Chapter 1 Results of the Initial Environmental Survey in FY2023

1. Purpose of the survey

Initial Environmental Surveys are implemented in compliance with the Law Concerning Reporting, etc. of Releases of Specific Chemical Substances to the Environment and Promoting Improvement in Their Management (Law No. 86, 1999) (hereafter, the PRTR Law); these surveys provide the basic resources to properly evaluate chemical substances which may present environmental risk by compiling and tracking data notably from areas susceptible to high concentrations in their general environments, as well as for evaluating environmental and exposure risks to chemical substances that are other than as designated by law.

2. Target chemicals

In the FY2023 Initial Environmental Survey, 14 chemicals (groups) that were selected and designated as target chemicals. The combinations of target chemicals and the surveyed media are given below.

No.	Name	The Chemical Substances Control Law *1, 2		The PRTR Law *3			Surveyed media		
		Before the revision	After the revision	2000-	2008-	2021-	Surface water	Sediment	Air
[1]	Estradiols								
	[1-1] 17*β*-Estradiol						○		
	[1-2] 1,3,5(10)-Estratrien-3-ol-17-one (synonym: Estrone)						○		
	[1-3] 17*α*-Ethynylestradiol						○		
	[1-4] 16*α*-Hydroxyestradiol (synonym: Estriol)						○		
[2]	2,4-Xylenol				I 78	I 101	○	○	○
[3]	*p*-Chlorophenol	II Monitored III Monitored			I 121	I 146	○		○
[4]	*n*-Propylacetate						○		
[5]	*N*,*N*-Diethyl-3-methylbenzamide (synonym: *N*,*N*-Diethyl-*m*-toluamide)	II Monitored					○		
[6]	1-{2-[(2,4-Dichlorobenzyl)oxy]-2-(2,4-dichlorophenyl)ethyl}-1*H*-imidazole (synonym: Miconazole)						○		
[7]	(*Z*)-2-[4-(1,2-Diphenyl-1-butenyl)phenoxy]-*N*,*N*-dimethylethylamine (synonym: Tamoxifen) and its metabolites								
	[7-1] (*Z*)-2-[4-(1,2-Diphenyl-1-butenyl)phenoxy]-*N*,*N*-dimethylethylamine (synonym: Tamoxifen)						○		
	[7-2] (*Z*)-2-[4-(1,2-Diphenyl-1-butenyl)phenoxy]-*N*-methyl-ethanamine (synonym: *N*-Desmethyltamoxifen)						○		
	[7-3] 4-[(*Z*)-1-[4-[2-(dimethylamino)ethoxy]phenyl]-2-phenyl-1-butenyl]phenol (synonym: 4-Hydroxytamoxifen)						○		
	[7-4] 4-[(*Z*)-1-[4-[2-(methylamino)ethoxy]phenyl]-2-phenyl-1-butenyl]phenol (synonym: 4-Endoxifen)						○		
[8]	2-(2,4-Difluorophenyl)-1,3-bis(1*H*-1,2,4-triazol-1-*yl*)propan-2-ol (synonym: Fluconazole)						○		
[9]	Ciprofloxacin						○		
[10]	Trichloroacetic acid	II Monitored			I 282		○		
[11]	Hexamethylenediamine	II Monitored		I 292	I 390	I 434	○		○
[12]	Benzophenone				I 403	II 456	○		
[13]	Methylcyclohexane	III Monitored					○		
[14]	Methyl *tert*-butyl ether						○		

(Note 1) “The Chemical Substances Control Law” hereafter means “Law Concerning the Examination and Regulation of Manufacture, etc. of Chemical Substances (Law No. 117 of 1973).”

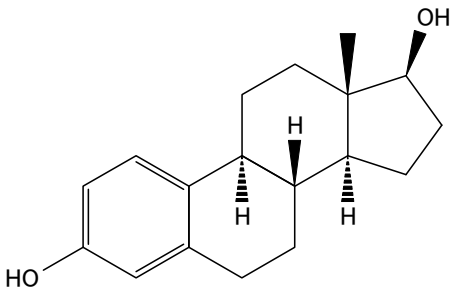
(Note 2) “Before the revision” in “The Chemical Substances Control Law” means designation before the May 20, 2009 revison of tha low (enforced April 1, 2011), and “After the revision” means designation after the law revison.

(Note 3) “2000-” in the “The PRTR Law” means designation at the time of enactment of government ordinance of tha low on June 7, 2000, "2008-" means the designation after the revision of the government ordinance on November 21, 2008, and "2021-" means the designation after the revision of the government ordinance on October 20, 2021.

Chemical and physical properties of target chemicals of the Initial Environmental Survey are as follows.

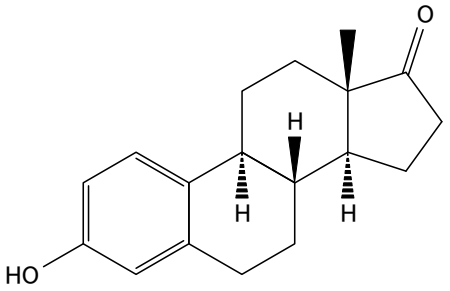
[1] Estradiols

[1-1] 17β-Estradiol



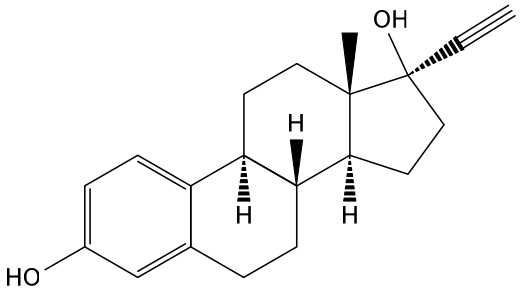
Molecular formula: $C_{18}H_{24}O_2$
CAS: 50-28-2
ENCS: No pertinence
MW: 272.38
mp: 169.9 °C [1)]
bp: 413.45 °C [1)]
sw: 1.5 mg/L (20 °C) [1)]
Specific gravities: 1.202 (20 °C) [1)]
logPow: 4.01 [2)]

[1-2] 1,3,5(10)-Estratrien-3-ol-17-one (synonym: Estrone)



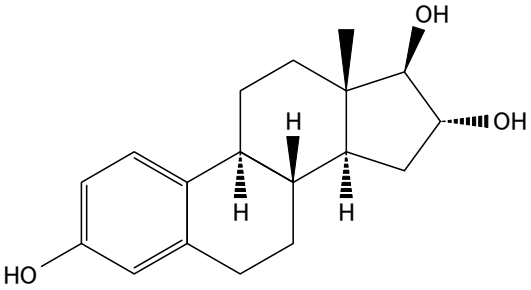
Molecular formula: $C_{18}H_{22}O_2$
CAS: 53-16-7
ENCS: 9-2145
MW: 270.37
mp: 262.4 °C [1)]
bp: 445.2 °C [2)]
sw: 0.76 mg/L (20 °C) [1)]
Specific gravities: 1.24 g/cm^3 (20 °C) [1)]
logPow: 2.6 (25 °C) [1)]

[1-3] 17α-Ethynylestradiol



Molecular formula: $C_{20}H_{24}O_2$
CAS: 57-63-6
ENCS: No pertinence
MW: 296.40
mp: 142 ~ 146 °C or 180 ~ 186 °C [2)]
bp: Uncertain
sw: 11.3 mg/L (27 °C) [2)]
Specific gravities: Uncertain
logPow: 3.67 [2)]

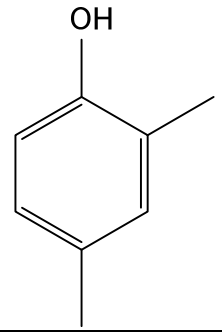
[1-4] 16α-Hydroxyestradiol (synonym: Estriol)



Molecular formula: $C_{18}H_{24}O_3$
CAS: 50-27-1
ENCS: 9-203
MW: 288.39
mp: 288 °C (decomposes) [2)]
bp: Uncertain
sw: 13.25 mg/L [2)]
Specific gravities: 1.24 g/cm^3 (25 °C) [2)]
logPow: 2.45 [2)]

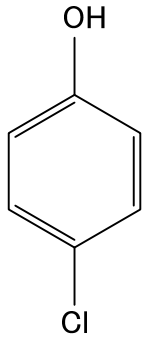
(Abbreviations) CAS CAS registry number, ENCS registry number in the Existing and New Chemical Substances List, MW molecular weight, mp melting point, bp boiling point, SW solubility in water, Specific gravities Specific gravity(no unit) or density, logPow *n*-octanol-water partition coefficient, kPa kilopascal (1 atom approximately equal to 101.3kPa).

