

Interim Report

R&D Project 397

**Draft List of Potential Target Contaminants of Fish
Tissue**

**WRc
(Dissemination by NRA)
October 1992
R&D 397/4/ST**

**Dissemination Status: Internal - Restricted (for comment)
External - Restricted**

R&D Project 397 (D02(91)04) Body Burdens in Fish

**Project Leader: Roy Sedgewick (NRA Severn-Trent, Upper Trent Area)
Telephone (0543) 444141**

**Contractor: WRc Medmenham
Project Manager: Ian Johnson**

Report disseminated in this form by NRA through the Project Leader

ENVIRONMENT AGENCY



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1. INTRODUCTION

This note is abstracted from an interim report of current progress in the project 'Body burdens in Fish'. It describes, briefly, the processes involved in prioritising an extensive list of chemical compounds which, if discharged into surface waters, are potential contaminants of fish tissues. This is a key stage in the development of a cost effective strategy for monitoring the tissues of freshwater fish in the UK. Compounds have been selected on the basis of four criteria: toxicity, propensity for biaccumulation, persistence in the environment and extent of use. The exercise effectively reduced an initial list of more than 700 chemical compounds to a group of 16 which will form, though not exclusively, the core targets around which the sampling strategy will be constructed.

2. DERIVATION OF A LIST OF POTENTIAL TARGET CONTAMINANTS OF FISH TISSUE TO BE MONITORED IN A NATIONAL PROGRAMME

2.1 Introduction

The derivation of a list of potential substances to be monitored in fish tissues has been accomplished in four stages;

1. Identifying potential substances of concern by collation of data obtained from regulators in the United Kingdom;
2. Ranking these substances on the basis of their toxicity and propensity for bioaccumulation using two different scoring schemes;
3. Determining which of the substances scoring highly were likely to cause problems in the receiving water due to their persistence;
4. Identifying which of the persistent and toxic substances with a potential to bioaccumulate are used in sufficient quantities to have a reasonable likelihood of entering receiving waters.

Each of these stages is described in more detail in the following sections.

2.2 Identifying potential substances of concern

Information on potential substances of concern was obtained by contacting key personnel in the United Kingdom who have responsibilities for legislation related to the control of potentially dangerous substances. These were the National Rivers Authority, The Water Directorate and Drinking Water Inspectorate of the Department of the Environment, Her Majesty's Inspectorate of Pollution, the Health and Safety Executive, the Ministry of Agriculture Fisheries and Food and contacts within WRc working on related projects.

In compiling the list the following information was used:

1. List I and II substances considered dangerous under EC Directive 76/464/EEC (CEC 1976, 1982);
2. Substances listed in the United Kingdom 'Red List' (DoE 1989);
3. The Priority Hazardous substances agreed at the 3rd North Sea Conference (DoE 1990);
4. Substances listed in the Paris and Oslo Conventions;
5. Substances covered by the CIMAH regulations;
6. Pesticides monitored in groundwater by UK Water companies;
7. Pesticides most commonly reported in groundwater;
8. Substances for which enquiries were received by the WRC Environmental Toxicology Advisory Service;
9. Substances identified by the Chemical Industrial Association as being produced in the United Kingdom or imported from non-EC countries in quantities greater than 10000 tonnes annually;
10. The occurrence of persistent toxic substances in the tissues of fish sampled by the 10 NRA regions;

2.3 Initial ranking of substances based on toxicity and potential for bioaccumulation

In the first instances the two schemes described below were used to rank the list of potential substances of concern (Table A1) on the basis of their toxicity and potential for bioaccumulation. The ecotoxicological data used to rank the substances are given in Table A2. It was obtained

Table 2.1 Toxicity and bioaccumulation criteria used to rank potential target contaminants of fish tissue using the proposed 7th amendment of the General Classification and Labelling Requirements for Dangerous Substances (EC Directive 76/548/EEC)

Class	Description	Toxicity in any of 72 hr algal, 48 hr <i>Daphnia</i> or 96 hr fish tests (mg/l)	Potential for bioaccumulation as measured by Kow or BCF
1	Very toxic and may accumulate in aquatic invertebrates and fish	< 1.0	log Kow > 3 unless BCF < 100
2	Very toxic but unlikely to accumulate in aquatic invertebrates and fish	< 1.0	log Kow < 3 unless BCF > 100
3	Toxic and may accumulate in aquatic invertebrates and fish	1 - 10	log Kow > 3 unless BCF < 100
4	Toxic but unlikely to accumulate in aquatic invertebrates and fish	1 - 10	log Kow < 3 unless BCF > 100
5	Harmful and may accumulate in aquatic invertebrates and fish	10 - 100	log Kow > 3 unless BCF < 100
6	Harmful but unlikely to accumulate in aquatic invertebrates and fish	10 - 100	log Kow < 3 unless BCF > 100
7	Unlikely to be harmful in the aquatic environment	> 100	-
8	Insufficient data on the toxicity or the potential for bioaccumulation of the substance to assess the hazard	-	-

from a number of sources including Verschueren (1977), an SRI report on priority substances (SRI 1980), the Pesticide Manual (Worthing 1991), WRc Reports to the DoE on List I and II substances, Environmental Health Criteria reports issued by the World Health Organisation and reports of the Associate Committee on Scientific Criteria for Environmental Quality of the National Research Council of Canada.

The first scheme used criteria for toxicity and bioaccumulation potential (Table 2.1) given in the proposed 7th Amendment of the General Classification and Labelling Requirements for Dangerous Substances (EC Directive 76/548/EEC). In the assessment of the toxicity of substances, the algal data used related to the species specified in the OECD/EC guidelines for acute algal growth inhibition tests, that is *Selenastrum capricornutum*, *Scenedesmus subspicatus* and *Chlorella vulgaris*. The fish acute data is specific to the species listed in the OECD/EC test guidelines, that is the zebra-fish (*Brachydanio rerio*), fathead minnow (*Pimephales promelas*), common carp (*Cyprinus carpio*), red killifish (*Oryzias latipes*), guppy (*Poecilia reticulata*), bluegill (*Lepomis macrochirus*), rainbow trout (*Oncorhynchus mykiss*) and the golden orfe (*Leuciscus idus*). Data for indigenous species such as brown trout (*Salmo trutta*), gudgeon (*Gobio gobio*), perch (*Perca fluviatilis*), roach (*Rutilus rutilus*) and rudd (*Scardinius erythrophthalmus*) were also considered. The lowest toxicity value available for an alga, *Daphnia* and fish was used to rank the substance.

The likelihood for bioaccumulation was assessed using either a measured bioconcentration factor (BCF) for aquatic invertebrates and fish or an octanol/water partition coefficient (Kow). In the scheme a substance was considered to bioaccumulate if the BCF was greater than 100 or the log Kow was greater than 3 (Table 2.1). The BCF was for contaminant levels in the whole body or muscle of the organisms and was calculated based on the wet weight of the organism. A BCF was used in preference to the Kow whenever a suitable value was available.

The second scheme was that given in a draft environmental priority setting scheme for existing chemicals prepared for the Department of the

Environment (DoE 1991). The criteria used to score the toxicity of the substance are shown in Table 2.2 and for both acute (< 7 days) or chronic (> 7 days) exposure the value used were the lowest available for alga, invertebrates and fish from the published literature. The bandings for toxicity were the same as those used in the first scheme. Chronic toxicity was incorporated on the basis of a ratio of 10 between acute and chronic toxicity indices. This is consistent with findings from studies of the toxicity of a range of pure substances to a variety of freshwater species (Rand and Petrocelli 1985).

Table 2.2 Criteria for acute and chronic toxicity used to rank substances using a draft environmental priority setting scheme for existing chemicals

Score	Acute toxicity (mg/l)	Chronic toxicity (mg/l)
1	> 100	> 10
2	> 10 - ≤ 100	> 1.0 - ≤ 10
3	> 1.0 - ≤ 10	> 0.1 - ≤ 1.0
4	> 0.1 - ≤ 1.0	> 0.01 - ≤ 0.1
5	> 0.01 - ≤ 0.1	> 0.01 - ≤ 0.001
6	≤ 0.01	≤ 0.001

The likelihood of bioaccumulation of the substance in aquatic invertebrates and fish was scored using either the bioconcentration factor or the octanol water/partition coefficient (Table 2.3). The BCF was again used in preference to the log Kow whenever an appropriate value was available. In this scheme the criteria for bioaccumulation between Kow and BCF did not correspond to that used in the first scheme. The first scheme considered a substance likely to bioaccumulate if log Kow was > 3 or BCF > 100, whereas in the second scheme a log Kow of 3 was comparable with a BCF of > 10 - < 100. The scoring system was therefore amended since it was necessary that the bands for classifying the potential for bioaccumulation using Kow or BCF were complementary.

Table 2.3 Criteria for bioaccumulation potential used to rank substances using adraft environmental priority setting scheme

Score	log Kow	Score	BCF	
			Initial	Amended
1	< 1	1	< 10	≤10
1.2	1 - 2	1.3	-	>10-≤100
1.4	2 - 3	1.5	>10-<100	-
1.6	3 - 4	1.7	-	>100-<1000
1.8	4 - 5			
2	> 5	2	> 100	> 1000

The amended bandings for Kow and BCF used were derived using a quantitative structure activity relationships which related these two parameters. The relationship:

$$\log \text{BCF} = 0.79 \log \text{Kow} - 0.40 \quad (n = 122, r = 0.928)$$

was derived from data on organic chemicals in a variety of fish species (Veith and Kosian 1983).

In the second scheme the total for each substance was obtained by multiplying the scores for toxicity and likelihood for bioaccumulation. Scores were not derived for substances for which data was not available on both indices. The potential range of scores was from 12 for substances which were very toxic and likely to bioaccumulate to 1 for substances which should not be harmful in the aquatic environment.

After consideration of the lists produced by each ranking scheme (Tables 2.4 and 2.5) it was decided to progress with the second list (Table 2.5), in which each substance was scored for toxicity and bioaccumulation potential where possible. The classification using this approach allowed greater discrimination between substances and provided an indication of the relative importance of toxicity and the potential for bioaccumulation.

Table 2.5 Ranking of substances using a draft environmental priority setting scheme

Score			Substance
Total	Toxicity	Bioaccumulation	
12	6	2	Aldrin
	6	2	Benzo(a)anthracene
	6	2	Benzo(k)fluoranthene
	6	2	Benzo(ghi)perylene
	6	2	Benzo(a)pyrene
	6	2	Chlorpyrifos
	6	2	Cyfluthrin
	6	2	Cyhalothrin
	6	2	Cypermethrin
	6	2	DDD
	6	2	DDT
	6	2	Dieldrin
	6	2	Endosulphan
	6	2	Endrin
	6	2	Fenpropathrin
	6	2	Heptachlor
	6	2	Heptachlor epoxide
	6	2	Mercury (Organic)
	6	2	Methoxychlor
	6	2	Permethrin
	6	2	Toxaphene
	6	2	Trifluralin
10.8	6	1.8	Pirimiphos-methyl
10.2	6	1.7	Cadmium
	6	1.7	Carbaryl
	6	1.7	Diazinon
	6	1.7	Deltamethrin
	6	1.7	Fenitrothion
	6	1.7	Fenvalerate
	6	1.7	γ -Hexachlorcyclohexane [Lindane]
	6	1.7	Tributyltin
10	5	2	1,1-Bis (tert-butylperoxy) cyclohexamine
	5	2	pp'-DDE
	5	2	Fluoranthene
	5	2	Hexachlorobenzene
	5	2	Hexachlorobutadiene
	5	2	Pentachlorophenol
	5	2	Phenanthrene
	5	2	Pyrene
	5	2	Technazene

Table 2.5 Continued

Score			Substance
Total	Toxicity	Bioaccumulation	
10	5	2	Triphenyltin
9.6	6	1.6	Azinophos-methyl
	6	1.6	Coumaphos
	6	1.6	Parathion-methyl
	6	1.6	Phorate
9	5	1.8	Bioresmethrin
	5	1.8	Chlorothalonil
	5	1.8	Chlorpyrifos-methyl
	5	1.8	Phosalone
8.5	5	1.7	Anthracene
	5	1.7	Chlordane
	5	1.7	Chlordecone [Kepone]
	5	1.7	Eulan (Chlorphenylid)
	5	1.7	Fluocifuron
	5	1.7	Tetraethyl lead
8.4	6	1.4	Fenthion
8	5	1.6	4-Chloro-3-methylphenol
	4	2	Di-(2-ethylhexyl)phthalate
	5	1.6	Disulfoton
	4	2	Lead (Inorganic)
	4	2	PCB ₅₂
	4	2	PCB ₁₀₁
	4	2	Pendimethalin
	5	1.6	Phoxim
	5	1.6	Pirimiphos-ethyl
	4	2	1,2,3-Trichlorobenzene
	4	2	1,2,4-Trichlorobenzene
7.8	6	1.3	Chromium (VI)
	6	1.3	Copper
	6	1.3	Diiflubenzuron
	6	1.3	Diuron
	6	1.3	Hexahydropyrimidine
	6	1.3	Malathion
	6	1.3	Mercury (Inorganic)
	6	1.3	Parathion
7.2	4	1.8	2,2-Bis (tert-butylperoxy) butane
	4	1.8	1-Chloronapthalene

