REPORT

Local Authority Air Pollution Monitoring Helpline: Operational Report for January to March 2003

A report produced for the Department for Environment, Food and Rural Affairs, the Scottish Executive, the Welsh Assembly Government and Department of Environment in Northern Ireland

AEAT/ENV/R/1482 ISSUE 1
April 2003

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Executive Summary

This is the fifteenth operational report for the Local Authority Air Pollution Monitoring Helpline, covering the period January to March 2003.

Over this three month period, the Helpline dealt with a total of 92 enquiries. This is more than in the previous 3 months due to the re-issue of LAQM TG.03 and the next round of the Review and Assessment Process. On average each enquiry takes around an hour to log, research, and reply:

90 were dealt with within 24 hours.
2 were dealt with between 24 hours and 1 week.
No calls took longer than 1 week to resolve.

Analysis of the queries received by the Helpline to date has enabled us to compile a list of questions that are often fundamental to local authority air pollution monitoring programmes. Within this report we present a table of what we consider to be the most appropriate answers for review and assessment purposes. These questions and answers have been recently updated and are also published on the National Air Quality Information Archive - http://www.airquality.co.uk/archive/laqm/helpline.php

The Helpline is available via e-mail:
aqm.helpline@aeat.co.uk

Telephone calls, faxes and recorded messages are taken on a single number:
01235 463356

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1 Introduction

This is the fifteenth operational report for the Local Authority Air Pollution Monitoring Helpline, covering the period to January to March 2003. Reports are issued on a quarterly basis within one month of the end of each period.

The Helpline is operated by **netcen**, on behalf of the Department for Environment, Food and Rural Affairs, the Scottish Executive, the Welsh Assembly Government and Department of Environment in Northern Ireland.

Analysis of call frequency, response time and recent publicity is provided in Section 2. Section 3 provides a list of frequently asked questions together with model answers, which have recently been updated and feature on the National Air Quality Information Archive under the "LAQM" section.

2 Routine Operations for January to March 2003

2.1 NUMBER OF ENQUIRIES

Over this three month period, the Helpline dealt with a total of 92 enquiries. This is more than in the previous 3 months due to the re-issue of LAQM TG.03 and the next round of the Review and Assessment Process. Figure 1 (overleaf) shows how enquiries were distributed on a month-by-month basis.

