MOTT MACDONALD

Agreement No. CE 59/2020 (EP) Environmental Monitoring and Audit for Disposal Facility to the East of Sha Chau (2021-2026) – Investigation

Monthly EM&A Report for
Contaminated Mud Pits to the East of Sha Chau
– April 2022

May 2022

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Mott MacDonald Hong Kong Limited
registered in Hong Kong no. 236497

土木工程拓展署
Civil Engineering and
Development Department

MOTT MACDONALD

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

Environmental Certification Sheet

Environmental Permit No. 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 – April 2022
Date of Report:	11 May 2022
Date prepared by ET:	11 May 2022
Date received by IA:	11 May 2022

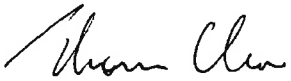
Reference EP Condition

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 10 working days after the end of the reporting month. The EM&A Reports shall include a summary of all non-compliance (exceedances) of the environmental quality performance limits (Action and Limit Levels). The submissions shall be 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.

Ir Thomas Chan,
Environmental Team Leader (ETL):  Date: 11 May 2022

IA Verification

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

Dr Wang Wen Xiong,
Independent Auditor (IA):  Date: 11 May 2022

Issue and Revision Record

Revision	Date	Originator	Checker	Approver	Description
A	May 2022	Various	Thomas Chan	Eric Ching	Revision A of Submission

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1 Introduction

1.1 Background

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 East of Sha Chau (ESC) for the disposal of contaminated sediment, and various open-sea disposal grounds located to the South of Cheung Chau (SCC), East of Tung Lung Chau (ETLC) and East of Ninepins (ENP) for the disposal of uncontaminated sediment.

Environmental Permits (EPs) (Ref. No. EP-312/2008/A) was issued by the Environmental Protection Department (EPD) to the CEDD, the Permit Holder, on 28 November 2008 for the Project - Disposal of Contaminated Sediment – Dredging, Management and Capping of Sediment Disposal Facility at Sha Chau.

Under the requirements of the EP, 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. 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.

A proposal on the change of number of sample replication of water quality and sediment monitoring as well as combination of routine water quality monitoring and water quality monitoring during capping operation was submitted to EPD and agreed by EPD on 3 December 2020. The proposed changes have been effective for the EM&A activities since December 2020. The latest sampling schedule is provided in **Appendix A**.

The present EM&A programme under Agreement No. CE 59/2020 (EP) covers the dredging, disposal and capping operations of the ESC CMP V (see **Appendix A** for the EM&A programme.) Detailed works schedule for ESC CMP V is shown in **Table 1.1**. In April 2022, the following works were undertaken:

- Dredging of accumulated natural deposits at ESC CMP Vc;
- Disposal of contaminated mud at ESC CMP Vb; and
- Capping operations at ESC CMP Vd.

Table 1.1: Works Schedule for ESC CMP V

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

[2] ERM (2017) Final Report. Submitted under Agreement No. CE 23/2012 (EP) Environmental Monitoring and Audit for Contaminated Mud Pits to the South of The Brothers and at East Sha Chau (2012 - 2017). For CEDD.

1.2 Reporting Period

This *Monthly EM&A Report for Contaminated Mud Pits to the East of Sha Chau – April 2022* covers the EM&A activities for the reporting period of April 2022 (from 1 to 30 April 2022).

1.3 Details of Sampling and Laboratory Testing Activities

The following monitoring activities were undertaken for ESC CMP V during the reporting period:

- Water Column Profiling of ESC CMP Vb;
- Routine Water Quality Monitoring of ESC CMPs;
- Pit Specific Sediment Chemistry of ESC CMP Vb; and
- Water Quality Monitoring During Dredging of ESC CMP Vc.

1.4 Details of Outstanding Sampling or Analysis

No outstanding sampling remained for the reporting month (April 2022).

2 Brief Discussion of Monitoring Results for ESC CMP V

2.1 Introduction

This section presents a brief discussion of the results obtained from the following monitoring activities for ESC CMP V during the reporting period:

- Water Column Profiling of ESC CMP Vb;
- Routine Water Quality Monitoring of ESC CMPs;
- Pit Specific Sediment Chemistry of ESC CMP Vb; and
- Water Quality Monitoring During Dredging of ESC CMP Vc.

2.2 Water Column Profiling of ESC CMP Vb – in April 2022

Water Column Profiling was undertaken at a total of two sampling stations (Upstream and Downstream stations) on 20 April 2022. 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 2011 – 2020 from stations in the North Western Water Control Zone (WCZ), where the ESC CMPs are located.[3] 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 **Appendix B** for details).

2.2.1 In-situ Measurements

Analyses of results for April 2022 indicated that levels of Salinity, pH and DO complied with the WQOs at both Downstream and Upstream stations (**Table B2** of **Appendix B**). Levels of DO and Turbidity at all stations complied with the Action and Limit Levels (**Tables B1 and B2** of **Appendix B**).

2.2.2 Laboratory Measurements for Suspended Solids (SS)

Analyses of results for April 2022 indicated that the SS level at both Downstream and Upstream stations complied with the WQO and the Action and Limit Levels (**Tables B1 and B2** of **Appendix B**).

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.

2.3 Routine Water Quality Monitoring of ESC CMPs – in April 2022

Routine Water Quality Monitoring of ESC CMPs was undertaken on 14 April 2022. The monitoring results have been assessed for compliance with the WQOs (see **Section 2.2** above for details). The monitoring results are shown in **Tables B3 and B4** of **Appendix B** and **Figures 1 to 10** of **Appendix C**. A total of sixteen (16) monitoring stations were sampled in April 2022 as shown in **Figure 2.1**.

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

2.3.1 In-situ Measurements

Graphical presentation of the monitoring results (Temperature, DO, pH, Salinity and Turbidity) is shown in **Figures 1 to 6** of **Appendix C**. Analyses of results indicated that the levels of pH, Salinity and DO complied with the WQOs at most stations in April 2022, except for higher levels of Salinity were recorded at Ma Wan station. The higher Salinities recorded at Ma Wan station are likely to be caused by the larger separation distance to Pearl River Delta mouth, which releases a large amount of freshwater runoff in the area during wet season, when compared to the Reference stations.

The levels of DO and Turbidity complied with the Action and Limit Levels at all stations (**Table B3** of **Appendix B**; **Figures 3 and 6** of **Appendix C**).

Overall, in-situ measurement results of the Routine Water Quality Monitoring indicated that the disposal and capping operation at ESC CMPs did not appear to cause any unacceptable impacts in water quality in April 2022.

2.3.2 Laboratory Measurements

Laboratory analysis of samples obtained during the reporting period indicated that the concentrations of Arsenic, Chromium, Copper, Lead, Nickel and Zinc were detected in the samples at all stations and their concentrations of most metals and metalloids were generally similar across stations, except the concentration of Zinc which was higher at Intermediate (INE) station (**Table B4** of **Appendix B**; **Figure 7** of **Appendix C**).

For nutrients, concentrations of Total Inorganic Nitrogen (TIN) were higher than the WQO (0.5 mg/L) at Reference (RFE), Impact (IPE), Intermediate (INE) and Ma Wan stations (**Table B4** of **Appendix B**; **Figure 8** of **Appendix 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.[4] Therefore, the exceedances of TIN WQO at these stations are unlikely to be caused by the disposal operation at ESC CMPs. The concentration of Ammonia Nitrogen (NH_3-N) was slightly higher at Ma Wan station (**Table B4** of **Appendix B**; **Figure 8** of **Appendix C**). The concentration of Biochemical Oxygen Demand (BOD_5) was higher at Intermediate (INE) station (**Table B4** of **Appendix B**; **Figure 9** of **Appendix C**).

Analyses of results for the reporting period indicated that the SS levels at all stations complied with the wet season WQO (12.0 mg/L) and the Action and Limit Levels (**Tables B1 and B4** of **Appendix B**; **Figure 10** of **Appendix C**).

Overall, results of the Routine Water Quality Monitoring indicated that the disposal and capping operation at ESC CMPs did not appear to cause any unacceptable deterioration in water quality during the reporting period. Detailed statistical analysis will be presented in the Quarterly EM&A Report to investigate any spatial and temporal trends of potential concern.

2.4 Pit Specific Sediment Chemistry of ESC CMP Vb – in April 2022

Monitoring locations for Pit Specific Sediment Chemistry for ESC CMP Vb are shown in **Figure 2.2**. A total of six (6) monitoring stations were sampled on 7 April 2022.

The concentrations of most inorganic contaminants were lower than the Lower Chemical Exceedance Levels (LCELs) at most stations, except for Copper, Arsenic and Silver. The concentrations of Copper and Silver were higher than the LCELs at Active-Pit station ESC-NPCA; The concentrations of Arsenic were higher than the LCEL at Pit-Edge station ESC-NECA and Active-Pit station ESC-NPCB (**Figures 11 and 12** of **Appendix C**).

[4] http://www.epd.gov.hk/epd/misc/marine_quality/1986-2005/textonly/eng/index.htm

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.[5] It is presumed that the natural concentrations of Arsenic are similar in onshore and offshore sediments,[6] and relatively high Arsenic levels may thus occur throughout Hong Kong. Therefore, the LCEL 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.

Considering that the higher levels of Copper and Silver occurred within one Active-Pit station only but not at the Pit-Edge and Near-Pit stations, 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 the reporting month.

For organic contaminants, the concentration of Total Organic Carbon (TOC) was higher at Active-Pit station ESC-NPCA during the reporting period (**Figure 13** of **Appendix C**). The concentrations of Tributyltin (TBT), Total Polychlorinated Biphenyls (PCBs), Total dichloro-diphenyl-trichloroethane (DDT), 4,4'-dichlorodiphenyldichloroethylene (DDE), Low Molecular Weight and High Molecular Weight Polycyclic Aromatic Hydrocarbons (PAHs) were below the limit of reporting at all stations during the reporting period.

Overall, there is no evidence indicating any unacceptable environmental impacts to sediment quality outside the pit area as a result of the contaminated mud disposal operations at ESC CMP Vb during the reporting period.

Statistical analysis will be undertaken and presented in the corresponding Quarterly EM&A Report to investigate whether there are any unacceptable impacts in the area caused by the contaminated mud disposal.

2.5 Impact Water Quality Monitoring during Dredging Operations of ESC CMP Vc – April 2022

Dredging activities were carried out from 1 to 24 April 2022 during this reporting period and suspended from 25 to 30 April 2022 due to machinery issue. Water quality monitoring was conducted during the reporting period on 1, 4, 6, 8, 11, 13, 15, 19, 21, 23 and 25 April 2022. During each survey day, monitoring was conducted during both mid-ebb and mid-flood tides at two Reference (Upstream) stations and five Impact (Downstream) stations around the dredging operations at ESC CMP Vc. Monitoring was also conducted at one Sensitive Receiver station situated in Ma Wan. A total of eight (8) stations were monitored and locations of the sampling stations are shown in **Figure 2.3**.

Monitoring results are presented in **Table B5** of **Appendix B**. Daily dredging volume in April 2022 is reported in **Appendix D**. Levels of DO, Turbidity and SS generally complied with the Action and Limit Levels (see **Table B1** of **Appendix B** for details), except for the following occasions discussed in **Table 2.1** below. The results indicated that the dredging operations at ESC CMP Vc did not appear to cause any unacceptable deterioration in water quality during this reporting period. Therefore, no further action, except for those recommended in the Environmental Permit (EP-312/2008/A), are considered necessary for the dredging operations.

