

UK Technical Advisory Group on the Water Framework Directive

Reporting Confidence in Groundwater Status Assessments

This Guidance Paper is a working draft defined by the UKTAG. It documents the principles to be adopted by agencies responsible for implementing the Water Framework Directive (WFD) and the Groundwater Daughter Directive in the UK. The methods will evolve as they are tested and further clarification on the requirements for trend assessment is provided by the European Commission through its Common Implementation Strategy Guidance. This draft will be amended accordingly.

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WFD Requirement:	Classification schemes	UKTAG Review:	No date set

Purpose

- 1 This paper provides an outline of the methods that will be used to report confidence in the classification of groundwater bodies. It should be read in conjunction with UK Technical Advisory Group (UKTAG) papers 11b(i) and 11b(ii), which provide guidance on groundwater classification.
- 2 Note that the level of confidence in a status assessment is different to the level of confidence and precision in monitoring. This latter issue is addressed separately in UKTAG guidance on groundwater monitoring 12a.

Background – WFD Requirements

- 3 The Water Framework Directive (WFD) sets 3 objectives for groundwater:
 - to achieve good chemical and quantitative status and ensure no deterioration of status (status objectives);
 - "prevent or limit" the input of pollutants; and,
 - put in place measures to reverse any significant and sustained upward trends in pollutant.

- 4 There are only 2 groundwater status classes; either “good” or “poor”. In contrast, surface water status, which can be high, good, moderate, poor, or bad.
- 5 There is no explicit requirement in the WFD to report confidence in groundwater status. In relation to WFD chemical status objectives, Annex V 2.4.1 requires only that *“Estimates of the level of confidence and precision of the results provided by the monitoring programmes shall be given in the plan.”* No additional stipulations on confidence are given in the Groundwater Daughter Directive (GWDD).
- 6 There are no specific requirements at all for assigning confidence in relation to quantitative status or “prevent and limit” objectives in either the WFD or GWDD.
- 7 In relation to trend objectives, WFD (Annex V 2.4.1) requires that *“Reversal of a trend shall be demonstrated statistically and the level of confidence associated with the identification stated.”* Similar requirements are outlined in Annex IV of the GWDD.
- 8 In contrast to groundwater, the WFD places a much greater onus on confidence for surface waters with a much more explicit link between confidence and status. For example, Annex V (1.3) states that *“Member States ... identify the appropriate taxonomic level required to achieve adequate confidence and precision in the classification of the quality elements.”*
- 9 UKTAG guidance on surface water classification gives the assessment of confidence a real practical relevance in order to help assess the need for remedial action. The guidance states that *“understanding and managing the risk of misclassification is important because of the potential to fail to act because a water body has been wrongly reported as better than it is or to waste resources on water bodies that have been wrongly classed as worse than good..... We will only seek costly action to improve particular water bodies if we have high confidence that such action is truly needed.”* The guidance on surface water proposes to report both “face value” results and the confidence in classification. This will be done for each quality element for each water body.

Principles for Reporting Confidence in Groundwater Status

- 10 Though not an explicit requirement of the WFD, UKTAG recommends that groundwater classification should be accompanied by an assessment of the level of confidence in the result. This is in line with UKTAG surface water requirements and will help provide a “common language” for River Basin Planners across both surface and groundwaters.
- 11 Groundwater classification comprises 4 quantitative and 5 chemical status tests, (ref UKTAG paper 11b(i) and 11b (ii)). Through River Basin Planning, each of the status test results should be reported as a face value class plus an assessment of confidence.
- 12 Confidence should be reported as a qualitative statement, and should be used as an indicator for prioritising action. Given that the basic classification criteria for both chemical and quantitative status comprise a rigorous weight of evidence approach, all poor status classifications for groundwater will require some form of action.

13 Confidence in poor status will be reported as “high”, and “low”, depending on the test. For groundwater status, these terms are defined as follows:

- “High” confidence will usually mean that competent authorities can proceed immediately to considering restorative action, or, for example, improvement to existing measures, according to procedures in the Directive.
- “Low” confidence will usually mean that further investigation should be carried out as a priority to improve confidence and measures taken in the first River Basin Cycle where appropriate.

It is stressed that the assessment of confidence in status should not be used as the only driver for instigating measures. Good status groundwater bodies may require higher priority attention if they are predicted to fail either the trend objective in the long term or some other measure of the risk of future deterioration in status.

14 Confidence in good status will be reported either “high” or “low”; being defined as follows:

- “High” confidence will usually mean that the only requirement is to assess potential deterioration using surveillance monitoring.
- “Low” confidence is associated with a more limited evidence base. Further monitoring will be required to improve the level of confidence.

15 It is recommended that decisions on which level of confidence to assign to each status test should be reached using a combination of statistical and weight of evidence criteria, using the principles outlined in this paper.

16 The basic UKTAG classification criteria (as outlined in papers 11b(i) and 11b(ii)) set out the poor/good class boundaries. There is considerable scope within these criteria for amendment or interpretation at a local level by agencies. The detailed guidance on confidence as outlined in this document reflects only the UKTAG criteria. Where agencies have developed variations on these criteria, confidence assessments can be adjusted in accordance with the principles set out here.

17 As a principle guiding the assessment of confidence in each of the individual status tests, the key criteria are: a) the strength of the overall “weight of evidence” supporting the status assessment, and b) a combined assessment of the monitoring data in terms of the magnitude of overall departure from the poor/good status boundary and the variability of the data.

18 Directive requirements for reporting on confidence & precision in monitoring programmes are a separate issue. They have been addressed for groundwater in UKTAG guidance on groundwater monitoring (paper 12a) and CIS monitoring guidance. The reporting mechanism will be through Article 8 reporting via the WISE1 database. Directive requirements relating to groundwater trends objective are also addressed in a separate UKTAG paper.

¹ Water Information System for Europe

Criteria for Reporting Confidence in Groundwater Status

- 19 Although there is no formal requirement to report confidence alongside status the confidence associated with both chemical and quantitative status will be reported in the RBMP (see paragraphs 5 and 10). The WFD requires both chemical and quantitative status of groundwater bodies to be reported.
- 20 Confidence in chemical status and quantitative status will be determined and reported separately. For poor status groundwater bodies, the highest level of confidence from each of the individual tests should be reported. For good status groundwater bodies, the lowest level of confidence from each of the individual tests should be reported. An example is provided in Figure 1.
- 21 Reporting a single overall status result encompassing both chemical and quantitative elements is not required or advisable.

Figure 1: Classification and Confidence: example results and procedure for defining overall confidence

Test	Status result	Confidence
No saline or other intrusions	Good	High
Drinking Water Protected Areas (DWPA).	Good	Low
Groundwater Dependent Terrestrial Ecosystem (GWDTE).	Poor	Low
No significant diminution of surface water chemistry and ecology	Poor	High
General Chemical Test	Poor	Low

Overall Chemical Status: Poor Status (High Confidence)

Test	Status result	Confidence
Water Balance Test	Good	High
Surface Water Element	Good	High
Groundwater Dependent Terrestrial Ecosystem (GWDTE).	Good	Low
No saline or other intrusions	Good	High

Overall Quantitative Status: Good Status (Low Confidence)