

## Chapter 2 Results of the Detailed Environmental Survey in FY2018

### 1. Purpose of the survey

The Detailed Environmental Survey is implemented to provide as required under the Chemical Substances Control Law (Law 117, 1973), 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 FY2018 Detailed Environmental Survey, 10 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		The PRTR Law		Surveyed media		
		Before the revision	After the revision	Before the revision	After the revision	Surface water	Sedi-ment	Air
[1]	Alkylbenzene sulfonates (The alkyl group is linear with 10 - 14 carbon atoms.) and its solts (synonym: LAS (The alkyl group has 10 - 14 carbon atoms.) and its solts)		Priority Assessment Chemical Substances	I 24	I 30			
	[1-1] Linear decylbenzene sulphonates and its solts						○	
	[1-2] Linear undecylbenzene sulphonates and its solts						○	
	[1-3] Linear dodecylbenzene sulphonates and its solts						○	
	[1-4] Linear tridecylbenzene sulphonates and its solts						○	
	[1-5] Linear tetradecylbenzene sulphonates and its solts				○			
[2]	2-(4-Ethoxyphenyl)-2-methylpropyl 3-phenoxybenzyl ether (synonym: Etofenprox)	III Monitored			I 64	○	○	
[3]	Chloroethanoic acid and its solts	II Monitored	Priority Assessment Chemical Substances	I 80	I 98	○		
[4]	<i>N,N</i> -Dimethylformamide	II Monitored	Priority Assessment Chemical Substances	I 172	I 232	○		
[5]	Thiocyanic acid and its solts		Priority Assessment Chemical Substances <sup>*4</sup>			○		
[6]	Medium-chain chlorinated paraffins (The alkyl chain has 10 - 14 carbon atoms, and the chlorinated number is 4 - 9.)		Priority Assessment Chemical Substances <sup>*5</sup>					
	[6-1] Chlorinated tetradecanes (The chlorinated number is 4 - 9.)					○	○	
	[6-2] Chlorinated pentadecanes (The chlorinated number is 4 - 9.)					○	○	
	[6-3] Chlorinated hexadecanes (The chlorinated number is 4 - 9.)					○	○	
	[6-4] Chlorinated heptadecanes (The chlorinated number is 4 - 9.)					○	○	
[7]	Hydrazine	II Monitored III Monitored	Priority Assessment Chemical Substances	I 253	I 333		○	○

No.	Name	The Chemical Substances Control Law		The PRTR Law		Surveyed media		
		Before the revision	After the revision	Before the revision	After the revision	Surface water	Sedi-ment	Air
[8]	(1-Hydroxyethane-1,1-diy)ldiphosphonic acid and its solts		Priority Assessment Chemical Substances			○		
[9]	3-Phenoxybenzyl 3-(2,2-dichlorovinyl)-2,2-dimethylcyclopropanecarboxylate (synonym: Permethrin)	III Monitored		I 267	I 350	○	○	
[10]	<i>n</i> -Hexane	II Monitored	Priority Assessment Chemical Substances		I 392	○	○	

(Note 1) "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)."

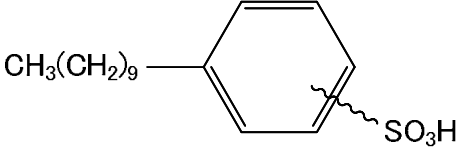
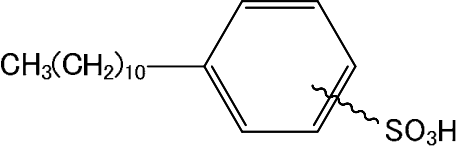
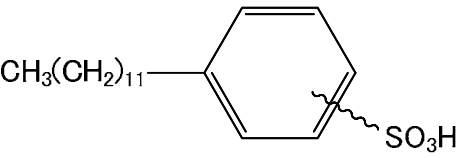
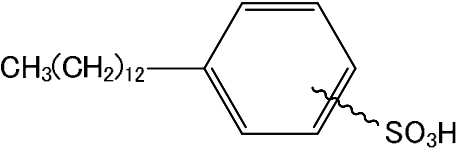
(Note 2) Pre-Revision "Areas as designated under the Chemical Substances Control Law" refer to those areas designated prior to the 20 May 2009 revision of the law (which went into effect on 1 April 2011), while "Post Revision Areas" refer to the areas defined as designated post-20 May 2009.

(Note 3) "Before the revision" in "The PRTR Law" means "appointments before the revision of government ordinance on November 21, 2008" and "After the revision" in "The PRTR Law" means "appointments after that revision".

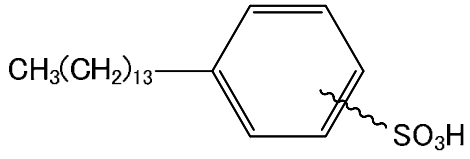
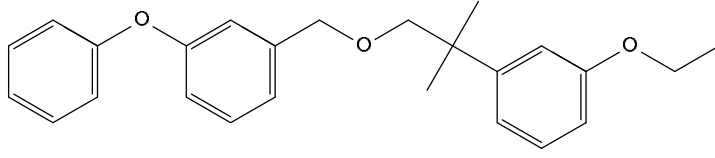
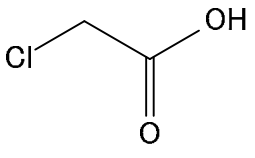
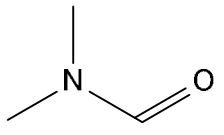
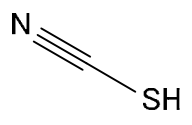
(Note 4) \*4: Copper (I) thiocyanate is designated as a Priority Assessment Chemical Substances.

