








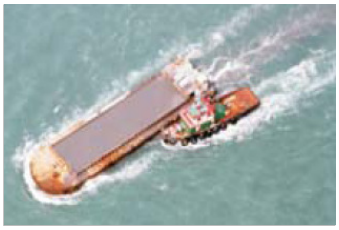
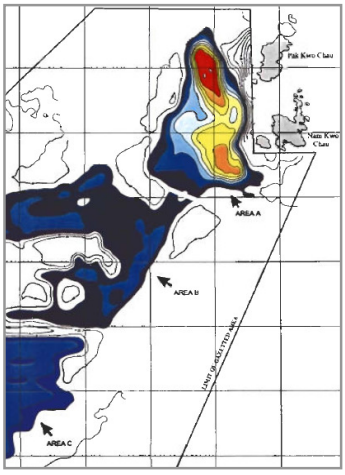

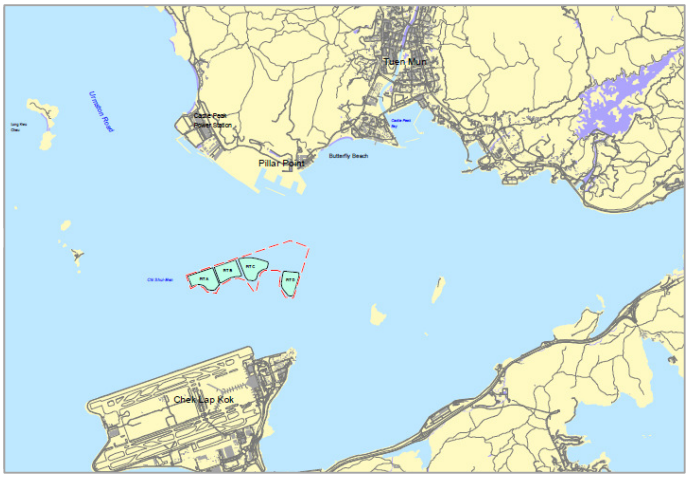

土木工程拓展署
Civil Engineering and Development Department

Environmental Monitoring and Audit for Contaminated Mud Pit at Sha Chau (2009-2013) – Investigation

Agreement No. CE 4/2009(EP)

46th Monthly Progress Report for Contaminated Mud Pits at Sha Chau – April 2013

Revision 0

15 May 2013

Environmental Resources Management
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Environmental Monitoring and Audit for Contaminated Mud Pit at Sha Chau (2009-2013) – Investigation

46th Monthly Progress Report for Contaminated Mud Pits at Sha Chau – April 2013

Revision 0

Document Code: 0103262 Monthly Progress Apr 13_v0.doc

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Client: Civil Engineering and Development Department (CEDD)	Project No: 0103262
Summary: This document presents progress of monitoring works on contaminated mud pits at Sha Chau in April 2013 under Agreement No. CE 4/2009 (EP).	Date: 15 May 2013 Approved by:  *Dr Robin Kennish* *Director*

Revision	Description	By	Checked	Approved	Date
0	46th Monthly Progress Report for ESC CMP	RC	JT	RK	15/5/13

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CEDD Civil Engineering and Development Department

New Contaminated Mud Marine Disposal Facility at Airport East/East Sha Chau Area

Environmental Certification Sheet
EP-312/2008/A

Reference Document/Plan

Document/~~Plan~~ to be ~~Certified~~/ Verified:	46th Monthly Progress Report for Contaminated Mud Pits at Sha Chau – April 2013
Date of Report: 15/05/2013	
Date received by ET: 15/05/2013	
Date received by IA: 15/05/2013	

Reference EP Condition

Environmental Permit Condition: Condition No.: 3.4

Content:

Four hard copies and one 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.

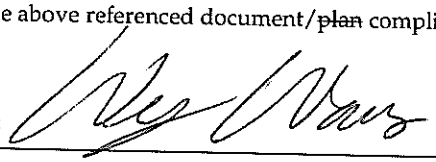
ET Certification

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

Dr Robin Kennish,
Environmental Team Leader:  Date: 15/5/2013

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:  Date: 15/5/2013

Notes:

CONTENTS

ANNEXES

Agreement No. CE 4/2009 (EP)
Environmental Monitoring and Audit
for Contaminated Mud Pit at Sha Chau (2009-2013) - Investigation

46TH MONTHLY PROGRESS REPORT FOR CONTAMINATED MUD PITS AT SHA CHAU APRIL 2013

1.1 BACKGROUND

1.1.1 Since 1992, the East of Sha Chau (ESC) area has been the site of a series of dredged contaminated mud pits (CMPs) designed to provide confined marine disposal capacity for contaminated mud arising from the HKSAR's dredging and reclamation projects. In April 2013, the following works were being undertaken at the CMPs:

- Capping was being undertaken at CMP IVc;
- Disposal of contaminated mud was taking place at CMP Va; and
- Dredging of CMP Vd was in progress.

1.1.2 The Environmental Monitoring and Audit (EM&A) programme for the CMPs at the ESC area presently covers the above operations.

1.2 REPORTING PERIOD

1.2.1 This Monthly Progress Report covers the monitoring period of April 2013.

1.3 DETAILS OF SAMPLING AND LABORATORY TESTING ACTIVITIES

1.3.1 The following monitoring activities have been undertaken for CMP V in April 2013:

- *Routine Water Quality Monitoring* was conducted for CMP Va on 9 April 2013;
- *Water Column Profiling* was scheduled to be undertaken on 11 April 2013. However, there was no dumping activity at CMP Va while the monitoring team was on-site. As such, *in-situ* measurements and water sampling were not undertaken for *Water Column Profiling* in April 2013.
- *Impact Water Quality Monitoring during Dredging Operations* for CMP Vd were conducted on 16 April 2013; and
- *Pit Specific Sediment Chemistry* was conducted for CMP Va on 23 April 2013.

1.3.2 A summary of field activities are presented in *Annex A*.

1.4 DETAILS OF OUTSTANDING SAMPLING AND / OR ANALYSIS

1.4.1 No outstanding sampling remained and laboratory analyses of *Pit Specific Sediment Chemistry* conducted in April 2013 were yet to be completed during preparation of this monthly report.

1.5 BRIEF DISCUSSION OF THE MONITORING RESULTS FOR CMP V

1.5.1 *Table 1.1* summarises the monitoring results that are presented in the current monthly report. Brief discussion of the monitoring results is presented in this section. Detailed discussion will be presented in the corresponding *Quarterly Report*.

Table 1.1 Monitoring activities in March / April 2013

Monitoring activities	Date of Monitoring	Monitoring results presented in this report?
Pit Specific Sediment Chemistry Monitoring for CMP Va	12 Mar 2013	Yes
	23 Apr 2013	No. Laboratory analysis yet to be completed during preparation of this monthly report.
Impact Water Quality Monitoring during Dredging Operations of CMP Vd	16 Apr 2013	Yes
Water Column Profiling for CMP Va	11 Apr 2013	No. *In-situ* measurements and water sampling were not undertaken as there was no dumping activity on the monitoring day.
Routine Water Quality Monitoring for CMP Va	9 Apr 2013	Yes

1.5.2 Pit Specific Sediment Chemistry of CMP Va – March 2013

1.5.3 Monitoring locations for Pit Specific Sediment Chemistry for CMP Va are shown in *Figure 1.1*. A total of six monitoring stations were sampled in March 2013. Most contaminants complied with the Lower Chemical Exceedance Level (LCEL) at all stations except Arsenic. Concentrations of Arsenic exceeded the LCEL at Pit Edge stations NEDA and NEDB and Near Pit station NNDA (*Figures 1-2* of *Annex B*). It is also observed that the variations of metal concentrations at Active Pit Stations were much larger (ie greater standard deviation) when compared to other stations. 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 exceedances of the LCEL for Arsenic are unlikely to be caused by the disposal operations at CMP Va but rather as a result of naturally occurring deposits.

1.5.4 For organic contaminants, Total Organic Carbon (TOC) concentration was similar amongst all stations (*Figure 3* of *Annex B*). Tributyltin (TBT) concentration was found to be higher at Active Pit station NPDA and Near Pit station NNDA (*Figure 4* of *Annex B*). Low Molecular Weigh Polycyclic Aromatics Hydrocarbons (Low MW PAHs) and High Molecular Weight Polycyclic Aromatics Hydrocarbons (High MW PAHs) concentrations were recorded above the limit of reporting at Active Pit stations NPDA and NPDB only (*Figure 5 of Annex B*). Total Polychlorinated Biphenyls (PCBs), Total Dichloro-diphenyl-trichloroethane (DDT) and 4,4'-Dichloro-diphenyl-dichloroethylene (4,4'-DDE) were below the limit of reporting at all stations. The Active Pit station is located within CMP Va which was receiving contaminated mud during the reporting period. Therefore, the higher concentrations of contaminants (including metals and organic contaminants) recorded at the Active Pit stations only are not considered as indicating any dispersal of contaminated mud from CMP Va. Nevertheless, detailed analysis will be presented in the *Quarterly Report* to reveal any trend of increasing sediment contaminant concentrations towards CMP Va.

1.5.5 Overall, there is no evidence indicating any unacceptable environmental impacts to sediment quality as a result of the contaminated mud disposal operations at CMP Va during this monthly period.

