Chapter 2 Summary of the FY2002 Initial Environmental Survey

1. Purpose of the Survey

The purpose of this Initial Environmental Survey is to grasp the status of environmental persistence of those substances such as Designated Chemical Substances specified in the Chemical Substances Control Law, candidate substances for the PRTR system, unintentionally formed chemical substances and the substances required by social factors.

2. Surveyed substances, media and areas

In the FY2002 Initial Environmental Survey, the following 13 substances (groups) totaling 24 substances-media, which had been discussed and selected from among substances and media given priority at the FY2002 Expert Group on Substance Selection for the Comprehensive Survey of Chemical Substances on Environmental Safety were surveyed.

Table 2-1 Target Substances and Media for the FY2002 Initial Environmental Survey

Survey No.	Target substance	Number of surveyed areas per media			
		Surface water	Bottom sediment	Aquatic wildlife	Air
1	Isoprene	14	14		
2	Epichlorohydrin				6
3	1-Octanol	19	19	8	
4	Chlorodifluoromethane				15
5	*p*-Chloronitrobenzene			9	
6	Dinitrotoluene				8
7	Methylbromide	16			
8	Terephthalic acid	23	22		
9	2,4,6-Tri-*tert*-butylphenol	20	19	7	
10	Nitrobenzene	18	17		6
11	Polychlorinated terphenyls {total, 1–14 chlorides and 9 isomers (groups)}	10	10	2	
12	Methacrylic acid				11
13	Methyl-*tert*-butyl ether	18	18		

Surveys for surface water were conducted on 1 to 8 substances (groups) at 29 areas including 8 areas where all 8 target substances were surveyed; for bottom sediment on 1 to 7 substances (groups) at 27 areas including 8 areas where all 7 substances (groups) were surveyed; for aquatic wildlife on 1 to 4 substances (groups) at 10 areas including 2 areas where all 4 target substances (groups) were surveyed; and for air on

1 to 5 substances (groups) at 18 areas including 4 areas where all 5 substances (groups) were surveyed.

Surveyed areas of the FY2002 Initial Environmental Survey are shown in Figure 2-1 (surface water, bottom sediment), Figure 2-2 (aquatic wildlife) and Figure 2-3 (air).

3. Sampling and analytical method

Suggested sampling and analytical methods are shown in Appendix C and Appendix D, respectively.

4. Survey results

Five substances (groups) in surface water, 4 substances (groups) in bottom sediment, 2 substances (groups) in aquatic wildlife, and 5 substances (groups) in air were detected.

Detection results of the FY2002 Initial Environmental Survey are shown in Table 2-3, and the detection results of polychlorinated terphenyl homologs and their isomers are shown in Table 2-4.

A total of 801 substances (groups) were surveyed in the past (from FY1974 to FY2002), of which 346 substances (groups) were detected in the general environment.

Table 2-2 Summary of Results of the Environmental Survey

	Surface water	Bottom sediment	Aquatic wildlife	Air	Total
Number of surveyed substances	765*	739	251	248	801*
Number of detected substances	157*	236	101	162	346*
Ratio of detection (%)	20.5*	31.9	40.2	65.3	43.2*

* : In the FY2002 survey, 2 substances (perfluorooctane sulfonic acid (PFOS) and perfluorooctanoic acid (PFOA) for surface water were newly surveyed in the Environmental Survey for Exposure Study.

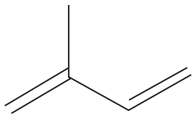
5. Evaluation of the survey results

In the FY2002 survey, 9 substances (groups) from among the 13 substances (groups) {epichlorohydrin (air), 1-octanol (surface water, bottom sediment, wildlife), chlorodifluoromethane (air), dinitrotoluene (air), terephthalic acid (surface water, bottom sediment), nitrobenzene (surface water, bottom sediment, air), polychlorinated terphenyl (surface water, bottom sediment, wildlife), methacrylic acid (air), and methyl-*tert*-butyl ether (surface water)} were detected.

Survey number	Target substance	Status of survey (√ : detected, n: not detected, --: not surveyed)			
		Surface water	Bottom sediment	Aquatic wildlife	Air
1	Isoprene	n	n	--	--
2	Epichlorohydrin	--	--	--	√
3	1-Octanol	√	√	√	--
4	Chlorodifluoromethane	--	--	--	√
5	*p*-Chloronitrobenzene	--	--	n	--
6	Dinitrotoluene	--	--	--	√
7	Methylbromide	n	--	--	--
8	Terephthalic acid	√	√	--	--
9	2,4,6-Tri-*tert*-butylphenol	n	n	n	--
10	Nitrobenzene	√	√	--	√
11	Polychlorinated terphenyls	√	√	√	--
12	Methacrylic acid	--	--	--	√
13	Methyl-*tert*-butyl ether	√	n	--	--

Evaluations of survey results for each substance (group) are described below.

[1] Isoprene (CAS RN: 78-79-5; surveyed media in FY2002: surface water and bottom sediment)



Chemical formula / molecular weight: C_5H_8 / 68.13

Melting point: -145.95°C [1] , -146.7°C [2]

Boiling point: 34.067°C [1]

Water solubility (Sw): 300 mg/L (20°C)[3]

Specific gravity: 0.681[1]

n-Octanol/water partition coefficient (LogPow): 2.30 (observed value)[4]

Degradability: Not easily degradable [16]

Accumulativeness: Low concentration [16]

Use: Mainly raw material for synthetic rubber; raw material for geraniol, linalool, flavor and others; raw material for intermediates of agrochemicals such as chrysanthemic acid; raw material for isophytol [15]

Production / import amount:

Production amount: About 80,000 t [10] in FY2001

Released amount (Reported by PRTR): FY2001

Released to the atmosphere: 122,140 kg/year

Released to public water bodies: 0 kg/year [27]

Survey results

In FY1978, survey of isoprene in surface water was conducted in 4 areas under the detection limit of 1 μg/L and it was not detected. In FY2002, survey was conducted under the detection limit of 0.1 μg/L and it was not detected in any surveyed areas. Although isoprene was not detected in the past surveys, it is difficult to grasp the tendency of its persistence, as the value of the detection limit in the past was high.

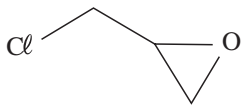
In FY1978, survey of isoprene in bottom sediment was conducted in 4 areas under the detection limit of 1 ng/g-dry and it was not detected. In FY2002, survey was conducted under the detection limit of 10 ng/g-dry and it was not detected in any surveyed areas. As isoprene was not detected in the past surveys, it can be judged to have no significant increase in concentration.

As shown in the above data, isoprene was not detected in surface water or bottom sediment and it was confirmed that isoprene is not persistent in either surface water or bottom sediment under the detection limit adopted in this survey.

