

**Environmental Monitoring and Audit  
 for Contaminated Mud Pits to the  
 South of The Brothers and at East  
 Sha Chau (2012-2017) – Investigation  
 Agreement No. CE 23/2012(EP)**

**39<sup>th</sup> Monthly Progress Report for Contaminated  
 Mud Pits to the South of The Brothers and at  
 East Sha Chau – November 2015**

Draft (Revision 0)

14 December 2015

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# Environmental Monitoring and Audit for Contaminated Mud Pits to the South of The Brothers and at East Sha Chau (2012-2017) – Investigation




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Client: Civil Engineering and Development Department (CEDD)		Project No: 0175086			
Summary:  This document presents the 39 <sup>th</sup> monthly progress report for Contaminated Mud Pits at the South of The Brothers and at East Sha Chau.		Date: 14 December 2015			
		Approved by: 			
		Craig A. Reid Partner			
v0	39 <sup>th</sup> Monthly Progress Report for ESC CMPs and SB CMPs	EL	JT	CAR	14/12/15
Revision	Description	By	Checked	Approved	Date
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## Dredging, Management and Capping of Contaminated Sediment Disposal Facility to the South of The Brothers

### Environmental Certification Sheet EP-427/2011/A

#### Reference Document/Plan

Document/ <del>Plan</del> -to be-Certified/ Verified:	39 <sup>th</sup> Monthly Progress Report for Contaminated Mud Pits to the South of The Brothers and at East Sha Chau - November 2015
Date of Report:	14 December 2015
Date prepared by ET:	14 December 2015
Date received by IA:	14 December 2015

#### Reference EP Condition

Environmental Permit Condition:	Condition No.: 4.4
4 hard copies and 1 electronic copy of monthly EM&A Report shall be submitted to the Director within 2 weeks after the end of the reporting month. The EM&A Reports shall include a summary of all non-compliance (exceedances) of the environmental quality performance limits (Action and Limit Levels). The submissions shall be certified by the ET Leader and verified by the Independent Auditor. Additional copies of the submission shall be provided to the Director upon request by the Director.	

#### ET Certification

I hereby certify that the above referenced document/~~plan~~ complies with the above referenced condition of EP-427/2011/A

Craig A. Reid,  
Environmental Team Leader:

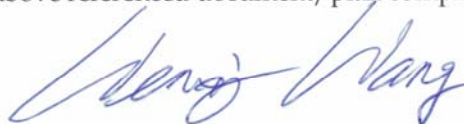


Date: 14/12/2015

#### IA Verification

I hereby verify that the above referenced document/~~plan~~ complies with the above referenced condition of EP-427/2011/A

Dr Wang Wen Xiong,  
Independent Auditor:



Date: 14/12/2015

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**Agreement No. CE 23/2012 (EP)**  
**Environmental Monitoring and Audit**  
**for Contaminated Mud Pits to the South of The Brothers and at East Sha**  
**Chau (2012-2017) - Investigation**

**39<sup>TH</sup> MONTHLY PROGRESS REPORT FOR NOVEMBER 2015**

**1.1 BACKGROUND**

1.1.1 Since early 1990s, contaminated sediment <sup>(1)</sup> arising from various construction works (e.g. dredging and reclamation projects) in Hong Kong has been disposed of at a series of seabed pits at East of Sha Chau (ESC). In late 2008, a review indicated that the existing and planned facilities at ESC would not be able to meet the disposal demand after 2012. In order to meet this demand, the Hong Kong Special Administrative Region Government (HKSARG) decided to implement a new contained aquatic disposal (CAD) <sup>(2)</sup> facility at the South of The Brothers (SB CMPs) which had been under consideration for a number of years.

1.1.2 The environmental acceptability of the construction and operation of the Project had been confirmed by findings of the associated Environmental Impact Assessment (EIA) study completed in 2005 under *Agreement No. CE 12/2002(EP)* <sup>(3)</sup>. The Director of Environmental Protection (DEP) approved this EIA report under the *Environmental Impact Assessment Ordinance (Cap. 499) (EIAO)* in September 2005 (*EIA Register No.: AEIAR-089/2005*).

1.1.3 In accordance with the EIA recommendation, prior to commencement of construction works for the SB CMPs, the Civil Engineering and Development Department (CEDD) undertook a detailed review and update of the EIA findings for the SB site <sup>(4)</sup>. Findings of the EIA review undertaken in 2009/2010 confirmed that the construction and operation of the SB site had been predicted to be environmentally acceptable.

(1) According to the Management Framework of Dredged/ Excavated Sediment of ETWB TC(W) No. 34/2002, contaminated sediment in general shall mean those sediment requiring Type 2 – Confined Marine Disposal as determined according to this TC(W).

(2) CAD options may involve use of excavated borrow pits, or may involve purpose-built excavated pits. CAD sites are those which involve filling a seabed pit with contaminated mud and capping it with uncontaminated material such that the original seabed level is restored and the contaminated material is isolated from the surrounding marine environment.<sup>7</sup>

(3) Detailed Site Selection Study for a Proposed Contaminated Mud Disposal Facility within the Airport East/ East of Sha Chau Area (*Agreement No. CE 12/2002(EP)*)

(4) Under the CEDD study *Contaminated Sediment Disposal Facility to the South of The Brothers (Agreement No. FM 2/2009)*



1.3.2 The following monitoring activities have been undertaken for SB CMPs in November 2015:

- *Pit Specific Sediment Chemistry of CMP 2* was undertaken on 3 November 2015;
- *Water Column Profiling of CMP 2* was undertaken on 5 November 2015; and
- *Routine Water Quality Monitoring of CMP 2* was undertaken on 12 November 2015.

#### 1.4 **DETAILS OF OUTSTANDING SAMPLING AND/OR ANALYSIS**

1.4.1 No outstanding sampling remained for November 2015.

1.4.2 A summary of field activities conducted are presented in *Annex A*. The following laboratory analyses were still in progress during the preparation of this monthly report and hence are not presented in this monthly report:

- Laboratory analyses of sediment samples collected for *Pit Specific Sediment Chemistry of SB CMP 2* in November 2015.

## 1.5 **BRIEF DISCUSSION OF THE MONITORING RESULTS FOR ESC CMPS**

1.5.1 Brief discussion of the monitoring results of the *Impact Water Quality Monitoring during Dredging Operations of ESC CMP Vd* conducted in November 2015 is presented below.

### 1.5.2 ***Impact Water Quality Monitoring during Dredging Operations of ESC CMP Vd – November 2015***

1.5.3 Dredging activities were carried out on 13 and 14 November 2015 during this reporting period. As such, *Impact Water Quality Monitoring during Dredging Operations of ESC CMP Vd* was conducted three times per week from 13 to 20 November 2015 to monitor water quality around the CMP during dredging activities. On each survey day, monitoring was conducted during both mid-ebb and mid-flood tides at two Reference (Upstream) stations and five Impact (Downstream) stations around the dredging operations at ESC CMP Vd. Monitoring was also conducted at one Sensitive Receiver station situated in Ma Wan. A total of eight (8) stations were monitored and locations of the sampling stations are shown in *Figure 1.2*.

1.5.4 Monitoring results are presented in *Table B1 of Annex B*. Daily dredging volume in November 2015 is reported in *Annex C*. Levels of Dissolved Oxygen (DO), Turbidity and Suspended Solid (SS) complied with the Action and Limit Levels (see *Table B2 of Annex B* for details) set in the *Baseline Monitoring Report* <sup>(1)</sup>.

1.5.5 The results indicated that the dredging operations at ESC CMP Vd did not appear to cause any unacceptable deterioration in water quality during this reporting period. Therefore, no further action, except for those recommended in the Environmental Permit (*EP-312/2008/A*), are considered necessary for the dredging operations.

(1) ERM (2009). Draft Second Review of the EM&A Manual. Under Agreement No. CE 4/2009 (EP) EM&A for Contaminated Mud Pit at Sha Chau (2009-2013) – Investigation



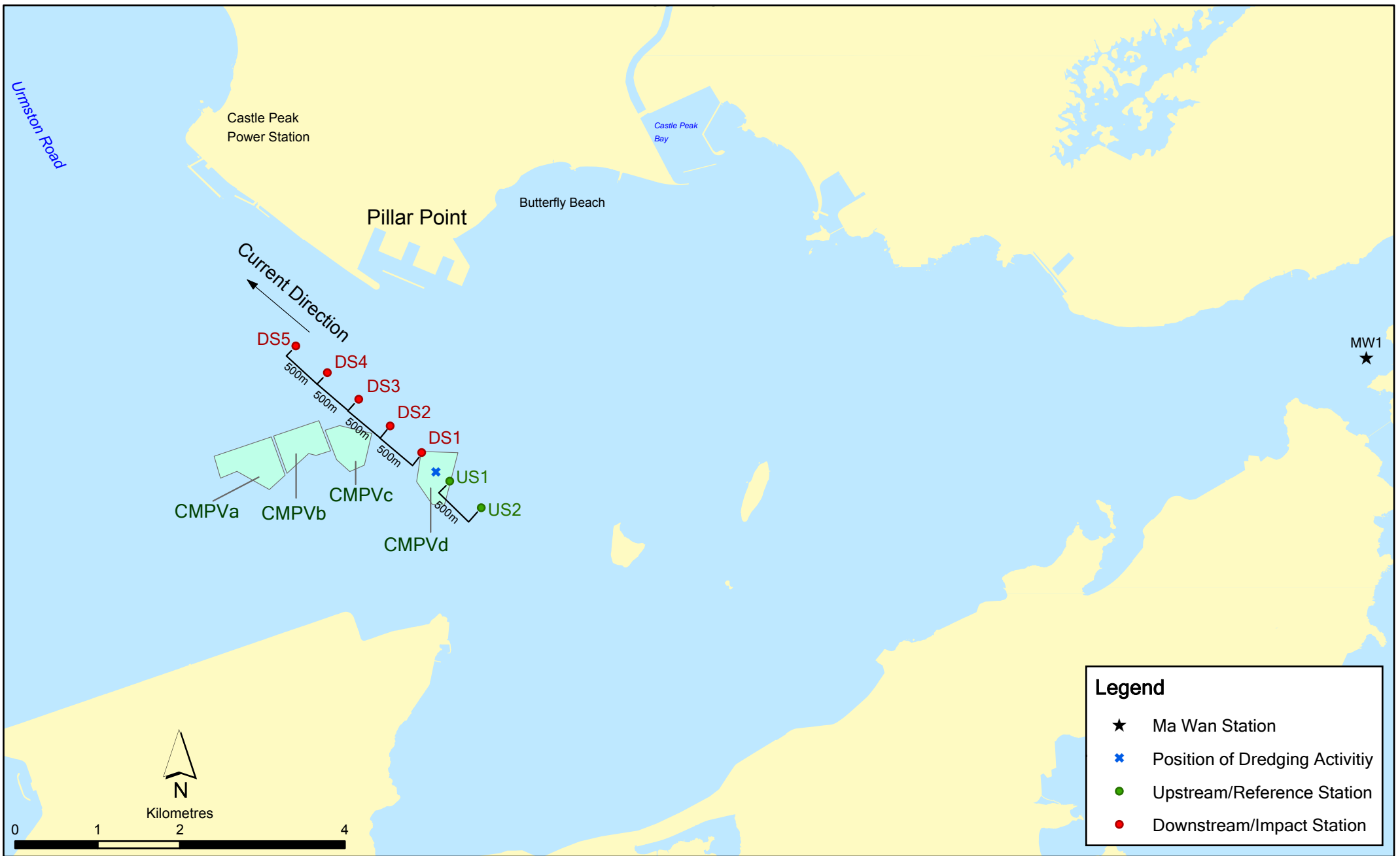


Figure 1.2

Indicative Dredging Impact Sampling Stations for CMPVd

Note: The locations of sampling stations will be determined on site based on current direction and position of dredging activities.

