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



- OThe 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.
- OBy 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.
- OThroughout 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.

## Changes in soil temperatures over time

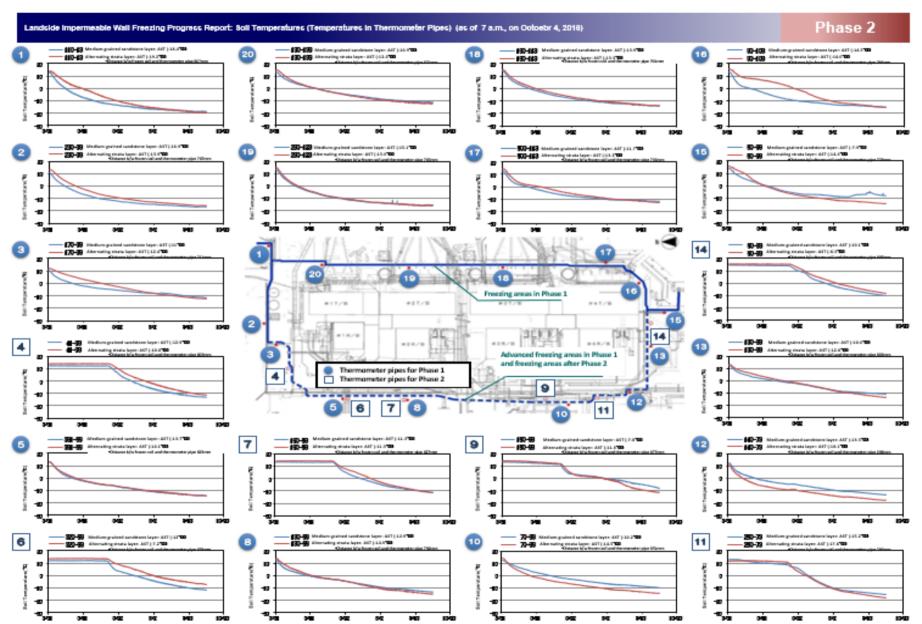
Average Soil Temperature (AST) of medium-grained sandstone layer (blue line):

average value of thermometer temperatures measured at 1m intervals except for the areas

between ground surface and Ground Level 2m and the areas around the first muddy layer boarder.

Average Soil Temperature (AST) of alternating strata layer (red line):
 Average value of thermometer temperatures measured at 1m intervals except for the areas around the upper and lower parts of the alternating layer boarder.





(in the medium-grained sandstone layer 1 on the seaside)



