

North South Shared Aquatic Resource (NS Share)

Water Framework Directive

A Directive establishing a new framework for Community action in the field of water policy (2000/60/EC) came into force in December 2000. This Water Framework Directive (WFD) rationalises and updates existing legislation and provides for water management on the basis of River Basin Districts (RBDs). The WFD was transposed into national law in Northern Ireland by the Water Environment (Water Framework Directive) Regulations (Northern Ireland) 2003 and in the Republic of Ireland by the European Communities (Water Policy) Regulations 2003. The primary objective of the WFD is to maintain the “high status” of waters where it exists, prevent deterioration in existing status of waters and to achieve at least “**good status**” in relation to all waters by 2015.

NS Share Study Area

NS Share is a cross border project and incorporates three River Basin Districts as set out in the joint North/South Consultation paper *Managing our Shared Waters*:

1. North Western International River Basin District (NWIRBD);
2. Neagh Bann International river Basin District (NBIRBD);
3. North Eastern River Basin District (NERBD).

The NW and NB are International River Basin Districts as they share their waters between Northern Ireland (NI) and Republic of Ireland (ROI). The NERBD is contained wholly within NI.

NS Share Project

The overall objective of the project is to strengthen inter-regional capacity for environmental monitoring and management at the river basin district level, to improve public awareness and participation in water management issues, and to protect and enhance the aquatic environment and dependent ecosystems.

The NS Share project aims to facilitate delivery of the objectives of the WFD within the project area between August 2004 and March 2008.

The NS Share project is funded by the EU INTERREG IIIA Programme for Ireland / Northern Ireland. The Department of the Environment (NI) and the Department of the Environment, Heritage and Local Government (ROI) are implementing agents for the project. Donegal County Council is the project promoter. Technical support is provided by the Environment and Heritage Service an agency within the Department of the Environment (NI), and the Environmental Protection Agency (ROI). RPS Consulting Engineers in association with Jennings O'Donovan are the principal consultants.

Assistance was also provided by the Marine Institute, Central Fisheries Board, Geological survey Ireland, Geological survey Northern Ireland, Loughs Agency, North West Regional Fisheries Board, and Cavan, Leitrim, Longford, Louth, Meath, Monaghan, and Sligo County Councils.

Project publications are available at www.nsshare.com/publications

PREFACE

The work presented in this paper was carried out as part of the NS SHARE project, which is funded by the European Union INTERREG IIIA programme for Ireland/Northern Ireland. The implementing agents for the NS SHARE project are the Department of Environment (DOE), Northern Ireland, and the Department of Environment Heritage and Local Government (DEHLG), Republic of Ireland. Donegal County Council (DCC) is the project promoter.

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Glossary

CIS	-	Common Implementation Strategy
COMMPS	-	Combined Monitoring-based and Modelling-based Priority Setting Scheme
DARD	-	Department of Agriculture and Rural Development
DEFRA	-	Department for Environment, Food and Rural Affairs
DSD	-	Dangerous Substances Directive (76/464/EEC)
EPA	-	Environmental Protection Agency
EPER	-	European Pollutant Emission Register
EQS	-	Environmental Quality Standards
IMPRESS	-	Impact and Pressures Common Implementation Strategy Working Group
OSPAR	-	Oslo Paris Convention
PNEC	-	Predicted No Effects Concentration
UNEP POPs	-	United Nations Environmental Programme - Persistent Organic Pollutants
WFD	-	Water Framework Directive
WRc	-	Water Research Centre
WRc-NSF	-	Water Research Centre and National Sanitation Foundation
WWTP	-	Waste Water Treatment Plant
SNIFFER	-	The Scotland and Northern Ireland Forum for Environmental Research

1.0 Introduction

Member States are required under Article 5 (Annex II 1.4 – 2.5) of the Water Framework Directive (WFD) to assess the likelihood that waterbodies in their river basin districts will fail to meet the directive's environmental objectives. As part of this process, Member States must estimate and identify significant point and diffuse source pollution, in particular by substances listed in Annex VIII. An assessment of the susceptibility of surface water status to the identified pressures is also required. Northern Ireland, as a region of the UK, has applied a methodology presented in the Common Implementation Strategy IMPRESS guidance to develop a list of Candidate Specific Pollutants for Northern Ireland which supports the development of the UK's candidate specific pollutant list. This document records the data considered and the recommendations made by an expert group established by EHS to support Water Framework Directive implementation.

