Format for submitting pursuant to Article 8 of the Stockholm Convention the information specified in Annex E of the Convention

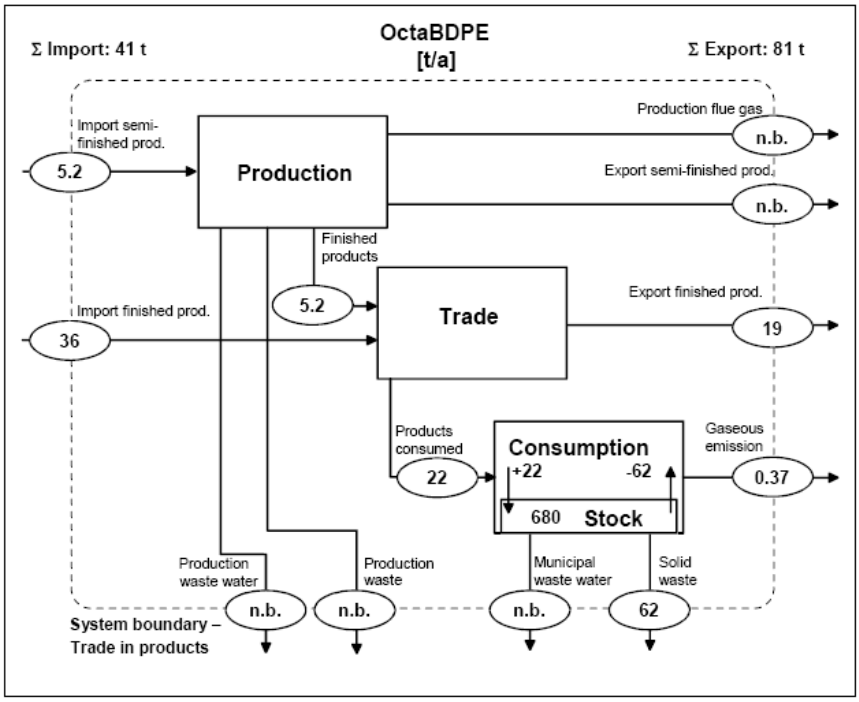
Introductory information	
Name of the submitting Party/observer	**Switzerland**
Contact details (name, telephone, e-mail) of the submitting Party/observer	**Federal Office for the Environment Substances, Soil and Biotechnology Division Contact: Bettina Hitzfeld / Georg Karlaganis bettina.hitzfeld@bafu.admin.ch / georg.karlaganis@bafu.admin.ch +41 31 32 31768**
Chemical name (as used by the POPS Review Committee (POPRC))	**Commercial mixture octabromodiphenyl ether**
Date of submission	**7 February 2007**

(a) Sources, including as appropriate (provide summary information and relevant references)	
(i) Production data: Quantity Location	**No production**
Other	
(ii) Uses	**Plastics in EE (electrical and electronics) appliances. Usage is declining**

