

Chapter 3 Summary of Results of the FY2002 Environmental Survey for Exposure Study

1. Purpose of the Survey

The purpose of this survey is to grasp the status of environmental persistence of chemical substances such as the Designated Chemical Substances specified in the Chemical Substances Control Law and Class 1 Designated Chemical Substances of the PRTR Law, which is necessary for understanding the exposure amount to humans and wildlife used in the environmental risk assessment targeting these chemical substances.

2. Target survey substances and survey areas

In FY2002, environmental survey for exposure study was conducted on the following 6 substances (groups) totaling 15 substances-media selected from among the priority substances-media determined by the Expert Group on Substance Selection of the Comprehensive Survey of Chemical Substances on Environmental Safety.

Table 3-1 Target Substances and Media for the FY2002 Environmental Survey for Exposure Study

Survey No.	Target substance	Number of survey areas classified by media (number of households for diet)				
		Surface water	Bottom sediment	Aquatic wildlife	Air	Diet
1	1,2-Dichlorobenzene	38	62		28	
2	Perfluorooctane sulfonic acid (PFOS)	20				
3	Perfluorooctanoic acid (PFOA)	20				
4	Benzo[<i>a</i>]pyrene	38	62	10		
5	Polychlorinated naphthalenes (total and mono to octa chloride)			10	11	50
6 6-1 6-2	Polybrominated diphenylether Octabromide Decabromide	38	62	10		50

Surveyed areas are shown in Figures 3-1 to 3-4. Surveys were conducted for 3 or 5 substances in 38 areas in total for surface water, 3 substances in 62 areas in bottom sediment, 3 substances (groups) in 10 areas for aquatic wildlife, and 2 substances (groups) in 29 areas in total for air.

As to diet, 2 substances (groups) were surveyed in 10 areas (Hokkaido, Miyagi Prefecture, Tokyo Metropolis, Nagano Prefecture, Ishikawa Prefecture, Osaka Prefecture, Ehime Prefecture, Fukuoka Prefecture, and Okinawa Prefecture), at 5 households each (total: 50 households).

3. Sampling and analytical method

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

4. Survey results

Among the 6 substances in the total of 15 substances-media, 12 substances-media were detected, with the 3 substances-media exceptions being benzo[*a*]pyrene in aquatic wildlife and polybrominated diphenyl ethers in aquatic wildlife and diet.

Table 3-2 List of Detection Limits of the Environmental Survey for Exposure Study in FY2002

Survey No.	Substance	Number of survey areas classified by media				
		Surface water (ng/L)	Bottom sediment (ng/g-dry)	Aquatic wildlife (ng/g-wet)	Air (ng/m ³)	Diet (ng/g-fresh weight)
1	1,2-Dichlorobenzene	0.4	0.02		15	
2	Perfluorooctane sulfonic acid (PFOS)	0.04				
3	Perfluorooctanoic Acid (PFOA)	0.04				
4	Benzo[<i>a</i>]pyrene	0.29	0.30	0.2		
5	Polychlorinated naphthalene (total)(Note 2)			0.002 - 0.003	0.00002 - 0.001	0.001 - 0.005
6	Polybrominated diphenyl ethers					
6-1	Octabromide					0.5, 0.2 (Note 3)
6-2	Decabromide	120	9.7	0.25		

Note 1: Half-tone screened area (gray) denotes that the survey was conducted in other media not targeted in this survey.

Note 2: Detection limits of Polychlorinated naphthalenes are shown as ranges based on the detection limits of homologs and isomers.

Note 3: The following two isomers are surveyed as octabromides in diet and each detection limit is shown on the right side of the isomers.

