

ภาคผนวก ค

ใบรับรองผลการวิเคราะห์

ภาคผนวก ค-1

คุณภาพอากาศในบรรยากาศโดยทั่วไป



Analysis / Test Report

TESTING
No.0042

Client : Glow SPP 3 Co., Ltd.
11, Map Ta Phut Industrial Estate, I-5 Road, Muang, Rayong Thailand 21150

P/O :

Project Name :

Project Location : Sea dredging

Lot ID: 22114259

Date Received : Oct 06, 2022

Date Reported : Oct 12, 2022

Report Number: 2435144-1

Page 1 of 1

Sample Description	Air Quality
Location	Thai Tank Farm (GPS 47P 0731944, 1401159)
Date Analysis Commenced	Oct 07, 2022
Condition of Sample	Drawn into one glass filter paper (8x10 inch) placed in plastic bag and one quartz filter paper (8x10 inch) placed in plastic bag

Sample Number	Sampled Date	Total Suspended Particulate (mg/m3)	Particulate Matter (PM-10) (mg/m3)	Barometric Pressure (mm Hg)	Atmospheric Temperature (°C)
22114259-1	Oct 03 - Oct 04, 2022	0.025	0.008	757	30
22114259-2	Oct 04 - Oct 05, 2022	0.019	0.016	757	32
22114259-3	Oct 05 - Oct 06, 2022	0.016	0.012	757	32
Guideline		0.33	0.12	-	-

Reference Method

Total Suspended Particulate : US EPA 40 CFR Part 50 Appendix B

Particulate Matter (PM-10) : US EPA 40 CFR Part 50 Appendix J

Guideline : Notification of the National Environmental Board. No.24, 2004 (B.E.2547) dated September 22, 2004

Sampled By : Satcha Phetsawaeng

Remark :

- The laboratory has been accepted as an accredited laboratory complying with the ISO/IEC 17025.

Approved by

Thanita K.

Thanita Kulsuriwong
Scientist (4)

The above results are valid only for the analyzed/tested sample(s) as indicated in this report. No part of this report or certificate may be reproduced in any form without written consent from the Laboratory. ALS Laboratory Group (Thailand) strongly recommends that this report is not reproduced except in full.

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Analysis / Test Report

TESTING
No.0042

Client : Glow SPP 3 Co., Ltd.
11, Map Ta Phut Industrial Estate, I-5 Road, Muang, Rayong Thailand 21150

P/O :

Project Name :

Project Location : Sea dredging

Lot ID: 22114259

Date Received : Oct 06, 2022

Date Reported : Oct 12, 2022

Report Number: 2435144-2

Page 1 of 1

Sample Description	Air Quality
Location	Map Ta Phut Port (North of Project) (GPS 47P 0731869, 1401636)
Date Analysis Commenced	Oct 07, 2022
Condition of Sample	Drawn into one glass filter paper (8x10 inch) placed in plastic bag and one quartz filter paper (8x10 inch) placed in plastic bag

Sample Number	Sampled Date	Total Suspended Particulate (mg/m3)	Particulate Matter (PM-10) (mg/m3)	Barometric Pressure (mm Hg)	Atmospheric Temperature (°C)
22114259-4	Oct 03 - Oct 04, 2022	0.020	0.008	757	30
22114259-5	Oct 04 - Oct 05, 2022	0.033	0.015	757	32
22114259-6	Oct 05 - Oct 06, 2022	0.023	0.012	757	32
Guideline		0.33	0.12	-	-

Reference Method

Total Suspended Particulate : US EPA 40 CFR Part 50 Appendix B

Particulate Matter (PM-10) : US EPA 40 CFR Part 50 Appendix J

Guideline : Notification of the National Environmental Board. No.24, 2004 (B.E.2547) dated September 22, 2004

Sampled By : Satcha Phetsawaeng

Remark :

- The laboratory has been accepted as an accredited laboratory complying with the ISO/IEC 17025.

Approved by

Thanita K.

Thanita Kulsuriwong
Scientist (4)

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Analysis / Test Report

Client : Glow SPP 3 Co., Ltd.
11, Map Ta Phut Industrial Estate, I-5 Road, Muang, Rayong Thailand 21150
P/O :
Project Name :
Project Location : Sea dredging

Lot ID : 22114262
Date Received : Oct 07, 2022
Date Reported : Oct 17, 2022
Report Number : 2435142-1

Page 1 of 2

Sample Number : 22114262-1 to 3
Parameter : Wind Speed / Wind Direction
Location : Thai Tank Farm (GPS 47P 0731944, 1401159)
Sampling Date : Oct 03 - Oct 06, 2022
Sampling by : Satcha Phetsawaeng

Time	Oct 03 - Oct 04, 2022			Oct 04 - Oct 05, 2022			Oct 05 - Oct 06, 2022			-			-			-			-		
	WS (m/s)	WD (deg)		WS (m/s)	WD (deg)		WS (m/s)	WD (deg)		-	-		-	-		-	-		-	-	
10:00 AM - 11:00 AM	1.1	134.0	SE	1.0	147.0	SSE	0.6	331.0	NNW	-	-	-	-	-	-	-	-	-	-	-	-
11:00 AM - 12:00 PM	1.1	135.0	SE	0.9	129.0	SE	0.3	354.0	N	-	-	-	-	-	-	-	-	-	-	-	-
12:00 PM - 01:00 PM	1.2	178.0	S	0.9	117.0	ESE	1.1	141.0	SE	-	-	-	-	-	-	-	-	-	-	-	-
01:00 PM - 02:00 PM	1.7	206.0	SSW	1.0	126.0	SE	1.1	132.0	SE	-	-	-	-	-	-	-	-	-	-	-	-
02:00 PM - 03:00 PM	1.7	201.0	SSW	1.0	134.0	SE	1.0	138.0	SE	-	-	-	-	-	-	-	-	-	-	-	-
03:00 PM - 04:00 PM	1.8	207.0	SSW	1.0	135.0	SE	1.1	141.0	SE	-	-	-	-	-	-	-	-	-	-	-	-
04:00 PM - 05:00 PM	1.7	201.0	SSW	1.2	147.0	SSE	1.2	143.0	SE	-	-	-	-	-	-	-	-	-	-	-	-
05:00 PM - 06:00 PM	1.6	174.0	S	1.1	139.0	SE	1.3	150.0	SSE	-	-	-	-	-	-	-	-	-	-	-	-
06:00 PM - 07:00 PM	1.1	153.0	SSE	0.8	105.0	ESE	1.3	157.0	SSE	-	-	-	-	-	-	-	-	-	-	-	-
07:00 PM - 08:00 PM	0.6	80.0	E	0.4	54.0	NE	1.4	165.0	SSE	-	-	-	-	-	-	-	-	-	-	-	-
08:00 PM - 09:00 PM	0.4	16.0	NNE	0.6	339.0	NNW	1.1	164.0	SSE	-	-	-	-	-	-	-	-	-	-	-	-
09:00 PM - 10:00 PM	0.4	10.0	N	0.4	59.0	ENE	0.9	129.0	SE	-	-	-	-	-	-	-	-	-	-	-	-
10:00 PM - 11:00 PM	0.5	355.0	N	0.4	26.0	NNE	1.2	132.0	SE	-	-	-	-	-	-	-	-	-	-	-	-
11:00 PM - 12:00 AM	0.7	335.0	NNW	0.4	356.0	N	1.1	133.0	SE	-	-	-	-	-	-	-	-	-	-	-	-
12:00 AM - 01:00 AM	0.5	353.0	N	0.4	48.0	NE	1.0	128.0	SE	-	-	-	-	-	-	-	-	-	-	-	-
01:00 AM - 02:00 AM	0.8	333.0	NNW	0.7	325.0	NW	0.9	124.0	SE	-	-	-	-	-	-	-	-	-	-	-	-
02:00 AM - 03:00 AM	0.5	350.0	N	0.6	336.0	NNW	0.6	85.0	E	-	-	-	-	-	-	-	-	-	-	-	-
03:00 AM - 04:00 AM	0.8	334.0	NNW	0.3	24.0	NNE	0.4	34.0	NE	-	-	-	-	-	-	-	-	-	-	-	-
04:00 AM - 05:00 AM	0.9	325.0	NW	0.8	310.0	NW	0.4	2.0	N	-	-	-	-	-	-	-	-	-	-	-	-
05:00 AM - 06:00 AM	1.0	325.0	NW	0.2	-	-	0.4	341.0	NNW	-	-	-	-	-	-	-	-	-	-	-	-
06:00 AM - 07:00 AM	1.1	323.0	NW	0.6	125.0	SE	1.0	325.0	NW	-	-	-	-	-	-	-	-	-	-	-	-
07:00 AM - 08:00 AM	1.0	325.0	NW	0.8	335.0	NNW	1.2	318.0	NW	-	-	-	-	-	-	-	-	-	-	-	-
08:00 AM - 09:00 AM	0.4	27.0	NNE	1.1	316.0	NW	1.2	316.0	NW	-	-	-	-	-	-	-	-	-	-	-	-
09:00 AM - 10:00 AM	0.9	112.0	ESE	1.7	308.0	NW	0.4	56.0	NE	-	-	-	-	-	-	-	-	-	-	-	-

Reference Method : Cup Anemometer & Anodized Aluminium Vane Method

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Approved by

Sarayuth Jittranont
Assistant General Manager



Analysis / Test Report

Client : Glow SPP 3 Co., Ltd.

11, Map Ta Phut Industrial Estate, I-5 Road, Muang, Rayong Thailand 21150

P/O :

Project Name :

Project Location : Sea dredging

Lot ID : 22114262

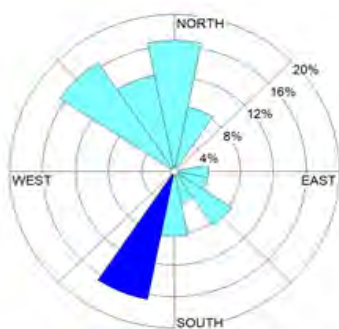
Date Received : Oct 07, 2022

Date Reported : Oct 17, 2022

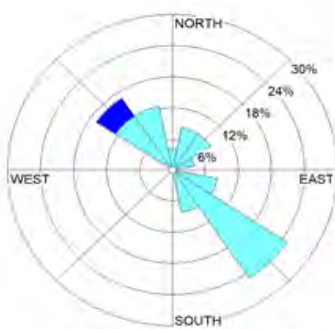
Report Number : 2435142-1

Page 2 of 2

Wind Rose



Date : Oct 03-04, 2022



Date : Oct 04-05, 2022



Date : Oct 05-06, 2022



Date : Oct 03-06, 2022

WS(m/s)	%
≥ 10.0	0.00
8.0-10.0	0.00
5.5-8.0	0.00
3.3-5.5	0.00
1.7-3.3	6.94
0.3-1.7	91.67
Calms	1.39

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Approved by

Sarayuth Jittrantont
Assistant General Manager



Analysis / Test Report

Client : Glow SPP 3 Co., Ltd.

11, Map Ta Phut Industrial Estate, I-5 Road, Muang, Rayong Thailand 21150

P/O :

Project Name :

Project Location : Sea dredging

Lot ID : 22114262

Date Received : Oct 07, 2022

Date Reported : Oct 17, 2022

Report Number : 2435142-1

Page 1 of 2

Sample Number 22114262-4 to 6
 Parameter Wind Speed / Wind Direction
 Location Map Ta Phut Port (North of Project) (GPS 47P 0731869, 1401636)
 Sampling Date Oct 03 - Oct 06, 2022
 Sampling by Satcha Phetsawaeng

Time	Oct 03 - Oct 04, 2022			Oct 04 - Oct 05, 2022			Oct 05 - Oct 06, 2022			-			-			-			-		
	WS (m/s)	WD (deg)		WS (m/s)	WD (deg)		WS (m/s)	WD (deg)		-	-		-	-		-	-		-	-	
11:00 AM - 12:00 PM	1.0	180.0	S	1.2	152.0	SSE	0.8	10.0	N	-	-	-	-	-	-	-	-	-	-	-	-
12:00 PM - 01:00 PM	0.9	185.0	S	1.3	154.0	SSE	1.2	145.0	SE	-	-	-	-	-	-	-	-	-	-	-	-
01:00 PM - 02:00 PM	1.5	178.0	S	0.6	125.0	SE	1.3	180.0	S	-	-	-	-	-	-	-	-	-	-	-	-
02:00 PM - 03:00 PM	1.6	200.0	SSW	0.9	126.0	SE	0.9	185.0	S	-	-	-	-	-	-	-	-	-	-	-	-
03:00 PM - 04:00 PM	1.4	204.0	SSW	0.9	130.0	SE	0.8	184.0	S	-	-	-	-	-	-	-	-	-	-	-	-
04:00 PM - 05:00 PM	1.3	206.0	SSW	1.3	135.0	SE	1.6	145.0	SE	-	-	-	-	-	-	-	-	-	-	-	-
05:00 PM - 06:00 PM	1.6	201.0	SSW	1.6	101.0	E	1.0	161.0	SSE	-	-	-	-	-	-	-	-	-	-	-	-
06:00 PM - 07:00 PM	1.1	154.0	SSE	1.4	101.0	E	1.4	156.0	SSE	-	-	-	-	-	-	-	-	-	-	-	-
07:00 PM - 08:00 PM	0.8	155.0	SSE	0.5	50.0	NE	1.2	160.0	SSE	-	-	-	-	-	-	-	-	-	-	-	-
08:00 PM - 09:00 PM	0.6	156.0	SSE	0.6	51.0	NE	1.3	165.0	SSE	-	-	-	-	-	-	-	-	-	-	-	-
09:00 PM - 10:00 PM	0.8	154.0	SSE	0.6	52.0	NE	0.8	166.0	SSE	-	-	-	-	-	-	-	-	-	-	-	-
10:00 PM - 11:00 PM	0.4	10.0	N	0.8	27.0	NNE	1.6	135.0	SE	-	-	-	-	-	-	-	-	-	-	-	-
11:00 PM - 12:00 AM	0.8	11.0	N	0.9	28.0	NNE	1.5	136.0	SE	-	-	-	-	-	-	-	-	-	-	-	-
12:00 AM - 01:00 AM	0.6	8.0	N	0.7	29.0	NNE	1.4	134.0	SE	-	-	-	-	-	-	-	-	-	-	-	-
01:00 AM - 02:00 AM	0.9	331.0	NNW	0.9	325.0	NW	1.2	136.0	SE	-	-	-	-	-	-	-	-	-	-	-	-
02:00 AM - 03:00 AM	0.7	332.0	NNW	1.6	326.0	NW	0.9	86.0	E	-	-	-	-	-	-	-	-	-	-	-	-
03:00 AM - 04:00 AM	1.1	334.0	NNW	1.4	324.0	NW	0.9	87.0	E	-	-	-	-	-	-	-	-	-	-	-	-
04:00 AM - 05:00 AM	1.2	326.0	NW	1.2	10.0	N	1.4	88.0	E	-	-	-	-	-	-	-	-	-	-	-	-
05:00 AM - 06:00 AM	0.8	327.0	NNW	1.2	1.0	N	1.6	345.0	NNW	-	-	-	-	-	-	-	-	-	-	-	-
06:00 AM - 07:00 AM	1.3	10.0	N	0.4	10.0	N	1.4	345.0	NNW	-	-	-	-	-	-	-	-	-	-	-	-
07:00 AM - 08:00 AM	1.2	1.0	N	0.6	335.0	NNW	1.2	347.0	NNW	-	-	-	-	-	-	-	-	-	-	-	-
08:00 AM - 09:00 AM	0.8	28.0	NNE	1.3	331.0	NNW	0.5	315.0	NW	-	-	-	-	-	-	-	-	-	-	-	-
09:00 AM - 10:00 AM	0.6	29.0	NNE	0.8	305.0	NW	0.8	316.0	NW	-	-	-	-	-	-	-	-	-	-	-	-
10:00 AM - 11:00 AM	1.3	150.0	SSF	0.6	306.0	NW	1.6	320.0	NW	-	-	-	-	-	-	-	-	-	-	-	-

Reference Method : Cup Anemometer & Anodized Aluminium Vane Method

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Approved by

Sarayuth Jittranont
 Assistant General Manager



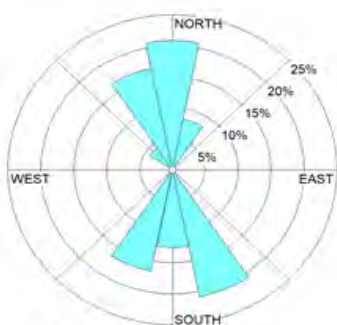
Analysis / Test Report

Client : Glow SPP 3 Co., Ltd.
 11, Map Ta Phut Industrial Estate, I-5 Road, Muang, Rayong Thailand 21150
 P/O :
 Project Name :
 Project Location : Sea dredging

Lot ID : 22114262
 Date Received : Oct 07, 2022
 Date Reported : Oct 17, 2022
 Report Number : 2435142-1

Page 2 of 2

Wind Rose



Date : Oct 03-04, 2022



Date : Oct 04-05, 2022



Date : Oct 05-06, 2022



Date : Oct 03-06, 2022

WS(m/s)	%
≥ 10.0	0.00
8.0-10.0	0.00
5.5-8.0	0.00
3.3-5.5	0.00
1.7-3.3	0.00
0.3-1.7	100.00
Calms	0.00

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Approved by

Sarayuth Jittrantont
 Assistant General Manager

ภาคผนวก ค-2

ระดับเสียงโดยทั่วไป



Analysis / Test Report

TESTING
No.0042

Client : Glow SPP 3 Co., Ltd.
11, Map Ta Phut Industrial Estate, I-5 Road, Muang, Rayong Thailand 21150

P/O :

Project Name :

Project Location : Sea dredging

Lot ID: 22114255

Date Received : Oct 06, 2022

Date Reported : Oct 08, 2022

Report Number: 2458745-1

Page 1 of 1

Sample Number 22114255-1
Parameter Noise (Leq 24 hrs.)
Location Thai Tank Farm (GPS 47P 0731944, 1401181)
Measurement Date Oct 03 - Oct 04, 2022
Measurement by Satcha Phetsawaeng
Sound Level meter Serial No. 1222716

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
11:00 AM - 12:00 PM	63.1	90.0	61.9
12:00 PM - 01:00 PM	62.9	77.9	62.2
01:00 PM - 02:00 PM	62.1	66.7	61.8
02:00 PM - 03:00 PM	61.8	69.9	60.8
03:00 PM - 04:00 PM	62.1	79.2	61.7
04:00 PM - 05:00 PM	62.3	70.9	61.9
05:00 PM - 06:00 PM	62.4	68.8	62.0
06:00 PM - 07:00 PM	61.6	69.8	60.5
07:00 PM - 08:00 PM	62.2	64.9	60.7
08:00 PM - 09:00 PM	64.0	71.4	62.4
09:00 PM - 10:00 PM	62.7	66.2	61.9
10:00 PM - 11:00 PM	63.4	71.6	62.8
11:00 PM - 12:00 AM	63.2	70.2	62.8
12:00 AM - 01:00 AM	63.1	68.2	62.7
01:00 AM - 02:00 AM	63.1	66.3	62.7
02:00 AM - 03:00 AM	62.9	71.0	62.5
03:00 AM - 04:00 AM	62.8	65.2	62.4
04:00 AM - 05:00 AM	63.0	67.8	62.6
05:00 AM - 06:00 AM	63.0	71.1	62.6
06:00 AM - 07:00 AM	62.8	76.6	62.3
07:00 AM - 08:00 AM	62.1	75.5	61.5
08:00 AM - 09:00 AM	61.8	73.0	61.4
09:00 AM - 10:00 AM	61.6	75.5	61.2
10:00 AM - 11:00 AM	61.2	68.5	60.8

Leq Average 24 hrs. (dB(A)) 62.6
Lmax (dB(A)) 90.0
L90 (dB(A)) 61.9
Ldn (dB(A)) 69.4
Standard (dB(A)) 70 115

Reference Method : ISO1996-1 and 1996-2

Standard : 1. ประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ ฉบับที่ 15 (พ.ศ. 2540) เรื่องกำหนดมาตรฐานระดับเสียงโดยทั่วไป
2. ประกาศกระทรวงอุตสาหกรรม เรื่องกำหนดค่าระดับเสียงการรบกวน และระดับเสียงที่เกิดจากการประกอบกิจการโรงงาน พ.ศ. 2548

Remark :

- The laboratory has been accepted as an accredited laboratory complying with the ISO/IEC 17025.

Technical Management

Thanita K.

Thanita Kulsuriwong
Scientist (4)

Approved by

Supot S.

Supot Salamteh
Section Head

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Analysis / Test Report

TESTING
No.0042

Client : Glow SPP 3 Co., Ltd.
11, Map Ta Phut Industrial Estate, I-5 Road, Muang, Rayong Thailand 21150

P/O :

Project Name :

Project Location : Sea dredging

Lot ID: 22114255

Date Received : Oct 06, 2022

Date Reported : Oct 08, 2022

Report Number: 2458746-1

Page 1 of 1

Sample Number 22114255-2
Parameter Noise (Leq 24 hrs.)
Location Thai Tank Farm (GPS 47P 0731944, 1401181)
Measurement Date Oct 04 - Oct 05, 2022
Measurement by Satcha Phetsawaeng
Sound Level meter Serial No. 1222716

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
11:00 AM - 12:00 PM	62.0	72.1	61.0
12:00 PM - 01:00 PM	61.8	71.4	61.3
01:00 PM - 02:00 PM	62.7	83.6	61.2
02:00 PM - 03:00 PM	61.5	67.1	61.0
03:00 PM - 04:00 PM	61.7	78.1	61.2
04:00 PM - 05:00 PM	61.8	78.8	61.3
05:00 PM - 06:00 PM	62.0	72.9	61.6
06:00 PM - 07:00 PM	62.0	72.3	61.6
07:00 PM - 08:00 PM	61.7	63.7	61.2
08:00 PM - 09:00 PM	61.8	67.1	61.4
09:00 PM - 10:00 PM	62.0	66.8	61.6
10:00 PM - 11:00 PM	61.6	67.2	61.2
11:00 PM - 12:00 AM	60.0	63.8	59.6
12:00 AM - 01:00 AM	60.9	72.3	59.8
01:00 AM - 02:00 AM	60.4	77.0	59.5
02:00 AM - 03:00 AM	59.8	73.4	59.5
03:00 AM - 04:00 AM	60.2	65.0	59.6
04:00 AM - 05:00 AM	60.8	67.6	60.0
05:00 AM - 06:00 AM	61.0	65.1	60.5
06:00 AM - 07:00 AM	60.4	74.2	59.9
07:00 AM - 08:00 AM	59.7	63.6	59.3
08:00 AM - 09:00 AM	59.4	67.5	58.9
09:00 AM - 10:00 AM	60.7	80.4	59.4
10:00 AM - 11:00 AM	61.2	85.3	60.6

Leq Average 24 hrs. (dB(A)) 61.2
Lmax (dB(A)) 85.3
L90 (dB(A)) 60.6
Ldn (dB(A)) 67.2
Standard (dB(A)) 70 115

Reference Method : ISO1996-1 and 1996-2

Standard : 1. ประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ ฉบับที่ 15 (พ.ศ. 2540) เรื่องกำหนดมาตรฐานระดับเสียงโดยทั่วไป
2. ประกาศกระทรวงอุตสาหกรรม เรื่องกำหนดค่าระดับเสียงการรบกวน และระดับเสียงที่เกิดจากการประกอบกิจการโรงงาน พ.ศ. 2548

Remark :

- The laboratory has been accepted as an accredited laboratory complying with the ISO/IEC 17025.

Technical Management

Thanita K.

Thanita Kulsuriwong
Scientist (4)

Approved by

Supot S.

Supot Salamteh
Section Head

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Analysis / Test Report

TESTING
No.0042

Client : Glow SPP 3 Co., Ltd.
11, Map Ta Phut Industrial Estate, I-5 Road, Muang, Rayong Thailand 21150

P/O :

Project Name :

Project Location : Sea dredging

Lot ID: 22114255

Date Received : Oct 06, 2022

Date Reported : Oct 08, 2022

Report Number: 2458747-1

Page 1 of 1

Sample Number 22114255-3
Parameter Noise (Leq 24 hrs.)
Location Thai Tank Farm (GPS 47P 0731944, 1401181)
Measurement Date Oct 05 - Oct 06, 2022
Measurement by Satcha Phetsawaeng
Sound Level meter Serial No. 1222716

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
11:00 AM - 12:00 PM	61.5	80.3	60.6
12:00 PM - 01:00 PM	61.2	80.3	60.6
01:00 PM - 02:00 PM	60.9	70.5	60.4
02:00 PM - 03:00 PM	61.4	83.2	60.4
03:00 PM - 04:00 PM	62.3	70.2	61.9
04:00 PM - 05:00 PM	62.5	78.9	62.0
05:00 PM - 06:00 PM	62.7	70.0	62.4
06:00 PM - 07:00 PM	62.8	64.5	62.4
07:00 PM - 08:00 PM	62.8	65.2	62.5
08:00 PM - 09:00 PM	62.9	65.4	62.5
09:00 PM - 10:00 PM	62.9	82.1	62.5
10:00 PM - 11:00 PM	63.1	76.0	61.7
11:00 PM - 12:00 AM	63.7	70.0	63.2
12:00 AM - 01:00 AM	63.8	70.5	63.3
01:00 AM - 02:00 AM	63.6	67.4	63.1
02:00 AM - 03:00 AM	63.4	66.6	62.6
03:00 AM - 04:00 AM	61.4	64.1	61.1
04:00 AM - 05:00 AM	61.9	68.2	61.1
05:00 AM - 06:00 AM	61.4	75.6	61.1
06:00 AM - 07:00 AM	63.2	74.3	62.5
07:00 AM - 08:00 AM	62.8	65.6	62.3
08:00 AM - 09:00 AM	62.4	78.5	62.0
09:00 AM - 10:00 AM	61.4	80.2	60.5
10:00 AM - 11:00 AM	61.1	80.2	60.5

Leq Average 24 hrs. (dB(A)) 62.5
Lmax (dB(A)) 83.2
L90 (dB(A)) 62.0
Ldn (dB(A)) 69.2
Standard (dB(A)) 70 115

Reference Method : ISO1996-1 and 1996-2

Standard : 1. ประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ ฉบับที่ 15 (พ.ศ. 2540) เรื่องกำหนดมาตรฐานระดับเสียงโดยทั่วไป
2. ประกาศกระทรวงอุตสาหกรรม เรื่องกำหนดค่าระดับเสียงการรบกวน และระดับเสียงที่เกิดจากการประกอบกิจการโรงงาน พ.ศ. 2548

Remark :

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Technical Management

Thanita K.

Thanita Kulsuriwong
Scientist (4)

Approved by

Suppt S.

Supot Salamteh
Section Head

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Analysis / Test Report

TESTING
No.0042

Client : Glow SPP 3 Co., Ltd.
11, Map Ta Phut Industrial Estate, I-5 Road, Muang, Rayong Thailand 21150

P/O :

Project Name :

Project Location : Sea dredging

Lot ID: 22114255

Date Received : Oct 06, 2022

Date Reported : Oct 08, 2022

Report Number: 2458748-1

Page 1 of 1

Sample Number 22114255-4
Parameter Noise (Leq 24 hrs.)
Location Map Ta Phut Port (North of Project) (GPS 47P 0731902, 1401609)
Measurement Date Oct 03 - Oct 04, 2022
Measurement by Satcha Phetsawaeng
Sound Level meter Serial No. 1122607

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
12:00 PM - 01:00 PM	57.3	87.5	55.0
01:00 PM - 02:00 PM	55.5	72.0	54.7
02:00 PM - 03:00 PM	56.3	75.4	54.9
03:00 PM - 04:00 PM	55.9	70.9	55.0
04:00 PM - 05:00 PM	55.9	78.2	54.9
05:00 PM - 06:00 PM	55.6	66.2	54.8
06:00 PM - 07:00 PM	55.2	69.0	52.6
07:00 PM - 08:00 PM	55.1	63.2	52.6
08:00 PM - 09:00 PM	58.5	66.9	56.3
09:00 PM - 10:00 PM	57.7	66.5	56.6
10:00 PM - 11:00 PM	56.4	62.6	55.3
11:00 PM - 12:00 AM	54.8	64.0	53.6
12:00 AM - 01:00 AM	53.6	67.1	52.9
01:00 AM - 02:00 AM	53.7	62.3	53.0
02:00 AM - 03:00 AM	54.4	63.5	53.6
03:00 AM - 04:00 AM	55.3	73.3	53.6
04:00 AM - 05:00 AM	56.1	71.3	53.9
05:00 AM - 06:00 AM	55.8	69.5	54.5
06:00 AM - 07:00 AM	55.9	66.8	54.9
07:00 AM - 08:00 AM	58.3	76.9	55.7
08:00 AM - 09:00 AM	56.2	73.1	55.0
09:00 AM - 10:00 AM	56.0	75.7	54.6
10:00 AM - 11:00 AM	59.3	82.7	54.3
11:00 AM - 12:00 PM	54.9	68.9	54.1

Leq Average 24 hrs. (dB(A)) 56.2
Lmax (dB(A)) 87.5
L90 (dB(A)) 54.6
Ldn (dB(A)) 61.9
Standard (dB(A)) 70 115

Reference Method : ISO1996-1 and 1996-2

Standard : 1. ประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ ฉบับที่ 15 (พ.ศ. 2540) เรื่องกำหนดมาตรฐานระดับเสียงโดยทั่วไป
2. ประกาศกระทรวงอุตสาหกรรม เรื่องกำหนดค่าระดับเสียงการรบกวน และระดับเสียงที่เกิดจากการประกอบกิจการโรงงาน พ.ศ. 2548

Remark :

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Technical Management

Thanita K.

Thanita Kulsuriwong
Scientist (4)

Approved by

Supot S.

Supot Salamteh
Section Head

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Analysis / Test Report

TESTING
No.0042

Client : Glow SPP 3 Co., Ltd.
11, Map Ta Phut Industrial Estate, I-5 Road, Muang, Rayong Thailand 21150

P/O :

Project Name :

Project Location : Sea dredging

Lot ID: 22114255

Date Received : Oct 06, 2022

Date Reported : Oct 08, 2022

Report Number: 2458749-1

Page 1 of 1

Sample Number 22114255-5
Parameter Noise (Leq 24 hrs.)
Location Map Ta Phut Port (North of Project) (GPS 47P 0731902, 1401609)
Measurement Date Oct 04 - Oct 05, 2022
Measurement by Satcha Phetsawaeng
Sound Level meter Serial No. 1122607

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
12:00 PM - 01:00 PM	55.3	68.8	54.3
01:00 PM - 02:00 PM	54.9	64.8	54.1
02:00 PM - 03:00 PM	55.2	70.3	54.3
03:00 PM - 04:00 PM	55.4	66.6	54.5
04:00 PM - 05:00 PM	54.8	67.2	54.0
05:00 PM - 06:00 PM	55.0	69.6	54.1
06:00 PM - 07:00 PM	55.2	74.2	54.2
07:00 PM - 08:00 PM	55.3	69.5	52.9
08:00 PM - 09:00 PM	55.5	72.6	54.6
09:00 PM - 10:00 PM	55.5	61.3	54.8
10:00 PM - 11:00 PM	55.7	65.6	54.9
11:00 PM - 12:00 AM	53.8	62.5	52.5
12:00 AM - 01:00 AM	54.1	60.2	52.2
01:00 AM - 02:00 AM	54.3	61.0	52.4
02:00 AM - 03:00 AM	53.3	70.3	51.8
03:00 AM - 04:00 AM	56.1	72.3	53.2
04:00 AM - 05:00 AM	57.0	72.6	54.3
05:00 AM - 06:00 AM	56.3	70.9	54.4
06:00 AM - 07:00 AM	55.2	71.7	53.6
07:00 AM - 08:00 AM	55.9	73.1	53.8
08:00 AM - 09:00 AM	55.3	72.1	53.9
09:00 AM - 10:00 AM	56.5	71.0	54.5
10:00 AM - 11:00 AM	54.9	69.8	53.5
11:00 AM - 12:00 PM	55.6	73.5	52.6

Leq Average 24 hrs. (dB(A)) 55.3
Lmax (dB(A)) 74.2
L90 (dB(A)) 54.0
Ldn (dB(A)) 61.7
Standard (dB(A)) 70 115

Reference Method : ISO1996-1 and 1996-2

Standard : 1. ประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ ฉบับที่ 15 (พ.ศ. 2540) เรื่องกำหนดมาตรฐานระดับเสียงโดยทั่วไป
2. ประกาศกระทรวงอุตสาหกรรม เรื่องกำหนดค่าระดับเสียงการรบกวน และระดับเสียงที่เกิดจากการประกอบกิจการโรงงาน พ.ศ. 2548

Remark :

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Technical Management

Thanita K.

Thanita Kulsuriwong
Scientist (4)

Approved by

Supot S.

Supot Salamteh
Section Head

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Analysis / Test Report

TESTING
No.0042

Client : Glow SPP 3 Co., Ltd.
11, Map Ta Phut Industrial Estate, I-5 Road, Muang, Rayong Thailand 21150

P/O :

Project Name :

Project Location : Sea dredging

Lot ID: 22114255

Date Received : Oct 06, 2022

Date Reported : Oct 08, 2022

Report Number: 2458750-1

Page 1 of 1

Sample Number 22114255-6
Parameter Noise (Leq 24 hrs.)
Location Map Ta Phut Port (North of Project) (GPS 47P 0731902, 1401609)
Measurement Date Oct 05 - Oct 06, 2022
Measurement by Satcha Phetsawaeng
Sound Level meter Serial No. 1122607

Time	Leq (dB(A))	Lmax (dB(A))	L90 (dB(A))
12:00 PM - 01:00 PM	53.9	71.6	52.8
01:00 PM - 02:00 PM	59.0	78.8	52.5
02:00 PM - 03:00 PM	54.6	68.8	52.4
03:00 PM - 04:00 PM	55.2	76.0	54.2
04:00 PM - 05:00 PM	55.2	66.8	54.4
05:00 PM - 06:00 PM	55.4	72.1	54.6
06:00 PM - 07:00 PM	55.3	66.5	54.5
07:00 PM - 08:00 PM	55.2	68.9	54.5
08:00 PM - 09:00 PM	55.1	64.8	54.5
09:00 PM - 10:00 PM	55.6	70.2	54.7
10:00 PM - 11:00 PM	55.6	66.7	53.1
11:00 PM - 12:00 AM	55.9	64.7	55.3
12:00 AM - 01:00 AM	55.8	59.5	55.2
01:00 AM - 02:00 AM	55.7	68.1	55.1
02:00 AM - 03:00 AM	55.9	68.7	55.3
03:00 AM - 04:00 AM	54.0	66.3	52.5
04:00 AM - 05:00 AM	56.2	69.7	53.1
05:00 AM - 06:00 AM	54.3	68.3	53.0
06:00 AM - 07:00 AM	56.4	68.7	54.3
07:00 AM - 08:00 AM	57.2	78.0	55.8
08:00 AM - 09:00 AM	55.7	75.2	54.5
09:00 AM - 10:00 AM	55.6	71.1	54.7
10:00 AM - 11:00 AM	55.1	75.9	54.1
11:00 AM - 12:00 PM	55.1	66.7	54.3

Leq Average 24 hrs. (dB(A)) 55.7
Lmax (dB(A)) 78.8
L90 (dB(A)) 54.4
Ldn (dB(A)) 62.0
Standard (dB(A)) 70

Reference Method : ISO1996-1 and 1996-2

Standard : 1. ประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ ฉบับที่ 15 (พ.ศ. 2540) เรื่องกำหนดมาตรฐานระดับเสียงโดยทั่วไป
2. ประกาศกระทรวงอุตสาหกรรม เรื่องกำหนดค่าระดับเสียงการรบกวน และระดับเสียงที่เกิดจากการประกอบกิจการโรงงาน พ.ศ. 2548

Remark :

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Technical Management

Thanita K.