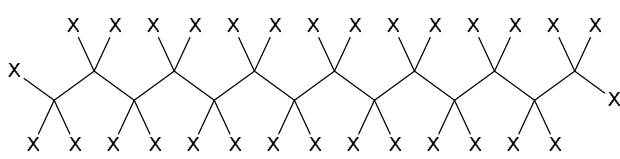
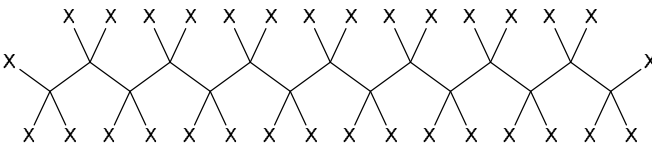
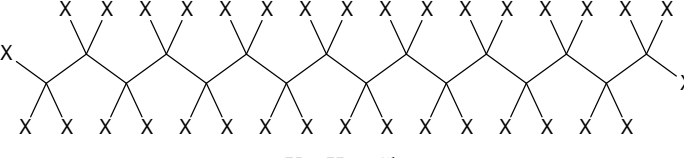
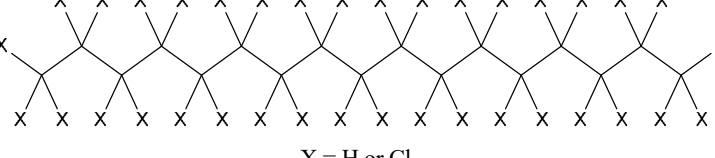
(Note 5) \*5: Medium-chain chlorinated paraffins (limited to linear alkyl chain, and those containing one or more chlorine atoms) is designated as a Priority Assessment Chemical Substances.

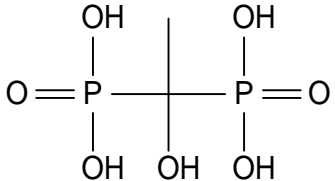
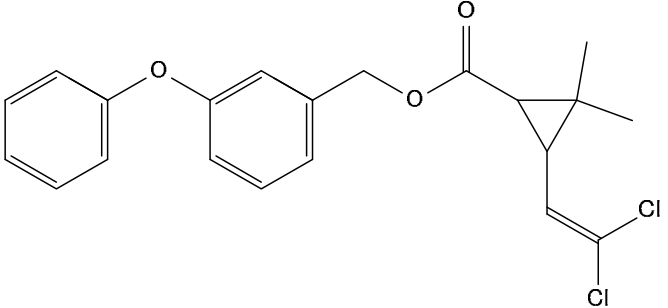
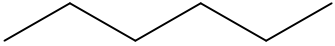
Chemical and physical properties of target chemicals of the Detailed Environmental Survey are as follows.

<p>[1] Alkylbenzene sulfonates (The alkyl group is linear with 10 - 14 carbon atoms.) and its solts (synonym: LAS (The alkyl group has 10 - 14 carbon atoms.) and its solts)</p> <p>[1-1] Linear decylbenzene sulphonates and its solts</p>		<p>Molecular formula: C<sub>16</sub>H<sub>26</sub>O<sub>3</sub>S            CAS: 1322-98-1(as sodium salts)            ENCS: 3-1884,3-1906,3-1949            MW: 320.43            mp: Uncertain            bp: Uncertain            sw: Uncertain            Specific gravities: Uncertain            logPow: Uncertain</p>
<p>[1-2] Linear undecylbenzene sulphonates and its solts</p>		<p>Molecular formula: C<sub>17</sub>H<sub>28</sub>O<sub>3</sub>S            CAS: 27636-75-5(as sodium salts)            ENCS: 3-1884,3-1906,3-1949            MW: 334.45            mp: Uncertain            bp: Uncertain            sw: Uncertain            Specific gravities: Uncertain            logPow: Uncertain</p>
<p>[1-3] Linear dodecylbenzene sulphonates and its solts</p>		<p>Molecular formula: C<sub>18</sub>H<sub>30</sub>O<sub>3</sub>S            CAS: 25155-30-0(as sodium salts)            ENCS: 3-1884,3-1906,3-1949            MW: 348.49            mp: 198.5 ° C<sup>1)</sup>            bp: 444 ° C(decompose)<sup>1)</sup>            sw: 0.8g/L(20 ~ 25 ° C)<sup>2)</sup>            Specific gravities: 1.0(20 ° C,60% as suspended)<sup>2)</sup>            logPow: 0.45<sup>2)</sup></p>
<p>[1-4] Linear tridecylbenzene sulphonates and its solts</p>		<p>Molecular formula: C<sub>19</sub>H<sub>32</sub>O<sub>3</sub>S            CAS: 26248-24-8(as sodium salts)            ENCS: 3-1884,3-1906,3-1949            MW: 362.45            mp: Uncertain            bp: Uncertain            sw: Uncertain            Specific gravities: Uncertain            logPow: 2.52<sup>2)</sup></p>

(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).

