TISCH Environmental

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ORIFICE TRANSFER STANDARD CERTIFICATION WORKSHEET TE-5025A

Date - Mar 20, 2017 Rootsmeter S/N 0438320 Ta (K) - 293
Operator Tisch Orifice I.D. - 0005 Pa (mm) - 759.46

PLATE OR Run #	VOLUME START (m3)	VOLUME STOP (m3)	DIFF VOLUME (m3)	DIFF TIME (min)	METER DIFF Hg (mm)	ORFICE DIFF H2O (in.)
1	NA	NA	1.00	1.3960	3.2	2.00
2	NA	NA	1.00	0.9970	6.4	4.00
3	NA	NA	1.00	0.8910	7.8	5.00
4	NA	NA	1.00	0.8500	8.7	5.50
5	NA	NA	1.00	0.6990	12.7	8.00

DATA TABULATION

Vstd	(x axis) Qstd	(y axis)		Va	(x axis) Qa	(y axis)
1.0120	0.7249	1.4257		0.9958	0.7133	0.8784
1.0078	1.0108	2.0163		0.9916	0.9946	1.2423
1.0058	1.1288	2.2543		0.9896	1.1107	1.3889
1.0047	1.1820	2.3643		0.9885	1.1630	1.4567
0.9993	1.4296	2.8514		0.9832	1.4066	1.7568
Qstd slope (m) =		2.02533		Qa slope (m) =		1.26823
intercept (b) =		-0.03593		intercept (b) =		-0.02214
coefficient (r) =		0.99983		coefficient (r) =		0.99983
y axis = SQRT[H2O(Pa/760)(298/Ta)]				y axis = SQRT[H2O(Ta/Pa)]		

CALCULATIONS

Vstd = Diff. Vol[(Pa-Diff. Hg)/760](298/Ta)
Qstd = Vstd/Time

Va = Diff Vol [(Pa-Diff Hg)/Pa]
Qa = Va/Time

For subsequent flow rate calculations:

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

Calibration Data for High Volume Sampler (TSP Sampler)

Location	:	CMA1b	**Calibration Date**	:	21-Nov-17
Equipment no.	:	HVS001	**Calibration Due Date**	:	21-Jan-18

CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition					
Temperature, T_a	292	Kelvin	**Pressure, P_a**	1018	mmHg

Orifice Transfer Standard Information					
Equipment No.	**Ori001**	**Slope, m_c**	2.02533	**Intercept, bc**	-0.03593
Last Calibration Date	20-Mar-17	$(H \times P_a / 1013.3 \times 298 / T_a)^{1/2}$			
Next Calibration Date	20-Mar-18	$m_c \times Q_{std} + b_c$			

Calibration of TSP

Calibration Point	**Manometer Reading H (inches of water)** (up)	(down)	(difference)	**Q_{std}** (m^3 / min.) **X-axis**	**Continuous Flow Recorder, W** (CFM)	**IC** $(W(P_a/1013.3 \times 298/T_a)^{1/2}/35.31)$ **Y-axis**
1	1.5	1.5	3.0	0.8837	27	27.3392
2	2.5	2.5	5.0	1.1357	34	34.4271
3	3.9	3.9	7.8	1.4140	43	43.5402
4	5.0	5.0	10.0	1.5987	50	50.6281
5	6.2	6.2	12.4	1.7782	58	58.7286

By Linear Regression of Y on X

Slope, m	=	34.7877	Intercept, b	=	-4.4504
Correlation Coefficient*	=	0.9960			
Calibration Accepted	=	Yes/~~No~~**			

* if Correlation Coefficient < 0.990, check and recalibration again.

** Delete as appropriate.

Remarks : As per client's provided information, the equipment reference no. of the calibrated High Volume Sampler has been re-assigned from EL452 to HVS001 with respect to the update in quality management system.

Calibrated by	:	Jackey MA	**Checked by**	:	Pauline Wong
Date	:	21-Nov-17	**Date**	:	21-Nov-17

Calibration Data for High Volume Sampler (TSP Sampler)

Location	:	CMA1b	**Calibration Date**	:	17-Jan-18
Equipment no.	:	HVS001	**Calibration Due Date**	:	17-Mar-18

CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition					
Temperature, T_a	293	Kelvin	**Pressure, P_a**	1014	mmHg

Orifice Transfer Standard Information					
Equipment No.	**Ori001**	**Slope, m_c**	2.02533	**Intercept, bc**	-0.03593
Last Calibration Date	20-Mar-17	$(H \times P_a / 1013.3 \times 298 / T_a)^{1/2}$			
Next Calibration Date	20-Mar-18	$m_c \times Q_{std} + b_c$			

Calibration of TSP

Calibration Point	**Manometer Reading H (inches of water)** (up)	(down)	(difference)	**Q_{std}** (m^3 / min.) **X-axis**	**Continuous Flow Recorder, W** (CFM)	**IC** $(W(P_a/1013.3 \times 298/T_a)^{1/2}/35.31)$ **Y-axis**
1	1.6	1.6	3.2	0.9088	28	28.2476
2	2.5	2.5	5.0	1.1316	36	36.3184
3	3.9	3.9	7.8	1.4089	45	45.3980
4	5.1	5.1	10.2	1.6086	52	52.4599
5	6.4	6.4	12.8	1.7998	58	58.5130

By Linear Regression of Y on X

Slope, m	=	33.9466	Intercept, b =	-2.3715
Correlation Coefficient*	=	0.9998		
Calibration Accepted	=	Yes/~~No~~**		

* if Correlation Coefficient < 0.990, check and recalibration again.

** Delete as appropriate.

Remarks : As per client's provided information, the equipment reference no. of the calibrated High Volume Sampler has been re-assigned from EL452 to HVS001 with respect to the update in quality management system.

Calibrated by	:	Jackey MA	**Checked by**	:	Pauline Wong
Date	:	17-Jan-18	**Date**	:	17-Jan-18

Calibration Data for High Volume Sampler (TSP Sampler)

Location	:	CMA2a	**Calibration Date**	:	21-Nov-17
Equipment no.	:	HVS002	**Calibration Due Date**	:	21-Jan-18

CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition					
Temperature, T_a	292	Kelvin	**Pressure, P_a**	1018	mmHg

Orifice Transfer Standard Information					
Equipment No.	**Ori001**	**Slope, m_c**	2.02533	**Intercept, bc**	-0.03593
Last Calibration Date	20-Mar-17	$(H \times P_a / 1013.3 \times 298 / T_a)^{1/2}$			
Next Calibration Date	20-Mar-18	$m_c \times Q_{std} + b_c$			

Calibration of TSP

Calibration Point	**Manometer Reading H (inches of water)** (up)	(down)	(difference)	**Q_{std}** (m^3 / min.) **X-axis**	**Continuous Flow Recorder, W** (CFM)	**IC** $(W(P_a/1013.3 \times 298/T_a)^{1/2}/35.31)$ **Y-axis**
1	1.6	1.6	3.2	0.9121	29	29.3643
2	2.6	2.6	5.2	1.1578	34	34.4271
3	4.1	4.1	8.2	1.4494	45	45.5653
4	5.2	5.2	10.4	1.6300	52	52.6532
5	6.3	6.3	12.6	1.7924	56	56.7035

By Linear Regression of Y on X

Slope, m	=	32.6438	Intercept, b	=	-1.5778
Correlation Coefficient*	=	0.9948			
Calibration Accepted	=	Yes/~~No~~**			

* if Correlation Coefficient < 0.990, check and recalibration again.

** Delete as appropriate.

Remarks : As per client's provided information, the equipment reference no. of the calibrated High Volume Sampler has been re-assigned from EL449 to HVS002 with respect to the update in quality management system.

