

# 1. SUMMARY REPORT FOR POLYBROMINATED FLAME RETARDANTS

## 1.1 CHEMICAL IDENTITY AND COMPOSITION

Details of chemical names, chemical abstract service (CAS) and EINECS numbers, synonyms and trade names, molecular formulae and molecular weights for each of the PBFR chemicals assessed in the full report are described as follows:

### 1.1.1 Tetrabromobisphenol A

#### Chemical name

This substance is listed on the Australian Inventory of Chemical Substances as phenol, 4,4'-(1-methylethylidene)bis[2,6-dibromo-].

#### Registry numbers

CAS number                    79-94-7

#### Other names

2,2',6,6'-Tetrabromo-4,4'-isopropylidenediphenol

2,2-Bis(4'-hydroxy-3',5'-dibromophenyl) propane

4,4'-(1-Methylethylidene)bis[2,6-dibromophenol]

2,2',6,6'-Tetrabromobisphenol A

2,2-Bis(4-hydroxy-3,5-dibromophenyl) propane

3,5,3',5'-Tetrabromobisphenol A

4,4'-(1-Methylethylidene)bis[2,6-dibromophenol]

4,4'-Isopropylidenebis(2,6-dibromophenol)

Phenol, 4,4'-isopropylidenebis(2,6-dibromo-)

Tetrabromodian

TBBPA

Tetrabromodiphenylolpropane

#### Trade names

Derakane

### 1.1.2 Tris (2,3-dibromopropyl) phosphate

#### Chemical name

This substance is listed on the Australian Inventory of Chemical Substances as 1-propanol, 2,3-dibromo-phosphate (3:1).

**Registry numbers**

CAS number 126-72-7

**Other names**

Tris(2,3-dibromopropyl) phosphate

**Trade names**

Numerous

**1.1.3 Bis (2,3-dibromopropyl) phosphate**

**Chemical name**

This substance is a new chemical that was recently notified to NICNAS. It is not yet listed on the Australian Inventory of Chemical Substances.

**Registry numbers**

CAS number 5412-25-9

**Other names**

1-Propanol, 2,3-dibromo-, hydrogen phosphate

Bis (2,3-dibromopropyl) hydrogen phosphate

**Trade names**

No trade names are listed for this substance.

**1.1.4 Tetradecabromo (p-diphenoxybenzene)**

**Chemical name**

This substance is listed on the Australian Inventory of Chemical Substances as benzene, 1,2,4,5-tetrabromo-3,3-bis(pentabromophenoxy)-.

**Registry numbers**

CAS number 58965-66-5

**Other names**

1,4-Bis (pentabromophenoxy) tetrabromobenzene

Perbromo-1,4-diphenoxybenzene

**Trade names**

BT 120

Saytex 120

### 1.1.5 Decabromodiphenyl ether

#### Chemical name

This substance is listed on the Australian Inventory of Chemical Substances as benzene, 1,1'-oxybis(2,3,4,5,6-pentabromo)-.

#### Registry numbers

CAS number                    1163-19-5

#### Other names

Bis(pentabromophenyl) ether

Decabromodiphenyl ether

1,1'-Oxybis(2,3,4,5,6-pentabromobenzene)

2,2',3,3',4,4',5,5',6,6'-Decabromodiphenyl ether

Decabromobiphenyl ether

Decabromobiphenyl oxide

Decabromodiphenyl ether

Decabromodiphenyl oxide

Decabromophenyl ether

Ether, bis(pentabromophenyl)

Pentabromophenyl ether

#### Trade names

Numerous

#### Technical mixtures

Commercial DBDPE product is reported to comprise :  $\geq 97\%$  DBDPE,  $\sim 3\%$  NBDPE and  $< 1\%$  OBDPE.

### 1.1.6 Nonabromodiphenyl ether

#### Chemical name

This substance is listed on the Australian Inventory of Chemical Substances as benzene, pentabromo(tetrabromophenoxy)-.

#### Registry numbers

CAS number 63936-56-1

**Other names**

Pentabromo(tetrabromophenoxy) benzene

Nonabromodiphenyl oxide

Nonabromobiphenyl oxide

Nonabromodiphenyl ether

Nonabromophenoxybenzene

**Trade names**

No trade names are listed for this substance, which is not itself a commercial product but is a component of mixtures with other bromodiphenyl oxide designations.

