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MICROPROOF
Micropollutants in Road RunOff

Environmental Risk Assessment

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Table of contents

Executive summary

Overall, the objective of this project, MICROPROOF, is to provide scientific insights about risks and measures in a practical manner for road managers in order to preserve, protect and improve European water quality. To reach the objective, this project follows a four-step approach, covering 1) Sources, concentrations and loadings in road run-off; 2) Environmental pathways and concentrations; 3) Environmental risk assessment; 4) Treatment systems. The underlying report covers the third step of this project: the environmental risk assessment.

The environmental risk assessment involves:

- Risk categorisation (first tier);
  Within the first tier the Predicted Environmental Concentration (PEC) of selected substances is compared with the sensitivity of the environment (Predicted No-Effect Concentration (PNEC). The PECs are taken from Deliverable 2.2, which is a result of the first two steps of this project. PNEC values are based on literature, or are derived using available toxicity data.
- Quantification of risk (second tier).
  Within the second tier for each of the selected substances a Species Sensitivity Distribution (SSD) is derived, based on No Observed Effect Concentration (NOEC) values from literature and using the software ETX 2.1. The SSD is used to represent the sensitivity of the environment. The PEC compared with the SSD indicates the probability that a specific fraction of species is exposed above their NOEC value. This is reported as the Potentially Affected Fraction of species (PAF), in percentage, at the exposure concentration.

The risks of pollution in road runoff for the European waters are assessed based on estimated and measured exposure for the water phase and sediment. Samples were taken from surface water and sediment (from a small waterway near highway A2 in the Netherlands and from the river Rhine) and from road runoff (water and solids/sludge taken from highway A61 in Germany and highway E18 in Sweden). The risks were assessed within the first tier (PEC/PNEC ratio) for all substances and within the second tier (PAF) for most substances assuming exposure via the water phase only.

The underlying risk assessment shows that for most of the selected Organic Micro Pollutants (OMPs), the risks from road traffic for the European waters are within acceptable limits. However few substances might lead to environmental risks.
Concentrations of OMP in surface water indicate risk (i.e. unacceptable effects are not unlikely) for benzo(a)pyrene and fluoranthene. For sediment, risks are identified for 4-tert-octylphenol and tolyltriazole. The higher tier risk assessment indicates that for benzo(a)pyrene, fluoranthene and di(2-ethylhexyl)phthalate the risk may be above acceptable limits.
For OMPs in road runoff, the first tier risk assessment show PEC/PNEC ratio's > 1 for benzo(a)pyrene, 4-tert-octylphenol and diisodecyl phthalate in the water phase and for fluoranthene, 4-tert-octylphenol, bisphenol A, mercaptobenzothiazole, tolyltriazole and diisodecyl phthalate in the solid phase. The higher tier risk assessment shows that for 4-tert-octylphenol and di(2-ethylhexyl)phthalate the risk may be above acceptable limits.

For microplastics unacceptable effects on organisms cannot be ruled out for exposure via water and sediment. The risk of microplastics from road runoff on the European waters is above acceptable limits. However, it should be noted that the PEC, PNEC and PAF for microplastics should be interpreted with care due to the high uncertainty of measured PEC

values and heterogeneity of the tested microplastic used for PNEC derivation considering polymer type, size and shape.

Whole Effluent Toxicity (WET)-tests, conducted to support the underlying risk assessment, represent the toxicity of all substances present. WET-tests of the surface water sample show no significant toxic effects for bacteria, algae and crustacea. WET-tests of road runoff from Germany and Sweden show no significant toxic effects for bacteria and crustacea. The algae growth inhibition test shows significant dose-related growth inhibition when exposed to the runoff samples.

1 Introduction

The European Union Water Framework Directive (WFD) requires good chemical and ecological status for all European waters (European Commission, 2000). Diffuse pollution from runoff during building and operating roads might affect the status of European waters. The MICROPROOF project focuses on the impact of pollution in road runoff on European waters and on possible reduction measures.

Overall, the objective of this project is to provide scientific insights about risks and measures in a practical manner for road managers in order to preserve, protect and improve European water quality. To reach the objective, this project follows a four-step approach, covering sources, pathways and concentrations, environmental risks and treatment systems in each step.

- Sources, concentrations and loadings in road run-off

The first step entails an extensive literature review of sources, concentrations and loadings of organic micropollutants and microplastics in road run-off. The different traffic related sources of microplastics and organic micropollutants are described in previous deliverables (D1.1, D1.2 and D1.3).

- Environmental pathways and concentrations

In the second step, these insights are used to develop predicted environmental concentrations (PEC) of a selection of substances in several road border types. The results are described in two deliverables: D2.1 elaborates the different pathways of microplastics and organic micropollutants from traffic related sources to open water; and D2.2 describes the PEC-values for 10 micropollutants in surface water and sediment, to be used in the risk assessment.

- Environmental risk assessment

In the third step, the environmental risks of the particles are assessed by comparing the observed concentrations with predicted no-effect concentrations (PNEC). Also a probabilistic risk assessment is performed in this step to quantify the probability that a species is exposed above its PNEC. The underlying report (D3.1) describes these results.

- Treatment systems

In the last step, the existing treatment systems of contaminated water streams are compared on their effectiveness in reducing environmental risks. Combined with information from the environmental risk assessment, this will provide an advice of when and how contaminated runoffs should be treated in several scenarios. This is described in the deliverable D4.3 (decision support scheme) and accompanying mini-report (D4.4).

2 Method

2.1 Assessment steps

The environmental risk assessment described in this report involves the following steps:

- Identification of substances and their environmental concentrations;
- Risk assessment:
  - Risk categorisation (first tier);
  - Quantification of risk (second tier).

Whole Effluent Toxicity (WET)-tests are performed to support the risk assessment.

Each step is described in the paragraphs below.

2.2 Identification of substances

As a first step, based on input of WP1 and WP2, a list of organic micropollutants and microplastics relevant for risk assessment was established, including their environmental concentrations as presented in the deliverable D2.2 (Dröge, 2019).

2.3 Risk assessment

2.3.1 General approach

If environmental risk assessment is applied to chemical exposure, the assessment will be based on the comparison of the exposure of the ecosystem to a chemical with the sensitivity of the same part of the ecosystem for this chemical through this specific exposure-route (Suter, 1993) (Figure 1). The exposure is represented by the Predicted Environmental Concentration (PEC), and can be obtained by actual field measurements (monitoring data) or by estimations using environmental fate models. The toxicity threshold, defined as predicted no-effect concentrations (PNEC), represents the sensitivity of the ecosystem, and is usually derived from standardised toxicity tests.

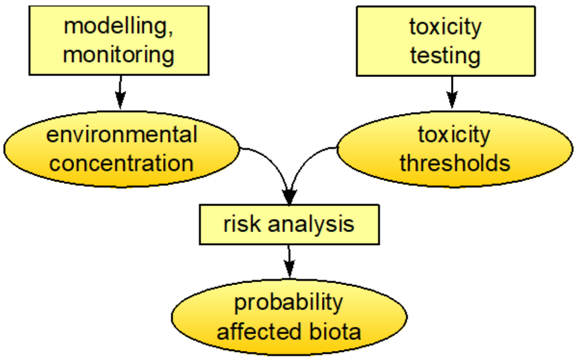

Figure 1 The general framework for Environmental Risk Assessment based on the comparison of an environmental concentration with the sensitivity of the environment.

There are different combinations of exposure and sensitivity within environmental risk assessment. Four different combinations of exposure and sensitivity are depicted in Figure 2. The traditional PEC:PNEC approach is presented in Figure 2a. The ratio of PEC and PNEC indicates whether unacceptable effects on organisms are likely to occur as a result of exposure to the specific chemical. It does, however, not provide a quantification of the environmental risk (severity and likelihood of effects) (Volosin and Cardwell, 2002). When a single value for the PNEC is compared to a distribution of PEC values (Figure 2b), the term ‘most likely’ can be represented by the probability that the exposure concentration is higher than the PNEC. In case the SSD based on No Observed Effect Concentration (NOEC) values is used to represent the sensitivity of the environment (Figure 2c, d), the assessment endpoint risk will indicate the probability that a specific fraction of species is exposed above their NOEC value.

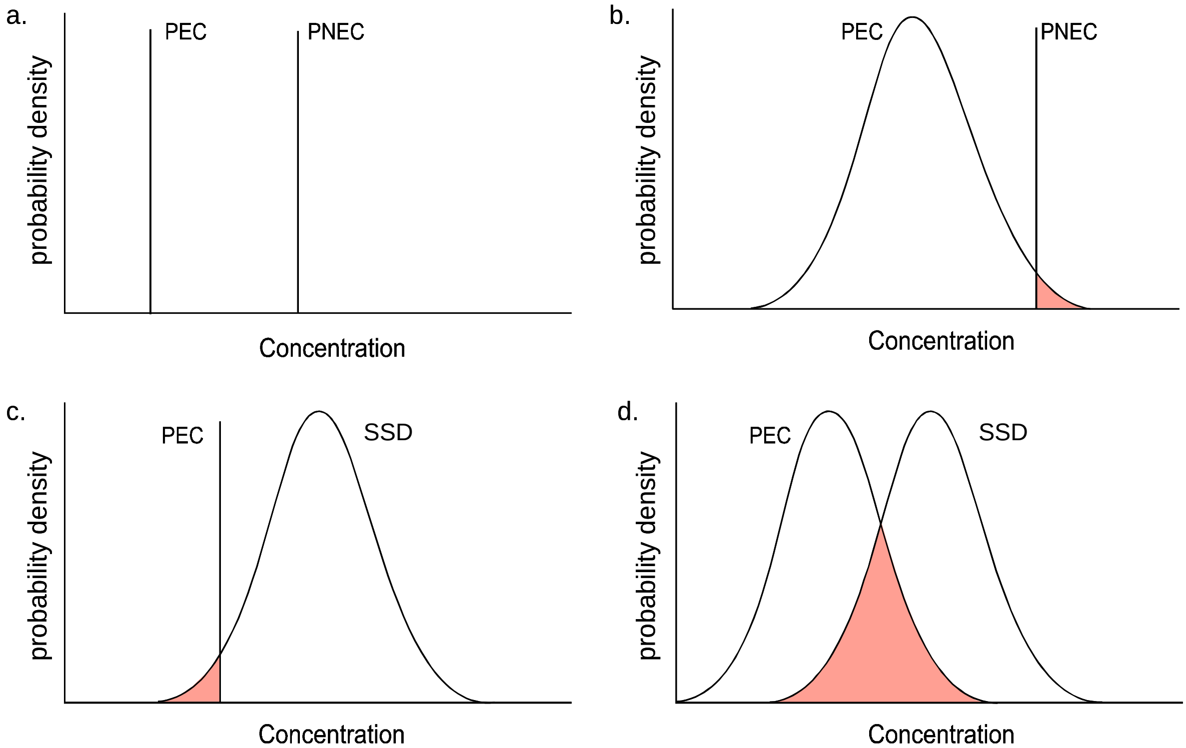

Figure 2 Four possible approaches for environmental risk assessment based on (a) point estimates, (d) probabilistic distributions, or (b and c) a mixture of both (SSD=Species Sensitivity Distribution).

For this study, a tiered approach was followed:
1. Risk categorisation
   PEC:PNEC risk screening based on worst-case assumptions on sensitivity (PNEC) and exposure (PEC), see Figure 2a;
2. Quantification of risk
   Probabilistic risk assessment; based on best estimates for sensitivity (using SSD) and exposure (PEC) resulting in a more quantified risk estimate (probability that a species is exposed above its PNEC or the probability that the exposure concentration is higher than the PNEC), see Figure 2c.

Because PEC values are only available as point estimates, the approaches visualised in Figure 2b and 2d are not possible.

The first (risk categorisation) and second (risk quantification) tier assessment are described in the sub-paragraphs below.

2.3.2 Risk categorisation

In this step the PNEC values are compared with environmental concentrations (PEC:PNEC ratio) in order to derive an indication of risk. The ratio of PEC and PNEC indicates whether unacceptable effects on organisms are likely to occur as a result of exposure to the specific chemical. This approach is conform the EU Technical Guidance Document on risk assessment (European Commission, 2003a). A PEC:PNEC ratio higher than 1 indicates that unacceptable effects on organisms are not unlikely to occur; the higher the ratio, the more likely that unacceptable effects may occur. The PEC:PNEC ratio can be used for screening and prioritising and is well suited for a first tier risk assessment because of the minimum amount of data required and worst-case assumptions. However, this ratio does not provide a quantification of the likelihood or a characterisation of the severity of effects. This is estimated in the next tier.

2.3.2.1 PEC values

PEC values are taken from deliverable D2.2 (Dröge, 2019) and from new measurements conducted within the MicroProof project (Dröge and Tromp, 2019). The PEC values from deliverable D2.2 are a first estimate based on literature data combined with an assumed dilution. The new measurements include measurements of concentrations in runoff and in surface water (near a highway). Measurements include micro-rubber particles and a broad screening of micropollutants.
The sample locations are described by Dröge and Tromp (2019) and summarised below:

- Surface water:
  - The Netherlands, highway A2
    In the Netherlands, in a surface water body next to the A2 highway, a sample has been taken of the surface water and the sediment. Highway A2 is a busy highway with 5 lanes in each direction and an emergency lane with an average of 190,000 vehicles per day and the asphalt consists of porous asphalt.
  - The Netherlands, Rhine
    In the river Rhine, near Lobith (the border between the Netherlands and Germany), solids from surface water have been gathered. The river Rhine is a large European river with an average flow of 2200 m^3 per second (near Lobith). There are no direct road traffic related emission sources.
- Road runoff:
  - Germany, highway A61
    In Germany, samples have been gathered of runoff and soil from the highway A61 near Bonn. Highway A61 is a busy highway with 5 lanes and an emergency lane with an average of 73,310 vehicles per day and the asphalt consists of normal asphalt.
  - Sweden, highway E18
    In Sweden, samples have been gathered from a well where runoff is collected from the highway E18. Highway E18 is a highway with 2 lanes in each direction (4 lanes in total) and no emergency lane, with an average of 21,300 vehicles per day and the asphalt consists of stone mastic asphalt.

2.3.2.2 PNEC values

PNEC values are based on literature or derived using available toxicity data.

Organic micropollutants
For each substance, a PNEC value is selected or derived. PNEC values are (in order of priority):

- Based on Existing EU standards (i.e. EQS). Quality standards are available for priority substances (Directive 2008/105/EC and related documents);
- Based on PNEC values reported in EU Risk Assessment Reports;
- Based on PNEC values reported on ECHA website (https://echa.europa.eu/substance-information/);
- Based on PNEC values reported in literature;

- Derived using available toxicity information in combination with an appropriate safety factor (as indicated by the EU Technical Guidance Document). Regarding OMPs, toxicity values will be searched in the US-EPA ECOTOX database (https://cfpub.epa.gov/ecotox/), which is a comprehensive, publicly available knowledgebase providing single chemical environmental toxicity data. If toxicity data is still limited, a search will be performed in peer-reviewed literature using the search engine SCOPUS (www.scopus.com). If toxicity data is still limited, a search in grey literature (e.g. using google-scholar) will be conducted.
- Estimated based on existing tools/methods, e.g. quantitative structure-activity relationships (QSAR), Estimation Program Interface (EPI) Suite developed by the EPA US. This last solution is not preferred, but it can be used to provide an indication of PNEC values.

Microplastics
For the assessment of effects of microplastics a recent paper on micro- and nanoplastic in the aquatic environment (Besseling et al., 2019) is used. Besseling (2019) searched the scientific literature for data on effect levels in order to ascertain how adverse effects of micro- and nanoplastic are distributed among species, ecosystems, exposure media and plastic particles with varying characteristics and presented an overview based on 174 published effect levels from 69 different studies.
The SSD for microplastic derived by Besseling *et al.* (2019) is considered as an “all-inclusive” SSD and not specific for tyre wear particles. Ecotoxicological knowledge of tyre wear particles is focussed on the toxicity of the tyre constituents (like metals, flame retarders, softeners, etc.) which may or may not leach out of the particles and not to the toxicity of the particles themselves (see discussion in section 4.2.1). As the toxicity of these substances is addressed separately in the risk assessment of OMPs, the underlying risk assessment of microplastics from tyre wear is focused on the microparticles only, as represented by the SSD for microplastic derived by Besseling *et al.* (2019).

2.3.2.3 Relevant environmental compartments

The risk assessment is conducted for the aquatic environment and primarily focusses on the water phase. Risk assessment for the sediment is addressed in case required information is readily available. For organic contaminants in general, the log Kow is used as an indicator for bioaccumulation potential and adsorption to sediment. A log Koc or log Kow of ≥ 3 can be used as a trigger value for sediment effects assessment (European Commission, 2003a), but this is not applied in this first tier risk assessment. Instead, log Kow values are used as indicator for bioaccumulation potential and adsorption to sediment.

In case a PNECsediment is not available in literature and toxicity data for benthic species is lacking, the PNEC can be calculated based on equilibrium partitioning, by using the following equations (European Commission, 2003a):

$$PNEC\ sed = \frac{K\ sed - water}{RHO\ sed} \times PNEC\ water\ \times 1000$$

Where,
RHO sed = the bulk of wet sediment (1300 kg/m^3)
Ksed-water = sediment-water partitioning coefficient (l/kg)

$$K\ sed - water = F\ water + F\ solid - sed\ x\ \frac{K\ p\ sed}{1000} \times RHO\ solid$$

Where,
K sed-water = partition coefficient sediment - water
Fwater = fraction water in sediment (0.8)
Fsolid-sed = fraction solids in sediment (0.2)
Kp sed = partition coefficient sediment
RHO solid = density of the solid phase (2500 kg/m^3)

$$Kp\ sed = Foc\ sed\ \times Koc$$

Where,
Foc sed = Weight fraction organic carbon sediment solids (0.05 kg oc/kg solid)
Koc = partition coefficient organic carbon

$$\log Koc = a\ x \log Kow + b$$

Where,
Kow = partition coefficient octanol water
a, b = constants based on QSARs for soil and sediment sorption for different chemical classes (European Commission, 2003a).

2.3.3 Quantification of risk

As already mentioned, the actual quantification of risk is (partly) based on probabilistic risk assessment (Figure 2). The feasibility of this approach (second tier assessment) will depend on the availability of information as derived by WP2 (D2.2: PEC) and WP3.1 (D3.1: PNEC) and may thus not be possible for all substances.

The probabilistic risk assessment of the selected substances is based on Species Sensitivity Distribution (SSD). The main assumption for the use of SSDs in risk assessment is that the distribution based on a selection of species (for which data is available) is representative for all species (in the field) (Aldenberg & Jaworska 2000; Posthuma *et al.* 2002; Forbes & Calow 2002a; Forbes & Calow 2002b). The method should be applied for all reliable NOECs from chronic/long-term studies (European Commission, 2003a). First step in the probabilistic risk assessment is, therefore, to search for reliable NOECs for the selected substances. To enlarge the availability of ecotoxicological data we also searched for effect concentrations up to 10% (EC0 to EC10) to derive chronic effect values. This approach is conform the EU TGD (Technical Guidance Document; European Commission, 2003b) and research showed that the choice of EC10 or NOEC does not largely affect the resulting HC5 (Iwasaki *et al.*, 2015). In addition, the search was expanded to also include acute studies (i.e. EC50 and LC50 values). Extrapolation techniques have been developed to derive chronic toxicity levels from acute toxicity data. For this risk assessment a pragmatic acute to chronic ratio of 10 is used, see for example Ahlers *et al.* (2006).

For each substance, ecotoxicological effect values were gathered. Effect values for microplastics were taken from Besseling *et al.* (2019). It should be noted that suitable threshold data for microplastics are limited. Therefore, Besseling *et al.* (2019) scaled effect data to a single endpoint using extrapolation factors leading to relatively conservative estimates. Effect values for OMPs are based on effect values reported as reliable in EU Risk Assessment Reports and/or selected from the US-EPA ECOTOX database (https://cfpub.epa.gov/ecotox/).

The ECOTOX database was searched using the CAS numbers of the 10 selected substances.

The search results were checked for relevance according to the following criteria:

- Only relevant endpoints
    a. Acute: EC50, LC50;
    b. Chronic: EC/LC0 and EC/LC10 (including effect percentages between 0 and 10%) or NOEC;
- Concentration must be expressed as environmental concentration (i.e. exposure: mg/l, µg/l) and not in food or organism (i.e. dosage: mg/kg bw etc.);
- Only exact numerical values were selected, in other words, effect concentrations reported as: 'NR'; greater than ('>'); smaller than ('<'), or approximate ('~') were not selected.

Only one effect value (NOEC) per species is required to construct the SSD. In general, for each species the lowest value is taken to represent the NOEC. When more than one value was found for the same species under similar conditions (i.e. same end-point and an analysis of the test conditions used cannot explain the difference in observed response), the geometric mean of these values is used.

An SSD is constructed, based upon the selected values for each substance by using the software ETX 2.1 (Van Vlaardingen et al., 2004) which is freely available at https://rvs.rivm.nl/risicobeoordeling/modellen-voor-risicobeoordeling/ETX. ETX 2.1 applies a cumulative log-normal distribution, where sensitivity values for species are fitted to a logarithmic scale.

The minimum species requirements when using the SSD method are at least 10 NOECs (preferably more than 15) for different species covering at least 8 taxonomic groups (European Commission, 2003a). Deviations from these recommendations can be made, on a case-by-case basis, through consideration of sensitive endpoints, sensitive species, mode of toxic action, and/or knowledge from structure-activity considerations. Depending on the quality of the data and the number of tested species, an SSD can also be based on acute effect values (e.g. EC50-SSD) as described by Aldenberg *et al.* (2002). Ideally, SSDs use the effect threshold values of one single endpoint (one type of harm) for more than 10 different species, with environmental variables kept constant (Diepens et al., 2016). Such data is not yet available for plastic as a stressor. Furthermore, the SSD for microplastic is fundamentally different from single substance-single endpoint because microplastic is a mixture of different sizes and types of particles triggering responses through different modes of action (Besseling *et al.*, 2019 and see also the discussion in this report). The SSD for microplastic should thus be considered as provisional.

The affected fraction of the species is referred to as the PAF-level (Potentially Affected Fraction), see e.g. European Commission (2003b) and Aldenberg & Slob (1993). The PAF value can be explained as the probability that a randomly selected species is exposed to a concentration exceeding its chronic no effect level at a certain level of exposure (See Figure 3 for a cumulative NOEC-SSD).

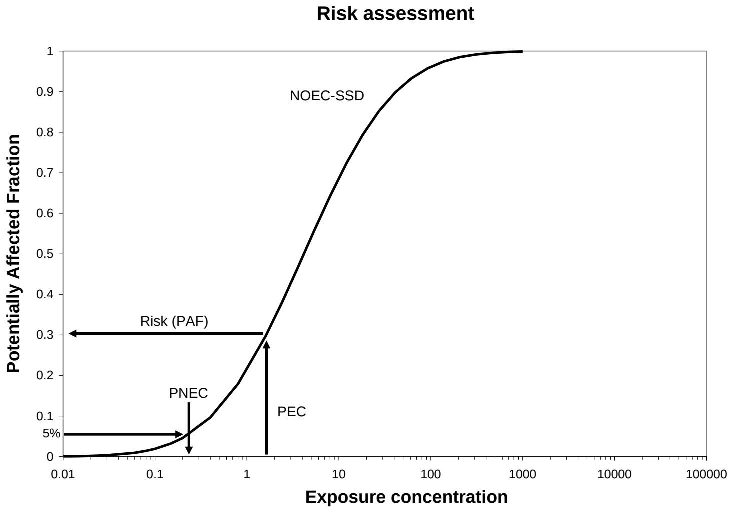

Figure 3 Use of the NOEC-SSD for translating PEC values to values for the Potentially Affected Fraction of Species. In this graph, the PNEC level corresponds to a PAF of 5%. Note that the EU TGD (European Commission, 2003a) **recommends to use an appropriate assessment factor between 5 and 1 to derive the PNEC level based on the PAF of 5%.**

The concentration at which the PAF is 5% is also referred to as the HC5: the hazardous concentration affecting 5% of species. The software ETX 2.1 estimates the HC5 and provides lower, median and upper estimates (90% confidence interval). The HC5 are estimated for each of the 10 selected substances, if possible (i.e. if sufficient data is available). As the EU TGD (European Commission, 2003a) recommends to apply an appropriate assessment factor between 5 and 1 to derive the PNEC level based on the HC5, the HC5 is divided by 5 to derive the PNEC (i.e. a conservative assessment factor of 5 will be used).
In addition, the mean and standard deviation (s.d.) of the normal distribution through the data are reported as well as the sample size. The estimated fraction affected (PAF) at the exposure concentration (PEC) is reported as a median estimate (50% confidence), plus lower estimate (5% confidence) and upper estimate (95% confidence) of the fraction affected. If a series of exposure concentrations is used, the expected ecological risk (EER) is reported. The EER is defined as the probability that a randomly drawn species for a random draw of exposure is affected.

2.4 Whole Effluent Toxicity (WET)-tests

To support the risk assessment, the potential toxicity of three samples from run-off (highway A61, Germany and highway E18, Sweden) and surface water (highway A2, the Netherlands) has been tested by WMR. These samples are identical to those used for the risk assessment (see paragraph 2.3.2.1 for a description of the sample locations). Fresh water WET-tests (Whole Effluent Toxicity-tests) are performed for species from multiple tropic levels, namely bacteria, algae and crustacea. Test methods and results are reported by Keur and Kaag (2019a, 2019b, 2019c). Main aspects of the test methods are:

- Bacteria
    - Species: *Vibrio fischer*i
    - Test duration: 30 minutes

    - Endpoint: luminescence inhibition
- Algae:
    - Species: *Raphidocelis subcapitata*
    - Test duration: 72 hours
    - Endpoint: growth inhibition
- Crustacea:
    - Species: *Daphnia magna*
    - Test duration: 48 hours
    - Endpoint: immobilisation

The NOEC is derived from the data noting that the effect at the NOEC should not exceed 10%. The EC50 is calculated using a 'sigmoidal dose-response curve' with variable slope and is based on the effect in the test concentrations relative to the blank condition.

3 Results

3.1 Identification of substances

Relevant organic micropollutants have been identified within WP1 of this project (Table 1). The table presents the pollutants that could be relevant for water quality and should be measured more frequently in road run-off and/or surface water.

Table 1 Relevant organic micropollutants identified within WP1. Substances marked with * indicates a priority substance within the Water Framework Directive (Dröge and Hulskotte, 2018).

Source	Substance	Short name	CAS number
Tyres	Benzothiazole	BT	95-16-9
	Mercaptobenzothiazole	MBT	149-30-4
	Benzothiazolone	BTON	934-34-9
	Hydroxybenzothiazole	OHBT	934-34-9
	Benzothiazole-2-sulfonate	BTSA	941-57-1
	2-(methylthio)-benzothiazole	MTBT / MeSBT	615-22-5
	2-Morpholinobenzothiazole	24MoBT	4225-26-7
	Cyclohexylamine	CHA	108-91-8
	Dicyclohexylamine	DCHA	101-83-7
	Hydroxydiphenylamine	4-HDPA	122-37-2
	Aminodiphenylamine	4-ADPA	101-54-2
	Aniline		62-53-3
	PAH*1)		
Brakes and brake fluid	Polyglycol ethers		
	Boric-acid-ester		
	Tributylphosphate		126-73-8
	Triethanolamine		102-71-6
	PAH*2)		
Car coatings	Hexa(methoxymethyl)melamine	HMMM	3089-11-0
	Nonylphenol ethoxylates	NP1EO, NP2EO	9016-45-9, 20427-84-3
	Octylphenolethoxylates	OP2EO, OP2EO	51437-89-9, 2315-61-9

Source	Substance	Short name	CAS number
	Bisphenol A	BPA	80-05-7
Coolants	Benzotriazole		95-14-7
	Tolyltriazole	TT	29385-43-1
	Mercapto benzothiazole	MBT	149-30-4
Other	Diisodecyl phthalate	DIDP	26761-40-0
	Di(2-ethylhexyl)phthalate*	DEHP	117-81-7
	Tris(1-chloropropan-2-yl) phosphate	TCCP	13674-84-5
	Nonylphenol monocarboxylate	NP1EC	3115-49-9
	Nonylphenol*	NP	104-40-5
	4-tert-octylphenol*	OP	140-66-9

1) PAHs that are released from tyres (Dröge and Hulskotte, 2018): Acenaphthene, Acenaphthylene, Antanthrene, Anthracene, Benzo(a)anthracene, Benzo(a)fluorine, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(b+j+k)fluoranthene, Benzo(e)pyrene, Benzo(g,h,i)perylene, Benzo(j)fluoranthene, Benzo(k)fluoranthene, Chrysene, Dibenzo(a,h)anthracene, Dibenzo(a,j)anthracene, Fluoranthene, Fluorene, Indeno(1,2,3-cd)pyrene, Naphthalene, Phenanthrene, Pyrene
2) PAHs that are released from lubricants (Dröge and Hulskotte, 2018): Acenaphthene, Acenaphthylene, Anthracene, Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(g,h,i)perylene, Benzo(k)fluoranthene, Chrysene, Dibenzo(a,h)anthracene, Fluoranthene, Fluorene, Indeno(1,2,3-cd)pyrene, Naphthalene, Phenanthrene, Pyrene

This list was condensed to a selection of 10 pollutants within WP2 (Dröge, 2019). The following criteria have been used to select the relevant pollutants:

- Priority substances from the Water Framework Directive have been included in the list (if they are released from roads)
- Other relevant pollutants (as selected in Baun *et al.*, 2006; Markiewicz *et al.*, 2017), i.e. pollutants with the following properties: low volatility; persistent; risk for bioaccumulation; risk for toxicity; long-term adverse effects.

Table 2 shows the ten selected pollutants.

Table 2 Ten pollutants and microplastics, proposed for inclusion in the risk assessment (Dröge, 2019).

	Pollutant	Short name	Cas number	Source
	Microplastics			Tyres, road marking, brakes
WFD	Benzo(a)pyrene	BaP	50-32-8	Tyres, asphalt, lubricants
	Fluoranthene		206-44-0	Tyres, asphalt, lubricants
	Nonylphenol	NP	104-40-5	Vehicles
	4-tert-octylphenol	OP	140-66-9	Vehicles
	Di(2-ethylhexyl)phthalate	DEHP	117-81-7	Vehicles
	Bisphenol A	BPA	80-05-7	Brake fluid
Other	Mercaptobenzothiazole	MBT	149-30-4	Tyres
	Tolyltriazole	TT	29385-43-1	Brake fluid, coolants
	Diisodecyl phthalate	DIDP	26761-40-0	Vehicles
	Hexa(methoxymethyl)melamine	HMMM	3089-11-0	Car coatings

3.2 Risk categorisation

3.2.1 PEC values

Environmental concentrations of microplastics and organic micropollutants have been reported as rough estimates (Dröge, 2019) and as measured values (Dröge and Tromp, 2019). The PEC values used for the risk assessment are presented in Table 3 (rough estimates), Table 4 (measured concentrations in road runoff) and Table 5 (measured concentration in surface water and sediment).

Table 3 PEC values of selected substances based on literature data and assumed dilution resulting in rough estimates of the PEC (Dröge, 2019).

	Estimated PEC values	
Pollutant	**Water (µg/l)**	**Sediment (µg/g)**
Microplastics	120	1200
Benzo(a)pyrene	0.00829	0.08290
Fluoranthene	0.03649	0.36490
Nonylphenol	0.00360	0.03100
4-tert-octylphenol	0.00060	0.00600
Di(2-ethylhexyl)phthalate	0.02270	0.98000
Bisphenol A	0.00550	0.05500
Mercaptobenzothiazole	0.00110	0.01100
Tolyltriazole	0.02300	0.23000
Diisodecyl phthalate	0.08600	0.86000
Hexa(methoxymethyl) melamine	0.00880	0.08800

Table 4 PEC values of selected substances based on measurements in runoff from highway A61, Germany (concentration in water (dissolved fraction) and suspended solids) and highway E18, Sweden (concentration in surface water (dissolved fraction) and sludge) (Dröge and Tromp, 2019).

Pollutant	Measured PEC values in road runoff			
	Highway A61, Germany		Highway E18, Sweden	
	Water (µg/l)	Suspended solids (µg/g)	Water (µg/l)	Sludge (µg/g)
Microplastics (tyre wear)#	58500 *	150000	975	13000
Benzo(a)pyrene	0.00117683	0.942947496	0.000810941	0.209619612
Fluoranthene	0.002954398	2.41479169	0.003060442	0.302287857
Nonylphenol	<0.01	<0.001	<0.01	<0.001
4-tert-octylphenol	0.1972	1.4521	0.016220987	0.526492347
Di(2-ethylhexyl)phthalate	0.6587	65.427	0.719583606	2.437924004
Bisphenol A	0.0278	0.2435	0.100713365	0.055756515
Mercaptobenzothiazole	<0.01	1.0102	<0.01	0.189183607
Tolyltriazole	<0.01	1.0985	0.398199449	0.039427781
Diisodecyl phthalate	2.5752	139.59	0.603887342	4.609315279
Hexa(methoxymethyl) melamine	3.8921	0.0324	2.19672584	0.001689847

Tyre wear concentrations are estimated using 4-phenylcyclohexene as a marker (Dröge and Tromp, 2019). PEC values for microplastics should thus be regarded as estimates with high uncertainty.
* Total tyre wear concentration in water phase.

Table 5 PEC values of selected substances based on measurements in surface water from the river Rhine near Lobith in the Netherlands, close to the border of Germany (concentration in suspended solids), and from a small waterway next to the A2 highway in the Netherlands (concentration in surface water (dissolved fraction) and sediment) (Dröge and Tromp, 2019).

	Measured PEC values in surface water		
	River Rhine, the Netherlands	**Waterway next to highway A2, the Netherlands**	
Pollutant	**Suspended solids (µg/g)**	**Water (µg/l)**	**Sediment (µg/g)**
Microplastics (tyre wear)#	300	6	300
Benzo(a)pyrene	0.23857659	0.000106244	0.073378266
Fluoranthene	0.452031915	0.001118509	0.166609199
Nonylphenol	0.0010736	<0.01	0.020837769
4-tert-octylphenol	0.004177317	<0.01	<0.001
Di(2-ethylhexyl)phthalate	14.302	0.978092266	10.27108339
Bisphenol A	0.005307634	<0.01	<0.001
Mercaptobenzothiazole	<0.0001	<0.01	0.002327304
Tolyltriazole	0.006404022	<0.01	0.005834757
Diisodecyl phthalate	0.650244276	<0.001	1.970898724
Hexa(methoxymethyl) melamine	<0.001	0.0707	<0.001

Tyre wear concentrations are estimated using 4-phenylcyclohexene as a marker (Dröge and Tromp, 2019). PEC values for microplastics should thus be regarded as estimates with high uncertainty.
* Total tyre wear concentration in water phase.

