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## Biological Testing



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## Amphipod Test

Test report

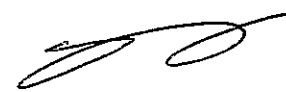
**Report No.** : 101864N  
**Project Name** : Agreement No. CE 42/2005 (WS) Laying of Western Cross Harbour Main and Associated Land Mains From West Kowloon to Sai Ying Pun - Investigation  
**Customer Name** : Geotechnical Projects Division, Geotechnical Engineering Office, Civil Engineering and Development Department  
**Customer Address** : 8/F Civil Engineering and Development Building, 101 Princess Margaret Road, Kowloon, Hong Kong  
**Contract No.** : GE/2005/47  
**Works Order No.** : GE/2005/47.19  
**Lab. Job No.** : J469  
**Lab. Sample Ref. No.** : 18263/1-9  
**No. of Sample(s) & Description** : 10 no. of samples stated as sediment were received on chilled condition  
9 no. of samples were tested including  
VC4a (10.9m - 11.9m), VC7a (0.9m - 1.9m), VC8a (10.9m - 11.9m),  
VC11a (0.9m - 1.9m), VC12a (0.0m - 0.9m),  
VC13a (0.0m - 0.9m) + VC13a (4.9m - 5.9m), VC14a (0.0m - 0.9m),  
VC15a (10.9m - 11.9m) & Reference Sediment  
as per customer's instruction  
**Sample Receive Date** : 6 -22 Sept, 2006  
**Test Date** : 29 Oct - 8 Nov, 2006

Test Parameter

Parameter	Test Method
Amphipod Sediment Bioassay	USEPA 1994

- Note(s):
1. Uncertainty is calculated as 2 SD.
  2. Standard Method: Methods for Assessing Toxicity of Sediment-associated Contaminants with Estuarine and Marine Amphipods. EPA/600/R-94/025, USEPA, 1994.
  3. This is the final report and supersedes the draft report with the same report number.

Authorized signatory:



Yi Zhang  
(Ecotoxicologist)

Date: 22-Dec-2006

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Lam Laboratories Limited Room 1412, Honour Industrial Centre, 6 Sun Yip Street, Chaiwan, Hong Kong.

Tel: (852) 2897 3282 Fax: (852) 2897 5509 Email: [info@lamlab.com](mailto:info@lamlab.com)

Test report

Report no.: 101864N

1. Method

This 10-day toxicity test with *Leptocheirus plumulosus* was conducted using the USEPA method (1994) "Methods for Assessing the Toxicity of Sediment-associated Contaminants with Estuarine and Marine Amphipods". *Leptocheirus plumulosus* is exposed to the test sediment overlaid with seawater for a 10-day test period and survival rate is determined as the primary endpoint.

2. Sample storage and pretreatment

All samples were homogenized thoroughly. Debris and indigenous organisms present in the sediment were removed and the sediment samples were stored at 4°C in dark until analyzed.

3. Test organism

Species: *Leptocheirus plumulosus*  
Source: Purchased from research organism supplier from USA, mortality during shipping was 0.79%  
Size/age: 3-4 mm in length  
Acclimation: under test conditions with feeding provided, as per USEPA 1994, mortality during acclimation was 4.35%  
Health condition: healthy

4. Summary of test particulars

Type of test: static  
Duration: 29 Oct - 8 Nov, 2006  
Control sediment: mud and sand collected from a clean area on the eastern coast of the New Territories and Hong Kong Island respectively, shipped to the laboratory on the same day, sieved through 425 micrometer mesh sieve, mixed and stored at 4°C in dark until use  
Control seawater: reconstituted seawater prepared with the Instant Ocean salt at 20 ppt, aerated for two days after preparation  
Test temperature: 25±1°C  
Lighting: continuous  
Aeration: provided (around 100 bubbles/min)  
Test vessel: 1000ml glass jars  
Volume of sediment: 175ml  
Volume of overlying water: 775 ml  
No. of replicates: 5  
No. of organisms/replicate: 20  
Feeding: none  
Monitoring: temperature, DO, pH and salinity in overlying water everyday, ammonia in overlying water at test initiation and termination  
Reference toxicant test: 96 hour water only test with CdCl<sub>2</sub>

Test report

Report no.: 101864N

5. Summary of test results

Table 1. Survival of amphipods on Day 10

Sample ID	Number of living amphipod on Day 10					Mean	SD
	Replicate 1	Replicate 2	Replicate 3	Replicate 4	Replicate 5		
Negative Control with sediment	20	19	19	19	20	19.4	0.5
VC4a (0.9m - 1.9m)	16	16	15	12	15	14.8	1.6
VC7a (0.9m - 1.9m)	16	14	14	14	19	15.4	2.2
VC8a (10.9m - 11.9m)	15	17	19	16	14	16.2	1.9
VC11a (0.9m - 1.9m)	15	14	15	11	15	14.0	1.7
VC12a (0.0m - 0.9m)	17	18	18	14	14	16.2	2.0
VC13a (0.0m - 0.9m) + VC13a (4.9m - 5.9m)	14	12	16	15	14	14.2	1.5
VC14a (0.0m - 0.9m)	15	18	14	19	17	16.6	2.1
VC15a (10.9m - 11.9m)	9	7	10	11	12	9.8	1.9
Reference sediment	16	19	16	17	17	17.0	1.2

Table 2. Survival percentage of amphipods on Day 10

Sample ID	Survival percentage of amphipod on Day 10 (%)					Mean	SD
	Replicate 1	Replicate 2	Replicate 3	Replicate 4	Replicate 5		
Negative Control with sediment	100	95	95	95	100	97.0	2.7
VC4a (0.9m - 1.9m)	80	80	75	60	75.0	74.0	8.2
VC7a (0.9m - 1.9m)	80	70	70	70	95.0	77.0	11.0
VC8a (10.9m - 11.9m)	75	85	95	80	70.0	81.0	9.6
VC11a (0.9m - 1.9m)	75	70	75	55	75.0	70.0	8.7
VC12a (0.0m - 0.9m)	85	90	90	70	70.0	81.0	10.2
VC13a (0.0m - 0.9m) + VC13a (4.9m - 5.9m)	70	60	80	75	70.0	71.0	7.4
VC14a (0.0m - 0.9m)	75	90	70	95	85.0	83.0	10.4
VC15a (10.9m - 11.9m)	45	35	50	55	60.0	49.0	9.6
Reference sediment	80	95	80	85	85	85.0	6.1

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Table 3. Summary of the amphipod survival in relation to the reference sediment

Sample ID	Survival in relation to reference site (%)	Difference between sample and reference sediment (t-test)
VC4a (0.9m - 1.9m)	87.1	NA <sup>1</sup>
VC7a (0.9m - 1.9m)	90.6	NA <sup>1</sup>
VC8a (10.9m - 11.9m)	95.3	NA <sup>1</sup>
VC11a (0.9m - 1.9m)	82.4	NA <sup>1</sup>
VC12a (0.0m - 0.9m)	95.3	NA <sup>1</sup>
VC13a (0.0m - 0.9m) + VC13a (4.9m - 5.9m)	83.5	NA <sup>1</sup>
VC14a (0.0m - 0.9m)	97.6	NA <sup>1</sup>
VC15a (10.9m - 11.9m)	57.6	Significantly different, t critical=1.86, t stat=-7.060, p<0.05 (one tail)
NA <sup>1</sup> . As the average survival of the amphipods for the test sediment was no less than 80% of that of the reference sediment, statistical analysis is not required.		

Test report

Report no.: 101864N

6. Test validity

Table 3. Test validity criteria and water quality ranges in the amphipod test

Parameter	Minimum during the test period	Maximum during the test period	Acceptable Range in USEPA 1994
Overlying salinity	19 ppt	21 ppt	19-21 ppt
Dissolved oxygen	6.4 mg/L	7.7 mg/L	>4.7 mg/L <sup>1</sup>
Overlying pH	7.3	8.1	NA <sup>2</sup>
Temperature	24.2 °C	25.4 °C	22.0-28.0 °C time-average 24.0-26.0 °C
Total ammonia in overlying water (initiation / termination)	0.06 mg/L	2.31 mg/L	<60 mg/L <sup>3</sup>
Interstitial salinity (initiation)	27 ppt	32 ppt	1.5-32 ppt <sup>4</sup>
Interstitial pH (initiation)	7.1	8.1	NA <sup>2</sup>
Amphipod survival in the negative control	95-100% , averagely 97.0 %		≥ 90% average ≥ 80% in any individual replicate
96-h LC <sub>50</sub> obtained from the reference toxicant test	0.72 mg/L		0.95±0.35 mg/L
1. 60% of saturation level at 20 ppt 2. pH is not adjusted or controlled 3. The acceptance level for overlying ammonia was < 20 mg/L in ETWB TCW 34/2002. When this level is exceeded, additional set of amphipod test is conducted with purging of sediment. 4. VC4a(10.9m - 11.9m), VC8a(10.9m -11.9m), VC11a(0.9m - 1.9m), VC12a(0.0m - 0.9m) and VC13a(0.0m - 0.9m) + VC13a(4.9m - 5.9m) were pre-mixed with 20 ppt reconstituted seawater, so that interstitial salinity was below 32 ppt at test initiation.			

As shown in Table 3, the water quality parameters during the test period ranged within acceptable limits: temperature ranged from 24.2 to 25.4 °C, the dissolved oxygen level ranged from 6.4 to 7.7 mg/L, pH ranged from 7.3 to 8.1, the salinity ranged from 19 to 21 ppt. As a result, the data are interpretable.

The tests were validated by acceptable survival of control organisms. The average survival rate in controls was greater than 90% and survival rate in any control replicates greater than 80%.

The organisms also demonstrated comparable sensitivity to the reference toxicant (cadmium). The 96-hr LC<sub>50</sub> for *Leptocheirus plumulosus* obtained was 0.72 mgCd/L and found within the laboratory control limits (Mean±2STD, i.e., 0.95±0.35 mgCd/L). Therefore, the data are acceptable.

End of report

Data entry checked by: Y.M. Choy / W.K. Cheuk



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## Polychaete Test




TEST REPORT

**Report No.** : 101866N  
**Project Name** : Agreement No. CE 42/2005 (WS) Laying of Western Cross Harbour Main and Associated Land Mains From West Kowloon to Sai Ying Pun - Investigation  
**Customer Name** : Geotechnical Projects Division, Geotechnical Engineering Office, Civil Engineering and Development Department  
**Customer Address** : 8/F Civil Engineering and Development Building, 101 Princess Margaret Road, Kowloon, Hong Kong  
**Contract No.** : GE/2005/47  
**Works Order No.** : GE/2005/47.19  
**Lab. Job No.** : J469  
**Lab. Sample Ref. No.** : 18263/1-9  
**No. of Sample(s) & Description** : 10 no. of samples stated as sediment were received on chilled condition  
9 no. of samples were tested including  
VC4a (10.9m - 11.9m), VC7a (0.9m - 1.9m), VC8a (10.9m - 11.9m),  
VC11a (0.9m - 1.9m), VC12a (0.0m - 0.9m),  
VC13a (0.0m - 0.9m) + VC13a (4.9m - 5.9m), VC14a (0.0m - 0.9m),  
VC15a (10.9m - 11.9m) & Reference Sediment  
as per customer's instruction  
**Sample Receive Date** : 6 -22 Sept, 2006  
**Test Date** : 26 Oct - 15 Nov, 2006

Test Parameter

Parameter	Test Method
Polychaete Sediment Bioassay	PSEP 1995

- Note(s):
1. Results related to sample(s) as received.
  2. NA = Not applicable.
  3. Uncertainty is calculated as 2 SD.
  4. Standard method: Puget Sound Estuary Program Recommended Guidelines for Conducting Laboratory Bioassays on Puget Sound Sediments, USEPA, Revised July 1995.
  5. This is the final report and supersedes the draft report with the same report number.

**Authorized signatory:**   
Yi Zhang  
(Ecotoxicologist)

**Date:** 22-Dec-2006

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Lam Laboratories Limited Room 1412, Honour Industrial Centre, 6 Sun Yip Street, Chaiwan, Hong Kong.

Tel: (852) 2897 3282 Fax: (852) 2897 5509 Email: [info@lamlab.com](mailto:info@lamlab.com)

Test report

Report No.: 101866N

1. Method

This 20-day toxicity test on sediment with *Neanthes arenaceodentata* was conducted using the PSEP method (1995) "Recommended Guidelines for Conducting Laboratory Bioassays on Puget Sound Sediments". *Neanthes arenaceodentata* is exposed to the test sediment overlaid with seawater for a 20-day test period. The endpoints are survival and growth.

2. Sample storage and pretreatment

All samples were homogenized thoroughly. Debris and indigenous organisms present in the sediment were removed and the sediment samples were stored at 4°C in dark until analyzed.