**Legend**

- ★ Ma Wan Station
- ✕ Position of Dredging Activity
- Upstream/Reference Station
- Downstream/Impact Station

## 1.6 **BRIEF DISCUSSION OF THE MONITORING RESULTS FOR SB CMPs**

1.6.1 Brief discussion of the monitoring results of the following activities for SB CMPs is presented in this 39<sup>th</sup> *Monthly Progress Report*:

- *Pit Specific Sediment Chemistry* of CMP 2 in October 2015;
- *Routine Water Quality Monitoring* of CMP 2 in November 2015; and
- *Water Column Profiling* of CMP 2 in November 2015.

### 1.6.2 ***Pit Specific Sediment Chemistry of CMP 2 - October 2015***

1.6.3 Monitoring locations for *Pit Specific Sediment Chemistry* for CMP 2 are shown in *Figure 1.3*. A total of six (6) monitoring stations were sampled in October 2015.

1.6.4 The concentrations of most inorganic contaminants (Arsenic, Cadmium, Chromium, Lead, Nickel and Zinc) were lower than the Lower Chemical Exceedance Level (LCEL) at all stations, except Copper, Mercury and Silver (*Figures 1 and 2 of Annex D*). Copper exceeded the LCEL at Active Pit stations SB-NPBA (*Figure 1 of Annex D*) while Silver exceeded the LCEL at both Active Pit stations SB-NPBA and SB-NPBB (*Figure 2 of Annex D*). In addition, mercury exceeds LCEL at Near Pit Stations SB-NNBA and SB-NNBB and Pit-edge Station SB-NEBA (*Figure 2 of Annex D*).

1.6.5 Higher Copper and Silver concentrations were recorded within the Active Pit stations only which were receiving contaminated mud during the reporting month whilst higher Mercury concentrations were only recorded at Near Pit stations and Pit-edge Station. Therefore, there is no evidence indicating any dispersal of contaminants from the Active Pit due to the disposal activities.

1.6.6 For organic contaminants, the concentrations of Total Organic Carbon (TOC) were similar at all stations (*Figure 3 of Annex D*). Tributyltin (TBT) concentrations were observed to be higher at Active Pit station SB-NPBA (*Figure 4 of Annex D*). Low and High Molecular Weight Polycyclic Aromatic Hydrocarbons (PAHs), Total Polychlorinated Biphenyls (PCBs), 4,4'-dichlorodiphenyldichloroethylene (DDE) and Total dichlorodiphenyltrichloroethane (DDT) concentrations were below the limit of reporting at most stations, except High Molecular Weight PAHs at Active Pit stations SB-NPBA and SB-NPBB (*Figure 5 of Annex D*).

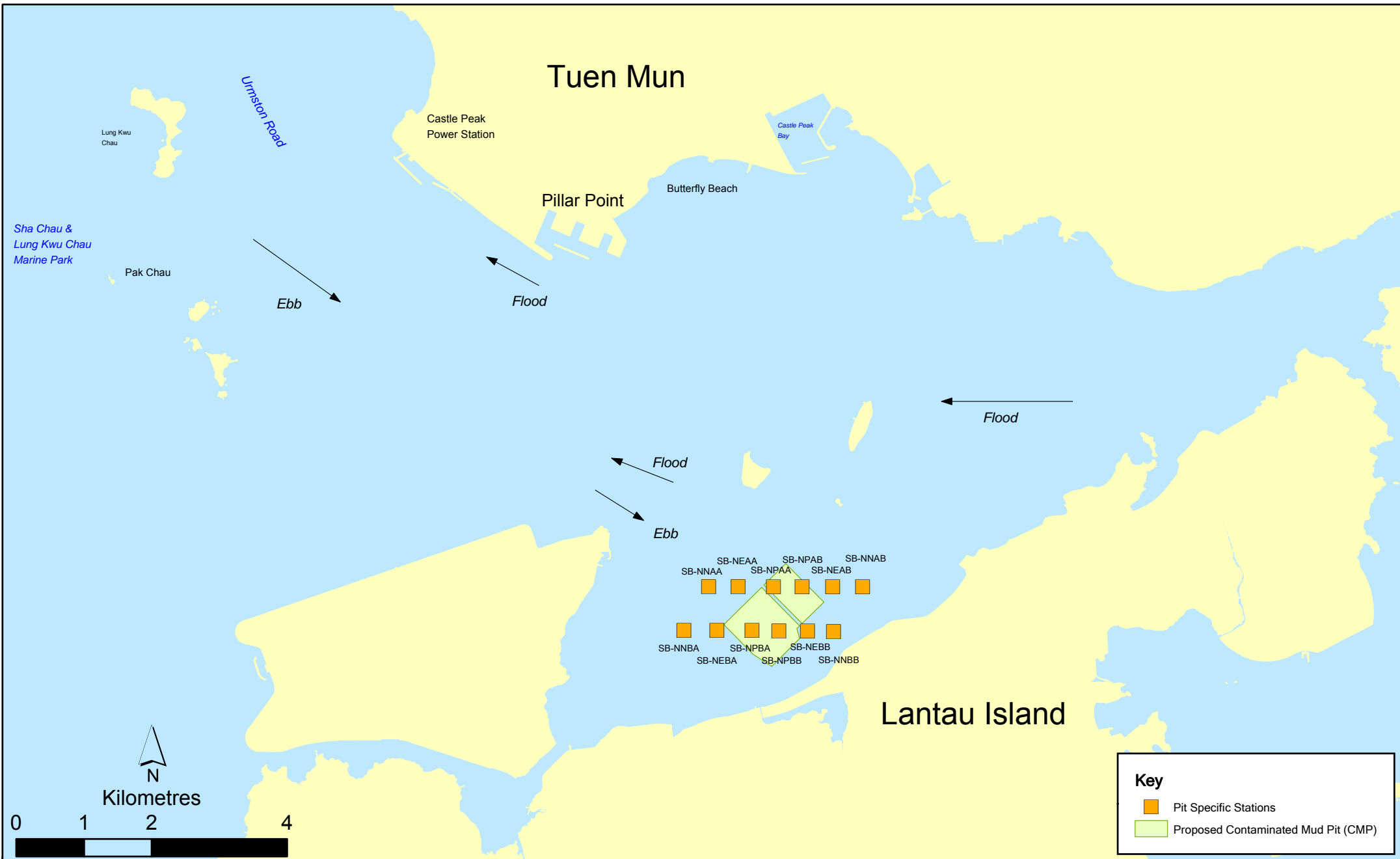


Figure 1.3

Pit Specific Sediment Quality Monitoring Stations for South Brothers Facility

1.6.7 Overall, there is no evidence indicating any unacceptable environmental impacts to sediment quality as a result of the contaminated mud disposal operations at CMP 2 in October 2015. Statistical analysis will be undertaken and presented in the quarterly report to investigate whether there are any unacceptable impacts in the area caused by the contaminated mud disposal.

1.6.8 ***Routine Water Quality Monitoring of SB CMP 2 - November 2015***

The monitoring results for the Routine Water Quality Monitoring conducted in November 2015 in the dry season have been assessed for compliance with the Water Quality Objectives (WQOs) set by Environmental Protection Department (EPD). This consists of a review of the EPD routine water quality monitoring data for the dry season period (November to March) of 2005 - 2014 from stations in the Northwestern Water Control Zone (WCZ), where the CMPs are located <sup>(1)</sup>. For Salinity, the averaged value obtained from the Reference stations was used for the basis as the WQO. Levels of DO and Turbidity were also assessed for compliance with the Action and Limit Levels (see Table B3 of Annex B for details). The monitoring results are shown in Figures 6-16 of Annex D and Tables B4 and B5 of Annex B. A total of fourteen (14) monitoring stations were sampled in November 2015 as shown in *Figure 1.4*.

