

<Reference>

# **Enhancement of Monitoring Plan at the East Side of Unit 1-4 Turbine Buildings and in the Port at Fukushima Daiichi Nuclear Power Station**

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**Tokyo Electric Power Company**



# Purpose of the Enhancement of Monitoring Plan

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## ■ Purpose

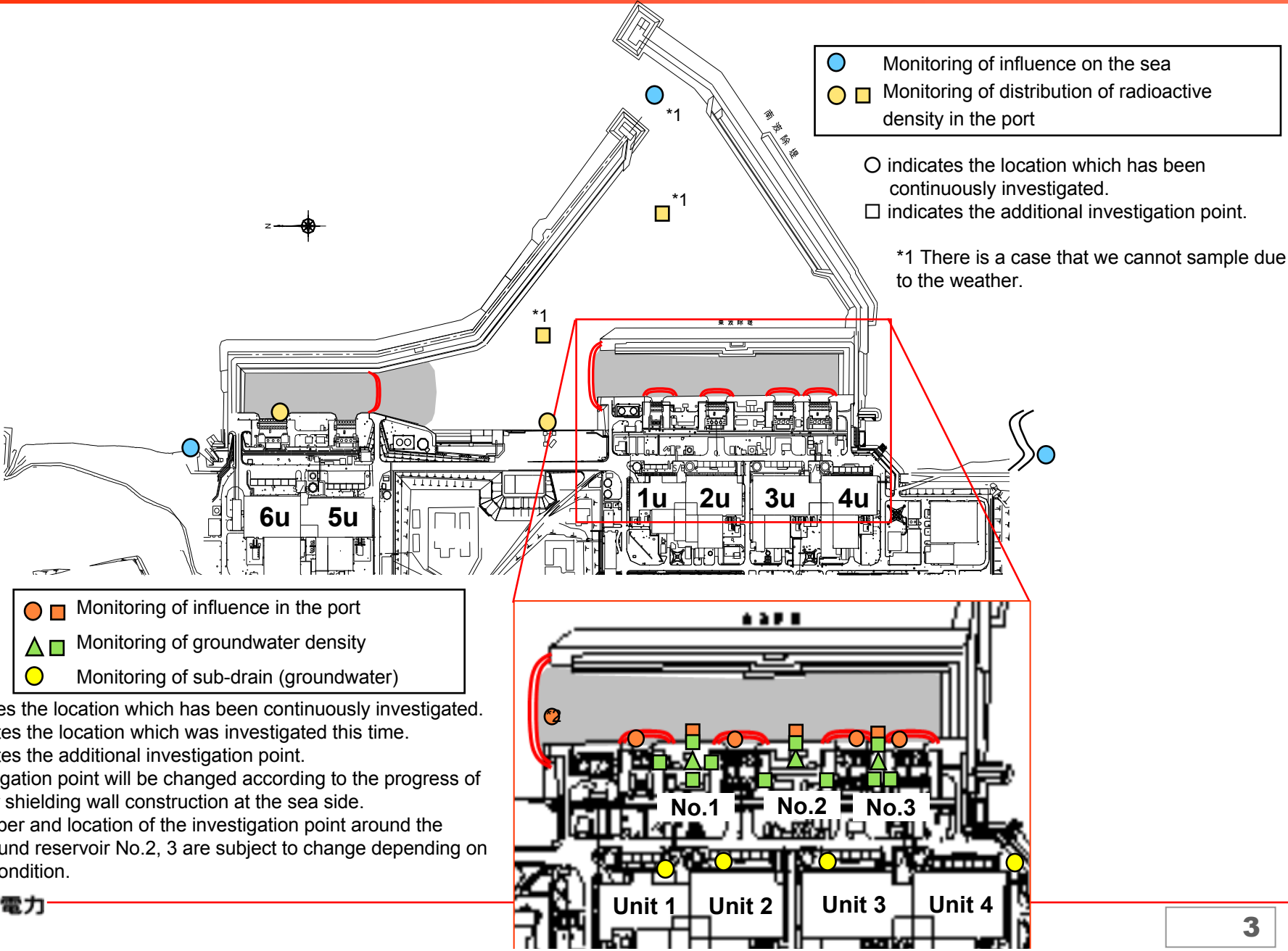
- Since high density of radioactive materials (tritium: 500,000Bq/L, strontium: 1,000Bq/L) was detected from groundwater obtained in the sea side observation holes at Unit 1,2 Turbine Building, groundwater quality survey will be performed around the sea side observation holes in order to determine the source and the extent of the materials.
- Seawater monitoring around Unit 1-4 water intake channel will be enhanced in order to monitor whether the radioactive materials included in groundwater affect the sea.
- Monitoring at the port entrance and around north/south discharge channel will be enhanced in order to assess the influence on the sea.

