Appendix-5.1

(Result of Environmental and Social Consideration Survey)

Regarding the environmental conditions of the project site and its surroundings, JICA survey team has referred/ reviewed “Bangladesh Coal-Fired Power Plant Construction Project Preparatory Survey Report Final Report on Units 1/2 Construction Project” (November 2013), The Environmental monitoring report on Units 1/2 Construction Work “, and the results of the rainy and dry season surveys (including interview surveys) conducted in this survey.

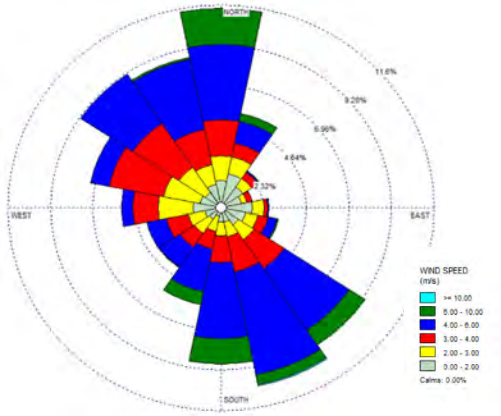
The details of the survey results are organized in each Appendix.

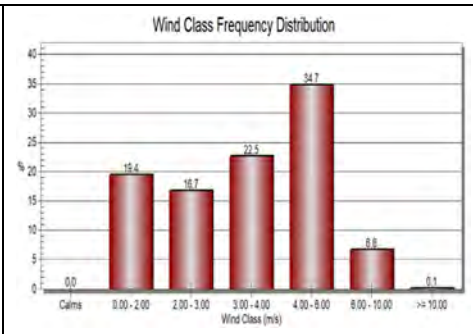
Referred Literature/ document	Survey period	Remarks
The survey for FS 3/4	February, July,2021	February is dry season and July is rainy season.
Bangladesh Coal-Fired Power Plant Construction Project Preparatory Survey Report Final Report on Units 1/2 Construction Project	October 2012,January,2013	
The Environmental monitoring report on Units 1/2 Construction Work	From January,2019 to December,2020	Environmental monitoring of construction works has continued. As for refereeing to survey data from January, 2019 to January, 2020, these data were before Covid- 19 pandemic. Construction works in this period, such as dredging work, foundation ground work, and port construction work, which have greatly affected to the surrounding environment, were carried out.

Appendix5.1.1

(1) Meteorology

2020.1.1-2020.12.31





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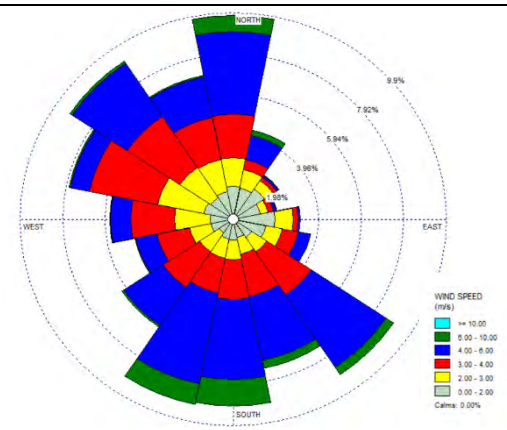

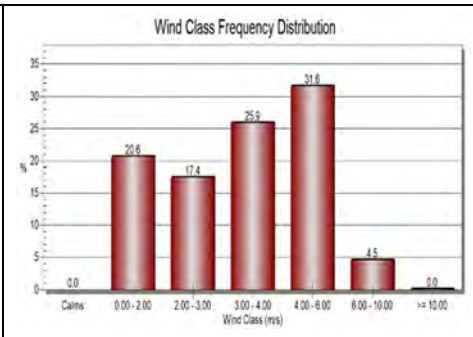

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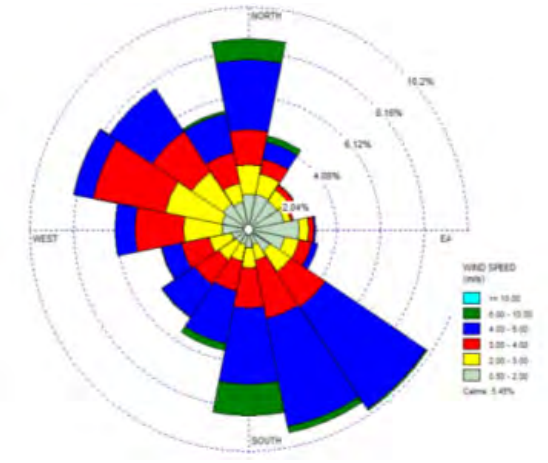
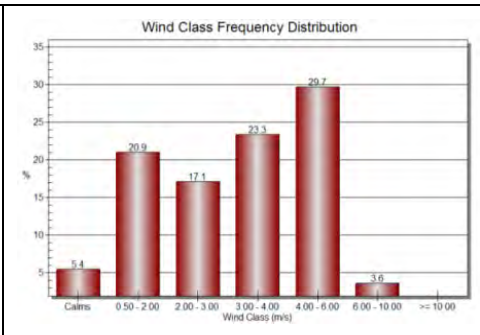
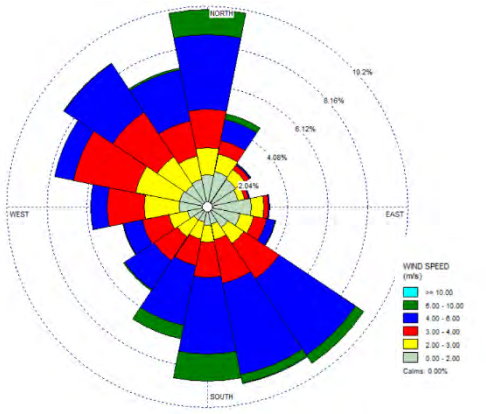
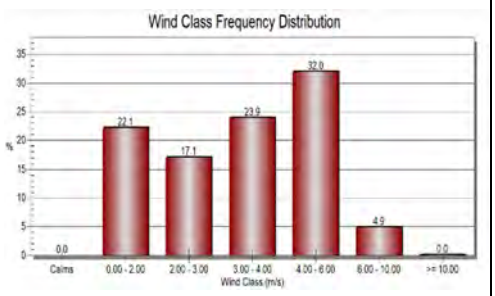




Note; Wind rose by MM5

Appendix 5.1 Figure (1)-1 Wind rose

2018.1.1-2020.12.31	
	

Note; Wind rose by MM5

Appendix 5.1 Figure (1)-2 Wind rose

(2) Air pollutants

(2-1) The survey for FS 3/4

Appendix 5.1 Table (2-1) -1(1) Air quality (24hr) (Dry season)

(μg/m³)

Sample Location	Date	PM10	PM2.5	SO2	NOx
AQ-4 (Matarbali)	07-08/Jan,2021	67.1	23.2	<2.5	<5.0
	04-05/Mar,2021	75.9	30.2	<2.5	<5.0
	05-06/Mar,2021	52.8	27.9	<2.5	<5.0
	Average	65.3	27.1	<2.5	<5.0
AQ-5 (Dhalghata)	08-09/Jan,2021	27.3	32.4	<2.5	<5.0
	06-07/Mar,2021	57.9	27.2	<2.5	<5.0
	07-08/Mar,2021	47.2	24.0	<2.5	<5.0
	Average	44.1	27.9	<2.5	<5.0
Ambient Air Quality Standards		SPM；200 (8hr) PM10: 150 (24hr) PM10: 50 (year)	PM2.5: 65 (24hr) PM2.5: 15 (year)	365 (24hr) 80 (year)	100 (year)
IFC EHS Guideline (General: 2007)		PM10: 150 (24hr) PM10: 70 (year)	PM2.5: 75 (24hr) PM2.5: 35 (year)	500 (10min) 125 (24hr)	200 (1hr) 40 (year)

Appendix 5.1 Table (2-1) -1(2) Air quality (24hr) (Rainy season)

(μg/m³)

Sample Location	Date	PM10	PM2.5	SO2	NOx
AQ-4 (Matarbali)	04-05/Jun,2021	13.9	9.7	<2.5	<5.0
	05-06/Jun,2021	8.8	18.2	<2.5	<5.0
	06-07/Jun,2021	12.5	10.6	<2.5	<5.0
	11.7	12.8	<2.5	<5.0	11.7
AQ-5 (Dhalghata)	01-02/Jun,2021	9.3	12.3	<2.5	<5.0
	02-03/Jun,2021	13.4	5.7	<2.5	<5.0
	03-04/Jun,2021	11.3	7.1	<2.5	<5.0
	Average	11.3	8.4	<2.5	<5.0
Ambient Air Quality Standards		SPM；200 (8hr) PM10: 150 (24hr) PM10: 50 (year)	PM2.5: 65 (24hr) PM2.5: 15 (year)	365 (24hr) 80 (year)	100 (year)
IFC EHS Guideline (General: 2007)		PM10: 150 (24hr) PM10: 70 (year)	PM2.5: 75 (24hr) PM2.5: 35 (year)	500 (10min) 125 (24hr)	200 (1hr) 40 (year)

Note; Survey location

AQ4 (Matarbari), AQ5 (Dhalghata)
(AQ1～AQ3: Units 1/2 Environmental monitoring report)

(2-2) Bangladesh Coal-Fired Power Plant Construction Project Preparatory Survey Report Final Report on Units 1/2 Construction Project

Appendix 5.1 Table (2-2) (1) Survey results of air quality (rainy season)

(19 - 20/October/2012)

Parameter	Unit	Results			Ambient Air Quality Standards	IFC EHS Guideline (General: 2007)
		AN1	AN2	AN-3		
SPM	μg/m^3	54	56	42	200 (8hr) PM_{10}: 150 (24hr) PM_{10}: 50 (year)	SPM: - PM_{10}: 150 (24hr) PM_{10}: 70 (year)
SO_2	μg/m^3	3.2	3.4	3.0	365 (24hr) 80 (year)	500 (10min) 125 (24hr)
NO_2	μg/m^3	6.2	6.5	6.0	100 (year)	200 (1hr) 40 (year)

Appendix 5.1 Table (2-2) (2) Survey results of air quality (dry season)

(29 - 30/January/2013)

Parameter	Unit	Results			Ambient Air Quality Standards	IFC EHS Guideline (General: 2007)
		AN1	AN2	AN-3		
SPM	μg/m^3	59	62	45	200 (8hr) PM_{10}: 150 (24hr) PM_{10}: 50 (year)	SPM: - PM_{10}: 150 (24hr) PM_{10}: 70 (year)
SO_2	μg/m^3	4.0	4.1	3.0	365 (24hr) 80 (year)	500 (10min) 125 (24hr)
NO_2	μg/m^3	7.4	7.6	5.0	100 (year)	200 (1hr) 40 (year)

Sampling Point	Latitude (North)	Longitude (East)
AN-1	21°43’19”	91°53’03”
AN-2	21°43’56”	91°53’28”
AN-3	21°42’28”	91°52’43”

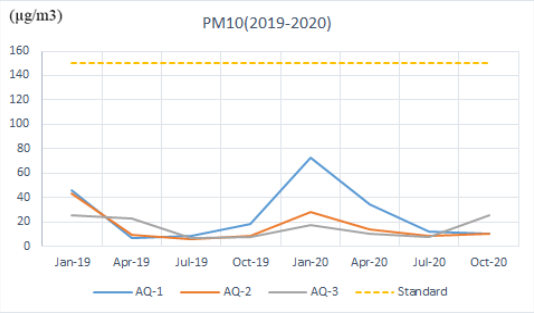
(2-3) The Environmental monitoring report on Units 1/2 Construction Work

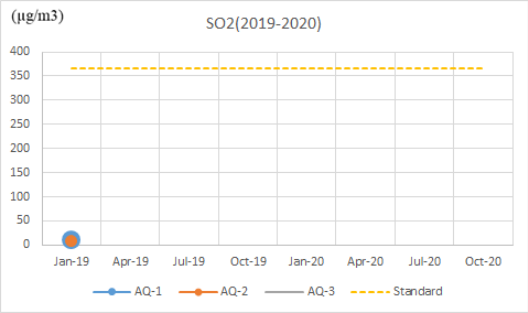
Appendix 5.1 Table (2-3) Survey results of air quality (2019.1-2020.12)

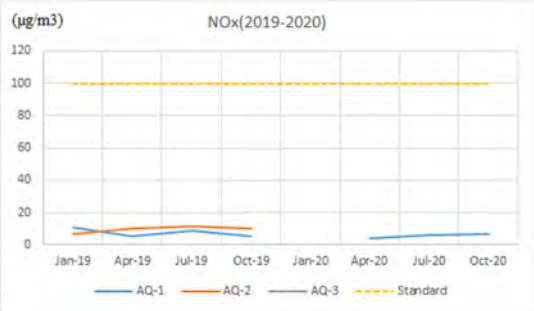
Location	Survey Period	PM_{10} ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NO_X ($\mu g/m^3$)	CO (ppm)
AQ-1	Jan-19	45.6	10.3	11	1
	Apr-19	6.8	ND	5.5	0.7
	Jul-19	8.5	ND	9	0.7
	Oct-19	18.2	ND	5.5	0.8
	Jan-20	72.7	ND	ND	1.1
	Apr-20	34.5	ND	4.1	1
	Jul-20	11.7	ND	6.1	1
	Oct-20	10.5	ND	6.7	1.1
	Maximum value during survey	72.7	10.3	11	1.1
	Minimum value during survey	6.8	ND	4.1	0.7
AQ-2	Jan-19	42.8	8.7	6.4	1.3
	Apr-19	9	ND	10.1	0.7
	Jul-19	5.4	ND	11.2	0.6
	Oct-19	8.2	ND	10.1	0.9
	Jan-20	27.7	ND	ND	0.8
	Apr-20	13.6	ND	ND	0.8
	Jul-20	8.4	ND	ND	0.8
	Oct-20	9.9	ND	7.1	1
	Maximum value during survey	42.8	8.7	11.2	1.3
	Minimum value during survey	5.4	ND	6.4	0.6
AQ-3	Jan-19	25.3	ND	ND	1.6
	Apr-19	22.4	ND	5.2	1
	Jul-19	6.6	ND	ND	0.9
	Oct-19	7.4	ND	ND	0.9
	Jan-20	17.3	ND	ND	1
	Apr-20	10.1	ND	ND	0.8
	Jul-20	7.6	ND	ND	0.7
	Oct-20	25.3	ND	6.4	1.6
	Maximum value during survey	5.4	ND	5.2	0.6
	Minimum value during survey	6.6	ND	5.2	0.9
Bangladesh Standard (Amended Schedule - 2, July'05 of ECR 1997)		150 (24 hrs)	365 (24 hrs)	100 (1year)	9 (8 hrs)

Note; Sampling Duration: 24hr. ND; Not Detected

Sampling Point	Latitude (North)	Longitude (East)
AQ-1	21°42'15.8" N	91°53'22.8" E
AQ-2	21°41'52.6" N	91°52'18.0" E
AQ-3	21°42'36.8" N	91°52'29.7" E







Note; Analysis method for the monitoring of Units 1/2

Parameters	Sampling Method	Laboratory Analysis Method
PM_{10}	Sample of ambient air is to be carried out by Respirable Dust Sampler [Model 36C12] Sampling is conducted for 24 hours at a flowrate of 1.38 m3/min. Sampler is located at an open area (minimum 20 m clearance from any tall structures or vegetation / trees / shrubs) to prevent disturbance After completion of sampling, each filter paper with trapped PM shall preserve in airtight Polly packet and is again packed in an envelope. All samples to be accompanied by Chain of Custody (CoC) forms for QA/QC purpose.	IS 5182 (Part 23):2006 - Methods for Measurement of Air Pollution, Part 23: Respirable Suspended Particulate Matter (P_{M10}), Cyclonic Flow Technique
SO_2	Gaseous pollutants are absorbed in 30 mL of absorbing solution. Sampling is conducted for 24 hours Gaseous samples preserve in plastic containers with levels of sampling details and carries in icebox (preserved at 4oC) from site to SGS laboratory at Dhaka. All samples to be accompanied by Chain of Custody (CoC) forms for QA/QC purpose.	IS 5182 (Part 2):2001 - Methods for Measurement of Air Pollution, Part 2: Sulphur Dioxide
NO_x	Gaseous pollutants are absorbed in 30 mL of absorbing solution. Sampling is conducted for 24 hours Gaseous samples preserve in plastic containers with levels of sampling details and carries in icebox (preserved at 4oC) from site to SGS laboratory at Dhaka. All samples to be accompanied by Chain of Custody (CoC) forms for QA/QC purpose.	IS 5182 (Part 6):2006 - Methods for Measurement of Air Pollution, Part 6: Oxides of nitrogen
CO	Sampling using portable gas sensor Model COH-9902SD with resolution of 1 ppm and range of 0 ppm to 100 ppm Sampling conducted for <1 hour with interval of 20 minutes. The readings are then averaged.	Electrochemical Sensor
CO_2	Sampling using portable gas sensor Model GC-2028 with resolution with resolution of 1 ppm and range of 0 ppm to 4000 ppm Sampling conducted for <1 hour with interval of 20 minutes seconds. The readings are then averaged.	Electrochemical Sensor

Appendix5.1.2

5.1.2 Noise/Vibration

(1) The survey for FS 3/4

(1-1) Noise

Appendix 5.1 Table (1-1) -1　Survey result of Noise (Dry season)

(Unit: dBA)

Survey phase	Results		Standards for Noise				
	Day (6:00-21:00)	Night (21:00-6:00)	A	B	C	D	E
NQ4 (Matarbali)	58.0	52.0	Day: 45 Night:35	Day: 50 Night:40	Day: 60 Night:50	Day: 70 Night:60	Day: 70 Night:70
NQ5 (Dhalghata)	51.8	41.7					

Survey date：7,8 March, 2021

Appendix 5.1 Table (1) -2　Survey result of Noise (Rainy season)

(Unit: dBA)

Survey phase	Results		Standards for Noise				
	Day (6:00-21:00)	Night (21:00-6:00)	A	B	C	D	E
NQ4 (Matarbali)	56.4	51.2	Day: 45 Night:35	Day: 50 Night:40	Day: 60 Night:50	Day: 70 Night:60	Day: 70 Night:70
NQ5 (Dhalghata)	41.5	38.2					

Survey date：1,3 June, 2021

Note; Category is as below.

A: Quiet place

B: Residential area

C: Complex area (mainly residential area, and also applied to commercial and industrial area)

D: Commercial area

E: Industrial area

Survey location

NQ4 (Matarbari), NQ5 (Dhalghata)
(NQ1～NQ3: Units 1/2 Environmental monitoring report)

(1-2) Vibration

(1-2-1) Ground characteristic and vibration around the project site

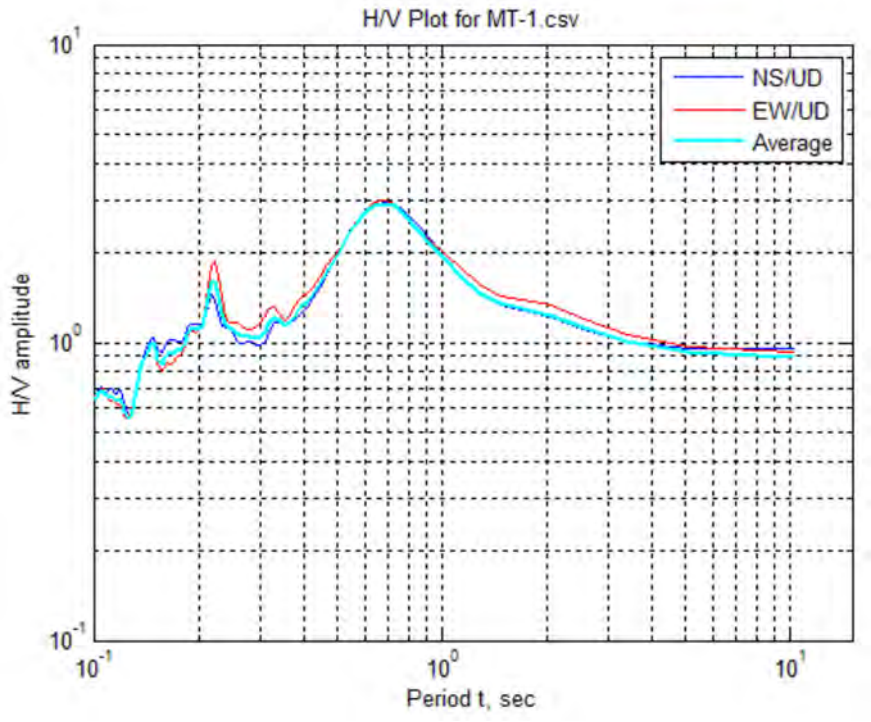
Information on dynamic characteristics such as predominant period, amplitude, maximum ground acceleration, and shear wave velocity can be obtained from the observation of microtremor survey.

In general, the shape of the H/V spectral ratio has remarkable peaks in case of soft ground/soil, but is flat (close to 1) in case of rock and hard ground/soil.

According to the observation results of microtremor survey at Matarbari village and Dhalghata village, H/V spectral ratio, peak amplitude, and predominant period at both observation points are similar, indicating a tendency of soft ground/soil.

The softer the ground/soil is, the slower the velocity is. As a result, the wavelength of seismic waves that is propagating underground becomes shorter, and the amplitude increases. So it tends to fluctuate/ vibrate often.

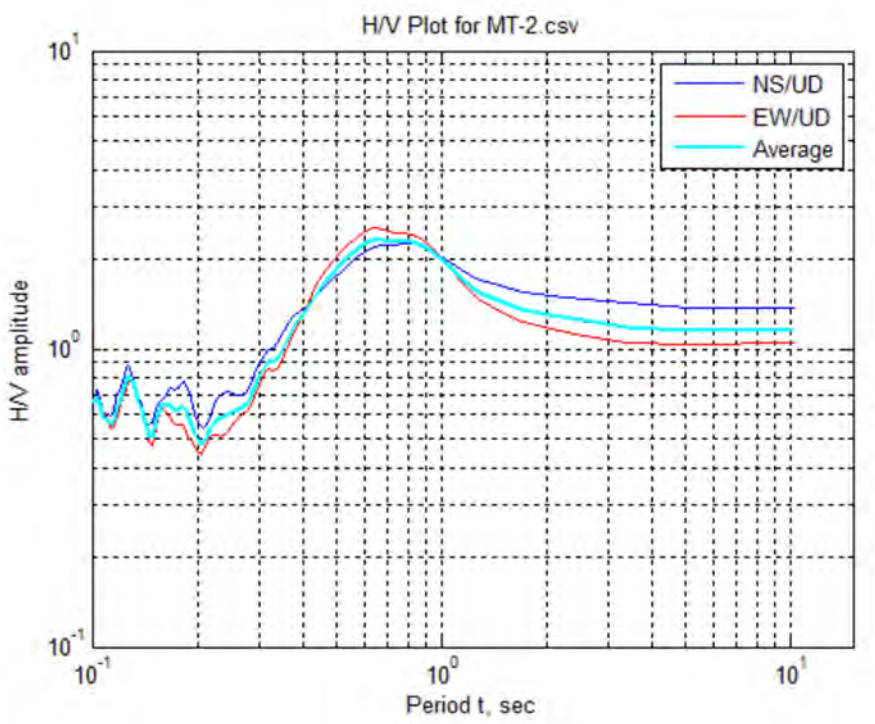
In addition, at the time of the observation, no large vibration source was confirmed around Matarbari village and Dhalghata village.



Location	The Peak Amplitude	The Peak Period
Matarbari village	2.920	0.68

Survey date : April 03, 2021

Appendix 5.1 Figure (2-1)-1 H/V spectral ratio at Matarbari village



Location	The Peak Amplitude	The Peak Period
Dhalghata village	2.320	0.64

Survey date：April 03, 2021

Appendix 5.1 Figure (2-1)-2　H/V spectral ratio at Dhalghata village

(1-2-2) Study about vibration level around the project site

Appendix 5.1 Table (2-2)-1 Survey results of Vibration level

[Matarbari village] （Unit：dB）

Category	Time		Lveq	Lvmax	Lvmin	Lv5	**Lv10**	Lv50	Lv90	Lv95	**Average (Lv10)**
Day time	2021/6/21	10:00	31	46	22	35	**33**	30	26	24	**28**
		11:00	27	38	18	32	**30**	26	23	22	
		12:00	20	31	15	22	**21**	19	17	17	
		13:00	27	35	23	31	**29**	27	25	25	
		14:00	26	40	19	28	**27**	25	22	22	
		15:00	39	64	22	30	**28**	26	24	24	
		16:00	26	45	19	28	**26**	24	22	22	
		17:00	26	40	18	31	**29**	25	21	20	
Night time		18:00	25	34	19	28	**27**	24	21	21	**22**
		19:00	22	29	17	24	**23**	21	19	19	
		20:00	20	23	15	21	**21**	19	17	17	
		21:00	19	26	14	22	**21**	18	16	16	
		22:00	18	28	14	21	**20**	17	16	15	
		23:00	22	25	19	24	**23**	22	21	21	
	2021/6/22	0:00	19	26	14	24	**23**	17	15	15	
		1:00	20	28	14	21	**20**	19	17	16	
		2:00	15	18	14	15	**15**	14	14	14	
		3:00	22	30	18	23	**23**	22	20	20	
		4:00	16	19	14	16	**16**	14	14	14	
		5:00	21	35	14	25	**22**	17	15	15	
		6:00	22	34	17	25	**24**	21	19	18	
Day time		7:00	25	42	19	28	**27**	24	21	21	**28**
		8:00	23	37	18	26	**25**	23	20	20	
		9:00	26	32	21	29	**28**	25	23	23	

[Dhalghata village] （Unit：dB）

Category	Time		Lveq	Lvmax	Lvmin	Lv5	**Lv10**	Lv50	Lv90	Lv95	**Average (Lv10)**
Day time	2021/6/22	12:00	40	55	23	46	**44**	36	29	27	**43**
		13:00	37	48	23	43	**41**	34	28	27	
		14:00	59	81	24	60	**50**	37	29	27	

Category	Time		Lveq	Lvmax	Lvmin	Lv5	**Lv10**	Lv50	Lv90	Lv95	**Average (Lv10)**
		15:00	34	45	23	39	**37**	30	26	25	
		16:00	39	55	22	46	**43**	33	26	25	
		17:00	36	50	22	41	**39**	32	27	25	
Night time		18:00	38	52	23	45	**41**	32	26	25	
		19:00	35	45	25	40	**38**	32	28	27	
		20:00	36	52	24	41	**39**	33	27	27	
		21:00	36	53	22	42	**38**	31	25	24	
		22:00	30	45	24	33	**31**	28	26	26	
		23:00	29	41	21	33	**32**	26	23	23	
	2021/6/23	0:00	33	37	30	36	**35**	33	31	31	**42**
		1:00	30	39	25	37	**35**	28	26	26	
		2:00	26	30	21	28	**27**	26	22	22	
		3:00	29	32	23	31	**30**	28	26	25	
		4:00	34	40	27	38	**37**	33	29	28	
		5:00	31	36	25	34	**34**	31	27	26	
		6:00	36	50	28	39	**39**	35	31	31	
Day time		7:00	33	52	21	37	**33**	27	24	23	
		8:00	34	45	25	39	**38**	32	28	27	
		9:00	31	50	23	35	**33**	28	25	24	**43**
		10:00	34	47	25	41	**37**	30	27	27	
		11:00	43	60	27	47	**46**	40	33	32	

Remarks:

(1) Under Japanese vibration law, the evaluation of vibration level is set to the upper value at 80% (mentioned as L10), and it is able to be referred to Lv10 from the survey results. This survey is set to day time is from 7AM to 17 PM, night time is from 18PM to 6AM.

(2) Survey location

(3) As reference, Japanese vibration standard for factory

(Unit: dB)

Item	Day time	Night time
Residential area	60-65	55-60
Commercial Industrial area	65-70	60-65

Source: Japanese vibration law

(2) Bangladesh Coal-Fired Power Plant Construction Project Preparatory Survey Report Final Report on Units 1/2 Construction Project

Appendix 5.1 Table (2) Survey result of Noise

(Unit: dBA)

Survey phase	Results			Standards for Noise				
	St.1	St.2	St.3	A	B	C	D	E
Rainy season 19 20/October/2012	57.0	57.3	49.5	Day (6AM-9PM): 45 Night (9PM-6AM): 35	Day: 50 Night: 40	Day: 60 Night: 50	Day: 70 Night: 60	Day: 70 Night: 70
Dry Season 29 30/January/2013	56.0	57.0	45.3					

Note; Category is as below.

A: Quiet place
B: Residential area
C: Complex area (mainly residential area, and also applied to commercial and industrial area)
D: Commercial area
E: Industrial area

As Reference: IFC/EHS guidelines

Receptor	Day 07:00-22:00	Night 22:00-07:00
Residential, institutional, educational area	55	45
Industrial, commercial area	70	70

Sampling Point	Latitude (North)	Longitude (East)
AN-1	21°43’19”	91°53’03”
AN-2	21°43’56”	91°53’28”
AN-3	21°42’28”	91°52’43”

(3) The Environmental monitoring report on Units 1/2 Construction Work

Appendix 5.1 Table-(3) Survey result of Noise (2019.1-2020.12)

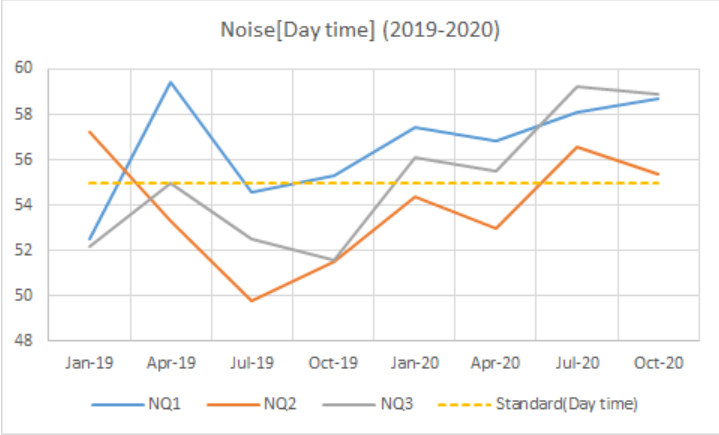
(Unit; dB (A))

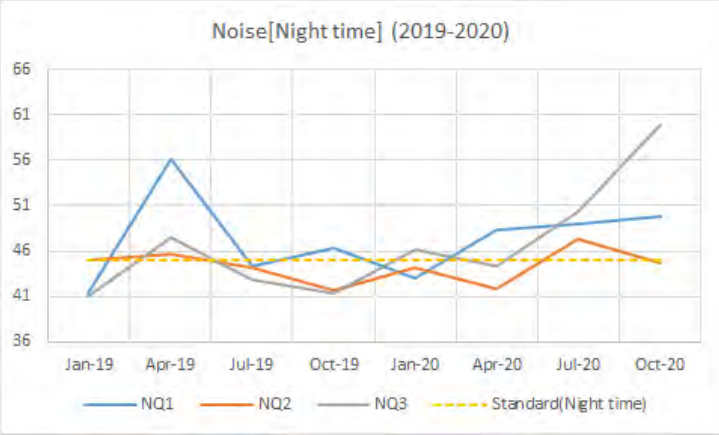
	Jan-19		Apr-19		Jul-19		Oct-19	
Sampling Location	Daytime	Nighttime	Daytime	Nighttime	Daytime	Nighttime	Daytime	Nighttime
	6.00 to 21.00	21.00 to 6.00	6.00 to 21.00 hrs	21.00 to 6.00 hrs	6.00 to 21.00 hrs	21.00 to 6.00 hrs	6.00 to 21.00 hrs	21.00 to 6.00 hrs
NQ1	53	41	59	56	55	44	55	46
NQ2	57	45	53	46	50	44	52	42
NQ3	52	41	55	48	53	43	52	41
Bangladesh Standard	55	45	55	45	55	45	55	45

Sampling Location	Jan-20		Apr-20		Jul-20		Oct-20	
	Daytime	Nighttime	Daytime	Nighttime	Daytime	Nighttime	Daytime	Nighttime
	6.00 to 21.00	21.00 to 6.00	6.00 to 21.00 hrs	21.00 to 6.00 hrs	6.00 to 21.00 hrs	21.00 to 6.00 hrs	6.00 to 21.00 hrs	21.00 to 6.00 hrs
NQ1	57	43	57	48	58	49	59	50
NQ2	54	44	53	42	57	47	55	45
NQ3	56	46	56	44	59	50	59	60
Bangladesh Standard	55	45	55	45	55	45	55	45

Note; As reference, about NQ2 and NQ3, Bangladesh Standard for Residential Zone according to the Sound Pollution (Control) Rules-2006

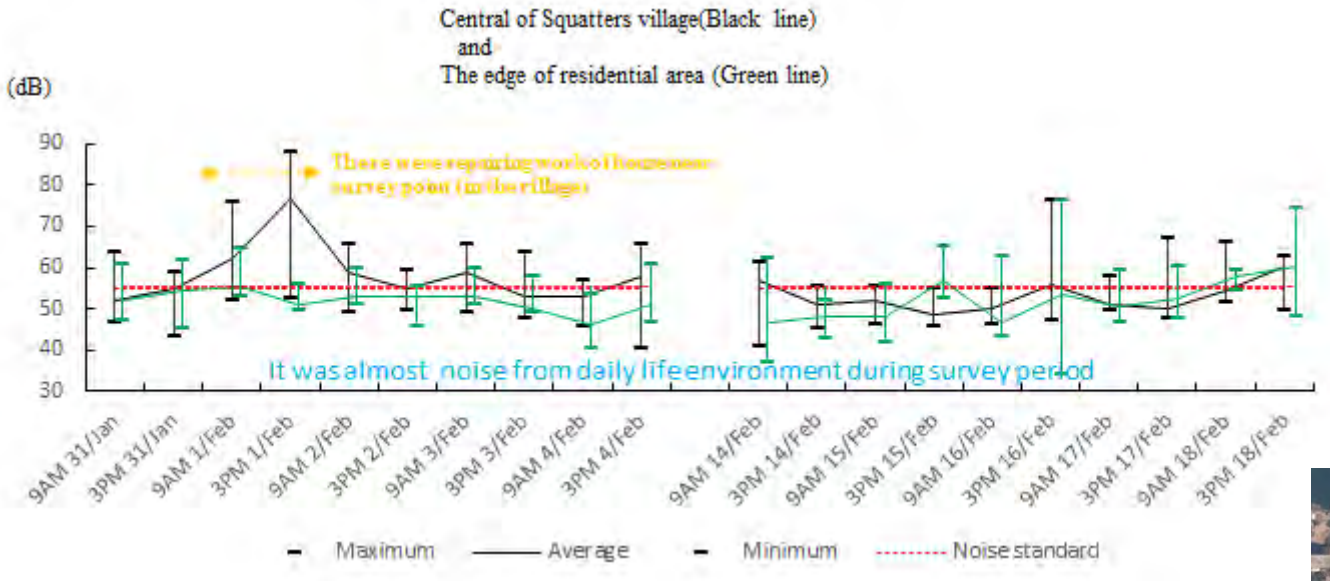
Sampling Point	Latitude (North)	Longitude (East)
NQ1	21°42'15.8" N	91°53'22.8" E
NQ2	21°41' 51.9" N	91°52' 11.4" E
NQ3	21°42' 31.0" N	91°52' 42.0" E





[Reference]

The simple measurement of noise level in the residential area near the project site was carried out, as distinguished from "Environmental Monitoring Report conducted at Units 1/2". As a result, it was confirmed that the noise level of the living environment in the village routinely exceeded 55dB during the daytime.



Source：JICA survey team

Appendix 5.1.3

5.1.3 Odor

The Environmental monitoring report on Units 1/2 Construction Work

Appendix 5.1 Table-(1)-1 Survey results of odor (2019.1-2020.1)

Sampling Location	Jan-19		Apr-19		Jul-19		Oct-19		Jan-20		Apr-20		Jul-20		Oct-20	
	NH_3	H_2S	NH_3	NH_3	H_2S	NH_3	NH_3	H_2S	NH_3	H_2S	NH_3	NH_3	H_2S	NH_3	NH_3	H_2S
	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
OD-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
OD-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
OD-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bangladesh Standard (according to the amendment of	1-5	0.02 - 0.2	1-5	0.02 - 0.2	1-5	0.02 - 0.2	1-5	0.02 - 0.2	1-5	0.02 - 0.2	1-5	0.02 - 0.2	1-5	0.02 - 0.2	1-5	0.02 - 0.2

Note: ND; Not Detected

Sampling Point	Latitude (North)	Longitude (East)
OD-1	21°42’41.00” N	91°52’54.30” E
OD-2	21°42'14.80" N	91°53'23.10" E
OD-3	21°41’50.19” N	91°52’31.40” E

Parameters	**Sampling Method**	**Laboratory Analysis Method**
Hydrogen Sulphide (H_2S)	Sampling using portable gas sensor Model SAW4 with resolution of 0.01 % vol. and range of 0.00 to 5.00% vol. Sampling conducted for 1 hour with interval of ≤ 20 Second. The readings are then averaged.	Electrochemical Sensor
Ammonia (NH_3)		Electrochemical Sensor

Appendix5.1.4

5.1.4 Water quality

(1) Water quality

(1.1) Sea water

(1-1-1) The survey for FS 3/4

Appendix 5.1 Table- (1-1-1) 1 Survey results of seawater quality (dry season)

Test Parameters	UNIT	LOD	SW1-1	SW1-2	SW1-3	S3-1	S3-2	S3-3	S4-1	S4-2	S4-3	S14-1	S14-2	S14-3	S15-1	S15-2	S15-3	Average			
			0.5m	4 m	8 m	0.5m	4 m	8 m	0.5m	4 m	8 m	0.5m	4 m	8 m	0.5m	4 m	8 m	0.5m	4 m	8 m	Total
Temperature (in-situ)	°C	--	23	23	22	24	23	23	23	23	22	24	24	23	24	24	23	24	23	23	23
Salinity	ppt	--	25	23	25	25	25	25	26	25	25	26	25	25	25	25	25	25	25	25	25
pH	--	--	8.3	8.3	8.2	8.4	8.3	8.3	8.4	8.3	8.3	8.3	8.2	8.2	8.3	8.3	8.3	8.3	8.3	8.3	8.3
Dissolved Oxygen, DO	mg/L	--	6.4	6.4	6.5	6.5	6.5	6.4	6.6	6.5	6.4	6.2	6.2	6.1	6.3	6.3	6.2	6.4	6.4	6.3	6.4
Turbidity	NTU	--	173	152	209	28	13	42	67	56	78	153	132	243	167	149	265	118	100	167	128
Electrical Conductivity	µs/cm	--	1480	1423	1389	1578	1432	1436	1408	1419	1358	1671	1598	1488	1680	1647	1452	1563	1504	1425	1497
Total Suspended Solid, (TSS)	mg/L	1	214	252	238	154	168	36	24	36	28	560	308	308	228	232	306	236	199	183	206
Demand, BOD	mg/L	1	1.4	1.9	1.7	1.6	1.4	1.6	1.5	1.8	1.9	1.7	1.6	1.5	1.4	1.8	1.7	1.5	1.7	1.7	1.6
COD	mg/L	5	32	24	24	24	32	24	24	32	32	24	24	24	24	32	24	26	29	26	27
Nitrogen(NH3-N)	mg/L	0.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	-	-	-
Total Nitrogen	mg/L	1	4.98	4.88	4.75	4.56	4.64	5.16	5.23	5.27	5.31	5.34	3.47	3.67	3.76	3.97	3.94	4.77	4.45	4.57	4.60
Nitrate (NO3)	mg/L	0.05	0.7	ND	ND	ND	0.12	0.25	0.07	0.19	0.31	1.04	1.12	1.28	0.07	0.25	0.32	0.47	0.42	0.54	0.48
Nitrite (NO2)	mg/L	0.05	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	-	-	-
Iron (as Fe)	mg/L	0.05	0.11	0.09	0.13	0.2	0.07	0.13	0.2	0.09	0.13	0.06	0.09	0.13	0.09	0.09	0.13	0.13	0.09	0.13	0.12
Arsenic (as As)	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	-	-
Cadmium (as Cd)	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	-	-
Chromium (as Cr)	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	-	-
Copper (as Cu)	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	-	-
Mercury (as Hg)	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	-	-
Lead (as Pb)	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	-	-
Zinc (as Zn)	mg/L	0.001	0.03	0.02	<0.001	0.12	0.13	0.13	0.02	0.02	0.02	0.01	<0.001	<0.001	<0.001	<0.001	<0.001	0.05	0.06	0.08	0.06
Oil & Grease	mg/L	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	-	-	-
Total Phosphorus	mg/L	0.15	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	-	-	-
Total Phosphate	mg/L	0.46	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	-	-	-

Note Survey date; 10th Jan, 2021

Appendix 5.1 Table- (1-1-1) 2 Survey results of seawater quality (rainy season)

Test Parameters	UNIT	LOD	SW1-1	SW1-2	SW1-3	S3-1	S3-2	S3-3	S4-1	S4-2	S4-3	S14-1	S14-2	S14-3	S15-1	S15-2	S15-3	Average			
			0.5m	4 m	8 m	0.5m	4 m	8 m	0.5m	4 m	8 m	0.5m	4 m	8 m	0.5m	4 m	8 m	0.5m	4 m	8 m	Total
Temperature (in-situ)	°C	--	27	27	26	27	27	27	27	27	26	27	27	27	27	27	27	27	27	27	27
Salinity	ppt	--	21	22	23	20	23	22	21	22	23	20	21	22	20	21	21	20	22	22	21
pH	--	--	8.2	8.2	8.2	8.4	8.1	8.3	8.3	8.2	8.3	8.1	8.2	8.3	8.2	8.2	8.3	8.2	8.2	8.3	8.2
Dissolved Oxygen, DO	mg/L	--	6.5	6.6	6.6	6.3	6.4	6.5	6.4	6.5	6.6	6.4	6.5	6.5	6.3	6.5	6.5	6.4	6.5	6.5	6.5
Turbidity	NTU	--	296	243	334	91	80	115	82	69	102	342	316	402	431	388	460	248	219	283	250
Electrical Conductivity	μs/cm	--	1452	1503	1479	1553	1612	1465	1391	1393	1260	1453	1432	1398	1573	1572	1501	1484	1502	1421	1469
Total Suspended Solid,	mg/L	1	520	656	666	208	184	220	200	258	206	690	700	750	180	230	206	360	406	410	392
BOD	mg/L	1	1.8	1.9	1.4	1.5	1.3	1.4	1.8	1.9	1.7	1.6	1.8	1.4	1.5	1.6	1.8	1.6	1.7	1.5	1.6
COD	mg/L	5	24	16	24	24	16	32	24	32	32	16	24	24	24	32	24	22	24	27	25
Ammonical –Nitrogen(NH3-N)	mg/L	0.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	-	-	-
Total Nitrogen	mg/L	1	2.3	2.3	1.9	2	3.2	2.8	2.4	2.3	2.5	2.5	2.4	2.4	1.8	1.9	1.6	2.2	2.4	2.2	2.3
Nitrate (NO3)	mg/L	0.05	0.32	0.29	0.23	0.25	0.28	0.3	0.39	0.42	0.22	0.23	0.36	0.4	0.32	0.34	0.18	0.30	0.34	0.27	0.30
Nitrite (NO2)	mg/L	0.05	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	-	-	-
Iron (as Fe)	mg/L	0.05	0.08	0.08	0.12	0.12	0.23	0.23	0.18	0.18	0.23	0.12	0.07	0.12	0.23	0.18	0.18	0.15	0.15	0.18	0.16
Arsenic (as As)	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	-	-
Cadmium (as Cd)	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	-	-
Chromium (as Cr)	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	-	-
Copper (as Cu)	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	-	-
Mercury (as Hg)	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	-	-
Lead (as Pb)	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	-	-
Zinc (as Zn)	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	-	-
Oil & Grease	mg/L	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	-	-	-
Total Phosphorus	mg/L	0.15	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	-	-	-
Total Phosphate	mg/L	0.46	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	-	-	-

Note Survey date; 13th Jul, 2021

Note Regarding analysis method, please see (1-1-3) The Environmental monitoring report on Units 1/2 Construction Work.

(1-1-2) Bangladesh Coal-Fired Power Plant Construction Project Preparatory Survey Report Final Report on Units 1/2 Construction Project

Appendix 5.1 Table- (1-1-2) 1 Survey results of seawater quality (rainy season)

(6 - 7/October/2012)

Parameter	Unit	SP-1			SP-2			SP-3		
		Surface	Middle	Bottom	Surface	Middle	Bottom	Surface	Middle	Bottom
Depth	M	0.5	4.5	8.0	0.5	6.5	12.0	0.5	6.5	12.0
Temperature	ºC	30.0	28.8	29.0	30.0	29.0	28.5	30.5	29.5	28.5
Salinity	-	35.3	17.5	18.5	16.5	18.0	18.5	16.3	16.5	17.2
pH	-	8.19	8.26	8.11	7.90	8.10	8.00	8.13	8.10	8.12
DO	mg/L	5.4	5.3	5.0	5.5	5.3	5.1	5.6	5.4	5.1
BOD	mg/L	1.0	0.7	0.6	1.0	0.8	0.7	0.8	0.7	0.6
COD	mg/L	180	182	160	184	182	182	178	180	180
Oil & Grease	mg/L	5.5	3.0	0.5	5.4	3.1	0.5	4.5	3.0	0.5
SS	mg/L	782	641	834	780	640	835	776	688	795
T-Cr	mg/L	0.011	0.014	0.057	0.019	0.023	0.050	0.009	0.010	0.016
Cu	mg/L	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Fe	mg/L	2.24	4.59	60.50	13.30	21.60	51.90	2.50	4.10	8.72
Zn	mg/L	0.1	0.1	0.13	0.1	0.1	0.11	0.1	0.1	0.1
Pb	mg/L	0.01	0.01	0.018	0.01	0.01	0.019	0.01	0.01	0.01
Cd	mg/L	0.001	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.001
Hg	mg/L	0.003	0.002	0.006	0.002	0.003	0.005	0.004	0.005	0.005
As	mg/L	0.005	0.008	0.010	0.007	0.005	0.009	0.005	0.008	0.005

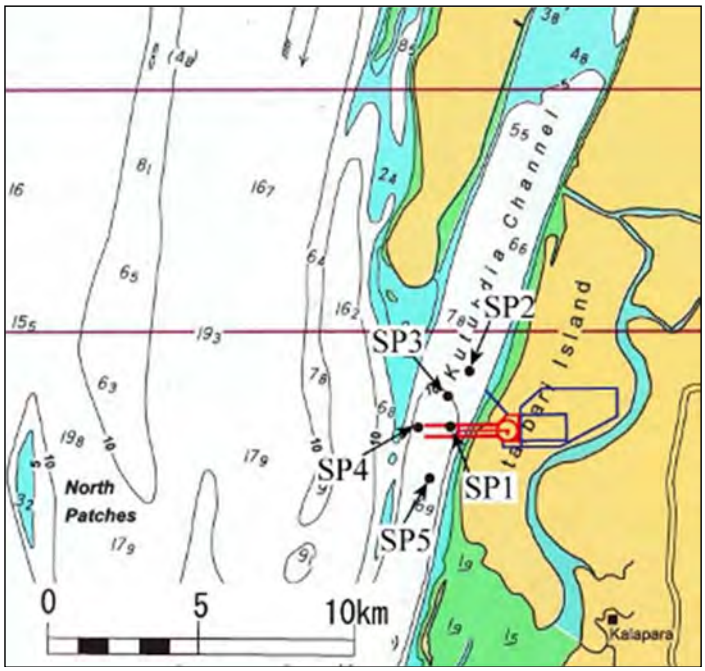
Parameter	Unit	SP-4			SP-5			Average		
		Surface	Middle	Bottom	Surface	Middle	Bottom	Surface	Middle	Bottom
Depth	M	0.5	8.5	16.0	0.5	6.5	12.0	-	-	-
Temperature	ºC	29.0	28.5	30.0	30.5	30.5	29.0	30.0	29.3	29.0
Salinity	-	19.6	20.1	20.2	20.8	21.2	21.6	17.8	18.7	19.2
pH	-	8.15	8.00	8.20	8.18	8.15	7.95	8.11	8.12	8.08
DO	mg/L	5.4	5.2	4.9	5.4	4.9	4.6	5.5	5.2	4.9
BOD	mg/L	1.1	0.8	0.7	1.1	0.8	0.8	1.0	0.8	0.7
COD	mg/L	191	193	193	196	197	195	186	187	182
Oil & Grease	mg/L	4.4	3.0	0.5	5.5	3.0	0.5	5.1	3.0	0.5
SS	mg/L	770	752	883	782	761	910	778	696	851
T-Cr	mg/L	0.012	0.015	0.027	0.013	0.017	0.017	0.013	0.016	0.033
Cu	mg/L	0.1	0.1	0.23	0.1	0.1	0.1	0.10	0.10	0.13
Fe	mg/L	5.00	10.20	25.70	5.17	10.60	11.60	5.64	10.22	31.68
Zn	mg/L	0.1	0.1	1.21	0.1	0.1	0.1	0.10	0.10	0.33
Pb	mg/L	0.01	0.01	0.130	0.01	0.01	0.01	0.010	0.010	0.037
Cd	mg/L	0.002	0.002	0.001	0.001	0.001	0.002	0.001	0.001	0.001
Hg	mg/L	0.003	0.004	0.008	0.005	0.003	0.004	0.003	0.003	0.006
As	mg/L	0.019	0.005	0.037	0.014	0.014	0.005	0.010	0.008	0.013

Appendix 5.1 Table (1-1-2) -1 Survey results of seawater quality (dry season)

(29/January/2013)

Parameter	Unit	SP-1			SP-2			SP-3		
		Surface	Middle	Bottom	Surface	Middle	Bottom	Surface	Middle	Bottom
Depth	M	0.5	5.0	9.0	0.5	5.0	9.0	0.5	4.5	8.0
Temperature	ºC	19.0	19.0	19.0	18.0	18.0	18.0	18.0	18.0	18.0
Salinity	-	37.3	35.8	35.3	35.2	36.2	35.7	35.0	35.8	34.9
pH	-	8.03	8.01	7.91	7.86	7.91	8.02	8.00	7.82	7.85
DO	mg/L	6.0	5.8	5.4	6.1	5.9	5.4	6.2	6.0	5.8
BOD	mg/L	0.2	0.4	0.6	0.2	0.4	0.5	0.2	0.3	0.5
COD	mg/L	207	209	226	205	211	231	205	208	230
Oil&Grease	mg/L	4.4	3.0	0.5	4.3	3.1	0.5	4.2	3.0	0.5
SS	mg/L	52	73	281	49	84	293	51	81	308
T-Cr	mg/L	0.035	0.050	0.050	0.105	0.061	0.052	0.035	0.048	0.037
Cu	mg/L	0.1	0.11	0.31	0.1	0.58	0.54	0.1	0.30	0.31
Fe	mg/L	4.17	10.8	27.2	25.4	28.6	18.1	18.3	25.8	26.1
Zn	mg/L	0.05	0.10	0.18	0.05	0.16	0.12	0.05	0.11	0.14
Pb	mg/L	0.01	0.01	0.02	0.01	0.03	0.06	0.01	0.02	0.017
Cd	mg/L	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Hg	mg/L	0.016	0.022	0.018	0.018	0.029	0.014	0.018	0.021	0.009
As	mg/L	0.005	0.005	0.007	0.007	0.010	0.005	0.006	0.005	0.008

Parameter	Unit	SP-4			SP-5			Average		
		Surface	Middle	Bottom	Surface	Middle	Bottom	Surface	Middle	Bottom
Depth	M	0.5	7.8	14.6	0.5	7.8	14.6	-	-	-
Temperature	ºC	18.0	18.0	18.0	18.0	18.0	18.0	18.2	18.2	18.2
Salinity	-	34.4	35.4	34.3	34.4	34.7	34.8	35.3	35.6	35.0
pH	-	7.95	8.02	7.84	7.85	7.86	8.01	7.94	7.92	7.93
DO	mg/L	6.4	6.1	5.8	6.2	6.0	5.7	6.2	6.0	5.6
BOD	mg/L	0.2	0.3	0.5	0.3	0.4	0.6	0.2	0.4	0.5
COD	mg/L	205	211	223	203	212	235	205	210	229
Oil&Grease	mg/L	4.2	3.1	0.5	4.0	3.0	0.5	4.2	3.0	0.5
SS	mg/L	48	79	312	46	81	329	49	80	305
T-Cr	mg/L	0.021	0.027	0.057	0.019	0.039	0.055	0.043	0.045	0.050
Cu	mg/L	0.1	0.17	0.38	0.1	0.28	0.12	0.10	0.29	0.33
Fe	mg/L	3.25	3.88	45.2	2.97	32.1	25.0	10.82	20.24	28.32
Zn	mg/L	0.05	0.08	0.18	0.05	0.21	0.12	0.05	0.13	0.15
Pb	mg/L	0.01	0.01	0.02	0.01	0.018	0.01	0.010	0.018	0.025
Cd	mg/L	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Hg	mg/L	0.008	0.007	0.011	0.005	0.007	0.007	0.013	0.017	0.012
As	mg/L	0.005	0.005	0.012	0.005	0.009	0.007	0.006	0.007	0.008



Sampling Points	Latitude (North)	Longitude (East)
SP1	21°41'58.92”	91°51'04.99"
SP2	21°43'00.57”	91°51'32.44”
SP3	21°42'33.74”	91°51'08.55”
SP4	21°41'56.99”	91°50'29.11”
SP5	21°40'56.65”	91°50'43.90”

(1-1-3) The Environmental monitoring report on Units 1/2 Construction Work

Appendix 5.1 Table (1-1-3)-1 Survey results of seawater quality (Temperature) (2019.1-2020.12)

[Temp (°C)]

Survey Period	SW1				SW2				SW3				SW4				SW5				SW6			
	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV
	0.5 m	4 m	8 m	---	0.5m	4 m	8 m	---	0.5 m	4 m	8 m	---	0.5 m	4 m	8 m	---	0.5 m	4 m	8 m	---	0.5 m	4 m	8 m	---
Jan'19	20	20	19	20	20	19	18	19	21	20	20	20	21	20	20	20	22	21	20	21	20	20	20	20
Feb'19	20	19	19	19	20	19	19	19	20	19	19	19	20	19	19	19	20	19	19	19	20	19	19	19
Mar'19	22	21	20	21	22	21	21	21	22	20	20	21	23	21	21	22	21	20	20	20	21	20	20	20
April'19	28	28	27	28	28	28	28	28	28	28	28	28	29	28	28	28	29	28	28	28	29	29	28	29
May'19	28	28	27	28	29	29	28	29	28	28	27	28	29	27	27	28	28	28	27	28	29	28	28	28
June'19	30	29	28	29	30	30	29	30	30	29	29	29	28	29	28	28	29	29	27	28	30	29	28	29
July'19	29	28	28	28	29	28	28	29	29	28	28	28	28	28	27	28	28	27	27	27	27	28	27	27
Aug'19	28	28	27	28	29	29	28	29	28	28	27	28	28	27	27	27	29	29	27	28	28	27	27	27
Sept'19	28	27	28	28	28	28	27	28	29	27	27	28	26	27	27	27	28	28	28	28	28	28	26	27
Oct'19	25	25	26	25	25	25	25	25	26	25	25	25	25	25	25	25	25	26	25	25	25	25	25	25
Nov'19	26	25	25	25	27	27	26	27	27	27	26	27	27	26	26	26	27	27	26	27	28	27	27	27
Dec'19	24	23	23	23	24	24	23	24	24	23	23	23	25	24	24	24	25	24	24	24	25	24	24	24
Jan'20	17	18	18	18	17	18	18	18	16	17	17	17	17	16	16	16	18	17	17	17	18	18	18	18
Feb'20	23	23	22	23	24	24	23	24	25	25	24	25	25	25	25	25	26	25	25	25	26	26	25	26
Mar'20	25	25	24	25	25	25	25	25	26	25	25	25	24	24	24	24	24	23	23	23	24	24	24	24
Apr'20	26	25	25	25	25	25	24	25	25	25	25	25	25	24	24	24	25	25	24	25	25	25	25	25
May'20	26	26	24	25	26	26	25	26	27	26	25	26	27	25	25	26	26	25	25	25	26	25	24	25
June'20	27	26	26	26	27	26	26	26	26	26	26	26	26	26	25	26	26	25	25	25	26	25	25	25
July'20	25	25	25	25	25	25	25	25	24	25	24	24	24	25	24	24	25	25	25	25	24	25	25	25
Aug'20	24	24	24	24	25	24	24	24	25	25	24	25	25	24	24	24	25	25	25	25	25	25	24	25
Sept'20	26	25	25	25	26	26	25	26	26	25	25	25	26	26	25	26	26	25	25	25	26	25	25	25
Oct'20	28	27	27	27	28	28	27	28	28	27	27	27	28	28	27	28	27	27	27	27	28	27	27	27
Nov'20	22	21	21	21	22	22	21	22	22	22	21	22	23	22	21	22	23	22	22	22	23	22	22	22
Dec'20	20	20	19	20	21	20	20	20	20	20	19	20	20	19	19	19	21	20	20	20	20	20	20	20
Maximum	30	29	28	-	30	30	29	-	30	29	29	-	29	29	28	-	29	29	28	-	30	29	28	-
Minimum	17	18	18	-	17	18	18	-	16	17	17	-	17	16	16	-	18	17	17	-	18	18	18	-

Appendix 5.1 Table (1-1-3) -2 Survey results of seawater quality (Salinity) (2019.1-2020.12)

[Salinity (ppt)]

Survey Period	SW1				SW2				SW3				SW4				SW5				SW6			
	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV
	0.5 m	4 m	8 m	---	0.5m	4 m	8 m	---	0.5 m	4 m	8 m	---	0.5 m	4 m	8 m	---	0.5 m	4 m	8 m	---	0.5 m	4 m	8 m	---
Jan'19	30	30	30	30	29	30	30	30	30	30	30	30	30	30	30	30	29	30	30	30	29	30	29	29
Feb'19	32	30	30	31	32	32	30	31	32	30	29	30	32	30	29	30	32	30	30	31	32	30	29	30
Mar'19	23	21	21	22	23	22	21	22	23	21	21	22	24	22	20	22	23	22	20	22	24	22	21	22
April'19	20	20	19	20	21	20	20	20	20	20	20	20	21	22	21	21	22	21	20	21	20	20	20	20
May'19	25	25	24	25	25	25	25	25	24	24	24	24	24	24	24	24	24	24	23	24	24	24	23	24
June'19	25	25	25	25	24	24	26	25	24	24	25	24	24	23	24	24	24	23	23	23	24	24	24	24
July'19	21	22	23	22	20	21	20	20	21	20	20	20	19	18	17	18	17	15	15	16	13	14	13	13
Aug'19	23	24	24	24	25	24	24	24	24	24	24	24	23	23	23	23	25	24	23	27	23	23	23	24
Sept'19	22	22	22	22	23	22	23	23	22	22	22	22	23	23	22	23	22	22	22	22	22	22	22	22
Oct'19	23	23	23	23	24	23	23	23	22	23	23	23	23	23	23	23	23	22	23	23	23	23	23	23
Nov'19	22	22	22	22	22	22	22	22	23	22	22	22	23	22	22	22	24	23	23	23	24	23	23	23
Dec'19	24	24	23	24	24	24	24	24	24	23	23	23	24	24	23	24	24	23	23	23	24	24	23	24
Jan'20	25	25	25	25	24	24	24	24	25	25	25	25	24	25	25	25	25	25	25	25	25	25	25	25
Feb'20	22	22	22	22	22	22	21	22	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21
Mar'20	21	22	21	21	22	22	22	22	23	22	22	22	21	22	22	22	21	21	21	21	22	22	22	22
Apr'20	21	21	21	21	22	21	21	21	22	22	21	22	21	21	21	21	20	20	21	20	20	21	21	21
May'20	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21
June'20	21	20	20	20	21	20	20	20	21	21	21	21	20	20	20	20	20	20	20	20	20	21	20	20
July'20	21	22	21	21	21	22	22	22	22	21	22	22	22	21	21	21	21	21	22	21	22	21	21	21
Aug'20	20	20	20	20	20	21	20	20	21	21	20	21	21	20	20	20	21	20	20	20	21	20	20	20
Sept'20	22	22	22	22	22	22	22	22	22	22	22	22	22	22	21	22	22	22	22	22	22	22	22	22
Oct'20	23	23	22	23	23	22	22	22	23	23	22	23	23	22	22	22	23	22	22	22	23	23	22	23
Nov'20	21	21	21	21	21	21	21	21	22	21	21	21	22	21	21	21	22	21	21	21	22	21	21	21
Dec'20	23	23	23	23	23	23	23	23	23	22	23	23	23	22	22	22	23	22	22	22	23	22	22	22
Maximum	32	30	30	-	32	32	30	-	32	30	30	-	32	30	30	-	32	30	30	-	32	30	29	-
Minimum	20	20	19	-	20	20	20	-	20	20	20	-	19	18	17	-	17	15	15	-	13	14	13	-

Appendix 5.1 Table (1-1-3) -3 Survey results of seawater quality (pH) (2019.1-2020.12)

[pH (--)]

