



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 – August 2018

Revision 0

September 2018

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Document Code: 0400720_Monthly August 2018_v0.doc

Environmental Resources Management

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Client: Project No: Civil Engineering and Development Department (CEDD) 0400720 Summary: Date: 14 September 2018 Approved by: 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. Craig A. Reid Partner RC 14/9/18 v0 Monthly EM&A Report for ESC CMPs and SB CMPs CY CAR Revision Description By Checked Approved Date Distribution This report has been prepared by Environmental Resources Management the trading name of 'ERM Hong-Kong, Limited', with all reasonable skill, care and diligence within the terms of the Contract with the client, incorporating our General Terms and Conditions of Business and Internal taking account of the resources devoted to it by agreement with the client. OHSAS 18001:2007 We disclaim any responsibility to the client and others in respect of any matters outside the Public scope of the above. This report is confidential to the client and we accept no responsibility of whatsoever nature to third parties to whom this report, or any part thereof, is made known. Any such party relies on Confidential the report at their own risk.







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 – August 2018
Date of Report:	14 September 2018
Date prepared by ET:	14 September 2018
Date received by IA:	14 September 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 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/ $\frac{1}{plan}$ complies with the above referenced condition of EP-312/2008/A and EP-427/2011/A

Craig Reid, Environmental Team Leader:



Date:

14/9/2018

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:	14/9/2018	

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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 AUGUST 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 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). Detailed works schedule for ESC CMP V and SB CMPs is shown in *Figure 1.1*. In August 2018, the following work was being undertaken:
 - Disposal of contaminated mud 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 and SB CMPs

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	Dredging																																																					
ESC CMP V	Disposal																																																					
	Capping																																																					
	Dredging																																																					
SB CMP 2	Disposal																																																					
	Capping																																																					

1.2 **REPORTING PERIOD**

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

1.3 DETAILS OF SAMPLING AND LABORATORY TESTING ACTIVITIES

- 1.3.1 The following monitoring activities were undertaken for ESC CMP V in August 2018:
 - Water Column Profiling of ESC CMP Vd;
 - Routine Water Quality Monitoring of ESC CMPs;
 - Pit Specific Sediment Chemistry of ESC CMP Vd;
 - Cumulative Impact Sediment Chemistry of ESC CMPs;
 - Sediment Toxicity Tests of ESC CMPs; and
 - Demersal Trawling for ESC CMPs.
- 1.3.2 The following monitoring activity was undertaken for SB CMP in August 2018:
 - Benthic Recolonisation Studies of SB CMPs.

1.4 DETAILS OF OUTSTANDING SAMPLING AND/OR ANALYSIS

- 1.4.1 No outstanding sampling remained for August 2018.
- 1.4.2 The following laboratory analyses were 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 August 2018; and
 - Laboratory analyses of sediment samples collected for Cumulative Impact Sediment Chemistry of ESC CMP V in August 2018.

- 1.4.3 The following analyses are in progress and will be presented in the corresponding quarterly report:
 - Species identification of the biota samples collected from *Demersal Trawling for ESC CMPs* in August 2018;
 - Laboratory analyses for *Sediment Toxicity Test of ESC CMP V* in August 2018; and
 - Laboratory analyses of sediment samples collected for *Benthic Recolonisation Studies of SB CMPs* in August 2018.

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 August 2018*:
 - *Water Column Profiling of ESC CMP Vd* in August 2018;
 - Routine Water Quality Monitoring of ESC CMPs in August 2018; and
 - *Pit Specific Sediment Chemistry of ESC CMP Vd* in July 2018.

1.5.2 Water Column Profiling of ESC CMP Vd – August 2018

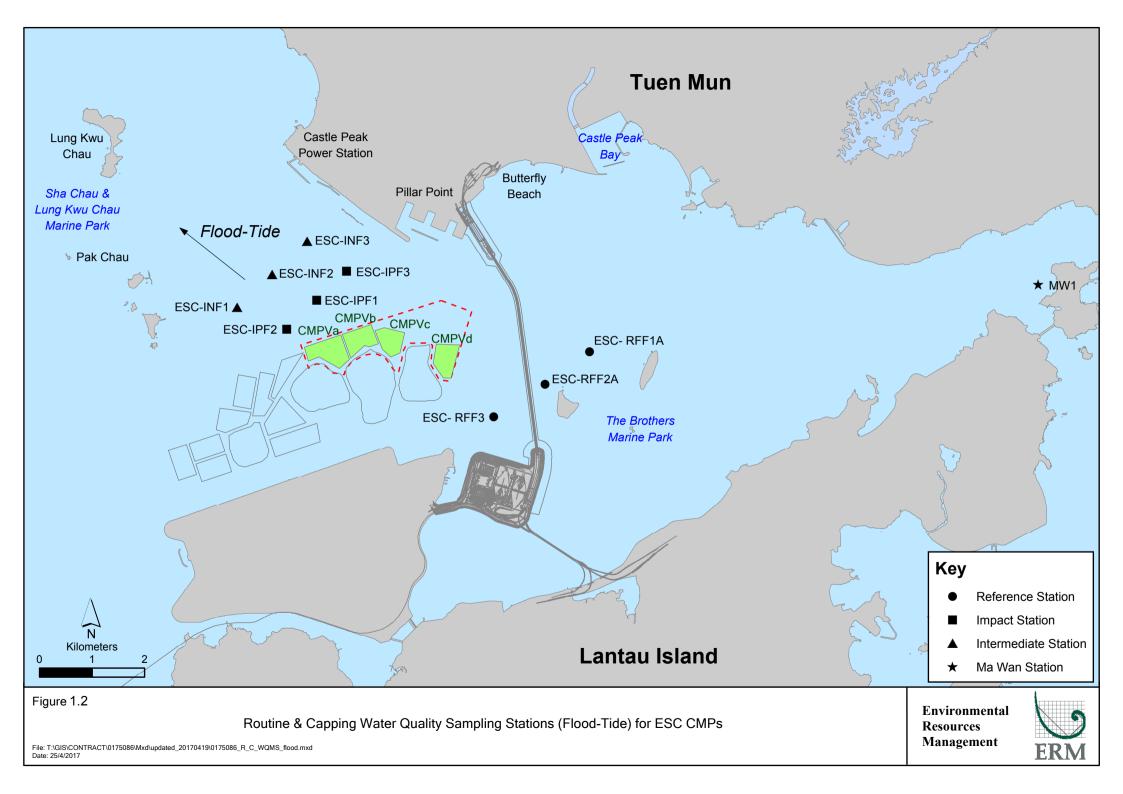
1.5.3 *Water Column Profiling* was undertaken at a total of two sampling stations (Upstream and Downstream stations) on 16 August 2018. The monitoring results have been assessed for compliance with the Water Quality Objectives (WQOs) set by Environmental Protection Department (EPD). This consists of 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 August 2018 indicated that levels of DO, Salinity and pH complied with the WQOs at both Downstream and Upstream stations (*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 August 2018 indicated that the SS levels complied with the WQO and the Action and Limit Level at both Downstream and Upstream stations (*Tables B1* and *B2* of *Annex B*).
- 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 Routine Water Quality Monitoring of ESC CMP V August 2018
- 1.5.8 *Routine Water Quality Monitoring of ESC CMP V* was undertaken on 17 August 2018. The monitoring results have been assessed for compliance with the WQOs (see *Section 1.5.3* for details). The monitoring results are shown in *Tables B3 and B4* of *Annex B* and *Figures 1 10* of *Annex C*. A total of ten (10) monitoring stations were sampled in August 2018 as shown in *Figure 1.2*.



