

**Environmental Monitoring and Audit
 for Contaminated Mud Pits to the
 South of The Brothers and at East
 Sha Chau (2012-2017) – Investigation
 Agreement No. CE 23/2012(EP)**

**44th Monthly Progress Report for Contaminated
 Mud Pits to the South of The Brothers and at
 East Sha Chau – April 2016**

Draft (Revision 0)

16 May 2016

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Client: Civil Engineering and Development Department (CEDD)		Project No: 0175086			
Summary: This document presents the 44 th monthly progress report for Contaminated Mud Pits at the South of The Brothers and at East Sha Chau.		Date: 16 May 2016			
		Approved by: 			
		Craig A. Reid Partner			
v0	44 th Monthly Progress Report for ESC CMPs and SB CMPs	RC	JT	CAR	16/5/16
Revision	Description	By	Checked	Approved	Date
<p>This report has been prepared by Environmental Resources Management the trading name of 'ERM Hong-Kong, Limited', with all reasonable skill, care and diligence within the terms of the Contract with the client, incorporating our General Terms and Conditions of Business and taking account of the resources devoted to it by agreement with the client.</p> <p>We disclaim any responsibility to the client and others in respect of any matters outside the scope of the above.</p> <p>This report is confidential to the client and we accept no responsibility of whatsoever nature to third parties to whom this report, or any part thereof, is made known. Any such party relies on the report at their own risk.</p>		<p>Distribution</p> <p><input type="checkbox"/> Internal</p> <p><input checked="" type="checkbox"/> Public</p> <p><input type="checkbox"/> Confidential</p>			
		 			

Dredging, Management and Capping of Contaminated Sediment Disposal Facility to the South of The Brothers

Environmental Certification Sheet EP-427/2011/A

Reference Document/Plan

Document/ Plan to be Certified/ Verified:	44 th Monthly Progress Report for Contaminated Mud Pits to the South of The Brothers and at East Sha Chau - April 2016
Date of Report:	16 May 2016
Date prepared by ET:	16 May 2016
Date received by IA:	16 May 2016

Reference EP Condition

Environmental Permit Condition: Condition No.: 4.4

4 hard copies and 1 electronic copy of monthly EM&A Report shall be submitted to the Director within 2 weeks after the end of the reporting month. The EM&A Reports shall include a summary of all non-compliance (exceedances) of the environmental quality performance limits (Action and Limit Levels). The submissions shall be certified by the ET Leader and verified by the Independent Auditor. Additional copies of the submission shall be provided to the Director upon request by the Director.

ET Certification

I hereby certify that the above referenced document/~~plan~~ complies with the above referenced condition of EP-427/2011/A

Craig A. Reid,
Environmental Team Leader:

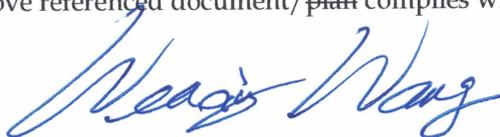


Date: 16/5/2016

IA Verification

I hereby verify that the above referenced document/~~plan~~ complies with the above referenced condition of EP-427/2011/A

Dr Wang Wen Xiong,
Independent Auditor:



Date: 16/5/2016

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Agreement No. CE 23/2012 (EP)
Environmental Monitoring and Audit
for Contaminated Mud Pits to the South of The Brothers and at East Sha
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44TH MONTHLY PROGRESS REPORT FOR APRIL 2016

1.1 BACKGROUND

1.1.1 Since early 1990s, contaminated sediment ⁽¹⁾ arising from various construction works (e.g. dredging and reclamation projects) in Hong Kong has been disposed of at a series of seabed pits at East of Sha Chau (ESC). In late 2008, a review indicated that the existing and planned facilities at ESC would not be able to meet the disposal demand after 2012. In order to meet this demand, the Hong Kong Special Administrative Region Government (HKSARG) decided to implement a new contained aquatic disposal (CAD) ⁽²⁾ facility at the South of The Brothers (SB CMPs) which had been under consideration for a number of years.

1.1.2 The environmental acceptability of the construction and operation of the Project had been confirmed by findings of the associated Environmental Impact Assessment (EIA) study completed in 2005 under *Agreement No. CE 12/2002(EP)* ⁽³⁾. The Director of Environmental Protection (DEP) approved this EIA report under the *Environmental Impact Assessment Ordinance (Cap. 499) (EIAO)* in September 2005 (*EIA Register No.: AEIAR-089/2005*).

1.1.3 In accordance with the EIA recommendation, prior to commencement of construction works for the SB CMPs, the Civil Engineering and Development Department (CEDD) undertook a detailed review and update of the EIA findings for the SB site ⁽⁴⁾. Findings of the EIA review undertaken in 2009/2010 confirmed that the construction and operation of the SB site had been predicted to be environmentally acceptable.

(1) According to the Management Framework of Dredged/ Excavated Sediment of ETWB TC(W) No. 34/2002, contaminated sediment in general shall mean those sediment requiring Type 2 – Confined Marine Disposal as determined according to this TC(W).

(2) CAD options may involve use of excavated borrow pits, or may involve purpose-built excavated pits. CAD sites are those which involve filling a seabed pit with contaminated mud and capping it with uncontaminated material such that the original seabed level is restored and the contaminated material is isolated from the surrounding marine environment.⁷

(3) Detailed Site Selection Study for a Proposed Contaminated Mud Disposal Facility within the Airport East/ East of Sha Chau Area (*Agreement No. CE 12/2002(EP)*)

(4) Under the CEDD study *Contaminated Sediment Disposal Facility to the South of The Brothers (Agreement No. FM 2/2009)*

- *Pit Specific Sediment Chemistry of ESC CMP Vd* was undertaken on 7 April 2016.

1.3.2 No monitoring activities were scheduled to be undertaken for SB CMPs in April 2016.

1.4 *DETAILS OF OUTSTANDING SAMPLING AND/OR ANALYSIS*

1.4.1 No outstanding sampling and analysis remained for April 2016.

1.5 *BRIEF DISCUSSION OF THE MONITORING RESULTS FOR ESC CMPs*

1.5.1 Brief discussion of the monitoring results of the following activities for ESC CMPs is presented in this 44th *Monthly Progress Report*:

- *Routine Water Quality Monitoring of ESC CMP Vd* in April 2016;
- *Water Column Profiling of ESC CMP Vd* in April 2016; and
- *Pit Specific Sediment Chemistry of ESC CMP Vd* in March and April 2016.

- 1.5.2 ***Pit Specific Sediment Chemistry of ESC CMP Vd - March and April 2016***
- 1.5.3 Monitoring locations for *Pit Specific Sediment Chemistry for ESC CMP Vd* are shown in *Figure 1.2*. A total of six (6) monitoring stations were sampled in March and April 2016.
- 1.5.4 The concentrations of most inorganic contaminants were lower than the Lower Chemical Exceedance Level (LCEL) at all stations, except Mercury (*Figures 1, 2, 5 and 6 of Annex C*). In March 2016, Mercury exceeded the LCEL at all stations except Near Pit station ESC-NNBA (*Figure 2 and 6 of Annex C*). In April 2016, Mercury exceeded the LCEL at all stations except Active Pit station ESC-NPBB (*Figures 2 and 6 of Annex C*). Since Mercury concentrations were recorded to be similar amongst all stations, the exceedances of the LCEL at those stations are unlikely to be caused by the disposal operation at ESC CMP Vd.
- 1.5.5 For organic contaminants, the concentrations of Total Organic Carbon (TOC) were similar amongst most stations and it was observed to be lower at Near Pit station ESC-NNBA in March 2016 (*Figures 3 and 7 of Annex C*). In March 2016, Tributyltin (TBT) concentrations were observed to be lower at Pit Edge station ESC-NEBB (*Figure 4 of Annex C*). In April 2016, Tributyltin (TBT) concentrations were observed to be higher at Near Pit station ESC-NNBA and Pit Edge stations ESC-NEBA (*Figure 8 of Annex C*). Low and High Molecular Weight Polycyclic Aromatic Hydrocarbons (PAHs), Total Polychlorinated Biphenyls (PCBs), Total dichlorodiphenyltrichloroethane (DDT) and 4,4'-dichlorodiphenyldichloroethylene (DDE) concentrations were below the limit of reporting at all stations in March and April 2016.
- 1.5.6 Overall, there is no evidence indicating any unacceptable environmental impacts to sediment quality as a result of the contaminated mud disposal operations at ESC CMP Vd in March and April 2016. Statistical analysis will be undertaken and presented in the quarterly report to investigate whether there are any unacceptable impacts in the area caused by the contaminated mud disposal.
- 1.5.7 ***Water Column Profiling of ESC CMP Vd - April 2016***
- 1.5.8 *Water Column Profiling* was undertaken on 6 April 2016. 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 2005 - 2014 from stations in the Northwestern Water Control Zone (WCZ), where the ESC CMPs are located ⁽¹⁾. For Salinity, the averaged value obtained from the Reference stations was used for the basis as the WQO. Levels of Dissolved Oxygen (DO) and Turbidity were also assessed for compliance with the Action and Limit Levels (see *Table B1 of Annex B* for details).

