


 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)

11th Monthly Progress Report for Contaminated Mud Pits at Sha Chau – May 2010

Revision 0

24 June 2010

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Revision 0

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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 May 2010 under Agreement No. CE 4/2009 (EP).		Date: 24 June 2010			
		Approved by:  <i>Dr Robin Kennish</i> Director			
0	11 th Monthly Progress Report for CMP – Revision 0	SL	CAR	RK	24/06/10
Revision	Description	By	Checked	Approved	Date
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Agreement No. CE 4/2009 (EP)
Environmental Monitoring and Audit
for Contaminated Mud Pit at Sha Chau (2009-2013) - Investigation

11th MONTHLY PROGRESS REPORT FOR CONTAMINATED MUD PITS
AT SHA CHAU - May 2010

1.1 BACKGROUND

Since 1992, the East of Sha Chau 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. CMP IVc is presently in operation for backfilling by contaminated mud and is anticipated to reach its capacity in 2010. A series of four newly constructed seabed pits at the East of Sha Chau area, CMP Va-d, will be provided for the disposal of contaminated mud after CMP IVc is full. Dredging operations are now taking place to construct CMP Va. The environmental monitoring and audit (EM&A) programme for the CMPs at the East of Sha Chau area presently covers disposal operations at CMP IVc and dredging operations at CMP V.

1.2 REPORTING PERIOD

This *Monthly Progress Report* covers the monitoring period of May 2010.

1.3 DETAILS OF SAMPLING AND LABORATORY TESTING ACTIVITIES

No sampling activity was conducted for CMP IVc during the reporting period. For CMP V, sampling for *Impact Water Quality Monitoring during Dredging Operations* was conducted on 24 May 2010. A summary of field activities are presented in *Annex A*.

A summary of laboratory analysis results submitted by the Contractor in this reporting month is presented in *Table 1.1*.

Table 1.1 *Summary of laboratory analysis results submitted by the Contractor during the reporting month*

Key Task	Monitoring Component	Results Received from the Contractor
CMP V		
Water Sampling and Chemical Analysis	Impact Monitoring during Dredging Operations	May's sampling: 24 May 2010

1.4 *DETAILS OF OUTSTANDING SAMPLING AND / OR ANALYSIS*

No outstanding sampling and laboratory analysis remained from May 2010.

1.5 *BRIEF DISCUSSION OF THE MONITORING RESULTS*

Results of *Pit Specific Sediment Chemistry* for April 2010 are presented for CMP IV. Results of *Impact Water Quality Monitoring during Dredging Operations* for May 2010 are presented for CMP V. Detailed results will be discussed in the relevant *Quarterly Reports*.

1.5.1 *CMP IV*

Pit Specific Sediment Chemistry for CMP IV during April 2010

Concentrations of metals at all stations were below the *Lower Chemical Exceedance Level (LCEL)*, with the exception of Arsenic (*Figures 1 and 2 of Annex B*). Concentrations of Arsenic slightly exceeded the LCEL at all Near Pit and Pit Edge stations. No metal concentrations exceeded the *UCEL* (*Figures 1 and 2 of Annex B*).

Concentrations of Total DDT and 4,4' DDE were higher than the detection limits at the Pit-Edge station CPA (*Figure 3 of Annex B*). Total Organic Carbon (TOC) concentration in the sediment was the highest at the Pit-Edge station CPB when compared to other stations (*Figure 4*). Sediments were mainly composed of silt and clay (65.0 – 95.5 %) materials with the exception of Pit-Edge station CPA, in which sediments were mainly composed of sand (63 %; *Figure 5*).

Concentrations of Low Molecular Weight (LMW) Polycyclic Aromatic Hydrocarbons (PAHs), High Molecular Weight (HMW) PAHs, Total PAHs, Polychlorinated Biphenyls (PCBs) and TBT were below detection limits in sediment samples collected from all stations.

1.5.2 *CMP V*

Impact Water Quality Monitoring during Dredging Operations of CMP V – May 2010

Impact Water Quality Monitoring during Dredging Operations of CMP V was conducted on 24 May 2010. 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 V. Monitoring was also conducted at the 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).

Monitoring results are presented in *Figures 6 to 9 of Annex B*. Levels of DO, depth-average Turbidity and TSS complied with the Action and Limit Levels set in the *Baseline Monitoring Report* ⁽¹⁾ (*Tables B1 and B2 of Annex B*).

1.6 *ACTIVITIES SCHEDULED FOR THE NEXT MONTH*

The following monitoring activities will be conducted in the next monthly period of June 2010:

- *Water Column Profiling* for CMP IV;
- *Water Quality Monitoring during Capping* for CMP IV; and,
- *Impact Water Quality Monitoring during Dredging Operations* for CMP V.

The sampling schedule is presented in *Annex A*.

1.7 *STUDY PROGRAMME*

A summary of the Study programme is presented in *Annex C*.

(1) ERM (2009) Baseline Monitoring Report. Environmental Monitoring and Audit for Contaminated Mud Pit at Sha Chau (2009-2013) – Investigation. Agreement No. CE 4/2009(EP). Submitted to EPD in September 2009.

