Plan to prevent water leakage containing highly concentrated radioactive materials to outside environment in Fukushima Daiichi nuclear power plant

June 1, 2011

Tokyo Electric Power Company

Following the instruction “regarding the countermeasure report against water outflow including radioactive materials to the outside from Unit 3 of Fukushima Daiichi Nuclear Power Station“ received on May 23, 2011, we have conducted the situation survey of vertical shafts and shore protection (cracks on the wall etc) that were not surveyed before and established the plan to prevent water leakage containing highly concentrated radioactive materials to outside environment. The content is hereby reported as follows.

1. Past incidents

On April 2, 2011, the water leakage containing highly concentrated radioactive materials (“contaminated water”) occurred at the Unit 2 water intake. As a countermeasure to prevent leakage, pits located around the water intake were filled with concrete, etc in order to shut the water flow. However, on May 11, another leakage occurred at the power cable pit through the crack penetrating the concrete wall of screen room (appendix 1: Unit 3 Seawater Pipe Trench Horizontal Sectional View). On May 20, TEPCO reported the countermeasures in order to prevent the leakage of contaminated water located at the height of O.P. + 4.0 m in these vertical shafts based on the survey. In addition, following the instruction dated May 23, TEPCO has conducted the situation survey of other vertical shafts and shore protection and reports the plan to prevent water leakage today.

2. Survey conducted for leakage prevention

(1) content of the survey

Survey was conducted for the following 3 items in order to specify the leakage route and to shut the route in effective way.

- Leakage route from turbine building to the yard on seaside at the height of O.P. + 4.0 m
- Leakage route in the yard on seaside at the height of O.P. + 4.0 m and the status of pit near the shore protection
- Status of shore protection (cracks on the wall etc)

In addition to the survey on the drawings and specifications including drawings of vertical shafts and of underground facilities, site survey was conducted in order to specify the

leakage route which may not be specified in the drawings. Part of the drawings stored in the library located at main office building of the power plant could not be carried out due to the possible collapse of the building by aftershocks and the entry restriction because of the high radiation dose. Therefore, the information that was not confirmed by the drawings was supplemented by conducting interview with our employee with sufficient site knowledge.

Survey content in each survey location is summarized as follows.

a. Survey for Leakage route from turbine building to the yard on seaside at the height of O.P. + 4.0 m

Survey of the shafts and pipes connected to the underground floor of turbine building below the height of O.P. + 4.0 m was conducted using building design drawings in order to specify the leakage route from turbine building, where the contaminated water accumulates, to the yard on seaside at the height of O.P. + 4.0 m

b. Survey for leakage route in the yard on seaside at the height of O.P. + 4.0 m and the status of pit near the shore protection

Regarding the leakage route specified in a., the height above the sea level of vertical shafts, shafts, pipes and pits were confirmed in order to specify the potential leakage route reaching to the vicinity of screen pump room. In addition, leakage route and status of pits near the shore protection were surveyed. As a result, several pits were selected to close and shut the leakage route in effective manner.

The following site survey was conducted at the same time.

- Site survey period: from May 13 to May 15, from May 23 to May 25, 2011
- Site survey location: the yard on seaside at the height of O.P. + 4.0 m
- Site survey conductors: TEPCO employee, employee of other companies
- Site survey content: kinds of pits, depth, existence of debris and water

From May 13 to 15, reacting to the leakage found on May 11, survey was mainly conducted for the pits located near the leakage route, the vicinity of screen pump room, and pits near the shore protection. Survey was also conducted for the pits which were not on the drawings but were confirmed during the site survey.

From May 23 to 25, survey for the implementation of construction work to close the leakage route was conducted. The existence of debris in the area from seawater pipe trench, through which contaminated water was estimated to flow in, to power cable trench was surveyed as well (appendix 2: Layout photo of surveyed pits).

c. Survey for status of shore protection (cracks on the wall etc)

Survey was conducted as follows:

- Site survey period: from May 24 to May 26
- Site survey location: open channel for water intake of Unit 1 to 4 in shore protection (appendix 3: Surveyed locations at shore protection)
- Site survey conductors: TEPCO employee
- Site survey content: visual survey from the shore protection was conducted for the top of the steel sheet pile

Survey was conducted in order to find water leakage through the cracks caused by the earthquake above the seawater.

(2) result of the survey

a. Result of survey for leakage route from turbine building to the yard on seaside at the height of O.P. + 4.0 m

It was confirmed by the drawings that shafts and pipes connected to the underground floor of turbine building below the height of O.P. + 4.0 m were seawater pipe trench, power cable trench, and multi pipe conduits (appendix 4: Duct penetrating turbine building). Also their bottom level was confirmed using drawings (appendix 5: Location map of trenches and pipe lines on sea side, appendix 6: Cross sectional view of trenches and pipe lines on sea side, appendix 7: Trench on the east side of turbine building).

As a result of survey in Unit 1, it was confirmed that water will not flow from turbine building to the yard on seaside at the height of O.P. + 4.0 m because both the seawater pipe trench and power cable trench connects to the turbine building at O.P. +10.2m and +7.9m respectively.

Accordingly it was confirmed that the potential leakage route was seawater pipe trench in Unit 2 to 4 (appendix 8: Vertical view of seawater pipe trench).

As a result of survey for the trenches on mountain side (west side) of Unit 1 to 4, it was confirmed that the waste system common pipe trench connecting Unit 1 to 4 and each radiation waste treatment facilities (Rw/B) was the only trench whose connection was located below O.P. + 4.0 m. As such trench becomes vertical shaft and goes up to O.P. + 10.0 m right after the radiation waste treatment facilities, it can not be the leakage route of contaminated water from the turbine building.

b. Result of survey for leakage route in the yard on seaside at the height of O.P. + 4.0 m and the status of pit near the shore protection

As leakage routes in the yard on seaside at the height of O.P. + 4.0 m, the route from seawater pipe trench to power line conduit through power cable trench was specified. The feasibility of closing such route was also confirmed by site survey (appendix 9: Map of survey result of inflow route of radioactive water).
Regarding the pits located near the leakage route and shore protection, in 81 pits in total (74 pits during the survey conducted from May 13 to 15 and 7 pits from May 24 to 26), kinds of pits, depth, existence of debris and water were surveyed(appendix 10: Unit 1 to 4 survey list of yard pit on sea side).
6 pits out of 81 pits were not located in the drawings and were not confirmed by the interview with TEPCO employee. Therefore, it could not be confirmed whether those pits located on the leakage route.

c. Result of survey for status of shore protection (cracks on the wall etc)
A connecting part of steel sheet pile at the south side of Unit 1 screen room was found to be damaged (appendix 11: Protected shore survey result). This damage is considered to be caused by the transformation of connecting part due to the earthquake. While the damaged part locates above the seawater level, water leakage from that part is not found at the moment. It locates near the corner of Unit 1 screen room. No trace of contaminated water was found as no trenches nearby had inflow of contaminated water and radiation dose in the closest pit was low.

3. Plan to prevent water leakage
(1) measures already implemented before this plan
a. closing of vertical shaft of seawater pipe trench in Unit 2 to 4
5 vertical shafts of seawater pipe trench in Unit 2 to 4 were planned to be closed. Closing work in Unit 4 vertical shaft was completed on April 6 and in Unit 2 vertical shaft B on May 9. (appendix 12, 13: Vertical shaft cross sectional view of closed conditions)
As for Unit 2 vertical shaft C, Unit 3 vertical shaft B and C, ordinary closing work was difficult because there was stairs inside the shaft. Therefore, closing was to be conducted at the joint part with power cable trench at the height of O.P. + 4.0 m and opening part at the ground level was also to be closed. Closing work of opening part was completed for Unit 3 vertical shaft B and C on May 26 (appendix 14: Vertical shaft cross sectional view of closed conditions) and will be completed for Unit 2 vertical shaft C on June 2.

b. Closing of pits near the screen pump room

All the pits (10 in total) near the screen pump room were closed by May 19 as the leakage from such pits is considered highly likely from the case of Unit 2 and 3.

c. Installation of steel plate in front of screen pump room

A steel plate was installed in front of screen pump room on April 15 in order to prevent dispersion of leaked water. A sliding timber weir was installed in front of the emergency equipment cooling seawater pump room on May 26.

(2) Content of the plan

As a result of the survey described in 2 above, the leakage route of contaminated water and the status of pits located near the shore protection were confirmed. Based on such result, the plan to prevent contaminated water leakage was established while considering status of debris in the site, distribution of radiation dose, safety of workers, procurement of construction materials, and feasibility of construction work.

The following were the main measures of the plan.

Measure 1: Closing of seawater pipe trench located on the upstream of leakage route.

Measure 2: Closing of upstream of power cable trenches which connects to seawater pipe trenches.

Measure 3: Closing of the damaged part in the shore protection

Measure 4: Implementation of dispersion prevention measures in case of another leakage

Other measures: in addition to the above, measure will be taken for the contaminated water remaining in the closing trenches.

Regarding the above measures, specific prevention measures described below were planned and implemented.

a. Measure 1: Closing of seawater pipe trench located on the upstream of leakage route.

As vertical shaft of seawater pipe trenches in Unit 2 to 4, which are the only potential leakage route from turbine building to the yard on seaside at the height of O.P. + 4.0 m, locates in the upstream of leakage route, closing of such shaft is expected to be quite effective for shutting the leakage route. Therefore, vertical shafts (5 in total) located at the height of O.P. + 4.0 m will be closed using concrete, etc.

For the part where such work is difficult, closing will be conducted at the joint part (4 in total) with power cable trench at the height of O.P. + 4.0 m.

b. Measure 2: Closing of upstream of power cable trenches which connects to seawater pipe trenches.
The leakage route is shut by closing multiple pits located on the leakage route at the height of O.P. + 4.0 m. The followings were taken into consideration when selecting the pits to be closed.

- All the pits located on the leakage route are shut in order to shut the leakage route with certainty.
- Pits near the screen pump room are closed immediately as the leakage from such pits is considered highly likely from the case of Unit 2 and 3.
- Pits whose connection parts were not confirmed in the design drawings are closed to make sure.

Among 81 pits confirmed during the survey, 35 pits were selected from the above perspective and will be closed. When establishing the work plan, they are classified into following groups in accordance with the priority.

Measure 2-1: Closing of pits near the screen pump room. This is necessary considering the case of Unit 2 and 3. There are 10 parts in total.
Measure 2-2: Closing of the pits near the pits treated in measure 1. This is to make sure the shutting of leakage route. There are 8 parts in total.
Measure 2-3: Closing of the pits located on the extended path of leakage route and the pits whose route is unknown and possibility of leakage can not be denied. This is to make sure there will be no leakage. There are 17 parts in total.

Based on above, 35 parts in total will be closed by concrete, etc, once the debris is removed and other preparation is completed (appendix 15: Map of plans to closing vertical shafts and pits, appendix 16: Outline of closing pits) In the leakage case of Unit 2, chemicals were injected into rock bed with high water permeability located beneath the power cable conduit in order to prevent water leakage. While closely surveying the damage status of pits and grounds, such measure will be taken as necessary after closing the pits.

c. Measure 3: Closing of the damaged part in the shore protection
The survey described above found that a connecting part of steel sheet pile at the south side of Unit 1 screen room was damaged. However, it is unlikely that contaminated water flows into the sea through this damaged part as there is no trench nearby and other trenches with

potential contaminated water inflow will be closed at the upstream. To make sure, damaged part will be closed using grout materials (appendix 17: Image of repair of damaged shore protection).

d. Measure 4: Implementation of dispersion prevention measures by installing sliding timber weir (partially in progress)
In Unit 2, the steel plate was installed in front of the screen room as a countermeasure to prevent dispersion (implemented on April 15). In addition, in response to the sharp increase of water level in the vertical shaft occurred along with the water transfer in the condenser, sliding timber weir was installed in front of the emergency equipment cooling seawater pump room (implemented on May 26). Such weir will be installed in front of the screen room of Unit 1 to 4 (appendix 18: Dispersion prevention measures (installation of sliding timber weir in front of screen pump house: example of Unit 2)).

(3) Progress status and schedule ahead
a. measure 1: Closing of seawater pipe trench located on the upstream of leakage route.
As of May 31, in Unit 2 to 4, 2 vertical shafts out of 5 were closed. Another 2 were closed at the opening part and remaining 1 will be closed on June 2.
The joint part (4 in total) between seawater pipe trench and power cable trench were all closed by May 30.

b. Measure 2: Closing of upstream of power cable trenches which connects to seawater pipe trenches.
As of May 31, measure 2-1 is completed in all 10 parts. Measure 2-2 is conducted in 3 parts out of 8. Measure 2-3 in 5 parts out of 17.
In summary, measure 1 is completed in all 4 parts. Measure 2 is conducted in 18 parts out of 35. In total, 22 parts out of 35 were closed and remaining 17 are planned to be closed using concrete, etc, by the end of June (appendix 19: Roadmap of closing of vertical shafts and pits).

c. Measure 3: Closing of the damaged part in the shore protection
Damaged parts will be closed using grout materials by the middle of June.

d. Implementation of dispersion prevention measures by installing sliding timber weir
Manufacturing of weir was initiated from the end of May and weirs are planned to be transferred to the site by mid June and installed by the end of June.