(1) <http://epic.epd.gov.hk/EPICRIVER/marine/?lang=en>

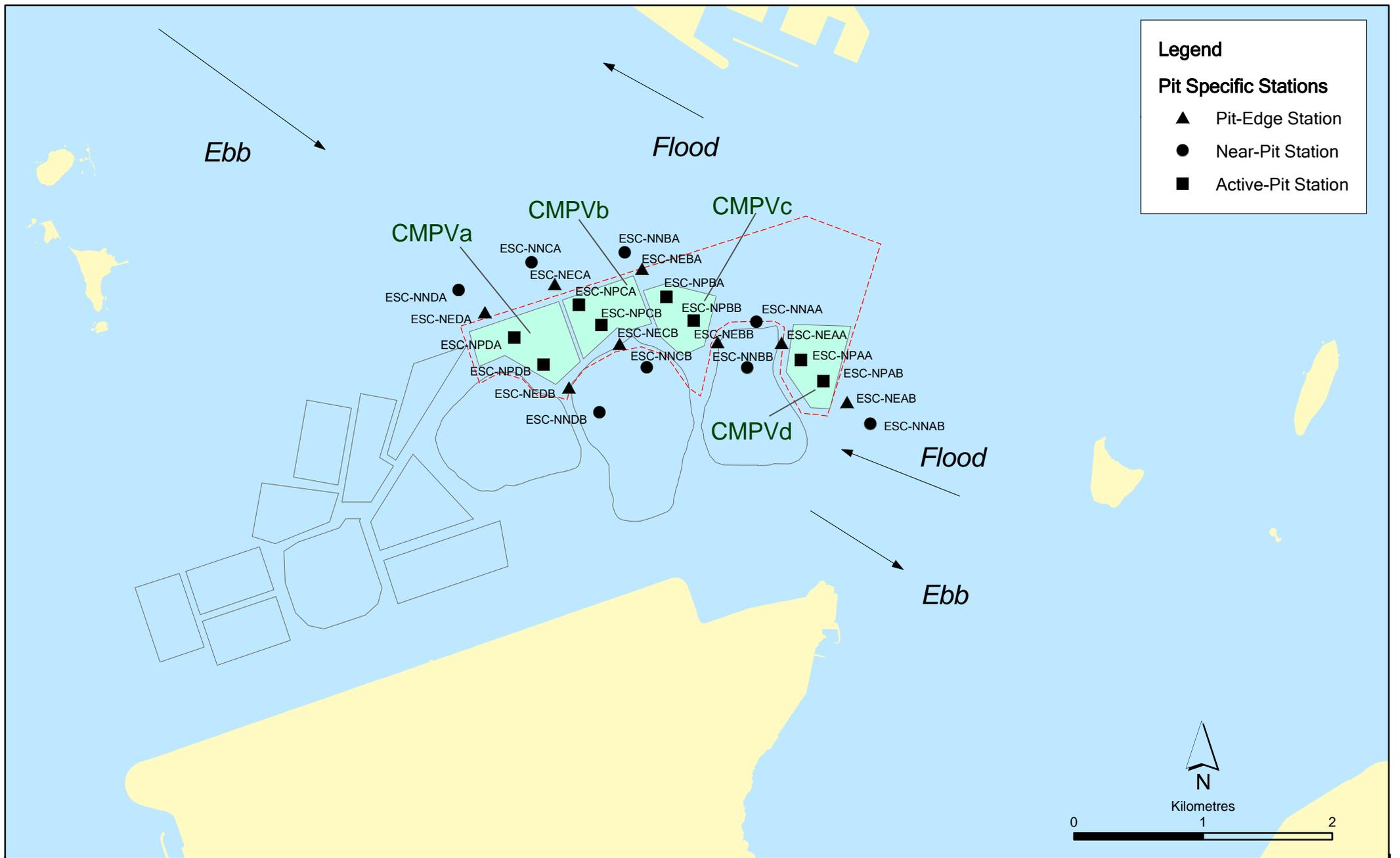


Figure 1.2

Pit Specific Sediment Quality Monitoring Stations for CMPV

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Date: 29/10/2009

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In-situ Measurements

- 1.5.9 Analyses of results for April 2016 indicated that levels of Salinity, DO and pH complied with the WQOs at both Downstream and Upstream stations (*Table B2 of Annex B*). In addition, DO and Turbidity at all stations complied with the Action and Limit Levels (*Table B2 of Annex B*).

Laboratory Measurements for Suspended Solids (SS)

- 1.5.10 Analyses of results for April 2016 indicated that the SS levels complied with the WQO and the Action and Limit Levels at both Upstream and Downstream stations (*Table B2 of Annex B*).

Overall, the monitoring results indicated that the mud disposal operation at ESC CMP Vd did not appear to cause any deterioration in water quality during this reporting period.

1.5.11 ***Routine Water Quality Monitoring of ESC CMP Vd – April 2016***

1.5.12 *Routine Water Quality Monitoring* was undertaken on 5 April 2016. The monitoring results have been assessed for compliance with the WQOs (see *Section 1.5.8* for details). Levels of DO and Turbidity were also assessed for compliance with the Action and Limit Levels (see *Table B1* of *Annex B* for details). The monitoring results are shown in *Tables B3 and B4* of *Annex B* and *Figures 9 - 14* of *Annex C*. A total of ten (10) monitoring stations were sampled in April 2016 as shown in *Figure 1.3*.

In-situ Measurements

1.5.13 Graphical presentation of the monitoring results (Temperature, DO, pH, Salinity and Turbidity) is shown in *Figures 9 - 14* of *Annex C*. Analyses of results for April 2016 indicated that the levels of pH and DO complied with the WQOs at all stations (Impact, Intermediate, Reference and Water Sensitive Receiver stations) in April 2016 (*Table B3* of *Annex B*; *Figures 11 and 14* of *Annex C*). Levels of Salinity at most stations also complied with WQO, except for Ma Wan station (*Table B3* of *Annex B*; *Figure 13* of *Annex C*). The higher Salinities recorded at Ma Wan station are likely to be caused by the larger separation distance to Pearl River mouth, which release a large amount of freshwater runoff in the area during flooding, when compared to the Reference stations.

1.5.14 The levels of DO and Turbidity complied with the Action and Limit Levels at all stations (*Table B3* of *Annex B*; *Figures 11 and 14* of *Annex C*).

1.5.15 Overall, *in-situ* measurement results of the *Routine Water Quality Monitoring* indicated that the disposal operation at ESC CMP Vd did not appear to cause any unacceptable impacts in water quality in April 2016.

Laboratory Measurements

1.5.16 Laboratory analysis of April 2016 results indicated that concentrations of Cadmium, Chromium, Lead, Silver and Mercury were below their limit of reporting at all stations. Arsenic, Copper, Zinc and Nickel were detected in April 2016 samples and the concentrations were similar amongst stations (*Table B4* of *Annex B*; *Figure 15* of *Annex C*).

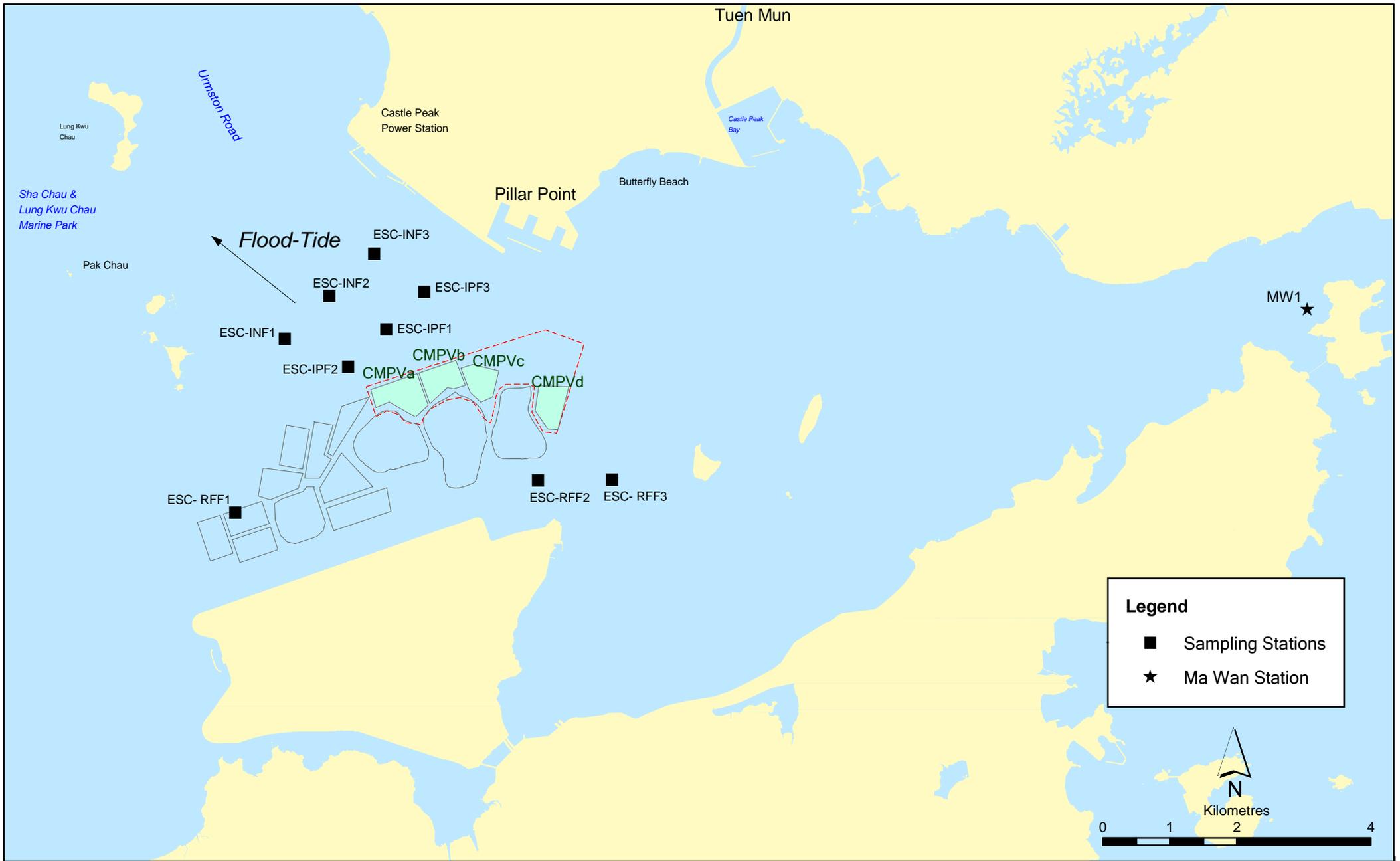


Figure 1.3

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

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Date: 29/10/2009

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- 1.5.17 For nutrients, concentrations of Total Inorganic Nitrogen (TIN) at Impact, Intermediate and Reference stations in April 2016 exceeded the WQO (0.5 mg/L) (*Table B4 of Annex B; Figure 16 of Annex C*). It should be noted that due to effect of Pearl River, the North Western WCZ has historically experienced higher levels of TIN⁽¹⁾. Since TIN concentrations were recorded to be similar amongst all stations, the exceedances of TIN WQO at all stations are unlikely to be caused by the disposal operation at ESC CMP Vd. Concentrations of Ammonia Nitrogen (NH₃-N) were relatively similar amongst all stations (*Table B4 of Annex B; Figure 16 of Annex C*). Levels of 5-day Biochemical Oxygen Demand (BOD₅) appear to be higher at Ma Wan station in April 2016 (*Table B4 of Annex B; Figure 17 of Annex C*).
- 1.5.18 Concentrations of SS complied with the WQO (11.1 mg/L for wet season), except in Reference stations. Concentrations of SS complied with the Action and Limit Levels at all stations in April 2016 (*Table B4 of Annex B; Figure 18 of Annex C*).
- 1.5.19 Overall, results of the *Routine Water Quality Monitoring* indicated that the disposal operation at ESC CMP Vd did not appear to cause any unacceptable deterioration in water quality in April 2016. Detailed statistical analysis will be presented in the Quarterly Report to investigate any spatial and temporal trends of potential concern.