3.2.2 PNEC values

PNEC values for organic micropollutants and microplastics in road run-off are presented in Table 6. PNEC values are preferably EU environmental quality standards or, if no priority substance, taken from literature. In case a PNEC was not available in literature, it has been derived from available toxicity values by applying an AF conform the EU TGD (European Commission, 2003a).

Table 6 PNEC values for organic micropollutants and microplastics in road run-off.

Pollutant	Water (fresh water)		Sediment	
	PNEC (µg/l)	Reference	PNEC (µg/kg$_{dw}$)	Reference
Microplastics #	0.33 #	Besseling *et al.* (2019)	100 #	Besseling *et al.* (2019)
Benzo(a)pyrene	1.70E-04	EQS (European Commission, 2012)	1830	EU RAR (European Commission, 2008a)
Fluoranthene	0.0063	EQS (European Commission, 2012)	2000	EQS Dossier (European Commission, 2011a)
Nonylphenol	0.3	EQS (European Commission, 2012)	4620	Background document (ECHA, 2014)
4-tert-octylphenol	0.1	EQS (European Commission, 2012)	1.61	Brooke *et al.* (2005)
Di(2-ethylhexyl)phthalate	1.3	EQS (European Commission, 2012)	100000	EU RAR (European Commission, 2008b)
Bisphenol A	1.5	EU RAR (European Commission, 2010)	63	EU RAR (European Commission, 2010)
Mercaptobenzothiazole	4	ECHA registration (ECHA, 2019a)	147	ECHA registration (ECHA, 2019a)
Tolyltriazole	8	ECHA registration (ECHA, 2019b)	3	ECHA registration (ECHA, 2019b)
Diisodecyl phthalate	0.6	Derived by WMR (see text below this table)	3300	Derived by WMR (see text below this table)
Hexa(methoxymethyl) melamine	54	Slobodnik *et al.* (2012)	133	Derived by WMR (see text below this table)

it should be noted that the PNEC for microplastics has a limited reliability due to heterogeneity of the tested microplastic considering polymer type, size and shape

For most selected substances, PNEC values were available in literature. Exceptions are the PNEC water and sediment of diisodecyl phthalate (DIDP) and the PNEC sediment of hexa(methoxymethyl)melamine (HMMM). For five of the ten selected substances EQS were available, which apply for surface waters in Europe (European Commission, 2008c). Member states are obliged to monitor their waters for compliance with the EQS.

Toxicity measurements of diisodecyl phthalate (DIDP) are limited by low solubility of the substance (European Commission, 2003b). It was tentatively concluded in the EU Risk Assessment Report (European Commission, 2003b) that DIDP does not cause adverse chemical effects towards the aquatic ecosystem, including the sediment compartment. Therefore, a PNEC value could not be found in literature. Our search in the Aquire ECOTOX database resulted in four toxicity values: 3 NOECs for *Daphnia magna* (lowest 30 µg/l; Rhodes *et al.*, 1995) and 1 NOEC for *Pimephales promelas* (1 mg/l; Bionomics, 1983). Other studies (34 hits in total) reported zero values ("0"). An additional search in peer reviewed literature (using the SCOPUS search engine) resulted in the following: NOECs for two freshwater invertebrates *Hyalella azteca* and *Chironomus tentans* in sediment is >3,200 mg/kg dry weight (Call et al., 2001). These NOECs are however reported as 'greater than' and are based on the sediment and not on the water phase. Therefore these values cannot be used to derive a PNEC. In addition, the literature search resulted in two NOECs for *Daphnia magna* of 70 µg/l (Adams et al., 1995) and 30 µg/l (Rhodes et al., 1995). Taking the lowest available NOEC of 30 µg/l and applying an assessment factor of 50 (two NOECs available for two trophic levels; European Commission, 2003b) results in a PNECwater of 0.6 µg/l.

The PNECsediment for DIDP is calculated using the equilibrium method (see section 2.3.2.3). Koc values are available for DIDP: 286000 +/- 274000 (Williams et al., 1995) and 111000 - 611000 l/kg (European Commission, 2003c)(European Commission, 2003c). Based on the average Koc value of 286000 the PNEC sediment is calculated at 3300 µg/kg.

Another substance that was selected for inclusion in the risk assessment and for which a PNEC sediment was not available in literature, is hexa(methoxymethyl)melamine (HMMM) with a log Kow of 1.61 (Wluka, 2017). For HMMM the Koc is not available but can be extrapolated using the logKow of 1.61 (Dsikowitzky and Schwarzbauer, 2015) and the constants for the group of triazines: a = 0.3 and b = 1.5 (European Commission, 2003b; see section 2.3.2.3). The PNECsediment is calculated at 133 µg/kg.

Based on the log Kow value most substances are likely to adsorb to sediment (Table 7).

Table 7 Bioaccumulation potential and adsorption to sediment of the selected substances. Substances with a log Kow > 3 are likely to bioaccumulate and adsorb to sediment

Pollutant	Log Kow	Source	Likely to bioaccumulate and adsorb to sediment?
Benzo(a)pyrene	6.13	ECHA (2016)	Yes
Fluoranthene	5.20	European Commission (2011a)	Yes
Nonylphenol	4.48 and 5.4	ECHA (2014)	Yes
4-tert-octylphenol	4.12	Brooke *et al.* (2005)	Yes
Di(2-ethylhexyl)phthalate	4.8 to 9.6	European Commission (2008b)	Yes
Bisphenol A	3.4	European Commission (2010)	Yes
Mercaptobenzothiazole	2.86	BAuA (2014)	No
Tolyltriazole	1.081	ECHA (2019c)	No
Diisodecyl phthalate	8.8	European Commission (2003b)	Yes
Hexa(methoxymethyl) melamine	1.61	Dsikowitzky and Schwarzbauer (2015)	No

3.2.3 PEC/PNEC ratio

The PNEC values have been compared with environmental concentrations (PEC:PNEC ratio) in order to derive an indication of risk, *i.e.* whether unacceptable effects on organisms are likely to occur as a result of exposure to the specific chemical (European Commission, 2003a). A PEC:PNEC ratio higher than 1 indicates that unacceptable effects on organisms are not unlikely to occur; the higher the ratio, the more likely that unacceptable effects may occur.

Indication of risk based on exposure concentrations from literature (rough estimates)
Rough estimates of environmental concentrations have been reported by Dröge (2019). The PNEC values of the selected pollutants have been compared with these PEC values (Table 8). For the water phase, only microplastics and two PAHs (benzo(a)pyrene and fluoranthene) have a PEC:PNEC ratio > 1, indicating that unacceptable effects on organisms are not unlikely to occur for these three substances. For sediment, the PEC:PNEC ratio > 1 for microplastics, benzo(a)pyrene, 4-tert-octylphenol and tolyltriazole. For all other substances the PEC:PNEC ratio < 1, thus unacceptable effects are unlikely to occur.

Table 8 PEC/PNEC values of selected substances based on rough estimates. Note that PEC values are rough estimates as reported by Dröge (2019), and not actual measurements. PNEC values are taken from Table 6. PEC:PNEC ratio higher than 1 (marked in red) indicates that unacceptable effects on organisms are not unlikely to occur.

	PEC		PNEC		PEC/PNEC ratio	
Pollutant	**Water (µg/l)**	**Sediment (µg/g)**	**Water (µg/l)**	**Sediment (µg/g)**	**Water**	**Sediment**
Microplastics	120	1200	0.33 #	0.1 #	363.64 #	12000 #
Benzo(a)pyrene	0.00829	0.08290	1.70E-04	1.38	48.765	0.0453
Fluoranthene	0.03649	0.36490	0.0063	2	5.7921	0.1825
Nonylphenol	0.00360	0.03100	0.3	4.62	0.0120	0.0067
4-tert-octylphenol	0.00060	0.00600	0.1	0.0016	0.0060	3.7297
Di(2-ethylhexyl)phthalate	0.02270	0.98000	1.3	100	0.0175	0.0098
Bisphenol A	0.00550	0.05500	1.5	0.063	0.0037	0.8730
Mercaptobenzothiazole	0.00110	0.01100	4	0.147	0.0003	0.0748
Tolyltriazole	0.02300	0.23000	8	0.003	0.0029	76.667
Diisodecyl phthalate	0.08600	0.86000	0.6	3.3	0.1433	0.2606
Hexa(methoxymethyl) melamine	0.00880	0.08800	54	0.133	0.0002	0.6617

it should be noted that the PNEC for microplastics has a limited reliability due to heterogeneity of the tested microplastic considering polymer type, size and shape;

Indication of risk based on measured exposure concentrations
The PNEC values have been compared with measured concentrations (Dröge and Tromp, 2019) in runoff from Germany (Table 9) and Sweden (Table 10) and in surface water from the river Rhine near Lobith in the Netherlands, close to the border of Germany and a small waterway near highway A2 in the Netherlands (Table 12). Most of the selected pollutants in runoff (i.e. microplastics, benzo(a)pyrene, fluoranthene, 4-tert-octylphenol, bisphenol A, mercaptobenzothiazole, tolyltriazole and diisodecyl phthalate) have a PEC:PNEC ratio > 1, indicating that unacceptable effects on organisms are not unlikely to occur for these substances. For all other substances (i.e. nonylphenol, di(2-ethylhexyl)phthalate and hexa(methoxymethyl) melamine) the PEC:PNEC ratio < 1, thus unacceptable effects are unlikely to occur.
PEC:PNEC ratios based on measurements from a small waterway near highway A2 in the Netherlands show that only microplastics and tolyltriazole have a ratio > 1.

Table 9 PEC/PNEC values of selected substances based on measurements in runoff from highway A61, Germany (concentration in water (dissolved fraction) and suspended solids) (Dröge and Tromp, 2019). PNEC values are taken from Table 6. PEC:PNEC ratio higher than 1 (marked in red) indicates that unacceptable effects on organisms are not unlikely to occur.

	PEC		PNEC		PEC/PNEC ratio	
Pollutant	**Water (µg/l)**	**Susp. solids (µg/g)**	**Water (µg/l)**	**Sediment (µg/g)**	**Water**	**Solids**
Microplastics	58500*#	150000	0.33 #	0.1 #	177273	1500000
Benzo(a)pyrene	1.18E-03	0.9429	1.70E-04	1.83	6.923	0.515
Fluoranthene	0.0030	2.4148	0.0063	2	0.469	1.207
Nonylphenol	0.01	0.001	0.3	4.62	0.033	0.000
4-tert-octylphenol	0.1972	1.4521	0.1	0.0016	1.972	907.540
Di(2-ethylhexyl)phthalate	0.6587	65.4269	1.3	100	0.507	0.654
Bisphenol A	0.0278	0.2435	1.5	0.063	0.019	3.865
Mercaptobenzothiazole	0.01	1.0102	4	0.147	0.003	6.872
Tolyltriazole	0.01	1.0985	8	0.003	0.001	366.162
Diisodecyl phthalate	2.5752	139.5939	0.6	3.3	4.292	42.301
Hexa(methoxymethyl) melamine	3.8921	0.0324	54	0.133	0.072	0.244

* total concentration in water phase
# it should be noted that the PEC for microplastics has high uncertainty and the PNEC for microplastics has a limited reliability due to heterogeneity of the tested microplastic considering polymer type, size and shape

Table 10 PEC/PNEC values of selected substances based on measurements in runoff from highway E18, Sweden (concentration in water (dissolved fraction) and sludge) (Dröge and Tromp, 2019). PNEC values are taken from Table 6. PEC:PNEC ratio higher than 1 (marked in red) indicates that unacceptable effects on organisms are not unlikely to occur.

	PEC		PNEC		PEC/PNEC ratio	
Pollutant	**Water (µg/l)**	**Sludge (µg/g)**	**Water (µg/l)**	**Sediment (µg/g)**	**Water**	**Sludge**
Microplastics	975 *	13000	0.33 #	0.1 #	2955	130000
Benzo(a)pyrene	8.11E-04	0.2096	1.70E-04	1.83	4.7702	0.1145
Fluoranthene	0.0031	0.3023	0.0063	2	0.4858	0.1511
Nonylphenol	<0.01	<0.001	0.3	4.62	<0.0333	<0.0002
4-tert-octylphenol	0.0162	0.5265	0.1	0.0016	0.1622	329.0577
Di(2-ethylhexyl)phthalate	0.7196	2.4379	1.3	100	0.5535	0.0244
Bisphenol A	0.1007	0.0558	1.5	0.063	0.0671	0.8850
Mercaptobenzothiazole	<0.01	0.1892	4	0.147	<0.0025	1.2870
Tolyltriazole	0.3982	0.0394	8	0.003	0.0498	13.1426
Diisodecyl phthalate	0.6039	4.6093	0.6	3.3	1.0065	1.3968
Hexa(methoxymethyl) melamine	2.1967	0.0017	54	0.133	0.0407	0.0127

* total concentration in water phase
# it should be noted that the PEC for microplastics has high uncertainty and the PNEC for microplastics has a limited reliability due to heterogeneity of the tested microplastic considering polymer type, size and shape

Table 11 PEC/PNEC values of selected substances based on measurements of surface water of the river Rhine near Lobith at the border of Germany and the Netherlands (concentration in suspended solids) (Dröge and Tromp, 2019). PNEC values are taken from Table 6. PEC:PNEC ratio higher than 1 (marked in red) indicates that unacceptable effects on organisms are not unlikely to occur.

	PEC	**PNEC**	**PEC/PNEC ratio**
Pollutant	**Suspended solids (µg/g)**	**Sediment (µg/g)**	**Suspended solids**
Microplastics	300 #	0.1 #	3000
Benzo(a)pyrene	0.2386	1.83	0.1
Fluoranthene	0.4520	2	0.226
Nonylphenol	0.0011	4.62	0.0002
4-tert-octylphenol	0.0042	0.0016	2.611
Di(2-ethylhexyl)phthalate	14.3024	100	0.143
Bisphenol A	0.0053	0.063	0.084
Mercaptobenzothiazole	<0.0001	0.147	<0.001
Tolyltriazole	0.0064	0.003	2.135
Diisodecyl phthalate	0.6502	3.3	0.197
Hexa(methoxymethyl) melamine	<0.001	0.133	<0.008

it should be noted that the PEC for microplastics has high uncertainty and the PNEC for microplastics has a limited reliability due to heterogeneity of the tested microplastic considering polymer type, size and shape

Table 12 PEC/PNEC values of selected substances based on measurements from a small waterway near highway A2 in the Netherlands (concentration in surface water (dissolved fraction) and sediment) (Dröge and Tromp, 2019). PNEC values are taken from Table 6. PEC:PNEC ratio higher than 1 (marked in red) indicates that unacceptable effects on organisms are not unlikely to occur.

	PEC		PNEC		PEC/PNEC ratio	
Pollutant	**Water (µg/l)**	**Sediment (µg/g)**	**Water (µg/l)**	**Sediment (µg/g)**	**Water**	**Sediment**
Microplastics	6 *#	300#	0.33 #	0.1 #	18	3000
Benzo(a)pyrene	1.06E-04	0.0734	1.70E-04	1.83	0.6250	0.0401
Fluoranthene	0.0011	0.1666	0.0063	2	0.1775	0.0833
Nonylphenol	<0.01	0.0208	0.3	4.62	<0.0333	0.0045
4-tert-octylphenol	<0.01	<0,001	0.1	0.0016	<0.1000	<0.6250
Di(2-ethylhexyl)phthalate	0.9781	10.2711	1.3	100	0.7524	0.1027
Bisphenol A	<0.01	<0,001	1.5	0.063	<0.0067	<0.0159
Mercaptobenzothiazole	<0.01	0.0023	4	0.147	<0.0025	0.0158
Tolyltriazole	<0.01	0.0058	8	0.003	<0.0013	1.9449
Diisodecyl phthalate	<0.001	1.9709	0.6	3.3	<0.0017	0.5972
Hexa(methoxymethyl) melamine	0.0707	<0,001	54	0.133	0.0013	<0.0075

* total concentration in water phase
# it should be noted that the PEC for microplastics has high uncertainty and the PNEC for microplastics has a limited reliability due to heterogeneity of the tested microplastic considering polymer type, size and shape

A quantification of the likelihood of effects is estimated in the next tier (section 3.3).

3.3 Quantification of risk

3.3.1 Data selected for species sensitivity distribution

In total 1006 chronic effect values were selected, of which 985 for chemical compounds and 21 for microplastics (Table 13). A total of 901 acute effect values were also selected. The acute data were used when the chronic effect values were not sufficient for deriving an SSD. The effect values used in this study are presented in Annex A.

The species included in the dataset cover the aquatic environment, including sediment dwelling species. Therefore, the second tier assessment covers both the water column and the sediment. However, all effect values are expressed as concentrations in water (in other words, no effect values are available expressed as concentrations in sediment). Exposure of sediment dwelling species is only covered via the water phase. Because effect concentrations in sediment were lacking, exposure via ingestion of sediment was not covered within this second tier assessment.

The quantification of risk including the underlying effect data is described per substance in the sections below.

Table 13 The number of chronic, acute and combined (chronic and acute) effect values, the number of species and taxonomic groups for each pollutant available after selection. The requirements for the SSD method (minimum of 10 NOECs (i.e. for 10 different species) covering at least 8 taxonomic groups (European Commission, 2003a)**) are indicated by colour: values in red do not meet the requirements. For each pollutant the dataset used for deriving an SSD (i.e. chronic and/or acute effect values) is indicated in bold. In case the chronic dataset was used, the acute and combined dataset was not further analysed, i.e. not relevant (n.r.)**

Pollutant	**Number of values**			**Number of species**			**Number of tax. groups**		
	Chronic	**Acute**	**Combined**	**Chronic**	**Acute**	**Combined**	**Chronic**	**Acute**	**Combined**
Microplastics	45	18*	**63**	17	5	**19**	12	3	**12**
Benzo(a)pyrene (BaP)	21	23	**44**	8	13	**16**	5	10	**12**
Fluoranthene	**59**	200	259	**20**	n.r.	n.r.	**15**	n.r.	n.r.
Nonylphenol (NP)	**402**	437	839	**25**	n.r.	n.r.	**14**	n.r.	n.r.
4-tert-octylphenol (OP)	81	35	**116**	4	13	**15**	4	8	**10**
Di(2-ethylhexyl)phthalate (DEHP)#	56	24	**80**	7	5	**8**	6	5	**8**
Bisphenol A (BPA)	**322**	115	437	**17**	n.r.	n.r.	**13**	n.r.	n.r.
Mercaptobenzothiazole (MBT)	4	37	**41**	4	8	**8**	4	7	**7**
Tolyltriazole (TT)	0	4	4	0	2	2	0	2	2
Diisodecyl phthalate (DIDP)	3	0	3	2	0	2	2	0	2
Hexa(methoxymethyl)melamine (HMMM)	0	0	0	0	0	0	0	0	0

* Acute values have been extrapolated to a chronic level by Besseling *et al*. (2019) and Adam *et al*. (2019).
# as DEHP has a very low solubility only measured values have been selected (to avoid unrealistic nominal effect concentrations).

3.3.2 Microplastic

Effect values and SSD

The group of microplastics consists of many different polymer types, in different shapes and sizes. This may influence the effect of microplastics on the aquatic environment. It should be noted that the SSD and PNEC for microplastics should be interpreted with care due to heterogeneity of the microplastic tested, considering polymer type, size and shape. Also, the PEC values provided for tyre wear particles are uncertain, because reported values are not measurements of particles, but are based on measured marker concentrations that are assumed to have leached from the rubber. This is further elaborated in the discussion of this report (Chapter 4).

Based on the values as presented in Table 14, an SSD was derived (Figure 4). The requirements for the SSD method (minimum of 19 NOECs (*i.e.* for 19 different species) covering at least 12 taxonomic groups) were met.

Table 14 Chronic effect values used to derive the SSD for microplastic. Effect values have been taken from Besseling *et al*. (2019) and Adam *et al*. (2019). The full dataset is presented in Annex A

Taxonomic group	Species	Lowest effect value (µg/l)
Algae/Chlorellales	*Chlorella vulgaris*	5000
Amphipoda	*Gammarus fossarum*	291000
Amphipoda	*Hyalella azteca*	27.2
Angiospermae	*Lemna minor*	12410
Anthoathecata	*Hydra attenuata*	4000000
Bivalvia	*Corbicula fluminea*	2800
Bivalvia	*Crassostrea gigas*	23
Cladocera	*Ceriodaphnia dubia*	0.212
Cladocera	*Daphnia magna*	1.06
Cladocera	*Daphnia pulex*	0.016
Copepoda	*Calanus helgolandicus*	33
Copepoda	*Tigriopus japonicus*	4
Cypriniformes	*Cyprinus carpio*	2000
Cypriniformes	*Danio rerio*	500
Cypriniformes	*Misgurnus anguillicaudatus*	5000
Decapoda	*Erocheir sinensis*	40000
Diatomea	*Skeletonema costatum*	100
Echinodermata	*Tripneustes gratilla*	328
Rotifera	*Brachionus koreanus*	15.4
All groups	**All species**	**0.016**

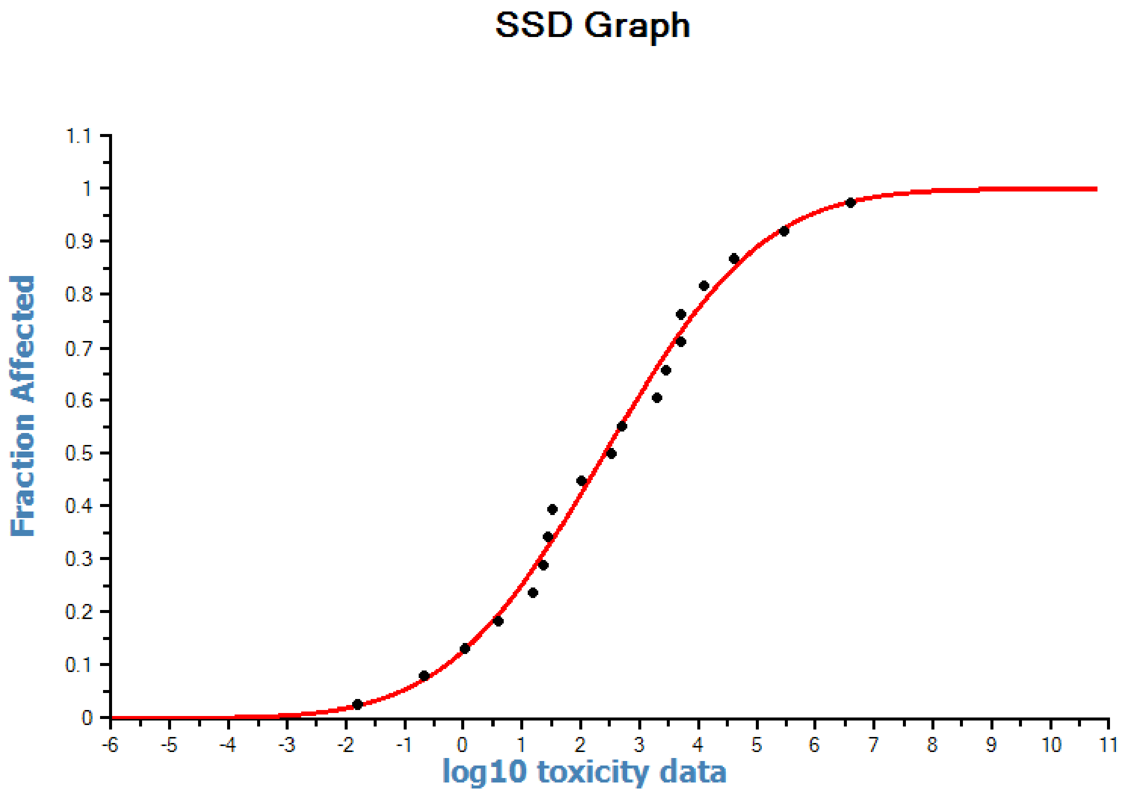

Figure 4 SSD of microplastics (in µg/l, logarithmic scale, mean value 2.4096, s.d. 2.1146, n=19)..

HC5
The HC5 was estimated at 0.0746 (0.0019 – 0.8866) µg/l. Applying an AF of 5 (European Commission, 2003a), this results in a PNEC of 0.0149 µg/l. The estimated PEC value based on literature (Dröge, 2019) as well as the estimated values based on measured marker concentrations (Dröge and Tromp, 2019) exceed the HC5 and PNEC value.

PAF
The estimated average PAF of species at the available PEC levels range from 22.38% in surface water to 86.38% in road runoff (Table 15). It should be noted that these values have high uncertainty due to the limitations of available exposure and effect data (see discussion).

Table 15 Estimated PAF of species for microplastics. PAF > 5% (marked in red) indicate that unacceptable effects might occur

Compartment	Sample location	PEC derivation	PEC value (µg/l)	PAF (%)
Surface water	-	Estimated from literature (Dröge, 2019)	120	43.88 (29.67-58.94)
	Highway A2, the Netherlands	Estimated from measured marker concentration (Dröge and Tromp, 2019)	6	22.38 (11.65-37.05)
Road runoff	Highway A61, Germany	Estimated from measured marker concentration (Dröge and Tromp, 2019)	58500	86.38 (73.20-94.38)
	Highway E18, Sweden	Estimated from measured marker concentration (Dröge and Tromp, 2019)	975	60.64 (45.43-74.37)

3.3.3 Benzo(a)pyrene

Effect values and SSD

Chronic effect values were available for 8 species covering 7 taxonomic groups. Thus, the requirements for the SSD method (minimum of 10 NOECs covering at least 8 taxonomic groups) were not met. The acute dataset consists of 23 effect values for 13 species. When extrapolating these values to a chronic level (by applying a factor of 10) and combining this data with the chronic data the requirements are met. Therefore, the combined dataset consisting of chronic effect values and acute effect values extrapolated to a chronic level (Table 16), was used to derive an SSD (Figure 5).

Table 16 Effect values used to derive the SSD for benzo(a)pyrene. The full dataset is presented in Annex A

		Lowest effect value (mg/l)		
Taxonomic group	**Species**	**Chronic**	**Acute / 10**	**Overall**
Diptera	*Chironomus riparius*	10.03	3.159	3.159
Diptera	*Chironomus tentans*	0.5	0.9873	0.5
Chlorellales	*Chlorella fusca var. vacuolata*	-	0.00011985	0.00011985
Cypriniformes	*Danio rerio*	0.01	0.0131204	0.01
Cladocera	*Daphnia magna*	-	0.000130321	0.000130321
Cladocera	*Daphnia pulex*	-	0.0005	0.0005
Euplotida	*Euplotes crassus*	0.02523153	-	0.02523153
Calanoida	*Eurytemora affinis*	0.012	0.0058	0.0058
Amphipoda	*Gammarus duebeni*	-	1.1	1.1
Archaeogastropoda	*Haliotis diversicolor*	0.1	0.1005	0.1
Decapoda	*Palaemonetes pugio*	-	0.000102	0.000102
Basommatophora	*Physella acuta*	0.01	-	0.01
Sphaeropleales	*Pseudokirchneriella subcapitata*	-	0.0015	0.0015
Sphaeropleales	*Scenedesmus acutus*	-	0.0005	0.0005
Anura	*Xenopus laevis*	-	1.0075	1.0075
Cypriniformes	*Zacco platypus*	0.0162	-	0.0162
All groups	**All species**	**0.01**	**0.000102**	**0.000102**

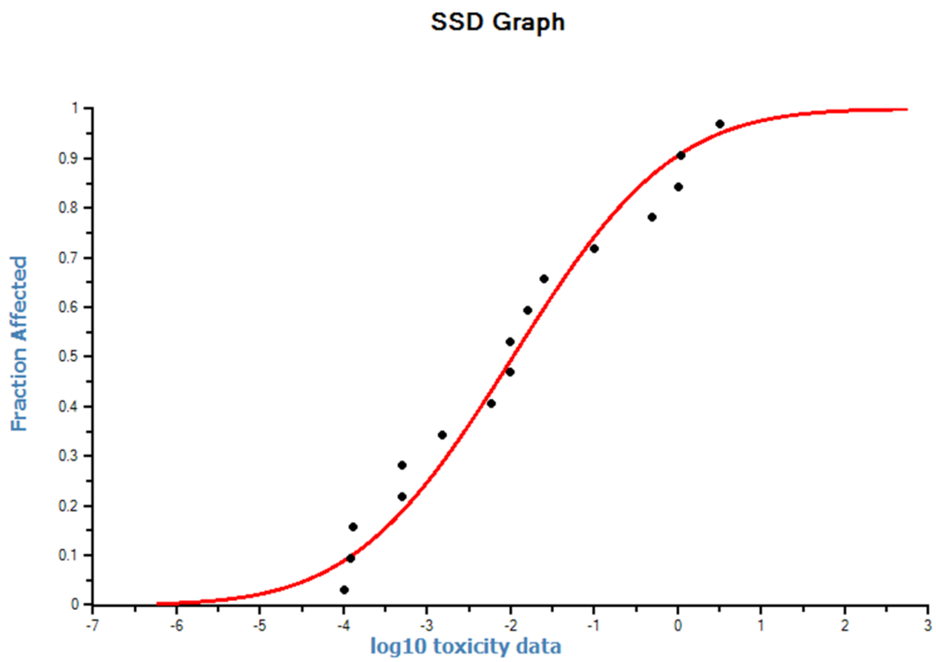

Figure 5 SSD of benzo(a)pyrene (in mg/l, logarithmic scale, mean value -1.97535, s.d. 1.502018, n=16).

HC5
The HC5 was estimated at 0.032 (0.002 – 0.214) µg/l. Using an AF of 5 (European Commission, 2003a), this results in a PNEC of 0.0064µg/l. The estimated PEC value based on literature (Dröge, 2019) is below the HC5 and above the PNEC value, whereas the measured concentrations (Dröge and Tromp, 2019) do not exceed both the HC5 and PNEC value.

PAF
The estimated average PAF of species at the available PEC levels range from 0.05% in surface water to 0.51% in road runoff, based on measured concentrations (Table 17). The PAF at the estimated exposure concentration is higher, at 2.14%.

Table 17 Estimated PAF of species for benzo(a)pyrene. PAF > 5% (marked in red) indicate that unacceptable effects might occur

Compartment	Sample location	PEC derivation	PEC value (µg/l)	PAF (%)
Surface water	-	Estimated from literature (Dröge, 2019)	0.00829	2.14 (0.26-9.55)
	Highway A2, the Netherlands	Measured (Dröge and Tromp, 2019)	0.0001	0.05 (0.001-1.25)
Road runoff	Highway A61, Germany	Measured (Dröge and Tromp, 2019)	0.0012	0.51 (0.03-4.27)
	Highway E18, Sweden	Measured (Dröge and Tromp, 2019)	0.0008	0.36 (0.02-3.55)

3.3.4 Fluoranthene

Effect values and SSD
Based on the values as presented in Table 18, an SSD was derived (Figure 6).

The requirements for the SSD method (minimum of 10 NOECs covering at least 8 taxonomic groups) are met. The effects covered by the dataset are development, growth, morphology, mortality, population and reproduction (see also Annex A).

Table 18 Chronic effect values used to derive the SSD for fluoranthene. The full dataset is presented in Annex A

Taxonomic group	Species	Lowest effect value (mg/l)
Mysida	*Americamysis bahia*	0.0006
Chlorophyceae	*Ankistrodesmus sp.*	0.019
Diptera	*Chironomus riparius*	0.043
Diptera	*Chironomus tentans*	0.025
Chlorellales	*Chlorella fusca var. vacuolata*	0.01274209
Bivalvia	*Crassostrea virginica*	0.01
Cyprinodontiformes	*Cyprinodon variegatus*	560
Cladocera	*Daphnia magna*	0.0014
Amphipoda	*Diporeia sp.*	0.861608004
Amphipoda	*Hyalella azteca*	0.018
Angiospermae	*Lemna minor*	0.166
Amphipoda	*Leptocheirus plumulosus*	0.212
Decapoda	*Palaemonetes pugio*	0.022
Naviculales	*Phaeodactylum tricornutum*	0.05
Cyprinidae	*Pimephales promelas*	0.0104
Chlorophyceae	*Pseudokirchneriella subcapitata*	16.02085
Bivalvia	*Ruditapes decussatus*	0.004
Diatomea	*Skeletonema costatum*	10
Annelida	*Stylaria lacustris*	0.115
Copepoda	*Tisbe battagliai*	0.013325
All groups	**All species**	**0.0006**

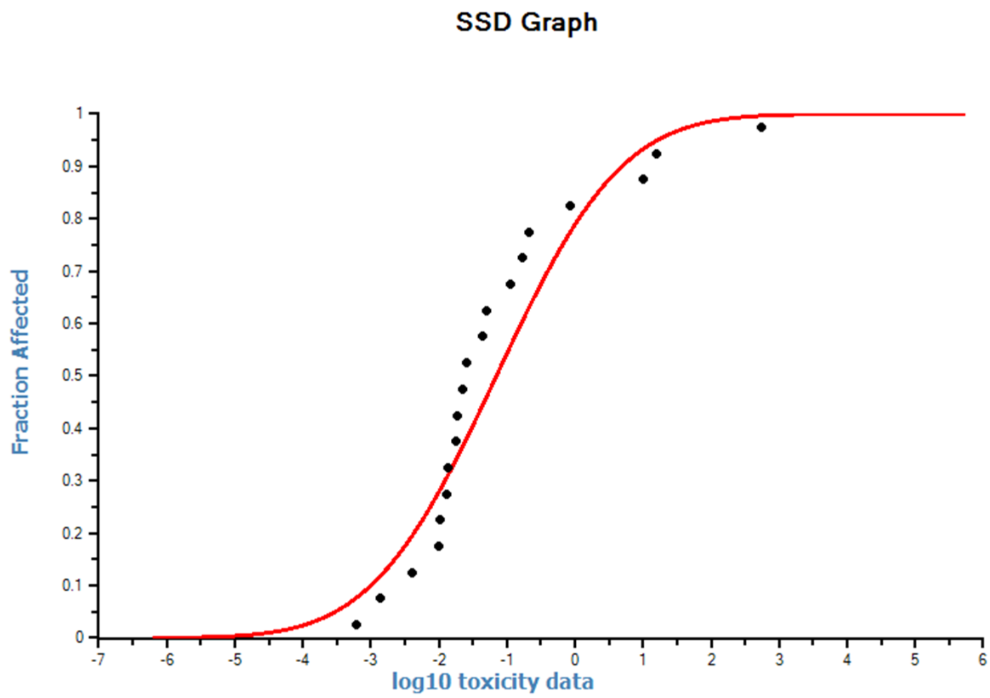

Figure 6 SSD of fluoranthene (in mg/l, logarithmic scale, mean value -1.15623, s.d. 1.440216, n=20).