Annex A

Sampling Schedule

			2009					2010						
Pit Specific Sediment Chemistry	Code	Frequency	J	A	S	O	N	D	J	F	M	A	M	J
Active-Pit	NCA 1-8	3 times per year	*					*				*		
	NCB 1-8	3 times per year	*					*				*		
Pit-Edge	CPA 1-8	3 times per year	*					*				*		
	CPB 1-8	3 times per year	*					*				*		
Near-Pit	CNA 1-8	3 times per year	*					*				*		
	CNB 1-8	3 times per year	*					*				*		

			J	A	S	O	N	D	J	F	M	A	M	J
Near-field Stations	RNA 1-9	2 times per year	*					*						
	RNB 1-9	2 times per year	*					*						
Mid-field Stations	RMA 1-9	2 times per year	*					*						
	RMB 1-9	2 times per year	*					*						
Capped Pit Stations	RCA 1-9	2 times per year	*					*						
	RCB 1-9	2 times per year	*					*						
Far-Field Stations	RFA 1-9	2 times per year	*					*						
	RFB 1-9	2 times per year	*					*						

			J	A	S	O	N	D	J	F	M	A	M	J
Near-Field Stations	TCA	2 times per year	3					3						
	TCB	2 times per year	3					3						
Reference Stations	TRA	2 times per year	3					3						
	TRB	2 times per year	3					3						

			J	A	S	O	N	D	J	F	M	A	M	J
Near-Pit Stations	INA	2 times per year	*							*				
	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	*							*				

			J	A	S	O	N	D	J	F	M	A	M	J
Near Pit Stations	INA 1-5	4 times per year	5	5					5	5				
	INB 1-5	4 times per year	5	5					5	5				
Reference North	TNA 1-5	4 times per year	5	5					5	5				
	TNB 1-5	4 times per year	5	5					5	5				
Reference South	TSA 1-5	4 times per year	5	5					5	5				
	TSB 1-5	4 times per year	5	5					5	5				

			J	A	S	O	N	D	J	F	M	A	M	J
Ebb Tide														
Impact Station Downcurrent	IPE1	4 times per year	3	3				3	3					3
	IPE2	4 times per year	3	3				3	3					3
	IPE3	4 times per year	3	3				3	3					3
	IPE4	4 times per year	3	3				3	3					3
	IFC1	4 times per year	3	3				3	3					3
Intermediate Station Downcurrent	INE1	4 times per year	3	3				3	3					3
	INE2	4 times per year	3	3				3	3					3
	INE3	4 times per year	3	3				3	3					3
	INE4	4 times per year	3	3				3	3					3
	INE5	4 times per year	3	3				3	3					3
Reference Station Upcurrent	RFE1	4 times per year	3	3				3	3					3
	RFE2	4 times per year	3	3				3	3					3
	RFE3	4 times per year	3	3				3	3					3
	RFE4	4 times per year	3	3				3	3					3
	RFE5	4 times per year	3	3				3	3					3
Flood Tide														
Impact Station Downcurrent	INF1	4 times per year	3	3				3	3					3
	IFC2	4 times per year	3	3				3	3					3
	INF3	4 times per year	3	3				3	3					3
Intermediate Station Downcurrent	IPF1	4 times per year	3	3				3	3					3
	IPF2	4 times per year	3	3				3	3					3
	IPF3	4 times per year	3	3				3	3					3
Reference Station Upcurrent	RFF1	4 times per year	3	3				3	3					3
	RFF2	4 times per year	3	3				3	3					3
	RFF3	4 times per year	3	3				3	3					3

			J	A	S	O	N	D	J	F	M	A	M	J
Routine Water Quality Monitoring														
Ebb Tide														
Impact Station Downcurrent	IPE1	2 times per year	*							*				
	IPE2	2 times per year	*							*				
	IPE3	2 times per year	*							*				
	IPE4	2 times per year	*							*				
	IPE5	2 times per year	*							*				
Intermediate Station Downcurrent	INE1	2 times per year	*							*				
	INE2	2 times per year	*							*				
	INE3	2 times per year	*							*				
	INE4	2 times per year	*							*				
	INE5	2 times per year	*							*				
Reference Station Upcurrent	RFE1	2 times per year	*							*				
	RFE2	2 times per year	*							*				
	RFE3	2 times per year	*							*				
	RFE4	2 times per year	*							*				
	RFE5	2 times per year	*							*				
Flood Tide														
Impact Station Downcurrent	INF1	2 times per year	*							*				
	INF2	2 times per year	*							*				
	INF3	2 times per year	*							*				
Intermediate Station Downcurrent	IPF1	2 times per year	*							*				
	IPF2	2 times per year	*							*				
	IPF3	2 times per year	*							*				
Reference Station Upcurrent	RFF1	2 times per year	*							*				
	RFF2	2 times per year	*							*				
	RFF3	2 times per year	*							*				

			J	A	S	O	N	D	J	F	M	A	M	J
Water Column Profiling														
Plume Stations	WCP1	6 times per year	2	2				2	2	2				2
	WCP2	6 times per year	2	2				2	2	2				2



			J	A	S	O	N	D	J	F	M	A	M	J
Benthic Recolonisation Studies														
Capped Contaminated Mud Pits	CPA 1-3	2 times per year	3					3						
	CPB 1-3	2 times per year	3					3						
	CPC 1-3	2 times per year	3					3						
Reference Stations	RBA 1-3	2 times per year	3					3						
	RBB 1-3	2 times per year	3					3						
	RBC 1-3	2 times per year	3					3						

* = Number of replicates depends on field catch or parameters

Sampling completed

Annex A2 - East of Sha Chau Environmental Monitoring and Audit Sampling Schedule for CMP V (July 2009 - April 2010)