1.6 **BRIEF DISCUSSION OF THE MONITORING RESULTS FOR SB CMPs**

1.6.1 Brief discussion of the monitoring results of the following activities for SB CMPs is presented in this 44th *Monthly Progress Report*:

- *Pit Specific Sediment Chemistry of CMP 2 in March 2016.*

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

- 1.6.2 ***Pit Specific Sediment Chemistry of CMP 2 – March 2016***
- 1.6.3 Monitoring locations for *Pit Specific Sediment Chemistry for CMP 2* are shown in *Figure 1.4*. A total of six (6) monitoring stations were sampled in March 2016.
- 1.6.4 The concentrations of most inorganic contaminants were lower than the LCEL at all stations, except Mercury and Silver (*Figures 20 of Annex C*) in March 2016. Mercury and Silver exceeded the LCEL at Active Pit stations SB-NPBB and SB-NPBA, respectively (*Figure 20 of Annex C*).
- 1.6.5 For organic contaminants, the concentrations of TOC were similar amongst most stations and it was observed to be lower at Pit Edge station SB-NEBB and Active Pit station SB-NPBB in March 2016 (*Figure 21 of Annex C*). TBT concentrations were observed to be higher at Active Pit station SB-NPBA and Near Pit station SB-NNBA (*Figure 22 of Annex C*). Low and High Molecular Weight PAHs, Total PCBs, Total DDT and 4,4'-DDE concentrations were below the limit of reporting at all stations in March 2016.
- 1.6.6 Overall, there is no evidence indicating any unacceptable environmental impacts to sediment quality as a result of the contaminated mud disposal operations at SB CMP 2 in March 2016. Statistical analysis will be undertaken and presented in the quarterly report to investigate whether there are any unacceptable impacts in the area caused by the contaminated mud disposal.

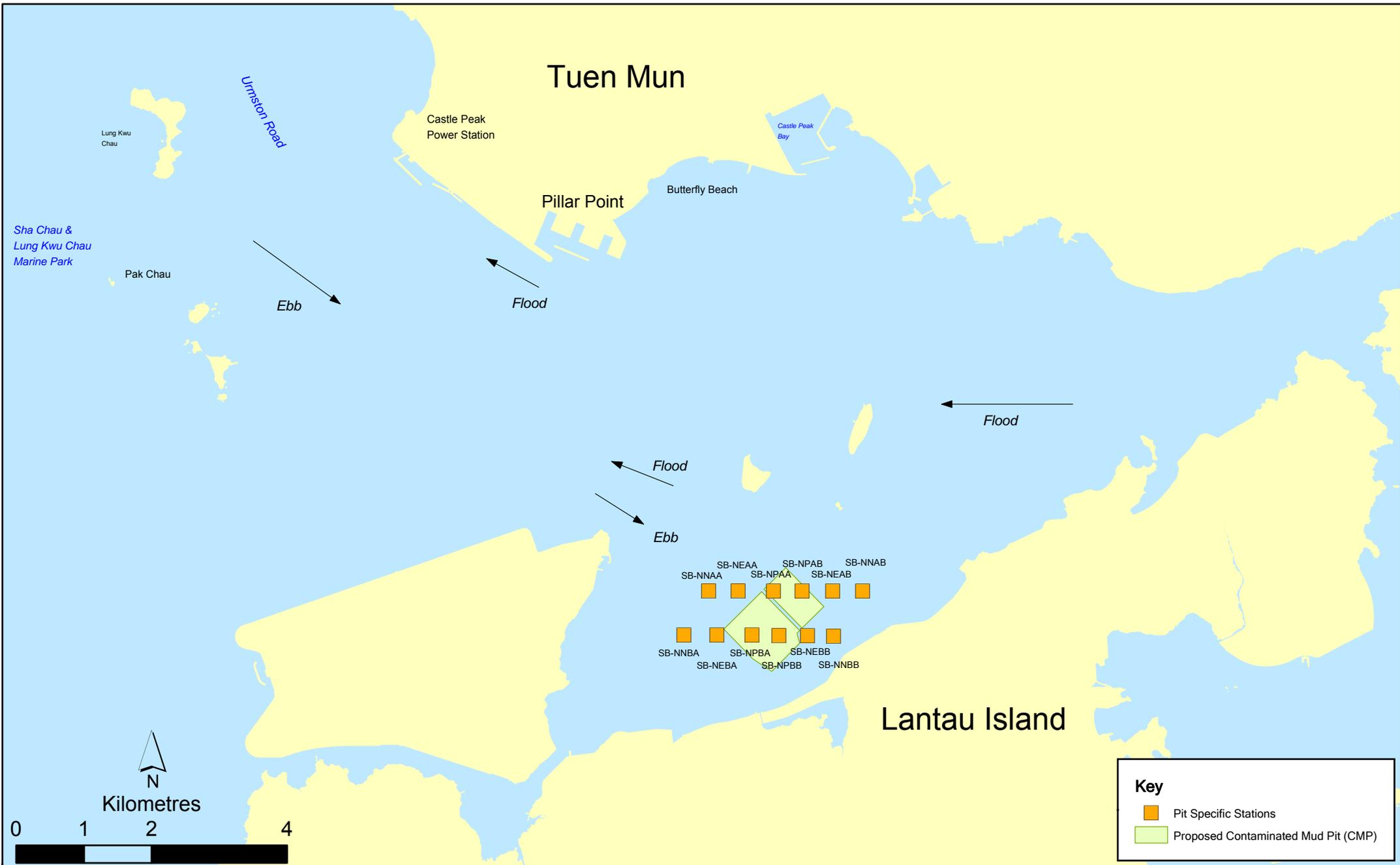


Figure 1.4

Pit Specific Sediment Quality Monitoring Stations for South Brothers Facility

1.7 **ACTIVITIES SCHEDULED FOR THE NEXT MONTH**

1.7.1 No monitoring activities will be scheduled in the next monthly period of May 2016 for SB CMPs.

1.7.2 The following monitoring activities will be conducted in the next monthly period of May 2016 for ESC CMPs:

- *Routine Water Quality Monitoring of ESC CMP Vd;*
- *Pit Specific Sediment Chemistry of ESC CMP Vd; and*
- *Water Column Profiling of ESC CMP Vd.*

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

1.8 **STUDY PROGRAMME**

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

Annex A

Sampling Schedule

Annex B

Water Quality Monitoring Results

Table B1 *Action and Limit Levels of Water Quality for Dredging, Backfilling and Capping Activities at ESC CMPs*

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

Notes:

- (1) For DO, non-compliance of the water quality limits occurs when monitoring result is lower than the limits.
- (2) The Action and Limit Levels for DO for Surface & Middle layers were calculated from the combined pool of baseline surface layer data and baseline middle layer data.
- (3) Given the Action Level for DO for Surface & Middle layers has already been lower than 4 mg L⁻¹, it is proposed to set the Limit Level at 3.11 mg L⁻¹ which is the first percentile of the baseline data.
- (4) "Depth-averaged" is calculated by taking the arithmetic means of reading of all three depths.
- (5) For turbidity and SS, non-compliance of the water quality limits occurs when monitoring result is higher than the limits.

Table B2 *Water Column Profiling Results for ESC CMP Vd in April 2016*

Stations	Temp (°C)	Salinity (ppt)	Turbidity (NTU)	Dissolved Oxygen (%) (mg L ⁻¹)		pH (mg L ⁻¹)	Suspended Solids (mg L ⁻¹)
WCP 1 (Downstream)	19.97	23.14	9.08	104.67	8.31	8.14	8.30
WCP 2 (Upstream)	20.03	22.78	7.19	103.42	8.22	8.10	6.85
WQO (Wet season)	N/A	20.66 – 25.06 [#]	N/A	N/A	>4	6.5-8.5	11.1

Note:
[#]Not exceeding 10% of natural ambient level which is the result obtained from the Reference Station.
 Cell shaded yellow / red indicate value exceeding the Action/Limit levels.
 Cell shaded grey indicate value exceeding the WQO.

Table B3 *In-situ Monitoring Results for Routine Water Quality Monitoring of ESC Vd in April 2016*

Sampling Period	Stations	Temp (°C)	Salinity (ppt)	Turbidity (NTU)	Dissolved Oxygen (%) (mg L ⁻¹)		pH (mg L ⁻¹)
April 2016	RFF (Reference)	19.43	24.01	14.94	106.72	8.51	8.15
	IPF (Impact)	19.10	25.77	4.48	103.86	8.25	8.12
	INF (Intermediate)	19.05	25.88	4.33	102.46	8.14	8.12
	Ma Wan	18.51	29.40	4.47	106.10	8.34	8.16
	WQO	N/A	21.61 – 26.41 [#]	N/A	N/A	>4	6.5-8.5

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

Table B4 *Laboratory Results for Routine Water Quality Monitoring of ESC Vd in April 2016*

Sampling Period	Stations	As (µg/L)	Cd (µg/L)	Cr (µg/L)	Cu (µg/L)	Pb (µg/L)	Hg (µg/L)	Ni (µg/L)	Ag (µg/L)	Zn (µg/L)	NH ₃ (mg/L)	TIN (mg/L)	BOD ₅ (mg/L)	SS (mg/L)
April 2016	RFF	2.17	<LOR	<LOR	2.33	<LOR	<LOR	<LOR	<LOR	5.99	0.22	0.75	2.93	18.79
	IPF	2.30	<LOR	<LOR	6.07	<LOR	<LOR	1.03	<LOR	13.40	0.23	0.70	1.50	8.08
	INF	2.51	<LOR	<LOR	5.71	<LOR	<LOR	<LOR	<LOR	11.21	0.25	0.69	2.12	7.63
	Ma Wan	2.22	<LOR	<LOR	5.83	<LOR	<LOR	<LOR	<LOR	7.86	0.14	0.34	4.01	8.54

WQO of TIN: 0.5 mg/L
 Wet Season WQO of SS : 11.1 mg/L

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

Annex C

Graphical Presentations

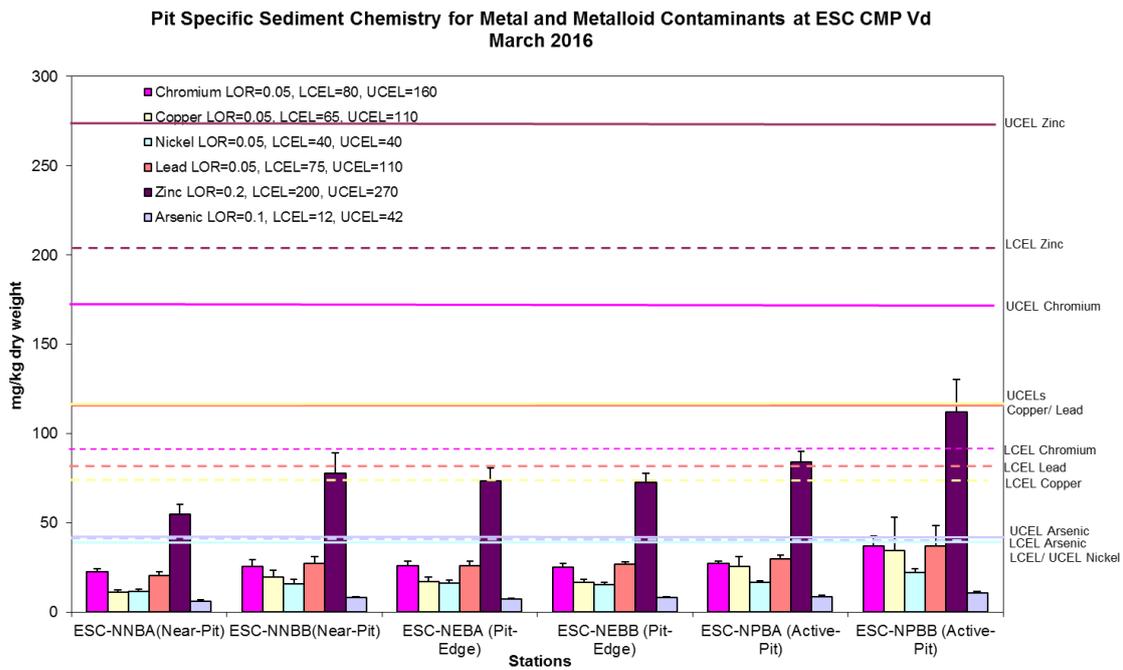


Figure 1: Concentration of Metals (Cr, Cu, Ni, Pb, Zn, As; mg/kg dry weight; mean +SD) in sediment samples collected from Pit Specific Sediment Chemistry Monitoring for ESC CMP Vd in March 2016.

