Sha Chau
沙洲

CMP V

The Brothers
大小磨刀

CMP 1

CMP 2

土木工程拓展署
CEDD **Civil Engineering and Development Department**

Agreement No. CE 63/2016 (EP)
Environmental Monitoring and Audit for Disposal Facility to the East of Sha Chau (2017-2020) – Investigation

Monthly EM&A Report for Contaminated Mud Pits to the East of Sha Chau and the South of The Brothers – June 2018

Revision 0

July 2018

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Client:				Project No:			
Civil Engineering and Development Department (CEDD)				0400720			
Summary:				Date: 16 July 2018			
This document presents the Monthly EM&A Report for *Environmental Monitoring and Audit for Disposal Facility to the East of Sha Chau and the South of The Brothers*.				Approved by: Craig A. Reid *Partner*			
v0	Monthly EM&A Report for ESC CMPs and SB CMPs			CY	JT	CAR	16/7/18
Revision	Description			By	Checked	Approved	Date

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CEDD Civil Engineering and
Development Department

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Dredging, Management and Capping of Contaminated Sediment Disposal Facility at Sha Chau and to the South of The Brothers

Environmental Certification Sheet
EP-312/2008/A & EP-427/2011/A

Reference Document/Plan

Document/~~Plan~~ to be ~~Certified~~/ Verified:	Monthly EM&A Report for Contaminated Mud Pits to the East of Sha Chau and the South of The Brothers – June 2018
Date of Report:	16 July 2018
Date prepared by ET:	16 July 2018
Date received by IA:	16 July 2018

Reference EP Condition

Environmental Permit Condition:

Condition 3.4 of EP-312/2008/A and Condition 4.4 of EP-427/2011/A:
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-312/2008/A and EP-427/2011/A

Jovy Tam,
Environmental Team Leader:
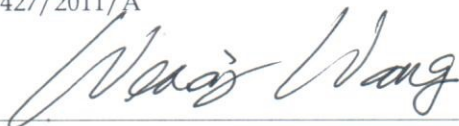
Date: 16/7/2018

IA Verification

I hereby verify that the above referenced document/~~plan~~ complies with the above referenced condition of EP-312/2008/A and EP-427/2011/A

Dr Wang Wen Xiong,
Independent Auditor:

Date: 16/7/2018

CONTENTS

ANNEXES

Agreement No. CE 63/2016 (EP)
Environmental Monitoring and Audit
for Disposal Facility to the East of Sha Chau (2017-2020) - Investigation

MONTHLY EM&A REPORT FOR JUNE 2018

1.1   *BACKGROUND*

1.1.1   The Civil Engineering and Development Department (CEDD) is managing a number of marine disposal facilities in Hong Kong waters, including the Contaminated Mud Pits (CMPs) to the South of The Brothers (SB) and to the East of Sha Chau (ESC) for the disposal of contaminated sediment, and open-sea disposal grounds located to the South of Cheung Chau (SCC), East of Tung Lung Chau (ETLC) and East of Ninepins (ENP) for the disposal of uncontaminated sediment.   Two Environmental Permits (EPs), EP-312/2008/A and EP-427/2011/A, were issued by the Environmental Protection Department (EPD) to the CEDD, the Permit Holder, on 28 November 2008 and 23 December 2011 for the Dredging, Management and Capping of Contaminated Sediment Disposal Facilities at ESC CMP V and SB CMPs, respectively.

1.1.2   Under the requirements of the two EPs for ESC CMP V and SB CMPs, EM&A programmes which encompass water and sediment chemistry, fisheries assessment, tissue and whole body analysis, sediment toxicity and benthic recolonisation studies as set out in the EM&A Manuals are required to be implemented.   EM&A programmes have been continuously carried out during the operation of the CMPs at ESC and SB.   A review of the collection and analysis of such environmental data from the monitoring programme demonstrated that there had not been any adverse environmental impacts resulting from disposal activities [1] [2].   The current programme will assess the impacts resulting from dredging, disposal and capping operations of CMP V as well as capping operations of SB CMPs.

1.1.3   The present EM&A programme under *Agreement No. CE 63/2016 (EP)* covers the dredging, disposal and capping operations of the ESC CMP V as well as the capping operations of the SB CMPs (see *Annex A* for the EM&A programme).   Detailed works schedule for ESC CMP V and SB CMPs is shown in *Figure 1.1.*   In June 2018, the following work was being undertaken:

- Disposal of contaminated mud at ESC CMP Vd.

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(1)   ERM (2013)   Final Report.   Submitted under Agreement No. CE 4/2009 (EP) Environmental Monitoring and Audit for Contaminated Mud Pit at East Sha Chau.   For CEDD.

(2)   ERM (2017)   Final Report.   Submitted under 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).   For CEDD.

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Figure 1.1   *Works Schedule for ESC CMP V and SB CMPs*

Pit	Operation	2017									2018												2019												2020												2021		
		A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M
ESC CMP V	Dredging			▓	▓	▓	▓																																										
	Disposal	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓
	Capping																										▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓
SB CMP 2	Dredging																																																
	Disposal																																																
	Capping			▓	▓	▓	▓																																										

1.2   REPORTING PERIOD

1.2.1   This *Monthly EM&A Report for June 2018* covers the EM&A activities for the reporting month of June 2018.

1.3   DETAILS OF SAMPLING AND LABORATORY TESTING ACTIVITIES

1.3.1   The following monitoring activities were undertaken for ESC CMP V in June 2018:

- *Water Column Profiling of ESC CMP Vd*;

- *Pit Specific Sediment Chemistry of ESC CMP Vd;* and

- *Cumulative Impact Sediment Chemistry of ESC CMP V*.