Calibrated by	:	Jackey MA	**Checked by**	:	Pualine Wong
Date	:	21-Nov-17	**Date**	:	21-Nov-17

Calibration Data for High Volume Sampler (TSP Sampler)

Location	:	CMA2a	**Calibration Date**	:	17-Jan-18
Equipment no.	:	HVS002	**Calibration Due Date**	:	17-Mar-18

CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition					
Temperature, T_a	293	Kelvin	**Pressure, P_a**	1014	mmHg

Orifice Transfer Standard Information					
Equipment No.	**Ori001**	**Slope, m_c**	2.02533	**Intercept, bc**	-0.03593
Last Calibration Date	20-Mar-17	$(H \times P_a / 1013.3 \times 298 / T_a)^{1/2}$			
Next Calibration Date	20-Mar-18	$m_c \times Q_{std} + b_c$			

Calibration of TSP

Calibration Point	**Manometer Reading H (inches of water)** (up)	(down)	(difference)	**Q_{std}** (m^3 / min.) **X-axis**	**Continuous Flow Recorder, W** (CFM)	**IC** $(W(P_a/1013.3 \times 298/T_a)^{1/2}/35.31)$ **Y-axis**
1	1.8	1.8	3.6	0.9628	33	33.2919
2	2.8	2.8	5.6	1.1965	41	41.3626
3	4.1	4.1	8.2	1.4441	50	50.4422
4	5.4	5.4	10.8	1.6547	56	56.4953
5	6.6	6.6	13.2	1.8275	60	60.5307

By Linear Regression of Y on X

Slope, m	=	31.9847	Intercept, b	=	3.0980
Correlation Coefficient*	=	0.9970			
Calibration Accepted	=	Yes/~~No~~**			

* if Correlation Coefficient < 0.990, check and recalibration again.

** Delete as appropriate.

Remarks : As per client's provided information, the equipment reference no. of the calibrated High Volume Sampler has been re-assigned from EL449 to HVS002 with respect to the update in quality management system.

Calibrated by	:	Jackey MA	**Checked by**	:	Pualine Wong
Date	:	17-Jan-18	**Date**	:	17-Jan-18

Calibration Data for High Volume Sampler (TSP Sampler)

Location	:	CMA3a	**Calibration Date**	:	20-Nov-17
Equipment no.	:	HVS012	**Calibration Due Date**	:	20-Jan-18

CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition					
Temperature, T_a	292	Kelvin	**Pressure, P_a**	1019	mmHg

Orifice Transfer Standard Information					
Equipment No.	**Ori001**	**Slope, m_c**	2.02533	**Intercept, bc**	-0.03593
Last Calibration Date	20-Mar-17	$(H \times P_a / 1013.3 \times 298 / T_a)^{1/2}$			
Next Calibration Date	20-Mar-18	$m_c \times Q_{std} + b_c$			

Calibration of TSP

Calibration Point	Manometer Reading H (inches of water) (up)	(down)	(difference)	Q_{std} (m^3 / min.) X-axis	Continuous Flow Recorder, W (CFM)	IC $(W(P_a/1013.3 \times 298/T_a)^{1/2}/35.31)$ Y-axis
1	1.3	1.3	2.6	0.8243	36	36.4701
2	2.2	2.2	4.4	1.0670	42	42.5485
3	3.4	3.4	6.8	1.3221	48	48.6268
4	4.4	4.4	8.8	1.5016	54	54.7052
5	5.5	5.5	11.0	1.6767	60	60.7835

By Linear Regression of Y on X

Slope, m = 28.1915 Intercept, b = 12.5891

Correlation Coefficient* = 0.9961

Calibration Accepted = Yes/~~No~~**

* if Correlation Coefficient < 0.990, check and recalibration again.

** Delete as appropriate.

Remarks : As per client's provided information, the equipment reference no. of the calibrated High Volume Sampler has been re-assigned from EL333 to HVS012 with respect to the update in quality management system.

Calibrated by	:	Jackey MA	**Checked by**	:	Pauline Wong
Date	:	20-Nov-17	**Date**	:	20-Nov-17

Calibration Data for High Volume Sampler (TSP Sampler)

Location	:	CMA3a	**Calibration Date**	:	16-Jan-18
Equipment no.	:	HVS012	**Calibration Due Date**	:	16-Mar-18

CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition					
Temperature, T_a	291	Kelvin	**Pressure, P_a**	1015	mmHg

Orifice Transfer Standard Information					
Equipment No.	**Ori001**	**Slope, m_c**	2.02533	**Intercept, bc**	-0.03593
Last Calibration Date	20-Mar-17	$(H \times P_a / 1013.3 \times 298 / T_a)^{1/2}$			
Next Calibration Date	20-Mar-18	$m_c \times Q_{std} + b_c$			

Calibration of TSP						
Calibration Point	**Manometer Reading H (inches of water)** (up)	(down)	(difference)	**Q_{std}** (m^3 / min.) **X-axis**	**Continuous Flow Recorder, W** (CFM)	**IC** ($W(P_a/1013.3 \times 298/T_a)^{1/2}/35.31$) **Y-axis**
1	1.4	1.4	2.8	0.8545	35	35.4482
2	2.2	2.2	4.4	1.0667	40	40.5122
3	3.4	3.4	6.8	1.3218	48	48.6146
4	4.4	4.4	8.8	1.5012	53	53.6786
5	5.6	5.6	11.2	1.6913	58	58.7427

By Linear Regression of Y on X

Slope, m	=	28.3766	Intercept, b	=	10.8760
Correlation Coefficient*	=	0.9991			
Calibration Accepted	=	Yes/~~No~~**			

* if Correlation Coefficient < 0.990, check and recalibration again.

** Delete as appropriate.

Remarks : As per client's provided information, the equipment reference no. of the calibrated High Volume Sampler has been re-assigned from EL333 to HVS012 with respect to the update in quality management system.

Calibrated by	:	Jackey MA	**Checked by**	:	Pauline Wong
Date	:	16-Jan-18	**Date**	:	16-Jan-18

Calibration Data for High Volume Sampler (TSP Sampler)

Location	:	CMA4a	**Calibration Date**	:	20-Nov-17
Equipment no.	:	HVS004	**Calibration Due Date**	:	20-Jan-18

CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition					
Temperature, T_a	292	Kelvin	**Pressure, P_a**	1019	mmHg

Orifice Transfer Standard Information					
Equipment No.	**Ori001**	**Slope, m_c**	2.02533	**Intercept, bc**	-0.03593
Last Calibration Date	20-Mar-17	$(H \times P_a / 1013.3 \times 298 / T_a)^{1/2}$			
Next Calibration Date	20-Mar-18	$m_c \times Q_{std} + b_c$			

Calibration of TSP						
Calibration Point	**Manometer Reading H (inches of water)**			**Q_{std}** (m^3 / min.)	**Continuous Flow Recorder, W**	**IC** $(W(P_a/1013.3 \times 298/T_a)^{1/2}/35.31)$
	(up)	(down)	(difference)	**X-axis**	(CFM)	**Y-axis**
1	1.5	1.5	3.0	0.8841	23	23.3004
2	2.4	2.4	4.8	1.1136	32	32.4179
3	3.8	3.8	7.6	1.3967	42	42.5485
4	4.8	4.8	9.6	1.5675	48	48.6268
5	6.0	6.0	12.0	1.7505	52	52.6791

By Linear Regression of Y on X

Slope, m	=	34.4902	Intercept, b	=	-6.3878
Correlation Coefficient*	=	0.9965			
Calibration Accepted	=	Yes/~~No~~**			

* if Correlation Coefficient < 0.990, check and recalibration again.