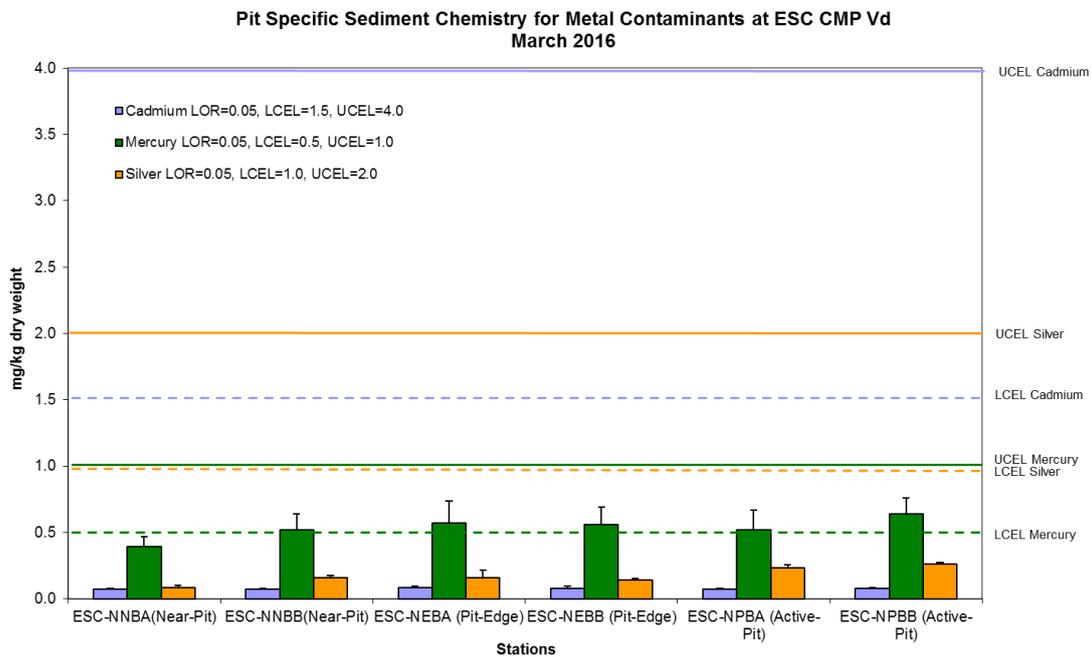


Figure 2: Concentration of Metals (Cd, Hg, Ag; mg/kg dry weight; mean +SD) in sediment samples collected from Pit Specific Sediment Chemistry Monitoring for ESC CMP Vd in March 2016.

**Pit Specific Sediment Chemistry for Total Organic Carbon (TOC) at ESC CMP Vd
March 2016**

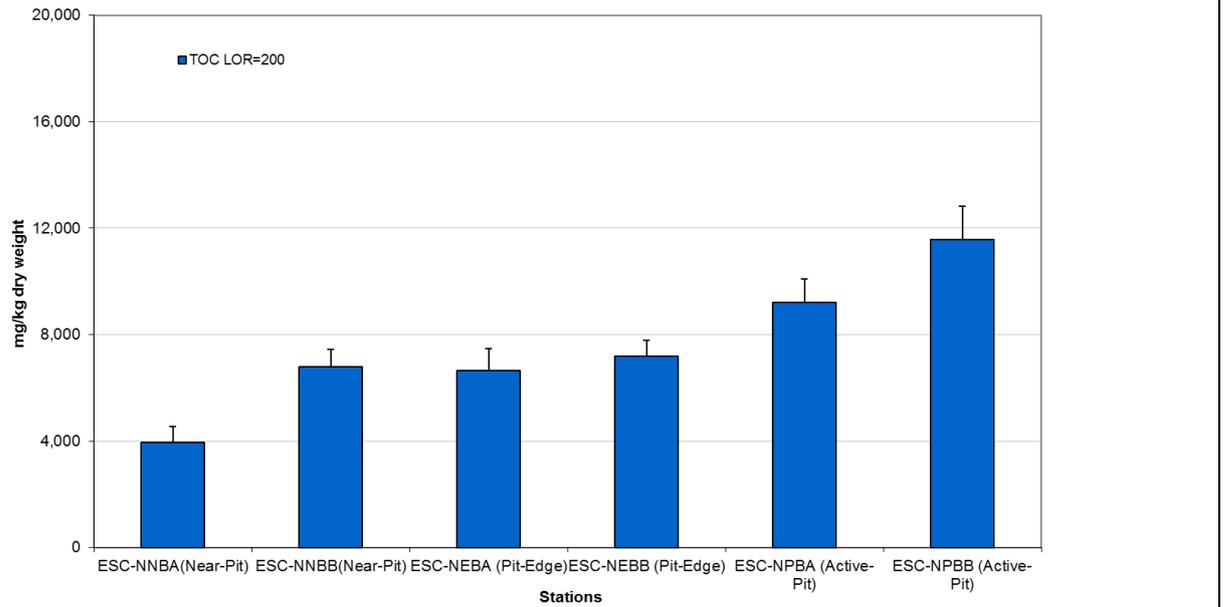


Figure 3: Concentration of Total Organic Carbon (TOC) (mg/kg dry weight; mean +SD) in sediment samples collected from Pit Specific Sediment Chemistry Monitoring for ESC CMP Vd in March 2016.

**Pit Specific Sediment Chemistry for Tributyltin (TBT) at ESC CMP Vd
March 2016**

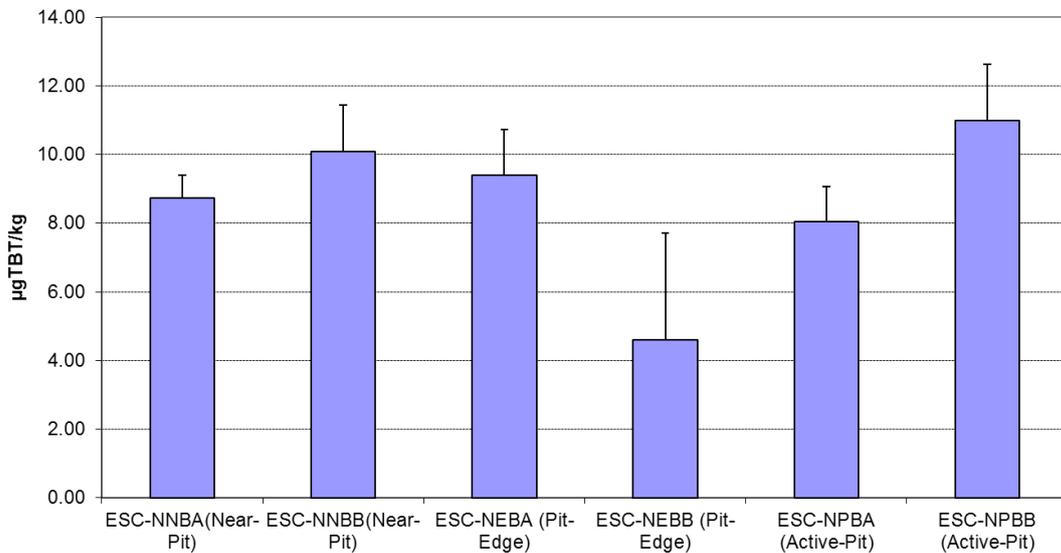


Figure 4: Concentration of Tributyltin (TBT) (µg TBT/kg; mean +SD) in sediment samples collected from Pit Specific Sediment Chemistry Monitoring for ESC CMP Vd in March 2016.

**Pit Specific Sediment Chemistry for Metal and Metalloid Contaminants at ESC CMP Vd
April 2016**

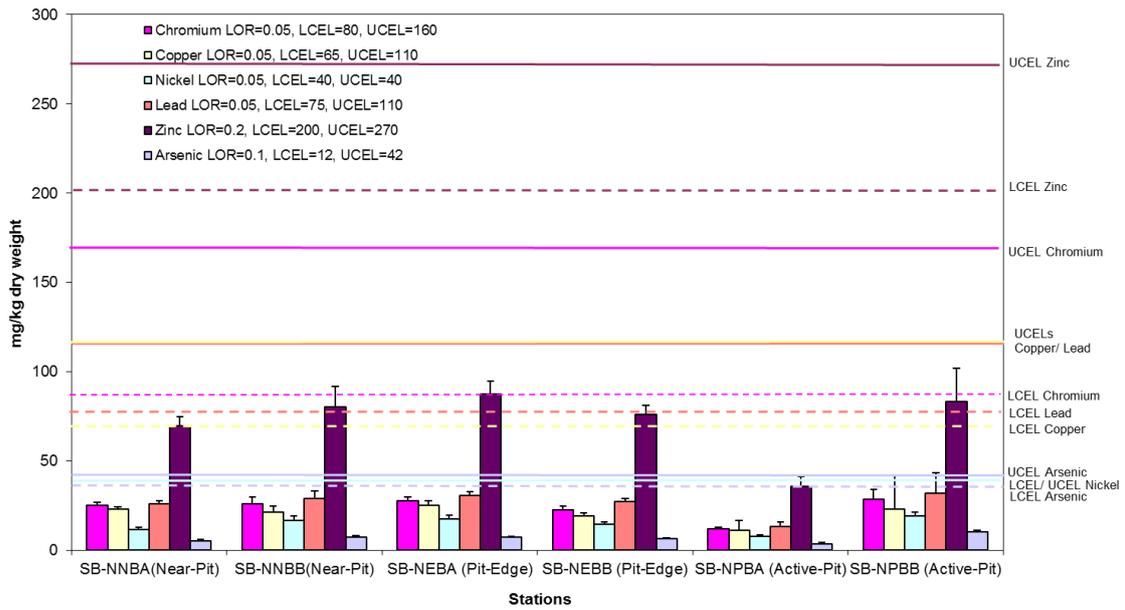


Figure 5: Concentration of Metals (Cr, Cu, Ni, Pb, Zn, As; mg/kg dry weight; mean +SD) in sediment samples collected from Pit Specific Sediment Chemistry Monitoring for ESC CMP Vd in April 2016.

