0.57
07-Apr-2003	- 21-Apr-2003	14	0.63
21-Apr-2003	- 05-May-2003	14	0.08
05-May-2003	- 19-May-2003	14	0.04
19-May-2003	- 02-Jun-2003	14	0.08
02-Jun-2003	- 16-Jun-2003	14	0.06
16-Jun-2003	- 30-Jun-2003	14	0.13
30-Jun-2003	- 14-Jul-2003	14	0.05
14-Jul-2003	- 28-Jul-2003	14	0.15
28-Jul-2003	- 11-Aug-2003	14	0.08
11-Aug-2003	- 25-Aug-2003	14	0.09
25-Aug-2003	- 08-Sep-2003	14	0.07
08-Sep-2003	- 10-Sep-2003	02	N
10-Sep-2003	- 22-Sep-2003	12	N
22-Sep-2003	- 06-Oct-2003	14	N
06-Oct-2003	- 20-Oct-2003	14	N
20-Oct-2003	- 03-Nov-2003	14	N
03-Nov-2003	- 17-Nov-2003	14	N
17-Nov-2003	- 01-Dec-2003	14	N
01-Dec-2003	- 15-Dec-2003	14	N
15-Dec-2003	- 29-Dec-2003	14	N
29-Dec-2003	- 26-Jan-2004	28	N



Annual Mean Concentration = -  
 Data Capture = 68.5%

Notes:

- (1) N = no or non valid measurement;
- (2) Measurements preceded by < are below the Limit of Detection.  
 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%.

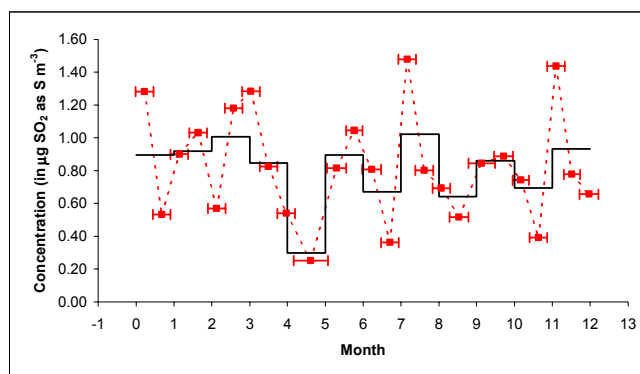


National Environmental Technology Centre  
 Sulphur Dioxide Concentration in Air ( $\mu\text{g SO}_2$  as  $\text{S m}^{-3}$ )

Site: 5007 Barcombe Mills

Fortnightly measurements, collection-day - non standard  
 Summary for January 2003 to December 2003

Start Date	End Date	Duration	Concentration
31-Dec-2002	- 14-Jan-2003	14	1.28
14-Jan-2003	- 28-Jan-2003	14	0.53
28-Jan-2003	- 11-Feb-2003	14	0.90
11-Feb-2003	- 25-Feb-2003	14	1.03
25-Feb-2003	- 11-Mar-2003	14	0.57
11-Mar-2003	- 25-Mar-2003	14	1.18
25-Mar-2003	- 08-Apr-2003	14	1.28
08-Apr-2003	- 22-Apr-2003	14	0.83
22-Apr-2003	- 06-May-2003	14	0.54
06-May-2003	- 02-Jun-2003	27	0.25
02-Jun-2003	- 17-Jun-2003	15	0.82
17-Jun-2003	- 30-Jun-2003	13	1.04
30-Jun-2003	- 15-Jul-2003	15	0.81
15-Jul-2003	- 29-Jul-2003	14	0.36
29-Jul-2003	- 12-Aug-2003	14	1.48
12-Aug-2003	- 26-Aug-2003	14	0.80
26-Aug-2003	- 09-Sep-2003	14	0.69
09-Sep-2003	- 24-Sep-2003	15	0.52
24-Sep-2003	- 15-Oct-2003	21	0.84
15-Oct-2003	- 30-Oct-2003	15	0.89
30-Oct-2003	- 12-Nov-2003	13	0.74
12-Nov-2003	- 26-Nov-2003	14	0.39
26-Nov-2003	- 10-Dec-2003	14	1.44
10-Dec-2003	- 23-Dec-2003	13	0.78
23-Dec-2003	- 07-Jan-2004	15	0.66



Annual Mean Concentration	=	0.81
Data Capture	=	100.0%

Notes:

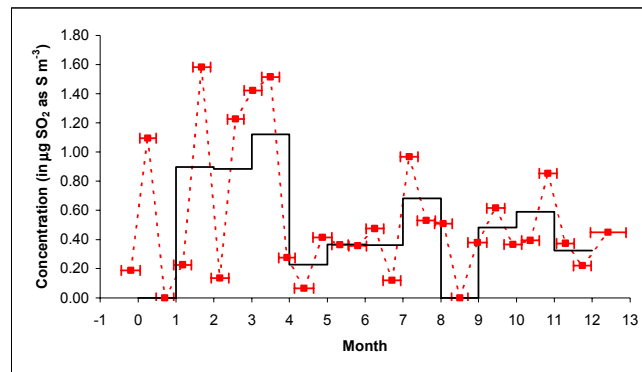
- (1) N = no or non valid measurement;
- (2) Measurements preceded by < are below the Limit of Detection.  
 included in the calculation of the statistical parameters at 50% of its value
- (3) Statistical parameters calculated only if data capture is greater than 75%.

National Environmental Technology Centre  
 Sulphur Dioxide Concentration in Air ( $\mu\text{g SO}_2$  as  $\text{S m}^{-3}$ )

Site: 5008 Yarner Wood

Fortnightly measurements, collection-day - non standard  
 Summary for January 2003 to December 2003

Start Date	End Date	Duration	Concentration
18-Dec-2002	- 02-Jan-2003	15	0.19
02-Jan-2003	- 15-Jan-2003	13	1.10
15-Jan-2003	- 29-Jan-2003	14	N
29-Jan-2003	- 12-Feb-2003	14	0.23
12-Feb-2003	- 26-Feb-2003	14	1.58
26-Feb-2003	- 12-Mar-2003	14	0.14
12-Mar-2003	- 25-Mar-2003	13	1.23
25-Mar-2003	- 08-Apr-2003	14	1.42
08-Apr-2003	- 22-Apr-2003	14	1.51
22-Apr-2003	- 05-May-2003	13	0.28
05-May-2003	- 20-May-2003	15	0.07
20-May-2003	- 04-Jun-2003	15	0.42
04-Jun-2003	- 17-Jun-2003	13	0.36
17-Jun-2003	- 01-Jul-2003	14	0.36
01-Jul-2003	- 15-Jul-2003	14	0.47
15-Jul-2003	- 29-Jul-2003	14	0.12
29-Jul-2003	- 12-Aug-2003	14	0.97
12-Aug-2003	- 26-Aug-2003	14	0.53
26-Aug-2003	- 09-Sep-2003	14	0.51
09-Sep-2003	- 22-Sep-2003	13	N
22-Sep-2003	- 07-Oct-2003	15	0.38
07-Oct-2003	- 21-Oct-2003	14	0.62
21-Oct-2003	- 04-Nov-2003	14	0.37
04-Nov-2003	- 18-Nov-2003	14	0.39
18-Nov-2003	- 02-Dec-2003	14	0.85
02-Dec-2003	- 16-Dec-2003	14	0.37
16-Dec-2003	- 30-Dec-2003	14	0.22
30-Dec-2003	- 27-Jan-2004	28	0.45



Annual Mean Concentration = 0.60  
 Data Capture = 92.6%

Notes:

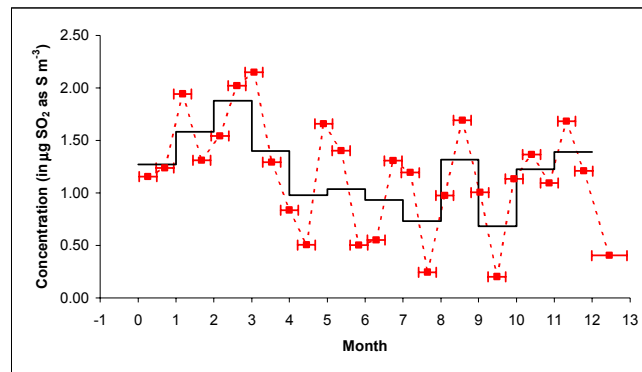
- (1) N = no or non valid measurement;
- (2) Measurements preceded by < are below the Limit of Detection.  
 included in the calculation of the statistical parameters at 50% of its value
- (3) Statistical parameters calculated only if data capture is greater than 75%.

National Environmental Technology Centre  
 Sulphur Dioxide Concentration in Air ( $\mu\text{g SO}_2$  as  $\text{S m}^{-3}$ )

Site: 5009 High Muffles

Fortnightly measurements, collection-day - non standard  
 Summary for January 2003 to December 2003

Start Date	End Date	Duration	Concentration
01-Jan-2003	- 15-Jan-2003	14	1.16
15-Jan-2003	- 29-Jan-2003	14	1.24
29-Jan-2003	- 12-Feb-2003	14	1.94
12-Feb-2003	- 26-Feb-2003	14	1.31
26-Feb-2003	- 12-Mar-2003	14	1.54
12-Mar-2003	- 26-Mar-2003	14	2.02
26-Mar-2003	- 09-Apr-2003	14	2.15
09-Apr-2003	- 23-Apr-2003	14	1.29
23-Apr-2003	- 07-May-2003	14	0.84
07-May-2003	- 21-May-2003	14	0.50
21-May-2003	- 04-Jun-2003	14	1.66
04-Jun-2003	- 18-Jun-2003	14	1.40
18-Jun-2003	- 02-Jul-2003	14	0.50
02-Jul-2003	- 16-Jul-2003	14	0.55
16-Jul-2003	- 30-Jul-2003	14	1.31
30-Jul-2003	- 13-Aug-2003	14	1.19
13-Aug-2003	- 27-Aug-2003	14	0.24
27-Aug-2003	- 10-Sep-2003	14	0.97
10-Sep-2003	- 24-Sep-2003	14	1.69
24-Sep-2003	- 08-Oct-2003	14	1.00
08-Oct-2003	- 22-Oct-2003	14	0.20
22-Oct-2003	- 05-Nov-2003	14	1.13
05-Nov-2003	- 19-Nov-2003	14	1.37
19-Nov-2003	- 03-Dec-2003	14	1.09
03-Dec-2003	- 17-Dec-2003	14	1.68
17-Dec-2003	- 31-Dec-2003	14	1.21
31-Dec-2003	- 28-Jan-2004	28	0.41



Annual Mean Concentration	=	1.20
Data Capture	=	100.0%

Notes:

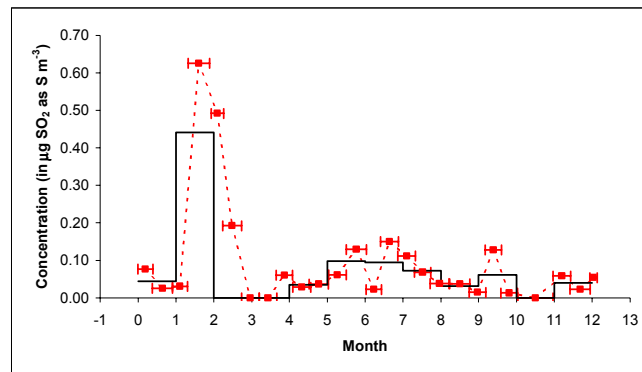
- (1) N = no or non valid measurement;
- (2) Measurements preceded by < are below the Limit of Detection.  
 included in the calculation of the statistical parameters at 50% of its value
- (3) Statistical parameters calculated only if data capture is greater than 75%.

National Environmental Technology Centre  
 Sulphur Dioxide Concentration in Air ( $\mu\text{g SO}_2$  as  $\text{S m}^{-3}$ )

Site: 5010 Strathvaich Dam

Fortnightly measurements, collection-day - non standard  
 Summary for January 2003 to December 2003

Start Date	End Date	Duration	Concentration
31-Dec-2002	- 12-Jan-2003	12	0.08
12-Jan-2003	- 28-Jan-2003	16	0.03
28-Jan-2003	- 09-Feb-2003	12	0.03
09-Feb-2003	- 26-Feb-2003	17	0.63
26-Feb-2003	- 08-Mar-2003	10	0.49
08-Mar-2003	- 23-Mar-2003	15	0.19
23-Mar-2003	- 06-Apr-2003	14	N
06-Apr-2003	- 20-Apr-2003	14	N
20-Apr-2003	- 03-May-2003	13	0.06
03-May-2003	- 17-May-2003	14	0.03
17-May-2003	- 01-Jun-2003	15	0.04
01-Jun-2003	- 15-Jun-2003	14	0.06
15-Jun-2003	- 01-Jul-2003	16	0.13
01-Jul-2003	- 13-Jul-2003	12	0.02
13-Jul-2003	- 27-Jul-2003	14	0.15
27-Jul-2003	- 10-Aug-2003	14	0.11
10-Aug-2003	- 23-Aug-2003	13	0.07
23-Aug-2003	- 07-Sep-2003	15	0.04
07-Sep-2003	- 23-Sep-2003	16	0.04
23-Sep-2003	- 06-Oct-2003	13	0.01
06-Oct-2003	- 19-Oct-2003	13	0.13
19-Oct-2003	- 01-Nov-2003	13	0.01
01-Nov-2003	- 29-Nov-2003	28	N
29-Nov-2003	- 13-Dec-2003	14	0.06
13-Dec-2003	- 29-Dec-2003	16	0.02
29-Dec-2003	- 04-Jan-2004	06	0.05



Annual Mean Concentration = 0.11  
 Data Capture = 84.7%

Notes:

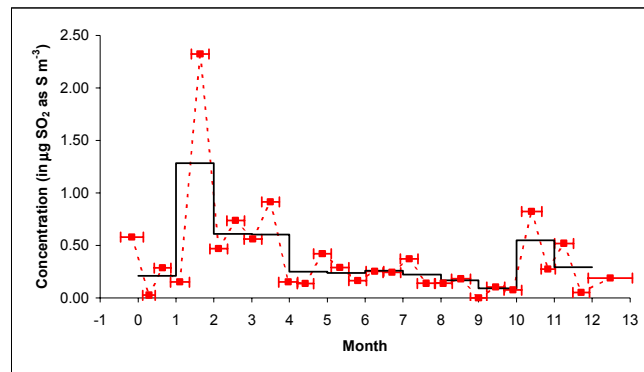
- (1) N = no or non valid measurement;
- (2) Measurements preceded by < are below the Limit of Detection.  
 included in the calculation of the statistical parameters at 50% of its value
- (3) Statistical parameters calculated only if data capture is greater than 75%.

