



大成環境科技拓展有限公司  
**ENVIRONMENTAL PIONEERS & SOLUTIONS LIMITED**

豐盛創建環保科技集團附屬公司 Subsidiary of FSE Environmental Technologies Group  
豐盛創建成員 Member of FSE Holdings

## **Proposed Road Improvement Works in West Kowloon Reclamation Development – Phase 1**

### **Baseline Environmental Monitoring (AM4-A 24-hr TSP) Report**


Flat A, 19/F, Chaiwan Industrial Centre, 20 Lee Chung Street, Chai Wan, Hong Kong Tel: (852) 2556 9172 Fax: (852) 2856 2010  
香港柴灣利眾街 20 號柴灣中心工業大廈 19 字樓 A 座 電話: (852) 2556 9172 傳真: (852) 2856 2010 <http://www.epsl.com.hk>



## **APPROVAL SHEET**

Prepared and Certified by:

Environmental Team Leader (Environmental Pioneers & Solutions Limited)

Signature:  \_\_\_\_\_ Date: 1 September 2016

Ms. Goldie Fung  
(ET Leader)

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## **EXECUTIVE SUMMARY**

This baseline monitoring report presents the baseline air quality monitoring results performed from AM4-A.

24-hr Total Suspended Particulates (TSP) of AM4-A baseline monitoring for 14 consecutive days were conducted as stipulated in their respective sections in the Environmental Monitoring and Audit Manual. Data obtained from the monitoring was processed to establish action and limit levels.

24-hr TSP baseline monitoring was conducted at AM4-A from 6<sup>th</sup> August 2016 to 19<sup>th</sup> August 2016.

Details of the monitoring location and results are presented in this baseline monitoring report.

## **1. INTRODUCTION**

### **1.1 Project Background Information**

This is a road improvement project in West Kowloon Reclamation Development (WKRd) for completing the developments and the commissioning of the new transport facilities.

Apart from the additional traffic impacts arising from the major development and transport facilities in WKRd, several major junctions in the area are currently operating with insufficient capacity causing serious congestion to some existing major road corridors such as Jordan Road (JRD), Ferry Street (FST) and Canton Road (CRD).

To enhance the road network of the area, Transport Department commissioned the “West Kowloon Reclamation Development Traffic Study” which identified and recommended Core and Additional Schemes together with the improvement works at the junction of CRD/FST/JRD. Implementation of these schemes would enable most of the key road junctions in the study area to operate with spare capacity, and the traffic queue length would also be reduced avoiding blockage to the upstream junctions.

In accordance with the requirements stated in the Environmental Permit (no.: EP-455/2013) based on the Environmental Monitoring and Audit (EM&A) Manual and reference to Annex 21 Technical Memorandum under the Environmental Impact Assessment Ordinance (EIAO-TM), baseline monitoring of air quality and noise are required to be carried out prior to the commencement of construction of the project.

### **1.2 Purpose**

By establishing the baseline level of air quality, the performance of the construction contractor shall be measured in meeting required environmental protection standards and requirements of the EM&A Manual. This report presents the methodology, monitoring location, equipment, period, results and observations for the environmental measurements during the baseline monitoring period.

## **2. AIR QUALITY MONITORING**

According to the EM&A Manual, monitoring of the 24 Hours Total Suspended Particulate (24-hr TSP) levels should be carried out for 14 consecutive days at four monitoring locations.

This is the baseline monitoring report for 24-hr TSP for monitoring location AM4-A.

24-hr TSP monitoring for AM1, AM2 and AM3-A have been conducted from 8<sup>th</sup> January 2016 to 21<sup>st</sup> January 2016, 19<sup>th</sup> March 2016 to 1<sup>st</sup> April 2016 and 19<sup>th</sup> December 2015 to 1<sup>st</sup> January 2016.

### **2.1 Monitoring Methodology and Parameters**

Measurements of 24-hr TSP monitoring were taken by High Volume Sampler (HVS).

HVS fitted with appropriate sampling inlets were employed for air quality monitoring. Each sampler was composed of a motor, a filter holder, a flow controller and a sampling inlet and its performance specification complies with that required by USEPA Standard Title 40, Code of Federation Regulations Chapter 1 (Part 50).

