Progress of Landside Impermeable Wall freezing: Phase 2 of the first stage

November 24, 2016

TEPCO

Tokyo Electric Power Company Holdings, Inc.

Landside impermeable wall

- The purpose of the Landside Impermeable Wall construction lies not in freezing soil to form an underground wall but in keeping groundwater from flowing into the reactor/turbine buildings and preventing new contaminated water from being generated.
- By closing less than 95 percent of the mountain side of the Landside Impermeable Wall in Phase 2 of the first stage, it is expected that the amount of groundwater flowing into the areas around the reactor/turbine buildings will be reduced. This will help keep groundwater from being contaminated during the first stage.
- Throughout the first stage, how freezing of the Landside Impermeable Wall has progressed will be checked by monitoring the difference in groundwater levels inside and outside of the wall and the amount of groundwater pumped up by the subdrain and groundwater drain systems and the well point system.

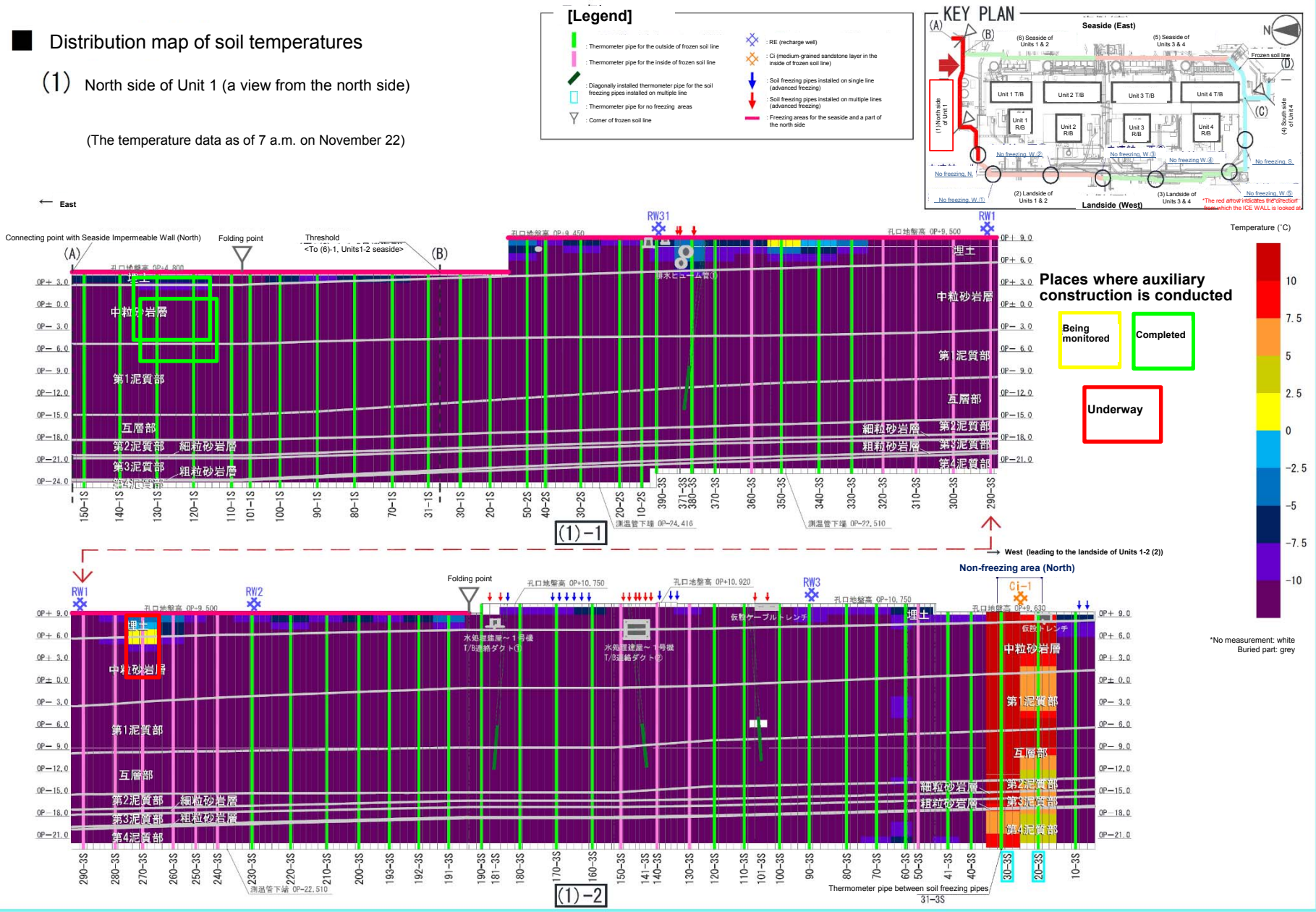
Contents

1-1 Distribution map of soil temperatures (north side of Unit 1)

■ Distribution map of soil temperatures

(1) North side of Unit 1 (a view from the north side)

(The temperature data as of 7 a.m. on November 22)

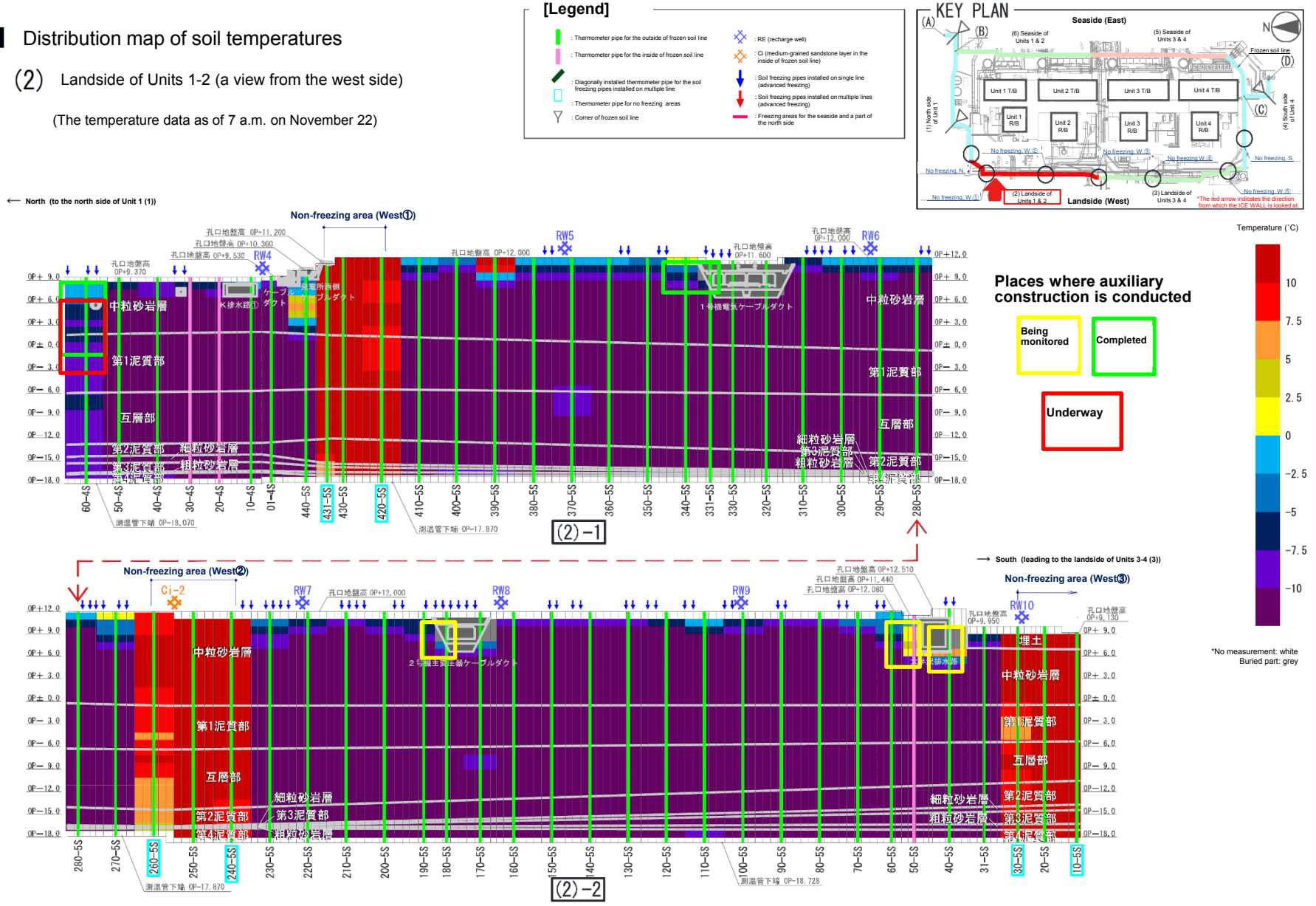


1-2 Distribution map of soil temperatures (west side of Units 1-2)

■ Distribution map of soil temperatures

(2) Landside of Units 1-2 (a view from the west side)

(The temperature data as of 7 a.m. on November 22)

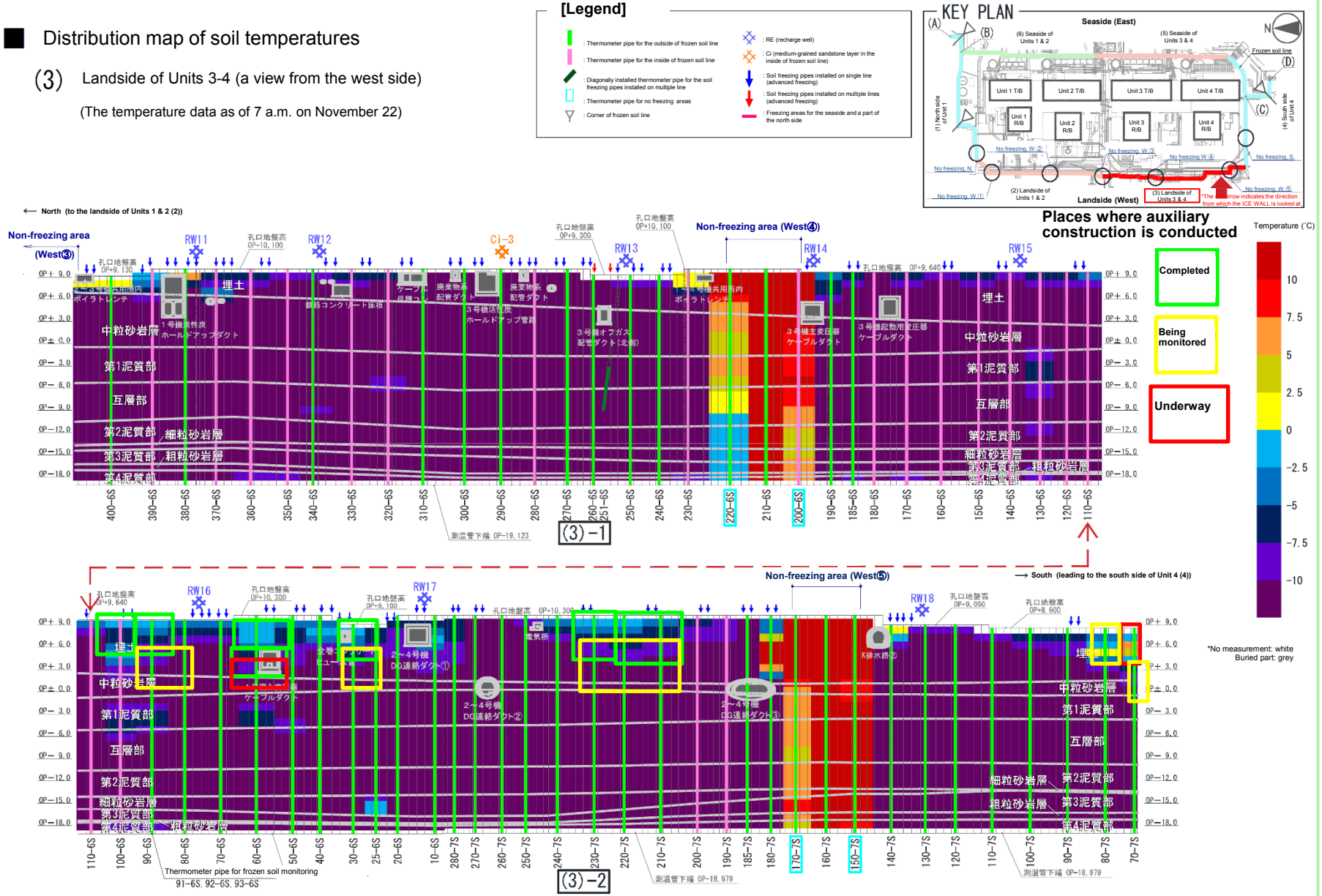


1-3 Distribution map of soil temperatures (west side of Units 3-4)

■ Distribution map of soil temperatures

(3) Landside of Units 3-4 (a view from the west side)

(The temperature data as of 7 a.m. on November 22)

