



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 – June 2020

Revision 0

July 2020

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Client:		Project N	lo:		
Civil Eng	gineering and Development Department (CEDD)	040072	0		
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		14 July	2020		
		Approved			
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		Craig A <i>Partner</i>	. Reid		
v0	Monthly EM&A Report for ESC CMPs	GS	RC	CAR	14/07/20
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name of 'EF terms of the	has been prepared by Environmental Resources Management the trading RM Hong-Kong, Limited', with all reasonable skill, care and diligence within the Contract with the client, incorporating our General Terms and Conditions of Ind taking account of the resources devoted to it by agreement with the client.	Distributi	^{on} ernal		5 18001:2007 No. OHS 515956
We disclaim the scope o	any responsibility to the client and others in respect of any matters outside f the above.	🛛 Pu	blic		BSI
nature to thi	s confidential to the client and we accept no responsibility of whatsoever rd parties to whom this report, or any part thereof, is made known. Any such on the report at their own risk.	🗌 Co	nfidential	ISO S Certificat	001 : 2008 e No. FS 32515







Dredging, Management and Capping of Contaminated Sediment Disposal Facility at Sha Chau

Environmental Certification Sheet EP-312/2008/A

Reference Document/Plan

Document/Plan to be Certified / Verified:	Monthly EM&A Report for Contaminated Mud Pits to the East of Sha Chau – June 2020
Date of Report:	14 July 2020
Date prepared by ET:	14 July 2020
Date received by IA:	14 July 2020

Reference EP Condition

Environmental Permit Condition:

Condition 3.4 of EP-312/2008/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 noncompliance (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

Craig Reid, **Environmental Team Leader:**



Date:

14/07/2020

IA Verification

I hereby verify that the a	bove referenced document/ plan complies with	h the above	referenced condition of
EP-312/2008/A			
Dr Wang Wen Xiong, Independent Auditor:	Mean Mang	Date:	14/07/2020

Dr Wang Wen Xiong, Independent Auditor:

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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 2020

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 opensea 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). The scheduled EM&A programme for SB CMPs was completed in December 2018. Detailed works schedule for ESC CMP V is shown in *Figure 1.1*. In June 2020, the following works were undertaken:
 - Disposal of contaminated mud at ESC CMP Vb; and
 - Capping operations at ESC CMP Vd.

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.

Figure 1.1 Works Schedule for ESC CMP V

Dit	Oneration					20	17										20	18	1										20	19								_	_		202	0						20	21	Ī
Pit	Operation	Α	N	J	J	A	S	5	0	N	D	J	F	Μ	A	м	J	J	Α	s	0	Ν	D	J	F	М	Α	м	J	J	Α	s	ο	Ν	D	J	F	М	Α	М	J	J	4	s	D	N	э.	J	FI	N
	Dredging																																																	٦
ESC CMP V	Disposal																																																	
	Capping																																																	

1.2 **REPORTING PERIOD**

- 1.2.1 This *Monthly EM&A Report for June 2020* covers the EM&A activities for the reporting month of June 2020.
- **1.3** DETAILS OF SAMPLING AND LABORATORY TESTING ACTIVITIES
- 1.3.1 The following monitoring activities were undertaken for ESC CMP V in June 2020:
 - Water Column Profiling of ESC CMP Vb;
 - *Pit Specific Sediment Chemistry of ESC CMP Vb;*
 - Cumulative Impact Sediment Chemistry of ESC CMPs; and
 - Water Quality Monitoring During Capping of ESC CMPs.

1.4 DETAILS OF OUTSTANDING SAMPLING AND/OR ANALYSIS

- 1.4.1 No outstanding sampling remained for June 2020.
- 1.5 BRIEF DISCUSSION OF THE MONITORING RESULTS FOR ESC CMP V
- 1.5.1Brief discussion of the monitoring results of the following activities for ESC
CMP V is presented in this *Monthly EM&A Report for June 2020*:
 - Water Column Profiling of ESC CMP Vb;
 - *Pit Specific Sediment Chemistry of ESC CMP Vb;*
 - *Cumulative Impact Sediment Chemistry of ESC CMPs;* and
 - Water Quality Monitoring During Capping of ESC CMPs.

1.5.2 Water Column Profiling of ESC CMP Vb – June 2020

1.5.3 *Water Column Profiling* was undertaken at a total of two sampling stations (Upstream and Downstream stations) on 11 June 2020. 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 2009 - 2018 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).

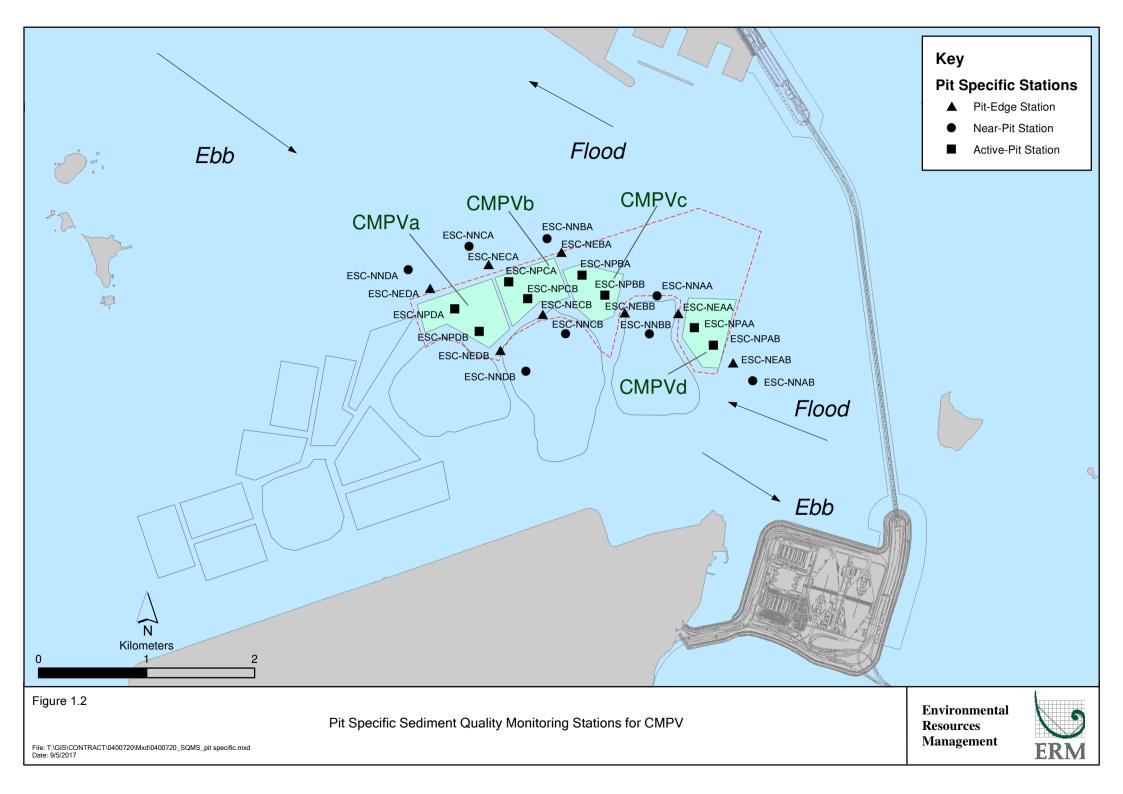
In-situ Measurements

1.5.4 Analyses of results for June 2020 indicated that levels of Salinity, pH and DO complied with the WQOs at both Downstream and Upstream stations (*Table B2* of *Annex B*). 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 June 2020 indicated that the SS levels at both Downstream and Upstream stations complied with the WQO and the Action and Limit Levels (*Tables B1* and *B2* of *Annex B*).
- 1.5.6 Overall, the monitoring results indicated that the mud disposal operation at ESC CMP Vb did not appear to cause any deterioration in water quality during this reporting period.
- 1.5.7 *Pit Specific Sediment Chemistry of ESC CMP Vb June 2020*
- 1.5.8 Monitoring locations for *Pit Specific Sediment Chemistry for ESC CMP Vb* are shown in *Figure 1.2.* A total of six (6) monitoring stations were sampled on 3 June 2020.
- 1.5.9 The concentrations of most inorganic contaminants were lower than the Lower Chemical Exceedance Levels (LCELs) at most stations, except for Arsenic (*Figures 1 and 2* of *Annex C*). The concentrations of Arsenic were higher than the LCEL at Near-Pit station ESC-NNCA, Pit-Edge station ESC-NECA and Active-Pit station ESC-NPCB.