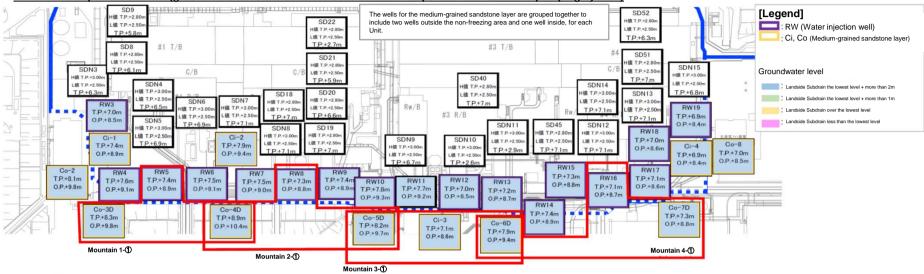
What to be monitored in an early stage of the ice wall freezing (Phase 1 Stage 1, seaside, water levels in the middle-grained sandstone layer) 1. Landside Impermeable Wall (groundwater levels around the seaside and the operations of Subdrain pumping system) [Legend] RW (Water injection well) Ci. Co (Observation well) The wells for the medium-grained sandstone layer are grouped together to show the difference in water levels close to each Groundwater level Unit, except for non-freezing areas (the bottom of Unit 4 seawater piping trench) . The lowest level (from Dec 1, 2015 to Mar, 14, 2016) + more than 1m Sea 1-① Over the lowest level (from Dec 1, 2015 to Mar, 14, 2016) Sea 2-① Sea 2-2 Less than the lowest level (from Dec. 1, 2015 to Mar. 14, 2016) T.P.+2.42n Co-14 Co-13 T.P.+3.01m TP+3.18m TP+31m T.P.+3.0m O.P.+4.7m OP+46m O.P.+4.5m Northside RW28 RW23 T.P.+4.1m T.P.+4.2n T.P.+3.8n RW27 TP+3.7m T.P.+3.6n OP+57r O.P.+5.3r Co-16 T.P.+3.6m O.P.+5.2m O.P.+5.1n O.P.+5.0m T.P.+4.6m OP+51m O.P.+6.1m SD2 SD1 SD27 SD32 H値 T.P.+2.80 SD58 SD25 TP+43m TP+43n SD26 H値 T.P.+2.80m H値 T.P.+2.80 H値 T.P.+2.80 H値 T.P.+2.80m O.P.+5.8r O.P.+5.8n L值 T.P.+2.50m L值 T.P.+2.50m L值 T.P.+2.80 SD56 L値 T.P.+2.50m L値 T P +2.50m RW1 T.P.+3.37n H値 T.P.+2.80 T.P.+2.6m T.P.+7.2m T.P.+2.7m T.P.+2.8m T.P.+2.6m O.P.+4.9n TP+54m L値 T.P.+2.50r H値 T.P.+2.80 O.P.+6.9m #4 T T.P.+3.7m L値 T.P.+2.50 Co-9 C/B C/B RW2 TP+5.5m SD23 SD24 C/B TP+6.3m TP+56m H値 T.P.+2.80m H値 T.P.+2.80m O.P.+7.0m O.P.+5.8n O.P.+7.1m L値 T.P.+2.50m L値 T.P.+2.50n 2. Groundwater levels inside and outside of the Landside Impermeable Wall Rainfall (mm) Rainfall (mm) Sea 1-1 -RW31 ----- Co-16 Sea 2-① -SD27 ----RW28 140 Start of Phase 5.5 2 freezing 1 freezing 1 freezina 2 freezina 2 freezing 120 120 100 4.5 4.5 80 80 3.5 3.5 60 3.5 60 2.5 2.5 2016/3/15 2016/4/14 2016/5/14 2016/6/13 2016/7/13 2016/8/12 2016/9/11 2016/3/15 2016/4/14 2016/5/14 2016/6/13 2016/7/13 2016/8/12 2016/9/11 2016/3/15 2016/4/14 2016/5/14 2016/6/13 2016/7/13 2016/8/12 2016/9/11 T.P.+m Sea 4-(1) Sea 2-2 Rainfall (mm) T.P.+m Sea 3-(1) T.P.+m -RW21 ----RW24 140 140 Start of Phase 5.5 2 freezing 2 freezina 5.5 5.5 120 120 120 100 100 4.5 4.5 4.5 80 80 3.5 3.5 3.5 40 40

(in the medium-grained sandstone layer 2 on the landside)

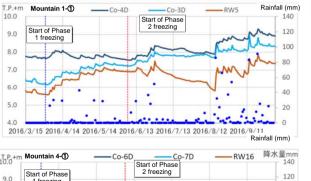


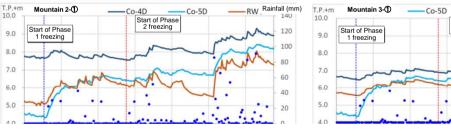
What to be monitored in an early stage of the ice wall freezing (Phase 1 Stage 1, seaside, water levels in the middle-grained sandstone layer)

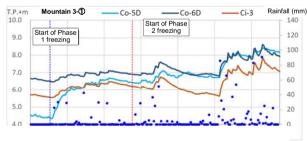
#### 3. Landside Impermeable Wall (groundwater levels around the seaside and the operations of Subdrain pumping system)



#### 4. Groundwater levels inside and outside of the Landside Impermeable Wall





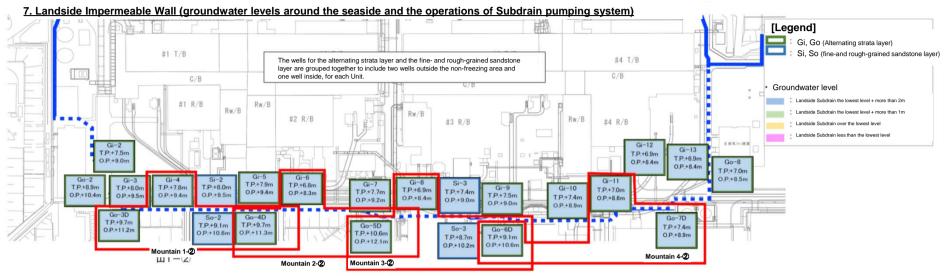


(in the alternating strata layer and the fine- and rough-grained sandstone layer 1 on the seaside) T = PCO