National Environmental Technology Centre  
 Sulphur Dioxide Concentration in Air ( $\mu\text{g SO}_2$  as  $\text{S m}^{-3}$ )

Site: 5011 Glen Dye

Fortnightly measurements, collection-day - non standard  
 Summary for January 2003 to December 2003

Start Date	End Date	Duration	Concentration
17-Dec-2002	- 04-Jan-2003	18	0.58
04-Jan-2003	- 14-Jan-2003	10	0.03
14-Jan-2003	- 27-Jan-2003	13	0.28
27-Jan-2003	- 11-Feb-2003	15	0.15
11-Feb-2003	- 25-Feb-2003	14	2.32
25-Feb-2003	- 11-Mar-2003	14	0.47
11-Mar-2003	- 25-Mar-2003	14	0.74
25-Mar-2003	- 08-Apr-2003	14	0.56
08-Apr-2003	- 22-Apr-2003	14	0.92
22-Apr-2003	- 07-May-2003	15	0.15
07-May-2003	- 20-May-2003	13	0.14
20-May-2003	- 03-Jun-2003	14	0.42
03-Jun-2003	- 17-Jun-2003	14	0.29
17-Jun-2003	- 01-Jul-2003	14	0.16
01-Jul-2003	- 15-Jul-2003	14	0.25
15-Jul-2003	- 29-Jul-2003	14	0.24
29-Jul-2003	- 12-Aug-2003	14	0.37
12-Aug-2003	- 26-Aug-2003	14	0.14
26-Aug-2003	- 09-Sep-2003	14	0.14
09-Sep-2003	- 24-Sep-2003	15	0.18
24-Sep-2003	- 07-Oct-2003	13	N
07-Oct-2003	- 21-Oct-2003	14	0.10
21-Oct-2003	- 04-Nov-2003	14	0.08
04-Nov-2003	- 20-Nov-2003	16	0.82
20-Nov-2003	- 01-Dec-2003	11	0.27
01-Dec-2003	- 16-Dec-2003	15	0.52
16-Dec-2003	- 29-Dec-2003	13	0.05
29-Dec-2003	- 02-Feb-2004	04	0.19



Annual Mean Concentration	=	0.40
Data Capture	=	96.4%

Notes:

- (1) N = no or non valid measurement;
- (2) Measurements preceded by < are below the Limit of Detection.  
 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 3.2 Particulate Sulphate Data, 2003**

Monthly and Annual Mean Concentrations of Particulate Sulphate in 2003  
 Concentration in Air ( $\mu\text{g SO}_4$  [as S]  $\text{m}^{-3}$ )

Site	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean
Eskdalemuir	0.21	0.88	1.00	1.09	0.65	0.69	0.62	0.75	0.34	0.34	0.36	0.24	0.60
Lough Navar	0.22	0.83	0.91	0.89	0.33	0.41	0.49	0.41	0.34	0.32	0.26	0.27	0.47
Barcombe Mills	0.53	1.12	1.39	1.05	0.78	1.03	0.79	1.57	-	-	0.74	0.64	0.95
Yarner Wood	0.38	0.95	1.42	0.99	0.58	0.71	0.66	1.42	-	0.51	0.40	-	0.78
High Muffles	0.35	0.97	1.09	1.18	0.59	0.80	0.67	0.70	0.56	0.37	0.52	0.43	0.68

Note: - indicates that no average was determined as the data capture was less than 75%.

National Environmental Technology Centre  
 Site: 5002 Eskdalemuir - Sulphate as S (SO<sub>4</sub> - S)  
 Concentration in air (µg S m<sup>-3</sup>)

Daily measurements - Summary for January 2003 to December 2003

MONTH	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
DATE												
1 - 2	0.25	0.12	0.61	0.30	0.41	1.14	0.78	0.19	0.39	1.26	N	0.24
2 - 3	0.34	0.05	0.53	0.32	0.68	0.44	0.27	0.25	0.36	1.64	N	0.27
3 - 4	0.37	0.07	0.53	0.55	0.42	0.71	0.30	0.16	0.11	0.70	N	0.78
4 - 5	0.51	0.07	0.39	0.50	0.98	0.56	0.58	0.43	0.39	0.11	N	0.23
5 - 6	0.30	0.12	0.44	1.00	0.47	0.48	1.37	0.90	0.90	0.08	0.75	0.09
6 - 7	0.18	0.35	0.49	0.71	0.35	1.04	0.67	1.56	0.59	0.11	0.45	0.13
7 - 8	0.22	0.50	0.56	1.67	N	0.69	0.55	2.35	0.11	0.09	0.68	0.24
8 - 9	0.08	0.28	0.43	1.77	N	0.48	0.84	0.91	0.11	0.13	0.80	0.30
9 - 10	0.21	0.23	0.59	0.54	N	0.47	1.16	1.73	0.07	0.06	1.14	0.64
10 - 11	0.14	0.44	0.35	0.70	N	0.70	0.11	3.93	0.19	0.17	1.10	0.73
11 - 12	0.31	0.30	0.34	1.18	N	0.63	0.19	1.26	0.25	0.10	0.62	0.13
12 - 13	0.26	0.37	0.36	1.64	N	0.57	0.40	1.16	0.13	0.37	0.44	0.11
13 - 14	0.23	1.49	0.72	1.81	N	0.61	1.24	0.61	0.19	0.52	0.23	0.13
14 - 15	0.26	0.34	0.83	1.17	0.62	0.69	1.12	0.37	0.52	0.43	0.34	0.06
15 - 16	0.21	0.89	0.97	1.46	0.46	0.50	1.69	0.40	0.97	0.25	0.21	0.08
16 - 17	0.25	2.01	1.15	1.29	0.83	0.93	1.01	0.67	1.18	0.10	0.07	0.26
17 - 18	0.14	1.32	1.79	1.64	0.34	0.76	1.33	1.02	0.77	0.43	0.18	0.56
18 - 19	0.28	0.94	1.86	1.66	0.38	0.37	0.68	0.69	0.81	0.64	0.16	0.54
19 - 20	0.24	1.47	2.02	1.06	0.36	0.39	0.53	0.35	0.16	0.33	0.04	0.32
20 - 21	0.20	1.68	0.75	1.70	0.29	0.48	0.44	0.42	0.15	0.19	0.17	0.14
21 - 22	0.34	1.48	0.48	1.57	0.30	0.56	0.42	0.41	0.18	0.16	0.11	0.13
22 - 23	0.14	2.54	1.98	0.23	0.17	1.41	0.54	0.35	0.30	0.10	0.19	0.09
23 - 24	0.11	1.08	1.19	1.37	0.31	0.47	0.22	0.45	0.06	0.46	0.16	0.22
24 - 25	0.07	1.45	1.64	2.51	0.25	0.58	0.32	0.60	0.14	0.19	0.25	0.19
25 - 26	0.13	1.07	2.03	1.63	0.28	1.42	0.43	0.46	0.29	0.08	0.18	0.19
26 - 27	0.07	1.60	1.79	0.34	0.38	1.12	0.43	0.58	0.35	0.06	0.16	0.12
27 - 28	0.16	1.52	2.03	0.52	0.45	0.02	0.41	0.32	0.09	0.16	0.31	0.15
28 - 29	0.10	0.91	2.56	0.36	1.09	0.65	0.04	0.15	0.14	0.71	0.24	0.08
29 - 30	0.09		0.45	0.39	0.68	1.05	0.34	0.21	0.19	N	0.26	0.07
30 - 31	0.12		0.39	1.11	3.00	0.79	0.45	0.13	0.20	N	0.14	0.09
31 - 1	0.10		0.63		2.11		0.27	0.30		N		0.18
Arithmetic Mean (3)	0.21	0.88	1.00	1.09	0.65	0.69	0.62	0.75	0.34	0.34	0.36	0.24
Standard Deviation (3)	0.10	0.69	0.68	0.60	0.64	0.31	0.41	0.78	0.30	0.37	0.30	0.20
Sample Size	31	28	31	30	24	30	31	31	30	28	26	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: 5006 Lough Navar - Sulphate as S (SO<sub>4</sub> - S)  
 Concentration in air ( $\mu\text{g S m}^{-3}$ )

Daily measurements - Summary for January 2003 to December 2003

MONTH	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
DATE												
1 - 2	0.07	0.15	0.11	0.17	0.18	0.36	0.46	0.23	0.15	0.42	0.10	0.24
2 - 3	0.24	0.14	0.10	0.13	0.13	0.36	0.33	0.30	0.10	0.13	0.09	0.36
3 - 4	0.24	0.09	0.37	0.09	0.29	0.36	0.30	0.42	0.21	0.25	0.19	0.17
4 - 5	0.15	0.08	0.19	0.12	0.18	0.32	0.34	N	1.64	0.10	0.33	0.08
5 - 6	0.31	0.16	0.14	0.34	0.16	0.34	0.40	0.45	0.34	0.17	0.45	0.08
6 - 7	0.43	0.10	0.13	1.31	0.26	0.37	0.28	0.01	0.10	0.34	0.65	0.67
7 - 8	0.74	0.16	0.11	N	0.26	0.23	0.41	0.57	0.11	0.14	1.20	0.54
8 - 9	0.37	0.14	0.38	N	0.19	0.23	0.68	2.53	0.14	0.21	1.51	0.80
9 - 10	0.15	0.15	0.19	0.73	0.12	0.28	0.66	1.19	0.10	0.17	0.55	0.64
10 - 11	0.25	0.17	0.18	1.01	0.11	0.35	0.24	0.22	0.09	0.26	0.44	0.20
11 - 12	0.31	0.11	0.19	1.22	0.12	0.31	0.28	0.05	0.38	0.20	0.23	0.10
12 - 13	0.26	0.22	0.22	1.68	0.15	0.28	0.64	0.21	0.39	0.76	0.13	0.11
13 - 14	0.15	0.96	1.24	0.89	0.13	0.47	0.67	0.18	0.56	1.05	0.21	0.17
14 - 15	0.22	2.32	0.88	0.68	0.15	0.55	1.64	0.24	0.53	0.95	0.15	0.24
15 - 16	0.25	0.95	0.74	0.76	0.29	0.29	1.92	0.22	0.83	0.54	0.05	0.32
16 - 17	0.20	1.98	1.24	0.96	0.11	0.66	1.83	0.77	1.07	0.60	0.08	0.63
17 - 18	0.15	2.30	1.75	1.58	0.17	0.36	0.73	0.45	0.72	0.66	0.08	0.44
18 - 19	0.16	1.38	1.82	1.61	0.11	0.18	0.37	0.43	0.36	0.61	0.10	0.24
19 - 20	0.27	1.37	2.28	1.08	0.14	0.25	0.38	0.25	0.13	0.39	0.16	0.16
20 - 21	0.14	2.22	0.26	1.58	0.18	0.26	0.25	0.14	0.06	0.08	0.06	0.08
21 - 22	0.19	1.32	0.81	2.38	0.17	0.56	N	0.19	0.34	0.08	0.18	0.13
22 - 23	0.13	1.58	1.34	1.78	0.21	0.54	0.26	0.19	0.11	0.24	0.19	0.14
23 - 24	0.26	0.20	2.12	1.93	0.24	0.33	0.18	0.60	0.17	0.51	<0.02	0.08
24 - 25	0.19	1.24	2.17	1.40	0.23	0.53	0.18	N	0.24	0.08	0.17	0.13
25 - 26	0.24	1.45	2.07	0.29	0.15	1.11	0.10	0.76	0.55	0.07	0.13	0.16
26 - 27	0.10	1.28	1.88	0.20	0.34	0.60	0.19	0.59	0.10	0.08	0.07	0.14
27 - 28	0.18	0.82	2.39	0.20	0.41	0.15	0.15	0.30	0.06	0.27	0.11	0.11
28 - 29	0.16	0.20	1.84	0.29	0.72	0.32	0.19	0.15	0.06	0.10	0.12	0.17
29 - 30	0.09		0.45	0.24	0.79	0.51	0.15	0.03	0.14	0.06	0.11	0.13
30 - 31	0.13		0.16	0.21	1.95	0.83	0.27	0.10	0.32	0.30	0.08	0.46
31 - 1	0.11		0.54		1.53		0.15	0.11		0.12		0.45
Arithmetic Mean (3)	0.22	0.83	0.91	0.89	0.33	0.41	0.49	0.41	0.34	0.32	0.26	0.27
Standard Deviation (3)	0.13	0.78	0.81	0.67	0.41	0.20	0.48	0.48	0.35	0.27	0.34	0.20
Sample Size	31	28	31	28	31	30	30	29	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: 5007 Barcombe Mills - Sulphate as S (SO<sub>4</sub> - S)  
 Concentration in air ( $\mu\text{g S m}^{-3}$ )

