

The Water Framework Directive and its Relevance to Plant Protection Products

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Overview

- What does the WFD require?
- Which PPPs are covered by the WFD?
- How are substances selected & prioritised for WFD EQS derivation?
- How is a WFD EQS derived?
- How is EQS compliance monitored?
- Differences between WFD EQS and PPP registration methods & consequences of these
- Ways forward & conclusions

What does the WFD require?

- All inland and coastal waters to achieve “good status” by 2015.
- Establish river basin district structure with demanding environmental objectives. These include ecological targets for surface waters and the use of environmental quality standards (EQS) for individual chemical pollutants.
- All types of water including surface water, groundwater, estuaries and coastal waters.

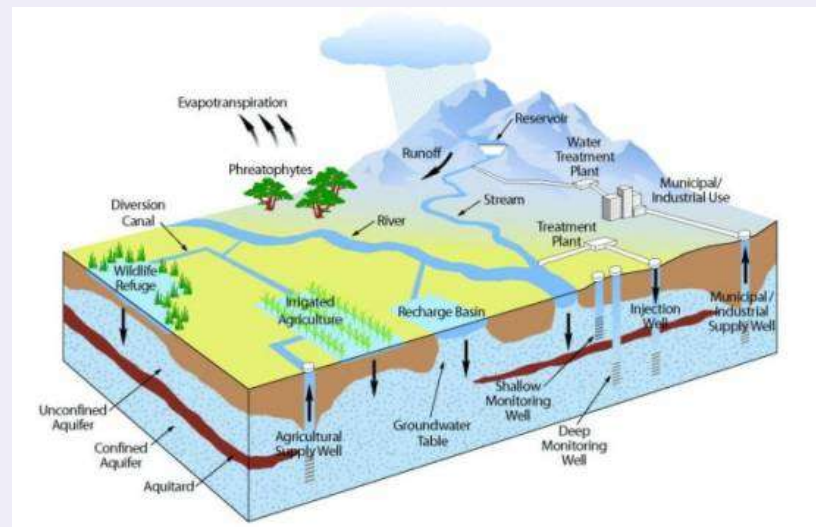
Surface waters

- EQS for PPPs designated as EU Priority and Priority Hazardous Substances and UK Specific Pollutants will need to be complied with to ensure achievement of “good” chemical and “good” ecological status respectively.
- For all other PPPs the aim is to ensure that levels are not present which lead to less than good status as shown by biological monitoring, or to a deterioration in ecological class.



Groundwaters

- Entry of PPPs into groundwater must be prevented or limited depending on their status as either “hazardous” or “non hazardous” substances, respectively.
- Concentration limits of 0.1 ug l^{-1} for a single PPP or 0.5 ug l^{-1} for total PPPs must not be breached across a groundwater body to ensure that good chemical status is maintained.
- Also, for groundwater there is an additional objective to take measures to reverse any significant upward trends.



Drinking water

- For catchments used for drinking water Member States must aim to *"ensure the necessary protectionwith the aim of avoiding deterioration in their quality in order to reduce the level of purification treatment required in the production of drinking water"*.
- Local objectives to limit PPP concentrations in intake water may vary depending on the risks within the catchment & level of treatment already installed.
- However at a UK level it is considered that the risk of exceeding 0.1 ug l^{-1} (the EC Drinking Water Directive limit for any individual PPP at the tap) should be the benchmark for initial risk assessment since any exceedance could trigger the need for treatment.



Which PPPs are covered by the WFD?

- WFD Annex X (EQS Directive 2008/105/EC)
 - Priority Substances/Priority Hazardous Substances
 - Set across EU by Commission
- WFD Annex VIII
 - Specific pollutants
 - Set by MS



Annex X (“PPPs”)

<i>Substance</i>	<i>CAS#</i>	<i>AA-EQS Inland surface waters</i>	<i>AA-EQS Other surface waters</i>	<i>MAC-EQS Inland surface waters</i>	<i>MAC-EQS Other surface waters</i>
Alachlor	15972-60-8	0.3	0.3	0.7	0.7
Atrazine	1912-24-9	0.6	0.6	2.0	2.0
Chlorfenvinphos	470-90-6	0.1	0.1	0.3	0.3
Chlorpyrifos	2921-88-2	0.03	0.03	0.1	0.1
Cyclodiene pesticides:		$\Sigma = 0.01$	$\Sigma = 0.01$	N/A	N/A
Aldrin	309-00-2				
Dieldrin	60-57-1				
Endrin	72-20-8				
Isodrin	465-73-6				
DDT total	N/A	0.025	0.025	N/A	N/A
para-para-DDT	50-29-3	0.01	0.01	N/A	N/A
Diuron	330-54-1	0.2	0.2	1.8	1.8
Endosulfan	115-29-7	0.005	0.0005	0.01	0.004
Isoproturon	34123-59-6	0.3	0.3	1.0	1.0
Simazine	122-34-9	1.0	1.0	4.0	4.0
Trifluralin	1582-09-8	0.03	0.03	N/A	N/A