K0582396 290705

(iii) Releases:	**There are no measurements of releases of OctaBDE. A substance-flow analysis was performed in 2002. The pdf is provided and a excerpt herein:** **Selected polybrominated flame retardants PBDE and TBBPA: Substance flow analysis** ENVIRONMENTAL SERIES No. 338, Environmentally hazardous substances. Authors: Leo Morf, Geo Partner, Zurich, Roman Smutny, RMA, Vienna, Ruedi Taverna, Geo Partner, Zurich, Hans Daxbeck, RMA, Vienna. Published by the Swiss Agency for the Environment, Forests and Landscape (SAEFL),Bern, 2002 In Switzerland consumption of OctaBDE is estimated to be 22 t/a. Domestic production of electric and electronic goods is using about 5 t/a. Preparations of OctaBDE are not used in Switzerland. About 60% of the 22 t OctaBDE which are used per year in consumer goods are used in electric and electronic goods, 40% in cars. About 70% of the total OctaBDE stock of 680 t can be found in electric and electronic goods. The most important products for stocks and emissions are TVs (40%), cars (20%) and buidling materials such as plastic foils (10%; these do, however, not contain OctaBDE anymore). **Summary (excerpt)** Brominated flame retardants (BFR) have been a controversial topic for over 15 years. Today, more is known about the behaviour of BFR and about the potential threat that they present to human beings and to the environment than was known at the time about PCB, when their use and production were prohibited. Among the BFR examined here, some present a potential threat in that they are persistent and can accumulate in the food-chain (e.g. pentaBDPE and TBBPA). Also, dioxins and furans may be formed during uncontrolled incineration (e.g. decaBDPE), and there are indications of carcinogenic potential (e.g. decaBDPE) and estrogenic effects (e.g. pentaBDPE). The present study presents substance flow analyses for four representative groups of brominated flame retardants: pentabromodiphenyl ethers [pentaBDPE], octabromodiphenyl ethers [octaBDPE], decabromodiphenyl ethers [decaBDPE] and tetrabromobisphenol A [TBBPA]. The study is based solely on data available in the literature, and examines the use of BFR in Switzerland in the late 1990s. The accumulated anthropogenic stock was determined from the figures for semi-finished and finished products treated with flame retardants that were imported into Switzerland. The annual flows arising from export, waste management and emission to the environment, were also estimated. In the 1990s, the four groups of substances under study accounted for about two thirds of world demand for BFR. In recent decades, the demand has risen sharply as a result of the increasing use of plastics, and stricter fire regulations. The world consumption of the BFR under study rose between 1991 and 1999 from 100 000 t/a to 190 000 t/a, and further increases of 5 to 7 percent per annum are expected up to 2005. From a detailed breakdown of the data, it may be seen that the consumption of octaBDPE decreased strongly during the 1990s, while that of pentaBDPE, decaBDPE and TBBPA rose sharply. **Results** About 1700 tonnes of the BFR under study are imported annually into Switzerland via semifinished and finished products. About 46 percent of these are re-exported via finished products, and the remainder is consumed in Switzerland ('trade in products'). The consumption of pentaBDPE within Switzerland is mainly accounted for by motor vehicles (upholstery, textiles), of octaBDPE by electrical and electronic appliances (EE appliances) and motor vehicles, of decaBDPE by EE appliances (EDP and office equipment), motor vehicles and building materials (PE sheeting), and of TBBPA by EE appliances (computers). Over the past twenty years, the consumption of products treated with flame retardants in Switzerland has resulted in the accumulation of about 12 000 t of the BFR under study. While the stocks of pentaBDPE and octaBDPE are at present declining, that of TBBPA is increasing, and that of decaBDPE is approximately in dynamic equilibrium. Approximately 900 tonnes of BFR leave the stock in consumption annually, almost all of which is disposed of via solid waste. A total of 65 to 85 percent of the BFR (except for pentaBDPE with only 23 percent) are treated in controlled incineration processes, in which they are almost completely destroyed. Over and above the stock in consumption, a further stock of 1500 t of BFR (i.e. about a factor of 10 lower) has accumulated in Swiss landfills in recent decades. This is increasing by about 130 t per year. If inappropriately managed, this, too, could represent a potential future hazard to humans and the environment. In the absence of up-to-date measurements for Switzerland, only very rough estimates of the flows to the environment from consumption and from waste management could be made. **Subsystem: 'trade in products'**

Fig. 6-2: OctaBDPE flows in the subsystem: 'trade in products'