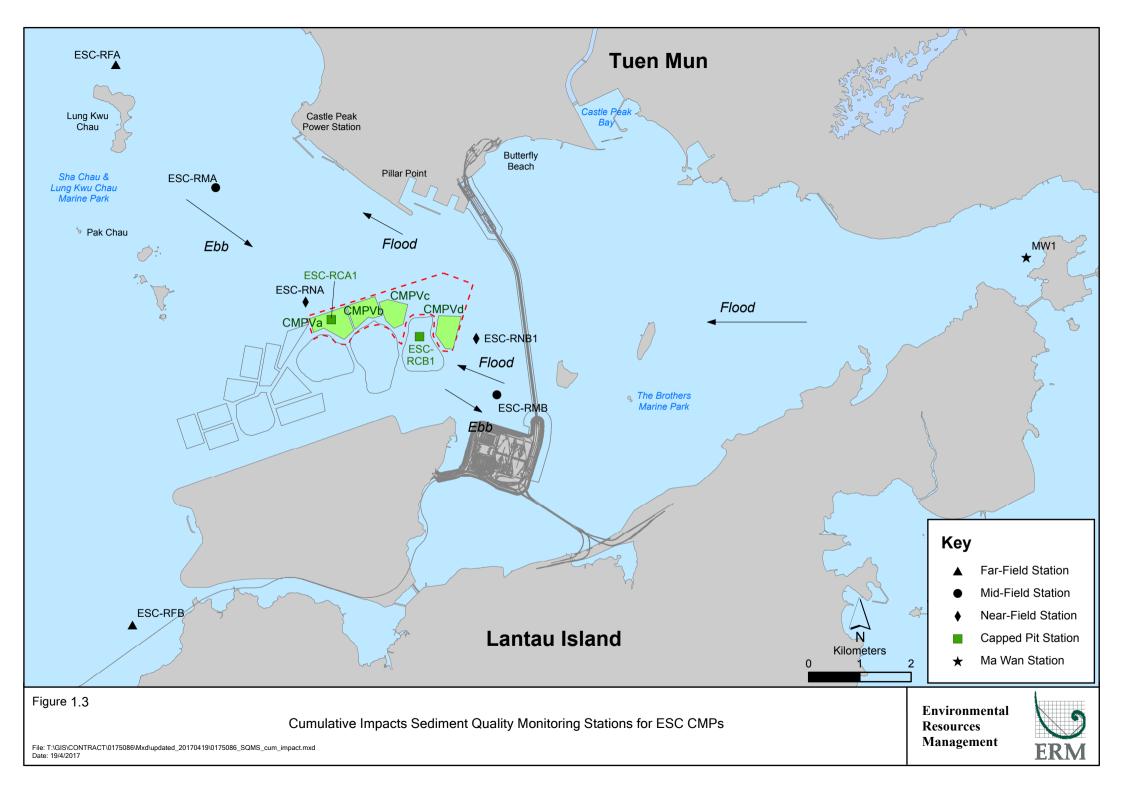
(1) http://epic.epd.gov.hk/EPICRIVER/marine/?lang=en



- 1.5.10 Whilst the average concentration of Arsenic in the Earth's crust is generally ~2mg/kg, significantly higher Arsenic concentrations (median = 14 mg/kg) have been recorded in Hong Kong's onshore sediments ⁽¹⁾. It is presumed that the natural concentrations of Arsenic are similar in onshore and offshore sediments ⁽²⁾, and relatively high Arsenic levels may thus occur throughout Hong Kong. Therefore, the LECL exceedances of Arsenic are unlikely to be caused by the disposal operations at ESC CMP Vb but rather as a result of naturally occurring deposits.
- 1.5.11 For organic contaminants, the concentrations of Total Organic Carbon (TOC) were higher at Active-Pit station ESC-NPCB in June 2020 (*Figure 3 of Annex C*). The concentrations of Low Molecular Weight and High Molecular Weight Polycyclic Aromatic Hydrocarbons (PAHs) were lower than the LCELs at all stations (*Figure 4 of Annex C*). The concentration of Tributyltin (TBT) was higher at Active-Pit station ESC-NPCA (*Figure 5 of Annex C*). The concentrations of Total Polychlorinated Biphenyls (PCBs), Total dichloro-diphenyl-trichloroethane (DDT) and 4,4'-dichlorodiphenyldichloroethylene (DDE) were below the limit of reporting at all stations in June 2020.
- 1.5.12 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 Vb in June 2020. 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.
- 1.5.13 *Cumulative Impact Sediment Chemistry of ESC CMPs June 2020*
- 1.5.14 Monitoring locations for Cumulative Impact Sediment Chemistry for ESC CMPs are shown in *Figure 1.3*. A total of nine (9) monitoring stations were sampled on 4 and 5 June 2020.
- 1.5.15 Analyses of results for the *Cumulative Impact Sediment Chemistry Monitoring* indicated that the concentrations of most inorganic contaminants were below the LCEL at most stations in June 2020, except concentrations of Arsenic were higher than the LCEL at Mid-field stations ESC-RMA, ESC-RMB and Capped Pit station ESC-RCB1 (*Figures 6* and 7 of *Annex C*). As discussed in *Section 1.5.10*, the LECL exceedances of Arsenic are unlikely to be caused by the disposal operations at ESC CMP Vb but rather as a result of naturally occurring deposits.

⁽¹⁾ Sewell RJ (1999) Geochemical Atlas of Hong Kong. Geotechnical Engineering Office, Government of the Hong Kong Special Administrative Region

⁽²⁾ Whiteside PGD (2000) Natural geochemistry and contamination of marine sediments in Hong Kong. In: The Urban Geology of Hong Kong (ed Page A & Reels SJ). Geological Society of Hong Kong Bulletin No. 6, p109-121



