

ภาคผนวก ญ
ใบรายงานผลการวิเคราะห์



คุณภาพอากาศ



ANALYSIS REPORT

CUSTOMER NAME : ECO ORIENT RESOURCES (THAILAND) LTD.
ADDRESS : 555 RASA TOWER II, 12TH FLOOR, UNIT 1203 PHAHOLYOTHIN ROAD CHATUCHAK CHATUCHAK BANGKOK 10900
CONTACT INFORMATION : TEL : 0 2937 1124-9 e-mail : anucha@eco-thai.net
SAMPLING SOURCE : L33-8-A8 : MOO 10 BAN NA RAI DIEW (UTM WGS 84 ZONE 47P 726659E 1735616N)
SAMPLE TYPE : AMBIENT
SAMPLING DATE : *, **
SAMPLING TIME : *, **
SAMPLING BY : MR PREEDA CHAIYAPOOMSAKUL
ANALYZED BY : MISS JETJARIN TUMSA-AT

RECEIVED DATE : MARCH 3, 2022
ANALYTICAL DATE : MARCH 3-9, 2022
REPORT NO. : 2022-U017273
WORK NO. : 2022-001208
ANALYSIS NO. : T22AD980-0001 - T22AD980-0002

PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT		REGULATORY STANDARD
			L33-8-A8 : MOO 10 BAN NA RAI DIEW		
			* T22AD980-0001	** T22AD980-0002	
TOTAL SUSPENDED PARTICULATE	mg/m³	GRAVIMETRIC (HIGH VOLUME METHOD)	0.025	0.024	≤ 0.33
PARTICULATE MATTER (≤ 10 µm)	mg/m³	GRAVIMETRIC (HIGH VOLUME METHOD)	0.015	0.014	≤ 0.12
SAMPLE CONDITION			COMPLETE	COMPLETE	

REMARK

RESULT : REFERENCE CONDITION IS 25 DEGREE CELSIUS AT 1 ATMOSPHERE.

TSP : US EPA, CODE OF FEDERAL REGULATION SEARCH RESULTS, 40 CFR-CHAPTER I PART 50, APPENDIX B.

PM10 : US EPA, CODE OF FEDERAL REGULATION SEARCH RESULTS, 40 CFR-CHAPTER I PART 50, APPENDIX J.

REGULATORY STANDARD : AMBIENT AIR QUALITY STANDARDS, NOTIFICATION OF THE NATIONAL ENVIRONMENT BOARD NO.24, B.E.2547 (2004).

***** : SAMPLING FROM 08:30 HOUR ON FEBRUARY 20, 2022 TO 08:30 HOUR ON FEBRUARY 21, 2022.

****** : SAMPLING FROM 08:30 HOUR ON FEBRUARY 21, 2022 TO 08:30 HOUR ON FEBRUARY 22, 2022.

Piyapat S.

(MRS PIYAPAT SUTTAMANUTWONG)
LABORATORY SUPERVISOR

MARCH 14, 2022



ANALYSIS REPORT

CUSTOMER NAME : ECO ORIENT RESOURCES (THAILAND) LTD.
ADDRESS : 555 RASA TOWER II, 12TH FLOOR, UNIT 1203 PHAHOLYOTHIN ROAD CHATUCHAK CHATUCHAK BANGKOK 10900
CONTACT INFORMATION : TEL : 0 2937 1124-9 e-mail : anucha@ecothai.net
SAMPLING SOURCE : L33-8-A8 : MOO 10 BAN NA RAI DIEW (UTM WGS 84 ZONE 47P 726659E 1735616N)
SAMPLE TYPE : AMBIENT
SAMPLING DATE : *
SAMPLING TIME : *
SAMPLING BY : MR PREEDA CHAIYAPOOMSAKUL
ANALYZED BY : MISS JETJARIN TUMSA-AT

RECEIVED DATE : MARCH 3, 2022
ANALYTICAL DATE : MARCH 3-9, 2022
REPORT NO. : 2022-U017274
WORK NO. : 2022-001208
ANALYSIS NO. : T22AD980-0003

PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT	REGULATORY STANDARD
			L33-8-A8 : MOO 10 BAN NA RAI DIEW T22AD980-0003	
TOTAL SUSPENDED PARTICULATE	mg/m ³	GRAVIMETRIC (HIGH VOLUME METHOD)	0.042	≤ 0.33
PARTICULATE MATTER (≤ 10 µm)	mg/m ³	GRAVIMETRIC (HIGH VOLUME METHOD)	0.027	≤ 0.12
SAMPLE CONDITION			COMPLETE	

REMARK

RESULT : REFERENCE CONDITION IS 25 DEGREE CELSIUS AT 1 ATMOSPHERE.

TSP : US EPA, CODE OF FEDERAL REGULATION SEARCH RESULTS, 40 CFR-CHAPTER I PART 50, APPENDIX B.

PM10 : US EPA, CODE OF FEDERAL REGULATION SEARCH RESULTS, 40 CFR-CHAPTER I PART 50, APPENDIX J.

REGULATORY STANDARD : AMBIENT AIR QUALITY STANDARDS, NOTIFICATION OF THE NATIONAL ENVIRONMENT BOARD NO.24, B.E.2547 (2004).

* : SAMPLING FROM 08:30 HOUR ON FEBRUARY 22, 2022 TO 08:30 HOUR ON FEBRUARY 23, 2022.

Piyapat S.

(MRS PIYAPAT SUTTAMANUTWONG)
LABORATORY SUPERVISOR

MARCH 14, 2022



ANALYSIS REPORT

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CONTACT INFORMATION : TEL : 0 2937 1124-9 e-mail : anucha@eco-thai.net
MEASURING PLACE : L33-8-A8 : MOO 10 BAN NA RAI DIEW (2) (UTM WGS 84 ZONE 47P 726659E 1735616N)
MEASURING TYPE : AMBIENT (AIR) **RECEIVED DATE** : FEBRUARY 20-23, 2022
MEASURING DATE : FEBRUARY 20-23, 2022 **ANALYTICAL DATE** : FEBRUARY 20-23, 2022
MEASURING TIME : * **REPORT NO.** : 2022-U017975
MEASURING METHOD : NON-DISPERSIVE INFRARED DETECTION **WORK NO.** : 2022-001208
MEASURED BY : MR PREEDA CHAIYAPOOMSAKUL **ANALYSIS NO.** : T22AD980-0001-T22AD980-0003

TIME*	RESULT		
	CARBON MONOXIDE		
	L33-8-A8 : MOO 10 BAN NA RAI DIEW (2) (UTM WGS 84 ZONE 47P 726659E 1735616N)		
	FEBRUARY 20-21, 2022 T22AD980-0001	FEBRUARY 21-22, 2022 T22AD980-0002	FEBRUARY 22-23, 2022 T22AD980-0003
08:00-16:00 HOUR	1.01	0.76	0.92
16:00-00:00 HOUR	0.91	0.87	1.22
00:00-08:00 HOUR	0.99	0.81	1.08
UNIT	ppm		



(MR SILA BANJONGJAIKUK)

LABORATORY SUPERVISOR

MARCH 11, 2022

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CONTACT INFORMATION : TEL : 0 2937 1124-9 e-mail : anucha@ecoantai.net
MEASURING PLACE : L33-8-A8 : MOO 10 BAN NA RAI DIEW (2) (UTM WGS 84 ZONE 47P 726659E 1735616N)
MEASURING TYPE : AMBIENT (AIR) **RECEIVED DATE** : FEBRUARY 20-23, 2022
MEASURING DATE : FEBRUARY 20-23, 2022 **ANALYTICAL DATE** : FEBRUARY 20-23, 2022
MEASURING TIME : * **REPORT NO.** : 2022-U017976
MEASURING METHOD : CHEMILUMINESCENCE **WORK NO.** : 2022-001208
MEASURED BY : MR PREEDA CHAIYAPOOMSUKUL **ANALYSIS NO.** : T22AD980-0001 - T22AD980-0003

