

# Fukushima Daiichi Nuclear Power Station

## Results from secondary treatment performance confirmation tests on water treated with multi-nuclide removal equipment (final report)

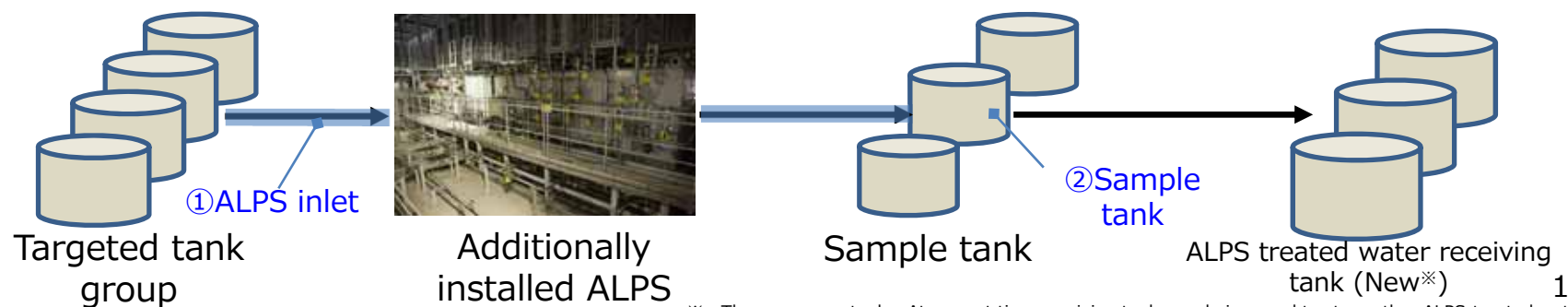
<Reference Document>

December 24, 2020

Tokyo Electric Power Company Holdings, Inc.  
Fukushima Daiichi Decontamination &  
Decommissioning Engineering Company

