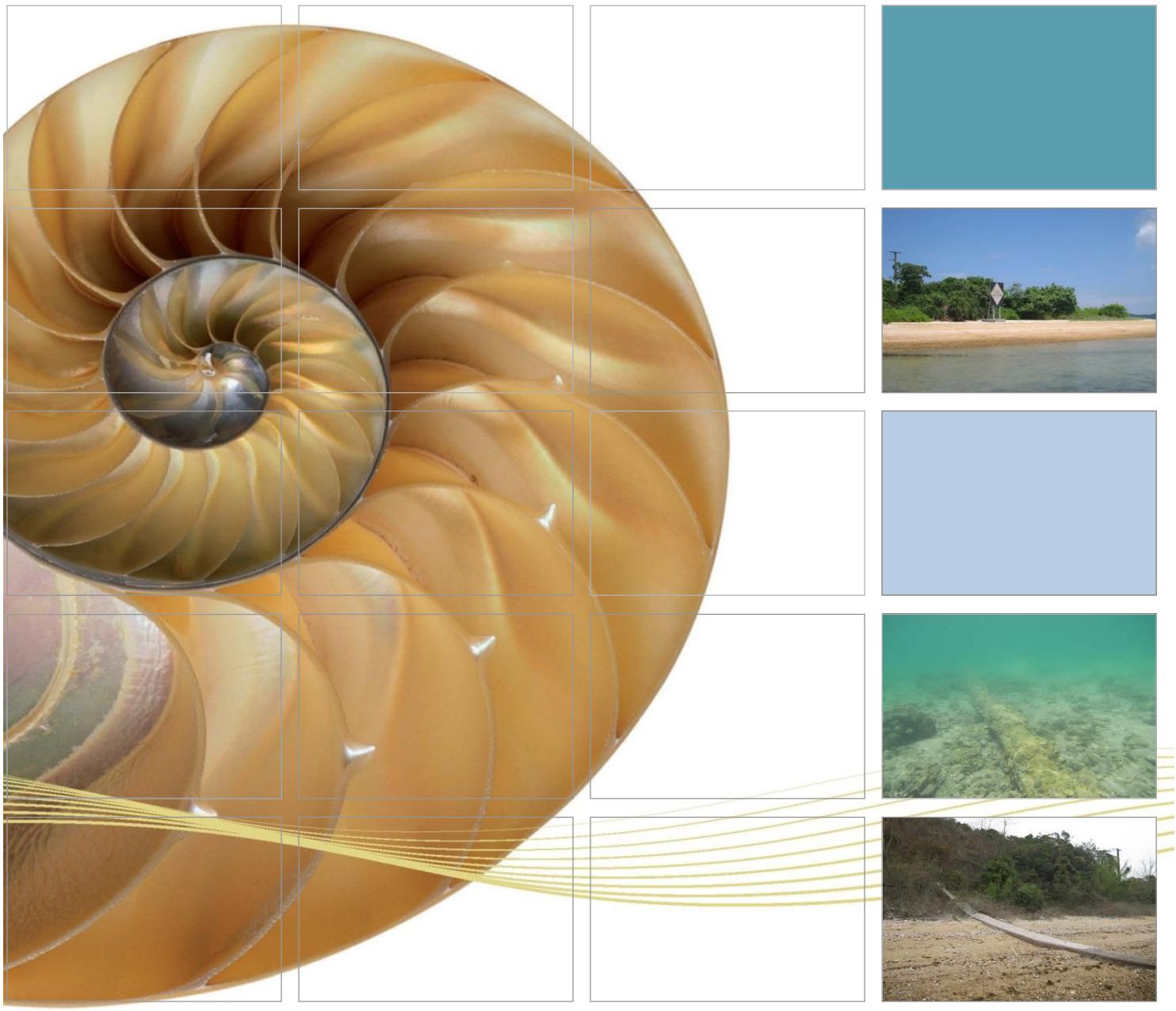

Proposed 11kV Submarine Cables Replacement Connecting Liu Ko Ngam and Pak Sha Tau Tsui at Kat O - Environmental Monitoring & Audit

Second Weekly Impact Water Quality Monitoring Report

11 January 2016

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Proposed 11kV Submarine Cables Replacement Connecting Liu Ko Ngam and Pak Sha Tau Tsui at Kat O - Environmental Monitoring & Audit

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Second Weekly Impact Water Quality Monitoring Report

Document Code: 0259952_Second Weekly Impact Water Quality Monitoring Report.doc

Client:	Project No:
CLP Power Hong Kong Limited (CLP)	0259952
Summary: This document presents the monitoring requirements, methodologies and results of the second weekly impact water quality measurements at the monitoring locations near the proposed 11kV submarine cables replacement connecting Liu Ko Ngam and Pak Sha Tau Tsui at Kat O.	Date: 11 January 2016 Approved by:  *Terence Fong* *Partner*

v0	Second Weekly Impact Water Quality Monitoring Report	YL	FZ	TF	11/1/16
Revision	Description	By	Checked	Approved	Date

Distribution

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Certificate No. FS 32515

Proposed 11kV Submarine Cables Replacement Connecting Liu Ko Ngam and Pak Sha Tau Tsui at Kat O - Environmental Monitoring & Audit

Environmental Certification Sheet

EP-461/2013

Reference Document/Plan

Document/~~Plan~~ to be ~~Certified~~/ Verified:	Second Weekly Impact Water Quality Monitoring Report
Date of Report:	11 January 2016
Date prepared by Environmental Team:	11 January 2016
Date received by IC:	11 January 2016

Reference Project Profile Annex E EM&A Requirement and EP Requirement

EM&A Requirement: Project Profile, Annex E EM&A Requirements, Section E1

Content: *Water Quality Monitoring and Reporting*

E.1.3 "Impact Monitoring will comprise sampling two times a week during the cable installation works at the same location as the Baseline Monitoring Stations. Samples shall be taken during both mid flood and mid ebb tidal states on each sampling occasion...In case the Impact Monitoring is ceased with reasons such as the operations of the cable installation has no disturbance of seabed or the works are suspended due to safety issue or adverse weather conditions etc. for more than 1 week. The Contractor should send a confirmation letter to EPD and AFCD 1 week before the cessation of Impact Monitoring."

E.1.5 "Schedule for impact monitoring should be submitted to EPD and AFCD at least 1 week before commencement of the monitoring works for agreement. A letter report shall be provided to EPD and AFCD that shall include the monitoring results and an interpretation of monitoring results. The monitoring data should be provided graphically to show the relationship between the Control, Gradient and Impact Stations and compliance or noncompliance with respect to the Action/Limit Levels…. An Impact Monitoring Report shall be provided within one week of completing every weekly monitoring survey for the first three impact monitoring weeks. If there are no exceedances recorded during the first three weeks, a Bi-weekly Impact Monitoring Report shall be provided within 1 week of completing every two weekly monitoring surveys."

EP Condition: Condition No. 2.1

Content: *Water Quality Monitoring*

2.1 All measures described in the Project Profile (No. PP-489/2013) submitted by the applicant on 30 May 2013 shall be fully implemented.

IC Verification

I hereby verify that the above referenced document/~~plan~~ complies with the above referenced condition of EP-461/2013.

Terence Fong, Date: 11 January 2016

Independent Checker

CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ANNEXES

The submarine cable installation works for the 11kV submarine cable connecting Liu Ko Ngam to Pak Sha Tau Tsui at Kat O commenced in the week starting 21 December 2015. This is the **Second Weekly Impact Water Quality Monitoring Report** presenting results and findings of the impact water quality monitoring conducted during the week from 28 December 2015 to 3 January 2016 in accordance with the *Environmental Monitoring and Audit Requirement* (*EM&A Requirement*).

Water Quality Monitoring

Two (2) monitoring events were scheduled in the reporting period, on 29 and 31 December 2015. Monitoring events at designated monitoring stations were performed on schedule.

Environmental Non-conformance

No exceedances of Action and Limit Levels were recorded during the reporting week.

No complaint and summons/prosecution was received during the reporting week.

Impact water quality monitoring will be carried out in parallel with the cable installation works.

1 INTRODUCTION

ERM-Hong Kong, Limited (ERM) was appointed by CLP Power Hong Kong Limited (CLP) as the Environmental Team (ET) to implement the Environmental Monitoring and Audit (EM&A) programme for the installation of an 11kV submarine cable connecting Liu Ko Ngam to Pak Sha Tau Tsui at Kat O (the Project).

1.1 PURPOSE OF THE REPORT

This is the *Second Weekly Impact Water Quality Monitoring Report*, which summarises the results of impact water quality monitoring as part of the EM&A programme during the reporting period from 28 December 2015 to 3 January 2016**.**

1.2 STRUCTURE OF THE REPORT

The structure of the Report is as follows:

Section 1 : ***Introduction***
Provides the Project background, purpose and report structure.

Section 2 : ***Project Information***
Summarises background and scope of the project, the construction works undertaken and the status of Environmental Permits/Licenses during the reporting period.

Section 3 : ***Impact Water Quality Monitoring Requirements***
Summarises the monitoring parameters, monitoring programmes, monitoring methodologies, monitoring frequency, monitoring locations, Action and Limit Levels, and Event Action Plan.

Section 4 : ***Impact Water Quality Monitoring Results***
Summarises the water quality monitoring results obtained in the reporting period.

Section 5 : ***Environmental Non-conformance***
Summarises any monitoring exceedance, environmental complaints and environmental summons within the reporting period.

Section 6 : ***Future Key Issues***
Summarises the monitoring schedule for the next reporting period.

Section 7 : ***Conclusions***
Presents the key findings of the impact monitoring results.

2 PROJECT INFORMATION

2.1 BACKGROUND

CLP Power Hong Kong Limited (CLP) proposes to enhance the security of power supply to Kat O Island. At present, there is only one set of 11kV submarine cable connecting Liu Ko Ngam to Pak Sha Tau Tsui at Kat O for power supply. The existing 11kV submarine cable is however more than 30 years old and deteriorating, thus potentially limiting the continuous supply of electricity in the future. CLP therefore proposes to replace the existing 11kV submarine cable connecting Liu Ko Ngam to Pak Sha Tau Tsui at Kat O to ensure the continuous power supply for Kat O. The Project involves the installation of an 11kV cable circuit consisting of two individual cables, with an intended burial depth up to 5 m for the submarine cable section and about 1 m for the land section. The two submarine cables (except the shore end sections which will be at only about 1 m separation and joining into a single cable trench at each landing site) will be 30 m away from each other and running parallel along the alignment. In areas (especially near the landing site) where the cable burial depth does not meet the requirements due to seabed geotechnical constraints, a protective cover such as a concrete slab will be adopted. The total length of the proposed cable alignment is approximately 880 m. A map showing the proposed submarine cable route is presented in *Figure 2.1*.

A *Project Profile* (Register No. PP-489/2013, *Replacement of the Existing 11kV Submarine Cable Circuit Connecting Liu Ko Ngam and Pak Sha Tau Tsui at Kat O*) which includes an assessment of the potential environmental impacts associated with the installation of the submarine cables was prepared and submitted to the Environmental Protection Department (EPD) according to *Section 5(11)* of *the Environmental Impact Assessment Ordinance (EIAO)* for the application for Permission to apply directly for *Environmental Permit* (*EP*). On 11 July 2013 EPD approved the *Project Profile* (*PP*) and a direct application for *EP* was submitted on 23 July 2013 (Application No. AEP-461/2013). On 27 August 2013 EPD granted an environmental permit for the Project (EP - 461/2013) pursuant to *Section 10* of *EIAO*.

Pursuant to *Condition 2.1* of the *EP*, Water Quality Sampling, as set out in the approved *PP Annex E Environmental Monitoring & Audit (EM&A) Requirements* (henceforth "*EM&A Requirement*"), is required for this Project. Water Quality Sampling shall be conducted prior to and throughout the cable installation works, and after its completion as set out in the *EM&A Requirement*.

Baseline water quality monitoring was conducted prior to the installation works and results were summarised in the *Baseline Water Quality Monitoring Report* of November 2015.