Table 2.5 Continued

Score			Substance
Total	Toxicity	Bioaccumulation	
7.2	6	1.2	Dichlorvos
	4	1.8	Diclofop methyl
	4	1.8	Fenchlorphos
	4	1.8	Prochloraz
7	5	1.4	Bromoxynil
	5	1.4	Dimethoate
	5	1.4	Dinoseb
6.8	4	1.7	Aluminium
	4	1.7	Napthalene
	4	1.7	Nickel
6.5	5	1.3	Selenium (Selenate/Selenite)
	5	1.3	2,4,5-T
6.4	4	1.6	4-Chloro-2-nitrotoluene
	4	1.6	3,3-Dichlorobenzene
	4	1.6	Fenpropadin
	4	1.6	Hexachloroethane
	4	1.6	Linuron
	4	1.6	2,4,5-Trichlorophenol
6	5	1.2	Aldicarb
	3	2	Amitraz
	6	ND	Azinphos-ethyl
	6	ND	Carbophenothion
	6	ND	Chlorfenviphos
	6	ND	00-Diethyl S propythiomethyl phosphorodithoate
	6	ND	EPN
	6	ND	Ethion
	6	1	Hydrogen sulphide
	6	ND	Isodrin
	6	1	Malathion
	6	ND	Mevinphos
	6	1	Phenkepton
	6	ND	Phosphamidon
	5	1.2	Pirimicarb
	6	ND	Resmethrin
	6	ND	Sulphotep
	6	1	Trichlorofen
5.6	4	1.4	2,4-D

Table 2.5 Continued

			Substance
Total	Toxicity	Bioaccumulation	
5.4	4	1.4	3,4-Dichloroaniline
	4	1.4	2,4-Dichlorophenol
	3	1.8	Fenpropimorph
	3	1.8	3,3,6,6,9,9-Hexamethyl-1,2,4,5-tetroxa-cyclonane
	3	1.8	1,2,3,4-Tetrachlorobenzene
	3	1.8	1,2,3,5-Tetrachlorobenzene
	3	1.8	1,2,4,5-Tetrachlorobenzene
	3	1.8	Tributyl phosphate
	3	1.8	Tridemorph
5.2	4	1.3	Arsenic (III)
	4	1.3	Atrazine
	4	1.3	Beryllium
	4	1.3	Iron
	4	1.3	o-Xylene
5.1	3	1.7	Biphenyl
	3	1.7	2-Chlorophenol
	3	1.7	1,2-Dichlorobenzene
	3	1.7	1,3-Dichlorobenzene
	3	1.7	1,4-Dichlorobenzene
	3	1.7	Phenol
	3	1.7	Thallium
5	5	1	Acrolein
	5	1	Chlorine
	5	ND	Demeton
	5	ND	Dialifos
	5	ND	Furazolidane
	5	1	Hydrogen cyanide/Cyanide
	5	ND	Juglone (5-Hydroxynaphthalene-1,4-diole)
	5	1	Mecarbam
	5	1	Metham sodium
	5	ND	Omethoate
	5	ND	Oxydemeton-methyl
	5	ND	Pensulphotion
	5	ND	Pyrethrin
	5	1	Sodium hypochlorite
	5	ND	TEPP
	5	ND	Thionazin
	5	ND	Triallate
	5	1	Zinc
4.8	3	1.6	Acenaphthalene

Table 2.5 Continued

			Substance
Total	Toxicity	Bioaccumulation	
4.8	3	1.6	4-Aminodiphenyl
	4	1.2	Carbendazim
	4	1.2	Carbofuran
	4	1.2	2-Chloroaniline
	4	1.2	4-Chloroaniline
	3	1.6	2-Chlorotoluene
	3	1.6	3-Chlorotoluene
	3	1.6	4-Chlorotoluene
	4	1.2	Dibutyltin
	3	1.6	Dicamba
	3	1.6	Dichlorobenil
	4	1.2	1,3-Dichloropropene
	3	1.6	Disulphoton
	3	1.6	EPTC
	3	1.6	Iprodione
	4	1.2	Mercaptobenthothiazole
	3	1.6	Pebulate
	3	1.6	Phenmedipham
	3	1.6	Prometryn
	3	1.6	Terbutryn
	3	1.6	Tetrabutyl tin
	3	1.6	Triazophos
	3	1.6	Trichlorotrifluroethane
	3	1.6	Tris (2-chloropropyl) phosphate
4.2	3	1.4	Chlorobenzene
	3	1.4	3-Chlorophenol
	3	1.4	Dichloroprop
	3	1.4	MCPA
	3	1.4	2-Naphthylamine
	3	1.4	Paraquat
	3	1.4	Procetamphos
	3	1.4	Propanil
	3	1.4	Toluene
4	4	1	Ammonia (Unionised)
	4	1	Aniline
	4	ND	Benomyl
	4	ND	Captofol
	4	ND	Chloroamines
	4	ND	Creosote
	4	ND	2-Cyanopropan-2-ol
	4	1	Di (ethylhexyl) adipate
	4	1	DNOC
	4	ND	Ethyl acrylates

Table 2.5 Continued

Score			Substance
Total	Toxicity	Bioaccumulation	
4	4	ND	Malachite green
	4	ND	Maneb
	4	ND	Methiocarb
	4	ND	Nonylphenylethoxylate
	4	ND	Paraoxon
	4	1	2-Propen-1-ol
	4	1	Simazine
	4	ND	Thiram
	2	2	1,3,5-Trichlorobenzene
	4	1	Urea
3.9	3	1.3	1-Chloro-2-nitrobenzene
	3	1.3	1-Chloro-3-nitrobenzene
	3	1.3	1-Chloro-4-nitrobenzene
	3	1.3	4-Chlorophenol
	3	1.3	Dichlorobenil
	3	1.3	Sulcofuron
	3	1.3	1,1,2,2-Tetrachloroethylene
	3	1.3	m-Xylene
	3	1.3	p-Xylene
3.6	3	1.2	Benzaldehyde
	3	1.2	Benzidine
	3	1.2	3-Chloroaniline
	3	1.2	1,2-Dibromoethane
	3	1.2	2,4-Dinitrophenol
	3	1.2	2,4,6-Trinitroanisole
3.4	2	1.7	Benzene
	2	1.7	Tin (Inorganic)
3.2	2	1.6	Benzylidene chloride
	2	1.6	Bis (2,4,6-trinitrophenyl) amine
	2	1.6	Cyclohexane
	2	1.6	Dalapon
	2	1.6	Diethyl phthalate
	2	1.6	Etrimifos
	2	1.6	Propyzamide
	2	1.6	Triadimenol
	2	1.6	Triadimeton
3	3	ND	Acetic anhydride
	3	1	Acetone
	3	ND	Alkylbenzene sulphonic acids
	3	ND	Allylamine

Table 2.5 Continued

Score			Substance
Total	Toxicity	Bioaccumulation	
3	3	ND	2-Amino-4-chlorophenol
	3	1	Benzyl chloride
	3	ND	Bromine
	3	ND	Butyl acrylate
	3	ND	m-Cresol
	3	ND	p-Cresol
	3	ND	Crimidine
	3	1	Cyanazine
	3	ND	Cyclotrimethylene trinitramine
	3	ND	Dichlorophen
	3	1	Diquat
	3	ND	Diphacinone
	3	ND	Ethyl acrylate
	3	ND	Ethyleneimine
	3	ND	Hexane
	3	ND	2,2',4,4',6,6'-Hexanitrostilbene
	3	1	Hydrochloric acid
	3	ND	Ioxynil
	3	ND	Mancozeb
	3	ND	Manganese
	3	ND	Methyl acrylates
	3	1	Methylethyl ketone
	3	ND	Nitroglycerine
	3	1	Oxolinic acid
	3	1	Propazine
	3	ND	Sodium iso-propyl xanthate
	3	ND	Sodium lauryethyl sulphonate
	3	1	Thiourea
	3	ND	Trietazine
	3	ND	2,4,6 Trinitroresorcinol
	3	ND	2,4,6 Trinitrotoluene
	3	1	Vanadium
2.8	2	1.4	Chloridazon
	2	1.4	Chlorotoluron
	2	1.4	Dimethylamine
	2	1.4	Di-n-propyl peroxydicarbonate
	2	1.4	Di-sec-butyl peroxydicarbonate
	2	1.4	Ethirimol
	2	1.4	Ethofumesate
	2	1.4	Isoproturon
	2	1.4	Tert-butyl peroxy-pivalate
	2	1.4	1,1,2,2-Tetrachloroethane
	2	1.4	1,1,1-Trichloroethane
	2	1.4	1,1,2-Trichloroethane

Table 2.5 Continued

Score			Substance
Total	Toxicity	Bioaccumulation	
2.6	2	1.3	Carbon tetrachloride
	2	1.3	Styrene
	2	1.3	Tetramethyl lead
	2	1.3	Trichloroethylene
2.4	2	1.2	Anabasine
	2	1.2	Chloroform
	2	1.2	3-Chloroprene
	2	1.2	1,1-Dichloroethane
	2	1.2	2,3-Dichloropropene
	2	1.2	2,4-Dimethylaniline
	2	1.2	Formothion
	2	1.2	Hexanoic acid
	2	1.2	Monolinuron
	2	1.2	Tris(2-chloroethyl) phosphate
2	2	1	Acetic acid
	2	1	Acrylamide
	2	1	Acrylonitrile
	2	1	Adipic acid
	2	1	Amitrole
	2	1	Antimony
	2	1	Barium
	2	ND	Benzocaine
	2	1	1,2-Benzenediol
	2	ND	Bromomethane
	2	ND	Chlormequat
	2	ND	Chloroacetic acid
	2	1	2-Chloroethanol
	2	ND	Chlorthiamid
	2	ND	o-Cresol
	2	ND	Cyclotetramethylenetetranitrame
	2	1	Diethylamine
	2	1	Epichlorohydrin
	2	1	Ethylbenzene
	2	1	2-Ethyl hexanol
	2	1	Ethylene oxide
	2	ND	Fluoride
	2	ND	Flutriafol
	2	ND	MCPB
	2	1	Methamidophos
	1	2	Metamitron
	2	1	Methyl bromide
	2	1	Metsulfuron-methyl
	2	1	Morpholine

Table 2.5 Continued

Score			Substance
Total	Toxicity	Bioaccumulation	
2	2	ND	Nickel tetracarbonyl
	2	ND	Nitrophenol
	2	ND	Pentaborane
	2	ND	Propiconazole
	2	1	Propionic acid
	2	ND	Pyrazonon
	2	1	Pyridine
	2	1	Sulphuric acid
	ND	2	2,3,7,8-Tetrachlorodibenzo-p-dioxin
	2	1	1,3,5-Triamino-2,4,6-trinitrobenzene
	2	ND	Tribrissen
	2	ND	Vinyl acetate
	2	ND	Warfarin
1.7	1	1.7	Cobalt
	ND	1.7	Dichlorodiisopropyl ether
1.6	1	1.6	Fluroxypr
	ND	1.6	Isopropylbenzene
1.4	1	1.4	Anisole
	1	1.4	Carbon disulphide
	ND	1.4	1-Chloro-2,4-dinitrobenzene
	1	1.4	4-Chloro-2-nitrophenol
	ND	1.4	2-Chloro-p-toluidine
	1	1.4	1,2-Dichloropropane
	1	1.4	00-Diethyl S-ethylsulphinylmethyl phosphorothionate
	1	1.4	Diisobutyl peroxide
	1	1.4	Ethofumesate
	1	1.4	Mecoprop
	ND	1.4	Trichlorofluoromethane
	1	1.4	2,4,6-Trinitrophenol
1.2	1	1.2	Benzoic acid
	1	1.2	Bis (chloromethyl) ether
	1	1.2	Carbonyl chloride
	1	1.2	Chloral hydrate
	1	1.2	Cyclohexanol
	1	1.2	1,2-Dichloroethane
	1	1.2	1,1-Dichloroethylene
	1	1.2	1,2-Dichloroethylene
	1	1.2	Dichloromethane
	1	1.2	1,3-Dichloropropan-2-ol
	1	1.2	2,3-Dichloropropene

Table 2.5 Continued

Score			Substance
Total	Toxicity	Bioaccumulation	
1.2	1	1.2	00-Diethyl S-ethylsulphonylmethyl phosphorothionate
	ND	1.2	Ethylchloride
	ND	1.2	2-Methylpyridine
	1	1.2	Nitrobenzene
	1	1.2	Oxydisulphoton
	1	1.2	1-Pentanol
	1	1.2	Tert-butyl peroxyisobutyrate
	ND	1.2	Phenylacetaldehyde
	1	1.2	Tert-butyl peroxy isopropyl carbonate
	1	1.2	Vinyl chloride
1	1	1	Acetonitrile
	1	1	Acetylene
	1	1	Alloxydim sodium
	1	1	Asulam
	1	ND	Bentazone
	1	ND	Boron
	1	1	1-Butanol
	1	1	2-Butanol
	1	1	Carbetamide
	1	1	4-(Chloroformyl)morpholine
	1	1	Chloromethyl methyl ether
	1	1	Citric acid
	1	ND	Clopyralid
	1	1	Cyclohexamide
	ND	1	Cyclohexanone
	1	ND	Diacetone alcohol
	1	1	Diethyl ether
	1	1	Difenzoquat
	1	1	Dimethylcarbamoyl chloride
	ND	1	Dinocap
	1	1	Ethanol
	1	1	Ethanolamine
	1	1	Ethyl acetate
	1	1	Ethylene glycol
	1	1	Ethylene glycol dinitrate
	1	ND	Ethylene glycol monobutyl ether
	1	1	Ethylene glycol monoethyl ether
	1	1	Ethyl nitrate
	1	1	Formaldehyde
	1	1	Formic acid
	1	ND	Forsamine ammonium
	1	ND	1-Guanyl-4-nitrosaminoguanyl-1-tetrazene
	1	1	Glycerol