[2] 2,4-Xylenol



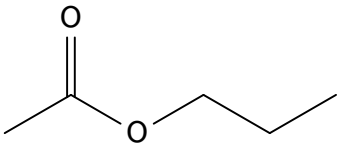
Molecular formula: $C_8H_{10}O$
CAS: 105-67-9
ENCS: 3-521[*1]、4-57*[2]
MW: 117.19
mp: 25.4~26 °C [3)]
bp: 211.5 °C [3)]
sw: 7,870 mg/L (25 °C) [3)]
Specific gravities: 0.9650 (20 °C/4 °C) [2)]
logPow: 2.30 [3)]

[3] *p*-Chlorophenol



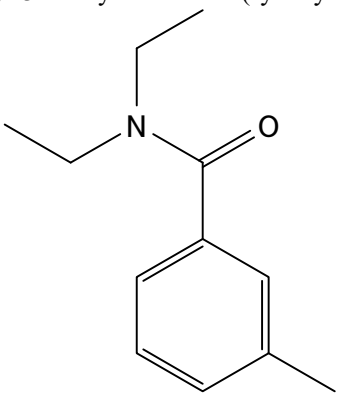
Molecular formula: $C_6H_{65}ClO$
CAS: 106-48-9
ENCS: 3-895 (Monochlorophenol)
MW: 128.56
mp: 42.8 °C [3)]
bp: 220 °C [3)]
sw: 24×10^3 mg/L (25 °C) [3)]
Specific gravities: 1.2238 (78 °C /4 °C) [4)]
logPow: 2.39 [3)]

[4] *n*-Propylacetate



Molecular formula: $C_5H_{10}O_2$
CAS: 109-60-4
ENCS: 2-727 (Propylacetate)
MW: 102.13
mp: -92 °C [5)]
bp: 101.6 °C [5)]
sw: 16×10^3 mg/L (20 °C) [5)]
Specific gravities: 0.9 [5)]
logPow: 1.24 [5)]

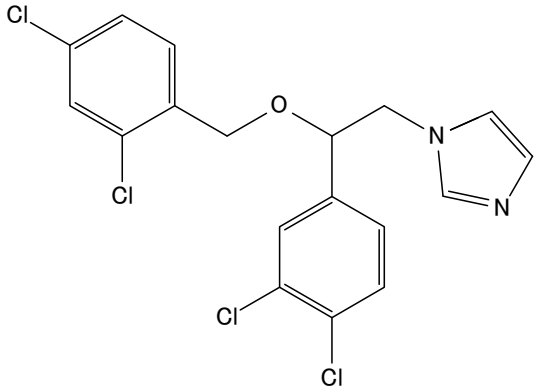
[5] *N*,*N*-Diethyl-3-methylbenzamide (synonym: *N*,*N*-Diethyl-*m*-toluamide)



Molecular formula: $C_{12}H_{17}NO$
CAS: 134-62-3
ENCS: 3-1321
MW: 191.27
mp: -45 °C [2)]
bp: 285 °C (760 mmHg) [2)]
sw: 19.6 mg/L [2)]
Specific gravities: 0.996 g/cm^3 (20 °C) [2)]
logPow: 2.02 [2)]

(Note 1) Dialkyl phenol (The alkyl groups have 1 ~ 5 carbon atoms)
(Note 2) Poly alkyl poly hydroxy poly phenyl (1 ~ 3 alkyl groups which have 1 ~ 3 carbon atoms, 1 ~ 3 hydroxyl groups and 1 ~ 5 phenyl groups)

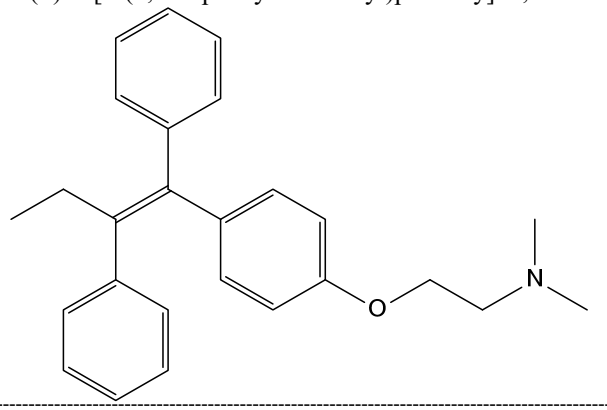
[6] 1-{2-[(2,4-Dichlorobenzyl)oxy]-2-(2,4-dichlorophenyl)ethyl}-1*H*-imidazole (synonym: Miconazole)



Molecular formula: $C_{18}H_{14}Cl_4N_2O$
CAS: 22916-47-8
ENCS: No pertinence
MW: 416.12
mp: 159 ~ 163 °C [2)]
bp: Uncertain
sw: 0.763 mg/L [2)]
Specific gravities: Uncertain
logPow: 6.1 [2)]

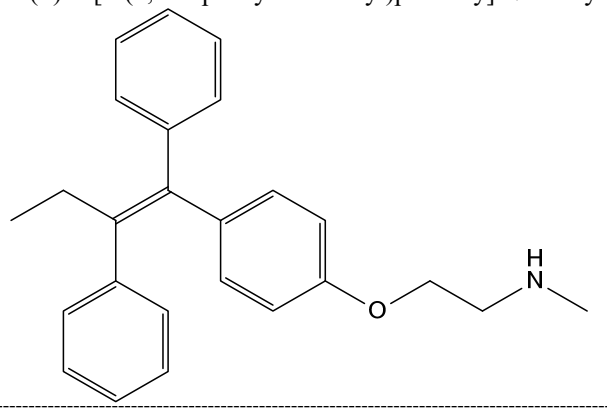
[7] (*Z*)-2-[4-(1,2-Diphenyl-1-butenyl)phenoxy]-*N*,*N*-dimethylethylamine (synonym: Tamoxifen) and its metabolites

[7-1] (*Z*)-2-[4-(1,2-Diphenyl-1-butenyl)phenoxy]-*N*,*N*-dimethylethylamine (synonym: Tamoxifen)



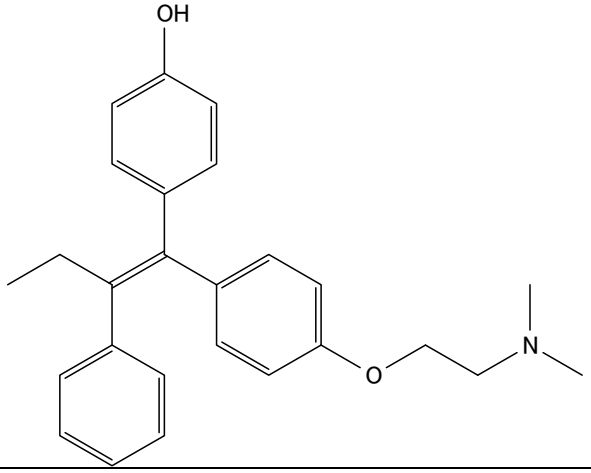
Molecular formula: $C_{26}H_{29}NO$
CAS: 10540-29-1
ENCS: No pertinence
MW: 371.52
mp: 96 °C [1)]
bp: Uncertain
sw: 0.167 mg/L (25 °C) [1)]
Specific gravities: 1.042 (20 °C) [1)]
logPow: 7.1 [2)]

[7-2] (*Z*)-2-[4-(1,2-Diphenyl-1-butenyl)phenoxy]-*N*-methyl-ethanamine (synonym: *N*-Desmethyltamoxifen)



