

Annex B

Calibration Reports of Multi-parameter Sensor



Form Name : **Temperature/Salinity Calibration Record**

Procedure Type **Calibration**
 Form No/Rev **En10R / 2**
 Date **19th September 2006**
 Approved by **REH**

CALIBRATION RECORD FOR TEMPERATURE/SALINITY SENSOR

Instrument model: **YSI** Calibration date **08 Jun 2009**
 Serial Number **02J0058-AC** EGS Instrument No **MPP17** Calibration Engineer **Ricky Wong**

Cal Thermometers	0-15 °C	15-30 °C	30-45 °C	Cal Salinometer	Ref A	Ref B	Cal A	Cal B
Thermoschneider	916265	919402	991335	ORTASAL 69470	0	0	0	0

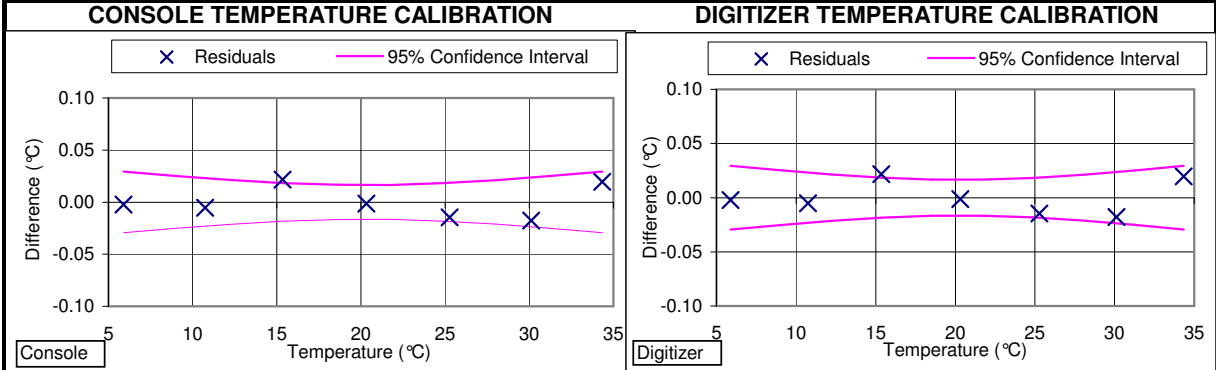
TEMPERATURE CALIBRATION

Console temperature calibration record (°C)

Reference	Console	Calculated	Residual				
5.89	10.74	15.34	20.32	25.27	30.11	34.33	
5.79	10.64	15.21	20.21	25.17	30.01	34.19	
5.892	10.745	15.318	20.321	25.285	30.128	34.310	
-0.002	-0.005	0.022	-0.001	-0.015	-0.018	0.020	

Digitizer temperature calibration record (°C)

Digitizer	Calculated	Residual				
5.79	10.64	15.21	20.21	25.17	30.01	34.19
5.892	10.745	15.318	20.321	25.285	30.128	34.310
-0.002	-0.005	0.022	-0.001	-0.015	-0.018	0.020



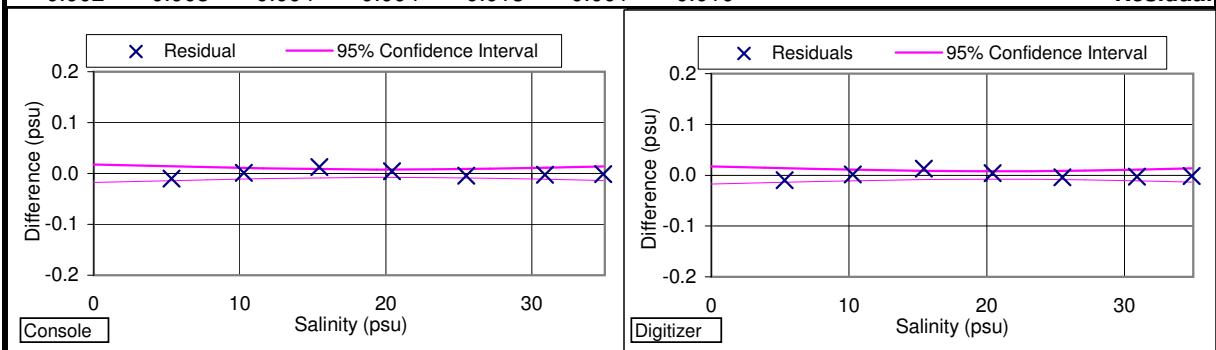
SALINITY CALIBRATION

Console salinity calibration record (psu)