3. Test organism

Species: *Neanthes arenaceodentata*  
Source: Purchased from research organism supplier from USA, mortality during shipping was 0%  
Age/size: 2-3 weeks post emergence  
Acclimation: under test conditions with feeding provided, as per USEPA 1994, mortality during acclimation was 0%  
Health condition: healthy  
Mean initial dry weight: 0.63 mg/worm

4. Summary of test particulars

Type of test: renewal every three days  
Duration: 26 Oct - 15 Nov, 2006  
Control sediment: mud and sand collected from a clean area on the eastern coast of the New Territories and Hong Kong Island respectively, shipped to the laboratory on the same day, sieved through 425 micrometer mesh sieve, mixed and stored at 4°C in dark until use  
Control seawater: reconstituted seawater prepared with the Instant Ocean salt at 28 ppt, aerated for two days after preparation  
Test temperature: 20±1°C  
Lighting: continuous  
Aeration: provided (around 100 bubbles/min)  
Test vessel: 1000ml glass jars  
Volume of sediment: 175ml  
Volume of overlying water: 775 ml  
No. of replicates: 5  
No. of organisms/replicate: 5  
Feeding: Tetramarin powder, 8 mg per worm each time, once every two days  
Monitoring: temperature, DO, pH and salinity in overlying water everyday, ammonia in overlying water at test initiation and termination  
Reference toxicant test: 96 hour water only test with CdCl<sub>2</sub>

Test report

Report No.: 101866N

5. Summary of test results

Table 1. Survival of polychaetes on Day 20

Sample ID	Number of living polychaete on Day 20					Mean	SD
	Replicate 1	Replicate 2	Replicate 3	Replicate 4	Replicate 5		
Negative control with sediment	5	5	5	5	5	5.0	0.0
VC4a (0.9m - 1.9m)	5	5	5	5	5	5.0	0.0
VC7a (0.9m - 1.9m)	4	4	5	5	5	4.6	0.5
VC8a (10.9m - 11.9m)	2	5	5	5	3	4.0	1.4
VC11a (0.9m - 1.9m)	5	5	5	5	5	5.0	0.0
VC12a (0.0m - 0.9m)	4	5	5	5	4	4.6	0.5
VC13a (0.0m - 0.9m) + VC13a (4.9m - 5.9m)	5	5	5	5	5	5.0	0.0
VC14a (0.0m - 0.9m)	5	5	5	5	5	5.0	0.0
VC15a (10.9m - 11.9m)	5	5	4	5	5	4.8	0.4
Reference sediment	5	5	5	5	3	4.6	0.9

Table 2. Survival percentage of polychaetes on Day 20

Sample ID	Survival percentage of polychaete on Day 20 (%)					Mean	SD
	Replicate 1	Replicate 2	Replicate 3	Replicate 4	Replicate 5		
Negative control with sediment	100	100	100	100	100	100.0	0.0
VC4a (0.9m - 1.9m)	100	100	100	100	100	100.0	0.0
VC7a (0.9m - 1.9m)	80	80	100	100	100	92.0	11.0
VC8a (10.9m - 11.9m)	40	100	100	100	60	80.0	28.3
VC11a (0.9m - 1.9m)	100	100	100	100	100	100.0	0.0
VC12a (0.0m - 0.9m)	80	100	100	100	80	92.0	11.0
VC13a (0.0m - 0.9m) + VC13a (4.9m - 5.9m)	100	100	100	100	100	100.0	0.0
VC14a (0.0m - 0.9m)	100	100	100	100	100	100.0	0.0
VC15a (10.9m - 11.9m)	100	100	80	100	100	96.0	8.9
Reference sediment	100	100	100	100	60	92.0	17.9

Table 3. Total dry weight of polychaetes on Day 20

Sample ID	Total dry weight of polychaete on Day 20 (mg)					Mean	SD
	Replicate 1	Replicate 2	Replicate 3	Replicate 4	Replicate 5		
Negative control with sediment	40.14	73.51	63.54	64.96	77.05	63.8	14.4
VC4a (0.9m - 1.9m)	63.66	60.28	47.74	48.75	46.89	53.5	7.9
VC7a (0.9m - 1.9m)	54.36	63.03	53.78	76.16	56.06	60.7	9.4
VC8a (10.9m - 11.9m)	33.21	70.69	65.63	51.66	41.49	52.5	15.8
VC11a (0.9m - 1.9m)	65.03	64.89	59.30	60.05	50.38	59.9	6.0
VC12a (0.0m - 0.9m)	40.82	47.24	24.56	55.57	53.64	44.4	12.5
VC13a (0.0m - 0.9m) + VC13a (4.9m - 5.9m)	67.49	63.49	71.87	55.23	55.99	62.8	7.2
VC14a (0.0m - 0.9m)	60.45	53.08	49.84	56.45	62.14	56.4	5.1
VC15a (10.9m - 11.9m)	62.97	58.20	62.03	48.32	70.17	60.3	8.0
Reference sediment	58.07	51.14	2.16	78.82	61.06	50.3	28.8

Test report

Report No.: 101866N

Table 4. Summary of the total dry weight of polychaetes in relation to the reference sediments

Sample ID	Total dry weight in relation to reference site (%)	Difference between sample and reference sediment (t-test)
VC4a (0.9m - 1.9m)	106.4	NA <sup>1</sup>
VC7a (0.9m - 1.9m)	120.8	NA <sup>1</sup>
VC8a (10.9m - 11.9m)	104.5	NA <sup>1</sup>
VC11a (0.9m - 1.9m)	119.3	NA <sup>1</sup>
VC12a (0.0m - 0.9m)	88.3	Insignificantly different, t critical=1.86, t stat=-0.420, p=0.3429 (one tail)
VC13a (0.0m - 0.9m) + VC13a (4.9m - 5.9m)	125.0	NA <sup>1</sup>
VC14a (0.0m - 0.9m)	112.2	NA <sup>1</sup>
VC15a (10.9m - 11.9m)	120.1	NA <sup>1</sup>
NA <sup>1</sup> - As the average total dry weight for the test sediment was no less than 90% of that of the reference sediment, statistical analysis is not required.		

Test report

Report No.: 101866N

6. Test validity

Table 5. Test validity criteria and water quality ranges in the polychaete test

Parameter	Minimum during the test period	Maximum during the test period	Control Limit
Overlying salinity	26 ppt	30 ppt	26-30 ppt
Dissolved oxygen	6.3 mg/L	7.4 mg/L	not specified
Overlying pH	7.1	8.3	NA <sup>1</sup>
Temperature	19.2 °C	20.4 °C	19-21°C
Unionized ammonia in overlying water (initiation/termination)	<0.002 mg/L	0.287 mg/L	NA <sup>2</sup>
Interstitial salinity (initiation/termination)	26 ppt	30 ppt	>20ppt
Interstitial pH (initiation/termination)	7.0	8.1	NA <sup>1</sup>
Polychaete survival in the negative control	All 100% , averagely 100.0%		≥ 90% average ≥ 80% in any individual replicate
96-h LC <sub>50</sub> obtained from the reference toxicant test	9.96 mg/L		10.10±2.95 mg/L
1. pH is not adjusted or controlled 2. Overlying ammonia is not controlled. Results could be qualified as possible false positive when unionized ammonia greater than 0.7 mg/L			

As shown in Table 5, the water quality parameters during the test period ranged within acceptable limits: temperature ranged from 19.2 to 20.4 °C, the salinity ranged from 26 to 30 ppt. As a result, the data are interpretable.

The tests were validated by acceptable survival of control organisms. The average survival rate in controls was greater than 90% and survival rate in any control replicates greater than 80%.

The organisms also demonstrated comparable sensitivity to the reference toxicant (cadmium). The 96-hr LC<sub>50</sub> for *Neanthes arenaceodentata* obtained was 9.96 mgCd/L and found within the laboratory control limits (Mean±2STD, i.e., 10.10±2.95 mgCd/L). Therefore, the data are acceptable.

End of report

Data entry checked by: Y.M. Choy / W.K. Cheuk



Laboratories

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**Bivalve Test**

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TEST REPORT

**Report No.** : 101865N  
**Project Name** : Agreement No. CE 42/2005 (WS) Laying of Western Cross Harbour Main and Associated Land Mains From West Kowloon to Sai Ying Pun - Investigation  
**Customer Name** : Geotechnical Projects Division, Geotechnical Engineering Office, Civil Engineering and Development Department  
**Customer Address** : 8/F Civil Engineering and Development Building, 101 Princess Margaret Road, Kowloon, Hong Kong  
**Contract No.** : GE/2005/47  
**Works Order No.** : GE/2005/47.19  


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**Lab. Job No.** : J469  
**Lab. Sample Ref. No.** : 18263/1-9  
**No. of Sample(s) & Description** : 10 no. of samples stated as sediment were received on chilled condition  
9 no. of samples were tested including  
VC4a (10.9m - 11.9m), VC7a (0.9m - 1.9m), VC8a (10.9m - 11.9m),  
VC11a (0.9m - 1.9m), VC12a (0.0m - 0.9m),  
VC13a (0.0m - 0.9m) + VC13a (4.9m - 5.9m), VC14a (0.0m - 0.9m),  
VC15a (10.9m - 11.9m) & Reference Sediment  
as per customer's instruction  
**Sample Receive Date** : 6 -22 Sept, 2006  
**Test Date** : 31 Oct - 2 Nov, 2006

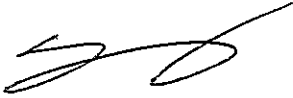
Test Parameter

Parameter	Test Method
Bivalve Larvae Sediment Bioassay	PSEP 1995

- Note(s):
1. Results related to sample(s) as received.
  2. NA = Not applicable.
  3. Uncertainty is calculated as 2 SD.
  4. Standard method: Puget Sound Estuary Program Recommended Guidelines for Conducting Laboratory Bioassays on Puget Sound Sediments, USEPA, Revised July 1995.
  5. This is the final report and supersedes the draft report with the same report number.

Authorized signatory: \_\_\_\_\_

Date: 22-Dec-2006

  
 Yi Zhang  
 (Ecotoxicologist)

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Lam Laboratories Limited Room 1412, Honour Industrial Centre, 6 Sun Yip Street, Chaiwan, Hong Kong.

Tel: (852) 2897 3282 Fax: (852) 2897 5509 Email: [info@lamlab.com](mailto:info@lamlab.com)

Test report

Report No.: 101865N

1. Method

This bivalve larvae test with *Crassostrea gigas* was conducted using the PSEP method (1995) "Recommended Guidelines for Conducting Laboratory Bioassays on Puget Sound Sediments". Bivalve adults are induced to spawn and gametes are fertilized. After fertilization the embryos are immediately exposed to the test sediment overlaid with seawater and allowed to develop for 48-60 hours. The normality survival of larvae is determined as endpoint.

2. Sample storage and pretreatment

All samples were homogenized thoroughly. Debris and indigenous organisms present in the sediment were removed and the sediment samples were stored at 4°C in dark until analyzed.

3. Test organism

Species:	<i>Crassostrea gigas</i>
Source:	purchased from a research organism supplier in UK
Acclimation:	24 hours under test conditions, as per PSEP 1995, mortality during acclimation was 0 %
Conditions of eggs:	mature and clean
Conditions of sperms:	active
Fertilization rate:	90.8%
Mean initial stocking:	27434 fertilized eggs per test chamber

4. Summary of test particulars

Type of test:	static and non-renewal
Duration:	31 October - 2 November, 2006, 48 hours in total
Control seawater:	collected from a clean area on the eastern coast of the Hong Kong Island, filtered through 0.45 mm filter paper, adjusted to 28 ppt, aerated for two days after preparation
Test temperature:	20±1°C
Lighting:	14h light : 10h dark cycle
Aeration:	provided (around 100 bubbles/min)
Test vessel:	1000ml glass jars
Volume of sediment:	18g
Volume of overlying water:	900 ml
No. of replicates:	5
Feeding:	none
Monitoring:	temperature, DO, pH and salinity in overlying water everyday, and termination ammonia in overlying water at test initiation
Reference toxicant test:	48 hour water only test with CdCl <sub>2</sub>



Test report

Report No.: 101865N

5. Summary of test results

Table 1. Total number of normal larvae in each test chamber at test termination

Sample ID	Number of normal larvae in each test chamber at test termination						
	Replicate 1	Replicate 2	Replicate 3	Replicate 4	Replicate 5	Mean	SD
Negative Control with Seawater I	19400	17800	20100	21400	19900	19720	1302.7
Negative Control with Seawater II	19700	19800	20100	21100	20900	20320	641.9
VC4a (0.9m - 1.9m)	16000	17400	18100	15400	17000	16780	1082.6
VC7a (0.9m - 1.9m)	12400	11600	10100	10100	9800	10800	1138.0
VC8a (10.9m - 11.9m)	17100	17000	17600	16900	17500	17220	311.4
VC11a (0.9m - 1.9m)	16100	15200	17000	17900	17000	16640	1026.2
VC12a (0.0m - 0.9m)	11500	9600	10200	11000	10600	10580	729.4
VC13a (0.0m - 0.9m) + VC13a (4.9m - 5.9m)	17000	18800	17700	16800	18000	17660	805.0
VC14a (0.0m - 0.9m)	14000	15800	15200	15300	14000	14860	817.3
VC15a (10.9m - 11.9m)	17000	16500	18100	17000	17100	17140	585.7
Reference sediment	19100	16800	20700	19400	18400	18880	1430.7