Discharges

The worldwide consumption of octaBDPE flame retardants declined markedly by (38%) over the past decade from 6000 t in 1991 to 3800 t in 1999. The principal application of octaBDPE was in ABS plastics in EE (electrical and electronics) appliances, which have a market share of 85%. For ABS blends containing alternative flame retardant substances, the market share of octaBDPE has declined sharply. World consumption of octaBDPE flame retardants in relation to total PBDE (pentaBDPE, octaBDPE and decaBDPE) consumed in 1999 was approx. 5.7%. In Europe it was of the same order, i.e. approx. 5.5% (450 t/a). The world and European figures for the consumption of octaBDPE refer to commercial flame retardant products having an average content of approx. 34% of the pure substance octaBDPE. At the end of the 1990s, the average import of octaBDPE via semi-finished and finished products to the subsystem: 'trade in products' was approx. 41 t/a, of which approx. 46% were re-exported in the form of finished products. The percentage of finished products containing octaBDPE that are manufactured in Switzerland was very low at approx. 14% of imports. The import of octaBDPE flame retardants in finished products is mainly accounted for by EE appliances (some 67%), whereby EDP and office equipment dominate. Upholstery (flexible PUR foams), textiles and plastics in motor vehicles that contain flame retardants represent a further significant fraction (approx. 33%) of imports. For these applications, PBDE are usually employed, and it is assumed that a small percentage (approx. 8%) of this occurs in the form of octaBDPE.
The octaBDPE flow in home-produced finished products is accounted for entirely by EE appliances assembled from imported components containing octaBDPE. No chemicals containing octaBDPE are processed in Switzerland.
In comparison to imports, home production accounts for only a small flow of octaBDPE of approx. 5.2 t/a (13%). The export of semi-finished products containing octaBDPE could not be determined. For this reason, the quantity of octaBDPE used in the production sector might be higher than the 5.2 t/a estimated. This difference could, for example, arise from semi-finished products containing octaBDPE that are traded, but not processed or consumed, in Switzerland. The flow of octaBDPE in finished products destined for consumption (approx. 22 t/a) is about the same as that in exported finished products (approx. 19 t/a). Most of the octaBDPE flow in consumed finished products (approx. 59%) is attributable to EE appliances. EDP equipment account for approx. 22%, and large household appliances approx. 13%, of the total flow. In addition to EE appliances, plastic components in cars represent an important field of application of octaBDPE. Approximately 41% of the annual consumption of octaBDPE in finished products is attributable to motor vehicles. At the end of the 1990s, building materials destined for consumption no longer contained octaBDPE flame retardants.
The stock in consumption built up in Switzerland over the last two decades through the use of products containing octaBDPE is approx. 680 t octaBDPE. This is mainly composed of consumer goods containing octaBDPE used in private households (EE appliances, cars) and building materials containing octaBDPE that form part of the infrastructure.
Although about 22 t/a of products containing octaBDPE are added to the stock, approximately three times this amount (62 t/a) is removed from the stock, so that this is now diminishing rapidly.

Although the use of octaBDPE flame retardants is now declining in Switzerland, large quantities (62 t/a) are still being passed on to waste managemen through the elimination of stock. On the assumption that the trend towards reduced application of octaBDPE in new products continues, it will take a further 17 years for the stock of products in consumption that contain octaBDPE to be eliminated.
The main products in relation to stock and emission of octaBDPE are EE appliances, which account for approx. 69% of the stock, and cars, which account for 21%. In detail, the stock comprises:
• approx. 42 % octaBDPE in TV appliances
• approx. 21 % octaBDPE in cars
• approx. 10 % octaBDPE in building materials (plastic sheeting)
• approx. 9 % octaBDPE in small electrical components (plugs and switches)
• approx. 7 % octaBDPE in smaller and larger EE household appliances • approx. 6 % octaBDPE in EDP + office equipment
• approx. 5 % octaBDPE in other EE appliances (household electronics, electrical appliances in industry)