Table 2.5 Continued

			Substance
Score			
Total	Toxicity	Bioaccumulation	
1	1	1	Glyphosate
	1	1	Hydroxyacetoneitrile
	1	1	Imazapyr
	1	1	Isopropanol
	1	ND	Maleic anhydride
	1	1	Maleic hydrazide
	1	1	Methanol
	1	ND	2-Methyl4-chlorophenoxyacetic acid
	1	ND	Methylethyl ketone peroxide
	1	ND	Methylisobutyl ketone
	1	ND	Methylisobutyl ketone peroxide
	1	1	Methyl isocyanate
	1	ND	Methyl methacrylate
	ND	1	Napthalene sulphonate
	1	1	Oxalic acid
	1	1	Oxygen difluoride
	ND	1	Paraldehyde
	ND	1	Pentaerythritol tetranitrate
	1	1	Peracetic acid
	1	1	Propan-1-ol
	1	1	Propan-2-ol
	1	1	Propylene glycol
	1	1	Propyleneimine
	1	1	Propylene oxide
	1	ND	Sodium bisulphite
	1	ND	Sodium chlorate
	1	ND	2,3,6-TBA
	1	ND	Terramycin
	1	1	Trichloroacetic acid
	1	1	Tert-butyl peroxyacetate
	1	1	Tert-butyl peroxy maleate
	1	ND	Zineb

Insufficient data on the toxicity or potential for bioaccumulation to assess the hazard of the chemical:

Aldicab
4-Aminobiphenyl
Amiton
Aramite
Benzalkonium chloride
Benzo[b]fluoranthene
Benzo[y]fluoranthene
Benzothiazolone
Bis (4-Aminophenyl) methane
Bis (2-chloroethyl) sulphide
Bis (2-ethylhexyl) phthalate
Bromodichloromethane
Bromoform
Bromohydantoins
Bromophos
Butadiene
Cellulose nitrate
Cetyl alcohol
Chlorbufam
Chlopropham
Chlordimeform
Chlorodibromomethane
Chloroethanoic acid
Chloroethylene
4-Chloro-2-methylphenoxyacetic acid
4 (4-chloro-2-methyl phenoxy) butyric acid
4-Chloro-2-nitroaniline
Chlorotrinitrobenzene
Chloroxynil and esters
Chloropicrin
Choline chloride
Cismethrin
Coconut diethanolamide
Cruformate
Cumene
Cyanogenamide
Cyanthoate
Cyanuric chloride
2,4-DB
DCA
Diazodinitrophenol
Dibenzyl peroxydicarbonate
Dibrom
Dibromochloromethane
Dichlogention
2,2-Dichloro-2-methyl phenoxy propionic acid
2,4-Dichloro-3,5-xyleneol
00-Diethyl S-isopropylthiomethyl phosphorodithioate
Diethyl peroxydicarbonate
2,2-Dihydroperoxypropane
2,3-Dihydroxybutane

Dimefox
Dimethanoate
Dimethyl methylphosphonate
Dimethylnitrosamine
Dimethyl phosphoramidocyanidic acid
2,5-Dimethylpyridine
Diphenylguanidine
Dithiocarbamate
2,2-Dithiobisbenzothiazole
4,4-Dithiomorpholine
EBDCs
Ethoate methyl
Ethylene
Ferbam
Fluometil
Flumethrin
Fluoracetic acid
Fluoracetic acid, amides
Fluoracetic acid, esters
Fluoracetic acid, salts
4-Fluorbutyric acid, amides
4-Fluorbutyric acid, esters
4-Fluorbutyric acid, salts
4-Fluorocrotonic acid
4-Fluorocrotonic acid, amides
4-Fluorocrotonic acid, esters
4-Fluorocrotonic acid, salts
4-Fluoro-2-hydroxybutyric acid
4-Fluoro-2-hydroxybutyric acid, amides
4-Fluoro-2-hydroxybutyric acid, esters
4-Fluoro-2-hydroxybutyric acid, salts
Furfuryl alcohol
Glutaraldehyde
Glycine
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin
Hydrazine nitrate
Hydrogen peroxide
Iodofenphos
Isobenzan
Isopropylphenol
Isothiocyanatobenzene
Kelevan
Lead azide
Lead 2,4,6-trinitroresorcinoxide
Melamine
Mencozeb
Metaldehyde
Methabenzthiazuron
Methacrifos
Methylbenzothiazole
2-Methylbenzothiazolethiol
2-Methyl-4-chlorophenoxy propanoic acid
Methylcyclohexanol
Methyl salicylate

2-(Methyl sulphinyl) benzothiazole
Methyl sulfone benzothiazole
N-methyl-N-2,4,6-tetranitroaniline
Molybdenum
Morfamquat
Morpholine,4-thiocarbonic acidanilide
2-Morpholinobenzothiazole
Morpholinyl,methylcarbodithioate
Morphotothion
Nabam
Nitrofen
Nitrogen oxides
Oxytetracycline
PCTs
Persulphuric acid
Phenoxyacetic acid
Phenylacetone nitrile
Phopham
Phosacetim
Phosphine
Phthalamide N-cyclohexylthio-
Phthalic anhydride
Polychlorinated terpenes
Promurit
1,3-Propanesultone
1-Propen-2-chloro-1,3-diol-diacetate
n-Propylene
Pyrazon
Quintozene
Sarbam
Selenium hexafluoride
Silicon (Organic)
Silver
Sodium 2-phenyl phenate
Sodium picramate
Sodium sulphite
Sodium xylene sulphonate
Sulphur
Sulphur dichloride
Sulphur trioxide
Tellurium
Tellurium hexafluoride
1,1,1,2-Tetrachloroethane
Tetramethylenedisulphotetramine
Thallium
Tirpate
Titanium
Triazines
2,3,6-Trichlorobenzoic acid
2,3,4-Trichlorocarbonilide
3,4,4-Trichlorocarbonilide
Trichloromethanesulphenyl chloride
Triethylenelamine
Trimethyl-1,2-dihydroquinolone

Trinitroaniline
Trinitrobenzene
Trinitrobenzoic acid
Trinitrocresol
2,4,6-Trinitrophenetole
Uranium
Xylene sulphonic acid

2.4 Consideration of the persistence of chemicals scoring highly in the list ranked using a draft environmental priority setting scheme

Further prioritisation of the substances ranked highly in Table 2.5 was achieved firstly by assessing the persistence of these chemicals. This process was restricted to those substances with a toxicity score of 5 or 6 and a bioaccumulation score of 1.6 to 2 (that is a BCF > 100 or a log Kow > 3.0). Substances with a toxicity score of 5 or 6, but no score for bioaccumulation were also considered. The aim of assessing the persistence of these highly toxic and bioaccumulable substances was to determine, whether substances entering inland surface waters would remain for sufficient time to cause deleterious effects on fish populations.

Persistence was assessed using the half lives of substances in surface waters. This index provides an integrated assessment and includes rates of degradation and loss for individual processes, such as hydrolysis, photolysis and volatilisation. The half lives were obtained from data on 1500 chemicals considered dangerous to aquatic life and consumers of water and aquatic species (SRI 1980).

Substances were considered to be persistent if the half life in surface waters was greater than 28 days. This classification of substances is consistent with approaches outlined in both of the ranking schemes used for toxicity and bioaccumulation potential. The assessment of persistence prioritised the list from 81 to 59 substances. Data was not available for 28 chemicals and in a precautionary approach these were retained on the resulting list. The remaining substances consisted of:

4 metals and organometallic chemicals (cadmium, mercury, tributyltin and triphenyltin);

3 organic chemicals (1,1-Bis(tert-butylperoxy)cyclohexamine, 4-Chloro-3-methylphenol and OO-Diethyl-S-propylthiomethyl phosphorodithioate);

2 polyaromatic hydrocarbons (benzo(ghi)perylene and pyrene);

50 pesticides and breakdown products, of which 43 are currently in use.

2.5 Consideration of the use of persistent and toxic chemicals with a propensity to bioaccumulate

Obtaining information on the current use of the persistent, toxic and bioaccumulable substances from Table 2.6 proved to be problematical, particularly for the large number of pesticides in the list. There was no single source of information which detailed usage of inorganic and organic substances in industrial processes or the use of pesticides in agricultural and non-agricultural situations.

Information on the presence of the 26 UK 'Red List' substances in point sources in England and Wales in 1989 was collated by Hedgecott (1990). This provided information on the likely impact of controlled release of some of the 59 persistent substances in Table 2.6.

Table 2.7 shows the top 50 'pesticides' (insecticides, herbicides, fungicides, molluscides) by weight of active ingredient, in a survey of agricultural and non-agricultural use during 1990 growing season (NRA 1992, MAFF 1992). Table 2.8 shows information obtained from FARMSTAT surveys of the agricultural use of a wide range of pesticides in NRA North West, Severn Trent, Southern and Yorkshire regions (Oakes, pers comm). Data was available on the use of a substance at greater than 0.1 tonnes per annum in each of the regions. Information for these regions totalled about 35% of the agricultural land in England and Wales (NRA 1992) and should provide a reasonable reflection of pesticide usage over the total area. Care has to be exercised when interpreting these figures, as weight of active ingredient does not necessarily indicate widespread use. Many recently introduced formulations are extremely potent per unit weight of active ingredient, compared to the older chemicals such as sulphuric acid which require higher applications of active ingredients per unit area to achieve the desired effect.

2.6 Identification of potential contaminants to be measured

Table 2.7 shows the substances which it is considered from data on toxicity, bioaccumulation potential, persistence and level of use should be measured in fish tissues in any national sampling programme.

2.6.1 Metals and organometallic substances

Cadmium, mercury and triorganotin compounds are considered appropriate candidates for monitoring in fish tissues since Hedgecott (1990) found 428, 225 and 49 point releases of these substances respectively in a survey of these sources in England and Wales in 1989. Releases of these substances from diffuse sources to inland surface waters are also expected (Seager 1987).

2.6.2 Organic chemicals

At this time none of the organic chemicals should be routinely monitored as there is uncertainty over their toxicity data. For 4-chloro-3-methylphenol, the US EPA 96h LC₅₀ for fathead minnow of 0.1 mg l⁻¹ was used in the ranking exercise. However, Holcombe (1984) reported a 96h LC₅₀ for the same species of 7.6 mg l⁻¹ and questioned the derivation of the EPA value. For the other two compounds, the toxicity data was obtained from a database and more information is being obtained on the these tests.

2.6.3 Polyaromatic hydrocarbons

Polyaromatic hydrocarbons may enter surface waters from point sources such as oil processing plants or via diffuse sources such as atmospheric deposition and surface runoff from urban areas. It is extremely difficult to obtain a realistic estimate of the annual loads reaching receiving waters. However, taking a precautionary approach the persistent compounds benzo(ghi)perylene and pyrene should probably be measured in fish tissue.

2.6.4 Pesticides

Among the currently used pesticides in Table 2.6 only the herbicides triallate and trifluralin, the insecticides chlorpyrifos, fenvalerate lindane and phorate and the fungicide chlorothalinol were sufficiently widely used to merit monitoring in fish tissues (Tables 2.7 and 2.8).

Although the use of insecticides such as DDT and the 'drins' (aldrin and dieldrin) is banned in the UK, monitoring is necessary due to their persistence. A recent report on point sources of red list substances in England and Wales in 1989 (Hedgecote, 1990) indicated that trace levels of these substances continued to be present in discharges as contaminants of raw materials or as wastes. These substances will also be associated with sediments and bioavailable to fish populations by accumulation through ingestion of contaminated benthic invertebrates.