1.3.2   No monitoring activities were undertaken for SB CMP in June 2018.

1.4   DETAILS OF OUTSTANDING SAMPLING AND/OR ANALYSIS

1.4.1   No outstanding sampling remained for June 2018.

1.4.2   The following laboratory analysis was still in progress during the preparation of this monthly report and hence is not presented in this monthly report:

- Laboratory analyses of sediment samples collected for *Pit Specific Sediment Chemistry of ESC CMP Vd* in June 2018; and

- Laboratory analyses of sediment samples collected for *Cumulative Impact Sediment Chemistry for ESC CMP Vd* in June 2018.

1.5   BRIEF DISCUSSION OF THE MONITORING RESULTS FOR ESC CMP V

1.5.1   Brief discussion of the monitoring results of the following activities for ESC CMP V is presented in this *Monthly EM&A Report for June 2018*:

- *Water Column Profiling of ESC CMP Vd* in June 2018; and

- *Pit Specific Sediment Chemistry of ESC CMP Vd* in May 2018.

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1.5.2   *Water Column Profiling of ESC CMP Vd – June 2018*

1.5.3   *Water Column Profiling* was undertaken at a total of two sampling stations (Upstream and Downstream stations) on 29 June 2018.   The monitoring results 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 wet season period (April to October) of 2007 - 2016 from stations in the Northwestern Water Control Zone (WCZ), where the ESC CMPs are located [1].   For Salinity, the averaged value obtained from the Reference (Upstream) station was used for the basis as the WQO.   Levels of Dissolved Oxygen (DO) and Turbidity were also assessed for compliance with the Action and Limit Levels (see *Table B1* of *Annex B* for details).

In-situ Measurements

1.5.4   Analyses of results for June 2018 indicated that levels of DO, Salinity and pH complied with the WQOs at both Downstream and Upstream stations, except slightly lower salinity was recorded at the Downstream station (*Table B2* of *Annex B*).   In addition, levels of DO and Turbidity at all stations complied with the Action and Limit Levels (*Tables B1* and *B2* of *Annex B*).

Laboratory Measurements for Suspended Solids (SS)

1.5.5   Analyses of results for June 2018 indicated that the SS levels slightly exceeded the WQO at the Downstream station (*Tables B1* and *B2* of *Annex B*). However, both Upstream and Downstream stations complied with the Action and Limit Level.

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

1.5.7   ***Pit Specific Sediment Chemistry of ESC CMP Vd – May 2018***

1.5.8   Monitoring locations for *Pit Specific Sediment Chemistry for ESC CMP Vd* are shown in *Figure 1.2.*   A total of six (6) monitoring stations were sampled in May 2018.

1.5.9   The concentrations of all inorganic contaminants were lower than the Lower Chemical Exceedance Level (LCEL) at all stations in May 2018 (*Figures 1* and *2* of *Annex C*).

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[1]   http://epic.epd.gov.hk/EPICRIVER/marine/?lang=en

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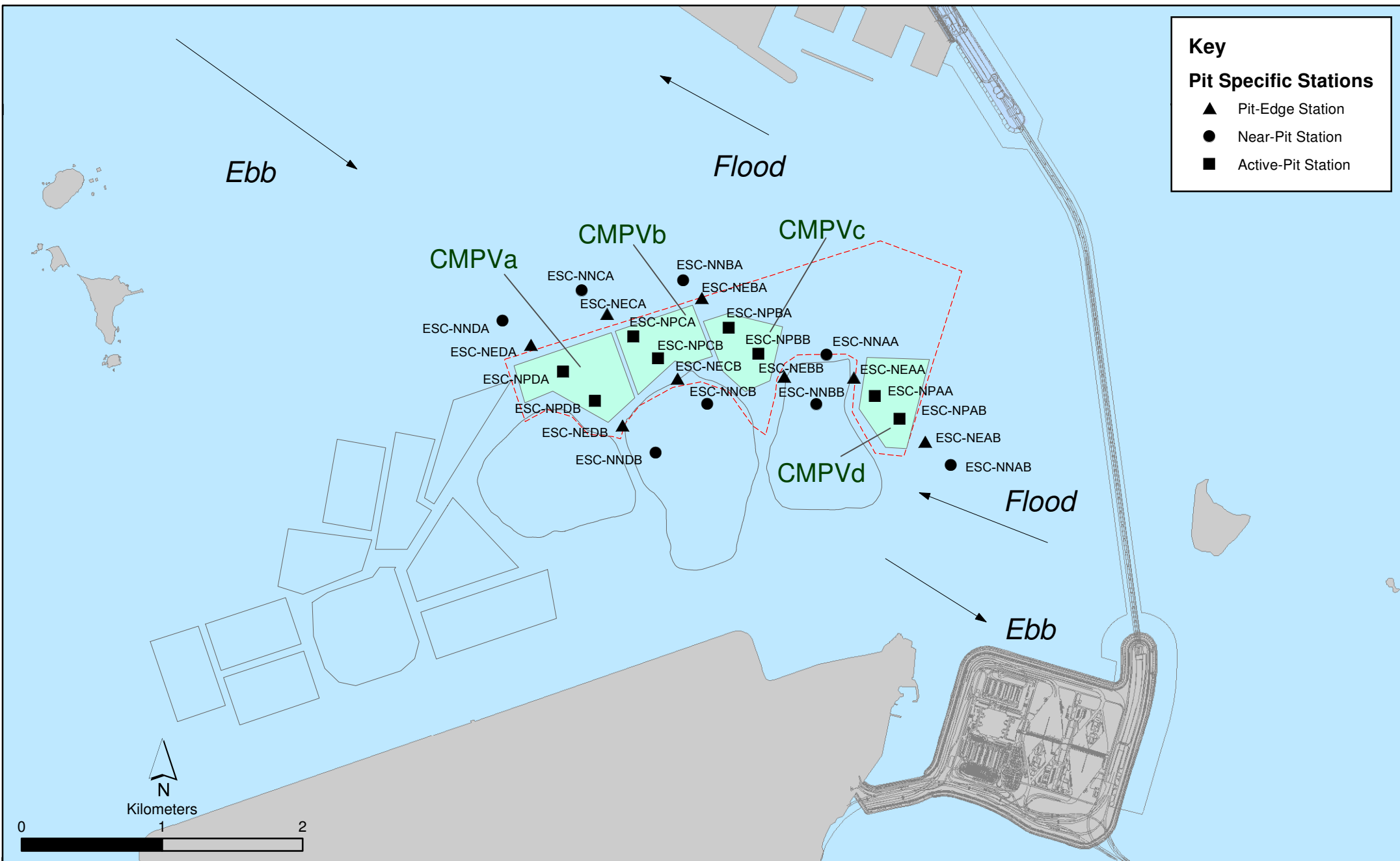
Figure 1.2