**1.1.7 Octabromodiphenyl ether**

**Chemical name**

This substance is listed on the Australian Inventory of Chemical Substances as benzene, 1,1'-oxybis-, octabromo derivate.

**Registry numbers**

CAS number 32536-52-0

**Other names**

Diphenyl ether, octabromo derivative

Octabromodiphenyl oxide

Octabromobiphenyl oxide

Octabromodiphenyl ether

Phenyl ether, octabromo derivative

**Trade names**

Bromkal 79-8DE

CD 79

DE 79

EB 8

FR 1208

FR 143

Tardex 80

### **Technical mixtures**

The OBDPE commercial product is composed of brominated diphenyl ether congeners ranging from hexa- to nona- with minor amounts (<0.1%) of deca-BDPE.

#### **1.1.8 Hexabromodiphenyl ether**

##### **Chemical name**

This substance is listed on the Australian Inventory of Chemical Substances as benzene, 1,1'-oxybis-, hexabromo derivative.

##### **Registry numbers**

CAS number                    36483-60-0

##### **Other names**

Diphenyl ether, hexabromo derivative  
Hexabromodiphenyl ether  
1,1'-Oxybisbenzene hexabromo derivative  
Hexabromodiphenyl ether  
Hexabromodiphenyl oxide  
Hexabromophenoxybenzene

##### **Trade names**

BR 33N

HR 60P

##### **Technical mixtures**

HBDPE is not produced as an individual flame retardant. HBDPE congeners are reported components of the commercial OBDPE and PeBDPE products.

#### **1.1.9 Pentabromodiphenyl ether**

##### **Chemical name**

This substance is listed on the Australian Inventory of Chemical Substances as benzene, 1,1'-oxybis-, pentabromo derivative.

##### **Registry numbers**

CAS number                    32534-81-9

##### **Other names**

Diphenyl ether, pentabromo derivative

Pentabromodiphenyl oxide  
Pentabromodiphenyl ether  
Pentabromophenoxybenzene

### **Trade names**

Bromkal G 1  
DE 60FTM  
Planelon PB 501  
Saytex 125

### **Technical mixtures**

The composition of commercial PeBDPE has been reported as a mixture of penta- (~55%), tetra- (~30%), hexa- (~10%) and tri (<5%) BDPE congeners. 2,2',4,4',5-PeBDPE and 2,2',4,4'-TBDPE are the predominant isomers in the commercial PeBDPE product.

## **1.1.10 Tetrabromodiphenyl ether**

### **Chemical name**

This substance is listed on the Australian Inventory of Chemical Substances as benzene, 1,1'-oxybis-, tetrabromo derivative.

### **Registry numbers**

CAS number           40088-47-9

### **Other names**

Diphenyl ether, tetrabromo derivative  
1,1'-Oxybisbenzene tetrabromo derivative  
Tetrabromobiphenyl ether  
Tetrabromodiphenyl ether  
Tetrabromodiphenyl oxide

### **Trade names**

Pyrogard SR 900  
SR 900

### **Technical mixtures**

TBDPE is not produced as an individual flame retardant. TBDPE congeners are components of the commercial PeBDPE product. The 2,2',4,4'-TBDPE isomer is the predominant TBDPE isomer in the commercial PeBDPE product.

### 1.1.11 Tribromodiphenyl ether

#### Chemical name

This substance is listed on the Australian Inventory of Chemical Substances as benzene, 1,1'-oxybis-, tribromo derivative.

#### Registry numbers

CAS number 49690-94-0

#### Other names

Diphenyl ether, tribromo derivative

1,1-Oxybisbenzene tribromo derivative

Tribromodiphenyl ether

#### Trade names

No trade names are known for this substance, which is normally only found as a component of mixtures prepared by varying degrees of bromination of diphenyl ether.

#### Technical mixtures

TrBDPE is not produced as an individual flame retardant, but is reported to be present at < 5% in the commercial PeBDPE product.

### 1.1.12 2-Propenoic acid (pentabromophenylmethyl) ester, homopolymer

#### Chemical name

This substance is listed on the Australian Inventory of Chemical Substances as 2-propenoic acid, (pentabromophenyl)methyl ester, homopolymer.

#### Registry numbers

CAS number 59447-57-3

#### Other names

Poly (2,3,4,5,6-pentabromobenzyl acrylate)

Polymer of 2,3,4,5,6-pentabromobenzyl acrylate

Pentabromobenzyl acrylate homopolymer

Poly(pentabromobenzyl acrylate)

#### Trade names

Ameribrom FR 1025

FR 1025

FR 1025P

PBB-PA

### 1.1.13 Polystyrene, brominated

#### Chemical name

This substance is listed on the Australian Inventory of Chemical Substances as benzene, ethenyl-, homopolymer, brominated.

