



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

Environmental Monitoring & Audit Report

01/12/2019 – 31/12/2019

Prepared by:	 <u>Andy Tsang</u>
Certificated by:	 <u>Goldie Fung</u> (Environmental Team Leader)

Environmental Pioneers & Solutions Limited
Flat A, 8/F, Chaiwan Industrial Centre,
20 Lee Chung Street, Chai Wan, Hong Kong
Tel: 2556 9172 Fax: 2856 2010

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Executive Summary

This is the forty-seventh monthly Environmental Monitoring and Audit (EM&A) Report for Proposed Road Improvement Works in West Kowloon Reclamation Development – Phase 1. The project commenced on 6 February 2016. This report documents the finding of EM&A Works conducted from 1 December 2019 to 31 December 2019.

Environmental Monitoring and Audit Progress

Air Quality Monitoring

1-hr Total Suspended Particulates (TSP) monitoring and 24-hr TSP monitoring were carried out on 3, 9, 14, 20, 24 and 30 December 2019.

Noise Monitoring

30-min LAeq noise monitoring was carried out on 3, 9, 14, 20, 24 and 30 December 2019.

Waste Management

According to Contractor's waste flow data, 1432.23 tonnes of inert C&D materials and 59.93 tonnes of general refuse were generated and disposed.

Landscape and Visual Impact

Bi-weekly inspections were conducted on 12 and 27 December 2019. Most of the necessary mitigation measures have been implemented. Details of the audit findings and implementation status are presented in Section 6.

Environmental Site Inspection

Joint weekly inspections were conducted by representatives of the Contract Administrator, Engineer, Contractor and ET on 4, 11, 20 and 27 2019. The representative of the IEC conducted the site inspection on 11 December 2019. Details of the audit findings and implementation status are presented in Section 6.

Environmental Exceedance / Non-compliance / Compliant / Summons and Successful Prosecution

No exceedance of action level and limit level was recorded for TSP. Six exceedances

were recorded at NM4 on 3, 9, 14, 20, 24 and 30 December 2019 for Noise. No Non-compliance event, compliant, notification of summons and successful prosecution against the Project were received in this reporting month.

Variation in Construction Method

No variation in construction method from the proposed construction programme was made and affected the EM&A.

Future Key Issues

The major construction works to be undertaken in the next reporting month include:

- Portion I – Pile Cap, Pier and Bridge Deck Construction Works
- Portion I – E&M Installation and Road Works
- Portion HA – Road Pavement, Street Furniture Installation

Potential environmental impacts arising from the above construction activities are mainly associated with dust, construction noise, water quality and waste management. The Contractor has been reminded to properly implement dust, construction noise and water quality control measures as well as proper waste management in order to minimize the potential environmental impacts due to the construction works of this Project.

1 Introduction

1.1 The Project

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.

The Environmental Team (ET), Environmental Pioneers & Solutions Limited (EPSL), was appointed by Vibro Construction Co. Ltd. to undertake the Environmental Monitoring and Audit (EM&A) programme during construction phase of the Proposed Road Improvement Works in West Kowloon Reclamation Development – Phase 1. The project proponent is Highways Department. This is a Designated Project under the Environmental Impact Assessment Ordinance (Cap.499). The No. of Environment Permit is EP-455/2013.

The construction works and EM&A programme of this project was commenced on 6 February 2016. The construction programme and project layout plan are shown in [Appendix A](#).

1.2 Construction Programme and Activities

A summary of the major construction activities undertaken in this reporting period is shown as follows.

- Portion I – Pile Cap, Pier and Bridge Deck Construction Works
- Portion I – E&M Installation and Road Works
- Portion HA – Pile Cap, Pier and Bridge Deck Construction Works
- Portion HA – Road Pavement, Street Furniture Installation

1.3 Project Organization

The project organization chart and contact details are shown in [Appendix B](#).

1.4 Status of Environmental Licences, Notification and Permits

A summary of the relevant permits, licences, and notifications on environmental protection for this Project is presented in [Table 1.4.1](#).

Table 1.4.1 Summary of the Status of Environmental Licences and Permits

Permit / License No.	Valid Period		Status	Remark
	From	To		
Notification pursuant to Air Pollution Control (Construction Dust) Regulation				
Ref. No. 386894	23/03/2015	N/A	Valid	/
Effluent Discharge License				
WT00021818-2015	18/06/2015	30/06/2020	Valid	Portion I
WT00021822-2015	18/06/2015	30/06/2020	Valid	Portion HA
WT00021825-2015	18/06/2015	30/06/2020	Valid	Portion J
WT00021826-2015	18/06/2015	30/06/2020	Valid	Portion Q
WT00021903-2015	26/06/2015	30/06/2020	Valid	Works area 1
Waste Disposal (Charges for Disposal of Construction Waste) Regulation				
Billing Account No.7022012	31/03/2015	N/A	Valid	/
Registration of Chemical Waste Producer				
WPN5213-229-V2215-01	01/06/2015	N/A	Valid	/
Construction Noise Permit				
GW-RE1183-15	04/12/2015	03/06/2016	Expire	Portion HA

GW-RE0469-16	04/06/2016	03/12/2016	Expire	Portion HA
GW-RE0330-17	25/04/2017	23/10/2017	Expire	Portion HA
PP-RE0029-17	18/10/2017	16/04/2018	Expire	Portion HA

2 Air Quality Monitoring

2.1 Monitoring Locations

According to the EM&A Manual Section 3.5, four impact monitoring locations have been established for air quality monitoring, which are summarized in [Table 2.1.1](#).

Table 2.1.1 Air Quality Monitoring Locations

Identification No.	Monitoring Location	Description	Parameter
AM1	Marine Department New Yau Ma Tei Public Cargo Working Area Administrative Building	Ground Floor Face to Hoi Po Road	1-hr TSP 24-hr TSP
AM2	Garden Building	Ground Floor Face to Canton Road	1-hr TSP 24-hr TSP
AM3	The Cullinan I	Ground Floor Face to Nga Cheung Road	1-hr TSP 24-hr TSP
AM4	Lai Chack Middle School	Ground Floor Face to Canton Road	1-hr TSP 24-hr TSP

Due to the rejection from the representatives/ property management of the premises, high volume samplers are not feasible to be installed at AM3 and AM4 for the 24-hr TSP monitoring. Alternative locations AM3-B and AM4-A are proposed accordingly. The monitoring locations are summarized in [Table 2.1.2](#). The details of monitoring location plan are shown in [Appendix C](#).

Alternative monitoring location AM4-A is adjacent to the construction site of Xiqu Centre. Power supply for AM4-A was temporarily provided by the Main Contractor of Xiqu Centre, Hip Hing Engineering Co. Ltd.. Due to the outside surface works and drainage works of Xiqu Centre, the power distribution box under Hip Hing Engineering Co. Ltd. was relocated. The power supply to AM4-A has been cut off from early August 2017. 24hr-TSP monitoring at AM4-A was ceased from August 2017.

Table 2.1.2 Air Quality Monitoring Locations

ID No.	Monitoring Location	Description	Coordinates	Parameter
AM1	Marine Department New Yau Ma Tei Public Cargo Working Area Administrative Building	Ground Floor Face to Hoi Po Road	22°18'44.8"N 114°09'37.4"E	1-hr TSP
AM2	Garden Building	Ground Floor Face to Canton Road	22°18'12.7"N 114°10'05.7"E	1-hr TSP
AM3	The Cullinan I	Ground Floor Face to Nga Cheung Road	22°18'22.0"N 114°09'39.3"E	1-hr TSP
AM4	Lai Chack Middle School	Ground Floor Face to Canton Road	22°18'05.4"N 114°10'05.3"E	1-hr TSP
AM1	Marine Department New Yau Ma Tei Public Cargo Working Area Administrative Building	Rooftop Face to Hoi Po Road	22°18'44.8"N 114°09'37.4"E	24-hr TSP
AM2	Garden Building	Ground Floor Face to Canton Road	22°18'12.7"N 114°10'05.7"E	24-hr TSP
AM3-B* ¹	The Cullinan II (W Hong Kong)	Ground Floor Face to The Cullinan II	22°18'16.3"N 114°09'34.5"E	24-hr TSP
AM4-A	Tsim Sha Tsui Fire Station	Ground Floor Face to Canton Road	22°18'05.5"N 114°10'04.0"E	24-hr TSP

Remark:

*¹ Monitoring station was amended from AM3-A to AM3-B from October 2016. AM3-B is located at the site boundary of Scheme I. There is no obstacle between the site (dust emission source) and monitoring point. It is more representative for monitoring the dust impact caused by the construction activities.

2.2 Monitoring Frequency

For 1-hr TSP monitoring, the sampling frequency is at least three times in every six days when the highest dust impact occurs.

For 24-hr TSP monitoring, the sampling frequency is once in every six days when the highest dust impact occurs.

Monitoring was carried out on 3, 9, 14, 20, 24 and 30 December 2019.

2.3 Monitoring Equipment

1-hr TSP monitoring was carried out by the portable dust meters. A comparison test for the portable dust meters with the HVS was carried out to ensure the accuracy for direct reading of the portable dust meter. 24-hr TSP monitoring was carried out by the high volume samplers. The monitoring equipment is listed in [Table 2.3.1](#) and Calibration Certificates of the equipment are shown in [Appendix D](#).

Table 2.3.1 Air Quality Monitoring Equipment

Equipment	Manufacturer & Model No.	Serial No.	Latest Calibration Date	Next Calibration Date
Portable Dust Meter	TSI AM520	5201932015	13/08/2019	12/08/2020
		5201932016	12/08/2020	13/08/2019
		5201933005	13/08/2019	12/08/2020
		5201933006	13/08/2019	12/08/2020
High Volume Sampler	Tisch TE-5170	0001	03/12/2019	02/02/2020
		0002	03/12/2019	02/02/2020
		0003	03/12/2019	02/02/2020
Calibration Kit	Tisch TE-5028A	3371	07/02/2019	06/02/2020

2.4 Monitoring Methodology and Parameters

Measurements of 1-hr TSP monitoring were taken by a Dust Trak aerosol monitor or its equivalent that is a portable and battery-operated laser photometer capable of performing real time 1-hr TSP measurements.

Field monitoring procedures are as follows:

- The monitoring station was set at a point 1m from the exterior of the sensitive receivers building façade and set at a position 1.2m above the ground.
- The battery condition was checked to ensure good functioning of the dust monitor.
- Zero Cal was conducted to the dust monitor to each test for ensuring more accurate data.
- Logging setup and Instrument setup such as log interval, test length, number of test and impactor adaptor will set as follows:
 - log interval : 1min
 - test length : 60mins
 - number of test : 3
 - Impactor adaptor: 100μ
- Start the monitoring lasting 3 hours for each monitoring location
- At the end of the monitoring period, the Average, Maximum and Minimum of each TSP test shall be recorded. In addition on a standard record sheet.

Measurements of 24-hr TSP monitoring were taken by High Volume Samplers (HVSs).

HVSs 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 HVSs:

- 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.

2.5 Maintenance and Calibration

Dust Trak aerosol monitors were calibrated by the manufacturer or a HOKLAS Laboratory for every year and on-site Zero Cal before every monitoring. HVSs were calibrated after installation and re-calibrated on bi-monthly basis.

2.6 Quality Assurance / Quality Control Results and Detection Limits

The portable dust meter was calibrated annually by the manufacturer or a HOKLAS laboratory. HVSs were first been calibrated after installation and repeated on bi-monthly basis. Calibration Kit for HVSs was calibrated annually by the manufacturer or a HOKLAS laboratory. The detection limits of the HVSs meet with the prescribed standard. Calibration details and current Calibration Certificates are shown in [Appendix D](#).

2.7 Action and Limit Level for 1-hr TSP and 24-hr TSP

The Action and Limit levels for air quality impact monitoring results at all monitoring locations are summarized in [Table 2.7.1](#), which would be applied for compliance assessment of air quality for this project. If the air quality monitoring results at any monitoring stations exceeded the criteria, the actions in accordance with the Event and Action Plan in [Table 2.7.2](#) shall be taken.

Table 2.7.1 Established TSP Actions and Limit Level

Monitoring Locations	Monitoring Parameter	Action Level ($\mu\text{g}/\text{m}^3$)	Limit Level ($\mu\text{g}/\text{m}^3$)
AM1	1-hr TSP	288	500
AM2		299	500
AM3		299	500
AM4		303	500
AM1	24-hr TSP	157	260
AM2		183	260
AM3-B		177	260
AM4-A		176	260

Table 2.7.2 Event and action Plan for Air Quality

EVENT	ACTION			
	ET	IEC	ER	CONTRACTOR
ACTION LEVEL				
1. Exceedance for one sample	1. Inform IEC, ER and Contractor; 2. Identify source, investigate the causes of exceedance and propose remedial measures; 3. Repeat measurement to confirm finding.	1. Check monitoring data submitted by ET; 2. Check Contractor's working method.	1. Notify Contractor.	1. Rectify any unacceptable practice; 2. Amend working methods if appropriate.
2. Exceedance for two or more consecutive samples	1. Inform IEC, ER and Contractor; 2. Identify source; 3. Advise the ER on the effectiveness of the proposed remedial measures; 4. Repeat measurements to confirm findings; 5. Increase monitoring frequency to daily; 6. Discuss with IEC, ER and Contractor on remedial actions required; 7. If exceedance continues, arrange meeting with IEC and ER; 8. If exceedance stops, cease additional monitoring.	1. Check monitoring data submitted by ET; 2. Check Contractor's working method; 3. Discuss with ET and Contractor on possible remedial measures; 4. Advise the ET/ER on the effectiveness of the proposed remedial measures; 5. Supervise Implementation of remedial measures.	1. Confirm receipt of notification of failure in writing; 2. Notify Contractor; 3. Ensure remedial measures properly implemented.	1. Submit proposals for remedial to ER and IEC within 3 working days of notification; 2. Implement the agreed proposals; 3. Amend proposal if appropriate.

LIMIT LEVEL				
1.Exceedance for one sample	1. Inform IEC, ER, Contractor and EPD; 2. Identify source, investigate the causes of exceedance and propose remedial measures; 3. Repeat measurement to confirm finding; 4. Increase monitoring frequency to daily; 5. Assess effectiveness of Contractor's remedial actions and keep IEC, EPD and ER informed of the results.	1. Check monitoring data submitted by ET; 2. Check Contractor's working method; 3. Discuss with ET and Contractor on possible remedial measures; 4. Advise the ER on the effectiveness of the proposed remedial measures; 5. Supervise implementation of remedial measures.	1. Confirm receipt of notification of failure in writing; 2. Notify Contractor; 3. Ensure remedial measures properly implemented.	1. Take immediate action to avoid further exceedance; 2. Discuss with ET and IEC on remedial actions 3. Submit proposals for remedial actions to IEC within 3 working days of notification; 4. Implement the agreed proposals; 5. Amend proposal if appropriate.
2.Exceedance for two or more consecutive samples	1. Notify IEC, ER, Contractor and EPD; 2. Identify source; 3. Repeat measurement to confirm findings; 4. Increase monitoring frequency to daily; 5. Carry out analysis of Contractor's working procedures to determine possible mitigation to be implemented; 6. Arrange meeting with IEC and ER and Contractor to discuss the remedial actions to be taken; 7. Assess effectiveness of Contractor's remedial actions and keep IEC, EPD and ER informed of the results; 8. If exceedance stops, cease additional monitoring.	1. Check monitoring data submitted by ET; 2. Check Contractor's working method; 3. Discuss amongst ER, ET, and Contractor on the potential remedial actions; 4. Review Contractor's remedial actions whenever necessary to assure their effectiveness and advise the ER accordingly; 5. Supervise the implementation of remedial measures.	1. Confirm receipt of notification of failure in writing; 2. Notify Contractor; 3. In consultation with the IEC, agree with the Contractor on the remedial measures to be implemented; 4. Ensure remedial measures properly implemented; 5. If exceedance continues, consider what portion of the work is responsible and instruct the Contractor to terminate that portion of work until the exceedance ceases.	1. Take immediate action to avoid further exceedance; 2. Discuss with ET and IEC on remedial actions 3. Submit proposals for remedial actions to ER and IEC within 3 working days of notification; 4. Implement the agreed proposals; 5. Resubmit proposals if problems still not under control; 6. Stop the relevant portion of works as determined by the ER until the exceedance ceases.

2.8 Monitoring Results and Observations

1-hr TSP monitoring was conducted at four monitoring locations. The monitoring results are summarized in [Table 2.8.1](#). 24-hr TSP monitoring was conducted at three monitoring locations. The monitoring results are summarized in [Table 2.8.2](#). Detailed impact monitoring data of 1-hr TSP, 24-hr TSP and meteorological data are shown in [Appendix E](#).

Table 2.8.1 Summary of average 1-hr TSP monitoring data

Monitoring Locations	Average 1-hr TSP ($\mu\text{g}/\text{m}^3$)	Range 1-hr TSP ($\mu\text{g}/\text{m}^3$)	Action Level ($\mu\text{g}/\text{m}^3$)	Limit Level ($\mu\text{g}/\text{m}^3$)
AM1	52	41 – 64	288	500
AM2	50	34 – 64	299	500
AM3	42	29 – 57	299	500
AM4	40	31 – 49	303	500

Table 2.8.2 Summary of average 24-hr TSP monitoring data

Monitoring Locations	Average 24-hr TSP ($\mu\text{g}/\text{m}^3$)	Range 24-hr TSP ($\mu\text{g}/\text{m}^3$)	Action Level ($\mu\text{g}/\text{m}^3$)	Limit Level ($\mu\text{g}/\text{m}^3$)
AM1	71	51 – 97	157	260
AM2	58	42 – 84	183	260
AM3-B	29	11 – 50	177	260
AM4-A	-	-	176	260

In accordance with the established action and limited levels for impact monitoring, there was no exceedance recorded in the reporting period.

During the monitoring period, vehicle emissions were identified as one of the dust sources for AM1, AM2, AM3, AM4 and AM3-B. TSP levels of AM2 and AM4 may be affected by the construction activities from other construction sites near Canton Road.

2.9 Monitoring Schedule for Next Reporting Month

TSP monitoring for next reporting month is scheduled on 3, 8, 14, 20, 23 and 29 January 2020.

3 Noise Monitoring

3.1 Monitoring Locations

According to the EM&A Manual Section 4.5, five impact monitoring locations have been established for noise impact monitoring during the construction phase of the project, which are summarized in [Table 3.1.1](#). The details of monitoring location plan are shown in [Appendix C](#).

Table 3.1.1 Noise Monitoring Locations

Identification No.	Noise Monitoring Location	Description	Measurement Type
NM1	Sorrento - Tower 1 ^{*1}	Podium Level ^{*1} Face to Nga Cheung Road	Façade
NM2	Yau Ma Ti Catholic Primary School (Hoi Wang Road)	Ground Floor Face to Hoi Ting Road	Façade
NM3	The Cullinan I	Ground Floor Face to Nga Cheung Road	Façade
NM4	Lai Chack Middle School	Ground Floor Face to Canton Road	Façade
NM5	Yue Tak Building	Ground Floor Face to Jordan Road	Façade

Remark:

^{*1} According to EPD's comment and requirement for EM&A Report (February 2016) on 7 April 2016, noise measurement at NM1 was relocated from the ground level (roadside) of Nga Cheung Road to podium level of the Sorrenti Tower 1 starting from June 2016.

3.2 Monitoring Frequency

The regular monitoring for each location was performed on a weekly basis. The monitoring was carried out on 3, 9, 14, 20, 24 and 30 December 2019.

3.3 Monitoring Equipment

Noise monitoring was conducted by using BSWA 806 / SVANTEK 971 which complied with the International Electrotechnical Commission Publications 61672:2002 (Type 1), 60651:1979 (Type 1) and 60804:1985 (Type 1) Specifications as referred to the

Technical Memorandum to the Noise Control Ordinance. The equipment was calibrated and verified by certified laboratory to ensure they can perform to the same level of accuracy as stated in the manufacturer's specification. Before and after the baseline measurement, the reading of sound level meter was checked with the acoustic calibrator and the measurements were accepted as valid if the calibration levels before and after the noise measurement agreed to within 1.0 dB. The measurement equipment is listed in [Table 3.3.1](#) and Calibration Certificates of the equipment are shown in [Appendix D](#).

Table 3.3.1 Equipment List for Noise Monitoring

Equipment	Manufacturer & Model No.	Precision Grade	Serial No.	Latest Calibration Date	Next Calibration Date
Sound level meter	SVANTEK 971	IEC61672 Type 1	56272	15/01/2019	14/01/2020
	SVANTEK 971	IEC61672 Type 1	61421	27/03/2019	26/03/2020
Acoustical calibrator	SVANTEK SV30A	IEC 942 Type 1	7908	28/03/2019	27/03/2020
	BSWA CA111	IEC 942 Type 1	490239	22/08/2019	21/08/2020

3.4 Monitoring Methodology and Parameters

The construction noise level was measured in terms of the A-weighted equivalent continuous sound pressure level, L_{Aeq} . L_{Aeq} (30minutes) was used as the monitoring parameter for the impact monitoring in the time period between 0700 to 1900 hours on normal weekdays.

In case of non-compliance with the construction noise criteria, more frequent monitoring, as specified in the Action plan in Table 3.6.2, shall be carried out. This additional monitoring shall be carried out until the recorded noise levels are rectified or proved to be irrelevant to the construction activities.

Field monitoring procedures are as follows:

- The monitoring station was set at a point 1m from the exterior of the sensitive receivers building façade and set at a position 1.2m above the ground.
- The battery condition was checked to ensure good functioning of the meter.

- Parameters such as frequency weighting, the time weighting and the measurement time will set as follows:
 - frequency weighting : A
 - time weighting : Fast
- Prior to and after noise measurement, the meter shall be calibrated using the calibrator for 94.0 dB at 1000 Hz. If the difference in the calibration level before and after measurement is more than 1.0 dB, the measurement will be considered invalid and repeat of noise measurement is required after re-calibration or repair of the equipment.
- The wind speed at the monitoring station shall be checked with the portable wind meter.
- Noise monitoring should be cancelled in the presence of fog, rain, and wind with a steady speed exceeding 5 m/s, or wind with gusts exceeding 10 m/s. Noise measurement should be paused during periods of high intrusive noise if possible and observation shall be recorded when intrusive noise is not avoided.
- At the end of the monitoring period, the Leq, L₁₀ and L₉₀ shall be recorded. In addition, site conditions and noise sources should be recorded on a standard record sheet.

3.5 Maintenance and Calibration

Monitoring equipment was calibrated by the HOKLAS Laboratory for every year and on-site calibrated before and after every monitoring.

3.6 Quality Assurance / Quality Control Results and Detection Limits

The sound level meter and calibrator were calibrated annually by the HOKLAS laboratory. The detection limits of the sound level meter meet with the prescribed standard. Calibration details and current Calibration Certificates are shown in [Appendix D](#).

3.7 Action and Limit Level for Construction Noise

The Action and Limit levels for construction noise are defined in [Table 3.7.1](#). Should exceedance of the criteria occur, action in accordance with the Action Plan in [Table 3.7.2](#) shall be carried out.

Table 3.7.1 Action and Limit Levels for Construction Noise at all Sensitive Receivers

Monitoring Locations	Building Type	Time Period	Action Level	Limit Level
NM1	Residential	Daytime 0700 – 1900 hrs on normal weekdays	When one documented complaint is received	75 dB(A)
NM2	Education			70 dB(A) / 65dB(A)*
NM3	Residential			75 dB(A)
NM4	Education			70 dB(A) / 65dB(A)*
NM5	Residential			75 dB(A)

*Remark: 70dB(A) and 65dB(A) for schools during normal teaching periods and school examination periods, respectively.

Table 3.7.2 Event / Action Plan for Construction Noise

EVENT	ACTION			
	ET	IEC	ER	CONTRACTOR
Action Level	1. Notify IEC, ER and Contractor of exceedance; 2. Identify source 3. Investigate the causes of exceedance and propose remedial measures; 4. Report the results of investigation to the IEC, ER and Contractor; 5. Discuss with the IEC, ER and Contractor and formulate remedial measures; 6. Increase monitoring frequency to check mitigation effectiveness.	1. Review the analysed results submitted by the ET; 2. Review the proposed remedial measures by the Contractor and advise the ER accordingly; 3. Supervise the implementation of remedial measures.	1. Confirm receipt of notification of failure in writing; 2. Notify Contractor; 3. Require Contractor to propose remedial measures for the analysed noise problem; 4. Ensure remedial measures are properly implemented	1. Submit noise mitigation proposals to ER with copy to ET and IEC; 2. Implement noise mitigation proposals.
Limit Level	1. Inform IEC, ER, EPD and Contractor; 2. Identify source; 3. Repeat measurements to confirm findings; 4. Increase monitoring frequency; 5. Carry out analysis of Contractor's working procedures to determine possible mitigation to be implemented; 6. Inform IEC, ER and EPD the causes and actions taken for the exceedances; 7. Assess effectiveness of Contractor's remedial actions and keep IEC, EPD and ER informed of the results; 8. If exceedance stops, cease additional monitoring.	1. Discuss amongst ER, ET, and Contractor on the potential remedial actions; 2. Review Contractor's remedial actions whenever necessary to assure their effectiveness and advise the ER accordingly; 3. Supervise the implementation of remedial measures.	1. Confirm receipt of notification of failure in writing; 2. Notify Contractor; 3. Require Contractor to propose remedial measures for the analysed noise problem; 4. Ensure remedial measures are properly implemented; 5. If exceedance continues, investigate what portion of the work is responsible and instruct the Contractor to terminate that portion of work until the exceedance ceases.	1. Take immediate action to avoid further exceedance; 2. Submit proposals for remedial actions to ER with copy to ET and IEC within 3 working days of notification; 3. Implement the agreed proposals; 4. Resubmit proposals if problem still not under control; 5. Terminate the relevant portion of works as determined by the ER until the exceedance ceases.