Pit Specific Sediment Quality Monitoring Stations for CMPV

Key

Pit Specific Stations

▲ Pit-Edge Station

● Near-Pit Station

■ Active-Pit Station

Ebb

Flood

CMPVa

CMPVb

CMPVc

CMPVd

Flood

Ebb

ESC-NNCA

ESC-NNBA

ESC-NEBA

ESC-NECA

ESC-NPBA

ESC-NPCA

ESC-NNDA

ESC-NPBB

ESC-NEDA

ESC-NPCB

ESC-NNAA

ESC-NECB

ESC-NPDA

ESC-NEBB

ESC-NEAA

ESC-NPDB

ESC-NNCB

ESC-NEBB

ESC-NNBB

ESC-NPAA

ESC-NEDB

ESC-NPAB

ESC-NNDB

ESC-NEAB

ESC-NNAB

N

Kilometers

0   1   2

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Date: 9/5/2017

1.5.10   For organic contaminants, the concentrations of Total Organic Carbon (TOC) were generally similar in May 2018 (*Figures 3* of *Annex C*).   The concentration of Tributyltin (TBT) was generally higher at Active-Pit stations ESC-NPAB and ESC-NPAA in May 2018 (*Figure 4* of *Annex C*).   Low and High Molecular Weight Polycyclic Aromatic Hydrocarbons (PAHs), Total Polychlorinated Biphenyls (PCBs), Total dichloro-diphenyl-trichloroethane (DDT) and 4,4'-dichlorodiphenyldichloroethylene (DDE) concentrations were below the limit of reporting at all stations in May 2018.

1.5.11   Overall, there is no evidence indicating any unacceptable environmental impacts to sediment quality as a result of the contaminated mud disposal operations at ESC CMP Vd in May 2018.   Statistical analysis will be undertaken and presented in the corresponding quarterly report to investigate whether there are any unacceptable impacts in the area caused by the contaminated mud disposal.

1.6   *ACTIVITIES SCHEDULED FOR THE NEXT MONTH*

1.6.1   The following monitoring activities will be conducted in the next monthly period of July 2018 for ESC CMP V (see *Annex A* for the sampling schedule):

- *Water Column Profiling of ESC CMP Vd*;

- *Routine Water Quality Monitoring of ESC CMP Vd;*

- *Pit Specific Sediment Chemistry of ESC CMP Vd;* and

- *Demersal Trawling for ESC CMPs.*

1.6.2   No monitoring activities are scheduled to be undertaken for SB CMPs in July 2018.

1.7   *STUDY PROGRAMME*

1.7.1   A summary of the Study Programme is presented in *Annex D*.

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Annex A

Sampling Schedule

Annex A

Sampling Schedule

Month columns span: **2017** (Apr–Dec), **2018**, **2019**, **2020**, **2021** (Jan–Mar). Column letters below run A M J J A S O N D | J F M A M J J A S O N D | J F M A M J J A S O N D | J F M A M J J A S O N D | J F M.

Pit Specific Sediment Chemistry

Station / Type	Code	Frequency	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M
Active-Pit																																																		
	ESC-NPAA	Monthly	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
	ESC-NPAB	Monthly	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Pit-Edge																																																		
	ESC-NEAA	Monthly	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
	ESC-NEAB	Monthly	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Near-Pit																																																		
	ESC-NNAA	Monthly	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
	ESC-NNAB	Monthly	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12

Cumulative Impact Sediment Chemistry

Station / Type	Code	Frequency	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M
Near-field Stations																																																		
	ESC-RNA	4 times per year			12			12			12			12			12			12			12			12			12			12			12			12			12			12			12			12
	ESC-RNB1	4 times per year			12			12			12			12			12			12			12			12			12			12			12			12			12			12			12			12
Mid-field Stations																																																		
	ESC-RMA	4 times per year			12			12			12			12			12			12			12			12			12			12			12			12			12			12			12			12
	ESC-RMB	4 times per year			12			12			12			12			12			12			12			12			12			12			12			12			12			12			12			12
Capped Pit Stations																																																		
	ESC-RCA1	4 times per year			12			12			12			12			12			12			12			12			12			12			12			12			12			12			12			12
	ESC-RCB1	4 times per year			12			12			12			12			12			12			12			12			12			12			12			12			12			12			12			12
Far-Field Stations																																																		
	ESC-RFA	4 times per year			12			12			12			12			12			12			12			12			12			12			12			12			12			12			12			12
	ESC-RFB	4 times per year			12			12			12			12			12			12			12			12			12			12			12			12			12			12			12			12
Ma Wan Station																																																		
	MW1	4 times per year			12			12			12			12			12			12			12			12			12			12			12			12			12			12			12			12

