

# Installation of ALPS treated water dilution/discharge facility and related facilities



August 3, 2022

Tokyo Electric Power Company Holdings, Inc.

- Considering the Japanese government's basic policy announced in April 2021, TEPCO had been reviewing the details of the design and operation of ALPS treated water dilution/discharge facility and related facilities. On December 21, 2021, TEPCO submitted the "Application Documents for Approval to Amend the Implementation Plan for Fukushima Daiichi Nuclear Power Station Specified Nuclear Facility" for the basic design of ALPS treated water dilution/discharge facility and related facilities to the Nuclear Regulation Authority (NRA), and on July 22, 2022, these application documents were approved by the NRA.
- In December 2021, TEPCO also submitted a request for prior consent to Fukushima Prefecture, Okuma Town, and Futaba Town regarding the installation of ALPS treated water dilution/discharge facilities, etc. based on the "Agreement to Ensure Safety in Surrounding Areas Related the Decommissioning of Fukushima Daiichi Nuclear Power Station". On August 2, 2022, municipalities granted us prior consent after confirming the state of the necessary safety measures.
- In installing the ALPS treated water dilution/discharge facilities, etc., TEPCO will steadily implement initiatives based on the Japanese government's basic policy and will respond sincerely to each and every one of the eight requirements regarding additional safety improvements and easy-to-understand information dissemination laid out in the "Report on the Confirmation Results of the new Installation of ALPS Treated Water Dilution/Discharge Facility and Related Facilities at the TEPCO Fukushima Daiichi Nuclear Power Station" issued by the Fukushima Prefecture Nuclear Power Station Safety Assurance Technical Review Committee.
- Continuing to move steadily and safely forward with decommissioning/contaminated water and treated water measures at Fukushima Daiichi Nuclear Power Station requires risk reduction efforts in the long term. We will steadily work to further reduce the amount of contaminated water generated and to properly manage the radioactive waste generated in contaminated water treatment, which the prefectural governor and the mayors of the towns have given us on August 2, 2022.
- Furthermore, we will continue to do our utmost to increase the understanding of people of Fukushima and society at large regarding the handling of ALPS treated water as part of the decommissioning work, by focusing on our efforts to disseminate information based on scientific evidence to parties within and outside Japan in an easy-to-understand manner and taking every opportunity to listen to the concerns and opinions of the public and explain our approach and response.
- While construction of ALPS treated water dilution/discharge facilities, etc. will begin on August 4, 2022, with safety as the top priority, we will also work to build trust of people within and outside Japan, by responding sincerely to safety confirmation by municipalities and reviews by the International Atomic Energy Agency (IAEA) and disclosing the construction status as appropriate to secure objectivity and transparency.

# 1. Report on the Confirmation Results of the new Installation of ALPS Treated Water Dilution/Discharge Facility and Related Facilities



- We will respond seriously to each and every one of the results of the confirmation to the main items verified by the Fukushima Prefecture Nuclear Power Station Safety Assurance Technical Review Committee and requirements for TEPCO (8 items)\*.
- We will explain the status of our progress at technical review committee as soon as it is summarized.

Main confirmation items verified by the Technical Review Committee (12 points of confirmation)	
(1)	Secondary treatment of treated water to be re-purified
(2)	Reliability of measurements of treated water and discharge water
(3)	Dilution and discharge management
(4)	Response to malfunctions
(5)	Response to natural disasters
(6)	Detailed design of facilities and equipment
(7)	Management/maintenance of facilities and equipment
(8)	Safety in construction work
(9)	Disclosing measurement results
(10)	Structure/security quality management
(11)	Effective dose assessment at the site boundary
(12)	Radiological impact assessment for discharge into the sea

Requirements for TEPCO (8 items)	
(1)	Confirmation of radioactive materials contained in ALPS treated water
(2)	Appropriate operation and management for circulation and agitation of ALPS treated water
(3)	Management of radioactive materials contained in seawater for dilution
(4)	Effective maintenance plans for preventing problems
(5)	Measures to mitigate the effects on the environment should an event occur
(6)	Construction with safety as the top priority in a shortened construction period
(7)	Disseminating information such as measurements of the treated water in an easy-to-understand manner
(8)	Disseminating information such as radiological assessment in an easy-to-understand manner

\* Report on the Confirmation Results of the new Installation of ALPS Treated Water Dilution/Discharge Facility and Related Facilities at the TEPCO Fukushima Daiichi Nuclear Power Station (on July 26, 2022, the Fukushima Prefecture Nuclear Power Station Safety Assurance Technical Review Committee)

## 2-1 To foster understanding regarding our efforts

- Measures for decommissioning/contaminated water and treated water measures at Fukushima Daiichi Nuclear Power Station requires risk reduction efforts in the long term. TEPCO will continue to explain our approach and response to secure safety in equipment design, operation, management, radioactive material monitoring to the local community, people involved in the fisheries industry and other parties concerned and will **engage in and address each and every concern and question the people may have.**
- To **increase the understanding** of people within and outside Japan, we will continue and strengthen our efforts to **disseminate information** regarding ALPS treated water measurements, equipment operations, and radiological impact assessments **in an easy-to-understand manner.**

### Increase the understanding of the people domestic and abroad

- **Information dissemination through domestic and foreign media**

- We will issue press releases, hold press conferences and explanatory meetings and open the station to the public to make sure **information based on scientific evidence** is being communicated to the public.

- We have briefed **foreign major media** and the diplomatic missions and others, and held press tours. We have been also disseminating information to neighboring countries. We will be focusing our efforts on disseminating information to foreign media outlets and to embassies.

E.g., Briefed foreign media, and the diplomatic missions and others on May 10, 2022

- We will also disseminate information on decommissioning via the media.



Press conference

## 2-2 To foster understanding regarding our efforts

### Increase the understanding of the people domestic and abroad (continued)

- **Develop and expand tools to foster understanding (including for foreign audiences)**

- “Treated Water Portal Site”, a site dedicated to treated water within the TEPCO website, is gradually being expanded in Japanese, English, Chinese and Korean.

- Results of radioactive material monitoring will be disclosed in a timely manner.

- <https://www.tepco.co.jp/en/decommission/progress/watertreatment/index-e.html>

- ※The “TEPCO Shorts ALPS treated water” series launched on YouTube in Japanese and English on March 30, 2022.

- <https://www.tepco.co.jp/en/decommission/progress/watertreatment/link/index-e.html>

- ※Pamphlets that explain tritium and radiological impact assessment results have been printed in Japanese, English, Chinese, and Korean.

- **Progress in marine organisms rearing tests in seawater are being widely disseminated**

- On March 17, 2022, **rearing test of flounder using normal seawater around the station commenced**. The state of the marine organisms is shared on the company website and on Twitter in a timely manner.

- <http://www.tepco.co.jp/decommission/information/newsrelease/breedingtest/index-j.html> (in Japanese only)

- <https://twitter.com/TEPCOfishkeeper> (in Japanese only)



- **Rearing tests in ALPS treated water diluted with seawater** will be started around September 2022. Preparations are underway for the start of the rearing tests.

- ※ Share of marine organisms status on the website and regular publication of analysis results is scheduled to begin around September 2022.



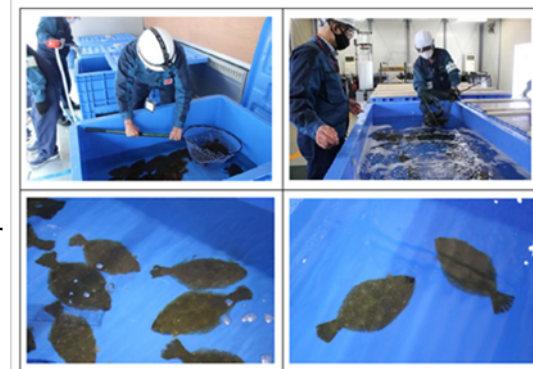
Overhauled in January 2022

#03

How do you check the safety of the sea?