2,2',3,4,4',5,5',6-OctaBDE: 0.5 ng/g-fresh weight

2,3,3',4,4',5,5',6-OctaBDE: 0.2 ng/g-fresh weight

Table 3-3 Results of the Environmental Survey for Exposure Study in FY2002

Survey No.	Substance	Surface water 38 areas, 114 samples		Bottom sediment 62 areas, 186 samples		Aquatic wildlife 10 areas, 30 samples		Air 28 areas, 84 samples		Diet 10 regions, 50 areas	
		Range (ng/L) (frequency (area))	Median value (ng/L)	Range (ng/g -dry) (frequency (area))	Median value (ng/g-dry)	Range (ng/g -dry) (frequency (area))	Median value (ng/g-dry)	Range (ng/m ³) (frequency (area))	Median value (ng/m ³)	Range (ng/g -fresh weight) (frequency (area))	Median value (ng/g-fresh weight)
1	1,2-Dichlorobenzene	ND - 200 (10/38)	ND	ND - 38 (59/62)	0.55			18 - 2,200 (19/28)	ND		
2	Perfluorooctane sulfonic acid (PFOS)	0.07 - 24 (20/20)	1.2								
3	Perfluorooctanoic acid (PFOA)	0.33 - 100 (20/20)	2.5								
4	Benzo[<i>a</i>]pyrene	ND - 2.1 (7/38)	ND	ND - 1,200 (57/62)	41	--- (0/10)	ND				
5	Polychlorinated naphthalene (total)					0.012 - 2.0 (10/10)	0.12	0.00048 - 0.55 (11/11)	0.047	ND - 0.30 (36/50)	0.006
6	Polybrominated diphenyl ethers										
6-1	Octabromide									--- (0/50)	ND
6-2	Decabromide	ND - 590 (1/38)	ND	ND - 4,400 (34/62)	ND	--- (0/10)	ND				

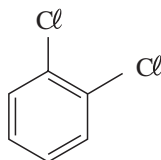
Note 1: Half-tone screened area (gray) denotes that the survey was conducted in other media not targeted in this survey.

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.

5. Survey results of each substance (group)

[1] **1,2-Dichlorobenzene** (CAS RN: 95-50-1; surveyed media in FY2002: surface water, bottom sediment and air)



Chemical formula / molecular weight: C₆H₄Cl₂ / 147.0

Melting point: -17.3°C ⁷⁾

Boiling point: 180.5°C ^{4), 5), 6)}

Water solubility (Sw): 100 mg/L (20°C) ³⁾

Specific gravity: 1.3059

n-Octanol/water partition coefficient (LogPow): 3.43 (observed value) ⁹⁾, 3.45 (calculated value) ⁹⁾

Degradability: Not easily degradable ¹⁶⁾

Accumulativeness: Low ¹⁵⁾

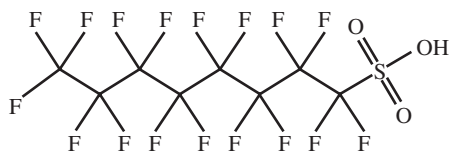
Survey of 1,2-dichlorobenzene in surface water was conducted under the detection limit of 0.4 ng/L and it was detected in 10 areas out of 38, with the maximum detected concentration being 200 ng/L.

Survey of 1,2-dichlorobenzene in bottom sediment was conducted under the detection limit of 0.02 ng/g-dry and it was detected in 59 areas out of 62, with the maximum detected concentration being 38 ng/g-dry.

Survey of 1,2-dichlorobenzene in air was conducted under the detection limit of 15 ng/m³ and it was detected in 19 areas out of 28. The maximum detected concentration was 2,200 ng/m³, exceeding the maximum value in the past (420 ng/m³ in FY1999 survey).

Substance	Surface water 38 areas, 114 samples		Bottom sediment 62 areas, 186 samples		Air 28 areas, 84 samples	
	Detected range (ng/L) (frequency (area))	Median value (ng/L)	Detected range (ng/g-dry) (frequency (area))	Median value (ng/g-dry)	Detected range (ng/m ³) (frequency (area))	Median value (ng/m ³)
1,2-Dichlorobenzene	0.4 - 200 (10/38)	ND	0.02 - 38 (59/62)	0.55	18 - 2,200 (19/28)	ND

[2] **Perfluorooctane sulfonic acid (PFOS)** (CAS RN: 1763-23-1; surveyed media in FY2002: surface water)



Chemical formula / molecular weight: C₈HF₁₇SO₃ / 500.1

Melting point: Unknown

Boiling point: Unknown

Water solubility (Sw): Unknown

Specific gravity: Unknown

n-Octanol/water partition coefficient (LogPow): Unknown

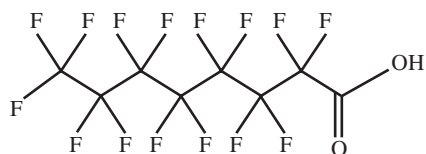
Degradability: Unknown

Accumulativeness: Unknown

Perfluorooctane sulfonic acid (PFOS) was surveyed in FY2002 for the first time. The survey was conducted under the detection limit of 0.04 ng/L and it was detected in 20 areas out of 20, with the maximum concentration being 24 ng/L.