Sediment Toxicity Tests

Station / Type	Code	Frequency	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M
Near-Pit Stations																																																		
	ESC-TDA	2 times per year					5						5						5						5						5						5						5						5	
	ESC-TDB1	2 times per year					5						5						5						5						5						5						5						5	
Reference Stations																																																		
	ESC-TRA	2 times per year					5						5						5						5						5						5						5						5	
	ESC-TRB	2 times per year					5						5						5						5						5						5						5						5	
Ma Wan Station																																																		
	MW1	2 times per year					5						5						5						5						5						5						5						5	

Tissue / Whole Body Sampling

Station / Type	Code	Frequency	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M
Near-Pit Stations																																																		
	ESC-INA	2 times per year					*						*						*						*						*						*						*						*	
	ESC-INB	2 times per year					*						*						*						*						*						*						*						*	
Reference North																																																		
	TNA	2 times per year					*						*						*						*						*						*						*						*	
	TNB	2 times per year					*						*						*						*						*						*						*						*	
Reference South																																																		
	TSA	2 times per year					*						*						*						*						*						*						*						*	
	TSB	2 times per year					*						*						*						*						*						*						*						*	

Demersal Trawling

Station / Type	Code	Frequency	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M
Near Pit Stations																																																		
	ESC-INA	4 times per year					5	5					5	5					5	5					5	5					5	5					5	5					5	5					5	5
	ESC-INB	4 times per year					5	5					5	5					5	5					5	5					5	5					5	5					5	5					5	5
Reference North																																																		
	TNA	4 times per year					5	5					5	5					5	5					5	5					5	5					5	5					5	5					5	5
	TNB	4 times per year					5	5					5	5					5	5					5	5					5	5					5	5					5	5					5	5
Reference South																																																		
	TSA	4 times per year					5	5					5	5					5	5					5	5					5	5					5	5					5	5					5	5
	TSB	4 times per year					5	5					5	5					5	5					5	5					5	5					5	5					5	5					5	5

Capping

Station / Type	Code	Frequency	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M
Ebb Tide																																																		
Impact Station Downcurrent																																																		
	ESC-IPE1A	4 times per year																							3	3					3	3					3	3					3	3					3	3
	ESC-IPE2A	4 times per year																							3	3					3	3					3	3					3	3					3	3
	ESC-IPE3	4 times per year																							3	3					3	3					3	3					3	3					3	3
	ESC-IPE4	4 times per year																							3	3					3	3					3	3					3	3					3	3
	ESC-IPE5	4 times per year																							3	3					3	3					3	3					3	3					3	3
Intermediate Station Downcurrent																																																		
	ESC-INE1A	4 times per year																							3	3					3	3					3	3					3	3					3	3
	ESC-INE2A	4 times per year																							3	3					3	3					3	3					3	3					3	3
	ESC-INE3A	4 times per year																							3	3					3	3					3	3					3	3					3	3
	ESC-INE4A	4 times per year																							3	3					3	3					3	3					3	3					3	3
	ESC-INE5A	4 times per year																							3	3					3	3					3	3					3	3					3	3
Reference Station Upcurrent																																																		
	ESC-RFE1	4 times per year																							3	3					3	3					3	3					3	3					3	3
	ESC-RFE2	4 times per year																							3	3					3	3					3	3					3	3					3	3
	ESC-RFE3	4 times per year																							3	3					3	3					3	3					3	3					3	3
	ESC-RFE4	4 times per year																							3	3					3	3					3	3					3	3					3	3
	ESC-RFE5	4 times per year																							3	3					3	3					3	3					3	3					3	3
Ma Wan Station																																																		
	MW1	4 times per year																							3	3					3	3					3	3					3	3					3	3
Flood Tide																																																		
Impact Station Downcurrent																																																		
	ESC-IPF1	4 times per year																							3	3					3	3					3	3					3	3					3	3
	ESC-IPF2	4 times per year																							3	3					3	3					3	3					3	3					3	3
	ESC-IPF3	4 times per year																							3	3					3	3					3	3					3	3					3	3
Intermediate Station Downcurrent																																																		
	ESC-INF1	4 times per year																							3	3					3	3					3	3					3	3					3	3
	ESC-INF2	4 times per year																							3	3					3	3					3	3					3	3					3	3
	ESC-INF3	4 times per year																							3	3					3	3					3	3					3	3					3	3
Reference Station Upcurrent																																																		
	ESC-RFF1A	4 times per year																							3	3					3	3					3	3					3	3					3	3
	ESC-RFF2A	4 times per year																							3	3					3	3					3	3					3	3					3	3
	ESC-RFF3	4 times per year																							3	3					3	3					3	3					3	3					3	3
Ma Wan Station																																																		
	MW1	4 times per year																							3	3					3	3					3	3					3	3					3	3