Impact monitoring started on 22 December 2015, when the cable installation works commenced. Impact monitoring was conducted twice a week during

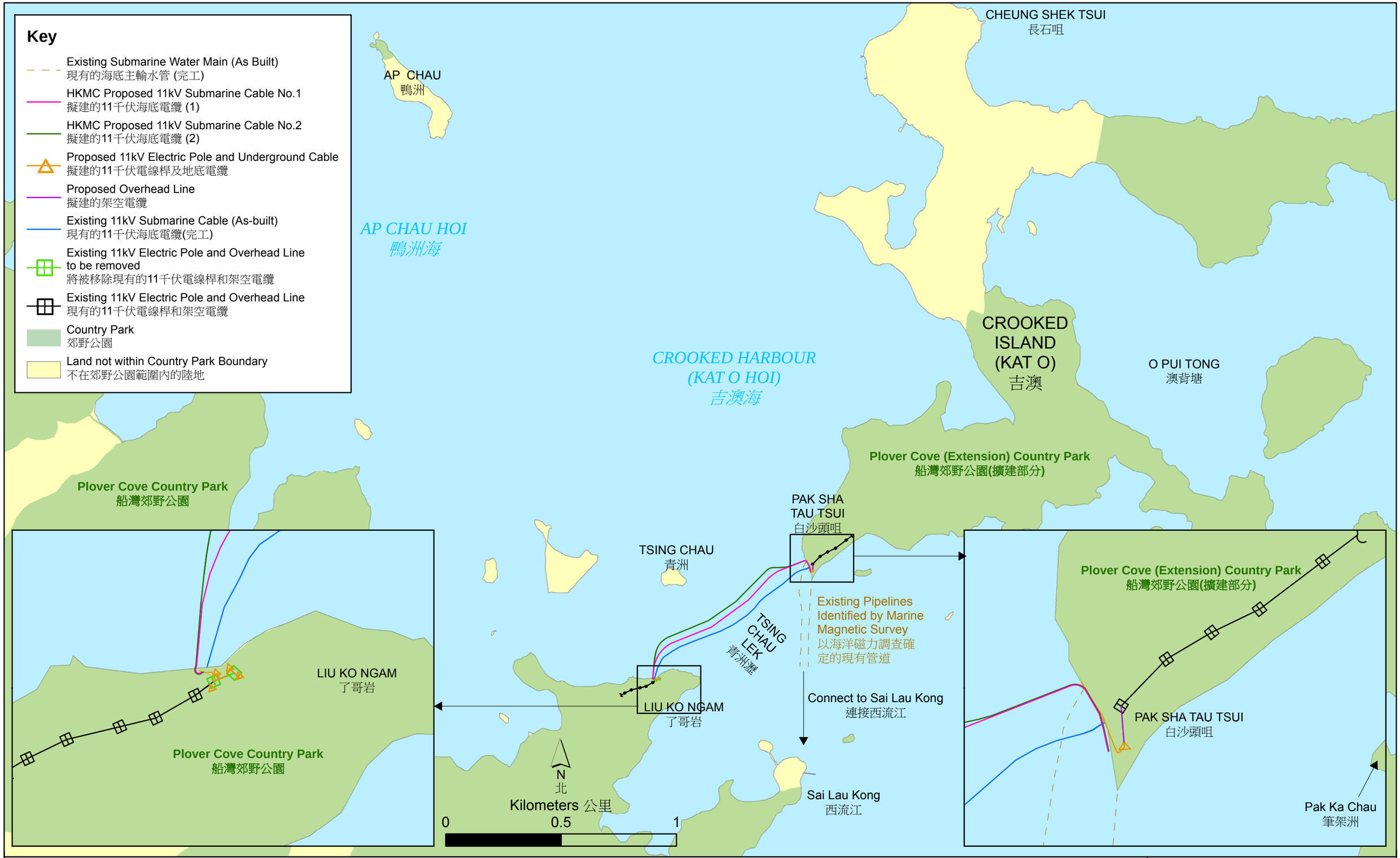

Figure 2.1
圖2.1

Alignment of the Proposed 11kV Submarine Cable Circuit from Liu Ko Ngam to Pak Sha Tau Tsui
了哥岩至白沙頭咀的擬建11kV海底電纜路線

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Date: 2/12/2015

Environmental Resources Management

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cable installation works. The *First Weekly Impact Monitoring Report* for the first week impact monitoring was submitted on 4 January 2016. The impact water quality monitoring is used to reflect the water quality conditions and to identify potential water quality impacts during the cable installation works. This *Second Weekly Impact Monitoring Report* (the "Report") presents the results and findings for the second week impact monitoring conducted on 29 and 31 December 2015, at the same locations as the baseline monitoring stations.

2.2 MARINE CONSTRUCTION WORKS UNDERTAKEN DURING REPORTING WEEK

During the reporting period of the week from 28 December 2015 to 3 January 2016, cable installation preparation works were conducted and some Project shore-end marine works proceeded at Pak Sha Tau Tsui No works were undertaken on the public holidays (1 January 2016).

2.3 STATUS OF ENVIRONMENTAL APPROVAL DOCUMENTS

A summary of the relevant permits, licences and reports on marine water quality for this Project is presented in *Table 2.1*.

Table 2.1 Summary of Environmental Licensing, Notification, Permit and Reporting Status

Permit / Licence / Notification / Report	Reference	Validity Period	Remarks
Project Profile	PP-489/2013	Throughout the construction and operation stages	Submitted on 30 May 2013
Environmental Permit	EP-461/2013	Throughout the construction and operation stages	Granted on 27 August 2013
Baseline Water Quality Monitoring Report	-	Throughout the construction period	Submitted on 20 November 2015
First Weekly Impact Monitoring Report	-	Construction period of week from 21 to 27 December 2015	Submitted on 4 January 2016

3 IMPACT WATER QUALITY MONITORING REQUIREMENTS

3.1 MONITORING LOCATIONS

In accordance with the *EM&A Requirement,* water quality monitoring samples were collected at the ten (10) stations situated around the cable installation works, following commencement of Project marine installation works. The locations of the sampling stations are shown in *Figure 3.1.*

- C1 is a Control Station to the north of the cable alignment (approximately 1.4 km away) with the same coordinates as EPD routine monitoring station MM2, which is not supposed to be influenced by the construction works due to its remoteness to the Project works area;
- C2 is a Control Station to the south of the cable alignment (over a distance of 1.6 km) with the same coordinates as EPD routine monitoring station MM7, which is not supposed to be influenced by the construction works due to its remoteness to the Project site;
- SR1 is Impact Station used to monitor the effect of the cable installation works on coral communities of high ecological concern at Tsing Chau;
- SR2 is Impact Station used to monitor the effect of the cable installation works on coral communities of high ecological concern at Ngau Shi Wu Wan;
- SR3 is Impact Station used to monitor the effect of the cable installation works on Lai Chi Wo/ Yan Chau Tong Marine Park (to the west of the Project site);
- SR4 is Impact Station used to monitor the effect of the cable installation works on Yan Chau Tong Marine Park (to the south of the Project site);
- SR5 is Impact Station used to monitor the effect of the cable installation works on Sai Lau Kong FCZ;
- G1 is regarded as a Gradient Station in between Impact Station SR1 and the construction work alignment;
- G2 is Gradient Station located between Impact Stations SR2, SR4 and SR5 and construction work alignment; and
- G3 is Gradient Station located between Impact Stations SR3 and the construction work alignment and landing point at Kiu Ko Ngam.

The co-ordinates of the above monitoring stations are listed in *Table 3.1.*

Key 圖例

- Water Quality Monitoring Stations 水質監察站
- Proposed 11kV Submarine Cable 擬議鋪設的11千伏海底電纜
- Existing 11kV Submarine Cable (As built) 現有的11千伏海底電纜（完工情況）
- Fish Culture Zone 魚類養殖區
- Marine Park 海岸公園
- Coral Colonies of High Ecological Value 具高生態價值的珊瑚群落
- Artificial Reef Depolyment Site 人工魚礁放置地點
- Recognized Seagrass Habitat 認可海草生境

Water Quality Monitoring Stations 水質監察站	Easting 東經	Northing 北緯
SR1	846957.82	843601.61
SR2	847041.35	843125.56
SR3	846208.21	843365.71
SR4	847534.45	842914.89
SR5	847209.44	842883.44
G1	846580.39	843334.26
G2	847066.97	843218.44
G3	847031.21	843538.70
C1	846615.32	844892.99
C2	848633.26	842648.35

AP CHAU 鴨洲
AP CHAU HOI 鴨洲海
KAT O HOI 吉澳海
C1
CROOKED ISLAND (KAT O) 吉澳
O PUI TONG 澳背塘
TSING CHAU 青洲
PAK SHA TAU TSUI 白沙頭咀
SR1
G3
SR3
G1
Yan Chau Tong Marine Park 印洲塘海岸公園
G2
SR2
LIU KO NGAM 了哥岩
SR4
SR5
LAI CHI WO 荔枝窩
NGAU SHI WU WAN 牛屎湖灣
SAI LAU KONG 西流江
C2
Yan Chau Tong Marine Park 印洲塘海岸公園
N 北
Meters 米
0 500 1,000

Figure 3.1
圖 3.1

Water Quality Monitoring Stations

水質監察站

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Date: 30/12/2015

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Table 3.1 Water Quality Monitoring Stations

Station	Nature	Easting	Northing
C1	Control Station	846615.32	844892.99
C2	Control Station	848633.26	842648.35
SR1	Impact Station	846957.82	843601.61
SR2	Impact Station	847041.35	843125.56
SR3	Impact Station	846208.21	843365.71
SR4	Impact Station	847534.45	842914.89
SR5	Impact Station	847209.44	842883.44
G1	Gradient Station	846580.39	843334.26
G2	Gradient Station	847025.97	843218.44
G3	Gradient Station	847031.21	843538.70

3.2 MONITORING PARAMETERS

The second week impact water quality monitoring was conducted in accordance with the requirements stated in the *EM&A Requirement*. Monitoring parameters are presented below.

The parameters measured *in situ* were:

- Dissolved Oxygen (DO) (% saturation and mg/L)
- Water temperature (°C)
- Turbidity (Nephelometric Turbidity Units [NTU])
- Salinity (parts per thousand [ppt])

The only parameter to be measured in the laboratory was:

- Suspended solids (SS) (mg/L)

In addition to the water quality parameters, other relevant data were also measured and recorded in field logs, including the location of the sampling stations, water depth, sampling depth, current velocity and direction, time, weather conditions, sea conditions (where appropriate), tidal state (where appropriate), special phenomena and work activities undertaken around the monitoring and Project works area that may have influenced the monitoring results.

These parameters will be monitored at all designated marine water quality monitoring stations throughout the whole impact monitoring phase.

3.3 MONITORING EQUIPMENT AND METHODOLOGY

3.3.1 Monitoring Equipment

Table 3.2 summaries the equipment used for the impact water quality monitoring.

Table 3.2 Equipment Used during Impact Water Quality Monitoring

Equipment	Model
Global Positioning Device	GARMIN eTrex 10
Water Depth Gauge	Speedtech Instruments SM-5
Water Sampling Equipment	Wildlife Kemmerer 1520
Salinity, DO, Temperature Measuring Meter	YSI PRO 2030
Current Velocity and Direction	Global Water FP111
Turbidity Meter	HACH 2100Q

3.3.2 Monitoring Frequency and Timing

The water quality monitoring was carried out on two occasions (days) and the intervals between the two sets of monitoring were not less than 36 hours. The water quality sampling was undertaken within a 3 hour window of 1.5 hours before and 1.5 hours after mid flood and mid-ebb tides. The tidal range selected for the baseline monitoring was at least 0.5 m for both flood and ebb tides as far as practicable.

Reference were made to the predicted tides at Ko Lau Wan, which is the tidal station nearest to the Project Site, published on the website of the Hong Kong Observatory [1]. Based on the predicted tidal levels at Ko Lau Wan, the second week water quality monitoring was conducted on 29 and 31 December 2015, following the schedule presented in *Annex A*.

3.3.3 Sampling/Testing Protocol

All *in situ* monitoring instruments were checked, calibrated and certified by a laboratory accredited under HOKLAS or any other international accreditation scheme before use (see calibration reports in *Annex B*), and subsequently will be re-calibrated at-monthly intervals throughout all stages of the water quality monitoring. Responses of sensors and electrodes were checked with certified standard solutions before each use.

For the on-site calibration of field equipment, the *BS 1427: 1993, Guide to Field and On-Site Test Methods for the Analysis of Waters* was observed. Sufficient stocks of spare parts were maintained for replacements when necessary. Backup monitoring equipment was made available.

Water samples for SS measurements were collected in high density polythene bottles, packed in ice (cooled to 4° C without being frozen), and delivered to a HOKLAS laboratory as soon as possible after collection.

At each measurement / sampling depth, two (2) consecutive *in-situ* measurements (DO concentration and saturation, temperature, turbidity, and salinity) and two water samples for SS were taken for lab analysis.