Table 2.6 Persistence data on substances scoring highly in Table 2.5

Substance	Type	Score			Half life in surface waters (days)	Persistent
		Total	Toxicity	Bioaccum		
Aldrin	Insecticide (OC)	12	6	2	3648	Y
Benzo(a)anthracene		12	6	2	0.91	N
Benzo(k)fluoranthene		12	6	2	10.5	N
Benzo(ghi)perylene		12	6	2	620	Y
Benzo(a)pyrene		12	6	2	0.03	N
Chlorpyrifos	Insecticide (OP)	12	6	2	76	Y
Cyfluthrin	Insecticide (P)	12	6	2	ND	-
Cyhalothrin	Insecticide (P)	12	6	2	20	N
Cypermethrin	Insecticide (P)	12	6	2	14	N
DDD		12	6	2	ND	-
DDT	Insecticide (OC)	12	6	2	1824	Y
Dieldrin	Insecticide (OC)	12	6	2	730	Y
Endosulphan	Insecticide (OC)	12	6	2	7.5	N
Endrin	Insecticide (OC)	12	6	2	5107	Y
Fenpropathrin	Insecticide (P)	12	6	2	ND	-
Heptachlor	Insecticide (OC)	12	6	2	3.0	N
Heptachlor-epoxide	Insecticide (OC)	12	6	2	293	Y
Mercury (Organic)		12	6	2	-	Y
Methoxychlor	Insecticide (DP)	12	6	2	0.16	N
Permethrin	Insecticide (P)	12	6	2	2.5	N
Toxaphene	Insecticide (CBT)	12	6	2	-	-
Trifluralin	Herbicide (DNA)	12	6	2	61	Y
Pirimiphos-methyl	Insecticide (OP)	10.8	6	1.8	ND	-
Cadmium		10.2	6	1.7	-	Y
Carbaryl	Insecticide (MC)	10.2	6	1.7	ND	-
Diazinon	Insecticide (OP)	10.2	6	1.7	30	Y
Deltamethrin	Insecticide (P)	10.2	6	1.7	1.0	N
Fenitrothion	Insecticide (OP)	10.2	6	1.7	30	Y

Table 2.6 Continued

Substance	Type	Score			Half life in surface waters (days)	Persistent
		Total	Toxicity	Bioaccum		
Fenvalerate	Insecticide (P)	10.2	6	1.7	ND	-
Lindane	Insecticide (OC)	10.2	6	1.7	456	Y
Tributyltin		10.2	6	1.7	365	Y
1,1-Bis (tert-butyl peroxy) cyclohexamine		10	5	2	ND	-
pp'-DDE		10	5	2	3.4	N
Fluoranthene		10	5	2	1.7	N
Hexachlorobenzene	Fungicide (CB)	10	5	2	1.8	N
Hexachlorobutadiene		10	5	2	1.5	N
Pentachlorophenol	Pesticide (P)	10	5	2	10	N
Phenanthrene		10	5	2	15	N
Pyrene		10	5	2	ND	-
Technazene	Fungicide (CB)	10	5	2	180	Y
Triphenyltin		10	5	2	365	Y
Azinphos-methyl	Insecticide (OP)	9.6	6	1.6	30	Y
Coumaphos	Insecticide	9.6	6	1.6	33	Y
Parathion-methyl	Insecticide (OP)	9.6	6	1.6	7.6	N
Phorate	Insecticide (OP)	9.6	6	1.6	ND	-
Bioresmethrin	Insecticide (P)	9	5	1.8	ND	-
Chlorothalinol	Fungicide (CP)	9	5	1.8	ND	-
Chlorpyrifos-methyl	Insecticide (OP)	9	5	1.8	ND	-
Phosalone	Insecticide (OP)	9	5	1.8	45	Y
Anthracene		8.5	5	1.7	0.152	N
Chlordane	Insecticide (CH)	8.5	5	1.7	835	Y
Chlordecone	Pesticide	8.5	5	1.7	521	Y

Table 2.6 Continued

Substance	Type	Score			Half life in surface waters (days)	Persistent
		Total	Toxicity	Bioaccum		
Eulan	Insecticide	8.5	5	1.7	ND	-
Flucifuron	Insecticide (U)	8.5	5	1.7	ND	-
Tetraethyl lead		8.5	5	1.7	0.21	N
4-Chloro-3-methylphenol		8	5	1.6	ND	-
Disulphoton	Insecticide (OP)	8	5	1.6	365	Y
Phoxim	Insecticide (OP)	8	5	1.6	365	Y
Pirimiphos-ethyl	Insecticide (OP)	8	5	1.6	ND	-
Azinphos-ethyl	Insecticide (OP)	6	6	ND	30	Y
Carbophenothion	Insecticide	6	6	ND	76	Y
Chlorfenviphos	Insecticide (OP)	6	6	ND	50	Y
00-Diethyl S prpylthio- methyl phosphorodithoate		6	6	ND	ND	-
EPN	Insecticide (OP)	6	6	ND	ND	-
Ethion	Insecticide (OP)	6	6	ND	30	-
Isodrin	Insecticide (OC)	6	6	ND	ND	-
Mevinphos	Insecticide (OP)	6	6	ND	9	N
Phosphimadon	Insecticide (P)	6	6	ND	9	N
Resmethrin	Insecticide (P)	6	6	ND	ND	-
Sulphotep	Insecticide (OP)	6	6	ND	91	Y
Demeton	Insecticide (OP)	5	5	ND	3	N
Dialifos	Insecticide (OP)	5	5	ND	ND	-
Furazolidane	Veternary Prod	5	5	ND	ND	-
Juglone		5	5	ND	ND	-
Omethoate	Insecticide (OP)	5	5	ND	365	Y
Oxydemeton-methyl	Insecticide (OP)	5	5	ND	365	Y
Pensulphotion	Insecticide	5	5	ND	ND	-
Pyrethrin	Insecticide	5	5	ND	ND	-

Table 2.6 Continued

Substance	Type	Score			Half life in surface waters (days)	Persistent
		Total	Toxicity	Bioaccum		
TEPP	Pesticide	5	5	ND	ND	-
Thionazin	Pesticide	5	5	ND	ND	-
Triallate	Herbicide (T)	5	5	ND	43	-

CB - Chlorobenzene

CBT - Chlorinated bicyclic terpenes

CH - Chlorinated hydrocarbon

CP - Chlorophenyl

DNA - 2,6-Dinitroaniline

DB - Diphenyl

MC - Methylcarbamate

OC - Organochlorine

OP - Organophosphorus

P - Pyrethroid

T - Thiocarbamate

U - Urea

Table 2.7 Estimated amount of the Fifty Active Ingredients of pesticides, used most by weight, in agricultural and non-agricultural situations during the 1989 growing season

Active ingredient	Amount used (tonnes)			Score
	Agricultural	Non-agricultural	Total	
Sulphuric acid	5466	-	5466	-
Mecoprop	3099	32	3131	1.4
Isoproturon	2720	-	2720	4.2
Chlormequat	1446	-	1446	ND
Chlorotoluron	773	-	773	2.8
Mancozeb	673	-	673	3.0
Maneb	647	-	647	4.0
Fenpropimorph	560	-	560	5.4
Chlorothalinol	500	-	500	9.0
Prochloraz	436	-	436	7.2
Carbendazim	379	-	379	4.8
Sulphur	346	-	346	-
MCPA	320	19	339	2.8
Tridemorph	323	-	323	5.4
Trifluralin	318	-	318	12.0
Captafol	309	-	309	ND
Glyphosate	246	8	254	2.0
Pendimethalin	254	-	254	8.0
TCA	249	-	249	1.0
Ioxynil	239	-	239	3.0
Choline chloride	238	-	238	ND
Bromoxynil	233	-	233	6.0
Tri-allate	189	-	189	5.0
Propiconazole	178	-	178	2.0
Terbutryn	177	-	177	4.8
Dimethoate	163	-	163	5.6
Fenpropadin	146	-	146	6.4
Linuron	143	-	143	5.6
Manganese, zinc ethylene bisdithiocarbamate	127	-	127	ND
Diclofop-methyl	127	-	127	3.2
Simazine	80	41	121	5.6
Propyzamide	119	-	119	3.2
Flamprop-M-isopropyl	113	-	113	3.0
Diquat	112	-	112	5.0
Metasulfuron-methyl	111	-	111	2.0
Methabenzthiazuron	98	-	98	-
Ethirimol	90	-	90	2.8
Metaldehyde	83	-	83	ND
Methiocarb	81	-	81	4.0
Demeton-S-methyl	78	-	78	-
Difenzoquat	76	-	76	1.0
Fluroxypyr	74	-	74	1.6

Table 2.7 Continued

Active ingredient	Amount used (tonnes)			Score
	Agricultural	Non-agricultural	Total	
Paraquat	72	-	72	4.2
Mecoprop-p	72	-	72	1.6
Dichlorprop	70	-	70	4.2
Iprodione	69	-	69	1.6
Flutriafol	62	-	62	2.0
Triadimenol	62	-	62	3.2
Cyanazine	60	-	60	-
Carbetamide	59	-	59	-

Table 2.8 Agricultural use of 43 pesticides in Table 2.6 in NRA North West, Severn Trent, Southern and Yorkshire regions

Substance	Amount of pesticide used in each region for agricultural use in 1990 growing season (tonnes)				
	N.West	S.Trent	Southern	Yorkshire	Total
Chlorpyrifos	0.1	3.1	2.1	0.7	6.0
Cyfluthrin	-	-	-	-	-
Fenpropathrin	-	-	-	-	-
Toxaphene	-	-	-	-	-
Trifluralin	0.9	46.7	8.3	19.0	74.9
Pirimiphos-methyl	-	-	-	-	-
Carbaryl	-	-	-	-	-
Diazinon	-	-	-	-	-
Fentrothion	-	-	-	-	-
Fenvalerate	-	0.5	0.4	0.5	1.4
Lindane	-	3.5	1.2	0.5	5.2
Technazene	-	-	-	-	-
Azinphos-methyl	-	-	-	-	-
Coumaphos	-	-	-	-	-
Phorate	-	-	-	-	-
Bioresmethrin	-	-	-	-	-
Chlorothalinal	0.5	49.2	27.7	14.2	91.6
Chlorpyrifos-methyl	-	-	-	-	-
Phosalone	-	-	0.3	-	0.3
Chlordane	-	-	-	-	-
Chlordecone	-	-	-	-	-
Eulan	-	-	-	-	-
Flucofuran	-	-	-	-	-
Disulphoton	-	-	-	-	-
Phoxim	-	-	-	-	-
Pirimiphos-ethyl	-	-	-	-	-
Azinphos-ethyl	-	-	-	-	-
Carbophenothion	-	-	-	-	-
Chlorfenviphos	-	-	-	-	-
EPN	-	-	-	-	-
Ethion	-	-	-	-	-
Resmethrin	-	-	-	-	-
Sulphotep	-	-	-	-	-

Table 2.8 Continued

Substance	Amount of pesticide used in each region for agricultural use in 1990 growing season (tonnes)				
	N.West	S.Trent	Southern	Yorkshire	Total
Dialifos	-	-	-	-	-
Furazolidane	-	-	-	-	-
Juglone	-	-	-	-	-
Omethoate	-	-	-	-	-
Oxydemeton-methyl	-	-	-	-	-
Pensulphothion	-	-	-	-	-
Pyrethrin	-	-	-	-	-
TEPP	-	-	-	-	-
Thionazin	-	-	-	-	-
Triallate	0.2	29.2	18.6	9.1	57.1

- does not indicate the pesticide is not used but that it is used at less than 0.1 tonnes

Table 2.9 Substances proposed for monitoring in the tissues of fish

Substance	EC Number	EQS (EC/National)
Metals and organometallic substances:		
Cadmium	12	EC (List I)
Mercury	92	EC (List I)
Tributyltin	115	National
Triphenyltin	125-127	National
Polyaromatic hydrocarbons:		
Benzo(ghi)perylene	-	-
Pyrene	-	-
Pesticides:		
Aldrin	1	EC (List I)
Dieldrin	71	EC (List I)
Endrin	77	EC (List I)
Isodrin	-	-
DDT (DDD/DDE)	46	EC (List I)
Chlorpyrifos	-	-
Chlorothalinalol	-	-
Fenvalerate	-	-
Lindane	85	EC (List I)
Triallate	-	-
Trifluralin	124	-

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Table A2 Toxicity and bioaccumulation data used to rank substances using the schemes detailed in Section 2

Substance	log Kow	BCF	Species	Lowest acute toxicity for algae, Daphnia and fish (mg/l)		Worst case toxicity (mg/l)	
				Test/Species	Conc	Species	Conc
Acenaphthalene	3.92			96h LC50 F.minnow	1.72	-	-
Acetic acid	-0.24	-	-	24h EC50 Daphnia	47.0	-	-
Acetic anhydride	-	-	-	48h EC50 Daphnia	10.0	-	-
Acetone	-0.24	-	-	48h EC50 Daphnia	10.0	-	-
Acetonitrile	-0.34	-	-	96h LC50 F.minnow	1000	-	-
Acetylene (Ethyne)	0.37	-	-	33h LC50 R.triut	200	-	-
Acrylamide	-1.65	-	-	48h LC50 Daphnia	98	-	-
Acrylonitrile	-0.92	-	-	96h LC50 Bluegills	11.8	-	-
Adipic acid	0.08	-	-	96h LC50 F.minnow	97	-	-
Aldicarb	1.04	-	-	48h EC50 Daphnia	0.07	-	-
Aldicab	-	-	-	-	-	-	-
Aldrin	3.0-7.4	4444	Catfish	96h LC50 Carp	0.004	Stonefly 30d LC50	0.0025
Alkylbenzene sulphonic acids	-	-	-	96h LC50 R.trout	1.7	-	-
Alloxydim sodium	-0.20	-	-	48h LC50 Carp	3500	-	-
Allylamine	-	-	-	-	-	-	-
Aluminium	NR	36-215	B.trout	48h LC50 Brook trout	0.45	-	-
4-Aminobiphenyl	-	-	-	-	-	-	-
2-Amino-4-chlorophenol	-	-	-	-	-	Fish 96h LC50	2.0
4-Aminodiphenyl	3.09	-	-	-	-	Fish 96h LC50	4.5
Amiton	-	-	-	-	-	-	-
Amitraz	5.50	-	-	96h LC50 Bluegills	1.3	-	-
Amitrole	0.52	-	-	48h LC50 Daphnia	30.0	Copepods 96h LC50	22.1
Ammonia	0.37	-	-	24h LC50 Salmon	0.16	-	-
Anabasine	1.64	-	-	-	-	Fish 96h LC50	47.3
Aniline	0.9-1.0	-	-	48h LC50 Daphnia	-	-	-
Anisole	2.0-2.1	-	-	-	-	-	-
Anthracene	4.45	760	Daphnia	48h EC50 Daphnia	0.036	-	-
Antimony	-	<10	Fish	96h LC50 F.minnow	12.0	-	-
Aramite	-	-	-	-	-	-	-