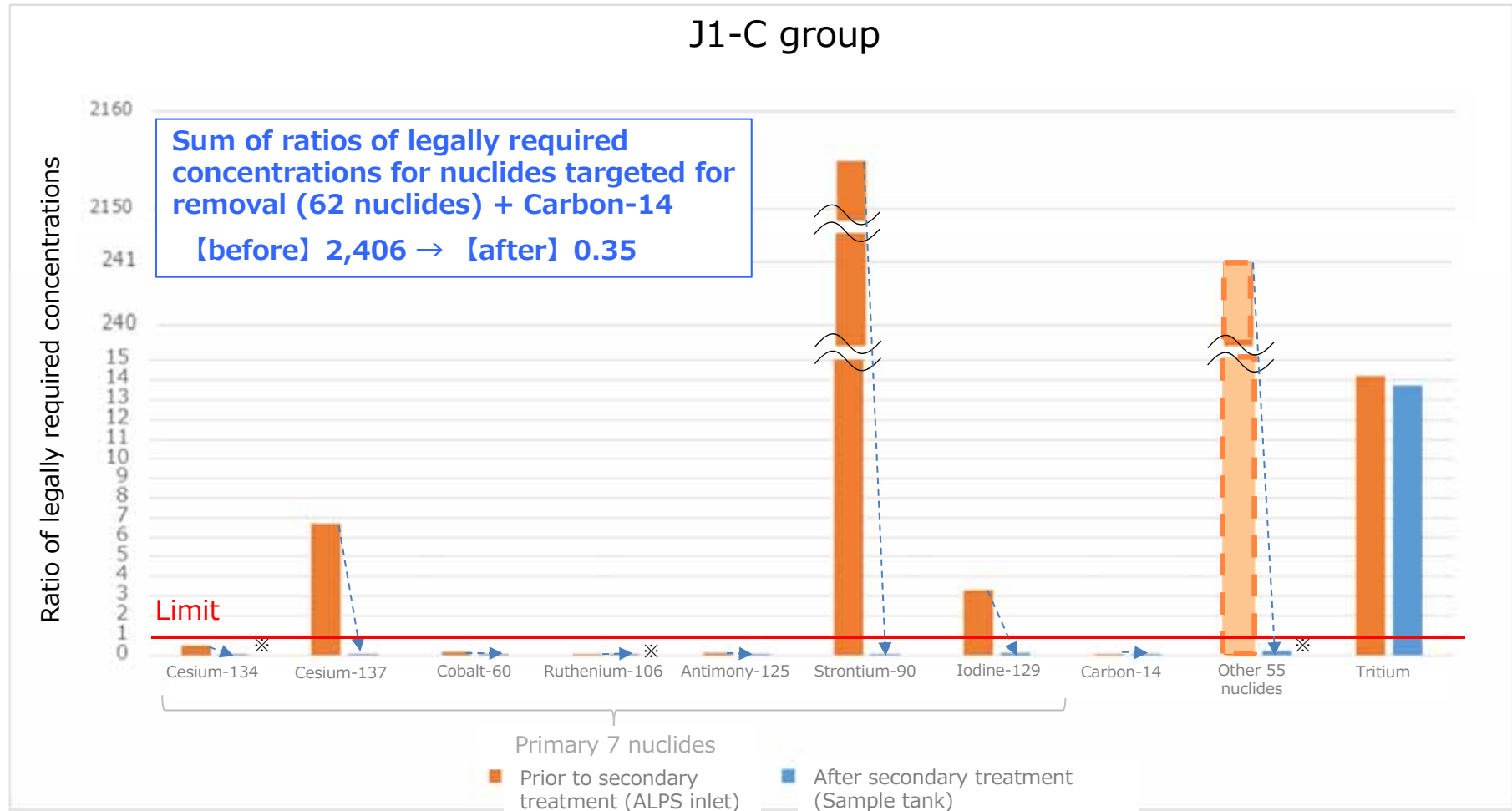
- Since September 15, 2020, we have been treating approximately 1,000m<sup>3</sup> of water from both the J1-C group (sum of ratios of legally required concentrations for the primary seven nuclides: 3,791 (J1-C1)) and the J1-G group (sum of ratios of legally required concentrations for the primary seven nuclides: 153 (J1-G1)) (Total: Approx. 2,000m<sup>3</sup>) out of the tank groups for which the sum of the ratios of legally required concentrations <sup>※1</sup>, excluding tritium, exceeds 100.  
<[Announced on September 10, 2020](#)>
- Water sampled before and after secondary treatment from each tank group has been analyzed for nuclides targeted for removal (60 nuclides) + carbon-14, excluding nickel-63/cadmium-113m, and we have confirmed that compared with prior to secondary treatment, the concentration of radioactive substances after secondary treatment (sample tank) is lower.  
<[Announced on November 16, 2020 \(J1-C group\)](#)> <[Announced on November 26, 2020 \(J1-G group\)](#)>
- After that, water from both tank groups was analyzed for nickel-63/cadmium-113m thereby concluding analysis for all nuclides to be analyzed during secondary treatment performance confirmation tests (64 nuclides (nuclides targeted for removal (62 nuclides) + carbon-14 and tritium)). Test results showed that the sum of ratios of legally required concentrations excluding tritium can be reduced to less than 1 through secondary treatment with ALPS.  
**Sum of ratios of legally required concentrations for nuclides targeted for removal (62 nuclides) + Carbon-14:**  
**J1-C group: [before] 2,406 → [after] 0.35, J1-G group: [before] 387 → [after] 0.22**
- It was confirmed through in-house analysis that the sum of ratios of legally required concentrations excluding tritium is reduced to less than 1. Going forward, we will improve our nuclide analysis procedures and processes by identifying issues with sample analysis performed by third party organizations following TEPCO analysis procedures.

※1 : The concentration ratios of concentrations required by law that have been stipulated for each radioactive substance are calculated and totaled



