Appendix 10.3: WFD Classification

Department for Environment Food & Rural Affairs

Llywodraeth Cymru
Welsh Government

Water Framework Directive implementation in England and Wales: new and updated standards to protect the water environment

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1. Purpose

This document informs interested parties of the details of new and updated environmental standards to be used in the second cycle of Water Framework Directive (2000/60/EC) river basin management planning process in England and Wales. It also presents new and updated assessment criteria for biological elements that must be monitored to assess the ecological status of surface water bodies. This document does not cover any standards and biological assessment criteria that are unchanged for second cycle. The document should be read alongside the draft updated Ministerial Guidance to the Environment Agency and Natural Resources Wales on River Basin Management Planning which refers to the standards in **Chapter 9**. The relevant Directions to the Environment Agency and Natural Resources Wales (referred to hereafter as the Agencies) will be updated to give legal effect to the standards by September 2015.

2. Introduction

2.1 The Water Framework Directive (WFD) (2000/60/EC) introduced a comprehensive river basin management planning system to help protect and improve the ecological health of our rivers, lakes, estuaries and coastal and groundwaters. This is underpinned by the use of environmental standards to help assess risks to the ecological quality of the water environment and to identify the scale of improvements that would be needed to bring waters under pressure back into a good condition.

2.2 In 2009, prior to the publication of the first river basin management plans, the Agencies were directed by the Secretary of State and Welsh Ministers to apply a range of environmental standards in protecting and improving the water environment. These 2009 Standards Directions were later replaced by the 2010 Standards Directions. The Agencies were also directed on the use of the standards in assessing the status of the water environment ("the 2009 Classification Directions"). In parallel, Ministerial Guidance[1] included a description of how the Agencies were expected to use standards in classifying the status of water bodies, regulating controlled activities and setting environmental objectives.

2.3 The Agencies are now reviewing the River Basin Management Plans for the 2nd cycle (2015 – 2021) for consultation later this year and Ministerial sign-off by December 2015. Work to review and update classifications and objectives for the 2nd cycle will be carried out on the basis of new and updated standards based on recommendations from the UK Technical Advisory Group ("UKTAG") on the Water Framework Directive, a partnership of the UK environment and conservation agencies. These recommendations reflect the latest scientific understanding of the standards needed for a healthy water environment.

2.4 The technical basis for the standards has already been subject to peer review and public consultation by UKTAG and the updates to the ecological standards reflect the outcome of the latest, peer reviewed work across Europe to harmonise standards for good status. **This information document is about the adoption and application of the new and updated standards in river basin management in England and Wales. The 2010 Standards Directions and the 2009 Classification Directions will be updated to reflect these standards prior to finalisation of the Plans. The updated Standards Directions will include these new and updated standards as well as the standards that have not been changed within the current 2010 Directions and which continue to be applicable.**

[1] River Basin Planning Guidance, 2006 and River Basin Planning Guidance Volume 2, August 2008

2.5 The Directive 2013/39/EC updating the list of priority substances and priority hazardous substances that will apply to WFD assessment has not been reflected in this document. However, it is our intention to transpose the Directive by updating the list of priority substances in the updated 2010 Directions, such that the standards set by the 2013 Directive will apply for the second cycle river basin management plans.

2.6 Adopting these new and updated standards has implications for classification of water bodies and where we target our efforts to protect and improve the water environment. However, the standards do not dictate the achievement of the WFD objectives, since the latter strikes a balance between protecting the water environment and enabling its sustainable use. Where, for example, making the improvements needed to achieve the standards required for good status would be disproportionately expensive, we will extend the deadline for the achievement of the objectives or set less stringent objectives. When Ministers agree the final plans they will take into account the balance of costs and benefits and the appropriate phasing of improvements over this 2nd cycle period (to 2021) and beyond to 2027.

3. Overview of proposals

3.1 Deriving standards

3.1.1 UKTAG is a working group of experts drawn from UK environment agencies and conservation agencies[2]. It also includes representatives from the Republic of Ireland. UKTAG develops guidance and makes recommendations to the UK's government administrations on technical aspects of implementation of the Water Framework Directive to help with river basin planning. It operates through a series of technical task teams established for specific subjects including chemicals, marine waters; water resources, groundwater and fresh-waters, and recommendations are made following stakeholder engagement. UKTAG's role includes provision of technical advice on appropriate classification tools and classification rules for chemical, biological and physical quality elements and the environmental standards for achieving different WFD status and how they may be used for river basin planning. The group also offers advice to the Agencies that provide its members.

3.1.2 In developing recommendations for environmental standards the UKTAG takes into consideration available scientific and technical evidence and it may commission research into specific areas where the science is not fully understood. UKTAG involved stakeholders in their latest review through workshops and technical consultations on their proposals between April 2012 and July 2013.

3.1.3 In presenting its advice and recommendations to the UK's government administrations, UKTAG sought to put into context proposals for new or revised standards by describing the likely changes in WFD status classification at a UK level or at an individual country level where possible.

3.1.4 In developing its standards, where possible UKTAG has used ecological data collected from hundreds or thousands of sites. UKTAG has compared these with information for the same sites on the environmental conditions to which the plants and animals are sensitive. This process can identify standards that correspond directly with the ecological definition of good status. In other cases, in estuaries and coastal waters for example, and generally for pollutants not historically subject to big programmes of monitoring, there are insufficient data to derive standards in this way. In such cases, UKTAG has used the current scientific understanding of the causes of ecological change, or the risk of harm in the case of chemicals. UKTAG has compared this understanding with the Directive's biological descriptions of the classes. In doing this, UKTAG has sought advice from independent experts from a range of scientific disciplines. UKTAG has used this

[2] Natural England (NE), Environment Agency (EA, England), Natural Resources Wales (NRW), Northern Ireland Environment Agency (NIEA), Joint Nature Conservation Committee (JNCC), Scottish Environment Protection Agency (SEPA), Scottish Natural Heritage (SNH), Republic of Ireland's Department of Environment, Community and Local Government (DECLG).

approach to identify limits for river flow and water levels, and for standards for particular chemicals.

3.1.5 Environmental standards form the foundation of a risk-based approach to river basin management planning. Updating environmental standards in light of improved scientific understanding enables us to ensure we appropriately protect the water environment without imposing unnecessary constraints on development. It also enables us to refine our understanding of where the water environment is under pressure and the scale of environmental improvements we would need to achieve good ecological quality.

3.2 Biological assessment methods

3.2.1 We are proposing to direct the Agencies to apply 21 new or revised biological assessment methods. The new methods will provide the most comprehensive understanding yet of the biological impact of human pressures, particularly nutrient pollution.

3.2.2 Inputs of plant nutrients, such as phosphorus, from sewage, fertilisers and animal manures are our most widespread form of pollution. All of the new biological methods are more accurate so that we can better identify where to target measures to protect the environment. The new methods will provide the most comprehensive understanding yet of the impact of nutrient pollution. The Agencies will also be able to start to directly assess some of the ecological impacts of water abstractions. Section 4 discusses the new biological assessment methods in more detail.

3.3 Water quality standards

3.3.1 We are proposing to direct the Agencies to apply new and revised water quality standards for: 16 specific pollutants in surface waters; phosphorus, oxygen conditions and acidity in rivers; nitrates and other pollutants in groundwater. These standards are detailed in Section 5. The standards incorporate the latest understanding of the ecological risk posed by the pollutants and include, for example, standards for a number of metals that, for the first time, take account of local environmental characteristics that affect how much of the metal is bound up and so unavailable to cause toxic effects.

3.3.2 Protected areas under WFD include shellfish waters and we are proposing to direct the Agencies to continue to endeavour to observe the microbial standard in shellfish waters, to contribute to a high quality shellfish product directly edible by humans. The standard will remain almost identical, but will be updated in Directions to measure *E.Coli*.

3.4 River flow and lake level standards

3.4.1 We are proposing to direct the Agencies to apply revised standards for water levels in freshwater lakes. UKTAG were commissioned to review the standards to make sure that we further develop our knowledge from their application and from continuing developments in scientific understanding. These are discussed in Section 6. Section 6 also includes further information about current river flow standards. We are not proposing to introduce revised standards for river flows.

3.5 Invasive non-native species

3.5.1 We are proposing to revise the list of high impact invasive non-native species that the Agencies are specifically required to take into account when classifying the status of rivers, lakes, estuaries and coastal waters. The revisions are based on new and improved risk assessments undertaken by the Great Britain Non-Native Species Secretariat (GBNNSS). A number of species originally thought to be high impact are now considered likely to have a moderate or even low impact. We are proposing to remove these species from the high impact list. Further details are provided in Section 7.

3.6 Summary of the implications of our proposals

3.6.1 In each section, the potential implications for water body classification of applying the new or revised standards are described. The standards are based on the latest scientific understanding of aquatic ecosystems and take account of the evidence gained from using the existing standards and environmental monitoring programmes from across the UK and beyond.

3.6.2 There are new ecological standards for rivers, lakes, estuaries and coastal waters. The majority of these have been benchmarked with corresponding standards used by other European countries. Their introduction will make an important contribution to improving our understanding of the ecological quality of the water environment. This will help us better prioritise action, including in relation to two of our most widespread pressures, nutrient pollution and water abstraction.