Reference	Console	Calculated	Residual			
34.89	30.9	25.5	20.42	15.44	10.27	5.33
34.87	30.88	25.48	20.39	15.4	10.24	5.31
34.892	30.903	25.504	20.416	15.427	10.269	5.340
-0.002	-0.003	-0.004	0.004	0.013	0.001	-0.010

Digitizer salinity calibration record (psu)

Digitizer	Calculated	Residual				
34.87	30.88	25.48	20.39	15.4	10.24	5.31
34.892	30.903	25.504	20.416	15.427	10.269	5.340
-0.002	-0.003	-0.004	0.004	0.013	0.001	-0.010



CALIBRATION SUMMARY

	Temperature console	digitizer	Salinity console	Salinity digitizer
Calibration gradient, m	1.0006 ±0.0003	1.0006 ±0.0003	0.9997 ±0.0001	0.9997 ±0.0001
Calibration intercept, c	0.10 ±0.00	0.10 ±0.00	0.03 ±0.00	0.03 ±0.00
95% Confidence interval	0.029 °C	0.029 °C	0.017 psu	0.017 psu
PASS/FAIL CRITERION	0.1 PASS	0.1 PASS	0.2 PASS	0.2 PASS

Calibration Engineer	Ricky Wong	Geoscientist	Margie Chen	Senior Engineer	Anderson Leung
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EGS (ASIA) LIMITED

CALIBRATION RECORD FOR YSI SILTMETER

Job No : L13909	Pre-cal. X	Post-cal.	12Mth cal.
EGS No : MPP17	Model : YSI 6820-C-M	S/N :	02J0058-AC

SILTMETER CALIBRATION

Formazin Concentration (NTU)	Console Voltage (Volts)	Console Formazin Conc. (NTU)	Ratio=NTU/Console Reading
100		99.90	Not Used
90		89.50	1.006
80		79.00	1.013
70		69.10	1.013
60		59.30	1.012
50		48.70	1.027
40		38.80	Not Used
30		28.70	Not Used
20		19.00	Not Used
10		9.30	Not Used
0		0.00	Not Used

Mean Ratio, M : **1.014**
Standard Deviation of Ratio : **0.008**

Acceptance Criteria :

- i) $0.75 < \text{Mean Ratio} < 1.25$
- ii) $\text{Standard Deviation of Ratio} < 0.05$
- iii) $-2.5 \text{ NTU} < \text{Console Reading in Distilled Water} < 2.5 \text{ NTU}$