Routine Water Quality Monitoring

Station / Type	Code	Frequency	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M
Ebb Tide																																																		
Impact Station Downcurrent																																																		
	ESC-IPE1A	8 times per year	8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8	
	ESC-IPE2A	8 times per year	8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8	
	ESC-IPE3	8 times per year	8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8	
	ESC-IPE4	8 times per year	8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8	
	ESC-IPE5	8 times per year	8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8	
Intermediate Station Downcurrent																																																		
	ESC-INE1A	8 times per year	8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8	
	ESC-INE2A	8 times per year	8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8	
	ESC-INE3A	8 times per year	8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8	
	ESC-INE4A	8 times per year	8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8	
	ESC-INE5A	8 times per year	8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8	
Reference Station Upcurrent																																																		
	ESC-RFE1	8 times per year	8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8	
	ESC-RFE2	8 times per year	8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8	
	ESC-RFE3	8 times per year	8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8	
	ESC-RFE4	8 times per year	8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8	
	ESC-RFE5	8 times per year	8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8	
Ma Wan Station																																																		
	MW1	8 times per year	8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8	
Flood Tide																																																		
Impact Station Downcurrent																																																		
	ESC-IPF1	8 times per year	8	8		8	8		8	8					8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8	
	ESC-IPF2	8 times per year	8	8		8	8		8	8					8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8	
	ESC-IPF3	8 times per year	8	8		8	8		8	8					8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8	
Intermediate Station Downcurrent																																																		
	ESC-INF1	8 times per year	8	8		8	8		8	8					8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8	
	ESC-INF2	8 times per year	8	8		8	8		8	8					8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8	
	ESC-INF3	8 times per year	8	8		8	8		8	8					8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8	
Reference Station Upcurrent																																																		
	ESC-RFF1A	8 times per year	8	8		8	8		8	8					8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8	
	ESC-RFF2A	8 times per year	8	8		8	8		8	8					8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8	
	ESC-RFF3	8 times per year	8	8		8	8		8	8					8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8	
Ma Wan Station																																																		
	MW1	8 times per year	8	8		8	8		8	8					8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8		8	8	

Water Column Profiling

Station / Type	Code	Frequency	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M
Plume Stations	WCP1	Monthly	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	WCP2	Monthly	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

Benthic Recolonisation Studies

Station / Type	Code	Frequency	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M
Capped Stations at CMPV	ESCV-CPA	2 times per year																																																
	ESCV-CPB	2 times per year																																																
	ESCV-CPC	2 times per year																																																
	ESCV-CPD	2 times per year																																																
Reference Stations	RBA	2 times per year																																																
	RBB	2 times per year																																																
	RBC1	2 times per year																																																

Impact Monitoring for Dredging

Station / Type	Code	Frequency	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M
Upstream Stations	US1	3 times per week				2	2																																											
	US2	3 times per week				2	2																																											
Downstream Stations	DS1	3 times per week					2	2	2																																									
	DS2	3 times per week					2	2	2																																									
	DS3	3 times per week					2	2	2																																									
	DS4	3 times per week					2	2	2																																									
	DS5	3 times per week					2	2	2																																									
Ma Wan Station	MW1	3 times per week					2	2	2																																									

Notes:
The number shown in each cell represents the numbers of replicates per monitoring station
Impact Monitoring for Dredging will be scheduled when dredging operations commence.
Benthic Recolonisation Studies for CMP V will be scheduled when capping operation for CMP V is completed.

Annex A2 - *Environmental Monitoring and Audit Sampling Schedule for South of The Brothers (April 2017 - December 2018)*

Capping Water Quality Monitoring			2017									2018											
			A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
Ebb Tide																							
Impact Stations Downcurrent																							
	SB-IPE1	4 times per year		3	3		3	3															
	SB-IPE2	4 times per year		3	3		3	3															
	SB-IPE3	4 times per year		3	3		3	3															
	SB-IPE4	4 times per year		3	3		3	3															
	SB-IPE5	4 times per year		3	3		3	3															
Intermediate Stations Downcurrent																							
	SB-INE1	4 times per year		3	3		3	3															
	SB-INE2	4 times per year		3	3		3	3															
	SB-INE3	4 times per year		3	3		3	3															
	SB-INE4	4 times per year		3	3		3	3															
	SB-INE5	4 times per year		3	3		3	3															
Reference Stations Upcurrent																							
	SB-RFE1	4 times per year		3	3		3	3															
	SB-RFE2	4 times per year		3	3		3	3															
	SB-RFE3	4 times per year		3	3		3	3															
	SB-RFE4	4 times per year		3	3		3	3															
	SB-RFE5	4 times per year		3	3		3	3															
Sensitive Receiver Stations																							
	MW1	4 times per year		3	3		3	3															
	THB1	4 times per year		3	3		3	3															
	THB2	4 times per year		3	3		3	3															
	WSR45C	4 times per year		3	3		3	3															
	WSR46	4 times per year		3	3		3	3															
Flood Tide																							
Impact Stations Downcurrent																							
	SB-IPF1	4 times per year		3	3		3	3															
	SB-IPF2	4 times per year		3	3		3	3															
	SB-IPF3	4 times per year		3	3		3	3															
Intermediate Stations Downcurrent																							
	SB-INF1	4 times per year		3	3		3	3															
	SB-INF2	4 times per year		3	3		3	3															
	SB-INF3	4 times per year		3	3		3	3															
Reference Stations Upcurrent																							
	SB-RFF1	4 times per year		3	3		3	3															
	SB-RFF2	4 times per year		3	3		3	3															
	SB-RFF3	4 times per year		3	3		3	3															
Sensitive Receiver Stations																							
	MW1	4 times per year		3	3		3	3															
	THB1	4 times per year		3	3		3	3															
	THB2	4 times per year		3	3		3	3															
	WSR45C	4 times per year		3	3		3	3															
	WSR46	4 times per year		3	3		3	3															

Benthic Recolonisation Studies			A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
Capped Contaminated Mud Pits																							
	SB-CPA	2 times per year					12				12								12			12
	SB-CPB	2 times per year					12				12								12			12
Reference Stations																							
	RBA	2 times per year					12				12								12			12
	RBB	2 times per year					12				12								12			12
	RBC	2 times per year					12				12								12			12

Notes:

The number shown in each cell represents the numbers of replicates per monitoring station

Capping works are planned to be conducted between May and December 2017.