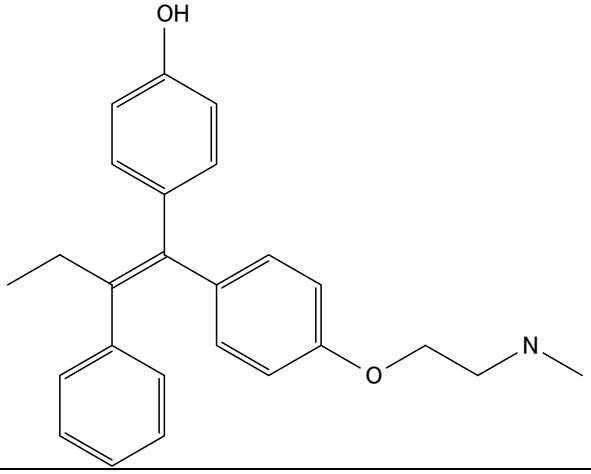
Molecular formula: $C_{25}H_{27}NO$
CAS: 31750-48-8
ENCS: No pertinence
MW: 357.50
mp: Uncertain
bp: Uncertain
sw: Uncertain
Specific gravities: Uncertain
logPow: Uncertain

[7-3] 4-[(*Z*)-1-[4-[2-(dimethylamino)ethoxy]phenyl]-2-phenyl-1-butenyl]phenol (synonym: 4-Hydroxytamoxifen)



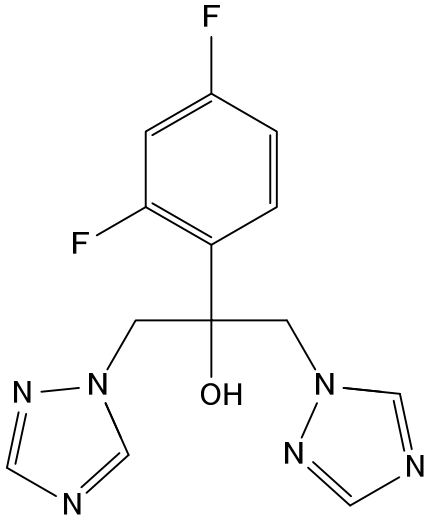
Molecular formula: $C_{26}H_{29}NO_2$
CAS: 68047-06-3
ENCS: No pertinence
MW: 387.51
mp: Uncertain
bp: Uncertain
sw: Uncertain
Specific gravities: Uncertain
logPow: Uncertain

[8-4] 4-[(*Z*)-1-[4-[2-(methylamino)ethoxy]phenyl]-2-phenyl-1-butenyl]phenol (synonym: 4-Endoxifen)



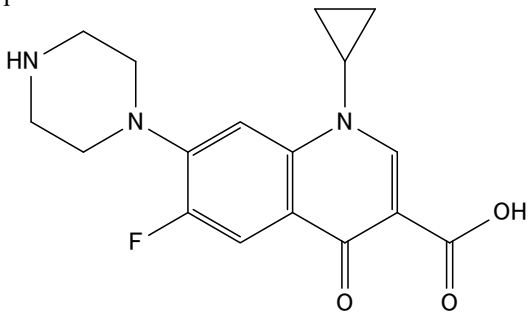
Molecular formula: $C_{25}H_{27}NO_2$
CAS: 112093-28-4
ENCS: No pertinence
MW: 373.49
mp: Uncertain
bp: Uncertain
sw: Uncertain
Specific gravities: Uncertain
logPow: Uncertain

[8] 2-(2,4-Difluorophenyl)-1,3-bis(1*H*-1,2,4-triazol-1-*yl*)propan-2-ol (synonym: Fluconazole)



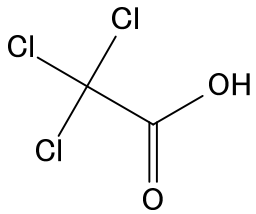
Molecular formula: $C_{13}H_{12}F_2N_6O$
CAS: 86386-73-4
ENCS: No pertinence
MW: 306.28
mp: 138 ~ 140 °C [2)]
bp: 579.8 °C [2)]
sw: 1.39×10^3 mg/L [2)]
Specific gravities: Uncertain
logPow: 0.5 [2)]

[9] Ciprofloxacin



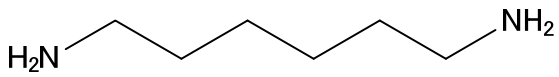
Molecular formula: $C_{17}H_{18}FN_2O_3$
CAS: 85721-33-1
ENCS: No pertinence
MW: 331.35
mp: 225 ~ 257 °C [2)]
bp: Uncertain
sw: 30×10^3 mg/L (20 °C) [2)]
Specific gravities: Uncertain
logPow: 0.28 [2)]

[10] Trichloroacetic acid



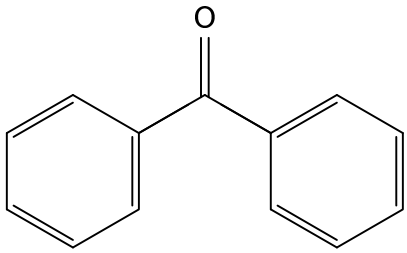
Molecular formula: $C_2HCl_3O_2$
CAS: 76-03-9
ENCS: 2-1188
MW: 163.39
mp: 57 ~ 59.1 °C [3)]
bp: 198.2 °C (760 mmHg) [3)]
sw: 923×10^3 ~ 930×10^3 mg/L (20 °C) [3)]
Specific gravities: 1.6126 g/cm^3 (64 °C) [3)]
logPow: 1.33 [3)]

[11] Hexamethylenediamine



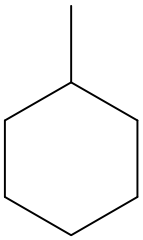
Molecular formula:	$C_6H_{16}N_2$
CAS:	124-09-4
ENCS:	2-153
MW:	116.21
mp:	38.8 ~ 40.75 °C [3]
bp:	197 ~ 205 °C (760 mmHg) [3]
sw:	600×10^3 mg/L (16 °C) [3]
Specific gravities:	0.854 g/cm^3 (25 °C) [3]
logPow:	1.33 [3]

[12] Benzophenone



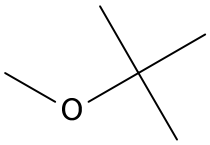
Molecular formula:	$C_{13}H_{10}O$
CAS:	119-61-9
ENCS:	3-1258、4-125
MW:	182.22
mp:	48.0 ~ 51 °C [3]
bp:	305.4 ~ 305.9 °C (760 mmHg) [3]
sw:	137 mg/L (25 °C) [3]
Specific gravities:	1.11 g/cm^3 (18 °C) [3]
logPow:	3.18 [3]

[13] Methylcyclohexane



Molecular formula:	C_7H_{14}
CAS:	108-87-2
ENCS:	3-2230
MW:	98.19
mp:	-126.6 °C [1]
bp:	100.93 °C [1]
sw:	14 mg/L (25 °C) [1]
Specific gravities:	0.7694 g/cm^3 (20 °C) [1]
logPow:	3.88 [1]

[14] Methyl *tert*-butyl ether



Molecular formula:	$C_5H_{12}O$
CAS:	1634-04-4
ENCS:	2-3220
MW:	88.15
mp:	-108.6 °C [3]
bp:	55.2 °C (760 mmHg) [3]
sw:	51×10^3 mg/L (25 °C) [3]
Specific gravities:	0.7405 g/cm^3 (20 °C) [3]
logPow:	0.94 [3]

References

1) European Chemicals Agency (ECHA), REACH registered substance factsheets (https://echa.europa.eu/)
2) U.S. National Library of Medicine, PubChem (https://pubchem.ncbi.nlm.nih.gov/, Retrieved on November, 2023)
3) Ministry of the Environment Government of Japan, The Initial Environmental Risk Assessment of Chemicals (https://www.env.go.jp/en/chemi/chemicals/profile_erac/index.html)
4) National Institute of Technology and Evaluation (NITE), *p*-Chlorophenol, Chemicals Initial Risk Assessment Report Ver. 1.0 No. 209 (2005) (in Japanese)
5) International Labour Organization (ILO), *n*-Propylacetate, International Chemical Safety Cards (ICSCs), 0940 (2014)

3. Surveyed site and procedure

In the Initial Environmental Survey, the sampling and analysis of specimens was entrusted to prefectural governments and government-designated cities across Japan, and some specimens were sampled and analysed by private analytical laboratories.