○ Survey Results of Isoprene

Media	Year	Detection frequency (number)		Detected range	Detection limit
		Sample	Area		
Surface water	FY1978	0% (0/12)	0% (0/4)	---	1 μg/L
	FY2002	0% (0/42)	0% (0/14)	---	0.1 μg/L
Bottom sediment	FY1978	0% (0/12)	0% (0/4)	---	1 ng/g-dry
	FY2002	0% (0/42)	0% (0/14)	---	10 ng/g-dry

[2] Epichlorohydrin (CAS RN: 106-89-8; surveyed media in FY2002: air)



Chemical formula / molecular weight: $C_3H_5C\ell O$ / 92.53

Melting point: -25.6°C [4)]

Boiling point: 117.9°C [4)]

Water solubility (Sw): 60,000 mg/L (20°C) [5)]

Specific gravity: 1.18122)

n-Octanol/water partition coefficient (LogPow): 0.45 [6)]

Degradability: Easily degradable [16)]

Accumulativeness: BCF: 3 (calculated value)[22)]

Use: Raw material for epoxy resin, synthetic glycerin, glycidyl methacrylate, detergent, ion exchange resin and others; processor for textiles; solvent, plasticizer, stabilizer, insecticide and bactericide; raw material for pharmaceuticals, intermediates for organic synthesis [10)]

Production / import amount:

Domestic production amount in FY2001: 119,806 t
Import amount: 12,431 t
Export amount: 26,570 t [10)]
Estimated amount of domestic circulation: 105,667 t
Reported production amount to OECD: Over 10,000 t [24)]

Released amount (Reported by PRTR):

Released to the atmosphere: 95,247 kg/year [27)]
Released to public water bodies: 1,869 kg/year [27)]

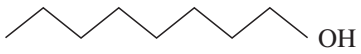
Survey results

Survey of epichlorohydrin in air was carried out in FY2002 for the first time. The survey was conducted under the detection limit of 0.14 ng/m^3 and epichlorohydrin was detected in 4 areas out of 5, with the maximum detected value being 2.8 ng/m^3. Thus, it was confirmed that epichlorohydrin is persistent in air under the detection limit adopted in this survey.

○Survey Results of Epichlorohydrin

Media	Year	Detection frequency (number)		Detected range	Detection limit
		Sample	Area		
Surface water	FY1977	0% (0/3)	0% (0/2)	---	10 μg/L
	FY1986	0% (0/27)	0% (0/9)	---	0.5 μg/L
Bottom sediment	FY1977	0% (0/3)	0% (0/1)	---	60 ng/g-dry
	FY1986	0% (0/27)	0% (0/9)	---	20 ng/g-dry
Air	FY2002	70% (7/10)	80% (4/5)	1.0 - 2.8 ng/m^3	0.14 ng/m^3

[3] 1-Octanol (CAS RN: 111-87-5; surveyed media in FY2002: surface water, bottom sediment and aquatic wildlife)



Chemical formula / molecular weight: $C_8H_{18}O$ / 130.23

Melting point: -15.5°C [7)] , -15°C [4)]

Boiling point: 195.1°C [7)] , 194-195°C [4)]

Water solubility (Sw): 540 mg/L (25°C)

Specific gravity: 0.827 (20°C) [4)]

n-Octanol/water partition coefficient (LogPow): 3 [7)] , 2.97 [4)]

Degradability: Easily degradable [16)]

Accumulativeness: Unknown

Use: Solvent (flavor, cosmetics, organic synthesis), raw material for synthesis (plasticizer, stabilizer, detergent, cross-linking agent) [21)]

Released amount (Reported by PRTR):

Released to the atmosphere: 1,924 kg/year [27)]

Released to public water bodies: 49 kg/year [27)]

Survey results

In FY1979, survey of 1-octanol in surface water was conducted in 9 areas under the detection limit of 5-50 μg/L and it was not detected in any area. In FY2002, survey was conducted under the detection limit of 0.002 μg/L and it was detected in 8 areas out of 17, with the maximum detected concentration being 0.046 μg/L. Although 1-octanol was not detected in the past surveys and it was detected this time, it is difficult to grasp the tendency of its persistence, as the detection limit in the past survey (5-50 μg/L) is higher than the maximum detected concentration (0.046 μg/L).

In FY1979, survey of 1-octanol in bottom sediment was conducted in 9 areas under the detection limit of 300-1,000 ng/g-dry and it was not detected in any area. In FY2002, survey was conducted under the detection limit of 0.24 ng/g-dry and it was detected in 11 areas out of 17, with the maximum detected concentration being 24 ng/g-dry. Although 1-octanol was not detected in the past surveys and it was detected this time, it is difficult to grasp the tendency of its persistence in the environment, as the detection limit in the past survey (300-1,000 ng/g-dry) is higher than the maximum detected concentration (24 ng/g-dry).

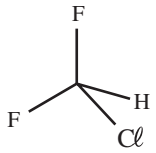
Survey of 1-octanol in aquatic wildlife was carried out in FY2002 for the first time. The survey was conducted under the detection limit of 0.77 ng/g-wet and it was detected in 4 areas out of 7, with the maximum detected value being 62 ng/g-wet.

Consequently, although it is difficult to grasp the tendency, persistence of 1-octanol in surface water, bottom sediment and aquatic wildlife was confirmed under the detection limit adopted in this survey.

○ Survey Results of 1-Octanol

Media	Year	Detection frequency (number)		Detected range	Detection limit
		Sample	Area		
Surface water	FY1979	0% (0/27)	0% (0/9)	---	5 - 50 μg/L
	FY2002	47% (24/51)	47% (8/17)	0.002 - 0.046 μg/L	0.002 μg/L
Bottom sediment	FY1979	0% (0/27)	0% (0/9)	---	300 - 1,000 ng/g-dry
	FY2002	63% (31/49)	65% (11/17)	0.94 - 24 ng/g-dry	0.24 ng/g-dry
Aquatic wildlife	FY2002	57% (12/21)	57% (4/7)	2.4 - 62 ng/g-wet	0.77 ng/g-wet

[4] Chlorodifluoromethane (CAS RN: 75-45-6; surveyed media in FY2002: air)



Chemical formula / molecular weight: $CHC\ell F_2$ / 86.47

Melting point: -157.4°C [4), 7)], -146°C [8)]

Boiling point: -40.7°C [4), 7)], -41°C [8)]

Water solubility (Sw): 2,770 mg/L (25°C) [4), 7)]

Specific gravity: Not known

n-Octanol/water partition coefficient (LogPow): 1.08 [7), 8)]

Degradability: Not easily degradable [16)]

Accumulativeness: Low concentration

Use: Freon gas [21)], coolant [10)]

Production / amount:

Production amount: 39,983 t [26)] in FY1993

Released amount (Reported by PRTR):

Released to the atmosphere: 1,190,875 kg/year [27)]

Released to public water bodies: 2,400 kg/year [27)]

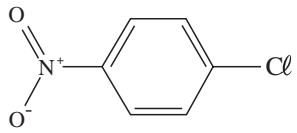
Survey results

Survey of chlorodifluoromethane in air was carried out in FY2002 for the first time. The survey was conducted under the detection limit of 6 ng/m^3 and it was detected in 15 areas out of 15, with the maximum detected value being 4,600 ng/m^3. Thus, it was confirmed that chlorodifluoromethane is widely persistent in air under the detection limit adopted in this survey.