The major part of the approximately 62 t/a octaBDPE disposed of via waste results from electronic appliances (approx. 77%), of which TV appliances account for some 36% and EDP + office equipment for 26%. Approximately 9 t octaBDPE are disposed of annually via used cars, and a further 5.2 t are contained in PE films in residual building waste.
The diffuse emission from the use of products containing octaBDPE of about 0.37 t/a is ecologically significant. Of this, 69% is attributable to EE appliances in private households. Since worst-case emission rates were applied in the calculations, it can be assumed that the emission is in fact lower. To obtain the highest possible figure for pollution, it is assumed that the emission takes place entirely to the atmosphere. In comparison to the other two PBDEs (pentaBDPE and decaBDPE), diffuse emission of octaBDPE represents about one-fifth. This is attributable to the fact that the emission rate of octaBDPE is an order of magnitude lower than that of pentaBDPE, and that the stock of products containing octaBDPE is only about one eighth of that containing decaBDPE.

Data gaps and range of error
Concerning the foremost application of octaBDPE in this study (i.e. in ABS plastics), realistic estimates were made based on the lists of plastics constituents obtained from flame retardants manufacturers. However, it was necessary to make certain assumptions concerning the market share of flame retardants used in ABS plastics and on the percentage of plastics used in products.

Subsystem: 'waste management'

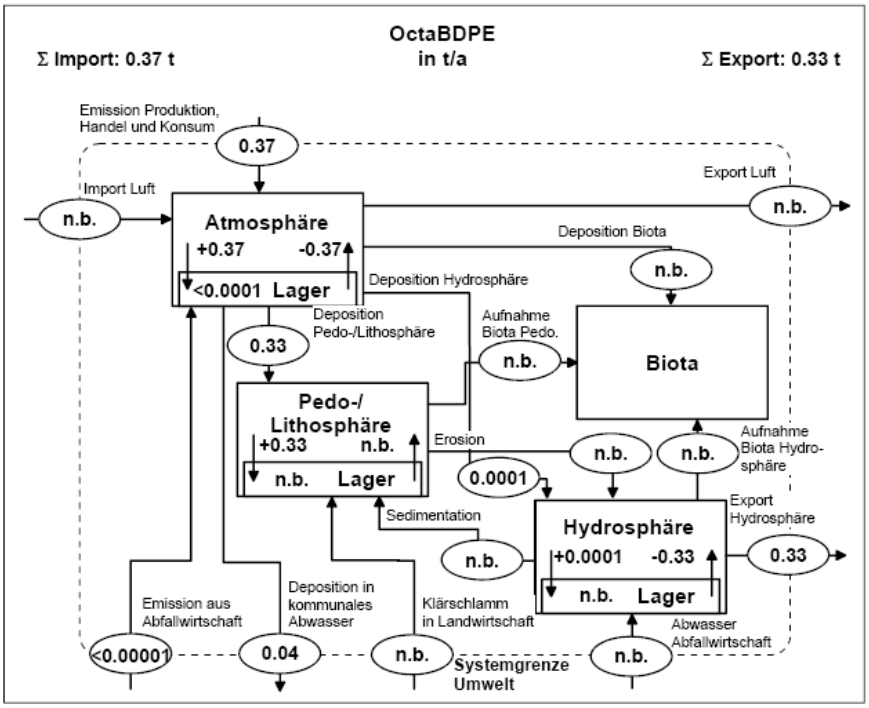
The input of octaBDPE from consumption to Swiss waste management at the end of the 1990s was estimated at a total of 62 t/a. As with the other BFR, the entire quantity of octaBDPE occurs in the solid waste fraction. This may be divided into separately collected waste (53 %), thermally treated waste (37 %) and landfill material (10 %). From the estimates made in the subsystem: 'trade in products', an input via waste water is regarded as improbable. A total of 33 t octaBDPE were contained in the separately collected waste assigned to reuse. Of this, 2.3 t/a were exported, some 31 t/a passed on in the form of residual substances to incineration, and the remaining 1.1 t/a deposited in landfills. No data are available on emission from 'reuse'. This could possibly be relevant to the environment. Almost all of the 54 t/a of octaBDPE treated thermally in the process: 'incineration' is destroyed (to >99.9 %). The total output from incineration amounts to 0.029 t/a. Of this, exports amount to 0.01 t/a (ash), and incineration residues to landfills 0.019 t/a (slag and ash). For octaBDPE, emission to the environment (flue gases and waste water) is estimated at <0.00001 t/a. No measurements are available for octaBDPE in sewage sludge. OctaBDPE flows in sewage sludge and purified waste water were therefore not estimated. The input from the atmosphere (via deposition of dust particles) to the waste water treatment system is estimated at 0.04 t/a, amounting to 10 % of the emission from consumption in Switzerland. Also, approx. 0.007 t/a is carried over into waste water via seepage water.
At the end of the 1990s, approx. 7.1 t/a octaBDPE were deposited in landfills (of which 1.1 t/a arose from the process: 'reuse' and 6 t/a directly in the form of waste from the subsystem: 'trade in products'). Emission from landfills is estimated at 0.0007 t/a. It is assumed that 10 % of the emission in seepage water finds its way directly to the environment, and the rest to waste water treatment. Gaseous emission is neglected. The landfill stock is estimated at approx. 130 t.
The total output of octaBDPE from the subsystem: 'waste management' amounts to an annual 2.4 t. Although this represents only 4 % of input, the flow is twice that for pentaBDPE. Approximately 10 % (7.1 t/a) of the total input are deposited in landfills within the subsystem, and 86 % are almost completely destroyed by thermal treatment. It is assumed here that no decaBDPE is carried back into the subsystem: 'trade in products' via reused products. To what extent this assumption applies

