【Reference -1】

Progress Status of “Drastic Countermeasures Preventing Groundwater Inflow into Reactor Buildings etc.”

①Progress Status of the Groundwater Bypass

②Progress Status of the Sub-drain Purification Test

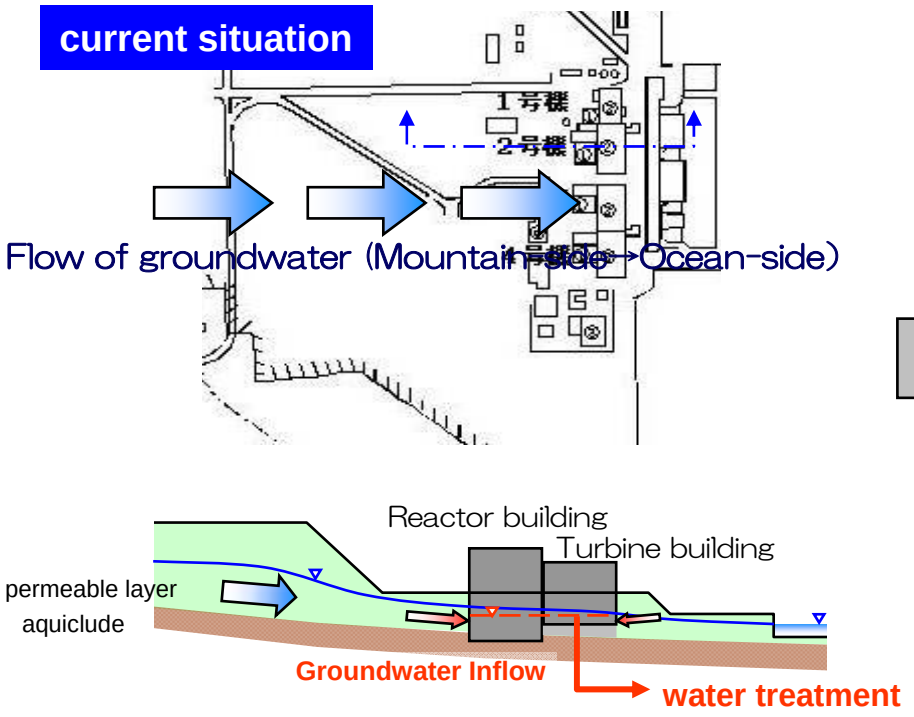
June 18, 2012

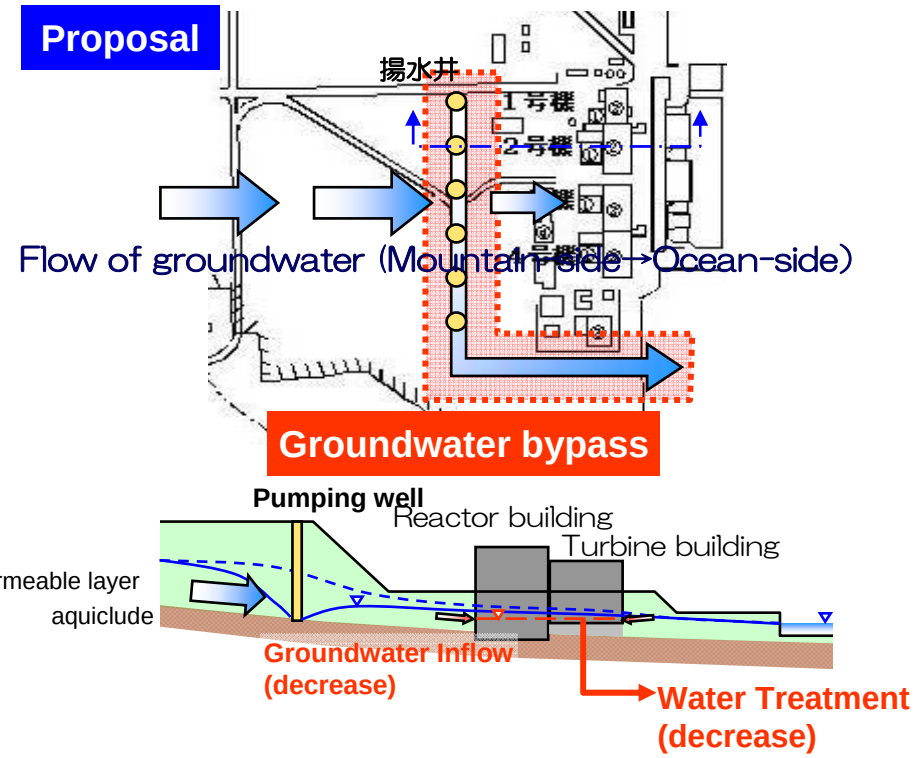
Tokyo Electric Power Company

The Sub-drain Reinforcements Underway

- Groundwater from the mountain-side is pumped up at the upstream from the building(O.P.+35m) to change the flow path (groundwater bypass)。
- To lower the groundwater level surrounding the building (mainly the mountainside) via the groundwater bypass and mitigate the amount of groundwater inflow into the building.
- Pumped up water is redirected into the sea via a dedicated water path. We are also monitoring the water quality.

①Progress Status of Groundwater Bypass Concept (Source:4/23briefing material)