Calibration Equation : $M \times \text{Console Reading} + C$

M = **1.014** C = **0.000**

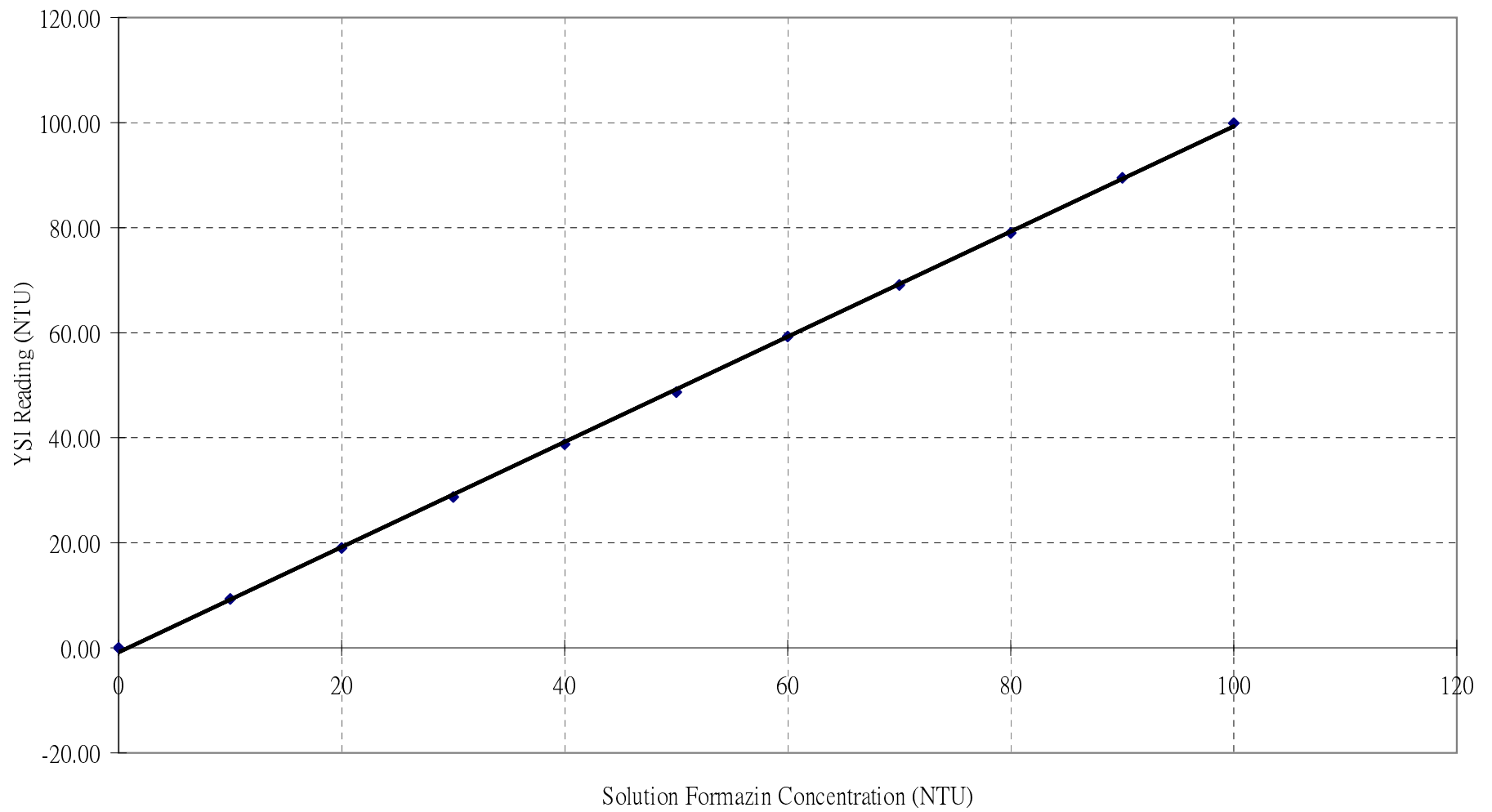
CALIBRATING ENGINEER : **Ricky Wong** Date : **8-Jun-09**