(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

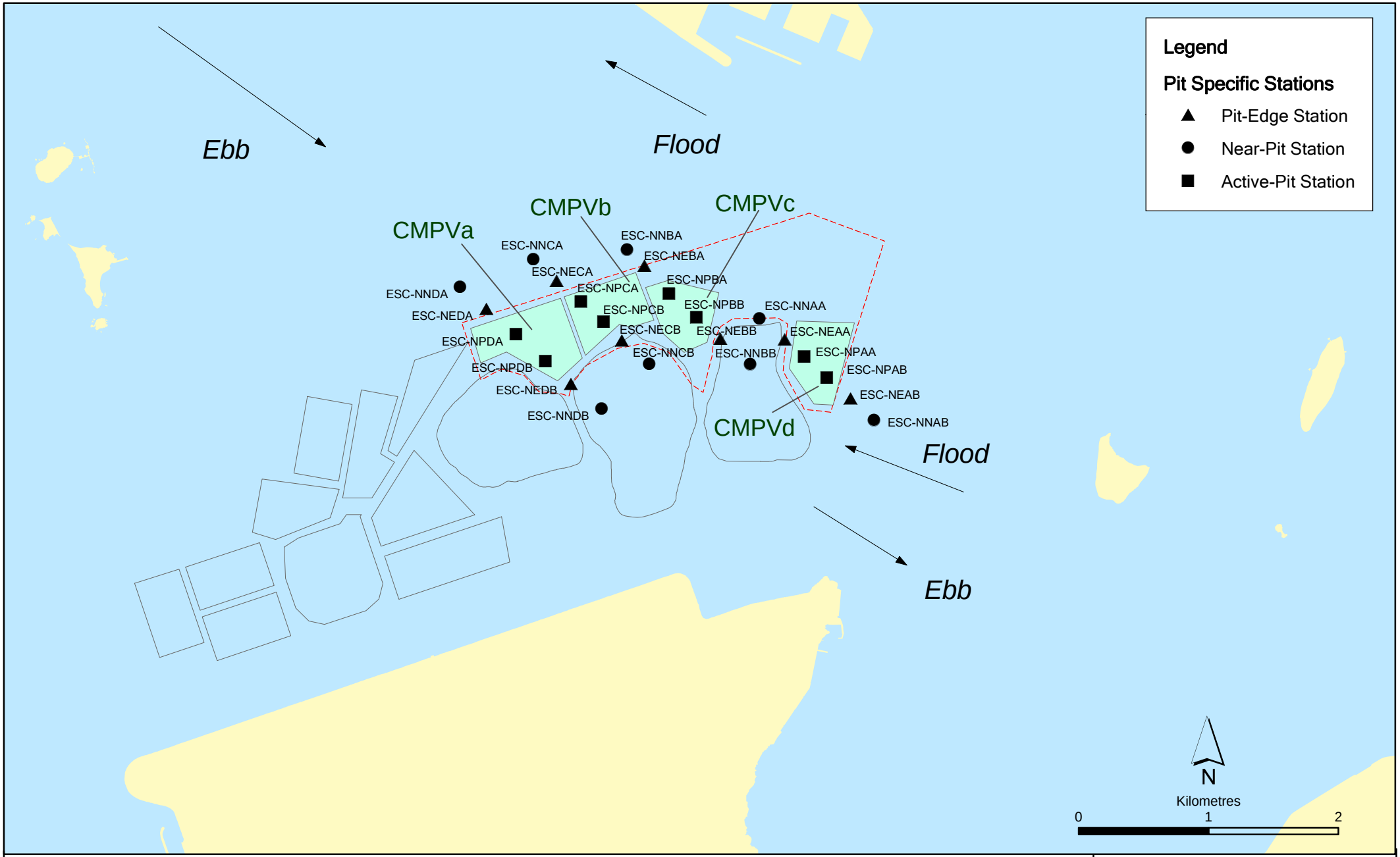


Figure 1.1

Pit Specific Sediment Quality Monitoring Stations for CMPV

File: CMPV\0103262_SQMS_pit specific.mxd
Date: 29/10/2009

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1.5.6 Impact Water Quality Monitoring during Dredging Operations of CMP Vd – April 2013

1.5.7 *Impact Water Quality Monitoring during Dredging Operations of CMP Vd* was conducted on 16 April 2013. On the survey day, sampling was conducted during both mid-ebb and mid-flood tides at two Reference (Upstream) stations upstream and five Impact (Downstream) stations downstream of the dredging operations at CMP Vd (*Figure 1.2*). Monitoring was also conducted at Ma Wan station. At each station, *in-situ* measurements of water quality parameters as well as water samples were taken from three depths in the water column (ie surface: 1 m below sea surface, mid-depth and bottom: 1 m above the seabed). Where water depth was less than 6 m, the mid-depth station was omitted. If water depth was less than 3 m, only the mid-depth station was monitored.

1.5.8 Monitoring results are presented in *Table C1* of *Annex C*. Levels of Dissolved Oxygen (DO), Turbidity and Suspended Solids (SS) complied with the Action and Limit Levels set in the Baseline Monitoring Report (1).

1.5.9 Overall, there appears to be no unacceptable water quality impacts causing by the dredging operations at CMP Vd and no additional measures are thus considered required except for those stated in the Environmental Permit (*EP-312/2008*).

1.5.10 Routine Water Quality Monitoring for CMP Va – April 2013

1.5.11 The results for the Routine Water Quality Monitoring conducted during April 2013 in the wet season 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 (November to March) of 1999-2010 from stations in the Northwestern Water Control Zone, where the CMPs are located. For Salinity, the average value obtained from the Upstream Station was used for the basis as the WQO. *In-situ* monitoring and laboratory results are shown in *Tables 1.2* and *1.3*, respectively, with graphical presentation provided in *Annex B*. Monitoring was undertaken at a total of 16 stations in the reporting month (see *Figure 1.3*).

(1) ERM (2009). Draft Second Review of the EM&A Manual. Prepared for CEDD for EM&A for Contaminated Mud Pit at Sha Chau (2009-2013) – Investigation Agreement No. CE 4/2009 (EP).

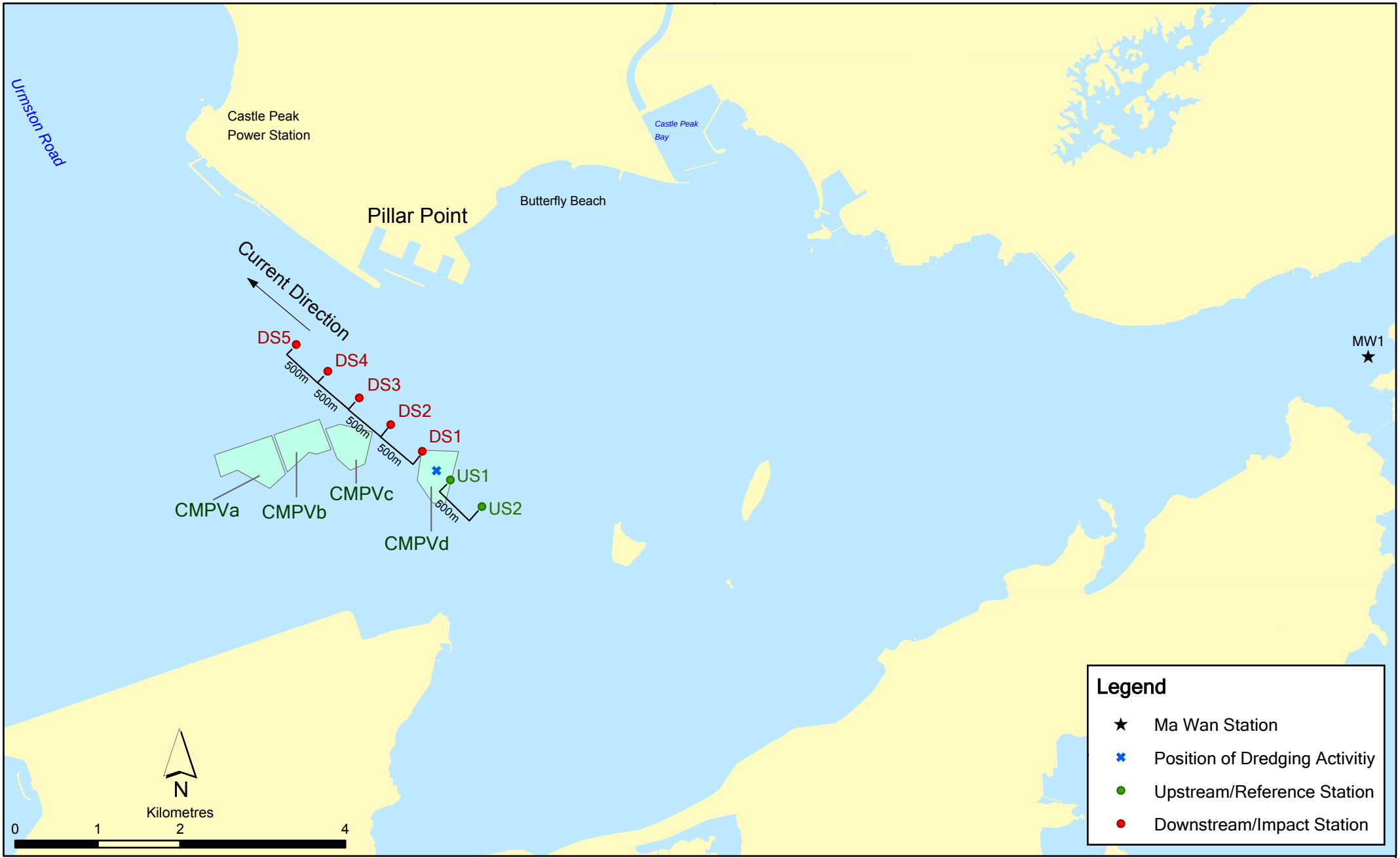

Figure 1.2

Indicative Dredging Impact Sampling Stations for CMPVd

Note: The locations of sampling stations will be determined on site based on current direction and position of dredging activities.

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Date: 28/11/2012

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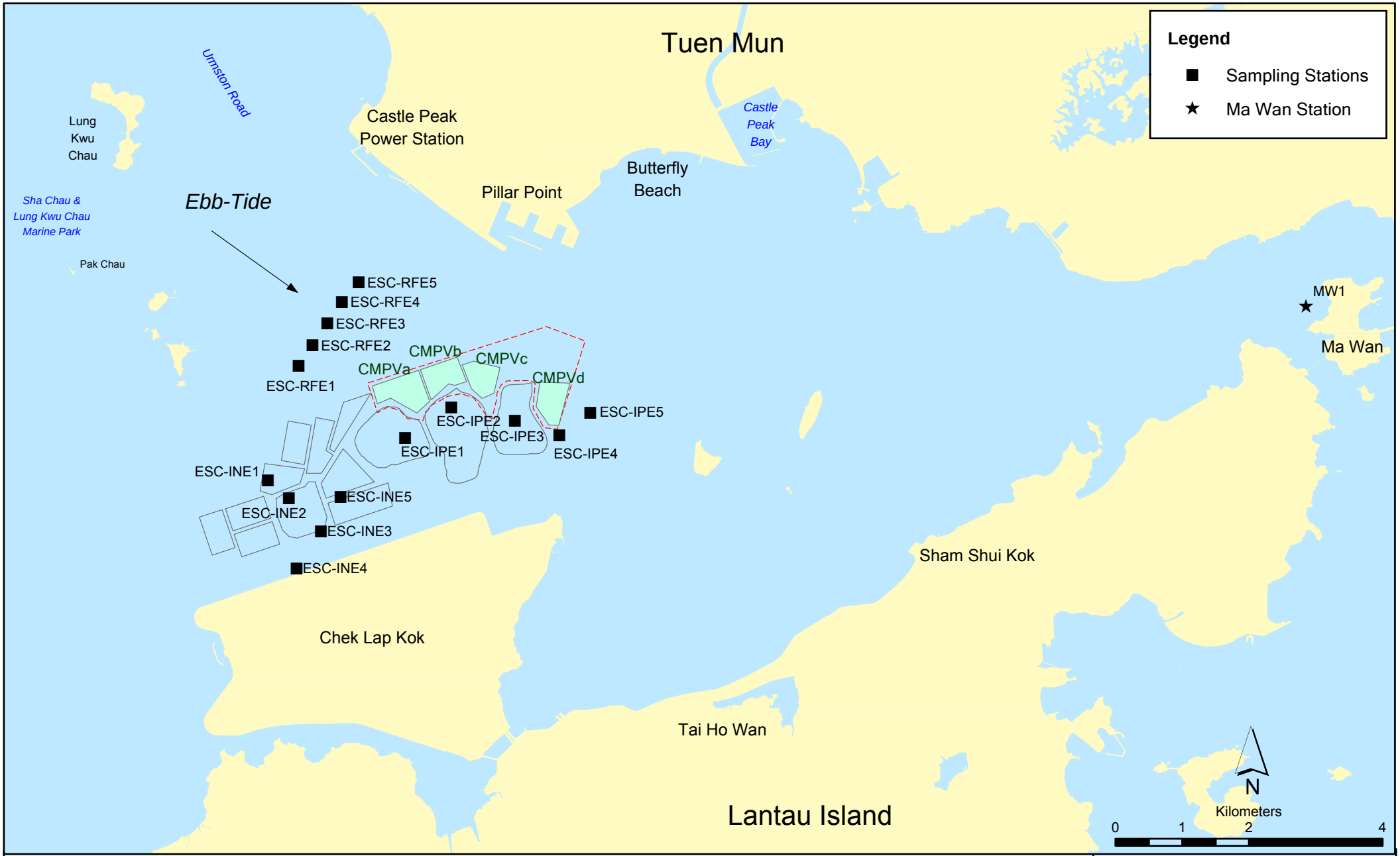