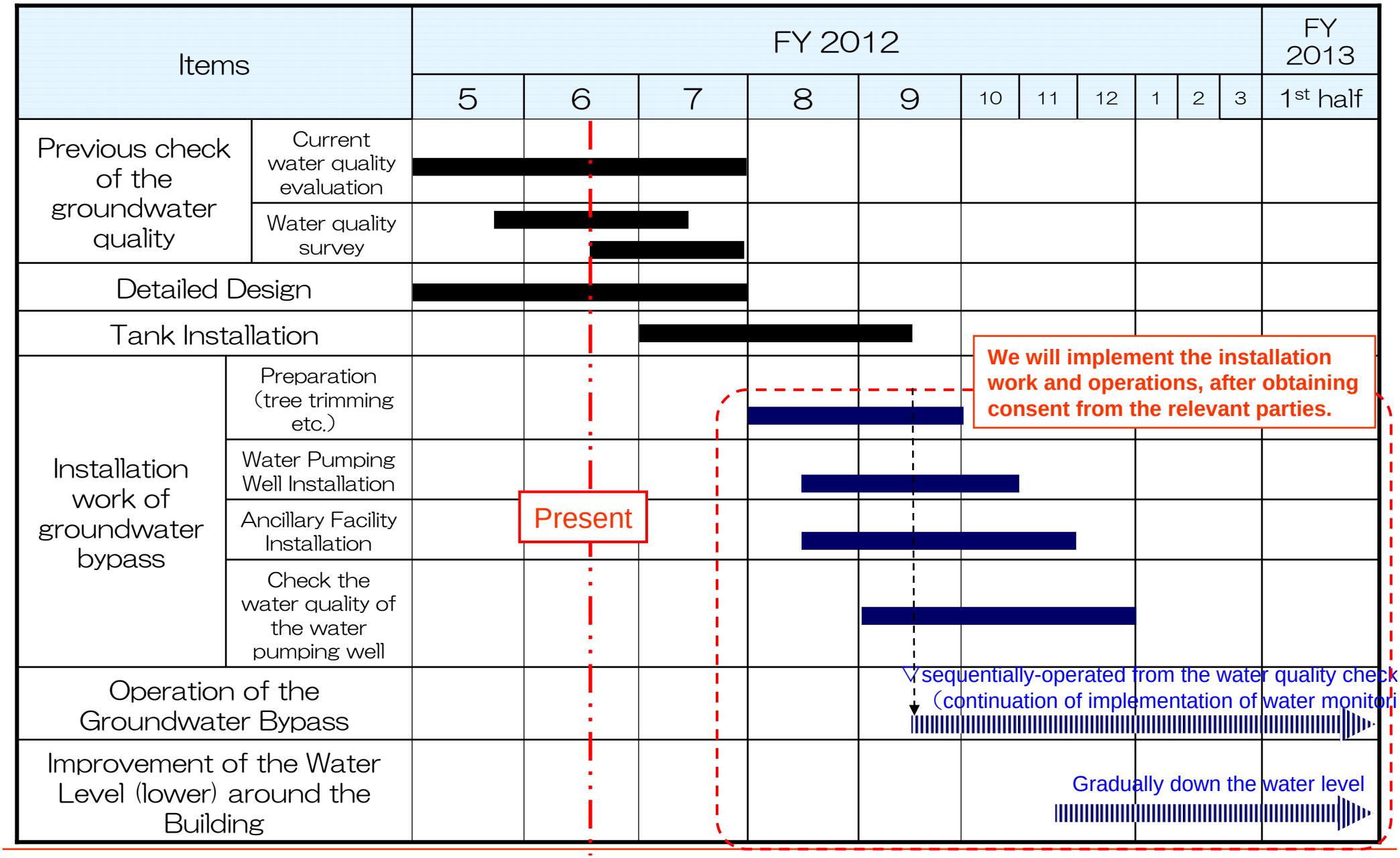




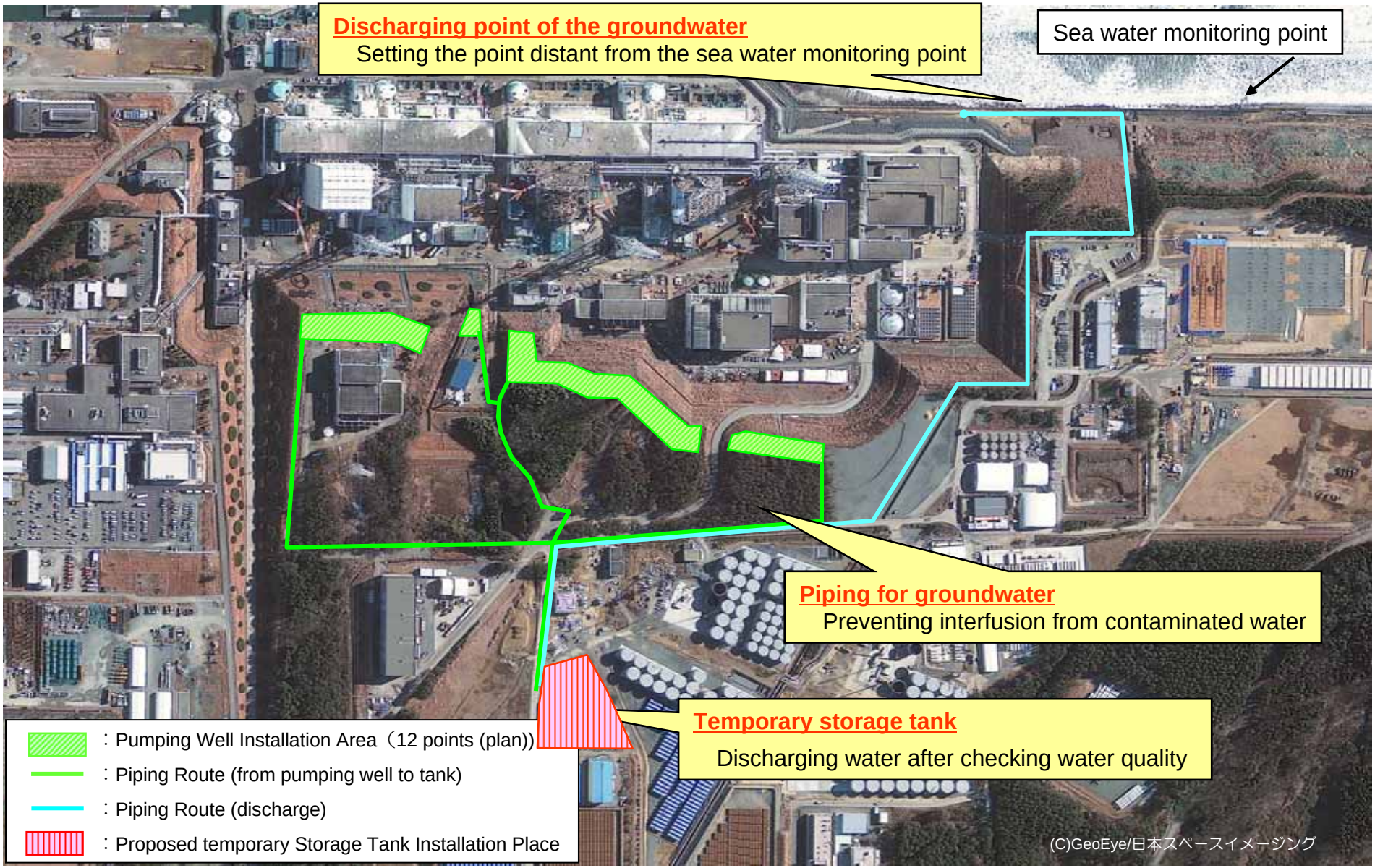
- Groundwater mainly flows from the permeable layers of the mountain-side towards the ocean-side.
- In the course of flowing into the sea, a part of the groundwater flows into the building.
  →Increase of accumulated water in the building
- Mitigation of groundwater inflow into the building, the sub-drain is under rehabilitation.