(1) Organisations responsible for sampling

Local communities	Organisations responsible for sampling *1	Surveyed media		
		Surface water	Sedi-ment	Air
Hokkaido	Recycling-based Society Promotion Division, Environment and Lifestyle Department, Environmental Conservation Bureau, Hokkaido Prefectural Government and Research Institute of Energy, Environment and Geology, Hokkaido Research Organization	○		
Sapporo City	Sapporo City Institute of Public Health	○		
Iwate Pref.	Research Institute for Environmental Sciences and Public Health of Iwate Prefecture	○	○	
Miyagi Pref.	Miyagi Prefectural Institute of Public Health and Environment	○		
Sendai City	Sendai City Institute of Public Health	○	○	○
Akita Pref.	Akita Research Center for Public Health and Environment	○	○	
Yamagata Pref.	Yamagata Environmental Science Research Center	○		
Fukushima Pref.	Fukushima Prefectural Environmental Center	○		
Ibaraki Pref.	Ibaraki Kasumigaura Environmental Science Center	○		○
Tochigi Pref.	Tochigi Prefectural Institute of Public Health and Environmental Science	○		
Gunma Pref.	Gunma Prefectural Institute of Public Health and Environmental Sciences	○		
Saitama Pref.	Center for Environmental Science in Saitama	○		○
Saitama City	Saitama City Institute of Health Science and Research	○		○
Chiba Pref.	Chiba Prefectural Environmental Research Center	○	○	
Tokyo Met.	Environmental Improvement Division, Bureau of Environment, Tokyo Metropolitan Government and Tokyo Metropolitan Research Institute for Environmental Protection	○	○	○
Kanagawa Pref.	Kanagawa Environmental Research Center			○
Yokohama City	Yokohama Environmental Science Research Institute	○		
Kawasaki City	Kawasaki Environment Research Institute	○	○	○
Niigata Pref.	Niigata Prefectural Institute of Public Health and Environmental Sciences	○	○	
Toyama Pref.	Environment Preservation Division, Living Environmental and Cultural Affairs Department, Toyama Prefectural Government and Toyama Prefectural Environmental Science Research Center	○		
Ishikawa Pref.	Ishikawa Prefectural Institute of Public Health and Environmental Science	○		○
Nagano Pref.	Nagano Environmental Conservation Research Institute	○	○	○
Shizuoka Pref.	Shizuoka Institute of Environment and Hygiene	○		
Aichi Pref.	Aichi Environmental Research Center	○	○	
Nagoya City	Nagoya City Environmental Science Research Center, Regional Environmental measures Division, Environmental Bureau, Nagoya city	○		○
Mie Pref.	Mie Prefecture Health and Environment Research Institute	○	○	○
Shiga Pref.	Lake Biwa Environmental Research Institute	○	○	○
Kyoto Pref.	Kyoto Prefectural Institute of Public Health and Environment	○		○
Kyoto City	Kyoto City Institute of Health and Environmental Sciences	○	○	○
Osaka Pref.	Environment Preservation Division, Environment Management Office, Department of Environment, Agriculture, Forestry and Fisheries, Osaka Prefectural Government	○	○	○*2
Osaka City	Osaka City Institute of Public Health and Environmental Sciences	○	○	
Hyogo Pref.	Water and Air Division, Environment Department, Hyogo Prefectural Government and Hyogo Prefectural Institute of Environmental Sciences, Hyogo Environmental Advancement Association	○		
Kobe City	Environmental Conservation Division, Environment Bureau, Kobe City and Kobe City Institute of Health and Environmental Science	○	○	
Nara Pref.	Nara Prefecture Landscape and Environment Center	○	○	
Wakayama Pref.	Wakayama Prefectural Research Center of Environment and Public Health	○		○
Okayama Pref.	Okayama Prefectural Institute for Environmental Science and Public Health	○	○	
Hiroshima Pref.	Hiroshima Prefectural Technology Research Institute Health and Environment Center			○
Yamaguchi Pref.	Yamaguchi Prefectural Institute of Public Health and Environment	○	○	○
Tokushima Pref.	Tokushima Prefectural Public Health, Pharmaceutical and Environmental Sciences Center	○		○
Kagawa Pref.	Kagawa Prefectural Research Institute for Environmental Sciences and Public Health	○	○	
Ehime Pref.	Ehime Prefectural Institute of Public Health and Environmental Science	○		

Local communities	Organisations responsible for sampling *1	Surveyed media		
		Surface water	Sedi-ment	Air
Fukuoka Pref.	Fukuoka Institute of Health and Environmental Sciences	○		
Kitakyushu City	Kitakyushu City Institute of Health and Environmental Sciences	○	○	
Fukuoka City	Fukuoka City Institute for Hygiene and the Environment	○		
Saga Pref.	Saga Prefectural Environmental Research Center	○	○	○
Kumamoto Pref.	Kumamoto Prefectural Institute of Public-Health and Environmental Science	○		
Oita Pref.	Environment Preservation Division, Department of Environment, Oita Prefectural Government and Oita Prefectural Institute of Health and Environment	○	○	
Miyazaki Pref.	Miyazaki Prefectural Institute for Public Health and Environment	○		○*2
Okinawa Pref.	Okinawa Prefectural Institute of Health and Environment	○		

(Note 1) *1: Organisations responsible for sampling are described by their official names in FY 2023.
(Note 2) *2: Those organizations cooperated with a private analytical laboratory in sampling specimens

(2) Surveyed sites and target chemicals

The numbers of target chemicals and the numbers of surveyed sites, etc. by surveyed medium in the initial environmental survey were as shown in the following table.

The target chemicals and the national distribution map of the survey sites for each medium are shown in Table 1-1-1 and Fig.1-1 for surface water, Table 1-1-2 and Fig.1-1 for sediment, Table 1-1-3 and Fig.1-2 for air.

In addition, about 20 sites were selected as survey sites per target chemical. To obtain data for areas to be expected to high concentrations in the general environment survey sites are selected based on information regarding releases and emissions. Among the sites considering to rank in the top of PRTR emissions, it was included the surrounding sites where samples can be taken in the survey sites.

Surveyed media	Numbers of local communities	Numbers of target chemicals	Numbers of surveyed sites	Numbers of samples at a surveyed site
Surface water	47	14	72	1
Sediment	22	1	26	3
Air	21*	3	22	3
All media	49	14	94	

(Note) *: For 2 of the 21 organizations, they were cooperated with a private analytical laboratory in sampling specimens.

(3) Sampling method of specimens

The sampling of specimens and the preparation of samples were carried out following the “Guidelines on Conducting of Environmental Surveys and Monitoring of Chemicals” (published on March 2021) by the Environment Health and Safety Division, Environmental Health Department, Ministry of the Environment of Japan (MOE).

(4) Detection limit

The detection limits of analysed values reported by the analytical laboratory are not necessarily the same because of differences in the properties of specimens and in the available measurement equipment. To enable summarisation, therefore, a unified detection limit is predetermined and the analytical values reported by the analytical laboratory are summarised by the following procedure.

Treatment of measured value as an undetected value in high-sensitivity analysis

In the case of high-sensitivity analysis, in which the detection limit of the analytical laboratory is lower than the unified detection limit, any measured value lower than the unified detection limit is treated as an undetected value in the nationwide summary (see schematic (A)).

Elimination of undetected values in low-sensitivity analysis from summary subject

When the detection limit of the analytical laboratory is higher than the unified detection limit, any target chemical not detected is eliminated from the subject of the summary (see schematic (B)).