**Pit Specific Sediment Chemistry for Metal Contaminants at ESC CMP Vd
April 2016**

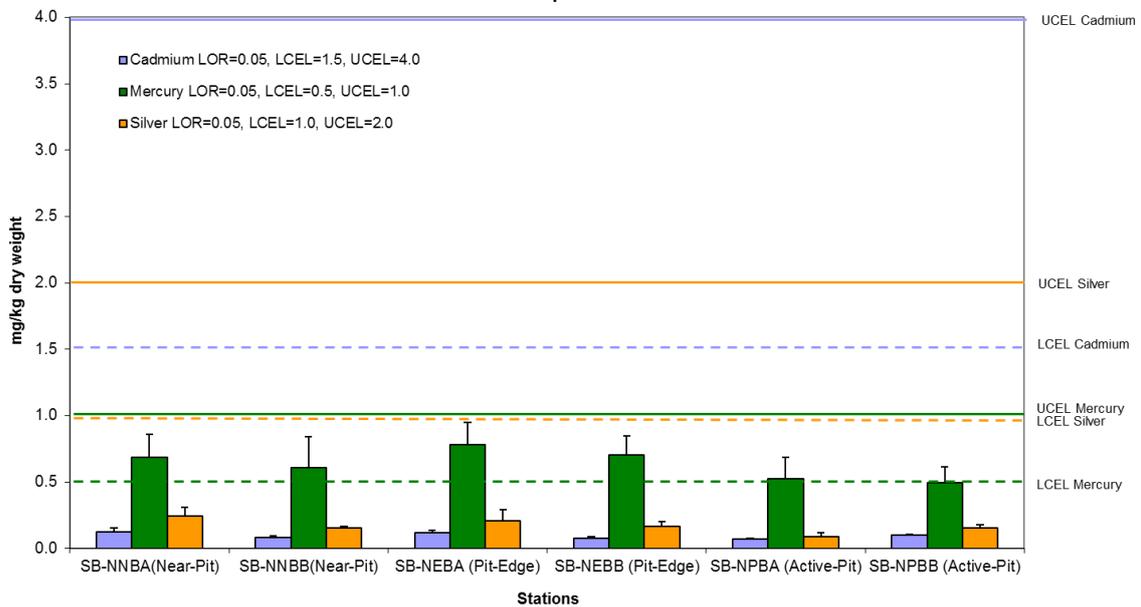


Figure 6: Concentration of Metals (Cd, Hg, Ag; mg/kg dry weight; mean +SD) in sediment samples collected from Pit Specific Sediment Chemistry Monitoring for ESC CMP Vd in April 2016.

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Date: 10/5/2016

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Pit Specific Sediment Chemistry for Total Organic Carbon (TOC) at ESC CMP Vd
April 2016

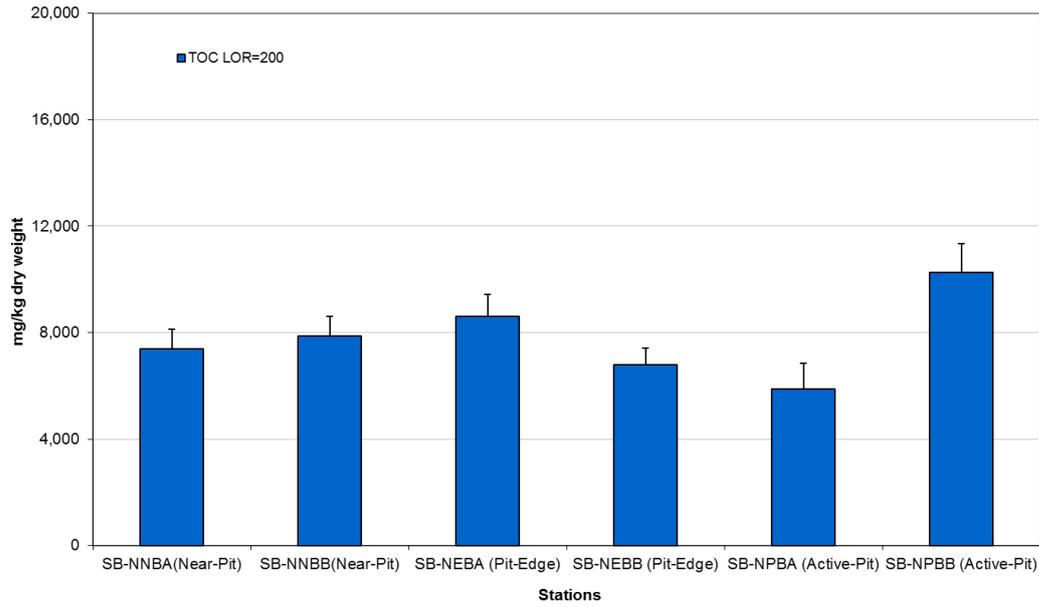


Figure 7: Concentration of Total Organic Carbon (TOC) (mg/kg dry weight; mean +SD) in sediment samples collected from Pit Specific Sediment Chemistry Monitoring for ESC CMP Vd in April 2016.

Pit Specific Sediment Chemistry for Tributyltin (TBT) at ESC CMP Vd
April 2016

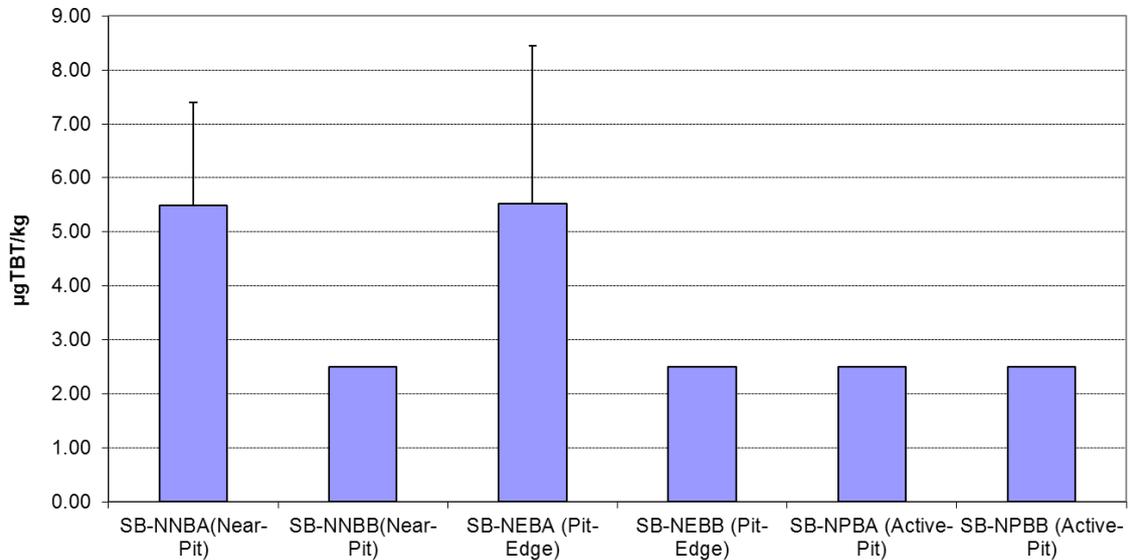


Figure 8: Concentration of Tributyltin (TBT) (µg TBT/kg; mean +SD) in sediment samples collected from Pit Specific Sediment Chemistry Monitoring for ESC CMP Vd in April 2016.

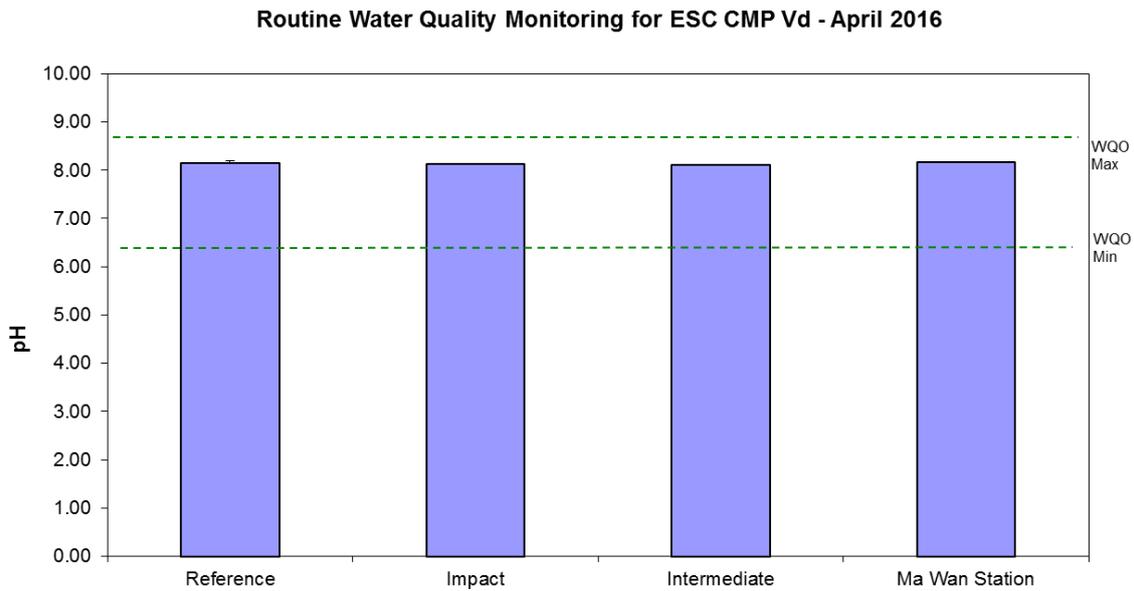


Figure 9: Level of pH recorded during Routine Water Quality Monitoring for disposal operations at ESC CMP Vd in April 2016.