<p>[1-5] Linear tetradecylbenzene sulphonates and its salts</p> 	<p>Molecular formula: C<sub>20</sub>H<sub>34</sub>O<sub>3</sub>S  CAS: 28348-61-0(as sodium salts)  ENCS: 3-1884,3-1906,3-1949  MW: 376.53  mp: Uncertain  bp: Uncertain  sw: Uncertain  Specific gravities: Uncertain  logPow: Uncertain</p>
<p>[2] 2-(4-Ethoxyphenyl)-2-methylpropyl 3-phenoxybenzyl ether (synonym: Etofenprox)</p> 	<p>Molecular formula: C<sub>25</sub>H<sub>28</sub>O<sub>3</sub>  CAS: 80844-07-1  ENCS: 3-3981  MW: 376.50  mp: 36.4-38.0 ° C<sup>3)</sup>  bp: 200 ° C (0.18mm Hg)<sup>4)</sup>  sw: below 1ppb (25 ° C)<sup>3)</sup>  Specific gravities: Uncertain  logPow: 7.05<sup>4)</sup></p>
<p>[3] Chloroethanoic acid and its salts</p> 	<p>Molecular formula: C<sub>2</sub>H<sub>3</sub>ClO<sub>2</sub>  CAS: 79-11-8 etc  ENCS: 2-1145  MW: 94.49  mp: 63 ° C( -crystal)  55-56 ° C( -crystal)  50 ° C( -crystal)  61-63 ° C(commercial)<sup>3)</sup>  bp: 189 ° C<sup>3)</sup>  sw: 858g/L(25 ° C)<sup>2)</sup>  Specific gravities: 1.580<sup>3)</sup>  logPow: 0.22<sup>2)</sup></p>
<p>[4] <i>N,N</i>-Dimethylformamide</p> 	<p>Molecular formula: C<sub>3</sub>H<sub>7</sub>NO  CAS: 68-12-2  ENCS: 2-680  MW: 73.10  mp: -61 ° C<sup>3)</sup>  bp: 153 ° C<sup>3)</sup>  sw: miscible<sup>3)</sup>  Specific gravities: 0.9445(25 ° C/4 ° C)<sup>3)</sup>  logPow: -1.01<sup>5)</sup></p>
<p>[5] Thiocyanic acid and its salts</p> 	<p>Molecular formula: CHNS  CAS: 463-56-9 etc  ENCS: 1-142  MW: 59.09  mp: 5 ° C<sup>6)</sup>  bp: Uncertain  sw: Very soluble<sup>3)</sup>  Specific gravities: Uncertain  logPow: Uncertain</p>

<p>[6] Medium-chain chlorinated paraffins (The alkyl chain has 10 - 14 carbon atoms, and the chlorinated number is 4 - 9.)</p> <p>[6-1] Chlorinated tetradecanes (The chlorinated number is 4 - 9.)</p>  <p style="text-align: center;">X = H or Cl</p>	<p>Molecular formula: <math>C_{14}H_{(30-i)}Cl_i</math> (<math>i = 4 \sim 9</math>)</p> <p>CAS: Uncertain</p> <p>ENCS: 2-68</p> <p>MW: Not specified</p> <p>mp: Not specified</p> <p>bp: Not specified</p> <p>sw: Not specified</p> <p>Specific gravities: Not specified</p> <p>logPow: Not specified</p>
<p>[6-2] Chlorinated pentadecanes (The chlorinated number is 4 - 9.)</p>  <p style="text-align: center;">X = H or Cl</p>	<p>Molecular formula: <math>C_{15}H_{(32-i)}Cl_i</math> (<math>i = 4 \sim 9</math>)</p> <p>CAS: Uncertain</p> <p>ENCS: 2-68</p> <p>MW: Not specified</p> <p>mp: Not specified</p> <p>bp: Not specified</p> <p>sw: Not specified</p> <p>Specific gravities: Not specified</p> <p>logPow: Not specified</p>
<p>[6-3] Chlorinated hexadecanes (The chlorinated number is 4 - 9.)</p>  <p style="text-align: center;">X = H or Cl</p>	<p>Molecular formula: <math>C_{16}H_{(34-i)}Cl_i</math> (<math>i = 4 \sim 9</math>)</p> <p>CAS: Uncertain</p> <p>ENCS: 2-68</p> <p>MW: Not specified</p> <p>mp: Not specified</p> <p>bp: Not specified</p> <p>sw: Not specified</p> <p>Specific gravities: Not specified</p> <p>logPow: Not specified</p>
<p>[6-4] Chlorinated heptadecanes (The chlorinated number is 4 - 9.)</p>  <p style="text-align: center;">X = H or Cl</p>	<p>Molecular formula: <math>C_{17}H_{(36-i)}Cl_i</math> (<math>i = 4 \sim 9</math>)</p> <p>CAS: Uncertain</p> <p>ENCS: 2-68</p> <p>MW: Not specified</p> <p>mp: Not specified</p> <p>bp: Not specified</p> <p>sw: Not specified</p> <p>Specific gravities: Not specified</p> <p>logPow: Not specified</p>
<p>[7] Hydrazine</p> <p style="text-align: center;"><math>H_2N - NH_2</math></p>	<p>Molecular formula: <math>H_4N_2</math></p> <p>CAS: 302-01-2</p> <p>ENCS: 1-374</p> <p>MW: 32.05</p> <p>mp: <math>2.0^\circ C^3</math></p> <p>bp: <math>113.5^\circ C^3</math></p> <p>sw: miscible<sup>3)</sup></p> <p>Specific gravities: 1.011(<math>15^\circ C</math>), 1.0036(<math>25^\circ C^3</math>)</p> <p>logPow: <math>-2.07^2</math></p>