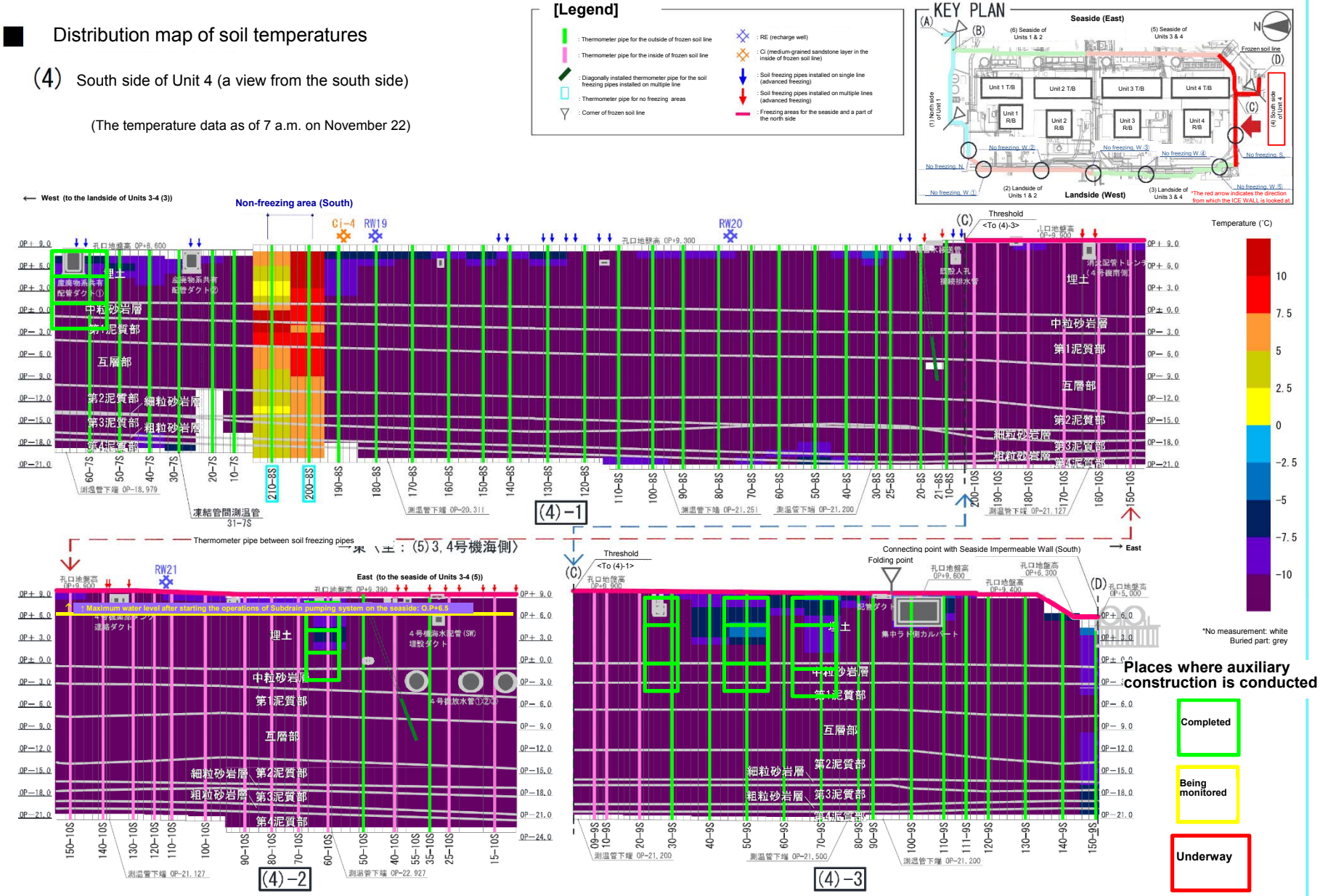


1-4 Distribution map of soil temperatures (south side of Unit 4)

■ Distribution map of soil temperatures

(4) South side of Unit 4 (a view from the south side)

(The temperature data as of 7 a.m. on November 22)

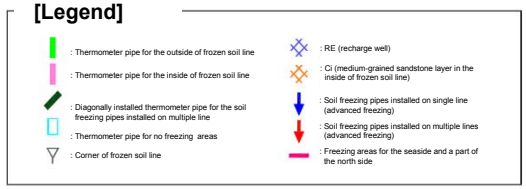


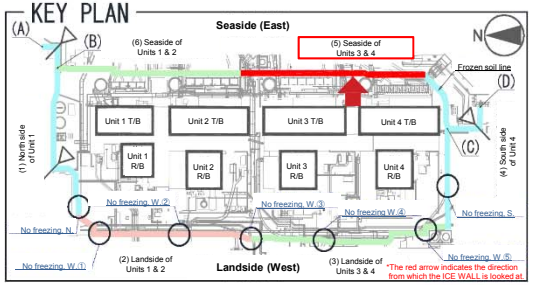
1-5 Distribution map of soil temperatures (east side of Units 3-4)

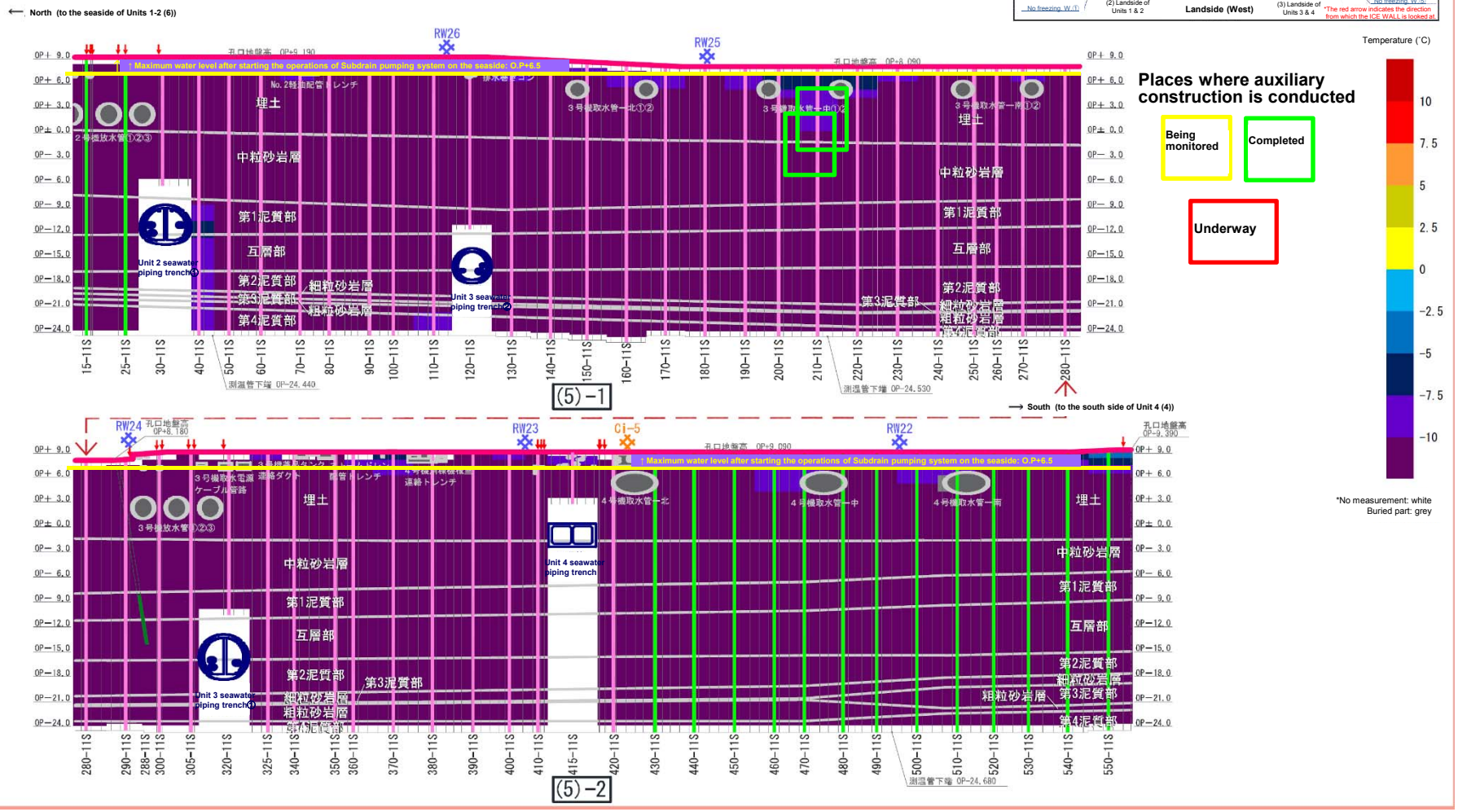
■ Distribution map of soil temperatures

(5) Seaside of Units 3-4
(west side: a view from the inside of frozen soil)

(The temperature data as of 7 a.m. on November 22)





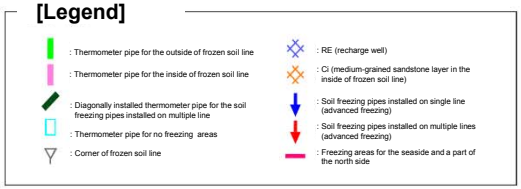


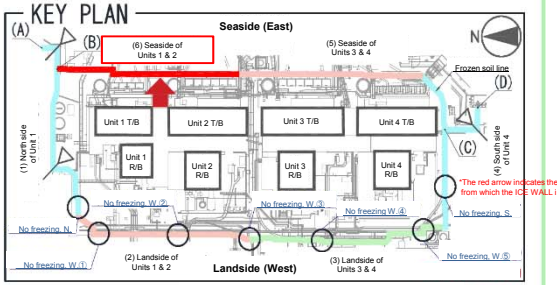
1-6 Distribution map of soil temperature (east side of Units 1-2)

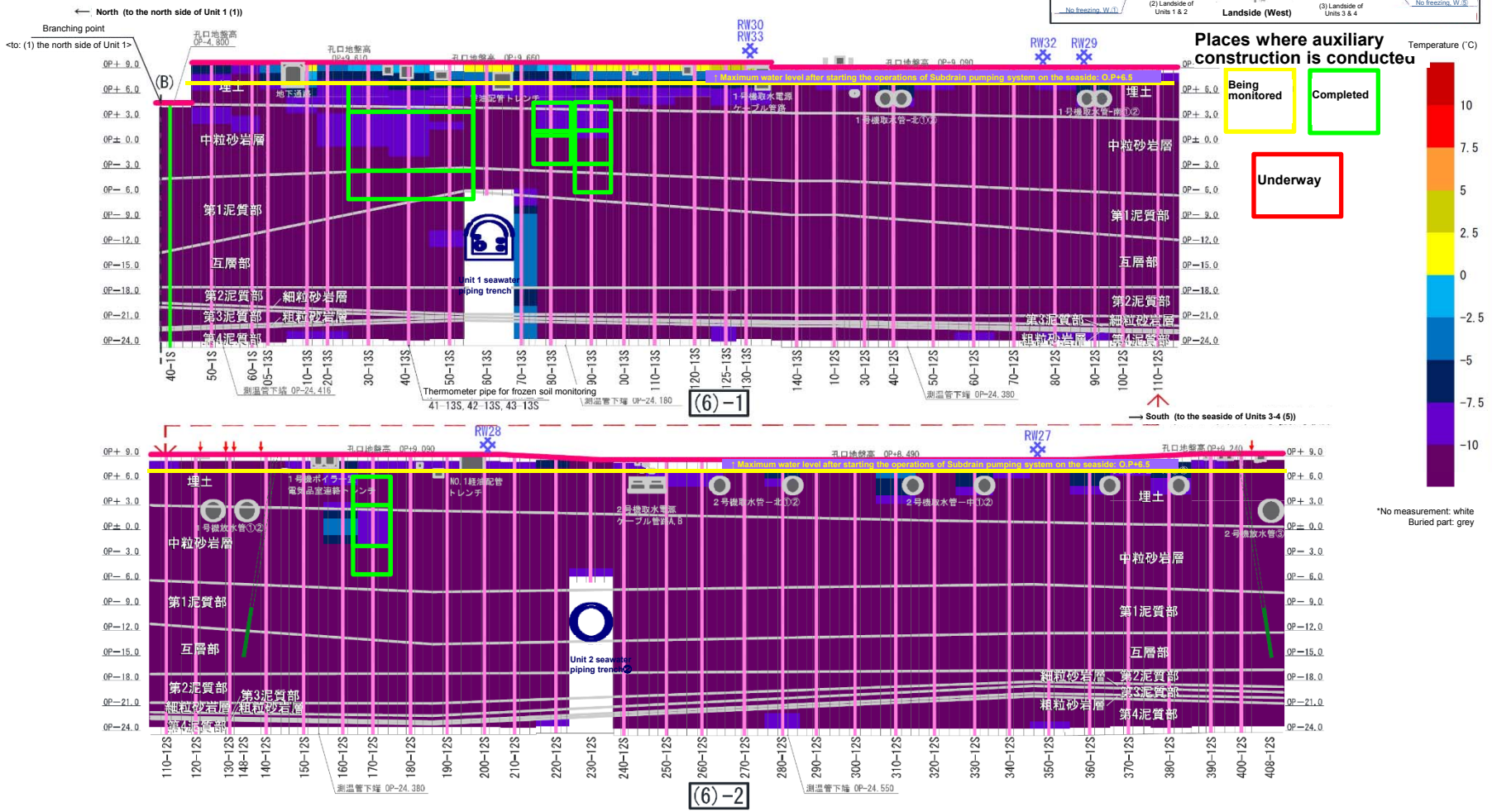
■ Distribution map of soil temperatures

(6) Seaside of Units 1-2
(west side: a view from the inside of frozen soil)

(The temperature data as of 7 a.m. on November 22)

