Appendix E. Calibration Certificates

ALS Technichem (HK) Pty Ltd

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

SUB-CONTRACTING REPORT

CONTACT	: VANIA CHU	WORK ORDER	:	**HK2039261**
CLIENT	: **MOTT MACDONALD HONG KONG LIMITED**			
ADDRESS	: 3/F INTERNATIONAL TRADE TOWER, 348 KWUN TONG ROAD, KWUN TONG, KOWLOON, HONG KONG	SUB-BATCH	:	1
		DATE RECEIVED	:	14-OCT-2020
		DATE OF ISSUE	:	27-OCT-2020
PROJECT	: CALIBIRATION/PERFORMANCE CHECK OF DUST METER (S/N: 296098)	NO. OF SAMPLES	:	1
		CLIENT ORDER	:	----

General Comments

- **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.**
- **Calibration was subcontracted to and analysed by Action United Enviro Services.**

Signatories

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

Signatories	*Position*
Richard Fung	Managing Director

This is the Final Report and supersedes any preliminary report with this batch number.

All pages of this report have been checked and approved for release.

ALS Technichem (HK) Pty Ltd
Part of the ALS Laboratory Group
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Tel. +852 2610 1044 Fax. +852 2610 2021 **www.alsglobal.com**

WORK ORDER	:	HK2039261
SUB-BATCH	:	1
CLIENT	:	MOTT MACDONALD HONG KONG LIMITED
PROJECT	:	CALIBIRATION/PERFORMANCE CHECK OF DUST METER (S/N: 296098)

ALS Lab ID	Client's Sample ID	Sample Type	Sample Date	External Lab Report No.
HK2039261-001	S/N: 296098	Equipments	14-Oct-2020	S/N: 296098

Equipment Verification Report (TSP)

Equipment Calibrated:

Type:	Laser Dust monitor
Manufacturer:	Sibata LD-3B
Serial No.	296098
Equipment Ref:	Nil
Job Order	HK2039261

Standard Equipment:

Standard Equipment:	Higher Volume Sampler
Location & Location ID:	AUES office (calibration room)
Equipment Ref:	HVS 018
Last Calibration Date:	8 October 2020

Equipment Verification Results:

Testing Date: 20 & 21 October 2020

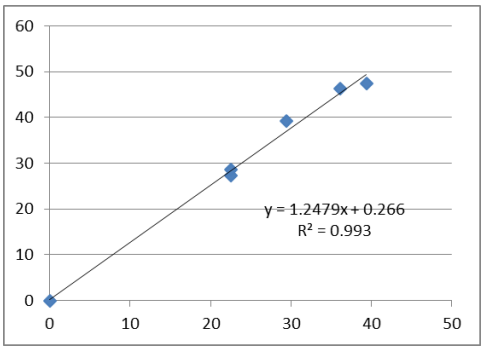
Hour	Time	Mean Temp °C	Mean Pressure (hPa)	Concentration in µg/m³ (Standard Equipment)	Total Count (Calibrated Equipment)	Count/Minute (Total Count/min)
2hr	09:23 ~ 11:23	25	1015	27	2700	22.5
2hr03min	11:25 ~ 13:28	25	1015	29	2773	22.5
2hr01min	13:30 ~ 15:31	25	1015	47	4772	39.4
2hr13min	09:18 ~ 11:31	24.5	1011.8	39	3921	29.4
2hr10min	11:33 ~ 13:43	24.5	1011.8	46	4707	36.2

Linear Regression of Y or X

Slope (K-factor): 1.2479 (µg/m3)/CPM

Correlation Coefficient 0.9965

Date of Issue 27 October 2020



Remarks:

1. **Strong** Correlation (R>0.8)
2. Factor 1.2479 (µg/m3)/CPM should be applied for TSP monitoring