Survey Period	SW1				SW2				SW3				SW4				SW5				SW6			
	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV
	0.5 m	4 m	8 m	---	0.5m	4 m	8 m	---	0.5 m	4 m	8 m	---	0.5 m	4 m	8 m	---	0.5 m	4 m	8 m	---	0.5 m	4 m	8 m	---
Jan'19	8.2	8.2	8.1	8.2	8.1	8.2	8.0	8.1	8.2	8.1	8.1	8.1	8.2	8.0	8.1	8.1	8.1	8.2	8.1	8.1	8.2	8.1	8.1	8.1
Feb'19	8.1	8.0	8.1	8.1	8.0	8.1	8.1	8.1	8.1	8.2	8.1	8.1	8.1	8.1	8.2	8.1	8.1	8.1	8.1	8.1	8.2	8.1	8.1	8.1
Mar'19	8.2	8.1	8.0	8.1	8.1	8.0	8.0	8.0	8.1	8.1	8.0	8.1	8.2	8.1	8.0	8.1	8.0	8.1	8.1	8.1	8.2	8.1	8.1	8.1
April'19	8.1	8.0	8.0	8.0	8.1	8.1	8.0	8.1	8.0	8.1	8.0	8.0	8.0	8.0	8.0	8.0	8.2	8.0	8.0	8.1	8.1	8.0	8.0	8.0
May'19	8.1	8.0	8.0	8.0	8.1	8.1	8.0	8.1	8.0	8.0	7.9	8.0	8.0	8.0	8.0	8.0	8.1	8.0	8.0	8.0	8.1	8.0	8.0	8.0
June'19	8.0	8.1	8.0	8.0	8.1	8.1	8.1	8.1	8.1	8.1	8.2	8.1	8.0	8.0	8.1	8.0	8.1	8.2	8.2	8.2	8.2	8.1	8.2	8.2
July'19	7.8	7.7	7.7	7.7	7.9	7.7	7.7	7.8	7.9	7.7	7.7	7.8	7.7	7.8	7.7	7.7	7.7	7.6	7.6	7.6	7.6	7.6	7.7	7.6
Aug'19	8.2	8.1	8.1	8.1	8.2	8.1	8.0	8.1	8.2	8.2	8.0	8.1	8.1	8.1	8.1	8.1	8.1	8.2	8.0	8.1	8.2	8.1	8.0	8.1
Sept'19	8.1	8.0	8.1	8.1	8.2	8.2	8.2	8.2	8.0	8.1	8.1	8.1	8.2	8.2	8.2	8.2	8.1	8.1	8.0	8.1	8.1	8.1	8.2	8.1
Oct'19	8.1	8.0	8.1	8.1	8.3	8.2	8.2	8.2	8.0	8.1	8.0	8.0	8.1	8.1	8.1	8.1	8.1	8.0	8.1	8.1	8.0	8.1	8.1	8.1
Nov'19	8.1	8.1	8.1	8.1	8.2	8.1	8.1	8.1	8.2	8.2	8.1	8.2	8.2	8.2	8.2	8.2	8.3	8.2	8.2	8.2	8.3	8.2	8.2	8.2
Dec'19	8.3	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.3	8.3	8.2	8.3	8.2	8.2	8.2	8.2	8.3	8.2	8.2	8.2	8.2	8.2	8.2	8.2
Jan'20	8.5	8.5	8.4	8.5	8.5	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.5	8.4	8.4	8.3	8.3	8.3	8.3	8.3	8.4	8.3	8.3
Feb'20	8.4	8.4	8.4	8.4	8.3	8.4	8.4	8.4	8.4	8.5	8.4	8.4	8.4	8.4	8.4	8.4	8.3	8.4	8.4	8.4	8.4	8.4	8.4	8.4
Mar'20	8.2	8.1	8.1	8.1	8.0	8.1	8.1	8.1	8.2	8.2	8.3	8.2	8.2	8.2	8.1	8.2	8.1	8.0	8.1	8.1	8.2	8.1	8.2	8.2
Apr'20	8.3	8.2	8.2	8.2	8.1	8.1	8.1	8.1	8.2	8.3	8.2	8.2	8.1	8.2	8.2	8.2	8.1	8.1	8.2	8.1	8.2	8.2	8.2	8.2
May'20	8.4	8.3	8.3	8.3	8.3	8.3	8.2	8.3	8.3	8.3	8.3	8.3	8.4	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.2	8.3
June'20	8.2	8.2	8.3	8.2	8.3	8.2	8.2	8.2	8.3	8.3	8.3	8.3	8.2	8.3	8.3	8.3	8.2	8.3	8.3	8.3	8.3	8.2	8.3	8.3
July'20	8.1	8.1	8.1	8.1	8.2	8.1	8.2	8.2	8.3	8.2	8.2	8.2	8.2	8.3	8.3	8.3	8.2	8.2	8.2	8.2	8.2	8.3	8.2	8.2
Aug'20	8.3	8.3	8.2	8.3	8.3	8.2	8.2	8.2	8.3	8.3	8.2	8.3	8.3	8.2	8.2	8.2	8.3	8.3	8.3	8.3	8.3	8.3	8.2	8.3
Sept'20	8.3	8.2	8.2	8.2	8.3	8.2	8.2	8.2	8.3	8.2	8.2	8.2	8.3	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2
Oct'20	8.3	8.3	8.2	8.3	8.4	8.3	8.3	8.3	8.3	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.3	8.3	8.2	8.3	8.3	8.2	8.2	8.2
Nov'20	8.4	8.4	8.3	8.4	8.4	8.3	8.3	8.3	8.3	8.4	8.3	8.3	8.4	8.3	8.3	8.3	8.4	8.3	8.4	8.4	8.4	8.4	8.3	8.4
Dec'20	8.3	8.2	8.2	8.2	8.2	8.3	8.2	8.2	8.4	8.3	8.3	8.3	8.3	8.3	8.2	8.3	8.3	8.3	8.4	8.3	8.3	8.4	8.4	8.4
Maximum	8.5	8.5	8.4	-	8.5	8.4	8.4	-	8.4	8.5	8.4	-	8.4	8.5	8.4	-	8.4	8.4	8.4	-	8.4	8.4	8.4	-
Minimum	7.8	7.7	7.7	-	7.9	7.7	7.7	-	7.9	7.7	7.7	-	7.7	7.8	7.7	-	7.7	7.6	7.6	-	7.6	7.6	7.7	-

Appendix 5.1 Table (1-1-3) -4 Survey results of seawater quality (DO) (2019.1-2020.12)

[DO (mg/l)]

Survey Period	SW1				SW2				SW3				SW4				SW5				SW6			
	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV
	0.5 m	4 m	8 m	---	0.5m	4 m	8 m	---	0.5 m	4 m	8 m	---	0.5 m	4 m	8 m	---	0.5 m	4 m	8 m	---	0.5 m	4 m	8 m	---
Jan'19	6.5	6.6	6.4	6.5	6.7	6.5	6.3	6.5	6.8	6.6	6.4	6.6	6.7	6.6	6.4	6.6	6.8	6.7	6.5	6.7	6.8	6.6	6.5	6.6
Feb'19	7.8	7.6	7.4	7.6	7.8	7.8	7.5	7.7	7.8	7.7	7.4	7.6	7.8	7.5	7.5	7.6	7.8	7.7	7.6	7.7	7.9	7.7	7.6	7.7
Mar'19	6.5	6.4	6.4	6.4	6.7	6.3	6.2	6.4	6.7	6.5	6.3	6.5	6.8	6.5	6.4	6.6	6.7	6.5	6.4	6.5	6.8	6.6	6.4	6.6
April'19	6.2	6.1	6.0	6.1	6.3	6.1	6.2	6.2	6.4	6.2	6.2	6.3	6.3	6.4	6.2	6.3	6.4	6.2	6.1	6.2	6.5	6.3	6.1	6.3
May'19	7.3	7.3	7.2	7.3	7.3	7.2	7.2	7.2	7.2	7.2	7.1	7.2	7.2	7.1	7.1	7.1	7.3	7.2	7.1	7.2	7.3	7.2	7.2	7.2
June'19	6.5	6.4	6.5	6.5	6.3	6.3	6.3	6.3	6.4	6.2	6.4	6.3	6.2	6.1	6.2	6.2	6.4	6.4	6.4	6.3	6.3	6.2	6.2	6.2
July'19	6.8	6.7	6.8	6.8	6.6	6.4	6.6	6.5	6.7	6.6	6.8	6.7	6.6	6.6	6.8	6.7	6.5	6.7	6.8	6.7	6.5	6.7	6.7	6.6
Aug'19	6.1	6.2	6.3	6.2	6.1	6.2	6.3	6.2	6.1	6.2	6.3	6.2	6.1	6.2	6.3	6.2	6.1	6.2	6.3	6.2	6.1	6.2	6.3	6.2
Sept'19	6.2	6.2	6.1	6.2	6.0	6.0	6.0	6.0	6.1	6.1	6.0	6.1	6.2	6.2	6.1	6.2	6.2	6.2	6.2	6.2	6.1	6.0	6.1	6.1
Oct'19	6.2	6.2	6.3	6.2	6.1	6.0	6.1	6.1	6.1	6.1	6.2	6.1	6.2	6.2	6.2	6.2	6.0	6.1	6.1	6.1	6.1	6.1	6.1	6.1
Nov'19	6.4	6.4	6.5	6.4	6.4	6.4	6.4	6.4	6.5	6.4	6.4	6.4	6.3	6.3	6.3	6.3	6.3	6.3	6.4	6.3	6.4	6.3	6.3	6.3
Dec'19	6.5	6.5	6.4	6.5	6.5	6.4	6.4	6.4	6.4	6.4	6.3	6.4	6.4	6.4	6.3	6.4	6.3	6.3	6.3	6.3	6.4	6.3	6.3	6.3
Jan'20	6.5	6.5	6.5	6.5	6.4	6.4	6.4	6.4	6.5	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.1	6.4	6.4	6.3	6.4	6.4	6.4	6.4
Feb'20	6.4	6.4	6.5	6.4	6.4	6.4	6.5	6.4	6.4	6.5	6.5	6.5	6.4	6.5	6.6	6.5	6.5	6.5	6.6	6.5	6.5	6.6	6.6	6.6
Mar'20	6.1	6.2	6.1	6.1	6.0	6.1	6.0	6.0	6.2	6.1	6.3	6.2	6.2	6.2	6.1	6.2	6.1	6.2	6.3	6.2	6.2	6.1	6.2	6.2
Apr'20	6.2	6.2	6.2	6.2	6.1	6.1	6.1	6.1	6.3	6.3	6.2	6.3	6.2	6.2	6.1	6.2	6.2	6.2	6.1	6.2	6.3	6.2	6.2	6.2
May'20	6.2	6.3	6.3	6.3	6.2	6.2	6.3	6.2	6.3	6.3	6.3	6.3	6.3	6.4	6.4	6.4	6.3	6.3	6.4	6.3	6.3	6.3	6.4	6.3
June'20	6.4	6.3	6.3	6.3	6.3	6.4	6.4	6.4	6.3	6.3	6.4	6.3	6.2	6.3	6.3	6.3	6.3	6.3	6.4	6.3	6.3	6.4	6.4	6.4
July'20	6.4	6.2	6.3	6.3	6.3	6.3	6.2	6.3	6.2	6.2	6.3	6.2	6.4	6.4	6.3	6.4	6.3	6.3	6.4	6.3	6.3	6.3	6.4	6.3
Aug'20	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.5	6.4	6.4	6.4	6.5	6.5	6.5	6.5	6.5	6.4	6.4	6.4	6.5	6.5	6.5	6.5
Sept'20	6.4	6.2	6.3	6.3	6.3	6.3	6.2	6.3	6.2	6.2	6.3	6.2	6.4	6.4	6.3	6.4	6.3	6.3	6.4	6.3	6.3	6.3	6.4	6.3
Oct'20	6.3	6.3	6.4	6.3	6.1	6.2	6.3	6.2	6.2	6.2	6.3	6.2	6.3	6.3	6.4	6.3	6.3	6.4	6.5	6.4	6.3	6.4	6.4	6.4
Nov'20	6.7	6.7	6.6	6.7	6.8	6.7	6.7	6.7	6.6	6.5	6.5	6.5	6.6	6.5	6.5	6.5	6.6	6.6	6.5	6.6	6.7	6.6	6.6	6.6
Dec'20	6.6	6.6	6.5	6.6	6.4	6.5	6.5	6.5	6.5	6.4	6.5	6.5	6.7	6.6	6.7	6.7	6.7	6.6	6.6	6.6	6.6	6.5	6.6	6.6
Maximum	7.8	7.6	7.4	-	7.8	7.8	7.5	-	7.8	7.7	7.4	-	7.8	7.5	7.5	-	7.8	7.7	7.6	-	7.9	7.7	7.6	-
Minimum	6.1	6.1	6.0	-	6.0	6.0	6.0	-	6.1	6.1	6.0	-	6.1	6.1	6.1	-	6.0	6.1	6.1	-	6.1	6.0	6.1	-

Appendix 5.1 Table (1-1-3) -5 Survey results of seawater quality (Turbidity) (2019.1-2020.12)

[Turbidity (NTU)]

Survey Period	SW1				SW2				SW3				SW4				SW5				SW6			
	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV
	0.5 m	4 m	8 m	---	0.5m	4 m	8 m	---	0.5 m	4 m	8 m	---	0.5 m	4 m	8 m	---	0.5 m	4 m	8 m	---	0.5 m	4 m	8 m	---
Jan'19	42	29	51	41	48	32	59	46	29	21	37	29	17	25	36	26	21	18	32	24	19	15	24	19
Feb'19	29	22	37	29	47	38	57	47	27	20	32	26	23	17	26	22	19	15	23	19	18	16	25	20
Mar'19	65	52	76	64	61	49	72	61	49	34	56	46	42	33	52	42	29	25	37	30	22	19	34	25
April'19	122	107	139	123	108	96	113	106	78	62	84	75	52	40	47	46	39	28	43	37	30	23	39	31
May'19	119	106	124	116	124	110	138	124	109	100	121	110	91	88	102	94	96	80	108	95	97	86	111	98
June'19	269	261	283	271	103	97	112	104	129	128	135	131	128	135	138	134	181	173	193	182	118	110	129	119
July'19	147	135	161	148	189	177	197	188	118	107	129	118	113	105	121	113	168	154	176	166	152	143	165	153
Aug'19	181	168	175	175	178	151	194	174	116	112	119	116	98	112	129	113	160	138	146	148	169	173	151	164
Sept'19	318	312	327	319	348	339	357	348	206	201	213	207	183	177	189	183	382	376	387	382	365	360	372	366
Oct'19	84	80	89	84	120	113	127	120	62	56	68	62	99	92	107	99	169	153	178	167	135	129	141	135
Nov'19	84	65	93	81	67	51	79	66	60	77	72	70	56	50	64	57	75	63	81	73	53	42	62	52
Dec'19	27	21	34	27	38	26	44	36	31	25	41	32	29	22	34	28	24	19	30	24	20	17	26	21
Jan'20	52	43	59	51	69	54	78	67	73	64	81	73	54	41	60	52	44	38	53	45	41	35	49	42
Feb'20	67	52	74	64	81	65	89	78	59	43	63	55	49	40	55	48	49	41	52	47	58	46	63	56
Mar'20	48	43	57	49	76	70	83	76	39	36	47	41	43	34	55	44	36	32	45	38	53	48	62	54
Apr'20	72	64	64	67	81	78	76	78	42	33	51	42	54	43	61	53	45	41	53	46	61	56	70	62
May'20	74	59	83	72	88	69	95	84	80	64	97	80	53	41	68	54	50	43	64	52	57	45	68	57
June'20	241	222	274	246	263	232	289	261	187	170	204	187	153	144	173	157	140	127	162	143	132	118	149	133
July'20	215	208	228	217	243	233	256	244	152	140	168	153	123	117	134	125	188	172	193	184	175	160	187	174
Aug'20	365	325	388	359	340	309	367	339	286	252	311	283	241	221	273	245	215	199	244	219	185	167	206	186
Sept'20	97	76	121	98	85	73	92	83	78	67	86	77	65	53	76	65	53	42	65	53	43	34	50	42
Oct'20	97	76	121	98	104	85	132	107	78	64	89	77	73	58	82	71	58	49	63	57	175	160	187	174
Nov'20	39	27	44	37	52	41	59	51	36	30	45	37	42	30	51	41	42	34	48	41	54	43	63	53
Dec'20	51	39	62	51	66	52	74	64	44	31	57	44	59	51	67	59	84	61	93	79	62	54	73	63
Maximum	365	325	388	-	348	339	367	-	286	252	311	-	241	221	273	-	382	376	387	-	365	360	372	-
Minimum	27	21	34	-	38	26	44	-	27	20	32	-	17	17	26	-	19	15	23	-	18	15	24	-

Appendix 5.1 Table (1-1-3) -6 Survey results of seawater quality (Total suspended solids) (2019.1-2020.12)

[TSS (mg/l)]

Survey Period	SW1				SW2				SW3				SW4				SW5				SW6			
	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV
	0.5 m	4 m	8 m	---	0.5m	4 m	8 m	---	0.5 m	4 m	8 m	---	0.5 m	4 m	8 m	---	0.5 m	4 m	8 m	---	0.5 m	4 m	8 m	---
Jan'19	188	188	190	189	208	198	154	187	192	192	198	194	184	202	192	193	196	188	190	191	186	188	196	190
Feb'19	266	256	248	257	244	268	268	260	266	284	274	275	254	256	238	249	240	258	254	251	256	258	266	260
Mar'19	254	300	266	273	254	262	286	267	222	242	238	234	222	244	260	242	254	280	270	268	220	230	244	231
April'19	662	572	694	643	360	426	448	411	368	342	352	354	396	306	324	342	300	254	308	287	306	304	344	318
May'19	292	298	280	290	298	316	302	305	310	312	318	313	324	336	302	321	326	306	294	309	332	442	312	362
June'19	264	484	624	457	266	324	344	311	306	292	300	299	288	248	244	260	266	328	334	309	274	370	384	343
July'19	158	162	158	159	160	166	174	167	162	176	172	170	176	160	166	167	164	160	166	163	170	172	172	171
Aug'19	186	176	144	169	172	159	181	171	176	163	192	177	170	168	186	175	196	182	178	185	190	172	158	173
Sept'19	1,020	942	1,002	988	932	930	918	927	552	536	558	549	562	552	554	556	772	736	788	765	724	760	864	783
Oct'19	167	168	172	169	183	179	176	179	302	297	289	296	284	278	280	281	336	323	339	333	346	338	345	343
Nov'19	157	198	201	185	193	212	218	208	215	214	230	220	212	216	216	215	184	179	198	187	176	175	178	176
Dec'19	133	129	131	131	130	134	137	134	136	135	136	136	138	146	128	137	129	131	131	130	135	140	144	140
Jan'20	178	182	173	178	167	165	159	164	178	169	170	172	175	157	158	163	171	168	155	165	161	154	162	159
Feb'20	200	206	201	202	224	210	213	216	189	187	209	195	195	207	176	193	173	190	180	181	179	183	194	185
Mar'20	165	162	159	162	172	162	156	163	163	167	177	169	183	194	146	174	174	163	155	164	154	179	162	165
Apr'20	191	173	165	176	211	186	161	186	175	162	182	173	193	205	179	192	254	210	164	209	184	173	154	170
May'20	170	151	142	154	190	175	153	173	154	171	165	163	198	216	226	213	224	271	243	246	154	184	193	177
June'20	232	252	232	239	320	268	252	280	240	244	256	247	274	298	308	293	326	296	318	313	300	314	302	305
July'20	243	267	275	262	341	276	287	301	271	285	265	274	310	334	351	332	358	319	353	343	341	338	351	343
Aug'20	757	776	792	775	914	800	856	857	770	792	782	781	796	862	830	829	774	834	820	809	804	906	858	856
Sept'20	821	843	854	839	911	934	957	934	801	792	784	792	812	834	831	826	893	883	875	884	932	910	909	917
Oct'20	170	191	187	183	211	192	197	200	288	321	309	306	281	289	311	294	342	332	351	342	367	312	318	332
Nov'20	126	144	168	146	152	160	72	128	72	52	70	65	56	72	74	67	68	72	78	73	74	76	50	67
Dec'20	111	132	143	129	141	110	97	116	65	41	63	56	43	53	49	48	51	57	48	52	69	58	44	57
Maximum	1020	942	1002	-	932	934	957	-	801	792	784	-	812	862	831	-	893	883	875	-	932	910	909	-
Minimum	111	129	131	-	130	110	72	-	65	41	63	-	43	53	49	-	51	57	48	-	69	58	44	-

Appendix 5.1 Table (1-1-3) -7 Survey results of seawater quality (BOD) (2019.1-2020.12)

[BOD (mg/l)]

Survey Period	SW1				SW2				SW3				SW4				SW5				SW6			
	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV
	0.5 m	4 m	8 m	---	0.5m	4 m	8 m	---	0.5 m	4 m	8 m	---	0.5 m	4 m	8 m	---	0.5 m	4 m	8 m	---	0.5 m	4 m	8 m	---
Jan'19	2.5	2.5	2.7	2.6	2.0	2.4	2.1	2.2	2.1	2.2	1.9	2.1	2.0	1.9	1.9	1.9	2.1	2.0	1.9	2.0	1.6	1.5	1.4	1.5
Feb'19	2.4	2.4	2.5	2.4	2.6	2.3	2.4	2.4	2.6	2.1	2.1	2.3	2.5	2.2	2.1	2.3	2.3	1.9	2.0	2.1	1.8	1.8	1.9	1.8
Mar'19	2.2	2.1	2.2	2.2	2.2	2.0	2.2	2.1	1.9	1.9	2.0	1.9	1.9	2.1	2.0	2.0	2.0	2.1	1.9	2.0	1.8	1.8	1.9	1.8
April'19	2.1	2.2	2.1	2.1	2.1	2.0	2.2	2.1	2.0	2.0	1.9	2.0	1.9	2.1	2.0	2.0	1.9	2.0	2.2	2.0	2.1	1.8	1.9	1.9
May'19	2.1	2.2	2.1	2.1	2.1	2.1	2.2	2.1	2.0	2.2	2.0	2.1	2.0	2.1	2.1	2.1	2.1	2.2	2.0	2.1	1.9	2.0	1.9	1.9
June'19	1.9	2.0	2.1	2.0	1.9	2.0	1.9	1.9	2.1	1.8	2.0	2.0	2.1	1.9	1.8	1.9	1.9	1.7	2.0	1.9	1.9	1.8	1.7	1.8
July'19	2.0	1.8	1.2	1.7	1.3	1.2	1.1	1.2	1.2	1.3	1.2	1.2	1.2	1.1	1.1	1.1	1.3	1.2	1.5	1.3	1.3	1.2	1.2	1.2
Aug'19	1.9	1.8	2.0	1.9	1.4	1.5	1.2	1.4	1.3	1.3	1.4	1.3	1.6	1.8	1.8	1.7	1.6	1.2	1.8	1.5	1.3	1.3	1.4	1.3
Sept'19	2.0	2.0	1.9	2.0	1.9	1.8	1.6	1.8	1.4	1.3	1.6	1.4	1.8	1.8	1.9	1.8	1.5	1.4	1.3	1.4	1.3	1.5	1.4	1.4
Oct'19	2.0	1.9	2.0	2.0	2.0	1.8	1.4	1.7	1.6	1.8	1.9	1.8	1.5	1.4	1.3	1.4	1.4	1.4	1.5	1.4	1.6	1.3	1.5	1.5
Nov'19	1.9	2.0	2.0	2.0	1.8	1.6	1.5	1.6	1.8	1.9	1.4	1.7	1.3	1.6	1.4	1.4	1.6	1.3	1.8	1.6	1.7	1.4	1.6	1.6
Dec'19	1.9	2.0	1.9	1.9	1.8	1.9	1.4	1.7	2.5	1.6	1.7	1.9	1.4	1.5	1.3	1.4	1.4	1.3	1.6	1.4	1.3	1.5	1.4	1.4
Jan'20	1.8	1.9	2.0	1.9	1.7	1.5	1.6	1.6	1.8	2.0	1.6	1.8	1.4	1.5	1.7	1.5	1.9	1.8	1.4	1.7	1.3	1.6	1.5	1.5
Feb'20	2.0	1.9	1.8	1.9	1.6	1.5	1.8	1.6	1.7	1.5	1.6	1.6	1.9	2.0	1.8	1.9	1.6	1.4	1.6	1.5	1.3	1.5	1.4	1.4
Mar'20	1.2	1.3	1.5	1.3	1.2	1.6	1.8	1.5	1.3	1.4	1.2	1.3	1.7	1.5	1.4	1.5	1.3	1.5	1.4	1.4	1.2	1.2	1.1	1.2
Apr'20	1.3	1.5	1.5	1.4	1.5	1.4	1.9	1.6	1.4	1.4	1.5	1.4	1.6	1.8	1.9	1.8	1.6	1.6	1.7	1.6	1.3	1.3	1.5	1.4
May'20	1.4	1.4	1.4	1.4	1.5	1.6	1.6	1.6	1.5	1.4	1.4	1.4	1.7	1.7	1.8	1.7	1.7	1.6	1.6	1.6	1.5	1.6	1.6	1.6
June'20	1.9	1.8	1.7	1.8	1.6	1.5	1.6	1.6	1.7	1.8	2.0	1.8	1.6	1.4	1.3	1.4	1.5	1.4	1.6	1.5	1.4	1.7	1.9	1.7
July'20	2.1	2.0	1.8	2.0	1.7	1.7	1.8	1.7	1.9	1.9	2.0	1.9	1.8	1.5	1.5	1.6	1.8	1.6	1.6	1.7	1.7	1.9	2.0	1.9
Aug'20	1.9	1.8	1.8	1.8	1.6	1.7	1.9	1.7	1.7	1.5	1.4	1.5	1.9	1.8	1.8	1.8	1.4	1.5	1.8	1.6	1.4	1.8	1.5	1.6
Sept'20	2.0	2.0	1.9	2.0	1.8	1.9	1.9	1.9	1.8	1.7	1.8	1.8	1.9	1.9	1.8	1.9	1.8	1.7	1.8	1.8	1.7	1.8	1.8	1.8
Oct'20	2.0	2.0	1.9	2.0	1.8	1.9	1.9	1.9	2.0	1.9	1.8	1.9	1.8	1.8	1.9	1.8	1.9	1.9	1.8	1.9	1.8	1.7	1.8	1.8
Nov'20	1.8	1.7	1.6	1.7	1.5	1.8	1.4	1.6	1.6	1.4	1.5	1.5	1.8	1.9	1.5	1.7	1.4	1.7	1.8	1.6	1.6	1.5	1.4	1.5
Dec'20	1.6	1.7	1.6	1.6	1.5	1.7	1.5	1.6	1.6	1.5	1.5	1.5	1.7	1.6	1.6	1.6	1.4	1.6	1.7	1.6	1.5	1.5	1.4	1.5
Maximum	2.5	2.5	2.7	-	2.6	2.4	2.4	-	2.6	2.2	2.1	-	2.5	2.2	2.1	-	2.3	2.2	2.2	-	2.1	2.0	2.0	-
Minimum	1.2	1.3	1.2	-	1.2	1.2	1.1	-	1.2	1.3	1.2	-	1.2	1.1	1.1	-	1.3	1.2	1.3	-	1.2	1.2	1.1	-

Appendix 5.1 Table (1-1-3) -8 Survey results of seawater quality (COD) (2019.1-2020.12)

[COD (mg/l)]

Survey Period	SW1				SW2				SW3				SW4				SW5				SW6			
	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV
	0.5 m	4 m	8 m	---	0.5m	4 m	8 m	---	0.5 m	4 m	8 m	---	0.5 m	4 m	8 m	---	0.5 m	4 m	8 m	---	0.5 m	4 m	8 m	---
Jan'19	320	240	280	280	300	300	280	293	280	260	300	280	280	260	300	280	300	280	260	280	300	320	300	307
Feb'19	260	260	280	267	260	340	340	313	320	340	340	333	340	300	280	307	300	300	280	293	340	340	340	340
Mar'19	300	300	320	307	260	260	280	267	280	320	280	293	300	280	240	273	280	260	300	280	280	260	240	260
April'19	340	340	340	340	320	300	280	300	300	280	260	280	240	300	300	280	300	300	260	287	240	220	220	227
May'19	260	260	300	273	300	320	280	300	300	320	260	293	220	240	260	240	260	260	280	267	320	340	340	333
June'19	120	120	100	113	100	100	120	107	100	120	100	107	100	120	100	107	100	100	100	100	120	100	100	107
July'19	140	120	120	127	100	120	140	120	120	120	100	113	100	140	120	120	140	100	140	127	120	100	120	113
Aug'19	120	120	140	127	100	100	120	107	140	120	120	127	100	140	120	120	120	100	120	113	100	100	120	107
Sept'19	31	23	15	23	23	31	31	28	38	31	15	28	38	15	23	25	15	31	23	23	23	31	23	26
Oct'19	31	31	23	28	31	31	23	28	23	31	23	26	38	31	38	36	31	31	23	28	23	15	15	18
Nov'19	31	31	31	31	23	23	31	26	23	31	15	23	23	15	23	20	38	31	23	31	15	23	23	20
Dec'19	31	23	31	28	31	31	23	28	38	31	15	28	23	31	23	26	31	23	31	28	31	15	31	26
Jan'20	16	16	16	16	24	32	24	27	16	32	16	21	23	16	16	18	32	24	24	27	32	16	16	21
Feb'20	16	24	16	19	32	16	24	24	16	24	16	19	32	16	24	24	16	32	16	21	24	16	24	21
Mar'20	32	24	24	27	24	32	24	27	24	24	16	21	32	24	24	27	16	24	24	21	16	16	24	19
Apr'20	28	26	21	25	31	29	25	28	30	27	19	25	28	21	20	23	18	19	17	18	21	18	26	22
May'20	24	27	31	27	29	36	28	31	33	29	22	28	34	25	28	29	21	18	29	23	19	24	31	25
June'20	24	16	16	19	32	24	16	24	24	24	16	21	32	24	16	24	24	32	16	24	24	16	24	21
July'20	19	15	15	16	29	22	17	23	22	22	13	19	27	24	15	22	23	30	16	23	21	17	22	20
Aug'20	16	24	16	19	32	16	24	24	32	16	16	21	24	32	16	24	16	24	32	24	16	32	24	24
Sept'20	21	26	22	23	34	21	25	27	28	21	20	23	27	30	23	27	21	26	29	25	22	28	29	26
Oct'20	24	27	22	24	38	24	24	29	32	24	22	26	25	33	26	28	19	27	32	26	25	26	31	27
Nov'20	16	32	24	24	24	32	16	24	24	32	16	24	24	16	24	21	32	24	24	27	16	24	24	21
Dec'20	15	29	22	22	16	30	23	23	23	32	15	23	22	15	25	21	28	21	19	23	15	20	21	19
Maximum	340	340	340	-	320	340	340	-	320	340	340	-	340	300	300	-	300	300	300	-	340	340	340	-
Minimum	15	15	15	-	16	16	16	-	16	16	13	-	22	15	15	-	15	18	16	-	15	15	15	-

Appendix 5.1 Table (1-1-3) -9 Survey results of seawater quality (Nitrate) (2019.1-2020.12)

[Nitrate (mg/l)]

Survey Period	SW1				SW2				SW3				SW4				SW5				SW6			
	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV
	0.5 m	4 m	8 m	---	0.5m	4 m	8 m	---	0.5 m	4 m	8 m	---	0.5 m	4 m	8 m	---	0.5 m	4 m	8 m	---	0.5 m	4 m	8 m	---
Jan'19	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.7	0.7	0.8	1	0.8	0.8	0.7	0.9	0.8	0.7	0.8	0.8	0.8
Feb'19	0.6	0.6	0.6	0.6	0.5	0.6	0.6	0.6	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.5	0.4	0.5	0.5	0.5	0.5	0.5	0.5
Mar'19	0.8	0.8	1	0.9	1	0.7	0.8	0.8	0.7	0.7	0.7	0.7	0.6	0.8	0.6	0.7	0.7	0.7	0.7	0.7	0.5	0.7	0.6	0.6
April'19	0.9	0.5	0.8	0.7	0.5	0.5	0.4	0.5	0.2	0.4	0.4	0.3	0.4	0.3	0.3	0.4	0.4	0.5	0.4	0.4	0.5	0.6	0.5	0.5
May'19	0.6	0.4	0.4	0.5	0.4	0.5	0.5	0.5	0.4	0.5	0.5	0.5	0.6	0.7	0.4	0.6	0.3	0.3	0.4	0.3	0.5	0.5	0.5	0.5
June'19	0.9	0.3	0.4	0.5	0.3	0.6	0.6	0.5	0.6	0.6	0.6	0.6	0.6	0.6	0.3	0.5	0.4	0.3	0.3	0.3	0.3	0.5	0.5	0.4
July'19	0.9	0.9	0.8	0.9	0.8	0.9	0.9	0.9	0.9	1	1	1	1	0.9	0.9	0.9	1.2	1.2	0.8	1.1	0.8	0.8	0.9	0.8
Aug'19	0.5	0.6	0.3	0.5	0.6	0.7	0.6	0.6	0.6	0.6	0.7	0.6	0.7	0.7	0.8	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.6	0.7
Sept'19	0.5	0.5	0.6	0.5	0.6	0.5	0.5	0.5	0.5	0.5	0.6	0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.8	0.7	0.7	0.5	0.5	0.6
Oct'19	0.6	0.5	0.6	0.6	0.6	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.9	0.9	0.8	0.5	0.5	0.4	0.5	0.4	0.5	0.4	0.4
Nov'19	0.4	0.4	0.3	0.4	0.3	0.3	0.3	0.3	0.5	0.5	0.3	0.4	0.1	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3
Dec'19	0.4	0.3	0.5	0.4	0.4	0.8	0.5	0.6	0.5	0.4	0.9	0.6	0.6	0.4	0.3	0.4	0.6	0.5	0.5	0.5	0.5	0.6	0.5	0.5
Jan'20	0.8	0.9	0.4	0.7	0.4	0.5	0.4	0.4	0.5	0.6	0.6	0.6	0.4	0.8	0.7	0.6	0.5	0.6	0.6	0.6	0.8	0.7	0.6	0.7
Feb'20	0.7	0.7	0.9	0.8	0.9	0.9	0.9	0.9	0.9	0.8	0.9	0.9	0.8	0.9	0.9	0.9	0.9	1.1	1.1	1.1	1	1.1	1.1	1.1
Mar'20	0.7	0.7	0.8	0.7	0.8	0.7	0.6	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.8	0.9	0.8
Apr'20	0.8	0.8	0.8	0.8	0.7	0.7	0.9	0.8	0.5	0.8	0.8	0.7	0.6	0.5	0.5	0.5	0.7	0.8	0.8	0.8	0.7	0.7	0.8	0.7
May'20	0.9	0.8	0.8	0.8	1	0.9	0.9	0.9	0.7	0.8	0.8	0.8	0.6	0.5	0.6	0.6	0.8	0.8	0.7	0.8	0.7	0.7	0.8	0.7
June'20	1.1	1.1	0.9	1	0.8	1	1	0.9	1.1	1	0.8	1	0.8	0.7	0.7	0.7	0.8	0.9	1.1	0.9	1.1	1	1	1
July'20	0.9	1	0.9	0.9	0.8	0.8	0.9	0.8	1	0.9	0.8	0.9	0.7	0.7	0.6	0.7	0.7	0.8	1	0.8	1	0.9	0.9	0.9
Aug'20	0.6	0.6	0.6	0.6	0.5	0.8	0.8	0.7	0.7	0.6	0.7	0.7	0.6	0.6	0.6	0.6	0.5	0.5	0.6	0.6	0.5	0.5	0.5	0.5
Sept'20	0.5	0.6	0.6	0.6	0.7	0.8	0.6	0.7	0.6	0.8	0.8	0.7	0.6	0.7	0.7	0.7	0.6	0.5	0.7	0.6	0.6	0.6	0.5	0.6
Oct'20	0.7	0.6	0.8	0.7	0.7	0.8	0.8	0.8	0.5	0.7	0.9	0.7	0.7	0.7	0.8	0.7	0.6	0.6	0.8	0.7	0.6	0.6	0.6	0.6
Nov'20	0.6	0.6	0.5	0.6	0.6	0.6	0.5	0.6	0.5	0.7	0.6	0.6	0.6	0.5	0.4	0.5	0.4	0.3	0.5	0.4	0.6	0.5	0.4	0.5
Dec'20	0.6	0.6	0.7	0.6	0.5	0.5	0.6	0.5	0.5	0.6	0.6	0.6	0.6	0.5	0.5	0.5	0.4	0.5	0.5	0.5	0.6	0.5	0.5	0.5
Maximum	1.1	1.1	1.0	-	1.0	1.0	1.0	-	1.1	1.0	1.0	-	1.0	0.9	1.0	-	1.2	1.2	1.1	-	1.1	1.1	1.1	-
Minimum	0.4	0.3	0.3	-	0.3	0.3	0.3	-	0.2	0.4	0.3	-	0.1	0.3	0.2	-	0.2	0.2	0.2	-	0.2	0.3	0.3	-

Appendix 5.1 Table (1-1-3) -10 Survey results of seawater quality (Iron) (2019.1-2020.12)

[Fe (mg/l)]

Survey Period	SW1				SW2				SW3				SW4				SW5				SW6			
	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV
	0.5 m	4 m	8 m	---	0.5m	4 m	8 m	---	0.5 m	4 m	8 m	---	0.5 m	4 m	8 m	---	0.5 m	4 m	8 m	---	0.5 m	4 m	8 m	---
Jan'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	0.1	ND	ND	-	ND	ND	ND	-
Feb'19	0	ND	ND	0	ND	ND	ND	-	ND	ND	ND	-	0	0	0	0	0	0.1	0.1	0.1	0.1	0	0	0.0
Mar'19	ND	ND	ND	-	ND	ND	ND	-	0.1	0.1	ND	0.1	ND	ND	ND	-	0.1	0.1	ND	0.1	ND	ND	ND	-
April'19	0.1	0.1	0.3	0.2	0.1	0.2	0	0.1	0	0.8	0.1	0.3	0.7	0.1	0.1	0.3	0	0	ND	0	0	0	0.8	0.3
May'19	ND	ND	0.2	-	ND	0.1	0.1	0.1	0.7	0.6	ND	0.4	0.7	1.7	ND	0.8	ND	0.8	0.4	0.4	ND	0.3	1.3	0.5
June'19	3.1	3.9	4.5	3.8	0.6	2.5	3.8	2.3	0.4	0.2	0.6	0.4	0.3	0.3	0.2	0.3	0.5	1.8	2.1	1.5	0.4	3.7	4.1	2.7
July'19	1.1	1	1.1	1.1	0.8	1.1	0.8	0.9	0.9	1.1	1	1	1	1	1	1	1.1	0.9	0.6	0.9	0.8	0.8	1.2	0.9
Aug'19	1.5	2	2	1.8	1.5	2	1.1	1.5	0.6	1.9	1.7	1.4	1.4	1.2	2	1.5	1.7	2	1.9	1.9	1.1	1.2	1.3	1.2
Sept'19	0.8	0.4	0.4	0.5	1.8	1.4	1.1	1.4	0.8	2	1.6	1.5	0.03	1.6	1.1	0.9	1.5	1.3	1.4	1.4	1.4	1.4	0.3	1
Oct'19	1.7	1.8	1.9	1.8	1.8	1.7	2	1.8	1.4	1.5	1.3	1.4	1.8	1.4	1.5	1.6	1.1	1.7	1.6	1.5	1.9	1	1.1	1.3
Nov'19	0.5	0.5	0.6	0.5	0.5	0.5	0.4	0.5	0.3	0.4	0.4	0.4	0.4	0.8	0.4	0.5	0.3	0.4	0.4	0.4	0.2	0.4	0.5	0.4
Dec'19	0.1	0.1	0.1	0.1	0.1	ND	0.1	0.1	ND	ND	ND	-	ND	ND	0.1	-	0.1	ND	ND	-	ND	ND	ND	-
Jan'20	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.3	0.1	0.1	0.2	0.1	0.1	0.2	0.1
Feb'20	0.1	0.1	0.1	0.1	0.3	0.3	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.3	0.2	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1
Mar'20	0.1	0.2	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.2	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Apr'20	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.1	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.3	0.2	0.1	0.2
May'20	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.2	0.2	0.2	0.1	0.2	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.2	0.1	0.1
June'20	0.1	0.1	0.3	0.2	0.2	0.3	0.1	0.2	0.1	0.1	0.2	0.1	0.2	0.1	0.2	0.2	0.2	0.1	0.1	0.1	0.2	0.1	0.2	0.2
July'20	0.1	0.1	0.2	0.1	0.1	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.2	0.2	0.1	0.2
Aug'20	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Sept'20	0.2	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.2	0.2	0.1	0.2	0.1	0.2	0.1	0.1
Oct'20	0.4	0.3	0.2	0.3	0.3	0.2	0.3	0.3	0.5	0.4	0.4	0.4	0.3	0.3	0.4	0.3	0.3	0.3	0.4	0.3	0.2	0.2	0.2	0.2
Nov'20	0.1	0.1	0.3	0.2	0.1	0.1	0.1	0.1	0.1	0.3	0.1	0.2	0.1	0.1	0.3	0.2	0.1	0.1	0.3	0.2	0.1	0.1	0.3	0.2
Dec'20	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.1	0.2	0.2	0.1	0.1	0.2	0.1	0.1	0.2	0.2	0.2
Maximum	3.1	3.9	4.5	-	1.8	2.5	3.8	-	1.4	2.0	1.7	-	1.8	1.7	2.0	-	1.7	2.0	2.1	-	1.9	3.7	4.1	-
Minimum	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-

Note: ND; Not Detected

Appendix 5.1 Table (1-1-3) -11 Survey results of seawater quality (Arsenic) (2019.1-2020.12)

[As (mg/l)]

Survey Period	SW1				SW2				SW3				SW4				SW5				SW6			
	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV
	0.5 m	4 m	8 m	---	0.5m	4 m	8 m	---	0.5 m	4 m	8 m	---	0.5 m	4 m	8 m	---	0.5 m	4 m	8 m	---	0.5 m	4 m	8 m	---
Jan'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Feb'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Mar'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
April'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
May'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
June'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
July'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Aug'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Sept'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Oct'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Nov'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Dec'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Jan'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Feb'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Mar'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Apr'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
May'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
June'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
July'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Aug'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Sept'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Oct'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Nov'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Dec'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-

Note: ND; Not Detected

Appendix 5.1 Table (1-1-3) -12 Survey results of seawater quality (Cadmium) (2019.1-2020.12)

[Cd (mg/l)]

Survey Period	SW1				SW2				SW3				SW4				SW5				SW6			
	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV
	0.5 m	4 m	8 m	---	0.5m	4 m	8 m	---	0.5 m	4 m	8 m	---	0.5 m	4 m	8 m	---	0.5 m	4 m	8 m	---	0.5 m	4 m	8 m	---
Jan'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Feb'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Mar'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
April'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
May'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
June'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
July'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Aug'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Sept'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Oct'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Nov'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Dec'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Jan'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Feb'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Mar'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Apr'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
May'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
June'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
July'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Aug'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Sept'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Oct'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Nov'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Dec'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-

Note: ND; Not Detected

Appendix 5.1 Table (1-1-3) -13 Survey results of seawater quality (Total Chromium) (2019.1-2020.12)

[T-Cy (mg/l)]

Survey Period	SW1				SW2				SW3				SW4				SW5				SW6			
	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV
	0.5 m	4 m	8 m	---	0.5m	4 m	8 m	---	0.5 m	4 m	8 m	---	0.5 m	4 m	8 m	---	0.5 m	4 m	8 m	---	0.5 m	4 m	8 m	---
Jan'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Feb'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Mar'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
April'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
May'19	ND	ND	ND	-	ND	ND	ND	-	ND	0.1	ND	-	0.1	ND	ND	-	ND	ND	ND	-	ND	0.1	0.4	0.2
June'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
July'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Aug'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Sept'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Oct'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Nov'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Dec'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Jan'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Feb'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Mar'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Apr'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
May'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
June'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
July'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Aug'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Sept'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Oct'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Nov'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Dec'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Maximum	ND	ND	ND	-	ND	ND	ND	-	ND	0.1	ND	-	0.1	ND	ND	-	ND	ND	ND	-	ND	0.1	0.4	-
Minimum	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-

Note: ND; Not Detected

Appendix 5.1 Table (1-1-3) -14 Survey results of seawater quality (Cupper) (2019.1-2020.12)

[Cu (mg/l)]

Survey Period	SW1				SW2				SW3				SW4				SW5				SW6			
	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV
	0.5 m	4 m	8 m	---	0.5m	4 m	8 m	---	0.5 m	4 m	8 m	---	0.5 m	4 m	8 m	---	0.5 m	4 m	8 m	---	0.5 m	4 m	8 m	---
Jan'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	0	ND	0	ND	ND	ND	-
Feb'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Mar'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
April'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
May'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
June'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
July'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Aug'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Sept'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Oct'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Nov'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Nov'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Dec'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Jan'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Feb'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Mar'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Apr'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
May'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
June'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
July'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Aug'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Sept'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Oct'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Nov'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Dec'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-

Note: ND; Not Detected

Appendix 5.1 Table (1-1-3)-15 Survey results of seawater quality (Mercury) (2019.1-2020.12)

[Hg (mg/l)]

Survey Period	SW1				SW2				SW3				SW4				SW5				SW6			
	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV
	0.5 m	4 m	8 m	---	0.5m	4 m	8 m	---	0.5 m	4 m	8 m	---	0.5 m	4 m	8 m	---	0.5 m	4 m	8 m	---	0.5 m	4 m	8 m	---
Jan'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Feb'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Mar'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
April'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
May'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
June'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
July'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Aug'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Sept'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Sept'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Oct'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Nov'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Dec'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Jan'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Feb'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Mar'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Apr'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
May'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
June'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
July'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Aug'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Sept'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Oct'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Nov'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Dec'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-

Note: ND; Not Detected

Appendix 5.1 Table (1-1-3) -16 Survey results of seawater quality (Lead) (2019.1-2020.12)

[Pb (mg/l)]

Survey Period	SW1				SW2				SW3				SW4				SW5				SW6			
	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV
	0.5 m	4 m	8 m	---	0.5m	4 m	8 m	---	0.5 m	4 m	8 m	---	0.5 m	4 m	8 m	---	0.5 m	4 m	8 m	---	0.5 m	4 m	8 m	---
Jan'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Feb'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Mar'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
April'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
May'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
June'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
July'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Aug'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Sept'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Sept'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Oct'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Nov'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Dec'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Jan'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Feb'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Mar'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Apr'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
May'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
June'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
July'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Aug'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Sept'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Oct'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Nov'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Dec'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-

Note: ND; Not Detected

Appendix 5.1 Table (1-1-3) -17 Survey results of seawater quality (Zinc) (2019.1-2020.12)

[Zn (mg/l)]

Survey Period	SW1				SW2				SW3				SW4				SW5				SW6			
	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV
	0.5 m	4 m	8 m	---	0.5m	4 m	8 m	---	0.5 m	4 m	8 m	---	0.5 m	4 m	8 m	---	0.5 m	4 m	8 m	---	0.5 m	4 m	8 m	---
Jan'19	ND	0.1	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Feb'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	--
Mar'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
April'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
May'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
June'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
July'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Aug'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Sept'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Oct'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Nov'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Dec'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Jan'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Feb'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Mar'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Apr'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
May'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
June'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
July'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Aug'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Sept'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Oct'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Nov'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Dec'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-

Note: ND; Not Detected

Appendix 5.1 Table (1-1-3) -18 Survey results of seawater quality (Oil and Grease) (2019.1-2020.12)

[Oil & Grease (mg/L)]

Survey Period	SW1				SW2				SW3				SW4				SW5				SW6			
	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV
	0.5 m	4 m	8 m	---	0.5m	4 m	8 m	---	0.5 m	4 m	8 m	---	0.5 m	4 m	8 m	---	0.5 m	4 m	8 m	---	0.5 m	4 m	8 m	---
Jan'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Feb'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Mar'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
April'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
May'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
June'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
July'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Aug'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Sept'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Oct'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Nov'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Dec'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Jan'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Feb'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Mar'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Apr'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
May'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
June'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
July'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Aug'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Sept'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Oct'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Nov'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Dec'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-

Note: ND; Not Detected

Appendix 5.1 Table (1-1-3) -19 Survey results of seawater quality (Total Phosphorus) (2019.1-2020.12)

[T Phosphorus (mg/l)]

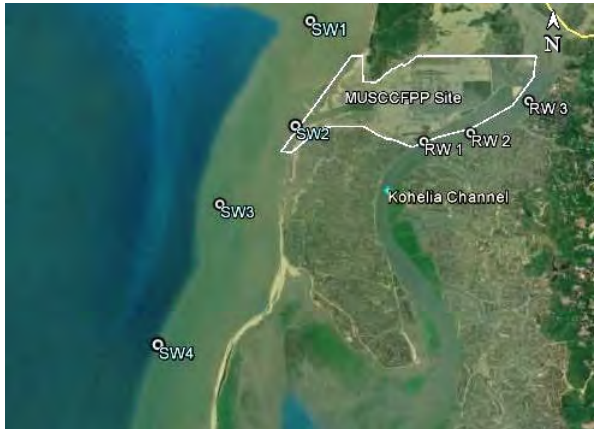
Survey Period	SW1				SW2				SW3				SW4				SW5				SW6			
	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV
	0.5 m	4 m	8 m	---	0.5m	4 m	8 m	---	0.5 m	4 m	8 m	---	0.5 m	4 m	8 m	---	0.5 m	4 m	8 m	---	0.5 m	4 m	8 m	---
Jan'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Feb'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Mar'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
April'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
May'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
June'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
July'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Aug'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Sept'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Sept'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Oct'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Nov'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Dec'19	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Jan'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Feb'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Mar'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Apr'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
May'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
June'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
July'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Aug'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Sept'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Oct'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Nov'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-
Dec'20	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-	ND	ND	ND	-

Note: ND; Not Detected

Appendix 5.1 Table (1-1-3)-20 Survey results of seawater quality (Fecal Coliform) (2019.1-2020.12)

[Fecal Coliform (MPN/100 ml)]

Survey Period	SW1				SW2				SW3				SW4				SW5				SW6			
	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV
	0.5 m	4 m	8 m	---	0.5m	4 m	8 m	---	0.5 m	4 m	8 m	---	0.5 m	4 m	8 m	---	0.5 m	4 m	8 m	---	0.5 m	4 m	8 m	---
Jan'19	<1.8	<1.8	4.5	1.5	<1.8	<1.8	<1.8	-	<1.8	<1.8	<1.8	-	<1.8	<1.8	<1.8	-	<1.8	<1.8	<1.8	-	<1.8	<1.8	<1.8	-
Feb'19	<1.8	17	<1.8	5.7	<1.8	<1.8	4.5	1.5	<1.8	<1.8	<1.8	-	<1.8	<1.8	<1.8	-	<1.8	<1.8	<1.8	-	<1.8	<1.8	<1.8	-
Mar'19	<1.8	<1.8	<1.8	<1.8	<1.8	<1.8	<1.8	<1.8	<1.8	<1.8	<1.8	-	<1.8	<1.8	34	12.5	5.6	130	<1.8	45.8	4.5	23	<1.8	9.8
April'19	<1.8	23	<1.8	-	2	<1.8	<1.8	-	<1.8	<1.8	<1.8	-	<1.8	<1.8	<1.8	-	<1.8	<1.8	33	-	<1.8	<1.8	<1.8	-
May'19	<1.8	<1.8	2	-	<1.8	<1.8	<1.8	-	<1.8	2	<1.8	-	3.7	<1.8	<1.8	-	<1.8	<1.8	<1.8	-	<1.8	<1.8	<1.8	-
June'19	<1.8	<1.8	<1.8	-	<1.8	<1.8	<1.8	-	<1.8	<1.8	<1.8	-	<1.8	<1.8	<1.8	-	<1.8	<1.8	<1.8	-	<1.8	<1.8	<1.8	-
July'19	34	130	130	98	240	240	130	203	240	130	22	131	11	49	49	36	49	49	130	76	27	49	22	33
Aug'19	23	49	23	32	23	33	49	35	49	33	13	32	33	49	79	54	33	23	23	26	49	23	49	40
Sept'19	34	130	79	81	170	130	110	137	27	34	79	47	22	49	49	40	79	49	49	59	130	79	110	106
Oct'19	7.8	13	2	7.6	13	7.8	6.8	9.2	23	13	33	23	23	22	13	19	9.3	13	7.8	10	23	4.5	13	14
Nov'19	9.3	<1.8	<1.8	-	<1.8	<1.8	<1.8	-	3.7	<1.8	2	1.9	4.5	<1.8	<1.8	-	<1.8	2	<1.8	-	<1.8	<1.8	<1.8	-
Dec'19	<1.8	<1.8	<1.8	-	<1.8	<1.8	13	-	<1.8	<1.8	<1.8	-	<1.8	<1.8	4.5	-	<1.8	<1.8	<1.8	-	<1.8	<1.8	<1.8	-
Jan'20	<1.8	<1.8	<1.8	-	<1.8	<1.8	<1.8	-	<1.8	<1.8	<1.8	-	<1.8	<1.8	<1.8	-	<1.8	2	<1.8	-	34	<1.8	<1.8	-
Feb'20	4.5	<1.8	6.8	-	4.5	33	13	17	17	7.8	11	12	2	<1.8	<1.8	-	2	<1.8	<1.8	-	<1.8	10	<1.8	-
Mar'20	<1.8	<1.8	<1.8	-	<1.8	<1.8	4	-	<1.8	<1.8	<1.8	-	<1.8	<1.8	<1.8	-	<1.8	4	15	6	12	8	<1.8	7
Apr'20	<1.8	<1.8	<1.8	-	2	<1.8	<1.8	-	5	11	13	9.7	<1.8	4.5	2	2.2	10	4	11	8.3	<1.8	8	<1.8	-
May'20	5	11	<1.8	5.4	14	11	15	13	7	9	4	6.7	<1.8	<1.8	6	-	17	15	11	14	7	13	<1.8	6.7
June'20	<1.8	<1.8	<1.8	-	<1.8	7.8	<1.8	-	4.5	4.5	<1.8	3	<1.8	<1.8	13	-	<1.8	<1.8	2	-	<1.8	<1.8	<1.8	-
July'20	<1.8	<1.8	2.5	-	<1.8	7.8	3.1	3.6	11	3	<1.8	4.7	<1.8	<1.8	<1.8	-	4.5	<1.8	<1.8	-	<1.8	<1.8	<1.8	-
Aug'20	23	130	79	77	79	79	79	79	130	130	79	113	49	33	49	44	49	49	27	42	49	49	79	59
Sept'20	43	96	56	65	31	64	43	46	38	52	46	45	11	33	23	22	43	35	21	33	31	31	23	28
Oct'20	11	7	18	12	9	14	11	11	5	9	13	9	16	11	8	12	12	9	11	11	18	13	8	13
Nov'20	11	7	18	12	9	14	11	11	5	9	13	9	16	11	8	12	12	9	11	11	18	13	8	13
Dec'20	2	4	3	3	3	7	3	4.3	2	4	5	3.7	11	4	4	6.3	8	6	7	7	11	7	5	7.7
Maximum	43	130	130	-	240	240	130	-	240	130	79	-	49	49	79	-	79	130	130	-	130	79	110	-
Minimum	<1.8	<1.8	<1.8	-	<1.8	<1.8	<1.8	-	<1.8	<1.8	<1.8	-	<1.8	<1.8	<1.8	-	<1.8	<1.8	<1.8	-	<1.8	<1.8	<1.8	-



Sampling Point	Latitude (North)	Longitude (East)
SW 1	21°43'15.75"N	91°51'46.25"E
SW 2	21°41'49.44"N	91°51'36.50"E
SW 3	21°40'48.88"N	91°50'42.39"E
SW 4	21°39'6.37"N	91°50'3.33"E
SW 5	21°37'22.52"N	91°49'28.16"E
SW 6	21°35'1.30"N	91°48'55.28"E

Note; Analysis method for the monitoring of Units 1/2

Parameters	Sampling Method	Laboratory Analysis Method
Depth	Sampling program has been undertaken according to the procedures outlined in ISO 5667-9:1992 -Water Quality Sampling Guidance. • Sampling is conducted using a vertical Van Dorn Water Sampler (Beta Plus) to collect samples. • New sampling bottles are rinsed with distilled water for three times and then two times with sample water. • All sampling bottles have been properly labeled and transported in ice box (4°C) from site to SGS laboratory at Dhaka. • All samples accompanied by Chain of Custody (CoC) forms for QA/QC purpose. *Before September'19 the analysis of COD by EPA - 410.3 (for high saline water), 1978 method was done. After September'19, the analysis of COD has been done by APHA 22THEdition 2012. The difference of methodology caused the difference of analysis values. **Detection limits about heavy metals in monitoring reports is <0.01 mg/l.	By Ultrasonic Depth Sounder
Temperature *(in site)*		Analog Thermometer
pH		APHA 22nd Edition 2012 (4500H+ B)
Biochemical Oxygen Demand (BOD_5)		APHA 22nd EDITION 2012 (5210 B), Analysis carries with BOD Incubator
Chemical Oxygen Demand (COD) *		In-House based on APHA 5220 B (23rd Edition 2017)
Total Suspended Solids (TSS)		APHA 22nd Edition 2012 (2540 D)
Oil & Grease		APHA 22nd EDITION 2012 (5520-B)
Arsenic (As) **		APHA 22TH Edition 2012 by ICP-OES/MS
Cadmium (Cd) **		APHA 22TH Edition 2012 by ICP-OES/MS
Chromium(Cr)* *		APHA 22nd Edition 2012 (3500-Cr(VI)B)
Copper (Cu) **		APHA 22TH Edition 2012 by ICP-OES/MS
Iron (Fe) **		APHA 22TH Edition 2012 by ICP-OES/MS
Lead (Pb) **		APHA 22TH Edition 2012 by ICP-OES/MS
Mercury(Hg) **		APHA 22TH Edition 2012 by ICP-OES/MS
Salinity*(in site)*		Electrometric Method
Total Phosphorus (P)		APHA 22nd Edition.2012 (4500-P B&E) (Flame Photometric)
Dissolved Oxygen*(in site)*		APHA 22ND Edition 2012 (4500-O G)
Nitrate (NO_3^-)		APHA 22nd Edition 2012, (4500-NO3 B)
Zinc (Zn) **		APHA 22TH Edition 2012 by ICP-OES
Fecal Coliform		APHA 22nd Edition 2012 (9221E)
Turbidity*(in site)*		Electrometric Method

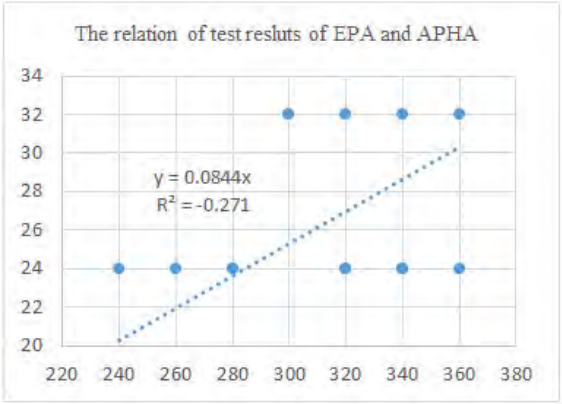
Supplemental explanation : * Change of COD analysis method; COD analysis was adopted EPA -410.3-1978 until August 2019 and is changed to APHA 22TH Edition 2012 from September 2019. The relationship between the two analysis data due to the change of analytical method was confirmed using the same sample. Note_Table 1 shows the relation between analysis data by EPA -410.3-1978 and analysis data by APHA 22TH Edition 2012, and conversion formula is Value of APHA 22TH Edition 2012 = Value of

EPA -410.3-1978 x 0.0844(Note_Figure-1). And converted results is shown in Note_Table 2.

