Attachment 2

The Study Result on the Water Shielding Wall at the Groundside

1. Purpose of this study

We conducted analysis on the effect and influence of installing water shielding wall at the groundside in addition to the one at the seaside from the following aspects:

(1) Effect to prevent further expansion of ocean contamination
(2) Risk of accumulated water inside the buildings flowing into groundwater
(3) Interference with other projects

For the mitigation of groundwater flow into the buildings, because it is difficult to mange groundwater level around the buildings in accordance with the water level of accumulated water inside the building by implementing water shielding wall at the groundwater, we plan to study on another solution to manage groundwater level around the buildings by sub-drain around the buildings.

2. Study Result

(1) Effect to prevent further expansion of ocean contamination

Because hydrogeological structure around Units 1 to 4 buildings draws a slope evenly from mountain side to seaside, groundwater flows from mountain side to seaside. Therefore, groundwater around the buildings would not flow out into four directions, but always flow into the sea (Figure-2).
Taking into account the characteristics of groundwater flow at the designated location, we have analyzed the effect of further expansion of ocean contamination by installing water shielding wall by means of three-dimensional flow line trace analysis. As a result, we find that we can prevent groundwater around the buildings from flowing into the sea by managing with ground water drain, installing water shielding wall at the seaside (Figure-3).
In case of installing water shielding wall at the groundside, because it is not possible to prevent groundwater from flowing from mountainside completely, it is necessary to implement countermeasures like water shielding wall at the seaside in order to prevent further expansion of ocean contamination.

(2) Risk of accumulated water inside the buildings flowing into groundwater

We analyzed the level of change in groundwater level around the buildings, caused by the installation of water shielding wall, by means of three-dimensional seepage analysis.
As a result, regarding the groundwater level around the buildings, the level would decrease by 0 to 0.5m from current situation in case of water shielding

wall at the seaside. In case of water shielding wall at the groundside, the level would decrease by 1 to 2 m from current situation (Figure-4). Therefore, it is concluded that the case installing water shielding wall at the groundwater would increase the influence in terms of the risk of accumulated water inside the buildings to flow out, because the possibility which the level of groundwater would be lower that the level of accumulated water inside the building would rise.

(3) Interference with other projects

Water shielding wall at the seawater would not interfere with the other projects because the wall will be installed at the seaside of existing seawall. On the other hand, water shielding wall at the groundside interferes with important facilities and construction which aim for stabilization. Further because it has many difficulties in its implementation, e.g. requiring the removal and move of existing facilities, there would be more influence by installing water shielding wall at the groundside from points of interference with the other projects (Figure-5).

3. Conclusion

Regarding the prevention of further expansion of ocean contamination, it is important not to let accumulated water inside the buildings flow into groundwater. In this sense, it is appropriate to see the water shielding wall as the countermeasure to prevent such flow of contaminated groundwater into ocean. We deem that we should avoid countermeasures which would increase such risk of accumulated water inside the building to flow out.

With those aspects, after the comprehensive evaluation on the effect and influence by installing water shielding wall at the groundside, we have reached the conclusion that it is appropriate to address the issues only with water shielding wall at the seaside, not combining the one at the groundside (Table-1).

For the installation of the water shielding wall at the groundside, we will discuss the matter again at an appropriate point of time, based on the progress of the other projects.