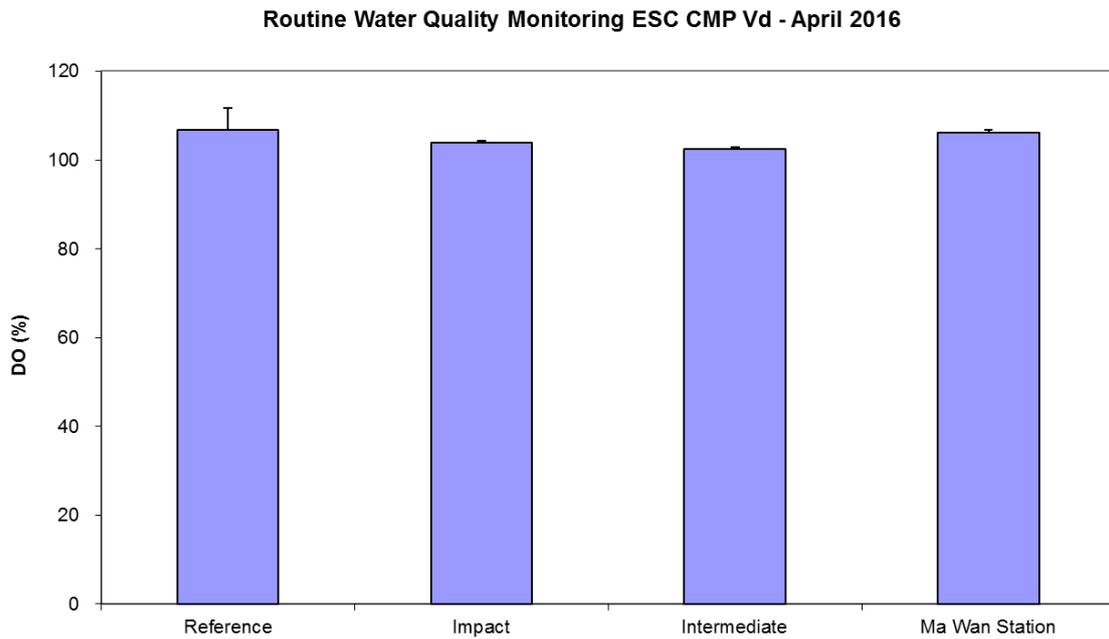


Figure 10: Level of Dissolved Oxygen (DO) (% saturation; mean + SD) recorded during Routine Water Quality Monitoring for disposal operations at ESC CMP Vd in April 2016.

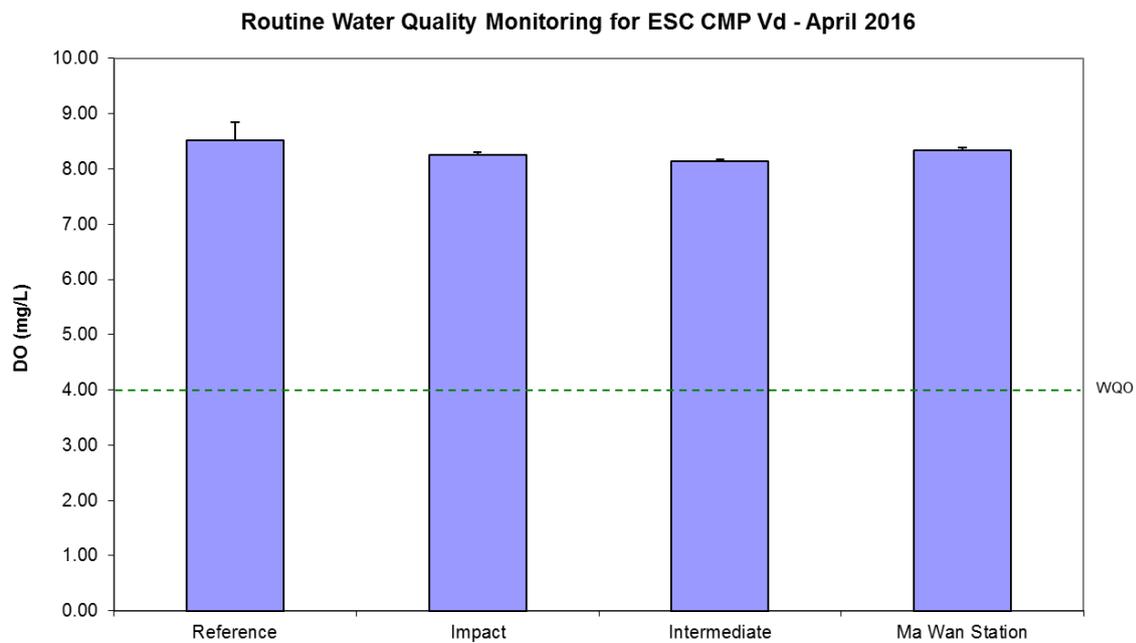


Figure 11: Concentration of Dissolved Oxygen (DO) (mg/L; mean + SD) recorded during Routine Water Quality Monitoring for disposal operations at ESC CMP Vd in April 2016.

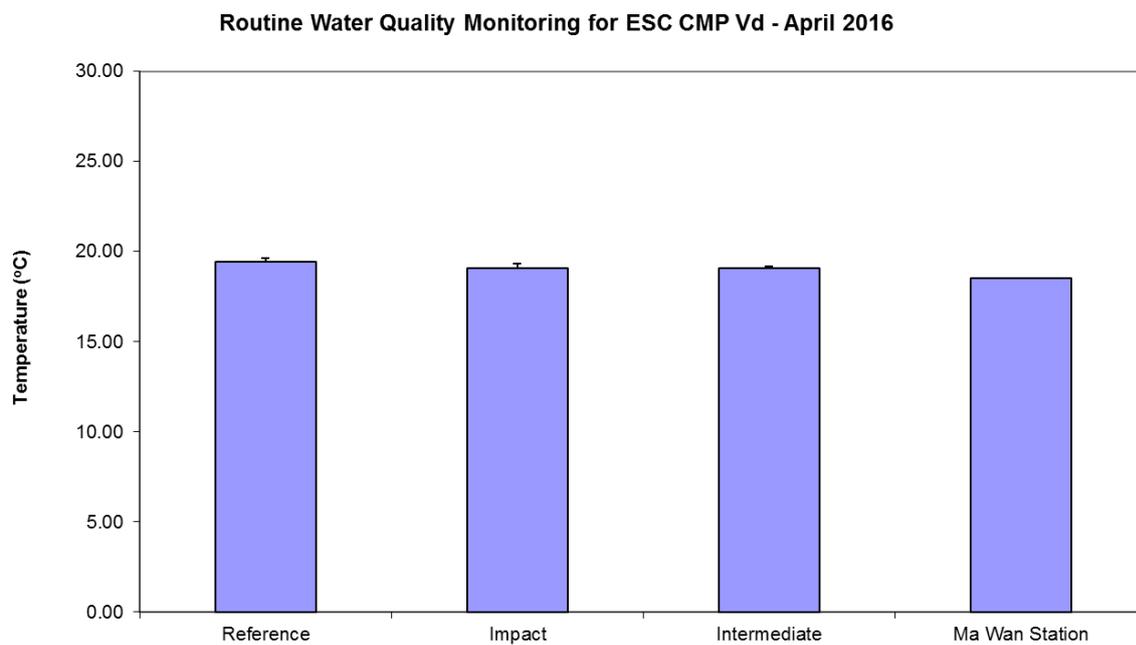


Figure 12: Level of Temperature (°C; mean + SD) recorded during Routine Water Quality Monitoring for disposal operations at ESC CMP Vd in April 2016.

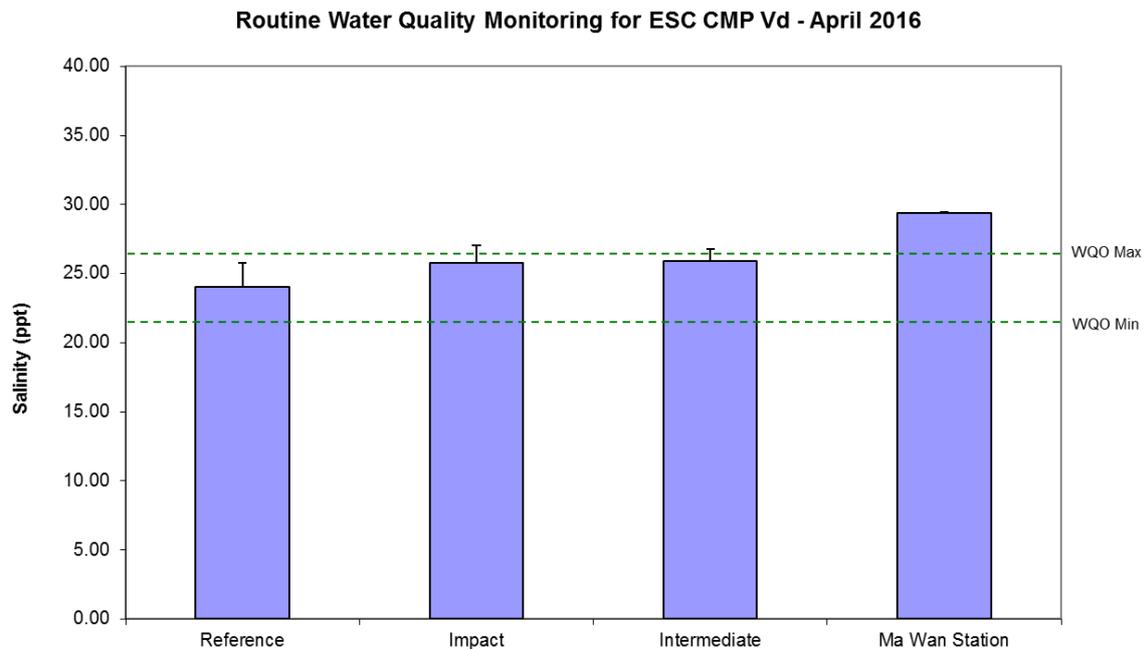


Figure 13: Level of Salinity (ppt; mean + SD) recorded during Routine Water Quality Monitoring for disposal operations at ESC CMP Vd in April 2016.

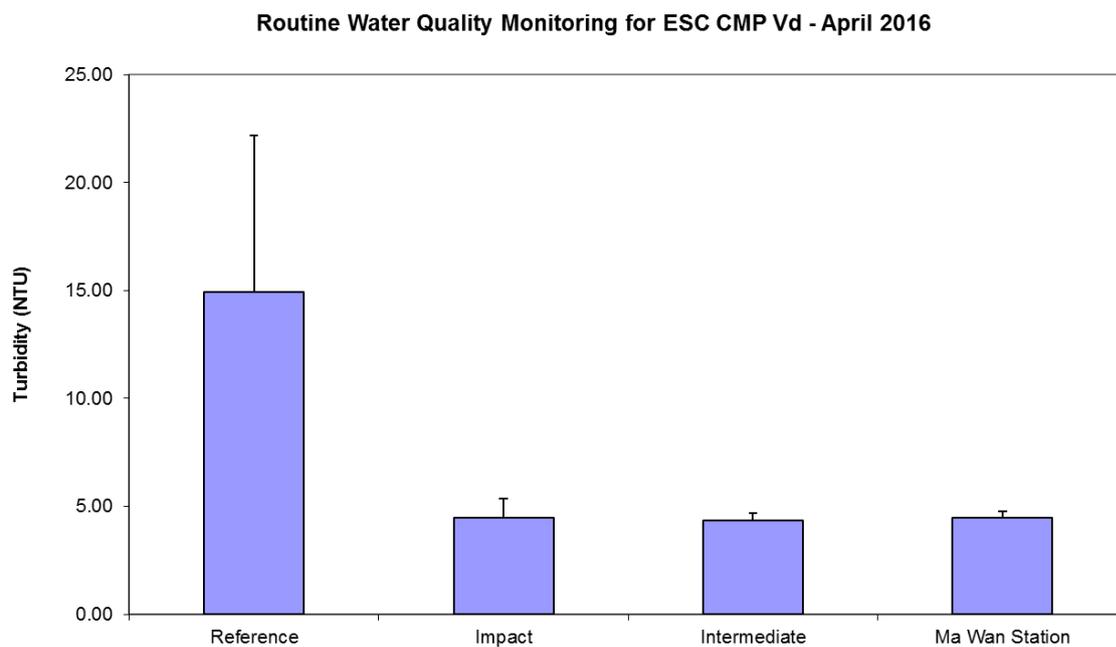


Figure 14: Levels of Turbidity (NTU; mean + SD) recorded during Routine Water Quality Monitoring for disposal operations at ESC CMP Vd in April 2016.