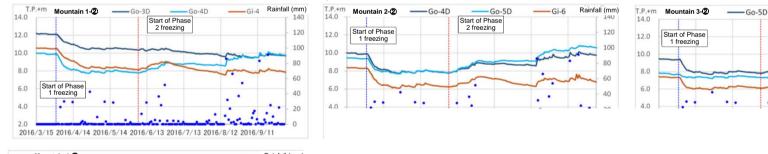
What to be monitored in an early stage of the ice wall freezing (Phase 1 Stage 1, seaside, water levels in the middle-grained sandstone laver) 5. Landside Impermeable Wall (groundwater levels around the seaside and the operations of Subdrain pumping system) [Legend] Gi, Go (Alternating strata layer) The wells for the alternating strata layer and the fine- and rough-grained sandstone layer are grouped together to show the difference in water levels close to each Unit, except for non-freezing areas (the bottom Si, So (fine-and rough-grained sandstone layer) of seawater piping trench for each Unit). So-5(Fz7) Groundwater level T.P.+3.5n O.P.+5.0n Sea 1-(2) Sea 2-4 The lowest level (from Apr. 1 to Apr. 11, 2016) + more than 0.5m Over the lowest level (from Apr. 1 to Apr. 11, 2016) T.P.+3.1m T.P.+3.2n TP+34 TP+34n Less than the lowest level (from Apr. 1 to Apr. 11, 2016) O.P.+5.6m Sea 4-(2) TD+50m O.P.+7.6m T.P.+4.1m Gi-21 TP+48m T.P.+3.6m T.P.+4.1m TP+356 O.P.+6.5n TP+40m O.P.+5.7m OP+56n TD+54e OP+64m O.P.+5.4m O.P.+5.6m 0P+55m OP+56m 0P+56m Gi-15 T.P.+4.7n Sea 3-2 #3 T/B #4 T/B Go-9 T.P.+5.3n TP+56m C/B O.P.+6.8r C/B 0P+710 C/B T.P.+5.8m T.P.+8.0r So-4 T.P.+5.2m TP+61m O.P.+6.7m O.P.+7.6m 6. Groundwater levels inside and outside of the Landside Impermeable Wall Rainfall (mm) Rainfall (mm) Rainfall (mm) -Gi-23 ----- Go-20 Gi-19 — Go-14 Sea 2-(3) 140 Start of Phase Start of Phase 2 freezing 6.0 6.0 6.0 2 freezing 120 120 Start of Phase Start of Phase 1 freezing 100 100 100 5.0 5.0 5.0 80 80 Start of Phase 4.0 4.0 4.0 2 freezing 60 60 Start of Phase 1 freezing 40 3.0 2016/3/15 2016/4/14 2016/5/14 2016/6/13 2016/7/13 2016/8/12 2016/9/11 2016/3/15 2016/4/14 2016/5/14 2016/6/13 2016/7/13 2016/8/12 2016/9/11 2016/3/15 2016/4/14 2016/5/14 2016/6/13 2016/7/13 2016/8/12 2016/9/11 Rainfall (mm) Rainfall (mm) Sea 2-40 —Si-6 —So-6 Rainfall (mm) T.P.+m —Gi-17 ——Go-13 T.P.+m -Gi-15 -----Go-10 140 140 Start of Phase Start of Phase Start of Phase 6.0 6.0 2 freezing 120 120 120 Start of Phase Start of Phase Start of Phase 1 freezina 1 freezing 100 100 5.0 5.0 5.0 80 80 4.0 4.0 4.0 3.0 3.0 3.0 2016/3/15 2016/4/14 2016/5/14 2016/6/13 2016/7/13 2016/8/12 2016/9/11 2016/3/15 2016/4/14 2016/5/14 2016/6/13 2016/7/13 2016/8/12 2016/9/11 2016/3/15 2016/4/14 2016/5/14 2016/6/13 2016/7/13 2016/8/12 2016/9/11

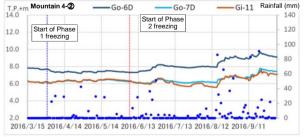
(in the alternating strata layer and the fine- and rough-grained sandstone layer 2 on the landside)

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)



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





Rainfall (mm)