#### Registry numbers

CAS number 88497-56-7

#### Other names

Polystyrene, brominated

Brominated ethenylbenzene homopolymer

#### Trade names

PDBS 80

#### Related substances

The substance with CAS No. 88497-57-3 is a generic 'brominated polystyrene' category, which may include the products of bromination of pre-formed polystyrene as well as a range of polymers produced from brominated styrene monomers. There are also specific CAS numbers for several such polymers, for example that from dibromostyrene has CAS No. 148993-99-1, and that from a related tribromostyrene has CAS No. 57137-10-7 (marketed as Pyrocheck 68).

### 1.1.14 TBBPA bis (2,3-dibromopropyl) ether

#### Chemical name

Benzene, 1,1'-(1-methylethylidene)bis[3,5-dibromo-4-(2,3-dibromopropoxy)-

#### Registry numbers

CAS number 21850-44-2

#### Other names

1,1'-(Isopropylidene)bis[3,5-dibromo-4-(2,3-dibromopropoxy)benzene

2,2-Bis[4-(2,3-dibromopropoxy)-3,5-dibromophenyl]propane

1,1'-(1-Methylethylidene)bis[3,5-dibromo-4-(2,3-dibromopropoxy)- benzene]

2,2-Bis[3,5-dibromo-4(2,3-dibromopropoxy)phenyl]propane

2,2-Bis[3,5-dibromo-4-(2,3-dibromopropoxy)phenyl]propane

3,3',5,5'-Tetrabromobisphenol A bis(2,3-dibromopropyl) ether  
4,4'-Isopropylidenebis[2,6-dibromo-1-(2,3-dibromopropoxy)benzene]  
Bis(2,3-dibromopropoxy)tetrabromobisphenol A  
Propane, 2,2-bis[3,5-dibromo-4-(2,3-dibromopropoxy)phenyl]-  
Tetrabromobisphenol A 2,3-dibromopropyl ether  
Tetrabromobisphenol A bis(2,3-dibromopropyl) ether

**Trade names**

FR 720

**1.1.15 Bis (2,4,6-tribromophenyl) carbonate**

**Chemical name**

This substance is listed in the Australian Inventory of Chemical Substances as phenol, 2,4,6-tribromo-, carbonate (2:1).

**Registry numbers**

CAS number 67990-32-3

**Other names**

Bis(2,4,6-tribromophenyl) carbonate

**Trade names**

No trade names are recorded for this substance. It occurs as an impurity in a tribromophenol-terminated oligomer (see Section 4.2.12) below.

**1.1.16 1,2-Bis (2,4,6-tribromophenoxy) ethane**

**Chemical name**

This substance is listed on the Australian Inventory of Chemical Substances as benzene, 1,1'-[1,2-ethanediylbis(oxy)]bis[2,4,6-tribromo]-.

**Registry numbers**

CAS number 37853-59-1

**Other names**

1,1'-(Ethane-1,2-diylbisoxy)bis(2,4,6-tribromobenzene)

1,2-Bis(2,4,6-tribromophenoxy)ethane

1,1'-[1,2-Ethanediylbis(oxy)]bis[2,4,6-tribromobenzene]

Bis (2,4,6-tribromophenoxy)ethane

Bis-1,2-(2,4,6-tribromophenoxy)ethane

**Trade names**

FF680

FireMaster 680

FireMaster FF 680

**1.1.17 Disodium tetrabromophthalate**

**Chemical name**

This substance is listed on the Australian Inventory of Chemical Substances as disodium tetrabromophthalate.

**Registry numbers**

CAS number 25357-79-3

**Other names**

1,2-Benzenedicarboxylic acid, 3,4,5,6-tetrabromo-, disodium salt

Phthalic acid, tetrabromo-, sodium salt

Tetrabromophthalic acid, sodium salt

**Trade names**

FR 756

**1.1.18 1H-Isoindole-1,3(2H)-dione, 2,2'-(1,2-ethanediyl)bis[4,5,6,7-tetrabromo]**

**Chemical name**

This substance is listed on the Australian Inventory of Chemical Substances as 1H-isoindole-1,3-(2H)-dione, 2,2'-(1,2-ethanediyl)bis [4,5,6,7-tetrabromo]-.