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

[6] 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

Table 2.1: Details of Exceedances Recorded at ESC CMP Vc during the Reporting Period

Date	Tide	Parameter	Station	Type of Exceedance	Remarks
19 April 2022	Mid-Flood	Turbidity	DS4	Action	These exceedances were not considered as indicating any unacceptable impacts from the dredging operations to Water Sensitive Receivers (WSRs) outside the works area due to the following reason: • Stations DS4 and DS5 are located further away from the works area of ESC CMP Vc when compared to stations DS1-3 at which the levels of Turbidity did not exceed the Action and Limit Levels during the same tidal period.
19 April 2022	Mid-Flood	Turbidity	DS5	Limit	
19 April 2022	Mid-Flood	SS	DS4	Action	This exceedance was not considered as indicating any unacceptable impacts from the dredging operations to WSRs outside the works area due to the following reason: • Station DS4 is located further away from the works area of ESC CMP Vc when compared to stations DS1-3 at which the levels of SS did not exceed the Action and Limit Levels during the same tidal period.

3 Future Key Issues

3.1 Activities Scheduled for the Next Reporting Period

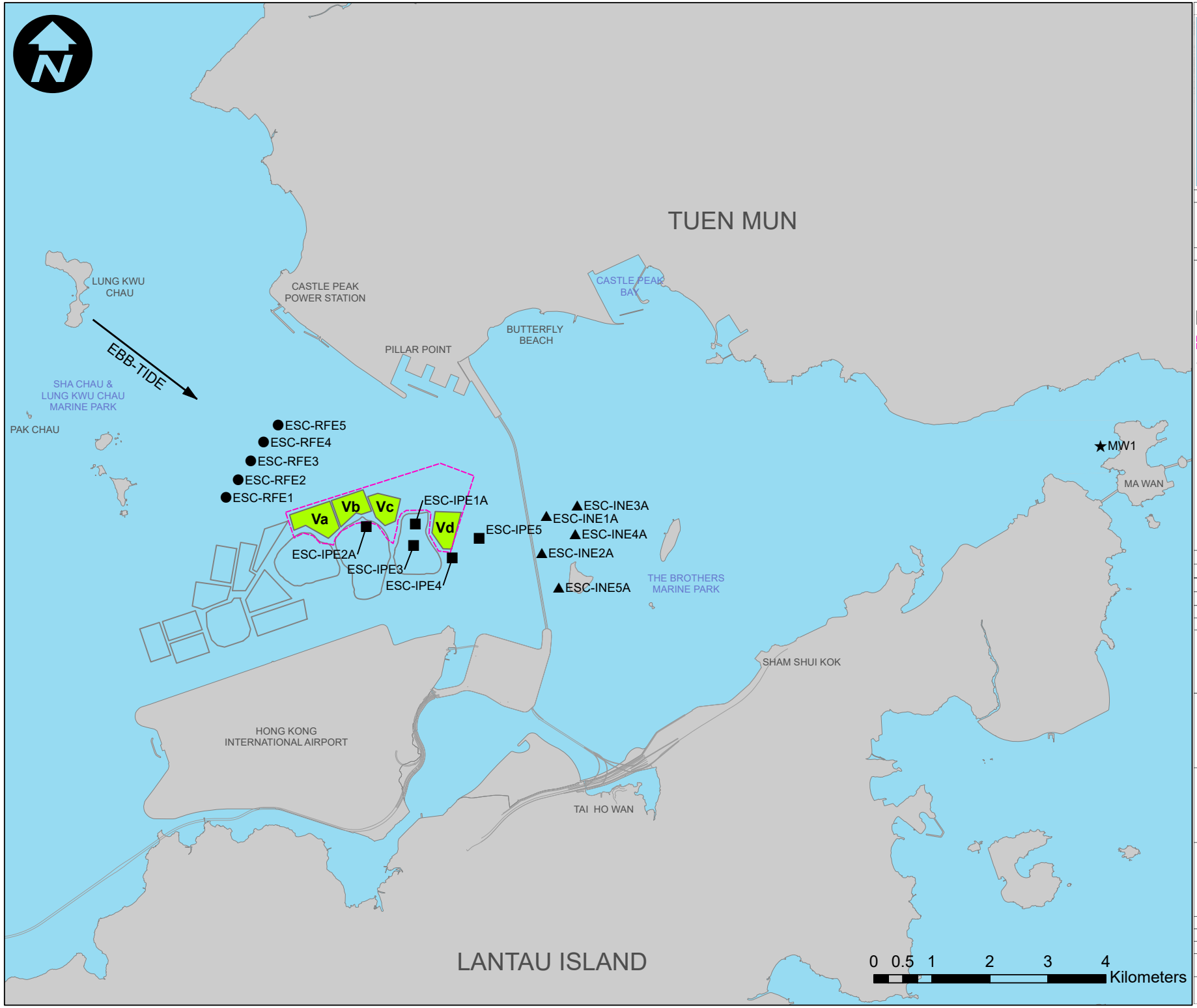
The following monitoring activities will be conducted in the next reporting period of May 2022 for ESC CMP V (see **Appendix A** for the sampling schedule):

- Water Column Profiling of ESC CMP Vb;
- Routine Water Quality Monitoring of ESC CMPs;
- Pit Specific Sediment Chemistry of ESC CMP Vb; and
- Water Quality Monitoring During Dredging of ESC CMP Vc.

3.2 Study Programme

A summary of the Study Programme is presented in **Appendix E**.

Figures



Key Plan:

Notes:

Key to symbols:

LEGEND

- ESC CMP V
- ESC USABLE AREA 1

WATER QUALITY SAMPLING STATIONS

- ■ IMPACT STATION
- ▲ INTERMEDIATE STATION
- ● REFERENCE STATION
- ★ MA WAN STATION

Rev	Date	Drawn	Description	Ch'k'd	App'd
P1	APR 2021	KN			

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Project

AGREEMENT NO. CE 59/2020 (EP) ENVIRONMENTAL MONITORING AND AUDIT FOR DISPOSAL FACILITY TO THE EAST OF SHA CHAU (2021-2026) – INVESTIGATION

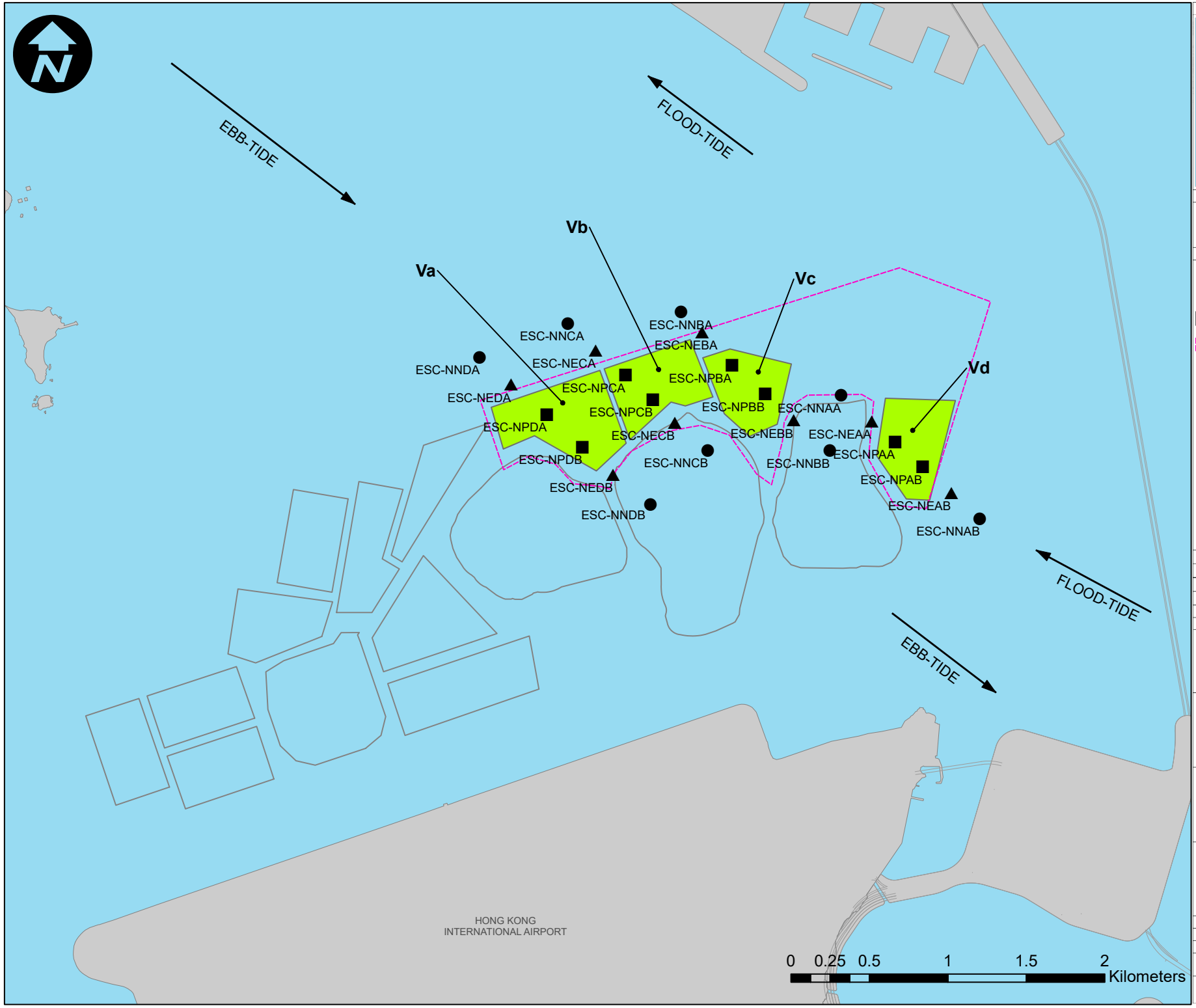
Title

ROUTINE & CAPPING WATER QUALITY SAMPLING STATIONS (EBB-TIDE) FOR ESC CMPS

Designed			Eng check		
Drawn			Coordination		
Dwg check			Approved		
Scale at A3		Status		Rev	

Drawing Number

FIGURE 2.1



Key Plan:

Notes:

Key to symbols:

LEGEND

ESC CMP V

ESC USABLE AREA 1

PIT SPECIFIC SEDIMENT MONITORING STATIONS

ACTIVE-PIT STATION

PIT-EDGE STATION

NEAR-PIT STATION

Rev	Date	Drawn	Description	Ch'k'd	App'd
P1	APR 2021	KN			

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ENVIRONMENTAL MONITORING AND AUDIT FOR DISPOSAL FACILITY TO THE EAST OF SHA CHAU (2021-2026) – INVESTIGATION**