3.8 Monitoring Results and Observations

Noise impact monitoring was conducted at five monitoring locations. The monitoring results are summarized in [Table 3.8.1](#). Detailed impact monitoring data of noise are shown in [Appendix F1](#).

Table 3.8.1 Summary of average noise monitoring data

Monitoring Locations	Monitoring Date	Baseline Level (dB(A))	L _{Aeq} * ¹ (dB(A))	Re-M* ² L _{Aeq} (dB(A))	Action Level (dB(A))	Limit Level (dB(A))
NM1	3/12/2019	75.1	67.2	N/A	When one documented complaint is received	75 dB(A)
	9/12/2019		67.4	N/A		
	14/12/2019		68.1	N/A		
	20/12/2019		67.3	N/A		
	24/12/2019		65.8	N/A		
	30/12/2019		65.2	N/A		
NM2	3/12/2019	66.5	64.8	N/A	When one documented complaint is received	70 dB(A) * ³
	9/12/2019		64.1	N/A		70 dB(A) * ³
	14/12/2019		63.9	N/A		70 dB(A) * ³
	20/12/2019		62.8	N/A		70 dB(A) * ³
	24/12/2019		64.1	N/A		70 dB(A) * ³
	30/12/2019		64.2	N/A		70 dB(A) * ³
NM3	3/12/2019	74.5	74.0	N/A	When one documented complaint is received	75 dB(A)
	9/12/2019		74.2	N/A		
	14/12/2019		74.4	N/A		
	20/12/2019		74.1	N/A		
	24/12/2019		73.8	N/A		
	30/12/2019		73.9	N/A		
NM4	3/12/2019	73.3	78.6	78.9	When one documented complaint is received	70 dB(A) * ³
	9/12/2019		75.4	75.2		70 dB(A) * ³
	14/12/2019		75.2	76.0		65 dB(A) * ⁴
	20/12/2019		73.8	73.3		70 dB(A) * ³
	24/12/2019		73.7	74.1		70 dB(A) * ³
	30/12/2019		74.0	74.1		70 dB(A) * ³
NM5	3/12/2019	71.8	73.2	N/A	When one documented complaint is	75 dB(A)
	9/12/2019		73.0	N/A		
	14/12/2019		71.2	N/A		

	20/12/2019		70.8	N/A	received	
	24/12/2019		72.1	N/A		
	30/12/2019		70.9	N/A		

Remark:

*¹ Measured result would be rounded down before comparison with the limit level

*² Repeat noise measurement when exceedance is recorded

*³ 70dB(A) for schools during normal teaching periods. School schedule is shown in [Appendix F2](#)

*⁴ 65dB(A) for schools examination periods. School schedule is shown in [Appendix F2](#)

In accordance with the established action and limited levels for impact monitoring, six exceedances were recorded at NM4 on 3, 9, 14, 20, 24 and 30 December 2019 for Noise. Noise measurement was repeated for confirming the findings and identifying the noise source for each exceedance according to the event and action plan.

The noise source for causing exceedances at NM4 was from the traffic of Canton Road. The NM4 was directly affected by the noise generated from the traffic. The recorded monitoring results at the NM4 were near the baseline noise level. The exceedances were not caused by the construction works of this project.

During the monitoring period, traffic noise was identified as one of the noise source for NM2, NM3, NM4 and NM5. Noise levels of NM3 may be influenced by the construction activities from other construction sites near Nga Cheung Road. Noise level of NM2 may be influenced by construction activities from other construction sites near Hoi Ting Road. Noise levels of NM4 and NM5 may be influenced by the construction activities from other construction sites near Canton Road.

3.9 Monitoring Schedule for Next Reporting Month

Noise monitoring for next reporting month is scheduled on 3, 8, 14, 20, 23 and 29 January 2020.

4 Solid and Liquid Waste Management Status

With reference to relevant handling records and trip tickets of this Project, the quantities of different types of waste generated in the reporting month are summarised in [Table 4.1](#). During this reporting month, inert C&D materials and general refuse were generated and disposed. No mixed waste was generated. No chemical waste was generated and collected by licensed collector. No paper, plastic and metal was recycled. Detail of waste management data is presented in [Appendix G](#).

Table 4.1 Quantities of Waste Disposed from the Project

Reporting Month	Quantity						
	C&D Materials (inert) ^(a)	C&D Materials (non-inert) ^(b)					
		General Refuse	Mixed Waste	Chemical Waste	Recycled materials		
					Paper/ cardboard	Plastics	Metals
	(in '000kg)	(in '000kg)	(in '000kg)	(in '000kg)	(in '000kg)	(in '000kg)	(in '000kg)
Dec 2019	1432.23	59.93	0	0	0	0	0
Notes:							
(a) Inert C&D materials include bricks, concrete, building debris, rubble and excavated soil.							
(b) Non-inert C&D materials include steel, paper/cardboard packaging waste, plastics and other wastes such as general refuse and vegetative wastes. Steel metal generated from the Project are grouped into non-inert C&D materials as the materials were not disposed of with other inert C&D materials.							

Waste materials were generated during this reporting period, such as excavated waste, demolition waste and general refuse. Contractor handled, stored and disposed in accordance with good waste management practice and EPD's regulation and requirements.

5 Landscape and Visual Impact

In accordance with the EM&A Manual, the landscape and visual mitigation measures shall be implemented to minimize the landscape and visual impacts during the construction works. The proposed monitoring program for landscape and visual impact is detailed in [Table 5.1](#).

Table 5.1 Proposed Monitoring Program

Stage	Monitoring Task	Frequency	Report	Approval
Construction stage	Mitigation measures implementation	Bi-weekly	Landscape and Visual Impact Assessment Checklist	Registered Landscape Architect & ET Leader

Bi-weekly site inspections were conducted by representatives of the Engineer, Contractor and ET on 12 and 27 December 2019. The observations, reminders and recommendations made during the site inspections are summarized in Section 6, [Table 6.1](#).

The implementation status of the proposed mitigation measures for landscape and visual impacts is given in [Appendix H](#). Should non-conformity on one occur, action in accordance with the Action Plan in [Table 5.2](#) shall be carried out.

Table 5.2 Event / Action Plan for Landsscape and Visual Impact

EVENT	ACTION			
	ET	IEC	ER	CONTRACTOR
Non-conformity on one occasion	1. Identify Source 2. Inform IEC and ER 3. Discuss remedial actions with IEC, ER and Contractor 4. Monitor remedial actions until rectification has been completed	1. Check report 2. Check Contractor's working method 3. Discuss with ET and Contractor on possible remedial measures 4. Advise ER on effectiveness of proposed remedial measures. 5. Check implementation of remedial measures.	1. Notify Contractor 2. Ensure remedial measures are properly implemented	1. Amend working methods 2. Rectify damage and undertake any necessary replacement
Repeated Non-conformity	1. Identify Source 2. Inform IEC and ER 3. Increase monitoring frequency 4. Discuss remedial actions with IEC, ER and Contractor 5. Monitor remedial actions until rectification has been completed 6. If non-conformity stops, cease additional monitoring	1. Check monitoring report 2. Check Contractor's working method 3. Discuss with ET and Contractor on possible remedial measures 4. Advise ER on effectiveness of proposed remedial measures 5. Supervise implementation of remedial measures.	1. Notify Contractor 2. Ensure remedial measures are properly implemented	1. Amend working methods 2. Rectify damage and undertake any necessary replacement

6 Environmental Site Inspection

6.1 Site Audit

Site audit was carried out by ET on weekly basis to monitor the timely implementation of proper environmental management practices and mitigation measures in the Project site.

Joint weekly inspections were conducted by representatives of the Contract Administrator, Engineer, Contractor and ET on 4, 11, 20 and 27 December 2019. The representative of the IEC conducted the site inspection on 11 December 2019. Observations were recorded and summarized in Table 6.1.

During site inspection in the reporting month, no non-compliance was identified.

6.2 Implementation Status of Environmental Mitigation Measures

According to the EM&A Manual of the Project, the mitigation measures detailed in the documents shall be implemented during the construction phase. Updated status summary of the Environmental Mitigation Implementation Schedule is provided in [Appendix H](#).

The observations, reminders and recommendations made during the audit sessions are summarized in [Table 6.1](#).

Table 6.1 Summary results of site inspections findings.

Date	Findings	Identification	Advice from ET	Action taken	Closing date
4 Dec 19	Exposed road surface was dry and dusty.	Observation	Contractor was advised to carry out water spraying for dust suppression	Water spraying was implemented.	11 Dec 19
11 Dec 19	Muddy track was observed at the site exit point.	Observation	Contractor was advised to clear the muddy track.	The tyre track was properly cleared.	20 Dec 19
11 Dec 19	Exposed surface was observed.	Reminder	Contractor was reminded to regularly implement water spraying for dust control.	N/A	N/A
20 Dec 19	Cement was not properly stored	Observation	Contractor was advised to properly store the cement materials for preventing dust pollution	Cement materials were properly covered.	27 Dec 19
27 Dec 19	Exposed surface was dry and dusty.	Observation	Contractor was advised to frequently conduct water spray to the exposed surface for dust control.	The follow-up status will be reported in the next reporting period.	N/A
Landscape and Visual Impact					
8 Feb 19 21 Feb 19 8 Mar 19 19 Mar 19 4 Apr 19 18 Apr 19 2 May 19 16 May 19 30 May 19 2 May 19 16 May 19 30 May 19 13 Jun 19 27 Jun 19 11 Jul 19 25 Jul 19 8 Aug 19 22 Aug 19 5 Sep 19 19 Sep 19 3 Oct 19 17 Oct 19 31 Oct 19 14 Nov 19 28 Nov 19 12 Dec 19 27 Dec 19	Construction materials were piled within the TPZ of T25.	Observation	Contractor was reminded to relocate the construction materials which were piled within the TPZ	The follow-up status will be reported in the next reporting period.	N/A
12 Dec 19 27 Dec 19	No stabilization system was provided for T41, T44, T58, WKI 230, WKI 293, WKI 314 and WKI 316.	Reminder	Contractor was reminded to provide stabilization system after the transplantation.	N/A	N/A
12 Dec 19 27 Dec 19	No mulching was provided for transplanted trees.	Reminder	Contractor was reminded to provide stabilization system after the transplantation.	N/A	N/A
18 Apr 19	Soil loss was observed at	Observation	Backfilling with soil was	The follow-up status	N/A

Date	Findings	Identification	Advice from ET	Action taken	Closing date
2 May 19 16 May 19 30 May 19 13 Jun 19 27 Jun 19 11 Jul 19 25 Jul 19 8 Aug 19 22 Aug 19 5 Sep 19 19 Sep 19 3 Oct 19 17 Oct 19 31 Oct 19 14 Nov 19 28 Nov 19 12 Dec 19 27 Dec 19	T12, T15, T16, T17 and T19		required	will be reported in the next reporting period.	
13 Jun 19 27 Jun 19 11 Jul 19 25 Jul 19 8 Aug 19 22 Aug 19 5 Sep 19 19 Sep 19 3 Oct 19 17 Oct 19 31 Oct 19 14 Nov 19 28 Nov 19 12 Dec 19 27 Dec 19	Plants and materials were placed near the root zone of transplanted trees T6, T9, T11, T12, T13, T16, T17, T19, T41, T44, T58, WKI316 & WKI230.	Observation	Contractor was advised to remove the plants and materials.	The follow-up status will be reported in the next reporting period.	N/A
12 Dec 19 27 Dec 19	The health condition of the transplanted Tree was declining.	Reminder	Contractor was reminded to provide appropriate maintenance works for the transplanted trees.	N/A	N/A
12 Dec 19 27 Dec 19	For the retain trees, WKI 381 and WKI 383, in Scheme Q1, the root zones of the retained trees were fenced off by other department for laying water mains.	Reminder	Contractor should remain the related department to relocate the construction materials which were piled within TPZ, provide robust TPZ for the trees and avoid damaging the root zone under the dripline.	N/A	N/A

7 Environmental Non-Conformance

7.1 Summary of Environmental Exceedances

No exceedance of action level and limit level was recorded for TSP. Six exceedances were recorded at NM4 on 3, 9, 14, 20, 24 and 30 December 2019 for Noise.

7.2 Summary of Environmental Non-Compliance

No environmental non-compliance was recorded in the reporting month.

7.3 Summary of Environmental Complaint

No environmental complaint was recorded in the reporting month.

7.4 Summary of Notification of Summons and Successful Prosecution

There was no successful environmental prosecution or notification of summons received since the Project commencement.

The cumulative log for environmental exceedance, non-compliance, complaint and summon and successful prosecution since the commencement of the Project is presented in [Appendix I](#).

8 Future Key Issues

The major construction activities in the coming month will include:

- Portion I – Pile Cap, Pier and Bridge Deck Construction Works
- Portion I – E&M Installation and Road Works
- Portion HA – Road Pavement, Street Furniture Installation

Potential environmental impacts arising from the above construction activities are mainly associated with dust, construction noise, water quality and waste management. The Contractor has been reminded to properly implement dust, construction noise and water quality control measures as well as proper waste management in order to minimize the potential environmental impacts due to the construction works of this Project.

9 Comment, Recommendations and Conclusions

9.1 Comment

The recommended mitigation measures accordance with the EM&A Manual had been effectively implemented to minimize the environmental impacts due to the construction. The contractor had implemented the mitigation measures to control the dust and noise impacts. No dust and noise impacts obviously affected to the environment and sensitive receivers. The follow up actions were implemented for environmental observations made during the site inspections. The environmental performance during the reporting period was considered satisfactory.

9.2 Recommendations

According to the environmental audit performed in the reporting month, the following recommendation was made:

Dust/ Air Pollutions

- To carry out water spraying for dust suppression.
- To clear the muddy track.
- To properly store the cement materials for preventing dust pollution.

Visual and Landscape Impact

- To remove the constructions materials near the retained plants and set up a tree protection zone for preventing any damage.
- To relocate the construction materials which were piled within the TPZ.
- To provide mulching and stabilization system after the transplantation.
- To backfilling with soil.
- To provide appropriate maintenance works for the transplanted trees.
- To implement watering.
- To remain the related department to relocate the construction materials which were piled within TPZ, provide robust TPZ for the trees and avoid damaging the root zone under the dripline.

9.3 Conclusions

This is the monthly Environmental Monitoring and Audit (EM&A) Report presenting the EM&A works undertaken from 1 December 2019 to 31 December 2019 in

accordance with the EM&A Manual.

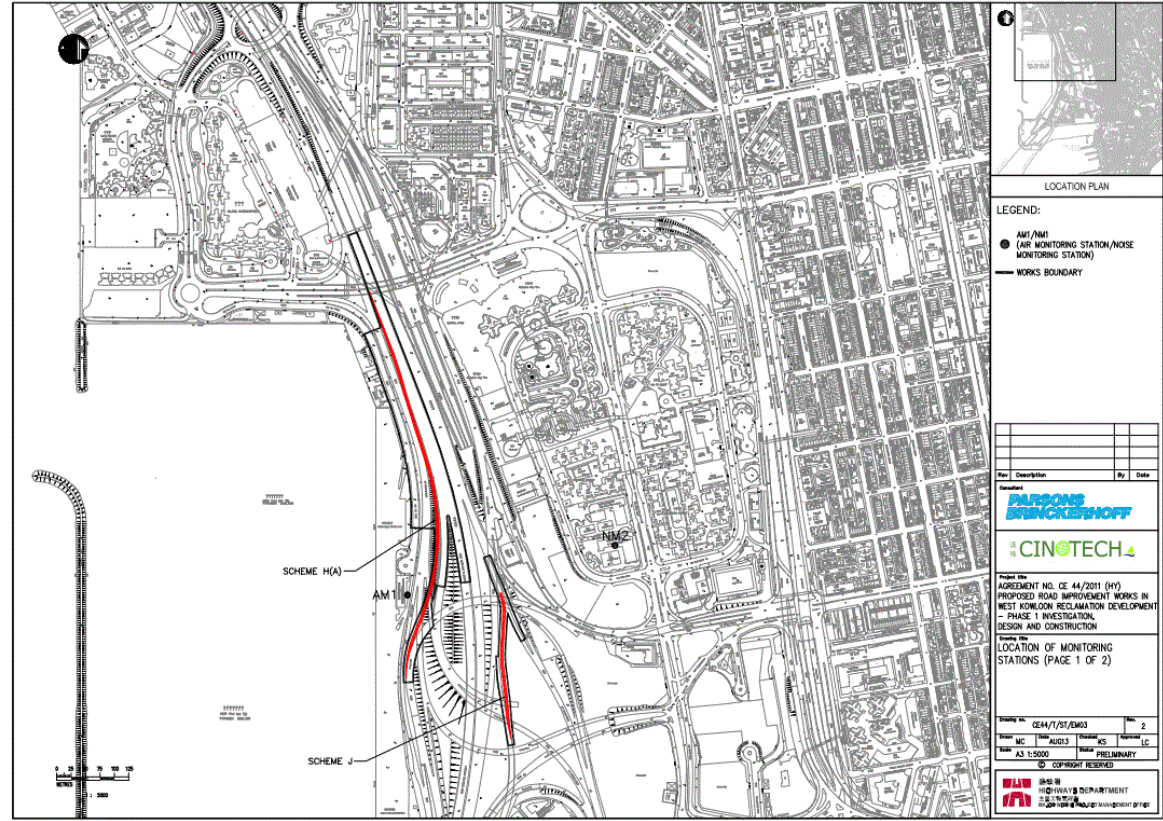
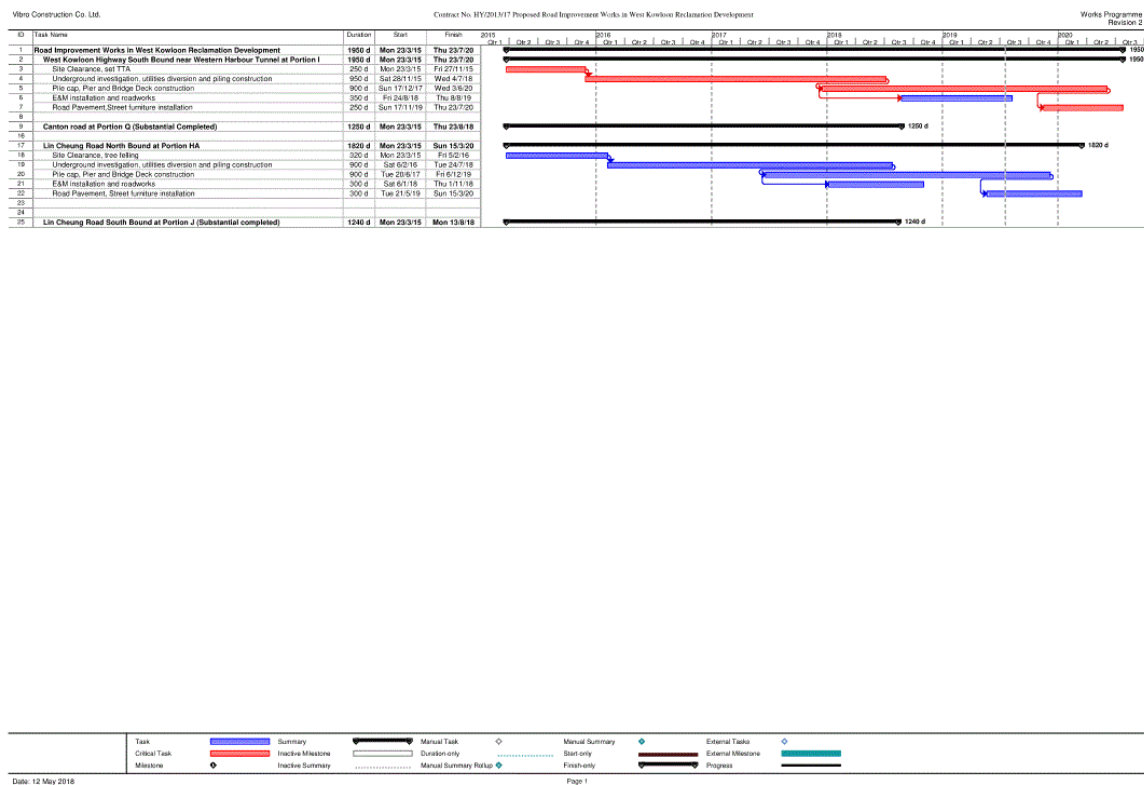
No exceedance of action level and limit level was recorded for TSP. Six exceedances were recorded at NM4 on 3, 9, 14, 20, 24 and 30 December 2019 for Noise. No Non-compliance event, complaint, notification of summons and successful prosecution against the Project were received in this reporting month.

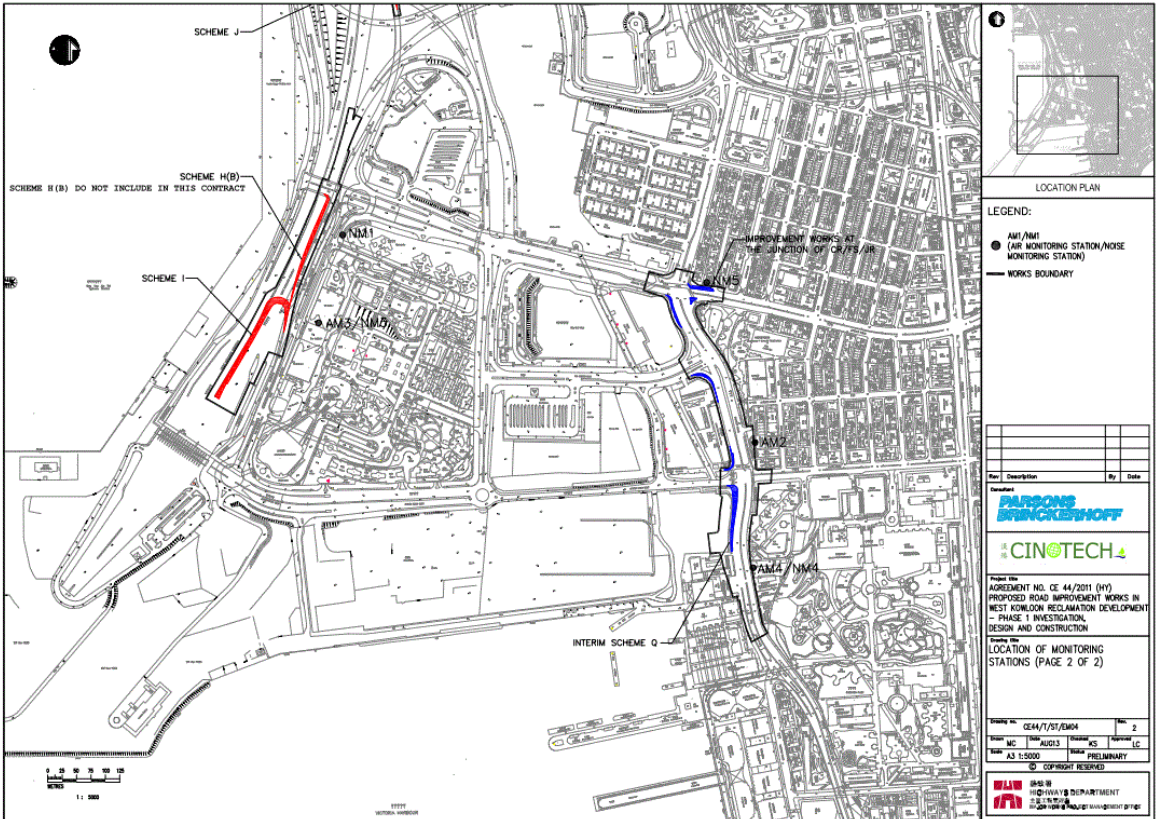
4 nos. of environmental site inspections and 2 nos. of landscape and visual inspections were carried out in this reporting month. Recommendations on remedial actions were given to the Contractor for the deficiencies identified during the site audit.

ET has reminded the contractor to provided environmental pollution control measures, waste management measures and good site practice.

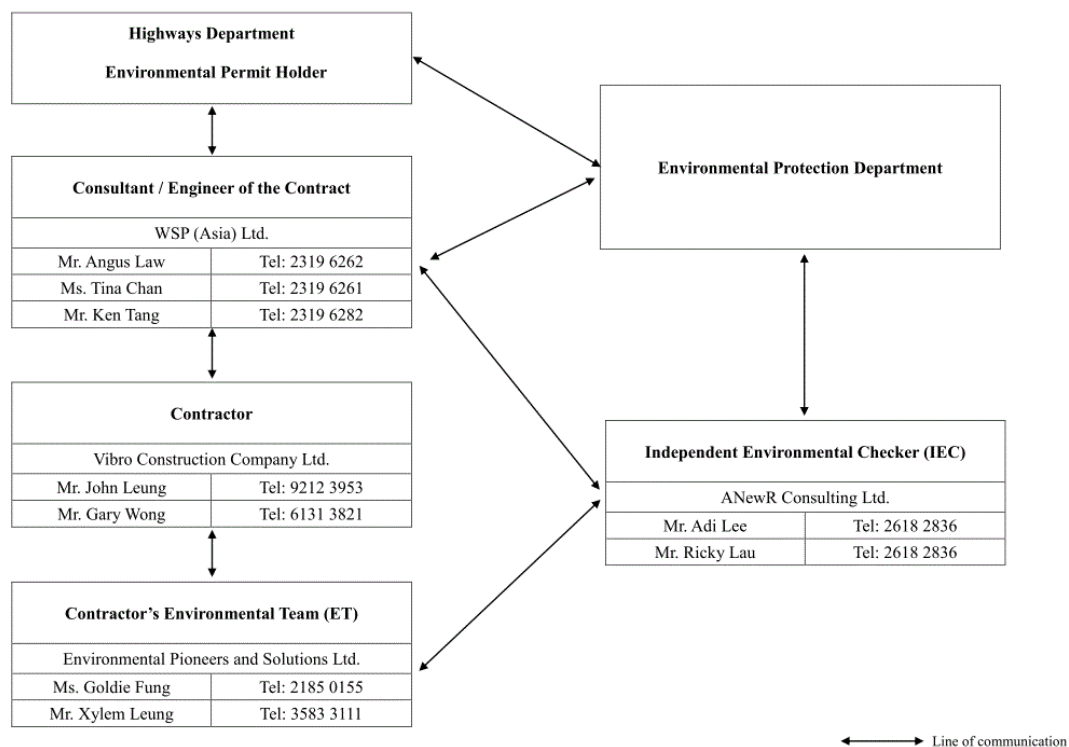
ET will keep tracking of the EM&A programme to ensure compliance of environmental requirements and the proper implementation of all the necessary mitigation measures.