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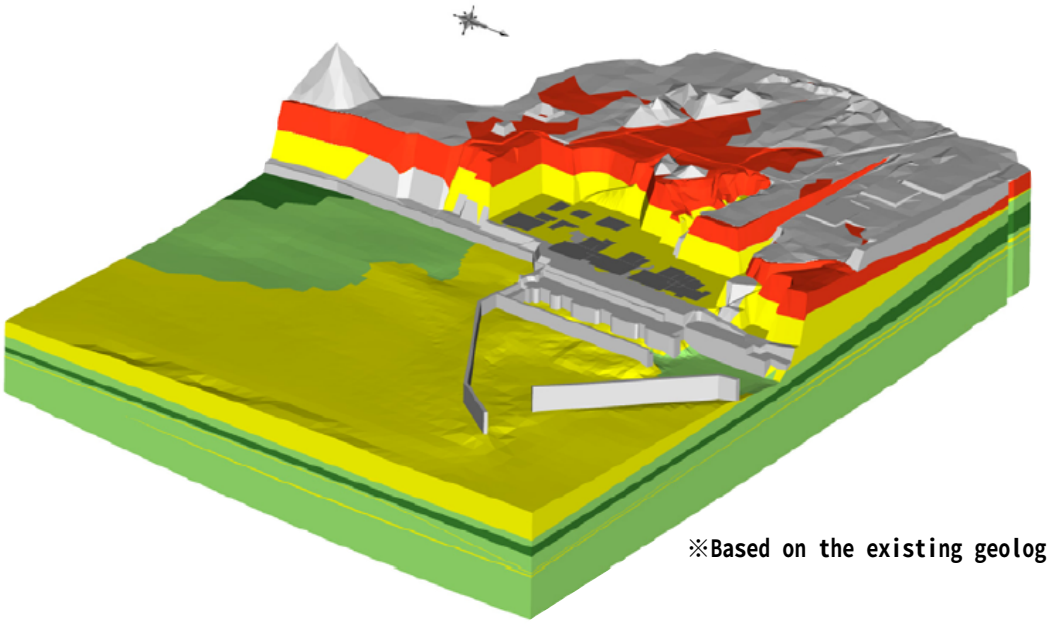
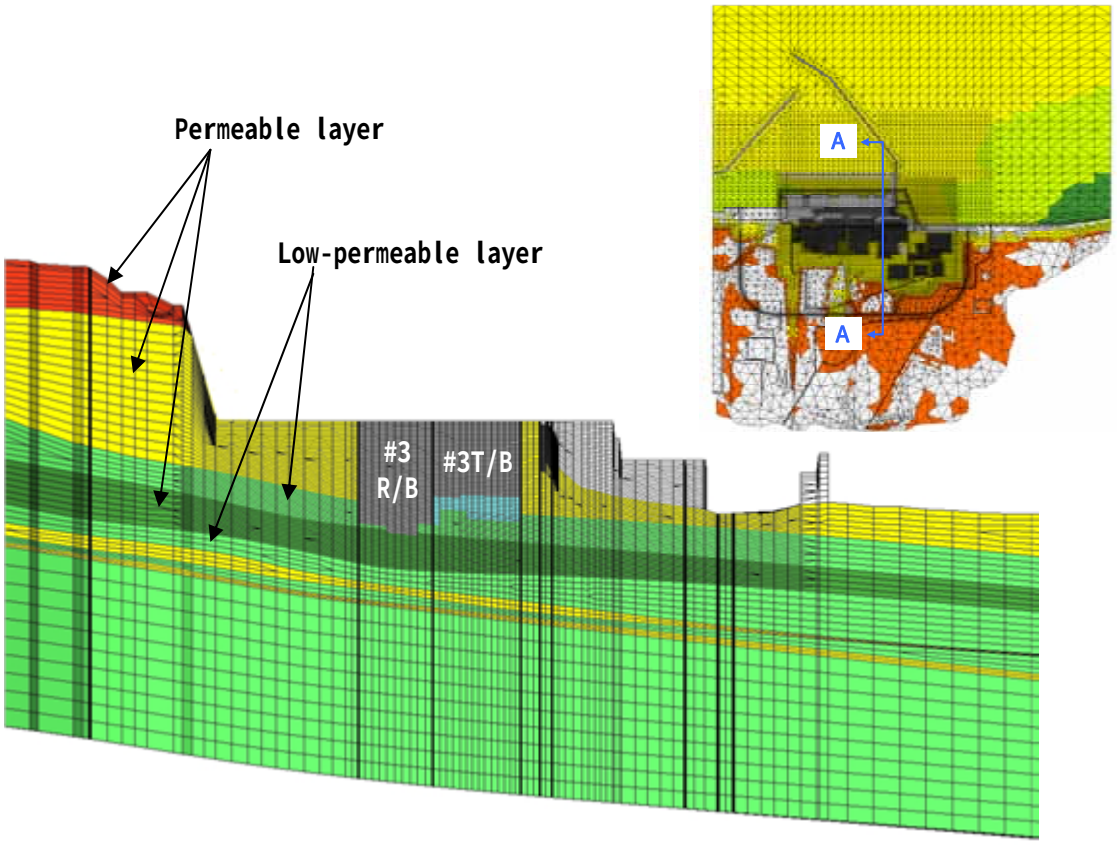