<p>[8] (1-Hydroxyethane-1,1-diyl) diphosphonic acid and its salts</p> 	<p>Molecular formula: C<sub>2</sub>H<sub>8</sub>O<sub>7</sub>P<sub>2</sub>  CAS: 2809-21-4 etc  ENCS: 2-2936,2-4162  MW: 206.03  mp: 105 ° C<sup>5)</sup>  bp: Uncertain  sw: 690g/L(20 ° C)<sup>4)</sup>  Specific gravities: Uncertain  logPow: Uncertain</p>
<p>[9] 3-Phenoxybenzyl 3-(2,2-dichlorovinyl)-2,2-dimethylcyclopropanecarboxylate (synonym: Permethrin)</p> 	<p>Molecular formula: C<sub>21</sub>H<sub>20</sub>Cl<sub>2</sub>O<sub>3</sub>  CAS: 52645-53-1  ENCS: 3-4010  MW: 391.29  mp: approx. 35 ° C<sup>3)</sup>  bp: above 290 ° C<sup>2)</sup>  sw: 0.0002g/kg(20 ° C)<sup>5)</sup>  Specific gravities: 1.190 ~ 1.272(20 ° C)<sup>3)</sup>  logPow: 6.50<sup>2)</sup> approx.30°C</p>
<p>[10] <i>n</i>-Hexane</p> 	<p>Molecular formula: C<sub>6</sub>H<sub>14</sub>  CAS: 110-54-3  ENCS: 2-6  MW: 86.18  mp: from -100 to -95 ° C<sup>3)</sup>  bp: 69 ° C<sup>3)</sup>  sw: 0.0098(25 ° C)<sup>5)</sup>  Specific gravities: 0.6591(20 ° C/4 ° C)<sup>3)</sup>  logPow: 3.90<sup>2)</sup></p>

#### References

- 1) OECD, Screening Information Dataset (SIDS) for High Product inVolume Chemicals (Processed by UNEP Chemicals) (<http://www.inchem.org/pages/sids.html>)
- 2) U.S. National Library of Medicine, Hazardous Substances Data Bank (HSDB) (<https://toxnet.nlm.nih.gov/cgi-bin/sis/htmlgen?HSDB>)
- 3) O'Neil, M.J. (ed), The Merck Index 15th Edition (2013), CRC Press.
- 4) U.S. EPA, Estimation Programs Interface (EPI) Suite v4.1 (<http://www.epa.gov/oppt/exposure/pubs/episuite.html>)
- 5) Rumble, J.R. (ed), CRC Handbook of Chemistry and Physics 98th Edition (2017), The Royal society of Chemistry.
- 6) International Programme on Chemical Safety, International Chemical Safety Cards (ICSC) ([http://www.ilo.org/safework/info/publications/WCMS\\_113134/lang--en/index.htm](http://www.ilo.org/safework/info/publications/WCMS_113134/lang--en/index.htm))

### 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*1	Surveyed media		
		Surface water	Sediment	Air
Hokkaido	Environmental Promotion Section, Environment Division, Department of Environment and Lifestyle, Hokkaido Prefectural Government and Hokkaido Research Organization Environmental and Geological Research Department Institute of Environmental Sciences	○	○	○
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 Institute of Environmental Sciences	○	○	
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.	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 and Research Institute of Environment, Agriculture and Fisheries, Osaka Prefecture	○	○	○*2
Osaka City	Osaka City Institute of Public Health and Environmental Sciences	○	○	
Hyogo Pref.	Water and Air Quality Control Division, Environmental Management Bureau, Agricultural and Environmental Affairs Department, Hyogo Prefectural Government and Hyogo Prefectural Institute of Environmental Sciences, Hyogo Environmental Advancement Association	○	○	○
Kobe City	Natural Environmental Symbiotic Division, Environmental Preservation Branch, Environment Bureau, Kobe City and Kobe Institute of Health, Welfare Bureau, Health Division, Health	○		
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	○	○	
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	○	○	

(Note 1) \*1: Organisations responsible for sampling are described by their official names in FY 2018.

(Note 2) \*2: That organization cooperated with a private analytical laboratory in sampling specimens

## (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 2-1-1 for surface water, Table 2-1-2 and Fig.2-1-1 for sediment, Table 2-1-3 and Fig.2-1-2 for wildlife and Table 2-1-4 and Fig.2-1-3 for the 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	41	8	69	1
Sediment	36	6	51	3
Air	15*	1	16	3
All media	44	10	94	

(Note) \*: For 1 of the 15 organization, it was cooperated with a private analytical laboratory in sampling specimens.

## (3) 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.

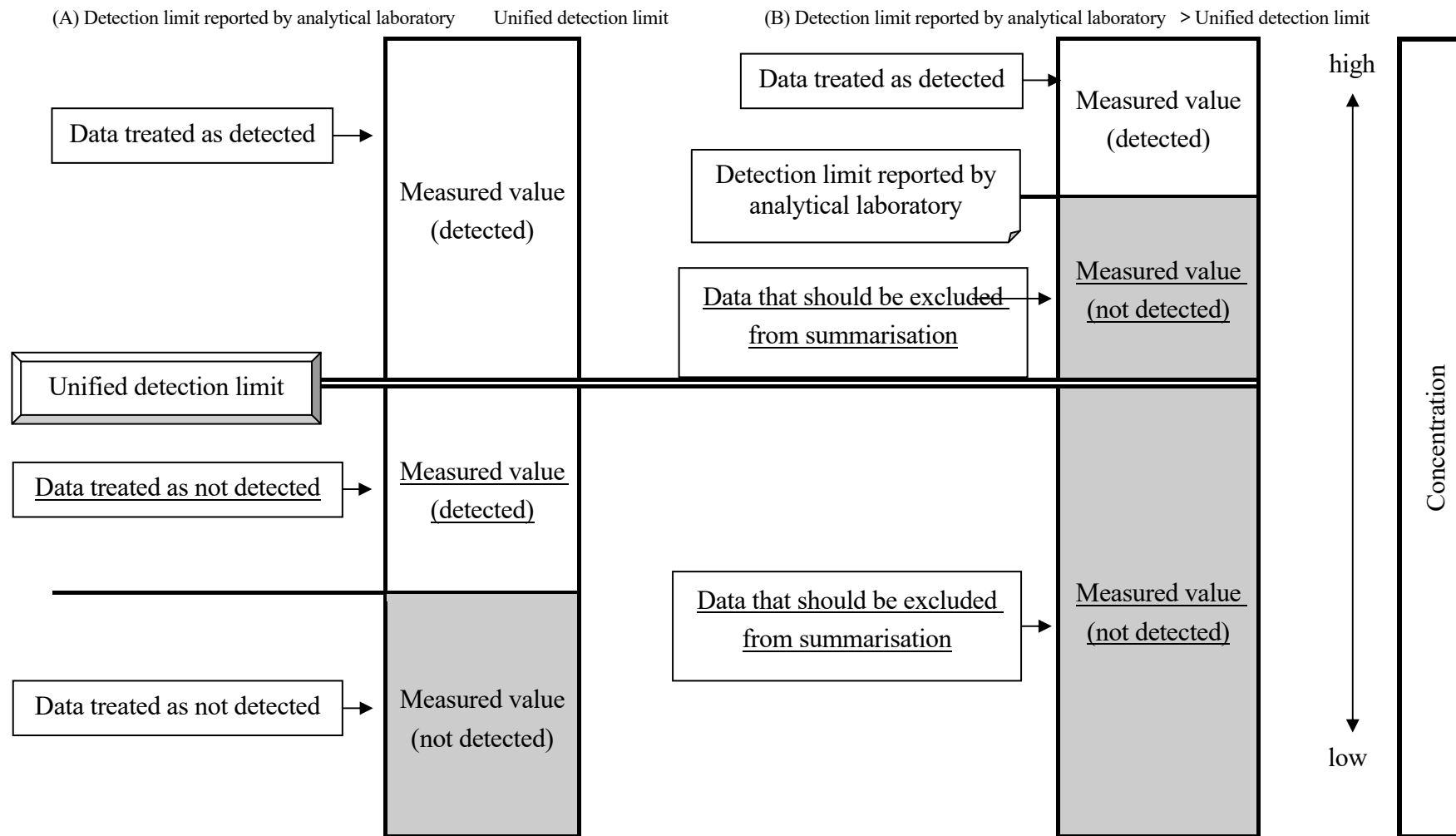
When IDL and MDL are not given in the Initial Environmental Survey Analytical Method, the detection limit is predetermined by the following procedure.