Appendix A: Construction Programme and Project Layout Plan



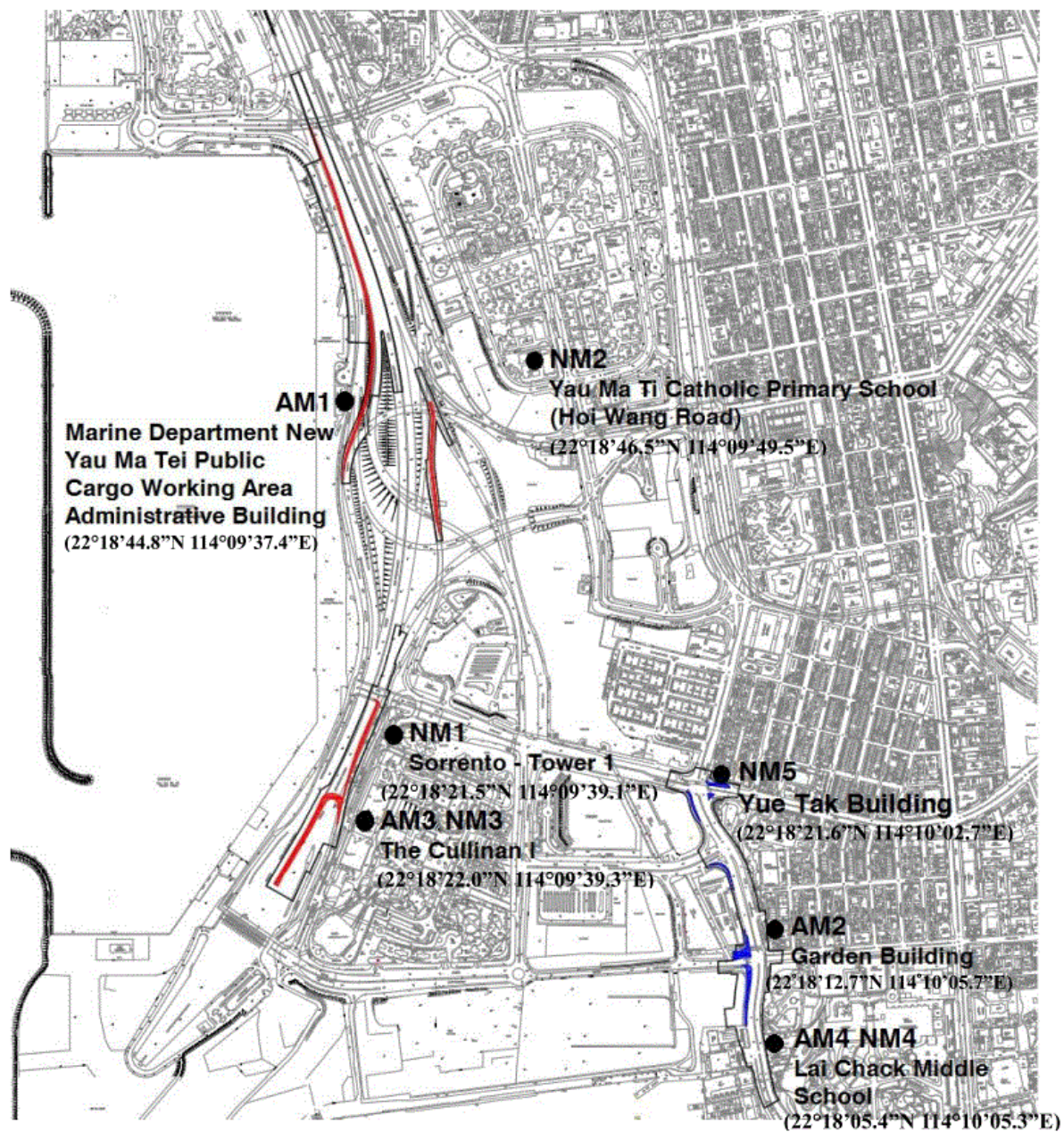






Appendix B: Project Organization Chart

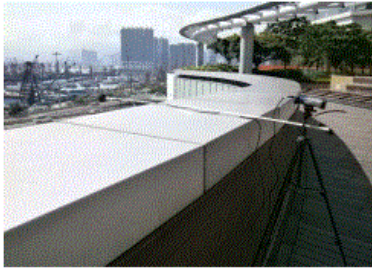






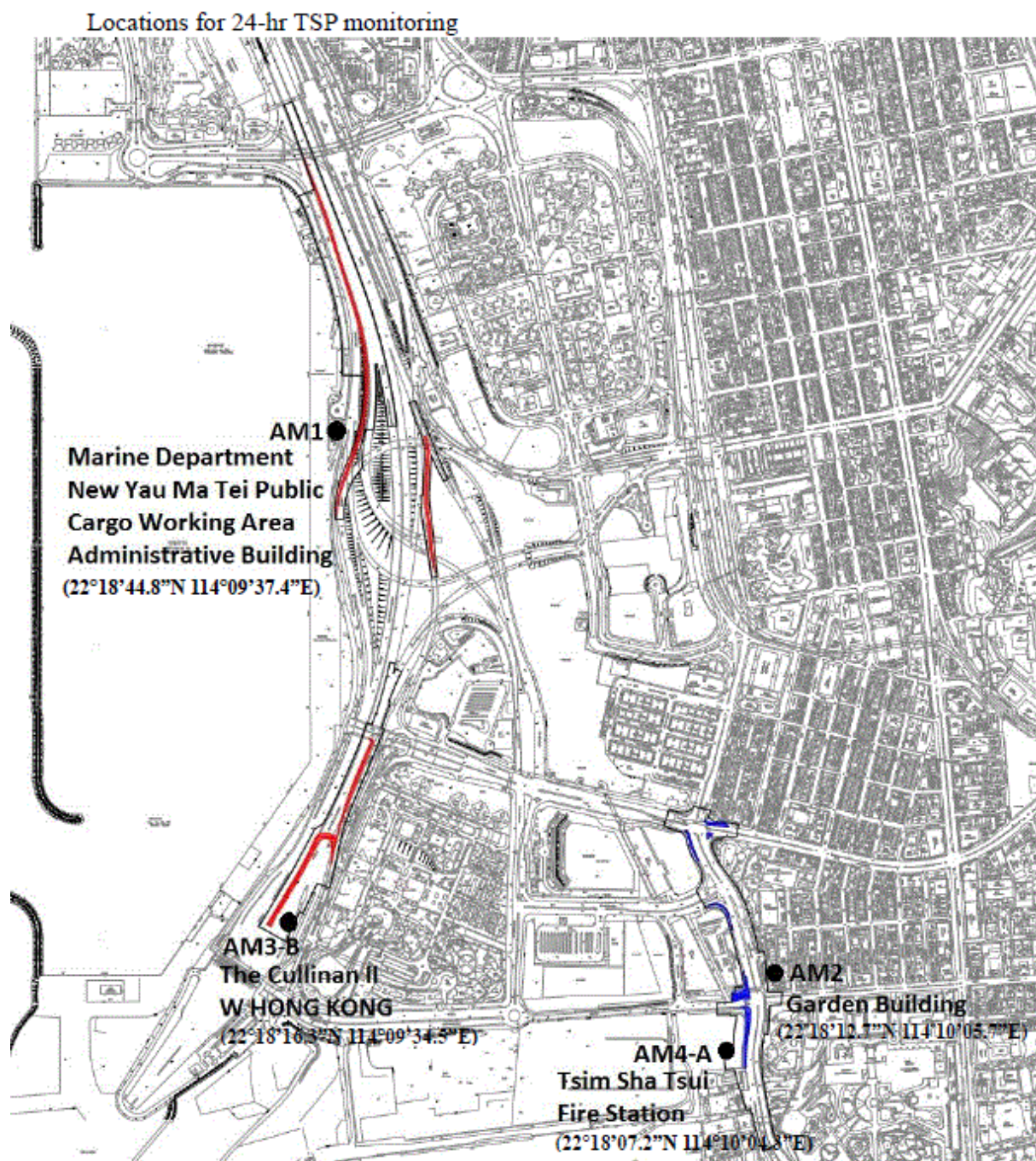
Appendix C: Monitoring Locations

Locations for 1-hr TSP and Noise monitoring




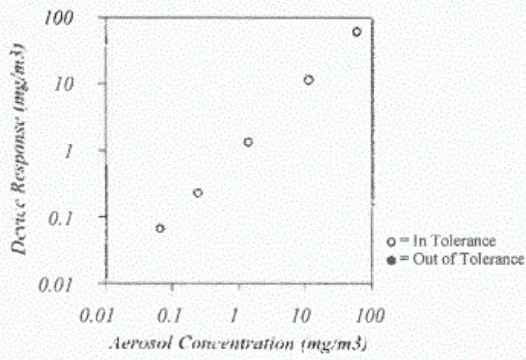
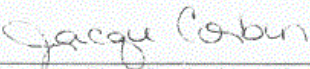
Monitoring Location	Photo Record
AM1 Marine Department New Yau Ma Tei Public Cargo Working Area Administrative Building	
AM2 Garden Building	
AM3 The Cullinan I	
AM4 Lai Chack Middle School	


Monitoring Location	Photo Record
NM1 Sorrento - Tower 1	
NM2 Yau Ma Tei Catholic Primary School (Hoi Wang Road)	
NM3 The Cullinan I	
NM4 Lai Chack Middle School	
NM5 Yue Tak Building	



Monitoring Location	Photo Record
<p>AM1</p> <p>Marine Department New Yau Ma Tei Public Cargo Working Area Administrative Building</p>	
<p>AM2</p> <p>Garden Building</p>	
<p>AM3-B</p> <p>The Cullinan II (W Hong Kong)</p>	
<p>AM4-A</p> <p>Tsim Sha Tsui Fire Station</p>	

Appendix D: Calibration Certification

 CERTIFICATE OF CALIBRATION AND TESTING TSI Incorporated, 500 Cardigan Road, Shoreview, MN 55126 USA Tel: 1-800-874-2811 1-651-490-2811 Fax: 1-651-490-3824 http://www.tsi.com																																											
Environment Conditions <table border="1"> <tr> <td>Temperature</td> <td>74.49 (23.6)</td> <td>°F (°C)</td> </tr> <tr> <td>Relative Humidity</td> <td>49.5</td> <td>%RH</td> </tr> <tr> <td>Barometric Pressure</td> <td>28.94 (980.0)</td> <td>inHg (hPa)</td> </tr> </table>		Temperature	74.49 (23.6)	°F (°C)	Relative Humidity	49.5	%RH	Barometric Pressure	28.94 (980.0)	inHg (hPa)	<table border="1"> <tr> <td>Model</td> <td>AM520</td> </tr> <tr> <td>Serial Number</td> <td>5201932015</td> </tr> </table>		Model	AM520	Serial Number	5201932015																											
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<input checked="" type="checkbox"/> As Left <input type="checkbox"/> As Found		<input checked="" type="checkbox"/> In Tolerance <input type="checkbox"/> Out of Tolerance																																									
<p align="center">Concentration Linearity Plot</p>  <p align="right">System ID: DTH01-01</p>																																											
<table border="1"> <thead> <tr> <th colspan="4">CONCENTRATION</th> <th colspan="4">Unit: mg/m³</th> </tr> <tr> <th>#</th> <th>STANDARD</th> <th>MEASURED</th> <th>ALLOWABLE RANGE</th> <th>#</th> <th>STANDARD</th> <th>MEASURED</th> <th>ALLOWABLE RANGE</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>0.066</td> <td>0.065</td> <td>0.046–0.086</td> <td>4</td> <td>11.207</td> <td>11.139</td> <td>10.086–12.328</td> </tr> <tr> <td>2</td> <td>0.239</td> <td>0.229</td> <td>0.203–0.275</td> <td>5</td> <td>60.404</td> <td>60.202</td> <td>54.364–66.444</td> </tr> <tr> <td>3</td> <td>1.379</td> <td>1.325</td> <td>1.241–1.517</td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>				CONCENTRATION				Unit: mg/m ³				#	STANDARD	MEASURED	ALLOWABLE RANGE	#	STANDARD	MEASURED	ALLOWABLE RANGE	1	0.066	0.065	0.046–0.086	4	11.207	11.139	10.086–12.328	2	0.239	0.229	0.203–0.275	5	60.404	60.202	54.364–66.444	3	1.379	1.325	1.241–1.517				
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<p><i>TSI Incorporated does hereby certify that all materials, components, and workmanship used in the manufacture of this equipment are in strict accordance with the applicable specifications agreed upon by TSI and the customer and with all published specifications. All performance and acceptance tests required under this contract were successfully conducted according to required specifications. There is no NIST standard for optical mass measurements. Calibration of this instrument performed by TSI has been done using emery oil and has been nominally adjusted to respirable mass per standard ISO 12103-1, A1 test dust (Arizona dust). Our calibration ratio is greater than 4:1</i></p>																																											
<table border="1"> <thead> <tr> <th>Measurement Variable</th> <th>System ID</th> <th>Last Cal.</th> <th>Cal. Due</th> </tr> </thead> <tbody> <tr> <td>Photometer</td> <td>E003433</td> <td>03-19-19</td> <td>09-30-19</td> </tr> <tr> <td>DC Voltage(Keithley)</td> <td>E002859</td> <td>08-21-18</td> <td>08-31-19</td> </tr> <tr> <td>Temp/Humidity</td> <td>E005410</td> <td>10-15-18</td> <td>10-31-19</td> </tr> <tr> <td>Temp/Humidity</td> <td>E005409</td> <td>10-12-18</td> <td>10-31-19</td> </tr> </tbody> </table>		Measurement Variable	System ID	Last Cal.	Cal. Due	Photometer	E003433	03-19-19	09-30-19	DC Voltage(Keithley)	E002859	08-21-18	08-31-19	Temp/Humidity	E005410	10-15-18	10-31-19	Temp/Humidity	E005409	10-12-18	10-31-19	<table border="1"> <thead> <tr> <th>Measurement Variable</th> <th>System ID</th> <th>Last Cal.</th> <th>Cal. Due</th> </tr> </thead> <tbody> <tr> <td>Flowmeter</td> <td>E004570</td> <td>06-13-19</td> <td>06-30-20</td> </tr> <tr> <td>Microbalance</td> <td>M001324</td> <td>10-03-18</td> <td>10-31-20</td> </tr> <tr> <td>Pressure</td> <td>E005651</td> <td>07-18-19</td> <td>07-31-20</td> </tr> </tbody> </table>		Measurement Variable	System ID	Last Cal.	Cal. Due	Flowmeter	E004570	06-13-19	06-30-20	Microbalance	M001324	10-03-18	10-31-20	Pressure	E005651	07-18-19	07-31-20				
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Pressure	E005651	07-18-19	07-31-20																																								
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CERTIFICATE OF CALIBRATION AND TESTING

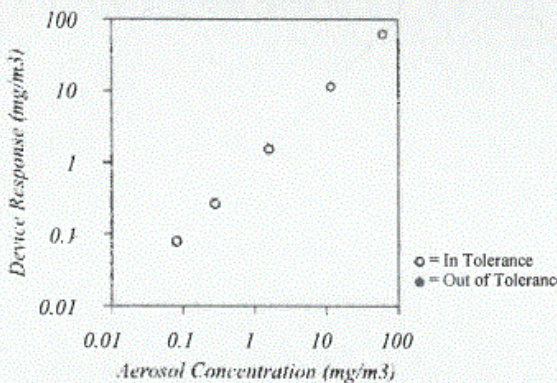
TSI Incorporated, 500 Cardigan Road, Shoreview, MN 55126 USA
Tel: 1-800-874-2811 1-651-490-2811 Fax: 1-651-490-3824 http://www.tsi.com

Environment Conditions			Model	AM520
Temperature	73.14 (22.9)	°F (°C)	Serial Number	5201932016
Relative Humidity	47.4	%RH		
Barometric Pressure	28.97 (981.0)	inHg (hPa)		

☒ As Left
☐ As Found

☒ In Tolerance
☐ Out of Tolerance

Concentration Linearity Plot



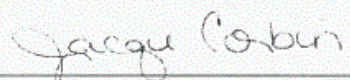
System ID: DTH01-01

CONCENTRATION				Unit: mg/m3			
#	STANDARD	MEASURED	ALLOWABLE RANGE	#	STANDARD	MEASURED	ALLOWABLE RANGE
1	0.081	0.079	0.057~0.105	4	11.512	11.444	10.361~12.663
2	0.278	0.268	0.236~0.320	5	62.247	61.693	56.022~68.472
3	1.601	1.534	1.441~1.761				

TSI Incorporated does hereby certify that all materials, components, and workmanship used in the manufacture of this equipment are in strict accordance with the applicable specifications agreed upon by TSI and the customer and with all published specifications. All performance and acceptance tests required under this contract were successfully conducted according to required specifications. There is no NIST standard for optical mass measurements. Calibration of this instrument performed by TSI has been done using emery oil and has been nominally adjusted to respirable mass per standard ISO 12103-1. A1 test dust (Arizona dust). Our calibration ratio is greater than 4:1

Measurement Variable	System ID	Last Cal.	Cal. Due
Photometer	E003433	03-19-19	09-30-19
DC Voltage(Keithley)	E002859	08-21-18	08-31-19
Temp/Humidity	E005410	10-15-18	10-31-19
Temp/Humidity	E005409	10-12-18	10-31-19

Measurement Variable	System ID	Last Cal.	Cal. Due
Flowmeter	E004570	06-13-19	06-30-20
Microbalance	M001324	10-03-18	10-31-20
Pressure	E005651	07-18-19	07-31-20



Calibrated


August 13, 2019

Date

TSI PN 2360157

Environmental Pioneers & Solutions Limited

Page 40



CERTIFICATE OF CALIBRATION AND TESTING

TSI Incorporated, 500 Cardigan Road, Shoreview, MN 55126 USA
Tel: 1-800-874-2811 1-651-490-2811 Fax: 1-651-490-3824 http://www.tsi.com

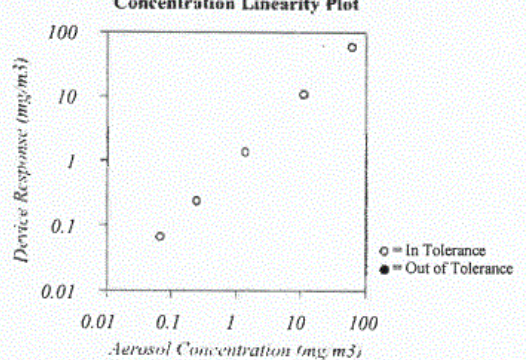
Environment Conditions			
Temperature	74.98 (23.9)	°F (°C)	
Relative Humidity	47.7	%RH	
Barometric Pressure	28.96 (980.7)	inHg (hPa)	

Model	AM520
Serial Number	5201933005

☒ As Left
 ☐ As Found

☒ In Tolerance
 ☐ Out of Tolerance

Concentration Linearity Plot



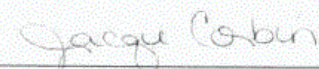
System ID: DT1101-01

CONCENTRATION				Unit: mg/m3			
#	STANDARD	MEASURED	ALLOWABLE RANGE	#	STANDARD	MEASURED	ALLOWABLE RANGE
1	0.068	0.068	0.048~0.088	4	11.185	11.111	10.066~12.304
2	0.243	0.239	0.207~0.279	5	60.075	59.832	54.067~66.083
3	1.403	1.358	1.263~1.543				

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Measurement Variable	System ID	Last Cal.	Cal. Due
Photometer	E003433	03-19-19	09-30-19
DC Voltage(Keithley)	E002859	08-21-18	08-31-19
Temp/Humidity	E005410	10-15-18	10-31-19
Temp/Humidity	E005409	10-12-18	10-31-19


Measurement Variable	System ID	Last Cal.	Cal. Due
Flowmeter	E004570	06-13-19	06-30-20
Microbalance	M001324	10-03-18	10-31-20
Pressure	E005651	07-18-19	07-31-20



Calibrated

August 13, 2019

Date



CERTIFICATE OF CALIBRATION AND TESTING

TSI Incorporated, 500 Cardigan Road, Shoreview, MN 55126 USA
Tel: 1-800-874-2811 1-651-490-2811 Fax: 1-651-490-3824 <http://www.tsi.com>

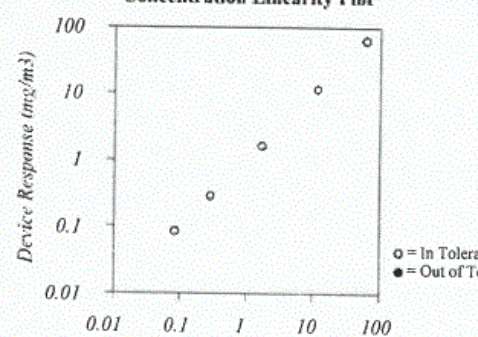
Environment Conditions		
Temperature	73.3 (22.9)	°F (°C)
Relative Humidity	46	%RH
Barometric Pressure	28.97 (981.0)	inHg (hPa)

Model	AM520
Serial Number	5201933006

☒ As Left
☐ As Found

☒ In Tolerance
☐ Out of Tolerance

Concentration Linearity Plot



○ = In Tolerance
● = Out of Tolerance

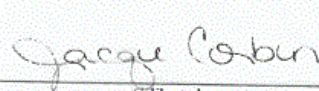
System ID: DTII01-01

CONCENTRATION				Unit: mg/m3			
#	STANDARD	MEASURED	ALLOWABLE RANGE	#	STANDARD	MEASURED	ALLOWABLE RANGE
1	0.083	0.083	0.058-0.108	4	11.419	11.425	10.277-12.561
2	0.290	0.278	0.247-0.333	5	61.302	61.286	55.172-67.432
3	1.687	1.603	1.518-1.856				

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Measurement Variable	System ID	Last Cal.	Cal. Due
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Temp/Humidity	E005409	10-12-18	10-31-19

Measurement Variable	System ID	Last Cal.	Cal. Due
Flowmeter	E004570	06-13-19	06-30-20
Microbalance	M001324	10-03-18	10-31-20
Pressure	E005651	07-18-19	07-31-20



Calibrated

August 13, 2019

Date

TSI P/N: 2200157



RECALIBRATION
DUE DATE:

February 7, 2020

Certificate of Calibration

Calibration Certification Information

Cal. Date: February 7, 2019 Rootsmeter S/N: 438320 Ta: 293 °K
Operator: Jim Tisch Pa: 744.22 mm Hg
Calibration Model #: TE-5028A Calibrator S/N: 3371

Run	Vol. Init (m3)	Vol. Final (m3)	ΔVol. (m3)	ΔTime (min)	ΔP (mm Hg)	ΔH (in H2O)
1	1	2	1	1.2590	4.3	1.50
2	3	4	1	0.9760	7.1	2.50
3	5	6	1	0.8880	8.5	3.00
4	7	8	1	0.8210	10.0	3.50
5	9	10	1	0.6180	17.3	6.00

Data Tabulation

Vstd (m3)	Qstd (x-axis)	$\sqrt{\Delta H \left(\frac{Pa}{Pstd} \right) \left(\frac{Tstd}{Ta} \right)}$ (y-axis)	Va	Qa (x-axis)	$\sqrt{\Delta H \left(\frac{Ta}{Pa} \right)}$ (y-axis)
0.9902	0.7865	1.2223	0.9942	0.7897	0.7685
0.9864	1.0107	1.5779	0.9905	1.0148	0.9921
0.9846	1.1088	1.7285	0.9886	1.1133	1.0868
0.9826	1.1968	1.8670	0.9866	1.2017	1.1739
0.9728	1.5741	2.4445	0.9768	1.5805	1.5369
QSTD	m=	1.54996	QA	m=	0.97056
	b=	0.00828		b=	0.00521
	r=	0.99996		r=	0.99996

Calculations

Vstd=	$\Delta Vol \left(\frac{Pa - \Delta P}{Pstd} \right) \left(\frac{Tstd}{Ta} \right)$	Va=	$\Delta Vol \left(\frac{Pa - \Delta P}{Pa} \right)$
Qstd=	Vstd/ΔTime	Qa=	Va/ΔTime
For subsequent flow rate calculations:			
Qstd=	$1/m \left(\sqrt{\Delta H \left(\frac{Pa}{Pstd} \right) \left(\frac{Tstd}{Ta} \right)} - b \right)$	Qa=	$1/m \left(\sqrt{\Delta H \left(\frac{Ta}{Pa} \right)} - b \right)$

Standard Conditions

Tstd:	298.15 °K
Pstd:	760 mm Hg
Key	
ΔH:	calibrator manometer reading (in H2O)
ΔP:	rootsmeter manometer reading (mm Hg)
Ta:	actual absolute temperature (°K)
Pa:	actual barometric pressure (mm Hg)
b:	intercept
m:	slope

RECALIBRATION

US EPA recommends annual recalibration per 1998 40 Code of Federal Regulations Part 50 to 51, Appendix B to Part 50, Reference Method for the Determination of Suspended Particulate Matter in the Atmosphere, 9.2.17, page 30.