Thanita Kulsuriwong
Scientist (4)

Approved by

Supot S.

Supot Salamteh
Section Head

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ภาคผนวก ค-3

คุณภาพน้ำทะเล



Analysis / Test Report

Client : Glow SPP 3 Co., Ltd.
11, Map Ta Phut Industrial Estate, I-5 Road, Muang, Rayong Thailand 21150
P/O : GLOW-OM-22-103
Project Name :
Project Location : Sea dredging

Lot ID: 22114194

Date Received : Oct 19, 2022
Date Reported : Nov 18, 2022
Report Number : 2495597-1

Page 1 of 2

Sample Number 22114194-1
Sampled Date Oct 19, 2022 11:13 AM
Sample Description Sea Water
Location พื้นที่ทะเลใกล้บริเวณท่าเทียบเรือ กนอ.
Date Analysis Commenced Oct 19, 2022
Condition of Sample Contained in two glass vials, one BOD bottle, one amber glass bottle and eight plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Metals Testing							
Cadmium	ug/L	0.90	3.00	Not Detected	≤5	Based on APHA (2017), 3125	Bangkok
Lead	ug/L	1.00	3.00	Not Detected	≤8.5	Based on APHA (2017), 3125	Bangkok
Mercury	ug/L	0.003	0.05	<0.05	≤0.1	Based on US EPA, Method 1631 Revision E	Bangkok
Zinc	ug/L	1.00	3.00	9.60	≤50	Based on APHA (2017), 3125	Bangkok
Water Testing							
BOD (5 days at 20 Degree C)	mg/L	-	2	3	No Standard	APHA (2017), 5210 B	Rayong
COD	mg/L	-	40	61	No Standard	APHA (2017), 5220 C	Rayong
Conductivity at 25 Degree C	micromhos/cm	-	0.5	47840	No Standard	Based on APHA (2017), 2510 B	Rayong
Cyanide as CN	mg/L	0.001	0.005	<0.005	≤0.007	Based on APHA (2017), 4500-CN(C), (E)	Rayong
Depth	m	-	-	16.0	No Standard	Water Level Meter	Bangkok
Dissolved Oxygen	mg/L	-	0.1	5.6	>4	Based on APHA (2017), 4500-O(C)	Rayong
Oil & Grease	mg/L	-	3	<3	No Standard	Based on APHA (2017), 5520 B	Rayong
pH at 25 degree C	-	-	-	8.2	7.0-8.5	Based on APHA (2017), 4500-H (B)	Rayong
Phenol	mg/L	0.0005	0.001	Not Detected	≤0.03	APHA (2017), 5530 D	Rayong
Salinity	ppt	-	0.1	28.9	Change from lower salinity not more than 10%	Based on APHA (2017), 2520 B	Rayong
Sulfide as H ₂ S	mg/L	-	0.01	0.01	≤0.01	Based on APHA (2017), 4500-S ₂ (D)	Bangkok
Temperature	Degree C	-	-	30.0	Change from natural condition not more than 2 degree C	Based on APHA (2017), 2550 B	Rayong
Total Dissolved Solids Dried at 180 degree C	mg/L	-	5	33950	No Standard	APHA (2017), 2540 C	Rayong

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Approved by

Narin Saiseng
Supervisor



Analysis / Test Report

Client : Glow SPP 3 Co., Ltd.
11, Map Ta Phut Industrial Estate, I-5 Road, Muang, Rayong Thailand 21150

P/O : GLOW-OM-22-103

Project Name :

Project Location: Sea dredging

Lot ID: 22114194

Date Received : Oct 19, 2022

Date Reported : Nov 18, 2022

Report Number : 2495597-1

Page 2 of 2

Sample Number 22114194-1
Sampled Date Oct 19, 2022 11:13 AM
Sample Description Sea Water
Location พื้นที่ทะเลใกล้บริเวณท่าเทียบเรือ กนอ.
Date Analysis Commenced Oct 19, 2022
Condition of Sample Contained in two glass vials, one BOD bottle, one amber glass bottle and eight plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Water Testing							
Total Solids Dried at 103-105 degree C	mg/L	-	5	35600	No Standard	APHA (2017), 2540 B	Rayong
Total Suspended Solids Dried at 103-105 degree C	mg/L	-	2	3	No Standard	APHA (2017), 2540 D	Rayong
Transparency	m	-	-	1.0	Change from Natural condition not more than 10% of the lowest transparency	NIOSH (1994)	Rayong
Turbidity	NTU	-	0.1	3.4	No Standard	Based on APHA (2017), 2130 B	Rayong

Guideline : Notification of the National Environmental Board, B.E.2564 : Coastal Water Quality Standard (Class 5)

Sampled By : Paramet Sattayakun

Remark :

- LOD : Limit of Detection
- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)

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Approved by

Narin Saiseng
Supervisor



Analysis / Test Report

Client : Glow SPP 3 Co., Ltd.
11, Map Ta Phut Industrial Estate, I-5 Road, Muang, Rayong Thailand 21150
P/O : GLOW-OM-22-103
Project Name :
Project Location : Sea dredging

Lot ID: 22114194

Date Received : Oct 19, 2022
Date Reported : Nov 18, 2022
Report Number : 2495598-1

Page 1 of 2

Sample Number 22114194-2
Sampled Date Oct 19, 2022 10:52 AM
Sample Description Sea Water
Location ทะเลใกล้บริเวณ Liquid Tank Farm
Date Analysis Commenced Oct 19, 2022
Condition of Sample Contained in two glass vials, one BOD bottle, one amber glass bottle and eight plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Metals Testing							
Cadmium	ug/L	0.90	3.00	Not Detected	≤5	Based on APHA (2017), 3125	Bangkok
Lead	ug/L	1.00	3.00	Not Detected	≤8.5	Based on APHA (2017), 3125	Bangkok
Mercury	ug/L	0.003	0.05	Not Detected	≤0.1	Based on US EPA, Method 1631 Revision E	Bangkok
Zinc	ug/L	1.00	3.00	4.27	≤50	Based on APHA (2017), 3125	Bangkok
Water Testing							
BOD (5 days at 20 Degree C)	mg/L	-	2	6	No Standard	APHA (2017), 5210 B	Rayong
COD	mg/L	-	-	71	No Standard	APHA (2017), 5220 C	Rayong
Conductivity at 25 Degree C	micromhos/cm	-	0.5	47920	No Standard	Based on APHA (2017), 2510 B	Rayong
Cyanide as CN	mg/L	0.001	0.005	Not Detected	≤0.007	Based on APHA (2017), 4500-CN(C), (E)	Rayong
Depth	m	-	-	16.2	No Standard	Water Level Meter	Bangkok
Dissolved Oxygen	mg/L	-	0.1	5.0	>4	Based on APHA (2017), 4500-O(C)	Rayong
Oil & Grease	mg/L	-	3	<3	No Standard	Based on APHA (2017), 5520 B	Rayong
pH at 25 degree C	-	-	-	8.2	7.0-8.5	Based on APHA (2017), 4500-H (B)	Rayong
Phenol	mg/L	0.0005	0.001	Not Detected	≤0.03	APHA (2017), 5530 D	Rayong
Salinity	ppt	-	0.1	29.0	Change from lower salinity not more than 10%	Based on APHA (2017), 2520 B	Rayong
Sulfide as H ₂ S	mg/L	-	0.01	0.01	≤0.01	Based on APHA (2017), 4500-S ₂ (D)	Bangkok
Temperature	Degree C	-	-	30.1	Change from natural condition not more than 2 degree C	Based on APHA (2017), 2550 B	Rayong
Total Dissolved Solids Dried at 180 degree C	mg/L	-	5	33650	No Standard	APHA (2017), 2540 C	Rayong

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Approved by

Narin Saiseng
Supervisor



Analysis / Test Report

Client : Glow SPP 3 Co., Ltd.
11, Map Ta Phut Industrial Estate, I-5 Road, Muang, Rayong Thailand 21150

P/O : GLOW-OM-22-103

Project Name :

Project Location: Sea dredging

Lot ID: 22114194

Date Received : Oct 19, 2022

Date Reported : Nov 18, 2022

Report Number : 2495598-1

Page 2 of 2

Sample Number	22114194-2						
Sampled Date	Oct 19, 2022 10:52 AM						
Sample Description	Sea Water						
Location	ทะเลใกล้บริเวณ Liquid Tank Farm						
Date Analysis Commenced	Oct 19, 2022						
Condition of Sample	Contained in two glass vials, one BOD bottle, one amber glass bottle and eight plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)						

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Water Testing							
Total Solids Dried at 103-105 degree C	mg/L	-	5	35500	No Standard	APHA (2017), 2540 B	Rayong
Total Suspended Solids Dried at 103-105 degree C	mg/L	-	2	3	No Standard	APHA (2017), 2540 D	Rayong
Transparency	m	-	-	1.3	Change from Natural condition not more than 10% of the lowest transparency	NIOSH (1994)	Rayong
Turbidity	NTU	-	0.1	1.5	No Standard	Based on APHA (2017), 2130 B	Rayong

Guideline : Notification of the National Environmental Board, B.E.2564 : Coastal Water Quality Standard (Class 5)

Sampled By : Paramet Sattayakun

Remark :

- LOD : Limit of Detection
- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)

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Narin Saiseng
Supervisor



Analysis / Test Report

Client : Glow SPP 3 Co., Ltd.
11, Map Ta Phut Industrial Estate, I-5 Road, Muang, Rayong Thailand 21150
P/O : GLOW-OM-22-103
Project Name :
Project Location : Sea dredging

Lot ID: 22114194

Date Received : Oct 19, 2022
Date Reported : Nov 18, 2022
Report Number : 2495599-1

Page 1 of 2

Sample Number 22114194-3
Sampled Date Oct 19, 2022 10:31 AM
Sample Description Sea Water
Location Port groove
Date Analysis Commenced Oct 19, 2022
Condition of Sample Contained in two glass vials, one BOD bottle, one amber glass bottle and eight plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Metals Testing							
Cadmium	ug/L	0.90	3.00	Not Detected	≤5	Based on APHA (2017), 3125	Bangkok
Lead	ug/L	1.00	3.00	Not Detected	≤8.5	Based on APHA (2017), 3125	Bangkok
Mercury	ug/L	0.003	0.05	Not Detected	≤0.1	Based on US EPA, Method 1631 Revision E	Bangkok
Zinc	ug/L	1.00	3.00	6.09	≤50	Based on APHA (2017), 3125	Bangkok
Water Testing							
BOD (5 days at 20 Degree C)	mg/L	-	2	3	No Standard	APHA (2017), 5210 B	Rayong
COD	mg/L	-	-	41	No Standard	APHA (2017), 5220 C	Rayong
Conductivity at 25 Degree C	micromhos/cm	-	0.5	48060	No Standard	Based on APHA (2017), 2510 B	Rayong
Cyanide as CN	mg/L	0.001	0.005	Not Detected	≤0.007	Based on APHA (2017), 4500-CN(C), (E)	Rayong
Depth	m	-	-	11.1	No Standard	Water Level Meter	Bangkok
Dissolved Oxygen	mg/L	-	0.1	5.4	>4	Based on APHA (2017), 4500-O(C)	Rayong
Oil & Grease	mg/L	-	3	<3	No Standard	Based on APHA (2017), 5520 B	Rayong
pH at 25 degree C	-	-	-	8.2	7.0-8.5	Based on APHA (2017), 4500-H (B)	Rayong
Phenol	mg/L	0.0005	0.001	Not Detected	≤0.03	APHA (2017), 5530 D	Rayong
Salinity	ppt	-	0.1	29.0	Change from lower salinity not more than 10%	Based on APHA (2017), 2520 B	Rayong
Sulfide as H ₂ S	mg/L	-	0.01	<0.01	≤0.01	Based on APHA (2017), 4500-S ₂ (D)	Bangkok
Temperature	Degree C	-	-	30.4	Change from natural condition not more than 2 degree C	Based on APHA (2017), 2550 B	Rayong
Total Dissolved Solids Dried at 180 degree C	mg/L	-	5	33300	No Standard	APHA (2017), 2540 C	Rayong

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Narin Saiseng
Supervisor



Analysis / Test Report

Client : Glow SPP 3 Co., Ltd.
11, Map Ta Phut Industrial Estate, I-5 Road, Muang, Rayong Thailand 21150

P/O : GLOW-OM-22-103

Project Name :

Project Location: Sea dredging

Lot ID: 22114194

Date Received : Oct 19, 2022

Date Reported : Nov 18, 2022

Report Number : 2495599-1

Page 2 of 2

Sample Number	22114194-3
Sampled Date	Oct 19, 2022 10:31 AM
Sample Description	Sea Water
Location	Port groove
Date Analysis Commenced	Oct 19, 2022
Condition of Sample	Contained in two glass vials, one BOD bottle, one amber glass bottle and eight plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Water Testing							
Total Solids Dried at 103-105 degree C	mg/L	-	5	35000	No Standard	APHA (2017), 2540 B	Rayong
Total Suspended Solids Dried at 103-105 degree C	mg/L	-	2	2	No Standard	APHA (2017), 2540 D	Rayong
Transparency	m	-	-	1.6	Change from Natural condition not more than 10% of the lowest transparency	NIOSH (1994)	Rayong
Turbidity	NTU	-	0.1	1.7	No Standard	Based on APHA (2017), 2130 B	Rayong

Guideline : Notification of the National Environmental Board, B.E.2564 : Coastal Water Quality Standard (Class 5)

Sampled By : Paramet Sattayakun

Remark :

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Supervisor



Analysis / Test Report

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11, Map Ta Phut Industrial Estate, I-5 Road, Muang, Rayong Thailand 21150
P/O : GLOW-OM-22-103
Project Name :
Project Location : Sea dredging

Lot ID: 22114194

Date Received : Oct 19, 2022
Date Reported : Nov 18, 2022
Report Number : 2495600-1

Page 1 of 2

Sample Number 22114194-4
Sampled Date Oct 19, 2022 9:47 AM
Sample Description Sea Water
Location พื้นที่ทะเลที่ตักดินของเกาะสะเก็ด
Date Analysis Commenced Oct 19, 2022
Condition of Sample Contained in two glass vials, one BOD bottle, one amber glass bottle and eight plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Metals Testing							
Cadmium	ug/L	0.90	3.00	Not Detected	≤5	Based on APHA (2017), 3125	Bangkok
Lead	ug/L	1.00	3.00	Not Detected	≤8.5	Based on APHA (2017), 3125	Bangkok
Mercury	ug/L	0.003	0.05	<0.05	≤0.1	Based on US EPA, Method 1631 Revision E	Bangkok
Zinc	ug/L	1.00	3.00	4.82	≤50	Based on APHA (2017), 3125	Bangkok
Water Testing							
BOD (5 days at 20 Degree C)	mg/L	-	2	<2	No Standard	APHA (2017), 5210 B	Rayong
COD	mg/L	-	-	59	No Standard	APHA (2017), 5220 C	Rayong
Conductivity at 25 Degree C	micromhos/cm	-	0.5	46880	No Standard	Based on APHA (2017), 2510 B	Rayong
Cyanide as CN	mg/L	0.001	0.005	Not Detected	≤0.007	Based on APHA (2017), 4500-CN(C), (E)	Rayong
Depth	m	-	-	2.90	No Standard	Water Level Meter	Bangkok
Dissolved Oxygen	mg/L	-	0.1	7.2	>4	Based on APHA (2017), 4500-O(C)	Rayong
Oil & Grease	mg/L	-	3	<3	No Standard	Based on APHA (2017), 5520 B	Rayong
pH at 25 degree C	-	-	-	8.2	7.0-8.5	Based on APHA (2017), 4500-H (B)	Rayong
Phenol	mg/L	0.0005	0.001	Not Detected	≤0.03	APHA (2017), 5530 D	Rayong
Salinity	ppt	-	0.1	28.6	Change from lower salinity not more than 10%	Based on APHA (2017), 2520 B	Rayong
Sulfide as H ₂ S	mg/L	-	0.01	<0.01	≤0.01	Based on APHA (2017), 4500-S ₂ (D)	Bangkok
Temperature	Degree C	-	-	30.6	Change from natural condition not more than 2 degree C	Based on APHA (2017), 2550 B	Rayong
Total Dissolved Solids Dried at 180 degree C	mg/L	-	5	33200	No Standard	APHA (2017), 2540 C	Rayong

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Narin Saiseng
Supervisor



Analysis / Test Report

Client : Glow SPP 3 Co., Ltd.
11, Map Ta Phut Industrial Estate, I-5 Road, Muang, Rayong Thailand 21150

P/O : GLOW-OM-22-103

Project Name :

Project Location: Sea dredging

Lot ID: 22114194

Date Received : Oct 19, 2022

Date Reported : Nov 18, 2022

Report Number : 2495600-1

Page 2 of 2

Sample Number	22114194-4						
Sampled Date	Oct 19, 2022 9:47 AM						
Sample Description	Sea Water						
Location	พื้นที่ทะเลที่ตักน้ำของเกาะสะเก็ด						
Date Analysis Commenced	Oct 19, 2022						
Condition of Sample	Contained in two glass vials, one BOD bottle, one amber glass bottle and eight plastic bottles, sample containers comply to pretreatment - preservation standards (APHA, USEPA)						

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Water Testing							
Total Solids Dried at 103-105 degree C	mg/L	-	5	34750	No Standard	APHA (2017), 2540 B	Rayong
Total Suspended Solids Dried at 103-105 degree C	mg/L	-	2	4	No Standard	APHA (2017), 2540 D	Rayong
Transparency	m	-	-	0.9	Change from Natural condition not more than 10% of the lowest transparency	NIOSH (1994)	Rayong
Turbidity	NTU	-	0.1	3.0	No Standard	Based on APHA (2017), 2130 B	Rayong

Guideline : Notification of the National Environmental Board, B.E.2564 : Coastal Water Quality Standard (Class 5)

Sampled By : Paramet Sattayakun

Remark :

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Supervisor



Analysis / Test Report

Client : Glow SPP 3 Co., Ltd.
11, Map Ta Phut Industrial Estate, I-5 Road, Muang, Rayong Thailand 21150

P/O :

Project Name :

Project Location: Sea dredging

TESTING

No.0009

Lot ID: 22135760

Date Received : Nov 09, 2022

Date Reported : Nov 17, 2022

Report Number : 2485542-1

Page 1 of 4

Sample Number 22135760-1
Sampled Date Nov 09, 2022 10:20 AM
Sample Description Sea Water
Location พื้นที่ทะเลใกล้บริเวณท่าเทียบเรือ กนอ.
Date Analysis Commenced Nov 10, 2022
Condition of Sample Contained in one plastic bottle, sample containers comply to pretreatment - preservation standards (APHA, USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Microbiological Testing							
Fecal Coliform	CFU/100mL	-	-	6	≤100	APHA (2017), 9222 D	Bangkok
Total Coliform	MPN/100mL	-	-	7.8	≤1000	APHA (2017), 9221 B	Bangkok

Guideline : Notification of the National Environmental Board, B.E.2564 : Coastal Water Quality Standard (Class 5)

Sampled By : Wanlop Hunchainaow

Remark :

- LOD : Limit of Detection
- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)
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- The laboratory has been accepted as an accredited laboratory complying with the ISO/IEC 17025.

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Sithichok T.

Sithichok Thongnguen
Scientist (3)

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Analysis / Test Report

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11, Map Ta Phut Industrial Estate, I-5 Road, Muang, Rayong Thailand 21150

P/O :

Project Name :

Project Location: Sea dredging

TESTING

No.0009

Lot ID: 22135760

Date Received : Nov 09, 2022

Date Reported : Nov 17, 2022

Report Number : 2485542-1

Page 2 of 4

Sample Number	22135760-2
Sampled Date	Nov 09, 2022 10:30 AM
Sample Description	Sea Water
Location	ทะเลใกล้บริเวณ Liquid Tank Farm
Date Analysis Commenced	Nov 10, 2022
Condition of Sample	Contained in one plastic bottle, sample containers comply to pretreatment - preservation standards (APHA, USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Microbiological Testing							
Fecal Coliform	CFU/100mL	-	-	<1	≤100	APHA (2017), 9222 D	Bangkok
Total Coliform	MPN/100mL	-	-	2.0	≤1000	APHA (2017), 9221 B	Bangkok

Guideline : Notification of the National Environmental Board, B.E.2564 : Coastal Water Quality Standard (Class 5)

Sampled By : Wanlop Hunchainaow

Remark :

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Sithichok T.

Sithichok Thongnguen
Scientist (3)



Analysis / Test Report

Client : Glow SPP 3 Co., Ltd.
11, Map Ta Phut Industrial Estate, I-5 Road, Muang, Rayong Thailand 21150

P/O :

Project Name :

Project Location: Sea dredging

TESTING

No.0009

Lot ID: 22135760

Date Received : Nov 09, 2022

Date Reported : Nov 17, 2022

Report Number : 2485542-1

Page 3 of 4

Sample Number	22135760-3
Sampled Date	Nov 09, 2022 10:35 AM
Sample Description	Sea Water
Location	Port groove
Date Analysis Commenced	Nov 10, 2022
Condition of Sample	Contained in one plastic bottle, sample containers comply to pretreatment - preservation standards (APHA, USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Microbiological Testing							
Fecal Coliform	CFU/100mL	-	-	<1	≤100	APHA (2017), 9222 D	Bangkok
Total Coliform	MPN/100mL	-	-	<1.8	≤1000	APHA (2017), 9221 B	Bangkok

Guideline : Notification of the National Environmental Board, B.E.2564 : Coastal Water Quality Standard (Class 5)

Sampled By : Wanlop Hunchainaow

Remark :

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P/O :

Project Name :

Project Location: Sea dredging

TESTING

No.0009

Lot ID: 22135760

Date Received : Nov 09, 2022

Date Reported : Nov 17, 2022

Report Number : 2485542-1

Page 4 of 4

Sample Number	22135760-4
Sampled Date	Nov 09, 2022 11:55 AM
Sample Description	Sea Water
Location	พื้นที่ทะเลที่ติดตั้งวันตกของเกาะสะเก็ด
Date Analysis Commenced	Nov 10, 2022
Condition of Sample	Contained in one plastic bottle, sample containers comply to pretreatment - preservation standards (APHA, USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Microbiological Testing							
Fecal Coliform	CFU/100mL	-	-	4	≤100	APHA (2017), 9222 D	Bangkok
Total Coliform	MPN/100mL	-	-	17.0	≤1000	APHA (2017), 9221 B	Bangkok

Guideline : Notification of the National Environmental Board, B.E.2564 : Coastal Water Quality Standard (Class 5)

Sampled By : Wanlop Hunchainaow

Remark :

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11, Map Ta Phut Industrial Estate, I-5 Road, Muang, Rayong Thailand 21150

P/O :

Project Name :

Project Location: Glow SPP3

Lot ID: 22114160

Date Received : Oct 19, 2022

Date Reported : Oct 24, 2022

Report Number : 2471486-2

Page 1 of 1

Sample Number	22114160-3
Sampled Date	Oct 19, 2022 10:30 AM
Sample Description	Sea Water
Location	Station 2000 m.
Date Analysis Commenced	Oct 19, 2022
Condition of Sample	Contained in one amber glass bottle and one plastic bottle, sample containers comply to pretreatment - preservation standards (APHA, USEPA)

Analyte	Unit	LOD	LOQ (LOR)	Result	Guideline / Specification	Method	Testing Location
Water Testing							
Temperature	Degree C	-	-	30.3	Change from natural condition not more than 2 degree C	Based on APHA (2017), 2550 B	Rayong

Guideline : Notification of the National Environmental Board, B.E.2564 : Coastal Water Quality Standard (Class 5)

Sampled By : Pitthaya Thongtaeng

Remark :

- LOD : Limit of Detection
- "<" : Lower than LOQ (Limit of Quantitation) / LOR (Limit of Reporting)

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Approved by

Narumon Banchongkit
Supervisor

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ภาคผนวก ค-4

นิเวศวิทยาทางทะเล



สถานีวิจัยประมงศรีราชา
101/12 หมู่ 9 ต. บางพระ
อ. ศรีราชา จ. ชลบุรี 20110
โทร./โทรสาร. (038) 311379

Client : Glow SPP 3 Co., Ltd.

Address : 11 Map Ta Phut Industrial Estate, I-5 Road, Muang, Rayong, Thailand, 21150

Project Location : Sea dredging

รายงานผลการวิเคราะห์สัตว์หน้าดิน

ตาราง ผลการวิเคราะห์สัตว์หน้าดิน (เก็บตัวอย่างวันที่ 19 ตุลาคม 2565)

สกุลสัตว์หน้าดิน	ปริมาณสัตว์หน้าดิน (ตัวต่อตารางเมตร)			
	22114247-1	22114247-2	22114247-3	22114247-4
Phylum Annelida				
Class Polychaeta				
Order Cirratulida				
Family Paraonidae				
<i>Paraonis</i> sp. (ไส้เดือนทะเล)	15	-	-	-
Order Opheliida				
Family Opheliidae				
<i>Armandia</i> sp. (ไส้เดือนทะเล)	-	-	30	-
<i>Ophelina</i> sp. (ไส้เดือนทะเล)	-	-	-	15
Order Orbiniida				
Family Orbiniidae				
<i>Scoloplos</i> sp. (ไส้เดือนทะเล)	45	-	45	-
Order Spionida				
Family Magelonidae				
<i>Magelona</i> sp. (ไส้เดือนทะเล)	-	-	15	-

ตาราง ผลการวิเคราะห์สัตว์หน้าดิน (เก็บตัวอย่างวันที่ 19 ตุลาคม 2565)

(ต่อ)

สกุลสัตว์หน้าดิน	ปริมาณสัตว์หน้าดิน (ตัวต่อตารางเมตร)			
	22114247-1	22114247-2	22114247-3	22114247-4
Phylum Arthropoda				
Class Malacostraca				
Order Amphipoda				
Family Ampeliscidae				
<i>Ampelisca</i> sp. (แอมฟิพอด)	-	-	-	15
Order Tanaidacea				
Family Leptocheliidae				
<i>Leptochelia</i> sp. (ทาไนด์เชียน)	15	15	-	-
Phylum Mollusca				
Class Bivalvia				
Order Cardiida				
Family Tellinidae				
<i>Tellina</i> sp. (หอยสองฝาชนิดหนึ่ง)	-	-	-	15
Order Mytilida				
Family Mytilidae				
<i>Modiolus</i> sp. (หอยกะพง)	-	-	-	15
Order Vernerida				
Family Veneridae				
<i>Circe</i> sp. (หอยสองฝาชนิดหนึ่ง)	-	-	-	15
<i>Timoclea</i> sp. (หอยสองฝาชนิดหนึ่ง)	-	-	-	15
สกุลสัตว์หน้าดิน	3	1	3	6
ปริมาณสัตว์หน้าดิน	75	15	90	90
ค่าดัชนีความหลากหลายสัตว์หน้าดิน	0.9503	0.0000	1.0114	1.7918

Sample Location : 1. สถานี 22114247-1 : พื้นที่ทะเลใกล้บริเวณท่าเทียบเรือ กนอ.
2. สถานี 22114247-2 : ทะเลใกล้บริเวณ Liquid Tank Farm
3. สถานี 22114247-3 : Port groove
4. สถานี 22114247-4 : พื้นที่ทะเลทิศตะวันตกของเกาะสะเก็ด

Condition of Sample : contained in one plastic zip bag



(นายอรรถวุฒิ กันทะวงศ์)
ผู้วิเคราะห์



(นายอลงกต อินทรชาติ)
หัวหน้าสถานีวิจัยประมงศรีราชา



สถานีวิจัยประมงศรีราชา

101/12 หมู่ 9 ต. บางพระ

อ. ศรีราชา จ. ชลบุรี 20110

โทร./โทรสาร. (038) 311379

Client : Glow SPP 3 Co., Ltd.

Address : 11 Map Ta Phut Industrial Estate, I-5 Road, Muang, Rayong, Thailand, 21150

Project Location : Sea dredging

รายงานผลการวิเคราะห์แพลงก์ตอนพืช

ตาราง ผลการวิเคราะห์แพลงก์ตอนพืช (เก็บตัวอย่างวันที่ 19 ตุลาคม 2565)

สกุลแพลงก์ตอนพืช	ปริมาณแพลงก์ตอนพืช (หน่วยต่อลูกบาศก์เมตร)			
	22114249-1	22114249-2	22114249-3	22114249-4
Division Cyanophyta				
Class Cyanophyceae				
Order Nostocales				
Family Oscillatoriaceae				
1. <i>Oscillatoria</i> sp.	-	13,000	-	-
Family Nostocaceae				
2. <i>Pseudanabaena</i> sp.	29,000	-	-	-
Division Chromophyta				
Class Bacillariophyceae				
Order Biddulphiales				
Suborder Coscinodiscineae				
Family Thalassiosiraceae				
3. <i>Cyclotella</i> sp.	334,000	106,000	31,000	47,000
4. <i>Lauderia</i> sp.	73,000	106,000	-	94,000
5. <i>Planktoniella</i> sp.	15,000	-	-	-

ตาราง ผลการวิเคราะห์แพลงก์ตอนพืช (เก็บตัวอย่างวันที่ 19 ตุลาคม 2565)

(ต่อ)

สกุลแพลงก์ตอนพืช	ปริมาณแพลงก์ตอนพืช (หน่วยต่อลูกบาศก์เมตร)			
	22114249-1	22114249-2	22114249-3	22114249-4
6. <i>Skeletonema</i> sp.	2,320,000	798,000	61,000	1,193,000
7. <i>Stephanopyxis</i> sp.	-	173,000	-	-
8. <i>Thalassiosira</i> sp.	2,030,000	2,261,000	168,000	628,000
Family Melosiraceae				
9. <i>Palmeria</i> sp.	-	-	15,000	-
Family Leptocyliodraceae				
10. <i>Corethron</i> sp.	102,000	1,556,000	-	16,000
Family Coscinodiscaceae				
11. <i>Coscinodiscus</i> sp.	290,000	27,000	31,000	16,000
12. <i>Paralia</i> sp.	-	-	-	94,000
Family Hemidiscaceae				
13. <i>Pseudoguinaradia</i> sp.	44,000	80,000	107,000	-
Family Asterolampraceae				
14. <i>Asteromphalus</i> sp.	-	13,000	-	16,000
Family Heliopeltaceae				
15. <i>Actinoptychus</i> sp.	29,000	13,000	31,000	-
Suborder Rhizosoleniineae				
Family Rhizosoleniaceae				
16. <i>Dactyliosolen</i> sp.	102,000	346,000	214,000	47,000
17. <i>Guinardia</i> sp.	1,160,000	2,660,000	1,836,000	1,727,000
18. <i>Proboscia</i> sp.	58,000	160,000	122,000	-
19. <i>Pseudosolenia</i> sp.	-	53,000	31,000	31,000
20. <i>Rhizosolenia</i> sp.	145,000	319,000	107,000	251,000
Suborder Biddulphiineae				
Family Hemiaulaceae				
21. <i>Cerataulina</i> sp.	754,000	2,128,000	1,071,000	2,826,000
22. <i>Eucampia</i> sp.	261,000	492,000	306,000	236,000

ตาราง ผลการวิเคราะห์แพลงก์ตอนพืช (เก็บตัวอย่างวันที่ 19 ตุลาคม 2565)

(ต่อ)

สกุลแพลงก์ตอนพืช	ปริมาณแพลงก์ตอนพืช (หน่วยต่อลูกบาศก์เมตร)			
	22114249-1	22114249-2	22114249-3	22114249-4
23. <i>Hemiaulus</i> sp. Family Chaetoceraceae	1,044,000	1,224,000	138,000	942,000
24. <i>Bacteriastrum</i> sp.	1,160,000	1,197,000	138,000	1,256,000
25. <i>Chaetoceros</i> sp. Family Lithodesmaceae	14,580,000	15,827,000	7,250,000	25,905,000
26. <i>Ditylum</i> sp. Family Eupodiscaceae	15,000	106,000	46,000	-
27. <i>Odontella</i> sp. Order Bacillariales	15,000	133,000	184,000	79,000
Suborder Fragilariineae				
Family Fragilariaceae				
28. <i>Fragilaria</i> sp. Family Thalassionemataceae	116,000	-	-	-
29. <i>Thalassionema</i> sp. Family Tabellariaceae	261,000	585,000	291,000	1,335,000
30. <i>Tabellaria</i> sp. Suborder Bacillariineae	232,000	27,000	-	-
Family Naviculaceae				
31. <i>Amphora</i> sp.	116,000	133,000	61,000	63,000
32. <i>Diploneis</i> sp.	-	13,000	-	16,000
33. <i>Haslea</i> sp.	102,000	160,000	46,000	79,000
34. <i>Meunier</i> sp.	15,000	266,000	46,000	-
35. <i>Navicula</i> sp.	73,000	13,000	61,000	31,000
36. <i>Pleurosigma</i> sp.	58,000	146,000	77,000	-
37. <i>Trachyneis</i> sp. Family Bacillariaceae	-	-	-	16,000
38. <i>Bacillaria</i> sp.	87,000	200,000	122,000	236,000

ตาราง ผลการวิเคราะห์แพลงก์ตอนพืช (เก็บตัวอย่างวันที่ 19 ตุลาคม 2565)

(ต่อ)

สกุลแพลงก์ตอนพืช	ปริมาณแพลงก์ตอนพืช (หน่วยต่อลูกบาศก์เมตร)			
	22114249-1	22114249-2	22114249-3	22114249-4
39. <i>Cylindrotheca</i> sp.	58,000	-	-	-
40. <i>Nitzschia</i> sp.	174,000	-	-	141,000
41. <i>Pseudo-nitzschia</i> sp.	696,000	746,000	459,000	1,413,000
Family Surirellaceae				
42. <i>Entomoneis</i> sp.	87,000	27,000	-	63,000
Class Dictyochophyceae				
Order Dictyochales				
Family Dictyochophyceae				
43. <i>Dictyocha</i> sp.	-	13,000	-	16,000
Class Dinophyceae				
Order Prorocentrales				
Family Prorocentraceae				
44. <i>Prorocentrum</i> sp.	-	40,000	31,000	-
Order Dinophysiales				
Family Dinophysiaceae				
45. <i>Dinophysis</i> sp.	-	27,000	15,000	16,000
Order Noctilucales				
Family Noctilucaceae				
46. <i>Noctiluca</i> sp.	-	-	31,000	-
Order Gonyaulacales				
Family Ceratiaceae				
47. <i>Ceratium</i> sp.	15,000	-	15,000	-
Family Goniodomaceae				
48. <i>Goniodoma</i> sp.	-	27,000	46,000	-
Family Gonyaulacaceae				
49. <i>Gonyaulax</i> sp.	-	13,000	-	47,000

ตาราง ผลการวิเคราะห์แพลงก์ตอนพืช (เก็บตัวอย่างวันที่ 19 ตุลาคม 2565)


(ต่อ)

สกุลแพลงก์ตอนพืช	ปริมาณแพลงก์ตอนพืช (หน่วยต่อลูกบาศก์เมตร)			
	22114249-1	22114249-2	22114249-3	22114249-4
Family Pyrophacaceae 50. <i>Pyrophacus</i> sp.	-	-	-	16,000
Order Peridiniales Family Protoperidiniaceae 51. <i>Protoperidinium</i> sp.	131,000	67,000	15,000	93,000
สกุลแพลงก์ตอนพืช	36	40	33	33
ปริมาณแพลงก์ตอนพืช	26,781,000	32,294,000	13,203,000	38,985,000
ดัชนีความหลากหลายแพลงก์ตอนพืช	1.9207	2.0977	1.8367	1.4748
ดัชนีความสม่ำเสมอแพลงก์ตอนพืช	0.5360	0.5687	0.5253	0.4218


Sample Location :

1. สถานี 22114249-1 : พื้นที่ทะเลใกล้บริเวณท่าเทียบเรือ กนอ.
2. สถานี 22114249-2 : ทะเลใกล้บริเวณ Liquid Tank Farm
3. สถานี 22114249-3 : Port groove
4. สถานี 22114249-4 : พื้นที่ทะเลทิศตะวันตกของเกาะสะเก็ด

Condition of Sample : contained in one plastic bottle, sample containers comply to pretreatment-preservation standards (APHA, USEPA)



 (นางสาวกนกวรรณ ขาวด่อน)
 ผู้วิเคราะห์



 (นายอลงกต อินทรชาติ)
 หัวหน้าสถานีวิจัยประมงศรีราชา



สถานีวิจัยประมงศรีราชา
101/12 หมู่ 9 ต. บางพระ
อ. ศรีราชา จ. ชลบุรี 20110
โทร./โทรสาร. (038) 311379

Client : Glow SPP 3 Co., Ltd.