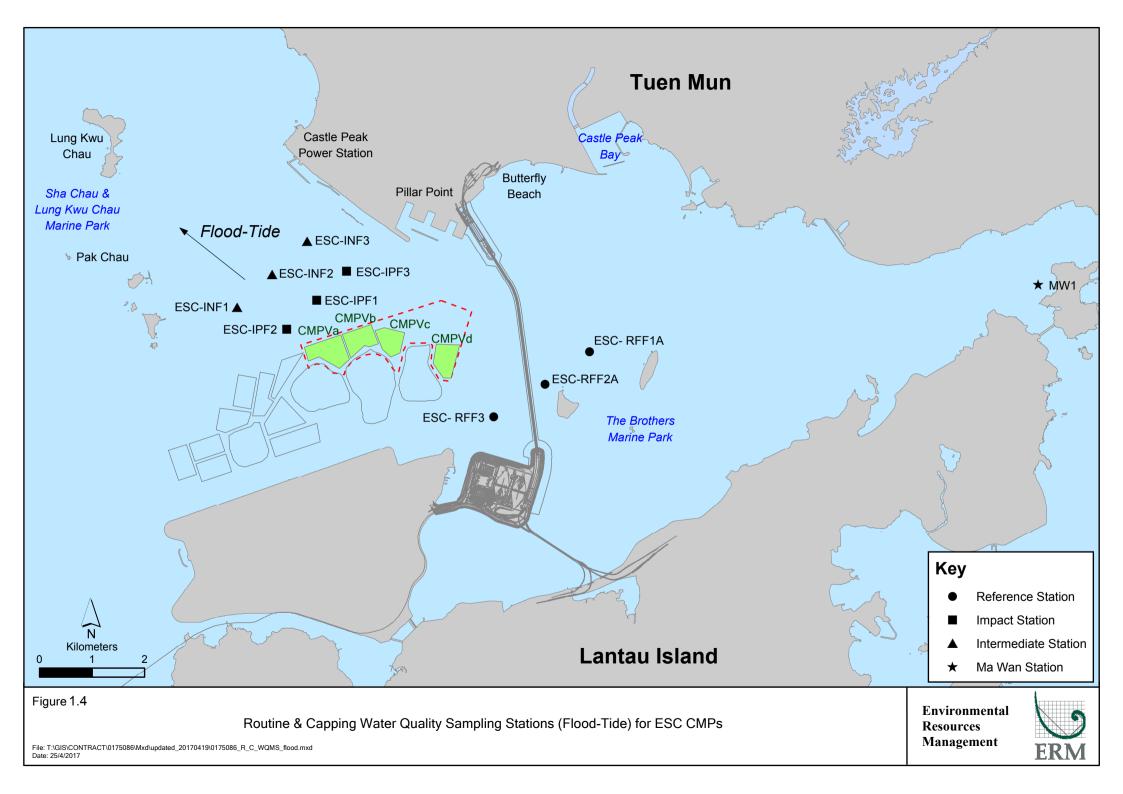
- 1.5.16 For organic contaminants, the concentrations of TOC varied between stations in June 2020, with generally higher concentrations of TOC recorded at Midfield station ESC-RMA and Ma Wan station (*Figure 8* of *Annex C*). The concentrations of TBT were below the limit of reporting at most stations, except at Far-field station ESC-RFA, Capped-pit station ESC-RCA1 and Ma Wan station, and higher concentrations were recorded at Ma Wan station (*Figure 9* of *Annex C*). The concentrations of High Molecular Weight PAHs were below the LCEL at all stations (*Figure 10* of *Annex C*). The concentrations of Total PCBs, Total DDT, 4,4'-DDE and Low Molecular Weight PAHs were below the limit of reporting at all stations in June 2020.
- 1.5.17 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 Vb in June 2020. 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.

1.5.18 Water Quality Monitoring during Capping of ESC CMPs – June 2020

1.5.19 The monitoring results obtained during June 2020 sampling in the wet season have been assessed for compliance with the WQOs (see *Section 1.5.3* for details). A total of ten (10) monitoring stations were sampled on 12 June 2020 as shown in *Figure 1.4*.

In-situ Measurements

- 1.5.20 Graphical presentation of the monitoring results (Temperature, DO, pH, Salinity and Turbidity) is shown in *Figures 11-18* of *Annex C*. Levels of pH at all stations in June 2020 complied with the WQO while the Levels of Salinity were higher than WQO at Impact, Intermediate and Ma Wan Stations, and the levels of DO of Surface and Mid water average were lower than the WQO at Ma Wan station (*Table B3* of *Annex B*). Levels of DO and Turbidity complied the Action and Limit levels at most stations, except the averaged levels of DO recorded for surface and mid-depth water at Ma Wan station was below Action level (*Tables B1* and *B3* of *Annex B*).
- 1.5.21 The higher Salinities recorded at Ma Wan station are likely to be caused by the larger separation distance to Pearl River mouth, which release a large amount of freshwater runoff in the area during wet season, when compared to the Reference stations. The Reference stations are located relatively closer to nearby islands (e.g. Hong Kong Boundary Crossing Facilities, Tai Mo To, Siu Mo To) and localised freshwater runoff from the nearby islands might be resulted during wet season, resulting in lower Salinities at Reference stations.
- 1.5.22 Since action level exceedance of DO (surface and mid-depth water) was recorded at Ma Wan station only and Ma Wan is located further away from ESC CMPs comparing to other stations where levels of DO compiled with the action and limit levels, the LECL exceedance of DO (surface and mid-depth water) is unlikely to be caused by the capping operations at ESC CMPs.



Laboratory Measurements for Suspended Solids (SS)

- 1.5.23 Concentrations of SS complied with the WQO at all stations. Concentrations of SS complied with the Action and Limit Levels at all stations in June 2020 (*Table B3* of *Annex B; Figure 17* of *Annex C*).
- 1.5.24 Overall, results of the Water Quality Monitoring during Capping of ESC CMPs indicated that the capping operation at ESC CMP Vd did not appear to cause any unacceptable deterioration in water quality in June 2020. Further statistical analysis will be undertaken in the quarterly report to investigate whether the capping operations at ESC CMP Vd is causing any unacceptable deterioration in water quality of the area.

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 2020 for ESC CMP V (see *Annex A* for the sampling schedule ⁽¹⁾):
 - Water Column Profiling of ESC CMP Vb;
 - Routine Water Quality Monitoring of ESC CMPs;
 - Pit Specific Sediment Chemistry of ESC CMP Vb; and
 - Demersal Trawling for ESC CMPs.

1.7 STUDY PROGRAMME

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

(1) The scheduled EM&A Programme for SB CMPs was completed in December 2018.