4. Other measures

Collection and treatment for the contaminated water remaining in the closing trenches such as seawater pipe trenches will be considered along with the treatment of contaminated water accumulated in the turbine building, etc. Such water will be collected as much as possible and be treated by the treatment facilities located inside the plant site.

End

Appendix

Appendix 1: Unit 3 Seawater Pipe Trench Horizontal Sectional View
Appendix 2: Layout photo of surveyed pits
Appendix 3: Surveyed locations at shore protection
Appendix 4: Duct penetrating turbine building
Appendix 5: Location map of trenches and pipe lines on sea side
Appendix 6: Cross sectional view of trenches and pipe lines on sea side
Appendix 7: Trench on the east side of turbine building
Appendix 8: Vertical view of seawater pipe trench
Appendix 9: Map of survey result of inflow route of radioactive water
Appendix 10: Unit 1 to 4 survey list of yard pit on sea side
Appendix 11: Protected shore survey result
Appendix 12, 13, 14: Vertical shaft cross sectional view of closed conditions
Appendix 15: Map of plans to closing vertical shafts and pits
Appendix 16: Outline of closing pits
Appendix 17: Image of repair of damaged shore protection
Appendix 18: Dispersion prevention measures (installation of sliding timber weir in front of screen pump house: example of Unit 2)
Appendix 19: Roadmap of closing of vertical shafts and pits

Terms:

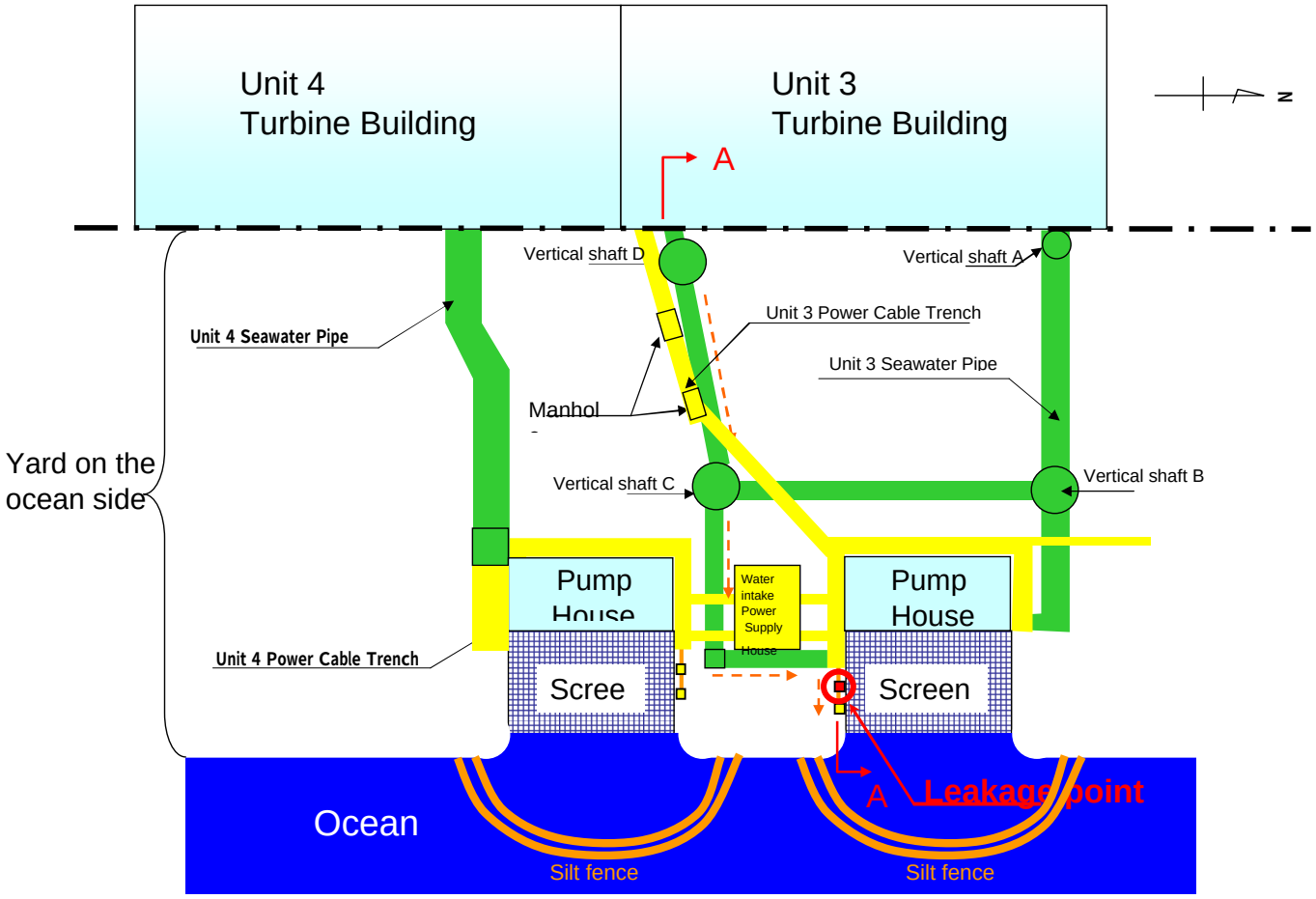
In this document, vertical shaft and pit are defined as follows:

Vertical shaft: vertical shaft in the underground with depth of approx. 10 m

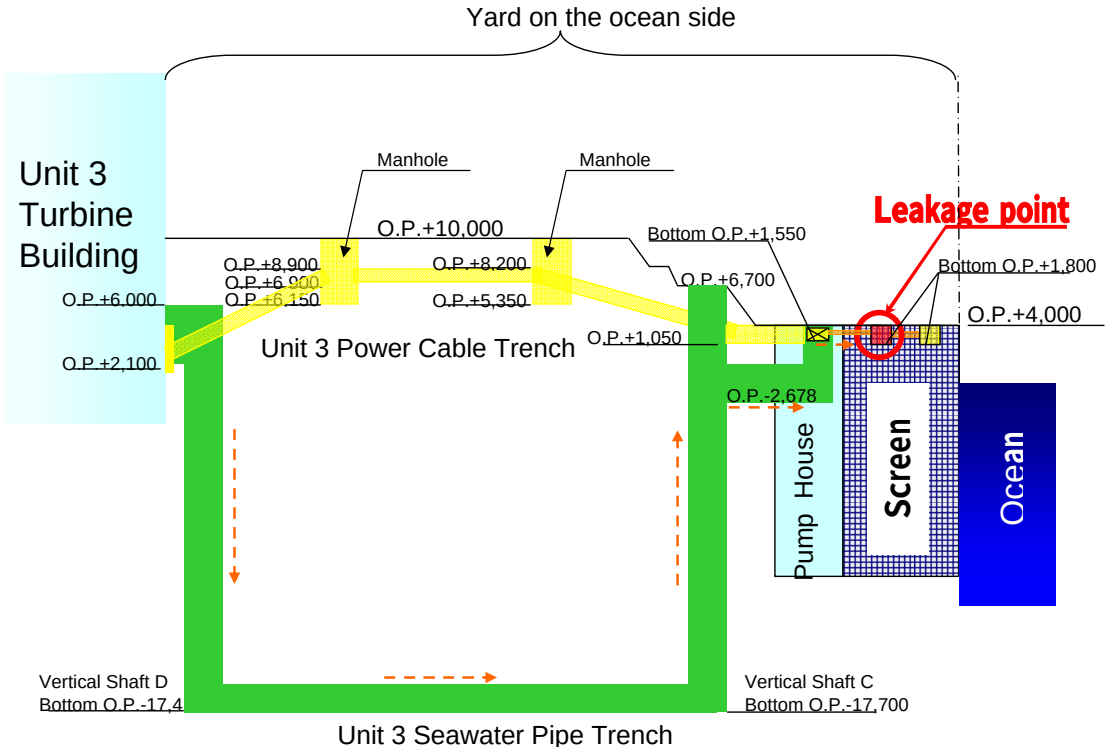
Pit: underground facilities with the depth of approx. 1 to 2 m having the structure like a manhole.

Unit 3 Seawater Pipe Trench　Horizontal Sectional View

Appendix 1



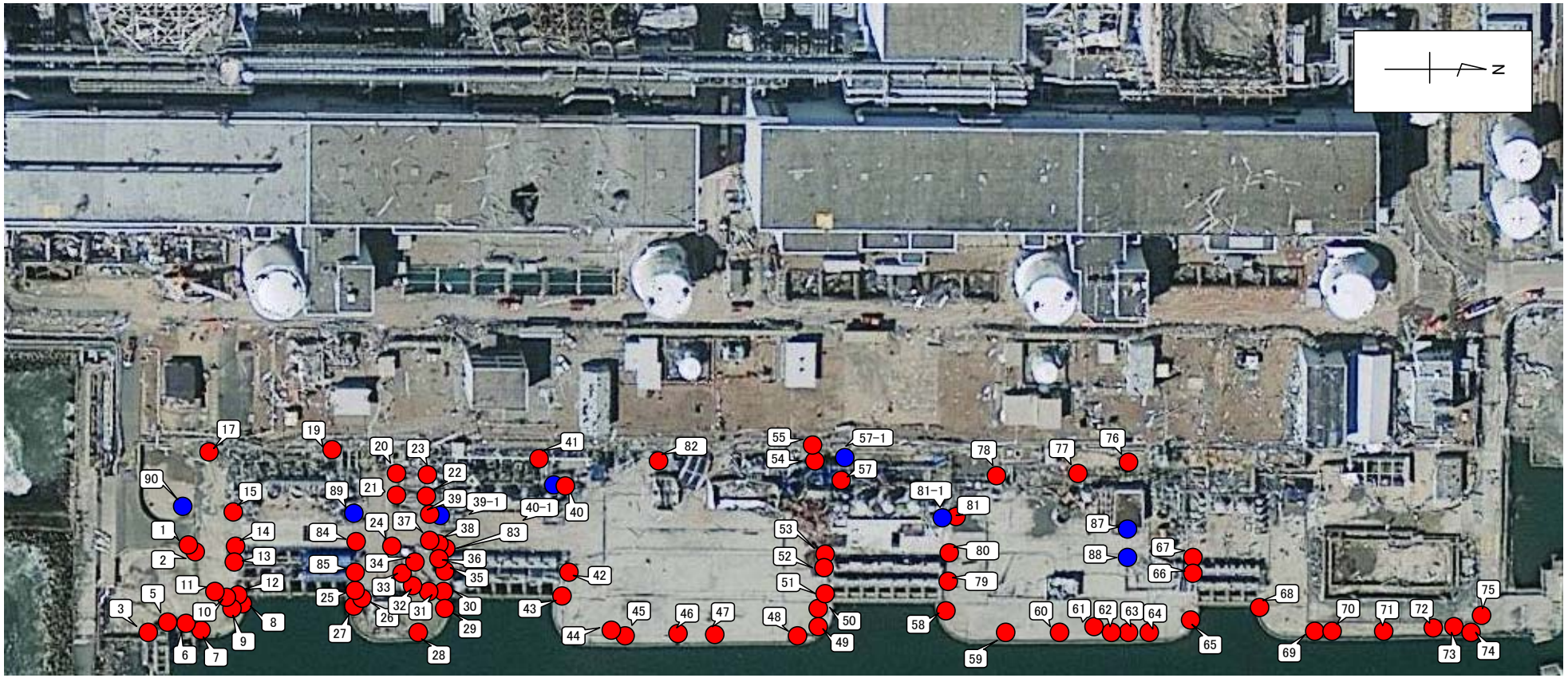
Unit 3 Seawater Pipe Trench　Vertical Sectional View (A-A cross-sectional view)



Unit 3 Seawater Pipe Trench

Appendix 2

Layout Photo of surveyed pits



【Legend】

: From May 13 to May 15, 2011, investigation was conducted at 74 points*1)

: From May 23 to 25, 2011, investigation was conducted at 7 points*2)

*1) 7 points out of 81 points in total was excluded in the investigation as they were already shut off.

*2) One point out of 8 points was excluded in the investigation as it was already shut off.