Annex B

Water Quality Monitoring Results

Table B1   *Action and Limit Levels of Water Quality for Dredging, Disposal and Capping Activities at ESC CMP V*

Parameter	Action Level	Limit Level
Dissolved Oxygen (DO) [1]	<u>Surface and Mid-depth</u> [2] 5%-ile of baseline data for surface and middle layer = **3.76 mg L⁻¹** and Significantly less than the reference stations mean DO (at the same tide of the same day)	<u>Surface and Mid-depth</u> [2] 1%-ile of baseline data for surface and middle layer = **3.11 mg L⁻¹** [3] and 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 = **2.96 mg L⁻¹** 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 readings are **<2 mg/L⁻¹** and Significantly less than the reference stations mean DO (at the same tide of the same day)
Depth-averaged Suspended Solids (SS) [4] [5]	95%-ile of baseline data for depth average = **37.88 mg L⁻¹** and 120% of control station's SS at the same tide of the same day	99%-ile of baseline data for depth average = **61.92 mg L⁻¹** and 130% of control station's SS at the same tide of the same day
Depth-averaged Turbidity (Tby) [4] [5]	95%-ile of baseline data = **28.14 NTU** and 120% of control station's Tby at the same tide of the same day	99%-ile of baseline data = **38.32 NTU** 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)   Given the Action Level for DO for Surface & Middle layers has already been lower than 4 mg L⁻¹, it is proposed to set the Limit Level at 3.11 mg L⁻¹ 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 B2 *Water Column Profiling Results for ESC CMP Vd in June 2018*

Stations	Temp (°C)	Salinity (ppt)	Turbidity (NTU)	Dissolved Oxygen (%)	Dissolved Oxygen (mg L⁻¹)	pH	Suspended Solids (mg L⁻¹)
WCP 1 (Downstream)	29.39	17.53	11.01	79.78	5.54	7.95	10.98
WCP 2 (Upstream)	29.03	20.01	12.16	72,49	4.99	7.90	8.58
WQO (Wet Season)	N/A	18.01–22.01#	N/A	N/A	>4	6.5-8.5	10.8

Note:

#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.

	Temp (°C)	Salinity (ppt)	Turbidity (NTU)	Dissolved Oxygen (%)	Dissolved Oxygen (mg L⁻¹)	pH	Suspended Solids (mg L⁻¹)

Annex C

Graphical Presentations
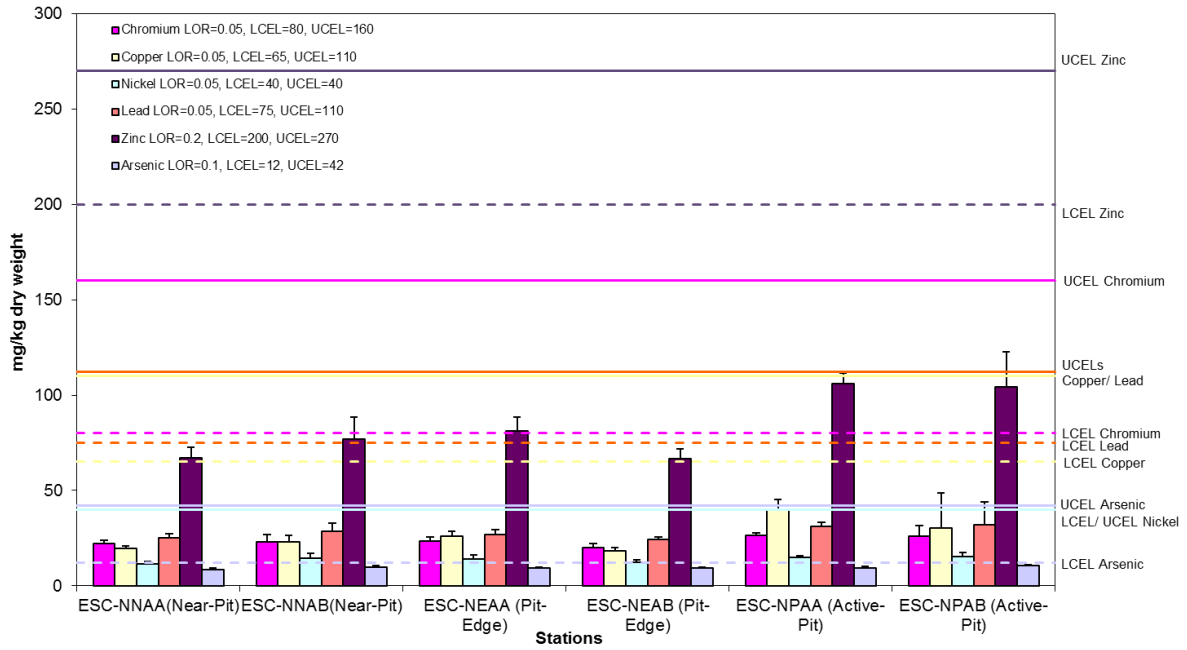
Figure 11: Concentration of Metals and Metalloid (Cr, Cu, Ni, Pb, Zn, As; mg/kg dry weight; mean +SD) in sediment samples collected from Pit Specific Sediment Chemistry Monitoring for ESC CMP Vd in May 2018.
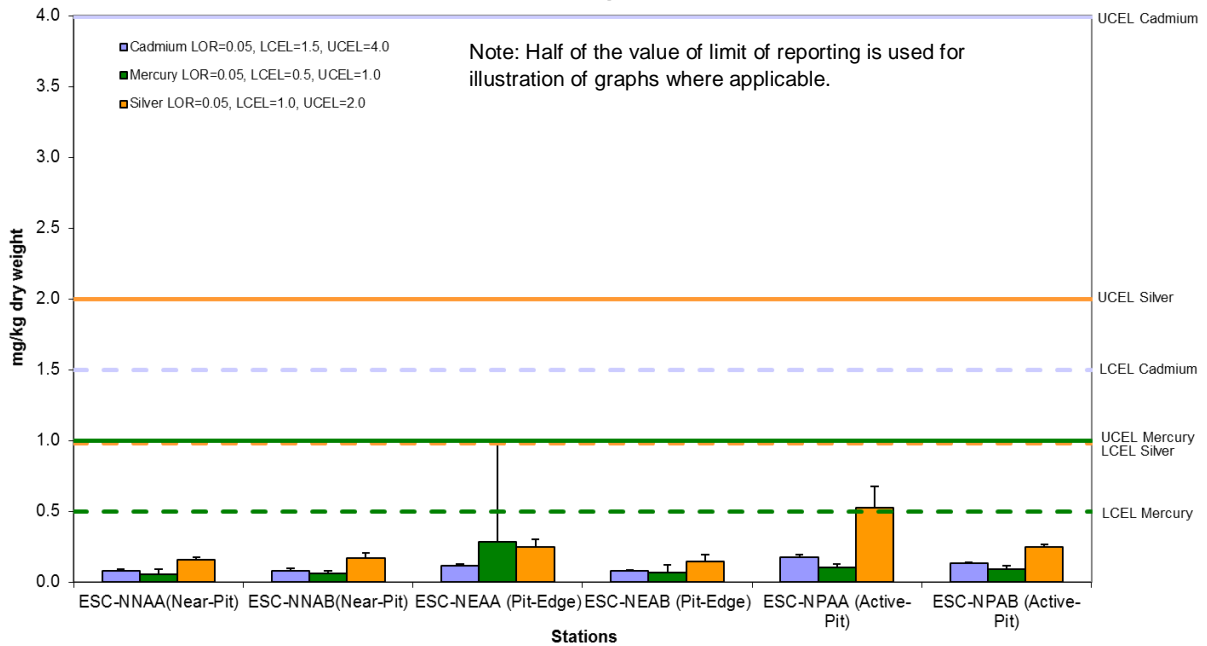
Figure 12: Concentration of Metals (Cd, Hg, Ag; mg/kg dry weight; mean +SD) in sediment samples collected from Pit Specific Sediment Chemistry Monitoring for ESC CMP Vd in May 2018.