# Vision of the Enhancement of Monitoring Plan

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- Additional boring will be performed around the sea side observation holes (at 4 directions), in which highly radioactive material was detected. We will determine the extent of radioactive material by groundwater sampling.
- In addition to the sampling performed in front of the water intake channel so far, monitoring of the radioactive material densities at additional investigation points, which locates in front of the bank protection between the water intake channel at each Units, will be performed.
- Monitoring will be performed at additional investigation points, which locates in the port and at the port entrance, in order to assess the influence on the sea.
- In addition to the monitoring of cesium, which has been performed mostly so far, monitoring of tritium, all  $\beta$  and strontium will be performed. All  $\beta$  analysis, of which the analysis time is shorter, will be performed to see if there is any strontium or the other nuclides. Detailed analysis to identify strontium, of which the analysis time is longer, will be performed once a month.
- Frequency of analysis at investigation point, where no detection is found or the amount is stable (ex. all  $\beta$  at south discharge channel), will be reviewed appropriately.

# Enhancement of Monitoring (Sampling Locations)



# Enhancement of Monitoring (Analysis Item, Frequency)

Area	Sampling location	Current analysis item and frequency				Contents of the change <sup>*4</sup>				
		$\gamma$ ray	Tritium (3H)	All $\beta$	Sr-90	$\gamma$ ray	H-3	All $\beta$	Sr-90	
Around Unit 1-4 water intake channel	Between the water intake channel of Unit 1 and Unit 2 (surface layer)	-	-	-	-	1 time a week (3 times a week <sup>*5</sup> )	1 time a week (3 times a week <sup>*6</sup> )	1 time a week (3 times a week <sup>*5</sup> )	1 time a month	
	Between the water intake channel of Unit 1 and Unit 2 (lower layer)	-	-	-	-					
	Inside the silt fence of Unit 1	1 time a day	-	-	-	1 time a day	1 time a week	1 time a week	1 time a month	
	Inside the silt fence of Unit 2									
	North side of Unit 1-4 water intake channel <sup>*1</sup>	1 time a day	1 time a month	1 time a week	2 times a month	1 time a day	1 time a week	1 time a week	1 time a month <sup>*6</sup>	
	Outside the silt fence of Unit 1	1 time a day	-	-	-	1 time a day	-	-	-	
	Outside the silt fence of Unit 2									
	Between the water intake channel of Unit 2 and Unit 3 (surface layer)	-	-	-	-	-	1 time a week	1 time a week	1 time a week	1 time a month
	Between the water intake channel of Unit 3 and Unit 4 (surface layer)						1 time a week	1 time a week	1 time a week	1 time a month
	Inside the silt fence of Unit 3	1 time a day	-	-	-	2 times a month	1 time a day	1 time a week	1 time a week	1 time a month <sup>*6</sup>
	Inside the silt fence of Unit 4									
	Outside the silt fence of Unit 3	1 time a day	-	-	-	-	1 time a day	-	-	-
Outside the silt fence of Unit 4										
South side of Unit 1-4 water intake channel										
In the port	In front of shallow draft quay	1 time a day	-	-	-	1 time a day	1 time a week	1 time a week	1 time a month	
	In front of Unit 6 water intake channel	1 time a week	-	-	-	1 time a week	1 time a week	1 time a week	-	
	West side in the port <sup>*2</sup>	-	-	-	-	1 time a week	1 time a week	1 time a week	-	
	East side in the port <sup>*2</sup>									
	Port entrance <sup>*2</sup>	Non-regular <sup>*3</sup>	-	-	-	-	1 time a week	1 time a week	1 time a week	1 time a month
Around the north/south discharge channel	North side of Unit 5,6 discharge channel	1 time a day	1 time a month	1 time a month	1 time a month	1 time a day	1 time a week	1 time a week	1 time a month	
	Around the south discharge channel	1 time a day	1 time a month	1 time a day	1 time a month	1 time a day	1 time a week	1 time a day	1 time a month	
Land area (sea side of Unit 1-4 Turbine Building)	Underground reservoir No.1 (includes additional boring)	-	-	-	-	1 time a week (2 times a week <sup>*5</sup> )	1 time a week (2 times a week <sup>*5</sup> )	1 time a week (2 times a week <sup>*5</sup> )	1 time a month	
	Underground reservoir No.2 (includes additional boring)	-	-	-	-	1 time a week	1 time a week	1 time a week	Only for the first time	
	Underground reservoir No.3 (includes additional boring)									
	Unit 1 sub-drain	3 times a week	2 times a year	2 times a year	2 times a year	3 times a week	2 times a year	2 times a year	2 times a year	
	Unit 2 sub-drain	3 times a week	1 time a month	1 time a month	1 time a month	3 times a week	1 time a month	1 time a month	1 time a month	
	Unit 3 sub-drain	3 times a week	2 times a year	2 times a year	2 times a year	3 times a week	2 times a year	2 times a year	2 times a year	
Unit 4 sub-drain										

