Chapter 2 Results of the Detailed Environmental Survey in FY2022

1. Purpose of the survey

The Detailed Environmental Survey is implemented to provide as required under the Law Concerning the Examination and Regulation of Manufacture, etc. of Chemical Substances (Law 117, 1973) (hereafter, the Chemical Substances Control Law), the data and details required for risk assessments et al. of chemical substances prioritized for evaluations. This compiled material is intended to allow for nationwide assessments of exposure in the general environment.

2. Target chemicals

In the FY2022 Detailed Environmental Survey, 6 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		The PRTR Law *2, 3			Surveyed media	
		Before the revision	After the revision	2000-	2008-	2021-	Surface water	Sedi-ment
[1]	Alkanols (The alkyl group is linear with 10 ~ 16 carbon atoms.)		Priority Assessment Chemical Substances					
	[1-1] 1-Decanol				I 257	I 34	○	
	[1-2] 1-Undecanol						○	
	[1-3] 1-Dodecanol				I 273	I 315	○	
	[1-4] 1-Tridecanol						○	
	[1-5] 1-Tetradecanol						○	
	[1-6] 1-Pentadecanol						○	
	[1-7] 1-Hexadecanol						○	
[2]	Alkyl(benzyl)(dimethyl)ammonium salts (The alkyl group has 12, 14 or 16 carbon atoms.)		Priority Assessment Chemical Substances			I 44	○	
	[2-1] Dodecyl(benzyl)(dimethyl)ammonium salts						○	
	[2-2] Tetradecyl(benzyl)(dimethyl)ammonium salts						○	
	[2-3] Hexadecyl(benzyl)(dimethyl)ammonium salts						○	
[3]	Di(oxyethylene)dodecyl ether sulfonate and its salts		Priority Assessment Chemical Substances		I 423 (Sodium salt)	I 423 (Sodium salt)	○	
[4]	*N*,*N*-Dimethylalkane-1-amine oxides (The alkyl group is linear with 10, 12, 14, 16 or 18 carbon atoms.)		Priority Assessment Chemical Substances				○	○
	[4-1] *N*,*N*-Dimethyldecane-1-amine oxide						○	○
	[4-2] *N*,*N*-Dimethyldodecane-1-amine oxide			I 166	I 224	I 253	○	○
	[4-3] *N*,*N*-Dimethyltetradecane-1-amine oxide						○	○
	[4-4] *N*,*N*-Dimethylhexadecane-1-amine oxide						○	○
	[4-5] *N*,*N*-Dimethyloctadecane-1-amine oxide						○	○
[5]	Trimethyl(octadecyl)ammonium salts		Priority Assessment Chemical Substances			I 339		○
[6]	4,4'-(Propane-2,2-diyl)diphenol (synonym: 4,4'-Isopropylidenediphenol or Bisphenol A)	II Monitored III Monitored	Priority Assessment Chemical Substances	I 29	I 37	I 55	○	

(Note 1) “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.

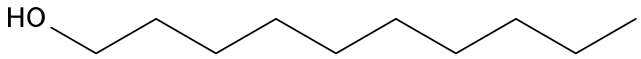
(Note 2) “The PRTR Law” hereafter means “Act on Confirmation, etc. of Release Amounts of Specific Chemical Substances in the Environment and Promotion of Improvements to the Management Thereof (Law No. 86 of 1999).”

(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 Detailed Environmental Survey are as follows.

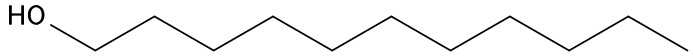
[1] Alkanols (The alkyl group is linear with 10 ~ 16 carbon atoms.)

[1-1] 1-Decanol



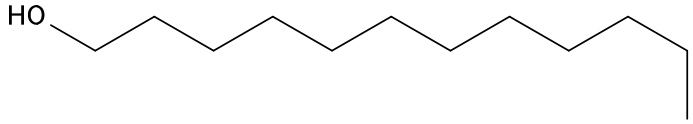
Molecular formula: $C_{10}H_{22}O$
CAS: 112-30-1
ENCS: 2-217 [*1]
MW: 158.28
mp: 7 °C [1)]
bp: 230 °C [1)]
sw: 3.7 g/L (20°C) [1)]
Specific gravities: 0.83 g/cm^3 [1)]
logPow: 4.57 [2)]

[1-2] 1-Undecanol



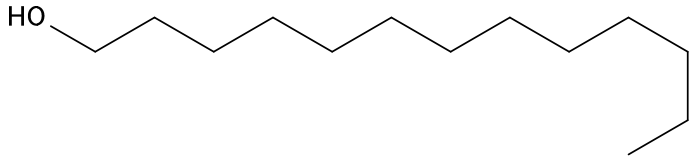
Molecular formula: $C_{11}H_{24}O$
CAS: 112-42-5
ENCS: 2-217 [*1]
MW: 172.31
mp: 15.9 °C [3)]
bp: 245 °C [3)]
sw: Insoluble [3)]
Specific gravities: 0.83 [3)]
logPow: 4.72 [2)]

[1-3] 1-Dodecanol



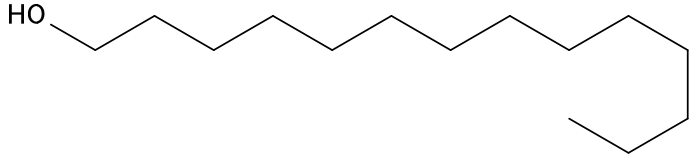
Molecular formula: $C_{12}H_{26}O$
CAS: 112-53-8
ENCS: 2-217 [*1]
MW: 186.34
mp: 24 °C [4)]
bp: 250 °C (101.3 kPa) [4)]
sw: 4 mg/L (25 °C) [4)]
Specific gravities: 0.83 (24 °C) [4)]
logPow: 5.13 °C [4)]