3.6.3 Good ecological quality depends on having the right environmental conditions for water plants and animals to thrive. The revised standards for water quality, lake levels, and river flows are better matched to ecological risk than before. The application of the standards will strengthen our risk-based, proportionate approach to managing pressures on the water environment.

3.6.4 Some of the existing standards have proved to be insufficiently stringent to protect ecological quality whilst others have proved more stringent than necessary. As a consequence, some of the proposed standards are less stringent than the existing standards they will replace whilst others are more stringent.

3.6.5 The introduction of the new standards will give us a better basis for prioritising environmental improvements and identifying the reduction in pressures likely to be needed to improve ecological quality. However, it is the achievement of the WFD objectives which will continue to determine whether action to reduce pressures on the water environment is proportionate, taking account of the costs and benefits involved.

Links to UKTAG documents relevant to each section are provided in Appendix 3 for reference.

4. Biological standards

4.1 Overview of biological methods

4.1.1 We are planning to introduce a range of new or revised biological standards and associated assessment methods for the purpose of classifying, and assessing risks to the status of water bodies. Biological standards are values for quantifying indicators of ecological quality, such as the abundance of different types of fish or invertebrates. They define the boundaries between five ecological status classes (high, good, moderate, poor and bad) and are used in assessing the status of rivers, lakes, estuaries and coastal waters. Classification of waters into status classes helps identify where environmental improvements are needed and where improvement efforts have been successful.

4.1.2 The standards and methods proposed are summarised below with the likely impact of their adoption on the status classification of waters.

4.1.3 Most of the proposed standards for high and good status reflect the result of a major exercise facilitated by the European Commission to harmonise our standards[3] with those used by other countries across Europe (intercalibration). We cannot apply standards less stringent than those identified through this peer reviewed exercise.

4.1.4 Improved biological assessment methods enable better, risk-based targeting of measures. This is because information from biological classification provides direct evidence of environmental damage or health. This evidence is used in prioritising efforts to protect the status of the water environment. Detailed technical information about the standards and the associated assessment methods is available from UKTAG.

4.2 Standards for rivers

4.2.1 We are proposing to introduce new standards for water plants, invertebrates and fish relevant to assessing the impact of a range of pressures on rivers, including nutrient enrichment, toxic pollution, oxygen depletion, acidification, barriers to fish migration, and damage to river habitats caused by modifications to river beds and banks. The standards for good and high status applicable to all but two of the methods[4] have been harmonised with the corresponding standards used by

[3] Information on the intercalibration exercise is available on the EC website

[4] The method for assessing the impact of bacterial tufts on phytobenthic communities. The ecological indicators for assessing the impact of water abstractions and damage to river habitats do not include standards for high or good status

other countries across the EU as part of the harmonisation exercise facilitated by the European Commission.

4.2.2 The proposed standards are likely to reduce the number of river water bodies in which aquatic plant communities are classed as adversely affected by nutrient enrichment. Initial indications suggest they are also likely to increase the number of rivers in which fish and invertebrates are classed as worse than good by 17% and 3%, respectively.

4.2.3 The overall effect on classification of the fish and invertebrate standards is likely to be limited because in many cases the pressures to which they are responding will be already reflected in classifications for other indicators of ecological quality.

Table 4.2 summarises the implications of the proposed standards for rivers (UK).

Table 4.2: Implications of proposed biology standards for rivers

Aquatic plants or animals assessed by the method	Principal pressures to which method is responsive	Link to proposed method & standards	Indicative implications		
			% water bodies less than good		No of water bodies on which assessment based
			Old method	New method	
Larger rooted or floating plants (macrophytes)	Nutrient enrichment	Link - revises existing method	28	28	1293
Small, bottom-living algae (phytobenthos)	Nutrient enrichment	Link - revises existing method	71	39	4019
Combined new macrophytes & phytobenthos methods[1]	Nutrient enrichment	Link – for further information	53	29	1213
Small, bottom-living algae (phytobenthos) interfered with by the growth of bacterial tufts and coats	Organic enrichment	Link – new, no existing method	No significant impact on overall classifications is expected. The impact of organic enrichment is already taken into account in assessments of invertebrates and water quality.		
Bottom-living invertebrate animals	General degradation, organic & nutrient enrichment, toxic pollutants and physical habitat damage	Link - revises existing method	24	24	2222
Acid-sensitive bottom-living invertebrate animals	Acidification	Link - revises existing method	18*	19*	114*

Notes

1. The macrophyte and phytobenthos assessment methods both respond to nutrient enrichment and so help identify where eutrophication is a problem. The diatom assessment method can be used on its own if mean alkalinity is < 75 mg/l $CaCO_3$ and the macrophyte method can be used on its own if mean alkalinity is >200 mg/l $CaCO_3$. Between values both assessment methods should be applied.

*Scotland data only

4.3 Standards for freshwater lakes

4.3.1 We are proposing to introduce new/modified standards for water plants relevant to assessing the impact of nutrient enrichment on freshwater lakes. These include standards for good and high status that have been aligned with the standards used by other countries across the EU. Assessments to date indicate that these proposals are likely to reduce the number of lakes in which aquatic plant and animal communities are classed as adversely affected by nutrient enrichment.

Table 4.3 summarises the implications of the proposed standards for freshwater lakes.

Table 4.3: Implications of proposed biology standards for lakes

Aquatic plants or animals assessed by the method	Principal pressures to which method is responsive	Nature of changes to assessment methods	Indicative implications		
			% water bodies less than good		No of water bodies on which assessment based
			Old method	New method	
Microscopic plants in the water column (phytoplankton)	Nutrient enrichment	Link - revises existing method	42	39	539
Larger rooted or floating plants (macrophytes)	Nutrient enrichment	Link - revises existing method	46	62	238
Small, bottom-living algae (phytobenthos)	Nutrient enrichment	Link - revises existing method	25	27	151
Combined new macrophyte, & phytobenthos methods[1]	Nutrient enrichment	Link - revises existing method	50	63	275

Notes
1) The macrophyte, and phytobenthos assessment methods all respond to nutrient enrichment and so help identify where eutrophication is a problem, so a combined assessment is summarised in the table. Benthic invertebrate assessments also contribute to assessment of nutrient enrichment but are not expected to affect proportions of water bodies classed as worse than good status.

4.4 Standards for coastal waters

4.4.1 We are proposing to introduce new or modified standards for water plants and invertebrate animals in coastal waters relevant to assessing the impact of nutrient enrichment, oxygen depletion, toxic pollution and some forms of habitat damage resulting from alterations to the sea bed or sea shore.

4.4.2 The standards for good and high status applicable to all the methods have been considered under the harmonisation exercise facilitated by the European Commission. This work is not expected to be complete until 2016 but the Commission is recommending that the proposed standards be used in the interim. UKTAG advise this is appropriate.

Table 4.4 summarises the implications of the proposed standards for coastal waters.

Table 4.4: Implications of proposed biology standards in coastal waters

Aquatic plants or animals assessed by the method	Principal pressures to which method is responsive	Nature of changes to assessment methods	Indicative implications
Microscopic plants in the water column (phytoplankton)	Nutrient enrichment	Link - revises existing method	Only minor changes in phytoplankton classification expected. Pressure may also be accounted for by opportunistic seaweed classifications and classifications of nutrient status.
Seaweeds - opportunistic species	Nutrient enrichment	Link - revises existing method	Only minor changes in classification expected.
Saltmarsh	Physical change	Link – new method	Not known but physical change is also reflected by the heavily modified water designations
Invertebrate animals – dog whelks	Toxic pollutant - tributyl tin	Link - revises existing method	No changes to classifications expected.[1]
Bottom-living invertebrate animals[2]	Organic pollution; toxic pollutants; Smothering - physical disturbance	Link - revises existing method	Only minor changes in invertebrate classification expected. Organic pollution & toxic pollutants also reflected at least in part by existing water quality classifications.

Notes

1. The method has been re-drafted to better explain how to apply it in practice, and a minor correction is to be made to the EQR for the good moderate boundary (corrected to 0.34 from 0.33).

2. Updated method includes reference conditions for a wider range of habitats, and also includes minor alterations to the weightings given to different taxa to reflect their relative sensitivity to pressures

4.5 Standards for estuaries

4.5.1 We are proposing to introduce new or modified standards for water plants, invertebrate animals and fish relevant to assessing the impact of nutrient enrichment, oxygen depletion, toxic pollution and some forms of habitat damage resulting from alterations to the bed or shore of estuaries.

4.5.2 The development of robust ecological assessment methods for use in estuaries has proved particularly technically challenging. The proposals represent a significant step forward and start to fill significant gaps in the existing range of assessment methods.

4.5.3 The same technical challenges have also limited progress across Europe in harmonising standards for good and high status in estuaries. The harmonisation exercise, facilitated by the European Commission, is not expected to be complete until 2016 but the Commission is recommending that the proposed standards be used in the interim. UKTAG advise this is appropriate.

Table 4.4 summarises the implications of the proposed standards for estuaries.