(1) <http://epic.epd.gov.hk/EPICRIVER/marine/?lang=en>

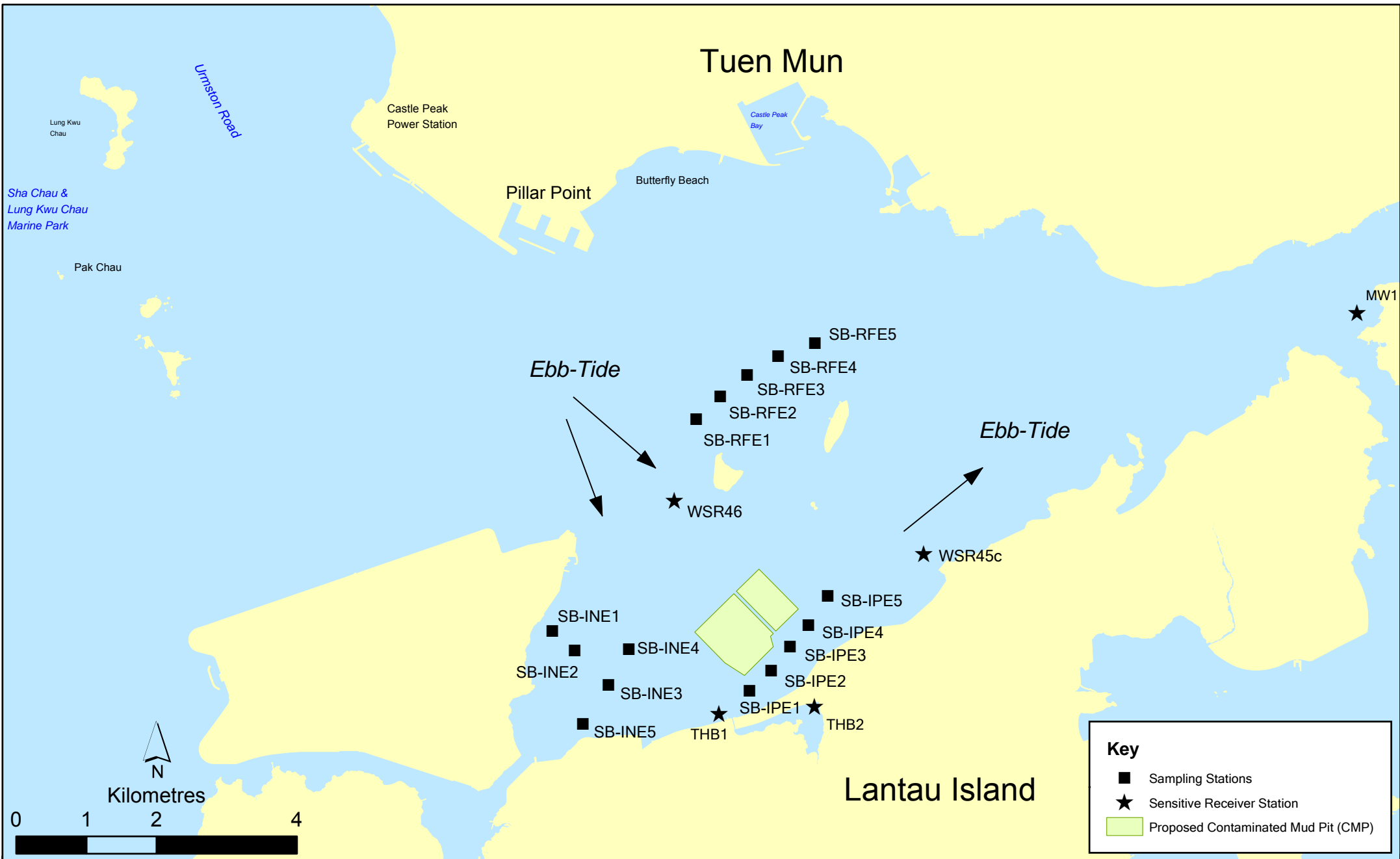


Figure 1.4

Routine Water Quality Sampling Stations (Ebb-Tide) for South Brothers Facility

### *In-situ Measurements*

- 1.6.9 Graphical presentation of the monitoring results (Temperature, DO, pH, Salinity and Turbidity) is shown in *Figures 6 -11 of Annex D*. Analyses of results for November 2015 indicated that the levels of pH, DO and Salinity complied with the WQOs at all stations (Impact, Intermediate, Reference and Water Sensitive Receiver stations) in November 2015 (*Figures 6 – 8, 10 of Annex D*).
- 1.6.10 The levels of DO and Turbidity complied with the Action and Limit Levels at all stations (*Table B4 of Annex B; Figures 8 and 11 of Annex D*).
- 1.6.11 Overall, *in-situ* measurement results of the *Routine Water Quality Monitoring* indicated that the disposal operation at CMP 2 did not appear to cause any unacceptable impacts in water quality in November 2015.

### *Laboratory Measurements*

- 1.6.12 Laboratory analysis of November 2015 results indicated that concentrations of Cadmium, Silver and Mercury were below their limit of reporting at all stations. Arsenic, Chromium, Copper, Lead, Nickel and Zinc were detected in November 2015 samples and the concentrations were similar amongst stations (*Figures 12 & 13 of Annex D*). Results of laboratory analysis were shown in *Table B5 of Annex B*.
- 1.6.13 For nutrients, concentrations of Total Inorganic Nitrogen (TIN) at Intermediate stations in November 2015 exceeded the WQO (0.5 mg/L) (*Figure 14 of Annex D*). Ammonia Nitrogen (NH<sub>3</sub>-N) concentration was relatively similar amongst all stations (*Figure 14 of Annex D*). Levels of 5-day Biochemical Oxygen Demand (BOD<sub>5</sub>) appear to be higher at Shum Shui Kok and Tai Mo To stations in November 2015 (*Figure 15 of Annex D*).
- 1.6.14 Concentrations of SS exceeded the WQO (13.5 mg/L for dry season) at Reference and Sham Shui Kok stations in November 2015. Concentrations of SS also exceeded the Action Levels at Sham Shui Kok while it complied with the Action and Limit Levels at all other stations in November 2015 (*Figure 16 of Annex D; Table B5 of Annex B*). Since Sham Shui Kok station is located further away from Impact stations where exceedances of Action and Limit Levels did not occur, the exceedance of SS level was unlikely to be caused by mud disposal works at CMP 2 and it is considered to be sporadic events and characteristic of water quality in this area of Hong Kong.
- 1.6.15 Overall, results of the *Routine Water Quality Monitoring* indicated that the disposal operation at CMP 2 did not appear to cause any unacceptable deterioration in water quality in November 2015. Detailed statistical analysis will be presented in the Quarterly Report to investigate any spatial and temporal trends of potential concern.

1.6.16 *Water Column Profiling of CMP 2 – November 2015*

1.6.17 *Water Column Profiling* was undertaken at a total of two sampling stations (Upstream and Downstream stations) on 5 November 2015. The monitoring results have been assessed for compliance with the WQOs (see *Section 1.6.9* for details).

*In-situ Measurements*

1.6.18 Analyses of results for November 2015 indicated that levels of Salinity, DO and pH complied with the WQOs at both Downstream and Upstream stations (*Table B6 of Annex B*). In addition, DO and Turbidity at all stations complied with the Action and Limit Levels (*Tables B3 and B6 of Annex B*).

*Laboratory Measurements for SS*

1.6.19 Analyses of results for November 2015 indicated that the SS levels complied with the WQO at Downstream stations. Both Upstream and Downstream stations complied with the Action and Limit Levels (*Tables B3 and B6 of Annex B*).

Overall, the monitoring results indicated that the mud disposal operation at CMP 2 did not appear to cause any deterioration in water quality during this reporting period.

## 1.7 *ACTIVITIES SCHEDULED FOR THE NEXT MONTH*

1.7.1 The following monitoring activities will be conducted in the next monthly period of December 2015 for SB CMPs:

- *Pit Specific Sediment Chemistry of CMP 2;*
- *Cumulative Impact Sediment Chemistry of SB CMPs;*
- *Water Column Profiling of CMP 2;*
- *Water Quality Monitoring During Capping of CMP 1; and*
- *Benthic Recolonisation Studies of CMP 1.*

1.7.2 The following monitoring activities will be conducted in the next monthly period of December 2015 for ESC CMPs:

- *Impact Water Quality Monitoring during Dredging Operations of CMP Vd*
- *Benthic Recolonisation Studies of CMP IV; and*
- *Water Quality Monitoring During Capping of ESC CMPs.*

1.7.3 The sampling schedule is presented in *Annex A*.

## 1.8 *STUDY PROGRAMME*

1.8.1 A summary of the Study programme is presented in *Annex E*.



Annex A

## Sampling Schedule

















Annex B

# Water Quality Monitoring Results

Table B1

## Summary Table of DO, Turbidity and SS Levels Recorded in November 2015

Sampling Date	Tidal Period	Station	Average DO Levels (mg/L)		Average Turbidity Level (NTU)	Average SS Level (mg/L)
			Bottom	Surface and Mid Depth		
2015/11/13	Mid-Ebb	DS1	6.13	6.19	6.32	7.55
		DS2	6.05	6.18	7.43	10.60
		DS3	6.13	6.17	6.45	8.30
		DS4	6.22	6.23	8.46	9.48
		DS5	6.25	6.24	6.35	9.20
		US1	5.86	6.12	10.09	9.22
		US2	6.04	6.15	7.65	8.63
	Mid-Flood	MW1	5.69	5.79	4.74	6.42
		DS1	6.08	6.15	13.57	14.65
		DS2	5.98	6.12	14.17	14.95
		DS3	5.95	6.07	12.97	16.88
		DS4	6.03	6.14	13.12	14.28
		DS5	5.98	6.13	18.20	15.28
		US1	6.31	6.28	11.42	13.70
		US2	6.27	6.25	13.65	16.65
		MW1	5.79	5.83	10.29	13.05
		2015/11/16	Mid-Ebb	DS1	6.12	6.27
DS2	6.09			6.28	5.92	10.28
DS3	6.20			6.37	5.15	6.00
DS4	5.99			6.08	7.62	5.57
DS5	6.45			6.56	4.87	6.15
US1	6.17			6.36	4.95	5.98
US2	6.06			6.28	5.27	6.77
Mid-Flood	MW1		5.85	5.92	4.57	6.40
	DS1		5.85	5.94	16.53	15.33
	DS2		5.87	5.93	16.43	13.57
	DS3		5.86	6.00	9.89	10.18
	DS4		5.78	5.89	12.46	12.95
	DS5		5.77	5.93	15.27	12.50
	US1		5.87	6.06	17.30	12.47
	US2		5.98	6.14	11.81	12.28
	MW1		5.73	5.84	10.20	12.27
	2015/11/18		Mid-Ebb	DS1	5.84	6.15
DS2		5.82		6.21	4.97	5.48
DS3		5.97		6.34	4.30	5.37
DS4		6.25		6.42	3.64	4.50
DS5		6.48		6.50	4.04	4.37
US1		5.71		6.00	9.10	10.02
US2		5.75		6.10	6.78	6.35
Mid-Flood		MW1	5.61	6.01	3.96	10.02
		DS1	5.73	5.85	8.96	10.28
		DS2	5.70	5.89	7.95	8.48
		DS3	5.70	5.98	5.37	6.08
		DS4	5.74	6.10	4.52	4.48
		DS5	5.73	6.06	5.00	6.38
		US1	5.70	6.00	7.48	7.92
		US2	5.70	5.93	7.48	7.02
		MW1	5.62	5.71	7.92	10.02

Sampling Date	Tidal Period	Station	Average DO Levels (mg/L)		Average Turbidity Level (NTU)	Average SS Level (mg/L)
			Bottom	Surface and Mid Depth		
2015/11/20	Mid-Ebb	DS1	5.58	6.04	5.28	6.25
		DS2	5.84	6.00	4.13	5.10
		DS3	5.78	5.94	6.36	7.83
		DS4	6.05	5.99	3.83	3.75
		DS5	6.07	5.94	4.03	4.98
		US1	5.74	5.97	4.16	4.53
		US2	5.64	5.95	5.05	5.07
		MW1	5.63	5.84	3.20	4.18
		Mid-Flood	DS1	5.46	5.70	6.30
	DS2		5.56	5.75	5.98	5.52
	DS3		5.67	6.05	3.71	4.07
	DS4		5.66	6.19	4.46	5.88
	DS5		5.82	6.20	4.60	6.13
	US1		5.73	6.14	5.76	7.25
	US2		5.73	5.99	6.11	8.10
	MW1		5.65	5.59	4.90	6.82

Notes:

1. Please refer to Table C2 below for the Action and Limit Levels for dredging activities.
2. Cell shaded yellow indicated value exceeding the Action Level criteria.
3. Cell shaded red indicated value exceeding the Limit Level criteria.