Table A2 Continued

Substance	log Kow	BCF	Species	Lowest acute toxicity for algae, Daphnia and fish (mg/l)		Worst case toxicity (mg/l)	
				Test/Species	Conc	Species	Conc
Arsenic (III)	NR	7-12	Insects	48h LC50 Daphnia	2.1	Insect 48h LC50	0.68
Asulam	<1.0	-	-	96h LC50 Bluegills	>3000	-	-
Atrazine	2.7	68	Mayflies	18h EC50 Daphnia	0.6	-	-
Azinphos-ethyl	-	-	-	48h EC50 Daphnia	0.0032	-	-
Azinphos-methyl	3.0-3.8	-	-	48h EC50 Daphnia	0.0032	Gammarus 96h LC50	0.0001
Barium	NR	<10	Insects	48h LC50 Daphnia	14.5	-	-
Benomyl	-	-	-	96h LC50 R.trout	0.17	-	-
Bentazone	-0.46	-	-	-	-	-	-
Benzaldehyde	1.48	-	-	96h LC50 Bluegills	1.07	-	-
Benzalkonium chloride	-	-	-	-	-	-	-
Benzene	2.13	225	Daphnia	96h LC50 F.minnow	15.1	-	-
1,2-Benzenediol	0.9-1.0	-	-	-	-	Goldfish LC50	14.0
Benzidine	1.81	-	-	-	-	Fish 96h LC50	2.0
Benzo(a)anthracene	-	1106	Daphnia	96h LC50 Daphnia	0.01	-	-
Benzocaine	-	-	-	24h LC50 F.minnow	35.4	-	-
Benzo[b]fluoranthene	-	-	-	-	-	-	-
Benzo[k]fluoranthene	6.06	13225	Daphnia	13h LC50 Daphnia	0.0014	-	-
Benzo[y]fluoranthene	-	-	-	-	-	-	-
Benzoic acid	1.87	-	-	48h LC50 G.orfe	460	-	-
Benzo[ghi]perylene	6.51	28288	Daphnia	14h LC50 Daphnia	0.0002	-	-
Benzo[a]pyrene	-	2720	Daphnia	96h LC50 Daphnia	0.005	-	-
Benzothiazolone	-	-	-	-	-	-	-
Benzyl chloride	0.36	-	-	96h LC50 F.minnow	6.0	-	-
Benzylidene chloride	3.22	-	-	-	-	Fish 96h LC50	50.0
Beryllium	-	19	Bluegills	96h LC50 F.minnow	0.15	-	-
Bioresmethrin	4.70	-	-	-	-	Fish 96h LC50	0.014
Biphenyl	3.2-4.1	436	R.trout	48h EC50 Daphnia	3.08	-	-
Bis(4-Aminophenyl)methane	-	-	-	-	-	-	-

Table A2 Continued

Substance	log Kow	BCF	Species	Lowest acute toxicity for algae, Daphnia and fish (mg/l)		Worst case toxicity (mg/l)	
				Test/Species	Conc	Species	Conc
Bis(2-chloroethyl) sulphide	-	-	-	-	-	-	-
Bis(chloromethyl) ether	1.15	-	-	-	-	-	-
Bis(2-ethylhexyl) phthalate	-	-	-	-	-	-	-
2,2-Bis(tert-butylperoxy) butane (concentration ~70%)	4.98	-	-	-	-	Fish 96h LC50	<0.2
1,1-Bis(tert-butylperoxy) cyclohexane (concentration ~80)	5.5	-	-	-	-	Fish 96h LC50	0.08
Bis(2,4,6-trinitrophenyl) amine	3.1	-	-	-	-	Fish 96h LC50	23.1
Boron	NR	-	-	48h LC50 Daphnia	226	Daphnia 21d LC50	53.2
Bromine	-	-	-	-	-	Fish 96h LC50	10.0
Bromodichloromethane	-	-	-	-	-	-	-
Bromoform	-	-	-	-	-	-	-
Bromo hydantoins	-	-	-	-	-	-	-
Bromomethane (Methyl bromide)	-	-	-	96h LC50 Bluegills	11.0	-	-
Bromophos	-	-	-	-	-	-	-
Bromoxynil	2.9	-	-	96h LC50 R.trout	0.05	Catfish 96h LC50	0.023
Butadiene	-	-	-	-	-	-	-
1-Butanol	-0.06	<10	Fish	24h LC50 Daphnia	1855	-	-
2-Butanol	-0.21	-	-	-	-	Goldfish 24h LC50	4300
Butyl acrylate	-	-	-	-	-	Fish 72h LC50	5.0
Cadmium	NR	250	Guppy	48h LC50 Daphnia	0.03	Daphnia 20d LC50	0.00037
Caesium	-	-	-	-	-	-	-
Captafol	-	-	-	96h LC50 Bluegills	0.15	-	-
Carbaryl	0.14-2.4	300	Snail	48h LC50 Daphnia	0.0064	Insect 30d LC50	0.0022
Carbendazim	1.56	-	-	96h LC50 R.trout	0.36	-	-
Carbetamide	-1.59	-	-	-	-	Fish 96h LC50	165
Carbofuran	1.60	-	-	96h LC50 R.trout	0.38	-	-
Carbon disulphide	1.8-2.2	-	-	-	-	Fish 96h LC50	135

Table A2 Continued

Substance	log Kow	BCF	Species	Lowest acute toxicity for algae, Daphnia and fish (mg/l)		Worst case toxicity (mg/l)	
				Test/Species	Conc	Species	Conc
Carbon tetrachloride	1.8-2.8	17.3	R.trout	48h EC50 Daphnia	51.9	-	-
Carbonly chloride (Phosgene)	1.27	-	-	-	-	-	-
Carbophenothion	-	-	-	-	-	Gammarus 96h LC50	0.0052
Cellulose nitrate	-	-	-	-	-	-	-
Cetyl alcohol	-	-	-	-	-	-	-
Chlorbufam	-	-	-	-	-	-	-
Chlopropham	-	-	-	-	-	-	-
Chloral hydrate	1.61	-	-	-	-	Fish 96h LC50	1720
Chloramines	-	-	-	2h LC50 R.trout	0.66	-	-
Chlordane	6.0	322	Bluegills	96hr LC50 R.trout	0.022	Insect 96h LC50	0.015
Chlordecone (Kepone)	-	211-548	Fish	96hr LC50 R.trout	0.02	-	-
Chlordimeform	-	-	-	-	-	-	-
Chlorfenvinphos	-	-	-	48h LC50 Daphnia	0.0001	-	-
Chloridazon	2.2	-	-	96h LC50 Trout	27.0	-	-
Chlormequat	-	-	-	48h LC50 Daphnia	16.9	-	-
Chlorine	-	<10	-	96h LC50 R.trout	0.17	Catfish 96h LC50	0.07
Chloroacetic acid	-	-	-	-	-	Fish 96h LC50	14.0
2-Chloroaniline	1.9	-	-	48h EC50 Daphnia	0.35	-	-
3-Chloroaniline	1.88	-	-	48h EC50 Daphnia	1.8	-	-
4-Chloroaniline	1.83	-	-	48h EC50 Daphnia	0.31	-	-
Chlorobenzene	2.84	-	-	48h LC50 R.trout	4.1	Daphnia 14d EC50	2.5
Chlorodibromomethane	-	-	-	-	-	-	-
1-Chloro-2,4-dinitrobenzene	2.06	-	-	-	-	-	-
Chloroethanoic acid	-	-	-	-	-	-	-
2-Chloroethanol	0.03	-	-	-	-	Fish 96h LC50	15.5
Chloroethylene	-	-	-	-	-	-	-
Chloroform	1.97	-	-	48h EC50 Daphnia	23.5	Gammarus 21d EC50	13.0
4-(Chloroformyl)morpholine	0.20	-	-	-	-	Fish 96h LC50	9000
Chloromethyl methyl ether	0.57	-	-	-	-	Fish 96h LC50	<2200

Table A2 Continued

Substance	log Kow	BCF	Species	Lowest acute toxicity for algae, Daphnia and fish (mg/l)		Worst case toxicity (mg/l)	
				Test/Species	Conc	Species	Conc
4-Chloro-3-methylphenol	3.1	-	-	96h LC50 F.minnow	0.1	-	-
4-chloro-2-methylphenoxy- acetic acid-	-	-	-	-	-	-	-
4 (4 Chloro-2-methyl phenoxy) butyric acid	-	-	-	-	-	-	-
1-Chloronaphthalene	4.0	-	-	48h EC50 Daphnia	0.81	-	-
4-chloro-2-nitroaniline	-	-	-	-	-	-	-
1-Chloro-2-nitrobenzene	2.24	28	Fish	96h LC50 Bluegills	1.2	-	-
1-Chloro-3-nitrobenzene	2.2-2.5	47	Fish	96h LC50 Bluegills	1.2	-	-
1-Chloro-4-nitrobenzene	2.4	39	Fish	48h EC50 Daphnia	2.7	-	-
4-Chloro-2-nitrophenol	2.6	-	-	-	-	-	-
4-Chloro-2-nitrotoluene	3.0	-	-	-	-	Fish 96h LC50	0.5
2-Chlorophenol	2.1-2.2	214	Bluegills	96h LC50 Bluegills	2.6	-	-
3-Chlorophenol	2.5	-	-	96h LC50 Guppy	6.5	Fish 96h LC50	3.0
4-Chlorophenol	2.4	10	Goldfish	48h EC50 Daphnia	2.5	-	-
3-Chloroprene	1.53	-	-	96h LC50 F.minnow	19.8	Guppy 14d LC50	1.2
Chlorothalonil	4.38	-	-	96h LC50 R.trout	0.049	-	-
2-Chlorotoluene	3.42	-	-	48h LC50 Daphnia	1.1	-	-
3-Chlorotoluene	3.28	-	-	48h LC50 Daphnia	1.1	-	-
4-Chlorotoluene	3.33	-	-	48h LC50 Daphnia	1.1	-	-
2-Chloro-p-toluidine	2.20	-	-	-	-	-	-
Chlorotoluron	2.29	-	-	96h LC50 R.trout	20-35	-	-
Chlorotrinitrobenzene	-	-	-	-	-	-	-
Chloroxynil and esters	-	-	-	-	-	-	-
Chloropicrin	-	-	-	-	-	-	-
Chlorpyralid	-	-	-	-	-	-	-
Chlorpyriphos	5.11	-	-	96h LC50 Bluegills	0.0026	Insect 96h LC50	0.0004
Chlorpyriphos-methyl	-	-	-	3h LC50 Daphnia	0.017	-	-
Chlorthiamid	-	-	-	48h LC50 Guppy	41.0	Fish 24h LC50	33.0

Table A2 Continued

Substance	log Kow	BCF	Species	Lowest acute toxicity for algae, Daphnia and fish (mg/l)		Worst case toxicity (mg/l)	
				Test/Species	Conc	Species	Conc
Choline chloride	-	-	-	-	-	-	-
Chromium (VI)	NR	<1-49	Fish	24h EC50 Daphnia	0.01	-	-
Cismethrin	-	-	-	-	-	-	-
Citric acid	-1.72	-	-	-	-	Daphnia LC50	100
Clopyralid	-	-	-	96h LC50 R.trout	103.5	-	-
Cobalt	NR	190	F.minnow	-	-	Fish 96h LC50	>1000
Coconut diethanolamide	-	-	-	-	-	-	-
Copper	NR	25-200	Fish	48h EC50 Daphnia	0.0037	-	-
Coumaphos	4.11	-	-	48h LC50 R.trout	0.55	Gammarus 96h LC50	0.00007
Creosote	-	-	-	96h LC50 R.trout	0.56	-	-
o-Cresol	-	-	-	96h LC50 F.minnow	13.4	-	-
m-Cresol	-	-	-	96h LC50 Bluegills	10.0	-	-
p-Cresol	-	-	-	48h EC50 Daphnia	7.7	-	-
Crimidine	-	-	-	-	-	Fish 96h LC50	5.0
Cruformate	-	-	-	-	-	-	-
Cumene	-	-	-	-	-	-	-
Cyanazine	-	-	-	-	-	Fish 48h LC50	10.0
Cyanogenamide	-	-	-	-	-	-	-
2-Cyanopropan-2-ol	-	-	-	-	-	Fish 96h LC50	0.57
Cyanthoate	-	-	-	-	-	-	-
Cyanuric chloride	-	-	-	-	-	-	-
Cyclohexane	3.44	-	-	96h LC50 F.minnow	32.0	-	-
Cyclohexanol	1.23	-	-	96h LC50 Bluegills	1100	-	-
Cyclohexanone	0.81	-	-	-	-	-	-
Cycloheximide	0.55	-	-	-	-	Fish 96h LC50	<8000
Cyclotetramethylenetetranitramine	-	-	-	-	-	Fish 96h LC50	15.0
Cyclotrimethylene trinitramine	-	-	-	-	-	Fish 96h LC50	3.8
Cyfluthrin	5.0	-	-	96h LC50 R.trout	0.0006	-	-
Cyhalothrin	7.0	-	-	48h LC50 Daphnia	0.001	Gammarus 48h LC50	0.00008