could not be assessed. Diffuse emission to the *environment* (excluding possible emission of waste water from the process: 'reuse') is estimated at 6 kg/a (< 0.01 %).

Subsystem: 'environment'

The input of octaBDPE *to the environment* was estimated at a total of 0.37 t/a at the end of the 1990s. This input consists in the main of emission to the atmosphere from the subsystem: 'trade in products'. Emission from the subsystem: 'waste management' to the atmosphere (excluding reuse processes) plays a subordinate role, amounting to <0.00001 t/a. No estimates of the input of octaBDPE to the environment via sewage sludge or compost, nor of waste water from waste management, could be made. The estimated export of 0.33 t/a via the hydrosphere (Rhine and Rhone) is the most significant output from the subsystem: 'environment'. The estimated deposition to municipal waste water via particle deposition from the atmosphere of 0.04 t/a (=10 % of the emission from the process: 'trade in products') to the subsystem: 'waste management' is an order of magnitude lower. Exports and imports via the atmosphere are neglected. A rough estimate of the stock of octaBDPE in the environment was made based on data found in the literature for the concentration in environmental compartments and estimated compartment weights for the atmosphere, the pedo/lithosphere and the hydrosphere. The results show that <0.0001 t octaBDPE are present in the atmosphere. However, no estimates of the stocks in the hydrosphere or the pedo/lithosphere could be made.