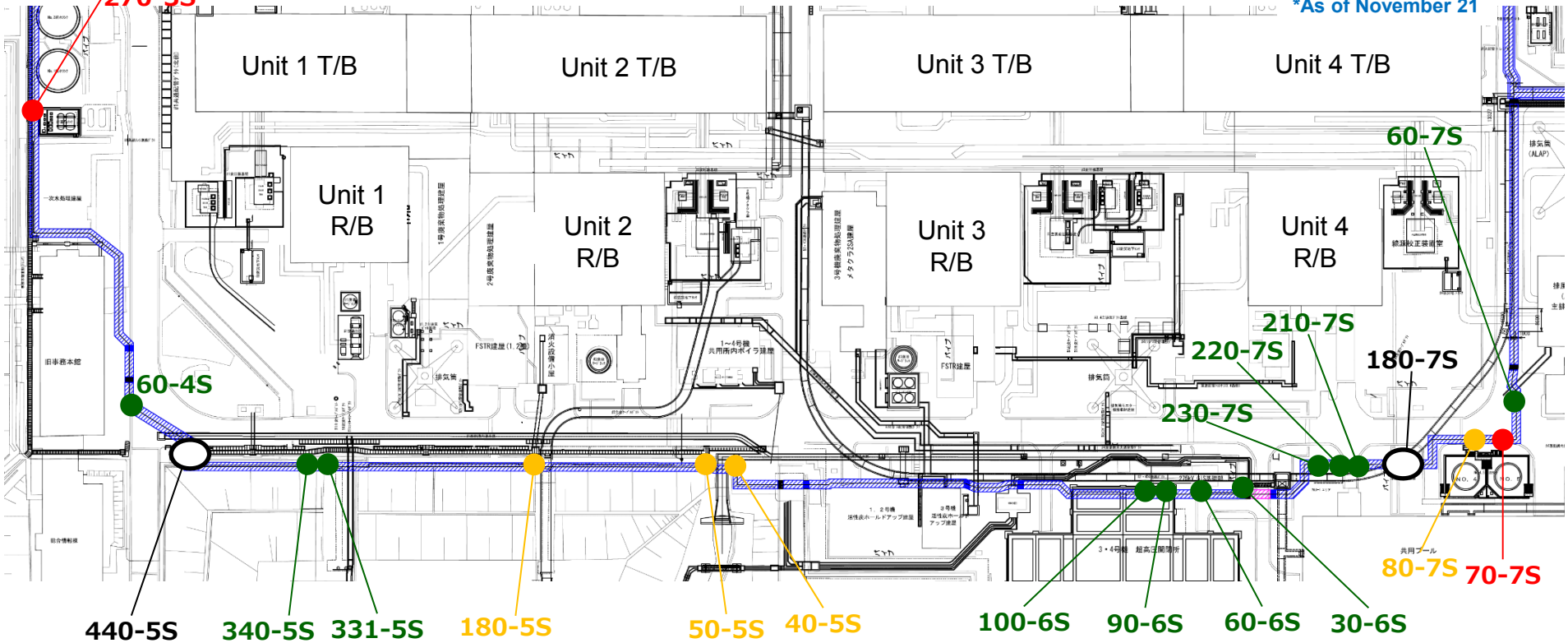






1-7 Auxiliary construction to assist freezing of the landside

*As of November 21



Legend
- : Completed
- : Being monitored
- : Underway
- : Not yet started

1-8 Process of auxiliary construction to assist freezing of the mountainside

Process 1 . In the data of soil temperatures obtained from all the thermometer pipes that are buried deeper than 2m from the ground, the depth at which auxiliary construction is supposed to take place, find measurement points where the current soil temperatures and the expected soil temperatures*1 are both above 0°C.

Process 2. Among the measurement points, find the ones with 3 or more consecutive “Shindo”s*2 where the current soil temperatures and the expected soil temperatures are both above 5°C. Auxiliary construction will take place at these points as a “Highest Priority.”

Process 3. Among the measurement points found in Process 1 but excluded in Process 2, auxiliary construction will take place as the “2nd highest priority” at the points which are located in the layers shallower than the medium-grained sandstone layers.

Process 4. Among the measurement points found in Process 1 but excluded in Process 2, auxiliary construction will take place as the “3rd highest priority” at the points which are located in the layers deeper than the alternating strata layers.

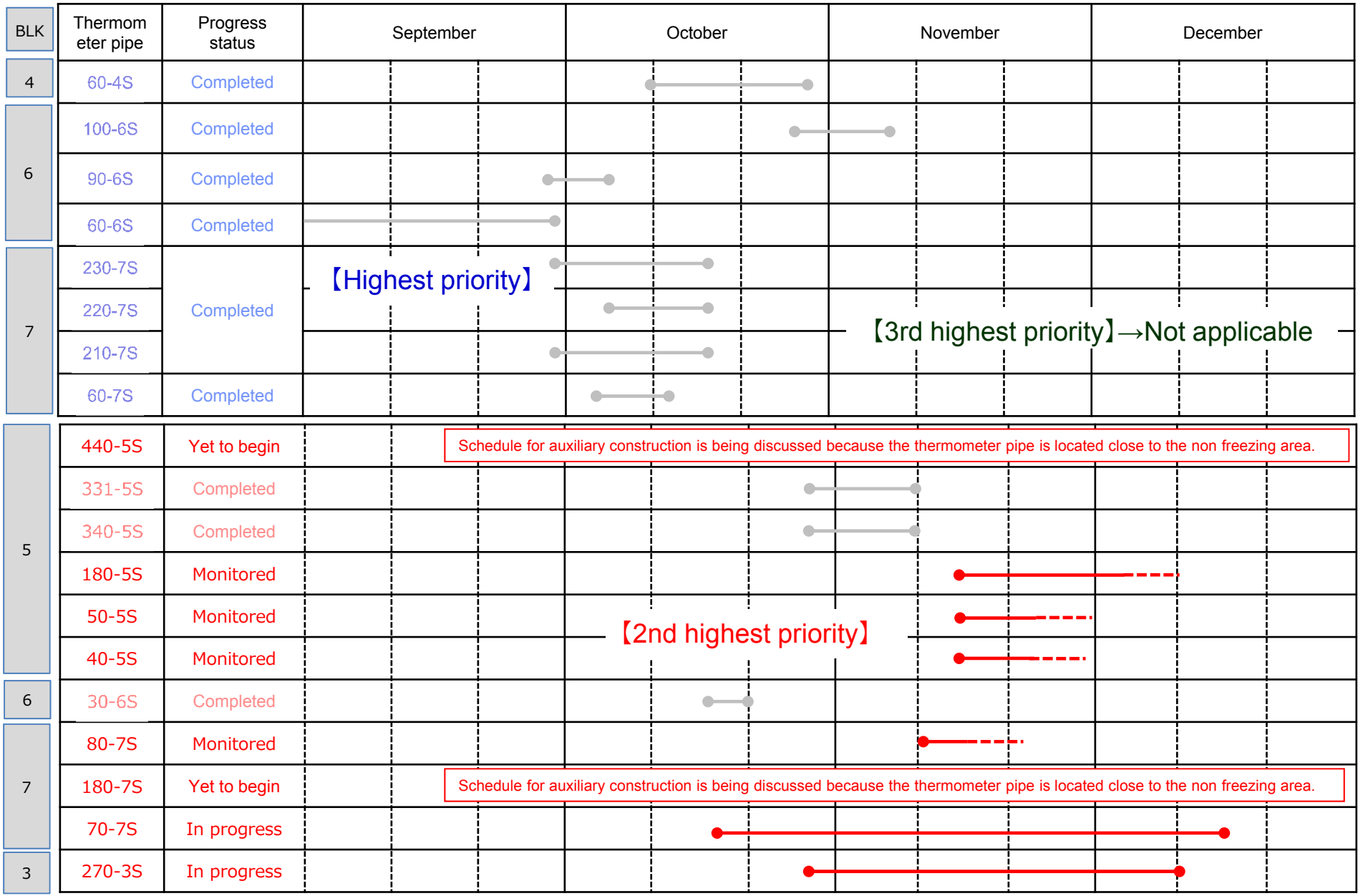
Process 5. In principle, auxiliary construction will take place in the order of “Highest Priority,” “2nd highest priority” and “3rd highest priority.”

Process 6. Processes 1-4 will continue to be reviewed at least once in two weeks. At each time, the points where auxiliary construction will take place will be added or deleted and then reflected to the schedule. This process will be applied to the not frozen areas when they will be frozen in the future.

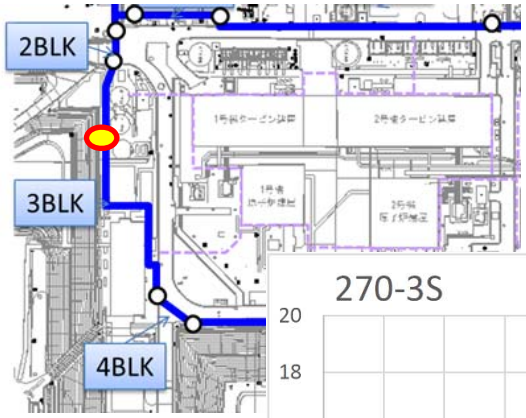
*1 Expected soil temperatures: Soil temperatures measured 30 days after making the assumption that the temperature measured during a week will maintain.

*2 “Shindo”: 1 “Shindo” is about 1m deep and a measurement point indicates an average temperature of the 1m deep interval.

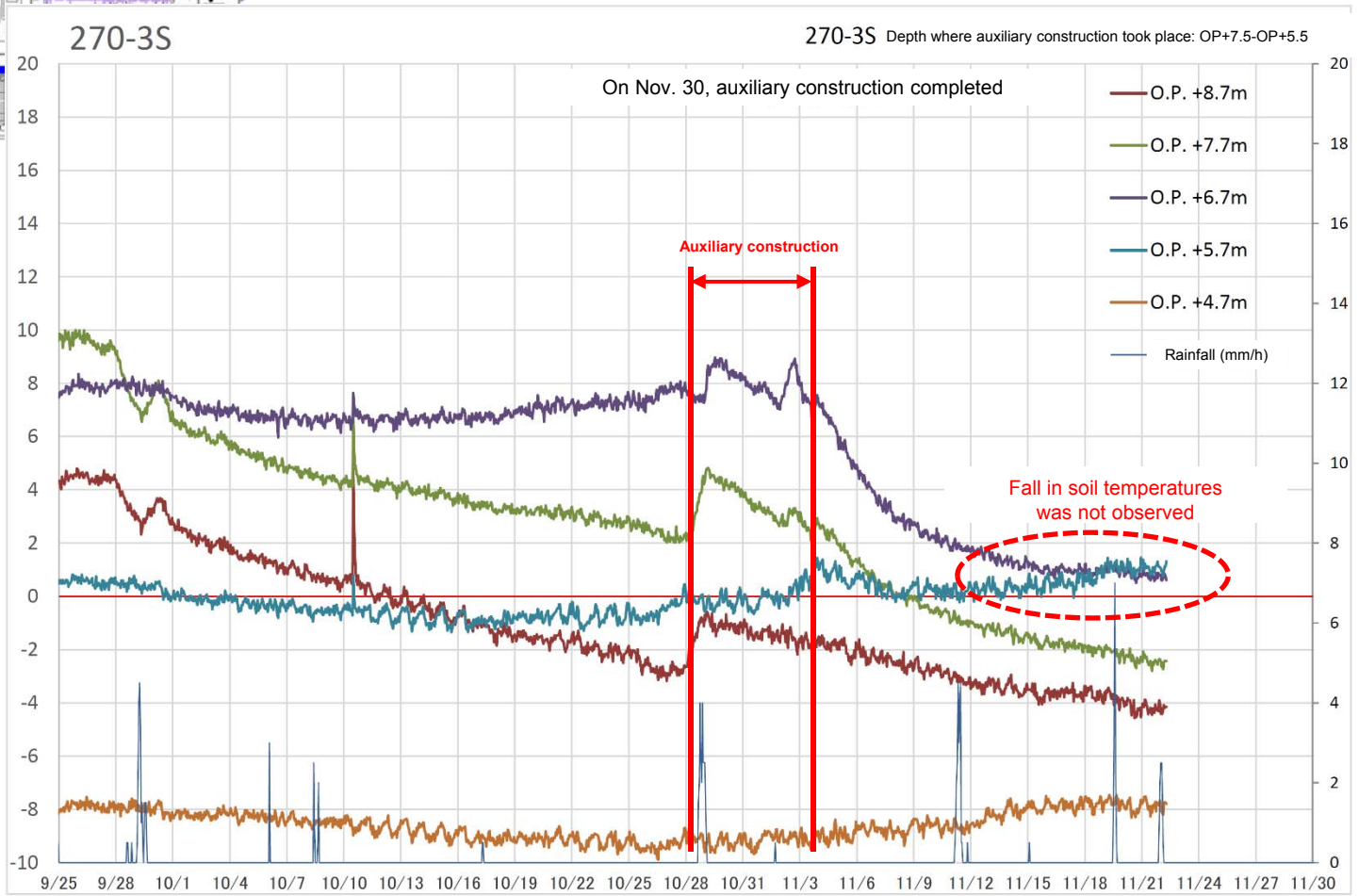
1-9 Schedule for auxiliary construction to assist freezing of the landside (based on the changes of soil temperatures from November 4 to November 11) and its progress (as of November 21)