Tisch Environmental, Inc.
145 South Miami Avenue
Village of Cleves, OH 45002

www.tisch-env.com
TOLL FREE: (877)263-7610
FAX: (513)467-9009



TE-5170 Calibration Worksheet

Site Information

Location: YMT Public Cargo Working Area	Date: 3-Dec-19
Location ID: AML	Tech: Eric Lai
Sampler: TE-5170 MFC (0001)	

Site Conditions

Barometric Pressure (in Hg): 30.50	Corrected Pressure (mm Hg): 775
Temperature (deg F): 65	Temperature (deg K): 291
Average Press. (in Hg): 29.65	Corrected Average (mm Hg): 753
Average Temp. (deg F): 65	Average Temp. (deg K): 291

Calibration Orifice

Make: Tisch	Qstd Slope: 1.54996
Model: TE-5028A	Qstd Intercept: 0.00828
Serial#: 3371	Date Certified: 7-Feb-19

Calibration Information

Plate or Test #	H2O (in)	Qstd (m3/min)	I (chart)	IC (corrected)	Linear Regression
1	1.80	0.879	20.0	20.42	Slope: 44.1450
2	3.20	1.173	34.0	34.72	Intercept: -17.6044
3	4.60	1.408	44.0	44.93	Corr. Coeff: 0.9985
4	5.80	1.581	52.0	53.10	
5	7.60	1.811	60.0	61.27	# of Observations: 5

Calculations

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

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

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:
 $1/m[(I[\sqrt{298/Ta}(Pav/760)] - b)]$

m = sampler slope
b = sampler intercept
I = chart response
Tav = daily average temperature
Pav = daily average pressure

Average I (chart): 50.0
Average Flow Calculation m3/min 1.539096724
Average Flow Calculation in CFM 54.34550534
Sample Time (Hrs): 24.0
Total Flow/Volume in m3 2216.299283
Total Flow in CFM 78257.52769



TE-5170 Calibration Worksheet

Site Information

Location: Canton Road Garden Building	Date: 3-Dec-19
Location ID: AM2	Tech: Eric Lai
Sampler: TE-5170 MFC (0002)	

Site Conditions

Barometric Pressure (in Hg): 30.50	Corrected Pressure (mm Hg): 775
Temperature (deg F): 65	Temperature (deg K): 291
Average Press. (in Hg): 29.65	Corrected Average (mm Hg): 753
Average Temp. (deg F): 65	Average Temp. (deg K): 291

Calibration Orifice

Make: Tisch	Qstd Slope: 1.54996
Model: TE-5028A	Qstd Intercept: 0.00828
Serial#: 3371	Date Certified: 7-Feb-19

Calibration Information

Plate or Test #	H2O (in)	Qstd (m3/min)	I (chart)	IC (corrected)	Linear Regression
1	1.80	0.879	20.0	20.42	Slope: 41.3351
2	3.40	1.209	30.0	30.63	Intercept: -17.5196
3	5.40	1.526	44.0	44.93	Corr. Coeff: 0.9944
4	6.60	1.687	50.0	51.06	
5	8.00	1.858	60.0	61.27	# of Observations: 5

Calculations

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

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

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

m = sampler slope
b = sampler intercept
I = chart response
Tav = daily average temperature
Pav = daily average pressure

Average I (chart): 50.0
Average Flow Calculation m3/min 1.641673233
Average Flow Calculation in CFM 57.96748186
Sample Time (Hrs): 24.0
Total Flow/Volume in m3 2364.009456
Total Flow in CFM 83473.17388



TE-5170 Calibration Worksheet

Site Information

Location: Nga Cheung Road Portion I	Date: 3-Dec-19
Location ID: AM3-B	Tech: Eric Lai
Sampler: TE-5170 MFC (0003)	

Site Conditions

Barometric Pressure (in Hg): 30.50	Corrected Pressure (mm Hg): 775
Temperature (deg F): 65	Temperature (deg K): 291
Average Press. (in Hg): 29.65	Corrected Average (mm Hg): 753
Average Temp. (deg F): 65	Average Temp. (deg K): 291

Calibration Orifice

Make: Tisch	Qstd Slope: 1.54996
Model: TE-5028A	Qstd Intercept: 0.00828
Serial#: 3371	Date Certified: 7-Feb-19

Calibration Information

Plate or Test #	H2O (in)	Qstd (m3/min)	I (chart)	IC (corrected)	Linear Regression
1	2.00	0.926	20.0	20.42	Slope: 43.6206
2	3.40	1.209	32.0	32.68	Intercept: -20.3003
3	5.20	1.497	44.0	44.93	Corr. Coeff: 0.9966
4	6.20	1.635	48.0	49.01	
5	7.80	1.835	60.0	61.27	# of Observations: 5

Calculations

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

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

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

m = sampler slope
b = sampler intercept
I = chart response
Tav = daily average temperature
Pav = daily average pressure

Average I (chart): 50.0
Average Flow Calculation m3/min 1.619406587
Average Flow Calculation in CFM 57.18124659
Sample Time (Hrs): 24.0
Total Flow/Volume in m3 2331.945485
Total Flow in CFM 82340.99509



綜合試驗有限公司
SOILS & MATERIALS ENGINEERING CO., LTD.
香港黃竹坑道37號利達中心12樓
12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong.
E-mail: smec@cigismec.com Website: www.cigismec.com

Tel: (852) 2873 6860
Fax: (852) 2555 7533



CERTIFICATE OF CALIBRATION

Certificate No.: 19CA0114 04-01

Page 1 of 2

Item tested

Description:	Sound Level Meter (Type 1)	Microphone
Manufacturer:	SVANTEK, Poland	ACO, Japan
Type/Model No.:	971	7052E
Serial/Equipment No.:	56272	65172
Adaptors used:	-	-

Item submitted by

Customer Name: Environmental Pioneers & Solutions Limited
Address of Customer: -
Request No.: -
Date of receipt: 14-Jan-2019

Date of test: 15-Jan-2019

Reference equipment used in the calibration

Description:	Model:	Serial No.	Expiry Date:	Traceable to:
Multi function sound calibrator	B&K 4226	2288444	23-Aug-2019	CIGISMEC
Signal generator	DS 360	33873	24-Apr-2019	CEPREI
Signal generator	DS 360	61227	26-Dec-2019	CEPREI

Ambient conditions

Temperature: 20 ± 1 °C
Relative humidity: 50 ± 10 %
Air pressure: 1000 ± 5 hPa

Test specifications

- The Sound Level Meter has been calibrated in accordance with the requirements as specified in BS 7580: Part 1: 1997 and the lab calibration procedure SMTP004-CA-152.
- The electrical tests were performed using an electrical signal substituted for the microphone which was removed and replaced by an equivalent capacitance within a tolerance of $\pm 20\%$.
- The acoustic calibration was performed using an B&K 4226 sound calibrator and corrections was applied for the difference between the free-field and pressure responsiveness of the Sound Level Meter.

Test results

This is to certify that the Sound Level Meter conforms to BS 7580: Part 1: 1997 for the conditions under which the test was performed.

Details of the performed measurements are presented on page 2 of this certificate.

Actual Measurement data are documented on worksheets.

Approved Signatory:

Feng Junqi

Date: 19-Jan-2019

Company Chop:



Comments: The results reported in this certificate refer to the condition of the instrument on the date of calibration and carry no implication regarding the long-term stability of the instrument.



綜合試驗有限公司
SOILS & MATERIALS ENGINEERING CO., LTD.
香港黃竹坑道37號利達中心12樓
12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong.
E-mail: smec@cigismec.com Website: www.cigismec.com

Tel: (852) 2873 6860
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CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.: 19CA0114 04-01

Page 2 of 2

1. Electrical Tests

The electrical tests were performed using an equivalent capacitance substituted for the microphone. The results are given in below with test status and the estimated uncertainties. The "Pass" means the result of the test is inside the tolerances stated in the test specifications. The "-" means the result of test is outside these tolerances.

Test:	Subtest:	Status:	Expanded Uncertainty (dB)	Coverage Factor
Self-generated noise	A	Pass	0.3	2.1
	C	Pass	0.8	
	Lin	Pass	1.6	
Linearity range for Leq	At reference range, Step 5 dB at 4 kHz	Pass	0.3	2.2
	Reference SPL on all other ranges	Pass	0.3	
	2 dB below upper limit of each range	Pass	0.3	
	2 dB above lower limit of each range	Pass	0.3	
Linearity range for SPL	At reference range, Step 5 dB at 4 kHz	Pass	0.3	
	A	Pass	0.3	
	C	Pass	0.3	
	Lin	Pass	0.3	
Time weightings	Single Burst Fast	Pass	0.3	
	Single Burst Slow	Pass	0.3	
Peak response	Single 100µs rectangular pulse	Pass	0.3	
R.M.S. accuracy	Crest factor of 3	Pass	0.3	
Time weighting I	Single burst 5 ms at 2000 Hz	Pass	0.3	
	Repeated at frequency of 100 Hz	Pass	0.3	
Time averaging	1 ms burst duty factor 1/10 ³ at 4kHz	Pass	0.3	
	1 ms burst duty factor 1/10 ⁴ at 4kHz	Pass	0.3	
Pulse range	Single burst 10 ms at 4 kHz	Pass	0.4	
Sound exposure level	Single burst 10 ms at 4 kHz	Pass	0.4	
Overload indication	SPL	Pass	0.3	
	Leq	Pass	0.4	

2. Acoustic tests

The complete sound level meter was calibrated on the reference range using a B&K 4226 acoustic calibrator with 1000Hz and SPL 94 dB. The sensitivity of the sound level meter was adjusted. The test result at 125 Hz and 8000 Hz are given in below with test status and the estimated uncertainties.

Test:	Subtest	Status	Expanded Uncertainty (dB)	Coverage Factor
Acoustic response	Weighting A at 125 Hz	Pass	0.3	
	Weighting A at 8000 Hz	Pass	0.5	

3. Response to associated sound calibrator

N/A

The expanded uncertainties have been calculated in accordance with the ISO Publication "Guide to the expression of uncertainty in measurement", and gives an interval estimated to have a level of confidence of 95%. A coverage factor of 2 is assumed unless explicitly stated.

Calibrated by:

Fung Chi Yip
Date: 15-Jan-2019

Checked by:

Shek Kwong Tai
Date: 19-Jan-2019

The standard(s) and equipment used in the calibration are traceable to national or international recognised standards and are calibrated on a schedule to maintain the required accuracy level.

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Form No CARP152-2/Issue 1/Rev C/01/02/2007

Hong Kong Accreditation Service (HKAS) has accredited this laboratory (Reg. No. HOKLAS 028) under the Hong Kong Laboratory Accreditation Scheme (HOKLAS) for specific calibration activities as listed in the HOKLAS directory of accredited laboratories. The results shown in this certificate are traceable to the International System of Units (SI) or recognised measurement standards. This certificate shall not be reproduced except in full.



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SMECLab

Test Data for Sound Level Meter

Page 1 of 5

Sound level meter type: 971 Serial No. 56272 Date 15-Jan-2019
Microphone type: 7052E Serial No. 65172
Report: 19CA0114 04-01

SELF GENERATED NOISE TEST

The noise test is performed in the most sensitive range of the SLM with the microphone replaced by an equivalent impedance.

Noise level in A weighting 14.3 dB
Noise level in C weighting 18.1 dB
Noise level in Lin (Z) 27.4 dB

LINEARITY TEST

The linearity is tested relative to the reference sound pressure level using a continuous sinusoidal signal of frequency 4 kHz. The measurement is made on the reference range for indications at 5 dB intervals starting from the 94 dB reference sound pressure level. And until within 5 dB of the upper and lower limits of the reference range, the measurements shall be made at 1 dB intervals. (SLM set to LEQ/SPL)

Reference/Expected level	Actual level		Tolerance	Deviation	
	non-integrated	integrated		non-integrated	integrated
dB	dB	dB	+/- dB	dB	dB
94.0	94.0	94.0	0.7	0.0	0.0
99.0	99.0	99.0	0.7	0.0	0.0
104.0	104.0	104.0	0.7	0.0	0.0
109.0	109.0	109.0	0.7	0.0	0.0
114.0	114.0	114.0	0.7	0.0	0.0
119.0	119.0	119.0	0.7	0.0	0.0
120.0	120.0	120.0	0.7	0.0	0.0
121.0	121.0	121.0	0.7	0.0	0.0
122.0	122.0	122.0	0.7	0.0	0.0
123.0	123.0	123.0	0.7	0.0	0.0
124.0	124.0	124.0	0.7	0.0	0.0
125.0	125.0	125.0	0.7	0.0	0.0
89.0	89.0	89.0	0.7	0.0	0.0
84.0	84.0	84.0	0.7	0.0	0.0
79.0	79.0	79.0	0.7	0.0	0.0
74.0	74.0	74.0	0.7	0.0	0.0
69.0	69.0	69.0	0.7	0.0	0.0
64.0	64.0	64.0	0.7	0.0	0.0
59.0	59.0	59.0	0.7	0.0	0.0
54.0	54.0	54.0	0.7	0.0	0.0
49.0	49.0	49.0	0.7	0.0	0.0
44.0	44.0	44.0	0.7	0.0	0.0
39.0	39.0	39.0	0.7	0.0	0.0
34.0	33.9	33.9	0.7	-0.1	-0.1
29.0	28.7	28.7	0.7	-0.3	-0.3
28.0	27.6	27.6	0.7	-0.4	-0.4

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綜合試驗有限公司
SOILS & MATERIALS ENGINEERING CO., LTD.
香港黃竹坑道37號利達中心12樓
12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong.
E-mail: smec@cigismec.com Website: www.cigismec.com

Tel: (852) 2873 6860
Fax: (852) 2555 7533

SMECLab

Test Data for Sound Level Meter

Page 2 of 5

Sound level meter type: 971 Serial No. 56272 Date 15-Jan-2019
Microphone type: 7052E Serial No. 65172 Report: 19CA0114 04-01

27.0	26.4	26.4	0.7	-0.6	-0.6
------	------	------	-----	------	------

Measurements for an indication of the reference SPL on all other ranges which include it

Other ranges	Expected level	Actual level	Tolerance	Deviation
dB	dB	dB	+/- dB	dB
27-125	94.0	94.0	0.7	0.0
37-139	94.0	94.0	0.7	0.0

Measurements on all level ranges for indications 2 dB below the upper limit and 2 dB above the lower limit

Ranges	Reference/Expected level	Actual level	Tolerance	Deviation
dB	dB	dB	+/- dB	dB
27-125	29.0	28.7	0.7	-0.3
	123.0	123.0	0.7	0.0
37-139	39.0	38.9	0.7	-0.1
	137.0	137.0	0.7	0.0

FREQUENCY WEIGHTING TEST

The frequency response of the weighting networks are tested at octave intervals over the frequency ranges 31.5 Hz to 12500 Hz. The signal level at 1000 Hz is set to give an indication of the reference SPL.

Frequency weighting A:

Frequency	Ref. level	Expected level	Actual level	Tolerance(dB)		Deviation
Hz	dB	dB	dB	+	-	dB
1000.0	94.0	94.0	94.0	0.0	0.0	0.0
31.6	94.0	54.6	54.6	1.5	1.5	0.0
63.1	94.0	67.8	67.8	1.5	1.5	0.0
125.9	94.0	77.9	77.9	1.0	1.0	0.0
251.2	94.0	85.4	85.4	1.0	1.0	0.0
501.2	94.0	90.8	90.8	1.0	1.0	0.0
1995.0	94.0	95.2	95.2	1.0	1.0	0.0
3981.0	94.0	95.0	95.1	1.0	1.0	0.1
7943.0	94.0	92.9	93.1	1.5	3.0	0.2
12590.0	94.0	89.7	89.6	3.0	6.0	-0.1

Frequency weighting C:

Frequency	Ref. level	Expected level	Actual level	Tolerance(dB)		Deviation
Hz	dB	dB	dB	+	-	dB
1000.0	94.0	94.0	94.0	0.0	0.0	0.0
31.6	94.0	91.0	91.0	1.5	1.5	0.0
63.1	94.0	93.2	93.1	1.5	1.5	-0.1
125.9	94.0	93.8	93.8	1.0	1.0	0.0
251.2	94.0	94.0	94.0	1.0	1.0	0.0
501.2	94.0	94.0	94.0	1.0	1.0	0.0
1995.0	94.0	93.8	93.9	1.0	1.0	0.1
3981.0	94.0	93.2	93.3	1.0	1.0	0.1

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SOILS & MATERIALS ENGINEERING CO., LTD.
香港黃竹坑道37號利達中心12樓
12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong.
E-mail: smec@cigismec.com Website: www.cigismec.com

Tel: (852) 2873 6860
Fax: (852) 2555 7533

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Test Data for Sound Level Meter

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Sound level meter type: 971 Serial No. 56272 Date 15-Jan-2019
Microphone type: 7052E Serial No. 65172 Report: 19CA0114 04-01

7943.0	94.0	91.0	91.1	1.5	3.0	0.1
12590.0	94.0	87.8	87.7	3.0	6.0	-0.1

Frequency weighting Z:

Frequency	Ref. level	Expected level	Actual level	Tolerance(dB)		Deviation
Hz	dB	dB	dB	+	-	dB
1000.0	94.0	94.0	94.0	0.0	0.0	0.0
31.6	94.0	94.0	94.1	1.5	1.5	0.1
63.1	94.0	94.0	94.0	1.5	1.5	0.0
125.9	94.0	94.0	94.0	1.0	1.0	0.0
251.2	94.0	94.0	94.0	1.0	1.0	0.0
501.2	94.0	94.0	94.0	1.0	1.0	0.0
1995.0	94.0	94.0	94.0	1.0	1.0	0.0
3981.0	94.0	94.0	94.0	1.0	1.0	0.0
7943.0	94.0	94.0	94.0	1.5	3.0	0.0
12590.0	94.0	94.0	94.0	3.0	6.0	0.0

TIME WEIGHTING FAST TEST

Time weighting F is tested on the reference range with a single sinusoidal burst of duration 200 ms at a frequency 2000 Hz and an amplitude which produces an indication 4 dB below the upper limit of the primary indicator range when the signal is continuous. (Weight A, Maximum hold)

Ref. level	Expected level	Actual level	Tolerance(dB)		Deviation
dB	dB	dB	+	-	dB
121.0	120.0	120.0	1.0	1.0	0.0

TIME WEIGHTING SLOW TEST

Time weighting S is tested on the reference range with a single sinusoidal burst of duration 500 ms at a frequency 2000 Hz and an amplitude which produces an indication 4 dB below the upper limit of the primary indicator range when the signal is continuous. (Weight A, Maximum hold)

Ref. level	Expected level	Actual level	Tolerance(dB)		Deviation
dB	dB	dB	+	-	dB
121.0	116.9	116.9	1.0	1.0	0.0

PEAK RESPONSE TEST

The onset time of the peak detector is tested on the reference range by comparing the response to a 100 us rectangular test pulse with the response to a 10 ms reference pulse of the same amplitude. The amplitude of the 10 ms reference pulse is such as to produce an indication 1 dB below the upper limit of the primary indicator range.

Positive polarities: (Weighting Z, set the generator signal to single, Lzpeak)

Ref. level	Response to 10 ms	Response to 100 us	Tolerance	Deviation
dB	dB	dB	+/- dB	dB
124.0	124.0	124.2	2.0	0.2

Negative polarities:

Ref. level	Response to 10 ms	Response to 100 us	Tolerance	Deviation
dB	dB	dB	+/- dB	dB

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SOILS & MATERIALS ENGINEERING CO., LTD.
香港黃竹坑道37號利達中心12樓
12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong.
E-mail: smec@cigismec.com Website: www.cigismec.com

Tel: (852) 2873 6860
Fax: (852) 2555 7533

SMECLab

Test Data for Sound Level Meter

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Sound level meter type:	971	Serial No.	56272	Date	15-Jan-2019
Microphone type:	7052E	Serial No.	65172	Report:	19CA0114 04-01
124.0	124.0	124.2	2.0	0.2	

RMS ACCURACY TEST

The RMS detector accuracy is tested on the reference range for a crest factor of 3.

Test frequency: 2000 Hz
Amplitude: 2 dB below the upper limit of the primary indicator range.
Burst repetition frequency: 40 Hz
Tone burst signal: 11 cycles of a sine wave of frequency 2000 Hz. (Set to INT)

	Ref. Level	Expected level	Tone burst signal	Tolerance	Deviation
Time weighting	dB	dB	indication(dB)	+/- dB	dB
Slow	88.0±6.6	88.0	88.0	0.5	0.0

TIME WEIGHTING IMPULSE TEST

Time weighting I is tested on the reference range (Set the SLM to LAImax)

Test frequency: 2000 Hz
Amplitude: The upper limit of the primary indicator range.

Single sinusoidal burst of duration 5 ms:

Ref. Level	Single burst indication	Tolerance	Deviation
dB	Expected (dB)	Actual (dB)	+/- dB
125.0	116.2	116.1	2.0
			-0.1

Repeated at 100 Hz

Ref. Level	Repeated burst indication	Tolerance	Deviation
dB	Expected (dB)	Actual (dB)	+/- dB
125.0	122.3	122.1	1.0
			-0.2

TIME AVERAGING TEST

This test compares the SLM reading for continuous sine signals with readings obtained from a sine tone burst sequence having the same RMS level. The test level is 30 dB below the upper limit of the linearity range and repeated for Type 1 SLM with 40 dB below the upper limit of the linearity.

Frequency of tone burst: 4000 Hz

Duration of tone burst: 1 ms

Repetition Time	Level of tone burst	Expected Leq	Actual Leq	Tolerance	Deviation	Remarks
msec	dB	dB	dB	+/- dB	dB	
1000	95.0	95.0	94.9	1.0	-0.1	60s integ.
10000	85.0	85.0	84.8	1.0	-0.2	6min. integ.

PULSE RANGE AND SOUND EXPOSURE LEVEL TEST

The test tone burst signal is superimposed on a baseline signal corresponding to the lower limit of reference range

Test frequency: 4000 Hz

Integration time: 10 sec

The integrating sound level meter set to Leq:

Duration	Rms level of tone burst (dB)	Expected	Actual	Tolerance	Deviation
msec	dB	dB	dB	+/- dB	dB
10	95.0	65.0	65.0	1.7	0.0

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SOILS & MATERIALS ENGINEERING CO., LTD.
香港黃竹坑道37號利達中心12樓
12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong.
E-mail: smec@cigismec.com Website: www.cigismec.com

Tel: (852) 2873 6860
Fax: (852) 2555 7533

SMECLab

Test Data for Sound Level Meter

Page 4 of 5

Sound level meter type:	971	Serial No.	56272	Date	15-Jan-2019
Microphone type:	7052E	Serial No.	65172	Report:	19CA0114 04-01
124.0	124.0	124.2	2.0	0.2	

RMS ACCURACY TEST

The RMS detector accuracy is tested on the reference range for a crest factor of 3.

Test frequency: 2000 Hz
Amplitude: 2 dB below the upper limit of the primary indicator range.
Burst repetition frequency: 40 Hz
Tone burst signal: 11 cycles of a sine wave of frequency 2000 Hz. (Set to INT)

	Ref. Level	Expected level	Tone burst signal	Tolerance	Deviation
Time weighting	dB	dB	indication(dB)	+/- dB	dB
Slow	88.0±6.6	88.0	88.0	0.5	0.0

TIME WEIGHTING IMPULSE TEST

Time weighting I is tested on the reference range (Set the SLM to LAImax)

Test frequency: 2000 Hz
Amplitude: The upper limit of the primary indicator range.

Single sinusoidal burst of duration 5 ms:

Ref. Level	Single burst indication		Tolerance	Deviation
dB	Expected (dB)	Actual (dB)	+/- dB	dB
125.0	116.2	116.1	2.0	-0.1

Repeated at 100 Hz

Ref. Level	Repeated burst indication		Tolerance	Deviation
dB	Expected (dB)	Actual (dB)	+/- dB	dB
125.0	122.3	122.1	1.0	-0.2

TIME AVERAGING TEST

This test compares the SLM reading for continuous sine signals with readings obtained from a sine tone burst sequence having the same RMS level. The test level is 30 dB below the upper limit of the linearity range and repeated for Type 1 SLM with 40 dB below the upper limit of the linearity.

Frequency of tone burst: 4000 Hz

Duration of tone burst: 1 ms

Repetition Time	Level of tone burst	Expected Leq	Actual Leq	Tolerance	Deviation	Remarks
msec	dB	dB	dB	+/- dB	dB	
1000	95.0	95.0	94.9	1.0	-0.1	60s integ.
10000	85.0	85.0	84.8	1.0	-0.2	6min. integ.

PULSE RANGE AND SOUND EXPOSURE LEVEL TEST

The test tone burst signal is superimposed on a baseline signal corresponding to the lower limit of reference range

Test frequency: 4000 Hz

Integration time: 10 sec

The integrating sound level meter set to Leq:

Duration	Rms level of tone burst (dB)	Expected	Actual	Tolerance	Deviation
msec	dB	dB	dB	+/- dB	dB
10	95.0	65.0	65.0	1.7	0.0

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SOILS & MATERIALS ENGINEERING CO., LTD.