Note_Table-1

Location	LAYER	Test result (mg/L)		APHA/EPA		
		EPA Method	APHA Method	Average	Maximum	Minium
SW - 1 (21.718611N,91.865444E)	LAYER - 1	360	32	0.09		
	LAYER - 2	340	24	0.07		
	LAYER - 3	320	24	0.08		
SW - 3 (21.6775N,91.847083E)	LAYER - 1	340	24	0.07		
	LAYER - 2	300	32	0.11		
	LAYER - 3	280	24	0.09		
SW - 4 (21.6595N,91.84036E)	LAYER - 1	340	24	0.07		
	LAYER - 2	340	32	0.09		
	LAYER - 3	320	32	0.10		
SW - 14 (21.742916N,91.8565E)	LAYER - 1	360	24	0.07		
	LAYER - 2	240	24	0.10		
	LAYER - 3	260	24	0.09		
SW - 15 (21.770419N,91.877052E)	LAYER - 1	280	24	0.09		
	LAYER - 2	300	32	0.11		
	LAYER - 3	320	24	0.08		
	Whole			0.09	0.11	0.07
	LAYER - 1			0.08	0.09	0.07
	LAYER - 2			0.09	0.11	0.07
	LAYER - 3			0.09	0.10	0.08

Note_Figure-1

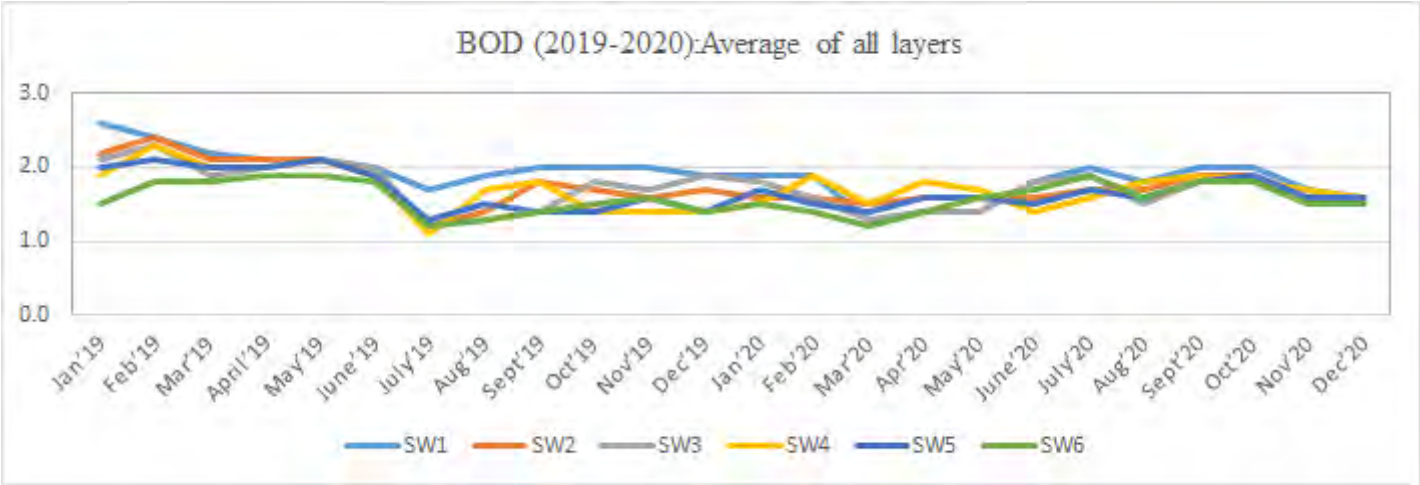


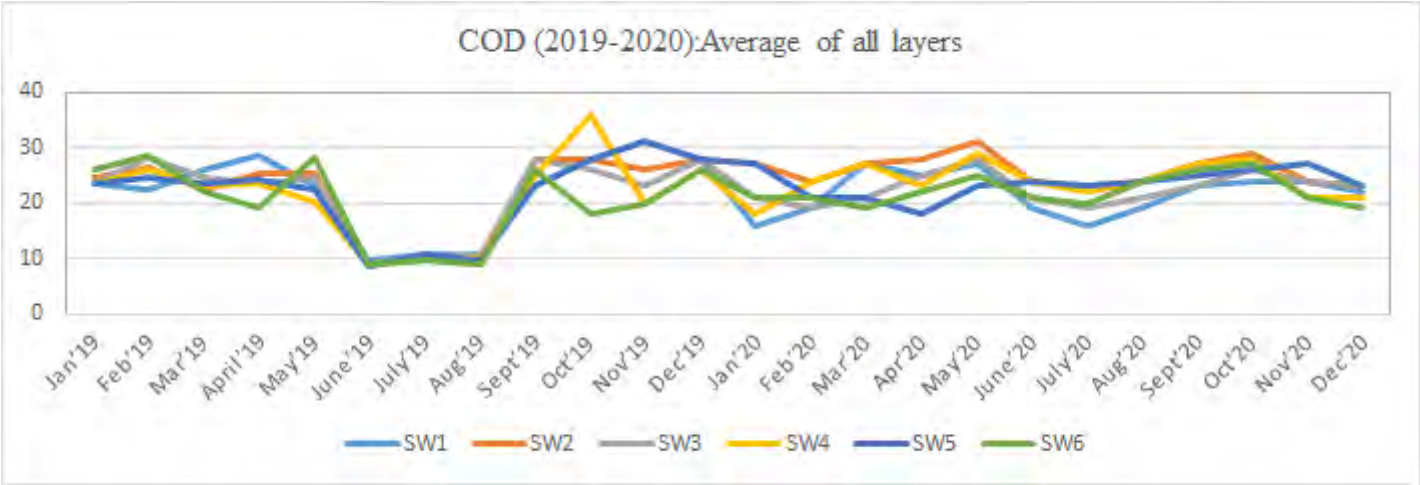
Note_Table-2

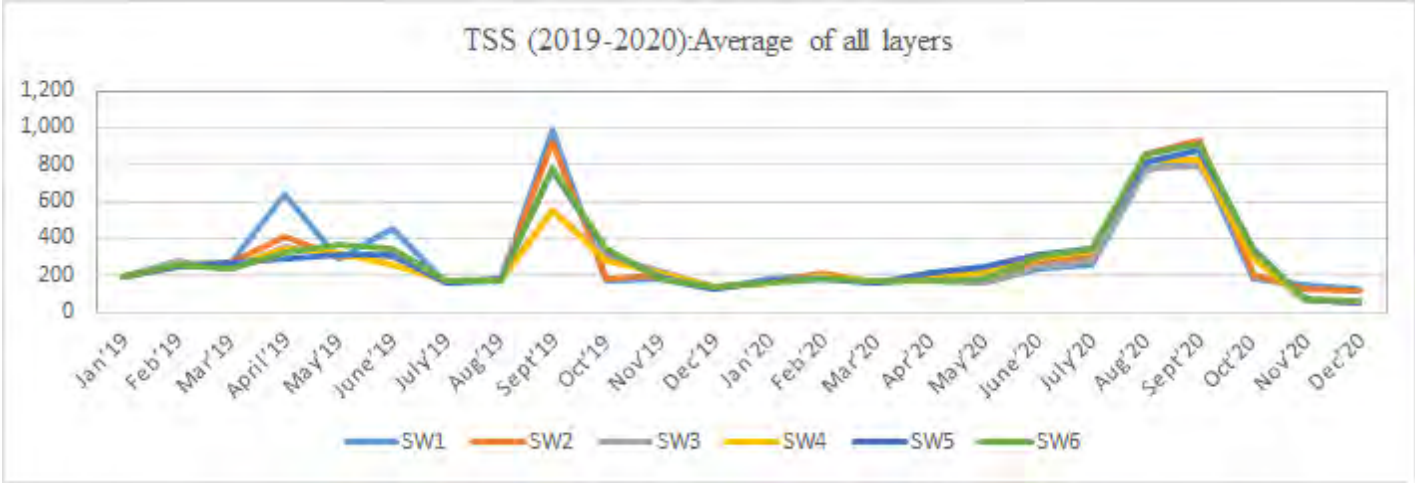
[COD (mg/l)]

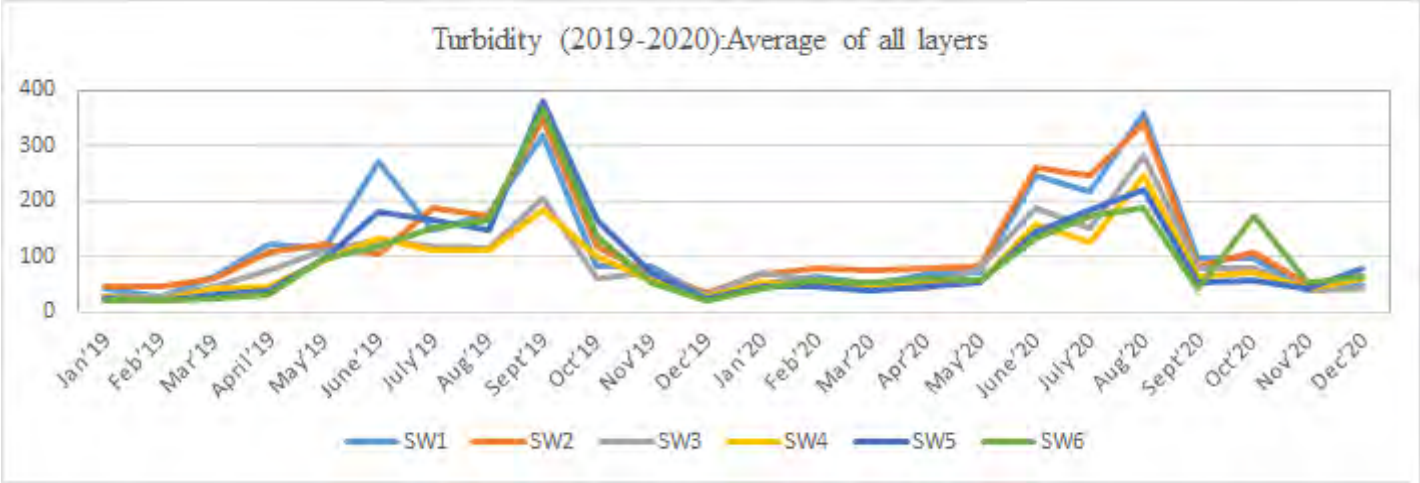
Survey Period	SW1				SW2				SW3				SW4				SW5				SW6			
	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV	L1	L2	L3	AV
	0.5 m	4 m	8 m	---	0.5m	4 m	8 m	---	0.5 m	4 m	8 m	---	0.5 m	4 m	8 m	---	0.5 m	4 m	8 m	---	0.5 m	4 m	8 m	---
Jan'19	27*	20*	24*	24*	25*	25*	24*	25*	24*	22*	25*	24*	24*	22*	25*	24*	25*	24*	22*	24*	25*	27*	25*	26*
Feb'19	22*	22*	24*	23*	22*	29*	29*	26*	27*	29*	29*	28*	29*	25*	24*	26*	25*	25*	24*	25*	29*	29*	29*	29*
Mar'19	25*	25*	27*	26*	22*	22*	24*	23*	24*	27*	24*	25*	25*	24*	20*	23*	24*	22*	25*	24*	24*	22*	20*	22*
April'19	29*	29*	29*	29*	27*	25*	24*	25*	25*	24*	22*	24*	20*	25*	25*	24*	25*	25*	22*	24*	20*	19*	19*	19*
May'19	22*	22*	25*	23*	25*	27*	24*	25*	25*	27*	22*	25*	19*	20*	22*	20*	22*	22*	24*	23*	27*	29*	29*	28*
June'19	10*	10*	8*	10*	8*	8*	10*	9*	8*	10*	8*	9*	8*	10*	8*	9*	8*	8*	8*	8*	10*	8*	8*	9*
July'19	12*	10*	10*	11*	8*	10*	12*	10*	10*	10*	8*	10*	8*	12*	10*	10*	12*	8*	12*	11*	10*	8*	10*	10*
Aug'19	10*	10*	12*	11*	8*	8*	10*	9*	12*	10*	10*	11*	8*	12*	10*	10*	10*	8*	10*	10*	8*	8*	10*	9*
Sept'19	31	23	15	23	23	31	31	28	38	31	15	28	38	15	23	25	15	31	23	23	23	31	23	26
Oct'19	31	31	23	28	31	31	23	28	23	31	23	26	38	31	38	36	31	31	23	28	23	15	15	18
Nov'19	31	31	31	31	23	23	31	26	23	31	15	23	23	15	23	20	38	31	23	31	15	23	23	20
Dec'19	31	23	31	28	31	31	23	28	38	31	15	28	23	31	23	26	31	23	31	28	31	15	31	26
Jan'20	16	16	16	16	24	32	24	27	16	32	16	21	23	16	16	18	32	24	24	27	32	16	16	21
Feb'20	16	24	16	19	32	16	24	24	16	24	16	19	32	16	24	24	16	32	16	21	24	16	24	21
Mar'20	32	24	24	27	24	32	24	27	24	24	16	21	32	24	24	27	16	24	24	21	16	16	24	19
Apr'20	28	26	21	25	31	29	25	28	30	27	19	25	28	21	20	23	18	19	17	18	21	18	26	22
May'20	24	27	31	27	29	36	28	31	33	29	22	28	34	25	28	29	21	18	29	23	19	24	31	25
June'20	24	16	16	19	32	24	16	24	24	24	16	21	32	24	16	24	24	32	16	24	24	16	24	21
July'20	19	15	15	16	29	22	17	23	22	22	13	19	27	24	15	22	23	30	16	23	21	17	22	20
Aug'20	16	24	16	19	32	16	24	24	32	16	16	21	24	32	16	24	16	24	32	24	16	32	24	24
Sept'20	21	26	22	23	34	21	25	27	28	21	20	23	27	30	23	27	21	26	29	25	22	28	29	26
Oct'20	24	27	22	24	38	24	24	29	32	24	22	26	25	33	26	28	19	27	32	26	25	26	31	27
Nov'20	16	32	24	24	24	32	16	24	24	32	16	24	24	16	24	21	32	24	24	27	16	24	24	21
Dec'20	15	29	22	22	16	30	23	23	23	32	15	23	22	15	25	21	28	21	19	23	15	20	21	19
Maximum	32	32	31	-	38	36	31	-	38	32	29	-	38	33	38	-	38	32	32	-	32	32	31	-
Minimum	10	10	8	-	8	8	10	-	8	10	8	-	8	10	8	-	8	8	8	-	8	8	8	-

Regarding BOD and COD as indexes of the dirty water, TSS, Turbidity as indexes of influence due to civil works such as excavation and so on, the trend of two years is shown as below.






TSS (2019-2020):Average of all layers
1,200
1,000
800
600
400
200
0
Jan'19
Feb'19
Mar'19
April'19
May'19
June'19
July'19
Aug'19
Sept'19
Oct'19
Nov'19
Dec'19
Jan'20
Feb'20
Mar'20
Apr'20
May'20
June'20
July'20
Aug'20
Sept'20
Oct'20
Nov'20
Dec'20
SW1
SW2
SW3
SW4
SW5
SW6


Turbidity (2019-2020):Average of all layers
400
300
200
100
0
Jan'19
Feb'19
Mar'19
April'19
May'19
June'19
July'19
Aug'19
Sept'19
Oct'19
Nov'19
Dec'19
Jan'20
Feb'20
Mar'20
Apr'20
May'20
June'20
July'20
Aug'20
Sept'20
Oct'20
Nov'20
Dec'20
SW1
SW2
SW3
SW4
SW5
SW6

(1.2) Surface water (Kohelia Canal)

(1-2-1) The survey for FS 3/4

Appendix 5.1 Table (1-2-1)-1 Survey results of water quality of Surface water (Kohelia Canal)

Location	Test Parameters	Test Method	UNIT	Lower Detection Limit	Results	Standards for Inland Surface Water
SURFACE WATER (MATARBARI)	Temperature (in-situ)	Analog Thermometer	°C	-	24	-
	pH Value (in-situ)	Electrometric Method by pH Meter	-	-	8	6.5-8.8
	Dissolved Oxygen, DO (in-situ)	Electrometric Method	mg/L	-	6.5	5 or above
	Turbidity (in-situ)	ISO :7027	NTU	-	139	-
	Biochemical Oxygen Demand, BOD	APHA 22nd Edition 2012 (5210 B)	mg/L	1	1.8	3 or less
	Chemical Oxygen Demand, COD	APHA 22nd Edition 2012 (5220 B)	mg/L	5	16	-
SURFACE WATER (DHALGHATA)	Temperature (in-situ)	Analog Thermometer	°C	-	23	-
	pH Value (in-situ)	Electrometric Method by pH Meter	-	-	7.9	6.5-8.8
	Dissolved Oxygen, DO (in-situ)	Electrometric Method	mg/L	-	6.6	5 or above
	Turbidity (in-situ)	ISO :7027	NTU	-	83	-
	Biochemical Oxygen Demand, BOD	APHA 22nd Edition 2012 (5210 B)	mg/L	1	1.6	3 or less
	Chemical Oxygen Demand, COD	APHA 22nd Edition 2012 (5220 B)	mg/L	5	24	-

Note：1)Standards for Inland Surface Water：B: Water area for recreation

2)Survey date：11 Jan, 2021

3) Survey location

Appendix 5.1 Table (1-2-1)-2 Survey results of water quality of Surface water (Kohelia Canal)

Location	Test Parameters	Test Method	UNIT	Lower Detection Limit	Results	Standards for Inland Surface Water
SURFACE WATER (MATARBARI)	Temperature (in-situ)	Analog Thermometer	°C	-	27	-
	pH Value (in-situ)	Electrometric Method by pH Meter	-	-	7.9	6.5-8.8
	Dissolved Oxygen, DO (in-situ)	Electrometric Method	mg/L	-	6.6	5 or above
	Turbidity (in-situ)	ISO :7027	NTU	-	183	-
	Biochemical Oxygen Demand, BOD	APHA 22nd Edition 2012 (5210 B)	mg/L	1	1.7	3 or less
	Chemical Oxygen Demand, COD	APHA 22nd Edition 2012 (5220 B)	mg/L	5	16	-
SURFACE WATER (DHALGHATA)	Temperature (in-situ)	Analog Thermometer	°C	-	27	-
	pH Value (in-situ)	Electrometric Method by pH Meter	-	-	7.9	6.5-8.8
	Dissolved Oxygen, DO (in-situ)	Electrometric Method	mg/L	-	6.5	5 or above
	Turbidity (in-situ)	ISO :7027	NTU	-	164	-
	Biochemical Oxygen Demand, BOD	APHA 22nd Edition 2012 (5210 B)	mg/L	1	1.8	3 or less
	Chemical Oxygen Demand, COD	APHA 22nd Edition 2012 (5220 B)	mg/L	5	24	-

Note：1)Standards for Inland Surface Water：B: Water area for recreation
2)Survey date：7 Jul, 2021
3) Survey location; same as above

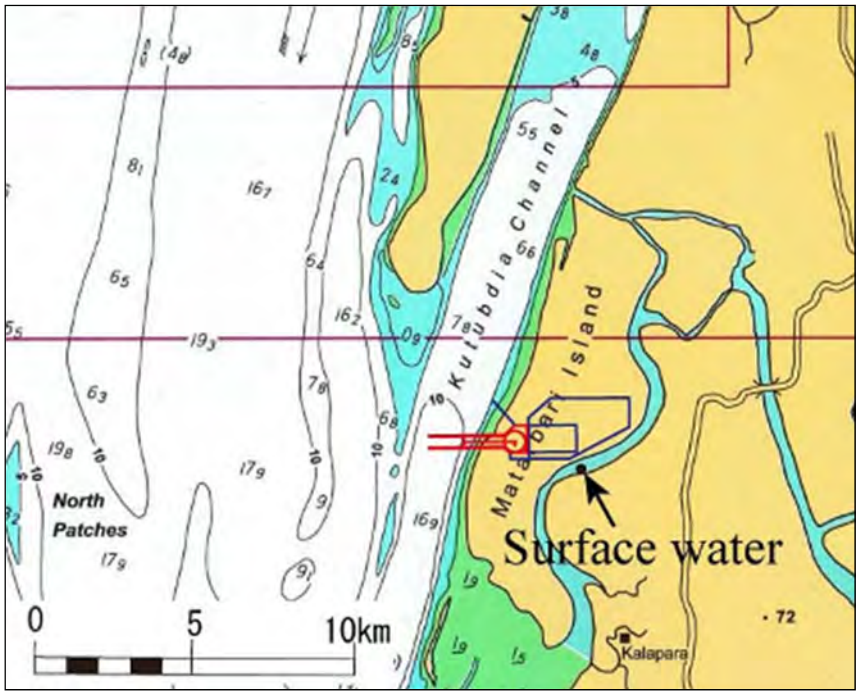
(1-2-2) Bangladesh Coal-Fired Power Plant Construction Project Preparatory Survey Report Final Report on Units 1/2 Construction Project

Appendix 5.1 Table (1-2-2)-1 Survey results of water quality of Surface water (Kohelia Canal)

Parameter	Unit	Results		Standards for Inland Surface Water					
		Rainy season: 7/Oct/2012	Dry season: 30/Jan/2013	A	B	C	D	E	F
Depth	M	0.5	0.5	-	-	-	-	-	-
Temperature	ºC	30.6	18.0	-	-	-	-	-	-
Salinity	-	9.8	35.8	-	-	-	-	-	-
pH	-	7.82	8.00	6.5-8.5	6.5-8.6	6.5-8.7	6.5-8.8	6.5-8.9	6.5-8.9
DO	mg/L	5.5	5.8	6 or above	5 or above	6 or above	5 or above	5 or above	5 or above
BOD	mg/L	0.8	0.4	2 or less	3 or less	3 or less	6 or less	10 or less	10 or less
COD	mg/L	97	241	-	-	-	-	-	-
Oil&Grease	mg/L	4.2	-	-	-	-	-	-	-
SS	mg/L	613	-	-	-	-	-	-	-

Note: The categories of water bodies are:

A: Water area that can be used as drinking water just by removing bacteria
B: Water area for recreation
C: Water area that can be used as drinking water with conventional treatment
D: Waters used for aquaculture
E: Waters that can be used as industrial water for cooling and other processes
F: Water area that can be used as irrigation water



Sampling Point	Latitude (North)	Longitude (East)
	21º41'35"	91º53'17"

(1-2-3) The Environmental monitoring report on Units 1/2 Construction Work

Appendix 5.1 Table (1-2-3)-1 Survey results of water quality of Surface water (Kohelia Canal) (2019.1-2020.12)

Location		Sep-17	(Baseline)		Jan-19			Apr-19			Jul-19			Oct-19			Bangladesh Standard	Range(Min - Max) during survey			Bangladesh Standard
Monitoring Parameter	Unit	RW-1	RW-2	RW-3	RW-1	RW-2	RW-3	RW-1	RW-2	RW-3	RW-1	RW-2	RW-3	RW-1	RW-2	RW-3		Min	~	Max	
Depth	(meter)	---	---	---	3.3	2.1	2.1	5.3	4.6	1.9	3.2	2.1	2.1	2.5	3.2	2.8	---	1.9	~	5.3	---
Temperature	(°C)	30	30	31	19	19	19	29	29	29	27	28	27	25	25	25	NYS	19	~	29	NYS
Salinity	(ppt)	14	13	13	27	28	27	15	15	15	6	7	7	16	17	16	NYS	6	~	28	NYS
pH	(---)	7.6	7.6	7.6	7.8	7.7	7.8	7.6	7.6	7.8	7.8	7.7	7.1	7.8	7.7	7.8	6.5 – 8.5	7.1	~	7.8	6.5 – 8.5
DO	(mg/L)	6.2	5.9	6	6.9	6.7	6.8	6.8	6.7	6.8	7.3	7.3	7.4	6.8	7.1	6.9	≥ 5	6.7	~	7.4	≥ 5
BOD	(mg/L)	27	26	22	2.5	2.4	2.4	1.8	1.7	1.8	1	1	1.2	1.6	1.5	1.8	≤ 6	1	~	2.5	≤ 6
COD	(mg/L)	148(12)	144(12)	128(11)	300(25)	240(20)	240(20)	180(15)	160(14)	180(15)	100(8)	120(10)	100(8)	22	15	37	NYS	15(8)	~	300(37)	NYS
TSS	(mg/L)	46	42	36	224	194	162	982	702	592	98	158	90	104	141	138	NYS	90	~	982	NYS
Turbidity	(NTU)	71.2	70.2	73.9	42	47	38	183	209	118	285	293	251	225	237	208	NYS	38	~	293	NYS
Nitrate	(mg/L)	0.6	0.6	0.5	0.6	0.8	0.8	0.5	0.3	0.8	0.6	0.5	0.5	0.6	0.5	0.6	NYS	0.3	~	0.8	NYS
Oil & Grease	(mg/L)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NYS			ND	NYS
Total Phosphorus	(mg/L)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NYS			ND	NYS
Fecal Coliform	(MPN/ 100 ml)	33	23	43	4.5	23	ND	33	33	350	79	130	49	240	240	240	≤ 5000	4.5	~	350	≤ 5000

Location		Sep-17	(Baseline)		Jan-20			Apr-20			Jul-20			Oct-20			Bangladesh Standard	Range(Min - Max) during survey			Bangladesh Standard
Monitoring Parameter	Unit	RW-1	RW-2	RW-3	RW-1	RW-2	RW-3	RW-1	RW-2	RW-3	RW-1	RW-2	RW-3	RW-1	RW-2	RW-3		Min	~	Max	
Depth	(meter)	---	---	---	2.5	3.2	2.8	2.5	3.2	2.8	2.5	3.2	2.8	2.6	2.5	2.4	---	2.4	~	3.2	---
Temperature	(°C)	30	30	31	20	21	21	25	25	24	24	24	24	28	28	28	NYS	20	~	28	NYS
Salinity	(ppt)	14	13	13	17	18	21	17	17	16	20	20	20	14	15	15	NYS	14	~	21	NYS
pH	(---)	7.6	7.6	7.6	8.0	8.0	8.0	7.8	7.8	7.7	8	8.1	8.1	7.9	7.8	7.8	6.5 – 8.5	7.7	~	8.1	6.5 – 8.5
DO	(mg/L)	6.2	5.9	6	6.2	6.1	6.1	6.3	6.2	6.2	6.4	6.3	6.3	5.7	5.6	5.7	≥ 5	5.6	~	6.4	≥ 5
BOD	(mg/L)	27	26	22	1.6	1.4	1.5	1.7	1.6	1.6	1.4	1.5	1.5	1.6	1.8	1.5	≤ 6	1.4	~	1.8	≤ 6
COD	(mg/L)	148(12)	144(12)	128(11)	16	8	16	16	24	16	16	24	16	16	24	16	NYS	8	~	24	NYS
TSS	(mg/L)	46	42	36	221	403	470	252	221	228	71	79	82	146	144	98	NYS	71	~	470	NYS
Turbidity	(NTU)	71.2	70.2	73.9	174	197	186	112	124	156	108	123	115	49	37	22	NYS	22	~	197	NYS
Nitrate	(mg/L)	0.6	0.6	0.5	0.7	0.6	0.7	0.5	1.1	1.1	0.6	0.6	0.5	0.7	0.6	0.7	NYS	0.5	~	1.1	NYS
Oil & Grease	(mg/L)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NYS			ND	NYS
Total Phosphorus	(mg/L)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NYS			ND	NYS
Fecal Coliform	(MPN/ 100 ml)	33	23	43	22	49	240	23	13	13	240	240	240	240	240	240	≤ 5000	13	~	240	≤ 5000

Note: NYS; Not Yet Set, ND; Not Detected

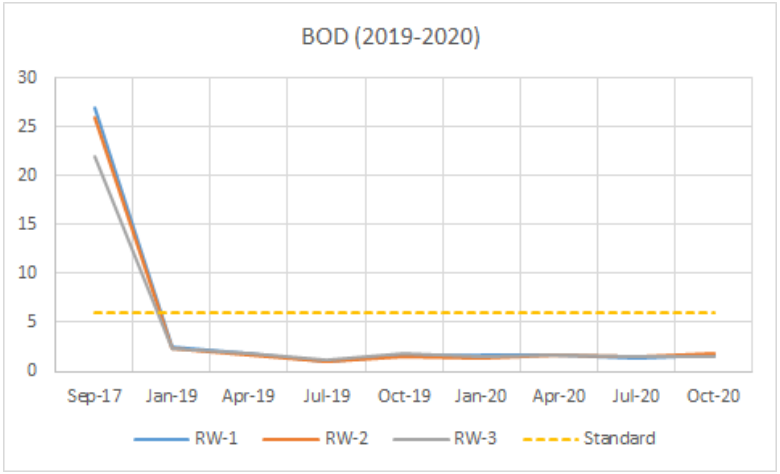
Supplemental explanation：* Change of COD analysis method; COD analysis was adopted EPA -410.3-1978 until August 2019 and is changed to APHA 22TH Edition 2012 from September 2019. The relationship between the two analysis data due to the change of analytical method was confirmed using the same sample (please see Note of “Survey results of seawater quality”).

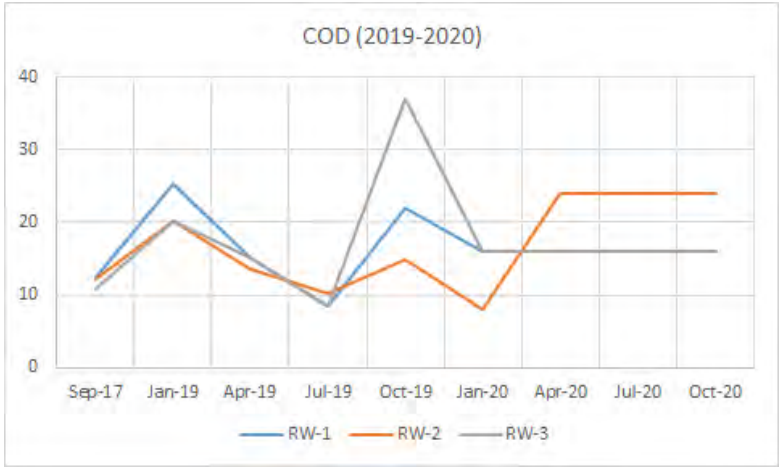

RW3
RW2
RW1
Google Earth

Sampling Point	Latitude (North)	Longitude (East)
RW-1	21° 41' 37.37"N	91° 53' 12.5"E
RW-2	21° 41' 43.93"N	91° 53' 47.61"E
RW-3	21° 42' 09.68"N	91° 54' 32.25"E

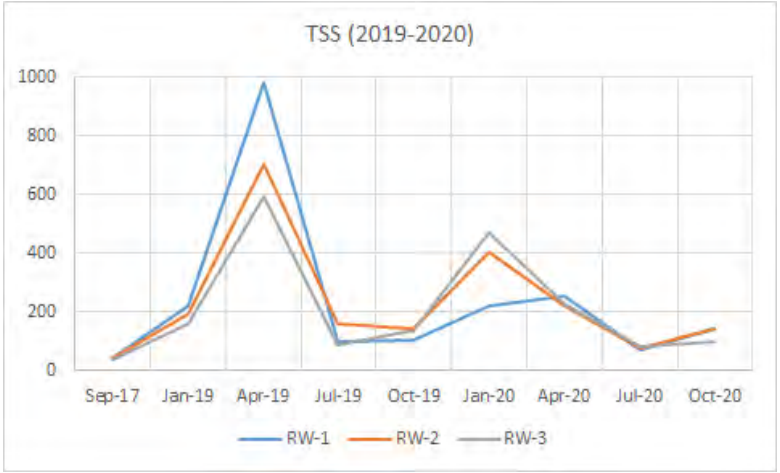
Parameters	Sampling Method	Laboratory Analysis Method
Depth	Sampling program has been undertaken according to the procedures outlined in ISO 5667-9:1992 -Water Quality Sampling Guidance. Sampling is conducted using a vertical Van Dorn Water Sampler (Beta Plus) to collect samples. New sampling bottles are rinsed with distilled water for three times and then two times with sample water. All sampling bottles are properly labeled and transported in ice box (4oC) from site to SGS laboratory at Dhaka. All samples accompanied by Chain of Custody (CoC) forms for QA/QC purpose. *Before September'19 the analysis of COD by EPA - 410.3 (for high saline water), 1978 method was done. After September'19, the analysis of COD has been done by APHA 22THEdition 2012. The difference of methodology caused the difference of analysis values.	By rope
Temperature *(in situ)*		Analog Thermometer
pH		APHA 22nd Edition 2012 (4500H+ B), Electrometric Method by pH Meter
Biochemical Oxygen Demand (BOD_5)		APHA 22nd EDITION 2012 (5210 B), Analysis carries with BOD Incubator
Dissolved Oxygen *(in situ)*		APHA 22ND Edition 2012 (4500-O G)
Total Fecal Coliform		APHA 22nd Edition 2012 (9221E)
Salinity *(in situ)*		Electrometric Method
Total Suspended Solids (TSS)		APHA 22nd Edition 2012 (2540 D)
Oil & Grease (O & G)		APHA 22nd Edition 2012 (5520-B)
Chemical Oxygen Demand (COD)		APHA 22nd Edition 2012 (5220 B), Open Reflux Method by Titration
Total Phosphorus (P)		APHA 22nd Edition.2012 (4500-P B&E) (Flame Photometric:)
Nitrate (NO^{3-})		APHA 22nd Edition 2012, (4500-NO3 B)
Turbidity *(in situ)*		Electrometric Method

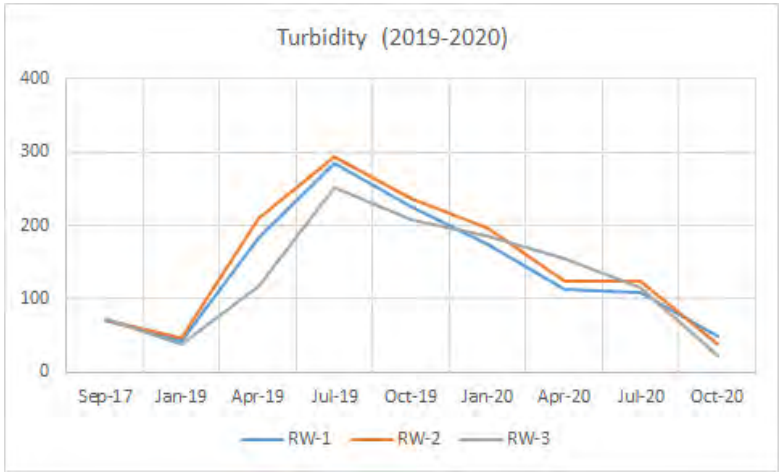
Regarding BOD and COD as indexes of the dirty water, TSS, Turbidity as indexes of influence due to civil works such as excavation and so on, the trend of two years is shown as below.





Note; Chart of COD is shown based on values after conversion.





(1.3) Ground water

(1-3-1) The survey for FS 3/4

Appendix 5.1 Table (1-3-1)-1 Survey results of water quality of ground water (Dry season)

Test Parameters	Test Method	UNIT	Lower Detection Limit	GW1 (Matarbali)	GW2 (Dhalghata)	Standard limit	WHO guideline
Temperature	Analog Thermometer	°C	-	25	24	20-30	-
pH	Electrometric Method by pH Meter	-	-	7.2	6.9	6.5-8.5	-
DO	Electrometric Method	mg/L	-	6.2	5.8	6	-
Turbidity	ISO :7027	NYU	-	9	14	10	-
Electrical Conductivity(in-situ)	Electrical method	µs/cm	-	789	952	-	-
Odor	Sensory Examination	-	-	Unobjectionable	Unobjectionable	Odorless	-
Color	APHA 22nd Edition 2012 (2120 B)/ISO7887(Method D)	Pt-Co	5	<5	10	15	-
Suspended particulate matters	APHA 22nd Edition 2012 (2540 D)	mg/L	1	ND	12	10	-
Total dissolved solids	APHA 22nd Edition 2012 (2540 C)	mg/L	1	172	552	1000	1000
Oil & Grease	APHA 22nd Edition 2012 (5520-B)	mg/L	1	ND	ND	0.01	-
BOD5 20 ºC	APHA 22nd Edition 2012 (5210 B)	mg/L	1	ND	ND	0.2	-
COD	APHA 22nd Edition 2012 (5220 B)	mg/L	4	ND	8	4	-
Chloride	APHA 22nd Edition 2012 (4500-Cl- B)	mg/L	0.5	3.99	257.92	150-600	-
Hardness (as CaCO3)	APHA 22nd Edition 2012 (2340 C)	mg/L	2	76	92	200-500	-
Chlorine (residual)	APHA 22nd Edition 2012 (4500-Cl B)	mg/L	0.14	ND	ND	0.2	-
Cyanide	APHA 22nd Edition 2012(4500- CN- E)	mg/L	0.01	ND	ND	0.1	-
Ammonia (NH3)	APHA 22nd Edition 2012 (4500 B&C)	mg/L	0.5	ND	ND	0.5	-
Chromium (hexavalent)	APHA 22nd Edition 2012 (3500-Cr (VI) B)	mg/L	0.005	ND	ND	0.05	-
Nitrate	APHA 22nd Edition 2012, (4500-NO3 B)	mg/L	0.05	0.07	0.7	10	3
Nitrite	APHA 22nd Edition 2012, (4500-NO2 B)	mg/L	0.05	ND	ND	Less than 1	-
Phenolic compounds	APHA 22nd Edition 2012 (5530 B) & EPA	mg/L	0.001	ND	ND	0.002	-

Test Parameters	Test Method	UNIT	Lower Detection Limit	GW1 (Matarbali)	GW2 (Dhalghata)	Standard limit	WHO guideline
Sulfate	APHA 22nd Edition 2012, (4500-SO42-E)	mg/L	5	ND	ND	400	-
Sulfide	APHA 22nd Edition 2012 (4500-SO2-D)	mg/L	0.005	ND	ND	0	-
Nitrogen (Total)	APHA 22nd Edition 2012 (4500 N-C)	mg/L	1	2.5	1.16	1	-
Phosphorus	APHA 22nd Edition 2012 (4500-P B & E)	mg/L	0.15	ND	ND	0	-
Phosphate	APHA 22nd Edition 2012 (4500-P B & E) & calculation	mg/L	0.46	ND	ND	6	-
Coliform (fecal)	APHA 22nd Edition, 2012 (9221 B)	MPN/ 100 ml	-	<1.8	2	0	-
Coliform (total)	APHA 22nd Edition, 2012 (9221 E)	MPN/ 100 ml	-	<1.8	2	0	-
Silver	APHA 22nd Edition 2012 by ICP-OES/MS	ppm	0.001	<0.001	<0.001	0.02	-
Aluminum	APHA 22nd Edition 2012 by ICP-OES/MS	ppm	0.001	<0.001	<0.001	0.2	0.2
Arsenic	APHA 22nd Edition 2012 by ICP-OES/MS	ppm	0.001	<0.001	<0.001	0.05	0.01
Boron	APHA 22nd Edition 2012 by ICP-OES/MS	ppm	0.001	<0.001	<0.001	1	0.5
Barium	APHA 22nd Edition 2012 by ICP-OES/MS	ppm	0.001	<0.001	<0.001	0.01	0.7
Calcium	APHA 22nd Edition 2012 by ICP-OES/MS	ppm	0.05	45.58	49.27	75	-
Cadmium	APHA 22nd Edition 2012 by ICP-OES/MS	ppm	0.001	<0.001	<0.001	0.005	0.003
Chromium (total)	APHA 22nd Edition 2012 by ICP-OES/MS	ppm	0.001	<0.001	<0.001	0.05	0.05
Copper	APHA 22nd Edition 2012 by ICP-OES/MS	ppm	0.001	<0.001	<0.001	1	-
Iron	APHA 22nd Edition 2012 by ICP-OES/MS	ppm	0.05	4.43	104.61	0.3	-
Mercury	APHA 22nd Edition 2012 by ICP-OES/MS	ppm	0.001	<0.001	<0.001	0.001	0.006
Magnesium	APHA 22nd Edition 2012 by ICP-OES/MS	ppm	0.05	24.91	31.68	30-35	-
Manganese	APHA 22nd Edition 2012 by ICP-OES/MS	ppm	0.001	<0.001	5.47	0.1	0.4

Test Parameters	Test Method	UNIT	Lower Detection Limit	GW1 (Matarbali)	GW2 (Dhalghata)	Standard limit	WHO guideline
Sodium	APHA 22nd Edition 2012 by ICP-OES/MS	ppm	0.05	63.85	305.07	200	-
Nickel	APHA 22nd Edition 2012 by ICP-OES/MS	ppm	0.001	<0.001	<0.001	0.1	0.07
Lead	APHA 22nd Edition 2012 by ICP-OES/MS	ppm	0.001	<0.001	<0.001	0.05	0.01
Selenium	APHA 22nd Edition 2012 by ICP-OES/MS	ppm	0.001	<0.001	<0.001	0.01	-
Zinc	APHA 22nd Edition 2012 by ICP-OES/MS	ppm	0.001	<0.001	<0.001	5	-

Note: 1) Survey date11 Jan, 2021

2) Survey location

Appendix 5.1 Table (1-3-1)-2 Survey results of water quality of ground water (Rainy season)

Test Parameters	Test Method	UNIT	Lower Detection Limit	GW1 (Matarbali)	GW2 (Dhalghata)	Standard limit	WHO guideline
Temperature	Analog Thermometer	°C	-	27	28	20-30	-
pH	Electrometric Method by pH Meter	-	-	7.1	7.1	6.5-8.5	-
DO	Electrometric Method	mg/L	-	6.3	5.7	6	-
Turbidity	ISO :7027	NYU	-	8	14	10	-
Electrical Conductivity(in-situ)	Electrical method	µs/cm	-	290	1008	-	-
Odor	Sensory Examination	-	-	Unobjectionable	Unobjectionable	Odorless	-
Color	APHA 22nd Edition 2012 (2120 B)/ISO7887(Method D)	Pt-Co	5	10.78	12.5	15	-
Suspended Solids	APHA 22nd Edition 2012 (2540 D)	mg/L	1	ND	12	10	-
Total dissolved solids	APHA 22nd Edition 2012 (2540 C)	mg/L	1	212	472	1000	1000
Oil & Grease	APHA 22nd Edition 2012 (5520-B)	mg/L	1	ND	ND	0.01	-
BOD5 20 ºC	APHA 22nd Edition 2012 (5210 B)	mg/L	1	ND	ND	0.2	-
COD	APHA 22nd Edition 2012 (5220 B)	mg/L	4	ND	10	4	-
Chloride	APHA 22nd Edition 2012 (4500-Cl- B)	mg/L	0.5	3.99	241.92	150-600	-
Hardness (as CaCO3)	APHA 22nd Edition 2012 (2340 C)	mg/L	2	76	88	200-500	-
Chlorine (residual)	APHA 22nd Edition 2012 (4500-Cl B)	mg/L	0.14	ND	ND	0.2	-
Cyanide	APHA 22nd Edition 2012(4500- CN- E)	mg/L	0.01	ND	ND	0.1	-
Ammonia (NH3)	APHA 22nd Edition 2012 (4500 B&C)	mg/L	0.5	ND	ND	0.5	-
Chromium (hexavalent)	APHA 22nd Edition 2012 (3500-Cr (VI) B)	mg/L	0.005	ND	ND	0.05	-
Nitrate	APHA 22nd Edition 2012, (4500-NO3 B)	mg/L	0.05	0.64	ND	10	3
Nitrite	APHA 22nd Edition 2012, (4500-NO2 B)	mg/L	0.05	ND	ND	Less than 1	-
Phenolic compounds	APHA 22nd Edition 2012 (5530 B) & EPA	mg/L	0.001	ND	ND	0.002	-
Sulfate	APHA 22nd Edition 2012, (4500-SO42- E)	mg/L	5	ND	ND	400	-
Sulfide	APHA 22nd Edition 2012 (4500-SO2- D)	mg/L	0.005	ND	ND	0	-

Test Parameters	Test Method	UNIT	Lower Detection Limit	GW1 (Matarbali)	GW2 (Dhalghata)	Standard limit	WHO guideline
Nitrogen (Total)	APHA 22nd Edition 2012 (4500 N-C)	mg/L	1	2.5	1.01	1	-
Phosphorus	APHA 22nd Edition 2012 (4500-P B & E)	mg/L	0.15	ND	ND	0	-
Phosphate	APHA 22nd Edition 2012 (4500-P B & E) & calculation	mg/L	0.46	ND	ND	6	-
Coliform (fecal)	APHA 22nd Edition, 2012 (9221 B)	MPN/ 100 ml	-	<1.8	<1.8	0	-
Coliform (total)	APHA 22nd Edition, 2012 (9221 E)	MPN/ 100 ml	-	<1.8	<1.8	0	-
Silver	APHA 22nd Edition 2012 by ICP-OES/MS	ppm	0.001	<0.001	<0.001	0.02	-
Aluminum	APHA 22nd Edition 2012 by ICP-OES/MS	ppm	0.001	<0.001	<0.001	0.2	0.2
Arsenic	APHA 22nd Edition 2012 by ICP-OES/MS	ppm	0.001	<0.001	<0.001	0.05	0.01
Boron	APHA 22nd Edition 2012 by ICP-OES/MS	ppm	0.001	<0.001	<0.001	1	0.5
Barium	APHA 22nd Edition 2012 by ICP-OES/MS	ppm	0.001	<0.001	<0.001	0.01	0.7
Calcium	APHA 22nd Edition 2012 by ICP-OES/MS	ppm	0.05	45.58	32.31	75	-
Cadmium	APHA 22nd Edition 2012 by ICP-OES/MS	ppm	0.001	<0.001	<0.001	0.005	0.003
Chromium (total)	APHA 22nd Edition 2012 by ICP-OES/MS	ppm	0.001	<0.001	<0.001	0.05	0.05
Copper	APHA 22nd Edition 2012 by ICP-OES/MS	ppm	0.001	<0.001	<0.001	1	-
Iron	APHA 22nd Edition 2012 by ICP-OES/MS	ppm	0.05	4.43	92.32	0.3	-
Mercury	APHA 22nd Edition 2012 by ICP-OES/MS	ppm	0.001	<0.001	<0.0001	0.001	0.006
Magnesium	APHA 22nd Edition 2012 by ICP-OES/MS	ppm	0.05	24.91	26.31	30-35	-
Manganese	APHA 22nd Edition 2012 by ICP-OES/MS	ppm	0.001	<0.001	3.36	0.1	0.4
Sodium	APHA 22nd Edition 2012 by ICP-OES/MS	ppm	0.05	63.85	301.02	200	-
Nickel	APHA 22nd Edition 2012 by ICP-OES/MS	ppm	0.001	<0.001	<0.001	0.1	0.07

Test Parameters	Test Method	UNIT	Lower Detection Limit	GW1 (Matarbali)	GW2 (Dhalghata)	Standard limit	WHO guideline
Lead	APHA 22nd Edition 2012 by ICP-OES/MS	ppm	0.001	<0.001	<0.001	0.05	0.01
Selenium	APHA 22nd Edition 2012 by ICP-OES/MS	ppm	0.001	<0.001	<0.001	0.01	-
Zinc	APHA 22nd Edition 2012 by ICP-OES/MS	ppm	0.001	<0.001	<0.001	5	-

Note: 1) Survey date15 Jul, 2021

2) Survey locations are same as locations of dry.

(1-3-2) Bangladesh Coal-Fired Power Plant Construction Project Preparatory Survey Report Final Report on Units 1/2 Construction Project

Appendix 5.1 Table (1-3-2)-1 Survey results of water quality of ground water

Parameter	Unit	Results		Standards for Drinking Water
		Rainy season 7/October/2012	Dry season 30/January/2013	
Temperature	ºC	29.7	20.1	20 – 30
pH	-	7.48	7.20	6.5 8.5
Chloride	mg/L	167	167	150 – 600
NH_3	mg/L	0.04	0.04	0.5
Iron (Fe)	mg/L	0.92	0.92	0.3 1.0
Hardness	mg/L	164	164	200 – 500
Arsenic (As)	mg/L	0.01	0.01	0.05
DO	mg/L	3.5	4.7	6.0
BOD	mg/L	0.4	0.2	0.2
COD	mg/L	0	0	4.0
SS	mg/L	0.2	-	10
Coliform	N/100mL	0	-	0
Salinity	-	0.3	0.7	-

Sampling Point	Latitude (North)	Longitude (East)
Ground water	21º42’42”	91º52’50”

(1-3-3) The Environmental monitoring report on Units 1/2 Construction Work

Appendix 5.1 Table (1-3-3)-1 Survey results of water quality of ground water (2019.1-2020.1)

Parameter	Unit	Groundwater Quality								Range(Min - Max) during survey			Bangladesh Standards
		Jan-19	Apr-19	Jul-19	Oct-19	Jan-20	Apr-19	Jul-19	Oct-19	Min	~	Max	
pH	(-)	7.0	7.0	7.0	7.3	7.6	7.5	7.4	8.2	7.0	~	8.2	6.5 – 8.5
Total Hardness	(mg/L)	10.2	98	108	108	100	84	ND	110	10.2	~	110.0	200 – 500
TDS	(mg/L)	182	186	152	196	175	195	150	190	150.0	~	196.0	1000
Nitrate	(mg/L)	0.3	ND	0.4	0.2	ND	ND	0.1	0.3	0.1		0.4	10
Chloride	(mg/L)	7.9	7.9	8.0	6.0	6.0	16.0	5.0	6.0	5.0	~	16.0	1000.0
Sulfate	(mg/L)	ND	ND	ND	ND	ND	ND	ND	ND			ND	400
Total Phosphorus	(mg/L)	ND	ND	ND	ND	ND	ND	ND	ND			ND	0
As	(mg/L)	ND	ND	ND	ND	ND	ND	ND	ND			ND	0.05
Cd	(mg/L)	ND	ND	ND	ND	ND	ND	ND	ND			ND	0.005
Fe	(mg/L)	ND	0.2	0.4	0.2	0.1	0.2	0.1	0.1	0.1	~	0.4	0.3 – 1.0
Mn	(mg/L)	ND	ND	ND	ND	0.1	0.1	0.1	0.1	ND	~	0.1	0.1
Pb	(mg/L)	ND	ND	ND	ND	ND	ND	ND	ND			ND	0.05
TSS	(mg/L)	ND	ND	ND	ND	ND	ND	ND	ND			ND	NYS
Ammonical Nitrogen	(mg/L)	ND	ND	ND	ND	ND	ND	ND	ND			ND	NYS
Fecal Coliform	(MPN/ 100 ml)	ND	ND	240	<1.8[3]	<1.8[3]	<1.8	<1.8	<1.8	ND	~	240.0	0

Note: 1) NYS; Not Yet Set, ND; Not Detected
2) If no evidence of Fecal Coliform observed in the tested sample, as per 5 tube table result expressed as <1.8 MPN/100 ml.
3) Depth of ground water monitoring source: 220 meters

Sampling Point	Latitude (North)	Longitude (East)
GW-1	21°42'13.80" N	91°53'23.30" E

Note; Analysis method for the monitoring of Units 1/2

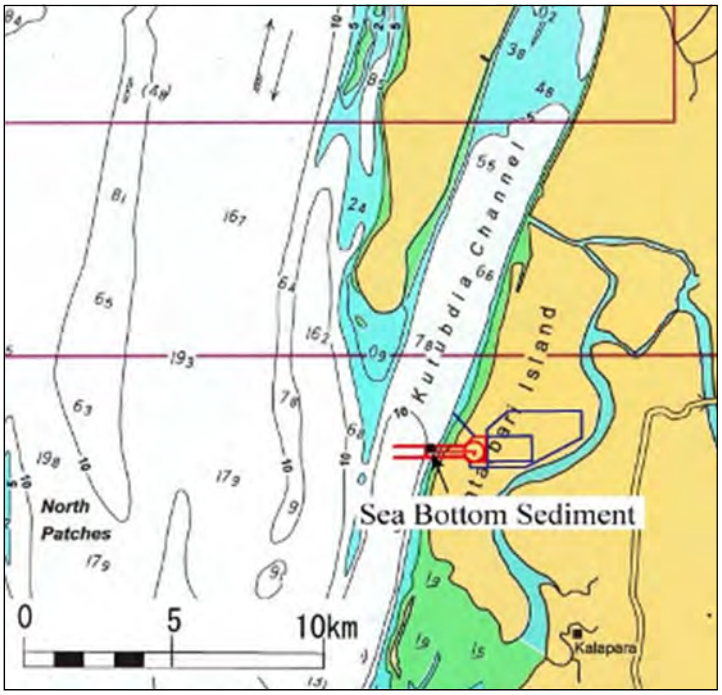
Parameters	Sampling Method	Laboratory Analysis Method
pH	Sampling program has been undertaken according to the procedures outlined in ISO 5667-9:1992 -Water Quality Sampling Guidance. New sampling bottles are rinsed with distilled water for three times and then two times with sample water. 2.5 liters of sample have been collected. All sampling bottles have been properly labeled and transported in icebox (4oC) from site to SGS laboratory at Dhaka. All samples accompanied by Chain of Custody (CoC) forms for QA/QC purpose.	APHA 22nd Edition 2012 (4500H + B), Electrometric Method by pH Meter
Chloride (Cl^-)		APHA 22nd EDITION 2012 (4500-Cl-B)
Ammonia (NH_3)		Ammoniac – Nitrogen (NH3-N); APHA 22nd Edition 2012 (4500 C)
Iron (Fe)		APHA 22TH Edition 2012 by ICP-OES/MS
Nitrite (NO^-_2)		APHA 22nd EDITION 2012, (4500-NO2 B)
Total Hardness (as $CaCO_3$)		APHA 22nd Edition 2012 (2340 C)
Arsenic (As)		AOAC 19th Edition 2012, Optical Emission Spectrometry by ICP-OES.
Total Suspended Solids (TSS)		APHA 22nd Edition 2012 (2540 D)
Total Dissolved Solids (TDS)		APHA 22nd Edition 2012 (2540 C)
Fecal Coliform		APHA 22nd Edition 2012 (9221E)
Nitrate (NO_3^-)		APHA 22nd Edition 2012, (4500-NO3 B)
Cadmium (Cd)		APHA 22nd Edition 2012 by ICP-OES/MS
Lead (Pb)		APHA 22TH Edition 2012 by ICP-OES/MS
Manganese (Mn)		APHA 22nd Edition 2012 by ICP-OES
Sulfate (SO_4^{2-})		APHA 22nd Edition 2012, (4500-SO_4^{2-} E)
Sulfide (S^{2-})		APHA 22nd Edition 2012 (4500-SO_2-D) Methylene Blue Method

(2) Sediment

Bangladesh Coal-Fired Power Plant Construction Project Preparatory Survey Report Final Report on Units 1/2 Construction Project

Appendix 5.1 Table (2)1 Survey results of Sediment (Heavy metals)

Parameter	Unit	Results		Guideline of NOAA	
		Rainy season 15/October /2012	Dry season 28/January /2013	ERL	ERM
Hg	mg/kg	0.142	0.456	0.15	0.71
Cd	mg/kg	0.032	0.05	1.2	9.6
Pb	mg/kg	11.6	3.39	46.7	218
As	mg/kg	4.45	2.91	8.2	70
Cu	mg/kg	23.8	3.75	34	270
Zn	mg/kg	63.7	20.2	410	410
Fe	mg/kg	27,400	11,183	-	-



Sampling Point	Latitude (North)	Longitude (East)
Sea bottom sediment	21°41'59.00”	91°51'20.52"

Appendix5.1.5

(1) Kohelia

N/A

(2) Marine Part

(2-1) Current Survey at Marine Part

The survey area of current measurement in marine environment is belonging within 15 km radius of the site (Coastal area facing marine part). Location point details are as below.

Survey activity has been completed in dry season from 19 February to 17 March 2021.

Appendix 5.1 Figure-1-1: Location point of Current survey at coastal face marine environment.

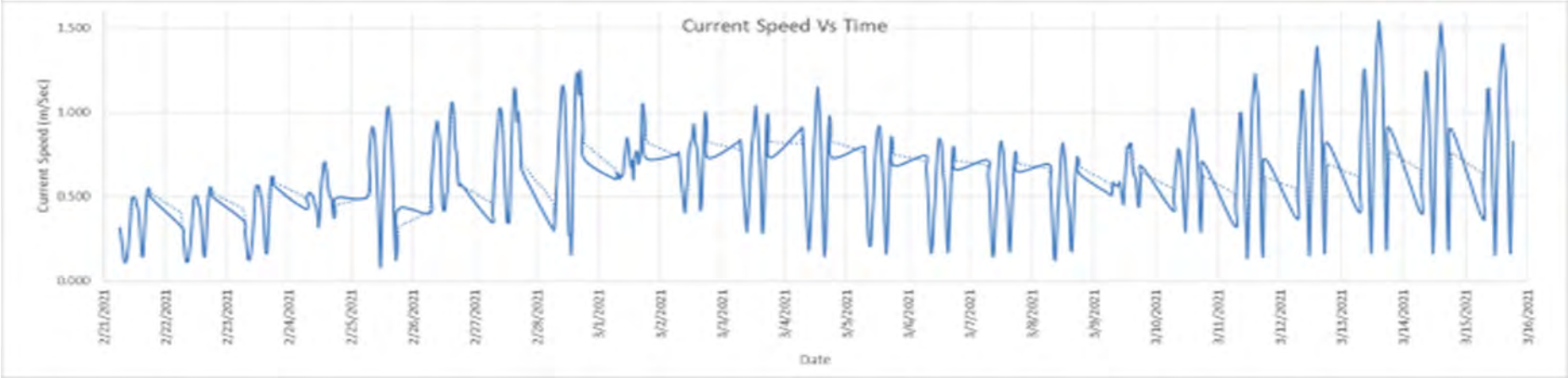
Location Id	Latitude	Longitude
SW-7	21.676767°	91.817120°
SW-9	21.706155°	91.815058°
SW-11	21.733700°	91.840623°

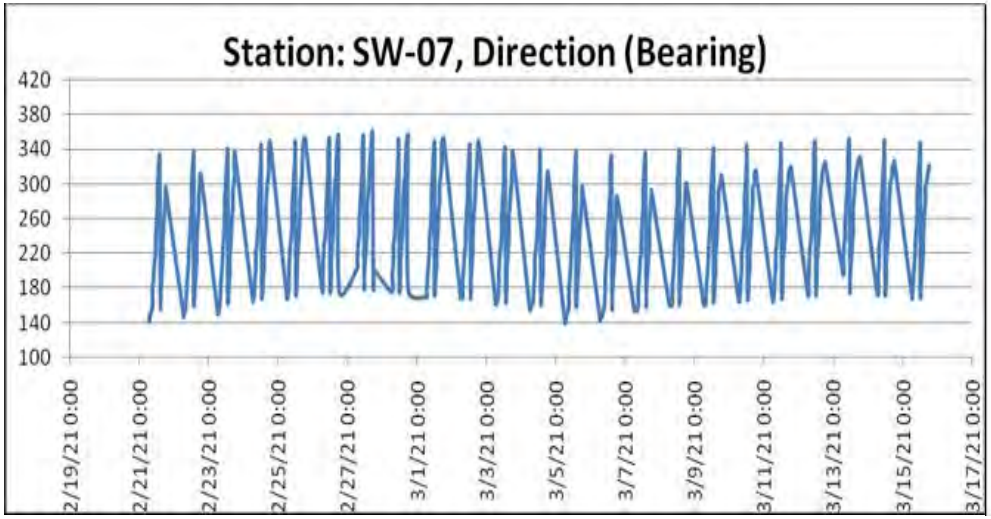
(2-1-1) Dry Season

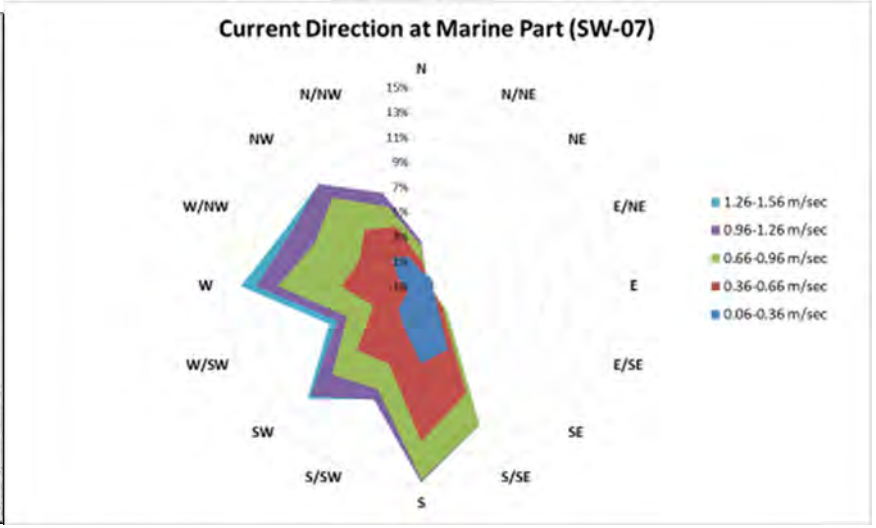
Location Id	Current characteristics
SW-07	Water depth was about 14.70 m; and maximum, minimum and average current speed was 1.541 m/s, 0.076 m/s and 0.642 m/s respectively. Current

Location Id	Current characteristics
	speed and direction mostly controlled by tidal cycle, there was no other influence such as upstream water flow and storm surge, because current measurement data has been taken in dry season. The directions were shown from South to South-East (140 degree) in low tide situation and North to North-West in high tide situation (340 degree).
SW-09	Water depth was about 12.97 m; and maximum, minimum and average current speed was 1.205 m/s, 0.098 m/s and 0.620 m/s respectively. Current speed and direction mostly controlled by tidal cycle, there was no other influence such as upstream water flow and storm surge, because current measurement data has been taken in dry season. The directions were shown from South to South-East (150 degree) in low tide situation and North to North-West in high tide situation (350 degree).
SW-11	Water depth was about 4.50 m; and maximum, minimum and average current speed was 0.907 m/s, 0.138 m/s and 0.439 m/s respectively. Current speed and direction mostly controlled by tidal cycle, there was no other influence such as upstream water flow and storm surge, because current measurement data has been taken in dry season. The directions were shown from South to South-East (150 degree) in low tide situation and North to North-West in high tide situation (350 degree).

