



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 – February 2018

Revision 0

March 2018

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Environmental Resources Management

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'ERM Hong- Contract with	has been prepared by Environmental Resources Management the trading name of Kong, Limited', with all reasonable skill, care and diligence within the terms of the h the client, incorporating our General Terms and Conditions of Business and int of the resources devoted to it by agreement with the client.	Distri		ernal		18001:2007 No. OHS 515956
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third parties	s confidential to the client and we accept no responsibility of whatsoever nature to to whom this report, or any part thereof, is made known. Any such party relies on their own risk.		Cor	nfidential		001 : 2008 2 No. FS 32515







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 – February 2018
Date of Report:	14 March 2018
Date prepared by ET:	14 March 2018
Date received by IA:	14 March 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/plan complies with the above referenced condition of EP-312/2008/A and EP-427/2011/A

Jovy Tam, Environmental Team Leader:

les

Date:

14/3/2018

IA Verification

I hereby verify that the ab EP-312/2008/A and EP-4	ove referenced document/ plan complies with 27/2011/A	the above	e referenced condition of
Dr Wang Wen Xiong, Independent Auditor:	Wiend Wang	Date:	14/3/2018

Date:

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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 FEBRUARY 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 February 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

Pit	Operation				20	17										20	018	3						_					2	01	9												20	20						2	021	ī
FIL	Operation	Α	м,	J,	J	۹ (S	ol	1),	J	F	М	A	М	J	J	ŀ	1 5	6	D	Ν	D	J	F	М	A	М	J	ı,	J	4	s	0	Ν	D	J	F	- 1	N	A	М	J	J	Α	s	С	1	D,	J	F	м
	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 February 2018* covers the EM&A activities for the reporting month of February 2018.

1.3 DETAILS OF SAMPLING AND LABORATORY TESTING ACTIVITIES

- 1.3.1 The following monitoring activities were undertaken for ESC CMP V in February 2018:
 - *Pit Specific Sediment Chemistry of ESC CMP Vd* was undertaken on 5 February 2018;
 - *Cumulative Impact Sediment Chemistry of ESC CMP V* was undertaken on 6 and 7 February 2018;
 - *Sediment Toxicity Tests of ESC CMP V* was undertaken on 6 and 7 February 2018;
 - *Routine Water Quality Monitoring of ESC CMP V* was undertaken on 8 February 2018;
 - *Water Column Profiling of ESC CMP Vd* was undertaken on 9 February 2018; and
 - *Demersal Trawling for ESC CMP V* was undertaken on 26 and 27 February 2018.
- 1.3.2 No monitoring activities were undertaken for SB CMP in February 2018.
- 1.4 DETAILS OF OUTSTANDING SAMPLING AND/OR ANALYSIS
- 1.4.1 No outstanding sampling remained for February 2018.
- 1.4.2 The following laboratory analyses were still in progress during the preparation of this monthly report and hence are not presented in this monthly report:
 - Laboratory analyses of sediment samples collected for *Pit Specific Sediment Chemistry for ESC CMP Vd* in February 2018; and

- Laboratory analyses of sediment samples collected for *Cumulative Impact Sediment Chemistry for ESC CMP V* in February 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 CMP V* in February 2018; and
 - Laboratory analyses for *Sediment Toxicity Test of ESC CMP V* in February 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 February 2018*:
 - Water Column Profiling of ESC CMP Vd in February 2018;
 - *Routine Water Quality Monitoring of ESC V* in February 2018;

1.5.2 Water Column Profiling of ESC CMP Vd – February 2018

1.5.3 *Water Column Profiling* was undertaken at a total of two sampling stations (Upstream and Downstream stations) on 9 February 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 dry season period (November to March) 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 February 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) http://epic.epd.gov.hk/EPICRIVER/marine/?lang=en

- 1.5.5 Analyses of results for February 2018 indicated that the SS levels complied with the WQO and the Action and Limit Levels at both Upstream and Downstream 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 – February 2018

1.5.8 Routine Water Quality Monitoring of ESC CMP V was undertaken on 8 February 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 February 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 *Figures 1 6* of *Annex C*. Analyses of results for February 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 February 2018 (*Table B3* of *Annex B*; *Figures 1, 3 and 5* of *Annex C*).
- 1.5.10 The levels of DO and Turbidity 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 February 2018.