[1] Hong Kong Observatory (2015) http://www.hko.gov.hk/tide/eQUBtide.htm [Accessed in December 2015]

3.3.4 Laboratory Analysis

All laboratory work was carried out in a HOKLAS accredited laboratory. Water samples of about 1,000 mL were collected at the monitoring and control stations for carrying out the laboratory determinations. The determination work started within the next working day after collection of the water samples. The SS laboratory measurements were provided within two (2) days of the sampling event (i.e. within 48 hours). The analyses followed the standard methods as described in APHA Standard Methods for the *Examination of Water and Wastewater*, 19th Edition, unless otherwise specified (APHA 2540D for SS).

The QA/QC details were in accordance with requirements of HOKLAS or another internationally accredited scheme (*Annex C*)

3.3.5 Sampling Depths & Replication

Each station was sampled and measurements/ water samples were taken at three depths, namely, 1 m below water surface, mid-depth and 1 m above sea bed, except where the water depth less than 6 m, the mid-depth station may be omitted. For stations that are less than 3 m in depth, only the mid-depth sample was taken.

For *in situ* measurements, duplicate readings were made at each water depth at each station. Duplicate water samples were collected at each water depth at each station.

3.4 ACTION AND LIMIT LEVELS

The Action and Limit levels which were established based on the results of *Baseline Water Quality Monitoring*, are presented in *Table 3.3*.

Table 3.3 Action and Limit Levels of Water Quality

Parameter	Action Level	Limit Level
DO in mg/L[a]	Surface and Middle 5%-ile of baseline data for surface and middle layer (4.85 mg/L), and 20% exceedance of value at any impact station compared with corresponding data from control stations Bottom 5%-ile of baseline data for bottom layers (4.72 mg/L), and 20% exceedance of value at any impact station compared with corresponding data from control stations	Surface and Middle 1%-ile of baseline for surface and middle layer (4.57 mg/L) Bottom 1%-ile of baseline data for bottom layer (4.46 mg/L)

Parameter	Action Level	Limit Level
SS in mg/L (Depth-averaged [b]) [c]	95%-ile of baseline data (5.40 mg/L) and 20% exceedance of value at any impact station compared with corresponding data from control stations	99%-ile of baseline data (5.71 mg/L) and 30% exceedance of value at any impact station compared with corresponding data from control stations
Turbidity in NTU (Depth-averaged [a]) [c]	95%-ile of baseline data (4.92 NTU) and 20% exceedance of value at any impact station compared with corresponding data from control stations	99%-ile of baseline data (5.11 NUT) and 30% exceedance of value at any impact station compared with corresponding data from control stations

Notes:

a. For DO, non-compliance of the water quality limits occurs when monitoring result is lower than the limits.

b. "Depth-averaged" is calculated by taking the arithmetic means of reading of all three depths (at 1 metre below surface, mid-depth and 1 metre above seabed for the definition of sampling water depth).

c. For SS and turbidity, non-compliance of the water quality limits occurs when monitoring result is higher than the limits.

3.5 EVENT AND ACTION PLAN

The Event and Action Plan for water quality monitoring which was stipulated in *EM&A Requirement* is presented in *Table 3.4*.

Table 3.4 Event Action Plan for Water Quality

Event	Contractor
Action Level Exceedance	**Step 1** - repeat sampling event to confirm findings. **Step 2** - if findings are confirmed, discuss with cable installation contractor the most appropriate method of reducing suspended solids during cable installation (e.g. reduce cable laying speed/volume of water used during installation, increase effectiveness of silt curtain). **Step 3** - repeat measurements after implementation of mitigation for confirmation of compliance. **Step 4** - if non-compliance continues - increase measures in Step 2 and repeat measurements in Step 3. If non-compliance occurs at a third time, the cable laying operations should be suspended.
Limit Level Exceedance	Inform EPD and AFCD and confirm notification of the non-compliance in writing within 24 hours after a limit level exceedance is recorded. Undertake **Steps 1-3** immediately, if further non-compliance continues at the Limit Level, suspend cable laying operations until an effective solution is identified.

A total of two (2) monitoring events (days) were scheduled in the second week impact monitoring from 28 December 2015 to 3 January 2016 (*Annex A*). In each monitoring day (29 and 31 December 2015), two rounds of water quality measurement and sampling were undertaken, at mid-ebb and mid-flood tidal stage respectively. Monitoring events at all designated monitoring stations were performed on schedule.

The results of both the first and the second week impact monitoring (from 21 December 2015 to 3 January 2016) and their graphical presentations are included in *Annex D*. No exceedances of Action and Limit Levels were recorded in the monitoring period. The monitoring results of Turbidity, SS and DO are discussed together as follows.

The overall DO concentrations at all the water depths (surface, mid-depth and bottom) during the impact monitoring period were observed generally above 7.3 mg/L, well above the Action Level of 4.85 mg/L (for surface and mid-depth) and of 4.72 mg/L (for bottom depth) as shown in *Figure D1-D3* of *Annex D*. DO levels of each water depth at mid-ebb tidal stage moved towards the same magnitude whilst DO levels of each station at mid-flood tidal stage stayed at a similar level throughout the monitoring period.

Depth-averaged Turbidity levels recorded during the first and the second week impact monitoring are shown in *Figure D4* of *Annex D*. Turbidity levels were recorded generally below 2 NTU, well below the Action Level of 4.92 NTU. Although minor fluctuations were observed, the differences of Turbidity levels among the stations were within a limited range of 1 NTU throughout the monitoring period.

Levels of depth-averaged SS measured during the impact monitoring period showed a minor variation over time (*Figure D5* of *Annex D*). Differences among the stations were recorded although no exceedances of Action and Limit Levels were observed. In general, SS levels recorded were between 1 mg/L to 3 mg/L, below the Action Level of 5.4 mg/L.

In general, the water quality was stable throughout the second week impact monitoring (similarly to the first week) and the overall Turbidity, SS and DO levels recorded at the impact stations did not exceed Action or Limit Levels.

5 ENVIRONMENTAL NON-CONFORMANCES

5.1 SUMMARY OF ENVIRONMENTAL EXCEEDANCE

No exceedances of the Action and Limit Levels were recorded during the reporting period.

5.2 SUMMARY OF ENVIRONMENTAL NON-COMPLIANCE

No non-compliance events were recorded during the reporting period.

5.3 SUMMARY OF ENVIRONMENTAL COMPLAINT

No complaints were received during the reporting period.

5.4 SUMMARY OF ENVIRONMENTAL SUMMONS AND PROSECUTION

No summons or prosecution on environmental matters were received during the reporting period.

In the week from 4 to 10 January 2016, the cable installation works will continue, with no works carried out on the public holiday(s). Impact water quality monitoring will be carried out in parallel with the cable installation works.

7 CONCLUSIONS

This *Second Weekly Impact Monitoring Report* presents the results and findings of impact water quality monitoring undertaken during the period of the week from 28 December 2015 to 3 January 2016 in accordance with the *EM&A Requirement* and the requirements under Environmental Permit (*EP - 461/2013*) for the Project.

No exceedances of Action and Limit Levels were recorded during the impact water quality monitoring period. No complaints or summons/prosecutions were received either during the reporting period.

Water quality was generally stable throughout the reporting period. DO levels were generally similar among the sampling stations. Although some small differences of Turbidity and SS levels among the sampling stations were recorded, no exceedances of Action and Limit Levels were observed.

In general, the overall water quality at the impact stations was found to be similar to that at the control stations. It is concluded that there was no deterioration of water quality during the reporting period and hence the effect of the Project cable installation works on water quality is considered to be negligible over this reporting period.

Annex A

Impact Water Quality Monitoring Schedule

Replacement of the Existing 11 KV Submarine Cable Circuit Connecting Liu Ko Ngam and Pak Sha Tau at Kat O
Impact Marine Water Quality Monitoring (WQM) Schedule

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
20-Dec	21-Dec	22-Dec	23-Dec	24-Dec	25-Dec	26-Dec
		WQM Mid-Ebb 9:19 (07:34 - 11:04) Mid-Flood 15:29 (13:44 - 17:14)		**WQM** Mid-Ebb 11:13 (09:28 - 12:58) Mid-Flood 17:10 (15:25 - 18:55)		
27-Dec	28-Dec	29-Dec	30-Dec	31-Dec	01-Jan	02-Jan
		WQM Mid-Flood 9:14 (07:29 - 10:59) Mid-Ebb 14:31 (12:46 - 16:16)		**WQM** Mid-Flood 10:44 (08:59 - 12:29) Mid-Ebb 16:12 (14:27 - 17:57)		
03-Jan	04-Jan	05-Jan	06-Jan	07-Jan	08-Jan	09-Jan
			WQM Mid-Ebb 9:36 (07:12 - 10:42) Mid-Flood 15:05 (13:20 - 16:50)		**WQM** Mid-Ebb 11:09 (09:24 - 12:54) Mid-Flood 16:35 (14:50 - 18:20)	
10-Jan	11-Jan	12-Jan	13-Jan	14-Jan	15-Jan	16-Jan
			WQM Mid-Flood 8:57 (08:19 - 11:49) Mid-Ebb 14:38 (12:53 - 16:23)		**WQM** Mid-Flood 10:27 (08:42 - 12:12) Mid-Ebb 16:25 (14:40 - 18:10)	
17-Jan	18-Jan	19-Jan	20-Jan	21-Jan	22-Jan	23-Jan
			WQM Mid-Ebb 8:58 (07:13 - 10:43) Mid-Flood 15:00 (13:15 - 16:45)		**WQM** Mid-Ebb 11:00 (09:15 - 12:45) Mid-Flood 16:52 (15:07 - 18:37)	
24-Jan	25-Jan	26-Jan	27-Jan	28-Jan	29-Jan	30-Jan
			WQM Mid-Flood 8:45 (07:00 - 10:30) Mid-Ebb 14:19 (12:34 - 16:04)		**WQM** Mid-Flood 9:55 (08:10 - 11:40) Mid-Ebb 15:41 (13:56 - 17:26)	
31-Jan	01-Feb	02-Feb	03-Feb	04-Feb	05-Feb	06-Feb
	WQM Mid-Flood 11:47 (10:02 - 13:32) Mid-Ebb 18:14 (16:29 - 19:59)				**WQM** Mid-Ebb 10:39 (08:54 - 12:24) Mid-Flood 14:53 (13:08 - 16:38)	

Annex B

Calibration Reports of Multi-parameter Sensor

東業德勤測試顧問有限公司
ETS-TESTCONSULT LIMITED

Internal Calibration Report of Dissolved Oxygen Meter

Equipment Ref. No.	:	ET/EW/008/006	Manufacturer	:	YSI
Model No.	:	Pro 2030	Serial No.	:	12A 100554
Date of Calibration	:	19/12/2015	Calibration Due Date	:	18/01/2016

Temperature Verification

Ref. No. of Reference Thermometer : ET/0521/020

Ref. No. of Water Bath : ---

	Temperature (°C)			
Reference Thermometer reading	Measured	19.7	Corrected	20.4
DO Meter reading	Measured	20	Difference	0.4

Standardization of sodium thiosulphate ($Na_2S_2O_3$) solution

Reagent No. of $Na_2S_2O_3$ titrant	CPE/012/4.5/001/13	Reagent No. of 0.025N $K_2Cr_2O_7$	CPE/012/4.4/002/05

	Trial 1	Trial 2
Initial Vol. of $Na_2S_2O_3$ (ml)	0.00	10.20
Final Vol. of $Na_2S_2O_3$ (ml)	10.20	20.50
Vol. of $Na_2S_2O_3$ used (ml)	10.20	10.30
Normality of $Na_2S_2O_3$ solution (N)	0.02451	0.02427
Average Normality (**N**) of $Na_2S_2O_3$ solution (N)	0.02439	
Acceptance criteria, Deviation	Less than ± 0.001N	

Calculation: Normality of $Na_2S_2O_3$, **N** = 0.25 / ml $Na_2S_2O_3$ used

Lineality Checking

Determination of dissolved oxygen content by Winkler Titration *

Purging Time (min)	2		5		10	
Trial	1	2	1	2	1	2
Initial Vol. of $Na_2S_2O_3$ (ml)	0.00	11.10	22.00	0.00	6.80	10.40
Final Vol. of $Na_2S_2O_3$ (ml)	11.10	22.00	28.80	6.80	10.40	14.00
Vol. (**V**) of $Na_2S_2O_3$ used (ml)	11.10	10.90	6.80	6.80	3.60	3.60
Dissolved Oxygen (**DO**), mg/L	7.27	7.14	4.45	4.45	2.36	2.36
Acceptance criteria, Deviation	Less than + 0.3mg/L		Less than + 0.3mg/L		Less than + 0.3mg/L	