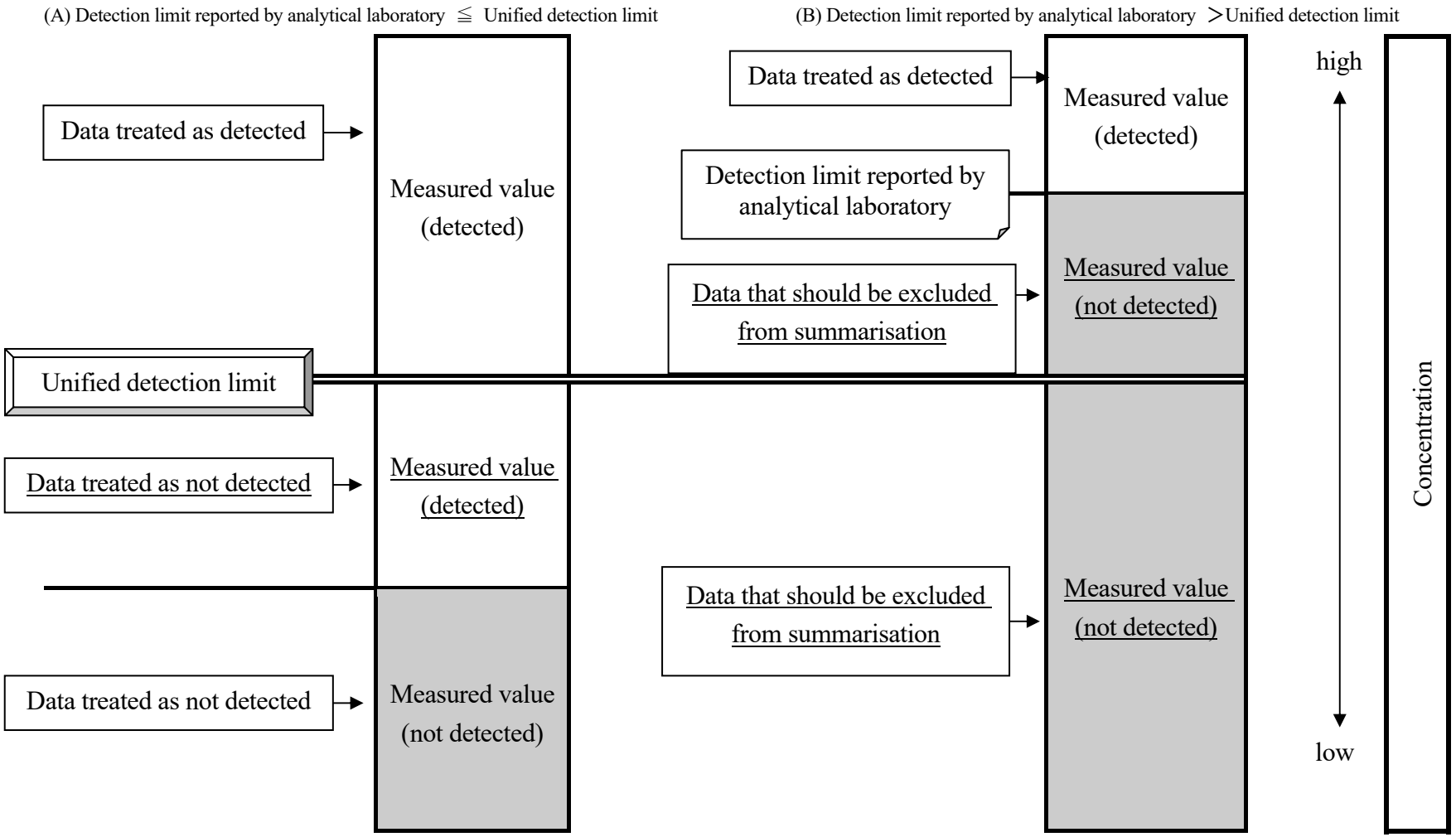
When the instrument detection limit (IDL) and the method detection limit (MDL) are given in the analytical method, which is described in reports on the investigation of the development of analytical methods for chemicals and adopted in the Initial Environmental Survey (hereafter, the Initial Environmental Survey Analytical Method), if the IDL measured by the analytical laboratory is lower than the given IDL, the MDL of the Initial Environmental Survey Analytical Method is used as the detection limit by the analytical laboratory.

When IDL and MDL are not given in the Initial Environmental Survey Analytical Method, the detection limit is predetermined by the following procedure.

When the analytical laboratory calculates the appropriate IDL and MDL following the calculation method stated in the analytical method development instruction manuals, this calculated MDL is used as the detection limit by the analytical laboratory.

When the appropriate IDL and MDL are not calculated by the analytical laboratory, one of the following procedures was employed to establish the detection limit by the analytical laboratory.

- deduction from the IDL and MDL calculated for the corresponding chemical by Initial Environmental Survey Analytical Method or other analytical laboratories
- deduction from the lowest calibration curve concentration and the results of recovery tests
- deduction from the results of addition and collection tests, the results of operation blank tests, and the signal/noise ratio (S/N ratio) obtained from the chromatogram of environmental specimens



Schematic of procedure for data summarisation

Table 1-1-1 List of surveyed sites (surface water) and target chemicals in the Initial Environmental Survey in FY2023

Local communities	Surveyed sites	Target chemicals													
		[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]	[14]
Hokkaido	Inou-ohashi Bridge, Riv. Ishikari (Asahikawa City)	○				○		○			○				
Sapporo City	Nakanuma of Riv.Toyohira (Sapporo City)	○		○		○	○	○	○	○	○		○		
	Daiichishinkawa-bashi Bridge, Riv. Shin (Sapporo City)	○		○		○	○	○	○	○	○		○		
Iwate Pref.	Toyosawa-bashi Bridge, Riv. Toyosawa (Hanamaki City)		○		○	○	○		○		○	○			
Miyagi Pref.	Futatsuya-bashi Bridge, Riv. Hasama (Tome City)	○		○							○				
	Sakura-hodoukyou Bridge, Riv.Shiroishi (Shibata Town)	○		○							○				
Sendai City	Hirose-ohashi Bridge, Riv. Hirose (Sendai City)		○	○								○	○	○	○
Akita Pref.	Akita Canal (Akita City)	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Yamagata Pref.	Goten-bashi Bridge, Riv. Mogami (Murayama City)				○	○	○	○	○	○					
Fukushima Pref.	Onahama Port										○				
Ibaraki Pref.	Tonekamome-ohasi Bridge, Mouth of Riv. Tone (Kamisu City)			○		○						○			
Tochigi Pref.	Yajikka-bashi Bridge, Riv. Tagawa (Shimono City)	○	○		○	○	○	○	○	○		○	○		
Gunma Pref.	Furutone-bashi Bridge, Riv. Ishida (Ota City)	○				○	○	○	○	○	○		○		
	Nakajima-bashi Bridge, Riv. Hirose (Isesaki City)		○												○
Saitama Pref.	Kachi-hashi Bridge, Riv. Ichino (Yoshimi Town)		○	○							○				
	Akigaseshusuizeki of Riv. Arakawa (Shiki City)				○						○			○	
	Shiki-ohasi Bridge, Riv. Yanase (Miyoshi Town)	○				○	○	○	○	○	○		○		
Saitama City	Nakadote-hashi Bridge, Riv. Kamo (Saitama City)		○	○	○	○						○			
Chiba Pref.	Coast of Ichihara and Anegasaki	○	○	○	○	○				○	○	○	○	○	○
Tokyo Met.	Mouth of Riv. Arakawa (Koto Ward)	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	Mouth of Riv. Sumida (Minato Ward)	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Yokohama City	Kamenoko-bashi Bridge, Riv.Tsurumi (Yokohama City)	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	Yokohama Port			○										○	○
	Yoshikura-bashi Bridge, Riv.Kashio (Yokohama City)	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Kawasaki City	Mouth of Riv. Tama (Kawasaki City)	○	○			○	○	○	○	○		○	○	○	○
	Front of Chidori Town, Keihin Canal, Port of Kawasaki	○				○	○	○	○	○	○		○	○	
	Front of Ougi Town, Keihin Canal, Port of Kawasaki		○	○	○							○		○	○
Niigata Pref.	Lower Riv. Shinano (Niigata City)	○	○		○	○	○	○	○	○		○	○	○	○
Toyama Pref.	Ishida-bashi Bridge, Riv. Kurose (Kurobe City)										○				
Ishikawa Pref.	Mouth of Riv. Sai (Kanazawa City)	○		○		○	○	○	○	○		○	○		
Nagano Pref.	Lake Suwa (center)	○	○	○		○	○	○	○	○					
Shizuoka Pref.	Shimizu Port				○										
	Siosai-bashi Bridge, Riv. Kikukawa (Kakegawa City)					○	○	○	○	○			○		
	Kaketsuka-bashi Bridge, Riv. Tenryu (Iwata City)				○										
Aichi Pref.	Kinuura Port				○										
	West of Shiomi Wharf, Nagoya Port		○		○						○	○	○	○	○
	Nikko-bashi Bridge, Riv. Nikko (Tsushima City)	○	○	○		○	○	○	○	○	○	○	○		
Nagoya City	Hinode-bashi Bridge, Riv.Shin-hori (Nagoya City)	○				○	○	○	○	○	○		○		
	Minatoshinbashi Bridge, Riv. Hori (Nagoya City)	○				○	○	○	○	○	○		○		
	Tenpaku-bashi Bridge, Riv. Tenpaku (Nagoya City)										○				○
Mie Pref.	Yokkaichi Port		○	○	○						○	○	○	○	○
Shiga Pref.	Lake Biwa (center, offshore of Minamihira)		○	○	○							○		○	
	Lake Biwa (center, offshore of Karasaki)		○	○	○							○		○	
Kyoto Pref.	Miyazu Port														○
Kyoto City	Miyamae-bashi Bridge, Riv. Katsura (Kyoto City)	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Osaka Pref.	Mouth of Riv. Yamato (Sakai City)	○	○	○	○	○	○	○	○	○		○	○	○	○
Osaka City	Kema-bashi Bridge, Riv. Oh-kawa (Osaka City)	○	○				○	○	○	○	○	○	○		○
	Osaka Port	○	○				○	○	○	○	○	○	○		○
Hyogo Pref.	Koubu-bashi Bridge, Riv. Mukogawa (Nishinomiya City)		○								○				○
	Offshore of Nishinomiya City, Osaka Bay										○				
Kobe City	Kobe Port (center)		○	○	○								○	○	○
Nara Pref.	Taisho-bashi Bridge, Riv. Yamato (Oji Town)	○	○	○	○	○	○	○	○	○			○		
Wakayama Pref.	Kinokawa-ohashi Bridge, Mouth of Riv. Kinokawa (Wakayama City)											○			
	Offshore of Riv. Kinokawa, Wakayama Sea area										○				○
	Aizu-bashi Bridge, Riv. Hidariaizu (Tanabe City)														○
Okayama Pref.	Sasagase-bashi Bridge, Riv. Sasagase (Okayama City)	○				○	○	○	○	○	○				
	Offshore of Mizushima		○	○							○			○	○

