REPORT

Evaluation of Swedish National Screening Studies 2007-2012

Assessment of the Need for Follow-up

Petra Wallberg, Karin Norström Magnus Rahmberg, Irmelin Hansen, Katarina Hansson, Lennart Kaj, Mikael Remberger and Eva Brorström-Lundén

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John Munthe
Vice President, research

IVL Swedish Environmental Research Institute

NATUR VÅRDS VERKET
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IVL Swedish Environmental Research Institute

Organization

IVL Swedish Environmental Research Institute Ltd.

Address

P.O. Box 21060
SE-100 31 Stockholm

Telephone

+46 (0)8-598 563 00

Report Summary

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Assessment of the Need for Follow-up

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Author

Petra Wallberg, Karin Norström Magnus Rahmberg, Irmelin Hansen, Katarina Hansson, Lennart Kaj, Mikael Remberger and Eva Brorström-Lundén

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Summary

IVL Swedish Environmental Research Institute has made an assessment of the need for follow-up of Swedish national screening studies performed during the years 2007-2012. Defined tasks were to select approximately 25 substances for risk evaluation and to identity if there is a need for a more in-depth evaluation for any of these substances, and to select approximately 8 screening studies where there are needs for follow-up studies.

Forty screening studies were performed during the selected time period and the total number of screened substances amounted to 540 individual chemical substances, groups of substances and metals. Substances not prioritized for risk evaluation were: classical well known substances (*e.g.* PCBs, dioxins, metals) and their metabolites; substances with low detection frequency in biotic < 50%; substances listed on as a priority substance within the Water Framework Directive (WFD) and substances treated as a group rather than as individuals (*e.g.* unintentionally produced substances). Finally 22 substances remained for risk evaluation. Two brominated flame retardants (HBB and PBEB), two UV-filters (OTNE and AC) and one benzotriazole (UV 327) were suggested to be considered for an in depth evaluation.

The screening studies not recommended for follow-up were: studies where a follow-up already had been done; studies concerning priority substances in the WFD; studies where the authors concluded that the substances do not pose a risk or that no issues remain at present; studies where follow-up studies, research projects and/or literature reviews are ongoing, and studies where method development is ongoing or needed before further screening can be performed. Six studies were not prioritized for a new screening but need to be considered further. Finally, the studies selected to be prioritized for further screening included the following substances; UV-filters, pharmaceuticals, fragrances, benzothiazoles and benzotriazoles, platinum group metals, organophosphate esters, metabolites of PAHs and phthalates in urine, and antioxidants and their degradation products.

Keyword

Screening, evaluation, environmental risk assessment

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Summary

In October 2013 the Swedish Environmental Research Institute IVL were assigned by the Swedish EPA to make an assessment of the need for further follow-up of Swedish national screening studies performed during the years 2007-2012. Defined tasks were to:

- Select approximately 25 substances for risk evaluation and to identity if there is a need for a more in-depth evaluation for any of these substances.
- Select approximately 8 screening studies where there are needs for follow-up studies and rank them in order of preference. The need for method development should also be identified.

Forty screening studies were performed during the selected time period and the total number of screened substances amounted to 540 individual chemical substances, groups of substances and metals (Appendix 1, Table 1). For the Swedish EPA it was important that each step in the selection procedure was accounted for in the report.

The first set criteria for reduction of substances not relevant for **risk evaluation** were:

- Classical well known substances (e.g. PCBs, dioxins, metals) or are metabolites.
- Substances with low detection frequency in biotic samples including humans, < 50%.
- Priority substances within the Water Framework Directive (WFD) and therefore considered as well known
- Substances that should be treated as a group rather than as individual compounds, *e.g.* unintentionally produced substances.

After this selection step, 22 substances remained on the list (Table 3). Two brominated flame retardants (HBB and PBEB), two UV-filters (OTNE and AC) and one benzotriazole (UV 327) was suggested for an in depth evaluation.

The forty screening studies were evaluated for follow up (Table 2). The set of criteria for studies not selected for a follow-up were:

- A follow up study has already been performed (7 studies).
- The screening study concerned priority substances within the WFD (2 studies).
- The screening showed that the substances do not pose any risk or that no issues remain at present (5 studies).
- Follow-up studies, research projects and/or literature reviews are ongoing (9 studies).
- Method development is ongoing or needed before further screening (2 studies).

Six studies were not prioritized for a new screening but needs to be considered (see Appendix 3, Table 1 for comments). Finally, nine studies, of which two concerns fragrances, where prioritized for further screening.

Below the screening studies are listed and commented in priority order where the first three are of most relevance. (See the report for each screening study for a more extended presentation.)

National screening, 2009, UV filters

The screening results show that the occurrence of UV-filters is widespread in surface water from background areas and in the urban environment. Several of the included UV-filters pose a potential risk to the environment. The highest concentrations occur during the reproductive season and the use is not likely to decrease. The industry of personal care products may be perceptive to new information on risks concerning these substances. A new screening should therefore be preceded by a review on use, ecotoxicity and persistence of UV filters.

National screening, 2010, Pharmaceuticals

There is an increasing amount of evidence that pharmaceuticals may cause effects in the environment. Three pharmaceutical substances are on the watch-list within the WFD. Thus, more data is requested concerning environmental concentrations. The results in the screening show that removal rates of some pharmaceuticals in WWTP are difficult to determine. Method development and a follow-up screening would contribute to a better assessment of predicted environmental concentrations. Furthermore, the knowledge of the fate of pharmaceuticals in sewage sludge, in soil receiving sludge amendments and subsequent uptake in biota is limited. In a recent screening conducted in Norway the authors highlighted the number of pharmaceuticals detected in prawns, fish and birds (> 30; Miljødirektoratet 2013).

National screening, 2008, Musk substances and metabolites
National screening, 2011 Fragances; OTNE, acetyl cedrene and diphenyleter

Fragrance substances and their metabolites are widespread in the environment and were detected in surface water, sediment, fish, soil (to which sludge has been amended) and in breast milk. Many of these substances can bioaccumlate and the data indicate that these substances are persistent and that atmospheric long range transport occurs. Ecotoxicological data are limited for many of these substances. A new screening should be preceded by a literature review regarding usage and relevant substances. Fragrances that have been reported to occur in human samples should be included, and screening in human breast milk repeated. Furthermore, we suggest that the air compartment should be included.

National screening, 2011 Benzothiazoles, benzenediamines, dicyclohexylamine and benzotriazoles

A widespread occurrence of benzotriazoles was reported, both at background and urban areas. However, as no ecotoxicity data were found, no assessment of risk could be made.

The result of the screening was also reflected by analytical challenges of these substances. Benzothiazoles and benzotriazoles have recently been reported in different matrixes in a non-target screening in Norway (Miljødirektoratet, 2013).

A follow up screening is recommended, but before the need for method development should be assessed.

National screening, 2007, Platinum group metals

The screening study included the platinum group elements (PGEs) platinum (Pt), palladium (Pd) and rhodium (Rh). Pd was almost consistently detected in the biological samples (fish, moose, cow, white tailed eagle and plants). The concentrations of Pd in groundwater were higher than in run-off water ponds. The authors concluded that the results in this study do not indicate that PGEs pose a risk to humans or the aquatic ecosystem, but that this conclusion is based on lack of reference values and proper risk assessments for humans as well as biota.

National screening, 2007, Organophosphate esters in human breast milk and fish in Swedish lakes and coastal areas

The results from this study indicate that environmental load of organophosphate esters (OP) are high and that there is chronic exposure of OP. The authors concluded that the knowledge of the effects and the fate of these substances is limited and that more information on sources, degradation and uptake in biota is needed. A literature survey is suggested before decision on the selection of substances and environmental matrices for a follow up. Air and dust are likely to be important exposure routes for humans.

National screening, 2008, Exposure and effect screening in urine of women

The results show that urine is a good matrix for human biomonitoring of many organic chemicals and metals. The authors suggested follow-up studies on a selection of PAHs and phthalate metabolites and a larger test group could better establish factors influencing metabolite concentration in urine. We suggest that based on the outcome of other screening studies, also metabolites of other organic chemicals and metals, *e.g.* silver and metabolites of fragrances, should be considered.

National screening, 2007, Octadecyl 3-(3,5-di-tert-butyl-4-hydroxyphenyl) propionate

Available data for the aquatic environment indicates that octadecyl 3-(3,5-di-tert-butyl-4-hydroxyphenyl)propionate has low acute toxicity but no chronic tests have been done, and, thus, it is not possible to determine the risk. Given the persistent properties and the large production volume a follow up study is recommended, also including degradation products. It may be of interest to also include other antioxidants of similar chemical structure and their degradation products.

Sammanfattning

Avrapporterade screeningundersökningar bör med jämna mellanrum granskas för att avgöra om uppföljande undersökningar behövs eller om ny kunskap tillkommit som medför att riskbilden eller riskbedömningen för hälsa och miljö behöver ändras.

IVL Svenska miljöinstitutet fick i oktober 2013 uppdraget av Naturvårdsverket att göra en utvärdering av rapporterade screeningundersökningar från åren 2007-2012. Den första delen av uppdraget innebar att riskutvärdera cirka 25 ämnen. Förslag på några ämnen som eventuellt bör bli föremål för fördjupade utvärderingar vid ett senare tillfälle skulle också anges.

Den andra delen av uppdraget var att göra en bedömning av behovet av uppföljning där cirka åtta screeningar eller ett urval av de ämnena som ingått i screeningarna genomförda under åren 2007 – 2012 skulle rangordnas utifrån angelägenhetsgrad för uppföljande screeningar. Eventuella förslag på utredningar som bör göras för att fylla angelägna behov av fördjupade utvärderingar skulle anges. Förslag på behov av metodutveckling skulle också anges. En viktig aspekt för Naturvårdsverket var en tydlig redogörelse över hur gallringen av ämnen och screeningrapporter hade genomförts.

Totalt har 40 stycken screeningstudier genomförts under åren 2007-2012 och det totala antalet kemiska ämnen eller grupper av ämnen och som var inlagda i screeningdatabasen var 540 (Appendix 1, tabell 1). Enligt överenskommelse med Naturvårdsverket baserades utvärderingen på antagandet att urvalet av screeningmatriser var relevanta.

Kriterier för den första gallringen av substanser som inte är relevanta för riskutvärdering var:

- Välkända kemiska ämnen som till exempel PCB, PBDE, men även metaboliter och metaller.
- Låg detektionsfrekvens i biota eller humanprover (< 50 % av totala antalet prover).
- Prioriterat ämne inom ramen för vattendirektivet, vilket innebär att de är väl utredda och övervakas regelbundet.
- Ämnen som bör behandlas som grupp som t.ex. oavsiktligt bildade ämnen.

Slutligen återstod 22 kemiska ämnen (tabell 3).

De fyrtio screeningrapporter utvärderades med avseende på behov av uppföljande screeningundersökningar (tabell 2). Kriterier för att screening studier som inte bedömdes som prioriterade för att följa upp var (Appendix 3, tabell 1):

- En uppföljande screening har redan genomförts (7 studier).
- Studien omfattar prioriterade ämnen inom ramen för vattendirektivet (2 studier).

- Författarna anger att resultaten visar att det inte finns någon risk för hälsa eller för miljön eller att de frågor som legat till grund för undersökningen har klarlagts (5 studier).

- Screeningundersökningar, där forskning eller utvärderingar redan pågår (9 studier).

- Metodutveckling pågår eller behövs innan en ny screening genomförs (2 studier).

För sex undersökningar rekommenderas inte en ny screening men andra typer av uppföljning (Appendix 3, tabell 1). För nio screeningundersökningar, av vilka två rör doftämnen, rekommenderas en ny uppföljande screening. I den följande texten har undersökningarna rangordnats utifrån angelägenhetsgrad varav de tre första bedöms som mest angelägna. För mer information om screeningstudierna och om ämnena (användningsområden, ekotoxicitet etcetera) hänvisas till ursprungsrapporterna.

Nationell screening, 2009, UV filter

Författarnas slutsats var att undersökningen visar en utbredd förekomst av UV-filter i den svenska akvatiska miljön. Flera av de analyserade UV-filtren utgör en potentiell miljörisk, särskilt med hänsyn till att de högsta koncentrationerna förekommer under den reproduktiva perioden och användningen inte bedöms komma att minska. Under senare år har data om hormonstörande egenskaper rapporterats för alla undersökta substanser i denna screening. Vi antar att man inom industrin för hygienprodukter är receptiv för signaler om risker. En ny undersökning bör därför föregås av en litteraturstudie av vilka substanser som används och nya ekotoxikologiska data.

Nationell screening, 2010, Läkemedel

Det finns allt fler rapporter som visar att läkemedel orsakar effekter framför allt i den akvatiska miljön. Tre läkemedel finns på bevakningslistan in ramen för vattendirektivet vilket innebär att mer miljöövervakningsdata efterfrågas. Resultaten från denna studie visar att det för vissa substanser finns svårigheter att mäta hur mycket som släpps ut från reningsverken. Metodutveckling och en uppföljande studie skulle bidra till en bättre bedömning av PEC. Kunskapen om vad som händer med läkemedel som hamnar i reningsverksslam, jord som gödslas med slam och därefter upptag i biota är begränsad. I en nyligen genomförd norsk screeningstudie uttryckte författarna förvåning över antalet läkemedel (> 30) som kunde analyseras i kräftdjur, fisk och fågel (Miljødirektoratet 2013).

Nationell screening, 2008, Muskämnen och deras metaboliter
Nationell screening, 2011 Doftämnen; OTNE, acetyl cedren och difenyleter

Doftämnen och dess metaboliter rapporterades i ytvatten, sediment, i jord som gödslat med slam och i bröstmjölk. Flera av dessa ämnen kan bioackumuleras, är persistenta och rapporterade data tyder på att de kan transporteras långa sträckor med luft. Det ekotoxikologiska dataunderlaget är begränsat för flera av dessa substanser. Vi rekommenderar att utvecklingen av användningen av doftämnen följs. Vi antar att industrin för hygienprodukter är särskilt mottagliga för ny information rörande risk och därför bör

en ny screening föregås av en litteraturstudie för urval av relevanta substanser. Doftämnen som rapporterats från humana prover föreslås inkluderas och screening i bröstmjölk upprepas. Vi föreslår också att luftprover övervägs i en eventuell ny screening.

Nationell screening, 2011, Bensothiazoler, bensenediaminer, dicyclohexylamin och bensotriazoler

Resultaten av denna screening reflekterades av analytiska svårigheter och av att kunskapen om många av dessa ämnen är begränsad. Bensotriasoler var vanligt förekommande i både urbana och bakgrundsmiljöer men ingen riskbedömning kunde genomföras eftersom inga toxikologiska eller ekotoxikologska data kunde hittas i litteraturen. Bensothiazoler och bensotriazoler rapporterades nyligen i olika matriser i en norsk screening (Miljødirektoratet, 2013). Innan en ny screening genomförs behövs en bedömning av behovet av metodutveckling och en ny litteraturgenomgång.

Nationell screening, 2007, Katalysatormetaller

Screeningen omfattade katalysatormetallerna (PGE) platinum (Pt), palladium (Pd) och rhodium (Rh). I motsats till Pt och Rh hittades Pd i nästan alla biologiska prov (fisk, älg, ko, havsörn och växter) och Pd halter i grundvatten var högre än i dagvatten från starkt trafikerade vägar. Författarna drog slutsatsen att PGE inte tycks utgöra en risk men att denna bedömning baseras på brist på referensvärden och att en full riskutvärdering inte kunnat göras vare sig för människa eller för miljön.

Nationell screening, 2007, Organofosfatestrar i humanmjölk och fisk från svenska sjöar och kustnära områden

Resultaten från denna studie tyder på en hög belastning och en kronisk exponering av organofosfatestrar (OP). Kunskapen om effekter och vad som händer med OP i den yttre miljön är begränsad och mer data rörande källor, nedbrytning och upptag i biota behövs. Vi föreslår att en ny screening föregås av en litteraturstudie för urval av OP och matriser i miljön. För människa antas luft och damm vara särskilt viktiga exponeringsvägar. Det pågår förnärvarande åtminstone två forskningsprojekt som kommer att bidra med mer kunskap om inomhusexponering från OP.

Nationell screening, 2008, Exponering och effektscreening i urinprov från kvinnor

Resultaten visar att urin är en lämplig matris för hälsorelaterad miljöövervakning av organiska kemikalier och metaller. Författarna föreslår en uppföljande screening på ett urval av PAH- och ftalatmetaboliter baserat på resultaten från denna undersökning. Prover från fler individer skulle också kunna analyseras för att bättre kunna klarlägga vilka faktorer som påverkar koncentrationerna i urin. Vi föreslår att även metaboliter av andra organiska ämnen/ kemiska grupper och metaller, baserat på resultat från andra screeningundersökningar övervägs vid urval av ämnen, till exempel silver och metaboliter av doftämnen.

Nationell screening, 2007, Octadecyl 3-(3,5-di-tert-butyl-4-hydroxyfenyl)propionat

Ekotoxikologiska data tyder på att octadecyl 3-(3,5-di-tert-butyl-4-hydroxyfenyl)propionat har låg akut toxicitet men data för kronisk exponering saknas vilket medför att det inte går att göra en full riskbedömning. Till följd av ämnets persistenta egenskaper och stora produktionsvolymer så föreslår vi en uppföljande screeningstudie som också inkluderar nedbrytningsprodukter. Författarna till screeningrapporten föreslår att även inkludera andra antioxidanter med liknande kemisk struktur och deras nedbrytningsprodukter.