- Groundwater from the mountain-side is pumped up at the upstream area from the building and changes its flow path.
  (groundwater bypass)
- To lower the groundwater level surrounding the building (mainly the mountainside) via the groundwater bypass and mitigate the amount of groundwater inflow into the building.
- Continuation of sub-drain rehabilitation.

①Progress Status of Groundwater Bypass Schedule (tentative)



① Progress Status of Groundwater Bypass
Facility layout



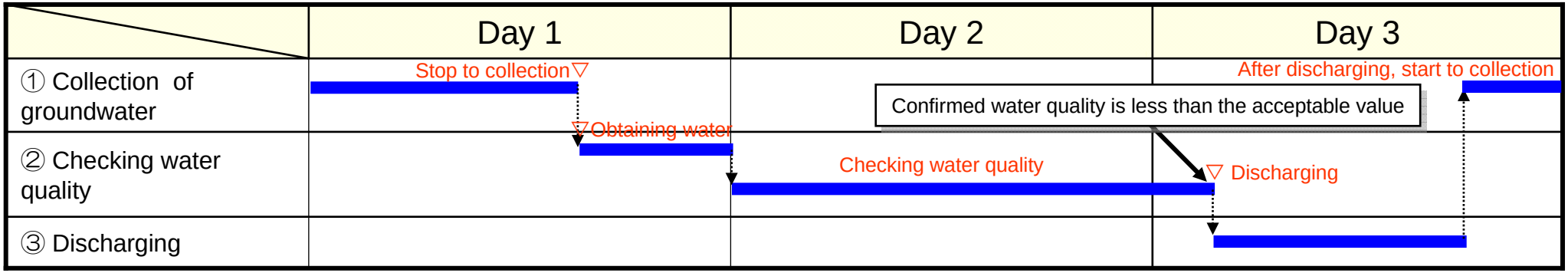
① Progress Status of Groundwater Bypass
Operation of groundwater treatment

■Basic policy

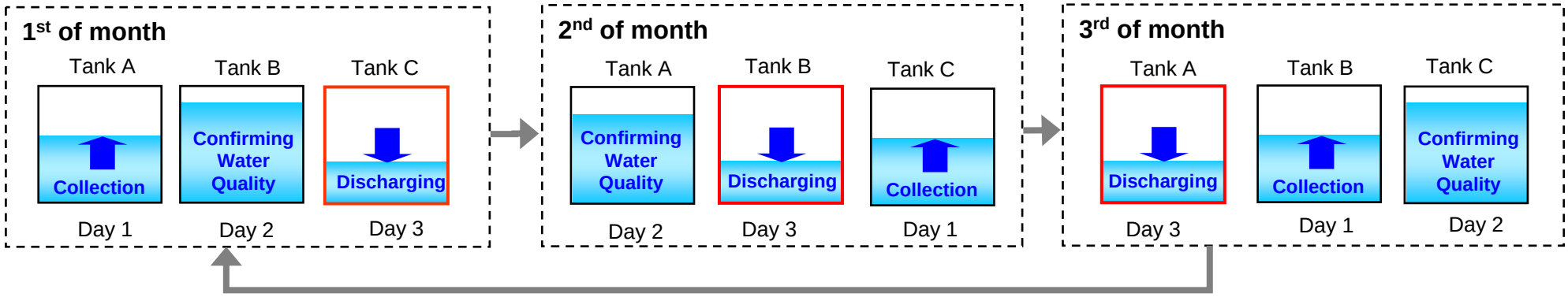
・The pumped groundwater is collected temporarily and discharged into the sea after checking water quality.

・The acceptable water quality value should be confirmed in accordance with the various regulation values of the concentration of radioactive cesium, water quality and the accuracy of the assayed standard of public water and measurable limits of normal monitoring in addition to obtaining the consent of relevant parties.

■Operating cycle



・Operations per a three sets × three days cycle, and discharging water after confirming water quality

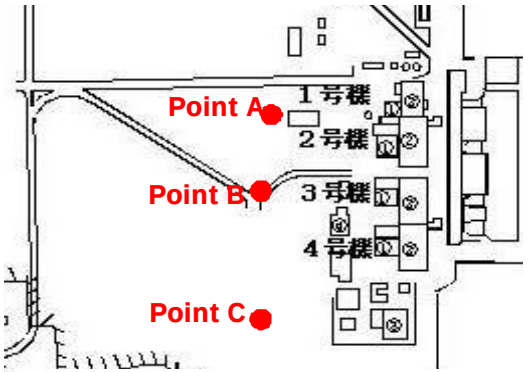


Operating repeatedly, and discharging water after confirming water quality

①Progress Status of Groundwater Bypass
<Reference> Current situation of the quality of ground water

- According to the analysis based on the detection limit of 1Bq/L, Cs-134 and Cs-137 was not detected.
- Analysis presently underway by decreasing the detection limit.

Detected nuclides: All γ nuclides, all α nuclides, all β nuclides and tritium
Analysis result: All γ nuclides, all α nuclides, all β nuclides were below the detection limit*.
*The detection limit: All α=3.0Bq/L, All β=6.7Bq/L
Regarding Cs-134 and Cs-137, refer to the table below.