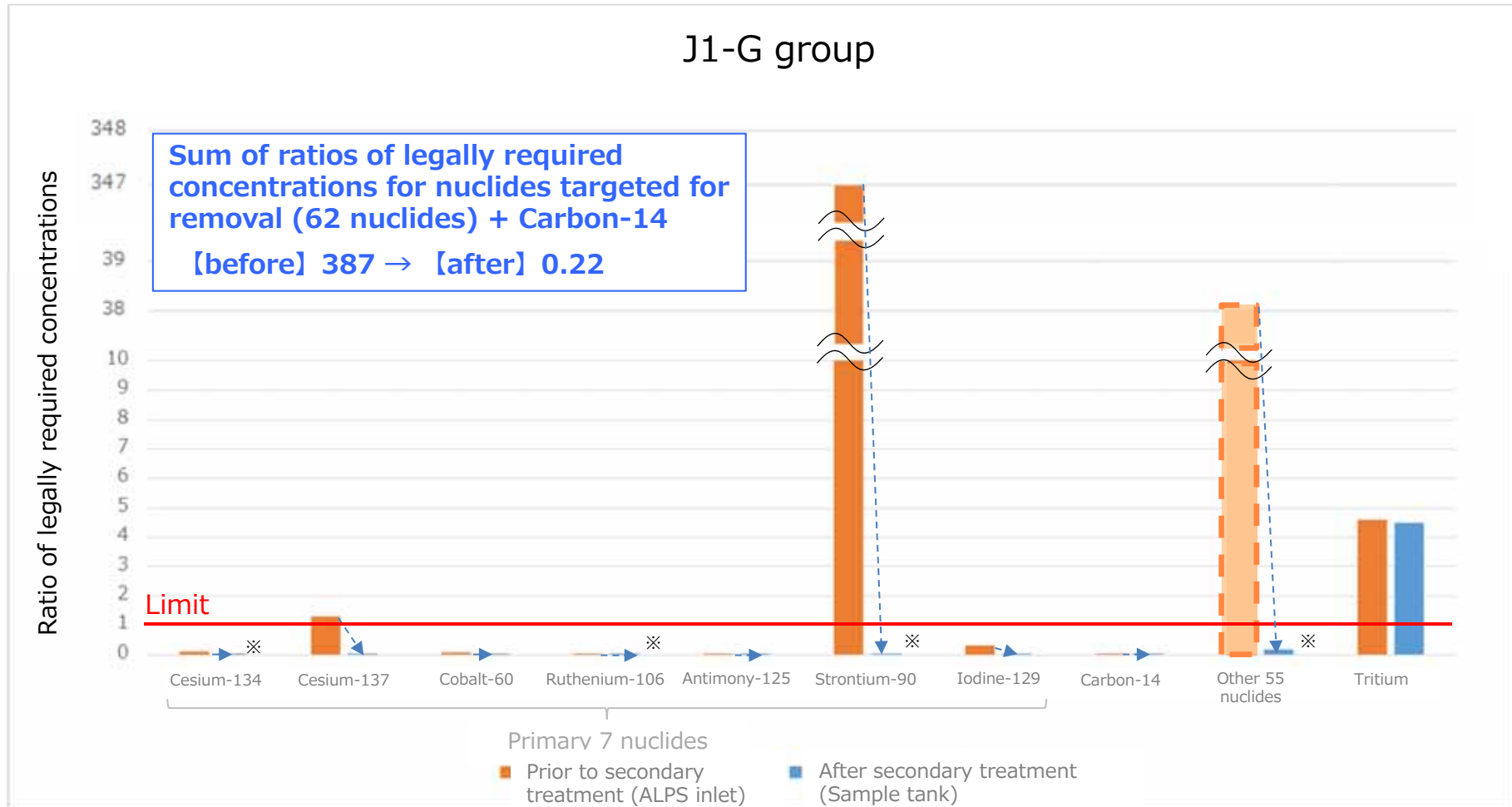
※ : These are new tanks. At current time receiving tanks are being used to store other ALPS-treated water

# <Reference> Comparison of the concentrations of radioactive substances before and after secondary treatment (J1-C group)



※ Detectable limits are used for nuclides for which the analysis results were below detectable limits.

# <Reference> Comparison of the concentrations of radioactive substances before and after secondary treatment (J1-G group)



※ Detectable limits are used for nuclides for which the analysis results were below detectable limits.

## <Reference> Secondary Treatment Performance Confirmation Test Result (J1-C group)

	Concentrations required by law [Bq/l]	Prior to secondary treatment (ALPS inlet) <sup>※1</sup>		After secondary treatment (sample tank) <sup>※2</sup>	
		Analysis results [Bq/l] ※3	Ratio of legally required concentrations <sup>※4</sup>	Analysis results [Bq/l] ※3	Ratio of legally required concentrations <sup>※4</sup>
Cesium-134	60	29.3	0.49	ND (0.0760)	0.0013
Cesium-137	90	599	6.7	0.185	0.0021
Cobalt-60	200	36.3	0.18	0.333	0.0017
Ruthenium-106	100	ND (5.00)	0.050	1.43	0.014
Antimony-125	800	83.0	0.10	0.226	0.00028
Strontium-90	30	64,600	2,155	0.0357	0.0012
Iodine-129	9	29.9	3.3	1.16	0.13
Carbon-14	2,000	15.3	0.0076	17.6	0.0088
Tritium	60,000	851,000	14.2	822,000	13.7

	Prior to secondary treatment (additional ALPS inlet) <sup>※1</sup>	After secondary treatment (Sample tank) <sup>※2</sup>
Primary 7 nuclides	2,165	0.15
Sum of the ratio of legally required concentrations for the nuclides targeted for removal (62 nuclides) + carbon-14	2,406	0.35

※1 Specimens sampled on September 19, 20 and 21 were mixed/agitated analyzed

※2 Specimens sampled on September 27 were analyzed

※3 "ND" indicates that results were below detectable limits and the detectable limits are noted in parentheses

※4 Detectable limits are used for calculation for nuclides for which the analysis results were below detectable limits