TIME *	RESULT (ppm)		
	NITROGEN DIOXIDE		
	L33-8-A8 : MOO 10 BAN NA RAI DIEW (2) (UTM WGS 84 ZONE 47P 726659E 1735616N)		
	FEBRUARY 20-21, 2022 T22AD980-0001	FEBRUARY 21-22, 2022 T22AD980-0002	FEBRUARY 22-23, 2022 T22AD980-0003
08:00-09:00 HOUR	0.0071	0.0081	0.0074
09:00-10:00 HOUR	0.0072	0.0066	0.0086
10:00-11:00 HOUR	0.0066	0.0088	0.0083
11:00-12:00 HOUR	0.0082	0.0099	0.0057
12:00-13:00 HOUR	0.0077	0.0107	0.0078
13:00-14:00 HOUR	0.0072	0.0093	0.0058
14:00-15:00 HOUR	0.0078	0.0097	0.0097
15:00-16:00 HOUR	0.0080	0.0101	0.0082
16:00-17:00 HOUR	0.0085	0.0094	0.0079
17:00-18:00 HOUR	0.0073	0.0071	0.0091
18:00-19:00 HOUR	0.0081	0.0097	0.0091
19:00-20:00 HOUR	0.0079	0.0102	0.0076
20:00-21:00 HOUR	0.0088	0.0103	0.0087
21:00-22:00 HOUR	0.0085	0.0099	0.0089
22:00-23:00 HOUR	0.0079	0.0087	0.0114
23:00-00:00 HOUR	0.0079	0.0101	0.0097
00:00-01:00 HOUR	0.0067	0.0086	0.0131
01:00-02:00 HOUR	0.0074	0.0092	0.0114
02:00-03:00 HOUR	0.0086	0.0088	0.0098
03:00-04:00 HOUR	0.0070	0.0092	0.0107
04:00-05:00 HOUR	0.0075	0.0100	0.0104
05:00-06:00 HOUR	0.0086	0.0083	0.0103
06:00-07:00 HOUR	0.0071	0.0088	0.0084
07:00-08:00 HOUR	0.0077	0.0091	0.0079



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ADDRESS : 555 RASA TOWER II, 12TH FLOOR, UNIT 1203 PHAHOLYOTHIN ROAD CHATUCHAK CHATUCHAK BANGKOK 10900
CONTACT INFORMATION : TEL : 0 2937 1124-9 e-mail : anucha@eco-thai.net
MEASURING PLACE : L33-8-A8 : MOO 10 BAN NA RAI DIEW (2) (UTM WGS 84 ZONE 47P 726659E 1735616N)
MEASURING TYPE : AMBIENT (AIR) **RECEIVED DATE** : FEBRUARY 20-23, 2022
MEASURING DATE : FEBRUARY 20-23, 2022 **ANALYTICAL DATE** : FEBRUARY 20-23, 2022
MEASURING TIME : * **REPORT NO.** : 2022-U017977
MEASURING METHOD : UV FLUORESCENCE **WORK NO.** : 2022-001208
MEASURED BY : MR PREEDA CHAIYAPOOMSUKUL **ANALYSIS NO.** : T22AD980-0001 - T22AD980-0003

TIME *	RESULT (ppm)		
	SULPHUR DIOXIDE		
	L33-8-A8 : MOO 10 BAN NA RAI DIEW (2) (UTM WGS 84 ZONE 47P 726659E 1735616N)		
	FEBRUARY 20-21, 2022 T22AD980-0001	FEBRUARY 21-22, 2022 T22AD980-0002	FEBRUARY 22-23, 2022 T22AD980-0003
08:00-09:00 HOUR	0.0011	0.0020	0.0015
09:00-10:00 HOUR	0.0014	0.0012	0.0012
10:00-11:00 HOUR	0.0016	0.0009	0.0009
11:00-12:00 HOUR	0.0018	0.0009	0.0011
12:00-13:00 HOUR	0.0017	0.0014	0.0013
13:00-14:00 HOUR	0.0019	0.0015	0.0018
14:00-15:00 HOUR	0.0015	0.0017	0.0019
15:00-16:00 HOUR	0.0021	0.0022	0.0018
16:00-17:00 HOUR	0.0021	0.0020	0.0015
17:00-18:00 HOUR	0.0019	0.0017	0.0018
18:00-19:00 HOUR	0.0018	0.0022	0.0020
19:00-20:00 HOUR	0.0023	0.0017	0.0021
20:00-21:00 HOUR	0.0018	0.0019	0.0014
21:00-22:00 HOUR	0.0020	0.0018	0.0020
22:00-23:00 HOUR	0.0015	0.0019	0.0019
23:00-00:00 HOUR	0.0014	0.0022	0.0021
00:00-01:00 HOUR	0.0011	0.0016	0.0018
01:00-02:00 HOUR	0.0007	0.0020	0.0025
02:00-03:00 HOUR	0.0008	0.0019	0.0017
03:00-04:00 HOUR	0.0008	0.0014	0.0023
04:00-05:00 HOUR	0.0013	0.0021	0.0018
05:00-06:00 HOUR	0.0014	0.0020	0.0017
06:00-07:00 HOUR	0.0018	0.0013	0.0018
07:00-08:00 HOUR	0.0018	0.0013	0.0015
AVERAGE 24 HOUR	0.0016	0.0017	0.0017



(MR SILA BANJONGJAIKUK)
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MARCH 14, 2022



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SAMPLING SOURCE : L33-8-A8 : MOO 10 BAN NA RAI DIEW (2) (UTM WGS 84 ZONE 47P 726659E 1735616N)
SAMPLE TYPE : AMBIENT (AIR) **RECEIVED DATE** : FEBRUARY 20-23, 2022
SAMPLING DATE : * , ** , *** **ANALYTICAL DATE** : FEBRUARY 20-23, 2022
SAMPLING TIME : * , ** , *** **REPORT NO.** : 2022-U017978
SAMPLING METHOD : 1' **WORK NO.** : 2022-001208
SAMPLING BY : MR PREEDA CHAIYAPOOMSAKUL **ANALYSIS NO.** : T22AD980-0001-T22AD980-0003
ANALYZED BY : MR PREEDA CHAIYAPOOMSAKUL

PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT		
			L33-8-A8 : MOO 10 BAN NA RAI DIEW (2)		
			(UTM WGS 84 ZONE 47P726659E 1735616N)		
			*	**	***
			T22AD980-0001	T22AD980-0002	T22AD980-0003
TOTAL HYDROCARBONS	ppm	BAG SAMPLING, TOTAL HYDROCARBON ANALYZER (FID) METHOD 1'	3.06	2.98	3.13
SAMPLE CONDITION			SAMPLING BAG		

REMARK

- * : SAMPLING FROM 08:00 HOUR ON FEBRUARY 20, 2022 TO 08:00 HOUR ON FEBRUARY 21, 2022
- ** : SAMPLING FROM 08:00 HOUR ON FEBRUARY 21, 2022 TO 08:00 HOUR ON FEBRUARY 22, 2022
- *** : SAMPLING FROM 08:00 HOUR ON FEBRUARY 22, 2022 TO 08:00 HOUR ON FEBRUARY 23, 2022



(MR SILA BANJONGJAIRAK)

LABORATORY SUPERVISOR

MARCH 11, 2022

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MEASURING PLACE : L33-8-A8 : MOO 10 BAN NA RAI DIEW (2) (UTM WGS 84 ZONE 47P 726659E 1735616N)
MEASURING TYPE : AMBIENT (AIR) **RECEIVED DATE** : FEBRUARY 20-23, 2022
MEASURING DATE : FEBRUARY 20-23, 2022 **ANALYTICAL DATE** : FEBRUARY 20-23, 2022
MEASURING TIME : * **REPORT NO.** : 2022-U017979
MEASURING METHOD : WIND SPEED & WIND DIRECTION EQUIPMENT **WORK NO.** : 2022-001208
MEASURED BY : MR PREEDA CHAIYAPOOMSUKUL **ANALYSIS NO.** : T22AD980-0001 - T22AD980-0003