In-situ Measurements

1.5.9	Graphical presentation of the monitoring results (Temperature, DO, pH,
	Salinity and Turbidity) is shown in <i>Figures 1 - 6</i> of <i>Annex C</i> . Analyses of
	results for August 2018 indicated that the levels of pH, Salinity and DO
	complied with the WQOs at all stations (Impact, Intermediate, Reference and
	Ma Wan stations) in August 2018.
1 = 10	

- 1.5.10The levels of DO and Turbidity also complied with the Action and Limit
Levels at all stations (*Table B3* of *Annex B*; *Figures 3* and 6 of *Annex C*).
- 1.5.11 Overall, *in-situ* measurement results of the *Routine Water Quality Monitoring* indicated that the disposal operation at ESC CMP Vd did not appear to cause any unacceptable impacts in water quality in August 2018.

Laboratory Measurements

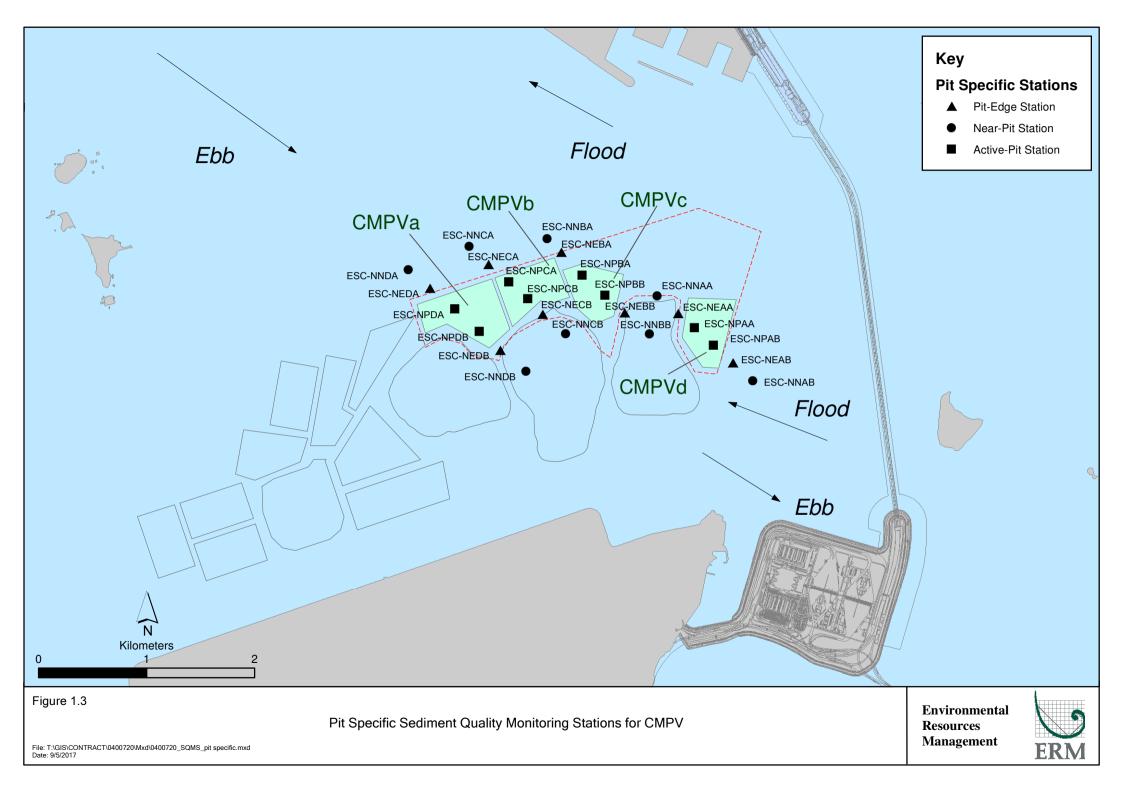
- 1.5.12 Laboratory analysis of August 2018 results indicated that concentrations of Cadmium, Chromium, Silver and Mercury were below their limit of reporting at all stations. Arsenic, Nickel, Lead, Copper and Zinc were detected in August 2018 samples at most stations and the concentrations of these metals and metalloids were similar amongst the stations (*Table B4* of *Annex B*; *Figure 7* of *Annex C*).
- 1.5.13 For nutrients, concentrations of Total Inorganic Nitrogen (TIN) at all stations in August 2018 were higher than the WQO (0.5 mg/L) (*Table B4* of *Annex B*; *Figure 8* of *Annex C*). It should be noted that due to the effect of the Pearl River, the North Western WCZ has historically experienced higher levels of TIN ⁽¹⁾. Therefore, the exceedances of TIN WQO at these stations are unlikely to be caused by the disposal operation at ESC CMP Vd. Concentrations of Ammonia Nitrogen (NH₃-N) and 5-day Biochemical Oxygen Demand (BOD₅) were generally similar amongst the stations in August 2018 (*Table B4* of *Annex B; Figure 8 and 9* of *Annex C*), except higher BOD₅ was detected at Impact stations.
- 1.5.14 Analyses of results for August 2018 indicated that the SS levels at most stations were lower than the WQO (10.8 mg/L for wet season), except the exceedance of SS recorded at the Impact stations. However, the SS levels compiled with the Action and Limit Levels at all stations (*Tables B1 and B4* of *Annex B; Figure 10* of *Annex C*).
- 1.5.15 Overall, results of the *Routine Water Quality Monitoring* indicated that the disposal operation at ESC CMP Vd did not appear to cause any unacceptable deterioration in water quality in August 2018. Detailed statistical analysis will be presented in the Quarterly Report to investigate any spatial and temporal trends of potential concern.