** Delete as appropriate.

Remarks : As per client's provided information, the equipment reference no. of the calibrated High Volume Sampler has been re-assigned from EL390 to HVS004 with respect to the update in quality management system.

Calibrated by	:	Jackey MA	**Checked by**	:	Pauline Wong
Date	:	20-Nov-17	**Date**	:	20-Nov-17

Calibration Data for High Volume Sampler (TSP Sampler)

Location	:	CMA4a	**Calibration Date**	:	16-Jan-18
Equipment no.	:	HVS004	**Calibration Due Date**	:	16-Mar-18

CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition					
Temperature, T_a	291	Kelvin	**Pressure, P_a**	1015	mmHg

Orifice Transfer Standard Information					
Equipment No.	**Ori001**	**Slope, m_c**	2.02533	**Intercept, bc**	-0.03593
Last Calibration Date	20-Mar-17	$(H \times P_a / 1013.3 \times 298 / T_a)^{1/2}$			
Next Calibration Date	20-Mar-18	$m_c \times Q_{std} + b_c$			

Calibration of TSP						
Calibration Point	**Manometer Reading H (inches of water)**			**Q_{std}** (m^3 / min.)	**Continuous Flow Recorder, W**	**IC** $(W(P_a/1013.3 \times 298/T_a)^{1/2}/35.31)$
	(up)	(down)	(difference)	**X-axis**	(CFM)	**Y-axis**
1	1.5	1.5	3.0	0.8839	24	24.3073
2	2.4	2.4	4.8	1.1133	33	33.4225
3	3.7	3.7	7.4	1.3781	42	42.5378
4	4.8	4.8	9.6	1.5671	50	50.6402
5	5.7	5.7	11.4	1.7062	55	55.7042

By Linear Regression of Y on X

Slope, m = 38.0715 Intercept, b = -9.3021

Correlation Coefficient* = 0.9995

Calibration Accepted = Yes/~~No~~**

* if Correlation Coefficient < 0.990, check and recalibration again.

** Delete as appropriate.

Remarks : As per client's provided information, the equipment reference no. of the calibrated High Volume Sampler has been re-assigned from EL390 to HVS004 with respect to the update in quality management system.

Calibrated by	:	Jackey MA	**Checked by**	:	Pauline Wong
Date	:	16-Jan-18	**Date**	:	16-Jan-18

Calibration Data for High Volume Sampler (TSP Sampler)

Location	:	CMA5b	**Calibration Date**	:	20-Nov-17
Equipment no.	:	HVS010	**Calibration Due Date**	:	20-Jan-18

CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition					
Temperature, T_a	292	Kelvin	**Pressure, P_a**	1019	mmHg

Orifice Transfer Standard Information					
Equipment No.	**Ori001**	**Slope, m_c**	2.02533	**Intercept, bc**	-0.03593
Last Calibration Date	20-Mar-17	$(H \times P_a / 1013.3 \times 298 / T_a)^{1/2}$			
Next Calibration Date	20-Mar-18	$= m_c \times Q_{std} + b_c$			

Calibration of TSP

Calibration Point	**Manometer Reading H (inches of water)** (up)	(down)	(difference)	**Q_{std}** (m^3 / min.) **X-axis**	**Continuous Flow Recorder, W** (CFM)	**IC** $(W(P_a/1013.3 \times 298/T_a)^{1/2}/35.31)$ **Y-axis**
1	1.3	1.3	2.6	0.8243	40	40.5224
2	2.2	2.2	4.4	1.0670	46	46.6007
3	3.3	3.3	6.6	1.3028	52	52.6791
4	4.4	4.4	8.8	1.5016	59	59.7705
5	5.5	5.5	11.0	1.6767	62	62.8097

By Linear Regression of Y on X

Slope, m = 27.0050 Intercept, b = 18.0599

Correlation Coefficient* = 0.9969

Calibration Accepted = Yes/~~No~~**

* if Correlation Coefficient < 0.990, check and recalibration again.

** Delete as appropriate.

Remarks : As per client's provided information, the equipment reference no. of the calibrated High Volume Sampler has been re-assigned from EL222 to HVS010 with respect to the update in quality management system.

Calibrated by	:	Jackey MA	**Checked by**	:	Pauline Wong
Date	:	20-Nov-17	**Date**	:	20-Nov-17

Calibration Data for High Volume Sampler (TSP Sampler)

Location	:	CMA5b	**Calibration Date**	:	16-Jan-18
Equipment no.	:	HVS010	**Calibration Due Date**	:	16-Mar-18

CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition					
Temperature, T_a	291	Kelvin	**Pressure, P_a**	1015	mmHg

Orifice Transfer Standard Information					
Equipment No.	**Ori001**	**Slope, m_c**	2.02533	**Intercept, bc**	-0.03593
Last Calibration Date	20-Mar-17	$(H \times P_a / 1013.3 \times 298 / T_a)^{1/2}$			
Next Calibration Date	20-Mar-18	$= m_c \times Q_{std} + b_c$			

Calibration of TSP

Calibration Point	**Manometer Reading H (inches of water)** (up)	(down)	(difference)	**Q_{std}** (m^3 / min.) **X-axis**	**Continuous Flow Recorder, W** (CFM)	**IC** $(W(P_a/1013.3 \times 298/T_a)^{1/2}/35.31)$ **Y-axis**
1	1.4	1.4	2.8	0.8545	40	40.5122
2	2.1	2.1	4.2	1.0426	46	46.5890
3	3.1	3.1	6.2	1.2629	53	53.6786
4	3.9	3.9	7.8	1.4144	58	58.7427
5	4.7	4.7	9.4	1.5509	63	63.8067

By Linear Regression of Y on X

Slope, m = 33.2153 Intercept, b = 11.9753

Correlation Coefficient* = 0.9997

Calibration Accepted = Yes/~~No~~**

* if Correlation Coefficient < 0.990, check and recalibration again.

** Delete as appropriate.

Remarks : As per client's provided information, the equipment reference no. of the calibrated High Volume Sampler has been re-assigned from EL222 to HVS010 with respect to the update in quality management system.

Calibrated by	:	Jackey MA	**Checked by**	:	Pauline Wong
Date	:	16-Jan-18	**Date**	:	16-Jan-18

Calibration Data for High Volume Sampler (TSP Sampler)

Location	:	CMA6a	**Calibration Date**	:	20-Nov-17
Equipment no.	:	HVS013	**Calibration Due Date**	:	20-Jan-18

CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition					
Temperature, T_a	292	Kelvin	**Pressure, P_a**	1019	mmHg

Orifice Transfer Standard Information					
Equipment No.	**Ori001**	**Slope, m_c**	2.02533	**Intercept, bc**	-0.03593
Last Calibration Date	20-Mar-17	$(H \times P_a / 1013.3 \times 298 / T_a)^{1/2}$			
Next Calibration Date	20-May-17	$= m_c \times Q_{std} + b_c$			

Calibration of TSP

Calibration Point	Manometer Reading H (inches of water) (up)	(down)	(difference)	Q_{std} (m^3 / min.) X-axis	Continuous Flow Recorder, W (CFM)	IC $(W(P_a/1013.3 \times 298/T_a)^{1/2}/35.31)$ Y-axis
1	1.4	1.4	2.8	0.8547	34	34.4440
2	2.3	2.3	4.6	1.0905	41	41.5354
3	3.5	3.5	7.0	1.3411	48	48.6268
4	4.5	4.5	9.0	1.5183	54	54.7052
5	5.6	5.6	11.2	1.6917	58	58.7574

By Linear Regression of Y on X

Slope, m = 29.4252 Intercept, b = 9.3820

Correlation Coefficient* = 0.9992

Calibration Accepted = Yes/~~No~~**

* if Correlation Coefficient < 0.990, check and recalibration again.