Appendix 3

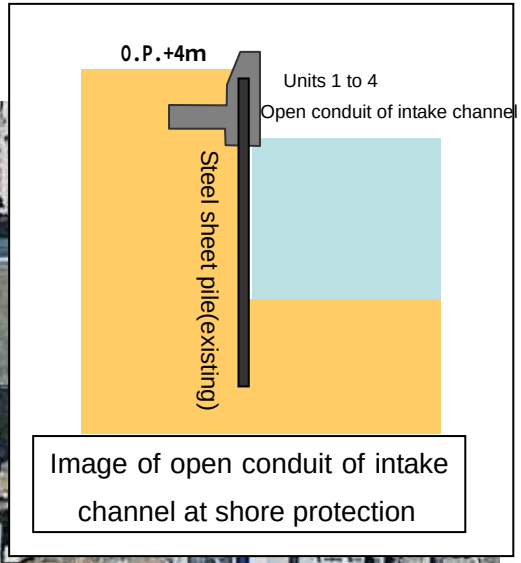
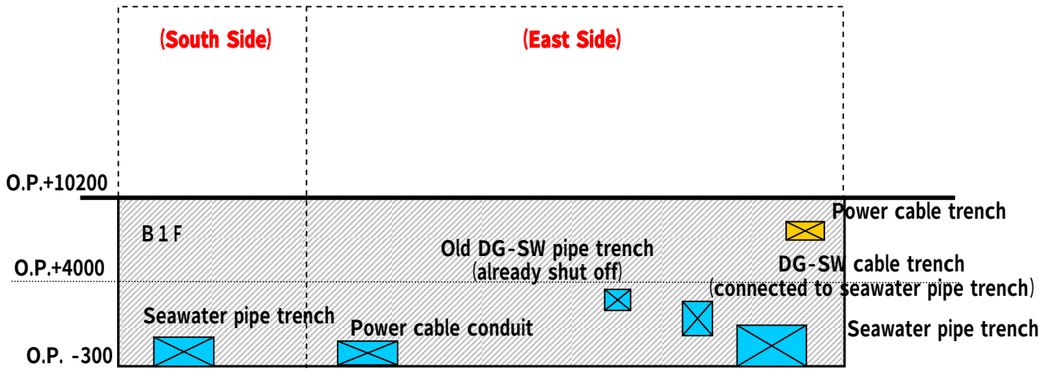


Image of open conduit of intake channel at shore protection

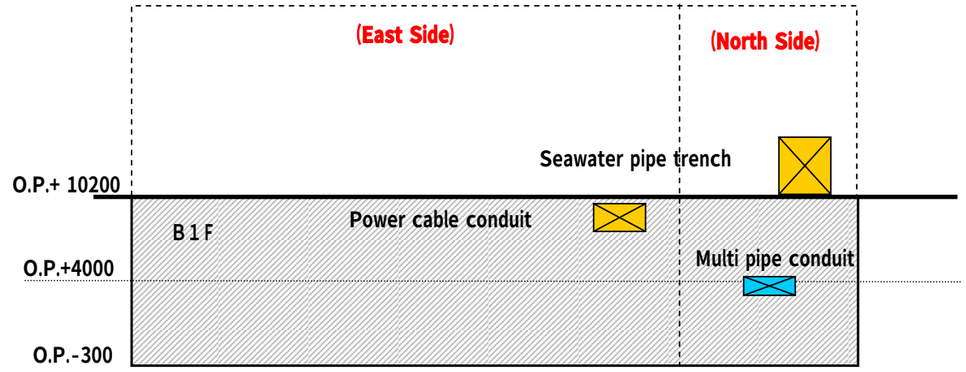
：Investigated locations

Surveyed locations at shore protection

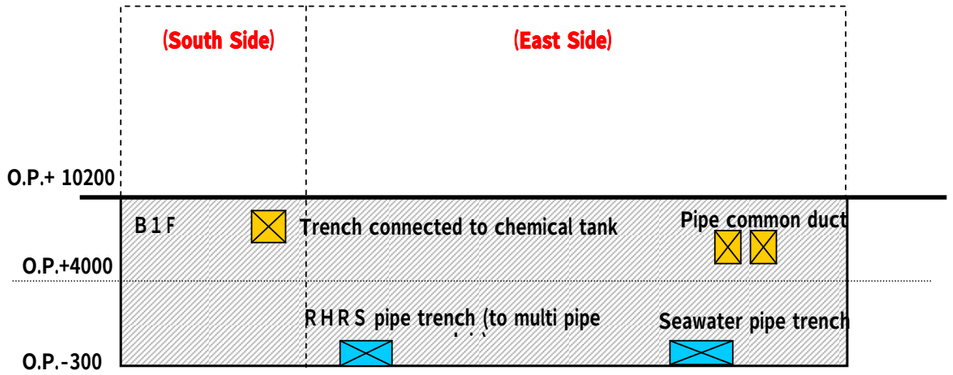
Appendix 4



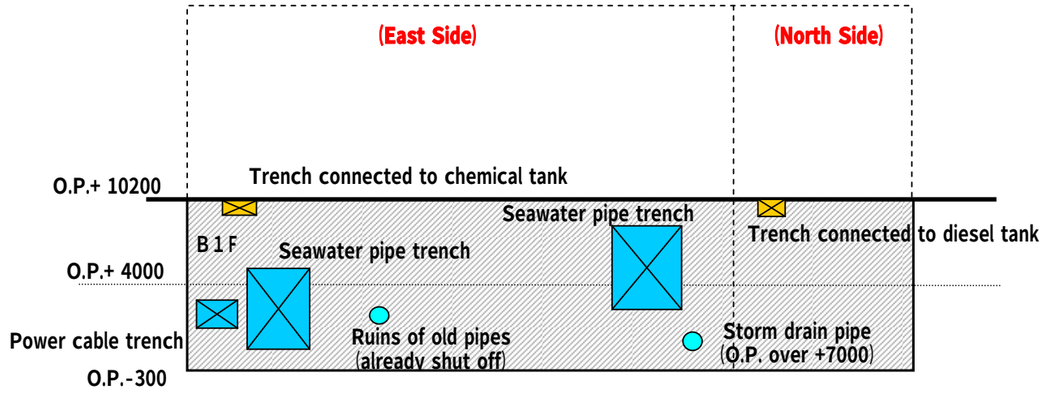
Unit 2 Turbine Building



Unit 1 Turbine Building



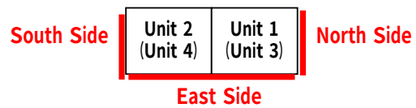
Unit 4 Turbine Building



Unit 3 Turbine Building

[Interpretation of terminology]

- DG - SW:
  System to cool cooling water of emergency diesel generators by seawater
- Strom drain:
  Nonradioactive water such as condensed water of air-conditioning equipment, dew condensation water and seawater drained at inspections
- RHRS(Residual Heat Removal Sea Water System):
  After we stop operating reactors, we cool (remove decay heat) cooling water and, in case of emergency, cooling water in the system to maintain reactor wate by heat exchangers. RHRS is a system to supply seawater to cool cooling water in Residual Heat Removal System.



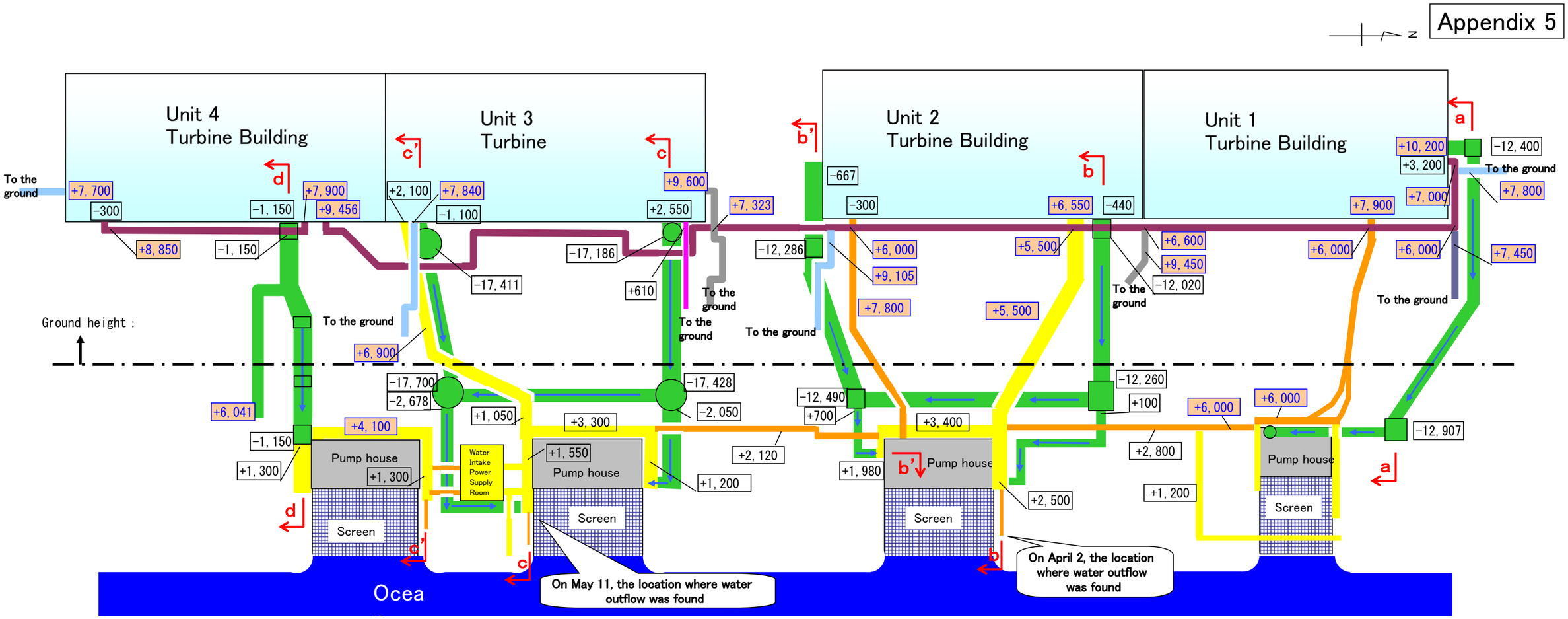
[Legend]

: Trench etc. located above O.P.+4000
(Not including pipes located aboce O.P.+4000)

: Trench etc. located below O.P.+4000

Duct penetrating Turbine Building (Sea Side)

Appendix 5



Legend

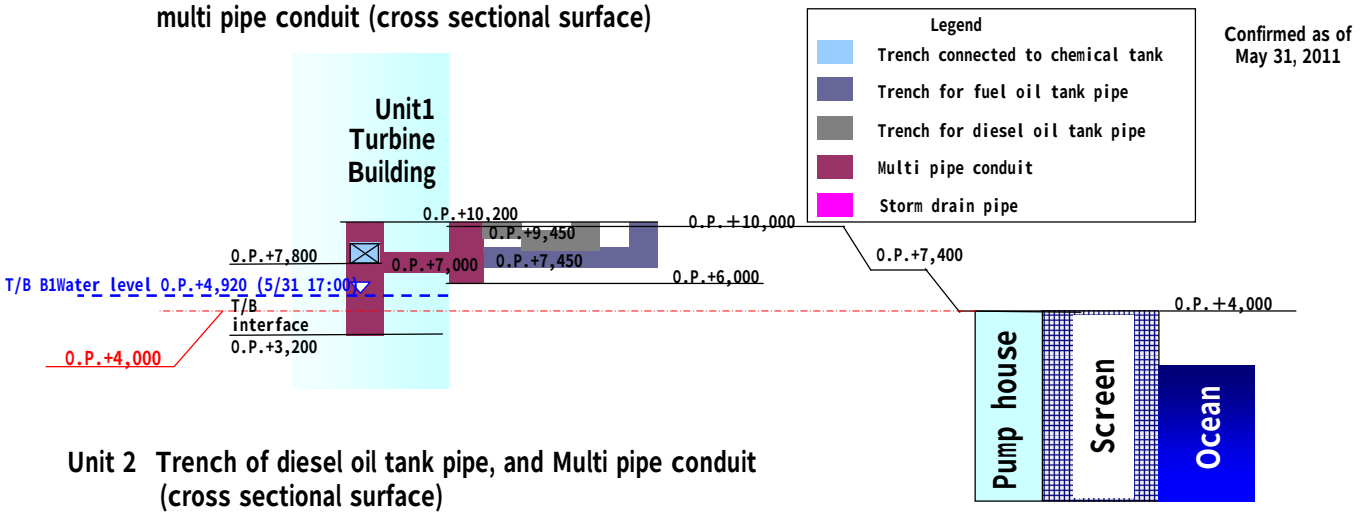
- Seawater pipe trench
- Power cable trench
- Power cable conduit
- multi pipe conduit
- Storm drain pipe
- Trench connected to chemical tank
- Trench for fuel oil tank pipe
- Trench for diesel oil tank pipe
- Elevation of base slab of structure (O.P.mm)
- Elevation of base slab of structure (O.P.mm) (O.P. equal to or above 4000mm)