Local communities	Surveyed sites	Target chemicals													
		[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]	[14]
Yamaguchi Pref.	Tokuyama Bay		○	○	○							○	○	○	○
	Onoda Industrial Canal, Ube Port			○											
Tokushima Pref.	Shinmachi-bashi Bridge, Riv. Shinmachi (Tokushima City)										○				○
Kagawa Pref.	Takamatsu Port	○	○	○	○	○	○	○	○	○	○		○	○	○
Ehime Pref.	Niihama Port				○							○		○	○
Fukuoka Pref.	Kabura-bashi Bridge, Riv. Raizan (Itoshima City)		○		○					○			○		
	Offshore of Omuta				○					○			○		
Kitakyushu City	Dokai Bay		○	○	○	○						○	○	○	○
Fukuoka City	Hakata Bay	○				○	○	○	○	○	○		○		
Saga Pref.	Imari Bay		○	○									○		
Kumamoto Pref.	Ubujima-bashi Bridge, Mizunashi River (Yatsushiro City)			○											
Oita Pref.	Mouth of Riv. Oita (Oita City)	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Miyazaki Pref.	Naka Bridge, Riv. Hama (Nobeoka City)											○			
Okinawa Pref.	Naha Port										○				
	Ryutou-bashi Bridge, Riv. Nagadou (Tomigusuku City, Haebaru Town)		○												

[1] Estradiols, [2] 2,4-Xylenol, [3] *p*-Chlorophenol, [4] *n*-Propylacetate, [5] *N*,*N*-Diethyl-3-methylbenzamide (synonym: *N*,*N*-Diethyl-m-toluamide), [6] 1-{2-[(2,4-Dichlorobenzyl)oxy]-2-(2,4-dichlorophenyl)ethyl}-1*H*-imidazole (synonym: Miconazole), [7] (*Z*)-2-[4-(1,2-Diphenyl-1-butenyl)phenoxy]-*N*,*N*-dimethylethylamine (synonym: Tamoxifen) and its metabolites, [8] 2-(2,4-Difluorophenyl)-1,3-bis(1*H*-1,2,4-triazol-1-*yl*)propan-2-ol (synonym: Fluconazole), [9] Ciprofloxacin, [10] Trichloroacetic acid, [11] Hexamethylenediamine, [12] Benzophenone, [13] Methylcyclohexane, [14] Methyl *tert*-butyl ether

Table 1-1-2 List of surveyed sites (sediment) and target chemical in the Initial Environmental Survey in FY2023

Local communities	Surveyed sites	Target chemicals
		[2] 2,4-Xylenol,
Iwate Pref.	Toyosawa-bashi Bridge, Riv. Toyosawa (Hanamaki City)	○
Sendai City	Hirose-ohashi Bridge, Riv. Hirose (Sendai City)	○
Akita Pref.	Akita Canal (Akita City)	○
Chiba Pref.	Coast of Ichihara and Anegasaki	○
Tokyo Met.	Mouth of Riv. Arakawa (Koto Ward)	○
	Mouth of Riv. Sumida (Minato Ward)	○
Kawasaki City	Mouth of Riv. Tama (Kawasaki City)	○
	Front of Ougi Town, Keihin Canal, Port of Kawasaki	○
Niigata Pref.	Lower Riv. Shinano (Niigata City)	○
Nagano Pref.	Lake Suwa (center)	○
Aichi Pref.	West of Shiomi Wharf, Nagoya Port	○
Mie Pref.	Yokkaichi Port	○
Shiga Pref.	Lake Biwa (center, offshore of Minamihira)	○
	Lake Biwa (center, offshore of Karasaki)	○
Kyoto City	Miyamae-bashi Bridge, Riv. Katsura (Kyoto City)	○
Osaka Pref.	Mouth of Riv. Yamato (Sakai City)	○
Osaka City	Kema-bashi Bridge, Riv. Oh-kawa (Osaka City)	○
	Osaka Port	○
Kobe City	Kobe Port (center)	○
Nara Pref.	Taisho-bashi Bridge, Riv. Yamato (Oji Town)	○
Okayama Pref.	Offshore of Mizushima	○
Yamaguchi Pref.	Tokuyama Bay	○
Kagawa Pref.	Takamatsu Port	○
Kitakyushu City	Dokai Bay	○
Saga Pref.	Imari Bay	○
Oita Pref.	Mouth of Riv. Oita (Oita City)	○