HC5
Based on the SSD (Figure 6) the HC5 was estimated at 0.273 (0.0247-1.419) µg/l. Using an AF of 5 (European Commission, 2003a), this results in a PNEC of 0.0546 µg/l. The estimated PEC value based on literature (Dröge, 2019) as well as the measured concentrations (Dröge and Tromp, 2019) do not exceed the HC5 and PNEC value.

PAF
The estimated average PAF of species at the available PEC levels range from 0.05% in surface water to 0.15% in road runoff, based on measured concentrations (Table 19). The PAF at the estimated exposure concentration is higher, at 1.25%.

Table 19 Estimated PAF of species for fluoranthene. PAF > 5% (marked in red) indicate that unacceptable effects might occur

Compartment	Site location	PEC derivation	PEC value (µg/l)	PAF (%)
Surface water	-	Estimated from literature (Dröge, 2019)	0.03649	1.25 (0.15-6.00)
	Highway A2, the Netherlands	Measured (Dröge and Tromp, 2019)	0.0011	0.05 (0.002-0.92)
Road runoff	Highway A61, Germany	Measured (Dröge and Tromp, 2019)	0.0030	0.14 (0.005-1.67)
	Highway E18, Sweden	Measured (Dröge and Tromp, 2019)	0.0031	0.15 (0.005-1.70)

3.3.5 Nonylphenol

Effect values and SSD
For nonylphenol, chronic effect values were found for 47 species covering 29 taxonomic groups (Table 20). Based on these values, an SSD was derived (Figure 7).

The requirements for the SSD method (minimum of 10 NOECs covering at least 8 taxonomic groups) are met.

Table 20 Chronic effect values used to derive the SSD for nonylphenol. The full dataset is presented in Annex A

Taxonomic group	Species	Lowest effect value (mg/l)
Cypriniformes	*Alburnus tarichi*	0.2
Sessilia	*Balanus amphitrite*	0.000059
Cladocera	*Ceriodaphnia dubia*	0.1
Decapoda	*Charybdis japonica*	1.244
Diptera	*Chironomus riparius*	0.1
Diptera	*Chironomus tentans*	0.042
Bivalvia	*Crassostrea gigas*	0.0001
Gasterosteiformes	*Culaea inconstans*	0.243
Cypriniformes	*Danio rerio*	0.01
Cladocera	*Daphnia galeata*	0.01
Cladocera	*Daphnia magna*	0.005
Perciformes	*Dicentrarchus labrax*	0.89243775
Bivalvia	*Dreissena polymorpha*	0.5
Neoophora	*Dugesia japonica*	0.25
Sessilia	*Elminius modestus*	0.01
Calanoida	*Eurytemora affinis*	0.007
Gadiformes	*Gadus morhua*	0.029
Cypriniformes	*Gobiocypris rarus*	0.003
Siluriformes	*Heteropneustes fossilis*	0.001
Anthoathecata	*Hydra vulgaris*	0.031
Bivalvia	*Lampsilis cardium*	0.2
Bivalvia	*Lampsilis siliquoidea*	0.24
Angiospermae	*Lemna minor*	0.901
Perciformes	*Lepomis macrochirus*	0.076
Bivalvia	*Leptodea fragilis*	0.13
Bivalvia	*Ligumia subrostrata*	0.24
Anura	*Lithobates pipiens*	0.1
Anura	*Lithobates sylvaticus*	0.1
Gastropoda	*Lymnaea stagnalis*	0.1
Melosirales	*Melosira varians*	0.02
Chroococcales	*Microcystis aeruginosa*	0.5
Cladocera	*Moina macrocopa*	0.05
Decapoda	*Neocaridina denticulata*	0.25
Salmonidae	*Oncorhynchus mykiss*	0.001
Cichliformes	*Oreochromis spilurus*	0.0035
Beloniformes	*Oryzias latipes*	0.00608
Basommatophora	*Physella acuta*	0.05
Cyprinidae	*Pimephales promelas*	0.00015
Cyprinodontiformes	*Poecilia reticulata*	0.005
Pleuronectiformes	*Psetta maxima*	0.029
Anura	*Pseudepidalea raddei*	0.05
Chlorophyceae	*Pseudokirchneriella subcapitata*	0.694
Salmoniformes	*Salmo salar*	0.02
Sphaeropleales	*Scenedesmus subspicatus*	0.37
Copepoda	*Tigriopus japonicus*	0.00001
Bivalvia	*Utterbackia imbecillis*	0.34
Cyprinodontiformes	*Xiphophorus maculatus*	1.28
All groups	**All species**	**0.007**

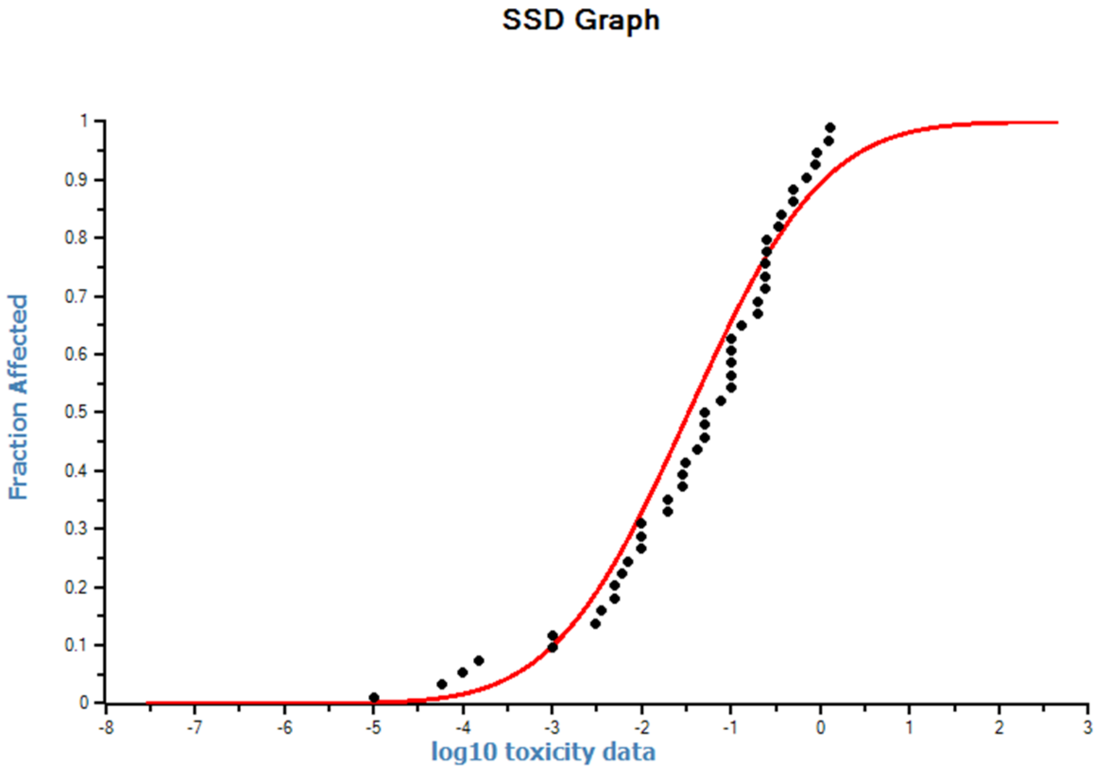

Figure 7 SSD of nonylphenol (in mg/l, logarithmic scale, mean value -1.4741, s.d. 1.1813, n=47).

HC5

Based on the SSD (Figure 7) the HC5 was estimated at 0.3716 (0.1169- 0.9244) µg/l. Using an AF of 5 (European Commission, 2003a), this results in a PNEC of 0.0743 µg/l. The estimated PEC value based on literature (Dröge, 2019) as well as the measured concentrations (Dröge and Tromp, 2019) do not exceed the HC5 and PNEC value.

PAF

The estimated average PAF of species at the available PEC levels is <0.15% in surface water and in road runoff, based on measured concentrations (Table 21). The PAF at the estimated exposure concentration is lower, at 0.04%. All PAF values are below the 5% trigger (European Commission, 2003a).

Table 21 Estimated PAF of species for nonylphenol. PAF > 5% (marked in red) indicate that unacceptable effects might occur

Compartment	Site location	PEC derivation	PEC value (µg/l)	PAF (%)
Surface water	-	Estimated from literature (Dröge, 2019)	0.00360	0.04 (0.005-0.30)
	Highway A2, the Netherlands	Measured (Dröge and Tromp, 2019)	<0.01	0.15 (0.02-0.76)
Road runoff	Highway A61, Germany	Measured (Dröge and Tromp, 2019)	<0.01	0.15 (0.02-0.76)
	Highway E18, Sweden	Measured (Dröge and Tromp, 2019)	<0.01	0.15 (0.02-0.76)

3.3.6 4-tert-octylphenol (OP)

Effect values and SSD

The chronic effect values (Table 22) do not meet the requirements for the SSD method (minimum of 10 NOECs covering at least 8 taxonomic groups). Therefore, the acute effect values were extrapolated to a chronic level by applying a factor 10 and added to the chronic effect values. The combined dataset includes 15 species covering 10 taxonomic groups (Table 22). This dataset was used to derive an SSD (Figure 8).

Table 22 Effect values used to derive the SSD for 4-tert-octylphenol. The full dataset is presented in Annex A

		Lowest effect value (mg/l)		
Taxonomic group	**Species**	**Chronic**	**Acute / 10**	**Overall**
Copepoda	*Acartia tonsa*	-	0.0013	0.0013
Mysida	*Americamysis bahia*	-	0.008121667	0.008121667
Hemiaulales	*Bellerochea polymorpha*	-	0.009	0.009
Decapoda	*Crangon septemspinosa*	-	0.11	0.11
Cypriniformes	*Danio rerio*	0.0032	0.0028	0.0028
Cladocera	*Daphnia magna*	-	0.0011	0.0011
Cyprinodontiformes	*Fundulus heteroclitus*	-	0.028473278	0.028473278
Anura	*Lithobates pipiens*	0.002063281	0.028679606	0.002063281
Anura	*Lithobates sylvaticus*	0.2063281	0.015268279	0.015268279
Cyanobacteria	*Microcystis aeruginosa*	0.005488327	0.006767562	0.005488327
Beloniformes	*Oryzias latipes*	0.0237	0.074	0.0237
Gastropoda	*Potamopyrgus antipodarum*	0.05005		0.05005
Diatomea	*Skeletonema costatum*	-	0.014	0.014
Copepoda	*Tigriopus japonicus*	0.0001	0.03	0.0001
Perciformes	*Zoarces viviparus*	0.014	0.0013	0.014
All groups	**All species**	**0.0001**	**0.0011**	**0.0001**

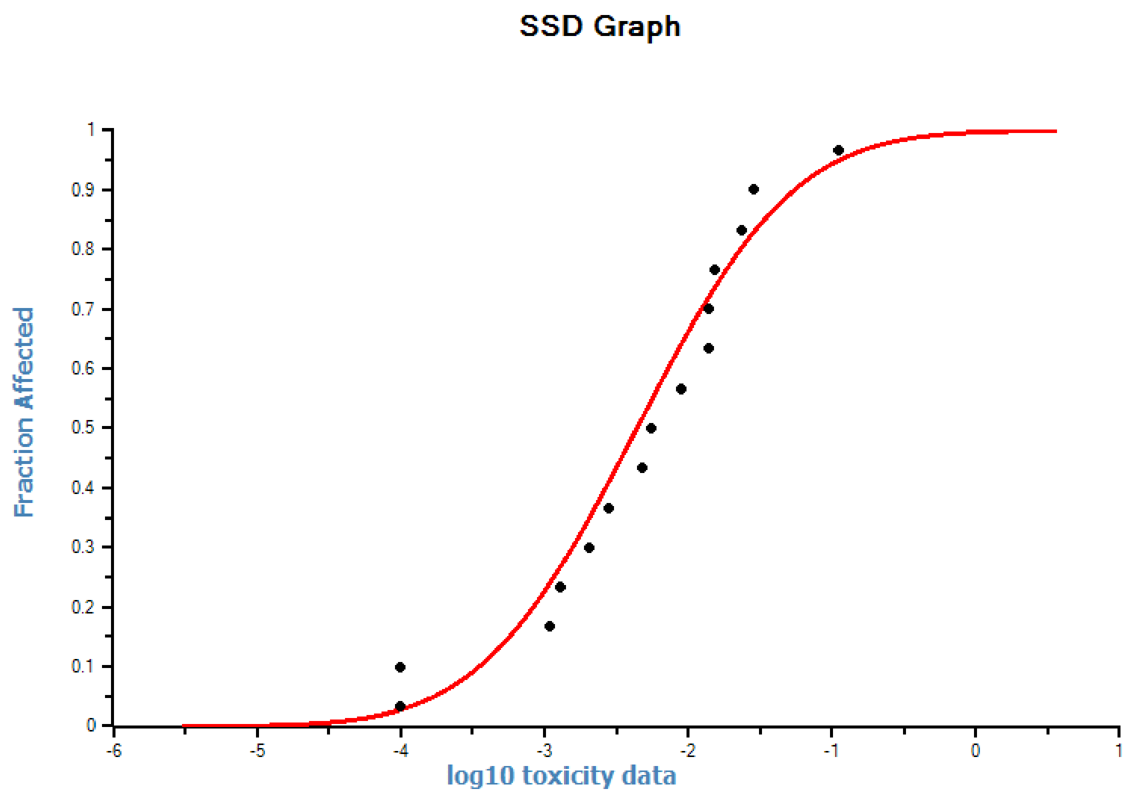

Figure 8 SSD of 4-tert-octylphenol (OP) (in mg/l, logarithmic scale, mean value -2.1622, s.d. 0.7634, n=15).

HC5

Based on the SSD (Figure 8), the HC5 was estimated at 0.3586 (0.0756 – 0.9712) µg/l. Using an AF of 5 (European Commission, 2003a), this results in an PNEC of 0.0717 µg/l. The estimated PEC value based on literature (Dröge, 2019) as well as most of the measured concentrations (Dröge and Tromp, 2019) do not exceed the HC5 and PNEC value. Exception is the measured concentration of 4-tert-octylphenol in road runoff from Germany (0.1972 µg/l), which is below the HC5 (0.36 µg/l), but above the PNEC (0.07 µg/l).

PAF

The estimated average PAF of species at the available PEC levels ranges from <0.015 % in surface water to 2.40% in road runoff, based on measured concentrations (Table 23). The PAF at the estimated exposure concentration is too low for estimation. All PAF values are below the 5% trigger (European Commission, 2003a), except for the upper limit in road runoff from Germany.

Table 23 Estimated PAF of species for 4-tert-octylphenol. PAF > 5% (marked in red) indicate that unacceptable effects might occur

Compartment	Site location	PEC derivation	PEC value (µg/l)	PAF (%)
Surface water	-	Estimated from literature (Dröge, 2019)	0.00060	Out of bounds
	Highway A2, the Netherlands	Measured (Dröge and Tromp, 2019)	<0.01	<0.015 (0.0003-0.68)
Road runoff	Highway A61, Germany	Measured (Dröge and Tromp, 2019)	0.1972	2.40 (0.30-10.63)
	Highway E18, Sweden	Measured (Dröge and Tromp, 2019)	0.0162	0.04 (0.0006-1.16)

3.3.7 Di(2-ethylhexyl)phthalate (DEHP)

Effect values and SSD
DEHP easily forms more or less colloidal dispersions in water, which hampers the establishment of chronic NOECs for organisms exposed via water (EC, 2008). Therefore, only effect values reported as measured concentrations were selected. Based on the values as presented in Table 24, an SSD was derived (Figure 9). This dataset consists of chronic toxicity values combined with acute values extrapolated to a chronic toxicity level (applying the pragmatic acute to chronic ratio of 10; Ahlers *et al*., 2006).

The requirements for the SSD method (minimum of 10 NOECs covering at least 8 taxonomic groups) are not met. However, the number of taxonomic groups are sufficient.

Table 24 Effect values for di(2-ethylhexyl)phthalate (only measured values). The full dataset is presented in Annex A

		Lowest effect value (mg/l)		
Taxonomic group	**Species**	**Chronic**	**Acute / 10**	**Overall**
Mysida	*Americamysis bahia*	34.5	12.5	12.5
Cladocera	*Daphnia magna*	0.077	-	0.077
Cypriniformes	*Gobiocypris rarus*	0.0036	-	0.0036
Archaeogastropoda	*Haliotis diversicolor ssp. supertexta*	0.0188	-	0.0188
Perciformes	*Micropterus salmoides*	0.0072	3.21	0.0072
Salmonidae	*Oncorhynchus mykiss*	0.15	13.91	0.15
Cyprinidae	*Pimephales promelas*	0.67	6.8	0.67
Chlorophyceae	*Pseudokirchneriella subcapitata*	34.5	0.096	0.096
All groups	**All species**			

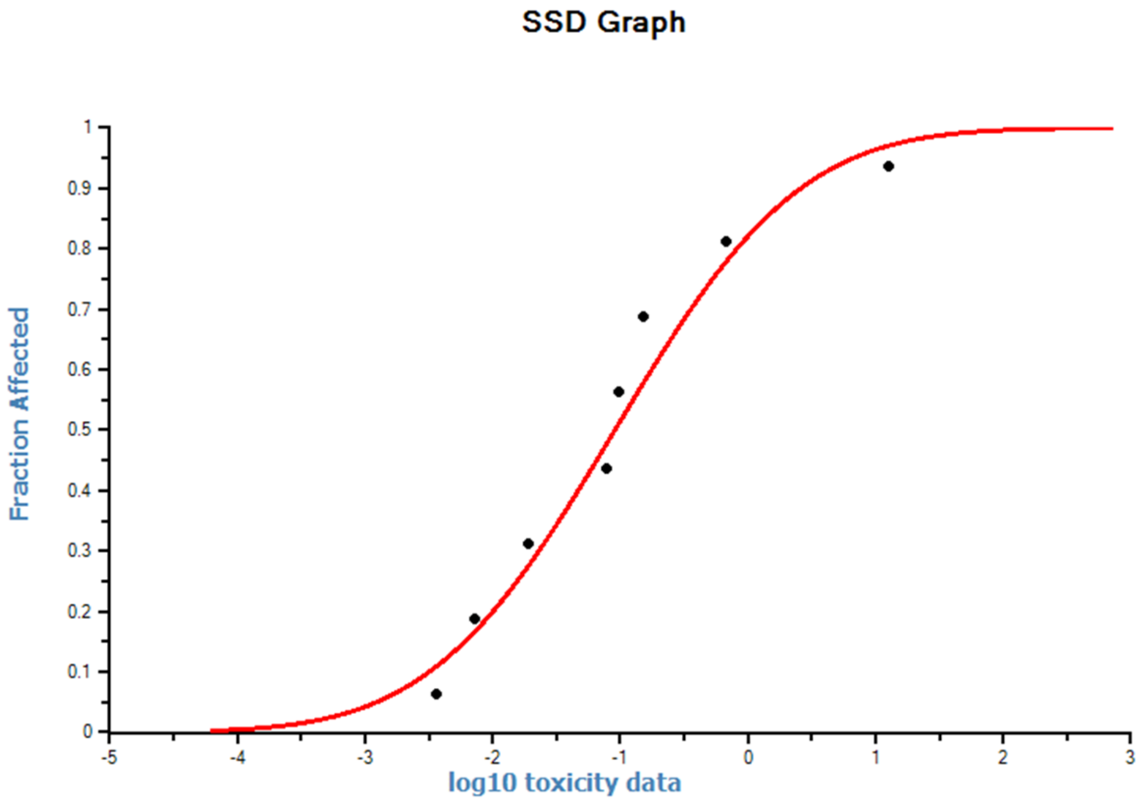

Figure 9 SSD of di(2-ethylhexyl)phthalate (in mg/l, logarithmic scale, mean value -1.04305, s.d. 1.135506, n=8). The PEC (2.27E-05 mg/l; Dröge, 2019) has a log10 value of -4.64 at which the PAF was estimated at 0.12 (8E-04 - 5.1)%.

HC5

Based on the SSD (Figure 9), the HC5 was estimated at 1.012 (0.022 – 7.398) µg/l. Applying an AF of 5 (European Commission, 2003a), this results in a PNEC of 0.2025 µg/l. The estimated PEC value based on literature (Dröge, 2019) do not exceed the HC5 (1.01 µg/l) and PNEC value (0.20 µg/l). The measured concentrations (Dröge and Tromp, 2019) are below the HC5 but above the PNEC value.

PAF

The estimated average PAF of species at the available PEC levels ranges from 3.58 % in road runoff to 4.87% in surface water, based on measured concentrations (Table 25). The PAF at the estimated exposure concentration is lower, at 0.12%. All average PAF values are below the 5% trigger (European Commission, 2003a), whereas all upper confidence limits exceed the threshold value.

Table 25 Estimated PAF of species for di(2-ethylhexyl)phthalate. PAF > 5% (marked in red) indicate that unacceptable effects might occur

Compartment	Site location	PEC derivation	PEC value (µg/l)	PAF (%)
Surface water	-	Estimated from literature (Dröge, 2019)	0.02270	0.12 (8E-04 - 5.1)
	Highway A2, the Netherlands	Measured (Dröge and Tromp, 2019)	0.9781	4.87 (0.40-22.69)
Road runoff	Highway A61, Germany	Measured (Dröge and Tromp, 2019)	0.6587	3.58 (0.21-19.86)
	Highway E18, Sweden	Measured (Dröge and Tromp, 2019)	0.7196	3.84 (0.25-20.47)

3.3.8 Bisphenol A

Effect values and SSD
Based on the values as presented in Table 26, an SSD was derived (Figure 10).

The requirements for the SSD method (minimum of 10 NOECs covering at least 8 taxonomic groups) are met.

Table 26 Chronic effect values (only NOEC values for mortality effects) for bisphenol A. The full dataset is presented in Annex A

Taxonomic group	Species	Lowest effect value (mg/l)
Rotifera	*Brachionus koreanus*	5
Diptera	*Chironomus riparius*	0.5
Diptera	*Chironomus tentans*	1.4
Enterogona	*Ciona intestinalis*	2.282908
Cypriniformes	*Danio rerio*	0.1
Cladocera	*Daphnia magna*	0.03
Amphipoda	*Gammarus fossarum*	0.5
Archaeogastropoda	*Haliotis diversicolor ssp. supertexta*	0.05
Gastropoda	*Marisa cornuarietis*	0.1
Beloniformes	*Oryzias latipes*	1.00E-04
Basommatophora	*Physella acuta*	0.1
Cyprinidae	*Pimephales promelas*	0.3485
Gastropoda	*Potamopyrgus antipodarum*	0.1
Anura	*Rhinella arenarum*	1.8
Copepoda	*Tigriopus japonicus*	0.01
Gastropoda	*Valvata piscinalis*	0.1
Anura	*Xenopus laevis*	0.02282908
All groups	**All species**	**1.00E-04**

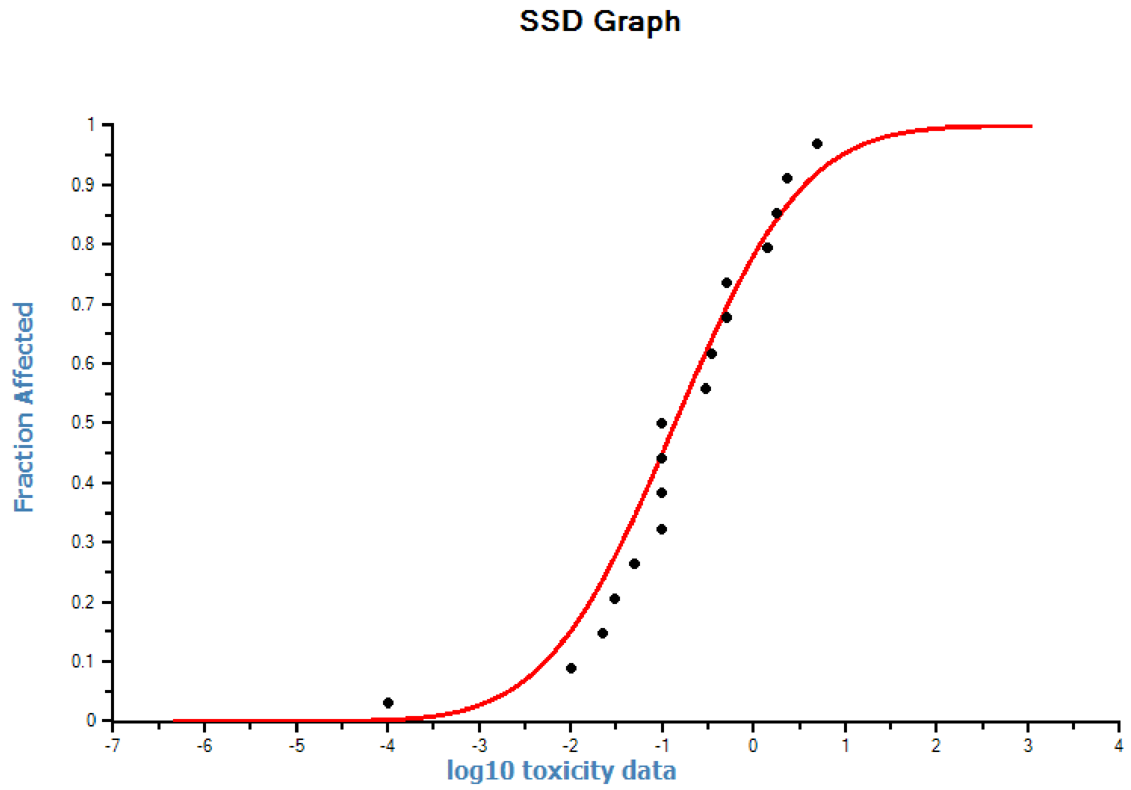

Figure 10 SSD of bisphenol A (in mg/l, logarithmic scale, mean value -0.85819, s.d. 1.105491, n=17).

HC5

Based on the SSD (Figure 10), the HC5 was estimated at 1.944 (0.247 - 7.591) µg/l. Using an AF of 5 (European Commission, 2003a), this results in a PNEC of 0.3888 µg/l. The estimated PEC value based on literature (Dröge, 2019) as well as the measured concentrations (Dröge and Tromp, 2019) do not exceed the HC5 and PNEC value.

PAF

The estimated average PAF of species at the available PEC levels ranges from 0.014 % in surface water to 0.28% in road runoff, based on measured concentrations (Table 27). The PAF at the estimated exposure concentration is lower, at 0.005%. All PAF values are below the 5% trigger (European Commission, 2003a).

Table 27 Estimated PAF of species for bisphenol A. PAF > 5% (marked in red) indicate that unacceptable effects might occur

Compartment	Site location	PEC derivation	PEC value (µg/l)	PAF (%)
Surface water	-	Estimated from literature (Dröge, 2019)	0.00550	0.005 (3.9E-05 - 0.31)
	Highway A2, the Netherlands	Measured (Dröge and Tromp, 2019)	<0.01	0.014 (0.0003-0.53)
Road runoff	Highway A61, Germany	Measured (Dröge and Tromp, 2019)	0.0278	0.056 (0.001-1.18)
	Highway E18, Sweden	Measured (Dröge and Tromp, 2019)	0.1007	0.28 (0.01-2.92)

3.3.9 Mercaptobenzothiazole (MBT)

Effect values and SSD

For MBT, a limited amount of chronic effect values was found: 4 NOECs covering 4 species. Acute effect values were more numerous: 37 LC/EC50 values for 8 species. These values were extrapolated to a chronic toxicity level by applying the pragmatic acute to chronic ratio of 10 (Ahlers *et al*. 2006). The total dataset (chronic and acute) consists of 41 effect values for 8 species covering 7 taxonomic groups. This combined dataset does not meet the requirements for the SSD method (minimum of 10 NOECs covering at least 10 species in 8 taxonomic groups). This decreases the reliability of the outcome. However, the number of species and taxonomic groups are close to the required data and, therefore, the combined dataset (Table 28) was used to derive an SSD (Figure 11).

Table 28 Effect values for mercaptobenzothiazole. The full dataset is presented in Annex A

Taxonomic group	**Species**	**Lowest effect value (mg/l)**		
		Chronic	**Acute / 10**	**Overall**
Cladocera	*Ceriodaphnia dubia*	0.839	0.125	0.125
Cladocera	*Daphnia magna*	1.8	0.555	0.555
Siluriformes	*Ictalurus punctatus*	-	0.165	0.165
Perciformes	*Lepomis macrochirus*	-	0.205	0.205
Salmonidae	*Oncorhynchus mykiss*	0.31	0.0605	0.0605
Cyprinidae	*Pimephales promelas*	4.2	1.1	1.1
Chlorophyceae	*Pseudokirchneriella subcapitata*	-	0.024	0.024
Hymenostomatida	*Tetrahymena pyriformis*	-	1	1
All groups	**All species**	**0.605**	**0.024**	**0.024**

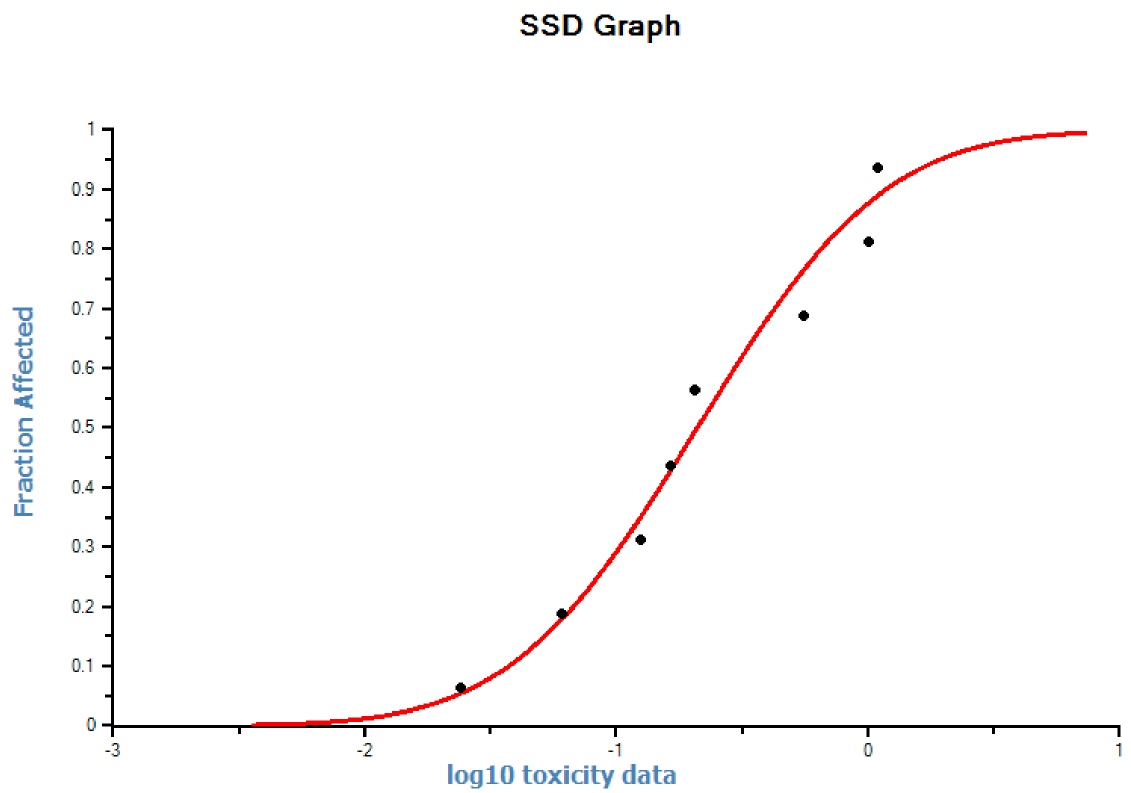

Figure 11 SSD of mercaptobenzothiazole (MBT) (in mg/l, logarithmic scale, mean value 0.6783, s.d. 0.5851, n=8)..

HC5
Based on the SSD (Figure 11), the HC5 was estimated at 20.7096 (2.8640 – 57.7057) µg/l. Applying an AF of 5 (European Commission, 2003a), this results in a PNEC of 4.1419 µg/l. The estimated PEC value based on literature (Dröge, 2019) as well as the measured concentrations (Dröge and Tromp, 2019) are far below the HC5 (20.7 µg/l) and PNEC value (4.14 µg/l).

PAF
The PAF could not be estimated at the exposure concentrations (PEC) because the PEC values are out of bounds, *i.e*. the PEC does not overlap the SSD (Table 29). The risk can be considered negligible.

Table 29 Estimated PAF of species for mercaptobenzothiazole. PAF > 5% (marked in red) indicate that unacceptable effects might occur

Compartment	Site location	PEC derivation	PEC value (µg/l)	PAF (%)
Surface water	-	Estimated from literature (Dröge, 2019)	0.00110	Out of bounds
	Highway A2, the Netherlands	Measured (Dröge and Tromp, 2019)	<0.01	Out of bounds
Road runoff	Highway A61, Germany	Measured (Dröge and Tromp, 2019)	<0.01	Out of bounds
	Highway E18, Sweden	Measured (Dröge and Tromp, 2019)	<0.01	Out of bounds

3.3.10 Tolyltriazole

There were no chronic toxicity values available for tolyltriazole. Some acute values were found: 4 LC50 values for 2 species (Table 30). The effect values were not sufficient to derive an SSD, as the dataset is far from the requirements for the SSD method (minimum of 10 NOECs covering at least 8 taxonomic groups). The second tier risk assessment is, therefore, not possible for tolyltriazole.

