April 4, 2017

Environmental Preservation Division
Department of Environment Affairs
Okinawa Prefectural Government

Survey of Perfluorinated Compounds in the Environmental Water in Okinawa (Results of Winter Survey in Fiscal Year 2016)

Results

Okinawa Prefectural Government (OPG) has been conducting a survey of perfluorinated compounds in the environmental water of the prefecture since August 2016 in order to assess perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA) levels in groundwater. The results of the most recent analysis of 41 samples from various sites (See Appendix 1) are listed in Appendix 2. The detected values of perfluorinated compounds in these samples were almost the same as the results of a previous summer survey, although there was some fluctuation. There are no standards set for perfluorinated compounds in water in Japan, however the total concentration levels of PFOS and PFOA at 6 out of 41 samples in groundwater around Marine Corps Air Station (MCAS) Futenma were found to have exceeded lifetime health advisory levels for drinking water in the United States (hereinafter referred to as "recommended levels"). The results of the summer survey have shown 3 samples out of 35 around MCAS Futenma to have exceeded recommended levels. Following the results of the summer survey, OPG conducted a survey of concentration levels of perfluorinated compounds in farm produce cultivated using the affected groundwater in December 2016; in all of the samples, PFOS and PFOA were not detected, so their effect on crops was not confirmed.

The levels detected are not considered to be a problem as long as residents do not drink the groundwater directly. In this winter survey, OPG conducted sampling and analysis of surface water around MCAS Futenma; it was confirmed that the concentration of PFOS and PFOA in surface water flowing into the air station is low. OPG will continue to monitor relatively high concentrations points during fiscal year 2017 to assess the situation.

Reference Material

The standards for PFOS and PFOA levels

○Japan(no standards set)

Ministry of Health, Labor and Welfare: Factors Requiring Monitoring Regarding Tap Water Quality (2009)

Maximum levels have not been set both for PFOS and PFOA

Ministry of the Environment: Factors Requiring Further Research for Water Quality Conservation Initiatives（March 2014）

Although PFOS and PFOA are marked to be researched, regulations are not yet set.

○United States

Lifetime health advisory levels in drinking water

2016: Total amount of both PFOS and PFOA 70ng/L

○Germany

Lifetime health advisory levels in drinking water

2006: Total amount of both PFOS and PFOA 300ng/L

About PFOS and PFOA

○ PFOS stands for perfluorooctane sulfonate while PFOA stands for perfluorooctanoic acid. Both are types of organofluorine compounds. Because PFOS and PFOA possess a hydrophobic nature (a physical property to repel water) and an oleophobic nature (a physical property to repel oil), they have been widely used for fire extinguishing foam, water repellents and stain-proofing agents, etc.