		2009					2010						
Baseline Water Quality Monitoring		J	A	S	O	N	D	J	F	M	A	M	J
Near Field	ESC-WNAA	*	*										
	ESC-WNAB	*	*										
	ESC-WNAC	*	*										
	ESC-WNAD	*	*										
	ESC-WNBA	*	*										
	ESC-WNBB	*	*										
	ESC-WNBC	*	*										
	ESC-WNBD	*	*										
Mid Field	ESC-WMB	*	*										
	ESC-WMA	*	*										
Far Field	ESC-WFA	*	*										
	ESC-WFB	*	*										
	MW1	*	*										
Reference Stations	NM1	*	*										
	NM2	*	*										
	NM3	*	*										
	NM5	*	*										
	NM6	*	*										
Water Column Profiling		J	A	S	O	N	D	J	F	M	A	M	J
Plume Stations	Upstream			2	2	2	2	2	2				
	Downstream			2	2	2	2	2	2				
Water Quality Impact Monitoring for Dredging		J	A	S	O	N	D	J	F	M	A	M	J
Downcurrent Impact Stations	1			*	*	*	*	*	*	*	*	*	*
	2			*	*	*	*	*	*	*	*	*	*
	3			*	*	*	*	*	*	*	*	*	*
	4			*	*	*	*	*	*	*	*	*	*
	5			*	*	*	*	*	*	*	*	*	*
Upcurrent Stations	1			*	*	*	*	*	*	*	*	*	*
	2			*	*	*	*	*	*	*	*	*	*
	MW1			*	*	*	*	*	*	*	*	*	*

 Sampling completed
 Sampling to be completed

Annex B

Monitoring Results

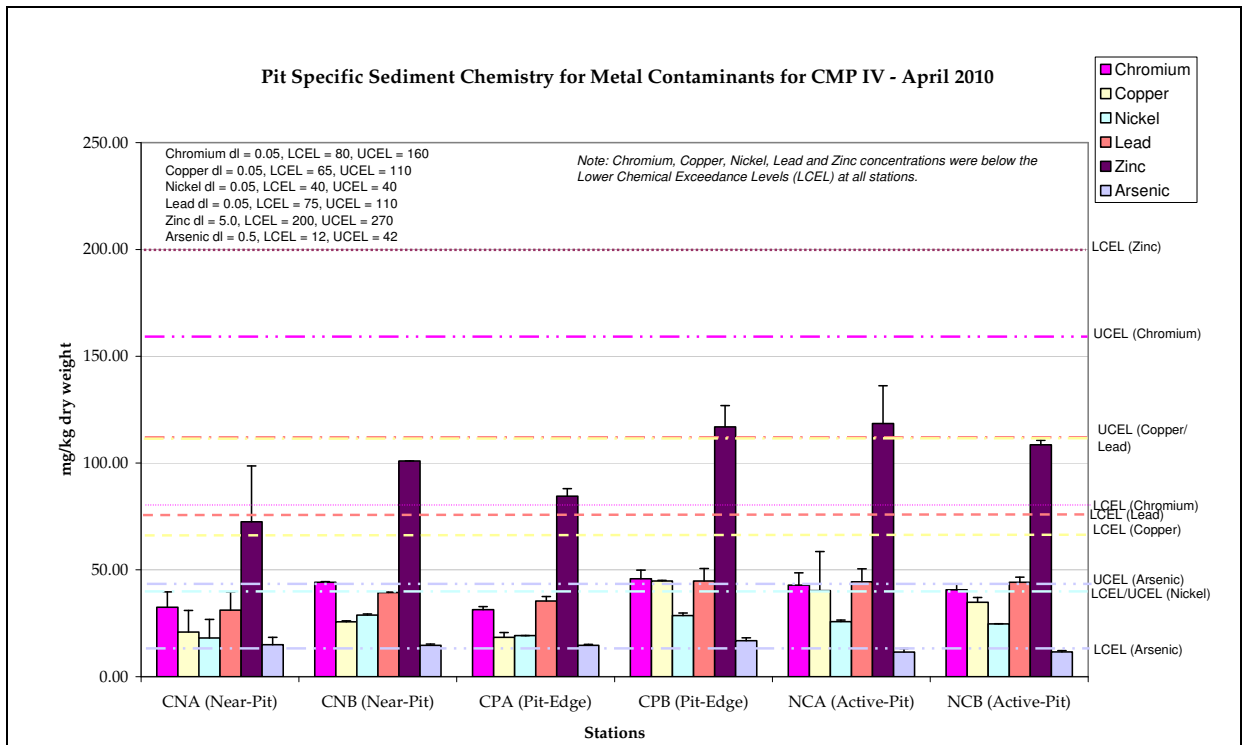


Figure 1: Concentrations of Metals (Cr, Cu, Ni, Pb, Zn and As) in sediment samples for Pit Specific Sediment Chemistry for CMP IV during April 2010.