Installation of HVS:

- A horizontal platform with appropriate support to secure the samplers against gusty wind should be provided;
- No two samplers should be placed less than 2 meters apart;
- The distance between the sampler and an obstacle, such as buildings, must be at least twice the height that the obstacle protrudes above the sampler;
- A minimum of 2 meters of separation from walls, parapets and penthouses is required for rooftop samplers;
- A minimum of 2 meters separation from any supporting structure, measured horizontally is required;
- No furnace or incinerator flue is nearby;
- Airflow around the sampler is unrestricted;
- The sampler is more than 20 meters from the dripline;
- Any wire fence and gate, to protect the sampler, should not cause any obstruction during monitoring;

- Permission must be obtained to set up the samplers and to obtain access to the monitoring stations; and
- A secured supply of electricity is needed to operate the samplers.

Data of wind speed and wind direction was extracted from King's Park Meteorological Station of Hong Kong Observatory. The collection of wind data meets the prescribed criteria in S.3.4.3 of the EM&A Manual.

Other relevant data such as monitoring location, time, weather conditions and any other special phenomena at the construction site were recorded during the measurement period. The monitoring parameters and frequency are summarized in **Table 2.1**.

Table 2.1 – 24-hr TSP Baseline Monitoring Parameters and Frequency

Parameter	Frequency	Monitoring Period
24-hr TSP	1 time per day	14 consecutive days

## 2.2 Monitoring Location

Monitoring for 24-hr TSP was conducted at AM4-A. Due to the rejection from the representative/property management of the premises, the HVS is not feasible to be installed at AM4. AM4-A is the alternative location for set up the HVS and conducting 24-hr TSP monitoring. The monitoring location is located close to the Tsim Sha Tsui Fire Station, is proposed with the consideration of the criteria as an air sensitive receiver. The considerations listed on the EM&A Manual Section 3.5.1, have been taken into account for setting up the monitoring location, which was approved by the ER and IEC. Details are shown in **Table 2.2** and **Appendix A**.

Table 2.2 – 24-hr TSP Baseline Monitoring Location

Identification No.	Monitoring Location	Description	Parameter	Monitoring Period
AM4-A	Tsim Sha Tsui Fire Station	Ground Floor Face to Canton Road	24-hr TSP	6 <sup>th</sup> Aug 16 to 19 <sup>th</sup> Aug 16

## 2.3 Monitoring Equipment

The measurement equipment for 24-hr TSP is summarized in **Table 2.3** and Calibration Certificates are shown in **Appendix B**.

Table 2.3 Air Quality Monitoring Equipment

Equipment	Manufacturer & Model No.	Parameter
High Volume Sampler (HVS)	Tisch TE-5170	TSP (24-hr)
Calibration Kit for HVS	Tisch TE-5028A	N/A

## 2.4 Quality Assurance / Quality Control Results and Detection Limits

Calibration was first been conducted after installing the HVS and repeated on bi-monthly basis. Calibration Kit for HVS was calibrated annually by the manufacturer or a HOKLAS laboratory. The detection limits of the HVS meet with the prescribed standard. Calibration details and current Calibration Certificates are shown in **Appendix B**.

## 2.5 Monitoring Results and Observations

There were a total of 14 sets of 24-hr TSP monitoring data obtained at the monitoring location. The monitoring results are summarized in **Table 2.4**. All monitoring data and the graphical plot are shown in **Appendix C**.

Table 2.5 Summary of Average 24-hr TSP Baseline Monitoring Results

Monitoring Location	Average 24-hr TSP ( $\mu\text{g}/\text{m}^3$ )
AM4-A	70

During the monitoring period, construction activities from other construction sites near Canton Road and vehicle emissions were the influencing factors for AM4-A.

## 2.6 Action and Limit Levels

According to the EM&A Manual, the criteria of establishing Action and Limit levels of 24-hr TSP are summarized in **Table 2.6.1**.