Table 4.5: Implications of proposed biology standards in estuaries			
Aquatic plants or animals assessed by the method	**Principal pressures to which method is responsive**	**Nature of changes to assessment methods**	**Indicative implications**
Microscopic plants in the water column (phytoplankton)	Nutrient enrichment	Link – new, no existing method	Some changes to classifications expected but pressure may also be accounted for in existing opportunistic seaweed classifications.
Seaweeds - opportunistic species	Nutrient enrichment	Link - revises existing method	Only minor changes in classification expected
Seaweeds – upstream distribution of specific seaweeds	Toxic substances	Link - revises existing method	Only minor changes in classification expected as change to existing method is minor. The pressure will also be accounted for, at least in part, in existing water quality classifications
Saltmarsh	Physical change	Link – new method	Not known but physical change is also reflected by the heavily modified water designations
Bottom-living invertebrate animals	Organic pollution; toxic pollutants; Smothering -physical disturbance	Link – new, no existing method	Some changes to classifications expected but organic pollution & toxic pollutants also accounted for at least in part by existing water quality classification.
Fish	Wide range of pressures	Link - revises existing method	Some changes in fish classification expected although at least some of pressures are also likely to be accounted for at least in part by existing classifications of other quality elements.

5. Water quality standards

5.1 Standards for phosphorus in rivers

5.1.1 We are proposing to introduce revised standards for phosphorus in rivers. Phosphorus is a plant nutrient and elevated concentrations can lead to accelerated growth of algae and other plants. The impact on the composition and abundance of plant species can have adverse implications for other aspects of water quality, such as oxygen levels and for the characteristics of river habitats. The various changes can then cause undesirable disturbances to the balance of plants living in the water and animals, such as invertebrates and fish. Elevated concentrations result from inputs of phosphorus from a range of sources, including in particular discharges of sewage and various diffuse agricultural sources.

5.1.2 The proposed new phosphorus standards are designed to take account of the proposed parallel changes to the standards for water plants in rivers and the latest scientific evidence on the effect of elevated phosphorus concentration on plant communities.

5.1.3 The proposal is for standards that are specific to the particular conditions at a site and calculated using the equation detailed in Appendix 1. This approach is designed to take account of the natural variation of nutrient concentrations along rivers and site-to site differences in the ecological response to elevated concentrations. Further technical details about the proposed standards are available from UKTAG.

5.1.4 UKTAG found the standards set in 2009 were not sufficiently stringent. In 75% of rivers with clear ecological impacts of nutrient enrichment, the existing standards produce phosphorus classifications of good or even high status. The proposed new standards are accordingly more stringent than the existing standards. Table 5.1a provides a comparison of the proposed new site-specific phosphorus standards and the existing type-specific standards.

Table 5.1a: Summary of existing and revised standards for phosphorus in rivers

Type (for existing standards)	Annual mean of reactive phosphorus (µg per litre)							
	High		Good		Moderate		Poor	
	Existing	New	Existing	New	Existing	New	Existing	New
Lowland, low alkalinity	30	19 (13-26)	50	40 (28-52)	150	114 (87-140)	500	842 (752-918)
Upland, low alkalinity	20	13 (13-20)	40	28 (28-41)	150	87 (87-117)	500	752 (752-851)
Lowland, high alkalinity	50	36 (27-50)	120	69 (52-91)	250	173 (141-215)	1000	1003 (921-1098)
Upland, high alkalinity	50	24 (18-37)	120	48 (28-70)	250	132 (109-177)	1000	898 (829-1012)

Notes:

1. The revised standards illustrated are the medians from, respectively, 456 lowland, high alkalinity sites; 129 upland high alkalinity sites; 137, lowland, low alkalinity sites; and 97 upland, low alkalinity sites. The numbers in parentheses are the upper and lower 5th and 95th percentiles of the standards for the sites in each type.
2. "Lowland" means less than or equal to 80 metres above mean sea.
   "Upland" means more than 80 metres above mean sea level.
   "Low alkalinity" with a concentration CaCO3 of less than 50 mg per litre.
   "High alkalinity" with a concentration $CaCO_3$ of greater than or equal to 50 mg per litre.

5.1.5 Based on an initial assessment of 804 sites in the UK, we expect the combined effect of the proposed new standards for phosphorus and for water plants (i.e. the biological elements most responsive to phosphorus) to classify up to 14% fewer water bodies as worse than good status as a result of nutrient enrichment. Table 5.1b summarises the likely effects on classifications.

Table 5.1b Comparison of the likely effects on classifications of the proposed new standards for phosphorus and water plants in rivers

	Proportion of waters in each class (%)					
	Existing standards			**Proposed new standards**		
	Phosphorus class only	**Combined phosphorus & plant class**	**Plant class only**	**Phosphorus class only**	**Combined phosphorus & plant class**	**Plant class only**
Good or better	80	34	39	65	48	60
Moderate or worse	20	66	41	35	52	40

5.1.6 The proposed standards represent a major step forward in matching nutrient concentrations to ecological change. However, it is also clear that factors other than those taken into account in the method for setting the standards can affect the extent to which water plants at any individual site respond to a given nutrient concentration.

5.1.7 Because we cannot be sure the standards are precisely matched to the ecology at any individual site, the proposal is not to seek costly action to reduce phosphorus concentrations at individual sites without appropriate ecological evidence of nutrient-related impacts.

5.1.8 Phosphorus standards are also used to assess whether the water environment can accommodate additional discharges without risking deterioration of status. Changes to the standards used in these assessments can affect the size of development that the Agencies advise can be accommodated in an area without, for example, increasing the level of sewage treatment.

5.1.9 The EA has estimated that the new standards will not tend to lead to any overall change in the capacity of rivers to accommodate potential increases in phosphorus loads (e.g. from growth at sewage discharges) compared to the current standards.

5.2 Standards for specific pollutants

5.2.1 Under the Water Framework Directive, chemicals posing the greatest risk of harm to or via the aquatic environment across the EU are classed as priority substances (or priority hazardous substances). Those considered as of concern at a national level are termed “River Basin Specific Pollutants”. The 2008 Environmental Quality Standards Directive[5] set the first list of priority substances: this list and the standards have recently been revised as an amendment via the 2013 Priority Substances Directive. While the amended Directive has yet to be transposed, we intend that the standards it sets will apply for the purposes of the second cycle of river basin plans.

5.2.2 In preparation for the first round of river basin management planning, UKTAG derived standards for 19 specific pollutants. These standards have now been reviewed for the second cycle. Revised standards for six existing specific pollutants and new standards for ten additional substances are proposed. The Agencies should take these new and revised standards into account when assessing risks to the water environment, classifying the status of water bodies and controlling discharges. Table 5.2a lists all the 29 pollutants with the new, revised and unchanged standards

[5] This Directive is also known as the Priority Substances Directive.

Table 5.2a: Proposed standards for 29 specific pollutants					
Substances	CONCENTRATION ug/l				Standard Status (Existing-E/ Revised-R/ New-N)
	Fresh water		Salt water		
	Long-term (Mean)	Short- term (95 percentile)	Long-term (Mean)	Short- term (95 percentile)	
Unionised ammonia	---	---	21	---	E
Arsenic	50	---	25	---	E
Benzyl butyl phthalate	7.5	51	0.75	10	N
Carbendazim	0.15	0.7	---	---	N
Chlorothalonil	0.035	1.2	---	---	N
Chromium(III)	4.7	32	---	---	E
Chromium(VI)	3.4	---	0.6	32	E
Chlorine	2	5	---	10	E
Copper	1µg/l bioavailable		3.76 µg/l dissolved, where DOC ≤1mg/l 3.76 + (2.677 x ((DOC/2) – 0.5)) µg/l dissolved, where DOC >1mg/l		R
Cyanide	1	5	1	5	E
Cypermethrin[1]	0.1	0.4	0.1	0.4	E
Diazinon	0.01	0.02	0.01	0.26	R/E
2,4- dichlorophenol	4.2	140	0.42	6	R
2,4- dichlorophenoxyacetic acid (2,4-D)	0.3	1.3	0.3	1.3	E
3,4- dichloroaniline	0.2	5.4	0.2	5.4	N
Dimethoate	0.48	4.0	0.48	4.0	E
Glyphosate	196	398	196	398	N
Iron	1	---	1	---	E
Linuron	0.5	0.9	0.5	0.9	E
Manganese	123µg/l bioavailable	---	---	---	N
Mecoprop	18	187	18	187	E
Methiocarb	0.01	0.77	---	---	N
Pendimethalin	0.3	0.58	---	---	N
Permethrin	0.001	0.01	0.0002	0.001	R
Phenol	7.7	46	7.7	46	E
Tetrachloroethane	140	1848	---	---	N
Triclosan	0.1	0.28	0.1	0.28	N
Toluene	74	380	74	370	R/E
Zinc	10.9 bioavailable plus Ambient Background Concentration (µg/l) dissolved		6.8 dissolved plus Ambient Background Concentration (µg/l)		R

[1] Note that cypermethrin becomes a Priority Substance under 2013/39/EU but there will be a transitional period before the PS standards apply.