Table 2. Combined normality/survival of the bivalve larvae at test termination

Sample ID	Normality survival of bivalve larvae at test termination (%)						
	Replicate 1	Replicate 2	Replicate 3	Replicate 4	Replicate 5	Mean	SD
Negative Control with Seawater I	70.7	64.9	73.3	78.0	72.5	71.9	4.7
Negative Control with Seawater II	71.8	72.2	73.3	76.9	76.2	74.1	2.3
VC4a (0.9m - 1.9m)	58.3	63.4	66.0	56.1	62.0	61.2	3.9
VC7a (0.9m - 1.9m)	45.2	42.3	36.8	36.8	35.7	39.4	4.1
VC8a (10.9m - 11.9m)	62.3	62.0	64.2	61.6	63.8	62.8	1.1
VC11a (0.9m - 1.9m)	58.7	55.4	62.0	65.2	62.0	60.7	3.7
VC12a (0.0m - 0.9m)	41.9	35.0	37.2	40.1	38.6	38.6	2.7
VC13a (0.0m - 0.9m) + VC13a (4.9m - 5.9m)	62.0	68.5	64.5	61.2	65.6	64.4	2.9
VC14a (0.0m - 0.9m)	51.0	57.6	55.4	55.8	51.0	54.2	3.0
VC15a (10.9m - 11.9m)	62.0	60.1	66.0	62.0	62.3	62.5	2.1
Reference sediment	69.6	61.2	75.5	70.7	67.1	68.8	5.2

End of Page

Test report

Report No.: 101865N

Table 3. Summary of the normality survival of bivalve larvae in relation to the reference sediments

Sample ID	Normality survival in relation to reference site (%)	Difference between sample and reference sediment (t-test)
VC4a (0.9m - 1.9m)	88.9	NA <sup>1</sup>
VC7a (0.9m - 1.9m)	57.2	Significantly different, t critical=1.86, t stat=-9.883, p<0.05 (one tail)
VC8a (10.9m - 11.9m)	91.2	NA <sup>1</sup>
VC11a (0.9m - 1.9m)	88.1	NA <sup>1</sup>
VC12a (0.0m - 0.9m)	56.0	Significantly different, t critical=1.86, t stat=-11.557 p<0.05 (one tail)
VC13a (0.0m - 0.9m) + VC13a (4.9m - 5.9m)	93.5	NA <sup>1</sup>
VC14a (0.0m - 0.9m)	78.7	Significantly different, t critical=1.86, t stat=-5.455, p<0.05 (one tail)
VC 15a (10.9m - 11.9m)	90.8	NA <sup>1</sup>
NA <sup>1</sup> - As the average normality survival of the bivalve larvae for the test sediment was no less than 80% of that of the reference sediment, statistical analysis is not required.		

End of Page

Test report

Report No.: 101865N

6. Test validity

Table 4. Test validity criteria and water quality ranges in the bivalve test

Parameter	Minimum during the test period	Maximum during the test period	Control Limit
Overlying salinity	27 ppt	29 ppt	27-29ppt
Dissolved oxygen	6.5 mg/L	7.3 mg/L	>4.5mg/L <sup>1</sup>
Overlying pH	6.8	7.9	NA <sup>2</sup>
Temperature	19.2 °C	20.6 °C	19.0-21.0°C
Unionized ammonia in overlying water (initiation/termination)	<0.002 mg/L	0.008 mg/L	NA <sup>3</sup>
Larvae normality survival in the negative control	64.9 - 78.0% , averagely 73.4%		≥ 70% averagely
48-h EC <sub>50</sub> obtained from the reference toxicant test	1.39 mg/L		1.44 ± 0.52 mg/L
1. 60% of saturation level at 28 ppt 2. pH is not adjusted or controlled 3. Overlying ammonia is not controlled. Results could be qualified as possible false positive when ammonia (unionized) is greater than 0.13 mg/L			

As shown in Table 4, the water quality parameters during the test period ranged within control limits: temperature ranged from 19.2 to 20.6 °C, the dissolved oxygen level ranged from 6.5 to 7.3 mg/L, pH ranged from 6.8 to 7.9, the salinity ranged from 27 to 29 ppt. As a result, the data are interpretable.

The tests were validated by acceptable normality survival of control organisms. The average normality survival rate in controls was greater than 70%.

The organisms also demonstrated comparable sensitivity to the reference toxicant (cadmium). The 48-hr EC<sub>50</sub> for *Crassostrea gigas* obtained was 1.39 mgCd/L and found within the laboratory control limits (Mean±2STD, i.e., 1.44±0.52 mgCd/L). Therefore, the data are acceptable.

End of Report

Data entry checked by: Y.M. Choy  
 Y.M. Choy / W.K. Cheuk



Laboratories

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## Ancillary Tests



Laboratories

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## Interstitial Ammonia

TEST REPORT

**Report No.** : 101867N  
**Project Name** : Agreement No. CE 42/2005 (WS) Laying of Western Cross Harbour Main and Associated Land Mains From West Kowloon to Sai Ying Pun - Investigation  
**Customer Name** : Geotechnical Projects Division, Geotechnical Engineering Office, Civil Engineering and Development Department  
**Customer Address** : 8/F Civil Engineering and Development Building, 101 Princess Margaret Road, Kowloon, Hong Kong  
**Contract No.** : GE/2005/47  
**Works Order No.** : GE/2005/47.19

---

**Lab. Job No.** : J469  
**Lab. Sample Ref. No.** : 18263/1-9  
**No. of Sample(s) & Description** : 10 no. of samples stated as sediment were received on chilled condition  
 9 no. of samples were tested including  
 VC4a (10.9m - 11.9m), VC7a (0.9m - 1.9m), VC8a (10.9m - 11.9m), VC11a (0.9m - 1.9m), VC12a (0.0m - 0.9m), VC13a (0.0m - 0.9m) + VC13a (4.9m - 5.9m), VC14a (0.0m - 0.9m), VC15a (10.9m - 11.9m) & Reference Sediment  
 as per customer's instruction  
**Sample Receive Date** : 6 -22 Sept, 2006  
**Test Date** : 21-Oct-06

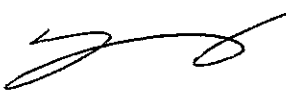
---

Test Parameter

Parameter	Test Method
Interstitial ammonia	APHA 4500-NH3 F. Phenate Method

- Note(s):
1. Results related to sample(s) as received.
  2. NA = Not applicable.
  3. This is the final report and supersedes the draft report with the same report number.

Authorized signatory: \_\_\_\_\_

  
 Yi Zhang  
 (Ecotoxicologist)

Date: \_\_\_\_\_ 22-Dec-2006

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 Tel: (852) 2897 3282 Fax: (852) 2897 5509 Email: [info@lamlab.com](mailto:info@lamlab.com)

Test report

Report no.: 101867N

Sample ID	Interstitial ammonia (mgNH <sub>3</sub> /L)
VC4a (0.9m - 1.9m)	See Note 1
VC7a (0.9m - 1.9m)	See Note 1
VC8a (10.9m - 11.9m)	21.9
VC11a (0.9m - 1.9m)	9.2
VC12a (0.0m - 0.9m)	16.4
VC13a (0.0m - 0.9m) + VC13a (4.9m - 5.9m)	14.8
VC14a (0.0m - 0.9m)	4.3
VC15a (10.9m - 11.9m)	4.1
Reference sediment	4.2
Detection limit	0.03
Note 1 - Analysis was not performed due to insufficient amount of porewater obtained.	

**Sample duplicate**

Sample ID	Relative deviation (%)
Reference Sediment	-5.3
Control limits	±20% from the mean

**Sample Spike**

Sample ID	Spike recovery (%)
Reference Sediment	-89.9
Control limits	80-120% from the nominal value

**End of Report**

Data entry checked by: W.K. Cheuk / Y.M. Choy



Laboratories

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## Interstitial Salinity



**TEST REPORT**


**Report No.** : 101868N  
**Project Name** : Agreement No. CE 42/2005 (WS) Laying of Western Cross Harbour Main and Associated Land Mains From West Kowloon to Sai Ying Pun - Investigation  
**Customer Name** : Geotechnical Projects Division, Geotechnical Engineering Office, Civil Engineering and Development Department  
**Customer Address** : 8/F Civil Engineering and Development Building, 101 Princess Margaret Road, Kowloon, Hong Kong  
**Contract No.** : GE/2005/47  
**Works Order No.** : GE/2005/47.19  
**Lab. Job No.** : J469  
**Lab. Sample Ref. No.** : 18263/1-9  
**No. of Sample(s) & Description** : 10 no. of samples stated as sediment were received on chilled condition  
9 no. of samples were tested including  
VC4a (10.9m - 11.9m), VC7a (0.9m - 1.9m), VC8a (10.9m - 11.9m),  
VC11a (0.9m - 1.9m), VC12a (0.0m - 0.9m),  
VC13a (0.0m - 0.9m) + VC13a (4.9m - 5.9m), VC14a (0.0m - 0.9m),  
VC15a (10.9m - 11.9m) & Reference Sediment  
as per customer's instruction  
**Sample Receive Date** : 6 -22 Sept, 2006  
**Test Date** : 17-Oct-06

**Test Parameter**

Parameter	Test Method
Interstitial salinity	APHA 2502 B

- Note(s):
1. Results related to sample(s) as received.
  2. NA = Not applicable.
  3. This is the final report and supersedes the draft report with the same report number.

Authorized signatory: \_\_\_\_\_



Yi Zhang

(Ecotoxicologist)

Date: 22-Dec-2006

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Test report

Report no.: 101868N

Sample ID	Interstitial salinity (ppt)
VC4a (0.9m - 1.9m)	35
VC7a (0.9m - 1.9m)	29
VC8a (10.9m - 11.9m)	34
VC11a (0.9m - 1.9m)	33
VC12a (0.0m - 0.9m)	33
VC13a (0.0m - 0.9m) + VC13a (4.9m - 5.9m)	35
VC14a (0.0m - 0.9m)	30
VC15a (10.9m - 11.9m)	31
Reference Sediment	30
Detection limit	NA

## Sample duplicate

Sample ID	Relative deviation (%)
Reference sediment	-11.2
Control limits	±20% from the mean

## Standard check

Sample ID	Recovery (%)
Reference standard	100.6
Control limits	80-120% from the nominal value

End of Report

Data entry checked by: W.K. Cheuk / Y.M. Chey  
W.K. Cheuk / Y.M. Chey



Laboratories

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**TOC, Grains Size &  
Moisture Content**

---

TEST REPORT

**Report No.** : 101869N  
**Project Name** : Agreement No. CE 42/2005 (WS) Laying of Western Cross Harbour Main and Associated Land Mains From West Kowloon to Sai Ying Pun - Investigation  
**Customer Name** : Geotechnical Projects Division, Geotechnical Engineering Office, Civil Engineering and Development Department  
**Customer Address** : 8/F Civil Engineering and Development Building, 101 Princess Margaret Road, Kowloon, Hong Kong  
**Contract No.** : GE/2005/47  
**Works Order No.** : GE/2005/47.19  


---

**Lab. Job No.** : J469  
**Lab. Sample Ref. No.** : 18263/1-9  
**No. of Sample(s) & Description** : 10 no. of samples stated as sediment were received on chilled condition  
: 9 no. of samples were tested including  
VC4a (10.9m - 11.9m), VC7a (0.9m - 1.9m), VC8a (10.9m - 11.9m),  
VC11a (0.9m - 1.9m), VC12a (0.0m - 0.9m),  
VC13a (0.0m - 0.9m) + VC13a (4.9m - 5.9m), VC14a (0.0m - 0.9m),  
VC15a (10.9m - 11.9m) & Reference Sediment  
as per customer's instruction  
**Sample Receive Date** : 6 -22 Sept, 2006  
**Test Date** : 17-Oct-06  


---

Parameter	Test Method
Grain size	Geospec 3: Test 8.1
Moisture content	Geospec 3: Test 5.2
Total Organic Carbon	ALS Method Code EP-009

- Note(s):
1. Results related to sample(s) as received.
  2. NA = Not applicable.
  3. The TOC samples were subcontracted to ALS Technichem (HK) Pty Ltd.
  4. This is the final report and supersedes the draft report with the same report number.