Calculation: DO (mg/L) = **V** x **N** x 8000/298

Purging time, min	DO meter reading, mg/L			Winkler Titration result *, mg/L			Difference (%) of DO Content
	1	2	Average	1	2	Average	
2	7.31	7.41	7.36	7.27	7.14	7.21	2.06
5	4.23	4.31	4.27	4.45	4.45	4.45	4.13
10	2.25	2.31	2.28	2.36	2.36	2.36	3.45
Linear regression coefficient				0.9980			

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Internal Calibration Report of Dissolved Oxygen Meter

Zero Point Checking

DO meter reading, mg/L	0.00

Salinity Checking

Reagent No. of NaCl (10ppt)	CPE/012/4.7/003/712	Reagent No. of NaCl (30ppt)	CPE/012/4.8/003/12

Determination of dissolved oxygen content by Winkler Titration **

Salinity (ppt)	10		30	
Trial	1	2	1	2
Initial Vol. of $Na_2S_2O_3$ (ml)	0.00	11.10	22.30	32.00
Final Vol. of $Na_2S_2O_3$ (ml)	11.10	22.30	32.00	41.50
Vol. (**V**) of $Na_2S_2O_3$ used (ml)	11.10	11.20	9.70	9.50
Dissolved Oxygen (**DO**), mg/L	7.27	7.33	6.35	6.22
Acceptance criteria, Deviation	Less than + 0.3mg/L		Less than + 0.3mg/L	

Calculation: DO (mg/L) = **V** x **N** x 8000/298

Salinity (ppt)	DO meter reading, mg/L			Winkler Titration result**, mg/L			Difference (%) of DO Content
	1	2	Average	1	2	Average	
10	7.43	7.45	7.44	7.27	7.33	7.30	1.90
30	6.51	6.38	6.45	6.35	6.22	6.29	2.51

Acceptance Criteria

(1) Differenc between temperature readings from temperature sensor of DO probe and reference thermometer : < 0.5 °C
(2) Linear regression coefficient : >0.99
(3) Zero checking: 0.0mg/L
(4) Difference (%) of DO content from the meter reading and by winkler titration : within ± 5%

The equipment complies # / ~~does not comply~~ # with the specified requirements and is deemed acceptable # / ~~unacceptable~~ # for use.

Delete as appropriate

Calibrated by : _____ Approved by : _____

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Performance Check of Salinity Meter

Equipment Ref. No. : ET/EW/008/006 Manufacturer : YSI

Model No. : Pro 2030 Serial No. : 12A 100554

Date of Calibration : 19/12/2015 Due Date : 18/01/2016

Ref. No. of Salinity Standard used (30ppt)	S/001/5

Salinity Standard (ppt)	Measured Salinity (ppt)	Difference %
30.0	30.6	2.00

(*) Difference (%) = (Measured Salinity – Salinity Standard value) / Salinity Standard value x 100

Acceptance Criteria

Difference : -10 % to 10 %

The salinity meter complies * / ~~does not comply~~ * with the specified requirements and is deemed acceptable * / ~~unacceptable~~ * for use. Measurements are traceable to national standards.

Checked by : _____ Approved by : _____

東業德勤測試顧問有限公司
ETS-TESTCONSULT LIMITED

Performance Check of Turbidity Meter

Equipment Ref. No. : ET/0505/011 Manufacturer : HACH

Model No. : 2100Q Serial No. : 12060 C 018534

Date of Calibration : 19/12/2015 Due Date : 18/01/2015

Theoretical Value of Turbidity Standard (NTU)	Measured Value (NTU)	Difference % *
20	19.7	-1.5
100	96.4	-3.6
800	782	-2.25

(*) Difference = (Measured Value – Theoretical Value) / Theoretical Value x 100

Acceptance Criteria

Difference : -5 % to 5 %

The turbidity meter complies * / ~~does not comply~~ * with the specified requirements and is deemed acceptable * / ~~unacceptable~~ * for use. Measurements are traceable to national standards.

Prepared by : _____ Checked by : _____

Annex C

QA/QC Results for Suspended Solids Testing

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QA/QC Results of Laboratory Analysis of Total Suspended Solids

Sampling Date	QC Sample	Sample Duplicate		Sample Spike	
	% Recovery *	Sample ID	% Error #	Sample ID	% Recovery @
12/29/2015	93.1	FC1-S1	0.00	FSR1-M2	104.5
	92.3	FG3-S1	0.00	FSR4-M2	93.9
	101.4	FSR4-B1	7.41	FC2-B2	95.1
	105.5	EC1-S1	9.52	ESR1-M2	101.5
	107.5	EG3-S1	8.70	ESR4-M2	97.1
	100.0	ESR4-B1	5.41	EC2-B2	100.0

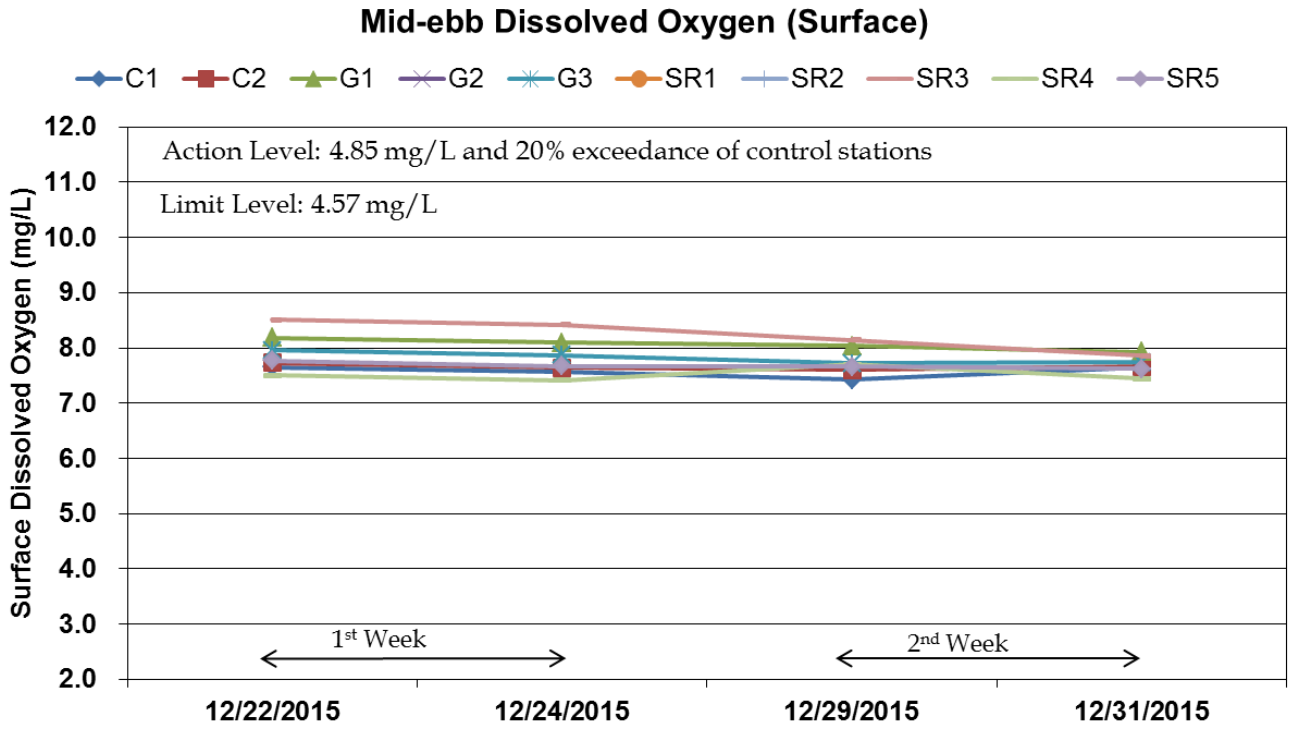
Note:
(*) % Recovery of QC sample should be between 85.5% to 113.5%.
(#) % Error of Sample Duplicate should be between 0% to 10%.
(@) % Recovery of Sample Spike should be between 80% to 120%.
(**) % Error of Sample Duplicate >10% but invalid due to sample results less than PQL (2.0 mg/L).

Sampling Date	QC Sample	Sample Duplicate		Sample Spike	
	% Recovery *	Sample ID	% Error #	Sample ID	% Recovery @
12/31/2015	92.9	FC1-S1	4.44	FG3-B2	106.4
	106.4	FSR2-M1	0.00	FSR3-M2	91.6
	93.5	FSR3-B1	0.00	FC2 -B2	107.4
	97.8	EC1-S1	4.44	EG3-B2	97.4
	102.7	ESR2-M1	0.00	ESR3-M2	95.8
	101.7	ESR3-B1	4.44	EC2-B2	99.6

Note:
(*) % Recovery of QC sample should be between 85.5% to 113.5%.
(#) % Error of Sample Duplicate should be between 0% to 10%.
(@) % Recovery of Sample Spike should be between 80% to 120%.
(**) % Error of Sample Duplicate >10% but invalid due to sample results less than PQL (2.0 mg/L).

Annex D

Second Weekly Water Quality Monitoring Results



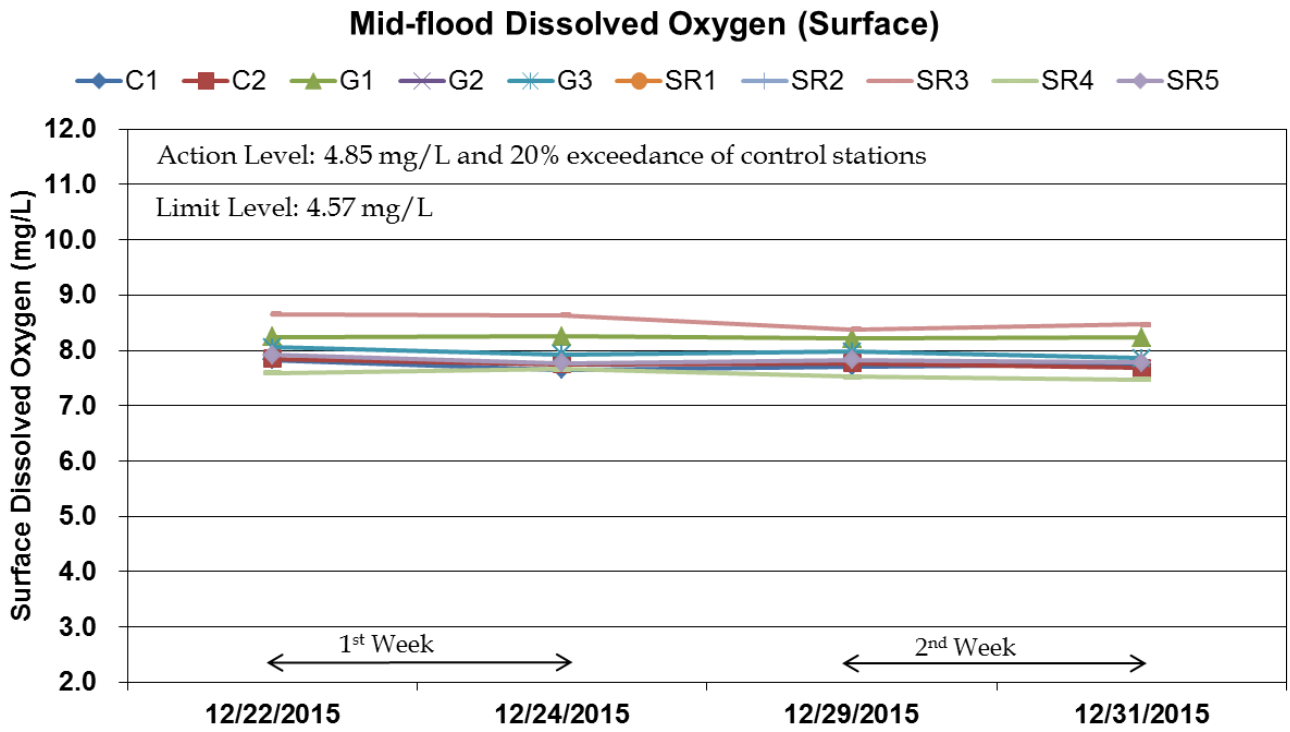
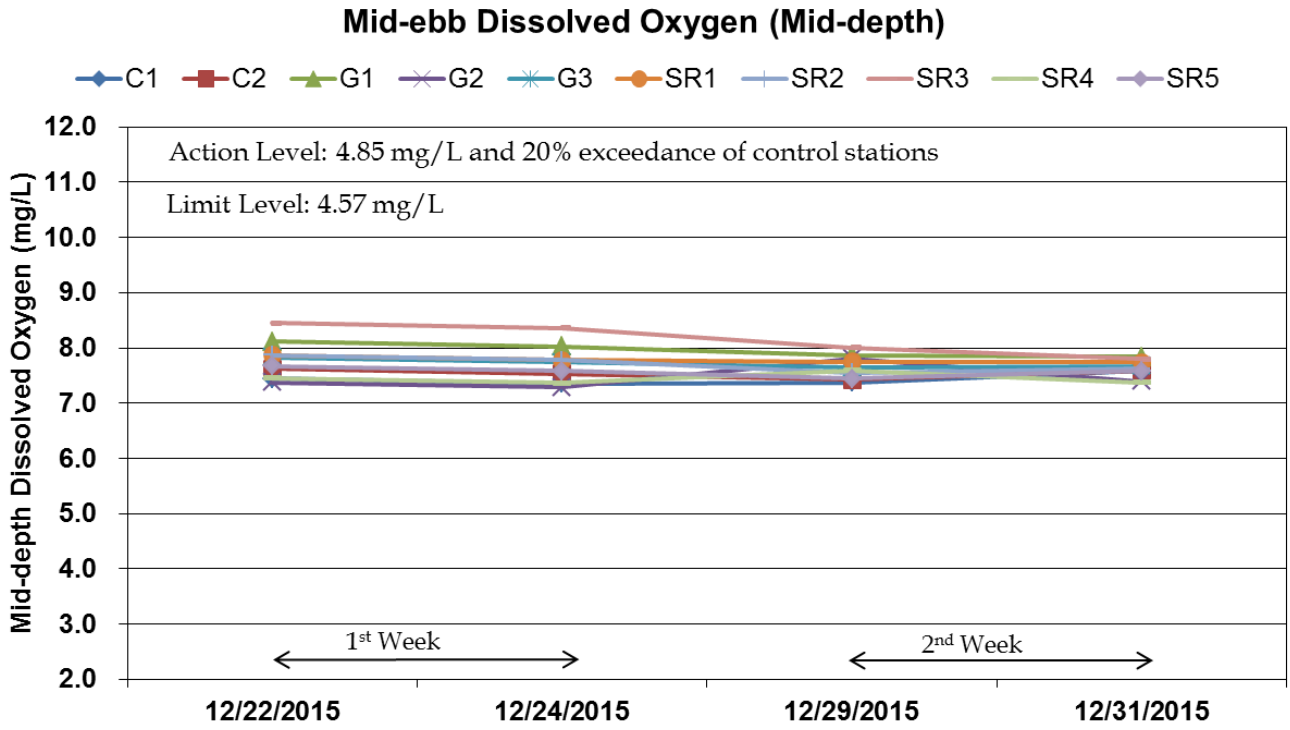