TEPCO Shorts ALPS treated water



Marine organisms rearing

## 2-3 To foster understanding regarding our efforts

### Increase the understanding of the people domestic and abroad (continued)

- **Communicate with parties concerned at every opportunity**

- The whole company is working to explain our approach to the handling of ALPS treated water, safety measures, and measures to respond to adverse impact on reputation, and **listen to the opinions** of parties concerned, and of people in the region and in the Tokyo Metropolitan area. (Sessions held approx. 3000 times in FY2021)
- Since FY2019, TEPCO has **held Fukushima Daiichi Nuclear Power Station tour and roundtables** in 13 municipalities in the Hamadori region. These tours and roundtables have been expanded to other parts of Fukushima Prefecture in FY 2021 and FY 2022. (Planning to conduct 17 roundtables and tours in FY2022)
- We also offer **online tours that connect the visitors and the guide through the Internet** via the Fukushima Daiichi virtual tour videos on our website to address the needs of the people domestic and abroad. (August 2020 - July 2022, online visitors : 59 organizations, 2,250 people : including overseas organizations)
- We will continue to take proactively every opportunity to communicate with parties concerned, and opinions from the public will be used to **run the decommissioning project safely and steadily.**



Roundtable



Virtual tour





## 2-4 To foster understanding regarding our efforts

### Securing objectivity and transparency

- **Safety assessments by the International Atomic Energy Agency**

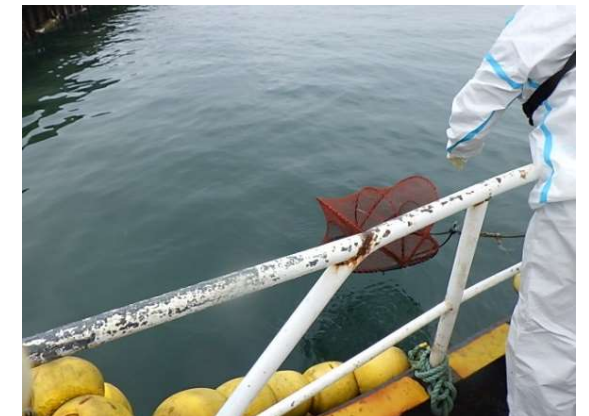
- In February 2022, IAEA staff and international experts from the US, UK, France, Russia, China, and Korea came to Japan to **technically verify our facilities according to international safety standards.** A safety assessment report based on this visit was published on April 29.
- The report states that in regards to the safety of the facilities, the IAEA has found that, "*...TEPCO successfully incorporated prevention measures in the design of the facility as well as in the associated operating procedures.*" And, in regards to the radiological impact assessment, "*...Task Force acknowledged the comprehensive and detailed assessment that was undertaken in the conduct of the REIA,*" adding that, "*...the doses to the assumed representative person are expected to be very low and significantly below the dose constraint set by the regulatory body (NRA).*"
- TEPCO will continue to make absolutely sure that it guarantees safety by checking under international safety standards, while providing information to parties both in Japan and overseas in a highly transparent manner.

- **Strengthening of sea monitoring**

- In March 2022, TEPCO set the radioactive material monitoring plan, which **enforced mainly tritium measurement** in seas off the coast of Fukushima near the station. (The Plan was put into effect in April 2022)
- **To secure transparency and objectivity** in the sea monitoring, we will ask local agriculture, forestry, fisheries producers and local government officials to participate in and observe sea area monitoring while promptly publishing the measurement result.



IAEA field inspection

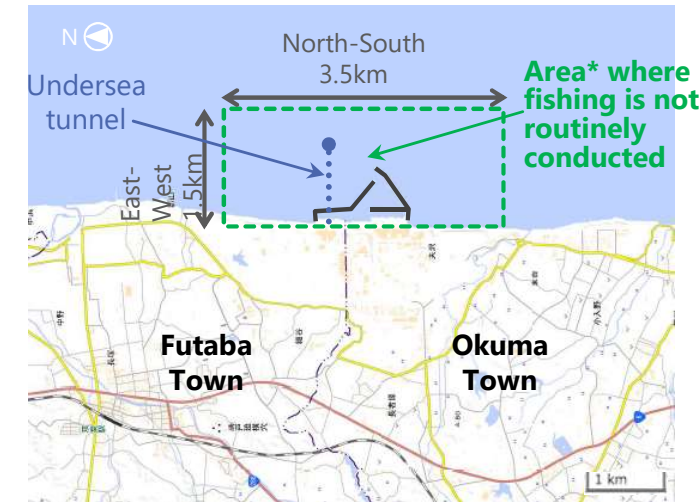


Sea area monitoring

# 3-1. Overview of the ALPS treated water dilution/discharge facility and related facilities



Source: Developed by Tokyo Electric Power Company Holdings, Inc. based on the map developed by the Geospatial Information Authority of Japan (electronic territory web)  
<https://maps.gsi.go.jp/#13/37.422730/141.044970/&base=std&ls=std&disp=1&vs=c1j0h0k0l0u0t0z0r0s0m0f1>



\*Area where common fishery rights are not set

## Secondary treatment facility (newly installed reverse osmosis membrane facility)

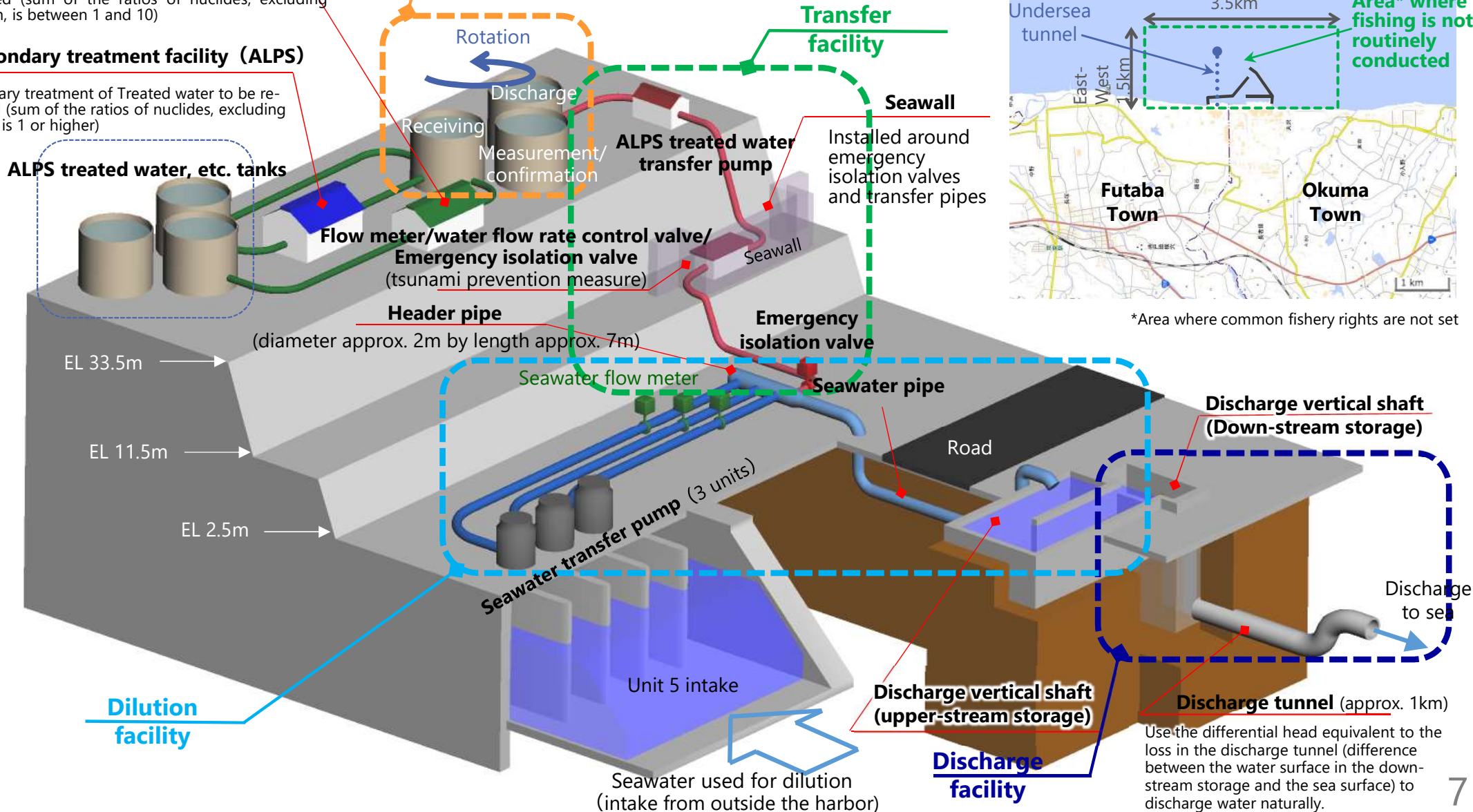
Secondary treatment of treated water to be re-purified (sum of the ratios of nuclides, excluding tritium, is between 1 and 10)

## Secondary treatment facility (ALPS)

Secondary treatment of Treated water to be re-purified (sum of the ratios of nuclides, excluding tritium, is 1 or higher)

## Measurement/confirmation facility (K4 tank group)

Comprised of three sets of tank groups each with the role of receiving, measurement/confirmation, and discharge. In the measurement/confirmation stage, water that has been made homogenized through circulation and agitating is sampled and analyzed (approx. 10,000m<sup>3</sup> × 3 groups)



Use the differential head equivalent to the loss in the discharge tunnel (difference between the water surface in the down-stream storage and the sea surface) to discharge water naturally.



## 3-2. Schedule for installing the ALPS treated water dilution/discharge facility and related facilities

- Based on the government's basic policy, we will be working with safety as top priority aiming for installation of the facilities in the spring of 2023.
- On the other hand, installation of the facilities may take place in the summer, because each process is subject to variable factors (uncertainties) such as weather and sea conditions.