2.0 Background

A key objective of the Water Framework Directive is to achieve good chemical and ecological status by 2015.

Chemical status is determined by reference to established Environmental Quality Standards (EQS) for Annex IX substances and EQS values currently being determined for Annex X Priority Substances.

Ecological status determination requires assessment of three groups of elements:

1. Biological quality elements
2. Chemical and physico-chemical elements supporting the biological elements e.g. thermal, oxygenation and nutrient conditions and chemical pollutants derived from the 'universe of substances' listed in Annex VIII.
3. Hydromorphological elements supporting the biological elements.

The WFD requires Member States to identify the supporting chemical and physico-chemical substances which are present at sufficient levels to impact or cause risk to water status. Table 1 is an excerpt from the WFD and gives the indicative list of the main pollutants. The identified substances, referred to as Specific Pollutants (SP), must be selected from Annex VIII (points 1 to 9 only). Points 10 to 12 represent substances more commonly considered as general components.

Table 1: WFD Annex VIII- Indicative list of the main pollutants

Extract from WFD: ANNEX VIII - INDICATIVE LIST OF THE MAIN POLLUTANTS	
1	<i>Organohalogen compounds and substances which may form such compounds in the aquatic environment.</i>
2	<i>Organophosphorous compounds.</i>
3	<i>Organotin compounds.</i>
4	<i>Substances and preparations, or the breakdown products of such, which have been proved to possess carcinogenic or mutagenic properties or properties which may affect steroidogenic, thyroid, reproduction or other endocrine-related functions in or via the aquatic environment.</i>
5	<i>Persistent hydrocarbons and persistent and bioaccumulable organic toxic substances.</i>
6	<i>Cyanides.</i>
7	<i>Metals and their compounds.</i>
8	<i>Arsenic and its compounds.</i>
9	<i>Biocides and plant protection products.</i>
10	<i>Materials in suspension.</i>
11	<i>Substances which contribute to eutrophication (in particular, nitrates and phosphates).</i>
12	<i>Substances which have an unfavourable influence on the oxygen balance (and can be measured using parameters such as BOD, COD, etc.)</i>

3.0 Article 5 Initial Characterisation Analyses for Priority Substances and Specific Pollutants

An initial assessment of the susceptibility of surface water status to identified chemical and physico-chemical discharges was required as part of the Article 5 pressure and impact analysis and was undertaken by EHS and reported to the European Commission in early 2005. This was based on an assessment of authorised discharges and monitoring data using the most recent validated data.

4.0 The Methodology for Developing the Specific Pollutants List for Northern Ireland

The Common Implementation Strategy Impacts and Pressures Working Group produced guidance on a generic approach to identify Specific Pollutants which involves both a 'top down' and 'bottom up' selection procedure (Figure 1). The top down approach begins with identifying potential pollutants which may be discharged from point and diffuse sources. In contrast the bottom up approach starts with identifying those river basins where good ecological quality is not achieved or is deteriorating due to known or unknown pollutants. The approaches are complementary. EHS, in accordance with the guidance, undertook analysis of local human activities and investigative monitoring data to identify the Specific Pollutants in the context of the Northern Ireland region of the UK.