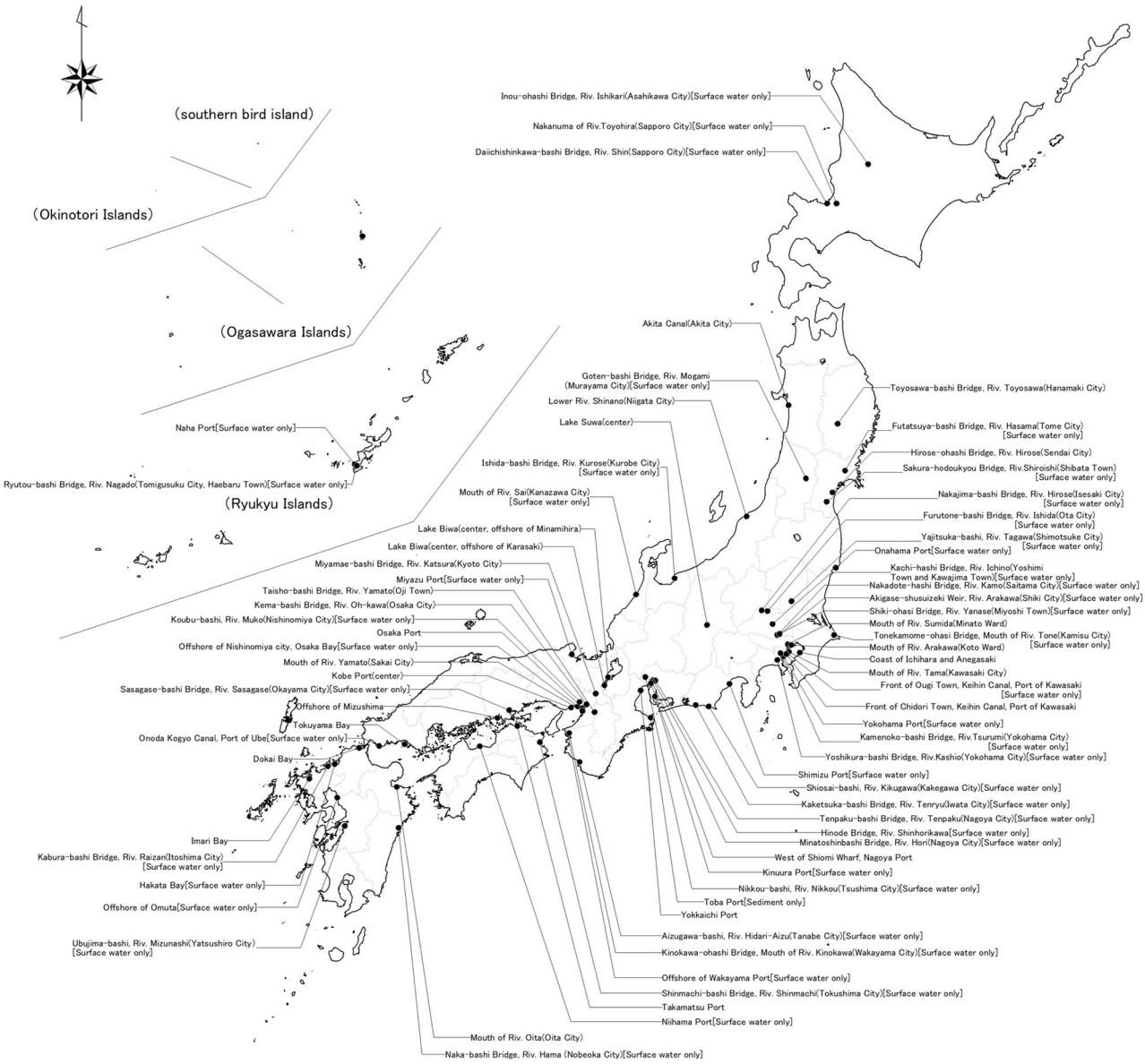


Figure 1-1 Surveyed sites (surface water and sediment) in the Initial Environmental Survey in FY 2023

Table 1-1-3 List of surveyed sites (air) and target chemicals in the Initial Environmental Survey in FY 2023

Local communities	Surveyed sites	Target chemicals		
		[2]	[3]	[11]
Sendai City	Tsutsujigaoka Park (Sendai City)	○	○	○
Ibaraki Pref.	Ibaraki Kasumigaura Environmental Science Center (Tsuchiura City)		○	○
Saitama Pref.	Center for Environmental Science in Saitama (Kazo City)	○		○
Saitama City	Saitama City Public Health Center (Saitama City)	○	○	
Tokyo Met.	Tokyo Metropolitan Research Institute for Environmental Protection (Koto Ward)	○	○	○
	Chichijima Island (Ogasawara Village)	○	○	○
Kanagawa Pref.	Kanagawa Environmental Research Center (Hiratsuka City)	○	○	○
Kawasaki City	Daishi Air Quality Monitoring Station (Kawasaki City)	○	○	○
Ishikawa Pref.	Ishikawa Prefectural Institute of Public Health and Environmental Science (Kanazawa City)		○	○
Nagano Pref.	Nagano Environmental Conservation Research Institute (Nagano City)	○	○	○
Nagoya City	Chikusa Ward Heiwa Park (Nagoya City)	○	○	○
Mie Pref.	Yokkaichi City Kusu Fureai Center (Yokkaichi City)	○		
Shiga Pref.	Hikone Air Quality Monitoring Station (Hikone City)			○
Kyoto Pref.	Uji Prefectural Government Building(Uji City)	○	○	○
Kyoto City	Kyoto City Institute of Health and Environmental Sciences(Kyoto City)	○	○	○
Osaka Pref.	Osaka Joint Prefectural Government Building, Building 2 Annex (Osaka City)	○	○	○
Wakayama Pref.	Wakayama Prefectural Research Center of Environment and Public Health (Wakayama City)			○
Hiroshima Pref.	Otake-Yumi Park (Otake City)			○
Yamaguchi Pref.	Yamaguchi Prefectural Institute of Public Health and Environment (Yamaguchi City)	○		○
Tokushima Pref.	Tokushima Prefectural Public Health, Pharmaceutical and Environmental Sciences Center (Tokushima City)	○	○	○
Saga Pref.	Saga Prefectural Environmental Research Center (Saga City)	○	○	○
Miyazaki Prif.	Sin-nobeoka Miyanomae Children's Park Air Quality Monitoring Station (Nobeoka City)			○