Annex A

Sampling Schedule

		-				2017							20		0							2019								020					2021	
Pit Specific Sediment Chemistry Active-Pit	Code ESC-NPAA	Frequency Monthly		M 12		J A 12 12		0 N			F M A			J A 12 12						A A 2 12		J J 12 12		5 O				M A M 12 12 12				5 O		D J	F 2 12	
Pit-Edge	ESC-NPAB ESC-NEAA	Monthly	12	12		12 12 12 12		12 1 12 1			12 12 1 12 12 1																	12 12 12 12 12 12					12		2 12 2 12	
Near-Pit	ESC-NEAB	Monthly	12	12	12	12 12	12	12 1	2 12	12	12 12 1	2 12	12	12 12	12	12 12	12	12	12 12	2 12	12	12 12	2 12	12 12	12 12	2 12	12	12 12 12	12	12	12	12 12	12	12 12	2 12	12
	ESC-NNAA ESC-NNAB			12 12		12 12 12 12		12 1 12 1			12 12 1 12 12 1																	12 12 12 12 12 12 12	12 12				12 12		2 12 2 12	
Cumulative Impact Sediment Cher Near-field Stations			A	М				0 1				A M		J A	S	0 N				A A	М			S O				M A M	J	J		S O			F	
Mid-field Stations	ESC-RNA ESC-RNB1	4 times per year 4 times per year			12 12	12			12		12 12		12 12	12			12 12		12			12 12	12		11		12 12		12 12		12 12			12	12	
	ESC-RMA ESC-RMB	4 times per year 4 times per year			12 12	12 12			12		12 12		12 12	12 12			12 12		12 12			12 12	12 12		11		12 12		12 12		12 12			12 12	12 12	
Capped Pit Stations	ESC-RCA1 ESC-RCB1	4 times per year 4 times per year			12 12	12			12		12 12	-	12 12	12 12			12 12		12 12			12 12	12 12	-	11		12 12		12 12		12 12			12 12	12 12	
Far-Field Stations	ESC-RFA ESC-RFB	4 times per year 4 times per year			12 12	12			12		12		12 12	12 12			12 12		12			12 12	12 12		11		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		11		12		12		12			12	12	
Sediment Toxicity Tests Near-Pit Stations			A	М	J	J A	S	0 1	I D	J	F M A	A M	IJ	J A	S	0 N	D	J	F M	A A	M	JJ	A	S O	N E	J	F	M A M	J	J	Α	S O	N	D J	F	Μ
Reference Stations	ESC-TDA ESC-TDB1	2 times per year 2 times per year				5 5					5			5					5 5				5 5				5 5				5 5				5 5	
	ESC-TRA ESC-TRB	2 times per year 2 times per year				5 5					5			5					5 5				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 Near-Pit Stations	ESC-INA	2 times per year	A	M	J	J A *	S	O N	1 D	J	F M A	A M	IJ	J A	S	O N	D	J	F M	A A	М	JJ	*	s o	N E) J	F *	M A M	J	J	*	s o	N	D J	*	M
Reference North	ESC-INB	2 times per year				*					*			*					*				*				*				*				*	
Reference South	TNA TNB	2 times per year 2 times per year				*					*			*					*				*				*				*				*	
	TSA TSB	2 times per year 2 times per year	\vdash			*					*			*					*				*			+	*				*				*	
Demersal Trawling Near Pit Stations	ECC DV:	4 tim	A	М		J A	S	0 1	1 D			A M	IJ	J A	S	0 N	D			A A	М			S O	N E			M A M	J			S O	N			Μ
Reference North	ESC-INA ESC-INB	4 times per year 4 times per year				5 5 5	E		+	5 5		+		5 5 5 5				5	5			5	5	+		5	5		E	5	5				5	
Reference South	TNA TNB	4 times per year 4 times per year				5 5 5 5				5	5			5 5 5 5					5			5		_		5	5			5	5			5		
	TSA TSB	4 times per year 4 times per year				5 5 5 5				5 5	5 5			5 5 5 5					5 5			5				5 5				5 5				5 5		
Capping Ebb Tide			Α	М	J	J A	S	0 1	I D	J	F M A	A M	J	J A	s	O N	D	J	F M	A A	М	JJ	A	s o	N E	J	F	M A M	J	J	Α	S 0	N	D J	F	Μ
Impact Station Downcurrent	ESC-IPE1A ESC-IPE2A	4 times per year 4 times per year																	_								3		3		3			3	3	
	ESC-IPE3 ESC-IPE4	4 times per year 4 times per year																									3 3		3		3 3			3 3	3	
Intermediate Station Downcurrent	ESC-IPE5 ESC-INE1A	4 times per year 4 times per year																									3		3		3			3	3	
		4 times per year 4 times per year 4 times per year																	_								3		3		3 3 3			3 3 3	3 3 3	
Reference Station Upcurrent	ESC-INE5A	4 times per year																	-					-			3		3		3			3	3	
	ESC-RFE1 ESC-RFE2 ESC-RFE3	4 times per year 4 times per year 4 times per year																									3 3 3		3 3 3		3 3 3			3 3 3	3 3 3	
Ma Wan Station	ESC-RFE4 ESC-RFE5	4 times per year 4 times per year																			_						3		3		3		-	3 3	3	
Flood Tide	MW1	4 times per year								-																-	3		3		3			3	3	_
Impact Station Downcurrent	ESC-IPF1 ESC-IPF2	4 times per year 4 times per year							-			-	-								_						3		3		3 3		-	3 3	3	
Intermediate Station Downcurrent	ESC-IPF3 ESC-INF1	4 times per year 4 times per year																									3		3		3			3	3	
	ESC-INF2 ESC-INF3	4 times per year 4 times per year																	-					-			3		3		3			3	3	
Reference Station Upcurrent	ESC-RFF1A ESC-RFF2A	4 times per year 4 times per year																									3		3 3		3 3			3 3	3	
Ma Wan Station	ESC-RFF3 MW1	4 times per year 4 times per year								-														_		-	3		3		3			3	3	
Routine Water Quality Monitoring	ŝ	• •	A	М	J	J A	S	0 1	1 D	J	F M A	A M	IJ	J A	s	0 N	D	J	F M	A A	М	JJ	A	s o	N E	J	F	M A M	J	J	Α	s o	N	D J	F	М
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	8	
	ESC-IPE2A ESC-IPE3 ESC-IPE4	8 times per year 8 times per year 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 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 8 8	8	8 8 8	8	8 8 8	8	
Intermediate Station Downcurrent	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	8	
	ESC-INE1A ESC-INE2A ESC-INE3A	8 times per year 8 times per year 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 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 8 8		8 8 8	8	8	8 8	8	8	
Reference Station Upcurrent	ESC-INE4A ESC-INE5A	8 times per year 8 times per year	8	8		8 8 8 8	Ħ	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-RFE1 ESC-RFE2 ESC-RFE3	8 times per year 8 times per year 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 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 8 8	8	8		8 8 8	8	
	ESC-RFE3 ESC-RFE4 ESC-RFE5	8 times per year 8 times per year 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 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 Flood Tide	MW1	8 times per year	8	8		8 8	H	8 8	3	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	\exists
Impact Station Downcurrent	ESC-IPF1 ESC-IPF2	8 times per year 8 times per year	8	8		8 8 8 8	П	8 8		-		8 8		8 8 8 8		8 8 8 8			8	8	8	8	8	8		8	8	88		8	8	8	8	8		
Intermediate Station Downcurrent	ESC-IPF3	8 times per year 8 times per year	8	8		8 8		8 8	;		5	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-INF1 ESC-INF2 ESC-INF3	8 times per year 8 times per year 8 times per year	8 8 8	8 8 8		8 8 8 8 8 8		8 8 8 8 8 8	;	\vdash	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 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	;	F	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	ESC-RFF2A ESC-RFF3	8 times per year 8 times per year	8	8		8 8 8 8		8 8		E	٤	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	MW1	8 times per year	8 A			8 8 J A	S	8 8 0 N	I D	I	1 1 1	8 8 A M		8 8 J A		8 8 0 N	D		8 F M	8 4 A		J J	1	8 5 0		8) J		8 8 M A M	I	8 J	8 A	8 5 0	1.1	8 D J		М
Plume Stations	WCP1 WCP2	Monthly 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	M A M 4 4 4 4 4 4 4 4	4	4	4	4 4	4	4 4	4	4
Benthic Recolonisation Studies Capped Stations at CMPV			Α	М	J	J A	S	0 1	I D	J	F M A	A M	IJ	J A	S	O N	D	J	F M	A A	М	JJ	A	S O	N E) J	F	M A M	J	J	A	S O	N	D J	F	Μ
	ESCV-CPB	2 times per year 2 times per year 2 times per year			+	+	E		1	E		+				+	Ħ		+	\square			Ħ	+	Ħ	F					Ħ		Ħ	\mp	₽	
Reference Stations	ESCV-CPD	2 times per year					Ħ		+	F		+					Ħ		+				\downarrow	+		F								╞	╞	
	RBA RBB RBC1	2 times per year 2 times per year 2 times per year	H			+	H		+	╞		+				_	+	\downarrow	+				+	+	+	+					\vdash		+	+	\downarrow	
Impact Monitoring for Dredging			Α	М	J	J A	S	0 1	1 D	J	F M A	A M	IJ	J A	S	0 N	D	J	F M	A A	М	JJ	A	S O	N E	J	F	M A M	J	J	A	S O	N	D J	F	Μ
Upstream Stations	US1 US2	3 times per week 3 times per week	H			2 2 2 2			1	F									+						2 2 2 2				L							
Downstream Stations			1		T		1	1		1			1			T	1 1	-	T			1		T		1	1		1	1	. —	T	1	Т	1-1	

	US1	3 times per week	2	2											2	2						
	US2	3 times per week	2	2	2										2	2			-			
Downstream Stations																						
	DS1	3 times per week	2	2	2										2	2						
	DS2	3 times per week	2	2	2										2	2						
	DS3	3 times per week	2	2	2										2	2			-			
	DS4	3 times per week	2		2										2	2						
	DS5	3 times per week	2		2										2	2						
Ma Wan Station																						
	MW1	3 times per week	2		2										2	2						
Notes:																						_