○ Survey Results of Chlorodifluoromethane

Media	Year	Detection frequency (number)		Detected range	Detection limit
		Sample	Area		
Air	FY2002	100% (45/45)	100% (15/15)	340 - 4,600 ng/m^3	6 ng/m^3

[5] *p*-Chloronitrobenzene (CAS RN: 100-00-5; surveyed media in FY2002: aquatic wildlife)



Chemical formula / molecular weight: $C_6H_4C\ell NO_2$ / 157.56

Melting point: 83.5°C [9), 10)] Boiling point: 239-242°C [9)]

Water solubility (Sw): 225 mg/L (20°C)[7)]

Specific gravity: 1.520[9), 10)]

n-Octanol/water partition coefficient (LogPow): 2.39 [7)]

Degradability: Not easily degradable [16)]

Accumulativeness: Low concentration [16)]

Use: Azo dyes, intermediate for sulfur dye [10)]

Production / import amount:

Production amount (estimated)[10)]: 15,000 t in FY2001

Released amount (Reported by PRTR):

Released to the atmosphere: 117 kg/year [27)]

Released to public water bodies: 200 kg/year [27)]

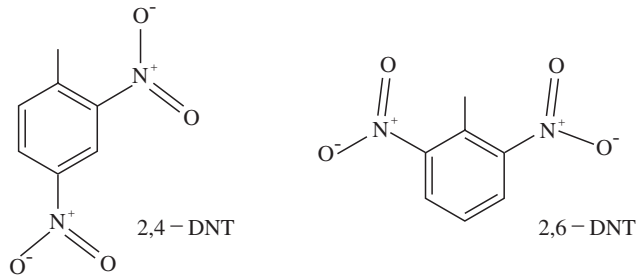
Survey results

In FY1991, survey was conducted in 46 areas under the detection limit of 7.5 ng/g-wet, and *p*-chloronitrobenzene was not detected in aquatic wildlife. In FY2002, survey was conducted under the detection limit of 7.8 ng/g-wet and it was also not detected in any surveyed areas. As it was not detected in both surveys under similar detection limits, it can be judged that there is no significant increase in its concentration. Thus, it was confirmed that *p*-chloronitrobenzene is not persistent in aquatic wildlife under the detection limit adopted in this survey.

○ Survey Results of *p*-Chloronitrobenzene

Media	Year	Detection frequency (number)		Detected range	Detection limit
		Sample	Area		
Surface water	FY1978	0% (0/24)	0% (0/8)	---	0.05 - 0.075 μg/L
	FY1991	0% (0/156)	0% (0/52)	---	0.3 μg/L
	FY2001	0% (0/150)	0% (0/50)	---	0.087 μg/L
Bottom sediment	FY1978	0% (0/15)	0% (0/5)	---	2 - 2.5 ng/g-dry
	FY1991	0% (0/162)	0% (0/54)	---	40 ng/g-dry
	FY2001	0% (0/144)	0% (0/48)	---	2.2 ng/g-dry
Aquatic wildlife	FY1991	0% (0/138)	0% (0/46)	---	7.5 ng/g-wet
	FY2002	0% (0/25)	0% (0/9)	---	7.8 ng/g-wet
Air	FY1991	9% (5/54)	11% (2/18)	3.6 - 110 ng/m^3	3 ng/m^3

[6] Dinitrotoluene (CAS RN: 25321-14-6; surveyed media in FY2002: air)



Chemical formula / molecular weight: $C_7H_6N_2O_4$ / 182.15

Melting point: 54-93°C [8)]

Boiling point: 250-300°C [8)]

Water solubility (Sw): 270 mg/L (22°C)[7)], <30 mg/100 mL[8)]

Specific gravity: 1.3[8)]

n-Octanol/water partition coefficient (LogPow): 2.18 (calculated value)[7)], 2[8)]

Degradability: Not easily degradable [16)]

Accumulativeness: Low concentration [16)]

Use: Synthesis intermediates (toluidine dye, explosives)[21)]

Production / import amount: Over 10,000 t[21)]

Released amount (Reported by PRTR):

Released to the atmosphere: 9,960 kg/year [27)]

Released to public water bodies: 3,650 kg/year [27)]

Survey results

Survey of dinitrotoluene in air was carried out in FY2002 for the first time. The survey of 2,4-dinitrotoluene was conducted under the detection limit of 0.95 ng/m^3 and it was detected in 2 areas out of 7, with the maximum detected concentration being 1.5 ng/m^3.

The survey of 2,6-dinitrotoluene was conducted under the detection limit of 0.89 ng/m^3 and it was detected in 1 area out of 6, with the maximum detected concentration being 14 ng/m^3.

It is difficult to grasp the tendency of persistence of dinitrotoluene from the above data, but its persistence in air was confirmed under the detection limit adopted in this survey.

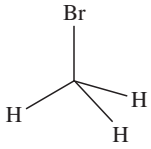
○ Survey Results of 2,4-Dinitrotoluene

Media	Year	Detection frequency (number)		Detected range	Detection limit
		Sample	Area		
Surface water	FY1976	0% (0/70)		---	0.08 - 0.1 μg/L
	FY1991	0% (0/48)	0% (0/16)	---	0.14 μg/L
Bottom sediment	FY1976	0% (0/50)		---	0.35 - 10 ng/g-dry
	FY1991	0% (0/48)	0% (0/16)	---	9.9 ng/g-dry
Aquatic wildlife	FY1976	0% (0/10)		---	60 ng/g-wet
	FY1991	0% (0/45)	0% (0/15)	---	50 ng/g-wet
Air	FY2002	14% (3/21)	29% (2/7)	1.0 - 1.5 ng/m^3	0.95 ng/m^3

○ Survey Results of 2,6-Dinitrotoluene

Media	Year	Detection frequency (number)		Detected range	Detection limit
		Sample	Area		
Surface water	FY1976	1% (1/70)		0.054	0.025 - 0.03 μg/L
	FY1991	0% (0/48)	0% (0/16)	---	0.11 μg/L
Bottom sediment	FY1976	5% (3/55)		---	0.7 - 10 ng/g-dry
	FY1991	0% (0/48)	0% (0/16)	---	11 ng/g-dry
Aquatic wildlife	FY1976	0% (0/10)		---	2 ng/g-wet
	FY1991	0% (0/45)	0% (0/15)	---	5 ng/g-wet
Air	FY2002	17% (3/18)	17% (1/6)	5.3 - 14 ng/m^3	0.89 ng/m^3

[7] Methyl bromide (CAS RN: 74-83-9; surveyed media in FY2002: surface water)



Chemical formula / molecular weight: CH_3Br / 94.94

Melting point: -94°C [11)]

Boiling point: 4°C [11)]

Water solubility (Sw): 900 mg/L [9)]

Specific gravity: 1.732 [12)]

n-Octanol/water partition coefficient (LogPow): 1.19 [11)]

Degradability: Not easily degradable [16)]

Accumulativeness: Low concentration [16)]

Use: Fumigator for foodstuff and soil, organic synthesis [10)]

Production / import amount:

Import amount: 1,130 t in FY2001
Export amount: 53 t [10)]
Estimated amount of domestic circulation: 1,077 t

Released amount (Reported by PRTR)

Released to the atmosphere: 542,393 kg/year [27)]
Released to public water bodies: 24 kg/year [27)]

Survey results

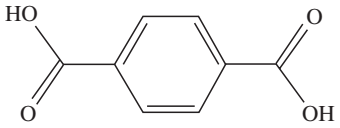
In FY1976, 60 samples were surveyed under the detection limit of 1.8-19 μg/L, and methyl bromide was not detected in any samples of surface water. In FY2002, survey was conducted in 16 areas under the detection limit of 0.1 μg/L, and it was not detected in any surveyed area. Although it was not detected in the past surveys, it is difficult to grasp the tendency of persistence, as the detection limit in the

past surveys was high. Consequently, it was confirmed that methyl bromide is not persistent in surface water under the detection limit adopted in this survey.