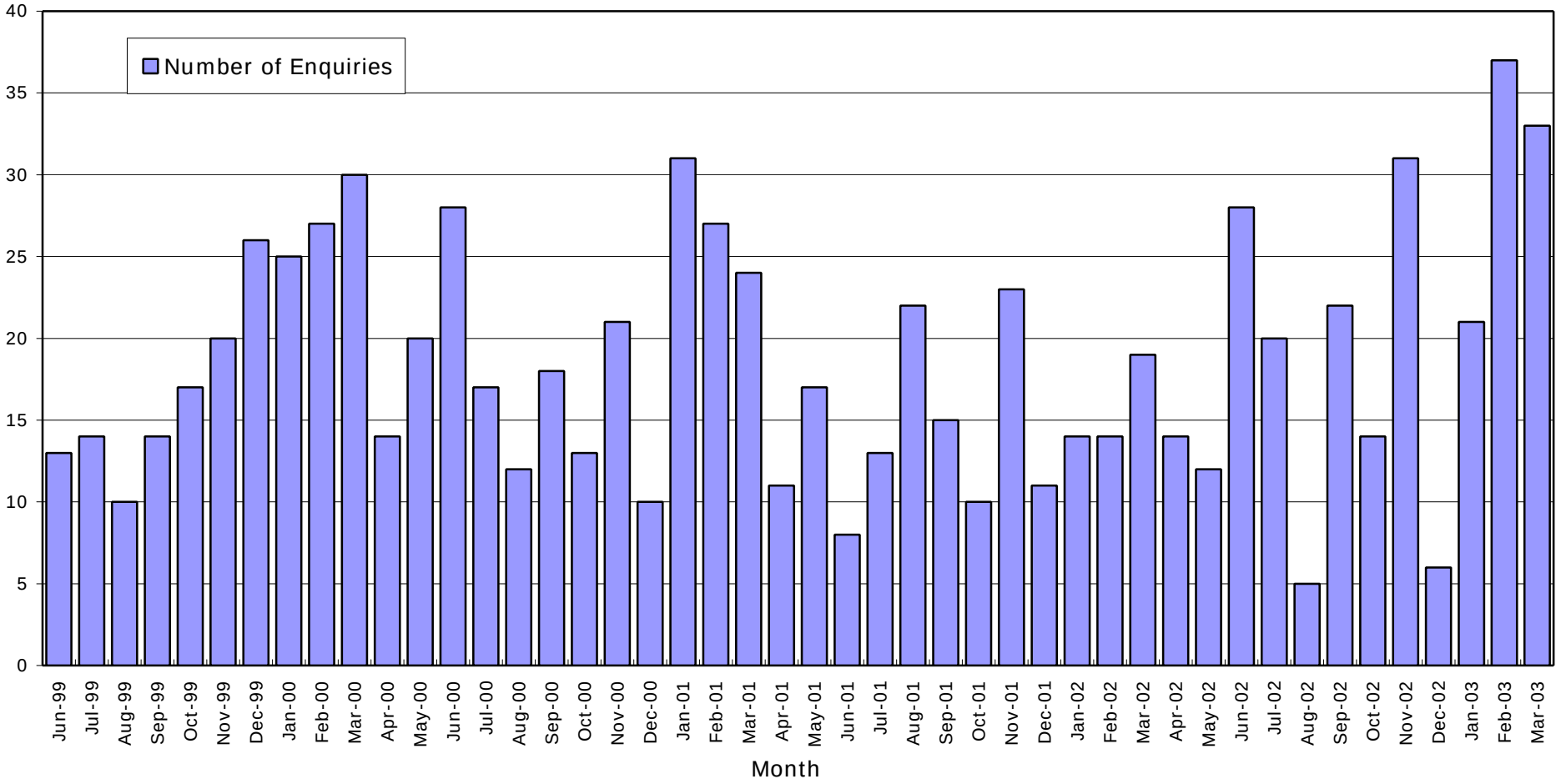
2.2 RESPONSE TIME

Of the 92 enquiries received by the Helpline during this period, our response times were as follows:

90 were dealt with within 24 hours.
2 were dealt with between 24 hours and 1 week.
No calls took longer than 1 week to resolve.

Delays are often caused by difficulties in contacting the local authority, rather than problems with providing a suitable response to the local authority question.

Figure 1 - Local Authority Air Quality Monitoring Helpline Enquiries
June 1999 to March 2003



3 Frequently Asked Questions

Analysis of the queries received by the Helpline to date has enabled us to identify a list of questions that are often fundamental to local authority air pollution monitoring programmes. These have recently been updated. In the list presented below we provide what we consider to be the most appropriate answer for review and assessment purposes, updated advice is highlighted in bold text.

QUESTIONS: SITE LOCATION	ANSWERS
Where should I try to locate my monitors for investigating road traffic emissions?	Firstly look for areas where public exposure to air pollution takes place over the relevant averaging period for the pollutants of concern. For the **Updating and Screening Assessment** you could carry out a survey using passive or active samplers and/or portable monitors over a variety of background and roadside locations. For the **Detailed Assessment** you would ideally monitor at roadside and background locations with accurate monitors in conjunction with ongoing passive or active samplers and portable monitoring. Try to site the monitors as near to the point of public exposure as possible e.g. at the building façade for residential housing. It is important (for model validation in particular) to cover a range of urban background and roadside or kerbside sites if possible. Highest concentrations are likely to be recorded near busy roads or congested traffic junctions.
Where should I try to locate my monitors for investigating emissions from point sources?	Firstly look for areas where public exposure to air pollution takes place over the relevant averaging period for the pollutants of concern. **For the Updating and Screening Assessment** you could carry out a survey using passive or active samplers and/or portable monitors over a variety of locations including the point of modelled maximum impact. **For the Detailed Assessment** you would ideally look at the modelled point of maximum impact with accurate monitors in conjunction with ongoing sampler and portable monitoring.
Once I've identified a suitable area for monitoring, what do I need to take into consideration when locating a specific site?	For automatic analyser enclosures visual impact and planning permission are always major issues. Noise may also be a consideration. Practical problems such as power and telephone connection, access and security may also limit your choice. Given that these concerns are satisfied, a monitoring site will be representative if it is: • Not enclosed by surrounding buildings or covered by overhanging vegetation. • Sampling air at a height of between 2 and 5 m. • Not close to local or point source emissions unless these have been specifically targeted for investigation.