## <Reference> Secondary Treatment Performance Confirmation Test Result (J1-G group)

	Concentrations required by law [Bq/l]	Prior to secondary treatment (ALPS inlet) <sup>※1</sup>		After secondary treatment (sample tank) <sup>※2</sup>	
		Analysis results [Bq/l] ※3	Ratio of legally required concentrations <sup>※4</sup>	Analysis results [Bq/l] ※3	Ratio of legally required concentrations <sup>※4</sup>
Cesium-134	60	5.94	0.099	ND (0.0665)	0.0011
Cesium-137	90	118	1.3	0.329	0.0037
Cobalt-60	200	13.1	0.065	0.233	0.0012
Ruthenium-106	100	ND (2.27)	0.023	0.483	0.0048
Antimony-125	800	32.3	0.040	0.137	0.00017
Strontium-90	30	10,400	347	ND (0.0318)	0.0011
Iodine-129	9	2.79	0.31	0.328	0.036
Carbon-14	2,000	12.6	0.0063	15.6	0.0078
Tritium	60,000	273,000	4.6	272,000	4.5

	Prior to secondary treatment (additional ALPS inlet) <sup>※1</sup>	After secondary treatment (Sample tank) <sup>※2</sup>
Primary 7 nuclides	349	0.048
Sum of the ratio of legally required concentrations for the nuclides targeted for removal (62 nuclides) + carbon-14	387	0.22

※1 Specimens sampled on October 5, 6 and 7 were mixed/agitated analyzed

※2 Specimens sampled on October 13 were analyzed

※3 "ND" indicates that results were below detectable limits and the detectable limits are noted in parentheses

※4 Detectable limits are used for calculation for nuclides for which the analysis results were below detectable limits

## <Reference> Secondary treatment performance confirmation test result details (J1-C group)

	Nuclide (half-life)	Concentrations required by law [Bq/l]	Prior to secondary treatment		After secondary treatment		Notes
			Analysis results [Bq/l]	Ratio of legally required concentrations ※1	Analysis results [Bq/l]	Ratio of legally required concentrations ※1	
1	Rubidium-86 (Approx. 19 days)	300	ND (4.11)	0.014	ND (0.497)	0.0017	
2	Strontium-89 (Approx. 51 days)	300	ND (6,720)	22	ND (0.0537)	0.00018	
3	Strontium-90 (Approx. 29 years)	30	64,600	2,200	0.0357	0.0012	
4	Yttrium-90 (Approx. 64 hours)	300	64,600	220	0.0357	0.00012	In radioactive equilibrium with Strontium-90
5	Yttrium-91 (Approx. 59 days)	300	ND (84.5)	0.28	ND (16.5)	0.055	
6	Niobium-95 (Approx. 35 days)	1,000	ND (0.350)	0.00035	ND (0.0496)	0.000050	
7	Technetium-99 (Approx. 210,000 years)	1,000	17.4	0.017	ND (1.23)	0.0012	
8	Ruthenium-103 (Approx. 40 days)	1,000	ND (0.721)	0.00072	ND (0.0527)	0.000053	
9	Ruthenium-106 (Approx. 370 days)	100	ND (5.00)	0.050	1.43	0.014	
10	Rhodium-103m (Approx. 56 minutes)	200,000	ND (0.721)	0.0000036	ND (0.0527)	0.00000026	In radioactive equilibrium with Ruthenium-103
11	Rhodium-106 (Approx. 30 seconds)	300,000	ND (5.00)	0.000017	1.43	0.0000048	In radioactive equilibrium with Ruthenium-106
12	Silver-110m (Approx. 250 days)	300	ND (0.541)	0.0018	ND (0.0426)	0.00014	
13	Cadmium-113m (Approx. 15 years)	40	ND (20.5)	0.51	ND (0.0852)	0.0021	

※1 To 2 significant figures 6

## <Reference> Secondary treatment performance confirmation test result details (J1-C group)

	Nuclide (half-life)	Concentrations required by law [Bq/l]	Prior to secondary treatment		After secondary treatment		Notes
			Analysis results [Bq/l]	Ratio of legally required concentrations ※1	Analysis results [Bq/l]	Ratio of legally required concentrations ※1	
14	Cadmium-115m (Approx. 45 days)	300	ND (22.6)	0.075	ND (2.70)	0.0090	
15	Tin-119m (Approx. 290 days)	2,000	ND (390)	0.19	ND (42.4)	0.021	Assessed using the radiation concentration of Tin-123
16	Tin-123 (Approx. 130 days)	400	ND (60.6)	0.15	ND (6.59)	0.016	
17	Tin-126 (Approx. 100,000 years)	200	ND (2.88)	0.014	ND (0.292)	0.0015	
18	Antimony-124 (Approx. 60 days)	300	ND (0.279)	0.00093	ND (0.0967)	0.00032	
19	Antimony-125 (Approx. 3 years)	800	83.0	0.10	0.226	0.00028	
20	Tellurium-123m (Approx. 120 days)	600	ND (0.832)	0.0014	ND (0.0919)	0.00015	
21	Tellurium-125m (Approx. 58 days)	900	83.0	0.092	0.226	0.00025	In radioactive equilibrium with Antimony-125
22	Tellurium-127 (Approx. 9 hours)	5,000	ND (72.5)	0.015	ND (4.69)	0.00094	
23	Tellurium-127m (Approx. 110 days)	300	ND (75.3)	0.25	ND (4.87)	0.016	Assessed using the radiation concentration of Tellurium-127
24	Tellurium-129 (Approx. 70 minutes)	10,000	ND (12.7)	0.0013	ND (0.615)	0.000061	
25	Tellurium-129m (Approx. 34 days)	300	ND (13.1)	0.044	ND (1.37)	0.0046	
26	Iodine-129 (Approx. 16,000,000 years)	9	29.9	3.3	1.16	0.13	