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 B

Water Quality Monitoring Results

Parameter	Action Level	Limit Level
Dissolved Oxygen (DO) (1)	Surface and Mid-depth (2)	Surface and Mid-depth ⁽²⁾
	5%-ile of baseline data for surface and	1%-ile of baseline data for surface and
	middle layer = 3.76 mg L ⁻¹	middle layer = 3.11 mg L ⁻¹ ⁽³⁾
	, ,	, C
	and	and
	Significantly less than the reference	Significantly less than the reference
	stations mean DO (at the same tide of	stations mean DO (at the same tide of
	the same day)	the same day)
	Bottom	Bottom
	5%-ile of baseline data for bottom	The average of the impact station
	layers = 2.96 mg L ⁻¹	readings are <2 mg/L ⁻¹
	, ,	0 0
	and	and
	Significantly less than the reference	Significantly less than the reference
	stations mean DO (at the same tide of	stations mean DO (at the same tide of
	the same day)	the same day)
Depth-averaged Suspended	95%-ile of baseline data for depth	99%-ile of baseline data for depth
Solids (SS) (4) (5)	average = 37.88 mg L ⁻¹	average = 61.92 mg L ⁻¹
	and	
		and
	120% of control station's SS at the same	130% of control station's SS at the same
	tide of the same day	tide of the same day
	the of the same day	the of the balle day
Depth-averaged Turbidity (Tby) (4) (5)	95%-ile of baseline data = 28.14 NTU	99%-ile of baseline data = 38.32 NTU
	and	and
	120% of control station's Tby at the	130% of control station's Tby at the
	same tide of the same day	same tide of the same day

Table B1Action and Limit Levels of Water Quality for Dredging, Disposal and
Capping Activities at ESC CMP V

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.

Stations	Temp	Salinity	Turbidity	Dissolved	l Oxygen	pН	Suspended Solids
	(°C)	(ppt)	(NTU)	(%)	(mg L-1)		(mg L-1)
WCP 1 (Downstream)	27.62	13.86	7.66	62.96	4.60	7.61	5.38
WCP 2 (Upstream)	27.85	12.73	11.42	62.59	4.59	7.53	7.90
WQO (Wet Season)	N/A	11.50-14.01#	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.

Table B3Monitoring Results for Water Quality Monitoring during Capping of ESC on
12 June 2020

		Temp	Salinity	Turbidity	Ι	Dissolve	d Oxyge	n	pН	SS
					(%	6)	(mg	; L-1)		(mg
Sampling Period	Stations	(°C)	(ppt)	(NTU)	Surface & Mid- depth water	Bottom Water	Surface & Mid- depth water	Bottom Water	(mg L- 1)	L-1)
June	RFF (Reference)	26.64	20.84	5.31	57.87	53.52	4.18	3.77	7.73	6.70
2020	IPF (Impact)	26.22	23.16	6.08	56.01	52.55	4.02	3.68	7.69	6.48
	INF (Intermediate)	26.21	23.33	6.93	56.11	52.00	4.03	3.65	7.65	6.58
	Ma Wan	24.70	32.33	3.21	50.20	49.37	3.47	3.41	7.83	5.40
	WQO	N/A	18.76- 22.92*	N/A	N/	/A	>4	>2	6.5- 8.5	10.8

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.

Annex C

Graphical Presentation

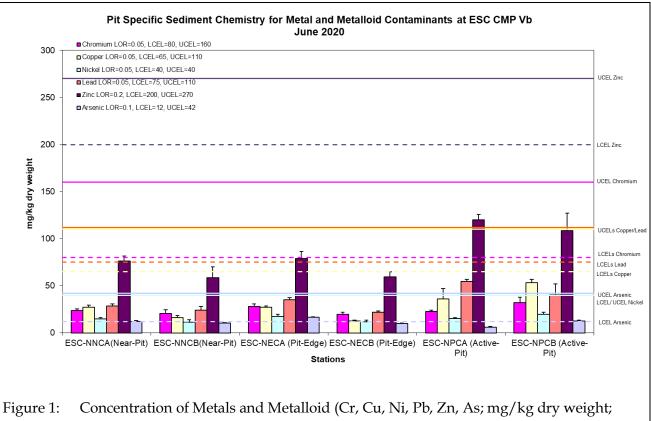
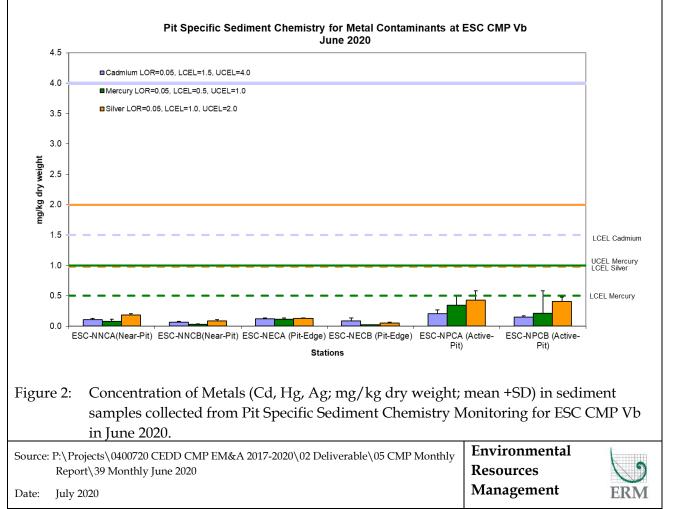
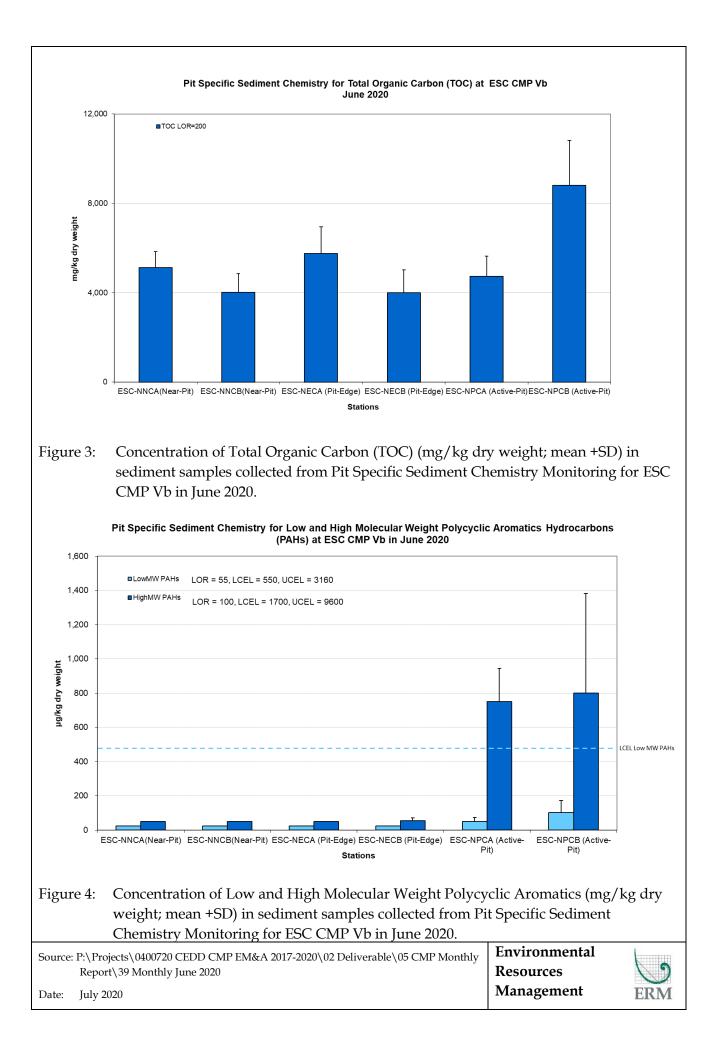
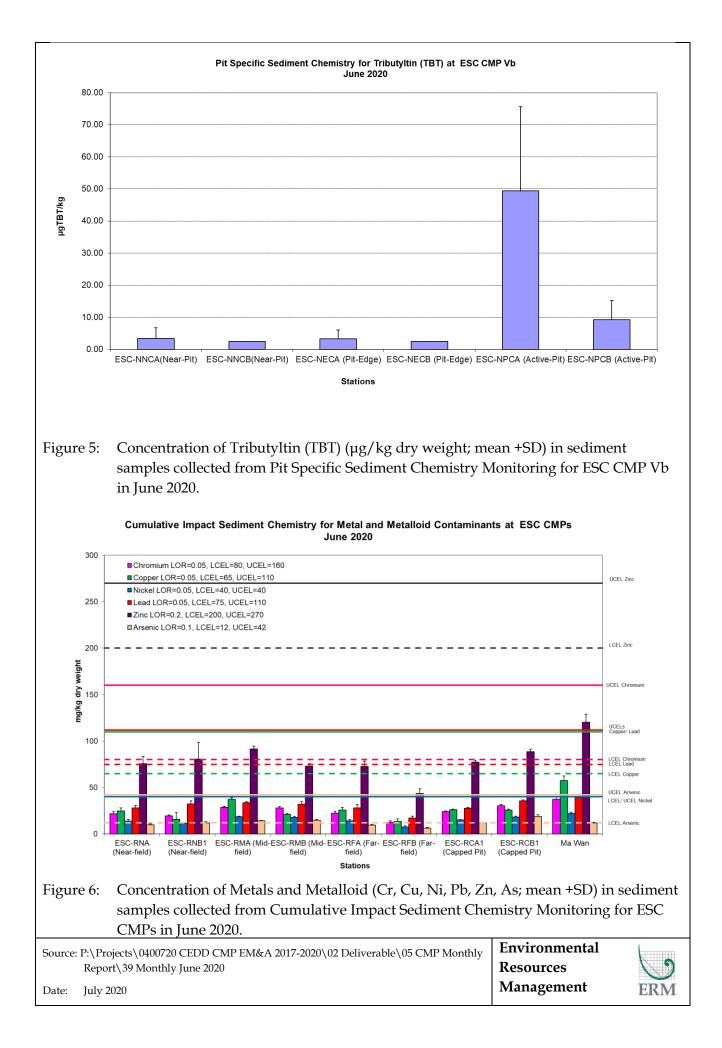
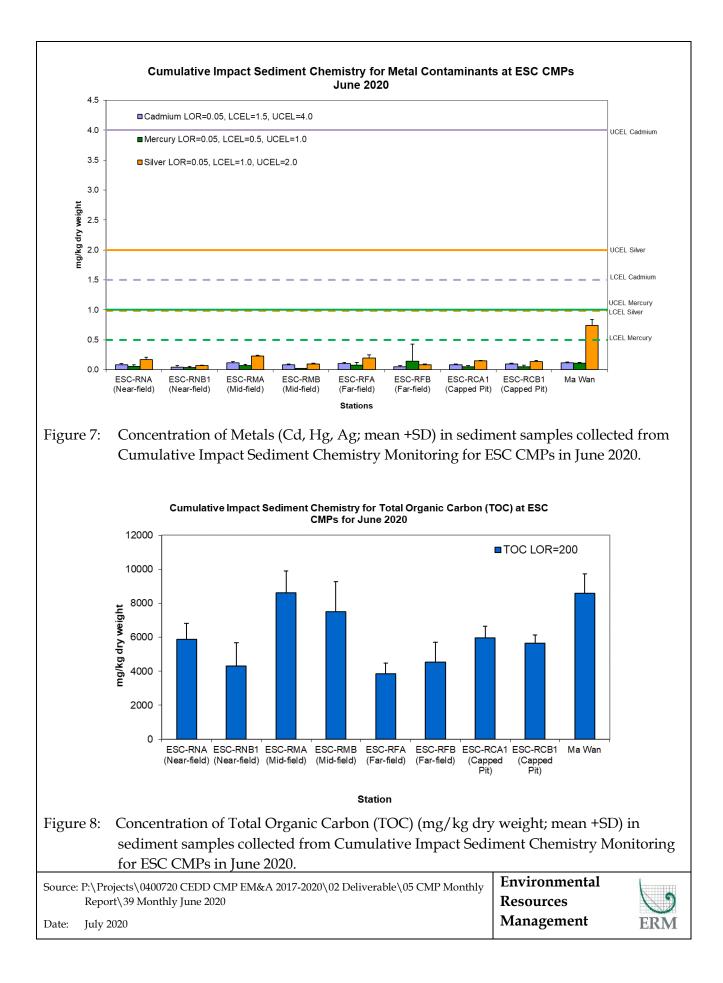