	FY2022									FY2023			
	7	8	9	10	11	12	1	2	3	1Q	2Q	3Q	
Measurement/ confirmation facility		Install circulation pumps, agitating equipment and pipes											
Transfer facility / dilution facility		Install ALPS treated water transfer pumps, seawater transfer pumps and pipes											
						Build upper-stream storage							
Discharge facility								Build down-stream storage					
		Install discharge tunnels and discharge port caisson											
Others		Build partitioning weir											
System tests										Test-related			

※ The schedule may be revised based on progress made and other factors.

## **Type of construction to be started by facility**

**Measurement/confirmation facility**

Transfer facility/dilution facility

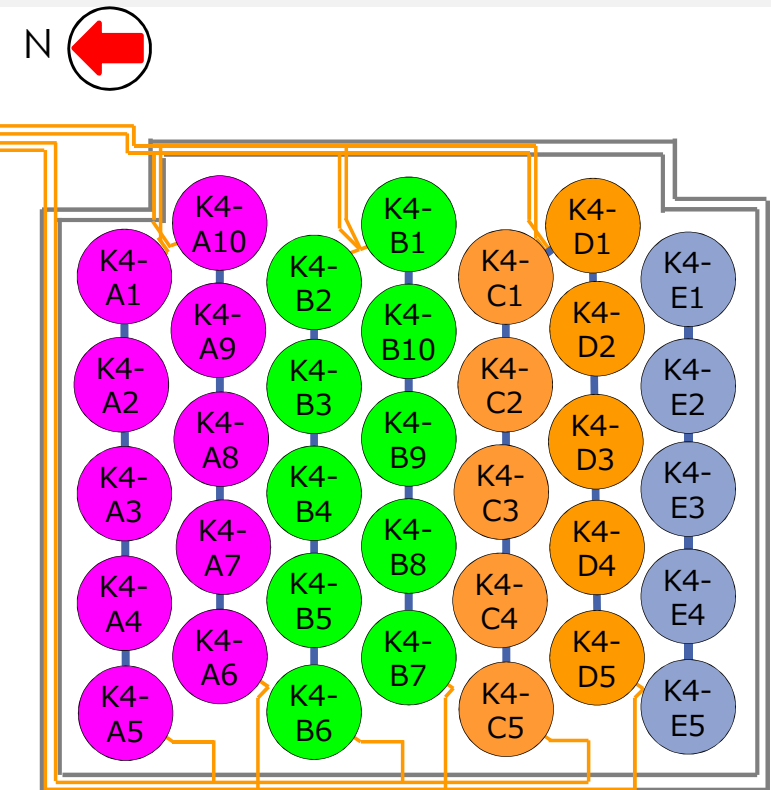
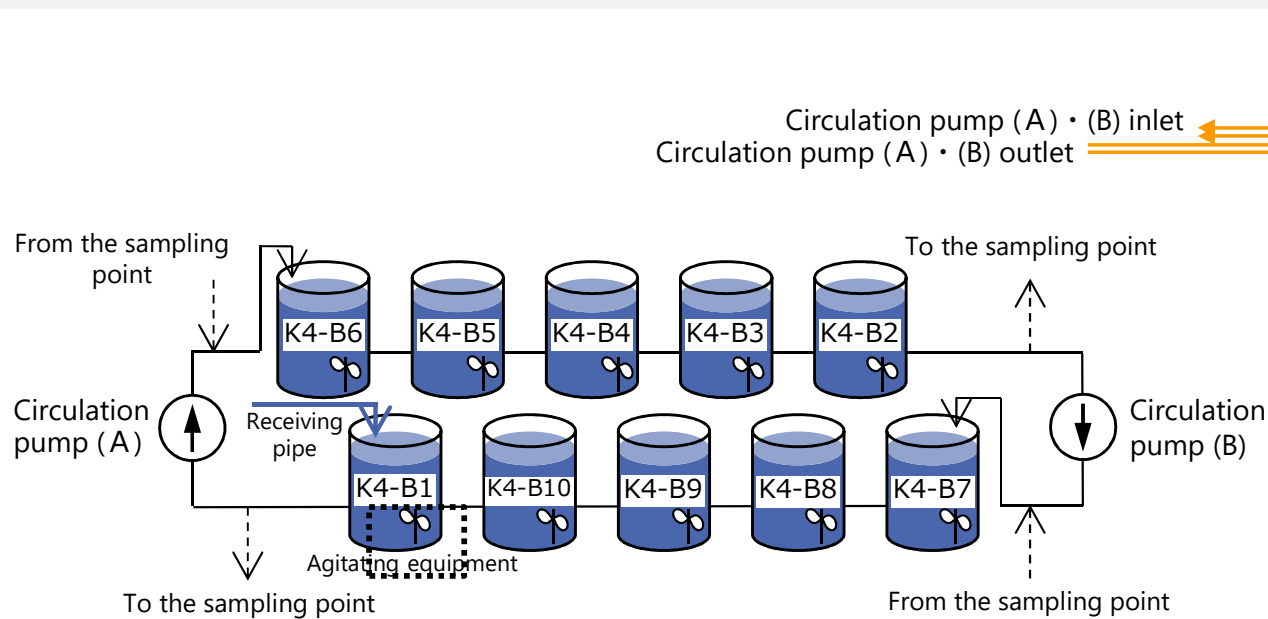
Discharge facility

Others

Seawater monitoring plan • turbidity countermeasures •  
response to abnormality

# 4. Installing the measurement/confirmation facility

- Circulation pipes made of polyester pipes will be laid around the existing K4 area tanks.
- Circulation pumps, agitating equipment, cables that make up facility will also be installed.
- Work on the measurement/confirmation facility will start from pipe and cable laying after tomorrow as soon as preparations are completed.



K4 area tank group

Measurement/confirmation facility configuration diagram

The facility for measurement and confirmation is designed to circulate the water in the tanks by the circulation pumps to make the concentration of radioactive materials almost homogeneous and to promote homogenization by agitation equipment installed in each tank before sampling, so that the representative sample is taken. The operating time of circulation and agitation will be operated to ensure at least two rounds of tank water volume for the time being after the start of discharge.

## **Type of construction to be started by facility**

Measurement/confirmation facility

**Transfer facility/dilution facility**

Discharge facility

Others

Seawater monitoring plan • turbidity countermeasures •  
response to abnormality



# 5-1 Installing the transfer facility

- For transfer pipes laid outdoors, joints between each polyethylene pipes are fusion-bonded<sup>※</sup> to prevent leakage. The polyethylene pipes are earthquake resistant as they are easily deformed.
- Transfer pipes laid next to roadways will be protected by fences to prevent damage to the pipes from external factors.
- Transfer pipes will be kept as far away from drainage channels as possible while sand bags will be placed where the discharge channel is crossed, and polyethylene pipes used for transfer pipes will be designed to prevent further leakage by attaching an outer sheath to the outside of the pipe.
- Work on the transfer facility will start from pipe and cable laying after tomorrow as soon as preparations are completed.

※ The structure where Polyethylene pipes and joints are completely integrated by heat without flanges