Table 2.6.1 Action and Limit Levels for 24-hr TSP

Cases	Action Level	Limit Level
Averaged baseline level $\leq 200 \mu\text{g}/\text{m}^3$	$= (\text{Baseline level} \times 1.3 + \text{Limit level}) / 2$	$260 \mu\text{g}/\text{m}^3$
Averaged baseline level $> 200 \mu\text{g}/\text{m}^3$	$= \text{Limit level}$	

The baseline monitoring results have formed the basis of air quality requirements for the impact monitoring. According to the measured baseline results, Action and Limit levels for 24-hr TSP impact monitoring are established in **Table 2.6.2**.

Table 2.6.2 Established 24-hr TSP Action and Limit Levels

Monitoring Location	Action Level	Limit Level
AM4-A	$176 \mu\text{g}/\text{m}^3$	$260 \mu\text{g}/\text{m}^3$

### **3. REVISIONS FOR INCLUSION IN THE EM&A MANUAL**

24-hr TSP monitoring was not conducted at AM4 listed on the EM&A Manual, due to the rejection from the representative/property management of the premises. The monitoring for 24-hr TSP was conducted at AM4-A, the alternative location of AM4. The conditions given in S.3.5.1 of the EM&A Manual were been taken into account for choosing the alternative location.

24-hr TSP baseline monitoring for AM1, AM2 and AM3-A, the alternative location of AM3, have been completed.

#### **4. CONCLUSION**

24-hr TSP monitoring for 14 consecutive days have been conducted at timeframe when there is no construction works underwent by this project in the identified nearest sensitive receiver, AM4-A, from 6<sup>th</sup> August 2016 to 19<sup>th</sup> August 2016.

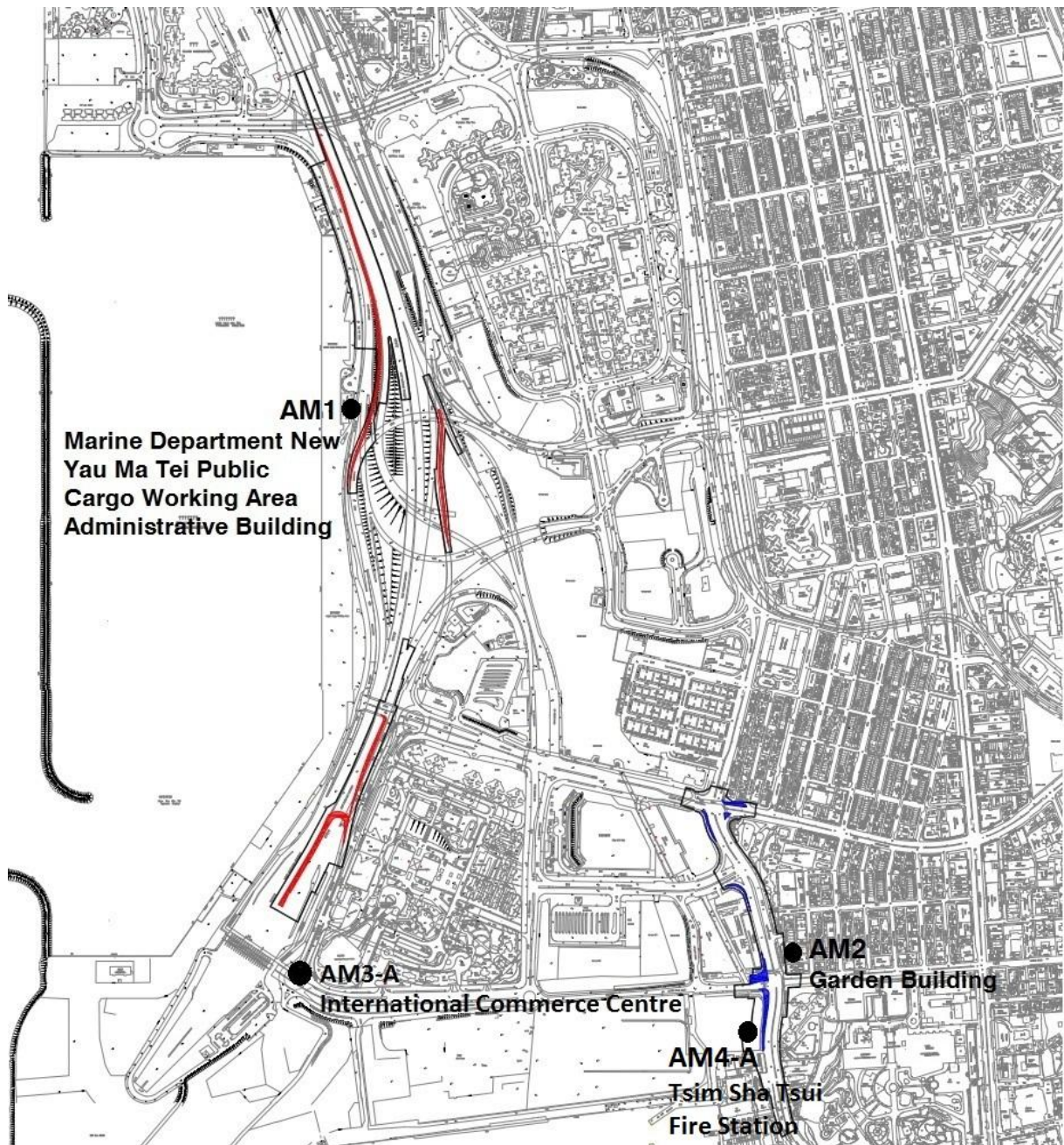
The average 24-hr TSP level was 70 $\mu\text{g}/\text{m}^3$ .