[1-4] 1-Tridecanol



Molecular formula: $C_{13}H_{28}O$
CAS: 112-70-9
ENCS: 2-217 [*1]
MW: 200.37
mp: 30 ~ 32 °C [5)]
bp: 274 °C [5)]
sw: 0.1 g/L (20 °C) [5)]
Specific gravities: 0.846 (20 °C) [2)]
logPow: 8.52 [5)]

[1-5] 1-Tetradecanol

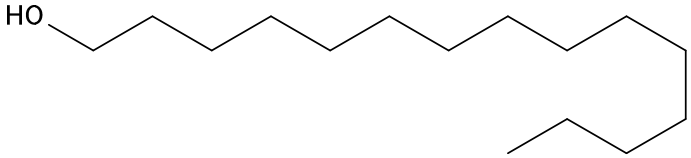


Molecular formula: $C_{14}H_{30}O$
CAS: 112-72-1
ENCS: 2-217 [*1]
MW: 214.39
mp: 39.5 °C [6)]
bp: 298 °C (15 mmHg) [6)]
sw: 191 g/L [6)]
Specific gravities: 0.84 g/cm^3 [6)]
logPow: 6.03 [6)]

(Note 1) Alkanol (The alkyl group has 5 ~ 38 carbon atoms.)

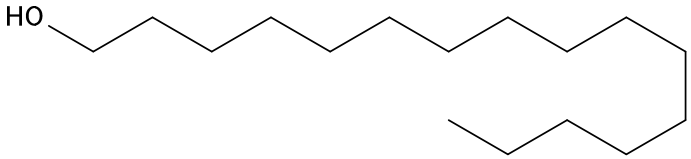
(Abbreviations) CAS CAS registry number, ENCS registry number in the Existing and New Chemical Substances List, MW molecular weight, mp melting point, bp boiling point, SW solubility in water, Specific gravities Specific gravity(no unit) or density, logPow *n*-octanol-water partition coefficient, kPa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

[1-6] 1-Pentadecanol



Molecular formula: $C_{15}H_{32}O$
CAS: 629-76-5
ENCS: 2-217 [*1]
MW: 228.42
mp: 43.9°C [2)]
bp: 300 °C (760 mmHg) [2)]
sw: 0.103 mg/L (25 °C) [7)]
Specific gravities: 0.829 (50 °C) [2)]
logPow: Uncertain

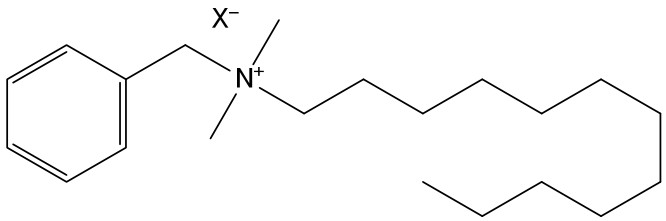
[1-7] 1-Hexadecanol



Molecular formula: $C_{16}H_{34}O$
CAS: 36653-82-4
ENCS: 2-217 [*1]
MW: 242.45
mp: 49.3 °C [2)]
bp: 344 °C (760 mmHg) [2)]
sw: 0.041mg/L (25 °C) [2)]
Specific gravities: 0.8187 (50 °C / 4 °C) [2)]
logPow: Uncertain

[2] Alkyl(benzyl)(dimethyl)ammonium salts (The alkyl group has 12, 14 or 16 carbon atoms.)

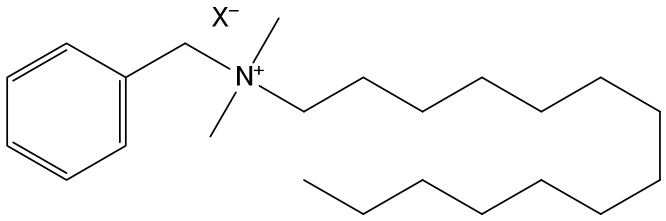
[2-1] Dodecyl(benzyl)(dimethyl)ammonium salts



X: Halogen

Molecular formula: $C_{21}H_{38}ClN$
CAS: 139-07-1 (Chloride)
ENCS: 3-326 [*2], 3-2694 [*3]
MW: 339.99 (Chloride)
mp: 60 °C (Chloride) [8)]
bp: Uncertain
sw: >1,000 mg/L [*4, 2)]
Specific gravities: Uncertain
logPow: Uncertain

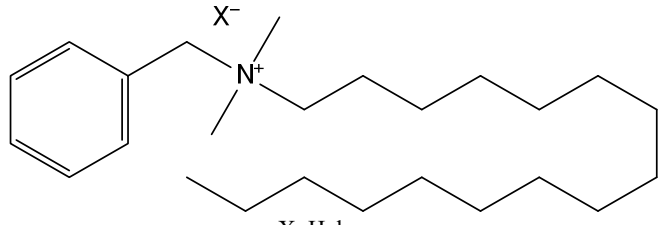
[2-2] Tetradecyl(benzyl)(dimethyl)ammonium salts



X: Halogen

Molecular formula: $C_{23}H_{42}ClN$
CAS: 139-08-2 (Chloride)
ENCS: 3-326 [*2], 3-2694 [*3]
MW: 368.04 (Chloride)
mp: 60 ~ 61°C (Chloride) [2)]
bp: Uncertain
sw: >1,000 mg/L [*4, 2)]
Specific gravities: Uncertain
logPow: Uncertain

[2-3] Hexadecyl(benzyl)(dimethyl)ammonium salts



X: Halogen

Molecular formula: $C_{25}H_{46}ClN$
CAS: 122-18-9 (Chloride)
ENCS: 3-326 [*2], 3-2694 [*3]
MW: 396.09 (Chloride)
mp: 59 °C (Chloride) [7)]
bp: Uncertain
sw: Uncertain
Specific gravities: Uncertain
logPow: Uncertain

(Note 2) [Hydroxy, carboxy or alkyl(or alkenyl, 10 ~ 26 carbon atoms)]-[trialkyl(or alkenyl, 1 ~ 20 carbon atoms) or hydroxyalkyl, benzyl] ammonium halide (chloride or bromide)

(Note 3) Polyalkyl(or alkenyl,) polybenzyl ammonium (The alkyl or alkenyl groups of 1 ~ 20 carbon atoms are 1 ~ 3 and the benzyl groups are 1 to 3.)