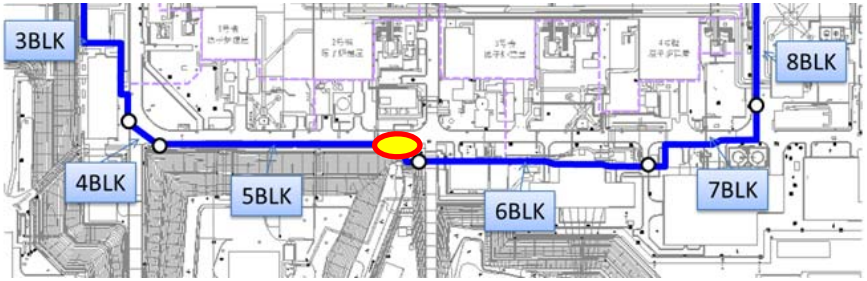
1-10 Auxiliary construction to assist freezing of the landside; fall in soil temperatures (3BLK)

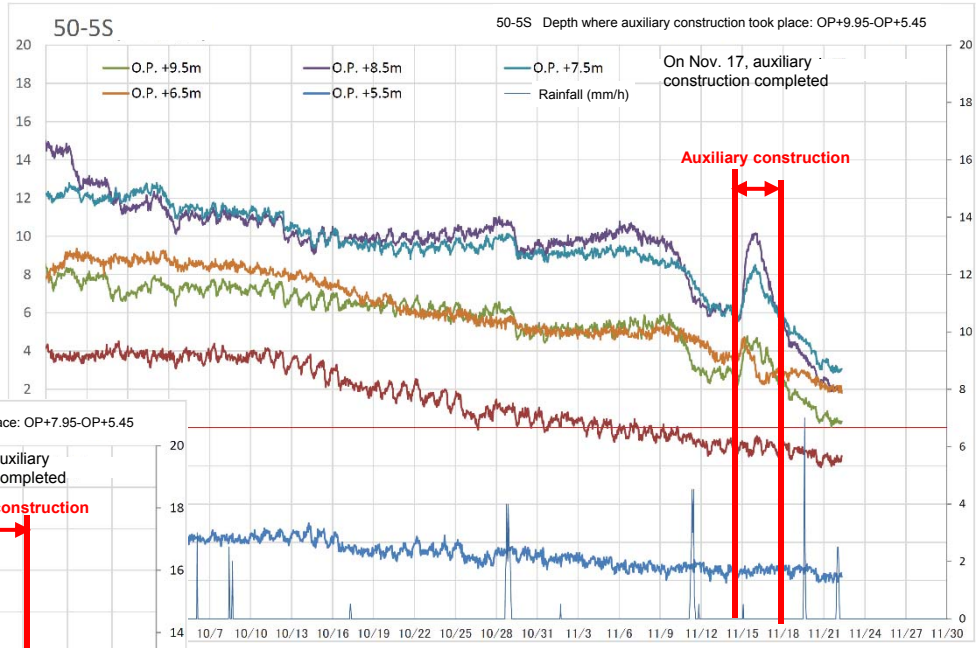


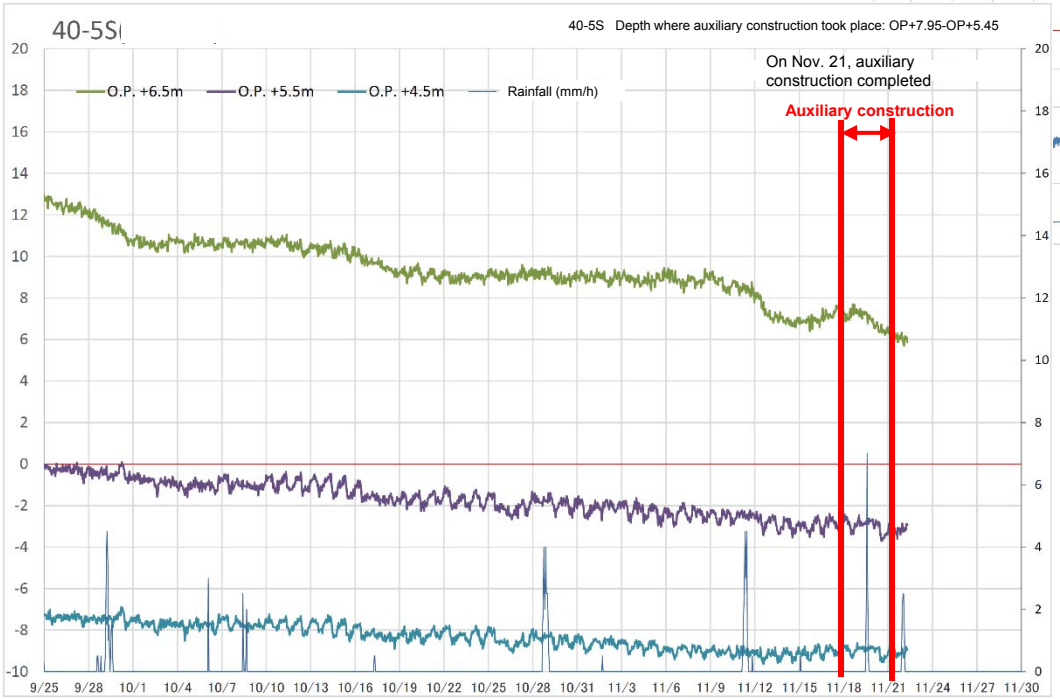
【270-3S】
Overall, the soil temperatures fell down relatively steadily. At the point of OP+5.7, however, the temperature remained at around 0°C and did not fall further. Additional auxiliary construction is being planned.



1-11 Auxiliary construction to assist freezing of the landside; fall in soil temperatures (5BLK-1)

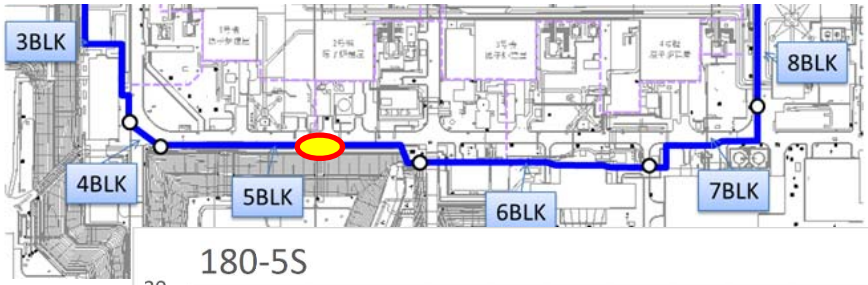




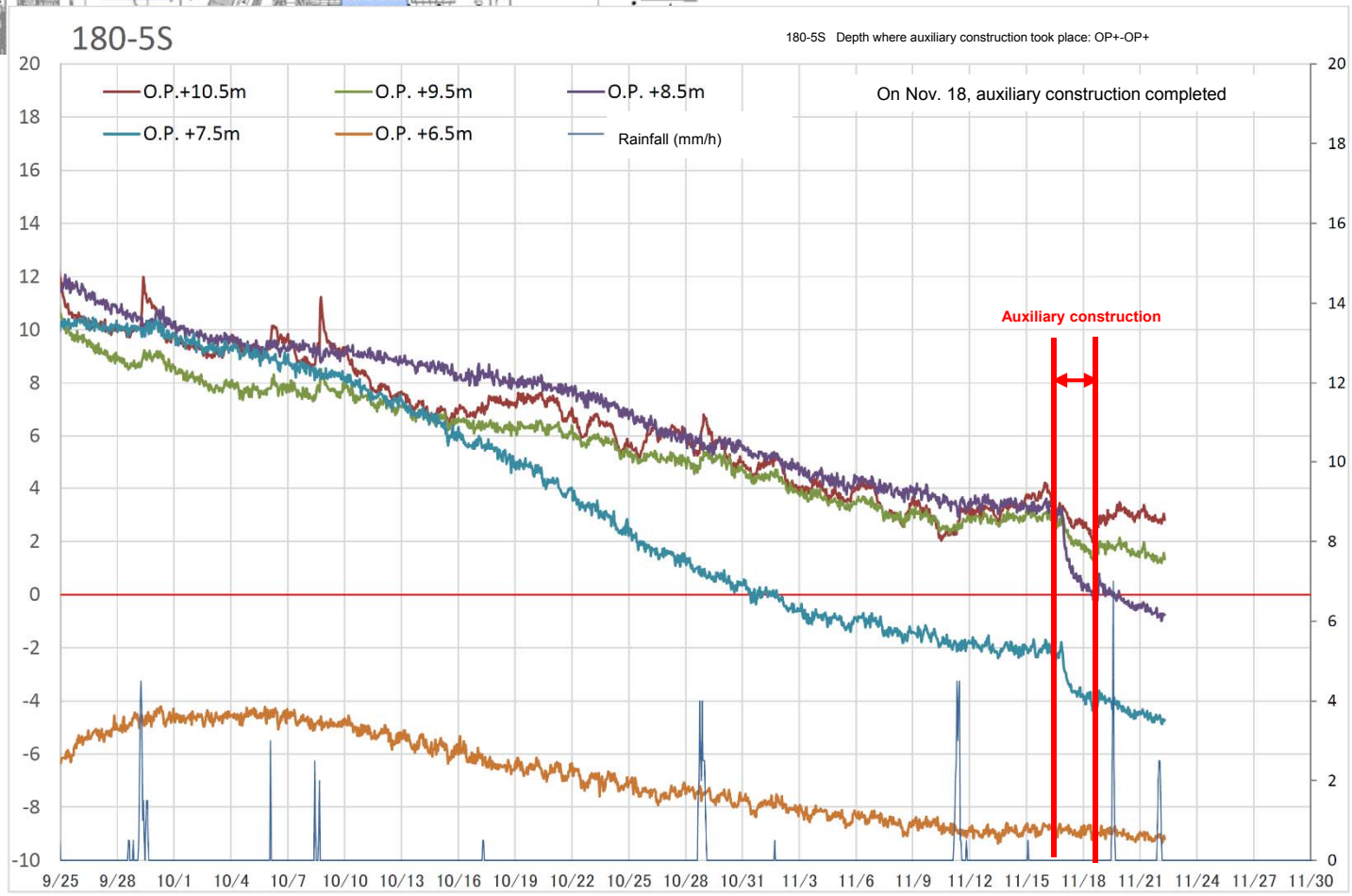


【40-5S】
Auxiliary construction was completed. The soil temperatures are still being monitored.
【50-5S】
Auxiliary construction was completed. The soil temperatures are still being monitored.

1-11 Auxiliary construction to assist freezing of the landside; fall in soil temperatures (5BLK-2)

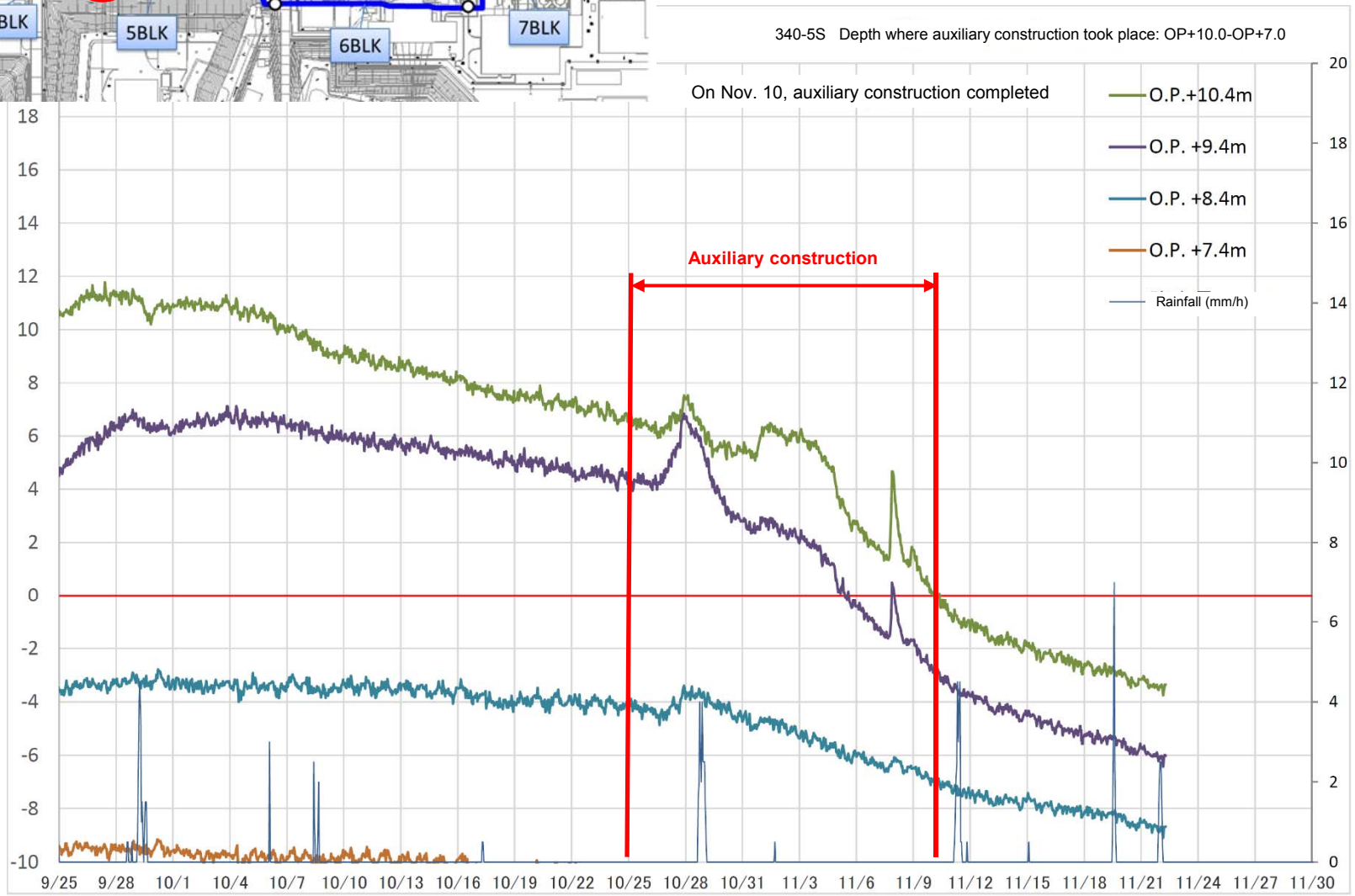


【180-5S】
Auxiliary construction was completed. The soil temperatures are still being monitored.