Title

PIT SPECIFIC SEDIMENT QUALITY MONITORING STATIONS FOR CMP V

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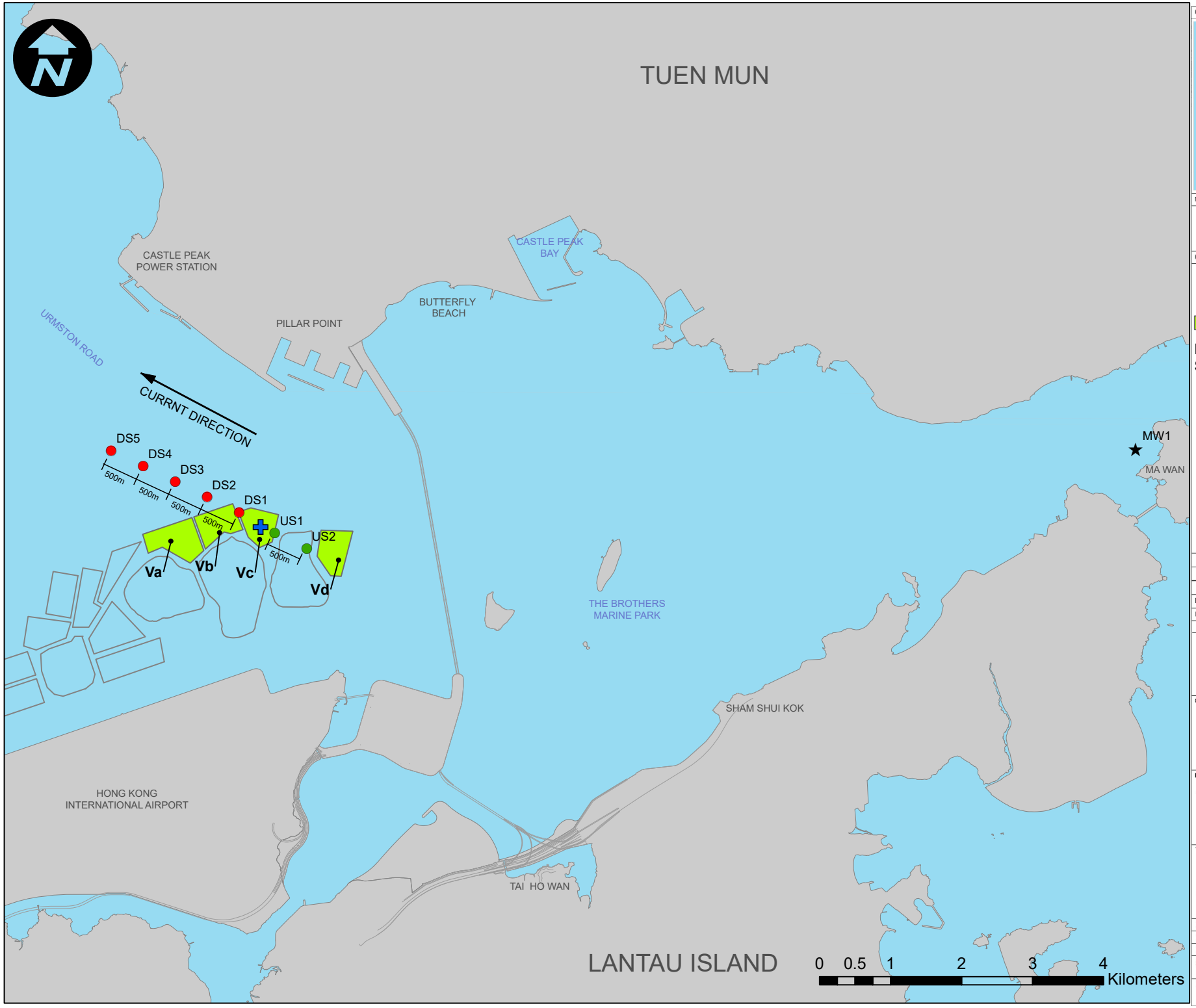
Drawn			Coordination		
Dwg check			Approved		
Scale at A3		Status		Rev	

Drawing Number

FIGURE 2.2



Key Plan:

Notes:

Key to symbols:

LEGEND

ESC CMP V

INDICATIVE DREDGING IMPACT SAMPLING STATIONS

- POSITION OF DREDGING ACTIVITY
- DOWNSTEAM/ IMPACT STATION
- UPSTREAM/ REFERENCE STATION
- MA WAN STATION

Rev	Date	Drawn	Description	Ch'k'd	App'd
P1	AUG 2021	KN			

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Title

INDICATIVE DREDGING IMPACT SAMPLING STATIONS FOR ESC CMPS

Designed			Eng check		
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Dwg check			Approved		
Scale at A3		Status		Rev	

Drawing Number

FIGURE 2.3

Appendices

Appendix A. Sampling Schedule

East of Sha Chau CMPs
Environmental Monitoring and Audit Sampling Schedule
(January 2021 - March 2026)

Parameter / Station Type	Station ID	Frequency	2021												2022												2023												2024												2025												2026		
Pit Specific Sediment Chemistry *			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Active-Pit																																																																		
	ESC-NPAA	Monthly	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
	ESC-NPAB	Monthly	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Pit-Edge																																																																		
	ESC-NEAA	Monthly	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
	ESC-NEAB	Monthly	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Near-Pit																																																																		
	ESC-NNAA	Monthly	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
	ESC-NNAB	Monthly	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Cumulative Impact Sediment Chemistry *			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Near-field Stations																																																																		
	ESC-RNA	4 times per year		6				6		6				6		6				6		6				6		6				6		6				6		6				6		6				6		6				6		6				6		6	
	ESC-RNB1	4 times per year		6				6		6				6		6				6		6				6		6				6		6				6		6				6		6				6		6				6		6				6		6	
Mid-field Stations																																																																		
	ESC-RMA	4 times per year		6				6		6				6		6				6		6				6		6				6		6				6		6				6		6				6		6				6		6				6		6	
	ESC-RMB	4 times per year		6				6		6				6		6				6		6				6		6				6		6				6		6				6		6				6		6				6		6				6		6	
Capped Pit Stations																																																																		
	ESC-RCA1	4 times per year		6				6		6				6		6				6		6				6		6				6		6				6		6				6		6				6		6				6		6				6		6	
	ESC-RCB1	4 times per year		6				6		6				6		6				6		6				6		6				6		6				6		6				6		6				6		6				6		6				6		6	
Far-field Stations																																																																		
	ESC-RFA	4 times per year		6				6		6				6		6				6		6				6		6				6		6				6		6				6		6				6		6				6		6				6		6	
	ESC-RFB	4 times per year		6				6		6				6		6				6		6				6		6				6		6				6		6				6		6				6		6				6		6				6		6	
Ma Wan Station																																																																		
	MW1	4 times per year		6				6		6				6		6				6		6				6		6				6		6				6		6				6		6				6		6				6		6				6		6	
Sediment Toxicity Tests			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Near-pit Stations																																																																		
	ESC-TDA	2 times per year		5						5							5#					5						5						5						5						5						5						5						5	
	ESC-TDB1	2 times per year		5						5							5#					5						5						5						5						5						5						5						5	
Reference Stations																																																																		
	ESC-TRA	2 times per year		5						5							5#					5						5						5						5						5						5						5						5	
	ESC-TRB	2 times per year		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						5						5						5	
Tissue / Whole Body Sampling			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Near-pit Stations																																																																		
	ESC-INA	2 times per year		*						*						*						*						*						*						*						*						*						*						*	
	ESC-INB	2 times per year		*						*						*						*						*						*						*						*						*						*						*	
Reference North																																																																		
	TNA	2 times per year		*						*						*						*						*						*						*						*						*						*						*	
	TNB	2 times per year		*						*						*						*						*						*						*						*						*						*						*	
Reference South																																																																		
	TSA	2 times per year		*						*						*						*						*						*						*						*						*						*						*	
	TSB	2 times per year		*						*						*						*						*						*						*						*						*						*						*	
Demersal Trawling			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Near-pit Stations																																																																		
	ESC-INA	4 times per year	5	5					5	5					5	5					5	5					5	5					5	5					5	5					5	5					5	5					5	5					5	5	
	ESC-INB	4 times per year	5	5					5	5					5	5					5	5					5	5					5	5					5	5					5	5					5	5					5	5					5	5	
Reference North																																																																		
	TNA	4 times per year	5	5					5	5					5	5					5	5					5	5					5	5					5	5					5	5					5	5					5	5					5	5	
	TNB	4 times per year	5	5					5	5					5	5					5	5					5	5					5	5					5	5					5	5					5	5					5	5					5	5	
Reference South																																																																		
	TSA	4 times per year	5	5					5	5					5	5					5	5					5	5					5	5					5	5					5	5					5	5					5	5					5	5	
	TSB	4 times per year	5	5					5	5					5	5					5	5					5	5					5	5					5	5					5	5					5	5					5	5					5	5	
Capping *			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Ebb Tide																																																																		
Impact Station Downcurrent																																																																		
	ESC-IPE1A	4 times per year *																																																																	
	ESC-IPE2A	4 times per year *																																																																	
	ESC-IPE3	4 times per year *																																																																	
	ESC-IPE4	4 times per year *																																																																	
	ESC-IPE5	4 times per year *																																																																	
Intermediate Station Downcurrent																																																																		
	ESC-INE1A	4 times per year *																																																																	
	ESC-INE2A	4 times per year *																																																																	
	ESC-INE3A	4 times per year *																																																																	
	ESC-INE4A	4 times per year *																																																																	
	ESC-INE5A	4 times per year *																																																																	
Reference Station Upcurrent																																																																		
	ESC-RFE1	4 times per year *																																																																	
	ESC-RFE2	4 times per year *																																																																	
	ESC-RFE3	4 times per year *																																																																	
	ESC-RFE4	4 times per year *																																																																	
	ESC-RFE5	4 times per year *																																																																	
Ma Wan Station																																																																		
	MW1	4 times per year *																																																																	
Flood Tide																																																																		
Impact Station Downcurrent																																																																		
	ESC-IPF1	4 times per year *																																																																	
	ESC-IPF2	4 times per year *																																																																	
	ESC-IPF3	4 times per year *																																																																	
Intermediate Station Downcurrent																																																																		
	ESC-INF1	4 times per year *																																																																	
	ESC-INF2	4 times per year *																																																																	
	ESC-INF3	4 times per year *																																																																	
Reference Station Upcurrent																																																																		
	ESC-RFF1A	4 times per year *																																																																	
	ESC-RFF2A	4 times per year *																																																																	
	ESC-RFF3	4 times per year *																																																																	
Ma Wan Station																																																																		
	MW1	4 times per year *																																																																	
Routine Water Quality Monitoring *			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Ebb Tide																																																																		
Impact Station Downcurrent																																																																		
	ESC-IPE1A	Monthly*				4	4	4		4		4	4			4		4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	ESC-IPE2A	Monthly*				4	4	4		4		4	4			4		4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	ESC-IPE3	Monthly*				4	4	4		4		4	4			4		4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	ESC-IPE4	Monthly*				4	4	4		4		4	4			4		4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	ESC-IPE5	Monthly*				4	4	4		4		4	4			4		4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Intermediate Station Downcurrent																																																																		
	ESC-INE1A	Monthly*				4	4	4		4		4	4			4		4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	ESC-INE2A	Monthly*				4	4	4		4		4	4			4		4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	ESC-INE3A	Monthly*				4	4	4		4		4	4			4		4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	ESC-INE4A	Monthly*				4	4	4		4		4	4			4		4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	ESC-INE5A	Monthly*				4	4	4		4		4	4			4		4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Reference Station Upcurrent																																																																		
	ESC-RFE1	Monthly*				4	4	4		4		4	4			4		4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	ESC-RFE2	Monthly*				4	4	4		4		4	4			4		4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	ESC-RFE3	Monthly*				4	4	4		4		4	4			4		4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	ESC-RFE4	Monthly*				4	4	4		4		4	4			4		4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	ESC-RFE5	Monthly*				4	4	4		4		4	4			4		4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Ma Wan Station																																																																		
	MW1	Monthly*				4	4	4		4		4	4			4		4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Flood Tide																																																																		
Impact Station Downcurrent																																																																		
	ESC-IPF1	Monthly*	4	4	4				4		4			4	4		4		4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	ESC-IPF2	Monthly*	4	4	4				4		4			4	4		4		4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	ESC-IPF3	Monthly*	4	4	4				4		4			4	4		4		4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Intermediate Station Downcurrent																																																																		
	ESC-INF1	Monthly*	4	4	4				4		4			4	4		4		4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	ESC-INF2	Monthly*	4	4	4				4		4			4	4		4		4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	ESC-INF3	Monthly*	4	4	4				4		4			4	4		4		4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Reference Station Upcurrent																																																																		
	ESC-RFF1A	Monthly*	4	4	4				4		4			4	4		4		4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	ESC-RFF2A	Monthly*	4	4	4				4		4			4	4		4		4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	ESC-RFF3	Monthly*	4	4	4				4		4			4	4		4		4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Ma Wan Station																																																																		
	MW1	Monthly*	4	4	4				4		4			4	4		4		4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Water Column Profiling *			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Plume Stations																																																																		
	WCP1	Monthly*	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	WCP2	Monthly*	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Benthic Recoloinisation Studies			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Capped Stations at CMP V																																																																		
	ESCV-CPA	2 times per year																																																																	
	ESCV-CPB	2 times per year																																																																	
	ESCV-CPC	2 times per year																																																																	
	ESCV-CPD	2 times per year																																																																	
Reference Stations																																																																		
	RBA	2 times per year																																																																	
	RBB	2 times per year																																																																	
	RBC1	2 times per year																																																																	
Impact Monitoring for Dredging			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Upstream Stations																																																																		
	US1	3 times per week														2	2	2	2																																														
	US2	3 times per week														2	2	2	2																																														
Downstream Stations																																																																		
	DS1	3 times per week														2	2	2	2																																														
	DS2	3 times per week														2	2	2	2																																														
	DS3	3 times per week														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:

(1) The number shown in each cell represents the numbers of replicates per monitoring station. The number shown in **green bolded text** represented monitoring works have been conducted before/ during the reporting period of this Monthly EM&A Report, while the number shown in black represent planned monitoring works after the reporting period of this Monthly EM&A Report.

(2) For the planned Routine Water Quality Monitoring (i.e. the numbers of replicates per monitoring station shown in black), the monitoring will be conducted at mid-ebb OR mid-flood tide. The yearly tidal selection of this monitoring will be based on a principle to obtain 6 months monitoring data at mid-ebb, and 6 months monitoring data at mid-flood.

(3) Impact Monitoring for Dredging will be scheduled when dredging operations commence.

(4) Benthic Recolonisation Studies for CMP V will be scheduled when capping operation for CMP V is completed.

Remarks:

* A proposal on the change of number of sample replication of water quality & sediment monitoring and combination of routine water quality monitoring and water quality monitoring during capping operation was submitted to EPD and agreed by EPD on 3 December 2020. The proposed changes have been implemented for the EM&A activities since December 2020. Water Quality Monitoring during Capping Operation and Routine Water Quality Monitoring are combined such that Routine Water Quality Monitoring have be conducted monthly starting in December 2020. The number of sampling replicates can be further reduced according to Sections 3 and 4, subject to the findings of the further data review.

Due to the logistic problem induced by the pandemic which adversely affecting the supply of international species adopted in testing programme of Sediment Toxicity Tests, as such, Sediment Toxicity Tests of ESC CMPs originally scheduled in February 2022 were postponed to March 2022.

Appendix B. Water Quality Monitoring Results

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

Parameters	Action	Limit
Dissolved Oxygen (DO) in mg L^{-1} (Surface, Middle & Bottom)[1]	**Surface and Middle Depth**[2]	**Surface and Middle Depth**[2]
	5%-ile of baseline data for surface and middle layer = **3.76**	1%-ile of baseline data for surface and middle layer = **3.11** [3]
	and	and
	Significantly less than the reference station's mean DO (at the same tide of the same day)	Significantly less than the reference station's mean DO (at the same tide of the same day)
	Bottom	**Bottom**
	5%-ile of baseline data for surface and middle layer = **2.96**	The average of the impact station readings are **< 2**
	and	and
	Significantly less than the reference station's mean DO (at the same tide of the same day)	Significantly less than the reference station's mean DO (at the same tide of the same day)
Suspended Solids (SS) in mg L^{-1} (depth-averaged)[5]	95%-ile of baseline data for depth-averaged = **37.88**	99%-ile of baseline data for depth-averaged = **61.92**
	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
Turbidity in NTU (depth-averaged)[4][5]	95%-ile of baseline data = **28.14**	99%-ile of baseline data = **38.32**
	and	and
	120% of control station's Turbidity at the same tide of the same day	130% of control station's Turbidity at the same tide of the same day

Notes:

1. For DO, non-compliance of the water quality limits occurs when monitoring result is lower than the limits.
2. Action and Limit Levels for DO for Surface and 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 and Middle layers has already been lower than 4 mg L^{-1}, it is proposed to set the Limit Level at 3.11 mg L^{-1} which is the first percentile of the baseline data.
4. "Depth-averaged" is calculated by taking the arithmetic means of reading of all three depths.
5. For turbidity and SS, non-compliance of the water quality limits occurs when monitoring result is higher than the limits.

Table B2: Water Column Profiling Results for ESC CMP Vb in April 2022

Station	Temp. (°C)	Salinity (ppt)	Turbidity (NTU)	Dissolved Oxygen (%)	Dissolved Oxygen (mg L^{-1})	pH	Suspended Solids (mg L^{-1})
WCP 1 (Downstream)	22.21	28.69	10.34	83.36	6.15	8.03	9.5
WCP 2 (Upstream)	22.24	29.00	18.41	83.71	6.16	8.02	11.1
WQO (Wet Season)	N/A	26.10 - 31.90#	N/A	N/A	>4	6.5 - 8.5	12.0

Notes:
1. # Not exceeding 10% of natural ambient level which is the result obtained from the Reference Station.
2. Cell shaded yellow / red indicates value exceeding the Action/Limit levels.
3. Cell shaded grey indicates value exceeding the WQO.

Table B3: In-situ Monitoring Results for Routine Water Quality Monitoring of ESC CMPs in April 2022

Station	Temp. (°C)	Salinity (ppt)	Turbidity (NTU)	Dissolved Oxygen (%)	Dissolved Oxygen (mg L^{-1})	pH
RFE (Reference)	23.10	24.72	2.33	109.03	8.10	8.19
IPE (Impact)	23.10	24.59	2.98	109.14	8.11	8.22
INE (Intermediate)	23.02	25.43	2.66	108.86	8.06	8.22
Ma Wan	22.84	27.46	0.84	106.74	7.84	8.18
WQO (Wet Season)	N/A	22.24 - 27.19#	N/A	N/A	>4	6.5 - 8.5

Notes:
1. # Not exceeding 10% of natural ambient level which is the result obtained from the Reference Station.
2. Cell shaded yellow / red indicates value exceeding the Action/Limit levels.
3. Cell shaded grey indicates value exceeding the WQO.

Table B4: Laboratory Results for Routine Water Quality Monitoring of ESC CMPs in April 2022

Station	As (µg/L)	Cd (µg/L)	Cr (µg/L)	Cu (µg/L)	Pb (µg/L)	Hg (µg/L)	Ni (µg/L)	Ag (µg/L)	Zn (µg/L)	NH_3 (mg/L)	TIN (mg/L)	BOD_5 (mg/L)	SS (mg/L)
RFE	2.13	<LOR	1.57	2.13	1.26	<LOR	1.79	<LOR	15.10	0.13	0.67	2.17	7.0
IPE	2.10	<LOR	1.60	2.18	1.30	<LOR	1.66	<LOR	15.73	0.14	0.62	2.06	7.3
INE	2.04	<LOR	1.56	2.35	1.17	<LOR	1.69	<LOR	20.70	0.12	0.57	2.26	6.8
Ma Wan	2.00	<LOR	2.63	1.73	<LOR	<LOR	<LOR	<LOR	16.73	0.15	0.53	2.05	5.9

WQO of TIN: 0.5 mg/L
Wet Season WQO of SS: 12.0 mg/L

Notes:
1. "<LOR" indicates the concentrations of metals and metalloids are below the limit of reporting.
2. Cell shaded yellow / red indicates value exceeding the Action/Limit levels.
3. Cell shaded grey indicates value exceeding the WQO.

Table B5: Summary Table of DO, Turbidity and SS Levels Recorded in April 2022 for Impact Water Quality Monitoring during Dredging Operations of ESC CMP Vc

Sampling Date	Tidal Period	Station	Average DO Levels (mg/L)		Average Turbidity Level (NTU)	Average SS Level (mg/L)
			Bottom	Surface and Mid Depth		
01/04/2022	Mid Ebb	US1	6.49	6.52	8.18	9.90
		US2	6.62	6.61	6.58	8.43
		DS1	6.62	6.59	7.16	8.58
		DS2	6.65	6.59	6.38	8.67
		DS3	6.53	6.52	6.43	9.37
		DS4	6.56	6.55	6.15	8.50
		DS5	6.63	6.66	5.33	7.33
		MW	6.52	6.47	4.87	7.08
	Mid Flood	US1	6.59	6.60	17.65	21.67
		US2	6.57	6.56	14.37	18.30
		DS1	6.44	6.55	13.29	26.10
		DS2	6.66	6.58	12.11	14.88
		DS3	6.47	6.57	15.22	23.78
		DS4	6.59	6.58	18.73	22.05
		DS5	6.52	6.58	18.79	25.93
		MW	6.52	6.58	4.87	7.02
04/04/2022	Mid Ebb	US1	6.79	6.77	5.58	9.52
		US2	6.79	6.74	6.20	9.47
		DS1	6.72	6.68	5.73	9.67
		DS2	6.71	6.69	5.56	9.77
		DS3	6.54	6.62	5.66	10.27
		DS4	6.77	6.69	7.58	10.03
		DS5	6.71	6.65	7.18	11.52
		MW	6.64	6.57	4.55	8.23
	Mid Flood	US1	6.72	6.64	19.58	21.97
		US2	6.74	6.68	17.15	37.38
		DS1	6.89	6.83	13.96	19.08
		DS2	7.10	6.88	13.34	18.50
		DS3	6.96	6.86	13.06	16.20
		DS4	6.90	6.80	15.07	22.60
		DS5	7.01	6.82	14.99	19.55
		MW	6.56	6.55	4.14	7.32