Location Map of Trenches and Pipe Lines on Sea Side

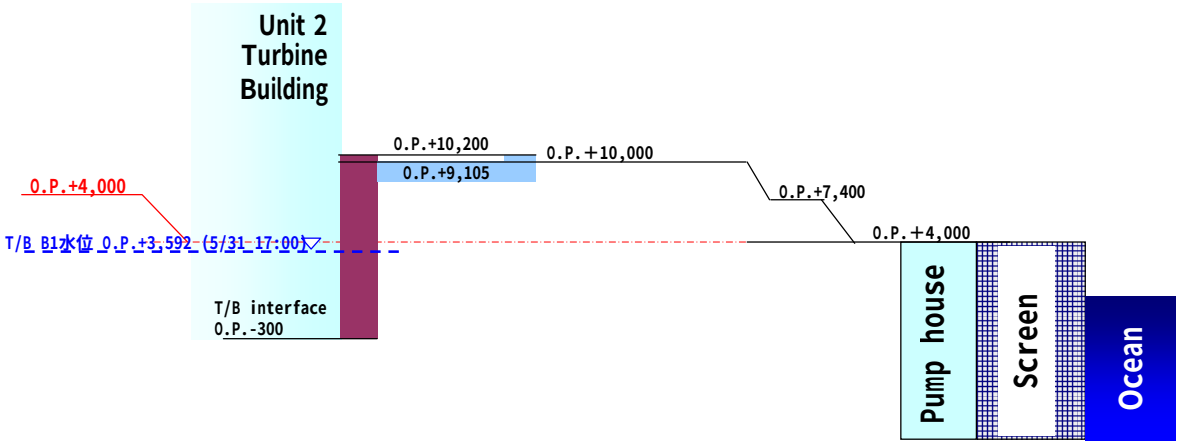
Appendix 6

Confirmed as of May 31, 2011

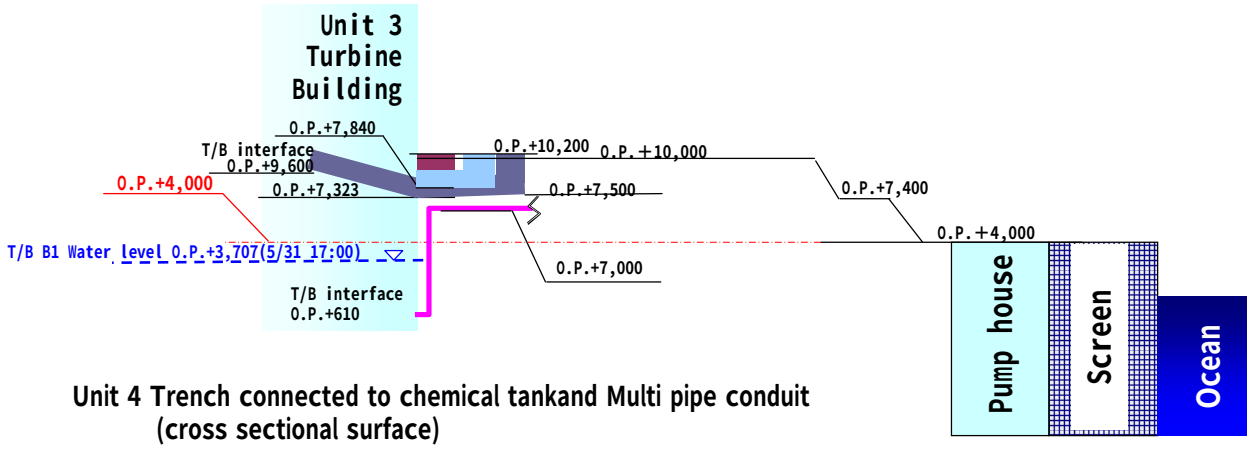
Unit 1 Trench connecting to chemical tank, Trench for fuel and diesel oil tank pipe, and multi pipe conduit (cross sectional surface)



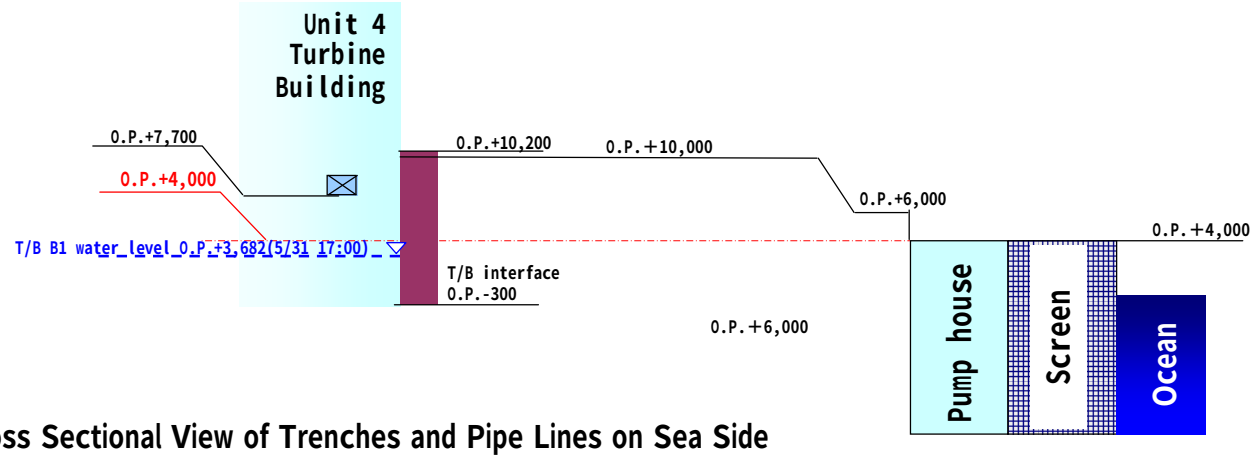
Unit 2 Trench of diesel oil tank pipe, and Multi pipe conduit (cross sectional surface)



Unit 3 Trench connected to chemical tank, Trench for fuel oil tank pipe and Multi pipe conduit (cross sectional surface)



Unit 4 Trench connected to chemical tankand Multi pipe conduit (cross sectional surface)



Cross Sectional View of Trenches and Pipe Lines on Sea Side

Appendix 7

Trench on the east side of Turbine Building

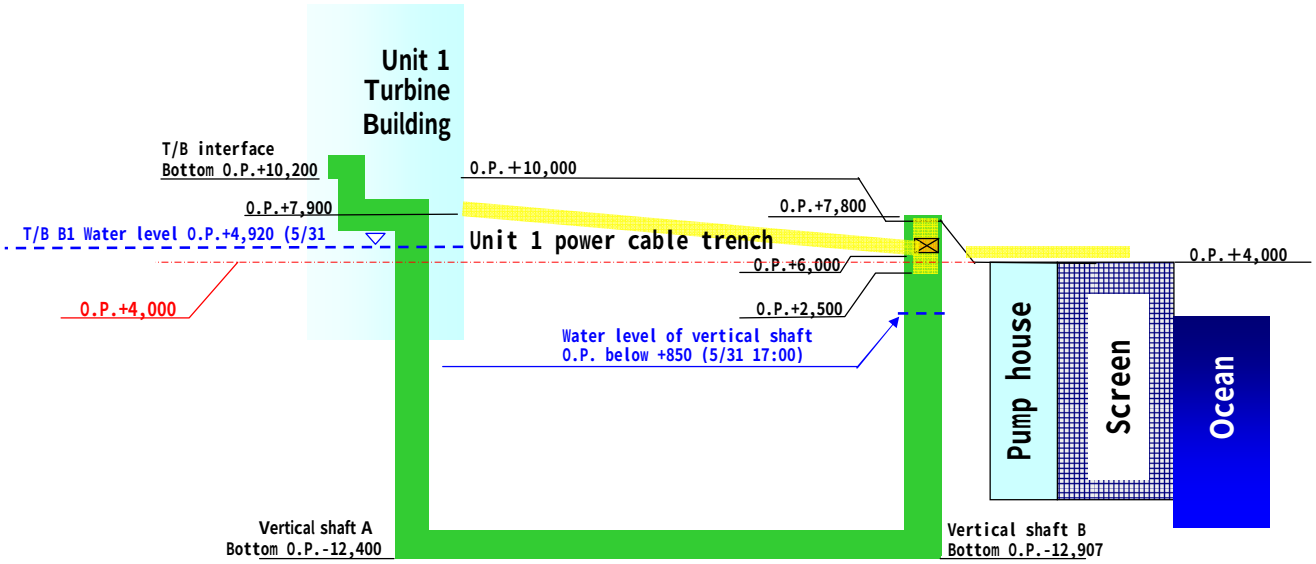
Unit	Name of Trench	Route	Height of interface on turbine building	Height of connection of trench to ocean side	Possibility of leakage of contaminated water
1	Trench connected to chemical tank	Unit 1 Turbine building～Multi pipe conduit (vertical shaft) ～Trench connected to chemical tank～Chemical tank	O.P.+3,200 (Multi pipe conduit (vertical shaft))	O.P.+7,800	×
	Trench for fuel oil tank pipe	Unit 1 Turbine building～Multi pipe conduit (vertical shaft) ～Trench for fuel oil tank pipe～Opening	O.P.+3,200 (Multi pipe conduit (vertical shaft))	O.P.+7,450	×
	Trench for diesel oil tank pipe	Unit 1 Turbine building～Multi pipe conduit (vertical shaft) ～ Trench for diesel oil tank pipe～Manhole on the east side	O.P.+3,200 (Multi pipe conduit (vertical shaft))	O.P.+9,450	×
2	Trench connected to chemical tank	Unit 2 Turbine building～Multi pipe conduit (vertical shaft)～Trench connected to chemical tank ～Chemical tank	O.P.-300 (Multi pipe conduit (vertical shaft))	O.P.+9,105	×
3	Trench connected to chemical tank	Unit 3 Turbine building～Trench connected to chemical tank～Chemical tank	O.P.+7,840 (Trench connected to chemical tank)	Same as on the left	×
	Trench for fuel oil tank pipe	Unit 3 Turbine building～Trench for diesel oil tank pipe～ Trench for fuel oil tank pipe～Unit 4 side	O.P.+9,600 (Trench for diesel oil tank pipe)	Same as on the left	×
	Trench for diesel oil tank pipe	Unit 3 Turbine building～Trench for diesel oil tank pipe ～Diesel oil tank	O.P.+9,600 (Trench for diesel oil tank pipe)	Same as on the left	×
	Storm drain pipe	Unit 3 Turbine building～Storm drain treatment building	O.P.+610[1)] (Storm drain pipe)	O.P.+7,000[2)]	×
4	Trench connected to chemical tank	Unit 4 Turbine building～Trench connected to chemical tank ～Chemical tank	O.P.+7,700 (Trench connected to chemical tank)	Same as on the left	×
	Trench for fuel oil tank pipe	Unit 4 Turbine building～Trench for fuel oil tank pipe ～Unit 3 side	O.P.+9,456 (Trench for fuel oil tank pipe)	Same as on the left	×

1) Height of pipe in a duct penetrating the turbine building
2) Height of passing-through pipe

Appendix 8

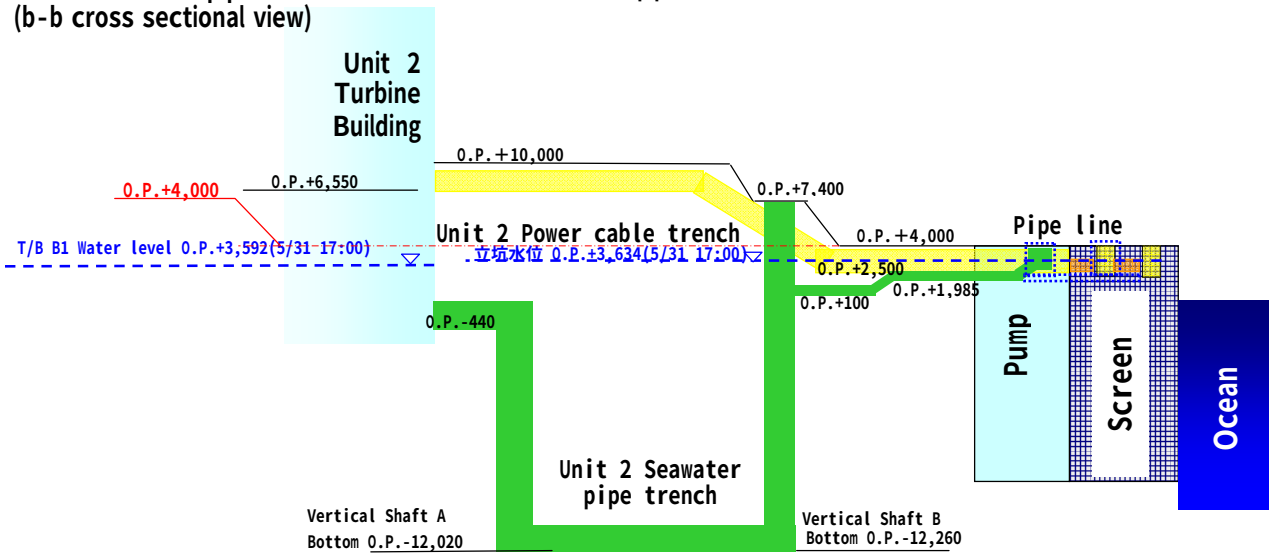
Confirmed as of May 31, 2011

Unit 1 Seawater pipe trench (a-a cross sectional view)