5.2.3 The proposed standards are set out in Appendix 2 in more detail. Technical details on how they were derived are available from UKTAG[6]. An initial assessment of the likely extent of breaches of the standards has been undertaken. Table 5.2b lists the six revised pollutants and the ten additional substances, their major uses and summarises the results of the assessments. On the basis of information currently available, good compliance is likely.

Table 5.2b: Specific pollutants for which new or revised standards are proposed and assessment of the likely extent of breaches

Substances	Major uses of the chemical	Initial assessment of likely extent of breaches	Information used for initial assessment
Benzyl butyl phthalate	PVC plasticiser occurring in a wide range of industrial and domestic products	No breaches identified	Monitoring data from a small number of fresh- and saltwater sites
Carbendazim	Fungicide used in horticulture and agriculture	No breaches identified	Monitoring data from a small number of sites
Chlorothalonil	Fungicide used in agriculture, horticulture and amenity turf	No breaches identified	Monitoring data from a small number of sites
Copper	Widespread use in domestic and industrial applications	A moderate number of breaches expected in freshwaters in England and Wales. Also a low number of failures in salt waters in England.. However, a net decrease compared to former standards.	Monitoring data for a large number of fresh- and saltwater sites
Diazinon	Organophosphate insecticide, with agricultural, horticultural and veterinary uses (sheep dip)	Proposed standard less stringent than existing standard	
3,4-dichloroaniline	Industrial intermediate	No or at most very small numbers of breaches expected	Based on limited monitoring data
2,4-dichlorophenol	Industrial intermediate	No breaches identified	Monitoring data from a moderate number of fresh- and saltwater sites
Glyphosate	Herbicide	No breaches identified. Potential for at least short-term breaches in some circumstances.	Monitoring data from a small number of sites
Manganese	Widespread occurrence in domestic and industrial applications	A small number of breaches identified.	Monitoring data for over 200 sites in England and Wales.
Methiocarb	Carbamate insecticide and molluscicide	No breaches identified	Monitoring data from a very small number of sites.
Pendimethalin	Agricultural herbicide	No breaches identified	Monitoring data from a small number of sites
Permethrin	Pyrethroid insecticide, including some household uses	No breaches identified. Analytical limitations mean that marginal breaches may not have been ed.	
Tetrachloroethane	Industrial solvent and intermediate	No or at most very small numbers of breaches expected	Based on limited monitoring data
Toluene	Industrial solvent and intermediate	Proposed standard less stringent than existing standard	
Triclosan	Biocide (antibacterial); widely used in domestic products and personal care products	Possibility of marginal breaches at a small number of sites	Based on extrapolation from limited monitoring data and modelling assessments.
Zinc	Widespread occurrence in domestic and industrial applications	A moderate number of breaches expected in fresh- and saltwaters in England and Wales. This is similar to that based on the existing standard.	Monitoring data for a large number of fresh- and saltwater sites

[6] The information available from UKTAG includes detailed technical reports for each specific pollutant.

5.3 Standards for acidity in rivers

5.3.1 We are proposing to introduce new standards for acid neutralising capacity (ANC) in rivers, alongside the existing standards for pH. Acidic (low pH) conditions in rivers can result in high levels of soluble aluminium which is toxic to biological communities. pH can be used as a surrogate for aluminium concentrations and ANC, as a measure of the available buffering capacity, is a direct indicator of anthropogenic acidification.

5.3.2 Acidification is caused by emissions to the atmosphere of sulphur dioxide and oxides of nitrogen from the burning of fossil fuels. The gases undergo oxidation to form acids which are then mainly deposited by rain or snow. Some soils can act as a natural buffer against acidity. Acidification of rivers occurs where the soils have limited buffering capacity, for example thin soils on granite rock. Afforestation can also increase acidification as the trees' 'rough' canopies cause air turbulence and increase the amount of atmospheric pollutants that are deposited on a given area.

5.3.3 The proposed standards are set out in Table 5.3. Technical details on how they were derived are available from UKTAG. The proposed ANC standards generally place rivers in the same class as that indicated using appropriate biological assessment methods.

Table 5.3: Proposed standards for acid neutralising capacity[1] (ANC) in rivers as annual mean values

Class	Clear waters	Humic waters[2]
High	80	80
Good	40	50
Moderate	15	10
Poor	-10	5

Note:

1. ANC is calculated by the Cantrell method.
2. Humic waters mean rivers with an annual average concentration of dissolved organic carbon of greater than 10mg/l. Clear waters mean rivers with an annual average concentration of dissolved organic carbon of less than or equal to 10mg/l.

5.4 Standards for oxygen conditions and ammonia in rivers in relation to intermittent discharges

5.4.1 We are proposing to introduce standards for dissolved oxygen, biochemical oxygen demand (BOD), total ammonia and un-ionised ammonia relevant to managing the impacts of intermittent discharges. Intermittent discharges to rivers can occur in wet weather. They include discharges from combined sewer overflows and discharges from storm tanks.

5.4.2 The proposed standards are set out in Table 5.4(a) to 5.4(d). They include two types of standards, fundamental intermittent standards and 99th percentile standards. Fundamental intermittent standards are included for dissolved oxygen and un-ionised ammonia and are set to avoid concentrations known to cause damage to fish species and macroinvertebrates. 99th percentile standards are standards that are failed if the concentration of the pollutant is greater than the standard for 1% or more of the time. They are included for biochemical oxygen demand (BOD), total ammonia and un-ionised ammonia and are derived from the 90th percentile standards the Agencies are already directed to apply for BOD and total ammonia to help manage the risk posed by continuous discharges.

5.4.3 Application of the fundamental intermittent standards in rivers requires a detailed accurate river model. The 99th percentile standards are applied instead of, or as well as, the fundamental intermittent standards. Further technical information about the standards is available from UKTAG.

5.4.4 The standards are intended to assist the Agencies in setting appropriate operating requirements for (i) proposed new intermittent discharges; and (ii) existing intermittent discharges where such requirements are considered the most cost-effective and proportionate means of improving the status of water bodies. The standards are not intended to be used in classifying the status of water bodies.

Table 5.4(a): Fundamental intermittent standards for dissolved oxygen in rivers

Salmonid waters			
Return period	**Dissolved oxygen concentration (mg/l)**		
	1 hour	**6 hours**	**24 hours**
1 month	5.0	5.5	6.0
3 months	4.5	5.0	5.5
1 year	4.0	4.5	5.0
Cyprinid waters			
Return period	**Dissolved oxygen concentration (mg/l)**		
	1 hour	**6 hours**	**24 hours**
1 month	4.0	5.0	5.5
3 months	3.5	4.5	5.0
1 year	3.0	4.0	4.5

Notes

1. "Salmonid waters" means rivers which, in the Agencies' judgement, would support a sustainable fish population dominated by salmonid species.
2. "Cyprinid waters" means rivers which, in the Agencies' judgement, would support a sustainable fish population dominated by cyprinid species.
3. The standards apply when the concurrent concentration of un-ionised ammonia concentration is below 0.02 mg/l. The following correction factors apply at higher concurrent un-ionised ammonia concentrations:
4. Where the un-ionised ammonia lies between 0.02-0.15 mg NH3-N/l: the correction factor is an addition of (0.97 x $\log_e$ (mg NH3-N/l) + 3.8) mg O/l. For concentrations that exceed 0.15 mg NH3-N/l, the correction factor is +2 mg O/litre.
5. A correction factor of 3 mg O/l is added for salmonid spawning grounds.

Table 5.4(b): Fundamental intermittent standards for un-ionised ammonia in rivers			
Salmonid waters			
Return period	**Un-ionised Ammonia concentration (mg NH3-N/l)**		
	1 hour	**6 hours**	**24 hours**
1 month	0.065	0.025	0.018
3 months	0.095	0.035	0.025
1 year	0.105	0.040	0.030
Cyprinid waters			
Return period	**Un-ionised Ammonia concentration (mg NH3-N/l)**		
	1 hour	**6 hours**	**24 hours**
1 month	0.150	0.075	0.030
3 months	0.225	0.125	0.050
1 year	0.250	0.150	0.065

Notes

1. "Salmonid waters" means rivers of a type which, in the Agencies' judgement, would support a sustainable fish population dominated by salmonid species.
2. "Cyprinid waters" means rivers of a type in which, in the Agencies' judgement, would support a sustainable fish population dominated by cyprinid species.
3. The above limits apply when the concurrent concentration of dissolved oxygen is above 5 mg/l. At lower concentrations of dissolved oxygen the following correction factor applies: For dissolved oxygen less than 5 mg/l DO, multiply the standard by 0.0126 and the concentration of dissolved oxygen in mg O/litre, C, raised to the power of 2.72, that is, $0.0126\ C^{2.72}$.
4. The standards also assume that the concurrent pH is greater than 7 and temperature is greater than 5 degrees Centigrade. For lower pH and temperatures the following correction factors apply: Where the pH is less than 7, multiply the standard by 0.0003 and by the value of the pH, p, raised to the power of 4.17, that is: $0.0003\ p^{4.17}$. Where the temperature is less than 5 degrees Centigrade, multiply this correction factor by a further 0.5.