1 Introduction

Within regular interval the previously conducted screening programs need to be evaluated in order to assess if new knowledge has become available that changes previous judgements concerning the risk for the human health or the environment and to assess if follow-up studies are needed.

In October 2013 IVL Swedish Environmental Research Institute, got the assignment from the Swedish EPA to make an evaluation of national screening studies performed during the years 2007-2012. Defined tasks were to

- Select approximately 25 substances for risk evaluation and to identity if there is a need for a more in-depth evaluation for any of these substances. These 25 substances should be frequently detected in biota, especially fish, and not very well known.
- Select approximately eight screening studies where there is a need for a follow-up study.

For the Swedish EPA it was important that each step in the selection procedure was accounted for in the report. The information concerning usage, sources, chemical properties etc. have not been repeated in this report. More information concerning the screening studies and data on individual substances are available in the original screening reports. The intended reader for this report is assumed to be authorities responsible for environmental monitoring and scientists working within the field of hazardous substances.

2 Methods

2.1 Selection of substances for risk evaluation

The total number of different substances included in the screening studies 2007-2012 amounted to 540 chemical substances according to the Swedish EPA database (www.ivl.se) including metabolites and metals, but also sums of compounds (Appendix 1, Table 1). The first criteria for reduction of substances not relevant for risk evaluation were:

- Classical well known substances/ substance groups such as: polychlorinated biphenyls (PCBs), polybrominated diphenylethers (PBDEs), chlorinated dibenzofuranes and dioxins, phtalates, hexachlorobenzene, pharmaceuticals, polycyclic aromatic hydrocarbons (PAHs) and their metabolites, and metals.
- Substances with a detection frequency < 50% in biota samples.

After the first selection 56 substances remained on the list (Appendix 1, Table 2). After a discussion with the Swedish EPA the following selection process was decided:

- Substances on the priority list within the Water Framework Directive (WFD) are considered as well known and are regularly included in monitoring studies. They were removed.
- Unintentionally produced substances were mainly excluded, but if included, they should be treated as a group and risk evaluated as a group.
- For the PCNs, three isomers constituted more than 70% of the amounts detected in biota, why the remaining isomers were removed.
- Bromadiolone (second generation anticoagulant) was removed.

Furthermore, three substances with detection frequency < 50% in biota were selected for evaluation.

- Isocyclemone E (OTNE) was found at relatively high concentrations. ONTE may also bioaccumulate and was found in human breast milk. The use of the substances appears to increase. Limited experimental data on the ecotoxicity of this substance is however available.
- Acetyl cedrene (AC) was found in one breast milk sample and is potentially persistent.
- 2,4,7,9-Tetramethyl-5-decyne-4,7-diol (TMDD) had high detection frequency in water but was not measured in biota.

Finally 22 substances were selected for risk evaluation. The 22 substances are presented in Appendix 2.

2.2 Risk evaluation

The risk evaluation was based on the suggested method presented in SWECOs Environmental Screening Report 2008:8 (SWECO 2010) where the parameters that we have included for the risk evaluation is presented.

Spatial range and persistence

How widespread a chemical is in the environment depends on factors such as emission sources, use pattern and on its physicochemical properties, *e.g.* persistence. Spatial range describes the degree to which a substance is widespread in the environment and its ability for atmospheric long range transport. The following definitions for evaluating the spatial range was used (SWECO 2010):

- Point source - found in the vicinity of industrial outfalls or waste water treatment plants (WWTPs).

- Local – found locally around a known source but in a broader region

- Regional – found all over a region but not nationally

- National – found in background areas, i.e. non affected areas

The ranked spatial risk categories were adopted from the SWECO report, *i.e.*,

Global = 5, national = 4, regional = 3, local = 2, point sources = 1

The spatial range was evaluated for the data presented in each screening report.

Environmental risk assessment

The assessment of environmental risk was based on the MEC/PNEC ratio (Measured Environmental Concentration /Predicted No Effect Concentration). The quotient is called the risk ratio and is a central concept in the regulation of chemicals in the European Union.

The median MEC values have been calculated using concentrations in surface water from both background areas as well as local areas, taken from the screening reports. Also, LOQs are included in the calculation of the median values. If no data was available in the report, data from the literature has been used. Data from WWTP effluents have been used if no surface water data could be found. The MEC/PNEC ratio has been calculated for the maximum MEC and the median MEC. Risk ratio based on maximum MEC from WWTP effluents should be regarded as worst case.

The ranked environmental risk categories were adopted from the SWECO report, *i.e.*,

MEC/PNEC risk ratio >1 = 5, >0.5 = 4, >0.1 = 3, >0.05 = 2, <0.05 = 1

Volumes

The total amount of a substance produced and used is generally reflected by the total amount present in the environment, depending on the sources and possible degradation processes in the WWTP and in the environment. The volumes were obtained from the SPIN database, ECHA database and OECD.

The ranked volumes categories was adopted from the SWECO report, *i.e.*,

Sweden/Nordic countries: >100 kg = 1, >1 tonne = 2, >10 tonnes =3 , >100 tonnes = 4, >1000 tonnes = 5.

EU/World: >1 tonne = 1, >10 tonnes =2, >100 tonnes = 3, >1000 tonnes = 4, >10000 tonnes = 5.

Bioaccumulation

The bioaccumulation potential of a compound is the bioconcentration factor (BCF) which is the ratio between the concentration in the environment and the concentration in the organism at steady state.

The ranked bioaccumulation categories were adopted from the SWECO report, *i.e.*,

Ranked BCF: >5000 = 5, >2000 = 4, >1000 = 3, >500 = 2, <500 = 1.

Models

Data for half-lives, BCFs and PNECs were primarily experimental values collected from QSAR Toolbox (OECD 2009). For several chemical substances no experimental data were found for different end points (see Table 1). Different models were therefore applied for those substances to generate the data needed. Three models/programs were used for modelling purposes (Table 1). For PNEC calculations NOEC values were primarily used and secondly acute toxicity data.

Table 1. Software used for calculation of properties

	Software		
Half-life	PBTprofiler[1]		
BCF	PBTprofiler	VEGA[2]	
PNEC	PBTprofiler		T.E.S.T[3]

1) http://www.pbtprofiler.net/
2) http://www.vega-qsar.eu
3) http://www.epa.gov/nrmrl/std/qsar/qsar.html

For each substance the corresponding Simplified Molecular Input Line Entry System (SMILE) notation were retrieved. The SMILE is a line notation for representation of molecule structure and used as in-data for the different models were appropriate. One important consideration when using models is if they have any kind of diagnostic function of the reliability of the predicted value. In other words, how good is the prediction and can it be used further. For the VEGA and T.E.S.T models, the user gets this information and in this study, results that are in the model domain have been used. For PBTprofiler this is not the case and hence these results could be uncertain.

2.3 Selection of screening studies where there is a need for follow up

Forty screening reports were evaluated (Table 2). Criteria for not recommend follow-up studies were:

- A follow up study has already been done (7 studies).
- The screening study concerned substances within the WFD and, thus, these substances are well known (2 studies).
- No follow-up study is needed as the authors concluded that the substances do not pose a risk or that no issues remain at present (5 studies).
- Follow-up studies, research projects and/or literature reviews are ongoing (9 studies).

- Development of measurement methods is ongoing or needed before further screening (2 studies).

Six studies were not prioritized for a new screening but needs to be considered at a later stage, for monitoring or for specific remaining issues (see Appendix 3, Table 1 for comments).
Finally, nine studies, of which two concerns fragrances, where selected to be prioritized for further screening.

Table 2. Swedish National screening reports 2007-2012.

	Report	**Executing organization**
1	National screening 2012: Rodenticides	IVL Swedish Environmental Research Institute
2	National screening 2011: Screening of Emerging Brominated Flame Retardants (BFRs) and Polybrominated dibenzofurans (PBDFs)	IVL Swedish Environmental Research Institute
3	National screening 2011: Fragances OTNE, acetyl cedrene and diphenyleter	WSP Environmental
4	National screening 2011: Complexing agents, EDTA, DTPA, NTA, 1,3-PDTA and ADA	WSP Environmental
5	National screening 2011: Polar pollutants, TPPO,TMDD and TCEP	WSP Environmental
6	National screening 2010: Pharmaceuticals	IVL Swedish Environmental Research Institute
7	National screening 2010: Chlorhexidine and p-chloroaniline	SWECO Environment
8	National screening 2010: N,N-dietyl-m-toluamid (DEET)	SWECO Environment
9	National screening 2010: Fluorescent Whitening Agents	IVL Swedish Environmental Research Institute
10	National screening 2010: Polychlorinated naphthalenes (PCNs)	IVL Swedish Environmental Research Institute
11	National screening 2009: Broad substance screening of sediments	Sweco Environment
12	National screening 2009: Broad substance screening of stormwater runoff	Sweco Environment
13	National screening 2009: UV-Filter	IVL Swedish Environmental Research Institute
14	National screening 2008: Musk substances and metabolites	Sweco Environment
15	National screening 2009: BCPS	IVL Swedish Environmental Research Institute
16	National screening 2009: Benzothiazoles, benzenediamines and benzotriazoles	IVL Swedish Environmental Research Institute
17	National screening 2009: Dechlorane Plus	IVL Swedish Environmental Research Institute
18	National screening 2008: Decabromodiphenyl ethane	Department for Applied Environmental Science (ITM), Stockholm University
19	National screening 2008: Methyl tert-butyl ether (MTBE) and Ethyl tert-butyl ether (ETBE)	IVL Swedish Environmental Research Institute
20	National screening 2008: Biocides: Difenacoum	IVL Swedish Environmental Research Institute
21	National screening 2008. Biocides: Glutaraldehyde	IVL Swedish Environmental Research Institute
22	National screening 2008: Exposure and effect screening in urine of women	Sweco Environment
23	National screening 2008: Screening of unintentionally produced organic contaminants	IVL Swedish Environmental Research Institute
24	National screening 2008: Biocides: 3-Iodo-2-propynyl butyl carbamate (IPBC) and 2,2-dibromo-2-cyanoacetamide (DBNPA)	IVL Swedish Environmental Research Institute
25	National screening 2008: Temporal variation of WFD priority substances	Sweco Environment

26	National screening 2007: Biocides and organic halogens	Sweco Environment
27	National screening 2007: Octadecyl 3-(3,5-di-tert-butyl-4-hydroxyphenyl)propionate	IVL Swedish Environmental Research Institute
28	National screening 2007: Concrete additives	Sweco Environment
29	National screening 2007: Musk substances	Sweco Environment
30	National screening 2007: Organophosphate esters in human breas milk and in fish from Swedish lakes and coastal areas	Department of Chemistry, Umeå University
31	National screening 2007: Pigments	IVL Swedish Environmental Research Institute
32	National screening 2007: Linear alkyl benzene sulfonate (LAS)	IVL Swedish Environmental Research Institute
33	National screening 2007: Human exposure to chlorinated paraffins via indoor air and dust	Department for Applied Environmental Science (ITM), Stockholm University
34	National screening 2007: Silver	IVL Swedish Environmental Research Institute
35	National screening 2007: Amines	IVL Swedish Environmental Research Institute
36	National screening 2007: Platinum group metals	SWECO VIAK
37	National screening 2007: Anti-inflammatory and analgesic drugs	IVL Swedish Environmental Research Institute
38	National screening 2007: Nationwide screening of WFD priority substances	SWECO VIAK
39	National and regional screening 2007: Sukralos part 2	IVL Swedish Environmental Research Institute
40	National screening 2007: Sukralos	IVL Swedish Environmental Research Institute

3 Risk evaluation of selected substances

Out of 540 substances, 22 were finally selected for risk evaluation, (Table 3). The evaluation of each substance is presented in Appendix 2, Tables 1-22.
Two brominated flame retardants (HBB and PBEB), two UV-filters (OTNE and AC) and one benzotriazole (UV 327) were considered for an in depth evaluation. In the following brief conclusions of the risk evaluation for each group of substances are presented.

Table 3. The 22 substances selected for risk evaluation.

	Substance	**CAS no.**
National screening, 2007, Organophosphate esters in human breast milk and in fish from Swedish lakes and coastal areas		
1	2-Ethylhexyl diphenyl phosphate (EHDPP)	1241-94-7
2	Tricresyl phosphate (TCP)	1330-78-5
3	Tri-n-butyl phosphate (TBP)	126-73-8
4	Triphenyl phosphate (TPP)	115-86-6
5	Tris(2-chloro-1-methylethyl) phosphate (TCPP)	13674-84-5
National screening, 2008, Musk substances and metabolites		
6	Galaxolide (HHCB)	1222-05-5
7	Tonalide (AHTN)	21145-77-7
National screening, 2009, BCPS		
8	Bis(4-chlorophenyl) sulfone (BCPS)	80-07-9
National screening, 2009, benzothiazoles, benzenediamines and benzotriazoles		
9	2-(2H-benzotriazol-2-yl)-4-(1,1,3,3-tetramethylbutyl)phenol (UV 329)	3147-75-9
10	2,4-di-tert-butyl-6-(5-chlorobenzotriazol-2-yl)phenol (UV 327)	3864-99-1
11	2-Mercaptobenzothiazole (MBT)	149-30-4
12	N-cyclohexylbenzothiazole-2-sulphenamid (CBS)	95-33-0
National screening, 2009, UV-Filter		
13	Ethylhexyl methoxycinnamate; Eusolex 2292 (OMC)	5466-77-3
14	Octocrylene (OC)	6197-30-4
National screening, 2010, Polychlorinated naphthalenes (PCNs)		
15	1,2,3,5,7-Pentachloronaphthalene (#52)	53555-65-0
16	1,2,4,6,7-Pentachloronaphthalene (#60)	150224-17-2
17	1,2,4,6,8-Pentachloronaphthalene (#61)	150224-22-9
National screening, 2011, Emerging Brominated Flame Retardants (BFRs) and Polybrominated dibenzofurans (PBDFs)		
18	Hexabromobenzene (HBB)	87-82-1
19	Pentabromoethylbenzene (PBEB)	85-22-3
National screening, 2011, Fragances OTNE, acetyl cedrene and diphenyleter		
20	OTNE	54464-57-2
21	Acetyl cedrene (AC)	32388-55-9
National screening 2011: Polar pollutants, TPPO,TMDD and TCEP		
22	2,4,7,9-Tetramethyl-5-decyne-4,7-diol (TMDD)	126-86-3

Organophosphate esters

Generally, the OPs had a high detection frequency in fish despite a low BCF. The high production of these substances are reflected by wide spread occurrence in the environment, although data indicate that these substances, with the exception for TCPP, are degraded in the environment. This screening study is also suggested for a follow up (see 4. Evaluation of the screening reports).

Musk substances

Galaxolide and tonalide are accumulated in fish and are widespread in the environment. Galaxolide is degraded to galaxolide lactone which often occurs in higher concentrations than galaxolide, *e.g.* in breast milk. Galaxoldie and tonalide has been targeted for risk evaluation by the European Commission (EC 2008a; EC 2008b) and the overall conclusion for the environmental compartment was that there is no need for further information and/or testing.

BCPS

Low levels of BCPS have been reported in fish. Previous studies have shown that BCPS is retained in the liver in a higher degree compared to the lipids because of its structure (Larsson et al 2004). It has also been shown that BCPS particularly biomagnifies in birds were very high levels have been detected (Jörundsdottir et al. 2006, Norström et al. 2004). BCPS is assumed to be distributed to the environment via water (Norström et al. 2004). However, in the evaluated screening study the LOQ was too high to determine if effluent water of WWTP are sources for this compound to the environment.

Benzothiazoles

CBS and MBT had a high detection frequency in fish despite a low BCF. The high production volumes of these substances are reflected by widespread occurrence in the environment. CBS can be degraded to MBT in the environment, which may explain the higher detection frequency for MBT in different environmental matrices. This screening is also suggested for follow up (see 4. Evaluation of the screening reports).

Benzotriazoles UV 327 and 329

UV 329 had a high detection frequency in fish despite a low BCF. For UV 327 ecotoxicological data is lacking and this substance is therefore suggested for an in depth evaluation. This screening study is also suggested for follow up (see 4. Evaluation of the screening reports).

UV filters

The evaluation of environmental risk of the UV filters is mainly based on modelled data. Both OMC and OC have relatively high log Kow values and consequently low solubility in

water. However, the detection frequencies in biota were relatively high compared to what could be expected from their BCF values. Based on maximum measured concentrations in WWTP effluents from an EU wide monitoring (Loos et al 2013) high MEC/PNEC ratios were calculated. Experimental data indicate that OMC is potentially persistent. These substances is suggested for follow up and in that case, an in depth evaluation is recommended. (4. Evaluation of the screening reports).

PCN

PCNs are classified as PBT chemicals and share the similar toxic mechanisms and effects as PCDD/Fs due to their structure. PCNs were found with high detection frequency in all different environmental samples analysed and long-range atmospheric transport was identified as the most likely significant pathway of PCNs from e.g. source to background areas. Several PCNs have been pre-registered at ECHA in agreement with the Reach legislation for production or import of chemical substances. Several PCN congeners are listed on the OSPAR list of chemicals for priority action (OSPAR 2011). (See Appendix 3, Table 1 for comments regarding further need for screening or regular monitoring.)