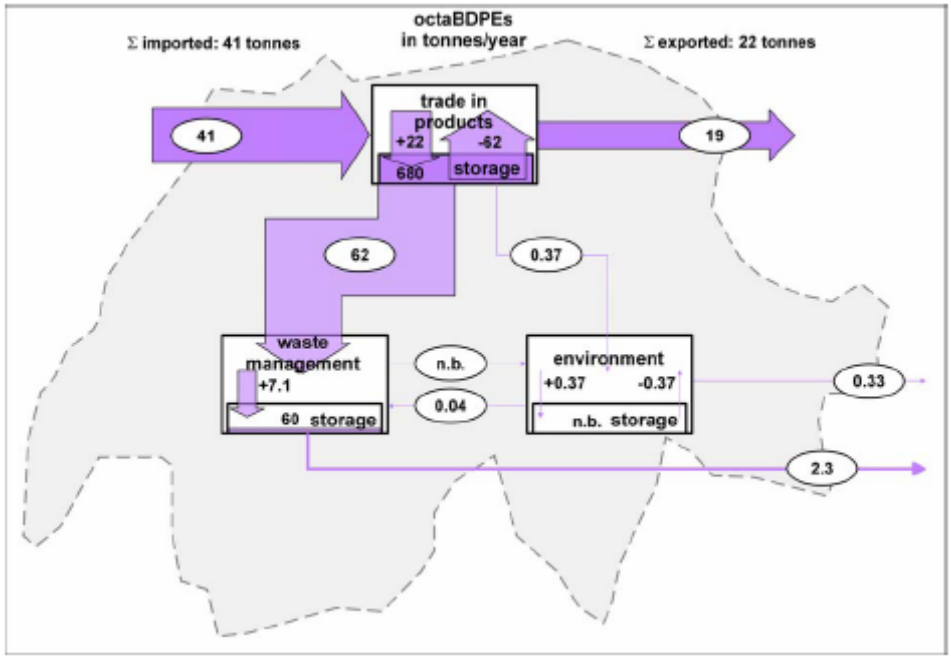
Fig. 6-10: OctaBDPE flows in the subsystem: 'environment'



(English translation can be provided if wanted)

OctaBDPE (octabromodiphenyl ether) – overall balance for Switzerland

Over the past ten years, the consumption of octaBDPE flame retardants has declined worldwide by nearly 40 %. At the end of the 1990s, some 41 t octaBDPE were imported to Switzerland in the form of flame retardants in products. Almost half (46 %) of the imported products are reexported. The octaBDPE imported is present in EE appliances (67 %) and in upholstery, textiles and plastics in motor vehicles (33 %). Similarly to pentaBDPE, a stock of 680 t octaBDPE built up in consumption (trade in products) over the last two decades. This stock is mainly accounted for by EE appliances (69 %) and motor vehicles (21 %). The remaining 10 % of the stock is found in building materials containing octaBDPE that were no longer employed in new products at the end of the 1990s. As for pentaBDPE, the stock of octaBDPE in the anthroposphere had already been eliminated at the end of the 1990s. An annual quantity of 22 t octaBDPE are input to the stock, while approx. 62 t/a are passed on to waste management. Of the 62 t octaBDPE that were passed on annually to waste management at the end of the 1990s, about 53 % was in separately collected waste, and of this, approx. 94 % contained in the residual materials was treated thermally. Also, of the octaBDPE contained in the 23 t of waste passed on directly for thermal treatment, approx. 87 %

	(contained in the solid waste) was treated thermally and thereby largely destroyed, and approx. 10 % was passed on to landfills in Switzerland. The remainder (3-4 %) was exported. An annual 0.4 t octaBDPE diffuses from the stock in consumption to the environment. Compared to the other two PBDEs (pentaBDPE and decaBDPE), the diffuse emission of octaBDPE amounts to about one-fifth. This flow is largely (0.3 t/a) input to the stock in the pedo/lithosphere. The stock of octaBDPE in the environment could not be determined. A comparison of the stock in consumption (trade in products) with that in waste management shows that at the end of the 1990s, the largest stock of octaBDPE (680 t) was present in consumption. This stock is presently diminishing at the rate of 40 t per annum. Approximately 11 % of the waste concerned is disposed of in landfills in waste management. Assuming that this trend continues, it will take about 13-18 years (i.e. about twice the time required for pentaBDPE) for the stock in waste management to become the key anthropogenic stock (then amounting to approx. 160 t).  *Figure 3: Flows of octaBDPE in Switzerland in the late 1990s*
Losses	
Emissions	
Other	

(b) Hazard assessment for endpoints of concern, including consideration of toxicological interactions involving multiple chemicals (provide summary information and relevant references)

(c) Environmental fate (provide summary information and relevant references)	
Chemical/physical properties	
Persistence	
How are chemical/physical properties and persistence linked to environmental transport, transfer within and between environmental compartments, degradation and transformation to other chemicals?	
Bio-concentration or bio-accumulation factor, based on measured values (unless monitoring data are judged to meet this need)	

(d) Monitoring data (provide summary information and relevant references)

Values for commercial OctaBDE are difficult to obtain. We have therefore compiled monitoring data for polybrominted diphenyl ethers and specified the congeners when known.