 $(^1) \qquad http://www.epd.gov.hk/epd/misc/marine_quality/1986-2005/textonly/eng/index.htm$

- 1.5.16 *Pit Specific Sediment Chemistry of ESC CMP Vd July* 2018
- 1.5.17 Monitoring locations for *Pit Specific Sediment Chemistry for ESC CMP Vd* are shown in *Figure 1.3.* A total of six (6) monitoring stations were sampled on 30 July 2018.
- 1.5.18 The concentrations of most inorganic contaminants were lower than the Lower Chemical Exceedance Level (LCEL) at all stations in July 2018, except the concentration of Arsenic slightly exceeded the LCEL at the Active-Pit stations ESC-NPAA and ESC-NPAB (*Figures 11 and 12 of Annex C*). 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 Vd but rather as a result of naturally occurring deposits.
- 1.5.19 For organic contaminants, the concentrations of Total Organic Carbon (TOC) were generally similar in July 2018, except higher concentrations of TOC were recorded at the Active-Pit stations ESC-NPAA and ESC-NPAB (*Figure 13* of *Annex C*). The concentration of Tributyltin (TBT) was generally similar amongst stations in July 2018 (*Figure 14* 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 July 2018.
- 1.5.20 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 July 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⁾ 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



1.6 ACTIVITIES SCHEDULED FOR THE NEXT MONTH

- 1.6.1 The following monitoring activities will be conducted in the next monthly period of September 2018 for ESC CMP V (see *Annex A* for the sampling schedule):
 - Water Column Profiling of ESC CMP Vd; and
 - Pit Specific Sediment Chemistry of ESC CMP Vd.
- 1.6.2 No monitoring activities are scheduled to be undertaken in the next monthly period of September 2018 for SB CMPs.
- 1.7 STUDY PROGRAMME
- 1.7.1 A summary of the Study Programme is presented in *Annex D*.