Authorized signatory: \_\_\_\_\_

Yi Zhang  
(Ecotoxicologist)

Date: 22-Dec-2006

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Test report

**Report No.** : 101869N  
**Project Name** : Agreement No. CE 42/2005 (WS) Laying of Western Cross Harbour Main and Associated Land Mains From West Kowloon to Sai Ying Pun - Investigation  
**Customer Name** : Geotechnical Projects Division, Geotechnical Engineering Office, Civil Engineering and Development Department  
**Contract No.** : GE/2005/47  
**Works Order No.** : GE/2005/47.19  
**Lab. Sample Ref. No.** : 18263/1-9

Sample ID	Grain Size < 63 mm (%)	Moisture Content <sup>1</sup> (%)	TOC (% Wet Weight)	TOC (% Dry Weight) <sup>2</sup>
VC4a(10.9m - 11.9m)	37	22	0.65	0.79
VC7a (0.9m - 1.9m)	44	51	0.49	0.74
VC8a (10.9m - 11.9m)	95	57	0.60	0.94
VC11a (0.9m - 1.9m)	62	53	0.66	1.01
VC12a (0.0m -0.9m)	18	40	0.40	0.56
VC13a (0.0m - 0.9m) + VC13a (4.9m - 5.9m)	40	59	0.62	0.99
VC14a (0.0m - 0.9m)	83	93	0.70	1.35
VC 15a (10.9m - 11.9m)	87	54	0.35	0.54
Reference Sediment	69	98	0.64	1.27
Detection Limit	NA	NA	0.05	0.10

Note 1. Moisture content is calculated as: (Sample Wet Weight – Sample Dry Weight) / Sample Dry Weight x 100%

End of Report

Data entry checked by: W. K. Cheuk / Y.M. Choy

**TEST REPORT ON DETERMINATION OF PARTICLE SIZE DISTRIBUTION**

Chemical and Biological Testing of Sediment(Term Contract)

Report No: 101887N

Agreement No. CE 42/2005 (WS) Laying of Western Cross Harbour Main and Associated Land Mains West Kowloon to

**Project :** Sai Ying Pung - Investigation Chemical, Elutriate and Biological Testing of Marine Sediment and Seawater Samples

**Client Name :** Geotechnical Projects Division, Geotechnical Engineering office, Civil Engineering and Development Department

**& Address :** 8/F Civil Engineering and Development Building, 101 Princess Margaret Road, Kowloon, Hong Kong

**Lab Job No :** J469

**Works Order No:** GE/2005/47.19

**Lab. Sample Ref. No:** 18263/1

**Composite**

**Sample No:**

**Depth m:** 10.90

**Specimen**

**Sample No. :** VC4a

- 11.90

**Depth m:**

**Sample Type:** Bulk

**Spec. Ref:**

**Geological Origin:** Sediment

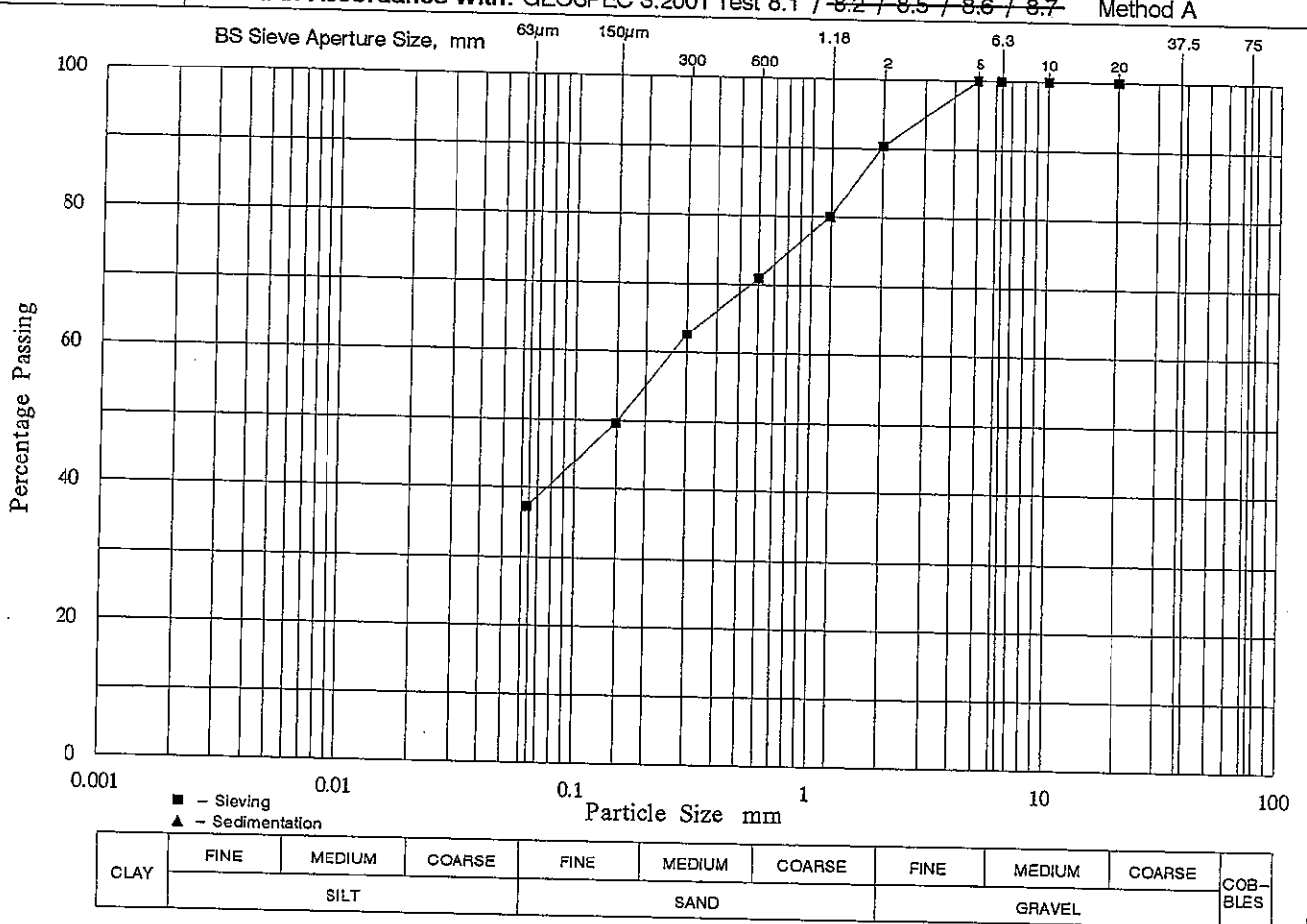
**Description :** Grey, gravelly, silty, very clayey SAND

**Date Sample:** 13/10/2006 **Date Tested:** 21/10/06

**Tested By:** H. W. Chu

**Received**

**Tested in Accordance With:** GEOSPEC 3:2001 Test 8.1 / 8.2 / 8.5 / 8.6 / 8.7 Method A



Remarks:

**SUMMARY :**

GRAVEL	10 %
SAND	53 %
SILT & CLAY	37 %

Approved Signatory:

*Lo Kam-chuen*  
Lo Kam-chuen

Date: 27-11-2006



**TEST REPORT ON DETERMINATION OF PARTICLE SIZE DISTRIBUTION**

Chemical and Biological Testing of Sediment(Term Contract)

Report No: 101888N

Agreement No. CE 42/2005 (WS) Laying of Western Cross Harbour Main and Associated Land Mains West Kowloon to

**Project :** Sai Ying Pung –Investigation Chemical, Elutriate and Biological Testing of Marine Sediment and Seawater Samples

**Client Name :** Geotechnical Projects Division, Geotechnical Engineering office, Civil Engineering and Development Department

**& Address :** 8/F Civil Engineering and Development Building, 101 Princess Margaret Road, Kowloon, Hong Kong

**Lab Job No :** J469

**Works Order No:** GE/2005/47.19

**Lab. Sample Ref. No:** 18263/2

**Composite**

**Sample No:**

**Depth m:** 0.90

**Specimen**

**Sample No. :** VC7a

- 1.90

**Depth m:**

**Sample Type:** Bulk

**Spec. Ref:**

**Geological Origin:** Sediment

**Description :** Grey, sandy CLAY with some shell fragments

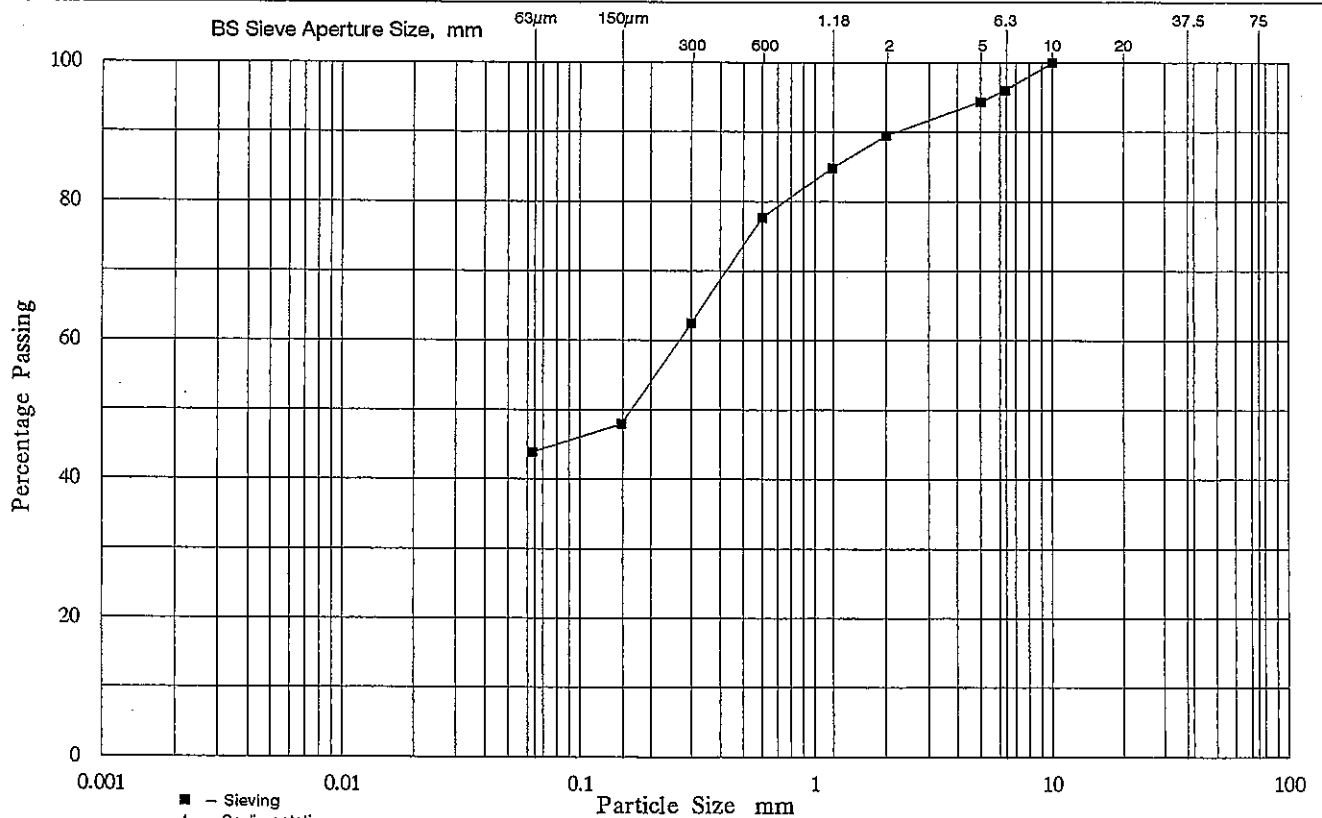
**Date Sample:** 13/10/2006

**Date Tested:** 21/10/2006

**Tested By:** H. W. Chu

**Received**

**Tested in Accordance With:** GEOSPEC 3:2001 Test 8.1 / ~~8.2 / 8.5 / 8.6 / 8.7~~ Method A



CLAY	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	COB- BLES
	SILT			SAND			GRAVEL			

Remarks:

**SUMMARY :**

GRAVEL	11 %
SAND	45 %
SILT &	44 %
CLAY	

Approved Signatory:

*Lo Kam-chuen*  
Lo Kam-chuen

Date: 27-11-2006





**TEST REPORT ON DETERMINATION OF PARTICLE SIZE DISTRIBUTION**

Chemical and Biological Testing of Sediment(Term Contract)

Report No: 101889N

Agreement No. CE 42/2005 (WS) Laying of Western Cross Harbour Main and Associated Land Mains West Kowloon to

**Project :** Sai Ying Pung –Investigation Chemical, Elutriate and Biological Testing of Marine Sediment and Seawater Samples

**Client Name :** Geotechnical Projects Division, Geotechnical Engineering office, Civil Engineering and Development Department