Location for investigation

Analysis result of Cs-134 and Cs-137
(Upper: detected on Feb 21-22, 2012, lower: May 24, 2012)
（Bq/L）

Location		Target depth (O.P.m)	Cs-134	Cs-137
Point A	①	12.9 - 9.3	0.85 or less	1.0 or less
			0.76 or less	0.87 or less
	②	26.0 - 14.5	0.92 or less	1.0 or less
			0.87 or less	0.91 or less
Point B	①	14.7 - 13.9	0.86 or less	1.0 or less
			0.84 or less	0.95 or less
	②	25.7 - 18.1	0.90 or less	1.1 or less
			1.2 or less	0.91 or less
Point C	①	13.4 - 9.5	0.89 or less	0.96 or less
			0.71 or less	0.99 or less
	②	26.3 - 18.4	0.80 or less	0.96 or less
			0.94 or less	1.0 or less

Detection of tritium

- At Point A and Point C, tritium was not detected. At Point C, low concentration (*only approx. one several hundredths of the density has been measured*) tritium was detected.
- We consider it clear that the contaminated water was not mixed in with the ground water. There are three reasons; the tritium was detected from only some points with low concentration, the ground water was from a higher place than the turbine building, and other nuclides were not detected.
- After the power plant accident, it can be assumed that the tritium was discharged as steam, descended to ground level and then penetrated. We will continue to monitor the situation.

(Upper: detected on Feb 21-22, 2012, lower: May 24, 2012)（Bq/L）

Location		Target depth (O.P.m)	Tritium
Point B	①	14.7 - 13.9	12
			61
	②	25.7 - 18.1	70
			180

(Published intensity of tritium: 60,000Bq/L)

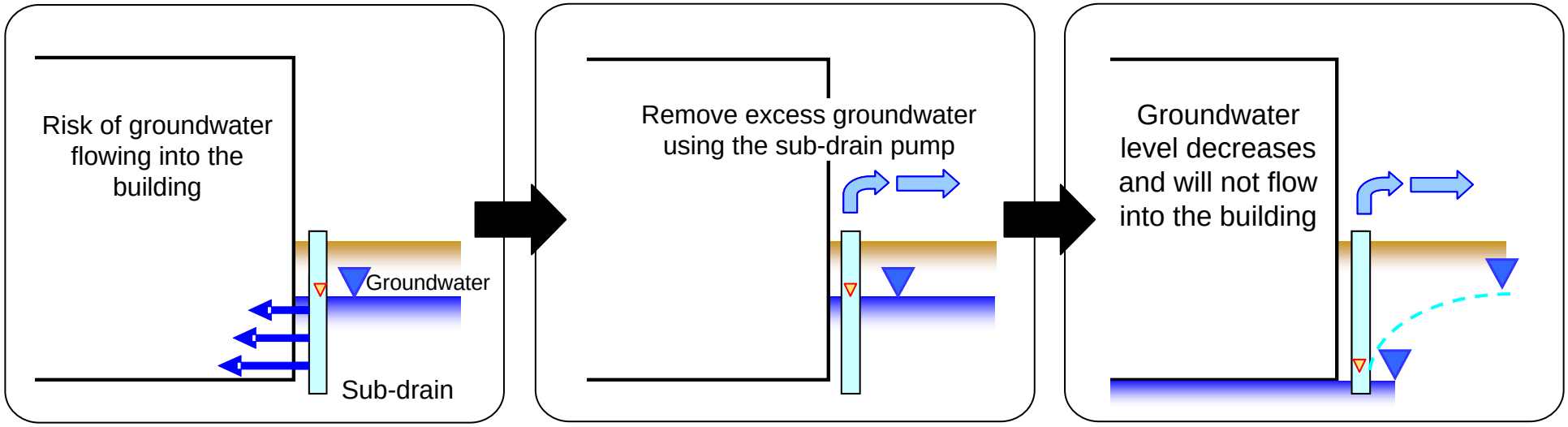
<Reference> The quality of water around the power plants

River water (Data from Ministry of Environment)	Maedagawa River (Futaba-cho, Namie-machi)	Mar. 4, 2012: 1 Bq/L
	Uedogawa River (Namie-machi)	Mar. 4, 2012: 1 Bq/L or less
	Kumagawa River (Okuma-machi)	Mar. 4, 2012: 1 Bq/L or less
	Tomiokakawa River (Tomioka-machi)	Mar. 4, 2012: 1 Bq/L or less
	Kidokawa River (Kawauchi-mura, Naraha-machi)	Mar. 4, 2012: 1 Bq/L or less
Sea water (Data from TEPCO)	Fukushima Daini (North Discharge Canal)	Average in Mar. 2012: 0.49Bq/L (Cs-137)
	Iwasawa Coast	Average in Mar. 2012: 0.43Bq/L (Cs-137)

② Progress Status of the Sub-drain Purification Test

The purpose of sub-drain is to maintain the optimum groundwater level and prevent groundwater from flowing into the building by removing excess groundwater using the pump equipped in the sub-drain pit.

Inside of sub-drain pit



Outline drawing

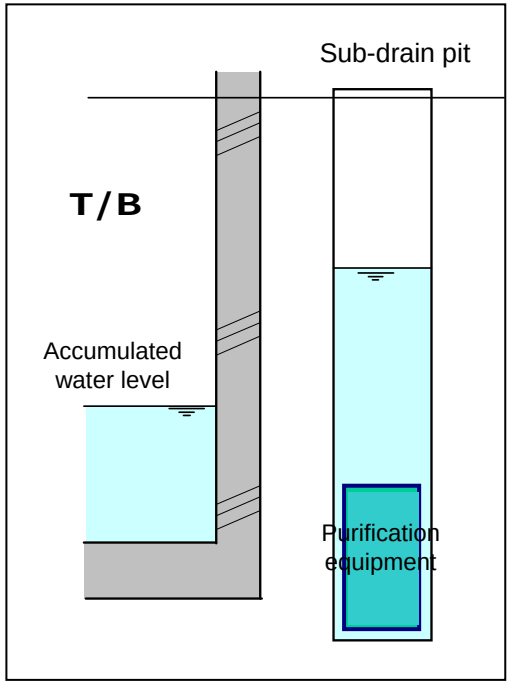
② Progress Status of Sub-drain the Purification Test: Sub-drain Purification Test

Small contamination was found in the water in the sub-drain pit as the contaminated rainwater flowed into the pit from the ground surface after the pit lids were opened by Tsunami. “Purification test” and “pumping test” are planned prior to restarting the sub-drain as the water accumulated in the sub-drain pit must be purified.