Address : 11 Map Ta Phut Industrial Estate, I-5 Road, Muang, Rayong, Thailand, 21150

Project Location : Sea dredging

รายงานผลการวิเคราะห์แพลงก์ตอนสัตว์

ตาราง ผลการวิเคราะห์แพลงก์ตอนสัตว์ (เก็บตัวอย่างวันที่ 19 ตุลาคม 2565)

สกุลแพลงก์ตอนสัตว์	ปริมาณแพลงก์ตอนสัตว์ (หน่วยต่อลูกบาศก์เมตร)			
	22114249-1	22114249-2	22114249-3	22114249-4
Phylum Protozoa				
Subphylum Ciliophora				
Class Ciliata				
Subclass Spirotricha				
Order Tintinnida				
Family Tintinnididae				
1. <i>Leprotintinnus</i> sp.	44,000	13,000	-	16,000
Family Codonellidae				
2. <i>Tintinnopsis</i> sp.	29,000	-	15,000	16,000
Family Codonellopsidae				
3. <i>Codonellopsis</i> sp.	15,000	13,000	-	-
Family Cyttarocylidae				
4. <i>Favella</i> sp.	15,000	-	-	-
Family Petalotrichidae				
5. <i>Metacylis</i> sp.	-	13,000	-	-

ตาราง ผลการวิเคราะห์แพลงก์ตอนสัตว์ (เก็บตัวอย่างวันที่ 19 ตุลาคม 2565)

(ต่อ)

สกุลแพลงก์ตอนสัตว์	ปริมาณแพลงก์ตอนสัตว์ (หน่วยต่อลูกบาศก์เมตร)			
	22114249-1	22114249-2	22114249-3	22114249-4
Family Tintinnidae				
6. <i>Amphorella</i> sp.	-	13,000	-	-
7. <i>Eutintinnus</i> sp.	-	40,000	-	-
Phylum Rotifera				
Class Monogononta				
Order Ploima				
Family Tricercidae				
8. <i>Trichocerca</i> sp.	-	13,000	-	-
Phylum Arthropoda				
Class Crustacea				
Subclass Copepoda				
9. Copepod nauplius	15,000	27,000	46,000	31,000
Order Calanoida				
10. Calanoid copepod	-	-	-	16,000
Order Harpacticoida				
11. Harpacticoid copepod	-	-	31,000	-
Subclass Cirripedia				
12. Cirripede nauplius	-	13,000	-	-
Phylum Mollusca				
Class Bivalvia				
13. Pelecypod larvae	-	13,000	-	-
Phylum Chordata				
Subphylum Urochordata				
Class Larvacea				
Family Oikopleuridae				
14. <i>Oikopleura</i> sp.	-	27,000	-	-

ตาราง ผลการวิเคราะห์เพลงก์ตอนสัตว์ (เก็บตัวอย่างวันที่ 19 ตุลาคม 2565)

(ต่อ)

สกุลเพลงก์ตอนสัตว์	ปริมาณเพลงก์ตอนสัตว์ (หน่วยต่อลูกบาศก์เมตร)			
	22114249-1	22114249-2	22114249-3	22114249-4
กลุ่ม/สกุลเพลงก์ตอนสัตว์	5	10	3	4
ปริมาณเพลงก์ตอนสัตว์	118,000	185,000	92,000	79,000
ดัชนีความหลากหลายเพลงก์ตอนสัตว์	1.4993	2.1991	1.0088	1.3373
ดัชนีความสม่ำเสมอเพลงก์ตอนสัตว์	0.9316	0.9551	0.9182	0.9647

Sample Location :

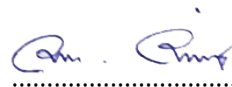
1. สถานี 22114249-1 : พื้นที่ทะเลใกล้บริเวณท่าเทียบเรือ กนอ.
2. สถานี 22114249-2 : ทะเลใกล้บริเวณ Liquid Tank Farm
3. สถานี 22114249-3 : Port groove
4. สถานี 22114249-4 : พื้นที่ทะเลทิศตะวันตกของเกาะสะเก็ด

Condition of Sample : contained in one plastic bottle, sample containers comply to pretreatment-preservation standards (APHA, USEPA)



(นางสาวกนกวรรณ ขาวดอน)

ผู้วิเคราะห์



(นายอลงกต อินทรชาติ)

หัวหน้าสถานีวิจัยประมงศรีราชา

ภาคผนวก ง

ใบรับรองการสอบเทียบเครื่องมือ

รายการเครื่องมือที่ใช้ในการวิเคราะห์ / ทดสอบ

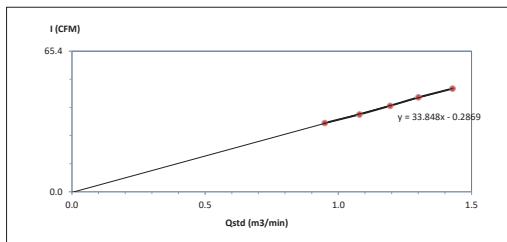
Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal	Freq. Calibrate (Months)
Ambient	Particulate Matter (PM-10)	High Volume	RYG_FS0400	-	-	On site Calibration
Ambient	Particulate Matter (PM-10)	High Volume	RYG_FS0184	-	-	On site Calibration
Ambient	Particulate Matter (PM-10)	Digital Balance	RYG_EN0001	23-Mar-22	23-Mar-23	12
Ambient	Total Suspended Particulate	High Volume	RYG_FS0176	-	-	On site Calibration
Ambient	Total Suspended Particulate	High Volume	RYG_FS0178	-	-	On site Calibration
Ambient	Total Suspended Particulate	Digital Balance	RYG_EN0001	23-Mar-22	23-Mar-23	12
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direct	RYG_FS0087	13-Jul-21	11-Jan-23	18
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direct	RYG_FS0329	31-Jan-22	29-Jul-23	18
Noise	Leq 24 hrs	Sound Calibrator	RYG_FS0213	26-Apr-22	26-Apr-23	12
Noise	Leq 24 hrs	Sound Level Meter	RYG_FS0020	10-Jan-22	10-Jan-23	12
Noise	Leq 24 hrs	Sound Level Meter	RYG_FS0019	10-Jan-22	10-Jan-23	12
Rayong Lab	Temperature	pH Meter	RYG_FS0420	14-Mar-22	14-Mar-23	12
Rayong Lab	pH at 25 °C	pH meter	RYG_EN0183	17-Mar-22	17-Mar-23	12
Rayong Lab	Conductivity	Conductivity meter	RYG_EN0029	23-Feb-22	24-Aug-23	18
Rayong Lab	Salinity	Conductivity meter	RYG_EN0029	23-Feb-22	24-Aug-23	18
Rayong Lab	Dissolved Oxygen	Chamber (Cold Room)	RYG_EN0184	22-Feb-22	22-Feb-23	12
Rayong Lab	BOD	DO meter with Sensor	RYG_EN0032	14-Feb-22	15-Aug-23	18
Rayong Lab	BOD	Incubator	RYG_EN0154	22-Apr-22	21-Oct-23	18
Rayong Lab	Oil & Grease	Electronic Balance	RYG_EN0002	23-Mar-22	23-Mar-23	12
Rayong Lab	Oil & Grease	Hot Air Oven	RYG_EN0006	5-May-21	3-Nov-22	18
Rayong Lab	Oil & Grease	Water Bath	RYG_EN0061	5-May-21	3-Nov-22	18
Rayong Lab	Total Suspended Solids	Electronic Balance	RYG_EN0002	23-Mar-22	23-Mar-23	12
Rayong Lab	Total Suspended Solids	Hot Air Oven	RYG_EN0010	5-May-21	3-Nov-22	18
Rayong Lab	Total Dissolved Solids 180°C	Electronic Balance	RYG_EN0002	23-Mar-22	23-Mar-23	12
Rayong Lab	Total Dissolved Solids 180°C	Hot Air Oven	RYG_EN0010	5-May-21	3-Nov-22	18
Rayong Lab	Total Solids	Electronic Balance	RYG_EN0002	23-Mar-22	23-Mar-23	12
Rayong Lab	Total Solids	Hot Air Oven	RYG_EN0010	5-May-21	3-Nov-22	18
Water Lab	Lead	ICP-MS	BKK_EL0043	30-Sep-21	29-Mar-23	18
Water Lab	Lead	Hot Block	BKK_EL0054	7-Apr-22	7-Oct-23	18
Water Lab	Lead	Chamber (Cold Room)	BKK_EN0167	30-Jun-22	30-Dec-23	18
Water Lab	Zinc	ICP-MS	BKK_EL0043	30-Sep-21	29-Mar-23	18
Water Lab	Zinc	Hot Block	BKK_EL0054	7-Apr-22	7-Oct-23	18
Water Lab	Zinc	Chamber (Cold Room)	BKK_EN0167	30-Jun-22	30-Dec-23	18
Water Lab	Mercury	DUO-CVAFS / CVAAS	BKK_EL0023	6-Jun-22	5-Jun-23	12
Water Lab	Total Coliform	Autoclave	BKK_ML0037	21-Jan-22	22-Jul-23	18
Water Lab	Total Coliform	Incubator	BKK_ML0010	21-Jan-22	22-Jul-23	18
Water Lab	Total Coliform	Hot Air Oven	BKK_ML0013	7-Jun-21	6-Dec-22	18
Water Lab	Fecal Coliform	Autoclave	BKK_ML0037	21-Jan-22	22-Jul-23	18
Water Lab	Fecal Coliform	Incubator	BKK_ML0010	21-Jan-22	22-Jul-23	18
Water Lab	Fecal Coliform	Hot Air Oven	BKK_ML0013	7-Jun-21	6-Dec-22	18
Water Lab	Fecal Coliform	Water Bath	BKK_ML0056	20-May-22	20-May-23	12



High Volume Air Sampler Calibration Worksheet

Project Site : Glow SPP 3 Co.,Ltd. Barometric Pressure (mm Hg) : 757
 Calibrate Location : Thai Tank Farm Temperature (°C) : 30
 Calibrate Date : 3-Oct-22 High Volume ID : RYG_FS0400
 CalibrationSheet No.: C-031022-RYG_FS0400 High Volume Model : TE-5009X
 Calibrator ID: RYG_FS0205 High Volume S/N : 5691
 Calibrator Model : TE-5028A Calibrator Slope : 1.50765
 Calibrator S/N : 1166 Calibrator Intercept : -0.02043

Test No.	Delta H ₂ O (inch)	Q _{std} (m ³ /min)	I: Chart (CFM)	Linear Regression
1	2.0	0.9488	32	Slope: 33.8478 Intercept: -0.2869 Correlation Coefficient: 0.9994
2	2.6	1.0790	36	
3	3.2	1.1948	40	
4	3.8	1.3002	44	
5	4.6	1.4284	48	



Calibrated by: Satcha P.
 (Mr.Satcha Phetsawaeng)
 Field Scientist(2)

Approved by: [Signature]
 (Mr. Noppong Juntarupan)
 Enviro Field Coordinator Scientist (3)

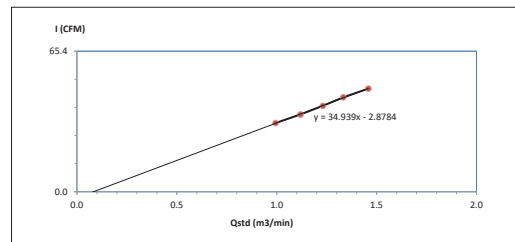
FORM NO.: F 06-074 REVISION NO.: ISSUE DATE: 14/03/16



High Volume Air Sampler Calibration Worksheet

Project Site : Glow SPP 3 Co.,Ltd. Barometric Pressure (mm Hg) : 757
 Calibrate Location : Map Ta Phut Port (North of Project) Temperature (°C) : 30
 Calibrate Date : 3-Oct-22 High Volume ID : RYG_FS0184
 CalibrationSheet No.: C-031022-RYG_FS0184 High Volume Model : TE-5009X
 Calibrator ID: RYG_FS0205 High Volume S/N : 4792
 Calibrator Model : TE-5028A Calibrator Slope : 1.50765
 Calibrator S/N : 1166 Calibrator Intercept : -0.02043

Test No.	Delta H ₂ O (inch)	Q _{std} (m ³ /min)	I: Chart (CFM)	Linear Regression
1	2.2	0.9942	32	Slope: 34.9392 Intercept: -2.8784 Correlation Coefficient: 0.9994
2	2.8	1.1189	36	
3	3.4	1.2309	40	
4	4.0	1.3334	44	
5	4.8	1.4587	48	



Calibrated by: Satcha P.
 (Mr.Satcha Phetsawaeng)
 Field Scientist(2)

Approved by: [Signature]
 (Mr. Noppong Juntarupan)
 Enviro Field Coordinator Scientist (3)

FORM NO.: F 06-074 REVISION NO.: ISSUE DATE: 14/03/16



PENTA CALIBRATION CO., LTD.
 66/124 The Connect 33 Village Kanchanaphisek Road
 Dokmai Prawet Bangkok 10250
 Tel: +66 (0) 2069-9773
 www.pentalcal.com

RYG_EN0001

Certificate of Calibration

Represent to Certificate of Calibration ,PTC/07/22102

Certificate No.: PTC/07/22102 Page: 1 of 2
 Equipment: Digital Balance Condition: Normal
 Manufacturer: Sartorius Serial No: 25409664
 Model: LA130S-F ID No: RYG_EN0001
 Type of Balance: Single interval

Customer: ALS Laboratory Group (Thailand) Co.,Ltd.
 616/10 Moo 5 T.Maenamkoo, A.Pluakdaeng,
 Rayong 21140, Thailand

Environment Condition: Temperature: 23.9 °C ± 0.3 °C
 Humidity: 58.1 %RH ± 4.4 %RH
 Air density: 1.17 kg/m³

Calibration Place: ALS Laboratory Group (Thailand) Co.,Ltd.
 616/10 Moo 5 T.Maenamkoo, A.Pluakdaeng,
 Rayong 21140, Thailand

The Method used: In house method, PTC-WI-07, base on Euramet cg. 18

Traceability: This certificate is traceable to the SI Units through Thai Calibration Service Co.,Ltd.
 , NSC-ONSAC Accreditation No.: Calibration 0189

Date Received: March 23, 2022

Calibration Date: March 23, 2022

Issued Date: March 25, 2022

Calibration By: Mr. Rungroj Metakul

REVIEW BY: [Signature]
 APPROVED BY: [Signature]
 NEXT CAL. DATE: 03/03/23



Reviewed by: [Signature]
 (Mr.Kriangsak Kalasri)

Approved By: [Signature]
 (Mr. Keattisak Kerdto)
 Laboratory Manager

This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.

This measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to the Expression of Uncertainty in Measurement (GUM). The effect that the results relate only to the items calibrated.

This calibration certificate shall not be reproduced except in full only, without written approval from penta calibration co., Ltd.

PTC-FMC-07-02-2 Feb-2020



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 66/124 The Connect 33 Village Kanchanaphisek Road
 Dokmai Prawet Bangkok 10250
 Tel: +66 (0) 2069-9773
 www.pentalcal.com

Represent to Certificate of Calibration ,PTC/07/22102

Certificate No.: PTC/07/22102

Page: 2 of 2

Measurement Results:

Without Adjustment:

Function Calibration: Non Adjustment

Eccentric Error: Weight to be 1/3, 1/2 or of Maximum capacity



Eccentricity test 50 (g)				
Position (g)				
1	2	3	4	5
0.0000	0.0000	-0.0001	0.0000	0.0001
Maximum deviation: 0.0001				

Repeatability Test : Weight to be 1/2 ≤ L₁ ≤ Maximum capacity

Determination of the standard deviation of weighing balance., Readability 0.0001 (g)

Nominal test value (g)	Standard Deviation
100	0.00009

Error of indication : from nominal value., Readability 0.0001 (g)

Nominal Value (g)	Conventional Mass (g)	Indication (g)	Correction of Balance (g)	Uncertainty (g)	k
0	0.00000	0.0000	0.0000	0.00026	2.87
0.01	0.01000	0.0100	0.0000	0.00026	2.65
0.05	0.05000	0.0500	0.0000	0.00026	2.65
0.1	0.10000	0.1000	0.0000	0.00026	2.65
0.5	0.50000	0.4999	0.0001	0.00026	2.65
1	1.00000	0.9999	0.0001	0.00026	2.65
2	2.00000	1.9999	0.0001	0.00026	2.65
5	5.00001	5.0000	0.0000	0.00026	2.65
10	10.00000	10.0001	-0.0001	0.00026	2.65
20	20.00003	20.0001	-0.0001	0.00026	2.52
100	100.00004	100.0001	-0.0001	0.00027	2.18

Note: Weight of adjust - (g)

The End of Certificate

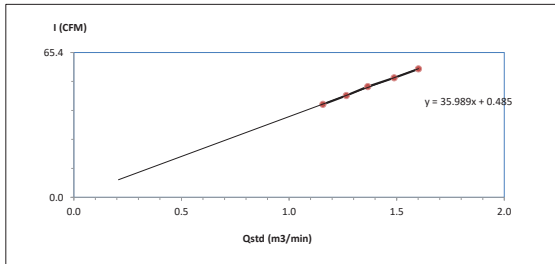
PTC-FMC-07-02-2 Feb-2020



High Volume Air Sampler Calibration Worksheet

Project Site : Glow SPP 3 Co.,Ltd. Barometric Pressure (mm Hg) : 757
Calibrate Location : Thai Tank Farm Temperature (°C) : 30
Calibrate Date : 3-Oct-22 High Volume ID : RYG_FS0176
CalibrationSheet No.: C-031022-RYG_FS0176 High Volume Model : TE-5170D
Calibrator ID : RYG_FS0205 High Volume S/N : 4802
Calibrator Model : TE-5028A Calibrator Slope : 1.50765
Calibrator S/N : 1166 Calibrator Intercept : -0.02043

Test No.	Delta H ₂ O (inch)	Q _{std} (m ³ /min)	I: Chart (CFM)	Linear Regression
1	3.0	1.1575	42	Slope : 35.9891 Intercept : 0.4850 Correlation Coefficient : 0.9995
2	3.6	1.2660	46	
3	4.2	1.3658	50	
4	5.0	1.4884	54	
5	5.8	1.6015	58	



Calibrated by Satcha P. Approved by Mr. Noppong Juntarupan
(Mr. Satcha Phetsawaeng) (Mr. Noppong Juntarupan)
Field Scientist(2) Enviro Field Coordinator Scientist (3)

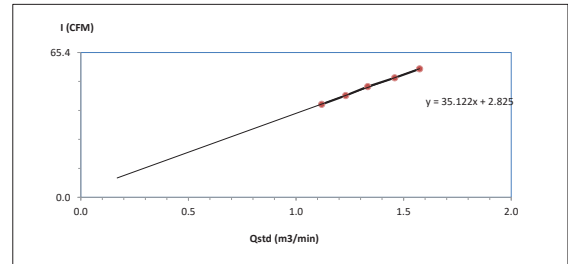
FORM NO.: F 06-073 REVISION NO.: ISSUE DATE: 14/03/16



High Volume Air Sampler Calibration Worksheet

Project Site : Glow SPP 3 Co.,Ltd. Barometric Pressure (mm Hg) : 757
Calibrate Location : Map Ta Phut Port (North of Project) Temperature (°C) : 30
Calibrate Date : 3-Oct-22 High Volume ID : RYG_FS0178
CalibrationSheet No.: C-031022-RYG_FS0178 High Volume Model : TE-5170D
Calibrator ID : RYG_FS0205 High Volume S/N : 4804
Calibrator Model : TE-5028A Calibrator Slope : 1.50765
Calibrator S/N : 1166 Calibrator Intercept : -0.02043

Test No.	Delta H ₂ O (inch)	Q _{std} (m ³ /min)	I: Chart (CFM)	Linear Regression
1	2.8	1.1189	42	Slope : 35.1217 Intercept : 2.8250 Correlation Coefficient : 0.9995
2	3.4	1.2309	46	
3	4.0	1.3334	50	
4	4.8	1.4587	54	
5	5.6	1.5740	58	



Calibrated by Satcha P. Approved by Mr. Noppong Juntarupan
(Mr. Satcha Phetsawaeng) (Mr. Noppong Juntarupan)
Field Scientist(2) Enviro Field Coordinator Scientist (3)

FORM NO.: F 06-073 REVISION NO.: ISSUE DATE: 14/03/16



63/14-15,67/35-36, Soi Petchkasem7,7/1, Petchkasem Rd,
Walthapa, Bangkokyai,Bangkok 10600 Thailand.
Tel.: (66) 02-8680812#13 Fax: (66) 02-8680860 www.jiranatee.com

CERTIFICATE OF CALIBRATION

Certificate No: WB-03072021
Page 1 of 2 pages

Measurement Item : Cup anemometer with data logger.
Manufacturer : Data logger: Novallink.
Cup anemometer: Novallink.
Model/Type : Data logger: 200-WB-20DL.
Cup anemometer: WB-02P.
Serial Number : Data logger: A4966.
Cup anemometer: -
ID No. : Data logger: RYG_FS0087.
Cup anemometer: -
Customer : ALS laboratory group (Thailand) co., ltd.
104 Phatthanakan 40, Phatthanakan Rd, Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10250 Thailand.
Test Conditions : Wind tunnel cross test section area: 900 cm²
Anemometer frontal area: 100 cm²
Diameter of mounting plate: 8mm
Blockage ratio of test object: 0.111
Test Conditions : Air temperature: 24.1 ±0.8 °C
Air pressure: 1009.3 ±0.4 hPa
Relative air humidity: 60.2 ±3.5 %RH
Calibration Procedure : Calibration was carried out based on:
ISO 91400-12-1 Ed.1: 2005-Power Performance Measurements of Electricity Producing Wind Turbines.
M&SNET Anemometer Calibration Procedure - Version 2: 2009.
Traceability : This calibration documents the traceability to national standard, which realizes the unit of measurements according to the international system of units (SI) through National Institute of Metrology Thailand (NIMT).
Measurement Date : Jul 13, 2021.
Issued Date : Jul 14, 2021.

REVIEW BY Mr. Noppong Juntarupan
APPROVED BY Mr. Noppong Juntarupan
NEXT CAL DATE 11/1/23

Calibrated by
☒ Mr. Satcha Phetsawaeng
☐ Miss Ornlai Wathitwong



Approved Signatory: Mr. Noppong Juntarupan
Technical Support
and Calibration Manager



63/14-15,67/35-36, Soi Petchkasem7,7/1, Petchkasem Rd,
Walthapa, Bangkokyai,Bangkok 10600 Thailand.
Tel.: (66) 02-8680812#13 Fax: (66) 02-8680860 www.jiranatee.com

Continuation of Certificate of Calibration Number

Certificate No: WB-03072021
Page 2 of 2 Pages

Result of calibration: ☒ Without adjustment ☐ With adjustment
Calibration in the range of 1 - 15 m/s at a calibration interval of 1 m/s.
The results of calibration and associated measurement uncertainties are reported in the table below:

V _{ref} Reading m/s	V _{act} Reading m/s	Error (m/s)	Uncertainty (%)
2.087	2.0	-0.1	2.4
4.180	4.1	-0.1	1.2
5.99	6.0	0.0	1.1
8.01	8.0	0.0	0.73
10.02	10.0	0.0	0.58
11.98	12.0	0.3	0.56
13.97	14.0	0.3	0.55
16.02	16.0	0.6	0.48
18.06	18.0	0.5	0.37
19.03	19.0	0.4	0.66
10.97	11.0	0.2	0.49
9.02	9.1	0.1	0.65
7.02	7.0	0.0	0.81
5.145	5.0	-0.2	0.88
3.018	3.0	0.0	1.6
1.037	0.9	-0.1	4.7

UNC: Unit Under Calibration
The reported expanded uncertainty is based on standard uncertainty multiplied by a coverage factor k=2 providing a level of confidence of approximately 95%.

Appendix 1: Instrumentations

NO	Sensor	Manufacturer	Model/Type	Calibration Date	Certificate Report Number	Range
1	Pitot static	TESTO INC.	04382145	July 15, 2020	WB-0035-20	5 - 30 m/s
2	Pressure (static), Pressure Meter	Zorgas	DP455-03	July 16, 2020	WB-0035-20	0 - 30 m/s
3	Air velocity transducer (Pitot static)	TEI INC.	8455-12	July 20, 2020	WB-0035-20	0 - 5 m/s
4	Temperature	Zorgas	DBR-TMP	March 30, 2021	WB-0303-2021	-30 - 70°C
5	Relative humidity	Zorgas	DBR-TMP	March 30, 2021	WB-0303-2021	0 - 100 %RH
6	Atmospheric pressure	Zorgas	DBR-TMP	March 30, 2021	WB-0303-2021	500 - 1100 hPa
7	Wind tunnel	ESOSM	MP3303	-	-	0 - 80 m/s

End of certificate of calibration



CERTIFICATE OF CALIBRATION

Certificate No: WD-03072021
Page 1 of 2 pages

Measurement Item : Wind direction sensor with data logger

Manufacturer : Data logger: Novallux
Wind direction sensor: Novallux

Model/Type : Data logger: 200-WS-250L
Wind direction sensor: WS-02P

Serial Number : Data logger: A4985
Wind direction sensor: -

ID No : Data logger: RYG_F80087
Wind direction sensor: -

Customer : ALS laboratory group (Thailand) Co.Ltd.
104 Phathanakan 40, Phathanakan Rd,Khwaeng Suan Luang, Khut Suan Luang, Bangkok 10250
Thailand.

Environmental Condition:

The measurement was carried out in an ambient temperature of (23±3)°C and relative humidity of (40±10)%.

Measurement Method:

The wind direction sensor calibration according to comparison method with reference angle measurement electronic theodolite and line laser is used for axis control. The measurement were taken at 45° intervals in clockwise and counterclockwise directions.

Note: The UUC was waited up for 1 hour prior to the calibration being performed

Traceability:

The measurement results are traceable to the International system of units (SI) through Certificate No: CC553-07-0345.
Certificate No: RWS63/0044.

Measurement Date : Jul 14, 2021.
Issued Date : Jul 14, 2021.



Approved Signatory:

[Signature]

Mr. Parinya Booncharoen,
Technical Support
and Calibration Manager

Performed by

☒ Mr. Soravit Thachwaid
☐ Miss Orathai Wivattalaya

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OBTAINED IN WRITING FROM THE LABORATORY.

Continuation of Certificate of Calibration Number

Certificate No: WD-03072021
Page 2 of 2 pages

Result of calibration: ☐ Without adjustment ☒ With adjustment.
Calibration in the range of 0 - 360 ° at a calibration interval of 45°.

The results of calibration and associated measurement uncertainties are reported in table below:

NO	Turning Direction	Nominal Angle [°]	Standard Reading [°]	UUC* Reading [°]	Error [°]	Uncertainty ±[°]
1	Clockwise	0/360	360	359	-1	3.0
2		45	45	42	-3	3.0
3		90	90	87	-3	3.0
4		135	135	132	-3	3.0
5		180	180	178	-2	3.0
6		225	225	222	-3	3.0
7		270	270	273	3	3.0
8		315	315	318	3	3.0
9	Counter Clockwise	0/360	360	359	-1	3.0
10		45	45	42	-3	3.0
11		90	90	87	-3	3.0
12		135	135	132	-3	3.0
13		180	180	178	-2	3.0
14		225	225	222	-3	3.0
15		270	270	273	3	3.0
16		315	315	318	3	3.0

UUC*, Unit Under Calibration The reported expanded uncertainty is based on standard uncertainty multiplied by a coverage factor k=2 providing a level of confidence of approximately 95%

End of Certificate of Calibration



CERTIFICATE OF CALIBRATION

Certificate No: WS-05012022
Page 1 of 2 pages

Measurement Item : Cup anemometer with data logger

Manufacturer : Data logger: Novallux
Cup anemometer: Novallux

Model/Type : Data logger: 200-WS-250L
Cup anemometer: WS-02P

Serial Number : Data logger: A5190
Cup anemometer: -

ID No : Data logger: RYG_F80329
Cup anemometer: -

Customer : ALS laboratory group (Thailand) co., ltd
104 Phathanakan 40, Phathanakan Rd, Khwaeng Suan Luang, Khut Suan Luang, Bangkok 10250,
Thailand.

Test Conditions : Wind tunnel, cross jet section area : 900 cm²
Anemometer frontal area : 100 cm²
Diameter of mounting pipe : - mm
Blockage ratio of test object : 0.111 [-]

Test Conditions : Air temperature : 23.6 ±0.8 °C
Air pressure : 1014.5 ±0.4 hPa
Relative air humidity : 53.4 ±3.5 %RH

Calibration Procedure : Calibration was carried out base on:
ISO 91400-12-1 (6.3): 2008-Performance Measurements of Electricity Producing Wind
Turbines
MMAWET Anemometer Calibration Procedure - Version 2: 2009

Traceability : This calibration documents the traceable to national standard, which realize the unit of
measurements according to the international system of units (SI) through National Institute of
Metrology Thailand (NIMT).

Measurement Date : JAN 26, 2022.
Issued Date : JAN 31, 2022.

Calibrated by

☒ Mr. Soravit Thachwaid
☐ Miss Orathai Wivattalaya



Approved Signatory:

[Signature]
Mr. Parinya Booncharoen
Calibration Department Manager

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Continuation of Certificate of Calibration Number

Certificate No: WS-05012022
Page 2 of 2 Pages

Result of calibration: ☒ Without adjustment ☐ With adjustment
Calibration in the range of 1 - 18 m/s at a calibration interval of 1 m/s.

The results of calibration and associated measurement uncertainties are reported in the table below.

V _{ref} Reading m/s	V _{UUC} Reading m/s	Error (m/s)	Uncertainty (%)
2.076	2.0	-0.1	2.4
4.101	4.1	0.0	1.2
5.99	6.0	0.0	0.95
8.01	8.0	0.0	0.83
10.01	10.1	0.1	0.79
12.01	12.1	0.1	0.67
13.99	14.1	0.1	0.70
15.99	16.4	0.4	0.43
16.00	16.2	0.2	0.79
13.01	13.0	0.0	0.83
11.02	11.0	0.0	0.76
9.03	9.0	0.0	0.81
7.02	7.0	0.0	0.82
5.130	5.1	0.0	0.96
2.991	3.0	0.0	1.6
1.036	0.9	-0.1	4.6

UUC*, Unit Under Calibration

The reported expanded uncertainty is based on standard uncertainty multiplied by a coverage factor k=2 providing a level of confidence of approximately 95%

Appendix 1: Instrumentations

NO	Sensor	Manufacturer	Model/Type	Calibration Date	Certificate Report Number	Range
1	Pilot static	TESTO INC.	0532145	Aug 07, 2021	MW-0034-21	0 - 30 m/s
2	Precision Differential Pressure Meter	Zorgas	DPM2500	Aug 07, 2021	MW-0034-21	0 - 30 m/s
3	Air velocity transducer (hot wire)	TSI INC.	8455-12	Aug 08, 2021	MW-0035-21	0 - 5 m/s
4	Temperature	Zorgas	DSH-T1P	March 30, 2021	CL-027-24	-30 - 70 °C
5	Relative humidity	Zorgas	DSH-T1P	March 30, 2021	PH-00332021	0 - 100 %RH
6	Atmospheric pressure	Zorgas	DSH-T1P	March 30, 2021	BP-01022021	500 - 1100 hPa
7	Wind tunnel	ESCOM	MP3300	-	-	0 - 80 Hz

End of certificate of calibration



CERTIFICATE OF CALIBRATION

Certificate No: WD-05012022
Page 1 of 2 pages

Measurement Item : Wind direction sensor with data logger.

Manufacturer : Data logger: Novallux.
Wind direction sensor: Novallux.

Model/Type : Data logger: 200-WS-25LB
Wind direction sensor: WS-02P

Serial Number : Data logger: A5190
Wind direction sensor: -

ID No : Data logger: PWD_#03020
Wind direction sensor: -

Customer : ALS laboratory group (Thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd, Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10250 Thailand.

Environmental Condition

The measurement was carried out in an ambient temperature of (23±3) °C, and relative humidity of (40±10) %.

Measurement Method:

The wind direction sensor calibration according to comparison method with reference angle measurement electronic theodolite and line laser is used for axis control. The measurement were taken at 45° intervals in clockwise and counterclockwise directions.

Note: The UUC was warmed up for 1 hour prior to the calibration being performed

Traceability:

The measurement results are traceable to the international system of units (SI) through Certificate No: Q21066014, Certificate No: KW364/0026.

Measurement Date : JAN 26, 2022.
Issued Date : JAN 31, 2022.

Performed by

☒ Mr. Somwit Thechaisud
☐ Miss Orathai Wiatwattayak



Approved Signatory:

Mr. Panyia Booncharoen,
Calibration Department Manager

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Continuation of Certificate of Calibration Number

Certificate No: WD-05012022
Page 2 of 2 pages

Result of calibration: ☐ Without adjustment ☒ With adjustment.

Calibration in the range of 0 ~ 360° at a calibration interval of 45°.

The results of calibration and associated measurement uncertainties are reported in table below.

NO	Turning Direction	Nominal Angle (°)	Standard Reading (°)	UUC* Reading (°)	Error (°)	Uncertainty (°)
1	Clockwise	0/360	0	0	0	3.0
2		45	45	43	-2	3.0
3		90	90	90	0	3.0
4		135	135	135	0	3.0
5		180	180	181	1	3.0
6		225	225	227	2	3.0
7		270	270	273	3	3.0
8		315	315	316	1	3.0
9	Counter Clockwise	0/360	0	0	0	3.0
10		45	45	43	-2	3.0
11		90	90	90	0	3.0
12		135	135	135	0	3.0
13		180	180	181	1	3.0
14		225	225	227	2	3.0
15		270	270	273	3	3.0
16		315	315	316	1	3.0

UUC*: Unit Under Calibration The reported expanded uncertainty is based on standard uncertainty multiplied by a coverage factor k=2 providing a level of confidence of approximately 95%.