Table A2 Continued

Substance	log Kow	BCF	Species	Lowest acute toxicity for algae, Daphnia and fish (mg/l)		Worst case toxicity (mg/l)	
				Test/Species	Conc	Species	Conc
Cypermethrin	4.47	>1000	R.trout	96h LC50 Rudd	0.0001	Gammarus 96h LC50	0.00009
2,4-D	2.81	-	-	48h LC50 Bluegills	0.9	-	-
Dalapon	3.87	-	-	48h EC50 Daphnia	11.0	-	-
2,4-DB	-	-	-	-	-	-	-
DCA	-	-	-	-	-	-	-
DDD	-	4460	Snail	48h EC50 Daphnia	0.0032	Gammarus 96h LC50	0.00064
pp'-DDE	4.3-5.7	36342	Snail	96h LC50 R.trout	0.032	-	-
DDT	6.19	>12000	Fish	96h LC50 B.trout	0.002	R.trout 15d LC50	0.00026
Deltamethrin	5.43	248-907	Fish	96h LC50 R.trout	0.00039	-	-
Demeton	-	-	-	96h LC50 Bluegills	0.1	Gammarus 96h LC50	0.027
Diacetone alcohol	-	-	-	96h LC50 Bluegills	420	-	-
Dialifos	-	-	-	3h LC50 Daphnia	0.027	-	-
Diazinon	3.1-4.0	152	Gudgeon	48h EC50 Daphnia	0.0008	Gammarus 30d LC50	0.00027
Diazodinitrophenol	-	-	-	-	-	-	-
Dibenzyl peroxydicarbonate (concentration ~90%)	-	-	-	-	-	-	-
Dibrom	-	-	-	-	-	-	-
Dibromochloromethane	-	-	-	-	-	-	-
1,2-Dibromoethane	1.60	-	-	48h LC50 Bluegills	18.0	Fish 96h LC50	4.80
Dibutyltin	1.49	-	-	-	-	Fish 96h LC50	0.81
Dicamba	3.67	-	-	96h LC50 Bluegills	23.0	Gammarus 96h LC50	3.9
Dichlobenil	3.14	13	R.trout	48h LC50 Daphnia	3.7	-	-
Dichlogention	-	-	-	-	-	-	-
3,4-Dichloroaniline	2.69	-	-	48h EC50 Daphnia	0.16	-	-
1,2-Dichlorobenzene	3.38	66-560	Fish	96h LC50 Guppy	5.9	-	-
1,3-Dichlorobenzene	3.38	89-740	Fish	96h LC50 Bluegills	5.0	-	-
1,4-Dichlorobenzene	3.39	60-720	Fish	96h LC50 R.trout	1.12	-	-
3,3-Dichlorobenzidine	3.24	-	-	-	-	Fish 96h LC50	0.5

Table A2 Continued

Substance	log Kow	BCF	Species	Lowest acute toxicity for algae, Daphnia and fish (mg/l)		Worst case toxicity (mg/l)	
				Test/Species	Conc	Species	Conc
Dichlorodiisopropyl ether	2.50	554	Bluegills	-	-	-	-
1,1-Dichloroethane	1.79	-	-	48h EC50 Daphnia	92.3	-	-
1,2-Dichloroethane	1.48	-	-	24h LC50 Daphnia	250	Guppy 7d LC50	106
1,1-Dichloroethylene	1.48	-	-	96h LC50 Bluegills	220	-	-
1,2-Dichloroethylene	1.9-2.1	-	-	96h LC50 Bluegills	140	-	-
Dichloromethane	1.25	-	-	48h LC50 Daphnia	224	-	-
2,2-Dichloro-2-methyl phenoxy propionic acid	-	-	-	-	-	-	-
Dichlorophen	-	-	-	-	-	Fish 96h LC50	3.6
2,4-Dichlorophenol	2.8-3.1	-	-	24h LC50 R.trout	1.7	R.trout 24dLC50	0.07
Dichloroprop (2-butoxyethyl ester)	2.75	-	-	48h LC50 Bluegills	1.1	-	-
1,2-Dichloropropane	2.02	-	-	96h LC50 Bluegills	32.0	Guppy 7d LC50	116
1,3-Dichloropropan-2-ol	1.71	-	-	24h LC50 Daphnia	983	Goldfish 24h LC50	160
1,3-Dichloropropene	1.98	-	-	-	-	Fish 96h LC50	7.0
2,3-Dichloropropene	1.99	-	-	-	-	Guppy 7d LC50	<100
2,4-Dichloro-3,5-xyleneol	-	-	-	-	-	-	-
Dichlorvos	1.47	-	-	48h LC50 Daphnia	0.0007	-	-
Diclofop-methyl	4.58	-	-	96h LC50 R.trout	0.35	-	-
Dieldrin	4.09	12500	Guppy	96h LC50 R.trout	0.0012	-	-
Diethylamine	0.58	-	-	96h LC50 R.trout	25	-	-
Diethyl ether	0.8-0.9	-	-	96h LC50 Bluegills	10000	Guppy 14d LC50	2138
00-Diethyl S-ethylsulphinylmethyl phosphorothioate	2.26	-	-	-	-	Fish 96h LC50	<1400
00-Diethyl S-ethylsulphonylmethyl phosphorothioate	1.78	-	-	-	-	Fish 96h LC50	<300
Di(ethylhexyl) adipate	-	<10	Bluegills	48h LC50 Daphnia	0.66	-	-
Di-(2-ethylhexyl)phthalate	4.9-5.1	13600	Gammarus	48h LC50 Daphnia	0.13	-	-

Table A2 Continued

Substance	log Kow	BCF	Species	Lowest acute toxicity for algae, Daphnia and fish (mg/l)		Worst case toxicity (mg/l)	
				Test/Species	Conc	Species	Conc
00-Diethyl S-isopropylthiomethyl phosphorodithioate	-	-	-	-	-	-	-
Diethyl peroxydicarbonate (concentration ~30%)	-	-	-	-	-	-	-
Diethyl phthalate	3.0	-	-	-	-	Copepod 96h LC50	74.0
00-Diethyl S-propylthiomethyl phosphorodithioate	-	-	-	-	-	Fish 96h LC50	0.0075
Difenzoquat	-0.62	-	-	96h LC50 R.trout	694	-	-
Di-flubenzuron	-	84	Bluegills	48h LC50 Daphnia	0.015	Daphnia 21d LC50	0.000062
2,2-Dihydroperoxypropan (concentration ~30%)	-	-	-	-	-	-	-
2,3-Dihydroxybutane	-	-	-	-	-	-	-
Di-isobutyl peroxide (concentration ~50%)	2.05	-	-	-	-	Fish 96h LC50	<160
Dimefox	-	-	-	-	-	-	-
Dimethanoate	-	-	-	-	-	-	-
Dimethoate	2.71	-	-	48h EC50 Daphnia	1.5	Stonefly 96h LC50	0.043
Dimethylamine	2.3-2.6	-	-	96h LC50 R.trout	17.0	-	-
2,4-Dimethylaniline	1.85	-	-	24h LC50 Daphnia	25.0	-	-
Dimethylcarbamoyl chloride	0.91	-	-	-	-	Fish 96h LC50	<1300
Dimethyl methylphosphonate	-	-	-	-	-	-	-
Dimethylnitrosamine	-	-	-	-	-	-	-
Dimethyl phosphoramidocyanidic acid	-	-	-	-	-	-	-
2,5-Dimethylpyridine	-	-	-	-	-	-	-
2,4-Dinitrophenol	1.5	-	-	-	-	Fish 96h LC50	3.4
Dinocap	4.54	-	-	-	-	-	-
Dinoseb	2.01	-	-	96h LC50 Trout	0.032	-	-
Diphacinone	-	-	-	96h LC50 R.trout	2.8	Fish 96h LC50	2.1

Table A2 Continued

Substance	log Kow	BCF	Species	Lowest acute toxicity for algae, Daphnia and fish (mg/l)		Worst case toxicity (mg/l)	
				Test/Species	Conc	Species	Conc
Diphenylguanidine	-	-	-	-	-	-	-
Di-n-propyl peroxydicarbonate (concentration ~80%)	2.41	-	-	-	-	Fish 96h LC50	<80
Diquat	-4.6	-	-	26h EC50 Daphnia	7.0	-	-
Di-sec-butyl peroxydicarbonate (concentration ~80%)	2.99	-	-	-	-	-	-
Disulfoton	3.81	-	-	3h LC50 Daphnia	0.07	-	-
Dithiocarbamate	-	-	-	-	-	-	-
2,2-Dithiobisbenzothiazole	-	-	-	-	-	-	-
4,4-Dithiomorpholine	-	-	-	-	-	-	-
Diuron	-	2	F.minnow	48h LC50 Daphnia	1.4	Insect 48h LC50	0.0012
DNOC	0.45	-	-	24h LC50 R.trout	0.12	-	-
EBDCs	-	-	-	-	-	-	-
Endosulfan	3.6	>1000	Fish	96h LC50 R.trout	0.0003	-	-
Endrin	4.6-5.6	10000	F.minnow	96h LC50 R.trout	0.0006	Stonefly 30d LC50	0.00035
Epichlorohydrin	0.30	-	-	96h LC50 F.minnow	10.6	-	-
EPN	-	-	-	96h LC50 Bluegills	0.1	Gammarus 96h LC50	0.007
EPTC	3.20	-	-	48h LC50 Daphnia	4.7	-	-
Ethanol	-0.32	-	-	24h LC50 Trout	11200	-	-
Ethanolamine	-1.31	-	-	-	-	Goldfish 96h LC50	170
Ethion	-	-	-	96h LC50 Bluegills	0.22	Gammarus 96h LC50	0.0018
Ethirimol	2.3	-	-	96h LC50 B.trou	20.0	-	-
Ethoate-methyl	-	-	-	-	-	-	-
Ethofumesate	2.70	-	-	24h LC50 Guppy	15.0	-	-
Ethyl acetate	0.6-0.7	-	-	96h LC50 Guppy	210	-	-
Ethyl acrylate	-	-	-	-	-	Guppy 14d LC50	0.7
Ethylbenzene	3.15	16	Goldfish	96h LC50 R.trout	14.0	-	-
Ethylchloride	1.54	-	-	-	-	-	-

Table A2 Continued

Substance	log Kow	BCF	Species	Lowest acute toxicity for algae, Daphnia and fish (mg/l)		Worst case toxicity (mg/l)	
				Test/Species	Conc	Species	Conc
Ethylene	-	-	-	-	-	-	-
Ethylene glycol	1.93	-	-	96h LC50 F.minnow	40000	-	-
Ethylene glycol dinitrate	0.35	-	-	-	-	Fish 96h LC50	3581
Ethylene glycol monobutyl ether	-	-	-	72h LC50 Bluegills	1800	Guppy 7d LC50	983
Ethylene glycol monoethyl ether	-0.1	-	-	96h LC50 Bluegills	10000	-	-
Ethyleneimine	-	-	-	-	-	Fish 96h LC50	2.0
Ethylene oxide	-	-	-	-	-	Goldfish 24h LC50	90.0
2-Ethyl hexanol	-	-	-	96h LC50 R.trout	32-37	-	-
Ethyl nitrate	0.84	-	-	-	-	Fish 96h LC50	741
Etrifos	3.3	-	-	96h LC50 Carp	13.3	-	-
Eulan WA (Chlorphenylid)	3.68	361	Pike	96h LC50 Bluegills	0.011	-	-
Fenchlorphos (Ronnel)	4.88	-	-	96h LC50 F.minnow	0.35	-	-
Fenitrothion	3.38	250	Trout	48h LC50 R.trout	0.0013	-	-
Fenpropathrin	6.0	-	-	48h LC50 Bluegills	0.002	-	-
Fenpropidin	3.0	-	-	48h LC50 Daphnia	0.5	-	-
Fenpropimorph	4.06	-	-	96h LC50 Carp	3.2	-	-
Fenthion	2.8	-	-	48h LC50 Daphnia	0.0008	-	-
Fenvalerate	4.42	683	Daphnia	96h LC50 Daphnia	0.000032	-	-
Ferbam	-	-	-	-	-	-	-
Flucofuron	6.04	126-940	Trout	48h LC50 B.trout	0.072	R.trout 35d LC50	0.012
Fluometil	-	-	-	-	-	-	-
Flumethrin	-	-	-	-	-	-	-
Fluoranthene	5.22	1738	Fish	48h LC50 Daphnia	0.053	-	-
Fluoride	-	<10	Fish	96h LC50 R.trout	205	R.trout 24d LC50	2.7
Fluoroacetic acid	-	-	-	-	-	-	-
Fluoroacetic acid amides	-	-	-	-	-	-	-
Fluoroacetic acid, esters	-	-	-	-	-	-	-
Fluoroacetic acid, salts	-	-	-	-	-	-	-

Table A2 Continued

Substance	log Kow	BCF	Species	Lowest acute toxicity for algae, Daphnia and fish (mg/l)		Worst case toxicity (mg/l)	
				Test/Species	Conc	Species	Conc
4-Fluorobutyric acid, amides	-	-	-	-	-	-	-
4-Fluorobutyric acid, esters	-	-	-	-	-	-	-
4-Fluorobutyric acid, salts	-	-	-	-	-	-	-
4-Fluorocrotonic acid	-	-	-	-	-	-	-
4-Fluorocrotonic acid, amides	-	-	-	-	-	-	-
4-Fluorocrotonic acid, esters	-	-	-	-	-	-	-
4-Fluorocrotonic acid, salts	-	-	-	-	-	-	-
4-Fluoro-2-hydroxybutric acid	-	-	-	-	-	-	-
4-Fluoro-2-hydroxybutric acid, salts	-	-	-	-	-	-	-
4-Fluoro-2-hydroxybutric acid, esters	-	-	-	-	-	-	-
4-Fluoro-2-hydroxybutric acid, amides	-	-	-	-	-	-	-
Fluroxypyr	3.79	-	-	48h LC50 Daphnia	>100	-	-
Flutriafol	-	-	-	96h LC50 R.trout	61	-	-
Formaldehyde (Formalin)	0.35	-	-	48h LC50 B.trout	157	-	-
Formic acid	-0.2/1.6	-	-	48h LC50 Daphnia	120	-	-
Formothion	1.48	-	-	96h LC50 Carp	>50	-	-
Fosamine ammonium	-	-	-	96h LC50 Bluegills	>415	-	-
Furazolidone	-	-	-	24h LC50 Daphnia	0.060	-	-
Furfuryl alcohol	-	-	-	-	-	-	-
Glutaraldehyde	-	-	-	-	-	-	-
Glycerol	-2.66	-	-	-	-	Goldfish 24h LC50	>5000
Glycine	-	-	-	-	-	-	-
Glyphosate	-3.25	-	-	96h LC50 R.trout	140	-	-
1-Guanyl-4-nitrosaminoguanyl- 1-tetrazene	-	-	-	-	-	Fish 96h LC50	19000