○ Survey Results of Methyl Bromide

Media	Year	Detection frequency (number)		Detected range	Detection limit
		Sample	Area		
Surface water	FY1976	0% (1/60)		---	1.8 - 19 μg/L
	FY2002	0% (0/48)	0% (0/16)	---	0.1 μg/L
Bottom sediment	FY1976	0% (0/40)		---	24 - 950 ng/g-dry
Aquatic wildlife	FY1976	0% (0/20)		---	12 - 50 ng/g-wet
Air	FY1980	19% (5/27)	38% (3/8)	64 - 130 ng/m^3	64 - 430 ng/m^3
	FY1998	92% (36/39)	93% (13/14)	49 - 340 ng/m^3	41 ng/m^3

[8] Terephthalic acid (CAS RN: 100-21-0; surveyed media in FY2002: surface water and bottom sediment)



Chemical formula / molecular weight: $C_8H_6O_4$ / 166.14

Melting point: 300°C (sublimation)[45)]

Boiling point: 402°C (sublimation)[8)]

Water solubility (Sw): 16 mg/L[9)]

Specific gravity: 1.51[4), 8)]

n-Octanol/water partition coefficient (LogPow): 2[4), 7)]

Degradability: Easily degradable [16)]

Accumulativeness: Unknown

Use: Raw material for synthesis (polyester fiber (Tetoron), engineering plastics (polyacrylate))[21)]

Production / import amount: Over 1,000,000 t[21)]

Released amount (Reported by PRTR):

Released to the atmosphere: 274 kg/year [27)]

Released to public water bodies: 25,044 kg/year [27)]

Survey results

In FY1983, survey of terephthalic acid in surface water was conducted in 8 areas under the detection limit of 2-50 μg/L and it was not detected in any area. Although terephthalic acid was surveyed

at 20 areas in FY1975 under the detection limit of 20-5,000 μg/L and it was detected in 3 areas, detected areas are limited and were not surveyed in FY2002. In FY2002, survey was conducted under the detection limit of 0.048 μg/L and it was detected in 2 areas out of 23, with the maximum detected concentration being 0.12 μg/L. However, it is difficult to grasp the tendency of its persistence in the environment, as the detection limit applied this time is lower than that of past surveys and the surveyed areas are changed in this survey.

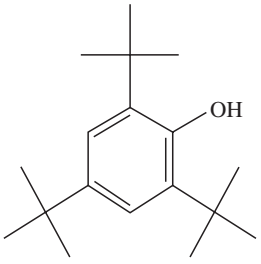
In FY1983, survey of terephthalic acid in bottom sediment was conducted in 8 areas under the detection limit of 50-280 ng/g-dry and it was not detected in any area. In FY2002, survey was conducted under the detection limit of 8.6 ng/g-dry and it was detected in 4 areas out of 21, with the maximum detected concentration being 20 ng/g-dry. It is difficult to grasp the tendency of its persistence in the environment, as the detection limit is lower than that of past surveys and the surveyed areas are changed in this survey.

Thus, although it is difficult to grasp the tendency of persistence in surface water and bottom sediment, persistence of terephthalic acid both in surface water and bottom sediment was confirmed under the detection limit adopted in this survey.

○Survey Results of Terephthalic Acid

Media	Year	Detection frequency (number)		Detected range	Detection limit
		Sample	Area		
Surface water	FY1975	6% (6/100)	15% (3/20)	200 - 700 μg/L	20 - 5,000 μg/L
	FY1983	0% (0/24)	0% (0/8)	---	2 - 50 μg/L
	FY2002	4% (3/69)	9% (2/23)	0.060 - 0.12 μg/L	0.048 μg/L
Bottom sediment	FY1983	0% (0/24)	0% (0/8)	---	50 - 280 ng/g-dry
	FY2002	13% (8/63)	19% (4/21)	10 - 20 μg/L	8.6 ng/g-dry

[9] 2,4,6-Tri-*tert*-butylphenol (CAS RN: 732-26-3; surveyed media in FY2002: surface water, bottom sediment and aquatic wildlife)



Chemical formula / molecular weight: $C_{18}H_{30}O$ / 262.44

Melting point: 129-132°C

Boiling point: 277°C [13)]

Water solubility (Sw): 35 mg/L

Specific gravity: Not known

n-Octanol/water partition coefficient (LogPow): Not known

Degradability: Not easily degradable [16)]

Accumulativeness: High concentration [16)]

Use: Anti-aging agent for rubber and plastic products [34)]

Production / import amount: 11,305 t (in FY1981, as trialkylphenol) [34)]

Released amount (Reported by PRTR): Not known

Survey results

In FY2001, survey of 2,4,6-tri-*tert*-butylphenol in surface water was conducted in 51 areas under the detection limit of 0.020 μg/L and it was not detected in any area. In FY2002, survey was conducted under the same detection limit (0.020 μg/L) and it was not detected in any of the surveyed areas. Thus, it can be judged that there is no significant increase in the concentration of 2,4,6-tri-*tert*-butylphenol.

In FY2001, survey of 2,4,6-tri-*tert*-butylphenol in bottom sediment was conducted in 53 areas under the detection limit of 7.0 ng/g-dry and it was detected in 1 area, with the detected range being 9.3-14 ng/g-dry. In FY2002, survey was conducted under the detection limit of 6.5 ng/g-dry and it was not detected in any area. Although its concentration was below the detection limit, detection of 2,4,6-tri-*tert*-butylphenol was reported in Nagoya Port (0.86 ng/g-dry, 1.0 ng/g-dry, 0.83 ng/g-dry). In the FY2001 survey, it was detected in two samples from Yokkaichi Port (9.3 ng/g-dry, 14 ng/g-dry). However, it is difficult to grasp the tendency of its persistence, as the FY2002 survey was not conducted in Yokkaichi Port.

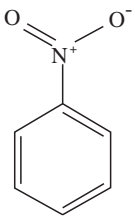
Survey of 2,4,6-tri-*tert*-butylphenol in aquatic wildlife was carried out in FY2002 for the first time. The survey was conducted under the detection limit of 21 ng/g-wet and it was not detected in any of the surveyed areas. However, although its concentration was below the detection limit, detection of 2,4,6-tri-*tert*-butylphenol was reported in 1 area (Yamato River, 0.68 ng/g-wet).

Although 2,4,6-tri-*tert*-butylphenol was not detected in any of the surveyed media (surface water, bottom sediment and aquatic wildlife), it is necessary to list it as a candidate substance for the Monitoring Investigation, as it is one of the Class 1 Specified Chemical Substances in the Chemical Substances Control Law and it was detected in bottom sediment in FY2001. Furthermore, it was selected as a target substance for air of the Initial Environmental Survey in FY2003.

○Survey Results of 2,4,6-Tri-*tert*-butylphenol

Media	Year	Detection frequency (number)		Detected range	Detection limit
		Sample	Area		
Surface water	FY1984	0% (0/30)	0% (0/10)	---	0.04 - 0.08 μg/L
	FY2001	0% (0/153)	0% (0/51)	---	0.020 μg/L
	FY2002	0% (0/48)	0% (0/16)	---	0.020 μg/L
Bottom sediment	FY1984	10% (3/30)	10% (1/10)	2.3 - 8.2 ng/g-dry	0.4 - 1.9 ng/g-dry
	FY2001	1% (2/159)	2% (1/53)	9.3 - 14 ng/g-dry	7.0 ng/g-dry
	FY2002	0% (0/57)	0% (0/19)	---	6.5 ng/g-dry
Aquatic wildlife	FY2002	0% (0/21)	0% (0/7)	---	21 ng/g-wet

[10] Nitrobenzene (CAS RN: 98-95-3; surveyed media in FY2002: surface water, bottom sediment and air)



Chemical formula / molecular weight: $C_6H_5NO_2$ / 123.11

Melting point: 5.7°C [4), 7)], 6°C [8)]

Boiling point: 210.8°C [4), 7)], 211°C [8)]

Water solubility (Sw): 2.09 g/L (25°C)[7)], 200 mg/100 mL[8)], 1.797 g/L (25°C)[4)]

Specific gravity: 1.2[8)], 1.2037 (20°C)[4)]

n-Octanol/water partition coefficient (LogPow): 1.85[4), 7)], 1.86[8)]

Degradability: Not easily degradable [16)]

Accumulativeness: Low concentration [16)]

Use: Raw material for synthesis {dye/flavor intermediate (aniline, benzidine, quinoline, azobenzene), solvent (cellulose nitrate), other use (dust suppressant, antioxidant)}[21)]

Production / import amount: Over 100,000 t[21)]

Released amount (Reported by PRTR):
Released to the atmosphere: 9,273 kg/year[27)]
Released to public water bodies: 5,402 kg/year[27)]

Survey results

In FY1977, survey of nitrobenzene in surface water was conducted in 39 areas under the detection limit of 0.1-30 μg/L and it was detected in 10 areas out of 39, with the detected range being 0.13-3.8 μg/L.