Table 5.4(c): 99th percentile standards for biochemical oxygen demand in rivers		
Status	**Types of river**	**99th percentile BOD (mg/l)**
High	1, 2, 4, 6 and salmonid	7.0
High	3, 5 and 7	9.0
Good	1, 2, 4, 6 and salmonid	
Good	3, 5 and 7	11.0
Moderate	1, 2, 4, 6 and salmonid	14.0
Moderate	3, 5 and 7	14.0
Poor	1, 2, 4, 6 and salmonid	16.0
Poor	3, 5 and 7	19.0

Table 5.4(d): 99th percentile standards for ammonia in rivers			
Type of standard	**Types of river**	**Total ammonia (mg NH4-N/l)**	**Un-ionised ammonia (mgNH3-N/l)**
		99th percentile	
High	1, 2, 4 and 6	0.5	0.04
High	3, 5 and 7	0.7	0.04
Good	1, 2, 4 and 6		
Good	3, 5 and 7	1.5	0.04
Moderate	1,2,4 and 6	1.8	0.04
Moderate	3,5 and 7	2.6	0.04
Poor	1,2,4 and 6		
Poor	3,5 and 7	6.0	-

Table 5.4(e): Types of river to which the proposed 99th percentile standards in Tables 5.4(c) and 5.4(d) apply					
Alkalinity (as mg/l $CaCO_3$)					
Altitude	Less than 10	10 to 50	50 to 100	100 to 200	Over 200
Under 80 metres	Type 1	Type 2	Type 3	Type 5	Type 7
Over 80 metres			Type 4	Type 6	

5.4.5 The proposed fundamental intermittent standards are the same as those the Agencies already applies operationally to manage risks from intermittent discharges. The 99th percentile standards in Tables 5.4(c) and 5.4(d) are derived from the Water Framework Directive 90th percentile standards that are already in use for managing the risk posed by continuous discharges. The Agencies previously used 99th percentiles that were derived from 90th percentile standards that were contained in previous classification systems, e.g. the River Ecosystem classes.

Water quality thresholds and standards for groundwater

5.5 Groundwater quality thresholds

5.5.1 We are proposing to introduce a range of new and revised thresholds for nitrate relevant to assessing the status of bodies of groundwater. The proposed nitrate thresholds are set out in Table 5.5(a). Further technical information about the thresholds and how they were derived is available from UKTAG.

Table 5.5(a): Proposed new and revised threshold values relevant to the assessment of groundwater chemical status

Risk indicated by failure of the threshold value		**Annual mean nitrate concentration (mg/l)**		
		Existing threshold	**Proposed threshold**	
			≤ 175 metres above Ordnance Datum	> 175 metres above Ordnance Datum
Risk to the quality of water being abstracted, or intended to be abstracted, from groundwater for human consumption[1]		42	37.5	37.5
Other risks to the quality of the groundwater resource		42	37.5	37.5
Risk to the quality of groundwater dependent wetlands[2,3,4,5]	Quaking bog	-	18	4
	Wet dune	-	13	13
	Fen (mesotrophic) and fen meadow	-	22	9
	Fen (oligotrophic and wetlands at tufa forming springs)	-	20	4
	Wet grassland	-	26	9
	Wet heath	-	13	9
	Peatbog and woodland on peatbog	-	9	9
	Wetland directly irrigated by spring or seepage	-	9	9
	Swamp (mesotrophic) and reedbed	-	22	22
	Swamp (oligotrophic)	-	18	18
	Wet woodland	-	22	9

Notes

1. The threshold value applies to groundwater representative of the quality of water being abstracted or intended to be abstracted.
2. When used for the purpose of status assessment, the wetland threshold values apply where (a) a wetland identified as directly dependent on groundwater is significantly damaged and (b) the characteristics of the damage are such that it may be due to nitrate reaching the wetland via groundwater.
3. The wetland nitrate thresholds are applied only in the groundwater on which the wetland depends. Monitoring or modelling information may be used for the assessments.
4. Detailed technical information about the derivation of the wetland threshold values is available from UKTAG.
5. When identifying wetland types in England, Wales and Northern Ireland one of best sources of information is a Scottish document on wetland typology titled 'A functional wetland typology for Scotland'.

5.5.2 Thresholds are used to help identify potential risks to the status of bodies of groundwater. If a threshold is found to be exceeded, this leads to further investigations to determine whether or not the body of groundwater concerned is in good or poor groundwater chemical status. The criteria for status assessment are specified in the 2009 Classification Directions. We are simultaneously proposing to introduce revised criteria for some of the relevant assessments. The proposed classification criteria are set out in Table 5.5(b).

Table 5.5(b): Proposed changes to risk indicators and classification criteria for groundwater chemical status

Trigger for investigation	**Investigation criteria for classification as poor status**
Failure of a threshold value indicative of risks to the quality of the groundwater resource[1] including its potential to support human uses.	1. The average of the monitoring results from all the monitoring points representative of the risk to the quality of the groundwater exceeds the threshold value; and 2. The concentration of the pollutant to which the threshold value applies exceeds the maximum concentration allowed in drinking water in at least one sample from an appropriately representative monitoring point.
A wetland identified as directly dependent on groundwater is significantly damaged; the characteristics of the damage are such that it may be due to nitrate reaching the wetland via groundwater; and failure of a threshold value indicative of risks to the ecological quality of the wetland type concerned	1. Evidence in the form of sufficient hydrogeological and ecological monitoring data of significant damage to a wetland caused by pollution; and the pollutants responsible for that damage are judged to have reached the wetland via groundwater. 2. The concentration of the pollutant to which the threshold value applies exceeds the maximum concentration allowed in drinking water in at least one sample from an appropriately representative monitoring point.

Note
1. Separate criteria are used in assessing whether deterioration in the quality of water within a drinking water protected area has compromised a relevant abstraction of water intended for human consumption. No changes are proposed to the way thresholds are applied for this purpose.

5.5.3 Elevated nitrate concentrations result from inputs from numerous diffuse sources, including in particular agricultural sources but also sewage infiltration. Widespread pollution can compromise existing uses of groundwater and impair the ability of groundwater to support abstractions for human consumption and other uses in the future. Good status requires that a groundwater body's ability to support human uses has not been significantly impaired.

5.5.4 Some groundwater bodies support important wetlands. If groundwater contains elevated concentrations of nitrate, this can produce significant changes to the natural plant communities of the wetlands. Good status requires that pollutants in groundwater are not causing significant damage to wetlands.

5.5.5 The proposed nitrate threshold indicative of risk to the quality of the groundwater resource is lower than the existing threshold. In combination with the proposed revised classification criteria, this is expected to lead to more investigations being triggered and more water bodies being identified as at poor status. The proposed change to this threshold means that common thresholds for nitrate will apply across the UK.

5.5.6 The nitrate thresholds indicative of risks to wetlands are not expected to be breached at many wetland sites. For example, if the 2009 classification was re-run using the new thresholds, UKTAG estimates that 5% of the groundwater bodies in England and 1% in Wales would progress to the stage of further investigations.

5.5.7 A significant proportion of flow in some rivers can come from groundwater. The ecological quality of such rivers can be harmed by changes to the quality of the groundwater inflows. One of the criteria for the classification of a groundwater body as good or poor is whether pressures on groundwater, such as pollution, are leading to significant damage to the ecological quality of a river, lake, estuary or coastal water. Each Member State is required to establish threshold values for groundwater for use in assessing this threat. The threshold values are designed to identify risks and so target further investigations. The latter are used to decide whether or not the groundwater body meets the criteria for classification as good or poor. A body is classed as poor status where:

- An environmental standard for a pollutant in an associated surface water body is breached; and
- The concentrations of the pollutant in the surface water resulting solely from anthropogenic inputs via groundwater represents at least 50% of the value of the environmental standard.

5.5.8 Following a review UKTAG has concluded that the existing method can produce thresholds that fail to identify significant risks. To improve the identification of risks requiring further investigation we propose to revise the method for deriving thresholds as follows:

Existing threshold	Proposed threshold
surface water standard ÷ dilution factor	0.5 x (surface water standard ÷ dilution factor)
Notes: The "dilution factor" is taken to be the fraction of the average annual river flow derived from groundwater inflows. It can be estimated from established hydrological indices such as the baseflow index, or from the ratio of catchment groundwater recharge to effective precipitation.	

5.5.9 Groundwater inflows can occur as obvious point sources (for example, from resurgences of mine water) and these can contribute to breaches of environmental standards in the surface water. In such cases assessments will continue to be based on a comparison of surface water quality upstream and downstream of the groundwater inflows. Threshold values in groundwater are not required for such assessments.

5.6 Groundwater quality standards

5.6.1 A regulatory approach to preventing and limiting the input of pollutants was set out in the UKTAG document 'Updated Recommendations on Environmental Standards'. This approach is being reviewed as part of an ongoing UKTAG project. We anticipate that UKTAG will consult on potential future options for meeting the prevent requirements of the 2006 Groundwater Directive in early summer 2014. In order to avoid any potential confusion pending the anticipated consultation the UKTAG standards have not been reproduced here.