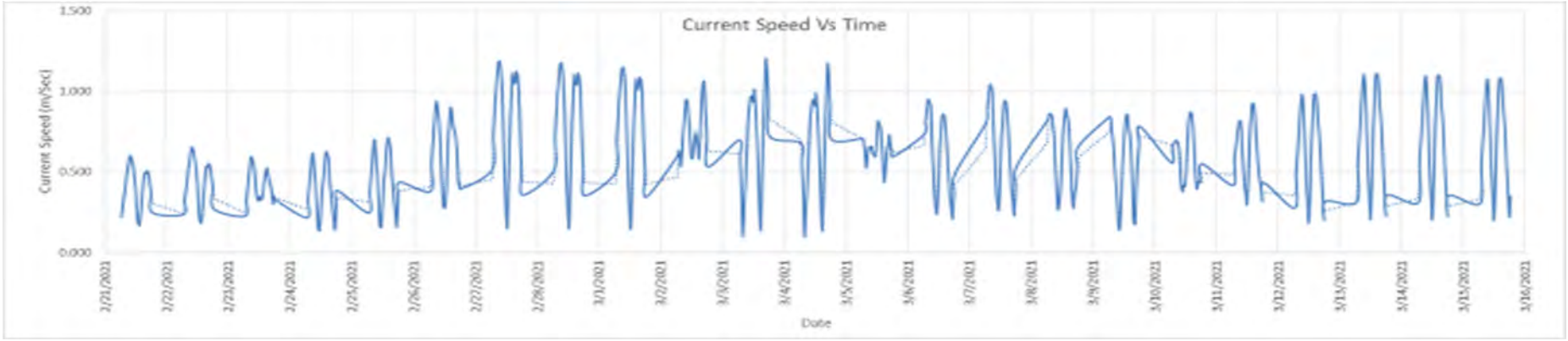
[Graphs are showing current speed and direction of location SW-07 at coastal face marine environment]

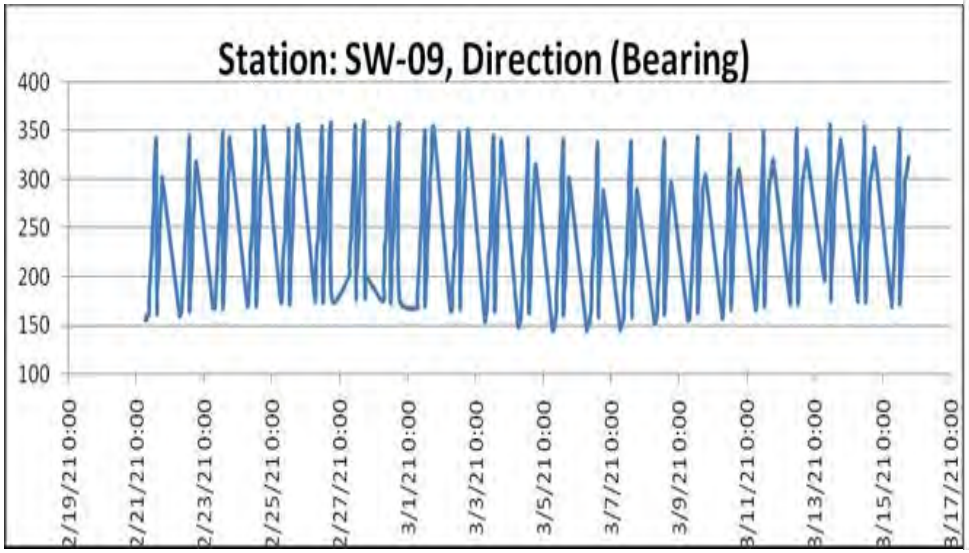


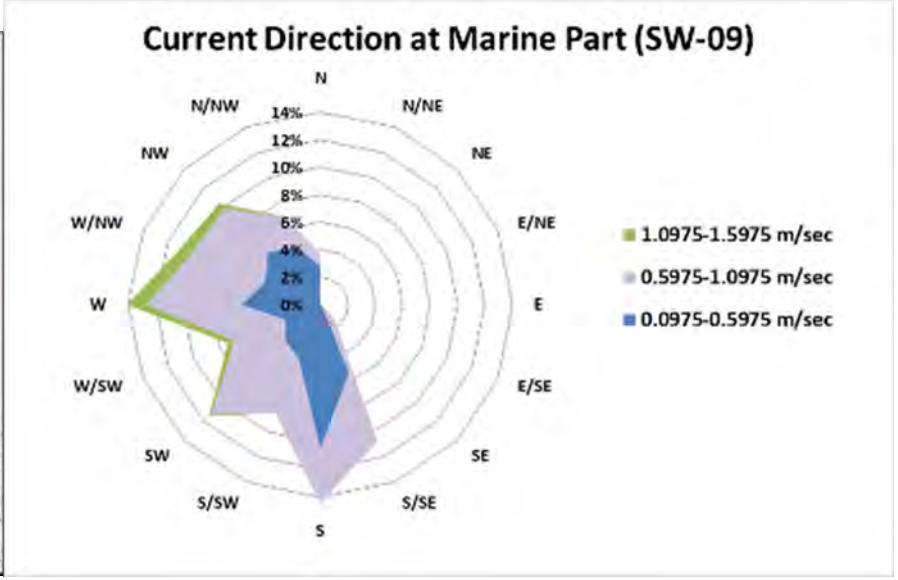




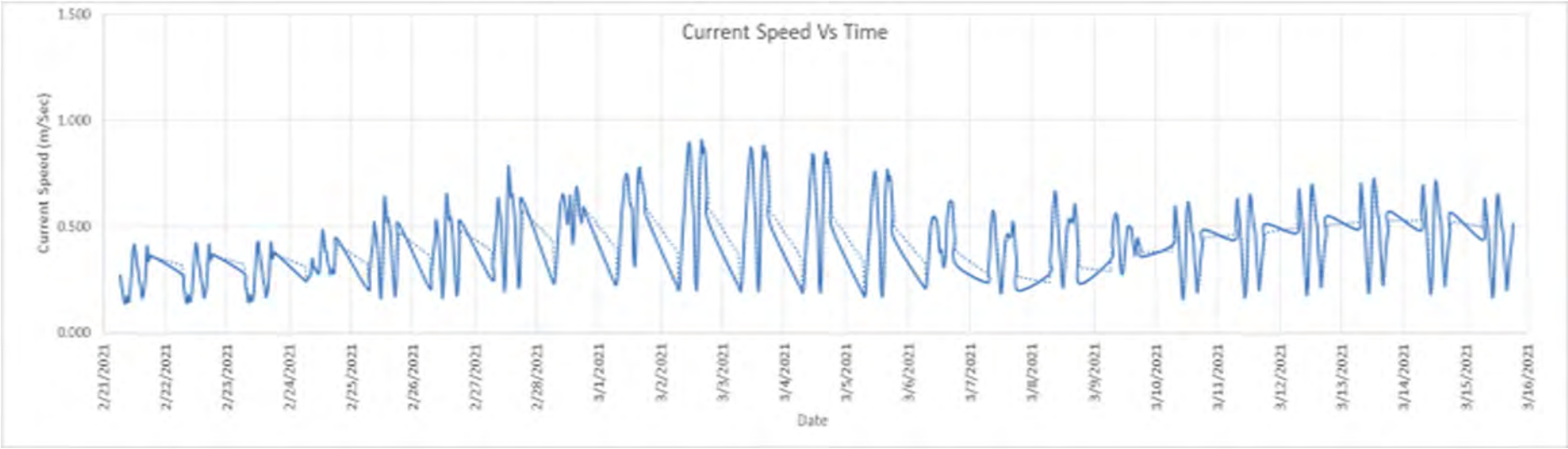
[Graphs are showing current speed and direction of location SW-09 at coastal face marine environment]

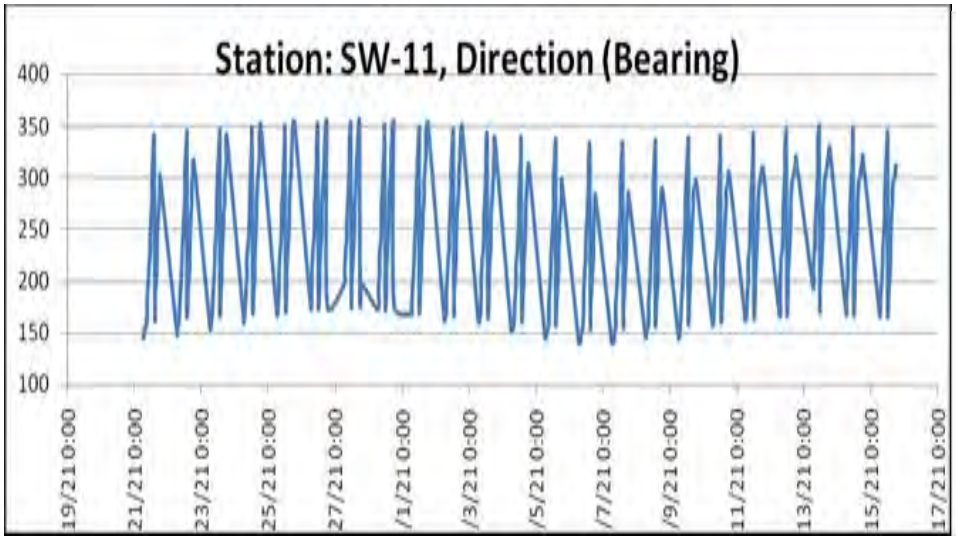


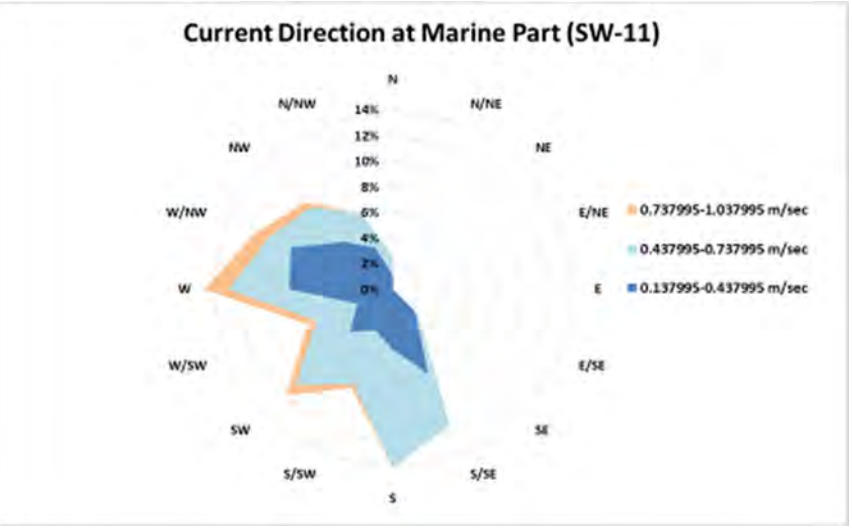




[Graphs are showing current speed and direction of location SW-11 at coastal face marine environment]





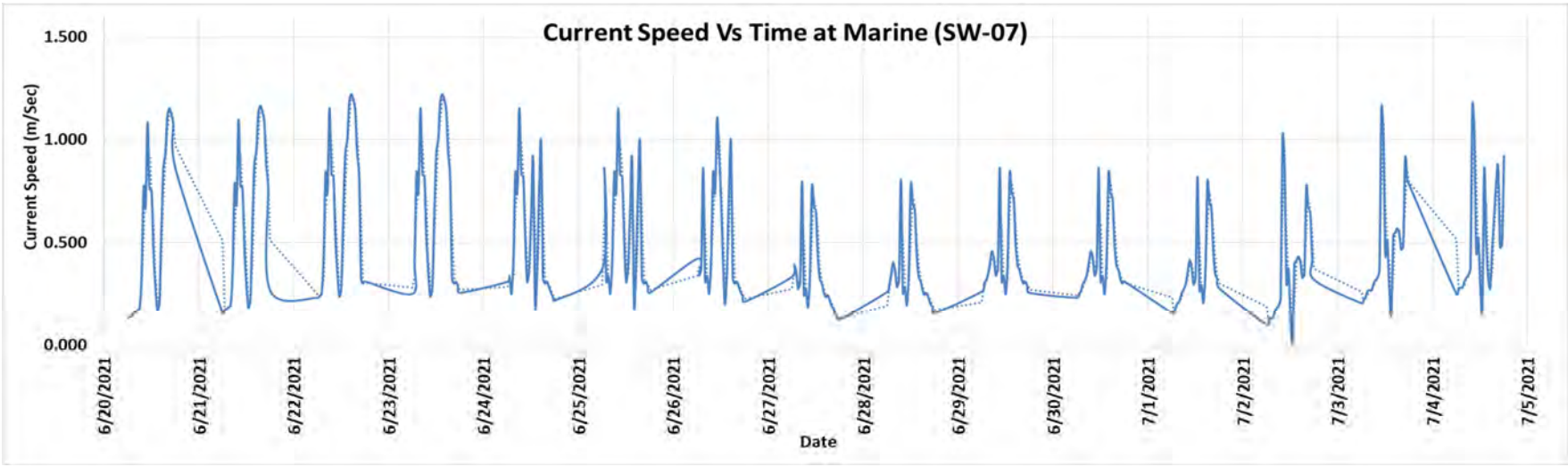


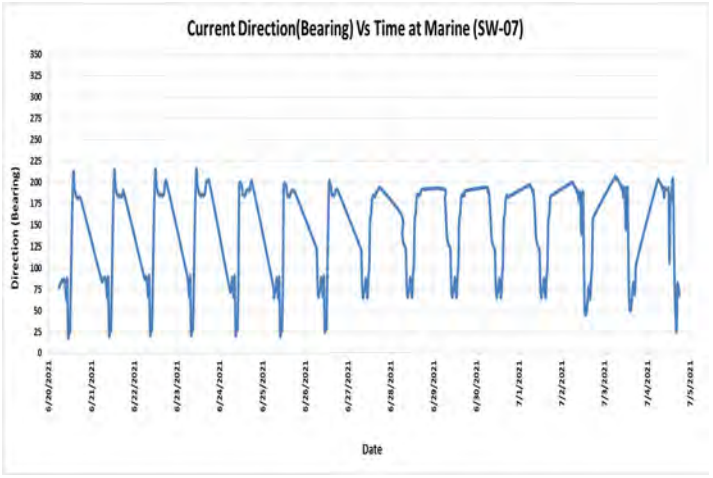
(2-1-2) Rainy Season

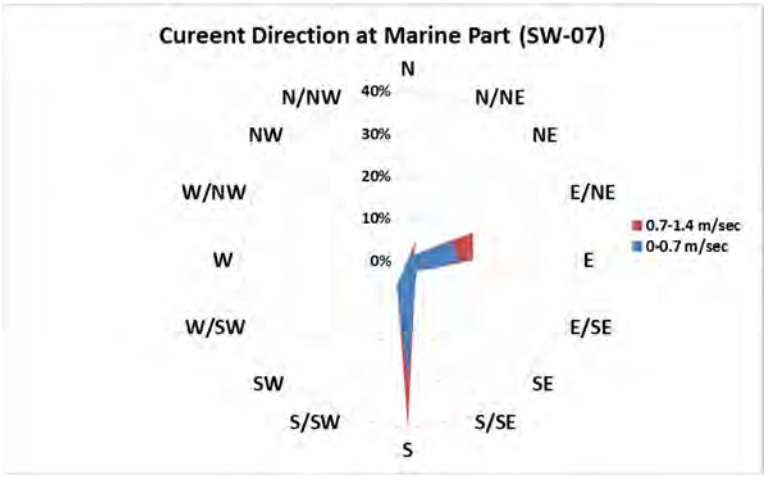
Location points is same as location of dry season. Survey activity has been completed in rainy season from 20 June to 14 July 2021.

Location Id	Current characteristics
SW-07	Maximum, minimum and average current speed was 1.221 m/s, 0.014 m/s and 0.487 m/s respectively. Current speed and direction mostly controlled by tidal cycle.
SW-09	Maximum, minimum and average current speed was 0.984 m/s, 0.146 m/s and 0.496 m/s respectively. Current speed and direction mostly controlled by tidal cycle.
SW-11	Maximum, minimum and average current speed was 1.528m/s, 0.052 m/s and 0.585 m/s respectively. Current speed and direction mostly controlled by tidal cycle.

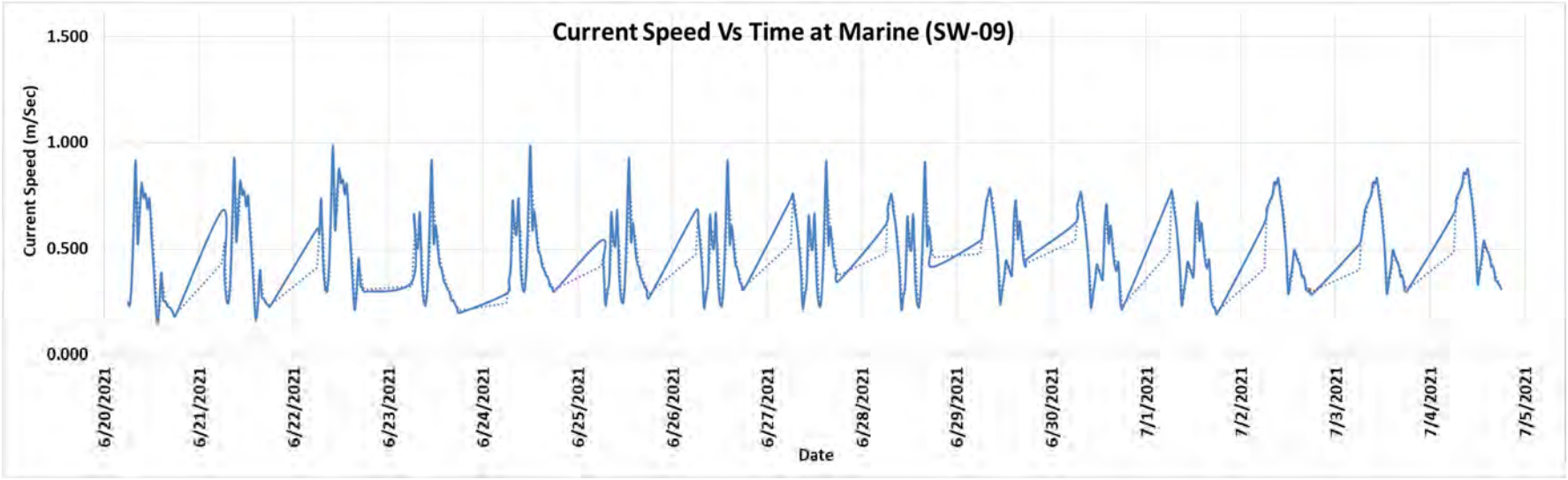
[Graphs are showing current speed and direction of location SW-07 at coastal face marine environment]

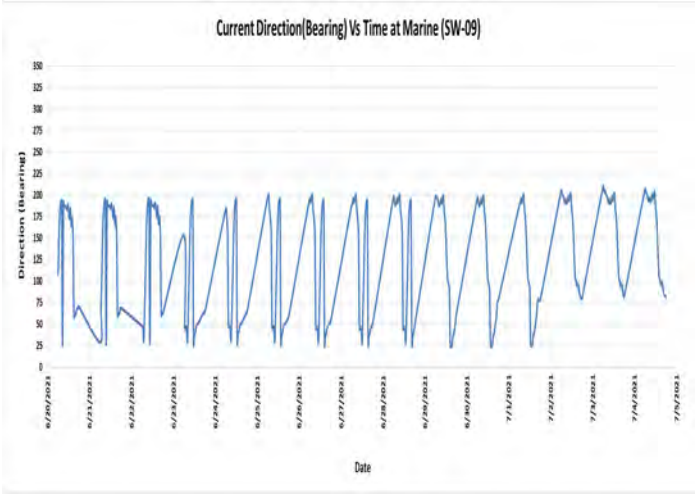


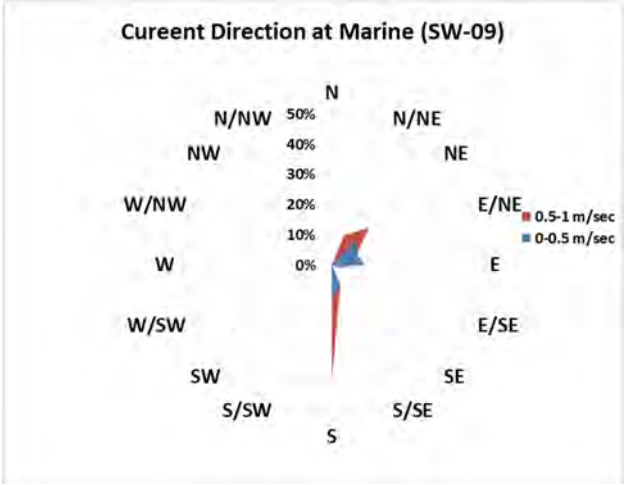




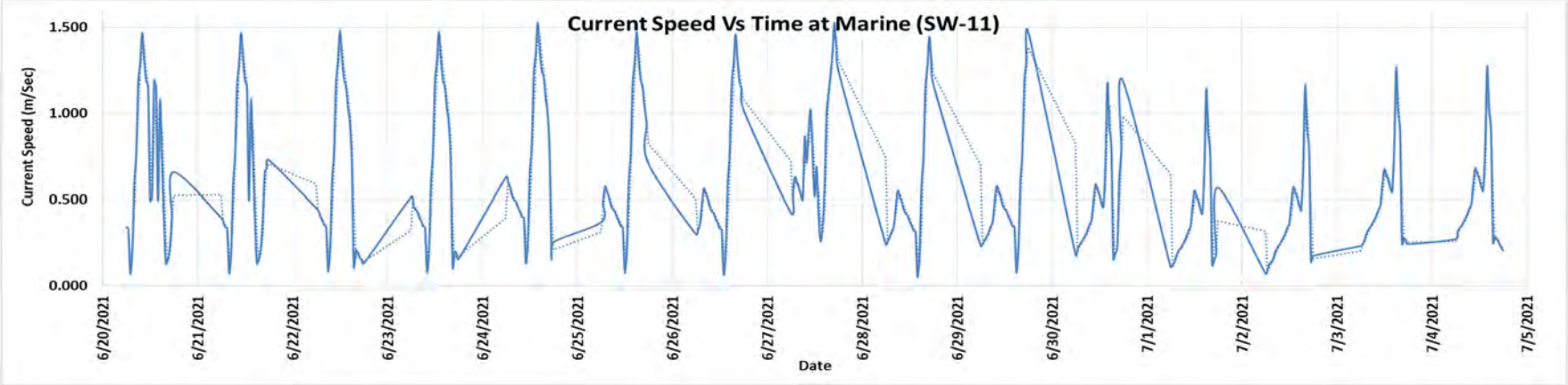
[Graphs are showing current speed and direction of location SW-09 at coastal face marine environment]

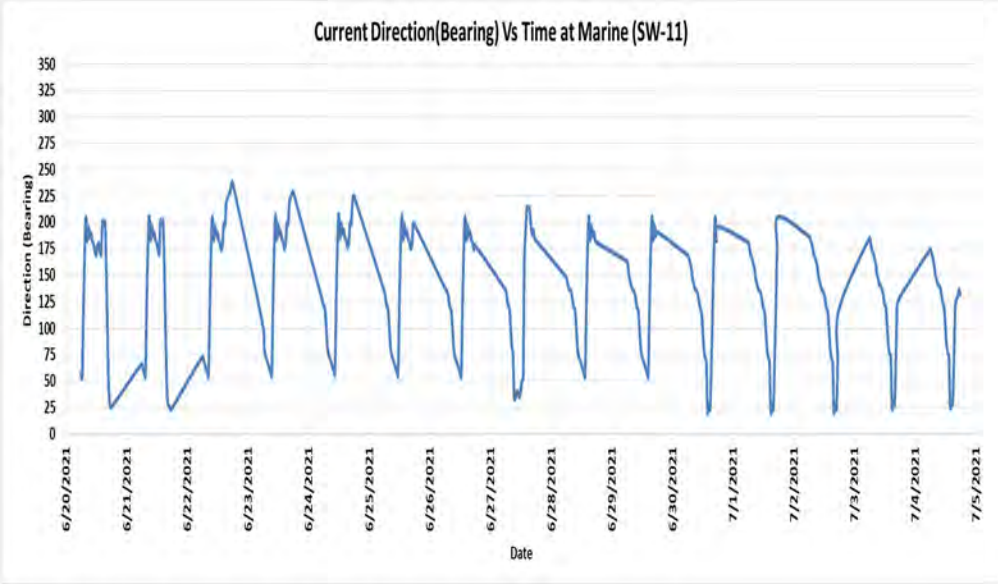


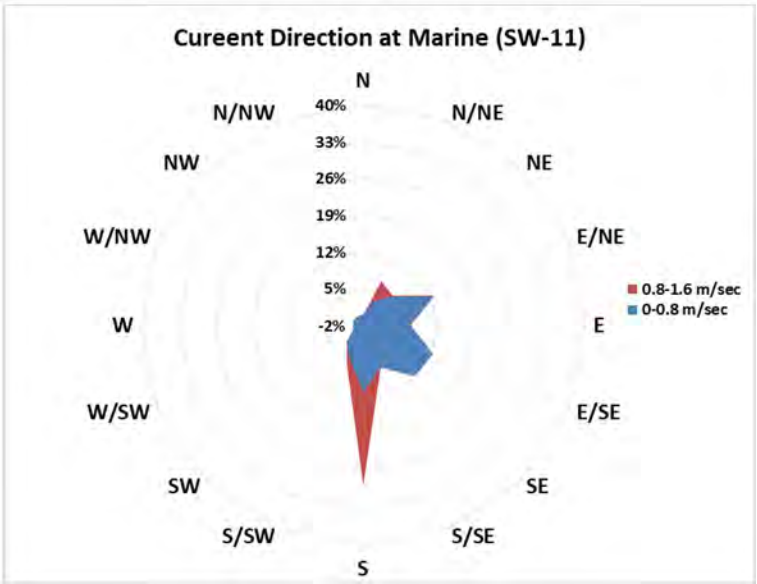




[Graphs are showing current speed and direction of location SW-11 at coastal face marine environment]







(2-2) Tidal Survey at Marine Part

(2-2-1) Dry Season

The survey area of tidal measurement is belonging within 15 km radius of the site. Location point details are as below.

Survey activity has been completed in dry season from 4 February to 7 March 2021.

Appendix 5.1 Figure-2-1: Location point detail.

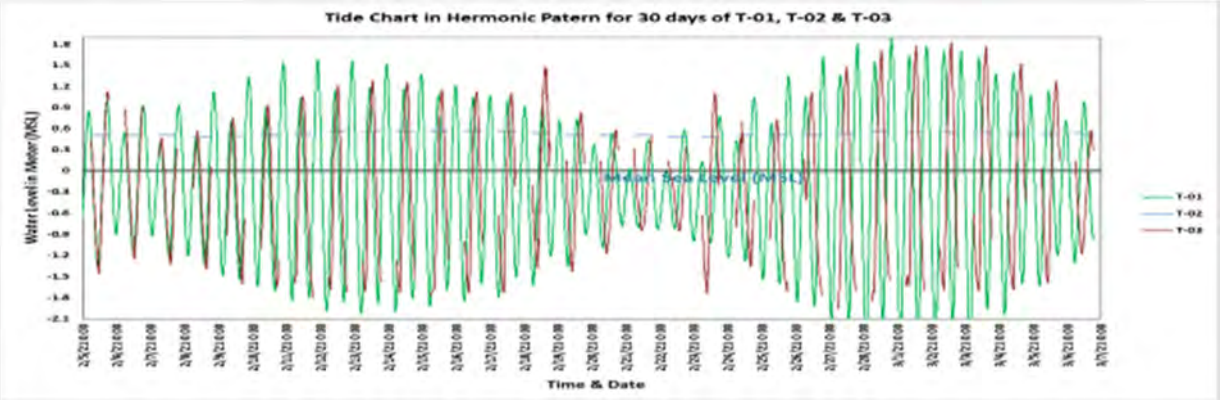
ID	Latitude	Longitude	Remarks
T1	21°42'16.57"N	91°52'19.03"E	This point is the Chittagong Port Authority tide monitoring station and data Collected from them.
T2	21°43'11.75"N	91°53'49.65"E	Data collection competed by survey team from Tide Gauge
T3	21°43'43.85"N	91°54'20.15"E	

Summary of maximum, minimum and average tide height situation are given in the following tables. Mean Sea Level (MSL) was used for height calculation. Periodic tide level graphs of T-01 and T-03 are following similar harmonic trend for both high tide and low tide situation. But periodic tide data of T-02 location is showing different from others and following flat trend without any fluctuation during high tide and low tide situation. This location point of tide level measurement is not well

connected with the marine water body.

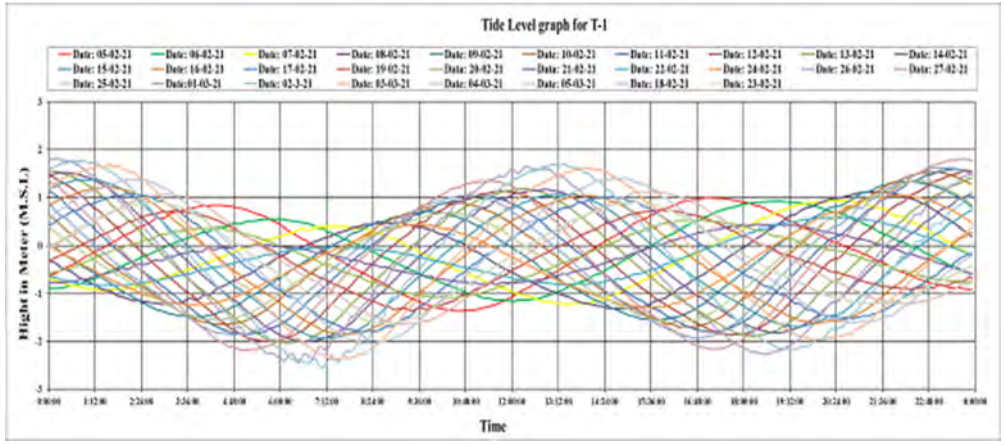
Appendix 5.1 Table-2-1: Tide level data analysis result summary.

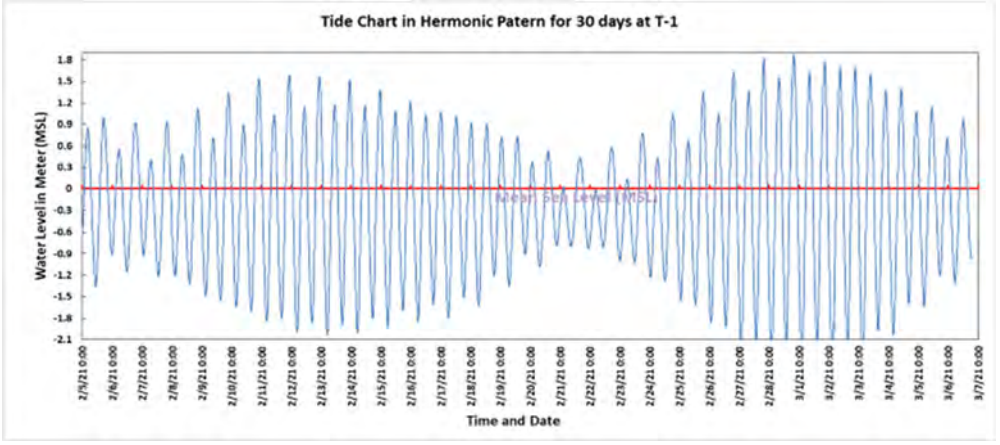
Sl	Location ID	Max. Tide Height	Min. Tide Height	Avg. Tide Height	Remarks
1	T-01	1.948m	-2.559m	-0.235m	Active Tidal Effect
2	T-02	0.571m	0.470m	0.526m	No Tidal Effect
3	T-03	1.824m	-1.956m	-0.269m	Active Tidal Effect



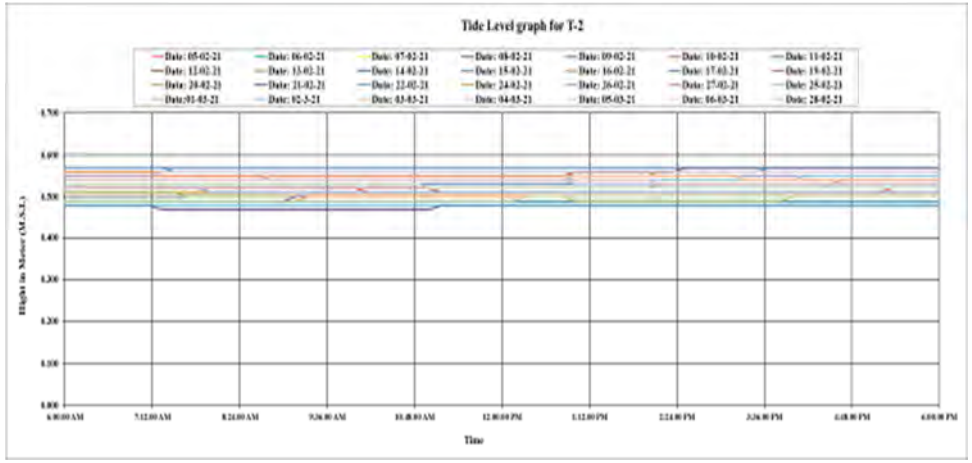
Appendix 5.1 Figure-2-2: Harmonic pattern of T-1, T-2 and T-3

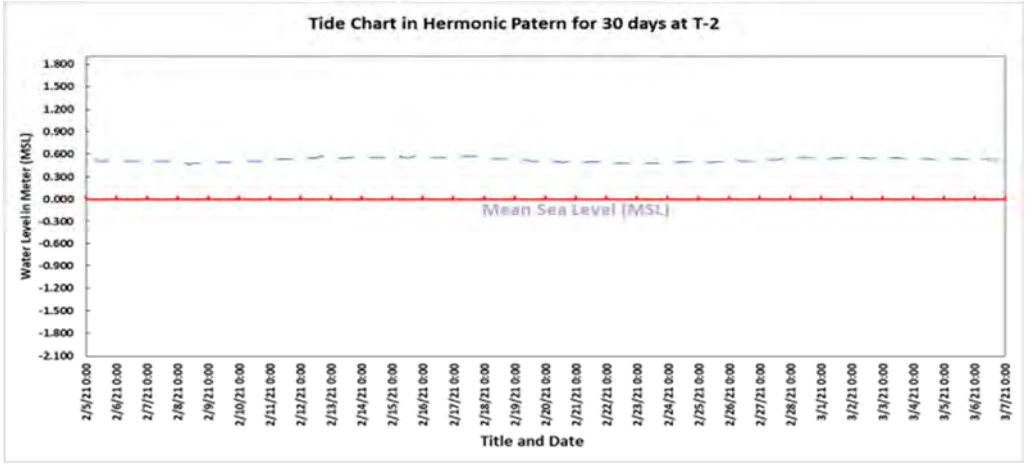
[Tide Level data at Location ID- T-01]



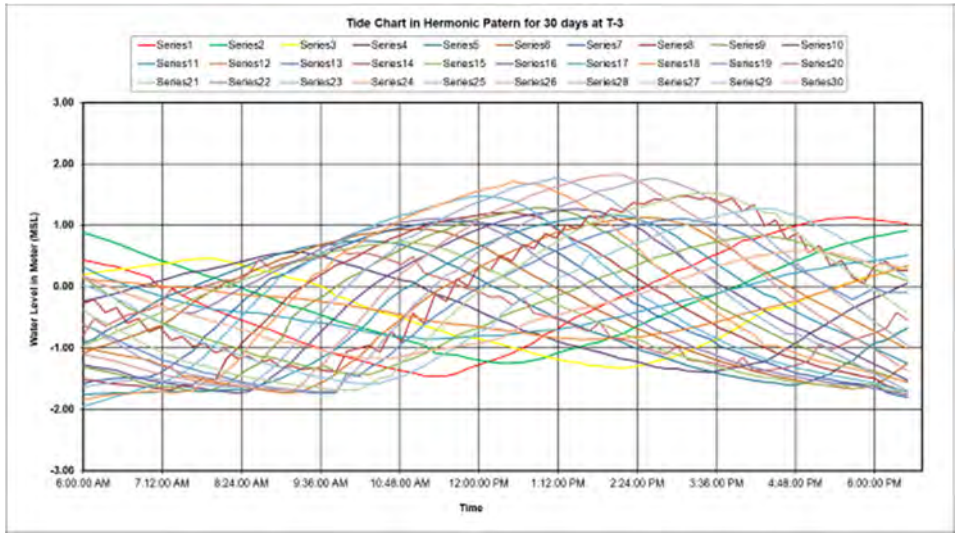


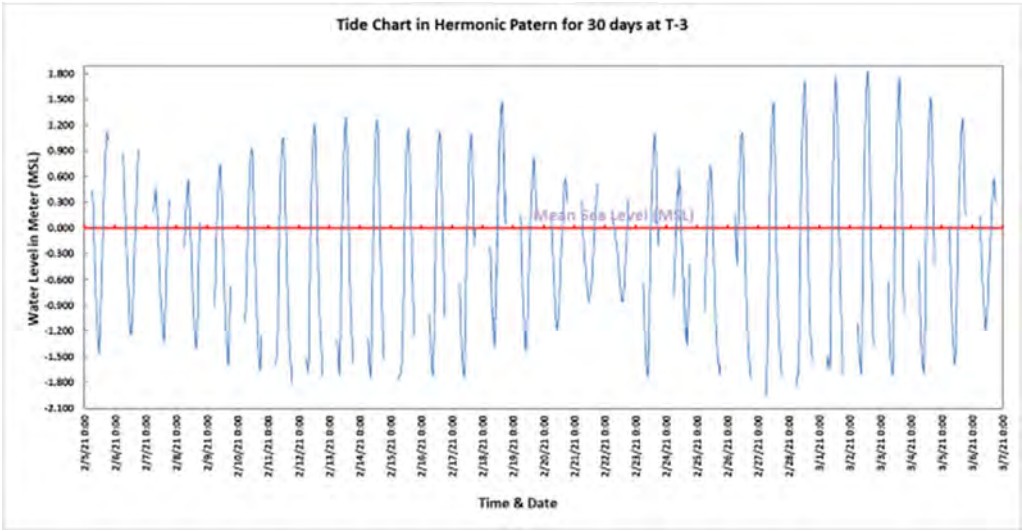
[Tide Level data at Location ID- T-02]





[Tide Level data at Location ID- T-03]





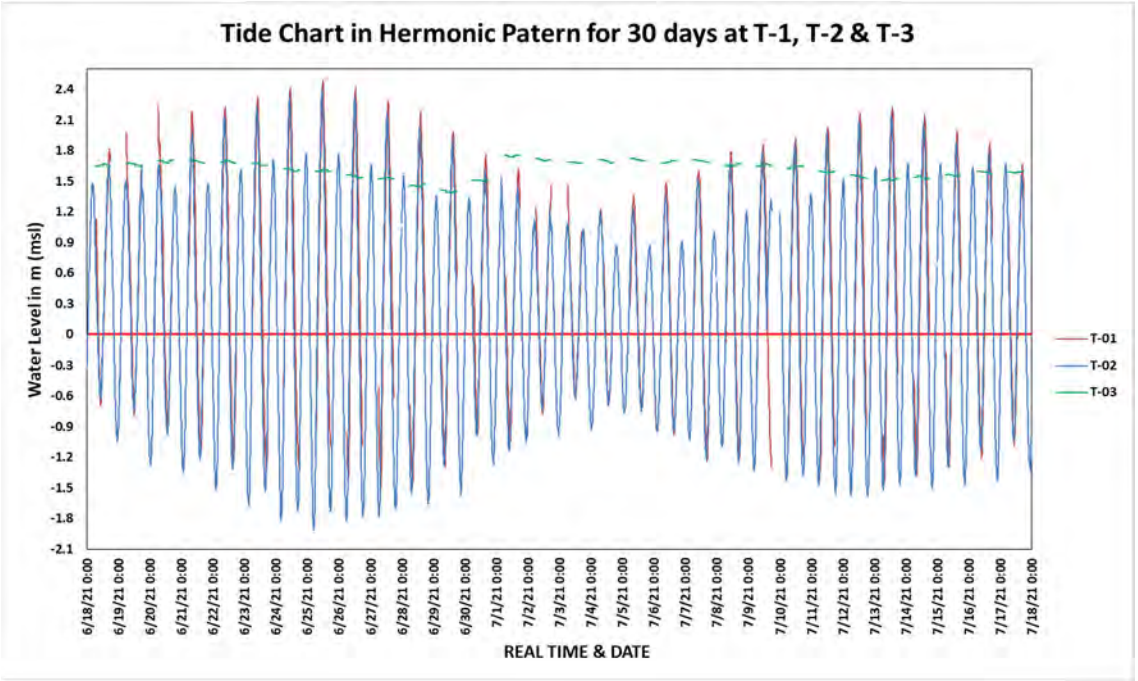
(2-2-2) Rainy Season

Location points is same as location of dry season. Survey activity has been completed in rainy season from 18 June to 17 July 2021.

Summary of maximum, minimum and average tide height situation are given in the following tables. Mean Sea Level (MSL) was used for height calculation. Periodic tide level graphs of T-01 and T-03 are following similar harmonic trend for both high tide and low tide situation. But periodic tide data of T-02 location is showing different from others and following flat trend without any fluctuation during high tide and low tide situation. This location point of tide level measurement is not well connected with the marine water body.

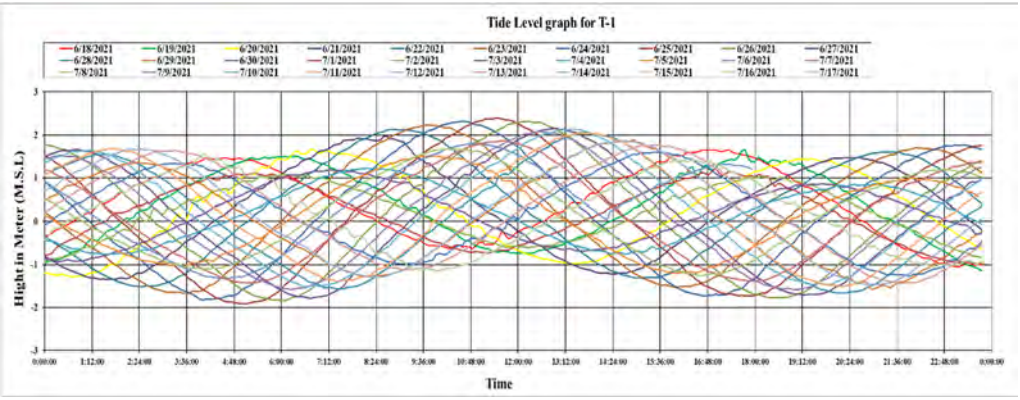
Appendix 5.1 Table-2-1: Tide level data analysis result summary.

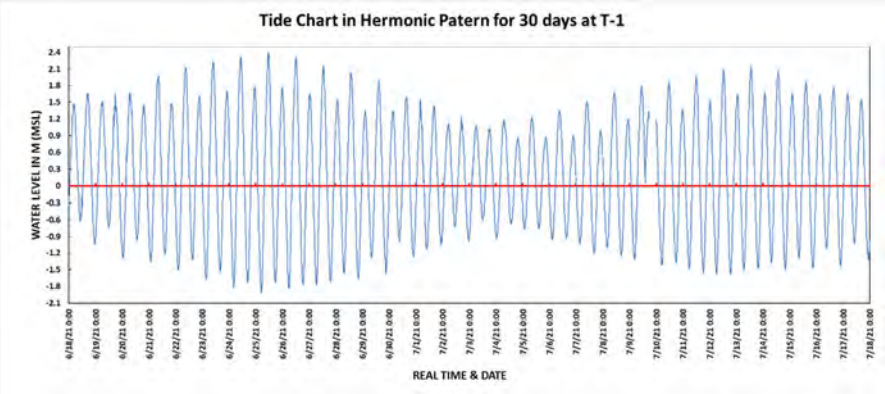
Sl	Location ID	Max. Tide Height	Min. Tide Height	Avg. Tide Height	Remarks
1	T-01	1.769m	-1.911m	-0.089m	Active Tidal Effect
2	T-02	1.750m	1.390m	1.619m	No Tidal Effect
3	T-03	2.490m	-1.500m	0.453m	Active Tidal Effect



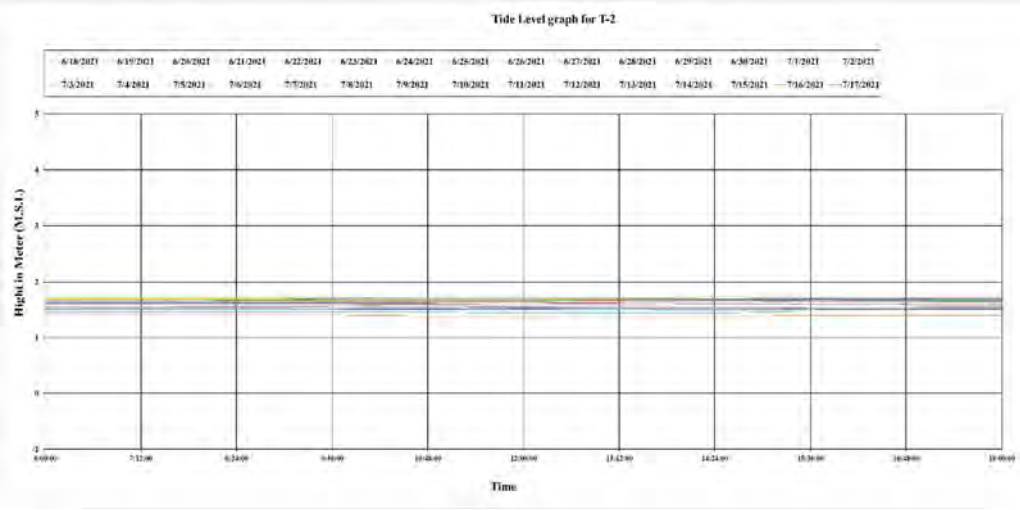
Appendix 5.1 Figure -(2-2)-2: Harmonic pattern of T-1, T-2 and T-3

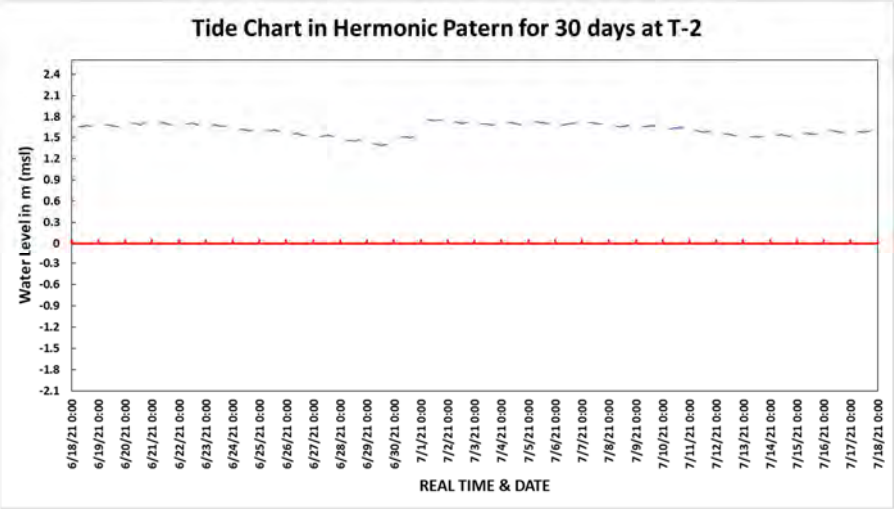
[Tide Level data at Location ID- T-01]



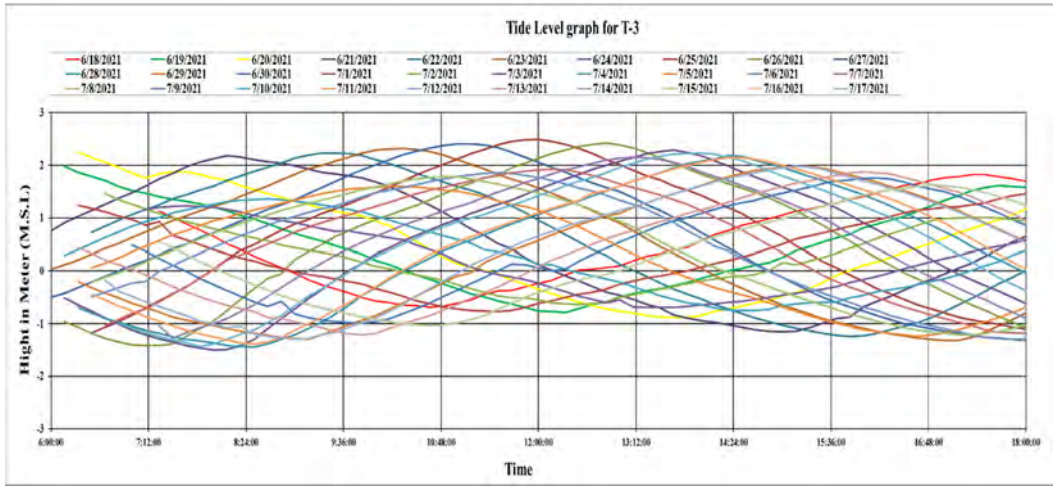


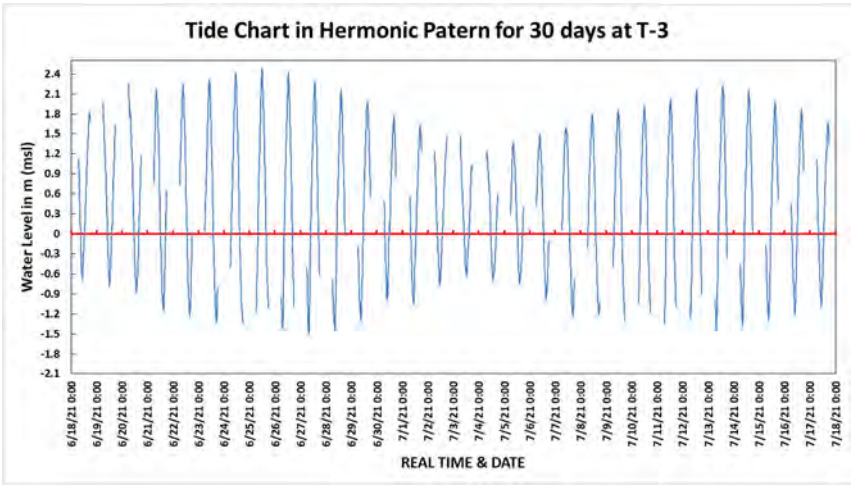
[Tide Level data at Location ID- T-02]





[Tide Level data at Location ID- T-03]





Appendix5.1.6

5.1.6 Soil

(1) The survey for FS 3/4

Appendix 5.1 Table (1)-1 Survey results of Soil

Location : SL03

Parameter	Unit	Dry season	Rainy season
		17-Feb-21	15-Jul-21
Arsenic	(ppm)	ND	ND
Cadmium	(ppm)	ND	ND
Chromium	(ppm)	15.3	31.6
Mercury	(ppm)	ND	ND
Lead	(ppm)	7.2	11.6
Total Nitrogen	(%)	0.06	0.08
Potassium	(K+/100g s	0.21	0.31
Phosphorus	(ppm)	3.3	4.7

Note: , ND; Not Detected

SL03 is in Matarbari village (SL01&SL02 are the project site boundary).

(2) The Environmental monitoring report on Units 1/2 Construction Work

Appendix 5.1 Table (2)-1 Survey results of Soil (2019.1-2020.12)

Parameter	Unit	Sep-17 (Baseline)		Jan-19		Apr-19		Jul-19		Oct-19		Range(Min - Max) during survey		
		SL-01	SL-02	SL-01	SL-02	SL-01	SL-02	SL-01	SL-02	SL-01	SL-02	Min	~	Max
Arsenic	(ppm)	ND	ND	6.3	1.8	ND	ND	ND	ND	ND	ND	ND	~	6.3
Cadmium	(ppm)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND			ND
Chromium	(ppm)	ND	ND	23.6	10.7	31.1	34.1	11.7	34.7	12.5	23.1	10.7	~	34.7
Mercury	(ppm)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND			ND
Lead	(ppm)	ND	ND	26	10.3	9.2	14.3	6.1	13.3	6.3	11.4	6.1	~	26
Total Nitrogen	(%)	0.07	0.07	0.06	0.12	0.04	0.04	0.08	0.05	0.07	0.08	0.04	~	0.12
Potassium	(K+/100g soil)	0.5	0.4	0.4	0.4	0.6	0.7	0.5	0.5	81.6	86.3	0.4	~	86.3
Phosphorus	(ppm)	48.8	12	41.6	2.7	17.6	1.6	38.7	2.5	20.6	2	1.6	~	41.6

Parameter	Unit	Sep-17 (Baseline)		Jan-20		Apr-19		Jul-19		Oct-19		Range(Min - Max) during survey		
		SL-01	SL-02	SL-01	SL-02	SL-01	SL-02	SL-01	SL-02	SL-01	SL-02	Min	~	Max
Arsenic	(ppm)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND			ND
Cadmium	(ppm)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND			ND
Chromium	(ppm)	ND	ND	23.2	27.4	18.1	24.3	18.3	36.7	16.1	27.3	16.1	~	36.7
Mercury	(ppm)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND			ND
Lead	(ppm)	ND	ND	8	12.2	6.2	7.6	9.8	19.4	10.4	20.7	6.2	~	20.7
Total Nitrogen	(%)	0.07	0.07	0.1	0.08	-	-	-	-	0.07	0.09	0.07	~	0.1
Potassium	(K+/100g soil)	0.5	0.4	0.3	0.4	-	-	-	-	0.5	0.5	0.3	~	0.5
Phosphorus	(ppm)	48.8	12	35.2	42.4	-	-	-	-	33.4	2.5	2.5	~	42.4

Note: , ND; Not Detected
-;Test not Performed

Sampling Point	Latitude (North)	Longitude (East)
SL-1	91°52'13.60"E	21°41'49.20"N
SL-2	91°52'39.60"E	21°42'31.50"N

Note; Analysis method

Parameters	Sampling Method	Laboratory Analysis Method
Physical Properties	Hand Auger uses as per following process prior to collect Sediment sample from top soil. Hand Auger to be washed with distilled water for 3 times prior to sampling at each location. Then it is washed again with 5% HNO3 and methanol separately to prevent from metal contamination. The Hand Auger to be kept in open air for drying prior to collect sample. 1 kg of samples are collected for each sampling location. Self-sealed plastic container uses to preserve and deliver the Soil samples to the SGS laboratory at Dhaka. All samples to be accompanied by Chain of Custody (CoC) forms for QA/QC purpose.	
Mercury (Hg)		AOAC 19th Edition 2012, Optical Emission Spectrometry by ICP-OES.
Arsenic		AOAC 19th Edition 2012, Optical Emission Spectrometry by ICP-OES.
Lead (Pb)		AOAC 19th Edition 2012, Optical Emission Spectrometry by ICP-OES.
Chromium Hexavalent (Cr^{6+})		APHA 22nd Edition 2012 (3500-Cr(VI)B)
Cadmium (Cd)		AOAC 19th Edition 2012, Optical Emission Spectrometry by ICP-OES.
Total Nitrogen (N)		Micra Kjeldahl
Potassium (K)		Flame Photometric Method
Phosphorus (P)		APHA 22nd Edition.2012 (4500-P B&E) (Flame Photometric:)

Appendix-5.1.4

(Result of Sedimentation Survey for Kohelia Channel)

5.1.4. Sedimentation

(1) Survey Location

Survey Location of Sedimentation is shown in the Figure 5.1.4-1. Survey Location points of Sedimentation is shown in the Table 5.1.4-1.

Source: Study Team

Figure 5.1.4-1 Survey Location of Sedimentation

Table 5.1.4-1 Survey Location points of Sedimentation

Location Id	Latitude	Longitude	Remarks
S-01	21.72868611°	91.90651111°	・ Survey and sample collection has been completed by one day. ・ Samples were shifted to the laboratory within 48 hours.
S-03	21.72092222°	91.90990833°	
S-05	21.71334722°	91.91280833°	
S-07	21.70579444°	91.91101944°	
S-09	21.69868333°	91.90424444°	
S-11	21.69428056°	91.89585278°	
S-13	21.69201667°	91.88673056°	
S-15	21.68686111°	91.87978056°	
S-17	21.67785833°	91.87807778°	
S-18	21.76384722°	91.90446944°	
S-19	21.66930000°	91.88086944°	
S-20	21.73900556°	91.90826389°	
S-23	21.65283889°	91.88671667°	
S-24	21.71677222°	91.90046944°	S-24 : Rangakhali River

Source: Study Team

(2) Survey Period

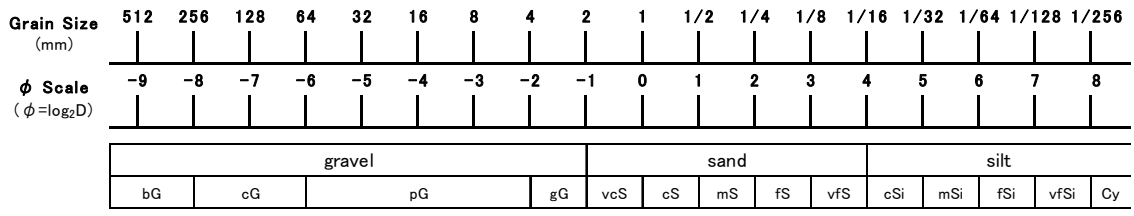
Dry season : February,2021

Normal season : July,2021

(3) Grain Size Analysis

Samples collected were performed according to Wentworth grain size classification. Grain size standard for sediment classification is shown in the Figure 5.1.4-2. Sediment classification and naming is shown in the Table 5.1.4-2.

The grain size analysis was performed by sieving analysis. Sieve analysis is performed by sieving the test mesh sieve (2 mm, 1 mm, 0.5 (= 1/2) mm, 0.25 (= 1/4) mm, 0.125 (= 1/8) mm, 0.063 (= 1 /16)mm).



Source: Study Team

Figure 5.1.4-2 Grain size standard for sediment classification

Table 5.1.4-2 Sediment classification and naming

Aggregate	Clast	Abbreviation
gravel	boulder gravel	bG
	cobble gravel	cG
	pebble gravel	pG
	granule gravel	gG
sand	very coarse sand	vcS
	coarse sand	cS
	midium sand	mS
	fine sand	fS
	very fine sand	vfS
silt	coarse silt	cSi
	midium silt	mSi
	fine silt	fSi
	very fine silt	vfSi
	clay	Cy

Source: Study Team

(4) Results

(a) Dry Season

Histogram of grain size distribution at survey points is shown in the Table 5.1.4-3. Weight percent frequency shown in the Figure 5.1.4-3. Around the planned site and north of the planned site (S-20, S-01, S-03, S-05, S-07,S-13) and the Rangakhali Channel (S-24), the grain size of 0.25 mm (medium sand) is predominant. On the south side of the planned site (S-09, S-13, S-15), 0.063 mm (very fine sand), 0.125 mm (fine sand) and 0.25 mm (medium sand) were mixed. Further on the south side (S-17, S-19, S-23), the gtain size became smaller as it went south.

Composition Ratio of Sediment distribution is shown in the Figure 5.1.4-4.Composition Ratio of Sand distribution is shown in the Figure 5.1.4-5. The composition ratio of sand distribution at the survey site is 73.2 to 99.6%, and the sand content is very high, so it can be said that the sediment of the Kohelia Channel is sandy.

Cumulative Sieving Results at Survey Points (Grain size; small → large) is shown in the Table 5.1.4-4. Grain size accumulation line is shown in the Figure 5.1.4-6. Good or bad of grain size distribution is shown in the Table 5.1.4-5.The passing weight percentages of D10, D30, and D60 were read from the grain size accumulation line, and the uniformity coefficient U_c and the coefficient of curvature U_c' were calculated. According to the definitions of method of classification of soil in Japan※1 and method of classification of soil in America※2, grain size distribution was "good" except for S-09 and S-15. However, since the uniformity coefficient U_c was outside the scope of the both method of classification of soil, it was judged by the value of the coefficient of curvature U_c'.

※1　$U_c \geqq 10,\ 1 < U_c{}' < \sqrt{U_c}$

※2　$U_c \geqq 6,\ 1 < U_c{}' < 3$

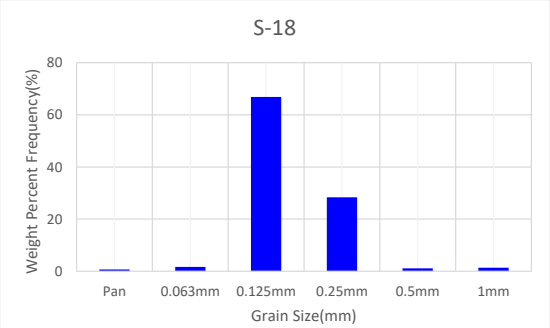
Cumulative Sieving Results at Survey Points (Grain size; large → small) is shown in the Table 5.1.4-6. Grain size distribution and transport mode of sediments based on Visher (1969) is shown in the Figure 5.1.4-7. Visher (1969) categorized the movement patterns of sediments into "suspension that floats in water", "traction that moves at the bottom", and "saltation". The grain size distribution was considered to be composed of these sub-populations. From the graph, it was found that the sand in the Kohelia Channel is mainly moved by "saltation".