Figure 1.3

Routine & Capping Water Quality Sampling Stations (Ebb-Tide) for CMPV

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Date: 3/12/2012

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In-situ Measurements

1.5.12 Analysis of results for April 2013 indicated that for all stations (Impact, Intermediate, Reference and Ma Wan), levels of pH and DO complied with the WQOs (*Figures 6-8* of *Annex B*). Levels of Salinity complied with the WQO at all stations, except at Ma Wan Station (*Figure 9* of *Annex B*). The higher salinity recorded at Ma Wan station is likely to be caused by its greater separation distance from the Pearl River mouth, which is a key source of freshwater inputs in the area, when compared to the Reference stations. Levels of DO and Turbidity within the reporting month complied with the Action and Limit Levels set in the *EM&A Manual* [(1)] (*Figures 7 and 10 of Annex B*). All *in-situ* water quality measurements showed relatively minor variations amongst Impact, Intermediate and Reference stations (*Figures 6-10* of *Annex B*).

Laboratory Measurements

1.5.13 Analyses of April 2013 results indicate that concentrations of Cadmium, Mercury and Silver were below their limit of reporting at all stations. Arsenic, Copper, Nickel and Zinc were detected in samples from all stations while Chromium and Lead were recorded in samples from Impact stations only. Concentrations of Arsenic, Chromium, Lead and Nickel appeared to be similar amongst all stations while concentrations of Copper and Zinc were slightly higher at Impact stations (*Figures 11 and 12 of Annex B*). Levels of 5-day Biochemical Oxygen Demand (BOD_5), Total Inorganic Nitrogen (TIN) and NH_3-N were similar amongst all stations (*Figures 13 and 14 of Annex B*). Concentrations of SS complied with the WQO (12.74 mg/L for wet season) and Action and Limit Levels at all stations during the reporting month (*Figure 15 of Annex B*).

1.5.14 Overall, the results indicated that the disposal operation at CMP Va did not appear to cause any unacceptable deterioration in water quality during this reporting period.

(1) ERM (2009). Draft Second Review of the EM&A Manual. Prepared for CEDD for EM&A for Contaminated Mud Pit at Sha Chau (2009-2013) – Investigation Agreement No. CE 4/2009 (EP).

Table 1.2 ***In-situ Monitoring Results for Routine Water Quality Monitoring of CMP Va in April 2013***

Stations	Temp (°C)	Salinity	Turbidity (NTU)	pH	Dissolved Oxygen (%)	Dissolved Oxygen (mg L^{-1})
RFE (Reference)	20.09	27.33	6.14	7.76	89.59	6.92
IPE (Impact)	19.95	28.38	7.70	7.79	91.60	7.05
INE (Intermediate)	19.87	28.69	6.66	7.80	93.07	7.16
Ma Wan Station	19.98	30.40	4.35	7.77	90.71	6.90
WQO	*N/A*	24.60-30.06#	*N/A*	*6.5-8.5*	*N/A*	>4

Note: #Not exceeding 10% of natural ambient level which is the result obtained from the Reference Station.

Table 1.3 ***Laboratory Results for Routine Water Quality Monitoring of CMP Va in April 2013***

Stations	As (µg/L)	Ag (µg/L)	Cd (µg/L)	Cr (µg/L)	Cu (µg/L)	Hg (µg/L)	Pb (µg/L)	Ni (µg/L)	Zn (µg/L)	NH_3-N (mg/L)	TIN (mg/L)	BOD_5 (mg/L)	SS (mg/L)
RFE	1.20	<LOR	<LOR	<LOR	5.55	<LOR	<LOR	3.08	6.33	0.27	0.83	1.22	8.40
IPE	1.43	<LOR	<LOR	0.58	9.35	<LOR	0.94	2.98	12.55	0.24	0.71	1.17	10.68
INE	1.13	<LOR	<LOR	<LOR	9.08	<LOR	<LOR	2.40	8.45	0.22	0.64	0.96	8.50
Ma Wan Station	1.00	<LOR	<LOR	<LOR	7.88	<LOR	<LOR	2.00	9.63	0.17	0.45	1.06	7.25
													WQO of SS: 12.74mg/L

Note: LOR = Limit Of Reporting

1.6 ACTIVITIES SCHEDULED FOR THE NEXT MONTH

1.6.1 The following monitoring activities will be conducted in the next monthly period of May 2013 for CMP V:

- *Pit Specific Sediment Chemistry* for CMP Va;
- *Routine Water Quality Monitoring* for CMP Va;
- *Water Column Profiling* for CMP Va; and
- *Impact Water Quality Monitoring during Dredging Operations* for CMP Vd.

1.6.2 The sampling schedule is presented in *Annex A*.

1.7 STUDY PROGRAMME

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

Annex A

Sampling Schedule

Annex A1 - East of Sha Chau Environmental Monitoring and Audit Sampling Schedule for CMP IV (January 2012 - December 2013)

		2012												2013											
Tissue/ Whole Body Sampling		J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
Near-Pit Stations																									
	INA		*																						
	INB		*																						
Reference North																									
	TNA		*																						
	TNB		*																						
Reference South																									
	TSA		*																						
	TSB		*																						
Demersal Trawling		J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
Near Pit Stations																									
	INA 1-5	*	*																						
	INB 1-5	*	*																						
Reference North																									
	TNA 1-5	*	*																						
	TNB 1-5	*	*																						
Reference South																									
	TSA 1-5	*	*																						
	TSB 1-5	*	*																						
Capping		J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
Ebb Tide																									
Impact Station Downcurrent																									
	IPE1		*				*		*				*		*				*		*				*
	IPE2		*				*		*				*		*				*		*				*
	IPE3		*				*		*				*		*				*		*				*
	IPE4		*				*		*				*		*				*		*				*
	PFC1		*				*		*				*		*				*		*				*
Intermediate Station Downcurrent																									
	INE1		*				*		*				*		*				*		*				*
	INE2		*				*		*				*		*				*		*				*
	INE3		*				*		*				*		*				*		*				*
	INE4		*				*		*				*		*				*		*				*
	INE5		*				*		*				*		*				*		*				*
Reference Station Upcurrent																									
	RFE1		*				*		*				*		*				*		*				*
	RFE2		*				*		*				*		*				*		*				*
	RFE3		*				*		*				*		*				*		*				*
	RFE4		*				*		*				*		*				*		*				*
	RFE5		*				*		*				*		*				*		*				*
Flood Tide																									
Impact Station Downcurrent																									
	INF1		*				*		*				*		*				*		*				*
	PFC2		*				*		*				*		*				*		*				*
	INF3		*				*		*				*		*				*		*				*
Intermediate Station Downcurrent																									
	IPF1		*				*		*				*		*				*		*				*
	IPF2		*				*		*				*		*				*		*				*
	IPF3		*				*		*				*		*				*		*				*
Reference Station Upcurrent																									
	RFF1		*				*		*				*		*				*		*				*
	RFF2		*				*		*				*		*				*		*				*
	RFF3		*				*		*				*		*				*		*				*
Water Column Profiling		J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
Plume Stations	WCP1	*																							
	WCP2	*																							
Benthic Recolonisation Studies		J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
Capped Contaminated Mud Pits III																									
CPA	1 grab per station								*																
CPB	1 grab per station								*																
CPC	1 grab per station								*																
Reference Stations																									
RBA	1 grab per station								*																
RBB	1 grab per station								*																
RBC	1 grab per station								*																

"*" = Number of replicates depends on field catch or parameters

Sampling completed

Sampling to be completed

Annex A2 - East of Sha Chau Environmental Monitoring and Audit Sampling Schedule for CMP V (January 2012 - February 2014)

		2012												2013												2014	
Pit Specific Sediment Chemistry	**Code**	**J**	**F**	**M**	**A**	**M**	**J**	**J**	**A**	**S**	**O**	**N**	**D**	**J**	**F**	**M**	**A**	**M**	**J**	**J**	**A**	**S**	**O**	**N**	**D**	**J**	**F**
Active-Pit																											
	ESC-NPDA		*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*						
	ESC-NPDB		*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*						
Pit-Edge																											
	ESC-NEDA		*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*						
	ESC-NEDB		*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*						
Near-Pit																											
	ESC-NNDA		*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*						
	ESC-NNDB		*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*						

Cumulative Impact Sediment Chemistry		**J**	**F**	**M**	**A**	**M**	**J**	**J**	**A**	**S**	**O**	**N**	**D**	**J**	**F**	**M**	**A**	**M**	**J**	**J**	**A**	**S**	**O**	**N**	**D**	**J**	**F**
Near-field Stations																											
	ESC-RNA		*				*		*				*		*				*		*						
	ESC-RNB		*				*		*				*		*				*		*						
Mid-field Stations																											
	ESC-RMA		*				*		*				*		*				*		*						
	ESC-RMB		*				*		*				*		*				*		*						
Capped Pit Stations																											
	ESC-RCA		*				*		*				*		*				*		*						
	ESC-RCB		*				*		*				*		*				*		*						
Far-Field Stations																											
	ESC-RFA		*				*		*				*		*				*		*						
	ESC-RFB		*				*		*				*		*				*		*						
Ma Wan Station																											
	MW1		*				*		*				*		*				*		*						