Sub-drain Purification Test Procedure

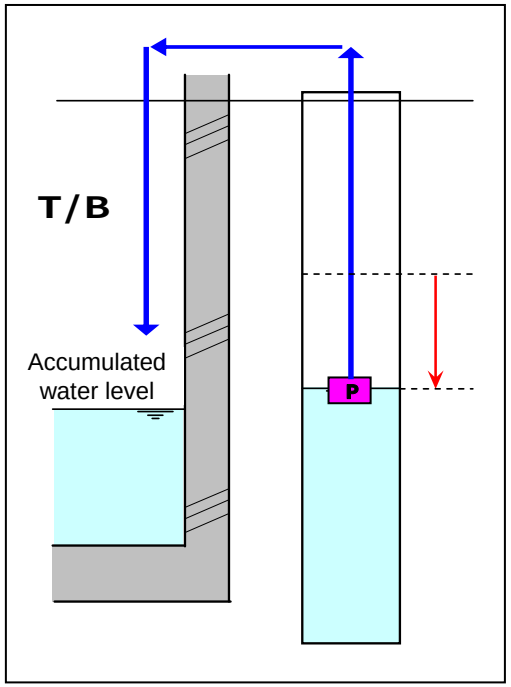
Purification Test

1. Purify the sub-drain water using a purification equipment and confirm that the radioactive density of the water is under the detection limit.

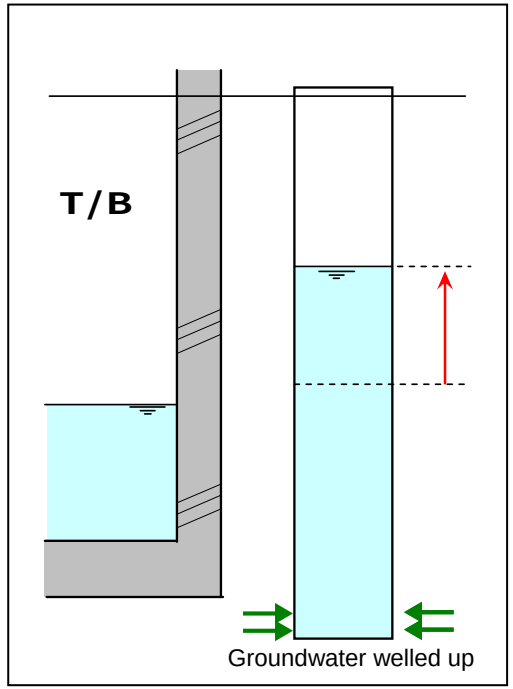


Pumping Test

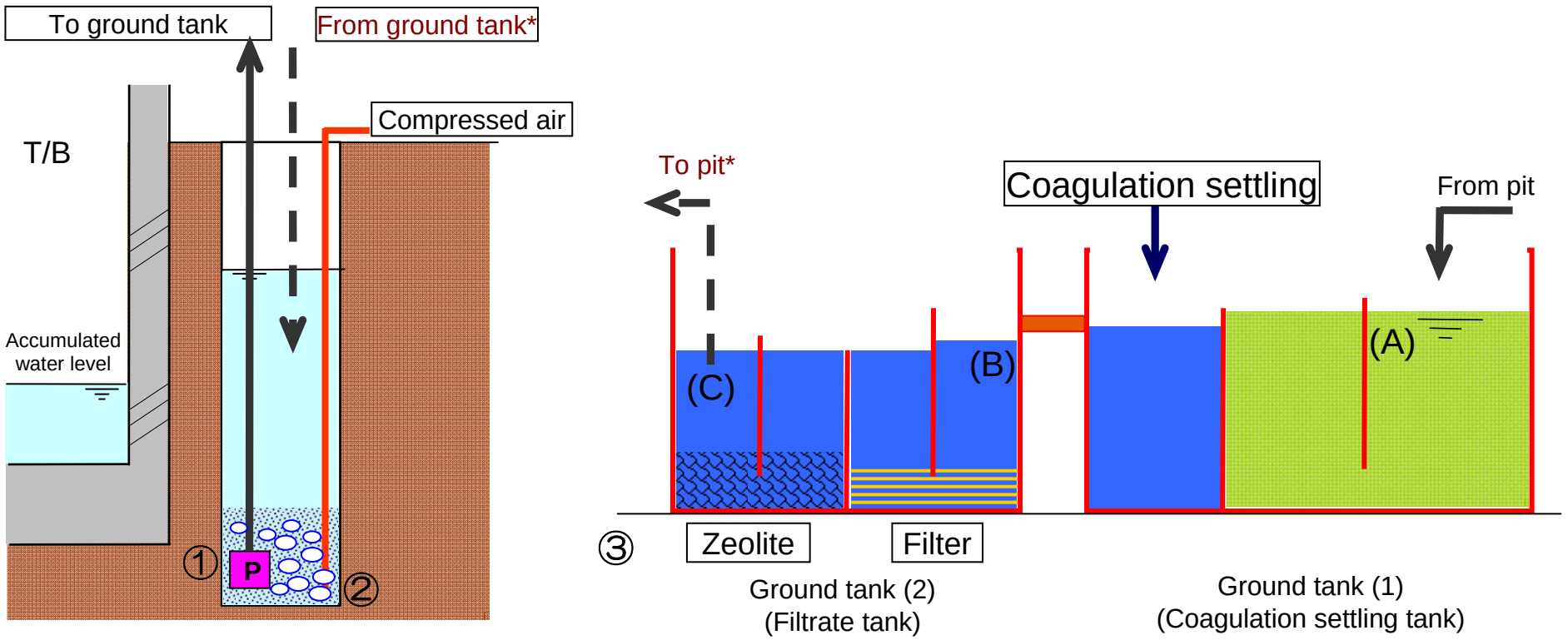
2. Reduce the accumulated water level down to the same level as that in T/B (Pump the water out to T/B).