Figure D1 Dissolved oxygen (mg/L) at surface of water column measured during the impact monitoring period from 21 December 2015 to 3 January 2016



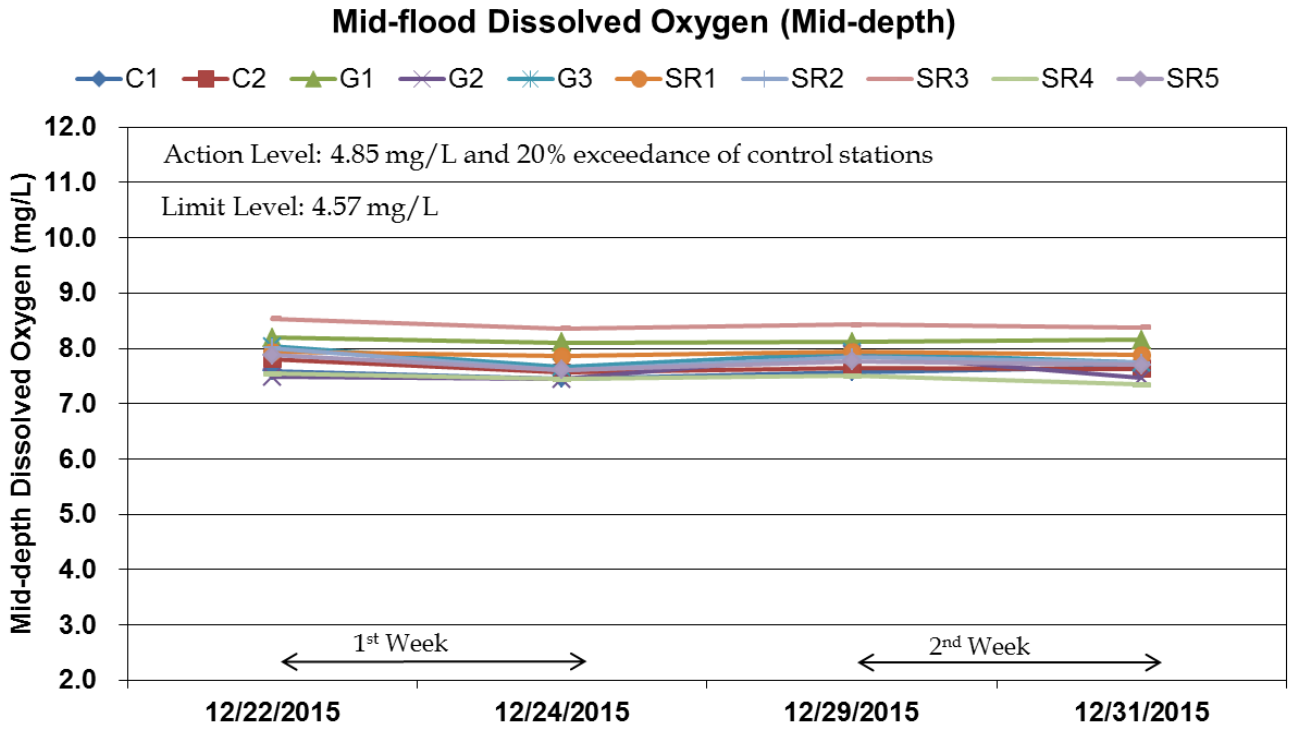
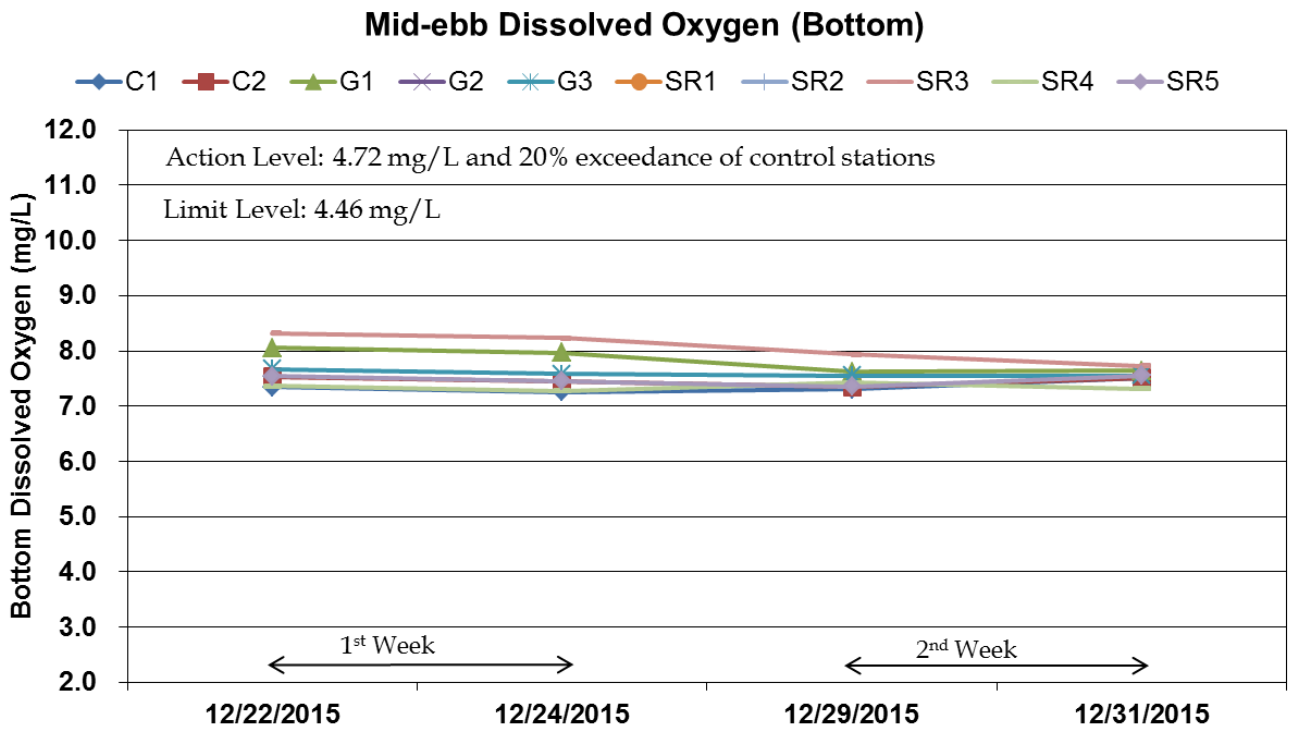


Figure D2 Dissolved oxygen (mg/L) at mid-depth of water column measured during the impact monitoring period from 21 December 2015 to 3 January 2016



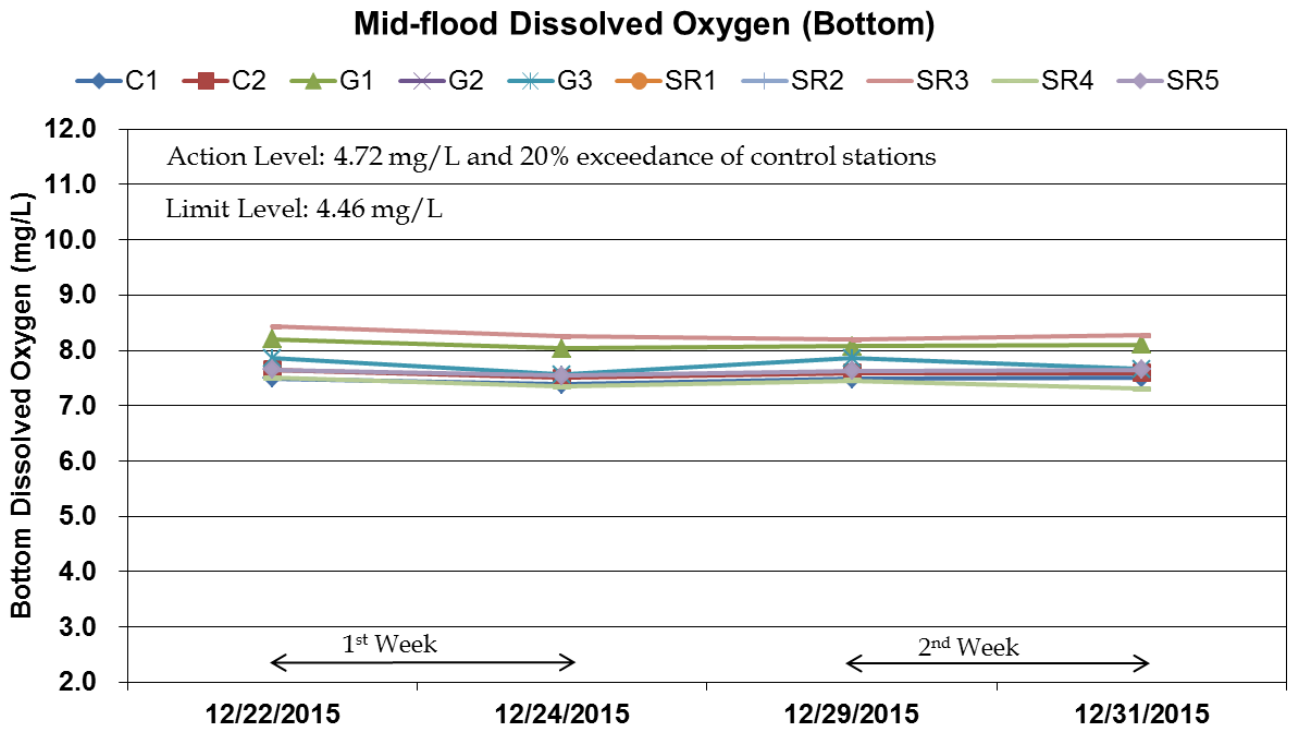
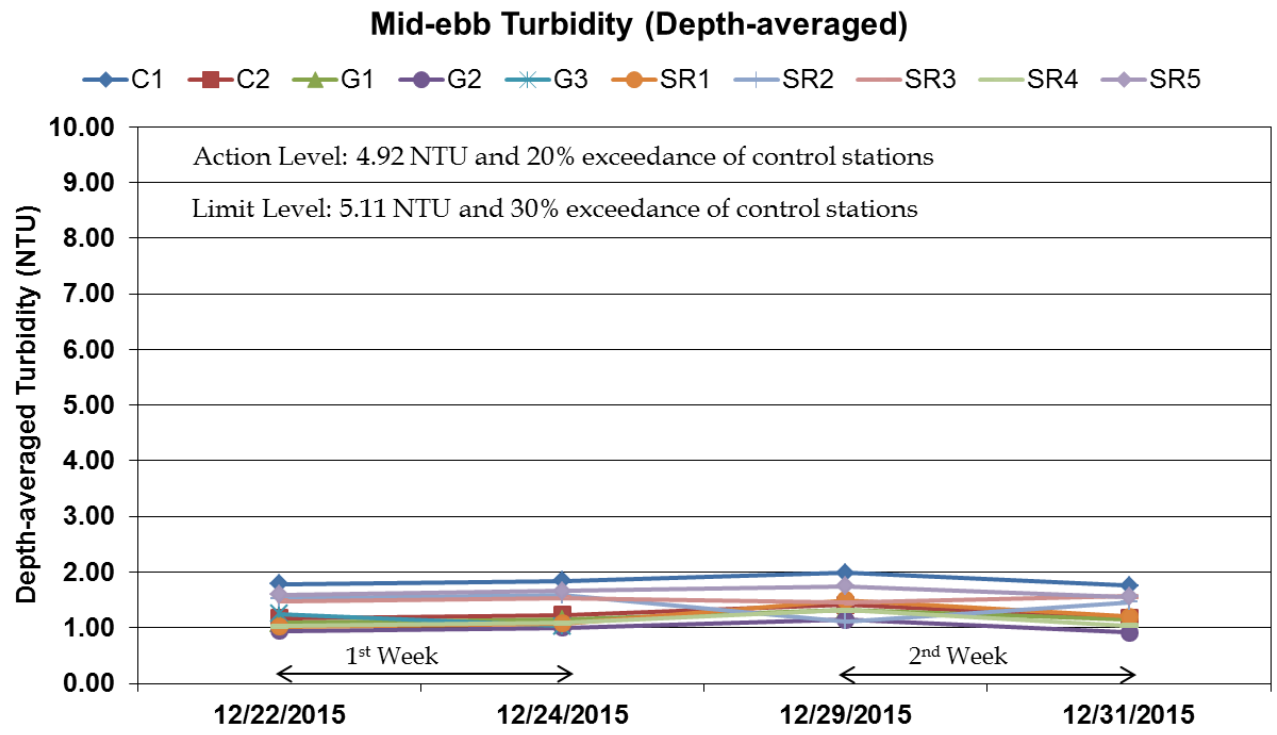