Sediment Toxicity Tests		**J**	**F**	**M**	**A**	**M**	**J**	**J**	**A**	**S**	**O**	**N**	**D**	**J**	**F**	**M**	**A**	**M**	**J**	**J**	**A**	**S**	**O**	**N**	**D**	**J**	**F**
Near-Field Stations																											
	ESC-TDA		*						*						*						*						
	ESC-TDB		*						*						*						*						
Reference Stations																											
	ESC-TRA		*						*						*						*						
	ESC-TRB		*						*						*						*						
Ma Wan Station																											
	MW1		*						*						*						*						

Tissue/ Whole Body Sampling		**J**	**F**	**M**	**A**	**M**	**J**	**J**	**A**	**S**	**O**	**N**	**D**	**J**	**F**	**M**	**A**	**M**	**J**	**J**	**A**	**S**	**O**	**N**	**D**	**J**	**F**
Impact Stations																											
	ESC-INA								*						*						*						
	ESC-INB								*						*						*						
Reference																											
	ESC-TNA								*						*						*						
	ESC-TNB								*						*						*						
	ESC-TSA								*						*						*						
	ESC-TSB								*						*						*						

Demersal Trawling		**J**	**F**	**M**	**A**	**M**	**J**	**J**	**A**	**S**	**O**	**N**	**D**	**J**	**F**	**M**	**A**	**M**	**J**	**J**	**A**	**S**	**O**	**N**	**D**	**J**	**F**
Impact Stations																											
	ESC-INA							*	*					*	*					*	*						
	ESC-INB							*	*					*	*					*	*						
Reference Stations																											
	ESC-TNA							*	*					*	*					*	*						
	ESC-TNB							*	*					*	*					*	*						
	ESC-TSA							*	*					*	*					*	*						
	ESC-TSB							*	*					*	*					*	*						

Capping		**J**	**F**	**M**	**A**	**M**	**J**	**J**	**A**	**S**	**O**	**N**	**D**	**J**	**F**	**M**	**A**	**M**	**J**	**J**	**A**	**S**	**O**	**N**	**D**	**J**	**F**
Ebb Tide																											
Impact Station																											
	ESC-IPE1																								*		*
	ESC-IPE2																								*		*
	ESC-IPE3																								*		*
	ESC-IPE4																								*		*
	ESC-IPE5																								*		*
Intermediate Station																											
	ESC-INE1																								*		*
	ESC-INE2																								*		*
	ESC-INE3																								*		*
	ESC-INE4																								*		*
	ESC-INE5																								*		*
Reference Station																											
	ESC-RFE1																								*		*
	ESC-RFE2																								*		*
	ESC-RFE3																								*		*
	ESC-RFE4																								*		*
	ESC-RFE5																								*		*
Ma Wan Station																											
	MW1																								*		*
Flood Tide																											
Impact Station																											
	ESC-IPF1																								*		*
	ESC-IPF2																								*		*
	ESC-IPF3																								*		*
Intermediate Station																											
	ESC-INF1																								*		*
	ESC-INF2																								*		*
	ESC-INF3																								*		*
Reference Station																											
	ESC-RFF1																								*		*
	ESC-RFF2																								*		*
	ESC-RFF3																								*		*
Ma Wan Station																											
	MW1																								*		*

		2012												2013												2014	
Routine Water Quality Monitoring		**J**	**F**	**M**	**A**	**M**	**J**	**J**	**A**	**S**	**O**	**N**	**D**	**J**	**F**	**M**	**A**	**M**	**J**	**J**	**A**	**S**	**O**	**N**	**D**	**J**	**F**
Ebb Tide																											
Impact Station																											
	ESC-IPE1		*		*	*		*	*		*	*		*	*		*	*		*	*						
	ESC-IPE2		*		*	*		*	*		*	*		*	*		*	*		*	*						
	ESC-IPE3		*		*	*		*	*		*	*		*	*		*	*		*	*						
	ESC-IPE4		*		*	*		*	*		*	*		*	*		*	*		*	*						
	ESC-IPE5		*		*	*		*	*		*	*		*	*		*	*		*	*						
Intermediate Station																											
	ESC-INE1		*		*	*		*	*		*	*		*	*		*	*		*	*						
	ESC-INE2		*		*	*		*	*		*	*		*	*		*	*		*	*						
	ESC-INE3		*		*	*		*	*		*	*		*	*		*	*		*	*						
	ESC-INE4		*		*	*		*	*		*	*		*	*		*	*		*	*						
	ESC-INE5		*		*	*		*	*		*	*		*	*		*	*		*	*						
Reference Station																											
	ESC-RFE1		*		*	*		*	*		*	*		*	*		*	*		*	*						
	ESC-RFE2		*		*	*		*	*		*	*		*	*		*	*		*	*						
	ESC-RFE3		*		*	*		*	*		*	*		*	*		*	*		*	*						
	ESC-RFE4		*		*	*		*	*		*	*		*	*		*	*		*	*						
	ESC-RFE5		*		*	*		*	*		*	*		*	*		*	*		*	*						
Ma Wan Station																											
	MW1		*		*	*		*	*		*	*		*	*		*	*		*	*						
Flood Tide																											
Impact Station																											
	ESC-IPF1		*		*	*		*	*		*	*		*	*		*	*		*	*						
	ESC-IPF2		*		*	*		*	*		*	*		*	*		*	*		*	*						
	ESC-IPF3		*		*	*		*	*		*	*		*	*		*	*		*	*						
Intermediate Station																											
	ESC-INF1		*		*	*		*	*		*	*		*	*		*	*		*	*						
	ESC-INF2		*		*	*		*	*		*	*		*	*		*	*		*	*						
	ESC-INF3		*		*	*		*	*		*	*		*	*		*	*		*	*						
Reference Station																											
	ESC-RFF1		*		*	*		*	*		*	*		*	*		*	*		*	*						
	ESC-RFF2		*		*	*		*	*		*	*		*	*		*	*		*	*						
	ESC-RFF3		*		*	*		*	*		*	*		*	*		*	*		*	*						
Ma Wan Station																											
	MW1		*		*	*		*	*		*	*		*	*		*	*		*	*						

Water Column Profiling		**J**	**F**	**M**	**A**	**M**	**J**	**J**	**A**	**S**	**O**	**N**	**D**	**J**	**F**	**M**	**A**	**M**	**J**	**J**	**A**	**S**	**O**	**N**	**D**	**J**	**F**
Plume Stations	WCP1		*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*						
	WCP2		*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*						

Benthic Recolonisation Studies		**J**	**F**	**M**	**A**	**M**	**J**	**J**	**A**	**S**	**O**	**N**	**D**	**J**	**F**	**M**	**A**	**M**	**J**	**J**	**A**	**S**	**O**	**N**	**D**	**J**	**F**
Capped Contaminated Mud Pits IVa-c																											
	ESC-CPA								*				*								*				*		
	ESC-CPB								*				*								*				*		
	ESC-CPC								*				*								*				*		
Reference Stations																											
	ESC-RBA								*				*								*				*		
	ESC-RBB								*				*								*				*		
	ESC-RBC								*				*								*				*		

Impact Monitoring for Dredging		**J**	**F**	**M**	**A**	**M**	**J**	**J**	**A**	**S**	**O**	**N**	**D**	**J**	**F**	**M**	**A**	**M**	**J**	**J**	**A**	**S**	**O**	**N**	**D**	**J**	**F**
Upstream/Reference Stations																											
	US1	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*								
	US2	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*								
Downstream/Impact Stations																											
	DS1	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*								
	DS2	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*								
	DS3	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*								
	DS4	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*								
	DS5	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*								
Ma Wan Station																											
	MW1	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*								

Sampling completed

Sampling to be completed

Annex B

Monitoring Results

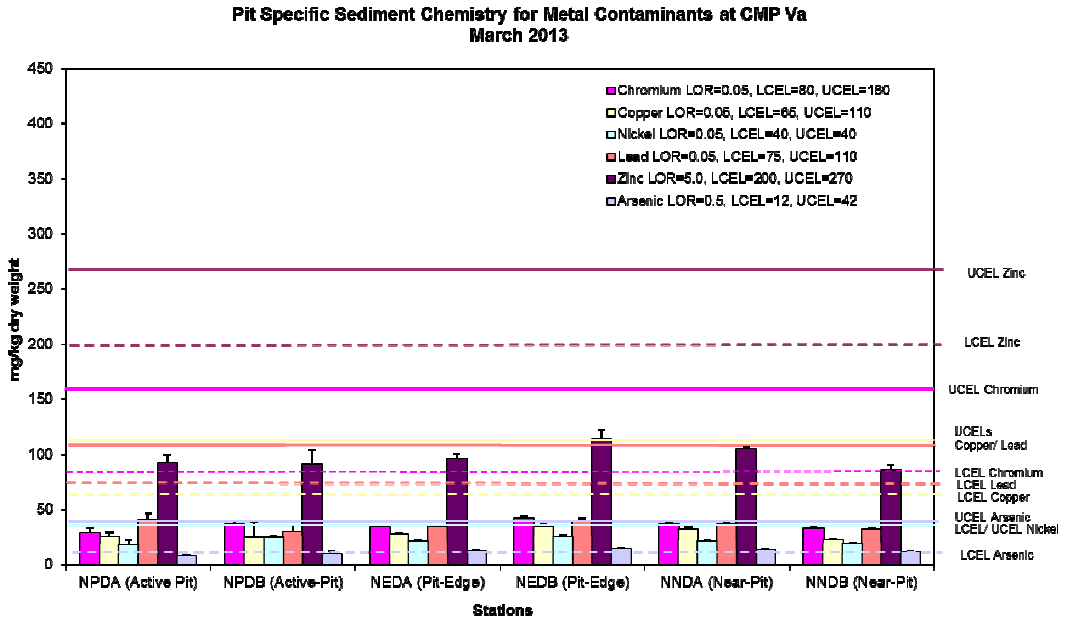

Figure 1: Concentration of Metals (Cr, Cu, Ni, Pb, Zn, As; mean +SD) in sediment samples collected from Pit Specific Sediment Chemistry Monitoring for CMP Va in March 2013.