\*1 Sampling point will be changed according to the progress of the water shielding wall construction at the sea side.

\*2 There is a case that we cannot sample due to the weather.

\*3 Sampling and measurement will be performed in case vessel enters the water intake channel.

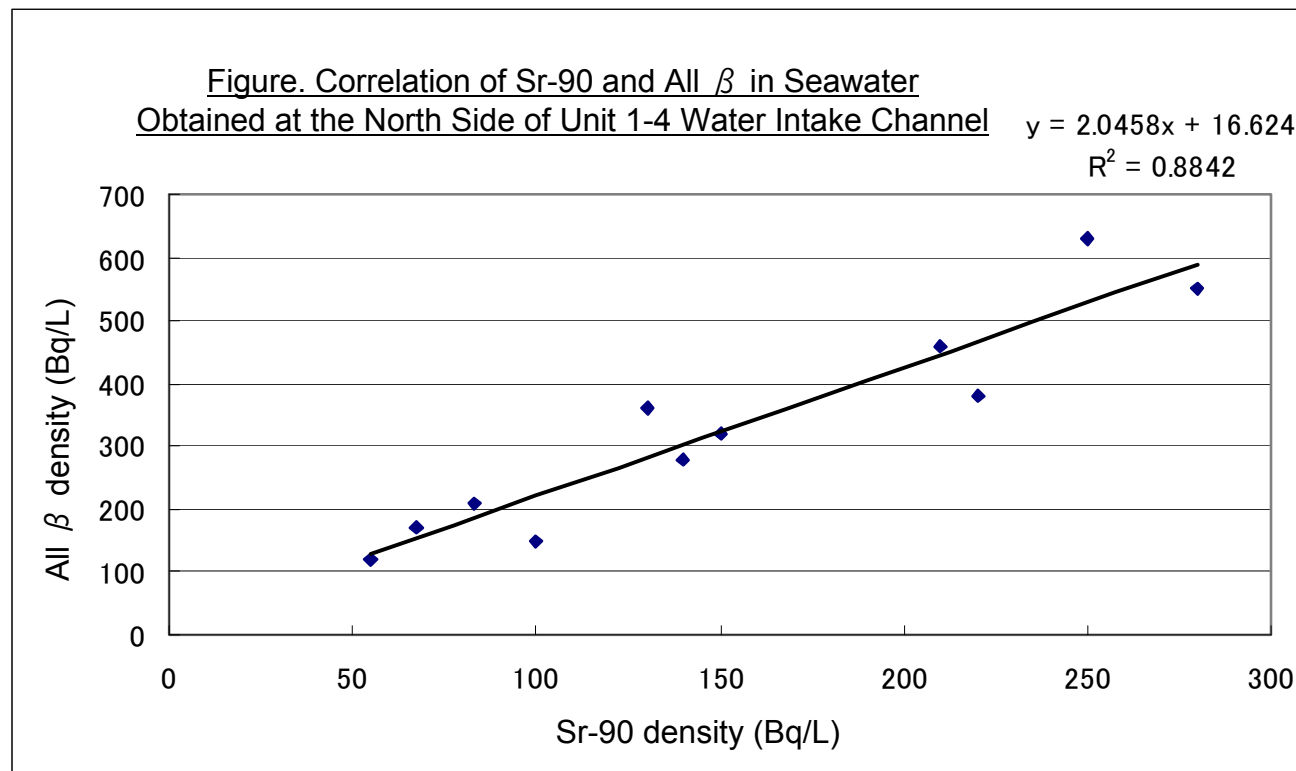
\*4 Measurement of  $\gamma$  ray, 3H and all  $\beta$  will be performed in order to monitor leakage to the sea. Measurement of strontium will be performed in order to compare with the notification level and to evaluate the exposure dose.

