

# Fukushima Daiichi Nuclear Power Station

## Tritium concentration analysis results from sea area monitoring (within 3km of the power station (near the discharge outlet))

< Reference document >  
September 1, 2023  
Tokyo Electric Power Company Holdings, Inc.  
Fukushima Daiichi Decontamination and  
Decommissioning Engineering Company

- In accordance with the Government's comprehensive monitoring plan, TEPCO formulated the sea area monitoring plan and has continued to monitor the conditions of the seawater and marine organisms, by measuring tritium concentrations etc., from before the commencement of discharge of ALPS treated water.
- In accordance with our sea area monitoring plan, tritium concentrations in seawater are analyzed using predetermined detection limits of 0.1Bq/liter or 0.4Bq/liter. Since the commencement of discharge (August 24), in addition to these conventional measurements, we have conducted the analyses with the detection limit set to 10Bq/liter in order to quickly obtain results and have confirmed that the concentrations of tritium are below the discharge suspension level (700Bq/liter) and the investigation level (350Bq/liter).

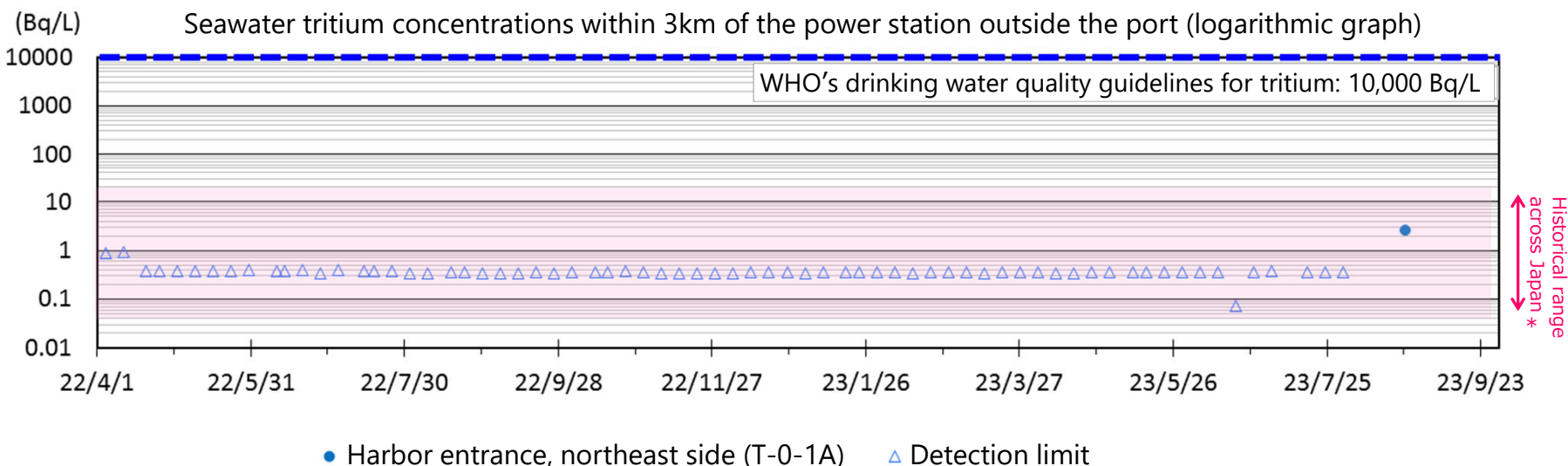
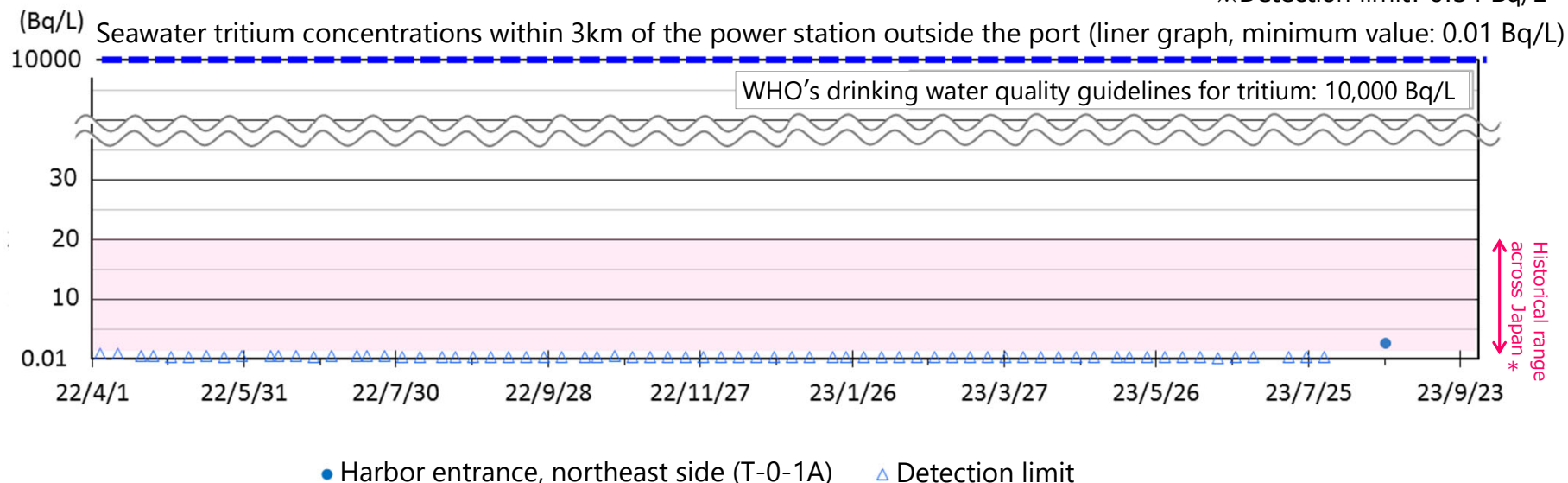
<announced by 31 August>

- The quick analysis results for samples taken on August 31 from 10 locations within 3km of the Fukushima Daiichi Nuclear Power Station have shown that the tritium concentration of the sample taken from the northeast side of the 1F port entrance (1km offshore, north of the site; approximately 200m from the discharge outlet [hereinafter referred to as, [T-0-1A]], which is the sampling point closest to the discharge outlet, was 10Bq/liter (detection limit: 8.4Bq/liter), and that the concentrations at all of the other nine locations were below detection limits (5.1~8.3Bq/liter).
- Furthermore, an analysis of samples taken on August 24 from the same 10 locations conducted based on the detection limit of 0.4Bq/liter found that the concentration of tritium at T-0-1A was 2.6Bq/liter (detection limit: 0.34Bq/liter), and that the concentrations at all of the other nine locations were below detection limits (detection limit: 0.32~0.35Bq/liter).
- All of these analysis results have shown of that tritium concentrations are below TEPCO's operational indices (discharge suspension level: 700Bq/liter, investigation level: 350Bq/liter within 3km of the power station), and that the ALPS treated water is being discharged safely as planned.
- Furthermore, we have not seen any inconsistencies when comparing these analysis results with trends seen in sea area dispersion simulations conducted during the Radiological Environmental Impact Assessment (construction stage).
- Analyses based on the detection limit of 0.4Bq/liter have been implemented from prior to the commencement of discharge, and over the last five years we have found that tritium concentrations fluctuate between 0.4~2.8Bq/liter.
- Based on these analysis results, we have confirmed that ALPS treated water is being sufficiently diluted and suitably dispersing in the vicinity of the power station. We will continue to carefully conduct quick analysis as well as conventional analyses (analyses based on the detection limit of 0.4 or 0.1Bq/liter) to measure tritium concentrations in the sea area and confirm that discharge is being carried out safely as planned.