(Note 4) Alkylbenzyldimethylammonium chloride (The alkyl group has 10 ~ 14 carbon atoms.)

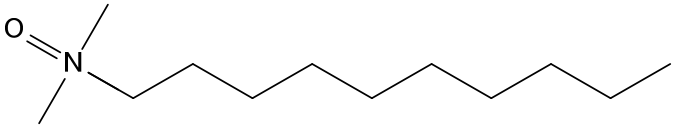
[3] Poly(oxyethylene) dodecyl ether sulfonate and its salts (The polymerisation degree of the oxyethylenes: 1 ~ 6)

CH_3-$(CH_2)_{11}$-O-$(CH_2$-CH_2-O$)_2$-SO_3H

Molecular formula: 7577-59-5
CAS: 4-123
ENCS: 354.50
MW: 7577-59-5
mp: 7.5 °C (101,325 Pa, Sodium salt) [9)]
bp: 113.439 °C (101,325 Pa, Sodium salt) [9)]
sw: 1,000,000 mg/L (39 °C, Sodium salt) [9)]
Specific gravities: 1.022 g/cm^3 (39 °C, Sodium salt) [9)]
logPow: -0.602 (39 °C, Sodium salt) [9)]

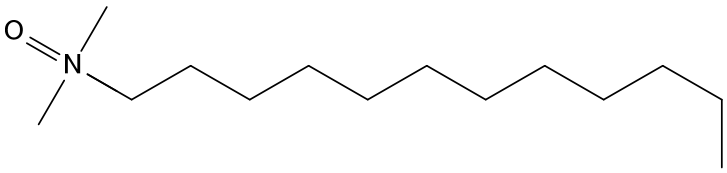
[4] *N*,*N*-Dimethylalkane-1-amine oxides (The alkyl group is linear with 10, 12, 14, 16 or 18 carbon atoms.)

[4-1] *N*,*N*-Dimethyldecane-1-amine oxide



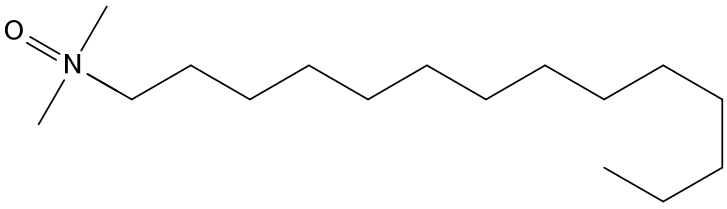
Molecular formula: $C_{12}H_{27}NO$
CAS: 2605-79-0
ENCS: 2-198 [*5]
MW: 201.35
mp: 133 ~ 136 °C [10)]
bp: 90~200 °C (Decomposition) [*6, 10)]
sw: 409.5 g/L [*7, 10)]
Specific gravities: Uncertain
logPow: <2.7 [*7, 10)]

[4-2] *N*,*N*-Dimethyldodecane-1-amine oxide



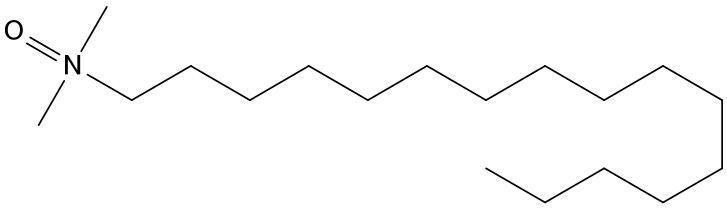
Molecular formula: $C_{14}H_{31}NO$
CAS: 1643-20-5
ENCS: 2-198 [*5]
MW: 229.41
mp: 130 ~ 134 °C [10)]
bp: 90~200 °C (Decomposition) [*6, 10)]
sw: 409.5 g/L [*7, 10)]
Specific gravities: 996 g/L [8)]
logPow: <2.7 [*7, 10)]

[4-3] *N*,*N*-Dimethyltetradecane-1-amine oxide



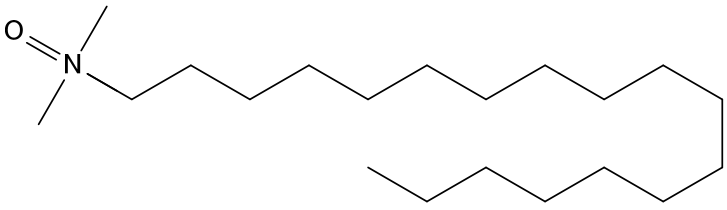
Molecular formula: $C_{16}H_{35}NO$
CAS: 3332-27-2
ENCS: 2-198 [*5]
MW: 257.46
mp: 125 ~ 129 °C [10)]
bp: 90~200 °C (Decomposition) [*6, 10)]
sw: 409.5 g/L [*7, 10)]
Specific gravities: Uncertain
logPow: <2.7 [*7, 10)]

[4-4] *N*,*N*-Dimethylhexadecane-1-amine oxide



Molecular formula: $C_{18}H_{39}NO$
CAS: 7128-91-8
ENCS: 2-198 [*5]
MW: 285.52
mp: 126 ~ 130 °C [10)]
bp: 90~200 °C (Decomposition) [*6, 10)]
sw: 409.5 g/L [*7, 10)]
Specific gravities: Uncertain
logPow: <2.7 [*7, 10)]

[4-5] *N*,*N*-Dimethyloctadecane-1-amine oxide



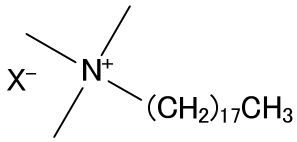
Molecular formula: $C_{20}H_{43}NO$
CAS: 2571-88-2
ENCS: 2-198 [*5]
MW: 313.56
mp: Uncertain
bp: Uncertain
sw: Uncertain
Specific gravities: Uncertain
logPow: Uncertain

(Note 5) Alkyl (or alkenyl)-amine-oxide (One or more of alkyl or alkenyl group has 8 ~ 24 carbon atoms, the others have 1 to 5 carbon atoms.)