**Registry numbers**

CAS number 32588-76-4

**Other names**

1H-Isoindole-1,3(2H)-dione,2,2'-(1,2-ethanediyl)bis[4,5,6,7-tetrabromo]-

N,N'-Ethylenebis(3,4,5,6-tetrabromophthalimide)

N,N'-Ethylenebis[3,4,5,6-tetrabromophthalimide]

2,2'-(1,2-Ethanediyl)bis[4,5,6,7-tetrabromo-1H-isoindole-1,3(2H)  
dione

1,2-Bis(tetrabromophthalimido)ethane

3,3',4,4',5,5',6,6'-Octabromo-*N,N'*-ethylenedipthalimide

Ethylene bis(tetrabromophthalimide)

Phthalimide, *N,N'*-ethylenebis[tetrabromo]-

**Trade names**

BT 93

BT 93W

Citex BT 93

Saytex BT 93

Saytex BT 93W

**1.1.19 Hexabromocyclododecane**

**Chemical name**

This substance is listed on the Australian Inventory of Chemical Substances as cyclododecane, hexabromo.

**Registry numbers**

CAS number                    25637-99-4

**Other names**

Hexabromocyclododecane

**Trade names**

Numerous

**Related substances**

The CAS No. 3194-55-6 refers to a specific isomer, 1,2,5,6,9,10-hexabromocyclododecane, whereas CAS No. 25637-99-4 represents the generic class of hexabromocyclododecanes. Manufacturers are changing their information sheets to reflect a change from the generic to the specific product.

**1.1.20 3,4,5,6-Tetrabromophthalic anhydride, diethylene glycol, propylene oxide reaction products**

**Chemical name**

This substance is listed on the Australian Inventory of Chemical Substances as 1,2-benzenedicarboxylic acid, 3,4,5,6-tetrabromo-, mixed esters with diethylene glycol and propylene glycol.

**Registry numbers**

CAS number 77098-07-8

**Other names**

3,4,5,6-Tetrabromo-1,2-benzenedicarboxylic acid, mixed esters with diethylene glycol and propylene glycol

**Trade names**

No trade names are listed for this substance.

**Related entry**

While the above details apparently relate to an alkyd-type polymer formed from the three components listed, the discrete mixed ester derived from the same three components is listed under CAS Number 20566-35-2, with Trade Names Saytex RB 79 and PHT 4-DIOL.

**1.1.21 Tris (tribromoneopentyl) phosphate**

**Chemical name**

This substance is not listed on the Australian Inventory of Chemical Substances.

**Registry numbers**

CAS number 19186-97-1

**Other names**

1-Propanol, 3-bromo-2,2-bis(bromomethyl)-, phosphate (3:1)

3-Bromo-2,2-bis(bromomethyl)propan-1-ol, phosphate (3:1)

Tris[3-bromo-2,2-bis(bromomethyl)propyl]phosphate

Tris(tribromoneopentyl) phosphate

Tris[2,2-bis(bromomethyl)-3-bromopropyl] phosphate

Tris[3-bromo-2,2-bis(bromomethyl)propyl] phosphate

**Trade names**

CR-900

Flame Cut 175R

TPB 3070

FR 370

FR 372

**1.1.22 Phosphoric acid, mixed 3-bromo-2,2-dimethylpropyl and 2-bromoethyl and 2-chloroethyl esters**

**Chemical name**

This substance is listed on the Australia Inventory of Chemical Substances as phosphoric acid, mixed 3-bromo-2,2-dimethylpropyl and 2-bromoethyl and 2-chloroethyl esters.

**Registry numbers**

CAS number 125997-20-8

**Other names**

No other names are listed for this substance.

**Trade names**

FM-836

FM-86

**1.1.23 TBBPA, 2,2-bis [4-(2,3-epoxypropyloxy)dibromophenyl] propane polymer****Chemical name**

This substance is listed on the Australian Inventory of Chemical Substances as 2,2'-[(1-methylethylidene)bis[(2,6-dibromo-4,1-phenylene)oxymethylene]]bis[oxirane].