Daily measurements - Summary for January 2003 to December 2003

MONTH	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
DATE												
1 - 2	0.51	0.27	0.60	0.75	0.42	1.33	0.55	0.74	0.38	N	0.06	N
2 - 3	0.29	0.26	0.36	0.58	0.51	1.24	0.63	0.63	N	N	0.29	N
3 - 4	0.37	0.24	0.49	0.63	0.44	0.62	0.56	2.59	N	N	0.30	N
4 - 5	0.56	0.28	0.61	0.99	0.48	0.65	0.52	0.57	N	N	0.59	1.89
5 - 6	1.03	0.27	1.12	0.48	0.51	1.30	1.03	1.86	N	N	0.62	2.03
6 - 7	0.59	0.46	0.32	0.69	0.33	0.88	1.04	2.06	N	N	0.74	0.88
7 - 8	1.40	0.64	0.32	0.49	0.36	0.42	0.53	2.60	N	N	0.91	0.44
8 - 9	1.41	0.62	0.53	0.66	0.31	1.14	0.62	4.56	N	N	1.58	0.81
9 - 10	0.39	0.55	0.98	0.57	0.42	0.76	0.01	3.13	N	N	0.96	0.83
10 - 11	0.57	0.80	0.71	0.81	0.37	0.70	1.56	4.91	N	N	0.83	1.01
11 - 12	0.64	0.52	0.54	0.77	0.25	0.41	1.16	3.75	N	N	0.62	0.72
12 - 13	0.98	1.23	0.49	1.24	0.28	1.19	1.08	4.61	N	N	2.05	0.39
13 - 14	0.61	3.50	0.67	0.93	0.47	1.77	1.63	3.26	N	N	0.41	0.31
14 - 15	0.58	2.18	0.50	0.78	0.59	2.21	1.26	0.60	N	N	0.41	0.28
15 - 16	0.53	1.65	1.22	1.14	0.94	2.01	1.05	0.53	N	0.38	0.29	0.32
16 - 17	0.32	3.77	1.85	1.13	0.93	0.85	1.02	0.91	N	0.72	0.33	N
17 - 18	0.45	1.44	1.97	1.62	0.69	0.96	0.75	1.22	N	0.63	0.31	0.39
18 - 19	0.39	1.31	2.66	1.52	0.29	0.80	0.91	1.66	N	0.90	0.37	0.75
19 - 20	0.29	1.30	1.37	1.40	0.55	0.77	1.08	0.60	N	0.69	0.72	1.31
20 - 21	0.41	1.13	1.46	2.41	1.46	1.87	0.57	0.65	N	0.25	0.78	0.90
21 - 22	0.35	1.15	2.93	1.81	0.93	1.02	0.53	0.44	N	0.31	0.24	0.33
22 - 23	0.31	1.86	2.08	1.47	0.50	0.84	0.69	0.72	N	0.75	0.65	0.27
23 - 24	0.43	1.26	1.36	1.88	0.35	1.17	0.63	0.79	N	0.91	0.51	0.53
24 - 25	0.38	1.12	2.25	2.21	0.39	1.18	0.58	0.92	N	0.55	0.36	0.46
25 - 26	0.39	1.06	2.58	1.41	0.96	1.43	0.56	0.47	N	0.34	0.37	0.30
26 - 27	0.45	1.02	3.16	0.62	1.22	0.50	0.54	0.90	N	0.35	2.60	0.53
27 - 28	0.46	0.63	1.91	0.95	1.74	0.77	0.60	0.95	N	0.55	2.20	0.14
28 - 29	0.32	0.72	2.57	0.65	1.66	1.28	0.40	0.73	N	1.08	N	0.21
29 - 30	0.29		2.97	0.59	2.68	0.47	0.61	0.22	N	0.52	N	0.13
30 - 31	0.32		2.27	0.47	2.17	0.50	0.62	0.44	N	0.10	N	0.41
31 - 1	0.35		0.39		0.94		1.23	0.64		0.27		0.84
Arithmetic Mean (3)	0.53	1.12	1.39	1.05	0.78	1.03	0.79	1.57	-	-	0.74	0.64
Standard Deviation (3)	0.29	0.87	0.93	0.53	0.60	0.47	0.35	1.40	-	-	0.64	0.48
Sample Size	31	28	31	30	31	30	31	31	1	17	27	27

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 - Sulphate as S (SO<sub>4</sub> - S)  
 Concentration in air ( $\mu\text{g S m}^{-3}$ )

Daily measurements - Summary for January 2002 to December 2002

MONTH	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
DATE												
1 - 2	1.27	0.49	0.28	2.30	0.30	0.75	0.31	0.60	0.50	0.79	1.10	0.26
2 - 3	0.97	0.70	0.40	1.63	0.49	1.55	0.28	0.29	0.64	1.02	0.29	0.24
3 - 4	0.91	0.46	0.87	2.18	0.68	0.96	<0.03	0.44	0.85	0.59	0.29	0.28
4 - 5	1.00	0.38	1.42	1.56	0.55	0.48	<0.03	0.42	1.17	0.24	0.59	0.33
5 - 6	0.78	0.25	1.00	2.27	0.55	0.64	0.58	0.92	1.06	0.39	0.62	0.38
6 - 7	1.05	0.23	0.83	1.99	1.40	0.94	1.29	1.33	0.52	0.30	0.33	1.42
7 - 8	2.24	0.38	0.53	0.90	0.57	<0.03	0.61	0.95	0.24	0.31	0.20	1.49
8 - 9	1.62	0.66	0.81	1.08	0.55	<0.03	0.41	0.52	0.33	N	0.23	2.55
9 - 10	1.44	0.22	0.22	1.02	0.79	<0.03	0.30	0.48	0.30	N	0.36	1.49
10 - 11	0.89	0.48	0.46	0.93	0.61	<0.03	0.45	0.12	0.74	N	0.32	1.97
11 - 12	0.87	0.45	0.79	0.42	1.37	0.33	0.56	0.75	1.15	N	0.34	1.84
12 - 13	1.59	0.45	1.23	1.64	0.72	0.33	0.97	0.46	1.17	N	0.30	1.67
13 - 14	1.46	0.43	0.36	2.42	0.97	0.84	1.29	0.71	0.61	N	0.22	0.98
14 - 15	0.73	0.32	1.20	2.43	0.83	1.16	1.37	1.26	1.15	N	0.23	1.38
15 - 16	0.56	0.44	0.92	1.92	0.38	0.68	<0.03	1.44	0.35	0.24	0.38	0.82
16 - 17	0.47	0.71	0.68	0.74	0.44	1.22	1.11	1.28	0.49	0.55	0.74	1.15
17 - 18	0.62	1.64	0.74	0.77	0.34	1.26	1.05	1.41	0.46	0.51	0.88	2.14
18 - 19	0.45	0.51	0.41	0.28	0.34	0.60	0.59	1.24	0.15	0.44	0.91	0.62
19 - 20	0.34	0.50	0.29	0.60	0.20	0.42	0.49	1.05	0.60	0.55	0.25	0.65
20 - 21	0.55	0.29	0.61	1.28	0.38	0.48	1.01	1.41	1.15	0.73	1.02	0.97
21 - 22	0.85	0.28	0.57	1.65	0.39	0.75	0.50	0.78	1.15	0.57	0.45	0.59
22 - 23	0.33	0.35	0.80	1.29	0.34	0.59	0.66	0.23	0.49	0.32	0.25	0.54
23 - 24	0.50	0.27	0.03	0.85	0.25	0.41	0.68	0.91	0.27	0.18	0.29	0.66
24 - 25	0.24	0.37	0.03	1.44	0.22	0.53	0.67	1.15	0.32	0.22	0.27	0.46
25 - 26	0.49	0.21	0.03	0.77	0.19	0.62	1.24	0.91	0.65	0.29	0.78	0.34
26 - 27	0.24	0.23	0.22	0.26	0.15	0.85	1.13	0.81	0.78	0.25	0.52	0.37
27 - 28	0.49	0.17	1.03	0.40	0.56	0.53	0.84	1.35	0.54	0.27	0.75	0.39
28 - 29	0.42	0.16	1.51	0.38	0.60	0.64	1.49	1.56	0.41	0.23	0.47	0.38
29 - 30	0.92		1.18	0.36	0.46	0.76	1.43	0.91	0.41	0.42	0.25	0.32
30 - 31	0.82		1.50	0.40	0.83	0.52	1.89	0.57	0.42	0.80	0.85	0.31
31 - 1	0.44		1.49		0.47		0.61	0.52		1.34		0.95
Arithmetic Mean (3)	0.82	0.43	0.72	1.20	0.55	0.63	0.77	0.86	0.63	0.48	0.48	0.90
Standard Deviation (3)	0.47	0.28	0.45	0.71	0.30	0.38	0.47	0.40	0.33	0.29	0.27	0.64
Sample Size	31	28	31	30	31	30	31	31	30	24	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 - Sulphate as S (SO<sub>4</sub> - S)  
 Concentration in air ( $\mu\text{g S m}^{-3}$ )

Daily measurements - Summary for January 2003 to December 2003

MONTH	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
DATE												
1 - 2	N	0.20	0.26	0.42	0.44	1.21	0.54	0.19	0.58	N	0.18	0.26
2 - 3	N	0.17	0.16	0.23	0.74	0.57	0.61	0.32	0.86	N	0.19	N
3 - 4	N	0.16	0.21	0.35	0.35	0.52	0.37	0.64	1.02	N	0.17	N
4 - 5	N	0.17	0.49	0.54	0.19	0.47	0.55	2.01	1.19	N	0.69	N
5 - 6	N	0.23	0.11	1.34	N	0.39	0.47	2.36	0.95	N	0.63	N
6 - 7	0.48	0.18	0.20	1.73	N	0.58	0.44	2.08	0.14	N	0.93	N
7 - 8	1.50	0.20	0.27	0.64	N	0.81	0.43	3.10	0.19	N	0.99	N
8 - 9	0.75	0.13	0.92	0.64	0.34	0.23	1.28	5.10	0.24	0.59	1.51	N
9 - 10	0.60	0.16	0.93	0.69	0.24	0.62	1.31	6.32	0.12	0.16	0.51	N
10 - 11	0.61	0.25	0.50	0.92	0.26	0.65	0.68	3.53	0.27	0.11	0.62	N
11 - 12	0.85	0.77	0.26	1.08	0.32	0.50	0.46	3.47	0.24	0.55	0.76	N
12 - 13	0.54	2.01	0.57	1.57	0.17	0.28	0.77	3.83	0.23	1.13	0.21	N
13 - 14	0.39	2.26	0.85	0.68	0.20	0.41	2.56	0.40	1.06	1.32	0.32	N
14 - 15	0.47	2.00	0.45	0.82	0.14	1.05	1.45	0.42	0.09	0.80	0.23	N
15 - 16	0.24	1.20	1.19	0.96	0.33	0.77	1.67	0.54	0.65	0.67	0.13	N
16 - 17	0.34	3.51	2.11	1.46	0.48	2.43	0.72	0.70	N	0.67	0.14	0.33
17 - 18	0.27	1.59	1.70	1.61	0.63	0.82	0.29	1.23	N	0.67	0.04	0.35
18 - 19	0.19	1.53	3.86	1.42	0.45	0.21	1.49	0.28	N	0.85	0.21	0.83
19 - 20	0.19	1.56	2.05	1.63	0.23	0.29	0.56	0.21	N	0.59	0.37	1.03
20 - 21	0.21	0.87	2.26	2.25	0.45	0.49	0.38	0.17	N	0.37	0.41	0.15
21 - 22	0.19	1.07	2.80	1.89	0.58	1.23	0.41	0.24	N	0.13	0.28	0.15
22 - 23	0.26	1.38	2.40	1.83	0.51	0.89	0.46	0.22	N	0.79	0.44	0.14
23 - 24	0.20	0.39	1.99	1.75	0.24	0.34	0.33	0.26	N	0.66	0.47	0.17
24 - 25	0.27	1.27	2.96	0.83	0.32	0.69	0.28	0.79	N	0.25	0.23	0.11
25 - 26	0.26	1.46	2.60	0.36	0.26	1.29	0.15	0.61	N	0.13	N	0.20
26 - 27	0.08	0.97	3.26	0.49	0.39	1.24	0.17	1.11	N	0.33	N	0.29
27 - 28	0.17	0.53	2.21	0.44	0.58	0.28	0.22	1.18	N	0.31	0.10	0.12
28 - 29	0.25	0.33	2.36	0.22	0.34	0.46	0.32	1.26	N	0.48	0.23	0.14
29 - 30	0.24		2.91	0.56	2.19	1.14	0.20	0.54	N	0.11	0.15	0.32
30 - 31	0.16		0.69	0.33	2.82	0.49	0.37	0.55	N	0.11	0.11	0.41
31 - 1	0.14		0.50		2.12		0.38	0.24		0.40		0.41
Arithmetic Mean (3)	0.38	0.95	1.42	0.99	0.58	0.71	0.66	1.42	-	0.51	0.40	-
Standard Deviation (3)	0.30	0.84	1.12	0.59	0.66	0.46	0.54	1.59	-	0.33	0.33	-
Sample Size	26	28	31	30	28	30	31	31	15	24	28	17