※1 To 2 significant figures

<Reference> Secondary treatment performance confirmation test result details (J1-C group)

	Nuclide (half-life)	Concentrations required by law [Bq/l]	Prior to secondary treatment		After secondary treatment		Notes
			Analysis results [Bq/l]	Ratio of legally required concentrations ※1	Analysis results [Bq/l]	Ratio of legally required concentrations※1	
27	Cesium-134 (Approx. 2 years)	60	29.3	0.49	ND (0.0760)	0.0013	
28	Cesium-135 (Approx. 3,000,000 years)	600	0.00381	0.0000064	0.00000118	0.0000000020	Assessed using the radiation concentration of Cesium-137
29	Cesium-136 (Approx. 13 days)	300	ND (0.377)	0.0013	ND (0.0468)	0.00016	
30	Cesium-137 (Approx. 30 years)	90	599	6.7	0.185	0.0021	
31	Barium-137m (Approx. 3 minutes)	800,000	599	0.00075	0.185	0.00000023	In radioactive equilibrium with Cesium-137
32	Barium-140 (Approx. 13 days)	300	ND (2.40)	0.0080	ND (0.202)	0.00067	
33	Cerium-141 (Approx. 32 days)	1,000	ND (1.51)	0.0015	ND (0.262)	0.00026	
34	Cerium-144 (Approx. 280 days)	200	ND (6.84)	0.034	ND (0.569)	0.0028	
35	Praseodymium-144 (Approx. 17 minutes)	20,000	ND (6.84)	0.00034	ND (0.569)	0.000028	In radioactive equilibrium with Cerium-144
36	Praseodymium-144m (Approx. 7 minutes)	40,000	ND (6.84)	0.00017	ND (0.569)	0.000014	In radioactive equilibrium with Cerium-144
37	Promethium-146 (Approx. 6 years)	900	ND (1.23)	0.0014	ND (0.0666)	0.000074	
38	Promethium-147 (Approx. 3 years)	3,000	ND (4.08)	0.0014	ND (0.804)	0.00027	Assessed using the radiation concentration of Europium-154
39	Promethium-148 (Approx. 5 days)	300	ND (0.649)	0.0022	ND (0.233)	0.00078	

※1 To 2 significant figures 8



## <Reference> Secondary treatment performance confirmation test result details (J1-C group)

	Nuclide (half-life)	Concentrations required by law [Bq/l]	Prior to secondary treatment		After secondary treatment		Notes
			Analysis results [Bq/l]	Ratio of legally required concentrations ※1	Analysis results [Bq/l]	Ratio of legally required concentrations※1	
40	Promethium-148m (Approx. 41 days)	500	ND (0.634)	0.0013	ND (0.0484)	0.000097	
41	Samarium-151 (Approx. 87 years)	8,000	ND (0.0577)	0.0000072	ND (0.0114)	0.0000014	Assessed using the radiation concentration of Europium-154
42	Europium-152 (Approx. 13 years)	600	ND (2.70)	0.0045	ND (0.284)	0.00047	
43	Europium-154 (Approx. 9 years)	400	ND (0.577)	0.0014	ND (0.114)	0.00028	
44	Europium-155 (Approx. 5 years)	3,000	ND (3.43)	0.0011	ND (0.336)	0.00011	
45	Gadolinium-153 (Approx. 240 days)	3,000	ND (3.17)	0.0011	ND (0.264)	0.000088	
46	Terbium-160 (Approx. 72 days)	500	ND (1.66)	0.0033	ND (0.143)	0.00029	
47	Plutonium-238 (Approx. 88 years)	4	0.570	0.14	ND (0.0325)	0.0081	Assessed as part of Gross-α radiation measurements
48	Plutonium-239 (Approx. 24,000 years)	4	0.570	0.14	ND (0.0325)	0.0081	Assessed as part of Gross-α radiation measurements
49	Plutonium-240 (Approx. 6,600 years)	4	0.570	0.14	ND (0.0325)	0.0081	Assessed as part of Gross-α radiation measurements
50	Plutonium-241 (Approx. 14 years)	200	20.7	0.10	ND (1.18)	0.0059	Assessed using the radiation concentration of Plutonium-238
51	Americium-241 (Approx. 430 years)	5	0.570	0.11	ND (0.0325)	0.0065	Assessed as part of Gross-α radiation measurements
52	Americium-242m (Approx. 150 years)	5	0.0103	0.0021	ND (0.000587)	0.00012	Assessed using the radiation concentration of Americium-241