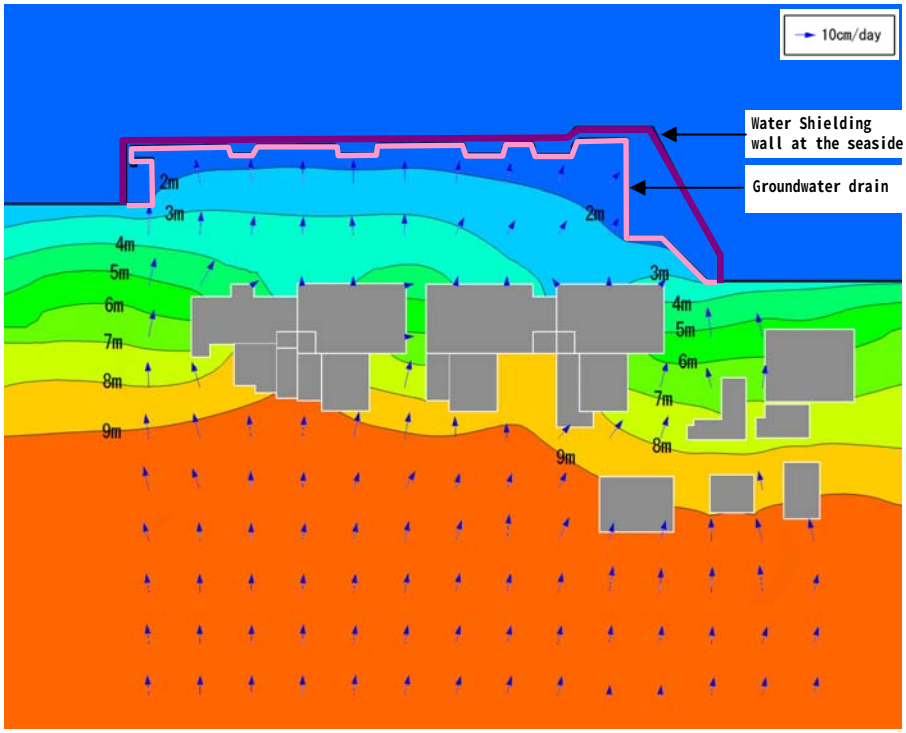
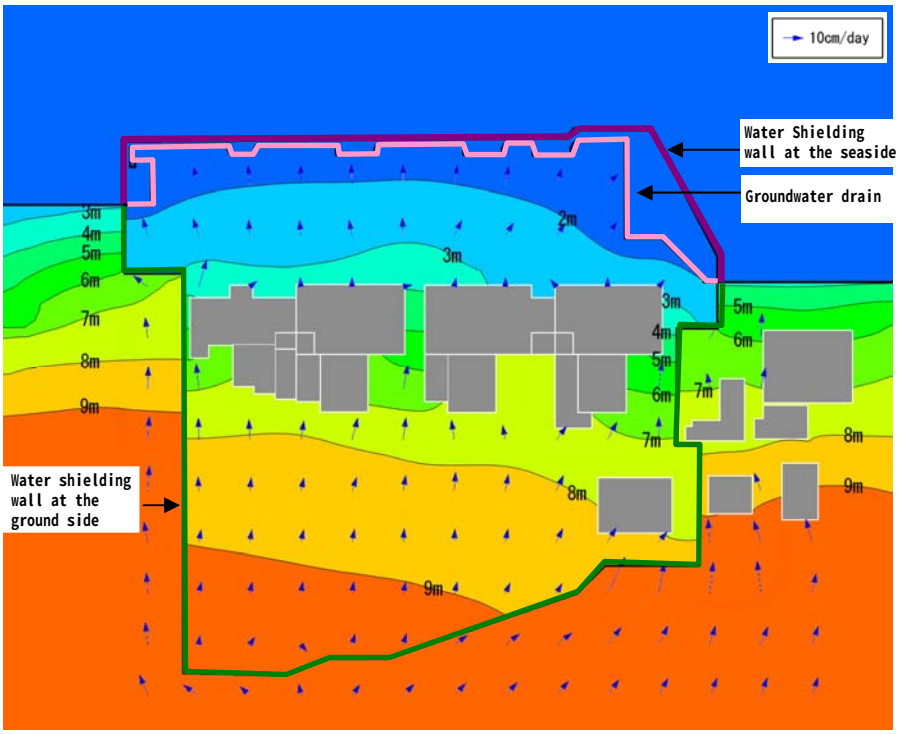
※Based on the existing geological survey