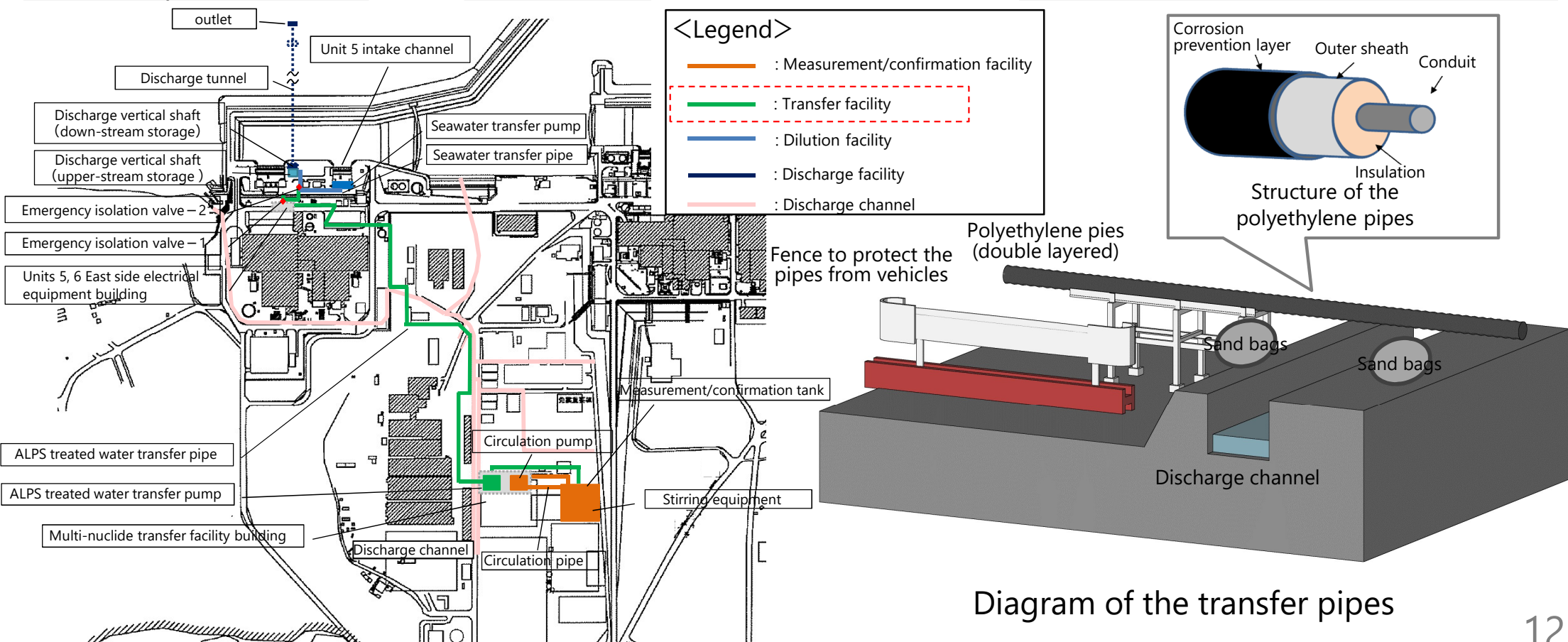
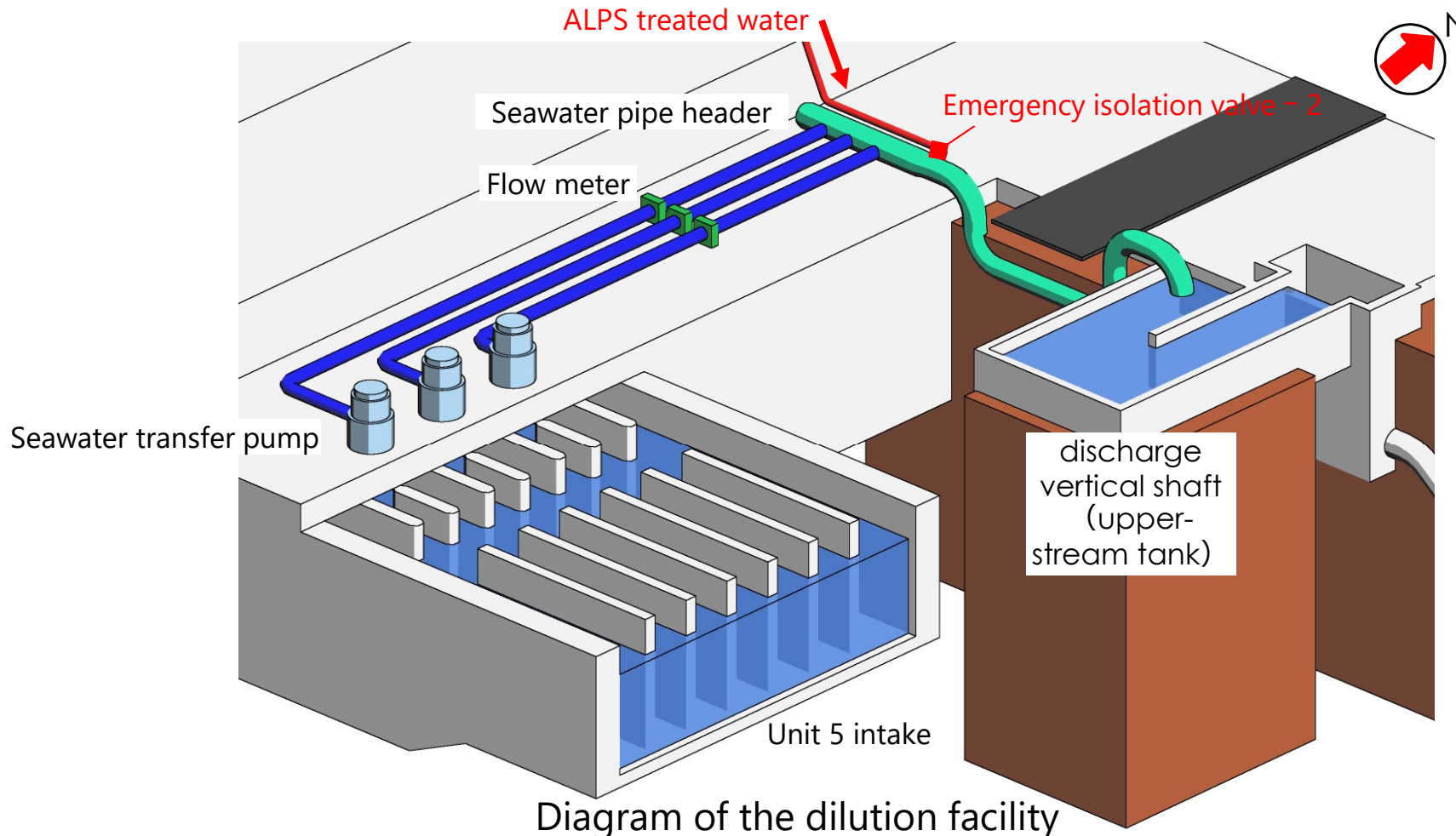


Diagram of the transfer pipes

## 5-2 Installing the dilution facility

- A seawater transfer pump to intake seawater for dilution will be installed where the Unit 5 circulating water pump used to be. The discharge pipe of seawater transfer pump will be equipped with a flow meter and the operating flow rate will be constantly monitored.
- Seawater pipe headers will be installed to inject ALPS treated water into diluted seawater for mixing and diluting the ALPS treated water. An emergency isolation valve-2 (transfer facility) will be installed just before the confluence with the seawater pipe header at the downstream end of the transfer pipe.
- Work on the dilution facility will start from pipe laying after tomorrow as soon as preparations are completed.