Table 30 Acute effect values (LC50) for tolyltriazole. The full dataset is presented in Annex A

Taxonomic group	Species	Effect value (mg/l)
Cladocera	*Ceriodaphnia dubia*	102
Cladocera	*Ceriodaphnia dubia*	108
Cyprinidae	*Pimephales promelas*	38
Cyprinidae	*Pimephales promelas*	65

3.3.11 Diisodecyl phthalate (DIDP)

For DIDP, a limited amount of chronic effect values was found: 3 NOECs for 2 species (Table 31). Acute effect values are more numerous: 11 LC/EC50 values for 7 species (Table 32). However, these were all rejected because the effect concentrations are all reported as larger than (>) values. It was, therefore, not possible to derive an SSD.

Table 31 Chronic effect values for DIDP. The full dataset is presented in Annex A

Taxonomic group	Species	Lowest effect value (mg/l)
Cladocera	*Daphnia magna*	0.03
Cyprinidae	*Pimephales promelas*	1
All groups	**All species**	**0.03**

Table 32 Acute effect values for DIDP. The full dataset is presented in Annex A

Taxonomic group	Species	Lowest effect value (mg/l)
Mysida	*Americamysis bahia*	>0.08
Cyprinodontiformes	*Cyprinodon variegatus*	>0.47
Perciformes	*Lepomis macrochirus*	>0.37
Salmonidae	*Oncorhynchus mykiss*	>0.62
Diptera	*Paratanytarsus parthenogeneticus*	>0.64
Cyprinidae	*Pimephales promelas*	>0.47
Chlorophyceae	*Pseudokirchneriella subcapitata*	>0.8
All groups	**All species**	**>0.08**

3.3.12 Hexa(methoxymethyl)melamine (HMMM)

There were no chronic toxicity values available for HMMM. Acute values were also not available. The second tier risk assessment is, therefore, not possible for HMMM.

3.4 Summary of risks

The risks of pollution in road runoff for the European waters within the first tier (i.e. PEC/PNEC ratios) are summarised for the water phase (Table 33) and sediment (**PEC/PNEC ratios of selected substances in sediment and solids based on rough estimates for exposure (extrapolated from values found in literature by Dröge (2019)), and measurements (Dröge and Tromp, 2019).**Table 34). The risks within the second tier (PAF) are summarised for exposure via the water phase only (Table 35), as there was insufficient data for the sediment compartment to conduct a second tier risk assement.

The first tier assessment indicates that for microplastics, benzo(a)pyrene and fluoranthene unacceptable effects on organisms are not unlikely to occur when exposed via the water phase using estimated exposure values. Measured exposure in surface water indicates that only for microplastics unacceptable effects on organisms are not unlikely to occur. Measured exposure in runoff indicates that for microplastics, benzo(a)pyrene, 4-tert-octylphenol and diisodecyl phthalate, unacceptable effects on organisms cannot be ruled out. Considering exposure via the sediment based on estimated exposure unacceptable effects on organisms are not unlikely to occur for microplastics, 4-tert-octylphenol and tolyltriazole. Based on measured exposure in suspended solids and sediment unacceptable effects on organisms are not unlikely to occur for microplastics, 4-tert-octylphenol and tolyltriazole. Based on measured exposure in runoff (solids and sludge) unacceptable effects on organisms are not unlikely to occur for microplastics, fluoranthene, 4-tert-octylphenol, bisphenol A, mercaptobenzothiazole, tolyltriazole and diisodecyl phthalate.

The second tier assessment indicates that only for microplastics the median potential affected fraction of species is above 5%, which is the threshold value for environmental protection (European Commission, 2003a). Based on estimated exposure concentrations, for some substances the highest range (95% confidence limit) exceeds the 5% threshold (see Table 35), i.e. for benzo(a)pyrene, fluoranthene and di(2-ethylhexyl)phthalate. Based on measured concentrations in road runoff, the upper confidence limit exceeds the 5% threshold for 4-tert-octylphenol and di(2-ethylhexyl)phthalate. Measured concentrations of di(2-ethylhexyl)phthalate in surface water also results in exceedance of the 5% threshold by the upper confidence limit. This means that unacceptable effects cannot be ruled out for these cases. The second tier assessment also covers sediment dwelling species but only for exposure via (pore)water. Quantification of risks from exposure based on sediment concentrations was not possible due to a lack of data.

A second tier assessment could not be performed for tolyltriazole, diisodecyl phthalate and hexa(methoxymethyl) melamine due to lack of toxicity data. Aquatic risks cannot be excluded for diisodecyl phthalate in highway run-off based on the first tier assessment, while sediment/suspended solid risk may be apparent for all 3 substances.

Table 33 PEC/PNEC ratios of selected substances in water (dissolved fraction) based on rough estimates for exposure (Dröge, 2019), and measured exposure (Dröge and Tromp, 2019).

Pollutant	PEC/PNEC ratio			
	Estimated exposure	Measured exposure		
	Surface water	Runoff, Germany	Runoff, Sweden	Surface water, the Netherlands
Microplastics#	363.64	177273	2955	18
Benzo(a)pyrene	48.765	6.923	4.7702	0.6250
Fluoranthene	5.7921	0.469	0.4858	0.1775
Nonylphenol	0.0120	0.033	<0.0333	<0.0333
4-tert-octylphenol	0.0060	1.972	0.1622	<0.1000
Di(2-ethylhexyl)phthalate	0.0175	0.507	0.5535	0.7524
Bisphenol A	0.0037	0.019	0.0671	<0.0067
Mercaptobenzothiazole	0.0003	0.003	<0.0025	<0.0025
Tolyltriazole	0.0029	0.001	0.0498	<0.0013
Diisodecyl phthalate	0.1433	4.292	1.0065	<0.0017
Hexa(methoxymethyl) melamine	0.0002	0.072	0.0407	0.0013

it should be noted that the PEC for microplastics has high uncertainty and the PNEC for microplastics has a limited reliability due to heterogeneity of the tested microplastic considering polymer type, size and shape

Table 34 PEC/PNEC ratios of selected substances in sediment and solids based on rough estimates for exposure (extrapolated from values found in literature by Dröge (2019)), and measurements (Dröge and Tromp, 2019).

	PEC/PNEC ratio				
	Estimated exposure	Measured exposure			
Pollutant	Sediment	Runoff, Germany (solids)	Runoff, Sweden (sludge)	Surface water, river Rhine, the Netherlands (solids)	Surface water, waterway, the Netherlands (sediment)
Microplastics#	12000	1500000	130000	3000	3000
Benzo(a)pyrene	0.0453	0.515	0.1145	0.130	0.0401
Fluoranthene	0.1825	1.207	0.1511	0.226	0.0833
Nonylphenol	0.0067	0.0002	0.0002	0.0002	0.0045
4-tert-octylphenol	3.7297	908	329	2.611	0.6250
Di(2-ethylhexyl)phthalate	0.0098	0.654	0.0244	0.143	0.1027
Bisphenol A	0.8730	3.865	0.8850	0.084	0.0159
Mercaptobenzothiazole	0.0748	6.872	1.287	0.001	0.0158
Tolyltriazole	76.667	366	13.143	2.135	1.9449
Diisodecyl phthalate	0.2606	42	1.397	0.197	0.5972
Hexa(methoxymethyl) melamine	0.6617	0.244	0.0127	0.008	0.0075

It should be noted that the PEC for microplastics has high uncertainty and the PNEC for microplastics has a low reliability due to heterogeneity of the tested microplastic considering polymer type, size and shape.

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Table 35 Summary of risks (PAF, %) of selected substances in water, based on estimated and measured exposure concentrations.

Pollutant	Estimated exposure	Measured exposure		
	Surface water	Surface water, the Netherlands	Road runoff, Germany	Road runoff, Sweden
Microplastics	43.88 (29.67-58.94)	22.38 (11.65-37.05)	86.38 (73.20-94.38)	60.64 (45.43-74.37)
Benzo(a)pyrene	2.14 (0.26-9.55)	0.05 (0.001-1.25)	0.51 (0.03-4.27)	0.36 (0.02-3.55)
Fluoranthene	1.25 (0.15-6.00)	0.05 (0.002-0.92)	0.14 (0.005-1.67)	0.15 (0.005-1.70)
Nonylphenol	0.04 (0.005-0.30)	0.15 (0.02-0.76)	0.15 (0.02-0.76)	0.15 (0.02-0.76)
4-tert-octylphenol	Out of bounds	<0.015 (0.0003-0.68)	2.40 (0.30-10.63)	0.04 (0.0006-1.16)
Di(2-ethylhexyl)phthalate	0.12 (8E-04 - 5.1)	4.87 (0.40-22.69)	3.58 (0.21-19.86)	3.84 (0.25-20.47)
Bisphenol A	0.005 (3.9E-05 - 0.31)	0.014 (0.0003-0.53)	0.056 (0.001-1.18)	0.28 (0.01-2.92)
Mercaptobenzothiazole	out of bounds	out of bounds	out of bounds	out of bounds
Tolyltriazole	n.a.	n.a.	n.a.	n.a.
Diisodecyl phthalate	n.a.	n.a.	n.a.	n.a.
Hexa(methoxymethyl) melamine	n.a.	n.a.	n.a.	n.a.

It should be noted that the PEC for microplastics has high uncertainty and the PAF for microplastics has a low reliability due to heterogeneity of the tested microplastic considering polymer type, size and shape

3.5 Whole Effluent Toxicity (WET)-tests

The results of the WET-tests conducted with runoff samples from highway E18, Sweden and highway A61, Germany and a surface water sample near highway A2, the Netherlands (Keur and Kaag, 2019a, 2019b, 2019c), are summarised in Table 36.

Table 36 Summary of WET-test results (Keur and Kaag, 2019a, 2019b, 2019c). Some endpoints are not available (n.a.), when effect parameters are too low to enable calculation. The concentration is expressed in % sample in test solution.

		Sample		
Test	**Endpoint**	**Runoff, Sweden**	**Runoff, Germany**	**Surface water, the Netherlands**
Bacteria	Effect	7.06% effect* at highest conc. (45%)	8.68% effect* at highest conc. (45%)	no effects
	EC50	>45%	>45%	>45%
	NOEC	n.a.	n.a.	n.a.
Algae	Effect	35% effect at highest conc. (100%)	84% effect at lowest conc. (30.3%)	6% effect* at highest conc. (100%)
	EC50	>96%	<30.3%	>96%
	NOEC	42.2%	<31.6%	n.a.
Crustacea	Effect	10% effect* in highest conc. (100%)	0% effect in highest conc. (100%)	10% effect* in highest conc. (100%)
	EC50	>100%	>100%	>100%
	NOEC	n.a.	n.a.	n.a.

* within the normal range of variation for this test

The acute luminescence inhibition test with the bacteria *Vibrio fischeri* showed no significant inhibition in any of the 3 samples (Keur and Kaag, 2019c). However, a slight inhibition was noted for the runoff samples from Germany and Sweden at the highest concentration tested. Due to the need to suspend the bacteria in culture medium, 45% was the highest concentration that could be tested. Effects at higher sample concentrations can, therefore, not be assessed using this procedure. The surface water sample from a water body near highway A2, the Netherlands, did not show any inhibition at any of the concentrations tested.

The algae growth inhibition test with *Raphidocelis subcapitata* shows significant dose-related growth inhibition when exposed to the runoff samples (Keur and Kaag, 2019b). The NOEC of runoff from highway E18, Sweden, is established at 42.2%. Even more effect was found for highway A61, Germany, where even at the lowest concentration of 30.3%, 84% effect was observed. A NOEC could not be established. The surface water sample from a water body near highway A2, the Netherlands, did not show significant growth inhibition.

The acute immobilization test with the freshwater crustacean *Daphnia magna* showed no effects for any of the three samples (Keur and Kaag, 2019a). The highest effect seen was 10%, which was within the normal range of variation for this test. The test results indicate absence of significant toxicity of runoff and surface water samples to the freshwater crustacean *Daphnia magna*.

4 Discussion

4.1 General issues

The risk assessment approach applied for this study is largely based on the EU Technical Guidance Document on risk assessment (European Commission, 2003a) and can thus be considered as a suitable and widely accepted approach.

To enlarge the availability of ecotoxicological data, the search for NOECs was expanded to include effect concentrations up to 10% (EC0 to EC10). The derivation of chronic effect values was thus based on NOECs and EC0 to EC10 values. This approach is conform the EU TGD (European Commission, 2003a). Research showed that the choice of EC10 or NOEC does not largely affect the resulting HC5s (Iwasaki et al., 2015).

In addition, the search was expanded to also include acute studies (i.e. EC50 and LC50 values). Extrapolation techniques have been developed to derive chronic toxicity levels from acute toxicity data. For this risk assessment a pragmatic acute to chronic ratio of 10 is used (Ahlers et al., 2006). However, a more refined approach is to apply extrapolation factors depending on the exposure duration of the toxicity test, e.g. (Adam *et al.*, 2019; Besseling *et al.*, 2019). This could slightly affect the outcome of the study.

For this study, effect values reported as greater than (>); smaller than (<) or approximate (~) were rejected. However, the values reported as greater than (>) could also have been included in the dataset as a worst case approach. This has not been investigated within the underlying study.

The software used for SSD derivation, ETX 2.1, applies a cumulative log-normal distribution, where sensitivity values for species are fitted to a logarithmic scale. The data is tested for normality by three statistical tests: Anderson-Darling, Kolmogorov-Smirnov and Cramer von Mises test. If the test results in acceptance at *e.g.* a significance level of 0.05, the applied log-normal distribution of the data can be considered as a valid assumption. If the test results in rejection, this does not mean that a normal distribution is not valid, just that it becomes less probable with decreasing significance levels. Thus, the confidence in the SSD and subsequent derivations decreases when the statistical test(s) fails. According to EU guidance (ECHA, 2008), the dataset should be investigated for specific sensitivities for certain species groups. In such a case, the dataset should be refined to only include a subset of (sensitive) species. SSD should not be applied on a dataset when statistical tests for log normal distribution fails. This criteria has been partly applied for the underlying risk assessment. The Kolmogorov-Smirnov test for normality, which focuses on differences in the middle of the distribution, was accepted for all substances at a significance level of 0.005. The Anderson-Darling and Cramer von Mises goodness-of-fit tests were accepted for most substances, but rejected for fluoranthene and nonylphenol. These tests highlight differences between the tail of the distribution and the input data. This adds uncertainty to the PAF for fluoranthene and nonylphenol. For bisphenol A the dataset was adjusted in order to achieve better results for normal distribution. As the type of effect (e.g. mortality, morphology, development, reproduction) has influence on the effect concentration and therewith adds to the uncertainty for species sensitivity, the chronic dataset for bisphenol A was limited to only include mortality effects. The dataset based on mortality effects only was found to be normally distributed (all tests were accepted), whereas the dataset based on all type of effects had a low probability of normal distribution (all tests failed).

4.2 Selected substances

4.2.1 Microplastics

Tyre wear is potentially the largest source of microplastics entering the aquatic environment (Hann et al., 2018). Assessing the environmental risk of microplastics from road run-off is, therefore, relevant, although on the basis of evidence published to date effects of microplastics at a population level appear unlikely (Hann et al., 2018).

The underlying risk assessment shows a PEC:PNEC ratio > 1 for microplastics, indicating that unacceptable effects on organisms are not unlikely to occur. The PNEC for the water phase used in the underlying report (0.33 µg/l) is taken from Besseling *et al*. (2019). Other values are available from literature, but are reported in number of particles instead of mass concentration: HC5 = 3500 particles/l (Burns and Boxall, 2019, 2018) and; HC5 = 3214 particles/l (Van Cauwenberghe, 2015). Besseling *et al*. (2019) also report an HC5 value in number of particles: 1015 particles/l, which is a factor 3 lower than the other values found in literature (Burns and Boxall, 2019, 2018; Van Cauwenberghe, 2015), meaning higher toxicity. Another recent study also reports a PNEC value in mass concentration (0.042 µg/l) together with the concentration in particle numbers (740 particles/l) (Adam *et al.*, 2019). Compared with these values, the values of Besseling *et al.* (2019) are higher, meaning lower toxicity. The PNEC values for microplastics used in the underlying study are thus within the range of other values available in literature.

There is considerable discussion on the uncertainties around the PNEC of microplastics as derived by Besseling *et al.* (2019) and others. The risk assessment of microplastics differs from OMP risk assessment because: 1) microplastic is a mixture of different sizes and types of particles, whereas OMP are assessed for individual substances, and 2) the different types and sizes of particles may trigger responses through different modes of action. Although toxicity mechanisms of microplastics are still unclear (Wang *et al*., 2019), uncertainties are reflected in the range of effect thresholds and consequently in the SSD. The tentative SSD for microplastic derived by Besseling *et al*. (2019) and applied here, reflects the combined variability of species sensitivity, properties of the stressor and effect mechanisms, as a function of the dosage and thus can be considered as an “all-inclusive” SSD. If indeed the mode of action significantly depends on the size and type of plastic, the microplastics included in the SSD should resemble the type and sizes of microplastics found in road run-off. When addressing microplastics from road run-off, it should be noted that there are different forms to be considered :
1) Tread particles (TP), generated from shredded/powdered tire tread or extracts of tire tread (Kreider et al., 2010);
2) Tire wear particles (TWP), resulting from mechanical abrasion of car tires by the road surface (Wagner et al., 2018) and;
3) Tire and road wear particles (TRWP), formed by the interaction of tire particles with road surface and consisting of a complex mixture of rubber, with both embedded asphalt and minerals from the pavement (Panko et al., 2013).

The microplastics tested in laboratories in order to derive toxicity on aquatic organisms may be very different from microplastics in or released from TRWP. In order to specify the dataset for TRWP the following selections should be made:
1. Exact composition of the TRWP. It is anticipated that most PNEC’s in literature deal with widely used plastics like poly ethylene (PE) and Poly styrene (PS) and not with typical plastics used in tyres.
2. Particle size as present in TRWP.
3. Particle shape of TRWP.

A more specific PNEC can be derived with the data yielded by this selection. However, in case no data or too few data remain, it is necessary to conduct toxicity tests with the right microplastic type, size and shape in order to compile a robust set of TRWP microplastic resembling microplastic toxicity data.

Concerning the microplastic polymer type. Besseling *et al.* (2019) used toxicity data for the following polymer types:
- PE: polyethylene

- PVC: polyvinylchloride
- PS: polystyrene
- PMMA: polymethylmethacrylate
- PHB: polyhydroxybutyrate
- PP: polypropylene

None of these polymer types are used in tires. The type of polymers used in tires are synthetic rubbers: styrene butadiene rubber (SBR) and isoprene (NR); natural rubbers: poly-cis-isoprene (see Deliverable D1.2). It should be noted, that no relation between effect level and polymer type was found by Besseling *et al*. (2019). There are studies available that have observed an influence of polymer type on the colonisation of microplastics by bacteria (Frère et al., 2018) and microalgae (Lagarde et al., 2016). The reasons for these differences are still unclear (Frère et al., 2018; Lagarde et al., 2016). However, these studies showed no negative effects of the polymers on microorganisms. Based on the available knowledge there seems to be no need to specify the dataset for polymers present in TRWP.

Tyres wear creates particles from sizes of some tenth of a millimetre and down, hence covering what often is referred to as micro (often defined as 1-5000 µm) and nano particles (often defined as 1-100 nm). All in all the question which particle sizes are the most abundant is hence ambiguous (D1.2). A few studies also measured the nano-fraction, and tire wear nano particles were clearly present (*e.g.* Dahl *et al.*, 2006; Mathissen *et al.*, 2011). We do currently not know how much of which size can be expected in real samples (Jes Vollertsen pers. com.). Particle diameter of TRWP from a composite of summer and winter tires on standardized asphalt ranges from 5 µm to 220 µm with a mode of 75 µm and a width/length ratio of 0.64 (range: 0.2 to 1) (Kreider et al., 2010). The SSD and PNEC used in the underlying study is based on microplastics with a range of 0.5 µm to 600 µm (Besseling *et al.*, 2019) and 0.1 µm to 400 µm (Adam *et al.*, 2019). The particle size of TRWP are thus within the range of the particle size of microplastics used to derive the PNEC for the underlying risk assessment.

The PEC values used for the underlying risk assessment are estimated based on literature and measurements of a marker for tire rubber (4-phenylcyclohexene) in water and solids (incl. sediment and sludge). The use of markers to calculate the tire particle concentration might lead to an underestimation due to degradation of the marker after leaching from the rubber or an overestimation due to emissions of the marker from other potential sources (Dave, 2013). Furthermore, the environmental fate of the marker might differ from the tire particles which also adds to the uncertainty of tire wear particle concentrations in different environmental matrices. The PEC values for microplastics in the underlying study are thus regarded as estimates with high uncertainty.

The density of the polymer types included in the SSD, ranges from 0.784 g/ml for PE to 1.39 g/ml for PVC (CROW, 2019; Fetters et al., 1994). While tire rubber and shredded tread particles (TP) have a density of approximately 1.2 g/ml and TRWP 1.5 - 2.2 g/ml (Klöckner et al., 2019). The relatively high density of TRWP is because approximately 50% of the mass of TRWP originates from road wear, i.e. mineral particles (Kreider et al., 2010). Such particles are not included in the microplastic SSD. On the other hand, the density of the microplastics from tires without road particles (TP) does fall within the density range of the microplastics used for the SSD.

Effects in the aquatic environment may stem from TRWP itself or from compounds released from TRWP (Wagner et al., 2018). Thus when addressing microplastics toxicity, one needs to consider the toxicity of the additives (like metals, flame retarders, softeners, etc.) which may or may not leach out of the particles in addition to the toxicity of the particles themselves. These have been covered by the underlying risk assessment of OMPs. However, tire particles also contain zinc, constituting roughly 1.5% of the tire tread but less when it becomes TRWP, as this is a mix of tire tread, road material, and road dust, all melted together) (Jes Vollertsen pers. com.). The bioavailability of Zn from TRWP/car tyre dust is low (see measurements of Redondo-Hasselerharm *et al.,* 2018). Therefore, addressing zinc within the risk assessment of TRWP does not seem to be relevant. The forced leachate tests may not be relevant under field conditions, as discussed by Redondo-Hasselerharm *et al.* (2018). It is suggested that real in situ effects of TP and TP-associated contaminants when dispersed in sediments are probably lower than those reported after forced leaching of contaminants from car tire particles.

To determine the toxicity of the water samples from runoff and surfacewater that have been subjected to the underlying risk assessment, Whole Effluent Toxicity tests (WET-tests) were conducted (Keur and Kaag, 2019a, 2019b, 2019c). This consists of tests with 3 species of different taxonomic groups and trophic levels (bacteria, algae, crustacea). WET-tests are performed in a concentration series of the diluted sample and effect concentrations are reported in percentage of the sample present in the dilution. Results are expressed as EC50 (the dilution of the original sample that causes 50% effect), NOEC (the dilution that caused no effect), or the % effect that is caused by the highest tested concentration. No effect of the highest tested concentration indicates that effects in the field are not to be expected. When an EC50 and/or a NOEC are available this can be used to assess the minimum dilution rate needed to reduce the toxic effect to nihil. It is good to realise that these dilutions are based on 'non-reactive' dilution water. Dilution with natural surface water will most likely result in a stronger reduction of the toxicity due to complexes that are being formed, resulting in reduced bioavailability of the toxic compounds. The results show no effect of the highest tested concentration for crustacea (Keur and Kaag, 2019a) and bacteria (Keur and Kaag, 2019c). For algae, significant dose-related growth inhibition was observed when exposed to the runoff samples (Keur and Kaag, 2019b). The NOEC of runoff from highway E18, Sweden, is calculated at 42.2%, indicating that >4x dilution is needed to derive safe concentrations. Even more effect was found for highway A61, Germany, where even at the lowest concentration of 30.3%, 84% effect was observed. A NOEC of runoff from highway A61, Germany could not be established but is considerably less than 31.6%, the lowest concentration tested. The surface water sample from a water body near highway A2, the Netherlands, did not show significant algae growth inhibition. It is recommended to apply the TIE (Toxicity Identification and Evaluation) approach in order to get insight in the type of compounds, or even to identify the individual compound(s) responsible for the toxicity in the two run-off samples. This knowledge facilitates effective measures to reduce the toxicity of the mixture.

Microplastic particles with a density higher as well as lower than water can settle and be buried in the sediment (Kooi et al., 2018). An additional approach is thus to develop SSDs of microplastics and preferable TRWP for benthic organisms exposed via sediment. However, more toxicity data for sediment organisms are necessary. Recently, standardised protocols for bioassays with such particles are developed, amongst others in TRAMP and in the CEFIC ECO49 project METAS (Bart Koelmans, pers. comment). An example are experimental tests on ingestion and chronic effects of car tire tread particles on freshwater benthic macroinvertebrates (Redondo-Hasselerharm *et al.*, 2018).

Adam *et al.* (2019) carried out a review of all exposure and ecotoxicity data available for microplastics in freshwaters in Europe, Asia and North America and performed a preliminary probabilistic risk assessment. A statistical analysis of the hazard data could not detect a significant influence of particle shape or type of polymer on the no-observed-effect concentration. However this is likely largely due to the limited quality and number of data, its

high diversity and the limited extent of the effect, rather than that such an influence would not exist at all.
Adam *et al.* (2019) found that the ranges of the probability distributions were <1 in Europe, meaning that no risk should currently be expected there. The authors mention that it should be kept in mind that this probabilistic risk assessment highly depends on the available data. For such new fields as microplastic environmental measurements and microplastic ecotoxicity, future data might indicate higher or lower risk than those reported in their study. They underline the importance of potential data gaps and research priorities.

Besseling *et al.* (2019) performed a 'proof of concept' risk assessment for nano- and microplastics, accounting for the diversity of the material. New data is included showing how bioturbation affects exposure, and exposure is evaluated based on literature data and model analyses.
They reviewed exposure and effect data and provide a worst case risk characterization, by comparing HC5 effect thresholds from 'all inclusive' Species Sensitivity Distributions (SSDs) with the highest environmental concentrations reported. HC5 values show wide confidence intervals yet suggest that sensitive aquatic organisms in near-shore surface waters might be at risk (Besseling et al., 2019).

As discussed above, the underlying risk assessment is based on microplastics in general and not on T(R)WP. The emissions, occurrence and behaviour and ecotoxicological effects of TWP described in literature indicate important knowledge gaps (Wagner et al., 2018; Wik and Dave, 2009). The available exposure and effect data need to be improved in order to assess the risks related to TWP in the aquatic environment (Wagner et al., 2018). In addition, research on TWP has focussed on chemical toxicity and not on physical interactions between particle and organism. Most studies showing ecotoxicological effects of TWP have been conducted using forced leaching (Day et al., 1993; Marwood et al., 2011; Panko et al., 2013; Turner and Rice, 2010; Volosin and Cardwell, 2002; Von der Ohe et al., 2011; Wang et al., 2019), which may not be relevant under field conditions (Redondo-Hasselerharm *et al.* 2018). Studies conducted under environmental conditions show that TRWP should be considered a low toxicity concern to aquatic ecosystems (Marwood et al., 2011; Panko et al., 2013). The acute effect concentrations of TWP leachates in aquatic media, including marine environments, were found to cover a range of 25 to 100,000 mg TWP/L, while chronic effect concentrations vary from 10 to 3600 mg TWP/L (Wagner et al., 2018). A PNECwater of 3.9 mg TWP/L was derived based on TWP leachate (Wik and Dave, 2009). Although expressed in TWP mass, these effect values are all based on the chemical constituents of TWP and not on the physical effects of the particles. The concentration of TWP[1] in the water phase measured in surface water along a highway (0.006 mg/l; Dröge and Tromp, 2019) used in the underlying study is below these effect thresholds. However, measured concentrations in runoff (0.975 and 58.5 mg/l; Dröge and Tromp, 2019), exceed the lower range of the effect concentrations and the PNEC, indicating these measured PEC values are likely to cause chemical toxicity. Indeed, some of the measured substance concentrations in runoff exceed toxicity thresholds (see Table 33). In addition, WET-tests have been conducted with samples from runoff and surface water. WET-test results represent the toxicity of all substances present. The lowest established NOEC is 42.2%% for runoff from Sweden (see paragraph 3.5). A PNEC for runoff can be derived by applying a factor 10 to the lowest available NOEC from three trophic levels (European Commission, 2003a) and results in 4.22%. The runoff sample from Sweden has a microplastic (tyre wear) concentration of 0.975 mg/l (Dröge and Tromp, 2019). Using the PNEC derived from the bioassay results (4.22%), this leads to a PNEC value of <0.041 mg/l. This is lower than the PNEC derived by Wik and Dave (2009)

[1] it should be noted that the measured environmental concentrations for microplastics (tyre wear) have high uncertainty

(3.9 mg/l) but higher than the PNEC derived for microplastics in the underlying study (0.00033 mg/l). Wagner *et al.* (2018) found that toxicity resulting from TWP in sediments is low, with low or absent effects at TWP concentrations of up to 10,000 mg TWP/kg sediment (Wagner et al., 2018). Measured concentrations used in the underlying study, 300 mg/kg in sediment of a waterbody along a highway and in sediment of the river Rhine in the Netherlands (Dröge and Tromp, 2019), are well below the reported effect threshold (Table 34). Measured concentrations in solids and sludge of highway runoff from Sweden and Germany (13,000 to 150,000 mg/kg, respectively) exceed the threshold value of Wagner *et al*. (2018). Thus, comparing the measured concentrations of TWP used in the underlying study with effect thresholds for TWP found in literature, indicates that effects are unlikely for surface water and sediment but cannot be ruled out for runoff. Consequently, local exceedance of threshold values and thus effects in the aquatic environment might occur.

In summary, based on the rough estimates for exposure and the “all-inclusive” SSD applied here, unacceptable effects of microplastics from road run-off cannot be rulled out.
The “all-inclusive” SSD is based on a dataset for a wide range of microplastics and can be considered a good proxy for the polymer component of car tire particles because the polymer type is not likely to have a great influence on the effect of microplastics and the size and density of the particles used for the SSD are comparable to that of car tire particles. Additional research is required for a risk assessment specifically for car tire particles.

4.2.2 Benzo(a)pyrene

For the PAH compound benzo(a)pyrene, the PEC/PNEC ratio was estimated at 49 for exposure via water and 0.05 for exposure via sediment, based on PEC extrapolated from value found in literature (Dröge, 2019). The PEC/PNEC ratio based on measured concentrations (Dröge and Tromp, 2019) is <1 in surface water and > 1 in runoff. This indicates that unacceptable effects on organisms are not unlikely to occur when exposed to runoff via the water phase. However, the PNEC value is based on the EQS of 0.00017 µg/l, which is set for the protection objective of human health via consumption of fishery products and not for the protection of the aquatic environment. It should thus be noted that for benzo(a)pyrene the first tier risk assessment overestimates the risk for the aquatic environment. EQS for other protection objectives (freshwater, marine, predators) are given independently in the EQS dossiers[2]. For benzo(a)pyrene the proposed maximum allowable concentration (MAC) EQS for freshwater is 0.27 µg/l and the annual average (AA) EQS for freshwater is 0.022 µg/l (European Commission, 2011b). All PEC values for benzo(a)pyrene in the water phase are below the EQS values for freshwater (European Commission, 2011b) and, therefore, unacceptable effects on aquatic organisms are unlikely to occur.
The highest PAF is estimated at 2.14 (0.26 - 9.55)% which also suggests that the risk of benzo(a)pyrene from trafic is within acceptable limits.

[2] Environmental Quality Standards (EQS) Dossiers provide detailed information on how the EQS were derived for each of the additional priority substances in the proposal and for seven existing priority substances. The EQS were derived as described in the 2011 Technical Guidance for Deriving Environmental Quality standards (European Commission, 2011c). The dossiers were reviewed by the Scientific Committee on Health and Environmental Risks (SCHER). An updated version of the Technical Guidance for Deriving Environmental Quality standards is now available (European Commission, 2018)

4.2.3 Fluoranthene

For the PAH compound fluoranthene, the PEC/PNEC ratio was estimated at 5.8 for exposure via water and 0.2 for exposure via sediment, based on PEC extrapolated from values found in literature (Dröge, 2019). The PEC/PNEC ratios based on measured concentrations (Dröge and Tromp, 2019) are <1 in surface water and runoff for the water phase, but >1 in runoff for solids. This indicates that unacceptable effects on organisms are not unlikely to occur for exposure via water and solids. However, as for benzo(a)pyrene, also for fluoranthene the EQS of 0.0063 µg/l is set for the protection objective of human health via consumption of fishery products and thus the first tier risk assessment for fluoranthene also overestimates the risk for the aquatic environment. For fluoranthene the MAC EQS for freshwater is 0.12 µg/l (European Commission, 2011a). An AA EQS value for freshwater is not available. The estimated PEC value for fluoranthene (0.03649 µg/l) is below the MAC EQS value for freshwater (European Commission, 2011b) and unacceptable effects on organisms are unlikely to occur. The PAF is estimated at 1.25 (0.15-6.00)% which also suggests that the risk of fluoranthene from trafic is within acceptable limits, but cannot be ruled out as the upper confidence limit is 6%. It should be noted that the uncertainty for the PAF of fluoranthene is relatively high (see section 4.1).

4.2.4 Nonylphenol

For nonylphenol all PEC/PNEC ratio's are < 1. This indicates that unacceptable effects on organisms are unlikely to occur. The PAF is estimated at 0.04 (0.005-0.3)% based on estimated exposure and 0.15 (0.02-0.76)% based on measured exposure. These values also suggest that the risk of nonylphenol from trafic is within acceptable limits. It should be noted that the uncertainty for the PAF of nonylphenol is relatively high (see section 4.1).

4.2.5 4-tert-octylphenol

For 4-tert-octylphenol, the PEC/PNEC ratio was estimated at 0.006 for exposure via water and 3.73 for exposure via sediment, based on PECs extrapolated from values found in literature (Dröge, 2019). The PEC/PNEC ratios based on measured concentrations (Dröge and Tromp, 2019) exceed 1 in surface water and in runoff. This indicates that unacceptable effects on organisms are not unlikely to occur. The median PAF is below 5% in all assessments which suggests that the risk of 4-tert-octylphenol from road run-off is within acceptable limits.

4.2.6 Di(2-ethylhexyl)phthalate

For di(2-ethylhexyl)phthalate, all PEC/PNEC ratio's are <1. This indicates that unacceptable effects on organisms are unlikely to occur. The median PAFs are all below 5% which also suggests that the risk of di(2-ethylhexyl)phthalate from road run-off is within acceptable limits. Upper confidence limits exceed 5%, however, indicating unacceptable effects cannot be ruled out.