Figure D3 Dissolved oxygen (mg/L) at bottom of water column measured during the impact monitoring period from 21 December 2015 to 3 January 2016



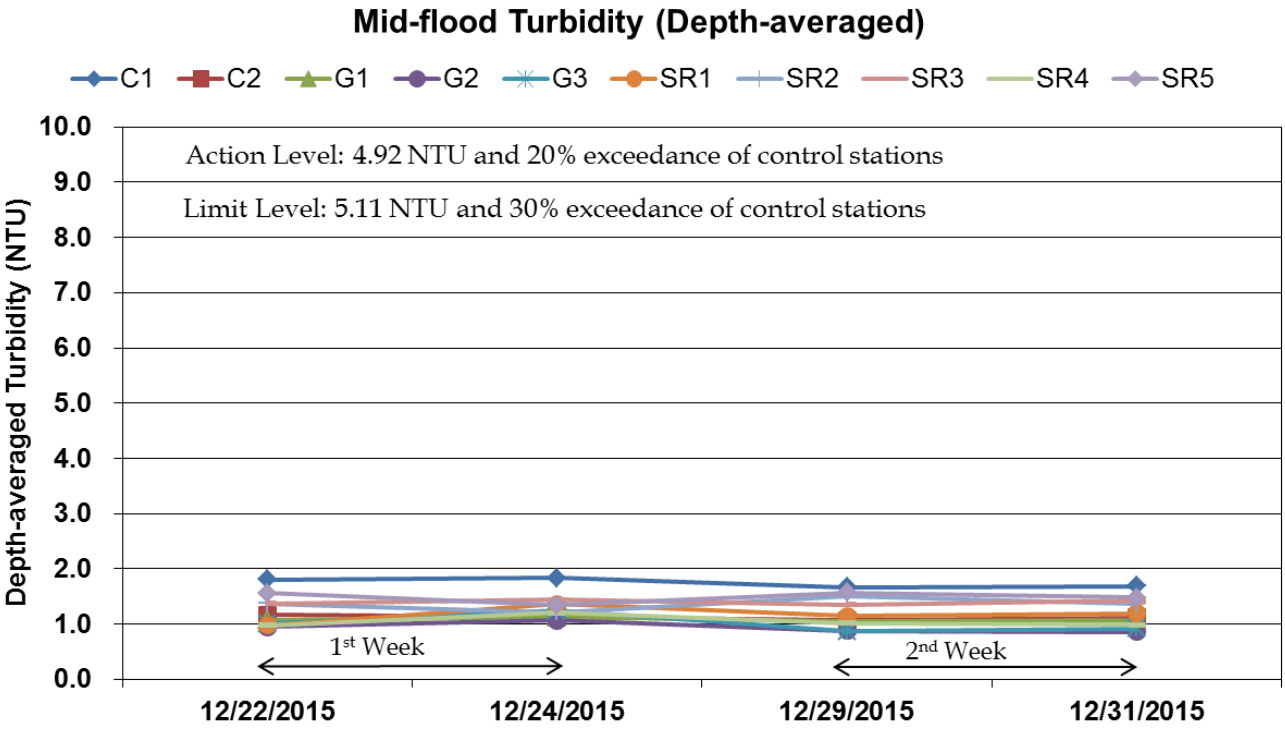
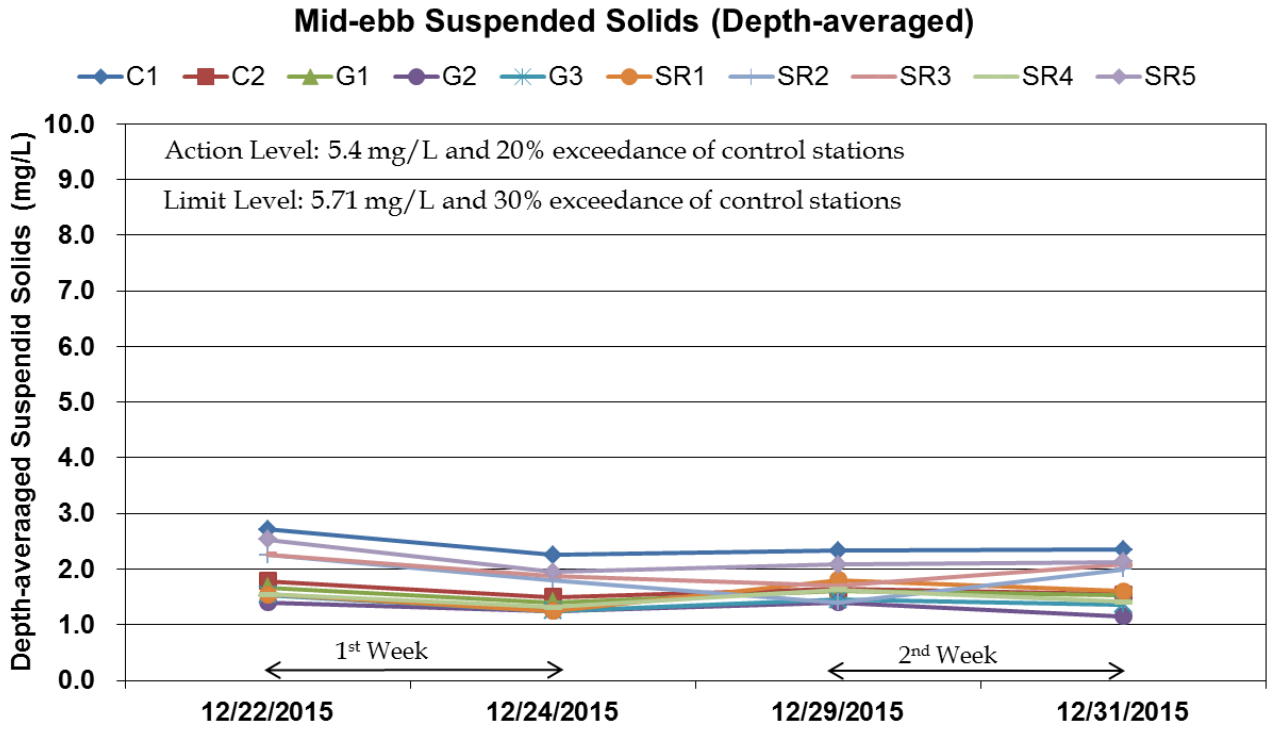


Figure D4 Depth-averaged turbidity (NTU) of water column measured during the impact monitoring period from 21 December 2015 to 3 January 2016



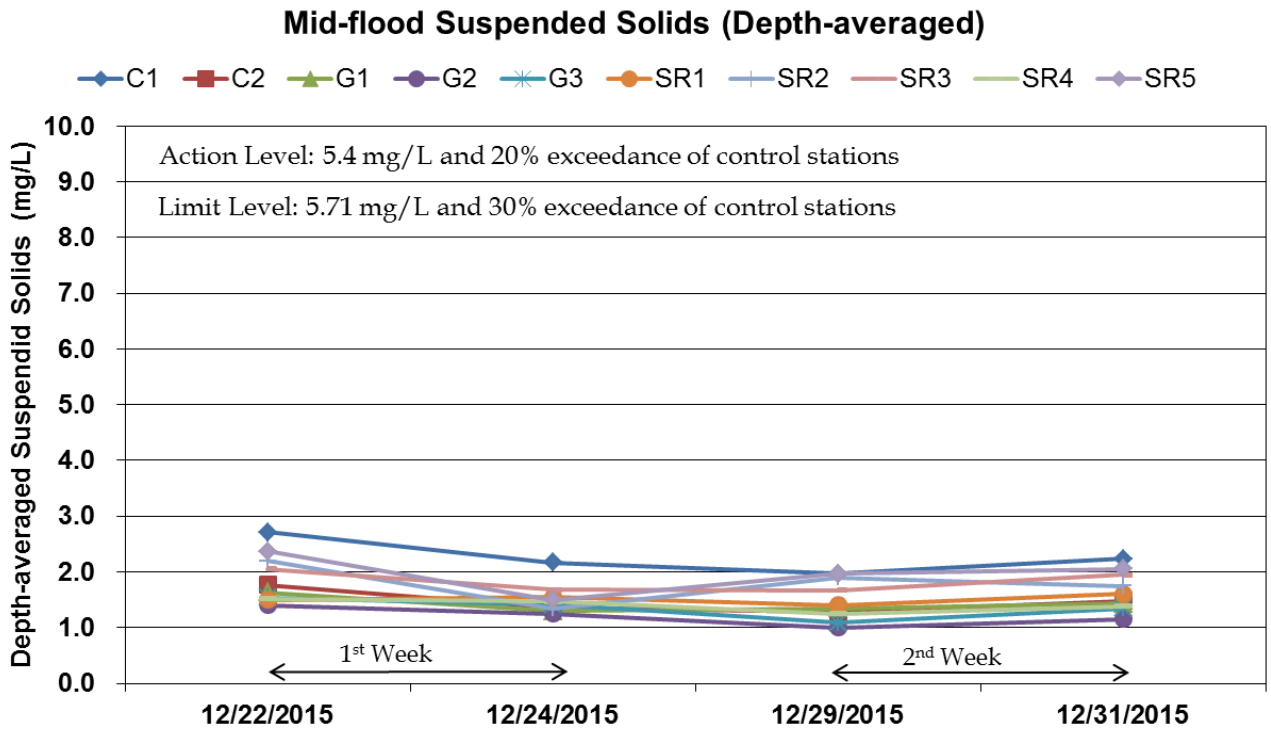


Figure D5 Depth-averaged suspended solid (mg/L) of water column measured during the impact monitoring period from 21 December 2015 to 3 January 2016