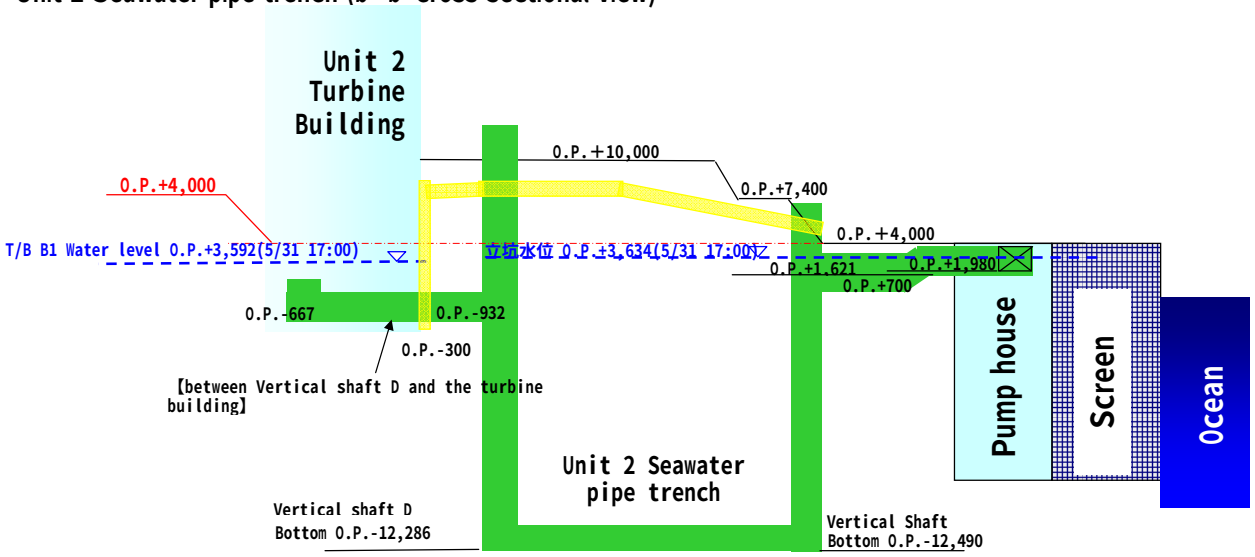


Unit 2 Seawater pipe trench (b-b cross sectional view)

Unit 1 Seawater pipe trench



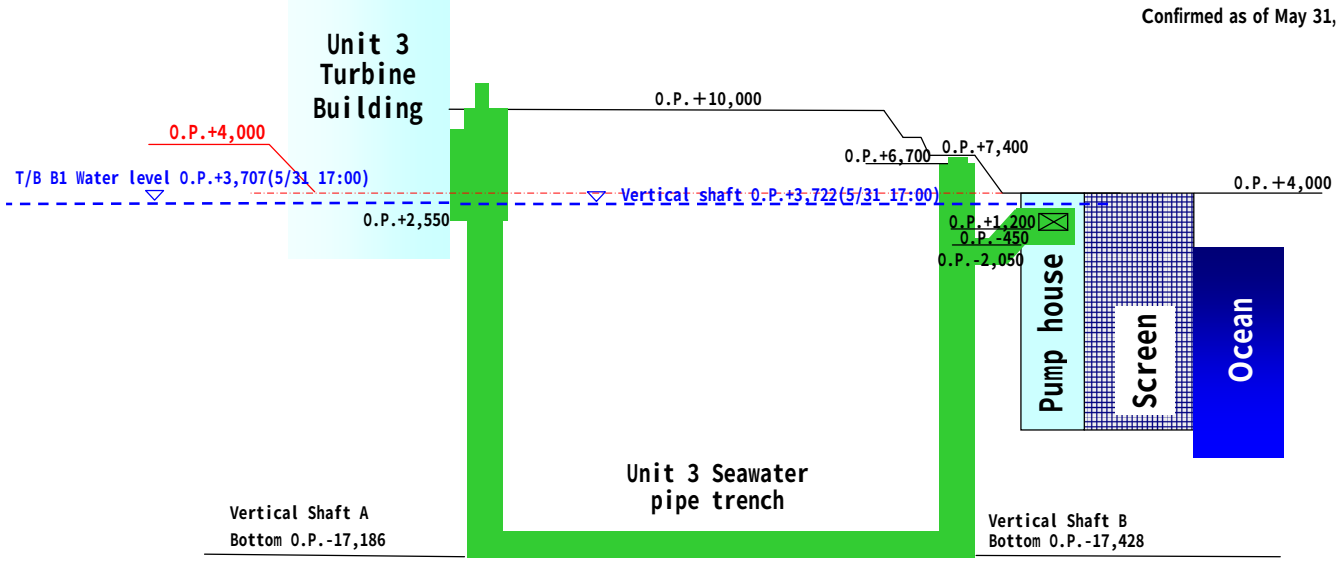
Unit 2 Seawater pipe trench (b'-b' cross sectional view)



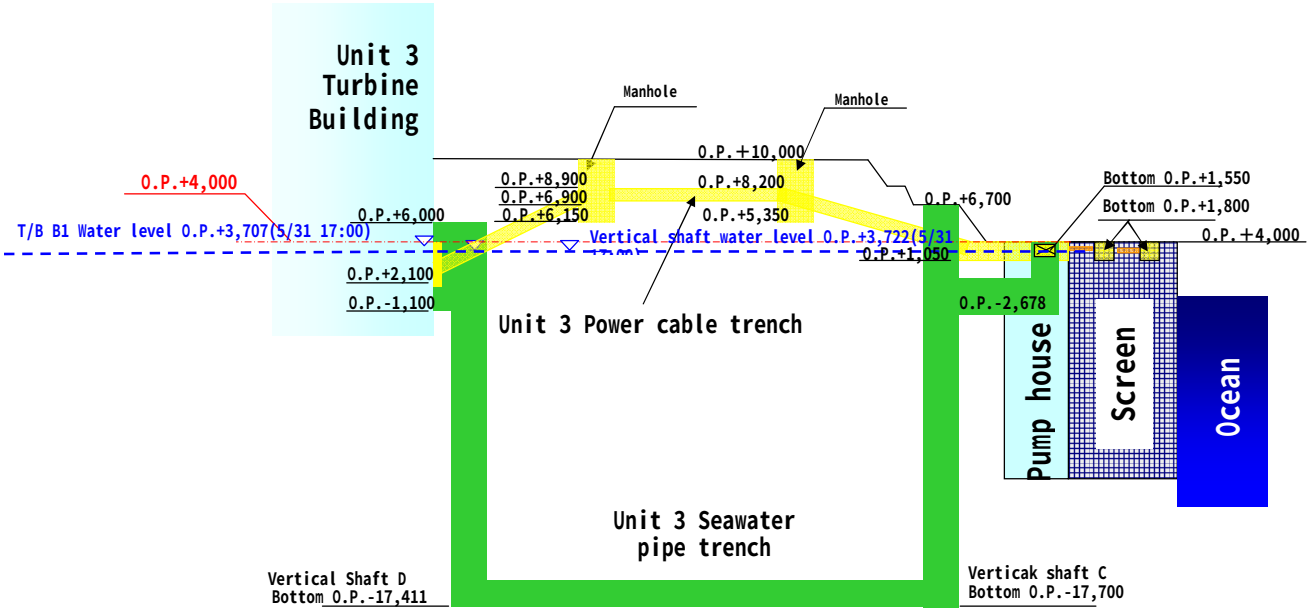
Vertical view of seawater pipe trench of Units 1 to 4 (1/2)

Unit 3 Seawater pipe trench (c-c cross sectional view)

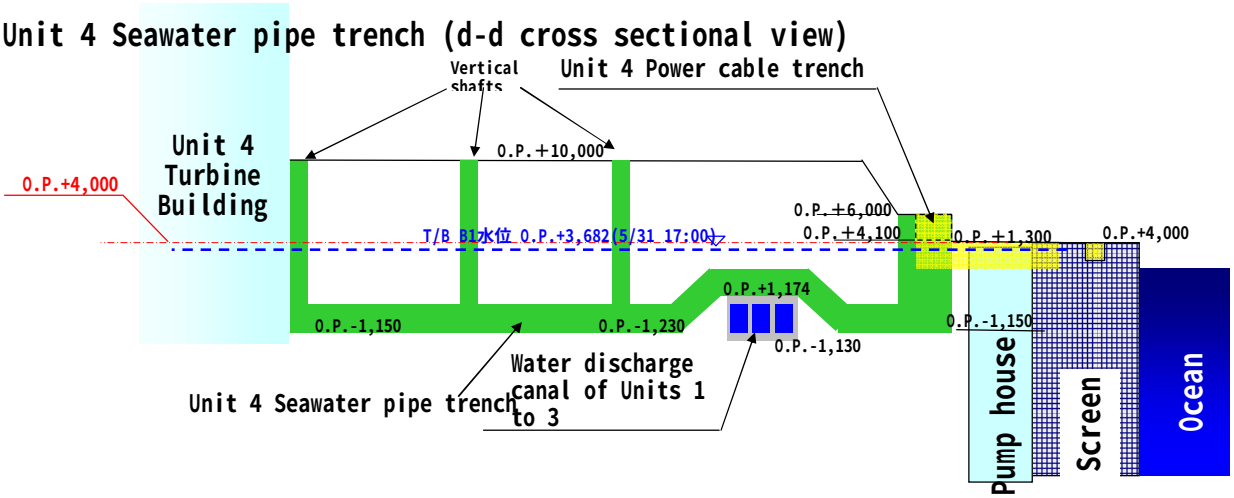
Confirmed as of May 31, 2011



Unit 3 Seawater pipe trench (c'-c' cross sectional view)



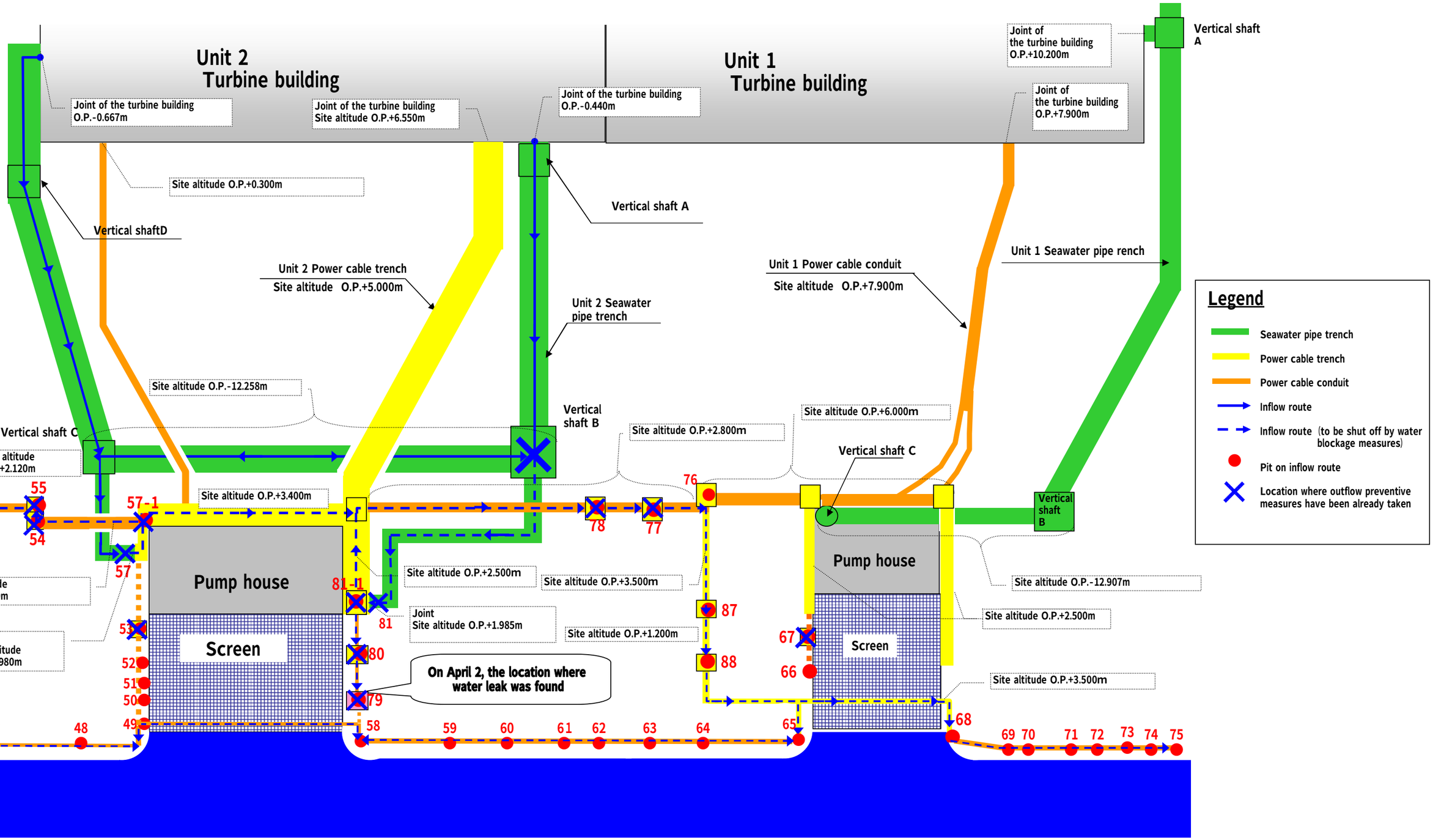
Unit 4 Seawater pipe trench (d-d cross sectional view)