# Seawater tritium concentration trends (Harbor entrance, northeast side: T-0-1A)

■ Measurement value: 2.6 Bq/L\* (Sampled on August 24) [Most recent measurement value: < 0.36 Bq/L (sampled on July 31)]

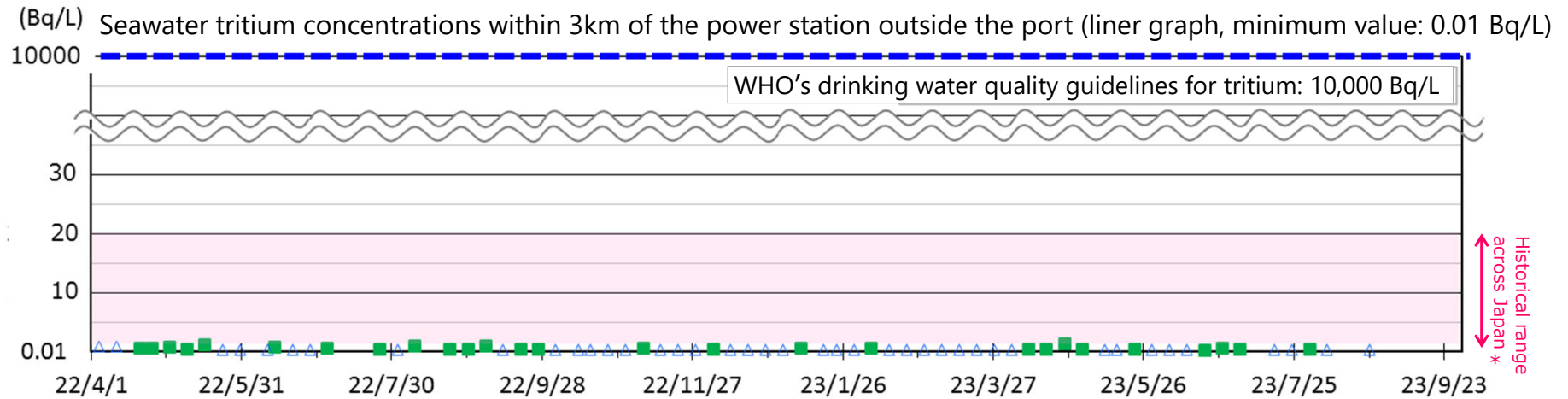
※Detection limit: 0.34 Bq/L



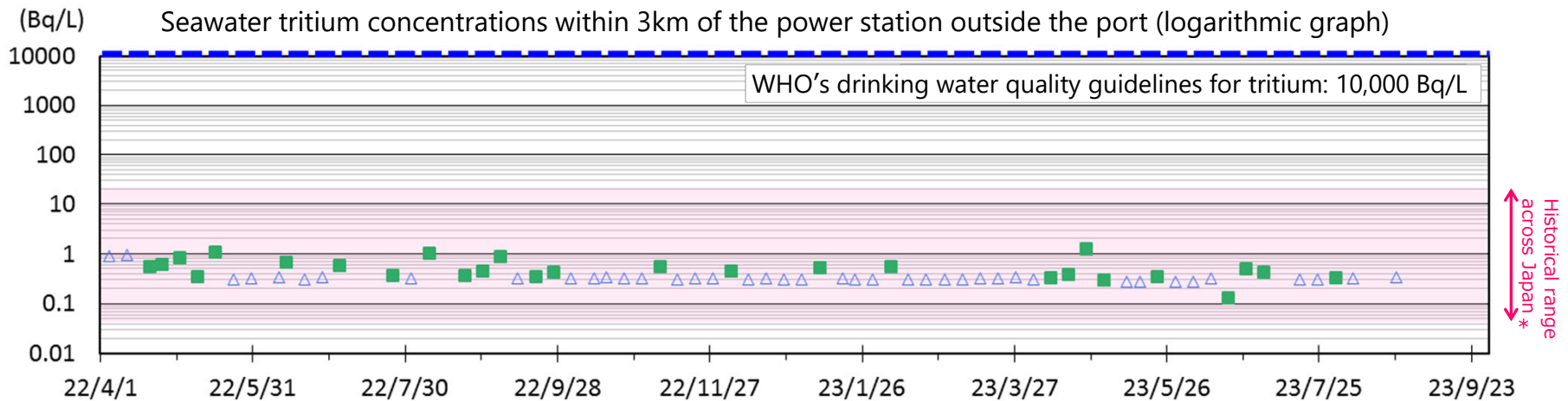
\*: Range of tritium concentration fluctuation between April 2019 ~ March 2022: 0.043 Bq/L ~ 20 Bq/L

# Seawater tritium concentration trends (Unit 5/6 discharge, north side: T-1)

■ Measurement value: < 0.34 Bq/L (Sampled on August 24) [Most recent measurement value: < 0.32 Bq/L (sampled on August 7)]



■ Unit 5/6 discharge, north side (T-1)      △ Detection limit

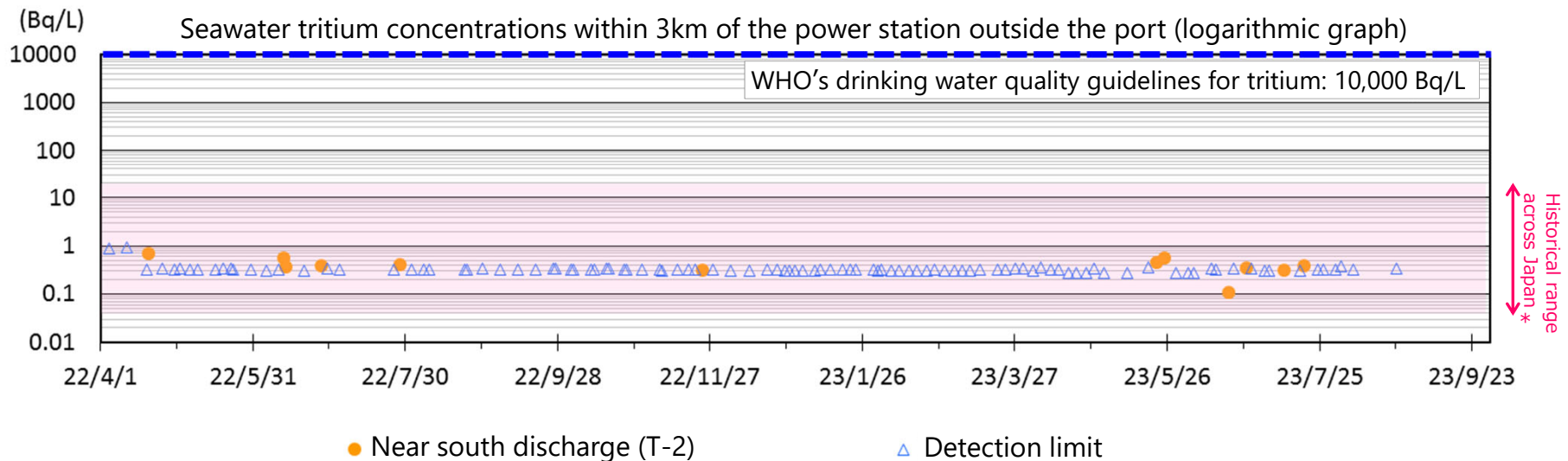
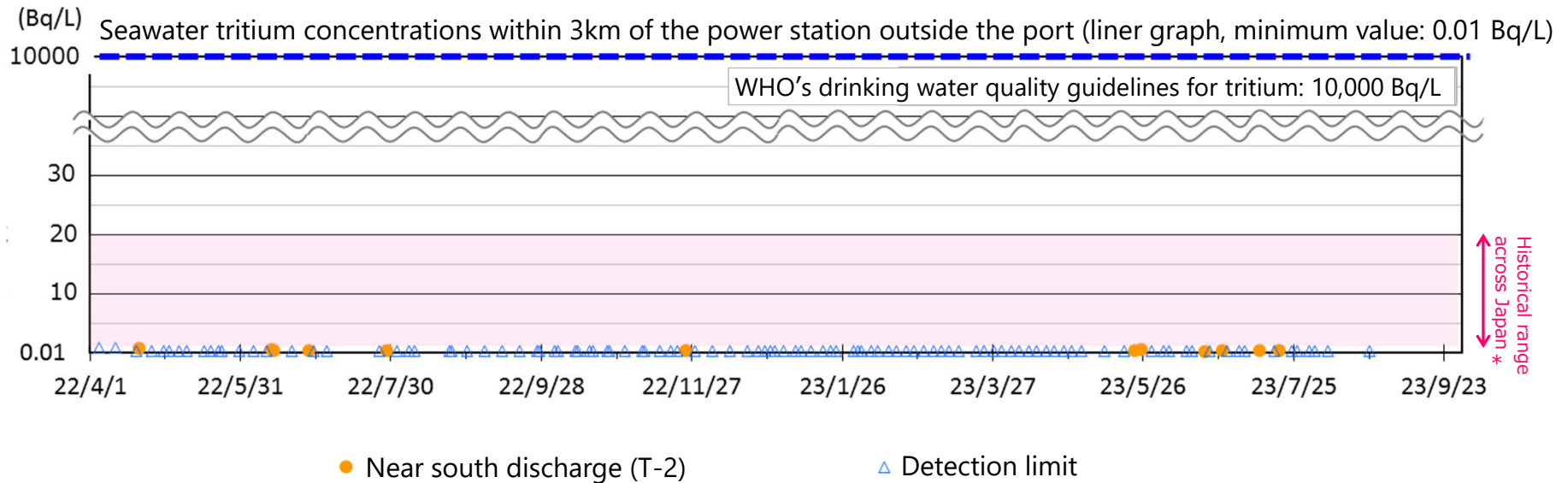