PLOT ACCEPTED BY GEOSCIENTIST : **Margie Chen** Date : **10-Jun-09**

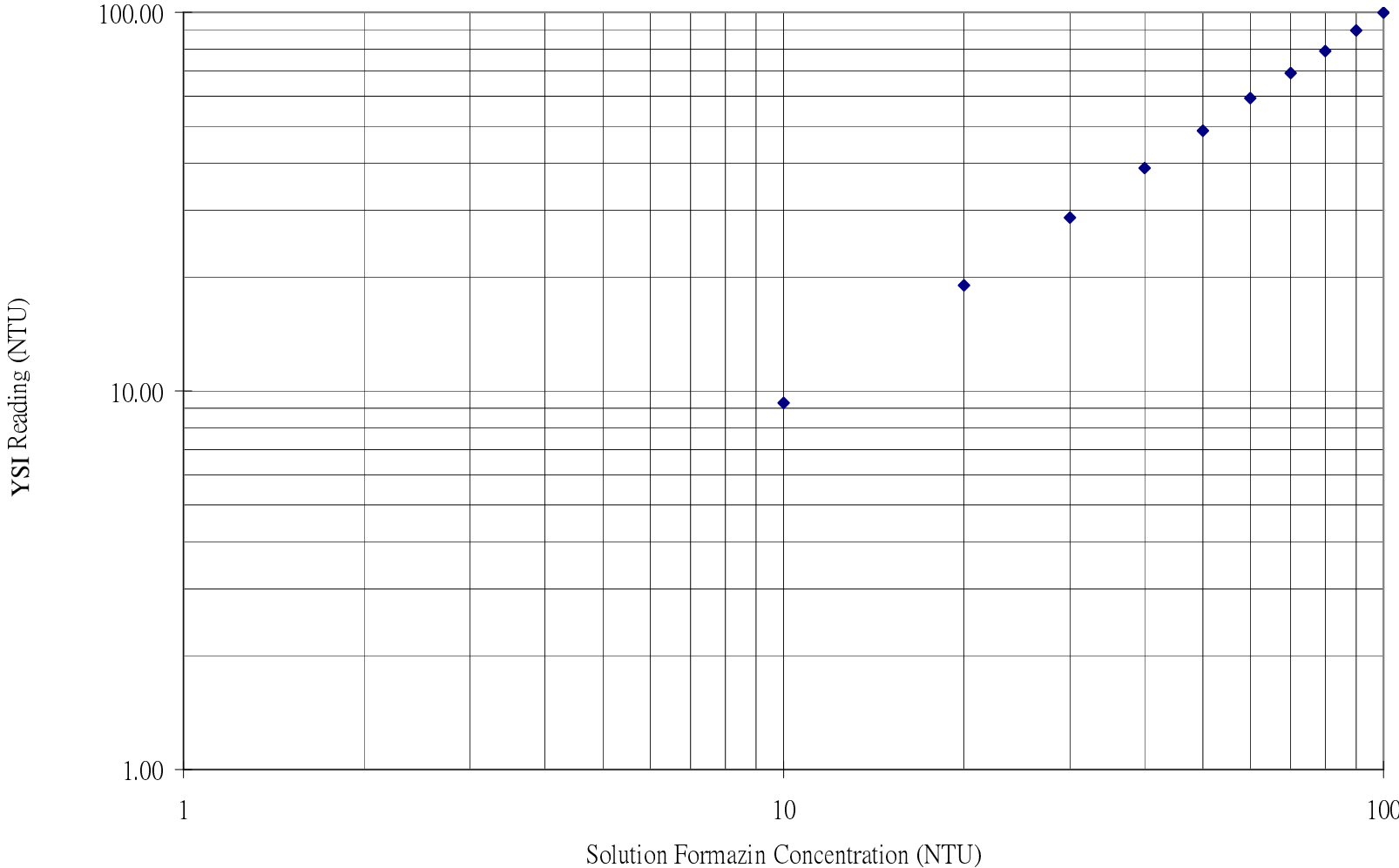
ACCEPTED BY SENIOR ENGINEER : **Anderson Leung** Date : **10-Jun-09**

CALIBRATION SCHEDULE UPDATED

Calibration Plot for YSI Siltmeter, EGS No:MPP17, 8-Jun-09



Calibration Plot for YSI Siltmeter, EGS No:MPP17, 8-Jun-09



YSI Siltmeter Regression Statistics

EGS No: MPP17
Date: 8-Jun-09

<i>Regression Statistics</i>	
Multiple R	0.99983197
R Square	0.99966397
Adjusted R Square	0.99962663
Standard Error	0.62244224
Observations	11

ANOVA

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	10373.19309	10373.193	26774.067	6.04727E-17
Residual	9	3.486909091	0.3874343		
Total	10	10376.68			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	1.14545455	0.351104776	3.2624294	0.0098006	0.351199756	1.939709335
X Variable 1	0.97109091	0.005934754	163.62783	6.047E-17	0.957665553	0.984516265