**Table B2** *Action and Limit Levels of Water Quality for Dredging, Backfilling and Capping Activities at ESC CMPs*

<b>Parameter</b>	<b>Action Level</b>	<b>Limit Level</b>
Dissolved Oxygen (DO) <sup>(1)</sup>	<u>Surface and Mid-depth</u> <sup>(2)</sup> 5%-ile of baseline data for surface and middle layer = <b>3.76 mg L<sup>-1</sup></b>	<u>Surface and Mid-depth</u> <sup>(2)</sup> 1%-ile of baseline data for surface and middle layer = <b>3.11 mg L<sup>-1</sup></b> <sup>(3)</sup>
	and	and
	Significantly less than the reference stations mean DO (at the same tide of the same day)	Significantly less than the reference stations mean DO (at the same tide of the same day)
	<u>Bottom</u> 5%-ile of baseline data for bottom layers = <b>2.96 mg L<sup>-1</sup></b>	<u>Bottom</u> The average of the impact station readings are <b>&lt;2 mg/L<sup>-1</sup></b>
	and	and
	Significantly less than the reference stations mean DO (at the same tide of the same day)	Significantly less than the reference stations mean DO (at the same tide of the same day)
Depth-averaged Suspended Solids (SS) <sup>(4)(5)</sup>	95%-ile of baseline data for depth average = <b>37.88 mg L<sup>-1</sup></b>	99%-ile of baseline data for depth average = <b>61.92 mg L<sup>-1</sup></b>
	and	and
	120% of control station's SS at the same tide of the same day	130% of control station's SS at the same tide of the same day
Depth-averaged Turbidity (Tby) <sup>(4)(5)</sup>	95%-ile of baseline data = <b>28.14 NTU</b>	99%-ile of baseline data = <b>38.32 NTU</b>
	and	and
	120% of control station's Tby at the same tide of the same day	130% of control station's Tby at the same tide of the same day

**Notes:**

- (1) For DO, non-compliance of the water quality limits occurs when monitoring result is lower than the limits.
- (2) The Action and Limit Levels for DO for Surface & Middle layers were calculated from the combined pool of baseline surface layer data and baseline middle layer data.
- (3) Given the Action Level for DO for Surface & Middle layers has already been lower than 4 mg L<sup>-1</sup>, it is proposed to set the Limit Level at 3.11 mg L<sup>-1</sup> which is the first percentile of the baseline data.
- (4) "Depth-averaged" is calculated by taking the arithmetic means of reading of all three depths.
- (5) For turbidity and SS, non-compliance of the water quality limits occurs when monitoring result is higher than the limits.

**Table B3 Action and Limit Levels of Water Quality for Dredging, Backfilling and Capping Activities for SB CMPs**

<b>Parameter</b>	<b>Action Level</b>	<b>Limit Level</b>
Dissolved Oxygen (DO) <sup>(1)</sup>	<u>Surface and Mid-depth</u> <sup>(2)</sup> The average of the impact, WSR 45C and WSR 46 station readings are < 5%-ile of baseline data for surface and middle layer = <b>4.32 mg L<sup>-1</sup></b>  and  Significantly less than the reference stations mean DO (at the same tide of the same day)	<u>Surface and Mid-depth</u> <sup>(2)</sup> The average of the impact, WSR 45C and WSR 46 station readings are < <b>4 mg L<sup>-1</sup></b>  and  Significantly less than the reference stations mean DO (at the same tide of the same day)
	<u>Bottom</u> The average of the impact, WSR 45C and WSR 46 station readings are < 5%-ile of baseline data for bottom layers = <b>3.12 mg L<sup>-1</sup></b>  and  Significantly less than the reference stations mean DO (at the same tide of the same day)	<u>Bottom</u> The average of the impact station, WSR 45C and WSR 46 readings are < <b>2 mg L<sup>-1</sup></b>  and  Significantly less than the reference stations mean DO (at the same tide of the same day)
Depth-averaged Suspended Solids (SS) <sup>(3)(4)</sup>	The average of the impact, WSR 45C and WSR 46 station readings are > 95%-ile of baseline data for depth average = <b>21.60 mg L<sup>-1</sup></b>  and  120% of control station's SS at the same tide of the same day	The average of the impact, WSR 45C and WSR 46 station readings are > 99%-ile of baseline data for depth average = <b>40.10 mg L<sup>-1</sup></b>  and  130% of control station's SS at the same tide of the same day
Depth-averaged Turbidity (Tby) <sup>(3)(4)</sup>	The average of the impact, WSR 45C and WSR 46 station readings are > 95%-ile of baseline data = <b>25.04 NTU</b>  and  120% of control station's Tby at the same tide of the same day	The average of the impact, WSR 45C and WSR 46 station readings are > 99%-ile of baseline data = <b>32.68 NTU</b>  and  130% of control station's Tby at the same tide of the same day

**Notes:**

- (1) For DO, non-compliance of the water quality limits occurs when monitoring result is lower than the limits.
- (2) The Action and Limit Levels for DO for Surface & Middle layers were calculated from the combined pool of baseline surface layer data and baseline middle layer data.
- (3) "Depth-averaged" is calculated by taking the arithmetic means of reading of all three depths.
- (4) For turbidity and SS, non-compliance of the water quality limits occurs when monitoring result is higher than the limits.

**Table B4** *In-situ Monitoring Results for Routine Water Quality Monitoring of SB CMP in November 2015*

Sampling Period	Stations	Temp (°C)	Salinity (ppt)	Turbidity (NTU)	Dissolved Oxygen (%)	Dissolved Oxygen (mg L <sup>-1</sup> )	pH (mg L <sup>-1</sup> )
November 2015	RFF (Reference)	26.25	31.08	7.92	85.35	5.79	7.89
	IPF (Impact)	26.05	29.06	10.09	89.29	6.14	7.88
	INF (Intermediate)	25.77	28.35	8.10	93.09	6.46	7.88
	Ma Wan	26.22	31.36	3.92	86.19	5.84	7.87
	Shum Shui Kok	26.19	29.45	13.86	86.55	5.93	7.87
	Tai Mo To	26.11	30.12	8.30	89.25	6.10	7.89
	Tai Ho Bay 1	25.89	28.49	11.17	91.70	6.35	7.90
Tai Ho Bay 2	26.07	29.55	10.21	85.81	5.89	7.66	
	WQO	N/A	27.97 - 34.19#	N/A	N/A	>4	6.5-8.5

**Notes:**

# Not exceeding 2°C of change of the results from the Reference Station.

#Not exceeding 10% of natural ambient level which is the result obtained from the Reference Station.

Cell shaded yellow / red indicate value exceeding the Action/Limit levels.

Cell shaded grey indicate value exceeding the WQO.

**Table B5** *Laboratory Results for Routine Water Quality Monitoring of SB CMP in November 2015*

Sampling Period	Stations	As (µg/L)	Cd (µg/L)	Cr (µg/L)	Cu (µg/L)	Pb (µg/L)	Hg (µg/L)	Ni (µg/L)	Ag (µg/L)	Zn (µg/L)	NH <sub>3</sub> (mg/L)	TIN (mg/L)	BOD <sub>5</sub> (mg/L)	SS (mg/L)
November 2015	RFF	2.31	<LOR	1.39	6.56	<LOR	<LOR	1.68	<LOR	16.57	0.07	0.36	1.09	13.81
	IPF	2.48	<LOR	1.70	7.55	1.08	<LOR	1.93	<LOR	15.12	0.08	0.45	1.54	11.63
	INF	2.76	<LOR	1.14	2.61	<LOR	<LOR	1.53	<LOR	6.16	0.06	0.56	1.38	9.48
	Ma Wan	1.73	<LOR	2.37	5.73	<LOR	<LOR	1.97	<LOR	20.27	0.07	0.34	0.91	11.70
	Shum Shui Kok	2.48	<LOR	1.63	6.13	<LOR	<LOR	1.65	<LOR	11.20	0.08	0.43	3.39	28.07
	Tai Mo To	2.54	<LOR	2.15	7.76	<LOR	<LOR	1.46	<LOR	12.04	0.07	0.42	2.90	13.33
	Tai Ho Bay 1	1.97	<LOR	1.62	1.52	<LOR	<LOR	1.77	<LOR	11.96	0.05	0.44	1.06	13.09
	Tai Ho Bay 2	1.96	<LOR	2.26	3.03	<LOR	<LOR	1.94	<LOR	12.46	0.08	0.50	1.32	8.35

WQO of TIN: 0.5 mg/L

Dry Season WQO of SS: 13.5 mg/L

**Note:** Cell shaded yellow / red indicate value exceeding the Action/Limit levels.

Cell shaded grey indicate value exceeding the WQO.

**Table B6** *Water Column Profiling Results for SB CMP 2 in November 2015*

Stations	Temp (°C)	Salinity (ppt)	Turbidity (NTU)	Dissolved Oxygen (%)	Dissolved Oxygen (mg L <sup>-1</sup> )	pH (mg L <sup>-1</sup> )	Suspended Solids (mg L <sup>-1</sup> )
WCP 1 (Downstream)	26.26	29.05	12.51	87.53	6.00	7.90	11.53
WCP 2 (Upstream)	26.35	29.08	11.36	88.00	6.02	7.91	14.35
WQO (Dry season)	N/A	26.16 - 31.99#	N/A	N/A	>4	6.5-8.5	13.5

**Note:**

#Not exceeding 10% of natural ambient level which is the result obtained from the Reference Station.

Cell shaded grey indicate value exceeding the WQO.

Annex C

Dredging Record for ESC  
CMP Vd in November 2015

Table C1 Dredging Record at ESC CMP Vd

Date	Daily Dredging Volume (m <sup>3</sup> )	Weekly Dredging Volume (m <sup>3</sup> ) (From Sunday to Saturday)
01-Nov-2015	0	0
02-Nov-2015	0	
03-Nov-2015	0	
04-Nov-2015	0	
05-Nov-2015	0	
06-Nov-2015	0	
07-Nov-2015	0	
08-Nov-2015	0	3,250
09-Nov-2015	0	
10-Nov-2015	0	
11-Nov-2015	0	
12-Nov-2015	0	
13-Nov-2015	1,300	
14-Nov-2015	1,950	
15-Nov-2015	0	0
16-Nov-2015	0	
17-Nov-2015	0	
18-Nov-2015	0	
19-Nov-2015	0	
20-Nov-2015	0	
21-Nov-2015	0	
22-Nov-2015	0	0
23-Nov-2015	0	
24-Nov-2015	0	
25-Nov-2015	0	
26-Nov-2015	0	
27-Nov-2015	0	
28-Nov-2015	0	0
29-Nov-2015	0	
30-Nov-2015	0	