香港黃竹坑道37號利達中心12樓
12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong.
E-mail: smec@cigismec.com Website: www.cigismec.com

Tel: (852) 2873 6860
Fax: (852) 2555 7533

SMECLab

Test Data for Sound Level Meter

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Sound level meter type: 971 Serial No. 56272 Date 15-Jan-2019
Microphone type: 7052E Serial No. 65172
Report: 19CA0114 04-01

The integrating sound level meter set to SEL:

Duration	Rms level of	Expected	Actual	Tolerance	Deviation
msec	tone burst (dB)	dB	dB	+/- dB	dB
10.0	95.0	75.0	75.0	1.7	0.0

OVERLOAD INDICATION TEST

For SLM capable of operating in a non-integrating mode.

Test frequency: 2000 Hz
Amplitude: 2 dB below the upper limit of the primary indicator range.
Burst repetition frequency: 40 Hz
Tone burst signal: 11 cycles of a sine wave of frequency 2000 Hz.

Level	Level reduced by	Further reduced	Difference	Tolerance	Deviation
at overload (dB)	1 dB	3 dB	dB	dB	dB
120.4	119.4	116.4	3.0	1.0	0.0

For integrating SLM, with the instrument indicating Leq.

For integrating SLM, with the instrument indicating Leq and set to the reference range. The test signal as following:

The test tone burst signal is superimposed on a baseline signal corresponding to the lower limit of reference range

Test frequency: 4000 Hz
Integration time: 10 sec
Single burst duration: 1 msec

Rms level	Level reduced by	Expected level	Actual level	Tolerance	Deviation
at overload (dB)	1 dB	dB	dB	dB	dB
126.9	125.9	85.9	85.9	2.2	0.0

ACOUSTIC TEST

The acoustic test of the complete SLM is tested at the frequency 125 Hz and 8000 Hz using a B&K type 4226 Multifunction Acoustic Calibrator. The test is performed in A weighting.

Frequency	Expected level	Actual level	Tolerance (dB)	Deviation
Hz	dB	Measured (dB)	+ -	dB
1000	94.0	94.0	0.0 0.0	0.0
125	77.9	78.5	1.0 1.0	0.6
8000	92.9	93.7	1.5 3.0	0.8

-----END-----



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SOILS & MATERIALS ENGINEERING CO., LTD.

香港黃竹坑道37號利達中心12樓
12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong.
E-mail: smec@cigismec.com Website: www.cigismec.com

Tel: (852) 2873 6860
Fax: (852) 2555 7533



CERTIFICATE OF CALIBRATION

Certificate No.: 19CA0325 01-01

Page 1 of 2

Item tested

Description:	Sound Level Meter (Type 1)	Microphone
Manufacturer:	SVANTEK, Poland	ACO, Japan
Type/Model No.:	971	7052E
Serial/Equipment No.:	61421	67606
Adaptors used:	-	-

Item submitted by

Customer Name: Environmental Pioneers & Solutions Limited
Address of Customer: -
Request No.: -
Date of receipt: 25-Mar-2019

Date of test: 27-Mar-2019

Reference equipment used in the calibration

Description:	Model:	Serial No.	Expiry Date:	Traceable to:
Multi function sound calibrator	B&K 4226	2288444	23-Aug-2019	CIGISMEC
Signal generator	DS 360	33873	24-Apr-2019	CEPREI
Signal generator	DS 360	61227	26-Dec-2019	CEPREI

Ambient conditions

Temperature: 21 ± 1 °C
Relative humidity: 55 ± 10 %
Air pressure: 1005 ± 5 hPa

Test specifications

- The Sound Level Meter has been calibrated in accordance with the requirements as specified in BS 7580: Part 1: 1997 and the lab calibration procedure SMTP004-CA-152.
- The electrical tests were performed using an electrical signal substituted for the microphone which was removed and replaced by an equivalent capacitance within a tolerance of $\pm 20\%$.
- The acoustic calibration was performed using an B&K 4226 sound calibrator and corrections was applied for the difference between the free-field and pressure responsiveness of the Sound Level Meter.

Test results

This is to certify that the Sound Level Meter conforms to BS 7580: Part 1: 1997 for the conditions under which the test was performed.

Details of the performed measurements are presented on page 2 of this certificate.

Actual Measurement data are documented on worksheets.

Approved Signatory:

Feng Junqi

Date: 29-Mar-2019

Company Chop:



Comments: The results reported in this certificate refer to the condition of the instrument on the date of calibration and carry no implication regarding the long-term stability of the instrument.



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SOILS & MATERIALS ENGINEERING CO., LTD.

香港黃竹坑道37號利達中心12樓
12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong.
E-mail: smec@cigismec.com Website: www.cigismec.com

Tel: (852) 2873 6860
Fax: (852) 2555 7533



CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.: 19CA0325 01-01

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1, Electrical Tests

The electrical tests were performed using an equivalent capacitance substituted for the microphone. The results are given in below with test status and the estimated uncertainties. The "Pass" means the result of the test is inside the tolerances stated in the test specifications. The "-" means the result of test is outside these tolerances.

Test:	Subtest:	Status:	Expanded Uncertainty (dB)	Coverage Factor
Self-generated noise	A	Pass	0.3	
	C	Pass	0.8	2.1
	Lin	Pass	1.6	2.2
Linearity range for Leq	At reference range, Step 5 dB at 4 kHz	Pass	0.3	
	Reference SPL on all other ranges	Pass	0.3	
	2 dB below upper limit of each range	Pass	0.3	
	2 dB above lower limit of each range	Pass	0.3	
Linearity range for SPL	At reference range, Step 5 dB at 4 kHz	Pass	0.3	
	A	Pass	0.3	
	C	Pass	0.3	
Frequency weightings	Lin	Pass	0.3	
	Single Burst Fast	Pass	0.3	
	Single Burst Slow	Pass	0.3	
Peak response	Single 100µs rectangular pulse	Pass	0.3	
R.M.S. accuracy	Crest factor of 3	Pass	0.3	
Time weighting I	Single burst 5 ms at 2000 Hz	Pass	0.3	
	Repeated at frequency of 100 Hz	Pass	0.3	
Time averaging	1 ms burst duty factor 1/10 ³ at 4kHz	Pass	0.3	
	1 ms burst duty factor 1/10 ⁴ at 4kHz	Pass	0.3	
Pulse range	Single burst 10 ms at 4 kHz	Pass	0.4	
Sound exposure level	Single burst 10 ms at 4 kHz	Pass	0.4	
Overload indication	SPL	Pass	0.3	
	Leq	Pass	0.4	

2, Acoustic tests

The complete sound level meter was calibrated on the reference range using a B&K 4226 acoustic calibrator with 1000Hz and SPL 94 dB. The sensitivity of the sound level meter was adjusted. The test result at 125 Hz and 8000 Hz are given in below with test status and the estimated uncertainties.

Test:	Subtest	Status	Expanded Uncertainty (dB)	Coverage Factor
Acoustic response	Weighting A at 125 Hz	Pass	0.3	
	Weighting A at 8000 Hz	Pass	0.5	

3, Response to associated sound calibrator

N/A

The expanded uncertainties have been calculated in accordance with the ISO Publication "Guide to the expression of uncertainty in measurement", and gives an interval estimated to have a level of confidence of 95%. A coverage factor of 2 is assumed unless explicitly stated.

- End -

Calibrated by:

Fong Chun Wai

Date: 27-Mar-2019

Checked by:

Fung Chi Yip

Date: 29-Mar-2019

The standard(s) and equipment used in the calibration are traceable to national or international recognised standards and are calibrated on a schedule to maintain the required accuracy level.

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SOILS & MATERIALS ENGINEERING CO., LTD.

香港黃竹坑道37號利達中心12樓
12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong.
E-mail: smec@cigismec.com Website: www.cigismec.com

Tel: (852) 2873 6860
Fax: (852) 2555 7533

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Test Data for Sound Level Meter

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Sound level meter type: 971 Serial No. 61421 Date 27-Mar-2019
Microphone type: 7052E Serial No. 67606
Report: 19CA0325 01-01

SELF GENERATED NOISE TEST

The noise test is performed in the most sensitive range of the SLM with the microphone replaced by an equivalent impedance.

Noise level in A weighting 16.7 dB
Noise level in C weighting 18.3 dB
Noise level in Lin (Z) 23.2 dB

LINEARITY TEST

The linearity is tested relative to the reference sound pressure level using a continuous sinusoidal signal of frequency 4 kHz. The measurement is made on the reference range for indications at 5 dB intervals starting from the 94 dB reference sound pressure level. And until within 5 dB of the upper and lower limits of the reference range, the measurements shall be made at 1 dB intervals. (SLM set to LEQ/SPL)

Reference/Expected level	Actual level		Tolerance	Deviation	
	non-integrated	integrated		non-integrated	integrated
dB	dB	dB	+/- dB	dB	dB
94.0	94.0	94.0	0.7	0.0	0.0
99.0	99.0	99.0	0.7	0.0	0.0
104.0	104.0	104.0	0.7	0.0	0.0
109.0	109.0	109.0	0.7	0.0	0.0
114.0	114.0	114.0	0.7	0.0	0.0
119.0	119.0	119.0	0.7	0.0	0.0
124.0	124.0	124.0	0.7	0.0	0.0
125.0	125.0	125.0	0.7	0.0	0.0
126.0	126.0	126.0	0.7	0.0	0.0
127.0	127.0	127.0	0.7	0.0	0.0
128.0	128.0	128.0	0.7	0.0	0.0
129.0	129.0	129.0	0.7	0.0	0.0
89.0	89.0	89.0	0.7	0.0	0.0
84.0	84.0	84.0	0.7	0.0	0.0
79.0	79.0	79.0	0.7	0.0	0.0
74.0	74.0	74.0	0.7	0.0	0.0
69.0	69.0	69.0	0.7	0.0	0.0
64.0	64.0	64.0	0.7	0.0	0.0
59.0	59.0	59.0	0.7	0.0	0.0
54.0	54.0	54.0	0.7	0.0	0.0
49.0	49.0	49.0	0.7	0.0	0.0
44.0	44.0	44.0	0.7	0.0	0.0
39.0	39.0	39.0	0.7	0.0	0.0
34.0	33.9	33.9	0.7	-0.1	-0.1
33.0	32.9	32.9	0.7	-0.1	-0.1
32.0	31.9	31.9	0.7	-0.1	-0.1

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香港黃竹坑道37號利達中心12樓
12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong.
E-mail: smec@cigismec.com Website: www.cigismec.com

Tel: (852) 2873 6860
Fax: (852) 2555 7533

SMECLab

Test Data for Sound Level Meter

Page 2 of 5

Sound level meter type: 971 Serial No. 61421 Date 27-Mar-2019
Microphone type: 7052E Serial No. 67606
Report: 19CA0325 01-01

31.0	30.9	30.9	0.7	-0.1	-0.1
------	------	------	-----	------	------

Measurements for an indication of the reference SPL on all other ranges which include it

Other ranges	Expected level	Actual level	Tolerance	Deviation
dB	dB	dB	+/- dB	dB
31-129	94.0	94.0	0.7	0.0
41-143	94.0	94.0	0.7	0.0

Measurements on all level ranges for indications 2 dB below the upper limit and 2 dB above the lower limit

Ranges	Reference/Expected level	Actual level	Tolerance	Deviation
dB	dB	dB	+/- dB	dB
31-129	33.0	32.9	0.7	-0.1
	127.0	127.0	0.7	0.0
41-143	43.0	43.0	0.7	0.0
	141.0	141.0	0.7	0.0

FREQUENCY WEIGHTING TEST

The frequency response of the weighting networks are tested at octave intervals over the frequency ranges 31.5 Hz to 12500 Hz. The signal level at 1000 Hz is set to give an indication of the reference SPL.

Frequency weighting A:

Frequency	Ref. level	Expected level	Actual level	Tolerance(dB)		Deviation
Hz	dB	dB	dB	+	-	dB
1000.0	94.0	94.0	94.0	0.0	0.0	0.0
31.6	94.0	54.6	54.5	1.5	1.5	-0.1
63.1	94.0	67.8	67.8	1.5	1.5	0.0
125.9	94.0	77.9	77.9	1.0	1.0	0.0
251.2	94.0	85.4	85.4	1.0	1.0	0.0
501.2	94.0	90.8	90.8	1.0	1.0	0.0
1995.0	94.0	95.2	95.2	1.0	1.0	0.0
3981.0	94.0	95.0	95.0	1.0	1.0	0.0
7943.0	94.0	92.9	93.0	1.5	3.0	0.1
12590.0	94.0	89.7	89.8	3.0	6.0	0.1

Frequency weighting C:

Frequency	Ref. level	Expected level	Actual level	Tolerance(dB)		Deviation
Hz	dB	dB	dB	+	-	dB
1000.0	94.0	94.0	94.0	0.0	0.0	0.0
31.6	94.0	91.0	91.1	1.5	1.5	0.1
63.1	94.0	93.2	93.2	1.5	1.5	0.0
125.9	94.0	93.8	93.8	1.0	1.0	0.0
251.2	94.0	94.0	94.0	1.0	1.0	0.0
501.2	94.0	94.0	94.0	1.0	1.0	0.0
1995.0	94.0	93.8	93.8	1.0	1.0	0.0
3981.0	94.0	93.2	93.2	1.0	1.0	0.0

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Form No: CAWS 152/Issue 1/Rev: B/01/02/2007

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綜合試驗有限公司

SOILS & MATERIALS ENGINEERING CO., LTD.

香港黃竹坑道37號利達中心12樓
12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong.
E-mail: smec@cigismec.com Website: www.cigismec.com

Tel: (852) 2873 6860
Fax: (852) 2555 7533

SMECLab

Test Data for Sound Level Meter

Page 3 of 5

Sound level meter type: 971
Microphone type: 7052E

Serial No. 61421
Serial No. 67606

Date 27-Mar-2019

Report: 19CA0325 01-01

7943.0	94.0	91.0	91.4	1.5	3.0	0.4
12590.0	94.0	87.8	87.7	3.0	6.0	-0.1

Frequency weighting Z:

Frequency	Ref. level	Expected level	Actual level	Tolerance(dB)		Deviation
Hz	dB	dB	dB	+	-	dB
1000.0	94.0	94.0	94.0	0.0	0.0	0.0
31.6	94.0	94.0	94.1	1.5	1.5	0.1
63.1	94.0	94.0	94.0	1.5	1.5	0.0
125.9	94.0	94.0	94.0	1.0	1.0	0.0
251.2	94.0	94.0	94.0	1.0	1.0	0.0
501.2	94.0	94.0	94.0	1.0	1.0	0.0
1995.0	94.0	94.0	94.0	1.0	1.0	0.0
3981.0	94.0	94.0	94.0	1.0	1.0	0.0
7943.0	94.0	94.0	94.0	1.5	3.0	0.0
12590.0	94.0	94.0	94.0	3.0	6.0	0.0

TIME WEIGHTING FAST TEST

Time weighting F is tested on the reference range with a single sinusoidal burst of duration 200 ms at a frequency 2000 Hz and an amplitude which produces an indication 4 dB below the upper limit of the primary indicator range when the signal is continuous. (Weight A, Maximum hold)

Ref. level	Expected level	Actual level	Tolerance(dB)		Deviation
dB	dB	dB	+	-	dB
125.0	124.0	124.0	1.0	1.0	0.0

TIME WEIGHTING SLOW TEST

Time weighting S is tested on the reference range with a single sinusoidal burst of duration 500 ms at a frequency 2000 Hz and an amplitude which produces an indication 4 dB below the upper limit of the primary indicator range when the signal is continuous. (Weight A, Maximum hold)

Ref. level	Expected level	Actual level	Tolerance(dB)		Deviation
dB	dB	dB	+	-	dB
125.0	120.9	120.8	1.0	1.0	-0.1

PEAK RESPONSE TEST

The onset time of the peak detector is tested on the reference range by comparing the response to a 100 us rectangular test pulse with the response to a 10 ms reference pulse of the same amplitude. The amplitude of the 10 ms reference pulse is such as to produce an indication 1 dB below the upper limit of the primary indicator range.

Positive polarities: (Weighting C, set the generator signal to single, Lcpeak)

Ref. level	Response to 10 ms	Response to 100 us	Tolerance	Deviation
dB	dB	dB	+/- dB	dB
128.0	128.0	128.4	2.0	0.4

Negative polarities:

Ref. level	Response to 10 ms	Response to 100 us	Tolerance	Deviation
dB	dB	dB	+/- dB	dB

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Form No.: CAWS 152 Issue 1/Rev. B 01/02/2007

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SOILS & MATERIALS ENGINEERING CO., LTD.

香港黃竹坑道37號利達中心12樓
12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong.
E-mail: smec@cigismec.com Website: www.cigismec.com

Tel: (852) 2873 6860
Fax: (852) 2555 7533

SMECLab

Test Data for Sound Level Meter

Page 4 of 5

Sound level meter type: 971 Serial No. 61421 Date 27-Mar-2019
Microphone type: 7052E Serial No. 67606
Report: 19CA0325 01-01

128.0	128.0	128.2	2.0	0.2
-------	-------	-------	-----	-----

RMS ACCURACY TEST

The RMS detector accuracy is tested on the reference range for a crest factor of 3.

Test frequency: 2000 Hz
Amplitude: 2 dB below the upper limit of the primary indicator range.
Burst repetition frequency: 40 Hz
Tone burst signal: 11 cycles of a sine wave of frequency 2000 Hz. (Set to INT)

	Ref. Level	Expected level	Tone burst signal	Tolerance	Deviation
Time weighting	dB	dB	indication(dB)	+/- dB	dB
Slow	129.0+6.6	129.0	128.8	0.5	-0.2

TIME WEIGHTING IMPULSE TEST

Time weighting I is tested on the reference range (Set the SLM to LAImax)

Test frequency: 2000 Hz
Amplitude: The upper limit of the primary indicator range.

Single sinusoidal burst of duration 5 ms:

Ref. Level	Single burst indication	Tolerance	Deviation
dB	Expected (dB)	Actual (dB)	+/- dB
129.0	120.2	120.1	-0.1

Repeated at 100 Hz

Ref. Level	Repeated burst indication	Tolerance	Deviation
dB	Expected (dB)	Actual (dB)	+/- dB
129.0	126.3	126.2	-0.1

TIME AVERAGING TEST

This test compares the SLM reading for continuous sine signals with readings obtained from a sine tone burst sequence having the same RMS level. The test level is 30 dB below the upper limit of the linearity range and repeated for Type 1 SLM with 40 dB below the upper limit of the linearity.

Frequency of tone burst: 4000 Hz

Duration of tone burst: 1 ms

Repetition Time	Level of tone burst	Expected Leq	Actual Leq	Tolerance	Deviation	Remarks
msec	dB	dB	dB	+/- dB	dB	
1000	100.0	100.0	99.9	1.0	-0.1	60s integ.
10000	90.0	90.0	89.9	1.0	-0.1	6min. integ.

PULSE RANGE AND SOUND EXPOSURE LEVEL TEST

The test tone burst signal is superimposed on a baseline signal corresponding to the lower limit of reference range.

Test frequency: 4000 Hz

Integration time: 10 sec

The integrating sound level meter set to Leq:

Duration	Rms level of tone burst (dB)	Expected	Actual	Tolerance	Deviation
msec	dB	dB	dB	+/- dB	dB
10	93.0	63.0	63.0	1.7	0.0



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香港黃竹坑道37號利達中心12樓
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E-mail: smec@cigismec.com Website: www.cigismec.com

Tel: (852) 2873 6860
Fax: (852) 2555 7533

SMECLab

Test Data for Sound Level Meter

Page 5 of 5

Sound level meter type: 971 Serial No. 61421 Date 27-Mar-2019
Microphone type: 7052E Serial No. 67606
Report: 19CA0325 01-01

The integrating sound level meter set to SEL:

Duration	Rms level of	Expected	Actual	Tolerance	Deviation
msec	tone burst (dB)	dB	dB	+/- dB	dB
10.0	93.0	73.0	73.0	1.7	0.0

OVERLOAD INDICATION TEST

For SLM capable of operating in a non-integrating mode.

Test frequency: 2000 Hz
Amplitude: 2 dB below the upper limit of the primary indicator range.
Burst repetition frequency: 40 Hz
Tone burst signal: 11 cycles of a sine wave of frequency 2000 Hz.

Level	Level reduced by	Further reduced	Difference	Tolerance	Deviation
at overload (dB)	1 dB	3 dB	dB	dB	dB
124.5	123.5	120.5	3.0	1.0	0.0

For integrating SLM, with the instrument indicating Leq.

For integrating SLM, with the instrument indicating Leq and set to the reference range. The test signal as following:
The test tone burst signal is superimposed on a baseline signal corresponding to the lower limit of reference range

Test frequency: 4000 Hz
Integration time: 10 sec
Single burst duration: 1 msec

Rms level	Level reduced by	Expected level	Actual level	Tolerance	Deviation
at overload (dB)	1 dB	dB	dB	dB	dB
130.6	129.6	89.6	89.6	2.2	0.0

ACOUSTIC TEST

The acoustic test of the complete SLM is tested at the frequency 125 Hz and 8000 Hz using a B&K type 4226 Multifunction Acoustic Calibrator. The test is performed in A weighting.

Frequency	Expected level	Actual level	Tolerance (dB)		Deviation
Hz	dB	Measured (dB)	+	-	dB
1000	94.0	94.0	0.0	0.0	0.0
125	77.9	78.6	1.0	1.0	0.7
8000	92.9	93.6	1.5	3.0	0.7

-----END-----



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香港黃竹坑道37號利達中心12樓
12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong.
E-mail: smec@cigismec.com Website: www.cigismec.com

Tel: (852) 2873 6860
Fax: (852) 2555 7533



CERTIFICATE OF CALIBRATION

Certificate No.: 19CA0325 01-02

Page: 1 of 2

Item tested

Description: Acoustical Calibrator (Type 1)
Manufacturer: SVANTEK
Type/Model No.: SV30A
Serial/Equipment No.: 7908
Adaptors used: -

Item submitted by

Customer: Environmental Pioneers & Solutions Limited
Address of Customer: -
Request No.: -
Date of receipt: 25-Mar-2019

Date of test: 28-Mar-2019

Reference equipment used in the calibration

Description:	Model:	Serial No.	Expiry Date:	Traceable to:
Lab standard microphone	B&K 4180	2412857	20-Apr-2019	SCL
Preamplifier	B&K 2673	2743150	27-Apr-2019	CEPREI
Measuring amplifier	B&K 2610	2346941	08-May-2019	CEPREI
Signal generator	DS 360	61227	24-Apr-2019	CEPREI
Digital multi-meter	34401A	US36087050	23-Apr-2019	CEPREI
Audio analyzer	8903B	GB41300350	23-Apr-2019	CEPREI
Universal counter	53132A	MY40003662	24-Apr-2019	CEPREI

Ambient conditions

Temperature: 22 ± 1 °C
Relative humidity: 55 ± 10 %
Air pressure: 1005 ± 5 hPa

Test specifications

- The Sound Calibrator has been calibrated in accordance with the requirements as specified in IEC 60942 1997 Annex B and the lab calibration procedure SMTP004-CA-156.
- The calibrator was tested with its axis vertical facing downwards at the specific frequency using insert voltage technique.
- The results are rounded to the nearest 0.01 dB and 0.1 Hz and have not been corrected for variations from a reference pressure of 1013.25 hectoPascals as the maker's information indicates that the instrument is insensitive to pressure changes.

Test results

This is to certify that the sound calibrator conforms to the requirements of annex B of IEC 60942: 1997 for the conditions under which the test was performed. This does not imply that the sound calibrator meets IEC 60942 under any other conditions.

Details of the performed measurements are presented on page 2 of this certificate.

Approved Signatory:


Feng Junqi

Date: 29-Mar-2019

Company Chop:



Comments: The results reported in this certificate refer to the condition of the instrument on the date of calibration and carry no implication regarding the long-term stability of the instrument.



綜合試驗有限公司
SOILS & MATERIALS ENGINEERING CO., LTD.
香港黃竹坑道37號利達中心12樓
12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong.
E-mail: smec@cigismec.com Website: www.cigismec.com

Tel: (852) 2873 6860
Fax: (852) 2555 7533



CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.: 19CA0325 01-02

Page: 2 of 2

1, Measured Sound Pressure Level

The output Sound Pressure Level in the calibrator head was measured at the setting and frequency shown using a calibrated laboratory standard microphone and insert voltage technique. The results are given in below with the estimated uncertainties.

(Output level in dB re 20 μ Pa)

Frequency Shown Hz	Output Sound Pressure Level Setting dB	Measured Output Sound Pressure Level dB	Estimated Expanded Uncertainty dB
1000	94.00	94.19	0.10

2, Sound Pressure Level Stability - Short Term Fluctuations

The Short Term Fluctuations was determined by measuring the maximum and minimum of the fast weighted DC output of the B&K 2610 measuring amplifier over a 20 second time interval as required in the standard. The Short Term Fluctuation was found to be:

At 1000 Hz STF = 0.019dB

Estimated expanded uncertainty 0.005 dB

3, Actual Output Frequency

The determination of actual output frequency was made using a B&K 4180 microphone together with a B&K 2673 preamplifier connected to a B&K 2610 measuring amplifier. The AC output of the B&K 2610 was taken to an universal counter which was used to determine the frequency averaged over 20 second of operation as required by the standard. The actual output frequency at 1 KHz was:

At 1000 Hz Actual Frequency = 1000.0Hz

Estimated expanded uncertainty 0.1 Hz Coverage factor k = 2.2

4, Total Noise and Distortion

For the Total Noise and Distortion measurement, the unfiltered AC output of the B&K 2610 measuring amplifier was connected to an Agilent Type 8903 B distortion analyser. The TND result at 1 KHz was:

At 1000 Hz TND = 0.4 %

Estimated expanded uncertainty 0.7 %

The expanded uncertainties have been calculated in accordance with the ISO Publication "Guide to the expression of uncertainty in measurement", and gives an interval estimated to have a level of confidence of 95%. A coverage factor of 2 is assumed unless explicitly stated.