Pit Specific Sediment Chemistry for Total Organic Carbon (TOC) at ESC CMP Vd May 2018
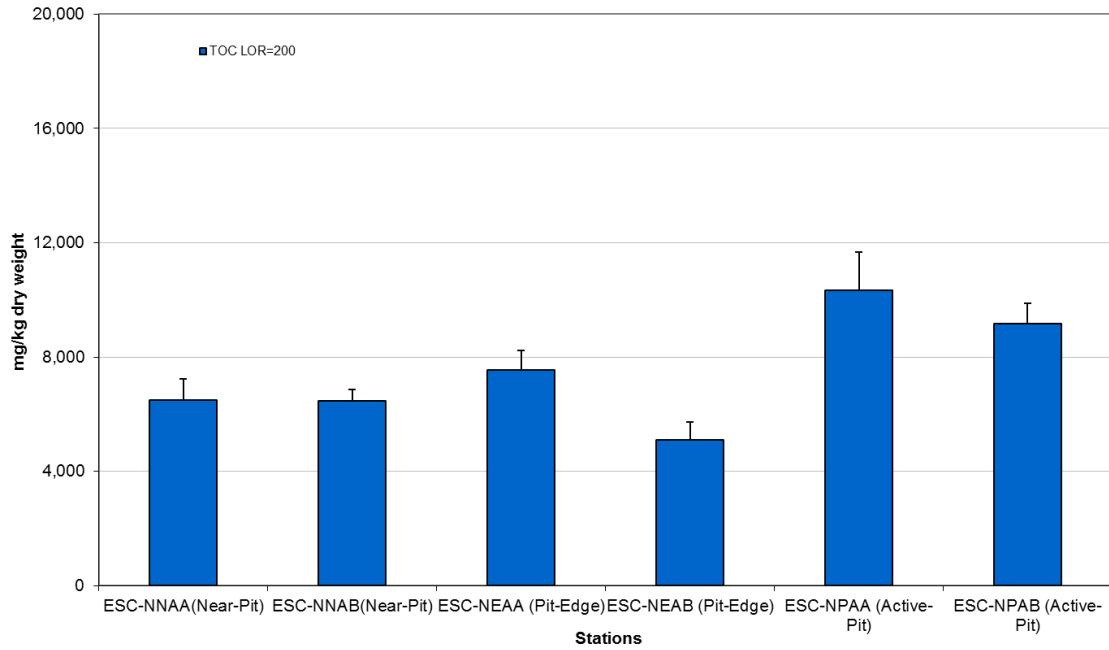
Figure 13: Concentration of Total Organic Carbon (TOC) (mg/kg dry weight; mean +SD) in sediment samples collected from Pit Specific Sediment Chemistry Monitoring for ESC CMP Vd in May 2018.