HBB and PBEB (emerging BRFs)

HBB and PBEB are brominated flame retardants that are used today. They have high log Kow and they are persistent, but they may undergo debromination in the environment. HBB and PBEB are found in WWTP sludge, and also in sediment from a recipient lake of a WWTP. The substances occur in high concentrations in air and dust from the recycle industry and they may be emitted to the environment to air and water. HBB and PBEB were detected in higher concentrations in fish compared to the PBDEs in the screening study evaluated here and have also frequently been found in biota in a Nordic screening study (Schlabach et al. 2011). PBEB has also been found in one human sera sample (present screening report). HBB and PBEB have not been measured in surface water and MEC/PNEC could not be calculated and they do not occur in the ECHA data base. The occurrence of these emerging BFRs in biota samples from regional sites shows that these chemicals are further spread to the environment. There is a need for a more in depth evaluation of these compounds.

OTNE and AC

The usage of OTNE and AC is increasing in Sweden and these substances are frequently detected in effluents from WWTPs. Ecotoxicological data are limited for these chemicals. They have high log Kow and have therefore a potential to bioaccumulate in biota, but the modelled BCF values are low. They have been found in human breast milk but in few samples. OTNE was only found in 8% of the fish samples from WWTP recipient. Based on the data in the screening, calculated MEC/PNEC ratios suggest that OTNE may pose a threat to the aquatic environment close to point sources. However, the PNEC is only based on one modelled value which makes the calculation highly uncertain. We suggest that

these substances are considered for further in depth risk evaluation due to increased usage and lack of ecotoxicological data.

TMDD

TMDD was not found in background areas but frequently detected in effluents from WWTPs which probably are the major emission source. The concentrations in surface water do not indicate an environmental risk and TMDD has low potential to bioaccumulate. However, its occurrence in Swedish products has increased.

4 Evaluation of the screening reports

Forty screening reports were evaluated (Table 2). Nine studies, of which two concern fragrances, were prioritized for further screening. For comments concerning studies not selected for a new screening, see Appendix 3, Table 1. More extended comments for the nine studies that were prioritized for further screening, are presented below in priority order where the first three are of most relevance. More information concerning the screening studies and data on individual substances is available in the original screening reports.

National screening, 2009, UV filters

The results show that the occurrence of UV-filters is widespread in the Swedish aquatic environment, both in background and in urban areas. Furthermore, several of the included UV-filters pose a potential risk as MEC/PNEC ratios (QSAR derived PNEC) were above 1 for several UV-filters and the highest concentrations occur during the reproductive season. During recent years the potential for endocrine disrupting properties of UV-filters has been raised. Given the fact the generally high awareness of the risk for skin cancer, the use is not likely to decrease. The industry of personal care products may be responsive to new information on risk of these substances. A new screening should therefore be preceded by a review concerning which substances that are used, their ecotoxicity and persistence.

National screening, 2010, Pharmaceuticals

There is an increasing amount of evidence that pharmaceuticals may cause effects in the environment. As one consequence, three pharmaceuticals are on the watch-list, that aims to support the functioning of the WFD by targeted EU-wide monitoring of substances of possible concern, to support the prioritization process in future reviews of the priority substances list (COM(2011)876).

Thus, more knowledge is requested concerning environmental concentrations in different matrixes and the effects, including end-points such as behaviour changes. In a recent screening conducted in Norway pharmaceuticals were found in both urban and remote air samples, which is surprising considering the water-bound nature and application of pharmaceutical compounds (Miljødirektoratet 2013). In comparison with other groups of substances, the authors where surprised by the number of pharmaceuticals (> 30) generally

found in biota samples; prawns, fish and birds. In a recent EU-wide monitoring survey on emerging polar organic compounds, several pharmaceuticals were identified in WWTP effluents to be of high relevance (Loos et al. 2013).

The results of the Swedish screening study show that the removal rates of some pharmaceuticals in WWTPs were difficult to determine. Of the 51 pharmaceuticals assessed 17 had negative removal rates. Method development and a follow-up screening would contribute to a better assessment of predicted environmental concentrations. Furthermore, the knowledge of the fate of pharmaceuticals in sewage sludge, in soil receiving sludge amendments and subsequent uptake in biota is limited.

National screening, 2008, Musk substances and metabolites
National screening, 2011 Fragrances; OTNE, acetyl cedrene and diphenyleter

Musk substances and metabolites were screened in 2008 and in the national screening study 2010 where galaxolide and the metabolite galaxolide lactone were included (National screening, 2011 Fragrances; OTNE, acetyl cedrene and diphenyleter).

Fragrances and their metabolites are widespread in the environment and were detected in surface water, sediment, fish and in soil to which sludge has been amended. Many of these substances can bioaccumlate and were also reported in human breast milk, *e.g.* OTNE. In the screening from 2010, galaxolide and galaxolide lactone were in contrast to the previous screening found in remote areas, indicating atmospheric long range transport and persistence.

We recommend that the development of the use and application of this group of chemicals are followed. The industry of personal care products is likely to be responsive to new information on risk of these substances, thus, a limited literature review may forgo a follow-up screening for selection of substances. Fragrances occur in human samples and screening in human breast milk should therefore be repeated. Furthermore, we suggest that the air compartment will be included.

Given the fact that the ecotoxicological data are limited for many of these substances, studies on the effects are needed and the potential for additive effects considered. The screening suggest a study of how operating parameters in a sewage treatment plant affect the levels of musk substances in sludge and outgoing water, and a mass balance study to evaluate the fate for different substances. The fate of musk substances that has been amended to soils was studied in the screening study 2008, but the results were ambiguous and needs to be further assessed.

National screening, 2011, Benzothiazoles, benzenediamines, dicyclohexylamine and benzotriazoles

This screening was carried out in collaboration with the research program ChEmiTecs (Organic **Che**micals **Emi**tted from **Tec**hnosphere Articles, www.chemitecs.se) as a strong need for environmental data of these chemicals was identified.

The results of the screening were reflected by analytical challenges for some of the included substances as well as lack of supporting data. For instance, the benzenediamine N,N'-

bis(1,4-dimetylpentyl)-1,4-benzenediamine (BBD) could not be analysed, the volume used in Sweden was confidential and no toxicity data could be found in available literature. Furthermore, the benzothiazole N-tert-butylbenzothiazole-2-sulphenamide (TBS), and the benzotriazole 2-tert-butyl-6-(5-chlorobenzotriazol-2-yl)-4-methylphenol (UV-326) could not be analysed and di(benzothiazole-2-yl)disulphide (DBD) could not be analysed in biota samples.

The results of the screening show a widespread occurrence of benzotriazoles in the environment, both at background and urban areas. However, as no toxicity or ecotoxicity data were found for any of the benzotriazoles in the available literature, no risk assessment could be made. The benzotriazoles, UV-329 (Cas nr 3147-75-9) and UV-327 (Cas nr 3864-99-19), were detected in three out of four fish samples, both at urban and background locations.

For the benzenediamine N-1,3-dimetthylbutyl-N'-phenyl-p-phenylenediamine (DPP) the risk quotient (MEC/PNEC) for surface was > 1 in river Viskan for the maximum concentration, although not for the median (< 0.1). DPP, N-cyclohexylbenzothiazole-2-sulphenamid (CBS) N, N-decyclohexylbenzothiazole-2-sulphenamid (DBS) and benzothiazole-2-thiol (MBT) are high production volume (HPV) chemicals. According to data in the literature DPP is relatively rapidly degraded in the environment. The production, use and recycling of benzothiazoles may cause exposure of a number of their derivates in the environment, both as a consequence of the mixture of derivates e.g. in tires and degradation in the environment. For DPP and benzothiazoles the possibility to assess the risk of combined exposure of degradation products and derivates should be considered (OECD SIDS 2004, EC 2008c).

Benzothiazole-2-thiol (MBT) was the benzothiazole with the highest detection frequency in all matrices, including biota, although literature data indicate low potential for bioaccumulation (EC 2008c). In addition to the production and usage, MBT may also be one of the degradation products of CBS, DBS and N-tert-butylbenzothiazole-2-sulphenamid (TBS). MBT may be further degraded to 2-benzothizolone and benzothiazole, which are among the most persistent benzothiazoles. In a recent risk assessment of CBS it was concluded that environmental monitoring data is lacking and suggested that 2-benzothizolone and benzothiazole should be considered in monitoring programs (EC 2008c).

Given the analytical difficulties and the limited knowledge about these substances and concentrations in the environment, a follow up screening is suggested. Benzothiazoles and benzotriazoles have recently been reported in different matrixes in a non-targets screening in Norway (Miljødirektoratet, 2013). Also, in a recent EU-wide monitoring survey on emerging polar organic compounds in WWT effluents, benzotriazoles were identified as one of the most relevant groups of compounds with the highest median concentration levels (Loos et al 2013). Before a new screening study is performed the need for method development should be assessed and available data on ecotoxicity, degradation and the selection of substances reviewed.

National screening, 2007, Platinum group metals

The screening study included the platinum group elements (PGEs) platinum (Pt), palladium (Pd) and rhodium (Rh). The authors conclude that the results in this study do not indicate that PGEs pose a risk to humans or the aquatic ecosystem, but that this conclusion is based on lack of reference values and proper risk assessments for humans as well as biota. The mobility of PEGs in both air and water indicate a need for further evaluation of the fate of these substances. Pd occurs in more mobile/soluble/bioavailable forms compared to Pt and Rh. Consequently, in contrast to Pt and Rh, that where almost never detected in the biological samples (fish, moose, cow, white tailed eagle and plants), Pd was consistently detected above the limit of quantification. Also, the concentrations of Pd in groundwater were higher than in run-off water ponds. The lack of risk assessments and reference data makes it difficult to evaluate the significance of these findings.

National screening, 2007, Organophosphate esters in human breast milk and in fish from Swedish lakes and coastal areas

The results from this study indicate that there is a chronic exposure to organophosphate esters (OP) in the environment. The authors conclude that the knowledge of the effects and the fate of these substances are limited and that more data concerning sources, degradation and uptake in biota are needed. According to the data in the literature, tributylphosphate (TBP) has a low BCF for fish, and should, as it is short-chained, be easily degraded. However, TBP is one of the most commonly detected organophosphates in fish as well as in human breast milk. These findings are confirmed by a recent screening in Norway where TBP was detected in fish as well as in birds (Miljødirektoratet, 2013). In the Norwegian study organophosphates were also found in remote air samples. In a recent EU-wide monitoring survey on emerging polar organic compounds in WWT effluents, several organophosphate esters were identified as one of the most relevant groups of compounds with the highest median concentration levels (Loos et al 2013). Tris(2-chloroetyl)phosphate (TCEP) has since the Swedish screening study become listed on Reach candidate list, and as a consequence, tris(2-kloroisopropyl)phosphate (TCPP) has become more prominent in (Loos et al 2013). Given the fact that the screening was conducted in 2007 a literature survey is suggested before decision in a follow up on the selection of substances and environmental matrices.

Air and dust are likely to be more important exposure routes for humans than food intake of *e.g.* fish. At present there are at least two ongoing research projects that may contribute to more knowledge about indoor exposure of these compounds to humans. The research project INFLAME aims to further understanding of how and to what extent flame retardant chemicals used in every-day consumer goods and construction materials enter humans and of the risk to health that such exposure presents. The research project "Mixture assessment of Endocrine Disrupting Compounds (EDC) with emphasis on thyroidogenicity – using cats as model for human indoor exposure" (MISSE; 2012-2017), will contribute to clarify the importance of dust as exposure route.

National screening, 2008, Exposure and effect screening in urine of women

The results show that urine is clearly a good matrix for human biomonitoring of organic chemicals and metals. The authors suggested follow-up studies on a selection of PAH and phthalate metabolites. If possible, the test group should be larger and also include men to better establish factors influencing metabolite concentration in urine. We suggest that based on the outcome of other screening studies metabolites of organic chemicals and metals should be included in a follow up. For instance, given the ongoing national screening of antibacterial substances (2013), we recommend that silver and metabolites of fragrances are considered.

National screening, 2007, Octadecyl 3-(3,5-di-tert-butyl-4-hydroxyphenyl) propionate

Fish seems to be the most sensitive matrix for the detection of octadecyl 3-(3,5-di-tert-butyl-4-hydroxyphenyl)propionate. Available data for the aquatic environment indicate that the chemical has low acute toxicity but no chronic tests have been done, and, thus, it is not possible to determine the risk.

Octadecyl 3-(3,5-di-tert-butyl-4-hydroxyphenyl)propionate, and other antioxidants of similar structure are used in relatively large amounts. According to the data in the SPIN database (December 2013), the usage is at the same level as presented in the report (100-150 tonnes/yr). However, the number of preparations steadily increases (Year: 2011: 337). Several degradation products have been identified. Given the persistent properties and the large production volume a follow up study is recommended, also including degradation products. In the screening report it is suggested to also include other antioxidants of similar chemical structure and their degradation products.

5 Need for method development

Chemical substances that have been identified for method development either in the process of selection of substances for risk evaluation or in the screening reports are listed in Appendix 3, Table 2.

6 Conclusions

An important factor to consider when evaluating screening data is that in general relatively few samples have been included in the study for each matrix and at each sampling location. Since the chemicals selected for a screening often are emerging substances, ecotoxicity data is generally lacking. Thus, if risk assessment is requested, the selection of matrixes should be considered based on the need of data.

Out of 540 substances, 22 were finally selected for risk evaluation. Most of these substances are used today and available data regarding production and usage indicates an increase over recent years. Since one of the criteria for the selection of these substances for risk evaluation was "high detection frequency in biota", they are mainly associated with physico-chemical properties such as high log Kow. Surface water have usually not been analysed in the screening studies and it was therefore not possible to calculate MEC/PNEC ratios for all substances based on environmental data. Other environmental compartments besides surface water could also be considered for risk evaluation.

In many cases the risk evaluation is based on modelled data (e.g. half-life, PNEC, BCF) and a more in depth search in the literature for experimental data is recommended. For example, in the risk evaluation the modelled data indicated a low BCF despite a high detection frequency in the screening studies (see for instance the benzothiazoles, UV filters, fragrances and organophosphate esters). Thus, the fact that these substances are detected in biota indicates a high potential to bioaccumulate.

Forty screening reports were evaluated in order to recommend follow up studies. In many cases follow up studies have already been done or is ongoing. Nine studies where prioritized for further screening, of which UV-filters, fragrances and pharmaceuticals were considered to be most important. There is no indication that the application of these groups of substances will decrease.

Chemicals used in personal care products were also identified as important to follow up in new studies due to broad application and requested properties, *e.g.* persistence. The results from the screening studies of UV-filters and fragrances show that these substances are widespread and may pose a potential risk for environment. A new screening should be preceded by a literature review regarding usage and relevant substances.

It is today well-known that pharmaceuticals may cause effects in the environment, and it has been reported that they may bioaccumulate as far up in the food chain as birds (Miljødirektoratet 2013). The fact that three pharmaceuticals are on the watch-list of the Water Framework Directive is a strong indication that more data is needed concerning these substances.

For the remaining five screening studies prioritized for follow up (*e.g.* platinum group metals, organophosphate esters), the lack of ecotoxicological data, methodological challenges and the need to include other substances with similar properties are important factors in order to make an environmental risk assessment.

7 References

7.1 Literature

COM(2011)876 final. Proposal for a directive of the European parliament and of the council amending Directives 2000/60/EC and 2008/105/EC as regards priority substances in the field of water policy

EC (2008a). European Union Risk Assessment Report 1,3,4,6,7,8-hexahydro-4,6,6,7,8,8-hexamethylcyclopenta-γ-2-benzopyran (1,3,4,6,7,8-hexahydro-4,6,6,7,8,8-hexamethylin-deno[5,6-c]pyran - HHCB) http://echa.europa.eu/documents/10162/947def3b-bbbf-473b-bc19-3bda7a8da910

EC (2008b). European Union Risk Assessment Report 1-(5,6,7,8-tetrahydro-3,5,5,6,8,8-hexamethyl-2-napthyl)ethan-1-one (AHTN) http://echa.europa.eu/documents/10162/26e223a9-eda9-4e79-8c4d-650d2a3c1124

EC (2008c). European Union Risk Assessment Report N-Cyclohexylbenzothiazol-2-sulphenamid http://echa.europa.eu/documents/10162/52baf757-f74c-4993-84c8-3bb72195cf55 Download 2014-01-09

Jörundsdóttir, H. et al. (2006).Temporal trend of Bis(4-chloropenyl) sulfone, PCB, methylsulfonyl-DDE and -PCBs in Baltic guillemot (Uria aalge) egg1971-2001 – A comparison to 4,4'-DDE and PCB trends.Environmental Pollution, 141, 226-237

Larsson, C., et al. (2004). Enantiomeric Specificity of Methylsulfonyl-PCBs and distribution of Bis(4-chloropenyl) sulfone, PCB, and DDE methylsulfone in grey seal tissues. Environmental Science and Technology, 38, 4950-4955

Loos R et al (2013) EU-wide monitoring survey on emerging polar organic conaminats in wastewater treatment plant effluents. Water research 47, 6475-6482.

Miljødirektoratet (2013) Non-target screening – A powerful tool for selecting environmental pollutants. Rapport M-27

Norström, K. et al. (2004) Bis(4-chlorophenyl) sulfone (BCPS) in Swedish marine and fresh water wildlife – a screening study. Environmental International, 30, 667-674

OECD SIDS (2004) N-(1,3-Dimethylbutyl)-N'-phenyl-1,4-phenylenediamine, CAS No: 793-24-8. Initial Assessment report. UNEP Publications

OECD (2009) Guidance document for using the OECD (Q)SAR Application Toolbox to develop chemical categories according to the OECD Guidance on Grouping of Chemicals. Series on Testing and Assessment. No 102 ENV/JM/MONO(2009)5

OSPAR (2011) http://ospar.org/content/content.asp?menu=00940304440000_000000_000000

Schlabach et al. Bromianted Flame Retardants in the Nordic Environment, TemaNord 2011:528.Nordic Council of Ministers, Copenhagen 2011.