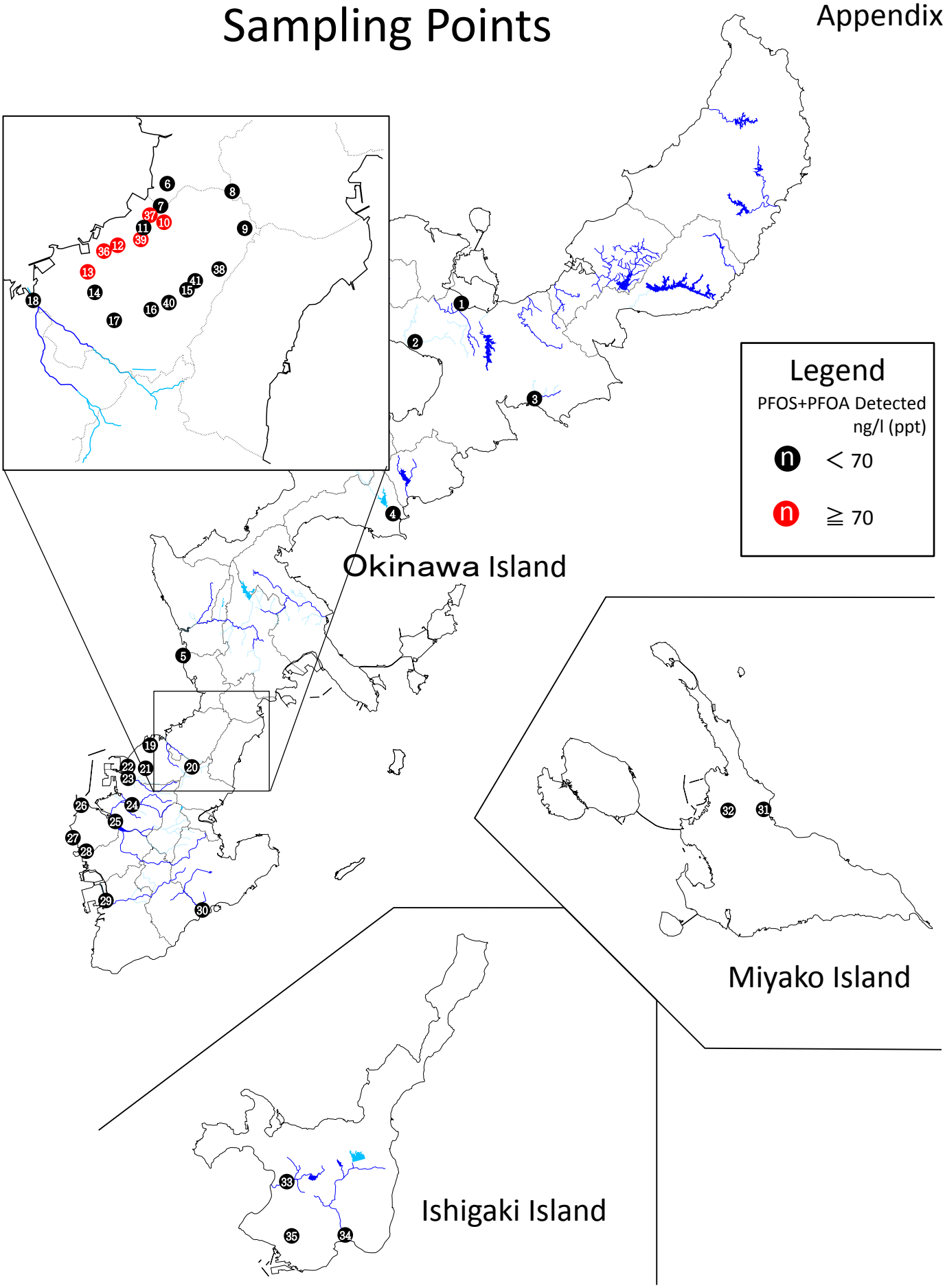
○ PFOS is mainly used for fire extinguishing foam, plating solution, aircraft hydraulic oil, water repellent, floor wax, etc. However, the authorized use of PFOS is currently limited to the production of etching solutions, semiconductor resistors, and industrial photographic films which cannot be replaced with substitutes. The use of PFOS for purposes other than those mentioned above is prohibited. PFOA is used for producing fluoroplastics. It has not been a target of regulation at the present moment, however it is expected to be regulated in the same way as PFOS in the future. Note that PFOS is not essential for fire extinguishing foam; however, its

use is permitted on the condition that its producers set technical standards in its handling and to make these standards public in order to prevent pollution. Yet, PFOS substitutes are recommended.

○ PFOS and PFOA are difficult to decompose naturally. Therefore, its persistence in the environment as well as bioaccumulation in living organisms are considered to be problematic and have been subject to regulation as environmental pollutants. The survey was conducted following that lifetime health advisories in regard to drinking water in the U.S. are now based on the total levels of PFOS and PFOA.

Sampling Points

Appendix 1



Name of Duty	Measurement duty of PFOS/PFOA in JFY2016
Analysis Items	Perfluorooctane sulfonate (PFOS)/Perfluorooctanoic Acid (PFOA)
Subject	Water quality