3. Confirm the property of the groundwater welled up



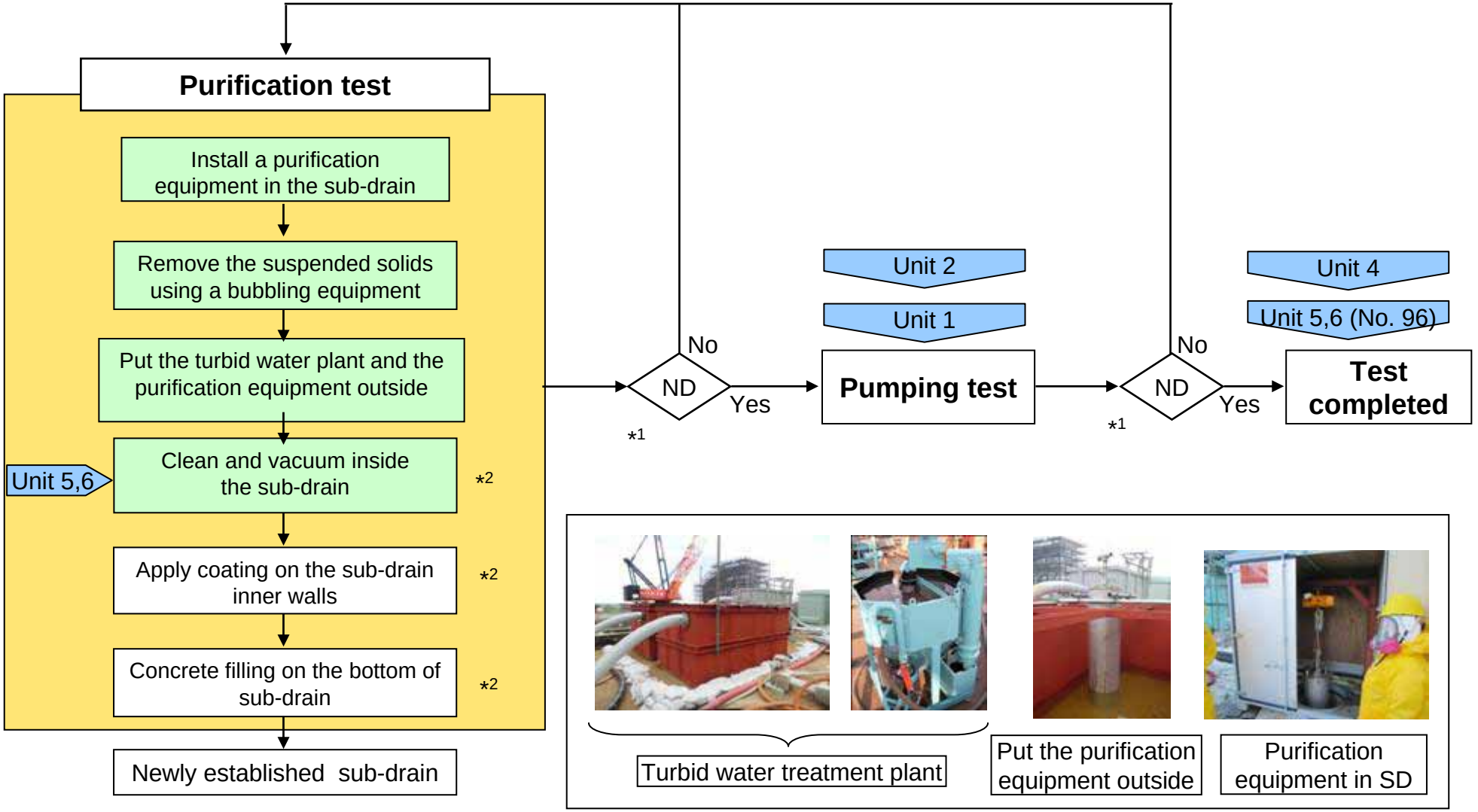
② Progress Status of the Sub-drain Purification Test: Suspended Solids Removal



1. Install a pump near the bottom of the pit to pump out the settled sediment and suspended solids.
2. Modify the tip of the bubbling equipment to enhance the agitation efficiency
3. In addition to the ordinary coagulation settling, filtrate the water going back into the pit using zeolite.
4. Confirm that the amount of suspended solids in the pit is less than approx. 5mg/L (Measure the radioactive density as well).
5. Purify the ionized radioactive materials using UD.