SWECO 2010. SWECO Environmental Screening Report 2008:8. Evaluation of results from Swedish screening studies; Suggestions for a methodology

7.2 Databases

ECHA (European Chemicals Agency), Registered substances:
http://www.echa.europa.eu/web/guest/information-on-chemicals/registered-substances?p_p_id=registeredsubstances_WAR_regsubsportlet&_registeredsubstances_WAR_regsubsportlet_name-sc=&_registeredsubstances_WAR_regsubsportlet_ec-number-sc=95-33-0&_registeredsubstances_WAR_regsubsportlet_cas-number-sc=95-33-0&_registeredsubstances_WAR_regsubsportlet_sc=true&_registeredsubstances_WAR_regsubsportlet_do-search Read: 2014-02-11

ESIS (European chemical Substances Information System):
http://esis.jrc.ec.europa.eu/index.php?PGM=hpv Read: 2013-12-14

Swedish EPA data base (www.ivl.se)

OECD, Existing Chemicals Database: http://webnet.oecd.org/hpv/ui/Search.aspx Read: 2013-12-14

SPIN - database on the use of Substances in Products in the Nordic Countries (www.kemi.se)

7.3 Webb addresses

CHEMITECS www.chemitecs.se

INFLAME http://www.birmingham.ac.uk/research/activity/inflame/index.aspx

MISSE; 2012-2017 http://www.mmk.su.se/misse/about-misse/vad-ar-misse

PBT profiler: http://www.pbtprofiler.net

Toxicity Estimation Software Tool (T.E.S.T.):
http://www.epa.gov/nrmrl/std/qsar/qsar.html

VEGA: http://www.vega-qsar.eu

Appendix 1.

Table1. Substances/substance groups included in Swedish National screening studies 2007-2012.

	Substance	CAS no.
1	1,1,1-Trichloroethane	71-55-6
2	1,1,2,2-Tetrachlorethane	79-34-5
3	1,1,2-Trichloroethane	79-00-5
4	1,1-Dichloroethane	75-34-3
5	1,2,3,4,5-Pentachloronaphthalene/1,2,3,6,7-Pentachloronaphthalene	1321-64-8
6	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin	3268-87-9
7	1,2,3,4,6,7,8-Heptabromodibenzodioxin	110999-47-8
8	1,2,3,4,6,7,8-Heptabromodibenzofuran	107555-95-3
9	1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4
10	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	35822-46-9
11	1,2,3,4,6-Pentachloronaphthalene	67922-26-3
12	1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673-89-7
13	1,2,3,4,7,8-Hexabromodibenzofuran	107555-94-2
14	1,2,3,4,7,8-Hexabromodibenzo-p-dioxin+1,2,3,6,7,8-Hexabromodibenzo-p-dioxin	
15	1,2,3,4,7,8-Hexachloro-dibenzofuran	70648-26-9
16	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	39227-28-6
17	1,2,3,5,6-Pentachloronaphthalene	150224-18-3
18	1,2,3,5,7-Pentachloronaphthalene	53555-65-0
19	1,2,3,5,8-Pentachloronaphthalene	150224-24-1
20	1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9
21	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	57653-85-7
22	1,2,3,6,8-Pentachloronaphthalene	150224-23-0
23	1,2,3,7,8,9-Hexabromodibenzo-p-dioxin	110999-46-7
24	1,2,3,7,8,9-Hexachlorodibenzofuran	72918-21-9
25	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	19408-74-3
26	1,2,3,7,8-Pentabromodibenzofuran	107555-93-1
27	1,2,3,7,8-Pentachlorodibenzofuran	57117-41-6
28	1,2,3,7,8-Pentachlorodibenzo-p-dioxin	40321-76-4
29	1,2,3,7,8-Pentachloronaphthalene	150205-21-3
30	1,2,3,7,8-Pentbromodibenzo-p-dioxin	109333-34-8
31	1,2,3-Trichlorobenzene	87-61-6
32	1,2,4,5,6-Pentachloronaphthalene	150224-20-7
33	1,2,4,5,7-Pentachloronaphthalene	150224-19-4
34	1,2,4,5,8-Pentachloronaphthalene	150224-25-2
35	1,2,4,6,7-Pentachloronaphthalene	150224-17-2
36	1,2,4,6,8-Pentachloronaphthalene	150224-22-9
37	1,2,4,7,8-Pentachloronaphthalene	150224-21-8
38	1,2,4-Trichlorobenzene	120-82-1
39	1,2,5,6-Tetrachloronaphthalene	67922-22-9
40	1,2,5,6,9,10-Hexabromocyclododecane	3194-55-6
41	1,2-Acenaphthendione	82-86-0
42	1,2-Dibromo-4-(1,2-dibromoethyl)cyclohexane	3322-93-8
43	1,2-Dichloroethane	107-06-2
44	1,2-Dichloropropane	78-87-5
45	1,3,5,7-Tetrachloronaphthalene	53555-64-9
46	1,3,5-Trichlorobenzene	108-70-3
47	1,3-Dinitropyrene	75321-20-9
48	1,6-Dinitropyrene	42397-64-8
49	1-Benzothiophene	11095-43-5
50	1-Hydroxy phenanthrene (ng/g)	2433-56-9
51	1-Hydroxy pyrene (ng/g)	5315-79-7
52	1-Hydroxy-9-fluorenone	6344-60-1
53	1-Hydroxychrysene	63019-38-5
54	1-Hydroxynaphthalene	90-15-3
55	1-Nitropyrene	5522-43-0
56	2-(2H-Benzotriazol-2-yl)-4-(1,1,3,3-tetramethylbutyl)phenol	3147-75-9
57	2,2'-Methylenebis(6-(2H-benzotriazol-2-yl)-4-(1,1,3,3-tetramethylbutyl)phenol)	103597-45-1
58	2-(2H-Benzotriazol-2-yl)-4,6-bis(1-methyl-1-phenylethyl)phenol	70321-86-7
59	2-(2H-Benzotriazol-2-yl)-4,6-ditertpentylphenol	25973-55-1
60	2-(Benzotriazol-2-yl)-4,6-di-tert-butylphenol	3846-71-7
61	2-(Benzotriazol-2-yl)-4-methylphenol	2440-22-4
62	2,2',3,4,4',5,5'-Heptachlorobiphenyl (CB180)	35065-29-3
63	2,2',3,4,4',5',6-Heptabromodiphenyl ether (PBDE183)	207122-16-5
64	2,2',3,4,4',5'-Hexabromodiphenyl ether (PBDE138)	182677-30-1
65	2,2',3,4,4',5'-Hexachlorobiphenyl (CB138)	35065-28-2
66	2,2',3,4,4'-Pentabromodiphenyl ether (PBDE85)	182346-21-0

	Substance	CAS no.
67	2,2',4,4',5,5'-Hexabromodiphenyl ether (PBDE153)	68631-49-2
68	2,2',4,4',5,5'-Hexachlorobiphenyl (CB153)	35065-27-1
69	2,2',4,4',5,6'-Hexabromodiphenyl ether (PBDE154)	207122-15-4
70	2,2',4,4',5-Pentabromodiphenyl ether (PBDE99)	60348-60-9
71	2,2',4,4',6-Pentabromodiphenyl ether (PBDE100)	189084-64-8
72	2,2',4,4'-Tetrabromodiphenyl ether (PBDE47)	5436-43-1
73	2,2',4,5,5'-Pentachlorobiphenyl (CB101)	37680-73-2
74	2,2',4-Tribromodiphenyl ether (PBDE17)	147217-75-2
75	2,2',5,5'-Tetrachlorobiphenyl (CB52)	35693-99-3
76	2,2´-Dihydroxy-4-metoxybensophenone	131-53-3
77	2,2',3,3',4,4',5',6-Octabromodiphenylether	32536-52-0
78	2,2-Dibromo-2-cyanoacetamide	10222-01-2
79	2,3,3',4,4',5,6-Heptabromodiphenyl ether (PBDE190)	189084-68-2
80	2,3',4,4',5-Pentachlorobiphenyl (CB118)	31508-00-6
81	2,3',4,4'-Tetrabromodiphenyl ether (PBDE66)	189084-61-5
82	2,3,4,6,7,8-Hexachlorodibenzofuran	60851-34-5
83	2,3',4',6-Tetrabromodiphenyl ether (PBDE71)	189084-62-6
84	2,3,4,7,8-Pentabromodibenzofuran	131166-92-2
85	2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4
86	2,3,7,8-Tetrabromodibenzo-4-dioxin	50585-41-6
87	2,3,7,8-Tetrabromodibenzo-furan	
88	2,3,7,8-Tetrachloro-dibenzo[b,e][1,4]dioxin	1746-01-6
89	2,3,7,8-Tetrachloro-dibenzofuran	51207-31-9
90	2,3,7,8-Tetrachloro-dibenzothiophene	133513-17-4
91	2,4,4'-Tribromodiphenyl ether (PBDE28)	41318-75-6
92	2,4,4'-Trichlorobiphenyl (CB28)	7012-37-5
93	2,4,7,9-Tetramethyl-5-decyne-4,7-diol	126-86-3
94	2,4-Dihydroxybensophenone	131-56-6
95	2,4-Di-tert-butyl-6-(5-chlorobenzotriazol-2-yl)phenol	3864-99-1
96	2.3-Benzofuran	271-89-6
97	2+3-Nitrofluoranthene altcas: 892-21-7	13177-29-2
98	2-Amino-musk ketone	
99	2-Amino-musk xylene	107342-67-6
100	2-Ethylhexyl diphenyl phosphate	1241-94-7
101	2-Hydoxychrysene	

	Substance	CAS no.
102	2-Hydroxy naphthalene	135-19-3
103	2-Hydroxy-9-fluorenone	6949-73-1
104	2-Hydroxyfluorene	2443-58-5
105	2-Hydroxyphenanthrene	605-55-0
106	2-Mehtyl-9,10-anthraquinone	84-54-8
107	2-Mercaptobenzothiazole	149-30-4
108	2-Methyl-pentane	73513-42-5
109	3,6,9,12-Tetraazatetradecane-1,14-diamine Pentaetylenehexamine	4067-16-7
110	3-Benzylidene camphor	15087-24-8
111	3-Hydroxy benzo(a)pyrene (ng/g)	13345-21-6
112	3-Hydroxychrysene	63019-39-6
113	3-Hydroxyphenanthrene	605-87-8
114	3-Iodo-2-propynyl butyl carbamate	55406-53-6
115	3-Methyl-pentane	96-14-0
116	3-Nitrobenzanthrone	17117-34-9
117	4-Amino-musk xylene	107342-55-2
118	4H-Cyclopenta[def]phenanthren-4-one	5737-13-3
119	4-Hydroxychrysene	63019-40-9
120	4-Hydroxyphenanthrene	7651-86-7
121	4-Methyl benzylidene camphor, Eusolex 6300	38102-62-4
122	4-Nitropyrene	57835-92-4
123	4-n-Nonylphenol	104-40-5
124	4-n-Octylphenol	1806-26-4
125	4-Nonylphenol, branched	84852-15-3
126	4-Nonylphenol-diethoxylate	9016-45-9
127	4-Nonylphenol-mono-ethoxylate	9016-45-9
128	4-Nonylphenol-triethoxylate	
129	4-t-Octylphenol	140-66-9
130	4-t-Octylphenol-diethoxylate	9063-89-2
131	4-t-Octylphenol-mono-ethoxylate	9063-89-2
132	4-t-Octylphenol-triethoxylate	
133	5H-Benzo(a)carbazole	243-28-7
134	6H-Benzo[cd]pyren-6-one	3074-00-8
135	7H-Benz(de)anthracene-7-one	82-05-3
136	7H-Dibenzo(c,g)carbazole	194-59-2
137	7-Nitrobenz(a)anthracene	20268-51-3
138	9,10-Anthraquinone	84-65-1
139	9-Fluorenone	486-25-9

	Substance	CAS no.
140	9-Hydroxyfluorene	1689-64-1
141	9-Hydroxyphenanthrene	484-17-3
142	9-Nitroanthracene	602-60-8
143	Acenaphthene	83-32-9
144	Acenaphthylene	208-96-8
145	Acetaldehyde	75-07-0
146	Aceton	67-64-1
147	Acetylsalicylic Acid	50-78-2
148	Acridine	260-94-6
149	Alachlor	15972-60-8
150	Alfuzosin	81403-80-7
151	Aliphatic hydrocarbons >C10-C12	
152	Aliphatic hydrocarbons >C12-C16	
153	Aliphatic hydrocarbons >C16-C35	
154	Aliphatic hydrocarbons >C5-C8	
155	Aliphatic hydrocarbons >C8-C10	
156	Alkylated, hydrated naphtalene	
157	alpha-Endosulfan	959-98-8
158	alpha-HCH (alpha-hexachlorocyclohexane)	319-84-6
159	Alpha-pinene	80-56-8
160	Alprazolam	28981-97-7
161	Aluminium	7429-90-5
162	Amiodarone	1951-25-3
163	Amitryptiline	50-48-6
164	Anthracene	120-12-7
165	Aromatic hydrocarbons >C8-C10	
166	arsenic	7440-38-2
167	Atenolol	29122-68-7
168	Atorvastatin	134523-00-5
169	Atracurium	64228-81-5
170	atrazine	1912-24-9
171	Azelastine	58581-89-8
172	Azithromycin	83905-01-5
173	Barium	7440-39-3
174	Beclomethasone	4419-39-0
175	Benz(a)acridine	225-11-6
176	Benz(a)anthracen-7,12dione	2498-66-0
177	Benzene	71-43-2

	Substance	CAS no.
178	Benzene, pentabromo(2,4,5-tribromophenoxy)-(PBDE 203)	337513-72-1
179	Benzo(b)naphto(2.1-d)thiophene	239-35-0
180	Benzo-(b)naphtofuran	
181	Benzo[a]anthracene	56-55-3
182	Benzo[a]pyrene	50-32-8
183	Benzo[b]fluoranthene	205-99-2
184	Benzo[ghi]perylene	191-24-2
185	Benzo[k]fluoranthene	207-08-9
186	Benzophenone-3; 2-Hydroxy-4-methoxy-benzophenone; Eusolex 4360	131-57-7
187	beta-Endosulfan	33213-65-9
188	beta-HCH (beta-hexachlorocyclohexane)	319-85-7
189	Biperiden	514-65-8
190	Bis(4-chlorophenyl) sulfone	80-07-9
191	Bis-Methylethyl-biphenyl	
192	Bisoprolol	66722-44-9
193	Brodifacoum	56073-10-0
194	Bromadiolone	28772-56-7
195	Bromocriptine	25614-03-3
196	Buprenorphine	52485-79-7
197	Bupropion	34911-55-2
198	Butyl benzyl phthalate	85-68-7
199	Butyl diphenyl phosphate	2752-95-6
200	Butylmethoxydibenzoylmethane; Avobenzone; Eusolex 9020	70356-09-1
201	Cadmium	7440-43-9
202	Calcium	7440-70-2
203	Carbamazepine	298-46-4
204	Carbazole	86-74-8
205	Carbon tetrachloride	56-23-5
206	Cashmeran	33704-61-9
207	Celestolide	13171-00-1
208	Chlorfenvinphos	470-90-6
209	Chlorhexidine	55-56-1
210	Chloroform	67-66-3
211	Chlorophacione	3691-35-8
212	Chlorothalonil	1897-45-6
213	Chlorpromazine	50-53-3
214	Chlorpyrifos	2921-88-2
215	Chromium	7440-47-3

	Substance	CAS no.
216	Chrysene	218-01-9
217	Cilazapril	88768-40-5
218	Ciprofloxacin	85721-33-1
219	Cis-1,2-dichloroethene	156-59-2
220	Citalopram	59729-33-8
221	Clarithromycine	81103-11-9
222	Clemastine	15686-51-8
223	Clindamycin	18323-44-9
224	Clomipramine	303-49-1
225	Clonazepam	1622-61-3
226	Clotrimazol	23593-75-1
227	Cobalt	7440-48-4
228	Codeine	76-57-3
229	Copper	7440-50-8
230	Coumatetralyl	5836-29-3
231	Creatinin	60-27-5
232	cyclo-Hexane	110-82-7
233	Cypermetrin	52315-07-8
234	Cyproheptadine	129-03-3
235	DAS1	16090-02-1
236	DAS2	16470-24-9
237	Decabromodiphenyl ether (PBDE209)	1163-19-5
238	Decabromodiphenylethane	84852-53-9
239	Decalin	91-17-8
240	Dechlorane plus	13560-89-9
241	Dechlorane plus, anti	135821-74-8
242	Dechlorane plus, syn	135821-03-3
243	delta-HCH (delta-hexachlorocyclohexane)	319-86-8
244	Desloratidin	100643-71-8
245	Di-(2-Ethylhexyl)-phthalate	117-81-7
246	Di(benzothiazol-2-yl) disulphide	120-78-5
247	Dibenz(a,h)acridine	226-36-8
248	Dibenz[a,h]anthracene	53-70-3
249	Dibenzofuran	132-64-9
250	Dibenzothiophene	132-65-0
251	Dibutyl phenyl phosphate	2528-36-1
252	Dibutyltin (DBT) - non-specified atoms/molecules bound to dibutyltin	GM
253	Dichlofluanid	1085-98-9