**& Address :** 8/F Civil Engineering and Development Building, 101 Princess Margaret Road, Kowloon, Hong Kong

**Lab Job No :** J469

**Works Order No:** GE/2005/47.19

**Lab. Sample Ref. No:** 18263/3

**Composite Sample No. :** VC8a

**Sample No:**

**Depth m:** 10.90

**Specimen**

– 11.90

**Depth m:**

**Sample Type:** Bulk

**Spec. Ref:**

**Geological Origin:** Sediment

**Description :** Grey, slightly sandy CLAY

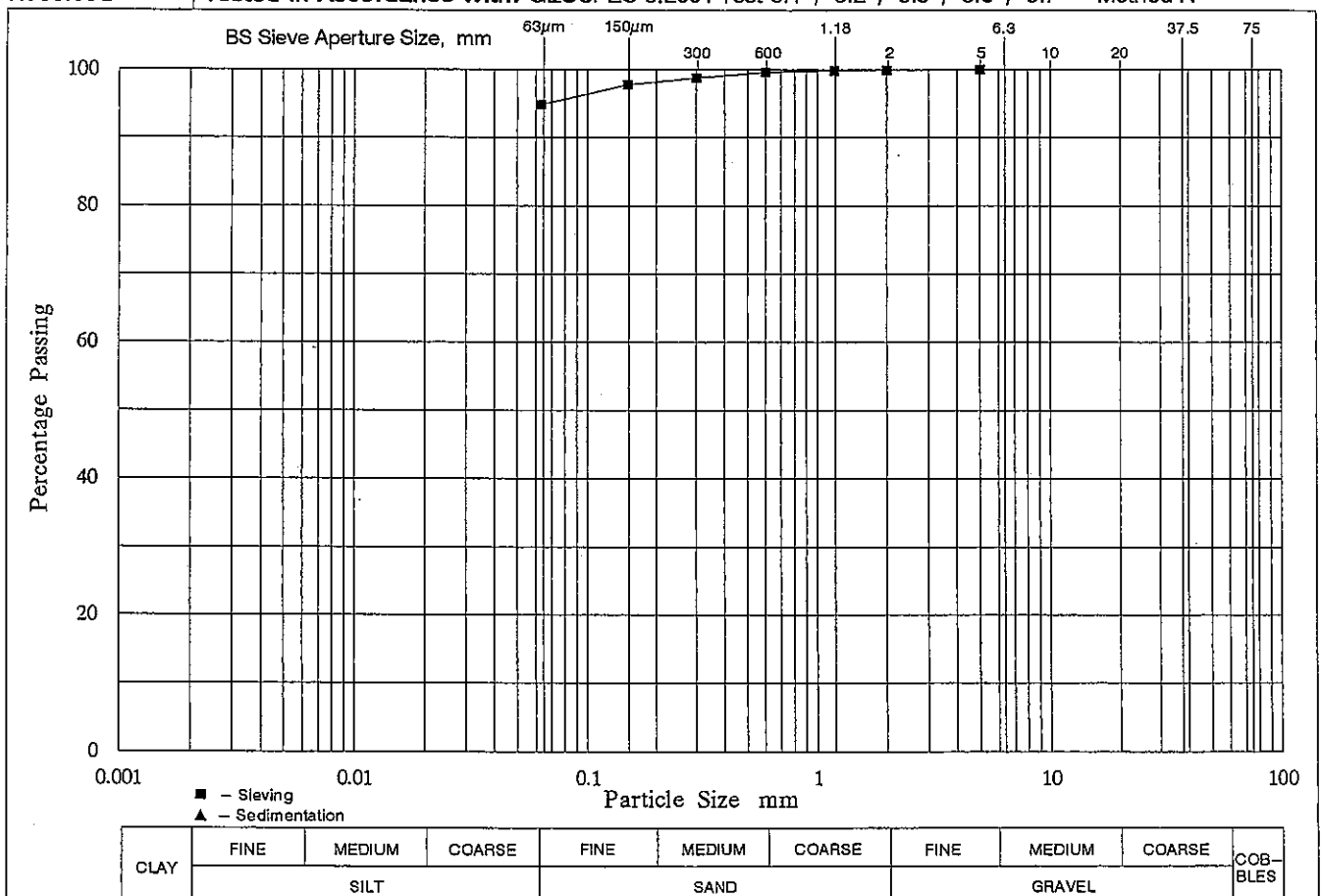
**Date Sample:** 13/10/2006

**Date Tested:** 21/10/2006

**Tested By:** H. W. Chu

**Received**

**Tested in Accordance With:** GEOSPEC 3:2001 Test 8.1 / ~~8.2~~ / ~~8.5~~ / ~~8.6~~ / ~~8.7~~ Method A



Remarks:

<b>SUMMARY :</b>	GRAVEL	0 %	Approved Signatory: <i>Lo Kam Chuen</i> Lo Kam-chuen
	SAND	5 %	
	SILT &	95 %	Date: 27-11-2006
	CLAY		

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**TEST REPORT ON DETERMINATION OF PARTICLE SIZE DISTRIBUTION**

(Page 2 of 2)

Chemical and Biological Testing of Sediment(Term Contract)

Report No: 101889N

Agreement No. CE 42/2005 (WS) Laying of Western Cross Harbour Main and Associated Land Mains West Kowloon to

**Project** : Sai Ying Pung – Investigation Chemical, Elutriate and Biological Testing of Marine Sediment and Seawater Samples

**Customer** : Geotechnical Projects Division, Geotechnical Engineering office, Civil Engineering and Development Department

**& Address** : 8/F Civil Engineering and Development Building, 101 Princess Margaret Road, Kowloon, Hong Kong

**Lab Job No** : J469 **Works Order No:** GE/2005/47.19 **Lab. Sample Ref. No:** 18263/3

**Composite Sample No. :** VC8a **Sample No:** **Depth m:** 10.90 **Specimen**  
- 11.90 **Depth m:**

**Sample Type:** Bulk **Spec. Ref:** **Geological Origin:** Sediment

**Description** : Grey, slightly sandy CLAY

**Date Sample:** 13/10/2006 **Date Tested:** 21/10/2006 **Tested By:** H. W. Chu

**Received** **Tested in Accordance With:** GEOSPEC 3:2001 Test 8.1 / ~~8.2~~ / ~~8.5~~ / ~~8.6~~ / ~~8.7~~ **Method A**

SIEVE ANALYSIS				
Initial Dry Mass of Soil m1		g: 102.85		
BS Test Sieve mm	Mass Retained g	Corr. Mass Retained g	Percent Retained %	Percent Passing %
75.0			0.0	100.0
37.5			0.0	100.0
20.0			0.0	100.0
Passing m2	20.0	102.85	cum. mass ret. + m2 = 102.85	
Riffled m3	20.0	102.85	difference from m1 % = 0.00	
Washed m4	5.37	Note: m4 = mass >63um		
10.0		0.00	0.0	100.0
6.3		0.00	0.0	100.0
Passing m5	6.3	5.37	cum. mass ret. + m5 = 5.37	
Riffled m6	6.3	5.37	difference from m4 % = 0.00	
5.00		0.00	0.0	100.0
2.00	0.07	0.07	0.1	99.9
1.18	0.09	0.09	0.1	99.8
0.600	0.27	0.27	0.3	99.6
0.300	0.82	0.82	0.8	98.8
0.150	0.99	0.99	1.0	97.8
0.063	3.10	3.10	3.0	94.8
Pan mE	0.01			
			cum. mass ret. + mE = 5.35	
			difference from m6 % = 0.37	

Approved Signatory: *Lo Kam-chuen*  
Lo Kam-chuen

Date: 27-11-2006

**TEST REPORT ON DETERMINATION OF PARTICLE SIZE DISTRIBUTION**

Chemical and Biological Testing of Sediment(Term Contract)

Report No: 101891N

Agreement No. CE 42/2005 (WS) Laying of Western Cross Harbour Main and Associated Land Mains West Kowloon to

**Project :** Sai Ying Pung – Investigation Chemical, Elutriate and Biological Testing of Marine Sediment and Seawater Samples

**Client Name :** Geotechnical Projects Division, Geotechnical Engineering office, Civil Engineering and Development Department

**& Address :** 8/F Civil Engineering and Development Building, 101 Princess Margaret Road, Kowloon, Hong Kong

**Lab Job No :** J469

**Works Order No:** GE/2005/47.19

**Lab. Sample Ref. No:** 18263/4

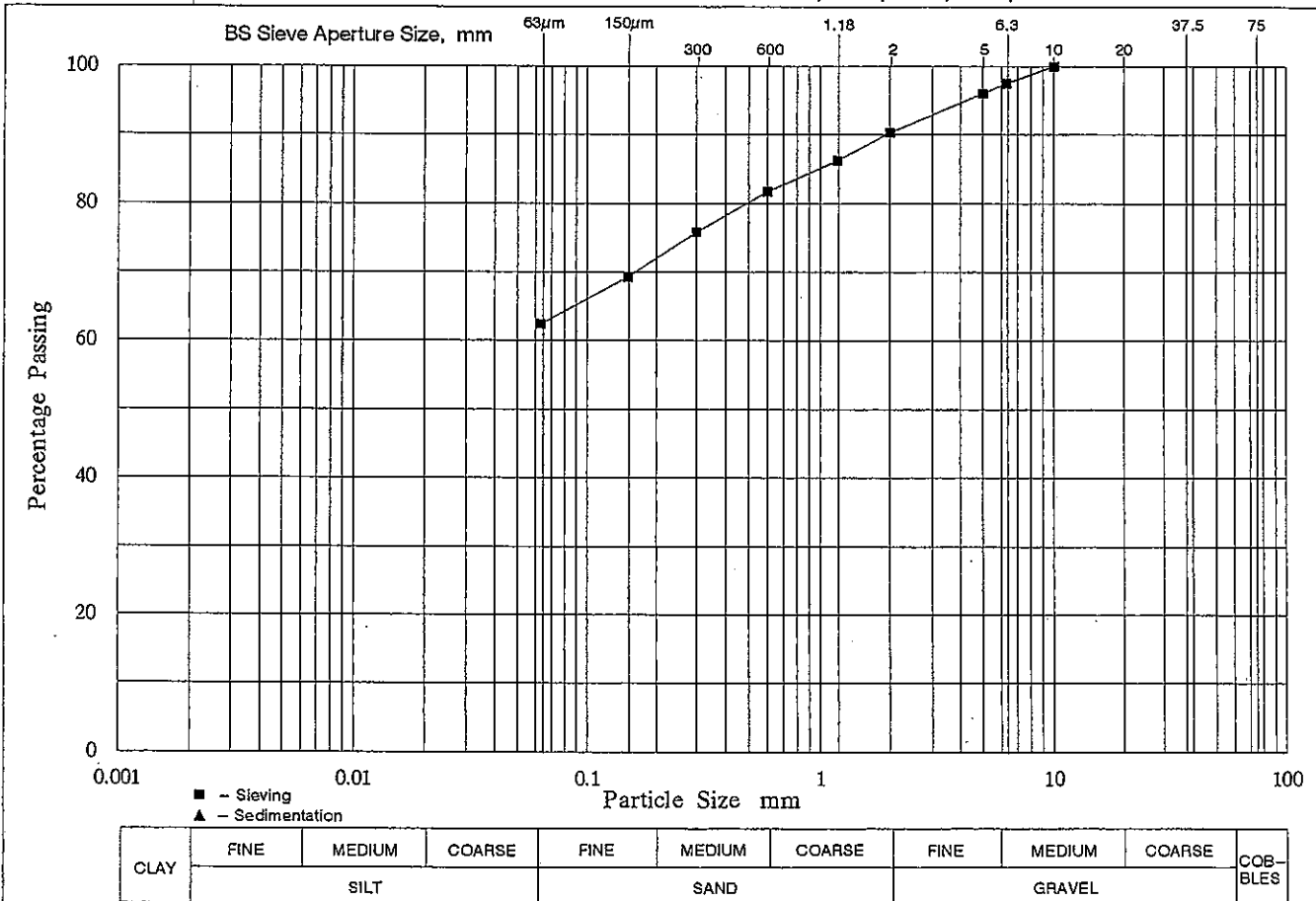
**Composite Sample No. :** VC11a **Sample No:** **Depth m:** 0.90 **Specimen Depth m:** - 1.90

**Sample Type:** Bulk **Spec. Ref:** **Geological Origin:** Sediment

**Description :** Grey, slightly gravelly, slightly sandy CLAY with occasional shell fragments

**Date Sample:** 13/10/2006 **Date Tested:** 21/10/2006 **Tested By:** H. W. Chu

**Received** **Tested in Accordance With:** GEOSPEC 3:2001 Test 8.1 / 8.2 / 8.5 / 8.6 / 8.7 **Method A**



Remarks:

<b>SUMMARY :</b>	GRAVEL	10 %	Approved Signatory: <i>Lo Kam-chuen</i> Lo Kam-chuen Date: 27-11-2006
	SAND	28 %	
	SILT &	62 %	
	CLAY		

Lam Laboratories Limited Rm 1412, Honour Industrial Centre, 6 Sun Yip Street, Chaiwan, Hong Kong Tel: 28973282







**TEST REPORT ON DETERMINATION OF PARTICLE SIZE DISTRIBUTION**

Chemical and Biological Testing of Sediment(Term Contract)

Report No: 101893N

Agreement No. CE 42/2005 (WS) Laying of Western Cross Harbour Main and Associated Land Mains West Kowloon to

**Project** : Sai Ying Pung – Investigation Chemical, Elutriate and Biological Testing of Marine Sediment and Seawater Samples

**Client Name** : Geotechnical Projects Division, Geotechnical Engineering office, Civil Engineering and Development Department

**& Address** : 8/F Civil Engineering and Development Building, 101 Princess Margaret Road, Kowloon, Hong Kong

**Lab Job No** : J469

**Works Order No**: GE/2005/47.19

**Lab. Sample Ref. No**: 18263/6

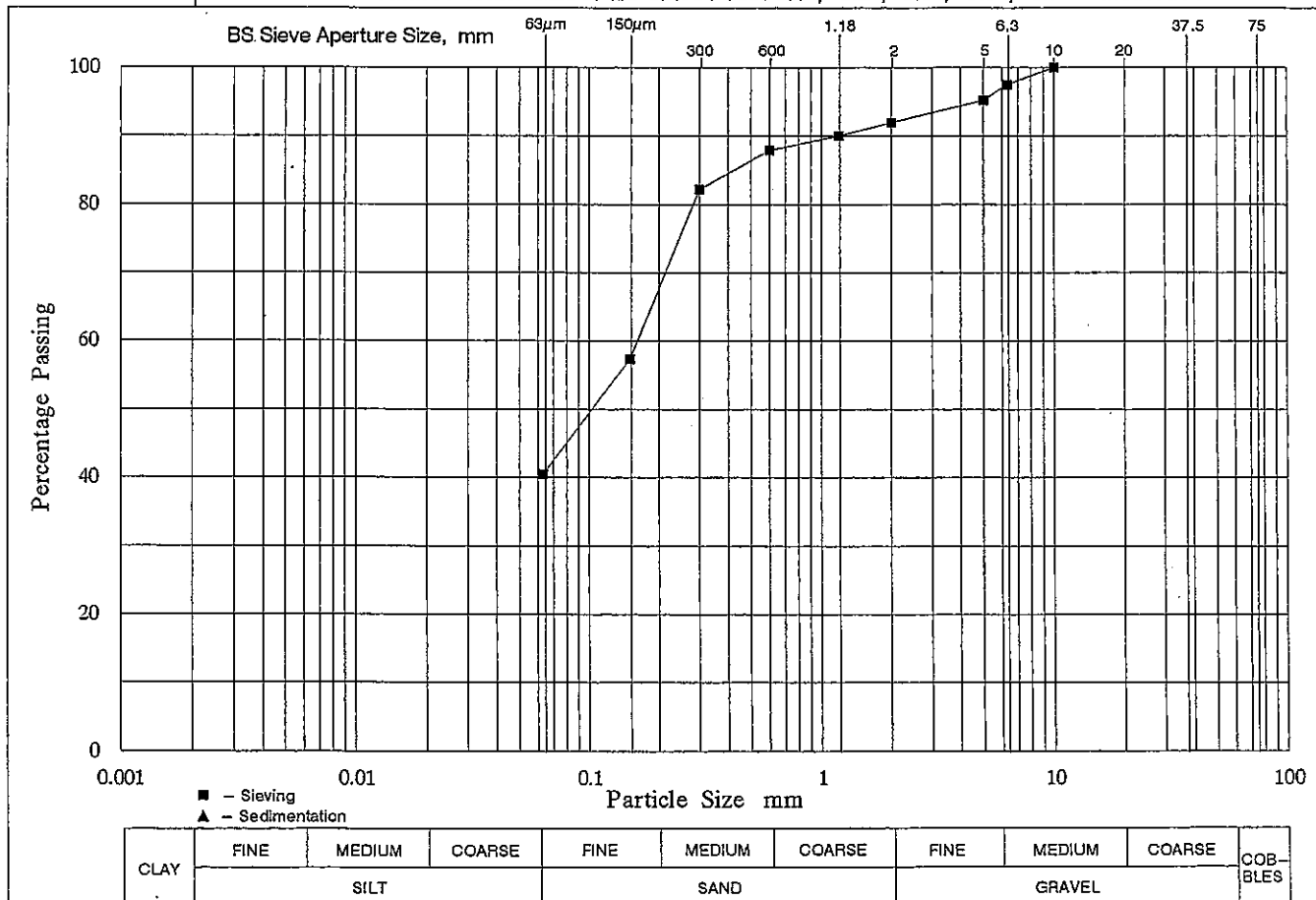
**Composite Sample No.** : VC13a **Sample No:** **Depth m:** 0.00 & 4.90 **Specimen**  
 - 0.90 5.90 **Depth m:**