Annex D

## Graphical Presentations

**Pit Specific Sediment Chemistry for Metal and Metalloid Contaminants at SB CMP 2  
October 2015**

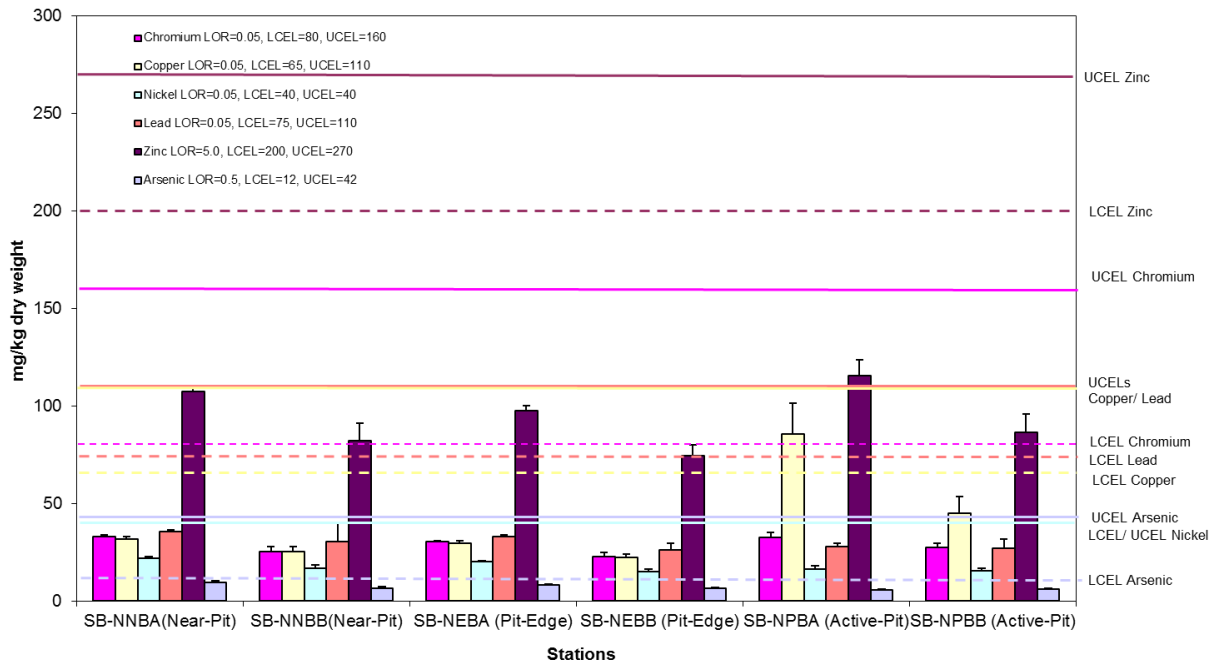


Figure 1: Concentration of Metals (Cr, Cu, Ni, Pb, Zn, As; mg/kg dry weight; mean +SD) in sediment samples collected from Pit Specific Sediment Chemistry Monitoring for CMP 2 in October 2015.

**Pit Specific Sediment Chemistry for Metal Contaminants at SB CMP 2  
October 2015**

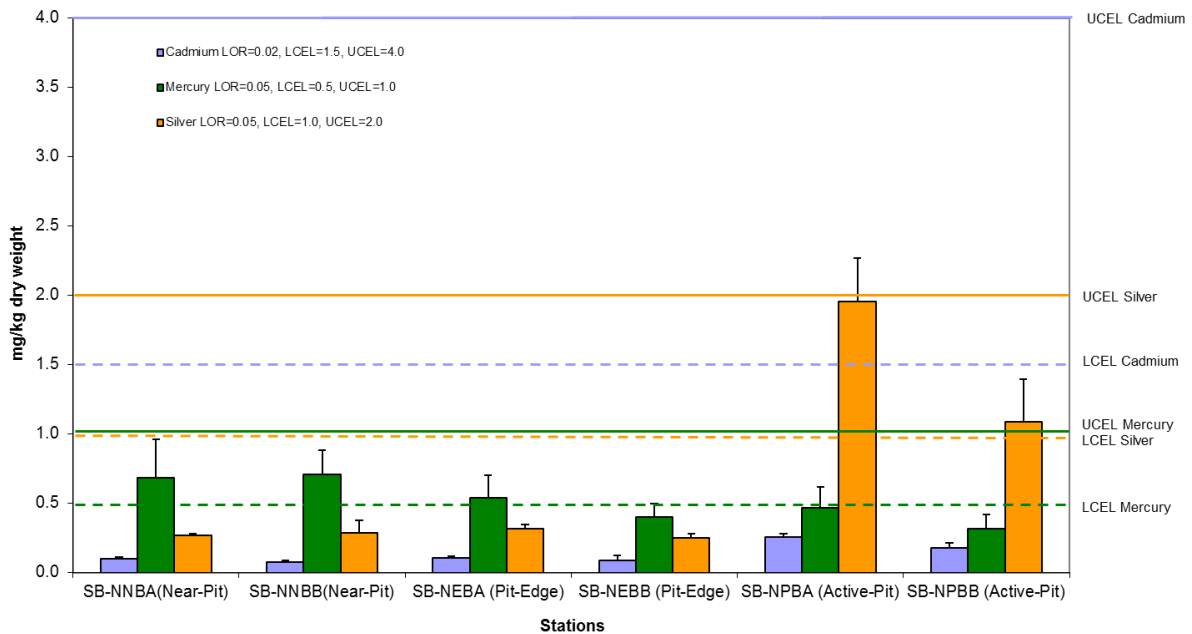


Figure 2: Concentration of Metals (Cd, Hg, Ag; mg/kg dry weight; mean +SD) in sediment samples collected from Pit Specific Sediment Chemistry Monitoring for CMP 2 in October 2015.

**Pit Specific Sediment Chemistry for Total Organic Carbon (TOC) at SB CMP 2  
October 2015**

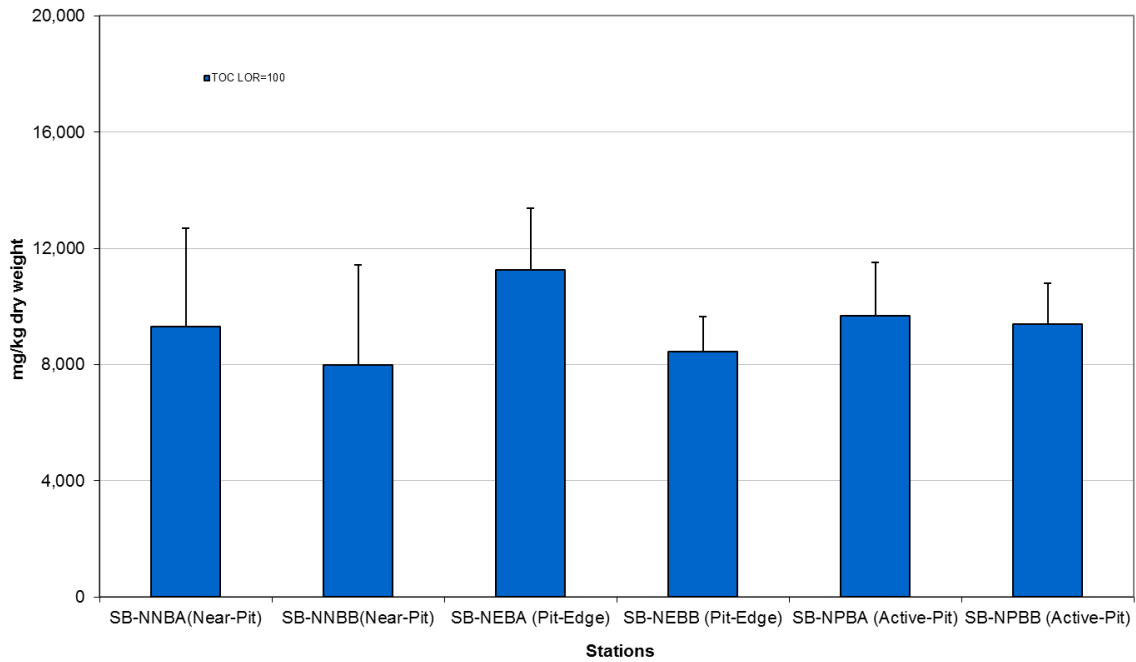


Figure 3: Concentration of Total Organic Carbon (TOC) (mg/kg dry weight; mean +SD) in sediment samples collected from Pit Specific Sediment Chemistry Monitoring for CMP 2 in October 2015.

**Pit Specific Sediment Chemistry for Tributyltin (TBT) at SB CMP 2  
October 2015**

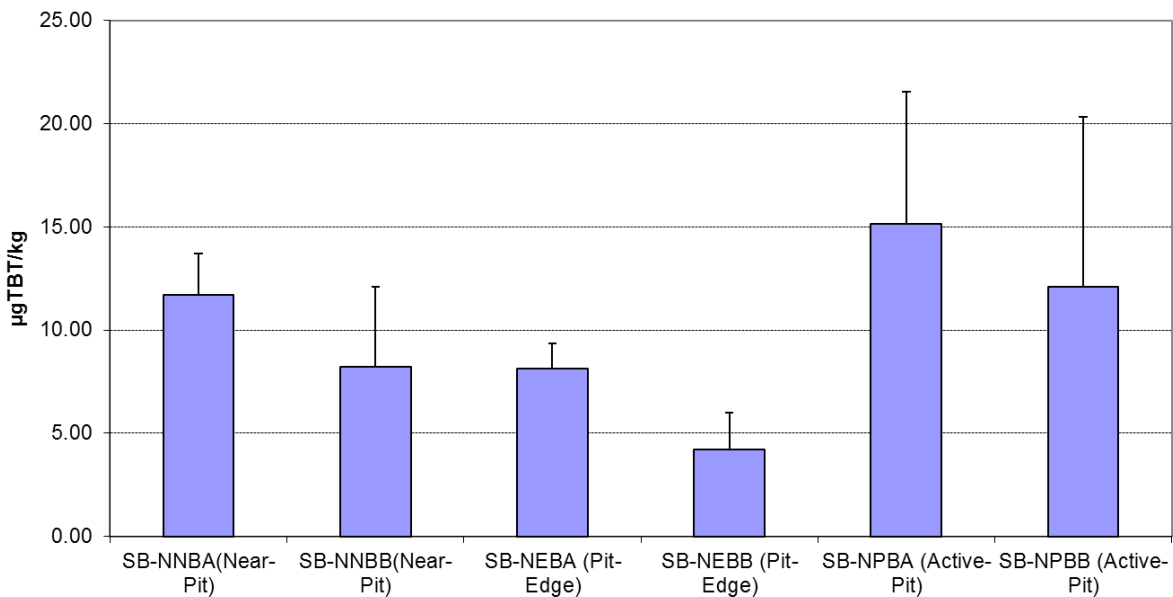


Figure 4: Concentration of Tributyltin (TBT) (µg TBT/kg; mean +SD) in sediment samples collected from Pit Specific Sediment Chemistry Monitoring for CMP 2 in October 2015.