	Substance	CAS no.
254	Dichlorobenzenes	
255	Dichloromethane	75-09-2
256	Dichloronaphthalenes	28699-88-9
257	Diclofenac	15307-86-5
258	Dicyclohexylamine	101-83-7
259	Dicycloverin	77-19-0
260	Diethanolamine	111-42-2
261	Diethylamino hydroxybenzoyl hexyl benzoate	302776-68-7
262	Diethyldithiophosphate	298-06-6
263	Diethylentriaminepentaacetic acid	67-43-6
264	Diethylphosphate	598-02-7
265	Diethylthiophosphate	5871-17-0
266	Difenacoum	56073-07-5
267	Dihydroergotamine	511-12-6
268	Diltiazem	42399-41-7
269	Dimethyl sulfide	75-18-3
270	Dimethyldithiophosphate	756-80-9
271	Dimethylphosphate	813-78-5
272	Dimethylthiophosphate	
273	Dioctyltin	
274	Diphenadione	82-66-6
275	Diphenhydramine	58-73-1
276	Diphenyl ether	101-84-8
277	Diphenyltin- non-specified atoms/molecules bound to diphenyltin	GM
278	Dipyridamole	58-32-2
279	Diuron	330-54-1
280	Donepezil	120014-06-4
281	DP anti / DP tot	
282	DSBP (Distyrylbiphenylsulfonate)	27344-41-8
283	Duloxetine	116539-59-4
284	Eprosartan	133040-01-4
285	Erythromycin	114-07-8
286	Estradiol	50-28-2
287	Ethinylestradiol	57-63-6
288	Ethyl tert-butyl ether (ETBE)	637-92-3
289	Ethylbenzene	100-41-4
290	Ethylendiamine-tetraacetic acid	60-00-4
291	Ethylhexyl dimethyl -p-aminobenzoat	21245-02-3

	Substance	CAS no.
292	Ethylhexyl methoxycinnamate; Eusolex 2292	5466-77-3
293	Ethylhexyl salicylate	118-60-5
294	Etonogestrel	54048-10-1
295	Ezetimibe	163222-33-1
296	FB28	4193-55-9
297	FB85	12224-06-5
298	Felodipine	72509-76-3
299	Fentanyl	437-38-7
300	Fexofenadine	83799-24-0
301	Finasteride	98319-26-7
302	Flecainide	54143-55-4
303	Flocoumafen	90035-08-8
304	Fluconazole	86386-73-4
305	Flunitrazepam	1622-62-4
306	Fluoranthene	206-44-0
307	Fluorene	86-73-7
308	Fluoxetine	54910-89-3
309	Flupentixol	2709-56-0
310	Fluphenazine	69-23-8
311	Flutamide	13311-84-7
312	Formaldehyde	50-00-0
313	Galaxolide	1222-05-5
314	Galaxolide lactone	
315	gamma-HCH (gamma-hexachlorocyclohexane)	58-89-9
316	Glibenclamide	10238-21-8
317	Glimepiride	93479-97-1
318	Glutaraldehyde	111-30-8
319	Grenad nonylfenol	90481-04-2
320	Haloperidol	52-86-8
321	Heptachlorodibenzothiophenes	134734-82-0
322	Hexabromobenzene	87-82-1
323	Hexachlorobenzene	118-74-1
324	Hexachlorobutadiene	87-68-3
325	Hexachlorodibenzothiophenes	
326	Homosalate; 3,3,5-Trimehtyl cyclohexyl salicylate	118-56-9
327	Hydrated, methylated isopropyl phenanthrene	
328	Hydroxyzine	68-88-2

	Substance	CAS no.
329	Ibuprofen	15687-27-1
330	Ibuprofen-COOH	
331	Ibuprofen-OH	156-86-5
332	Indane	496-11-7
333	Indeno[1,2,3-cd]pyrene	193-39-5
334	Indole	120-72-9
335	Irbesartan	138402-11-6
336	Iron	7439-89-6
337	Isoamyl p-methoxycinnamate	71617-10-2
338	Isocyclemone E	54464-57-2
339	iso-Octane	540-84-1
340	Isoproturon	34123-59-6
341	Isoquinoline	119-65-3
342	Kathon (CMI), 5-chloro-2-methyl-2 H -isothiazol-3-one (CMI) (5-klor-2-metyl-4-i	26172-55-4
343	Kathon (MI), 2-methyl-2 H -isothiazol-3-one (MI) (2-metyl-4-isotiazolin-3-on)	2682-20-4
344	Ketoconazole	65277-42-1
345	Ketoprofen	22071-15-4
346	lead	7439-92-1
347	Levomepromazine	60-99-1
348	Levonorgestrel	797-63-7
349	Linear alkyl benzene sulfonate (LAS), C10	
350	Linear alkyl benzene sulfonate (LAS), C10-14	
351	Linear alkyl benzene sulfonate (LAS), C11	
352	Linear alkyl benzene sulfonate (LAS), C12	
353	Linear alkyl benzene sulfonate (LAS), C13	
354	Linear alkyl benzene sulfonate (LAS), C14	
355	Loperamide	53179-11-6
356	m- & p-Xylene	GM
357	Magnesium	7439-95-4
358	Manganese	7439-96-5
359	Maprotiline	10262-69-8
360	Marknivå nedre	NA
361	Marknivå övre	NA
362	Meclozine	569-65-3
363	Memantine	19982-08-2
364	Mercury	7439-97-6
365	Metformin	657-24-9
366	Methyl cedryl ketone	32388-55-9

	Substance	CAS no.
367	Methyl tert-butyl ether (MTBE)	1634-04-4
368	Metoprolol	37350-58-6
369	Mianserin	24219-97-4
370	Miconazole	22916-47-8
371	Mirtazapine	61337-67-5
372	molybdenum	7439-98-7
373	Mono-(2-ethyl-5-hydroxyhexyl) phthalate	
374	Mono-(2-ethyl-5-oxohexyl) phthalate	
375	Mono-2-ethylhexyl phthalate	4376-20-9
376	Mono-benzyl phthalate	2528-16-7
377	Monobutyltin (MBT) - non-specified atoms/molecules bound to monobutyltin	GM
378	Monochlorobenzene	108-90-7
379	Mono-cyclohexyl phthalate	7517-36-4
380	Mono-ethyl phthalate	2306-33-4
381	Mono-isobutyl phthalate	
382	Mono-isononyl phthalate	
383	Mono-methyl phthalate	4376-18-5
384	Mono-n-octyl phthalate	5393-19-1
385	Monooctyltin	
386	Monophenyltin - non-specified atoms/molecules bound to monophenyltin	GM
387	Musk ambrette	83-66-9
388	Musk ketone	81-14-1
389	Musk moskene	116-66-5
390	Musk tibetene	145-39-1
391	Musk xylene	81-15-2
392	N-(2-Carboxyethyl)iminodiacetic acid	6245-75-6
393	N,N-dicyclohexylbenzothiazole-2-sulphenamid	4979-32-2
394	N,N-dietyl-m-toluamid (DEET)	134-62-3
395	N-1,3-dimethylbutyl-N'-phenyl-p-phenylenediamine	793-24-8
396	Naphthalene	91-20-3
397	Naproxen	22204-53-1
398	n-Bytyl-acetate	123-86-4
399	N-Cyclohexyl-2-benzothiazolamine	28291-75-0
400	N-cyclohexylbenzothiazole-2-sulphenamid	95-33-0
401	Nefazodone	83366-66-9
402	n-Heptane	142-82-5
403	n-Hexane	110-54-3
404	Nickel	7440-02-0
405	N-Isopropyl-N'-phenyl-p-phenylenediamine 4-(Isopropylamino)-diphenylamine,	101-72-4
406	Nitrilotriacetic acid	139-13-9
407	n-Nonane	111-84-2
408	n-Octane	111-65-9
409	Nonabromodiphenyl ether (sum of congeners)	GM
410	Norfloxacin	70458-96-7
411	N-Phenyl-benzeneamine Diphenylamine,	122-39-4
412	Octabromodibenzo-dioxin	
413	Octabromodibenzo-furan	
414	Octachlorinated dibenzothianthrene	
415	Octachloro-dibenzofuran	GM
416	Octachlorodibenzothiophenes	7683-05-08
417	Octadecyl 3-(3,5-di-tert-butyl-4-hydroxyphenyl)propionate	2082-79-3
418	Octocrylene	6197-30-4
419	Ofloxacin	82419-36-1
420	Orphenadrine	83-98-7
421	Oxazepam	604-75-1
422	o-Xylene	95-47-6
423	PAH, sum H	
424	PAH, sum L	
425	PAH, sum M	
426	Palladium	
427	Paracetamol	103-90-2
428	Paroxetine	61869-08-7
429	Particle content	NA
430	PCB28+PCB31	
431	p-Chloroaniline, 4-chloroaniline	106-47-8
432	Pentabromoethylbenzene	85-22-3
433	Pentabromotoluene	87-83-2
434	Pentachlorobenzene	608-93-5
435	Pentachlorodibenzothiophenes	134705-58-1
436	Pentachlorophenol	87-86-5
437	Percentage of organic carbon	NA
438	Permethrin	52645-53-1
439	Perphenazine	58-39-9

	Substance	CAS no.
440	Phantolide	
441	Phenanthrene	85-01-8
442	Phosphorus	7723-14-0
443	Pigment orange 5, CI 12075	3468-63-1
444	Pigment red 170, CI 12475	2786-76-7
445	Pigment red 53:1, CI 15585:1	5160-02-01
446	Pigment yellow 1, CI 11680, Hansa Yellow G	2512-29-0
447	Pizotifen	15574-96-6
448	Platinum	
449	Potassium	7440-09-7
450	Promethazine	60-87-7
451	Propiconazole	60207-90-1
452	Propylenediamine-tetraacetic acid	1939-36-2
453	Pyrene	129-00-0
454	Quinoline	91-22-5
455	Ranitidine	66357-35-5
456	Repaglinide	135062-02-1
457	Rhodium	
458	Risperidone	106266-06-2
459	Rosuvastatin	287714-41-4
460	Roxithromycin	80214-83-1
461	Salicylic Acid	69-72-7
462	Sertraline	79617-96-2
463	short chain chlorinated paraffin (C10-C13)	85535-84-8
464	Silicon	7440-21-3
465	Silver	7440-22-4
466	Simazine	122-34-9
467	Sodium	7440-23-5
468	Strontium	7440-24-6
469	Sucralose	56038-13-2
470	Sulfamethoxazole	723-46-6
471	Sulfur	7704-34-9
472	Sulphenone	80-00-2
473	Sum Chlorobenzenes	GM
474	Sum chlorodibenzothiophenes	GM
475	Sum Fluorescent whitening agents (5 st)	GM
476	Sum heptabromodibenzo-dioxin	GM
477	Sum heptabromodibenzo-furan	GM
478	Sum heptachlorinated dibenzothianthrene	GM
479	Sum hexabromodibenzo-dioxin	GM
480	Sum hexabromodibenzo-furan	GM
481	Sum hexachlorinated dibenzothianthrene	GM
482	sum of CBs.-Define in Plain Language Comment Record	GM
483	sum of CBs.-Sum of (CB28, CB52, CB101, CB118, CB138, CB153, CB180)	GM
484	Sum of short and medium chain chlorinated paraffins (C10-C17)	GM
485	Sum PAH 16	GM
486	Sum pentabromodibenzo-dioxin	GM
487	Sum pentabromodibenzo-furan	GM
488	Sum pentachlorinated dibenzothianthrene	GM
489	Sum polybrominated dibenzodioxins	GM
490	Sum polychlorinated dibenzothianthrenes	GM
491	Sum tetrabromodibenzo-dioxin	GM
492	Sum tetrabromodibenzo-furan	GM
493	Sum tetrachlorinated dibenzothianthrene	GM
494	Sum WHO-PCDD/F-TEQ lowerbound	GM
495	Sum WHO-PCDD/F-TEQ upperbound	GM
496	Summa PAH canc.	GM
497	Summa Polybrominated furan	GM
498	Tamoxifen	10540-29-1
499	Tebuconazole	107534-96-3
500	Telmisartan	144701-48-4
501	Tetrabutyltin - non-specified atoms/molecules bound to tetrabutyltin	GM
502	Tetrachlorodibenzothiophenes	134705-57-0
503	Tetrachloroethylene	127-18-4
504	Tetrachloronaphthalenes	1335-88-2
505	Tetracycline	64-75-5
506	Tetradifon	116-29-0
507	Tetramethyl-phenanthrene	
508	Tissue weight	NA
509	Toluene	108-88-3
510	Tolylfluanid	731-27-1
511	Tonalide	21145-77-7
512	Tramadol	27203-92-5
513	Trans-1,2-dichloroethene	156-60-5
514	traseolide	

	Substance	CAS no.
515	Tri(2-butoxyethyl) phosphate	78-51-3
516	Tributyltin (TBT) - non-specified atoms/molecules bound to tributyltin	GM
517	Trichloroethylene	79-01-6
518	Trichloronaphthaleners	1321-65-9
519	Tricresyl phosphate	1330-78-5
520	Tricyclohexyltin	
521	Triethanolamine	102-71-6
522	Trifluralin	1582-09-8
523	Trihexyphenidyl	144-11-6
524	Trimethoprim	738-70-5
525	Tri-n-butyl phosphate	126-73-8
526	Tri-o-cresyl phosphate	78-30-8
527	Triphenyl phosphate	115-86-6
528	Triphenylphosphine oxide	791-28-6
529	Triphenyltin - non-specified atoms/molecules bound to triphenyltin	GM
530	Tris(1,3-dichloro-2-propyl) phosphate	13674-87-8
531	Tris(2-chloro-1-methylethyl) phosphate	13674-84-5
532	Tris(2-chloroethyl) phosphate	115-96-8
533	Uranium	7440-61-1
534	Vanadium	7440-62-2
535	Warfarin	81-81-2
536	Venlafaxine	93413-69-5
537	Verapamil	52-53-9
538	Xylene	1330-20-7
539	Zinc	7440-66-6
540	Zolpidem	82626-48-0

Table 2. Substances remaining after the first reduction where classical substances, metabolites, metals and substances with detection frequency < 50% were excluded.

	Substance	CAS no.
1	2-Ethylhexyl diphenyl phosphate (EHDPP)	1241-94-7
2	Tricresyl phosphate (TCP)	1330-78-5
3	Tri-n-butyl phosphate (TBP)	126-73-8
4	Triphenyl phosphate (TPP)	115-86-6
5	Tris(2-chloro-1-methylethyl) phosphate (TCPP)	13674-84-5
6	Tris(2-chloroethyl) phosphate (TCEP)	115-96-8
7	Galaxolide (HHCB)	1222-05-5
8	Galaxolide lactone	metabolite
9	Tonalide (AHTN)	21145-77-7
10	1,2-Acenaphthendione	82-86-0
11	2,3,7,8-Tetrabromodibenzo-furan	
12	2-Mehtyl-9,10-anthraquinone	84-54-8
13	4H-Cyclopenta[def]phenanthren-4-one	5737-13-3
14	6H-Benzo[cd]pyren-6-one	3074-00-8
15	7H-Benz(de)anthracene-7-one	82-05-3
16	9,10-Anthraquinone	84-65-1
17	9-Fluorenone	486-25-9
18	9-Nitroanthracene	602-60-8
19	Acenaphthene	83-32-9
20	Anthracene	120-12-7
21	Benz(a)anthracen-7,12dione	2498-66-0
22	Benzo[a]anthracene	56-55-3
23	Benzo[b]fluoranthene	205-99-2
24	Benzo[ghi]perylene	191-24-2
25	Benzo[k]fluoranthene	207-08-9
26	Chrysene	218-01-9
27	Fluoranthene	206-44-0
28	Fluorene	86-73-7
29	Octabromodibenzo-furan	
30	Phenanthrene	.85-01-8
31	Bis(4-chlorophenyl) sulfone	.80-07-9
32	2-(2H-Benzotriazol-2-yl)-4-(1,1,3,3-tetramethylbutyl)phenol UV 329	3147-75-9
33	2,4-Di-tert-butyl-6-(5-chlorobenzotriazol-2-yl)phenol UV-327	3864-99-1
34	2-Mercaptobenzothiazole MBT	149-30-4
35	N-Cyclohexylbenzothiazole-2-sulphenamid CBS	95-33-0
36	Ethylhexyl methoxycinnamate; Eusolex 2292 (OMC)	5466-77-3
37	Octocrylene (OC)	6197-30-4
38	1,2,3,4,5-Pentachloronaphthalene (#49)/ 1,2,3,6,7-Pentachloronaphthalene (#54)	67922-25-2/ 150224-16-1
39	1,2,3,4,6-Pentachloronaphthalene (#50)	67922-26-3
40	1,2,3,5,6-Pentachloronaphthalene (#51)	150224-18-3
41	1,2,3,5,7-Pentachloronaphthalene (#52)	53555-65-0
42	1,2,3,5,8-Pentachloronaphthalene (#53)	150224-24-1
43	1,2,4,5,6-Pentachloronaphthalene (#57)	150224-20-7
44	1,2,4,5,7-Pentachloronaphthalene (#58)	150224-19-4
45	1,2,4,5,8-Pentachloronaphthalene (#59)	150224-25-2
46	1,2,4,6,7-Pentachloronaphthalene (#60)	150224-17-2
47	1,2,4,6,8-Pentachloronaphthalene (#61)	150224-22-9
48	1,2,4,7,8-Pentachloronaphthalene (#62)	150224-21-8
49	1,2,5,6- Tetrachloronaphthalene (#36)	67922-22-9
50	1,3,5,7-Tetrachloronaphthalene (#42)	53555-64-9
51	Dichloronaphthalenes (DiCN)	28699-88-9
52	Tetrachloronaphthalenes (TeCN)	1335-88-2
53	Trichloronaphthaleners (TrCN)	1321-65-9
54	Hexabromobenzene (HBB)	87-82-1
55	Pentabromoethylbenzene (PBEB)	85-22-3
56	Bromadiolone	28772-56-7

Appendix 2. Risk evaluation of the 22 compounds.