- End -

Calibrated by:
Fung Chi Yip
Date: 28-Mar-2019

Checked by:
Fong Chua Wai
Date: 29-Mar-2019

The standard(s) and equipment used in the calibration are traceable to national or international recognised standards and are calibrated on a schedule to maintain the required accuracy level.

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Form No. CARP156-2/Issue 1/Rev. C/01/05/2005

Hong Kong Accreditation Service (HKAS) has accredited this laboratory (Reg. No. HOKLAS 028) under the Hong Kong Laboratory Accreditation Scheme (HOKLAS) for specific calibration activities as listed in the HOKLAS directory of accredited laboratories. The results shown in this certificate are traceable to the International System of Units (SI) or recognised measurement standards. This certificate shall not be reproduced except in full.



輝創工程有限公司

Sun Creation Engineering Limited

Calibration & Testing Laboratory

Certificate of Calibration 校正證書

Certificate No. : C185735
證書編號

ITEM TESTED / 送檢項目 (Job No. / 序引編號 : IC18-2077) Date of Receipt / 收件日期 : 11 October 2018

Description / 儀器名稱 : Sound Calibrator
Manufacturer / 製造商 : BSWA
Model No. / 型號 : CA111
Serial No. / 編號 : 520284
Supplied By / 委託者 : Environmental Pioneers & Solutions Limited
Flat A, 8/F., Chai Wan Industrial Centre,
20 Lee Chung Street, Chai Wan, Hong Kong

TEST CONDITIONS / 測試條件

Temperature / 溫度 : $(23 \pm 2)^{\circ}\text{C}$ Relative Humidity / 相對濕度 : $(50 \pm 25)\%$
Line Voltage / 電壓 : ---

TEST SPECIFICATIONS / 測試規範

Calibration check

DATE OF TEST / 測試日期 : 20 October 2018

TEST RESULTS / 測試結果

The results apply to the particular unit-under-test only.
The results do not exceed manufacturer's specification.
The results are detailed in the subsequent page(s).

The test equipment used for calibration are traceable to National Standards via :

- The Government of The Hong Kong Special Administrative Region Standard & Calibration Laboratory
- The Bruel & Kjaer Calibration Laboratory, Denmark
- Agilent Technologies / Keysight Technologies
- Rohde & Schwarz Laboratory, Germany
- Fluke Everett Service Center, USA

Tested By
測試

H T Wong
Technical Officer

Certified By
核證

K C Lee
Engineer

Date of Issue : 23 October 2018
簽發日期

The test equipment used for calibration are traceable to the Nation Standards as specified in this certificate. This certificate shall not be reproduced except in full, without the prior written approval of this laboratory.

本證書所載校正用之測試器材均可溯源至國際標準。局部複印本證書需先獲本實驗室所書面批准。

Sun Creation Engineering Limited – Calibration & Testing Laboratory

c/o 4/F, 1 Hing On Lane, Tuen Mun, New Territories, Hong Kong

輝創工程有限公司 — 校正及檢測實驗室

c/o 香港新界屯門興安里一號四樓

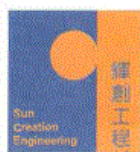
Tel/電話: (852) 2927 2606

Fax/傳真: (852) 2744 8986

E-mail/電郵: callab@suncreation.com

Website/網址: www.suncreation.com

Page 1 of 2



輝創工程有限公司
Sun Creation Engineering Limited
Calibration & Testing Laboratory

Certificate of Calibration 校正證書

Certificate No. : C185735
證書編號

- The unit-under-test (UUT) was allowed to stabilize in the laboratory for over 12 hours before the commencement of the test.
- The results presented are the mean of 3 measurements at each calibration point.
- Test equipment :

Equipment ID	Description	Certificate No.
CL130	Universal Counter	C183775
CL281	Multifunction Acoustic Calibrator	CDK1806821
TST150A	Measuring Amplifier	C181288

- Test procedure : MA100N.

- Results :

5.1 Sound Level Accuracy

UUT Nominal Value	Measured Value (dB)	Mfr's Spec. (dB)	Uncertainty of Measured Value (dB)
94 dB, 1 kHz	94.0	± 0.3	± 0.2
114 dB, 1 kHz	114.0		

5.2 Frequency Accuracy

UUT Nominal Value (kHz)	Measured Value (kHz)	Mfr's Spec.	Uncertainty of Measured Value (Hz)
1	1.000 0	1 kHz ± 0.5 %	± 0.1

Remark : The uncertainties are for a confidence probability of not less than 95 %.

Note :

Only the original copy or the laboratory's certified true copy is valid.

The values given in this Certificate only relate to the values measured at the time of the test and any uncertainties quoted will not include allowance for the equipment long term drift, variations with environment changes, vibration and shock during transportation, overloading, mis-handling, or the capability of any other laboratory to repeat the measurement. Sun Creation Engineering Limited shall not be liable for any loss or damage resulting from the use of the equipment.

The test equipment used for calibration are traceable to the Nation Standards as specified in this certificate. This certificate shall not be reproduced except in full, without the prior written approval of this laboratory.

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輝創工程有限公司 — 校正及檢測實驗室

c/o 香港新界屯門興安里一號四樓

Tel/電話: (852) 2927 2606

Fax/傳真: (852) 2744 8986

E-mail/電郵: callab@suncreation.com

Website/網址: www.suncreation.com

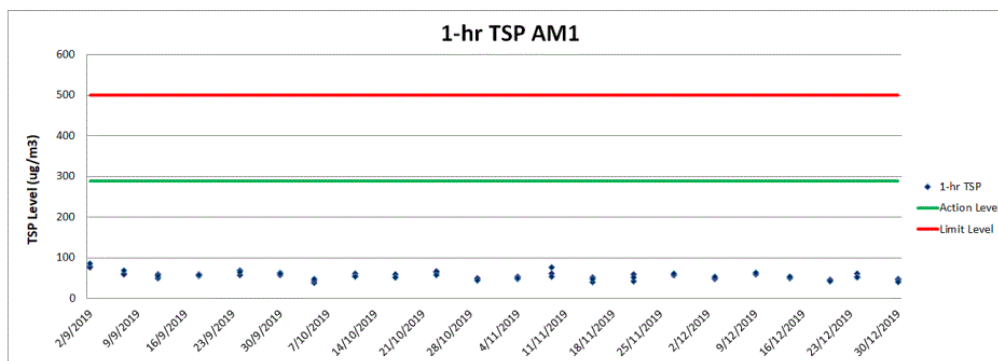
Page 2 of 2

Appendix E: TSP Monitoring Data

1-hr TSP Monitoring Result for AM1

Date	Weather	Temperature (°C) *	Wind Direction *	Wind Speed (m/s) *	Sampling Time			Reading (µg/m³)			
					1	2	3	1	2	3	Average
3/12/2019	Overcast	19.5 - 23.4	NE	<5m/s	13:00	14:01	15:02	48	50	53	50
9/12/2019	Overcast	18.1 - 24.7	NE	<5m/s	13:00	14:01	15:02	64	60	63	62
14/12/2019	Overcast	17.2 - 25.8	E	<5m/s	13:00	14:01	15:02	50	54	54	53
20/12/2019	Sunny	17.1 - 25.9	E	<5m/s	13:00	14:01	15:02	44	46	42	44
24/12/2019	Overcast	19.8 - 26.3	SE	<5m/s	13:00	14:01	15:02	62	54	51	56
30/12/2019	Sunny	18.4 - 24.3	NE	<6m/s	14:00	15:01	16:02	47	44	41	44

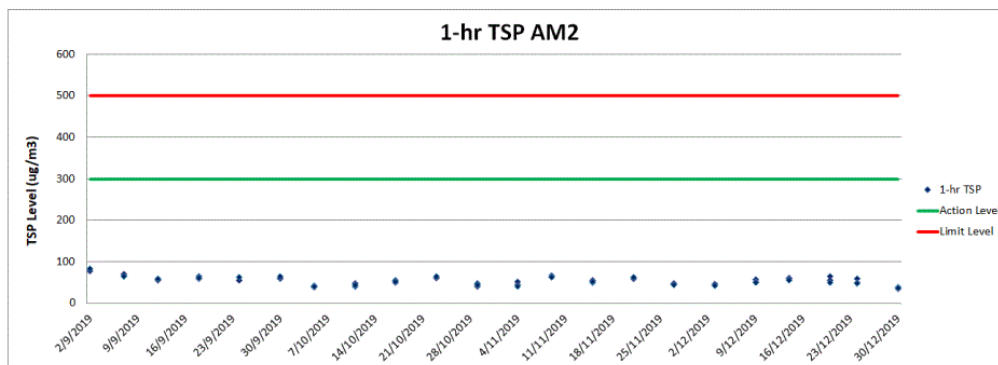
*Remark: Data of temperature, wind direction and wind speed was extracted from King's Park Meteorological Station of HKO



1-hr TSP Monitoring Result for AM2

Date	Weather	Temperature (°C) *	Wind Direction *	Wind Speed (m/s) *	Sampling Time			Reading (µg/m³)			
					1	2	3	1	2	3	Average
3/12/2019	Overcast	19.5 - 23.4	NE	<5m/s	9:00	10:01	11:02	45	46	42	44
9/12/2019	Overcast	18.1 - 24.7	NE	<5m/s	9:00	10:01	11:02	57	51	49	52
14/12/2019	Overcast	17.2 - 25.8	E	<5m/s	9:00	10:01	11:02	61	58	55	58
20/12/2019	Sunny	17.1 - 25.9	E	<5m/s	9:00	10:01	11:02	64	56	50	57
24/12/2019	Overcast	19.8 - 26.3	SE	<5m/s	8:00	9:01	10:02	59	50	48	52
30/12/2019	Sunny	18.4 - 24.3	NE	<6m/s	9:00	10:01	11:02	39	34	37	37

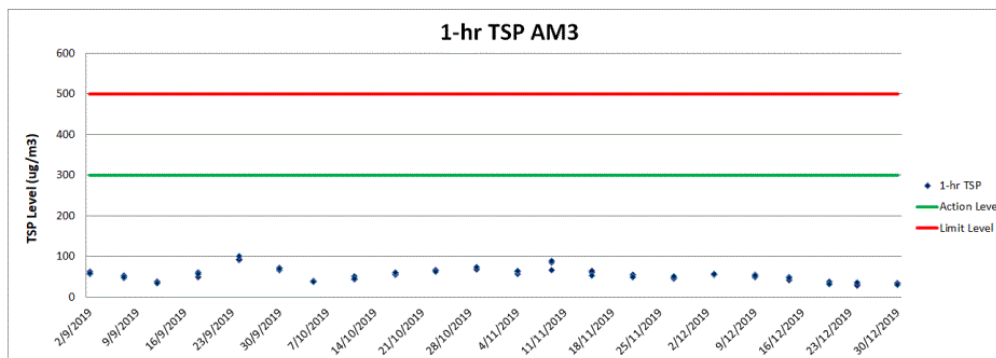
*Remark: Data of temperature, wind direction and wind speed was extracted from King's Park Meteorological Station of HKO



1-hr TSP Monitoring Result for AM3

Date	Weather	Temperature (°C) *	Wind Direction *	Wind Speed (m/s) *	Sampling Time			Reading (µg/m³)			
					1	2	3	1	2	3	Average
3/12/2019	Overcast	19.5 - 23.4	NE	<5m/s	14:00	15:01	16:02	55	57	56	56
9/12/2019	Overcast	18.1 - 24.7	NE	<5m/s	14:00	15:01	16:02	50	55	53	53
14/12/2019	Overcast	17.2 - 25.8	E	<5m/s	14:00	15:01	16:02	49	42	48	46
20/12/2019	Sunny	17.1 - 25.9	E	<5m/s	14:00	15:01	16:02	38	32	33	34
24/12/2019	Overcast	19.8 - 26.3	SE	<5m/s	13:00	14:01	15:02	33	29	35	32
30/12/2019	Sunny	18.4 - 24.3	NE	<6m/s	14:00	15:01	16:02	34	34	31	33

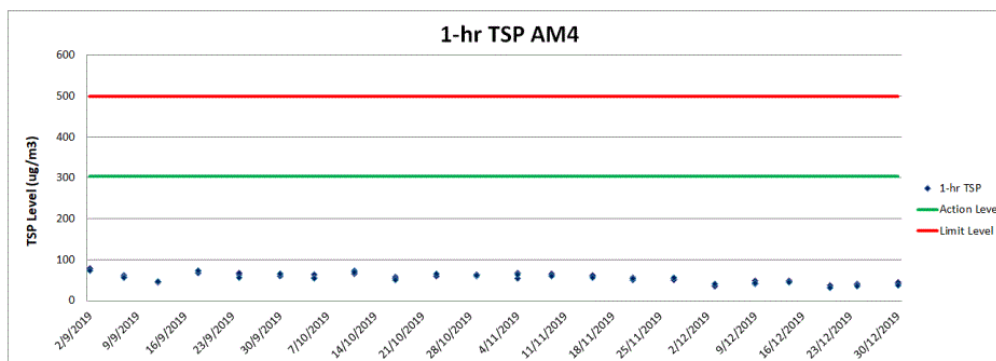
*Remark: Data of temperature, wind direction and wind speed was extracted from King's Park Meteorological Station of HKO



1-hr TSP Monitoring Result for AM4

Date	Weather	Temperature (°C) *	Wind Direction *	Wind Speed (m/s) *	Sampling Time			Reading (µg/m³)			
					1	2	3	1	2	3	Average
3/12/2019	Overcast	19.5 - 23.4	NE	<5m/s	13:30	14:31	15:32	35	35	41	37
9/12/2019	Overcast	18.1 - 24.7	NE	<5m/s	13:30	14:31	15:32	41	48	43	44
14/12/2019	Overcast	17.2 - 25.8	E	<5m/s	13:30	14:31	15:32	46	49	45	47
20/12/2019	Sunny	17.1 - 25.9	E	<5m/s	13:30	14:31	15:32	31	38	31	33
24/12/2019	Overcast	19.8 - 26.3	SE	<5m/s	12:30	13:31	14:32	40	39	35	38
30/12/2019	Sunny	18.4 - 24.3	NE	<6m/s	13:30	14:31	15:32	41	44	37	41

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

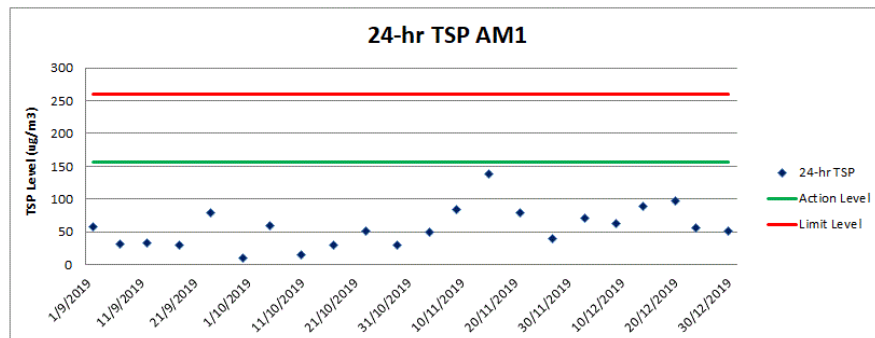


24-hr TSP Monitoring Result for AM1

Sampling ID & Paper No.	Temperature (°C) *1	Wind Direction *1	Wind Speed (m/s) *1	Sampling Date	Wt. of paper (g)			Flow Rate (CFM)	Total Volume *2 (m³)	TSP Concentration (µg/m³)
					Initial Wt.	Final Wt.	Wt. of dust			
AM11203 207426	19.5 - 23.4	NE	<5m/s	3/12/2019	2.6620	2.8199	0.1579	50.0	2216.30	71
AM11209 207414	18.1 - 24.7	NE	<5m/s	9/12/2019	2.6888	2.8293	0.1405	50.0	2216.30	63
AM11214 207411	17.2 - 25.8	E	<5m/s	14/12/2019	2.6864	2.8844	0.1980	50.0	2216.30	89
AM11220 207416	17.1 - 25.9	E	<5m/s	20/12/2019	2.6812	2.8955	0.2143	50.0	2216.30	97
AM11224 207433	19.8 - 26.3	SE	<5m/s	24/12/2019	2.6780	2.8038	0.1258	50.0	2216.30	57
AM11230 207384	18.4 - 24.3	NE	<5m/s	30/12/2019	2.6880	2.8012	0.1132	50.0	2216.30	51

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

*2 Remark: Total volume of the 24 hrs sampling was calculated from the Calibration worksheet (refer to Appendix D)

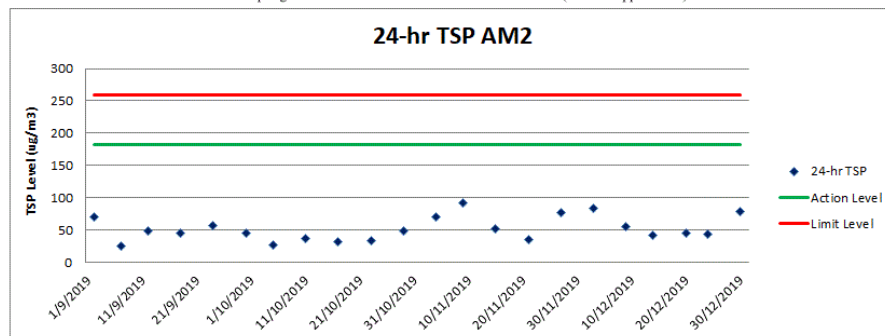


24-hr TSP Monitoring Result for AM2

Sampling ID & Paper No.	Temperature (°C) *1	Wind Direction *1	Wind Speed (m/s) *1	Sampling Date	Wt. of paper (g)			Flow Rate (CFM)	Total Volume *2 (m³)	TSP Concentration (µg/m³)
					Initial Wt.	Final Wt.	Wt. of dust			
AM21203 207410	19.5 - 23.4	NE	<5m/s	3/12/2019	2.6728	2.8707	0.1979	50.0	2364.01	84
AM21209 207415	18.1 - 24.7	NE	<5m/s	9/12/2019	2.6765	2.8077	0.1312	50.0	2364.01	55
AM21214 207379	17.2 - 25.8	E	<5m/s	14/12/2019	2.7202	2.8202	0.1000	50.0	2364.01	42
AM21220 207385	17.1 - 25.9	E	<5m/s	20/12/2019	2.7088	2.8144	0.1056	50.0	2364.01	45
AM21224 207386	19.8 - 26.3	SE	<5m/s	24/12/2019	2.7024	2.8055	0.1031	50.0	2364.01	44
AM21230 207387	18.4 - 24.3	NE	<5m/s	30/12/2019	2.6945	2.8790	0.1845	50.0	2364.01	78

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

*2 Remark: Total volume of the 24 hrs sampling was calculated from the Calibration worksheet (refer to Appendix D)

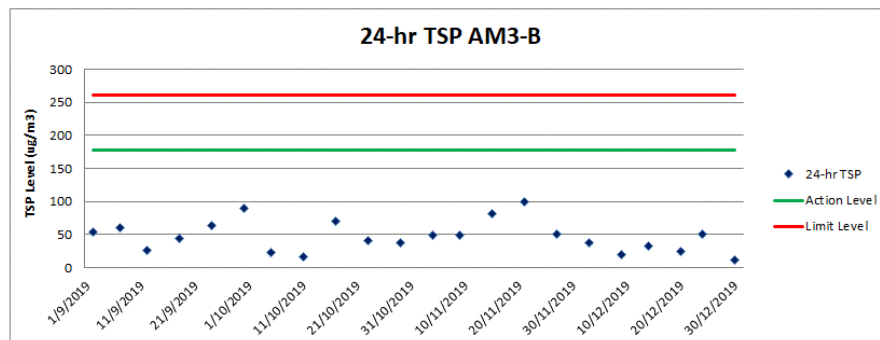


24-hr TSP Monitoring Result for AM3-B

Sampling ID & Paper No.	Temperature (°C) *1	Wind Direction *1	Wind Speed (m/s) *1	Sampling Date	Wt. of paper (g)			Flow Rate (CFM)	Total Volume *2 (m³)	TSP Concentration (µg/m³)
					Initial Wt.	Final Wt.	Wt. of dust			
AM3-B1203 207388	19.5 - 23.4	NE	<5m/s	3/12/2019	2.7009	2.7888	0.0879	50.0	2331.95	38
AM3-B1209 207380	18.1 - 24.7	NE	<5m/s	9/12/2019	2.7070	2.7542	0.0472	50.0	2331.95	20
AM3-B1214 207444	17.2 - 25.8	E	<5m/s	14/12/2019	2.6658	2.7405	0.0747	50.0	2331.95	32
AM3-B1220 207434	17.1 - 25.9	E	<5m/s	20/12/2019	2.6848	2.7400	0.0552	50.0	2331.95	24
AM3-B1224 207445	19.8 - 26.3	SE	<5m/s	24/12/2019	2.6762	2.7920	0.1158	50.0	2331.95	50
AM3-B1230 207441	18.4 - 24.3	NE	<5m/s	30/12/2019	2.6780	2.7044	0.0264	50.0	2331.95	11

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

*2 Remark: Total volume of the 24 hrs sampling was calculated from the Calibration worksheet (refer to Appendix D)



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ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

CERTIFICATE OF ANALYSIS

<p>Client : ENVIRONMENTAL PIONEERS & SOLUTION LTD</p> <p>Contact : MR ANDY TSANG</p> <p>Address : FLAT A, 8/F, CHAI WAN INDUSTRIAL CENTRE, 20 LEE CHUNG STREET, CHAI WAN, HONG KONG</p> <p>E-mail : kytsang@fsenv.com.hk</p> <p>Telephone : +852 2185 0159</p> <p>Facsimile : +852 2258 0568</p> <p>Project : PROPOSED ROAD IMPROVEMENT WORKS IN WEST KOWLOON RECLAMATION DEVELOPMENT - PHASE 1</p> <p>Order number : —</p> <p>C-O-C number : —</p> <p>Site : —</p>	<p>Laboratory : ALS Technichem (HK) Pty Ltd</p> <p>Contact : Richard Fung</p> <p>Address : 11/F., Chung Shun Knitting Centre, 1 - 3 Wing Yip Street, Kwai Chung, N.T., Hong Kong</p> <p>E-mail : richard.fung@alsglobal.com</p> <p>Telephone : +852 2610 1044</p> <p>Facsimile : +852 2610 2021</p> <p>Quote number : HKE/3415a/2018_V2</p>	<p>Page : 1 of 4</p> <p>Work Order : HK2000737</p> <p>Date Samples Received : 06-Jan-2020</p> <p>Issue Date : 09-Jan-2020</p> <p>No. of samples received : 6</p> <p>No. of samples analysed : 6</p>
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Signatories	Position	Authorised results for
 Fung Lim Chee, Richard	Managing Director	Inorganics

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Part of the ALS Laboratory Group

11/F., Chung Shun Knitting Centre, 1-3 Wing Yip Street, Kwai Chung, N.T., Hong Kong
Tel: +852 2610 1044 Fax: +852 2610 2021 www.alsglobal.com

Page Number : 2 of 4
Client : ENVIRONMENTAL PIONEERS & SOLUTION LTD
Work Order : HK2000737



General Comments

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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: HK2000737

Sample(s) was/were submitted by client. Sample(s) arrived laboratory in ambient condition. The result(s) related only to the item(s) tested.
Sample information (Project name, Sample ID, Sampling date/time, etc., if any) is provided by client.