Annex A

Sampling Schedule

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Active-Fit																												
Pit-Edge	ESC-NPAB	Monthly	12	12 12	12 12	12 12	12 12	2 12 1	2 12	12 12	12 1	2 12 1	2 12 12	12 :	2 12 12	12 1	2 12 1	2 12	12 12 12	12 12	12	12 12	12 12	. 12	12 12	2 12 1	2 12 1	.2 12 12
Near-Pit																												
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Capped Pit Stations	ESC-RMB	4 times per year	-	12	12		12	2 1	2		12	12		12	12	++	12	12		12	12		12	-	12		12	12
* *																												
Far-Field Stations																												
Ma Wan Station	MW1	4 times per year	-	12	12		12	2 1	2		12	12		12	12	++	12	12		12	12		12	2	12		12	12
Sediment Toxicity Tests				MI	TA	60	NE		E M		TT				TEN		A T T		S O N	DI	E	MA	MI	T			N D	TEN
Near-Pit Stations			A	IVI J	JA	3 0	IN L			AW))			D		A	v1 J J		3 0 N	D J		MA	IVI J					
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Ma Wan Station					5													5						1				
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Tissue/ Whole Body Sampling			A	M J	J A	S O	N E	J	F M	A M	JJ	A S	6 0 N	D	J F M	A	vi j j	A	S O N	D J	F	M A	M J	J	A S	0 1	N D	J F N
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Impact Station Downcurrent	BSCR 9 9 1																											
	ESC-IPE2A	4 times per year 4 times per year													3		3	3		3	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		3	3
Intermediate Station Downcurrent	ESC-IPE5	4 times per year							_					\square	3		3	3		3	3		3	F	3		3	3
		4 times per year													3		3	3		3	3		3	_	3		3	3
	ESC-INE2A ESC-INE3A	4 times per year 4 times per year													3		3	3		3	3		3		3		3	3
	ESC-INE4A ESC-INE5A	4 times per year 4 times per year							-						3		3	3		3	3		3	_	3		3	3
Reference Station Upcurrent	ESC-RFE1	4 times per year												\square	3		3	3		3	3		3	F	3		3	3
	ESC-RFE2	4 times per year													3		3	3		3	3		3	_	3		3	3
	ESC-RFE3 ESC-RFE4	4 times per year 4 times per year													3		3	3		3 3	3 3		3		3 3		3	3
Ma Wan Station	ESC-RFE5	4 times per year	-				$\left \right $					+		$\left \right $	3	+ +	3	3		3	3		3	+-	3	++	3	3
Flood Tide	MW1	4 times per year												Ц	3		3	3		3	3		3		3		3	3
Impact Station Downcurrent															1.1		1.1	1										
	ESC-IPF1 ESC-IPF2	4 times per year 4 times per year													3		3	3		3	3		3		3		3	3
Intermediate Station Downcurrent	ESC-IPF3	4 times per year	\vdash		+			++	+		++	++	\pm	<u></u> ↓	3	++	3	3		3	3		3	╞	3	++	3	3
	ESC-INF1 ESC-INF2	4 times per year 4 times per year		\square		\square	F	\square	+		F	\square		Ħ	3	\square	3	3		3	3		3	F	3	\square	3	3
	ESC-INF2 ESC-INF3	4 times per year 4 times per year	F					\ddagger	1					$ \uparrow \rangle$	3		3	3		3	3		3	1	3		3	3
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	ESC-RFF2A ESC-RFF3	4 times per year 4 times per year	\vdash				\vdash	++	╋		\vdash			+	3		3	3		3	3 3		3	_	3 3	+	3	3
Ma Wan Station	MW1	4 times per year			\square		F	\mp	Ŧ	F	F	\square	\square	F	3	H	3	3		3	3		2	F	3	Ħ	3	3
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Impact Station Downcurrent	ESC-IPE1A	8 times per year	8	8	8 8	8	8	8 8	3	8 8	8	8	8 8	H	8 8	8	8 8	8 8	8 8	8	8	8	8	8	8	8	8	8 8
	ESC-IPE2A ESC-IPE3	8 times per year	8	8 8	8 8	8	8	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	8 8 8
	ESC-IPE4	8 times per year 8 times per year	8	8	8 8	8	8	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
Intermediate Station Downcurrent	ESC-IPE5	8 times per year		8	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 8
	ESC-INE1A ESC-INE2A	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
	ESC-INE3A ESC-INE4A	8 times per year 8 times per year		8	8 8 8 8	8	8 8	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 8
	ESC-INE5A	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
Reference Station Upcurrent	ESC-RFE1	8 times per year		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
	ESC-RFE2 ESC-RFE3	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
	ESC-RFE4	8 times per year	8	8	8 8	8	8	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 8
Ma Wan Station	ESC-RFE5	8 times per year	8			8													8 8					8				
Flood Tide	MW1	8 times per year	8	8	8 8	8	8	8 8	3	8 8	8	8	8 8	\square	8 8	8	8 8	8	8 8	8	8	8	8	8	8	8	8	8 8
Impact Station Downcurrent	ESC-IPF1	8 times per year	9	8	80	8	8	+	-	8 8	8	8	8 8	+	8 8	8	8 8	1 2 1	8 8		8	8	8	8	8	8	8	8 8
	ESC-IPF2	8 times per year	8	8	8 8	8	8	\ddagger		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-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
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Polozono Chattan **	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
Reference Station Upcurrent		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
1		8 times per year	8	8	8 8	8	1 0 1	1 T	1	8 8	8	8	8 8	1 T	8 8	8	8 8	18	8 8	8	8	8		8	8	8	8	8 8

	ESC-REE2A	8 times per year	8	8	8	8	8	8		5	2 5	2	8	8	8	8	8	8	8	8	8		R	8	8	8	8	_	8	8	8	8	8	8	8 8	8
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Water Column Profiling			Α	Μ	JJ	A	S	C) N	D	J	F	N	1 /	A N	1]	IJ	A	1 5	5 (C	N	D	J	F	Μ	Α	Μ	J	J	A	I S	1) :	N	D	J	F	Μ	Α	M]]		J	A	s	0	Ν	D		ī 🛛	F	М
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	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	1	4	4	4	4	4	4	4	4	1	4	4	4	4	4	4	4	ł	4	4

Benthic Recolonisation Studies			Α	Μ	JJ	A	S	0	Ν	D	J	F N	1 A	M	IJ	J	Α	S (1 C	N 1	DJ	F	Μ	Α	M	JJ	J A	S	0	Ν	D	J	F N	A A	. M	J	J	Α	S	O N	D	J	F N
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	ESCV-CPB	2 times per year																																									
	ESCV-CPC	2 times per year																																									
		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			Α	Μ	J	I A	S	C) N	D	J	F	Μ	Α	М	J	J.	A S	6 C) N	D	J	F	Μ	Α	M	J	J A	. S	0	Ν	D	J	F N	í A	Μ	J	J	Α	S	O N	N D	J	F	М
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	DS3	3 times per week				2 2	2																														\square								
	DS4	3 times per week				2 2	2																														\square								
	DS5	3 times per week				2 2	2																														\square								
Ma Wan Station								Τ																																					
	MW1	3 times per week				2 2	2																														\square								

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)

Spanne Variability Monitoring Variability Monitoring Variability Monitoring N D I F M M J J A S D N D I F M M J J J A S C N D I F M A S C N D I F M A S S D I F M A S S D I F M A S S D I F M A S S D I F M A S S D I F M A S S D I F M A S S D I I I I I I I I I I I I I I I I I <t< th=""><th>O N</th><th></th></t<>	O N	
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Intermediate Stations Downcurrent SB-INF1 4 times per year 3 3 3 3 4	\rightarrow	+
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SB-CPB 2 times per year 12 12 12		1
	++	+
Reference Stations	-++	+
RBA 2 times per year 12 12 12 12		1
RBB2 times per year121212		1
RBC2 times per year121212		

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

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⁾							
	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)							
	Bottom 5%-ile of baseline data for bottom layers = 2.96 mg L -1	Bottom The average of the impact station readings are <2 mg/L -1							
	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) ^{(4) (5)}	95%-ile of baseline data for depth average = 37.88 mg L ⁻¹	99%-ile of baseline data for depth average = 61.92 mg L -1							
	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) ^{(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 same tide of the same day	130% of control station's Tby at the 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.