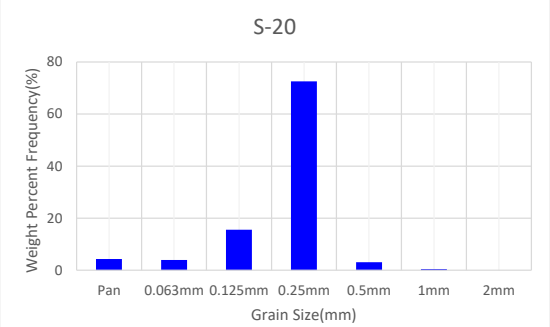
Table 5.1.4-3　【Dry Season】Histogram of grain size distribution at survey points

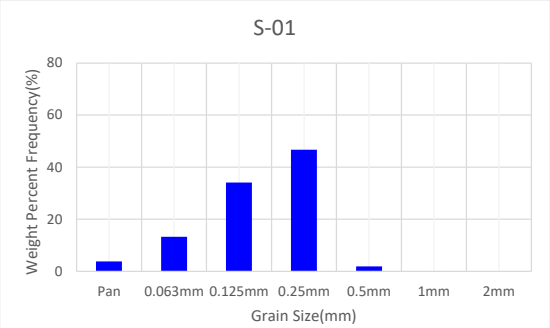
unit：%

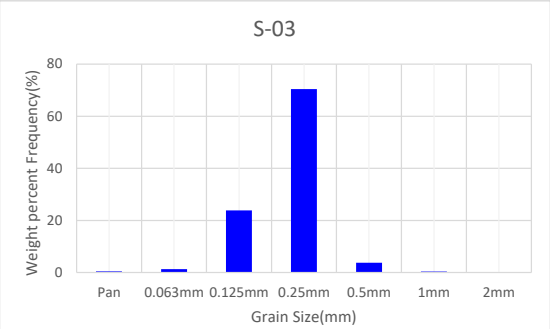
	cSi	vfS	fS	mS	cS	vcS	gG
Grain Size	Pan	0.063mm	0.125mm	0.25mm	0.5mm	1mm	2mm
Sample Id. / ϕ Scale	5	4	3	2	1	0	−1
S−18	0.659	1.635	66.908	28.408	1.064	1.327	0.000
S−20	4.324	3.962	15.557	72.582	3.123	0.452	0.000
S−01	3.855	13.269	34.127	46.728	1.883	0.137	0.000
S−03	0.397	1.301	23.792	70.466	3.701	0.343	0.000
S−05	0.635	6.929	33.484	58.056	0.668	0.228	0.000
S−07	1.043	4.931	26.512	61.255	6.149	0.111	0.000
S−09	26.814	19.361	24.299	29.508	0.018	0.000	0.000
S−11	7.145	32.226	32.876	26.392	1.361	0.000	0.000
S−13	1.566	7.780	38.287	51.740	0.264	0.363	0.000
S−15	11.900	19.129	40.603	27.434	0.926	0.009	0.000
S−17	2.350	73.388	6.263	17.836	0.161	0.002	0.000
S−19	0.641	5.846	61.244	25.818	5.105	1.345	0.000
S−23	1.431	10.729	13.970	67.184	6.367	0.320	0.000
S−24	1.160	9.890	12.630	68.760	7.240	0.320	0.000

Source: Study Team



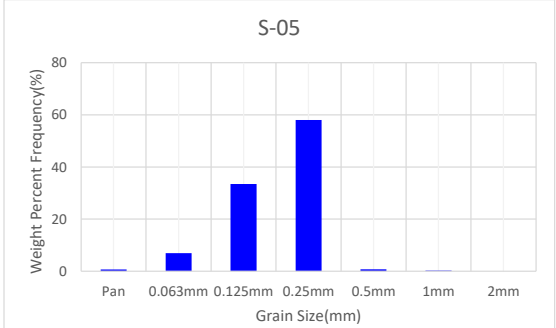


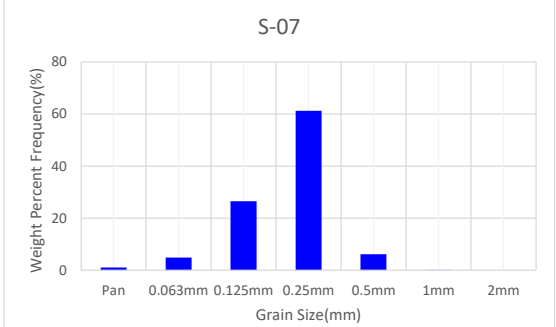


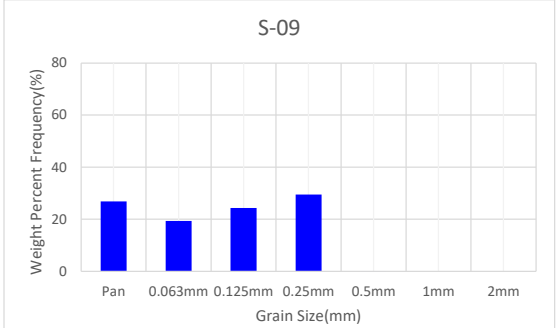


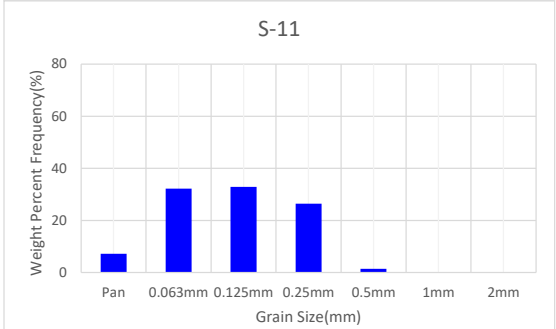
Source: Study Team

Figure 5.1.4-3(1)【Dry Season】Weight percent frequency（north side of the planned site）



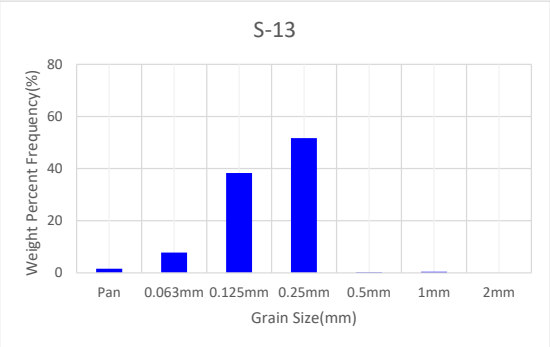






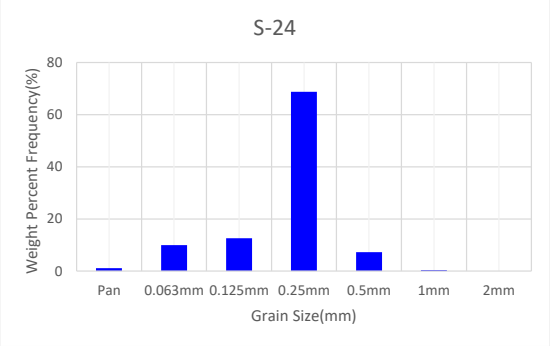
Source: Study Team

Figure 5.1.4-3(2)【Dry Season】Weight percent frequency（Around the planned site ①）



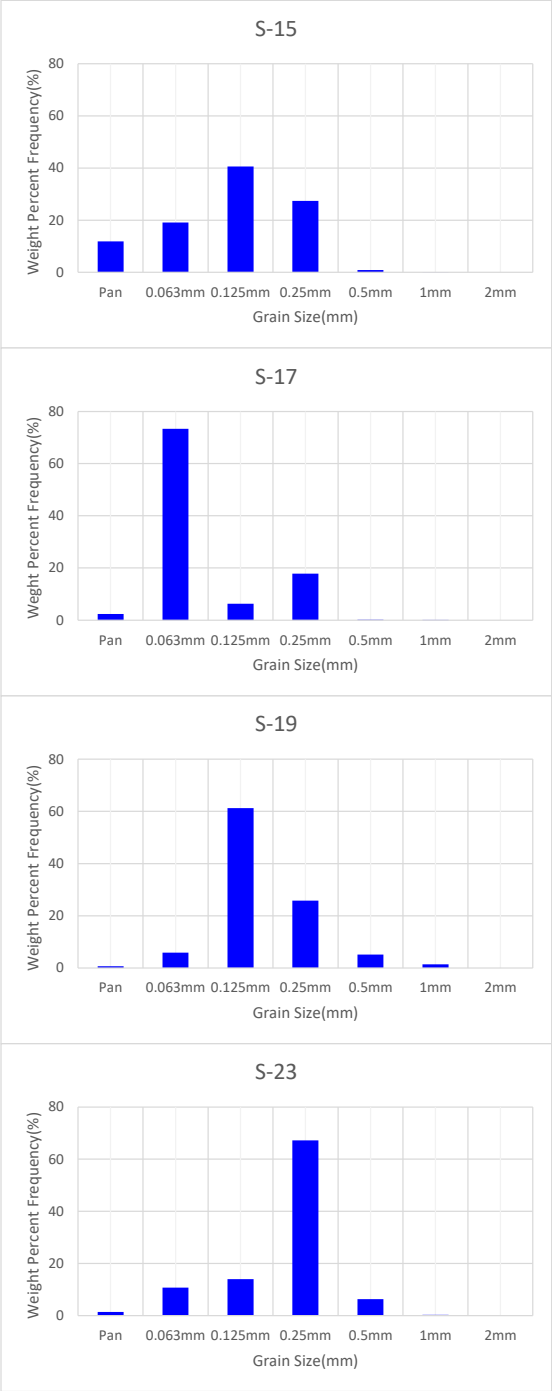
Source: Study Team

Figure 5.1.4-3(3)【Dry Season】Weight percent frequency（Around the planned site ②）



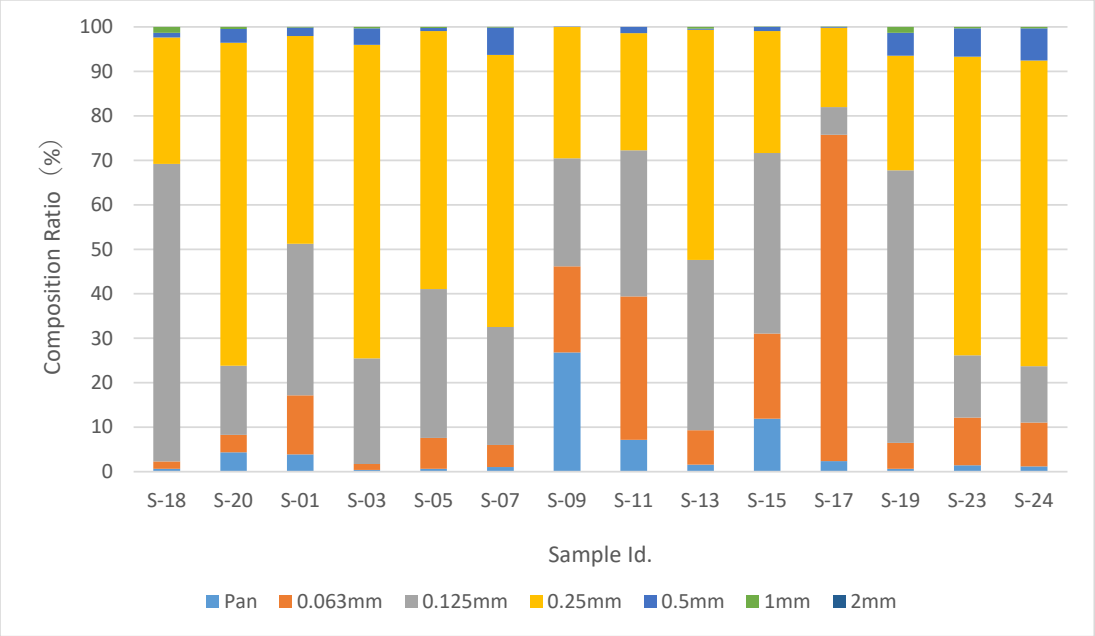
Source: Study Team

Figure 5.1.4-3(4)【Dry Season】Weight percent frequency（Rangakhali Channel）



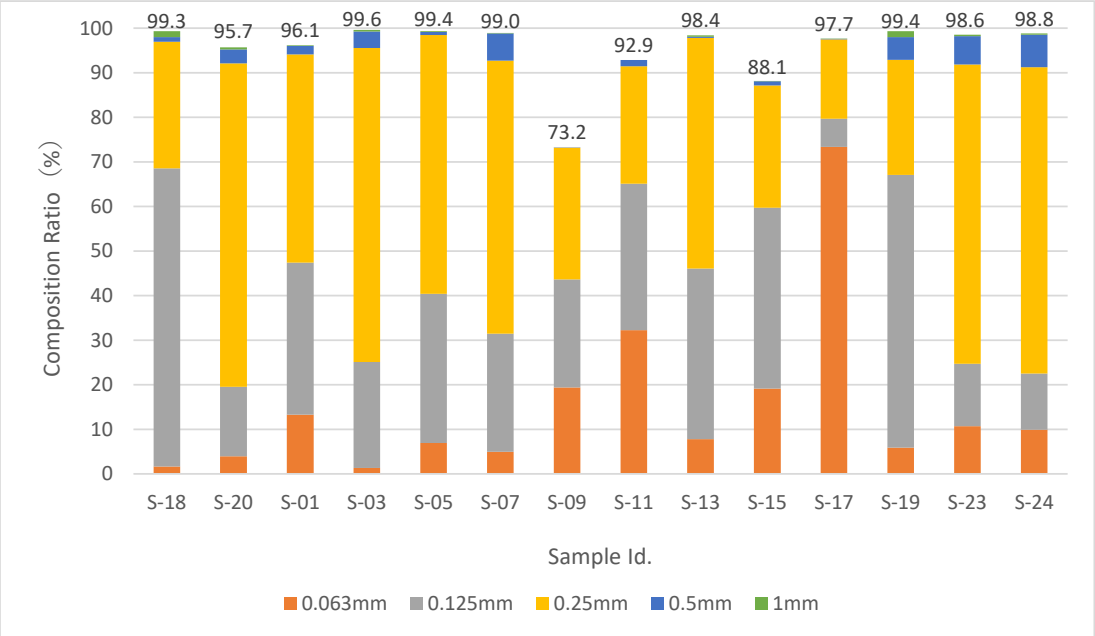
Source: Study Team

Figure 5.1.4-3(5)【Dry Season】Weight percent frequency（south side of the planned site）



Source: Study Team

Figure 5.1.4-4 【Dry Season】Composition Ratio of Sediment distribution



Source: Study Team

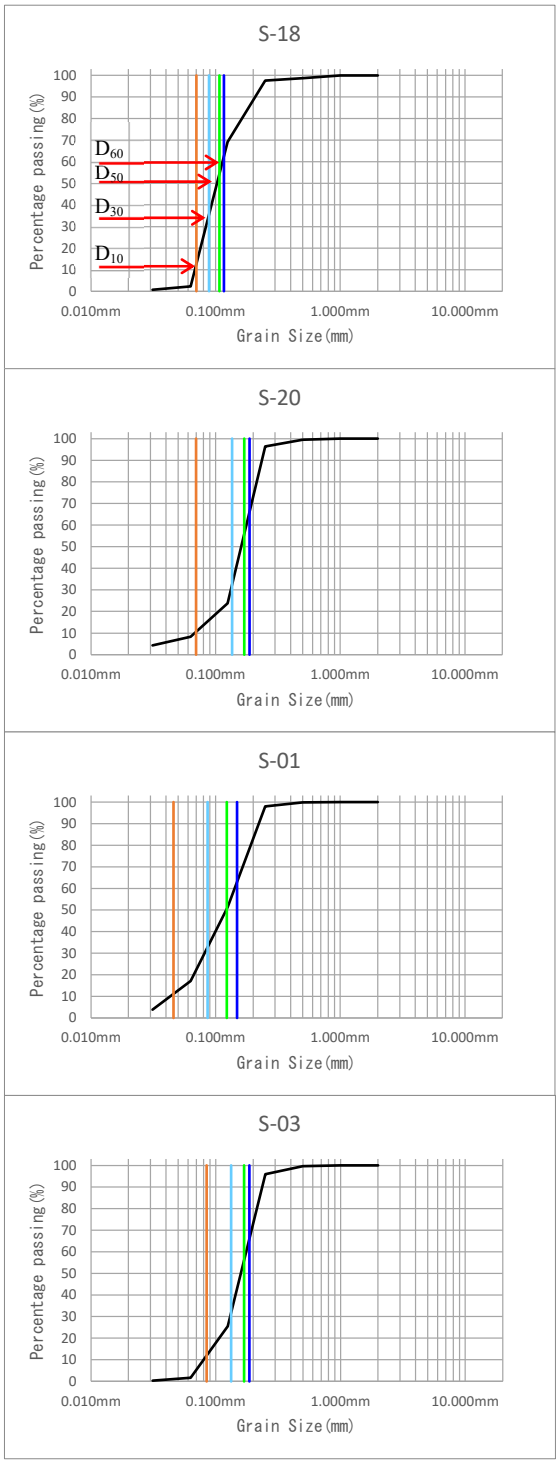
Figure 5.1.4-5 【Dry Season】Composition Ratio of Sand distribution

Table 5.1.4-4 【Dry Season】Cumulative Sieving Results at Survey Points
(Grain size; small → large)

unit : %

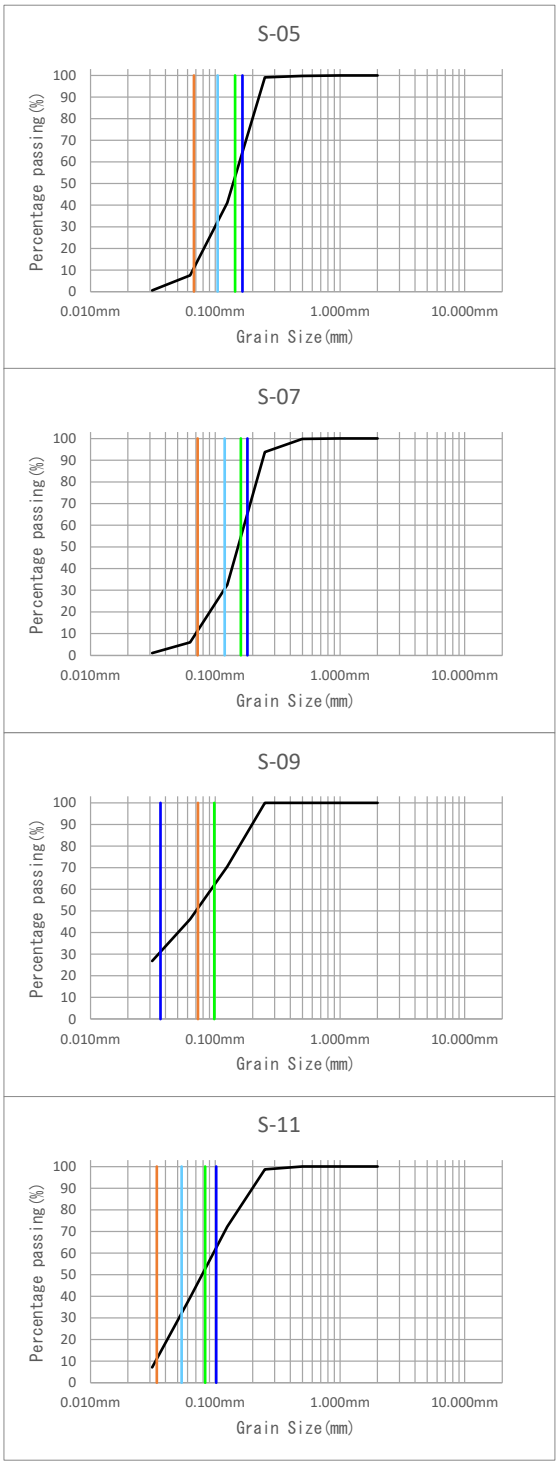
Grain Size / Sample Id.	Pan	0.063mm	0.125mm	0.250mm	0.500mm	1.000mm	2.000mm
φ Scale	5	4	3	2	1	0	−1
S−18	0.659	2.294	69.202	97.610	98.674	100.000	100.000
S−20	4.324	8.286	23.843	96.425	99.548	100.000	100.000
S−01	3.855	17.124	51.251	97.979	99.862	100.000	100.000
S−03	0.397	1.698	25.490	95.956	99.657	100.000	100.000
S−05	0.635	7.564	41.048	99.104	99.772	100.000	100.000
S−07	1.043	5.974	32.486	93.741	99.890	100.000	100.000
S−09	26.814	46.175	70.474	99.982	100.000	100.000	100.000
S−11	7.145	39.371	72.247	98.639	100.000	100.000	100.000
S−13	1.566	9.346	47.633	99.373	99.637	100.000	100.000
S−15	11.900	31.029	71.632	99.066	99.992	100.000	100.000
S−17	2.350	75.738	82.001	99.837	99.998	100.000	100.000
S−19	0.641	6.487	67.731	93.549	98.654	100.000	100.000
S−23	1.431	12.160	26.130	93.314	99.681	100.000	100.000
S−24	1.160	11.050	23.680	92.440	99.680	100.000	100.000

Source: Study Team



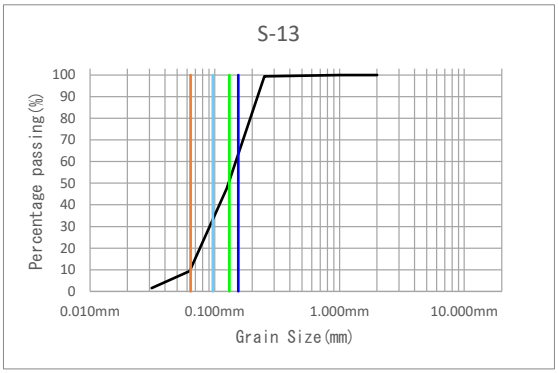
Source: Study Team

Figure 5.1.4-6(1) 【Dry Season】
Grain size accumulation line
(north side of the planned site)



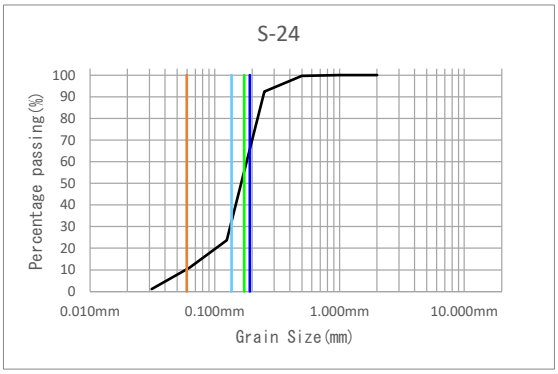
Source: Study Team

Figure 5.1.4-6(2) 【Dry Season】
Grain size accumulation line
(Around the planned site ①)



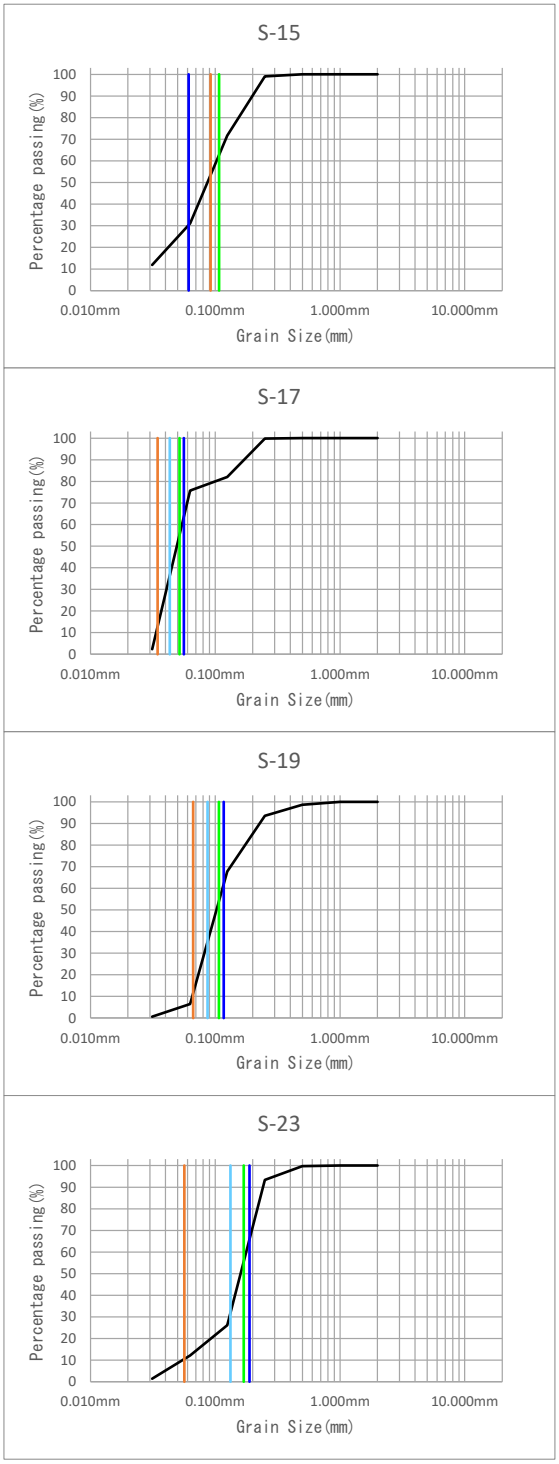
Source: Study Team

Figure 5.1.4-6 (3) 【Dry Season】
Grain size accumulation line
（Around the planned site ②）



Source: Study Team

Figure 5.1.4-6 (4) 【Dry Season】
Grain size accumulation line
（Rangakhali Channel）



Source: Study Team

Figure 5.1.4-6(5) 【Dry Season】
Grain size accumulation line
（south side of the planned site）

Table 5.1.4-5 【Dry Season】Good or bad of grain size distribution

Sample Id.	D_{10}	D_{30}	D_{50}	D_{60}	Uc D_{60}/D_{10}	Uc' $U_{30}^2/D_{10}D_{60}$	$\sqrt{Uc}$	grading quality
S-18	0.0701	0.0887	0.107	0.116	1.66	0.96	1.29	good
S-20	0.0698	0.136	0.170	0.187	2.68	1.41	1.64	good
S-01	0.0460	0.0864	0.123	0.148	3.23	1.09	1.80	good
S-03	0.0846	0.133	0.168	0.186	2.20	1.12	1.48	good
S-05	0.0675	0.105	0.144	0.166	2.46	0.98	1.57	good
S-07	0.0724	0.119	0.161	0.181	2.50	1.08	1.58	good
S-09	–	0.0365	0.0728	0.0983	–	–	–	Undecidable
S-11	0.0341	0.0538	0.0830	0.102	2.99	0.83	1.73	good
S-13	0.0641	0.0964	0.131	0.155	2.42	0.94	1.55	good
S-15	–	0.0613	0.0920	0.107	–	–	–	Undecidable
S-17	0.0346	0.0432	0.0519	0.0562	1.63	0.96	1.28	good
S-19	0.0666	0.0868	0.107	0.117	1.76	0.97	1.33	good
S-23	0.0566	0.132	0.169	0.188	3.32	1.64	1.82	good
S-24	0.0596	0.136	0.173	0.191	3.20	1.64	1.79	good

（Uc：uniformity coefficient, Uc'：coefficient of curvature）

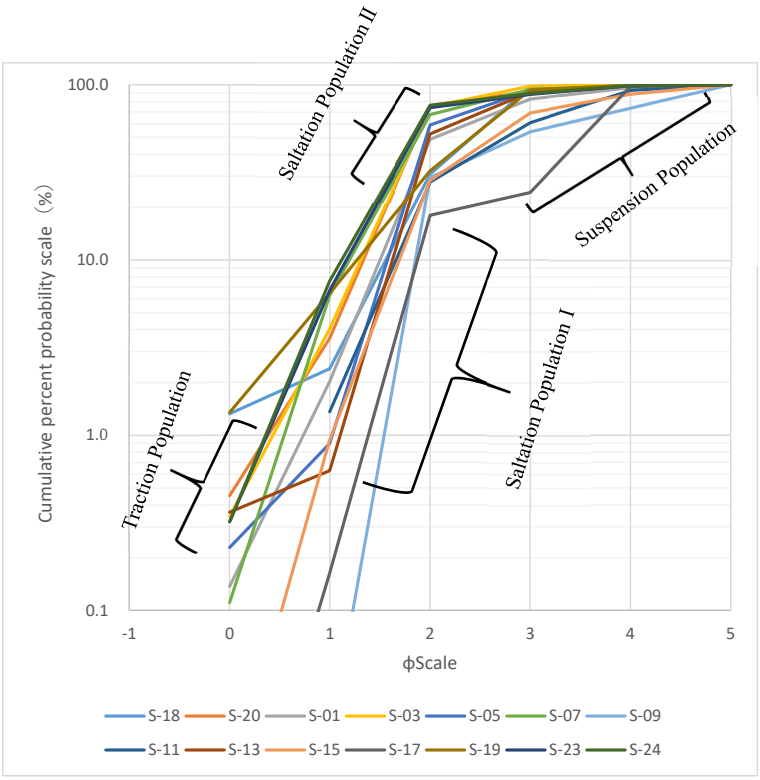
Source: Study Team

Table 5.1.4-6 【Dry Season】Cumulative Sieving Results at Survey Points
(Grain size; large → small)

unit：%

Grain Size / Sample Id. / ϕ Scale	2mm	1mm	0.5mm	0.25mm	0.125mm	0.063mm	Pan
	−1	0	1	2	3	4	5
S-18	0.000	1.327	2.391	30.799	97.707	99.342	100.00
S-20	0.000	0.452	3.575	76.157	91.714	95.676	100.00
S-01	0.000	0.137	2.020	48.748	82.875	96.144	100.00
S-03	0.000	0.343	4.044	74.510	98.302	99.603	100.00
S-05	0.000	0.228	0.896	58.952	92.436	99.365	100.00
S-07	0.000	0.111	6.260	67.515	94.027	98.958	100.00
S-09	0.000	0.000	0.018	29.526	53.825	73.186	100.00
S-11	0.000	0.000	1.361	27.753	60.629	92.855	100.00
S-13	0.000	0.363	0.627	52.367	90.654	98.434	100.00
S-15	0.000	0.009	0.935	28.369	68.972	88.101	100.00
S-17	0.000	0.002	0.163	17.999	24.262	97.650	100.00
S-19	0.000	1.345	6.450	32.268	93.512	99.358	100.00
S-23	0.000	0.320	6.687	73.871	87.841	98.570	100.00
S-24	0.000	0.320	7.560	76.320	88.950	98.840	100.00

Source: Study Team



Source: Study Team

Figure 5.1.4-7 【Dry Season】Grain size distribution and transport mode of sediments based on Visher (1969)

(b) Rainy Season

Histogram of grain size distribution at survey points is shown in the Table 5.1.4-7. Weight percent frequency shown in the Figure 5.1.4-8.On the north side of the planned site (S-20, S-01, S-03) and the Rangakhali Channel (S-24), the content ratio of grain size 0.25 mm (medium sand) was large. On the south side of the planned site (S-13, S-15, S-17, S-19), the content ratios of grain size 0.063 mm (very fine sand) and grain size 0.125 mm (fine sand) were large. Comparing the north and south sides of the entire Kohelia Channel, the grain size on the north side was large.

Composition Ratio of Sediment distribution is shown in the Figure 5.1.4-9.Composition Ratio of Sand distribution is shown in the Figure 5.1.4-10. The composition ratio of sand distribution at the survey site is 70.2 to 98.7%, and the sand content is very high, so it can be said that the sediment of the Kohelia Channel is sandy.

Cumulative Sieving Results at Survey Points (Grain size; small → large) is shown in the Table 5.1.4-8. Grain size accumulation line is shown in the Figure 5.1.4-11. Good or bad of grain size distribution is shown in the Table 5.1.4-9.The passing weight percentages of D10, D30, and D60 were read from the grain size accumulation line, and the uniformity coefficient U_c and the coefficient of

curvature U_c' were calculated. According to the definitions of method of classification of soil in Japan※1 and method of classification of soil in America※2, grain size distribution was "good" except for S-09 and S-15. However, since the uniformity coefficient U_c was outside the scope of the both method of classification of soil, it was judged by the value of the coefficient of curvature U_c'

※1 $U_c \geqq 10,\ 1 < U_c' < \sqrt{U_c}$

※2 $U_c \geqq 6,\ 1 < U_c' < 3$

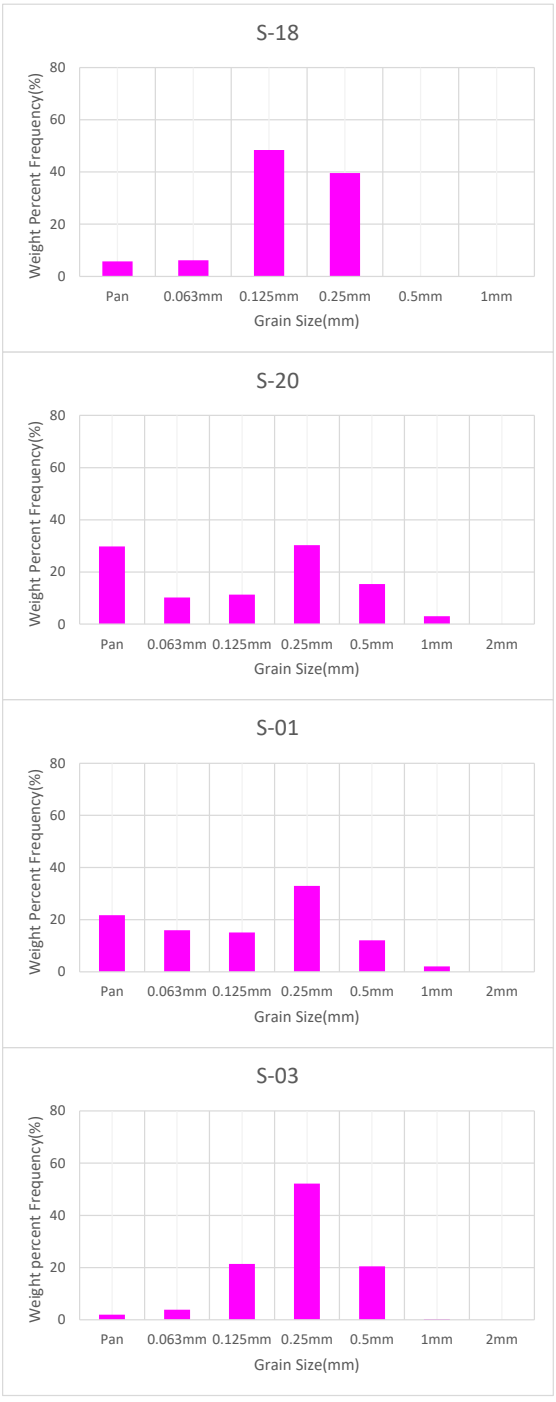
Cumulative Sieving Results at Survey Points (Grain size; large → small) is shown in the Table 5.1.4-10. Grain size distribution and transport mode of sediments based on Visher (1969) is shown in the Figure 5.1.4-12. Visher (1969) categorized the movement patterns of sediments into "suspension that floats in water", "traction that moves at the bottom", and "saltation". The grain size distribution was considered to be composed of these sub-populations. From the graph, it was found that the sand in the Kohelia Channel is mainly moved by "saltation".

Table 5.1.4-7 【Rainy Season】Histogram of grain size distribution at survey points

unit : %

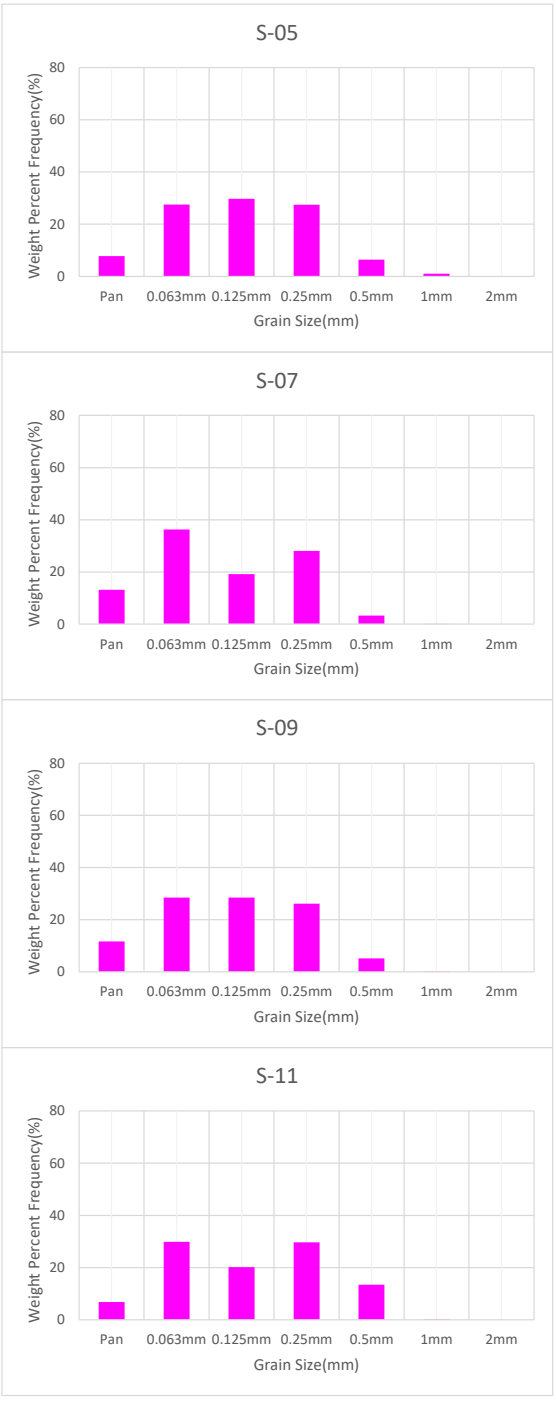
	cSi	vfS	fS	mS	cS	vcS	gG
Grain Size	Pan	0.063mm	0.125mm	0.25mm	0.5mm	1mm	2mm
Sample Id. / ϕ Scale	5	4	3	2	1	0	−1
S-18	5.686	6.197	48.377	39.642	0.098	0.000	0.000
S-20	29.812	10.267	11.330	30.278	15.319	2.994	0.000
S-01	21.726	16.045	15.122	32.964	12.050	2.092	0.000
S-03	1.937	3.830	21.403	52.150	20.410	0.270	0.000
S-05	7.799	27.575	29.727	27.494	6.412	0.993	0.000
S-07	13.105	36.283	19.176	28.080	3.219	0.136	0.000
S-09	11.659	28.447	28.447	26.124	5.203	0.121	0.000
S-11	6.783	29.888	20.156	29.658	13.394	0.121	0.000
S-13	19.695	42.591	11.919	20.133	4.944	0.718	0.000
S-15	1.303	8.584	72.538	14.726	2.318	0.531	0.000
S-17	6.914	27.356	37.283	21.054	6.287	1.106	0.000
S-19	8.068	42.832	24.897	18.059	5.744	0.401	0.000
S-23	3.301	12.961	26.536	48.269	8.600	0.333	0.000
S-24	12.132	28.859	19.137	35.330	4.543	0.000	0.000

Source: Study Team



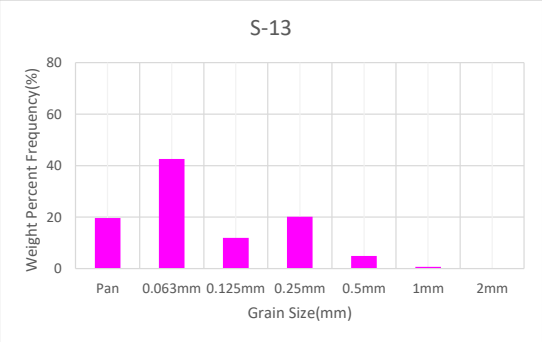
Source: Study Team

Figure 5.1.4-8(1)【Rainy Season】Weight percent frequency（north side of the planned site）



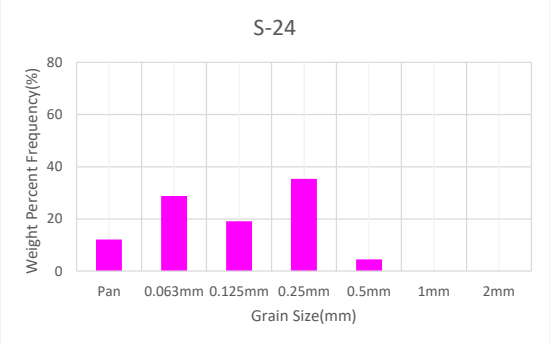
Source: Study Team

Figure 5.1.4-8(2)【Rainy Season】Weight percent frequency（Around the planned site ①）



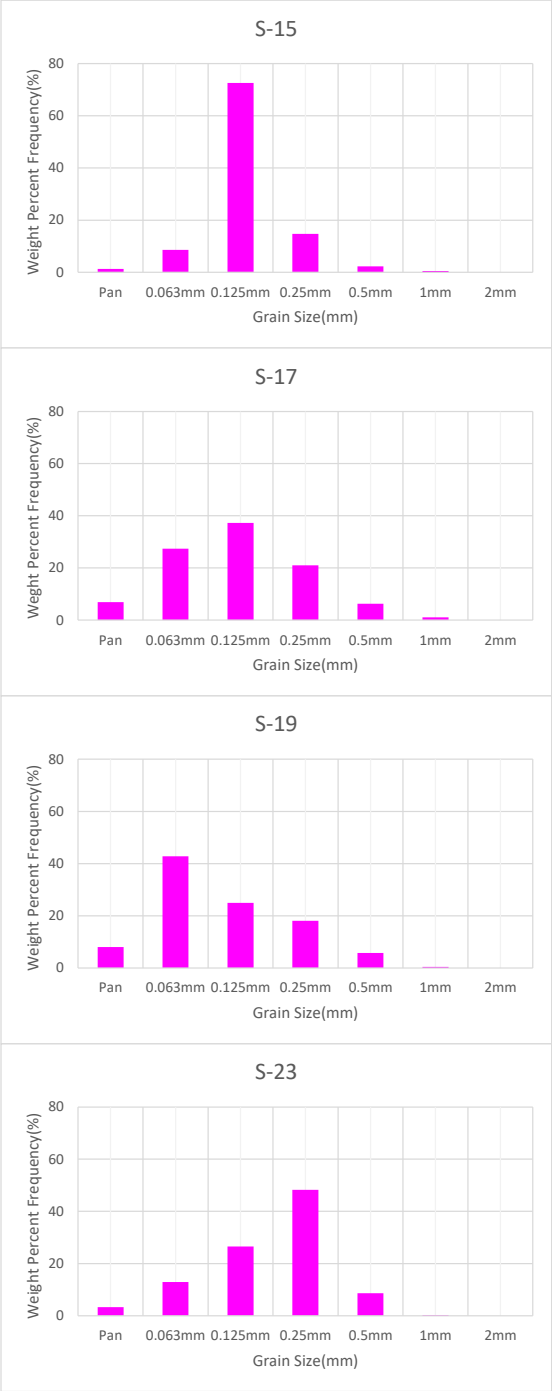
Source: Study Team

Figure 5.1.4-8(3)【Rainy Season】Weight percent frequency（Around the planned site ②）



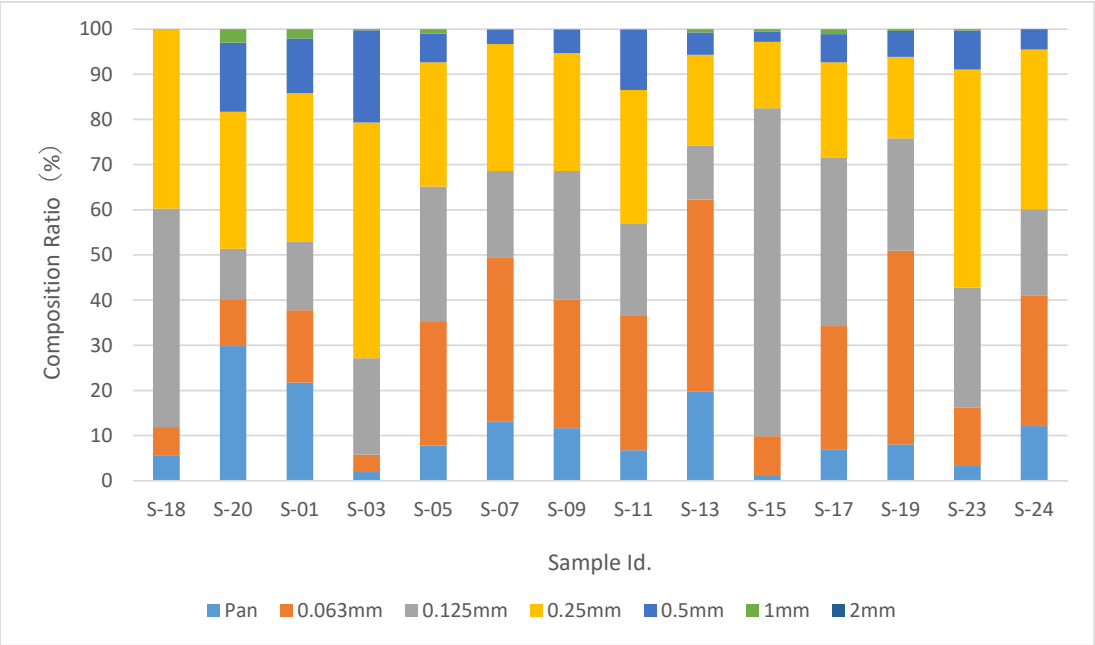
Source: Study Team

Figure 5.1.4-8(4)【Rainy Season】Weight percent frequency（Rangakhali Channel）



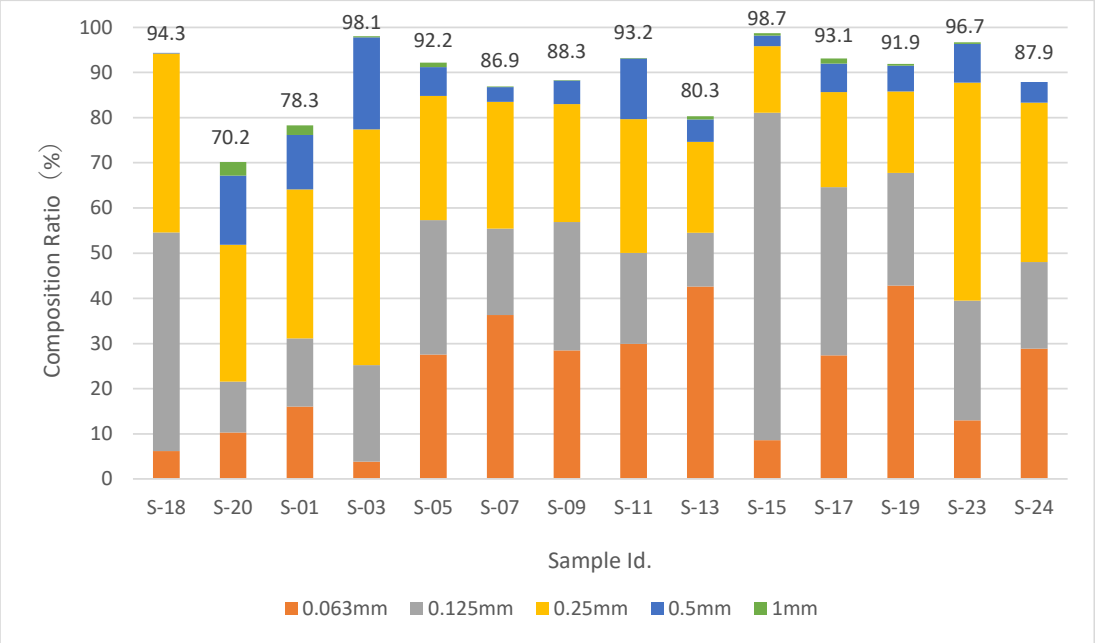
Source: Study Team

Figure 5.1.4-8(5)【Rainy Season】Weight percent frequency（south side of the planned site）



Source: Study Team

Figure 5.1.4-9 【Rainy Season】Composition Ratio of Sediment distribution



Source: Study Team

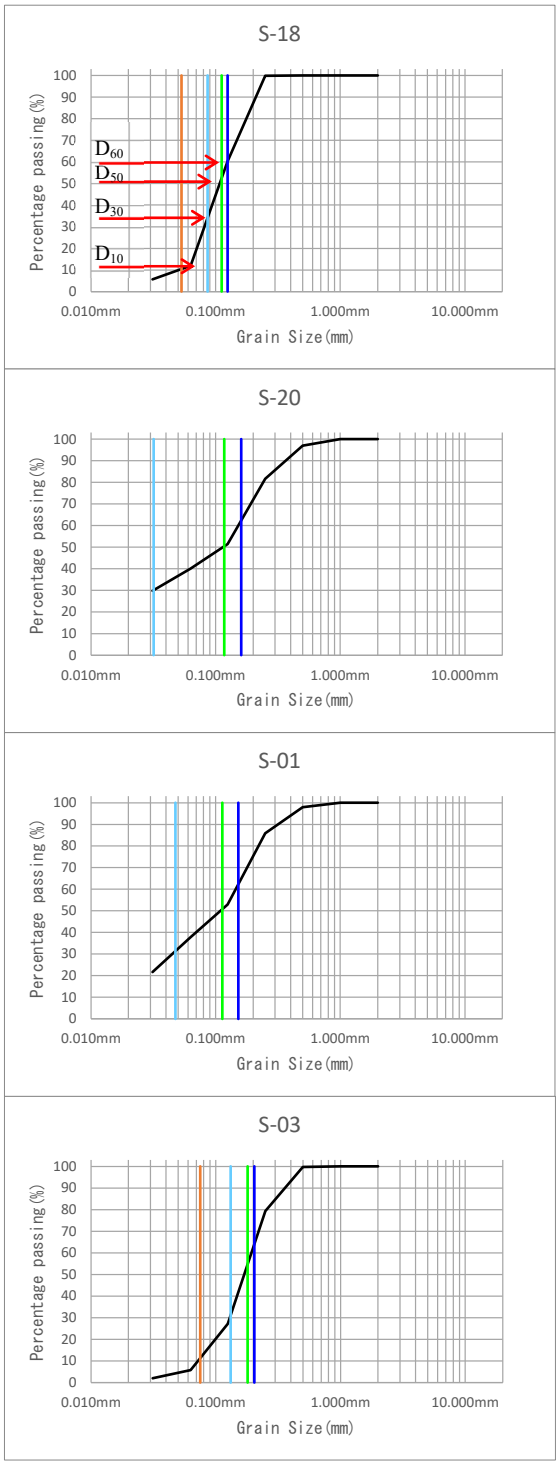
Figure 5.1.4-10 【Rainy Season】Composition Ratio of Sand distribution

Table 5.1.4-8 【Rainy Season】Cumulative Sieving Results at Survey Points
(Grain size; small → large)

unit : %

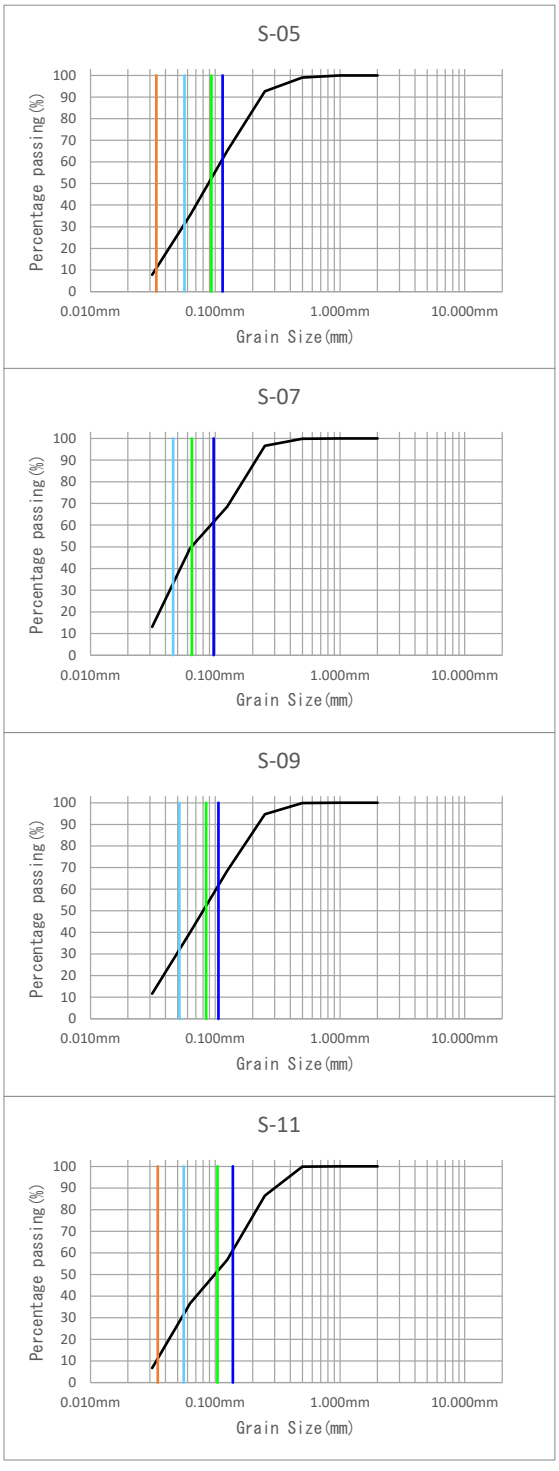
Grain Size / Sample Id.	Pan	0.063mm	0.125mm	0.250mm	0.500mm	1.000mm	2.000mm
φ Scale	5	4	3	2	1	0	−1
S−18	5.686	11.883	60.260	99.902	100.000	100.000	100.000
S−20	29.812	40.079	51.410	81.688	97.007	100.000	100.000
S−01	21.726	37.771	52.892	85.857	97.907	100.000	100.000
S−03	1.937	5.767	27.170	79.320	99.730	100.000	100.000
S−05	7.799	35.374	65.101	92.595	99.007	100.000	100.000
S−07	13.105	49.388	68.564	96.644	99.864	100.000	100.000
S−09	11.659	40.106	68.552	94.676	99.879	100.000	100.000
S−11	6.783	36.671	56.827	86.484	99.878	100.000	100.000
S−13	19.695	62.286	74.205	94.338	99.283	100.000	100.000
S−15	1.303	9.887	82.425	97.151	99.469	100.000	100.000
S−17	6.914	34.270	71.553	92.607	98.894	100.000	100.000
S−19	8.068	50.899	75.796	93.855	99.599	100.000	100.000
S−23	3.301	16.262	42.799	91.067	99.667	100.000	100.000
S−24	12.132	40.991	60.128	95.457	100.000	100.000	100.000

Source: Study Team



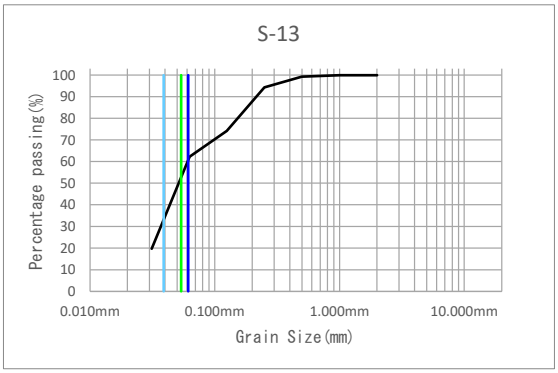
Source: Study Team

Figure 5.1.4-11(1) 【Rainy Season】
Grain size accumulation line
(north side of the planned site)



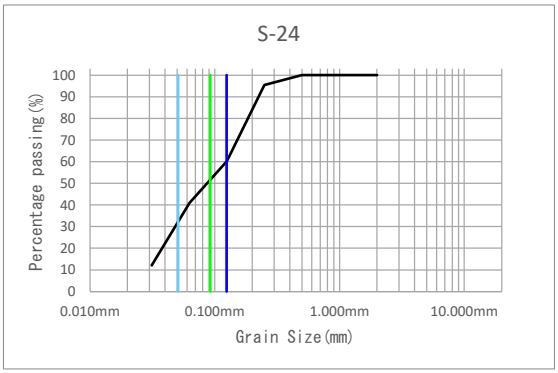
Source: Study Team

Figure 5.1.4-11(2) 【Rainy Season】
Grain size accumulation line
(Around the planned site ①)



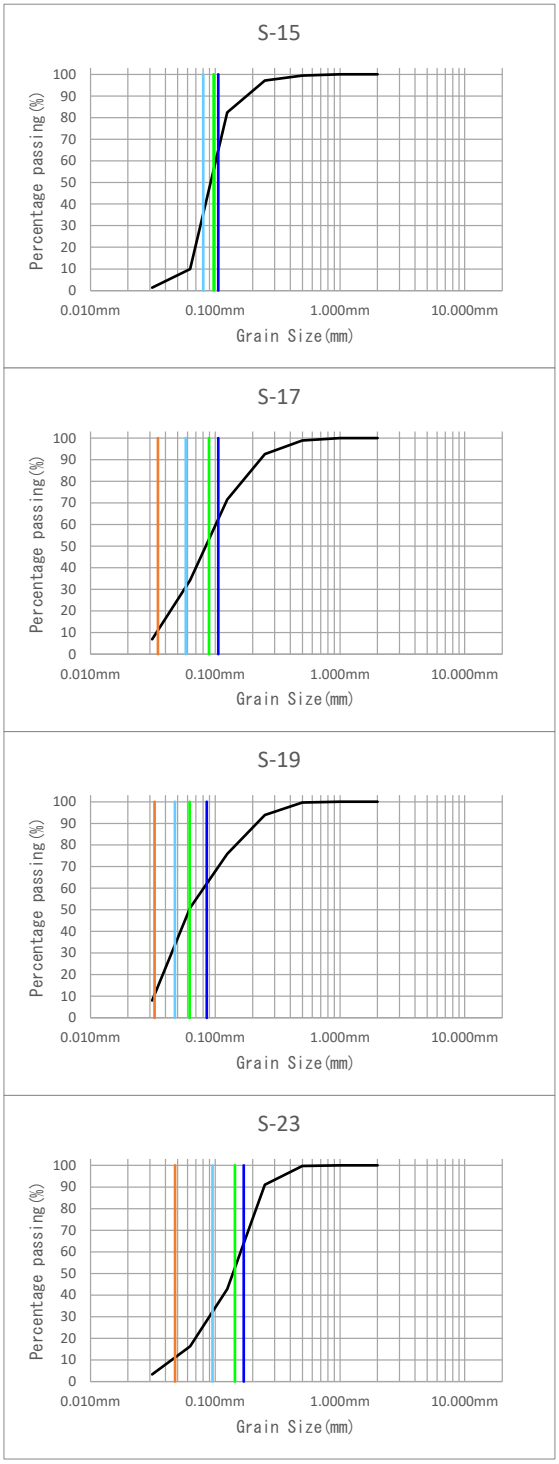
Source: Study Team

Figure 5.1.4-11 (3) 【Rainy Season】
Grain size accumulation line
（Around the planned site ②）



Source: Study Team

Figure 5.1.4-11 (4) 【Rainy Season】
Grain size accumulation line
（Rangakhali Channel）



Source: Study Team

Figure 5.1.4-11(5) 【Rainy Season】
Grain size accumulation line
（south side of the planned site）

Table 5.1.4-9 【Rainy Season】Good or bad of grain size distribution

Sample Id.	D_{10}	D_{30}	D_{50}	D_{60}	Uc D_{60}/D_{10}	Uc' $U_{30}^2/D_{10}D_{60}$	$\sqrt{Uc}$	grading quality
S-18	0.0534	0.0862	0.112	0.125	2.34	1.12	1.53	good
S-20	—	0.0318	0.117	0.160	—	—	—	Undecidable
S-01	—	0.0476	0.113	0.152	—	—	—	Undecidable
S-03	0.0753	0.132	0.180	0.204	2.71	1.13	1.65	good
S-05	0.0338	0.0568	0.0935	0.114	3.38	0.84	1.84	good
S-07	—	0.0460	0.0650	0.0973	—	—	—	Undecidable
S-09	—	0.0517	0.0846	0.106	—	—	—	Undecidable
S-11	0.0347	0.0559	0.104	0.138	3.99	0.65	2.00	good
S-13	—	0.0389	0.0538	0.0613	—	—	—	Undecidable
S-15	0.0631	0.0802	0.0973	0.106	1.68	0.96	1.30	good
S-17	0.0348	0.0580	0.0892	0.106	3.04	0.91	1.74	good
S-19	0.0327	0.0475	0.0623	0.0857	2.62	0.81	1.62	good
S-23	0.0477	0.0951	0.144	0.170	3.56	1.12	1.89	good
S-24	—	0.0509	0.0922	0.125	—	—	—	Undecidable

（Uc：uniformity coefficient, Uc'：coefficient of curvature）

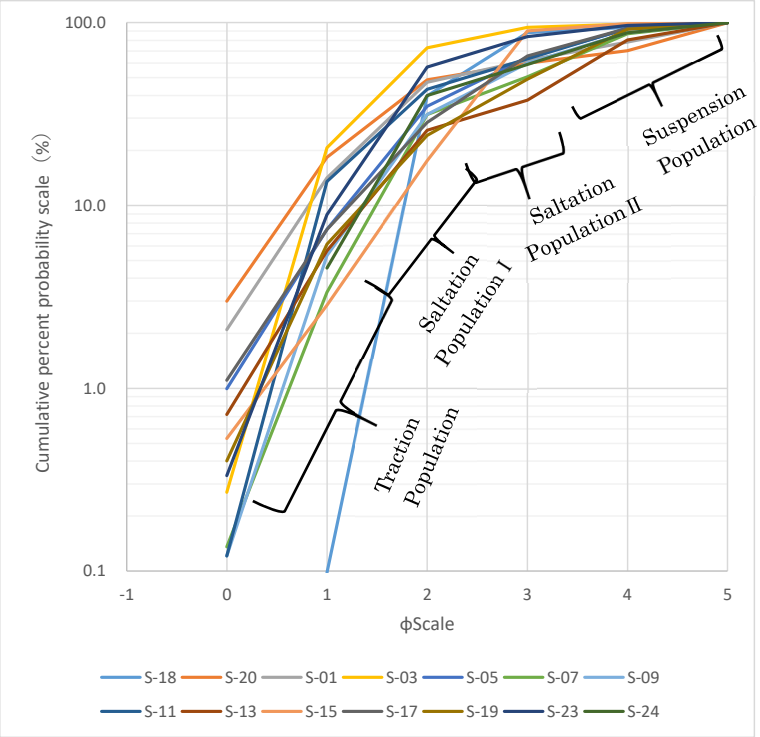
Source: Study Team

Table 5.1.4-10 【Rainy Season】Cumulative Sieving Results at Survey Points
(Grain size; large → small)

unit：%

Grain Size / Sample Id. / ϕ Scale	2mm	1mm	0.5mm	0.25mm	0.125mm	0.063mm	Pan
	-1	0	1	2	3	4	5
S-18	0.000	0.000	0.098	39.740	88.117	94.314	100.00
S-20	0.000	2.994	18.313	48.591	59.921	70.189	100.00
S-01	0.000	2.092	14.142	47.106	62.228	78.273	100.00
S-03	0.000	0.270	20.680	72.830	94.233	98.063	100.00
S-05	0.000	0.993	7.405	34.899	64.626	92.201	100.00
S-07	0.000	0.136	3.355	31.435	50.611	86.895	100.00
S-09	0.000	0.121	5.324	31.448	59.894	88.341	100.00
S-11	0.000	0.121	13.515	43.173	63.329	93.217	100.00
S-13	0.000	0.718	5.662	25.795	37.714	80.306	100.00
S-15	0.000	0.531	2.849	17.575	90.113	98.697	100.00
S-17	0.000	1.106	7.393	28.447	65.730	93.086	100.00
S-19	0.000	0.401	6.145	24.203	49.100	91.932	100.00
S-23	0.000	0.333	8.933	57.201	83.737	96.699	100.00
S-24	0.000	0.000	4.543	39.872	59.009	87.868	100.00

Source: Study Team



Source: Study Team

Figure 5.1.4-12 【Rainy Season】Grain size distribution and transport mode of sediments based on Visher (1969)

Appendix-5.1.5

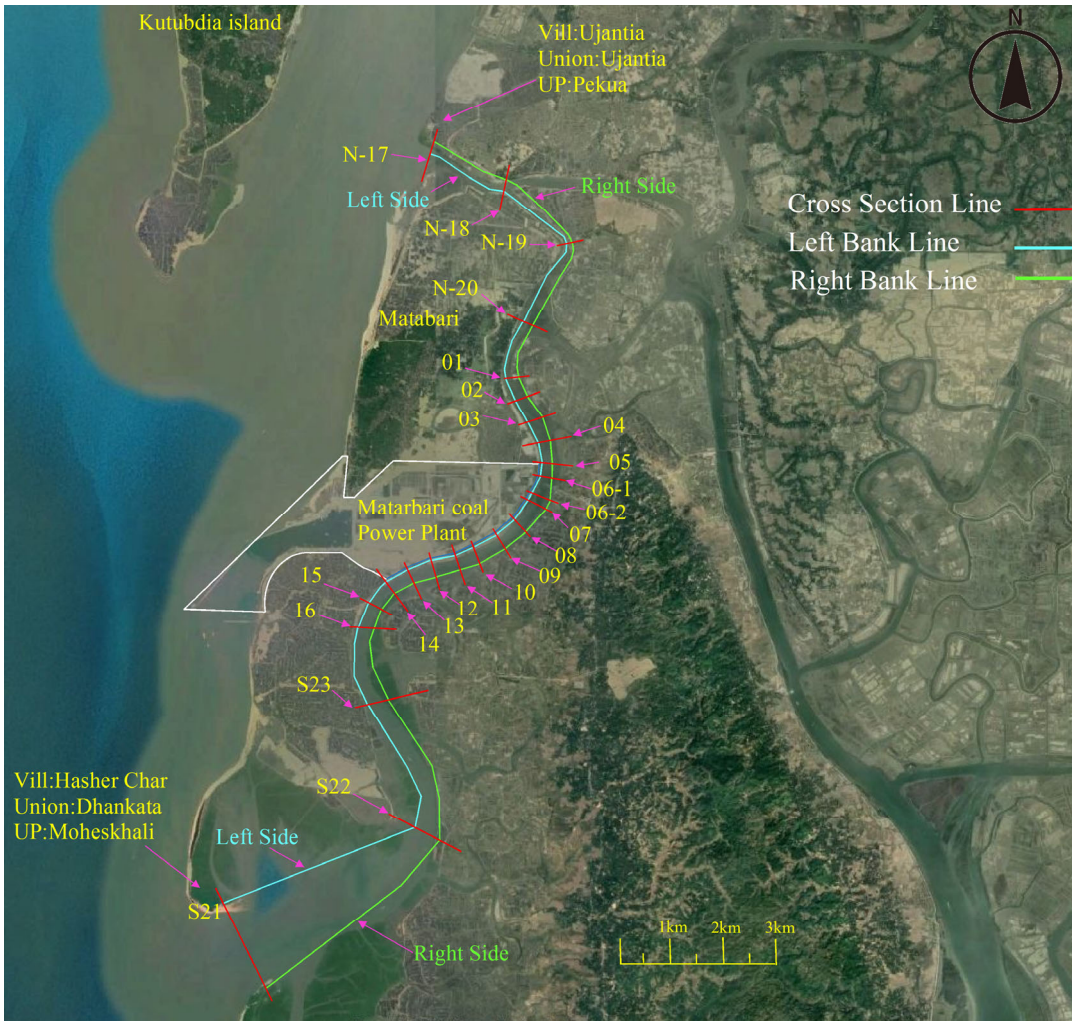
(Hydrographic Conditions of Kohelia Channel)

5.1.5. Hydrographic Conditions

(1) Bathymetric Survey

(a) Survey Location

Survey Location（Cross Section） is shown in the Figure 5.1.5-1.