TIME *	RESULT (m/s)					
	L33-8-A8 : MOO 10 BAN NA RAI DIEW (2) (UTM WGS 84 ZONE 47P 726659E 1735616N)					
	FEBRUARY 20-21, 2022 T22AD980-0001		FEBRUARY 21-22, 2022 T22AD980-0002		FEBRUARY 22-23, 2022 T22AD980-0003	
	WIND SPEED	WIND DIRECTION	WIND SPEED	WIND DIRECTION	WIND SPEED	WIND DIRECTION
08:00-09:00 HOUR	1.5	E	2.2	W	1.8	SW
09:00-10:00 HOUR	1.2	NNE	1.9	ENE	1.3	ESE
10:00-11:00 HOUR	1.6	ENE	2.3	NE	1.9	ENE
11:00-12:00 HOUR	1.3	ENE	2.5	NE	1.4	E
12:00-13:00 HOUR	1.1	NNE	1.8	NNE	0.9	NE
13:00-14:00 HOUR	0.3	ENE	1.9	NE	0.7	WSW
14:00-15:00 HOUR	0.4	ENE	1.7	WNW	0.5	NE
15:00-16:00 HOUR	0.3	SW	1.1	SSE	0.3	WSW
16:00-17:00 HOUR	0.3	W	1.3	NW	0.3	W
17:00-18:00 HOUR	0.4	N	0.8	SSW	0.8	WNW
18:00-19:00 HOUR	0.8	NW	0.7	W	0.6	WNW
19:00-20:00 HOUR	1.1	NW	1.3	W	1.1	SE
20:00-21:00 HOUR	0.9	NNW	1.4	W	1.4	SE
21:00-22:00 HOUR	0.5	W	0.8	WSW	1.3	SE
22:00-23:00 HOUR	1.3	WNW	0.3	WNW	1.2	ENE
23:00-00:00 HOUR	0.9	SW	0.3	WSW	1.7	NNE
00:00-01:00 HOUR	1.1	W	0.4	SW	0.6	NNE
01:00-02:00 HOUR	1.6	W	0.8	SE	0.3	NNW
02:00-03:00 HOUR	1.5	SW	1.1	SE	0.5	NW
03:00-04:00 HOUR	1.4	WNW	1.9	NE	0.8	NE
04:00-05:00 HOUR	1.5	W	1.6	NNE	1.1	E
05:00-06:00 HOUR	1.9	NNW	1.9	NE	1.9	NE
06:00-07:00 HOUR	2.3	NNE	2.0	NE	1.3	ENE
07:00-08:00 HOUR	1.9	NNE	1.6	NE	1.1	ENE



(MR SILA BANJONGJAIKUK)
LABORATORY SUPERVISOR

MARCH 14, 2022



คุณภาพน้ำผิวดิน



ANALYSIS REPORT

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ADDRESS : 555 RASA TOWER II, 12TH FLOOR, UNIT 1203 PHAHOLYOTHIN ROAD CHATUCHAK CHATUCHAK BANGKOK 10900
CONTACT INFORMATION : TEL : 0 2937 1124-9 e-mail : anucha@ecothai.net
SAMPLING SOURCE : L33-8-SW11 (UTM WGS 84 ZONE 47P 726832E 1735730N)
SAMPLE TYPE : SURFACE WATER
SAMPLING DATE : FEBRUARY 22, 2022
SAMPLING TIME : 14:20 HOUR
SAMPLING METHOD ° : GRAB, GRAB AND STERILE TECHNIQUE
SAMPLING BY ° : MR KRIDSANAPONG NAMTHIP
ANALYZED BY : MISS PORNPIMOL WAENTHONG

RECEIVED DATE : FEBRUARY 24, 2022
ANALYTICAL DATE : FEBRUARY 24 - MARCH 14, 2022
REPORT NO. : 2022-U017819
WORK NO. : 2022-001208
ANALYSIS NO. : T22AD336-0001

PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT	REGULATORY STANDARD	DETECTION LIMIT
			L33-8-SW11 T22AD336-0001		
pH °	-	ELECTROMETRIC METHOD AT SITE (SM:4500-H° B)	8.3 (29°C)	5.0-9.0	-
TEMPERATURE °	°C	THERMOMETER AT SITE (SM: 2550 B)	29	n°	-
ELECTRICAL CONDUCTIVITY °	µmhos/cm	ELECTRICAL CONDUCTIVITY METHOD AT SITE (SM: 2510 B)	260 (29°C)	-	0.1
SALINITY °	ppt	ELECTRICAL CONDUCTIVITY METHOD AT SITE (SM: 2520 B)	0.1	-	0.1
TOTAL SUSPENDED SOLIDS °	mg/L	TOTAL SUSPENDED SOLIDS DRIED AT 103-105 °C (SM: 2540 D)	8.1	-	5.0
TOTAL DISSOLVED SOLIDS °	mg/L	TOTAL DISSOLVED SOLIDS DRIED AT 180 °C (SM: 2540 C)	163	-	25
FAT, OIL AND GREASE °	mg/L	LIQUID-LIQUID, PARTITION-GRAVIMETRIC METHOD (SM: 5520 B)	ND	-	3
TOTAL PETROLEUM HYDROCARBONS °	mg/L	SOXHLET EXTRACTION METHOD (SM: 5520 D AND 5520 F)	ND	-	3
METALS					
ARSENIC °	mg/L As	HYDRIDE GENERATION AAS METHOD (SM: 3114 C)	ND	≤ 0.01	0.0003
BARIUM °	mg/L Ba	NITRIC ACID-HYDROCHLORIC ACID DIGESTION AND INDUCTIVELY COUPLED PLASMA (ICP) METHOD (SM: 3030 F AND 3120 B)	0.215	-	0.003
CADMIUM °	mg/L Cd	IN-HOUSE METHOD: UAE.TP.SW.01 (NITRIC ACID DIGESTION AND DIRECT AIR ACETYLENE FLAME METHOD); SM: 3030 E AND 3111 B	ND	≤ 0.005*, ≤ 0.05**	0.002
COPPER °	mg/L Cu	IN-HOUSE METHOD: UAE.TP.SW.01 (NITRIC ACID DIGESTION AND DIRECT AIR ACETYLENE FLAME METHOD); SM: 3030 E AND 3111 B	ND	≤ 0.1	0.002
IRON °	mg/L Fe	IN-HOUSE METHOD: UAE.TP.SW.01 (NITRIC ACID DIGESTION AND DIRECT AIR ACETYLENE FLAME METHOD); SM: 3030 E AND 3111 B	0.364	-	0.005
LEAD °	mg/L Pb	IN-HOUSE METHOD: UAE.TP.SW.01 (NITRIC ACID DIGESTION AND DIRECT AIR ACETYLENE FLAME METHOD); SM: 3030 E AND 3111 B	ND	≤ 0.05	0.003



PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT	REGULATORY STANDARD	DETECTION LIMIT
			L33-8-SW11 T22AD336-0001		
MANGANESE ^c	mg/L Mn	IN-HOUSE METHOD: UAE.TP.SW.01 (NITRIC ACID DIGESTION AND DIRECT AIR ACETYLENE FLAME METHOD); SM: 3030 E AND 3111 B	0.060	≤ 1.0	0.002
MERCURY ^b	mg/L Hg	IN-HOUSE METHOD: UAE.TP.HEM.002 (COLD VAPOUR ATOMIC ABSORPTION SPECTROMETRIC METHOD); SM: 3112 B	ND	≤ 0.002	0.0001
NICKEL ^c	mg/L Ni	IN-HOUSE METHOD: UAE.TP.SW.01 (NITRIC ACID DIGESTION AND DIRECT AIR ACETYLENE FLAME METHOD); SM: 3030 E AND 3111 B	ND	≤ 0.1	0.005
SELENIUM ^c	mg/L Se	HYDRIDE GENERATION AAS METHOD (SM: 3114 C)	ND	-	0.0005
TOTAL CHROMIUM ^c	mg/L Cr	IN-HOUSE METHOD: UAE.TP.SW.01 (NITRIC ACID DIGESTION AND DIRECT AIR ACETYLENE FLAME METHOD); SM: 3030 E AND 3111 B	ND	-	0.005
ZINC ^c	mg/L Zn	IN-HOUSE METHOD: UAE.TP.SW.01 (NITRIC ACID DIGESTION AND DIRECT AIR ACETYLENE FLAME METHOD); SM: 3030 E AND 3111 B	ND	≤ 1.0	0.003
MICROBIOLOGY					
FAECAL COLIFORM BACTERIA ^b	MPN/100 mL	MULTIPLE-TUBE FERMENTATION TECHNIQUE (SM: 9221 E)	78	≤ 4,000	1.8
VOLATILE ORGANIC COMPOUNDS					
BENZENE ^c	µg/L	PURGE AND TRAP GAS CHROMATOGRAPHIC/MASS SPECTROMETRIC METHOD (SM: 6200 B)	< 0.20	-	0.20
ETHYLBENZENE ^c	µg/L	PURGE AND TRAP GAS CHROMATOGRAPHIC/MASS SPECTROMETRIC METHOD (SM: 6200 B)	< 0.20	-	0.20
TOLUENE ^c	µg/L	PURGE AND TRAP GAS CHROMATOGRAPHIC/MASS SPECTROMETRIC METHOD (SM: 6200 B)	< 0.20	-	0.20

PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT	REGULATORY STANDARD	DETECTION LIMIT
			L33-8-SW11 T22AD336-0001		
TOTAL XYLENES ^c	µg/L	PURGE AND TRAP GAS CHROMATOGRAPHIC/MASS SPECTROMETRIC METHOD (SM: 6200 B)	< 0.60	-	0.60
SAMPLE CONDITION					
WATER'S COLOUR/TURBID			YELLOW/CLEAR		
SEDIMENT			YELLOW		

^a : ISO/IEC 17025 ACCREDITED BY THAI INDUSTRIAL STANDARDS INSTITUTE (TISI)

^b : ISO/IEC 17025 ACCREDITED BY DEPARTMENT OF SCIENCE SERVICE (DSS)

^c : VERIFIED BY OWN LABORATORY QUALITY SYSTEM, BUT STILL NOT ACCREDITED

IN-HOUSE : BASED ON STANDARD METHODS FOR THE EXAMINATION OF WATER AND WASTEWATER, APHA, AWWA, WEF, 23rd EDITION, 2017.