**Sample Type:** Bulk **Spec. Ref:** **Geological Origin:** Sediment

**Description** : Dark grey, slightly gravelly, silty, very clayey SAND with occasional shell fragments

**Date Sample:** 13/10/2006 **Date Tested:** 21/10/2006 **Tested By:** H. W. Chu

**Received** **Tested in Accordance With:** GEOSPEC 3:2001 Test 8.1 / 8.2 / 8.5 / 8.6 / 8.7 **Method A**



Remarks:

**SUMMARY :**  
 GRAVEL 8 %  
 SAND 52 %  
 SILT & CLAY 40 %

Approved Signatory: *Lo Kam-chuen*  
 Lo Kam-chuen  
 Date: 27-11-2006



**TEST REPORT ON DETERMINATION OF PARTICLE SIZE DISTRIBUTION**

(Page 2 of 2)

Report No: 101893N

Chemical and Biological Testing of Sediment(Term Contract)

Agreement No. CE 42/2005 (WS) Laying of Western Cross Harbour Main and Associated Land Mains West Kowloon to

**Project** : Sai Ying Pung – Investigation Chemical, Elutriate and Biological Testing of Marine Sediment and Seawater Samples

**Customer** : Geotechnical Projects Division, Geotechnical Engineering office, Civil Engineering and Development Department

**& Address** : 8/F Civil Engineering and Development Building, 101 Princess Margaret Road, Kowloon, Hong Kong

**Lab Job No** : J469 **Works Order No**: GE/2005/47.19 **Lab. Sample Ref. No**: 18263/6

**Composite Sample No.** : VC13a **Sample No**: **Depth m**: 0.00 & 4.90 **Specimen**  
- 0.90 5.90 **Depth m**:

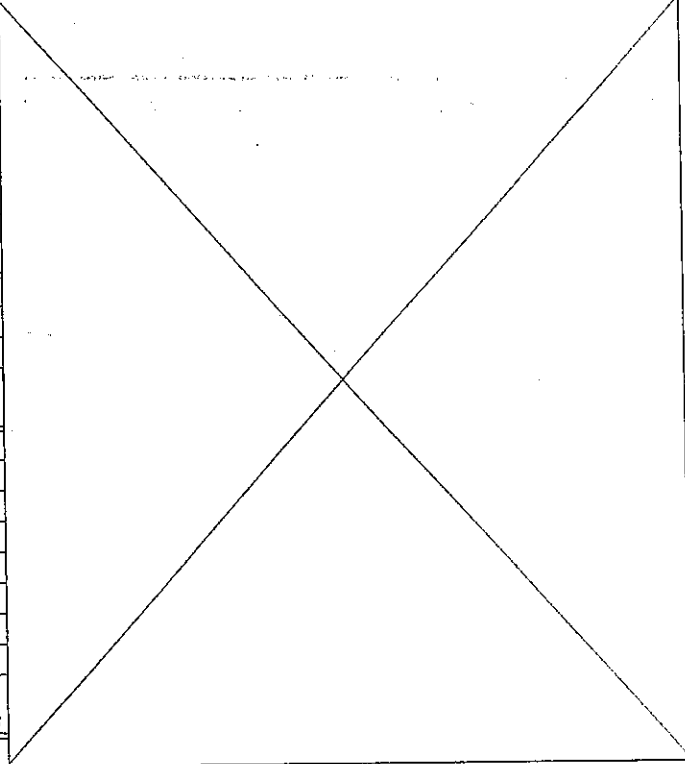
**Sample Type**: Bulk **Spec. Ref**: **Geological Origin**: Sediment

**Description** : Dark grey, slightly gravelly, silty, very clayey SAND with occasional shell fragments

**Date Sample**: 19/10/2006 **Date Tested**: 21/10/2006 **Tested By**: H. W. Chu

**Received** **Tested in Accordance With**: GEOSPEC 3:2001 Test 8.1 / ~~8.2~~ / ~~8.5~~ / ~~8.6~~ / ~~8.7~~ **Method A**

SIEVE ANALYSIS				
Initial Dry Mass of Soil m1		g: 107.02		
BS Test Sieve mm	Mass Retained g	Corr. Mass Retained g	Percent Retained %	Percent Passing %
75.0			0.0	100.0
37.5			0.0	100.0
20.0			0.0	100.0
Passing m2	20.0	107.02	cum. mass ret. + m2 = 107.02	
Riffled m3	20.0	107.02	difference from m1 % = 0.00	
Washed m4		63.76	Note: m4 = mass >63um	
10.0		0.00	0.0	100.0
6.3	2.63	2.63	2.5	97.5
Passing m5	6.3	61.13	cum. mass ret. + m5 = 63.76	
Riffled m6	6.3	61.13	difference from m4 % = 0.00	
5.00	2.47	2.47	2.3	95.2
2.00	3.53	3.53	3.3	91.9
1.18	2.08	2.08	1.9	90.0
0.600	2.28	2.28	2.1	87.9
0.300	6.11	6.11	5.7	82.2
0.150	26.55	26.55	24.8	57.3
0.063	17.98	17.98	16.8	40.5
Pan mE	0.04			
			cum. mass ret. + mE = 61.04	
			difference from m6 % = 0.15	




Approved Signatory: *Lo Kam-chuen*  
Lo Kam-chuen

Date: 27-11-2006

**TEST REPORT ON DETERMINATION OF PARTICLE SIZE DISTRIBUTION**

Chemical and Biological Testing of Sediment(Term Contract)

Report No: 101894N

Agreement No. CE 42/2005 (WS) Laying of Western Cross Harbour Main and Associated Land Mains West Kowloon to

**Project :** Sai Ying Pung – Investigation Chemical, Elutriate and Biological Testing of Marine Sediment and Seawater Samples

**Client Name :** Geotechnical Projects Division, Geotechnical Engineering office, Civil Engineering and Development Department

**& Address :** 8/F Civil Engineering and Development Building, 101 Princess Margaret Road, Kowloon, Hong Kong

**Lab Job No :** J469

**Works Order No:** GE/2005/47.19

**Lab. Sample Ref. No:** 18263/7

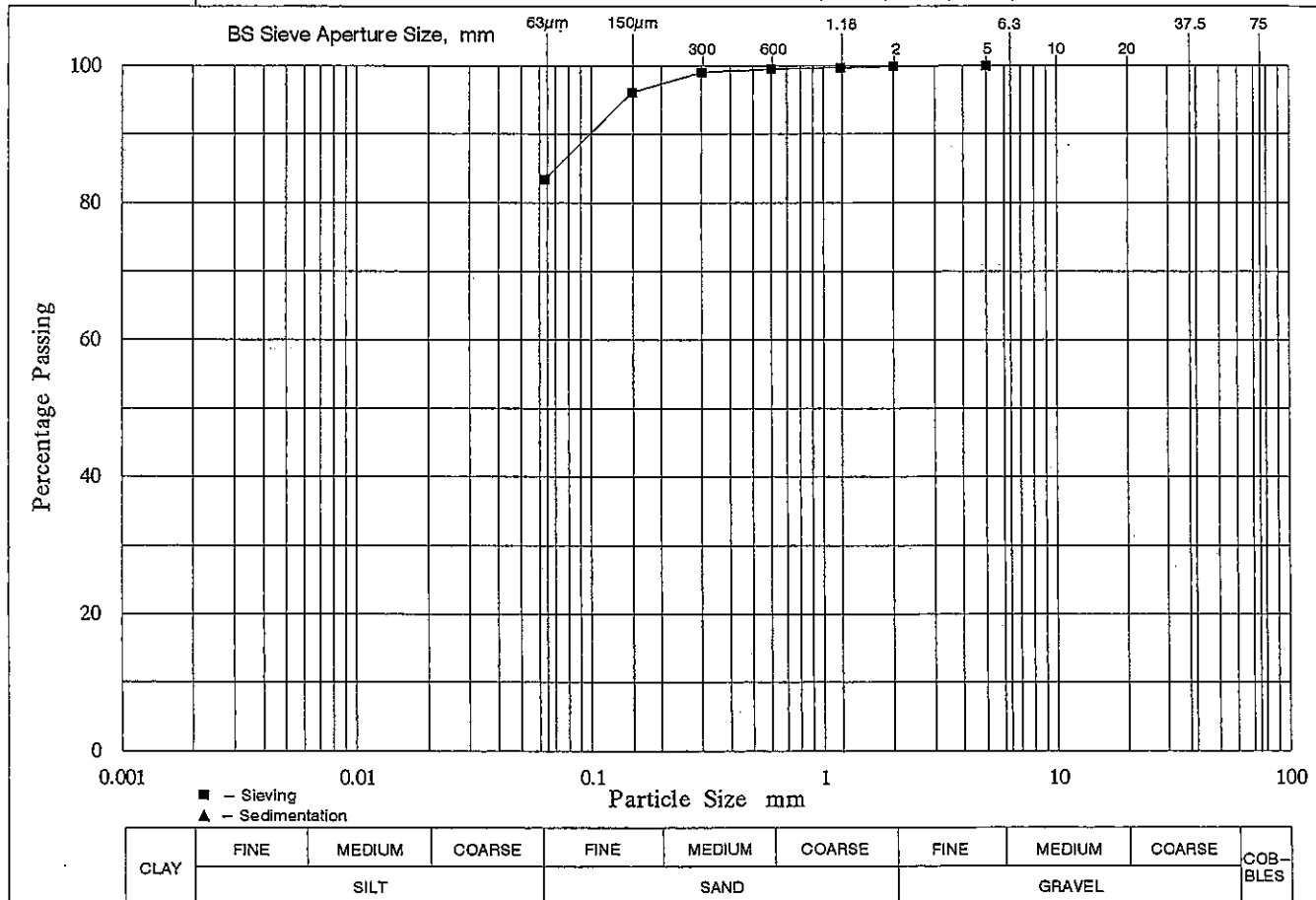
**Composite Sample No. :** VC14a **Sample No:** **Depth m:** 0.00 **Specimen**  
**Sample No. :** **Depth m:** - 0.90

**Sample Type:** Bulk **Spec. Ref:** **Geological Origin:** Sediment

**Description :** Grey, slightly sandy CLAY

**Date Sample:** 13/10/2006 **Date Tested:** 21/10/2006 **Tested By:** H. W. Chu

**Received** **Tested in Accordance With:** GEOSPEC 3:2001 Test 8.1 / ~~8.2~~ / ~~8.5~~ / ~~8.6~~ / ~~8.7~~ **Method A**



Remarks:

<b>SUMMARY :</b>	GRAVEL	0 %	Approved Signatory: <i>Lo Kam-chuen</i> Lo Kam-chuen Date: 27-11-2006
	SAND	17 %	
	SILT &	83 %	
	CLAY		

Lam Laboratories Limited Rm 1412, Honour Industrial Centre, 6 Sun Yip Street, Chaiwan, Hong Kong Tel: 28973282



**TEST REPORT ON DETERMINATION OF PARTICLE SIZE DISTRIBUTION**

Chemical and Biological Testing of Sediment(Term Contract)

Report No: 101890N

Agreement No. CE 42/2005 (WS) Laying of Western Cross Harbour Main and Associated Land Mains West Kowloon to

**Project :** Sai Ying Pung –Investigation Chemical, Elutriate and Biological Testing of Marine Sediment and Seawater Samples

**Client Name :** Geotechnical Projects Division, Geotechnical Engineering office, Civil Engineering and Development Department