**Registry numbers**

CAS number 68928-70-1

**Other names**

Phenol, 4,4'-(1-methylethylidene)bis[2,6-dibromo]-, polymer with 2,2'-[(1-methylethylidene)bis[(2,6-dibromo-4,1-phenylene)oxymethylene]]bis[oxirane]

4,4'-[(1-Methylethylidene)bis[2,6-dibromophenol] polymer with 2,2'-[(1-methylethylidene)bis[(2,6-dibromo-4,1-phenylene)oxymethylene]]bis[oxirane]

Tetrabromobisphenol A -tetrabromobisphenolA diglycidyl ether copolymer

Tetrabromobisphenol A diglycidyl ether - tetrabromobisphenol A copolymer

**Trade names**

FR 2400E

FR 2016

**1.1.24 Polymer of TBBPA, phosgene, and phenol****Chemical name**

This substance is listed on the Australian Inventory of Chemical Substances as carbonic dichloride, polymer with 4,4'-(1-methylethylidene)bis[2,6-dibromophenol] and phenol.

**Registry numbers**

CAS number 94334-64-2

**Other names**

Polymer of tetrabromobisphenol A, phosgene and phenol.

**Trade names**

BC-52

**1.1.25 2,4,6-Tribromophenyl terminated carbonate oligomer**

**Chemical name**

This substance is listed on the Australian Inventory of Chemical Substances as carbonic dichloride, polymer with 4,4'-(1-methylethylidene) bis[2,6-dibromophenol], 2,4,6-tribromophenyl ester.

**Registry numbers**

CAS number 71342-77-3

**Other names**

Phosgene-tetrabromobisphenol A polymer 2,4,6-tribromophenyl ester

Phosgene-tetrabromobisphenolA-tribromophenol copolymer

**Trade names**

BC-58

**1.1.26 Polybromobiphenyls**

The only registry listing of this general class of substances is ENCS 4-18. However, a number of individual congeners have been listed as follows:

**Decabromobiphenyl**

**Chemical name**

This substance is listed on the Australian Inventory of Chemical Substances as 1,1'-biphenyl, 2,2',3,3',4,4',5,5',6,6'-decabromo.

**Registry numbers**

CAS number 13654-09-6

**Other names**

Decabromo-1,1'-biphenyl

Decabromobiphenyl

2,2',3,3',4,4',5,5',6,6'-Decabromobiphenyl

Perbromobiphenyl

Biphenyl, decabromo-

PBB 209

**Trade names**

Adine 0102

Berkflam B 10

Flammex B 10

**Pentabromobiphenyl****Chemical name**

This substance is not listed on the Australian Inventory of Chemical Substances.

**Registry numbers**

CAS number 67888-96-18

**Other names**

2,2',4,5,5'-Pentabromobiphenyl

2,2',4,5,5'-Pentabromo-1,1'-biphenyl

2,4,5,2',5'-Pentabromo-1,1'-biphenyl

2,4,5,2',5'-Pentabromobiphenyl

**Trade names**

No trade names are listed for this substance.

**Tetrabromobiphenyl****Chemical name**

This substance is not listed on the Australian Inventory of Chemical Substances.

**Registry numbers**

CAS number 60044-24-8

**Other names**

1,1'-Biphenyl, 2,2',4,5'-tetrabromo

2,2',4',5-Tetrabromobiphenyl

2,2',4,5'-Tetrabromobiphenyl

2,4,2',5'-Tetrabromobiphenyl

### **Trade names**

No trade names are listed for this substance.

### **Dibromobiphenyl**

#### **Chemical name**

This substance is not listed on the Australian Inventory of Chemical Substances.

#### **Registry numbers**

CAS number            92-86-4

#### **Other names**

1,1'-Biphenyl, 4,4'-dibromo

4,4'-Dibromobiphenyl

4,4'-Dibromo-1,1'-biphenyl

Biphenyl, 4,4'-dibromo

*p,p'*-Dibromobiphenyl

#### **Trade names**

No trade names are listed for this substance.

### **Bromobiphenyl**

#### **Chemical name**

This substance is not listed on the Australian Inventory of Chemical Substances.

#### **Registry numbers**

CAS number            2052-07-5

#### **Other names**

1,1'-Biphenyl, 2-bromo

2-Bromobiphenyl

1-Bromo-2-phenylbenzene

2-Biphenyl bromide

2-Bromo-1,1'-biphenyl

Phenylbromobenzene

*o*-Bromobiphenyl

**Trade names**

No trade names are listed for this substance.

## 1.2 APPLICANTS

**Australian Council of Trade Unions**  
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**Dow Chemical (Australia) Ltd**  
Private Bag No 1  
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**International Sales & Marketing Pty Ltd**  
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