■ Unit 5/6 discharge, north side (T-1)      △ Detection limit

\*: Range of tritium concentration fluctuation between April 2019 ~ March 2022: 0.043 Bq/L ~ 20 Bq/L

# Seawater tritium concentration trends (Near south discharge: T-2)

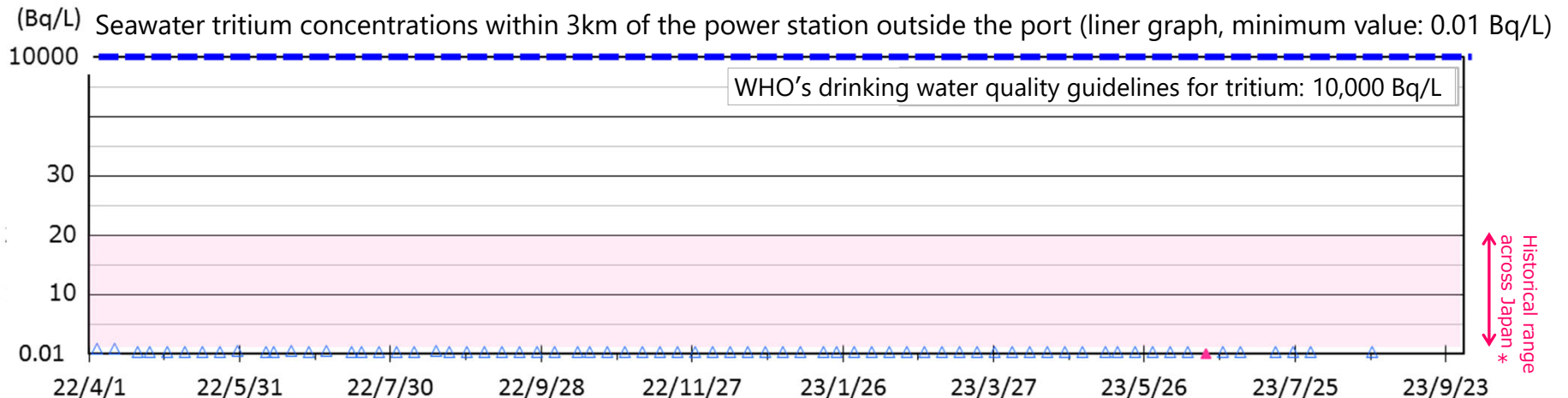
■ Measurement value: < 0.33 Bq/L (Sampled on August 24) [Most recent measurement value: < 0.32 Bq/L (sampled on August 7)]



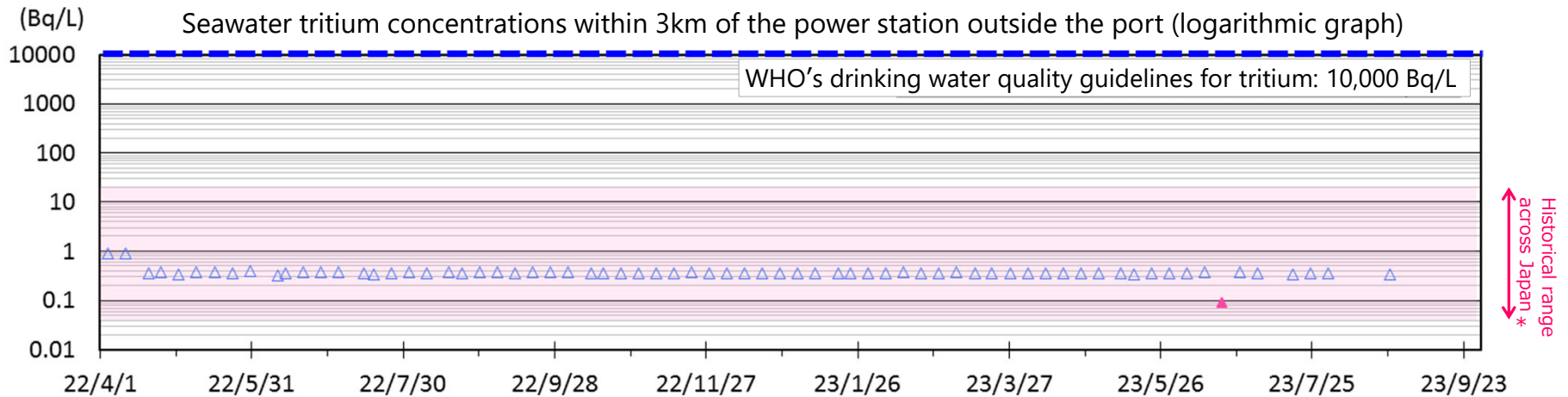
\*: Range of tritium concentration fluctuation between April 2019 ~ March 2022: 0.043 Bq/L ~ 20 Bq/L

# Seawater tritium concentration trends (North side of northern sea wall : T-0-1)

■ Measurement value: < 0.34 Bq/L (Sampled on August 24) [Most recent measurement value: < 0.35 Bq/L (sampled on July 31)]



▲ North side of northern sea wall (T-0-1)    △ Detection limit

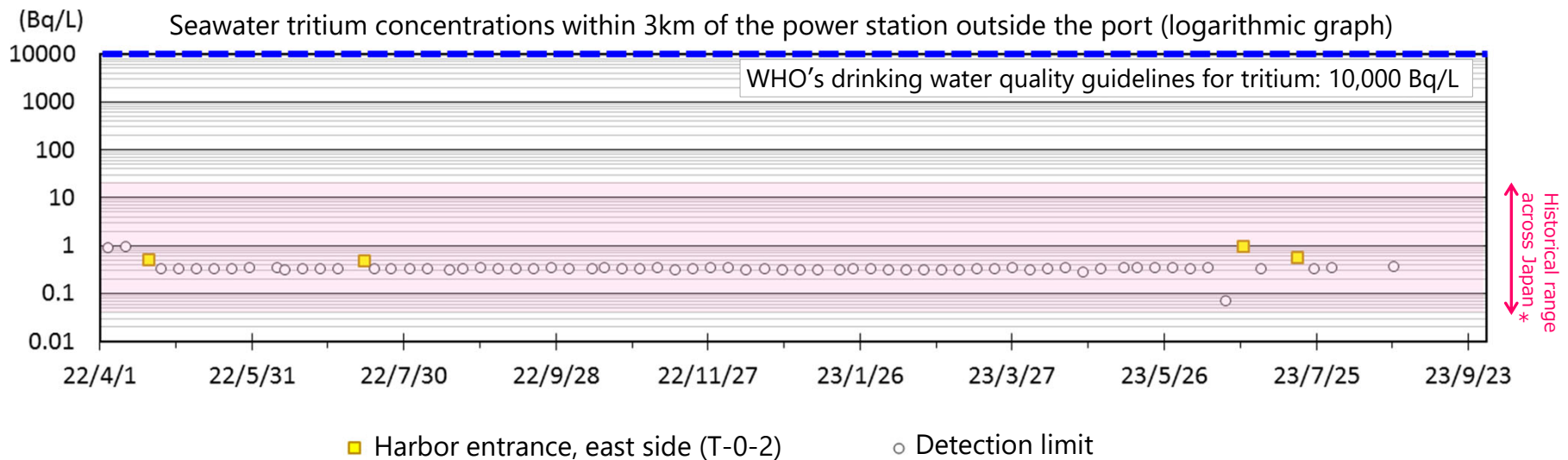
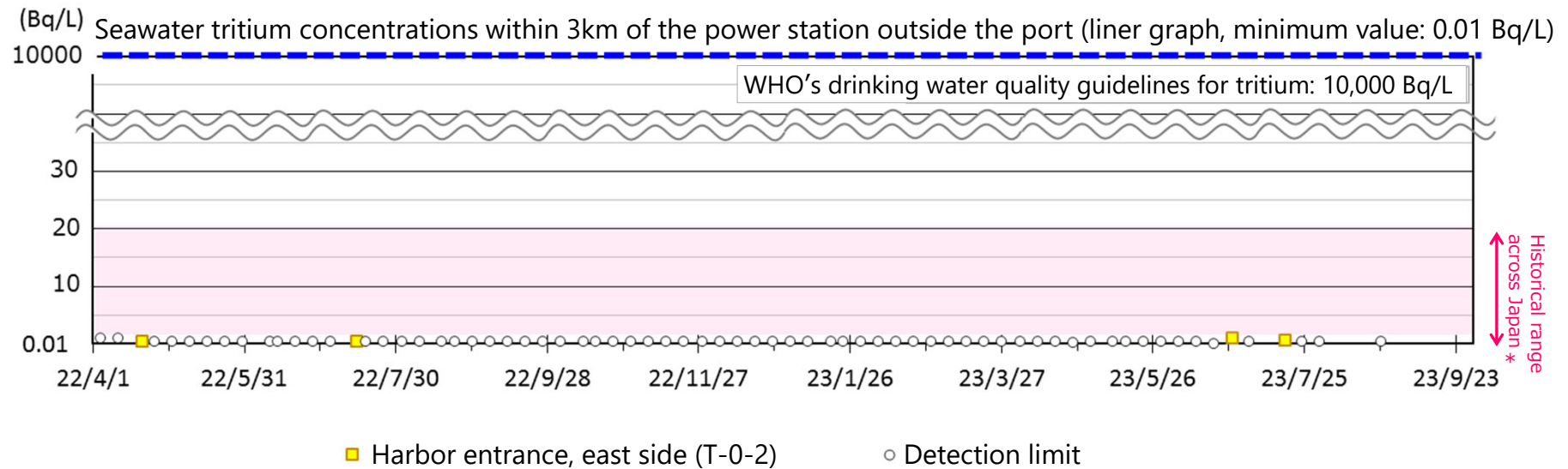