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 FY2018

Local communities	Surveyed sites	Target chemicals							
		[2]	[3]	[4]	[5]	[6]	[8]	[9]	[10]
Hokkaido	Ishikarikakokyo Bridge, Mouth of Riv. Ishikari(Ishikari City)		○		○	○	○		
	Tomakomai Port				○	○			○
Iwate Pref.	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.	River Mogami, around Kurotaki bridge	○							
	Mouth of Riv. Mogami(Sakata City)					○			
Ibaraki Pref.	Tonekamome-ohasi Bridge, Mouth of Riv. Tone(Kamisu City)	○		○		○	○	○	
Tochigi Pref.	Daidoizumi-bashi Bridge, Riv. Kinu(Moka City)			○					
	Tagawa Kyubun Area Head Works(Utsunomiya City)	○		○				○	
Gunma Pref.	Namiii-hashi Bridge, Riv. Kanzawa(Isesaki City, Maebashi City)			○					
Saitama Pref.	Maeyashiki-hashi Bridge, Riv. Oshi(Konosu City)			○					
	Saikachido-bashi Bridge, Riv. Ayase(Soka City)			○					
	Akigaseshusuizeki of Riv. Arakawa(Shiki City)		○					○	
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			○	○	○	○	○	○
Kawasaki City	Mouth of Riv. Tama(Kawasaki City)		○			○		○	
	Keihin Canal, Port of Kawasaki, The Coast of Chidori Town				○			○	
	Keihin Canal, Port of Kawasaki, The Coast of Ougi Town				○	○		○	
Niigata Pref.	Niigata Higashi Port								○
	Lower Riv. Shinano(Niigata City)	○		○		○	○	○	○
Toyama Pref.	Hagiura-bashi Bridge, Mouth of Riv. Jintsu(Toyama City)	○		○					
Ishikawa Pref.	Mouth of Riv. Sai(Kanazawa City)	○		○		○		○	
Nagano Pref.	Tategahana-bashi Bridge, Riv. Shinano(Nakano City)						○		
	Lake Suwa(center)		○						
Shizuoka Pref.	Shimizu Port						○		○
	Lower Riv. Niino(Omaezaki City)		○				○		○
Aichi Pref.	Riv. Tenryu(Iwata City)	○	○					○	○
	Nagoya Port , West of Shiomi Wharf	○	○		○		○	○	○
Nagoya City	Minatoshinbashi Bridge, Riv. Hori (Nagoya City)		○			○		○	
	Nagoya Port , South of Shiomi Wharf		○		○			○	

Local communities	Surveyed sites	Target chemicals							
		[2]	[3]	[4]	[5]	[6]	[8]	[9]	[10]
Mie Pref.	Yokkaichi Port			○	○				○
	Toba Port				○				○
Shiga Pref.	Lake Biwa(center, offshore of Minamihira)			○					○
	Lake Biwa(center, offshore of Karasaki)			○					○
Kyoto Pref.	Miyazu Port								○
	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.	Offshore of Himeji		○		○				○
	Aboshi Port		○						○
	Offshore of Takasago West Port				○	○			
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 Wakayama Port				○				
	Asahi-bashi Bridge, Riv. Waka(Wakayama City)		○						
Okayama Pref.	Offshore of Mizushima				○	○	○		○
Yamaguchi Pref.	Tokuyama Bay	○			○	○	○	○	○
	Offshore of Hagi	○						○	
Kagawa Pref.	Takamatsu Port			○	○				○
Ehime Pref.	Sawadu Fishing 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.	Hiraki-bashi Bridge, Riv. Midori(Uto City)	○		○					
Oita Pref.	Beppu Bay(center)				○				
	Saganoseki Port				○				
	Mouth of Riv. Oita(Oita City)					○	○		