(Note 6) Aliphatic-amine-oxides

(Note 7) Amine-oxides with alkyl group having 10- 16 (average 12.6) carbon atoms

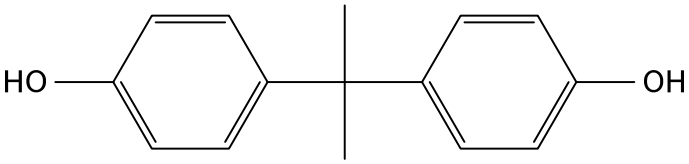
[5] | Trimethyl(octadecyl)ammonium salts



X: Halogen

Molecular formula: $C_{21}H_{46}XN$
CAS: 112-03-8 (Chloride), 1120-02-1 (Bromide)
ENCS: 2-184 [*8], 9-1971 [*9]
MW: 348.05 (Chloride), 392.28 (Bromide)
mp: 95 ~ 104 °C (Chloride) [11)]
bp: 235 ~ 249 °C (Chloride) [11)]
sw: 1.76mg/L (Chloride, 25 °C) [11)]
Specific gravities: Uncertain
logPow: 4.17 (Chloride) [11)]

[6] | 4,4'-(Propane-2,2-diyl)diphenol (synonym: 4,4'-Isopropylidenediphenol or Bisphenol A)



Molecular formula: $C_{15}H_{16}O_2$
CAS: 80-05-7
ENCS: 4-123
MW: 228.29
mp: 152 ~ 153 °C [12)]
bp: 250 ~ 252 °C (1.7 kPa) [12)]
sw: 120 mg/L (25 °C) [12)]
Specific gravities: 1.195 (25 °C / 25 °C) [12)]
logPow: 3.32 [12)]

(Note 9) Aliphatic alkyl quaternary ammonium salts (One or more of aliphatic alkyl group has 8 ~ 24 carbon atoms, the others have 1 to 5 carbon atoms.)

References

1) International Labour Organization (ILO), 1-Decanol, International Chemical Safety Cards (ICSCs), ICSC: 1490 (2005)
2) U.S. National Library of Medicine, PubChem (https://pubchem.ncbi.nlm.nih.gov/ Retrieved on November, 2023)
3) International Labour Organization (ILO), 1-Undecanol, International Chemical Safety Cards (ICSCs), 1539 (2004)
4) International Labour Organization (ILO), 1-Dodecanol, International Chemical Safety Cards (ICSCs), 1765 (2013)
5) International Labour Organization (ILO), 1-Tridecanol, International Chemical Safety Cards (ICSCs), 1176 (2017)
6) Ministry of Health, Labour and Welfare, Japan, Tetradecan-1-ol, Safety Data Sheet, Workplace Safety Wwbsite (2014) (https://anzeninfo.mhlw.go.jp/anzen/gmsds/112-72-1.html, Retrieved on November, 2023)
7) U.S. EPA, Estimation Programs Interface (EPI) Suite v4.11 (https://www.epa.gov/tsca-screening-tools/download-epi-suitetm-estimation-program-interface-v411)
8) Royal Society of Chemistry, ChemSpider (http://www.chemspider.com/, Retrieved on November, 2023)
9) European Chemicals Agency (ECHA), REACH (https://echa.europa.eu/, Retrieved on November, 2023)
10) OECD, Amine Oxides, SIDS Initial Assessment Report, SIAM 22, 18-21 April 2006 (2006)
11) Ministry of Health, Labour and Welfare, Japan, Trimethyl(octadecan-1-yl)ammonium chloride, Safety Data Sheet, Workplace Safety Wwbsite (2017) (https://anzeninfo.mhlw.go.jp/anzen/gmsds/112-03-8.html, Retrieved on November, 2023)
12) National Institute of Technology and Evaluation (NITE), 4,4'-Isopropylidenediphenol (synonym: Bisphenol A), Chemicals Initial Risk Assessment Report, Ver. 1.0, No. 4 (2005)

3. Surveyed site and procedure

In the Detailed 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 *	Surveyed media	
		Surface water	Sediment
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	○	
Akita Pref.	Akita Research Center for Public Health and Environment	○	○
Yamagata Pref.	Yamagata Environmental Science Research Center	○	
Fukushima Pref.	Fukushima Prefectural Environmental 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	○	○
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	○	○
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	○	
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	○	
Kochi Pref.	Kochi Prefectural Environmental Research Center	○	○
Kitakyushu City	Kitakyushu City Institute of Health and Environmental Sciences	○	○
Fukuoka City	Fukuoka City Institute for Hygiene and the Environment	○	○

Local communities	Organisations responsible for sampling *	Surveyed media	
		Surface water	Sedi-ment
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	○	
Kagoshima Pref.	Kagoshima Prefectural Institute for Environmental Research and Public Health	○	
Okinawa Pref.	Okinawa Prefectural Institute of Health and Environment	○	○

(Note) *: Organisations responsible for sampling are described by their official names in FY 2022

(2) Surveyed sites and target chemicals

The numbers of target chemicals (groups) and the numbers of surveyed sites, etc. by surveyed medium in the detailed 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 2-1-1 and Figures 2-1 for surface water, Table 2-1-2 and Fig.2-1 for sediment.