▲ North side of northern sea wall (T-0-1)    △ Detection limit

\*: Range of tritium concentration fluctuation between April 2019 ~ March 2022: 0.043 Bq/L ~ 20 Bq/L

# Seawater tritium concentration trends (Harbor entrance, east side : T-0-2)

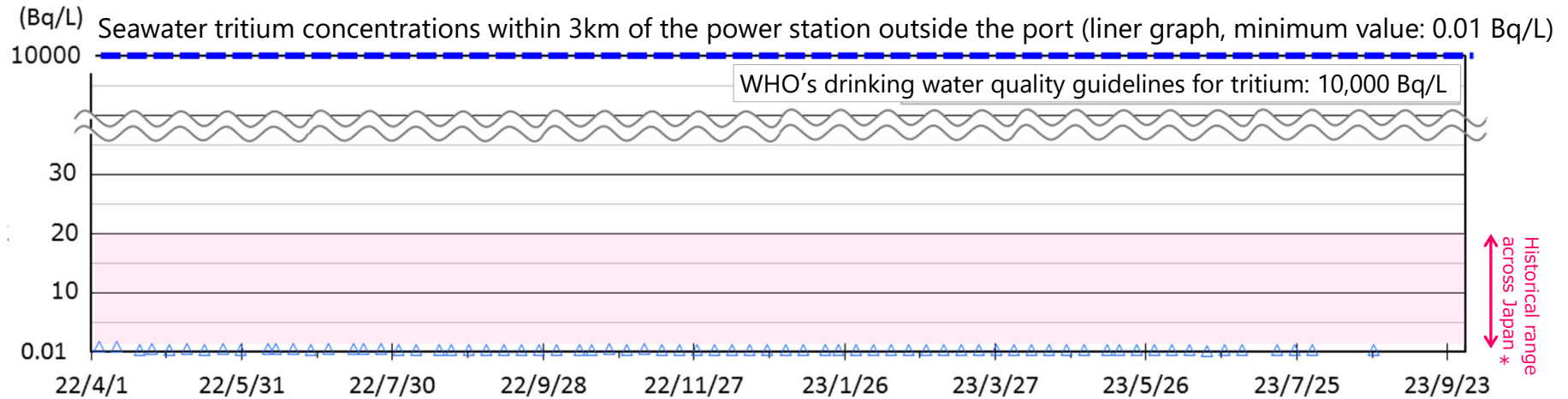
■ Measurement value: < 0.35 Bq/L (Sampled on August 24) [Most recent measurement value: < 0.34 Bq/L (sampled on July 31)]



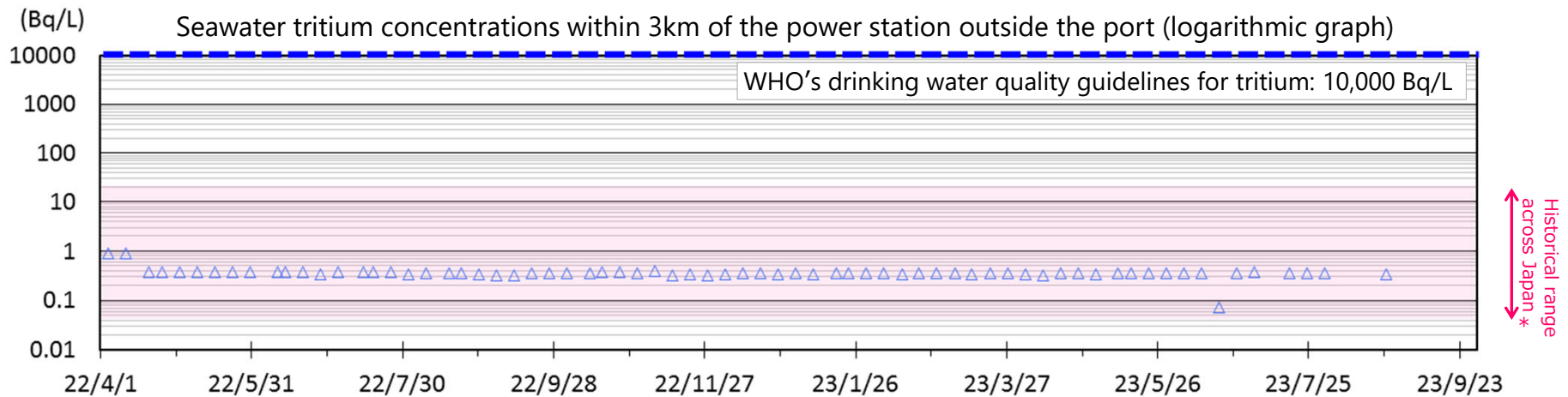
\*: Range of tritium concentration fluctuation between April 2019 ~ March 2022: 0.043 Bq/L ~ 20 Bq/L

# Seawater tritium concentration trends (Harbor entrance, southeast side : T-0-3A)

■ Measurement value: < 0.33 Bq/L (Sampled on August 24) [Most recent measurement value: < 0.36 Bq/L (sampled on July 31)]