**Routine Water Quality Monitoring Results for Metals
April 2016**

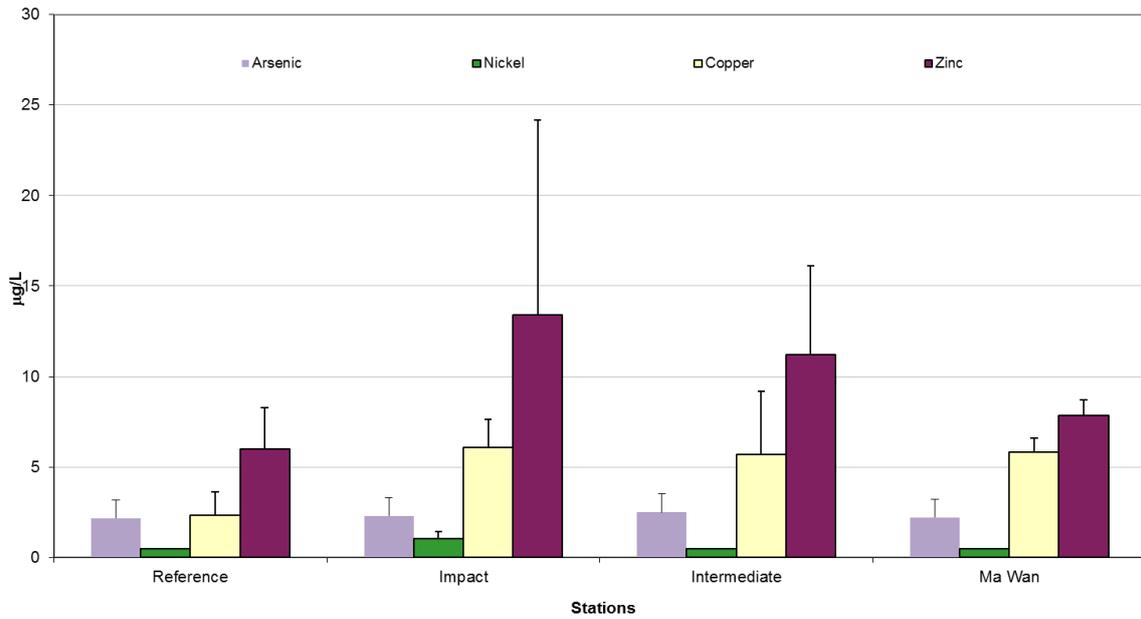


Figure 15: Concentration of Copper, Zinc, Arsenic and Nickel ($\mu\text{g/L}$; mean + SD) in water samples collected from Routine Water Quality Monitoring for disposal operations at ESC CMP Vd in April 2016.

**Routine Water Quality Monitoring Results for Nutrients
April 2016**

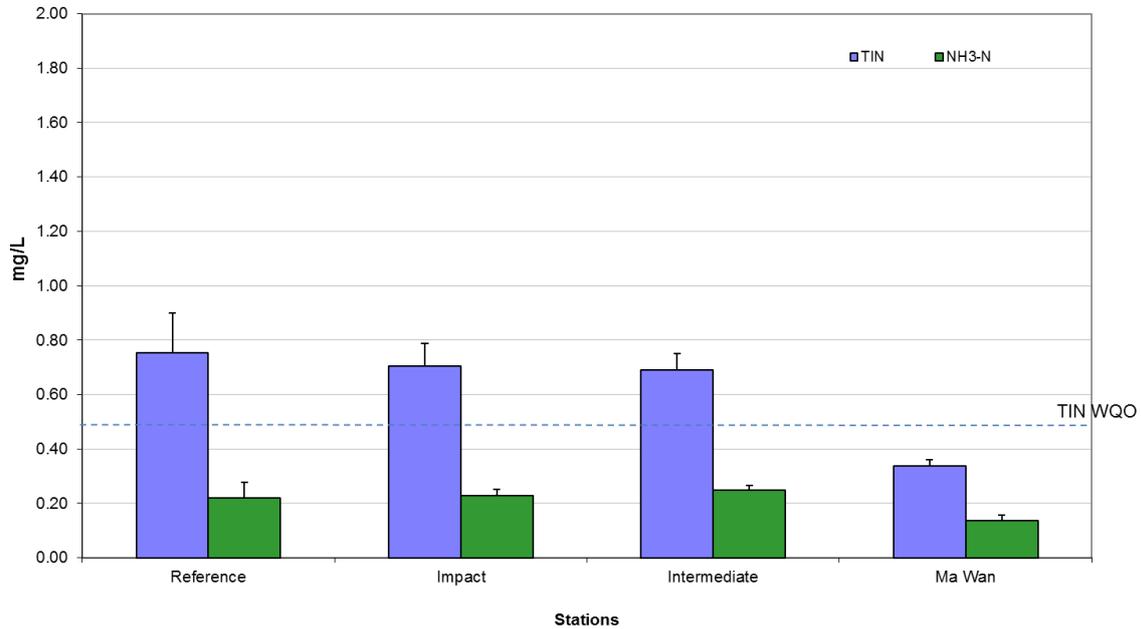


Figure 16: Concentration of Total Inorganic Nitrogen (TIN) and Ammonia Nitrogen ($\text{NH}_3\text{-N}$) ($\mu\text{g/L}$; mean + SD) in water samples collected from Routine Water Quality Monitoring for disposal operations at ESC CMP Vd in April 2016.

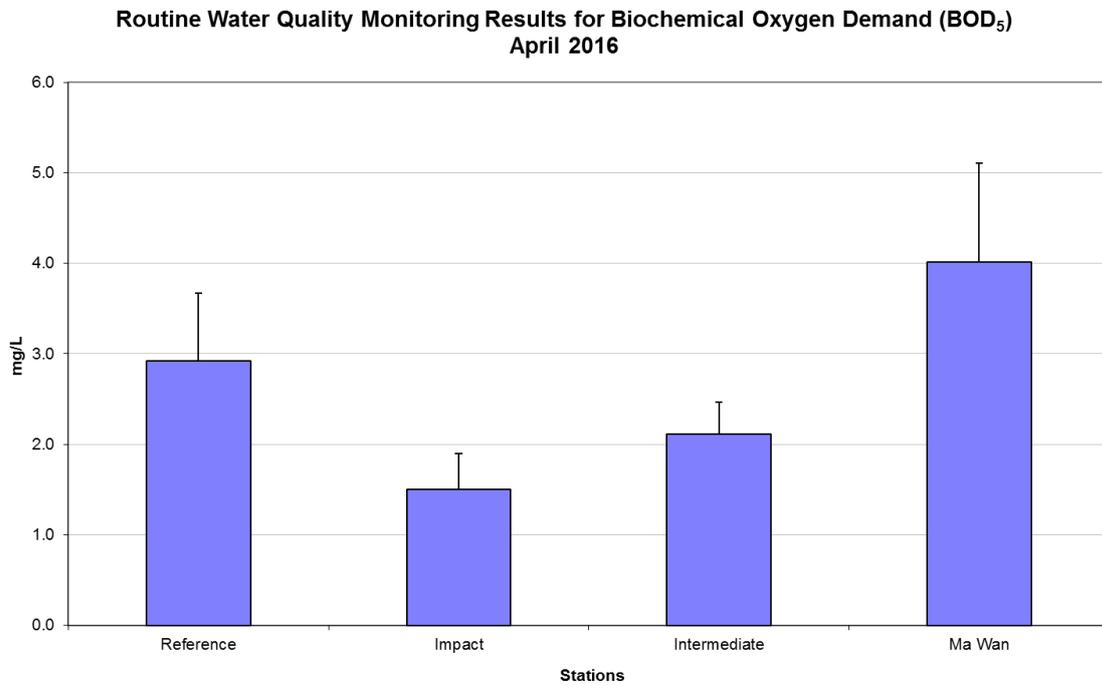


Figure 17: Level of Biochemical Oxygen Demand (BOD₅) (mg/L; mean + SD) in water samples collected from Routine Water Quality Monitoring for disposal operations at ESC CMP Vd in April 2016.

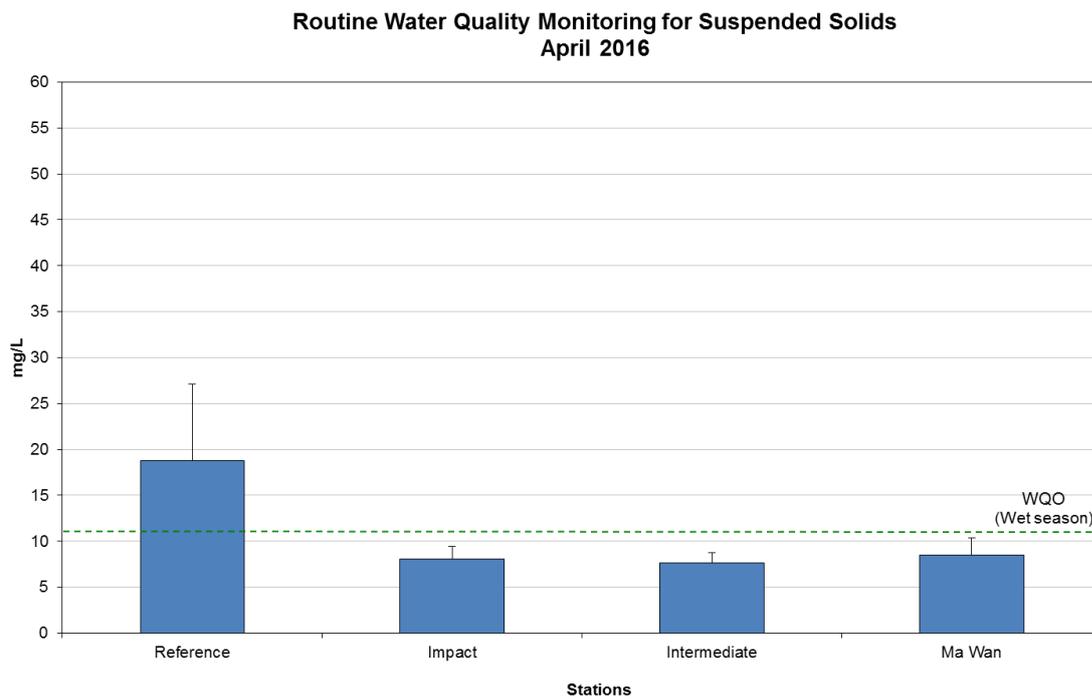


Figure 18: Concentration of Suspended Solids (SS) (mg/L; mean + SD) in water samples collected from Routine Water Quality Monitoring for disposal operations at ESC CMP Vd in April 2016.