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 (groups)	Numbers of surveyed sites	Numbers of samples at a surveyed site
Surface water	45	5	78	1
Sediment	27	2	35	3
All media	45	6	80	

(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

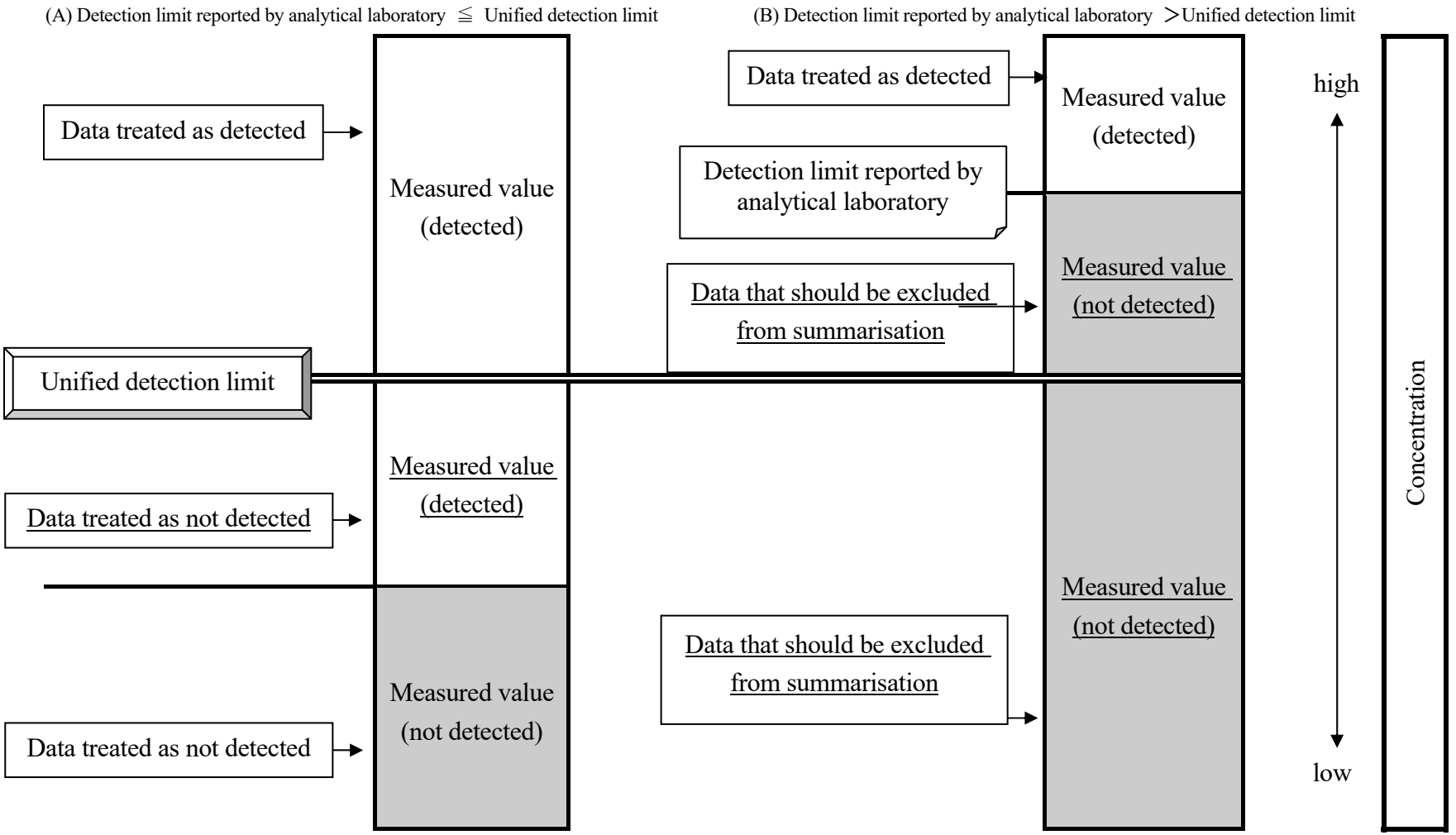
Analytical Method is used as the detection limit by the analytical laboratory.

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 2-1-1 List of surveyed sites (surface water) and target chemicals in the Detailed Environmental Survey in FY2022