4.2.7 Bisphenol A

For bisphenol A, most PEC/PNEC ratio's are <1, except for the PEC/PNEC based on measured concentrations in runoff (solids). This indicates that for most cases, unacceptable effects on organisms are unlikely to occur. All PAF values are <5 which also suggests that the risk of bisphenol A from trafic is within acceptable limits.

4.2.8 Mercaptobenzothiazole

For mercaptobenzothiazole, all PEC/PNEC ratio's are <1, except for runoff (solid fraction). This indicates that in most cases, unacceptable effects on organisms are unlikely to occur. The PAF was too low to estimate, which also suggests that the risk of mercaptobenzothiazole from trafic is within acceptable limits. It should be noted that the dataset on which the PAF was estimated did not fully meet the requirements, thus the result has high uncertainty. However, because of the very low PAF it is unlikely that, even with an additional safety factor, an unacceptable risk will occur for mercaptobenzothiazole.

4.2.9 Tolyltriazole

For tolyltriazole the PEC/PNEC ratio's are <1 for the water phase and > 1 for (suspended) solids and sediment in runoff. This indicates that unacceptable effects on organisms are unlikely to occur for exposure via water, but are not unlikely for exposure via suspended solids and sediment. The PAF could not be estimated due to data limitation.
The risk of tolyltriazole for exposure via sediment should be further addressed.

4.2.10 Diisodecyl phthalate

For diisodecyl phthalate the PEC/PNEC ratio are <1, based on PEC extrapolated from values found in literature (Dröge, 2019). Measured exposure (Dröge and Tromp, 2019) only exceeds the PNEC for runoff (water and solids) and not for the surface water and sediment. However, high ratios at the source (*i.e.* runoff) indicate that unacceptable effects on organisms cannot be ruled out. The PAF could not be estimated due to data limitation.

4.2.11 Hexa(methoxymethyl)melamine

For hexa(methoxymethyl)melamine all PEC/PNEC ratio's are < 1. This indicates that unacceptable effects on organisms are unlikely to occur. The PAF could not be estimated due to data limitation.

Hexa(methoxymethyl)melamine (HMMM) isomers were found in wastewaters of several large car-manufacturing enterprises in Western Slovakia (production of more than 800,000 cars per year) and, in two cases, their estimated concentrations (corrected for dilution in surface water) largely exceeded the PNEC value (Slobodnik et al., 2012). It also has been identified as an emerging contaminant in German rivers (Dsikowitzky and Schwarzbauer, 2015). Slobodnik *et al.* (2012) applied a PNEC value based on an approach that addresses especially the data scarcity for emerging substances (Von der Ohe et al., 2011). Slobodnik *et al.* (2012) recommended to confirm the predicted toxic effect, to check where HMMM is coming from exactly and in what quantities and to assess how serious the threat is. Data available for HMMM is still very scarce as ecotoxicity values were not available in the ECOTOX database. The results from the underlying risk assessment shows PEC values from road runoff that are below the PNEC value indicating no threat from HMMM in road runoff.

5 Conclusions

The underlying risk assessment shows that for most of the selected OMPs, the risks from road traffic for the European waters are within acceptable limits. Estimated concentrations in surface water based on values found in literature indicate risks (i.e. unacceptable effects are not unlikely) for benzo(a)pyrene and fluoranthene. Measured concentrations of the selected OMPs in surface water (samples taken in a small waterway near the busy highway A2 in the Netherlands) are, however, all below the PNEC, indicating unacceptable effects are unlikely. For OMPs in sediment, estimated concentrations based on literature values indicate risks for 4-tert-octylphenol and tolyltriazole. However, measured concentrations in sediment show the PEC/PNEC ratio to be > 1 only for tolyltriazole. The higher tier risk assessment, using the estimated (from literature) as well as measured concentrations in surface water, indicates that for benzo(a)pyrene, fluoranthene and di(2-ethylhexyl)phthalate the risk may be above acceptable limits. The risk of nonylphenol, 4-tert-octylphenol, bisphenol A and mercaptobenzothiazole in surface water is within acceptable limits. The PAFs for tolyltriazole, diisodecyl phthalate and hexa(methoxymethyl)melamine and the PAFs for exposure via sediment could not be estimated due to data limitation.

For OMPs in road runoff, the first tier risk assessment show PEC/PNEC ratio's > 1 for benzo(a)pyrene, 4-tert-octylphenol and diisodecyl phthalate in the water phase and for fluoranthene, 4-tert-octylphenol, bisphenol A, mercaptobenzothiazole, tolyltriazole and diisodecyl phthalate in the solid phase. The higher tier risk assessment shows that for 4-tert-octylphenol and di(2-ethylhexyl)phthalate the risk may be above acceptable limits.

For microplastics, based on the rough estimates for exposure and the "all-inclusive" SSD, unacceptable effects cannot be ruled out for exposure via water and sediment. However, it should be noted that the PEC, PNEC and PAF for microplastics should be interpreted with care due to the high uncertainty of measured PEC values and heterogeneity of the tested microplastic used for PNEC derivation considering polymer type, size and shape. Additional research is required for a risk assessment specifically for TRWP.

The WET-tests, conducted to support the underlying risk assessment, represent the toxicity of all substances present. WET-tests of surface water (a small waterway near highway A2, the Netherlands) show no significant toxic effects for bacteria, algae and crustacean. WET-tests of road runoff from Germany and Sweden show no significant toxic effects for bacteria and crustacean. The algae growth inhibition test shows significant dose-related growth inhibition when exposed to the runoff samples.

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Justification

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The scientific quality of this report has been peer reviewed by a colleague scientist and a member of the Management Team of Wageningen Marine Research

Approved: Dr. N.H.B.M. Kaag
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Date: 3 October 2019

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Annex A: Effect values

Table A1. Microplastic effect thresholds extrapolated to chronic LOECs or NOECs taken from Besseling et al. (2019) and Adam et al. (2019). Exposure via the water. Species from the marine, estuarine and freshwater environments. Included endpoints are growth, survival and reproduction. Abbreviations used: LOEC: lowest observed effect concentration, LC50: lethal dose 50%, EC50: effect concentration 50%. PE: polyethylene, PVC: polyvinylchloride, PS: polystyrene, PMMA: polymethylmethacrylate, PHB: polyhydroxybutyrate, PP: polypropylene, PMMA: poly(methylmethacrylate). PMMA-PSMA: Comprised of poly(methylmethacrylate-co-stearylmethacrylate) copolymer. N.A.: Not applicable. N.N.: Not necessary. Review reference 1: Besseling et al. (2019), review reference 2: Adam et al. (2019).

Taxonomic group	Species	Test material	Particle size range (µm)	Particle shape	Test endpoint	Dose descriptor	Exposure time (d)	Toxic dose (part/ml)	Toxic dose (µg/L)	Extrapolation factor	NOEC or chronic LOEC (ug/L) after extrapolation	Reference	Review reference
Angiospermae	*Lemna minor*	PE	30 - 600	Sphere	Growth	LOEC	7		1.00E+04	6.5	1.54E+03	Kalčíková et al., 2017	1
Diatomea	*Skeletonema costatum*	PVC	1	Sphere	Growth	LOEC	3		1.00E+03	10	1.00E+02	Zhang et al., 2017	1
Bivalvia	*Crassostrea gigas*	PS	2, 6	Sphere	Growth, reproduction	LOEC	60		2.30E+01	1	2.30E+01	Sussarellu et al., 2016	1
Amphipoda	*Gammarus fossarum*	PMMA	32 - 250	Irregular	Growth	LOEC	28	33.3		1	2.91E+05	Straub et al., 2017	1
Amphipoda	*Gammarus fossarum*	PHB	32 - 250	Irregular	Growth	LOEC	28	33.3		1	3.03E+05	Straub et al., 2017	1
Amphipoda	*Hyalella azteca*	PE	10 - 27	Sphere	Survival	LC50	10	4.60E+04		20	8.62E+03	Au et al., 2015	1
Amphipoda	*Hyalella azteca*	PP	20 x 75	Fibre	Survival	LC50	10	71		20	2.63E+02	Au et al., 2015	1
Amphipoda	*Hyalella azteca*	PE	10 - 27	Sphere	Growth, reproduction	LOEC	28	5.00E+03		1	1.87E+04	Au et al., 2015	1
Amphipoda	*Hyalella azteca*	PE	10 - 27	Sphere	Growth, reproduction	LOEC	28	1.00E+04		1	3.75E+04	Au et al., 2015	1
Amphipoda	*Hyalella azteca*	PP	20 x 75	Fibre	Growth, reproduction	EC50	10	45		10	3.34E+02	Au et al., 2015	1
Cladocera	*Daphnia magna*	PE	2.6	Irregular	Reproduction	EC50	21	8.60E+04		5	7.91E+01	Ogonowski et al., 2016	1

Taxonomic group	Species	Test material	Particle size range (µm)	Particle shape	Test endpoint	Dose descriptor	Exposure time (d)	Toxic dose (part/ml)	Toxic dose (µg/L)	Extrapolation factor	NOEC or chronic LOEC (ug/L) after extrapolation	Reference	Review reference
Copepoda	*Calanus helgolandicus*	PS	20	Sphere	Reproduction	LOEC	9	75		10	3.30E+01	Cole et al., 2015	1
Copepoda	*Tigriopus japonicus*	PS	0.5	Sphere	Survival	LC50	14		2.35E+04	20	1.18E+03	Lee et al., 2013	1
Copepoda	*Tigriopus japonicus*	PS	0.5	Sphere	Reproduction	EC50	14		7.00E+01	10	7.00E+00	Lee et al., 2013	1
Copepoda	*Tigriopus japonicus*	PS	6	Sphere	Reproduction	EC50	14		4.00E+01	10	4.00E+00	Lee et al., 2013	1
Copepoda	*Tigriopus japonicus*	PS	0.5	Sphere	Reproduction	EC50	14		1.00E+02	10	1.00E+01	Lee et al., 2013	1
Echinodermata	*Tripneustes gratilla*	PE	10 - 45	Sphere	Growth	LOEC	5	300		10	3.28E+02	Kaposi et al., 2014	1
Rotifera	*Brachionus koreanus*	PS	0.5	Sphere	Growth	LOEC	12		1.00E+02	6.5	1.54E+01	Jeong et al., 2016	1
Rotifera	*Brachionus koreanus*	PS	0.5	Sphere	Survival	LOEC	12		2.00E+04	6.5	3.08E+03	Jeong et al., 2016	1
Rotifera	*Brachionus koreanus*	PS	6	Sphere	Growth	LOEC	12		1.00E+02	6.5	1.54E+01	Jeong et al., 2016	1
Rotifera	*Brachionus koreanus*	PS	0.5	Sphere	Reproduction	LOEC	12		2.00E+04	6.5	3.08E+03	Jeong et al., 2016	1
Algae/Chlorellales	*Chlorella vulgaris*	Polystyrene	0.5	Spheres	Photosynthesis	HONEC	3	3640	2.50E+04	1	2.50E+04	Sjollema et al. (2016)	2
Algae/Chlorellales	*Chlorella vulgaris*	Polystyrene	0.1	Spheres	Growth	LOEC	30	1.82E+10	1.00E+04	2	5.00E+03	Mao et al. (2018)	2
Algae/Chlorellales	*Chlorella vulgaris*	Polystyrene	1	Spheres	Growth	LOEC	30	1.82E+07	1.00E+04	2	5.00E+03	Mao et al. (2018)	2
Angiospermae	*Lemna minor*	Polyethylene	96	Spheres	Growth	HNOEC	7	216	1.00E+05	1	1.00E+05	Kalcikova et al. (2017)	2
Angiospermae	*Lemna minor*	Polyethylene	71.3	Spheres	Growth	HNOEC	7	527	1.00E+05	1	1.00E+05	Kalcikova et al. (2017)	2
Cladocera	*Daphnia magna*	Polyethylene	1	Spheres	Mortality	LC50	4	1.14E+08	5.74E+04	100	5.74E+02	Rehse et al. (2016)	2
Cladocera	*Daphnia magna*	Polyethylene	58	Spheres	Mortality	LC10	2	1580	1.61E+05	20	8.05E+03	Frydkjær et al. (2017)	2

Taxonomic group	Species	Test material	Particle size range (µm)	Particle shape	Test endpoint	Dose descriptor	Exposure time (d)	Toxic dose (part/ml)	Toxic dose (µg/L)	Extrapolation factor	NOEC or chronic LOEC (ug/L) after extrapolation	Reference	Review reference
Cladocera	*Daphnia magna*	Polyethylene	69	Spheres	Mortality	HONEC	21	7.62	1.00E+05	1	1.00E+05	Canniff and Hoang (2018)	2
Cladocera	*Daphnia magna*	Polyethylene	0.183	Spheres	Mortality	HONEC	2	12.9	1.00E+05	10	1.00E+04	Jemec Kokalj et al. (2018)	2
Cladocera	*Daphnia magna*	Polyethylene	0.103	Spheres	Mortality	HONEC	2	105	1.00E+05	10	1.00E+04	Jemec Kokalj et al. (2018)	2
Cladocera	*Daphnia magna*	Polyethylene	0.264	Spheres	Mortality	HONEC	2	787	1.00E+05	10	1.00E+04	Jemec Kokalj et al. (2018)	2
Cladocera	*Daphnia magna*	Polyethylene	0.248	Spheres	Mortality	HONEC	2	N.A.	1.00E+05	10	1.00E+04	Jemec Kokalj et al. (2018)	2
Cladocera	*Daphnia magna*	Polyethylene	100	Spheres	Mortality	HONEC	4	796	4.00E+05	100	4.00E+03	Rehse et al. (2016)	2
Cladocera	*Daphnia magna*	Polyethylene	4.1	Spheres	Reproduction	EC50	21	2.80E+05	1.31E+04	10	1.31E+03	Ogonowski et al. (2016)	2
Cladocera	*Daphnia magna*	Polystyrene	0.194	Spheres	Mortality	EC50	2	1.06E+10	4.30E+04	100	4.30E+02	Kim et al. (2017)	2
Cladocera	*Daphnia magna*	Polystyrene	0.183	Spheres	Mortality	EC50	2	7.65E+09	2.60E+04	100	2.60E+02	Kim et al. (2017)	2
Cladocera	*Daphnia magna*	Polystyrene	0.1	Spheres	Mortality	HONEC	21	3.10E+07	1.00E+03	1	1.00E+03	Rist et al. (2017)	2
Cladocera	*Daphnia magna*	Polystyrene	2	Spheres	Mortality	HONEC	21	1.40E+04	1.00E+03	1	1.00E+03	Rist et al. (2017)	2
Cladocera	*Daphnia magna*	Polystyrene	2	Spheres	Reproduction	HONEC	21	2530	1.11E+01	1	1.11E+01	Aljaibachi and Callaghan (2018)	2
Cladocera	*Daphnia magna*	Fluorescent PMMA-PSMA	0.125	Spheres	Mortality	NEC	2	3.98E+11	4.07E+05	10	4.07E+04	Booth et al. (2016)	2
Cladocera	*Daphnia magna*	PMMA-PSMA	0.125	Spheres	Mortality	NEC	2	5.13E+11	5.24E+05	10	5.24E+04	Booth et al. (2016)	2
Cladocera	*Daphnia magna*	Proprietary polymer	2.5	Spheres	Mortality	LC50	4	1.00E+04	1.06E+02	100	1.06E+00	Jaikumar et al. (2018)	2
Cladocera	*Daphnia magna*	Unknown	2.5	Spheres	Reproduction	LOEC	21	1880	2.00E+01	2	1.00E+01	Pacheco et al. (2018)	2
Cladocera	*Daphnia magna*	Unknown	2.5	Spheres	Mortality	HONEC	21	9410	1.00E+02	1	1.00E+02	Martins and Guilhermino (2018)	2

Taxonomic group	Species	Test material	Particle size range (µm)	Particle shape	Test endpoint	Dose descriptor	Exposure time (d)	Toxic dose (part/ml)	Toxic dose (µg/L)	Extrapolation factor	NOEC or chronic LOEC (ug/L) after extrapolation	Reference	Review reference
Cladocera	*Daphnia magna*	Polyethylene	2	Fragments	Mortality		4	631	2.54E+00	100	2.54E-02	Jaikumar et al. (2018)	2
Cladocera	*Daphnia magna*	Polyethylene	0.425	Fragments	Mortality	LC50	2	1620	6.50E+04	100	6.50E+02	Frydkjær et al. (2017)	2
Cladocera	*Daphnia magna*	Polyethylene	0.137	Fragments	Mortality	HONEC	2	27.1	1.00E+05	10	1.00E+04	Jemec Kokalj et al. (2018)	2
Cladocera	*Daphnia magna*	Polyethylene	2.6	Fragments	Reproduction	EC50	21	8.60E+04	7.91E+02	10	7.91E+01	Ogonowski et al. (2016)	2
Cladocera	*Daphnia magna*	Polyamide	0.175	Fragments	Mortality	HONEC	2	7.89E+04	2.50E+05	10	2.50E+04	Rehse et al. (2018)	2
Cladocera	*Daphnia magna*	PET	280; 12b	Fibres	Mortality	LOEC	2	66.4	1.25E+04	20	6.25E+02	Jemec et al. (2016)	2
Cladocera	*Daphnia pulex*	Proprietary polymer	2.5	Spheres	Mortality	LC50	4	1000	1.06E+01	100	1.06E-01	Jaikumar et al. (2018)	2
Cladocera	*Daphnia pulex*	Polyethylene	2	Fragments	Mortality	LC50	4	398	1.60E+00	100	1.60E-02	Jaikumar et al. (2018)	2
Cladocera	*Ceriodaphnia dubia*	Polyethylene	0.5	Spheres	Reproduction	EC10	8	2.7	8.43E+01	20	4.22E+00	Ziajahromi et al. 2017	2
Cladocera	*Ceriodaphnia dubia*	Proprietary polymer	2.5	Spheres	Mortality	LC50	4	2.00E+03	2.12E+01	100	2.12E-01	Jaikumar et al. (2018)	2
Cladocera	*Ceriodaphnia dubia*	Polyethylene	2	Fragments	Mortality	LC50	4	1.00E+05	4.02E+02	100	4.02E+00	Jaikumar et al. (2018)	2
Cladocera	*Ceriodaphnia dubia*	Polyester (PET)	N.N.	Fibres	Mortality	EC10	8	2.4	2.08E+02	20	1.04E+01	Ziajahromi et al. (2017)	2
Amphipoda	*Hyalella azteca*	Polyethylene	18.5	Spheres	Mortality	LC50	10	4.60E+04	1.72E+05	100	1.72E+03	Au et al. (2015)	2
Amphipoda	*Hyalella azteca*	Polypropylene	20	Fibres	Mortality	LC50	10	71	2.82E+02	100	2.82E+00	Au et al. (2015)	2
Decapoda	*Erocheir sinensis*	Polystyrene	5	Spheres	Mortality	HONEC	21	5.40E+05	4.00E+04	1	4.00E+04	Yu et al. (2018)	2
Anthoathecata	*Hydra attenuata*	Polyethylene	400	Fragments	Reproduction	LOEC	0.04	6.40E+03	8.00E+07	20	4.00E+06	Murphy and Quinn (2018)	2
Bivalvia	*Corbicula fluminea*	Polyethylene	209	Fragments	Mortality	HONEC	28	0.586	2.80E+03	1	2.80E+03	Rochman et al. (2017)	2

Taxonomic group	Species	Test material	Particle size range (µm)	Particle shape	Test endpoint	Dose descriptor	Exposure time (d)	Toxic dose (part/ml)	Toxic dose (µg/L)	Extrapolation factor	NOEC or chronic LOEC (ug/L) after extrapolation	Reference	Review reference
Bivalvia	*Corbicula fluminea*	Polystyrene	179	Fragments	Mortality	HONEC	28	1.02	3.20E+03	1	3.20E+03	Rochman et al. (2017)	2
Bivalvia	*Corbicula fluminea*	PET	198	Fragments	Mortality	HONEC	28	0.731	4.10E+03	1	4.10E+03	Rochman et al. (2017)	2
Bivalvia	*Corbicula fluminea*	PVC	169	Fragments	Mortality	HONEC	28	1.19	4.20E+03	1	4.20E+03	Rochman et al. (2017)	2
Cypriniformes	*Danio rerio*	Polypropylene	70	Spheres	Mortality	LOEC	10	58.6	1.00E+04	20	5.00E+02	Lei et al. (2018)	2
Cypriniformes	*Cyprinus carpio*	Unknown	N.A.	Unknown	Mortality	HONEC	21	N.A.	2.00E+03	1	2.00E+03	Nematdoost Haghi and Banaee (2017)	2
Cypriniformes	*Misgurnus anguillicaudatus*	PVC	N.A.	Unknown	Mortality	HONEC	4	N.A.	5.00E+04	10	5.00E+03	Qu et al. (2018)	2

Table A2. Effect values for the ten selected substances. Extracted from the US EPA Ecotox database. Abbreviations used: N.r.: not reported; Exp. grow.: exponential growth phase (log); Meas.: measured; Unmeas.: unmeasured; Unmeas.*: unmeaserd values (some measured values reported in article); Reported: Chemical analysis reported; F.w.: fresh water; S.w.: salt water; LOEC: lowest observed effect concentration; NOEC: no observed effect concentration; LC50: lethal dose 50%; EC50: effect concentration 50%; Mort.: mortality; Pop. Population; Dev.: development; Rep. reproduction; Grow.: growth; Morp.: morphology; Conc.: effect concentration; Ref#: Reference number US EPA Ecotox database (full references listed below the table)

CAS#	Chemical name	Species	Lifestage	Exposure type	Chemical analysis	Media type	Observed duration (days)	End point	Effect	Conc. (mg/l)	Ref#
50328	Benzo[a]pyrene	*Chironomus riparius*	Larva	Static	Unmeas.	F.w.	1	LC50	Mort.	31.59	109624
50328	Benzo[a]pyrene	*Chironomus tentans*	Larva	Static	Unmeas.	F.w.	1	LC50	Mort.	9.873	108489
50328	Benzo[a]pyrene	*Chlorella fusca var. vacuolata*	N.r.	Static	Unmeas.	F.w.	1	EC50	Pop.	0.000631	120653
50328	Benzo[a]pyrene	*Chlorella fusca var. vacuolata*	N.r.	Static	Unmeas.	F.w.	1	EC50	Pop.	0.001766	120650
50328	Benzo[a]pyrene	*Danio rerio*	Embryo	Static	Unmeas.	F.w.	2.8958	EC50	Dev.	0.131204	155723
50328	Benzo[a]pyrene	*Danio rerio*	Embryo	Static	Unmeas.	F.w.	2.8958	LC50	Mort.	1.286808	155723
50328	Benzo[a]pyrene	*Daphnia magna*	Neonate	N.r.	Unmeas.	F.w.	2	EC50	Mort.	0.000982	86087
50328	Benzo[a]pyrene	*Daphnia magna*	Neonate	N.r.	Unmeas.	F.w.	2	EC50	Mort.	0.001625	86087
50328	Benzo[a]pyrene	*Daphnia magna*	Neonate	N.r.	Unmeas.	F.w.	2	LC50	Mort.	0.25	20485
50328	Benzo[a]pyrene	*Daphnia pulex*	N.r.	Static	Meas.	F.w.	4	LC50	Mort.	0.005	15337
50328	Benzo[a]pyrene	*Eurytemora affinis*	Nauplii	Static	Unmeas.	F.w.	4	LC50	Mort.	0.058	80951
50328	Benzo[a]pyrene	*Gammarus duebeni*	N.r.	Renewal	Unmeas.	S.w.	2	LC50	Mort.	11	18971
50328	Benzo[a]pyrene	*Gammarus duebeni*	N.r.	Renewal	Unmeas.	S.w.	1	LC50	Mort.	371	18971
50328	Benzo[a]pyrene	*Haliotis diversicolor*	N.r.	Renewal	Unmeas.	S.w.	4	LC50	Mort.	1.005	116906
50328	Benzo[a]pyrene	*Palaemonetes pugio*	Larva	Renewal	Meas.	S.w.	4	LC50	Mort.	0.00102	109323
50328	Benzo[a]pyrene	*Pseudokirchneriella subcapitata*	N.r.	Static	Unmeas.	F.w.	3	EC50	Grow.	0.015	15302
50328	Benzo[a]pyrene	*Scenedesmus acutus*	N.r.	Static	Unmeas.	F.w.	3	EC50	Grow.	0.005	15302
50328	Benzo[a]pyrene	*Xenopus laevis*	Embryo	Renewal	Unmeas.	F.w.	4	EC50	Dev.	8.7	14027
50328	Benzo[a]pyrene	*Xenopus laevis*	Embryo	Renewal	Unmeas.	F.w.	4	EC50	Dev.	9.6	14027
50328	Benzo[a]pyrene	*Xenopus laevis*	Embryo	Renewal	Unmeas.	F.w.	4	EC50	Dev.	10	69869

CAS#	Chemical name	Species	Lifestage	Exposure type	Chemical analysis	Media type	Observed duration (days)	End point	Effect	Conc. (mg/l)	Ref#
50328	Benzo[a]pyrene	*Xenopus laevis*	Embryo	Renewal	Unmeas.	F.w.	4	EC50	Dev.	12	69869
50328	Benzo[a]pyrene	*Xenopus laevis*	Embryo	Renewal	Unmeas.	F.w.	4	LC50	Mort.	13.4	14027
50328	Benzo[a]pyrene	*Xenopus laevis*	Embryo	Renewal	Unmeas.	F.w.	4	LC50	Mort.	16.7	14027
50328	Benzo[a]pyrene	*Chironomus riparius*	Larva	Static	Unmeas.	F.w.	1	LC10	Mort.	10.03	109624
50328	Benzo[a]pyrene	*Chironomus tentans*	Larva	Static	Unmeas.	F.w.	2	NOEC	Grow.	0.5	90390
50328	Benzo[a]pyrene	*Chironomus tentans*	Larva	Static	Unmeas.	F.w.	2	NOEC	Grow.	0.5	90390
50328	Benzo[a]pyrene	*Chironomus tentans*	Larva	Static	Unmeas.	F.w.	1	LC10	Mort.	5.982	108489
50328	Benzo[a]pyrene	*Danio rerio*	Embryo	Renewal	Unmeas.	F.w.	4.8333	NOEC	Rep.	0.01	170323
50328	Benzo[a]pyrene	*Danio rerio*	Embryo	Renewal	Unmeas.	F.w.	4.8333	NOEC	Mort.	0.01	170323
50328	Benzo[a]pyrene	*Danio rerio*	Embryo	Renewal	Unmeas.	F.w.	4.8333	NOEC	Morp.	0.01	170323
50328	Benzo[a]pyrene	*Danio rerio*	Embryo	Renewal	Unmeas.	S.w.	3.8958	NOEC	Dev.	0.024	166328
50328	Benzo[a]pyrene	*Danio rerio*	Embryo	Renewal	Unmeas.	S.w.	0.8958	NOEC	Mort.	0.024	166328
50328	Benzo[a]pyrene	*Danio rerio*	Embryo	Renewal	Unmeas.	S.w.	2.8958	NOEC	Mort.	0.024	166328
50328	Benzo[a]pyrene	*Euplotes crassus*	Exp. grow.	Static	Unmeas.	S.w.	1	NOEC	Pop.	0.025232	166144
50328	Benzo[a]pyrene	*Eurytemora affinis*	Nauplii	Renewal	Unmeas.	F.w.	21	NOEC	Rep.	0.012	80951
50328	Benzo[a]pyrene	*Eurytemora affinis*	Nauplii	Static	Unmeas.	F.w.	10	NOEC	Mort.	0.012	80951
50328	Benzo[a]pyrene	*Eurytemora affinis*	Nauplii	Renewal	Unmeas.	F.w.	21	NOEC	Rep.	0.012	80951
50328	Benzo[a]pyrene	*Haliotis diversicolor*	N.r.	Renewal	Unmeas.	S.w.	4	LC0	Mort.	0.1	116906
50328	Benzo[a]pyrene	*Physella acuta*	Embryo	Renewal	Unmeas.	F.w.	21	NOEC	Mort.	0.01	157640
50328	Benzo[a]pyrene	*Physella acuta*	Embryo	Renewal	Unmeas.	F.w.	21	NOEC	Mort.	0.02	157640
50328	Benzo[a]pyrene	*Zacco platypus*	N.r.	Flow-through	Meas.	F.w.	14	NOEC	Morp.	0.0162	166457
50328	Benzo[a]pyrene	*Zacco platypus*	N.r.	Flow-through	Meas.	F.w.	14	NOEC	Grow.	0.0162	166457
50328	Benzo[a]pyrene	*Zacco platypus*	N.r.	Flow-through	Meas.	F.w.	4	NOEC	Grow.	0.024	166457
50328	Benzo[a]pyrene	*Zacco platypus*	N.r.	Flow-through	Meas.	F.w.	4	NOEC	Morp.	0.024	166457
206440	Fluoranthene	*Americamysis bahia*	N.r.	Flow-through	Meas.	S.w.	31	NOEC	Mort.	0.0006	20588
206440	Fluoranthene	*Americamysis bahia*	N.r.	N.r.	Unmeas.	S.w.	<4	NOEC	Mort.	0.01	83925

CAS#	Chemical name	Species	Lifestage	Exposure type	Chemical analysis	Media type	Observed duration (days)	End point	Effect	Conc. (mg/l)	Ref#
206440	Fluoranthene	*Americamysis bahia*	N.r.	Flow-through	Meas.	S.w.	31	NOEC	Rep.	0.0111	20588
206440	Fluoranthene	*Americamysis bahia*	Juvenile	Flow-through	Meas.	S.w.	28	NOEC	Mort.	0.021	120941
206440	Fluoranthene	*Ankistrodesmus sp.*	Exp. grow.	Static	Unmeas.	S.w.	1.5	NOEC	Pop.	0.019	73408
206440	Fluoranthene	*Ankistrodesmus sp.*	Exp. grow.	Static	Unmeas.	S.w.	0.5	NOEC	Pop.	0.019	73408
206440	Fluoranthene	*Ankistrodesmus sp.*	Exp. grow.	Static	Unmeas.	S.w.	1	NOEC	Pop.	0.019	73408
206440	Fluoranthene	*Chironomus riparius*	Larva	Leaching	Meas.	F.w.	17.6	NOEC	Dev.	0.043	19191
206440	Fluoranthene	*Chironomus tentans*	N.r.	Static	Unmeas.	F.w.	10	NOEC	Mort.	0.02	14445
206440	Fluoranthene	*Chironomus tentans*	N.r.	Static	Unmeas.	F.w.	10	NOEC	Mort.	0.03	14445
206440	Fluoranthene	*Chlorella fusca var. vacuolata*	N.r.	Static	Unmeas.	F.w.	1	NOEC	Pop.	0.012742	95108
206440	Fluoranthene	*Crassostrea virginica*	N.r.	Renewal	Unmeas.	F.w.	21	NOEC	Morp.	0.01	91808
206440	Fluoranthene	*Crassostrea virginica*	N.r.	Renewal	Unmeas.	F.w.	7	NOEC	Morp.	0.1	91808
206440	Fluoranthene	*Cyprinodon variegatus*	Juvenile	Static	Unmeas.	S.w.	4	NOEC	Mort.	560	10366
206440	Fluoranthene	*Daphnia magna*	N.r.	Renewal	Meas.	F.w.	21	NOEC	Rep.	0.0014	20588
206440	Fluoranthene	*Daphnia magna*	Neonate	Renewal	Meas.	F.w.	21	NOEC	Mort.	0.017	61182
206440	Fluoranthene	*Daphnia magna*	Neonate	Renewal	Meas.	F.w.	21	NOEC	Grow.	0.017	151475
206440	Fluoranthene	*Daphnia magna*	Neonate	Renewal	Meas.	F.w.	21	NOEC	Grow.	0.017	61182
206440	Fluoranthene	*Daphnia magna*	N.r.	Renewal	Meas.	F.w.	21	NOEC	Grow.	0.017	20588
206440	Fluoranthene	*Daphnia magna*	N.r.	Renewal	Meas.	F.w.	~3	NOEC	Grow.	0.02	47311
206440	Fluoranthene	*Daphnia magna*	N.r.	Renewal	Meas.	F.w.	~3	NOEC	Pop.	0.02	47311
206440	Fluoranthene	*Daphnia magna*	N.r.	Renewal	Meas.	F.w.	~3	NOEC	Rep.	0.03	47311
206440	Fluoranthene	*Daphnia magna*	Neonate	Renewal	Meas.	F.w.	21	NOEC	Rep.	0.0353	61182
206440	Fluoranthene	*Daphnia magna*	Neonate	Renewal	Meas.	F.w.	21	NOEC	Rep.	0.0353	151475
206440	Fluoranthene	*Daphnia magna*	N.r.	Renewal	Unmeas.	F.w.	NR	EC05	Rep.	0.038	175263
206440	Fluoranthene	*Daphnia magna*	N.r.	Renewal	Unmeas.	F.w.	NR	EC05	Grow.	0.039	175263
206440	Fluoranthene	*Daphnia magna*	N.r.	Static	Unmeas.	F.w.	10	NOEC	Mort.	0.075	14445
206440	Fluoranthene	*Daphnia magna*	N.r.	Static	Unmeas.	F.w.	2	NOEC	Mort.	0.085	14445