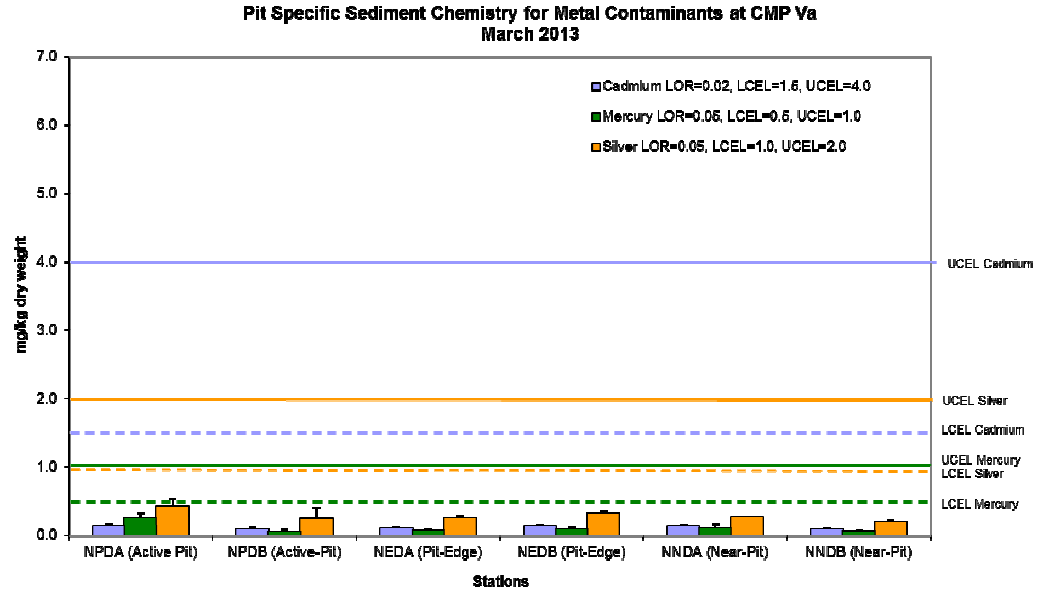

Figure 2: Concentration of Metals (Cd, Hg, Ag; mean +SD) in sediment samples collected from Pit Specific Sediment Chemistry Monitoring for CMP Va in March 2013.

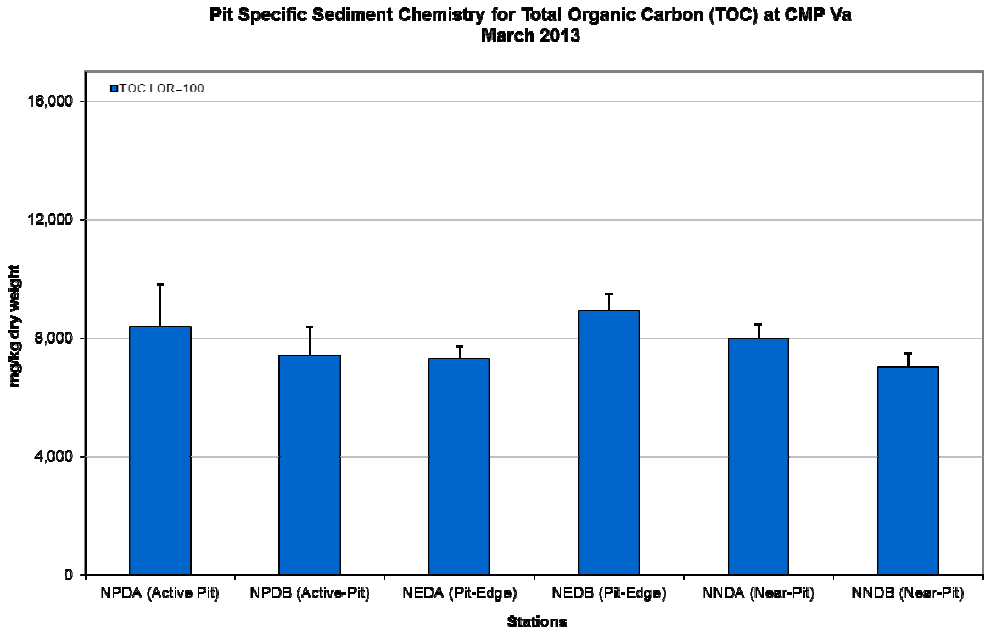

Figure 3: Concentration of Total Organic Carbon (mg/kg dry weight; mean +SD) in sediment samples collected from Pit Specific Sediment Chemistry Monitoring for CMP Va in March 2013.

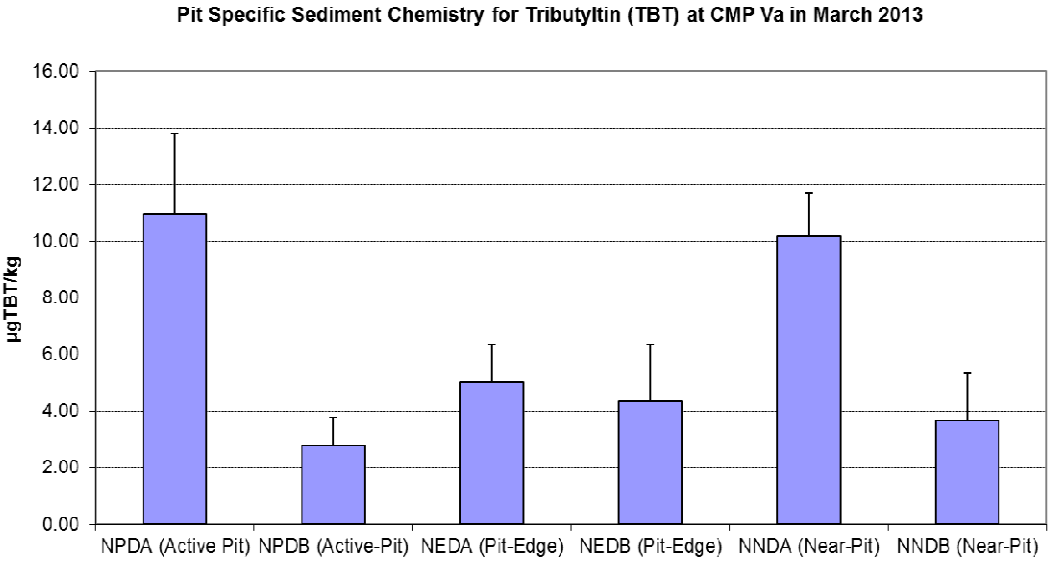

Figure 4: Concentration of Tributyltin (µg TBT/kg; mean +SD) in sediment samples collected from Pit Specific Sediment Chemistry Monitoring of CMP Va in March 2013.

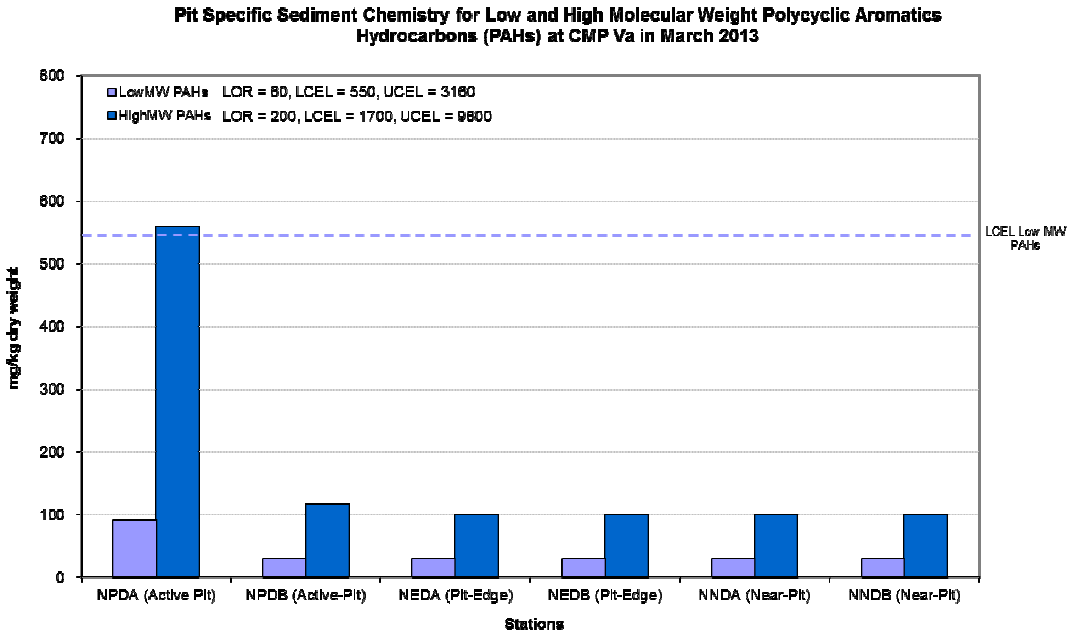

Figure 5: Concentration of Low and High Molecular Weight Polycyclic Aromatics Hydrocarbons (PAHs) (µg/kg; mean +SD) in sediment samples collected from Pit Specific Sediment Chemistry Monitoring for CMP Va in March 2013.

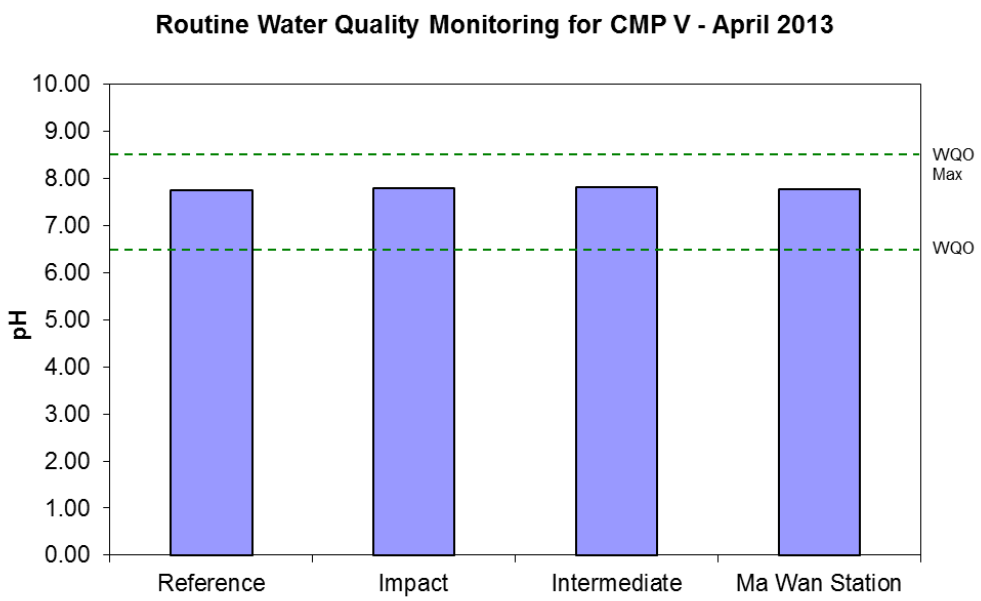

Figure 6: Level of pH (mean + SD) recorded during Routine Water Quality Monitoring for disposal operations at CMP Va in April 2013.