[2] 2,4-Xylenol, [3] *p*-Chlorophenol, [11] Hexamethylenediamine

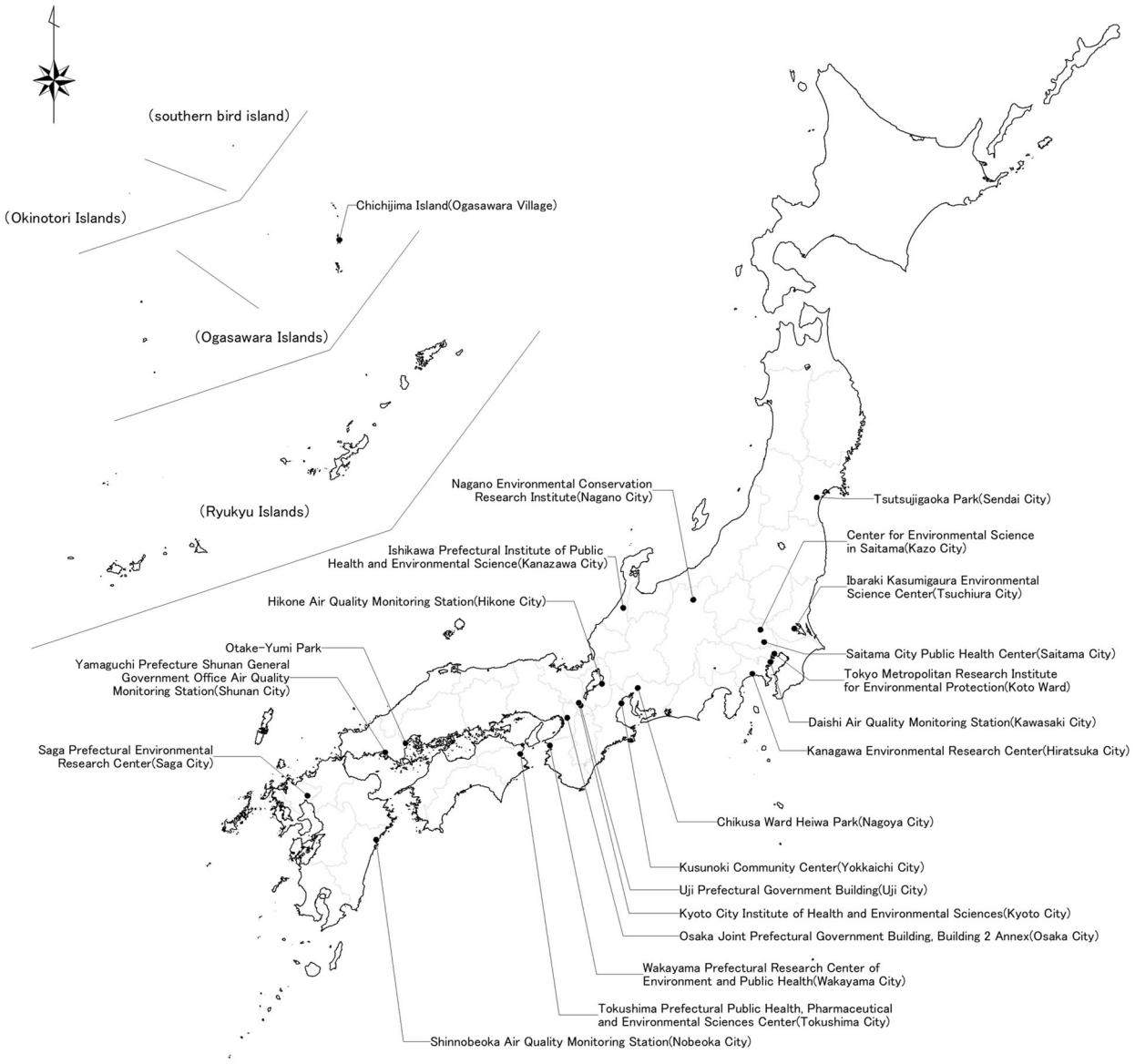


Figure 1-2 Surveyed sites (air) in the Initial Environmental Survey in FY 2023

4. Summary of survey results

The detection ranges and the detection limits are shown in Table 1-2. The survey results are summarized as follows.

In surface water, 13 out of the 14 target chemicals (groups) were detected. Target chemicals were categorized by analytical methods such as structurally similar chemicals capable of simultaneous analyses.

[1] Estradiols

[1-1] 17*β*-Estradiol: 18 of the 31 valid sites

[1-2] 1,3,5(10)-Estratrien-3-ol-17-one (synonym: Estrone): all 31 valid sites

[1-3] 17*α*-Ethynylestradiol: 3 of the 27 valid sites

[1-4] 6*α*-Hydroxyestradiol (synonym: Estriol): 16 of the 30 valid sites

[2] 2,4-Xylenol: 34 of the 36 valid sites

[3] *p*-Chlorophenol: 30 of the 33 valid sites

[5] *N*,*N*-Diethyl-3-methylbenzamide (synonym: *N*,*N*-Diethyl-*m*-toluamide): all 33 valid sites

[6] 1-{2-[(2,4-Dichlorobenzyl)oxy]-2-(2,4-dichlorophenyl)ethyl}-1*H*-imidazole (synonym: Miconazole): 18 of the 30 valid sites

[7] (*Z*)-2-[4-(1,2-Diphenyl-1-butenyl)phenoxy]-*N*,*N*-dimethylethylamine (synonym: Tamoxifen) and its metabolites

[7-1] (*Z*)-2-[4-(1,2-Diphenyl-1-butenyl)phenoxy]-*N*,*N*-dimethylethylamine (synonym: Tamoxifen): 5 of the 30 valid sites

[7-2] (*Z*)-2-[4-(1,2-Diphenyl-1-butenyl)phenoxy]-*N*-methyl-ethanamine (synonym: *N*-Desmethyltamoxifen): 2 of the 30 valid sites

[8] 2-(2,4-Difluorophenyl)-1,3-bis(1*H*-1,2,4-triazol-1-*yl*)propan-2-ol (synonym: Fluconazole): 23 of the 30 valid sites

[9] Ciprofloxacin: 6 of the 32 valid sites

[10] Trichloroacetic acid: 28 of the 38 valid sites

[11] Hexamethylenediamine: 7 of the 30 valid sites

[12] Benzophenone: 17 of the 34 valid sites

[13] Methylcyclohexane: 1 of the 26 valid sites

[14] Methyl *tert*-butyl ether: 1 of the 31 valid sites

In sediment, the target chemical was detected.

[2] 2,4-Xylenol: all 26 valid sites

In air, 2 out of the 3 target chemicals (groups) were detected.

[2] 2,4-Xylenol: all 14 valid sites

[11] Hexamethylenediamine: 1 of the 19 valid sites

Table 1-2 Summary of the detection ranges and the detection limits in the Initial Environmental Survey in FY 2023

No.	Target chemicals	Surface water [ng/L]		Sediment [ng/g-dry]		Air [ng/m^3]	
		Detection range and frequency	Detection limit	Detection range and frequency	Detection limit	Detection range and frequency	Detection limit
[1]	Estradiols *						
	[1-1] 17β-Estradiol	nd~15 18/31	0.088				
	[1-2] 1,3,5(10)-Estratrien-3-ol-17-one (synonym: Estrone)	0.13~200 31/31	0.0048				
	[1-3] 17α-Ethynylestradiol	nd~0.21 3/27	0.046				
	[1-1] 16α-Hydroxyestradiol (synonym: Estriol)	nd~0.47 16/30	0.055				
[2]	2,4-Xylenol *	nd~27 34/36	0.88	nd~7.6 26/26	0.022	0.26~350 14/14	0.16
[3]	*p*-Chlorophenol *	nd~490 30/33	0.33			nd 0/15	14
[4]	*n*-Propylacetate	nd 0/28	130				
[5]	*N*,*N*-Diethyl-3-methylbenzamide (synonym: *N*,*N*-Diethyl-*m*-toluamide) *	0.64~59 33/33	0.45				
[6]	1-{2-[(2,4-Dichlorobenzyl)oxy]-2-(2,4-dichlorophenyl)ethyl}-1*H*-imidazole (synonym: Miconazole) *	nd~13 18/30	0.46				
[7]	(*Z*)-2-[4-(1,2-Diphenyl-1-butenyl)phenoxy]-*N*,*N*-dimethylethylamine (synonym: Tamoxifen) and its metabolites *						
	[7-1] (*Z*)-2-[4-(1,2-Diphenyl-1-butenyl)phenoxy]-*N*,*N*-dimethylethylamine (synonym: Tamoxifen)	nd~0.076 5/30	0.028				
	[7-2] (*Z*)-2-[4-(1,2-Diphenyl-1-butenyl)phenoxy]-*N*-methyl-ethanamine (synonym: *N*-Desmethyltamoxifen)	nd~0.039 2/30	0.030				
	[7-3] 4-[(*Z*)-1-[4-[2-(dimethylamino)ethoxy]phenyl]-2-phenyl-1-butenyl]phenol (synonym: 4-Hydroxytamoxifen)	nd 0/30	0.030				
	[7-4] 4-[(*Z*)-1-[4-[2-(methylamino)ethoxy]phenyl]-2-phenyl-1-butenyl]phenol (synonym: 4-Endoxifen)	nd 0/30	0.11				
[8]	2-(2,4-Difluorophenyl)-1,3-bis(1*H*-1,2,4-triazol-1-yl)propan-2-ol (synonym: Fluconazole) *	nd~66 23/30	0.90				
[9]	Ciprofloxacin *	nd~3.8 6/32	0.49				
[10]	Trichloroacetic acid *	nd~5,200 28/38	31				
[11]	Hexamethylenediamine *	nd~220,000 7/30	6.4			nd~14 1/19	1.2
[12]	Benzophenone *	nd~9,500 17/34	4.0				
[13]	Methylcyclohexane	nd~26 1/26	1.8				
[14]	Methyl *tert*-butyl ether	nd~7.5 1/31	3.5				

(Note 1) Detection frequency is based on the number of sites, thus means (the number of detected sites/the number of surveyed sites). A site where data was not available was excluded from the number of surveyed sites. A site where the data became invalid under a unified detection limit was also excluded. In sediment and air, 3 samples were measured for a site, and the detection in more than one out of samples from a site can be defined as one detected site.

(Note 2) Detection range is based on the number of samples and therefore can be shown as "nd ~ " even if a target chemical is detected in all sites.

(Note 3) ▢ means the medium was not surveyed.

(Note 4) *: The substances were surveyed including the points selected for survey in light of documentation or submittals regarding emissions.