SM : STANDARD METHODS FOR THE EXAMINATION OF WATER AND WASTEWATER, APHA, AWWA, WEF, 23rd EDITION, 2017.

REGULATORY STANDARD : SURFACE WATER QUALITY STANDARDS CLASS 3, NOTIFICATION OF THE NATIONAL ENVIRONMENT BOARD, NO.8,
B.E. 2537 ISSUED UNDER THE ENHANCEMENT AND CONSERVATION OF NATIONAL ENVIRONMENTAL QUALITY
ACT, B.E. 2535, PUBLISHED IN THE ROYAL GOVERNMENT GAZETTE, VOL. 111, PART 16, DATED FEBRUARY 24,
B.E. 2537 (1994).

CLASS 3 : MEDIUM CLEAN FRESH SURFACE WATER RESOURCES USED FOR

- (1) CONSUMPTION, BUT PASSING THROUGH ON ORDINARY TREATMENT PROCESS BEFORE USING
- (2) AGRICULTURE

n' : NATURALLY BUT CHANGING NOT MORE THAN 3°C

≤ 0.005* : WHEN WATER HARDNESS NOT MORE THAN 100 mg/L AS CaCO₃

≤ 0.05** : WHEN WATER HARDNESS MORE THAN 100 mg/L AS CaCO₃

ND : NON-DETECTABLE.

Benjawan V.

(MISS BENJAWAN VIRIYOTHAI)
LABORATORY SUPERVISOR

MARCH 18, 2022

ANALYSIS REPORT

CUSTOMER NAME : ECO ORIENT RESOURCES (THAILAND) LTD.
ADDRESS : 555 RASA TOWER II, 12TH FLOOR, UNIT 1203 PHAHOLYOTHIN ROAD CHATUCHAK CHATUCHAK BANGKOK 10900
CONTACT INFORMATION : TEL : 0 2937 1124-9 e-mail : anucha@eco-thai.net
SAMPLING SOURCE : L33-8-SW12 (UTM WGS 84 ZONE 47P 727197E 1735790N)
SAMPLE TYPE : SURFACE WATER
SAMPLING DATE : FEBRUARY 22, 2022
SAMPLING TIME : 14:45 HOUR
SAMPLING METHOD ° : GRAB, GRAB AND STERILE TECHNIQUE
SAMPLING BY ° : MR KRIDSANAPONG NAMTHIP
ANALYZED BY : MISS PORNPIMOL WAENTHONG

RECEIVED DATE : FEBRUARY 24, 2022
ANALYTICAL DATE : FEBRUARY 24 - MARCH 14, 2022
REPORT NO. : 2022-U017820
WORK NO. : 2022-001208
ANALYSIS NO. : T22AD336-0002

PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT	REGULATORY STANDARD	DETECTION LIMIT
			L33-8-SW12 T22AD336-0002		
pH °	-	ELECTROMETRIC METHOD AT SITE (SM:4500-H° B)	7.5 (28°C)	5.0-9.0	-
TEMPERATURE °	°C	THERMOMETER AT SITE (SM: 2550 B)	28	n°	-
ELECTRICAL CONDUCTIVITY °	µmhos/cm	ELECTRICAL CONDUCTIVITY METHOD AT SITE (SM: 2510 B)	166 (28°C)	-	0.1
SALINITY °	ppt	ELECTRICAL CONDUCTIVITY METHOD AT SITE (SM: 2520 B)	0.1	-	0.1
TOTAL SUSPENDED SOLIDS °	mg/L	TOTAL SUSPENDED SOLIDS DRIED AT 103-105 °C (SM: 2540 D)	ND	-	5.0
TOTAL DISSOLVED SOLIDS °	mg/L	TOTAL DISSOLVED SOLIDS DRIED AT 180 °C (SM: 2540 C)	114	-	25
FAT, OIL AND GREASE °	mg/L	LIQUID-LIQUID, PARTITION-GRAVIMETRIC METHOD (SM: 5520 B)	ND	-	3
TOTAL PETROLEUM HYDROCARBONS °	mg/L	SOXHLET EXTRACTION METHOD (SM: 5520 D AND 5520 F)	ND	-	3
METALS					
ARSENIC °	mg/L As	HYDRIDE GENERATION AAS METHOD (SM: 3114 C)	0.0003	≤ 0.01	0.0003
BARIUM °	mg/L Ba	NITRIC ACID-HYDROCHLORIC ACID DIGESTION AND INDUCTIVELY COUPLED PLASMA (ICP) METHOD (SM: 3030 F AND 3120 B)	0.100	-	0.003
CADMIUM °	mg/L Cd	IN-HOUSE METHOD: UAE.TP.SW.01 (NITRIC ACID DIGESTION AND DIRECT AIR ACETYLENE FLAME METHOD); SM: 3030 E AND 3111 B	ND	≤ 0.005*, ≤ 0.05**	0.002
COPPER °	mg/L Cu	IN-HOUSE METHOD: UAE.TP.SW.01 (NITRIC ACID DIGESTION AND DIRECT AIR ACETYLENE FLAME METHOD); SM: 3030 E AND 3111 B	ND	≤ 0.1	0.002
IRON °	mg/L Fe	IN-HOUSE METHOD: UAE.TP.SW.01 (NITRIC ACID DIGESTION AND DIRECT AIR ACETYLENE FLAME METHOD); SM: 3030 E AND 3111 B	0.258	-	0.005
LEAD °	mg/L Pb	IN-HOUSE METHOD: UAE.TP.SW.01 (NITRIC ACID DIGESTION AND DIRECT AIR ACETYLENE FLAME METHOD); SM: 3030 E AND 3111 B	ND	≤ 0.05	0.003



PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT	REGULATORY STANDARD	DETECTION LIMIT
			L33-8-SW12 T22AD336-0002		
MANGANESE ^c	mg/L Mn	IN-HOUSE METHOD: UAE.TP.SW.01 (NITRIC ACID DIGESTION AND DIRECT AIR ACETYLENE FLAME METHOD); SM: 3030 E AND 3111 B	0.048	≤ 1.0	0.002
MERCURY ^b	mg/L Hg	IN-HOUSE METHOD: UAE.TP.HEM.002 (COLD VAPOUR ATOMIC ABSORPTION SPECTROMETRIC METHOD); SM: 3112 B	ND	≤ 0.002	0.0001
NICKEL ^c	mg/L Ni	IN-HOUSE METHOD: UAE.TP.SW.01 (NITRIC ACID DIGESTION AND DIRECT AIR ACETYLENE FLAME METHOD); SM: 3030 E AND 3111 B	ND	≤ 0.1	0.005
SELENIUM ^c	mg/L Se	HYDRIDE GENERATION AAS METHOD (SM: 3114 C)	ND	-	0.0005
TOTAL CHROMIUM ^c	mg/L Cr	IN-HOUSE METHOD: UAE.TP.SW.01 (NITRIC ACID DIGESTION AND DIRECT AIR ACETYLENE FLAME METHOD); SM: 3030 E AND 3111 B	ND	-	0.005
ZINC ^c	mg/L Zn	IN-HOUSE METHOD: UAE.TP.SW.01 (NITRIC ACID DIGESTION AND DIRECT AIR ACETYLENE FLAME METHOD); SM: 3030 E AND 3111 B	ND	≤ 1.0	0.003
MICROBIOLOGY					
FAECAL COLIFORM BACTERIA ^b	MPN/100 mL	MULTIPLE-TUBE FERMENTATION TECHNIQUE (SM: 9221 E)	13	≤ 4,000	1.8
VOLATILE ORGANIC COMPOUNDS					
BENZENE ^c	µg/L	PURGE AND TRAP GAS CHROMATOGRAPHIC/MASS SPECTROMETRIC METHOD (SM: 6200 B)	< 0.20	-	0.20
ETHYLBENZENE ^c	µg/L	PURGE AND TRAP GAS CHROMATOGRAPHIC/MASS SPECTROMETRIC METHOD (SM: 6200 B)	< 0.20	-	0.20
TOLUENE ^c	µg/L	PURGE AND TRAP GAS CHROMATOGRAPHIC/MASS SPECTROMETRIC METHOD (SM: 6200 B)	< 0.20	-	0.20

PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT	REGULATORY STANDARD	DETECTION LIMIT
			L33-8-SW12 T22AD336-0002		
TOTAL XYLENES ^c	µg/L	PURGE AND TRAP GAS CHROMATOGRAPHIC/MASS SPECTROMETRIC METHOD (SM: 6200 B)	< 0.60	-	0.60
SAMPLE CONDITION					
WATER'S COLOUR/TURBID			YELLOW/CLEAR		
SEDIMENT			BROWN		

^a : ISO/IEC 17025 ACCREDITED BY THAI INDUSTRIAL STANDARDS INSTITUTE (TISI)

^b : ISO/IEC 17025 ACCREDITED BY DEPARTMENT OF SCIENCE SERVICE (DSS)

^c : VERIFIED BY OWN LABORATORY QUALITY SYSTEM, BUT STILL NOT ACCREDITED

IN-HOUSE : BASED ON STANDARD METHODS FOR THE EXAMINATION OF WATER AND WASTEWATER, APHA, AWWA, WEF, 23rd EDITION, 2017.

SM : STANDARD METHODS FOR THE EXAMINATION OF WATER AND WASTEWATER, APHA, AWWA, WEF, 23rd EDITION, 2017.

REGULATORY STANDARD : SURFACE WATER QUALITY STANDARDS CLASS 3, NOTIFICATION OF THE NATIONAL ENVIRONMENT BOARD, NO.8, B.E. 2537 ISSUED UNDER THE ENHANCEMENT AND CONSERVATION OF NATIONAL ENVIRONMENTAL QUALITY ACT, B.E. 2535, PUBLISHED IN THE ROYAL GOVERNMENT GAZETTE, VOL. 111, PART 16, DATED FEBRUARY 24, B.E. 2537 (1994).

CLASS 3 : MEDIUM CLEAN FRESH SURFACE WATER RESOURCES USED FOR
(1) CONSUMPTION, BUT PASSING THROUGH ON ORDINARY TREATMENT PROCESS BEFORE USING
(2) AGRICULTURE

n' : NATURALLY BUT CHANGING NOT MORE THAN 3°C

≤ 0.005* : WHEN WATER HARDNESS NOT MORE THAN 100 mg/L AS CaCO₃

≤ 0.05** : WHEN WATER HARDNESS MORE THAN 100 mg/L AS CaCO₃

ND : NON-DETECTABLE.

Benjawan V.

(MISS BENJAWAN VIRIYOTHAI)
LABORATORY SUPERVISOR

MARCH 18, 2022

คุณภาพน้ำใต้ดิน



ANALYSIS REPORT

CUSTOMER NAME : ECO ORIENT RESOURCES (THAILAND) LTD.
ADDRESS : 555 RASA TOWER II, 12TH FLOOR, UNIT 1203 PHAHOLYOTHIN ROAD CHATUCHAK CHATUCHAK BANGKOK 10900
CONTACT INFORMATION : TEL : 0 2937 1124-9 e-mail : anucha@ecothai.net
SAMPLING SOURCE : MWL33-8 (UP GRADIENT) (UTM WGS 84 ZONE 47P 726941E 1735662N)
SAMPLE TYPE : GROUNDWATER
SAMPLING DATE : FEBRUARY 23, 2022
SAMPLING TIME : 09:10 HOUR
SAMPLING METHOD ° : SUBMERSIBLE PUMP
SAMPLING BY ° : MR KRIDSANAPONG NAMTHIP
ANALYZED BY : MISS NADNAPA KAMOLBOON

RECEIVED DATE : FEBRUARY 25, 2022
ANALYTICAL DATE : FEBRUARY 25 - MARCH 14, 2022
REPORT NO. : 2022-U018350
WORK NO. : 2022-001208
ANALYSIS NO. : T22AD428-0001

PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT	REGULATORY STANDARD	DETECTION LIMIT
			MWL33-8 (UP GRADIENT) T22AD428-0001		
pH °	-	ELECTROMETRIC METHOD AT SITE (SM:4500-H° B)	7.2 (28°C)	-	-
TEMPERATURE °	°C	THERMOMETER AT SITE (SM: 2550 B)	28	-	-
ELECTRICAL CONDUCTIVITY °	µmhos/cm	ELECTRICAL CONDUCTIVITY METHOD AT SITE (SM: 2510 B)	1,030 (28°C)	-	0.1
SALINITY °	ppt	ELECTRICAL CONDUCTIVITY METHOD AT SITE (SM: 2520 B)	0.5	-	0.1
TOTAL SUSPENDED SOLIDS °	mg/L	TOTAL SUSPENDED SOLIDS DRIED AT 103-105 °C (SM: 2540 D)	ND	-	5.0
TOTAL DISSOLVED SOLIDS °	mg/L	TOTAL DISSOLVED SOLIDS DRIED AT 180 °C (SM: 2540 C)	742	-	25
FAT, OIL AND GREASE °	mg/L	LIQUID-LIQUID, PARTITION-GRAVIMETRIC METHOD (SM: 5520 B)	ND	-	3
TOTAL PETROLEUM HYDROCARBONS °	mg/L	SOXHLET EXTRACTION METHOD (SM: 5520 D AND 5520 F)	ND	-	3
METALS					
ARSENIC °	mg/L As	HYDRIDE GENERATION AAS METHOD (SM: 3114 C)	ND	≤ 0.01	0.0003
BARIUM °	mg/L Ba	NITRIC ACID-HYDROCHLORIC ACID DIGESTION AND INDUCTIVELY COUPLED PLASMA (ICP) METHOD (SM: 3030 F AND 3120 B)	0.200	-	0.003
CADMIUM °	mg/L Cd	IN-HOUSE METHOD: UAE.TP.GW.01 (NITRIC ACID DIGESTION AND DIRECT AIR ACETYLENE FLAME METHOD); SM: 3030 E AND 3111 B	ND	≤ 0.003	0.002
COPPER °	mg/L Cu	IN-HOUSE METHOD: UAE.TP.GW.01 (NITRIC ACID DIGESTION AND DIRECT AIR ACETYLENE FLAME METHOD); SM: 3030 E AND 3111 B	ND	≤ 1.0	0.002
IRON °	mg/L Fe	IN-HOUSE METHOD: UAE.TP.GW.01 (NITRIC ACID DIGESTION AND DIRECT AIR ACETYLENE FLAME METHOD); SM: 3030 E AND 3111 B	ND	-	0.005
LEAD °	mg/L Pb	IN-HOUSE METHOD: UAE.TP.GW.01 (NITRIC ACID DIGESTION AND DIRECT AIR ACETYLENE FLAME METHOD); SM: 3030 E AND 3111 B	ND	≤ 0.01	0.003



PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT	REGULATORY STANDARD	DETECTION LIMIT
			MWL33-8 (UP GRADIENT) T22AD428-0001		
MANGANESE ^c	mg/L Mn	IN-HOUSE METHOD: UAE.TP.GW.01 (NITRIC ACID DIGESTION AND DIRECT AIR ACETYLENE FLAME METHOD); SM: 3030 E AND 3111 B	ND	≤ 0.5	0.002
MERCURY ^b	mg/L Hg	IN-HOUSE METHOD: UAE.TP.HEM.002 (COLD VAPOUR ATOMIC ABSORPTION SPECTROMETRIC METHOD); SM: 3112 B	ND	≤ 0.001	0.0001
NICKEL ^c	mg/L Ni	IN-HOUSE METHOD: UAE.TP.GW.01 (NITRIC ACID DIGESTION AND DIRECT AIR ACETYLENE FLAME METHOD); SM: 3030 E AND 3111 B	ND	≤ 0.02	0.005
SELENIUM ^c	mg/L Se	HYDRIDE GENERATION AAS METHOD (SM: 3114 C)	ND	≤ 0.01	0.0005
TOTAL CHROMIUM ^c	mg/L Cr	IN-HOUSE METHOD: UAE.TP.GW.01 (NITRIC ACID DIGESTION AND DIRECT AIR ACETYLENE FLAME METHOD); SM: 3030 E AND 3111 B	ND	-	0.005
ZINC ^c	mg/L Zn	IN-HOUSE METHOD: UAE.TP.GW.01 (NITRIC ACID DIGESTION AND DIRECT AIR ACETYLENE FLAME METHOD); SM: 3030 E AND 3111 B	ND	≤ 5.0	0.003
VOLATILE ORGANIC COMPOUNDS					
BENZENE ^c	µg/L	PURGE AND TRAP GAS CHROMATOGRAPHIC/MASS SPECTROMETRIC METHOD (SM: 6200 B)	< 0.20	≤ 5	0.20
ETHYLBENZENE ^c	µg/L	PURGE AND TRAP GAS CHROMATOGRAPHIC/MASS SPECTROMETRIC METHOD (SM: 6200 B)	< 0.20	≤ 700	0.20
TOLUENE ^c	µg/L	PURGE AND TRAP GAS CHROMATOGRAPHIC/MASS SPECTROMETRIC METHOD (SM: 6200 B)	< 0.20	≤ 1,000	0.20
TOTAL XYLENES ^c	µg/L	PURGE AND TRAP GAS CHROMATOGRAPHIC/MASS SPECTROMETRIC METHOD (SM: 6200 B)	< 0.60	≤ 10,000	0.60
SAMPLE CONDITION WATER'S COLOUR/TURBID SEDIMENT			COLOURLESS/CLEAR BROWN		