## **Type of construction to be started by facility**

Measurement/confirmation facility

Transfer facility/dilution facility

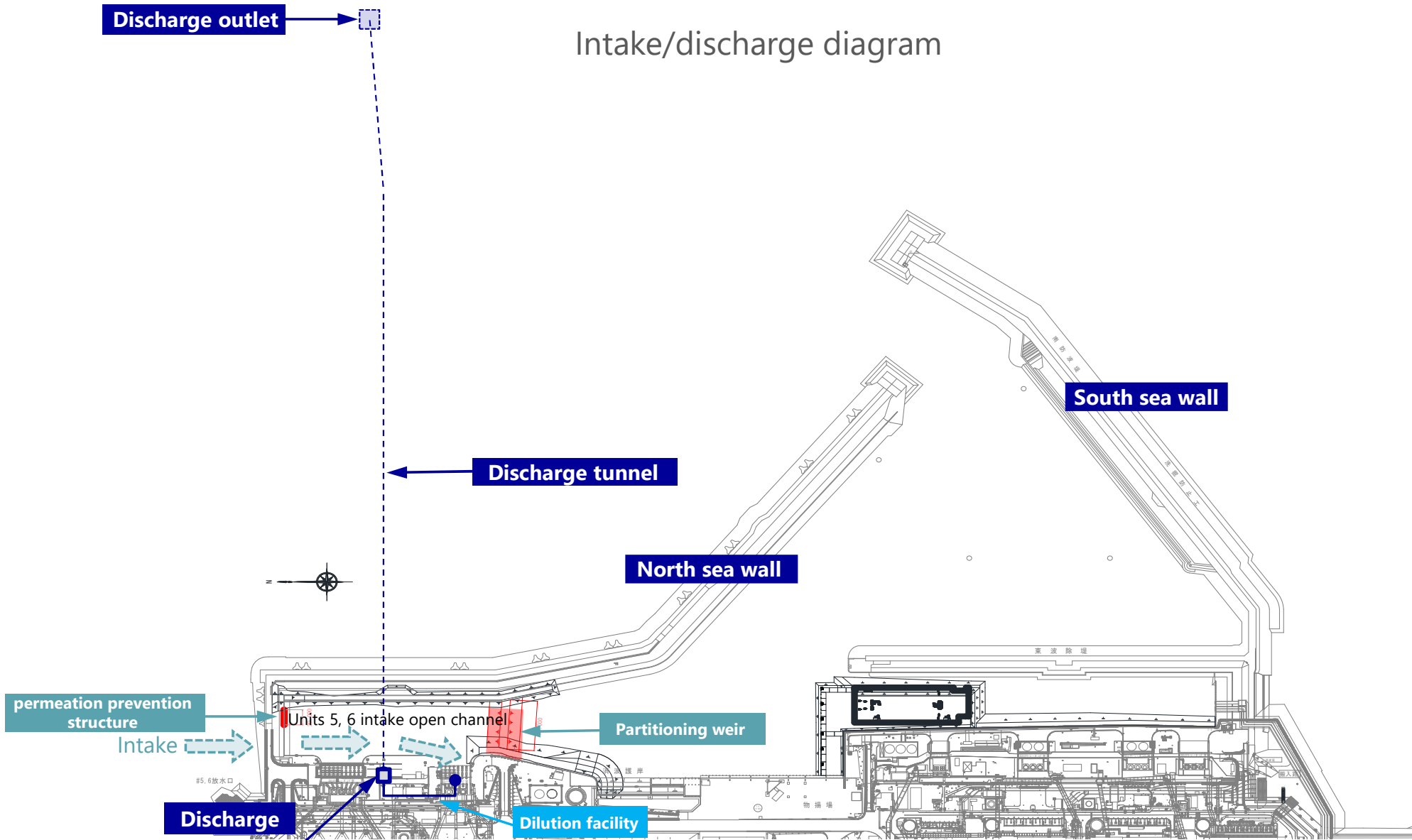
**Discharge facility**

Others

Seawater monitoring plan • turbidity countermeasures •  
response to abnormality

# 6-1. Overview of the discharge facility

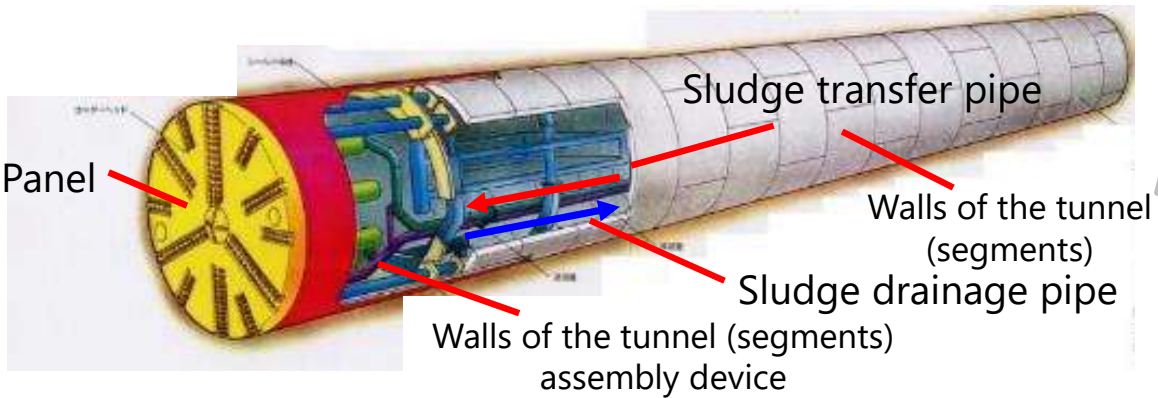
- Water that goes over the partition (weir) inside the discharge vertical shaft (upper-stream storage) will flow to the outlet which is one kilometer away, driven by the differential head between the water surface of the discharge vertical shaft (down-stream storage) and the sea level. The design takes into account friction loss in the discharge facility and increases in the sea level.





# 6-2. Discharge tunnel

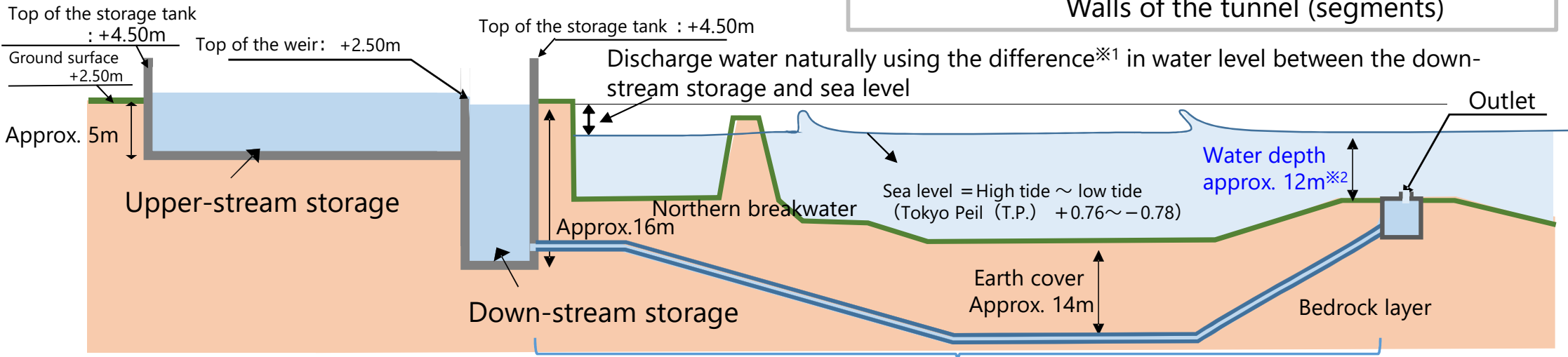
- The discharge tunnel has low leakage risk and is earthquake resistant<sup>※</sup> because it goes through the bedrock layer. The design of the tunnel takes into account typhoons (high waves) and storm tides (increased sea levels). Furthermore, the tunnel is designed to use the differential head equivalent to the loss in the discharge tunnel (difference between the water surface in the down-stream storage and the sea surface) to discharge water naturally (taking into account the adhesion of shellfishes). ※ Designed based on the quake-resistant design concept suggested by NRA.
- A slurry shield tunneling method will be used, and the walls of the tunnel (segments) will be made of reinforced concrete combined with two layers of sealing material to prevent water from coming in.
- Work on the discharge tunnel will start after tomorrow as soon as preparations are completed.



Overview of shield machine



Walls of the tunnel (segments)



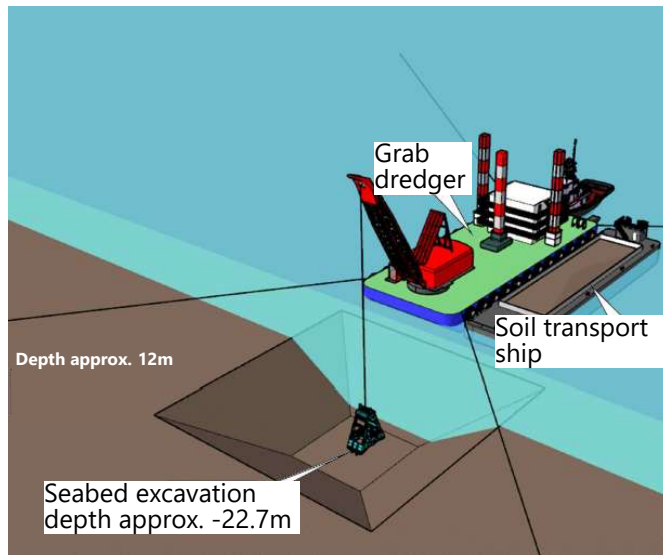
Discharge facility conceptual diagram

※ Heights are expressed in Tokyo Peil (T.P.)  
 ※1 Seawater transfer pump (3 units) : 1.6m, Seawater transfer pump (2 units) : 0.7m  
 ※2 Based on the standard time tide level in Tokyo Peil (T.P.)

# 6-3. Discharge Outlet Caisson (General Project Overview)

- Seafloor excavation and depositing/covering of rubble work at the discharge outlet of the discharge tunnel and its confirmation have been completed on July 22<sup>th</sup>. The caisson (a large concrete box) made of reinforced concrete will be installed on the seafloor using large crane ship after tomorrow as soon as preparations are completed while watching the weather and sea conditions. The area around the caisson will then be back filled with concrete.
- After the shield machine drilling the discharge tunnel reaches the caisson, a crane ship will be used to extract the shield arrival tube (containing the shield machine) from the outlet caisson.

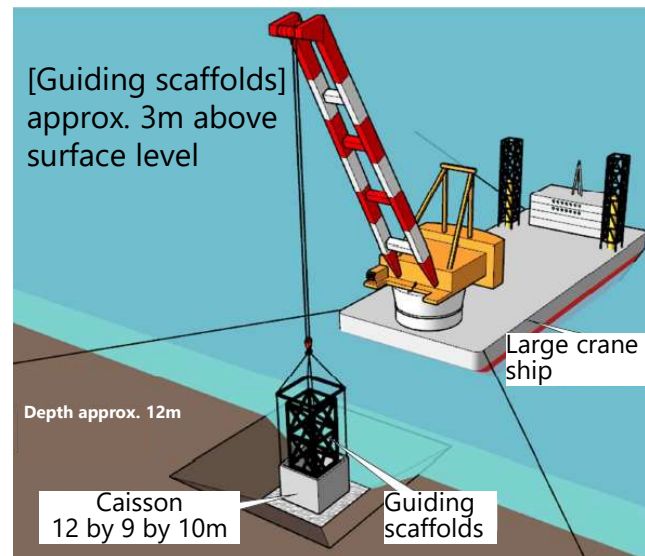
## — Improvements in the Surroundings (completed) —