Table 1: Substance: 2-Ethylhexyl diphenyl phosphate (EHDPP), Cas # 1241-94-7

Parameter	Evaluation of data			Evaluation of properties	Estimated results	Comment
Spatial range and persistence	Occurrence			Persistence in water	Ranked spatial range	Detection frequency in biota and humans 100%. In an EU wide monitoring in 2010 EHDPP was identified one of the most relevant compounds with 94% detection frequency[1].
National	yes (fish)			Half-life 109 days (experimental data)	4	
Regional	yes (fish)					
Local	yes (fish)					
Point source						
Environmental risk				Algae Daphnia Fish	Ranked risk	No data on surface water in Sweden.
Experimental NOEC (mg/l)				0.018		
NOEC (mg/l)[2]				0.072 0.021		Note that MEC is based on data from an EU wide monitoring on WWTP effluent for Europe and should be regarded as a worst case.
PNEC (mg/l)	0.00018 (AF 100)					
MEC range (ng/l)	n/a-5400					
MEC(median)/PNEC (mg/l)[1, 3]	0.004				1	
MEC(max)/PNEC (mg/l)	3				5	
Volumes (tonnes)					Ranked volume	
Year:	1999	2011	n/a			
Swedish product registry (total use)[4]	18	10			3	
Nordic product registry (total use)[4]		180.7			4	
EU production[5]			HPVC[6]		4-5	
EU production[2]			1 000-10 000		4	
World production			-			
Bioaccumulation					Ranked BCF	High detection frequency despite low BCF.
Experimental BCF	453				1	
BCF (Screening report)	413-465					

[1] Loos et al 2013, [2] ECHA- Registered substances database, [3] Effluent WWTP in Europe,
[4] SPIN database (Nordic countries = SE, DK, NO, FI), [5] ESIS- HPVC/LPVC database,
[6] A HPVC, is a chemical which is defined as being produced or imported in quantity of at least 1000 tonnes per year in EU by at least one Industry

Table 2: Substance: Tricresyl phosphate (TCP), Cas # 1330-78-5

Parameter	Evaluation of data			Evaluation of properties	Estimated results	Comment
Spatial range and persistence	Occurrence			Persistence in water	Ranked spatial range	Detection frequency in biota 84% and 43% in human breast milk.
National	yes (fish)			Half-life 49 days (experimental data)	4	
Regional	yes (fish)					
Local	yes (fish)					
Point source						
Environmental risk				Algae Daphnia Fish	Ranked risk	No surface water analysed in the screening study.
Experimental NOEC (mg/l)				0.088 0.62 0.00032		
PNEC (mg/l)	3.2E-05 (AF 10)					
MEC range (ng/l)[1, 2]	0.0-1.3					
MEC(median)/PNEC (mg/l)	0.0					
MEC(max)/PNEC (mg/l)	0.04				1	
Volumes (tonnes)					Ranked volume	
Year:	1999	2011	n/a			
Swedish product registry (total use)[3]	5	14			3	
Nordic product registry (total use)[3]		19.9			3	
EU production[4]			LPVC[5]		2-3	
EU production[6]			1 000-10 000		4	
World production						
Bioaccumulation					Ranked BCF	High detection frequency despite low BCF.
Experimental BCF	165				1	
BCF (Screening report)	770-2768				2-4	

[1] Loos et al. 2013
[2] Effluent WWTP in Europe
[3] SPIN database (Nordic countries = SE, DK, NO, FI)
[4] ESIS- HPVC/LPVC database
[5] LPVC, is a chemical which has been produced or imported in EU with a tonnage >10t/y- 1000 t/y
[6] ECHA- Registered substances database

Table 3: Substance: Tri-n-butyl phosphate (TBP), Cas # 126-73-8

Parameter	Evaluation of data			Evaluation of properties			Estimated results	Comment
Spatial range and persistence	Occurrence			Persistence in water			Ranked spatial range	100% detection frequency in biota and human breast milk samples. TBP has been reported in ground water in Europe (ref in the screening report). In an EU wide monitoring in 2010 TBP was identified one of the most relevant compounds with 100% detection frequency and high median concentration level [1].
National	yes (fish)			Half-life 8.7 days (modelled data)			4	
Regional	yes (fish)							
Local	yes (fish)							
Point source								
Environmental risk				Algae	Daphnia	Fish	Ranked risk	
Experimental NOEC (mg/l)				1.9	1	4.2		
PNEC (mg/l)	0.1 (AF 10)							
MEC range (ng/l)[1, 2]	n/a-1700							
MEC(median)/PNEC (mg/l)	0.0016						1	
MEC(max)/PNEC (mg/l)	0.017						1	
Volumes (tonnes)							Ranked volume	
Year:	1999	2011	n/a					
Swedish product registry (total use)[3]	27	13					3	
Nordic product registry (total use)[3]		32.8					3	
EU production[4]			HPVC[5]				4-5	
EU production[6]			1 000-10 000				4	
World production[7]			3 000-5 000				4	
Bioaccumulation							Ranked BCF	High detection frequency despite low BCF.
Experimental BCF	16.2						1	
BCF (Screening report)	11-49						1	

[1] Loos et al 2013, [2] Effluent WWTP in Europe, [3] SPIN database (Nordic countries = SE, DK, NO, FI), [4] ESIS- HPVC/LPVC database
[5] HPVC, is a chemical which is defined as being produced or imported in quantity of at least 1000 tonnes per year by at least one industry in EU
[6] ECHA- Registered substances database, [7] OECD - http://webnet.oecd.org/HPV/UI/handler.axd?id=5c1094d4-5757-43c0-a3c3-7af7cb5a6c64

Table 4: Substance: Triphenyl phosphate (TPP), Cas # 115-86-6

Parameter	Evaluation of data				Evaluation of properties			Estimated results	Comment
Spatial range and persistence	Occurrence				Persistence in water			Ranked spatial range	Detection frequency in biota and human milk samples was 100%. In an EU wide monitoring in 2010 EHDPP was identified one of the most relevant compounds with 94% detection frequency [1].
National	yes (fish)				Half-life 19 days (experimental data)			4	
Regional	yes (fish)								
Local	yes (fish)								
Point source									
Environmental risk					Algae	Daphnia	Fish	Ranked risk	
Experimental NOEC (mg/l)					0.087	0.25	0.055		
PNEC (mg/l)	0.0055 (AF 10)								
MEC range (ng/l)[1, 2]	n/a-610								
MEC(median)/PNEC (mg/l)	0.003							1	
MEC(max)/PNEC (mg/l)	0.11							3	
Volumes (tonnes)								Ranked volume	HPV Chemical.
Year:	1999	2000	2011	n/a					
Swedish product registry (total use)[3]	103		38					3	
Nordic product registry (total use)[3]			100.1					4	
EU production[4]		5 000-7 500						4	
EU production[5]				1 000-10 000				4	
World production[4]		20 000-30 000						5	
Bioaccumulation								Ranked BCF	High detection frequency despite low BCF.
Modelled BCF	250							1	
BCF (Screening report)	324-1368							1-3	

[1] Loos et al 2013
[2] Effluent WWTP in Europe
[3] SPIN database (Nordic countries = SE, DK, NO, FI)
[4] OECD- http://webnet.oecd.org/HPV/UI/handler.axd?id=84ec12e5-b201-4f75-bfcc-c240e529787c
[5] ECHA- Registered substances database

Table 5: Substance: Tris(2-chloroisopropyl)phosphate-n-butyl phosphate (TCPP), Cas # 13674-84-5

Parameter	Evaluation of data			Evaluation of properties	Estimated results	Comment
Spatial range and persistence	Occurrence			Persistence in water	Ranked spatial range	Detection frequency in biota and human milk samples was 100%. In an EU wide monitoring in 2010 TCPP was identified as one of the most relevant compounds with 100% detection frequency and highest median concentration level.[1]
National	widespread			Half-life >365 days (experimental data)	4	
Regional	widespread					
Local	yes					
Point source	n/a					
	100% detection frequency in biota and humans					
Environmental risk				Algae Daphnia Fish	Ranked risk	
Experimental NOEC (mg/l)				13 33.5 9.8		
PNEC (mg/l)	0.98 (AF 10)					
MEC range (µg/l)[1, 2]	n/a-21					
MEC(median)/PNEC (mg/l)	0.02				1	
MEC(max)/PNEC (mg/l)	0.0006				1	
Volumes (tonnes)					Ranked volume	HPV Chemical.
Year:	1999	2000	2011			
Swedish product registry (total use)[3]	185		93		3	
Nordic product registry (total use)[3]			1050.1		5	
EU production[4]		36 000-40 000			5	
EU production[5]		1 000-100 000			4-5	
World production			-			
Bioaccumulation					Ranked BCF	High detection frequency despite low BCF.
Experimental BCF	2.8				1	
Log Kow						

[1] Loos et al, [2] Effluent WWTP in Europe
[3] SPIN database (Nordic countries = SE, DK, NO, FI)
[4] ESIS- http://esis.jrc.ec.europa.eu/doc/risk_assessment/REPORT/tcppreport425.pdf
[5] ECHA- Registered substances database

Table 6: Substance: Galaxolide (HHCB), Cas # 1222-05-5

Parameter	Evaluation of data				Evaluation of properties	Estimated results	Comment
Spatial range and persistence	Occurrence				Persistence in water	Ranked spatial range	High detection frequency in fish, soil, sediment and surface water. The degradation product is galaxolide lactone. Has been found in human breast milk.
National	yes (fish)				Half-life 60 days (modelled data)	4	
Regional							
Local							
Point source							
Environmental risk					Fish	Ranked risk	
Experimental NOEC (mg/l)					1		
PNEC (mg/l)	0.01 (AF 100)						
MEC range (ng/l)	<1-800, n=51						
MEC(median)/PNEC (mg/l)	0.0005					1	
MEC(max)/PNEC (mg/l)	0.08					2	
Volumes (tonnes)						Ranked volume	Increased usage in Sweden.
Year:	1999	2000	2011	n/a			
Swedish product registry (total use)[1]	0		5			2	
Nordic product registry (total use)[1]			5.5			2	
EU production[2]		1000-5000				4	
EU production[3]				1000- 10 000		4	
World production[4]		1000-5000				4	
Bioaccumulation						Ranked BCF	High potential to bioaccumulate.
Modelled BCF	5410					5	
Log Kow	5.9-6.6						

[1] SPIN database (Nordic countries = SE, DK, NO, FI)
[2] OECD- http://webnet.oecd.org/HPV/UI/handler.axd?id=b36caa92-a554-4853-b98d-744e72cb9d56
[3] ECHA- Registered substances database
[4] OECD- http://webnet.oecd.org/HPV/UI/handler.axd?id=b36caa92-a554-4853-b98d-744e72cb9d57

Table 7: Substance: Tonalide (AHTN), Cas # 21145-77-7

Parameter	Evaluation of data			Evaluation of properties	Estimated results	Comment
Spatial range and persistence	Occurrence			Persistence in water	Ranked spatial range	High detection frequency in fish, soil, sediment and surface water. Has been found in human breast milk.
National				Half-life 60 days (modelled data)		
Regional	yes (fish)				3	
Local						
Point source						
Environmental risk				Fish	Ranked risk	
Experimental NOEC (mg/l)				0.01		
PNEC (mg/l)	0.0001 (AF 100)					
MEC range (ng/l)	<1-32, n=52					
MEC(median)/PNEC (mg/l)	0.04				1	
MEC(max)/PNEC (mg/l)	0.32				3	
Volumes (tonnes)					Ranked volume	
Year:	2000	2011	n/a			
Swedish product registry (total use)[1]	0	0			0	
Nordic product registry (total use)[1]		0.1			0	
EU production[2]	1 000-5 000				4	
EU production[3]			1-10		1	
World production[2]	1 000-5 000				4	
Bioaccumulation					Ranked BCF	High potential to bioaccumulate.
Modelled BCF	3200				4	
Log Kow	5.7-6.6					

[1] SPIN database (Nordic countries = SE, DK, NO)
[2] OECD- http://webnet.oecd.org/HPV/UI/handler.axd?id=8c2f9f16-c809-4e63-aa9c-1453e6398e80
[3] ECHA- Registered substances database

Table 8: Substance: Bis(4-chlorophenyl) sulfone (BCPS), Cas # 80-07-9

Parameter	Evaluation of data				Evaluation of properties	Estimated results	Comment
Spatial range and persistence	Occurrence				Persistence in water	Ranked spatial range	100% detection frequency in Baltic Sea fish. Found in marine surface waters. Found in 1 of 10 STP effluent samples due to high LOD.
National	widespread (fish)				Half-life >365 days (modelled data)	5	
Regional	widespread (fish)						
Local							
Point source	no (water)						
Environmental risk					T. pyriformis Daphnia Fish	Ranked risk	
Modelled E(L)C (mg/l)					14.93 13.85 4.8		
PNEC (mg/l)	0.0048 (AF 1000)						
MEC marine water range (ng/l)	0.33-1,3, n=3						
MEC(median)/PNEC (mg/l)	9.4E-05					1	
MEC(max)/PNEC (mg/l)	2.7E-04					1	
Volumes (tonnes)						Ranked volume	BCPS is imported as polymer. Pathways to the environment not clarified.
Year:	1999	2006	2011	n/a			
Swedish product registry (total use)[1]	0		0				
Nordic product registry (total use)			-				
EU production[2]				HVPC[3]		4-5	
EU production[4]				10 000-100 000		5	
World production[5]		18 000				5	
Bioaccumulation						Ranked BCF	BCF low for fish. Distributes to liver due to BCPS structure[5]. High biomagnigication in birds[7, 8].
Experimental BCF	108					1	
Log Kow	3.9						

[1] SPIN database, [2] ESIS- HPVC/LPVC database, [3] A HPVC, is a chemical which is defined as being produced or imported in quantity of at least 1000 tonnes per year in EU by at least one Industry, [4] ECHA- Registered substances database, [5] OECD http://webnet.oecd.org/HPV/UI/handler.axd?id=23f5c95f-af8c-467d-82f3-92b1420bcea7,
[6] Larsson et al 2004, [7] Jörundsdottir et al 2006, [8] Norström et al 2006

Table 9: Substance: 2-(2H-Benzotriazol-2-yl)-4-(1,1,3,3-tetramethylbutyl)phenol (UV 329) ,Cas # 3147-75-9

Parameter	Evaluation of data			Evaluation of properties	Estimated results	Comment
Spatial range and persistence	Occurrence			Persistence in water	Ranked spatial range	75% detection frequency in biota, both in urban and in background locations.
National	yes (water, fish)			Half-life 60 days (modelled data)	4	
Regional	yes (water, fish)					
Local						
Point source	yes (water)					
Environmental risk				T. pyriformis Daphnia Fish	Ranked risk	No risk evaluation was conducted in the screening report due to lack of data. Not a full record in the ECHA data base.
Modelled E(L)C (mg/l)				1.17 0.47 0.0068		
PNEC (mg/l)	6.8E-06 (AF 1000)					
MEC range (ng/l)	0.25-2.4, n=6					
MEC(median)/PNEC (mg/l)	0.099				2	
MEC(max)/PNEC (mg/l)	0.35				3	
Volumes (tonnes)					Ranked volume	
Year:	2008	2011	n/a			
Swedish product registry (total use)[1]	2	0			1	
Nordic product registry (total use)[1]		0			1	
EU production[2]			LPVC[3]		2-3	
EU production[4]			100-1 000		3-4	
World production			-			
Bioaccumulation					Ranked BCF	High detection frequency in biota despite low BCF.
Modelled BCF	880				2	
Log Kow						

[1] SPIN database (Nordic countries SE, DK, NO, FI)
[2] ESIS- HPVC/LPVC database
[3] A LPVC, is a chemical which has been produced or imported in EU with a tonnage >10t/y but never more than 1000 t/y
[4] ECHA- Registered substances database

Table 10: Substance: 2,4-Di-tert-butyl-6-(5-chlorobenzotriazol-2-yl)phenol (UV 327), Cas # 3864-99-1

Parameter	Evaluation of data			Evaluation of properties	Estimated results	Comment
Spatial range and persistence	Occurrence			Persistence in water	Ranked spatial range	High detection frequency in all matrixes; air, deposition, sediment, sludge, water. 75% detection frequency in biota, both in urban and background locations.
National	yes (water, fish)			Half-life 60 days (modelled data)	4	
Regional						
Local	yes (water, fish)					
Point source	yes (water)					
Environmental risk				Fish	Ranked risk	No risk evaluation was conducted in the screening report due to lack of data. No data in the EHCA database.
Experimental E(L)C (mg/l)				94.1		
PNEC (mg/l)	0.0941 (AF 1000)					
MEC range (ng/l)	<0.08-0.39 n=6					
MEC(median)/PNEC (mg/l)	1.3E-06				1	
MEC(max)/PNEC (mg/l)	4.1E-06				1	
Volumes (tonnes)					Ranked volume	
Year:	1999	2011	n/a			
Swedish product registry (total use)[1]	2	10			3	
Nordic product registry (total use)[1]		10.8			3	
EU production[2]			LPVC[3]		2-3	
EU production			-			
World production			-			
Bioaccumulation					Ranked BCF	High potential to bioaccumulate.
Experimental BCF	3240				4	
Log Kow						