^a : ISO/IEC 17025 ACCREDITED BY THAI INDUSTRIAL STANDARDS INSTITUTE (TISI)

^b : ISO/IEC 17025 ACCREDITED BY DEPARTMENT OF SCIENCE SERVICE (DSS)

^c : VERIFIED BY OWN LABORATORY QUALITY SYSTEM, BUT STILL NOT ACCREDITED

IN-HOUSE : BASED ON STANDARD METHODS FOR THE EXAMINATION OF WATER AND WASTEWATER, APHA, AWWA, WEF, 23rd EDITION, 2017.

SM : STANDARD METHODS FOR THE EXAMINATION OF WATER AND WASTEWATER, APHA, AWWA, WEF, 23rd EDITION, 2017.

REGULATORY STANDARD : GROUNDWATER QUALITY STANDARDS, NOTIFICATION OF THE NATIONAL ENVIRONMENT BOARD NO.20 (B.E. 2543)
ISSUED UNDER THE ENHANCEMENT AND CONSERVATION OF NATIONAL ENVIRONMENTAL QUALITY ACT B.E. 2535.

ND : NON-DETECTABLE.

Benjawan V.

(MISS BENJAWAN VIRIYOTHA)
LABORATORY SUPERVISOR

MARCH 17, 2022

ANALYSIS REPORT

CUSTOMER NAME : ECO ORIENT RESOURCES (THAILAND) LTD.
ADDRESS : 555 RASA TOWER II, 12TH FLOOR, UNIT 1203 PHAHOLYOTHIN ROAD CHATUCHAK CHATUCHAK BANGKOK 10900
CONTACT INFORMATION : TEL : 0 2937 1124-9 e-mail : anucha@ecothai.net
SAMPLING SOURCE : MWL33-8 (DOWN GRADIENT) (UTM WGS 84 ZONE 47P 726932E 1735827N)
SAMPLE TYPE : GROUNDWATER
SAMPLING DATE : FEBRUARY 23, 2022
SAMPLING TIME : 09:30 HOUR
SAMPLING METHOD ° : SUBMERSIBLE PUMP
SAMPLING BY ° : MR KRIDSANAPONG NAMTHIP
ANALYZED BY : MISS NADNAPA KAMOLBOON

RECEIVED DATE : FEBRUARY 25, 2022
ANALYTICAL DATE : FEBRUARY 25 - MARCH 14, 2022
REPORT NO. : 2022-U018351
WORK NO. : 2022-001208
ANALYSIS NO. : T22AD428-0002

PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT	REGULATORY STANDARD	DETECTION LIMIT
			MWL33-8 (DOWN GRADIENT) T22AD428-0002		
pH °	-	ELECTROMETRIC METHOD AT SITE (SM:4500-H+ B)	6.9 (28°C)	-	-
TEMPERATURE °	°C	THERMOMETER AT SITE (SM: 2550 B)	28	-	-
ELECTRICAL CONDUCTIVITY °	µmhos/cm	ELECTRICAL CONDUCTIVITY METHOD AT SITE (SM: 2510 B)	783 (28°C)	-	0.1
SALINITY °	ppt	ELECTRICAL CONDUCTIVITY METHOD AT SITE (SM: 2520 B)	0.4	-	0.1
TOTAL SUSPENDED SOLIDS °	mg/L	TOTAL SUSPENDED SOLIDS DRIED AT 103-105 °C (SM: 2540 D)	18.6	-	5.0
TOTAL DISSOLVED SOLIDS °	mg/L	TOTAL DISSOLVED SOLIDS DRIED AT 180 °C (SM: 2540 C)	498	-	25
FAT, OIL AND GREASE °	mg/L	LIQUID-LIQUID, PARTITION-GRAVIMETRIC METHOD (SM: 5520 B)	ND	-	3
TOTAL PETROLEUM HYDROCARBONS °	mg/L	SOXHLET EXTRACTION METHOD (SM: 5520 D AND 5520 F)	ND	-	3
METALS					
ARSENIC °	mg/L As	HYDRIDE GENERATION AAS METHOD (SM: 3114 C)	ND	≤ 0.01	0.0003
BARIUM °	mg/L Ba	NITRIC ACID-HYDROCHLORIC ACID DIGESTION AND INDUCTIVELY COUPLED PLASMA (ICP) METHOD (SM: 3030 F AND 3120 B)	0.781	-	0.003
CADMIUM °	mg/L Cd	IN-HOUSE METHOD: UAE.TP.GW.01 (NITRIC ACID DIGESTION AND DIRECT AIR ACETYLENE FLAME METHOD); SM: 3030 E AND 3111 B	ND	≤ 0.003	0.002
COPPER °	mg/L Cu	IN-HOUSE METHOD: UAE.TP.GW.01 (NITRIC ACID DIGESTION AND DIRECT AIR ACETYLENE FLAME METHOD); SM: 3030 E AND 3111 B	ND	≤ 1.0	0.002
IRON °	mg/L Fe	IN-HOUSE METHOD: UAE.TP.GW.01 (NITRIC ACID DIGESTION AND DIRECT AIR ACETYLENE FLAME METHOD); SM: 3030 E AND 3111 B	0.134	-	0.005
LEAD °	mg/L Pb	IN-HOUSE METHOD: UAE.TP.GW.01 (NITRIC ACID DIGESTION AND DIRECT AIR ACETYLENE FLAME METHOD); SM: 3030 E AND 3111 B	0.101	≤ 0.01	0.003



PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT	REGULATORY STANDARD	DETECTION LIMIT
			MWL33-8 (DOWN GRADIENT) T22AD428-0002		
MANGANESE ^c	mg/L Mn	IN-HOUSE METHOD: UAE.TP.GW.01 (NITRIC ACID DIGESTION AND DIRECT AIR ACETYLENE FLAME METHOD); SM: 3030 E AND 3111 B	0.027	≤ 0.5	0.002
MERCURY ^b	mg/L Hg	IN-HOUSE METHOD: UAE.TP.HEM.002 (COLD VAPOUR ATOMIC ABSORPTION SPECTROMETRIC METHOD); SM: 3112 B	ND	≤ 0.001	0.0001
NICKEL ^c	mg/L Ni	IN-HOUSE METHOD: UAE.TP.GW.01 (NITRIC ACID DIGESTION AND DIRECT AIR ACETYLENE FLAME METHOD); SM: 3030 E AND 3111 B	ND	≤ 0.02	0.005
SELENIUM ^c	mg/L Se	HYDRIDE GENERATION AAS METHOD (SM: 3114 C)	ND	≤ 0.01	0.0005
TOTAL CHROMIUM ^c	mg/L Cr	IN-HOUSE METHOD: UAE.TP.GW.01 (NITRIC ACID DIGESTION AND DIRECT AIR ACETYLENE FLAME METHOD); SM: 3030 E AND 3111 B	ND	-	0.005
ZINC ^c	mg/L Zn	IN-HOUSE METHOD: UAE.TP.GW.01 (NITRIC ACID DIGESTION AND DIRECT AIR ACETYLENE FLAME METHOD); SM: 3030 E AND 3111 B	ND	≤ 5.0	0.003
VOLATILE ORGANIC COMPOUNDS					
BENZENE ^c	µg/L	PURGE AND TRAP GAS CHROMATOGRAPHIC/MASS SPECTROMETRIC METHOD (SM: 6200 B)	< 0.20	≤ 5	0.20
ETHYLBENZENE ^c	µg/L	PURGE AND TRAP GAS CHROMATOGRAPHIC/MASS SPECTROMETRIC METHOD (SM: 6200 B)	< 0.20	≤ 700	0.20
TOLUENE ^c	µg/L	PURGE AND TRAP GAS CHROMATOGRAPHIC/MASS SPECTROMETRIC METHOD (SM: 6200 B)	< 0.20	≤ 1,000	0.20

PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT	REGULATORY STANDARD	DETECTION LIMIT
			MWL33-8 (DOWN GRADIENT) T22AD428-0002		
TOTAL XYLENES ^c	µg/L	PURGE AND TRAP GAS CHROMATOGRAPHIC/MASS SPECTROMETRIC METHOD (SM: 6200 B)	< 0.60	≤ 10,000	0.60
SAMPLE CONDITION WATER'S COLOUR/TURBID SEDIMENT			COLOURLESS/CLEAR BROWN		

^a : ISO/IEC 17025 ACCREDITED BY THAI INDUSTRIAL STANDARDS INSTITUTE (TISI)

^b : ISO/IEC 17025 ACCREDITED BY DEPARTMENT OF SCIENCE SERVICE (DSS)

^c : VERIFIED BY OWN LABORATORY QUALITY SYSTEM, BUT STILL NOT ACCREDITED

IN-HOUSE : BASED ON STANDARD METHODS FOR THE EXAMINATION OF WATER AND WASTEWATER, APHA, AWWA, WEF, 23rd EDITION, 2017.

SM : STANDARD METHODS FOR THE EXAMINATION OF WATER AND WASTEWATER, APHA, AWWA, WEF, 23rd EDITION, 2017.

REGULATORY STANDARD : GROUNDWATER QUALITY STANDARDS, NOTIFICATION OF THE NATIONAL ENVIRONMENT BOARD NO.20 (B.E. 2543)
ISSUED UNDER THE ENHANCEMENT AND CONSERVATION OF NATIONAL ENVIRONMENTAL QUALITY ACT B.E. 2535.

ND : NON-DETECTABLE.

Benjawan V.

(MISS BENJAWAN VIRIYOTHAI)
LABORATORY SUPERVISOR

MARCH 17, 2022

ANALYSIS REPORT

CUSTOMER NAME : ECO ORIENT RESOURCES (THAILAND) LTD.
ADDRESS : 555 RASA TOWER II, 12TH FLOOR, UNIT 1203 PHAHOLYOTHIN ROAD CHATUCHAK CHATUCHAK BANGKOK 10900
CONTACT INFORMATION : TEL : 0 2937 1124-9 e-mail : anucha@ecothai.net
SAMPLING SOURCE : L33-8-GW8 (UTM WGS 84 ZONE 47P 725021E 1733681N)
SAMPLE TYPE : GROUNDWATER
SAMPLING DATE : FEBRUARY 22, 2022
SAMPLING TIME : 14:00 HOUR
SAMPLING METHOD ° : SUBMERSIBLE PUMP
SAMPLING BY ° : MR KRIDSANAPONG NAMTHIP
ANALYZED BY : MISS NADNAPA KAMOLBOON

RECEIVED DATE : FEBRUARY 24, 2022
ANALYTICAL DATE : FEBRUARY 24 - MARCH 14, 2022
REPORT NO. : 2022-U017818
WORK NO. : 2022-001208
ANALYSIS NO. : T22AD335-0001

PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT	REGULATORY STANDARD	DETECTION LIMIT
			L33-8-GW8 T22AD335-0001		
pH °	-	ELECTROMETRIC METHOD AT SITE (SM:4500-H* B)	6.6 (30°C)	-	-
TEMPERATURE °	°C	THERMOMETER AT SITE (SM: 2550 B)	30	-	-
ELECTRICAL CONDUCTIVITY °	µmhos/cm	ELECTRICAL CONDUCTIVITY METHOD AT SITE (SM: 2510 B)	835 (30°C)	-	0.1
SALINITY °	ppt	ELECTRICAL CONDUCTIVITY METHOD AT SITE (SM: 2520 B)	0.4	-	0.1
TOTAL SUSPENDED SOLIDS °	mg/L	TOTAL SUSPENDED SOLIDS DRIED AT 103-105 °C (SM: 2540 D)	ND	-	5.0
TOTAL DISSOLVED SOLIDS °	mg/L	TOTAL DISSOLVED SOLIDS DRIED AT 180 °C (SM: 2540 C)	636	-	25
FAT, OIL AND GREASE °	mg/L	LIQUID-LIQUID, PARTITION-GRAVIMETRIC METHOD (SM: 5520 B)	ND	-	3
TOTAL PETROLEUM HYDROCARBONS °	mg/L	SOXHLET EXTRACTION METHOD (SM: 5520 D AND 5520 F)	ND	-	3
METALS					
BARIUM °	mg/L Ba	NITRIC ACID-HYDROCHLORIC ACID DIGESTION AND INDUCTIVELY COUPLED PLASMA (ICP) METHOD (SM: 3030 F AND 3120 B)	0.053	-	0.003
ARSENIC °	mg/L As	HYDRIDE GENERATION AAS METHOD (SM: 3114 C)	ND	≤ 0.01	0.0003
CADMIUM °	mg/L Cd	IN-HOUSE METHOD: UAE.TP.GW.01 (NITRIC ACID DIGESTION AND DIRECT AIR ACETYLENE FLAME METHOD); SM: 3030 E AND 3111 B	ND	≤ 0.003	0.002
COPPER °	mg/L Cu	IN-HOUSE METHOD: UAE.TP.GW.01 (NITRIC ACID DIGESTION AND DIRECT AIR ACETYLENE FLAME METHOD); SM: 3030 E AND 3111 B	ND	≤ 1.0	0.002
IRON °	mg/L Fe	IN-HOUSE METHOD: UAE.TP.GW.01 (NITRIC ACID DIGESTION AND DIRECT AIR ACETYLENE FLAME METHOD); SM: 3030 E AND 3111 B	0.102	-	0.005
LEAD °	mg/L Pb	IN-HOUSE METHOD: UAE.TP.GW.01 (NITRIC ACID DIGESTION AND DIRECT AIR ACETYLENE FLAME METHOD); SM: 3030 E AND 3111 B	ND	≤ 0.01	0.003



PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT	REGULATORY STANDARD	DETECTION LIMIT
			L33-8-GW8 T22AD335-0001		
MANGANESE ^c	mg/L Mn	IN-HOUSE METHOD: UAE.TP.GW.01 (NITRIC ACID DIGESTION AND DIRECT AIR ACETYLENE FLAME METHOD); SM: 3030 E AND 3111 B	ND	≤ 0.5	0.002
MERCURY ^b	mg/L Hg	IN-HOUSE METHOD: UAE.TP.HEM.002 (COLD VAPOUR ATOMIC ABSORPTION SPECTROMETRIC METHOD); SM: 3112 B	ND	≤ 0.001	0.0001
NICKEL ^c	mg/L Ni	IN-HOUSE METHOD: UAE.TP.GW.01 (NITRIC ACID DIGESTION AND DIRECT AIR ACETYLENE FLAME METHOD); SM: 3030 E AND 3111 B	ND	≤ 0.02	0.005
SELENIUM ^c	mg/L Se	HYDRIDE GENERATION AAS METHOD (SM: 3114 C)	ND	≤ 0.01	0.0005
TOTAL CHROMIUM ^c	mg/L Cr	IN-HOUSE METHOD: UAE.TP.GW.01 (NITRIC ACID DIGESTION AND DIRECT AIR ACETYLENE FLAME METHOD); SM: 3030 E AND 3111 B	ND	-	0.005
ZINC ^c	mg/L Zn	IN-HOUSE METHOD: UAE.TP.GW.01 (NITRIC ACID DIGESTION AND DIRECT AIR ACETYLENE FLAME METHOD); SM: 3030 E AND 3111 B	0.115	≤ 5.0	0.003
VOLATILE ORGANIC COMPOUNDS					
BENZENE ^c	µg/L	PURGE AND TRAP GAS CHROMATOGRAPHIC/MASS SPECTROMETRIC METHOD (SM: 6200 B)	< 0.20	≤ 5	0.20
ETHYLBENZENE ^c	µg/L	PURGE AND TRAP GAS CHROMATOGRAPHIC/MASS SPECTROMETRIC METHOD (SM: 6200 B)	< 0.20	≤ 700	0.20
TOLUENE ^c	µg/L	PURGE AND TRAP GAS CHROMATOGRAPHIC/MASS SPECTROMETRIC METHOD (SM: 6200 B)	< 0.20	≤ 1,000	0.20
TOTAL XYLENES ^c	µg/L	PURGE AND TRAP GAS CHROMATOGRAPHIC/MASS SPECTROMETRIC METHOD (SM: 6200 B)	< 0.60	≤ 10,000	0.60
SAMPLE CONDITION					
WATER'S COLOUR/TURBID SEDIMENT			COLOURLESS/CLEAR YELLOW		

^a : ISO/IEC 17025 ACCREDITED BY THAI INDUSTRIAL STANDARDS INSTITUTE (TISI)

^b : ISO/IEC 17025 ACCREDITED BY DEPARTMENT OF SCIENCE SERVICE (DSS)

^c : VERIFIED BY OWN LABORATORY QUALITY SYSTEM, BUT STILL NOT ACCREDITED

IN-HOUSE : BASED ON STANDARD METHODS FOR THE EXAMINATION OF WATER AND WASTEWATER, APHA, AWWA, WEF, 23rd EDITION, 2017.