Date:	29-Dec-15
Tide:	Mid-Flood
Weather:	Fine
Sea Conditions:	Small Wave

Location	Sampling Time	Water Depth (m)	Current direction	Current speed (ms^{-1})	Monitoring Depth	Temperature (°C)			Salinity (ppt)			DO (mg/l)			DO Saturation (%)			Turbidity (NTU)				Suspended Solids (mg/l)			
						1	2	Ave.*	1	2	Ave.*	1	2	Ave.*	1	2	Ave.*	1	2	Ave.*	D.A.**	1	2	Ave.*	D.A.**
C1	0829-0841	12.6	S	0.2	*Surface*	21.0	20.6	20.8	32.1	32.2	32.2	7.7	7.7	7.7	103.0	103.4	103.2	1.6	1.7	1.7		1.8	1.9	1.9	
					Middle	20.6	20.9	20.8	32.0	32.1	32.1	7.6	7.6	7.6	101.7	101.3	101.5	1.7	1.7	1.7	1.7	2.1	2.0	2.1	2.0
					Bottom	20.5	20.4	20.5	32.1	32.2	32.2	7.5	7.5	7.5	100.2	100.4	100.3	1.7	1.6	1.7		2.2	1.8	2.0	
C2	1019-1030	12.2	S	0.2	*Surface*	20.5	20.4	20.5	32.2	32.0	32.1	7.8	7.8	7.8	104.3	104.0	104.2	1.1	1.0	1.0		1.3	1.2	1.3	
					Middle	20.2	20.4	20.3	32.1	32.2	32.2	7.6	7.7	7.6	102.1	102.8	102.5	1.0	1.0	1.0	1.1	1.2	1.3	1.3	1.3
					Bottom	20.1	20.2	20.2	32.0	32.2	32.1	7.6	7.6	7.6	101.8	101.7	101.8	1.1	1.2	1.1		1.2	1.5	1.4	
G1	0858-0908	11.0	S	0.1	*Surface*	20.3	20.5	20.4	31.8	32.1	32.0	8.2	8.2	8.2	109.7	110.3	110.0	1.0	0.9	0.9		1.2	1.2	1.2	
					Middle	20.2	20.2	20.2	31.9	31.8	31.9	8.1	8.1	8.1	109.1	108.4	108.8	1.0	1.0	1.0	1.0	1.4	1.3	1.4	1.4
					Bottom	20.3	20.4	20.4	31.9	32.0	32.0	8.1	8.1	8.1	108.1	108.2	108.2	1.2	1.2	1.2		1.4	1.6	1.5	
G2	0934-0940	0.9	S	0.2	*Surface*	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---		---	---	---	
					Middle	20.4	20.3	20.4	32.2	32.0	32.1	7.9	7.9	7.9	106.0	105.6	105.8	0.9	0.9	0.9	0.9	1.0	1.0	1.0	1.0
					Bottom	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---		---	---	---	
G3	0920-0931	14.2	S	0.1	*Surface*	20.5	20.6	20.6	32.0	32.2	32.1	8.0	8.0	8.0	106.7	107.2	107.0	0.7	0.8	0.8		1.0	1.0	1.0	
					Middle	20.4	20.2	20.3	32.2	32.2	32.2	7.9	7.9	7.9	106.1	106.4	106.3	0.8	0.9	0.8	0.9	1.0	1.1	1.1	1.1
					Bottom	20.3	20.2	20.3	32.0	32.1	32.1	7.9	7.8	7.9	105.5	105.0	105.3	1.0	1.0	1.0		1.1	1.3	1.2	
SR1	0911-0918	1.2	S	0.2	*Surface*	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---		---	---	---	
					Middle	20.4	20.2	20.3	32.1	32.0	32.1	7.9	8.0	7.9	106.1	106.7	106.4	1.1	1.2	1.1	1.1	1.5	1.3	1.4	1.4
					Bottom	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---		---	---	---	
SR2	0942-0948	0.7	S	0.1	*Surface*	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---		---	---	---	
					Middle	20.2	20.3	20.3	32.2	32.1	32.2	7.9	7.8	7.8	105.3	104.8	105.1	1.5	1.5	1.5	1.5	1.9	1.9	1.9	1.9
					Bottom	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---		---	---	---	
SR3	0845-0855	6.2	S	0.1	*Surface*	20.7	20.5	20.6	32.0	32.0	32.0	8.4	8.4	8.4	112.2	112.6	112.4	1.3	1.3	1.3		1.6	1.6	1.6	
					Middle	20.2	20.4	20.3	32.1	32.1	32.1	8.4	8.4	8.4	112.7	113.1	112.9	1.3	1.3	1.3	1.4	1.5	1.7	1.6	1.7
					Bottom	20.1	20.4	20.3	32.0	32.1	32.1	8.2	8.2	8.2	109.3	110.1	109.7	1.4	1.5	1.5		1.7	1.9	1.8	
SR4	1003-1011	5.4	S	0.2	*Surface*	20.4	20.2	20.3	32.0	32.1	32.1	7.5	7.5	7.5	100.6	101.0	100.8	0.9	1.0	0.9		1.3	1.1	1.2	
					Middle	20.3	20.4	20.4	31.9	32.1	32.0	7.5	7.5	7.5	100.6	100.5	100.6	1.0	1.0	1.0	1.0	1.3	1.1	1.2	1.3
					Bottom	20.2	20.3	20.3	32.1	32.0	32.1	7.5	7.4	7.5	100.0	99.7	99.9	1.1	1.1	1.1		1.4	1.3	1.4	
SR5	0951-1001	8.6	S	0.2	*Surface*	20.5	20.4	20.5	32.1	32.2	32.2	7.8	7.8	7.8	104.7	105.1	104.9	1.4	1.4	1.4		1.8	1.8	1.8	
					Middle	20.2	20.3	20.3	32.0	32.1	32.1	7.8	7.8	7.8	104.1	104.0	104.1	1.6	1.6	1.6	1.6	2.0	1.8	1.9	2.0
					Bottom	20.1	20.2	20.2	32.1	32.1	32.1	7.6	7.7	7.6	102.1	102.5	102.3	1.7	1.7	1.7		2.2	2.2	2.2	

Remark or Obsevation:

1. * Average; ** Depth Average

2. Each station was sampled and measurements/ water samples were taken at three depths, namely, 1 m below water surface, mid-depth and 1 m above sea bed, except where the water depth less than 6 m, the mid-depth station may be omitted. For stations that are less than 3 m in depth, only the mid-depth sample was taken.

Date:	29-Dec-15
Tide:	Mid-Ebb
Weather:	Fine
Sea Conditions:	Small Wave

Location	Sampling Time	Water Depth (m)	Current direction	Current speed (ms^{-1})	Monitoring Depth	Temperature (°C)			Salinity (ppt)			DO (mg/l)			DO Saturation (%)			Turbidity (NTU)				Suspended Solids (mg/l)			
						1	2	Ave.*	1	2	Ave.*	1	2	Ave.*	1	2	Ave.*	1	2	Ave.*	D.A.**	1	2	Ave.*	D.A.**
C1	1246-1300	12.3	S	0.2	*Surface*	21.0	20.9	21.0	32.0	32.0	32.0	7.4	7.4	7.4	99.5	99.3	99.4	1.8	1.8	1.8		2.0	2.2	2.1	
					Middle	20.8	20.7	20.8	32.1	32.2	32.2	7.4	7.4	7.4	103.2	103.4	103.3	2.0	2.0	2.0	2.0	2.4	2.4	2.4	2.3
					Bottom	20.6	20.5	20.6	32.3	32.4	32.4	7.3	7.3	7.3	102.5	102.7	102.6	2.1	2.2	2.2		2.6	2.4	2.5	
C2	1243-1258	11.9	S	0.3	*Surface*	21.0	21.0	21.0	32.0	32.0	32.0	7.6	7.6	7.6	101.8	101.6	101.7	1.2	1.3	1.3		1.5	1.3	1.4	
					Middle	20.9	20.8	20.9	32.1	32.2	32.2	7.4	7.4	7.4	99.2	99.4	99.3	1.4	1.4	1.4	1.4	1.9	1.5	1.7	1.7
					Bottom	20.7	20.6	20.7	32.3	32.4	32.4	7.3	7.4	7.3	95.1	95.3	95.2	1.6	1.6	1.6		1.7	2.0	1.9	
G1	1320-1335	10.7	S	0.2	*Surface*	21.0	20.9	21.0	32.1	32.2	32.2	8.0	8.1	8.0	107.5	107.7	107.6	1.1	1.2	1.2		1.5	1.3	1.4	
					Middle	20.7	20.8	20.8	32.3	32.4	32.4	7.9	7.9	7.9	110.3	110.5	110.4	1.4	1.4	1.4	1.3	1.8	1.6	1.7	1.6
					Bottom	20.6	20.5	20.6	32.5	32.5	32.5	7.6	7.6	7.6	102.1	101.9	102.0	1.4	1.5	1.4		1.7	1.7	1.7	
G2	1408-1415	0.8	S	0.2	*Surface*	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---		---	---	---	
					Middle	20.5	20.4	20.5	32.4	32.4	32.4	7.8	7.8	7.8	104.4	104.6	104.5	1.1	1.2	1.1	1.1	1.3	1.5	1.4	1.4
					Bottom	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---		---	---	---	
G3	1355-1406	13.9	S	0.2	*Surface*	21.0	20.9	21.0	32.1	32.2	32.2	7.7	7.7	7.7	103.5	103.3	103.4	0.9	1.0	1.0		1.2	1.1	1.2	
					Middle	20.7	20.8	20.8	32.3	32.3	32.3	7.7	7.6	7.6	102.4	102.2	102.3	1.4	1.4	1.4	1.3	1.7	1.5	1.6	1.5
					Bottom	20.5	20.5	20.5	32.4	32.5	32.5	7.5	7.6	7.6	100.9	101.1	101.0	1.4	1.5	1.5		1.5	1.7	1.6	
SR1	1340-1350	1.1	S	0.3	*Surface*	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---		---	---	---	
					Middle	20.5	20.4	20.5	32.2	32.3	32.3	7.7	7.8	7.8	108.6	108.9	108.8	1.5	1.5	1.5	1.5	1.6	2.0	1.8	1.8
					Bottom	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---		---	---	---	
SR2	1420-1430	0.6	S	0.2	*Surface*	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---		---	---	---	
					Middle	20.3	20.4	20.4	32.3	32.2	32.3	7.6	7.5	7.6	101.2	101.0	101.1	1.1	1.1	1.1	1.1	1.2	1.6	1.4	1.4
					Bottom	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---		---	---	---	
SR3	1305-1315	5.9	S	0.1	*Surface*	21.1	21.0	21.1	32.1	32.2	32.2	8.1	8.2	8.1	108.8	109.0	108.9	1.4	1.4	1.4		1.5	1.8	1.7	
					Middle	20.9	20.7	20.8	32.3	32.3	32.3	8.0	8.0	8.0	112.2	112.4	112.3	1.4	1.5	1.4	1.5	1.6	1.9	1.8	1.7
					Bottom	20.7	20.6	20.7	32.4	32.5	32.5	7.9	8.0	7.9	106.2	106.4	106.3	1.6	1.6	1.6		1.7	1.7	1.7	
SR4	1515-1535	5.1	S	0.2	*Surface*	20.8	20.7	20.8	32.1	32.2	32.2	7.7	7.7	7.7	102.9	103.1	103.0	1.1	1.1	1.1		1.5	1.4	1.5	
					Middle	20.6	20.5	20.6	32.3	32.3	32.3	7.6	7.6	7.6	101.7	101.5	101.6	1.4	1.4	1.4	1.3	1.6	1.6	1.6	1.6
					Bottom	20.4	20.4	20.4	32.4	32.5	32.5	7.4	7.4	7.4	99.2	99.4	99.3	1.4	1.5	1.5		1.9	1.8	1.9	
SR5	1435-1450	8.3	S	0.3	*Surface*	20.8	20.9	20.9	32.0	32.0	32.0	7.7	7.7	7.7	102.4	102.6	102.5	1.6	1.6	1.6		1.8	1.8	1.8	
					Middle	20.7	20.7	20.7	32.1	32.2	32.2	7.4	7.5	7.4	99.5	99.7	99.6	1.8	1.8	1.8	1.8	2.1	2.2	2.2	2.1
					Bottom	20.5	20.6	20.6	32.3	32.4	32.4	7.4	7.3	7.4	98.5	98.3	98.4	1.9	1.9	1.9		2.4	2.2	2.3	

Remark or Obsevation:

1. * Average; ** Depth Average

2. Each station was sampled and measurements/ water samples were taken at three depths, namely, 1 m below water surface, mid-depth and 1 m above sea bed, except where the water depth less than 6 m, the mid-depth station may be omitted. For stations that are less than 3 m in depth, only the mid-depth sample was taken.