### [Bedrock excavation, caisson fabrication]

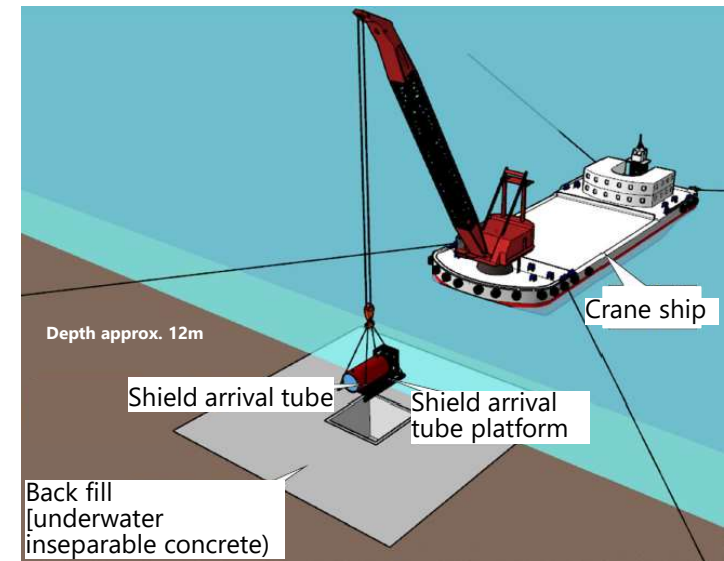
1. Use grab dredger (seafloor excavation ship) to excavate bedrock
2. Carry excavated soil to power station site
3. Deposit foundation rubble

## — Project to install discharge outlet caisson —



### [Install caisson]

1. The caisson transported by sea from outside the power station is installed using a large crane ship
2. Refill the area around the caisson with concrete
3. In preparation for the arrival of the shield machine, manage locational information of the discharge outlet by using the metal guiding scaffolds connected to the caisson



### [Remove excavator, install lid]

1. After the shield machine arrives inside the shield arrival tube in the caisson, fill the tunnel interior with seawater
2. Separate the collector and the tunnel, and collect the shield machine from the vertical shaft using a crane ship
3. Finally, install the caisson lid

## 6-3. Discharge Outlet Caisson (Installation of Discharge Outlet Caisson)

- Fix crane ship to the pre-installed sinker blocks (110t) and anchors using mooring wire.
- Guide crane ship to the installation location using GPS installed on the crane ship and surveying the guiding scaffolds installed on the caisson from the ground side (from two locations on the South seawall and North seawall). Fine adjustments for the positioning of the subject crane ship will be performed by winding and releasing the mooring wire using the crane ship's winch. Discharge caisson will be installed after moving the ship to the point of installation.

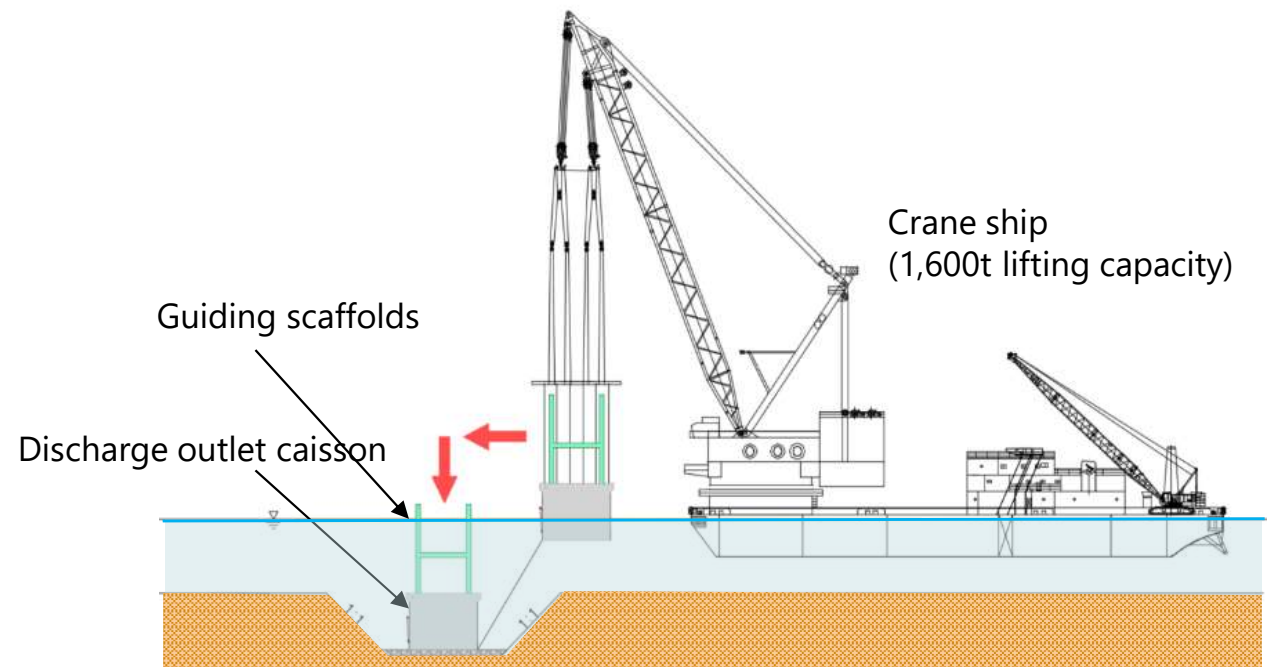
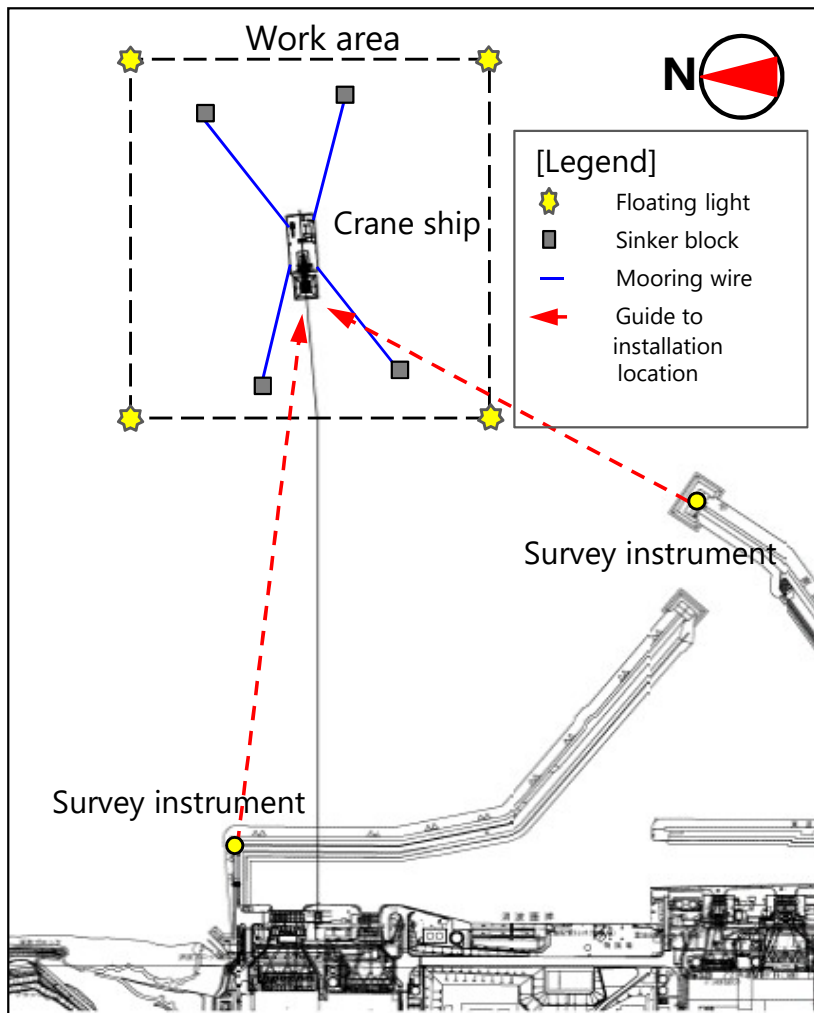
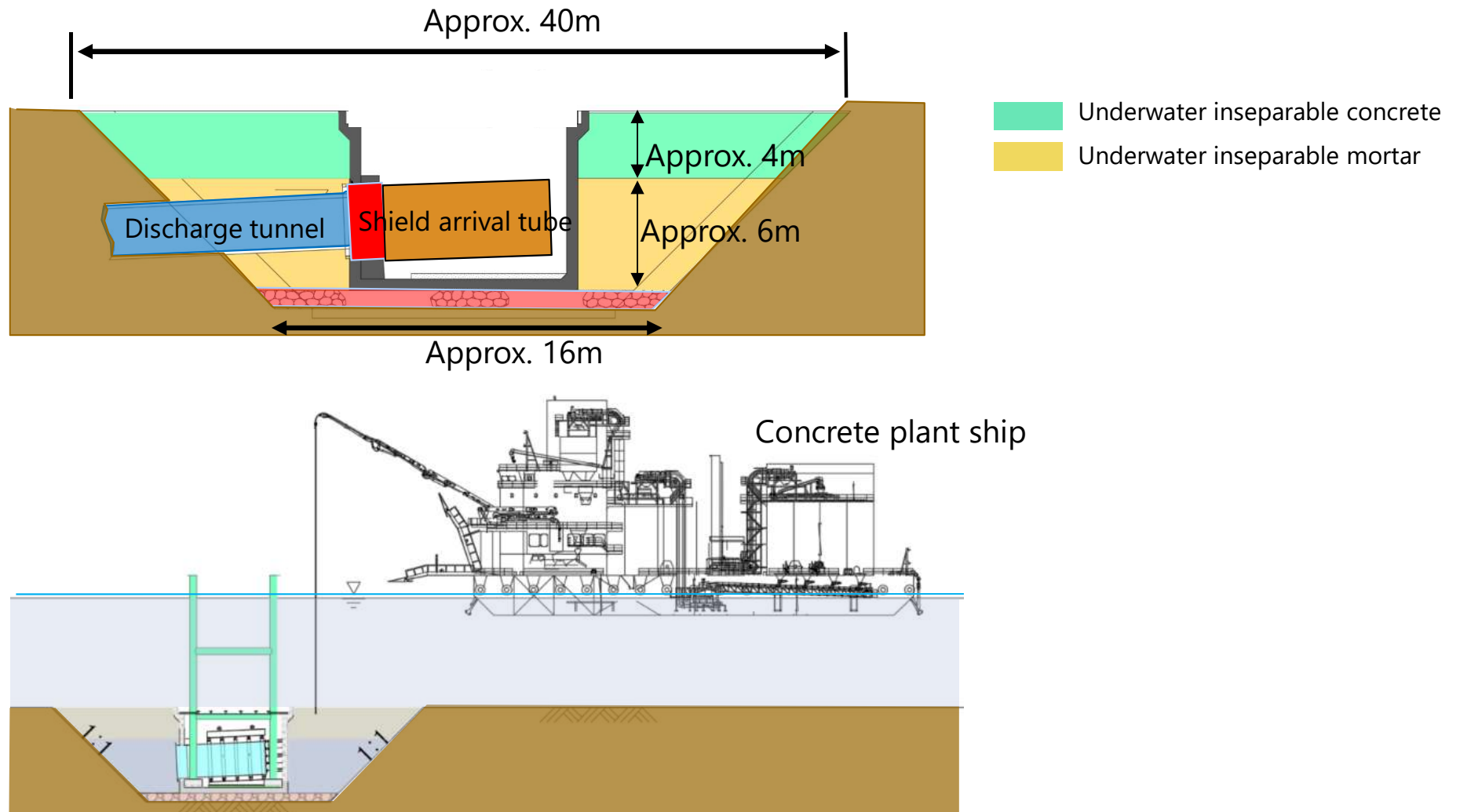