Local communities	Surveyed sites	Target chemicals				
		[1]	[2]	[3]	[4]	[6]
Hokkaido	Suzuran-ohashi Bridge, Riv. Tokachi (Obihiro City)	○	○	○	○	
	Inou-ohashi Bridge, Riv. Ishikari (Asahikawa City)	○	○	○	○	
	Osamunai-bashi Bridge, Riv. Ishikari (Fukagawa City)	○	○	○	○	
	Ishikarikakokyo Bridge, Mouth of Riv. Ishikari (Ishikari 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)		○	○		
Akita Pref.	Akita Canal (Akita City)	○	○	○	○	○
Yamagata Pref.	Goten-bashi Bridge, Riv. Mogami (Murayama City)					○
Fukushima Pref.	Shin-tsurumaki-hashi Bridge, Riv. Megami (Fukushima City)		○	○	○	
Tochigi Pref.	Tagawa Kyubun Area Head Works, Riv. Tagawa (Utsunomiya City)	○				
Gunma Pref.	Yata-gawa-bashi Bridge, Riv. Yata (Tatebayashi City)	○		○		
	Izumi-ohashi Bridge, Riv. Kyuhaku (Oizumi Town)			○	○	
	Furutone-bashi Bridge, Riv. Ishida (Ota City)	○	○	○	○	
Saitama Pref.	Shinsen-hashi Bridge, Riv. Motokoyama (Honjo City)		○	○	○	
	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.	Asai-bashi Bridge, Riv. Yourou (Ichihara City)	○	○	○	○	○
	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.	Hagiura-bashi Bridge, Mouth of Riv. Jintsu (Toyama City)	○				
	Jyokoji-hashi Bridge, Riv. Koyabu (Takaoka City)			○		
Ishikawa Pref.	Mouth of Riv. Sai (Kanazawa City)	○				○
Nagano Pref.	Lake Suwa (center)	○				
	Chuo-bashi Bridge, Riv. Tenryu (Ina City)	○				
Shizuoka Pref.	Kuroishi-bashi Bridge, Riv. Kuroishi (Yaizu City)		○	○	○	
	Kashima-hashi Bridge, Riv. Ushibuchi (Kakegawa City)		○	○	○	
Aichi Pref.	Kira Head Works, Riv. Hirota (Nishio City)				○	
	Inaharu-hashi Bridge, Riv. Gojo (Inazawa City, Kiyosu City)	○	○	○		○
	West of Shiomi Wharf, Nagoya Port				○	○
Nagoya City	Hinode-bashi Bridge, Riv.Shin-hori (Nagoya City)	○	○	○	○	
	Minatoshinbashi Bridge, Riv. Hori (Nagoya City)	○	○	○	○	○
	South of Shiomi Wharf, Nagoya Port					○
Mie Pref.	Yokkaichi Port					○
Shiga Pref.	Lake Biwa (center, offshore of Minamihira)	○			○	○
	Lake Biwa (center, offshore of Karasaki)	○			○	○
Kyoto Pref.	Gokou-bashi Bridge, Riv. Kizu (Yawata City)					○
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.	Sorei-bashi Bridge, Riv. Seto (Akashi City)		○	○	○	
	Under Sanyo Erectric Railway, Riv. Mizuta (Harima Town)		○	○	○	
	Yamakado-bashi Bridge, Riv. Ogawa (Kakogawa City)		○	○	○	
	Offshore of Himeji		○		○	

Local communities	Surveyed sites	Target chemicals				
		[1]	[2]	[3]	[4]	[6]
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)	○			○	
	Takashima-bashi Bridge, Riv. Kishi (Kinokawa City)	○				
	Noguchi-hashi Bridge, Riv. Hidaka (Gobo City)			○		
Okayama Pref.	Offshore of Mizushima		○			○
Yamaguchi Pref.	Tokuyama Bay	○	○	○		○
Tokushima Pref.	Fukuhara-ohashi Bridge, Riv.Katsuura (Kamikatsu Town)		○	○	○	
Kagawa Pref.	Takamatsu Port				○	
Ehime Pref.	Niihama Port					○
Kochi Pref.	Ototake, Riv.Uji (Ino Town)		○	○	○	
Kitakyushu City	Dokai Bay	○	○	○	○	○
Fukuoka City	Hakata Bay	○	○	○	○	
Kumamoto Pref.	Hiraki-bashi Bridge, Riv. Midori (Uto City)	○				
	Daini-ozaya-bashi Bridge, Riv. Ozaya (Yatsushiro City)		○	○	○	
Oita Pref.	Mouth of Riv. Oita (Oita City)					○
Miyazaki Pref.	Miyata-gawa Sluice, Riv. Miyata (Takanabe Town)		○	○	○	
	Mouth of Riv. Oyodo (Miyazaki City)	○				
	Shibita-bashi Bridge Riv. Oyodo (Miyakonojo. City)		○	○	○	
Kagoshima Pref.	Kawaharada-bashi Bridge, Riv. Kimotsuki (Kanoya City)	○				
Okinawa Pref.	Naha Port	○		○	○	

[1] Alkanols (The alkyl group is linear with 10 ~ 16 carbon atoms.), [2] Alkyl(benzyl)(dimethyl)ammonium salts (The alkyl group has 12, 14 or 16 carbon atoms.), [3] Di(oxyethylene) dodecyl ether sulfonate and its salts, [4] *N*,*N*-Dimethylalkane-1-amine oxides (The alkyl group is linear with 10, 12, 14, 16 or 18 carbon atoms.), [6] 4,4'-(Propane-2,2-diyl)diphenol (synonym: 4,4'-Isopropylidenediphenol or Bisphenol A)

(Note) *: "Front of Ogimachi, Keihin Canal, Port of Kawasaki" of Detailed Environmental Survey and "Keihin Canal, Port of Kawasaki" of Environmental Monitoring are the same point each.

Table 2-1-2 List of surveyed sites (sediment) and target chemical in the Detailed Environmental Survey in FY2022