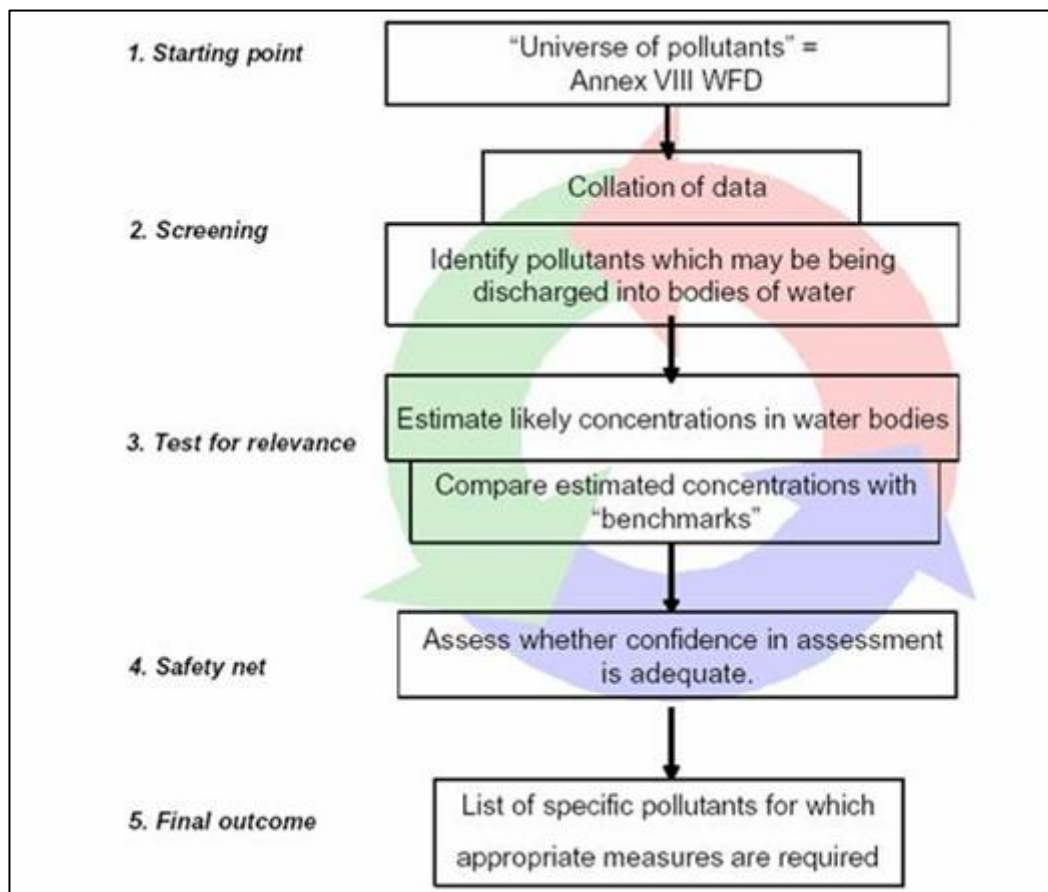


Figure 1 Generic Relevant Substance Selection Process – CIS IMPRESS Guidance

The steps involved in deriving the list are as follows:

Step 1 Starting Point. An initial 'Universe of Chemicals' was produced by the EHS, by compiling a comprehensive list of data sources relating to current obligations e.g. OSPAR, Dangerous Substances, monitoring programmes and information on other known problem substances. This list contained both Annex X Priority Substances and all other potential or known aquatic chemical pollutants.

Step 2 Screening. The screening process comprised collation of information about known discharges and impacts and on the production and usage of substances to identify a working list of substances potentially discharged to waterbodies. Sources of information such as existing water quality datasets and quantitative information from existing obligations such as the DSD, UNEP POPs and EPER programmes were investigated. This information was assessed by an expert group which screened the list based on knowledge of known discharges, known usage or results from previous monitoring programmes. Where there was reasonable confidence that a substance is not being discharged into waterbodies the substance was excluded from the working list. If insufficient data was available to determine whether a substance is discharged, application of the Precautionary Principle required that the substance was included on the U.K. candidate list. As substances contained in Annexes X and IX of WFD are to be controlled at European level only substances not included on these lists were considered for inclusion in the candidate list.