Form Name :
**Temperature/Salinity
 Calibration Record**

Procedure Type **Calibration**
 Form No/Rev **En10R / 2**
 Date **19th September 2006**
 Approved by **REH**

CALIBRATION RECORD FOR TEMPERATURE/SALINITY SENSOR

Instrument model: **YSI** Calibration date **08 Jun 2009**
 Serial Number **02J0998** EGS Instrument No **MPP19** Calibration Engineer **Ricky Wong**

Cal Thermometers	0-15 °C	15-30 °C	30-45 °C	Cal Salinometer	Ref A	Ref B	Cal A	Cal B
Thermoschneider	916265	909402	991335	ORTASAL 69470	0	0	0	0

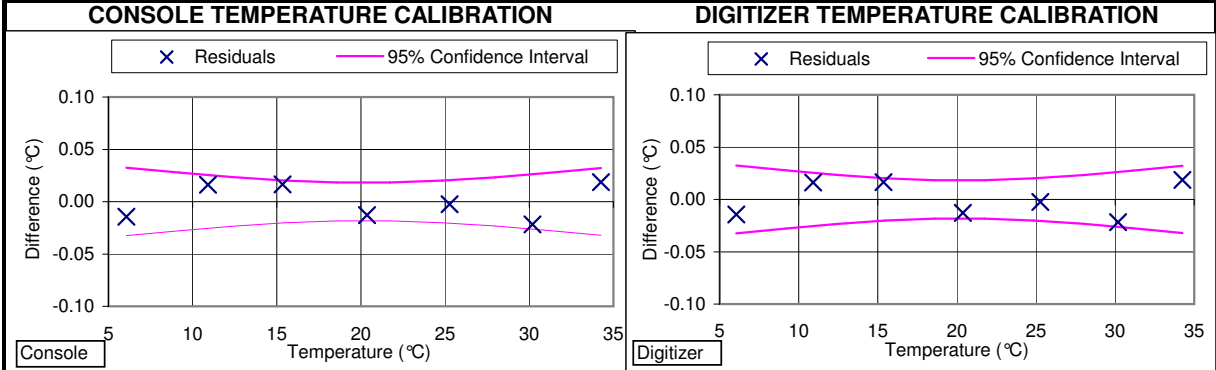
TEMPERATURE CALIBRATION

Console temperature calibration record (°C)

Reference	Console	Calculated	Residual				
6.06	10.91	15.35	20.37	25.27	30.19	34.25	
5.97	10.79	15.23	20.28	25.17	30.11	34.13	
6.074	10.894	15.333	20.383	25.272	30.212	34.231	
-0.014	0.016	0.017	-0.013	-0.002	-0.022	0.019	

Digitizer temperature calibration record (°C)

Digitizer	Calculated	Residual					
5.97	10.79	15.23	20.28	25.17	30.11	34.13	
6.074	10.894	15.333	20.383	25.272	30.212	34.231	
-0.014	0.016	0.017	-0.013	-0.002	-0.022	0.019	



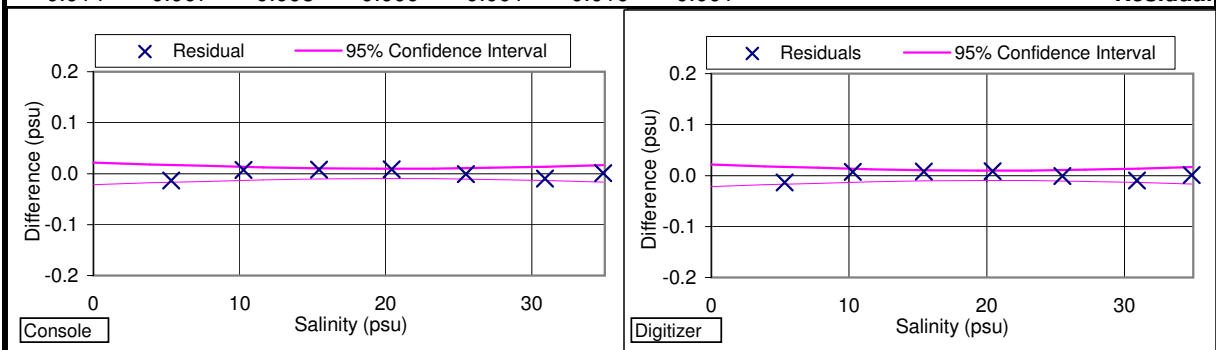
SALINITY CALIBRATION

Console salinity calibration record (psu)