[1] SPIN database (Nordic countries = SE, DK, NO)
[2] ESIS- HPVC/LPVC database
[3] A LPVC, is a chemical which has been produced or imported in EU with a tonnage >10t/y but never more than 1000 t/y

Table 11: Substance: 2-Mercaptobenzothiazole (MBT), Cas # 149-30-4

Parameter	Evaluation of data			Evaluation of properties	Estimated results	Comment
Spatial range and persistence	Occurrence			Persistence in water	Ranked spatial range	74% detection frequency in biota and 80% in effluent water from WWTP.
National	yes (water, fish)			Half-life 15 days (modelled data)	4	
Regional				Not ready biodegradable[1]		
Local	yes (water, fish)					
Point source	yes (water)					
Environmental risk				Algae Daphnia Fish	Ranked risk	
Experimental NOEC (mg/l)				0.066 0.08		
NOEC (mg/l)[1]				0.041		
PNEC (mg/l)	0.00132 (AF 50)					
MEC range (ng/l)	<3-19, n=11					
MEC(median)/PNEC (mg/l)	0.005				1	
MEC(max)/PNEC (mg/l)	0.01				1	
Volumes (tonnes)					Ranked volume	
Year:	1999	2011	n/a			
Swedish product registry (total use)[2]	25	10			3	
Nordic product registry (total use)[2]		16.7			3	
EU production[3]			HPVC[4]		4-5	
EU production[1]			1 000-10 000		4	
World production			-			
Bioaccumulation					Ranked BCF	Detected in biota despite low BCF and log Kow.
Experimental BCF	8				1	
Log Kow	2.42					

[1] ECHA- Registered substances database
[2] SPIN database (Nordic countries = SE, DK, NO, FI)
[3] ESIS- HPVC/LPVC database
[4] HPVC, is a chemical which is defined as being produced or imported in quantity of at least 1000 tonnes per year in EU by at least one Industry

Table 12: Substance: N-Cyclohexylbenzothiazole-2-sulphenamid (CBS), Cas # 95-33-0

Parameter	Evaluation of data				Evaluation of properties			Estimated results	Comment
Spatial range and persistence	Occurrence				Persistence in water			Ranked spatial range	Only detected in biota, (100%), 0% detection frequency in other matrixes. CBS is degraded to MBT.
National	yes (fish)				Half-life 0.52 days (experimental data)			4	
Regional	yes (fish)								
Local	yes (fish)								
Point source	yes (fish)								
Environmental risk					Algae	Daphnia	Fish	Ranked risk	
Experimental NOEC (mg/l)					0.0084	0.058	0.14		
PNEC (mg/l)	0.00084 (AF 10)								
MEC range (ng/l)	<0.4-7, n=11								
MEC(median)/PNEC (mg/l)	0.002							1	
MEC(max)/PNEC (mg/l)	0.008							1	
Volumes (tonnes)								Ranked volume	HPV Chemical.
Year:	1998	1999	2011	n/a					
Swedish product registry (total use)[1]		219	92					3	
Nordic product registry (total use)[1]			92					3	
EU production[2]				16 000				5	
EU production[3]				10 000+				5	
World production[2]	53 000							5	
Bioaccumulation								Ranked BCF	High detection frequency despite low BCF.
Modelled BCF	39							1	
Log Kow	4.93								

[1] SPIN database (Nordic countries = SE, FI)
[2] OECD http://webnet.oecd.org/HPV/UI/handler.axd?id=a1df7cf4-27ea-4098-9b03-a7d41d2e24c0
[3] ECHA- Registered substances database

Table 13: Substance: Ethylhexyl methoxycinnamate (Eusolex 2292, OMC) Cas # 5466-77-3

Parameter	Evaluation of data			Evaluation of properties	Estimated results	Comment
Spatial range and persistence	Occurrence			Persistence in water	Ranked spatial range	Detection frequency in biota 60%, surface water, STP effluent and sediment 40-50% and 100% in STP sludge.
National	yes (water, sediment and fish)			Half-life >365 days (experimental data)	4	
Regional						
Local	yes (fish, water)					
Point source	yes					
Environmental risk				Daphnia Fish	Ranked risk	Endocrine effects, induction of vitellogenin in fish has been reported (Screening report).
Modelled E(L)C (mg/l)				0.67 0.44		
PNEC (mg/l)	0.00044 (AF 1000)					
MEC range (ng/l)	<1-15, n=24					Limited data in the ECHA database.
MEC(median)/PNEC (mg/l)	0.003				1	
MEC(max)/PNEC (mg/l)	0.03				1	
Volumes (tonnes)					Ranked volume	
Year:	1999	2011	n/a			
Swedish product registry (total use)[1]	2	19			2	
Nordic product registry (total use)[1]		19			2	
EU production[2]			HPVC[3]		4-5	
EU production[4]			1 000-10 000		4	
World production			-			
Bioaccumulation					Ranked BCF	High detection frequency in biota despite low BCF.
Modelled BCF	44				1	
BCF[4]	279-432				1	
Log Kow	5.8					

[1] SPIN database (Nordic countries = SE)
[2] ESIS- HPVC/LPVC database
[3] HPVC, is a chemical which is defined as being produced or imported in quantity of at least 1000 tonnes per year by at least one industry in EU
[4] ECHA- Registered substances database

Table 14: Substance: Octocrylene (OC), Cas # 6197-30-4

Parameter	Evaluation of data			Evaluation of properties	Estimated results	Comment
Spatial range and persistence	Occurrence			Persistence in water	Ranked spatial range	80% detection frequency in biota, 57% in surface water, STP effluent, STP sludge and sediment. Not ready biodegradable[1].
National	yes (fish, water)			Half-life 15 days (modelled data)	4	
Regional						
Local	yes (fish, water)					
Point source	yes					
Environmental risk				T. pyrifomis Daphnia Fish	Ranked risk	Endocrine effects, induction of vitellogenin in fish has been reported (Screening report). Limited data in the ECHA data base.
Modelled E(L)C (mg/l)				0.26 0.21 0.0223		
PNEC (mg/l)	2.23E-05 (AF 1000)					
MEC range (ng/l)	13-1200, n=24					
MEC(median)/PNEC (mg/l)	0.35				3	
MEC(max)/PNEC (mg/l)	53.8				5	
Volumes (tonnes)					Ranked volume	
Year:	1999	2011	n/a			
Swedish product registry (total use)[2]	13	1			2	
Nordic product registry (total use)[2]		13.4			3	
EU production[3]			LPVC[4]		2-3	
EU production[1]			1 000-10 000		4	
World production			-			
Bioaccumulation					Ranked BCF	High detection frequency in biota despite low BCF.
Modelled BCF	205				1	
BCF[1]	915				2	
Log Kow	6.88					

[1] ECHA- Registered substances database
[2] SPIN database (Nordic countries = SE, DK)
[3] ESIS- HPVC/LPVC database
[4] A LPVC, is a chemical which has been produced or imported in EU with a tonnage >10t/y - 1000 t/y

Table 15: Substance: 1,2,3,5,7-Pentachloronaphthalene (#52), Cas # 53555-65-0

Parameter	Evaluation of data	Evaluation of properties	Estimated results	Comment
Spatial range and persistence National Regional Local Point source	Occurrence yes (fish) yes (fish)	Persistence in water Half-life 180 days (modelled data)	Ranked spatial range 4	100% detection frequency in fish and humans. High detection frequency in guillemot eggs, sediment, sludge, air.
Environmental risk Modelled E(L)C (mg/l) PNEC (mg/l) MEC (no surface water has been analysed)	 05.46E-05 (AF 1000)	T. pyriformis Daphnia Fish 0.45 0.18 0.0546	Ranked risk	No surface water has been analysed and no risk evaluation can be done.
Volumes (tonnes) Year: Swedish product registry (total use) Nordic product registry (total use) EU production EU production Total world production[1]	 200 000-400 000		Ranked volume	There is no production of PCN today[1]. The only estimate of how much that has been produced is for all PCN[1]. PCNs are also formed unintentionally.
Bioaccumulation Modelled BCF Log Kow	 16198		Ranked BCF 5	High potential to bioaccumulate.

[1] AMAP 2004

Table 16: Substance: 1,2,4,6,7-Pentachloronaphthalene (#60), Cas # 150224-17-2

Parameter	Evaluation of data	Evaluation of properties	Estimated results	Comment
Spatial range and persistence National Regional Local Point source	Occurrence yes (fish) yes (fish) 100% detection frequency in biota and human	Persistence in water Half-life 180 days (modelled data)	Ranked spatial range 4	100% detection frequency in fish and humans. High detection frequency in guillemot eggs, sediment, sludge, air.
Environmental risk Modelled E(L)C (mg/l) PNEC (mg/l) MEC (no surface water has been analysed)	 8.26E-05 (AF 1000)	T. pyriformis Daphnia Fish 0.47 0.12 0.0826	Ranked risk	No surface water has been analysed and no risk evaluation can be done.
Volumes (tonnes) Year: Swedish product registry (total use) Nordic product registry (total use) EU production EU production Total world production[1]	 200 000-400 000		Ranked volume	There is no production of PCN today[1]. The only estimate of how much that has been produced is for all PCN[1]. PCNs are also formed unintentionally.
Bioaccumulation Modelled BCF Log Kow	 16198		Ranked BCF 5	High potential to bioaccumulate.

[1] AMAP 2004

Table 17: Substance: 1,2,4,6,8-Pentachloronaphthalene (#61), Cas # 150224-22-9

Parameter	Evaluation of data	Evaluation of properties	Estimated results	Comment
Spatial range and persistence National Regional Local Point source	Occurrence yes (fish) yes (fish)	Persistence in water Half-life 180 days (modelled data)	Ranked spatial range 4	100% detection frequency in fish and humans. High detection frequency in guillemot eggs, sediment, sludge, air.
Environmental risk Modelled E(L)C (mg/l) PNEC (mg/l) MEC (no surface water has been analysed)	6.59E-05 (AF 1000)	T. pyriformis Daphnia Fish 0.45 0.14 0.0659	Ranked risk	No surface water has been analysed and no risk evaluation can be done.
Volumes (tonnes) Year: Swedish product registry (total use) Nordic product registry (total use) EU production EU production Total world production[1]	200 000-400 000		Ranked volume	There is no production of PCN today[1]. The only estimate of how much that has been produced is for all PCN[1]. PCNs are also formed unintentionally.
Bioaccumulation Modelled BCF Log Kow	16198		Ranked BCF 5	High potential to bioaccumulate.

[1] AMAP 2004

Table 18: Substance: Hexabromobenzene (HBB), Cas # 87-82-1

Parameter	Evaluation of data	Evaluation of properties	Estimated results	Comment
Spatial range and persistence	Occurrence	Persistence in water	Ranked spatial range	Not found in influent or effluent waters but in sludge from WWTP. Only detected in sediment at point source. 57% detection frequency in biota, low levels in fish.
National		Half-life 180 days (modelled data)	1	
Regional	no (fish)			
Local	no (fish)			
Point source	yes (fish)			
Environmental risk		Algae	Ranked risk	Surface water has not been analysed and environmental risk can not be calculated.
Experimental NOEC (mg/l)		8.0E-05		
PNEC (mg/l)	8E-07 (AF 100)			
PNEC (µg/l)[1]	0.53			
MEC(median)/PNEC (mg/l)				
MEC(max)/PNEC (mg/l)				
Volumes (tonnes)			Ranked volume	No data available in ECHA data base.
Year:				
Swedish product registry (total use)[2]	No information available about Swedish usage in chemical products. Is not produced in Europe.			
Nordic product registry (total use)				
EU production[3]				
EU production				
World production				
Bioaccumulation			Ranked BCF	Potential to bioaccululate.
Experimental BCF	1420		3	
Log Kow	6.11			

[1] Møskeland 2010
[2] SPIN database
[3] EFSA, 2012

Table 19: Substance: Pentabromoethylbenzene (PBEB), Cas # 85-22-3

Parameter	Evaluation of data	Evaluation of properties	Estimated results	Comment
Spatial range and persistence National Regional Local Point source	Occurrence yes (fish) yes (fish) yes (fish)	Persistence in water Half-life 180 days (modelled data)	Ranked spatial range 3	Detected in one influent water sample. Not found in effluent water but in sludge. Only detected in sediment at point source. 100% detection frequency in fish but low levels.
Environmental risk Modelled E(L)C (mg/l) PNEC (mg/l) PNEC (µg/l)[1] MEC(median)/PNEC (mg/l) MEC(max)/PNEC (mg/l)	 0.00029 (AF 1000) 0.53	Daphnia 0.29	Ranked risk	Surface water has not been analysed and environmental risk can not be calculated
Volumes (tonnes) Year: Swedish product registry (total use)[2] Nordic product registry (total use) EU production[3] EU production World production	n/a No information available about Swedish usage in chemical products. LPVC[4]		Ranked volume 2-3	No data available in ECHA data base
Bioaccumulation Experimental BCF Log Kow	 295 6.76		Ranked BCF 1	Low potential to bioacculuate according to the BCF but the log Kow is high and PBEB is frequently detected in fish.

[1] Møskeland 2010
[2] SPIN database
[3] ESIS- HPVC/LPVC database
[4] A LPVC, is a chemical which has been produced or imported in EU with a tonnage >10t/y but never more than 1000 t/y

Table 20: Substance: OTNE, Cas # 54464-57-2

Parameter	Evaluation of data			Evaluation of properties	Estimated results	Comment
Spatial range and persistence	Occurrence			Persistence in water	Ranked spatial range	Found in human breast milk.
National	no (water)			Half-life 60 days (modelled data)		8% detection frequency in fish.
Regional						High detection frequency in effluent water.
Local						
Point source	yes (water, fish)				1	
Environmental risk				Fish	Ranked risk	Possible high risk close to point sources.
Modelled E(L)C (mg/l)				0.037		No data in the ECHA database.
PNEC (mg/l)	3.7E-05 (AF 1000)					
MEC range (ng/l)	<3-460, n=30					
MEC(median)/PNEC (mg/l)	0.46				3	
MEC(max)/PNEC (mg/l)	12.4				5	
Volumes (tonnes)					Ranked volume	Increased usage in Sweden.
Year:	2002	2011	n/a			
Swedish product registry (total use)[1]	0	6			2	
Nordic product registry (total use)[1]		9.8			2	
EU production[2]			LVPC[3]		2-3	
EU production			-			
World production			-			
Bioaccumulation					Ranked BCF	High Log Kow indicate possible bioaccumulation.
Modelled BCF	620				2	
Log Kow	5.23					

[1] SPIN database (Nordic countries = SE, DK, NO, FI)
[2] ESIS- HPVC/LPVC database
[3] LPVC, is a chemical which has been produced or imported in EU with a tonnage >10t/y- 1000 t/y

Table 21: Substance: Acetyl cedrene (AC), Cas # 32388-55-9

Parameter	Evaluation of data			Evaluation of properties	Estimated results	Comment
Spatial range and persistence	Occurrence			Persistence in water	Ranked spatial range	Not detected in biota. Found in one human breast milk. High detection frequency in effluent water.
National	no (water)			Half-life 60 days (modelled data)		
Regional						
Local						
Point source	yes (water)				1	
Environmental risk				Fish	Ranked risk	Limited data in the ECHA database.
Modelled NOEC (mg/l)				2.14		
PNEC (mg/l)	0.00214 (AF 1000)					
MEC range (ng/l)	<1-46, n=30					
MEC(median)/PNEC (mg/l)	0.002				1	
MEC(max)/PNEC (mg/l)	0.02				1	
Volumes (tonnes)					Ranked volume	Increased usage in Sweden.
Year:	2002	2011	n/a			
Swedish product registry (total use)[1]	0	1			2	
Nordic product registry (total use)[1]		2.7			2	
EU production[2]			LPVC[3]		2-3	
EU production[4]			100-1 000		3	
World production			-			
Bioaccumulation					Ranked BCF	High Log Kow indicate possible bioaccumulation.
Modelled BCF	880				2	
Log Kow	5.6-5.9					

[1] SPIN database (Nordic countries = SE, DK, NO)
[2] ESIS- HPVC/LPVC database
[3] LPVC, is a chemical which has been produced or imported in EU with a tonnage >10t/y- 1000 t/y
[4] ECHA- Registered substances database

Table 22: Substance: 2,4,7,9-Tetramethyl-5-decyne-4,7-diol (TMDD), Cas # 126-86-3

Parameter	Evaluation of data			Evaluation of properties	Estimated results	Comment
Spatial range and persistence	Occurrence			Persistence in water	Ranked spatial range	High detection frequency in effluent water.
National	no (water)			Half-life 38 days (modelled data)		4 of 20 surface water samples contained TMDD.
Regional						Fish was not analysed.
Local						
Point source	yes (water)					
Environmental risk				Algae	Ranked risk	Acute tox data from the ECHA database suggest that algae are the most sensitive species.
Experimental NOEC (mg/l)[1]				1		
PNEC (mg/l)	0.01 (AF 100)					
MEC range (ng/l)	5-450, n=17					
MEC(median)/PNEC (mg/l)	0.003				1	
MEC(max)/PNEC (mg/l)	0.045				1	
Volumes (tonnes)					Ranked volume	Increased occurrence in products.
Year:	2002	2011	n/a			
Swedish product registry (total use)[2]	85	133			4	
Nordic product registry (total use)[2]		260.1			4	
EU production[3]			LPVC[4]		2-3	
EU production[1]			1 000+		4	
World production			-			
Bioaccumulation					Ranked BCF	Highly water soluble.
Modelled BCF	135				1	Low potential to bioaccumulate.
Log Kow	2.8					

[1] ECHA- Registered substances database
[2] SPIN database (Nordic countries = SE, DK, NO, FI)
[3] ESIS- HPVC/LPVC database
[4] LPVC, is a chemical which has been produced or imported in EU with a tonnage >10t/y- 1000 t/y

Appendix 3.