Local communities	Surveyed sites	Target chemicals	
		[4] *N*,*N*-Dimethylalkane-1-amine oxides (The alkyl group is linear with 10, 12, 14, 16 or 18 carbon atoms.)	[5] Trimethyl(octadecyl) ammonium salts
Sapporo City	Daiichishinkawa-bashi Bridge, Riv. Shin (Sapporo City)		○
Iwate Pref.	Toyosawa-bashi Bridge, Riv. Toyosawa (Hanamaki 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)	○	○
Yokohama City	Yokohama Port		○
Kawasaki City	Mouth of Riv. Tama (Kawasaki City)	○	○
	Front of Ougi Town, Keihin Canal, Port of Kawasaki *	○	○
Niigata Pref.	Lower Riv. Shinano (Niigata City)	○	○
Ishikawa Pref.	Mouth of Riv. Sai (Kanazawa City)		○
Nagano Pref.	Lake Suwa (center)		○
Shizuoka Pref.	Shimizu Port	○	○
Aichi Pref.	West of Shiomi Wharf, Nagoya Port	○	○
Nagoya City	Minatoshinbashi Bridge, Riv. Hori (Nagoya City)	○	○
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	○	○
Hyogo Pref.	Sorei-bashi Bridge, Riv. Seto (Akashi City)	○	
	Under Sanyo Erectric Railway, Riv. Mizuta (Harima Town)	○	
	Yamakado-bashi Bridge, Riv. Ogawa (Kakogawa City)	○	
	Offshore of Himeji	○	
	Aboshi Port		○
Kobe City	Kobe Port (center)	○	○
Wakayama Pref.	Kinokawa-ohashi Bridge, Mouth of Riv. Kinokawa (Wakayama City)	○	○
Yamaguchi Pref.	Tokuyama Bay	○	○
Kagawa Pref.	Takamatsu Port	○	○
Kochi Pref.	Ototake, Riv.Uji (Ino Town)	○	
Kitakyushu City	Dokai Bay	○	○
Fukuoka City	Hakata Bay	○	○
Oita Pref.	Mouth of Riv. Oita (Oita City)	○	○
Okinawa Pref.	Naha Port	○	

(Note) *: "Front of Ogimachi, Keihin Canal, Port of Kawasaki" of Detailed Environmental Survey and "Keihin Canal, Port of Kawasaki" of Environmental Monitoring are the same point each.

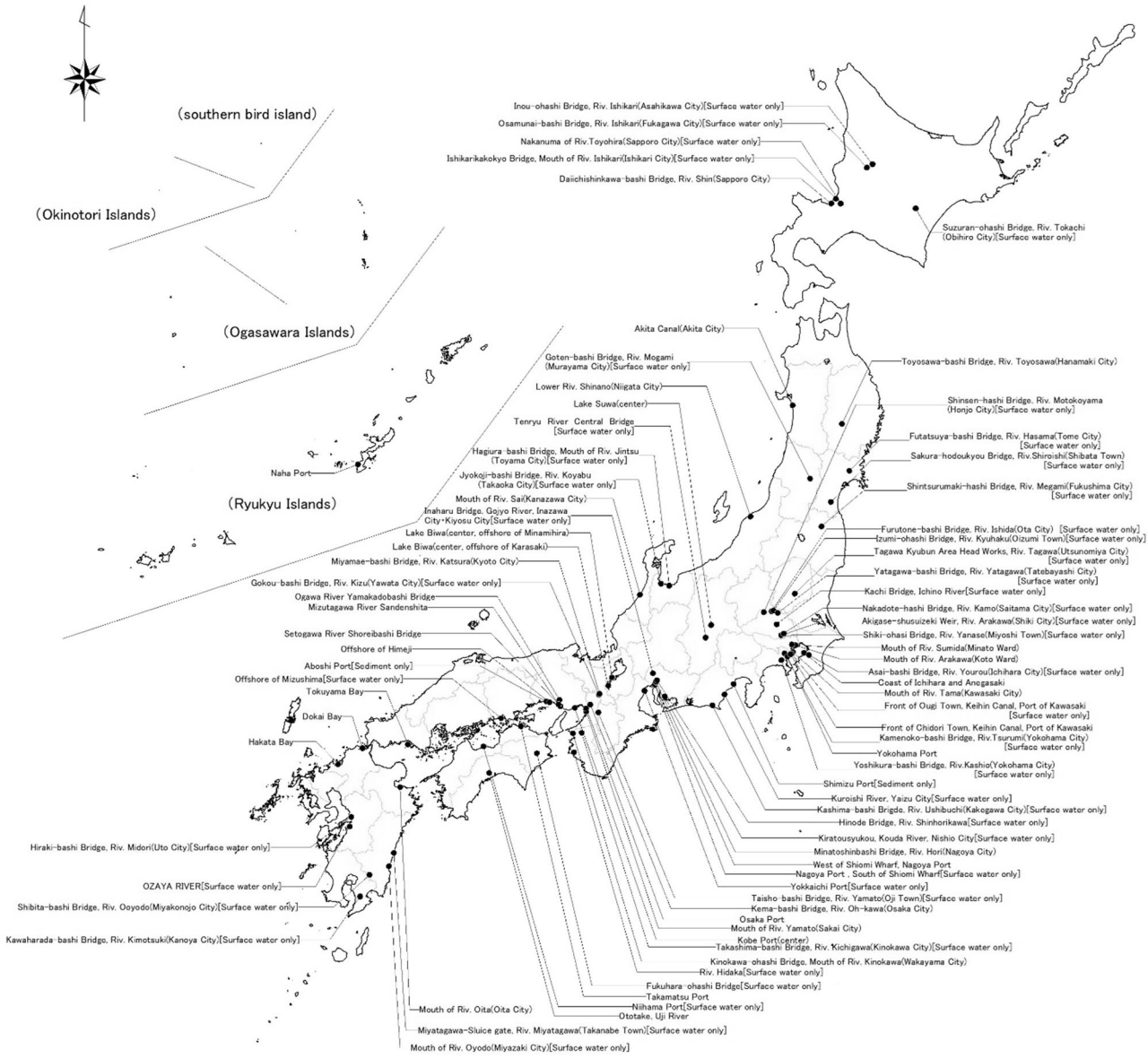


Figure 2-1 Surveyed sites (surface water and sediment) in the Detailed Environmental Survey in FY2022

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, all 5 target chemicals (groups) were detected. Target chemicals were categorized by analytical methods such as structurally similar chemicals capable of simultaneous analyses.