In FY1991, survey was conducted in 51 areas under the detection limit of 0.15 μg/L and it was detected in 1 area out of 51, with the detected range being 0.17 μg/L. In FY2001, survey was conducted in 49 areas under the detection limit of 0.037 μg/L, and it was detected in 2 areas out of 49, with the detected range being 0.046-0.51 μg/L. In FY2002, survey was conducted under the detection limit of 0.037 μg/L and it was detected in 2 areas out of 18, with the maximum detected concentration being 0.23 μg/L. Compared with the past survey for surface water, there is no apparent difference in the status of its persistence.

In FY1977, survey of nitrobenzene in bottom sediment was conducted in 39 areas under the detection limit of 1-1,000 ng/g-dry and it was detected in 9 areas out of 39, with the detected range being 9-1,500 ng/g-dry. In FY1991, survey was conducted in 54 areas under the detection limit of 23 ng/g-dry and it was detected in 1 area out of 51, with the detected range being 47-70 ng/g-dry. In FY2001, survey was conducted in 48 areas under the detection limit of 1.4 ng/g-dry and it was detected in 3 areas out of 48, with the detected range being 1.4-2.3 ng/g-dry. In FY2002, survey was conducted under the detection limit of 1.4 ng/g-dry and it was detected in 1 area out of 17, with the maximum detected concentration being 1.8 ng/g-dry. Compared with the past survey for bottom sediment, persistence of nitrobenzene showed a decreasing tendency in terms of detection range and the number of detected areas.

In FY1991, survey of nitrobenzene in air was conducted in 17 areas under the detection limit of 2 ng/m^3 and it was detected in 16 areas out of 17, with the detected range being 2.2-160 ng/m^3. Furthermore, median value, average value and geometric mean of the samples were 6.1 ng/m^3, 17.7 ng/m^3 and 6.8 ng/m^3, respectively (in calculating the average value, ND was assumed as one half of the detection limit). In FY2002, survey was conducted under the detection limit of 0.7 ng/m^3 and it was detected in 5 areas out of 6, with the maximum detected concentration being 14 ng/m^3. Furthermore, median value, average value and geometric mean of the samples were 4.1 ng/m^3, 4.6 ng/m^3 and 2.8 ng/m^3, respectively. Compared with the past survey for air, persistence of nitrobenzene in the environment showed a decreasing tendency in terms of detection range, average value and the geometric mean.

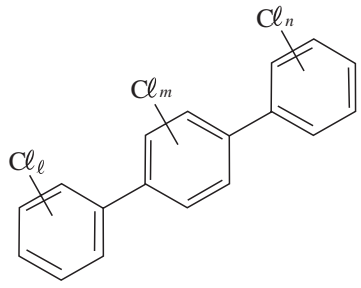
Based on the above data, there is little change in the detection frequency of nitrobenzene in bottom sediment and air and, although it exists widely in air, a decreasing tendency is observed in its concentration.

Little change is shown in the status of its persistence in surface water. Consequently, persistence of nitrobenzene in surface water, bottom sediment and air was confirmed under the detection limit adopted in this survey.

○ Survey Results of Nitrobenzene

Media	Year	Detection frequency (number)		Detected range	Detection limit
		Sample	Area		
Surface water	FY1976	39% (27/70)		0.1 - 1.4 μg/L	0.03 - 0.4 μg/L
	FY1977	19% (22/115)	26% (10/39)	0.13 - 3.8 μg/L	0.1 - 30 μg/L
	FY1991	1% (1/153)	2% (1/51)	0.17 μg/L	0.15 μg/L
	FY2001	3% (5/147)	4% (2/49)	0.046 - 0.51 μg/L	0.037 μg/L
	FY2002	11% (6/54)	11% (2/18)	0.12 - 0.23 μg/L	0.037 μg/L
Bottom sediment	FY1976	32% (15/47)		9.5 - 1,900 ng/g-dry	2 - 3.5 ng/g-dry
	FY1977	16% (19/117)	23% (9/39)	9 - 1,500 ng/g-dry	1 - 1,000 ng/g-dry
	FY1991	1% (2/162)	2% (1/54)	47 - 70 ng/g-dry	23 ng/g-dry
	FY2001	4% (6/144)	6% (3/48)	1.4 - 2.3 ng/g-dry	1.4 ng/g-dry
	FY2002	6% (3/51)	6% (1/17)	1.6 - 1.8 ng/g-dry	1.4 ng/g-dry
Aquatic wildlife	FY1976	100% (10/10)		3 - 580 ng/g-wet	
	FY1977	11% (9/85)	7% (2/29)	3 - 5 ng/g-wet	1 - 200 ng/g-wet
	FY1991	3% (4/147)	4% (2/49)	11 - 26 ng/g-wet	8.7 ng/g-wet
Air	FY1986	1% (1/73)	4% (1/24)	140 ng/m^3	100 ng/m^3
	FY1991	86% (42/49)	94% (16/17)	2.2 - 160 ng/m^3	2 ng/m^3
	FY2002	83% (15/18)	83% (5/6)	1.4 - 14 ng/m^3	0.7 ng/m^3

[11] Polychlorinated terphenyls (CAS RN: 61788-33-8; surveyed media in FY2002: surface water, bottom sediment and aquatic wildlife)



Chemical formula / molecular weight: (mixture) / (mixture)

Melting point: (mixture)

Boiling point: (mixture)

Water solubility (Sw): (mixture)

Specific gravity: 1.47-1.67 [14)]

n-Octanol/water partition coefficient (LogPow): 5.01[14)]

Degradability: Unknown

Accumulativeness: Unknown

Use: Electrical insulator[40)], occasionally used as a substitute for PCB[41)]

Production / import amount: Not known

Released amount (Reported by PRTR): Not known

Survey results

In FY1978, survey of polychlorinated terphenyls in surface water was conducted in 25 areas under the detection limit of 0.002-2.5 μg/L and it was not detected in any area. In FY2002, survey was conducted under the detection limit of 0.000013 μg/L(=0.013 ng/L) and it was detected in 1 area out of 10, with the maximum detected concentration being 0.44 ng/L. Although polychlorinated terphenyls were not detected in the past surveys, it is difficult to grasp the tendency of its persistence, as the value of the detection limit in the past was high.

In FY1978, survey of polychlorinated terphenyls in bottom sediment was conducted in 25 areas under the detection limit of 1-1,000 ng/g-dry and it was detected in 15 areas out of 25, with the detected range being 1-4,700 ng/g-dry. In FY2002, survey was conducted under the detection limit of 0.0091 ng/g-dry and it was detected in 9 areas out of 10, with the maximum detected concentration being 140 ng/g-dry. Compared with the past data, its persistence shows a decreasing tendency in terms of the detected range.