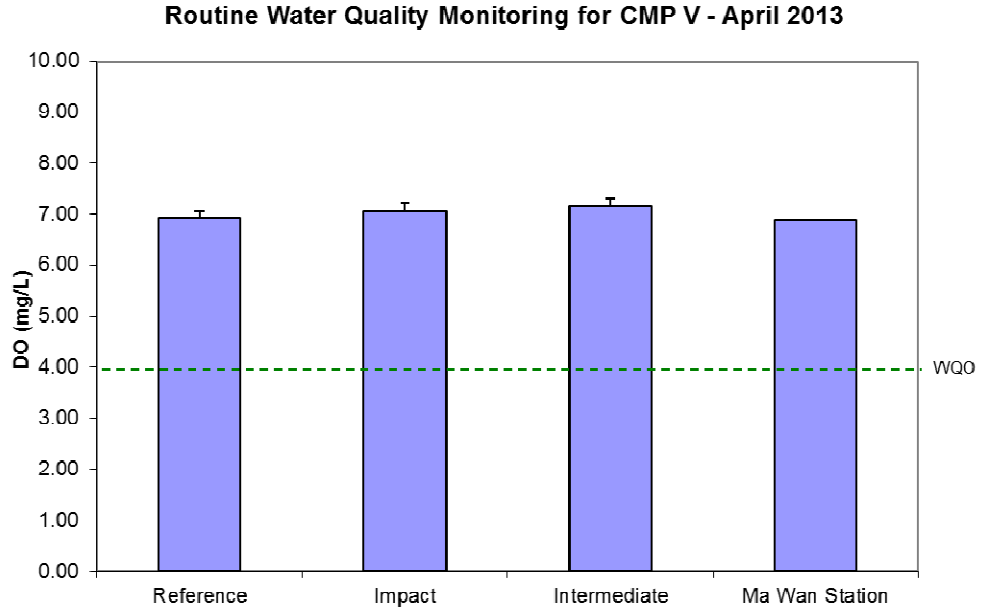

Figure 7: Concentration of Dissolved Oxygen (mg/L; mean + SD) recorded during Routine Water Quality Monitoring for disposal operations at CMP Va in April 2013.

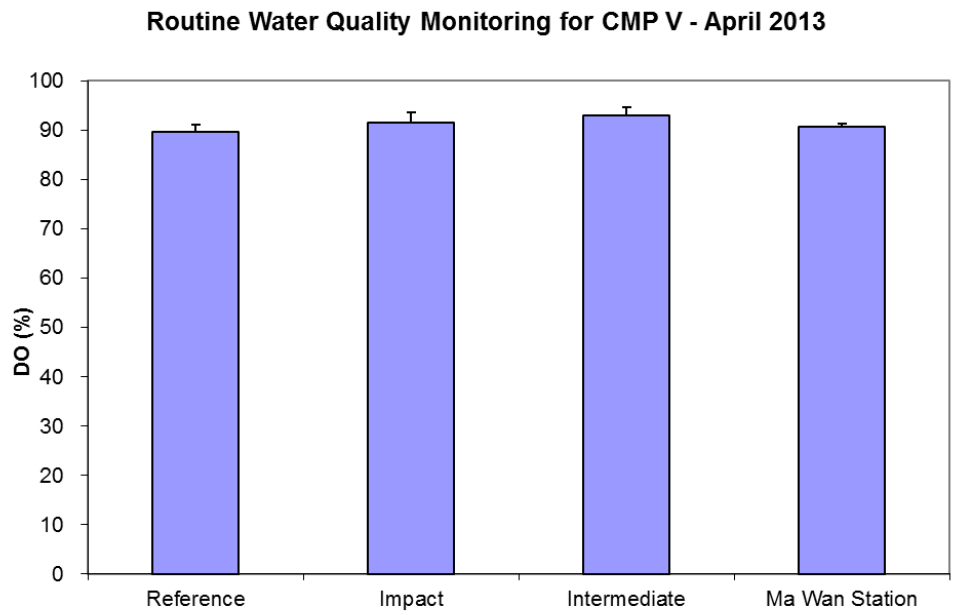

Figure 8: Level of Dissolved Oxygen (% saturation; mean + SD) recorded during Routine Water Quality Monitoring for disposal operations at CMP Va in April 2013.

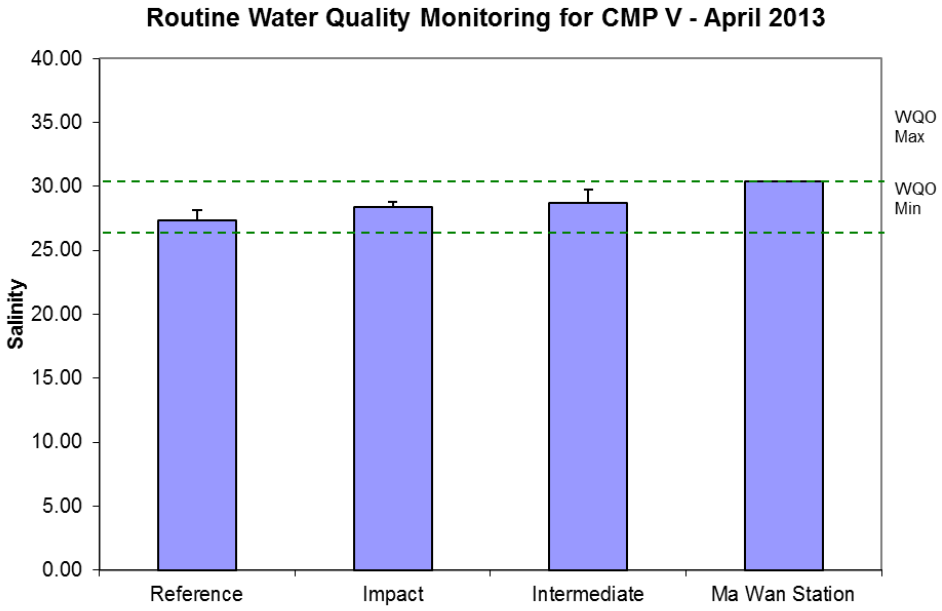

Figure 9: Level of Salinity (mean + SD) recorded during Routine Water Quality Monitoring for disposal operations at CMP Va in April 2013.

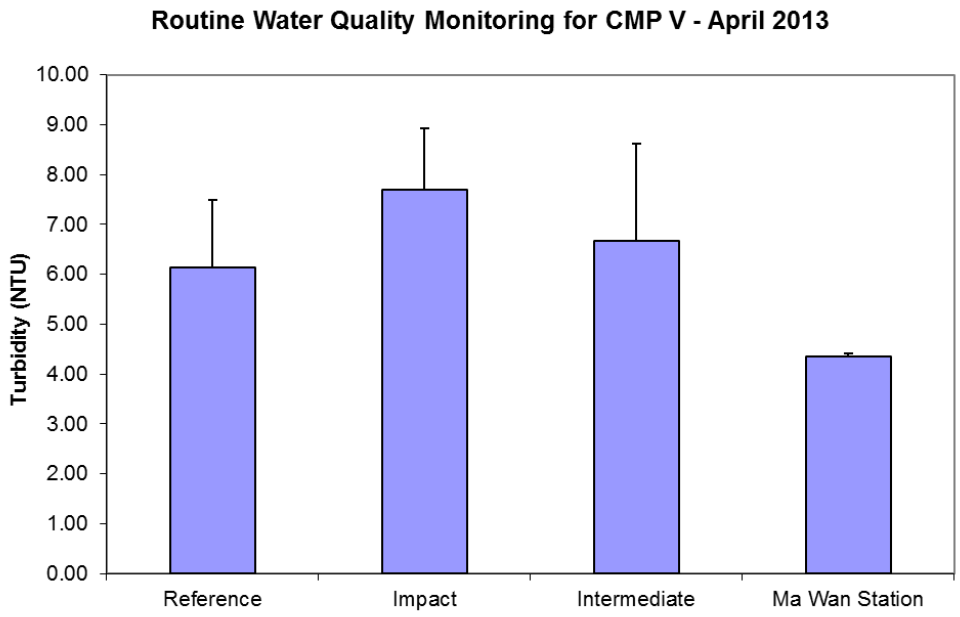

Figure 10: Level of Turbidity (NTU; mean + SD) recorded during Routine Water Quality Monitoring for disposal operations at CMP Va in April 2013.

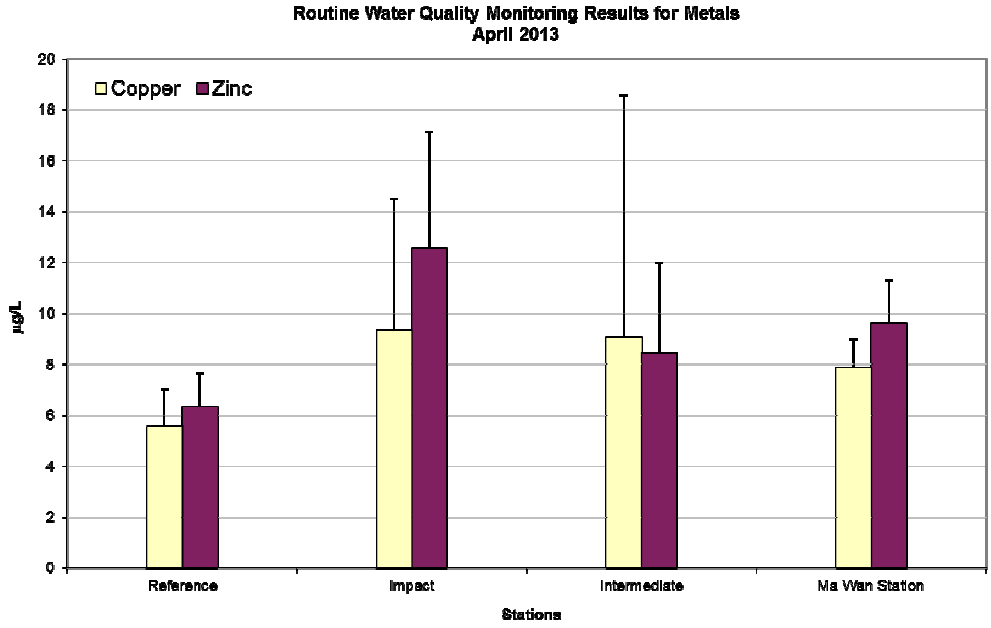

Figure 11: Concentration of Copper and Zinc (mean + SD) in water samples collected from Routine Water Quality Monitoring for disposal operations at CMP Va in April 2013.