*If R<0.5, repair or re-verification is required for the equipment

Operator : Fai So Signature : Date : 27 October 2020

QC Reviewer : Ben Tam Signature : Date : 27 October 2020

TSP SAMPLER CALIBRATION CALCULATION SPREADSHEET

Location :	Gold King Industrial Building, Kwai Chung	Date of Calibration:	8-Oct-20
Location ID :	Calibration Room	Next Calibration Date:	8-Jan-21

CONDITIONS

Sea Level Pressure (hPa)	1015.2	Corrected Pressure (mm Hg)	761.4
Temperature (°C)	25.5	Temperature (K)	299

CALIBRATION ORIFICE

Make->	TISCH	Qstd Slope ->	2.03014
Model->	5025A	Qstd Intercept ->	-0.04616
Calibration Date->	7-Feb-20	Expiry Date->	7-Feb-21

CALIBRATION

Plate No.	H20 (L) (in)	H2O (R) (in)	H20 (in)	Qstd (m3/min)	I (chart)	IC corrected	LINEAR REGRESSION
18	6.4	6.4	12.8	1.785	56	56.00	Slope = 38.0056
13	5.1	5.1	10.2	1.596	49	49.00	Intercept = -11.6655
10	4	4	8.0	1.416	42	42.00	Corr. coeff. = 0.9991
8	2.5	2.5	5.0	1.124	32	32.00	
5	1.5	1.5	3.0	0.876	21	21.00	

Calculations :

Qstd = 1/m[Sqrt(H20(Pa/Pstd)(Tstd/Ta))-b]

IC = I[Sqrt(Pa/Pstd)(Tstd/Ta)]

Qstd = standard flow rate

IC = corrected chart respones

I = actual chart response

m = calibrator Qstd slope

b = calibrator Qstd intercept

Ta = actual temperature during calibration (deg K)

Pstd = actual pressure during calibration (mm Hg)

For subsequent calculation of sampler flow:

1/m((I)[Sqrt(298/Tav)(Pav/760)]-b)

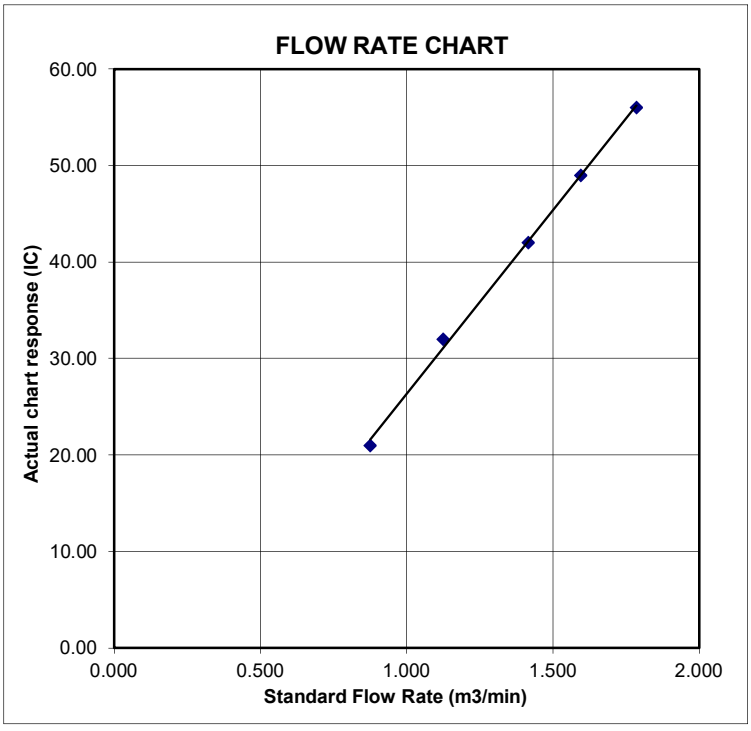
m = sampler slope

b = sampler intercept

I = chart response

Tav = daily average temperature

Pav = daily average pressure



TISCH Environmental

RECALIBRATION DUE DATE:
February 7, 2021

Certificate of Calibration

Calibration Certification Information				
Cal. Date:	February 7, 2020	**Rootsmeter S/N:** 438320	**Ta:** 295	°K
Operator:	Jim Tisch		**Pa:** 745.5	mm Hg
Calibration Model #:	TE-5025A	**Calibrator S/N:** **1612**		