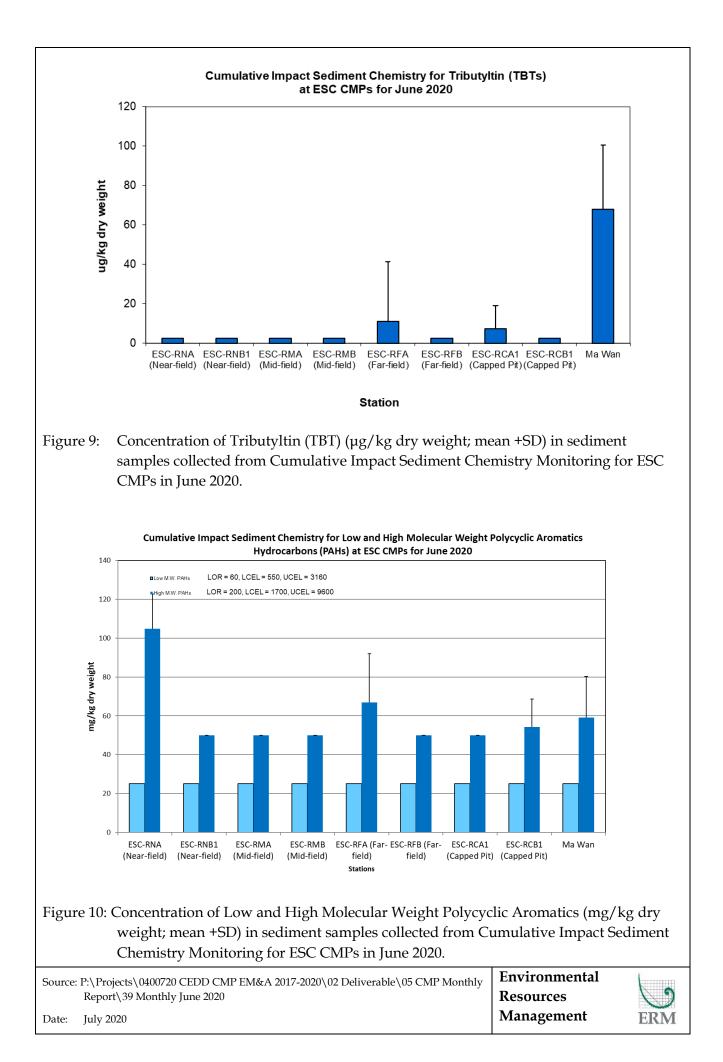
Figure 1: Concentration of Metals and Metalloid (Cr, Cu, Ni, Pb, Zn, As; mg/kg dry weight; mean +SD) in sediment samples collected from Pit Specific Sediment Chemistry Monitoring for ESC CMP Vb in June 2020.