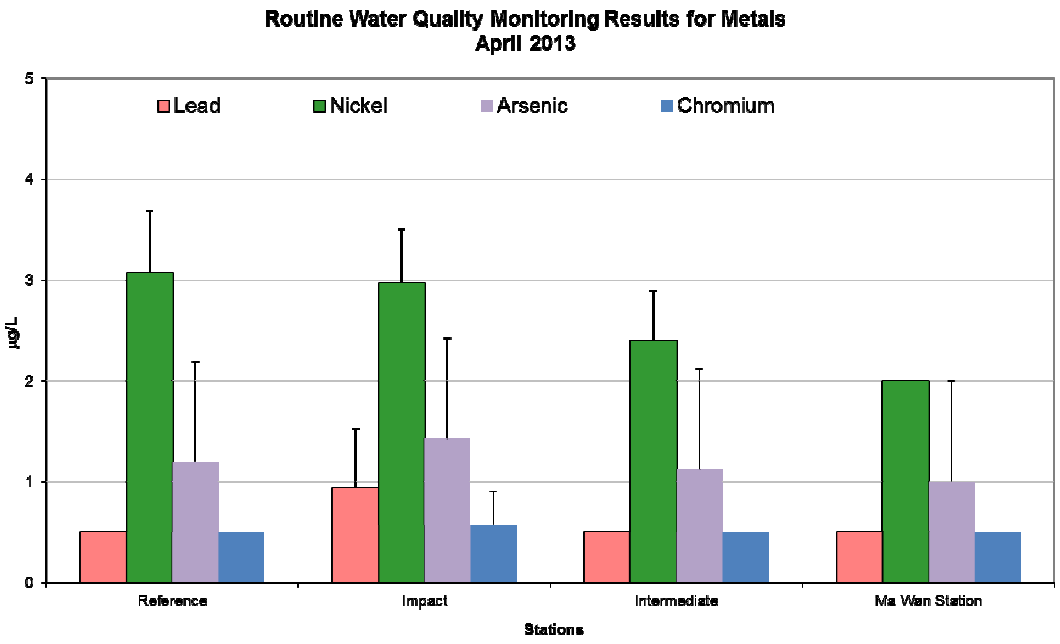

Figure 12: Concentration of Lead, Nickel, Arsenic and Chromium (mean + SD) in water samples collected from Routine Water Quality Monitoring for disposal operations at CMP Va in April 2013.

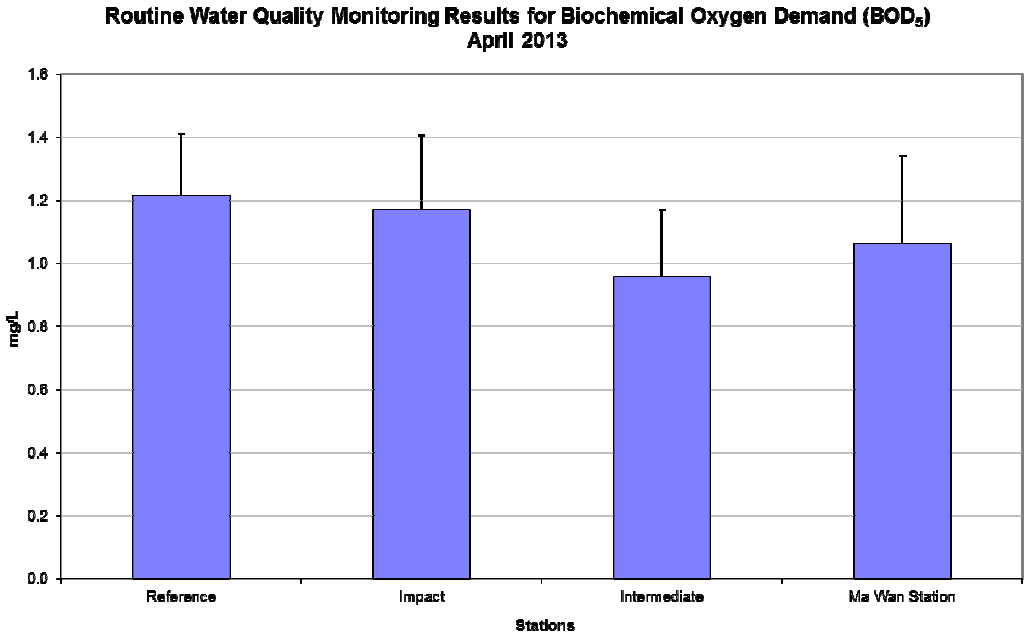

Figure 13: Level of Biochemical Oxygen Demand (BOD_5; mean + SD) in water samples collected from Routine Water Quality Monitoring for disposal operations at CMP Va in April 2013.

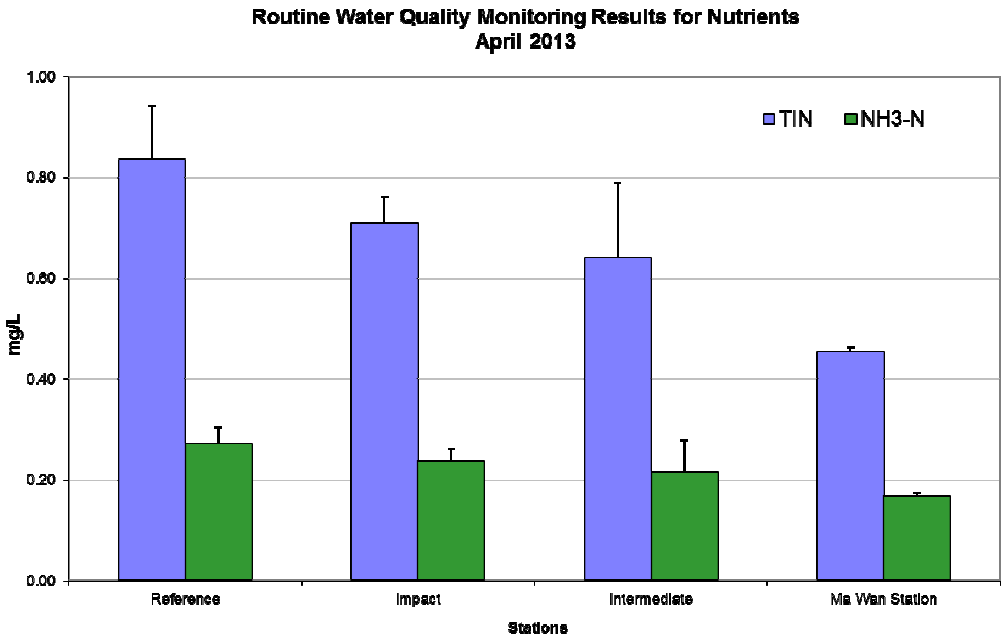

Figure 14: Concentration of Total Inorganic Nitrogen and NH_3-N (mean + SD) in water samples collected from Routine Water Quality Monitoring for disposal operations at CMP Va in April 2013.

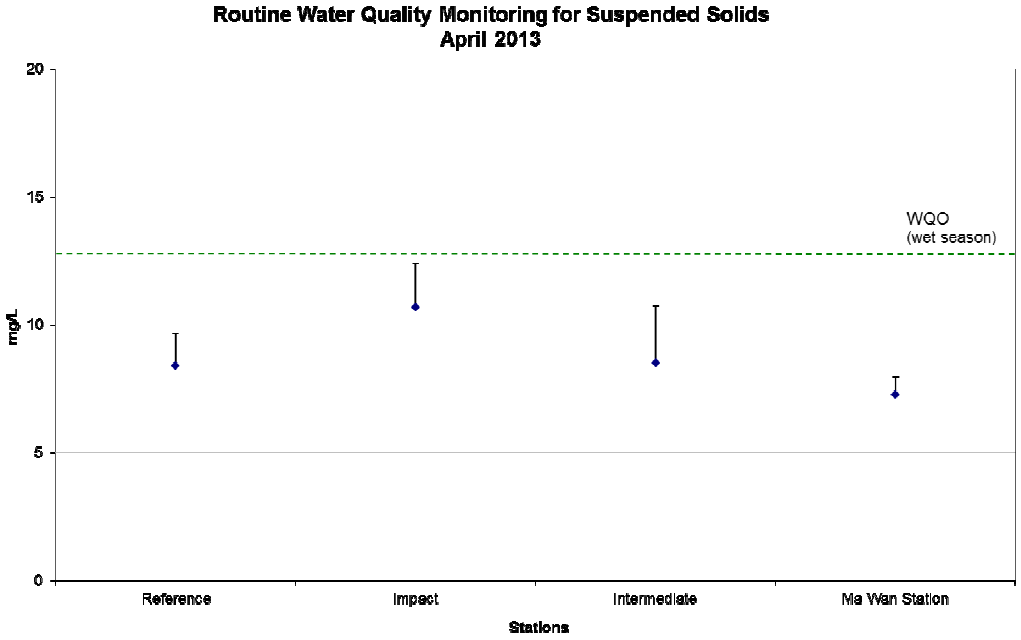

Figure 15: Concentration of Suspended Solids (mean + SD) in water samples collected from Routine Water Quality Monitoring for disposal operations at CMP Va in April 2013.

Annex C

Results of Impact Monitoring during CMP Vd Dredging Operations for April 2013

Table C1 Summary Table of DO, Turbidity and SS Levels Recorded in April 2013

Sampling Date	Tidal Period	Station	Average DO Levels (mg/L)		Average Turbidity Level (NTU)	Average SS Level (mg/L)
			Bottom	Surface and Mid Depth		
2013/4/16	ME	DS1	6.75	7.02	7.48	9.17
		DS2	6.63	6.94	7.68	10.00
		DS3	7.21	7.28	3.40	3.67
		DS4	7.32	7.38	2.82	3.83
		DS5	7.26	7.26	3.48	5.00
		MW1	6.77	6.90	2.38	5.00
		US1	6.62	6.94	5.50	7.83
		US2	6.62	7.03	4.85	7.33
	MF	DS1	6.48	6.54	12.10	17.17
		DS2	6.52	6.62	6.93	9.67
		DS3	6.40	6.59	7.55	14.83
		DS4	6.44	6.64	6.52	8.67
		DS5	6.64	6.83	4.92	6.83
		MW1	6.58	6.59	1.93	3.17
		US1	6.63	6.76	4.05	4.83
		US2	6.55	6.75	4.50	6.33

Notes:

1. Please refer to Table C2 below for the Action and Limit Levels for dredging activities.
2. Cell shaded yellow indicated value exceeding the Action Level criteria.
3. Cell shaded red indicated value exceeding the Limit Level criteria.

Table C2 Action and Limit Levels of Water Quality for Dredging Activities

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

Notes:

(1) For DO, non-compliance of the water quality limits occurs when monitoring result is lower than the limits.

(2) The Action and Limit Levels for DO for Surface & Middle layers were calculated from the combined pool of baseline surface layer data and baseline middle layer data.

(3) Given the Action Level for DO for Surface & Middle layers has already been lower than 4 mg L^{-1}, it is proposed to set the Limit Level at 3.11 mg L^{-1} which is the first percentile of the baseline data.

(4) "Depth-averaged" is calculated by taking the arithmetic means of reading of all three depths.

(5) For turbidity and SS, non-compliance of the water quality limits occurs when monitoring result is higher than the limits.