<Reference> Secondary treatment performance confirmation test result details (J1-C group)

	Nuclide (half-life)	Concentrations required by law [Bq/l]	Prior to secondary treatment		After secondary treatment		Notes
			Analysis results [Bq/l]	Ratio of legally required concentrations ※1	Analysis results [Bq/l]	Ratio of legally required concentrations ※1	
53	Americium-243 (Approx. 7,400 years)	5	0.570	0.11	ND (0.0325)	0.0065	Assessed as part of Gross-a radiation measurements
54	Curium-242 (Approx. 160 days)	60	0.570	0.0095	ND (0.0325)	0.00054	Assessed as part of Gross-a radiation measurements
55	Curium-243 (Approx. 29 years)	6	0.570	0.095	ND (0.0325)	0.0054	Assessed as part of Gross-a radiation measurements
56	Curium-244 (Approx. 18 years)	7	0.570	0.081	ND (0.0325)	0.0046	Assessed as part of Gross-a radiation measurements
57	Manganese-54 (Approx. 310 days)	1,000	ND (0.362)	0.00036	ND (0.0383)	0.000038	
58	Iron-59 (Approx. 45 days)	400	ND (0.641)	0.0016	ND (0.0866)	0.00022	
59	Cobalt-58 (Approx. 71 days)	1,000	ND (0.344)	0.00034	ND (0.0411)	0.000041	
60	Cobalt-60 (Approx. 5 years)	200	36.3	0.18	0.333	0.0017	
61	Nickel-63 (Approx. 100 years)	6,000	51.9	0.0086	ND (8.45)	0.0014	
62	Zinc-65 (Approx. 240 days)	200	ND (0.719)	0.0036	ND (0.0941)	0.00047	
63	Carbon-14 (Approx. 5,700 years)	2,000	15.3	0.0076	17.6	0.0088	
Total			-	2,400	-	0.35	

※1 To 2 significant figures

<Reference> Secondary treatment performance confirmation test result details (J1-C group)

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Nuclide (half-life)	Concentrations required by law 【Bq/l】	Prior to secondary treatment		After secondary treatment		Notes
		Analysis results 【Bq/l】	Ratio of legally required concentrations※ 1	Analysis results 【Bq/l】	Ratio of legally required concentrations ※1	
Gross-α	-	0.570	-	ND (0.0325)	-	
Tritium (Approx. 12 years)	60,000	851,000	14	822,000	14	

※1 To 2 significant figures

## <Reference> Secondary treatment performance confirmation test result details (J1-G group)

	Nuclide (half-life)	Concentrations required by law [Bq/l]	Prior to secondary treatment		After secondary treatment		Notes
			Analysis results [Bq/l]	Ratio of legally required concentrations ※1	Analysis results [Bq/l]	Ratio of legally required concentrations※1	
1	Rubidium-86 (Approx. 19 days)	300	ND (2.56)	0.0085	ND (0.467)	0.0016	
2	Strontium-89 (Approx. 51 days)	300	ND (787)	2.6	ND (0.0452)	0.00015	
3	Strontium-90 (Approx. 29 years)	30	10,400	350	ND (0.0318)	0.0011	
4	Yttrium-90 (Approx. 64 hours)	300	10,400	35	ND (0.0318)	0.00011	In radioactive equilibrium with Strontium-90
5	Yttrium-91 (Approx. 59 days)	300	ND (48.2)	0.16	ND (11.8)	0.039	
6	Niobium-95 (Approx. 35 days)	1,000	ND (0.256)	0.00026	ND (0.0470)	0.000047	
7	Technetium-99 (Approx. 210,000 years)	1,000	1.2	0.0012	ND (1.29)	0.0013	
8	Ruthenium-103 (Approx. 40 days)	1,000	ND (0.339)	0.00034	ND (0.0506)	0.000051	
9	Ruthenium-106 (Approx. 370 days)	100	ND (2.27)	0.023	0.483	0.0048	
10	Rhodium-103m (Approx. 56 minutes)	200,000	ND (0.339)	0.0000017	ND (0.0506)	0.00000025	In radioactive equilibrium with Ruthenium-103
11	Rhodium-106 (Approx. 30 seconds)	300,000	ND (2.27)	0.0000076	0.483	0.0000016	In radioactive equilibrium with Ruthenium-106
12	Silver-110m (Approx. 250 days)	300	ND (0.292)	0.00097	ND (0.0400)	0.00013	
13	Cadmium-113m (Approx. 15 years)	40	ND (20.4)	0.51	ND (0.0855)	0.0021	