The established action level for 24-hr TSP measurement was 176 $\mu\text{g}/\text{m}^3$ . The limit level was 260 $\mu\text{g}/\text{m}^3$ .

24-hr TSP baseline monitoring for AM1, AM2 and AM3-A have been completed and reported.

# **Appendix A**

## Monitoring Location



Monitoring Location	Photo Record
<p data-bbox="167 271 247 297">AM4-A</p> <p data-bbox="167 315 443 342">Tsim Sha Tsui Fire Station</p>	 <p>The top photograph shows a gas monitoring station (AM4-A) located outdoors. It consists of a white control unit with a digital display and a red emergency stop button, mounted on a white base. The unit is positioned next to a grey metal structure, possibly a fire station container. A red fire extinguisher is visible in the background. The bottom photograph is a closer view of the same unit, showing the digital display and the red emergency stop button. The unit is labeled 'GAS MONITORING STATION' and 'AM4-A'. A yellow warning sign with a lightning bolt symbol is also visible on the unit.</p>

## **Appendix B**

### **Calibration Certificate**



ORIFICE TRANSFER STANDARD CERTIFICATION WORKSHEET TE-5028A

Date - Feb 11, 2016 Rootmeter S/N 0438320 Ta (K) - 294  
Operator Tisch Orifice I.D. - 2137 Pa (mm) - 758.19

PLATE OR VDC #	VOLUME START (m3)	VOLUME STOP (m3)	DIFF VOLUME (m3)	DIFF TIME (min)	METER DIFF Hg (mm)	ORFICE DIFF H2O (in.)
1	NA	NA	1.00	1.3380	4.2	1.50
2	NA	NA	1.00	1.0270	6.9	2.50
3	NA	NA	1.00	0.9420	8.2	3.00
4	NA	NA	1.00	0.8730	9.6	3.50
5	NA	NA	1.00	0.6630	16.5	6.00

DATA TABULATION

Vstd	(x axis) Qstd	(y axis)	Va	(x axis) Qa	(y axis)
1.0055	0.7515	1.2316	0.9944	0.7432	0.7627
1.0019	0.9756	1.5900	0.9908	0.9648	0.9846
1.0002	1.0618	1.7417	0.9891	1.0500	1.0786
0.9983	1.1436	1.8813	0.9873	1.1309	1.1650
0.9891	1.4919	2.4632	0.9781	1.4754	1.5253
Qstd slope (m) = 1.66881			Qa slope (m) = 1.04498		
intercept (b) = -0.02897			intercept (b) = -0.01794		
coefficient (r) = 0.99983			coefficient (r) = 0.99983		
y axis = $\text{SQRT}[\text{H2O}(\text{Pa}/760)(298/\text{Ta})]$			y axis = $\text{SQRT}[\text{H2O}(\text{Ta}/\text{Pa})]$		