CAS#	Chemical name	Species	Lifestage	Exposure type	Chemical analysis	Media type	Observed duration (days)	End point	Effect	Conc. (mg/l)	Ref#
206440	Fluoranthene	*Daphnia magna*	N.r.	Static	Unmeas.	F.w.	10	NOEC	Mort.	0.09	14445
206440	Fluoranthene	*Diporeia sp.*	N.r.	Leaching	Meas.	F.w.	10	NOEC	Mort.	0.861608	68006
206440	Fluoranthene	*Diporeia sp.*	N.r.	Leaching	Meas.	F.w.	16	NOEC	Mort.	0.861608	68006
206440	Fluoranthene	*Hyalella azteca*	N.r.	Static	Unmeas.	F.w.	10	NOEC	Mort.	0.018	14445
206440	Fluoranthene	*Hyalella azteca*	N.r.	Leaching	Meas.	F.w.	30	NOEC	Mort.	0.418669	68006
206440	Fluoranthene	*Hyalella azteca*	N.r.	Leaching	Meas.	F.w.	10	NOEC	Mort.	1.187239	68006
206440	Fluoranthene	*Hyalella azteca*	N.r.	Static	Unmeas.	F.w.	10	NOEC	Mort.	3	93498
206440	Fluoranthene	*Lemna minor*	N.r.	Flow-through	Meas.	F.w.	4	NOEC	Pop.	0.166	151475
206440	Fluoranthene	*Leptocheirus plumulosus*	N.r.	Leaching	Meas.	S.w.	26	NOEC	Grow.	0.212	68001
206440	Fluoranthene	*Palaemonetes pugio*	Larva	Renewal	Unmeas.	S.w.	4	NOEC	Mort.	0.022	112130
206440	Fluoranthene	*Phaeodactylum tricornutum*	N.r.	Static	Unmeas.	S.w.	3	NOEC	Pop.	0.05	112476
206440	Fluoranthene	*Pimephales promelas*	N.r.	Flow-through	Meas.	F.w.	32	NOEC	Mort.	0.0014	20588
206440	Fluoranthene	*Pimephales promelas*	Embryo	Flow-through	Meas.	F.w.	32	NOEC	Mort.	0.0104	151475
206440	Fluoranthene	*Pimephales promelas*	Embryo	Flow-through	Meas.	F.w.	32	NOEC	Mort.	0.0104	151475
206440	Fluoranthene	*Pimephales promelas*	Embryo	Flow-through	Meas.	F.w.	32	NOEC	Grow.	0.0104	151475
206440	Fluoranthene	*Pimephales promelas*	N.r.	Flow-through	Meas.	F.w.	32	NOEC	Grow.	0.0104	20588
206440	Fluoranthene	*Pimephales promelas*	N.r.	Flow-through	Meas.	F.w.	32	NOEC	Mort.	0.0104	20588
206440	Fluoranthene	*Pimephales promelas*	N.r.	Flow-through	Meas.	F.w.	32	NOEC	Grow.	0.0104	20588
206440	Fluoranthene	*Pimephales promelas*	Embryo	Flow-through	Meas.	F.w.	32	NOEC	Grow.	0.0104	151475
206440	Fluoranthene	*Pimephales promelas*	Embryo	Flow-through	Meas.	F.w.	32	NOEC	Grow.	0.0104	151475
206440	Fluoranthene	*Pseudokirchneriella subcapitata*	N.r.	Static	Meas.	F.w.	4	NOEC	Pop.	0.0417	151475
206440	Fluoranthene	*Pseudokirchneriella subcapitata*	N.r.	Static	Unmeas.	F.w.	4	NOEC	Pop.	32	9607
206440	Fluoranthene	*Ruditapes decussatus*	Embryo	Static	Meas.	S.w.	1	NOEC	Dev.	0.004	167734
206440	Fluoranthene	*Ruditapes decussatus*	Larva	Renewal	Meas.	S.w.	4	NOEC	Mort.	0.088	167734
206440	Fluoranthene	*Skeletonema costatum*	N.r.	N.r.	Unmeas.	S.w.	<4	NOEC	Pop.	10	83925
206440	Fluoranthene	*Stylaria lacustris*	N.r.	Static	Unmeas.	F.w.	10	NOEC	Mort.	0.115	14445

CAS#	Chemical name	Species	Lifestage	Exposure type	Chemical analysis	Media type	Observed duration (days)	End point	Effect	Conc. (mg/l)	Ref#
206440	Fluoranthene	*Tisbe battagliai*	Adult	Renewal	Unmeas.	S.w.	6	EC10	Rep.	0.0092	96455
206440	Fluoranthene	*Tisbe battagliai*	Adult	Renewal	Unmeas.	S.w.	6	EC10	Rep.	0.0441	96455
206440	Fluoranthene	*Tisbe battagliai*	Nauplii	Renewal	Unmeas.	S.w.	4	LC10	Mort.	0.0444	96455
206440	Fluoranthene	*Tisbe battagliai*	Adult	Renewal	Unmeas.	S.w.	6	LC10	Mort.	0.0469	96455
206440	Fluoranthene	*Tisbe battagliai*	Adult	Renewal	Unmeas.	S.w.	6	LC10	Mort.	0.0633	96455
104405	4-Nonylphenol	*Alburnus tarichi*	N.r.	Renewal	Unmeas.	F.w.	32	NOEC	Rep.	0.2	157741
104405	4-Nonylphenol	*Balanus amphitrite*	Nauplii	Static	Meas.	S.w.	1	NOEC	Pop.	0.000059	60775
104405	4-Nonylphenol	*Ceriodaphnia dubia*	N.r.	Static	Unmeas.	F.w.	1	NOEC	Mort.	0.1	81810
104405	4-Nonylphenol	*Charybdis japonica*	Adult	Static	Unmeas.	S.w.	1	LC10	Mort.	1.244	170226
104405	4-Nonylphenol	*Chironomus riparius*	Larva	Renewal	Unmeas.	F.w.	4	NOEC	Mort.	0.1	172468
104405	4-Nonylphenol	*Chironomus riparius*	Larva	Renewal	Unmeas.	F.w.	1	NOEC	Mort.	0.1	172468
104405	4-Nonylphenol	*Chironomus tentans*	Larva	Pulse	Meas.	F.w.	20	NOEC	Mort.	0.042	18610
104405	4-Nonylphenol	*Culaea inconstans*	N.r.	Lentic	Meas.	F.w.	<121.76	NOEC	Pop.	0.243	51514
104405	4-Nonylphenol	*Danio rerio*	Fry	Renewal	Unmeas.	F.w.	>240	NOEC	Pop.	0.01	90396
104405	4-Nonylphenol	*Danio rerio*	Fry	Renewal	Unmeas.	F.w.	58	NOEC	Rep.	0.03	71918
104405	4-Nonylphenol	*Danio rerio*	Fry	Renewal	Unmeas.	F.w.	58	NOEC	Grow.	0.1	90396
104405	4-Nonylphenol	*Danio rerio*	Fry	Renewal	Unmeas.	F.w.	58	NOEC	Grow.	0.1	90396
104405	4-Nonylphenol	*Danio rerio*	Fry	Renewal	Unmeas.	F.w.	240	NOEC	Mort.	0.1	90396
104405	4-Nonylphenol	*Danio rerio*	Fry	Renewal	Unmeas.	F.w.	58	NOEC	Grow.	0.1	90396
104405	4-Nonylphenol	*Danio rerio*	Fry	Renewal	Unmeas.	F.w.	240	NOEC	Rep.	0.1	90396
104405	4-Nonylphenol	*Danio rerio*	Fry	Renewal	Unmeas.	F.w.	>240	NOEC	Rep.	0.1	90396
104405	4-Nonylphenol	*Daphnia galeata*	Neonate	Renewal	Unmeas.	F.w.	21	NOEC	Rep.	0.01	94650
104405	4-Nonylphenol	*Daphnia galeata*	Neonate	Renewal	Unmeas.	F.w.	21	NOEC	Mort.	0.01	94650
104405	4-Nonylphenol	*Daphnia galeata*	Neonate	Renewal	Unmeas.	F.w.	21	NOEC	Rep.	0.03	94648
104405	4-Nonylphenol	*Daphnia galeata*	Neonate	Renewal	Unmeas.	F.w.	42	NOEC	Mort.	0.05	94648
104405	4-Nonylphenol	*Daphnia galeata*	Neonate	Renewal	Unmeas.	F.w.	21	NOEC	Mort.	0.07	94648
104405	4-Nonylphenol	*Daphnia galeata*	Neonate	Renewal	Unmeas.	F.w.	42	NOEC	Rep.	0.07	94648

CAS#	Chemical name	Species	Lifestage	Exposure type	Chemical analysis	Media type	Observed duration (days)	End point	Effect	Conc. (mg/l)	Ref#
104405	4-Nonylphenol	*Daphnia magna*	Neonate	Renewal	N.r.	F.w.	21	NOEC	Mort.	0.005	170257
104405	4-Nonylphenol	*Daphnia magna*	N.r.	Renewal	Reported	F.w.	2	NOEC	Mort.	0.01	173962
104405	4-Nonylphenol	*Daphnia magna*	Neonate	Renewal	N.r.	F.w.	21	NOEC	Grow.	0.01	170257
104405	4-Nonylphenol	*Daphnia magna*	Neonate	Renewal	N.r.	F.w.	21	NOEC	Grow.	0.01	170257
104405	4-Nonylphenol	*Daphnia magna*	Adult	Renewal	Unmeas.*	F.w.	NR	NOEC	Grow.	0.01	160535
104405	4-Nonylphenol	*Daphnia magna*	Neonate	Renewal	N.r.	F.w.	21	NOEC	Rep.	0.01	170257
104405	4-Nonylphenol	*Daphnia magna*	Neonate	Renewal	N.r.	F.w.	21	NOEC	Rep.	0.01	170257
104405	4-Nonylphenol	*Daphnia magna*	N.r.	Renewal	Reported	F.w.	2	EC10	Pop.	0.011	173962
104405	4-Nonylphenol	*Daphnia magna*	Neonate	Renewal	Unmeas.	F.w.	35	NOEC	Pop.	0.0125	71864
104405	4-Nonylphenol	*Daphnia magna*	Neonate	Renewal	Meas.	F.w.	NR	NOEC	Rep.	0.0129	160535
104405	4-Nonylphenol	*Daphnia magna*	Neonate	Renewal	Meas.	F.w.	NR	NOEC	Grow.	0.0129	160535
104405	4-Nonylphenol	*Daphnia magna*	Neonate	Renewal	Meas.	F.w.	NR	NOEC	Pop.	0.0129	160535
104405	4-Nonylphenol	*Daphnia magna*	Neonate	Renewal	Meas.	F.w.	NR	NOEC	Mort.	0.0129	160535
104405	4-Nonylphenol	*Daphnia magna*	N.r.	Renewal	Reported	F.w.	2	EC10	Pop.	0.014	173962
104405	4-Nonylphenol	*Daphnia magna*	N.r.	Renewal	Reported	F.w.	2	EC10	Pop.	0.0162	173962
104405	4-Nonylphenol	*Daphnia magna*	N.r.	Renewal	Reported	F.w.	2	NOEC	Grow.	0.02	173962
104405	4-Nonylphenol	*Daphnia magna*	N.r.	Renewal	Reported	F.w.	2	NOEC	Mort.	0.02	173962
104405	4-Nonylphenol	*Daphnia magna*	Neonate	Renewal	Unmeas.*	F.w.	NR	NOEC	Pop.	0.02	160535
104405	4-Nonylphenol	*Daphnia magna*	Neonate	Renewal	Unmeas.*	F.w.	NR	NOEC	Grow.	0.02	160535
104405	4-Nonylphenol	*Daphnia magna*	N.r.	Renewal	Reported	F.w.	2	EC10	Rep.	0.0231	173962
104405	4-Nonylphenol	*Daphnia magna*	Neonate	N.r.	Unmeas.	F.w.	21	NOEC	Rep.	0.025	20032
104405	4-Nonylphenol	*Daphnia magna*	N.r.	Renewal	Reported	F.w.	2	EC10	Pop.	0.0255	173962
104405	4-Nonylphenol	*Daphnia magna*	N.r.	Renewal	Reported	F.w.	2	EC10	Rep.	0.0273	173962
104405	4-Nonylphenol	*Daphnia magna*	N.r.	Renewal	Reported	F.w.	2	EC10	Rep.	0.0345	173962
104405	4-Nonylphenol	*Daphnia magna*	N.r.	Renewal	Reported	F.w.	2	EC10	Rep.	0.0357	173962
104405	4-Nonylphenol	*Daphnia magna*	N.r.	Renewal	Reported	F.w.	2	NOEC	Mort.	0.04	173962
104405	4-Nonylphenol	*Daphnia magna*	Neonate	Renewal	Unmeas.*	F.w.	NR	NOEC	Mort.	0.04	160535

CAS#	Chemical name	Species	Lifestage	Exposure type	Chemical analysis	Media type	Observed duration (days)	End point	Effect	Conc. (mg/l)	Ref#
104405	4-Nonylphenol	*Daphnia magna*	N.r.	Renewal	Reported	F.w.	2	NOEC	Mort.	0.04	173962
104405	4-Nonylphenol	*Daphnia magna*	N.r.	Renewal	Reported	F.w.	2	NOEC	Grow.	0.04	173962
104405	4-Nonylphenol	*Daphnia magna*	Neonate	Renewal	Unmeas.*	F.w.	NR	NOEC	Rep.	0.04	160535
104405	4-Nonylphenol	*Daphnia magna*	Neonate	Renewal	Unmeas.	F.w.	35	NOEC	Pop.	0.05	71864
104405	4-Nonylphenol	*Daphnia magna*	Neonate	Renewal	Unmeas.	F.w.	35	NOEC	Rep.	0.05	71864
104405	4-Nonylphenol	*Daphnia magna*	N.r.	Renewal	Unmeas.	F.w.	21	NOEC	Rep.	0.05	18194
104405	4-Nonylphenol	*Daphnia magna*	Gestation	N.r.	Unmeas.	F.w.	NR	NOEC	Rep.	0.06	168576
104405	4-Nonylphenol	*Daphnia magna*	Neonate	Renewal	Unmeas.*	F.w.	NR	NOEC	Grow.	0.06	160535
104405	4-Nonylphenol	*Daphnia magna*	Adult	Renewal	Unmeas.*	F.w.	NR	NOEC	Grow.	0.08	160535
104405	4-Nonylphenol	*Daphnia magna*	Adult	Renewal	Unmeas.*	F.w.	NR	NOEC	Pop.	0.08	160535
104405	4-Nonylphenol	*Daphnia magna*	Adult	Renewal	Unmeas.*	F.w.	NR	NOEC	Mort.	0.08	160535
104405	4-Nonylphenol	*Daphnia magna*	Neonate	Renewal	Unmeas.*	F.w.	NR	NOEC	Rep.	0.08	160535
104405	4-Nonylphenol	*Daphnia magna*	Neonate	Renewal	Unmeas.*	F.w.	NR	NOEC	Grow.	0.08	160535
104405	4-Nonylphenol	*Daphnia magna*	Neonate	Renewal	Unmeas.*	F.w.	NR	NOEC	Pop.	0.08	160535
104405	4-Nonylphenol	*Daphnia magna*	Neonate	Renewal	Unmeas.*	F.w.	NR	NOEC	Mort.	0.08	160535
104405	4-Nonylphenol	*Daphnia magna*	Neonate	Renewal	Unmeas.	F.w.	14	NOEC	Mort.	0.1	71900
104405	4-Nonylphenol	*Daphnia magna*	Neonate	Renewal	Unmeas.	F.w.	14	NOEC	Grow.	0.1	71900
104405	4-Nonylphenol	*Daphnia magna*	Neonate	Renewal	Unmeas.	F.w.	14	NOEC	Rep.	0.1	71900
104405	4-Nonylphenol	*Daphnia magna*	Adult	Renewal	Unmeas.*	F.w.	NR	NOEC	Mort.	0.11	160535
104405	4-Nonylphenol	*Daphnia magna*	Neonate	Renewal	Meas.	F.w.	21	NOEC	Rep.	0.116	164890
104405	4-Nonylphenol	*Daphnia magna*	Neonate	Renewal	Meas.	F.w.	21	NOEC	Grow.	0.116	164890
104405	4-Nonylphenol	*Daphnia magna*	N.r.	Renewal	Unmeas.	F.w.	NR	EC05	Grow.	0.12	175263
104405	4-Nonylphenol	*Daphnia magna*	N.r.	Renewal	Unmeas.	F.w.	NR	EC05	Mort.	0.19	175263
104405	4-Nonylphenol	*Daphnia magna*	Gestation	Renewal	Unmeas.	F.w.	3	NOEC	Pop.	0.2	85682
104405	4-Nonylphenol	*Daphnia magna*	Neonate	Renewal	Meas.	F.w.	21	NOEC	Mort.	0.215	164890
104405	4-Nonylphenol	*Daphnia magna*	Neonate	Renewal	Meas.	F.w.	21	NOEC	Rep.	0.215	164890
104405	4-Nonylphenol	*Daphnia magna*	N.r.	Static	Unmeas.	F.w.	1	NOEC	Mort.	0.25	81810

CAS#	Chemical name	Species	Lifestage	Exposure type	Chemical analysis	Media type	Observed duration (days)	End point	Effect	Conc. (mg/l)	Ref#
104405	4-Nonylphenol	*Dreissena polymorpha*	N.r.	Renewal	Unmeas.	F.w.	112	NOEC	Grow.	0.5	87211
104405	4-Nonylphenol	*Dreissena polymorpha*	N.r.	Renewal	Unmeas.	F.w.	112	NOEC	Grow.	0.5	87211
104405	4-Nonylphenol	*Dreissena polymorpha*	N.r.	Renewal	Unmeas.	F.w.	50	LC10	Mort.	0.68	87211
104405	4-Nonylphenol	*Dreissena polymorpha*	N.r.	Renewal	Unmeas.	F.w.	NR	NOEC	Mort.	1	87211
104405	4-Nonylphenol	*Dreissena polymorpha*	N.r.	Renewal	Unmeas.	F.w.	35	LC10	Mort.	1.11	87211
104405	4-Nonylphenol	*Dreissena polymorpha*	N.r.	Renewal	Unmeas.	F.w.	15	LC10	Mort.	1.6	87211
104405	4-Nonylphenol	*Dugesia japonica*	N.r.	Renewal	Unmeas.	F.w.	4	NOEC	Mort.	0.25	98029
104405	4-Nonylphenol	*Dugesia japonica*	N.r.	Renewal	Unmeas.	F.w.	2	NOEC	Mort.	0.4	98029
104405	4-Nonylphenol	*Dugesia japonica*	N.r.	Static	Unmeas.	F.w.	4	NOEC	Mort.	0.75	111070
104405	4-Nonylphenol	*Dugesia japonica*	N.r.	Static	Unmeas.	F.w.	2	NOEC	Mort.	0.75	111070
104405	4-Nonylphenol	*Elminius modestus*	Larva	Renewal	Reported	S.w.	2	NOEC	Pop.	0.01	59297
104405	4-Nonylphenol	*Elminius modestus*	Larva	Renewal	Reported	S.w.	1	NOEC	Pop.	0.01	59297
104405	4-Nonylphenol	*Elminius modestus*	Larva	Renewal	Reported	S.w.	3	NOEC	Pop.	0.01	59297
104405	4-Nonylphenol	*Elminius modestus*	Nauplii	Renewal	Reported	S.w.	10	NOEC	Pop.	0.01	59297
104405	4-Nonylphenol	*Elminius modestus*	Larva	Renewal	Reported	S.w.	2	NOEC	Pop.	0.01	59297
104405	4-Nonylphenol	*Elminius modestus*	Larva	Renewal	Reported	S.w.	1	NOEC	Pop.	0.01	59297
104405	4-Nonylphenol	*Eurytemora affinis*	Nauplii	Renewal	Unmeas.	F.w.	21	NOEC	Rep.	0.007	80951
104405	4-Nonylphenol	*Eurytemora affinis*	Nauplii	Static	Unmeas.	F.w.	10	NOEC	Mort.	0.007	80951
104405	4-Nonylphenol	*Eurytemora affinis*	Nauplii	Renewal	Unmeas.	F.w.	21	NOEC	Rep.	0.007	80951
104405	4-Nonylphenol	*Gadus morhua*	Juvenile	Flow-through	Meas.	S.w.	21	NOEC	Grow.	0.029	95945
104405	4-Nonylphenol	*Gadus morhua*	Juvenile	Flow-through	Meas.	S.w.	21	NOEC	Grow.	0.029	95945
104405	4-Nonylphenol	*Gobiocypris rarus*	Sexually mature	Flow-through	Meas.	F.w.	>21	NOEC	Mort.	0.01853	101229
104405	4-Nonylphenol	*Gobiocypris rarus*	Sexually mature	Flow-through	Meas.	F.w.	>36	NOEC	Grow.	0.01853	101229
104405	4-Nonylphenol	*Gobiocypris rarus*	Sexually mature	Flow-through	Meas.	F.w.	>36	NOEC	Grow.	0.01853	101229
104405	4-Nonylphenol	*Gobiocypris rarus*	Sexually mature	Flow-through	Meas.	F.w.	21	NOEC	Rep.	0.01853	101229
104405	4-Nonylphenol	*Gobiocypris rarus*	Sexually mature	Flow-through	Meas.	F.w.	21	NOEC	Rep.	0.01853	101229

CAS#	Chemical name	Species	Lifestage	Exposure type	Chemical analysis	Media type	Observed duration (days)	End point	Effect	Conc. (mg/l)	Ref#
104405	4-Nonylphenol	*Gobiocypris rarus*	Sexually mature	Flow-through	Meas.	F.w.	21	NOEC	Rep.	0.01853	101229
104405	4-Nonylphenol	*Gobiocypris rarus*	Sexually mature	Flow-through	Meas.	F.w.	>36	NOEC	Mort.	0.01853	101229
104405	4-Nonylphenol	*Gobiocypris rarus*	Sexually mature	Flow-through	Unmeas.	F.w.	28	NOEC	Grow.	0.03	90411
104405	4-Nonylphenol	*Gobiocypris rarus*	Sexually mature	Flow-through	Unmeas.	F.w.	28	NOEC	Grow.	0.03	90411
104405	4-Nonylphenol	*Heteropneustes fossilis*	Oocyte, ova	N.r.	Unmeas.	F.w.	NR	NOEC	Rep.	0.001	170263
104405	4-Nonylphenol	*Hydra vulgaris*	Adult	Static	Meas.	F.w.	4	LC10	Mort.	0.031	95951
104405	4-Nonylphenol	*Hydra vulgaris*	Adult	Static	Meas.	F.w.	4	LC10	Mort.	0.031	95951
104405	4-Nonylphenol	*Hydra vulgaris*	Adult	Static	Meas.	F.w.	4	LC10	Mort.	0.035	95951
104405	4-Nonylphenol	*Hydra vulgaris*	Adult	Static	Meas.	F.w.	4	LC10	Mort.	0.051	95951
104405	4-Nonylphenol	*Hydra vulgaris*	Adult	Static	Meas.	F.w.	4	LC10	Mort.	0.063	95951
104405	4-Nonylphenol	*Hydra vulgaris*	Adult	Static	Meas.	F.w.	4	LC10	Mort.	0.067	95951
104405	4-Nonylphenol	*Hydra vulgaris*	Adult	Static	Meas.	F.w.	4	LC10	Mort.	0.069	95951
104405	4-Nonylphenol	*Hydra vulgaris*	Adult	Static	Meas.	F.w.	4	LC10	Mort.	0.07	95951
104405	4-Nonylphenol	*Hydra vulgaris*	Adult	Static	Meas.	F.w.	4	LC10	Mort.	0.108	95951
104405	4-Nonylphenol	*Lampsilis cardium*	Glochidia	Static	Unmeas.	F.w.	1	NOEC	Mort.	0.2	81810
104405	4-Nonylphenol	*Lampsilis siliquoidea*	Glochidia	Static	Unmeas.	F.w.	1	NOEC	Mort.	0.24	81810
104405	4-Nonylphenol	*Lemna minor*	N.r.	Flow-through	Meas.	F.w.	4	NOEC	Pop.	0.901	164890
104405	4-Nonylphenol	*Lepomis macrochirus*	Juvenile	Lentic	Meas.	F.w.	<121.76	NOEC	Pop.	0.076	51514
104405	4-Nonylphenol	*Leptodea fragilis*	Glochidia	Static	Unmeas.	F.w.	1	NOEC	Mort.	0.13	81810
104405	4-Nonylphenol	*Ligumia subrostrata*	Glochidia	Static	Unmeas.	F.w.	1	NOEC	Mort.	0.24	81810
104405	4-Nonylphenol	*Lithobates pipiens*	Tadpole	Renewal	Unmeas.	F.w.	~124	NOEC	Grow.	0.1	72419
104405	4-Nonylphenol	*Lithobates pipiens*	Tadpole	Renewal	Unmeas.	F.w.	~124	NOEC	Grow.	0.1	72419
104405	4-Nonylphenol	*Lithobates pipiens*	Tadpole	Renewal	Unmeas.	F.w.	~124	NOEC	Mort.	0.1	72419
104405	4-Nonylphenol	*Lithobates sylvaticus*	Tadpole	Renewal	Unmeas.	F.w.	~47	NOEC	Grow.	0.1	72419
104405	4-Nonylphenol	*Lithobates sylvaticus*	Tadpole	Renewal	Unmeas.	F.w.	~47	NOEC	Grow.	0.1	72419
104405	4-Nonylphenol	*Lithobates sylvaticus*	Tadpole	Renewal	Unmeas.	F.w.	~47	NOEC	Rep.	0.1	72419

CAS#	Chemical name	Species	Lifestage	Exposure type	Chemical analysis	Media type	Observed duration (days)	End point	Effect	Conc. (mg/l)	Ref#
104405	4-Nonylphenol	*Lithobates sylvaticus*	Tadpole	Renewal	Unmeas.	F.w.	~47	NOEC	Mort.	0.1	72419
104405	4-Nonylphenol	*Lymnaea stagnalis*	Sexually mature	Renewal	Unmeas.	F.w.	49	NOEC	Rep.	0.1	61042
104405	4-Nonylphenol	*Lymnaea stagnalis*	Sexually mature	Renewal	Unmeas.	F.w.	84	NOEC	Mort.	0.1	61042
104405	4-Nonylphenol	*Lymnaea stagnalis*	Sexually mature	Renewal	Unmeas.	F.w.	84	NOEC	Rep.	0.1	61042
104405	4-Nonylphenol	*Lymnaea stagnalis*	Sexually mature	Renewal	Unmeas.	F.w.	84	NOEC	Grow.	0.1	61042
104405	4-Nonylphenol	*Lymnaea stagnalis*	Sexually mature	Renewal	Unmeas.	F.w.	49	NOEC	Rep.	0.1	61042
104405	4-Nonylphenol	*Melosira varians*	N.r.	Static	Unmeas.	F.w.	10	NOEC	Pop.	0.02	99578
104405	4-Nonylphenol	*Melosira varians*	N.r.	Static	Unmeas.	F.w.	10	NOEC	Pop.	0.02	99578
104405	4-Nonylphenol	*Melosira varians*	N.r.	Static	Unmeas.	F.w.	10	NOEC	Pop.	0.04	99578
104405	4-Nonylphenol	*Melosira varians*	N.r.	Static	Unmeas.	F.w.	10	NOEC	Pop.	0.04	99578
104405	4-Nonylphenol	*Melosira varians*	N.r.	Static	Unmeas.	F.w.	10	NOEC	Pop.	0.08	99578
104405	4-Nonylphenol	*Melosira varians*	N.r.	Static	Unmeas.	F.w.	10	NOEC	Pop.	0.08	99578
104405	4-Nonylphenol	*Microcystis aeruginosa*	N.r.	Static	Unmeas.	F.w.	12	NOEC	Pop.	0.5	94642
104405	4-Nonylphenol	*Microcystis aeruginosa*	N.r.	Static	Unmeas.	F.w.	NR	NOEC	Pop.	2	94642
104405	4-Nonylphenol	*Microcystis aeruginosa*	N.r.	Static	Unmeas.	F.w.	12	NOEC	Pop.	2	94642
104405	4-Nonylphenol	*Moina macrocopa*	N.r.	Static	Unmeas.	F.w.	2	NOEC	Mort.	0.05	98029
104405	4-Nonylphenol	*Neocaridina denticulata*	N.r.	Renewal	Unmeas.	F.w.	2	NOEC	Mort.	0.25	98029
104405	4-Nonylphenol	*Neocaridina denticulata*	N.r.	Renewal	Unmeas.	F.w.	4	NOEC	Mort.	0.25	98029
104405	4-Nonylphenol	*Oncorhynchus mykiss*	Juvenile	Renewal	Unmeas.	F.w.	54	NOEC	Grow.	0.001	119225
104405	4-Nonylphenol	*Oncorhynchus mykiss*	Juvenile	Renewal	Unmeas.	F.w.	54	NOEC	Grow.	0.001	119225
104405	4-Nonylphenol	*Oncorhynchus mykiss*	Egg	Flow-through	Meas.	F.w.	91	NOEC	Grow.	0.006	164890
104405	4-Nonylphenol	*Oncorhynchus mykiss*	Egg	Flow-through	Meas.	F.w.	91	NOEC	Grow.	0.006	164890
104405	4-Nonylphenol	*Oncorhynchus mykiss*	Juvenile	Renewal	Unmeas.	F.w.	28	NOEC	Grow.	0.01	176065
104405	4-Nonylphenol	*Oncorhynchus mykiss*	Egg	Flow-through	Meas.	F.w.	91	NOEC	Mort.	0.0103	164890
104405	4-Nonylphenol	*Oncorhynchus mykiss*	Egg	Flow-through	Meas.	F.w.	91	NOEC	Pop.	0.0103	164890
104405	4-Nonylphenol	*Oncorhynchus mykiss*	Juvenile	Renewal	Unmeas.	F.w.	28	NOEC	Grow.	0.1	176065

CAS#	Chemical name	Species	Lifestage	Exposure type	Chemical analysis	Media type	Observed duration (days)	End point	Effect	Conc. (mg/l)	Ref#
104405	4-Nonylphenol	*Oncorhynchus mykiss*	Juvenile	Renewal	Unmeas.	F.w.	28	NOEC	Grow.	0.1	176058
104405	4-Nonylphenol	*Oncorhynchus mykiss*	Egg	Flow-through	Meas.	F.w.	40	NOEC	Mort.	0.114	164890
104405	4-Nonylphenol	*Oreochromis spilurus*	Adult	Renewal	Unmeas.	F.w.	30	NOEC	Grow.	0.03	172855
104405	4-Nonylphenol	*Oreochromis spilurus*	Adult	Renewal	Unmeas.	F.w.	30	NOEC	Grow.	0.03	172855
104405	4-Nonylphenol	*Oryzias latipes*	Embryo	Flow-through	Meas.	F.w.	60	NOEC	Grow.	0.0116	71858
104405	4-Nonylphenol	*Oryzias latipes*	Sexually mature	Renewal	Meas.	F.w.	21	NOEC	Rep.	0.0165	92799
104405	4-Nonylphenol	*Oryzias latipes*	Sexually mature	Renewal	Meas.	F.w.	14	NOEC	Rep.	0.0165	92799
104405	4-Nonylphenol	*Oryzias latipes*	Sexually mature	Renewal	Meas.	F.w.	14	NOEC	Rep.	0.0165	92799
104405	4-Nonylphenol	*Oryzias latipes*	Sexually mature	Renewal	Meas.	F.w.	21	NOEC	Rep.	0.0165	92799
104405	4-Nonylphenol	*Oryzias latipes*	Sexually mature	Renewal	Meas.	F.w.	21	NOEC	Rep.	0.0165	92799
104405	4-Nonylphenol	*Oryzias latipes*	Sexually mature	Renewal	Meas.	F.w.	7	NOEC	Rep.	0.0165	92799
104405	4-Nonylphenol	*Oryzias latipes*	Embryo	Flow-through	Meas.	F.w.	60	NOEC	Grow.	0.0235	71858
104405	4-Nonylphenol	*Oryzias latipes*	Embryo	Flow-through	Meas.	F.w.	60	NOEC	Mort.	0.0447	71858
104405	4-Nonylphenol	*Oryzias latipes*	Sexually mature	Flow-through	Unmeas.	F.w.	14	NOEC	Rep.	0.05	72418
104405	4-Nonylphenol	*Oryzias latipes*	Sexually mature	Flow-through	Meas.	F.w.	21	NOEC	Rep.	0.0509	72418
104405	4-Nonylphenol	*Oryzias latipes*	Sexually mature	Flow-through	Meas.	F.w.	21	NOEC	Rep.	0.0509	72418
104405	4-Nonylphenol	*Oryzias latipes*	Sexually mature	Flow-through	Meas.	F.w.	NR	NOEC	Rep.	0.0509	72418
104405	4-Nonylphenol	*Oryzias latipes*	Sexually mature	Renewal	Meas.	F.w.	21	NOEC	Grow.	0.0612	92799
104405	4-Nonylphenol	*Oryzias latipes*	Sexually mature	Renewal	Meas.	F.w.	7	NOEC	Rep.	0.0612	92799
104405	4-Nonylphenol	*Oryzias latipes*	Sexually mature	Renewal	Meas.	F.w.	21	NOEC	Grow.	0.0612	92799
104405	4-Nonylphenol	*Oryzias latipes*	Sexually mature	Renewal	Meas.	F.w.	7	NOEC	Rep.	0.0612	92799
104405	4-Nonylphenol	*Oryzias latipes*	Sexually mature	Renewal	Meas.	F.w.	14	NOEC	Rep.	0.0612	92799
104405	4-Nonylphenol	*Oryzias latipes*	Sexually mature	Renewal	Meas.	F.w.	21	NOEC	Grow.	0.0612	92799
104405	4-Nonylphenol	*Oryzias latipes*	Sexually mature	N.r.	Unmeas.	F.w.	14	NOEC	Rep.	0.1	94662
104405	4-Nonylphenol	*Oryzias latipes*	Sexually mature	Flow-through	Unmeas.	F.w.	14	NOEC	Rep.	0.1	72418
104405	4-Nonylphenol	*Oryzias latipes*	Sexually mature	Flow-through	Meas.	F.w.	21	NOEC	Rep.	0.101	72418