Substance	Surface water 20 areas, 60 samples	
	Detected range (ng/L) (frequency (area))	Median value (ng/L)
Perfluorooctane sulfonic acid (PFOS)	0.07 - 24 (20/20)	1.2

[3] **Perfluorooctanoic acid (PFOA)** (CAS RN: 335-67-1; surveyed media in FY2002: surface water)



Chemical formula / molecular weight: $C_8HF_{15}O_2$ / 414.1

Melting point: Unknown

Boiling point: Unknown

Water solubility (Sw): Unknown

Specific gravity: Unknown

n-Octanol/water partition coefficient (LogPow): Unknown

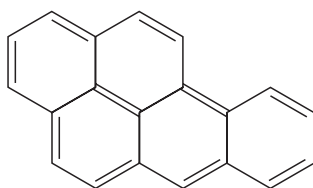
Degradability: Unknown

Accumulativeness: Unknown

Perfluorooctanoic acid (PFOA) in surface water was surveyed in FY2002 for the first time. The survey was conducted under the detection limit of 0.04 ng/L and it was detected in 20 areas out of 20, with the maximum concentration being 100 ng/L.

Substance	Surface water 20 areas, 60 samples	
	Detected range (ng/L) (frequency (area))	Median value (ng/L)
Perfluorooctanoic acid (PFOA)	0.33 - 100 (20/20)	2.5

[4] **Benzo[*a*]pyrene** (CAS RN: 50-32-8; surveyed media in FY2002: surface water, bottom sediment and aquatic wildlife)



Chemical formula / molecular weight: C₂₀H₁₂ / 252.3

Melting point: 179-179.3°C¹⁹⁾

Boiling point: 311°C (10 mmHg)¹⁸⁾

Water solubility (Sw): 0.003 mg/L¹⁷⁾

Specific gravity: Unknown

n-Octanol/water partition coefficient (LogPow): 6.57 (calculated value)²⁰⁾

Degradability: Unknown

Accumulativeness: Unknown

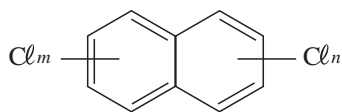
Survey of benzo[*a*]pyrene in surface water was conducted under the detection limit of 0.29 ng/L and it was detected in 7 areas out of 38, with the maximum detected concentration being 2.1 ng/L.

Survey of benzo[*a*]pyrene in bottom sediment was conducted under the detection limit of 0.30 ng/g-dry and it was detected in 57 areas out of 62, with the maximum detected concentration being 1,200 ng/g-dry.

Survey of benzo[*a*]pyrene in aquatic wildlife was conducted under the detection limit of 0.2 ng/g-wet and it was not detected in the 10 surveyed areas.

Substance	Surface water 38 areas, 114 samples		Bottom sediment 62 areas, 186 samples		Aquatic wildlife 10 areas, 30 samples	
	Detected range (ng/L) (frequency (area))	Median value (ng/L)	Detected range (ng/g-dry) (frequency (area))	Median value (ng/g-dry)	Detected range (ng/g-wet) (frequency (area))	Median value (ng/g-wet)
Benzo[<i>a</i>]pyrene	0.63 - 2.1 (7/38)	ND	0.34 - 1,200 (57/62)	41	--- (0/10)	ND

[5] **Polychlorinated naphthalenes** (CAS RN: 70776-03-3; surveyed media in FY2002: aquatic wildlife, air and diet)



Chemical formula / molecular weight: C₁₀H_nCl_(8-n) / 162.6-403.7

Melting point: Unknown

Boiling point: Unknown

Water solubility (Sw): Unknown

Specific gravity: Unknown

n-Octanol/water partition coefficient (LogPow): Unknown

Degradability: Not easily degradable ¹⁶⁾

Accumulativeness: High ¹⁵⁾

Survey of polychlorinated naphthalenes in aquatic wildlife was conducted under the detection limit of 0.002-0.003 ng/g-wet and it was detected in 10 areas out of 10, with the maximum detected concentration being 2.0 ng/g-wet.

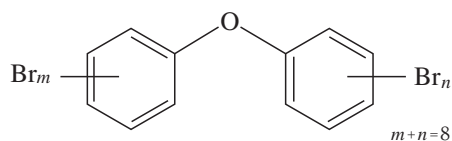
Survey of polychlorinated naphthalenes in air was conducted under the detection limit of 0.00002-0.001 ng/m³ and it was detected in 11 areas out of 11, with the maximum detected concentration being 0.55 ng/m³.