Vertical view of seawater pipe trench of Units 1 to 4 (2/2)

Map of Survey Result of Inflow Route of Radioactive Water (Unit 1 and 2)

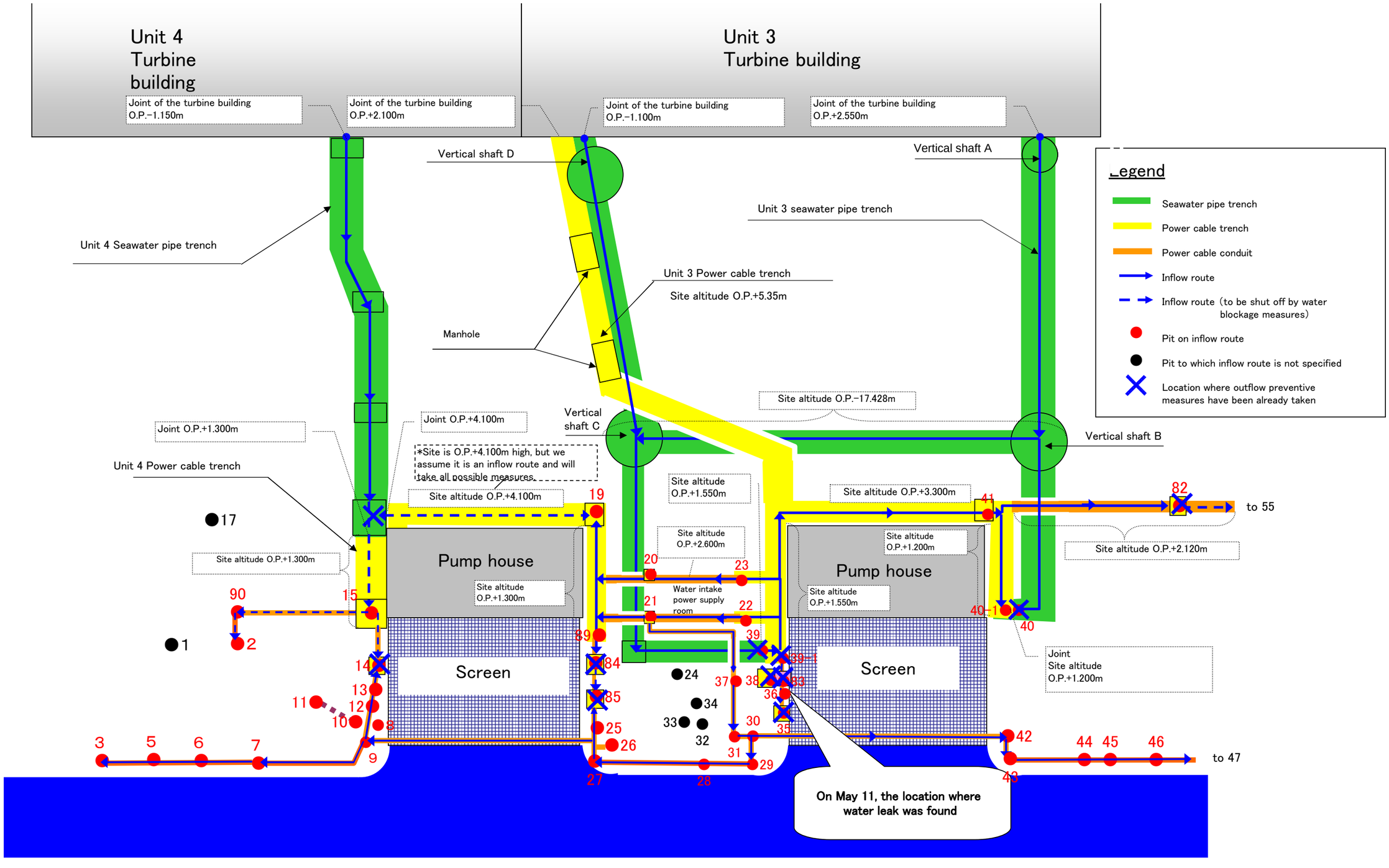
Appendix 9-1



Map of Survey Result of Inflow Route of Radioactive Water (Unit 3 and 4)

N

Appendix 9-2



Appendix 10

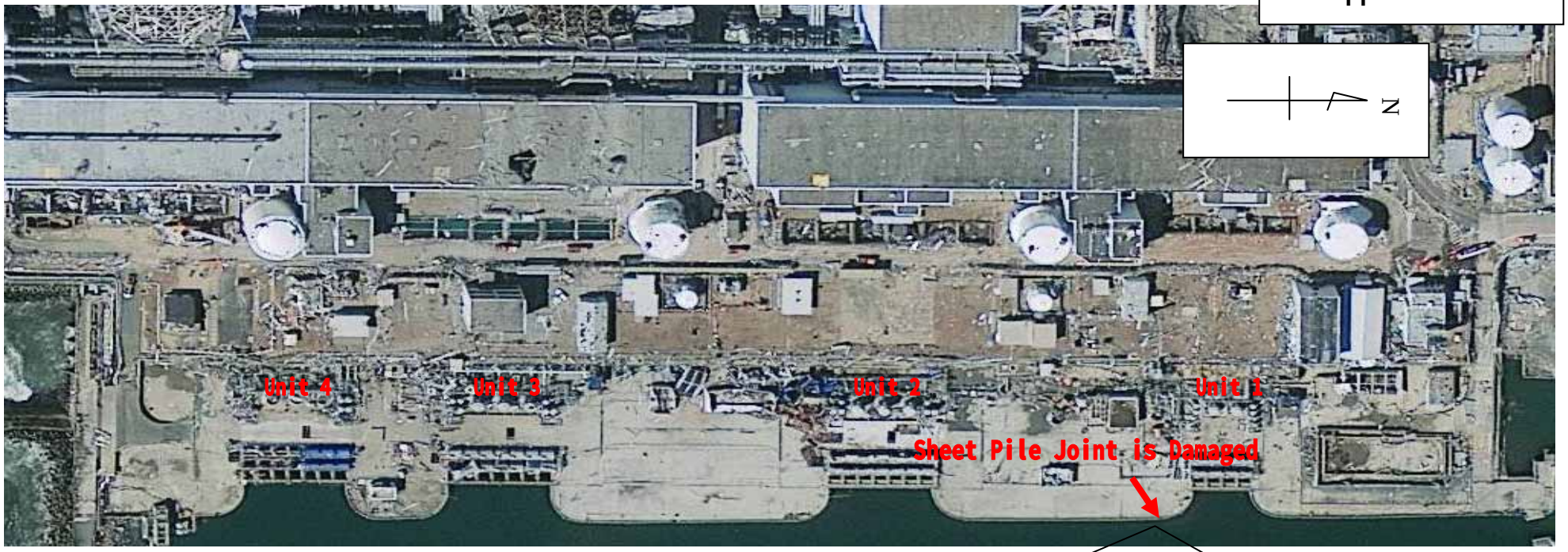
Units 1 to 4 survey list of yard pits on sea side

Unit	No.	Date of investigation	Lid/MH		Water		
			Existence (yes or no)	Open or Closed	Existence or Non-existence	Depth from top edge(mm)	Inflow (yes or no)
4	1	May 13	no	open	yes	680	no
4	2	May 13	no	open	yes	560	no
4	3	May 13	yes	closed	no	—	no
4	5	May 13	no	open	yes	800	no
4	6	May 13	no	open	no	-	no
4	7	May 13	no	open	no	-	no
4	8	May 13	yes	closed	no	-	no
4	9	May 13	no	open	no	-	no
4	10	May 13	no	open	no	-	no
4	11	May 13	no	open	yes	360	no
4	12	May 13	no	open	no	-	no
4	13	May 13	yes	open	yes	1,250	no
4	14	May 13 and 14	yes	open	no	-	no
4	15	May 13	no	open	yes	1,090	no
4	17	May 13	no	open	yes	650	no
4	19	May 13	no	open	yes	3,600	no
4	20	May 13	no	open	yes	1,450	no
4	21	May 13	no	open	yes	1,300	no
4	22	May 13	no	open	yes	1,080	no
3	23	May 13	no	open	yes	1,080	no
3	24	May 13	no	open	yes	1,000	no
3	25	May 13	no	open	no	-	no
3	26	May 13	no	open	yes	870	no
3	27	May 13	no	open	no	—	no
3	28	May 13	no	open	no	—	no
3	29	May 13	no	open	no	—	no
3	30	May 13	yes	closed	no	—	no
3	31	May 13	yes	open	no	—	no
3	32	May 13	no	open	yes	1,250	no
3	33	May 13	no	open	no	—	no
3	34	May 13	no	open	yes	1,150	no
3	35	May 13	no	open	yes	820	no
3	36	May 13	no	open	yes	1,200	no
3	37	May 13	no	open	no	-	no
3	38	May 13 and 14	yes	open	yes	1,500	no
3	39	May 13	yes	open	yes	1,070	no
3	39-1	May 13	yes	open	yes	1,070	no
3	40	May 13	yes	open	no	-	no
3	40-1	May 13	yes	open	no	-	no
3	41	May 13	no	open	yes	1,250	no
3	42	May 13	no	open	no	-	no
3	43	May 13	no	open	no	-	no
3	44	May 13	no	open	no	-	no
3	45	May 13	no	open	no	-	no

Unit	No.	Date of investigation	Lid/MH		Water		
			Existence (yes or no)	Open or Closed	Existence or Non-existence	Depth from top edge(mm)	Inflow (yes or no)
3	46	May 13	no	open	no	-	no
2	47	May 13	no	open	no	-	no
2	48	May 13	no	open	no	-	no
2	49	May 13	no	open	no	-	no
2	50	May 13	no	open	no	-	no
2	51	May 13	yes	closed	no	-	no
2	52	May 13	no	open	yes	1,230	no
2	53	May 13 and 14	yes	open	yes	2,500	no
2	54	May 13	yes	closed	no	-	no
2	55	May 13 and 14	yes	closed	yes	1,300	no
2	57	May 13	no	open	no	-	no
2	57-1	May 13	no	open	no	-	no
2	58	May 13	no	open	yes	800	no
2	59	May 13	no	open	no	-	no
2	60	May 13	no	open	no	-	no
1	61	May 13	no	open	yes	1,950	no
1	62	May 13	no	open	no	-	no
1	63	May 13	no	open	no	-	no
1	64	May 13	yes	open	no	-	no
1	65	May 13	no	open	no	-	no
1	66	May 13	no	open	yes	1,500	no
1	67	May 13 and 14	yes	open	no	-	no
1	68	May 13	yes	closed	no	-	no
1	69	May 13	yes	open	no	-	no
1	70	May 13	yes	open	no	-	no
1	71	May 13	yes	open	yes	1,900	no
1	72	May 13	yes	open	no	-	no
1	73	May 13	no	open	yes	2,520	no
1	74	May 13	no	open	no	-	no
1	75	May 13	no	open	no	-	no
1	76	May 14	no	open	no	-	no
2	77	May 14	yes	open	no	-	no
2	78	May 14	yes	closed	no	-	no
2	79	Already shut off (confirmed on May 13)	—	—	—	—	—
2	80	Already shut off (confirmed on May 13)	—	—	—	—	—
2	81	Already shut off (confirmed on May 13)	—	—	—	—	—
2	81-1	Already shut off (confirmed on May 24)	—	—	—	—	—
2	82	Already shut off (confirmed on May 13)	—	—	—	—	—
3	83	Already shut off (confirmed on May 13)	—	—	—	—	—
4	84	Already shut off (confirmed on May 13)	—	—	—	—	—
4	85	Already shut off (confirmed on May 13)	—	—	—	—	—
1	87	May 24	no	open	yes	1200	no
1	88	May 24	no	open	yes	1200	no
4	89	May 24	yes	open	yes	500	no
1	90	May 24	yes	open	no	—	no

※Pit 4, 16, 18, 56 and 86 are regarded as missing ones, as we could not confrim them in the on-the-spot investigation.
Existence of Pit 1,17,24,32,33 and 34 could not be confirmed on maps.