** Delete as appropriate.

Remarks : As per client's provided information, the equipment reference no. of the calibrated High Volume Sampler has been re-assigned from EL551 to HVS013 with respect to the update in quality management system.

Calibrated by	:	Jackey MA	**Checked by**	:	Pauline Wong
Date	:	20-Nov-17	**Date**	:	20-Nov-17

Calibration Data for High Volume Sampler (TSP Sampler)

Location	:	CMA6a	**Calibration Date**	:	16-Jan-18
Equipment no.	:	HVS013	**Calibration Due Date**	:	16-Mar-18

CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition					
Temperature, T_a	291	Kelvin	**Pressure, P_a**	1015	mmHg

Orifice Transfer Standard Information					
Equipment No.	**Ori001**	**Slope, m_c**	2.02533	**Intercept, bc**	-0.03593
Last Calibration Date	20-Mar-17	$(H \times P_a / 1013.3 \times 298 / T_a)^{1/2}$			
Next Calibration Date	20-May-17	$= m_c \times Q_{std} + b_c$			

Calibration of TSP

Calibration Point	Manometer Reading H (inches of water) (up)	(down)	(difference)	Q_{std} (m^3 / min.) X-axis	Continuous Flow Recorder, W (CFM)	IC $(W(P_a/1013.3 \times 298/T_a)^{1/2}/35.31)$ Y-axis
1	1.5	1.5	3.0	0.8839	38	38.4866
2	2.3	2.3	4.6	1.0903	44	44.5634
3	3.5	3.5	7.0	1.3408	52	52.6658
4	4.5	4.5	9.0	1.5179	56	56.7171
5	5.7	5.7	11.4	1.7062	62	62.7939

By Linear Regression of Y on X

Slope, m	=	29.3743	Intercept, b	=	12.6292
Correlation Coefficient*	=	0.9991			
Calibration Accepted	=	Yes/~~No~~**			

* if Correlation Coefficient < 0.990, check and recalibration again.

** Delete as appropriate.

Remarks : As per client's provided information, the equipment reference no. of the calibrated High Volume Sampler has been re-assigned from EL551 to HVS013 with respect to the update in quality management system.

Calibrated by	:	Jackey MA	**Checked by**	:	Pauline Wong
Date	:	16-Jan-18	**Date**	:	16-Jan-18

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.: 17CA0426 01-02 **Page** 1 **of** 2

Item tested

Description:	Sound Level Meter (Type 1)	,	Microphone
Manufacturer:	Larson Davis	,	PCB
Type/Model No.:	LxT1	,	377B02
Serial/Equipment No.:	0003737	,	171529
Adaptors used:	-	,	-

Item submitted by

Customer Name:	Lam Environmental Service Ltd.
Address of Customer:	-
Request No.:	-
Date of receipt:	26-Apr-2017

Date of test: 28-Apr-2017

Reference equipment used in the calibration

Description:	Model:	Serial No.	Expiry Date:	Traceable to:
Multi function sound calibrator	B&K 4226	2288444	18-Jun-2017	CIGISMEC
Signal generator	DS 360	61227	01-Apr-2018	CEPREI

Ambient conditions

Temperature:	21 ± 1 °C
Relative humidity:	50 ± 10 %
Air pressure:	1010 ± 5 hPa

Test specifications

1, 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.

2, 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 ±20%.

3, 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 responsess 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: Huang Jian Min/Feng Jun Qi **Date:** 04-May-2017 **Company Chop:** SOILS AND MATERIALS ENGINEERING COMPANY LTD. 綜合試驗有限公司

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.
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CERTIFICATE OF CALIBRATION

(Continuation Page)

1, Electrical Tests

The electrical tests were perfomed 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	
Frequency weightings	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	N/A	N/A	
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: Lai Sheng Jie **Date:** 28-Apr-2017

Checked by: Fung Chi Yip **Date:** 04-May-2017

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.

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
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E-mail: smec@cigismec.com Website: www.cigismec.com
Tel: (852) 2873 6860
Fax: (852) 2555 7533

CERTIFICATE OF CALIBRATION

Certificate No.: 17CA1110 02 **Page:** 1 **of** 2

Item tested

Description:	Acoustical Calibrator (Class 1)
Manufacturer:	Rion Co., Ltd.
Type/Model No.:	NC-73
Serial/Equipment No.:	10707358
Adaptors used:	-

Item submitted by

Curstomer:	Lam Geotechnics Ltd.
Address of Customer:	-
Request No.:	-
Date of receipt:	10-Nov-2017

Date of test: 14-Nov-2017

Reference equipment used in the calibration

Description:	Model:	Serial No.	Expiry Date:	Traceable to:
Lab standard microphone	B&K 4180	2341427	11-Apr-2018	SCL
Preamplifier	B&K 2673	2239857	05-May-2018	CEPREI
Measuring amplifier	B&K 2610	2346941	03-May-2018	CEPREI
Signal generator	DS 360	61227	01-Apr-2018	CEPREI
Digital multi-meter	34401A	US36087050	25-Apr-2018	CEPREI
Audio analyzer	8903B	GB41300350	21-Apr-2018	CEPREI
Universal counter	53132A	MY40003662	22-Apr-2018	CEPREI

Ambient conditions

Temperature:	21 ± 1 °C
Relative humidity:	50 ± 10 %
Air pressure:	1010 ± 5 hPa

Test specifications

1. 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.
2. The calibrator was tested with its axis vertical facing downwards at the specific frequency using insert voltage technique.
3. 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: Huang Jian Min/Feng Jun Qi **Date:** 15-Nov-2017 **Company Chop:**

SOILS AND MATERIALS ENGINEERING COMPANY LTD. 綜合試驗有限公司

Comments: The results reported in this certificate refer to the conditon 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.
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CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.: 17CA1110 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 μPa)

Frequency Shown Hz	Output Sound Pressure Level Setting dB	Measured Output Sound Pressure Level dB	Estimated Expanded Uncertainty dB
1000	94.00	93.93	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 = 0.008 dB**

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 = 991.5 Hz**

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 = 0.3 %**

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: Lai Sheng Jie **Checked by:** Fung Chi Yip

Date: 14-Nov-2017 **Date:** 15-Nov-2017

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.

綜合試驗有限公司
SOILS & MATERIALS ENGINEERING CO., LTD.
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CERTIFICATE OF CALIBRATION

Certificate No.: 17CA1124 02 **Page:** 1 of 2

Item tested

Description:	Acoustical Calibrator (Class 1)
Manufacturer:	Larson Davis
Type/Model No.:	CAL200
Serial/Equipment No.:	13128
Adaptors used:	-

Item submitted by

Curstomer:	Lam Environmental Service Ltd.
Address of Customer:	-
Request No.:	-
Date of receipt:	24-Nov-2017

Date of test: 30-Nov-2017

Reference equipment used in the calibration

Description:	Model:	Serial No.	Expiry Date:	Traceable to:
Lab standard microphone	B&K 4180	2341427	11-Apr-2018	SCL
Preamplifier	B&K 2673	2239857	05-May-2018	CEPREI
Measuring amplifier	B&K 2610	2346941	03-May-2018	CEPREI
Signal generator	DS 360	61227	01-Apr-2018	CEPREI
Digital multi-meter	34401A	US36087050	25-Apr-2018	CEPREI
Audio analyzer	8903B	GB41300350	21-Apr-2018	CEPREI
Universal counter	53132A	MY40003662	22-Apr-2018	CEPREI