End of Certificate of Calibration



SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

451-451/1 Sirinthorn Rd, Bangbunru, Bangplud Bangkok 10700 THAILAND.
Tel:0-2435-8800 Fax:0-2433-1679 e-mail:cal-center@sithiporn.com http://www.sithiporn.com



Cert. No. : ACC22013
Pages : 1 of 3

Calibration Certificate

Equipment : SOUND CALIBRATOR
Manufacturer : RION
Model : NC-74
Serial No.: 34178121
ID No.: RYG_FS0213

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,
KHWAENG PHATTHANAKAN, KHET SUAN LUANG,
BANGKOK, 10250 THAILAND.

Location :
Ambient Temperature : (23.0 ± 3) °C
Pressure : (101.3 ± 3) kPa
Relative Humidity : (50.0 ± 20) %

Received Date : 22 APRIL 2022
Calibration Date : 26 APRIL 2022
Date of Issue : 29 APRIL 2022



Calibrated by : Nathakorn Pisutpaisan

Approved by :

T. Petchurai
(Thanakul Petchurai)

This certificate is issued in accordance with the requirements of ISO/IEC 17025 standard, may not be reproduced other than in full, except with the prior written approval of the head of Calibration Laboratory.

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACC22013
Job No. : VC65AC0054
Pages : 2 of 3

Calibration Procedure : CP-AC-03

Calibration Method :

This equipment was calibrated by based on IEC-60942-2003 Standard.

The sound pressure level, frequency and total distortion of the sound calibrator was measured using the reference microphone.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33511B	MY52302742	EF-0008-22	04-Feb-23
Digital Multimeter	33461A	MY53220104	EEL-BP, 04/0265	09-Feb-23
Digital Multimeter	33461A	MY53220076	EEL-BP, 03/0265	09-Feb-23
Digital Multimeter	33461A	MY60024273	EEL-BP, 05/0265	09-Feb-23
Programmable Attenuator	MAT-1070	62100114	EF-0009-22	07-Feb-23
Condenser Microphone	4180	2977900	AA-1013-22	24-Feb-23
Measuring Amplifier	NA-42KAI	34560495	AA-3005-22	22-Feb-23
Audio Analyzer	AVR-3360A	V744B6069	EF-0010-22	07-Feb-23

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.

3. This certificate is traceable to the international system of unit maintained at :

3.1 National Institute of Metrology (Thailand).

3.2 Thailand Institute of Scientific and Technological Research (TISTR).

T. Petchurai

Cert. No. : ACC22013
Job No. : VC65AC0054
Pages : 3 of 3

Result of calibration :

1. Sound pressure level

Specified sound pressure level (dB)	Measured value (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit (dB)
94	94.11	0.11	0.14	0.40

2. Frequency

Specified Frequency (Hz)	Measured value (Hz)	Deviated value (%)	Uncertainty (%)	Tolerance limit (%)
1000	1003.1	0.3	0.1	1.0

3. Total distortion

Measured value (%)	Uncertainty (%)	Tolerance limit (%)
2.02	0.10	3.0

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor $k = 2$ or any value following calculation, providing a level of confidence of approximately 95 %

End of Calibration Certificate

QF-TS12-04-04-020664

451-451/1 Sirinthon Rd, Bangumru, Bangplud Bangkok 10700 THAILAND.
Tel:0-2435-8800 Fax:0-2431-1679 e-mail:cal-center@sithiporn.com http://www.sithiporn.comCert. No. : ACL22031
Pages : 1 of 8

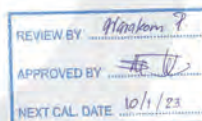
Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42/ Microphone U/C-52 / Preamplifier NH-24
Serial No. : 01222716 / 143832 / 22763
ID No. : RYG FS0020

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,
KHWAENG PHATTHANAKAN, KHET SUAN LUANG,
BANGKOK, 10250 THAILAND.

Location : -
Ambient Temperature : (23.0 ± 3) °C
Pressure : (101.3 ± 3) kPa
Relative Humidity : (50.0 ± 20) %
Received Date : 05 JANUARY 2022
Calibration Date : 10-12 JANUARY 2022
Date of Issue : 13 JANUARY 2022



Calibrated by : Nathakorn Pisutpaisan

Approved by :

T. Petchuraj
(Thanakul Petchuraj)

This certificate is issued in accordance with the requirements of ISO/IEC 17025 standard, may not be reproduced other than in full, except with the prior written approval of the head of Calibration Laboratory.

QF-TS12-04-04-020664

Cert. No. : ACL22031
Job No. : VC65AC0040
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by based on IEC-61672-3 (2013) Standard for sound level meter (SLM).
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.

For tests results of each items were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0012-21	10-Feb-22
Waveform Generator	33511B	MY52302742	EF-0011-21	10-Feb-22
Digital Multimeter	33461A	MY53220104	EEL_BP_05/0264	10-Feb-22
Digital Multimeter	33461A	MY53220076	EEL_BP_03/0264	08-Feb-22
Digital Multimeter	34461A	MY60024273	1-15180725251-1	15-Sep-22
Programmable Attenuator	MAT-1070	62100114	1500-07774E	08-Mar-22
Condenser Microphone	4180	2977900	AA-1008-21	05-Feb-22
Measuring Amplifier	NA-42KAI	34560495	AA-3003-21	16-Feb-22

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.

3. This certificate is traceable to the international system of unit maintained at :

3.1 National Institute of Metrology (Thailand).

3.2 Thailand Institute of Scientific and Technological Research (TISTR).

QF-TS12-04-04-020664

Cert. No. : ACL22031
Job No. : VC65AC0040
Pages : 3 of 8

Summary of Measurement Result :

Parameter	Pass	Fail	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	✓	-	0.2	N/A
2. Self-generated noise	✓	-	0.2	N/A
3. Acoustical signal tests of frequency weightings				
125 Hz	✓	-	0.3	0.6
1000 Hz	✓	-	0.3	0.6
8000 Hz	✓	-	0.3	0.7
4. Electrical signal tests of frequency weightings				
For 10 Hz to 4 kHz	✓	-	0.3	0.6
For > 4 kHz to 10 kHz	✓	-	0.3	0.7
For > 10 kHz to 20 kHz	-	-	-	1.0
5. Frequency and time weightings at 1 kHz	✓	-	0.2	0.2
6. Long-term stability	✓	-	0.1	0.1
7. Level linearity on the reference level range	✓	-	0.2	0.3
8. Level linearity including the level range control	✓	-	0.2	0.3
9. Tone burst response	✓	-	0.2	0.3
10. Peak C sound level	✓	-	0.2	0.35
11. Overload indication	✓	-	0.2	0.25
12. High level stability	✓	-	0.1	0.1

QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL22031
Job No. : VC65AC0040
Pages : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.96)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
14.6

2.2 The microphone of the sound level meter was replaced by electrical signal input device.

Frequency Weighting	Measured value (dB)
A - weight	12.6
C - weight	19.2
Flat	24.6

3. Acoustical signal tests of frequency weightings

Meter free-field acoustic response at a level of 84 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.7	0.7	0.7	± 1.5
1000	0.0	0.0	0.0	± 1.0
8000	-2.1	-2.0	-2.0	±5.0

QF-TS12-04-04-020664

P.T.A.

Continuation of Calibration Certificate

Cert. No. : ACL22031
Job No. : VC65AC0040
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	0.0	0.0	-0.1	±2.0
125	0.0	0.0	0.0	±1.5
250	0.0	0.0	0.0	±1.5
500	0.0	0.1	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.1	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	0.0	-
C - weight	94.0	0.0	± 0.2
Flat	94.0	0.0	± 0.2

5.2 Time weighting at 1 kHz

Frequency Weighting	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	94.0	0.0	-
Slow	94.0	0.0	± 0.1
Leq	94.0	0.0	± 0.1

6. Long - term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	94.0	0.0	± 0.3

QF-TS12-04-04-020664

P.T.A.

Continuation of Calibration Certificate

Cert. No. : ACL22031
Job No. : VC65AC0040
Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	± 1.1
136.0	136.0	0.0	± 1.1
135.0	135.0	0.0	± 1.1
134.0	134.0	0.0	± 1.1
133.0	133.0	0.0	± 1.1
132.0	132.0	0.0	± 1.1
131.0	131.0	0.0	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.0	0.0	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.0	0.0	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	54.0	0.0	± 1.1
49.0	49.0	0.0	± 1.1
44.0	44.0	0.0	± 1.1
39.0	38.9	-0.1	± 1.1
34.0	34.0	0.0	± 1.1
30.0	29.9	-0.1	± 1.1
29.0	28.9	-0.1	± 1.1
28.0	27.9	-0.1	± 1.1
27.0	26.9	-0.1	± 1.1
26.0	25.9	-0.1	± 1.1
25.0	24.8	-0.2	± 1.1

QF-TS12-04-04-020664

P.T.A.

Continuation of Calibration Certificate

Cert. No. : ACL22031
Job No. : VC65AC0040
Pages : 7 of 8

8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Auto	94.0	94.0	0.0	±1.1

9. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.5 ; -5.0
	2	8	117.0	117.0	0.0	1.0 ; -2.5
	200	800	134.0	134.1	0.1	±1.0
Slow	2	8	108.0	108.0	0.0	1.5 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
SEL	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.1	0.1	±1.0

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L _{Cpeak} (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
One	136.4	136.3	-0.1	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.1	0.1	-
Positive half cycle	135.4	135.2	-0.2	±2.0
Negative half cycle	135.4	135.2	-0.2	±2.0

QF-TS12-04-04-020664

P.T.A.

Continuation of Calibration Certificate

Cert. No. : ACL22031
Job No. : VC65AC0040
Pages : 8 of 8

11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle		
89.6	89.6	0.0	±1.5

12. High level stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	137.0	137.0	0.0	±0.3

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor $k = 2$ or any value following calculation, providing a level of confidence of approximately 95 %

End of Calibration Certificate

QF-TS12-04-04-020664



451-451/1 Sirinthorn Rd., Bangbunru, Bangkok 10700 THAILAND
Tel:0-2435-8800 Fax:0-2433-1679 e-mail:cal-center@sithiporn.com http://www.sithiporn.com

Cert. No. : ACL22030
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42/ Microphone UC-52 / Preamplifier NH-24
Serial No.: 01122607 / 145554 / 34373
ID No.: RYG_FS0019

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,
KHWAENG PHATTHANAKAN, KHET SUAN LUANG,
BANGKOK, 10250 THAILAND.

Location : -
Ambient Temperature : (23.0 ± 3) °C
Pressure : (101.3 ± 3) kPa
Relative Humidity : (50.0 ± 20) %
Received Date : 05 JANUARY 2022
Calibration Date : 10-12 JANUARY 2022
Date of Issue : 13 JANUARY 2022

REVIEW BY	<i>Natthakorn P.</i>
APPROVED BY	<i>T. Petchum</i>
NEXT CAL DATE	10/1/25

Calibrated by : Natthakorn Pisutpaisan

Approved by : *T. Petchum*
(Thanakul Petchum)

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QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL22030
Job No. : VC65AC0040
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by based on IEC-61672-3 (2013) Standard for sound level meter (SLM).
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.

For tests results of each items were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0012-21	10-Feb-22
Waveform Generator	33511B	MY52302742	EF-0011-21	10-Feb-22
Digital Multimeter	33461A	MY53220104	EEL.BP. 05/0264	10-Feb-22
Digital Multimeter	33461A	MY53220076	EEL.BP. 03/0264	08-Feb-22
Digital Multimeter	34461A	MY60024273	I-15180725251-1	15-Sep-22
Programmable Attenuator	MAT-1070	62100114	I500-07774E	08-Mar-22
Condenser Microphone	4180	2977900	AA-1008-21	05-Feb-22
Measuring Amplifier	NA-42KAI	34560495	AA-3003-21	16-Feb-22

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.

3. This certificate is traceable to the international system of unit maintained at :

3.1 National Institute of Metrology (Thailand).

3.2 Thailand Institute of Scientific and Technological Research (TISTR).

QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL22030
Job No. : VC65AC0040
Pages : 3 of 8

Summary of Measurement Result :

Parameter	Pass	Fail	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	✓	-	0.2	N/A
2. Self-generated noise	✓	-	0.2	N/A
3. Acoustical signal tests of frequency weightings				
125 Hz	✓	-	0.3	0.6
1000 Hz	✓	-	0.3	0.6
8000 Hz	✓	-	0.3	0.7
4. Electrical signal tests of frequency weightings				
For 10 Hz to 4 kHz	✓	-	0.3	0.6
For > 4 kHz to 10 kHz	✓	-	0.3	0.7
For > 10 kHz to 20 kHz	-	-	-	1.0
5. Frequency and time weightings at 1 kHz	✓	-	0.2	0.2
6. Long-term stability	✓	-	0.1	0.1
7. Level linearity on the reference level range	✓	-	0.2	0.3
8. Level linearity including the level range control	✓	-	0.2	0.3
9. Tone burst response	✓	-	0.2	0.3
10. Peak C sound level	✓	-	0.2	0.35
11. Overload indication	✓	-	0.2	0.25
12. High level stability	✓	-	0.1	0.1

QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL22030
Job No. : VC65AC0040
Pages : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.96)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
16.5

2.2 The microphone of the sound level meter was replaced by electrical signal input device.

Frequency Weighting	Measured value (dB)
A - weight	13.1
C - weight	19.4
Flat	24.8

3. Acoustical signal tests of frequency weightings

Meter free-field acoustic response at a level of 84 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.5	0.5	0.6	± 1.5
1000	0.0	0.0	0.0	± 1.0
8000	-1.7	-1.7	-1.6	±5.0

QF-TS12-04-04-020664

T. Btl.

Continuation of Calibration Certificate

Cert. No. : ACL22030
Job No. : VC65AC0040
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	-0.1	-0.1	-0.1	±2.0
125	-0.1	0.0	0.0	±1.5
250	0.0	0.0	0.0	±1.5
500	0.0	0.0	-0.1	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	0.0	-
C - weight	94.0	0.0	± 0.2
Flat	94.0	0.0	± 0.2

5.2 Time weighting at 1 kHz

Frequency Weighting	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	94.0	0.0	-
Slow	94.0	0.0	± 0.1
Leq	94.0	0.0	± 0.1

6. Long - term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	94.0	0.0	± 0.3

QF-TS12-04-04-020664

T. Btl.

Continuation of Calibration Certificate

Cert. No. : ACL22030
Job No. : VC65AC0040
Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	± 1.1
136.0	136.0	0.0	± 1.1
135.0	135.0	0.0	± 1.1
134.0	134.0	0.0	± 1.1
133.0	133.0	0.0	± 1.1
132.0	132.0	0.0	± 1.1
131.0	131.0	0.0	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.0	0.0	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.0	0.0	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.1	0.1	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.1	0.1	± 1.1
69.0	69.1	0.1	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.1	0.1	± 1.1
54.0	54.0	0.0	± 1.1
49.0	49.0	0.0	± 1.1
44.0	44.0	0.0	± 1.1
39.0	39.0	0.0	± 1.1
34.0	34.0	0.0	± 1.1
30.0	30.0	0.0	± 1.1
29.0	29.0	0.0	± 1.1
28.0	28.0	0.0	± 1.1
27.0	26.9	-0.1	± 1.1
26.0	25.9	-0.1	± 1.1
25.0	24.9	-0.1	± 1.1

QF-TS12-04-04-020664

T. Btl.

Continuation of Calibration Certificate

Cert. No. : ACL22030
Job No. : VC65AC0040
Pages : 7 of 8

8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Auto	94.0	94.0	0.0	±1.1

9. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.5 ; -5.0
	2	8	117.0	117.0	0.0	1.0 ; -2.5
	200	800	134.0	134.0	0.0	±1.0
Slow	2	8	108.0	108.0	0.0	1.5 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
SEL	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.0	0.0	±1.0

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, Lepeak (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
One	136.4	136.3	-0.1	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
Positive half cycle	135.4	135.1	-0.3	±2.0
Negative half cycle	135.4	135.1	-0.3	±2.0

QF-TS12-04-04-020664

T. Btl.

Continuation of Calibration Certificate

Cert. No. : ACL22030
Job No. : VC65AC0040
Pages : 8 of 8

11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle		
89.5	89.6	0.1	±1.5

12. High level stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	137.0	137.0	0.0	±0.3

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor $k = 2$ or any value following calculation, providing a level of confidence of approximately 95 %

End of Calibration Certificate



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
3344 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL: 0-2713-3880-27 FAX: 0-2719-9884



Cert.No.: 22GH377
Page.: 1 of 2

Certificate of Calibration

Equipment : pH Meter
Manufacturer : Mettler Toledo
Model : Seven2Go
Serial No. : B531256371
ID No. : RYG_FS0420
Condition As-Received : Used Item
Received Date : 11 March 2022
Calibration Date : 14 March 2022
Reference : 2203-0495DSG-1
Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd. Rayong Branch
618/10 Moo 5 T.Maenam Khu, A.Pluakdaeng, Rayong 21140, Thailand
Ambient Temperature : (25 ± 2.5) °C
Relative Humidity : (50 ± 15) %
Calibration Procedure : In-house method
- GP-CH5 by direct measurement with standard voltage calibrator and direct measurement with certified reference material (CRM)

Calibrated by : Worakorn Lemgagatrakul

Approved by :
Approved Signatory

() Malee Butruwae
() Sathip Meangmai
() Worakorn Lemgagatrakul

Issue Date : 17 March 2022

The Uncertainties are for a confidence probability of approximately 95%

This certificate may not be reproduced other than in full, except with the prior written approval of the head of Corporate Services & Equipment Calibration and Testing Services.

A 0039308

QF-TS12-04-04-020664

or 011



Cert. No.: 22CH377
Page.: 2 of 2

Condition of this calibration result

1. Reference Standard Instrument

Instrument	Serial No.	ID No.	Cert. No.	Due Date
1) Dismount Process Calibrator	64030049	130RC116	21E2682	30 Aug 2022

This certification is traceable to the International System of Unit maintained at:-
- Traceable to National Institute of Metrology (Thailand), NIMT

2. Certified Reference Materials : The measurement results are traceable to SI through CPA chem Ltd., ANSI-ASQ National Accreditation Board, Accredited No. ARI-1835

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.008	CPA chem	766820	23 Sep 2023
pH 6.863	CPA chem	766822	04 Sep 2022
pH 10.015	CPA chem	766824	04 Sep 2022

3. This certificate is valid only to the item calibrated on date and place of calibration.

Calibration Results

Function : mV Measurement

Performing standard curve by Fluke at pH (4,7,10)

Unit Under Calibration	Nominal Value	Standard Voltage Input		Actual Reading		Uncertainty of Measurement (mV)	Coverage factor k
		pH	mV	mV	pH		
pH Meter	4.00	177.48	177	4.00	0.58	2.00	
S/N: B5312563/1	7.00	0.00	0	7.00	0.58	2.00	
	10.00	-177.48	-176	10.00	0.58	2.00	

Function : pH Measurement

Performing three buffers standard curve by using buffer nominal pH (4,7,10)

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH measurement (z)	Coverage factor k
pH Electrode	4.008	4.01	181	0.0079	2.00
S/N: 1311407	6.863	6.86	7	0.0093	2.00
	10.015	10.01	-171	0.0092	2.00

The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor k , providing a level of confidence of approximately 95 %.

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a 1100595



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
3344 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL: 0-2713-3880-27 FAX: 0-2719-9884



Cert. No.: 22LME1
Page.: 1 of 2

Certificate of Calibration

Equipment : pH Meter with Sensor
Manufacturer : Mettler Toledo
Model : Seven2Go
Serial No. : B531256371
ID No. : RYG_FS0420
Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd.
(Rayong Branch)
618/10 Moo 5 T. Maenam Khu, A. Pluakdaeng, Rayong 21140 Thailand
Location : TPA On Site Calibration Laboratory
Received Order : 11 March 2022
Calibrated Date : 15 March 2022
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
AC Line Voltage : (220 ± 22) V

Calibrated by : Malee Butruwae

Approved by :
Approved Signatory

() Pantihipa Tameyaku
() Suwit Injai

Issue Date : 17 March 2022

The Uncertainties are for a confidence probability of approximately 95%

This certificate may not be reproduced other than in full, except with the prior written approval of the head of Corporate Services & Equipment Calibration and Testing Services.

A 0039307

Equipment : pH Meter with Sensor
Condition As-Received : Used Item
Reference : 2203-0495DSC-2
Procedure Used :-

Calibration were conducted using in-house calibration procedure CP-OT01 according to comparison with Industrial Platinum Resistance Thermometer (IPRT) into Temperature Bath.
 The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Digital Thermometer	1023	2100000	2111273	22 Nov 2022

2) This certificate is valid only to the item calibrated on date and place of calibration.
 3) This certification is traceable to the International System of Unit.

Result of Calibration :- (*) Without Adjustment

Function : Temperature measurement.

This instrument was connected with temperature sensor, Q/N.: 1311407

Calibration Point (°C)	Immersion Depth (mm)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty (± °C)	Coverage Factor k
25.0	100	25.009	25.4	0.391	0.16	2.00
30.0	100	30.008	30.5	0.492	0.16	2.00
40.0	100	39.997	40.6	0.603	0.16	2.00
50.0	100	49.997	50.6	0.603	0.16	2.00

UUC* : Unit Under Calibration

The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor k, providing a level of confidence of approximately 95 %.

-o-o-

a 1100597

TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
 CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
 5344 PATTANAKARN ROAD SOI 19, SUANLUANG, SUANLUANG BANGKOK 10250
 TEL: 0-2717-3000-27 FAX: 0-2719-9484

Certificate of Calibration

Equipment : pH Meter
Manufacturer : Mettler Toledo
Model : Seven Compact S220
Serial No. : C104059460
ID No. : RYG_EN0183
Condition As-Received : Used Item
Received Date : 16 March 2022
Calibration Date : 17 March 2022
Reference : 2203-0611DSC-4
Submitted by : ALS Laboratory Group (Thailand) Co., Ltd.
 Rayong Branch
 616/10 Moo 5 T.Maenam Khu.
 A.Pluakdaeng, Rayong 21140, Thailand

Ambient Temperature : (25 ± 2.5) °C
Relative Humidity : (50 ± 15) %
Calibration Procedure :
 In - house method :
 - CP-CH5 by direct measurement with standard voltage calibrator and direct measurement with certified reference material (CRM)
 - CP-CH8 by comparison with standard thermometer

Calibrated by : Warakorn Lemgagrakul

Approved by : *Malee*
 Approved Signatory

(/) Malee Butkruea
 () Sathip Meangmai
 () Warakorn Lemgagrakul

Issue Date : 22 March 2022

The Uncertainties are for a confidence probability of approximately 95 %

This certificate may not be reproduced other than in full, except with the prior written approval of the head of Corporate Services 3: Equipment Calibration and Testing Services.

A 0037307

Condition of this calibration result

1. Reference Standard Instrument :-

Instrument	Serial No.	ID No.	Cert. No.	Due Date
1) Document Process Calibrator	54030049	130RC116	21E2682	25 Aug 2022
2) Ref. Standard Thermometer	4982054	110RC044	2111201	26 Oct 2022

This certification is traceable to the International System of Unit maintained at:-
 - Traceable to National Institute of Metrology (Thailand), NIMT

2. Certified Reference Materials : The measurement results are traceable to SI through CPA chem Ltd., ANSI-ASQ National Accreditation Board, Accredited No. AR-1835

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.008	CPA chem	788995	01 Jan 2024
pH 6.982	CPA chem	761017	02 Aug 2022
pH 10.015	CPA chem	766824	04 Sep 2022

3. This certificate is valid only to the item calibrated on date and place of calibration.

Calibration Results

Function : mV Measurement

Performing standard curve by Fluke at pH (4,7,10)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading	Uncertainty of Measurement (± mV)	Coverage factor k	
pH Meter S/N.: C104059460	pH	mV	mV	pH		
	4.000	177.48	177.4	4.000	0.058	2.00
	7.000	0.00	-0.1	7.000	0.058	2.00
	10.000	-177.48	-177.5	10.000	0.058	2.00

a 1100955

Calibration Results

Function : pH Measurement

Performing three buffers standard curve by using buffer nominal pH (4,7,10)

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH measurement (±)	Coverage factor k
pH Electrode S/N.: 1453404	4.008	4.010	177.7	0.0046	2.00
	6.982	6.988	3.6	0.0084	2.00
	10.015	10.010	-172.9	0.0073	2.05

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model : InLab Expert Pro-ISM
 - Serial No. : 1453404
 - Dimension of probe;
 - Length : 120 mm.
 - Diameter : 12 mm.
 - Immersion Depth : 100 mm.

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of measurement (± °C)	Coverage factor k
25.0	25.002	24.9	-0.102	0.13	2.00

Remark :- UUC* = Unit Under Calibration

The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor k, providing a level of confidence of approximately 95 %.

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a 1100954

TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
53/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG, BANGKOK 10250
TEL. 0-2717-3000-24 FAX. 0-2719-9484

Certificate of Calibration Certificate No.: 22E986
Page: 1 of 2

Equipment: pH Meter
Manufacturer: Mettler Toledo
Model: SevenCompact S220
Serial No.: C104059460
ID No.: RYG_EN0183
Condition As-Received: Used Item
Received Date: 18 March 2022
Calibration Date: 21 March 2022
Reference: 2203-0611DSC
Ambient Temperature: (23 ± 2) °C
Relative Humidity: (50 ± 10) %
Submitted by: ALS Laboratory Group (Thailand) Co., Ltd. Rayong Branch
616/10 Moo 5 T.Maenam Khu, A.Pluakdaeng Rayong
21140, Thailand

Procedure used: Calibration was conducted using in-house calibration Procedure CP-E17 According to direct measurement method with Multi-Product Calibrator.

Condition of this result of calibration

1. Reference standards instruments:

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Multi-Product Calibrator	5500A	6440007	21E1444	07 May 2022

2. This result of calibration was made on requested at the point specified by customer.

3. This certificate is valid only to the item calibrated on date and place of calibration.

4. This Certification is traceable to the International System of Unit maintained at:-
National Institute of Metrology Thailand (NIMT)

Reviewed By: *[Signature]*
APPROVED BY: *[Signature]*
NEXT CAL DATE: 21/3/23

Calibrated by: Pongsorn Boonyaporn
Issue Date: 22 March 2022
Approved Signatory: *[Signature]*
[] Phalinee Prabpaipal
[] Nuntawat Khamchai
[] Pornthippa Tameyakul

B 0284414

Cert. No.: 22E986
Page: 2 of 2

Result of calibration:- (*) Without adjustment () After adjustment

Function: DC voltage measurement Range: 2000 mV

Standard Value	UUC* Reading	Error	Uncertainty
(mV)	(mV)	(mV)	(± μV)
-200.0000	-200.0	0.0	72
-150.0000	-150.0	0.0	69
-100.0000	-100.0	0.0	65
-50.0000	-50.0	0.0	62
0.0000	0.0	0.0	58
50.0000	50.0	0.0	62
100.0000	100.0	0.0	65
150.0000	150.0	0.0	69
200.0000	200.0	0.0	72

The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor $k = 2$, providing a level of confidence of approximately 95 %

*UUC= Unit Under Calibration.

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a 1101070

RYG_EN0029

TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
53/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG, BANGKOK 10250
TEL. 0-2717-3000-27 FAX. 0-2719-9484

Certificate of Calibration Cert.No.: 22CH283
Page: 1 of 2

Equipment: Conductivity Meter
Manufacturer: Mettler Toledo
Model: S230
Serial No.: B241407147
ID No.: RYG_EN0029
Condition As-Received: Used Item
Received Date: 22 February 2022
Calibration Date: 23 February 2022
Reference: 2202-0732DSC-1
Submitted by: ALS Laboratory Group (Thailand) Co., Ltd. (Rayong Branch)
616/10 Moo 5 T.Maenam Khu, A.Pluakdaeng Rayong 21140, Thailand
Ambient Temperature: (25 ± 2.5) °C
Relative Humidity: (50 ± 15) %
Calibration Procedure: In-house method:
- CP-CH6: based on direct measurement by using certified reference material (CRM)
Calibrated by: Walalak Sirthean
Approved by: *[Signature]*
Approved Signatory
(/) Malee Butkruea
(/) Sathip Meangmai
(/) Warakorn Lemgagrakul
Issue Date: 25 February 2022

Reviewed By: *[Signature]*
APPROVED BY: *[Signature]*
NEXT CAL DATE: 24/8/23

The Uncertainties are for a confidence probability of approximately 95%
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A 0038145

Cert.No.: 22CH283
Page: 2 of 2

Condition of this result of calibration

1. Reference Standard Instrument:-

Instrument	Serial No.	ID No.	Certificate No.	Due date
1) Thermometer	9549224	130RC003	21451	15 Apr 2022

This certification is traceable to the International System of Unit maintained at:-
- Traceable to National Institute of Metrology (Thailand), NIMT

2. Certified Reference Materials:-
- Conductivity calibration solution, CPA chem Ltd., The measurement results are traceable to SI through CPA chem Ltd., ANSI-ASQ National Accreditation Board, Accredited No. AR-1835

Conductivity Solution	Manufacturer	Lot No.	Exp. date
84.000 μS/cm	CPA Chem	754034	28 June 2022
1413.0 μS/cm	CPA Chem	766815	04 Sep 2022
12.880 mS/cm	CPA Chem	761022	02 Aug 2022

- Control Conductivity calibration solution temperature by Water bath (25±0.1) °C

3. This certificate is valid only to the item calibrated on date and place of calibration.

Calibration results
Function: Conductivity Measurement
(*) After Adjustment at 1413.0 μS/cm
Conductivity Electrode Serial No.: 5821441030

Standard Conductivity Solution	Before Adjustment UUC* Reading	After Adjustment UUC* Reading	Uncertainty of Measurement (±)	Coverage factor k
84.000 μS/cm	82.4 μS/cm	84.4 μS/cm	0.62 μS/cm	2.00
1413.0 μS/cm	1375 μS/cm	1413 μS/cm	9.2 μS/cm	2.00
12.880 mS/cm	12.54 mS/cm	12.81 mS/cm	0.086 mS/cm	2.00

Remark
- UUC* = Unit Under Calibration
- Cell constant = 0.555236 cm⁻¹

The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor k , providing a level of confidence of approximately 95 %

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a 1090534



Metrological Center

SCI ECO Services Company Limited

33/2 Moo 3, T.Banpa, A.Kaengkhoi, Saraburi 18110, Thailand.
Saraburi Tel : +66 3627 3096 Fax : +66 3627 3100
Bangkok Tel : +668 9205 6851 , +669 8247 2360
Website : www.scieco.co.th E-Mail : calibrate@scg.co.th



Certificate No. T220384101 "Substitute for Calibration Certificate Number T220384" Page 1 of 4

Certificate of Calibration

Equipment : Chamber (Cold Room)
Manufacturer : MODULAR
Model : IREVCOHCOO
Serial No. : C00351459
Customer Code : RYG_EN0184
ID No. : T1939A5
Customer : ALS Laboratory Group (Thailand) Co.,Ltd. (Rayong Branch)
616/10 Moo 5 T.Maenam Khu,
A.Pluakdaeng, Rayong 21140
Customer Location : Laboratory
Date of Receipt : 18 February 2022
Calibrated By : Boonchai Suriyawong (Site Calibration Manager)
Approved By : Sujjar Nakhakred (Site Calibration Manager)
Date of Issue : 18 MAR 2022



The uncertainties are for a confidence probability of approximately 95%.

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation Scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standard laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Metrological Center.

FM-L14 117/01-02-64



Metrological Center

SCI ECO Services Company Limited

33/2 Moo 3, T.Banpa, A.Kaengkhoi, Saraburi 18110, Thailand.



Certificate No. T220384101

Page 2 of 4

Calibration Report

Equipment : Chamber (Cold Room)
Date of Calibration : 22 February 2022
Environment : Temperature : 23.2-24.3 °C
Line Voltage : 221.8-227.2 V
Relative Humidity : 55 - 65 %RH

Condition of this results of calibration :

- This equipment was calibrated by insert 16 standard thermocouples type T into its chamber , the other one standard thermocouples type T use for ambient temperature measurement . The calibration was done in according to WI-T20 (based on ASTM E145-94 (Reapproved 2001) and AS2853-1986).
All data show below were final values and the initial data from customer request . The temperature scale used was based on ITS - 90 .
- Reference Standard Instrument :

Instrument	Model	Instrument No.	Certificate No.	Due Date
TC	TYPE T	TN141-TN150	T210743	21 April 2022
TC	TYPE T	TN151-TN160	T210743	21 April 2022
DATA LOGGER	34970A	T150	T210743	21 April 2022
- This certificate is traceable to :
National Institute of Metrology (Thailand) through Metrological Center (NSC-TISI-TIS 17025 CALIBRATION 0244.)
- Condition of calibrated item : good
Equipment Description :
Time Constant : * Hour 40 Minute At 3 °C
Fresh Air Damper : ☐ Open ☐ Min ☐ Medium ☐ Max
☐ Close
☒ Not Available
- Adjustment :
(X) without adjustment () after adjustment

Approved By: Sujjar Nakhakred

FM-L15 117/15-05-63



Metrological Center

SCI ECO Services Company Limited

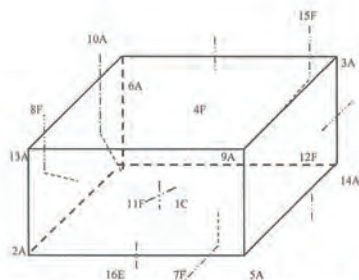
33/2 Moo 3, T.Banpa, A.Kaengkhoi, Saraburi 18110, Thailand.



Certificate No. T220384101

Page 3 of 4

Calibration Report



C = Centre, F = Centre of Face, A = Corner, E = Centre of Edge

1C = TN141	12F = TN152
2A = TN142	13A = TN153
3A = TN143	14A = TN154
4F = TN144	15F = TN155
5A = TN145	16E = TN156
6A = TN146	
7F = TN147	
8F = TN148	
9A = TN149	
10A = TN150	
11F = TN151	

Approved By: Sujjar Nakhakred

FM-L15 117/15-05-63



Metrological Center

SCI ECO Services Company Limited

33/2 Moo 3, T.Banpa, A.Kaengkhoi, Saraburi 18110, Thailand.



Certificate No. T220384101

Page 4 of 4

Calibration Report

Measurement Results

Calibration Point	Average Standard Reading at each position (°C)									
	TN141	TN142	TN143	TN144	TN145	TN146	TN147	TN148	TN149	TN150
3.0	2.80	2.96	2.98	2.97	3.16	3.29	2.95	3.14	3.10	3.45
	TN151	TN152	TN153	TN154	TN155	TN156				
	3.04	3.19	3.03	3.34	3.21	3.11				

Chamber (Cold Room)			Temperature Distribution				
Setting (°C)	Reading (°C)		Average (°C)	Stability (± °C)	Uniformity (°C)	Uncertainty (± °C)	Coverage Factor k
	Min	Max					
3.0	2.7	4.1	3.5	1.30	1.30	2.00	2.05

* The Accused uncertainty exclude "uniformity"

The calibration result apply only the above calibrated item.