5.6.2 In addition, the Joint Agencies Groundwater Directive Advisory Group (JAGDAG) is re-evaluating our approach to identifying hazardous substances in the context of the 2006 Groundwater Directive. Having implemented a revised methodology in 2012 JAGDAG are considering if any further revisions to this methodology are needed. We anticipate that further information will be available in the proposed UKTAG consultation in early summer 2014.

6. Water level and flow standards

6.1 Standards for river flows

6.1.1 We are not proposing to introduce revised standards for river flows. The Agencies use river flow standards to assess the risk to the ecological quality of rivers posed by new abstractions and in identifying the scale of improvements likely to be needed to achieve our objectives for rivers that are already under pressure from water abstraction.

6.1.2 The Agencies use flow standards to classify if a water body is at High Ecological Status and help identify where flows may not be supporting Good Ecological Status. The UKTAG flow standards for Good Ecological status are translated into the Environmental Flow Indicator which forms the basis of water abstraction regulation.

6.1.3 The review undertaken by UKTAG found insufficient evidence on which to base any revision of the existing flow standards for Good or High Ecological Status. Further details of the review are available from UKTAG.

6.1.4 The review did confirm that there is still uncertainty in the precise relationship between flow changes and good ecological quality. For this reason, UKTAG continues to recommend that, in a river in which the flow standards for Good are breached, supporting evidence of adverse ecological impacts is needed to have high confidence that the river is in a worse than Good status.

6.1.5 We do not expect the Agencies to require measures for improvements unless they are confident that the improvements are needed to achieve our environmental objectives.

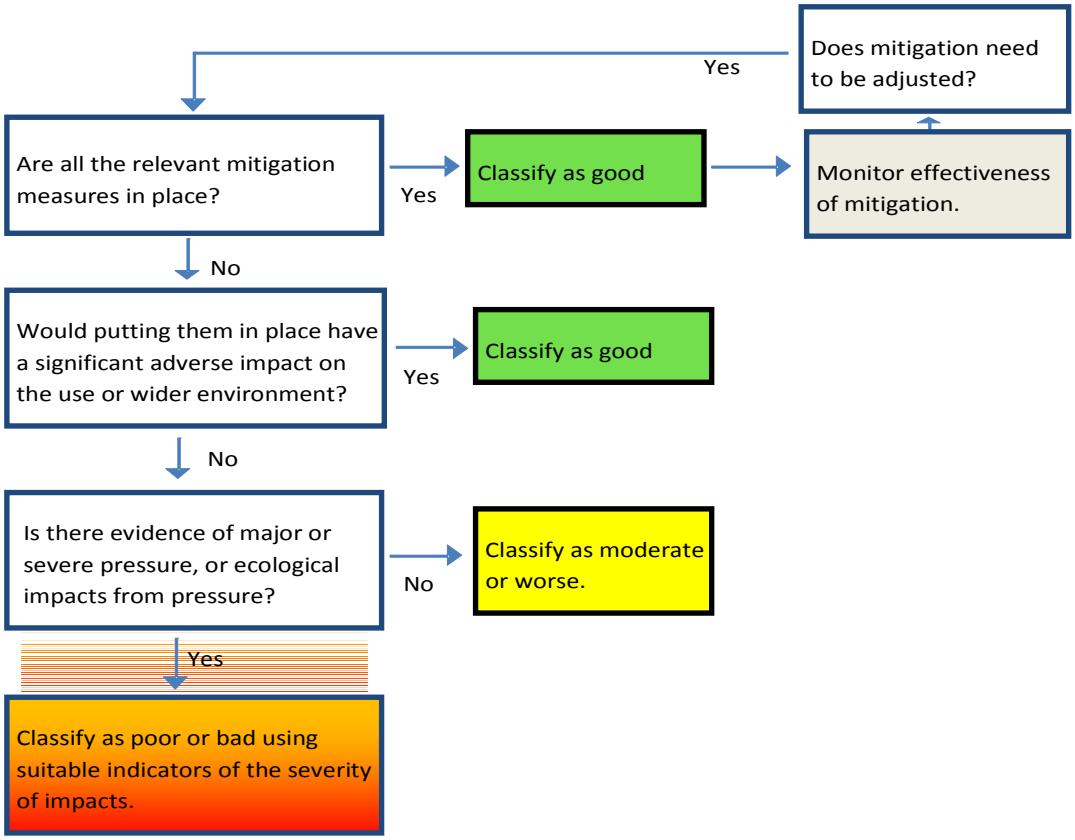
6.1.6 In rivers where flows are not supporting Good Ecological Status, the deviation from the Environmental Flow Indicator is assigned to a “non-compliance” band. These are used to prioritise investigations and improvement measures. The “non-compliance” bands will not be affected by the changes to the less than good standards.

Future developments in identifying the impacts of abstraction pressure

Work is being progressed by UKTAG on ecological assessment methods capable of measuring moderate impacts resulting from water abstractions as well as major and severe impacts. We expect these methods to become available within the next few years. Once they are, the Agencies expect to use them to add to the weight of evidence in managing abstraction pressure.

6.1.7 The Agencies also have to take account of pressures on river flows in classifying the ecological potential of heavily modified rivers (WR HMWB) affected by schemes that store water in reservoirs for hydroelectricity generation, public water supply or other uses. If, in the future, suitable ecological indicators of severity of impact are derived, a methodology to include these in future classification will be used. The revised approach we are proposing is outlined in Figure 6.1.

Figure 6.1: Outline of revised approach to taking account of pressures on river flows in classifying the ecological potential of heavily modified rivers affected by water storage schemes. Note: If other pressures are affecting the river, the overall ecological potential will be determined by the pressure having the greatest impact.



The ecological quality required for Good Ecological Potential depends on the mitigation that can be put in place without a significant impact on the benefit provided by the water use responsible for a water body's heavily modified physical characteristics or on the wider environment.

Mitigation measures for Good Ecological Potential

UKTAG has recently consulted on revised guidance to the UK environment agencies, on flows for good ecological potential. Copies of the guidance are available from UKTAG.

Different characteristics of the natural pattern of river flows are important for different ecological functions, such as fish migration. The guidance describes how to identify the flow needed for a number of key functions, taking account of the local characteristics of the river concerned.

We expect the Agencies to apply the UKTAG guidance in assessing whether or not the mitigation needed for good ecological potential has been put in place.

6.1.8 For uses such as drinking water supply, the significance of impacts on the benefit provided by the use has to be considered in a wider context. Improvements to different water bodies are also likely to have to be considered in different river basin planning cycles. The river basin planning process is expected to deal with these considerations as follows:

- Rivers for which there is ecological evidence of adverse impacts are prioritised for improvement and the objectives for them set out in the river basin management plans.
- The prioritisation is reviewed each planning cycle.
- When the cumulative impact of mitigation on the benefits provided by a use reaches a point beyond which it would become significant, any water bodies still classed as worse than Good Ecological Potential and for which no further mitigation can be put in place without a significant impact on use are re-classed as Good Ecological Potential. The box below contains the definition of significant adverse impact on use that will be used on WR HMWB that are designated as heavily modified due to water supply or storage operated by water companies.

Significant Adverse Impact On Use

The definition of Significant Adverse Impact on Use developed for WR HMWB (i.e. those designated for water supply and storage operated by water companies) is:
"The Water Resources Zone affected by the HMWB will go into a supply-demand deficit during the planning period, or experience an earlier or increased deficit during the planning period."

6.2 Standards for water levels in freshwater lakes

6.2.1 We are proposing to introduce new standards for lake levels in place of our existing standards. UKTAG reviewed the existing standards and found that they tend to over-estimate the risk posed by small changes in water levels and do not adequately differentiate between slight, moderate, major and severe impacts.

6.2.2 The proposed new standards are set out in Table 6.2. They are based on the effect of water level changes on lake surface area. Water abstraction lowers lake water levels. This can change the extent of shallow water through which sunlight can penetrate and increase the extent of very shallow habitats exposed to the erosive effect of wave action. The quality of deeper water habitats can in turn be reduced as a result of increased settlement of fine sediments from shallower areas. The extent of such effects largely depends on the shape of the bed of the lake, being greatest in shallow lakes with gently shelving sides. In contrast, deep, steep-sided lakes are less severely affected by water level changes.

6.2.3 Further technical information about the proposed standards and how they were developed is available from UKTAG.

Table 6.2: Standards for the effect of water level changes on lake surface area			
Daily maximum reduction in the reference condition lake surface area on 99% of days per year (%)			
High	Good	Moderate	Poor
1	5	10	20

Notes

1. "Lake surface area" means (a) the area of the lake's surface overlying water from the shore out to a depth 5 metres deeper than the depth at which rooted plants or bottom-living algae grow; or (b), if the deepest part of the lake is shallower than this, the whole area of the lake's surface.
2. "Reference condition" means the absence of any pressures that could affect the surface area of the lake or any pressures that could affect the depth at which rooted plants or bottom-living algae are able to grow. Reference conditions should be representative of the current standard UK Meteorological Office climate reference period (currently 1981 to 2010). For the purpose of assessing the risk posed to lakes identified as heavily modified, reference conditions means conditions consistent with good ecological potential.
3. With respect to note 1(a), in the absence of reliable information on the depth to which rooted plants or bottom-living algae grow under reference conditions, the depth out to which surface area is measured may be taken to be 7 metres in lakes of the geological sub-type "peat". For all other lakes, it may be taken to be 12 metres.
4. A lake is considered to be of geological sub-type peat where (i) its mean water colour is more than 90 hazen units; or (ii), where information on colour is unavailable, more than 75 % of the soils of its catchment area are comprised of peat.
5. Note: In England and Wales we do not use the less than good standards in classification but use them to prioritise collection of evidence to support potential remedial action.