Page Number : 3 of 4
Client : ENVIRONMENTAL PIONEERS & SOLUTION LTD
Work Order : HK2000737



Analytical Results

Sub-Matrix: FILTER (TSP/RSP)

				Client sample ID	AM11203 207426	AM11209 207414	AM11214 207411	AM11220 207416	AM11224 207433
				Client sampling date / time	03-Dec-2019	09-Dec-2019	14-Dec-2019	20-Dec-2019	24-Dec-2019
Compound	CAS Number	LOR	Unit		HK2000737-001	HK2000737-002	HK2000737-003	HK2000737-004	HK2000737-005
EA/ED: Physical and Aggregate Properties									
HK-TSP: Total Suspended Particulates	----	0.0010	g		0.1579	0.1405	0.1980	0.2143	0.1258
HK-TSP: Initial Weight	----	0.0010	g		2.6620	2.6888	2.6864	2.6812	2.6780
HK-TSP: Final Weight	----	0.0010	g		2.8199	2.8293	2.8844	2.8955	2.8038

Page Number : 4 of 4
Client : ENVIRONMENTAL PIONEERS & SOLUTION LTD
Work Order : HK2000737



Sub-Matrix: FILTER (TSP/RSP)				Client sample ID	AM11230 207384	---	---	---	---
				Client sampling date / time	30-Dec-2019	---	---	---	---
Compound	CAS Number	LOR	Unit		HK2000737-006	---	---	---	---
EA/ED: Physical and Aggregate Properties									
HK-TSP: Total Suspended Particulates	---	0.0010	g		0.1132	---	---	---	---
HK-TSP: Initial Weight	---	0.0010	g		2.6880	---	---	---	---
HK-TSP: Final Weight	---	0.0010	g		2.8012	---	---	---	---

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CERTIFICATE OF ANALYSIS

Client	: ENVIRONMENTAL PIONEERS & SOLUTION LTD	Laboratory	: ALS Technichem (HK) Pty Ltd	Page	: 1 of 4
Contact	: MR ANDY TSANG	Contact	: Richard Fung	Work Order	: HK2000739
Address	: FLAT A, 8/F, CHAI WAN INDUSTRIAL CENTRE, 20 LEE CHUNG STREET, CHAI WAN, HONG KONG 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			Date Samples Received	: 06-Jan-2020
Order number	: ---	Quote number	: HKE/3415a/2018_V2	Issue Date	: 09-Jan-2020
C-O-C number	: ---			No. of samples received	: 6
Site	: ---			No. of samples analysed	: 6

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Signatories	Position	Authorised results for
	Managing Director	Inorganics
Fung Lim Chee, Richard	Managing Director	Inorganics

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11/F., Chung Shun Knitting Centre, 1-3 Wing Yip Street, Kwai Chung, N.T., Hong Kong
Tel: +852 2610 1044 Fax: +852 2610 2021 www.alsglobal.com

Page Number : 2 of 4
Client : ENVIRONMENTAL PIONEERS & SOLUTION LTD
Work Order : HK2000739



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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: HK2000739

Sample(s) was/were submitted by client. Sample(s) arrived laboratory in ambient condition. The result(s) related only to the item(s) tested.
Sample information (Project name, Sample ID, Sampling date/time, etc., if any) is provided by client.

Page Number : 3 of 4
Client : ENVIRONMENTAL PIONEERS & SOLUTION LTD
Work Order : HK2000739



Analytical Results

Sub-Matrix: FILTER (TSP/RSP)

				Client sample ID	AM21203 207410	AM21209 207415	AM21214 207379	AM21220 207385	AM21224 207386
				Client sampling date / time	03-Dec-2019	09-Dec-2019	14-Dec-2019	20-Dec-2019	24-Dec-2019
Compound	CAS Number	LOR	Unit		HK2000739-001	HK2000739-002	HK2000739-003	HK2000739-004	HK2000739-005
EA/ED: Physical and Aggregate Properties									
HK-TSP: Total Suspended Particulates	----	0.0010	g		0.1979	0.1312	0.1000	0.1056	0.1031
HK-TSP: Initial Weight	----	0.0010	g		2.6728	2.6765	2.7202	2.7088	2.7024
HK-TSP: Final Weight	----	0.0010	g		2.8707	2.8077	2.8202	2.8144	2.8055

Page Number : 4 of 4
Client : ENVIRONMENTAL PIONEERS & SOLUTION LTD
Work Order : HK2000739



Sub-Matrix: FILTER (TSP/RSP)				Client sample ID	AM21230 207387	---	---	---	---
				Client sampling date / time	30-Dec-2019	---	---	---	---
Compound	CAS Number	LOR	Unit		HK2000739-006	---	---	---	---
EA/ED: Physical and Aggregate Properties									
HK-TSP: Total Suspended Particulates	---	0.0010	g		0.1845	---	---	---	---
HK-TSP: Initial Weight	---	0.0010	g		2.6945	---	---	---	---
HK-TSP: Final Weight	---	0.0010	g		2.8790	---	---	---	---

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CERTIFICATE OF ANALYSIS

Client	: ENVIRONMENTAL PIONEERS & SOLUTION LTD	Laboratory	: ALS Technichem (HK) Pty Ltd	Page	: 1 of 4
Contact	: MR ANDY TSANG	Contact	: Richard Fung	Work Order	: HK2000744
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	Date Samples Received	: 06-Jan-2020		
Order number	: ---	Quote number	: HKE/3415a/2018_V2	Issue Date	: 09-Jan-2020
C-O-C number	: ---	No. of samples received	: 6		
Site	: ---	No. of samples analysed	: 6		

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Signatories	Position	Authorised results for
	Managing Director	Inorganics
Fung Lim Chee, Richard	Managing Director	Inorganics

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11/F., Chung Shun Knitting Centre, 1-3 Wing Yip Street, Kwai Chung, N.T., Hong Kong
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Client : ENVIRONMENTAL PIONEERS & SOLUTION LTD
Work Order : HK2000744



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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: HK2000744

Sample(s) was/were submitted by client. Sample(s) arrived laboratory in ambient condition. The result(s) related only to the item(s) tested.
Sample information (Project name, Sample ID, Sampling date/time, etc., if any) is provided by client.

Page Number : 3 of 4
Client : ENVIRONMENTAL PIONEERS & SOLUTION LTD
Work Order : HK2000744



Analytical Results

Sub-Matrix: FILTER (TSP/RSP)

				Client sample ID	AM3-B1203 207388	AM3-B1209 207380	AM3-B1214 207444	AM3-B1220 207434	AM3-B1224 207445
				Client sampling date / time	03-Dec-2019	09-Dec-2019	14-Dec-2019	20-Dec-2019	24-Dec-2019
Compound	CAS Number	LOR	Unit		HK2000744-001	HK2000744-002	HK2000744-003	HK2000744-004	HK2000744-005
EA/ED: Physical and Aggregate Properties									
HK-TSP: Total Suspended Particulates	----	0.0010	g		0.0879	0.0472	0.0747	0.0552	0.1158
HK-TSP: Initial Weight	----	0.0010	g		2.7009	2.7070	2.6658	2.6848	2.6762
HK-TSP: Final Weight	----	0.0010	g		2.7888	2.7542	2.7405	2.7400	2.7920

Page Number : 4 of 4
Client : ENVIRONMENTAL PIONEERS & SOLUTION LTD
Work Order HK2000744

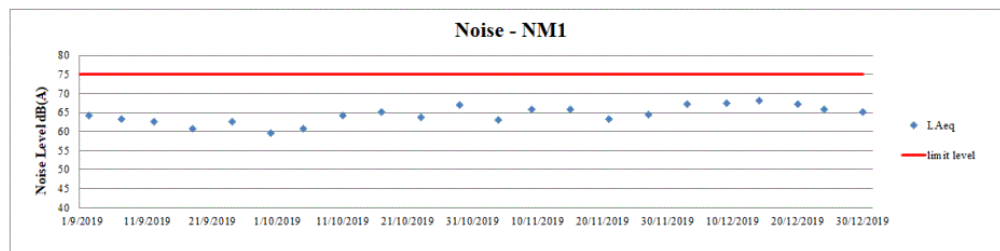


Sub-Matrix: FILTER (TSP/RSP)				Client sample ID	AM3-B1230	----	----	----	----
					207441				
				Client sampling date / time	30-Dec-2019	----	----	----	----
Compound	CAS Number	LOR	Unit	HK2000744-006					
EA/ED: Physical and Aggregate Properties									
HK-TSP: Total Suspended Particulates	----	0.0010	g	0.0264	----	----	----	----	----
HK-TSP: Initial Weight	----	0.0010	g	2.6780	----	----	----	----	----
HK-TSP: Final Weight	----	0.0010	g	2.7044	----	----	----	----	----

Appendix F1: Noise Monitoring Data

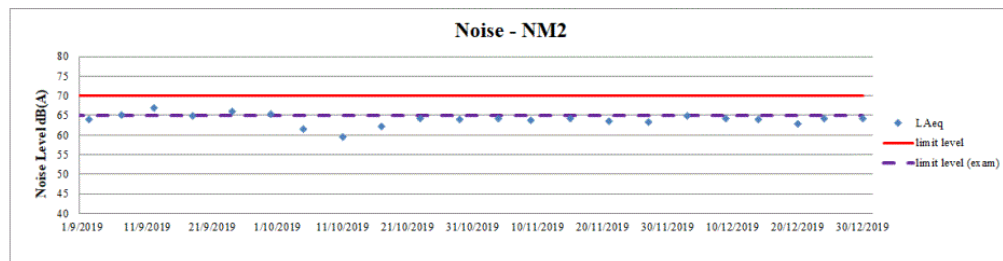
Noise Monitoring Result for NM1

Location	NM1					
Date	3/12/2019	9/12/2019	14/12/2019	20/12/2019	24/12/2019	30/12/2019
Weather Condition	Overcast	Overcast	Overcast	Sunny	Overcast	Sunny
Start Time	10:00	10:00	10:00	10:00	10:00	10:00
Measurement Period	30min	30min	30min	30min	30min	30min
Baseline Level	75.1					
L _{Aeq}	67.2	67.4	68.1	67.3	65.8	65.2
L ₁₀	69.5	69.1	69.9	69.2	67.1	67.3
L ₉₀	61.6	61.3	61.5	61.7	60.4	60.1



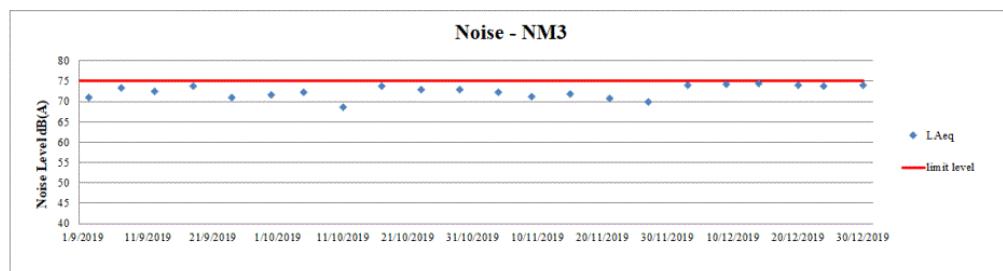
Noise Monitoring Result for NM2

Location	NM2					
Date	3/12/2019	9/12/2019	14/12/2019	20/12/2019	24/12/2019	30/12/2019
Weather Condition	Overcast	Overcast	Overcast	Sunny	Overcast	Sunny
Start Time	14:00	14:00	14:00	14:00	14:00	14:00
Measurement Period	30min	30min	30min	30min	30min	30min
Baseline Level	66.5					
L _{Aeq}	64.8	64.1	63.9	62.8	64.1	64.2
L ₁₀	66.9	66.8	67.0	66.1	66.7	67.0
L ₉₀	59.8	60.0	58.9	68.4	60.3	60.4



Noise Monitoring Result for NM3

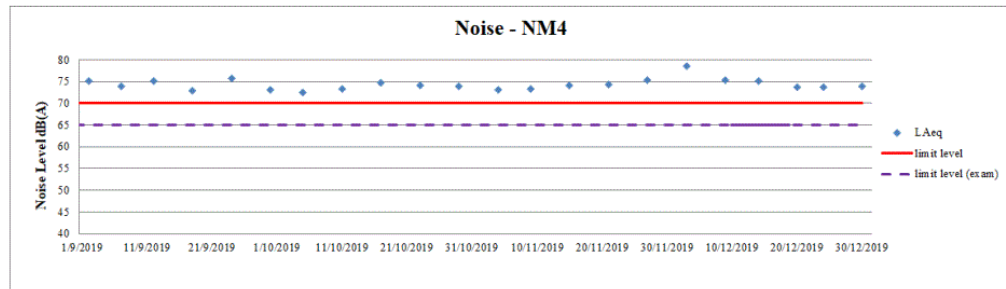
Location	NM3					
Date	3/12/2019	9/12/2019	14/12/2019	20/12/2019	24/12/2019	30/12/2019
Weather Condition	Overcast	Overcast	Overcast	Sunny	Overcast	Sunny
Start Time	9:00	9:00	9:00	9:00	9:00	9:00
Measurement Period	30min	30min	30min	30min	30min	30min
Baseline Level	74.5					
L _{Aeq}	74.0	74.2	74.4	74.1	73.8	73.9
L ₁₀	77.2	76.9	77.0	76.9	76.4	75.8
L ₉₀	68.9	68.8	69.1	67.4	66.8	67.3



Noise Monitoring Result for NM4

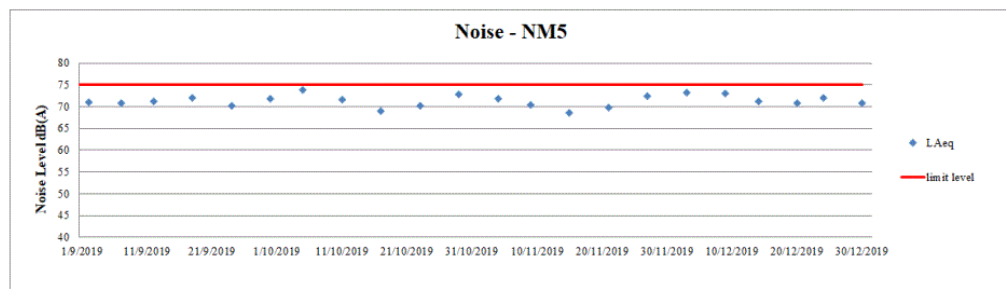
Location	NM4						NM4 (Re-measurement) *					
Date	3/12/2019	9/12/2019	14/12/2019	20/12/2019	24/12/2019	30/12/2019	3/12/2019	9/12/2019	14/12/2019	20/12/2019	24/12/2019	30/12/2019
Weather Condition	Overcast	Overcast	Overcast	Sunny	Overcast	Sunny	Overcast	Overcast	Overcast	Sunny	Overcast	Sunny
Start Time	13:00	13:00	13:00	13:00	13:00	13:00	13:30	13:30	13:30	13:30	13:30	13:30
Measurement Period	30min	30min	30min	30min	30min	30min	30min	30min	30min	30min	30min	30min
Baseline Level	73.3						73.3					
L _{Aeq}	78.6	75.4	75.2	73.8	73.7	74.0	78.9	75.2	76.0	73.3	74.1	74.1
L ₁₀	80.1	78.1	78.8	76.5	77.4	76.9	81.0	78.9	78.9	76.1	78.2	77.1
L ₉₀	71.9	68.3	70.8	69.1	66.0	70.3	72.4	67.5	70.1	69.4	66.5	69.8

* Repeat noise measurement when exceedance is recorded. The result is used to confirm the findings and it would not be showed on the graph plot



Noise Monitoring Result for NM5

Location	NM5					
Date	3/12/2019	9/12/2019	14/12/2019	20/12/2019	24/12/2019	30/12/2019
Weather Condition	Overcast	Overcast	Overcast	Sunny	Overcast	Sunny
Start Time	15:00	15:00	15:00	15:00	15:00	15:00
Measurement Period	30min	30min	30min	30min	30min	30min
Baseline Level	71.8					
L _{Aeq}	73.2	73.0	71.2	70.8	72.1	70.9
L ₁₀	74.8	75.0	74.8	73.7	75.4	73.7
L ₉₀	62.9	64.8	64.7	63.8	65.2	64.7



Appendix F2: School Schedule

油蔴地天主教小學(海泓道) 二零一九至二零二零年度校曆表(上學期)									
月份	周次	日	一	二	三	四	五	六	行事曆
九月	一	1	2 S	3 S	4 S	5 S	6 S	7	2/9 開學、升旗禮
	二	8	9 S	10 S	11 S	12 S	13	14	12/9 開學感恩祭 13/9 教師發展日(一) 14/9 中秋節翌日
	三	15	16 A	17 B	18 C	19 D	20 E	21	
	四	22	23 F	24 A	25 B	26 C	27 D	28	27/9 冬季校服度身 28/9 我和班主任有個約會
	五	29	30 E						
十月				1	2 F	3 A	4 S	5	1/10 國慶日 4/10 水運會
	六	6	7	8 B	9 C	10 D	11 E	12	7/10 重陽節
	七	13	14 F	15 A	16 B	17 C	18 D	19	
	八	20	21 E	22 F	23 A	24 B	25 C	26	25/10 J.6 升中座談會(一)
	九	27	28 D	29 E	30 F	31 A			
十一月							1 B	2	
	十	3	4 C	5 D	6 E	7 F	8 A	9	6/11 九龍南水運會
	十一	10	11 B	12 C	13 S	14 S	15 S	16	14/11-19/11 J.2-6 第一段考
	十二	17	18 S	19 S	20 D	21 E	22 F	23	
	十三	24	25 A	26 B	27 S	28	29 C	30	27/11 學校旅行 28/11 旅行翌日假期 29/11 全港疫苗資助計劃(第一針) 30/11 家校會嘉勳全民運動日
十二月	十四	1	2 D	3 E	4 F	5 A	6 B	7	7/12 家教會旅行 2/12-13/12 全方位學習周
	十五	8	9 C	10 D	11 E	12 F	13 A	14	14/12 第一次家長日
	十六	15	16 B	17 C	18 D	19 E	20 S	21	20/12 聖誕祈禱聚會
		22	23	24	25	26	27	28	21/12-1/1 聖誕及新年假期
		29	30	31					
一月	十七				1	2 F	3 A	4	1/1 元旦
	十八	5	6 B	7 C	8 D	9 E	10 F	11	11/1 家教會周年大會暨頒獎禮(一)
	十九	12	13 A	14 B	15 C	16 D	17 E	18	14/1 拍攝畢業照及班照 15/1 九龍南陸運會 16/1-18/1 教育營 17/1 全港疫苗資助計劃(第二針)
	二十	19	20 S	21 S	22	23	24	25	20/1 下學期 20/1 大掃除 21/1 開放日 25/1-27/1 初一至初三
		26	27	28	29	30	31		22/1-2/2 農曆新年假期
二月								1	
	廿一	2	3 F	4 A	5 B	6 C	7 D	8	
	廿二	9	10 E	11 F	12 A	13 B	14 C	15	14/2 J.5 升中座談會
	廿三	16	17 D	18 E	19 F	20 A	21 B	22	
	廿四	23	24 C	25 D	26 E	27 F	28 A	29	

麗澤中學 校曆表

<p>2019.08-2019.09</p> <table> <tr><th>周次</th><th>日</th><th>一</th><th>二</th><th>三</th><th>四</th><th>五</th><th>六</th></tr> <tr><td>B 1</td><td>25</td><td>26</td><td>27</td><td>28</td><td>29</td><td>30</td><td>31</td></tr> <tr><td>A 2</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td></tr> <tr><td>B 3</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td></tr> <tr><td>A 4</td><td>15</td><td>16</td><td>17</td><td>18</td><td>19</td><td>20</td><td>21</td></tr> <tr><td>B 5</td><td>22</td><td>23</td><td>24</td><td>25</td><td>26</td><td>27</td><td>28</td></tr> <tr><td>A 6</td><td>29</td><td>30</td><td></td><td></td><td></td><td></td><td></td></tr> </table> <p>九月 初二</p>												周次	日	一	二	三	四	五	六	B 1	25	26	27	28	29	30	31	A 2	1	2	3	4	5	6	7	B 3	8	9	10	11	12	13	14	A 4	15	16	17	18	19	20	21	B 5	22	23	24	25	26	27	28	A 6	29	30																																																																																											
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Appendix G: Waste Management Record

Monthly Summary Waste Flow Table for 2016 (year)

Month	<u>Actual Quantities of Inert C&D Materials Generated Monthly</u>					<u>Actual Quantities of Non-inert C&D Wastes Generated Monthly</u>					
	Total Quantity Generated	Hard Rocks & Broken Concrete	Reused in the Contract	Reused in other Projects	Disposed as Public Fill	Mixed Waste Disposal at Sorting Facility	Metals	Paper / cardboard packaging	Plastics	Chemical Waste	Others (general refuse)
	(in '000kg)	(in '000kg)	(in '000kg)	(in '000kg)	(in '000kg)	(in '000kg)	(in '000kg)	(in '000kg)	(in '000kg)	(in '000kg)	(in '000kg)
Jan	--	--	--	--	--	--	--	--	--	--	--
Feb	521.76	0	0	0	521.76	0	0	0	0	0	38.34
Mar	1527.37	0	0	0	1527.37	0	0	0	0	0	188.63
Apr	2676.73	0	0	0	2676.73	0	0	0	0	0	87.72
May	2028.43	0	0	0	2028.43	0	0	0	0	0	47.78
Jun	2058.16	0	0	0	2058.16	0	0	0	0	0	81.13
Sub-total	8812.45	0	0	0	8812.45	0	0	0	0	0	443.6
Jul	5031.54	0	0	0	5031.54	0	0	0	0	0	17.12
Aug	1026.39	0	0	0	1026.39	0	0	0	0	0	52.44
Sep	1833.94	0	0	0	1833.94	0	0	0	0	0	7.14
Oct	785.58	0	0	0	785.58	0	0	0	0	0	16.77
Nov	832.23	0	0	0	832.23	0	0	0	0	0	48.09
Dec	2183.48	0	0	0	2183.48	0	0	0	0	0	19.96
Total	20505.61	0	0	0	20505.61	0	0	0	0	0	605.12

Monthly Summary Waste Flow Table for 2017 (year)

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	Total Quantity Generated	Hard Rocks & Broken Concrete	Reused in the Contract	Reused in other Projects	Disposed as Public Fill	Mixed Waste Disposal at Sorting Facility	Metals	Paper / cardboard packaging	Plastics	Chemical Waste	Others (general refuse)
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Jan	717.69	0	0	0	717.69	0	0	0	0	0	7.57
Feb	2721.53	0	0	0	2721.53	0	0	0	0	0	13.08
Mar	2504.26	0	0	0	2504.26	0	0	0	0	0	5.55
Apr	2006.4	0	0	0	2006.4	0	0	0	0	0	10.43
May	1083.4	0	0	0	1083.4	0	0	0	0	0	10.04
Jun	840.63	0	0	0	840.63	0	0	0	0	0	12.53
Sub-total	9873.91	0	0	0	9873.91	0	0	0	0	0	59.2
Jul	1115.46	0	0	0	1115.46	0	0	0	0	0	19.58
Aug	1061.18	0	0	0	1061.18	0	0	0	0	0	25.19
Sep	3410.43	0	0	0	3410.43	0	0	0	0	0	30.62
Oct	2213.94	0	0	0	2213.94	0	0	0	0	0	30.56
Nov	2961.95	0	0	0	2961.95	0	0	0	0	0	26.85
Dec	3174.36	0	0	0	3174.36	0	0	0	0	0	35.72
Total	23811.23	0	0	0	23811.23	0	0	0	0	0	227.72
Grand Total (2016&2017)	44316.84	0	0	0	44316.84	0	0	0	0	0	832.84

Monthly Summary Waste Flow Table for 2018 (year)

Month	<u>Actual Quantities of Inert C&D Materials Generated Monthly</u>					<u>Actual Quantities of Non-inert C&D Wastes Generated Monthly</u>					
	Total Quantity Generated	Hard Rocks & Broken Concrete	Reused in the Contract	Reused in other Projects	Disposed as Public Fill	Mixed Waste Disposal at Sorting Facility	Metals	Paper / cardboard packaging	Plastics	Chemical Waste	Others (general refuse)
	(in '000kg)	(in '000kg)	(in '000kg)	(in '000kg)	(in '000kg)	(in '000kg)	(in '000kg)	(in '000kg)	(in '000kg)	(in '000kg)	(in '000kg)
Jan	3371.25	0	0	0	3371.25	0	0	0	0	0	31.67
Feb	1886.48	0	0	0	1886.48	0	0	0	0	0	11.76
Mar	2844.68	0	0	0	2844.68	0	0	0	0	0	14.42
Apr	3279.44	0	0	0	3279.44	0	0	0	0	0	23.84
May	2375.34	0	0	0	2375.34	0	0	0	0	0	26.76
Jun	2833.19	0	0	0	2833.19	0	0	0	0	0	20.63
Sub-total	16590.38	0	0	0	16590.38	0	0	0	0	0	129.08
Jul	2986.5	0	0	0	2986.5	0	0	0	0	0	50.88
Aug	1489.6	0	0	0	1489.6	0	0	0	0	0	55.64
Sep	1380.82	0	0	0	1380.82	0	0	0	0	0	75.78
Oct	1729.76	0	0	0	1729.76	0	0	0	0	0	41.18
Nov	1389.54	0	0	0	1389.54	0	0	0	0	0	36.60
Dec	1396.37	0	0	0	1396.37	0	0	0	0	0	25.37
Total	26962.97	0	0	0	26962.97	0	0	0	0	0	414.53
Grand Total (2016-2018)	71249.81	0	0	0	71249.81	0	0	0	0	0	1245.37

Monthly Summary Waste Flow Table for 2019 (year)

Month	<u>Actual Quantities of Inert C&D Materials Generated</u>					<u>Actual Quantities of Non-inert C&D Wastes Generated Monthly</u>					
	<u>Monthly</u>										
	Total Quantity Generated	Hard Rocks & Broken Concrete	Reused in the Contract	Reused in other Projects	Disposed as Public Fill	Mixed Waste Disposal at Sorting Facility	Metals	Paper / cardboard packaging	Plastics	Chemical Waste	Others (general refuse)
	(in '000kg)	(in '000kg)	(in '000kg)	(in '000kg)	(in '000kg)	(in '000kg)	(in '000kg)	(in '000kg)	(in '000kg)	(in '000kg)	(in '000kg)
Jan	1359.4	0	0	0	1359.4	0	0	0	0	0	29.60
Feb	742.02	0	0	0	742.02	0	0	0	0	0	15.93
Mar	1450.48	0	0	0	1450.48	0	0	0	0	0	30.17
Apr	2217.11	0	0	0	2217.11	0	0	0	0	0	18.31
May	1198.66	0	0	0	1198.66	0	0	0	0	0	33.77
Jun	1452.4	0	0	0	1452.4	0	0	0	0	0	39.61
Sub-total	8420.07	0	0	0	8420.07	0	0	0	0	0	167.39
Jul	1519.91	0	0	0	1519.91	0	0	0	0	0	49.44
Aug	1645.58	0	0	0	1645.58	0	0	0	0	0	35.87
Sep	3910.94	0	0	0	3910.94	0	0	0	0	0	40.42
Oct	2454.92	0	0	0	2454.92	0	0	0	0	0	36.64
Nov	1613.72	0	0	0	1613.72	0	0	0	0	0	64.64
Dec	1432.23	0	0	0	1432.23	0	0	0	0	0	59.93
Total	20997.37	0	0	0	20997.37	0	0	0	0	0	454.33
Grand Total (2016-2019)	92277.18	0	0	0	92277.18	0	0	0	0	0	1701.7