Table B2Water Column Profiling Results for ESC CMP Vd in August 2018

Stations	Temp	Salinity	Turbidity		solved ygen	pН	Suspended Solids
	(°C)	(ppt)	(NTU)	(%)	(mg L-1)		(mg L-1)
WCP 1	28.64	25.45	9.16	69.60	4.68	7.80	9.03
(Downstream)							
WCP 2	28.85	24.42	6.51	72.96	4.91	7.80	6.18
(Upstream)							
WQO (Wet Season)	N/A	21.98– 26.86#	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 B3In-situ Monitoring Results for Routine Water Quality Monitoring of ESC
CMPs in August 2018

Sampling	Stations	Temp	Salinity	Turbidity	Dissolve	pН	
Period	Stations	(°C)	(ppt)	(NTU)	(%)	(mg L-1)	(mg L-1)
August	RFF (Reference)	28.70	24.67	13.08	71.40	4.82	7.77
2018	IPF (Impact)	28.88	23.53	10.72	73.05	4.95	7.76
	INF (Intermediate)	28.91	22.71	9.88	72.15	4.90	7.72
	Ma Wan	28.58	25.64	4.21	69.64	4.68	7.73
	WOO	NT / A	22.20 -	N/A	N/A	>4	6.5-8.5
	WQU	N/A	27.13#	1N/A	1N/A	-4	0.3-8.5

Notes:

*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 B4Laboratory Results for Routine Water Quality Monitoring of ESC CMPs in
August 2018

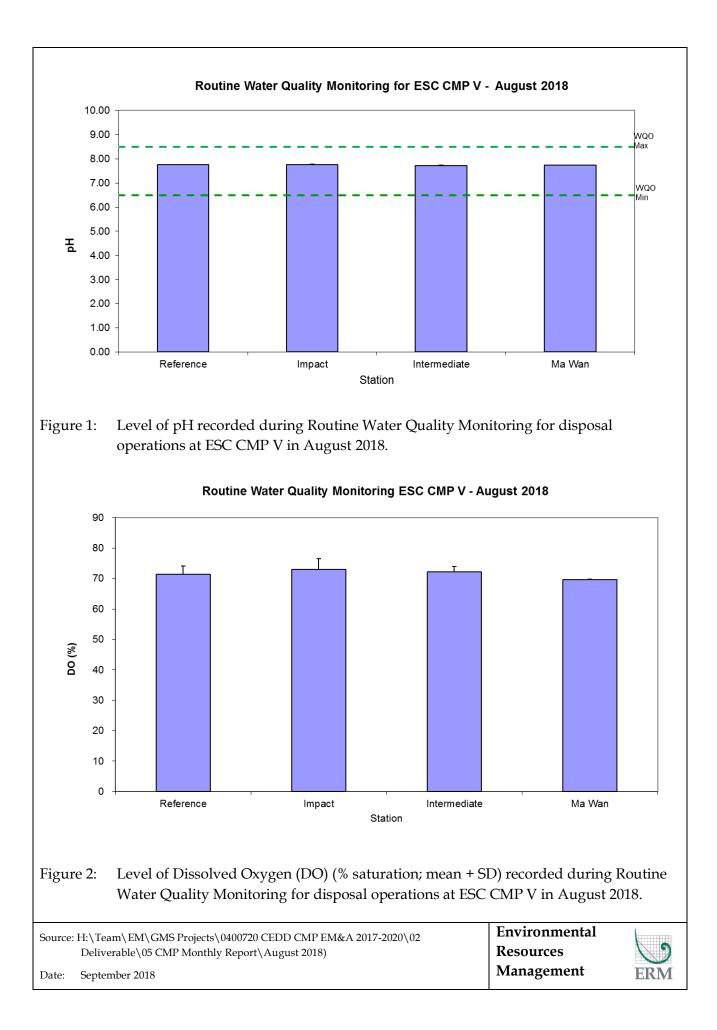
Sampling Period	Stations	As (µg/L)	Cd (µg/L)	Cr (µg/L)	Cu (µg/L)	Pb (µg/L)	Hg (µg/L)	Ni (µg/L)	Ag (µg/L)	Zn (µg/L)	NH3 (mg/L)	TIN (mg/L)	BOD5 (mg/L)	SS (mg/L)
August	RFE	1.86	< 0.50	<1.0	8.91	0.72	< 0.50	1.21	<1.0	17.26	0.06	0.70	1.24	9.41
2018	IPE	1.66	< 0.50	<1.0	7.53	0.86	< 0.50	1.70	<1.0	12.28	0.07	0.79	2.55	12.38
	INE	1.73	< 0.50	<1.0	8.46	2.02	< 0.50	1.73	<1.0	12.91	0.06	0.85	1.56	10.65
	Ma Wan	1.71	< 0.50	<1.0	6.07	<1.0	< 0.50	1.26	<1.0	17.25	0.07	0.65	1.23	5.15
												WQO of	f TIN: 0.	5 mg/L
										We	Season	WQO of	f SS : 10.8	8 mg/L