Laboratory Measurements

1.5.12 Laboratory analysis of February 2018 results indicated that concentrations of Cadmium, Silver and Mercury were below their limit of reporting at all stations. Arsenic, Chromium, Nickel, Lead, Copper and Zinc were detected in February 2018 samples at most stations and the concentrations of these metals and metalloids were similar amongst stations (*Table B4* of *Annex B*; *Figure 7* of *Annex C*).



- 1.5.13 For nutrients, concentrations of Total Inorganic Nitrogen (TIN) at Reference and Ma Wan stations in February 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⁾. In addition, no exceedances were recorded at Impact and Intermediate stations. 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 similar amongst all stations, except for slightly higher level of BOD₅ recorded at Ma Wan station in February 2018 (*Table B4* of *Annex B; Figure 8 and 9* of *Annex C*).
- 1.5.14 Analyses of results for February 2018 indicated that the SS levels at all stations were lower than the WQO (12.8 mg/L for dry season) and 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 February 2018. Detailed statistical analysis will be presented in the Quarterly Report to investigate any spatial and temporal trends of potential concern.

1.6 ACTIVITIES SCHEDULED FOR THE NEXT MONTH

- 1.6.1 The following monitoring activities will be conducted in the next monthly period of March 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 for SB CMPs in March 2018.