120

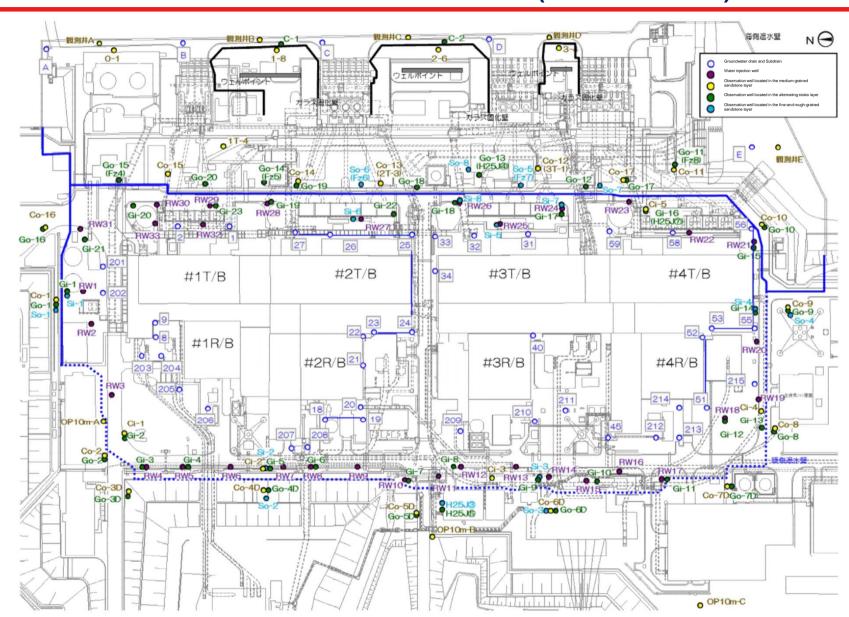
-Go-6D

Start of Phase

2 freezing

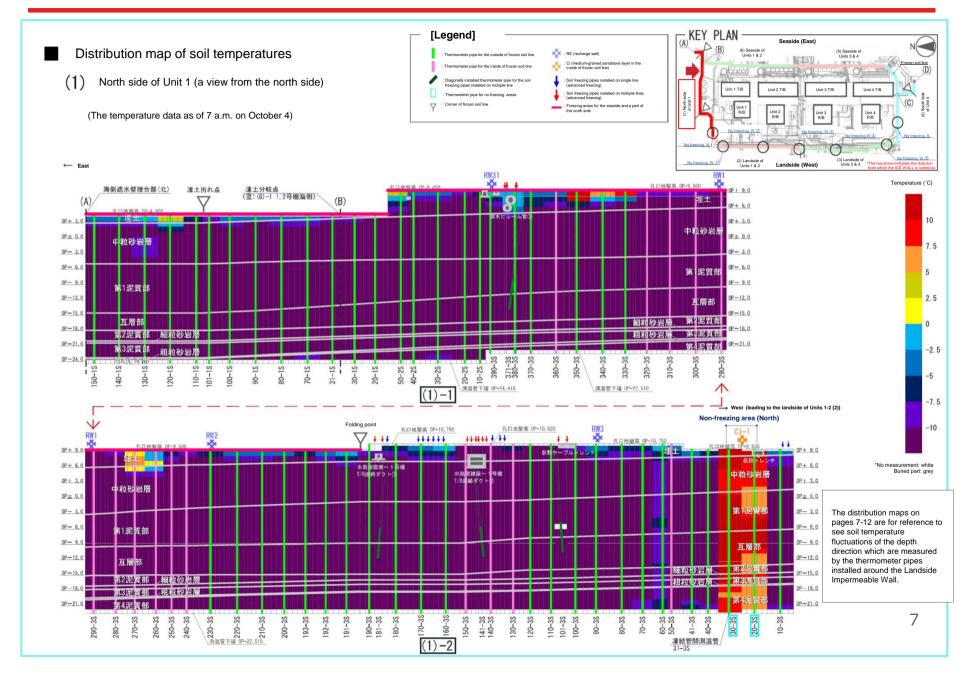
## [Reference] Location map of groundwater level observation wells (as of June 2016)