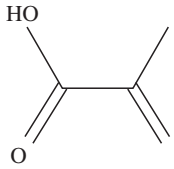
In FY1978, survey of polychlorinated terphenyls in aquatic wildlife was conducted in 66 samples under the detection limit of 0.2-100 ng/g-wet and it was detected in 3 samples, with the detected range being 0.3-3 ng/g-wet. In FY2002, survey was conducted under the detection limit of 0.0078 ng/g-wet and it was detected in 2 areas out of 2 (Tokyo Bay in Tokyo Metropolis, and offshore of Mizushima in Okayama Prefecture), with the maximum detected concentration being 0.54 ng/g-wet. It is difficult to grasp the tendency of its persistence, as the detection limit in the past surveys was higher in both cases than the maximum detected concentration in this survey.

Based on the above data, the concentration of polychlorinated terphenyls in bottom sediment shows a decreasing tendency. Although it is difficult to grasp the tendency of its persistence in surface water and aquatic wildlife, persistence of polychlorinated terphenyls was confirmed under the detection limit adopted in this survey.

○ Survey Results of Polychlorinated Terphenyls

Media	Year	Detection frequency (number)		Detected range	Detection limit
		Sample	Area		
Surface water	FY1974	0% (0/60)		---	0.1 μg/L
	FY1976	0% (0/156)		---	0.01 - 1 μg/L
	FY1978	0% (0/75)	0% (0/25)	---	0.002 - 2.5 μg/L
	FY2002	3% (1/30)	10% (1/10)	0.00044 μg/L (0.44 ng/L)	0.000013 μg/L (0.013 ng/L)
Bottom sediment	FY1974	0% (0/60)		---	50 ng/g-dry
	FY1976	14% (21/151)		1 - 330 ng/g-dry	1 - 200 ng/g-dry
	FY1978	49% (37/75)	60% (15/25)	1 - 4,700 ng/g-dry	1 - 1,000 ng/g-dry
	FY2002	90% (27/30)	90% (9/10)	0.59 - 140 ng/g-dry	0.0091 ng/g-dry
Aquatic wildlife	FY1974	27% (3/11)		50 - 120 ng/g-wet	100 ng/g-wet
	FY1976	0% (0/39)		---	1 - 200 ng/g-wet
	FY1978	5% (3/66)		0.3 - 3 ng/g-wet	0.2 - 100 ng/g-wet
	FY2002	100% (6/6)	100% (2/2)	0.015 - 0.54 ng/g-wet	0.0078 ng/g-wet
Air	FY2000	88% (21/24)	88% (7/8)	0.00092 - 0.0060 ng/m^3	0.001 ng/m^3

[12] Methacrylic acid (CAS RN: 79-41-4; surveyed media in FY2002: air)



Chemical formula / molecular weight: $C_4H_6O_2$ / 86.09

Melting point: 16°C [7), 8)]

Boiling point: 163°C [4), 7)], 159-163°C [8)]

Water solubility (Sw): 89,000 mg/L (20°C)[7)]

Specific gravity: 1.02[8)], 1.0153 (20°C)[4)]

n-Octanol/water partition coefficient (LogPow): 0.93[4), 7), 8)]

Degradability: Easily degradable [16)]

Accumulativeness: Unknown

Use: Raw material for synthesis (thermosetting resin, adhesives), processing agent (latex modifier, plastic modifier, processing agent for paper/textile, leather processor)[21)]

Production / import amount: Over 10,000 t [21)]

Released amount (Reported by PRTR):
Released to the atmosphere: 95,000 kg/year [27)]
Released to public water bodies: 20,353 kg/year [27)]

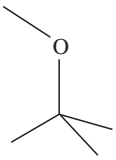
Survey results

Methacrylic acid in air was surveyed in FY2002 for the first time. The survey was conducted under the detection limit of 0.77 ng/m^3 and it was detected in 3 areas out of 9. The maximum detected concentration was 4.6 ng/m^3 and it was confirmed that methacrylic acid is persistent in air under the detection limit adopted in this survey.

○ Survey Results of Methacrylic Acid

Media	Year	Detection frequency (number)		Detected range	Detection limit
		Sample	Area		
Surface water	FY1987	0% (0/75)	0% (0/25)	---	6 μg/L
Bottom sediment	FY1987	0% (0/75)	0% (0/25)	---	140 ng/g-dry
Air	FY2002	22% (6/27)	33% (3/9)	1.1 - 4.6 ng/m^3	0.77 ng/m^3

[13] Methyl-*tert*-butyl ether (CAS RN: 1634-04-4; surveyed media in FY2002: surface water and bottom sediment)



Chemical formula / molecular weight: $C_5H_{12}O$ / 88.15

Melting point: -109˚C [2)]

Boiling point: 55.2˚C [10)]

Water solubility (Sw): 4.8 g/100 g [2)]

Specific gravity: 0.7455[2)]

n-Octanol/water partition coefficient (LogPow): Not known

Degradability: Not easily degradable [16)]

Accumulativeness: Unknown

Use: Octane number improver, antiknock agent, miscibility improver for the mixture of low-boiling-point solvent and lacquer thinner, solvent for high-performance liquid chromatography[2),10),43)]

Production / import amount: Not known

Released amount (Reported by PRTR): Not known

Survey results

Methyl-*tert*-butyl ether in surface water was surveyed in FY2002 for the first time. The survey was conducted under the detection limit of 0.006 μg/L and it was detected in 4 areas out of 15. The maximum detected concentration was 0.025 μg/L and it was confirmed that methyl-*tert*-butyl ether is persistent in surface water under the detection limit adopted in this survey.

Methyl-*tert*-butyl ether in bottom sediment was also surveyed in FY2002 for the first time. The survey was conducted under the detection limit of 0.70 ng/g-dry and it was not detected in any of the surveyed areas. It was confirmed that methyl-*tert*-butyl ether is not persistent in bottom sediment under the detection limit adopted in this survey.

Thus, it is difficult to grasp the tendency of its persistence in surface water and bottom sediment. However, it was confirmed that methyl-*tert*-butyl ether is persistent in surface water and not persistent in bottom sediment under the detection limit adopted in this survey.

○ Survey Results of Methyl-*tert*-butyl Ether

Media	Year	Detection frequency (number)		Detected range	Detection limit
		Sample	Area		
Surface water	FY2002	24% (11/45)	27% (4/15)	0.007 - 0.025 μg/L	0.006 μg/L
Bottom sediment	FY2002	0% (0/51)	0% (0/17)	---	0.70 ng/g-dry
Air	FY1999	80% (33/41)	87% (13/15)	22 - 330 ng/m^3	20 ng/m^3

Figure 2-1 Locations of the Initial Environmental Survey for Surface Water and Bottom Sediment (FY2002)