Table A2 Continued

Substance	log Kow	BCF	Species	Lowest acute toxicity for algae, Daphnia and fish (mg/l)		Worst case toxicity (mg/l)	
				Test/Species	Conc	Species	Conc
Heptachlor	3.87	9500	F.minnow	96h LC50 R.trout	0.007	Insect 96h LC50	0.0009
Heptachlor epoxide	2.7-5.4	14400	F.minnow	96h LC50 Bluegills	0.0053	-	-
Hexachlorobenzene (HCB)	6.18	1160-3740	Fish	24h EC50 Daphnia	0.03	-	-
Hexachlorobutadiene (HCBd)	6.09	-	-	-	-	Goldfish 96 LC50	0.09
Gamma-hexachlorocyclohexane	3.72	167-327	Fish	96h LC50 B.trout	0.002	-	-
1,2,3,7,8,9-Hexachlorodibenzo- p-dioxin	-	-	-	-	-	-	-
Hexachloroethane	3.58	-	-	-	-	Fish 96h LC50	0.98
Hexahydropyrimidine	-	70	Trout	96h LC50 G.orfe	0.03	Gammarus 7d LC50	0.0052
Hexamethylphosphoramide	-	-	-	-	-	Fish 96h LC50	7240
3,3,6,6,9,9-Hexamethyl- 1,2,4,5-tetroxacyclononane	4.12	-	-	-	-	Fish 96h LC50	<1.6
Hexane	-	-	-	48h LC50 Daphnia	3.87	-	-
2,2',4,4',6,6'-Hexanitrostilbene	-	-	-	-	-	Fish 96h LC50	4.6
Hexanoic acid	1.9	-	-	24h LC50 Daphnia	22.0	-	-
Hydrazine nitrate	-	-	-	-	-	-	-
Hydrochloric acid	NR	<10	-	48h LC50 Bluegill	3.6	-	-
Hydrogen cyanide/Cyanide	0.4-1.1	-	-	96h LC50 Daphnia	0.042	-	-
Hydrogen peroxide	-	-	-	-	-	-	-
Hydrogen sulphide	-	<10	-	96h LC50 B.trout	0.007	-	-
Hydroxyacetoneitrile	0.89	-	-	-	-	Fish 96h LC50	<44000
Imazapyr	-	<10	Bluegills	48h LC50 Daphnia	>100	-	-
Ioxynil	-	-	-	-	-	Fish 48h LC50	3.3
Iodofenphos	-	-	-	-	-	-	-
Iprodione	3.1	-	-	96h LC50 Bluegills	2.25	-	-
Iron	NR	47.8	B.trout	96h LC50 R.trout	-	-	-
Isobenzan	-	-	-	-	-	-	-
Isodrin	-	-	-	24h LC50 F.minnow	0.006	-	-

Table A2 Continued

Substance	log Kow	BCF	Species	Lowest acute toxicity for algae, Daphnia and fish (mg/l)		Worst case toxicity (mg/l)	
				Test/Species	Conc	Species	Conc
Isopropanol	-0.2/-0.3	-	-	96h LC50 F.minnow	11130	Guppy 7d LC50	7060
Isopropylbenzene	3.66	-	-	-	-	-	-
Isopropylphenol	-	-	-	-	-	-	-
Isoproturon	2.24	-	-	96h LC50 Guppy	90	-	-
Isothiocyanatobenzene	-	-	-	-	-	-	-
Juglone (5-Hydroxynaphthalene- 1,4-dione)	-	-	-	-	-	Fish 96h LC50	0.035
Kelevan	-	-	-	-	-	-	-
Lead	NR	197-1072	Guppy	48h LC50 Daphnia	0.45	R.trout 14d LC50	0.2
Lead azide	-	-	-	-	-	-	-
Lead (Organic)	-	726	R.trout	96h LC50 Bluegills	0.02	-	-
Lead 2,4,6-trinitroresorcin oxide	-	-	-	-	-	-	-
Linuron	3.0	-	-	24h EC50 Daphnia	0.31	-	-
Malachite green	-	-	-	48h LC50 Bluegills	0.11	-	-
Malathion	2.89	<10	Fish	48h LC50 Daphnia	0.0018	Gammarus 96h LC50	0.00076
Maleic anhydride	-	-	-	24h LC50 Bluegills	150	-	-
Maleic hydrazide	-3.67	-	-	96h LC50 Daphnia	107	-	-
Mancozeb	-	-	-	48h LC50 Daphnia	1.3	-	-
Maneb	-	-	-	96h LC50 R.trout	0.32	-	-
Manganese	NR	-	-	48h LC50 Daphnia	9.8	-	-
MCPA	2.07	-	-	48h LC50 Bluegills	100	Fish 96h LC50	1.5
MCPB	-	-	-	96h LC50 R.trout	11	-	-
MCPP (Mecoprop)	2.70	-	-	96h LC50 Bluegills	>100	Fish 96h LC50	115
Melamine	-	-	-	-	-	-	-
Mencozeb	-	-	-	-	-	-	-

Table A2 Continued

Substance	log Kow	BCF	Species	Lowest acute toxicity for algae, Daphnia and fish (mg/l)		Worst case toxicity (mg/l)	
				Test/Species	Conc	Species	Conc
2-Mercaptobenzothiazole	1.61	-	-	96h LC50 R.trout	0.75	-	-
Mecarbam	-	-	-	3h LC50 Daphnia	0.03	-	-
Mercury (Inorganic)	NR	5-26	Trout	48h LC50 Daphnia	0.003	-	-
Mercury (Organic)	-	>2000	R.trout	48h LC50 R.trout	0.004	-	-
Metamitron	6.8	-	-	-	-	Goldfish 96h LC50	>100
Metalddehyde	-	-	-	-	-	-	-
Methabenzthiazuron	-	-	-	-	-	-	-
Methacrifos	-	-	-	-	-	-	-
Metham sodium	1.0	-	-	96h LC50 R.trout	0.079	-	-
Methamidophos	-0.66	-	-	-	-	Fish 96h LC50	46.0
Methanol	-0.8/-0.7	-	-	96h LC50 Bluegills	12700	-	-
Methiocarb	-	-	-	96h LC50 Bluegills	0.21	-	-
Methoxychlor	-	1545	Fish	48h LC50 Daphnia	0.00078	-	-
Methyl acrylate	-	-	-	-	-	Fish 72h LC50	5.0
Methylbenzothiazole	-	-	-	-	-	-	-
2-Methylbenzothiazolethiol	-	-	-	-	-	-	-
Methyl bromide	-	-	-	96h LC50 Bluegills	11.0	-	-
2-Methyl-4-chlorophenoxyacetic acid	-	-	-	48h LC50 Bluegills	100	-	-
2-Methyl-4-chlorophenoxypropanoic acid	-	-	-	-	-	-	-
Methylcyclohexanol	-	-	-	-	-	-	-
Methylethyl ketone	0.26	-	-	Bluegill LC50	5.6	-	-
Methyl ethyl ketone peroxide (concentration ~60%)	-	-	-	-	-	Fish 96h LC50	5600
Methylisobutyl ketone	-	-	-	96h LC50 F.minnow	537	Goldfish 24h LC50	460
Methyl isobutyl ketone peroxide (concentration ~60%)	-	-	-	-	-	Fish 96h LC50	630
Methyl isocynate	-0.21	-	-	-	-	Fish 96h LC50	<10000

Table A2 Continued

Substance	log Kow	BCF	Species	Lowest acute toxicity for algae, Daphnia and fish (mg/l)		Worst case toxicity (mg/l)	
				Test/Species	Conc	Species	Conc
Methylmethacrylate	-	-	-	96h LC50 F.minnow	150	-	-
2-Methylpyridine	1.06	-	-	-	-	-	-
Methyl salicylate	-	-	-	-	-	-	-
2-(Methyl sulfinyl)benzothiazole	-	-	-	-	-	-	-
Methyl sulfone benzothiazole	-	-	-	-	-	-	-
N-methyl-N,2,4,6-tetra- nitroaniline	-	-	-	-	-	-	-
Metsulfuron-methyl	-1.85	-	-	48h LC50 R.trout	>12.5	-	-
Mevinphos	-	-	-	96h LC50 Daphnia	0.00016	-	-
Molybdenum	NR	-	-	96h LC50 F.minnow	70	-	-
Monolinuron	1.6	-	-	-	-	Fish 96h LC50	74.0
Morfamquat	-	-	-	-	-	-	-
Morpholine	-1.08	-	-	96h EC50 Algae	28.0	-	-
Morpholine,4-thiocarbonic acid anilide	-	-	-	-	-	-	-
2-Morpholinobenzothiazole	-	-	-	-	-	-	-
Morpholinyl,methylcarbodithioate-	-	-	-	-	-	-	-
Morphothion	-	-	-	-	-	-	-
Nabam	-	-	-	-	-	-	-
Naphthalene	3.0-3.5	-	-	96h LC50 R.trout	1.6	-	-
Naphthalene sulphonate	-1.63	-	-	-	-	-	-
2-Naphthylamine	2.2-2.5	-	-	-	-	Fish LC50	6.0
Nickel	NR	50-140	Fish	48h LC50 Daphnia	0.61	Daphnia 21d LC50	0.095
Nickel tetracarbonyl	-	-	-	-	-	Fish 96h LC50	50.0
Nitrobenzene	1.9	-	-	96h LC50 F.minnow	117	Guppy 14d LC50	62.0
Nitrofen	-	-	-	-	-	-	-
Nitrogen oxides	-	-	-	-	-	Fish 96h LC50	>1000
Nitroglycerine	-	-	-	96h LC50 Bluegills	1.76	-	-

Table A2 Continued

Substance	log Kow	BCF	Species	Lowest acute toxicity for algae, Daphnia and fish (mg/l)		Worst case toxicity (mg/l)	
				Test/Species	Conc	Species	Conc
Nitrophenols	-	-	-	48h LC50 Bluegills	46.3	-	-
Nonylphenylethoxylate	-	-	-	96h LC50 B.trout	1.0	-	-
Omethoate	-	-	-	-	-	Fish 96h LC50	0.018
Oxalic acid	-0.4/-0.8	-	-	48h LC50 G.orfe	160-325	-	-
Oxolinic acid	-	-	-	48h LC50 Carp	10.0	-	-
Oxydemeton-methyl	-	-	-	96h LC50 R.trout	4.0	Insects 96h LC50	0.035
Oxydisulfoton	1.73	-	-	-	-	Fish 96h LC50	<600
Oxygen difluoride	0.18	-	-	-	-	Fish 96h LC50	4010
Oxytetracycline	-	-	-	-	-	-	-
Paraldehyde	0.59	-	-	-	-	-	-
Paraoxon (Diethyl 4-nitrophenyl phosphate)	-	-	-	-	-	Fish 96h LC50	0.25
Paraquat	2.44	-	-	96h LC50 B.trout	2.5	-	-
Parathion	3.81	80	Fish	48h LC50 Daphnia	0.0006	Insects 30d LC50	0.000013
Parathion-methyl	3.81	-	-	3h LC50 Daphnia	0.0005	-	-
PCB 52	3.9-6.9	-	-	-	-	-	-
PCB 101	4.1-7.6	-	-	-	-	Gammarus 96h LC50	0.21
PCTs	-	-	-	-	-	-	-
Pebulate	3.84	-	-	-	-	Gammarus 96h LC50	10.0
Pendimethalin	5.18	-	-	96h LC50 R.trout	0.2	-	-
Pensulfothion	-	-	-	-	-	Fish 96h LC50	0.056
Pentaborane	-	-	-	-	-	Fish 96h LC50	50.0
Pentachlorophenol	3.3-5.9	>1000	Eels	48h LC50 Bluegills	0.03	-	-
Pentaerythritol tetranitrate	-1.7	-	-	-	-	-	-
1-Pentanol	1.4	-	-	96h LC50 R.trout	370-490	-	-
Peracetic acid	-0.57	-	-	-	-	Fish 96h LC50	13400
Permethrin	3.48	>1700	Bluegills	48h LC50 Daphnia	0.0006	Gammarus 96h LC50	0.00032