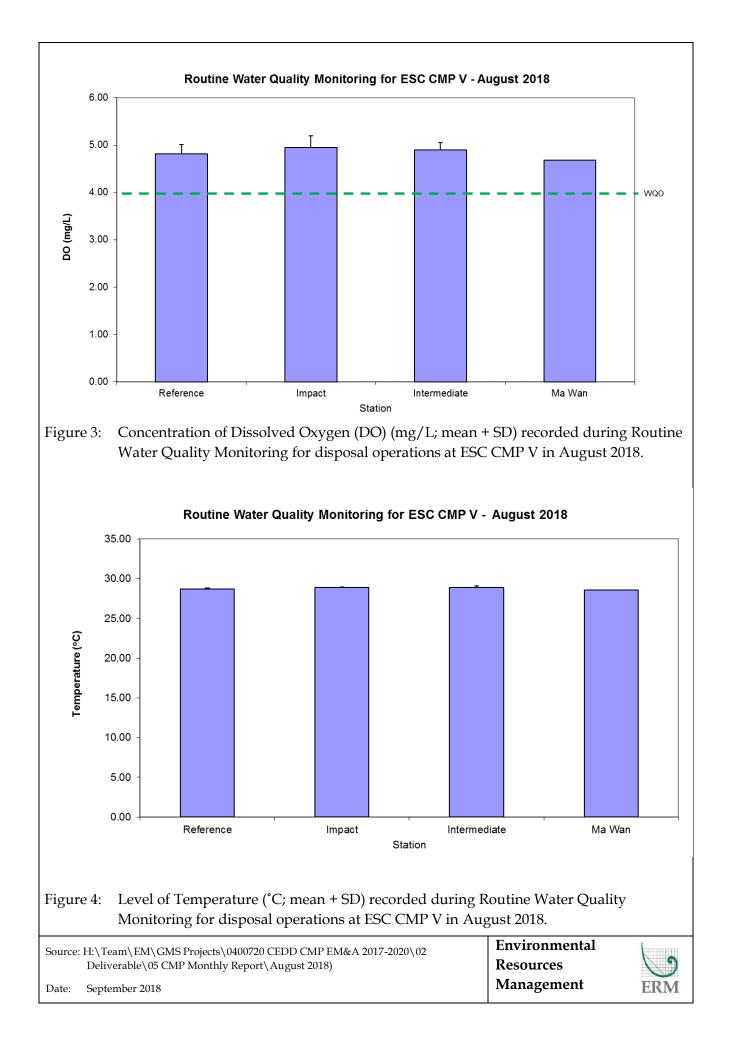
Notes:

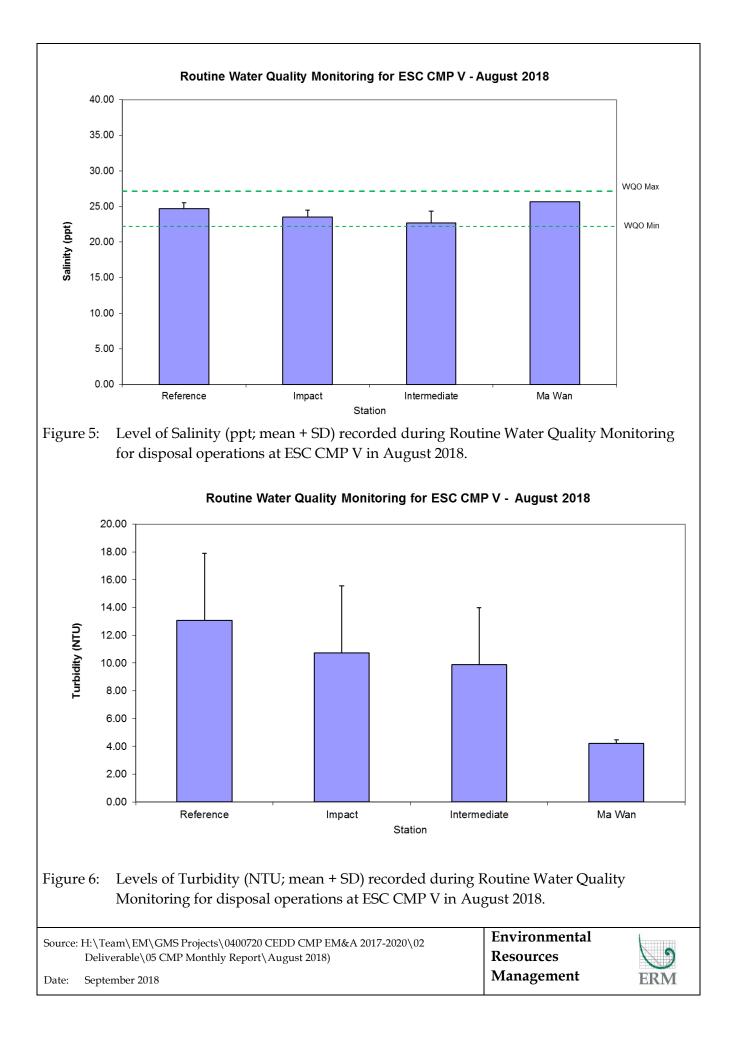
Cell shaded yellow / red indicate value exceeding the Action/Limit levels. Cell shaded grey indicate value exceeding the WQO.