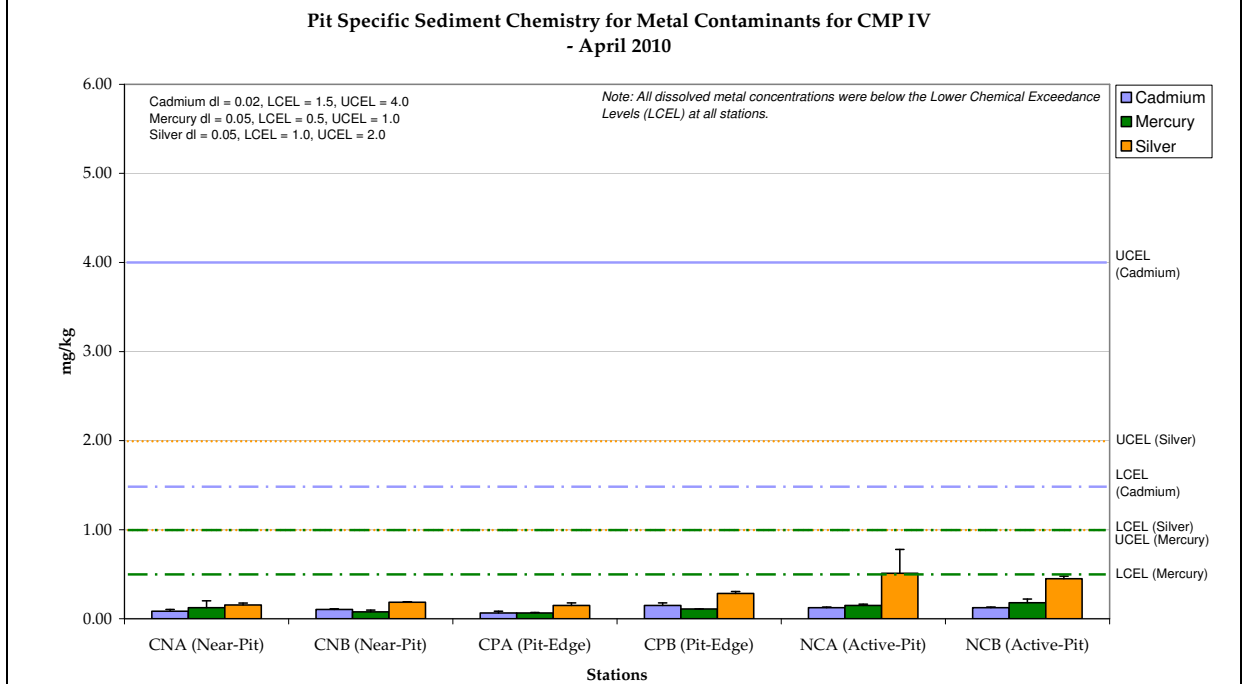


Figure 2: Concentrations of Metals (Cd, Hg and Ag) in sediment samples for Pit Specific Sediment Chemistry for CMP IV during April 2010.

Source: H:\Team\EM\GMS Projects\0103262 CEDD EM&A for CMP at Sha Chau (2009 - 2013)\06 Contractor Submission (LAM)\06.3 Pit Specific Sediment Chemistry\April 2010
 Date: 07/06/2010

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**Pit Specific Sediment Chemistry for Organic Contaminants (DDT & DDE) for CMP IV
- April 2010**

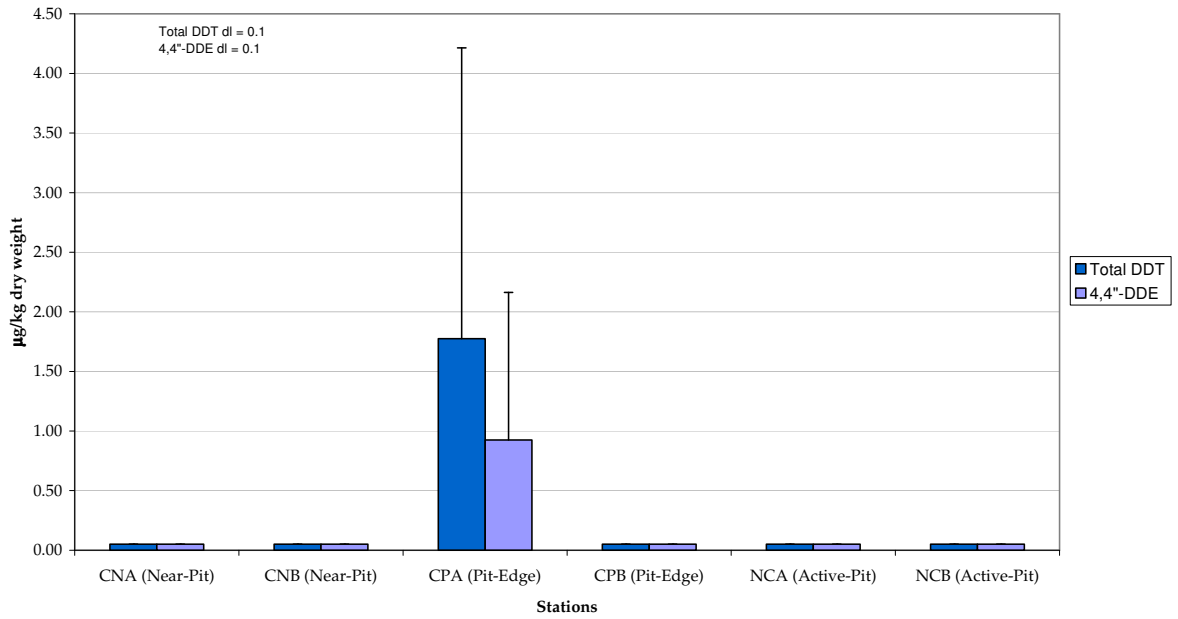


Figure 3: Concentrations of DDT and DDE in sediment samples for Pit Specific Sediment Chemistry for CMP IV during April 2010.