Polychlorinated naphthalenes in diet were surveyed in FY2002 for the first time. The survey was conducted under the detection limit of 0.001-0.005 ng/g-fresh weight and it was detected in 36 households out of 50, with the maximum detected concentration being 0.30 ng/g-fresh weight.

Substance	Aquatic wildlife 10 areas, 30 samples		Air 11 areas, 33 samples		Diet 10 regions, 50 areas	
	Detected range (ng/g-wet) (frequency (area))	Median value (ng/g-wet)	Detected range (ng/m ³) (frequency (area))	Median value (ng/m ³)	Detected range (ng/g-fresh weight) (frequency (area))	Median value (ng/g-fresh weight)
Polychlorinated naphthalenes (total)	0.012 - 2.0 (10/10)	0.12	0.00048 - 0.55 (11/11)	0.047	0.001 - 0.30 (36/50)	0.006

[6] **Polybrominated diphenyl ethers** (surveyed media in FY2002: surface water, bottom sediment, aquatic wildlife and diet)

Octabromide (CAS RN: 32536-52-0)



Chemical formula / molecular weight: $C_{12}H_2Br_8O$ / 801.4

Melting point: Unknown

Boiling point: Unknown

Water solubility (Sw): Unknown

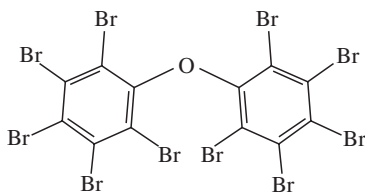
Specific gravity: Not known

n-Octanol/water partition coefficient (LogPow): Unknown

Degradability: Not easily degradable¹⁶⁾

Accumulativeness: Low¹⁵⁾

Decabromide (CAS RN: 1163-19-5)



Chemical formula / molecular weight: $C_{12}Br_{10}O$ / 959.2

Melting point: $304^{\circ}C$ ⁷⁾, $295^{\circ}C$ ²⁶⁾

Boiling point: $425^{\circ}C$ (decomposition)²³⁾, $425^{\circ}C$ ²⁶⁾

Water solubility (Sw): 0.02-0.03 mg/L²²⁾, 0.025 mg/L²⁶⁾

Specific gravity: 3

n-Octanol/water partition coefficient (LogPow): 5.2 (observed value)¹³⁾, 5.236 (calculated value)⁷⁾, 12.11 (calculated value)²⁶⁾, 5.24²⁷⁾

Degradability: Not easily degradable¹⁶⁾

Accumulativeness: Low¹⁵⁾

Survey was conducted on decabromide (deca-BDE) for surface water, bottom sediment and aquatic wildlife, and on octabromide (octa-BDE) for diet.

The survey in surface water was conducted under the detection limit of 120 ng/L and it was detected in 1 area out of 38, with the maximum detected concentration being 590 ng/L.

The survey in bottom sediment was conducted under the detection limit of 9.7 ng/g-dry and it was detected in 34 areas out of 62, with the maximum detected concentration being 4,400 ng/g-dry.

The survey in aquatic wildlife was conducted in 10 areas and it was not detected in any surveyed area.

Polybrominated diphenyl ether in diet were surveyed in FY2002 for the first time. The survey was conducted on two isomers of octa-BDE under the detection limit of 0.5 ng/g-fresh weight for

2,2',3,4,4',5,5'-octa-BDE and 0.2 ng/g-fresh weight for 2,3,3',4,4',5,5',6-octa-BDE in 10 areas (50 households), and they were not detected in any samples.

Substance	Substance Surface water 38 areas, 114 samples		Bottom sediment 62 areas, 186 samples		Aquatic wildlife 10 areas, 30 sample		Diet 10 areas, 50 households	
	Detected range (ng/L) (frequency (area))	Median value (ng/L)	Detected range (ng/g-dry) (frequency (area))	Median value (ng/g-dry)	Detected range (ng/g-dry) (frequency (area))	Median value (ng/g-dry)	Detected range (ng/g-fresh weight) (frequency (area))	Median value (ng/g-fresh weight)
Polybrominated diphenyl ethers								
Octa-bromide							--- (0/50)	ND
Deca-bromide	240 - 590 (1/38)	ND	10 - 4,400 (34/62)	ND	--- (0/10)	ND		