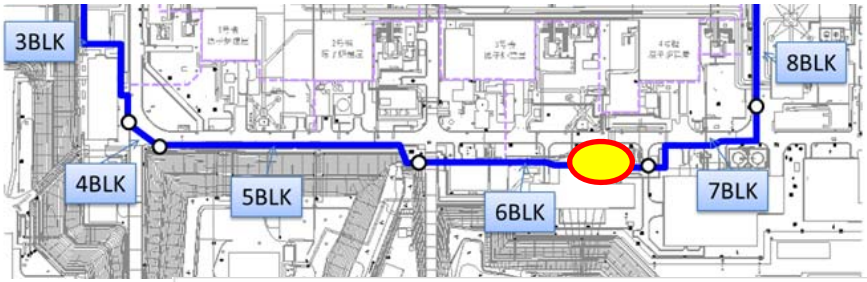


1-11 Auxiliary construction to assist freezing of the landside; fall in soil temperatures (5BLK-3)

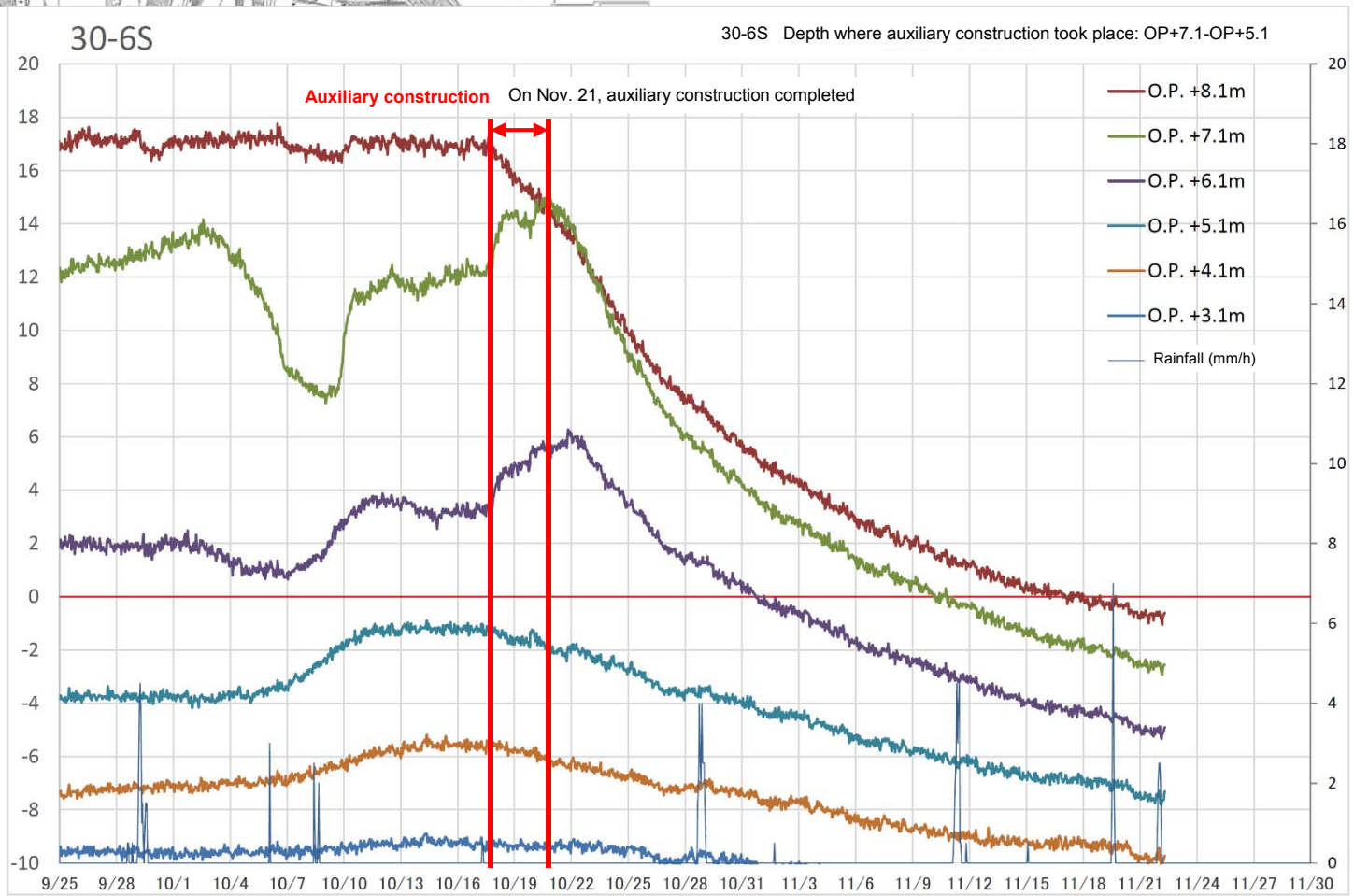
【340-5S】
Auxiliary construction was completed. The soil temperatures are still being monitored.



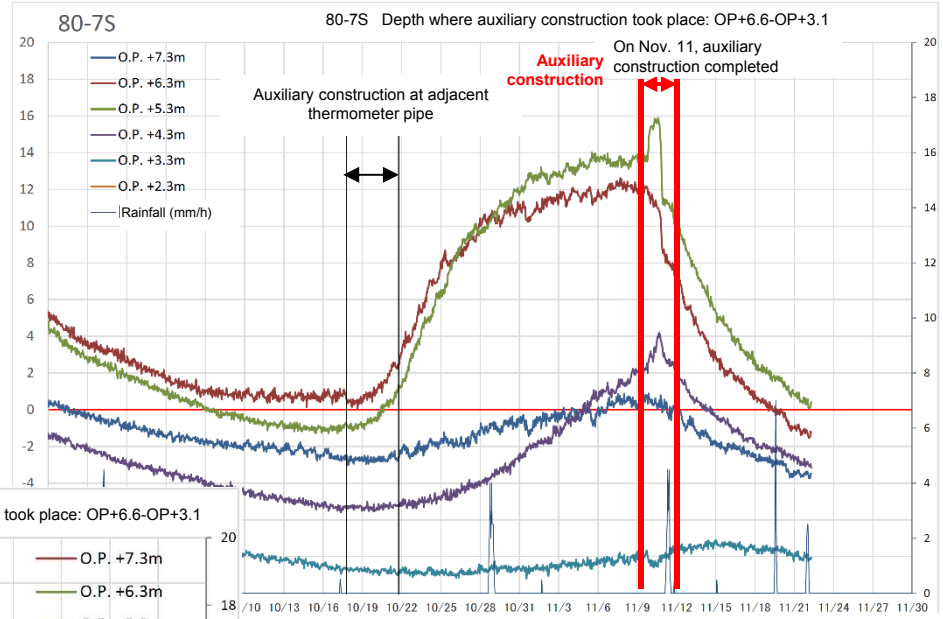
1-12 Auxiliary construction to assist freezing of the landside; fall in soil temperatures (6BLK)

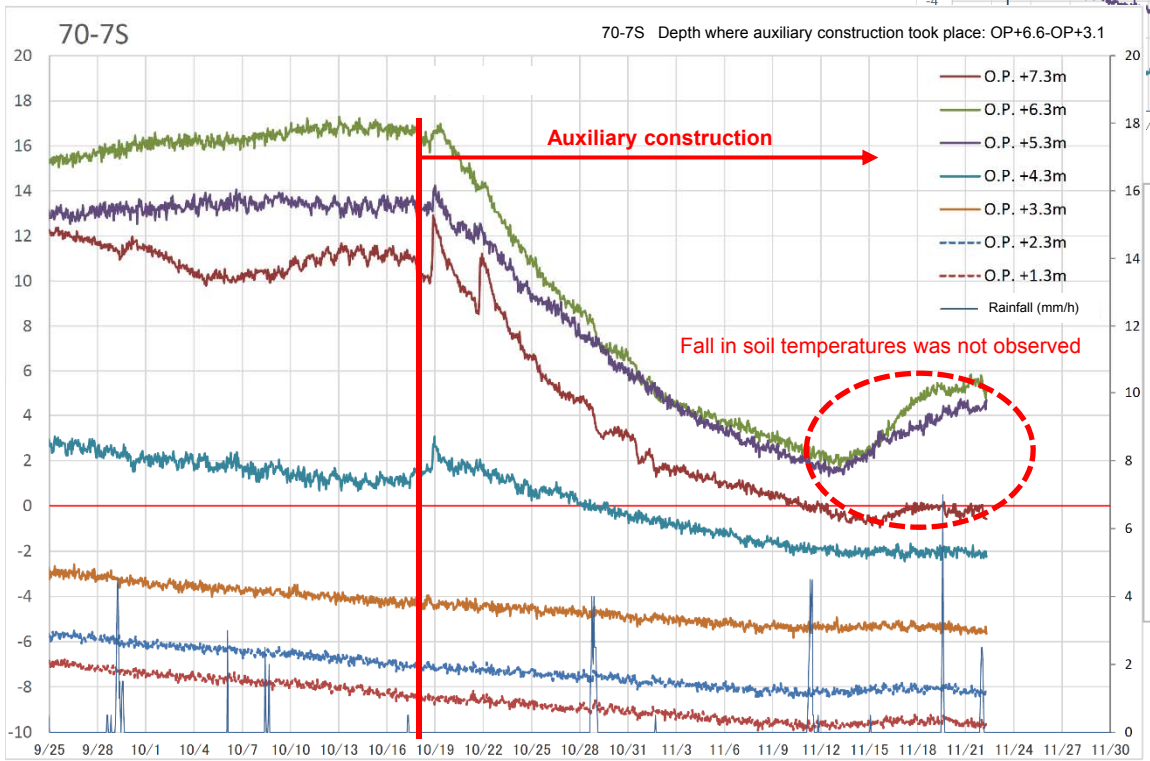


【30-6S】
Auxiliary work was completed. The soil temperatures went below 0℃.



1-13 Auxiliary construction to assist freezing of the landside; fall in soil temperatures (7BLK 2/2)



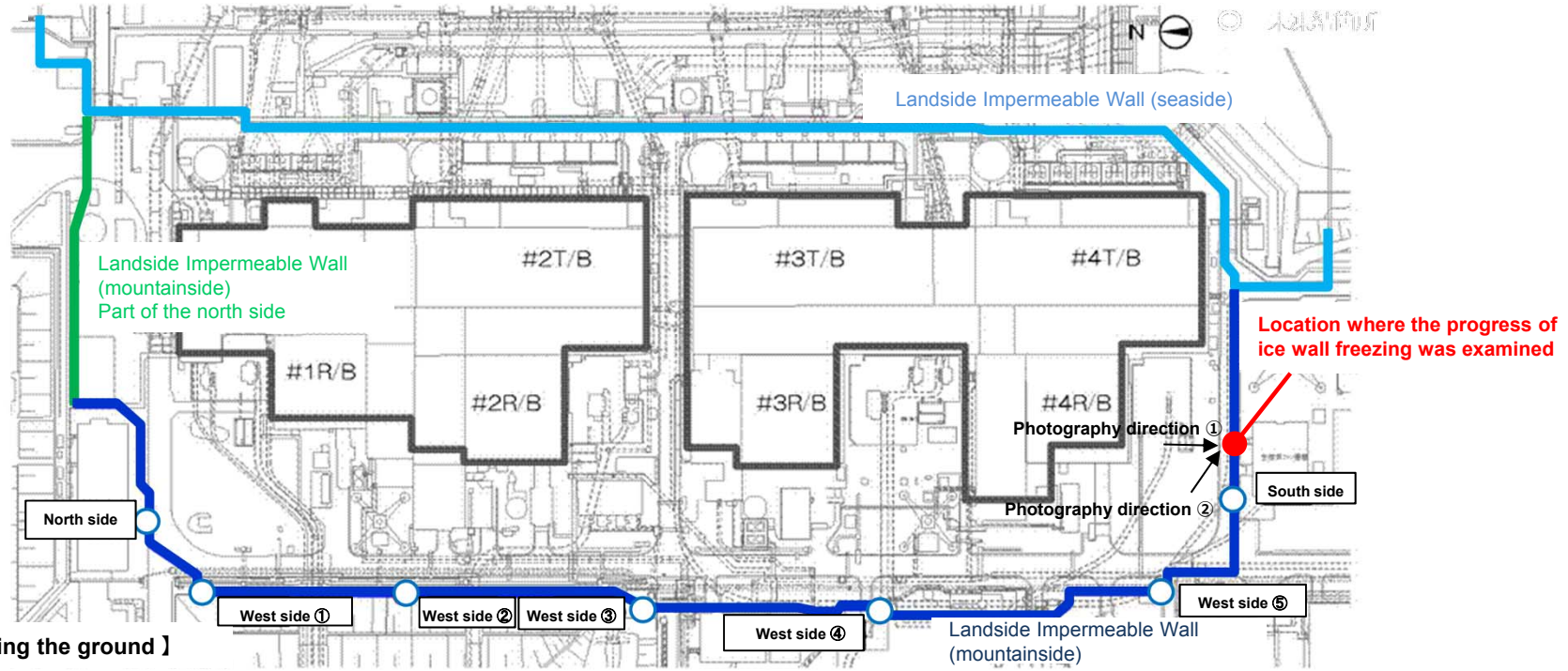


【70-7S】
After auxiliary construction at an adjacent 80-7S started having an effect, the soil temperatures started rising. Additional auxiliary construction is being planned.