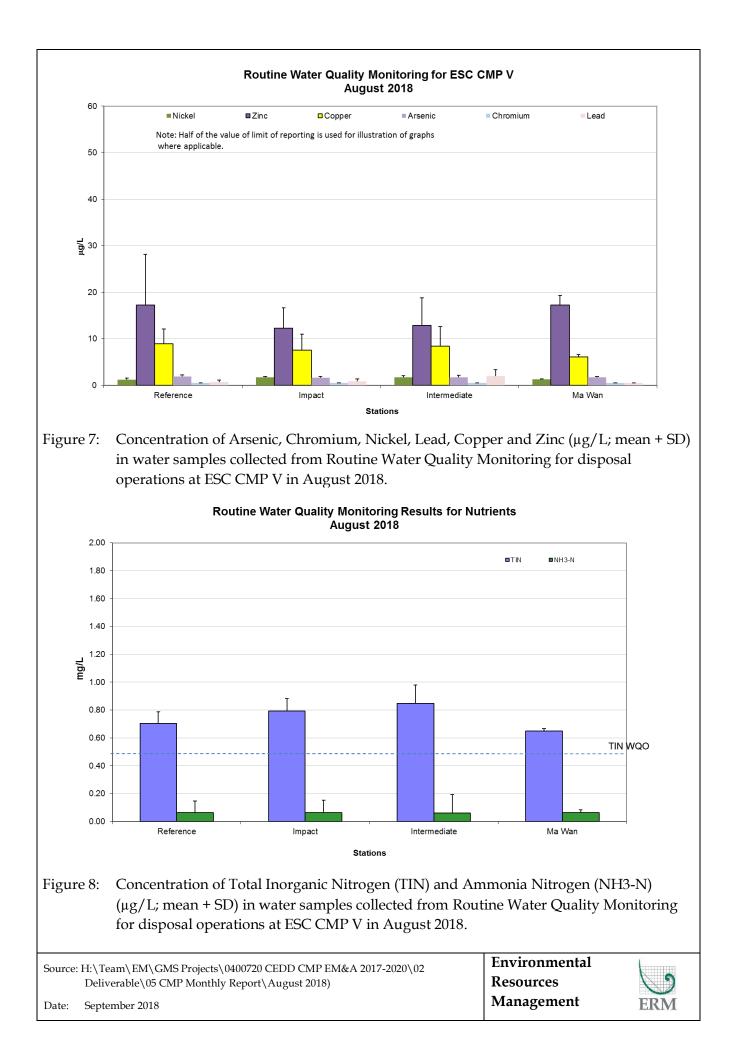
Annex C

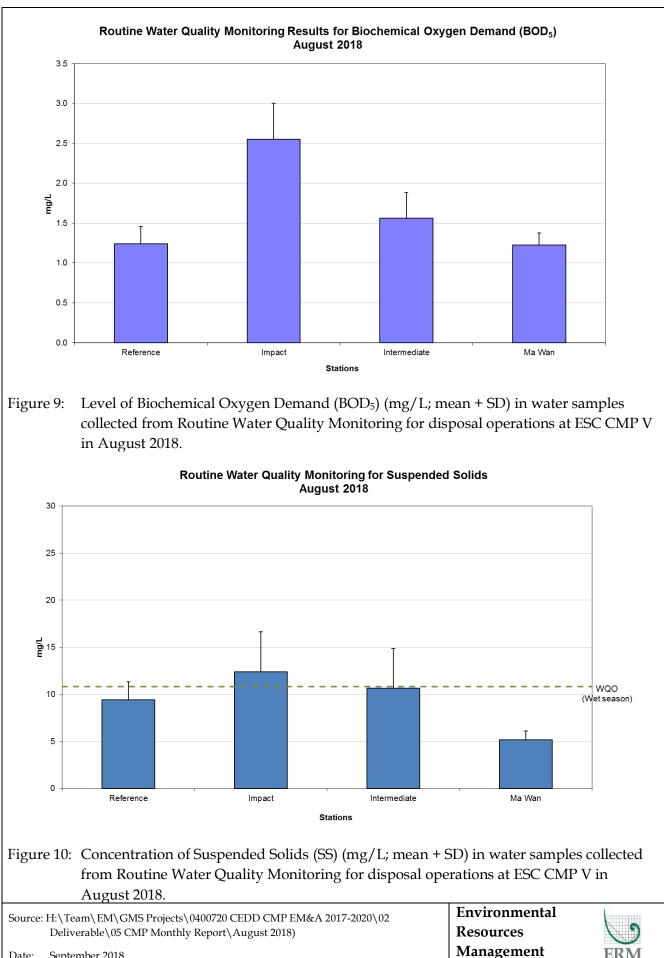
Graphical Presentations











ERM

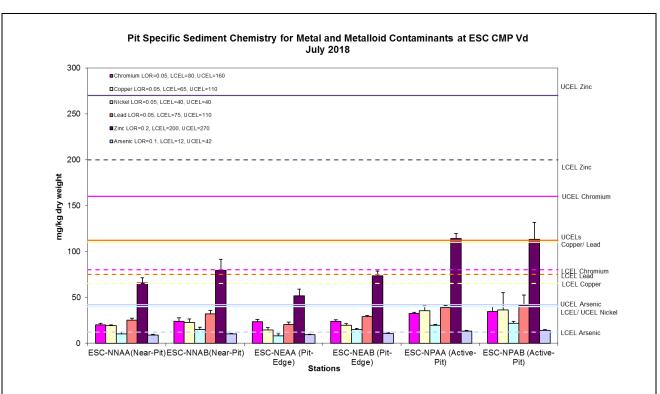
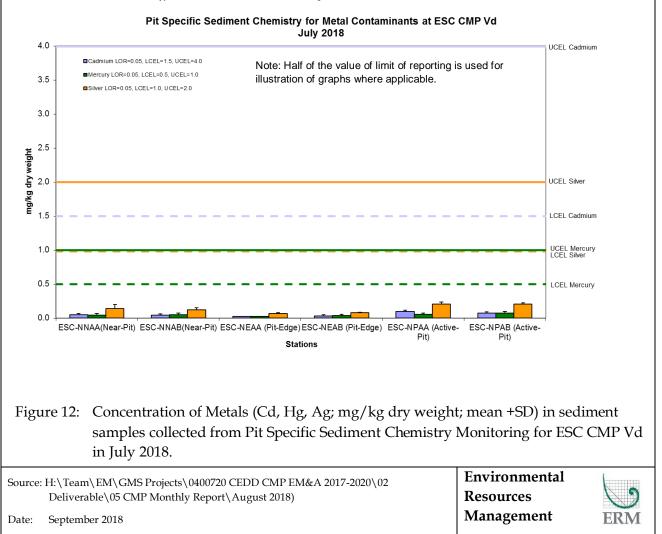
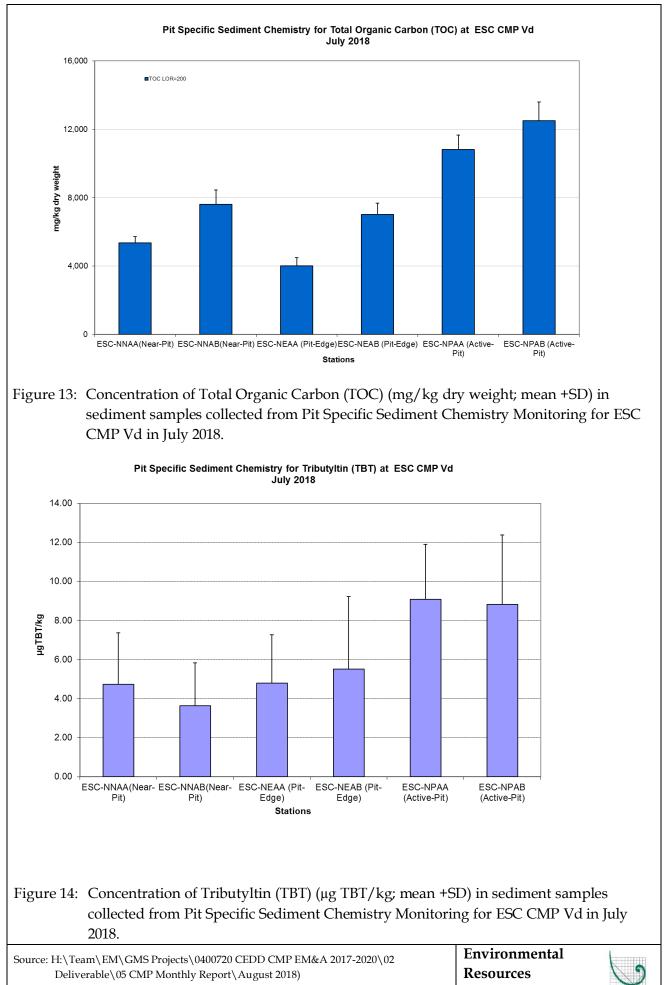