Ambient conditions

Temperature:	22 ± 1 °C
Relative humidity:	50 ± 10 %
Air pressure:	1005 ± 5 hPa

Test specifications

1. 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.
2. The calibrator was tested with its axis vertical facing downwards at the specific frequency using insert voltage technique.
3. 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 Jun Qi **Date:** 30-Nov-2017 **Company Chop:** SOILS AND MATERIALS ENGINEERING COMPANY LTD. 綜合試驗有限公司

Comments: The results reported in this certificate refer to the conditon 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.
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CERTIFICATE OF CALIBRATION

(Continuation Page)

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 μPa)

Frequency Shown Hz	Output Sound Pressure Level Setting dB	Measured Output Sound Pressure Level dB	Estimated Expanded Uncertainty dB
1000	94.0	94.01	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 = 0.010 dB**

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 = 999.5 Hz**

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 = 0.5 %**

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:** 30-Nov-2017

Checked by: Lam Tze Wai **Date:** 30-Nov-2017

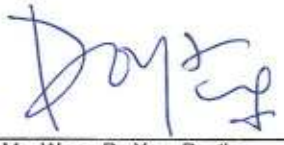
The standard(s) and equipment used in the calibration are traceable to national or international recognised standards and are calibrated on a schedule to maintain the required accuracy level.

PILOT TESTING

EQUIPMENT PERFORMANCE CHECK / CALIBRATION REPORT

Report No.	:	HK1710927
Project Name	:	EQUIPMENT PERFORMANCE CHECK/CALIBRATION REPORT
Date of Issue	:	13/11/2017
Customer	:	LAM ENVIRONMENTAL SERVICES LIMITED
Address	:	11/F., CENTRE POINT, 181-185 GLOUCESTER ROAD, WAN CHAI, HONG KONG
Calibration Job No.	:	HK1710927
Test Item No.	:	HK1710927-01
Test Item Details		
Test Item Description	:	Sonde
Manufacturer	:	YSI
Model No.	:	Professional Plus
Serial No.	:	14E100105
Performance Method	:	Checked according to in-house method CAL005 (References: Temperature (Section 6 of International Accreditation New Zealand Technical Guide No. 3 Second edition March 2008: Working Thermometer Calibration Procedure), pH value (APHA 21e 4500H:B), Salinity (Refer to Conductivity APHA 19e 2510B) , Dissolved oxygen (APHA 19e 4500-O,C))
Test Item Receipt Date	:	08/11/2017
Test Item Calibration Date	:	13/11/2017

Notes :
1. This report shall not be reproduced, except in full, without prior approval from Pilot Testing Limited.
2. Results relate to item(s) as received.
3. ± indicates the tolerance limit
4. N/A = Not applicable
5. APHA - American Public Health Association, American Water Works Association and Water Environment Federation, Standard Methods for the Examination of Water and Wastewater, APHA-AWWA-WEF. USA
6. DO, pH, salinity and temperature performance check was conducted by Pilot Testing Limited.
7. Because of high sensitivity and ease of measurement, the conductivity method (according to APHA 19e 2510) is used to determine salinity.

Approved Signatory : 

Ms. Wong Po Yan, Pauline
(Assistant Laboratory Manager)

Issue Date: 13/11/2017

PILOT TESTING

REPORT OF EQUIPMENT PERFORMANCE CHECK/CALIBRATION

WORK ORDER: HK1710927
DATE OF ISSUE: 13/11/2017
CLIENT: LAM ENVIRONMENTAL SERVICES LIMITED

Equipment Type	Sonde
Manufacturer	YSI
Model No.	Professional Plus
Serial No.	14E100105
Date of Calibration	13-Nov-17
Date of next Calibation	13-Feb-18

Parameters:

Temperature (Method Ref: Section 6 of International Accreditation New Zealand Technical Guide No.3 Second edition March 2008: Working Thermometer Calibration Procedure)

Reference Reading (°C)	Display Reading (°C)	Deviation (°C)
6.7	6.6	-0.1
17.0	16.7	-0.3
24.3	24.1	-0.2
	Tolerance Limit	±2.0

pH Value (Method Ref: APHA21e, 4500H:B)

Expected Reading (pH unit)	Reference Reading (pH unit)	Display Reading (pH unit)	Deviation (pH unit)
4.0	4.05	4.16	0.11
7.0	7.07	6.99	-0.08
10.0	10.10	9.93	-0.17
	Tolerance Limit		±0.20

Conductivity (Method Ref: APHA 19e, 2510)

KCl concentration (mol/L)	Reference Reading (ms/cm)	Display Reading (ms/cm)	Deviation (%)
0.0000	0.00	0.00	--
0.1000	12.1	12.1	0.00
0.2000	24.1	23.9	-0.83
0.5000	52.1	51.7	-0.77
	Tolerance Limit		±2.0

Dissolved Oxygen (DO) (Method Ref: APHA 19e, 4500-O, C)

Reference DO reading (mg/L)	DO reading od DO probe (mg/L)	Deviation (mg/L)
7.47	7.65	0.18
6.32	6.28	-0.04
5.75	5.66	-0.09
	Tolerance Limit	±0.20

Remarks:
(1) Maxium tolerance and calibration frequency stated in the report, unless otherewise stated, the internal acceptance criteria of Pilot Testing Limited will be followed.
(2) Displayed reading presents the figures shown on item under calibration/checking regardless of equipment precision or significant figures.
(3) Because of high sensitivity and ease of measurement, the conductivity method (accoridng to APHA 19e 2510) is used to determine salinity.

- End of Report -

PILOT TESTING

EQUIPMENT PERFORMANCE CHECK / CALIBRATION REPORT

Report No.	:	HK1810025
Project Name	:	EQUIPMENT PERFORMANCE CHECK/CALIBRATION REPORT
Date of Issue	:	08/01/2018
Customer	:	LAM ENVIRONMENTAL SERVICES LIMITED
Address	:	11/F., CENTRE POINT, 181-185 GLOUCESTER ROAD, WAN CHAI, HONG KONG
Calibration Job No.	:	HK1810025
Test Item No.	:	HK1810025-01
Test Item Details		
Test Item Description	:	Sonde
Manufacturer	:	YSI
Model No.	:	Professional Plus
Serial No.	:	14M100277
Performance Method	:	Checked according to in-house method CAL005 (References: Temperature (Section 6 of International Accreditation New Zealand Technical Guide No. 3 Second edition March 2008: Working Thermometer Calibration Procedure), pH value (APHA 21e 4500H:B), Salinity (Refer to Conductivity APHA 19e 2510B) , Dissolved oxygen (APHA 19e 4500-O,C))
Test Item Receipt Date	:	05/01/2018
Test Item Calibration Date	:	05/01/2018

Notes :
1. This report shall not be reproduced, except in full, without prior approval from Pilot Testing Limited.
2. Results relate to item(s) as received.
3. ± indicates the tolerance limit
4. N/A = Not applicable
5. APHA - American Public Health Association, American Water Works Association and Water Environment Federation, Standard Methods for the Examination of Water and Wastewater, APHA-AWWA-WEF. USA
6. DO, pH, salinity and temperature performance check was conducted by Pilot Testing Limited.
7. Because of high sensitivity and ease of measurement, the conductivity method (according to APHA 19e 2510) is used to determine salinity.