Sampling Date	Tidal Period	Station	Average DO Levels (mg/L)		Average Turbidity Level (NTU)	Average SS Level (mg/L)
			Bottom	Surface and Mid Depth		
06/04/2022	Mid Ebb	US1	6.92	7.08	3.95	6.72
		US2	6.92	7.16	8.16	14.70
		DS1	6.65	6.90	10.08	16.23
		DS2	6.72	6.94	8.25	15.62
		DS3	6.73	6.84	6.76	10.70
		DS4	6.87	6.93	5.33	8.75
		DS5	6.88	6.93	5.07	11.82
		MW	6.74	6.68	2.67	10.30
	Mid Flood	US1	6.70	6.74	8.26	13.97
		US2	6.65	6.65	7.26	16.83
		DS1	6.69	6.65	8.81	14.52
		DS2	6.79	6.81	6.71	13.60
		DS3	6.68	6.70	10.51	21.43
		DS4	6.74	6.72	9.93	16.70
		DS5	6.75	6.75	9.48	12.92
		MW	6.57	6.63	2.65	7.90
08/04/2022	Mid Ebb	US1	6.97	7.10	6.88	9.70
		US2	7.02	7.21	5.00	8.80
		DS1	6.86	6.91	7.95	11.12
		DS2	6.97	6.99	6.70	13.07
		DS3	6.87	6.98	6.31	11.80
		DS4	6.84	6.99	4.75	8.57
		DS5	7.06	7.11	3.85	7.30
		MW	7.10	7.26	1.09	4.83
	Mid Flood	US1	6.72	6.78	2.57	10.82
		US2	6.86	6.87	2.00	11.37
		DS1	6.79	6.83	2.67	6.43
		DS2	6.92	6.91	2.60	5.52
		DS3	6.85	6.84	2.74	5.13
		DS4	6.90	6.91	2.40	5.12
		DS5	6.98	7.00	2.17	4.63
		MW	6.44	6.40	3.04	7.88

Sampling Date	Tidal Period	Station	Average DO Levels (mg/L)		Average Turbidity Level (NTU)	Average SS Level (mg/L)
			Bottom	Surface and Mid Depth		
11/04/2022	Mid Ebb	US1	7.03	9.07	2.70	6.53
		US2	7.48	8.96	5.62	9.67
		DS1	6.88	7.40	4.75	7.95
		DS2	7.35	8.38	4.27	7.13
		DS3	6.88	7.84	6.15	8.18
		DS4	7.51	8.30	3.38	6.88
		DS5	8.06	8.93	4.03	7.02
		MW	9.39	11.82	1.99	4.18
	Mid Flood	US1	7.52	8.72	4.45	7.42
		US2	7.95	8.59	5.13	10.13
		DS1	7.68	8.29	4.80	8.23
		DS2	7.94	8.49	4.65	7.03
		DS3	8.33	8.70	3.95	8.10
		DS4	8.06	8.83	5.30	9.00
		DS5	8.23	8.93	4.95	8.67
		MW	7.03	7.13	3.84	5.90
13/04/2022	Mid Ebb	US1	7.76	9.26	1.60	5.30
		US2	7.42	9.24	2.05	7.35
		DS1	8.04	9.17	1.31	5.63
		DS2	7.21	9.26	1.90	4.88
		DS3	6.95	8.83	3.05	7.87
		DS4	7.41	8.90	2.63	7.58
		DS5	7.66	9.24	2.80	8.65
		MW	7.27	7.70	1.43	5.17
	Mid Flood	US1	7.96	8.85	1.70	4.55
		US2	6.96	8.48	3.36	8.70
		DS1	6.95	8.59	2.71	5.87
		DS2	6.63	8.67	4.70	9.68
		DS3	7.16	8.77	3.53	8.60
		DS4	7.22	8.75	2.81	6.67
		DS5	7.41	9.04	1.55	4.58
		MW	6.98	8.25	1.46	4.73

Sampling Date	Tidal Period	Station	Average DO Levels (mg/L)		Average Turbidity Level (NTU)	Average SS Level (mg/L)
			Bottom	Surface and Mid Depth		
15/04/2022	Mid Ebb	US1	6.95	7.18	6.11	7.23
		US2	7.01	7.20	8.21	16.37
		DS1	6.91	7.14	5.51	8.15
		DS2	6.95	7.17	5.00	9.05
		DS3	6.93	7.15	6.13	8.85
		DS4	7.03	7.16	4.26	6.00
		DS5	7.02	7.19	4.10	9.78
		MW	6.85	6.92	1.90	6.72
	Mid Flood	US1	6.77	7.11	10.78	14.53
		US2	6.82	7.05	5.90	10.53
		DS1	6.92	7.10	8.31	10.65
		DS2	6.97	7.11	7.91	12.68
		DS3	7.05	7.17	6.33	7.77
		DS4	7.10	7.17	5.10	8.08
		DS5	6.98	7.15	5.93	9.15
		MW	6.78	6.85	2.55	4.17
19/04/2022	Mid Ebb	US1	6.20	6.24	8.00	11.77
		US2	6.14	6.29	19.30	23.00
		DS1	6.14	6.20	10.76	19.43
		DS2	6.13	6.19	10.30	13.82
		DS3	6.03	6.16	10.86	14.58
		DS4	6.14	6.20	10.86	14.28
		DS5	6.17	6.21	17.98	24.80
		MW	6.22	6.25	5.01	9.08
	Mid Flood	US1	6.13	6.18	30.48	39.60
		US2	6.15	6.20	20.63	31.97
		DS1	6.13	6.28	25.36	29.82
		DS2	6.14	6.33	26.21	33.48
		DS3	6.17	6.34	28.70	32.03
		DS4	6.16	6.29	36.30	38.93
		DS5	6.18	6.30	38.40	44.37
		MW	6.18	6.22	6.16	9.65

Sampling Date	Tidal Period	Station	Average DO Levels (mg/L)		Average Turbidity Level (NTU)	Average SS Level (mg/L)
			Bottom	Surface and Mid Depth		
21/04/2022	Mid Ebb	US1	6.04	6.35	10.98	14.53
		US2	6.37	6.55	27.91	42.43
		DS1	6.14	6.40	11.25	15.48
		DS2	6.17	6.45	12.10	26.83
		DS3	6.18	6.41	13.08	22.40
		DS4	6.26	6.46	11.23	18.63
		DS5	6.31	6.48	10.88	35.88
		MW	6.14	6.24	4.18	10.30
	Mid Flood	US1	6.08	6.17	20.56	29.93
		US2	6.08	6.20	20.51	30.20
		DS1	6.09	6.16	17.58	31.32
		DS2	6.11	6.22	15.85	21.07
		DS3	6.13	6.24	13.36	23.67
		DS4	6.14	6.23	15.65	22.05
		DS5	6.14	6.22	17.96	21.43
		MW	5.97	6.06	4.21	11.07
23/04/2022	Mid Ebb	US1	6.13	6.93	5.15	8.15
		US2	6.30	7.74	4.18	6.20
		DS1	6.18	6.90	4.46	6.43
		DS2	6.17	6.78	4.80	8.73
		DS3	6.18	6.91	5.50	10.07
		DS4	6.33	7.10	4.61	7.18
		DS5	6.32	6.99	5.50	9.87
		MW	6.59	7.09	1.91	4.52
	Mid Flood	US1	6.24	6.47	3.10	5.73
		US2	6.26	6.48	2.91	4.60
		DS1	6.27	6.41	3.23	5.43
		DS2	6.33	6.47	3.03	5.38
		DS3	6.23	6.46	3.18	5.85
		DS4	6.22	6.58	3.23	6.02
		DS5	5.98	6.52	4.35	6.00
		MW	5.87	6.01	3.08	5.98

Sampling Date	Tidal Period	Station	Average DO Levels (mg/L)		Average Turbidity Level (NTU)	Average SS Level (mg/L)
			Bottom	Surface and Mid Depth		
25/04/2022	Mid Ebb	US1	6.31	7.92	3.28	5.47
		US2	6.48	8.04	3.98	6.60
		DS1	6.08	7.51	3.80	6.03
		DS2	6.23	7.74	2.55	6.37
		DS3	5.83	7.60	3.75	7.72
		DS4	6.48	7.73	2.76	6.13
		DS5	6.28	7.65	3.36	7.28
		MW	6.09	6.25	2.21	5.77
	Mid Flood	US1	6.35	6.72	2.93	5.08
		US2	5.76	7.51	4.91	9.62
		DS1	5.93	7.32	4.41	8.82
		DS2	5.93	7.48	4.21	9.07
		DS3	5.97	7.16	4.51	9.22
		DS4	6.28	7.64	3.90	8.42
		DS5	6.23	8.00	3.43	6.87
		MW	6.15	6.93	2.10	6.68

Notes:
1. Please refer to Table B1 above for the Action and Limit Levels for dredging activities.
2. Cell shaded yellow indicates value exceeding the Action Level criteria.
3. Cell shaded red indicates value exceeding the Limit Level criteria.

Appendix C. Graphical Presentations

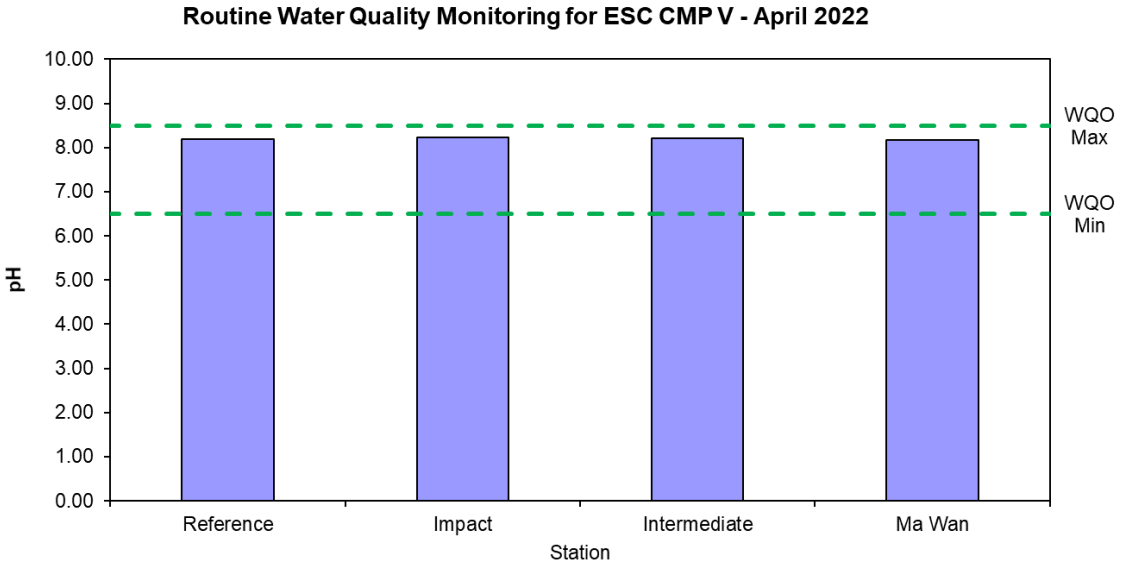


Figure 1: Level of pH recorded during Routine Water Quality Monitoring for disposal operations at ESC CMP V in April 2022