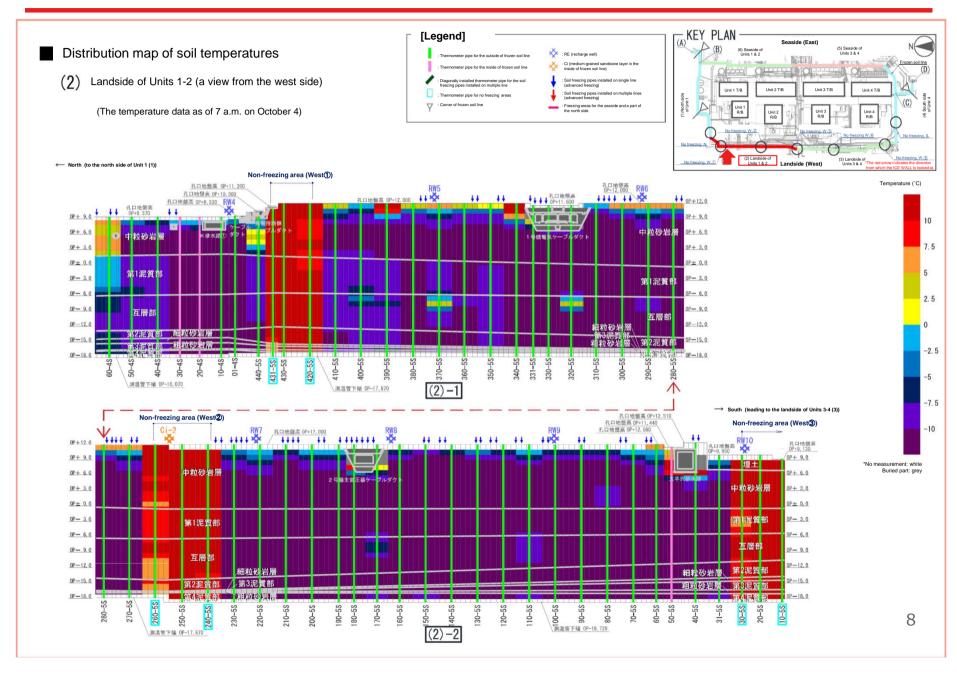
## [Reference] Distribution map of soil temperatures (north side of Unit 1) TEPCO





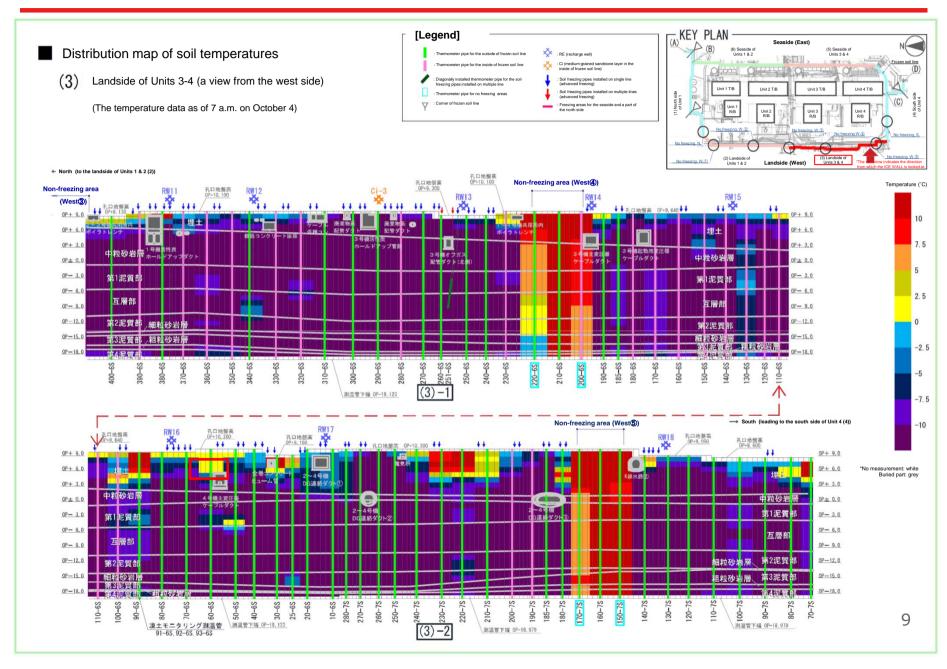
## [Reference] Distribution map of soil temperatures (west side of Units 1-2)