② Progress Status of the Sub-drain Purification Test: Test Progress Outline

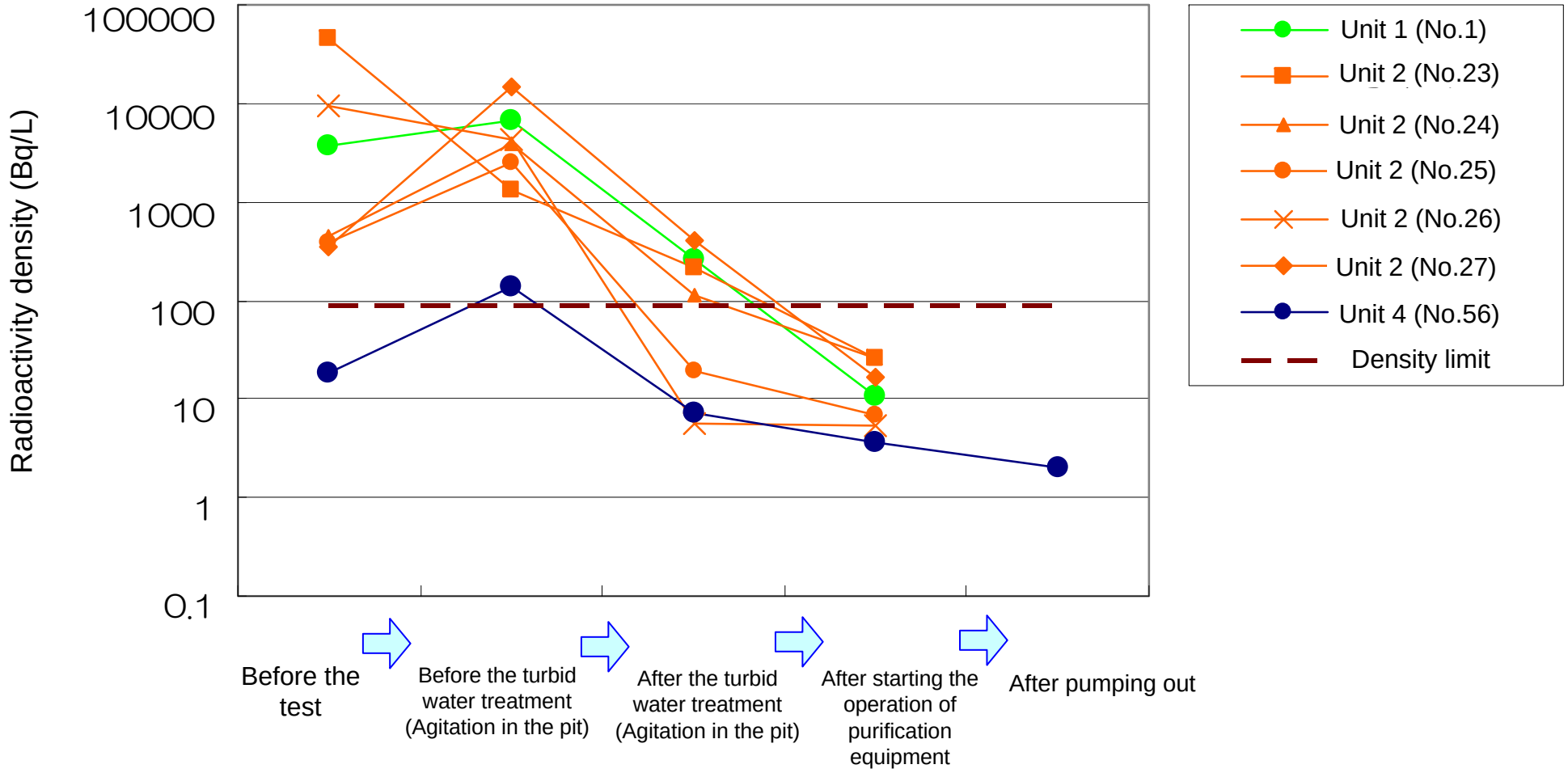
Purification Test Flow



*1 The measurement value must be far below the density limit.
*2 Applied to Unit 5 and 6 only as all the accumulated water can be pumped out in these units.

② Progress Status of the Sub-drain Purification Test: Radioactive Density Before and After the Sub-drain Purification Test

Change in radioactivity density (C-137) in each step of the purification test



② Progress Status of the Sub-drain Purification Test: Test Progress Outline

	Achievements	Future schedule
Unit 1	-After the purification by the purification equipment was completed, the pumping test was started on June 1. -Pumping may need a substantial amount of time considering that the pit water level is low.*1	-Complete the pumping test and the analysis of main nuclides by mid June. -Detailed nuclides analysis to be done (Planned to be completed in August or later).
Unit 2	-The schedule has been delayed as the suspended solids removal took more time than expected. Purification using the purification equipment started on May 29. -Pumping test stated on June 13.	-Complete the pumping test and the analysis of main nuclides by mid June. -Detailed nuclides analysis to be done (Planned to be completed in August or later).
Unit 3	Excluded from the test as the atmosphere dose in the surrounding area of sub-drain pit was high (5-7mSv/h)	
Unit 4	-Purification test completed (May 17) -The radioactivity density of the pumped out groundwater was in the level of a few Bq/L (main nuclides)	-Detailed nuclides analysis to be done (Planned to be completed in August or later).
Unit 5,6	-In 23 out of 27 pits, the radioactivity densities of main nuclides were 10Bq/L or less (in 4 of these pits, the densities were 1Bq/L or less) (March 15). -The cleaning method was improved*2 for No.96 sub-drain, and later the radioactivity density of main nuclides was 1Bq/L or less (June 5).	-As the cleaning of No.96 pit was completed, a ground tank for pumping our the water will be prepared by the end of June. Cleaning of pits will be completed by the end of August.

*1 The pumping tests for Unit 1-4 sub-drains are being conducted while maintaining the pit water level at OP+4000 (controlled water level). The current pit water level is approx. OP+4200.

*2 High-pressure water cleaning in the pit and suspended solids removal are done after making the pit empty.

② Progress Status of the Sub-drain Purification Test: Test Results (Unit 1-4)

Upper : Radioactivity density (Bq/L) / Lower (in parentheses): Sampling date

Main nuclides *1			Unit 1	Unit 2					Unit 4		
			No.1	No.23	No.24	No.25	No.26	No.27	No.53	No.55	No.56
γ nuclides (18)	Cs-134	Before test	2,313 (3/15)	37,120 (10/21)	335 (1/17)	296 (1/17)	7,012 (10/25)	271 (1/17)	17 (3/15)	49 (1/20)	13 (1/20)
		After test	Mid June						1.7 (5/17)	2.0 (5/17)	0.89 (5/17)
	Cs-137	Before test	3,661 (3/15)	46,180 (10/21)	451 (1/17)	384 (1/17)	9,630 (10/25)	358 (1/17)	11 (3/15)	61 (1/20)	18 (1/20)
		After test	Mid June						2.6 (5/17)	3.4 (5/17)	2.0 (5/17)
	I-131	After test	Mid June						< 0.31 (5/17)	< 0.79 (5/17)	< 0.34 (5/17)
	Other γ nuclides ① (15) Fe-59, Co-58,Y-91, Nb-95, Ru-103, Ag-110m, Sb-124, Cs-136, Ba-140, Ce-141, Ce-144, Pr-144, Mn-54, Co-60, Zn-65		Mid June						Below the detection limit *2 (5/17)		
All α			Mid June						< 11.6 (6/5)	< 11.6 (6/5)	< 11.6 (6/5)
All β									< 24.4 (6/5)	< 26.1 (6/5)	< 26.1 (6/5)
Tritium									3826 (6/5)	6114 (6/5)	5430 (6/5)

*1 The detailed analysis of other nuclides will be completed in August or later.

*2 The detection limit may vary depending on the types of nuclides.

② Progress Status of the Sub-drain Purification Test: Test Progress Status (Unit 5-6)

Data acquired on March 14-15 unless otherwise specified.