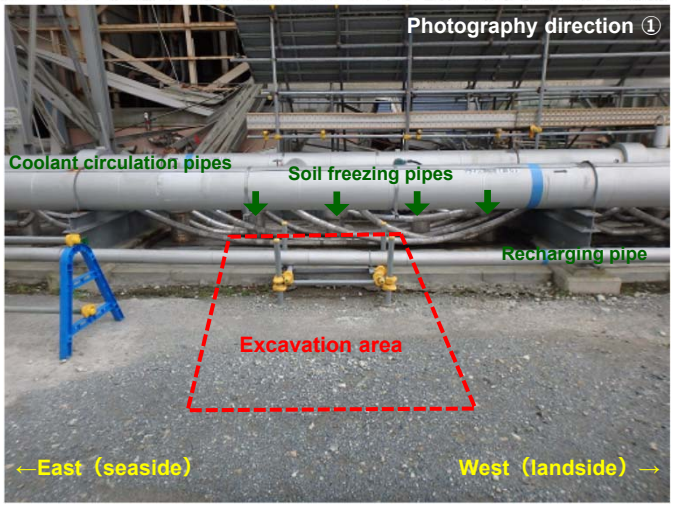
【80-7S】
Since the soil temperatures rose in an area around 70-7S, additional auxiliary construction took place and was completed on November 11. The temperatures are going down steadily.

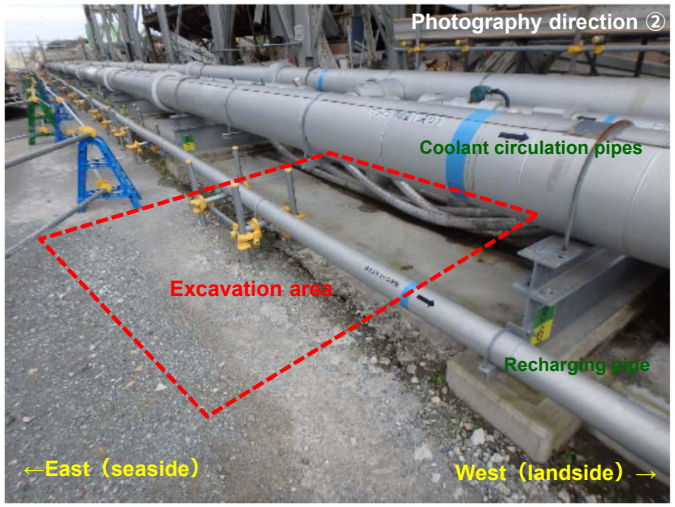
2. Freezing condition visually confirmed for the Landside Impermeable Wall

【Location map】



【 Before excavating the ground 】



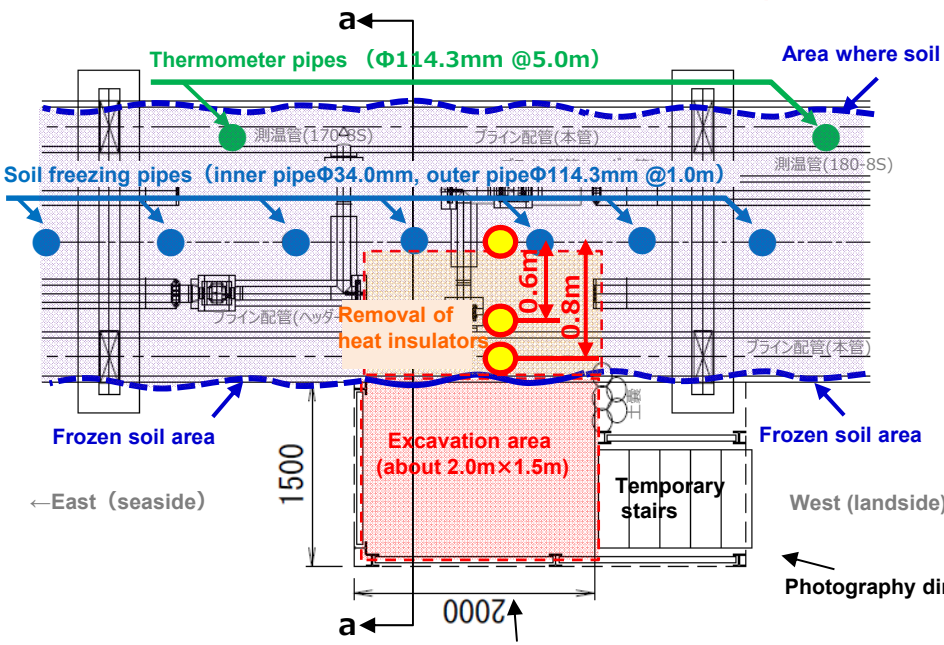


2. Freezing condition visually confirmed for the Landside Impermeable Wall

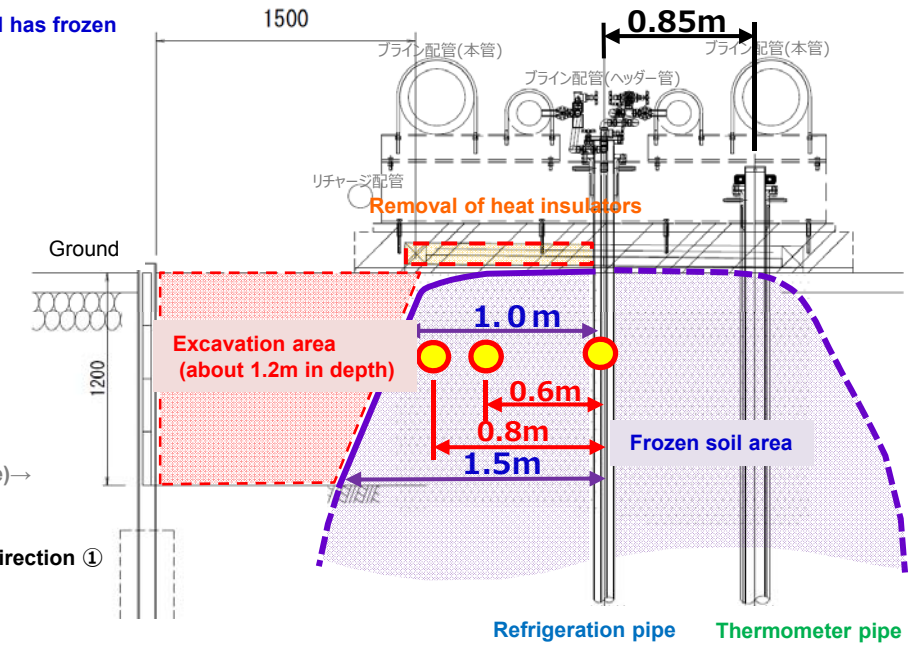
After digging a hole 1.2m deep, freezing condition of the ground soil was examined.

【Plain view】

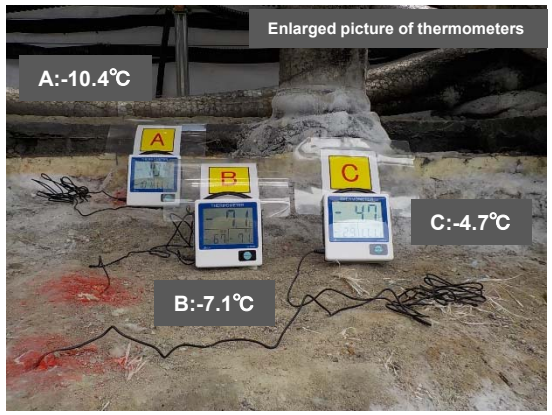
: places where thermometers are placed



【a-a Sectional view 】



【Pictures on Nov. 21】



3-1 Groundwater levels and hydraulic heads
(in the medium-grained sandstone layer 1 on the seaside)

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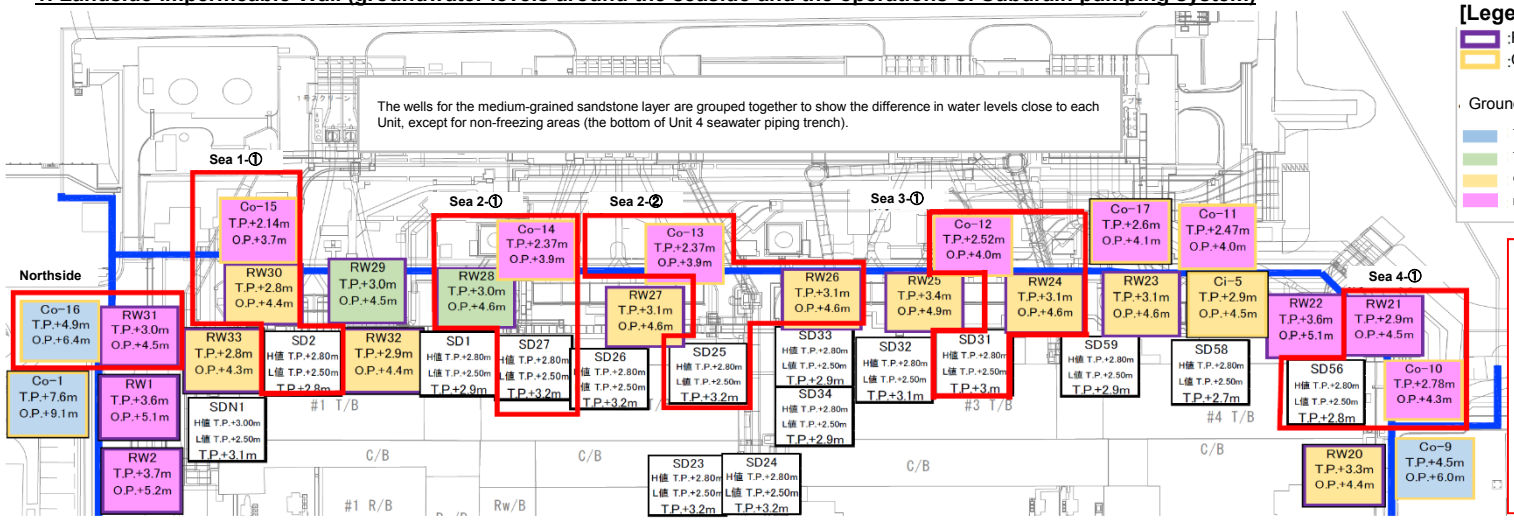
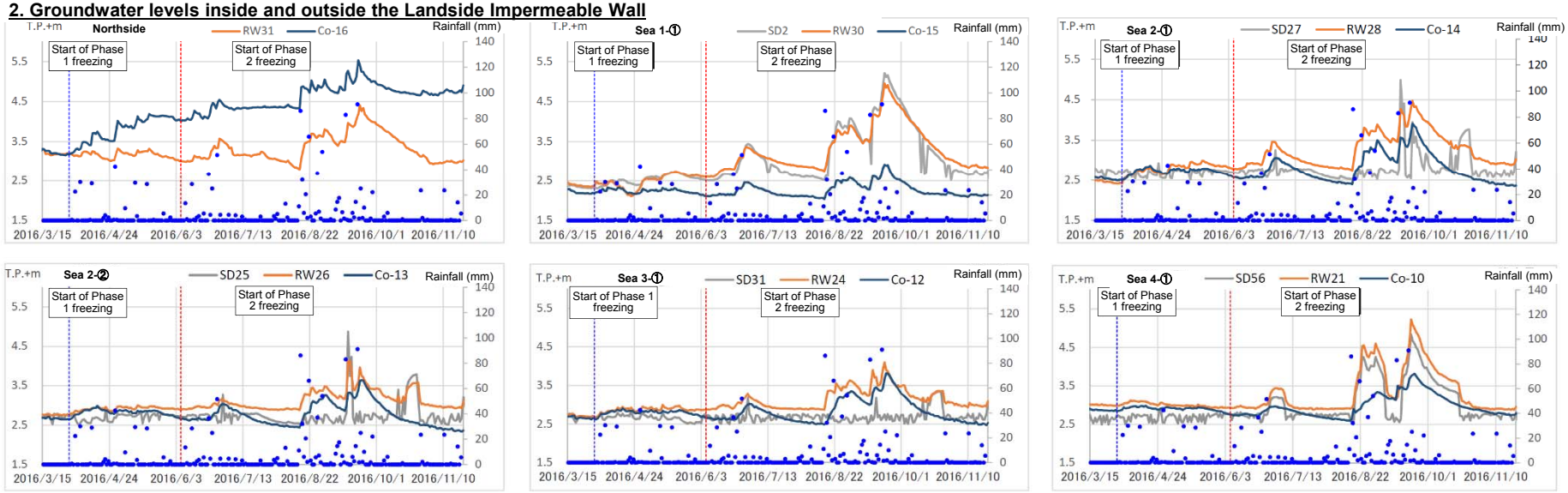
1. Landside Impermeable Wall (groundwater levels around the seaside and the operations of Subdrain pumping system)



Water levels within and outside of the ice wall are gradually widening. The landside impermeable wall has been confirmed to block the flow of groundwater. The temporary reversal of the water levels at Sea 4-① is assumed to have happened because of the operation of the Subdrain pumping system.