CALCULATIONS

$$\text{Vstd} = \text{Diff. Vol}[(\text{Pa} - \text{Diff. Hg})/760](298/\text{Ta})$$

$$\text{Qstd} = \text{Vstd}/\text{Time}$$

$$\text{Va} = \text{Diff Vol}[(\text{Pa} - \text{Diff Hg})/\text{Pa}]$$

$$\text{Qa} = \text{Va}/\text{Time}$$

For subsequent flow rate calculations:

$$\text{Qstd} = 1/\text{m}\{[\text{SQRT}(\text{H2O}(\text{Pa}/760)(298/\text{Ta}))] - b\}$$

$$\text{Qa} = 1/\text{m}\{[\text{SQRT}(\text{H2O}(\text{Ta}/\text{Pa}))] - b\}$$





## TE-5170 Calibration Worksheet

### Site Information

Location: Tsim Sha Tsui Fire Station  
Location ID: AM4-A  
Sampler: TE-5170 MFC

Date: 6-Aug-16  
Tech: Andy Tsang

### Site Conditions

Barometric Pressure (in Hg): 29.50  
Temperature (deg F): 68  
Average Press. (in Hg): 29.65  
Average Temp. (deg F): 70

Corrected Pressure (mm Hg): 749  
Temperature (deg K): 293  
Corrected Average (mm Hg): 753  
Average Temp. (deg K): 294

### Calibration Orifice

Make: Tisch  
Model: TE-5028A  
Serial#: 2137

Qstd Slope: 1.66881  
Qstd Intercept: -0.02897  
Date Certified: 11-Feb-16

### Calibration Information

Plate or Test #	H2O (in)	Qstd (m3/min)	I (chart)	IC (corrected)	Linear Regression
1	1.40	0.727	34.0	34.05	Slope: 32.6245
2	3.20	1.091	44.0	44.06	Intercept: 9.6301
3	4.00	1.217	49.0	49.07	Corr. Coeff: 0.9974
4	5.40	1.412	56.0	56.08	
5	6.40	1.535	60.0	60.08	# of Observations: 5

### Calculations

$$Qstd = 1/m[\text{Sqrt}(H_2O(Pa/Pstd)(Tstd/Ta)) - b]$$

$$IC = I[\text{Sqrt}(Pa/Pstd)(Tstd/Ta)]$$

Qstd = standard flow rate

IC = corrected chart response

I = actual chart response

m = calibrator Qstd slope

b = calibrator Qstd intercept

Ta = actual temperature during calibration (deg K)

Pa = actual pressure during calibration (mm Hg)

Tstd = 298 deg K

Pstd = 760 mm Hg

For subsequent calculation of sampler flow:

$$1/m((I[\text{Sqrt}(298/Tav)(Pav/760)] - b)$$

m = sampler slope

b = sampler intercept

I = chart response

Tav = daily average temperature

Pav = daily average pressure

Average I (chart): 45.0

Average Flow Calculation m3/min

1.086933785

Average Flow Calculation in CFM

38.37963195

Sample Time (Hrs): 24.0

Total Flow/Volume in m3

1565.18465

Total Flow in CFM

55266.67001

## **Appendix C**

### Monitoring Results and Graphical plots



## CERTIFICATE OF ANALYSIS

Client	: ENVIRONMENTAL PIONEERS & SOLUTION LTD	Laboratory	: ALS Technichem (HK) Pty Ltd	Page	: 1 of 3
Contact	: ANDY TSANG	Contact	: Fung Lim Chee, Richard	Work Order	: HK1634163
Address	: FLAT A, 8/F, CHAI WAN INDUSTRIAL CENTRE, 20 LEE CHUNG STREET, CHAI WAN HONG KONG	Address	: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing Yip Street, Kwai Chung, N.T., Hong Kong		
E-mail	: kytsang@fsenv.com.hk	E-mail	: Richard.Fung@alsglobal.com		
Telephone	: +852 2185 0159	Telephone	: +852 2610 1044		
Facsimile	: +852 2258 0568	Facsimile	: +852 2610 2021		
Project	: PROPOSED ROAD IMPROVEMENT WORKS IN WEST KOWLOON RECLAMATION DEVELOPMENT - PHASE 1	Quote number	: ----	Date Samples Received	: 23-AUG-2016
Order number	: ----			Issue Date	: 26-AUG-2016
C-O-C number	: ----			No. of samples received	: 7
Site	: ----			No. of samples analysed	: 7

### General Comments

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release. When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes. Testing period is from 23-AUG-2016 to 24-AUG-2016.