**& Address :** 8/F Civil Engineering and Development Building, 101 Princess Margaret Road, Kowloon, Hong Kong

**Lab Job No :** J469

**Works Order No:** GE/2005/47.19

**Lab. Sample Ref. No:** 18263/8

**Composite**

**Sample No:**

**Depth m:** 10.90

**Specimen**

**Sample No. :** VC15a

- 11.90

**Depth m:**

**Sample Type:** Bulk

**Spec. Ref:**

**Geological Origin:** Sediment

**Description :** Grey, slightly sandy CLAY

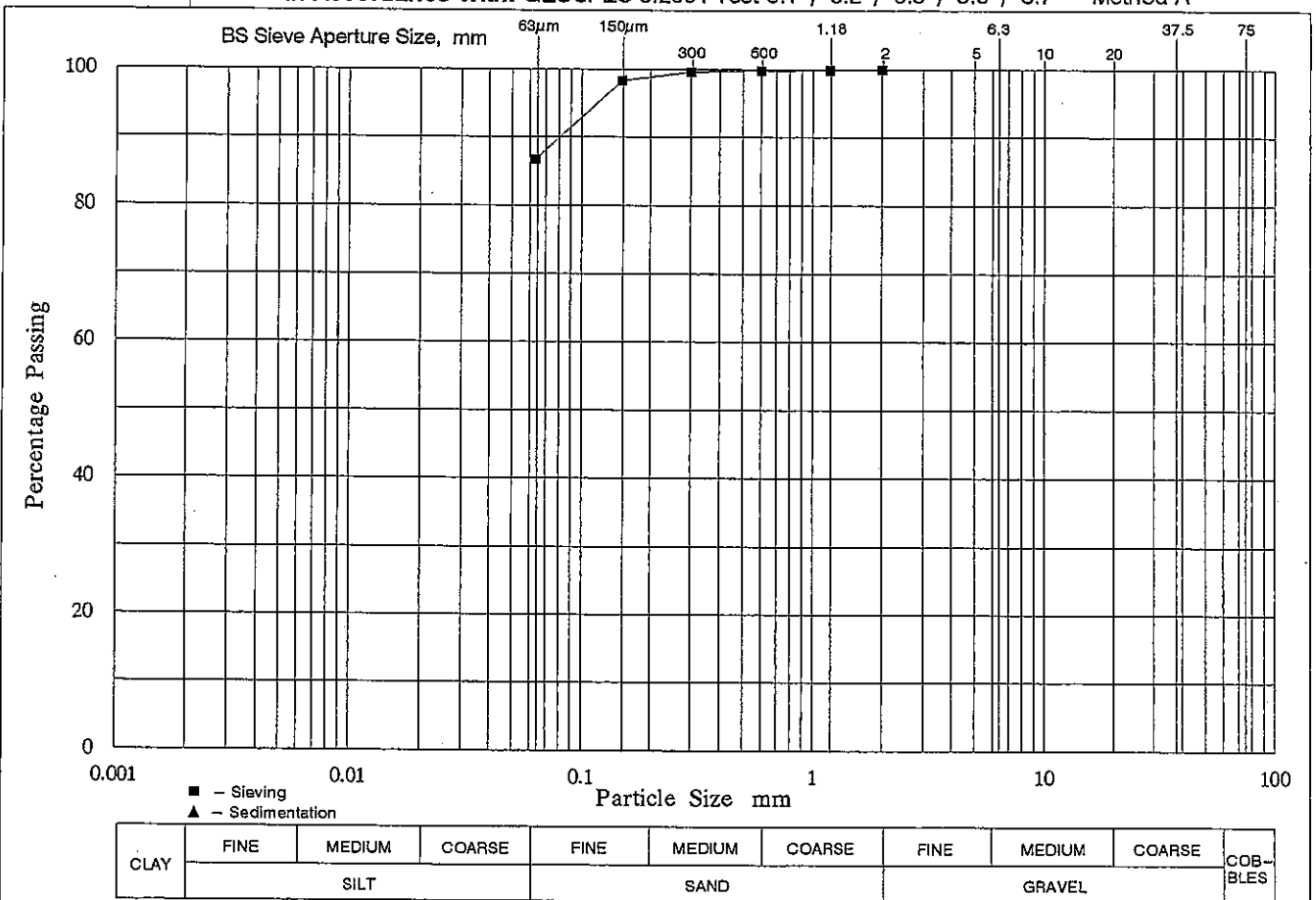
**Date Sample:** 13/10/2006

**Date Tested:** 21/10/2006

**Tested By:** H. W. Chu

**Received**

**Tested in Accordance With:** GEOSPEC 3:2001 Test 8.1 / ~~8.2~~ / ~~8.5~~ / ~~8.6~~ / ~~8.7~~ Method A



**Remarks:**

**SUMMARY :**

GRAVEL	0 %
SAND	13 %
SILT & CLAY	87 %

Approved Signatory:

*Lo Kam-chuen*  
Lo Kam-chuen

Date: 27-11-2006

**TEST REPORT ON DETERMINATION OF PARTICLE SIZE DISTRIBUTION**

(Page 2 of 2)

Chemical and Biological Testing of Sediment(Term Contract)

Report No: 101890N

Agreement No. CE 42/2005 (WS) Laying of Western Cross Harbour Main and Associated Land Mains West Kowloon to

**Project** : Sai Ying Pung –Investigation Chemical, Elutriate and Biological Testing of Marine Sediment and Seawater Samples

**Customer** : Geotechnical Projects Division, Geotechnical Engineering office, Civil Engineering and Development Department

**& Address** : 8/F Civil Engineering and Development Building, 101 Princess Margaret Road, Kowloon, Hong Kong

**Lab Job No** : J469 **Works Order No:** GE/2005/47.19 **Lab. Sample Ref. No:** 18263/8

**Composite Sample No. :** VC15a **Sample No:** **Depth m:** 10.90 **Specimen**  
- 11.90 **Depth m:**

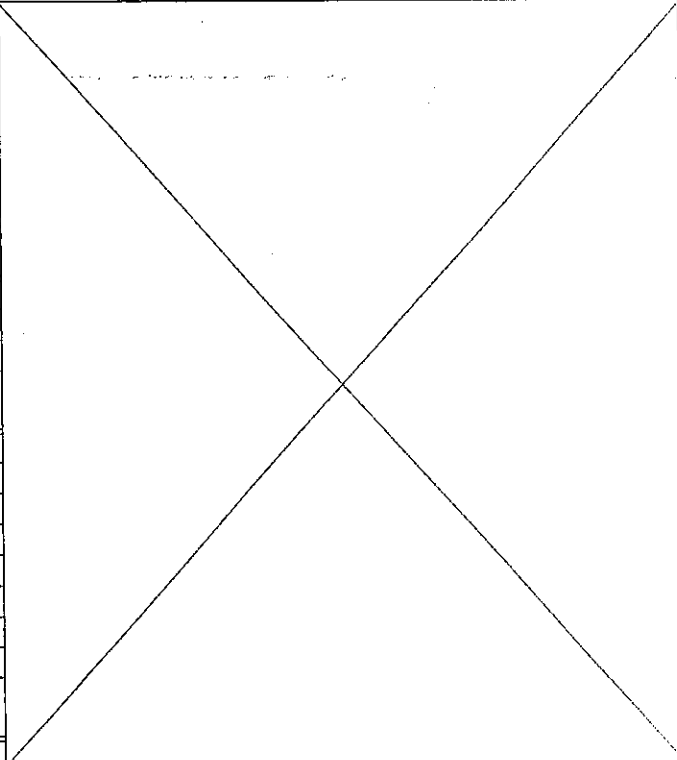
**Sample Type:** Bulk **Spec. Ref:** **Geological Origin:** Sediment

**Description :** Grey, slightly sandy CLAY

**Date Sample:** 13/10/2006 **Date Tested:** 21/10/2006 **Tested By:** H. W. Chu

**Received** **Tested in Accordance With:** GEOSPEC 3:2001 Test 8.1 / 8.2 / 8.5 / 8.6 / 8.7 **Method A**

SIEVE ANALYSIS				
Initial Dry Mass of Soil m1		g: 100.64		
BS Test Sieve mm	Mass Retained g	Corr. Mass Retained g	Percent Retained %	Percent Passing %
75.0			0.0	100.0
37.5			0.0	100.0
20.0			0.0	100.0
Passing m2	20.0	100.64	cum. mass ret. + m2 = 100.64	
Riffled m3	20.0	100.64	difference from m1 % = 0.00	
Washed m4		13.48 Note: m4 = mass >63um		
10.0		0.00	0.0	100.0
6.3		0.00	0.0	100.0
Passing m5	6.3	13.48	cum. mass ret. + m5 = 13.48	
Riffled m6	6.3	13.48	difference from m4 % = 0.00	
5.00		0.00	0.0	100.0
2.00		0.00	0.0	100.0
1.18	0.07	0.07	0.1	99.9
0.600	0.09	0.09	0.1	99.8
0.300	0.20	0.20	0.2	99.6
0.150	1.29	1.29	1.3	98.4
0.063	11.64	11.64	11.6	86.7
Pan mE	0.10			
			cum. mass ret. + mE = 13.39	
			difference from m6 % = 0.67	




Approved Signatory: *Lo Kam-chuen*  
Lo Kam-chuen

Date: 27-11-2006

**TEST REPORT ON DETERMINATION OF PARTICLE SIZE DISTRIBUTION**

Chemical and Biological Testing of Sediment(Term Contract)

Report No: 101895N

Agreement No. CE 42/2005 (WS) Laying of Western Cross Harbour Main and Associated Land Mains West Kowloon to

**Project :** Sai Ying Pung - Investigation Chemical, Elutriate and Biological Testing of Marine Sediment and Seawater Samples

**Client Name :** Geotechnical Projects Division, Geotechnical Engineering office, Civil Engineering and Development Department

**& Address :** 8/F Civil Engineering and Development Building, 101 Princess Margaret Road, Kowloon, Hong Kong

**Lab Job No :** J469

**Works Order No:** GE/2005/47.19

**Lab. Sample Ref. No:** 18263/9

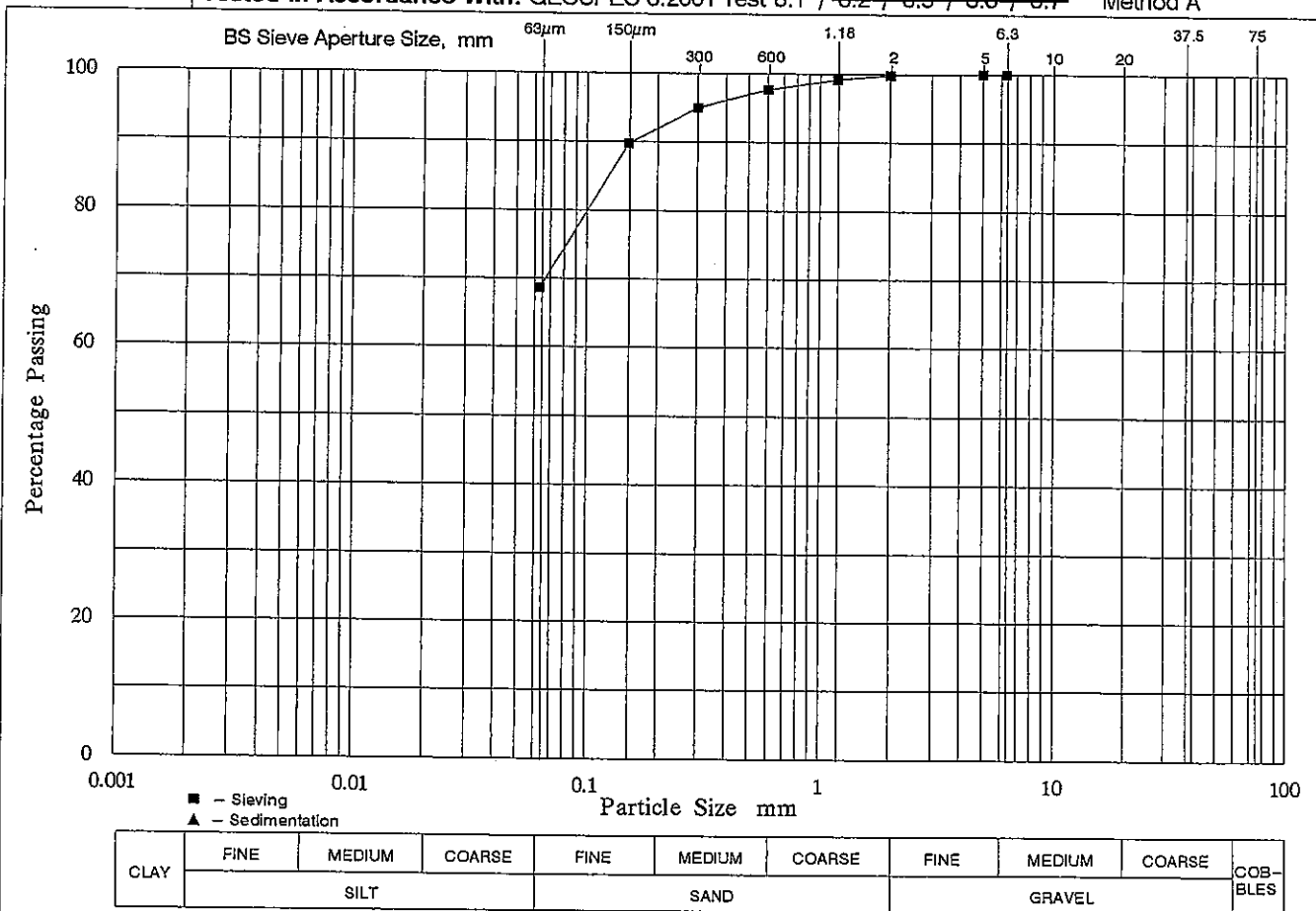
**Composite Sample No. :** Reference Sediment **Sample No:** **Depth m:** **Specimen Depth m:**