Run	Vol. Init (m3)	Vol. Final (m3)	ΔVol. (m3)	ΔTime (min)	ΔP (mm Hg)	ΔH (in H2O)
1	1	2	1	1.3730	3.2	2.00
2	3	4	1	0.9820	6.4	4.00
3	5	6	1	0.8780	8.0	5.00
4	7	8	1	0.8340	8.8	5.50
5	9	10	1	0.6900	12.8	8.00

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)	$\sqrt{\Delta H\left(Ta/Pa\right)}$ (y-axis)
0.9866	0.7186	1.4078	0.9957	0.7252	0.8896
0.9824	1.0004	1.9909	0.9914	1.0096	1.2581
0.9802	1.1165	2.2259	0.9893	1.1267	1.4066
0.9792	1.1741	2.3345	0.9882	1.1849	1.4753
0.9739	1.4114	2.8155	0.9828	1.4244	1.7792
QSTD	**m=**	**2.03014**	**QA**	**m=**	**1.27124**
	b=	**-0.04616**		**b=**	**-0.02917**
	r=	**0.99995**		**r=**	**0.99995**

Calculations

Vstd=	ΔVol((Pa-ΔP)/Pstd)(Tstd/Ta)	**Va=**	ΔVol((Pa-ΔP)/Pa)
Qstd=	Vstd/ΔTime	**Qa=**	Va/ΔTime

For subsequent flow rate calculations:

Qstd= $1/m\left(\left(\sqrt{\Delta H\left(\frac{Pa}{Pstd}\right)\left(\frac{Tstd}{Ta}\right)}\right)-b\right)$

Qa= $1/m\left(\left(\sqrt{\Delta H\left(Ta/Pa\right)}\right)-b\right)$

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

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Village of Cleves, OH 45002

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FAX: (513)467-9009

專業化驗有限公司
QUALITY PRO TEST-CONSULT LIMITED
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REPORT OF EQUIPMENT PERFORMANCE CHECK/ CALIBRATION

Report No. : AJ100093
Date of Issue : 23 October 2020

PART A – CUSTOMER INFORMATION

Enovative Environmental Service Ltd.
Flat 2207, Yu Fun House,
Yu Chui Court, Shatin
New Territories, Hong Kong
Attn: Mr. Thomas WONG

PART B – DESCRIPTION

Name of Equipment	:	YSI ProDSS (Multi-Parameters)
Manufacturer	:	YSI (a xylem brand)
Serial Number	:	17E100747
Date of Received	:	Oct 22, 2020
Date of Calibration	:	Oct 22, 2020
Date of Next Calibration[a]	:	Jan 21, 2021

PART C – REFERENCE METHODS/ DOCUMENTS FOR THE CALIBRATION

Parameter	Reference Method
pH at 25°C	APHA 21e 4500-H^+ B
Dissolved Oxygen	APHA 21e 4500-O G
Conductivity at 25°C	APHA 21e 2510 B
Salinity	APHA 21e 2520 B
Turbidity	APHA 21e 2130 B
Temperature	Section 6 of international Accreditation New Zealand Technical Guide no. 3 Second edition March 2008: Working Thermometer Calibration Procedure.