(1) Hydrogeological structure model around Units 1 to 4 buildings※



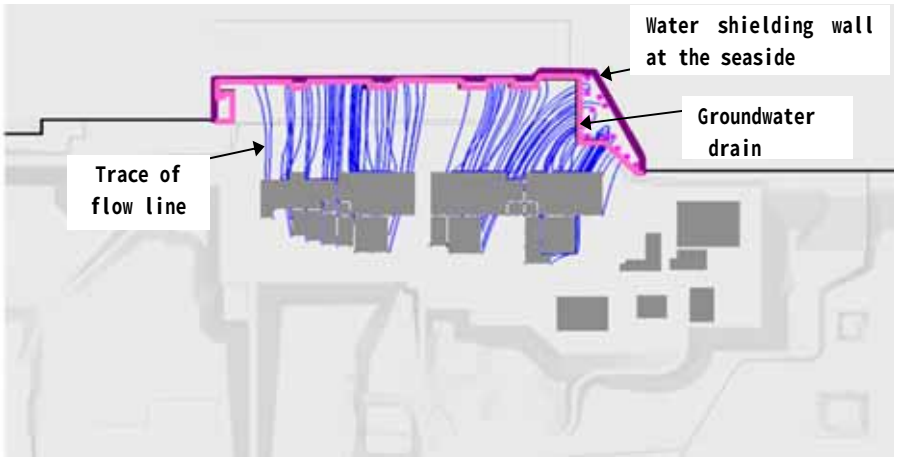
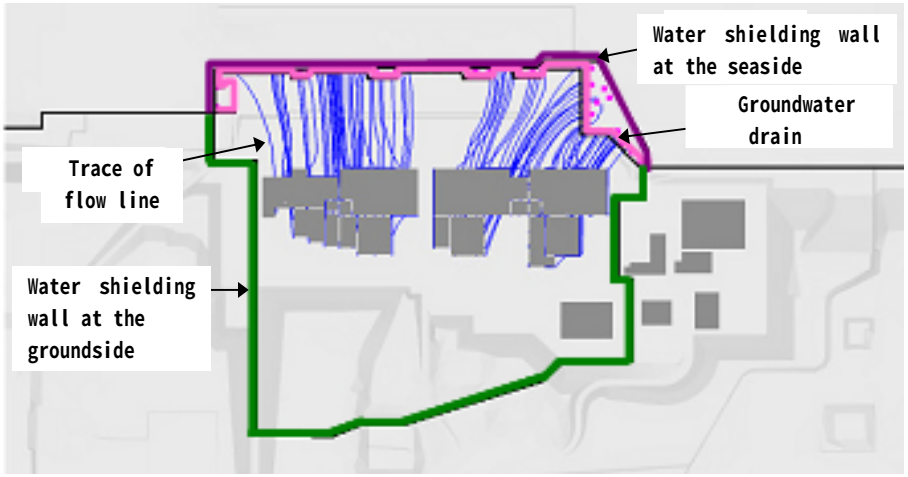
(2) Cross-section view in the analytical model (Around unit 3, in the orthogonal direction of the shoreline)

Figure-1 Hydrogeological structure (analytical model)

Analyzed case	Analysis result
Water shielding wall at the seaside	
Water shielding wall at the seaside + Water shielding wall at the groundside	