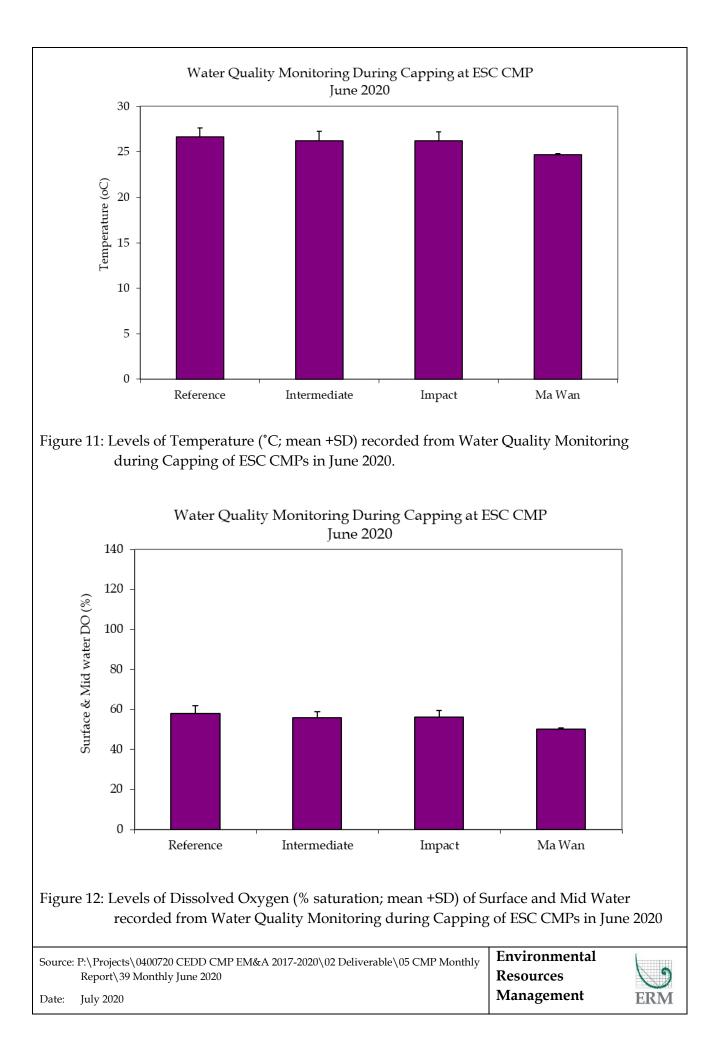


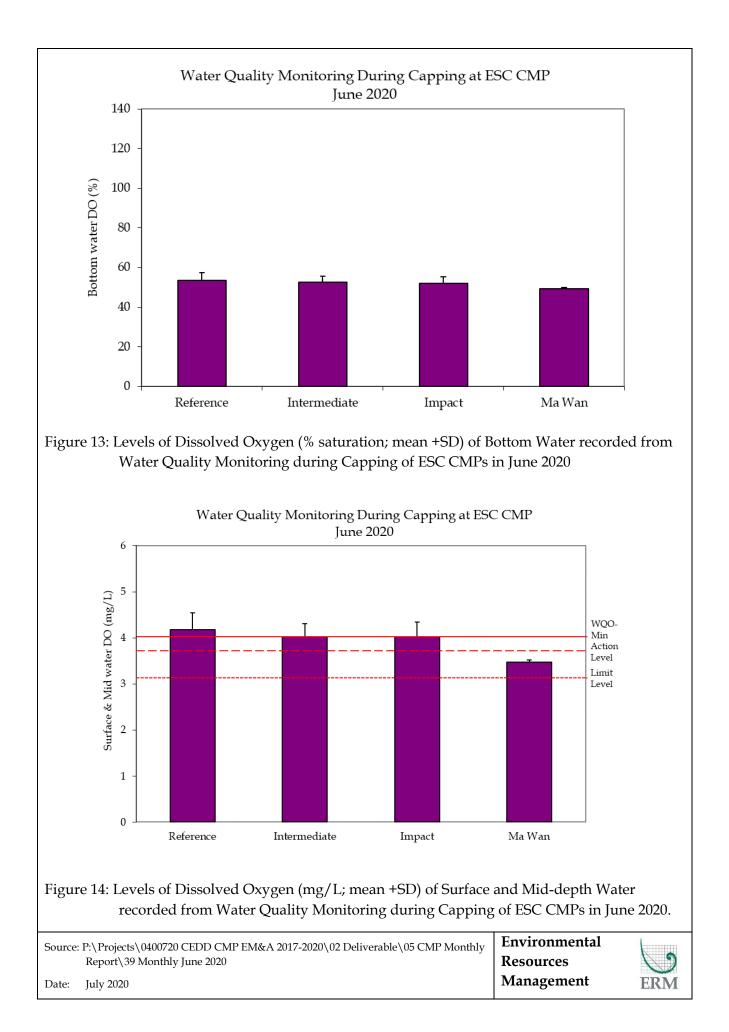


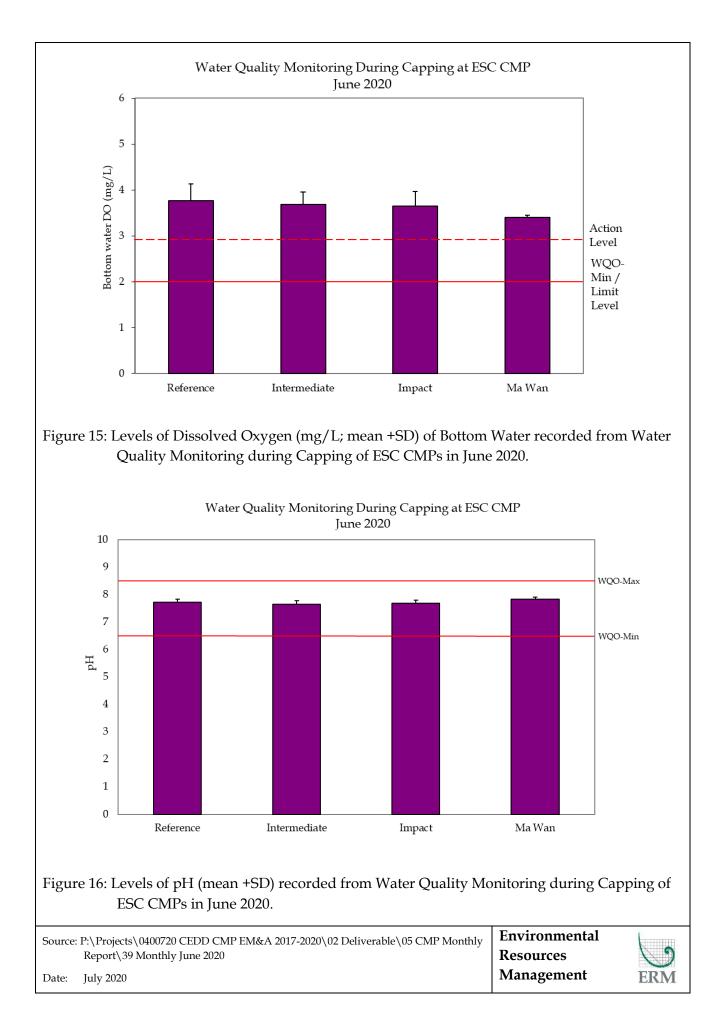


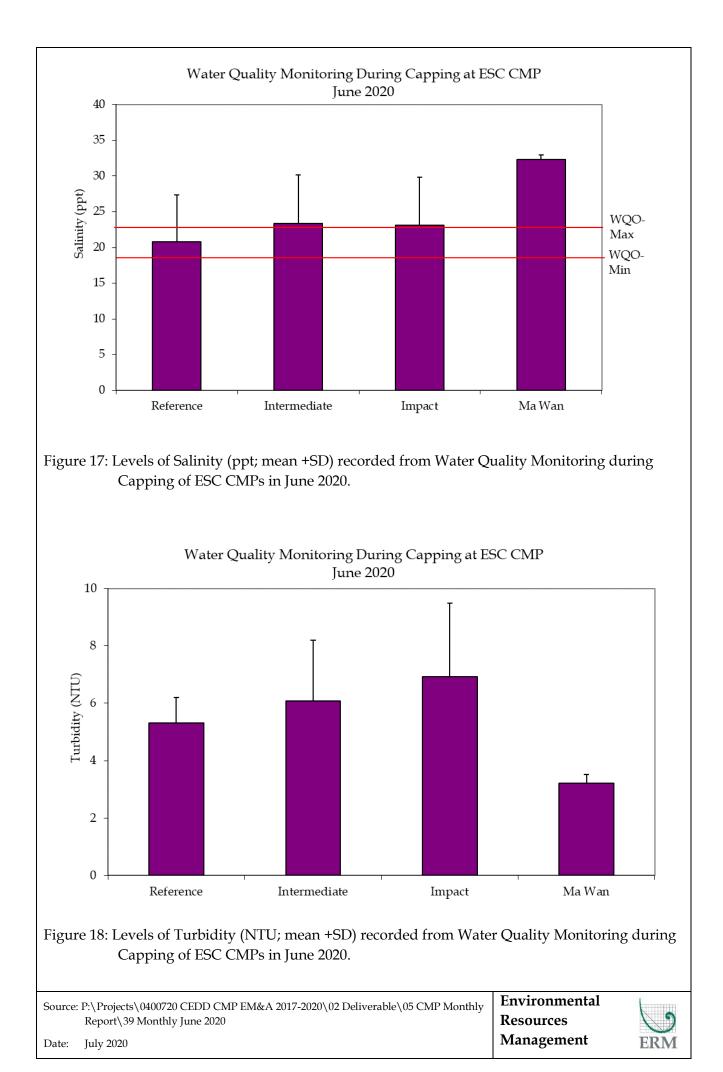


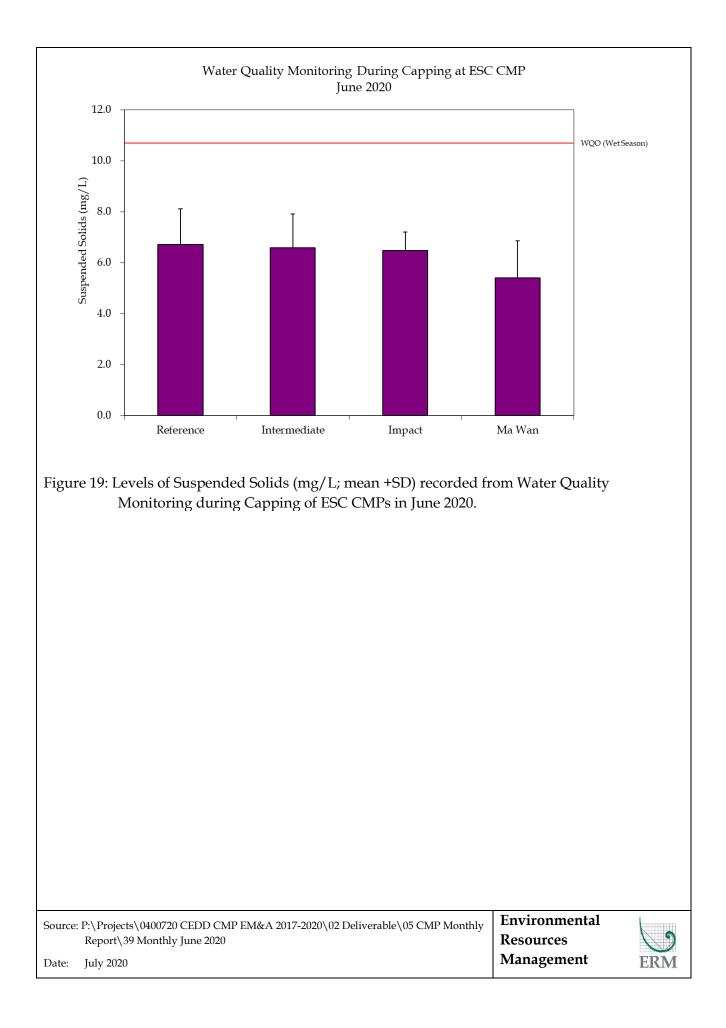












Annex D

Study Programme

Task Name	Start	Finish		201	7				2018	3				2019					2020				20)21	SON	
Commencement of Agreement No. CE 63/2016 (EP)	Sat 1/4/17	Sat 1/4/17			JAS		JJF	MA	MJJ	ASC	טאכ	JFN		JJ	ASO	ND	JFN		JJ	ASO	ND	JFM	AMJ	JA	SON	DJI
																				\parallel			\square			
	Nov 0/4/47	Mar 5/4/04																								
Project Management and General Deliverables	Mon 3/4/17	Mon 5/4/21																\square				\square				
For the disposal facilities to the East of Sha Chau (ESC) (between 2017 and 2021)	Sat 1/4/17	Fri 1/10/21	i 🐳															+	+	++	₩		+++	₩		
and the South of The Brothers (SB) (between 2017 and 2018)																										
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	$\left \right $	23	3/5	+++			++-			++	++					++-	$\left \right $	++-	++-	++-'	$\left \right + \left \right $	+++	'	$\left \right $
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																								
Derticipate in Linian Occurs Martiner / Occurs Matines on required by OCDD	Sat 1/4/17	Wed 31/3/21																						+++		
Participate in Liaison Group Meetings/ Consultations as required by CEDD	Sat 1/4/17	Weu 31/3/21																								
Submission of Monthly EM&A Report	Sun 14/5/17	Sun 14/3/21		>�	00		> <		$\diamond \diamond$	$\Diamond \Diamond$	$\Diamond \Diamond$	00		\diamond		$\diamond \diamond$		> 🔗		$\diamond \diamond$	$\Diamond \Diamond$	$\Diamond \Diamond$				
Submission of Quarterly EM&A Report	Fri 14/7/17	Wed 14/4/21	$\left \right $		>	\diamond					>		\diamond	\diamond					\diamond		<u>}</u>	++-'	\diamond	+++		$\left \right $