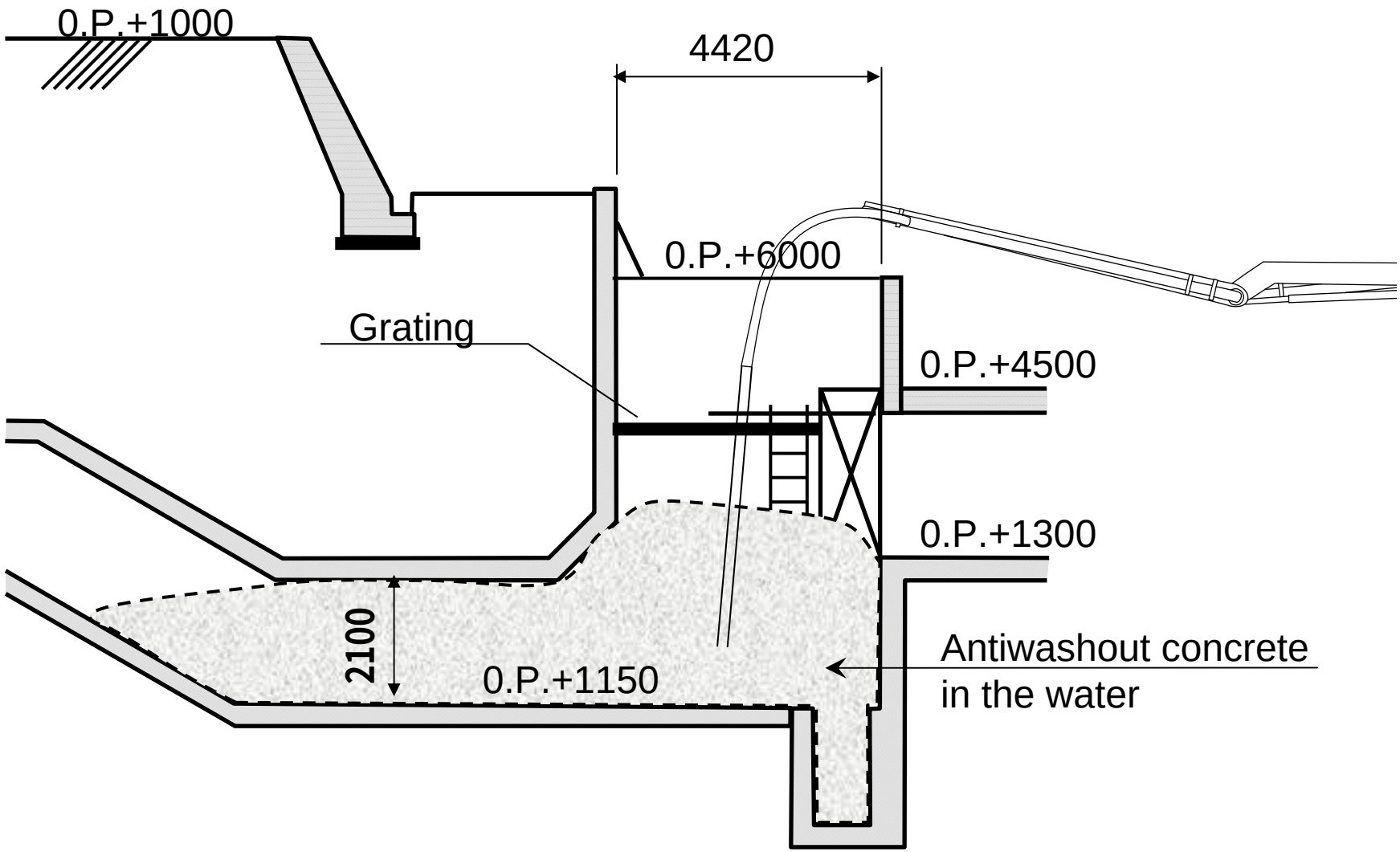
Appendix 11



Shore protection Survey Result

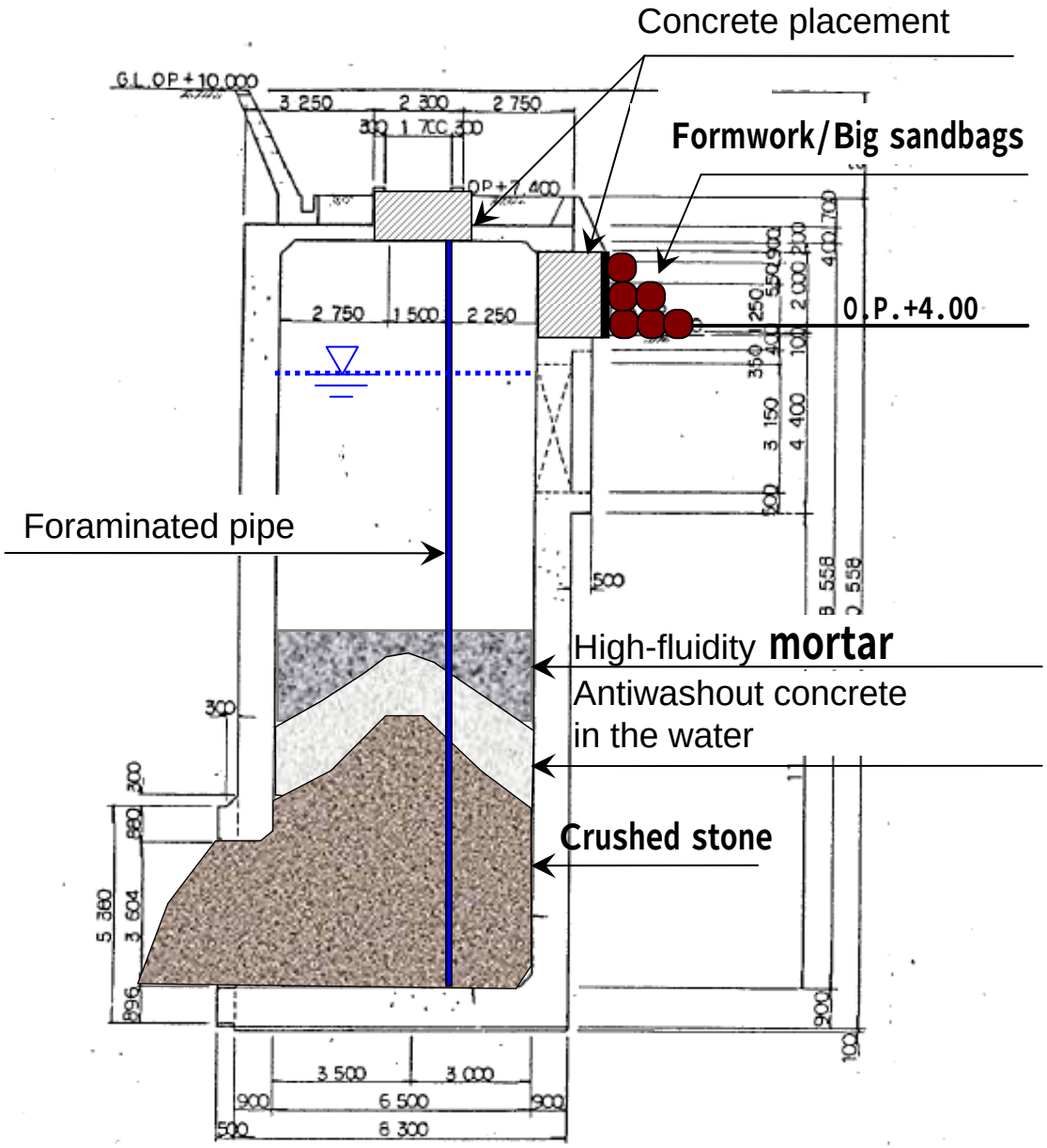
Appendix 12

Unit 4 vertical Shaft
Cross sectional view of closed conditions



Unit 2 vertical Shaft B
Cross sectional view of closed conditions

Appendix 13

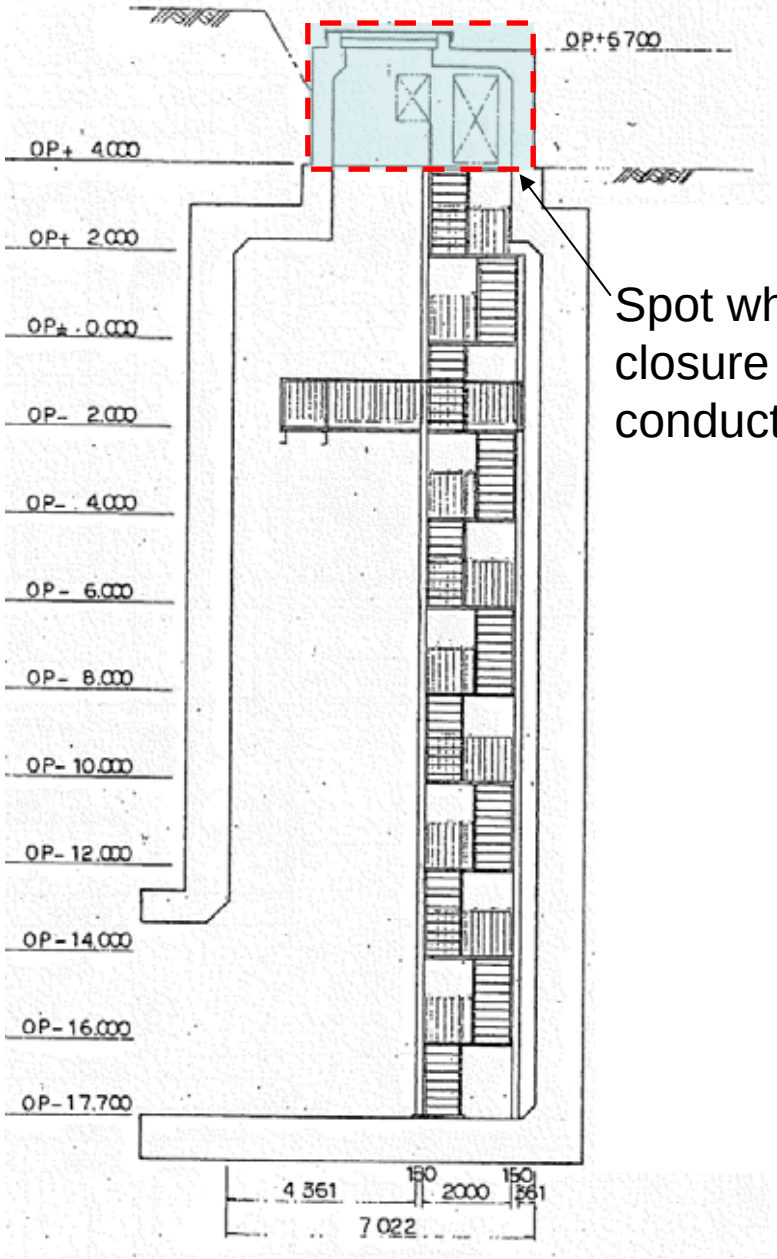



Pouring in crushed stone


Concrete placement

Unit 3 vertical shaft C
Cross sectional view of closed conditions

Appendix 14



Spot where closure was conducted

Closed condition (installment of sandbags)

Closed condition (concrete placement)

Map of plans to closing vertical shafts and pits (Unit 1 and 2)

Attachment 15-1

N

Unit 2
Turbine building

Unit 1
Turbine building

Vertical shaft A

Vertical shaft D

Vertical shaft A

Unit 1 seawater pipe trench

Unit 2 Power cable trench

Unit 1 Power cable conduit

Unit 2 seawater
pipe trench

Vertical shaft C

Vertical shaft B

Site altitude
O.P.+6.0m

Vertical shaft C

Vertical shaft B

Pump house

Pump house

Screen

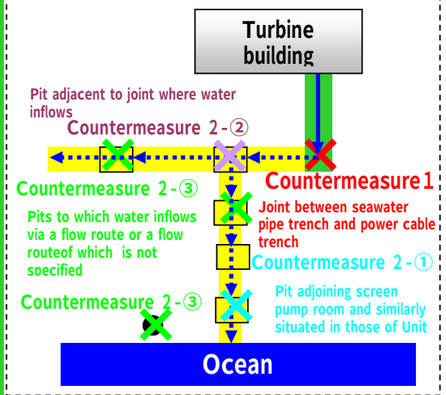
Screen

On April 2, the location where water leak was found

to 46

55 54 57-1 57 53 52 51 50 49 47 48 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 81-1 81 80 79 87 88

Image of how to close pits



Legend

- Seawater pipe trench
- Power cable trench
- Power cable conduit
- Inflow route
- Inflow route (to be shut off by outflow preventive measures)
- Pit on inflow route
- Pit to which flow channel is not specified
- Location where vertical shafts/pits have been already closed (*)
- Countermeasure 1
- Countermeasure 2-①
- Countermeasure 2-②
- Countermeasure 2-③

(*) as of May 31

Map of plans to closing vertical shafts and pits (Unit 3 and 4)

Appendix 15-2

N

Unit 4
Turbine building

Unit 3
Turbine building

Vertical shaft D

Vertical shaft A

Unit 3 Seawater pipe trench

Unit 4 Seawater pipe trench

Unit 3 Power cable trench

Manhole

Vertical shaft C

Vertical shaft B

*Site is O.P.+4.100m high, but we assume it is an inflow route and will take all possible measures.