Source: Study Team

Figure 5.1.5-1 Survey Location（Cross Section）

(b) Survey Period

Dry season : from February 6th ,2021 to February 11th ,2021

Normal season : from April 8th ,2021 to April 11th ,2021

Rainy season : from June 28th ,2021 to July 3rd ,2021

(c) Result

Comparison of cross-sectional depth survey results is shown in the Figure 5.1.5-2. Comparison of

water depth contours is shown in the Figure 5.1.5-3. The features obtained from the survey results are shown below.

① cross-sectional depth survey results

- Comparing the results of the bathymetric survey in the dry season, the normal season and rainy season, the results were similar except for Cross Section 06-2 and Cross Section S21.
- In Cross Section 06-2, the water depth became deeper by a maximum of about 3.0m on the Left Side (x-axis: between 50 and 100m) between the dry season and the normal season. On the other hand, between the normal season and the rainy season, the water depth became shallower by a maximum of about 2.0 m in the same section.
- In Cross Section S21, the water depth became deeper by a maximum of about 4.0m on the Left Side (x-axis: between 700 and 800m) between the dry season and the normal season. Furthermore, between the normal season and the rainy season, the water depth became deeper by a maximum of about 4.0 m on the Left Side (x-axis: between 400 and 550 m).
- In Cross Section S21, the width of the channel was widened by about 100m between the dry season and the normal season and about 150m between the normal season and the rainy season.

② water depth contours

The Study Team conducted at survey location shown in Figure 5.1.5-1, and a water depth contour drawing was created by interpolating the data between the cross section lines. From this water depth contours, characteristics related to channel width and water depth were obtained in four areas: north side of the channel (between Cross Section N-17 and Cross Section N-19), north side of the planned site(between Cross Section N-19 and Cross Section 05), area around the planned site(between Cross Section 05 and Cross Section 12) and south side of the planned site(between Cross Section 12 and Cross Section S21). The characteristics of related to each area are shown below.

ⅰ） north side of the channel (between Cross Section N-17 and Cross Section N-19)

- Between Cross Section N-17 and Cross Section N-18, the same channel width and maximum water depth are about 6.0 m.
- Between Cross Section N-18 and Cross Section N-19,the channel width narrows . Furthermore, the maximum water depth is about 3 m in this section, and the water depth becomes shallow.

ⅱ） north side of the planned site(between Cross Section N-19 and Cross Section 05)

- Between Cross Section 01 and Cross Section 05, the channel width is slightly wider than between Cross Section N-19 and Cross Section 01.
- Between Cross Section N-19 and Cross Section 05, the maximum water depth is 2.0 m. The actual channel width is narrow because the bottom of the Right Side is wide and high.

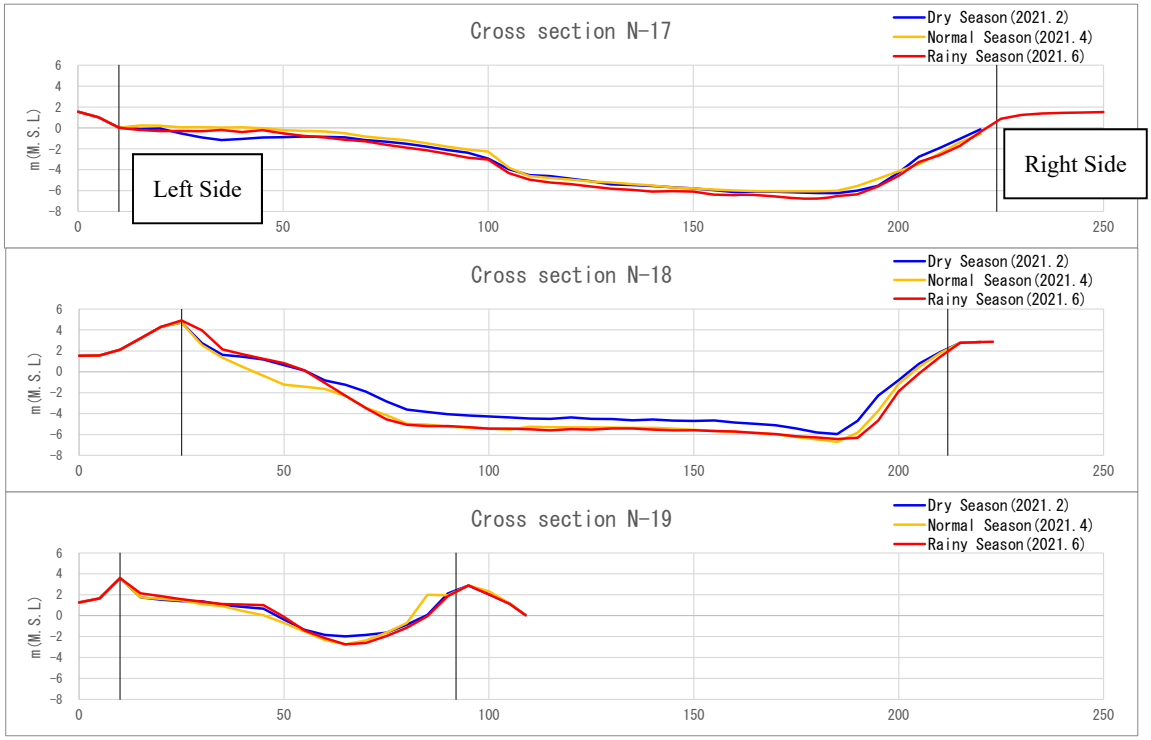
ⅲ） around the planned site(between Cross Section 05 and Cross Section 12)

- The water depth is deeper than north side of the planned site.
- The maximum water depth is about 3.0m.

ⅳ） south side of the planned site(between Cross Section 12 and Cross Section S21)

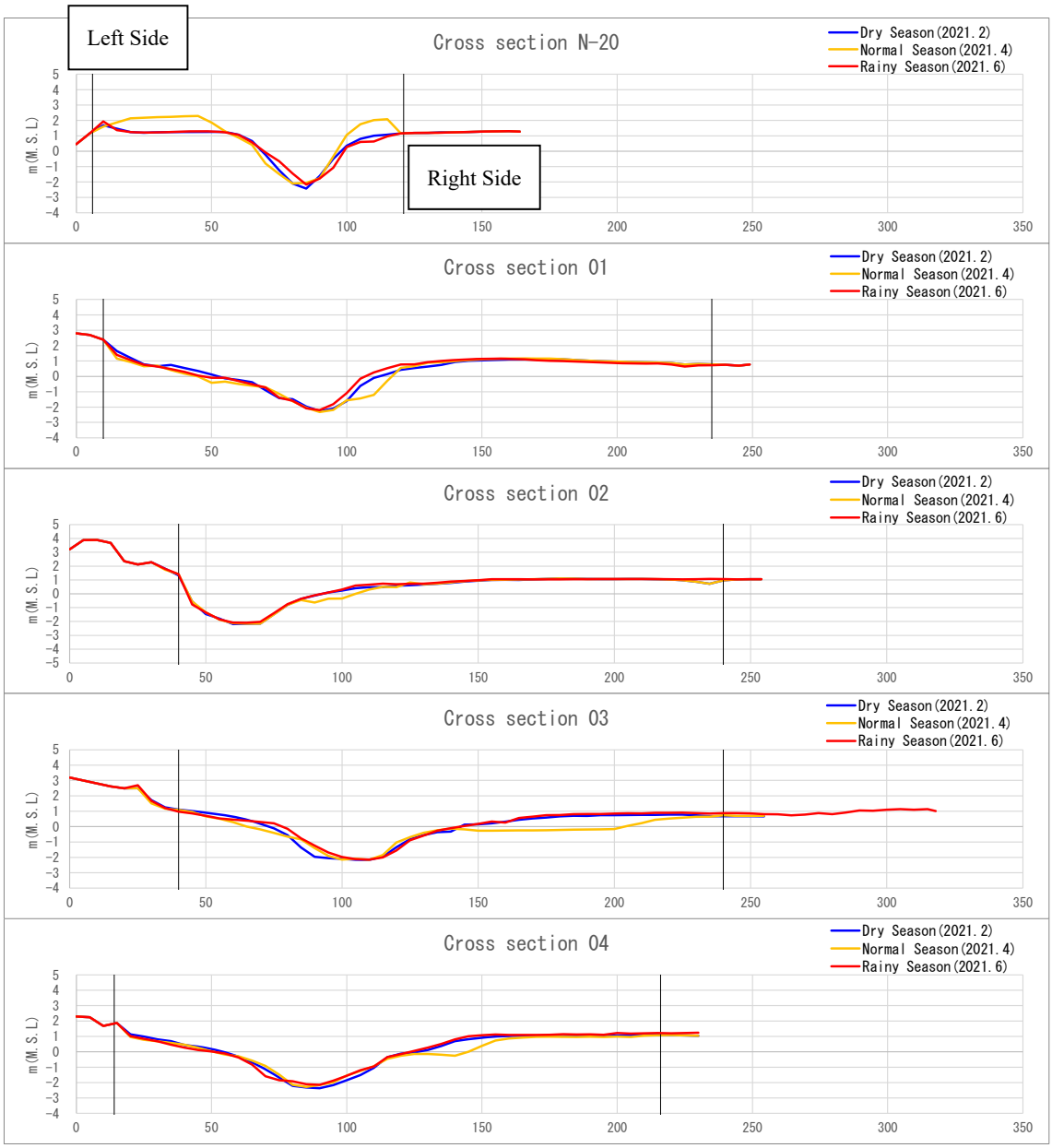
・The channel width is wider in the south.

・The maximum water depth is about 3.0 m between Cross Section 12 and Cross Section 13 around the planned site, and the maximum water depth on the south side of Cross Section 13 is about 4.0m or more.



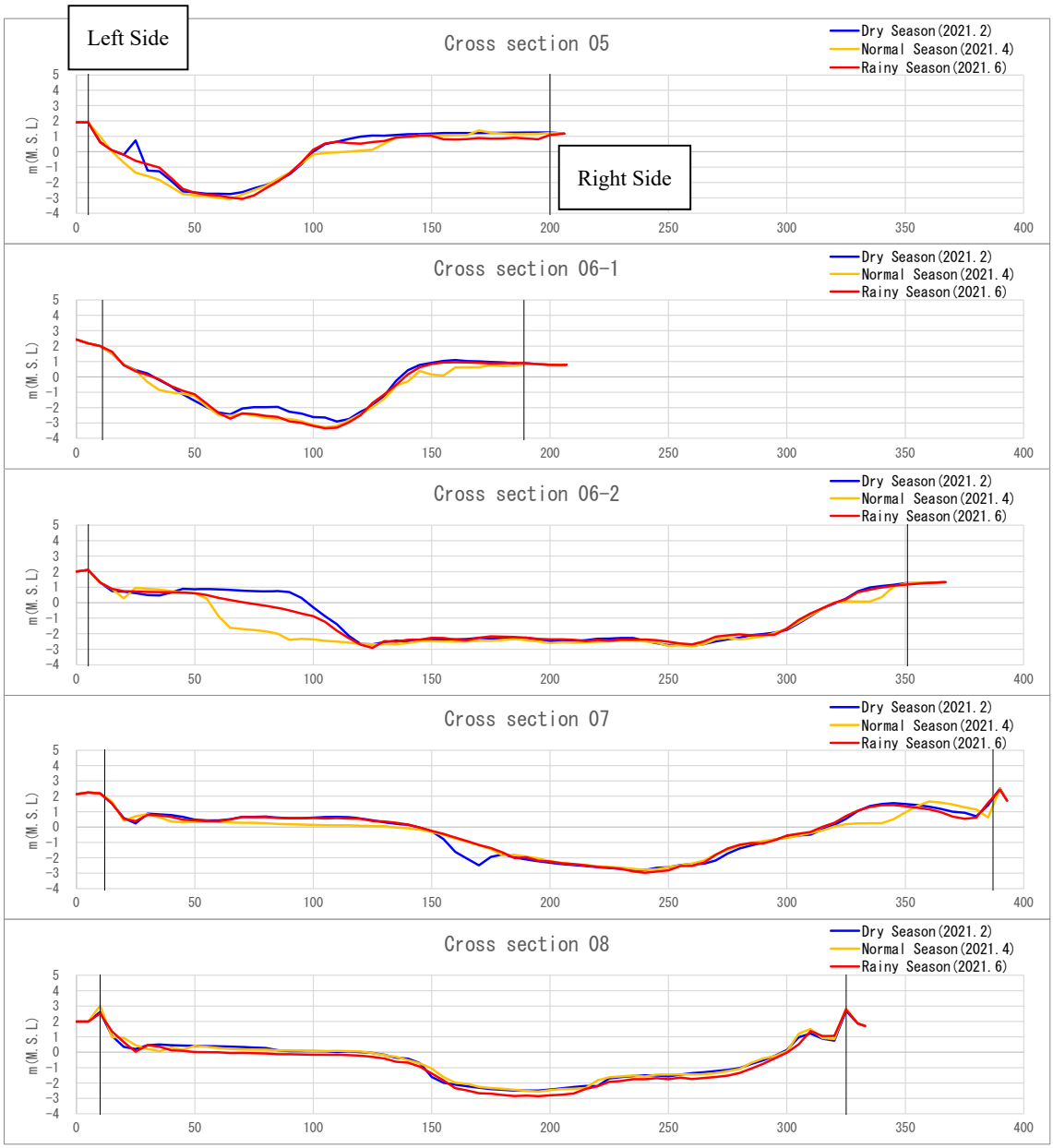
Source: Study Team

Figure 5.1.5-2 (1)　Comparison of cross-sectional depth survey results（Ujantia Area）



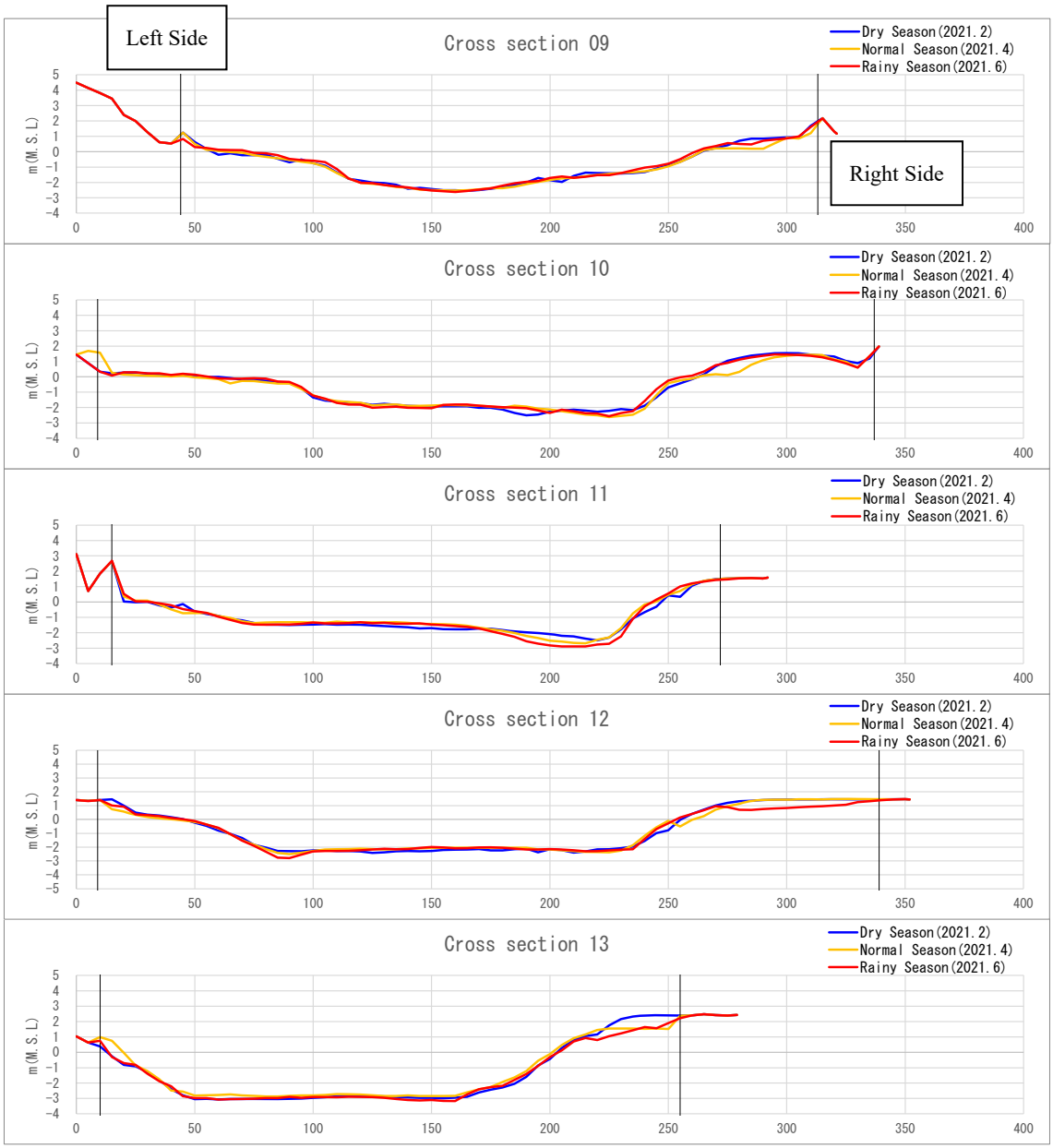
Source: Study Team

Figure 5.1.5-2 (2)　Comparison of cross-sectional depth survey results（North Area）



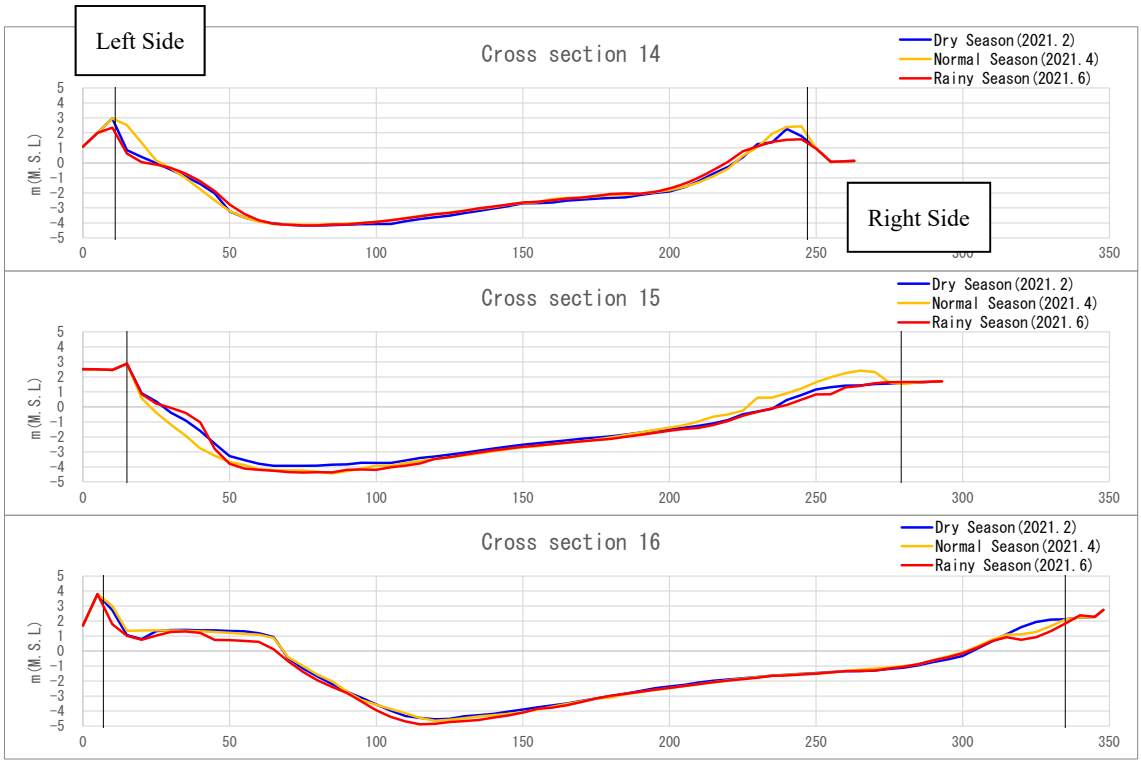
Source: Study Team

Figure 5.1.5-2 (3) Comparison of cross-sectional depth survey results
(north side of the planned site)



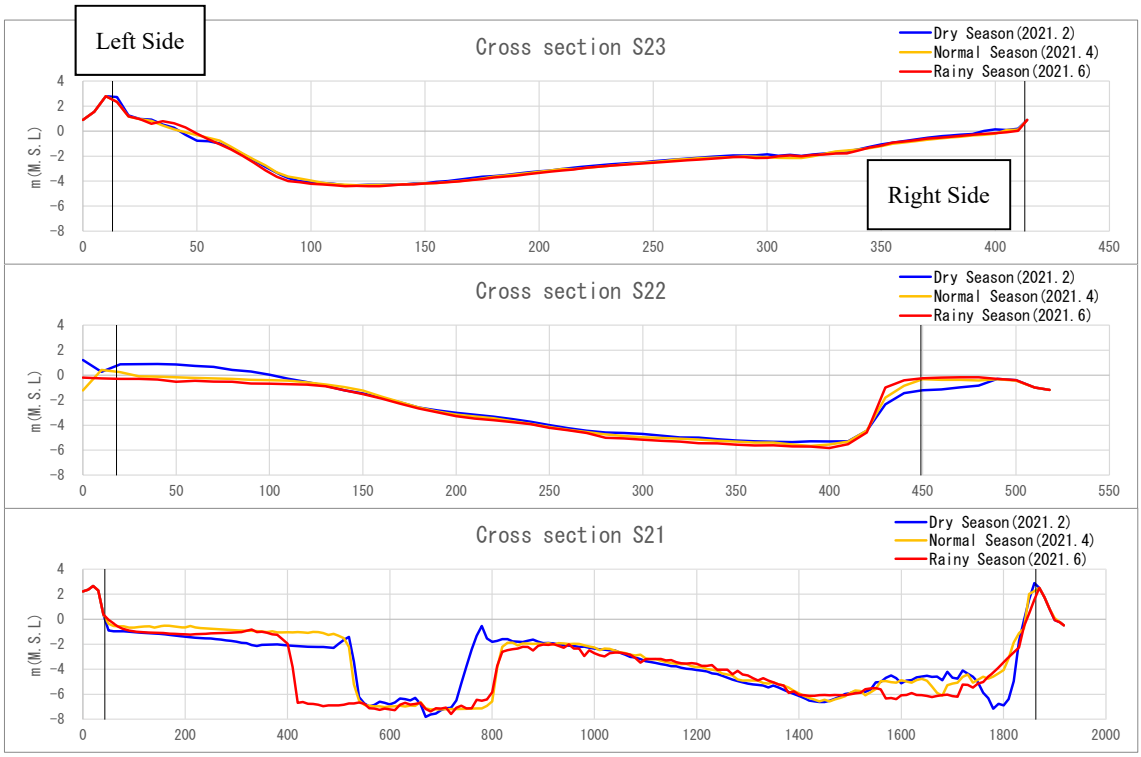
Source: Study Team

Figure 5.1.5-2 (4) Comparison of cross-sectional depth survey results (south side of the planned site)



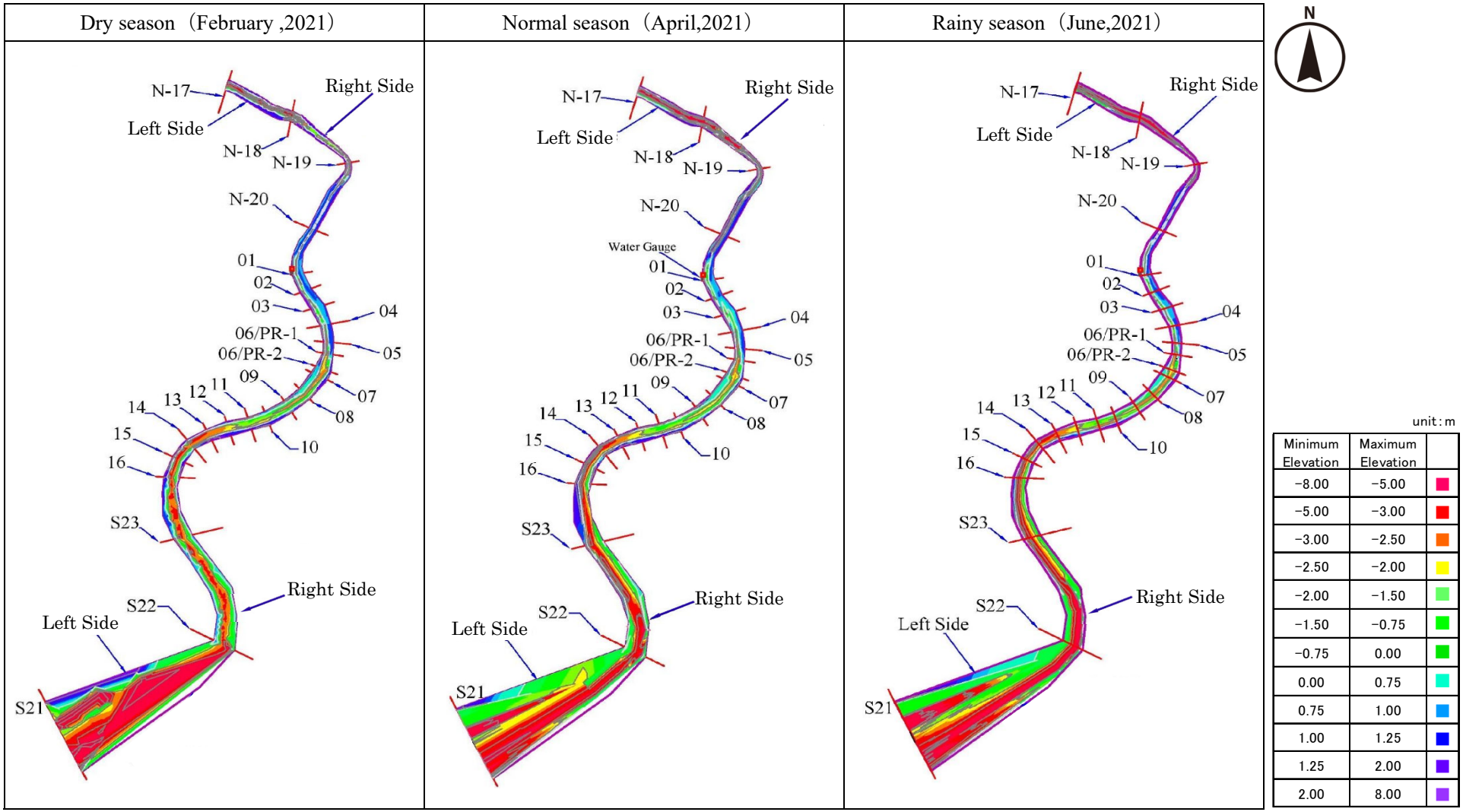
Source: Study Team

Figure 5.1.5-2 (5)　Comparison of cross-sectional depth survey results（South Area）



Source: Study Team

Figure 5.1.5-2 (6)　Comparison of cross-sectional depth survey results（Hasher Char Area）



Source: Study Team

Figure **5.1.5-3** Comparison of water depth contours

(2) Tidal Level

(a) Survey Location

Survey Location of tidal level is shown in the Figure 5.1.5-4. Survey Location points of tidal level is shown in the Table 5.1.5-1.

Source: Study Team

Figure 5.1.5-4 Survey Point of Tidal Level

Table 5.1.5-1 Survey Location points of Tidal Level

Location Id	Latitude	Longitude	Remarks
T1	21° 42'16.57"N	91° 52'19.03"E	MATARBARI AUTO TIDE GAUGE STATION COX'S BAZAR https://cloud.xylem.com/hydrosphere/public-sites/OWA_BACFF23D8C0244B89D7EB0E8808A4D09?customerId=OWA_BACFF23D8C0244B89D7EB0E8808A4D09&siteId=19B102
T2	21° 43'11.75"N	91° 53'49.65"E	Rangakhali River
T3	21° 43'43.85"N	91° 54'20.15"E	Kohelia Channel

Source: Study Team

(b) Survey Period

Dry season : from February 5th ,2021 to March 6th ,2021

Dry season : from June 18th ,2021 to July 17th ,2021

Observation time : T1 24hours, T2,T3 6:00～18:30

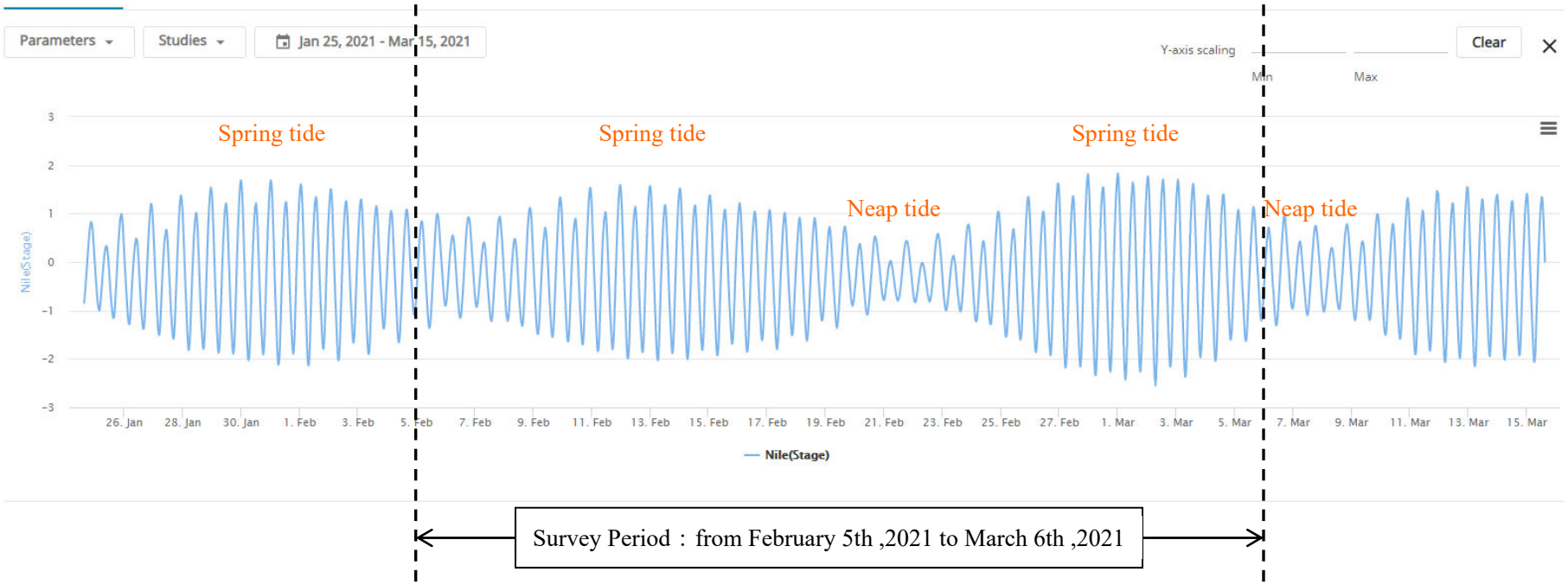
(c) Result

1) Dry season

Tidal Circulation at T1（Matabari Tide Gauge, from January 26th ,2021 to March 15th ,2021） is shown in the Figure 5.1.5-5. Tidal Circulation and Tide level difference at T1 is shown in the Figure 5.1.5-6. Tidal circulation at 3points（from February 5th ,2021 to March 6th ,2021） is shown in the Figure 5.1.5-7. Tidal circulation at 3points (every day) is shown in the Figure 5.1.5-8.

According to the tidal circulation at T1, it was neap tide between February 20th and 24th, and spring tide during the rest of the period.（Refer to Figure 5.1.5-5） The tide level difference was about 0.8m during the neap tide and 4.5 m during the spring tide. （Refer to Figure 5.1.5-6）

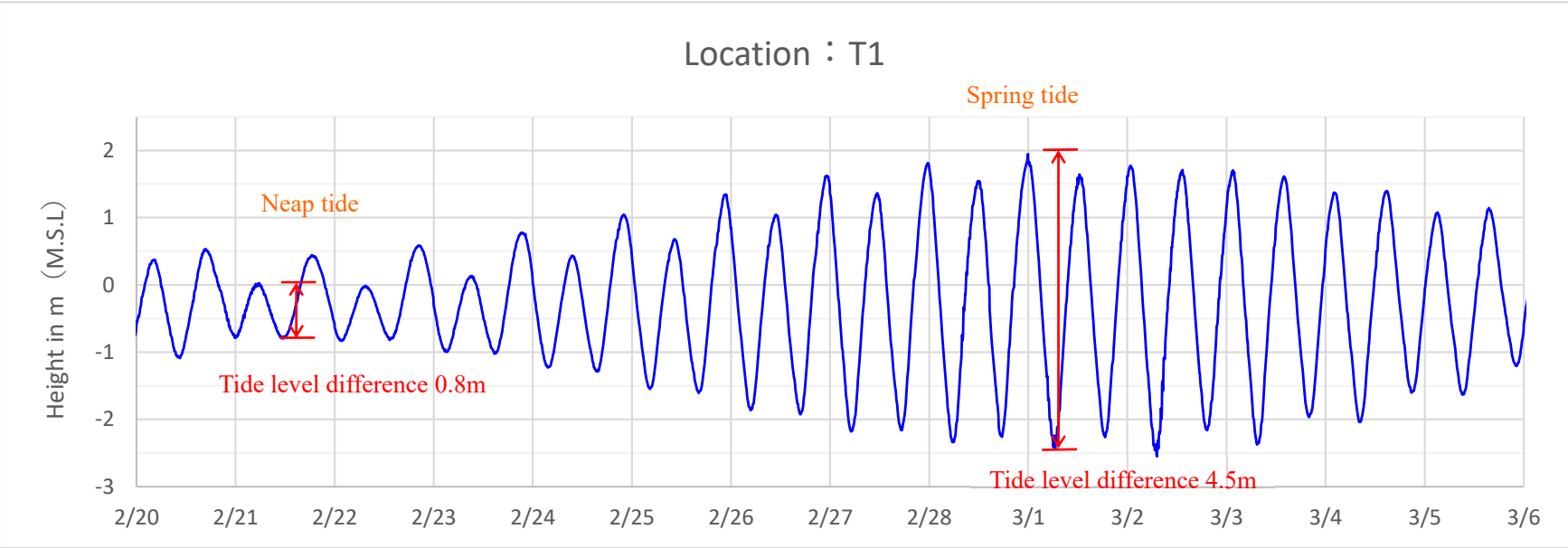
According to the tidal circulation at 3 points, tidal circulation was similar at the T1 and T3.On the other hand the tidal level was almost constant at the T2, which was completely different from the tide level circulation at T1 and T3. （Refer to Figure 5.1.5-7 and Figure 5.1.5-8）



Source：https://cloud.xylem.com/hydrosphere/public-sites/OWA_BACFF23D8C0244B89D7EB0E8808A4D09?customerId=OWA_BACFF23D8C0244B89D7EB0E8808A4D09&siteId=19B102

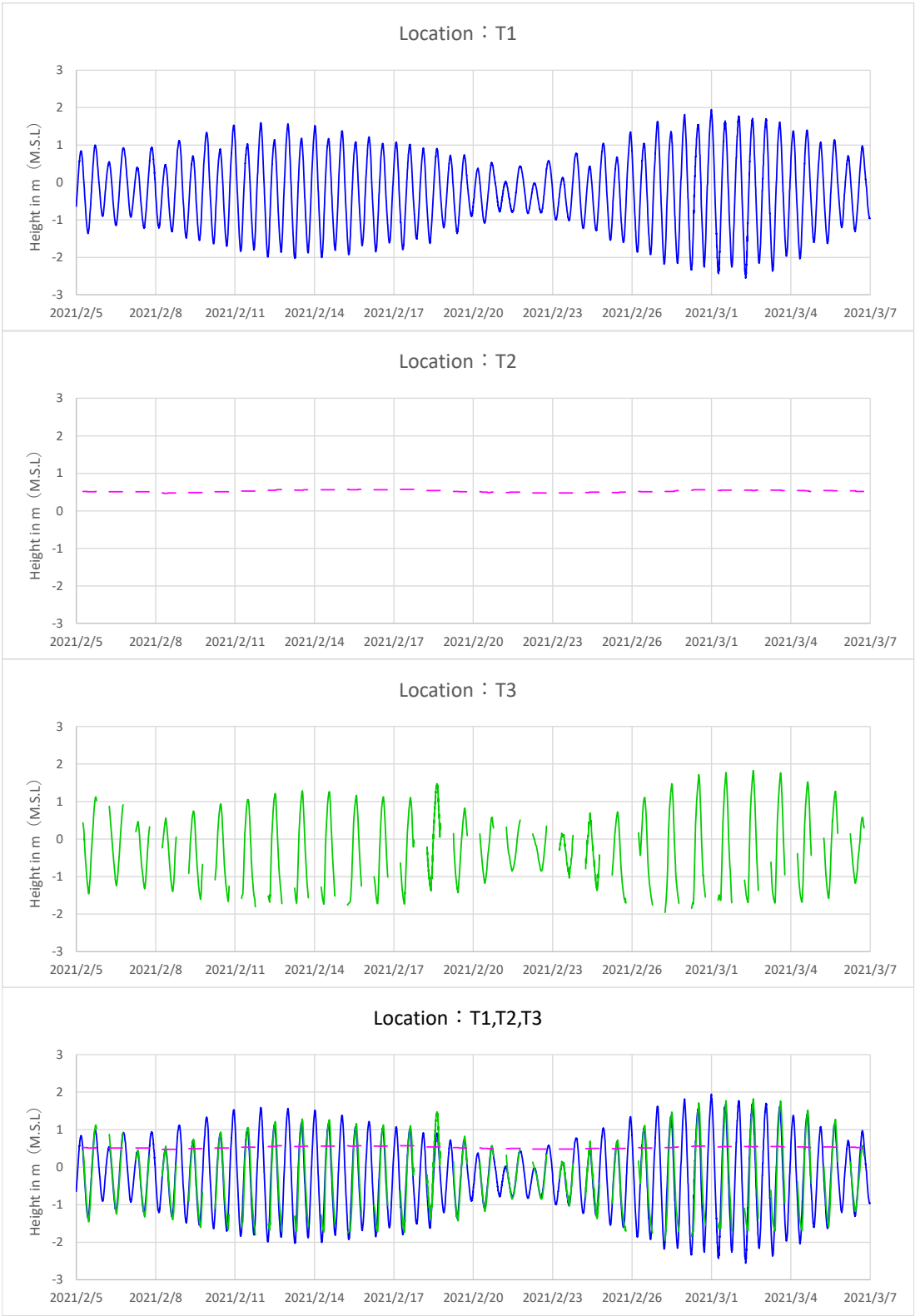
Addition：Study Team

Figure 5.1.5-5 【Dry Season】Tidal Circulation at T1（Matabari Tide Gauge, from January 25th ,2021 to March 15th ,2021）



Addition：Study Team

Figure 5.1.5-6 【Dry Season】Tidal Circulation and Tide level difference at T1

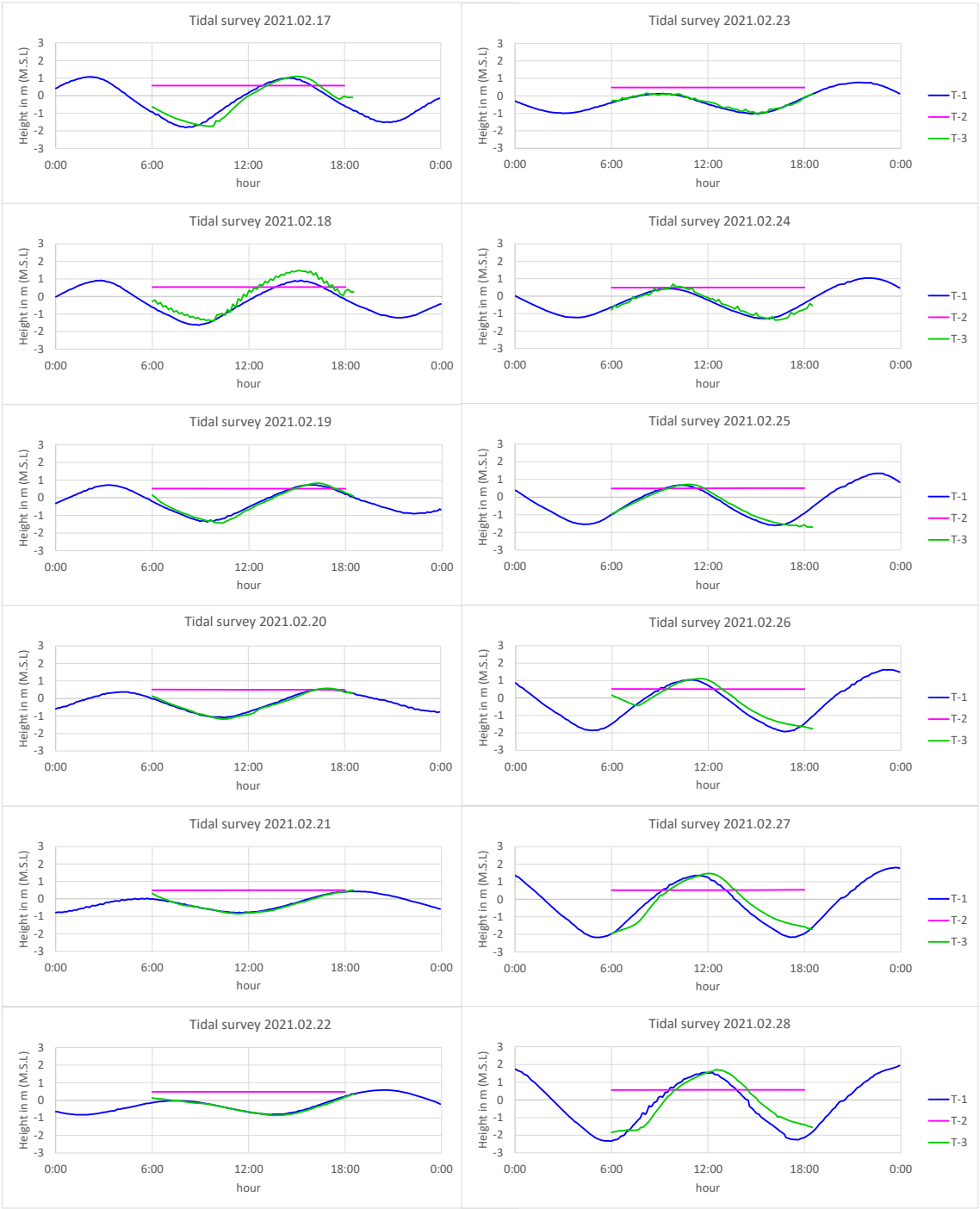


Source: Study Team

Figure 5.1.5-7 【Dry Season】Tidal Circulation at 3 Points
（from February 5th ,2021 to March 6th ,2021）

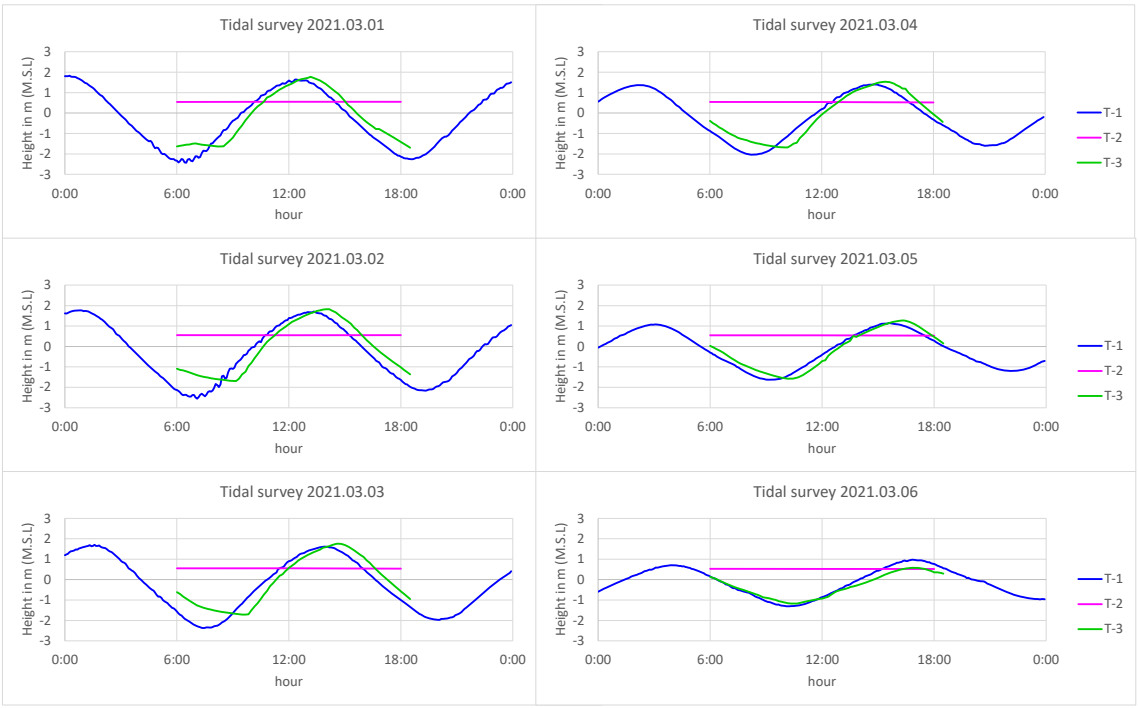
Source: Study Team

Figure 5.1.5-8 (1) 【Dry Season】Tidal circulation at 3points(every day)



Source: Study Team

Figure 5.1.5-8 (2) 【Dry Season】Tidal circulation at 3points(every day)



Source: Study Team

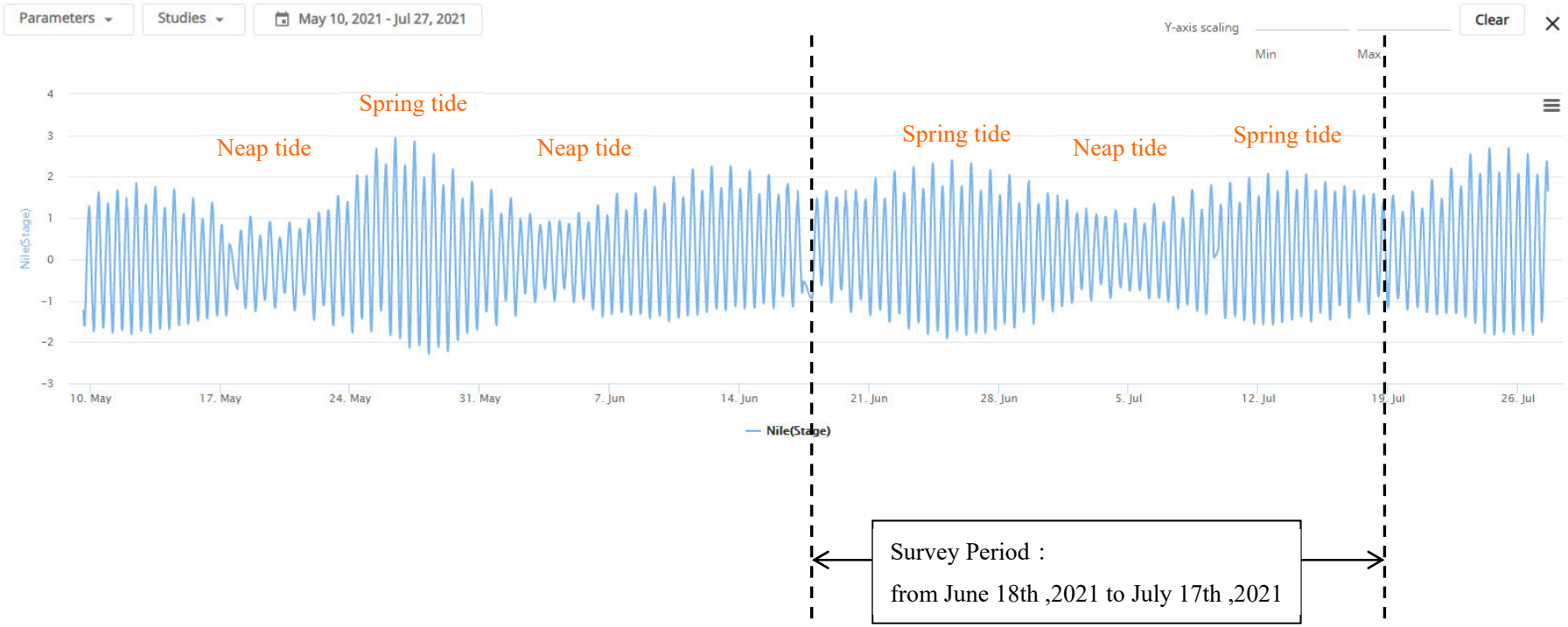
Figure 5.1.5-8 (3) 【Dry Season】Tidal circulation at 3points(every day)

2) Rainy season

Tidal Circulation at T1（Matabari Tide Gauge, from May 10th ,2021 to July 26th ,2021） is shown in the Figure 5.1.5-9. Tidal Circulation and Tide level difference at T1 is shown in the Figure 5.1.5-10. Tidal circulation at 3points（from June 18th ,2021 to July 17th ,2021） is shown in the Figure 5.1.5-11. Tidal circulation at 3points (every day) is shown in the Figure 5.1.5-12.

