Requirements for monitoring studies measuring ammonia concentration from Pig and Poultry sites.

This note summarises the key considerations when setting a monitoring conditions and discharging a pre-operational condition to agree a monitoring protocol for ammonia emissions monitoring from pig or poultry housing.

Objectives for an operator's monitoring protocol will be that if they follow their monitoring protocol, the results will be acceptable to be used as emission factors for their site to fulfil meeting BAT AEL requirements or habitats impact assessments. We will agree monitoring protocols on a case-by-case basis. Results from any individual assessment will not be applicable at other sites, unless agreed in writing by the environment agency; for example, if the monitoring performed at one location is representative of another and would enable comparisons on a like-for-like basis.

In advance of us agreeing to any monitoring, we must be confident that there is a scientific basis that an operator will achieve the proposed emission rate. This will then be confirmed through monitoring following the agreed protocol.

The IRPP Bref states that when monitoring, a protocol such as the VERA Protocols should be used. The test protocol for housing and management systems, as well as protocols for other control measures, is available here: https://www.vera-verification.eu/test-protocols/

We do not require the VERA protocol to be followed precisely; however it sets out some key aspects which, if followed will help us have confidence in the reliability of the data. The following summarises the key principles which should be included and met in a monitoring protocol:

General information required

1. Specific purpose of the study – define a baseline, established abatement efficacy, or achieve a specific emission factor for example. For abatement a clear description of the baseline set up and the proposed mitigation technique is required.
2. Monitoring information – sampling frequency, 24-hour average data for at least 6 periods over a year. The distribution should reflect the emission pattern, for example with a variable cycle such as broilers should be spread evenly over the crop.
3. Recording basic information including: animal number, type and weight, feed and dietary information, housing description, slurry storage system and volume and dimensions of housing.
4. Sampling locations should be set out.
5. Ventilation information recorded; location of inlets and outlets, and calculation of ventilation rates, incoming and outgoing air flow rates, air exchange rate, etc.
6. Monitoring technique – monitor specification, validation information, measurement uncertainty ranges, permitted deviation, limit of detection etc. calibration and Quality Assurance information.

7. Secondary information – temperature and humidity data in the shed, meteorological data if pertinent to ventilation calculations.

Specific requirements

Monitoring Information	Requirement
Sampling frequency	Minimum requirement is 6 periods of > 24 h over 1 year. Distribution depending on emission patterns.
Sampling conditions	• Cumulative sampling up to 24 hours • Continuous measuring methods: based on hourly values (24 samples). • Correction of background concentration.
Sampling requirements – pigs	In addition to stable patterns: • 50% of the sampling days in the first half of the production cycle. • 50% of the sampling days in the second half of the production cycle. • Sampling days in the second half of the production cycle should be equally distributed throughout the year.
Sampling requirement - broilers	In addition to stable patterns: • The production cycle is to be divided into three periods of equal length (same number of days). • 1st period: at least one sampling day. • 2nd period: at least two sampling days. • 3rd period: at least three sampling days equally distributed within the year.
Sampling points – mechanically ventilated	Locations of inlets and outlets: By measuring the ventilation rate as well as the concentration outside (background) and inside the building at the ventilation shafts. Emissions from mechanically ventilated buildings are calculated as the product of the amount of air leaving the building per unit of time (V; ventilation rate) and concentration in the outgoing air of the pollutant being measured (C_{out}) corrected by its concentration in the incoming air (C_{in}): • $E = V \times (C_{out} - C_{in})$ • By using a calculation method based on the ratio of measured concentrations of the primary parameter (e.g. ammonia), a tracer gas inside the facility and the injection rate of the tracer gas. See section 7.4.2.3 for how emissions are calculated.
Measurement equipment	Ammonia: impinger system Odour: dynamic olfactometry (EN 13725) Dust: EN standards
Measurement uncertainty	
Measurements relating to the Animals	
Animal data	Animal type Number and weight of animals in housing unit [kg] Floor space per animal [m^2] (Air volume per animal [m^3]
Manure parameters	Amount [m^3] • pH • DM [g/kg]

	• Organic DM [g/kg] • N, P and K [g/kg] • TAN [g/kg] • C:N • Additives/residues
	Dates of emptying the pits or manure channels (M) Cleaning of animal house and dunging behaviour (M) Fouling /pollution of surfaces (pen and animals) (M)
Feed composition parameters (O)	Amount [kg] • DM [g/kg] • ME [MJ/kg] • P and K • CP and CF • Lysine • Additives • Feeding strategy and frequency
Animal production parameters	Milk yield, [kg/animal/day] • Egg production [kg/animal/day] • Days of pregnancy Weight gain ((kg/animal/day)