The result of test was found accurate as shown on date and place of test only.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k which for a t-distribution, providing a level of confidence of approximately 95 % .

Approved By: Sujjar Nakhakred

FM-L15 117/15-05-63



Cert.No.: 22TW34
Page.: 1 of 2

Certificate of Testing

Equipment : DO Meter
Manufacturer : YSI
Model : 5000-115V
Serial No. : 15E102796
ID No. : RYG_EN0032
Received Date : 11 February 2022
Test Date : 14 February 2022
Reference : 2202-0404DSC-4
Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd.
(Rayong Branch)
616/10 Moo 5 T.Maenam Khu, A.Pluakdaeng,
Rayong 21140, Thailand
Laboratory Condition : Temperature (25 ± 5) °C
Humidity (50 ± 20) %
Test Procedure : In - house method : CP-CH9
by Comparison Technique with Azide Modification Method
Tested by : Walalak Sirthean
Approved by :
Approved Signatory
() Malee Butkruea
(✓) Saithip Meangmai
() Warakorn Lemgagrakul
Issue Date : 18 February 2022

REVIEW BY
APPROVED BY
NEXT CAL. DATE 15/8/23

B 0281285



Cert.No.: 22TW34
Page.: 2 of 2

Result : Dissolved Oxygen Meter Adjustment With Air 100 %
Dissolved Oxygen Probe No.: 15E100464

Titration Method (Azide Modification Method) (mg/L)	DO Meter Reading (mg/L)	Standard Deviation (mg/L)
8.02	8.02	0.0084

This report was certified only for the instrument we tested. It is allowable to use for study the system efficiency, The environmental impact control and present to organization it may concerned. Intend to use for advertising and referral purpose is prohibited. This report may not be reproduced other in full, without written approval of the laboratory.

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a 1094744



Cert. No.: 22LM12
Page.: 1 of 2

Certificate of Calibration

Equipment : DO Meter with Sensor
Manufacturer : YSI
Model : 5000-115V
Serial No. : 15E102796
ID No. : RYG_EN0032
Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd. (Rayong Branch)
616/10 Moo 5 T.Maenam Khu, A.Pluakdaeng,
Rayong 21140, Thailand
Location : TPA On Site Calibration Laboratory
Received Order : 11 February 2022
Calibrated Date : 21 February 2022
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
AC Line Voltage : (220 ± 22) V
Calibrated by : Kunchit Promprat
Approved by :
Approved Signatory
() Pornthippa Tameyakul
(✓) Malee Butkruea
() Suwit Imjai
Issue Date : 21 February 2022

The Uncertainties are for a confidence probability of approximately 95%.

This certificate may not be reproduced other than in full, except with the prior written
Approval of the head of Corporate Services 3 : Equipment Calibration and Testing Services.

A 0038008



Equipment : DO Meter with Sensor
Condition As-Received : Used Item
Reference : 2202-0404DSC-5
Procedure Used :-

Cert. No.: 22LM12
Page.: 2 of 2

Calibration were conducted using in-house calibration procedure CP-OT01 according to comparison with Industrial Platinum Resistance Thermometer (IPRT) into Temperature Bath.
The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Digital Thermometer	1523	2188080	2111273	22 Nov 2022

2. This certificate is valid only to the item calibrated on date and place of calibration.
3. This certification is traceable to the International System of Unit.

Result of Calibration :- (*) Without Adjustment

Function : Temperature measurement.

This instrument was connected with temperature sensor, S/N.: 15E100464

Calibration Point (°C)	Immersion Depth (mm)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty (± °C)	Coverage Factor k
20.00	45	20.001	19.88	-0.121	0.15	2.00

UUC* : Unit Under Calibration

The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor *k*, providing a level of confidence of approximately 95 %.

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a 1095714



Certificate of Calibration

Cert. No.: 22TM317
Page: 1 of 3

Equipment : Low Temp. Incubator
Manufacturer : Memmert
Model : IPP750
Serial No. : V818.0084
ID No. : RYG_EN0154
Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd.
(Rayong Branch)
616/10 Moo 5 T.Maenam Khu,
A.Pluakdaeng, Rayong 21140, Thailand
BOD Room
Location :
Received Order : 22 April 2022
Calibration Date : 22 April 2022
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
Calibrated by : Man Pattansongpaiboon
Approved by :
() Pornthippa Tameyakul
(x) Malee Butkruea
() Suwit Imjai

Issue Date : 3 May 2022
The Uncertainties are for a confidence probability of approximately 95%
This certificate may not be reproduced other than in full, except with the prior written
Approval of the head of Corporate Services 3: Equipment Calibration and Testing Services.

A 0040735



Equipment : Low Temp. Incubator
Condition As-Received : Used Item
Reference : 2204-0146OC-1
Procedure Used :-

Cert. No.: 22TM317
Page: 2 of 3

Calibration were conducted using calibration procedure CP-OT02 according to direct measurement
The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Data Acquisition	34970A	MY44031769	21LM12	02 Sep 2022

2. This certificate is valid only to the item calibrated on date and place of calibration.

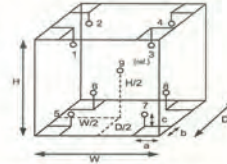
3. This certification is traceable to the International System of Unit.

Result of Calibration :- () Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close

Environment during calibration		
	Beginning	Finished
Temp. (°C)	25	25
REL.Humid. (%)	54	58
AC Supply (Volt)	221	223



Probe Installation Details : Dimension of Chamber :
a = 10 cm D = 0.80 m
b = 10 cm W = 1.0 m
c = 10 cm H = 1.2 m
Capacity = 0.75 m³

Position :	Ref. Std. ID No.:
1	9RTD-2/1
2	9RTD-2/2
3	9RTD-2/3
4	9RTD-2/4
5	9RTD-2/5
6	9RTD-2/6
7	9RTD-2/7
8	9RTD-2/8
9 (ref.)	9RTD-2/9

a 1106485



Equipment : Low Temp. Incubator
Condition As-Received : Used Item
Reference : 2204-0146OC-1
Result of Calibration :- () Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Close

Cert. No.: 22TM317
Page: 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Uncertainty (± °C)	Coverage Factor k
20.0	20.0	20.0	0.022	0.20	0.22	0.30	2

Calibration Point (°C)	Measured Temperature (°C)								
	Position								
	1	2	3	4	5	6	7	8	9 (ref.)
20.0	20.209	20.174	20.199	20.110	20.075	20.062	20.027	20.069	20.030

Average* : The average of 30 values in each position.
Temperature stability : One-half of the greatest maximum difference of measured temperature at any one sensor.
Temperature uniformity : The maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady-state conditions.
Overall Variation : The Difference of the maximum and minimum measured temperatures throughout observation.
UUC* : Unit Under Calibration
Note : The reported uncertainty of measurement was included stability and excluded uniformity .
The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor k, providing a level of confidence of approximately 95% .

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a 1106484



PENTA
CALIBRATION

PENTA CALIBRATION CO., LTD.
66/124 The Connect 33 Village Kanchanaphisek Road
Dokmai Prawat Bangkok 10250
Tel: +66 (0) 2069-9773
www.pentalab.com

Certificate of Calibration

Represent to Certificate of Calibration PTC/07/22103

Certificate No.:	PTC/07/22103	Page:	1 of 2
Equipment:	Digital Balance	Condition:	Normal
Manufacturer:	Sartorius	Serial No.:	26207038
Model:	MSE224S-100-DU	ID No.:	RYG_EN0002
Type of Balance:	Single interval		

Customer: ALS Laboratory Group (Thailand) Co.,Ltd.
616/10 Moo 5 T.Maenamkoo, A.Pluakdaeng,
Rayong 21140, Thailand

Environment Condition: Temperature 23.9 °C ± 0.3 °C
Humidity 58.1 %RH ± 4.4 %RH
Air density 1.17 kg/m³

Calibration Place: ALS Laboratory Group (Thailand) Co.,Ltd.
616/10 Moo 5 T.Maenamkoo, A.Pluakdaeng,
Rayong 21140, Thailand

The Method used: In house method, PTC-WI-07, base on Euramet cg. 18

Traceability: This certificate is traceable to the SI Units through Thai Calibration Service Co.,Ltd
, NSC-ONSC Accreditation No.: Calibration 0189

Date Received: March 23, 2022
Calibration Date: March 23, 2022
Issued Date: March 25, 2022
Calibration By: Mr. Rungroje Metakul

Reviewed by
(Mr.Kriangsak Kalasin)

Approved By :
(Mr. Keattisak Kerdto)
Laboratory Manager

This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.

The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to the Expression of Uncertainty in Measurement (GUM). The effect that the results relate only to the items calibrated.

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Represent to Certificate of Calibration_PTC/07/22103

Certificate No.: PTC/07/22103

Page: 2 of 2

Measurement Results:

Without Adjustment:

Function Calibration: Non Adjustment

Eccentric Error: Weight to be 1/3, 1/2, or of Maximum capacity



Eccentricity test 100 (g)				
Position (g)				
1	2	3	4	5
0.0000	0.0000	-0.0002	0.0002	0.0002
Maximum deviation: 0.0002				

Repeatability Test: Weight to be $1/2 \leq L_1 \leq$ Maximum capacity

Determination of the standard deviation of weighing balance., Readability 0.0001 (g)

Nominal test value (g)	Standard Deviation
200	0.00003

Error of indication : from nominal value., Readability 0.0001 (g)

Nominal Value (g)	Conventional Mass (g)	Indication (g)	Correction of Balance (g)	Uncertainty (g)	k
0	0.00000	0.0000	0.0000	0.000086	2.16
0.01	0.01000	0.0100	0.0000	0.00010	2.06
0.1	0.10000	0.1000	0.0000	0.00010	2.06
1	1.00000	1.0000	0.0000	0.00010	2.06
2	2.00000	1.9999	0.0001	0.00010	2.06
5	5.00001	5.0000	0.0000	0.00010	2.06
10	10.00000	10.0000	0.0000	0.00010	2.06
20	20.00003	19.9999	0.0001	0.00011	2.05
50	50.00004	49.9999	0.0001	0.00012	2.00
100	100.00004	100.0001	-0.0001	0.00017	2.00
200	200.00011	200.0000	0.0001	0.00027	2.00

Note: Weight of adjust - (g)

The End of Certificate

PTC/MC-01-01: 2 Feb 2020

RYG_EN0006



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CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
554/4 PATTANAKARN ROAD SOI 19, SUKHUMVIT, SUKHUMVIT BANGKOK 10250
TEL: 0-2171-3888-27 FAX: 0-2109-0054



Cert. No.: 21TM829
Page: 1 of 3

Certificate of Calibration

Equipment : Hot Air Oven

Manufacturer : Memmert

Model : UM 400

Serial No. : b495.0899

ID No. : RYG_EN0006

Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd. (Rayong Branch)
616/10 Moo 5 T. Maenam Khu,
A. Pluakdaeng,
Rayong 21140 Thailand
Oven Room

Location : Oven Room

Received Order : 5 May 2021

Calibration Date : 5 - 6 May 2021

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

Calibrated by : Khil Ruttanapachai

Approved by :
Approved Signatory

() Ponthippa Tameyakul
(/) Malee Butkrua
() Suwit Imjai

Issue Date : 14 May 2021

The Uncertainties are for a confidence probability of approximately 95%

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Approval of the head of Corporate Services, Technology Calibration and Testing Services

A 0028096



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2105-0005OC-1

Cert. No.: 21TM829
Page: 2 of 3

Procedure Used :-

Calibration were conducted using calibration procedure CP-OT02 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD).
The temperature scale used was based on ITS-90.

Condition of this result of calibration

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Data Acquisition	34972A	MY57013823	21LM3	26 Feb 2022

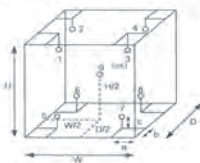
2. This certificate is valid only to the item calibrated on date and place of calibration.

3. This certification is traceable to the International System of Unit.

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close



Probe Installation Details :
a = 5.0 cm
b = 5.0 cm
c = 5.0 cm
Dimension of Chamber :
D = 0.33 m
W = 0.40 m
H = 0.40 m
Capacity = 0.053 m³

Environment during calibration		
	Beginning	Finished
Temp. (°C)	29	30
REL Humid. (%)	56	58
AC Supply (Volt)	221	222

Position :	Ref. Std. ID No.:
1	21-17RTD-01
2	21-17RTD-02
3	17RTD-03
4	17RTD-04
5	17RTD-05
6	17RTD-06
7	17RTD-07
8	17RTD-08
9 (ref.)	17RTD-09



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2105-0005OC-1

Cert. No.: 21TM829
Page: 3 of 3

Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Uncertainty (± °C)	Coverage Factor k
70.0	70.0	70.0	0.21	1.8	2.0	0.55	2

Calibration Point (°C)	Measured Temperature (°C)								
	1	2	3	4	5	6	7	8	9 (ref.)
70.0	70.404	70.277	70.607	70.307	68.789	69.257	68.846	69.331	70.495

Average* : The average of 30 values in each position.

Temperature stability : One-half of the greatest maximum difference of measured temperature at any one sensor.

Temperature uniformity : The maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady-state conditions.

Overall Variation : The Difference of the maximum and minimum measured temperatures throughout observation.

UUC* : Unit Under Calibration

Note : The reported uncertainty of measurement was included stability and excluded uniformity

The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor k, providing a level of confidence of approximately 95 %.

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TEL: 0-2717-3000-27 FAX: 0-2719-9464



Cert. No.: 21TM673
Page.: 1 of 3

Certificate of Calibration

Equipment : Water Bath
Manufacturer : Memmert
Model : WNB22
Serial No. : L513.0648
ID No. : RYG_EN0061
Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd. (Rayong Branch)
616/10 Moo 5 T. Maenam Khu,
A. Pluakdaeng,
Rayong 21140 Thailand
Location : Wet Chemistry Lab
Received Order : 5 May 2021
Calibration Date : 5 May 2021
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
Calibrated by : Tawatchai Pama
Approved by :
() Pornthippa Tameyakul
() Malee Butkruea
() Suwit Imjai
Issue Date : 14 May 2021

REVIEW BY
APPROVED BY
NEXT CAL DATE 3/1/22

The Uncertainties are for a confidence probability of approximately 95%.

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Approval of the head of Department Services (Equipment Calibration and Testing Services)

A 0028098



Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2105-0005OC-3
Procedure Used :-

Cert. No.: 21TM673
Page.: 2 of 3

Calibration were conducted using in-house calibration procedure CP-OT04 according to direct measurement method with Data Acquisition which connected with Industrial Platinum Resistance Thermometer (IPRT).

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Data Acquisition	34970A	MY44060450	21LM4	06 Mar 2022

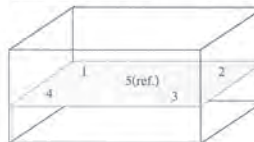
2. This certificate is valid only to the item calibrated on date and place of calibration.

3. This certification is traceable to the International System of Unit:

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

	Environmental		AC Voltage Supply
	(°C)	(%R.H.)	(Volt)
Beginning of Calibration	22	68	230
Finished of Calibration	20	64	231



Front

Position :	Ref. Std. S/N :
1	4803988-001
2	4803988-002
3	4803988-003
4	4803988-004
5(ref.)	4803988-005

a 1054289



Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2105-0005OC-3
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source

Cert. No.: 21TM673
Page.: 3 of 3

Calibration point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Average* Standard Reading (°C)				
			Position				
			1	2	3	4	5 (ref.)
85.0	85.0	85.0	84.891	84.893	84.880	84.892	84.917

Calibration point (°C)	Uniformity (°C)	Stability (± °C)	Uncertainty (± °C)	Coverage Factor k
85.0	0.089	0.052	0.22	2

Average* : The average of 30 values in each position.

Uniformity : The maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady-state conditions.

Stability : One-half of the greatest maximum difference of measured temperature at any one probe.

UUC* : Unit Under Calibration

Note : The reported uncertainty of measurement was included stability and excluded uniformity.

The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor k, providing a level of confidence of approximately 95%.

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a 1054288



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TEL: 0-2717-3000-27 FAX: 0-2719-9464



Cert. No.: 21TM827
Page.: 1 of 3

Certificate of Calibration

Equipment : Hot Air Oven

Manufacturer : Memmert

Model : UFE 500

Serial No. : G511.1572

ID No. : RYG_EN0010

Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd. (Rayong Branch)
616/10 Moo 5 T. Maenam Khu,
A. Pluakdaeng,
Rayong 21140 Thailand

Location : Oven Room

Received Order : 5 May 2021

Calibration Date : 5 May 2021

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

Calibrated by : KHIT Ruttanaprapachai

Approved by :
Approved Signatory

() Pornthippa Tameyakul
() Malee Butkruea
() Suwit Imjai

Issue Date : 14 May 2021

The Uncertainties are for a confidence probability of approximately 95%.

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Approval of the head of Department Services (Equipment Calibration and Testing Services)

A 0028099



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2105-0005OC-4
Procedure Used :-

Cert. No.: 21TM827
Page: 2 of 3

Calibration were conducted using calibration procedure CP-OT02 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD) and Thermocouple Type T.

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Data Acquisition	34972A	MY57013823	21LM3	26 Feb 2022

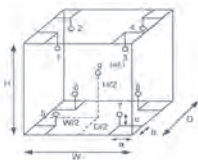
2. This certificate is valid only to the item calibrated on date and place of calibration

3. This certification is traceable to the International System of Unit.

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close



Probe Installation Details: Dimension of Chamber :
L = 5.0 cm D = 0.40 m
W = 5.0 cm W = 0.56 m
H = 5.0 cm H = 0.48 m
Capacity = 0.11 m³

Environment during calibration		
	Beginning	Finished
Temp. (°C)	28	29
REL.Humid. (%)	59	56
AC Supply (Volt)	220	221

Ref. Std. ID No.: @ Calibration Point		
Position :	(104) °C	(180) °C
1	21-17RTD-01	19-17TC-01
2	21-17RTD-02	19-17TC-02
3	17RTD-03	19-17TC-03
4	17RTD-04	19-17TC-04
5	17RTD-05	19-17TC-05
6	17RTD-06	19-17TC-06
7	17RTD-07	19-17TC-07
8	17RTD-08	19-17TC-08
9 (ref.)	17RTD-09	19-17TC-09

1054287



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2105-0005OC-4
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source

Cert. No.: 21TM827
Page: 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Uncertainty (± °C)	Coverage Factor k
104.0	104.0	104.0	0.063	0.54	0.70	0.42	2
180.0	180.0	180.0	0.15	0.89	1.3	1.1	2

Calibration Point (°C)	Measured Temperature (°C)								
	Position								
	1	2	3	4	5	6	7	8	9 (ref.)
104.0	104.243	103.732	103.760	103.742	103.863	103.743	104.311	103.689	103.815
180.0	180.101	180.481	179.401	179.692	179.980	179.943	180.127	179.915	179.709

Average* : The average of 30 values in each position.

Temperature stability : One-half of the greatest maximum difference of measured temperature at any one sensor.

Temperature uniformity : The maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady-state conditions.

Overall Variation : The Difference of the maximum and minimum measured temperatures throughout observation.

UUC* : Unit Under Calibration

Note : The reported uncertainty of measurement was included stability and excluded uniformity

The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor k, providing a level of confidence of approximately 95 %.

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Agilent CrossLab Compliance

Qualification Type: ICPMS-OQ
System ID: JP15471169
EQP Name: AgilentRecommended
EQP Revision: ICPMS.02.50
EQP Publish Date: March 2020
Date: September 30, 2021 4:07:18 PM
Report Type: Report
Org. Name: ALS Laboratory Group (Thailand) Co., Ltd.
Org. Location: 104 Phattanakarn 40, Suan Luang, Bangkok 10250.

REVIEW BY: *Suphan H.*
APPROVED BY: *Suphan H.*
NEXT CAL. DATE: 29 March 2023

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Test Summary

Purpose

This section includes a status for each scheduled test and the overall qualification. For each test that is run, (1) the status is automatically determined based on pre-defined limits, and (2) the total number of times the test was run is displayed. For detailed results and specifications for a test, refer to the test results in this EQR.

Details

Test	Status	Runs
Autosampler Check : SPS4	Pass	1
Integrated Sample Introduction System (ISIS) Check : ISIS3	Pass	1
Autotune : G8403A	Pass	1
Background (No Gas Mode) : G8403A	Pass	1
Background (Gas Modes) : G8403A	Pass	1
20-Minute Stability (No Gas Mode) : G8403A	Pass	1

Overall Qualification Status

Pass

Date: September 30, 2021 4:07:18 PM
System ID: JP15471169

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Service Details

Purpose

This section includes local contact and delivery details for this service.

General Details

Service Order No./Request:	8004837154
EOP Name:	AgilentRecommended
EOP Revision:	ICPMS.02.60
Report Type:	Report

Organization Details

Name:	ALS Laboratory Group (Thailand) Co., Ltd.
Location:	104 Phatthanakarn 40, Suan Luang, Bangkok 10250

Local Contact Details

Name:	Chetkarnai Komarakul
Job Title:	Manager
Qualification Location:	Laboratory

Operator Details

Name:	Panitap Kurasathin
Job Title:	Field Service Engineer

Data Acquisition Details

Acquisition Software Name:	MassHunter
Acquisition Software Revision:	C.01.04

Customer Data System (CDS):	icpMsc: MassHunter
-----------------------------	--------------------

Date: September 30, 2021 4:07:18 PM
System ID: JP15471169

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Instrument Details

Purpose

This section describes the as found system configuration.

Details

ICP-MS 1

Manufacturer:	Agilent Technologies
Name:	7900
Model Number:	G8403A
Installed Options:	#100H: Standard Package with Hydrogen option
Detector Type:	SQ
Nebulizer:	Mist Mist (G3181)
Spray Chamber:	Quartz
Torch:	Quartz
Sampling Cone:	Ni
Skimmer Cone:	Ni
Serial Number:	JP15471169
Firmware Revision:	C.01.04

ISIS 1

Manufacturer:	Agilent Technologies
Name:	ISIS3
Model Number:	G8611A
Type:	Portable pump system
Serial Number:	JP15510227

Autosampler 1

Manufacturer:	Agilent Technologies
Name:	SPS4
Model Number:	G8410A
Serial Number:	AU15430722

Date: September 30, 2021 4:07:18 PM
System ID: JP15471169

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Chiller 1

Manufacturer:	Agilent Technologies
Name:	Chiller
Model Number:	G3392A
Serial Number:	SU15107131

Date: September 30, 2021 4:07:18 PM
System ID: JP15471169

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Calculation Formulas

Purpose

This section includes calculation formulas for all available tests. Depending upon which tests are scheduled, all or some apply to your qualification.

For a description of calculations for ICP-MS tests performed by the MassHunter software, refer to the MassHunter application and documentation.

Date: September 30, 2021 4:07:18 PM
System ID: JP15471169

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Protocol Details

Purpose

This section lists the revisions for all test units used in this report. For complete test-specific and high-level change details, refer to the Revision History document.

Test Revision	Test
ICPMS.02.50	20-Minute Stability (No Gas Mode)
ICPMS.02.50	Autosampler Check
ICPMS.02.50	Autotune
ICPMS.02.50	Background (Gas Modes)
ICPMS.02.50	Background (No Gas Mode)
ICPMS.02.50	Integrated Sample Introduction System (ISIS) Check

Date: September 30, 2021 4:07:18 PM
System ID: JP15471169

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Autosampler Check

Purpose

This test demonstrates that the autosampler module is correctly installed and connected. It does not test module performance.

Setpoint

Results	Criteria	Observed Result	Expected Result	Status
	After the self test, is probe in the home position?	Yes	Yes	Pass
	As commanded, is the probe positioned at vial 2?	Yes	Yes	Pass
Setpoint Status:	Pass			Runs: 1

Overall Autosampler Check Test Status

Pass

Date: September 30, 2021 4:07:18 PM
System ID: JP15471169

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Integrated Sample Introduction System (ISIS) Check

Purpose

This test demonstrates that the ISIS module is correctly installed and connected. It does not test module performance.

Setpoint

Results	Criteria	Observed Result	Expected Result	Status
	As commanded, does the pump rotate?	Yes	Yes	Pass
	As commanded, do the valves load and inject?	Yes	Yes	Pass
Setpoint Status:	Pass			Runs: 1

Overall Integrated Sample Introduction System (ISIS) Check Test Status

Pass

Date: September 30, 2021 4:07:18 PM
System ID: JP15471169

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Autotune

Purpose

This test uses traceable checkout standards to run a software-executed autotune in all modes. The tune report provides values for peak width, mass axis, sensitivity, oxide species, and doubly-charged species tests.

Setpoint

Results

Peakwidth Mass 7 0.719 AMU

Agilent Recommended:
 >= 0.65
 <= 0.80

Status: **Pass**

Peakwidth Mass 89 0.750 AMU

Agilent Recommended:
 >= 0.65
 <= 0.80

Status: **Pass**

Peakwidth Mass 205 0.713 AMU

Agilent Recommended:
 >= 0.65
 <= 0.80

Status: **Pass**

Mass Axis 7 7.05 AMU

Agilent Recommended:
 >= 6.9
 <= 7.1

Status: **Pass**

Mass Axis 89 88.95 AMU

Agilent Recommended:
 >= 88.9
 <= 89.1

Status: **Pass**

Mass Axis 205 205.00 AMU

Agilent Recommended:
 >= 204.9
 <= 205.1

Status: **Pass**

Date: September 30, 2021 4:07:16 PM
 System ID: JP15471169

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Mass 7 Sensitivity No Gas 94.28 Mcps/ppm

Agilent Recommended:
 >= 25.5

Status: **Pass**

Mass 89 Sensitivity No Gas 307.15 Mcps/ppm

Agilent Recommended:
 >= 127.5

Status: **Pass**

Mass 205 Sensitivity No Gas 203.77 Mcps/ppm

Agilent Recommended:
 >= 76.5

Status: **Pass**

Mass 89 Sensitivity H₂ 28.38 Mcps/ppm

Agilent Recommended:
 >= 23.8

Status: **Pass**

Mass 89 Sensitivity H₂ 129.27 Mcps/ppm

Agilent Recommended:
 >= 68

Status: **Pass**

Oxide Ratio 156/140 1.047 %

Agilent Recommended:
 <= 1.38

Status: **Pass**

Doubly Charged Species Ratio 70/140 1.482 %

Agilent Recommended:
 <= 2.3

Status: **Pass**

Setpoint Status: **Pass**

Runs: 1

Overall Autotune Test Status

Pass

Date: September 30, 2021 4:07:16 PM
 System ID: JP15471169

Page 12 / 34

Background (No Gas Mode)

Purpose

This test examines the background of the ICP-MS in no gas mode by monitoring ions during a blank run.

Setpoint

Conditions

Masses:
 7 AMU
 89 AMU
 205 AMU

Measurements and Results

Masses (AMU):
 Measured Value:
 Agilent Recommended:
 Status:

Mass (AMU)	Measured Value	Agilent Recommended	Status
7	3.200	6.9	Pass
89	3.300	4.6	Pass
205	9.900	11.5	Pass

Setpoint Status: **Pass**

Runs: 1

Overall Background (No Gas Mode) Test Status

Pass

Date: September 30, 2021 4:07:16 PM
 System ID: JP15471169

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Background (Gas Mode)

Purpose

This test examines the background of the ICP-MS in the various gas modes by monitoring ions during a blank run.

Setpoint

Gas Mode: Helium

Conditions

Mass: 78 AMU
 Integration Time: 1.0 sec
 Cycles: 20

Measurements and Results

Mass (AMU):
 Measured Value:
 Agilent Recommended:
 Status:

Mass (AMU)	Measured Value	Agilent Recommended	Status
78	42.8500	115	Pass

Setpoint Status: **Pass**

Runs: 1

Overall Background (Gas Mode) Test Status

Pass

Date: September 30, 2021 4:07:16 PM
 System ID: JP15471169

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20-Minute Stability (No Gas Mode)

Purpose

This test monitors the abundance of ions present in the checkout standard over a 20-minute period to verify that the signal is stable. The %RSD of the abundance of given ions is calculated internally by the software and compared to the limit.

Setpoint

Conditions

Mode: Spectrum
Masses: 7, 9, 59, 89, 140, 205
Integration Time: 9.99 sec
Peak Pattern: 3 points/peak
Repetitions: 20
Sweeps/Replicates: 100

Measurements and Results

Masses (AMU):
Stability RSD:
Agilent Recommended:
Status:

Mass	Abundance	Stability RSD (%)	Status
7	0.96400	2.3	Pass
89	0.51495	2.3	Pass
205	0.73011	2.3	Pass

Setpoint Status: Pass Run: 1

Overall 20-Minute Stability (No Gas Mode) Test Status

Pass

Date: September 30, 2021 4:07:18 PM
System ID: JP15471169

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Declaration of Change Control

This document is under change control. Revision history is maintained and printed on each document. Access to the master documents is limited to process owners. Documents receive periodic review and cannot be assigned an evergreen status. The qualification performed according to this document refers only to the hardware/software configuration in place at the time of the qualification. Agilent Technologies recommends that instrument configuration change management procedures be in place in order to maintain the validation process. Any changes to the analytical or computer hardware or software must be clearly specified. A change management system provides a means for determining the degree of requalification required according to the extent of the changes made. All details of the changes must be thoroughly recorded and documented, together with details of completed tests and their results. Note: Hardware/software configuration management is the customer's responsibility.

Date: September 30, 2021 4:07:18 PM
System ID: JP15471169

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Attachments

Training requirements note: The delivery engineer attaches an ACE technique-specific training certificate to the Equipment Qualification Report (EQR). Obtaining ACE technique-specific certification includes pre-requisite trainings for Data Integrity, General Compliance topics (GMP, GLP, ALCOA, etc.), instrument hardware and software components, and the ACE technique itself. The new certificate encompasses all pre-requisite trainings as documented in the Agilent Learning Management System called Success Factors.


Location	Category	Document Name	Page
EQR	General	Certificate of System Qualification	18
EQR	General	Operator's training certificate and qualifications	19
EQR	General	Certificate of Qualification for ACE	20
EQR	General	Certificate of Qualification for ACE	21
EQR	General	Tune reports	22
EQR	General	Test Report	25
EQR	General	Test Report	27
EQR	General	Test Report	29

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General

Document Name: Certificate of System Qualification

 **Agilent Technologies**

Agilent Compliance Engine Self Qualification

Date: September 14, 2021 4:59:13 PM

Drive Serial #: ACA225C8

Platform Revision: ACE 3.11

Individual self-qualification reports for each specific technique installed are also available upon request. They provide additional details on the general report from the console summary and are structured by the actual algorithms challenged during the process. There is not a one-to-one relationship between algorithms and QC program tests because some algorithms are used by several tests and across multiple similar hardware components of the qualified systems.

Technique Type	Tests Completed	Result
Atomic Absorption	7	Conforms
Capillary Electrophoresis	10	Conforms
Distillation	8	Conforms
Empirical Spectroscopy	3	Conforms
Gas Chromatography - GCMS	17	Conforms
Gas Chromatography	29	Conforms
Gas Permeation Chromatography	6	Conforms
ICP-MS	4	Conforms
Infrared Spectroscopy	7	Conforms
Liquid Chromatography	17	Conforms
Liquid Chromatography - LCMS	8	Conforms
Microfluidics	18	Conforms
Sample Preparation - Gas Chromatography	9	Conforms
Sample Preparation - Liquid Chromatography	9	Conforms
Supercritical Fluid Chromatography	15	Conforms
Software	6	Conforms
UV-Vis Spectrophotometer	13	Conforms

Overall Qualification Status

Conforms

Date: September 30, 2021 4:07:18 PM
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General

Document Name: Operator's training certificate and qualifications

Agilent Technologies

Certificate of Completion

Learner Name: Parthap, Kuzambain

Title Of Course: AN-CB-ICPMS-2-034-A:Agilent 7900 ICPMS ISE update training

Completion Date: June 7, 2014

Certified By Company: Learning at Agilent

All Service and Support training certificates have the following specific restrictions.

A certificate for Service and Support training is only valid while employed by Agilent Technologies or while working as an Agilent authorized service provider, through which the service employee has ongoing access to Agilent's Safety Alerts, Service News, internal technical updates, update training, course dissemination, technical support, course parts and parts updates. Completion of training alone, without being employed by Agilent Technologies, does not qualify an individual to safely install, service or maintain Agilent products.

Date: September 30, 2021 4:07:18 PM
System ID: JP15471169

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General

Document Name: Certificate of Qualification for ACE

Agilent Technologies

Certificate of Completion

Learner Name: Parthap, Kuzambain

Title Of Course: AN-CB-SS-14-030-A: ACE 3.3X User Update Training

Completion Date: July 7, 2020

Certified By Company: Learning at Agilent

All Service and Support training certificates have the following specific restrictions.

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Date: September 30, 2021 4:07:18 PM
System ID: JP15471169

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General

Document Name: Certificate of Qualification for ACE

Agilent Technologies

Certificate of Completion

Learner Name: Parthap, Kuzambain

Title Of Course: AN-CB-ICPMS-2-035-IE: CrossLab Compliance Hardware Specific Delivery for Agilent ICP-MS Systems

Completion Date: October 31, 2020

Certified By Company: Learning at Agilent

All Service and Support training certificates have the following specific restrictions.

A certificate for Service and Support training is only valid while employed by Agilent Technologies or while working as an Agilent authorized service provider, through which the service employee has ongoing access to Agilent's Safety Alerts, Service News, internal technical updates, update training, course dissemination, technical support, course parts and parts updates. Completion of training alone, without being employed by Agilent Technologies, does not qualify an individual to safely install, service or maintain Agilent products.