According to the tidal circulation at T1, it was neap tide between July 2nd and 8th, and spring tide during the rest of the period.（Refer to Figure 5.1.5-9）The tide level difference was about 1.5m during the neap tide and 4.0 m during the spring tide. （Refer to Figure 5.1.5-10）

According to the tidal circulation at 3 points, tidal circulation was similar at the T1 and T3.On the other hand the tidal level was almost constant at the T2, which was completely different from the tide level circulation at T1 and T3. （Refer to Figure 5.1.5-11 and Figure 5.1.5-12）

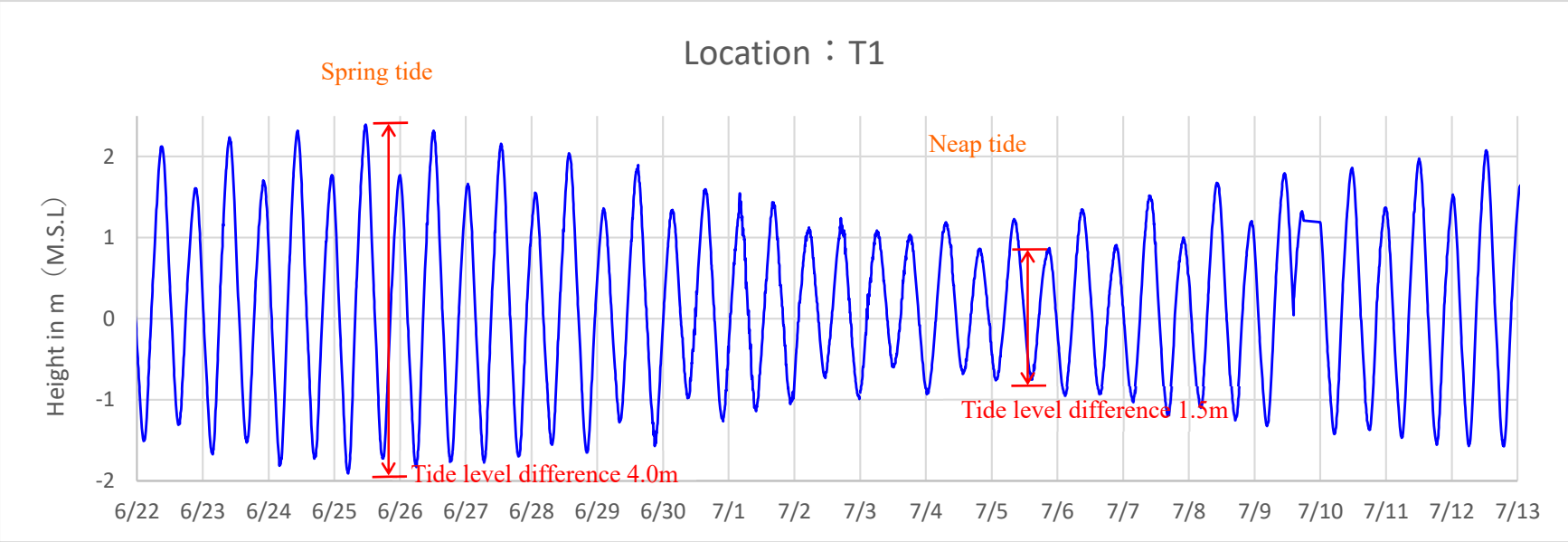


【supplementary explanation】June 17th, 10: 45-22: 20, July 9th, 14: 15-20: 20；Missing data

Source：https://cloud.xylem.com/hydrosphere/public-sites/OWA_BACFF23D8C0244B89D7EB0E8808A4D09?customerId=OWA_BACFF23D8C0244B89D7EB0E8808A4D09&siteId=19B102

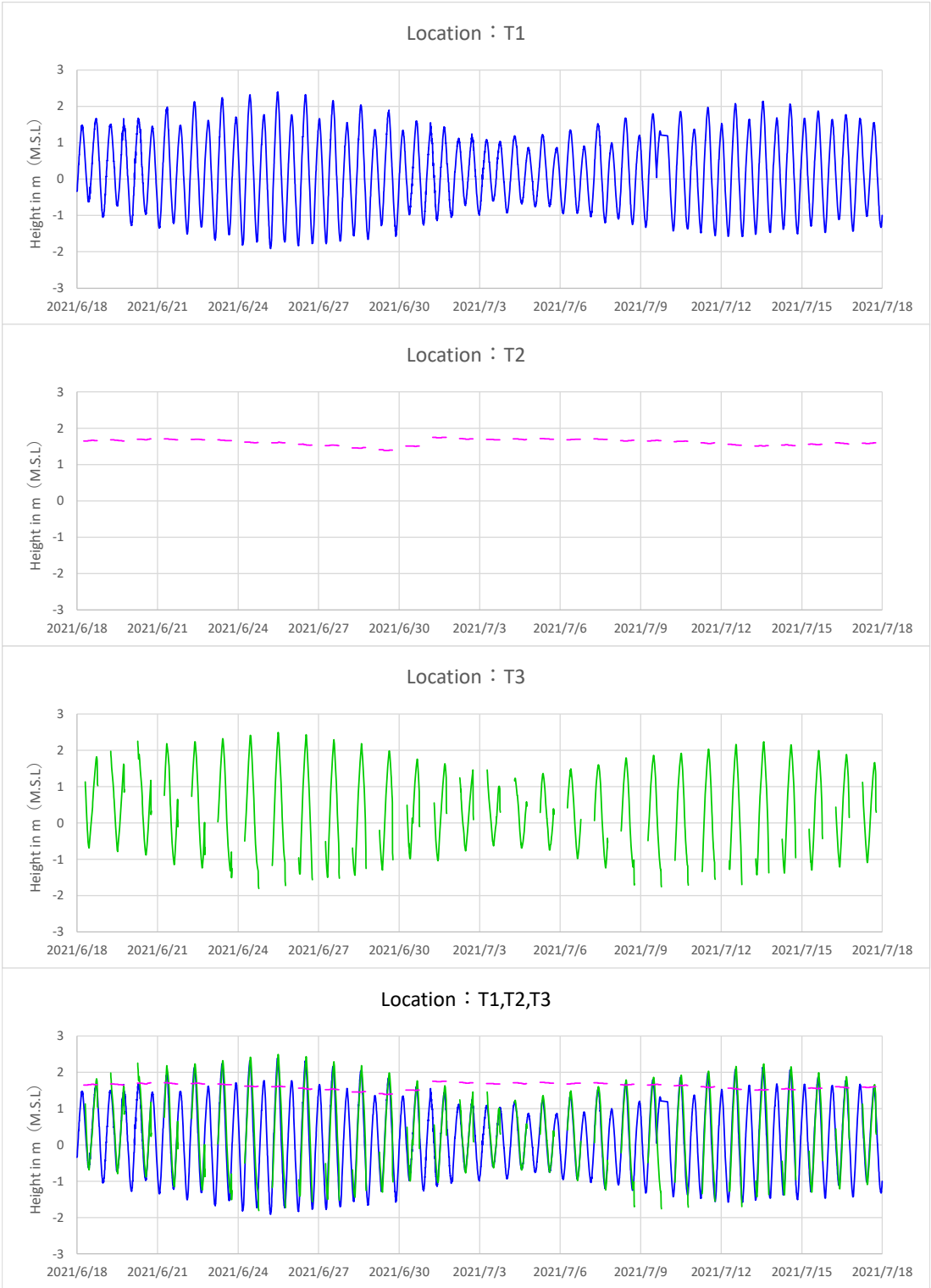
Addition：Study Team

Figure 5.1.5-9 【Rainy Season】Tidal Circulation at T1（Matabari Tide Gauge, from May 10th ,2021 to July 26th ,2021）



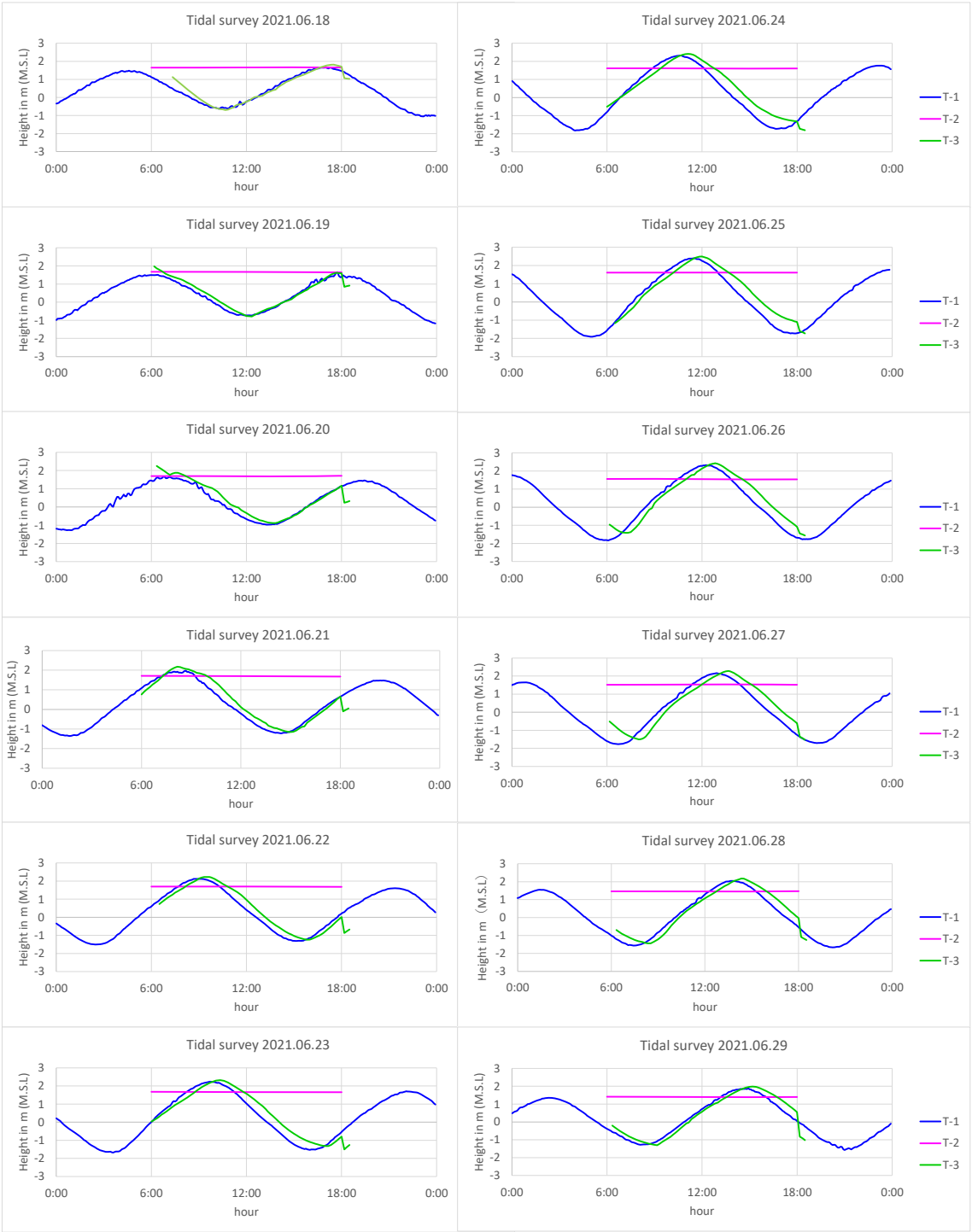
Addition：Study Team

Figure 5.1.5-10 【Rainy Season】Tidal Circulation and Tide level difference at T1



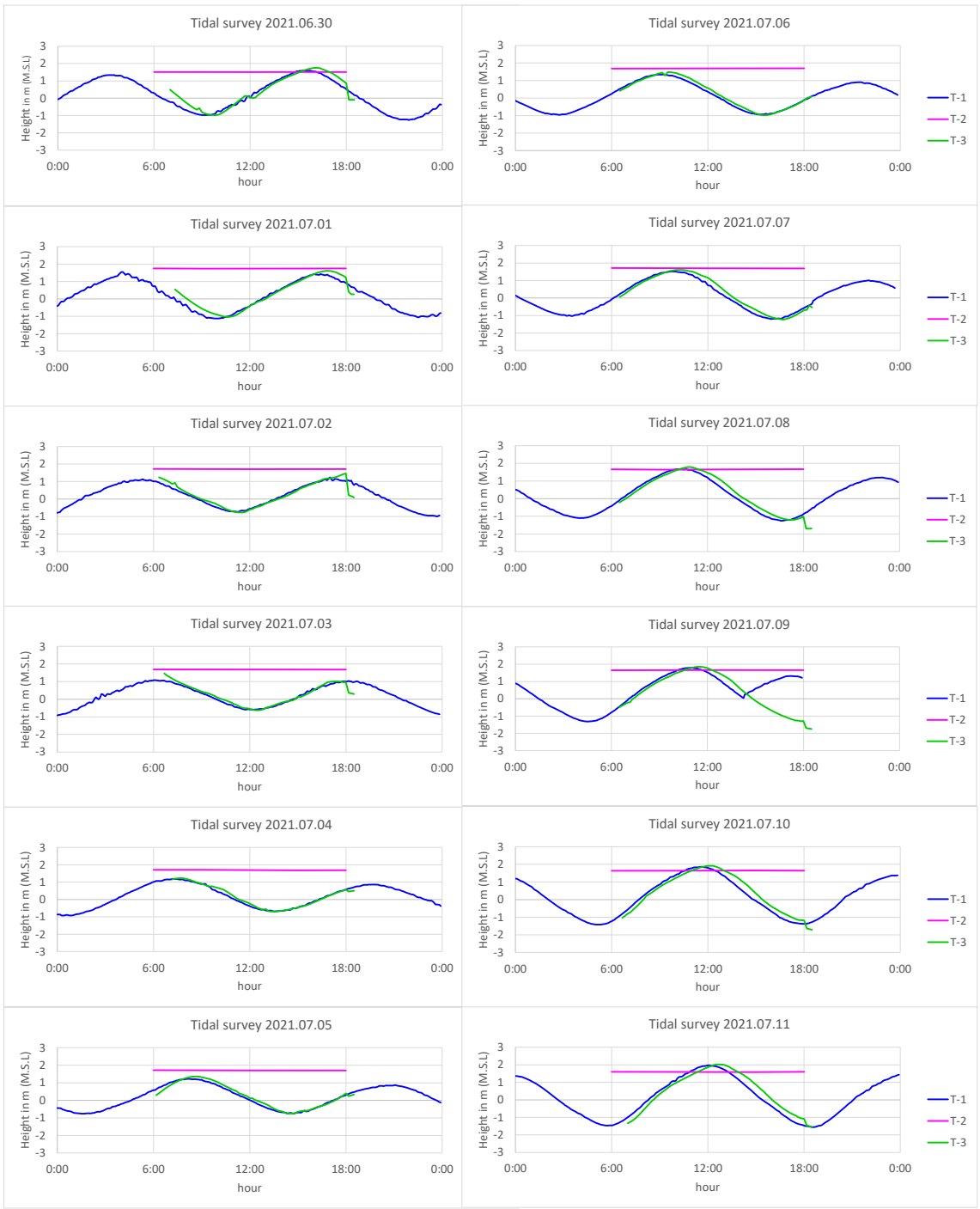
Source: Study Team

Figure 5.1.5-11 【Rainy Season】Tidal Circulation at 3 Points
（from June 18th ,2021 to July 19th ,2021）



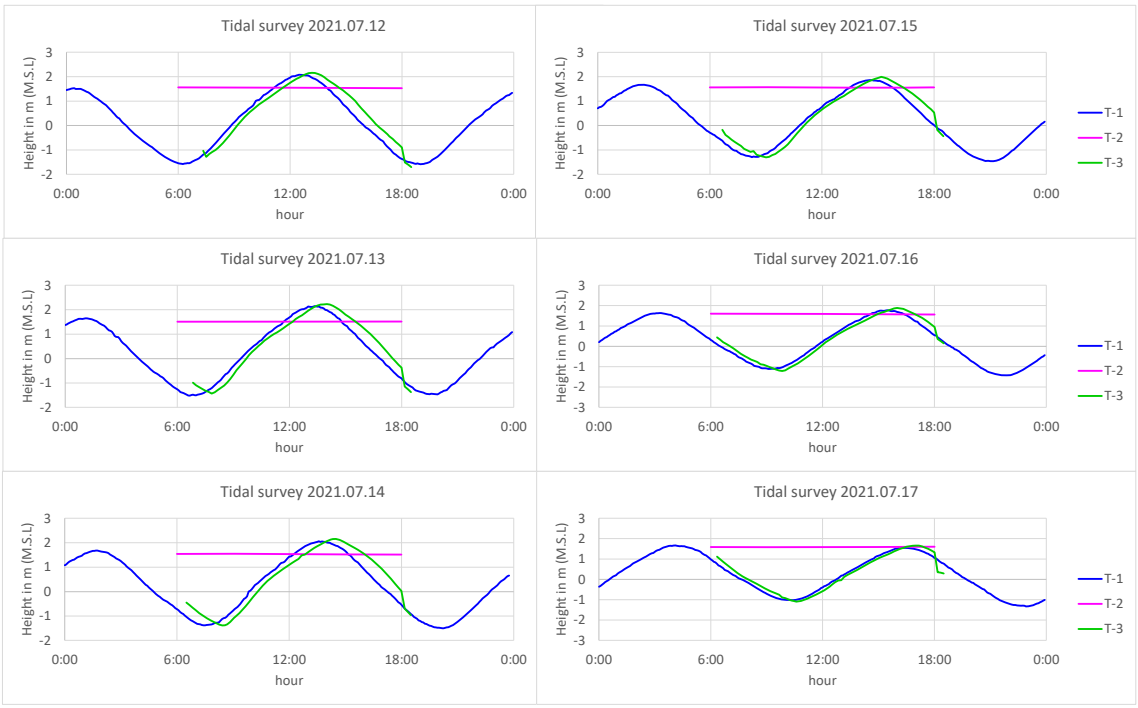
Source: Study Team

Figure 5.1.5-12 (1) 【Rainy Season】Tidal circulation at 3points(every day)



Source: Study Team

Figure 5.1.5-8 (2) 【Rainy Season】Tidal circulation at 3points(every day)



Source: Study Team

Figure 5.1.5-8 (3) 【Rainy Season】Tidal circulation at 3points(every day)

(3) Wave

(a) Survey Location

Survey Location of wave and wind is shown in the Figure 5.1.5-13. Survey Location points of Sedimentation is shown in the Table 5.1.5-2.

Source: Study Team

Figure 5.1.5-13 Survey Location of Wave and Wind

Table 5.1.5-2 Survey Location points of Wave and Wind

Location Id	Latitude	Longitude
WC-01	21.727208°	91.906028°
WC-02	21.714147°	91.912394°
WC-03	21.655439°	91.889770°

Source: Study Team

(b) Survey Period

Dry season : from February 14th ,2021 to March 15th ,2021

Rainy season : from June 20th ,2021 to July 19th ,2021

Observation time : 7:00～19:00

(c) Result

1) Dry season

Wave Height Distribution at 3 points is shown in the Figure 5.1.5-14 and Wave Direction Distribution at 3 points is shown in the Figure 5.1.5-15. Wind Speed Distribution at 3points s is shown in Figure 5.1.5-16 and Wind Direction Distribution at 3 points is shown in Figure 5.1.5-17.

Comparison of waves and wind speed conditions at WC-01 is shown in the Figure 5.1.5-18, and Appearance rate of waves and wind conditions at WC-01 is shown in the Figure 5.1.5-19.

Comparison of waves and wind speed conditions at WC-02 is shown in the Figure 5.1.5-20, and Appearance rate of waves and wind conditions at WC-02 is shown in the Figure 5.1.5-21.

Comparison of waves and wind speed conditions at WC-03 is shown in the Figure 5.1.5-22, and Appearance rate of waves and wind conditions at WC-03 is shown in the Figure 5.1.5-23.

The features obtained from the survey results are shown below.

① waves

- Comparing the wave height and wave direction at the 3points, the fluctuations were similar.
- Comparing the 3points the wave height of WC-01 tended to be low.
- Between February 14th and February 18th, the wave heights of WC-01 and WC-02 tended to be low, but the wave height of WC-03 was higher than that of the two points.

② wind

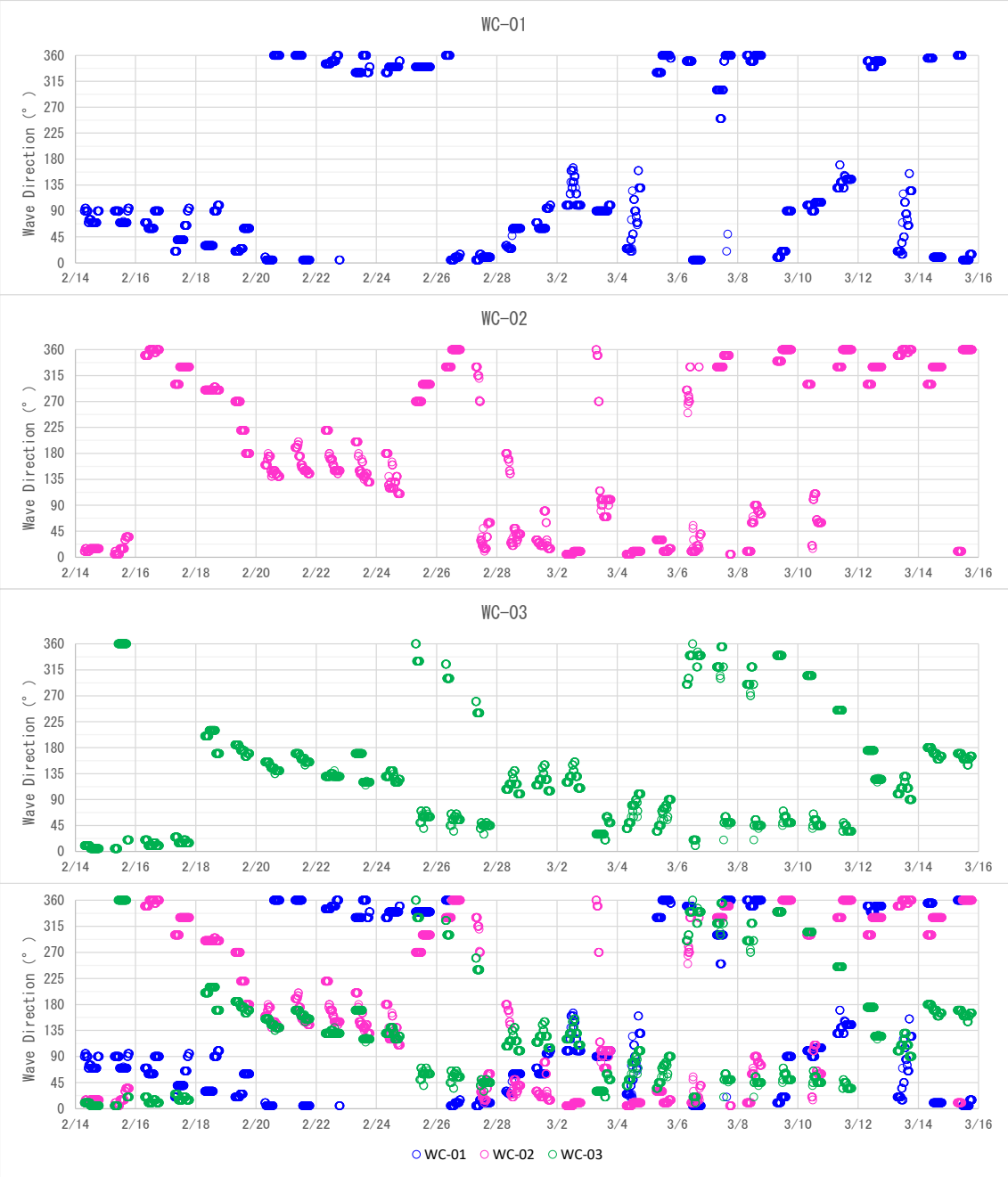
- Comparing the wind speed and wind direction at the 3points, the fluctuations were similar.
- Comparing the 3points the wind speed of WC-01 tended to be slow.
- Between February 14th and February 18th, the wind speed of WC-01 and WC-02 tended to be slower as in the case of waves, but the wave height of WC-03 was higher than that of the two points.

③ waves and wind

- Comparing the wave height and wind speed at each point, the fluctuations were similar.
- Comparing the wave direction and wind direction at each point, the direction of occurrence and the predominant direction were similar.
- The wave and wind directions of WC-01 and WC-02 were predominant in the north direction (NNW, N). The wave direction and wind direction of WC-03 were remarkable in the northeast direction (NE) and the southeast direction (SE).

Source: Study Team

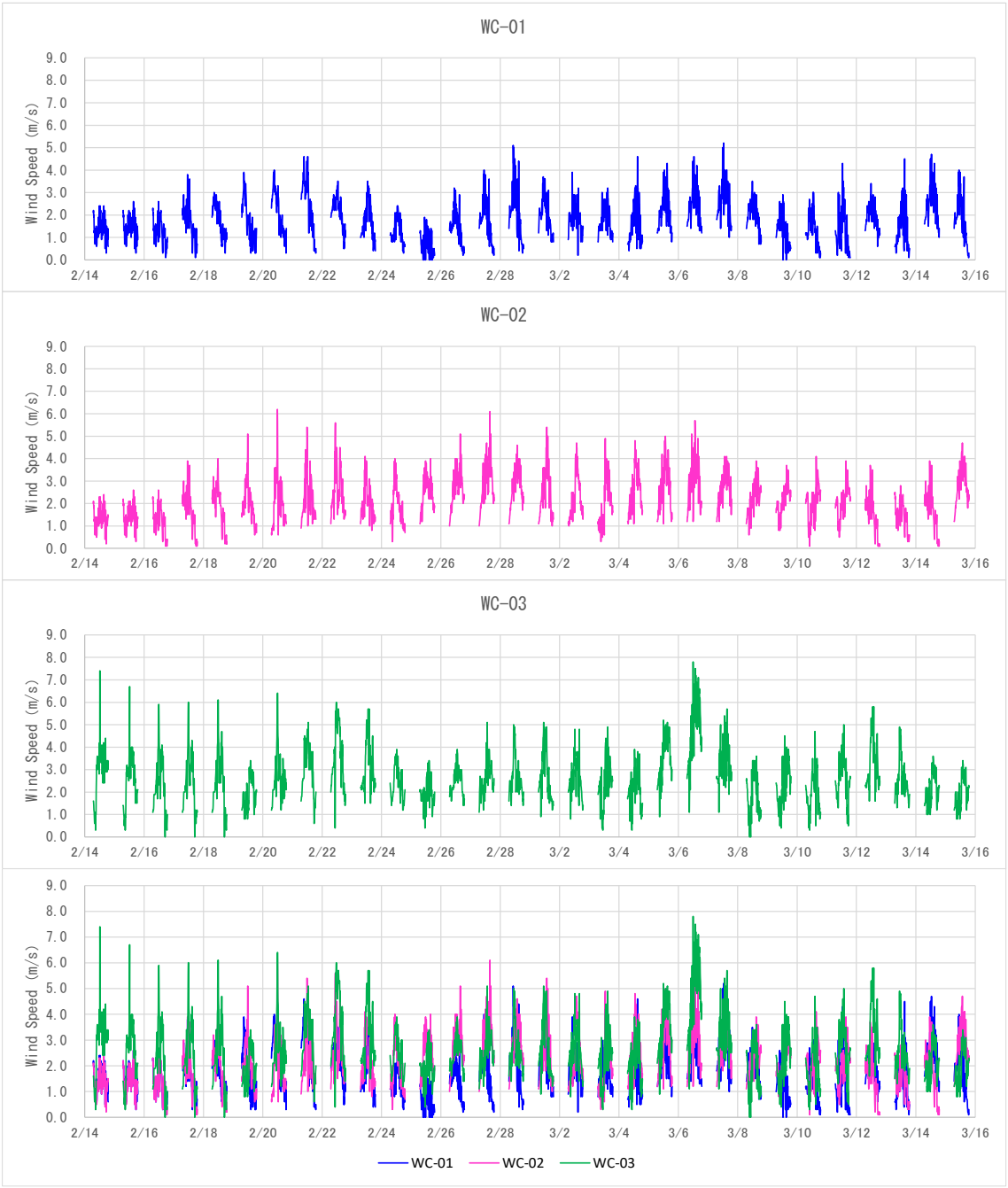
Figure 5.1.5-14 【Dry season】Wave Height Distribution at 3 Points



Remarks：N：0° ， E：90° ， S：180° ， W：270°

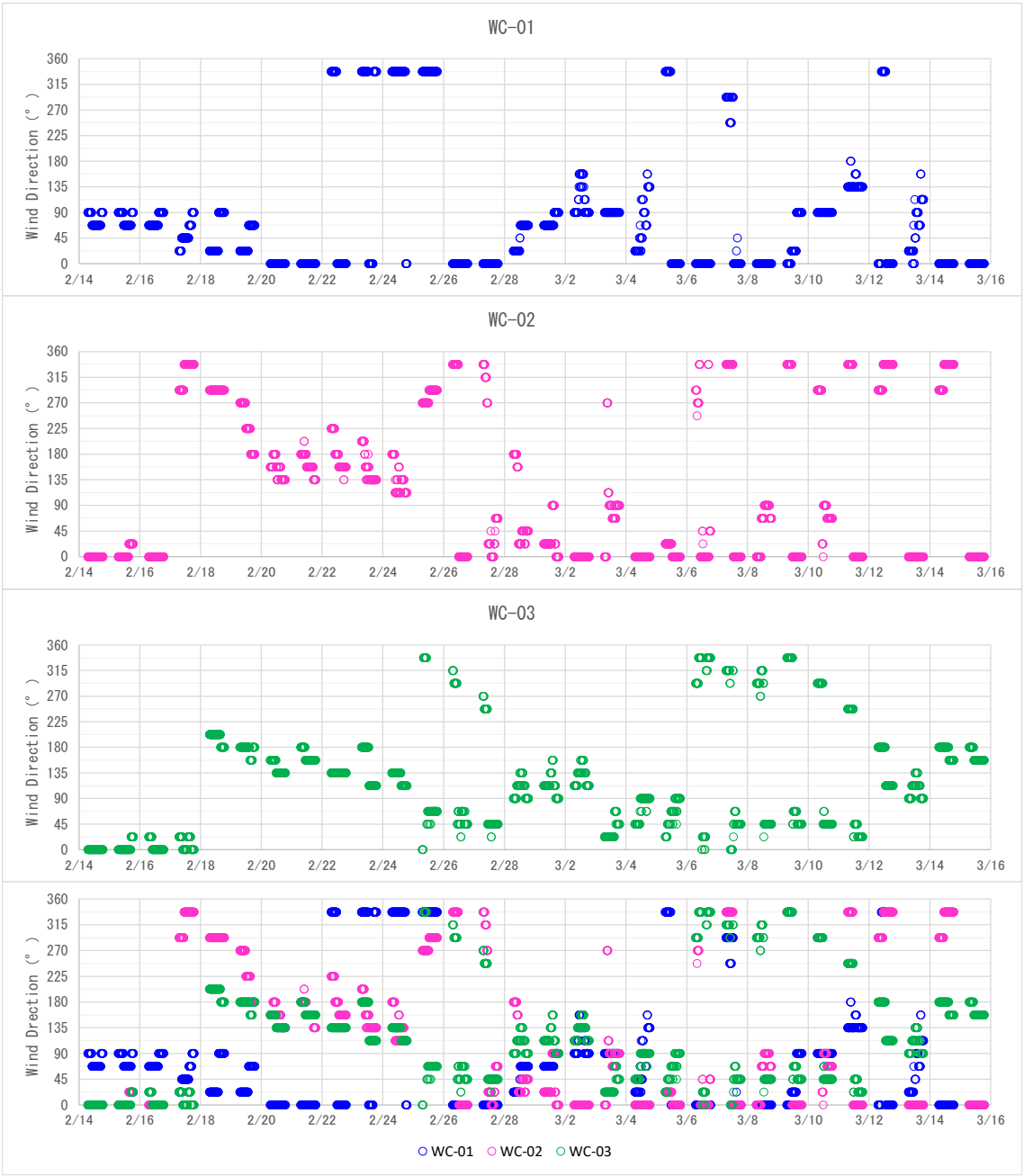
Source: Study Team

Figure 5.1.5-15 【Dry season】Wave Direction Distribution at 3 Points



Source: Study Team

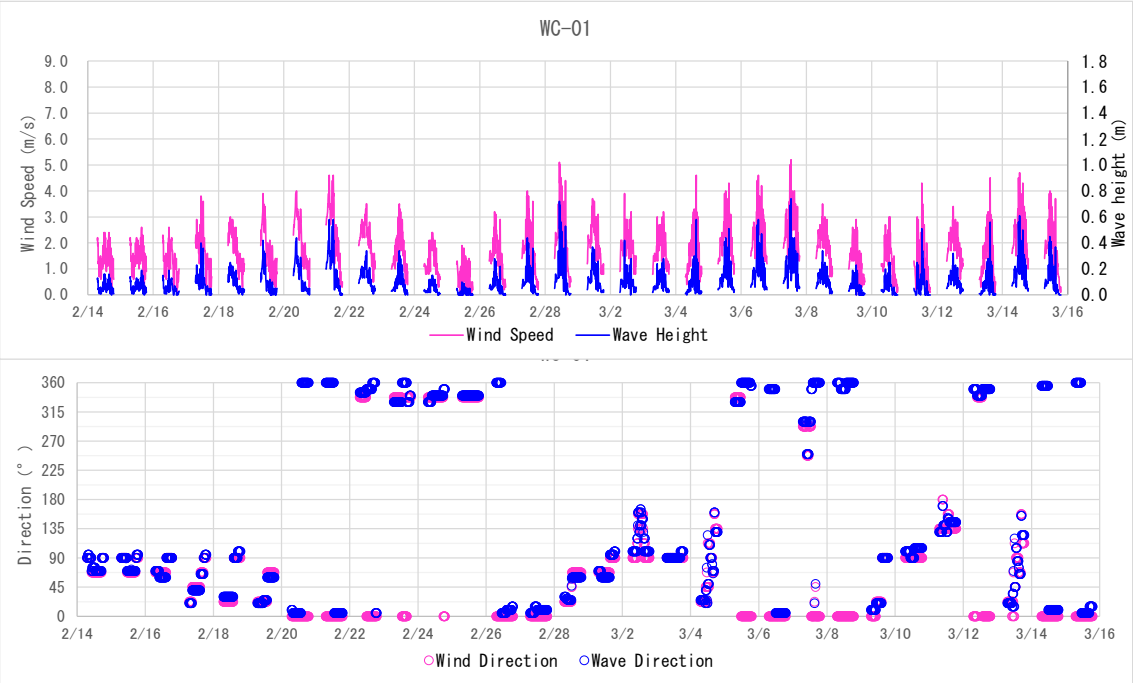
Figure 5.1.5-16 【Dry season】Wind Speed Distribution at 3 Points



Remarks：N：0° ， E：90° ， S：180° ， W：270°

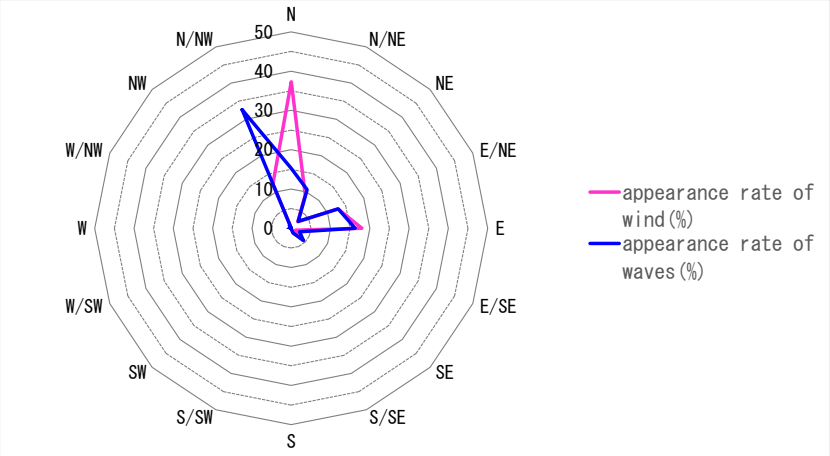
Source: Study Team

Figure 5.1.5-17 【Dry season】Wind Direction Distribution at 3 Points



Source: Study Team

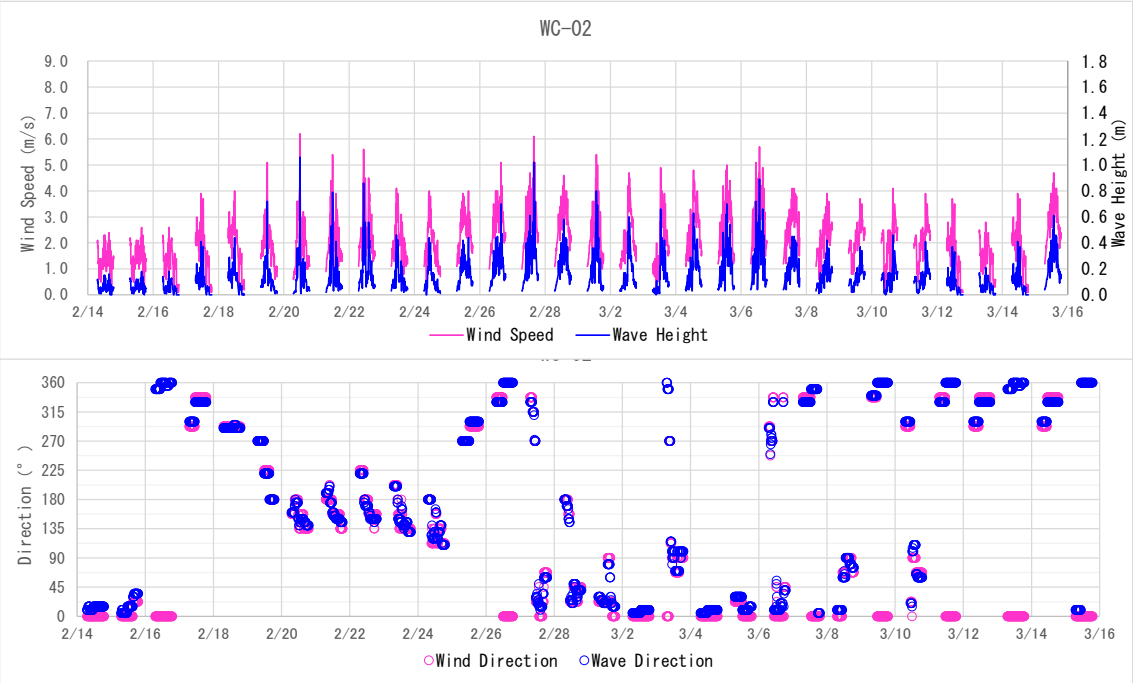
Figure 5.1.5-18 【Dry season】Comparison of waves and wind conditions at WC-01



Source: Study Team

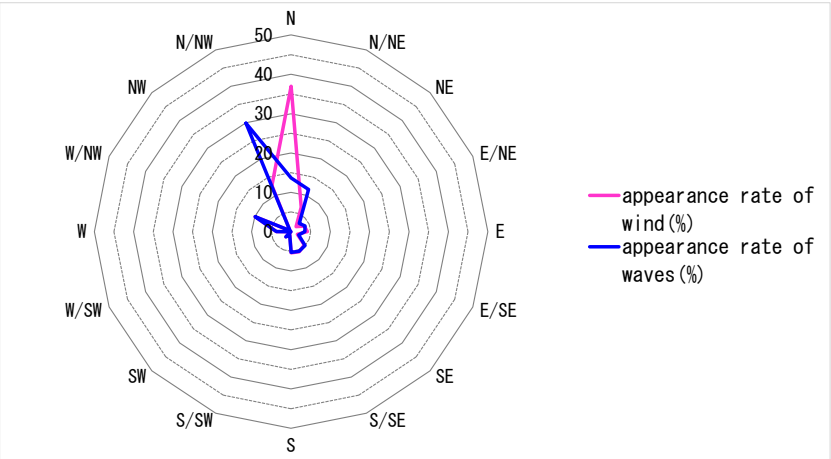
Remarks：N：0° ， E：90° ， S：180° ， W：270°

Figure 5.1.5-19 【Dry season】Appearance rate of waves and wind conditions at WC-01



Source: Study Team

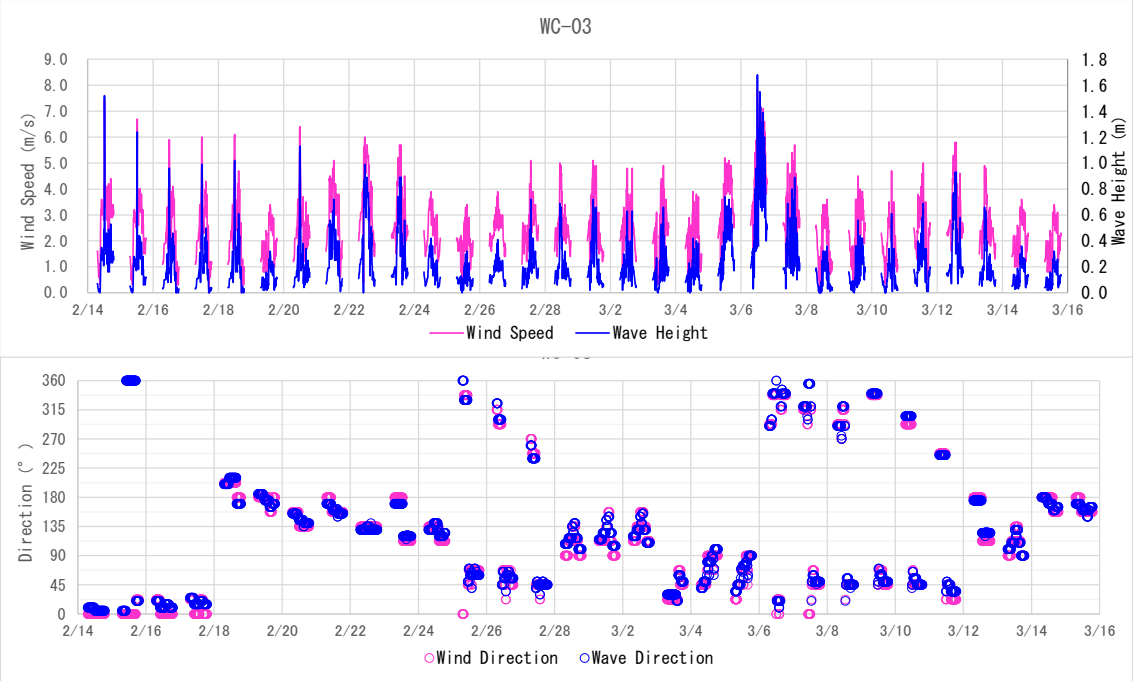
Figure 5.1.5-20 【Dry season】Comparison of waves and wind conditions at WC-02



Source: Study Team

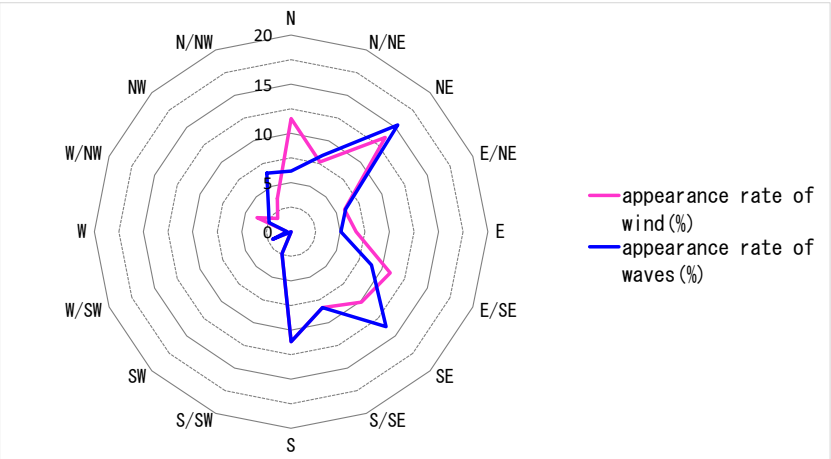
Remarks：N：0° ， E：90° ， S：180° ， W：270°

Figure 5.1.5-21 【Dry season】Appearance rate of waves and wind conditions at WC-02



Source: Study Team

Figure 5.1.5-22 【Dry season】Comparison of waves and wind conditions at WC-03



Remarks：N：0° ， E：90° ， S：180° ， W：270°

Source: Study Team

Figure 5.1.5-23 【Dry season】**A**ppearance rate of waves and wind conditions at WC-03

2) Rainy season

Wave Height Distribution at 3 points is shown in the Figure 5.1.5-24 and Wave Direction Distribution at 3 points is shown in the Figure 5.1.5-25. Wind Speed Distribution at 3points s is shown

in Figure 5.1.5-26 and Wind Direction Distribution at 3 points is shown in Figure 5.1.5-27.

Comparison of waves and wind speed conditions at WC-01 is shown in the Figure 5.1.5-28, and Appearance rate of waves and wind conditions at WC-01 is shown in the Figure 5.1.5-29.

Comparison of waves and wind speed conditions at WC-02 is shown in the Figure 5.1.5-30 and Appearance rate of waves and wind conditions at WC-02 is shown in the Figure 5.1.5-31.

Comparison of waves and wind speed conditions at WC-03 is shown in the Figure 5.1.5-32, and Appearance rate of waves and wind conditions at WC-03 is shown in the Figure 5.1.5-33.

The features obtained from the survey results are shown below.

① waves

- Comparing the wave height at the 3points, the fluctuations were similar.
- Comparing the wave directions at the 3 points, the frequency of wave directions from 0 to 90 ° was very low. The result was a large variation as a whole.
- Comparing the 3points the wave height of WC-01 tended to be low.
- Focusing on the case where the wave height was high (2.0 m or more), the number of appearances in WC-02 was large.

② wind

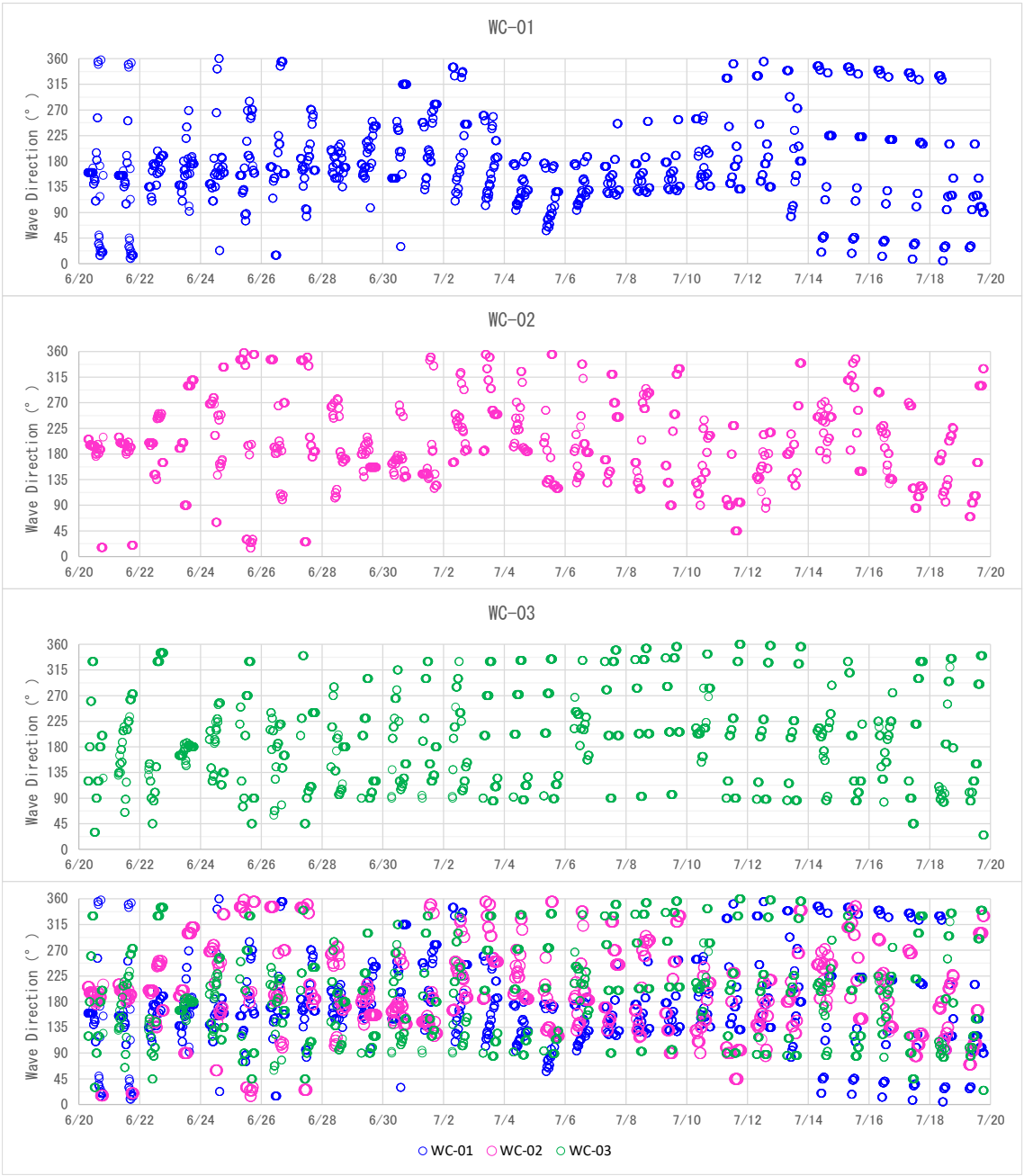
- Comparing the wind speed at the 3points, the fluctuations were similar.
- Comparing the wind directions at the 3 points, the frequency of wind directions from 0 to 90 ° was very low. The result was a large variation as a whole.

③ waves and wind

- Comparing the wave height and wind speed at each point, the fluctuations were similar.
- Comparing the wave direction and wind direction at each point, the direction of occurrence and the predominant direction were similar.
- The wave and wind directions of WC-01 and WC-02 were predominant in the southeast direction (SE, SSE, S). The wave direction and wind direction of WC-03 were remarkable in the east direction (E, ESE) and the southwest direction (SSW).

Source: Study Team

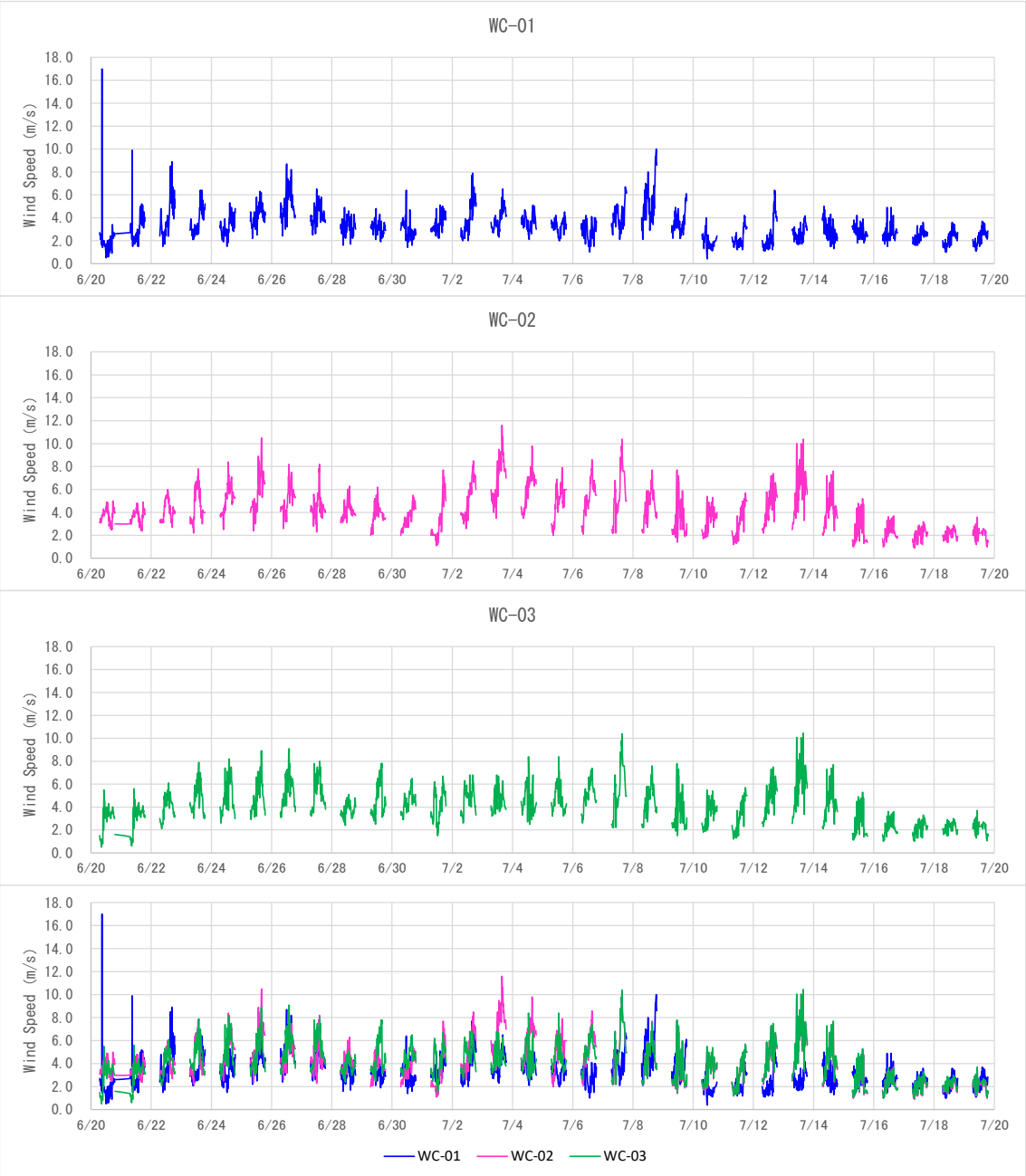
Figure 5.1.5-24 【Rainy season】Wave Height Distribution at 3 Points



Remarks：N：0° ， E：90° ， S：180° ， W：270°

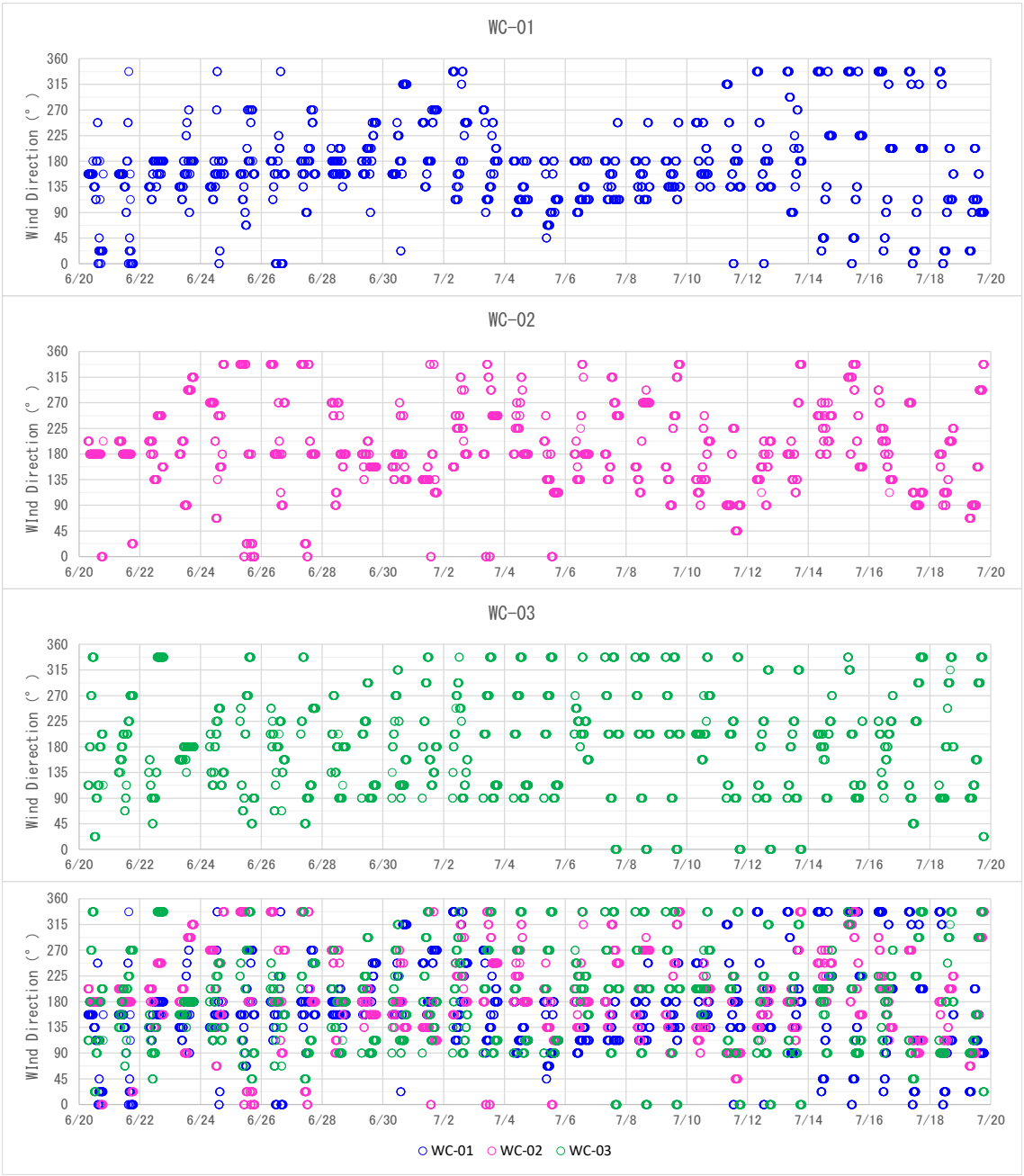
Source: Study Team

Figure 5.1.5-25 【Rainy season】Wave Direction Distribution at 3 Points



Source: Study Team

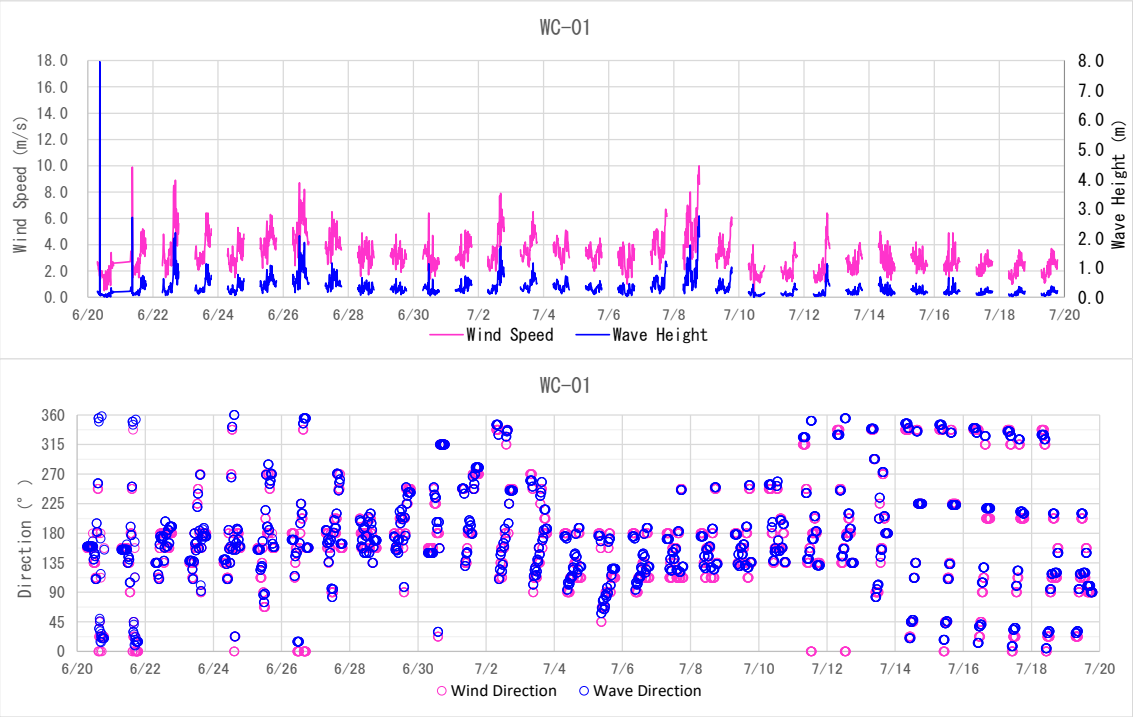
Figure 5.1.5-26 【Rainy season】Wind Speed Distribution at 3 Points



Remarks：N：0° ， E：90° ， S：180° ， W：270°

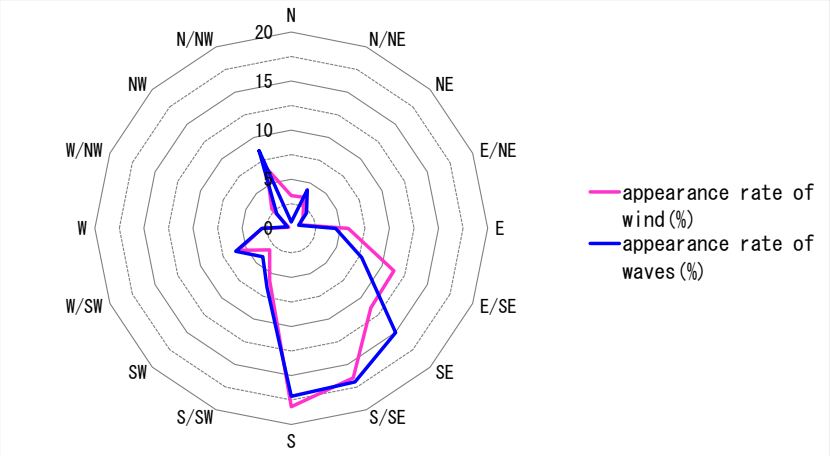
Source: Study Team

Figure 5.1.5-27 【Rainy season】Wind Direction Distribution at 3 Points



Source: Study Team

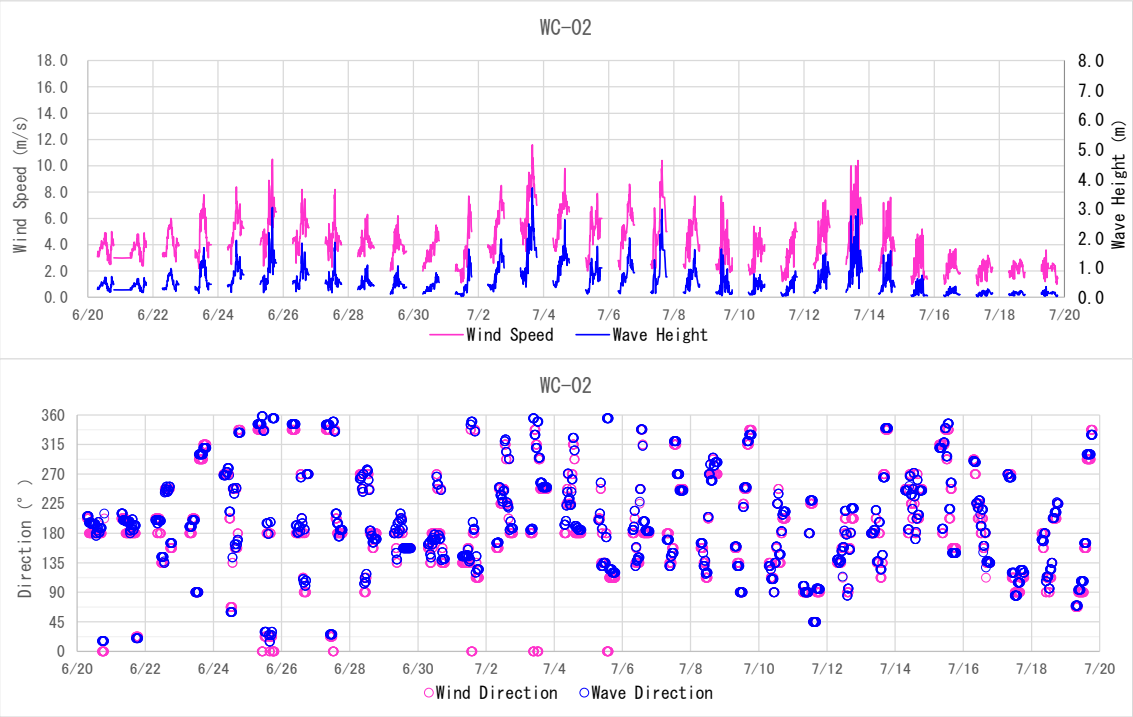
Figure 5.1.5-28 【Rainy season】Comparison of waves and wind conditions at WC-01



Remarks：N：0° ， E：90° ， S：180° ， W：270°

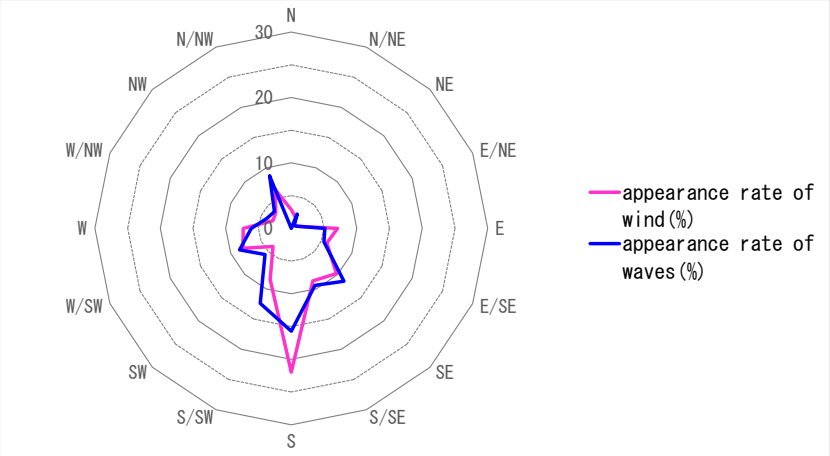
Source: Study Team

Figure 5.1.5-29 【Rainy season】Appearance rate of waves and wind conditions at WC-01



Source: Study Team

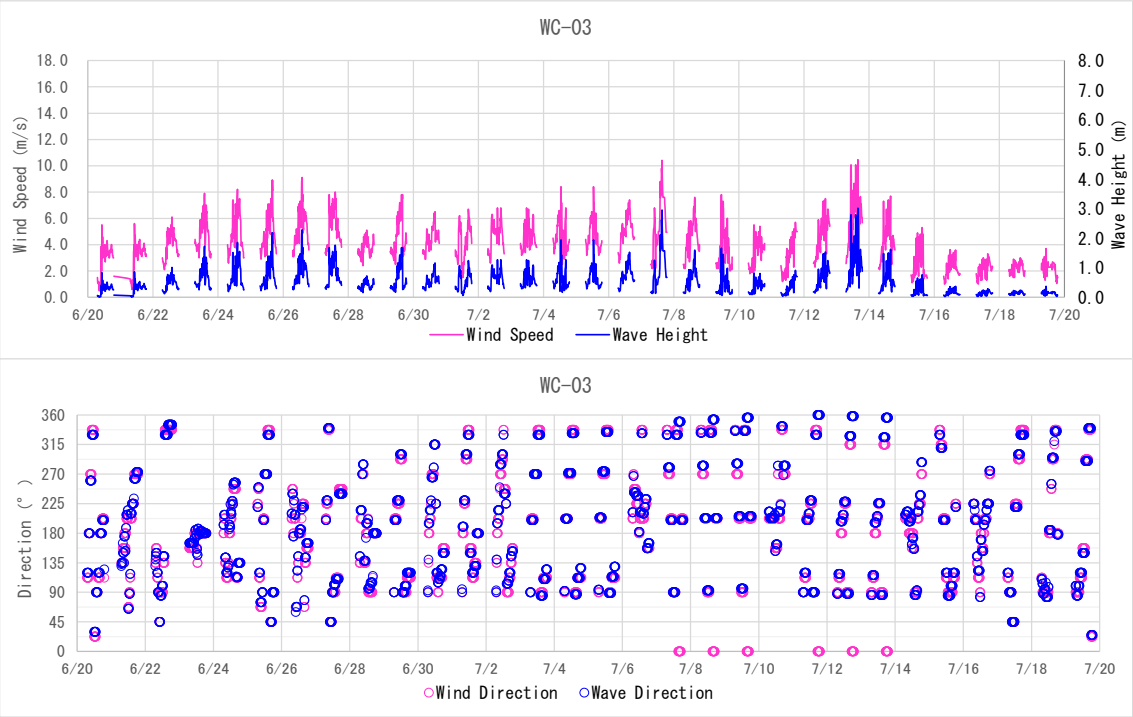
Figure 5.1.5-30 【Rainy season】Comparison of waves and wind conditions at WC-02



Remarks：N：0° ， E：90° ， S：180° ， W：270°

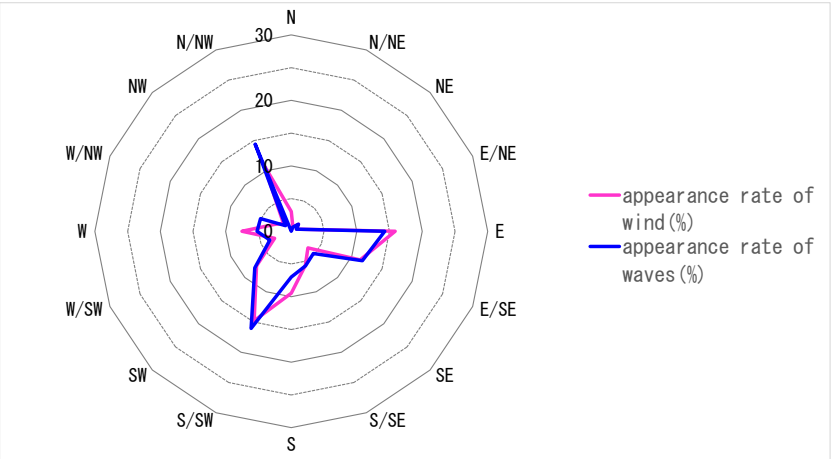
Source: Study Team

Figure 5.1.5-31 【Rainy season】Appearance rate of waves and wind conditions at WC-02



Source: Study Team

Figure 5.1.5-32 【Rainy season】Comparison of waves and wind conditions at WC-03



Remarks：N：0° ， E：90° ， S：180° ， W：270°

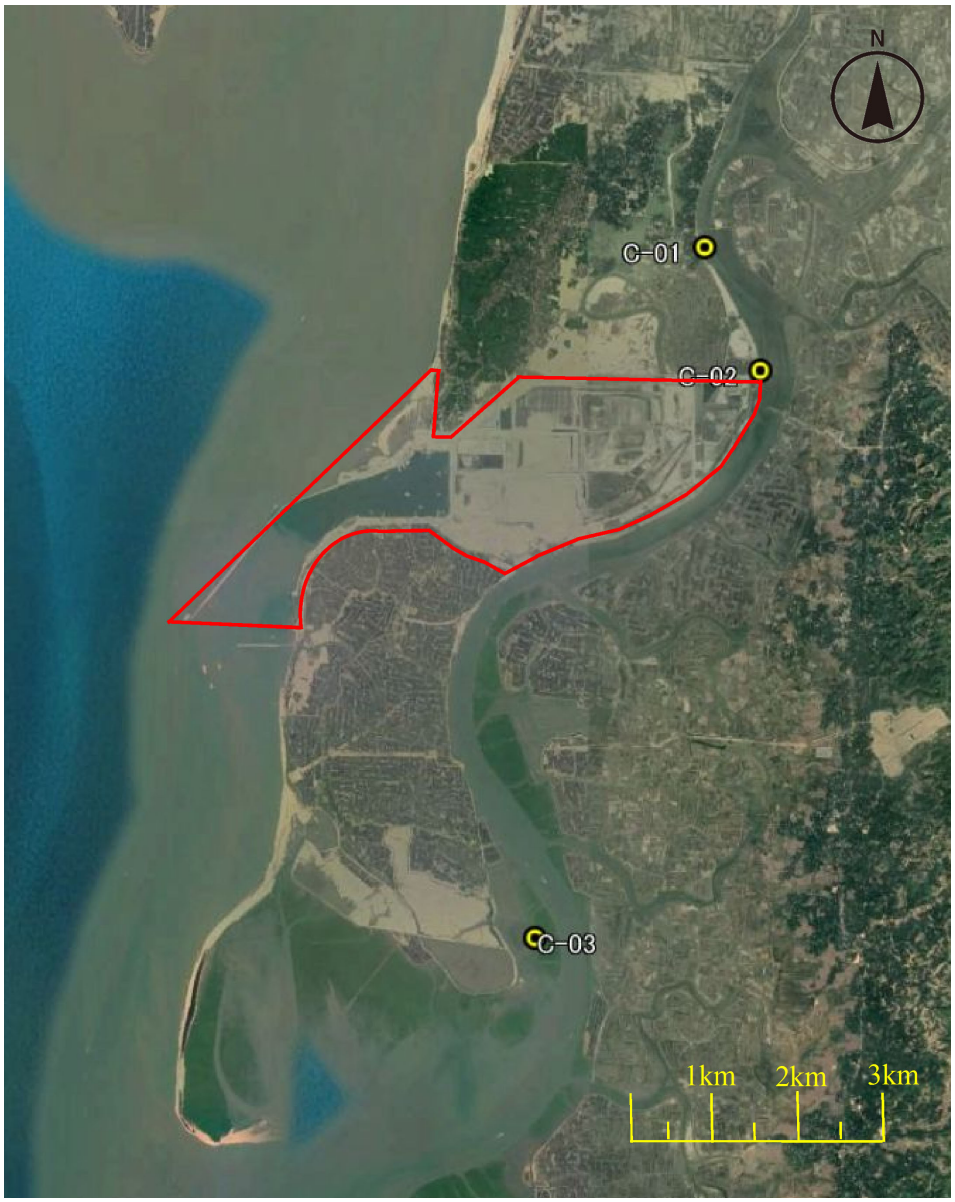
Source: Study Team

Figure 5.1.5-33 【Rainy season】Appearance rate of waves and wind conditions at WC-03

(4) Current

(a) Survey Location

Survey Location of current is shown in the Figure 5.1.5-34. Survey Location points of current is shown in the Table 5.1.5-3.