Approved Signatory : 

Ms. Wong Po Yan, Pauline
(Assistant Laboratory Manager)

Issue Date: 08/01/2018

PILOT TESTING

REPORT OF EQUIPMENT PERFORMANCE CHECK/CALIBRATION

WORK ORDER: HK1810025
DATE OF ISSUE: 08/01/2018
CLIENT: LAM ENVIRONMENTAL SERVICES LIMITED

Equipment Type	Sonde
Manufacturer	YSI
Model No.	Professional Plus
Serial No.	14M100277
Date of Calibration	05-Jan-18
Date of next Calibation	05-Apr-18

Parameters:

Temperature (Method Ref: Section 6 of International Accreditation New Zealand Technical Guide No.3 Second edition March 2008: Working Thermometer Calibration Procedure)

Reference Reading (°C)	Display Reading (°C)	Deviation (°C)
5.2	5.2	0.0
13.6	13.6	0.0
22.7	22.7	0.0
	Tolerance Limit	±2.0

pH Value (Method Ref: APHA21e, 4500H:B)

Expected Reading (pH unit)	Reference Reading (pH unit)	Display Reading (pH unit)	Deviation (pH unit)
4.0	3.98	4.07	0.09
7.0	7.11	7.10	-0.01
10.0	10.07	10.09	0.02
	Tolerance Limit		±0.20

Conductivity (Method Ref: APHA 19e, 2510)

KCl concentration (mol/L)	Reference Reading (ms/cm)	Display Reading (ms/cm)	Deviation (%)
0.0000	0.00	0.00	--
0.1000	11.3	11.2	-0.62
0.2000	23.2	23.3	0.43
0.5000	51.9	52.4	0.96
	Tolerance Limit		±2.0

Dissolved Oxygen (DO) (Method Ref: APHA 19e, 4500-O, C)

Reference DO reading (mg/L)	DO reading od DO probe (mg/L)	Deviation (mg/L)
8.10	8.13	0.03
7.72	7.65	-0.07
4.48	4.40	-0.08
	Tolerance Limit	±0.20

Remarks:
(1) Maxium tolerance and calibration frequency stated in the report, unless otherewise stated, the internal acceptance criteria of Pilot Testing Limited will be followed.
(2) Displayed reading presents the figures shown on item under calibration/checking regardless of equipment precision or significant figures.
(3) Because of high sensitivity and ease of measurement, the conductivity method (accoridng to APHA 19e 2510) is used to determine salinity.

- End of Report -

PILOT TESTING

EQUIPMENT PERFORMANCE CHECK / CALIBRATION REPORT

Report No.	:	HK1711109
Project Name	:	EQUIPMENT PERFORMANCE CHECK/CALIBRATION REPORT
Date of Issue	:	01/12/2017
Customer	:	LAM ENVIRONMENTAL SERVICES LIMITED
Address	:	11/F., CENTRE POINT, 181-185 GLOUCESTER ROAD, WAN CHAI, HONG KONG
Calibration Job No.	:	HK1711109
Test Item No.	:	HK1711109-01
Test Item Details		
Test Item Description	:	Sonde
Manufacturer	:	YSI
Model No.	:	Professional Plus
Serial No.	:	16J100298
Performance Method	:	Checked according to in-house method CAL005 (References: Temperature (Section 6 of International Accreditation New Zealand Technical Guide No. 3 Second edition March 2008: Working Thermometer Calibration Procedure), pH value (APHA 21e 4500H:B), Salinity (Refer to Conductivity APHA 19e 2510B) , Dissolved oxygen (APHA 19e 4500-O,C))
Test Item Receipt Date	:	28/11/2017
Test Item Calibration Date	:	01/12/2017

Notes :
1. This report shall not be reproduced, except in full, without prior approval from Pilot Testing Limited.
2. Results relate to item(s) as received.
3. ± indicates the tolerance limit
4. N/A = Not applicable
5. APHA - American Public Health Association, American Water Works Association and Water Environment Federation, Standard Methods for the Examination of Water and Wastewater, APHA-AWWA-WEF. USA
6. DO, pH, salinity and temperature performance check was conducted by Pilot Testing Limited.
7. Because of high sensitivity and ease of measurement, the conductivity method (according to APHA 19e 2510) is used to determine salinity.

Approved Signatory :

Ms. Wong Po Yan, Pauline
(Assistant Laboratory Manager)

Issue Date: 01/12/2017

PILOT TESTING

REPORT OF EQUIPMENT PERFORMANCE CHECK/CALIBRATION

WORK ORDER: HK1711109
DATE OF ISSUE: 01/12/2017
CLIENT: LAM ENVIRONMENTAL SERVICES LIMITED

Equipment Type	Sonde
Manufacturer	YSI
Model No.	Professional Plus
Serial No.	16J100298
Date of Calibration	01-Dec-17
Date of next Calibation	01-Mar-18

Parameters:

Temperature (Method Ref: Section 6 of International Accreditation New Zealand Technical Guide No.3 Second edition March 2008: Working Thermometer Calibration Procedure)

Reference Reading (°C)	Display Reading (°C)	Deviation (°C)
4.3	4.3	0.0
14.4	14.4	0.0
22.7	23.3	0.6
	Tolerance Limit	±2.0

pH Value (Method Ref: APHA21e, 4500H:B)

Expected Reading (pH unit)	Reference Reading (pH unit)	Display Reading (pH unit)	Deviation (pH unit)
4.0	4.10	4.11	0.01
7.0	7.08	7.06	-0.02
10.0	10.30	10.20	-0.10
	Tolerance Limit		±0.20

Conductivity (Method Ref: APHA 19e, 2510)

KCl concentration (mol/L)	Reference Reading (ms/cm)	Display Reading (ms/cm)	Deviation (%)
0.0000	0.00	0.00	--
0.1000	11.4	11.4	0.00
0.2000	23.1	22.7	-1.73
0.5000	51.0	51.8	1.57
	Tolerance Limit		±2.0

Dissolved Oxygen (DO) (Method Ref: APHA 19e, 4500-O, C)

Reference DO reading (mg/L)	DO reading od DO probe (mg/L)	Deviation (mg/L)
7.63	7.54	-0.09
6.31	6.30	-0.01
3.95	4.04	0.09
	Tolerance Limit	±0.20

Remarks:
(1) Maxium tolerance and calibration frequency stated in the report, unless otherewise stated, the internal acceptance criteria of Pilot Testing Limited will be followed.
(2) Displayed reading presents the figures shown on item under calibration/checking regardless of equipment precision or significant figures.
(3) Because of high sensitivity and ease of measurement, the conductivity method (accoridng to APHA 19e 2510) is used to determine salinity.

- End of Report -

PILOT TESTING

EQUIPMENT PERFORMANCE CHECK / CALIBRATION REPORT

Report No.	:	HK1711081
Project Name	:	EQUIPMENT PERFORMANCE CHECK/CALIBRATION REPORT
Date of Issue	:	27/12/2017
Customer	:	LAM ENVIRONMENTAL SERVICES LIMITED
Address	:	11/F., CENTRE POINT, 181-185 GLOUCESTER ROAD, WAN CHAI, HONG KONG
Calibration Job No.	:	HK1711081
Test Item No.	:	HK1711081-01
Test Item Details		
Test Item Description	:	Sonde
Manufacturer	:	YSI
Model No.	:	Professional Plus
Serial No.	:	17F100236
Performance Method	:	Checked according to in-house method CAL005 (References: Temperature (Section 6 of International Accreditation New Zealand Technical Guide No. 3 Second edition March 2008: Working Thermometer Calibration Procedure), pH value (APHA 21e 4500H:B), Salinity (Refer to Conductivity APHA 19e 2510B) , Dissolved oxygen (APHA 19e 4500-O,C))
Test Item Receipt Date	:	21/12/2017
Test Item Calibration Date	:	22/12/2017

Notes :
1. This report shall not be reproduced, except in full, without prior approval from Pilot Testing Limited.
2. Results relate to item(s) as received.
3. ± indicates the tolerance limit
4. N/A = Not applicable
5. APHA - American Public Health Association, American Water Works Association and Water Environment Federation, Standard Methods for the Examination of Water and Wastewater, APHA-AWWA-WEF. USA
6. DO, pH, salinity and temperature performance check was conducted by Pilot Testing Limited.
7. Because of high sensitivity and ease of measurement, the conductivity method (according to APHA 19e 2510) is used to determine salinity.