**Pit Specific Sediment Chemistry for Low and High Molecular Weight Polycyclic Aromatics Hydrocarbons (PAHs) at CMP 2 in October 2015**

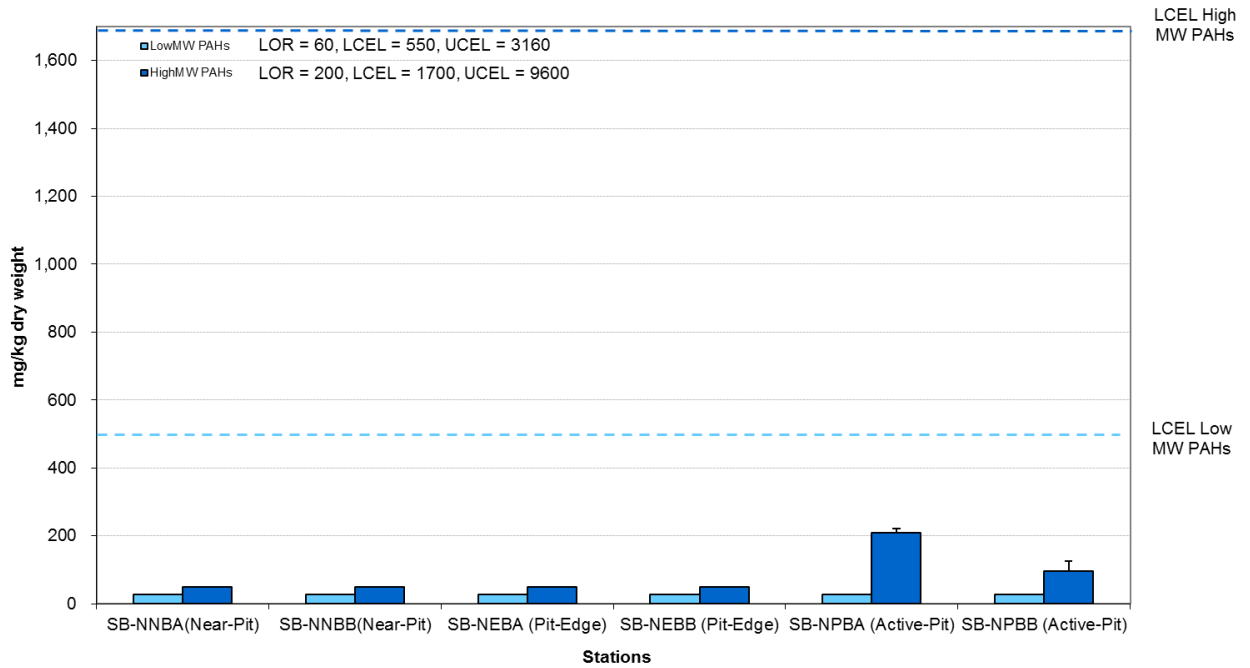


Figure 5: Concentration of Low and High Molecular Weight Polycyclic Aromatics Hydrocarbons (PAHs) (mg/kg dry weight; mean +SD) in sediment samples collected from Pit Specific Sediment Chemistry Monitoring for CMP 2 in October 2015.

**Routine Water Quality Monitoring for CMP 2 - November 2015**

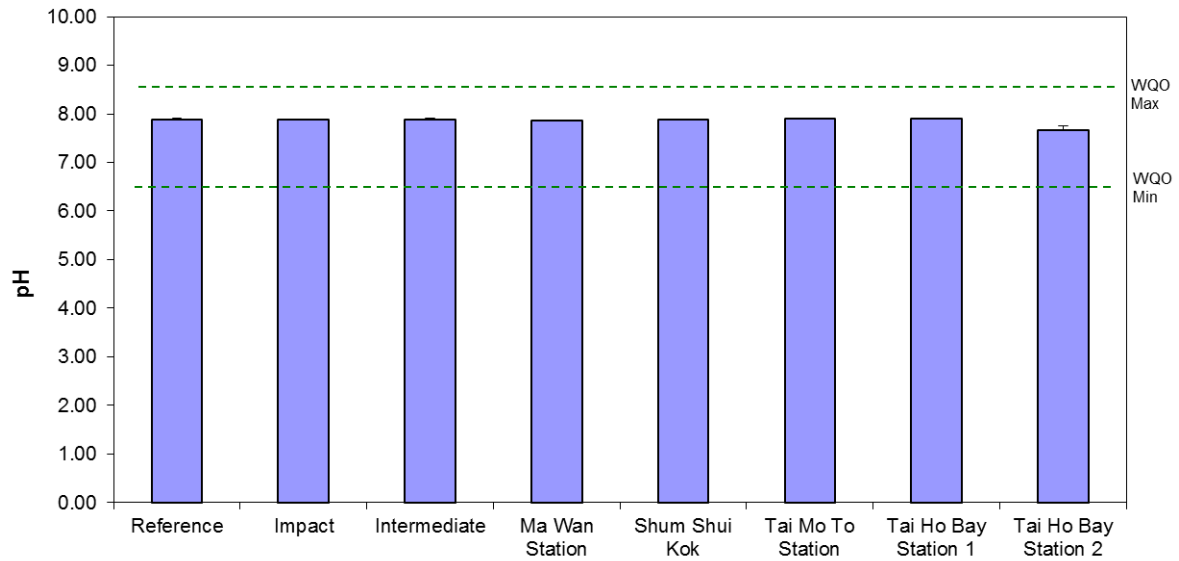


Figure 6: Level of pH recorded during Routine Water Quality Monitoring for disposal operations at CMP 2 in November 2015.

**Routine Water Quality Monitoring CMP 2 - November 2015**

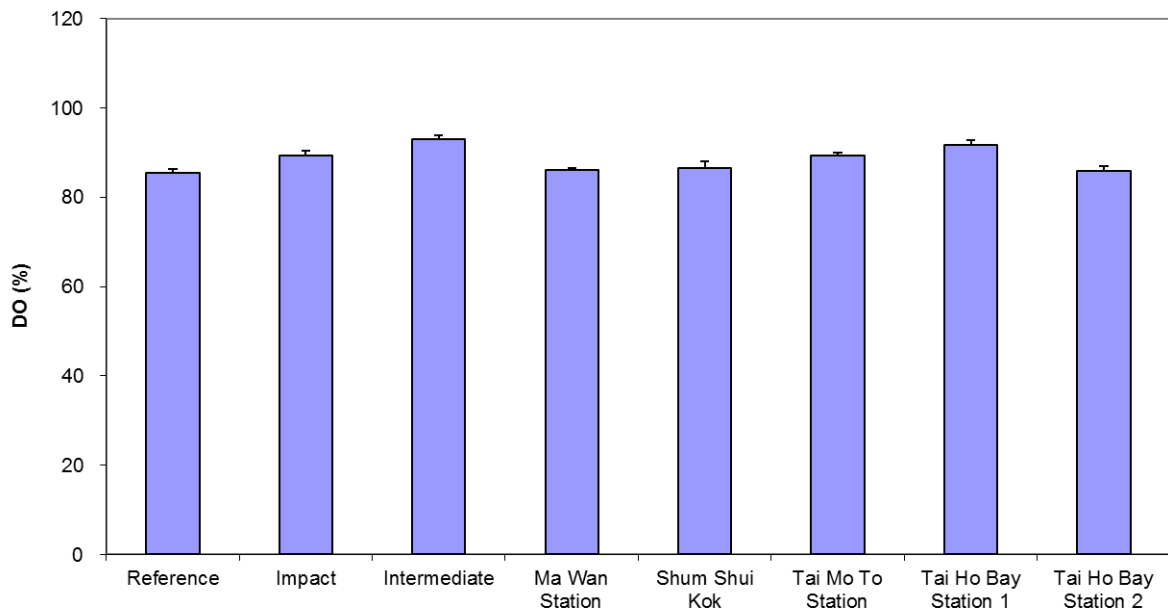


Figure 7: Level of Dissolved Oxygen (DO) (% saturation; mean + SD) recorded during Routine Water Quality Monitoring for disposal operations at CMP 2 in November 2015.

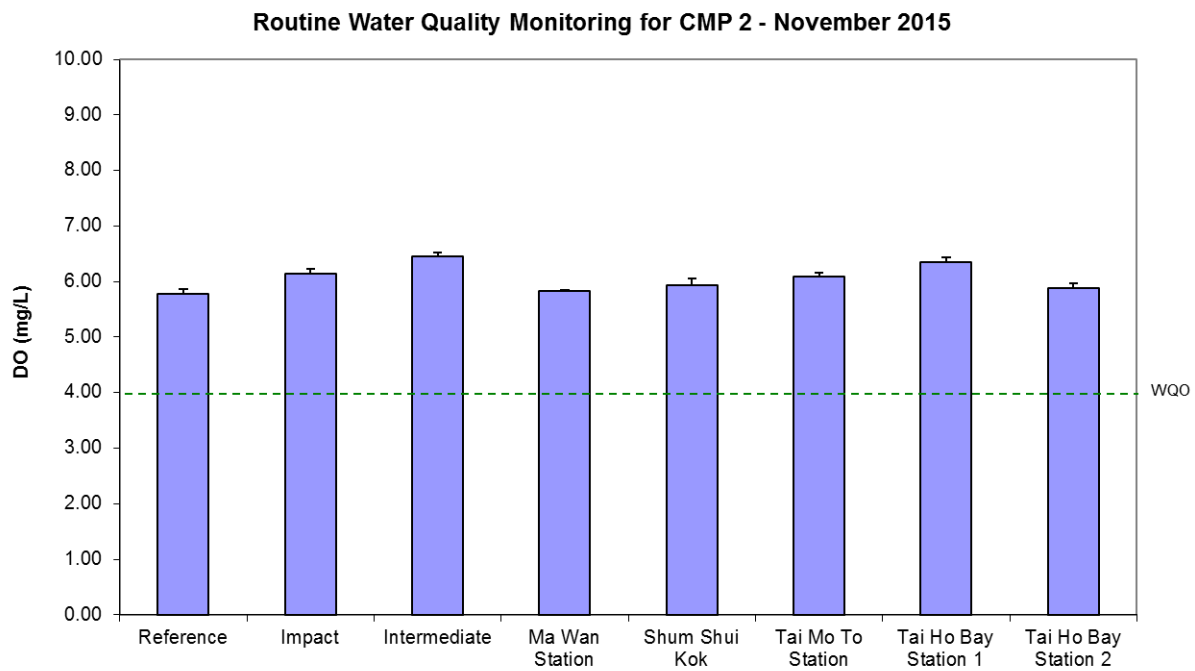


Figure 8: Concentration of Dissolved Oxygen (DO) (mg/L; mean + SD) recorded during Routine Water Quality Monitoring for disposal operations at CMP 2 in November 2015.