Table A2 Continued

Substance	log Kow	BCF	Species	Lowest acute toxicity for algae, Daphnia and fish (mg/l)		Worst case toxicity (mg/l)	
				Test/Species	Conc	Species	Conc
Persulphuric acid	-	-	-	-	-	-	-
Phenanthrene	4.46	1165	Daphnia	96h LC50 Daphnia	0.10	-	-
Phenkapton	-	-	-	3h LC50 Daphnia	0.008	-	-
Phenmedipham	3.59	-	-	96h LC50 R.trout	1.4	-	-
Phenol	1.46	277	Daphnia	96h LC50 R.trout	4.2	-	-
Phenoxy acetic acid	-	-	-	-	-	-	-
Phenylacetaldehyde	1.4-1.8	-	-	-	-	-	-
Phenylacetoneitrile	-	-	-	-	-	-	-
Phopham	-	-	-	-	-	-	-
Phorate	3.92	-	-	-	-	Gammarus 96h LC50	0.0006
Phosacetim	-	-	-	-	-	-	-
Phosalone	4.10	-	-	3h LC50 Daphnia	0.05	-	-
Phosphamidon	-	-	-	48h EC50 Daphnia	0.0088	Gammarus 96h LC50	0.0028
Phosphine	-	-	-	-	-	-	-
Phoxim	3.38	-	-	-	-	Fish 96h LC50	0.08
Phthalic anhydride	-	-	-	-	-	-	-
Phthalimide, N-(cyclohexylthio)	-	-	-	-	-	-	-
Pirimicarb	1.7	-	-	3h LC50 Daphnia	0.048	-	-
Pirimiphos-ethyl	4.46	-	-	96h LC50 B.trout	0.02	-	-
Pirimiphos-methyl	4.2	-	-	48h LC50 Pike	0.03	Insects 48h LC50	0.0016
Polychlorinated terpenes	-	-	-	-	-	-	-
Prochloraz	4.38	-	-	96h LC50 R.trout	1.0	-	-
Prometryn	3.34	-	-	96h LC50 R.trout	2.5	-	-
Promurit	-	-	-	-	-	-	-
Propanil	2.29	-	-	48h EC50 Daphnia	4.8	-	-
Propan-1-ol	0.34	-	-	48h LC50 Daphnia	2950	-	-
Propan-2-ol	-0.16/0.3	-	-	96h LC50 F.minnow	11130	Guppy 7d LC50	7060
1,3-Propanesultone	-	-	-	-	-	-	-
Propazine	-1.21	-	-	48h LC50 R.trout	7.8	-	-

Table A2 Continued

Substance	log Kow	BCF	Species	Lowest acute toxicity for algae, Daphnia and fish (mg/l)		Worst case toxicity (mg/l)	
				Test/Species	Conc	Species	Conc
2-Propenal (Acrolein)	-0.10	-	-	24h LC50 B.trout	0.046	-	-
1-Propen-2-chloro-1,3-diol- diacetate	-	-	-	-	-	-	-
2-Propen-1-ol (Allyl alcohol)	0.17	-	-	-	-	Goldfish 24h LC50	1.0
Propetamphos	2.90	-	-	96h LC50 R.trout	4.7	-	-
Propiconazole	-	-	-	96h LC50 B.trout	20	-	-
Propionic acid	0.3	-	-	24h LC50 Daphnia	50	-	-
n-Propylene	-	-	-	-	-	-	-
Propylene glycol	-1.4/-0.3	-	-	96h LC50 R.trout	>10000	-	-
Propyleneimine	-0.21	-	-	-	-	Fish 96h LC50	4538
Propylene oxide	-	-	-	96h LC50 Bluegills	215	Fish 96h LC50	141
Propyzamide	3.1-3.3	-	-	96h LC50 R.trout	72	-	-
Pyrazon	-	-	-	-	-	-	-
Pyrazoxon	-	-	-	-	-	Fish 96h LC50	35.0
Pyrene	-	4810	Guppy	48h LC50 Daphnia	0.09	-	-
Pyrethrin	-	-	-	96h LC50 Trout	0.023	Gammarus 96h LC50	0.011
Pyridine	0.6-1.0	-	-	96h LC50 Carp	26.0	-	-
Quintozene	-	-	-	-	-	-	-
Resmethrin	-	-	-	96h LC50 Trout	0.00028	-	-
Sarbam	-	-	-	-	-	-	-
Selenium	NR	8-78	Fish	48h LC50 Bluegills	0.4	-	-
Selenium hexafluoride	-	-	-	-	-	-	-
Silicon (organic compounds)	-	-	-	-	-	-	-
Silver	NR	-	-	-	-	-	-
Simazine	2.3	1-9	Bluegills	48h EC50 Daphnia	1.0	-	-
Sodium bisulphite	NR	-	-	-	-	Fish 96h LC50	24.0

Table A2 Continued

Substance	log Kow	BCF	Species	Lowest acute toxicity for algae, Daphnia and fish (mg/l)		Worst case toxicity (mg/l)	
				Test/Species	Conc	Species	Conc
Sodium chlorate	NR	-	-	96h LC50 R.trout	1750	-	-
Sodium hypochlorite	NR	-	-	96h LC50 R.trout	0.05	-	-
Sodium iso-propyl xanthate	-	-	-	24h EC50 Daphnia	3.7	-	-
Sodium laurylethyl sulphonate	-	-	-	96h LC50 Bluegills	1.3	-	-
Sodium 2-phenyl phenate	-	-	-	-	-	-	-
Sodium picramate	-	-	-	-	-	-	-
Sodium sulphite	-	-	-	-	-	-	-
Sodium xylene sulphonate	-	-	-	-	-	-	-
Styrene	3.16	13.5	Goldfish	48h LC50 Daphnia	15.0	-	-
Sulcofuron	1.75	37	G.orfe	48h LC50 B.trout	2.6	-	-
Sulfotep	-	-	-	-	-	Fish 96h LC50	0.0016
Sulphur	-	-	-	-	-	-	-
Sulphur dichloride	-	-	-	-	-	-	-
Sulphur dioxide	-	-	-	96h LC50 R.trout	0.98	-	-
Sulphur trioxide	-	-	-	-	-	-	-
Sulphuric acid	-	<10	-	48h LC50 Bluegills	49.0	-	-
2,4,5-T	-	26	Fish	-	-	Fish 96h LC50	0.05
2,3,6-TBA	-	-	-	48h LC50 Bluegills	1750	-	-
TCA	0.10	-	-	48h LC50 Daphnia	2000	-	-
Tecnazene	-	1590	R.trout	96h LC50 Gammarus	0.27	-	-
Tellurium	-	-	-	-	-	-	-
Tellurium hexafluoride	-	-	-	-	-	-	-
TEPP	-	-	-	96h LC50 Bluegills	1.1	Gammarus 96h LC50	0.039
Terbutryn	3.49	-	-	48h LC50 Daphnia	1.4	-	-
Terramycin	-	-	-	-	-	Fish 96h LC50	165
tert-Butyl peroxyacetate (concentration ~70%)	0.79	-	-	-	-	Fish 96h LC50	<2100

Table A2 Continued

Substance	log Kow	BCF	Species	Lowest acute toxicity for algae, Daphnia and fish (mg/l)		Worst case toxicity (mg/l)	
				Test/Species	Conc	Species	Conc
tert-Butyl peroxyisobutyrate (concentration ~80%)	2.0	-	-	-	-	Fish 96h LC50	<200
tert-Butyl peroxy maleate (concentration ~80%)	1.19	-	-	-	-	Fish 96h LC50	<1000
tert-Butyl peroxy isopropyl carbonate (concentration ~80)	2.0	-	-	-	-	Fish 96h LC50	<200
tert-Butyl peroxy pivalate (concentration ~77%)	2.92	-	-	-	-	Fish 96h LC50	<20
Tetrabutyl tin	3.9	-	-	-	-	Fish 96h LC50	10.0
1,2,3,4-Tetrachlorobenzene	4.5	-	-	-	-	Guppy 14d LC50	0.8
1,2,3,5-Tetrachlorobenzene	4.5	-	-	-	-	Guppy 14d LC50	0.8
1,2,4,5-Tetrachlorobenzene	4.5	-	-	-	-	Guppy 14d LC50	0.3
2,3,7,8-Tetrachlorodibenzo- p-dioxin	-	4875	Fish	-	-	-	-
1,1,1,2-Tetrachloroethane	-	-	-	-	-	-	-
1,1,2,2-Tetrachloroethane	2.45	-	-	-	-	Guppy 7d LC50	37.0
Tetrachloroethylene	2.6-2.9	-	-	96h LC50 R.trout	5.0	-	-
Tetraethyl lead	-	130	Fish	96h LC50 Bluegills	0.02	-	-
Tetramethylenedisulphotetramine	-	-	-	-	-	-	-
Tetramethyl lead	-	60	Fish	96h LC50 Bluegills	84	-	-
Thallium	-	130	Fish	96h LC50 Salmon	2.0	-	-
Thionazin	-	-	-	-	-	-	-
Thiourea	-2.4/-1.0	-	-	Daphnia LC50	1.8	-	-
Thiourea dioxide	-	-	-	-	-	-	-
Thiram	-	-	-	48h LC50 Trout	0.13	-	-
Tin (inorganic)	-	20-700	Gammarus	48h LC50 Daphnia	55.0	Daphnia 21d EC50	1.5
Tirpate	-	-	-	-	-	-	-
Titanium	-	-	-	-	-	-	-
Toluene	2.69	-	-	96h LC50 Salmon	5.5	Daphnia 16d EC50	1.4

Table A2 Continued

Substance	log Kow	BCF	Species	Lowest acute toxicity for algae, Daphnia and fish (mg/l)		Worst case toxicity (mg/l)	
				Test/Species	Conc	Species	Conc
Toxaphene	-	55000	F.minnow	96h LC50 Carp	0.004	Insect 48h LC50	0.0013
Triadimefon	3.18	-	-	-	-	Goldfish 96h LC50	10-50
Triadimenol	3.08	-	-	96h LC50 Bluegills	14	-	-
Triallate	-	-	-	48h EC50 Daphnia	0.057	-	-
1,3,5-Triamino-2,4,6- trinitrobenzene	-0.22	-	-	-	-	Fish 96h LC50	78.0
Triazines	-	-	-	-	-	-	-
Triazophos	3.3	-	-	96h LC50 Carp	5.6	-	-
Tribrissen	-	-	-	48h EC50 Daphnia	88	-	-
Tributyl phosphate	4.00	-	-	96h LC50 F.minnow	1-10	-	-
Tributyltin	2.2-3.7	79-340	Fish	48h LC50 Daphnia	0.0025	-	-
1,2,3-Trichlorobenzene	4.10	1250	Guppy	24h EC50 Daphnia	0.35	-	-
1,2,4-Trichlorobenzene	4.02	3200	R.trout	48h EC50 Daphnia	0.4	-	-
1,3,5-Trichlorobenzene	4.1-4.5	14000	Guppy	-	-	Guppy 14d LC50	3.3
2,3,4-Trichlorocarbonilide	-	-	-	-	-	-	-
2,3,4-Trichlorocarbonilide	-	-	-	-	-	-	-
1,1,1-Trichloroethane	2.2-2.5	-	-	96h LC50 F.minnow	52.8	-	-
1,1,2-Trichloroethane	2.42	-	-	-	-	Guppy 7d LC50	94.0
Trichloroethylene (TCE)	2.4-2.5	17-39	Fish	96h LC50 F.minnow	21.9	-	-
Trichlorofluoromethane	2.53	-	-	-	-	-	-
Trichlorofon	0.48	-	-	3h LC50 Daphnia	0.005	-	-
Trichloromethanesulphenyl chloride	-	-	-	-	-	-	-
2,4,5-Trichlorophenol	3.1-3.7	-	-	96h LC50 Bluegills	0.61	-	-
1,1,2-Trichlorotrifluoroethane	3.16	-	-	-	-	Fish 96h LC50	7.0
Tridemorph	4.20	-	-	96h LC50 Guppy	3.5	-	-
Trietazine	-	-	-	24h LC50 Guppy	5.5	-	-
Triethylenemelamine	-	-	-	-	-	-	-
Trifluralin	4.69	1060	F.minnow	96h LC50 R.trout	0.01	-	-

Table A2 Continued

Substance	log Kow	BCF	Species	Lowest acute toxicity for algae, Daphnia and fish (mg/l)		Worst case toxicity (mg/l)	
				Test/Species	Conc	Species	Conc
Trimethyl-1,2-dihydroquinoline	-	-	-	-	-	-	-
Trinitroaniline	-	-	-	-	-	-	-
2,4,6-Trinitroanisole	1.86	-	-	-	-	Fish 96h LC50	1.7
Trinitrobenzene	-	-	-	-	-	-	-
Trinitrobenzoic acid	-	-	-	-	-	-	-
Trinitrocresol	-	-	-	-	-	-	-
2,4,6-Trinitrophenetole	-	-	-	-	-	-	-
2,4,6-Trinitrophenol	2.03	-	-	-	-	Fish 96h LC50	110
2,4,6-Trinitroresorcinol	-	-	-	-	-	Fish 96h LC50	2.58
2,4,6-Trinitrotoluene	-	-	-	96h LC50 F.minnow	2.58	-	-
Triphenyltin	3.3-4.1	>9000	Snails	96h LC50 R.trout	0.015	-	-
Tris(2-chloroethyl) phosphate	1.43	-	-	-	-	Goldfish 96h LC50	90
Tris(2-chloropropyl) phosphate	3.76	-	-	-	-	Goldfish 96h LC50	3.6-5.1
Uranium	NR	-	-	96h LC50 R.trout	2.8	-	-
Urea	-3.0/-2.3	-	-	96h LC50 R.trout	0.23	-	-
Vanadium	NR	<10	Inverts	96h LC50 R.trout	5.2	-	-
Vinyl acetate	-	-	-	96h LC50 Bluegills	18.0	-	-
Vinyl chloride	1.58	-	-	-	-	Fish 96h LC50	1100
Warfarin	-	-	-	-	-	Fish 96h LC50	12.0
m-Xylene	3.2	14.8	Goldfish	24h EC50 Daphnia	4.7	-	-
o-Xylene	3.12	14.1	Goldfish	24h EC50 Daphnia	1.0	-	-
p-Xylene	3.15	14.8	Goldfish	24h EC50 Daphnia	3.6	-	-
Xylene sulphonc acid	-	-	-	-	-	-	-
Zinc	NR	<10	Fish	96h LC50 R.trout	0.066	-	-
Zineb	-	-	-	-	-	-	-