**Sample Type:** Bulk **Spec. Ref:** **Geological Origin:** Sediment

**Description :** Grey, slightly sandy CLAY with occasional shell fragments

**Date Sample:** 13/10/2006 **Date Tested:** 21/10/2006 **Tested By:** H. W. Chu

**Received** **Tested in Accordance With:** GEOSPEC 3:2001 Test 8.1 / 8.2 / 8.5 / 8.6 / 8.7 **Method A**



Remarks:

**SUMMARY :**  
 GRAVEL 0 %  
 SAND 31 %  
 SILT & CLAY 69 %

Approved Signatory: *Lo Kam-chuen*  
 Lo Kam-chuen  
 Date: 27-11-2006

**TEST REPORT ON DETERMINATION  
OF PARTICLE SIZE DISTRIBUTION**

Chemical and Biological Testing of Sediment(Term Contract)

Report No: 101895N

Agreement No. CE 42/2005 (WS) Laying of Western Cross Harbour Main and Associated Land Mains West Kowloon to

**Project :** Sai Ying Pung – Investigation Chemical, Elutriate and Biological Testing of Marine Sediment and Seawater Samples

**Customer :** Geotechnical Projects Division, Geotechnical Engineering office, Civil Engineering and Development Department

**& Address :** 8/F Civil Engineering and Development Building, 101 Princess Margaret Road, Kowloon, Hong Kong

**Lab Job No :** J469

**Works Order No:** GE/2005/47.19

**Lab. Sample Ref. No:** 18263/9

**Composite Sample No. :** Reference Sediment      **Sample No:**      **Depth m:**      **Specimen Depth m:**

**Sample Type:** Bulk      **Spec. Ref:**      **Geological Origin:** Sediment

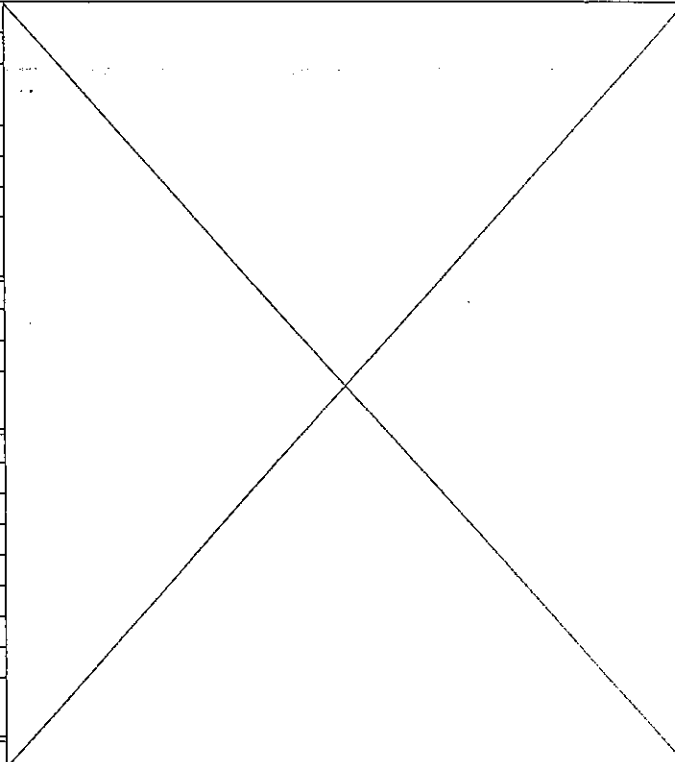
**Description :** Grey, slightly sandy CLAY with occasional shell fragments

**Date Sample:** 13/10/2006      **Date Tested:** 21/10/2006      **Tested By:** H. W. Chu

**Received**      **Tested in Accordance With:** GEOSPEC 3:2001 Test 8.1 / 8.2 / 8.5 / 8.6 / 8.7      **Method A**

**SIEVE ANALYSIS**

Initial Dry Mass of Soil m1 g: 104.98				
BS Test Sieve mm	Mass Retained g	Corr. Mass Retained g	Percent Retained %	Percent Passing %
75.0			0.0	100.0
37.5			0.0	100.0
20.0			0.0	100.0
Passing m2 20.0	104.98	cum. mass ret. + m2 =		104.98
Riffled m3 20.0	104.98	difference from m1 % =		0.00
Washed m4	33.01	Note: m4 = mass >63um		
10.0		0.00	0.0	100.0
6.3		0.00	0.0	100.0
Passing m5 6.3	33.01	cum. mass ret. + m5 =		33.01
Riffled m6 6.3	33.01	difference from m4 % =		0.00
5.00	0.02	0.02	0.0	100.0
2.00	0.22	0.22	0.2	99.8
1.18	0.62	0.62	0.6	99.2
0.600	1.53	1.53	1.5	97.7
0.300	2.82	2.82	2.7	95.0
0.150	5.60	5.60	5.3	89.7
0.063	22.12	22.12	21.1	68.6
Pan mE	0.03			
cum. mass ret. + mE =				32.96
difference from m6 % =				0.15



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Approved Signatory: *Lo Kam-chuen*  
Lo Kam-chuen

Date: 27-11-2006

# TEST REPORT ON DETERMINATION OF MOISTURE CONTENT

(By oven drying at 105°C ± 5°C)

Report No: 101896N

Chemical and Biological Testing of Sediment(Term Contract)

Agreement No. CE 42/2005 (WS) Laying of Western Cross Harbour Main and Associated Land Mains West Kowloon to

**Project** : Sai Ying Pung – Investigation Chemical, Elutriate and Biological Testing of Marine Sediment and Seawater Samples

**Customer** : Geotechnical Projects Division, Geotechnical Engineering office, Civil Engineering and Development Department

**& Address** : 8/F Civil Engineering and Development Building, 101 Princess Margaret Road, Kowloon, Hong Kong

**Lab Job No** : J469

**Works Order No** : GE/2005/47.19

**Date Samples Received** : 13/10/2006

**Tested in Accordance With** : GEOSPEC 3: 2001 Test 5.2

Composite Sample No.	Sample			Lab. Sample Ref. No.	Date Tested	Tested By	Description	Geological Origin	Moisture Content %
	No.	Depth m	Type						
VC4a		10.90–11.90	Bulk	18263/1	13/10/06	HWC	Grey, gravelly, silty, very clayey SAND	Sediment	22
VC7a		0.90–1.90	Bulk	18263/2	13/10/06	HWC	Grey, sandy CLAY with some shell fragments	Sediment	51
VC8a		10.90–11.90	Bulk	18263/3	13/10/06	HWC	Grey, slightly sandy CLAY	Sediment	57
VC11a		0.90–1.90	Bulk	18263/4	13/10/06	HWC	Grey, slightly gravelly, slightly sandy CLAY with occasional shell fragments	Sediment	53
VC12a		0.00–0.90	Bulk	18263/5	13/10/06	HWC	Black, grey, clayey, gravelly SAND with some shell fragments	Sediment	40
VC13a		0.00–0.90 & 4.90–5.90	Bulk	18263/6	13/10/06	HWC	Dark grey, slightly gravelly, silty, very clayey SAND with occasional shell fragments	Sediment	59
VC14a		0.00–0.90	Bulk	18263/7	13/10/06	HWC	Grey, slightly sandy CLAY	Sediment	93
VC15a		10.90–11.90	Bulk	18263/8	13/10/06	HWC	Grey, slightly sandy CLAY	Sediment	54

Remarks:

Approved Signatory:

*Lo Kam chuen*  
Lo Kam-chuen

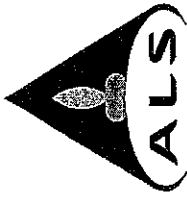
Date: 27-11-2006

Lam Laboratories Limited Rm 1412, Honour Industrial Centre, 6 Sun Yip Street, Chaiwan, Hong Kong Tel: 2897 3282





# ALS Technichem (HK) Pty Ltd



## ALS Laboratory Group

ANALYTICAL CHEMISTRY & TESTING SERVICES

### CERTIFICATE OF ANALYSIS

<b>Client</b>	: LAM LABORATORIES LIMITED	<b>Laboratory</b>	: ALS Technichem (HK) Pty Ltd	<b>Page</b>	: 1 of 6
<b>Contact</b>	: MS MAUREEN CHANG	<b>Contact</b>	: Alice Wong / Ivan Leung	<b>Work Order</b>	: HK0605630
<b>Address</b>	: RM 1412-16, HONOUR INDUSTRIAL CENTRE, 6 SUN YIP STREET, CHAI WAN, HONG KONG	<b>Address</b>	: 1/F., Chung Shun Knitting Centre, 1 -3 Wing Yip Street, Kwai Chung, N.T. Hong Kong		
<b>E-mail</b>	: maureenchang@lamlab.com	<b>E-mail</b>	: alice.wong@alsenviro.com		
<b>Telephone</b>	: +852 2975 3372	<b>Telephone</b>	: +852 2610 1044		
<b>Facsimile</b>	: +852 2897 5509	<b>Facsimile</b>	: +852 2610 2021		
<b>Project</b>	: J469 SO19	<b>Quote number</b>	: ---		
<b>Order number</b>	: ---			<b>Date received</b>	: 31 Oct 2006
<b>C-O-C number</b>	: ---			<b>Date of issue</b>	: 7 Nov 2006
<b>Site</b>	: ---			<b>No. of samples</b>	: - Received : 10
					: - Analysed : 9

### Report Comments

This report for ALS Technichem (HK) Pty Ltd work order reference HK0605630 supersedes any previous reports with this reference. The completion date of analysis is 3 Nov 2006. Results apply to sample(s) as submitted. All pages of this report have been checked and approved for release. When date(s) and/or time(s) are shown bracketed, these have been assumed by the laboratory for process purposes. Abbreviations: CAS number = Chemical Abstract Services number. LOR = Limit of reporting.

Specific comments for Work Order HK0605630 : **Sample(s) analysed and reported on an as received basis.**  
**Samples were received in an ambient condition.**

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This document has been electronically signed by those names that appear on this report and are the authorised signatories. Electronic signing has been carried out in compliance with procedures specified in the 'Electronic Transactions Ordinance' of Hong Kong, Chapter 553, Section 6.

Signatory

Fung Lim Chee, Richard

Position

General Manager

Authorised results for:-

Inorganics

### ALS Laboratory Group

Trading Name: ALS Technichem (HK) Pty Ltd.  
1/F., Chung Shun Knitting Centre, 1-3 Wing Yip Street, Kwai Chung, N.T. Hong Kong  
Tel: +852 2610 1044 Fax: +852 2610 2021 <http://www.alsenviro.com/>  
A Campbell Brothers Limited Company





**Analytical Results**

Submatrix: SOIL	Method: Analysis Description	CAS number	LOR	Units	Client Sample ID:		Laboratory Sample ID:	
					Sample Date / Time:		Sample Date / Time:	
	EP: Aggregate Organics	----	0.05	%	18263/6	HK0605630-006	18263/7	HK0605630-008
	EP009: Total Organic Carbon					[ 31 Oct 2006 ]		[ 31 Oct 2006 ]
							18263/8	HK0605630-009
								[ 31 Oct 2006 ]
							18263/9	HK0605630-010
								[ 31 Oct 2006 ]
								0.64
								0.35
								0.70
								0.62



Page Number : 4 of 6  
 Client : LAM LABORATORIES LIMITED  
 Work Order : HK0605630

**Quality Control - Laboratory Duplicate (DUP) Results**

Matrix Type: SOIL

Laboratory Sample ID	Client Sample ID	Method: Analysis Description	CAS number	LOR	Units	Duplicate (DUP) Results		RPD (%)
						Original Result	Duplicate Result	
<b>EP: Aggregate Organics (QC Lot: 300680)</b>								
HK0605629-001	Anonymous	EP009: Total Organic Carbon	----	0.05	%	0.26	0.25	0.0
HK0605629-003	Anonymous	EP009: Total Organic Carbon	----	0.05	%	0.93	1.07	13.8



**Quality Control - Method Blank (MB), Single Control Spike (SCS) and Duplicate Control Spike (DCS) Results**

Matrix Type: SOIL	Method Blank (MB) Results			Single Control Spike (SCS) and Duplicate Control Spike (DCS) Results				RPDs (%)
	LOR	Units	Result	SCS	DCS	Recovery Limits (%)	Value	
Method: Analysis Description	CAS number							
EP: Aggregate Organics (QGLot: 300680)								
EP009: Total Organic Carbon	0.05	%	<0.05	102	---	85	115	---



Page Number : 6 of 6  
 Client : LAM LABORATORIES LIMITED  
 Work Order : HK0605630

**Quality Control - Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Results**

Matrix Type: SOIL

Laboratory Sample ID	Client Sample ID	Method: Analysis Description	CAS number	Spike Concentration		Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Results			
				MS	MSD	Recovery Limits (%)	RPDs (%)	Value	Control Limit
EP: Aggregate Organics (QCLot: 300680)				40 %	101	75	125		
HK0605630-001	18263/1	EP009: Total Organic Carbon							