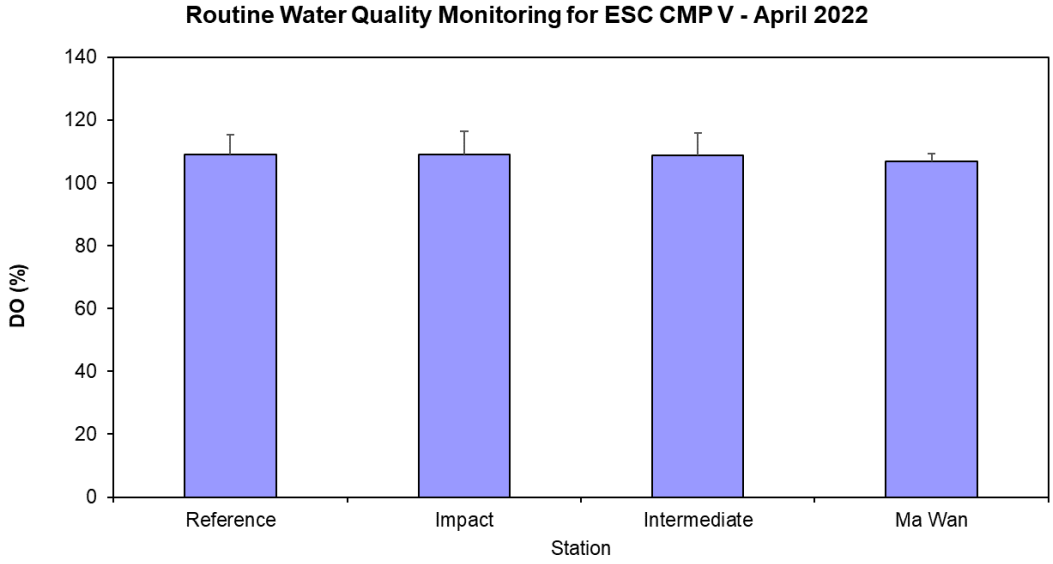


Figure 2: Level of Dissolved Oxygen (DO) (% saturation; mean + SD)[1] recorded during Routine Water Quality Monitoring for disposal operations at ESC CMP V in April 2022

[1] The mean and standard deviation (SD) for in-situ data are the mean and SD for water columns within the area.

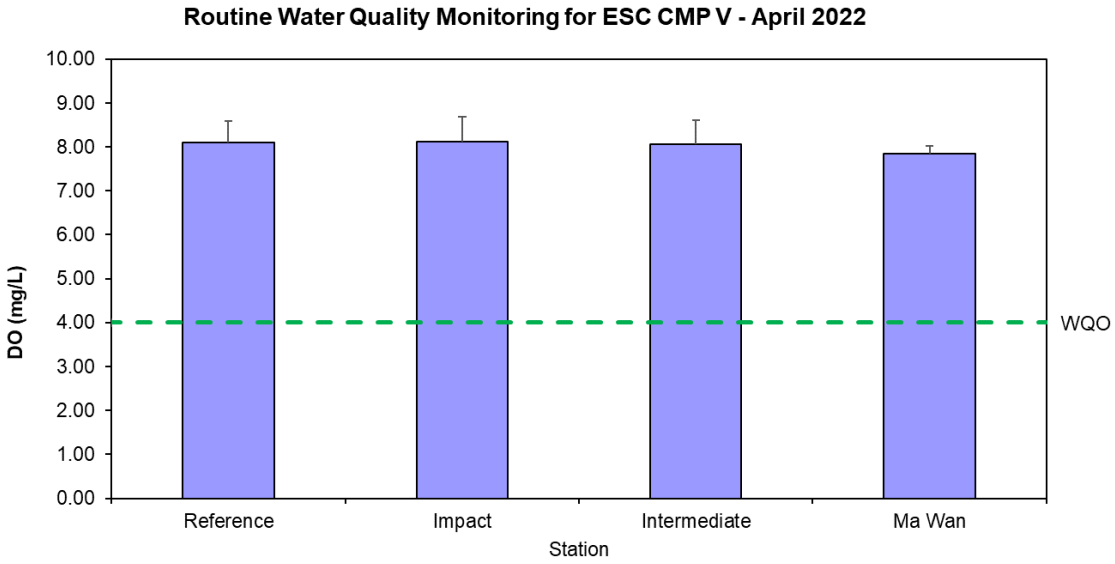


Figure 3: Concentration of Dissolved Oxygen (DO) (mg/L; mean + SD)[1] recorded during Routine Water Quality Monitoring for disposal operations at ESC CMP V in April 2022

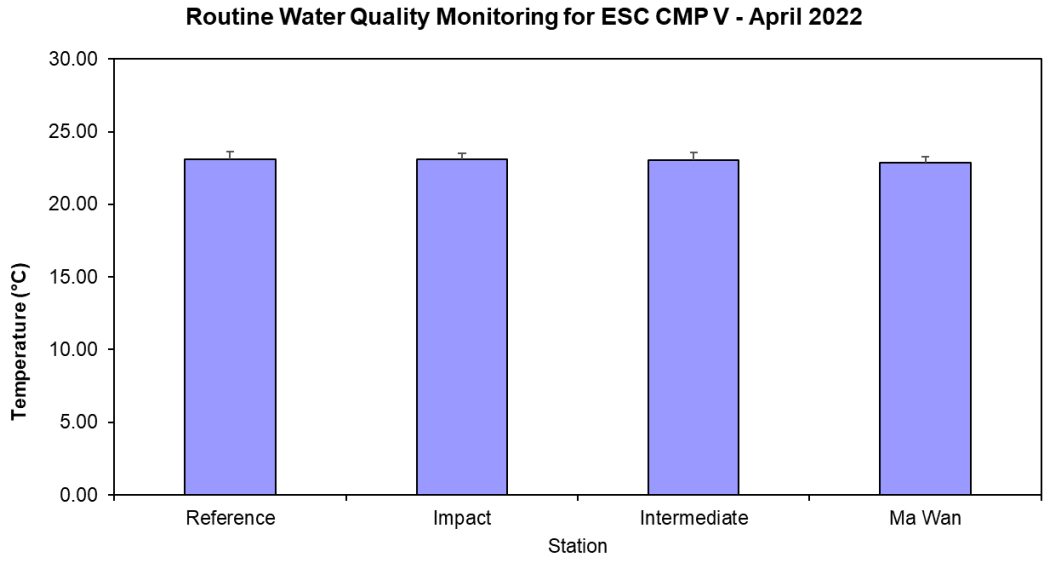


Figure 4: Level of Temperature (°C; mean + SD)[1] recorded during Routine Water Quality Monitoring for disposal operations at ESC CMP V in April 2022

1 The mean and standard deviation (SD) for in-situ data are the mean and SD for water columns within the area.

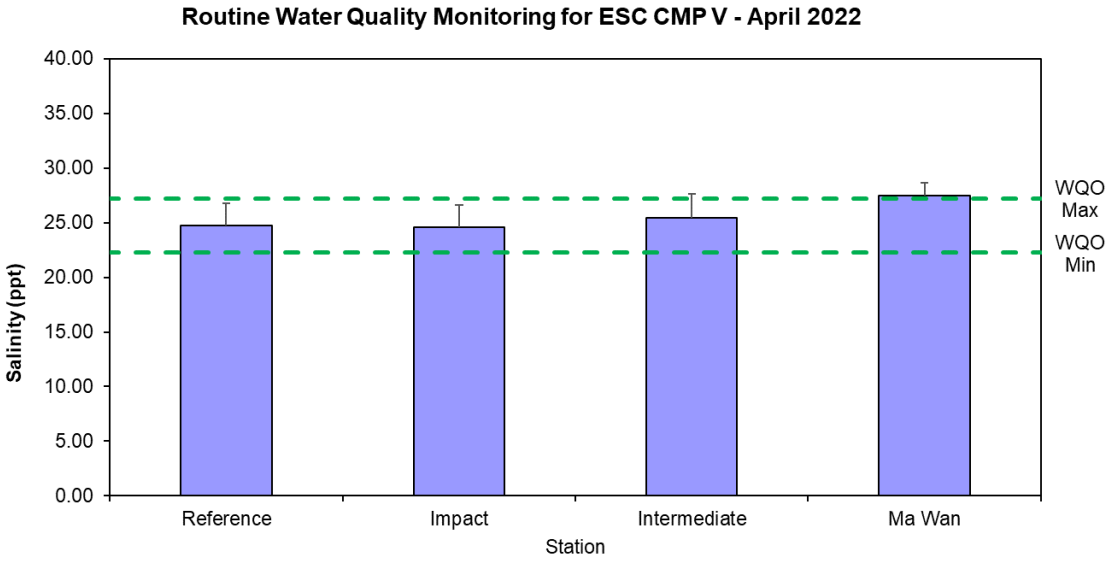


Figure 5: Level of Salinity (ppt; mean + SD)[1] recorded during Routine Water Quality Monitoring for disposal operations at ESC CMP V in April 2022

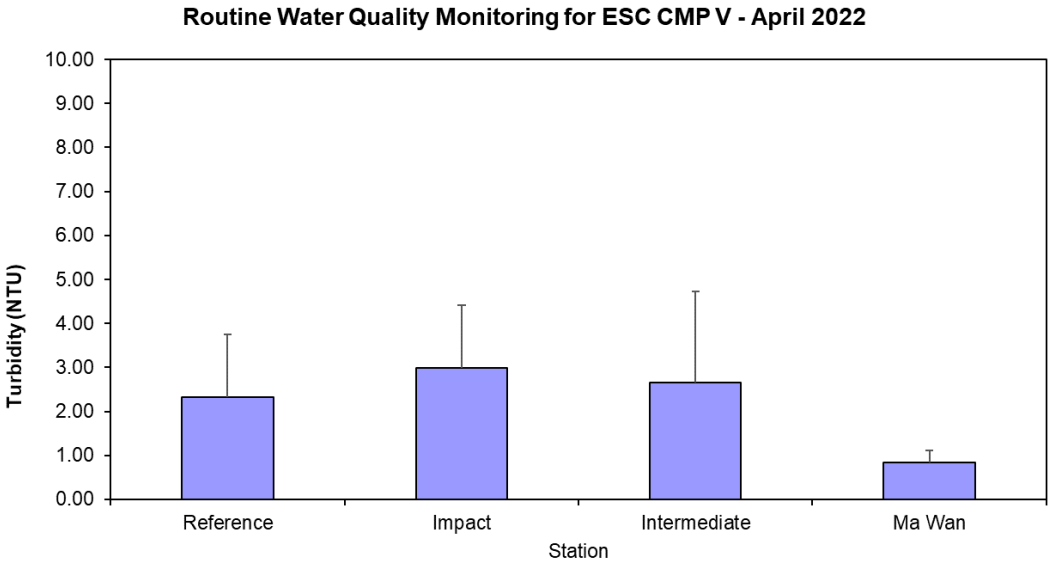


Figure 6: Level of Turbidity (NTU; mean + SD)[1] recorded during Routine Water Quality Monitoring for disposal operations at ESC CMP V in April 2022