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 - Sulphate as S (SO<sub>4</sub> - S)  
 Concentration in air ( $\mu\text{g S m}^{-3}$ )

Daily measurements - Summary for January 2003 to December 2003

MONTH	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
DATE												
1 - 2	0.35	0.27	0.80	0.21	0.32	1.93	0.42	0.48	0.22	1.26	0.42	0.34
2 - 3	0.33	0.11	0.20	0.34	0.54	0.86	0.66	0.51	0.33	1.44	0.22	0.68
3 - 4	0.41	0.14	0.39	0.37	0.54	1.11	0.36	0.81	0.35	0.36	0.17	2.23
4 - 5	0.62	0.10	0.67	0.26	0.56	1.05	1.82	1.25	1.51	0.15	0.57	0.69
5 - 6	0.33	0.28	0.26	0.65	0.24	0.70	0.63	1.35	1.31	0.20	1.43	0.17
6 - 7	0.34	0.92	0.20	0.38	0.27	1.00	0.42	2.14	0.44	0.17	1.24	0.25
7 - 8	0.33	0.42	0.36	0.48	0.54	1.03	0.32	1.09	0.37	0.13	0.89	0.30
8 - 9	0.12	0.39	0.39	1.01	0.24	0.79	0.50	1.24	0.38	0.24	1.30	0.54
9 - 10	0.21	0.19	0.56	0.37	0.29	0.83	1.28	2.18	0.21	0.19	1.02	1.02
10 - 11	0.31	0.71	0.22	0.52	0.51	0.71	0.94	2.06	0.35	0.28	1.78	0.82
11 - 12	0.74	0.54	0.17	1.00	0.32	0.53	0.30	1.71	0.62	0.25	0.58	0.24
12 - 13	0.70	0.89	0.18	1.93	0.19	0.50	0.52	1.46	0.28	0.26	0.30	0.25
13 - 14	0.24	2.02	0.10	1.92	0.13	0.54	1.06	0.26	0.53	0.44	0.67	0.12
14 - 15	0.31	0.66	0.30	2.18	0.18	1.43	0.89	0.19	0.63	0.27	0.30	0.14
15 - 16	0.33	0.48	0.99	2.04	0.86	0.87	0.71	0.33	0.69	0.25	0.18	0.23
16 - 17	0.32	1.45	1.73	1.91	0.55	N	0.98	0.37	0.82	0.34	0.18	0.73
17 - 18	0.34	0.93	2.01	2.04	0.81	N	1.64	0.46	0.97	0.38	0.30	0.73
18 - 19	0.41	1.06	2.36	1.64	0.33	0.52	0.30	0.51	1.27	0.45	0.30	0.72
19 - 20	0.31	1.79	N	1.12	0.29	0.25	0.88	0.22	0.57	0.16	0.18	0.26
20 - 21	0.21	1.61	N	1.95	0.17	0.33	0.60	0.27	0.34	0.13	0.29	0.25
21 - 22	0.45	2.04	N	1.78	0.33	0.55	0.43	0.36	0.96	0.33	0.27	0.28
22 - 23	0.48	3.14	1.51	2.04	0.67	1.43	0.56	0.23	0.28	0.53	0.27	0.16
23 - 24	0.49	1.25	1.09	1.60	0.42	0.59	0.80	0.47	0.11	0.30	0.22	0.16
24 - 25	0.68	1.33	1.89	2.02	0.26	0.39	0.36	0.28	0.32	0.18	0.46	0.39
25 - 26	0.27	1.18	2.37	2.37	0.39	1.04	0.41	0.20	0.79	0.13	0.56	0.27
26 - 27	0.18	1.16	3.37	0.86	0.73	0.80	0.51	0.21	0.28	0.20	0.23	0.24
27 - 28	0.14	1.10	2.64	1.14	1.08	0.93	0.24	0.21	0.18	0.34	0.29	0.26
28 - 29	0.09	1.06	2.82	0.62	1.42	0.43	0.54	0.16	0.38	0.74	0.43	0.10
29 - 30	0.16		1.61	0.44	1.73	0.76	0.41	0.25	0.46	0.31	0.29	0.30
30 - 31	0.28		0.30	0.36	1.40	0.52	0.68	0.17	0.97	0.37	0.38	0.22
31 - 1	0.39		1.16		2.13		0.72	0.26		0.60		0.37
Arithmetic Mean (3)	0.35	0.97	1.09	1.18	0.59	0.80	0.67	0.70	0.56	0.37	0.52	0.43
Standard Deviation (3)	0.16	0.71	0.97	0.73	0.49	0.37	0.38	0.64	0.36	0.30	0.42	0.41
Sample Size	31	28	28	30	31	28	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%.

# Appendix 4

# Nitrogen Dioxide Data

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National Environmental Technology Centre

Nitrogen Dioxide  
Concentration in air (ppb)

Monthly measurements, collection-day - non standard  
Summary for January 2003 to December 2003

Site	Sampling Period	Start Date	End Date	Concentration (in ppb)	Site	Sampling Period	Start Date/Time	End Date/Time	Concentration (in ppb)
Coonhilly	1	05-Dec-2002	30-Jan-2003	* N	Compton	1	30-Dec-2002	22-Jan-2003	15.30
	2	30-Jan-2003	26-Feb-2003	6.15		2	22-Jan-2003	24-Feb-2003	13.94
	3	26-Feb-2003	27-Mar-2003	5.22		3	24-Feb-2003	24-Mar-2003	11.45
	4	27-Mar-2003	07-May-2003	* 5.48		4	24-Mar-2003	22-Apr-2003	8.61
	5	07-May-2003	21-May-2003	5.64		5	22-Apr-2003	19-May-2003	6.61
	6	21-May-2003	23-Jun-2003	3.16		6	19-May-2003	16-Jun-2003	5.38
	7	23-Jun-2003	18-Jul-2003	0.66		7	16-Jun-2003	28-Jul-2003	* 5.05
	8	18-Jul-2003	14-Aug-2003	2.80		8	28-Jul-2003	11-Aug-2003	9.16
	9	14-Aug-2003	09-Sep-2003	4.49		9	11-Aug-2003	10-Sep-2003	8.19
	10	09-Sep-2003	06-Oct-2003	3.94		10	10-Sep-2003	23-Oct-2003	* 9.26
	11	06-Oct-2003	07-Nov-2003	5.91		11	23-Oct-2003	03-Nov-2003	10.09
	12	07-Nov-2003	05-Dec-2003	4.05		12	03-Nov-2003	04-Dec-2003	13.98
	13	05-Dec-2003	31-Dec-2003	4.10		13	04-Dec-2003	02-Jan-2004	9.47
	14	31-Dec-2003	28-Jan-2004	1.98		14			
Annual Mean Concentration =				4.32	Annual Mean Concentration =				9.52
Yarner Wood	1	04-Dec-2002	02-Jan-2003	9.74	Flatford Mill	1	31-Dec-2002	28-Jan-2003	11.42
	2	02-Jan-2003	29-Jan-2003	3.77		2	28-Jan-2003	25-Feb-2003	14.20
	3	29-Jan-2003	26-Feb-2003	6.41		3	25-Feb-2003	25-Mar-2003	9.23
	4	26-Feb-2003	25-Mar-2003	4.59		4	25-Mar-2003	22-Apr-2003	7.93
	5	25-Mar-2003	22-Apr-2003	4.59		5	22-Apr-2003	21-May-2003	6.91
	6	22-Apr-2003	20-May-2003	1.64		6	21-May-2003	17-Jun-2003	N
	7	20-May-2003	17-Jun-2003	1.79		7	17-Jun-2003	15-Jul-2003	4.45
	8	17-Jun-2003	15-Jul-2003	1.74		8	15-Jul-2003	12-Aug-2003	6.32
	9	15-Jul-2003	12-Aug-2003	2.27		9	12-Aug-2003	09-Sep-2003	6.49
	10	12-Aug-2003	09-Sep-2003	5.41		10	09-Sep-2003	07-Oct-2003	7.30
	11	09-Sep-2003	14-Oct-2003	4.93		11	07-Oct-2003	07-Nov-2003	10.12
	12	14-Oct-2003	11-Nov-2003	7.16		12	07-Nov-2003	02-Dec-2003	12.75
	13	11-Nov-2003	23-Dec-2003	* 4.72		13	02-Dec-2003	30-Dec-2003	1.55
	14	23-Dec-2003	27-Jan-2004	2.86		14	30-Dec-2003	27-Jan-2004	9.02
Annual Mean Concentration =				4.11	Annual Mean Concentration =				8.19
Barcombe Mills	1	31-Dec-2002	28-Jan-2003	7.95	Compton	1	30-Dec-2002	22-Jan-2003	15.30
	2	28-Jan-2003	25-Feb-2003	10.61		2	22-Jan-2003	24-Feb-2003	13.94
	3	25-Feb-2003	25-Mar-2003	7.64		3	24-Feb-2003	24-Mar-2003	11.45
	4	25-Mar-2003	22-Apr-2003	5.46		4	24-Mar-2003	22-Apr-2003	8.61
	5	22-Apr-2003	20-May-2003	3.38		5	22-Apr-2003	19-May-2003	6.61
	6	20-May-2003	17-Jun-2003	3.62		6	19-May-2003	16-Jun-2003	5.38
	7	17-Jun-2003	15-Jul-2003	0.95		7	16-Jun-2003	28-Jul-2003	* 5.05
	8	15-Jul-2003	16-Aug-2003	7.44		8	28-Jul-2003	11-Aug-2003	9.16
	9	16-Aug-2003	09-Sep-2003	0.38		9	11-Aug-2003	10-Sep-2003	8.19
	10	09-Sep-2003	15-Oct-2003	7.46		10	10-Sep-2003	23-Oct-2003	* 9.26
	11	15-Oct-2003	05-Nov-2003	9.42		11	23-Oct-2003	03-Nov-2003	10.09
	12	05-Nov-2003	03-Dec-2003	8.91		12	03-Nov-2003	04-Dec-2003	13.98
	13	03-Dec-2003	29-Dec-2003	10.40		13	04-Dec-2003	02-Jan-2004	9.47
	14	29-Dec-2003	28-Jan-2004	3.76		14			
Annual Mean Concentration =				6.43	Annual Mean Concentration =				9.52

Notes: \* denotes extended sampling period (greater than the expected 4 or 5 week period). N denotes missing sample. Annual mean concentration only given if the data capture is greater than 75%.