1.7 STUDY PROGRAMME

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

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

Annex A

Sampling Schedule

Pit Specific Sediment Chemistry	Code	Frequency	Α		2017 A S	O N	D	J F	M A	2018 M J J	A S	6 O N D	J F	M A	М	2019 J J	A S	O N D	J	F M A		J	A S	0	I D	2021 J F	
Active-Pit	ESC-NPAA ESC-NPAB	Monthly 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	2 12 12 12 2 12 12 12 2 12 12 12		12 12 12 12		12 12 12 12	12 12 12 12				12 12 12 12				2 12 1 2 12 1	12 12 12 12	
Pit-Edge	ESC-NEAA ESC-NEAB	Monthly Monthly	12 12	12 12 12 12 12 12					12 12 12 12			2 12 12 12 2 12 12 12						12 12 12 12 12 12								12 12 12 12	
Near-Pit	ESC-NNAA ESC-NNAB		12 12	12 12 12 12 12 12					12 12 12 12			2 12 12 12 2 12 12 12											12 12 12 12			12 12 12 12	
Cumulative Impact Sediment Che Near-field Stations	emistry		A			6 0 N	D	J F				O N D											A S	0 1	I D	J F	М
	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			12 12	12 12	12 12		12 12	12		12 12		12 12	12 12	
Mid-field Stations	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 12	12 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		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 12	12		12	12		12		12 12	12 12	_
Ma Wan Station	MW1	4 times per year 4 times per year		12	12		12	12		12	12	12	12			12	12	12		12	12		12		12	12	
Sediment Toxicity Tests Near-Pit Stations			A	M J J	A S	6 0 N	D	J F	M A	M J J	A S	OND	J F	M A	M	JJ	A S	O N D	J	F M A	M J	J	A S	0 1	I D	J F	М
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	
	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		1 1	5			5	
Tissue/ Whole Body Sampling Near-Pit Stations	ESC-INA	2 times per year	A	M J J	*		D	J F *	MA	MJJ	*	O N D	J F *	MA	м	JJ	A S	O N D	J	F M A	M J	J	A S			J F *	M
Reference North	ESC-INB TNA	2 times per year 2 times per year			*			*			*		*				*			*			*		\mp	*	
Reference South	TNB	2 times per year			*			*			*		*				*			*			*			*	
	TSA TSB	2 times per year 2 times per year			*			*			*		*				*			*			*			*	
Demersal Trawling Near Pit Stations	ESC-INA	4 times per year	A	M J J 5	A S	O N	D	J F 5 5	M A	M J J 5		OND	J F 5 5	M A	M	J J 5	A S	O N D		F M A 5	M J		A S	0 1		J F 5 5	M
Reference North	ESC-INB	4 times per year		5	5			5 5		5	5		5 5		H	5	5		5	5		5	5	Ħ		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		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		\square	5 5	5 5		5 5	5 5			5 5			5 5 5 5	
Capping Ebb Tide			A	M J J	A S	O N	D	J F	M A	M J J	A S	OND	J F	M A	M	l l	A S	O N D	J	F M A	M J	J	A S	0 1	1 D	J F	M
Impact Station Downcurrent	ESC-IPE1A ESC-IPE2A	4 times per year 4 times per year	H							3	3	3	3		╞	3	3	3	H	3 3	3		3		3	3	
	ESC-IPE3 ESC-IPE4 ESC-IPE5	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	3 3 3	3 3 3		3 3 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 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	3		3 3		3	3	
Reference Station Upcurrent	ESC-INE5A ESC-RFE1	4 times per year 4 times per year								3	3	3	3			3	3	3		3	3		3		3	3	
	ESC-RFE2 ESC-RFE3 ESC-RFE4	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	3 3 3	3 3 3		3 3 3	3		3 3 3		3 3 3	3 3 3	
Ma Wan Station	ESC-RFE5	4 times per year								3	3	3	3			3	3	3		3	3		3		3	3	
Flood Tide Impact Station Downcurrent	MW1	4 times per year								3	3	3	3			3	3	3		3	3		3		3	3	
	ESC-IPF1 ESC-IPF2 ESC-IPF3	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 3 3 3	3		3 3 3		3 3 3	3 3 3	
Intermediate Station Downcurrent	ESC-INF1 ESC-INF2	4 times per year								3	3	3	3			3	3	3		3	3		3		3	3	
Reference Station Upcurrent	ESC-INF3	4 times per year 4 times per year								3	3	3	3			3	3	3		3	3		3		3	3	
	ESC-RFF1A ESC-RFF2A ESC-RFF3	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	3 3 3	3 3 3		3 3 3	3 3 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		3	3	
Routine Water Quality Monitorin Ebb Tide	g		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	М	l l	A S	O N D	J	F M A	M J	J	A S	0 1	1 D	J F	Μ
Impact Station Downcurrent	ESC-IPE1A ESC-IPE2A ESC-IPE3 ESC-IPE4	8 times per year 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 8 8			8 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 times per year	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	8	8	8	8 8	8	8 8	
	ESC-INE1A ESC-INE2A ESC-INE3A ESC-INE4A	8 times per year 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 8	8 8 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-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 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	8 8 8 8 8 8	
Ma Wan Station	ESC-RFE4 ESC-RFE5	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	88	8	8 8 8 8	
Flood Tide	MW1	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	3	8 8	7
Impact Station Downcurrent	ESC-IPF1 ESC-IPF2	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	
Intermediate Station Downcurrent	ESC-IPF3 ESC-INF1	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	
Reference Station II-	ESC-INF2 ESC-INF3	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	
Reference Station Upcurrent	ESC-RFF1A 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 8 8 8		8 8 8 8	8	8	8	8 8	8	8 8 8 8	
Ma Wan Station	ESC-RFF3 MW1	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	88		8 8 8 8	
Water Column Profiling			Α	M J J	A S	6 0 N			M A	M J J	A S	O N D	J F	M A	M			O N D	J	F M A		J		0	N D	J F	
Plume Stations	WCP1 WCP2	Monthly Monthly	4	4 4 4	4 4	4 4	4	4 4	4 4	4 4 4	4 4	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	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 Capped Stations at CMPV	ESCV-CPA	2 times per year	A	M J J	A S	O N	D	J F	M A	M J J	A S	OND	J F	M A	M	JJ	A S	O N D	J	F M A	M J	J	A S	0 1	I D	J F	Μ
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Impact Monitoring for Dredging			Α	Μ	JJ	Α	S	0	N E) J	F	Μ	Α	Μ	J	J.	A S	6 0	Ν	D	J	F	Μ	AN	ИJ	J	Α	S	0	NI	J	F	Μ	A 1	M J	IJ	Α	s	0	NΓ) J	FM	í I
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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)