※1 To 2 significant figures

## <Reference> Secondary treatment performance confirmation test result details (J1-G group)

	Nuclide (half-life)	Concentrations required by law [Bq/l]	Prior to secondary treatment		After secondary treatment		Notes
			Analysis results [Bq/l]	Ratio of legally required concentrations ※1	Analysis results [Bq/l]	Ratio of legally required concentrations ※1	
14	Cadmium-115m (Approx. 45 days)	300	ND (11.6)	0.039	ND (2.29)	0.0076	
15	Tin-119m (Approx. 290 days)	2,000	ND (213)	0.11	ND (40.3)	0.020	Assessed using the radiation concentration of Tin-123
16	Tin-123 (Approx. 130 days)	400	ND (33.1)	0.083	ND (6.26)	0.016	
17	Tin-126 (Approx. 100,000 years)	200	ND (1.16)	0.0058	ND (0.147)	0.00073	
18	Antimony-124 (Approx. 60 days)	300	ND (0.220)	0.00073	ND (0.0842)	0.00028	
19	Antimony-125 (Approx. 3 years)	800	32.3	0.040	0.137	0.00017	
20	Tellurium-123m (Approx. 120 days)	600	ND (0.383)	0.00064	ND (0.0667)	0.00011	
21	Tellurium-125m (Approx. 58 days)	900	32.3	0.036	0.137	0.00015	In radioactive equilibrium with Antimony-125
22	Tellurium-127 (Approx. 9 hours)	5,000	ND (35.3)	0.0071	ND (4.33)	0.00087	
23	Tellurium-127m (Approx. 110 days)	300	ND (36.7)	0.12	ND (4.50)	0.015	Assessed using the radiation concentration of Tellurium-127
24	Tellurium-129 (Approx. 70 minutes)	10,000	ND (4.71)	0.00047	ND (0.594)	0.000059	
25	Tellurium-129m (Approx. 34 days)	300	ND (6.61)	0.022	ND (1.21)	0.0040	
26	Iodine-129 (Approx. 16,000,000 years)	9	2.79	0.31	0.328	0.036	

※1 To 2 significant figures

<Reference> Secondary treatment performance confirmation test result details (J1-G group)

	Nuclide (half-life)	Concentrations required by law [Bq/l]	Prior to secondary treatment		After secondary treatment		Notes
			Analysis results [Bq/l]	Ratio of legally required concentrations ※1	Analysis results [Bq/l]	Ratio of legally required concentrations ※1	
27	Cesium-134 (Approx. 2 years)	60	5.94	0.099	ND (0.0665)	0.0011	
28	Cesium-135 (Approx. 3,000,000 years)	600	0.000751	0.000001 3	0.00000210	0.0000000035	Assessed using the radiation concentration of Cesium-137
29	Cesium-136 (Approx. 13 days)	300	ND (0.196)	0.00065	ND (0.0363)	0.00012	
30	Cesium-137 (Approx. 30 years)	90	118	1.3	0.329	0.0037	
31	Barium-137m (Approx. 3 minutes)	800,000	118	0.00015	0.329	0.00000041	In radioactive equilibrium with Cesium-137
32	Barium-140 (Approx. 13 days)	300	ND (1.22)	0.0041	ND (0.173)	0.00058	
33	Cerium-141 (Approx. 32 days)	1,000	ND (0.939)	0.00094	ND (0.119)	0.00012	
34	Cerium-144 (Approx. 280 days)	200	ND (3.02)	0.015	ND (0.553)	0.0028	
35	Praseodymium-144 (Approx. 17 minutes)	20,000	ND (3.02)	0.00015	ND (0.553)	0.000028	In radioactive equilibrium with Cerium-144
36	Praseodymium-144m (Approx. 7 minutes)	40,000	ND (3.02)	0.000076	ND (0.553)	0.000014	In radioactive equilibrium with Cerium-144
37	Promethium-146 (Approx. 6 years)	900	ND (0.526)	0.00058	ND (0.0630)	0.000070	
38	Promethium-147 (Approx. 3 years)	3,000	ND (2.53)	0.00084	ND (0.720)	0.00024	Assessed using the radiation concentration of Europium-154
39	Promethium-148 (Approx. 5 days)	300	ND (0.519)	0.0017	ND (0.452)	0.0015	

※1 To 2 significant figures

<Reference> Secondary treatment performance confirmation test result details (J1-G group)