I. Compilation of total concentrations of persistent organic pollutants in fish from alpine lakes in the Grisons, Switzerland (ng/g, lipid weight (lw) based)

PBDE	***Lake Tuma***	***Lake Lunghin***	***Lake Moesola***	***Lake Suretta***	***Lake Diavolezza***	***Lake Teo***	***Lake Grond***
BDE 99	14	37	6.0	5.3	3.5	9.4	7.0
BDE 100	8.5	12	4.2	5.9	1.6	5.0	3.8
BDE 153	3.2	10	0.30	2.1	0.61	2.6	1.5
BDE 154	0.52	1.2	<0.22	<0.089	<0.12	<0.11	<0.26
BDE 183	1.1	6.9	0.86	0.91	0.40	0.84	0.67
Further information							
Fish species	Brown trout, alpine char	Lake trout	Brown trout	Brown trout, alpine char	Lake trout	Brown trout	Brown trout
Stocking	Annual	Last in 1992	Annual	Unknown	Last 1977	Annual	Last 1978

Reference: Schmid, P. et al., Persistent organic pollutants, brominated flame retardants and synthetic musks in fish from remote alpine lakes in Switzerland, Chemosphere (2007), doi:10.1016/j.chemosphere.2006.05.080.

II. PBDE in fish oil used as dietary supplement in Switzerland

Fish oil capsules were bought from pharmacies. The origin of the fish ranged from the Pacific (New Zealand, Peru) to South Atlantic (plus unknown).

PBDE (BDE 28, 47, 99, 100, 153, 154, 183, and 209) was detected in all samples. Sums were between 0.069 and 3.8 ng/g; PBDE patterns were dominated by BDE 47, 99, and 100.

Reference: Zennegg, M. and Schmid, P. PCDD/F, PCB, Dioxin-like PCB, and PBDE in fish oil used as dietary supplement in Switzerland. Organohalogen Compounds (2006), 68: 1967-1970.

III. ORGANIC POLLUTANTS IN SOURCE-SEPARATED COMPOST

Compost and digestate was investigated for the presence of ΣBDE 28, 47, 99, 100, 153, 154, 183: median concentration 2.0 µg/kg dw (0.2-4.5 µg/kg dw) and BDE 209: 7.3 µg/kg dw (0.6-30.8 µg/kg dw). Median concentrations of pentaBDE and octaBDE calculated according to Morf et al. 2005 were at 1.9 µg/kg dw, and 0.2 µg/kg dw, respectively.

References:
Morf, L. S., Tremp, J., Gloor, R., Huber, Y., Stengele, M., Zennegg, M. *Environ. Sci. Technol*. 2005;39:8691.
Brändli, R. et al. ORGANIC POLLUTANTS IN SOURCE- SEPARATED COMPOST, Organohalogen Compounds (2006), 68: 863-866

(e) Exposure in local areas (provide summary information and relevant references)

- general	**Unknown**
- as a result of long-range environmental transport	**Unknown**

- information regarding bio-availability	

(f) National and international risk evaluations, assessments or profiles and labelling information and hazard classifications, as available (provide summary information and relevant references)

OctaBDE is severly restricted in Switzerland.