Date: September 30, 2021 4:07:18 PM
System ID: JP15471169

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General

Document Name: Tune reports

Tune Report

Operator Name: Supriya Mha


Acid Case Batch: C:\Agilent\ICPMS\15471169\Tune_7900.b

Acq Date/Time: 2021-09-30 14:44:40

Report Generated: 09:30 Sep 2021

Instrument Name: GMA434A JP15471169

File Desc:
Sampling

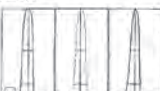


Mass	Range	Count	PRECISE	Range/Count
7	10000	1418	1.430	1.000
86	10000	10710	1.450	1.350
203	10000	10877	1.118	1.600

Sampling Time (sec): 6.311
Integration Time (sec): 6.1

Other/Unlabeled Charge Data:
Other: 100 / 140 1.067 %
Unlabeled Charge: 70 / 140 1.482 %

Flow Rate/Rate:



Mass	Flow Rate	Rate	PRECISE	Flow Rate
7	1417.60	7.00	0.62	0.718
86	10714.2	10.00	0.50	0.708
203	10877.0	10.00	0.50	0.713

Integration Time (sec): 6.1
Acquisition Time (sec): 22.73
Y Axis: Linear

Tune Parameters

Parameter	Value	Parameter	Value	Parameter	Value
Plasma Map	---	Injection Gas	1.00 L/min	Injection Gas	0.10 L/min
RF Power	1000 W	Optical Gas	---	Auxiliary Gas	0.90 L/min
RF Matching	1.18 V	Injection Pump	0.18 ml	Plasma Gas	15.0 L/min
Sample Depth	0.0 mm	BC Pump	2.0 °C		
Electrode 1	0.0 V	Omega L/H	0.1 V	Delta	12.0 V
Electrode 2	-205.0 V	Cell Overvoltage	0.0 V	Flow Rate	0.0 V
Electrode 3	-30 V	Cell (A)	-30 V		
Cell Parameters					
154 Gas	Re	Jet Gas Flow	---	Flow Determination	0.0 V
154 Flow	0.0 mL/min	Scrub Flow	-0.0 V		

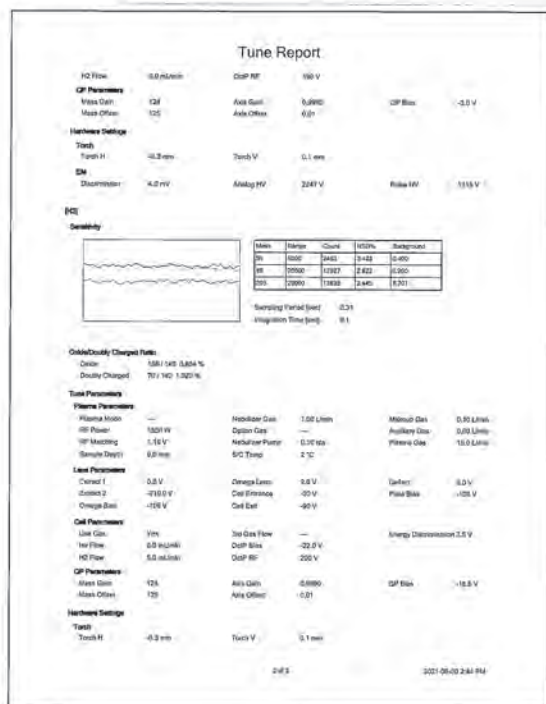
1 of 3 2021-09-30 2:44 PM

Date: September 30, 2021 4:07:18 PM
System ID: JP15471169

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Document Name:

Tune reports

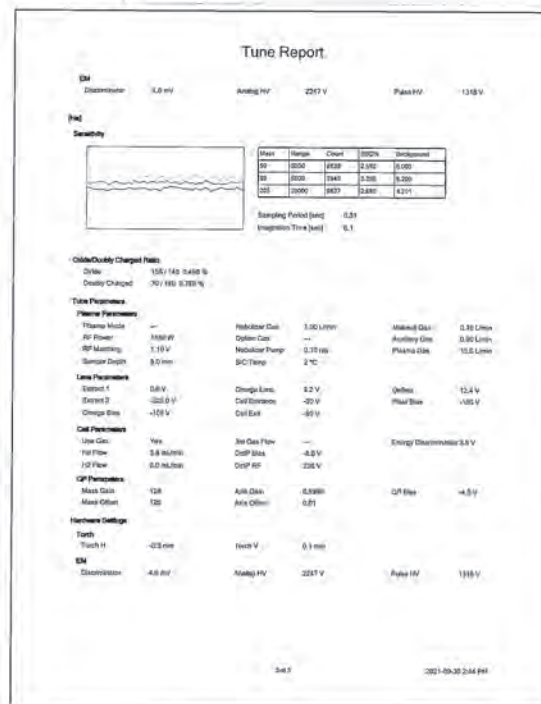


Date: September 30, 2021 4:07:18 PM
System ID: JP15471160

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Document Name:

Tune reports



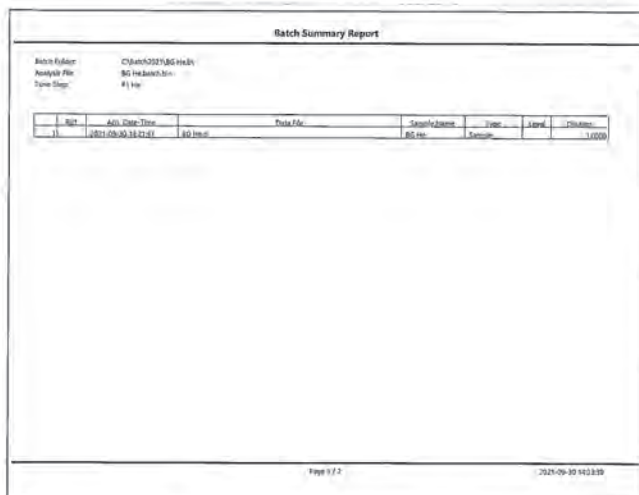
Date: September 30, 2021 4:07:18 PM
System ID: JP15471160

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General

Document Name:

Test Record

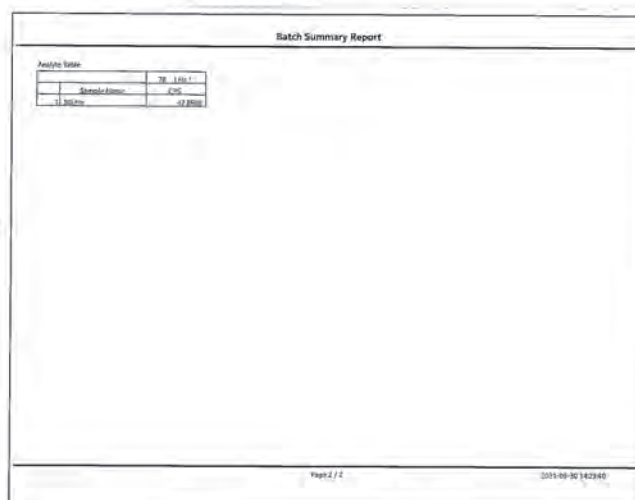


Date: September 30, 2021 4:07:18 PM
System ID: JP16471169

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Document Name:

Test Report



Date: September 30, 2021 4:07:18 PM
System ID: JP15471169

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General

Document Name: Test Report

Batch Summary Report							
Batch Folder: D:\Agilent Services\QCC 30 Sep 2021\QCC 30 Sep 2021							
Analysis File: B6102.msm\BatchSum							
Data Step: 4110							
Run	Acq Date/Time	Data File	Sample Name	Type	Level	Quantity	
1	2021-09-30 15:06:08	B6102.D	61100	Sample		1.0000	

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2021-09-30 15:06:08

Date: September 30, 2021 4:07:18 PM
System ID: JP15471169

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Document Name: Test Report

Batch Summary Report	
Analysis Table	
Sample Name	QCC
11 B6102	2.1000

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2021-09-30 15:06:08

Date: September 30, 2021 4:07:18 PM
System ID: JP15471169

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General

Document Name: Test Report

Batch Summary Report							
Batch Folder: D:\Agilent Services\QCC 30 Sep 2021\QCC 30 Sep 2021							
Analysis File: B6102.msm\BatchSum							
Data Step: 4110							
Run	Acq Date/Time	Data File	Sample Name	Type	Level	Quantity	
1	2021-09-30 15:06:08	B6102.D	61100	Sample		1.0000	

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2021-09-30 15:06:08

Date: September 30, 2021 4:07:18 PM
System ID: JP15471169

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Document Name: Test Report

Batch Summary Report									
Analysis Table									
Sample Name	QCC	QCC	QCC	QCC	QCC	QCC	QCC	QCC	QCC
11 B6102	2.1000	2.1000	2.1000	2.1000	2.1000	2.1000	2.1000	2.1000	2.1000

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2021-09-30 15:06:08

Date: September 30, 2021 4:07:18 PM
System ID: JP15471169

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Electronic Signature

Purpose

This signature page was created and published because the ACE sign-off action was executed, which is valid for the entire document, including attachments. The ACE sign-off is an electronic signature that requires two distinct identification components: unique username and personal password. The Agilent representative who has delivered this service understands the meaning and legal status of an electronic signature. As a trained official operator, the Agilent representative has a unique password and login to access ACE and electronically sign this document. (Other e-signatures can be applied to this document using a Document Content Management or other suitable method defined in your data access and control procedures.)

Details

Full Name of Signer: Panthep Kurassathain
Logged On User Name: panthep_kurassathain@agilent.com
Signature Creation Date: September 30, 2021
Reason for Signature: Executed protocol and published this original version of document

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Date: September 30, 2021 4:07:18 PM
System ID: JP15471168

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User Name: panthep_kurassathain
Host Name: ASD00000315
System ID: JP15471168
Print Date: September 30, 2021 4:07:22 PM

ALS OQHW T08-35Sep21 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
September 30, 2021 3:50:07 PM	Auth	Session Created	Session	None
September 30, 2021 3:50:07 PM	Start	Configuration	Session	None
September 30, 2021 3:52:07 PM	Auth	End Session	Session	User is Field Engineer and does not require an unlock code
September 30, 2021 3:52:12 PM	Auth	End Session	Session	EDP Module for primary workstation (not M) - File path: [ProtocolBookAgMuConfig\ambusa02_30Sep2021_02_53.eap] EDP File Name: [ppM02_53.eap] EDP Name: [AgilentRecommended]
September 30, 2021 3:52:54 PM	End	Configuration	Session	None
September 30, 2021 3:52:57 PM	Start	Qualification	Session	OQ
September 30, 2021 3:52:57 PM	Start	Execution	Autosampler Check : SP54 Autosampler Check	None
September 30, 2021 3:53:03 PM	End	Execution	Autosampler Check : SP54 Autosampler Check	Run Count : 1
September 30, 2021 3:53:04 PM	Start	Execution	Integrated Sample Introduction System (ISIS) Check : ISIS Integrated Sample Introduction System (ISIS) Check	None
September 30, 2021 3:53:08 PM	End	Execution	Integrated Sample Introduction System (ISIS) Check : ISIS Integrated Sample Introduction System (ISIS) Check	Run Count : 1

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Date: September 30, 2021 4:07:18 PM
System ID: JP15471168

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User Name: panthep_kurassathain
Host Name: ASD00000315
System ID: JP15471168
Print Date: September 30, 2021 4:07:32 PM

ALS OQHW T08-35Sep21 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
September 30, 2021 3:52:10 PM	Start	Execution	Autosampler : G4403A: Autosampler	None
September 30, 2021 3:53:08 PM	End	Execution	Autosampler : G4403A: Autosampler	Run Count : 1
September 30, 2021 3:53:12 PM	Start	Execution	Background (No Gas Mode) : G4403A: No Gas Mode Background	None
September 30, 2021 3:53:40 PM	End	Execution	Background (No Gas Mode) : G4403A: No Gas Mode Background	Run Count : 1
September 30, 2021 3:53:43 PM	Start	Execution	Background (Gas Mode) : G4403A: Gas Mode Background	None
September 30, 2021 3:53:17 PM	End	Execution	Background (Gas Mode) : G4403A: Gas Mode Background	Run Count : 1
September 30, 2021 3:53:19 PM	Start	Execution	Background (Gas Mode) : G4403A: Gas Mode Background	None
September 30, 2021 3:53:38 PM	End	Execution	Background (Gas Mode) : G4403A: Gas Mode Background	Run Count : 1
September 30, 2021 3:53:41 PM	Start	Execution	20 Minute Stability (No Gas Mode) : G4403A: 20 Minute Stability (No Gas Mode)	None
September 30, 2021 3:57:22 PM	End	Execution	20 Minute Stability (No Gas Mode) : G4403A: 20 Minute Stability (No Gas Mode)	Run Count : 1
September 30, 2021 3:57:24 PM	End	Qualification	Session	OQ
September 30, 2021 3:57:28 PM	Start	Reporting	Session	None

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Date: September 30, 2021 4:07:18 PM
System ID: JP15471168

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User Name: panthep_kurassathain
Host Name: ASD00000315
System ID: JP15471168
Print Date: September 30, 2021 4:07:32 PM

ALS OQHW T08-35Sep21 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
September 30, 2021 4:03:07 PM	Auth	Reporting	Session	Report Generated : Certificate
September 30, 2021 4:03:17 PM	Auth	Reporting	Session	Report Generated : Report
September 30, 2021 4:03:59 PM	Start	Qualification	Session	OQ
September 30, 2021 4:04:08 PM	End	Qualification	Session	OQ
September 30, 2021 4:04:08 PM	Start	Reporting	Session	None
September 30, 2021 4:04:20 PM	Auth	Reporting	Session	Report Generated : Certificate
September 30, 2021 4:04:38 PM	Auth	Reporting	Session	Report Generated : Report

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Date: September 30, 2021 4:07:18 PM
System ID: JP15471168

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Metrological Center


SCI ECO Services Company Limited


33/2 Moo 3, T.Banpa, A.Kaengkhoh, Saraburi 18110
Telephone : +66 2 586 5792-4 Fax : +66 2 586 5109
Website : www.scieco.co.th E-Mail : calibrate@scg.co.th

Certificate No. T220730

Page 1 of 6

Certificate of Calibration

Equipment : HEATING BLOCK
Manufacturer : Environmental Express
Model : SC 196
Serial No. : 6974CECW3285
Customer Code : BKK_EL0054
ID No. : T5306A3
Customer : ALS Laboratory Group (Thailand) Co.,Ltd.
104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan,
Khet Suan Luang, Bangkok 10250
Customer Location : Acid Digestion Lab
Date of Receipt : 30 March 2022
Calibrated By : Watcharapon Sangtong (Technician)
Approved By :  / Sujjar Naknakred (Site Calibration Manager)
Date of Issue : 12 APR 2022

REVIEW BY 
APPROVED BY 
NEXT CAL. DATE 7/10/23

The uncertainties are for a confidence probability of approximately 95%.

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation Scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standard laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Metrological Center.

FM-L12 109/30-05-57



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Website : www.scieco.co.th E-Mail : calibrate@scg.co.th

Certificate No. T220730

Page 2 of 6

Calibration Report

Equipment : HEATING BLOCK
Date of Calibration : 7 April 2022
Environment : Temperature : 21.8-23.1 °C
Line Voltage : 221.6-226.3 V
Relative Humidity : 55-65 %RH

Condition of this results of calibration :

1. This equipment was calibrated by insert nine standard thermocouples type T into its chamber, the other one standard thermocouples type T use for ambient temperature measurement. The calibration was done in according to WI-T20.
All data show below were final values and the initial data from customer request. The temperature scale used was based on ITS-90.

2. Reference Standard Instrument :

Instrument	Model	Instrument No.	Certificate No.	Due Date
TC	TYPE T	TN221-TN230	T210008	08 June 2022
TC	TYPE T	TN231-TN240	T210008	08 June 2022
DATA LOGGER	34970A	T149	T210008	08 June 2022

3. This certificate is traceable to :

National Institute of Metrology (Thailand) through Metrological Center (NSC-TIS-TIS 17025 CALIBRATION 0244.)

4. Condition of calibrated item : good

Equipment Description :

Time Constant : 2 Hour 25 Minute At 95 °C
Fresh Air Damper ☐ Open ☐ Min ☐ Medium ☐ Max
☐ Close
☒ Not Available

5. Adjustment :

() without adjustment (X) after adjustment

Approved By. 

FM-L13 108/30-05-57



Metrological Center

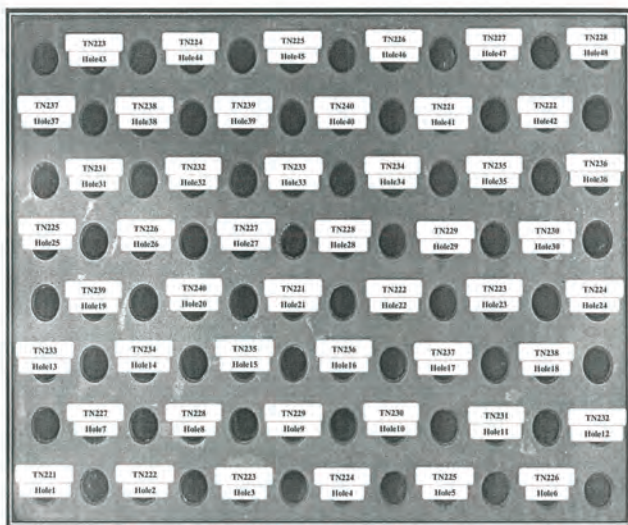
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Website : www.scieco.co.th E-Mail : calibrate@scg.co.th

Certificate No. T220730

Page 3 of 6

Calibration Report



FRONT CONTROL

Approved By. 

FM-L13 108/30-05-57



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Website : www.scieco.co.th E-Mail : calibrate@scg.co.th

Certificate No. T220730

Page 4 of 6

Calibration Report

Measurement Results

Calibration Point		Average Standard Reading at each position (°C)					
R1 Hole1-Hole6		TN221	TN222	TN223	TN224	TN225	TN226
CAL. POINT	Max	93.60	93.82	94.05	94.20	94.36	94.26
	Min	93.07	93.26	93.51	93.66	93.82	93.71
	Average	93.33	93.54	93.78	93.93	94.09	93.98
R2 Hole7-Hole12		TN227	TN228	TN229	TN230	TN231	TN232
	Max	94.59	94.79	94.63	94.55	94.82	95.00
	Min	94.05	94.25	94.08	93.97	94.26	94.44
	Average	94.32	94.52	94.36	94.26	94.54	94.72
R3 Hole13-Hole18		TN233	TN234	TN235	TN236	TN237	TN238
	Max	95.03	94.54	94.78	94.84	95.06	94.73
	Min	94.46	93.98	94.20	94.28	94.49	94.18
	Average	94.74	94.26	94.49	94.56	94.78	94.45
R4 Hole19-Hole24		TN239	TN240	TN241	TN242	TN243	TN244
	Max	94.89	94.82	95.73	95.85	95.73	96.10
	Min	94.33	94.26	95.51	95.62	95.51	95.88
	Average	94.61	94.54	95.62	95.73	95.62	95.97
R5 Hole25-Hole30		TN225	TN226	TN227	TN228	TN229	TN230
	Max	96.28	96.39	96.37	96.54	96.19	96.04
	Min	96.01	96.10	96.02	96.20	95.89	95.71
	Average	96.15	96.24	96.20	96.37	96.04	95.88
R6 Hole31-Hole36		TN231	TN232	TN233	TN234	TN235	TN236
	Max	96.84	96.97	97.03	96.48	96.33	95.76
	Min	96.53	96.65	96.71	96.08	95.98	95.43
	Average	96.68	96.81	96.87	96.28	96.16	95.60
R7 Hole37-Hole42		TN237	TN238	TN239	TN240	TN241	TN242
	Max	96.46	96.15	96.19	96.06	96.95	97.09
	Min	96.13	95.84	95.85	95.72	96.64	96.78
	Average	96.30	95.99	96.02	95.89	96.80	96.93
R8 Hole43-Hole48		TN223	TN224	TN225	TN226	TN227	TN228
	Max	96.91	96.58	96.13	96.19	96.34	96.19
	Min	96.55	96.21	95.80	95.87	96.03	95.88
	Average	96.73	96.40	95.96	96.03	96.18	96.06

Approved By. 

FM-L13 108/30-05-57



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Website : www.scieco.co.th E-Mail : calibrate@scg.co.th

Certificate No. T220730

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Calibration Report

Measurement Results

Calibration Point	Average Standard Reading at each position (°C)					
R1 Hole1-Hole6	TN221	TN222	TN223	TN224	TN225	TN226
CAL POINT	Max	104.47	104.65	104.79	105.31	105.47
	Min	104.15	104.27	104.45	104.98	105.14
	Average	104.31	104.46	104.62	105.15	105.31
R2 Hole7-Hole12	TN227	TN228	TN229	TN230	TN231	TN232
	Max	105.55	105.73	105.65	105.84	105.97
	Min	105.28	105.43	105.35	105.52	105.68
	Average	105.42	105.58	105.50	105.68	105.82
R3 Hole13-Hole18	TN233	TN234	TN235	TN236	TN237	TN238
	Max	106.14	106.06	105.81	106.05	105.81
	Min	105.85	105.81	105.55	105.80	105.53
	Average	106.00	105.94	105.68	105.92	105.67
R4 Hole19-Hole24	TN239	TN240	TN241	TN242	TN243	TN244
	Max	105.86	105.60	104.44	104.51	104.28
	Min	105.61	105.37	104.27	104.35	104.12
	Average	105.74	105.48	104.35	104.43	104.20
R5 Hole25-Hole30	TN225	TN226	TN227	TN228	TN229	TN230
	Max	104.94	104.93	104.97	105.08	104.68
	Min	104.77	104.75	104.76	104.90	104.51
	Average	104.85	104.84	104.86	104.99	104.60
R6 Hole31-Hole36	TN231	TN232	TN233	TN234	TN235	TN236
	Max	105.44	105.45	105.61	104.95	104.84
	Min	105.27	105.27	105.44	104.76	104.66
	Average	105.36	105.36	105.53	104.86	104.75
R7 Hole37-Hole42	TN237	TN238	TN239	TN240	TN241	TN242
	Max	105.17	104.70	104.59	104.51	105.22
	Min	105.00	104.53	104.41	104.35	105.04
	Average	105.08	104.62	104.50	104.43	105.13
R8 Hole43-Hole48	TN223	TN224	TN225	TN226	TN227	TN228
	Max	105.61	105.45	105.10	104.77	104.87
	Min	105.44	105.28	104.92	104.60	104.70
	Average	105.53	105.37	105.01	104.69	104.79

Approved By:

FM-L13 108/30-05-57



Metrological Center

SCI ECO Services Company Limited

33/2 Moo 3, T.Banpa, A.Kaengkhoh, Saraburi 18110
Telephone : +66 2 586 5792-4 Fax : +66 2 586 5109
Website : www.scieco.co.th E-Mail : calibrate@scg.co.th

Certificate No. T220730

Page 5 of 6

Calibration Report

Measurement Results:

HEATING BLOCK			Temperature Distribution	
Setting (°C)	Reading (°C)		Stability (± °C)	Uncertainty (± °C)
	Min, Max	Average		
100.0	100.0, 100.4	100.1	0.29	0.83
105.0	105.0, 105.4	105.1	0.20	0.79

* The quoted uncertainty exclude * uniformity *

The calibration result apply only the above calibrated item.

The result of test was found accurate as shown on date and place of test only.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k, which for a t-distribution, providing a level of confidence of approximately 95 %.

Approved By:

FM-L13 108/30-05-57



Metrological Center

SCI ECO Services Company Limited

33/2 Moo 3, T.Banpa, A.Kaengkhoh, Saraburi 18110, Thailand.
Saraburi Tel : +66 3627 3096 Fax : +66 3627 3100
Bangkok Tel : +668 9205 6851, +668 8247 2360
Website : www.scieco.co.th E-Mail : calibrate@scg.co.th



Certificate No. T211009

Page 1 of 4

Certificate of Calibration

Equipment : Chamber (Cold Room)

Manufacturer : KOLDTECH

Model : KM 320

Serial No. : TBN-1012061/05

Customer Code : BKK_EN0167

ID No. : T2463A3

Customer : ALS Laboratory Group (Thailand) Co.,Ltd.

104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan,
Khet Suan Luang, Bangkok 10250

Customer Location : Laboratory

Date of Receipt : 6 May 2021

Calibrated By : Watcharapon Songthong (Technician)

Approved By : / Boonchai Suriyawong (Site Calibration Manager)

Date of Issue : 20 MAY 2021

REVIEW BY	
APPROVED BY	
NEXT CAL. DATE	16/11/22

The uncertainties are for a confidence probability of approximately 95%.

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation Scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standard laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Metrological Center.

FM-L14 117/01-02-44



Metrological Center

SCI ECO Services Company Limited

33/2 Moo 3, T.Banpa, A.Kaengkhoh, Saraburi 18110, Thailand.



Certificate No. T211009

Page 2 of 4

Calibration Report

Equipment : Chamber (Cold Room)
Date of Calibration : 18 May 2021
Environment : Temperature : 23.4-24.9 °C
Line Voltage : 221.4-230.2 V
Relative Humidity : 55 - 65 %RH

Condition of this results of calibration :

1. This equipment was calibrated by insert 16 standard thermocouples type T into its chamber, the other one standard thermocouples type T use for ambient temperature measurement. The calibration was done in according to WI-T20 (based on ASTM E145-94 (Reapproved 2001) and AS2853-1986).
All data show below were final values and the initial data from customer request. The temperature scale used was based on ITS - 90.

2. Reference Standard Instrument :

Instrument	Model	Instrument No.	Certificate No.	Due Date
TC	TYPE T	TN161-TN170	T210009	8 January 2022
TC	TYPE T	TN171-TN180	T210009	8 January 2022
DATA LOGGER	34970A	T149	T210009	8 January 2022

3. This certificate is traceable to :

National Institute of Metrology (Thailand) through Metrological Center (NSC-TISI-TIS 17025 CALIBRATION 0244).

4. Condition of calibrated item : good

Equipment Description :

Time Constant : 1 Hour - Minute At 3 °C

Fresh Air Damper ☐ Open ☐ Min ☐ Medium ☐ Max

☐ Close ☒ Not Available

5. Adjustment :

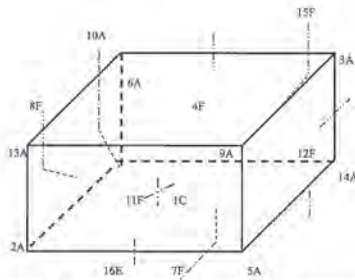
(X) without adjustment

() after adjustment

Approved By:

FM-L15 117/05-05-46

Calibration Report



C= Centre, F= Centre of Face, A= Corner, E= Centre of Edge

1C = TN161	12F = TN172
2A = TN162	13A = TN173
3A = TN163	14A = TN174
4F = TN164	15F = TN175
5A = TN165	16E = TN176
6A = TN166	
7F = TN167	
8F = TN168	
9A = TN169	
10A = TN170	
11F = TN171	

Approved By:

TM-L15117/15-05-01

Calibration Report

Measurement Results

Calibration Point	Average Standard Reading at each position (°C)									
	TN161	TN162	TN163	TN164	TN165	TN166	TN167	TN168	TN169	TN170
3	3.23	3.38	3.23	3.41	3.36	3.52	3.51	3.11	3.29	3.30
	TN171	TN172	TN173	TN174	TN175	TN176				
	3.36	3.18	3.52	3.22	3.28	3.31				

Chamber (Cold Room)			Temperature Distribution				
Setting (°C)	Reading (°C)		Average (°C)	Stability (± °C)	Uniformity (°C)	Uncertainty (± °C)	Coverage Factor k
	Min, Max	Average					
3.0	2.7, 3.4	3.0	3.34	1.00	1.10	1.46	2.00

* The Assorted uncertainty exclude "uniformity"

The calibration result apply only the above calibrated item.

The result of test was found accurate as shown on date and place of test only.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k which for a t-distribution, providing a level of confidence of approximately 95 %.

Approved By:

TM-L15117/15-05-01

REVIEW BY	Sudarat N.
APPROVED BY	Sudarat N.
NEXT CAL. DATE	5/06/2023

Serial-No.: K190A0143 Customer-No.: 104-002
Date: 6/06/2022 Carried out by: Mr. Sudarat N. Poon.

Maintenance with following Operational Qualification (OQ) ☐
(requires a separate OQ protocol)

Company	บริษัท วิทยาศาสตร์ เทคโนโลยี และ บริการ
User	สุรัตน์ นานา
Department	Lab
Street	104 ถนนพหลโยธิน แขวงจตุจักร กรุงเทพมหานคร
Zip Code, City	10250 กรุงเทพมหานคร 10250
Country	Thailand
Phone	
Fax	
E-mail	

Maintenance Protocol

Atomic Fluorescence Spectrometer
mercur DUO /
mercur DUO plus

Maintenance works basic unit

- lightness visual check inside the Mercur
- visual check if gold-traps are broken
- visual check if spectrometer is contaminated
- visual check of the fluorescence cell
- visual check of the absorption cell, incl. window
- reactor cleaning
- check pump-hose, if necessary change it
- check swivel drive (SEV)
- check drying-hose, output gas-liquid-separator
- test Bubble-Sensor
- check gas flows
- check volume flows, reagents
- recording stray light values
- measurement with 30 ng/l

Maintenance works Autosampler

Serial No.: 52 1102 250

- lubricate the dosing-winding (Teflon-grease-spray)
- clean the dosing cylinder, if necessary exchange it
- lubricate the winding system of the height drive with some drops of oil
- check the toothed belt
- check the position of the mechanical stopper (height: 13mm)
- check the pump rate of mixing pump (<14s AS52, typ.7s/<20s AS52S, typ.10s)
- check the pump rate of washing cup
- check the electrical hose connections for good contact
- check the connectors of the magnetic valves
- check the dosing hose for buckling, if necessary exchange it

Device parameter	nominal value	actual value
visual check general tightness inside the Mercur	<input checked="" type="checkbox"/> o.k.:	<input type="checkbox"/> changed:
visual check Goldtraps	<input checked="" type="checkbox"/> o.k.:	<input type="checkbox"/> changed:
visual check spectrometer		
Fluorescence cell	<input checked="" type="checkbox"/> o.k.:	<input type="checkbox"/> changed:
Absorption cell, incl. window	<input checked="" type="checkbox"/> o.k.:	<input type="checkbox"/> changed:
lens	<input checked="" type="checkbox"/> o.k.:	<input type="checkbox"/> changed:
Swivel drive (SEV)	<input checked="" type="checkbox"/> o.k.:	<input type="checkbox"/> changed:
check pump hoses	<input checked="" type="checkbox"/> o.k.:	<input type="checkbox"/> changed:
check hoses and hose connectors	<input checked="" type="checkbox"/> o.k.:	<input type="checkbox"/> changed:
check and clean reactor	<input checked="" type="checkbox"/> o.k.:	<input type="checkbox"/> changed:
check drying hose output Gas-liquid-separator	<input checked="" type="checkbox"/> o.k.:	<input type="checkbox"/> changed:
check bubble-sensor	<input checked="" type="checkbox"/> o.k.:	<input type="checkbox"/> not o.k.:
Check gasflow		
Argon pressure valve 4	1.2 – 1.5 bar	1.5 bar
Valve 1	10 Nl/h or 0.166 NL/min	0.166
Valve 2	50 Nl/h or 0.833 NL/min	0.833
Valve 3	5 Nl/h or 0.083 NL/min	0.084
Valve 4	10 Nl/h or 0.166 NL/min	0.167
Check liquidflow		
Acid	2.5ml/min ± 1 ml	2.5 ml/min
Red.-agent	2.5ml/min ± 1 ml	2.5 ml/min
Sample	10ml/min ± 2 ml	10 ml/min
Adventitious light - values	(V)	from file
	100	0
	200	0
	300	0
	350	1
	400	3
	450	7
	500	17
	550	36
	575	51
	600	91

Device parameter	nominal value	actual value
Analytical parameters Fluorescence cell		
Conditions.: max.conc.: 10µg/L PMT-voltage: <u>369</u> V		
Blank-solution		Int. <u>0.0003</u>
without enrichment / FBR 30 ng/L	Int > 0.0015 RSD < 3 %	Int. <u>0.0053</u> RSD <u>1.02</u> %
Conditions.: max.conc.: 1.7µg/L PMT-voltage: <u>352</u> V		
Blank-solution		Int. <u>0.0040</u>
with enrichment / FBR 30 ng/L	Int > 0.008 RSD < 3 %	Int. <u>0.0249</u> RSD <u>0.87</u> %
Fok.-factor (Int ₂ / Int ₁)	> 3.5	<u>4.206</u>
Analytical parameters Absorption cell		
Blank-solution		Ext. <u>0.0010</u>
without enrichment / FBR 100 ng/L	Ext. > 0.0012 RSD < 5 %	Ext. <u>0.0049</u> RSD <u>3.32</u> %
Comments		

Mr. Sorchai Pak-on
Signature Technician

Bangkok, 6/06/2022

Signature Customer

6/06/2022



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 16, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-3000-27 FAX. 0-2719-9484



Certificate of Calibration

Cert. No.: 22TM101
Page.: 1 of 3

Equipment: Autoclave

Manufacturer : Sanyo

Model : MLS-3781

Serial No. : 830167

ID No. : BKK ML0037

Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd.
104 Phatthanakan 40, Phatthanakan Rd.,
Khwaeng Phatthanakan, Khet Suan Luang,
Bangkok 10250 Thailand

Location : Media Preparation Room

Location : Media Preparation Room

Received Order : 21 January 2022

Calibration Date : 21 January 2022

Ambient Temperature : $(26 \pm 10)^\circ\text{C}$

Relative Humidity : (50 ± 30) %

Calibrated by : Krisda Malee

Approved by : Muku .
Approved Signatory

() Pornthippa Tameyakul
(✓) Malee Butkruea
() Suwit Imjai

Issue Date : 3 February 2022

The Uncertainties are for a confidence probability of approximately 95%

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Equipment : Autoclave
Condition As-Received : Used Item
Reference : 2201-0616OC-3
Procedure Used :-

Cert. No.: 22TM101
Page.: 2 of 3

Calibration were conducted using in-house calibration procedure CP-OT03 according to direct measurement method with Data Acquisition which connected with Thermocouple Type T.
The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Data Acquisition	34972A	MY57013711	21LM7	16 Jun 2022

- This certificate is valid only to the item calibrated on date and place of calibration.
 - This certification is traceable to the International System of Unit.
 - This result of calibration covers laboratory autoclaves for the sterilization of goods and material which could be infected with organisms categorized as Hazard Group 1, 2 and 3**
 - (** = Categorization of pathogens according to hazard and categories of containment, second edition, 1990)
- It does not cover autoclaves for use with material infect with organisms in Hazard Group 4, for which complete containment and sterilization of infected condensate is considered to be essential.
This result of calibration does not apply to sterilizers or disinfectors used for medical, dental, pharmaceutical or veterinary purposes which are directly concerned with patient care, or those used for fabrics subjected to sterilization which are required to be dry at the end of cycle.

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source



	Environmental		
	(°C)	(%R.H.)	(Volt)
Beginning of Calibration	27	57	220
Finished of Calibration	26	59	221

Position	Description	Ref. Std. ID No.:
1 =	Center of chamber	18-18TC-01
2 =	Temperature sensor	18-18TC-02
3 =	Exhaust port	18-18TC-03

Malee

a 1092305



Equipment : Autoclave
Condition As-Received : Used Item
Reference : 2201-0616OC-3
Result of Calibration :- (*) Without Adjustment

Cert. No.: 22TM101
Page.: 3 of 3

Operating parameter Set : Temperature = 108 °C
Sterilization period = 15 minute

UUC* Setting (°C)	UUC* Reading (°C)	Position	Average* Standard Reading (°C)	Stability (± °C)	Pressure Reading (MPa)	Uncertainty (± °C)	Coverage Factor k
108	108	1	108.044	0.29	0.040	0.94	2
		2	108.133				
		3	108.142				

Operating parameter Set : Temperature = 121 °C
Sterilization period = 15 minute

UUC* Setting (°C)	UUC* Reading (°C)	Position	Average* Standard Reading (°C)	Stability (± °C)	Pressure Reading (MPa)	Uncertainty (± °C)	Coverage Factor k
121	121	1	121.082	0.21	0.11	0.91	2
		2	121.068				
		3	121.128				

Average* : The average of 30 values in each position.

Stability : One-half of the greatest maximum difference of measured temperature at any one probe.

UUC* : Unit Under Calibration.

Note : The reported uncertainty of measurement was included stability and excluded uniformity.

The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor k, providing a level of confidence of approximately 95 %.