7. Invasive alien species

7.1 The 2009 Classification Directions require the Agencies to take account of a range of listed high impact non-native invasive species when classifying the status of rivers, lakes, estuaries and coastal waters. A high impact invasive alien species is expected to have a significant adverse effect on the ecological quality of any part of the water environment in which it becomes established. Waters in which one or more of the species have become established cannot be classed as high ecological status. Instead they are classed as good, moderate, poor or bad status, depending on the extent and severity of the impact they have on the other plants and animals present.

7.2 A new list of high impact species has been proposed and is detailed in Table 7.1. A number of species have been moved to lower risk categories and others have been added to the high impact list. The revised list is based on the results of detailed risk assessments undertaken by the Great Britain Non-Native Species Secretariat (GBNNSS). Further information about the background to the proposals is available from UKTAG.

7.3 The operational list held by UKTAG is dynamic and will change as new species arrive and/or new risk assessments are completed.

7.4 There is now a single list of species, rather than lists by water body type.

Table 8.1: Proposed list of high impact invasive alien species			
Species		**Result of GBNNSS risk assessment**	**Changes proposed to existing high impact list**
Australian swamp stonecrop	*Crassula helmsii*	High impact	None
Floating pennywort	*Hydrocotyle ranunculoides*	High impact	None
Water fern	*Azolla filiculoides*	High impact	None
Parrot's feather	*Myriophyllum aquaticum*	High impact	None
Curly water-thyme	*Lagarosiphon major*	High impact	None
Water primrose	*Ludwigia grandiflora*	High impact	None
Canadian pondweed	*Elodea canadensis*	High Impact	None
Nuttall's pondweed	*Elodea nuttallii*	High Impact	None
North American signal crayfish	*Pacifastacus leniusculus*	High impact	None
Freshwater amphipod	*Dikerogammarus villosus*	High impact	None
Freshwater amphipod	*Dikerogammarus haemobaphes*	High impact	Added
Mysid crustacean	*Hemimysis anomola*	Status not yet reviewed	None
Zebra mussel	*Dreissena polymorpha*	High impact	None
Topmouth gudgeon	*Pseudorasbora parva*	High impact	None
Red swamp crayfish	*Procambarus clarkii*	High impact	None
Virile crayfish	*Orconectes virilis*	High impact	Added
Goldfish	*Carassius auratus*	Status not yet reviewed	None
Common Carp	*Cyprinus carpio*	Status not yet finalised	None
Common cord-grass, Townsend's grass or ricegrass	Spartina anglica	Status not yet reviewed	None
Chinese mitten crab	*Eriocheir sinensis*	High impact	None
Slipper limpet	*Crepidula fornicata*	Status not yet reviewed	None
Leathery sea squirt	*Styela clava*	Status not yet reviewed	None
American oyster drill	*Urosalpinx cinerea*	Status not yet reviewed	None
Carpet Seasquirt	*Didemnum vexillum*	High impact	None
Australian tubeworm	*Ficopomatus enigmaticus*	Status not yet reviewed	None
Japanese knotweed	*Fallopia japonica*	High impact	None
Himalayan balsam	*Impatiens glandulifera*	Status not yet reviewed	None
Giant hogweed	*Heracleum mantegazzianum*	Status not yet reviewed	None
Rhododendron	*Rhododendron ponticum*	High impact	None
Giant knotweed	*Fallopia sachalensis*	High impact	Added
Japanese knotweed & Giant knotweed hybrid	*Fallopia x bohemica*	Status not yet reviewed	Added
Quagga mussel	*Dreissena bugensis*	Not present in UK	Removed
Freshwater amphipod	*Crangonyx pseudogracilis*	Low impact	Removed
Pacific oyster	*Crassotrea gigas*	Moderate impact	Removed
Japanese weed	*Sargassum muticum*	Low impact	Removed

8. Next steps

8.1 Following consideration of any comments received we plan to confirm to the Agencies in the updated Ministerial Guidance that the new and updated standards set out in this document should be used for the 2nd cycle of river basin management planning. By September 2015 we will update Directions to the Agencies on standards and classification. These will replace the Typology, Standards and Groundwater threshold values Directions 2010 and the Surface Water and Groundwater Classification Direction 2009.

8.2 We will be transposing Directive 2013/39/EU, which updates and amends the Environmental Quality Standards Directive 2008/105/EC. This will be done by making the requisite amendments to the 2010 Standards Direction by 14th September 2015.

8.3 This means that the Agencies will base the second river basin management plans on the improved understanding of the impacts of pressures on the water environment provided by the proposed standards.

8.4 Once the new Directions are finalised, the new standards will also apply in Marine Conservation Zones (MCZs) and regulators will apply them when carrying out their functions.

Appendix 1: Calculation of site specific river phosphorus standards

The standard for a site is calculated using the following equation:

Standard = 10^((1.0497 x log_{10} (EQR)+1.066) x (log_{10} (reference condition RP)- log_{10}(3,500)) + log_{10}(3,500))

The equation produces standards in the form of annual mean concentrations of reactive phosphorus in µg/l estimated for the lower class boundary of high, good, moderate and poor ecological status, depending on the value of "EQR" used.

“Reactive phosphorus" means the concentration of phosphorus as determined using the phosphomolybdenum blue colorimetric method. Where necessary to ensure the accuracy of the method, samples are recommended to be filtered using a filter not smaller than 0.45 µm pore size to remove gross particulate matter.

"EQR" means the ecological quality ratio at the status class boundary for the most sensitive of the new diatom and macrophyte assessment methods (i.e. the high, good, moderate or poor biological class boundaries). This is normally the diatom method at low alkalinities and the macrophyte method at high alkalinities. The values for EQR in the standard equation are: High, 0.702; good, 0.532; moderate, 0.356; poor, 0.166.

“Reference condition RP” means the reactive phosphorus concentration at near natural conditions as estimated using the equation below.

Reference condition RP = 10^(0.454 (log_{10}alk) – 0.0018 (altitude) + 0.476)

If the predicted value of reference condition RP predicted is < 7 µg/l, reference condition RP is set to 7 µg/l.

"Log10alk" means log10(alkalinity), where alkalinity is the concentration of $CaCO_3$ in mg/l. For sites with an alkalinity greater than 250, alkalinity is set to 250. For sites with an alkalinity less than 2, it is set to 2.

"Altitude" means the site's altitude above mean sea level in metres. For sites with an altitude greater than 355 metres, altitude is set to 355 metres.

Appendix 2: Standards for specific pollutants

Table A1: New/updated standards for benzyl butyl phthalate (µg/l)				
Water	**Exposure**	**Annual statistic**	**Proposed standard**	**Existing standard**
Fresh	Long-term	Mean	7.5	*20*
	Short-term	95-percentile	51	*100*
Salt	Long-term	Mean	0.75	*20*
	Short-term	95-percentile	10	*100*
NOTES 1. The recommended salt water standard is derived using a safety factor of 100. Where the standard is failed, it is recommended that supporting evidence of ecological damage should be obtained before committing to expensive action.				

Table A2: New/updated standards for carbendazim (µg/l)				
Water	**Exposure**	**Annual statistic**	**Proposed standard**	**Existing standard**
Fresh	Long-term	Mean	0.15	*0.1*
	Short-term	95-percentile	0.7	*1.0*

Table A3: New/updated standards for chlorothalonil (µg/l)				
Water	**Exposure**	**Annual statistic**	**Proposed standard**	**Existing standard**
Fresh	Long-term	Mean	0.035	*0.1*
	Short-term	95-percentile	1.2	*1.0*

Table A4: New/updated standards for copper (µg/l)				
Water	**Exposure**	**Annual statistic**	**Proposed standard**	**Existing standard**
Fresh	Long-term	Mean	1µg/l bioavailable[1]	*1–28* µg/l[4] dissolved
Salt	Long-term	Mean	3.76 µg/l dissolved, where DOC ≤ 1 mg/l	*5* µg/l dissolved
			3.76 + (2.677 x ((DOC/2) - 0.5)) µg/l dissolved, where DOC > 1 mg/l	
Notes 1. "Bioavailable" means the fraction of the dissolved concentration of copper likely to result in toxic effects as determined using the UKTAG Metal Bioavailability Assessment Tool (also referred to as a PNEC Estimator) for copper. 2. "DOC" means the annual mean concentration of dissolved organic carbon in mg/l. 3. The recommended salt water standard applies to the fraction of a water sample that passes through a 0.45-µm filter or that is obtained by any equivalent pre-treatment. 4. The existing freshwater standard depends on the hardness of the water.				