	Nuclide (half-life)	Concentrations required by law [Bq/l]	Prior to secondary treatment		After secondary treatment		Notes
			Analysis results [Bq/l]	Ratio of legally required concentrations ※1	Analysis results [Bq/l]	Ratio of legally required concentrations ※1	
40	Promethium-148m (Approx. 41 days)	500	ND (0.276)	0.00055	ND (0.0409)	0.000082	
41	Samarium-151 (Approx. 87 years)	8,000	ND (0.0357)	0.0000045	ND (0.0102)	0.0000013	Assessed using the radiation concentration of Europium-154
42	Europium-152 (Approx. 13 years)	600	ND (1.21)	0.0020	ND (0.190)	0.00032	
43	Europium-154 (Approx. 9 years)	400	ND (0.357)	0.00089	ND (0.102)	0.00025	
44	Europium-155 (Approx. 5 years)	3,000	ND (1.38)	0.00046	ND (0.175)	0.000058	
45	Gadolinium-153 (Approx. 240 days)	3,000	ND (1.21)	0.00040	ND (0.185)	0.000062	
46	Terbium-160 (Approx. 72 days)	500	ND (0.688)	0.0014	ND (0.135)	0.00027	
47	Plutonium-238 (Approx. 88 years)	4	ND (0.0319)	0.0080	ND (0.0280)	0.0070	Assessed as part of Gross-α radiation measurements
48	Plutonium-239 (Approx. 24,000 years)	4	ND (0.0319)	0.0080	ND (0.0280)	0.0070	Assessed as part of Gross-α radiation measurements
49	Plutonium-240 (Approx. 6,600 years)	4	ND (0.0319)	0.0080	ND (0.0280)	0.0070	Assessed as part of Gross-α radiation measurements
50	Plutonium-241 (Approx. 14 years)	200	ND (1.16)	0.0058	ND (1.02)	0.0051	Assessed using the radiation concentration of Plutonium-238
51	Americium-241 (Approx. 430 years)	5	ND (0.0319)	0.0064	ND (0.0280)	0.0056	Assessed as part of Gross-α radiation measurements
52	Americium-242m (Approx. 150 years)	5	ND (0.000577)	0.00012	ND (0.000505)	0.00010	Assessed using the radiation concentration of Americium-241

※1 To 2 significant figures

<Reference> Secondary treatment performance confirmation test result details (J1-G group)

	Nuclide (half-life)	Concentrations required by law [Bq/l]	Prior to secondary treatment		After secondary treatment		Notes
			Analysis results [Bq/l]	Ratio of legally required concentrations ※1	Analysis results [Bq/l]	Ratio of legally required concentrations ※1	
53	Americium-243 (Approx. 7,400 years)	5	ND (0.0319)	0.0064	ND (0.0280)	0.0056	Assessed as part of Gross-a radiation measurements
54	Curium-242 (Approx. 160 days)	60	ND (0.0319)	0.00053	ND (0.0280)	0.00047	Assessed as part of Gross-a radiation measurements
55	Curium-243 (Approx. 29 years)	6	ND (0.0319)	0.0053	ND (0.0280)	0.0047	Assessed as part of Gross-a radiation measurements
56	Curium-244 (Approx. 18 years)	7	ND (0.0319)	0.0046	ND (0.0280)	0.0040	Assessed as part of Gross-a radiation measurements
57	Manganese-54 (Approx. 310 days)	1,000	ND (0.202)	0.00020	ND (0.0379)	0.000038	
58	Iron-59 (Approx. 45 days)	400	ND (0.351)	0.00088	ND (0.0717)	0.00018	
59	Cobalt-58 (Approx. 71 days)	1,000	ND (0.211)	0.00021	ND (0.0374)	0.000037	
60	Cobalt-60 (Approx. 5 years)	200	13.1	0.065	0.233	0.0012	
61	Nickel-63 (Approx. 100 years)	6,000	ND (18.4)	0.0031	ND (8.84)	0.0015	
62	Zinc-65 (Approx. 240 days)	200	ND (0.435)	0.0022	ND (0.0797)	0.00040	
63	Carbon-14 (Approx. 5,700 years)	2,000	12.6	0.0063	15.6	0.0078	
Total			-	390	-	0.22	

※1 To 2 significant figures



<Reference> Secondary treatment performance confirmation test result details (J1-G group)

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Nuclide (half-life)	Concentrations required by law 【Bq/l】	Prior to secondary treatment		After secondary treatment		Notes
		Analysis results 【Bq/l】	Ratio of legally required concentrations ※1	Analysis results 【Bq/l】	Ratio of legally required concentrations ※1	
Gross-α	-	ND (0.0319)	-	ND (0.0280)	-	
Tritium (Approx. 12 years)	60,000	273,000	4.6	272,000	4.5	

※1 To 2 significant figures