Annex D

Study Programme

ID	Task Name
1	**Project Commencement**
2	
3	**For CMP IV and New Facility at East Sha Chau**
4	
5	Submission of Draft Inception Report & Draft Programme
6	Submission of Final Inception Report & Final Programme
7	Submission of Draft Operations Manual
8	Submission of Final Operations Manual
9	**Submission of Operations Manual Updates**
17	Submission of Draft Monitoring And Audit Manual (Rev 1)
18	Submission of Final Monitoring And Audit Manual (Rev 1)
19	Submission of Draft Monitoring And Audit Manual (Rev 2)
20	Submission of Final Monitoring And Audit Manual (Rev 2)
21	**Submission of EM&A Manual Updates**
29	
30	**Monitoring Contract Works**
31	Prepare Draft Letters of Invitation, Gazette Documents & Tender Documents
32	Submission of Draft Tender Documents
33	Submission of Draft Gazette Documents
34	Submission of Final Tender Documents
35	Submission of Final Gazette Documents
36	Tendering and Tender Assessment
37	Prepare Contact Documents
38	Submission of Contract Documents
39	Administrate and Supervise Contracted Field and Laboratory Works
40	**Submission of Report on Dredging & Capping Operations**
49	**Monthly Progress Report**
101	**Quarterly EM&A Reports**
115	**Submission of Annual Review Report**
120	**Submission of Annual Risk Assessment Report**
125	**Submission of Draft Final Report**
126	**Submission of the Final Report**
127	**Submission of Draft Executive Summary Report**
128	**Submission of Final Executive Summary Reports**
129	
130	**For East Tung Lung Chau Disposal Facility**
131	
132	**Submission of Monitoring Results & Monthly EM&A Progress Report**
133	October 2009
134	November 2009
135	December 2009
136	January 2010

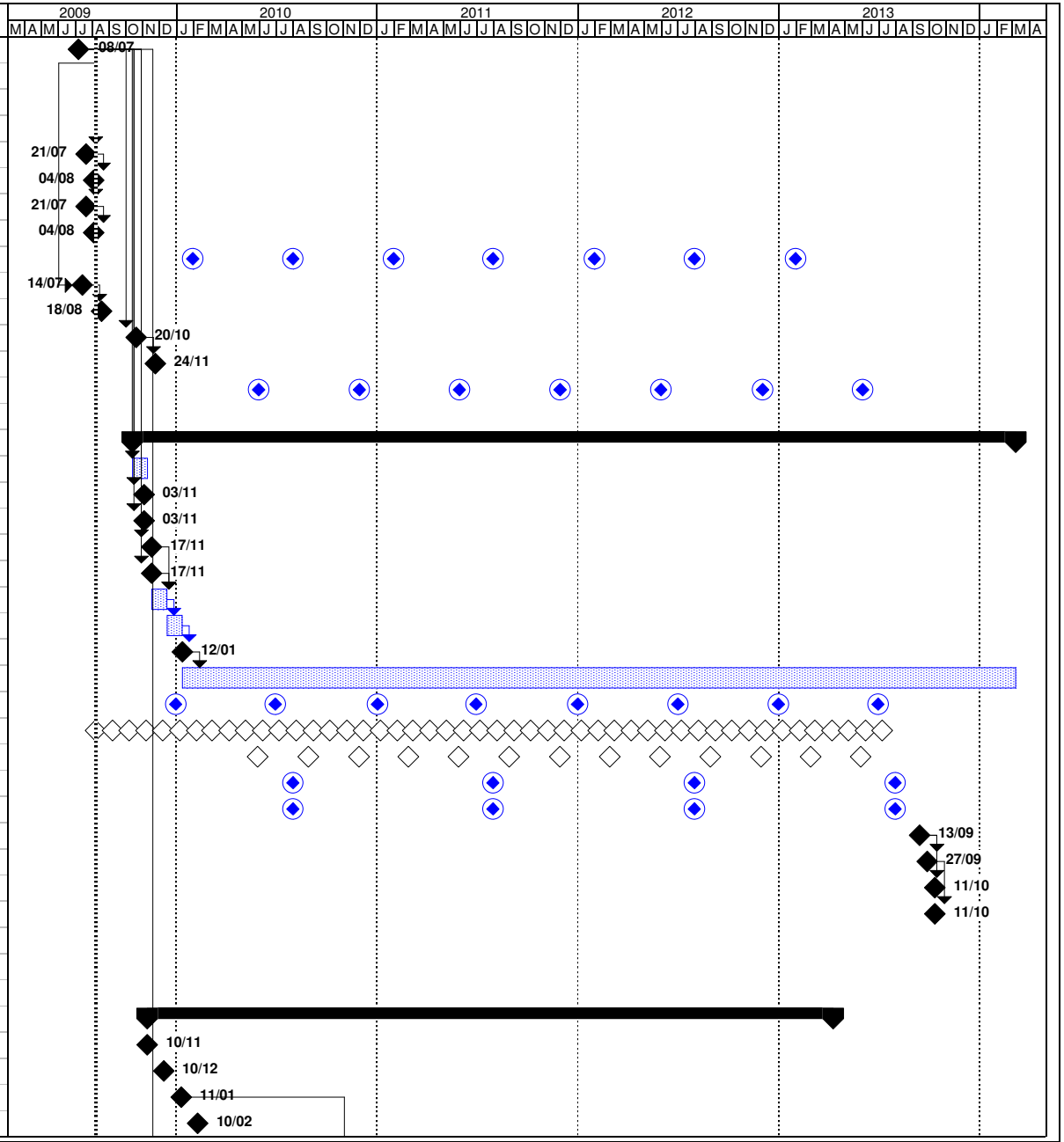

Figure 4.1 - Study Programme

Task | Milestone | Rolled Up Task
Progress | Summary | Rolled Up Milestone

Project: Agreement No. CE 4/2009 (EP) Environmental Monitoring and Audit for Contaminated Mud Pits at Sha Chau (2009-2013) - Investigation

ID	Task Name
137	February 2010
138	March 2010
139	October 2010
140	November 2010
141	December 2010
142	January 2011
143	February 2011
144	March 2011
145	October 2011
146	November 2011
147	December 2011
148	January 2012
149	February 2012
150	March 2012
151	October 2012
152	November 2012
153	December 2012
154	January 2013
155	February 2013
156	March 2013
157	**Submission of Initial Review Report**
158	**Submission of Quarterly EM&A Report**
159	Quarter 1 2010
160	Quarter 2 2010
161	Quarter 3 2011
162	Quarter 4 2011
163	Quarter 5 2012
164	Quarter 2 2012
165	Quarter 1 2013
166	**Submission of Annual Report**
167	Annual Report 1 2010
168	Annual Report 2 2011
169	Annual Report 3 2012
170	
171	**Alternative / Modified Capping Design**
172	
173	**Submission of Investigation Report**
174	**Submission of Annual Report**
175	Capping Design Annual Report 2010
176	Capping Design Annual Report 2011
177	Capping Design Annual Report 2012

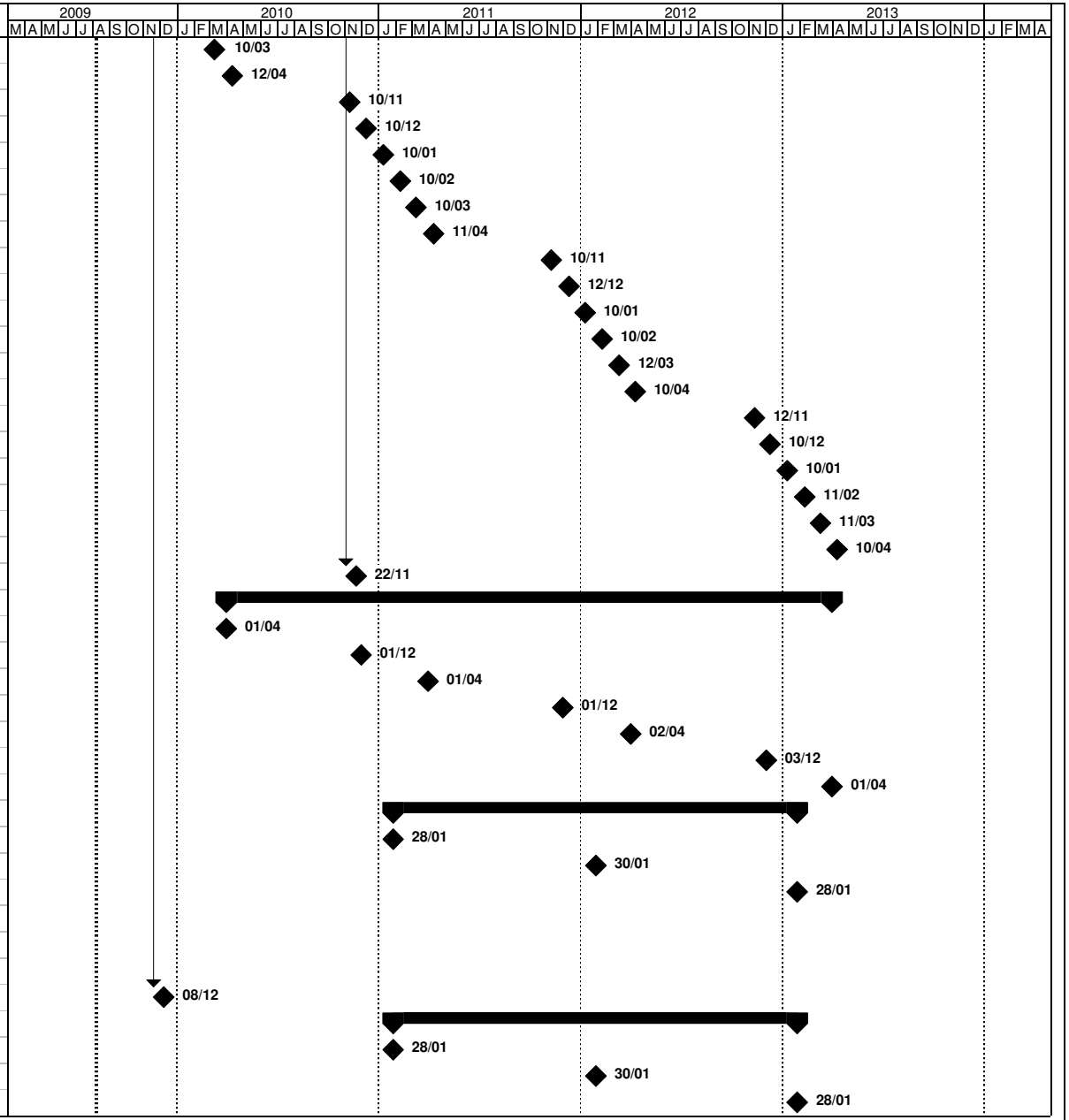

Figure 4.1 - Study Programme

Task | Milestone | Rolled Up Task
Progress | Summary | Rolled Up Milestone

Project: Agreement No. CE 4/2009 (EP) Environmental Monitoring and Audit for Contaminated Mud Pits at Sha Chau (2009-2013) - Investigation