Figure of Work to Install Discharge outlet Caisson (cross section)

Figure of Work to Install Discharge outlet Caisson (plan view)

## 6-3. Discharge Outlet Caisson (Back Fill)

- After installing the discharge outlet caisson, pour underwater inseparable mortar (area where the shield machine passes) and underwater inseparable concrete using a concrete plant ship for back filling.

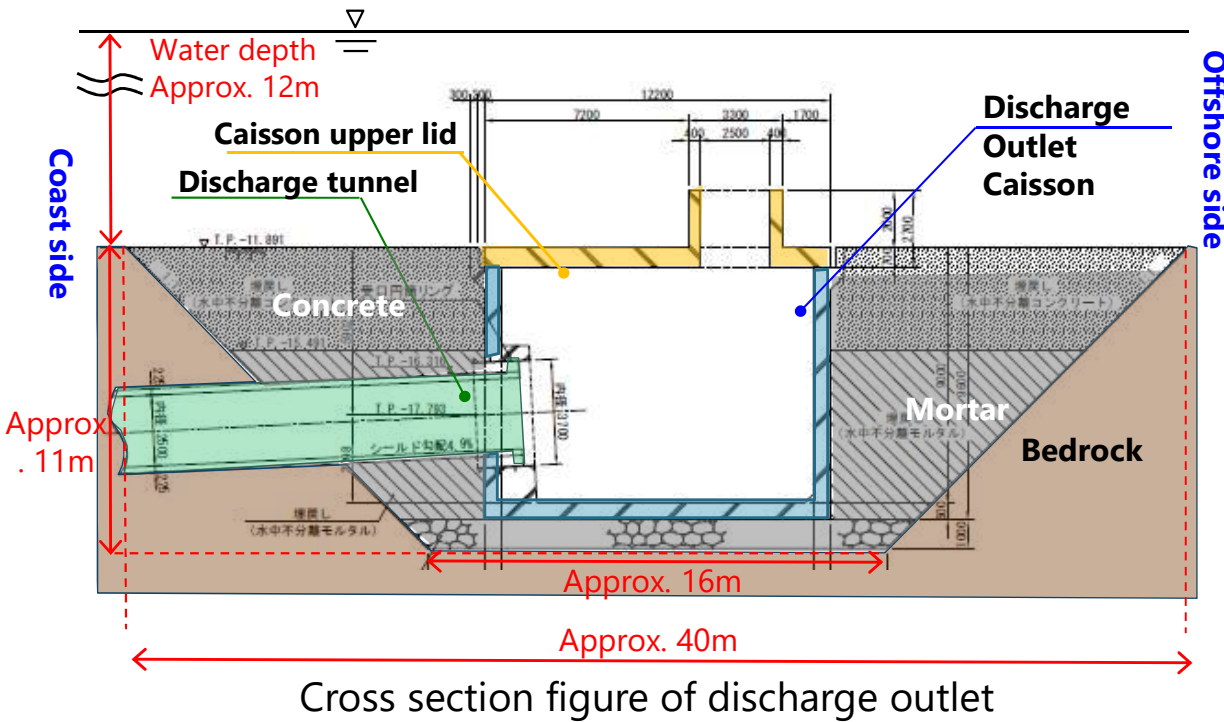


Cross section figure for back filling work



# 6-3. Discharge Outlet Caisson (Overview of Discharge Outlet Caisson) **TEPCO**

- A guiding scaffold used to manage location information while the tunnel is being excavated, and the shield arrival tube have been installed in advance inside the caisson.