**Pit Specific Sediment Chemistry for Total Organic Carbon (TOC) for CMP IV
- April 2010**

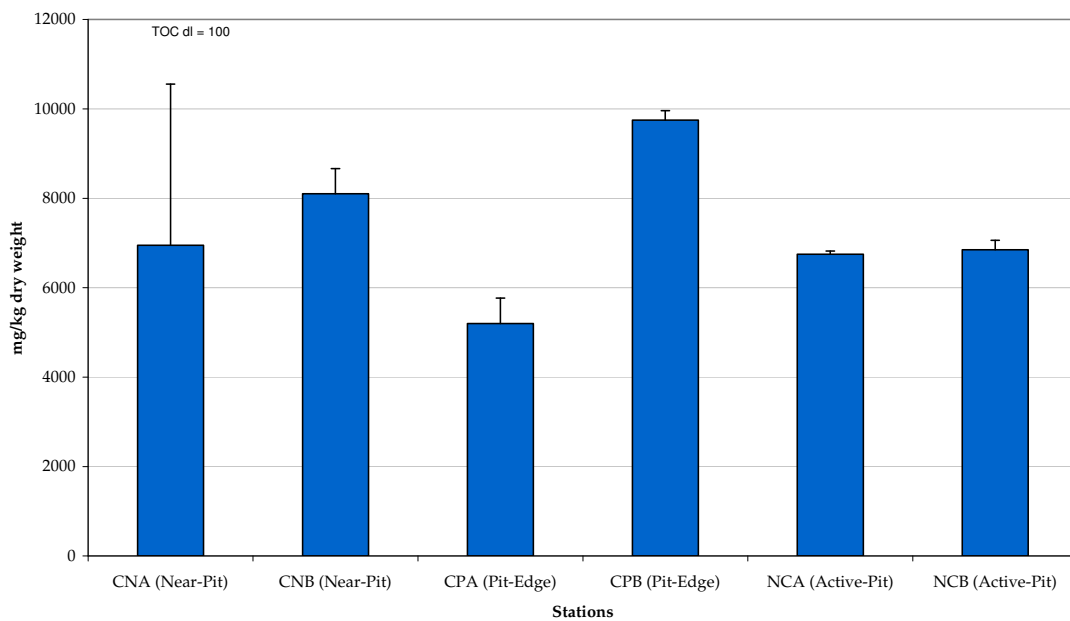


Figure 4: Concentrations of Total Organic Carbon (TOC) in sediment samples for Pit Specific Sediment Chemistry for CMP IV during April 2010.

Source: H:\Team\EM\GMS Projects\0103262 CEDD EM&A for CMP at Sha Chau (2009 - 2013)\06 Contractor Submission (LAM)\06.3 Pit Specific Sediment Chemistry\April 2010
Date: 07/06/2010

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**Pit Specific Sediment Chemistry for Particle Size Distribution for CMP IV
- April 2010**

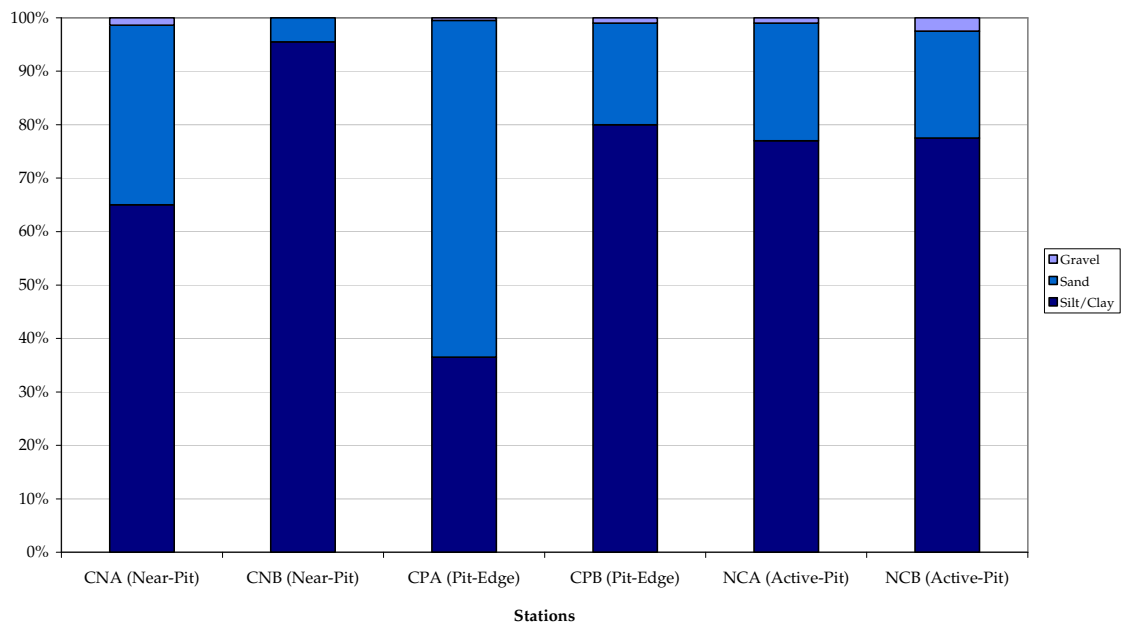


Figure 5: Particle Size Distribution in sediment samples for Pit Specific Sediment Chemistry for CMP IV during April 2010.