● Harbor entrance, southeast side (T-0-3A) ▲ Detection limit

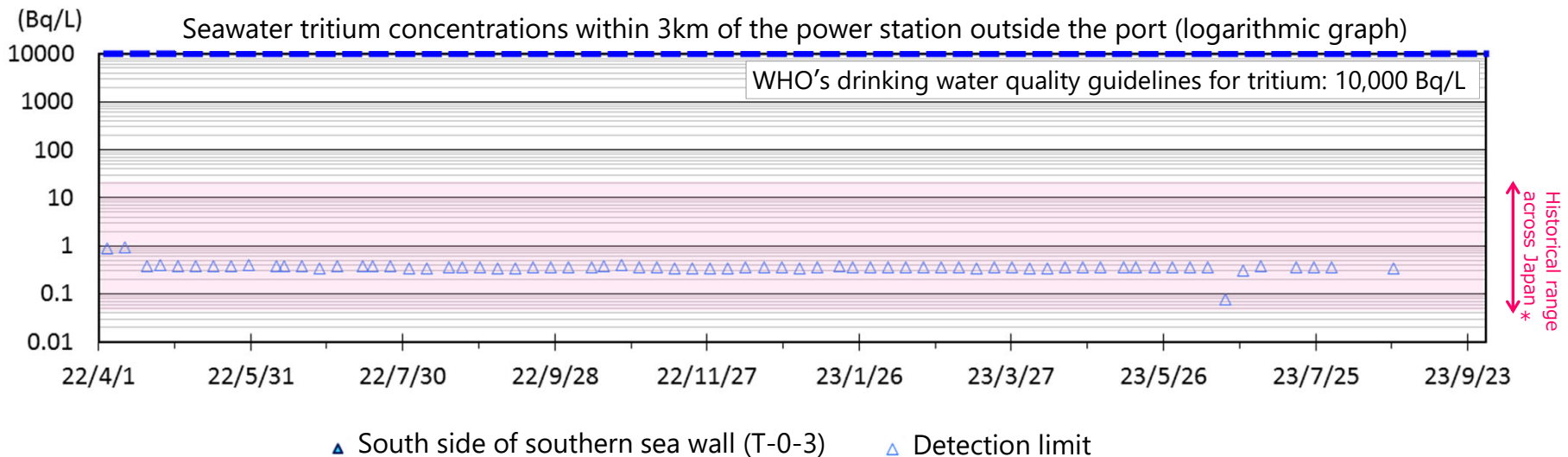
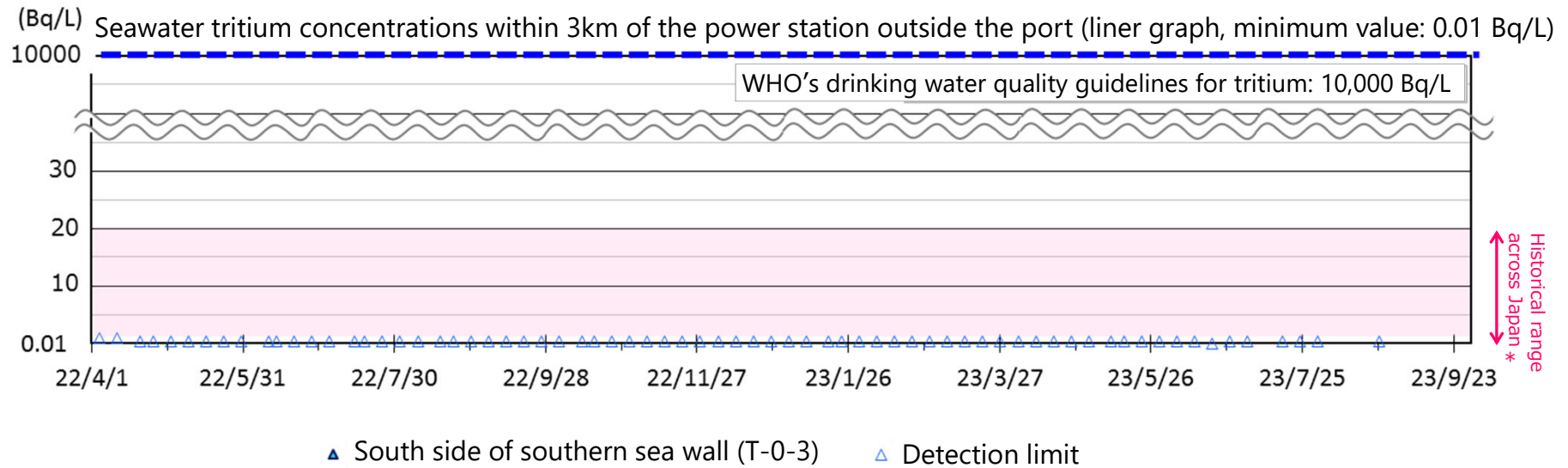


● Harbor entrance, southeast side (T-0-3A) ▲ Detection limit

\*: Range of tritium concentration fluctuation between April 2019 ~ March 2022: 0.043 Bq/L ~ 20 Bq/L

# Seawater tritium concentration trends (South side of southern sea wall : T-0-3)

■ Measurement value: < 0.34 Bq/L (Sampled on August 24) [Most recent measurement value: < 0.36 Bq/L (sampled on July 31)]

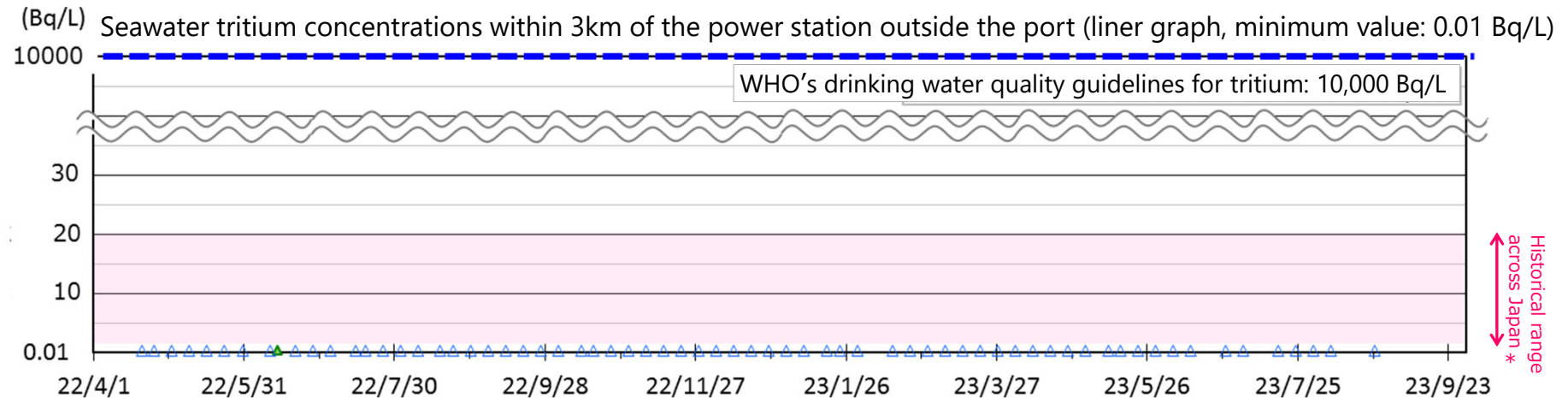


\*: Range of tritium concentration fluctuation between April 2019 ~ March 2022: 0.043 Bq/L ~ 20 Bq/L

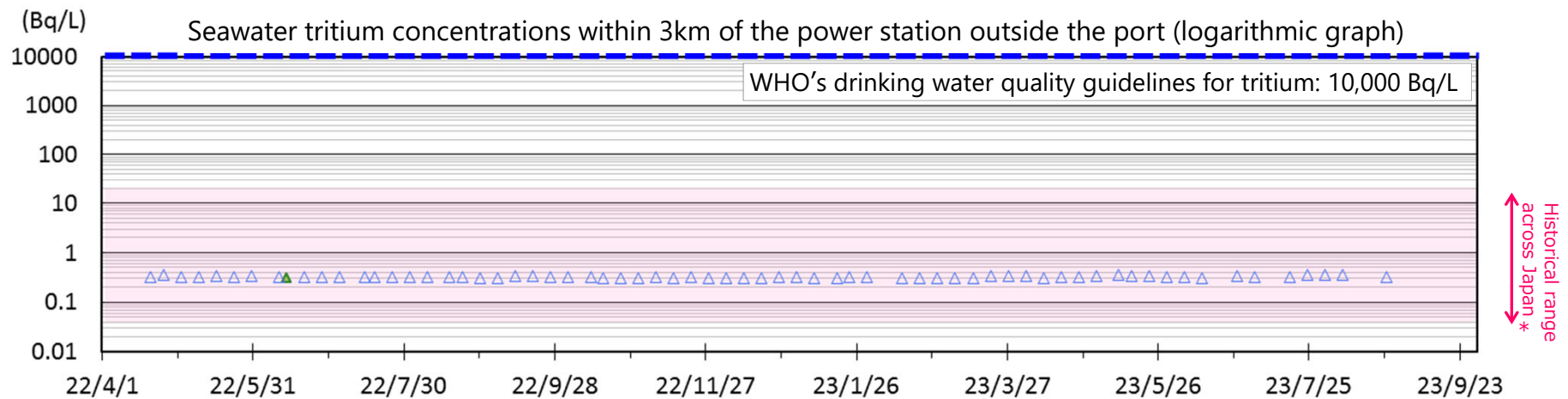


# Seawater tritium concentration trends (1.5km offshore north of the 1F site: T-A1)

■ Measurement value: < 0.32 Bq/L (Sampled on August 24) [Most recent measurement value: < 0.36 Bq/L (sampled on August 7)]