Table A5: New/updated standards for diazinon (µg/l)				
Water	**Exposure**	**Annual statistic**	**Proposed standard**	**Existing standard**
Salt	Short-term	95-percentile	0.26	*0.1*[1]
Notes 1. No changes are proposed to the UKTAG's existing recommendations on freshwater standards for diazinon or to the long-term salt water standard.				

Table A6: New/updated standards for 3,4-dichloroaniline (µg/l)				
Water	**Exposure**	**Annual statistic**	**Proposed standard**	**Existing standard**
Fresh	Long-term	Mean	0.2	–
	Short-term	95-percentile	5.4	–
Salt	Long-term	Mean	0.2	–
	Short-term	95-percentile	5.4	–

Table A7: New/updated standards for 2,4-dichlorophenol (µg/l)				
Water	**Exposure**	**Annual statistic**	**Proposed standard**	**Existing standard**
Fresh	Long-term	Mean	4.2	*20*
	Short-term	95-percentile	140	–
Salt	Long-term	Mean	0.42	*20*
	Short-term	95-percentile	6	–

Table A8: New/updated standards for glyphosate (µg/l)				
Water	**Exposure**	**Annual statistic**	**Proposed standard**	**Existing standard**
Fresh	Long-term	Mean	196	–
	Short-term	95-percentile	398	–
Salt	Long-term	Mean	196	–
	Short-term	95-percentile	398	–

Table A9: New/updated standards for manganese (µg/l)				
Water	**Exposure**	**Annual statistic**	**Proposed standard**	**Existing standard**
Fresh	Long-term	Mean	123 µg/l bioavailable[1]	-
Notes 1. "Bioavailable" means the fraction of the dissolved concentration of manganese likely to result in toxic effects as determined in accordance with the UKTAG Metal Bioavailability Assessment Tool (also referred to as a PNEC Estimator) for manganese.				

Table A10: New/updated standards for methiocarb (µg/l)				
Water	**Exposure**	**Annual statistic**	**UKTAG recommendation**	**Existing standard**
Fresh	Long-term	Mean	0.01	*0.01*
	Short-term	95-percentile	0.77	*0.16*

Table A11: New/updated standards for pendimethalin (µg/l)				
Water	**Exposure**	**Annual statistic**	**Proposed standard**	**Existing standard**
Fresh	Long-term	Mean	0.3	*1.5*
	Short-term	95-percentile	0.58	*6.0*

Table A12: New/updated standards for permethrin (µg/l)				
Water	**Exposure**	**Annual statistic**	**Proposed standard**	**Existing standard**
Fresh	Long-term	Mean	0.001	-
	Short-term	95-percentile	0.01	*0.01*
Salt	Long-term	Mean	0.0002	-
	Short-term	95-percentile	0.001	*0.01*

Table A13: New/updated standards for tetrachloroethane (TCE) (µg/l)				
Water	**Exposure**	**Annual statistic**	**Proposed standard**	**Existing standard**
Fresh	Long-term	Mean	140	–
	Short-term	95-percentile	1848	–

Table A14: New/updated standards for triclosan (µg/l)				
Water	**Exposure**	**Annual statistic**	**Proposed standard**	**Existing standard**
Fresh	Long-term	Mean	0.1	–
	Short-term	95-percentile	0.28	–
Salt	Long-term	Mean	0.1	–
	Short-term	95-percentile	0.28	–

Table A15: New/updated standards for toluene (µg/l)				
Water	**Exposure**	**Annual statistic**	**Proposed standard**	**Existing standard**
Fresh	Long-term	Mean	74	*50*
Salt	Long-term	Mean	74	*40*

Notes

1. No changes are proposed to the UKTAG's existing recommendations on short-term standards for toluene in freshwaters and salt waters.

Table A16: New/updated standards for zinc (µg/l)				
Water	**Exposure**	**Annual statistic**	**Proposed standard**	**Existing standard**
Fresh	Long-term	Mean	10.9 bioavailable plus Ambient Background Concentration (µg/l) dissolved[1,2]	*8–125 µg/l total*[3]
Salt	Long-term	Mean	6.8 dissolved plus Ambient Background Concentration (µg/l)	*40 µg/l total*

Notes:

1. "Bioavailable" means the fraction of the dissolved concentration of zinc likely to result in toxic effects as determined in accordance with the UKTAG Metal Bioavailability Assessment Tool for zinc.

2. Ambient Background Concentration (ABC) is an estimate of background based on a low percentile of monitoring data. ABCs for freshwaters in England & Wales are given in Table A17. For saltwater, an ABC of 1.1 µg/l is recommended. ABC is the environmental concentration expected where no (or only minor) anthropogenic inputs are present.

3. The existing freshwater standard depends on the hardness of the water.

Table A17: **Ambient Background Concentrations for dissolved zinc in freshwaters in England and Wales (to be used in conjunction with Table A16)**	
Catchment/Group of catchments[1]	**ABC (ug/l)**
Tyne	4.8
Tees	4.1
Ouse, Humber	2.9
Nene	4.0
Great Ouse	3.1
River Stour	3.0
Blackwater/Chelmer	3.6
Lee	3.3
Thames	2.0
Test	2.0
Avon/Hants	3.1
Exe	1.4
Dart	1.7
Clywd/Conwy	2.0
Dee	2.9
Eden	1.2
Anglesey	3.0
Tamar	2.9
Fal	5.8
Camel	7.1
Tone/Parrett	3.3
Frome, Bristol Avon	2.3
Wye	2.0
Usk	2.2
Taff	2.8
Neath	2.8
Loughar	3.9
Tywi	2.0
Teifi	2.5
Rheidol/Ystwyth	4.1
Dovey	3.2
Glaslyn	2.6
All other freshwaters not listed above	1.4
Notes 1. Freshwater ABCs in England and Wales are delineated by Hydrometric Area, details of which can be found on the CEH website.	

Appendix 3: – Reference to UKTAG reports

For ease of reference links to relevant UKTAG documents are noted under section headings used in the index and elsewhere within this document.

4. Biological standards

See: Updated Recommendations on Environmental Standards River Basin Management (2015-21), Final Report. Published November 2013. (Minor amendments January 2014)

http://www.wfduk.org/sites/default/files/Media/Environmental%20standards/UKTAG%20Environmental%20Standards%20Phase%203%20Final%20Report%2004112013.pdf

5. Water quality standards

5.1 Standards for phosphorus in rivers

See: Phosphorus Standards for Rivers Updated Recommendations, UK Technical Advisory Group. Published August 2013.

http://www.wfduk.org/sites/default/files/Media/UKTAG%20Phosphorus%20Standards%20for%20Rivers_Final%20130906_0.PDF

5.2 Standards for Specific Pollutants

See: Chapter 2: Standards for Specific Pollutants in the Updated Recommendations on Environmental Standards River Basin Management (2015-21), Final Report. Published November 2013. (Minor amendments January 2014)

http://www.wfduk.org/sites/default/files/Media/Environmental%20standards/UKTAG%20Environmental%20Standards%20Phase%203%20Final%20Report%2004112013.pdf

5.3 Standards for oxygen conditions and ammonia in rivers in relation to intermittent discharges.

See: Chapter 7 Intermittent Discharges in the Updated Recommendations on Environmental Standards River Basin Management (2015-21), Final Report. Published November 2013. (Minor amendments January 2014)

http://www.wfduk.org/sites/default/files/Media/Environmental%20standards/UKTAG%20Environmental%20Standards%20Phase%203%20Final%20Report%2004112013.pdf

5.4 Water quality thresholds and standards for groundwater

See: Chapter 3: Groundwater in the Updated Recommendations on Environmental Standards River Basin Management (2015-21), Final Report. Published November 2013. (Minor amendments January 2014)

http://www.wfduk.org/sites/default/files/Media/Environmental%20standards/UKTAG%20Environmental%20Standards%20Phase%203%20Final%20Report%2004112013.pdf

6. Water level and flow standards

6.1 Standards for river flows

See Chapter 5: River Flows in the Updated Recommendations on Environmental Standards River Basin Management (2015-21), Final Report. Published November 2013. (Minor amendments January 2014)

http://www.wfduk.org/sites/default/files/Media/Environmental%20standards/UKTAG%20Environmental%20Standards%20Phase%203%20Final%20Report%2004112013.pdf

6.2 Standards for water levels in freshwater lakes

See Chapter 6: Water Levels in Lakes in the Updated Recommendations on Environmental Standards River Basin Management (2015-21), Final Report. Published November 2013. (Minor amendments January 2014)

http://www.wfduk.org/sites/default/files/Media/Environmental%20standards/UKTAG%20Environmental%20Standards%20Phase%203%20Final%20Report%2004112013.pdf

7. Invasive alien species

See Chapter 4: Alien Species in the Updated Recommendations on Environmental Standards River Basin Management (2015-21), Final Report. Published November 2013. (Minor amendments January 2014).

http://www.wfduk.org/sites/default/files/Media/Environmental%20standards/UKTAG%20Environmental%20Standards%20Phase%203%20Final%20Report%2004112013.pdf