See also: http://www.bafu.admin.ch/chemikalien/01415/01422/index.html?lang=en and http://www.bafu.admin.ch/chemikalien/01410/01411/index.html?lang=en

The following is an excerpt from the:

Ordinance on Risk Reduction related to the use of certain particularly dangerous substances, preparations and articles (Ordinance on Risk Reduction related to Chemical Products (ORRChem)) of 18 May 2005

particularly

Art. 3

1 The restrictions and prohibitions applicable to the use of specific substances, preparations and articles and the exemptions to these are regulated in the annexes.

2 Exemptions under the annexes are granted only to persons who have their habitual residence or registered office in Switzerland

and

Annex 1.9 (Art. 3)

2 Brominated biphenyls and diphenylethers

2.1 Definitions

1 The following are brominated biphenyls and diphenylethers with a flame retardant effect:

a. polybrominated biphenyls (PBBs) with the molecular formula $C_{12}H_{10-n}Br_n$, where $2 \leq n \leq 10$;

b. pentabromodiphenylether (pentaBDE) with the molecular formula $C_{12}H_5Br_5O$;

c. octabromodiphenylether (octaBDE) with the molecular formula $C_{12}H_2Br_8O$;

d. decabromodiphenylether (decaBDE) with the molecular formula $C_{12}Br_{10}O$.

2 Substances under paragraph 1 letters b to d also include congeners produced as by-products during the manufacturing process.

2.2 Prohibitions

2.2.2 Pentabromodiphenylether (pentaBDE) and octabromodiphenylether (octaBDE)

1 It is prohibited to place on the market and to use pentaBDE and octaBDE or substances and preparations with a pentaBDE or octaBDE content equal to or greater than 0.1% by mass, except for analysis and research purposes.

2 It is prohibited for new articles to be placed on the market if their parts that are treated with flame retardants have a content of pentaBDE or octaBDE exceeding 0.1% by mass.

3 Transitional provisions

1 The prohibitions within the meaning of sections 2.2.1 to 2.2.3 do not apply to the following articles placed on

the market for the first time before 1 July 2006:

a. electrical and electronic equipment;

b. household luminaires;

c. spare parts for articles under letters a and b.

[2] The prohibitions within the meaning of section 2.2.1 paragraph 1 letter c and section 2.2.3 paragraph 1 letter c do not apply to spare parts for articles under paragraph 1 letters a and b.

[3] The prohibitions on the marketing and use of pentaBDE and octaBDE within the meaning of section 2.2.2 paragraph 1 do not apply to the manufacture of spare parts for articles under para-graph 1 letters a and b.

[4] Until 31 March 2006, the prohibitions on the marketing and use of pentaBDE within the mean-ing of section 2.2.2 paragraph 1 do not apply to the manufacture of aircraft emergency evacua-tion systems.

[5] The prohibition within the meaning of section 2.2.2 paragraph 2 does not apply to:

a. spare parts for articles under paragraph 1 letters a and b;

b. aircraft emergency evacuation systems which contain pentaBDE, until 31 March 2006.

The Swiss prohibition of octaBDE in the ORRChem is the application of the EU Directive 2003/11/EC.

The Cantons, which are responsible for implementation of the Chemical Laws in Switzerland, together with the Swiss Agency for the Environment, Forests and Landscape SAEFL (now Federal Office for the Environment FOEN), have in 1999 and in 2000-2002 conducted a market analysis of borminated flame retardants in plastics on the Swiss market. A total of 486 plastics components from 366 products were investigated from the following areas: office equipment, household and electrical appliances, vehocles, and electrical and building materials. Of the samples investigated, 1% contained OctaBDE.

Refence: E. Kuhn, T. Frey, R. Arnet, A. Känzig: Bromierte Flammschutzmittel in Kunststoffprodukten der Schweiz. Umwelt-Materialien Nr. 189, 2004. Publ.: Swiss Agency for the Environment, Forests and Landscape, now Federal Office for the Environment). German, English summary. http://www.bafu.admin.ch/php/modules/shop/files/pdf/phpf9yZ3c.pdf

(g) Status of the chemical under international conventions