Source: H:\Team\EM\GMS Projects\0103262 CEDD EM&A for CMP at Sha Chau (2009 - 2013)\06 Contractor Submission (LAM)\06.3 Pit Specific Sediment Chemistry\April 2010

Date: 07/06/2010

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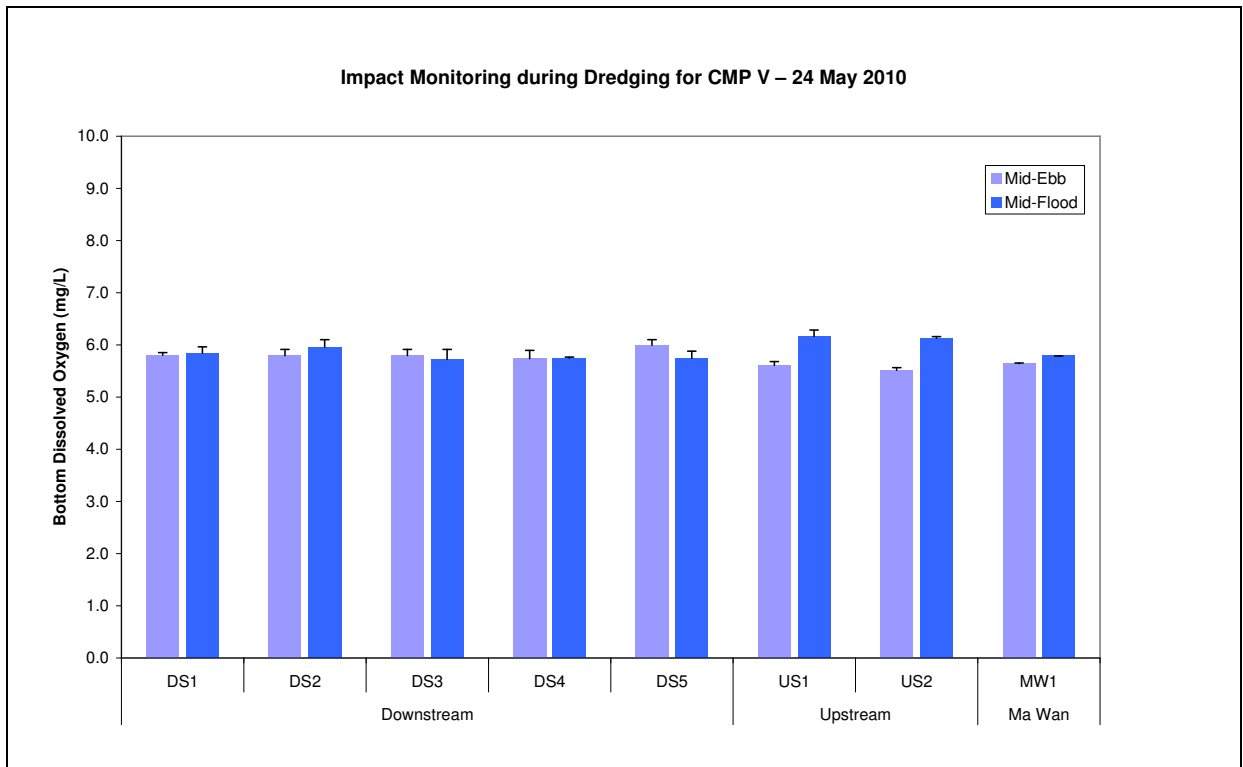


Figure 6: Bottom DO level (mean + SD) at Downstream (DS1, DS2, DS3, DS4 and DS5), Upstream (US1 and US2) and Ma Wan (MW1) stations during Impact Monitoring for Dredging at CMP V on 24 May 2010.