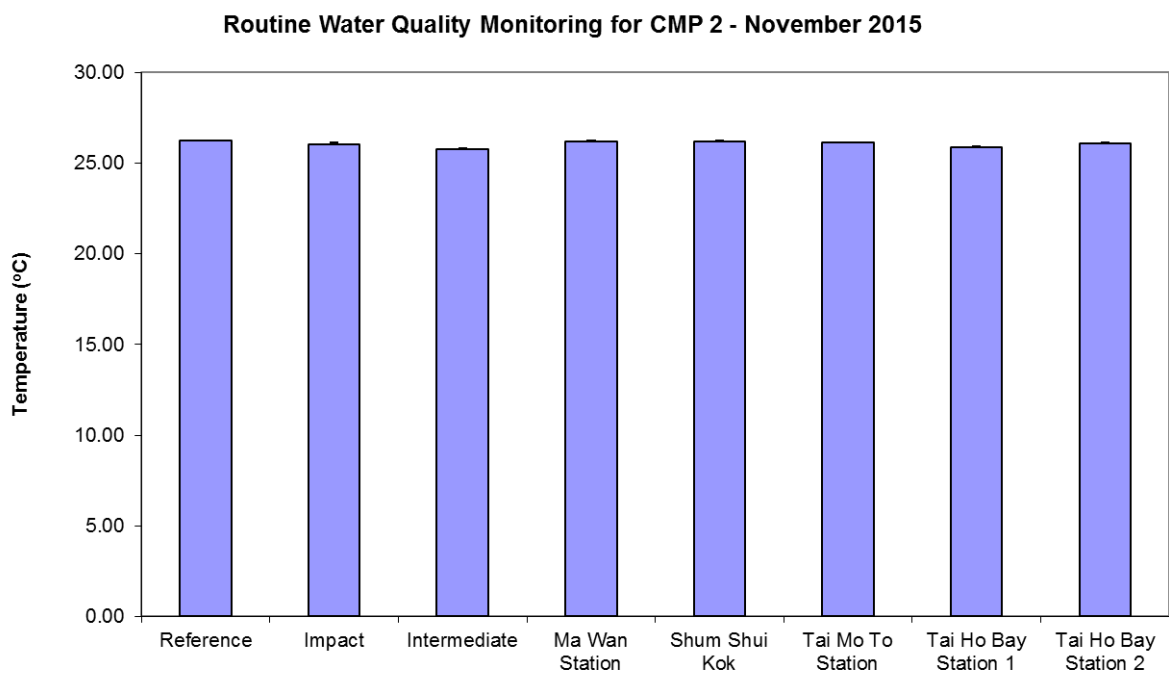


Figure 9: Level of Temperature (°C; mean + SD) recorded during Routine Water Quality Monitoring for disposal operations at CMP 2 in November 2015.

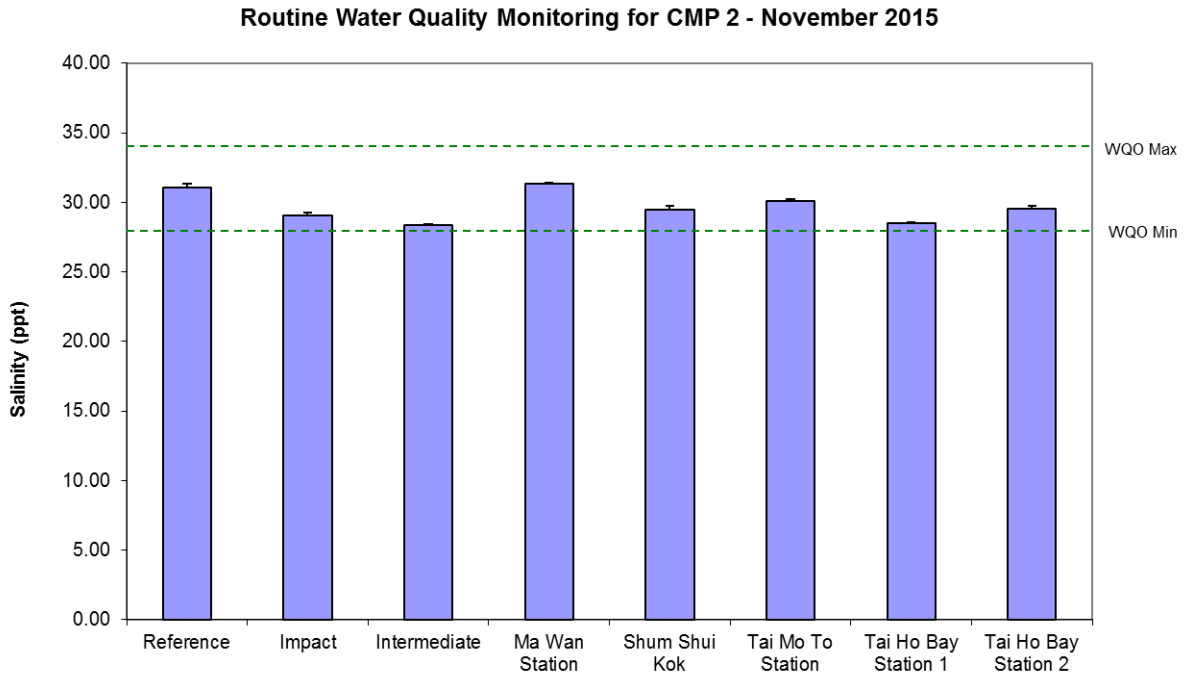


Figure 10: Level of Salinity (ppt; mean + SD) recorded during Routine Water Quality Monitoring for disposal operations at CMP 2 in November 2015.

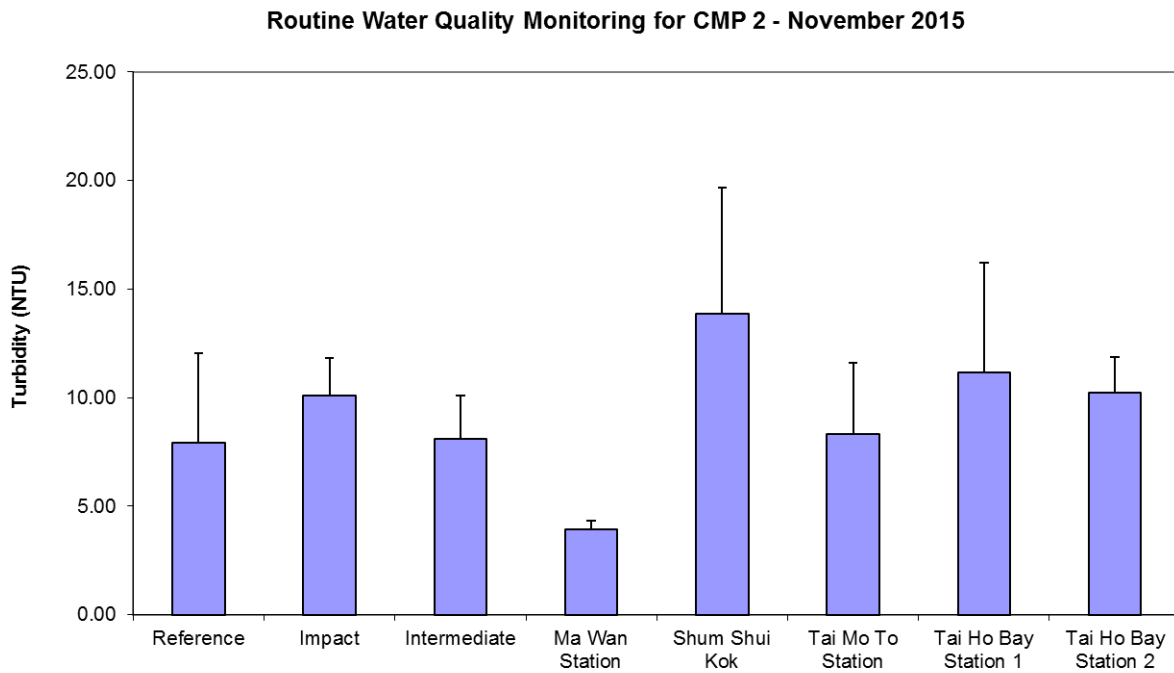


Figure 11: Levels of Turbidity (NTU; ,mean + SD) recorded during Routine Water Quality Monitoring for disposal operations at CMP 2 in November 2015.

**Routine Water Quality Monitoring Results for Metals  
November 2015**

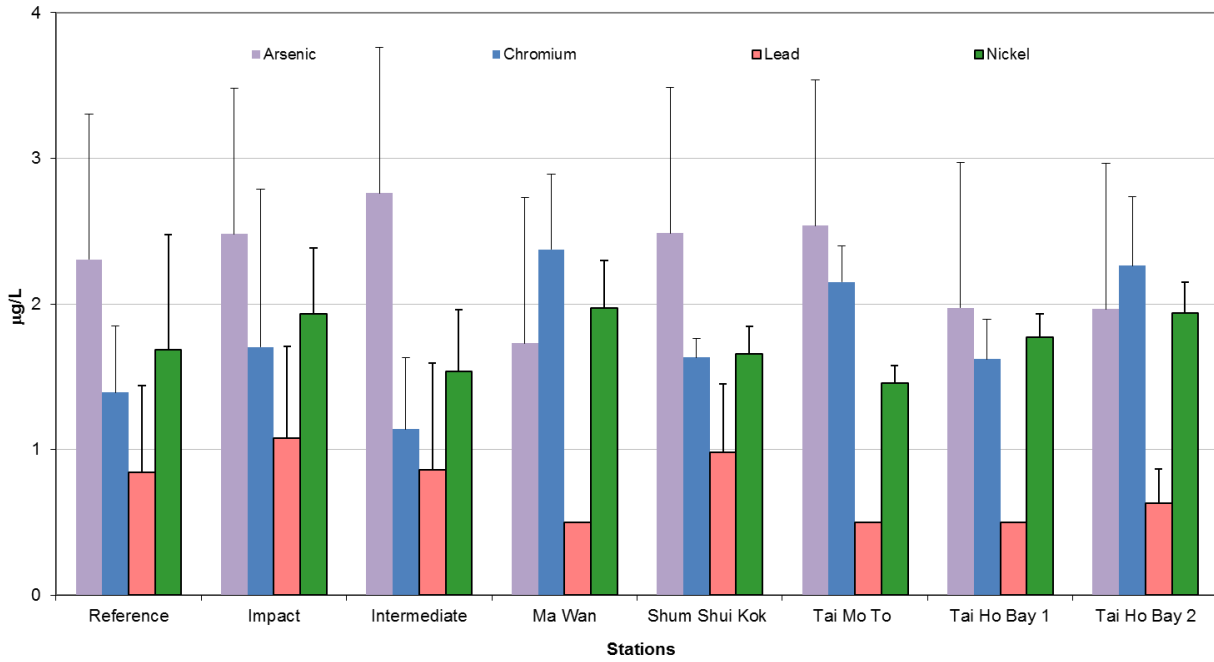


Figure 12: Concentration of Arsenic, Chromium, Copper and Lead ( $\mu\text{g/L}$ ; mean + SD) in water samples collected from Routine Water Quality Monitoring for disposal operations at CMP 2 in November 2015.