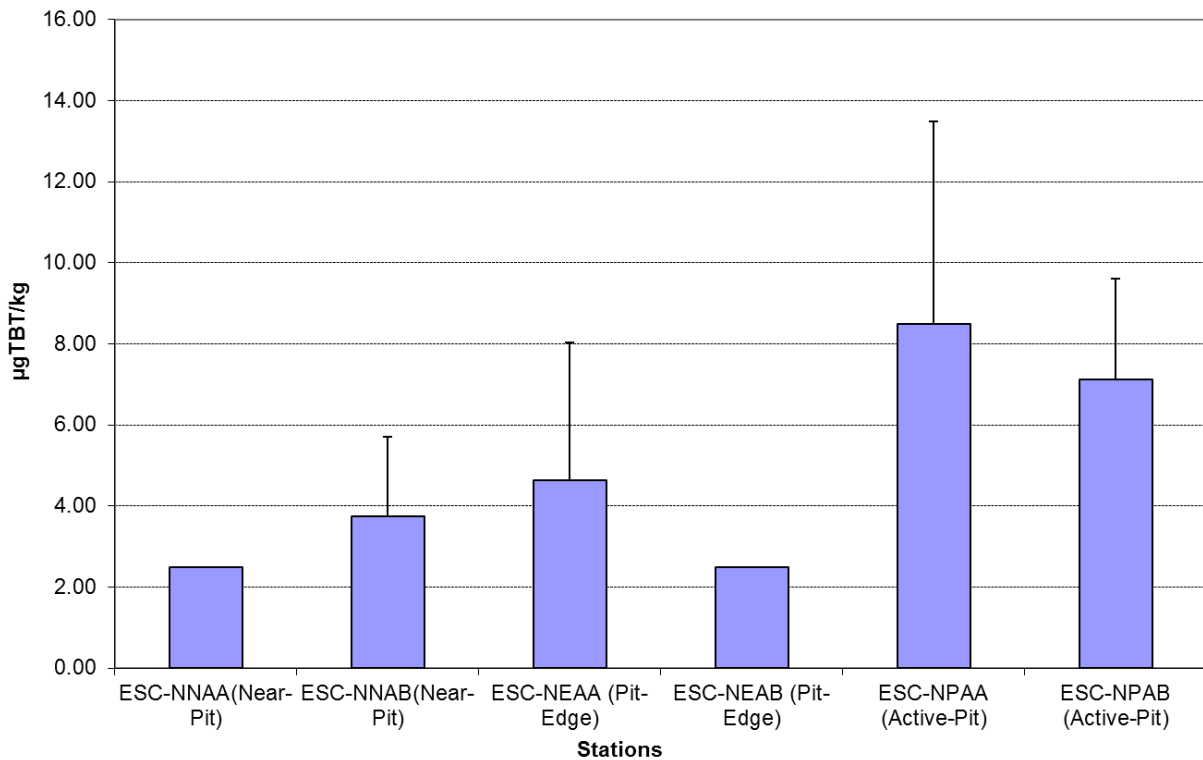**Pit Specific Sediment Chemistry for Tributyltin (TBT) at ESC CMP Vd May 2018**

Figure 14: Concentration of Tributyltin (TBT) (µg TBT/kg; mean +SD) in sediment samples collected from Pit Specific Sediment Chemistry Monitoring for ESC CMP Vd in May 2018.

Annex D

Study Programme

Task Name	Start	Finish	2017–2021 Timeline
Commencement of Agreement No. CE 63/2016 (EP)	Sat 1/4/17	Sat 1/4/17	◆ 1/4
Project Management and General Deliverables	Mon 3/4/17	Mon 5/4/21	(Summary bar 2017–2021)
For the disposal facilities to the East of Sha Chau (ESC) (between 2017 and 2021) and the South of The Brothers (SB) (between 2017 and 2018)	Sat 1/4/17	Fri 1/10/21	(Summary bar 2017–2021)
Draft Report on Review of EM&A Manual	Tue 2/5/17	Tue 2/5/17	◆ 2/5
Final Report on Review of EM&A Manual	Tue 23/5/17	Tue 23/5/17	◆ 23/5
Regular Review of EM&A Manual	Wed 2/5/18	Sat 2/5/20	◇ ◇ ◇
Regular Site Inspections of CMP Contractors	Sat 1/4/17	Wed 31/3/21	(Task bar)
Participate in Liaison Group Meetings/ Consultations as required by CEDD	Sat 1/4/17	Wed 31/3/21	(Task bar)
Submission of Monthly EM&A Report	Sun 14/5/17	Sun 14/3/21	◇◇ ◇◇ ...
Submission of Quarterly EM&A Report	Fri 14/7/17	Wed 14/4/21	◇ ◇ ...
Submission of Annual EM&A Report	Sun 14/1/18	Thu 14/1/21	◇ ◇ ◇ ◇
Submission of Annual Risk Assessment Report	Thu 14/6/18	Mon 14/6/21	◇ ◇ ◇ ◇
Submission of Draft Final Report (including database of all data collected)	Fri 23/7/21	Fri 23/7/21	◆ 23/7
Submission of Final Report (including database of all data collected)	Fri 27/8/21	Fri 27/8/21	◆ 27/8
Submission of Draft Executive Summary	Fri 27/8/21	Fri 27/8/21	◆ 27/8
Submission of Final Executive Summary	Fri 1/10/21	Fri 1/10/21	◆ 1/10
For East Tung Lung Chau Disposal Facility (subject to the actual disposal programme to be confirmed by CEDD)	Sun 14/10/18	Fri 14/12/18	(Summary bar)
Submission of Monthly EM&A Report	Sun 14/10/18	Fri 14/12/18	◇◇◇
Submission of Quarterly EM&A Report	Fri 14/12/18	Fri 14/12/18	◆ 14/12
Submission of Annual EM&A Report	Fri 14/12/18	Fri 14/12/18	◆ 14/12

Study Programme
Tue 13/6/17

Task — Milestone ◆ — Summary — Rolled Up Milestone ◇

Agreement No. CE 63/2016 (EP) Environmental Monitoring and Audit for Disposal Facility to the East of Sha Chau (2017-2020) - Investigation

0400720_CMP EM&A Programme_v1_EM&A.mpp