1 The mean and standard deviation (SD) for in-situ data are the mean and SD for water columns within the area.

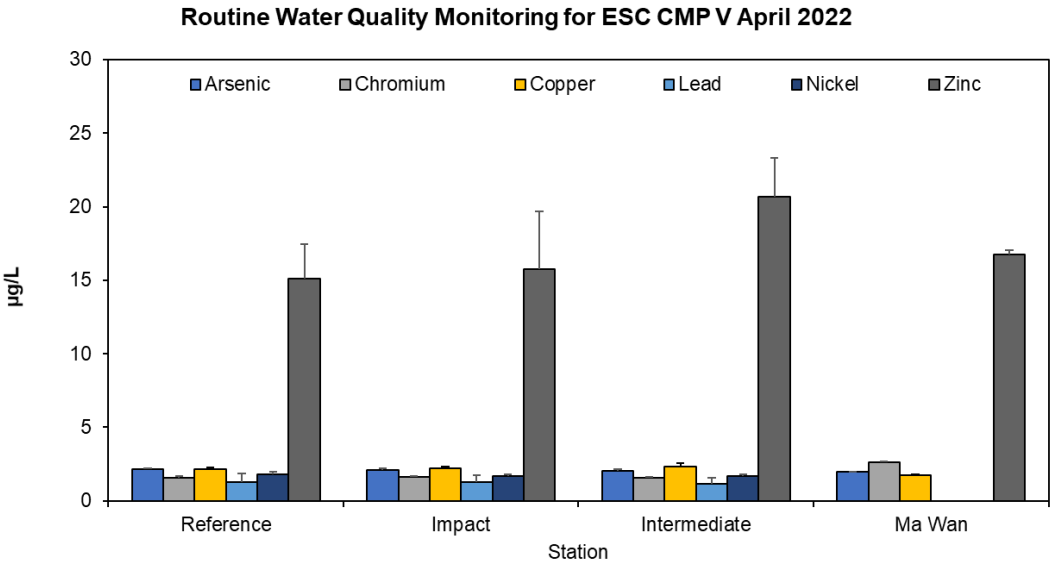


Figure 7: Concentration of Arsenic, Chromium, Copper, Lead, Nickel, and Zinc (µg/L; mean + SD) in water samples collected from Routine Water Quality Monitoring for disposal operations at ESC CMP V in April 2022

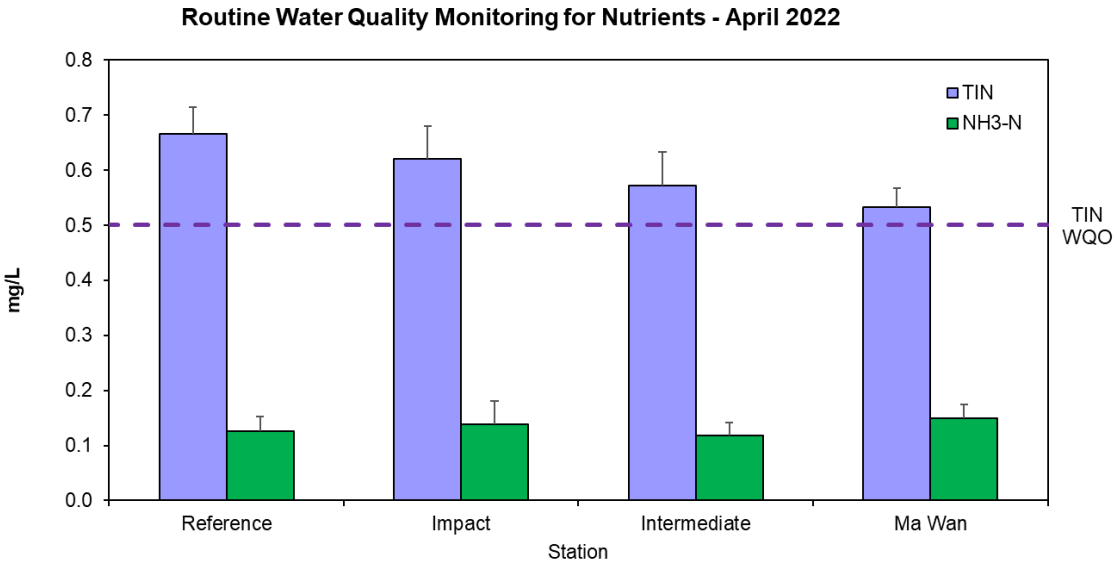


Figure 8: Concentration of Total Inorganic Nitrogen (TIN) and Ammonia Nitrogen (NH3-N) (mg/L; mean + SD) in water samples collected from Routine Water Quality Monitoring for disposal operations at ESC CMP V in April 2022

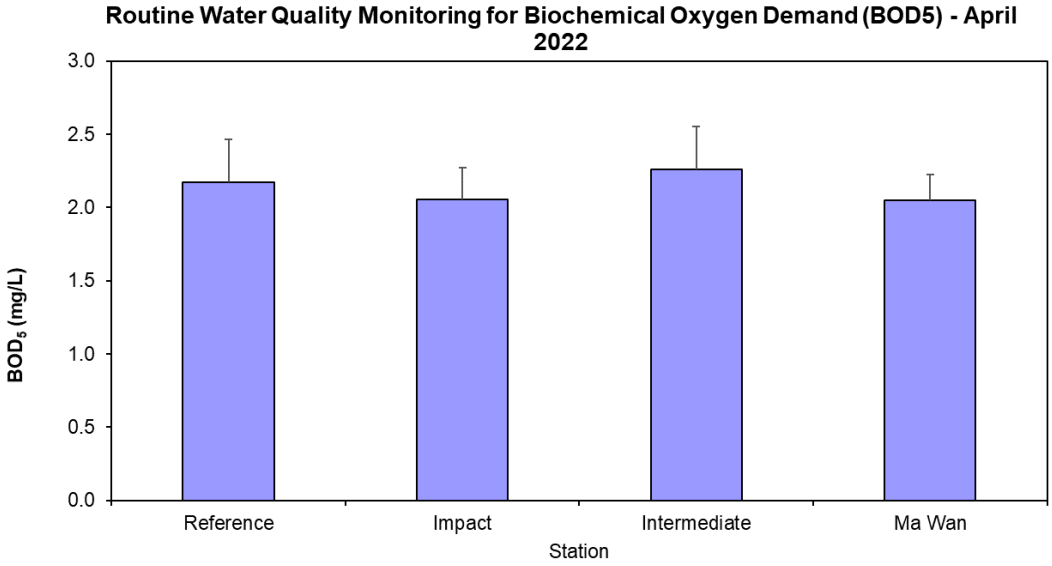


Figure 9: Level of Biochemical Oxygen Demand (BOD5) (mg/L; mean + SD) in water samples collected from Routine Water Quality Monitoring for disposal operations at ESC CMP V in April 2022

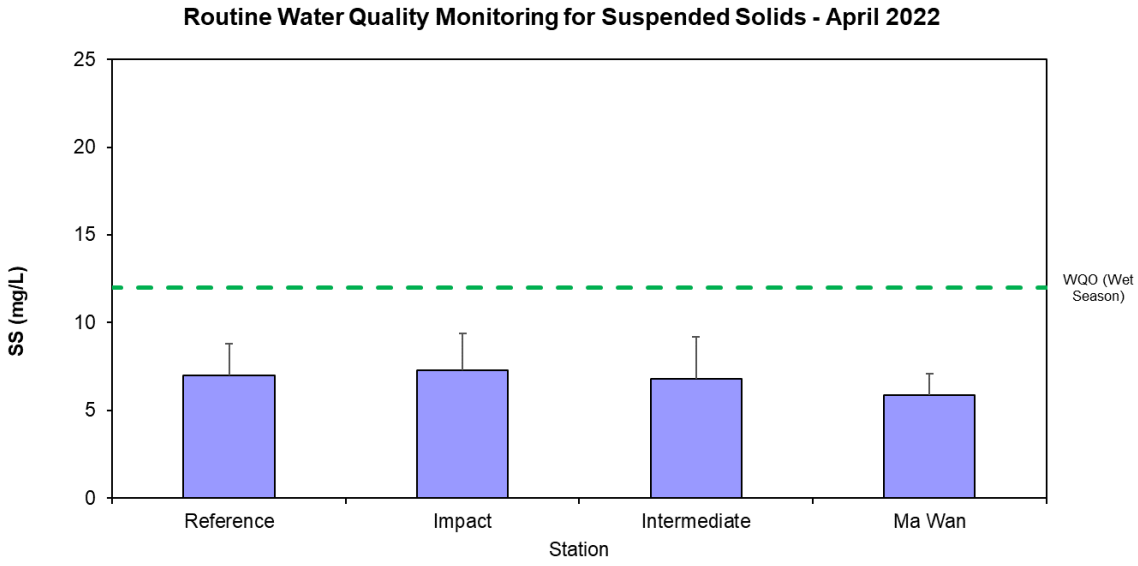


Figure 10: Concentration of Suspended Solids (SS) (mg/L; mean + SD) in water samples collected from Routine Water Quality Monitoring for disposal operations at ESC CMP V in April 2022

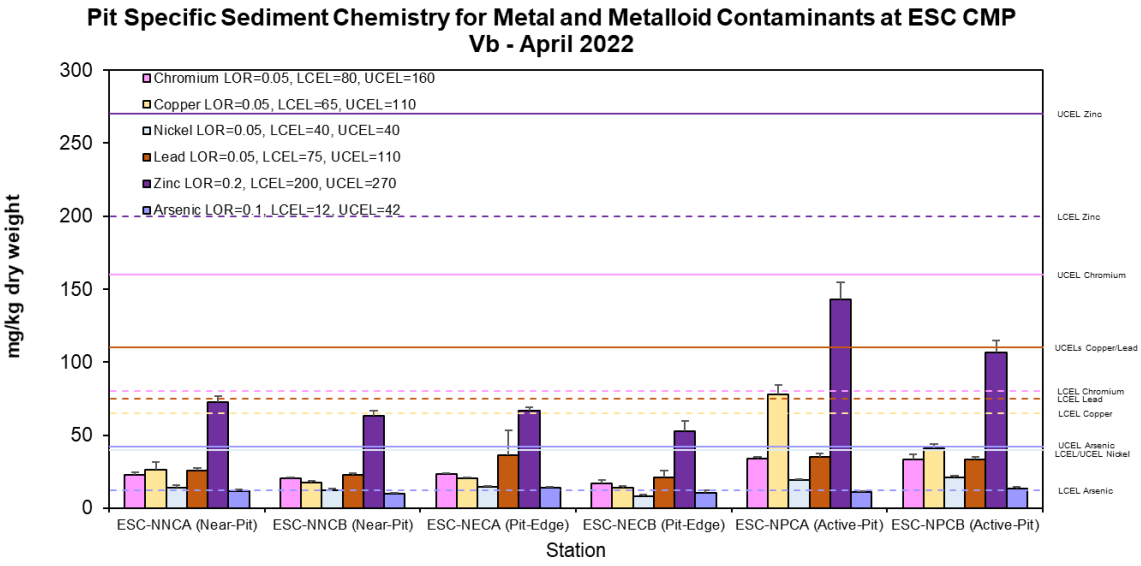


Figure 11: Concentration of Metals and Metalloid (Cr, Cu, Ni, Pb, Zn, As; mg/kg dry weight; mean + SD) in sediment samples collected from Pit Specific Sediment Chemistry Monitoring for ESC CMP Vb in April 2022