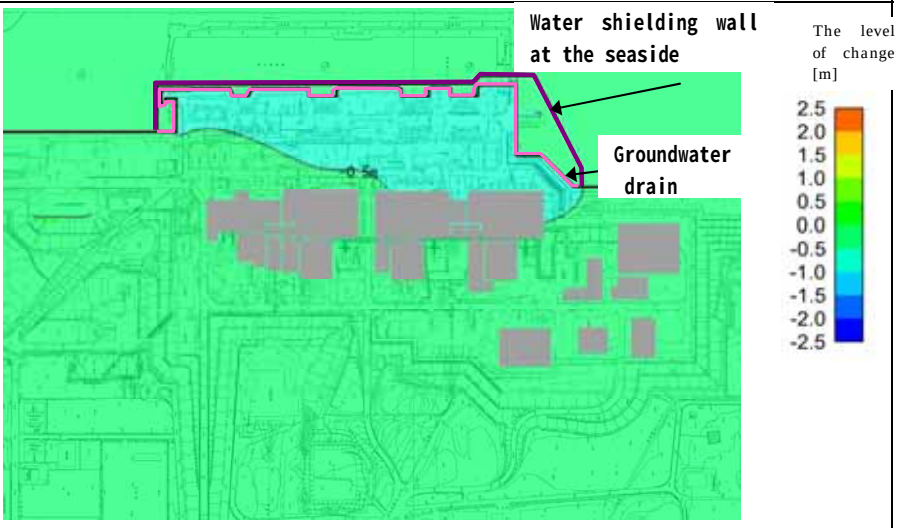
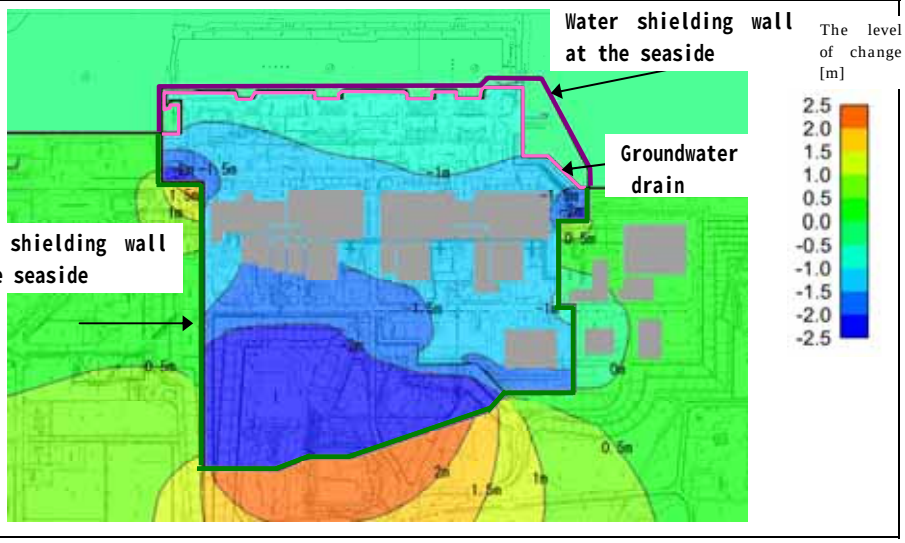
※In case of managing the groundwater level at – 0.5m in average from the tidal level measured at the point of groundwater drain.
※coefficient of permeability of the water shielding wall: 1.0×10-6 cm/sec

Figure-2 The flow of underground water

Analyzed case	Analysis Result
Water shielding wall at the seaside	
Water shielding wall at the seaside + Water shielding wall at the groundside	