[1] Alkanols (The alkyl group is linear with 10 ~ 16 carbon atoms.)
- [1-1] 1-Decanol: 1 of the 42 valid sites
- [1-3] 1-Undecanol: 24 of the 43 valid sites
- [1-4] 1-Tridecanol: 2 of the 43 valid sites
- [1-5] 1-Tetradecanol: 30 of the 43 valid sites
- [1-6] 1-Pentaecanol: 2 of the 43 valid sites
- [1-7] 1-Hexa1ecanol: 26 of the 43 valid sites

[2] Alkyl(benzyl)(dimethyl)ammonium salts (The alkyl group has 12, 14 or 16 carbon atoms.)
- [2-1] Dodecyl(benzyl)(dimethyl)ammonium salts: All 43 valid sites
- [2-2] Tetradecyl(benzyl)(dimethyl)ammonium salts: All 43 valid sites
- [2-3] Hexadecyl(benzyl)(dimethyl)ammonium salts: 38 of the 43 valid sites

[3] Di(oxyethylene)dodecyl ether sulfonate and its salts: All 25 valid sites

[4] *N*,*N*-Dimethylalkane-1-amine oxides (The alkyl group is linear with 10, 12, 14, 16 or 18 carbon atoms.)
- [4-1] *N*,*N*-Dimethyldecane-1-amine oxide: 7 of the 48 valid sites
- [4-2] *N*,*N*-Dimethyldodecane-1-amine oxide: 34 of the 48 valid sites
- [4-3] *N*,*N*-Dimethyltetradecane-1-amine oxide: 28 of the 48 valid sites
- [4-4] *N*,*N*-Dimethylhexadecane-1-amine oxide: 26 of the 48 valid sites
- [4-5] *N*,*N*-Dimethyloctadecane-1-amine oxide: 1 of the 48 valid sites

[6] 4,4'-(Propane-2,2-diyl)diphenol (synonym: 4,4'-Isopropylidenediphenol or Bisphenol A): 2 of the 32 valid sites

In sediment, all target chemicals (groups) were detected. Target chemicals were categorized by analytical methods such as structurally similar chemicals capable of simultaneous analyses.

[4] *N*,*N*-Dimethylalkane-1-amine oxides (The alkyl group is linear with 10, 12, 14, 16 or 18 carbon atoms.)
- [4-2] *N*,*N*-Dimethyldodecane-1-amine oxide: 23 of the 48 valid sites
- [4-3] *N*,*N*-Dimethyltetradecane-1-amine oxide: 7 of the 48 valid sites
- [4-4] *N*,*N*-Dimethylhexadecane-1-amine oxide: 1 of the 48 valid sites
- [4-5] *N*,*N*-Dimethyloctadecane-1-amine oxide: 1 of the 48 valid sites

[5] Trimethyl(octadecyl)ammonium salts: all 27 valid sites

Table 1-2 Summary of the detection ranges and the detection limits in theDetailed Environmental Survey in FY 2022

No.	Target chemicals	Surface water [ng/L]		Sediment [ng/g-dry]	
		Detection range and frequency	Detection limit	Detection range and frequency	Detection limit
[1]	Alkanols (The alkyl group is linear with 10 ~ 16 carbon atoms.) *				
	[1-1] 1-Decanol	nd ~ 10 1/42	6.3		
	[1-2] 1-Undecanol	nd 0/43	4.3		
	[1-3] 1-Dodecanol	nd ~ 480 24/43	4.8		
	[1-4] 1-Tridecanol	nd ~ 16 2/43	4.0		
	[1-5] 1-Tetradecanol	nd ~ 22 30/43	1.4		
	[1-6] 1-Pentadecanol	nd ~ 30 2/43	3.1		
	[1-7] 1-Hexadecanol	nd ~ 1,100 26/43	3.0		
[2]	Alkyl(benzyl)(dimethyl)ammonium salts (The alkyl group has 12, 14 or 16 carbon atoms.) *	2.5 ~ 310 43/43	1.6		
	[2-1] Dodecyl(benzyl)(dimethyl)ammonium salts	1.7 ~ 180 43/43	0.72		
	[2-2] Tetradecyl(benzyl)(dimethyl)ammonium salts	0.80 ~ 84 43/43	0.47		
	[2-3] Hexadecyl(benzyl)(dimethyl)ammonium salts	nd ~ 41 38/43	0.41		
[3]	Di(oxyethylene) dodecyl ether sulfonate and its salts	1.7 ~ 24 25/25	0.56		
[4]	*N*,*N*-Dimethylalkane-1-amine oxides (The alkyl group is linear with 10, 12, 14, 16 or 18 carbon atoms.) *				
	[4-1] *N*,*N*-Dimethyldecane-1-amine oxide	nd ~ 15,000 7/48	6.4 **	nd 0/28	1.5
	[4-2] *N*,*N*-Dimethyldodecane-1-amine oxide	nd ~ 1,800 34/48	26	nd ~ 12 23/28	2.0
	[4-3] *N*,*N*-Dimethyltetradecane-1-amine oxide	nd ~ 61 28/48	11	nd ~ 3.8 7/28	1.4
	[4-4] *N*,*N*-Dimethylhexadecane-1-amine oxide	nd ~ 11 26/48	0.58	nd ~ 2.3 1/28	2.1
	[4-5] *N*,*N*-Dimethyloctadecane-1-amine oxide	nd ~ 4.9 1/48	4.3	nd ~ 3.8 1/28	2.8
[5]	Trimethyl(octadecyl)ammonium salts *			2.6 ~ 2,500 27/27	0.14
[6]	4,4'-(Propane-2,2-diyl)diphenol (synonym: 4,4'-Isopropylidenediphenol or Bisphenol A) *	nd ~ 95 28/32	1.8		

(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, wildlife 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.

(Note 5) **: Indicates the sum value of the Quantification [Detection] limits of each target chemicals.

(Note 6) Concentrations of Alkyl(benzyl)(dimethyl)ammonium salts and Trimethyl(octadecyl)ammonium salts are stated as chloride.