Key: LOR = Limit of reporting; CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

### Specific Comments for Work Order: HK1634163

Sample(s) were picked up from client by ALS Technichem (HK) staff in an ambient condition.

Sample(s) analysed and reported on an as received basis.

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This document has been signed by those names that appear on this report and are the authorised signatories.

Signatories

Position

Authorised results for

Fung Lim Chee, Richard

General Manager

Inorganics



### Analytical Results

Sub-Matrix: FILTER (TSP/RSP)

Client sample ID

				AM40806 (201307)	AM40807 (201308)	AM40808 (201296)	AM40809 (201312)	AM40810 (201310)
				[06-AUG-2016]	[07-AUG-2016]	[08-AUG-2016]	[09-AUG-2016]	[10-AUG-2016]
Compound	CAS Number	LOR	Unit	HK1634163-001	HK1634163-002	HK1634163-003	HK1634163-004	HK1634163-005
<b>EA/ED: Physical and Aggregate Properties</b>								
HK-TSP: Total Suspended Particulates	----	0.0010	g	0.1821	0.1337	0.0736	0.2204	0.1842
HK-TSP: Initial Weight	----	0.0010	g	2.7552	2.7524	2.7694	2.8083	2.7641
HK-TSP: Final Weight	----	0.0010	g	2.9373	2.8861	2.8430	3.0287	2.9483



Sub-Matrix: <b>FILTER (TSP/RSP)</b>				Client sample ID	AM40811 (201321)	AM40812 (201309)			
				Client sampling date / time	[11-AUG-2016]	[12-AUG-2016]			
Compound	CAS Number	LOR	Unit	HK1634163-006	HK1634163-007				
EA/ED: Physical and Aggregate Properties									
HK-TSP: Total Suspended Particulates	----	0.0010	g	0.0816	0.1590				
HK-TSP: Initial Weight	----	0.0010	g	2.8123	2.7510				
HK-TSP: Final Weight	----	0.0010	g	2.8939	2.9100				



## CERTIFICATE OF ANALYSIS

Client	: ENVIRONMENTAL PIONEERS & SOLUTION LTD	Laboratory	: ALS Technichem (HK) Pty Ltd	Page	: 1 of 3
Contact	: ANDY TSANG	Contact	: Fung Lim Chee, Richard	Work Order	: HK1634166
Address	: FLAT A, 8/F, CHAI WAN INDUSTRIAL CENTRE, 20 LEE CHUNG STREET, CHAI WAN HONG KONG	Address	: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing Yip Street, Kwai Chung, N.T., Hong Kong		
E-mail	: kytsang@fsenv.com.hk	E-mail	: Richard.Fung@alsglobal.com		
Telephone	: +852 2185 0159	Telephone	: +852 2610 1044		
Facsimile	: +852 2258 0568	Facsimile	: +852 2610 2021		
Project	: PROPOSED ROAD IMPROVEMENT WORKS IN WEST KOWLOON RECLAMATION DEVELOPMENT - PHASE 1	Quote number	: ----	Date Samples Received	: 23-AUG-2016
Order number	: ----			Issue Date	: 25-AUG-2016
C-O-C number	: ----			No. of samples received	: 7
Site	: ----			No. of samples analysed	: 7

### General Comments

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release. When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes. Testing period is from 23-AUG-2016 to 24-AUG-2016.

Key: LOR = Limit of reporting; CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

### Specific Comments for Work Order: HK1634166

Sample(s) were received in ambient condition.

Sample(s) analysed and reported on an as received basis.

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This document has been signed by those names that appear on this report and are the authorised signatories.