[2] 2-(4-Ethoxyphenyl)-2-methylpropyl 3-phenoxybenzyl ether (synonym: Etofenprox), [3] Chloroethanoic acid and its salts, [4] *N,N*-Dimethylformamide, [5] Thiocyanic acid and its salts, [6] Medium-chain chlorinated paraffins (The alkyl chain has 10 - 14 carbon atoms, and the chlorinated number is 4 - 9.), [8] (1-Hydroxyethane-1,1-diyl) diphosphonic acid and its salts, [9] 3-Phenoxybenzyl 3-(2,2-dichlorovinyl)-2,2-dimethylcyclopropanecarboxylate (synonym: Permethrin), [10] *n*-Hexane

(Note) \*: “Keihin Canal, Port of Kawasaki (front of Ogimachi)” of Detailed Environmental Survey and “Keihin Canal, Port of Kawasaki” of Environmental Monitoring are the same point each.

\*\* : “Nagoya Port, West of Shiomi Wharf” of Detailed Environmental Survey and “Nagoya Port” of Environmental Monitoring are the same point each.

Table 2-1-2 List of surveyed sites (sediment) and target chemicals in the Detailed Environmental Survey in FY2018

Local communities	Surveyed sites	Target chemicals					
		[1]	[2]	[6]	[7]	[9]	[10]
Hokkaido	Ishikarikakokyo Bridge, Mouth of Riv. Ishikari (Ishikari City)	○		○	○		
	Tomakomai Port			○			
Iwate Pref.	Riv. Toyosawa (Hanamaki City)				○		
Sendai City	Hirose-ohashi Bridge, Riv. Hirose (Sendai City)	○					
Akita Pref.	Akita Canal (Akita City)	○	○	○	○	○	○
Yamagata Pref.	Murayamanogawa (Before Mogami Riv. joining)				○		
	Mouth of Riv. Mogami (Sakata City)		○	○			
Ibaraki Pref.	Tonekamome-ohashi Bridge, Mouth of Riv. Tone (Kamisu City)	○	○	○		○	
Gunma Pref.	Wada-bashi Bridge, Riv. Karasu (Takasaki City)	○					
	Neighbourhood of Shimonita Station, Riv. Kabura (Shimonita Town)	○					
Saitama Pref.	Shiki-ohashi Bridge, Riv. Yanase (Shiki City)	○					
	Kachi-hashii Bridge, Riv. Ichino (Yoshimi Town)	○					
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)	○		○	○	○	○
	Keihin Canal, Port of Kawasaki, The Coast of Ougi Town			○	○	○	○
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)					○	
	Shimizu Port				○		○
Shizuoka Pref.	Lower Riv. Niino (Omaezaki City)						○
	Riv. Tenryu (Iwata City)		○			○	
Aichi Pref.	Nagoya Port, West of Shiomi Wharf		○		○	○	
Nagoya City	Minatoshinbashi Bridge, Riv. Hori (Nagoya City)	○		○		○	
Mie Pref.	Yokkaichi Port	○			○		○
	Toba 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.	Offshore of Himeji	○					○
	Aboshi Port					○	
	Offshore of Takasago West Port	○		○	○		
Nara Pref.	Taisho-bashi Bridge, Riv. Yamato (Oji Town)					○	
Wakayama Pref.	Kinokawa-ohashi Bridge, Mouth of Riv. Kinokawa (Wakayama City)	○	○	○			
Okayama Pref.	Offshore of Mizushima			○	○		○
Yamaguchi Pref.	Tokuyama Bay	○	○	○	○	○	○
	Offshore of Hagi		○			○	
Kagawa Pref.	Takamatsu Port						○
	Sakaide Port			○	○		

Local communities	Surveyed sites	Target chemicals					
		[1]	[2]	[6]	[7]	[9]	[10]
Ehime Pref.	Niihama Port				○		○
Kitakyushu City	Dokai Bay		○	○		○	
Fukuoka City	Hakata Bay	○			○	○	
Saga Pref.	Imari Bay						○
Oita Pref.	Mouth of Riv. Oita (Oita City)			○			

[1] Alkylbenzene sulfonates (The alkyl group is linear with 10 - 14 carbon atoms.) and its salts (synonym: LAS (The alkyl group has 10 - 14 carbon atoms.) and its salts), [2] 2-(4-Ethoxyphenyl)-2-methylpropyl 3-phenoxybenzyl ether (synonym: Etofenprox), [6] Medium-chain chlorinated paraffins (The alkyl chain has 10 - 14 carbon atoms, and the chlorinated number is 4 - 9.), [7] Hydrazine, [9] 3-Phenoxybenzyl 3-(2,2-dichlorovinyl)-2,2-dimethylcyclopropanecarboxylate (synonym: Permethrin), [10] *n*-Hexane

(Note) \*: “Keihin Canal, Port of Kawasaki (front of Ogimachi)” of Detailed Environmental Survey and “Keihin Canal, Port of Kawasaki” of Environmental Monitoring are the same point each.

\*\* : “Nagoya Port, West of Shiomi Wharf” of Detailed Environmental Survey and “Nagoya Port” of Environmental Monitoring are the same point each.