▲ 1.5km offshore north of the 1F site (T-A1)    △ Detection limit

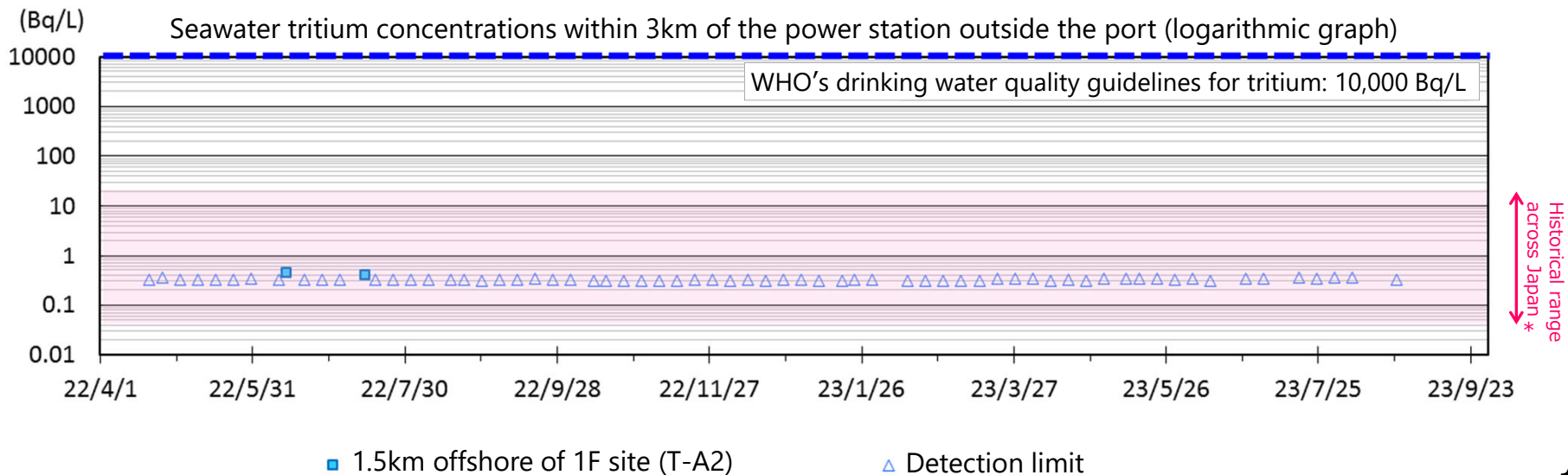
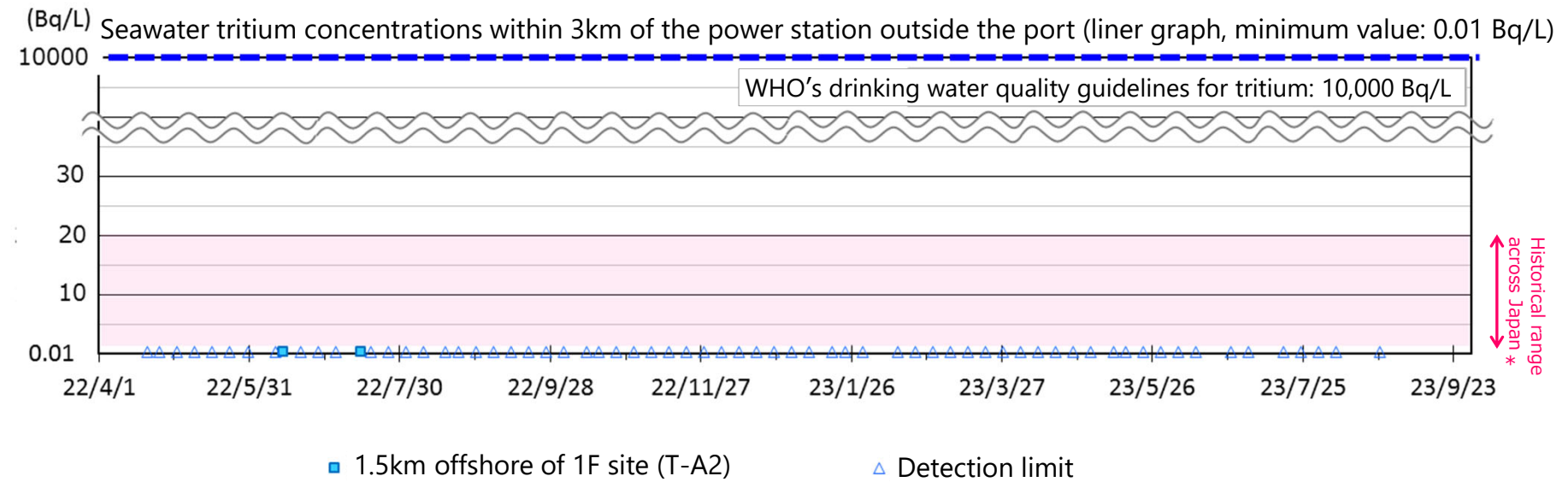


▲ 1.5km offshore north of the 1F site (T-A1)    △ Detection limit

\*: Range of tritium concentration fluctuation between April 2019 ~ March 2022: 0.043 Bq/L ~ 20 Bq/L

# Seawater tritium concentration trends (1.5km offshore of 1F site: T-A2)

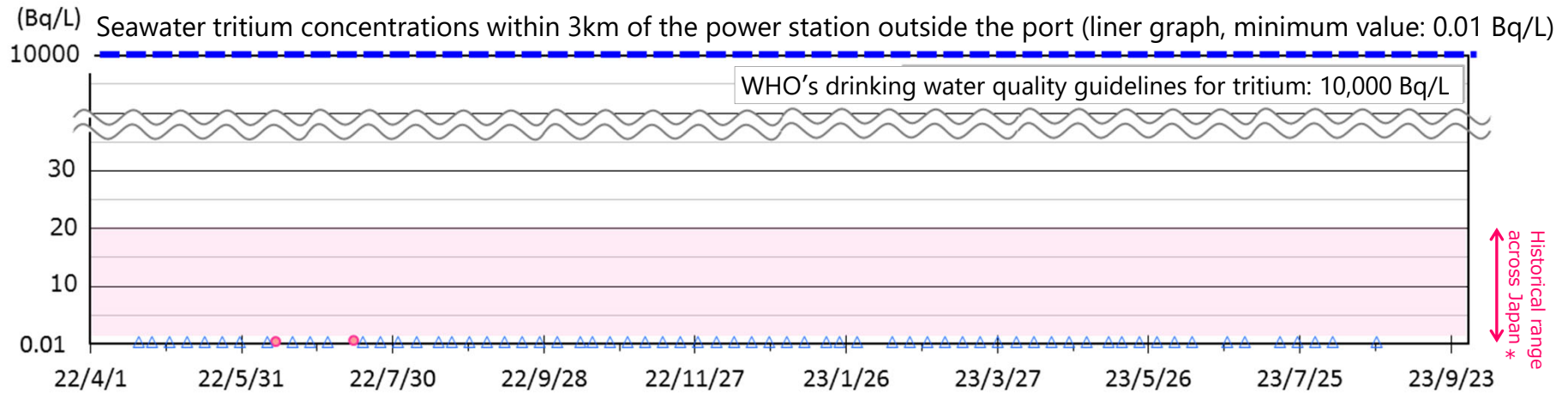
■ Measurement value: < 0.32 Bq/L (Sampled on August 24) [Most recent measurement value: < 0.35 Bq/L (sampled on August 7)]



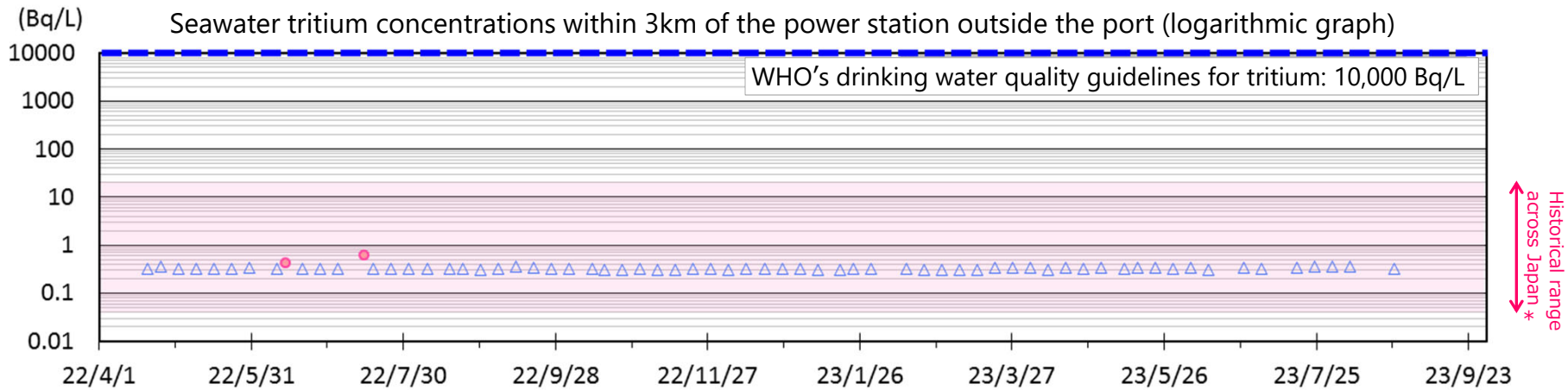
\*: Range of tritium concentration fluctuation between April 2019 ~ March 2022: 0.043 Bq/L ~ 20 Bq/L