2. Groundwater levels inside and outside the Landside Impermeable Wall

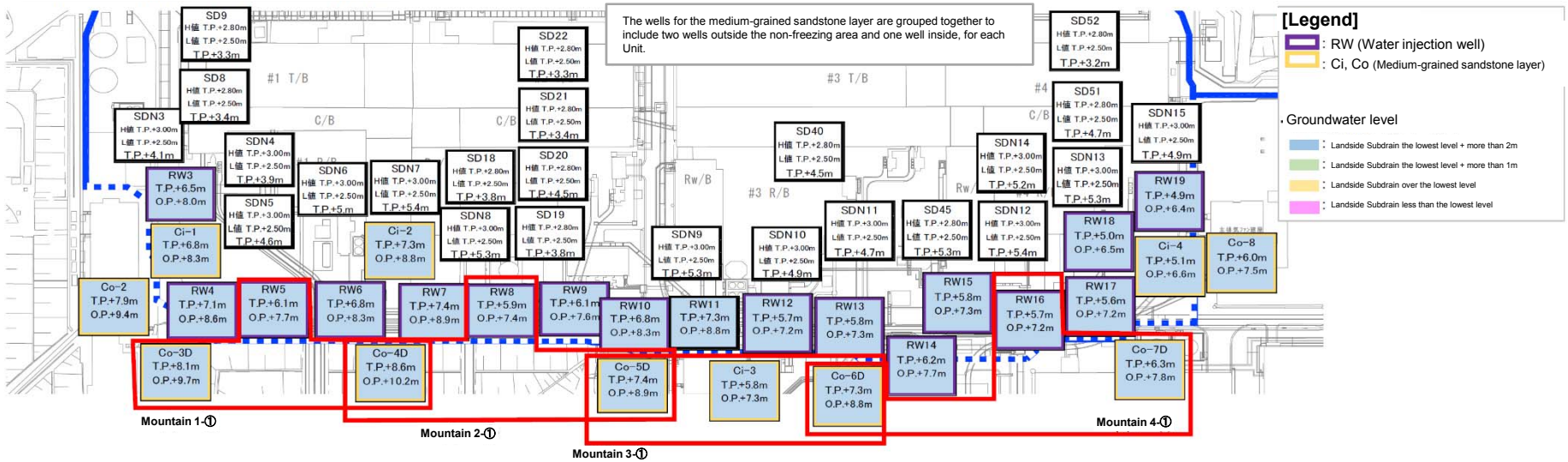


The data of groundwater levels as of 12 p.m. on November 24

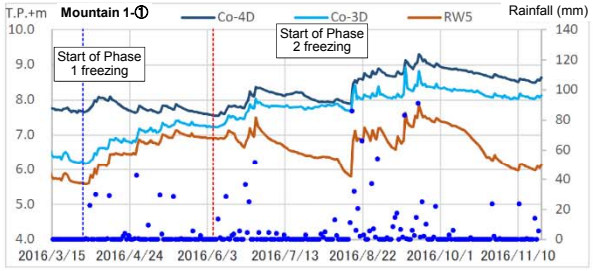
3-2 Groundwater levels and hydraulic heads
(in the medium-grained sandstone layer 2 on the landside)

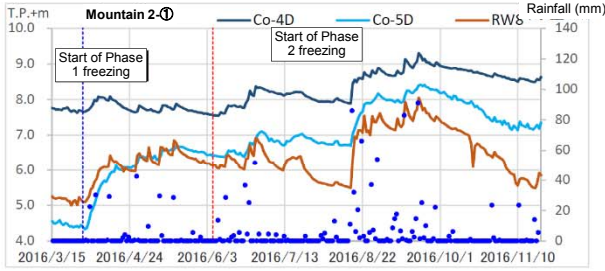
What to be monitored in an early stage of the ice wall freezing (Phase 1 Stage 1, seaside, water levels in the middle-grained sandstone layer)

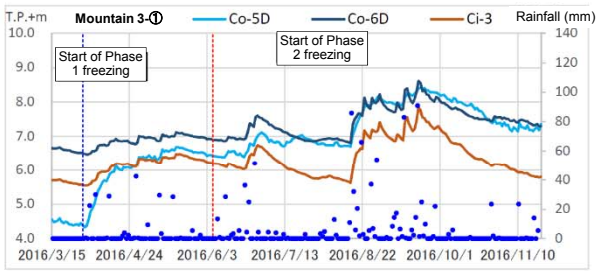
3. Landside Impermeable Wall (groundwater levels around the seaside and the operations of Subdrain pumping system)

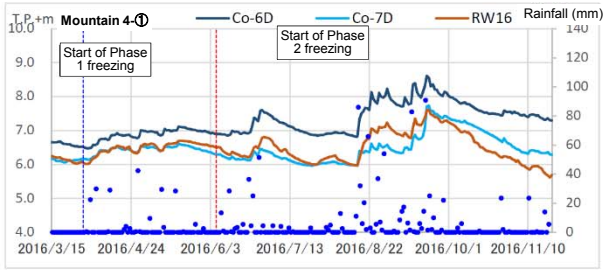


4. Groundwater levels inside and outside the Landside Impermeable Wall









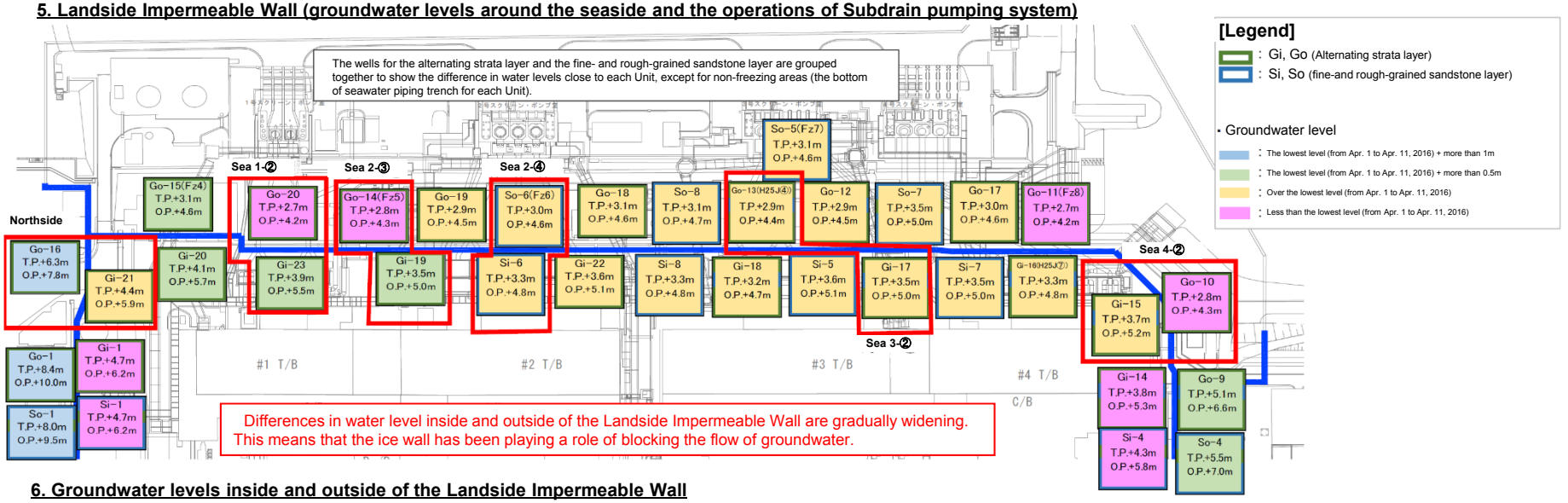
Differences in water level inside and outside of the Landside Impermeable Wall are gradually widening.
This means that the ice wall has been playing a role of blocking the flow of groundwater.

The data of groundwater levels as of 12 p.m. on November 24

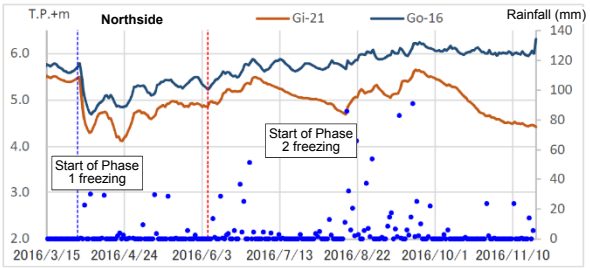
3-3 Groundwater levels and hydraulic heads
(in the alternating strata layer and the fine- and rough-grained sandstone layer 1 on the seaside)

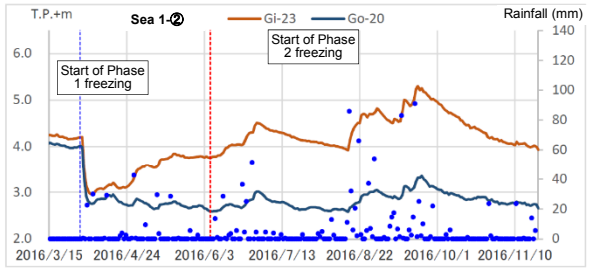
What to be monitored in an early stage of the ice wall freezing (Phase 1 Stage 1, seaside, water levels in the middle-grained sandstone layer)

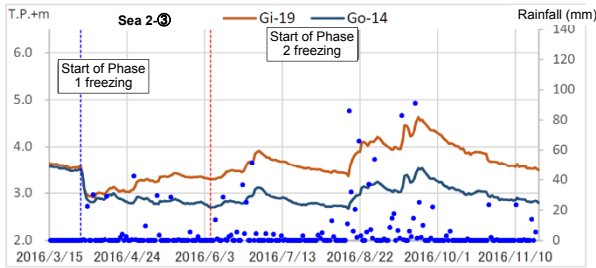
5. Landside Impermeable Wall (groundwater levels around the seaside and the operations of Subdrain pumping system)

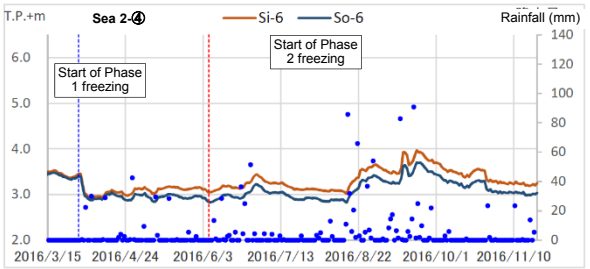


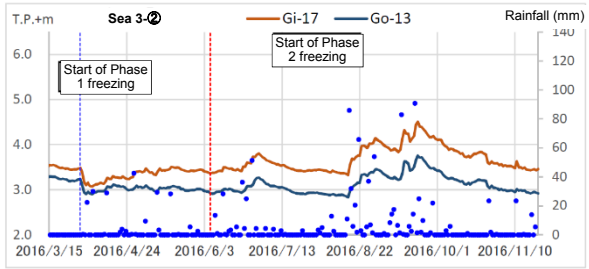
6. Groundwater levels inside and outside of the Landside Impermeable Wall

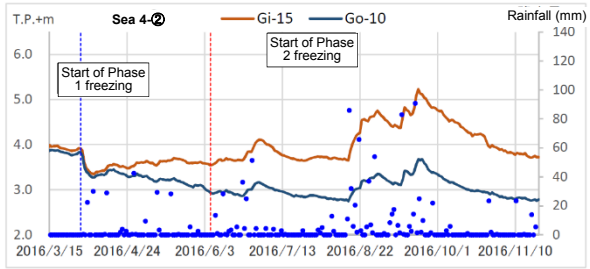










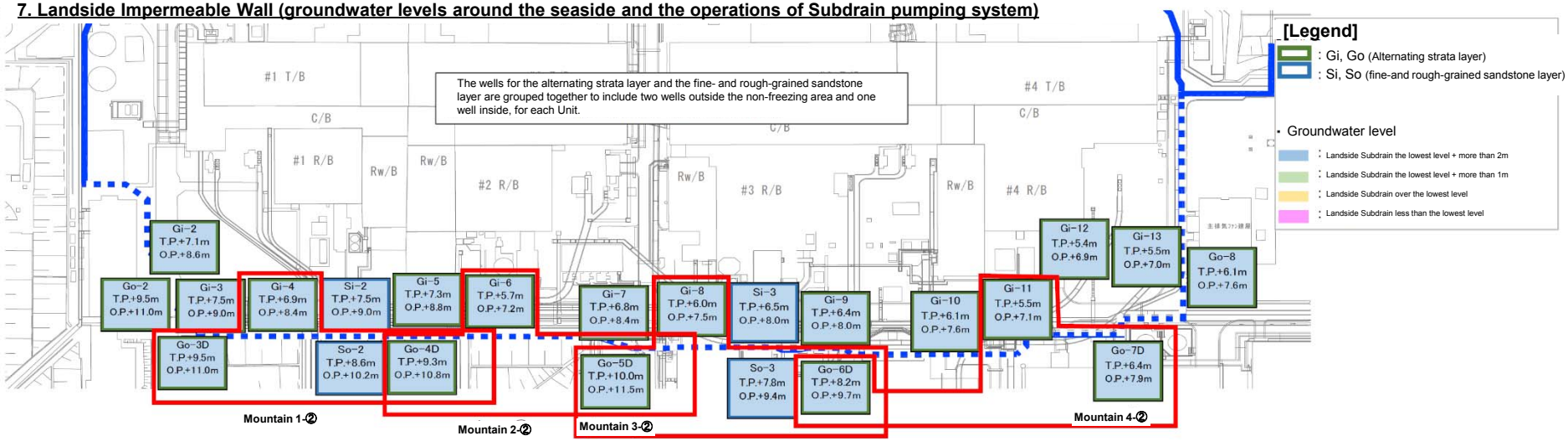


The data of groundwater levels as of 12 p.m. on November 24

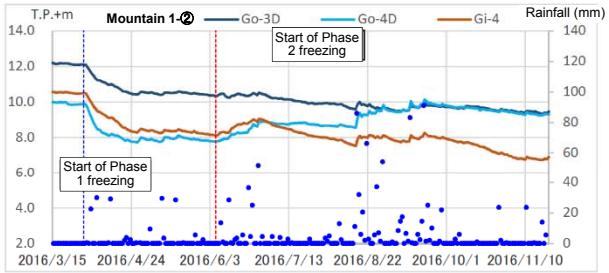
3-4 Groundwater levels and hydraulic heads
(in the alternating strata layer and the fine- and rough-grained sandstone layer 2 on the landside)