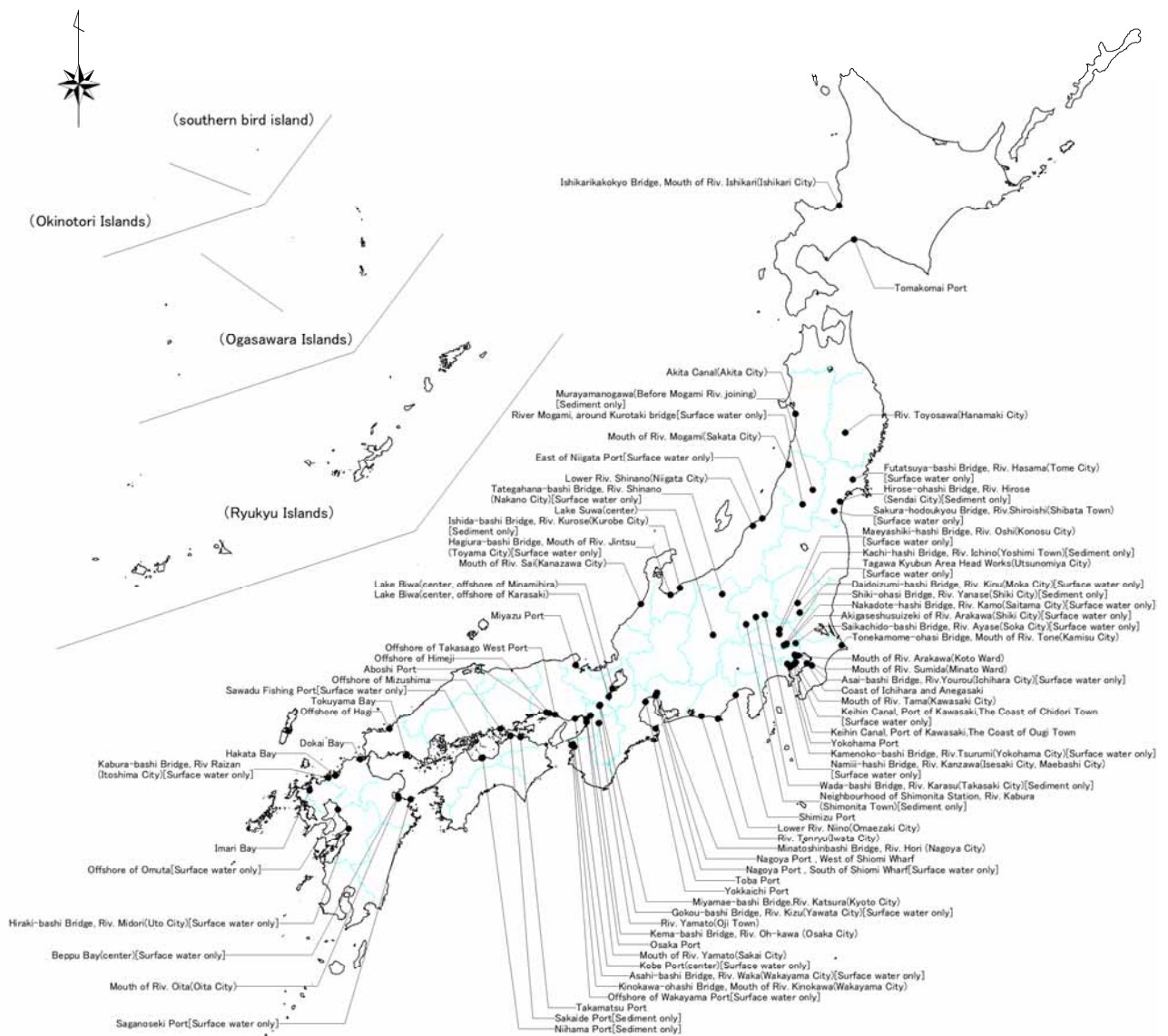


Figure 2-1-1 Surveyed sites (surface water and sediment) in the Detailed Environmental Survey in FY2018

Table 2-1-3 List of surveyed sites (air) and target chemicals in the Detailed Environmental Survey in FY2018

Local communities	Surveyed sites	Target chemicals
		[7] Hydrazine
Hokkaido	Hokkaido Research Organization Environmental and Geological Research Department Institute of Environmental Sciences	
Ibaraki Pref.	Ibaraki Kasumigaura Environmental Science Center (Tsuchiura City)	
Saitama Pref.	Center for Environmental Science in Saitama (Kazo City)	
Tokyo Met.	Tokyo Metropolitan Research Institute for Environmental Protection (Koto Ward)	
	Chichijima Island(Ogasawara Village)	
Kanagawa Pref.	Kanagawa Environmental Research Center (Hiratsuka City)	
Toyama Pref.	Uozu Air Quality Monitoring Station (Uozu City)	
Nagano Pref.	Nagano Environmental Conservation Research Institute (Nagano City)	
Mie Pref.	Mie Prefecture Health and Environment Research Institute (Yokkaichi 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)	
Hyogo Pref.	Aioi City Government Building (Aioi 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)	
Kagawa Pref.	Kagawa Prefectural Public Swimming Pool (Takamatsu City)	





Figure 2-1-2 Surveyed sites (air) in the Detailed Environmental Survey in FY 2018

#### 4. Summary of survey results

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

In surface water, 5 out of the 8 target chemicals (groups) were detected. Target chemicals were categorized by analytical methods such as structurally similar chemicals capable of simultaneous analyses.

- [3] Chloroethanoic acid and its salts : 3 of the 24 valid sites
- [4] *N,N*-Dimethylformamide : 13 of the 25 valid sites
- [5] Thiocyanic acid and its salts : All 24 valid sites
- [6] Medium-chain chlorinated paraffins (The alkyl chain has 10 - 14 carbon atoms, and the chlorinated number is 4 - 9.) : 3 of the 23 valid sites
  - [6-1] Chlorinated tetradecanes (The chlorinated number is 4 - 9.): 8 of the 23 valid sites
  - [6-2] Chlorinated pentadecanes (The chlorinated number is 4 - 9.): 5 of the 23 valid sites
  - [6-3] Chlorinated hexadecanes (The chlorinated number is 4 - 9.): 2 of the 23 valid sites
  - [6-4] Chlorinated heptadecanes (The chlorinated number is 4 - 9.): 2 of the 23 valid sites
- [10] *n*-Hexane: 1 of the 26 valid sites

In sediment, 5 out of the 6 target chemicals (groups) were detected. Target chemicals were categorized by analytical methods such as structurally similar chemicals capable of simultaneous analyses.