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Site	Sampling Period	Start Date	End Date	Concentration (in ppb)	Site	Sampling Period	Start Date/Time	End Date/Time	Concentration (in ppb)
Tycanol Wood	1	31-Dec-2002	29-Jan-2003	2.99	Stoke Ferry	1	03-Dec-2002	02-Jan-2003	13.31
	2	29-Jan-2003	26-Feb-2003	7.71		2	02-Jan-2003	28-Jan-2003	11.47
	3	26-Feb-2003	26-Mar-2003	4.37		3	28-Jan-2003	25-Feb-2003	14.54
	4	26-Mar-2003	23-Apr-2003	2.95		4	25-Feb-2003	25-Mar-2003	9.89
	5	23-Apr-2003	21-May-2003	1.36		5	25-Mar-2003	23-Apr-2003	6.31
	6	21-May-2003	18-Jun-2003	1.45		6	23-Apr-2003	20-May-2003	7.20
	7	18-Jun-2003	16-Jul-2003	2.18		7	20-May-2003	18-Jun-2003	5.78
	8	16-Jul-2003	13-Aug-2003	2.29		8	18-Jun-2003	15-Jul-2003	2.65
	9	13-Aug-2003	10-Sep-2003	2.40		9	15-Jul-2003	12-Aug-2003	6.02
	10	10-Sep-2003	08-Oct-2003	1.96		10	12-Aug-2003	09-Sep-2003	5.24
	11	08-Oct-2003	05-Nov-2003	4.14		11	09-Sep-2003	08-Oct-2003	7.90
	12	05-Nov-2003	03-Dec-2003	1.20		12	08-Oct-2003	10-Nov-2003	9.02
	13	03-Dec-2003	05-Jan-2004	4.81		13	10-Nov-2003	02-Dec-2003	14.08
	14					14	02-Dec-2003	06-Jan-2004	7.86
Annual Mean Concentration =				3.07	Annual Mean Concentration =				8.22
Llyn Brianne	1	04-Dec-2002	06-Jan-2003	10.97	Preston Montford	1	29-Dec-2002	28-Jan-2003	7.18
	2	06-Jan-2003	31-Jan-2003	3.34		2	28-Jan-2003	23-Feb-2003	13.47
	3	31-Jan-2003	26-Feb-2003	8.80		3	23-Feb-2003	23-Mar-2003	11.56
	4	26-Feb-2003	26-Mar-2003	4.10		4	23-Mar-2003	02-May-2003	* 7.48
	5	26-Mar-2003	21-May-2003	* 2.02		5	02-May-2003	29-May-2003	1.88
	6	21-May-2003	18-Jun-2003	1.58		6	29-May-2003	15-Jun-2003	3.75
	7	18-Jun-2003	16-Jul-2003	1.68		7	15-Jun-2003	16-Jul-2003	8.68
	8	16-Jul-2003	13-Aug-2003	2.29		8	16-Jul-2003	14-Aug-2003	5.61
	9	13-Aug-2003	24-Sep-2003	* 2.32		9	14-Aug-2003	08-Oct-2003	* 5.44
	10	24-Sep-2003	08-Oct-2003	3.66		10	08-Oct-2003	05-Nov-2003	7.91
	11	08-Oct-2003	07-Nov-2003	5.71		11	05-Nov-2003	03-Dec-2003	9.09
	12	07-Nov-2003	04-Dec-2003	4.89		12	03-Dec-2003	31-Dec-2003	8.90
	13	04-Dec-2003	05-Jan-2004	3.25		13	31-Dec-2003	28-Jan-2004	4.74
	14					14			
Annual Mean Concentration =				3.54	Annual Mean Concentration =				7.51
Pumlumon	1	03-Dec-2002	07-Jan-2003	9.30	Bottesford	1	02-Dec-2002	03-Jan-2003	13.98
	2	07-Jan-2003	28-Jan-2003	2.73		2	03-Jan-2003	25-Feb-2003	* 13.78
	3	28-Jan-2003	04-Mar-2003	7.06		3	25-Feb-2003	10-Mar-2003	13.97
	4	04-Mar-2003	25-Mar-2003	3.45		4	10-Mar-2003	08-Apr-2003	7.19
	5	25-Mar-2003	22-Apr-2003	3.01		5	08-Apr-2003	22-Apr-2003	7.06
	6	22-Apr-2003	20-May-2003	1.47		6	22-Apr-2003	20-May-2003	4.34
	7	20-May-2003	17-Jun-2003	1.04		7	20-May-2003	17-Jun-2003	4.46
	8	17-Jun-2003	15-Jul-2003	1.32		8	17-Jun-2003	22-Jul-2003	4.45
	9	15-Jul-2003	12-Aug-2003	2.51		9	22-Jul-2003	27-Aug-2003	6.27
	10	12-Aug-2003	09-Sep-2003	2.29		10	27-Aug-2003	18-Sep-2003	8.49
	11	09-Sep-2003	07-Oct-2003	4.37		11	18-Sep-2003	07-Oct-2003	9.61
	12	07-Oct-2003	11-Nov-2003	7.96		12	07-Oct-2003	12-Nov-2003	11.77
	13	11-Nov-2003	02-Dec-2003	< 0.44		13	12-Nov-2003	23-Dec-2003	* 12.44
	14	02-Dec-2003	30-Dec-2003	4.67		14	23-Dec-2003	03-Feb-2004	* 8.59
Annual Mean Concentration =				3.19	Annual Mean Concentration =				8.92

Notes: \* denotes extended sampling period (greater than the expected 4 or 5 week period). N denotes missing sample. Annual mean concentration only given if the data capture is greater than 75%.



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Site	Sampling Period	Start Date	End Date	Concentration (in ppb)	Site	Sampling Period	Start Date/Time	End Date/Time	Concentration (in ppb)	
Llyn Llydaw	1	01-Jan-2003	29-Jan-2003	1.47	Jenny Hurn	1				
	2	29-Jan-2003	26-Feb-2003	4.73		2				
	3	26-Feb-2003	26-Mar-2003	2.48		3				
	4	26-Mar-2003	23-Apr-2003	2.45		4				
	5	23-Apr-2003	21-May-2003	1.12		5				
	6	21-May-2003	18-Jun-2003	1.29		6				
	7	18-Jun-2003	16-Jul-2003	2.21		7				
	8	16-Jul-2003	13-Aug-2003	2.39		8				
	9	13-Aug-2003	10-Sep-2003	2.62		9				
	10	10-Sep-2003	08-Oct-2003	2.39		10				
	11	08-Oct-2003	12-Nov-2003	5.15		11				
	12	12-Nov-2003	03-Dec-2003	1.22		12				
	13	03-Dec-2003	31-Dec-2003	3.27		13				
	14	31-Dec-2003	28-Jan-2004	1.75		14				
Annual Mean Concentration =				2.60	Annual Mean Concentration =					
Wardlow Hay Cop	1	29-Dec-2002	26-Jan-2003	9.34	Thorganby	1	04-Dec-2002	02-Jan-2003	10.41	
	2	26-Jan-2003	26-Feb-2003	14.94		2	02-Jan-2003	29-Jan-2003	12.51	
	3	26-Feb-2003	23-Mar-2003	9.45		3	29-Jan-2003	26-Feb-2003	15.13	
	4	23-Mar-2003	20-Apr-2003	7.27		4	26-Feb-2003	26-Mar-2003	8.25	
	5	20-Apr-2003	20-May-2003	5.11		5	26-Mar-2003	23-Apr-2003	4.80	
	6	20-May-2003	22-Jun-2003	4.46		6	23-Apr-2003	21-May-2003	6.64	
	7	22-Jun-2003	13-Jul-2003	6.20		7	21-May-2003	18-Jun-2003	7.02	
	8	13-Jul-2003	11-Aug-2003	6.37		8	18-Jun-2003	16-Jul-2003	5.36	
	9	11-Aug-2003	21-Sep-2003	* 6.71		9	16-Jul-2003	13-Aug-2003	7.09	
	10	21-Sep-2003	05-Oct-2003	8.56		10	13-Aug-2003	10-Sep-2003	4.81	
	11	05-Oct-2003	16-Nov-2003	* 11.42		11	10-Sep-2003	08-Oct-2003	9.03	
	12	16-Nov-2003	14-Dec-2003	10.83		12	08-Oct-2003	07-Nov-2003	9.64	
	13	14-Dec-2003	28-Dec-2003	11.19		13	07-Nov-2003	03-Dec-2003	14.00	
	14	28-Dec-2003	25-Jan-2004	9.28		14	03-Dec-2003	31-Dec-2003	10.69	
Annual Mean Concentration =				8.56	Annual Mean Concentration =				8.82	
Driby	1	04-Dec-2002	15-Jan-2003	* 9.68	High Muffles	1	01-Jan-2003	29-Jan-2003	5.49	
	2	15-Jan-2003	29-Jan-2003	11.84		2	29-Jan-2003	26-Feb-2003	9.09	
	3	29-Jan-2003	26-Feb-2003	12.86		3	26-Feb-2003	26-Mar-2003	6.85	
	4	26-Feb-2003	05-Mar-2003	N		4	26-Mar-2003	23-Apr-2003	3.35	
	5	05-Mar-2003	26-Mar-2003	6.56		5	23-Apr-2003	21-May-2003	3.85	
	6	26-Mar-2003	21-May-2003	* 3.21		6	21-May-2003	18-Jun-2003	3.33	
	7	21-May-2003	18-Jun-2003	3.87		7	18-Jun-2003	16-Jul-2003	4.20	
	8	18-Jun-2003	31-Jul-2003	* 3.55		8	16-Jul-2003	13-Aug-2003	3.93	
	9	31-Jul-2003	18-Aug-2003	4.72		9	13-Aug-2003	10-Sep-2003	3.37	
	10	18-Aug-2003	10-Sep-2003	5.08		10	10-Sep-2003	08-Oct-2003	5.56	
	11	10-Sep-2003	05-Nov-2003	* 8.81		11	08-Oct-2003	06-Nov-2003	4.91	
	12	05-Nov-2003	03-Dec-2003	6.35		12	06-Nov-2003	03-Dec-2003	10.12	
	13	03-Dec-2003	31-Dec-2003	12.10		13	03-Dec-2003	31-Dec-2003	9.38	
	14	31-Dec-2003	28-Jan-2004	8.93		14	31-Dec-2003	28-Jan-2004	6.99	
Annual Mean Concentration =				6.87	Annual Mean Concentration =				5.64	

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Site	Sampling Period	Start Date	End Date	Concentration (in ppb)	Site	Sampling Period	Start Date/Time	End Date/Time	Concentration (in ppb)
Bannisdale	1	01-Jan-2003	26-Jan-2003	4.36	Cow Green Reservoir	1	06-Dec-2002	06-Jan-2003	7.60
	2	26-Jan-2003	23-Feb-2003	7.01		2	06-Jan-2003	28-Jan-2003	3.58
	3	23-Feb-2003	23-Mar-2003	7.33		3	28-Jan-2003	24-Feb-2003	9.47
	4	23-Mar-2003	20-Apr-2003	3.50		4	24-Feb-2003	26-Mar-2003	5.68
	5	20-Apr-2003	18-May-2003	3.30		5	26-Mar-2003	25-Apr-2003	3.26
	6	18-May-2003	18-Jun-2003	1.99		6	25-Apr-2003	19-May-2003	2.48
	7	18-Jun-2003	13-Jul-2003	2.93		7	19-May-2003	18-Jun-2003	2.30
	8	13-Jul-2003	10-Aug-2003	3.36		8	18-Jun-2003	15-Jul-2003	2.36
	9	10-Aug-2003	07-Sep-2003	2.63		9	15-Jul-2003	11-Aug-2003	2.62
	10	07-Sep-2003	05-Oct-2003	4.63		10	11-Aug-2003	18-Sep-2003	2.17
	11	05-Oct-2003	08-Nov-2003	1.43		11	18-Sep-2003	13-Oct-2003	3.17
	12	08-Nov-2003	30-Nov-2003	6.02		12	13-Oct-2003	06-Nov-2003	4.25
	13	30-Nov-2003	28-Dec-2003	2.14		13	06-Nov-2003	05-Dec-2003	5.76
	14	28-Dec-2003	25-Jan-2004	3.62		14	05-Dec-2003	05-Jan-2004	5.41
Annual Mean Concentration =				3.80	Annual Mean Concentration =				4.06
Hillsborough Forest	1	18-Dec-2002	08-Jan-2003	12.27	Loch Dee	1	02-Dec-2002	06-Jan-2003	4.71
	2	08-Jan-2003	29-Jan-2003	5.56		2	06-Jan-2003	07-Feb-2003	2.82
	3	29-Jan-2003	10-Mar-2003	* 11.74		3	07-Feb-2003	03-Mar-2003	9.70
	4	10-Mar-2003	09-Apr-2003	4.73		4	03-Mar-2003	01-May-2003	* 2.15
	5	09-Apr-2003	25-Apr-2003	5.44		5	01-May-2003	02-Jun-2003	1.74
	6	25-Apr-2003	21-May-2003	3.13		6	02-Jun-2003	01-Jul-2003	2.05
	7	21-May-2003	18-Jun-2003	2.22		7	01-Jul-2003	01-Aug-2003	1.48
	8	18-Jun-2003	16-Jul-2003	3.45		8	01-Aug-2003	06-Oct-2003	* 1.16
	9	16-Jul-2003	10-Sep-2003	* 4.52		9	06-Oct-2003	03-Nov-2003	1.74
	10	10-Sep-2003	24-Sep-2003	5.03		10	03-Nov-2003	06-Jan-2004	* 3.79
	11	24-Sep-2003	08-Oct-2003	5.45		11			
	12	08-Oct-2003	19-Nov-2003	* 8.96		12			
	13	19-Nov-2003	03-Dec-2003	6.99		13			
	14	03-Dec-2003	31-Dec-2003	6.55		14			
Annual Mean Concentration =				6.04	Annual Mean Concentration =				2.69
Lough Navar	1	30-Dec-2002	27-Jan-2003	2.17	Redesdale	1	03-Dec-2002	02-Jan-2003	6.65
	2	27-Jan-2003	24-Feb-2003	3.93		2	02-Jan-2003	28-Jan-2003	3.40
	3	24-Feb-2003	24-Mar-2003	3.15		3	28-Jan-2003	25-Feb-2003	7.91
	4	24-Mar-2003	23-Apr-2003	2.58		4	25-Feb-2003	25-Mar-2003	5.03
	5	23-Apr-2003	19-May-2003	2.87		5	25-Mar-2003	23-Apr-2003	3.22
	6	19-May-2003	16-Jun-2003	0.65		6	23-Apr-2003	20-May-2003	2.15
	7	16-Jun-2003	14-Jul-2003	4.74		7	20-May-2003	18-Jun-2003	2.36
	8	14-Jul-2003	25-Aug-2003	* 1.31		8	18-Jun-2003	15-Jul-2003	2.27
	9	25-Aug-2003	08-Sep-2003	1.92		9	15-Jul-2003	29-Jul-2003	N
	10	08-Sep-2003	13-Oct-2003	1.66		10	29-Jul-2003	12-Aug-2003	9.37
	11	13-Oct-2003	10-Nov-2003	3.37		11	12-Aug-2003	09-Sep-2003	1.85
	12	10-Nov-2003	30-Nov-2003	2.34		12	09-Sep-2003	07-Oct-2003	1.96
	13	30-Nov-2003	29-Dec-2003	1.57		13	07-Oct-2003	06-Nov-2003	3.16
	14	29-Dec-2003	26-Jan-2004	1.25		14	06-Nov-2003	02-Dec-2003	4.93
Annual Mean Concentration =				2.43	Annual Mean Concentration =				3.60