Step 3 Test for Relevance. This step aims to select substances on the candidate list which are causing or likely to cause, harm to the environment by threatening good ecological status. As it is not possible to confidently estimate likely concentrations in water bodies due to limited availability of monitoring data in Northern Ireland, the expert group relied on qualitative judgements to prioritise a short list of four key substances from the Candidate list, which were of greatest concern for Northern Ireland. This was in addition to substances already prioritised at U.K. level. These were submitted to the UK Chemistry Task Team as recommendations from Northern Ireland for inclusion in the early stages of the UK Prioritisation scheme. This scheme will identify those Specific Pollutants of most concern nationally and will be informed by the output from this project.

Step 4 Safety Net. This entails an iterative review to ensure that the list is current by periodically revisiting the process.

Step 5 Final Outcome. A list of Specific Pollutants will be produced for subsequent investigation at river basin district level by this process.

The Northern Ireland expert group has completed steps 1 and 2. Steps 3, 4 and 5 are being taken forward nationally through application of the UK Prioritisation Scheme and EHS will inform this process as necessary. Further review and development of this process will be undertaken prior to drafting the first river basin management plans. The application of this stepwise process in Northern Ireland to date is detailed further in Sections 5 to 7.

5.0 Starting Point - Data Sources - STEP 1

The following data sources and legislative obligations were consulted by EHS to compile the Universe of Chemicals:

Source/Sectoral Analysis

Any process or operation in Northern Ireland that may cause a pollutant to be released to the aquatic environment must be controlled by an authorisation issued by EHS. These authorisations were examined and any pollutants identified were included on the list.

Authorisation data sets included:

- Industrial Consents
- IPPC authorisations
- Radioactive Substances Act authorisations
- Water Service 'controlled' substances

Impact Datasets

Monitoring information contained in existing water quality data sets were examined and any pollutants monitored in the target water bodies, sediments or biota also included. The relevant monitoring programmes included:

- Shellfish Waters
- National Marine Monitoring Programme
- Environmental Change Network
- Fresh Water Fish
- Waste Tips
- Drinking Waters
- Bathing Waters
- Special Investigations

The following obligations and data sets were examined and substances listed were included on the Universe List:

Existing Obligations

Dangerous Substances Directive (DSD) 76/464/EEC - Of the 18 DSD list I substances for which daughter directives have established EQS controls, ten are included on the Annex X Priority Substances list. The remaining eight must be considered under the transitional arrangements of the WFD hence the principles for the identification of pollution problems and the substances causing them, the establishment of quality standards and the adoption of measures laid down in the WFD will apply. List I substances are therefore being addressed on the Priority Substances and ongoing DSD lists. DSD List II comprises 139 substances of which 12 are included on the Priority Substances list. All DSD substances were included on the Universe List. WRc report UC6201 (2003) states that clear justification would need to be given if any individual List II substance were to be considered not to be of national concern.

UNEP POPs – United Nations Environmental Programme Persistent Organic Pollutants - Twelve chemical substances have been identified as UNEP POPs under the Stockholm Convention.

OSPAR - The Convention for the Protection of the Marine Environment of the North East Atlantic - The OSPAR convention includes a list of prioritised chemicals and chemical groups. Substances selected from the OSPAR list by UKTAG Chemistry Task Team were included on the N.I. Universe List.

EPER – European Pollutant Emissions Register - EPER guidance has been developed for 26 aquatic pollutants prioritised on the basis of inventories from significant licensed industrial activities across Europe.

Other Data Sources

Pesticide Usage – Pesticides are designed to be toxic to target organisms but non-target organisms are frequently unintentionally impacted. Data on aquatic toxicity for pesticides is often inconclusive or difficult to obtain so for the purposes of this exercise it was assumed that all pesticides are potential aquatic pollutants. The Department of Agriculture and Rural Development maintains records of application levels and coverage for agricultural pesticides based on active ingredients. The top 50 pesticides for each identified crop type based on spray area were combined and used to produce a single list of the most widely used active ingredients for all crop types. A total of 130 pesticides from the DARD records were included on the Universal List.