Figure 11: Concentration of Metals and Metalloid (Cr, Cu, Ni, Pb, Zn, As; mg/kg dry weight; mean +SD) in sediment samples collected from Pit Specific Sediment Chemistry Monitoring for ESC CMP Vd in July 2018.





Date: September 2018



Annex D

Study Programme

Task Name	Start	Finish		201	7				2018	3				2019				2	020			JFMA	202	21		Ξ
Commencement of Agreement No. CE 63/2016 (EP)	Sat 1/4/17	Sat 1/4/17			JAS		JJF	MA	MJJ	ASC		JFI		JJ	ASO	ND	JFM	AM.	JJA	SON	4DJ	FMA	1 M J	JAS)]
																			\square			+++			\square	
	Nov 0/4/47	Mar 5/4/04																							\square	
Project Management and General Deliverables	Mon 3/4/17	Mon 5/4/21																	\square		Π		111			
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 \cdot \right $	23	3/5													$\left \right $	++	\square	++	+++	+++	++	\vdash	++
Regular Review of EM&A Manual	Wed 2/5/18	Sat 2/5/20							>									\diamond								
Regular Site Inspections of CMP Contractors	Sat 1/4/17	Wed 31/3/21																								
Derticipate in Linian Occurs Martiner / Occurs Matines on required by OFDD	Sat 1/4/17	Wed 31/3/21																					+++	++	\square	\square
Participate in Liaison Group Meetings/ Consultations as required by CEDD	Sat 1/4/17	Weu 31/3/21																	T							
Submission of Monthly EM&A Report	Sun 14/5/17	Sun 14/3/21		>�	00		> <		$\diamond \diamond$	$\diamond \diamond$	$\diamond \diamond$	~		\diamond	>>	$\diamond \diamond$	$\diamond \diamond$		> 0		\$¢	$\Diamond \Diamond$				
Submission of Quarterly EM&A Report	Fri 14/7/17	Wed 14/4/21	$\left \right $		>	\diamond					>		\diamond					\diamond	\diamond	\diamond	++		<u></u>	++	\vdash	++
Submission of Quarterly Enter Report						Ň							Ň					Ň	ľ							
Submission of Annual EM&A Report	Sun 14/1/18	Thu 14/1/21					\diamond					\diamond					\diamond					>				
Submission of Annual Risk Assessment Report	Thu 14/6/18	Mon 14/6/21							\diamond					\diamond		_			>	\square	++	+++	\diamond	++	\vdash	+
	Er: 00/7/04	Eri 02/7/01																				+++	+++	¢_23/		\square
Submission of Draft Final Report (including database of all data collected)	Fri 23/7/21	Fri 23/7/21																							1	
Submission of Final Report (including database of all data collected)	Fri 27/8/21	Fri 27/8/21																							27/8	T
Submission of Draft Executive Summary	Fri 27/8/21	Fri 27/8/21	$\left \cdot \right $			$\left \right $				$\left \right $	++		++	$\left \cdot \right $	+			$\left \right $	++-	++	++-	+++	+++	-	27/8	++
Submission of Dran Excedure Summary																										
Submission of Final Executive Summary	Fri 1/10/21	Fri 1/10/21																							1/10	2
			$\left \right $						++-		++		++		++	_		\vdash	++	\square	++	+++	+++	++	\vdash	+
For East Tung Lung Chau Disposal Facility (subject to the actual disposal	Sun 14/10/18	Fri 14/12/18	$\left \right $													_		$\left \right $	++	\square	++	+++	+++	++	H	++
programme to be confirmed by CEDD)																										
Submission of Monthly EM&A Report	Sun 14/10/18	Fri 14/12/18									>00								++-							T
		Fri 14/12/18										14/1	2					\square	++	\square	++	+++	+++		\square	
Submission of Quarterly EM&A Report		111 14/12/10											2													
Submission of Annual EM&A Report		Fri 14/12/18									•	14/1	2													
Study Programme Task Milestone	•	S	Summa	ary						F F	Rolled	Up M	ilesto	ne 🛇												
Tue 13/6/17				<u> </u>						-																
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	a Cha	iu (20	17-2	020)	- Inv	estiga	atior	י ו)4007	20_C	MP EN	M&A	Progra	amme_	_v1_E	Л&А.m	npp