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Site	Sampling Period	Start Date	End Date	Concentration (in ppb)	Site	Sampling Period	Start Date/Time	End Date/Time	Concentration (in ppb)
Eskdalemuir	1	04-Dec-2002	17-Jan-2003	* 2.68	Polloch	1	31-Dec-2002	28-Jan-2003	0.58
	2	17-Jan-2003	29-Jan-2003	2.52		2	28-Jan-2003	25-Feb-2003	2.24
	3	29-Jan-2003	26-Feb-2003	5.20		3	25-Feb-2003	25-Mar-2003	1.84
	4	26-Feb-2003	26-Mar-2003	3.17		4	25-Mar-2003	22-Apr-2003	1.28
	5	26-Mar-2003	23-Apr-2003	2.41		5	22-Apr-2003	20-May-2003	0.81
	6	23-Apr-2003	21-May-2003	1.74		6	20-May-2003	17-Jun-2003	0.64
	7	21-May-2003	18-Jun-2003	1.55		7	17-Jun-2003	15-Jul-2003	0.59
	8	18-Jun-2003	16-Jul-2003	1.11		8	15-Jul-2003	13-Aug-2003	0.95
	9	16-Jul-2003	10-Sep-2003	* 1.20		9	13-Aug-2003	09-Sep-2003	0.91
	10	10-Sep-2003	08-Oct-2003	1.53		10	09-Sep-2003	07-Oct-2003	0.87
	11	08-Oct-2003	08-Nov-2003	2.76		11	07-Oct-2003	08-Nov-2003	< 0.29
	12	08-Nov-2003	03-Dec-2003	4.03		12	08-Nov-2003	02-Dec-2003	1.65
	13	03-Dec-2003	31-Dec-2003	3.01		13	02-Dec-2003	30-Dec-2003	0.96
	14	31-Dec-2003	29-Jan-2004	1.96		14	30-Dec-2003	27-Jan-2004	0.75
Annual Mean Concentration =				2.41	Annual Mean Concentration =				1.02
Whiteadder	1	30-Dec-2002	27-Jan-2003	3.88	Glen Dye	1	03-Dec-2002	04-Jan-2003	2.69
	2	27-Jan-2003	10-Mar-2003	* 4.75		2	04-Jan-2003	27-Jan-2003	1.45
	3	10-Mar-2003	24-Mar-2003	3.49		3	27-Jan-2003	25-Feb-2003	3.97
	4	24-Mar-2003	21-Apr-2003	2.49		4	25-Feb-2003	25-Mar-2003	3.64
	5	21-Apr-2003	19-May-2003	1.39		5	25-Mar-2003	22-Apr-2003	1.76
	6	19-May-2003	16-Jun-2003	1.59		6	22-Apr-2003	07-May-2003	N
	7	16-Jun-2003	17-Jul-2003	1.62		7	07-May-2003	20-May-2003	2.03
	8	17-Jul-2003	10-Aug-2003	2.25		8	20-May-2003	17-Jun-2003	1.29
	9	10-Aug-2003	08-Sep-2003	2.35		9	17-Jun-2003	15-Jul-2003	0.96
	10	08-Sep-2003	06-Oct-2003	2.40		10	15-Jul-2003	12-Aug-2003	1.75
	11	06-Oct-2003	06-Nov-2003	3.46		11	12-Aug-2003	09-Sep-2003	1.31
	12	06-Nov-2003	02-Dec-2003	4.84		12	09-Sep-2003	07-Oct-2003	1.74
	13	02-Dec-2003	29-Dec-2003	3.84		13	07-Oct-2003	04-Nov-2003	1.09
	14	29-Dec-2003	08-Mar-2004	* 2.82		14	04-Nov-2003	20-Nov-2003	N
Annual Mean Concentration =				2.98	Annual Mean Concentration =				2.00
Balquhiddy 2	1	29-Dec-2002	27-Jan-2003	1.62	Ailt a' Mharcaidh	1	30-Dec-2002	27-Jan-2003	0.99
	2	27-Jan-2003	24-Feb-2003	3.86		2	27-Jan-2003	24-Feb-2003	1.92
	3	24-Feb-2003	24-Mar-2003	3.55		3	24-Feb-2003	24-Mar-2003	1.61
	4	24-Mar-2003	21-Apr-2003	2.03		4	24-Mar-2003	21-Apr-2003	0.65
	5	21-Apr-2003	27-May-2003	1.14		5	21-Apr-2003	19-May-2003	0.62
	6	27-May-2003	16-Jun-2003	1.59		6	19-May-2003	30-Jun-2003	* 0.90
	7	16-Jun-2003	14-Jul-2003	1.50		7	30-Jun-2003	28-Jul-2003	0.82
	8	14-Jul-2003	11-Aug-2003	1.96		8	28-Jul-2003	25-Aug-2003	1.53
	9	11-Aug-2003	08-Sep-2003	1.19		9	25-Aug-2003	08-Sep-2003	1.53
	10	08-Sep-2003	06-Oct-2003	1.32		10	08-Sep-2003	07-Oct-2003	1.05
	11	06-Oct-2003	30-Nov-2003	* 2.44		11	07-Oct-2003	18-Nov-2003	* 1.66
	12	30-Nov-2003	28-Dec-2003	2.01		12	18-Nov-2003	14-Jan-2004	* 0.90
	13	28-Dec-2003	26-Jan-2004	2.70		13			
	14					14			
Annual Mean Concentration =				2.05	Annual Mean Concentration =				1.16

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Site	Sampling Period	Start Date	End Date	Concentration (in ppb)	Site	Sampling Period	Start Date/Time	End Date/Time	Concentration (in ppb)
Strathvaich Dam	1	31-Dec-2002	28-Jan-2003	0.40		1			
	2	28-Jan-2003	26-Feb-2003	1.16		2			
	3	26-Feb-2003	23-Mar-2003	1.56		3			
	4	23-Mar-2003	20-Apr-2003	0.67		4			
	5	20-Apr-2003	17-May-2003	0.79		5			
	6	17-May-2003	15-Jun-2003	< 0.32		6			
	7	15-Jun-2003	13-Jul-2003	2.13		7			
	8	13-Jul-2003	10-Aug-2003	0.76		8			
	9	10-Aug-2003	07-Sep-2003	0.65		9			
	10	07-Sep-2003	06-Oct-2003	0.95		10			
	11	06-Oct-2003	07-Nov-2003	7.75		11			
	12	07-Nov-2003	13-Dec-2003	1.03		12			
	13	13-Dec-2003	29-Dec-2003	0.93		13			
	14	29-Dec-2003	24-Jan-2004	0.59		14			
Annual Mean Concentration =				0.93	Annual Mean Concentration =				
Achanarras	1	01-Jan-2003	29-Jan-2003	0.88		1			
	2	29-Jan-2003	26-Feb-2003	2.21		2			
	3	26-Feb-2003	26-Mar-2003	2.43		3			
	4	26-Mar-2003	09-Apr-2003	N		4			
	5	09-Apr-2003	23-Apr-2003	1.64		5			
	6	23-Apr-2003	21-May-2003	0.73		6			
	7	21-May-2003	18-Jun-2003	1.36		7			
	8	18-Jun-2003	16-Jul-2003	1.39		8			
	9	16-Jul-2003	13-Aug-2003	1.61		9			
	10	13-Aug-2003	10-Sep-2003	0.87		10			
	11	10-Sep-2003	08-Oct-2003	1.10		11			
	12	08-Oct-2003	05-Nov-2003	2.16		12			
	13	05-Nov-2003	03-Dec-2003	2.51		13			
	14	03-Dec-2003	31-Dec-2003	0.98		14			
Annual Mean Concentration =				1.52	Annual Mean Concentration =				
Forsinard	1	30-Dec-2002	27-Jan-2003	0.59		1			
	2	27-Jan-2003	24-Feb-2003	2.48		2			
	3	24-Feb-2003	23-Mar-2003	2.99		3			
	4	23-Mar-2003	21-Apr-2003	1.13		4			
	5	21-Apr-2003	19-May-2003	0.85		5			
	6	19-May-2003	16-Jun-2003	0.79		6			
	7	16-Jun-2003	14-Jul-2003	0.91		7			
	8	14-Jul-2003	10-Aug-2003	1.89		8			
	9	10-Aug-2003	08-Sep-2003	1.16		9			
	10	08-Sep-2003	06-Oct-2003	0.89		10			
	11	06-Oct-2003	03-Nov-2003	0.87		11			
	12	03-Nov-2003	30-Nov-2003	1.72		12			
	13	30-Nov-2003	28-Dec-2003	0.86		13			
	14	28-Dec-2003	26-Jan-2004	0.89		14			
Annual Mean Concentration =				1.31	Annual Mean Concentration =				

Notes: \* denotes extended sampling period (greater than the expected 4 or 5 week period). N denotes missing sample. Annual mean concentration only given if the data capture is greater than 75%.

# Appendix 5

## Denuder Measurements

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Table A5.1 provides a listing of the measurements and the summary statistics of the monthly concentrations of HNO<sub>3</sub>, SO<sub>2</sub> and HCl in the gas phase and of NO<sub>3</sub><sup>-</sup>, SO<sub>4</sub><sup>2-</sup>, Cl<sup>-</sup>, Na<sup>+</sup>, Mg<sup>2+</sup> and Ca<sup>2+</sup> in the aerosol phase.

The 12 sites which comprise the network are listed below:

Site Number	Site Name	Grid Ref
1	Bush OTC	NT245635
21	Glensaugh	NO664799
24	Rothamstead	TL123129
30	Strathvaich Dam	NH347750
31	Eskdalemuir	NT235030
32	High Muffles	SE776939
33	Stoke Ferry	TL700988
34	Yarner Wood	SX786789
83	Barcombe Mills	TQ438149
40	Sutton Bonington	SK505268
45	Lough Navar	IH065545
70	Cwmystwyth	SN771742

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**Table A5.1a Monthly Concentrations of HNO<sub>3</sub> and of Aerosol NO<sub>3</sub><sup>-</sup> Measured at the 12 Monitoring Sites in the Nitric Acid Monitoring Network in 2003.**

**HNO<sub>3</sub> (µg m<sup>-3</sup>)**

Month	Site 1	Site 21	Site 24	Site 30	Site 31	Site 32	Site 33	Site 34	Site 83	Site 40	Site 45	Site 70
Jan-03	0.53	0.24	1.86	0.10	0.23	0.86	1.34	ND <sup>1</sup>	1.09	2.22	0.19	0.53
Feb-03	1.43	0.70	<b>5.16</b>	0.33	ND <sup>1</sup>	1.36	1.78	1.16	1.66	2.80	0.82	0.98
Mar-03	1.64	1.19	3.53	0.60	0.69	1.53	1.83	1.46	1.74	2.39	0.57	1.17
Apr-03	1.51	1.31	2.76	1.09	1.05	1.26	1.84	1.52	1.55	1.99	0.66	1.48
May-03	0.35	0.22	1.78	0.21	0.33	0.57	1.30	0.19	0.86	1.32	0.18	0.43
Jun-03	0.76	0.67	2.58	0.36	0.48	1.24	1.37	1.01	1.73	1.58	0.18	0.58
Jul-03	0.73	0.33	2.51	0.42	0.48	0.87	1.60	0.76	1.83	1.73	0.25	0.70
Aug-03	1.21	0.39	5.59	0.25	0.89	0.88	2.47	1.76	3.13	3.31	0.28	0.98
Sep-03	0.46	<b>0.66</b> <sup>2</sup>	1.59	0.07	0.48	0.61	1.68	0.75	1.75	2.57	0.26	0.65
Oct-03	0.69	0.25	4.59	0.12	0.49	1.39	1.16	1.34	1.64	2.57	0.17	0.94
Nov-03	0.59	0.48	2.39	<b>0.31</b> <sup>2</sup>	0.46	1.37	1.34	0.67	1.09	2.02	0.26	0.48
Dec-03	0.75	<b>0.25</b>	2.85	0.11	0.50	1.48	1.77	1.01	1.56	2.02	0.21	0.88
Mean	0.89	0.56	3.10	0.33	0.55	1.12	1.62	1.06	1.64	2.21	0.34	0.82
Min	0.35	0.22	1.59	0.07	0.23	0.57	1.16	0.19	0.86	1.32	0.17	0.43
Max	1.64	1.31	5.59	1.09	1.05	1.53	2.47	1.76	3.13	3.31	0.82	1.48
SD	0.44	0.37	1.34	0.28	0.24	0.34	0.35	0.45	0.56	0.56	0.22	0.31
CV (%)	49.7	66.2	43.2	86.2	43.0	30.3	21.8	42.7	34.5	25.2	65.8	38.5
N	12	12	12	12	11	12	12	11	12	12	12	12