Table 1. Evaluation of National Swedish screening reports.

Report	**Comments**
Suggested for follow-up	
National screening 2009: UV-Filter	Selected reports presented in priority order See text for comments
National screening 2010: Pharmaceuticals	
National screening 2011: Fragrances; OTNE, acetyl cedrene and diphenyleter	
National screening 2008: Musk substances and metabolites	
National screening 2009: Benzothiazoles, benzenediamines and benzotriazoles	
National screening 2007: Platinum group metals	
National screening 2007: Organophosphate esters in human breast milk and in fish from Swedish lakes and coastal areas	
National screening 2008: Exposure and effect screening in urine of women	
National screening 2007: Octadecyl 3-(3,5-di-tert-butyl-4-hydroxyphenyl)propionate	
Not prioritized for a new screening but needs to be considered	
National screening 2010: Polychlorinated naphthalenes (PCNs)	PCNs had a high detection frequency in fish. The authors conclude that the concentrations are not alarming but PCN contribute to the pollutant burden of PCDD/Fs that are already close to EU maximum residue level (MRL). Human breast milk contained relatively high concentrations of PCNs. Expressed on relative potency (REP) basis the levels are similar to those of PCDD/F-TEQs. The weekly PCN-REP intake for a 1-month child was estimated to be 22 pg/kg body weight, which is above the tolerable weekly intake of 14 pg TEQ/kg body weight recommended by EU Scientific Committee of Food. Therefore we suggest that relevant PCNs are further evaluated, and considered for regular monitoring in human breast milk. Please see evaluation of substances, Appendix 2, Tables 15-17 for further information.
National screening 2009: BCPS	BCPS is classified as a HPV chemical and is frequently detected in marine biota in the Baltic Sea. Particularly high concentrations are found in guillemot eggs. Further studies to clarify emission sources and major pathways are recommended. Please see evaluation of substances, Appendix 2, Table 8 for further information.

National screening 2010: N,N-Dietyl-m-toluamid (DEET)	The authors conclude that no further screening study of DEET is necessary at present. The assessment should be reviewed when more data becomes available on the long term ecological effects of DEET, toxicological interactions with other compounds and occurrence and effects of degradation products.
National screening 2010: Fluorescent Whitening Agents	Follow up studies of the fate of FWA in sludge may be warranted and of local effects of benthic organisms outside paper and pulp industries and STP. Relevant PNECs for evaluation of risks for sediment dwelling organisms were not available.
National screening 2011: Complexing agents; EDTA, DTPA, NTA, 1,3-PDTA and ADA	Based on the risk assessment and the detected concentrations, the authors conclude that complexing agents do not pose an obvious ecotoxicological risk. The general occurrence of EDTA and NTA may nevertheless cause indirect effects by their strong ability to influence the bioavailability toxic metals in the aquatic environments. Furthermore, EDTA is environmentally persistent. To assess the significance of these circumstances a more detailed evaluation is needed.
National screening 2011: Polar pollutantsC TPPO,TMDD and TCEP	The need of follow-up for TCEP is included in the discussion concerning organophosphate esters (see above). The authors conclude that the results show that TMDD is generally occurring at high concentrations and have fairly persistent properties. It is therefore suggested to be considered for follow- up. Please see evaluation of substances, Appendix 2, Table 22 for further information.
Await method development	
National screening 2009: Broad substance screening of sediments	Method development for non-target screening is ongoing (Umeå University)
National screening 2007: Pigments	Method development is needed before a new screening. Of the seven selected pigments analytical methods could be developed for four, of which one had high LOQ.
Follow-up screening or research/review is ongoing	
National screening 2011: Screening of Emerging Brominated Flame Retardants (BFRs) and Polybrominated dibenzofurans (PBDFs)	Swedish EPA have already suggested a new screening for analysis of human and air samples and a literature review is ongoing.
National screening 2009: Dechlorane Plus	
Screening 2009: Broad substance screening of storm water runoff	An assessment of the occurrence of storm water related pollutants in effluents and sludge from municipal wastewater treatment plants (M-WWTPs) is ongoing. IVL report in prep "Assessment of the occurrence of storm water related substances in sewage sludge and effluent water". Method development for non-target screening is ongoing (Umeå University)

National screening 2007: Concrete additives	A follow-up screening was finalized in the autumn 2013
National screening 2007: Silver	National Screening 2013 Antibacterial substances
National screening 2007: Human exposure to chlorinated paraffins via indoor air and dust	HELCOM ämnen, MISSE and Inflame
National and regional screening 2007: Sukralos part 2	Stockholm university is in the process to publish a new study on behavioural effects of sucralose on aquatic organisms. In addition to sucralose other artificial sweeteners, *e.g.* acesulfame, should be included. Acesulfame was reported to be one of the most relevant compounds in an EU-wide monitoring survey on emerging polar organic compounds in WWT effluents (Loos et al 2013).
National screening 2007: Sucralose	
National screening 2007: Biocides and organic halogens	The screened biocides were not found at levels that give rise to any immediate environmental and/or health concern. Outcome of the report ”Biociders spridning i miljön och deras hälso- och miljörisker - utifrån screeningdata 2000-2012” (Swedish EPA, in preparation) may revise this conclusion.
Follow-up study is not needed at present	
National screening 2012: Rodenticides	Two screening studies have been conducted and no issues remain at present.
National screening 2010: Chlorhexidine and p-chloroaniline	Observed concentrations are well below effect concentrations.
National screening 2008: Methyl tert-butyl ether (MTBE) and Ethyl tert-butyl ether (ETBE)	Observed concentrations are well below effect concentrations.
National screening 2008: Biocides: Glutaraldehyde	Glutaraldehyde does not appear to pose a risk to the environment
National screening 2008: Biocides: 3-Iodo-2-propynyl butyl carbamate (IPBC) and 2,2-dibromo-2-cyanoacetamide (DBNPA)	IPBC and DBNPA do not appear to pose a risk to the environment.
Priority substances within the WFD	
Screening 2008: Temporal variation of WFD priority substances	
National screening 2007: Nationwide screening of WFD priority substances	
Follow-up screening has been done	
National screening 2008: Biocides: Difenacoum	Screening 2012: Rodenticides
National screening 2008: Screening of unintentionally produced organic contaminants	National screening 2011 Screening of Emerging Brominated Flame Retardants (BFRs) and Polybrominated dibenzofurans (PBDFs)
National screening 2008: Decabromodiphenyl ethane	National screening 2011 Screening of Emerging Brominated Flame Retardants (BFRs) and Polybrominated dibenzofurans (PBDFs)
National screening 2007: Linear alkyl benzene sulphonate (LAS)	IVL report B1808

National screening 2007: Musk substances	Nationell screening 2008: Musk substances and metabolites
National screening 2007: Amines	Nationell screening 2009: Benzothiazoles, benzenediamines and benzotriazoles
National screening 2007: Anti-inflammatory and analgesic drugs	Nationell screening 2010: Läkemedel

Table 2. Screening reports where there is a need for method development.

Report	**Identified need for method development**
National screening 2009: Benzothiazoles, benzenediamines and benzotriazoles	* DBD was found in soil and sediment but was not possible to analyse in crops and biota. * TBS and BBD were not possible to analyse. * UV-326 (2-tert-butyl-6-(5-chlorobenzotriazol-2-yl)-4-methylphenol) could not be fragmented
National screening 2007: Nationwide screening of WFD priority substances National screening 2008: Temporal variation of WFD priority substances	LOQ of TBT is approximately 5 – 10 times higher than the AA-EQS value.
National screening 2007: Amines	Need for metohd development of aliphatc amine pentaerthyleneehexamine (PEHA)
National screening 2007: Pigments	Analytical methods for pigments Pigment violet 23, Pigment blue 15 and Pigment green 3 could not be established.
National screening 2009: Broad substance screening of sediments National screening 2009: Broad substance screening of stormwater runoff	Stormwater and sediments is a very complicated matrix as the organic composition is usually dominated by oil and fuel related substances. The presence of oil- and fuel related hydrocarbons as well as humic substances in the sample creates so called matrix disturbance that tends to dominate and hide the presence of other compounds. To elucidate the identity of unknown organic substances in such a complex matrix, may demand other extraction methods and possibly even more refined analytical detection methods.
National screening 2010: Pharmaceuticals	Azelastine, buprenorphine, estradiol, ethinyl estradiol, felodipine, flupentixol, levomepromazine, meclozine and perphenazine have inadequate LOQs. Method development is also needed to get a better assessment of the retention of certain pharmaceuticals in STP.

Appendix 4.

Tabell 1. Utvärdering av screening rapporter, svensk version.

Rapport	**Kommentar**
Föreslagen för uppföljning	
Nationell screening 2009: UV-Filter	Rapporterna är presenterade i prioritetsordning Se text för kommentarer
Nationell screening 2010: Läkemedel	
Nationell screening 2011 Doftämnen: OTNE, acetyl cedren och difenyleter	
Nationell screening 2008: Muskämnen och metaboliter	
Nationell screening 2009: Benzothiazoler, benzenediaminer och benzotriazoler	
Nationell screening 2007: Platinum gruppelement	
Nationell screening 2007: Organofosfatestrar i humanmjölk och fisk från svenska sjöar och kustnära områden	
Nationell screening 2008: Exponering och effektscreening av urinprov från kvinnor	
Nationell screening 2007: Octadecyl 3-(3,5-di-tert-butyl-4-hydroxyfenyl)propionate	
Inte prioriterad i dagsläget för ny screening men behöver beaktas	
Nationell screening 2010: Polychlorinerade naftalener (PCN)	Detektionsfrekvensen för PCN var hög i fisk. Författarnas slutsats var att koncentrationerna inte var anmärkningsvärda men att PCN bidrar till belastningen av PCDD/Fs, som redan ligger nära EU högsta tillåtna gränsvärden (maximum residue level). Bröstmjölk innehöll relativt höga halter av PCN. Omräknat som relativ biologisk potens (REP) motsvarar halterna de för PCDD/F (uttryckt i totala toxiska ekvivalenter; TEQs). Veckointaget av PCN-REP beräknades för 1 månad gamla spädbarn till 22 pg/kg kroppsvikt vilket ligger över det tolerabla veckointaget, 14 pg TEQ/kg kroppsvikt, enligt EU:s vetenskapliga kommitté för livsmedel. Vi föreslår därför att dessa substanser utvärderas ytterligare och att relevanta PCN övervägs för regelbuden miljöövervakning i bröstmjölk. Se även utvärdering av enskilda ämnen Appendix 2, tabell 15-17.
Nationell screening 2009: BCPS	BCPS är klassificerad som en HPV kemikalie och rapporteras ofta i marin biota i Östersjön. Särskilt höga koncentrationer har hittats i sillgrissleägg. Det behövs ytterligar studier för att klargöra emissionskällor och dominerande flödesvägar. Se även utvärdering av enskilda ämnen, Appendix 2, tabell 8.

Nationell screening 2010: N,N-Dietyl-m-toluamid (DEET)	Författarnas slutsats vara att ingen ytterligare screening av DEET behövs för närvarande eftersom miljökoncentrationerna är långt under effektkoncentrationerna. Bedömningen bör omprövas när data om långtidseffekter finns eller om samverkanseffekter med andra kemikalier upptäcks eller ny kunskap om förekomst och effekt av nedbrytningsprodukter tillkommer.
Nationell screening 2010: Optiska vitmedel	Behovet av en uppföljande studie om optiska vitmedel i slam och en undersökning av eventuella effekter på bentiska organismer utanför pappers- och massaindustrier och reningsverk kan övervägas. PNECs för sedimentlevande organismer saknas.
Nationell screening 2011: Komplexbildare: EDTA, DTPA, NTA, 1,3-PDTA and ADA	Baserat på riskbedömningen och uppmätta koncentrationen drar författarna slutsatsen att komplexbildare inte utgör en uppenbar miljörisk. EDTA och NTA förekommer i nästan alla ytvattenprov som analyserats och EDTA är svårnedbrytbar. Genom sin förmåga att komplexbilda toxiska metaller kan dessa ämnen ha en indirekt påverkan men för att kunna göra en bedömning av effekten av den egenskapen behövs en mer detaljerad utvärdering.
Nationell screening 2011: Polära föroreningar: TPPO, TMDD and TCEP	Angående behovet att följa upp screeningen av TCEP, se text om organfosfater. Författarnas slutsats var att TMDD generellt förekommer i höga koncentrationer och har persistenta egenskaper och föreslås därför kunna vara relevant för uppföljning. Se även utvärderingen av enskilda ämnen, Appendix 2, tabell 22.
Avvakta metodutveckling	
Nationell screening 2009: Bred ämnesscreening av sediment	Metodutveckling för icke-specifik (non-target) screening pågår vid Umeå universitet.
Nationell screening 2007: Pigment	Metodutveckling behövs innan en ny screening. Av de sju utvalda pigmenten kunde fyra analytiska metoder utvecklas för fyra av vilka en hade högt LOQ.
Uppföljande screening, forskning eller litteraturstudie pågår	
Nationell screening 2011: Screening av nya bromerade flamskyddsmedel (BFRs) and polybrominerade dibenzofuraner (PBDFs)	Naturvårdsverket har redan föreslagit en ny screening för analys av human och luftprover och en litteratur studie pågår.
Nationell screening 2009: Dechlorane Plus	
Nationell screening 2009: Bred ämnesscreening av dagvatten	En utvärdering av förekomsten av dagvattenrelaterade miljöföroreningar i utgående vatten och slam från kommunala reningsverk pågår. IVL rapport (manuscript) "Assessment of the occurrence of storm water related substances in sewage sludge and effluent water". Metodutveckling för icke-specifik (non-target) screening pågår vid Umeå universitet.
Nationell screening 2007: Betongtillsatser	En ny screening slutfördes under hösten 2013.
Nationell screening 2007: Silver	National Screening 2013: Antibakteriella substanser
Nationell screening 2007: Human exponering för chlorinerade	HELCOM ämnen. Forskningsprogrammen MISSE och Inflame pågår.

paraffiner via inomhus luft och damm.	
Nationell och regional screening 2007: Sukralos del 2	Stockholms universitet kommer att publicera en ny studie om effekter av sucralos på akvatiska organismer. Även andra artificiella sötningsmedel bör beaktas. I en nyligen genomförd screening över nya polära organiska föreningar vid utflöden från reningsverk inom EU, rapporterades acesulfame vara ett av de mest relevanta ämnena (Loos et al 2013).
Nationell screening 2007: Sucralose	
Nationell screening 2007: Biocider and organiska halogener	De analyserade biociderna hittades inte i koncentrationer som ger upphov till någon direkt oro för hälsa eller miljön. Litteraturstudien ”Biociders spridning i miljön och deras hälso- och miljörisker - utifrån screeningdata 2000-2012” (Naturvårdsverket manuskript) pågår.
Uppföljande screening bedöms inte behövas	
Nationell screening 2012: Rodenticider	Två screening studier har genomförts och inga frågor återstår för närvarande.
Nationell screening 2011: Klorhexidin och p-kloroaniline	Rapporterade koncentrationer ligger långt under effektnivåer.
Nationell screening 2008: Methyl tert-butyl eter (MTBE) och ethyl tert-butyl eter (ETBE)	Rapporterade koncentrationer ligger långt under effektnivåer.
Nationell screening 2008: Biocider: Glutaraldehyd	Resultaten visar att glutaraldehyd inte utgör en risk för miljön.
Nationell screening 2008: Biocider: 3-Iodo-2-propynyl butyl carbamate (IPBC) och 2,2-dibromo-2-cyanoacetamide (DBNPA)	Resultaten visar att IPBC och DBNPA inte utgör en risk för miljön.
Prioriterade ämnen inom ramen för vattendirektivet	
Nationell screening 2008: Temporal variation av vattendirektivets prioriterade ämnen	
Nationell screening 2007: Nationell screening av vattendirektivets prioriterade ämnen	
Uppföljande studier har genomförts	
Nationell screening 2008: Biocider: Difenacoum	Screening 2012: Rodenticider
Nationell screening 2008: Oavsiktligt bildade ämnen	Nationell screening 2011: Screening av nya bromerade flamskyddsmedel (BFRs) and polybrominerade dibenzofuraner (PBDFs).
Nationell screening 2008: Decabromodifenyletan	Nationell screening 2011: Screening av nya bromerade flamskyddsmedel (BFRs) and polybrominerade dibenzofuraner (PBDFs).
Nationell screening 2007: Linear alkyl benzene sulfonate (LAS)	IVL rapport B1808
Nationell screening 2007: Musksubstanser	Nationell screening 2008: Musk substanser och metaboliter
Nationell screening 2007: Aminer	Nationell screening 2009: Benzothiazoler, benzenediaminer och benzotriazoler
Nationell screening 2007: Anti-inflammatoriska o smärtstillande medel	Nationell screening 2010: Läkemedel