Signatories

Position

Authorised results for

Fung Lim Chee, Richard

General Manager

Inorganics



### Analytical Results

Sub-Matrix: FILTER (TSP/RSP)

Client sample ID

				AM40813 (201311)	AM40814 (201320)	AM40815 (201325)	AM40816 (201324)	AM40817 (201322)
				[13-AUG-2016]	[14-AUG-2016]	[15-AUG-2016]	[16-AUG-2016]	[17-AUG-2016]
Compound	CAS Number	LOR	Unit	HK1634166-001	HK1634166-002	HK1634166-003	HK1634166-004	HK1634166-005
<b>EA/ED: Physical and Aggregate Properties</b>								
HK-TSP: Total Suspended Particulates	----	0.0010	g	0.0982	0.0471	0.1102	0.0710	0.0282
HK-TSP: Initial Weight	----	0.0010	g	2.8145	2.8048	2.8059	2.8080	2.8032
HK-TSP: Final Weight	----	0.0010	g	2.9127	2.8519	2.9161	2.8790	2.8314



Sub-Matrix: FILTER (TSP/RSP)				Client sample ID	AM40818 (201323)	AM40819 (201329)			
				Client sampling date / time	[18-AUG-2016]	[19-AUG-2016]			
Compound	CAS Number	LOR	Unit		HK1634166-006	HK1634166-007			
EA/ED: Physical and Aggregate Properties									
HK-TSP: Total Suspended Particulates	----	0.0010	g		0.0552	0.0874			
HK-TSP: Initial Weight	----	0.0010	g		2.8068	2.8018			
HK-TSP: Final Weight	----	0.0010	g		2.8620	2.8892			



## 24-hr TSP Monitoring Result for AM4-A

Sampling ID & Paper No.	Sampling Date	Wt. of paper (g)			Flow Rate (CFM)			Total Volume # (m <sup>3</sup> )	TSP Concentration (µg/m <sup>3</sup> )	Temperature (°C) *	Wind Direction *	Wind Speed (m/s) *
		Initial Wt.	Final Wt.	Wt. of dust	Initial	Final	Avg Flow					
AM40806 201307	06/08/16	2.7552	2.9373	0.1821	45	45	45.0	1565.18	116	27 - 33	W	0.1-3.6
AM40807 201308	07/08/16	2.7524	2.8861	0.1337	45	45	45.0	1565.18	85	27 - 33	W	0-3.6
AM40808 201296	08/08/16	2.7694	2.8430	0.0736	45	45	45.0	1565.18	47	28 - 32	W	0-4.2
AM40809 201312	09/08/16	2.8083	3.0287	0.2204	45	45	45.0	1565.18	141	25 - 33	W	0-5.8
AM40810 201310	10/08/16	2.7641	2.9483	0.1842	45	45	45.0	1565.18	118	24 - 28	SE	0-5
AM40811 201307	11/08/16	2.8123	2.8939	0.0816	45	45	45.0	1565.18	52	25 - 29	W	0-3.3
AM40812 201307	12/08/16	2.7510	2.9100	0.1590	45	45	45.0	1565.18	102	27 - 30	NW	0-3.1
AM40813 201311	13/08/16	2.8145	2.9127	0.0982	45	45	45.0	1565.18	63	26 - 32	SE	0.1-5
AM40814 201320	14/08/16	2.8048	2.8519	0.0471	45	45	45.0	1565.18	30	25 - 29	SE	0.1-5.3
AM40815 201325	15/08/16	2.8059	2.9161	0.1102	45	45	45.0	1565.18	70	25 - 28	NE	0-3.3
AM40816 201324	16/08/16	2.8080	2.8790	0.0710	45	45	45.0	1565.18	45	25 - 27	SE	0-4.2
AM40817 201322	17/08/16	2.8032	2.8314	0.0282	45	45	45.0	1565.18	18	26 - 28	SE	0.83-6.4
AM40818 201323	18/08/16	2.8068	2.8620	0.0552	45	45	45.0	1565.18	35	26 - 29	SE	1.1-6.9
AM40819 201329	19/08/16	2.8018	2.8892	0.0874	45	45	45.0	1565.18	56	26 - 31	SE	0.83-5

\*Remark: Data of temperature, wind direction and wind speed was extracted from King's Park Meteorological Station of HKO

#Remark: Total volume of the 24 hrs sampling was calculated from the Calibration worksheet (refer to Appendix B)

**AM4-A - 24-hr TSP Graph plot**