-00-

Malee

a 1092304



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2713-9080/27 FAX. 0-2719-4884



Cert. No.: 22TM102
Page.: 1 of 3

Certificate of Calibration

Equipment : Incubator
Manufacturer : SHEL-LAB
Model : 1915A
Serial No. : 0200599
ID No. : BKK_ML0010

Submitted by : ALS Laboratory Group (Thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd.,
Khwaeng Phatthanakan, Khet Suan Luang,
Bangkok 10250 Thailand

Location : Incubation & Micrological Reading
Received Order : 21 January 2022
Calibration Date : 21 January 2022
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %

Calibrated by : Krisda Malee

Approved by :
Approved Signatory

() Pornthippa Tameyakul
() Malee Butkruea
() Suwit Imjai

Issue Date : 3 February 2022

The Uncertainties are for a confidence probability of approximately 95%

This certificate may not be reproduced other than in full, except with the prior written
Approval of the head of Corporate Services : Equipment Calibration and Testing Services.

A 0037377



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2201-0616OC-1
Procedure Used :-

Cert. No.: 22TM102
Page.: 2 of 3

Calibration were conducted using calibration procedure CP-OT02 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD).
The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

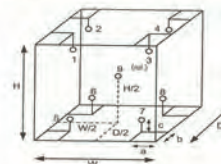
Instrument	Model	Serial No.	Cert. No.	Due Date
1) Data Acquisition	34972A	MY57013711	21LM7	16 Jun 2022

- This certificate is valid only to the item calibrated on date and place of calibration.
- This certification is traceable to the International System of Unit.

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close



Probe Installation Details :
a = 10 cm
b = 10 cm
c = 10 cm
Dimension of Chamber :
D = 0.90 m
W = 0.75 m
H = 1.2 m
Capacity = 0.81 m³

Environment during calibration		
	Beginning	Finished
Temp. (°C)	26	25
REL. Humid. (%)	53	54
AC Supply (Volt)	220	221

Position :	Ref. Std. ID No.:
1	18-18RTD-01
2	18-18RTD-02
3	18-18RTD-03
4	18-18RTD-04
5	18-18RTD-05
6	18-18RTD-06
7	18-18RTD-07
8	18-18RTD-08
9 (ref.)	18-18RTD-09

Malee

a 1092309



Equipment : Incubator
 Condition As-Received : Used Item
 Reference : Z201-0616OC-1
 Result of Calibration :- (*) Without Adjustment
 Function of UUC* : Temperature Source
 Fresh air setting : Close

Cert. No.: 22TM102
 Page.: 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Uncertainty (± °C)	Coverage Factor k
35.0	35.0	35.0	0.043	0.41	0.42	0.30	2

Calibration Point (°C)	Measured Temperature (°C)								
	Position								
	1	2	3	4	5	6	7	8	9 (ref.)
35.0	34.801	34.888	34.862	35.012	35.040	35.010	35.084	35.040	35.178

Average* : The average of 30 values in each position.
Temperature stability : One-half of the greatest maximum difference of measured temperature at any one sensor.
Temperature uniformity : The maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady-state conditions.
Overall Variation : The Difference of the maximum and minimum measured temperatures throughout observation.
UUC* : Unit Under Calibration
 Note : The reported uncertainty of measurement was included stability and excluded uniformity .

The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor k, providing a level of confidence of approximately 95 %.

-o0o-

Mala.

a 1092308



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
 CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
 53/44 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
 TEL. 0-2715-3000-27 FAX. 0-2719-9481



Cert. No.: 21TM1101
 Page.: 1 of 3

Certificate of Calibration

Equipment : Hot Air Oven
 Manufacturer : BINDER
 Model : ED240/E2
 Serial No. : 00-15533
 ID No. : BKK_ML0013
 Submitted by : ALS Laboratory Group (Thailand) Co., Ltd.
 104 Phatthanakan 40, Phatthanakan Rd.,
 Khwaeng Phatthanakan, Khet Suan Luang,
 Bangkok 10250 Thailand
 Location : Media Preparation Room
 Received Order : 7 June 2021
 Calibration Date : 7 June 2021
 Ambient Temperature : (26 ± 10) °C
 Relative Humidity : (50 ± 30) %
 Calibrated by : Preecha Hlahib

REVIEW BY	Sthichak
APPROVED BY	
NEXT CAL DATE	6/12/22

Approved by : Mala.
 Approved Signatory

() Pornthippa Tameyakul
 (/) Malee Butkruea
 () Suwit Imjai

Issue Date : 21 June 2021

The Uncertainties are for a confidence probability of approximately 95 %

This certificate may not be reproduced other than in full, except with the prior written approval of the head of Corporate Services 3: Equipment Calibration and Testing Services.

A 0029135



Equipment : Hot Air Oven
 Condition As-Received : Used Item
 Reference : 2106-0101OC-2
 Procedure Used :-

Cert. No.: 21TM1101
 Page.: 2 of 3

Calibration were conducted using calibration procedure CP-OT02 according to direct measurement method with Data Acquisition which connected with Thermocouple Type T.
 The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

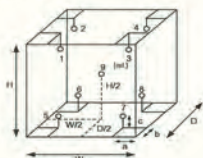
Instrument	Model	Serial No.	Cert. No.	Due Date
1) Data Acquisition	34972A	MY57013823	21LM3	26 Feb 2022

2. This certificate is valid only to the item calibrated on date and place of calibration.
 3. This certification is traceable to the International System of Unit.

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close



Probe Installation Details :
 a = 5.0 cm
 b = 5.0 cm
 c = 5.0 cm
 Dimension of Chamber :
 D = 0.50 m
 W = 0.80 m
 H = 0.60 m
 Capacity = 0.24 m³

Environment during calibration	
	Beginning
Temp. (°C)	26
REL Humid. (%)	65
AC Supply (Volt)	220

Position :	Ref. Std. ID No.:
1	19-17TC-01
2	19-17TC-02
3	19-17TC-03
4	19-17TC-04
5	19-17TC-05
6	19-17TC-06
7	19-17TC-07
8	19-17TC-08
9 (ref.)	19-17TC-09

Mala.

a 1059245



Equipment : Hot Air Oven
 Condition As-Received : Used Item
 Reference : 2106-0101OC-2
 Result of Calibration :- (*) Without Adjustment
 Function of UUC* : Temperature Source

Cert. No.: 21TM1101
 Page.: 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Uncertainty (± °C)	Coverage Factor k
180	180	180	0.67	2.4	3.3	1.5	2

Calibration Point (°C)	Measured Temperature (°C)								
	Position								
	1	2	3	4	5	6	7	8	9 (ref.)
180	179.315	181.249	178.684	180.035	179.941	180.511	178.429	180.268	179.065

Average* : The average of 30 values in each position.
Temperature stability : One-half of the greatest maximum difference of measured temperature at any one sensor.
Temperature uniformity : The maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady-state conditions.
Overall Variation : The Difference of the maximum and minimum measured temperatures throughout observation.
UUC* : Unit Under Calibration
 Note : The reported uncertainty of measurement was included stability and excluded uniformity .

The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor k, providing a level of confidence of approximately 95 %.

-o0o-

Mala.

a 1059244



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
53/44 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-3000-27 FAX. 0-2719-9484



Certificate of Calibration

Cert. No.: 22TM677
Page.: 1 of 3

Equipment : Water Bath

Manufacturer : Memmert

Model : WNE 45

Serial No. : L712.0429

ID No. : BKK_ML0056

Submitted by : ALS Laboratory Group (Thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd.,
Khaeng Phatthanakan, Khet Suan Luang,
Bangkok 10250 Thailand
Incubator & Microbiological Reading

Location :

Received Order : 20 May 2022

Calibration Date : 26 May 2022

Ambient Temperature : $(26 \pm 10) ^\circ\text{C}$

Relative Humidity : $(50 \pm 30) \%$

Calibrated by : Preecha Hlahib

Approved by :

- () Pornthippa Tamayakul
() Malee Butkrus
(x) Suwit Imjai

Issue Date : 24 May 2022

The Uncertainties are for a confidence probability of approximately 95%

This certificate may not be reproduced other than in full, except with the prior written
Approval of the head of Corporate Services : Equipment, Calibration and Testing Services.



A 0041433



Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2205-0404OC-1
Procedure Used :-

Cert. No.: 22TM677
Page.: 2 of 3

Calibration were conducted using in-house calibration procedure CP-OT04 according to direct measurement method with Data Acquisition which connected with Industrial Platinum Resistance Thermometer (IPRT).

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Data Acquisition	34972A	MY57013823	22LM24	26 Feb 2023

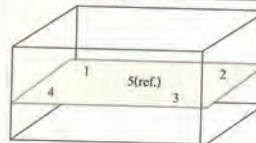
2. This certificate is valid only to the item calibrated on date and place of calibration.

3. This certification is traceable to the International System of Unit.

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

	Environmental		AC Voltage Supply
	(°C)	(%R.H.)	(Volt)
Beginning of Calibration	24	47	220
Finished of Calibration	24	52	221



Front

Position :	Ref. Std. S/N.:
1	4804539-006
2	4804539-007
3	4804539-008
4	4804539-009
5(ref.)	4804539-010

a 1109674



Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2205-0404OC-1
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source

Cert. No.: 22TM677
Page.: 3 of 3

Calibration point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Average* Standard Reading (°C)				
			Position				
44.5	44.4	44.4	1	2	3	4	5 (ref.)
			44.539	44.497	44.476	44.506	44.507

Calibration point (°C)	Uniformity (°C)	Stability (± °C)	Uncertainty (± °C)	Coverage Factor k
44.5	0.068	0.030	0.15	2

Average* : The average of 30 values in each position.

Uniformity : The maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady-state conditions.

Stability : One-half of the greatest maximum difference of measured temperature at any one probe.

UUC* : Unit Under Calibration

Note : The reported uncertainty of measurement was included stability and excluded uniformity.

The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor k, providing a level of confidence of approximately 95 %.

-000-

a 1109673

ภาคผนวก จ

สำเนาหนังสืออนุญาตขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

ที่ อก ๐๓๑๐(๑)/ ๑๐๖๙



กรมโรงงานอุตสาหกรรม
ถนนพระรามที่ ๖ เขตราชเทวี
กรุงเทพมหานคร ๑๐๔๐๐

๒๘ มกราคม ๒๕๖๕

เรื่อง ต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

เรียน กรรมการผู้จัดการ บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน
ลงวันที่ ๓๐ กรกฎาคม ๒๕๖๓

- สิ่งที่ส่งมาด้วย ๑. รายชื่อผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๑ แผ่น
๒. รายชื่อเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๕ แผ่น
๓. ขอบข่ายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๓๑ แผ่น

ตามหนังสือที่อ้างถึง บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด ขอต่ออายุ
หนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ว-๒๐๔ สถานที่ตั้งเลขที่ ๑๐๔
ซอยพัฒนาการ ๔๐ ถนนพัฒนาการ แขวงพัฒนาการ เขตสวนหลวง กรุงเทพมหานคร
ต่อกรมโรงงานอุตสาหกรรม นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย)
จำกัด ต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน โดยมีองค์ประกอบดังนี้

- ก. ผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๖ ราย ตามสิ่งที่ส่งมาด้วย ๑
ข. เจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๑๖๒ ราย ตามสิ่งที่ส่งมาด้วย ๒
ค. ขอบข่ายสารมลพิษที่ได้รับขึ้นทะเบียนให้วิเคราะห์ในน้ำเสีย จำนวน ๕๙ รายการ น้ำใต้ดิน
จำนวน ๑๒๖ รายการ อากาศเสีย ๑๖ รายการ สิ่งปฏิกูลหรือวัสดุที่ไม่ใช้แล้ว จำนวน ๓๕ รายการ และดิน
จำนวน ๑๒๕ รายการ รวมทั้งสิ้นจำนวน ๓๖๑ รายการ ตามสิ่งที่ส่งมาด้วย ๓

หนังสือฉบับนี้จะหมดอายุในวันที่ ๒ กันยายน ๒๕๖๖ หากประสงค์จะต่ออายุหนังสือ
รับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน ให้ยื่นคำขอต่ออายุพร้อมเอกสารประกอบคำขอ
ต่อกรมโรงงานอุตสาหกรรม ภายใน ๓๐ วัน ก่อนวันสิ้นอายุของหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์
เอกชน ซึ่งคำขอต่ออายุดังกล่าวขอรับได้ที่กรมโรงงานอุตสาหกรรม

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

(นายศิริะ จันทรเจต)

นักวิทยาศาสตร์ชำนาญการพิเศษ รักษาการแทน
ผู้อำนวยการกองวิจัยและเตือนภัยมลพิษโรงงาน
ปฏิบัติราชการแทนอธิบดีกรมโรงงานอุตสาหกรรม

กองวิจัยและเตือนภัยมลพิษโรงงาน

กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษและทะเบียนห้องปฏิบัติการ

โทร. ๐ ๒๒๐๒ ๔๑๔๖ ๐ ๒๒๐๒ ๔๐๐๒

โทรสาร ๐ ๒๓๕๔ ๓๒๐๘ ๐ ๒๓๕๔ ๓๔๑๕

เอกสารแนบท้ายหนังสือรับต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด

เลขทะเบียน ว-๒๐๔

ที่ อก ๐๓๑๐(๑)/

ลงวันที่ ๒๘ มกราคม ๒๕๖๕

ก. ผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๖ ราย

๑) นางสาวยุพาพร จันทร์เปล่ง

ทะเบียนเลขที่ ว-๒๐๔-ค-๔๗๐๐

๒) นางสาวชัชชัย โกมารกุล ณ นคร

ทะเบียนเลขที่ ว-๒๐๔-ค-๔๗๐๑

๓) นายศรายุทธ จิตรานนท์

ทะเบียนเลขที่ ว-๒๐๔-ค-๔๗๐๒

๔) นางสาวกนกกร เอนก

ทะเบียนเลขที่ ว-๒๐๔-ค-๖๑๑๑

๕) นายสุริยา สอนแก้ว

ทะเบียนเลขที่ ว-๒๐๔-ค-๖๑๑๒

๖) นายวิชาญ ชูณหะวัณ

ทะเบียนเลขที่ ว-๒๐๔-ค-๖๑๑๓

(นายศิริระ จันทรเจ็ด)

นักวิทยาศาสตร์ชำนาญการพิเศษ รักษาการแทน

ผู้อำนวยการกองวิจัยและเตือนภัยมลพิษโรงงาน

ปฏิบัติราชการแทนอธิบดีกรมโรงงานอุตสาหกรรม

เอกสารแนบท้ายหนังสือรับต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด

เลขทะเบียน ว-๒๐๔

ที่ อก ๐๓๑๐(๑)/ ๑๐๖๙

ลงวันที่ ๒๘ มกราคม ๒๕๖๕

ข. เจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๑๖๒ ราย

๑) นางสาวจินดา ไชจุลธรรม	ทะเบียนเลขที่ ว-๒๐๔-จ-๔๗๐๘
๒) นางสาวสาวิตรี น้อยเสงี่ยม	ทะเบียนเลขที่ ว-๒๐๔-จ-๔๗๐๙
๓) นางสาวชนัญญาญจน์ อัมขม	ทะเบียนเลขที่ ว-๒๐๔-จ-๔๗๑๐
๔) นางสาวนรินทร์ สายเส็ง	ทะเบียนเลขที่ ว-๒๐๔-จ-๔๗๑๕
๕) นางสาวนันทวดี สมบูรณ์	ทะเบียนเลขที่ ว-๒๐๔-จ-๔๗๑๖
๖) นางสาวศรัณยา เฉลิมธำรงค์	ทะเบียนเลขที่ ว-๒๐๔-จ-๔๗๑๗
๗) นางสาวสรารักษ์ มงคลจิรวุฒิ	ทะเบียนเลขที่ ว-๒๐๔-จ-๔๗๑๙
๘) นางสาวศิริลักษณ์ พึ่งแพง	ทะเบียนเลขที่ ว-๒๐๔-จ-๔๗๒๐
๙) นายณพพงศ์ จันทรพันธุ์	ทะเบียนเลขที่ ว-๒๐๔-จ-๕๔๐๘
๑๐) นายนรเศรษฐ์ โกมลาลัย	ทะเบียนเลขที่ ว-๒๐๔-จ-๕๔๑๑
๑๑) นายธันวา จริยา	ทะเบียนเลขที่ ว-๒๐๔-จ-๕๔๑๔
๑๒) นางสาวเกศรินทร์ แก้วมัน	ทะเบียนเลขที่ ว-๒๐๔-จ-๕๔๑๖
๑๓) นางสาวสุวิมล ชัยเรืองวุฒิ	ทะเบียนเลขที่ ว-๒๐๔-จ-๕๔๑๗
๑๔) นางสาวสุชาดา ธรรมถาวร	ทะเบียนเลขที่ ว-๒๐๔-จ-๕๔๒๑
๑๕) นางสาวเบมิกา ชัยเดชธนกุล	ทะเบียนเลขที่ ว-๒๐๔-จ-๕๔๒๓
๑๖) นางสาวศศิธร หมูสวัสดิ์	ทะเบียนเลขที่ ว-๒๐๔-จ-๕๔๒๔
๑๗) นางสาวเสาวลักษณ์ ภู่นภาอำพร	ทะเบียนเลขที่ ว-๒๐๔-จ-๕๔๒๕
๑๘) นายอภิสิทธิ์ สิงหา	ทะเบียนเลขที่ ว-๒๐๔-จ-๕๔๒๖
๑๙) นายศักดิ์สิทธิ์ ไพศาลพิสุทธ์	ทะเบียนเลขที่ ว-๒๐๔-จ-๕๔๒๗
๒๐) ว่าที่ร้อยตรีหญิง พรรณิภา ขำเจริญ	ทะเบียนเลขที่ ว-๒๐๔-จ-๕๔๒๘
๒๑) นางจิตดา คำภูแก้ว	ทะเบียนเลขที่ ว-๒๐๔-จ-๕๔๓๑
๒๒) นางสาวอรรพรรณ รักยง	ทะเบียนเลขที่ ว-๒๐๔-จ-๖๑๑๕
๒๓) นางสาวนพรัตน์ แยมกรานต์	ทะเบียนเลขที่ ว-๒๐๔-จ-๖๑๑๙
๒๔) นายจุลเดช วารินทร์	ทะเบียนเลขที่ ว-๒๐๔-จ-๖๑๒๐
๒๕) นางสาวดาญรัตน์ ร้องคำ	ทะเบียนเลขที่ ว-๒๐๔-จ-๖๑๒๑
๒๖) นายนคร สุขเจริญ	ทะเบียนเลขที่ ว-๒๐๔-จ-๖๑๒๒
๒๗) นายบัญชา นามเขตต์	ทะเบียนเลขที่ ว-๒๐๔-จ-๖๑๒๓
๒๘) นายพรมมี ศรีปัตเนตร	ทะเบียนเลขที่ ว-๒๐๔-จ-๖๑๒๕
๒๙) นายอุทิศ อุ่นสิม	ทะเบียนเลขที่ ว-๒๐๔-จ-๖๑๒๖
๓๐) ว่าที่ร้อยตรี เฉลิมเกียรติ อมรศรีเสริม	ทะเบียนเลขที่ ว-๒๐๔-จ-๖๑๒๘
๓๑) นางสาววริยา สร้างนา	ทะเบียนเลขที่ ว-๒๐๔-จ-๖๑๒๙
๓๒) นายอนุพงศ์ รัตนศรีประเสริฐ	ทะเบียนเลขที่ ว-๒๐๔-จ-๖๑๓๐
๓๓) นางสาวจุฑารัตน์ โอนสันเทียะ	ทะเบียนเลขที่ ว-๒๐๔-จ-๖๑๔๒
๓๔) นางสาวจรรววรรณ พิมพ์อริกฤติยา	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๗๖

(นายศิระ จันทรเจ็ด)

๓๕) นางสาวปรารค์ทิพย์...

นักวิทยาศาสตร์ชำนาญการพิเศษ รักษาการแทน

ผู้อำนวยการกองวิจัยและเตือนภัยมลพิษโรงงาน

สำนักงานคณะกรรมการอาหารและยา

๓๕) นางสาวปรางค์ทิพย์ กิจไพศาลศักดิ์	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๗๙
๓๖) นางสาวเดือนใจ ทางกลาง	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๘๐
๓๗) นางสาวจิราพร ศิริเวช	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๘๑
๓๘) นายวรกร ผูกרך	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๘๒
๓๙) นายทอง วิริยะสทกิจ	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๘๓
๔๐) นายธนิต เจนจบ	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๘๔
๔๑) นายคณิศร ขำเพชร	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๘๕
๔๒) นายอรรคพล นิยมวิทยาพันธ์	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๘๖
๔๓) นายภูวิช พรหมสะอาด	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๘๗
๔๔) นายธนเดช โภคาพิพัฒน์	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๘๘
๔๕) นายชวฤทธิ์ วงษ์จันทร์	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๘๙
๔๖) นายอาทิตย์ ศรีแสน	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๙๐
๔๗) นายเจษฎินทร์ คงศักดิ์ไทย	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๙๑
๔๘) นายจรัส บุญยิ่ง	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๙๒
๔๙) นายธนาณัติ เอนก	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๙๓
๕๐) นายอภิวัฒน์ ทุมหนู	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๙๔
๕๑) นางสาวสุภาขวัญ มาก	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๙๕
๕๒) นางสาวหัตพร ขวาลสมบูรณ์	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๙๖
๕๓) นางสาวธิดิมา บุญเพ็ง	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๐๐
๕๔) นางสาวกนกอร เข้มเพ็ชร	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๐๑
๕๕) นางสาวพัชรียา หงษ์สมดี	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๐๒
๕๖) นางสาวภาวนิดา สุรวงศ์ตระกูล	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๐๓
๕๗) นางสาวภาณุมาศ นามวัฒน์	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๐๔
๕๘) นางสาวอุไรรัตน์ ทิงสร้างแป้น	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๐๕
๕๙) นายธีรวัฒน์ ปวงสุข	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๐๖
๖๐) นายอิทธิพล ยะโส	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๐๗
๖๑) นายประพจน์ วรรณชูชัย	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๐๘
๖๒) นายชยธร พวงทิพย์	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๐๙
๖๓) นางสาวกนกวรรณ จันทบาล	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๑๐
๖๔) นางสาวเกษร หลักบุญ	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๑๑
๖๕) นายสิทธิโชค ธงเงิน	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๑๒
๖๖) นางศิลปวรรณ ใจบุญ	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๑๓
๖๗) นางสาวพรรณธิดา พุ่มคง	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๕๐๕
๖๘) นางสาวศรณีย์ ยิ่งดี	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๕๐๘
๖๙) นายนวกัทร ศรีวิริยะ	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๕๐๙
๗๐) นายสุวิชา ทองอ่อน	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๕๑๐
๗๑) นายวิญญู บุญตะนัย	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๕๑๑
	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๕๑๓

(นายศิริระ จันทรเจ็ด)

นักวิทยาศาสตร์ชำนาญการพิเศษ รักษาการแทน

ผู้อำนวยการกองวิจัยและเตือนภัยมลพิษโรงงาน

บริษัท ปูนซิเมนต์ไทย จำกัด (มหาชน)

๗๒) นายสมบูรณ์...

[illegible]

(นายศิระ จันทรเจ็ด)

นักวิทยาศาสตร์ชำนาญการพิเศษ รักษาราชการแทน

ผู้อำนวยการกองวิจัยและเตือนภัยมลพิษโรงงาน

ปณิธิราชมารทพาลกิจเด็กมรโงรงามมดตามมด

๑๐๙) นายนนทชัย...

๑๐๙) นายพนนพชัย อุปถัมภ์	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๕๙๔
๑๑๐) นายนิรุฬพล คุณสุทธิ	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๕๙๕
๑๑๑) นายนิพนธ์วัฒน์ สาริน	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๕๙๖
๑๑๒) นายปิยะนัฐ พลมะศรี	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๕๙๗
๑๑๓) นายพงศ์สิริ โสมเขียว	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๕๙๘
๑๑๔) นายพีรพัฒน์ กำคำ	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๕๙๙
๑๑๕) นายภาณุพงศ์ มานิตย์	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๖๐๐
๑๑๖) นายมงคล ผลาทิพย์	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๖๐๑
๑๑๗) นายมนูรินทร์ พูลศิริ	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๖๐๒
๑๑๘) นายสิรินันท์ ทองอ้น	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๖๐๓
๑๑๙) นายอเนชา ทันสมัย	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๖๐๔
๑๒๐) นายอดิศักดิ์ ผมไผ	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๖๐๕
๑๒๑) นายอนันตชัย วิสุม	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๖๐๖
๑๒๒) นายณัฐดนัย เจือละออง	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๖๐๗
๑๒๓) นายวรวิธ คีนิก	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๖๐๘
๑๒๔) นายแสงตะวัน นະตะສັດ	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๖๐๙
๑๒๕) นายยุทธพงศ์ รัตนะ	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๖๑๐
๑๒๖) นายชัยวัฒน์ ไซยะนิจ	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๖๑๑
๑๒๗) นายวิศรุต ศรีธรรมมา	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๖๑๒
๑๒๘) นายพนนทกร เผือกผ่อง	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๖๑๓
๑๒๙) นายกำชัย สุทธะ	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๖๑๔
๑๓๐) นางสาวณัฐภรณ์ รักทะเล	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๑๙
๑๓๑) นางสาวประภาภรณ์ บุตรพรม	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๒๐
๑๓๒) นางสาวนิลาวัลย์ นามพรม	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๒๑
๑๓๓) นางสาวพัชรินทร์ แสนสร้อย	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๒๒
๑๓๔) นายไพโรจน์ เปี่ยมพิมาย	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๒๓
๑๓๕) นางสาวศุภมาศ ทองมาก	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๒๔
๑๓๖) นางสาวลลิตา จิตรสว่าง	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๒๕
๑๓๗) นางสาวชไมพร เสิกภูเขียว	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๒๖
๑๓๘) นางสาวกฤติมาพร คำมีแก่น	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๒๗
๑๓๙) นางสาวสกลรัตน์ ภาควุฒิ	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๒๘
๑๔๐) นางสาวกาญจนา คงคุณ	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๒๙
๑๔๑) นางสาวไพรินทร์ ศรีรูปี	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๓๐
๑๔๒) นางสาวทิพนันดา ฝูญปัญญา	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๓๑
๑๔๓) นางสาวสาธิตา ปานทอง	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๓๒
๑๔๔) นางสาวอริสา ทองนวล	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๓๓
๑๔๕) นางสาวอริยา คำคลอง	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๓๔

(นายศิริ จันทรเจ็ด)

นักวิทยาศาสตร์ชำนาญการพิเศษ รักษาการแทน

ผู้อำนวยการกองวิจัยและเตือนภัยมลพิษโรงงาน

๑๔๖) นางสาวบุษดาภรณ์...

๑๔๖) นางสาวชุตติภรณ์ สุนทรสนาน	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๓๕
๑๔๗) นางสาวสุภารัตน์ นนทประสาท	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๓๖
๑๔๘) นางสาวรัชนิกร เนียมกลาง	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๓๗
๑๔๙) นางสาวกัญญารัตน์ ศรีนิลทา	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๓๘
๑๕๐) นางสาวอัญชลี คำจันทร์	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๓๙
๑๕๑) นายบุญฤทธิ์ เอี่ยมเทศ	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๔๐
๑๕๒) นายศิริวัฒน์ พานิชย์	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๔๑
๑๕๓) นางสาวศุภรดา ปันมยุรา	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๔๒
๑๕๔) นางสาวพาฤดี คุณนาน	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๔๓
๑๕๕) นางสาวจิราเจต พองดา	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๔๔
๑๕๖) นางสาวกนกภรณ์ อุระ	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๔๕
๑๕๗) นางสาวอารยา มีชัย	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๔๖
๑๕๘) นางสาวจิตสุภา ประเทืองสุข	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๔๗
๑๕๙) นางสาวอริสา วิริยขันติธรรม	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๔๘
๑๖๐) นางสาววิษุตา นาคผจญ	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๔๙
๑๖๑) นางสาวพนิดา ยอดอินทร์	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๕๐
๑๖๒) นางสาวนันทิยา จันทะสุน	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๕๑



(นายศิริระ จันทรเจต)

นักวิทยาศาสตร์ชำนาญการพิเศษ รักษาการแทน

ผู้อำนวยการกองวิจัยและเตือนภัยมลพิษโรงงาน

ปฏิบัติราชการแทนอธิบดีกรมโรงงานอุตสาหกรรม

เอกสารแนบท้ายหนังสือรับต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด

เลขทะเบียน ว-๒๐๔

ที่ อก ๐๓๑๐(๑)/ ๑๐๖๕

ลงวันที่ ๒๘ มกราคม ๒๕๖๕

ขอขยายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๓๖๑ รายการ

น้ำเสีย จำนวน 59 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Aldicarb	High-Performance Liquid Chromatographic Method ^[4]
2	Aldicarb Sulfone	High-Performance Liquid Chromatographic Method ^[4]
3	Aldicarb Sulfoxide	High-Performance Liquid Chromatographic Method ^[4]
4	Aldrin	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
5	Arsenic	1) Digestion, Inductively Coupled Plasma Method ^[4] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[4]
6	Barium	1) Digestion, Inductively Coupled Plasma Method ^[4] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[4]
7	α -BHC	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
8	β -BHC	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
9	δ -BHC	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
10	γ -BHC	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
11	Biochemical Oxygen Demand	1) 5-Day BOD Test, Azide Modification Method ^[4] 2) 5-Day BOD Test, Membrane Electrode Method ^[4]
12	Carbaryl	High-Performance Liquid Chromatographic Method ^[4]
13	Carbofuran	High-Performance Liquid Chromatographic Method ^[4]
14	Cadmium	1) Digestion, Inductively Coupled Plasma Method ^[4] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[4]
15	Chemical Oxygen Demand	1) Closed Reflux, Colorimetric Method ^[4] 2) Closed Reflux, Titrimetric Method ^[4]
16	Chlordane	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
17	Chromium	1) Digestion, Inductively Coupled Plasma Method ^[4] 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[4]
18	Color	ADMI Weighted-Ordinate Spectrophotometric Method



(นางริกาญจน์ จิตรสกุลไชย)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ

และทะเบียนห้องปฏิบัติการ

19 Copper...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
19	Copper	1) Digestion, Inductively Coupled Plasma Method ^[4] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[4]
20	Cyanide	Distillation, Colorimetric Method ^[4]
21	2,4'-DDD	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
22	4,4'-DDD	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
23	2,4'-DDE	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
24	4,4'-DDE	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
25	2,4'-DDT	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
26	4,4'-DDT	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
27	Dieldrin	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
28	Endosulfan Sulfate	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
29	Endosulfan I	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
30	Endosulfan II	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
31	Endrin	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
32	Endrin Aldehyde	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
33	Formaldehyde	Distillation, Colorimetric Method ^[3]
34	Free Chlorine	1) DPD Ferrous Titrimetric Method ^[4] 2) Iodometric Method ^[4]
35	Heptachlor	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
36	Heptachlor epoxide	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
37	Hexavalent Chromium	Filtration, Colorimetric Method ^[4]
38	3-Hydroxycarbofuran	High-Performance Liquid Chromatographic Method ^[4]
39	Lead	1) Digestion, Inductively Coupled Plasma Method ^[4] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[4]
40	Manganese	1) Digestion, Inductively Coupled Plasma Method ^[4] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[4]
41	Mercury	1) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^[4] 2) Digestion, Inductively Coupled Plasma/Mass spectrometric Method ^[4]
42	Methiocarb	High-Performance Liquid Chromatographic Method ^[4]
43	Methoxychlor	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]

วิมล

44 Methomyl...

(นางริกาญจน์ ฉัตรสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ

กรมส่งเสริมการค้าระหว่างประเทศ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
44	Methomyl	High-Performance Liquid Chromatographic Method ^[4]
45	Nickel	1) Digestion, Inductively Coupled Plasma Method ^[4] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[4]
46	Oil & Grease	1) Liquid-Liquid, Partition-Gravimetric Method ^[4] 2) Soxhlet Extraction Method ^[4]
47	Oxamyl	High-Performance Liquid Chromatographic Method ^[4]
48	Propoxur	High-Performance Liquid Chromatographic Method ^[4]
49	pH	Electrometric Method ^[4]
50	Phenols	1) Distillation, Chloroform Extraction Method ^[4] 2) Distillation, Direct Photometric Method ^[4]
51	Selenium	1) Digestion, Inductively Coupled Plasma Method ^[4] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[4]
52	Sulfide	Iodometric Method ^[4]
53	Temperature	Laboratory and Field Methods ^[4]
54	Total Dissolved Solids	Dried at 180 °C ^[4]
55	Total Kjeldahl Nitrogen	Semi-Micro Kjeldahl Method ^[4]
56	Total Suspended Solids	Dried at 103-105 °C ^[4]
57	Toxaphene	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
58	Trivalent Chromium	1) Digestion, Inductively Coupled Plasma Method; Colorimetric Method; Calculation ^[4] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method; Colorimetric Method; Calculation ^[4]
59	Zinc	1) Digestion, Inductively Coupled Plasma Method ^[4] 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[4]

น้ำใต้ดิน จำนวน 126 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Acenaphthene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
2	Acetone	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4]

วิมล

3 Aldrin...

(นางริภาญจน์ ฉัตรสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ
และทะเบียนห้องปฏิบัติการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
3	Aldrin	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
4	Anthracene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
5	Antimony	1) Digestion, Inductively Coupled Plasma Method ^[4] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[4]
6	Arsenic	1) Digestion, Inductively Coupled Plasma Method ^[4] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[4]
7	Atrazine	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
8	Barium	1) Digestion, Inductively Coupled Plasma Method ^[4] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[4]
9	Benz(a)anthracene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
10	Benzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4]
11	Benzo(b)fluoranthene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
12	Benzo(k)fluoranthene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
13	Benzoic Acid	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
14	Benzo(a)pyrene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
15	Benzo[g,h,i]perylene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
16	Beryllium	1) Digestion, Inductively Coupled Plasma Method ^[4] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[4]
17	Bis(2-chloroethyl)ether	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]

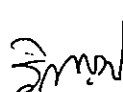
วิธีทาง)

18 Bis(2-ethylhexyl)phthalate...

(นางริกาญจน์ ฉัตรสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ
และทะเบียนห้องปฏิบัติการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
18	Bis(2-ethylhexyl)phthalate	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
19	Bromodichloromethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4]
20	Bromoform	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4]
21	Butanol	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4] Equilibrium Headspace, Gas Chromatographic/ Mass Spectrometric Method ^[4]
22	Butyl Benzyl Phthalate	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
23	Cadmium	1) Digestion, Inductively Coupled Plasma Method ^[4] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[4]
24	Carbazole	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
25	Carbon Disulfide	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4]
26	Carbon tetrachloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4]
27	Chlordane	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
28	p-Chloroaniline	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
29	Chlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4]
30	Chlorodibromomethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4]
31	Chloroform	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4]
32	2-Chlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
33	Chromium	1) Digestion, Inductively Coupled Plasma Method ^[4] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[4]

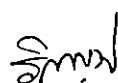


34 Chromium (III)...

(นางริกาญจน์ จิตรสกุลไธ)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
51	cis-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4]
52	trans-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4]
53	2,4-Dichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
54	1,2-Dichloropropane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4]
55	1,3-Dichloropropane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4]
56	1,3-Dichloropropene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4]
57	Dieldrin	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
58	Diethyl Phthalate	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
59	2,4-Dimethylphenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
60	2,4-Dinitrophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
61	2,4-Dinitrotoluene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
62	2,6-Dinitrotoluene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
63	Di-n-Octyl Phthalate	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
64	Endosulfan	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
65	Endrin	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
66	Ethylbenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4]
67	Fluoranthene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]



(นางริกาญจน์ ฉัตรสกุลวิไล)

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68 Fluorene...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
68	Fluorene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
69	Heptachlor	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
70	Heptachlor epoxide	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
71	Hexachlorobenzene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
72	Hexachloro-1,3-butadiene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4]
73	n-Hexane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4]
74	α -HCH	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
75	β -HCH	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
76	γ -HCH	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
77	Hexachlorocyclopentadiene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
78	Hexachloroethane	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
79	Indeno(1,2,3-cd)pyrene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
80	Isophorone	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
81	Lead	1) Digestion, Inductively Coupled Plasma Method ^[4] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[4]
82	Manganese	1) Digestion, Inductively Coupled Plasma Method ^[4] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[4]
83	Mercury	1) Cold Vapor Atomic Absorption Spectrometric Method ^[4] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[4]

ร.พ.ว.