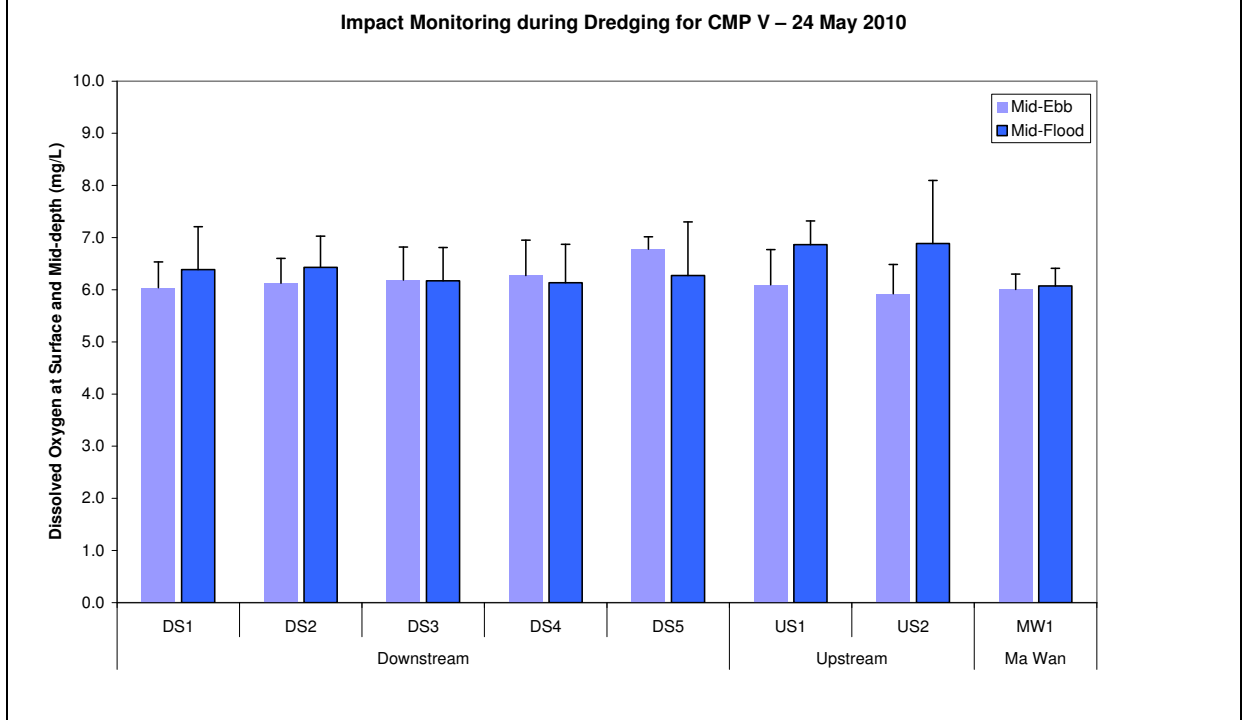


Figure 7: DO level at Surface and Mid-depth (mean + SD) at Downstream (DS1, DS2, DS3, DS4 and DS5), Upstream (US1 and US2) and Ma Wan (MW1) stations during Impact Monitoring for Dredging at CMP V on 24 May 2010.

Impact Monitoring during Dredging for CMP V – 24 May 2010

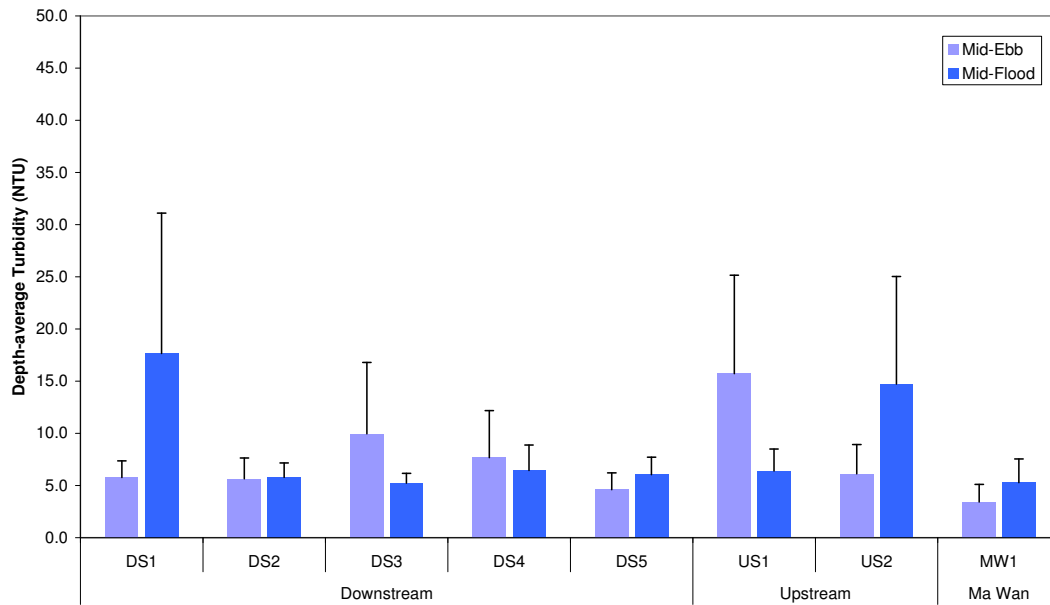


Figure 8: Depth-average Turbidity (mean + SD) at Downstream (DS1, DS2, DS3, DS4 and DS5), Upstream (US1 and US2) and Ma Wan (MW1) stations during Impact Monitoring for Dredging at CMP V on 24 May 2010.

Impact Monitoring during Dredging for CMP V – 24 May 2010

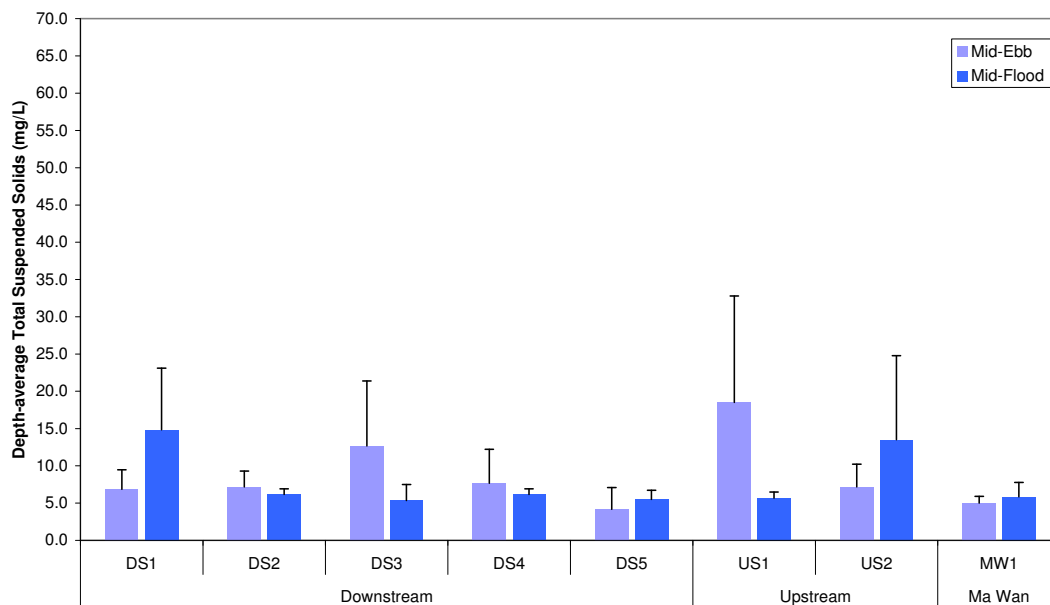


Figure 9: Depth-average TSS (mean + SD) at Downstream (DS1, DS2, DS3, DS4 and DS5), Upstream (US1 and US2) and Ma Wan (MW1) stations during Impact Monitoring for Dredging at CMP V on 24 May 2010.