PART D – CALIBRATION RESULTS[b,c]

(1) pH at 25°C

Target (pH unit)	Displayed Reading[d] (pH Unit)	Tolerance[e](pH Unit)	Results
4.00	3.92	-0.08	Satisfactory
7.42	7.41	-0.01	Satisfactory
10.01	10.12	0.11	Satisfactory

Tolerance of pH should be less than ±0.20 (pH unit)

(2) Temperature

Reading of Ref. thermometer (°C)	Displayed Reading (°C)	Tolerance (°C)	Results
10	10.0	0.00	Satisfactory
20	20.1	0.10	Satisfactory
45	45.1	0.10	Satisfactory

Tolerance limit of temperature should be less than ±2.0 (°C)

~ CONTINUED ON NEXT PAGE ~

Remark(s): -

(a) *The "Date of Next Calibration" is recommended according to best practice principals as practiced by QPT or quoted form relevant international standards.*
(b) *The results relate only to the calibrated equipment as received*
(c) *The performance of the equipment stated in this report is checked with independent reference material and results compared against a calibrated secondary source.*
(d) *"Displayed Reading" denotes the figure shown on item under calibration/ checking regardless of equipment precision or significant figures.*
(e) *The "Tolerance Limit" mentioned is referenced to YSI product specifications.*

LEE Chun-ning, Desmond
Senior Chemist

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REPORT OF EQUIPMENT PERFORMANCE CHECK/ CALIBRATION

Report No. : AJ100093
Date of Issue : 23 October 2020

PART D – CALIBRATION RESULTS (Cont'd)

(3) Dissolved Oxygen

Expected Reading (mg/L)	Displayed Reading (mg/L)	Tolerance (mg/L)	Results
0.16	0.32	0.16	Satisfactory
3.19	3.37	0.18	Satisfactory
6.20	6.40	0.20	Satisfactory
8.10	8.11	0.01	Satisfactory

Tolerance limit of dissolved oxygen should be less than ±0.50 (mg/L)

(4) Conductivity at 25°C

Conc. of KCl (M)	Expected Reading (µS/cm)	Displayed Reading (µS/cm)	Tolerance (%)	Results
0.001	146.9	155.1	5.58	Satisfactory
0.01	1412	1480	4.82	Satisfactory
0.1	12890	12794	-0.74	Satisfactory
0.5	58670	57248	-2.42	Satisfactory
1.0	111900	110736	-1.04	Satisfactory

Tolerance limit of conductivity should be less than ±10.0 (%)

(5) Salinity

Expected Reading (g/L)	Displayed Reading (g/L)	Tolerance (%)	Results
10	9.92	-0.80	Satisfactory
20	19.88	-0.60	Satisfactory
30	30.41	1.37	Satisfactory

Tolerance limit of salinity should be less than ±10.0 (%)

(6) Turbidity

Expected Reading (NTU)	Displayed Reading[f] (NTU)	Tolerance[g] (%)	Results
0	0.11	--	Satisfactory
10	10.20	2.0	Satisfactory
20	20.36	1.8	Satisfactory
100	104.42	4.4	Satisfactory
800	793.77	-0.8	Satisfactory

Tolerance limit of turbidity should be less than ±10.0 (%)

~ END OF REPORT ~

Remark(s): -

(f) "Displayed Reading" presents the figures shown on item under calibration/ checking regardless of equipment precision or significant figures.

(g) The "Tolerance Limit" mentioned is the acceptance criteria applicable for similar equipment used by Quality Pro Test-Consult Ltd. or quoted form relevant international standards.

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REPORT OF EQUIPMENT PERFORMANCE CHECK/ CALIBRATION

Report No. : AJ100092
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Enovative Environmental Service Ltd.
Flat 2207, Yu Fun House,
Yu Chui Court, Shatin
New Territories, Hong Kong
Attn: Mr. Thomas WONG

PART B – DESCRIPTION

Name of Equipment	:	YSI 6920V2 (Multi-Parameters)
Manufacturer	:	YSI (a xylem brand)
Serial Number	:	0001C6A7
Date of Received	:	Oct 22, 2020
Date of Calibration	:	Oct 22, 2020
Date of Next Calibration[a]	:	Jan 21, 2021

PART C – REFERENCE METHODS/ DOCUMENTS FOR THE CALIBRATION

Parameter	Reference Method
pH at 25°C	APHA 21e 4500-H^+ B
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Turbidity	APHA 21e 2130 B
Temperature	Section 6 of international Accreditation New Zealand Technical Guide no. 3 Second edition March 2008: Working Thermometer Calibration Procedure.