CAS#	Chemical name	Species	Lifestage	Exposure type	Chemical analysis	Media type	Observed duration (days)	End point	Effect	Conc. (mg/l)	Ref#
104405	4-Nonylphenol	*Oryzias latipes*	Sexually mature	Flow-through	Meas.	F.w.	14	NOEC	Rep.	0.101	72418
104405	4-Nonylphenol	*Oryzias latipes*	Sexually mature	Flow-through	Meas.	F.w.	14	NOEC	Rep.	0.184	72418
104405	4-Nonylphenol	*Oryzias latipes*	Sexually mature	Flow-through	Meas.	F.w.	7	NOEC	Rep.	0.184	72418
104405	4-Nonylphenol	*Oryzias latipes*	Sexually mature	Flow-through	Meas.	F.w.	7	NOEC	Rep.	0.184	72418
104405	4-Nonylphenol	*Physella acuta*	N.r.	Renewal	Unmeas.	F.w.	4	NOEC	Mort.	0.05	98029
104405	4-Nonylphenol	*Physella acuta*	N.r.	Renewal	Unmeas.	F.w.	2	NOEC	Mort.	0.1	98029
104405	4-Nonylphenol	*Pimephales promelas*	N.r.	Flow-through	Meas.	F.w.	28	NOEC	Rep.	0.00015	107590
104405	4-Nonylphenol	*Pimephales promelas*	N.r.	Flow-through	Meas.	F.w.	28	NOEC	Rep.	0.005	107590
104405	4-Nonylphenol	*Poecilia reticulata*	Adult	Renewal	Unmeas.	F.w.	7	NOEC	Grow.	0.15	94668
104405	4-Nonylphenol	*Poecilia reticulata*	Adult	Renewal	Unmeas.	F.w.	14	NOEC	Grow.	0.15	94668
104405	4-Nonylphenol	*Poecilia reticulata*	Adult	Renewal	Unmeas.	F.w.	21	NOEC	Grow.	0.15	94668
104405	4-Nonylphenol	*Psetta maxima*	Juvenile	Flow-through	Meas.	S.w.	21	NOEC	Grow.	0.029	95945
104405	4-Nonylphenol	*Pseudepidalea raddei*	Sperm	Static	Unmeas.	F.w.	0.0174	NOEC	Rep.	0.05	165058
104405	4-Nonylphenol	*Pseudepidalea raddei*	Sperm	Static	Unmeas.	F.w.	0.0083	NOEC	Rep.	0.05	165058
104405	4-Nonylphenol	*Pseudepidalea raddei*	Sperm	Static	Unmeas.	F.w.	0.0042	NOEC	Rep.	0.05	165058
104405	4-Nonylphenol	*Pseudepidalea raddei*	Sperm	Static	Unmeas.	F.w.	0.0014	NOEC	Rep.	0.05	165058
104405	4-Nonylphenol	*Pseudepidalea raddei*	Sperm	Static	Unmeas.	F.w.	0.0042	NOEC	Rep.	0.05	165058
104405	4-Nonylphenol	*Pseudepidalea raddei*	Sperm	Static	Unmeas.	F.w.	0.0083	NOEC	Rep.	0.05	165058
104405	4-Nonylphenol	*Pseudepidalea raddei*	Sperm	Static	Unmeas.	F.w.	0.0174	NOEC	Rep.	0.05	165058
104405	4-Nonylphenol	*Pseudepidalea raddei*	Sperm	Static	Unmeas.	F.w.	0.0042	NOEC	Rep.	0.2	165058
104405	4-Nonylphenol	*Pseudepidalea raddei*	Sperm	Static	Unmeas.	F.w.	0.0042	NOEC	Rep.	0.4	165058
104405	4-Nonylphenol	*Pseudepidalea raddei*	Mature	Renewal	Unmeas.	F.w.	3	NOEC	Rep.	0.4	165058
104405	4-Nonylphenol	*Pseudepidalea raddei*	Mature	Renewal	Unmeas.	F.w.	3	NOEC	Rep.	0.4	165058
104405	4-Nonylphenol	*Pseudepidalea raddei*	Mature	Renewal	Unmeas.	F.w.	1	NOEC	Rep.	0.4	165058
104405	4-Nonylphenol	*Pseudepidalea raddei*	Mature	Renewal	Unmeas.	F.w.	2	NOEC	Rep.	0.4	165058
104405	4-Nonylphenol	*Pseudepidalea raddei*	Sperm	Static	Unmeas.	F.w.	0.0014	NOEC	Rep.	0.4	165058

CAS#	Chemical name	Species	Lifestage	Exposure type	Chemical analysis	Media type	Observed duration (days)	End point	Effect	Conc. (mg/l)	Ref#
104405	4-Nonylphenol	*Pseudepidalea raddei*	Mature	Renewal	Unmeas.	F.w.	3	NOEC	Rep.	0.4	165058
104405	4-Nonylphenol	*Pseudepidalea raddei*	Sperm	Static	Unmeas.	F.w.	0.0021	NOEC	Rep.	0.4	165058
104405	4-Nonylphenol	*Pseudepidalea raddei*	Mature	Renewal	Unmeas.	F.w.	3	NOEC	Rep.	0.4	165058
104405	4-Nonylphenol	*Pseudokirchneriella subcapitata*	N.r.	Static	Meas.	F.w.	4	NOEC	Pop.	0.694	164890
104405	4-Nonylphenol	*Salmo salar*	Parr	Renewal	Unmeas.	S.w.	NR	NOEC	Grow.	0.02	73287
104405	4-Nonylphenol	*Salmo salar*	Parr	Renewal	Unmeas.	S.w.	NR	NOEC	Grow.	0.02	73287
104405	4-Nonylphenol	*Scenedesmus subspicatus*	N.r.	Static	Meas.	F.w.	3	EC10	Pop.	0.37	72421
104405	4-Nonylphenol	*Scenedesmus subspicatus*	N.r.	Static	Meas.	F.w.	3	EC10	Pop.	0.55	72421
104405	4-Nonylphenol	*Tigriopus japonicus*	Nauplii	Renewal	Unmeas.	S.w.	21	NOEC	Mort.	0.01	73293
104405	4-Nonylphenol	*Tigriopus japonicus*	Nauplii	Renewal	Unmeas.	S.w.	21	NOEC	Pop.	0.01	73293
104405	4-Nonylphenol	*Tigriopus japonicus*	Nauplii	Renewal	Unmeas.	S.w.	21	NOEC	Rep.	0.01	73293
104405	4-Nonylphenol	*Tigriopus japonicus*	Nauplii	Renewal	Unmeas.	S.w.	42	NOEC	Pop.	0.01	73293
104405	4-Nonylphenol	*Tigriopus japonicus*	Nauplii	Renewal	Unmeas.	S.w.	42	NOEC	Rep.	0.01	73293
104405	4-Nonylphenol	*Tigriopus japonicus*	Nauplii	Renewal	Unmeas.	S.w.	42	NOEC	Mort.	0.01	73293
104405	4-Nonylphenol	*Tigriopus japonicus*	Adult	Renewal	Unmeas.	S.w.	4	NOEC	Mort.	0.13	111315
104405	4-Nonylphenol	*Tigriopus japonicus*	Adult	Renewal	Unmeas.	S.w.	4	LC10	Mort.	0.2	111315
104405	4-Nonylphenol	*Utterbackia imbecillis*	Glochidia	Static	Unmeas.	F.w.	1	NOEC	Mort.	0.34	81810
140669	4-tert-Octylphenol	*Danio rerio*	Egg	Renewal	Meas.	F.w.	3	NOEC	Mort.	0.0032	85750
140669	4-tert-Octylphenol	*Danio rerio*	Egg	Renewal	Meas.	F.w.	2	NOEC	Mort.	0.0032	85750
140669	4-tert-Octylphenol	*Danio rerio*	Egg	Renewal	Meas.	F.w.	2	NOEC	Mort.	0.0032	85750
140669	4-tert-Octylphenol	*Danio rerio*	Egg	Renewal	Meas.	F.w.	3	NOEC	Mort.	0.0032	85750
140669	4-tert-Octylphenol	*Danio rerio*	Egg	Renewal	Meas.	F.w.	>117	NOEC	Rep.	0.0032	85750
140669	4-tert-Octylphenol	*Danio rerio*	Larva	Renewal	Meas.	F.w.	3	NOEC	Mort.	0.0032	85750
140669	4-tert-Octylphenol	*Danio rerio*	Egg	Renewal	Meas.	F.w.	4	NOEC	Mort.	0.0032	85750
140669	4-tert-Octylphenol	*Danio rerio*	Egg	Renewal	Meas.	F.w.	>124	NOEC	Rep.	0.0032	85750
140669	4-tert-Octylphenol	*Danio rerio*	Egg	Renewal	Meas.	F.w.	2	NOEC	Mort.	0.0032	85750
140669	4-tert-Octylphenol	*Danio rerio*	Egg	Renewal	Meas.	F.w.	>117	NOEC	Rep.	0.0032	85750

CAS#	Chemical name	Species	Lifestage	Exposure type	Chemical analysis	Media type	Observed duration (days)	End point	Effect	Conc. (mg/l)	Ref#
140669	4-tert-Octylphenol	*Danio rerio*	Egg	Renewal	Meas.	F.w.	4	NOEC	Mort.	0.0032	85750
140669	4-tert-Octylphenol	*Danio rerio*	Egg	Renewal	Meas.	F.w.	>124	NOEC	Rep.	0.0032	85750
140669	4-tert-Octylphenol	*Danio rerio*	Egg	Renewal	Meas.	F.w.	5	NOEC	Mort.	0.0032	85750
140669	4-tert-Octylphenol	*Danio rerio*	Larva	Renewal	Meas.	F.w.	>131	NOEC	Rep.	0.0032	85750
140669	4-tert-Octylphenol	*Danio rerio*	Larva	Renewal	Meas.	F.w.	>124	NOEC	Rep.	0.0032	85750
140669	4-tert-Octylphenol	*Danio rerio*	Egg	Renewal	Meas.	F.w.	>117	NOEC	Rep.	0.0032	85750
140669	4-tert-Octylphenol	*Danio rerio*	Egg	Renewal	Meas.	F.w.	>131	NOEC	Rep.	0.0032	85750
140669	4-tert-Octylphenol	*Danio rerio*	Larva	Renewal	Meas.	F.w.	>117	NOEC	Rep.	0.0032	85750
140669	4-tert-Octylphenol	*Danio rerio*	Larva	Renewal	Meas.	F.w.	>131	NOEC	Rep.	0.0032	85750
140669	4-tert-Octylphenol	*Danio rerio*	Larva	Renewal	Meas.	F.w.	>117	NOEC	Rep.	0.0032	85750
140669	4-tert-Octylphenol	*Danio rerio*	Egg	Renewal	Meas.	F.w.	>131	NOEC	Rep.	0.0032	85750
140669	4-tert-Octylphenol	*Danio rerio*	Larva	Renewal	Meas.	F.w.	1	NOEC	Mort.	0.0032	85750
140669	4-tert-Octylphenol	*Danio rerio*	Larva	Renewal	Meas.	F.w.	>124	NOEC	Rep.	0.0032	85750
140669	4-tert-Octylphenol	*Danio rerio*	Larva	Renewal	Meas.	F.w.	>131	NOEC	Rep.	0.0032	85750
140669	4-tert-Octylphenol	*Danio rerio*	Egg	Renewal	Meas.	F.w.	>131	NOEC	Rep.	0.0032	85750
140669	4-tert-Octylphenol	*Danio rerio*	Larva	Renewal	Meas.	F.w.	>117	NOEC	Rep.	0.0032	85750
140669	4-tert-Octylphenol	*Danio rerio*	Egg	Renewal	Meas.	F.w.	>124	NOEC	Rep.	0.0032	85750
140669	4-tert-Octylphenol	*Danio rerio*	Egg	Renewal	Meas.	F.w.	4	NOEC	Mort.	0.0032	85750
140669	4-tert-Octylphenol	*Danio rerio*	Larva	Renewal	Meas.	F.w.	>124	NOEC	Rep.	0.0032	85750
140669	4-tert-Octylphenol	*Danio rerio*	Larva	Renewal	Meas.	F.w.	2	NOEC	Mort.	0.0032	85750
140669	4-tert-Octylphenol	*Danio rerio*	Egg	Renewal	Meas.	F.w.	3	NOEC	Mort.	0.0032	85750
140669	4-tert-Octylphenol	*Danio rerio*	Egg	Renewal	Meas.	F.w.	2	NOEC	Mort.	0.0062	85750
140669	4-tert-Octylphenol	*Danio rerio*	Egg	Renewal	Meas.	F.w.	3	NOEC	Mort.	0.0062	85750
140669	4-tert-Octylphenol	*Danio rerio*	Egg	Renewal	Meas.	F.w.	4	NOEC	Mort.	0.0062	85750
140669	4-tert-Octylphenol	*Danio rerio*	Egg	Renewal	Meas.	F.w.	1	NOEC	Mort.	0.0062	85750
140669	4-tert-Octylphenol	*Danio rerio*	Egg	Renewal	Meas.	F.w.	5	NOEC	Mort.	0.0062	85750
140669	4-tert-Octylphenol	*Danio rerio*	Egg	Renewal	Meas.	F.w.	2	NOEC	Mort.	0.0062	85750

CAS#	Chemical name	Species	Lifestage	Exposure type	Chemical analysis	Media type	Observed duration (days)	End point	Effect	Conc. (mg/l)	Ref#
140669	4-tert-Octylphenol	*Danio rerio*	Egg	Flow-through	Meas.	F.w.	78	NOEC	Grow.	0.012	93706
140669	4-tert-Octylphenol	*Danio rerio*	Egg	Flow-through	Meas.	F.w.	NR	NOEC	Rep.	0.012	93706
140669	4-tert-Octylphenol	*Danio rerio*	Egg	Flow-through	Meas.	F.w.	NR	NOEC	Rep.	0.012	93706
140669	4-tert-Octylphenol	*Danio rerio*	Egg	Flow-through	Meas.	F.w.	NR	NOEC	Rep.	0.012	93706
140669	4-tert-Octylphenol	*Danio rerio*	Egg	Flow-through	Meas.	F.w.	NR	EC10	Rep.	0.0135	93706
140669	4-tert-Octylphenol	*Danio rerio*	Egg	Flow-through	Meas.	F.w.	38	NOEC	Grow.	0.035	93706
140669	4-tert-Octylphenol	*Danio rerio*	Egg	Flow-through	Meas.	F.w.	NR	NOEC	Pop.	0.035	93706
140669	4-tert-Octylphenol	*Danio rerio*	Egg	Flow-through	Meas.	F.w.	38	NOEC	Mort.	0.035	93706
140669	4-tert-Octylphenol	*Danio rerio*	Egg	Flow-through	Meas.	F.w.	185	NOEC	Grow.	0.035	93706
140669	4-tert-Octylphenol	*Danio rerio*	Egg	Flow-through	Meas.	F.w.	185	NOEC	Mort.	0.035	93706
140669	4-tert-Octylphenol	*Danio rerio*	Egg	Renewal	Unmeas.	F.w.	5	LC10	Mort.	0.0866	85750
140669	4-tert-Octylphenol	*Lithobates pipiens*	Tadpole	Renewal	Unmeas.	F.w.	63	NOEC	Dev.	0.002063	119281
140669	4-tert-Octylphenol	*Lithobates pipiens*	Tadpole	Renewal	Unmeas.	F.w.	29	NOEC	Grow.	0.002063	119281
140669	4-tert-Octylphenol	*Lithobates pipiens*	Tadpole	Renewal	Unmeas.	F.w.	34	NOEC	Grow.	0.002063	119281
140669	4-tert-Octylphenol	*Lithobates pipiens*	Tadpole	Renewal	Unmeas.	F.w.	14	NOEC	Dev.	0.206328	90342
140669	4-tert-Octylphenol	*Lithobates pipiens*	Tadpole	Renewal	Unmeas.	F.w.	14	NOEC	Dev.	0.206328	90342
140669	4-tert-Octylphenol	*Lithobates pipiens*	Tadpole	Renewal	Unmeas.	F.w.	14	NOEC	Dev.	0.51582	90342
140669	4-tert-Octylphenol	*Lithobates sylvaticus*	Tadpole	Renewal	Unmeas.	F.w.	14	NOEC	Dev.	0.206328	90342
140669	4-tert-Octylphenol	*Microcystis aeruginosa*	N.r.	N.r.	Unmeas.	F.w.	10	EC10	Pop.	0.005488	118870
140669	4-tert-Octylphenol	*Oryzias latipes*	Embryo	Flow-through	Meas.	F.w.	60	NOEC	Dev.	0.0237	71858
140669	4-tert-Octylphenol	*Oryzias latipes*	Embryo	Flow-through	Meas.	F.w.	60	NOEC	Grow.	0.094	71858
140669	4-tert-Octylphenol	*Oryzias latipes*	Embryo	Flow-through	Meas.	F.w.	60	NOEC	Grow.	0.094	71858
140669	4-tert-Octylphenol	*Potamopyrgus antipodarum*	Adult	Renewal	Unmeas.	F.w.	42	NOEC	Rep.	0.0001	90226
140669	4-tert-Octylphenol	*Potamopyrgus antipodarum*	Adult	Renewal	Unmeas.	F.w.	42	NOEC	Morp.	0.1	95947
140669	4-tert-Octylphenol	*Potamopyrgus antipodarum*	Adult	Renewal	Unmeas.	F.w.	42	NOEC	Rep.	0.1	95947
140669	4-tert-Octylphenol	*Potamopyrgus antipodarum*	Adult	Renewal	Unmeas.	F.w.	63	NOEC	Mort.	0.1	95947

CAS#	Chemical name	Species	Lifestage	Exposure type	Chemical analysis	Media type	Observed duration (days)	End point	Effect	Conc. (mg/l)	Ref#
140669	4-tert-Octylphenol	*Potamopyrgus antipodarum*	Adult	Renewal	Unmeas.	F.w.	42	NOEC	Morp.	0.1	95947
140669	4-tert-Octylphenol	*Potamopyrgus antipodarum*	Adult	Renewal	Unmeas.	F.w.	21	NOEC	Morp.	0.1	95947
140669	4-tert-Octylphenol	*Potamopyrgus antipodarum*	Adult	Renewal	Unmeas.	F.w.	21	NOEC	Morp.	0.1	95947
140669	4-tert-Octylphenol	*Potamopyrgus antipodarum*	Adult	Renewal	Unmeas.	F.w.	63	NOEC	Morp.	0.1	95947
140669	4-tert-Octylphenol	*Tigriopus japonicus*	Nauplii	Renewal	Unmeas.	S.w.	<=42	NOEC	Dev.	0.0001	73293
140669	4-tert-Octylphenol	*Tigriopus japonicus*	Nauplii	Renewal	Unmeas.	S.w.	21	NOEC	Pop.	0.01	73293
140669	4-tert-Octylphenol	*Tigriopus japonicus*	Nauplii	Renewal	Unmeas.	S.w.	21	NOEC	Mort.	0.01	73293
140669	4-tert-Octylphenol	*Tigriopus japonicus*	Nauplii	Renewal	Unmeas.	S.w.	21	NOEC	Rep.	0.01	73293
140669	4-tert-Octylphenol	*Tigriopus japonicus*	Nauplii	Renewal	Unmeas.	S.w.	42	NOEC	Mort.	0.01	73293
140669	4-tert-Octylphenol	*Tigriopus japonicus*	Nauplii	Renewal	Unmeas.	S.w.	42	NOEC	Rep.	0.01	73293
140669	4-tert-Octylphenol	*Tigriopus japonicus*	Nauplii	Renewal	Unmeas.	S.w.	42	NOEC	Pop.	0.01	73293
140669	4-tert-Octylphenol	*Tigriopus japonicus*	Nauplii	Renewal	Unmeas.	S.w.	13.2	NOEC	Dev.	0.01	73293
140669	4-tert-Octylphenol	*Tigriopus japonicus*	Adult	Renewal	Unmeas.	S.w.	4	NOEC	Mort.	0.13	111315
140669	4-tert-Octylphenol	*Tigriopus japonicus*	Adult	Renewal	Unmeas.	S.w.	4	LC10	Mort.	0.15	111315
140669	4-tert-Octylphenol	*Zoarces viviparus*	Gestation	Flow-through	Meas.	S.w.	35	NOEC	Mort.	0.014	82314
140669	4-tert-Octylphenol	*Zoarces viviparus*	Gestation	Flow-through	Meas.	S.w.	35	NOEC	Morp.	0.014	82314
140669	4-tert-Octylphenol	*Zoarces viviparus*	Gestation	Flow-through	Meas.	S.w.	35	NOEC	Morp.	0.065	82314
140669	4-tert-Octylphenol	*Zoarces viviparus*	Gestation	Flow-through	Meas.	S.w.	35	NOEC	Morp.	0.065	82314
140669	4-tert-Octylphenol	*Acartia tonsa*	Egg	Renewal	Meas.	S.w.	5	EC50	Dev.	0.013	66691
140669	4-tert-Octylphenol	*Acartia tonsa*	Adult	Static	Meas.	S.w.	2	LC50	Mort.	0.42	66691
140669	4-tert-Octylphenol	*Americamysis bahia*	N.r.	Static	Unmeas.	S.w.	4	LC50	Mort.	0.0479	2280
140669	4-tert-Octylphenol	*Americamysis bahia*	N.r.	Static	Unmeas.	S.w.	4	LC50	Mort.	0.0534	2280
140669	4-tert-Octylphenol	*Americamysis bahia*	N.r.	Static	Unmeas.	S.w.	4	LC50	Mort.	0.0551	2280
140669	4-tert-Octylphenol	*Americamysis bahia*	N.r.	Static	Unmeas.	S.w.	4	LC50	Mort.	0.1056	2280
140669	4-tert-Octylphenol	*Americamysis bahia*	N.r.	Static	Unmeas.	S.w.	4	LC50	Mort.	0.1122	2280
140669	4-tert-Octylphenol	*Americamysis bahia*	N.r.	Static	Unmeas.	S.w.	4	LC50	Mort.	0.1131	2280

CAS#	Chemical name	Species	Lifestage	Exposure type	Chemical analysis	Media type	Observed duration (days)	End point	Effect	Conc. (mg/l)	Ref#
140669	4-tert-Octylphenol	*Bellerochea polymorpha*	N.r.	N.r.	Unmeas.	S.w.	2	EC50	Pop.	0.09	13180
140669	4-tert-Octylphenol	*Crangon septemspinosa*	N.r.	Renewal	Meas.	S.w.	4	LC50	Mort.	1.1	15164
140669	4-tert-Octylphenol	*Danio rerio*	Egg	Flow-through	Meas.	F.w.	NR	EC50	Rep.	0.028	93706
140669	4-tert-Octylphenol	*Danio rerio*	Embryo	Flow-through	Unmeas.	F.w.	~78	EC50	Rep.	0.028061	69836
140669	4-tert-Octylphenol	*Danio rerio*	N.r.	N.r.	N.r.	F.w.	4	LC50	Mort.	0.37	93706
140669	4-tert-Octylphenol	*Danio rerio*	Egg	Renewal	Unmeas.	F.w.	5	LC50	Mort.	0.5776	85750
140669	4-tert-Octylphenol	*Daphnia magna*	N.r.	Static	Unmeas.	F.w.	2	LC50	Mort.	0.011	155080
140669	4-tert-Octylphenol	*Daphnia magna*	Neonate	Static	Unmeas.	F.w.	2	LC50	Mort.	0.09	18976
140669	4-tert-Octylphenol	*Fundulus heteroclitus*	Larva	Renewal	Unmeas.	S.w.	4	LC50	Mort.	0.284733	56564
140669	4-tert-Octylphenol	*Fundulus heteroclitus*	Multiple	Renewal	Unmeas.	S.w.	4	LC50	Mort.	0.292986	56564
140669	4-tert-Octylphenol	*Fundulus heteroclitus*	Larva	Renewal	Unmeas.	S.w.	4	LC50	Mort.	0.342505	56564
140669	4-tert-Octylphenol	*Fundulus heteroclitus*	Larva	Renewal	Unmeas.	S.w.	2	LC50	Mort.	0.363137	56564
140669	4-tert-Octylphenol	*Fundulus heteroclitus*	Larva	Renewal	Unmeas.	S.w.	2	LC50	Mort.	0.441542	56564
140669	4-tert-Octylphenol	*Fundulus heteroclitus*	Multiple	Renewal	Unmeas.	S.w.	2	LC50	Mort.	0.445669	56564
140669	4-tert-Octylphenol	*Fundulus heteroclitus*	Embryo	Renewal	Unmeas.	S.w.	4	LC50	Mort.	3.858335	56564
140669	4-tert-Octylphenol	*Fundulus heteroclitus*	Embryo	Renewal	Unmeas.	S.w.	2	LC50	Mort.	3.858335	56564
140669	4-tert-Octylphenol	*Lithobates pipiens*	Tadpole	Renewal	Unmeas.	F.w.	14	LC50	Mort.	0.280606	90342
140669	4-tert-Octylphenol	*Lithobates pipiens*	Tadpole	Renewal	Unmeas.	F.w.	14	LC50	Mort.	0.292986	90342
140669	4-tert-Octylphenol	*Lithobates pipiens*	Tadpole	Renewal	Unmeas.	F.w.	14	LC50	Mort.	0.577719	90342
140669	4-tert-Octylphenol	*Lithobates sylvaticus*	Tadpole	Renewal	Unmeas.	F.w.	14	LC50	Mort.	0.152683	90342
140669	4-tert-Octylphenol	*Microcystis aeruginosa*	N.r.	N.r.	Unmeas.	F.w.	10	EC50	Pop.	0.067676	118870
140669	4-tert-Octylphenol	*Oryzias latipes*	Egg	Static	Unmeas.	F.w.	17	LC50	Mort.	0.45	20339
140669	4-tert-Octylphenol	*Oryzias latipes*	Egg	Static	Unmeas.	F.w.	17	LC50	Mort.	0.83	20339
140669	4-tert-Octylphenol	*Oryzias latipes*	Egg	Static	Unmeas.	F.w.	17	LC50	Mort.	0.94	20339
140669	4-tert-Octylphenol	*Skeletonema costatum*	N.r.	N.r.	Unmeas.	S.w.	3	EC50	Pop.	0.14	13180
140669	4-tert-Octylphenol	*Tigriopus japonicus*	Adult	Renewal	Unmeas.	S.w.	4	LC50	Mort.	0.3	111315

CAS#	Chemical name	Species	Lifestage	Exposure type	Chemical analysis	Media type	Observed duration (days)	End point	Effect	Conc. (mg/l)	Ref#
140669	4-tert-Octylphenol	*Tigriopus japonicus*	Adult	Static	Unmeas.	S.w.	2	LC50	Mort.	0.62	73293
117817	Di-2-ethylhexyl phthalate	*Americamysis bahia*	N.r.	Flow-through	Meas.	S.w.	28	LC50	Mort.	125	14563
117817	Di-2-ethylhexyl phthalate	*Americamysis bahia*	N.r.	Flow-through	Meas.	S.w.	28	LC50	Mort.	475	14563
117817	Di-2-ethylhexyl phthalate	*Bufo woodhousei ssp. fowleri*	Embryo	Renewal	Unmeas.	F.w.	NR	LC50	Mort.	3.88	6772
117817	Di-2-ethylhexyl phthalate	*Bufo woodhousei ssp. fowleri*	Embryo	Renewal	Unmeas.	F.w.	NR	LC50	Mort.	44.14	6772
117817	Di-2-ethylhexyl phthalate	*Daphnia magna*	Neonate	Static	Unmeas.	F.w.	2	LC50	Mort.	3.31	170733
117817	Di-2-ethylhexyl phthalate	*Daphnia magna*	N.r.	Static	Unmeas.	F.w.	2	LC50	Mort.	11	5184
117817	Di-2-ethylhexyl phthalate	*Eurytemora affinis*	Nauplii	Static	Unmeas.	F.w.	4	LC50	Mort.	0.511	80951
117817	Di-2-ethylhexyl phthalate	*Ictalurus punctatus*	Embryo	Renewal	Unmeas.	F.w.	~7	LC50	Mort.	0.69	6772
117817	Di-2-ethylhexyl phthalate	*Ictalurus punctatus*	Embryo	Renewal	Unmeas.	F.w.	~3	LC50	Mort.	1.21	6772
117817	Di-2-ethylhexyl phthalate	*Karenia brevis*	N.r.	Static	Unmeas.	S.w.	4	EC50	Grow.	31000	555
117817	Di-2-ethylhexyl phthalate	*Lemna gibba*	N.r.	Renewal	Unmeas.	F.w.	7	EC50	Pop.	117.6	18928
117817	Di-2-ethylhexyl phthalate	*Lemna gibba*	N.r.	Renewal	Unmeas.	F.w.	7	EC50	Pop.	136.3	18928
117817	Di-2-ethylhexyl phthalate	*Lemna gibba*	N.r.	Renewal	Unmeas.	F.w.	7	EC50	Pop.	171.5	18928
117817	Di-2-ethylhexyl phthalate	*Lemna gibba*	N.r.	Renewal	Unmeas.	F.w.	7	EC50	Pop.	365.1	18928
117817	Di-2-ethylhexyl phthalate	*Lemna gibba*	N.r.	Renewal	Unmeas.	F.w.	7	EC50	Pop.	408.3	18928
117817	Di-2-ethylhexyl phthalate	*Lemna gibba*	N.r.	Renewal	Unmeas.	F.w.	7	EC50	Pop.	502.6	18928
117817	Di-2-ethylhexyl phthalate	*Lemna gibba*	N.r.	Renewal	Unmeas.	F.w.	7	EC50	Pop.	569.5	18928
117817	Di-2-ethylhexyl phthalate	*Lemna gibba*	N.r.	Renewal	Unmeas.	F.w.	7	EC50	Pop.	663.5	18928
117817	Di-2-ethylhexyl phthalate	*Lemna gibba*	N.r.	Renewal	Unmeas.	F.w.	7	EC50	Pop.	735.1	18928
117817	Di-2-ethylhexyl phthalate	*Lemna gibba*	N.r.	Renewal	Unmeas.	F.w.	7	EC50	Pop.	2495.6	18928
117817	Di-2-ethylhexyl phthalate	*Lemna gibba*	N.r.	Renewal	Unmeas.	F.w.	7	EC50	Pop.	3071.2	18928
117817	Di-2-ethylhexyl phthalate	*Lemna gibba*	N.r.	Renewal	Unmeas.	F.w.	7	EC50	Pop.	5489.5	18928
117817	Di-2-ethylhexyl phthalate	*Lemna gibba*	N.r.	Renewal	Unmeas.	F.w.	7	EC50	Pop.	7469.9	18928
117817	Di-2-ethylhexyl phthalate	*Lemna gibba*	N.r.	Renewal	Unmeas.	F.w.	7	EC50	Pop.	7492.1	18928

CAS#	Chemical name	Species	Lifestage	Exposure type	Chemical analysis	Media type	Observed duration (days)	End point	Effect	Conc. (mg/l)	Ref#
117817	Di-2-ethylhexyl phthalate	*Lepomis microlophus*	Embryo	Renewal	Unmeas.	F.w.	NR	LC50	Mort.	6.18	6772
117817	Di-2-ethylhexyl phthalate	*Lepomis microlophus*	Embryo	Renewal	Unmeas.	F.w.	NR	LC50	Mort.	77.2	6772
117817	Di-2-ethylhexyl phthalate	*Lithobates pipiens*	Embryo	Renewal	Unmeas.	F.w.	NR	LC50	Mort.	4.44	6772
117817	Di-2-ethylhexyl phthalate	*Lithobates pipiens*	Embryo	Renewal	Unmeas.	F.w.	NR	LC50	Mort.	5.52	6772
117817	Di-2-ethylhexyl phthalate	*Micropterus salmoides*	Egg	Flow-through	Meas.	F.w.	3.5	LC50	Mort.	32.1	563
117817	Di-2-ethylhexyl phthalate	*Micropterus salmoides*	Embryo	Flow-through	Meas.	F.w.	NR	LC50	Mort.	32.9	6772
117817	Di-2-ethylhexyl phthalate	*Micropterus salmoides*	Embryo	Flow-through	Meas.	F.w.	NR	LC50	Mort.	42.1	6772
117817	Di-2-ethylhexyl phthalate	*Micropterus salmoides*	Egg	Flow-through	Meas.	F.w.	7.5	LC50	Mort.	45.5	563
117817	Di-2-ethylhexyl phthalate	*Micropterus salmoides*	Egg	Flow-through	Meas.	F.w.	7.5	LC50	Mort.	55.7	563
117817	Di-2-ethylhexyl phthalate	*Micropterus salmoides*	Embryo	Flow-through	Meas.	F.w.	NR	LC50	Mort.	63.9	6772
117817	Di-2-ethylhexyl phthalate	*Micropterus salmoides*	Egg	Flow-through	Meas.	F.w.	3.5	LC50	Mort.	65.5	563
117817	Di-2-ethylhexyl phthalate	*Micropterus salmoides*	Embryo	Flow-through	Meas.	F.w.	NR	LC50	Mort.	66.1	6772
117817	Di-2-ethylhexyl phthalate	*Oncorhynchus mykiss*	Embryo	Flow-through	Meas.	F.w.	~22	LC50	Mort.	139.1	6772
117817	Di-2-ethylhexyl phthalate	*Oncorhynchus mykiss*	Egg	Flow-through	Meas.	F.w.	23	LC50	Mort.	139.1	563
117817	Di-2-ethylhexyl phthalate	*Oncorhynchus mykiss*	Egg	Flow-through	Meas.	F.w.	27	LC50	Mort.	139.5	563
117817	Di-2-ethylhexyl phthalate	*Oncorhynchus mykiss*	Embryo	Flow-through	Meas.	F.w.	~26	LC50	Mort.	139.5	6772
117817	Di-2-ethylhexyl phthalate	*Oncorhynchus mykiss*	Embryo	Flow-through	Meas.	F.w.	~26	LC50	Mort.	149.2	6772
117817	Di-2-ethylhexyl phthalate	*Oncorhynchus mykiss*	Egg	Flow-through	Meas.	F.w.	27	LC50	Mort.	149.2	563
117817	Di-2-ethylhexyl phthalate	*Oncorhynchus mykiss*	Embryo	Flow-through	Meas.	F.w.	~22	LC50	Mort.	154	6772
117817	Di-2-ethylhexyl phthalate	*Oncorhynchus mykiss*	Egg	Flow-through	Meas.	F.w.	23	LC50	Mort.	154	563
117817	Di-2-ethylhexyl phthalate	*Pimephales promelas*	Egg	Flow-through	Meas.	F.w.	32	LC50	Mort.	68	61022
117817	Di-2-ethylhexyl phthalate	*Pimephales promelas*	Egg	Flow-through	Meas.	F.w.	32	LC50	Mort.	71.5	61022
117817	Di-2-ethylhexyl phthalate	*Pimephales promelas*	Egg	Flow-through	Meas.	F.w.	32	LC50	Mort.	74.8	61022
117817	Di-2-ethylhexyl phthalate	*Pimephales promelas*	N.r.	Flow-through	Meas.	F.w.	4	LC50	Mort.	1106.2	45758
117817	Di-2-ethylhexyl phthalate	*Pseudokirchneriella subcapitata*	N.r.	Static	Meas.	F.w.	5	EC50	Pop.	0.96	14312