\*5 Monitoring will be enhanced until ground improvement at the bank protection between the water intake channel of Unit 1 and Unit 2 will be finished.

\*6 All  $\beta$  will be substituted for the monitoring of strontium taking analysis capacity into consideration.

## [Reference] Correlation of Sr-90 and All $\beta$ in Seawater Obtained at the North Side of Unit 1-4 Water Intake Channel

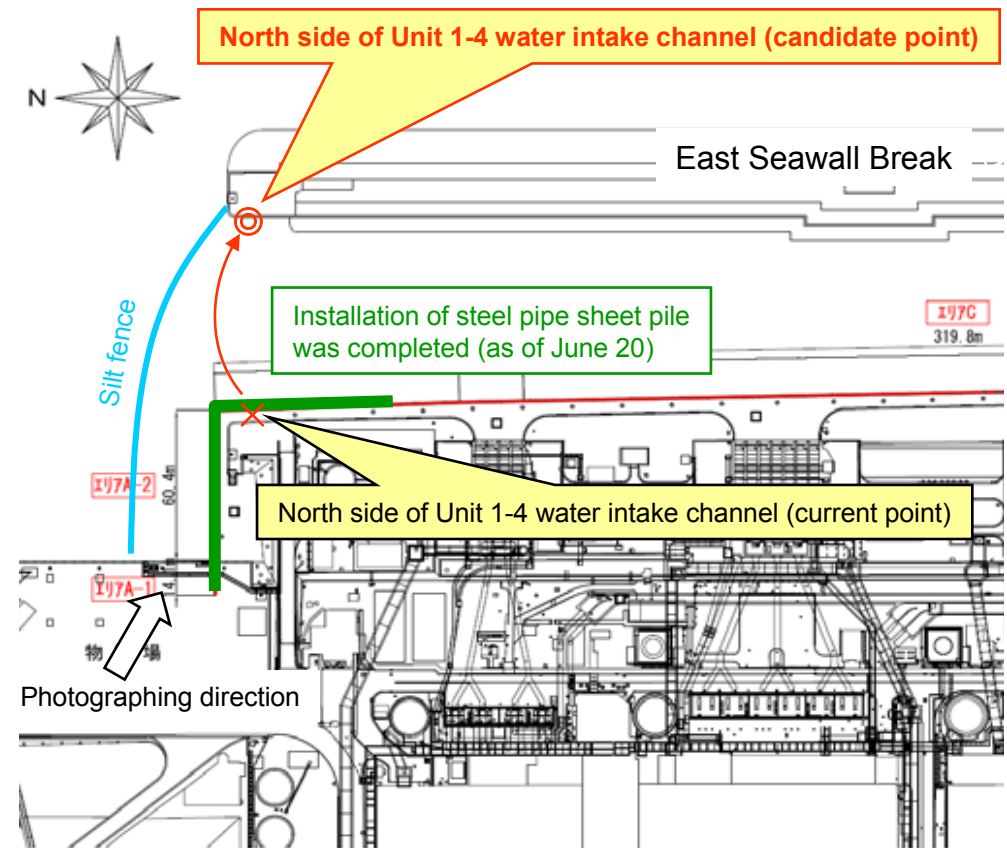
- Sr-90 is included in all  $\beta$  density since it is a pure  $\beta$  nuclide.
- Proportion of Sr-89 density in all  $\beta$  density is declining as time passes, due to the short half-life (approx. 51 days). Therefore, proportion of the Sr-90 density, which has a long half-life (approx. 29 years), is increasing as time passes.
- According to the measurement results collected so far, there is a positive correlation between all  $\beta$  density and Sr-90 density in the period, when the Sr-89 density declined and the density ratio of all  $\beta$  and Sr-90 was stable (since November 2011).



# Progress of the Water Shielding Wall Construction and the Sampling Points of Seawater



Condition at the north side of Unit 1-4 water intake channel



Current sampling point is closing due to the progress of the water shielding wall construction. Therefore, seawater sampling point <North side of Unit 1-4 water intake channel> will be changed after measurement and evaluation at current sampling point and candidate point will be finished.

Candidate point: on the tip of the East Seawall Break (opposite shore of the current sampling point)