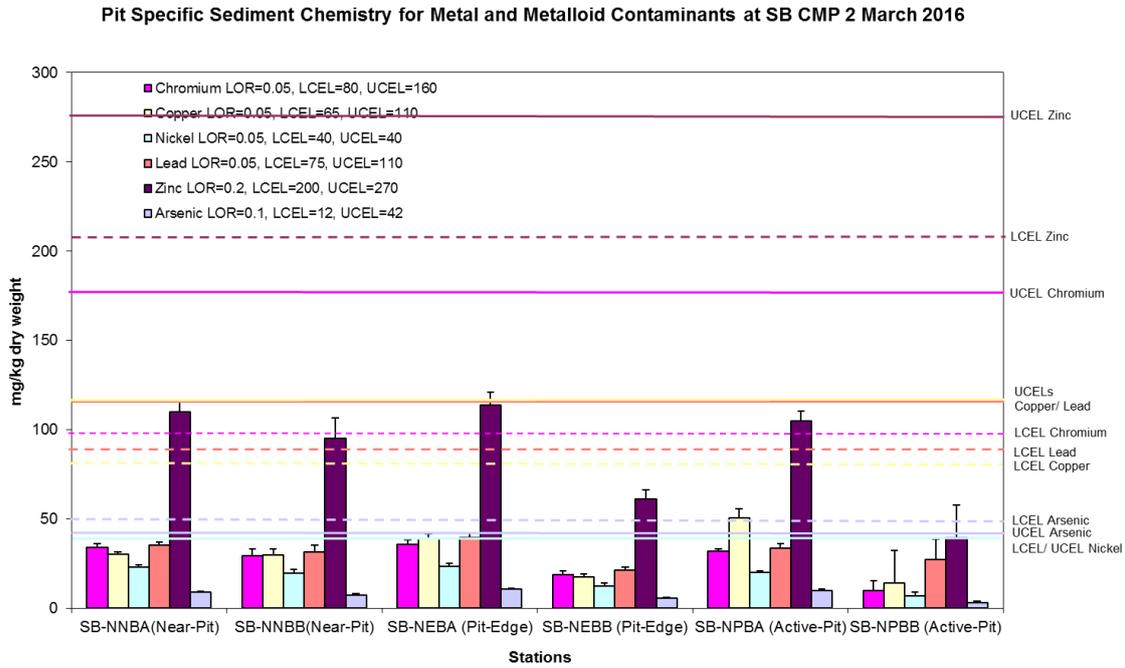


Figure 19: Concentration of Metals (Cr, Cu, Ni, Pb, Zn, As; mg/kg dry weight; mean +SD) in sediment samples collected from Pit Specific Sediment Chemistry Monitoring for SB CMP 2 in March 2016.

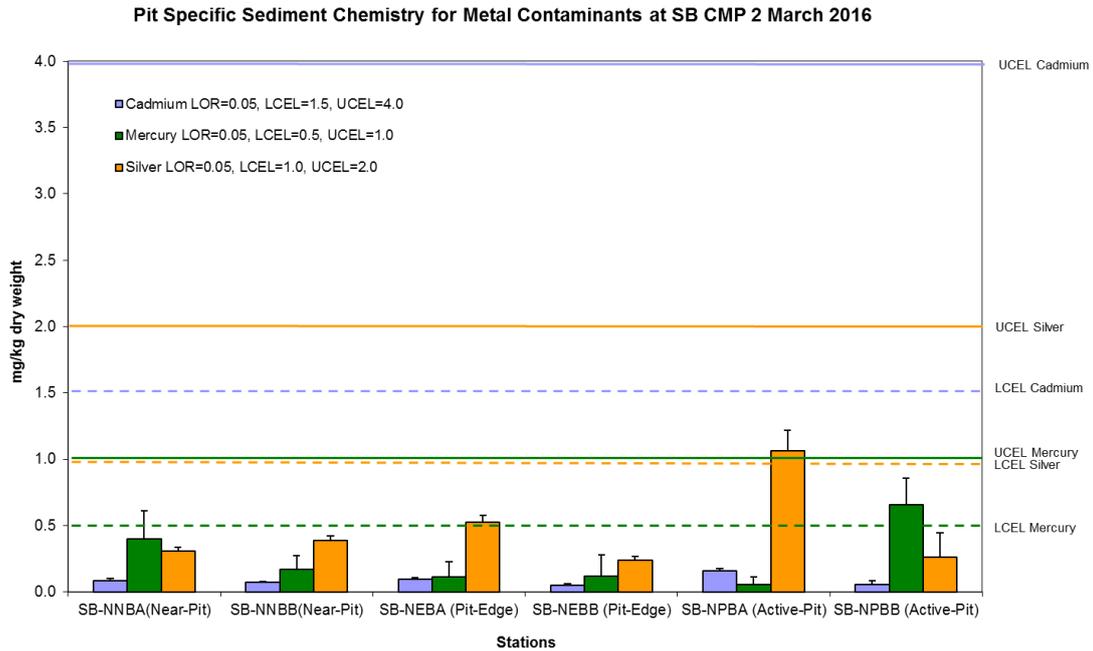


Figure 20: Concentration of Metals (Cd, Hg, Ag; mg/kg dry weight; mean +SD) in sediment samples collected from Pit Specific Sediment Chemistry Monitoring for SB CMP 2 in March 2016.

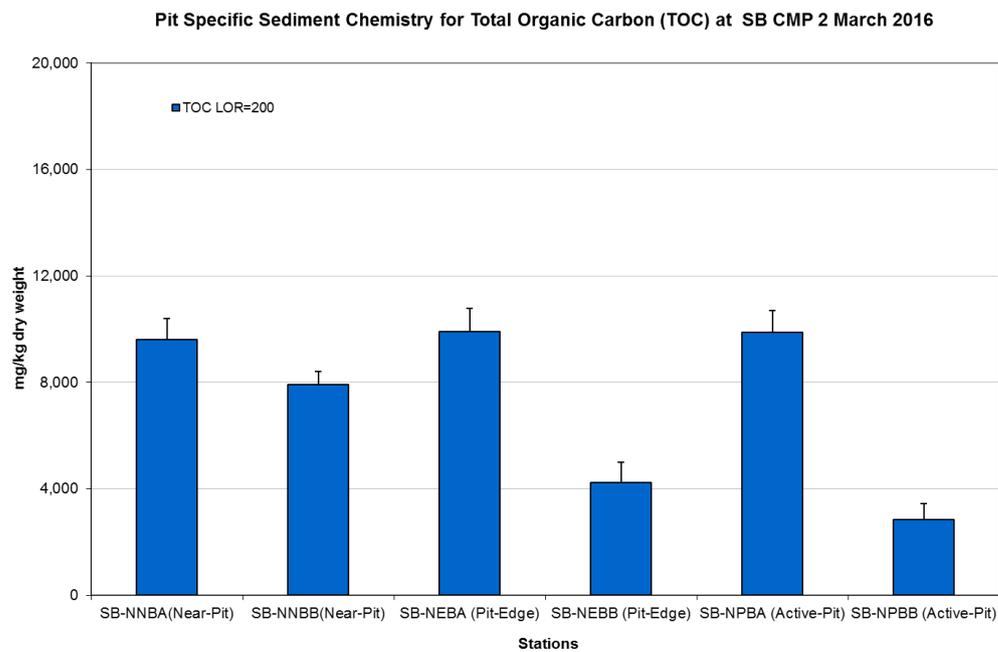


Figure 21: Concentration of Total Organic Carbon (TOC) (mg/kg dry weight; mean +SD) in sediment samples collected from Pit Specific Sediment Chemistry Monitoring for SB CMP 2 in March 2016.

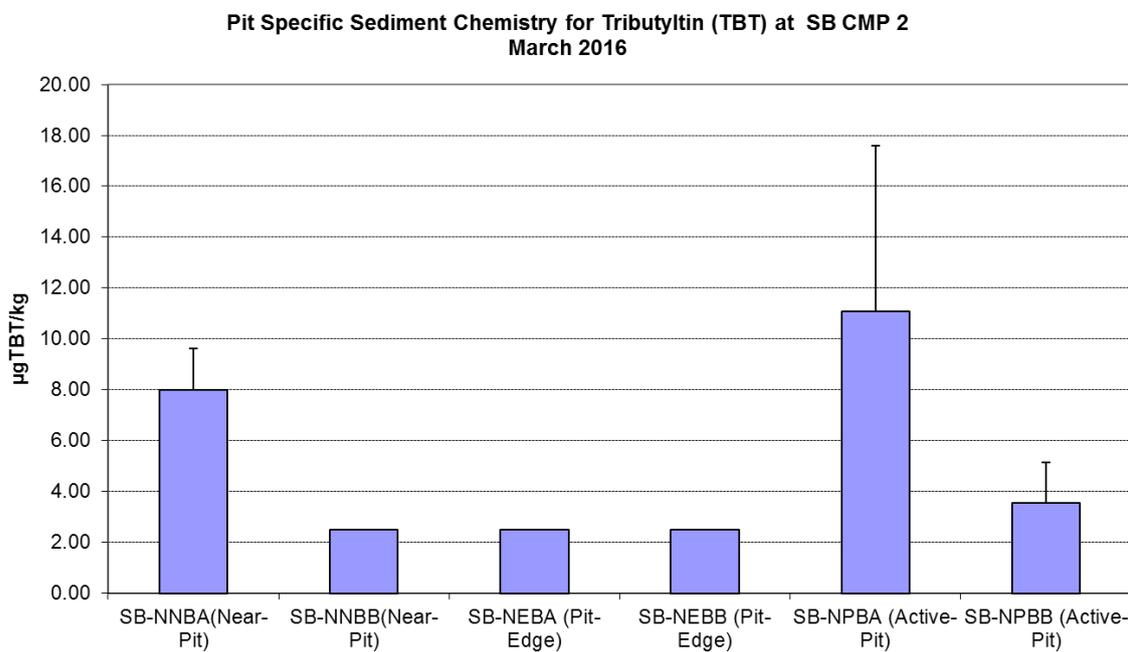


Figure 22: Concentration of Tributyltin (TBT) (µg TBT/kg; mean +SD) in sediment samples collected from Pit Specific Sediment Chemistry Monitoring for SB CMP 2 in March 2016.

Annex D

Study Programme