Source: Study Team

Figure 5.1.5-34 Survey Location of current

Table 5.1.5-3 Survey Location points of current

Location Id	Latitude	Longitude
C-01	21.727208°	91.906028°
C-02	21.714147°	91.912394°
C-03	21.654136°	91.886597°

Source: Study Team

(b) Survey Period

Dry season : from February 18th ,2021 to March 19th ,2021

Dry season : from February 18th ,2021 to March 19th ,2021

Observation time : 6:00～18:00

(c) Result

1) Dry season

Flow Velocity Distribution at 3 points is shown in Figure 5.1.5-35. The Flow Direction distribution at 3 points is shown in Figure 5.1.5-36.

The features obtained from the survey results are shown below.

① flow velocity

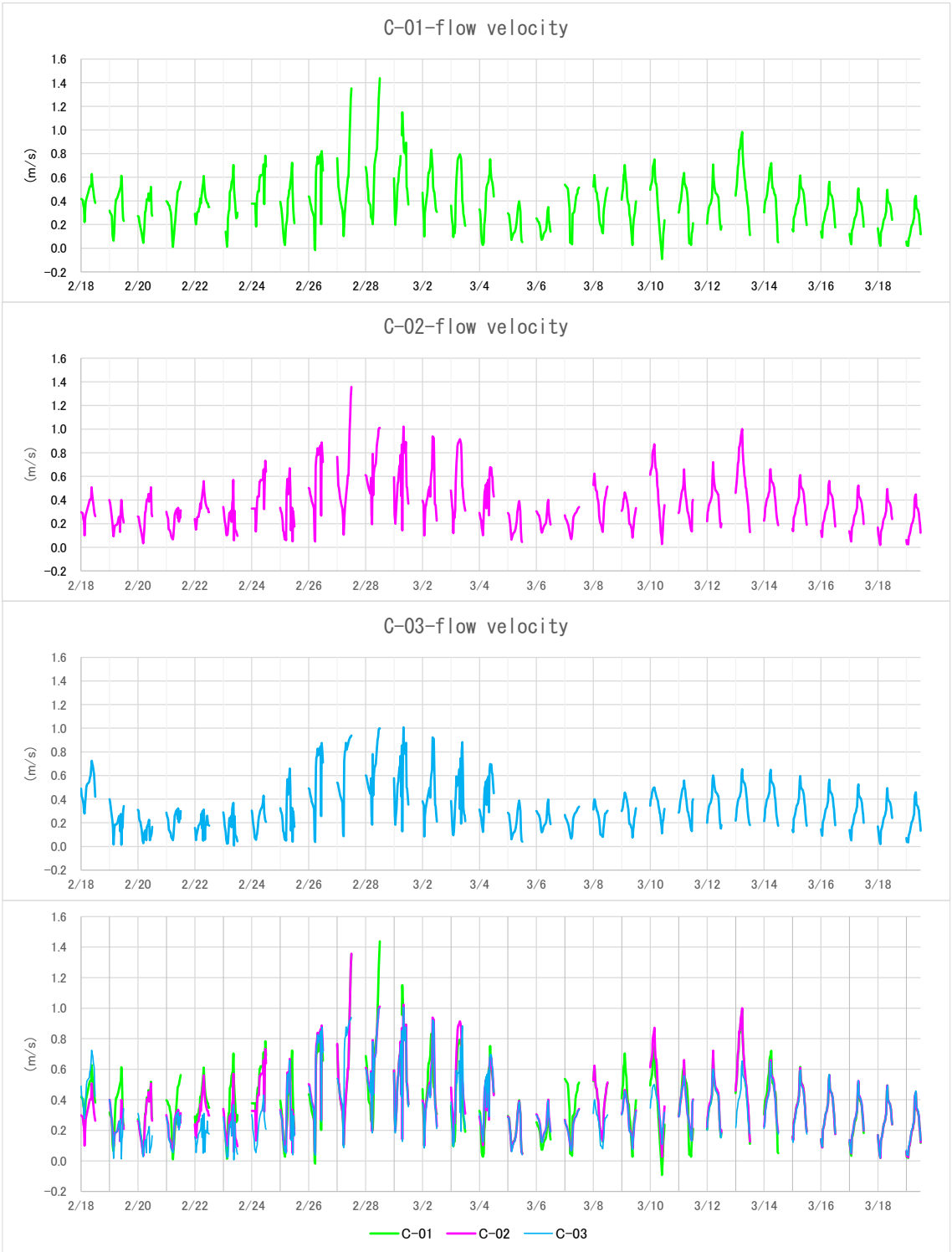
・Comparing the flow velocity at the 3points, the fluctuations were similar.

・The flow velocity of C-03 was slightly smaller than that of C-01 and C-02.

② flow direction

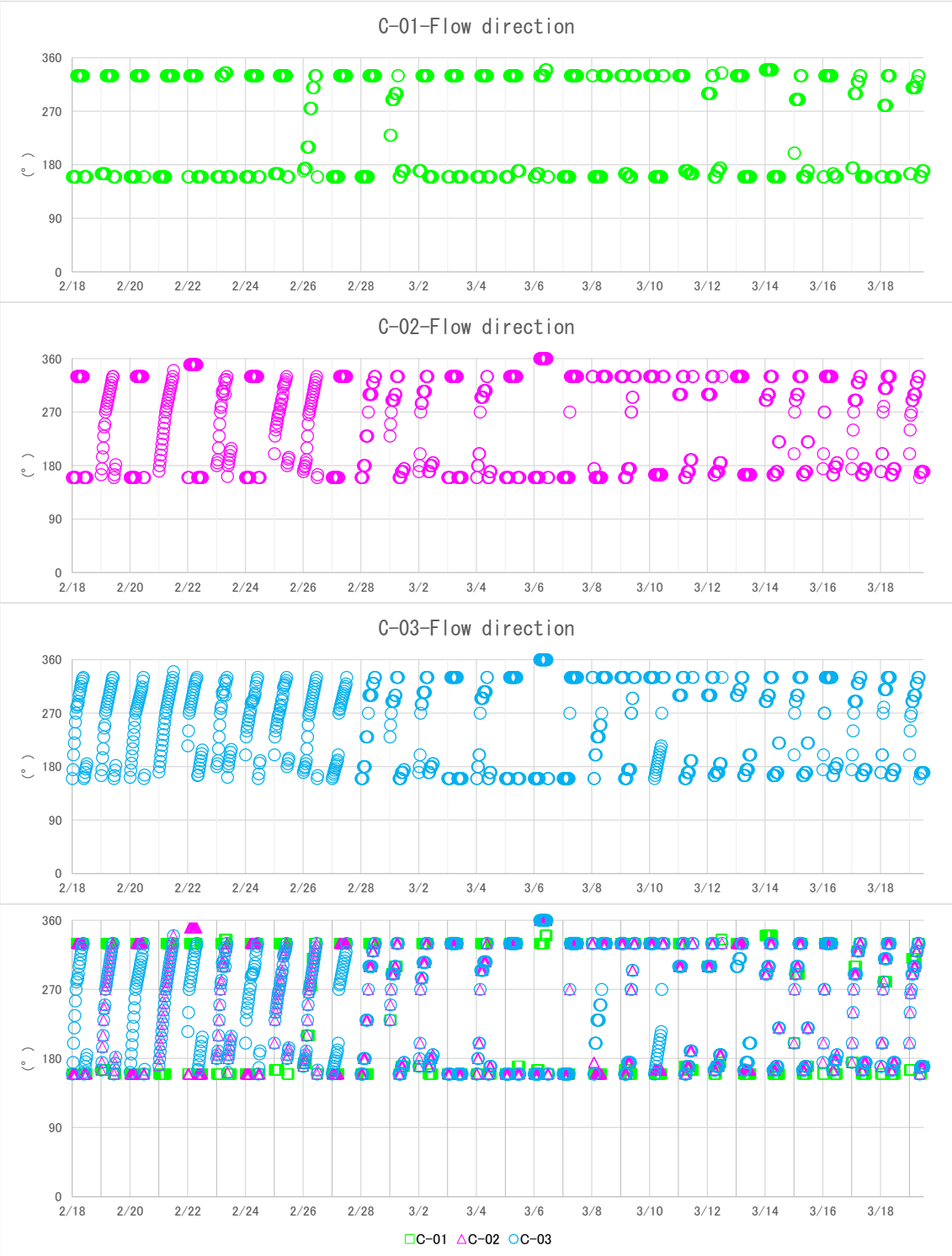
・The flow direction was dominated between 180 ° and 360 °(S → W → N) at 3 points.

・The flow direction of WC-01 was predominant at the 180° position (S) and the 360° position (N). Comparing C-01, the flow direction varied in the order of C-02 and C-03.



Source: Study Team

Figure 5.1.5-35 【Dry season】Flow Velocity Distribution at 3 Points



Remarks：N：0° ， E：90° ， S：180° ， W：270°

Source: Study Team

Figure 5.1.5-36 【Dry season】Flow Direction at 3 Points

2) Rainy season

Flow Velocity Distribution at 3 points is shown in Figure 5.1.5-35. The Flow Direction distribution at 3 points is shown in Figure 5.1.5-36.

The features obtained from the survey results are shown below.

① flow velocity

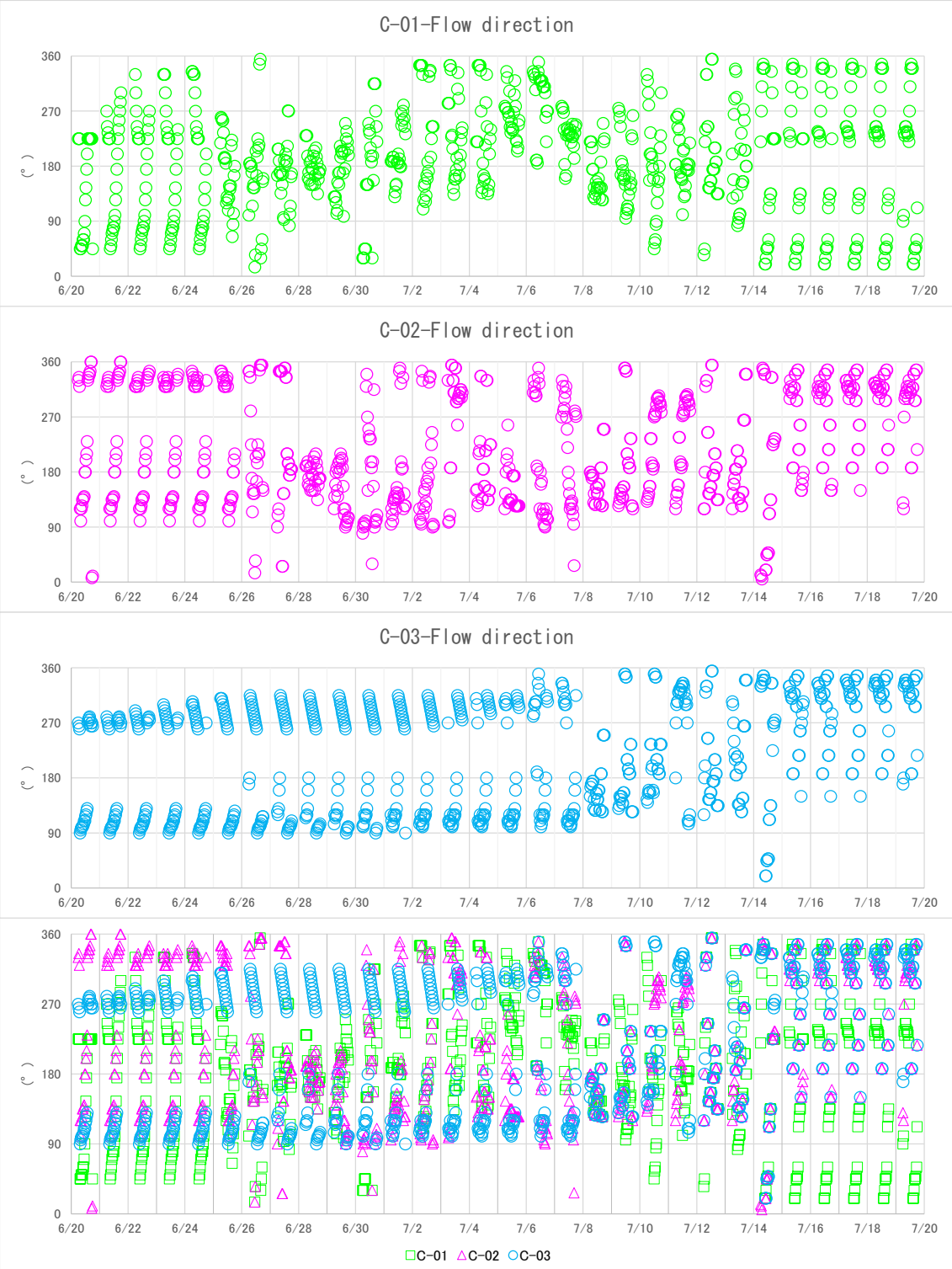
- Comparing the flow velocity at the 3points, the fluctuations were similar.
- Focusing on the result of high flow velocity in June, it was observed on the 23rd in C-02 and on the 24th in C-03. On the other hand, the result of high flow velocity was not observed at the same time in C-01,
- On July 6th, the results of high flow velocities were observed at 3 points.

② flow direction

- The flow directions were similar in C-01 and C-02
- The flow direction of C-03 was predominant at the 90° position (E) and the 270° position (W) between June 30th and July 6th. Comparing C-02 and C-03, the flow direction varied C-01.

Source: Study Team

Figure 5.1.5-37 【Rainy season】Flow Velocity Distribution at 3 Points



Remarks：N：0° ， E：90° ， S：180° ， W：270°

Source: Study Team

Figure 5.1.5-38 【Rainy season】Flow Direction at 3 Points

(5) Turbidity

(a) Survey Location

Survey Location of turbidity is shown in the Figure 5.1.5-39. Survey Location points of turbidity is shown in the Table 5.1.5-4

Source: Study Team

Figure 5.1.5-39 Survey Location of turbidity

Table 5.1.5-4 Survey Location points of turbidity

Location Id	Latitude	Longitude	Remarks
T-01	21.72868611°	91.90651111°	・ Survey and sample collection has been completed by one day. ・ Samples were shifted to the laboratory within 48 hours.
T-03	21.72092222°	91.90990833°	
T-05	21.71334722°	91.91280833°	
T-07	21.70579444°	91.91101944°	
T-09	21.69868333°	91.90424444°	
T-11	21.69428056°	91.89585278°	
T-13	21.69201667°	91.88673056°	
T-15	21.68686111°	91.87978056°	
T-17	21.67785833°	91.87807778°	
T-18	21.76384722°	91.90446944°	
T-19	21.66930000°	91.88086944°	
T-20	21.73900556°	91.90826389°	
T-23	21.65283889°	91.88671667°	
T-24	21.71677222°	91.90046944°	S-24 : Rangakhali River

Source: Study Team

(b) Survey Period

Dry season : February ,2021

Rainy season : July ,2021

(c) Result

Results of Turbidity analysis is shown in the Table 5.1.5-5. Secchi Depth Distribution is shown in Figure 5.1.5-40. Total Suspended Solid（SS）for surface and bottom water is shown in the Table 5.1.5-6. Surface and bottom water Suspended Solid（SS）is shown in the Figure 5.1.5-41

The features obtained from the survey results are shown below.

① Secchi depth

The degree of turbidity was measured and the secchi depth was measured. The secchi depth decreases as the water becomes muddy.

・In the dry season, the secchi depth was high on the north side of the planned site (T-01, T-03), around the planned site (T-07, T-09, T-11) and on the south side (T-19). The result was that the turbidity was low around the point.

・In the rainy season, the secchi depth was high on around the planned site (T-07, T-09, T-11, T-13) and on the south side (T-15, T-17, T-19). The result was that the turbidity was low around the point.

② Suspended Solid（SS）

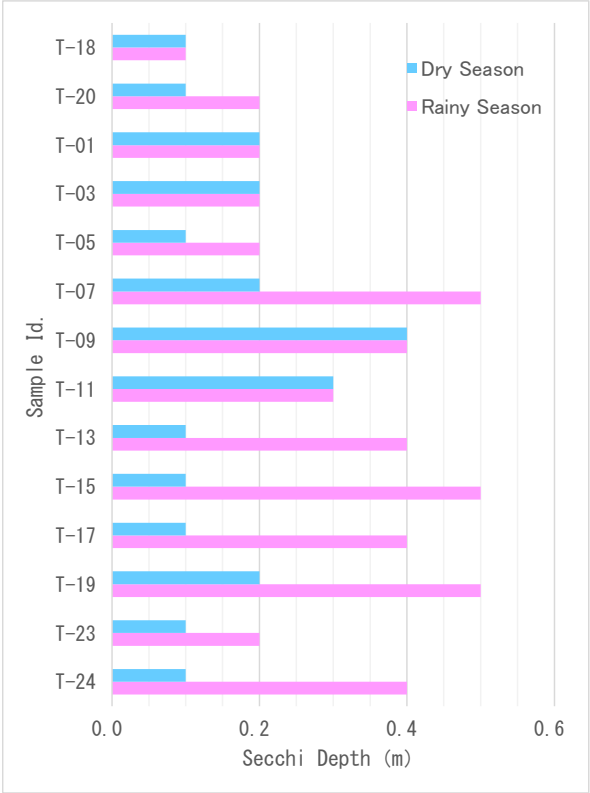
- In the dry season, the total SS on the surface water was high on the north side (T-20, T-01), south side (T-19, T-23) and the Rangakhali Channel (T-24).
- In the rainy season, the total SS on the surface water was high on the north side (T-20), south side (T-17,T-19, T-23) and the Rangakhali Channel (T-24).
- Except for the north and south sides of the Kohelia Channel and the Rangakhali Channel, the total SS of surface water and the total SS of bottom water was small, and they were well mixed.

Table 5.1.5-5 Results of Turbidity analysis

	Dry season				Rainy Season			
Sample Id.	Depth (m)	Secchi Depth (m)	Secchi Depth (ft)	Turbidity (FNU)	Depth (m)	Secchi Depth (m)	Secchi Depth (ft)	Turbidity (FNU)
T-18	5.00	0.1	0.33	9.44	6.80	0.1	0.33	252.50
T-20	0.50	0.1	0.33	9.44	2.90	0.2	0.66	85.05
T-01	0.50	0.2	0.66	6.07	0.50	0.2	0.66	85.05
T-03	0.50	0.2	0.66	6.07	0.50	0.2	0.66	85.05
T-05	1.50	0.1	0.33	9.44	0.50	0.2	0.66	85.05
T-07	0.30	0.2	0.66	6.07	3.00	0.5	1.64	20.18
T-09	3.50	0.4	1.31	3.90	3.00	0.4	1.31	28.65
T-11	2.00	0.3	0.98	4.69	1.50	0.3	0.98	45.00
T-13	0.50	0.1	0.33	9.44	1.90	0.4	1.31	28.65
T-15	0.40	0.1	0.33	9.44	4.90	0.5	1.64	20.18
T-17	1.00	0.1	0.33	9.44	3.20	0.4	1.31	28.65
T-19	2.75	0.2	0.66	6.07	5.10	0.5	1.64	20.18
T-23	0.50	0.1	0.33	9.44	0.80	0.2	0.66	85.05
T-24	0.40	0.1	0.33	9.44	2.60	0.4	1.31	28.65

FNU : Formazin Nephelometric Unit

Source: Study Team



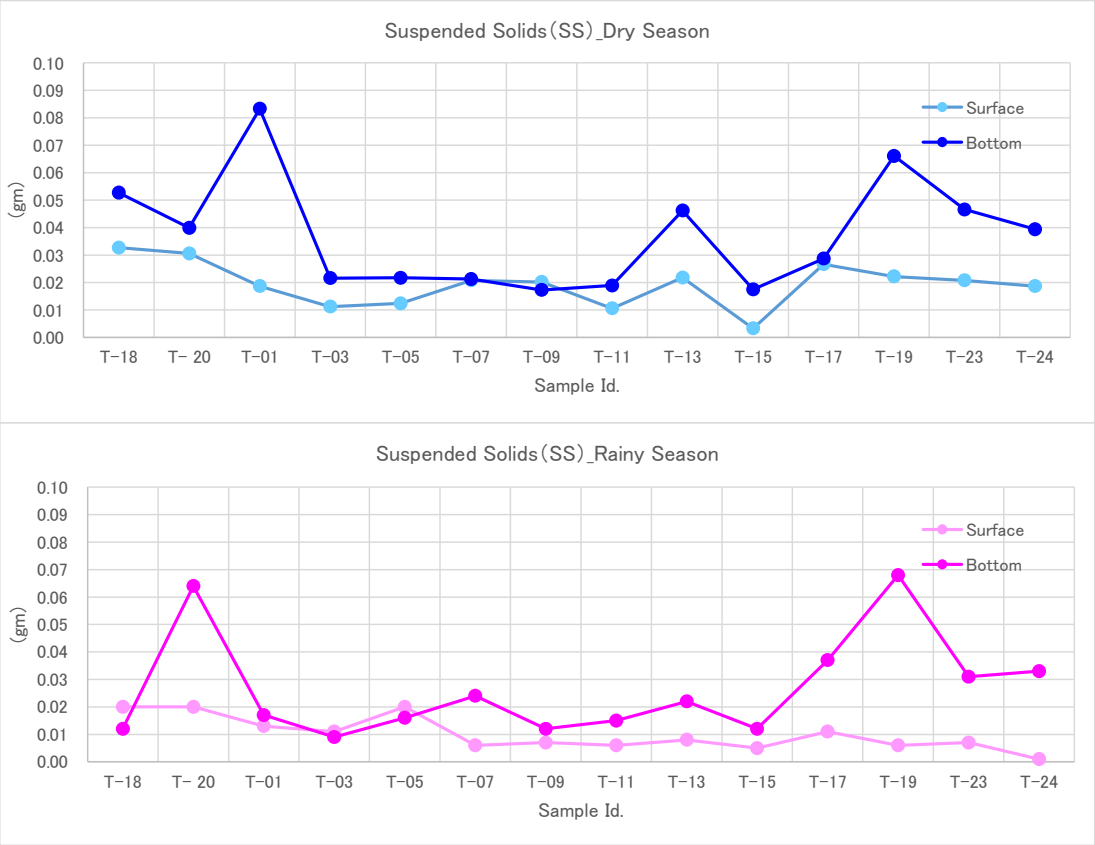
Source: Study Team

Figure 5.1.5-40 Secchi Depth Distribution

Table 5.1.5-6 Total Suspended Solid（SS） for surface and bottom water

	Dry season		Rainy season	
Sample ID	Wt(gm) Surface	Wi (gm) Bottom	Wt(gm) Surface	Wi (gm) Bottom
T-18	0.0327	0.0527	0.0200	0.0120
T-20	0.0306	0.0399	0.0200	0.0640
T-01	0.0187	0.0833	0.0130	0.0170
T-03	0.0112	0.0216	0.0110	0.0090
T-05	0.0124	0.0217	0.0200	0.0160
T-07	0.0208	0.0213	0.0060	0.0240
T-09	0.0202	0.0173	0.0070	0.0120
T-11	0.0106	0.0189	0.0060	0.0150
T-13	0.0218	0.0462	0.0080	0.0220
T-15	0.0033	0.0175	0.0050	0.0120
T-17	0.0267	0.0287	0.0110	0.0370
T-19	0.0222	0.0661	0.0060	0.0680
T-23	0.0208	0.0466	0.0070	0.0310
T-24	0.0187	0.0394	0.0010	0.0330

Source: Study Team



Source: Study Team

Figure 5.1.5-41　Surface and bottom water Suspended Solid（SS）

(6)　Conclusions

From the results of this survey, the Study Team considered the topographical features of the channel. First, the Study Team grasped the characteristics of the kohelia Channel using aerial photographs of Google Earth, and considered based on its characteristics and the characteristics of the survey results.

(a)　The characteristics of the kohelia Channel

The Study Team considered the characteristics of the Kohelia Channel from the timeline of aerial photographs of Google Earth. Aerial photograph around the target area is shown in Figure 5.1.5-42 and Figure 5.1.5-43.

In order to understand the characteristics of the kohelia Channel, the Study Team focused on the sand bar（Refer to Figure 5.1.5-42 and Figure 5.1.5-43，area surrounded by white） in the channel and selected the photographs.

①　Characteristics of the Kohelia Channel before and after the development of the power plant

Photographs of November 2013, November 2017, and January 2021 were selected to understand

the characteristics of the channel before and after the development of the power plant. November 2013 is before the power plant development, November 2017 and 2021 are after the power plant development. The sand bar exists in all the photos. It is conceivable that there will be no impact by the passage of time and from the development of the power plant.

Next, the intertidal flat（Refer to Figure 5.1.5-42，area surrounded by blue）that existed in November 2017 was reclaimed in January 2021, and the shape of the channel changed. However, since sand bar exists, it is considered that there will be no impact on the progress of power plant development. On the other hand, it is presumed that there was a change in water depth due to the reclamation of the intertidal flat.

② Characteristics of the Kohelia Channel by comparing photographs from the same period

October 2020 and January 2021 were selected to understand the characteristics of the channel during the same period. Since only three months have passed since October 2020, it was judged that the topography at the planned site and the topography in the channel have not changed significantly.※1 Focusing on the sand bar in the channel, it disappeared in October 2020, but its existence was confirmed in January 2021. As shown in ①, since sand bar existed in the past and in January 2021, it is estimated that sand bar was submerged in October 2020. The reason for this is that the Kohelia channel has a tidal level difference of 4.0 m or more※2（Refer to Figure 5.1.5-5 and Figure 5.1.5-6）at high tide levels.

③ Characteristics of the Kohelia Channel in latter half of the Dry Season（February and March）

Since the latter half of the dry season has very little rainfall, it is considered that the depth of the Kohelia channel is shallow during the year. Therefore, March 2015, February 2018, and March 2020 were selected in order to understand the characteristics of the channel when the water depth is shallow in the latter half of the dry season. March 2015 is before the power plant development, February 2018 and March 2020 are after the power plant development. The sand bar exists in all the photos. Furthermore, the shape of the channel is the same as in November (Refer to Figure 5.1.5-42), which is the first half of the dry season. From this also, it is conceivable that there will be no impact by the passage of time and from the development of the power plant.

④ Characteristics of the Kohelia Channel

As shown in ①, ② and ③, it is estimated that the topographical changes in the Kohelia Channel are small even before the power plant was developed. Furthermore, it is speculated that changes in the water depth of the channel are large due to tidal circulation.

※1 In this survey, it was confirmed that there was no change in the bathymetric survey results（the topography in the channel）in about 6 months.

※2 It is a value based on the results of this survey.

(b) Summary based on survey results

① the topographical features of the channel

Bathymetric surveys were conducted during the dry season (February 2021), normal season (April 2021), and rainy season (June 2021), and similar results were obtained except for Cross Section 06-2 and Cross Section S21. From this, it was found that there was no change in the topography in the channel. In section 06-2 and section S21, a large topographical change of 3.0 m or more occurred.
Generally, when changes occur in the marinebottom topography, it means that external forces (waves and currents) have worked. Since there was no change in the terrain except for Cross Section 06-2 and Cross Section S21, it could be seen that the external force is very small. From this, the topographical changes in Cross Section 06-2 and Cross Section S21 were not due to hydrographic conditions but due to dredging and sedimentation.

② tidal level

Continuous measurement was performed for one month in the dry season and the rainy season. Similar tidal circulation occurred in the marine area and the Kohelia Channel, with tide level differences of 0.8 m to 1.5 m for neap tide and 4.0 to 4.5 m for spring tide. It was found that the tide level circulation very much and greatly affects the water depth of the channel.

③ Waves

The Study Team conducted wave and wind survey in the channel and compared wave height and wind speed, and wave direction and wind direction at the same point.
Since the fluctuations in wave height and wind speed, and the frequency of appearance of wave direction and wind direction were similar, it was found that waves in the channel were generated due to wind .

The effect of waves on the marinebottom topography is estimated to be very small as shown in ①.

④ current

The Study Team conducted current survey in the chanal. In the dry season, the fluctuations in flow velocity at the survey points were similar, and the flow directions that appeared were similar. In the rainy season, the fluctuations in flow velocity at the survey points were similar, but the flow directions varied.

The effect of current on the marinebottom topography is estimated to be very small as shown in ①.

⑤ turbidity

As a result of investigating the amount of Suspended Solid（SS） in the dry season and the rainy season, there was a difference between the surface water and the bottom water on the north and south sides of the Kohelia Channel.In general, the SS value, etc. differs between the marine area and the channel (including rivers) because the water conditions are different. Therefore, the hydrographic conditions of channel inlet are subject to marine conditions. It is probable that the north and south sides, which are the inlets of the Kohelia Channel, were also affected by the hydrographic conditions

of the marine, so the surface and bottom water could not be sufficiently mixed and a difference occurred. At other points, the difference between the total SS of surface water and the total SS of bottom water is small, and because they are well mixed, there is no rolling up or movement of the sediment. The channel is thought calm.

⑥ the features of the Kohelia Channel

As shown in ① to ⑤, it is presumed that the influence of hydrographic conditions in the Kohelia Channel on topographical changes is small.

Month,Year	Aerial photograph
November, 2013	
November, 2017	
October, 2020	
January,2021	

Source: Study Team

Figure 5.1.5-42 Aerial photograph around the target area

Month,Year	Aerial photograph
March, 2015	
February, 2018	
March, 2020	

Source: Study Team

Figure 5.1.5-43 Aerial photograph around the target area（latter half of the Dry Season）

Appendix-5.1.7 (1)

(Topographic Survey)

5.1.7　Topographic Survey

(1) Survey area

The Study Team conducted topographic survey on the north and west sides of the project site. The topographic survey area (area surrounded by red) is shown in　Figure 5.1.7-1

Source: Study Team

Figure 5.1.7-1 topographic survey area

(2) Survey Period

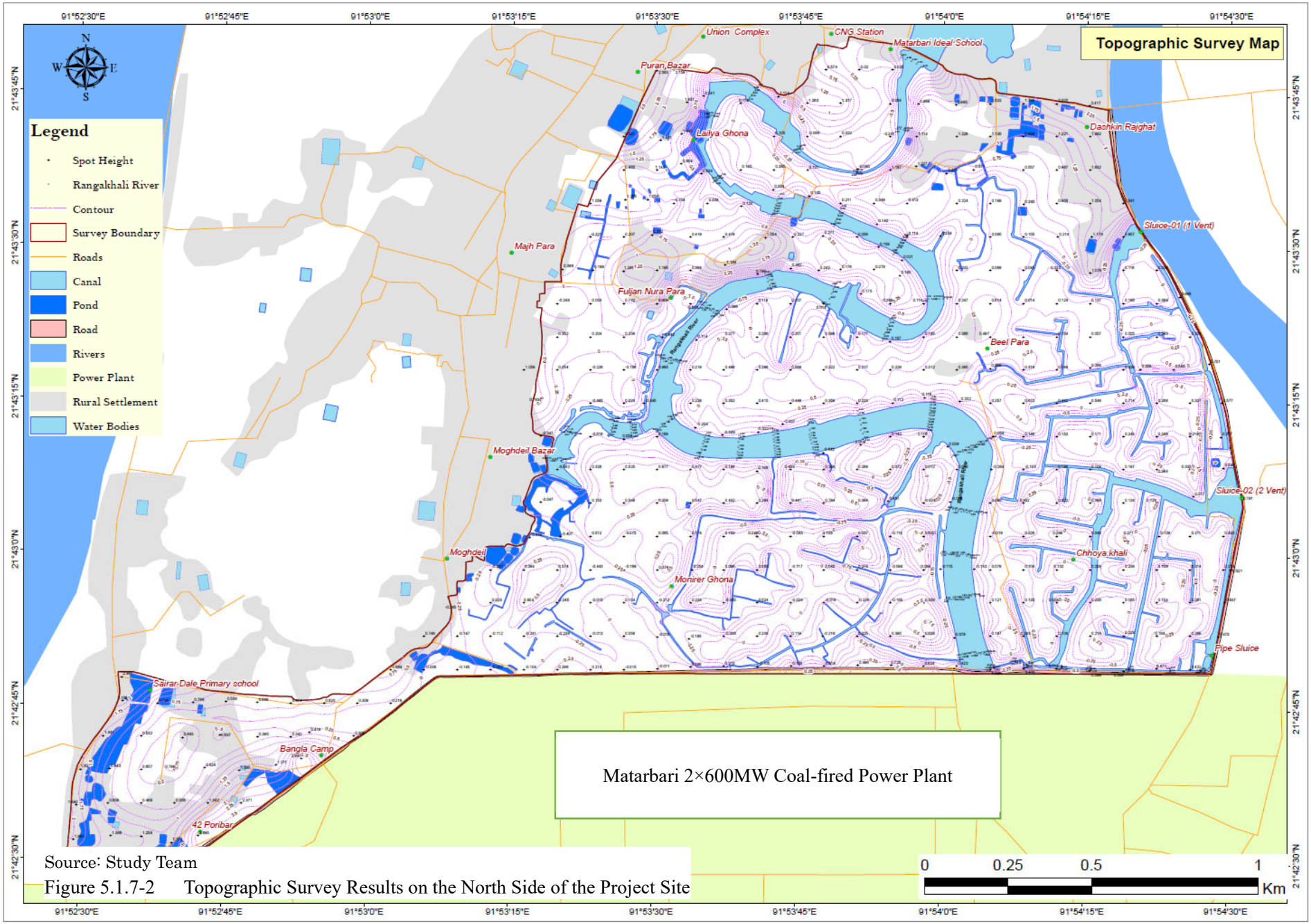
Survey Implementation Period：From January 1st ,2021 to February 18th ,2021

Completion Period　　：April 2021

(3) Survey Result

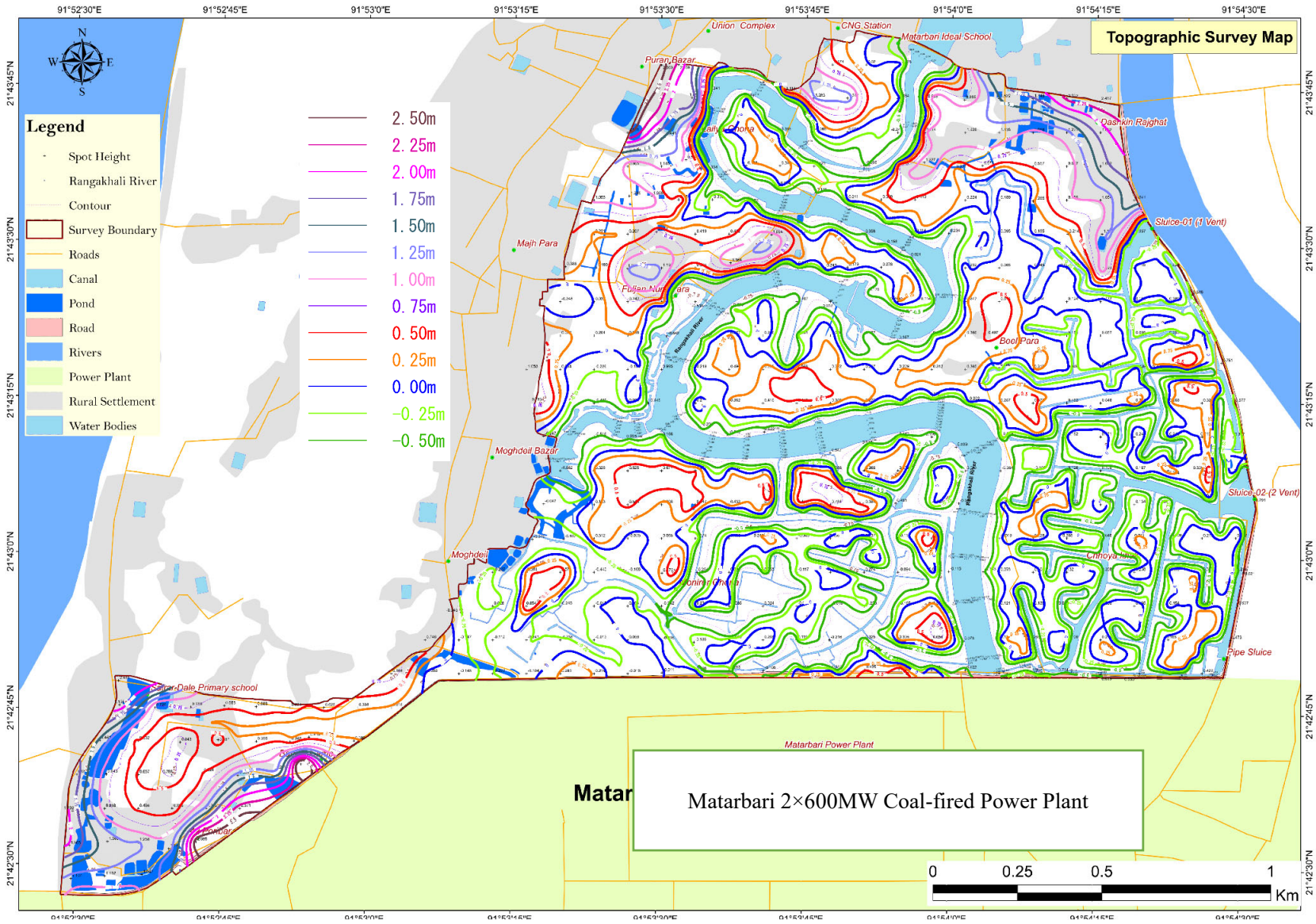
Topographic Survey Results on the North Side of the Project Site is shown in Figure 5.1.7-2.

Topographic Survey Results and Topographic Contours on the North Side of the Project Site is shown in Figure 5.1.7-3, Topographic Contours above 0.25m above Sea Level is shown in Figure 5.1.7-4 and Topographic Contours below 0m above Sea Level is shown in Figure 5.1.7-5



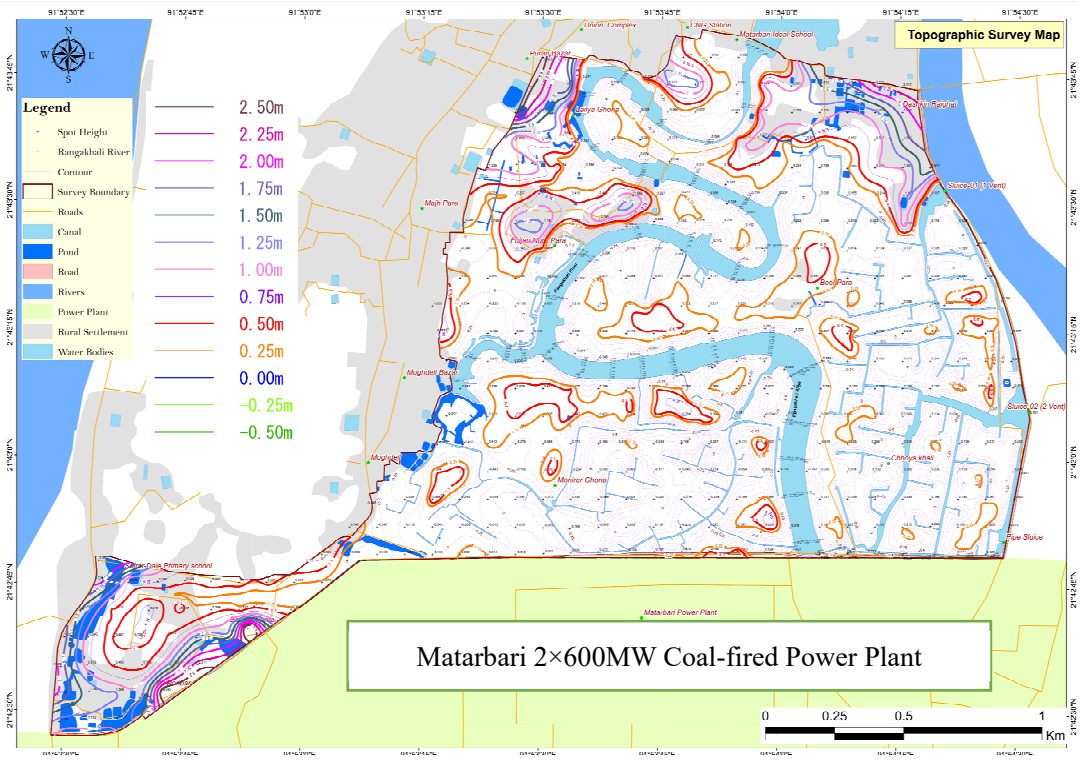
Source: Study Team

Figure 5.1.7-2 Topographic Survey Results on the North Side of the Project Site



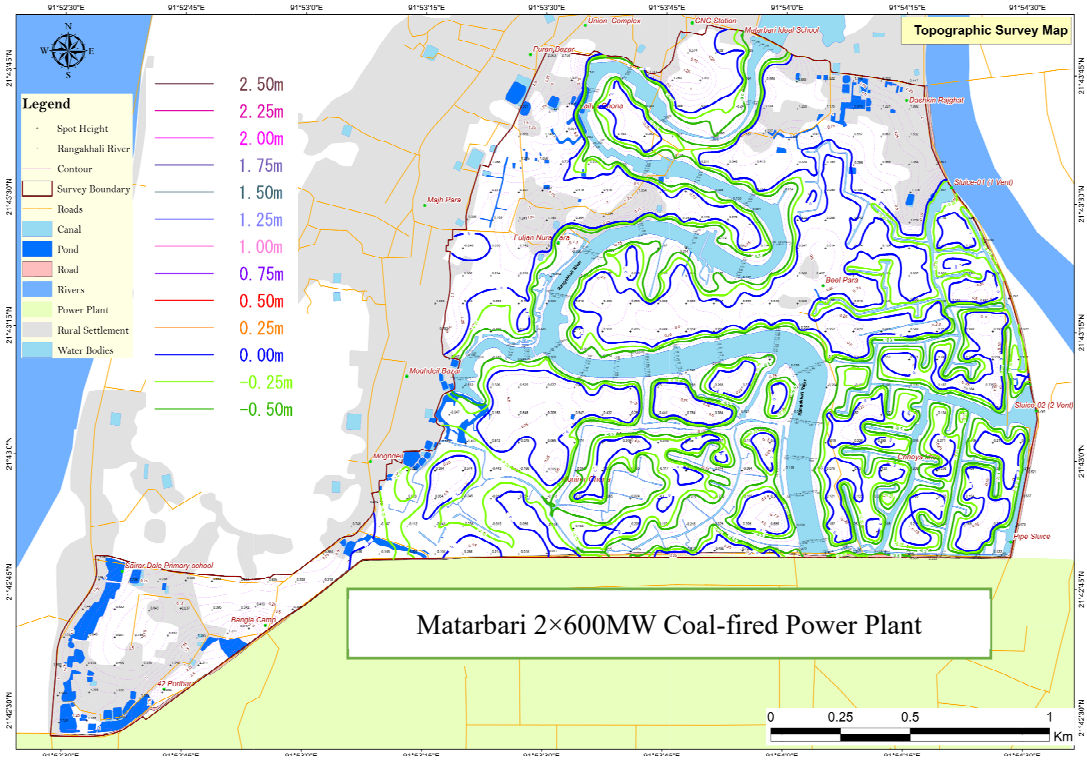
Source: Study Team

Figure 5.1.7-3 Topographic Survey Results and Topographic Contours on the North Side of the Project Site



Source: Study Team

Figure 5.1.7-4 Topographic Contours above 0.25m above Sea Level



Source: Study Team

Figure 5.1.7-5 Topographic Contours below 0m above Sea Level

(4) Conclusions

As shown in "(3) Survey results", the surface elevation is zero meters or less in areas other than the settlement area (Rural Settlement) on the north side of the project site and the west side of the project site. In such areas, if the drainage function is reduced during floods, etc., it is possible that inundation will occur in the land area.

Therefore, The Study Team considered under what circumstances inundation occurs from "Hydraulic Features" and "Topographical Features".

(a) Hydraulic Features

Around the project site, there is a marine area on the west side, the Kohelia Channel on the east side, and the Rangakhali Channel on the north side. Since the tide level difference is large in this area, it is possible that the Kohelia Channel and the Ranghakali Channel will be affected by tidal circulation in the marine area. Therefore, the Study Team considered the hydraulic characteristics from the tidal circulation.

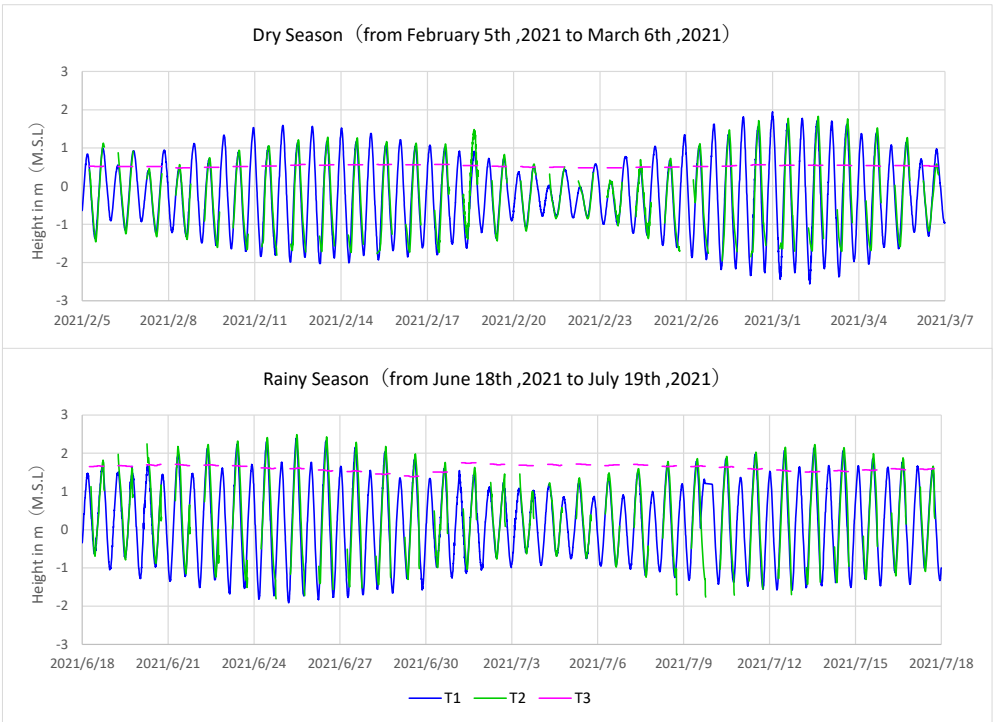
The Study Team considered using the results of tidal level measurements in the marine, the Kohelia Channel, and the Rangakhali Channel. （Refer to Appendix 5.1.5(2)） Survey Point of Tidal Level is shown in Figure 5.1.7-6. Tidal Circulation at marine, Rangakhali Channel and Kohelia Channel is shown Figure 5.1.7-7.

Comparing the tidal circulations at each point, the marine area and the Kohelia channel show similar circulations. This indicates that the tidal circulations of the marine area and the Kohelia channel are similar because the marine area and the Kohelia channel are connected. On the other hand, the Rangakhali Channel continues to have a constant water level and does not show the same tidal circulation as the marine area and the Kohelia Channel. It can be seen that the Rangakhali Channel is unaffected by tidal circulation in the marine and the Kohelia Channel.

Since the water level of the Rangakhali Channel remains constant even at high tides, it is presumed that the Rangakhali Channel does not overflow and that the floodgates are adjusted to keep the water level constant.

Source: Study Team

Figure 5.1.7-6 Survey Point of Tidal Level
（Location T1：marine ,T2：Rangakhali Channel ,T3：Kohelia Channel）



Source: Study Team

Figure 5.1.7-7 Tidal Circulation at marine , Rangakhali Channel and Kohelia Channel

(b) Topographical Features

Using aerial photographs of Google Earth, the Study Team grasped the past and present topographical conditions around the target area and estimated the factors that occur inundation. Specifically, the Study Team picked up photographs that can grasp the features of the terrain from the timeline of aerial photographs of Google Earth, and considered the features of the terrain.

Aerial photograph around the target area is shown in Figure 5.1.7-8. March 2013, November 2013, and November 2017 were selected as photographs that show changes in topography in an easy-to-understand manner. The reasons for selection are as follows.

Since the shooting times are close in March 2013 and November 2013, the Study Team thought that the topographical conditions and topographical conditions such as altitude were similar.

Inundation occurred on the Rangakhali Channel and the south side in November 2013, but no inundation occurred in March 2013. Therefore, it was selected to estimate the reason for the inundation in November 2013.

Next, the reason for choosing November 2017 is to make a comparison with November 2013. Both photographs are in November, and it is considered that the meteorological conditions (dry season) are the same. Development of the Unit 1/2 power plant began in November 2017, and although the topographical conditions are different, similar inundation has occurred around the Rangakhali Channel. Therefore, it was selected to estimate the reason for the inundation around the Rangakhari Channel.

① The reason why inundation occurred in November 2013

There are observation records（Refer to Table 5.1.7-1） that monthly precipitation is 0 to 3 mm in March 2013 and November 2013, and it is a month with very low precipitation. From this, it can be revealed that the Rangakhali Channel was not flooded by rainfall. The reason for the inundation in November 2013 is thought to be that it overflowed the embankment at high tide and stayed in an area with low altitude. At high tide levels, a tide level difference of 4.0m or more has been confirmed（Refer to Appendix 5.1.5(2)）, and it is possible that the embankment. Furthermore, it is considered that the inundation is spreading because the accumulated water could not be drained in a short time.

② The reason why inundation occurred in November 2017

Comparing the area around the Rangakhali Channel（Refer to Figure 5.1.7-8, area surrounded by blue） in November 2013 and November 2017, inundation occurred in a similar area. In November 2017, there are observation records （Refer to Table 5.1.7-2）that the monthly precipitation is 2 to 4 mm, and it is a month with very low precipitation. From this, the same reason as shown in ① can be considered.

③ The reason why inundation occur

As shown in ① and ②, inundation has occurred around the planned site even before the power plant was developed.The following topographical features are presumed as the reason.

- In the land around the planned site, water overflows the embankment at high tide and accumulates in the low altitude area.
- The accumulated water cannot be drained in a short time.（poor drainage）

Month,Year	Aerial photograph
May,2013	
November,2013	
November,2017	

Source: Study Team

Figure 5.1.7-8 Aerial photograph around the target area

Table 5.1.7-1　2013 observation record by Japan Meteorological Agency

Chittagong

Month, Year	Monthly average temperature (℃)	Monthly average maximum temperature (℃)	Monthly average minimum temperature (℃)	Monthly precipitation (mm)
January, 2013	16.9	25.0	12.7	0
February, 2013	21.4	29.3	16.9	1
March, 2013	25.0	31.1	20.2	3
April, 2013	27.6	31.9	24.4	60
May, 2013	27.0	30.4	24.5	773
June, 2013	28.4	31.7	26.1	515
July, 2013	28.0	31.2	26.0	404
August, 2013	27.6	30.2	25.7	269
September, 2013	27.8	31.3	25.8	172
October, 2013	26.7	29.9	24.5	370
November, 2013	23.2	28.7	20.1	0
December, 2013	19.7	26.0	16.2	0

latitude:22.27N　longitude:91.82E

Cox's Bazar

Month, Year	Monthly average temperature (℃)	Monthly average maximum temperature (℃)	Monthly average minimum temperature (℃)	Monthly precipitation (mm)
January, 2013	18.4	26.0	13.9	0
February, 2013	22.0	30.6	18.2	0
March, 2013	25.2	32.2	21.4	0
April, 2013	28.0	33.8	24.5	56
May, 2013	27.6	31.8	24.8	744
June, 2013	28.3	32.4	25.8	873
July, 2013	27.5	31.6	25.1	834
August, 2013	27.5	31.2	25.5	939
September, 2013	27.6	32.0	25.6	233
October, 2013	26.5	31.2	24.5	419
November, 2013	24.4	31.2	21.3	0
December, 2013	20.3	28.4	17.1	0

latitude:21.43N　longitude:91.93E

【supplementary explanation】

Since there is no observation record in Matabari, the Study Team referred to the observation records of Chittagong and Cox's Bazar.

Souce:http://www.data.jma.go.jp/gmd/cpd/monitor/climatview/graph_mkhtml.php?&n=41992&p=12&s=3&r=1&y=2017&m=11&e=0&k=0&d=2

Addition: Study Team

Table 5.1.7-2　2017 observation record by Japan Meteorological Agency

Chittagong

Month, Year	Monthly average temperature (℃)	Monthly average maximum temperature (℃)	Monthly average minimum temperature (℃)	Monthly precipitation (mm)
January, 2013	19.6	27.5	15.3	0
February, 2013	22.4	30.0	18.0	0
March, 2013	24.4	30.3	20.7	102
April, 2013	27.3	31.0	24.1	297
May, 2013	29.7	33.7	26.5	275
June, 2013	28.4	33.0	26.0	699
July, 2013	27.9	31.4	25.8	1008
August, 2013	28.5	32.4	26.1	514
September, 2013	27.9	32.1	26.0	558
October, 2013	27.3	31.7	24.8	124
November, 2013	24.9	30.9	21.8	2
December, 2013	22.0	27.8	17.9	15

latitude:22.27N　longitude:91.82E

Cox's Bazar

Month, Year	Monthly average temperature (℃)	Monthly average maximum temperature (℃)	Monthly average minimum temperature (℃)	Monthly precipitation (mm)
January, 2013	20.3	28.1	16.5	0
February, 2013	22.7	30.3	18.3	0
March, 2013	24.4	30.3	20.6	216
April, 2013	27.2	31.7	24.4	361
May, 2013	29.3	33.7	26.3	151
June, 2013	28.2	31.6	25.7	560
July, 2013	27.2	30.2	25.4	1433
August, 2013	27.5	31.0	25.5	511
September, 2013	27.5	31.4	25.4	512
October, 2013	27.3	31.6	24.9	158
November, 2013	25.4	31.1	22.6	4
December, 2013	21.7	28.9	18.6	36

latitude:21.43N　longitude:91.93E

【supplementary explanation】

Since there is no observation record in Matabari, the Study Team referred to the observation records of Chittagong and Cox's Bazar.

Souce:http://www.data.jma.go.jp/gmd/cpd/monitor/climatview/graph_mkhtml.php?&n=41992&p=12&s=3&r=1&y=2017&m=11&e=0&k=0&d=2

Addition: Study Team