

The Sussex Air Quality Network

The Sussex Air Quality Network (SAQN) is composed of local authority (LA) owned air quality monitoring stations and data provided from the UK national Automatic Urban and Rural Network (AURN) stations. “Live” data from both networks is provided for all stations on the Sussex-Air website (www.sussex-air.net), however the SAQN data and AURN have differing quality standards applied to them. It is therefore important to distinguish the differences in the quality of data provided by each type of station and the different processes the SAQN and the AURN data go through.

SAQN quality assurance data checks and procedures

Throughout the data management and validation process Bureau Veritas undertakes a series of reviews, checks and procedures to ensure the quality of data provided for the Sussex local authorities is to the highest quality possible. The following sections set out the data validation processes, data collection verification checks, database security, data transfer reviews and final approved data checks.

Data validation process

A data validation process is a means by which confidence in data reported from air quality instruments to the Sussex-Air website can be gained by users. The process of data collection, review and verification can be complex and has numerous influencing factors, on which ultimately the reporting of a final data set is dependent.

The SAQN data are managed and validated by Bureau Veritas, with the AURN data audited and verified separately by the AURN Quality Assurance and Quality Control (QA/QC) Unit. Therefore, there is a need to recognise that a two-tier QA/QC regime exists across the sites that form the Sussex air quality network. The following definitions of data quality are provided as follows:

Provisional data

- The supply of provisional data involves initial data reviews and observations of data to minimum quality standards, and takes account of an immediate equipment malfunctions, error codes, calibration drift and breakdowns that are otherwise immediately obvious to the data managers. This process operates for both (SAQN and AURN) networks and is completed daily (almost in real-time) as data is disseminated to the Sussex-air website.

Quarterly reviews and provision of “Approved Data”:

- Having taken an initial review of the quality of the data Bureau Veritas undertakes data reviews quarterly to maintain the highest quality data sets possible. Quarterly reviews look back on the initial decisions made on scaling and deletion of data, whilst additional reviewing any further information that may have become available: i.e. LSO observations, ESU services and maintenance, etc. Any further amends to the data are made as necessary considering the quarterly review discussions and data re-issued to Sussex-air website.
- An annual review is completed at year end (calendar year) and data is then issued as “Approved Data” onto the Sussex-air website.
- This process is set-out in [Sussex Data Validation Process Document \(Oct 2023\)](#).
- SAQN stations do not have a formal QA/QC regime and as such data are not validated to national ISO 17025 standards in the same way as data for the AURN stations is (see below).

Ratification (used for AURN but also referred to at EU level as “verification”):

- Ratification is the process of further review based on wider evidence not available at the time of doing the verification process. The AURN follows a formal ISO 17025 QA/QC regime put in place as provided by an independently QA/QC unit, with QA/QC

audits undertaken and reviews of data providing further evidence of analyser performance, ESU service and maintenance, cross checks against primary standards for gases and photometers (in the case of ozone).

- Following quarterly “Quality Circles” held between the data managers and the QA/QC units, data is finalised and deemed to be “ratified”.
- This process is set-out in [The Air Quality Data Validation and Ratification Process \(Apr 2017\)](#)

Flow charts 1 and 2 set out the stages of data collection through to validation of data for both the SAQN and AURN stations.

Summary of SAQN data validation process

The SAQN data quality process set out in flow chart 1, shows how the data is processed, starting with the collection of data directly from the SAQN stations to the verification checks, the quarterly reviews and onto the final annual review to produce “Approved Data” sets on the Sussex-air website.

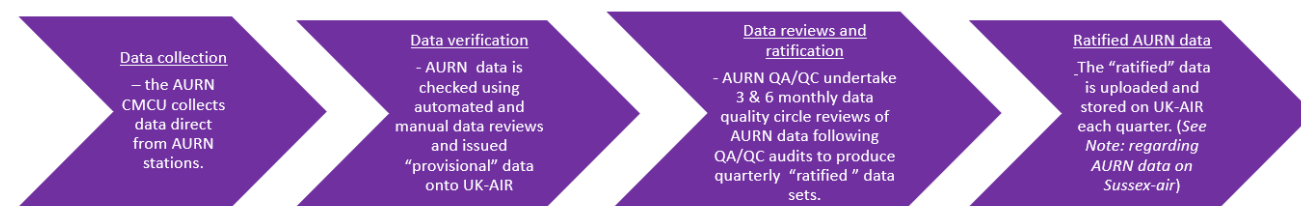
Flow chart 1: SAQN data validation process



AURN data validation process

The AURN data validation process set out in flow chart 2, shows the how data is processed from the collection of data by the AURN Central Management and Co-ordination Unit (CMCU) from the AURN stations through to data that is issued onto the UK-AIR website. To provide “live” AURN data on the Sussex-air website, an application programming interface (API) collects data from UK-AIR hourly and displays the current data onto Sussex-air. As described in the ratification process, the AURN QA/QC unit carries out audits each 6-months and reviews the data to result in “verified” data being issued onto the UK-AIR website and then moved to “ratified” once the Quality Circle reviews have taken place (for the data on the preceding quarter).

Flow chart 2: AURN data validation process



Note: “Live” data for the AURN stations displayed on the Sussex-air website are collected using an API from the UK-AIR database and is stored as “provisional” data on the Sussex-air website database only. “Ratified” data sets are not downloaded after the AURN quarterly Quality Circle reviews, as such, the UK-AIR website should always be referred to as the source for “ratified” AURN data.

SAQN server and database security

Our data management system (Indic Airviro) collects data from the air quality instruments and stores the data in the “raw” data database. Data is copied to a “provisional” database where it is checked, scaled and edited through automated and manual processes. The “provisional” data is then transferred onto the Sussex-air website database. The Airviro system retains both “raw” and “provisional” data sets and the Sussex-air website database receives and retains the duplicate “provisional” data and final “approved” data.

The Airviro data management system and Sussex-air website are on separate systems, both with their own secure servers and cloud-based back-up systems. This ensures data is duplicated in near real-time. The servers are hosted in safe environments and our partner providers have ISO 27001 accreditation (the international standard for information security management) and follow Cyber-Essentials to guard against the most common cyber threats and demonstrate your commitment to cyber security.

SAQN “Approved” data

After the annual review of SAQN data, the final “provisional” data sets are transferred over to Sussex-air database and cross checked to ensure a complete data transfer has occurred. Upon confirmation that the complete data set for the previous calendar year is correct, this final data is assigned and locked down as “Approved” data.

The Sussex-air website then automatically recalculates the 15-minute data values to create the additional averaging period tables (1-hour, 8-hour, 24-hour and annual), and a final review is undertaken to complete the process. The final “Approved” databases are then posted onto the Sussex-air website and is made available to the Sussex authorities for use in LAQM reporting.

Appendices

Appendix 1: Data status terminology

The following table provides the data validation cycle and terminology used for the SAQN and AURN air quality data.

Table 1: Data validation process and data status terminology

Network	Data provided in real-time on Sussex-air	Review period	Data status post reviews
AURN sites	“Provisional” data	Quarterly	“Ratified / Verified” data
Sussex LA sites	“Provisional” data	Annual	“Approved” data