Endocrine Disrupting Substances - Endocrine disruptors are substances of increasing concern in the environment. A report by EU Commission appointed consultants BKH in 2000 identified 66 Category 1 substances which were included on the Universal list. WRc-NSF has produced a list of priority action endocrine disrupting chemicals which was also included.

Human Pharmaceuticals - A technical report on a Targeted Monitoring Programme for Pharmaceuticals in the Aquatic Environment (P6-012/06/TR) commissioned by the Environment Agency for England and Wales identified twelve substances of potential concern. The substances were selected on the basis of a review of information on the occurrence, fate and effects of human pharmaceuticals in the environment and using the EU Technical Guidance document on risk assessment (1996). It is reasonable to assume that human pharmaceuticals used in England and Wales are equivalent to those used in Northern Ireland and consequently all the substances identified were included.

Diffuse Pollution Screening Tool - A screening tool was developed in conjunction with SNIFFER (The Scotland and Northern Ireland Forum for Environmental Research) to estimate the risk to water bodies in Northern Ireland and Scotland from a range of diffuse pollutants. These pollutants include a selection of metals, pesticides and other chemical substances.

UK Chemical Stakeholder Forum - A list of chemicals of concern was produced by the UK Chemical Stakeholders Forum. This was included in the Universal List.

DEFRA Publication 'Potential contaminants for the assessment of land' - This publication identifies and prioritises contaminated land chemicals on the basis of their potential for significant occurrence and impact in the UK. Substances prioritised on the basis of their level of threat to the aquatic environment were included.

Assessment of the data sources collated resulted in a compiled Universal List of **487 substances** which were identified as potential aquatic pollutants in Northern Ireland.

6.0 Screening of the Universal list by an Expert Group to produce Candidate Specific Pollutants List - STEP 2

A Northern Irish Dangerous Substances Expert Group was established to assist with the screening step of developing a Candidate Specific Pollutant List for surface waters in Northern Ireland. This group met in May and September 2005.

The members of the expert group are as follows:

EHS Water Management Unit - David McMullan (Chair), Wendy McKinley, David Charlton, Caroline Barry, Mark Charlesworth, John Farren, Adrian Gregory, Carol Majury, Ibe Sesay, Norman King, Ray Thomas, John McCartney, Alan Deyermond, Roslyn Stewart

EHS Drinking Water Inspectorate - David O'Neill

EHS Industrial Pollution & Radiochemical Inspectorate - David Bell

EPA - Ciaran O'Donnell, Colman Concannon

DARD - Stephen Jess

DRD Water Service - Angela Halpenny

NS Share Project - Tony McNally, Alan Barr, Grace Glasgow, Fiona Murphy

The purpose of the group was to screen the Universal List (487 substances) using expert knowledge of discharges, known usages and results of monitoring programmes. Each member was asked to review the list under the following questions:

- Could these substances be present in waterbodies?
- What level of confidence do you have in your assessment e.g. are you aware that the substance is discharged to water or has a known pathway to water?
- Has the substance been detected through monitoring?
- Has the substance been monitored for and never detected?
- Are there any sources or uses of the substance that could lead to its presence in water bodies?
- Can you provide details of geographical distribution / levels detected?
- Is the substance used and / or released to the environment in Northern Ireland but is known to have no pathway to waterbodies?
- Is the substance no longer used in Northern Ireland?
- Are there any other substances that should be included?

To date there has been input from eight members of the expert group identifying the candidate specific pollutants from the Universal List where they had knowledge of known

discharge, usage or findings in previous monitoring programmes. There were a number of overlaps of substances from expert input.