Approved Signatory : 

Ms. Wong Po Yan, Pauline
(Assistant Laboratory Manager)

Issue Date: 27/12/2017

Pilot Testing Limited
Address: Room B12, Block B, 5/F, Tonic Industrial Centre, 19 Lam Hing Street, Kowloon Bay, Kowloon
Tel: (852) 2527 6691 email: test@pilot-testing.com

PILOT TESTING

REPORT OF EQUIPMENT PERFORMANCE CHECK/CALIBRATION

WORK ORDER: HK1711081
DATE OF ISSUE: 27/12/2017
CLIENT: LAM ENVIRONMENTAL SERVICES LIMITED

Equipment Type	Sonde
Manufacturer	YSI
Model No.	Professional Plus
Serial No.	17F100236
Date of Calibration	22-Dec-17
Date of next Calibation	22-Mar-18

Parameters:

Temperature (Method Ref: Section 6 of International Accreditation New Zealand Technical Guide No.3 Second edition March 2008: Working Thermometer Calibration Procedure)

Reference Reading (°C)	Display Reading (°C)	Deviation (°C)
5.9	5.9	0.0
15.1	15.1	0.0
28.0	28.0	0.0
	Tolerance Limit	±2.0

pH Value (Method Ref: APHA21e, 4500H:B)

Expected Reading (pH unit)	Reference Reading (pH unit)	Display Reading (pH unit)	Deviation (pH unit)
4.0	4.07	3.95	-0.12
7.0	7.02	6.90	-0.12
10.0	10.03	10.04	0.01
	Tolerance Limit		±0.20

Conductivity (Method Ref: APHA 19e, 2510)

KCl concentration (mol/L)	Reference Reading (ms/cm)	Display Reading (ms/cm)	Deviation (%)
0.0000	0.00	0.00	--
0.1000	11.4	11.2	-1.75
0.2000	22.8	22.7	-0.44
0.5000	57.3	56.8	-0.87
	Tolerance Limit		±2.0

Dissolved Oxygen (DO) (Method Ref: APHA 19e, 4500-O, C)

Reference DO reading (mg/L)	DO reading od DO probe (mg/L)	Deviation (mg/L)
7.37	7.40	0.03
6.62	6.57	-0.05
5.45	5.51	0.06
	Tolerance Limit	±0.20

Remarks:
(1) Maxium tolerance and calibration frequency stated in the report, unless otherewise stated, the internal acceptance criteria of Pilot Testing Limited will be followed.
(2) Displayed reading presents the figures shown on item under calibration/checking regardless of equipment precision or significant figures.
(3) Because of high sensitivity and ease of measurement, the conductivity method (accoridng to APHA 19e 2510) is used to determine salinity.

- End of Report -

REPORT OF EQUIPMENT PERFORMANCE CHECK / CALIBRATION

Information supplied by customer:

CONTACT:	**MR. SAM LAM**	**WORK ORDER:**	**HK1710885**
CLIENT:	**LAM GEOTECHNICS LIMITED**		
DATE RECEIVED:	**23/10/2017**		
DATE OF ISSUE:	**26/10/2017**		
ADDRESS:	**11/F, CENTRE POINT, 181-185, GLOUCESTER ROAD, WANCHAI, HONG KONG**		
PROJECT:	---		

METHOD OF PERFORMANCE CHECK/ CALIBRATION:
Ref: APHA22nd ed 2130B

COMMENTS
It is certified that the item under performance check/calibration has been calibrated/checked by corresponding calibrated equipment in the laboratory.
Maximum Tolerance and calibration frequency stated in the report, unless otherwise stated, the internal acceptance criteria of Pilot Testing Limited will be followed.

Scope of Test:	Turbidity
Equipment Type:	Turbidimeter
Brand Name:	Xin Rui
Model No.:	WGZ-3B
Serial No.:	1309192
Equipment No.:	---
Date of Calibration:	25/10/2017

Remarks:
This is the Final Report. Results apply to sample(s) as submitted. All pages of this report have been checked and approved for release.

Approved Signatory: _____ Issue Date: 26/10/2017

Ms. Wong Po Yan, Pauline
Assistant Laboratory Manager

Address: No.B12, 5th Floor, Block B, Tonic Industrial Centre, No.19 Lam Hing Street, Kowloon Bay, Kowloon
Phone +852 2527 6691 | Email info@pilot-testing.com

REPORT OF EQUIPMENT PERFORMANCE CHECK / CALIBRATION

WORK ORDER: HK1710885
DATE OF ISSUE: 26/10/2017
CLIENT: LAM GEOTECHNICS LIMITED

Equipment Type:	Turbidimeter
Brand Name:	Xin Rui
Model No.:	WGZ-3B
Serial No.:	1309192
Equipment No.:	---
Date of Calibration:	25/10/2017
Date of next Calibation:	25/01/2018

Parameters:
Turbidity

Method Ref: APHA 22nd ed. 2130B

Expected Reading (NTU)	Display Reading (NTU)	Tolerance
0	0.00	---
4	4.23	5.8%
10	9.42	-5.8%
40	36.5	-8.8%
100	100	-0.4%
400	422	5.4%
1000	1001	0.1%
	Tolerance Limit (±)	10%

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

Address: No.B12, 5th Floor, Block B, Tonic Industrial Centre, No.19 Lam Hing Street, Kowloon Bay, Kowloon
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REPORT OF EQUIPMENT PERFORMANCE CHECK / CALIBRATION

Information supplied by customer:

CONTACT:	**MR. SAM LAM**	**WORK ORDER:**	**HK1810086**
CLIENT:	**LAM GEOTECHNICS LIMITED**		
DATE RECEIVED:	**23/01/2018**		
DATE OF ISSUE:	**25/01/2018**		
ADDRESS:	**11/F, CENTRE POINT, 181-185, GLOUCESTER ROAD, WANCHAI, HONG KONG**		
PROJECT:	---		

METHOD OF PERFORMANCE CHECK/ CALIBRATION:
Ref: APHA22nd ed 2130B

COMMENTS
It is certified that the item under performance check/calibration has been calibrated/checked by corresponding calibrated equipment in the laboratory.
Maximum Tolerance and calibration frequency stated in the report, unless otherwise stated, the internal acceptance criteria of Pilot Testing Limited will be followed.

Scope of Test:	Turbidity
Equipment Type:	Turbidimeter
Brand Name:	Xin Rui
Model No.:	WGZ-3B
Serial No.:	1309192
Equipment No.:	---
Date of Calibration:	24/01/2018

Remarks:
This is the Final Report. Results apply to sample(s) as submitted. All pages of this report have been checked and approved for release.