# Seawater tritium concentration trends (1.5km offshore south of 1F site: T-A3)

■ Measurement value: < 0.32 Bq/L (Sampled on August 24) [Most recent measurement value: < 0.35 Bq/L (sampled on August 7)]



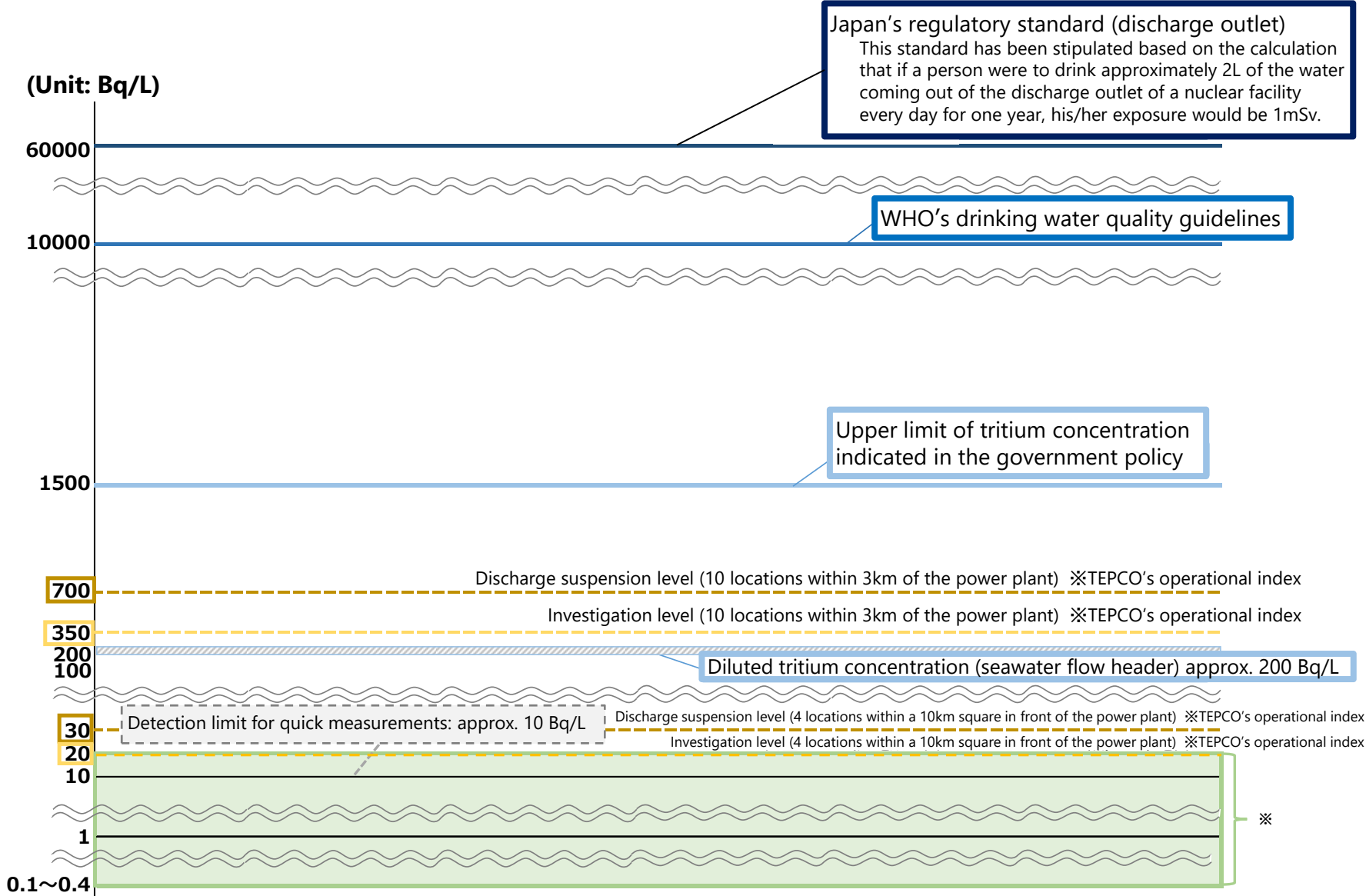
● 1.5km offshore south of 1F site: T-A3      △ Detection limit



● 1.5km offshore south of 1F site: T-A3      △ Detection limit

\*: Range of tritium concentration fluctuation between April 2019 ~ March 2022: 0.043 Bq/L ~ 20 Bq/L

# [Reference] Comparison of tritium concentrations



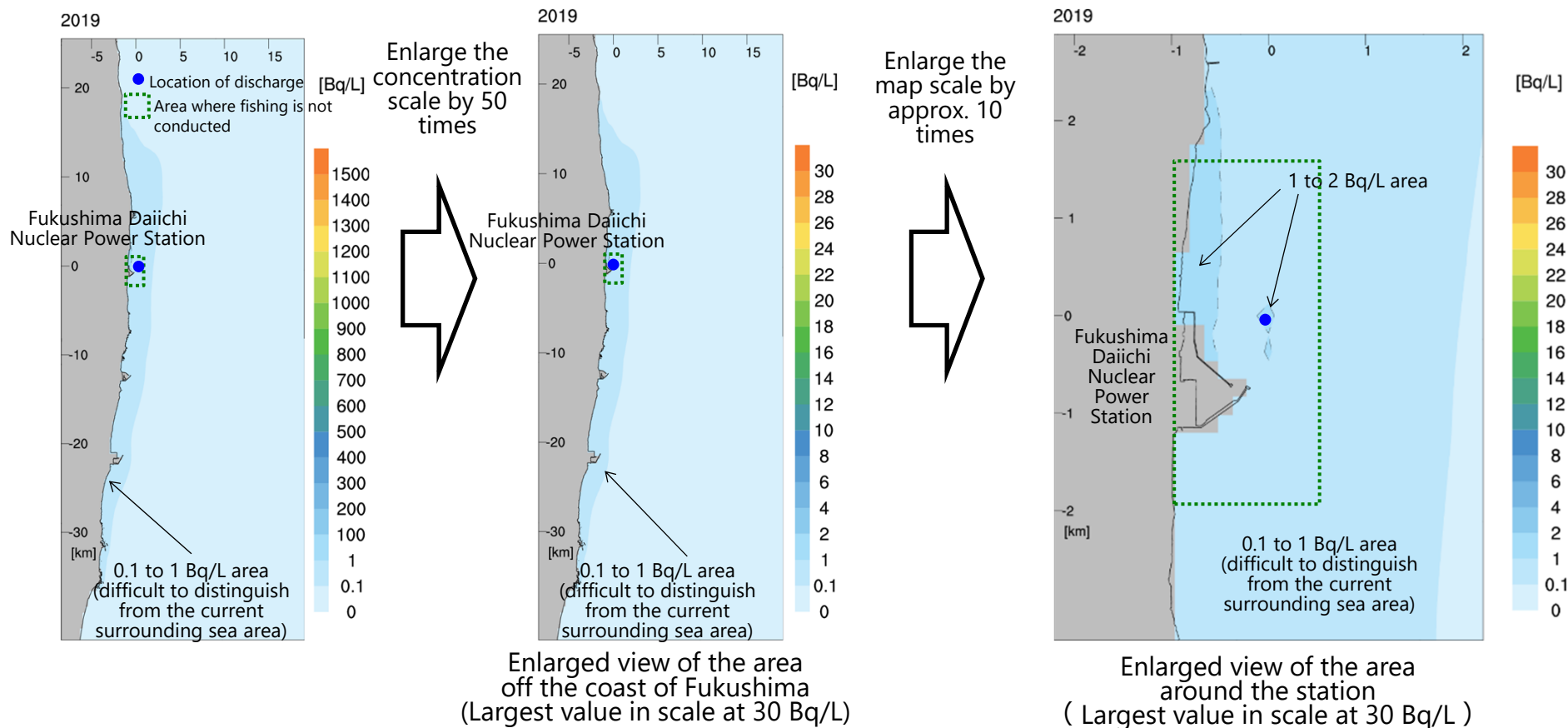
※ Historical range across Japan: approx. 0.043 ~ 20 Bq/L  
(source "Environmental Radioactivity and Radiation in Japan" (period: April 2019 to March 2022))

## [Reference] Results of dispersion simulation at sea



Assessment using the meteorological and sea conditions data from 2019 found that the area with higher tritium concentrations than the current surrounding area (0.1-1 Bq/L\*) (the area inside the dotted line) will be limited to the area 2 to 3 km from the station.