Unit 4 power cable trench

to 55

to 47

Pump house

Pump house

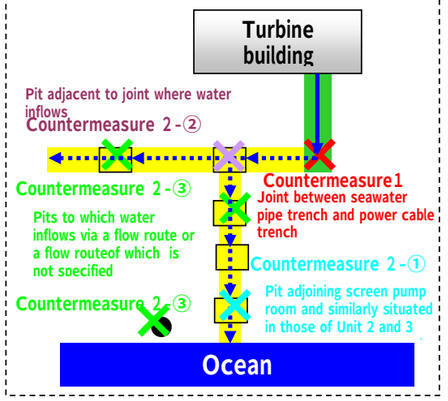
Water intake power supply room

Screen

Screen

On May 11, the location where water leak was found

Image of how to close pits



Legend

- Seawater pipe trench
- Power cable trench
- Power cable conduit
- Inflow route
- Inflow route (to be shut off by outflow preventive measures)
- Pit on inflow route
- Pit to which flow channel is not specified
- Location where vertical shafts/pits have been already closed (*)
  Countermeasure 1
- Countermeasure 2-①
- Countermeasure 2-②
- Countermeasure 2-③

(*) as of May 31

Appendix 16

Outline of closing pits

Construction method	Outline
LW Injection （Injection of chemical substances of liquid glass cement）	If we may have difficulty in adequately filling up normal concrete due to conditions how rubble and cables etc. remain, we adopt LW injection method that high-fluidity liquid glass and cement are injected at the same time. If contaminated water flows though crushed stone layers located in the lower part of power cable conduits, the LW injection method can be used to conduct the blockage of water.
Concrete placement	If we have less difficulty in the approach of heavy machinery etc. due to conditions of rubble, we close pits by direct concrete placement. In pits such as power cable trenches where power cables are installed, we conduct concrete placement after cutting cables to the possible extent.

LW injection case [No.40]

Concrete placement case [No.84]

Appendix 17

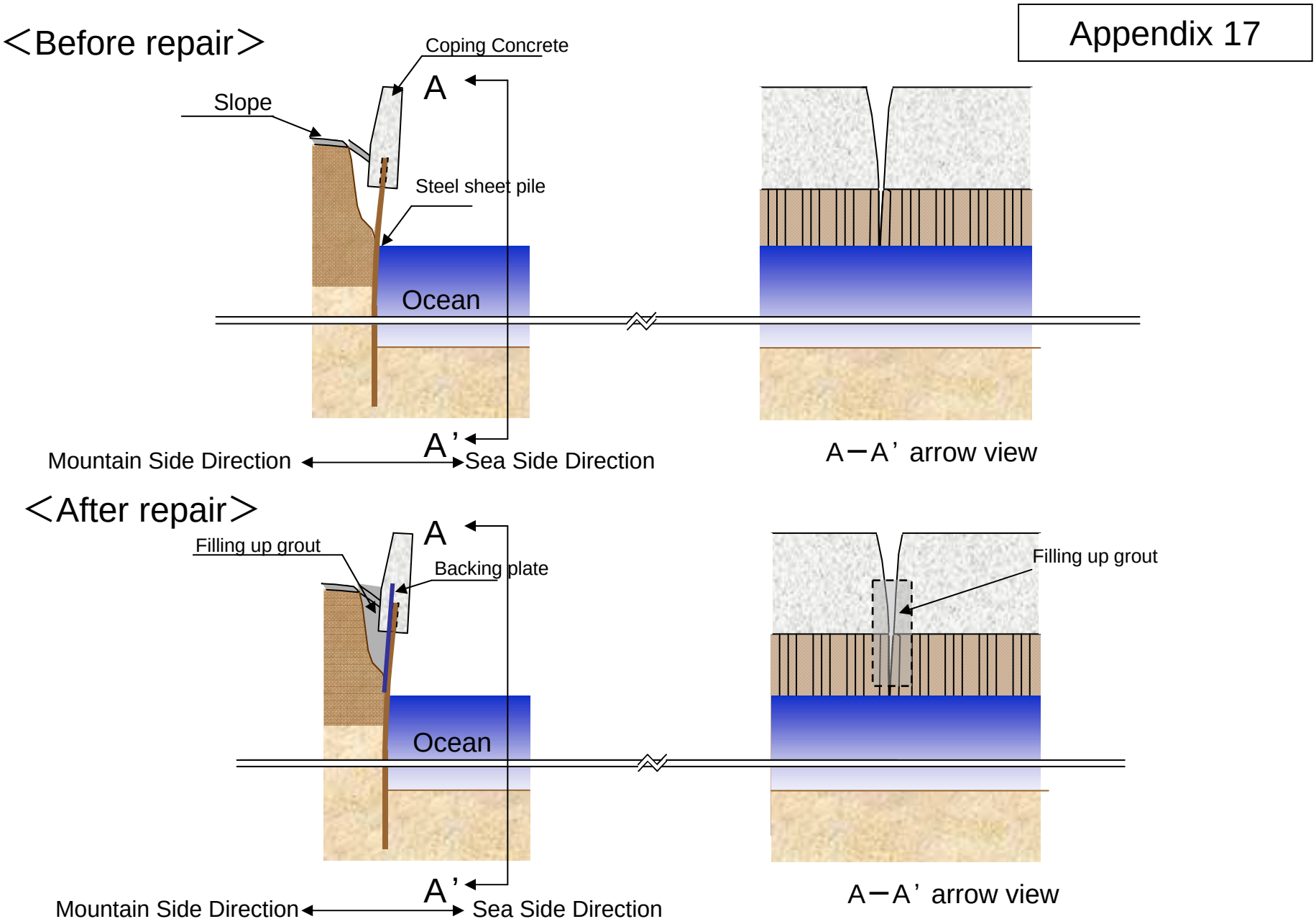


Image of repair of damaged shore protection

Dispersion prevention measures (installation of sliding timber weir in front of screen pump house: example of Unit 2)

Appendix 18

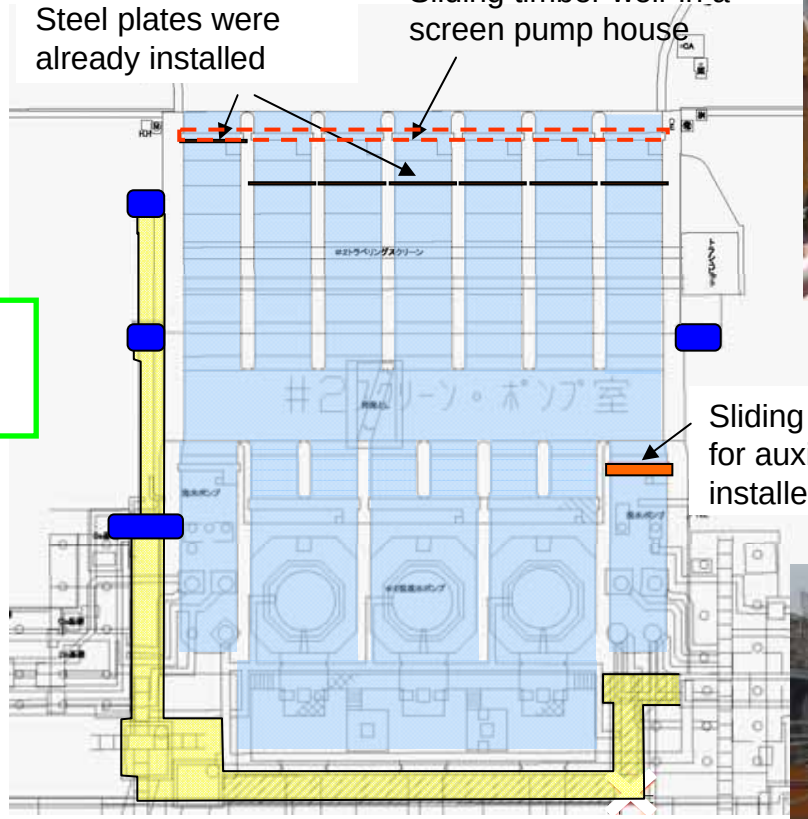
Steel plates were already installed (Unit 2) (completed by April 15)

Sliding timber weir in seawater pump house for auxiliary equipment cooling was already installed (Unit 2) (Completed by May 24)

Sliding timber weir (made of precast concrete)

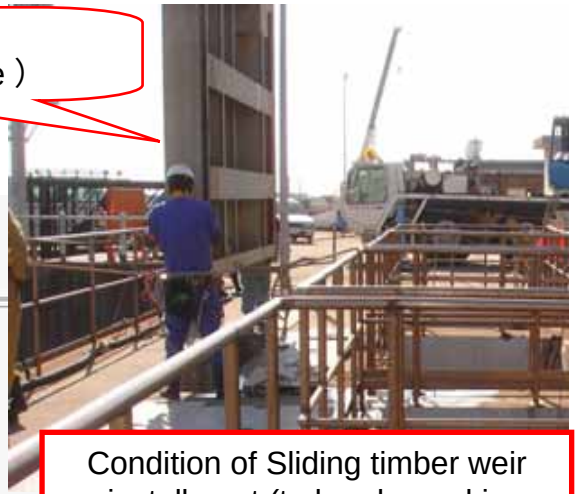
Steel plates were already installed

Sliding timber weir in a screen pump house



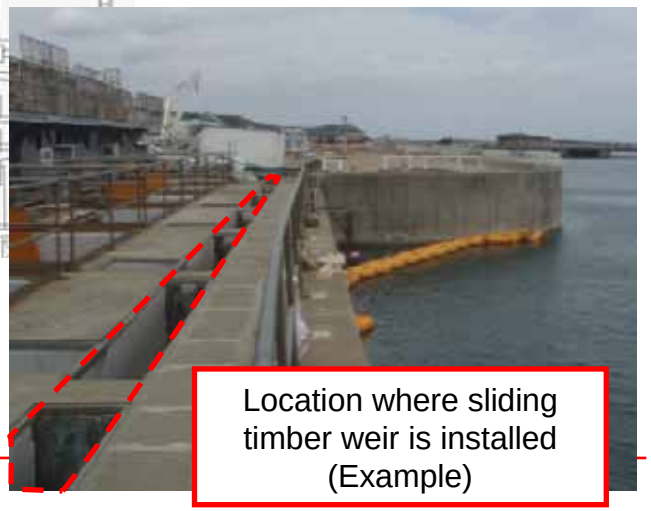
Power cable trench

Closed pits



Condition of Sliding timber weir installment (to be planned in Units 1 to 4)

Sliding timber weir in seawater pump house for auxiliary equipment cooling was already installed.



Location where sliding timber weir is installed (Example)

Appendix 19

Roadmap of closing of vertical shafts and pits

Closing vertical shafts and pits	Intended facility		Locations where closing has been already conducted as of May 31	May									June			Notes
	Unit	Equipment		23rd	24th	25th	26th	27th	28th	29th	30th	31st	Beginning	Middle	Late	
【Countermeasure 1】 - to close seawater pipe trench located in upper stream of flow route	1	Vertical Shaft	—													■Intended pits: two (no remaining pit) - Unit 1: Joint is over O.P. +4.0m and inflow will be unlikely to occur. Hence no countermeasure will be required. - Unit 2: Vertical shaft B - Unit 3: No intended pit - Unit 4: Vertical shaft ■Intended pits: four (no remaining pit) - Unit 1: No intended pit - Unit 2: No 57 and 81 - Unit 3: No 39 and 40 - Unit 4: No intended pit
		Pit	—													
	2	Vertical Shaft	1													
		Pit	2		NO.57 LW											
	3	Vertical Shaft	—													
		Pit	2					NO.40 LW			NO.39 LW					
	4	Vertical Shaft	1													
		Pit	—													
【Countermeasure 2－①】 - To close pits adjoining a screen pump house and similarly situated regarding water outflow in Unit 2 and 3	Unit 1		1													■Intended pits: ten (no remaining pit) - Unit 1: No. 67 - Unit 2: No. 53, 79 and 80 - Unit 3: No. 35, 38 and 83 - Unit 4: No.14, 84 and 85
	Unit 2		3													
	Unit 3		3													
	Unit 4		3													
【Countermeasure 2－②】 - To close pits adjacent to joints between seawater pipe trenches and power supply cables trenches	Unit1		—													■Intended pits: eight (remaining pits: Five) - Unit 1: No intended pits - Unit 2: No. 57-1 and 81-1 - Unit 3: No. 22, 23, 39-1 and 40-1 - Unit 4: No. 15 and 19
	Unit 2		2			NO.57-1 CON placement										
	Unit 3		1								NO.39-1 LW		NO.22,23 LW			
													NO.40-1			
	Unit 4		0										NO.19			
													NO.15			
【Countermeasure 2－③】 - To close pits to which contaminated water inflows via a flow route or, though a flow route is not specified, from which we cannot dany water may leak	Unit 1		1													■Intended pits: Seventeen (remaining pits: Twelve) - Unit 1: No. 77 - Unit 2: No. 52, 54, 78 and 55 - Unit 3: No. 24, 32, 33, 34, 41 and 82 - Unit 4: No. 1, 17, 20, 21, 89 and 90
	Unit 2		3				NO.54 LW							NO.52		
	Unit 3		1											NO.24,32,33,34,41		
	Unit 3		0											NO.1,17,20,21,89,90		
Closing vertical shafts	Unit 1		—													■Intended vertical shafts: Four (remaining vertical shaft: One) - Unit 1: No intended vertical shaft - Unit 2: Vertical shaft B and C - Unit 3: Vertical shaft B and C - Unit 4: No intended vertical shaft
	Unit 2		1		Vertical shaft B				Vertical shaft C							
	Unit 3		2		Vertical shaft B and C											
	Unit 4		—													

Legend

; Alredy conducted

; Planned

LW: Liquid glass and cementious medical substances were or will be injected

CON Placement: Concrete placement

As of May 31

Red：Already conducted
Black: To be conducted