SCHEDULE 8

Regulation 16(2) Regulation 17(2)(d) Regulation 19(4) Regulation 20(4)

Data quality objectives

PART 1

Group A pollutants and $PM_{2·5}$

Group A pollutants (other than benzene and carbon monoxide) and $PM_{2·5}$

1. The data-quality objectives set out in the following table for the required uncertainty of assessment methods, of minimum time coverage and of data capture of measurement are laid down to guide quality assurance programmes–

	Sulphur dioxide, nitrogen dioxide and oxides of nitrogen	*Lead, $PM_{2·5}$ and PM_{10}*
Continuous measurement		
Uncertainty	15%	25%
Minimum data capture	90%	90%
Indicative measurement		
Uncertainty	25%	50%
Minimum data capture	90%	90%
Minimum time coverage	14% (One measurement a week at random, evenly distributed over the year, or eight weeks evenly distributed over the year)	14% (One measurement a week at random, evenly distributed over the year, or eight weeks evenly distributed over the year)
Modelling		
Uncertainty		
Hourly averages	50%–60%	
Daily averages	50%	
Annual averages	30%	50%
Objective estimation		
Uncertainty	75%	100%

2. The uncertainty of the measurement is defined as that set out in the "Guide to the Expression of Uncertainty of Measurements" (ISO 1993)(**1**) or in ISO 5725-1 "Accuracy (trueness and precision) of measurement methods and results" (ISO 1994). The percentages in the table at paragraph 1 are given for individual measurements averaged, over the period considered, by the limit value, for a

(**1**) Copies of International Standards Organisation publications referred to in this Schedule or in Schedule 9 may be purchased from the British Standards Institution ("BSI") Sales Department either by telephone (0208 996 9001) or by post from the BSI, Standards House, 389 Chiswick High Road, London W4 4AL, http://www.bsi-global.com.

95% confidence interval (bias + two times the standard deviation). The uncertainty for continuous measurements shall be interpreted as being applicable in the region of the appropriate limit value.

3. The uncertainty for modelling and objective estimation is defined as the maximum deviation of the measured and calculated concentration levels, over the period considered by the limit value, without taking account the timing of the events.

4. The requirements for minimum data capture and time coverage do not include losses of data due to the regular calibration or the normal maintenance of the instrumentation.

5. The Scottish Ministers may allow for random measurements to be made instead of continuous measurements for lead, $PM_{2·5}$ and PM_{10} by methods for which uncertainty within the 95% confidence interval with respect to continuous monitoring has been demonstrated to be within 10%. Random sampling shall be spread evenly over the year.

Benzene and carbon monoxide

6. The data quality objectives set out in the following table, for allowed uncertainty of assessment methods, of minimum time coverage and of data capture of measurement are provided to guide quality assurance programmes–

	Benzene	*Carbon monoxide*
Fixed measurements		
Uncertainty	25%	15%
Minimum data capture	90%	90%
Minimum time coverage	35% urban background and traffic sites (distributed over the year to be representative of various conditions for climate and traffic); 90% industrial sites	
Indicative measurements		
Uncertainty	30%	25%
Minimum data capture	90%	90%
Minimum time coverage	14% (one day's measurement a week at random, evenly distributed over the year, or eight weeks evenly distributed over the year)	14% (one measurement a week at random, evenly distributed over the year, or eight weeks evenly distributed over the year)
Modelling		
Uncertainty:		
Eight-hour averages		50%
Annual averages	50%	
Objective estimation		
Uncertainty	100%	75%

7. The uncertainty (on a 95% confidence interval) of the assessment methods shall be evaluated in accordance with the "Guide to the Expression of Uncertainty of Measurements" (ISO 1993) or the methodology of ISO 5725:1994. The percentages for uncertainty in the table in paragraph 6 are given for individual measurements averaged over the period considered by the limit value, for a 95% confidence interval. The uncertainty for the fixed measurements shall be interpreted as being applicable in the region of the appropriate limit value.

8. The uncertainty for modelling and objective estimation is defined as the maximum deviation of the measured and calculated concentration levels, over the period considered by the limit value, without taking into account the timing of the events.

9. The requirements for minimum data capture and time coverage do not include losses of data due to the regular calibration or the normal maintenance of the instrumentation.

10. The Scottish Ministers may allow for random measurements to be made instead of continuous measurements for benzene if the uncertainty, including the uncertainty due to random sampling, meets the quality objective of 25%. Random sampling shall be spread evenly over the year.