\*1/100,000 to 1/10,000 of the WHO Guidelines for drinking-water quality (10,000 Bq/L)



## **[Reference] Setting index (discharge suspension level, etc.) 1/2**

### ○ **Positioning of index (discharge suspension level)**

- In ALPS treated water will be discharged into the sea after dilution with seawater, the surrounding sea area has been monitored to ensure that the water to be discharged is dispersing sufficiently. Index, as discharge suspension level, has been set in order to determine if the discharge needs to be suspended as the facility operation in the event that sea area monitoring results indicate that the water to be discharged is not dispersing sufficiently (tritium concentration unusual situation). If the aforementioned set values are exceeded, the sea discharge will be immediately suspended.
- In order to quickly ascertain the tritium concentration conditions in the sea area, the detectable limits at 14 locations will be raised to **10 Bq/L**, and measurements will be taken.

### ○ **Setting index (discharge suspension level)**

#### ① **In the vicinity of the discharge outlet (10 locations within 3km of the power station): 700 Bq/L**

- Although the government's policy stipulates the upper limit of tritium concentration during the discharge at less than 1,500 Bq/L, the maximum management value during the discharge has been set approx. 700 Bq/L, which will not be exceeded 1,500 Bq/L even in consideration of facility and measurement uncertainties and also this value is included in the implementation plan.
- Based on this maximum management value, the index (discharge suspension level) for this area in the vicinity of the discharge outlet (within 3km from the power station) has been set at 700 Bq/L.

#### ② **Outside the vicinity of the discharge outlet (4 locations within a 10km square in front of the power station): 30 Bq/L**

- The index (discharge suspension level) for this area outside the vicinity of the discharge outlet (10km square in front of the power station) has been set at **30 Bq/L**, which is 1.5 times of 20 Bq/L, as the case which the maximum tritium concentration\* in the sea area in front of nuclear power stations throughout Japan over the last three years (20 Bq/L) clearly exceeds is considered to be an unusual situation.

\*: Maximum value in data for April 2019~March 2022 in the following database.

Source: Environmental Radioactivity and Radiation in Japan Environmental Radiation Database <https://www.kankyo-hoshano.go.jp/en/data-en/database-en/>

## **[Reference] Setting index (discharge suspension level, etc.) 2/2** **TEPCO**

### ○ **Responding to index (discharge suspension level) exceedance**

- After sea area monitoring measurement results have been fixed, values will be immediately checked and if the index (discharge suspension level) will be exceeded at even one location, the discharge will immediately be suspended. After the discharge is shut down, trends will be ascertained through more frequent monitoring and weather/sea conditions will be checked in order to assess dispersion conditions.
- However, even if index (700 Bq/L or 30 Bq/L) is exceeded, tritium concentration in the surrounding sea area was still fall below the legal requirement of 60,000 Bq/L and also the WHO's drinking water guidelines of 10,000 Bq/L, so the sea area will be considered to be safe.

### ○ **Recommencing discharge after discharge suspension**

- Facilities and operation status will be inspected for abnormalities, and operational procedures will be inspected for problems.
- Sea area monitoring results after suspension will be checked to confirm that concentrations are below index (discharge suspension level).
- After these checks have been completed, discharge will recommence after announcing the commencement of discharge.

### ○ **Setting investigation level**

- "Investigation level" has been also set as values that require action to be taken before index (discharge suspension level) is reached. The "investigation level" in the vicinity of the discharge outlet (10 locations within 3km of the power station) is **350 Bq/L** (one half of the index), and the investigation level outside the vicinity of the discharge outlet (4 locations within a 10km square in front of the power station) is **20 Bq/L** (a little more than one half of the index). If these values are exceeded, immediately facilities/operation status will be inspected for abnormalities and operational procedures will be inspected for problems. At the same time, seawater will be resampled and the frequency of monitoring will be increased as necessary in accordance with the sampling results.

### ○ **Responding to the results of sea area monitoring performed in accordance with the comprehensive monitoring plan**

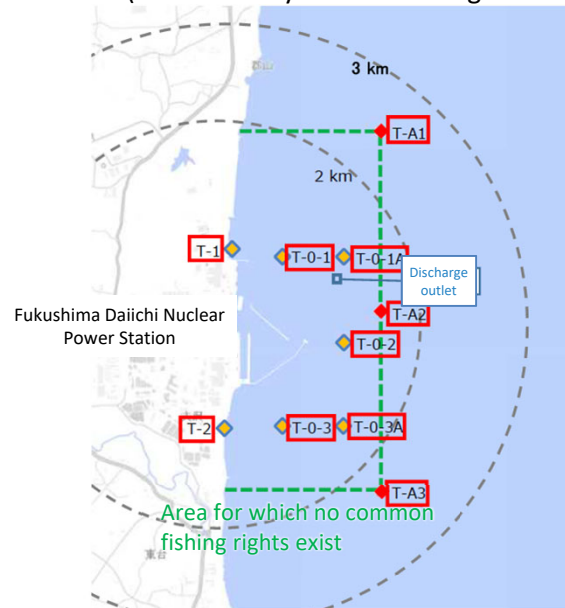
- If conditions that differ from normal are found during detailed monitoring by various agencies performed in accordance with the comprehensive monitoring plan, the necessary responses will be considered and implemented.

## [Reference] Manual shutdown by operators (in response to sea area monitoring)



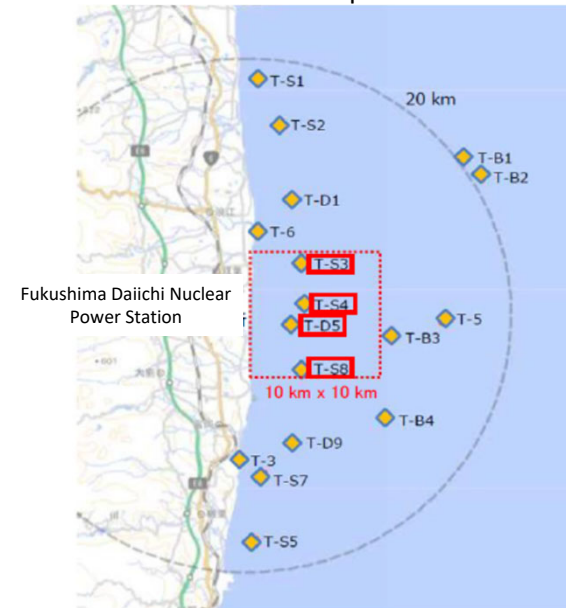
- Seawater tritium analysis is implemented once a week at all points on Figures 1 and 2 below, with the detection limit set to 0.1-0.4Bq/liter.
- In addition, quick tritium measurements with the detection limit set to 10Bq/liter will be implemented at the locations outlined in the red frames in Figures 1 and 2 below. In the case "discharge suspension level" indicators are exceeded, the discharge into the sea will be suspended.
- In light of the monitoring frequency outlined by the various organizations within the Comprehensive Monitoring Plan, frequency of quick tritium measurements specifically near the discharge outlets shown in Figure 1 will [be increased from once a week to every day for approximately one month after the start of the discharge into the sea.](#)

Figure 1. Sampling locations within a 3km radius of the power station  
(in the vicinity of the discharge outlet)



: Monitoring locations for quick tritium measurements (10 locations)  
**Indicator (discharge suspension level): 700Bq/liter**  
 Analysis frequency: once a week → [every day for approximately one month after the start of the discharge into the sea](#)

Figure 2. Sampling locations within a 10km square  
in front of the power station



: Monitoring locations for quick tritium measurements (4 locations)  
**Indicator (discharge suspension level): 30Bq/liter**  
 Analysis frequency: Once a week (T-D5),  
 Once a month (T-S3, T-S4, T-S8)