Appendix **2**

Result List

Number	Municipality	Location	Summer Survey (ng/L) PFOS	PFOA	Total Value	Winter Survey (ng/L) PFOS	PFOA	Total Value	Summer Survey Sampling Date	Winter Survey Sampling Date
①	Nago City	Gabusoka River, Goga Bridge	1.5	0.13	1.6	0.14	0.56	0.70		
②	Nago City	Yabu River, Furujima Bridge	0.16	0.09	0.25	0.40	0.38	0.78	8/24/2016	
③	Nago City	Teima River, 200 meters upstream from Kadekaru Bridge	<0.04	0.14	0.18	0.05	0.08	0.13		
④	Kin Town	Surounding area of Camp Hansen, Okukubi River	3.0	2.6	5.6	1.4	1.5	2.9	8/31/2016	1/18/2017
⑤	Chatan Town	Surrounding area of Kadena Air Base, Off estuary of Daido River	8.9	3.9	12	1.8	0.78	2.5		
⑥	Chatan Town	Surrounding area of Camp Zukeran, Western Drainage	19	5.4	24	4.0	2.6	6.6	9/1/2016	
⑦	Chatan Town	Surrounding area of Camp Zukeran, Futenma River	30	11	41	57	7.5	64		
⑧	Chatan Town	Surrounding area of Camp Zukeran, Futenma River (the Upper Stream)	8.4	8.7	17	6.2	2.6	8.8		
⑨	Ginowan City	Surrounding area of Futenma Air Station, Nodake Kushinuka (spring)	7.5	4.0	11	6.0	4.7	10		
⑩	Ginowan City	Surrounding area of Futenma Air Station, Chunnaga (spring)	1200	190	1300	730	150	880	9/15/2016	
⑪	Ginowan City	Surrounding area of Futenma Air Station, Hunshinga (spring)	38	21	59	39	22	61		
⑫	Ginowan City	Surrounding area of Futenma Air Station, Hiyakaga (spring)	180	31	210	94	26	120		
⑬	Ginowan City	Surrounding area of Futenma Air Station, Mendakarihijaga (spring)	680	35	710	670	42	710	9/21/2016	
⑭	Ginowan City	Surrounding area of Futenma Air Station, Morinokawa (spring)	30	9.4	39	40	5.4	45		1/11/2017
⑮	Ginowan City	Surrounding area of Futenma Air Station, Kamiyama・Aichi Nuruga (spring)	0.12	<0.04	0.16	0.15	0.04	0.19	9/15/2016	
⑯	Ginowan City	Surrounding area of Futenma Air Station, Ginowan Kumaiabu Ritual Site (spring)	7.2	3.9	11	6.7	3.0	9.7		
⑰	Ginowan City	Surrounding area of Futenma Air Station, Samashita Ubuga (spring)	24	9.0	33	30	11	41		
⑱	Urasoe City	Makiminato River, 150 meters downstream from the National Route 58	5.3	2.7	8.0	7.5	2.0	9.5	9/21/2016	
⑲	Urasoe City	Surrounding area of Camp Kinser, Shirinka (ditch)	15	6.0	21	28	3.8	31		
⑳	Urasoe City	Surrounding area of Camp Kinser, Agariga (spring)	13	0.70	13	4.0	0.21	4.2	9/2/2016	
㉑	Urasoe City	Surrounding area of Camp Kinser, Nakanishi Ubuga (spring)	20	7.1	27	20	5.6	25		
㉒	Urasoe City	Surrounding area of Camp Kinser, Kowan River	4.4	1.1	5.5	0.66	0.35	1.0		
㉓	Naha City	Aja River, Aja Bridge	4.5	1.8	6.3	1.2	0.96	2.1		1/16/2017
㉔	Naha City	Asato River, Asatoshin Bridge	22	4.1	26	13	2.3	15		
㉕	Naha City	Kokuba River, Nahaoo Bridge	1.2	0.62	1.8	0.36	0.38	0.74	8/24/2016	
㉖	Naha City	Naha Airport, Northern Waterway in Naha Airport	1.7	0.54	2.2	0.64	0.24	0.88		
㉗	Naha City	Naha Airport, South-western Waterway in Naha Airport	2.2	0.51	2.7	0.28	0.39	0.67		
㉘	Naha City	Naha Airport, Southern Waterway in Naha Airport	5.0	0.85	5.8	3.1	1.1	4.2		
㉙	Itoman City	Mukue River, Kawajiri Bridge	1.4	1.1	2.5	0.49	0.72	1.2	9/21/2016	1/11/2017
㉚	NanjjoCity	Yuhi River, Horikawa Bridge	1.3	1.7	3.0	0.56	0.85	1.4		
㉛	Miyakojima City	Shirakawada Water Resource	<0.04	<0.04	<0.08	<0.04	<0.04	<0.08	8/30/2016	1/12/2017
㉜	Miyakojima City	Nyaatsu Water Resource	2.7	0.28	2.9	1.8	0.27	2.0		
㉝	Ishigaki City	Miyara River, Miyara Bridge	0.35	0.49	0.84	0.31	0.21	0.52	9/13/2016	1/11/2017
㉞	Ishigaki City	Nagura River, in front of Ishigaki sugar manufactory Water Intake Facility	0.05	0.31	0.36	<0.04	0.65	0.69		
㉟	Ishigaki City	Arakawa River (Ishigaki Island), Downstream of Drainage in Former Ishigaki Airport	0.49	4.3	4.7	0.87	7.8	8.6		
㊱	Ginowan City	Surrounding area of Futenma Air Station, Ogumuya (spring)				550	21	570		12/9/2016
㊲	Ginowan City	Surrounding area of Futenma Air Station, Isaufuga (spring)				130	62	190		1/11/2017
㊳	Ginowan City	Surrounding area of Futenma Air Station, Uehara (Well)				4.8	4.5	9.3		3/13/2017
㊴	Ginowan City	Surrounding area of Futenma Air Station, Furuchinga (spring) ※Upstream of Ogumuya㊱				96	22	110		3/10/2017
㊵	Ginowan City	Surrounding area of Futenma Air Station, In Civic Park (Upstream Surface-Water)				6.6	3.8	10		3/13/2017
㊶	Ginowan City	Surrounding area of Futenma Air Station, Akamichi (Upstream Surface-Water)				12	4.1	16		

(Note) The results of measurement are shown in two effective digits (disregarding the third digit) in accordance with "Designation of Water Type in Environmental Standards Based on the Environmental Basic Law and Processing Standards Including Continuous Monitoring Based on the Water Pollution Prevention Act (Ref. 1303271 of March 27,2013)." When the total value was below the lowest detectable limit, the detectable value, 0.04ng/L is used to calcurate the value.