QUESTIONS: MONITORING EQUIPMENT	ANSWERS
Can you supply contact details for purchase of air quality monitoring equipment?	**netcen** have a list of suppliers of equipment currently used in the National Monitoring Networks, and a more general list of suppliers of all air monitoring equipment. Both are available by fax on request. Suppliers must be able to show that their analysers are "fit-for-purpose", and have some form of independent evaluation **e.g. the ambient MCERTS scheme operated by SIRA, the United States Environmental Protection Agency (USEPA) Federal Register or German TUV designation**. Also, analysers will need to be able to monitor over the time period of the air quality objective – e.g. 15-minute for SO_2.
What are the recommended methods for making measurements of nitrogen dioxide?	**For the Updating and Screening Assessment**, diffusion tubes or portable monitors can be used; diffusion tubes can also provide valuable data for the **Detailed Assessment**. If accurate, automatic monitoring data are required then chemiluminescent analysers are likely to be most cost-effective although remote optical/long-path analysers are also suitable. Electrochemical cell analysers are available on the market. The accuracy and precision of this equipment is uncertain and they are only recommended for use in screening surveys. However, if monitoring with this type of analyser, it is advisable to co-locate the equipment with a fully calibrated continuous analyser to validate the data. For the **Detailed Assessment**, monitoring it is important that a documented and traceable QA/QC scheme is implemented.
What are the recommended methods for making measurements of sulphur dioxide?	For the **Updating and Screening Assessment**, active samplers (bubblers) or portable monitors can be used. Diffusion tubes are not recommended, as they are unable to detect increases in short-term concentrations attributed to emissions from point sources. If accurate, automatic monitoring data are required then UV fluorescent analysers are likely to be most cost-effective although remote optical/long-path analysers are also suitable. Electrochemical cell analysers are available on the market. The accuracy and precision of this equipment is uncertain and they are only recommended for use in screening surveys. However, if monitoring with this type of analyser, it is advisable to co-locate the equipment with a fully calibrated continuous analyser to validate the data. For **all Detailed Assessment monitoring** it is important that a documented and traceable QA/QC scheme is implemented.

QUESTIONS: MONITORING EQUIPMENT	ANSWERS
What are the recommended methods for making measurements of PM_{10} particles?	For **the Updating and Screening Assessment**, gravimetric samplers or portable monitors can be used. If black smoke measurements are currently being undertaken, they can in some circumstances be used as an indicator for likely PM_{10} hot-spots. Note, however, there will not necessarily be a consistent correlation between black smoke and PM_{10} which is applicable to all location types and seasons. For more accurate data always choose gravimetric monitors, or, if automatic fixed-point monitors are required, then TEOM, Beta-Gauge, or light scattering devices are also suitable. For Detailed Assessment, monitoring the analyser should produce measurements equivalent to that of the EC reference samplers which effectively means tested to EN12341: ask the supplier for details of testing or approvals which have been given. In addition, for Beta-Gauge or light scattering devices it is advisable to check if they are configured to read as either TEOM or gravimetric analysers. If they do not use a heated inlet or filter it is unlikely that the volatile losses associated with the TEOM will occur. For the **Detailed Assessment**, monitoring it is important that a documented and traceable QA/QC scheme is implemented.