CAS#	Chemical name	Species	Lifestage	Exposure type	Chemical analysis	Media type	Observed duration (days)	End point	Effect	Conc. (mg/l)	Ref#
117817	Di-2-ethylhexyl phthalate	*Pseudokirchneriella subcapitata*	N.r.	Static	Meas.	F.w.	5	EC50	Pop.	0.96	3690
117817	Di-2-ethylhexyl phthalate	*Acartia tonsa*	N.r.	Static	Unmeas.	S.w.	4	NOEC	Mort.	50	14563
117817	Di-2-ethylhexyl phthalate	*Americamysis bahia*	N.r.	Static	Meas.	S.w.	4	NOEC	Mort.	34.5	14563
117817	Di-2-ethylhexyl phthalate	*Americamysis bahia*	N.r.	Flow-through	Meas.	S.w.	4	NOEC	Mort.	55	14563
117817	Di-2-ethylhexyl phthalate	*Bufo woodhousei ssp. fowleri*	Embryo	Renewal	Unmeas.	F.w.	NR	LC01	Mort.	0.06	6772
117817	Di-2-ethylhexyl phthalate	*Chironomus riparius*	Egg	Renewal	Unmeas.	F.w.	>30	NOEC	Pop.	0.01	101034
117817	Di-2-ethylhexyl phthalate	*Chironomus riparius*	Larva	Static	Unmeas.	F.w.	<=33	NOEC	Grow.	0.03	81390
117817	Di-2-ethylhexyl phthalate	*Chironomus riparius*	Larva	Static	Unmeas.	F.w.	<=33	NOEC	Grow.	0.03	81390
117817	Di-2-ethylhexyl phthalate	*Chironomus riparius*	Larva	Static	Unmeas.	F.w.	<=33	NOEC	Morp.	0.03	81390
117817	Di-2-ethylhexyl phthalate	*Chironomus riparius*	Larva	Static	Unmeas.	F.w.	<=33	NOEC	Morp.	0.03	81390
117817	Di-2-ethylhexyl phthalate	*Chironomus riparius*	Egg	Renewal	Unmeas.	F.w.	>30	NOEC	Rep.	0.1	101034
117817	Di-2-ethylhexyl phthalate	*Chironomus riparius*	Egg	Renewal	Unmeas.	F.w.	>30	NOEC	Rep.	0.1	101034
117817	Di-2-ethylhexyl phthalate	*Chironomus riparius*	Larva	Static	Unmeas.	F.w.	1	NOEC	Mort.	100	156029
117817	Di-2-ethylhexyl phthalate	*Chironomus tentans*	Larva	Static	Unmeas.	F.w.	2	NOEC	Grow.	50	90390
117817	Di-2-ethylhexyl phthalate	*Crangon septemspinosa*	N.r.	Static	Unmeas.	S.w.	4	NOEC	Mort.	43	14563
117817	Di-2-ethylhexyl phthalate	*Cyprinodon variegatus*	N.r.	Static	Unmeas.	S.w.	4	NOEC	Mort.	168	14563
117817	Di-2-ethylhexyl phthalate	*Cyprinodon variegatus*	Juvenile	Static	Unmeas.	S.w.	4	NOEC	Mort.	550	10366
117817	Di-2-ethylhexyl phthalate	*Danio rerio*	Adult	Renewal	Unmeas.	F.w.	21	NOEC	Rep.	0.002	170662
117817	Di-2-ethylhexyl phthalate	*Danio rerio*	Adult	Renewal	Unmeas.	F.w.	21	NOEC	Rep.	0.04	170662
117817	Di-2-ethylhexyl phthalate	*Daphnia magna*	N.r.	Flow-through	Meas.	F.w.	21	NOEC	Mort.	0.077	16380
117817	Di-2-ethylhexyl phthalate	*Daphnia magna*	Juvenile	Renewal	Unmeas.	F.w.	3	NOEC	Grow.	0.097641	173729
117817	Di-2-ethylhexyl phthalate	*Daphnia magna*	N.r.	Renewal	Meas.	F.w.	14	NOEC	Rep.	0.64	18379
117817	Di-2-ethylhexyl phthalate	*Daphnia magna*	N.r.	Renewal	Meas.	F.w.	21	NOEC	Rep.	0.64	18379
117817	Di-2-ethylhexyl phthalate	*Daphnia magna*	N.r.	Renewal	Meas.	F.w.	21	NOEC	Mort.	0.64	18379
117817	Di-2-ethylhexyl phthalate	*Daphnia magna*	N.r.	Static	Unmeas.	F.w.	2	NOEC	Mort.	1.1	5184

CAS#	Chemical name	Species	Lifestage	Exposure type	Chemical analysis	Media type	Observed duration (days)	End point	Effect	Conc. (mg/l)	Ref#
117817	Di-2-ethylhexyl phthalate	*Daphnia magna*	Juvenile	Renewal	Unmeas.	F.w.	3	NOEC	Dev.	2.694887	173729
117817	Di-2-ethylhexyl phthalate	*Eurytemora affinis*	Nauplii	Static	Unmeas.	F.w.	10	NOEC	Mort.	0.109	80951
117817	Di-2-ethylhexyl phthalate	*Eurytemora affinis*	Nauplii	Renewal	Unmeas.	F.w.	21	NOEC	Rep.	0.109	80951
117817	Di-2-ethylhexyl phthalate	*Eurytemora affinis*	Nauplii	Renewal	Unmeas.	F.w.	21	NOEC	Rep.	0.109	80951
117817	Di-2-ethylhexyl phthalate	*Gammarus annulatus*	N.r.	Static	Unmeas.	S.w.	4	NOEC	Mort.	105	14563
117817	Di-2-ethylhexyl phthalate	*Gobiocypris rarus*	Adult	Renewal	Meas.	F.w.	21	NOEC	Morp.	0.0036	173001
117817	Di-2-ethylhexyl phthalate	*Gobiocypris rarus*	Larva	Renewal	Meas.	F.w.	0.0042	NOEC	Dev.	0.0042	170664
117817	Di-2-ethylhexyl phthalate	*Gobiocypris rarus*	Larva	Renewal	Meas.	F.w.	NR	NOEC	Rep.	0.0042	170664
117817	Di-2-ethylhexyl phthalate	*Gobiocypris rarus*	Larva	Renewal	Meas.	F.w.	0.0042	NOEC	Rep.	0.0133	170664
117817	Di-2-ethylhexyl phthalate	*Gobiocypris rarus*	Larva	Renewal	Meas.	F.w.	0.0042	NOEC	Morp.	0.0133	170664
117817	Di-2-ethylhexyl phthalate	*Gobiocypris rarus*	Larva	Renewal	Meas.	F.w.	NR	NOEC	Grow.	0.0133	170664
117817	Di-2-ethylhexyl phthalate	*Gobiocypris rarus*	Larva	Renewal	Meas.	F.w.	0.0042	NOEC	Rep.	0.0133	170664
117817	Di-2-ethylhexyl phthalate	*Gobiocypris rarus*	Adult	Renewal	Meas.	F.w.	21	NOEC	Morp.	0.0394	173001
117817	Di-2-ethylhexyl phthalate	*Gobiocypris rarus*	Larva	Renewal	Meas.	F.w.	0.0042	NOEC	Grow.	0.0408	170664
117817	Di-2-ethylhexyl phthalate	*Gobiocypris rarus*	Larva	Renewal	Meas.	F.w.	<=.0049	NOEC	Mort.	0.0408	170664
117817	Di-2-ethylhexyl phthalate	*Gobiocypris rarus*	Larva	Renewal	Meas.	F.w.	NR	NOEC	Rep.	0.0408	170664
117817	Di-2-ethylhexyl phthalate	*Gobiocypris rarus*	Larva	Renewal	Meas.	F.w.	0.0042	NOEC	Grow.	0.0408	170664
117817	Di-2-ethylhexyl phthalate	*Gobiocypris rarus*	Larva	Renewal	Meas.	F.w.	0.0042	NOEC	Rep.	0.0408	170664
117817	Di-2-ethylhexyl phthalate	*Gobiocypris rarus*	Larva	Renewal	Meas.	F.w.	0.0042	NOEC	Morp.	0.0408	170664
117817	Di-2-ethylhexyl phthalate	*Gobiocypris rarus*	Larva	Renewal	Meas.	F.w.	0.0042	NOEC	Grow.	0.0408	170664
117817	Di-2-ethylhexyl phthalate	*Gobiocypris rarus*	Larva	Renewal	Meas.	F.w.	NR	NOEC	Dev.	0.0408	170664
117817	Di-2-ethylhexyl phthalate	*Gobiocypris rarus*	Larva	Renewal	Meas.	F.w.	0.0042	NOEC	Morp.	0.0408	170664
117817	Di-2-ethylhexyl phthalate	*Gobiocypris rarus*	Larva	Renewal	Meas.	F.w.	0.0042	NOEC	Dev.	0.0408	170664
117817	Di-2-ethylhexyl phthalate	*Gobiocypris rarus*	Larva	Renewal	Meas.	F.w.	NR	NOEC	Mort.	0.0408	170664
117817	Di-2-ethylhexyl phthalate	*Gobiocypris rarus*	Adult	Renewal	Meas.	F.w.	21	NOEC	Grow.	0.1176	173001

CAS#	Chemical name	Species	Lifestage	Exposure type	Chemical analysis	Media type	Observed duration (days)	End point	Effect	Conc. (mg/l)	Ref#
117817	Di-2-ethylhexyl phthalate	*Gobiocypris rarus*	Adult	Renewal	Meas.	F.w.	21	NOEC	Grow.	0.1176	173001
117817	Di-2-ethylhexyl phthalate	*Gobiocypris rarus*	Adult	Renewal	Meas.	F.w.	21	NOEC	Grow.	0.1176	173001
117817	Di-2-ethylhexyl phthalate	*Gobiocypris rarus*	Adult	Renewal	Meas.	F.w.	21	NOEC	Morp.	0.1176	173001
117817	Di-2-ethylhexyl phthalate	*Haliotis diversicolor ssp. supertexta*	Embryo	N.r.	Meas.	S.w.	<=4	NOEC	Dev.	0.0188	119401
117817	Di-2-ethylhexyl phthalate	*Haliotis diversicolor ssp. supertexta*	Embryo	N.r.	Meas.	S.w.	<=.5	NOEC	Dev.	4.93	119401
117817	Di-2-ethylhexyl phthalate	*Haliotis diversicolor ssp. supertexta*	Embryo	N.r.	Meas.	S.w.	<=4	NOEC	Dev.	19.74	119401
117817	Di-2-ethylhexyl phthalate	*Haliotis diversicolor ssp. supertexta*	Embryo	N.r.	Meas.	S.w.	<=.5	NOEC	Dev.	19.74	119401
117817	Di-2-ethylhexyl phthalate	*Haliotis diversicolor ssp. supertexta*	Larva	N.r.	Unmeas.	S.w.	4	NOEC	Pop.	20	165938
117817	Di-2-ethylhexyl phthalate	*Haliotis diversicolor ssp. supertexta*	Embryo	N.r.	Unmeas.	S.w.	NR	NOEC	Dev.	20	165938
117817	Di-2-ethylhexyl phthalate	*Hormosira banksii*	Gamete	Static	Unmeas.	S.w.	3	NOEC	Dev.	0.076	85363
117817	Di-2-ethylhexyl phthalate	*Hydra viridissima*	N.r.	Renewal	Unmeas.	F.w.	7	NOEC	Pop.	0.01	170217
117817	Di-2-ethylhexyl phthalate	*Ictalurus punctatus*	Embryo	Renewal	Unmeas.	F.w.	~7	LC01	Mort.	0.03	6772
117817	Di-2-ethylhexyl phthalate	*Lepomis microlophus*	Embryo	Renewal	Unmeas.	F.w.	NR	LC01	Mort.	0.26	6772
117817	Di-2-ethylhexyl phthalate	*Lithobates pipiens*	Embryo	Renewal	Unmeas.	F.w.	NR	LC01	Mort.	0.18	6772
117817	Di-2-ethylhexyl phthalate	*Menidia beryllina*	N.r.	Static	Unmeas.	S.w.	4	NOEC	Mort.	75	14563
117817	Di-2-ethylhexyl phthalate	*Micropterus salmoides*	Embryo	Flow-through	Meas.	F.w.	NR	LC01	Mort.	0.0072	6772
117817	Di-2-ethylhexyl phthalate	*Micropterus salmoides*	Embryo	Flow-through	Meas.	F.w.	NR	LC01	Mort.	0.0073	6772
117817	Di-2-ethylhexyl phthalate	*Neanthes arenaceodentata*	N.r.	Static	Unmeas.	S.w.	4	NOEC	Mort.	75	14563
117817	Di-2-ethylhexyl phthalate	*Oncorhynchus mykiss*	Embryo	Flow-through	Meas.	F.w.	~26	LC01	Mort.	0.15	6772
117817	Di-2-ethylhexyl phthalate	*Oncorhynchus mykiss*	Egg	Flow-through	Meas.	F.w.	90	NOEC	Mort.	0.502	56474
117817	Di-2-ethylhexyl phthalate	*Oncorhynchus mykiss*	Egg	Flow-through	Meas.	F.w.	NR	NOEC	Mort.	0.502	56474
117817	Di-2-ethylhexyl phthalate	*Oncorhynchus mykiss*	Egg	Flow-through	Meas.	F.w.	49	NOEC	Grow.	0.502	56474
117817	Di-2-ethylhexyl phthalate	*Oncorhynchus mykiss*	Egg	Flow-through	Meas.	F.w.	NR	NOEC	Mort.	0.502	56474
117817	Di-2-ethylhexyl phthalate	*Oncorhynchus mykiss*	Egg	Flow-through	Meas.	F.w.	42	NOEC	Grow.	0.502	56474
117817	Di-2-ethylhexyl phthalate	*Oncorhynchus mykiss*	Egg	Flow-through	Meas.	F.w.	90	NOEC	Grow.	0.5982	56474

CAS#	Chemical name	Species	Lifestage	Exposure type	Chemical analysis	Media type	Observed duration (days)	End point	Effect	Conc. (mg/l)	Ref#
117817	Di-2-ethylhexyl phthalate	*Oncorhynchus mykiss*	Embryo	Flow-through	Meas.	F.w.	~26	LC01	Mort.	0.68	6772
117817	Di-2-ethylhexyl phthalate	*Oryzias melastigma*	Larva	Renewal	Unmeas.	S.w.	~180	NOEC	Morp.	0.5	170535
117817	Di-2-ethylhexyl phthalate	*Oryzias melastigma*	Larva	Renewal	Unmeas.	S.w.	~180	NOEC	Grow.	0.5	170535
117817	Di-2-ethylhexyl phthalate	*Oryzias melastigma*	N.r.	Renewal	Unmeas.	S.w.	7	NOEC	Morp.	1	176956
117817	Di-2-ethylhexyl phthalate	*Palaemonetes pugio*	N.r.	Static	Unmeas.	S.w.	4	NOEC	Mort.	43	14563
117817	Di-2-ethylhexyl phthalate	*Pimephales promelas*	Adult	Renewal	Unmeas.	F.w.	28	NOEC	Morp.	0.012	169114
117817	Di-2-ethylhexyl phthalate	*Pimephales promelas*	N.r.	Flow-through	Meas.	F.w.	4	NOEC	Mort.	0.67	120990
117817	Di-2-ethylhexyl phthalate	*Pimephales promelas*	Egg	Flow-through	Meas.	F.w.	32	NOEC	Mort.	23.6	61022
117817	Di-2-ethylhexyl phthalate	*Pimephales promelas*	Egg	Flow-through	Meas.	F.w.	32	NOEC	Mort.	23.8	61022
117817	Di-2-ethylhexyl phthalate	*Pimephales promelas*	Egg	Flow-through	Meas.	F.w.	32	NOEC	Mort.	24	61022
117817	Di-2-ethylhexyl phthalate	*Pimephales promelas*	Egg	Flow-through	Meas.	F.w.	32	NOEC	Grow.	42.4	61022
117817	Di-2-ethylhexyl phthalate	*Pimephales promelas*	Egg	Flow-through	Meas.	F.w.	32	NOEC	Grow.	42.4	61022
117817	Di-2-ethylhexyl phthalate	*Pimephales promelas*	Egg	Flow-through	Meas.	F.w.	32	NOEC	Grow.	69.5	61022
117817	Di-2-ethylhexyl phthalate	*Pimephales promelas*	Egg	Flow-through	Meas.	F.w.	32	NOEC	Grow.	69.5	61022
117817	Di-2-ethylhexyl phthalate	*Pimephales promelas*	Egg	Flow-through	Meas.	F.w.	NR	NOEC	Mort.	69.5	61022
117817	Di-2-ethylhexyl phthalate	*Pimephales promelas*	Egg	Flow-through	Meas.	F.w.	32	NOEC	Grow.	69.6	61022
117817	Di-2-ethylhexyl phthalate	*Pimephales promelas*	Egg	Flow-through	Meas.	F.w.	NR	NOEC	Mort.	118.8	61022
117817	Di-2-ethylhexyl phthalate	*Pimephales promelas*	Egg	Flow-through	Meas.	F.w.	32	NOEC	Grow.	123.2	61022
117817	Di-2-ethylhexyl phthalate	*Pimephales promelas*	Egg	Flow-through	Meas.	F.w.	NR	NOEC	Mort.	123.2	61022
80057	Bisphenol A	*Brachionus koreanus*	Neonate	Renewal	Unmeas.	S.w.	NR	NOEC	Mort.	5	177378
80057	Bisphenol A	*Brachionus koreanus*	Neonate	Static	Unmeas.	S.w.	1	NOEC	Mort.	10	177378
80057	Bisphenol A	*Chironomus riparius*	Larva	Static	Unmeas.	F.w.	1	NOEC	Mort.	0.5	150065
80057	Bisphenol A	*Chironomus riparius*	Larva	Renewal	Unmeas.	F.w.	4	NOEC	Mort.	3	172468
80057	Bisphenol A	*Chironomus riparius*	Larva	Renewal	Unmeas.	F.w.	1	NOEC	Mort.	3	172468
80057	Bisphenol A	*Chironomus tentans*	Larva	Flow-through	Meas.	F.w.	4	NOEC	Mort.	1.4	165112

CAS#	Chemical name	Species	Lifestage	Exposure type	Chemical analysis	Media type	Observed duration (days)	End point	Effect	Conc. (mg/l)	Ref#
80057	Bisphenol A	*Ciona intestinalis*	Embryo	N.r.	Unmeas.	S.w.	0.7917	NOEC	Mort.	2.282908	170190
80057	Bisphenol A	*Danio rerio*	Embryo	Renewal	Unmeas.	Culture	0.9583	NOEC	Mort.	0.1	177212
80057	Bisphenol A	*Danio rerio*	Embryo	Renewal	Unmeas.	F.w.	<=6.8333	NOEC	Mort.	1	172465
80057	Bisphenol A	*Danio rerio*	Embryo	Renewal	Unmeas.	F.w.	4.8333	NOEC	Mort.	1	176942
80057	Bisphenol A	*Danio rerio*	Embryo	Renewal	Unmeas.	F.w.	6.8333	NOEC	Mort.	1	170212
80057	Bisphenol A	*Danio rerio*	Embryo	Renewal	Unmeas.	F.w.	2.0833	NOEC	Mort.	1	176942
80057	Bisphenol A	*Danio rerio*	Embryo	Renewal	Unmeas.	F.w.	6.8333	NOEC	Mort.	1	172465
80057	Bisphenol A	*Danio rerio*	Embryo	Renewal	Unmeas.	F.w.	1.8333	NOEC	Mort.	1	176942
80057	Bisphenol A	*Danio rerio*	Embryo	Static	Unmeas.	F.w.	5	NOEC	Mort.	2.5	170194
80057	Bisphenol A	*Danio rerio*	Embryo	Static	Unmeas.	F.w.	5	NOEC	Mort.	3.42	156380
80057	Bisphenol A	*Danio rerio*	Embryo	Renewal	Unmeas.	F.w.	~2.9583	NOEC	Mort.	5	170519
80057	Bisphenol A	*Daphnia magna*	N.r.	Static	Unmeas.	F.w.	1	NOEC	Mort.	0.03	150065
80057	Bisphenol A	*Gammarus fossarum*	Multiple	Renewal	Unmeas.	F.w.	103	NOEC	Mort.	0.5	171032
80057	Bisphenol A	*Haliotis diversicolor ssp. supertexta*	Embryo	Renewal	Unmeas.	S.w.	NR	NOEC	Mort.	0.05	164749
80057	Bisphenol A	*Marisa cornuarietis*	Embryo	Renewal	Unmeas.	F.w.	11	NOEC	Mort.	0.1	96163
80057	Bisphenol A	*Marisa cornuarietis*	Embryo	Renewal	Unmeas.	F.w.	12	NOEC	Mort.	0.1	96163
80057	Bisphenol A	*Marisa cornuarietis*	Embryo	Renewal	Unmeas.	F.w.	13	NOEC	Mort.	0.1	96163
80057	Bisphenol A	*Marisa cornuarietis*	Subadult	Renewal	Meas.	F.w.	4	NOEC	Mort.	1.18	165112
80057	Bisphenol A	*Marisa cornuarietis*	Subadult	Renewal	Meas.	F.w.	4	NOEC	Mort.	1.32	165112
80057	Bisphenol A	*Oryzias latipes*	Embryo	Renewal	Unmeas.	F.w.	4	NOEC	Mort.	0.0001	160106
80057	Bisphenol A	*Oryzias latipes*	Embryo	Renewal	Unmeas.	F.w.	NR	NOEC	Mort.	0.06	170159
80057	Bisphenol A	*Oryzias latipes*	Embryo	Renewal	Unmeas.	F.w.	NR	NOEC	Mort.	0.06	170159
80057	Bisphenol A	*Oryzias latipes*	Embryo	Renewal	Unmeas.	F.w.	NR	NOEC	Mort.	0.6	170159
80057	Bisphenol A	*Physella acuta*	Embryo	Renewal	Unmeas.	F.w.	21	NOEC	Mort.	0.1	157640
80057	Bisphenol A	*Physella acuta*	Embryo	Renewal	Unmeas.	F.w.	21	NOEC	Mort.	0.5	157640
80057	Bisphenol A	*Pimephales promelas*	Adult	Flow-through	Meas.	F.w.	164	NOEC	Mort.	0.13	170193
80057	Bisphenol A	*Pimephales promelas*	Adult	Flow-through	Meas.	F.w.	164	NOEC	Mort.	0.567	170193

CAS#	Chemical name	Species	Lifestage	Exposure type	Chemical analysis	Media type	Observed duration (days)	End point	Effect	Conc. (mg/l)	Ref#
80057	Bisphenol A	*Pimephales promelas*	Embryo	Flow-through	Meas.	F.w.	36	NOEC	Mort.	0.579	170216
80057	Bisphenol A	*Pimephales promelas*	Egg	Renewal	Unmeas.	F.w.	NR	NOEC	Mort.	1	89839
80057	Bisphenol A	*Potamopyrgus antipodarum*	Adult	Renewal	Unmeas.	F.w.	63	NOEC	Mort.	0.1	95947
80057	Bisphenol A	*Potamopyrgus antipodarum*	Adult	Flow-through	Unmeas.	F.w.	28	NOEC	Mort.	0.1	119284
80057	Bisphenol A	*Rhinella arenarum*	Larva	Renewal	Unmeas.	F.w.	14	NOEC	Mort.	1.8	168457
80057	Bisphenol A	*Rhinella arenarum*	Blastula	Renewal	Unmeas.	F.w.	2	NOEC	Mort.	15	168457
80057	Bisphenol A	*Tigriopus japonicus*	Nauplii	Renewal	Unmeas.	S.w.	42	NOEC	Mort.	0.01	73293
80057	Bisphenol A	*Tigriopus japonicus*	Nauplii	Renewal	Unmeas.	S.w.	21	NOEC	Mort.	0.01	73293
80057	Bisphenol A	*Tigriopus japonicus*	Adult	Renewal	Unmeas.	S.w.	4	NOEC	Mort.	0.1	111315
80057	Bisphenol A	*Valvata piscinalis*	Adult	Flow-through	Unmeas.	F.w.	28	NOEC	Mort.	0.1	119284
80057	Bisphenol A	*Xenopus laevis*	Tadpole	Renewal	Unmeas.	F.w.	84	NOEC	Mort.	0.022829	51029
80057	Bisphenol A	*Xenopus laevis*	Embryo	Renewal	Unmeas.	F.w.	36	NOEC	Mort.	4.565816	115666
80057	Bisphenol A	*Xenopus laevis*	Embryo	Renewal	Unmeas.	F.w.	4	NOEC	Mort.	6	167663
80057	Bisphenol A	*Xenopus laevis*	Embryo	Renewal	Unmeas.	F.w.	4	NOEC	Mort.	6	167663
149304	Mercaptobenzothiazole	*Ceriodaphnia dubia*	Neonate	Renewal	Meas.	F.w.	7	EC50	Mort.	1.25	80300
149304	Mercaptobenzothiazole	*Ceriodaphnia dubia*	Neonate	Static	Meas.	F.w.	2	EC50	Mort.	4.19	80300
149304	Mercaptobenzothiazole	*Daphnia magna*	N.r.	Static	Unmeas.	F.w.	2	LC50	Mort.	4.1	112108
149304	Mercaptobenzothiazole	*Daphnia magna*	N.r.	Static	Unmeas.	F.w.	2	LC50	Mort.	7	112108
149304	Mercaptobenzothiazole	*Ictalurus punctatus*	N.r.	Static	N.r.	F.w.	4	LC50	Mort.	1.65	6797
149304	Mercaptobenzothiazole	*Ictalurus punctatus*	N.r.	Static	N.r.	F.w.	1	LC50	Mort.	2.35	6797
149304	Mercaptobenzothiazole	*Lepomis macrochirus*	N.r.	Static	Unmeas.	F.w.	4	LC50	Mort.	1.5	112108
149304	Mercaptobenzothiazole	*Lepomis macrochirus*	N.r.	Static	N.r.	F.w.	4	LC50	Mort.	1.9	6797
149304	Mercaptobenzothiazole	*Lepomis macrochirus*	N.r.	Static	Unmeas.	F.w.	4	LC50	Mort.	1.9	13042
149304	Mercaptobenzothiazole	*Lepomis macrochirus*	N.r.	Static	Unmeas.	F.w.	2	LC50	Mort.	2	13042
149304	Mercaptobenzothiazole	*Lepomis macrochirus*	N.r.	Static	Unmeas.	F.w.	2	LC50	Mort.	2.1	112108
149304	Mercaptobenzothiazole	*Lepomis macrochirus*	N.r.	Static	N.r.	F.w.	1	LC50	Mort.	2.25	6797

CAS#	Chemical name	Species	Lifestage	Exposure type	Chemical analysis	Media type	Observed duration (days)	End point	Effect	Conc. (mg/l)	Ref#
149304	Mercaptobenzothiazole	*Lepomis macrochirus*	N.r.	Static	N.r.	F.w.	4	LC50	Mort.	2.25	6797
149304	Mercaptobenzothiazole	*Lepomis macrochirus*	N.r.	Static	Unmeas.	F.w.	1	LC50	Mort.	2.3	13042
149304	Mercaptobenzothiazole	*Lepomis macrochirus*	N.r.	Static	N.r.	F.w.	1	LC50	Mort.	2.35	6797
149304	Mercaptobenzothiazole	*Lepomis macrochirus*	N.r.	Static	Unmeas.	F.w.	1	LC50	Mort.	3.4	112108
149304	Mercaptobenzothiazole	*Lepomis macrochirus*	N.r.	Static	N.r.	F.w.	4	LC50	Mort.	4.2	6797
149304	Mercaptobenzothiazole	*Lepomis macrochirus*	N.r.	Static	N.r.	F.w.	1	LC50	Mort.	4.7	6797
149304	Mercaptobenzothiazole	*Lepomis macrochirus*	N.r.	Static	N.r.	F.w.	4	LC50	Mort.	7.6	6797
149304	Mercaptobenzothiazole	*Oncorhynchus mykiss*	N.r.	Static	Unmeas.	F.w.	4	LC50	Mort.	0.42	13042
149304	Mercaptobenzothiazole	*Oncorhynchus mykiss*	N.r.	Static	Unmeas.	F.w.	2	LC50	Mort.	0.46	13042
149304	Mercaptobenzothiazole	*Oncorhynchus mykiss*	Juvenile	Flow-through	Meas.	F.w.	8	LC50	Mort.	0.67	112108
149304	Mercaptobenzothiazole	*Oncorhynchus mykiss*	N.r.	Static	Meas.	F.w.	4	LC50	Mort.	0.73	112454
149304	Mercaptobenzothiazole	*Oncorhynchus mykiss*	Juvenile	Flow-through	Meas.	F.w.	4	LC50	Mort.	0.73	112108
149304	Mercaptobenzothiazole	*Oncorhynchus mykiss*	N.r.	Static	Unmeas.	F.w.	2	LC50	Mort.	0.75	112108
149304	Mercaptobenzothiazole	*Oncorhynchus mykiss*	N.r.	Static	Unmeas.	F.w.	4	LC50	Mort.	0.75	112108
149304	Mercaptobenzothiazole	*Oncorhynchus mykiss*	N.r.	Static	N.r.	F.w.	4	LC50	Mort.	0.76	6797
149304	Mercaptobenzothiazole	*Oncorhynchus mykiss*	N.r.	Static	N.r.	F.w.	1	LC50	Mort.	0.76	6797
149304	Mercaptobenzothiazole	*Oncorhynchus mykiss*	N.r.	Static	Unmeas.	F.w.	1	LC50	Mort.	0.92	112108
149304	Mercaptobenzothiazole	*Oncorhynchus mykiss*	N.r.	Static	Unmeas.	F.w.	1	LC50	Mort.	1	13042
149304	Mercaptobenzothiazole	*Oncorhynchus mykiss*	Juvenile	Flow-through	Meas.	F.w.	1	LC50	Mort.	1.14	112108
149304	Mercaptobenzothiazole	*Pimephales promelas*	N.r.	Static	Unmeas.	F.w.	4	LC50	Mort.	11	112108
149304	Mercaptobenzothiazole	*Pimephales promelas*	N.r.	Static	Unmeas.	F.w.	2	LC50	Mort.	13	112108
149304	Mercaptobenzothiazole	*Pimephales promelas*	N.r.	Static	Unmeas.	F.w.	1	LC50	Mort.	18	112108
149304	Mercaptobenzothiazole	*Pseudokirchneriella subcapitata*	N.r.	Static	Unmeas.	F.w.	4	EC50	Pop.	0.23	112108
149304	Mercaptobenzothiazole	*Pseudokirchneriella subcapitata*	N.r.	Static	Unmeas.	F.w.	4	EC50	Pop.	0.25	112108
149304	Mercaptobenzothiazole	*Tetrahymena pyriformis*	N.r.	Static	Unmeas.	F.w.	1	EC50	Pop.	10	11258

CAS#	Chemical name	Species	Lifestage	Exposure type	Chemical analysis	Media type	Observed duration (days)	End point	Effect	Conc. (mg/l)	Ref#
149304	Mercaptobenzothiazole	*Ceriodaphnia dubia*	Neonate	Renewal	Meas.	F.w.	7	NOEC	Rep.	0.839	80300
149304	Mercaptobenzothiazole	*Daphnia magna*	N.r.	Static	Unmeas.	F.w.	2	NOEC	Mort.	1.8	112108
149304	Mercaptobenzothiazole	*Oncorhynchus mykiss*	N.r.	Static	Meas.	F.w.	4	NOEC	Mort.	0.31	112454
149304	Mercaptobenzothiazole	*Pimephales promelas*	N.r.	Static	Unmeas.	F.w.	4	NOEC	Mort.	4.2	112108
29385431	Tolyltriazole	*Ceriodaphnia dubia*	N.r.	Static	Meas.	F.w.	2	LC50	Mort.	102	48385
29385431	Tolyltriazole	*Ceriodaphnia dubia*	N.r.	Static	Meas.	F.w.	2	LC50	Mort.	108	48385
29385431	Tolyltriazole	*Pimephales promelas*	N.r.	Static	Meas.	F.w.	4	LC50	Mort.	38	48385
29385431	Tolyltriazole	*Pimephales promelas*	N.r.	Static	Meas.	F.w.	4	LC50	Mort.	65	48385
26761400	Diisodecyl phthalate	*Pimephales promelas*	N.r.	Flow-through	Meas.	F.w.	2	LC50	Mort.	>1	120990
26761400	Diisodecyl phthalate	*Pimephales promelas*	Juvenile	Flow-through	Unmeas.	F.w.	4	LC50	Mort.	>1	15040
26761400	Diisodecyl phthalate	*Pimephales promelas*	N.r.	Flow-through	Meas.	F.w.	3	LC50	Mort.	>1	120990
26761400	Diisodecyl phthalate	*Pimephales promelas*	N.r.	Flow-through	Meas.	F.w.	1	LC50	Mort.	>1	120990
26761400	Diisodecyl phthalate	*Pseudokirchneriella subcapitata*	N.r.	Static	Unmeas.	F.w.	4	EC50	Pop.	>0.8	15040
26761400	Diisodecyl phthalate	*Paratanytarsus parthenogeneticus*	N.r.	Static	Unmeas.	F.w.	4	EC50	Mort.	>0.64	15040
26761400	Diisodecyl phthalate	*Oncorhynchus mykiss*	Juvenile	Flow-through	Unmeas.	F.w.	4	LC50	Mort.	>0.62	15040
26761400	Diisodecyl phthalate	*Cyprinodon variegatus*	Juvenile	Static	Unmeas.	F.w.	4	LC50	Mort.	>0.47	15040
26761400	Diisodecyl phthalate	*Pimephales promelas*	Juvenile	Static	Unmeas.	F.w.	4	LC50	Mort.	>0.47	15040
26761400	Diisodecyl phthalate	*Lepomis macrochirus*	Juvenile	Static	Unmeas.	F.w.	4	LC50	Mort.	>0.37	15040
26761400	Diisodecyl phthalate	*Americamysis bahia*	N.r.	Static	Unmeas.	F.w.	4	EC50	Mort.	>0.08	15040
26761400	Diisodecyl phthalate	*Daphnia magna*	N.r.	Flow-through	Meas.	F.w.	21	NOEC	Mort.	0.03	16380
26761400	Diisodecyl phthalate	*Daphnia magna*	N.r.	Flow-through	Meas.	F.w.	21	NOEC	Rep.	0.06	16380
26761400	Diisodecyl phthalate	*Pimephales promelas*	N.r.	Flow-through	Meas.	F.w.	4	NOEC	Mort.	1	120990

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