Date:	31-Dec-15
Tide:	Mid-Flood
Weather:	Fine
Sea Conditions:	Small Wave

Location	Sampling Time	Water Depth (m)	Current direction	Current speed (ms^{-1})	Monitoring Depth	Temperrature (°C)			Salinity (ppt)			DO (mg/l)			DO Saturation (%)			Turbidity (NTU)				Suspended Solids (mg/l)			
						1	2	Ave.*	1	2	Ave.*	1	2	Ave.*	1	2	Ave.*	1	2	Ave.*	D.A.**	1	2	Ave.*	D.A.**
C1	0959-1009	13.4	S	0.1	*Surface*	20.3	20.1	20.2	32.1	32.0	32.1	7.7	7.8	7.8	103.4	104.3	103.9	1.7	1.7	1.7		2.2	2.3	2.3	
					Middle	20.2	20.1	20.2	32.0	32.1	32.1	7.7	7.7	7.7	102.8	102.6	102.7	1.7	1.6	1.7	1.7	2.2	2.2	2.2	2.2
					Bottom	20.0	20.0	20.0	32.2	32.0	32.1	7.5	7.5	7.5	100.4	100.6	100.5	1.7	1.7	1.7		2.3	2.2	2.3	
C2	1137-1146	13.2	S	0.2	*Surface*	20.1	20.1	20.1	31.8	31.9	31.9	7.7	7.7	7.7	103.2	102.8	103.0	1.0	1.1	1.0		1.3	1.3	1.3	
					Middle	20.0	20.1	20.1	31.8	31.8	31.8	7.6	7.6	7.6	102.1	102.4	102.3	1.1	1.1	1.1	1.1	1.5	1.4	1.5	1.5
					Bottom	19.9	20.0	20.0	31.9	32.0	32.0	7.6	7.6	7.6	101.6	101.8	101.7	1.2	1.2	1.2		1.7	1.7	1.7	
G1	1025-1034	12.2	S	0.2	*Surface*	20.3	20.1	20.2	32.1	32.0	32.1	8.2	8.3	8.2	109.9	110.7	110.3	0.9	1.0	0.9		1.2	1.3	1.3	
					Middle	20.2	20.1	20.2	31.8	31.9	31.9	8.1	8.2	8.2	109.1	109.3	109.2	1.1	1.1	1.1	1.1	1.5	1.5	1.5	1.4
					Bottom	20.0	20.1	20.1	31.9	32.0	32.0	8.1	8.1	8.1	108.7	108.5	108.6	1.2	1.1	1.2		1.6	1.5	1.6	
G2	1056-1102	1.9	S	0.1	*Surface*	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---		---	---	---	
					Middle	20.0	20.1	20.1	32.0	31.8	31.9	7.4	7.5	7.5	89.7	100.2	95.0	0.8	0.9	0.9	0.9	1.1	1.2	1.2	1.2
					Bottom	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---		---	---	---	
G3	1043-1053	15.2	S	0.1	*Surface*	20.1	20.0	20.1	31.8	31.9	31.9	7.9	7.8	7.9	105.5	105.1	105.3	0.7	0.8	0.7		1.0	1.1	1.1	
					Middle	19.8	19.9	19.9	31.8	31.8	31.8	7.7	7.8	7.7	103.3	104.0	103.7	0.8	0.9	0.9	0.9	1.2	1.3	1.3	1.4
					Bottom	19.9	19.7	19.8	31.9	31.0	31.5	7.6	7.7	7.7	102.4	102.9	102.7	1.1	1.2	1.1		1.7	1.8	1.8	
SR1	1036-1041	2.4	S	0.1	*Surface*	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---		---	---	---	
					Middle	20.0	20.1	20.1	32.1	32.0	32.1	7.9	7.9	7.9	105.3	105.7	105.5	1.2	1.2	1.2	1.2	1.6	1.6	1.6	1.6
					Bottom	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---		---	---	---	
SR2	1004-1110	1.6	S	0.1	*Surface*	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---		---	---	---	
					Middle	20.1	20.0	20.1	31.9	32.0	32.0	7.7	7.8	7.7	103.4	104.0	103.7	1.3	1.4	1.4	1.4	1.7	1.8	1.8	1.8
					Bottom	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---		---	---	---	
SR3	1012-1022	7.2	S	0.1	*Surface*	20.2	20.1	20.2	31.9	31.9	31.9	8.5	8.5	8.5	113.4	113.6	113.5	1.3	1.4	1.3		1.9	1.9	1.9	
					Middle	20.1	20.2	20.2	31.8	32.0	31.9	8.4	8.4	8.4	112.4	112.2	112.3	1.4	1.4	1.4	1.4	1.9	2.0	2.0	2.0
					Bottom	20.0	20.1	20.1	31.9	31.9	31.9	8.3	8.3	8.3	110.7	111.1	110.9	1.5	1.6	1.5		2.0	2.0	2.0	
SR4	1125-1135	6.6	S	0.1	*Surface*	20.2	20.0	20.1	32.0	31.8	31.9	7.5	7.5	7.5	100.1	100.2	100.2	0.9	1.0	0.9		1.2	1.4	1.3	
					Middle	20.1	20.0	20.1	31.9	31.7	31.8	7.4	7.3	7.3	98.6	98.1	98.4	1.0	1.0	1.0	1.0	1.3	1.4	1.4	1.4
					Bottom	19.8	20.0	19.9	31.9	32.0	32.0	7.3	7.3	7.3	97.7	98.1	97.9	1.0	1.0	1.0		1.5	1.5	1.5	
SR5	1112-1122	9.4	S	0.1	*Surface*	20.2	20.0	20.1	32.1	32.0	32.1	7.8	7.8	7.8	104.1	104.3	104.2	1.2	1.3	1.2		1.6	1.7	1.7	
					Middle	19.8	19.7	19.8	31.9	32.0	32.0	7.7	7.7	7.7	103.0	103.3	103.2	1.5	1.6	1.6	1.5	2.0	2.2	2.1	2.1
					Bottom	19.9	19.8	19.9	31.8	31.9	31.9	7.6	7.7	7.7	102.4	102.6	102.5	1.6	1.6	1.6		2.4	2.4	2.4	

Remark or Obsevation:

1. * Average; ** Depth Average
2. Each station was sampled and measurements/ water samples were taken at three depths, namely, 1 m below water surface, mid-depth and 1 m above sea bed, except where the water depth less than 6 m, the mid-depth station may be omitted. For stations that are less than 3 m in depth, only the mid-depth sample was taken.

Date:	31-Dec-15
Tide:	Mid-Ebb
Weather:	Fine
Sea Conditions:	Small Wave

Location	Sampling Time	Water Depth (m)	Current direction	Current speed (ms^{-1})	Monitoring Depth	Temperrature (°C)			Salinity (ppt)			DO (mg/l)			DO Saturation (%)			Turbidity (NTU)				Suspended Solids (mg/l)			
						1	2	Ave.*	1	2	Ave.*	1	2	Ave.*	1	2	Ave.*	1	2	Ave.*	D.A.**	1	2	Ave.*	D.A.**
C1	1427-1438	13.1	E	0.2	*Surface*	20.4	20.5	20.5	31.9	31.8	31.9	7.6	7.7	7.6	102.1	102.4	102.3	1.7	1.6	1.7		2.3	2.2	2.3	
					Middle	20.4	20.3	20.4	32.0	31.9	32.0	7.6	7.6	7.6	101.6	101.2	101.4	1.8	1.7	1.8	1.8	2.4	2.3	2.4	2.4
					Bottom	20.1	20.2	20.2	32.1	32.2	32.2	7.5	7.5	7.5	100.6	100.2	100.4	1.8	1.9	1.8		2.4	2.5	2.5	
C2	1612-1622	12.9	E	0.1	*Surface*	20.2	20.3	20.3	31.9	31.8	31.9	7.7	7.7	7.7	102.6	102.4	102.5	1.1	1.1	1.1		1.4	1.6	1.5	
					Middle	20.2	20.1	20.2	31.9	32.0	32.0	7.6	7.6	7.6	101.8	101.4	101.6	1.1	1.2	1.2	1.2	1.4	1.6	1.5	1.6
					Bottom	20.0	20.0	20.0	32.1	32.2	32.2	7.5	7.5	7.5	100.6	100.4	100.5	1.2	1.3	1.2		1.7	1.6	1.7	
G1	1456-1506	11.8	E	0.2	*Surface*	20.5	20.4	20.5	31.8	31.9	31.9	7.9	7.9	7.9	105.9	106.2	106.1	1.1	1.0	1.1		1.4	1.4	1.4	
					Middle	20.4	20.3	20.4	31.9	32.0	32.0	7.9	7.8	7.8	104.9	104.6	104.8	1.2	1.2	1.2	1.2	1.5	1.6	1.6	1.5
					Bottom	20.1	20.2	20.2	32.2	32.1	32.2	7.6	7.7	7.6	102.0	102.4	102.2	1.2	1.3	1.2		1.6	1.7	1.7	
G2	1529-1534	1.6	E	0.1	*Surface*	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---		---	---	---	
					Middle	20.2	20.3	20.3	31.8	31.7	31.8	7.4	7.4	7.4	99.1	98.8	99.0	0.9	0.9	0.9	0.9	1.1	1.2	1.2	1.2
					Bottom	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---		---	---	---	
G3	1516-1526	14.8	E	0.1	*Surface*	20.3	20.4	20.4	31.7	31.8	31.8	7.7	7.8	7.7	103.5	103.8	103.7	0.9	0.9	0.9		1.2	1.2	1.2	
					Middle	20.1	20.2	20.2	31.9	31.9	31.9	7.7	7.7	7.7	102.8	102.6	102.7	1.0	1.0	1.0	1.0	1.3	1.4	1.4	1.4
					Bottom	20.0	20.0	20.0	32.0	32.1	32.1	7.5	7.6	7.6	100.9	102.3	101.6	1.2	1.2	1.2		1.5	1.6	1.6	
SR1	1509-1514	2.1	E	0.2	*Surface*	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---		---	---	---	
					Middle	20.4	20.4	20.4	31.9	31.8	31.9	7.8	7.7	7.7	103.6	103.3	103.5	1.1	1.3	1.2	1.2	1.5	1.7	1.6	1.6
					Bottom	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---		---	---	---	
SR2	1536-1541	1.2	E	0.1	*Surface*	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---		---	---	---	
					Middle	20.3	20.2	20.3	31.9	31.8	31.9	7.6	7.6	7.6	101.8	102.2	102.0	1.4	1.5	1.5	1.5	1.9	2.1	2.0	2.0
					Bottom	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---		---	---	---	
SR3	1442-1453	6.9	E	0.1	*Surface*	20.3	20.4	20.4	31.9	31.8	31.9	7.9	7.8	7.9	105.2	104.9	105.1	1.5	1.5	1.5		1.9	2.0	2.0	
					Middle	20.3	20.3	20.3	31.9	31.9	31.9	7.8	7.8	7.8	104.5	104.2	104.4	1.5	1.6	1.6	1.6	2.0	2.2	2.1	2.1
					Bottom	20.2	20.3	20.3	32.0	32.0	32.0	7.7	7.7	7.7	103.6	102.9	103.3	1.6	1.7	1.7		2.2	2.2	2.2	
SR4	1557-1606	6.3	E	0.1	*Surface*	20.3	20.4	20.4	31.8	31.7	31.8	7.4	7.5	7.4	99.4	99.8	99.6	1.0	1.0	1.0		1.4	1.2	1.3	
					Middle	20.3	20.3	20.3	31.9	31.8	31.9	7.4	7.4	7.4	98.7	98.4	98.6	1.0	1.1	1.1	1.0	1.4	1.5	1.5	1.4
					Bottom	20.2	20.3	20.3	31.9	31.9	31.9	7.3	7.3	7.3	97.9	98.1	98.0	1.1	1.1	1.1		1.6	1.4	1.5	
SR5	1543-1554	8.8	E	0.1	*Surface*	20.4	20.3	20.4	31.8	31.7	31.8	7.6	7.6	7.6	102.2	101.8	102.0	1.3	1.3	1.3		1.6	1.9	1.8	
					Middle	20.3	20.3	20.3	31.8	31.9	31.9	7.6	7.6	7.6	101.4	101.6	101.5	1.6	1.7	1.7	1.6	2.2	2.3	2.3	2.1
					Bottom	20.2	20.1	20.2	31.9	32.0	32.0	7.5	7.6	7.6	100.9	101.1	101.0	1.7	1.7	1.7		2.4	2.4	2.4	

Remark or Obsevation:

1. * Average; ** Depth Average
2. Each station was sampled and measurements/ water samples were taken at three depths, namely, 1 m below water surface, mid-depth and 1 m above sea bed, except where the water depth less than 6 m, the mid-depth station may be omitted. For stations that are less than 3 m in depth, only the mid-depth sample was taken.

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