Reference	Console	Calculated	Residual				
5.33	10.28	15.44	20.42	25.5	30.9	34.89	
5.33	10.26	15.42	20.4	25.49	30.9	34.88	
5.344	10.273	15.432	20.411	25.501	30.910	34.889	
-0.014	0.007	0.008	0.009	-0.001	-0.010	0.001	

Digitizer salinity calibration record (psu)

Digitizer	Calculated	Residual					
5.33	10.26	15.42	20.4	25.49	30.9	34.88	
5.344	10.273	15.432	20.411	25.501	30.910	34.889	
-0.014	0.007	0.008	0.009	-0.001	-0.010	0.001	



CALIBRATION SUMMARY

	Temperature console	digitizer	Salinity console	Salinity digitizer
Calibration gradient, m	0.9999 ±0.0003	0.9999 ±0.0003	0.9998 ±0.0002	0.9998 ±0.0002
Calibration intercept, c	0.10 ±0.00	0.10 ±0.00	0.01 ±0.00	0.01 ±0.00
95% Confidence interval	0.033 °C	0.033 °C	0.021 psu	0.021 psu
PASS/FAIL CRITERION	0.1 PASS	0.1 PASS	0.2 PASS	0.2 PASS

Calibration Engineer: Ricky Wong (Geoscientist), R E Hale (Senior Engineer), Anderson Leung (Senior Engineer)

EGS (ASIA) LIMITED

CALIBRATION RECORD FOR YSI SILTMETER

Job No : L13909	Pre-cal. X	Post-cal.	12Mth cal.
EGS No : MPP19	Model : YSI 6820-C-M	S/N :	02J0998

SILTMETER CALIBRATION

Formazin Concentration (NTU)	Console Voltage (Volts)	Console Formazin Conc. (NTU)	Ratio=NTU/Console Reading
100		100.00	Not Used
90		89.00	1.011
80		79.20	1.010
70		69.20	1.012
60		59.10	1.015
50		49.00	1.020
40		39.00	Not Used
30		28.60	Not Used
20		18.90	Not Used
10		9.50	Not Used
0		0.10	Not Used

Mean Ratio, M : **1.014**
Standard Deviation of Ratio : **0.004**

Acceptance Criteria :

- i) $0.75 < \text{Mean Ratio} < 1.25$
- ii) Standard Deviation of Ratio < 0.05
- iii) $-2.5 \text{ NTU} < \text{Console Reading in Distilled Water} < 2.5 \text{ NTU}$