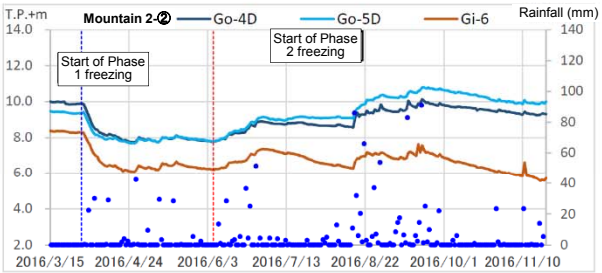
What to be monitored in an early stage of the ice wall freezing (Phase 1 Stage 1, seaside, water levels in the middle-grained sandstone layer)

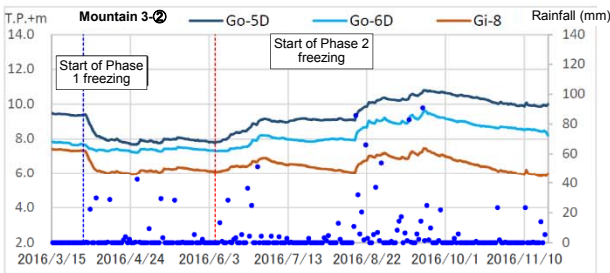
7. Landside Impermeable Wall (groundwater levels around the seaside and the operations of Subdrain pumping system)

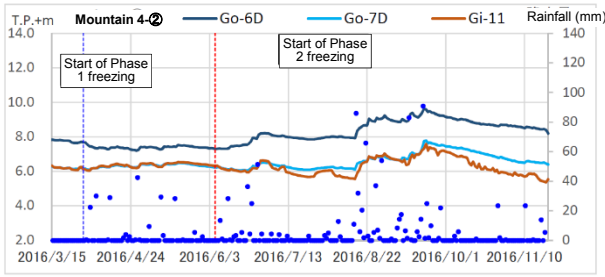


8. Groundwater levels inside and outside of the Landside Impermeable Wall





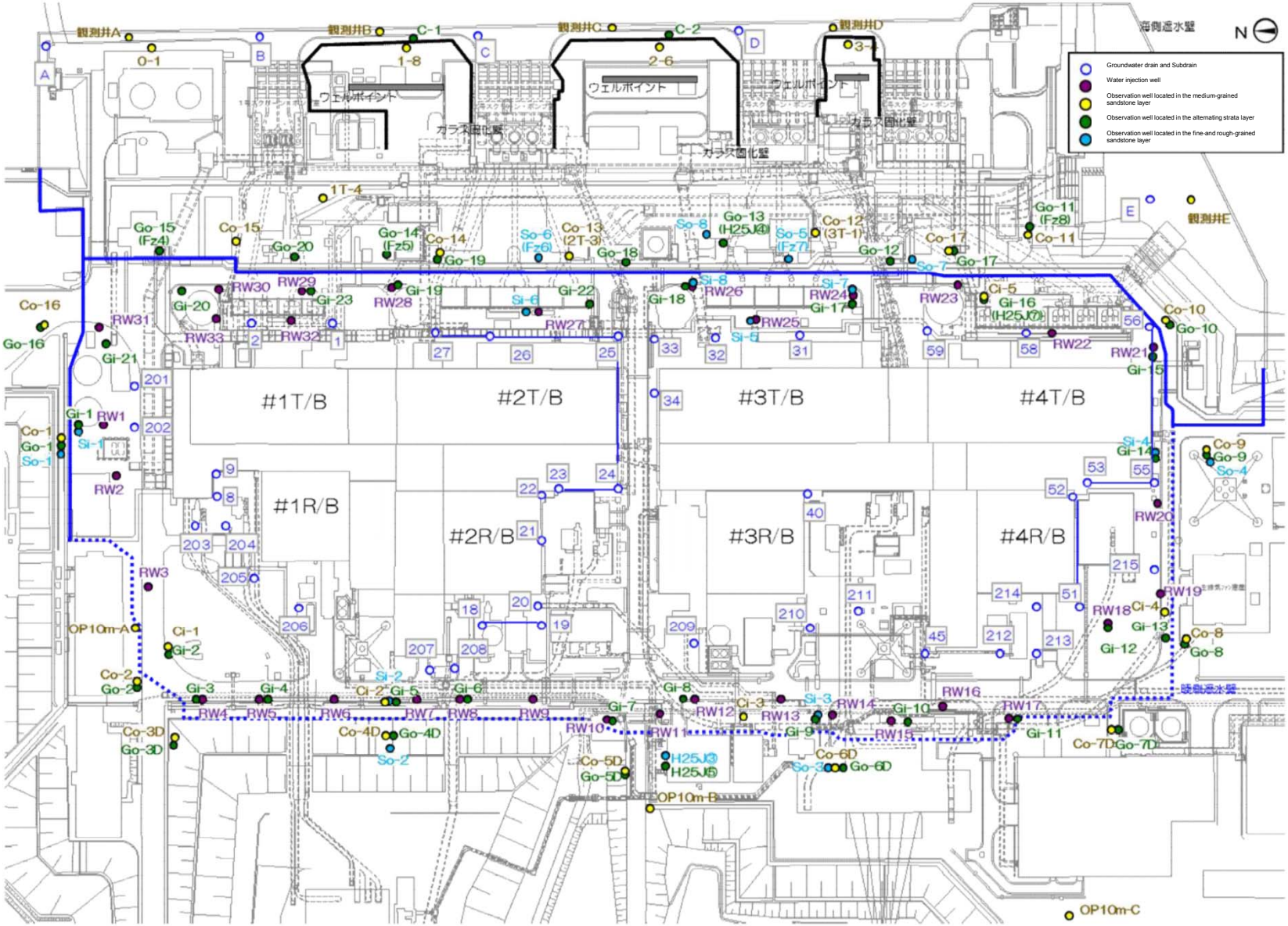




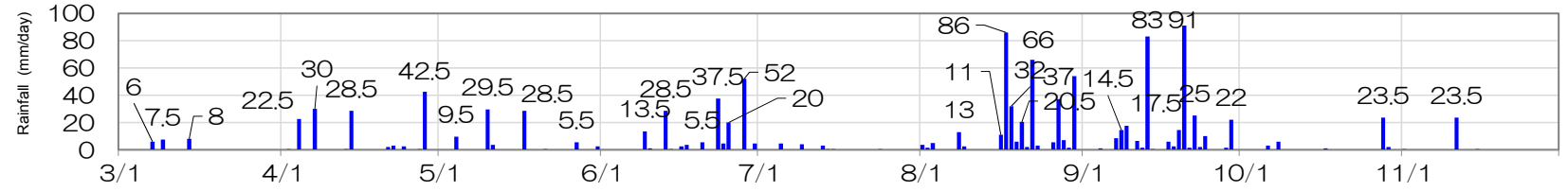
Differences in water level inside and outside of the Landside Impermeable Wall are gradually widening.
This means that the ice wall has been playing a role of blocking the flow of groundwater.

The data of groundwater levels as of 12 p.m. on November 24

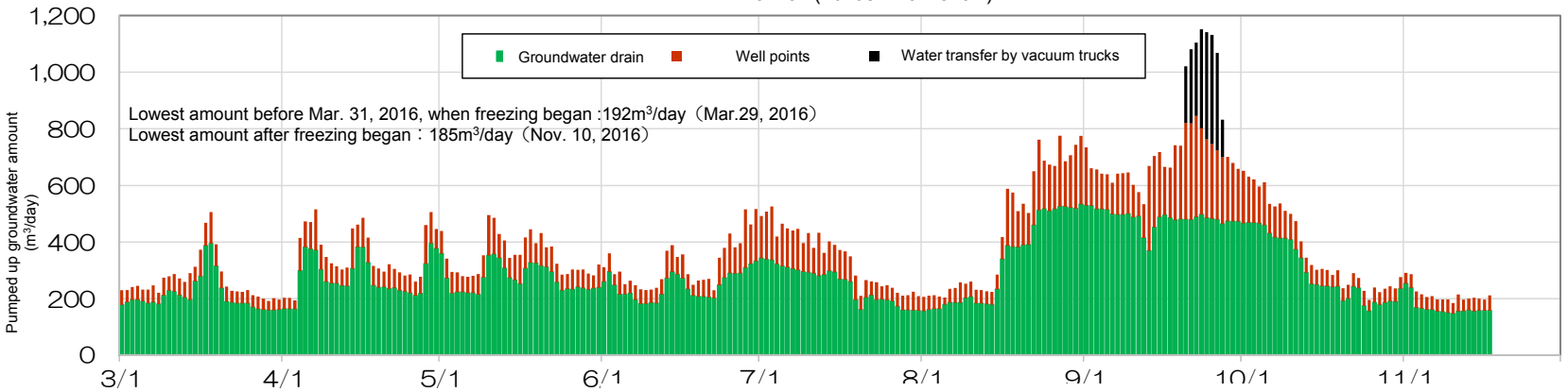
Reference: Location map of groundwater level observation wells



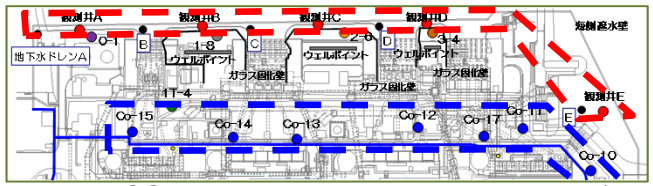
(Reference) Amount of groundwater pumped up from the ground 4m above sea level and changes in groundwater levels of the Landside Impermeable Wall on the seaside and of the reclaimed area

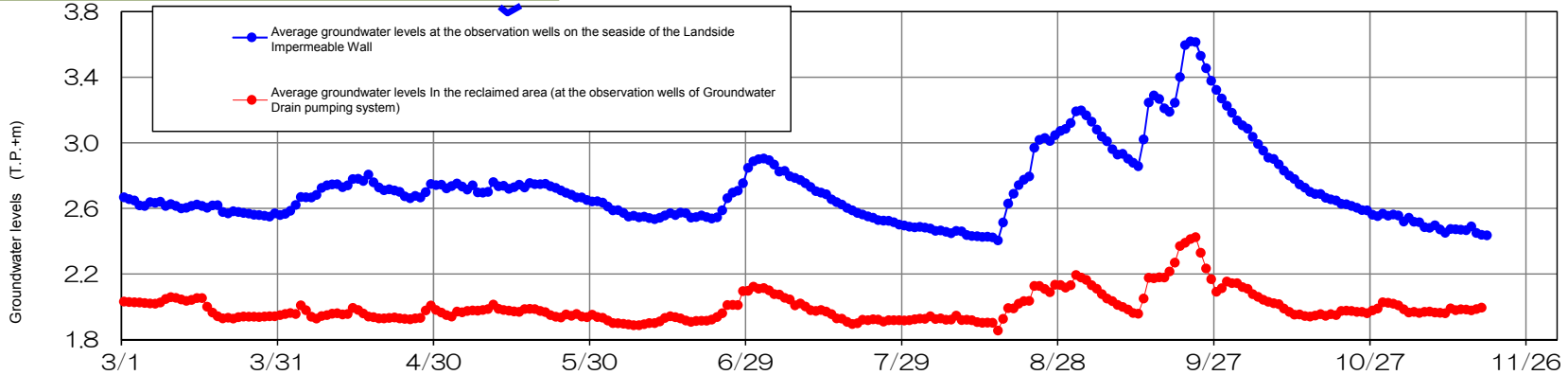


Rainfall (Fukushima Daiichi)



Amount of groundwater pumped up from the ground 4m above sea level (well points, groundwater drain, vacuum trucks)





Average groundwater levels at the observation wells on the seaside of the Landside Impermeable Wall and at the observation wells of Groundwater Drain pumping system