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Submission of Annual EM&A Report	Sun 14/1/18	Thu 14/1/21					\diamond					\diamond					\diamond					2				
Submission of Annual Risk Assessment Report	Thu 14/6/18	Mon 14/6/21							\diamond					\diamond				++-	\diamond	++	\square	++-'	6	>		$\left \right $
	Er: 00/7/04	Eri 00/7/01																	\square	++			\square	¢_2	2/7	
Submission of Draft Final Report (including database of all data collected)	Fri 23/7/21	Fri 23/7/21																							.3/7	
Submission of Final Report (including database of all data collected)	Fri 27/8/21	Fri 27/8/21																++-						Ť	27/8	
Submission of Draft Executive Summary	Fri 27/8/21	Fri 27/8/21	$\left \cdot \right $			$\left \right $						++	++					++-	$\left \right $	++		++-'	$\left \right \right $		27/8	$\left \right $
Submission of Drak Exceditive Summary																										
Submission of Final Executive Summary	Fri 1/10/21	Fri 1/10/21																							ا /	10
			$\left \right $						++-				++					++	++	++	++-	++-'	+++	+++	'	$\left \right $
For East Tung Lung Chau Disposal Facility (subject to the actual disposal	Sun 14/10/18	Fri 14/12/18	$\left \right $										++					++	+++	++	+++	++-'	+++	+++	'	$\left \right $
programme to be confirmed by CEDD)																										
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										14/1:	2						\square	++		'	\square	\square		
Submission of Quarterly EM&A Report	11114/12/10	111 14/12/10											^													
Submission of Annual EM&A Report	Fri 14/12/18	Fri 14/12/18									•	14/1:	2													
Study Programme Task Milestone	•	S	Summa	ary						F	olled	Up M	ilestor	ne 🗇												
Tue 13/6/17	•																									
Agreement No. CE 63/2016 (EP) Environmenta	al Monitoring a	nd Audit for Di	spos	al Fa	acilit	y to t	he E	ast o	of Sha	h Cha	u (20	17-2	020)	- Inv	estig	atio	n	0400	720_(CMP I	EM&A	Progr	ramme	_v1_E	EM&A.	.mpp