Calibration Equation : $M \times \text{Console Reading} + C$

M = **1.014** C = **-0.100**

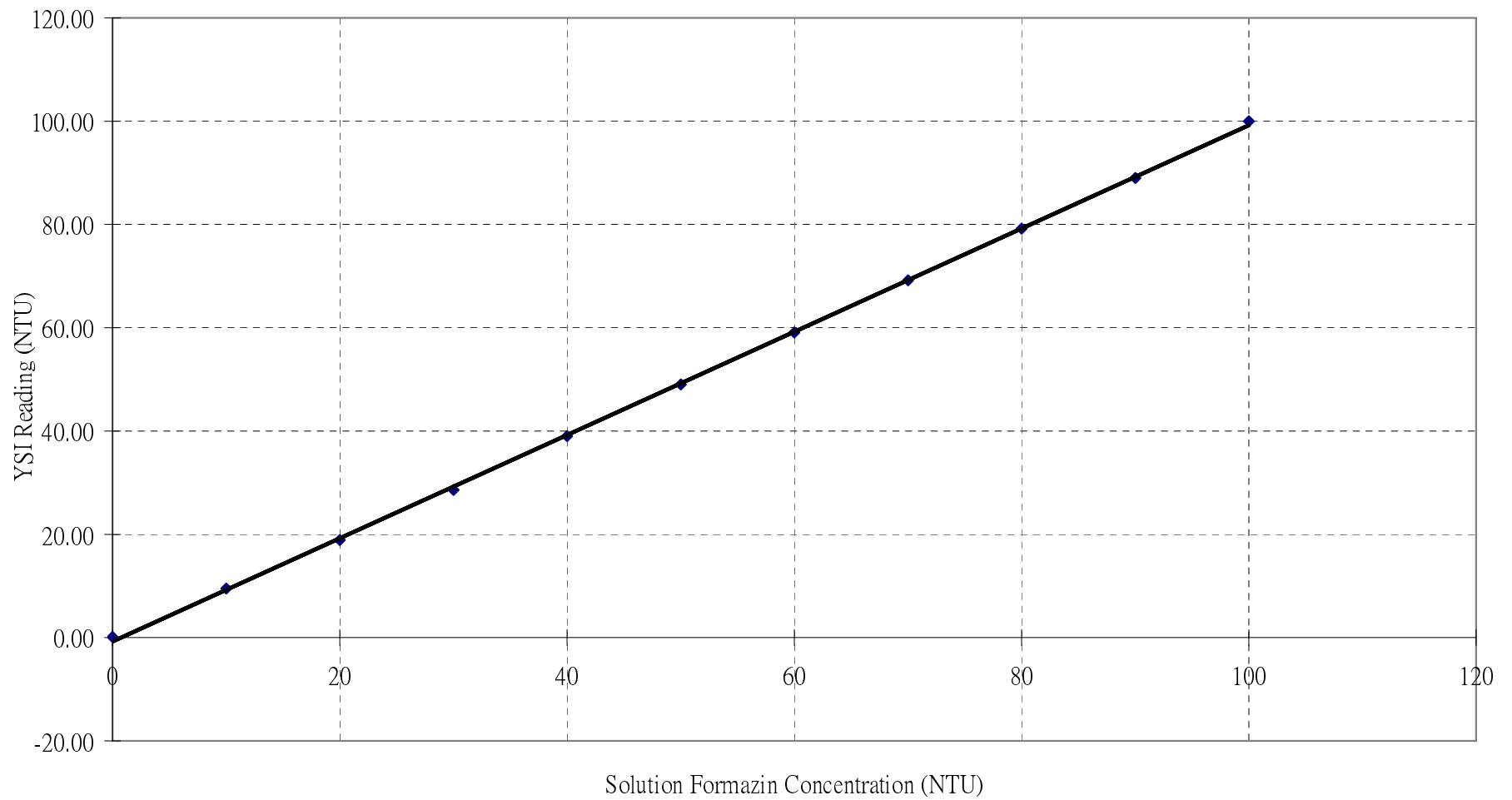
CALIBRATING ENGINEER : Ricky Wong Date : 9 June, 2009