**Routine Water Quality Monitoring Results for Metals  
November 2015**

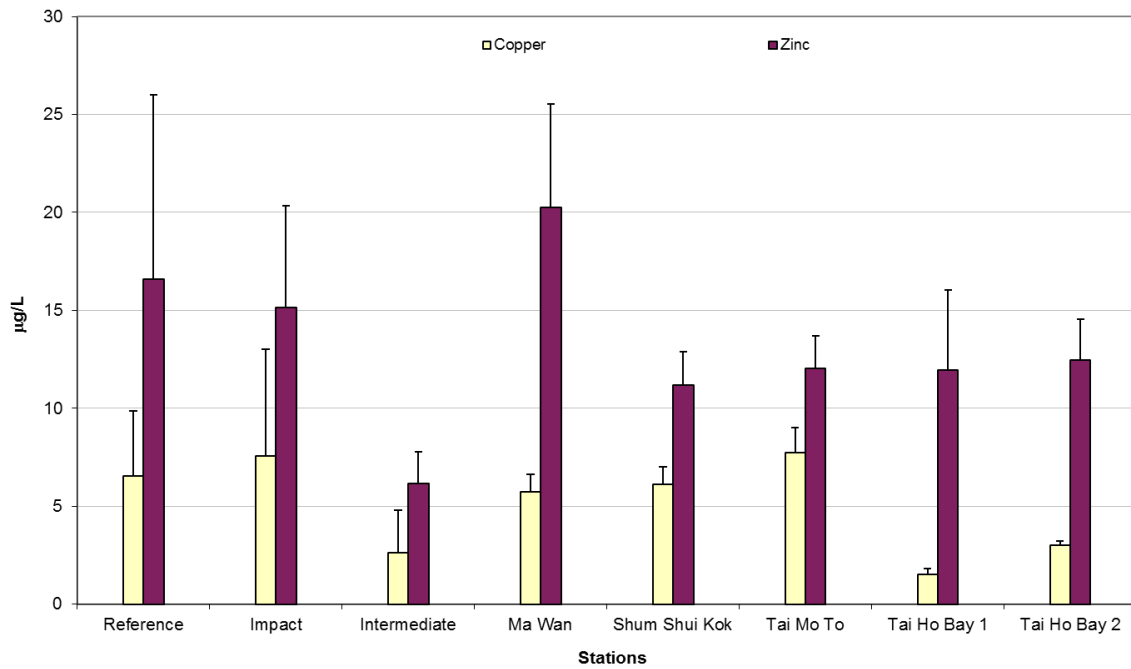


Figure 13: Concentration of Nickel and Zinc ( $\mu\text{g/L}$ ; mean + SD) in water samples collected from Routine Water Quality Monitoring for disposal operations at CMP 2 in November 2015.



**Routine Water Quality Monitoring Results for Nutrients  
November 2015**

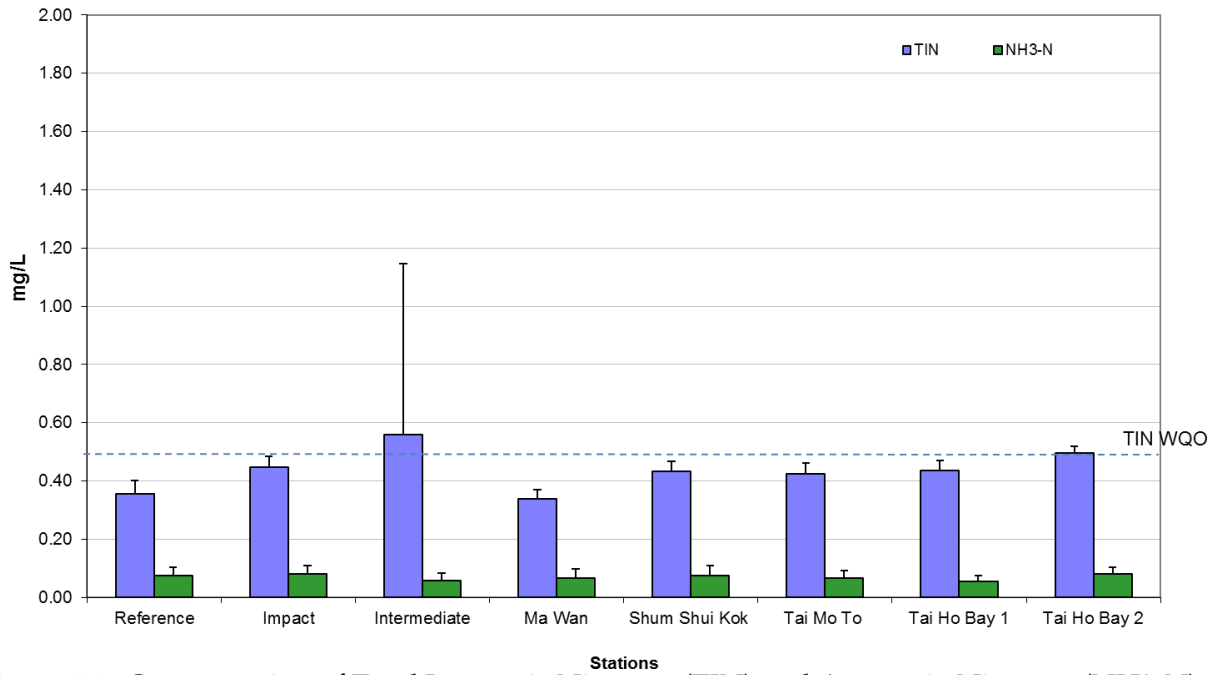


Figure 14: Concentration of Total Inorganic Nitrogen (TIN) and Ammonia Nitrogen (NH3-N) ( $\mu\text{g/L}$ ; mean + SD) in water samples collected from Routine Water Quality Monitoring for disposal operations at CMP 2 in November 2015.

**Routine Water Quality Monitoring Results for Biochemical Oxygen Demand (BOD<sub>5</sub>)  
November 2015**

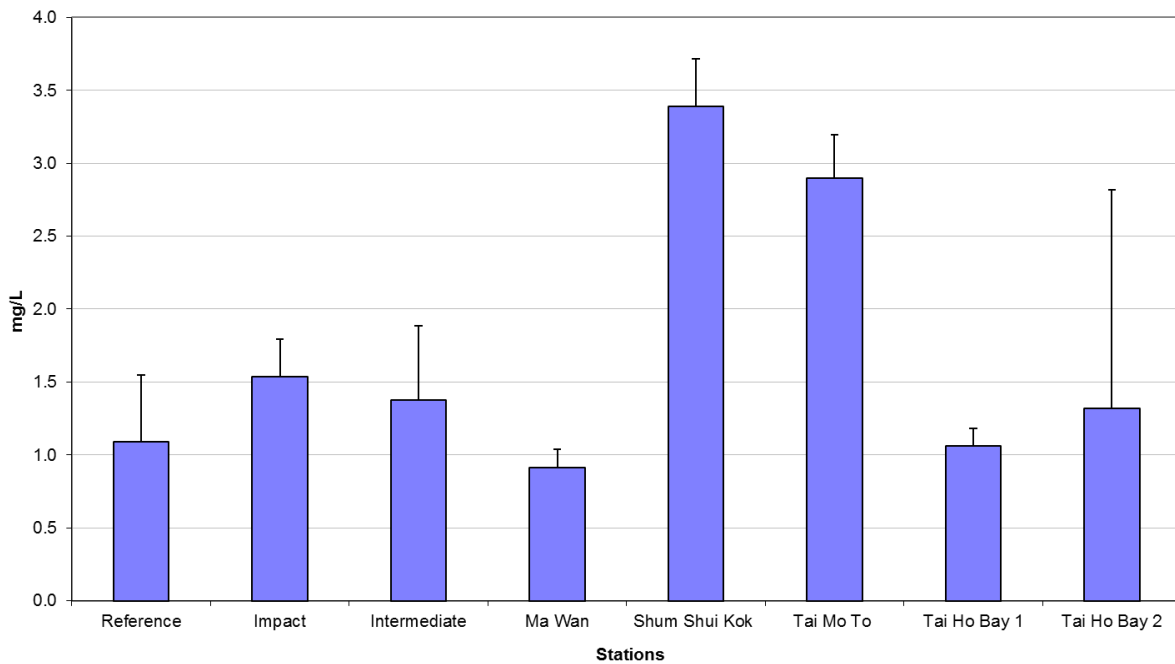


Figure 15: Level of Biochemical Oxygen Demand (BOD<sub>5</sub>) (mg/L; mean + SD) in water samples collected from Routine Water Quality Monitoring for disposal operations at CMP 2 in October 2015.

**Routine Water Quality Monitoring for Suspended Solids  
November 2015**

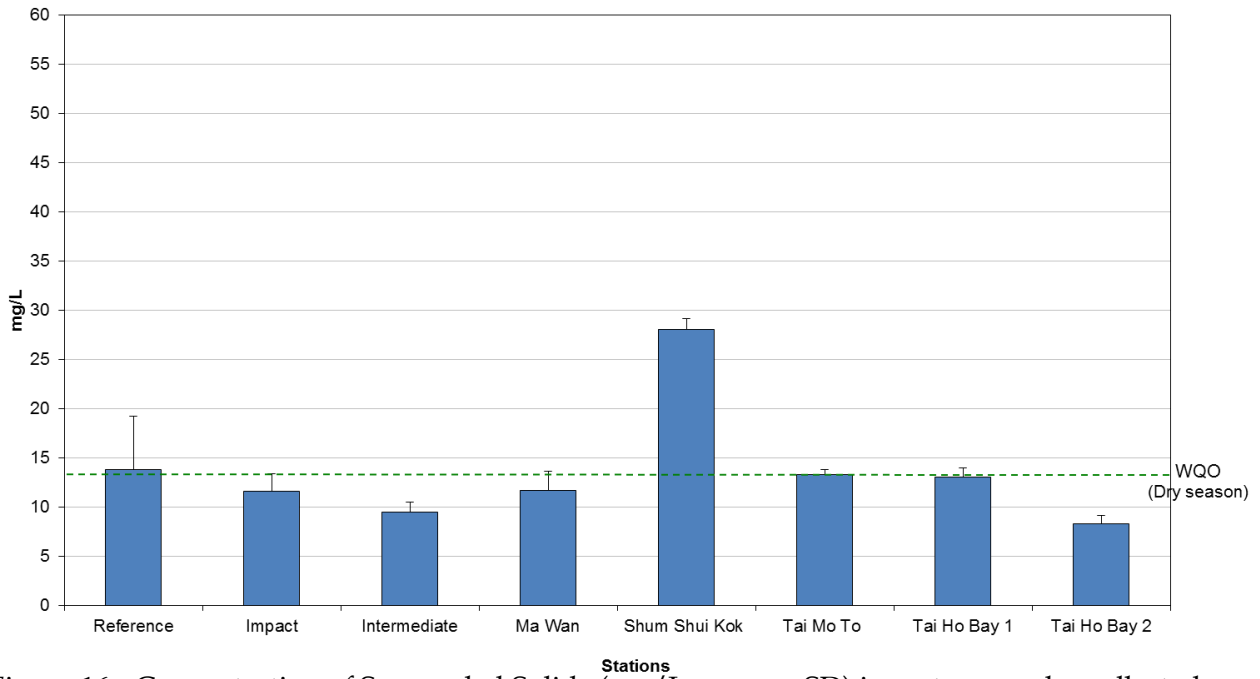


Figure 16: Concentration of Suspended Solids (mg/L; mean + SD) in water samples collected from Routine Water Quality Monitoring for disposal operations at CMP 2 in November 2015.

Annex E

## Study Programme