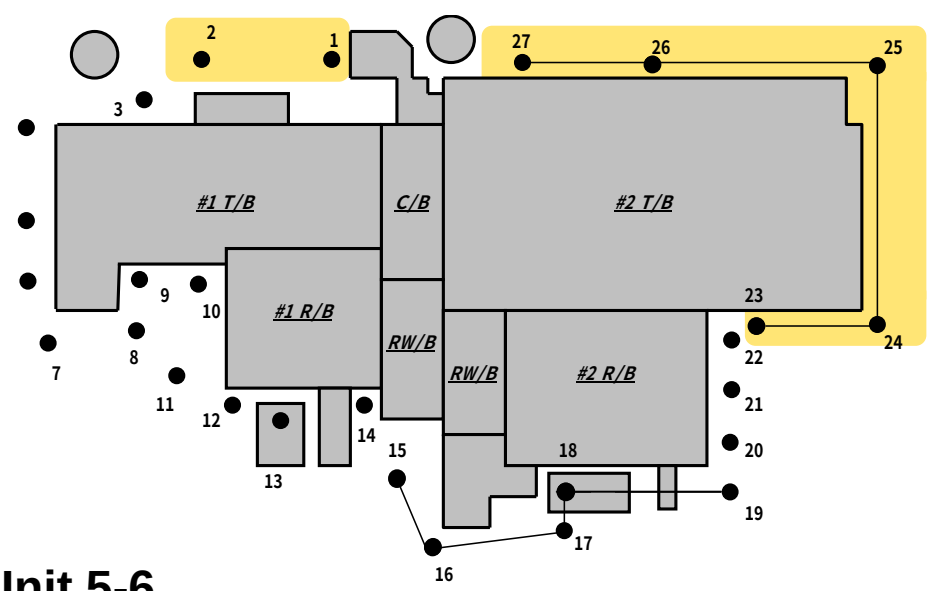
	Sub-drain No.	Radioactivity density (Unit: Bq/L)		
		Cs-134	Cs-137	I-131
Unit 5	71	1.1	2.4	< 0.7
	72	2.9	3.2	< 0.7
	73	6.5	8.9	< 0.9
	74	< 0.7	1.0	< 0.7
	75	1.5	1.6	< 0.7
	76	Sampling was not done due to obstacles		
	77	72.3	104.9	< 2.0
	78	29.9	39.9	< 1.3
	79	16.3	22.3	< 1.1
	80	1.4	1.9	< 0.7
	81	< 0.7	< 0.8	< 0.6
	82	1.5	1.7	< 0.7
	83	2.3	3.3	< 0.8

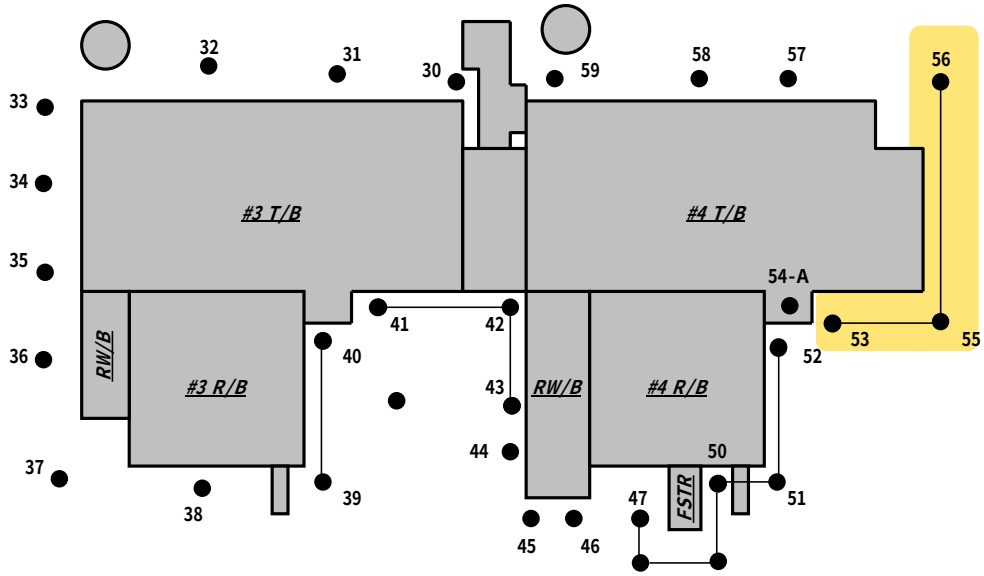
	Sub-drain No.	Radioactivity density (Unit: Bq/L)		
		Cs-134	Cs-137	I-131
Unit 6	84	< 0.7	< 0.8	< 0.7
	85	0.8	1.5	< 0.7
	86	1.5	1.8	< 0.8
	87	< 0.7	2.1	< 0.7
	88	1.1	1.3	< 0.7
	89	2.0	3.1	< 0.7
	90	1.3	1.9	< 0.7
	91	6.4	7.9	< 0.9
	92	1.0	2.1	< 0.8
	93	1.9	3.2	< 0.8
	94	2.1	2.2	< 0.8
	95	< 0.8	1.1	< 0.9
	96	3.6	4.6	< 0.6
	96 (After cleaning)*	< 0.7	< 0.9	< 0.4
	97	< 0.7	< 0.8	< 0.8

* Water analysis result acquired on May 30 after the pit cleaning was completed.

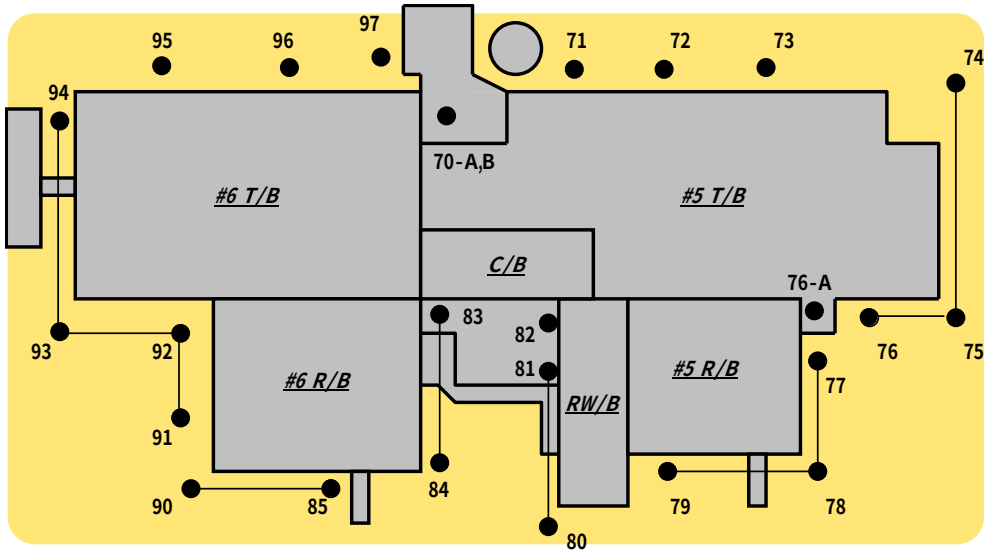
② Progress Status of the Sub-drain Purification Test: (Reference) Sub-drain pits

Unit 1-4





Unit 5-6



: Tested sub-drains

End