PLOT ACCEPTED BY GEOSCIENTIST : R E Hale Date : 17 June, 2009

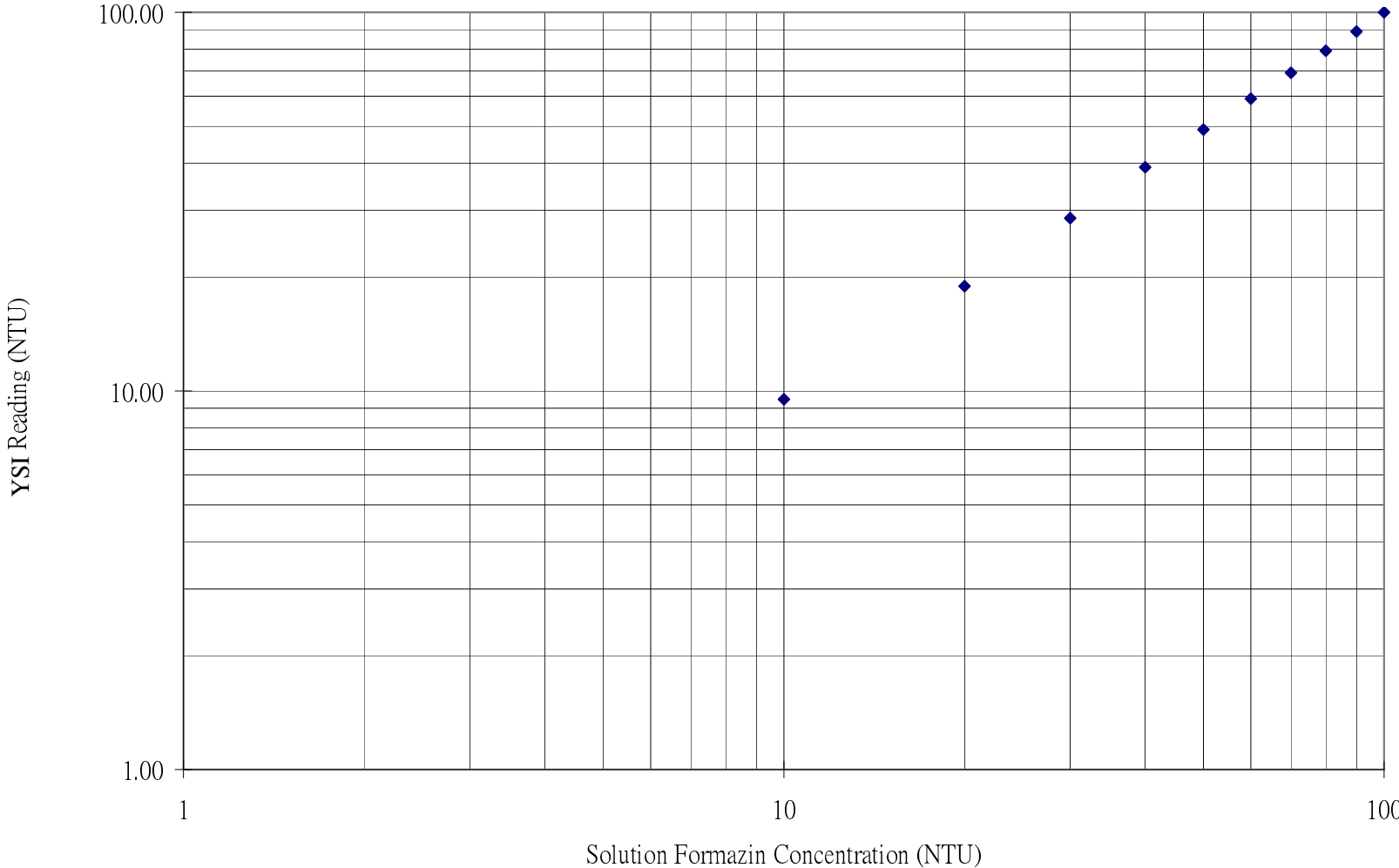
ACCEPTED BY SENIOR ENGINEER : Anderson Leung Date : 17 June, 2009

CALIBRATION SCHEDULE UPDATED

Calibration Plot for YSI Siltmeter, EGS No:MPP19, 9-Jun-09



Calibration Plot for YSI Siltmeter, EGS No:MPP19, 9-Jun-09



YSI Siltmeter Regression Statistics

EGS No: MPP19
 Date: 9-Jun-09

SUMMARY OUTPUT

<i>Regression Statistics</i>	
Multiple R	0.99983197
R Square	0.99966397
Adjusted R Square	0.99962663
Standard Error	0.62244224
Observations	11

ANOVA

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	10373.19309	10373.193	26774.067	6.04727E-17
Residual	9	3.486909091	0.3874343		
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	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	1.14545455	0.351104776	3.2624294	0.0098006	0.351199756	1.939709335
X Variable 1	0.97109091	0.005934754	163.62783	6.047E-17	0.957665553	0.984516265