84 Methanol...

(นางริกาญจน์ ฉัตรสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิชาการวิเคราะห์ทดสอบมลพิษ

แบบฟอร์มแจ้งผลการวิเคราะห์

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
84	Methanol	1) Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4] 2) Equilibrium Headspace, Gas Chromatographic/ Mass Spectrometric Method ^[4]
85	Methoxychlor	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
86	Methyl Bromide	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4]
87	Methylene Chloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4]
88	2-Methylphenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
89	2-Methylnaphthalene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
90	Methyl tert-Butyl Ether	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4]
91	Naphthalene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
92	Nickel	1) Digestion, Inductively Coupled Plasma Method ^[4] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[4]
93	Nitrobenzene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
94	N-Nitrosodiphenylamine	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
95	N-Nitrosodi-n-Propylamine	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
96	Polychlorinated Biphenyls - PCB 1016 - PCB 1221 - PCB 1232 - PCB 1242 - PCB 1248 - PCB 1254 - PCB 1260	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]

วิมล

97 Pentachlorophenol...

(นางริกาญจน์ ฉัตรสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ

และทะเบียนห้องปฏิบัติการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
97	Pentachlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
98	pH	Electrometric Method ^[4]
99	Phenanthrene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
100	Phenol	1) Distillation, Direct Photometric Method ^[4] 2) Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
101	Pyrene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
102	Selenium	1) Digestion, Inductively Coupled Plasma Method ^[4] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[4]
103	Silver	1) Digestion, Inductively Coupled Plasma Method ^[4] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[4]
104	Styrene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4]
105	1,1,2,2-Tetrachloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4]
106	Tetrachloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4]
107	Toluene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4]
108	Toxaphene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
109	TPH (C ₅ -C ₉)	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[13,24]
110	TPH (C ₈ -C ₁₆)	Solvent Extraction, Gas Chromatographic Method ^[9,21]
111	TPH (C ₁₆ -C ₃₅)	Solvent Extraction, Gas Chromatographic Method ^[9,21]
112	1,2,4-Trichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4]
113	1,1,1-Trichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4]

วิมล

114 1,1,2-Trichloroethane...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
114	1,1,2-Trichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4]
115	Trichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4]
116	2,4,5-Trichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
117	2,4,6-Trichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
118	1,3,5-Trimethylbenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4]
119	Vanadium	1) Digestion, Inductively Coupled Plasma Method ^[4] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[4]
120	Vinyl Acetate	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4]
121	Vinyl Chloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4]
122	m-Xylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4]
123	o-Xylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4]
124	p-Xylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4]
125	Xylene (Total)	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4]
126	Zinc	1) Digestion, Inductively Coupled Plasma Method ^[4] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[4]

อากาศเสีย (ปล่อยระบาย) จำนวน 16 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Antimony	Isokinetic, Digestion, Inductively Coupled Plasma Method ^[5]
2	Arsenic	Isokinetic, Digestion, Inductively Coupled Plasma Method ^[5]

วิทย์

3 Carbon Monoxide...

(นางริกาญจน์ ฉัตรสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิชาการวิเคราะห์ทดสอบมลพิษ

และหน่วยงานที่เกี่ยวข้อง

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
3	Carbon Monoxide	1) Sampling Bag Non-Dispersive Infrared Method ^[5] 2) Non-Dispersive Infrared Method ^[5] 3) Instrumental Analyzer Method ^[5]
4	Chlorine	1) Absorption Sampling, Ion Chromatographic Method ^[5] 2) Isokinetic Sampling, Ion Chromatographic Method ^[5]
5	Copper	Isokinetic, Digestion, Inductively Coupled Plasma Method ^[5]
6	Dioxins	Isokinetic Sampling, Analysis by ISO/IEC 17025 Accredited Laboratory or Analysis by Department of Industrial Works Registered Laboratory (Dioxins/Furans Analysis Approved) ^[5]
7	Hydrogen Chloride	1) Absorption Sampling, Ion Chromatographic Method ^[5] 2) Isokinetic Sampling, Ion Chromatographic Method ^[5]
8	Hydrogen Sulfide	Absorption Sampling, Iodometric Method ^[5]
9	Lead	Isokinetic, Digestion, Inductively Coupled Plasma Method ^[5]
10	Mercury	1) Isokinetic Sampling, Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^[5] 2) Isokinetic, Digestion, Inductively Coupled Plasma Method ^[5]
11	Opacity	Ringelmann's Method ^[2]
12	Oxides of Nitrogen	1) Absorption Sampling, Phenoldisulfonic Acid Method ^[5] 2) Chemiluminescence Method ^[5] 3) Instrumental Analyzer Method ^[5]
13	Sulfur Dioxide	1) Absorption Sampling, Barium-Thorin Titrimetric Method ^[5] 2) UV Fluorescence Method ^[5] 3) Instrumental Analyzer Method ^[5]
14	Sulfuric Acid	Isokinetic Sampling, Barium-Thorin Titrimetric Method ^[5]
15	Total Suspended Particulate	Isokinetic Sampling, Gravimetric Method ^[5]
16	Xylene	Adsorption Sampling, Gas Chromatographic Method ^[5]

วิมล

สิ่งปลูก...

(นางริกาญจน์ ฉัตรสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิชาการวิเคราะห์ทดสอบมลพิษ

กรมควบคุมมลพิษ

สิ่งปฏิกูลหรือวัสดุที่ไม่ใช้แล้ว จำนวน 35 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Aldrin	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[1,9,25] 2) Soxhlet Extraction, Gas Chromatographic Method ^[10,22] 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^[22,31]
2	Antimony	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,15] 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[1,6,16] 3) Digestion, Inductively Coupled Plasma Method ^[7,15] 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[7,16]
3	Arsenic	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,15] 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[1,6,16] 3) Digestion, Inductively Coupled Plasma Method ^[7,15] 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[7,16]
4	Barium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,15] 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[1,6,16] 3) Digestion, Inductively Coupled Plasma Method ^[7,15] 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[7,16]
5	Beryllium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,15] 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[1,6,16] 3) Digestion, Inductively Coupled Plasma Method ^[7,15] 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[7,16]



6 Cadmium...

(นางริกาญจน์ จิตรสกุลใจ)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ

และทะเบียนห้องปฏิบัติการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
6	Cadmium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,15] 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[1,6,16] 3) Digestion, Inductively Coupled Plasma Method ^[7,15] 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[7,16]
7	Chlordane	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[1,19,25] 2) Soxhlet Extraction, Gas Chromatographic Method ^[10,22] 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^[22,31]
8	Chromium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,15] 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[1,6,16] 3) Digestion, Inductively Coupled Plasma Method ^[7,15] 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[7,16]
9	Chromium (III)	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method; Waste Extraction, Colorimetric Method; Calculation Method ^[1,6,15,17] 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method; Waste Extraction, Colorimetric Method; Calculation Method ^[1,6,16,17] 3) Digestion, Inductively Coupled Plasma Method; Alkaline Digestion, Colorimetric Method; Calculation Method ^[7,8,15,17] 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method; Alkaline Digestion, Colorimetric Method; Calculation Method ^[7,8, 16,17]
10	Chromium (VI)	1) Waste Extraction, Colorimetric Method ^[1,6,17] 2) Alkaline Digestion, Colorimetric Method ^[8,17]



(นางริกาญจน์ ฉัตรสกุลวิไล)

11 Cobalt...

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ

.....เรียน...../.....

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
11	Cobalt	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,15] 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[1,6,16] 3) Digestion, Inductively Coupled Plasma Method ^[7,15] 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[7,16]
12	Copper	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,15] 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[1,6,16] 3) Digestion, Inductively Coupled Plasma Method ^[7,15] 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[7,16]
13	2,4-D	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[1,9,25] 2) Soxhlet Extraction, Gas Chromatographic Method ^[10,22] 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^[22,31]
14	DDD	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[1,9,25] 2) Soxhlet Extraction, Gas Chromatographic Method ^[10,22] 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^[22,31]
15	DDE	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[1,9,25] 2) Soxhlet Extraction, Gas Chromatographic Method ^[10,22] 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^[22,31]
16	DDT	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[1,9,25]

จิราพร

2) Soxhlet...

(นางริกาญจน์ จัตรสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ

และทะเบียนห้องปฏิบัติการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
17	Dieldrin	2) Soxhlet Extraction, Gas Chromatographic Method ^[10,22] 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^[22,31] 1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[1,9,25]
18	Endrin	2) Soxhlet Extraction, Gas Chromatographic Method ^[10,22] 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^[22,31] 1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[1,9,25]
19	Heptachlor	2) Soxhlet Extraction, Gas Chromatographic Method ^[10,22] 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^[22,31] 1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[1,9,25]
20	Lead	2) Soxhlet Extraction, Gas Chromatographic Method ^[10,22] 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^[22,31] 1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,15] 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[1,6,16] 3) Digestion, Inductively Coupled Plasma Method ^[7,15] 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[7,16]
21	Lindane	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[1,9,25] 2) Soxhlet Extraction, Gas Chromatographic Method ^[10,22] 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^[22,31]
22	Mercury	1) Waste Extraction, Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^[1,6,18]

วิมล

2) Waste Extraction...

(นางริกาญจน์ ฉัตรสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
23	Methoxychlor	2) Waste Extraction, Thermal Decomposition Amalgamation and Atomic Absorption Spectrometric Method ^[1,6,19] 3) Waste Extraction, Digestion, Cold-Vapor Atomic Fluorescence Spectrometric Method ^[1,6,20] 4) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^[18] 5) Thermal Decomposition Amalgamation and Atomic Absorption Spectrometric Method ^[19] 6) Digestion, Cold-Vapor Atomic Fluorescence Spectrometric Method ^[20]
24	Mirex	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[1,9,25] 2) Soxhlet Extraction, Gas Chromatographic Method ^[10,22] 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^[22,31]
25	Molybdenum	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[1,9,25] 2) Soxhlet Extraction, Gas Chromatographic Method ^[10,22] 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^[22,31]
26	Nickel	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,15] 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[1,6,16] 3) Digestion, Inductively Coupled Plasma Method ^[7,15] 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[7,16]
		1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,15] 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[1,6,16] 3) Digestion, Inductively Coupled Plasma Method ^[7,15] 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[7,16]

วิมล

27 Polychlorinated...

(นางริกาญจน์ ฉัตรสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
27	<p>Polychlorinated biphenyls (PCBs)</p> <ul style="list-style-type: none"> - Aroclor 1016 - Aroclor 1221 - Aroclor 1232 - Aroclor 1242 - Aroclor 1248 - Aroclor 1254 - Aroclor 1260 - 2-Chlorobiphenyl - 2,3-Dichlorobiphenyl - 2,2',5-Trichlorobiphenyl - 2,4',5-Trichlorobiphenyl - 2,2',3,5'-Tetrachlorobiphenyl - 2,2',5,5'-Tetrachlorobiphenyl - 2,3',4,4'-Tetrachlorobiphenyl - 2,2',3,4,5'-Pentachlorobiphenyl - 2,2',4,5,5'-Pentachlorobiphenyl - 2,3,3',4',6-Pentachlorobiphenyl - 2,2',3,4,4',5'-Hexachlorobiphenyl - 2,2',3,4,5,5'-Hexachlorobiphenyl - 2,2',3,5,5',6-Hexachlorobiphenyl - 2,2',4,4',5,5'-Hexachlorobiphenyl - 2,2',3,3',4,4',5-Heptachlorobiphenyl - 2,2',3,4,4',5,5'-Heptachlorobiphenyl - 2,2',3,4,4',5',6-Heptachlorobiphenyl - 2,2',3,4',5,5',6-Heptachlorobiphenyl - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl 	<p>1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method^[1,9,23]</p> <p>2) Soxhlet Extraction, Gas Chromatographic Method^[10,23]</p> <p>3) Automated Soxhlet Extraction, Gas Chromatographic Method^[22,31]</p>

วิมล

(นางริกาญจน์ ฉัตรสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ

28 Pentachlorophenol...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
28	Pentachlorophenol	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[1,9,25] 2) Soxhlet Extraction, Gas Chromatographic Method ^[10,22] 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^[22,31]
29	pH	Electrometric Method ^[29,30]
30	Selenium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,15] 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[1,6,16] 3) Digestion, Inductively Coupled Plasma Method ^[7,15] 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[7,16]
31	Silver	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,15] 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[1,6,16]
32	Thallium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,15] 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[1,6,16] 3) Digestion, Inductively Coupled Plasma Method ^[7,15] 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[7,16]
33	Toxaphene	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[1,9,25] 2) Soxhlet Extraction, Gas Chromatographic Method ^[10,22] 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^[22,31]
34	Vanadium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,15] 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[1,6,16] 3) Digestion, Inductively Coupled Plasma Method ^[7,15]

วิมล

(นางริกาญจน์ ฉัตรสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิชาการวิเคราะห์ทดสอบมลพิษ

4) Digestion...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
35	Zinc	4) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[7,16] 1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,15] 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[1,6,16] 3) Digestion, Inductively Coupled Plasma Method ^[7,15] 4) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[7,16]

ดิน จำนวน 125 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Acenaphthene	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[25,31]
2	Acetone	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[14,24]
3	Aldrin	1) Soxhlet Extraction, Gas Chromatographic Method ^[10,22] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[25,31]
4	Anthracene	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[25,31]
5	Antimony	1) Digestion, Inductively Coupled Plasma Method ^[7,15] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[7,16]
6	Arsenic	1) Digestion, Inductively Coupled Plasma Method ^[7,15] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[7,16]
7	Atrazine	1) Soxhlet Extraction, Gas Chromatographic Method ^[10,22] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[25,31]
8	Barium	1) Digestion, Inductively Coupled Plasma Method ^[7,15] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[7,16]

วิมล

(นางริกาณจน์ ฉัตรสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ

9 Benz(a)anthracene...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
9	Benz(a)anthracene	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[25,31]
10	Benzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[14,24]
11	Benzo(b)fluoranthene	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[25,31]
12	Benzo(k)fluoranthene	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[25,31]
13	Benzoic acid	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[25,31]
14	Benzo(a)pyrene	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[25,31]
15	Benzo(g,h,i)perylene	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[25,31]
16	Beryllium	1) Digestion, Inductively Coupled Plasma Method ^[7,15] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[7,16]
17	Bis(2-chloroethyl)ether	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[25,31]
18	Bis(2-ethylhexyl)phthalate	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[25,31]
19	Bromodichloromethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[14,24]
20	Bromoform	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[14,24]
21	Butanol	Equilibrium Headspace, Gas Chromatographic/ Mass Spectrometric Method ^[12,24]
22	Butyl Benzyl Phthalate	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[25,31]
23	Cadmium	1) Digestion, Inductively Coupled Plasma Method ^[7,15] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[7,16]
24	Carbazole	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[25,31]
25	Carbon Disulfide	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[14,24]



(นางริกาญจน์ ฉัตรสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ

26 Carbon tetrachloride...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
26	Carbon tetrachloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[14,24]
27	Chlordane	1) Soxhlet Extraction, Gas Chromatographic Method ^[10,22] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[25,31]
28	p-Chloroaniline	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[25,31]
29	Chlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[14,24]
30	Chlorodibromomethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[14,24]
31	Chloroform	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[14,24]
32	2-Chlorophenol	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[25,31]
33	Chromium	1) Digestion, Inductively Coupled Plasma Method ^[7,15] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[7,16]
34	Chromium (III)	1) Digestion, Inductively Coupled Plasma Method; Alkaline Digestion, Colorimetric Method; Calculation Method ^[7,8,15,17] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method; Alkaline Digestion, Colorimetric Method; Calculation Method ^[7,8,16,17]
35	Chromium (VI)	Alkaline Digestion, Colorimetric Method ^[8,17]
36	Chrysene	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[25,31]
37	Cyanide	Extraction, Distillation, Colorimetric Method ^[26,27,28]
38	2,4-D	1) Soxhlet Extraction, Gas Chromatographic Method ^[10,22] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[25,31]
39	DDD	1) Soxhlet Extraction, Gas Chromatographic Method ^[10,22] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[25,31]

วิฑูรย์

(นางวิภาณูจน์ ฉัตรสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ

40 DDE...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
40	DDE	1) Soxhlet Extraction, Gas Chromatographic Method ^[10,22] 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]
41	DDT	1) Soxhlet Extraction, Gas Chromatographic Method ^[10,22] 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]
42	Dibenz(a,h)anthracene	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]
43	Di-n-Butyl Phthalate	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]
44	1,2-Dichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,24]
45	1,3-Dichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,24]
46	1,4-Dichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,24]
47	3,3-Dichlorobenzidine	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]
48	1,1-Dichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,24]
49	1,2-Dichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,24]
50	1,1-Dichloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,24]
51	cis-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,24]
52	trans-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,24]
53	2,4-Dichlorophenol	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]
54	1,2-Dichloropropane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,24]
55	1,3-Dichloropropane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,24]
56	1,3-Dichloropropene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,24]

วิภาณี

57 Dieldrin...

(นางริกาญจน์ ฉัตรสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
57	Dieldrin	1) Soxhlet Extraction, Gas Chromatographic Method ^[10,22] 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]
58	Diethyl Phthalate	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]
59	2,4-Dimethylphenol	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]
60	2,4-Dinitrophenol	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]
61	2,4-Dinitrotoluene	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]
62	2,6-Dinitrotoluene	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]
63	Di-n-Octyl Phthalate	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]
64	Endosulfan	1) Soxhlet Extraction, Gas Chromatographic Method ^[10,22] 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]
65	Endrin	1) Soxhlet Extraction, Gas Chromatographic Method ^[10,22] 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]
66	Ethylbenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,24]
67	Fluoranthene	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]
68	Fluorene	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]
69	Heptachlor	1) Soxhlet Extraction, Gas Chromatographic Method ^[10,22] 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]
70	Heptachlor Epoxide	1) Soxhlet Extraction, Gas Chromatographic Method ^[10,22] 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
71	Hexachlorobenzene	1) Soxhlet Extraction, Gas Chromatographic Method ^[10,22] 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]
72	Hexachloro-1,3-butadiene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,24]
73	n-Hexane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,24]
74	α -HCH	1) Soxhlet Extraction, Gas Chromatographic Method ^[10,22] 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]
75	β -HCH	1) Soxhlet Extraction, Gas Chromatographic Method ^[10,22] 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]
76	γ -HCH	1) Soxhlet Extraction, Gas Chromatographic Method ^[10,22] 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]
77	Hexachlorocyclopentadiene	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]
78	Hexachloroethane	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]
79	Indeno(1,2,3-cd)pyrene	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]
80	Isophorone	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]
81	Lead	1) Digestion, Inductively Coupled Plasma Method ^[7,15] 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[7,16]
82	Manganese	1) Digestion, Inductively Coupled Plasma Method ^[7,15] 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[7,16]
83	Mercury	1) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^[18]

วิฑูรย์

(นางริกาญจน์ ฉัตรสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ

และหน่วยงานบังคับปฏิบัติการ

2) Thermal...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
84	Methanol	2) Thermal Decomposition, Amalgamation, and Atomic Absorption Spectrophotometry ^[19] 3) Digestion, Cold-Vapor Atomic Fluorescence Spectrometric Method ^[20] Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method ^[12,24]
85	Methoxychlor	1) Soxhlet Extraction, Gas Chromatographic Method ^[10,22] 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]
86	Methyl Bromide	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,24]
87	Methylene Chloride	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,24]
88	2-methylphenol	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]
89	2-Methylnaphthalene	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]
90	Methyl tert-Butyl Ether	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,24]
91	Naphthalene	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]
92	Nickel	1) Digestion, Inductively Coupled Plasma Method ^[7,15] 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[7,16]
93	Nitrobenzene	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]
94	N-Nitrosodiphenylamine	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]
95	N-Nitrosodi-n-propylamine	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]
96	Polychlorinated biphenyls (PCBs) - Aroclor 1016 - Aroclor 1221 - Aroclor 1232	1) Soxhlet Extraction, Gas Chromatographic Method ^[10,23] 2) Automated Soxhlet Extraction, Gas Chromatographic Method ^[23,32]

วิฑูรย์

(นางริกาญจน์ ฉัตรสกุลวิไล)

- Aroclor 1242...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
	<ul style="list-style-type: none"> - Aroclor 1242 - Aroclor 1248 - Aroclor 1254 - Aroclor 1260 - 2-Chlorobiphenyl - 2,2',3,5'-Tetrachlorobiphenyl - 2,2',5,5'-Tetrachlorobiphenyl - 2,3',4,4'-Tetrachlorobiphenyl - 2,2',3,4,5'-Pentachlorobiphenyl - 2,2',4,5,5'-Pentachlorobiphenyl - 2,3,3',4',6-Pentachlorobiphenyl - 2,2',3,4,4',5'-Hexachlorobiphenyl - 2,2',3,4,5,5'-Hexachlorobiphenyl - 2,2',3,5,5',6-Hexachlorobiphenyl - 2,2',4,4',5,5'-Hexachlorobiphenyl - 2,2',3,3',4,4',5-Heptachlorobiphenyl - 2,2',3,4,4',5,5'-Heptachlorobiphenyl - 2,2',3,4,4',5',6-Heptachlorobiphenyl - 2,2',3,4',5,5',6-Heptachlorobiphenyl - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl 	
97	Pentachlorophenol	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]
98	Phenanthrene	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]
99	Phenol	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]
100	Pyrene	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25,31]

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
101	Selenium	1) Digestion, Inductively Coupled Plasma Method ^[7,15] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[7,16]
102	Silver	1) Digestion, Inductively Coupled Plasma Method ^[7,15] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[7,16]
103	Styrene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[14,24]
104	1,1,2,2-Tetrachloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[14,24]
105	Tetrachloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[14,24]
106	Toluene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[14,24]
107	Toxaphene	1) Soxhlet Extraction, Gas Chromatographic Method ^[10,22] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[25,31]
108	TPH (C ₅ -C ₈)	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[14,24]
109	TPH (C ₈ - C ₁₆)	1) Solvent Extraction, Gas Chromatographic Method ^[11,21] 2) Automated Soxhlet Extraction, Gas Chromatographic Method ^[21,31]
110	TPH (C ₁₆ - C ₃₅)	1) Solvent Extraction, Gas Chromatographic Method ^[11,21] 2) Automated Soxhlet Extraction, Gas Chromatographic Method ^[21,31]
111	1,2,4-Trichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[14,24]
112	1,1,1-Trichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[14,24]
113	1,1,2-Trichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[14,24]
114	Trichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[14,24]
115	2,4,5-Trichlorophenol	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[25,31]

วิมล

116 2,4,6-Trichlorophenol...

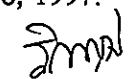
(นางริกาญจน์ ฉัตรสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
116	2,4,6-Trichlorophenol	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[25,31]
117	1,3,5-Trimethylbenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[14,24]
118	Vanadium	1) Digestion, Inductively Coupled Plasma Method ^[7,15] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[7,16]
119	Vinyl Acetate	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[14,24]
120	Vinyl Chloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[14,24]
121	m-Xylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[14,24]
122	o-Xylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[14,24]
123	p-Xylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[14,24]
124	Xylene (Total)	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[14,24]
125	Zinc	1) Digestion, Inductively Coupled Plasma Method ^[7,15] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[7,16]

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ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ
และทะเบียนห้องปฏิบัติการ



ที่ อก ๐๓๑๐(๓)/ ๖๔๗๐

กรมโรงงานอุตสาหกรรม
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท
เขตราชเทวี กรุงเทพฯ ๑๐๔๐๐

๒๘ มิถุนายน ๒๕๖๕

เรื่อง ขันทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

เรียน กรรมการผู้จัดการ บริษัท เอแอลเอส แลборาทอรี กรุ๊ป (ประเทศไทย) จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน
ลงวันที่ ๒๙ เมษายน ๒๕๖๔

สิ่งที่ส่งมาด้วย เอกสารแนบท้ายหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

บริษัท เอแอลเอส แลборาทอรี กรุ๊ป (ประเทศไทย) จำกัด จำนวน ๒ แผ่น

ตามหนังสือที่อ้างถึง บริษัท เอแอลเอส แลборาทอรี กรุ๊ป (ประเทศไทย) จำกัด ขอขึ้นทะเบียน
ห้องปฏิบัติการวิเคราะห์เอกชน พร้อมรายชื่อผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ เจ้าหน้าที่ประจำ
ห้องปฏิบัติการวิเคราะห์ และรายการสารมลพิษที่จะทำการวิเคราะห์ ต่อกรมโรงงานอุตสาหกรรม นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้บริษัท เอแอลเอส แลборาทอรี กรุ๊ป
(ประเทศไทย) จำกัด ขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน มีเลขทะเบียน ว-๓๒๓ สถานที่ตั้งเลขที่
๖๑๖/๑๐ หมู่ที่ ๕ ตำบลแม่น้ำคู้ อำเภอลวกแดง จังหวัดระยอง โดยมีองค์ประกอบดังนี้

ก. ผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์

- | | | |
|--------------------------|---------------|--------------|
| ๑) นายเดช ช้างชน | ทะเบียนเลขที่ | ว-๓๒๓-ค-๙๔๔๒ |
| ๒) นางวิลาวัลย์ บริรักษ์ | ทะเบียนเลขที่ | ว-๓๒๓-ค-๙๔๔๓ |
| ๓) นายสุพจน์ สลามเต๊ะ | ทะเบียนเลขที่ | ว-๓๒๓-ค-๙๔๔๔ |

ข. เจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์

- | | | |
|---------------------------------|---------------|--------------|
| ๑) นางสาวนฤมล บรรจงกิจ | ทะเบียนเลขที่ | ว-๓๒๓-จ-๙๔๔๕ |
| ๒) นางพจนา สีดา | ทะเบียนเลขที่ | ว-๓๒๓-จ-๙๔๔๖ |
| ๓) นางสาวธนิดา กุลสุริวงศ์ | ทะเบียนเลขที่ | ว-๓๒๓-จ-๙๔๔๗ |
| ๔) นายพิทยา ทองแดง | ทะเบียนเลขที่ | ว-๓๒๓-จ-๙๔๔๘ |
| ๕) นางชลธิชา สุนงข | ทะเบียนเลขที่ | ว-๓๒๓-จ-๙๔๔๙ |
| ๖) ว่าที่ ร.ต.รณชัย ม่วงมา | ทะเบียนเลขที่ | ว-๓๒๓-จ-๙๔๕๐ |
| ๗) นายวรารุณ ทัพพา | ทะเบียนเลขที่ | ว-๓๒๓-จ-๙๔๕๑ |
| ๘) นายศักดิ์รินทร์ จรัสกาย | ทะเบียนเลขที่ | ว-๓๒๓-จ-๙๔๕๒ |
| ๙) นายสุรศักดิ์ สาชิน | ทะเบียนเลขที่ | ว-๓๒๓-จ-๙๔๕๓ |
| ๑๐) นางสาวเพชรคุณ ภาภูตานนท์ | ทะเบียนเลขที่ | ว-๓๒๓-จ-๙๔๕๔ |
| ๑๑) นายสถาพร ถาแก้ว | ทะเบียนเลขที่ | ว-๓๒๓-จ-๙๔๕๕ |
| ๑๒) นายสุทธิดำรงค์ โชคปิตินันท์ | ทะเบียนเลขที่ | ว-๓๒๓-จ-๙๔๕๖ |

๑๓) นายวัลลภ หันไชยเนาว์	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๕๗
๑๔) นางสาววนาลี เจริญตระกูล	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๕๘
๑๕) นางสาวนิตา ผดุงจิตต์	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๕๙
๑๖) นายธนะสิทธิ์ วงศ์ไชย	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๖๐
๑๗) นายชัยนุสรณ์ เลิศนันทกุลชัย	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๖๑
๑๘) นายสัจจา เพ็ชรแสง	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๖๒
๑๙) นายกันตภณ มณีสัมพันธ์	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๖๓
๒๐) นางสาวจันทนีย์ โกเมนชนะ	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๖๔
๒๑) นายธารินทร์ อ็อกจินดา	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๖๕
๒๒) นายศุภณัฐ พิสัยพันธ์	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๖๖
๒๓) นายศุภชัย วงศ์สุริย์ฉาย	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๖๗
๒๔) นายปฐมพงศ์ กรสวัสดิ์	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๖๘
๒๕) นายไสว ตันโพธิ์	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๖๙
๒๖) นางสาวกิตติยา สัญญาอริยาภรณ์	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๗๐
๒๗) นางสาวเจษฎาพร ศรีบุญเรือง	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๗๑
๒๘) นางสาวมธุรินทร์ สิงห์เงา	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๗๒
๒๙) นางสาวธิดารัตน์ ศิริมั่งคะโร	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๗๓
๓๐) นายพิพัฒน์ นิภัทร์เศรษฐ์	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๗๔
๓๑) นายศิริวิทย์ เรืองสม	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๗๕
๓๒) นายปารามศ สัตยาคุณ	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๗๖
๓๓) นายนฤนาท ธรรมสโร	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๗๗
๓๔) นางสาวศุภรัตน์ โสจันทร์	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๗๘
๓๕) นายพชรกร อินทรเสนา	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๗๙
๓๖) นายทิวากร เชื้อมาก	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๘๐
๓๗) นายอนุรักษ์ ทองขจรศักดิ์	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๘๑
๓๘) นายอภิชาติ วิชาศ	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๘๒
๓๙) นายจรัสระวี ศรีรักษา	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๘๓
๔๐) นายประสานมิตร เชื้อนเพชร	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๘๔
๔๑) นายภาณุวัฒน์ วังบง	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๘๕
๔๒) นายสันติ ชัยชนะ	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๘๖
๔๓) นายสิทธิชัย แก้วเกตุ	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๘๗
๔๔) นายทินกร กุลชาติ	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๘๘

ค. ขอบข่ายสารมลพิษที่ได้รับขึ้นทะเบียนให้วิเคราะห์ในน้ำเสีย จำนวน ๑๔ รายการ
 อากาศเสีย (ปล่องระบาย) จำนวน ๗ รายการ และน้ำใต้ดิน จำนวน ๓ รายการ รวมทั้งสิ้นจำนวน ๒๔ รายการ
 ตามสิ่งที่ส่งมาด้วย

หนังสือฉบับนี้มีอายุ ๓ ปี นับจากวันที่กรมโรงงานอุตสาหกรรมออกหนังสือ หากประสงค์จะต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน ให้ยื่นคำขอต่ออายุพร้อมเอกสารประกอบคำขอต่อกรมโรงงานอุตสาหกรรมภายใน ๓๐ วัน ก่อนวันสิ้นอายุของหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน ซึ่งคำขอต่ออายุดังกล่าวขอรับได้ที่กรมโรงงานอุตสาหกรรม

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ



(นางจินดา เตชะศรีนทร์)

ผู้อำนวยการกองวิจัยและเตือนภัยมลพิษโรงงาน
ปฏิบัติราชการแทนอธิบดีกรมโรงงานอุตสาหกรรม

๒๘ มิ.ย. ๒๕๖๔

กองวิจัยและเตือนภัยมลพิษโรงงาน

ศูนย์วิจัยและเตือนภัยมลพิษโรงงานภาคตะวันออก

โทร. ๐ ๓๘๐๕ ๗๒๖๑-๓

ไปรษณีย์อิเล็กทรอนิกส์ eirw@diw.mail.go.th

เอกสารแนบท้ายหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด เลขทะเบียน ว-๓๒๓

ที่ ออก ๐๓๑๐(๓)/

๖๔๗๐

ลงวันที่

๒๘

มิถุนายน

๒๕๖๔

ขอขยาสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๒๔ รายการ
น้ำเสีย จำนวน 14 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Biochemical Oxygen Demand	1) 5-Day BOD Test, Membrane Electrode Method ^[2] 2) 5-Day BOD Test, Azide Modification Method ^[2]
2	Chemical Oxygen Demand	1) Open Reflux, Titrimetric Method ^[2] 2) Closed Reflux, Colorimetric Method ^[2] 3) Closed Reflux, Titrimetric Method ^[2]
3	Color	ADMI Weighted – Ordinate Spectrophotometric Method ^[2]
4	Cyanide	Distillation, Colorimetric Method ^[2]
5	Formaldehyde	Distillation, Colorimetric Method ^[1]
6	Free Chlorine	DPD-Ferrous Titrimetric Method ^[2]
7	Oil and Grease	Liquid-Liquid Partition-Gravimetric Method ^[2]
8	pH	Electrometric Method ^[2]
9	Phenols	1) Distillation, Chloroform Extraction Method ^[2] 2) Distillation, Direct Photometric Method ^[2]
10	Sulfide	ZnS Precipitation, Iodometric Method ^[2]
11	Temperature	Laboratory and Field Method ^[2]
12	Total Dissolved Solids	Dried at 180 °C ^[2]
13	Total Kjeldahl Nitrogen	Semi-Micro Kjeldahl Method ^[2]
14	Total Suspended Solids	Dried at 103-105 °C ^[2]

อากาศเสีย (ปล่อยระบาย) จำนวน 7 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Carbon Monoxide	1) Sampling Bag, Non-Dispersive Infrared Method ^[5] 2) Instrumental Analyzer Method ^[8]
2	Hydrogen Sulfide	Absorption Sampling, Iodometric Method ^[5]
3	Opacity	Ringelmann's Method ^[3,4]
4	Oxide of Nitrogen	1) Absorption Sampling, Phenoldisulfonic Acid Method ^[6] 2) Instrumental Analyzer Method ^[9]
5	Sulfur Dioxide	1) Absorption Sampling, Barium-Thorin Titrimetric Method ^[5] 2) Instrumental Analyzer Method ^[10]

วิภา สัมฤทธิ์ผล

(นางสาววิชุดา สัมฤทธิ์ผล)

ผู้อำนวยการ

ศูนย์วิจัยและเตือนภัยมลพิษโรงงานภาคตะวันออก

Sulfuric Acid...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
6	Sulfuric Acid	Isokinetic Sampling, Barium – Thorin Titrimetric Method ^[6]
7	Total Suspended Particulate	Isokinetic Sampling, Gravimetric Method ^[7]

น้ำใต้ดิน จำนวน 3 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Cyanide	Distillation, Colorimetric Method ^[2]
2	pH	Electrometric Method ^[2]
3	Phenols	Distillation, Direct Photometric Method ^[2]

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วิภา สัมฤทธิ์ผล

(นางสาววิชุดา สัมฤทธิ์ผล)

ผู้อำนวยการ

ศูนย์วิจัยและเตือนภัยมลพิษโรงงานภาคตะวันออก