Appendix H: Environmental Mitigation Implementation Schedule

Implementation Schedule for Environmental Mitigation Measures

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Objectives of the Recommended Measure & Main Concerns to address	Who to Implement the measure	Location of the measure	When to implement the measure	What requirements or standard for the measure to achieve	Implementation Status
Air Quality Impact (Construction Phase)								
4.8	A1	Good housekeeping to minimize dust generation, e.g. by properly handling and storing dusty materials	To minimize dust generation	HyD's Contractor	Whole construction site	Throughout construction phase	EIAO-TM, APCO	✓
4.8	A2	Adopt dust control measures, such as dust suppression using water spray on exposed soil (at least 8 times per day), in areas with dusty construction activities and during material handling	To minimize dust generation due to erosion	HyD's Contractor	Whole construction site	Throughout construction phase	EIAO-TM, APCO	#
4.8	A3	Store cement bags in shelter with 3 sides and the top covered by impervious materials if the stack exceeds 20 bags	To prevent leakage of cement	HyD's Contractor	Whole construction site	Throughout construction phase	EIAO-TM, APCO	*
4.8	A4	Maintain a reasonable height when dropping excavated materials to limit dust generation	To minimize dust generation during movement of excavated materials	HyD's Contractor	Whole construction site	Throughout construction phase	EIAO-TM, APCO	✓
4.8	A5	Limit vehicle speed within site to 10km/hr and confine vehicle movement in haul road	To minimize dust generation due to traffic movement	HyD's Contractor	Whole construction site	Throughout construction phase	EIAO-TM, APCO	✓
4.8	A6	Minimize exposed earth after completion of work in a certain area by hydroseeding, vegetating, soil compacting or covering with bitumen	To minimize dust generation due to erosion	HyD's Contractor	Whole construction site	Throughout construction phase	EIAO-TM, APCO	✓
4.8	A7	Provide wheel washing at site exit to clean the vehicle body and wheel	To prevent dust from being brought offsite	HyD's Contractor	Whole construction site	Throughout construction phase	EIAO-TM, APCO	*
4.8	A8	Hard pave the area at site exit with concrete, bitumen or hardcore	To prevent dust from being brought offsite	HyD's Contractor	Whole construction site	Throughout construction phase	EIAO-TM, APCO	✓
4.8	A9	Cover materials on trucks before leaving the site to prevent debris from dropping during traffic movement or being blown away by wind	To prevent falling of debris during traffic movement and by wind	HyD's Contractor	Whole construction site	Throughout construction phase	EIAO-TM, APCO	✓
4.8	A10	Regular maintenance of plant equipment to prevent black smoke emission	To minimize black smoke emission	HyD's Contractor	Whole construction site	Throughout construction phase	EIAO-TM, APCO	✓
4.8	A11	Throttle down or switch off unused machines or machine in intermittent use	To minimize unnecessary emission	HyD's Contractor	Whole construction site	Throughout construction phase	EIAO-TM, APCO	✓
4.8	A12	Carry out regular site inspection to audit the implementation of mitigation measures	To check the implementation status and effectiveness of mitigation measures	HyD's Contractor	Whole construction site	Throughout construction phase	EIAO-TM, APCO	✓

4.8	A13	Carry out air quality monitoring throughout the construction period	To monitor construction dust level	HyD's Contractor	At representative ASRs	Prior to and throughout construction phase	EIAO-TM	✓
Noise Impact (Construction Phase)								
3.8	N1	Adopt good site practice, such as regular maintenance of plant equipment, throttle down unused machines	To minimize construction noise level	HyD's Contractor	Whole construction site	Throughout construction phase	NCO,EIAO-TM	✓
3.8	N2	Use Quality Powered Mechanical Equipment (QPME) which produces lower noise level (e.g. Excavator/Loader (EPD-01431), Asphalt Paver (EPD-01226), Road Roller (EPD-00244) and Mobile Crane (EPD-01477))	To minimize construction noise level	HyD's Contractor	Whole construction site	Throughout construction phase	NCO,EIAO-TM	✓
3.8	N3	Erect movable noise barrier at significant noise source(e.g. Concrete Pump, Concrete Lorry Mixer, Excavator/Loader, Road Sweeper, Asphalt Paver, Road Roller, Lorry, Breaker and Poker)	To lower noise transmission	HyD's Contractor	Whole construction site	Throughout construction phase	NCO,EIAO-TM	✓
3.8	N5	Regular maintenance of plant equipment to prevent noise emission due to impair	To prevent noise emission due to impair	HyD's Contractor	Whole construction site	Throughout construction phase	NCO,EIAO-TM	✓
3.8	N6	Position mobile noisy equipment in location and direction away from NSR	To minimize noise transmission to NSR	HyD's Contractor	Whole construction site	Throughout construction phase	NCO,EIAO-TM	N/A

3.8	N7	Use silencer or muffler on plant equipment and should be properly maintained	To minimize noise transmission	HyD's Contractor	Whole construction site	Throughout construction phase	NCO,EIAO-TM	✓
3.8	N8	Throttle down or switch off unused machines or machine in intermittent use between work	To minimize noise production	HyD's Contractor	Whole construction site	Throughout construction phase	NCO,EIAO-TM	✓
3.8	N9	Make good use of stockpiles or other structures for noise screening	To minimize noise transmission	HyD's Contractor	Whole construction site	Throughout construction phase	NCO,EIAO-TM	N/A
3.8	N10	Avoid carrying out noisy activities at the same time	To minimize noise production	HyD's Contractor	Whole construction site	Throughout construction phase	NCO,EIAO-TM	✓
3.8	N11	Reduce the percentage on-time for some noisy PMEs	To minimize noise production	HyD's Contractor	Whole construction site	Throughout construction phase	NCO,EIAO-TM	✓
3.8	N12	Carry out noise monitoring	To monitor construction noise level	HyD's Contractor	At representative NSRs	Prior to and throughout construction phase	EIAO-TM	✓
Water Impact (Construction Phase)								
5.8	W1	Recirculate settled water for ground boring and drilling during site investigation or rock/soil anchoring.	To minimize wastewater generation	HyD's Contractor	Whole construction site	Throughout construction phase	ProPECC PN 1/94, EIAO-TM	✓
5.8	W2	Set up sedimentation tank for settling suspended solids in wastewater before discharge into storm drains. Sand/silt	To reduce the amount of suspended solid in wastewater	HyD's Contractor	Whole construction site	Throughout construction phase	ProPECC PN 1/94, EIAO-TM	✓

		removal facilities such as sand traps, silt traps and sedimentation basin should be provided with adequate capacity.						
5.8	W3	Pave the construction road between the wheel washing bay and the public road with backfall	To prevent soil and site runoff from leaving the site	HyD's Contractor	Whole construction site	Throughout construction phase	ProPECC PN 1/94, EIAO-TM	✓
5.8	W4	Follow ProPECC PN 1/94 "Construction Site Drainage" as far as practicable	To minimize surface runoff and chance of erosion	HyD's Contractor	Whole construction site	Throughout construction phase	ProPECC PN 1/94, EIAO-TM	✓
5.8	W5	Provide perimeter channels at site boundaries.	To stop offsite storm runoff from entering the site	HyD's Contractor	Whole construction site	Throughout construction phase	ProPECC PN 1/94, EIAO-TM	✓
5.8	W6	Construct catchpits and perimeter channels prior to commencement of site formation works and earthworks.	To stop runoff from flowing across the site	HyD's Contractor	Whole construction site	Throughout construction phase	ProPECC PN 1/94, EIAO-TM	✓
5.8	W7	Maintain silt removal facilities, channels, manholes before and after rainstorm.	To prevent failure that may lead to flooding	HyD's Contractor	Whole construction site	Throughout construction phase	ProPECC PN 1/94, EIAO-TM	✓
5.8	W8	Remove sediment from silt and grit at regular interval.	To prevent blockage the may lead to flooding	HyD's Contractor	Whole construction site	Throughout construction phase	ProPECC PN 1/94, EIAO-TM	✓
5.8	W9	Consider environmental requirements when diverting or realigning drainage.	To ensure adequate hydraulic capacity of all drains	HyD's Contractor	Whole construction site	Throughout construction phase	ProPECC PN 1/94, EIAO-TM	✓

5.8	W10	Maintain a minimum distance of 100m between discharge point of construction site runoff and the existing saltwater intakes. No effluent will be discharged into typhoon shelter. (for loations of seawater intakes, please refer to Figure 5.1 in EIA Report)	To prevent mixing	HyD's Contractor	Whole construction site	Throughout construction phase	ProPECC PN 1/94, EIAO-TM	✓
5.8	W11	Arrange soil excavation works outside rainy seasons (April to September) as far as possible. If this cannot be achieved, the following measures should be implemented: -Cover temporary exposed slope surfaces with impermeable materials, e.g. tarpaulin - Protect temporary access roads by crushed stone or gravel - Proved intercepting channels along crest/edge of excavation - Carry out adequate surface protection measures well before the arrival of a rainstorm	To minimize surface runoff and chance of erosion	HyD's Contractor	Whole construction site	Throughout construction phase	ProPECC PN 1/94, EIAO-TM	✓ N/A ✓ ✓
5.8	W12	Compact soil after earthwork. Provide permanent work or surface protection with appropriate drainage channels immediately after forming the final surfaces.	To prevent soil erosion under rainstorm	HyD's Contractor	Whole construction site	Throughout construction phase	ProPECC PN 1/94, EIAO-TM	✓
5.8	W13	Prevent rainwater from entering trenches. Excavation of trenches should be dug and backfilled in short sections during rainy	To prevent soil erosion under rainstorm	HyD's Contractor	Whole Construction site	Throughout construction phase	ProPECC PN 1/94, EIAO-TM	✓

		seasons. Remove silt in rainwater collected from the trenches or foundation excavations prior to discharge to storm drains.						
5.8	W14	Cover open stockpiles of construction materials (e.g. aggregates, sand and fill materials) with impermeable materials such as tarpaulin during rainstorms.	To prevent soil erosion under rainstorm	HyD's Contractor	Whole construction site	Throughout construction phase	ProPECC PN 1/94, EIAO-TM	✓
5.8	W15	Cover and temporary seal manholes (including newly constructed ones) to prevent silt, construction materials or debris and surface runoff from entering foul sewers.	To prevent overloading of foul sewers	HyD's Contractor	Whole construction site	Throughout construction phase	ProPECC PN 1/94, EIAO-TM	✓
5.8	W16	Remove waste from the site regularly.	To prevent waste accumulation	HyD's Contractor	Whole construction site	Throughout construction phase	ProPECC PN 1/94, EIAO-TM	✓
5.8	W17	Apply discharge license for effluent discharge. Treat the discharge to comply with the requirement in TM-DSS.	To ensure compliance with effluent discharge requirement	HyD's Contractor	Whole construction site	Throughout construction phase	WPCO, TM-DSS, EIAO-TM	✓
5.8	W18	Reuse treated effluent onsite, e.g. dust suppression, wheel washing and general cleaning.	To minimize wastewater generation	HyD's Contractor	Whole construction site	Throughout construction phase	Waste Disposal Ordinance, EIAO-TM	✓
5.8	W19	Monitor effluent water quality.	To ensure compliance with effluent discharge requirement	HyD's Contractor	Whole construction site	Throughout construction phase	WPCO, EIAO-TM	✓
5.8	W20	Register as chemical waste producer if chemical waste will be generated.	To control chemical waste	HyD's Contractor	Whole construction site	Throughout construction phase	Waste Disposal (Chemical Waste) (General)	✓

							Regulation, EIAO-TM	
5.8	W21	Perform maintenance of vehicles and equipment that have oil leakage and spillage potential on hard standings within a bunded area with sumps and oil interceptors.	To prevent oil leakage or spillage	HyD's Contractor	Whole construction site	Throughout construction phase	Waste Disposal (Chemical Waste) (General) Regulation, EIAO-TM	✓
5.8	W22	Dispose chemical waste in accordance to Waste Disposal Ordinance. Follow the <i>Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes</i> , examples as follows: - Store chemical wastes with suitable containers to avoid leakage or spillage during storage, handling and transport - Label chemical waste containers according to the CoP to notify and warn the waste handlers - Store chemical wastes at designated safe location with adequate space	To avoid accident in waste storage and handling	HyD's Contractor	Whole construction site	Throughout construction phase	Waste Disposal Ordinance, EIAO-TM	✓

5.8	W23	Provide sufficient chemical toilets with regular maintenance by licensed chemical waste collector	To proper collection of taskforce waste	HyD's Contractor	Whole construction site	Throughout construction phase	Waste Disposal Ordinance, EIAO-TM	✓
Water Impact (Operational Phase)								
5.8	W24	Direct surface runoff for silt removal through silt trap before flowing to public storm water drainage system	To remove silt in surface runoff	HyD	Whole construction site	Throughout construction phase	WPCO, EIAO-TM	✓
5.8	W25	Regularly maintain the silt traps	To prevent blockage	HyD	Whole construction site	Throughout construction phase	WPCO, EIAO-TM	✓
Waste Management (Construction Phase)								
6.5	WM1	Allocate an area for waste sorting and storage of C&D materials into the following categories for reuse, recycle or disposal: - excavated material suitable for reuse - inert C&D material for disposal offsite - non-inert C&D materials for disposal at landfills - chemical waste - general refuse	To minimize waste generation	HyD's Contractor	Whole construction site	Throughout construction phase	Waste Disposal Ordinance, EIAO-TM	✓
6.5	WM2	Adopt good site practice as follows: - Provide training to workers on site cleanliness, waste management (waste	To proper handling of waste	HyD's Contractor	Whole construction site	Throughout construction phase	Waste Disposal Ordinance, EIAO-TM	✓

		reduction, reuse and recycle) and chemical handling procedures - Provide sufficient waste collection points and regular removal - Cover waste materials with tarpaulin or in enclosure during transportation - Maintain drainage systems, sumps and oil interceptors - Sort out chemical waste for proper handling and treatment						
6.5	WM3	Adopt waste reduction measures as follows: - Allocate area/containers for sorting, recovering and storing waste for reuse, recycle or disposal (e.g. demolition debris and excavated materials, general refuse like aluminium cans) - Allocate area for proper storage of construction materials to prevent contamination - Minimize wastage through careful planning and avoiding over-purchase of construction materials	To minimize waste generation	HyD's Contractor	Whole construction site	Throughout construction phase	Waste Disposal Ordinance, EIAO-TM	✓
6.5	WM4	Prepare and implement a site specific Waste Management Plan (WMP) as part of Environmental Management Plan (EMP) in accordance with ETWB TCW No. 19/25. Detail waste management method in the form of avoidance, reuse, recovery,	To provide guidance to waste management	HyD's Contractor	Whole construction site	Throughout construction phase	ETWB TCW No. 19/2005, EIAO-TM	✓

		recycling, storage, collection, treatment and disposal according to the recommendations on the EIA and EM&A Manual. It should be approved by the ER and						
6.5	WM5	Store waste materials properly as follows: - Avoid contamination by proper handling and storing waste - Prevent erosion by covering waste or applying water spray - Maintain and clean storage area regularly - Sort and stockpile different materials at designated location to enhance reuse	To properly store waste	HyD's Contractor	Whole construction site	Throughout construction phase	ProPECC PN 1/94, EIAO-TM	✓
6.5	WM6	Apply for relevant waste disposal permits in accordance with the Waste Disposal Ordinance (Cap. 354), Waste Disposal (Charges for Disposal of Construction Waste) Regulation (Cap. 345) and the Land (Miscellaneous Provisions) Ordinance (Cap. 28).	To properly dispose waste	HyD's Contractor	Whole construction site	Throughout construction phase	Waste Disposal Ordinance (Cap. 354), Waste Disposal (Charges for Disposal of Construction Waste) Regulation (Cap. 345) and the Land (Miscellaneous Provisions) Ordinance (Cap. 28), EIAO-TM	✓

6.5	WM7	Hire licensed waste disposal contractors for waste collection and removal. Dispose waste at licensed waste disposal facilities	To properly dispose waste	HyD's Contractor	Whole construction site	Throughout construction phase	Waste Disposal Ordinance, EIAO-TM	✓
6.5	WM8	Implement trip-ticket system for recording the amount of waste generated, recycled and disposed, including chemical wastes	To monitor movement of waste	HyD's Contractor	Whole construction site	Throughout construction phase	Waste Disposal (Chemical Waste) (General) Regulation, Waste Disposal Ordinance, EIAO-TM	✓
6.5	WM9	Provide wheel washing bay at site exit to clean the vehicle body and wheel	To prevent dust from being brought offsite	HyD's Contractor	Whole construction site	Throughout construction phase	ProPECC PN 1/94, EIAO-TM	✓
6.5	WM10	Reduce water content in wet spoil generated from piling work by mixing with dry materials. Only dispose treated spoil with less than 25% dry density to Public Fill Reception Facilities	To minimize load to reception facilities	HyD's Contractor	Whole construction site	Throughout construction phase	Waste Disposal Ordinance, EIAO-TM	✓
6.5	WM11	Dispose dry waste or waste with less than 70% water content by weight to landfill	To minimize load to reception facilities	HyD's Contractor	Whole construction site	Throughout construction phase	Waste Disposal Ordinance, EIAO-TM	✓
6.5	WM12	Follow the <i>Code of Practice on the Packaging, Labelling and Storage of Chemical Waste</i> as follows: - Store chemical wastes with suitable	To avoid accident in waste storage and handling	HyD's Contractor	Whole construction site	Throughout construction phase	Waste Disposal Ordinance, EIAO-TM	✓

		containers. Seal and maintain the container to avoid leakage or spillage during storage, handling and transport - Label chemical waste containers in both English and Chinese with instructions in accordance to Schedule 2 of the Waste Disposal (Chemical Waste) (General) Regulation - The container capacity should be smaller than 450 litres unless agreed by the EPD						
6.5	WM13	Comply with the requirement of the chemical storage area: - Store only chemical waste and label clearly the chemical characters of the waste - Have at least 3 sides enclosed and protected from rainfall with cover - Provide sufficient ventilation - Have impermeable floor and has bunds to contain 110% of the capacity of the largest container or 20% of the total volume of the stored waste in the area, whichever is larger - Adequately spaced incompatible materials	To ensure proper storage of chemical waste	HyD's Contractor	Whole construction site	Throughout construction phase	Waste Disposal Ordinance, EIAO-TM	✓
6.5	WM14	Transfer used lubricants, waste oils and other chemicals to oil recycling companies, if possible, and empty oil drums for reuse or refill. No direct or indirect discharge is permitted	To ensure proper disposal of chemical waste	HyD's Contractor	Whole construction site	Throughout construction phase	Waste Disposal (Chemical Waste) (General) Regulation, EIAO-TM	N/A

6.5	WM15	Hire licensed chemical waste disposal contractors for waste collection and removal. Dispose chemical waste at the approved CWTC at Tsing Yi or other licensed facility	To ensure proper disposal of chemical waste	HyD's Contractor	Whole construction site	Throughout construction phase	Waste Disposal (Chemical Waste) (General) Regulation, EIAO-TM	N/A
6.5	WM16	Hire reputable waste collector to separately collect and dispose general refuse from other wastes. Cover the waste to prevent being blown away	To ensure proper disposal of general refuse	HyD's Contractor	Whole construction site	Throughout construction phase	Waste Disposal (Chemical Waste) (General) Regulation, EIAO-TM	✓
6.5	WM17	Provide recycling bins for sorting out recyclables for collection by recycling companies. Non-recyclables should be removed to designated landfills every day by licensed collectors to prevent environmental and health nuisance.	To ensure proper recycling and disposal of general refuse	HyD's Contractor	Whole construction site	Throughout construction phase	Waste Disposal Ordinance, EIAO-TM	✓
6.5	WM18	Organize training and reminders to site staff on waste minimization through avoidance and reduction, reusing and recycling	To ensure proper management of general refuse	HyD's Contractor	Whole construction site	Throughout construction phase	EIAO-TM	✓
6.5	WM19	Carry out testing to verify sediment quantity and quality	To verify the categories of sediment to be disposed in accordance with ETWB TC(W) No. 34/2002	HyD's GI Contractor	Drillholes CB1 to 5 as shown in Sediment Sampling and Testing Plan	Throughout construction phase	ETWB TC(W) No. 34/2002	✓

Landscape and Visual								
7.9.3	CM1	Shorten the construction period	To minimize duration of landscape and visual impact	HyD's Contractor	Whole construction site	Throughout construction phase	EIAO-TM	N/A
7.9.3	CM2	Limit work within site area without encroaching into the landscape resources offsite.	To minimize landscape and visual impact	HyD's Contractor	Whole construction site	Throughout construction phase	EIAO-TM	✓
7.9.3	CM3	Protect retained trees from damage during construction work according to the recommended in the detailed tree assessment report and the approval of Tree Removal Application under ETWB TCW No. 3/2006 Tree Preservation	To maintain and minimize damage to existing greenery	HyD's Contractor	Whole construction site	Throughout construction phase	ETWB TCW 3/2006, EIAOTM	✓
7.9.3	CM4	Transplant unavoidably affected trees wherever possible in accordance with ETWB TCW No. 3/2006 Tree Preservation. Maintain transplanted trees to ensure healthy development during the establishment period	To minimize tree loss and ensure survival of transplanted trees	HyD's Contractor	Whole construction site	Throughout construction phase	ETWB TCW 3/2006, EIAOTM	N/A
7.9.2.6	OM1	Carry out compensatory planting in areas proposed in the Tree Survey and Landscape and Greening Study Report in accordance to ETWB TCW 3/2006, which will be subjected to refinement in detailed design stage. Compensatory planting of a ratio no less than 1:1 in terms of quality and quantity will be provided for any potential tree	To compensate for loss greenery	HyD's Contractor	Whole construction site/Offsite	Construction phase	ETWB TCW 3/2006, EIAOTM	N/A

		felling within the site. Offsite planting may be required due to land constraint. 410 nos. of compensatory trees have been proposed						
7.9.2.6	OM2	Provide vertical greening at piers of elevated roads and shrub planting near amenity planting strips to soften the hard landscape (e.g. climber and shrub for hiding central divider and enclosures). Early comments from the ACABAS and relevant departments, implementation and maintenance agents shall be sought at the earlier stage.	To soften hard landscape	HyD's Contractor	Whole construction site	Construction phase	ETWB TCW 36/2004	N/A
7.9.2.6	OM3	Match the design and materials of road structure with the surrounding environment and with the schematic theme paving of the future West Kowloon Reclamation Development and the Advisory Committee on the Appearance of Bridges and Associated Structures (ACABAS)	To match with existing landscape character	HyD's Contractor	Whole construction site	Construction phase	ETWB TCW 36/2004	N/A

Remarks:

- ✓ Compliance of mitigation measure
- X Non-compliance of mitigation measure
- Non-compliance but rectified by the contractor
- * Recommendation was made during site audit but improved/rectified by the contractor
- # Waiting for improving/rectifying by the contractor
- N/A Not Applicable

Appendix I: Cumulative Log for Environmental Exceedance, Complaints, Notification of Summons and Successful Prosecutions

Cumulative Log for Environmental Exceedance, Non-Compliance, Complaints, Notification of Summons and Successful Prosecution

Reporting Month	Number of Exceedance	Number of Non-Compliance	Number of Environmental Complaints	Number of Notification of Summons	Number of Successful Prosecutions
February 2016	0	0	0	0	0
March 2016	0	0	0	0	0
April 2016	0	0	2	0	0
May 2016	7	0	0	0	0
June 2016	11	0	0	0	0
July 2016	6	0	0	0	0
August 2016	6	0	0	0	0
September 2016	5	0	0	0	0
October 2016	6	1	0	0	0
November 2016	5	0	0	0	0
December 2016	5	0	0	0	0
January 2017	5	0	0	0	0
February 2017	5	0	0	0	0
March 2017	6	0	0	0	0
April 2017	6	0	1	0	0
May 2017	5	0	0	0	0
June 2017	6	0	0	0	0
July 2017	5	0	0	0	0
August 2017	5	0	0	0	0

September 2017	6	0	0	0	0
October 2017	5	0	0	0	0
November 2017	6	0	0	0	0
December 2017	5	0	0	0	0
January 2018	5	0	0	0	0
February 2018	5	0	0	0	0
March 2018	6	0	0	0	0
April 2018	5	0	0	0	0
May 2018	7	0	1	0	0
June 2018	5	0	0	0	0
July 2018	5	0	0	0	0
August 2018	7	0	0	0	0
September 2018	5	0	0	0	0
October 2018	5	0	0	0	0
November 2018	7	0	0	0	0
December 2018	5	0	0	0	0
January 2019	5	0	0	0	0
February 2019	0	0	0	0	0
March 2019	5	0	0	0	0
April 2019	6	0	0	0	0
May 2019	6	0	4	0	0
June 2019	5	0	0	0	0
July 2019	5	0	0	0	0

August 2019	5	0	0	0	0
September 2019	6	0	0	0	0
October 2019	5	0	0	0	0
November 2019	5	0	0	0	0
December 2019	6	0	0	0	0
Grand Total	242	1	8	0	0