Approved Signatory: _____ Issue Date: 25/01/2018

Ms. Wong Po Yan, Pauline
Assistant Laboratory Manager

Address: No.B12, 5th Floor, Block B, Tonic Industrial Centre, No.19 Lam Hing Street, Kowloon Bay, Kowloon
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REPORT OF EQUIPMENT PERFORMANCE CHECK / CALIBRATION

WORK ORDER: HK1810086
DATE OF ISSUE: 25/01/2018
CLIENT: LAM GEOTECHNICS LIMITED

Equipment Type:	Turbidimeter
Brand Name:	Xin Rui
Model No.:	WGZ-3B
Serial No.:	1309192
Equipment No.:	---
Date of Calibration:	24/01/2018
Date of next Calibation:	24/04/2018

Parameters:
Turbidity

Method Ref: APHA 22nd ed. 2130B

Expected Reading (NTU)	Display Reading (NTU)	Tolerance
0	0.00	---
4	4.12	3.0%
10	10.4	4.0%
40	43.0	7.4%
100	107	7.0%
400	416	4.1%
1000	1000	0.0%
	Tolerance Limit (±)	10%

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

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REPORT OF EQUIPMENT PERFORMANCE CHECK / CALIBRATION

Information supplied by customer:

CONTACT:	**MR. SAM LAM**	**WORK ORDER:**	**HK1711010**
CLIENT:	**LAM GEOTECHNICS LIMITED**		
DATE RECEIVED:	**28/11/2017**		
DATE OF ISSUE:	**30/11/2017**		
ADDRESS:	**11/F, CENTRE POINT, 181-185, GLOUCESTER ROAD, WANCHAI, HONG KONG**		
PROJECT:	---		

METHOD OF PERFORMANCE CHECK/ CALIBRATION:
Ref: APHA22nd ed 2130B

COMMENTS
It is certified that the item under performance check/calibration has been calibrated/checked by corresponding calibrated equipment in the laboratory.
Maximum Tolerance and calibration frequency stated in the report, unless otherwise stated, the internal acceptance criteria of Pilot Testing Limited will be followed.

Scope of Test:	Turbidity
Equipment Type:	Turbidimeter
Brand Name:	Xin Rui
Model No.:	WGZ-3B
Serial No.:	1512036
Equipment No.:	---
Date of Calibration:	30/11/2017

Remarks:
This is the Final Report. Results apply to sample(s) as submitted. All pages of this report have been checked and approved for release.

Approved Signatory: 

Ms. Wong Po Yan, Pauline
Assistant Laboratory Manager

Issue Date: 30/11/2017

Address: No.B12, 5th Floor, Block B, Tonic Industrial Centre, No.19 Lam Hing Street, Kowloon Bay, Kowloon
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REPORT OF EQUIPMENT PERFORMANCE CHECK / CALIBRATION

WORK ORDER: HK1711010
DATE OF ISSUE: 30/11/2017
CLIENT: LAM GEOTECHNICS LIMITED

Equipment Type:	Turbidimeter
Brand Name:	Xin Rui
Model No.:	WGZ-3B
Serial No.:	1512036
Equipment No.:	---
Date of Calibration:	30/11/2017
Date of next Calibation:	28/02/2018

Parameters:
Turbidity

Method Ref: APHA 22nd ed. 2130B

Expected Reading (NTU)	Display Reading (NTU)	Tolerance
0	0.00	---
4	3.94	-1.5%
10	9.50	-5.0%
40	37.9	-5.3%
100	97.1	-2.9%
400	392	-2.0%
1000	976	-2.4%
	Tolerance Limit (±)	10%

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

Address: No.B12, 5th Floor, Block B, Tonic Industrial Centre, No.19 Lam Hing Street, Kowloon Bay, Kowloon
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REPORT OF EQUIPMENT PERFORMANCE CHECK / CALIBRATION

Information supplied by customer:

CONTACT:	**MR. SAM LAM**	**WORK ORDER:**	**HK1710902**
CLIENT:	**LAM GEOTECHNICS LIMITED**		
DATE RECEIVED:	**31/10/2017**		
DATE OF ISSUE:	**01/11/2017**		
ADDRESS:	**11/F, CENTRE POINT, 181-185, GLOUCESTER ROAD, WANCHAI, HONG KONG**		
PROJECT:	---		

METHOD OF PERFORMANCE CHECK/ CALIBRATION:
Ref: APHA22nd ed 2130B

COMMENTS
It is certified that the item under performance check/calibration has been calibrated/checked by corresponding calibrated equipment in the laboratory.
Maximum Tolerance and calibration frequency stated in the report, unless otherwise stated, the internal acceptance criteria of Pilot Testing Limited will be followed.

Scope of Test:	Turbidity
Equipment Type:	Turbidity Meter
Brand Name:	PCE Instruments
Model No.:	PCE-TUM 20
Serial No.:	Q942542
Equipment No.:	---
Date of Calibration:	31/10/2017

Remarks:
This is the Final Report. Results apply to sample(s) as submitted. All pages of this report have been checked and approved for release.

Approved Signatory: _____ Issue Date: 01/11/2017

Ms. Wong Po Yan, Pauline
Assistant Laboratory Manager

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REPORT OF EQUIPMENT PERFORMANCE CHECK / CALIBRATION

WORK ORDER: HK1710902
DATE OF ISSUE: 01/11/2017
CLIENT: LAM GEOTECHNICS LIMITED

Equipment Type:	Turbidity Meter
Brand Name:	PCE Instruments
Model No.:	PCE-TUM 20
Serial No.:	Q942542
Equipment No.:	---
Date of Calibration:	31/10/2017
Date of next Calibation:	31/01/2018

Parameters:
Turbidity

Method Ref: APHA 22nd ed. 2130B

Expected Reading (NTU)	Display Reading (NTU)	Tolerance
0	0.00	---
4	4.35	8.7%
20	22.0	10.0%
40	40.6	1.4%
100	94.0	-6.0%
400	437	9.3%
800	798	-0.3%
	Tolerance Limit (±)	10%

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

Address: No.B12, 5th Floor, Block B, Tonic Industrial Centre, No.19 Lam Hing Street, Kowloon Bay, Kowloon
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REPORT OF EQUIPMENT PERFORMANCE CHECK / CALIBRATION

Information supplied by customer:

CONTACT:	**MR. SAM LAM**	**WORK ORDER:**	**HK1810091**
CLIENT:	**LAM GEOTECHNICS LIMITED**		
DATE RECEIVED:	**25/01/2018**		
DATE OF ISSUE:	**25/01/2018**		
ADDRESS:	**11/F, CENTRE POINT, 181-185, GLOUCESTER ROAD, WANCHAI, HONG KONG**		
PROJECT:	**---**		

METHOD OF PERFORMANCE CHECK/ CALIBRATION:
Ref: APHA22nd ed 2130B

COMMENTS
It is certified that the item under performance check/calibration has been calibrated/checked by corresponding calibrated equipment in the laboratory.
Maximum Tolerance and calibration frequency stated in the report, unless otherwise stated, the internal acceptance criteria of Pilot Testing Limited will be followed.

Scope of Test:	Turbidity
Equipment Type:	Turbidity Meter
Brand Name:	PCE Instruments
Model No.:	PCE-TUM 20
Serial No.:	Q942542
Equipment No.:	---
Date of Calibration:	25/01/2018

Remarks:
This is the Final Report. Results apply to sample(s) as submitted. All pages of this report have been checked and approved for release.

Approved Signatory: _____ Issue Date: 25/01/2018

Ms. Wong Po Yan, Pauline
Assistant Laboratory Manager

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REPORT OF EQUIPMENT PERFORMANCE CHECK / CALIBRATION

WORK ORDER: HK1810091
DATE OF ISSUE: 25/01/2018
CLIENT: LAM GEOTECHNICS LIMITED

Equipment Type:	Turbidity Meter
Brand Name:	PCE Instruments
Model No.:	PCE-TUM 20
Serial No.:	Q942542
Equipment No.:	---
Date of Calibration:	25/01/2018
Date of next Calibation:	25/04/2018

Parameters:
Turbidity

Method Ref: APHA 22nd ed. 2130B

Expected Reading (NTU)	Display Reading (NTU)	Tolerance
0	0.00	---
4	4.17	4.3%
20	21.8	9.2%
40	42.5	6.2%
100	98.0	-2.0%
400	397	-0.8%
800	870	8.8%
	Tolerance Limit (±)	10%

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

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