- [1] Alkylbenzene sulfonates (The alkyl group is linear with 10 - 14 carbon atoms.) and its salts (synonym: LAS (The alkyl group has 10 - 14 carbon atoms.) and its salts) : 11 of the 25 valid sites
  - [1-1] Linear decylbenzene sulfonates and its salts: 9 of the 25 valid sites
  - [1-2] Linear undecylbenzene sulfonates and its salts: 8 of the 25 valid sites
  - [1-3] Linear dodecylbenzene sulfonates and its salts: 11 of the 25 valid sites
  - [1-4] Linear tridecylbenzene sulfonates and its salts: 13 of the 25 valid sites
  - [1-5] Linear tetradecylbenzene sulfonates and its salts: 16 of the 25 valid sites
- [2] 2-(4-Ethoxyphenyl)-2-methylpropyl 3-phenoxybenzyl ether (synonym: Etofenprox) : 14 of the 16 valid sites
- [6] Medium-chain chlorinated paraffins (The alkyl chain has 10 - 14 carbon atoms, and the chlorinated number is 4 - 9.) : 18 of the 23 valid sites
  - [6-1] Chlorinated tetradecanes (The chlorinated number is 4 - 9.): 19 of the 23 valid sites
  - [6-2] Chlorinated pentadecanes (The chlorinated number is 4 - 9.): 19 of the 23 valid sites
  - [6-3] Chlorinated hexadecanes (The chlorinated number is 4 - 9.): 15 of the 23 valid sites
  - [6-4] Chlorinated heptadecanes (The chlorinated number is 4 - 9.): 15 of the 23 valid sites
- [7] Hydrazine: All 20 valid sites
- [9] (1-Hydroxyethane-1,1-diyl)diphosphonic acid and its salts : 14 of the 16 valid sites

In air, 1 target chemical was detected. Target chemicals were categorized by analytical methods such as structurally similar chemicals capable of simultaneous analyses.

- [7] Hydrazine: 2 of the 15 valid sites

Table 1-2 Summary of the detection ranges and the detection limits in the Detailed Environmental Survey in FY 2018

No.	Target chemicals	Surface water [ng/L]		Sediment [ng/g-dry]		Air [ng/m <sup>3</sup> ]	
		Detection range and frequency	Detection limit	Detection range and frequency	Detection limit	Detection range and frequency	Detection limit
[1]	Alkylbenzene sulfonates (The alkyl group is linear with 10 - 14 carbon atoms.) and its salts (synonym: LAS (The alkyl group has 10 - 14 carbon atoms.) and its salts) *			nd ~ 8,500 11/25	120**		
	[1-1] Linear decylbenzene sulphonates and its salts			nd ~ 62 9/25	8.9		
	[1-2] Linear undecylbenzene sulphonates and its salts			nd ~ 1,000 8/25	38		
	[1-3] Linear dodecylbenzene sulphonates and its salts			nd ~ 2,600 11/25	40		
	[1-4] Linear tridecylbenzene sulphonates and its salts			nd ~ 4,700 13/25	32		
	[1-5] Linear tetradecylbenzene sulphonates and its salts			nd ~ 620 16/25	2.0		
[2]	2-(4-Ethoxyphenyl)-2-methylpropyl 3-phenoxybenzyl ether (synonym: Etofenprox)	nd 0/25	2.2	nd ~ 19 14/16	0.14		
[3]	Chloroethanoic acid and its salts	nd ~ 100 3/24	29				
[4]	<i>N,N</i> -Dimethylformamide*	nd ~ 410 13/25	59				
[5]	Thiocyanic acid and its salts	2.5 ~ 120 24/24	1.1				
[6]	Medium-chain chlorinated paraffins (The alkyl chain has 10 - 14 carbon atoms, and the chlorinated number is 4 - 9.)	nd ~ 140 3/23	20**	nd ~ 6,000 18/23	27**		
	[6-1] Chlorinated tetradecanes (The chlorinated number is 4 - 9.)	nd ~ 47 8/23	5.5***	nd ~ 3,100 19/23	7.5***		
	[6-2] Chlorinated pentadecanes (The chlorinated number is 4 - 9.)	nd ~ 37 5/23	4.6***	nd ~ 1,800 19/23	4.7***		
	[6-3] Chlorinated hexadecanes (The chlorinated number is 4 - 9.)	nd ~ 30 2/23	5.8***	nd ~ 750 15/23	7.8***		
	[6-4] Chlorinated heptadecanes (The chlorinated number is 4 - 9.)	nd ~ 22 2/23	3.9***	nd ~ 480 15/23	5.7***		
[7]	Hydrazine*			0.27 ~ 15 20/20	0.0096	nd ~ 0.65 2/15	0.33
[8]	(1-Hydroxyethane-1,1-diyl)diphosphonic acid and its salts	nd 0/24	3,300				
[9]	3-Phenoxybenzyl 3-(2,2-dichlorovinyl)-2,2-dimethylcyclopropanecarboxylate (synonym: Permethrin)	nd 0/25	0.31	nd ~ 32 14/18	0.22		
[10]	<i>n</i> -Hexane*	nd ~ 12 1/25	10	nd 0/21	1.1		

(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) \* connote target substances or points selected for survey in light of documentation or submittals regarding emissions.

(Note 5) \*\* Total value of detected limit value each number of carbon atoms in alkyl chain.

(Note 6) \*\*\* Total value of detected limit value each number of chlorine atoms.