PART 2

Group B pollutants, polycyclic aromatic hydrocarbons and total gaseous mercury

11. The data quality objectives set out in the following table are provided to guide quality assurance–

	Benzo(a)pyrene	*Arsenic, cadmium and nickel*	*Polycyclic aromatic hydrocarbons and total gaseous mercury*	*Total deposition*
Uncertainty				
Fixed and indicative measurements	50%	40%	50%	70%
Modelling	60%	60%	60%	60%
Minimum data capture	90%	90%	90%	90%
Minimum time coverage				
Fixed measurements	33%	50%		
Indicative measurements[(1)]	14%	14%	14%	33%

(1) Indicative measurement being measurements which are performed at reduced regularity but fulfil the other data quality objectives.

12. The uncertainty (expressed at a 95% confidence level) of the methods used for the assessment of ambient air concentrations shall be evaluated in accordance with the CEN Guide to the Expression

of Uncertainty in Measurement (ENV 13005-1999)(**2**), the methodology of ISO 5725:1994, and the guidance provided in the CEN Report, "Air quality – Approach to uncertainty estimation for ambient air reference measurement methods" (CR 14377:2002E). The percentages for uncertainty in the table in paragraph 11 are given for individual measurements, which are averaged over typical sampling times, for a 95% confidence interval. The uncertainty of the measurements shall be interpreted as being applicable in the region of the appropriate target value. Fixed and indicative measurements shall be evenly distributed over the year in order to avoid skewing of results.

13. The requirements for minimum data capture and time coverage do not include losses of data due to regular calibration or normal maintenance of the instrumentation. Twenty-four-hour sampling is required for the measurement of benzo(a)pyrene and polycyclic aromatic hydrocarbons. With care, individual samples taken over a period of up to one month may be combined and analysed as a composite sample, provided the method ensures that the samples are stable for that period. Where the three congeners benzo(b)fluoranthene, benzo(j)fluoranthene, benzo(k)fluoranthene, are difficult to resolve analytically, they may be reported as sum. The Scottish Ministers shall endeavour, in so far as practicable, to undertake twenty-four hour sampling for the measurement of arsenic, cadmium and nickel concentrations. Sampling shall be spread evenly over the weekdays and the year. For the measurement of deposition rates the Scottish Ministers shall endeavour, in so far as practicable, to obtain monthly, or weekly, samples throughout the year.

14. The Scottish Ministers may allow for use of wet only instead of bulk sampling if it can be demonstrated to their satisfaction that the difference between them is within 10%. Deposition rates shall generally be given as $\mu g/m^3$ per day.

15. The Scottish Ministers may apply a minimum time coverage lower than indicated in the table at paragraph 11, but not lower than 14% for fixed measurements and 6% for indicative measurements provided that they are satisfied that it can be demonstrated that the 95% expanded uncertainty for the annual mean, calculated from the data quality objectives in the table at paragraph 11 according to ISO 11222:2002 – "Determination of the uncertainty of the time average of air quality measurements" will be met.

PART 3

Ozone and related nitrogen oxide and nitrogen dioxide assessed at ozone sampling points

16. The data quality objectives set out in the following table, for allowed uncertainty of assessment methods, of minimum time coverage and of data capture of measurement, are provided to guide quality-assurance programmes–

	For ozone, NO and NO_2 assessed at ozone sampling points
Continuous fixed measurement	
Uncertainty of individual measurements	15%
Minimum data capture	90% during summer; 75% during winter
Indicative measurement	
Uncertainty of individual measurements	30%

(**2**) European Committee for Standardisation (CEN) publication; (copies may be obtained from CEN at 36, Rue de Stassart, B 1050, Brussels, Belgium, http://www.cenorm.be).

	For ozone, NO and NO_2 assessed at ozone sampling points
Minimum data capture	90%
Minimum time coverage	>10% during summer
Modelling	
Uncertainty	
1 hour averages (daytime)	50%
8 hours daily maximum	50%
Objective estimation	
Uncertainty	75%

17. The uncertainty (on a 95% confidence interval) of the measurement methods shall be evaluated in accordance with the principles laid down in the "Guide to the Expression of Uncertainty of Measurements" (ISO 1993) or the methodology in ISO 5725-1 "Accuracy (trueness and precision) of measurement methods and results" (ISO 1994) or equivalent. The percentages for uncertainty in the table at paragraph 16 are given for individual measurements, averaged over the period for calculating target values and long-term objectives, for a 95% confidence interval. The uncertainty for continuous fixed measurements shall be interpreted as being applicable in the region of the concentration used for the appropriate threshold.

18. The uncertainty for modelling and objective estimation means the maximum deviation of the measured and calculated concentration levels, over the period for calculating the appropriate threshold, without taking into account the timing of events.

19. "Time coverage" means the percentage of time considered for settling the threshold value during which the pollutant is measured.

20. "Data capture" means the ratio of the time for which the instrument produces valid data, to the time for which the statistical parameter or aggregated value is to be calculated.

21. The requirements for minimum data capture and time coverage do not include losses of data due to the regular calibration or normal maintenance of the instrument.