**NO<sub>3</sub><sup>-</sup> (µg m<sup>-3</sup>)**

Month	Site 1	Site 21	Site 24	Site 30	Site 31	Site 32	Site 33	Site 34	Site 83	Site 40	Site 45	Site 70
Jan-03	0.56	0.32	2.45	0.15	0.26	1.13	2.79	ND <sup>1</sup>	2.26	2.21	0.44	1.11
Feb-03	7.05	5.75	8.19	1.34	ND <sup>1</sup>	7.00	8.53	5.45	6.61	8.92	5.63	5.09
Mar-03	6.16	3.55	13.12	2.24	4.41	7.80	8.82	10.74	11.33	9.78	5.21	7.63
Apr-03	5.58	3.99	7.65	2.18	3.81	5.76	7.37	4.81	6.46	6.82	3.34	4.13
May-03	0.72	0.56	2.95	0.19	0.72	1.36	3.25	0.68	2.30	2.69	0.52	0.99
Jun-03	1.49	1.44	3.05	0.45	0.91	2.79	3.05	1.85	ND <sup>4</sup>	2.71	0.69	1.49
Jul-03	0.93	1.05	2.62	0.49	0.81	1.65	2.53	1.16	2.55	2.69	0.54	1.19
Aug-03	1.95	0.96	5.07	0.33	1.13	2.29	5.16	3.43	4.75	1.54	0.84	3.16
Sep-03	1.12	<b>1.50</b> <sup>2</sup>	2.42	0.34	0.98	1.49	4.15	2.07	3.45	3.65	1.47	1.96
Oct-03	1.31	0.37	4.79	0.18	1.39	2.97	2.23	2.80	2.41	3.17	0.44	2.57
Nov-03	1.34	1.37	4.38	<b>0.21</b> <sup>2</sup>	1.02	2.86	4.08	1.51	2.72	4.67	0.77	1.17
Dec-03	1.13	0.67	4.07	0.23	1.14	1.93	1.90	1.93	2.64	4.20	0.83	1.92
Mean	2.45	1.79	5.06	0.69	1.51	3.25	4.49	3.31	4.32	4.42	1.73	2.70
Min	0.56	0.32	2.42	0.15	0.26	1.13	1.90	0.68	2.26	1.54	0.44	0.99
Max	7.05	5.75	13.12	2.24	4.41	7.80	8.82	10.74	11.33	9.78	5.63	7.63
SD	2.35	1.71	3.18	0.78	1.32	2.29	2.45	2.87	2.84	2.68	1.90	2.02
CV (%)	96.2	95.3	62.8	111.8	87.9	70.5	54.7	86.8	65.7	60.6	110.1	74.9
N	12	12	12	12	11	12	12	11	11	12	12	12

**Note:**

ND<sup>1</sup>: Power off during sampling period.

Data<sup>2</sup> = Flow < 0.2 l/min (pump not working properly, or intermittent power cuts).

Data<sup>3</sup> = Samples exposed for more than one month.

ND<sup>4</sup> = Samples lost.

ND<sup>5</sup> = Problems with Aerosol Sampling.

ND<sup>6</sup> = Water in sampling train.

ND<sup>7</sup> = Possible contamination because sampling train returned separated.

**Numbers in bold:** Capture = < 75% in the first of the 2 glass denuders.

**Table A5.1b Monthly Concentrations of SO<sub>2</sub> and of Aerosol SO<sub>4</sub><sup>2-</sup> Measured at the 12 Monitoring Sites in the Nitric Acid Monitoring Network in 2003.**

**SO<sub>2</sub> (µg m<sup>-3</sup>)**

Month	Site 1	Site 21	Site 24	Site 30	Site 31	Site 32	Site 33	Site 34	Site 83	Site 40	Site 45	Site 70
Jan-03	1.76	0.24	3.66	0.02	0.81	2.62	2.21	ND <sup>1</sup>	2.06	8.51	0.30	1.81
Feb-03	3.43	1.45	4.53	0.68	ND <sup>1</sup>	4.49	5.12	2.10	3.03	4.05	1.10	2.07
Mar-03	3.31	2.01	4.15	0.68	1.33	5.00	2.87	2.17	2.70	4.48	0.79	1.82
Apr-03	2.87	1.70	3.16	0.84	1.80	3.35	2.26	2.01	2.17	3.40	0.83	2.35
May-03	0.50	0.22	1.32	0.00	0.32	1.43	1.70	0.06	1.39	1.57	0.03	0.23
Jun-03	1.01	0.94	2.41	0.24	0.49	2.69	1.93	0.97	1.74	2.17	0.28	0.57
Jul-03	1.54	0.25	2.20	0.13	0.33	1.91	2.02	0.71	1.69	2.05	0.20	0.55
Aug-03	5.56	0.04	5.11	0.10	0.96	2.25	2.75	1.92	2.94	10.04	0.20	1.44
Sep-03	1.20	0.57 <sup>2</sup>	2.42	0.09	0.82	1.01	2.85	1.08	2.09	4.99	0.39	1.12
Oct-03	0.76	0.18	3.85	0.11	0.47	3.15	1.35	1.04	1.28	2.43	0.13	1.19
Nov-03	1.16	0.92	3.39	0.13 <sup>2</sup>	0.69	3.96	2.17	1.16	1.91	3.00	0.29	0.66
Dec-03	1.45	0.44	2.47	0.07	0.83	3.01	2.19	0.98	1.87	2.76	0.17	2.37
Mean	2.04	0.75	3.22	0.26	0.80	2.91	2.45	1.29	2.07	4.12	0.39	1.35
Min	0.50	0.04	1.32	0.00	0.32	1.01	1.35	0.06	1.28	1.57	0.03	0.23
Max	5.56	2.01	5.11	0.84	1.80	5.00	5.12	2.17	3.03	10.04	1.10	2.37
SD	1.47	0.66	1.10	0.30	0.44	1.19	0.95	0.67	0.56	2.63	0.33	0.74
CV (%)	72.0	88.5	34.1	114.9	55.3	40.9	38.9	52.0	27.1	63.9	84.2	55.1
N	12	12	12	12	11	12	12	11	12	12	12	12

**SO<sub>4</sub><sup>2-</sup> (µg m<sup>-3</sup>)**

Month	Site 1	Site 21	Site 24	Site 30	Site 31	Site 32	Site 33	Site 34	Site 83	Site 40	Site 45	Site 70
Jan-03	0.46	0.25	1.09	0.31	0.29	0.97	1.27	ND <sup>1</sup>	1.52	1.32	0.57	0.97
Feb-03	2.61	1.99	3.20	1.03	ND <sup>1</sup>	2.64	3.10	2.64	2.63	3.43	2.27	2.19
Mar-03	2.80	1.63	4.50	1.45	2.41	3.21	3.06	3.57	3.75	3.88	2.44	2.87
Apr-03	2.86	2.21	3.25	1.99	2.66	2.78	2.72	2.29	2.96	3.06	1.99	2.58
May-03	0.64	0.42	1.82	0.53	1.07	0.92	1.75	0.90	1.36	1.86	0.77	1.33
Jun-03	1.66	1.26	2.23	1.00	1.26	2.05	2.03	1.82	ND <sup>4</sup>	2.06	1.04	1.33
Jul-03	1.32	0.99	2.39	1.07	1.24	1.85	2.40	1.69	2.60	2.33	1.14	1.55
Aug-03	2.75	0.96	6.36	0.94	2.26	2.20	5.15	5.21	6.42	1.47	1.07	4.02
Sep-03	0.77	0.99 <sup>2</sup>	1.12	0.39	0.84	1.08	1.83	0.92	1.94	1.91	0.87	0.83
Oct-03	1.09	0.29	3.38	0.40	1.16	1.59	1.59	2.84	2.55	1.92	1.04	1.79
Nov-03	0.88	0.64	2.03	0.44 <sup>2</sup>	0.76	1.16	1.78	0.87	1.56	2.39	0.66	0.94
Dec-03	0.65	0.40	1.43	0.35	0.79	1.01	0.68	1.04	1.52	1.91	0.79	0.99
Mean	1.54	1.00	2.73	0.82	1.34	1.79	2.28	2.16	2.62	2.30	1.22	1.78
Min	0.46	0.25	1.09	0.31	0.29	0.92	0.68	0.87	1.36	1.32	0.57	0.83
Max	2.86	2.21	6.36	1.99	2.66	3.21	5.15	5.21	6.42	3.88	2.44	4.02
SD	0.95	0.66	1.53	0.52	0.76	0.79	1.15	1.35	1.46	0.78	0.64	0.97
CV (%)	61.7	65.7	56.1	63.2	57.1	44.4	50.4	62.6	55.9	34.1	52.6	54.4
N	12	12	12	12	11	12	12	11	11	12	12	12

**Note:**

ND<sup>1</sup>: Power off during sampling period.

Data<sup>2</sup> = Flow < 0.2 l/min (pump not working properly, or intermittent power cuts).

Data<sup>3</sup> = Samples exposed for more than one month.

ND<sup>4</sup> = Samples lost.

ND<sup>5</sup> = Problems with Aerosol Sampling.

ND<sup>6</sup> = Water in sampling train.

ND<sup>7</sup> = Possible contamination because sampling train returned separated.

**Numbers in bold:** Capture = < 75% in the first of the 2 glass denuders.

**Table A5.1c Monthly Concentrations of HCl and of Aerosol Cl<sup>-</sup> Measured at the 12 Monitoring Sites in the Nitric Acid Monitoring Network in 2003.**

### HCl ( $\mu\text{g m}^{-3}$ )

Month	Site 1	Site 21	Site 24	Site 30	Site 31	Site 32	Site 33	Site 34	Site 83	Site 40	Site 45	Site 70
Jan-03	0.18	0.16	0.40	<b>0.12</b>	0.08	0.20	0.23	ND <sup>1</sup>	0.32	0.35	0.12	<b>0.36</b>
Feb-03	0.37	0.35	<b>0.79</b>	0.28	ND <sup>1</sup>	0.27	0.27	0.38	0.26	0.27	0.21	0.28
Mar-03	0.29	0.91	0.54	0.28	0.27	0.39	0.34	0.57	0.41	0.34	0.19	0.38
Apr-03	0.33	0.46	0.45	0.24	0.23	0.29	0.50	0.68	0.30	0.35	0.18	0.38
May-03	0.25	0.24	0.42	0.17	0.22	0.21	0.65	0.23	0.43	0.51	0.14	<b>0.57</b>
Jun-03	0.33	0.36	0.52	0.27	0.40	0.35	0.73	0.72	0.62	0.58	0.14	0.32
Jul-03	0.19	0.11	0.37	<b>0.51</b>	0.17	0.28	0.72	0.32	0.43	0.51	0.09	0.35
Aug-03	0.21	<b>0.13</b>	0.61	0.16	0.71	0.20	0.65	0.40	0.34	0.46	0.07	0.21
Sep-03	0.28	<b>1.29</b> <sup>2</sup>	0.37	0.18	0.27	0.27	0.45	0.30	0.84	0.66	0.13	0.24
Oct-03	0.20	0.08	0.59	<b>0.20</b>	0.19	0.30	0.27	0.35	0.25	0.37	0.07	0.41
Nov-03	0.24	0.29	0.33	<b>0.16</b> <sup>2</sup>	0.24	0.31	0.24	0.26	0.23	0.24	0.13	0.21
Dec-03	0.17	<b>0.09</b>	0.22	0.09	0.12	0.21	0.19	0.21	0.22	0.21	0.08	0.23
Mean	0.25	0.37	0.47	0.22	0.26	0.27	0.44	0.40	0.39	0.40	0.13	0.33
Min	0.17	0.08	0.22	0.09	0.08	0.20	0.19	0.21	0.22	0.21	0.07	0.21
Max	0.37	0.91	0.79	0.51	0.71	0.39	0.73	0.72	0.84	0.66	0.21	0.57
SD	0.07	0.37	0.15	0.11	0.17	0.06	0.21	0.18	0.18	0.14	0.05	0.11
CV (%)	26.1	99.5	32.8	49.3	64.5	22.7	47.0	43.8	47.1	34.8	37.1	32.1
N	12	12	12	12	11	12	12	11	12	12	12	12

### Cl<sup>-</sup> ( $\mu\text{g m}^{-3}$ )

Month	Site 1	Site 21	Site 24	Site 30	Site 31	Site 32	Site 33	Site 34	Site 83	Site 40	Site 45	Site 70
Jan-03	1.18	0.86	2.67	1.05	0.75	1.36	1.58	ND <sup>1</sup>	3.05	2.82	1.62	1.90
Feb-03	1.17	1.39	1.33	1.09	ND <sup>1</sup>	1.42	1.19	2.91	1.19	1.35	1.16	1.52
Mar-03	1.03	0.79	1.62	0.99	1.03	1.28	2.03	2.86	2.46	2.00	1.23	1.54
Apr-03	0.85	0.90	1.06	0.44	0.89	1.16	0.89	1.32	1.15	1.11	0.86	1.04
May-03	0.86	0.75	0.97	0.58	0.85	0.68	0.74	2.23	2.43	0.98	1.33	1.44
Jun-03	0.86	0.58	0.55	0.68	0.95	0.64	0.55	0.99	ND <sup>4</sup>	0.62	1.19	1.12
Jul-03	0.53	0.48	0.50	0.32	0.56	0.62	0.50	0.89	0.76	0.68	0.76	1.03
Aug-03	0.87	0.60	0.79	0.96	0.70	1.08	0.64	0.66	0.80	0.28	0.60	0.49
Sep-03	1.31	<b>3.04</b> <sup>2</sup>	1.29	1.08	1.19	1.60	2.20	1.22	2.04	2.27	1.73	1.04
Oct-03	0.92	0.19	1.35	1.42	0.71	0.73	0.66	1.53	0.50	0.63	0.77	1.54
Nov-03	0.94	0.82	1.17	<b>0.97</b> <sup>2</sup>	0.71	1.06	1.13	1.65	1.67	1.41	1.04	1.19
Dec-03	1.26	0.76	1.74	1.32	1.08	1.60	0.74	1.85	1.87	2.05	1.72	1.75
Mean	0.98	0.93	1.25	0.91	0.86	1.10	1.07	1.65	1.63	1.35	1.17	1.30
Min	0.53	0.19	0.50	0.32	0.56	0.62	0.50	0.66	0.50	0.28	0.60	0.49
Max	1.31	1.39	2.67	1.42	1.19	1.60	2.20	2.91	3.05	2.82	1.73	1.90
SD	0.22	0.72	0.59	0.34	0.19	0.37	0.58	0.76	0.82	0.78	0.38	0.39
CV (%)	22.4	77.7	46.9	37.3	22.5	33.2	54.1	45.9	50.3	58.0	32.9	29.9
N	12	12	12	12	11	12	12	11	11	12	12	12

#### Note:

ND<sup>1</sup>: Power off during sampling period.