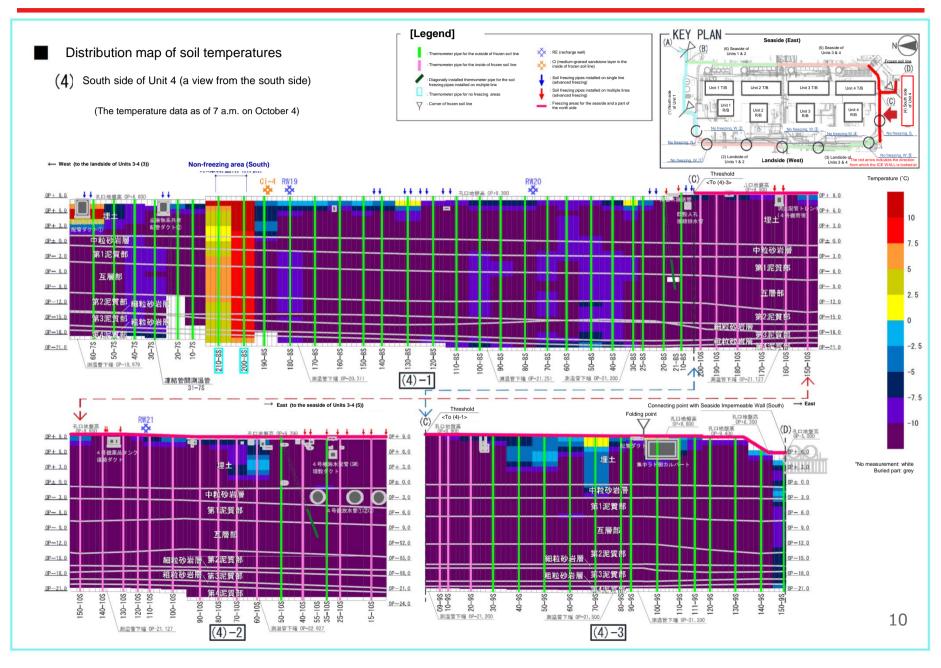
## [Reference] Distribution map of soil temperatures (west side of Units 3-4)



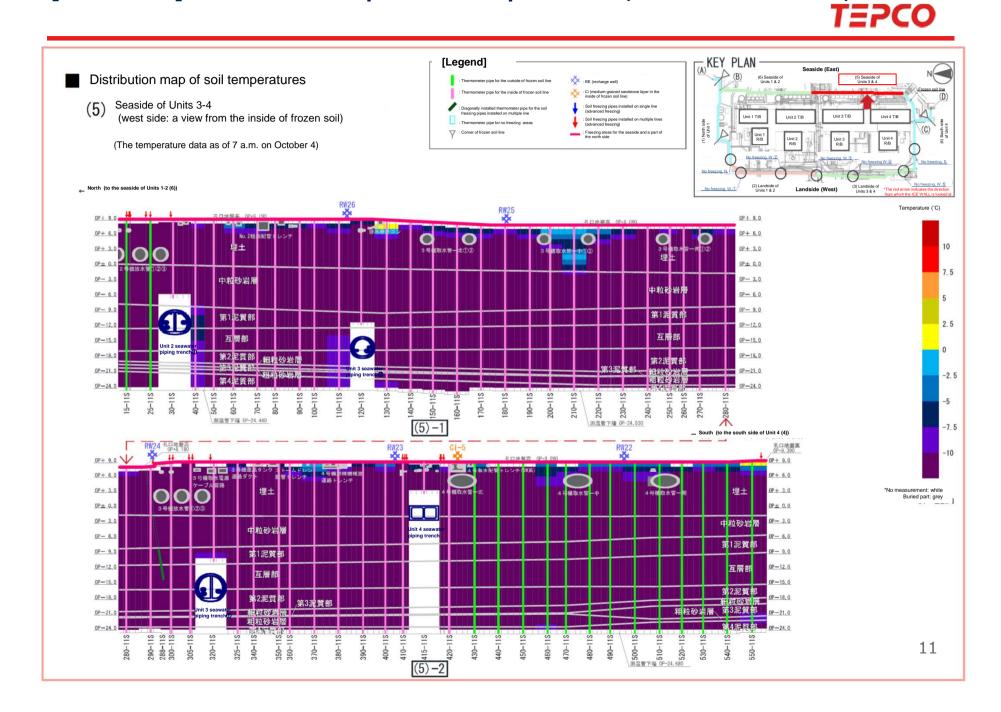


## [Reference] Distribution map of soil temperatures (south side of Unit 4)





## [Reference] Distribution map of soil temperatures (east side of Units 3-4)



## [Reference] Distribution map of soil temperature (east side of Units 1-2)