Cross section figure of discharge outlet

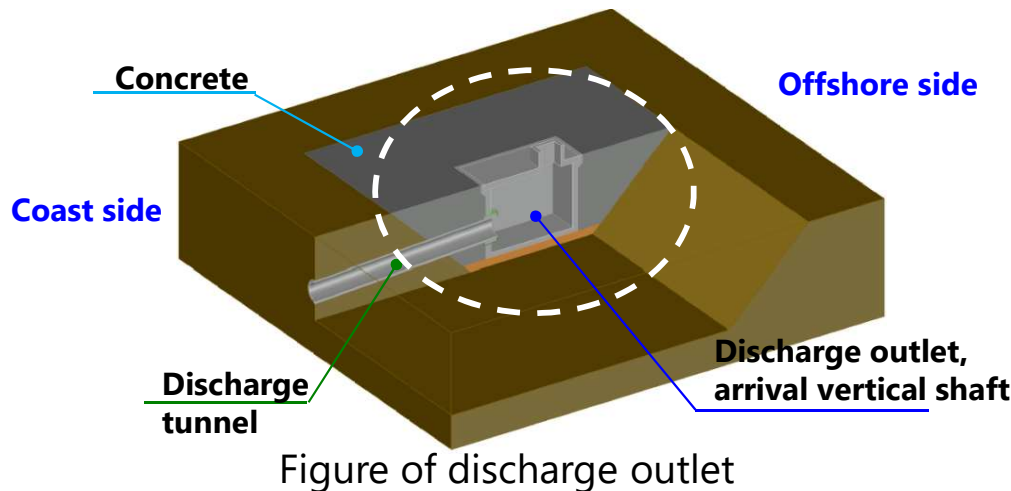


Figure of discharge outlet

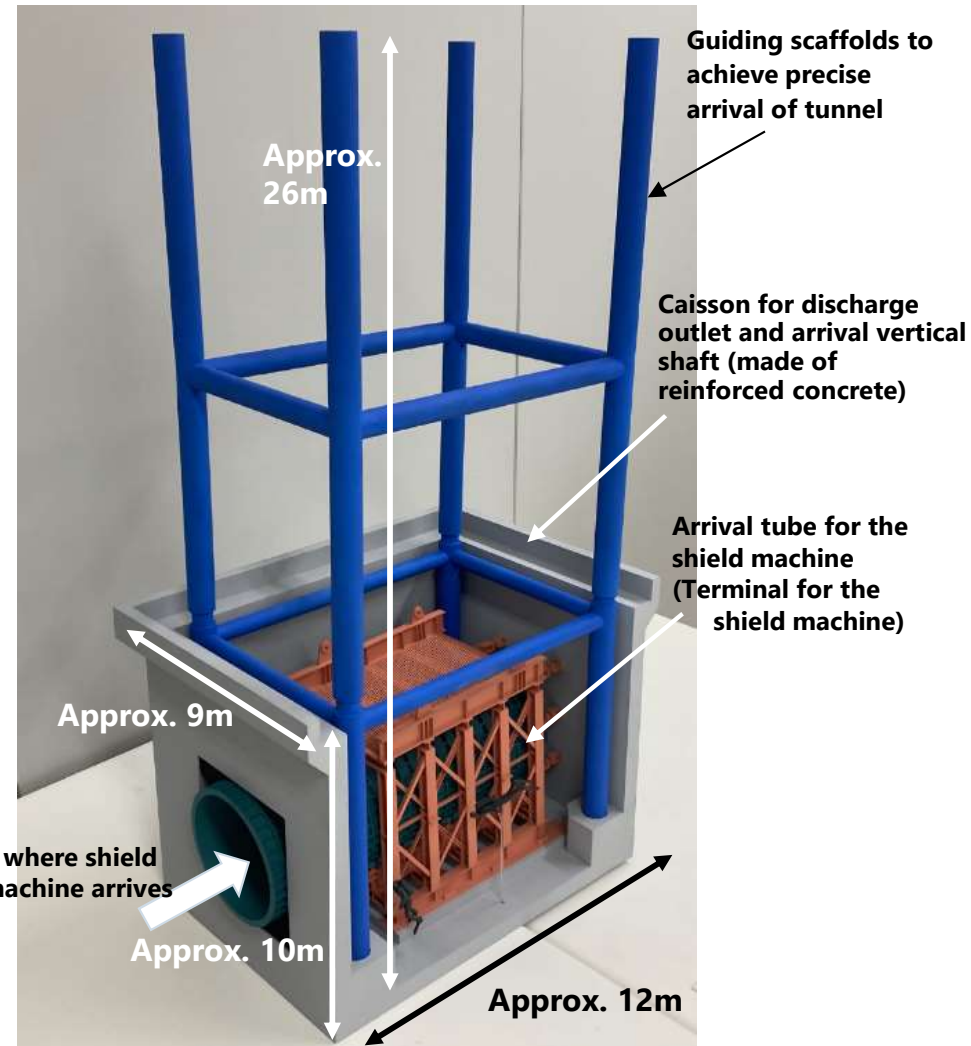


Figure for the fabrication of discharge outlet caisson

## **Type of construction to be started by facility**

Measurement/confirmation facility

Transfer facility/dilution facility

Discharge facility

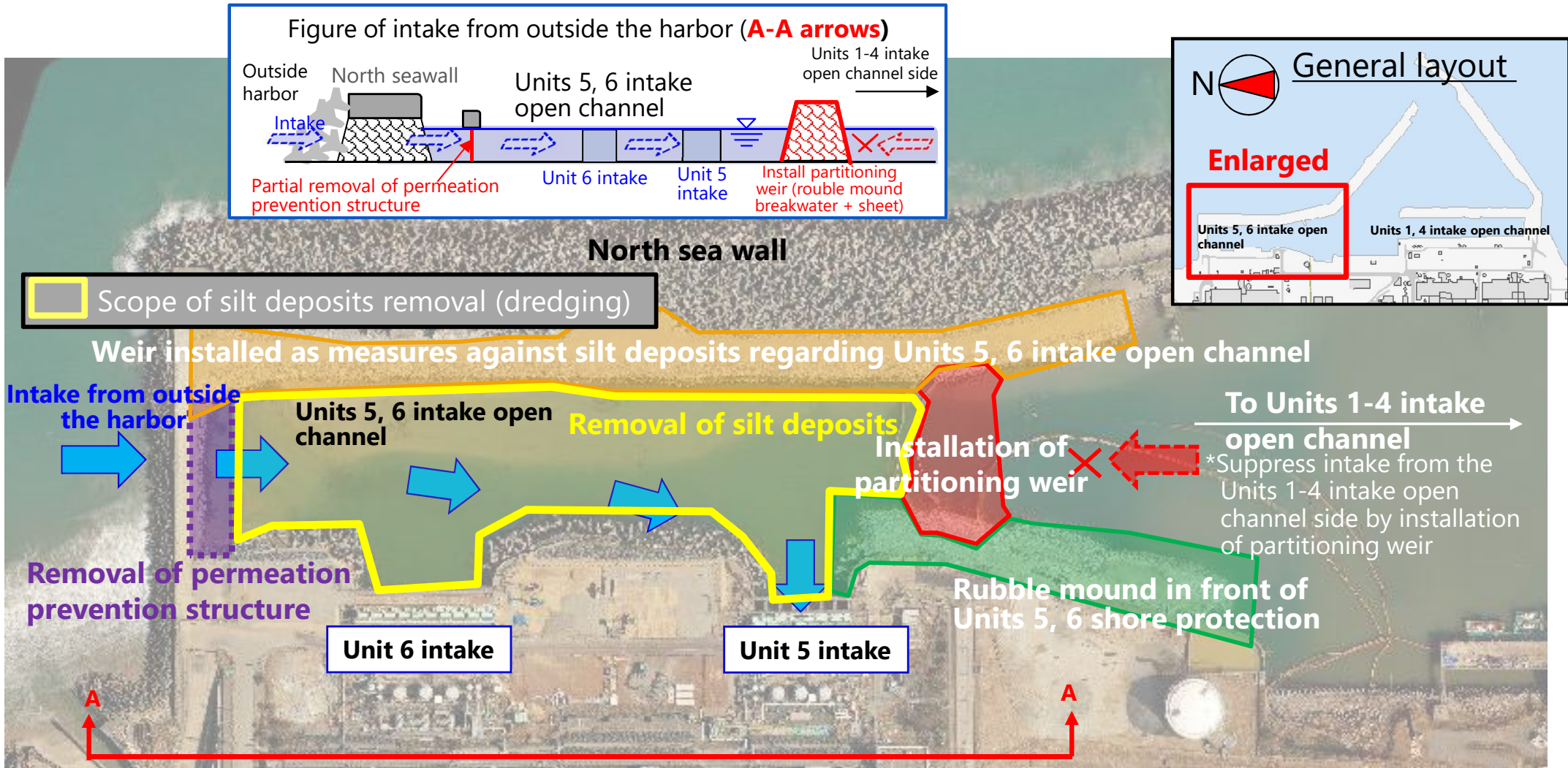
**Others**

Seawater monitoring plan • turbidity countermeasures •  
response to abnormality

# 7. Construction Projects Within the Harbor for Intake

- When preparations are ready, as a construction project for the harbor intake, a partitioning weir will be installed in the Units 5, 6 intake open channel (using rubble mound breakwater + sheet\*) to divide the harbor from the harbor on the Units 1-4 side with comparatively high concentration of radioactive material.
- Also, to take in seawater for dilution from outside the harbor, work to partially remove permeation prevention structure from the North sea wall shall be initiated from November 2022. Furthermore, silt deposits will be removed (dredged) for the purpose of improving the environment inside the Units 5, 6 intake open channel.

\* Flexible polyvinyl chloride mat, thickness = 5mm



Type of construction to be started by facility

Measurement/confirmation facility

Transfer facility/dilution facility

Discharge facility

Others

**Seawater monitoring plan • turbidity countermeasures •  
response to abnormality**



## 8. Seawater monitoring plan · turbidity countermeasures · response to abnormality

- During the offshore construction period, seawater from the vicinity shall be sampled and turbidity shall be measured.
- If a significant increase in sampling of seawater and measurement of turbidity, construction shall be suspended and appropriate action shall be taken.

### <Seawater monitoring>

Eligible construction: Construction outside the harbor (Install caisson, Refill caisson)

- During the offshore construction period, seawater from the vicinity of the improvement area shall be sampled daily and turbidity shall be checked at four locations along the border of the work area (using a turbidity meter).
- Turbidity shall be visually monitored while paying careful attention to tidal movements. In particular, work shall be done slowly during the initial phase of improvements and accelerated as suitable while watching turbidity and implementing measures to prevent it.

### < Turbidity countermeasures · response to abnormality >

Eligible construction: Construction outside the harbor (Install caisson, Refill caisson)

- If a significant increase in cesium concentration in the seawater is seen during construction or if a remarkable increase in seawater turbidity is observed, construction shall be suspended.
- Monitoring shall continue and construction shall only recommence after it is confirmed that there are no problems with seawater cesium concentrations or turbidity.
- The installation of an oil fence (or silt fence), or the use of sedimentation agents, etc., to suppress the turbidity dispersion shall be examined as necessary.

※For construction inside the harbor during building partitioning weir, countermeasures will be taken against swirling up marine sediment by installing silt fence for construction use.



Seawater Sampling