Units = $\mu\text{g l}^{-1}$

UK Annex VIII (“PPPs”)

<i>Substance</i>	<i>CAS#</i>	<i>Proposed AA-EQS Inland surface waters</i>	<i>Proposed AA-EQS Other surface waters</i>	<i>Proposed MAC-EQS Inland surface waters</i>	<i>Proposed MAC-EQS Other surface waters</i>
2,4-D	94-75-7	0.3	0.3	1.3	1.3
Cypermethrin	52315-07-8	0.0001	0.0001	0.0004	0.0004
Diazinon	333-41-5	0.01	0.01	0.02	0.26
Dimethoate	60-51-5	0.48	0.48	4.0	4.0
Linuron	330-55-2	0.5	0.5	0.9	0.9
Mecoprop	93-65-2	5.5	0.3	24.0	1.7
Permethrin	52645-53-1	0.0015	0.0003	0.01	0.007

Units = ug l⁻¹

Substance selection & prioritisation

- Annex X used COMMPS
- Annex VIII
 - Different methods depending on MS, but should comply with inclusion criteria in Annex VIII: *"discharged in significant quantities into the body of water."*
 - This includes consideration of Biocides & PPPs.
- Prioritisation of further substances is ongoing, so Annex X & VIII lists likely to grow (& include more PPPs).



How is a WFD EQS derived?

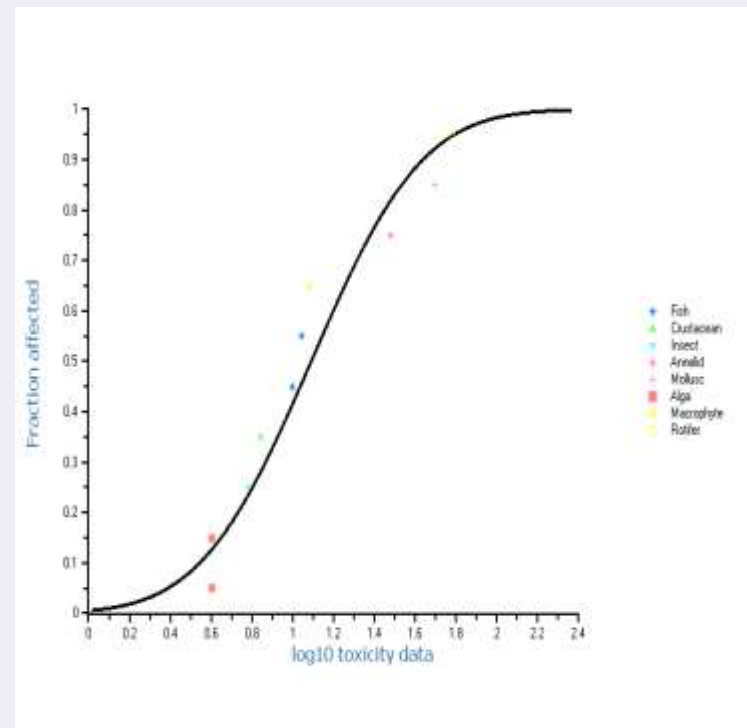
- Based on process described in WFD Annex V.
- Augmented by further guidance by FHI (Lepper 2005).
- Both of the above based on TGD procedure for deriving a PNEC.

Process

1. Perform full literature search
2. Identify most sensitive data point in each of three "trophic levels" (plant, invert & fish)
3. Score quality of each of these data (Klimisch) and relevance (demographic)
4. If of sufficient quality, use most sensitive of three as critical datum and apply AF (10 to 100).
5. If not, move on to next most sensitive datum until find the most sensitive, reliable & relevant.