Figure 3-1 Locations of the Environmental Survey for Exposure Study
(Surface water, FY2002)



Figure 3-2 Locations of the Environmental Survey for Exposure Study
(Bottom sediment, FY2002)

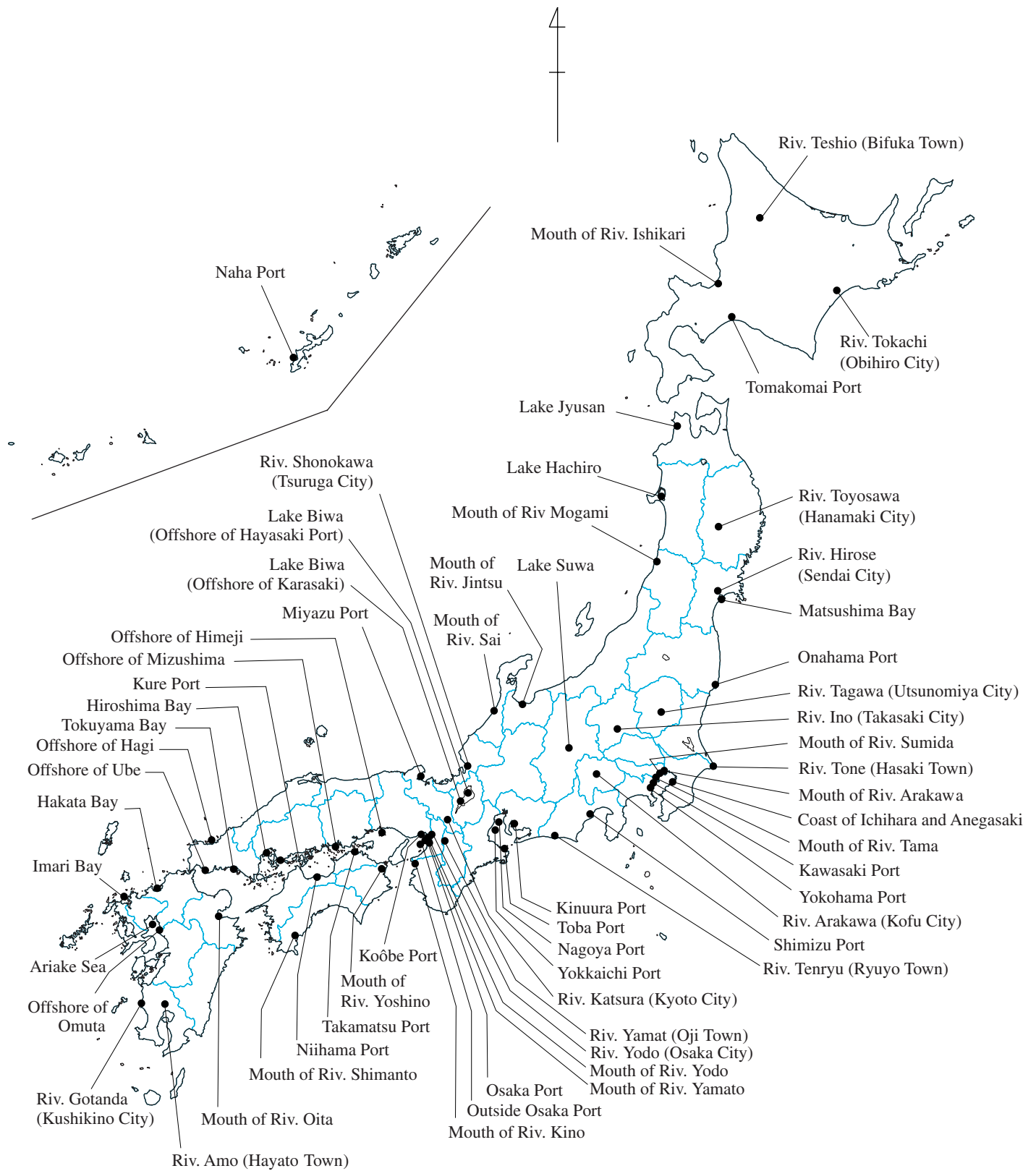


Figure 3-3 Locations of the Environmental Survey for Exposure Study
(Aquatic wildlife, FY2002)



Figure 3-4 Locations of the Environmental Survey for Exposure Study (Air, FY2002)



[References]

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