Source: H:\Team\EM\GMS Projects\0103262 CEDD EM&A for CMP at Sha Chau (2009 - 2013)\06 Contractor Submission (LAM)\06.2 Impact Monitoring during Dredging\May 2010

Date: 07/06/2010

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Table B1: Impact Water Quality Monitoring for Dredging Activities during Mid-ebb Tide for 24 May 2010

Station	Downstream (Impact)		
Time (hh:mm)	11:33-12:20		
Monitoring Depth (m)	Depth Average	Surface and Middle	Bottom
D.O. (mg/L)	N/A	6.28	5.82
Turbidity (NTU)	6.72	N/A	N/A
SS (mg/L)	7.70	N/A	N/A
Remarks	Dredging works were observed.		

Station	Upstream (Reference)		
Time (hh:mm)	11:08-11:29		
Monitoring Depth (m)	Depth Average	Surface and Middle	Bottom
D.O. (mg/L)	N/A	6.01	5.56
Turbidity (NTU)	10.92	N/A	N/A
SS (mg/L)	12.83	N/A	N/A
Remarks	Dredging works were observed.		

Station	Ma Wan		
Time (hh:mm)	08:54-09:00		
Monitoring Depth (m)	Depth Average	Surface and Middle	Bottom
D.O. (mg/L)	N/A	6.01	5.64
Turbidity (NTU)	3.42	N/A	N/A
SS (mg/L)	5.00	N/A	N/A
Remarks			

Compliance with Action and Limit Levels

Parameter	Action Level		Limit Level		Mean Value at Impact Stations	Mean Value at Reference Stations	Compliance with Action level	Compliance with Limit Level
	Impact Stations	Comparison between I and R ^(a)	Mean Value at Impact Stations	Comparison between I and R ^(a)				
DO (Bottom)	< 2.96	R significantly greater than I (t-test, p < 0.05)	< 2.00	R significantly greater than I (t-test, p < 0.05)	5.82	5.56	Y	Y
DO (Surface and Mid Depth)	< 3.76	R significantly greater than I (t-test, p < 0.05)	< 3.11	R significantly greater than I (t-test, p < 0.05)	6.28	6.01	Y	Y
Turbidity (Depth-averaged)	> 28.14	I ≥ 1.2 R (13.10)	> 38.32	I ≥ 1.3 R (14.19)	6.72	10.92	Y	Y
SS (Depth-averaged)	> 37.88	I ≥ 1.2 R (15.40)	> 61.92	I ≥ 1.3 R (16.68)	7.70	12.83	Y	Y

Table B2: Impact Water Quality Monitoring for Dredging Activities during Mid-flood Tide for 24 May 2010

Station	Downstream (Impact)		
Time (hh:mm)	15:21 - 16:07		
Monitoring Depth (m)	Depth Average	Surface and Middle	Bottom
D.O. (mg/L)	N/A	6.06	5.80
Turbidity (NTU)	8.22	N/A	N/A
SS (mg/L)	7.60	N/A	N/A
Remarks	Dredging works were observed.		

Station	Upstream (Reference)		
Time (hh:mm)	16:12 - 16:28		
Monitoring Depth (m)	Depth Average	Surface and Middle	Bottom
D.O. (mg/L)	N/A	6.88	6.15
Turbidity (NTU)	10.56	N/A	N/A
SS (mg/L)	9.58	N/A	N/A
Remarks	Dredging works were observed.		

Station	Ma Wan		
Time (hh:mm)	17:34 - 17:40		
Monitoring Depth (m)	Depth Average	Surface and Middle	Bottom
D.O. (mg/L)	N/A	6.07	5.79
Turbidity (NTU)	5.27	N/A	N/A
SS (mg/L)	5.83	N/A	N/A
Remarks			

Compliance with Action and Limit Levels

Parameter	Action Level		Limit Level		Mean Value at Impact Stations	Mean Value at Reference Stations	Compliance with Action level	Compliance with Limit Level
	Mean Value at Impact Stations	Comparison between I and R ^(a)	Mean Value at Impact Stations	Comparison between I and R ^(a)				
DO (Bottom)	< 2.96	R significantly greater than I (t-test, p < 0.05)	< 2.00	R significantly greater than I (t-test, p < 0.05)	5.80	6.15	Y	Y
DO (Surface and Mid Depth)	< 3.76	R significantly greater than I (t-test, p < 0.05)	< 3.11	R significantly greater than I (t-test, p < 0.05)	6.06	6.88	Y	Y
Turbidity (Depth-averaged)	> 28.14	I ≥ 1.2 R (12.67)	> 38.32	I ≥ 1.3 R (13.72)	8.22	10.56	Y	Y
SS (Depth-averaged)	> 37.88	I ≥ 1.2 R (11.50)	> 61.92	I ≥ 1.3 R (12.46)	7.60	9.58	Y	Y

Note: (a) I = Impact; R = Reference Stations

Annex C

Study Programme