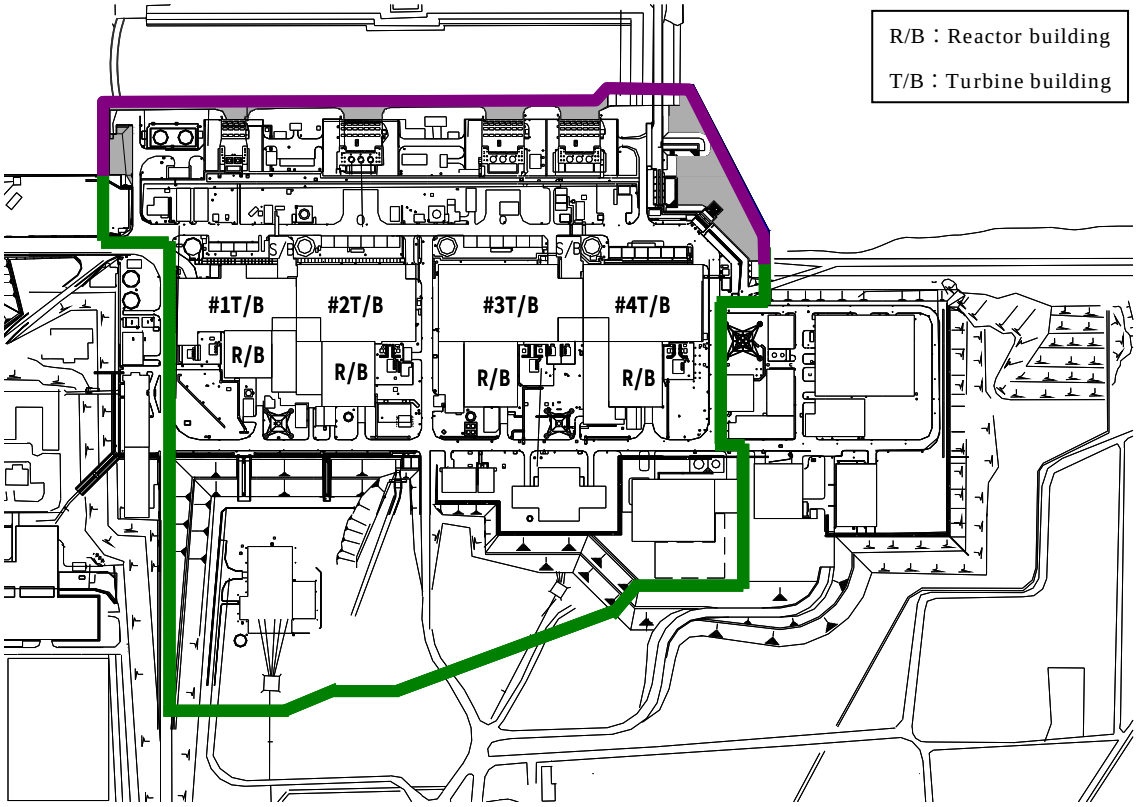
※In case of managing the groundwater level at – 0.5m in average from the tidal level measured at the point of groundwater drain.
※coefficient of permeability of the water shielding wall: 1.0×10^{-6} cm/sec

Figure-3 Effect to prevent further expansion of ocean contamination

Analyzed case	Analysis Result
Water shielding wall at the seaside	
Water shielding wall at the seaside + Water shielding wall at the groundside	

※In case of managing the groundwater level at – 0.5m in average from the tidal level measured at the point of groundwater drain.
※coefficient of permeability of the water shielding wall: 1.0×10^{-6} cm/sec

Figure-4 The level of change in groundwater level around the building



: Area relatively condensed with interference facilities.
[Important facilities, construction] Facilities to inject water to reactors, facilities to inject water into spent fuels, facilities to inject nitrogen.
[Existing facilities] common duct.
: Area relatively condensed with interference facilities.
[Important facilities, construction] Offsite power facilities, telecommunication facilities.[Existing facilities]drainage in the premise.
: Draft allocation of water shielding wall at the seaside
: Draft allocation of water shielding wall at the groundside.

Figure-5 Important facilities that interfere with water shielding wall at the groundside, construction, and existing facilities

Table-1 Evaluation of water shielding wall at the groundside

Evaluation item		Water shielding wall at the seaside	Water shielding wall at the seaside + Water shielding wall at the groundside
Effect	Prevention of the expansion of ocean contamination via ground water	○ ・Possible to prevent the leakage of contaminated groundwater into the ocean.	○ ・Possible to prevent the leakage of contaminated groundwater into the ocean.
Influence	Influence on the groundwater level around the buildings	○ ・Decrease in groundwater level around the buildings by 0 to 0.5 m.	× ・Decrease in groundwater level around the buildings by 1 to 2 m. ・Much risk of leakage by accumulated water inside the buildings to groundwater.
	Interference with other projects	○ ・Little interference with important facilities.	× ・Interfere with important facilities. Many issues in implementation.
Overall evaluation		○	× ・Consider this option again at an appropriate point of time, based on the other projects' progress.

※ For the mitigation of groundwater flow into the buildings, because it is difficult to mange groundwater level around the buildings in accordance with the water level of accumulated water inside the building by implementing water shielding wall at the groundwater, we plan to study on another solution to manage groundwater level around the buildings by sub-drain around the buildings.