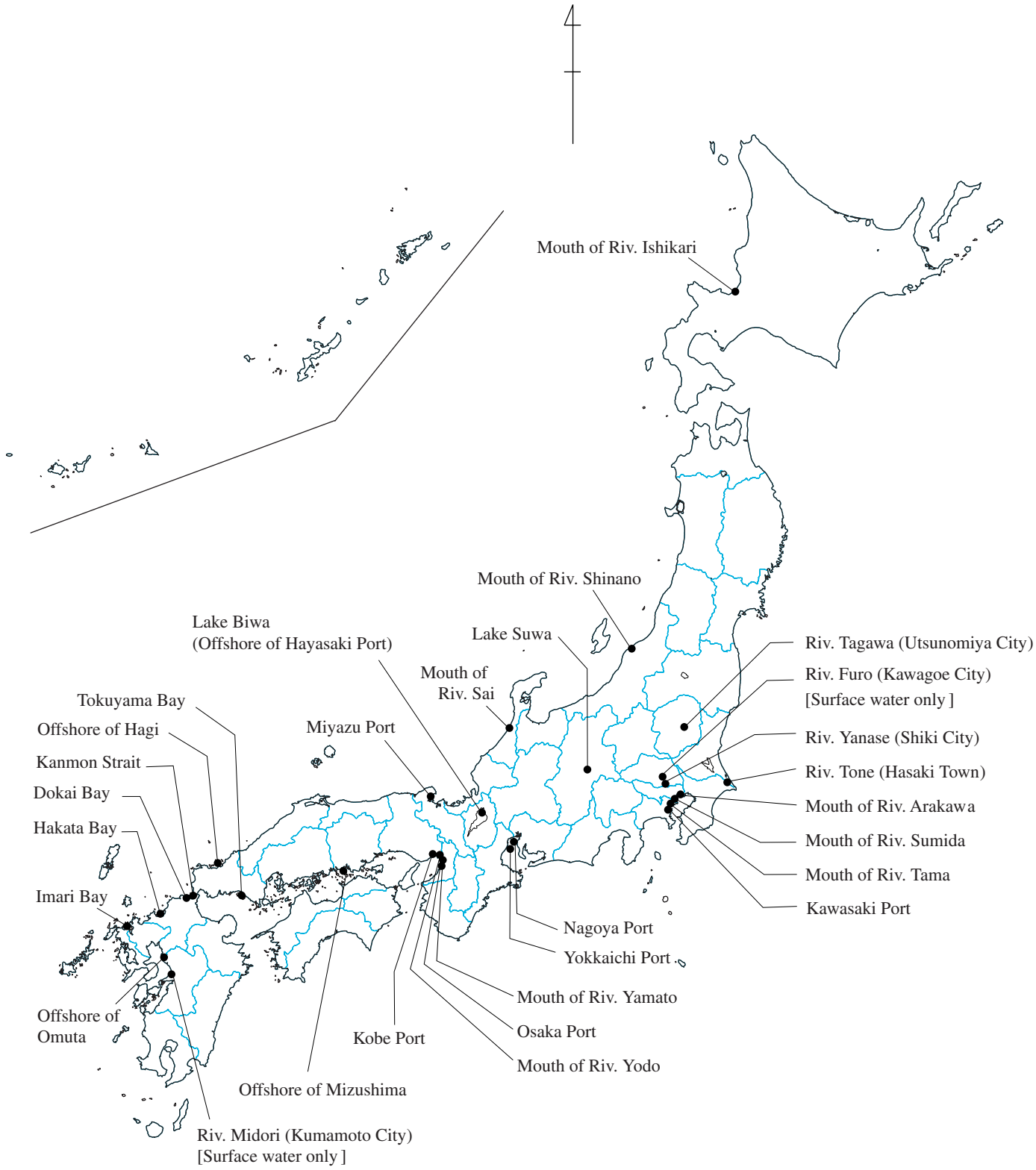


Figure 2-2 Locations of the Initial Environmental Survey for Aquatic Wildlife (FY2002)

Figure 2-3 Locations of the Initial Environmental Survey for Air (FY2002)