Data<sup>2</sup> = Flow < 0.2 l/min (pump not working properly, or intermittent power cuts).

Data<sup>3</sup> = Samples exposed for more than one month.

ND<sup>4</sup> = Samples lost.

ND<sup>5</sup> = Problems with Aerosol Sampling.

ND<sup>6</sup> = Water in sampling train.

ND<sup>7</sup> = Possible contamination because sampling train returned separated.

**Numbers in bold:** Capture = < 75% in the first of the 2 glass denuders.



**Table A5.1d Monthly Concentrations of Aerosol Ca<sup>2+</sup> and Mg<sup>2+</sup>  
Measured at the 12 Monitoring Sites in the Nitric Acid Monitoring Network in 2003.**

**Ca<sup>2+</sup> (µg m<sup>-3</sup>)**

Month	Site 1	Site 21	Site 24	Site 30	Site 31	Site 32	Site 33	Site 34	Site 83	Site 40	Site 45	Site 70
Jan-03	-0.05	-0.02	0.04	0.02	0.03	0.04	0.05	ND <sup>1</sup>	0.07	0.08	0.04	0.06
Feb-03	0.02	0.02	0.09	0.04	ND <sup>1</sup>	0.05	-0.02	0.05	0.07	0.09	0.06	0.08
Mar-03	-0.01	0.02	0.13	0.04	0.06	0.10	0.12	0.15	0.13	0.23	0.11	0.11
Apr-03	-0.01	-0.01	0.11	0.04	0.13	0.09	0.12	0.11	0.10	0.15	0.11	0.09
May-03	-0.06	-0.02	0.01	-0.01	0.00	0.02	0.03	0.04	0.04	0.02	0.02	0.03
Jun-03	0.03	-0.14	0.07	0.14	0.09	0.09	0.12	-0.03	ND <sup>4</sup>	0.06	0.01	0.08
Jul-03	-0.14	-0.18	-0.01	-0.04	-0.08	-0.06	-0.07	0.01	0.06	0.08	0.02	0.02
Aug-03	-0.10	-0.11	-0.03	0.03	0.05	-0.05	0.05	0.04	0.11	-0.05	0.10	0.08
Sep-03	-0.16	<b>-1.49<sup>2</sup></b>	0.01	0.03	0.03	0.05	0.13	0.03	0.04	0.11	0.09	0.04
Oct-03	-0.02	-0.05	0.12	0.02	0.02	0.06	0.10	0.10	0.06	0.10	0.02	0.09
Nov-03	-0.04	-0.05	0.01	<b>-0.04<sup>2</sup></b>	0.01	0.02	0.03	0.02	0.03	0.04	0.02	0.03
Dec-03	-0.03	0.01	0.02	0.02	0.01	0.03	0.04	0.05	0.06	0.06	0.07	0.07
Mean	-0.05	-0.05	0.05	0.03	0.03	0.04	0.06	0.05	0.07	0.08	0.06	0.06
Min	-0.16	-0.18	-0.03	-0.04	-0.08	-0.06	-0.07	-0.03	0.03	-0.05	0.01	0.02
Max	0.03	0.02	0.13	0.14	0.13	0.10	0.13	0.15	0.13	0.23	0.11	0.11
SD	0.06	0.07	0.06	0.04	0.05	0.05	0.06	0.05	0.03	0.07	0.04	0.03
CV (%)	-127.3	-138.2	115.6	145.9	167.5	141.9	104.5	99.9	43.3	86.0	69.0	45.0
N	12	12	12	12	12	12	12	12	12	12	12	12

**Mg<sup>2+</sup> (µg m<sup>-3</sup>)**

Month	Site 1	Site 21	Site 24	Site 30	Site 31	Site 32	Site 33	Site 34	Site 83	Site 40	Site 45	Site 70
Jan-03	0.01	0.03	0.10	0.07	0.07	0.08	0.10	ND <sup>1</sup>	0.16	0.13	0.10	0.13
Feb-03	0.04	0.08	0.07	0.07	ND <sup>1</sup>	0.07	0.02	0.12	0.08	0.07	0.07	0.10
Mar-03	0.03	0.06	0.11	0.06	0.08	0.09	0.11	0.17	0.14	0.15	0.10	0.11
Apr-03	0.03	0.06	0.08	0.04	0.08	0.08	0.07	0.09	0.08	0.08	0.07	0.07
May-03	0.00	0.02	0.04	0.03	0.04	0.04	0.04	0.09	0.12	0.05	0.06	0.08
Jun-03	0.04	0.04	0.05	0.05	0.06	0.05	0.05	0.04	ND <sup>4</sup>	0.04	0.05	0.07
Jul-03	0.01	0.02	0.04	0.03	0.03	0.03	0.03	0.05	0.05	0.06	0.04	0.06
Aug-03	0.03	0.04	0.04	0.04	0.05	0.05	0.06	0.05	0.07	0.03	0.04	0.04
Sep-03	0.02	<b>0.04<sup>2</sup></b>	0.06	0.06	0.06	0.08	0.12	0.08	0.12	0.13	0.11	0.06
Oct-03	0.01	-0.01	0.05	0.03	0.02	0.03	0.03	0.07	0.02	0.03	0.02	0.06
Nov-03	0.01	0.06	0.05	<b>0.08<sup>2</sup></b>	0.03	0.04	0.05	0.08	0.09	0.06	0.05	0.07
Dec-03	0.02	0.07	0.06	0.06	0.04	0.06	0.06	0.09	0.10	0.09	0.09	0.09
Mean	0.02	0.04	0.06	0.05	0.05	0.06	0.06	0.08	0.09	0.08	0.07	0.08
Min	0.00	-0.01	0.04	0.03	0.02	0.03	0.02	0.04	0.02	0.03	0.02	0.04
Max	0.04	0.08	0.11	0.08	0.08	0.09	0.12	0.17	0.16	0.15	0.11	0.13
SD	0.01	0.03	0.02	0.02	0.02	0.02	0.03	0.04	0.04	0.04	0.03	0.03
CV (%)	61.3	58.2	35.4	32.7	41.4	37.0	52.5	42.2	41.3	53.7	41.6	33.5
N	12	12	12	12	11	12	12	11	11	12	12	12

**Note:**

ND<sup>1</sup>: Power off during sampling period.

Data<sup>2</sup> = Flow < 0.2 l/min (pump not working properly, or intermittent power cuts).

Data<sup>3</sup> = Samples exposed for more than one month.

ND<sup>4</sup> = Samples lost.

ND<sup>5</sup> = Problems with Aerosol Sampling.

ND<sup>6</sup> = Water in sampling train.

ND<sup>7</sup> = Possible contamination because sampling train returned separated.

**Numbers in bold:** Capture = < 75% in the first of the 2 glass denuders.

**Table A5.1e Monthly Concentrations of Aerosol Na<sup>+</sup>  
Measured at the 12 Monitoring Sites in the Nitric Acid Monitoring Network in 2003.**

**Na<sup>+</sup> (µg m<sup>-3</sup>)**

Month	Site 1	Site 21	Site 24	Site 30	Site 31	Site 32	Site 33	Site 34	Site 83	Site 40	Site 45	Site 70
Jan-03	0.77	0.67	1.42	0.79	0.86	1.02	1.19	ND <sup>1</sup>	1.75	1.32	1.13	1.47
Feb-03	0.74	1.11	0.88	0.82	ND <sup>1</sup>	0.97	0.78	1.63	0.93	0.81	0.88	1.16
Mar-03	0.66	0.61	1.23	0.75	0.77	0.90	1.12	1.57	1.39	1.28	0.92	1.13
Apr-03	0.77	0.76	0.83	0.43	0.99	0.94	0.76	1.04	0.85	0.85	0.69	0.79
May-03	0.49	0.49	0.75	0.48	0.63	0.51	0.60	1.33	1.60	0.65	0.85	1.00
Jun-03	0.59	0.57	0.63	0.51	0.74	0.54	0.54	0.81	ND <sup>4</sup>	0.54	0.73	0.76
Jul-03	0.47	0.80	0.50	0.37	0.42	0.50	0.51	0.67	0.64	0.59	0.51	0.75
Aug-03	0.58	0.41	0.69	0.47	0.53	0.66	0.51	0.51	0.67	0.52	0.36	0.34
Sep-03	0.76	<b>1.88</b> <sup>2</sup>	0.82	0.72	0.80	1.03	1.39	0.83	1.31	1.36	0.99	0.65
Oct-03	0.59	0.14	0.98	0.83	0.46	0.43	0.47	1.08	0.38	0.43	0.43	0.94
Nov-03	0.54	0.47	0.64	<b>0.58</b> <sup>2</sup>	0.45	0.55	0.69	1.00	0.98	0.62	0.63	0.73
Dec-03	0.67	0.49	0.88	0.71	0.52	0.73	0.73	1.05	1.00	0.86	0.89	0.84
<b>Mean</b>	0.64	0.70	0.86	0.62	0.65	0.73	0.77	1.05	1.04	0.82	0.75	0.88
<b>Min</b>	0.47	0.14	0.50	0.37	0.42	0.43	0.47	0.51	0.38	0.43	0.36	0.34
<b>Max</b>	0.77	1.88	1.42	0.83	0.99	1.03	1.39	1.63	1.75	1.36	1.13	1.47
<b>SD</b>	0.11	0.44	0.26	0.17	0.19	0.23	0.30	0.35	0.42	0.33	0.24	0.29
<b>CV (%)</b>	16.9	63.0	30.5	26.6	29.3	31.1	38.7	33.4	40.5	40.2	31.3	32.8
<b>N</b>	12	12	12	12	11	12	12	11	11	12	12	12

**Note:**

ND<sup>1</sup>: Power off during sampling period.

Data<sup>2</sup> = Flow < 0.2 l/min (pump not working properly, or intermittent power cuts).

Data<sup>3</sup> = Samples exposed for more than one month.

ND<sup>4</sup> = Samples lost.

ND<sup>5</sup> = Problems with Aerosol Sampling.

ND<sup>6</sup> = Water in sampling train.

ND<sup>7</sup> = Possible contamination because sampling train returned separated.

**Numbers in bold:** Capture = < 75% in the first of the 2 glass denuders.

# Appendix 6

# Geostatistics

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## GEOSTATISTICS

The use of geostatistics in the analysis of United Kingdom precipitation composition was described by Webster *et al.* (1991). A brief discussion is reproduced here. In a geostatistical treatment of spatial variability the concentration of an ion in precipitation, 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 x 20 km grid square the variance would probably be smaller than within a 200 km x 200 km square. The dependence of the variance on separation (usually termed the lag) is described by a quantity known as the semi-variance:

$$\gamma(h) = \frac{\sum(z_1 - z_2)^2}{2n} \quad 1$$

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

$$\gamma(h) = c_0 + c_1 (1 - e^{-h/a}) \quad 2$$

### Spherical

$$\gamma(h) = c_0 + \frac{c_1}{2} \left\{ \frac{3h}{a} - \left( \frac{h}{a} \right)^3 \right\} \quad 3$$

### Linear

$$\gamma(h) = c_0 + \omega h^\theta \quad 4$$

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  $\omega$  is called the factor and  $\theta$  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  $l_1 z_1 + l_2 z_2 + \dots$ . 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.

The models fitted to the experimental points in the variogram for  $\log_e$  [acidity], non-marine sulphate, nitrate and ammonium are listed in Table A.6.1.

**Table A.6.1** – Variogram Models fitted to 2003 Annual Mean Concentrations of the Major Ions

Ion	Model	Sill ( $\mu\text{eq l}^{-1}$ ) <sup>2</sup>	Range (km)
acidity ( $\log_e$ transformed)	exponential	0.5	200
non-marine sulphate	exponential	240	200
nitrate	exponential	160	150
ammonium	exponential	600	250