QUESTIONS: QA/QC & OTHER ISSUES	ANSWERS
What QA/QC procedures do I need to implement for diffusion tube monitoring?	It is strongly recommended that laboratories contracted to perform diffusion tube preparation and analysis possess UKAS accreditation for this task and can adequately demonstrate consistency in their analyses. A number of laboratory intercomparisons and performance testing schemes such as the WASP scheme are available for this purpose, and information can be sourced directly from the laboratory. Local Authorities should satisfy themselves of the performance of the laboratory and report any evidence of bias in the measurements. Where appropriate at the **Detailed Assessment,** scaling factors may also be applied to the diffusion tube measurement data to correct for any systematic bias**.** If possible, it is advisable to obtain these scaling factors by co-locating triplicate diffusion tubes with an automatic analyser. Any use of scaling factors must be reported, and must be determined for the particular time period and location of the monitoring. Refer to the "UK NO_2 Diffusion Tube Survey Manual" for further details, this is available from the "Research Reports" section of the National Air Quality Information Archive - http://www.airquality.co.uk/archive/laqm/helpline.php

QUESTIONS: QA/QC & OTHER ISSUES	ANSWERS
What QA/QC procedures do I need to implement for SO_2 bubbler monitoring?	Appropriate laboratory-based QA/QC protocols must be established. In the case of the Total Acidity method, the "UK Smoke and SO_2 Networks instruction manual" provides useful information on required procedures. This is available from the "Research Reports" section of the National Air Quality Information Archive - http://www.airquality.co.uk/archive/laqm/helpline.php In particular: • Take care that the sampler is not left more than 8x24 hours without changing bubblers and filters. • Check for contamination by alkaline products. • Check flow rates remain within $2m^3$ per day (±10%). Beware of faulty solutions.
What QA/QC procedures do I need to implement for gravimetric PM_{10} monitoring?	Filters will need to be pre-conditioned for 48 hours in open dust protected sieve trays, in an air conditioned weighing room with a temperature of 20 ± 1°C and a relative humidity of 50 ± 3% before weighing. Before weighing a filter, it should be examined for pinholes and other imperfections by backlighting with an area light source similar to an x-ray film viewer. After exposure the filters need to be reconditioned (as above) and weighed. The samplers should be operated in accordance with the manual for the sampler utilised. The sampling heads should be cleaned regularly and sample flow rates measured as recommended in the manual. The filter exposure period and total sample flow must be recorded at each filter change. Ambient temperature and pressure may need to be recorded if the sampler does not make automatic corrections.
What QA/QC procedures do I need to implement for automatic PM_{10} monitoring?	The analysers should be operated in accordance with the manual for the equipment utilised. The sampling heads should be cleaned regularly and sample flow rates measured as recommended in the manual. Data from some analysers may need to be re-scaled in order to compare with EC or DEFRA standards – see latest DEFRA guidance for advice on this.
What QA/QC procedures do I need to implement for automatic NO_x and SO_2 monitoring?	The analysers should ideally be housed in an air-conditioned room, hut or trailer, and operated according to the manufacturers' instructions. The analysers should be calibrated at least once every two weeks for urban sites, monthly for rural sites. The calibration should be performed with zero air from a zero air cylinder or chemical scrubber and certificated gas cylinders. 15-minute averaged data should be collected and scaled using the best available calibration factors. Independent audit checks on monitors, gas standards and site operational procedures may be beneficial when using these highly complex analysers.