PART D – CALIBRATION RESULTS[b,c]

(1) pH at 25°C

Target (pH unit)	Displayed Reading[d] (pH Unit)	Tolerance[e](pH Unit)	Results
4.00	4.02	0.02	Satisfactory
7.42	7.46	0.04	Satisfactory
10.01	10.13	0.12	Satisfactory

Tolerance of pH should be less than ±0.20 (pH unit)

(2) Temperature

Reading of Ref. thermometer (°C)	Displayed Reading (°C)	Tolerance (°C)	Results
10	10.03	0.03	Satisfactory
20	20.08	0.08	Satisfactory
45	45.20	0.20	Satisfactory

Tolerance limit of temperature should be less than ±2.0 (°C)

~ CONTINUED ON NEXT PAGE ~

Remark(s): -

[a] *The "Date of Next Calibration" is recommended according to best practice principals as practiced by QPT or quoted form relevant international standards.*
[b] *The results relate only to the calibrated equipment as received*
[c] *The performance of the equipment stated in this report is checked with independent reference material and results compared against a calibrated secondary source.*
[d] *"Displayed Reading" denotes the figure shown on item under calibration/ checking regardless of equipment precision or significant figures.*
[e] *The "Tolerance Limit" mentioned is referenced to YSI product specifications.*

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REPORT OF EQUIPMENT PERFORMANCE CHECK/ CALIBRATION

Report No. : AJ100092
Date of Issue : 23 October 2020

PART D – CALIBRATION RESULTS (Cont'd)

(3) Dissolved Oxygen

Expected Reading (mg/L)	Displayed Reading (mg/L)	Tolerance (mg/L)	Results
0.16	0.34	0.18	Satisfactory
3.19	3.48	0.29	Satisfactory
6.20	6.45	0.25	Satisfactory
8.10	8.23	0.13	Satisfactory

Tolerance limit of dissolved oxygen should be less than ±0.50 (mg/L)

(4) Conductivity at 25°C

Conc. of KCl (M)	Expected Reading (µS/cm)	Displayed Reading (µS/cm)	Tolerance (%)	Results
0.001	146.9	154.7	5.31	Satisfactory
0.01	1412	1477	4.60	Satisfactory
0.1	12890	12815	-0.58	Satisfactory
0.5	58670	57692	-1.67	Satisfactory
1.0	111900	110899	-0.89	Satisfactory

Tolerance limit of conductivity should be less than ±10.0 (%)

(5) Salinity

Expected Reading (g/L)	Displayed Reading (g/L)	Tolerance (%)	Results
10	10.14	1.40	Satisfactory
20	20.24	1.20	Satisfactory
30	30.59	1.97	Satisfactory

Tolerance limit of salinity should be less than ±10.0 (%)

(6) Turbidity

Expected Reading (NTU)	Displayed Reading[f] (NTU)	Tolerance[g] (%)	Results
0	0.1	--	Satisfactory
10	9.9	-1.0	Satisfactory
20	20.3	1.5	Satisfactory
100	105.8	5.8	Satisfactory
800	795.6	-0.5	Satisfactory

Tolerance limit of turbidity should be less than ±10.0 (%)

~ END OF REPORT ~

Remark(s): -

(f) "Displayed Reading" presents the figures shown on item under calibration/ checking regardless of equipment precision or significant figures.

(g) The "Tolerance Limit" mentioned is the acceptance criteria applicable for similar equipment used by Quality Pro Test-Consult Ltd. or quoted form relevant international standards.