



Department  
for Environment  
Food & Rural Affairs

## The Air Quality Data Validation and Ratification Process

It is important to Defra and the Devolved Administrations that end users of UK-AIR have access to the best possible data at all times. To this end we have put in place a comprehensive system of both automatic and manual data reviews and updates for the UK Automatic Urban and Rural Monitoring Network (AURN) as described below.

Hourly mean monitoring results from the AURN are uploaded as **provisional data** every hour. These figures undergo some basic screening criteria in order to exclude clearly faulty data as far as possible. However, the objective of the exercise is to provide data for human health concerns on a near real-time basis, so the checks have to be essentially automatic and rapid. This means that full Quality Assurance and Quality Control (QA/QC) procedures cannot be applied and the data are therefore likely to be of lower accuracy and reliability than that required for final reporting. Provisional data and statistics are clearly marked with a flag in the database to indicate their status.

Following the publication of initial provisional data, there are at least a further two stages which all automatic monitoring data are required to go through to meet the standards required for National Air Quality Monitoring networks.

**Data Validation** is carried out on an ongoing basis and is nominally a process to "clean-up" the initial provisional data. Any corrections to the data made during the validation process are automatically uploaded (still as **provisional** at this stage) to UK-AIR for end-users to access. The process includes:

- Further manual review of the data to exclude any data from instrument malfunctions or faulty calibrations.
- Incorporation of any data which were initially missing due to communications failure with a monitoring station.
- Updates to data scaling following application of the most recent calibration factors.

**Data Ratification** (or verification) is a detailed manual check of the data set carried out on a quarterly basis for the AURN. It requires a longer-term view of the dataset incorporating the results from **independent QA/QC audits** of the monitoring stations. (Within the AURN,

the term 'ratification' is usually used in place of the European Union's term 'verification'; in this context, they mean the same thing).

Data ratification reviews all calibration data, information from analyser services and repairs and any other information available for the particular site or analyser over the whole ratification period. In addition, the results from the independent QA/QC audits are incorporated to take account of any problems detected during the QA/QC audits such as:

- Long-term drift in an ozone instrument calibration.
- Faulty NO<sub>x</sub> converters.
- Drifts in calibration cylinder concentrations.
- Instrument leaks or flow faults.
- Faulty instrument configuration.
- For automatic particulate matter (PM<sub>10</sub> and PM<sub>2.5</sub>), baseline correction in cases where the analyser's zero response is higher than 3 µg m<sup>-3</sup>.

Incorporation of the QA/QC audits ensures that ratified data are traceable to UK national and international gas calibration standards. In addition, data ratification also requires the judgement of experienced air quality consultants who will have to consider the validity of data in the light of many things including:

- Relationships between pollutants.
- The impact of air pollution episodes.
- The context of the results in the overall UK pollution climate.
- National and regional pollutant patterns.
- Long-term trends.

Once all the ratification checks and corrections have been made then the data are re-loaded to UK-AIR with a new status flag of "Verified".

Occasionally there are circumstances where it is necessary to make changes to data which have previously been flagged as "Verified". This may be for example where:

- A QA/QC audit or other investigation has detected a problem which affects data back into an earlier ratification period.
- Long-term analysis has detected an anomaly between expected and measured trends which requires further investigation and possible data correction.

- Further research comes to light which indicates that new or tighter QA/QC criteria are required to meet the data quality objectives. This may require review and revision of historic calibration data by applying the new criteria.

Any further necessary corrections to an annual data set are, as far as possible, made before the UK results are reported to the European Commission in **September of the following year**.

Changes to previously ratified data are logged on UK-AIR at <http://uk-air.defra.gov.uk/data/changes-to-ratified-data>.

In the event that there is a strong case for modifying datasets already reported to the European Commission, this will be done after consultation and agreement with Defra.

For more information, visit the Defra UK Air Information Resource, UK-AIR, at <http://uk-air.defra.gov.uk>.