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	++	+
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 February 2018

Stations	Temp	Salinity	Turbidity		solved ygen	pН	Suspended Solids
	(°C)	(ppt)	(NTU)	(%)	(mg L-1)		(mg L-1)
WCP 1	15.14	32.00	2.12	96.19	7.95	8.12	2.58
(Downstream) WCP 2 (Upstream)	15.26	32.00	2.09	95.44	7.87	8.10	3.08
WQO (Dry season)	N/A	28.80– 35.20#	N/A	N/A	>4	6.5-8.5	12.8

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 February 2018

Sampling	Stations	Temp	Salinity	Turbidity	Dissolve	d Oxygen	pН
Period	Stations	(°C)	(ppt)	(NTU)	(%)	(mg L-1)	(mg L-1)
February	RFE (Reference)	15.04	31.96	3.64	94.15	7.80	8.14
2018	IPE (Impact)	14.73	31.98	3.85	96.52	8.04	8.16
	INE (Intermediate)	14.65	31.98	4.23	97.11	8.11	8.18
	Ma Wan	15.46	32.00	2.08	89.40	7.34	8.09
	WOO	NT / A	28.76 -	N/A	N/A	>4	6.5-8.5
	WQU	N/A	35.15#	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
February 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)	
February	RFE	1.35	<0.5	0.68	1.95	0.74	< 0.5	1.86	<1.0	36.28	0.20	0.52	1.09	6.00	
2018	IPE	1.78	< 0.5	0.63	<1.0	<1.0	< 0.5	1.06	<1.0	32.10	0.13	0.35	1.85	6.23	
	INE	1.83	< 0.5	0.89	1.21	1.01	< 0.5	2.35	<1.0	31.66	0.14	0.47	1.18	5.98	
	Ma Wan	1.66	< 0.5	0.95	1.85	0.68	< 0.5	1.17	<1.0	43.49	0.20	0.53	3.21	5.28	
	WQO of TIN: 0.5 mg/L														
		Dry Season WQO of SS : 12.8 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











Annex D

Study Programme

Task Name		rt Finish			7				2018	3				2019				2	020			JFMA	202	21		Ξ
Commencement of Agreement No. CE 63/2016 (EP)		Sat 1/4/17			JAS		JJF	MA	MJJ	ASC		JFI		JJ	ASO	ND	JFM	AM.	JJA	SON	4DJ	FMA	1 M J	JAS)]
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		Mar 5/4/04																							\square	
Project Management and General Deliverables		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		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 OCDD	Sat 1/4/17	Wod 21/2/21																					+++	++	\square	\square
Participate in Liaison Group Meetings/ Consultations as required by CEDD	Sat 1/4/17	Wed 31/3/21																	T							
Submission of Monthly EM&A Report		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		Wed 14/4/21	$\left \right $		>	\diamond					>		\diamond					\diamond	\diamond	\diamond	++		<u></u>	++	\vdash	++
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Submission of Annual EM&A Report		Thu 14/1/21					\diamond					\diamond					\diamond					>				
Submission of Annual Risk Assessment Report		Mon 14/6/21							\diamond					\diamond		_			>	\square	++	+++	\diamond	++	\vdash	+
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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
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For East Tung Lung Chau Disposal Facility (subject to the actual disposal		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
Submission of Quarterly EM&A Report		Fri 14/12/18										14/1	2					\square	++	\square	++	+++	+++		\square	
Submission of Quarterly EMAA Report		111 14/12/10											2													
Submission of Annual EM&A Report		Fri 14/12/18									•	14/1	2													
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