The inputs were as follows:

1. Alan Deyermond (Lab Manager- Water Management Unit EHS) identified seven substances of concern. The rationale for inclusion was that these substances have been found in river monitoring, waste water treatment effluents, industrial effluents and OSPAR effluents.
2. Adrian Gregory (Agricultural Regulations EHS) identified four substances of concern which there was known widespread usage of.
3. David Bell (Industrial Pollution and Radiochemical Inspectorate EHS) identified six substances of concern. The rationale for inclusion for substances identified by IPRI was appearance on a pollution inventory return for a Part A installation discharging either to water or sewer at a level above the reporting threshold.
4. David Charlton (Chemicals Policy EHS) identified 97 substances of concern. The criteria used for the inclusion of these substances was as follows:
 - The substance was detected as part of an EHS or Water Service water monitoring programme carried out from 2000 on.
 - The substance has a consented point source discharge to water, regardless of compliance history.
 - The substance was detected as part of the extended EHS Waste Water Treatment Works monitoring programme completed between 1998 and 2000.
 - The substance is a pesticide with extensive application across Northern Ireland established aquatic toxicity and known aquatic pathways.
 - The substance has been noted as being an aquatic pollutant of national concern by a recognised body such as the Chemicals Stakeholder Forum.
 - The substance has widespread sources and uses in UK as detailed in the Environment Agency Pollution Inventory Substance Fact sheets and has known aquatic pathways.
5. John Farren (Freshwater Resources EHS) identified 111 substances of concern. These substances were known to be widely used as agricultural pesticides. A number of these were also detected under current Water Management Unit monitoring programmes.
6. Ray Thomas (Water Chemistry Branch EHS) identified 57 substances of concern. . The criteria used for the inclusion of these substances was as follows:
 - Toxicity - both acute and chronic toxicity effects were considered. For example Acetyl Cholinesterase Inhibition, Sodium Channel Signal Transmission Disruption, etc.

- Tendency to bioaccumulate.
 - Human Health Effects - relevant via both food chain and drinking water routes.
 - Nature of the potential source of pollution - point or diffuse.
 - Physical properties of the pollutants - Water Solubility, Soil Partition Coefficients (particularly important in the case of diffuse pollutants), Half Lives for both soil and water, etc..
 - Usage Statistics - for both the UK in general and Northern Ireland in particular.
 - Existing Monitoring data - this includes tentative detections by GCMS performed as part of recent investigative exercises and method development programmes.
 - ROI Dangerous Substances Screening exercise positive detections - particularly in border areas.
 - Relevant Journal Articles - particularly with respect to problems associated with pollutants present in WWTW effluent.
 - Potential of each proposed pollutant to disrupt the endocrine systems of receiving species and humans
7. Stephen Jess (Department of Agriculture and Rural Development) identified a total of 25 substances of concern. This list was constructed using pesticide usage survey data. These were included as they were the most frequently used pesticides in grassland, arable, top fruit crops and sheep dipping within the last decade.
8. Angela Halpenny provided a list of 64 substances detected in waste water treatment works and trade effluent discharges.

The screened Candidate Specific Pollutants List for Northern Ireland currently stands at **215 substances** (Appendix 1).

Priority Substances were identified in this report as those substances for which legislative instruments have been or will be laid down at the Community level i.e. substances listed in Annex IX and Annex X of the WFD. This list comprises of 41 substances (Appendix 2).

There is little or no information on sources, uses, aquatic pathways and occurrence for a significant number of substances on the Universal List. These substances were not included on the Candidate Specific Pollutants List however all potential aquatic pollutants will be assessed as part of the national prioritization programme.

7.0 Prioritisation task - STEP 3

EHS subsequently tasked its Specific Pollutants expert group with identifying and prioritising a short list of key substances of highest concern in Northern Ireland for consideration by the UK for EQS development. This was in addition to those substances already prioritised nationally. Four substances of highest concern have been identified based on known uses, detections in the aquatic environment, reported ecotoxicity (including USA EPA AQUIRE) and endocrine disrupting potential. The substances were ranked using an expert scoring system. It should be noted that the prioritisation process relied on expert judgement as monitoring data is very limited and is largely restricted to areas where significantly elevated levels of the target substances would not normally be expected e.g. drinking water abstraction points. Table 2 shows the selection criteria for the N.I. Expert Group Chemical Risk Weighting.