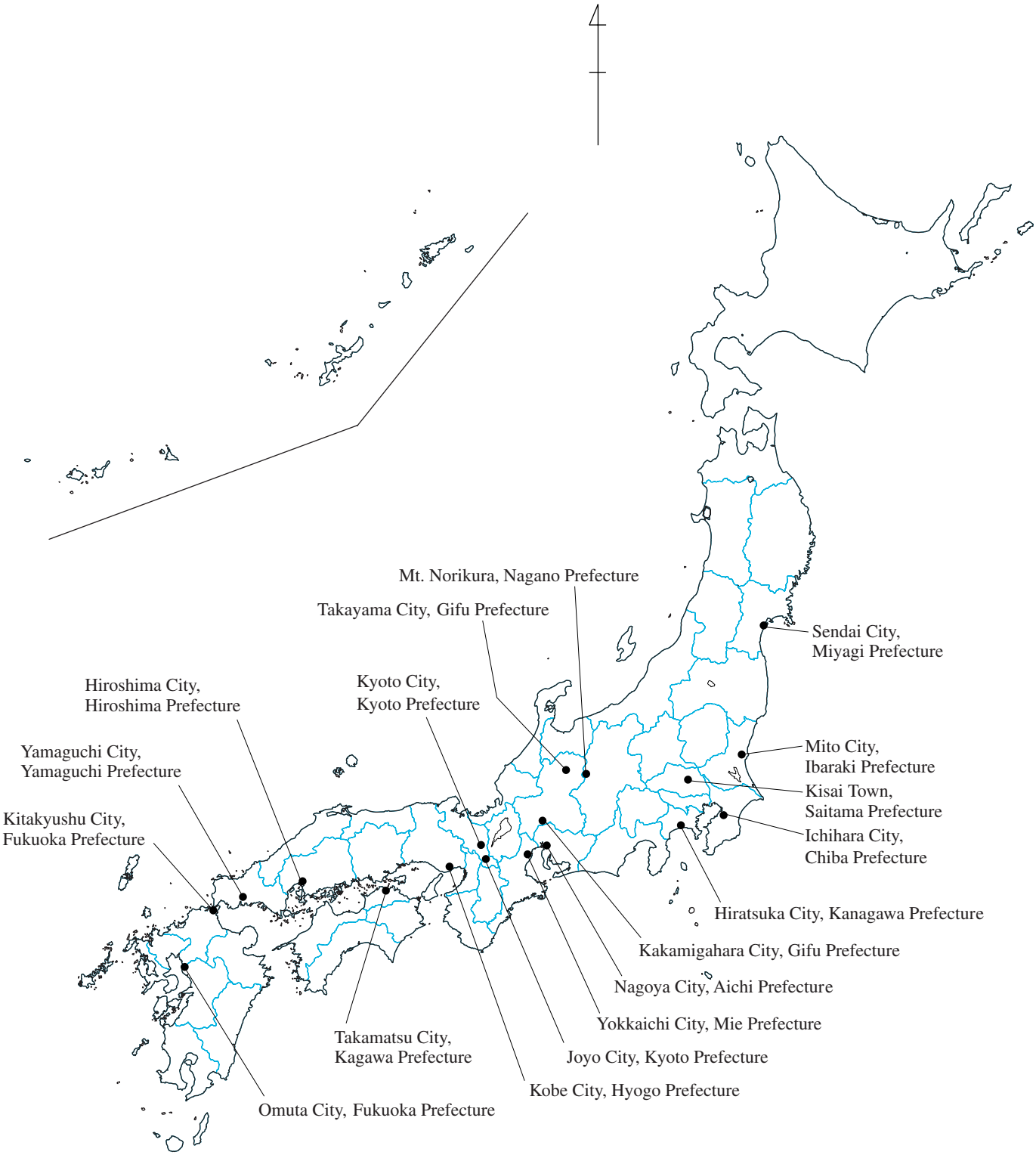


Table 2-3 Detection Results of the FY2002 Initial Environmental Survey

Survey No.	Substance	Surface water 29 areas in total		Bottom sediment 27 areas in total		Aquatic wildlife 10 areas in total		Air 18 areas in total	
		Detected range (μg/L) (frequency (area))	Detection limit (μg/L)	Detected range (ng/g-dry) (frequency (area))	Detection limit (ng/g-dry)	Detected range (ng/g-wet) (frequency (area))	Detection limit (ng/g-wet)	Detected range (ng/m^3) (frequency (area))	Detection limit (ng/m^3)
1	Isoprene	--- (0/14)	0.1	--- (0/14)	10				
2	Epichlorohydrin							1.0 - 2.8 (4/5)	0.14
3	1-Octanol	0.002 - 0.046 (8/17)	0.002	0.94 - 24 (11/17)	0.24	2.4 - 62 (4/7)	0.77		
4	Chlorodifluoromethane							340 - 4,600 (15/15)	6
5	*p*-Chloronitrobenzene					--- (0/9)	7.8		
6	Dinitrotoluene							1.0 - 1.5 (2/7)	0.95
6-1	2,4-Dinitrotoluene								
6-2	2,6-Dinitrotoluene							5.3 - 14 (1/6)	0.89
7	Methyl bromide	--- (0/16)	0.1						
8	Terephthalic acid	0.060 - 0.12 (2/23)	0.048	10 - 20 (4/21)	8.6				
9	2,4,6-Tri-*tert*-butylphenol	--- (0/16)	0.020	--- (0/19)	6.5	--- (0/7)	21		
10	Nitrobenzene	0.12 - 0.23 (2/18)	0.037	1.6 - 1.8 (1/17)	1.4			1.4 - 14 (5/6)	0.7
11	Polychlorinated terphenyls	0.00044 (= 0.44ng/L) (1/10)	0.000013 (= 0.013ng/L)	0.59 - 140 (9/10)	0.0091	0.015 - 0.54 (2/2)	0.0078		
12	Methacrylic acid							1.1 - 4.6 (9/9)	0.77
13	Methyl-*tert*-butyl ether	0.007 - 0.025 (4/15)	0.006	--- (0/17)	0.70				

(Note 1) Halftone screened area (gray) denotes that the survey was conducted in other media not targeted in this survey.
(Note 2) Frequency (area) indicates: Number of detected areas / Number of surveyed areas.
(Note 3) [---] in the range column denotes that there was no detected sample.

Table 2-4 Detection Results of Polychlorinated Terphenyl Homologs and Their Isomers in the FY2002 Initial Environmental Survey

Survey No.	Substance	Surface water 10 areas in total		Bottom sediment 10 areas in total		Aquatic wildlife 2 areas in total	
		Detected range (ng/L) (frequency (area))	Detection limit (ng/L)	Detected range (ng/g-dry) (frequency (area))	Detection limit (ng/g-dry)	Detected range (ng/g-wet) (frequency (area))	Detection limit (ng/g-wet)
11	Polychlorinated terphenyls	0.44 (1/10)	0.013	0.59 - 140 (9/10)	0.0091	0.015 - 0.54 (2/2)	0.0078
11-1	Monochlorinated terphenyl	--- (0/10)	0.013	0.052 - 0.84 (4/9)	0.019	0.005 - 0.017 (1/2)	0.0078
11-2	Dichlorinated terphenyl	--- (0/10)	0.016	0.040 - 2.6 (4/9)	0.019	--- (0/2)	0.016
11-3	Trichlorinated terphenyl	--- (0/10)	0.022	0.068 - 0.53 (2/10)	0.0091	--- (0/2)	0.0078
11-4	Tetrachlorinated terphenyl	0.045 (1/10)	0.024	0.086 - 1.0 (2/10)	0.017	--- (0/2)	0.020
11-5	Pentachlorinated terphenyl	0.39 (1/10)	0.024	0.044 - 0.41 (1/10)	0.020	--- (0/2)	0.021
11-6	Hexachlorinated terphenyl	--- (0/10)	0.42	0.17 - 2.9 (6/10)	0.039 - 0.19	--- (0/2)	0.077 - 0.096
11-7	Heptachlorinated terphenyl	--- (0/10)	0.42	0.078 - 5.7 (9/10)	0.039 - 0.19	0.20 - 0.26 (1/2)	0.077 - 0.096
11-8	Octachlorinated terphenyl	--- (0/10)	0.42	0.080 - 41 (9/10)	0.039 - 0.19	0.12 - 0.17 (1/2)	0.077 - 0.096
11-9	Nonachlorinated terphenyl	--- (0/10)	0.42	0.25 - 72 (9/10)	0.039 - 0.19	0.084 - 0.11 (1/2)	0.077 - 0.096
11.10	Decachlorinated terphenyl	--- (0/10)	0.42	0.17 - 22 (9/10)	0.039 - 0.19	--- (0/2)	0.077 - 0.096
11.11	Undecachlorinated terphenyl	--- (0/10)	0.42	0.10 - 1.6 (9/10)	0.039 - 0.19	--- (0/2)	0.077 - 0.096
11-12	Dodecachlorinated terphenyl	--- (0/10)	0.42	--- (0/10)	0.039 - 0.19	--- (0/2)	0.077 - 0.096
11-13	Tridecachlorinated terphenyl	--- (0/10)	0.42	--- (0/10)	0.039 - 0.19	--- (0/2)	0.077 - 0.096
11-14	Tetradecachlorinated terphenyl	--- (0/10)	0.33	--- (0/10)	0.031 - 0.19	--- (0/2)	0.061 - 0.076

Table 2-4 Detection Results of Polychlorinated Terphenyl Homologs and Their Isomers in the FY2002 Initial Environmental Survey (continued)

Survey No.	Substance	Surface water 10 areas in total		Bottom sediment 10 areas in total		Aquatic wildlife 2 areas in total	
		Detected range (ng/L) (frequency (area))	Detection limit (ng/L)	Detected range (ng/g-dry) (frequency (area))	Detection limit (ng/g-dry)	Detected range (ng/g-wet) (frequency (area))	Detection limit (ng/g-wet)
11-15	4-Monochloro-*o*-terphenyl	--- (0/10)	0.023	0.031 - 0.18 (3/8)	0.029	0.015 - 0.017 (1/2)	0.0078
11-16	4-Monochloro-*p*-terphenyl	--- (0/10)	0.013	0.032 - 0.098 (3/8)	0.019	--- (0/2)	0.026
11-17	2,5-Dichloro-*o*-terphenyl	--- (0/10)	0.021	--- (0/7)	0.019	--- (0/2)	0.016
11-18	2,5-Dichloro-*m*-terphenyl	--- (0/10)	0.016	0.023 - 0.13 (1/7)	0.091	--- (0/2)	0.016
11-19	2,4-Dichloro-*p*-terphenyl + 2,5-Dichloro-*p*-terphenyl	--- (0/10)	0.023	0.022 - 0.12 (1/7)	0.021	--- (0/2)	0.016
11-20	2,4,6-Trichloro-*p*-terphenyl	--- (0/10)	0.022	--- (0/8)	0.0091	--- (0/2)	0.0078
11-21	2,3,5,6-Tetrachloro-*p*-terphenyl	--- (0/10)	0.024	0.017 - 0.10 (1/8)	0.017	--- (0/2)	0.020
11-22	2,4,4",6-Tetrachloro-*p*-terphenyl	--- (0/10)	0.026	0.041 - 0.31 (1/8)	0.019	--- (0/2)	0.020
11-23	2,3,4,5,6-Pentachloro-*p*-terphenyl	0.39 (1/10)	0.024	--- (0/10)	0.020	--- (0/2)	0.021

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