QUESTIONS: QA/QC & OTHER ISSUES	ANSWERS
What ratification procedures do I need to follow for Benzene data obtained using diffusion tubes?	The process of ratification should include the determination of the limit of detection (lod) and the uncertainty in the measurement technique. The lod and uncertainty may well depend on the supplier and the analytical laboratory, which may not necessarily be the same. The work required to undertake the ratification will probably not be cost effective for smaller studies especially as diffusion tubes are viewed as a screening tool. The use of a few simple checks should however, increase confidence in the data obtained from the exposure of diffusion tubes. Most if not all Benzene diffusion tubes also absorb toluene, ethyl benzene and the xylenes i.e. they are BTEX diffusion tubes. The additional information should only add a small percentage to the price but can be valuable in helping to determine the reliability of the reported benzene concentrations. The ratio of the reported concentrations of BTEX on each tube can be used to assess the reliability of the results. In ambient air where motor vehicles are the major source of hydrocarbons the ratio of concentrations of BTEX compounds, in the order: Benzene: Toluene: Ethyl benzene: (m+p)-Xylene: o-Xylene, is approximately 1:3.5:1:2:1 i.e. if benzene is 1 ppb then the toluene will be 3.5 ppb etc. Should the results of the analysis of the tubes exhibit significant variations in the measured ratios or elevated concentrations for some of the analytes then the results should be treated with care. For example elevated concentrations of toluene, ethyl benzene and the xylenes may indicate a local source of the TEX compounds. Typical sources are some glue solvents and certain paint thinners. Elevated concentrations of a single component may well indicate that the result is suspect. Comparison of reported benzene concentrations at a UK Hydrocarbon Network site. If undertaking a larger study e.g. 10 or more monitoring locations the possibility of co-locating one of the diffusion tube sites with a UK Hydrocarbon Network site should be considered. The UK Hydrocarbon Network now employs both automatic and non-automatic monitoring techniques. The increased number of sites may mean that there is a UK Hydrocarbon Network site relatively close to the proposed diffusion tube survey. Comparison of the results from the diffusion tube survey and the Hydrocarbon Network site will provide useful information on the performance of the diffusion tubes.

QUESTIONS: QA/QC & OTHER ISSUES	ANSWERS
How long do I need to monitor for?	All surveys should ideally be carried out for a minimum of six months, three in the summer and three in the winter. For practical or budgetary reasons local authorities may only be able to carry out three-month surveys using automatic monitors. These still provide extremely useful information, in particular if levels can be compared with those from a nearby long-term air pollution monitoring site. The length of a monitoring survey may also depend upon the type of objective against which you are comparing, and the results that you obtain. For comparison against the annual mean NO_2 objective a 3 month survey may be sufficient, whereas where you are trying to capture a peak concentration such as the 99.9th percentile of 15-minute means for SO_2 then ideally you would measure for a full 12 months. Also, if after only 3 months monitoring concentrations have proved to be well below the objective then you could consider this to be sufficient data.
How to I obtain a bias correction factor for NO_2 diffusion tubes?	**It is advisable to carry out your own co-location study, for at least 9 months at a suitable automatic site in your area.** **If you do not have your own co-location study then use results from a co-location study carried out by neighbouring local authority who uses same tube preparation, analyst and exposure period as your own. In addition, approach your analyst and ask if it has done a suitable study; in November 2002 the UK NO_2 Network has co-ordinated an intercomparison at Wigan Leigh** **Air Quality Consultants have issued a report "Compilation of Diffusion Tube Collocation Studies" carried out by Local Authorities in 2002 which details a small number of default factors that may be applicable; a copy if the report is available at** http://www.airquality.co.uk/archive/reports/cat06/NO2DiffusionTubePerformance(Final).pdf **If none of these options apply you can't bias correct but you should refer to the previous netcen bias factors to provide an indication of whether your tubes generally over- read or under-read - and of course commence collocation in your area ASAP**

QUESTIONS: QA/QC & OTHER ISSUES	ANSWERS
How do I identify an outlying result from triplicate co-exposed NO_2 diffusion tubes?	**There is no definitive way to identify an outlier from a triplet of results, but this approach may be useful:** **If your survey consists of a number of sites where tubes are exposed in triplicate, first calculate a standard deviation and a coefficient of variation (CoV) for each triplicate set in your survey. This gives an indication of the typical scatter that can be expected in triplicate diffusion tube measurements in your survey. Triplets with unusually high coefficients of variation can then be inspected more closely, and rejection of outliers decided on a case-by-case basis. If there are two results in agreement and one obvious outlier, then the outlier should be rejected. If the three results are equally scattered, all three should be kept. Although this approach is not based upon any standard statistical test, it gives a consistent basis to screening the data.** **If in doubt, results should be kept rather than rejected. The obvious exceptions are tubes that are damaged (cracks, split end-caps), possibly contaminated (insects, rainwater etc. in tube), or otherwise suspect for a specific reason. Finally, it is worth asking your analytical laboratory to confirm any unusual result, to eliminate the possibility that the result is an error."**

This list of questions and answers will be updated as necessary in the light of further experience with the Helpline, and the development of agreed technical guidance.