Table 2: Selection Criteria for N.I. Expert Group Chemical Risk Weighting

Rank	Criteria
5	Believed to be very harmful to the aquatic environment and detected within the past three years in one or more N.I. water bodies. Believed to be present widely in the environment.
4	Believed to be very harmful to the aquatic environment. Not detected but high confidence that it is present widely in N.I. environment and has readily accessible pathways to water.
3	Believed to be moderately harmful to the aquatic environment and detected within the past three years in one or more N.I. water bodies.
2	Believed to be moderately harmful to the aquatic environment. Not detected but high confidence that it is present in N.I. environment and has readily accessible pathways to water.
1	Believed to be slightly harmful to aquatic environment and detected or is present in N.I. with pathways to water.

Guidance Notes

Very harmful= High toxicity, persistence and tendency to bioaccumulate AND/OR powerful endocrine disrupter.

Moderately harmful= Moderate toxicity, persistence and tendency to bioaccumulate AND/OR moderate endocrine disrupter.

Slightly harmful= Low toxicity, persistence and tendency to bioaccumulate AND/OR low level endocrine disrupter.

The short list of additional substances proposed is as follows:

a. Glyphosate - is an agricultural grassland herbicide with widespread use in Northern Ireland. The most recent available usage data indicates that some 20,391Kg are applied to agricultural crops in Northern Ireland annually. This does not include forestry applications for which data is not available. Recent detections in Northern Ireland are in the range 0.02 – 0.1ug/L. High toxicity to aquatic plants is reported and the substance is believed to be a potent endocrine disruptor. Moderate toxicity to some species of fish and crustaceans is reported. The substance biodegrades quickly in water but can persist in sediments and soils with moderate leaching potential. The substance is regularly detected in the current Republic of Ireland surface water screening exercise at levels in excess of 0.1ug/L

b. MCPA - is agricultural grassland and forestry herbicide frequently detected in Northern Irish surface waters at levels in excess of 0.1ug/L. Some detections were also recorded for ground waters. The most recent available usage data indicates that 23,864Kg are applied to agricultural crops in Northern Ireland each year. No forestry loading data is available. It has low soil persistence but is very mobile. Moderate toxicity is reported for some freshwater fish particularly as ester. It is potentially harmful to aquatic plants.

c. Mancozeb - has widespread usage as an agricultural fungicide. The most recent available usage data indicates that 68,198Kg are applied to agricultural crops in Northern Ireland each year. High toxicity is reported for some amphibians and moderate toxicity is reported for some fish and zooplankton. It is believed to be a potent endocrine disruptor. It breaks down readily in soil but its primary breakdown product, ETU, is more persistent and toxic.

d. Oestradiol – is a female steroid hormone closely associated with gender change in fish. It is widely detected in UK waters and believed to originate mainly from waste water treatment works effluent. No chemical monitoring data available for Northern Ireland to date.

8.0 Further data requirements and analysis

EHS, supported by its expert group, has successfully developed a candidate list of Specific Pollutant substances for Northern Ireland. This has provided regional information for the UK process and has also enabled assessment of cross border issues for the three international river basin districts in which Northern Ireland and the Republic of Ireland share waters.

Substances identified as potentially being present in waterbodies but for which there is currently no monitoring data will require further investigation to establish the extent of any impact as part of the review and development stages of the process. The current monitoring capabilities within Northern Ireland are being reviewed and new monitoring capabilities may have to be established.

Environmental Quality Standards are being developed on a phased basis as part of a UK wide process.

The process is iterative and the Northern Ireland Candidate List will be revisited and substances added to and removed from the list as new uses are identified and new substances come on to the market and old substances are removed from use.

9.0 References

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