Species Sensitivity Distribution (if n is high)

- Statistical approach to model (eco)toxicity data.
- A low value, the HC5, is theoretically protective of 95% of organisms.
- An assessment factor of 1-5 (usually 3-5) is applied to the HC5 to calculate a PNEC. At least 10 NOECs from at least 8 taxonomic groups:
 - fish
 - second family in the phylum Chordata (fish, amphibian, etc.)
 - crustacean
 - insect
 - family in phylum other than Arthropoda or Chordata (e.g. Rotifera, Annelida, Mollusca, etc.)
 - family in any order of insect or any phylum not already represented
 - algae
 - higher plants



Example: Atrazine

- Annex X Priority Substance
- EQS derived across whole of Europe (FHI on behalf of EC)
- Considered all available data & data compilations
- Methodology
 - Considered using SSDs based on different taxonomic groups
 - Also considered mesocosm results and a distribution of these.
 - Took scientifically-based approach: *"The TGD does not include a recommendation to use the 5-percentile of a distribution set up with mesocosm data to derive a threshold value for risk assessment (e.g. a PNEC). However, there do no scientific reasons exist as to why mesocosm NOECs could not be used the same way as single species tests NOECs in establishing such a distribution and threshold value"*
- $QS_{water} = \text{mesocosm HC5 (2.9 } \mu\text{g l}^{-1}\text{)} / \text{AF 5} = 0.6 \mu\text{g atrazine l}^{-1}$ (based on UK approach)

Compliance monitoring

- Only water column compliance required under WFD for almost all PS EQS (including all PPP EQS to date)
- Measurement of total (not dissolved) concentrations.
 - Can be a problem if high suspended sediments and hydrophobic PPP
- Some MS wish to monitor in sediment/biota
 - View of Commission to date is that this is generally too variable to be reliable, but individual MS allowed to do this if they wish
- Guidance on all aspects of priority substances (including monitoring) being developed by WFD CIS Working Group E.

Compliance monitoring

- Desire in UK for EQS to conform to criteria for “ideal standards:
 - Limit value (the “magnitude”)
 - Summary statistic (e.g., met for 95% of time): frequency
 - Period of time for calculation (e.g., a calendar year): duration
 - Definition of design risk (acceptable degree of failure, e.g. 1 year in 20)
 - Statistical confidence in demonstration of compliance (e.g. 95% confidence that failure occurs for more than 5% of the time)

WFD/PPP registration main differences

- Protection goals
 - Should be similar (good status versus no unacceptable effects)
 - But, EQS methodology much more protective than this.
 - Recovery considered for PPPs, which may make PPP authorisation less conservative than WFD EQS.
- Methodology
 - Broadly similar
 - WFD considers all existing data, PPP generates new data
 - SSD approach can be used differently
 - Higher tier assessments arguably more developed for PPPs?
 - WFD EQS subject to compliance monitoring (but WFD “weak” on monitoring of sediments & biota, so EQS for these of secondary importance)

Consequences

- Subtle differences in protection goals and methodologies may lead to different outcomes.
- Theoretical possibility that authorised PPPs used according to label will lead to WFD EQS failures.
- Leads to regulatory uncertainty



Ways forward?

- Uncertainty often leads to a precautionary response by authorities and a low EQS limit value.
- Authorities responsible for PPP authorisation may not be same as those developing WFD EQS – sociology can be at work here!
- Proprietary data may be valuable in EQS derivation (but can take too long to obtain from industry to be useful).
- It may be in interests of industry to fund further studies to fill gaps, reduce uncertainty, or allow use of SSD approach.
- Reliable monitoring data help to:
 - Prioritise (or de-prioritise!) specific pollutants.
 - Define the compliance monitoring methods & statistics.

Conclusions

- The WFD is relevant to PPPs at EU-wide and MS level, mainly through application of substance-specific EQS.
- More WFD EQS for PPPs likely to be developed over time.
- EQS derivation process similar to toxicity part of PPP authorisation process, but uses any available aquatic toxicity data.
- It is possible that differences in EQS and PPP authorisation approaches might lead to different results.
- The main difference is that current methods for derivation of an EQS are implicitly more conservative than the protection goals of both PPP authorisation and the WFD.
- Greater co-ordination between authorities responsible for PPPs and WFD EQS, and greater participation in EQS derivation by industry, would reduce chances for discrepancies and consequent over- or underprotection to occur.

Acknowledgments

- Environment Agency of England & Wales: Paul Whitehouse (Science) & Jo Kennedy (Policy).
- UK Chemicals Regulation Directorate: Simon Hoy.
- wca environment: Mel Gross & Claire Wells.

Derivation and Use of Environmental Quality and Human Health Standards for Chemical Substances in Water and Soil

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for Chemical Substances in Water and Soil

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