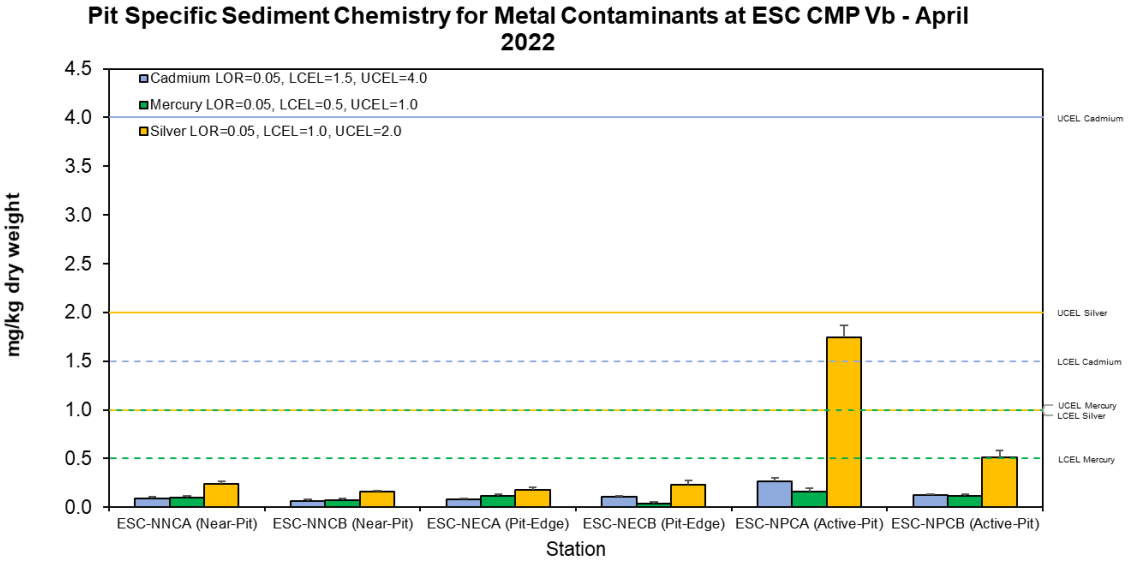


Figure 12: Concentration of Metals (Cd, Hg, Ag; mg/kg dry weight; mean + SD) in sediment samples collected from Pit Specific Sediment Chemistry Monitoring for ESC CMP Vb in April 2022

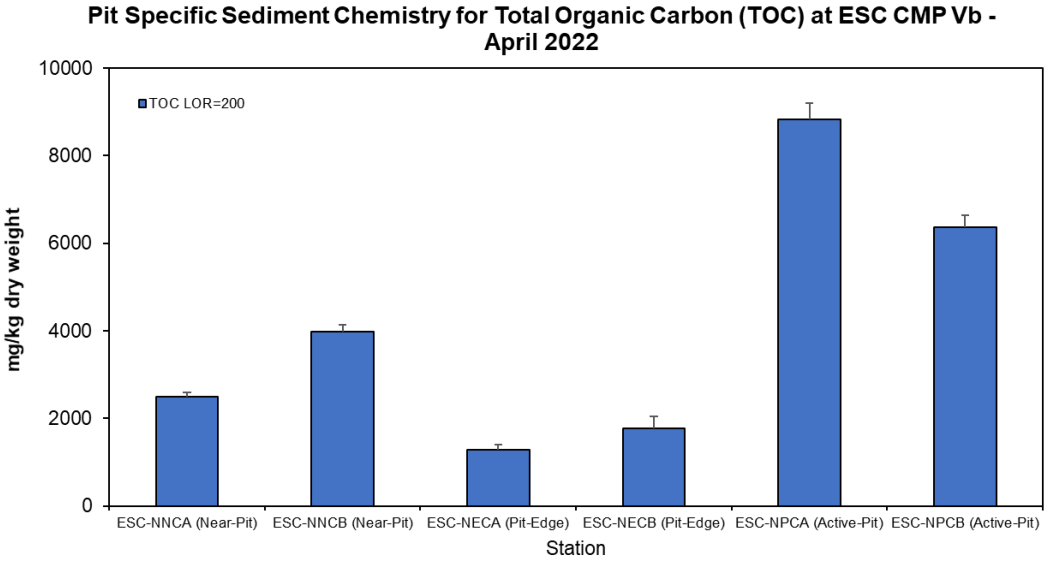


Figure 13: Concentration of Total Organic Carbon (TOC) (mg/kg dry weight; mean + SD) in sediment samples collected from Pit Specific Sediment Chemistry Monitoring for ESC CMP Vb in April 2022

Appendix D. Dredging Record

D1. Dredging Record at ESC CMP Vc

Date	Daily Dredging Volume (m^3)	Weekly Dredging Volume (m^3) (From Sunday to Saturday)
27 Mar 2022	3,250	18,200
28 Mar 2022	1,950	
29 Mar 2022	2,600	
30 Mar 2022	2,600	
31 Mar 2022	2,600	
1 Apr 2022	1,950	
2 Apr 2022	3,250	
3 Apr 2022	1,950	18,200
4 Apr 2022	3,250	
5 Apr 2022	1,950	
6 Apr 2022	3,250	
7 Apr 2022	1,950	
8 Apr 2022	2,600	
9 Apr 2022	3,250	
10 Apr 2022	3,250	20,150
11 Apr 2022	3,250	
12 Apr 2022	3,250	
13 Apr 2022	3,250	
14 Apr 2022	3,250	
15 Apr 2022	3,250	
16 Apr 2022	650	
17 Apr 2022	1,950	16,600
18 Apr 2022	2,950	
19 Apr 2022	2,600	
20 Apr 2022	3,250	
21 Apr 2022	2,600	
22 Apr 2022	1,950	
23 Apr 2022	1,300	
24 Apr 2022	2,600	3,250
25 Apr 2022	650	
26 Apr 2022	0	
27 Apr 2022	0	
28 Apr 2022	0	
29 Apr 2022	0	
30 Apr 2022	0	

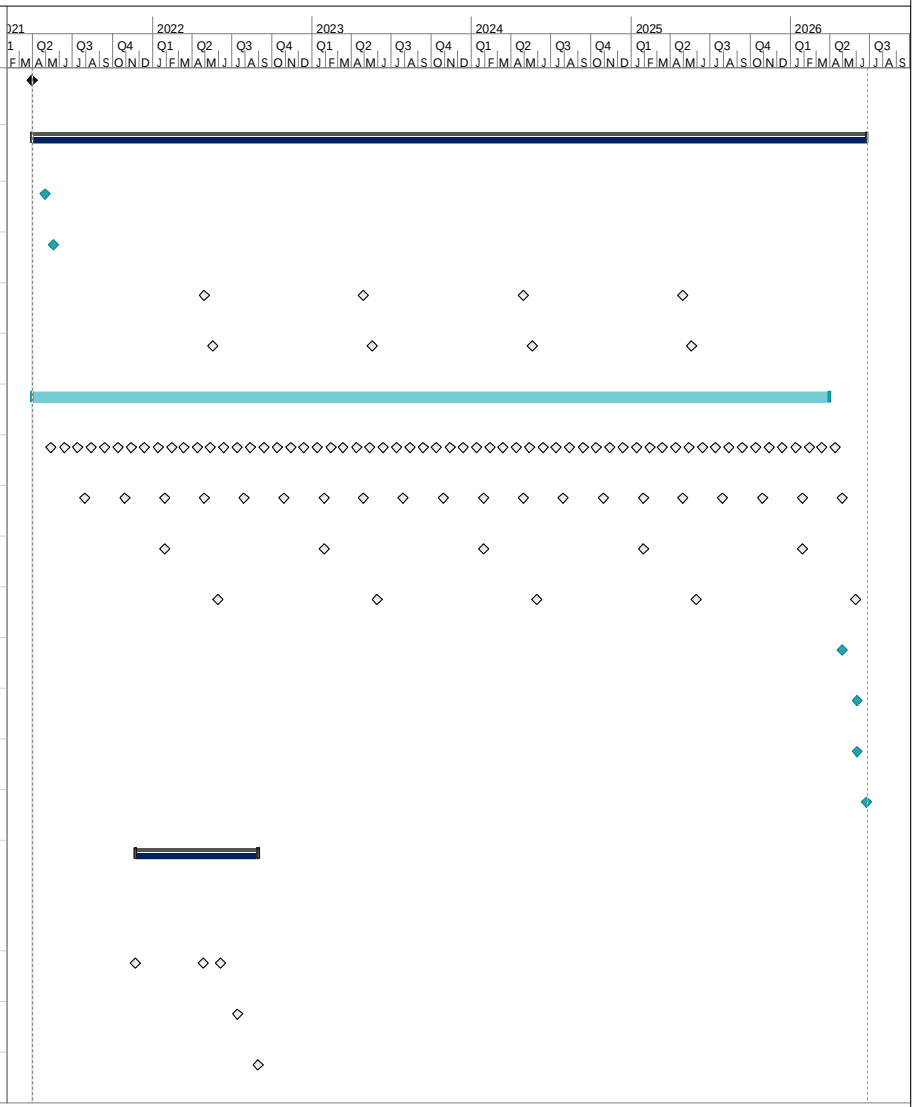
Appendix E. Study Programme

Study Programme

Agreement No. CE 59/2020 (EP)
Environmental Monitoring and Audit for Disposal Facility
to the East of Sha Chau (2021-2026) - Investigation

Mott MacDonald Hong Kong Limited

ID	Task Name	Start	Finish
1	COMMENCEMENT OF AGREEMENT NO. CE 59/2020 (EP)	01/04/21	
2	EAST OF SHA CHAU CONTAMINATED MUD PITS (ESC CMPs) BETWEEN 2021 & 2026	01/04/21	25/06/26
3	Draft Report of First Review of EM&A Manual (for ESC CMPs)		30/04/21
4	Final Report of First Review of EM&A Manual (for ESC CMPs)		20/05/21
5	Draft Report of Subsequent Review of EM&A Manual (for ESC CMPs) - annual basis assumed	30/04/22	30/04/25
10	Final Report of Subsequent Review of EM&A Manual (for ESC CMPs) - annual basis assumed	20/05/22	20/05/25
15	Regular Site Inspections of CMP Contractors	01/04/21	31/03/26
16	Monthly EM&A Report	14/05/21	14/04/26
77	Quarterly EM&A Report	30/07/21	30/04/26
98	Annual EM&A Report	30/01/22	30/01/26
104	Annual Risk Assessment Report	31/05/22	31/05/26
110	Draft Final Report		30/04/26
111	Final Report		04/06/26
112	Draft Executive Summary		04/06/26
113	Final Executive Summary		25/06/26
114	EAST OF TUNG LUNG CHAU (ETLC) DISPOSAL FACILITY (MONITORING PERIOD: SEPTEMBER 2021 & MARCH-APRIL 2022)	23/11/21	31/08/22
115	Monthly EM&A Report	23/11/21	06/06/22
119	Quarterly EM&A Report	15/07/22	15/07/22
121	Annual EM&A Report	31/08/22	31/08/22



Programme Revision: C
Date: 11/05/22

Start/End of ET Services
Location
Repeating Task
Start of Agreement
Submission
Multiple-Occasion Submission