SM : STANDARD METHODS FOR THE EXAMINATION OF WATER AND WASTEWATER, APHA, AWWA, WEF, 23rd EDITION, 2017.

REGULATORY STANDARD : GROUNDWATER QUALITY STANDARDS, NOTIFICATION OF THE NATIONAL ENVIRONMENT BOARD NO.20 (B.E. 2543)
ISSUED UNDER THE ENHANCEMENT AND CONSERVATION OF NATIONAL ENVIRONMENTAL QUALITY ACT B.E. 2535.

ND : NON-DETECTABLE.

Benjawan V.

(MISS BENJAWAN VIRIYOTHAJ)
LABORATORY SUPERVISOR

MARCH 17, 2022

ภาคผนวก ฎ
เอกสารสอบเทียบเครื่องมือ



List of Instruments Certification for Air & Noise Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
Ambient									
1	Orifice Transfer Standard Calibrator	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀)	Tisch Environmental, Inc.	TE-5025A 3393	Tisch Environmental, Inc.	27072020	27 Jul 20	26 Jul 22	-
2	U-Tube Manometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀)	Dwyer	1221-36-W/M -	Technology Promotion Association (Thailand-Japan)	22P801	12 Mar 22	11 Mar 23	-
3	Aneroid Barometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀)	Barigo, Germany	-	Technology Promotion Association (Thailand-Japan)	21P2499	21 Jul 21	20 Jul 22	-
4	Dial Thermo-Hygrometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀)	Barigo, Germany	-	Technology Promotion Association (Thailand-Japan)	22H771	5 Apr 22	4 Apr 23	-
5	Nitrogen Dioxide Analyzer	Nitrogen Dioxide	Thermo Scientific	42i 1191503038	UAE Consultant Co., Ltd.	04112021	4 Nov 21	3 Nov 22	-
6	Standard Gases (Mixture)	Nitrogen Dioxide	Airgas	EB0143262 2015PSIG	Airgas an Air Liquide company	E04NI99E15A01D3	21 Jun 21	21 Jun 24	-
7	Sulphur Dioxide Analyzer	Sulphur Dioxide	Thermo Scientific	43i 1182920014	UAE Consultant Co., Ltd.	09112021	22 Nov 21	21 Nov 22	-
8	Standard Gases (Mixture)	Sulphur Dioxide	Airgas	EB0143262 2015PSIG	Airgas an Air Liquide company	E04NI99E15A01D3	21 Jun 21	21 Jun 24	-
9	Carbon Monoxide Analyzer	Carbon Monoxide	Thermo	48i 1201778119	UAE Consultant Co., Ltd.	21122021	21 Dec 21	20 Dec 22	-
10	Standard Gases (Mixture)	Carbon Monoxide	Airgas	EB0143262 2015PSIG	Airgas an Air Liquide company	E04NI99E15A01D3	21 Jun 21	21 Jun 24	-
11	Total Hydrocarbons Analyzer	Total Hydrocarbons	HORIBA	APHA-370 GAL13KSE	UAE Consultant Co., Ltd.	12072021	12 Jul 21	11 Jul 22	-
12	Standard Gas	Total Hydrocarbons	Linde	D824432	Linde	09042013	4 Aug 20	4 Aug 28	-

List of Instruments Certification for Air & Noise Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
Ambient									
13	Wind Speed/Wind Direction	WS/WD	LSI LASTEM	E-LOG305 19040308	Thai Meteorological Department	385/21	16 Aug 21	15 Aug 22	-

List of Instruments Certification for Water Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
Water									
1	pH Meter	pH	YSI	pH100A JC03354	Technology Promotion Association (Thailand-Japan)	22CH60	13 Jan 22	12 Jan 23	-
2	Conductivity Meter	Conductivity	YSI	Pro30 18C105225	Technology Promotion Association (Thailand-Japan)	21CH1470	21 Oct 21	20 Oct 22	-

Certificate of Calibration

Calibration Certification Information				
Cal. Date:	July 27, 2020	Rootmeter S/N:	438320	Ta: 298 °K
Operator:	Jim Tisch	Pa:	749.3	mm Hg
Calibration Model #:	TE-5025A	Calibrator S/N:	3393	

Run	Vol. Init (m3)	Vol. Final (m3)	ΔVol. (m3)	ΔTime (min)	ΔP (mm Hg)	ΔH (in H2O)
1	1	2	1	1.3980	3.2	2.00
2	3	4	1	0.9960	6.3	4.00
3	5	6	1	0.8860	7.8	5.00
4	7	8	1	0.8430	8.7	5.50
5	9	10	1	0.7000	12.7	8.00

Data Tabulation					
Vstd (m3)	Qstd (x-axis)	$\sqrt{\Delta H \left(\frac{Pa}{Pstd} \right) \left(\frac{Tstd}{Ta} \right)}$ (y-axis)	Va	Qa (x-axis)	$\sqrt{\Delta H \left(\frac{Ta}{Pa} \right)}$ (y-axis)
0.9817	0.7022	1.4042	0.9957	0.7123	0.8919
0.9776	0.9816	1.9859	0.9916	0.9956	1.2613
0.9757	1.1012	2.2203	0.9896	1.1169	1.4101
0.9745	1.1560	2.3286	0.9884	1.1725	1.4790
0.9692	1.3846	2.8084	0.9831	1.4044	1.7837
m=		2.05151	m=		1.28462
b=		-0.03558	b=		-0.02260
r=		0.99994	r=		0.99994

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

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

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

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

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

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG, BANGKOK 10250
TEL. 0-2717-3000-24 FAX. 0-2719-9484

Certificate of Calibration

Certificate No.: 22P801
Page: 1 of 2

Equipment: U Tube Manometer
Manufacturer: Dwyer
Model: 1221-36-W/M
Serial No.: -
ID No.: UAE.EFM.178/2561

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Condition As-Received: Used Item
Received Date: 03 March 2022
Calibration Date: 12 March 2022

Reference: 2203-0131WSC
Ambient Temperature: (23 ± 2) °C
Relative Humidity: (50 ± 15) %
Atmospheric Pressure: 1010 mbar

Submitted by: United Analyst and Engineering Consultant Co.,Ltd.

81 Soi Udomsuk 41, Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260

Procedure used: The calibration was conducted by direct comparison method against Pressure Measuring Instruments Standard according to in-house calibration procedure CP-P04, using * DKD-R 6-1; Calibration of Pressure Gauges, Edition 03/2014 * as a guidelines.

Condition of this result of calibration

1. Reference standards instruments:

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Pressure Calibrator	PC106P	1189	MP-0110-21	09 Aug 2022
2. This result of calibration was made on requested at the point specified by customer.				
3. Scale and conversion factor is 1 kPa = 4.0146293 inH2O				
4. This instrument was used clean air as pressure media.				
5. This instrument was calibrated by applied pressure to high-port (+) side and low-port (-) side open to atmospheric pressure.				
6. This instrument was installed in vertical orientation and top of the pressure port was used as the reference level.				
7. The certificate is valid only to the item calibrated on date and place of calibration.				
8. This Certification is traceable to the International System of Unit maintained at:-				
-National Institute of Metrology Thailand (NIMT)				

Calibrated by: Suwit Aussarree
Issue Date: 14 March 2022

Approved Signatory: Attapol P.
[] Phalinee Prabpaipal
[] Sura Suwannasri
[x] Attapol Panurach

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Cert.No.: 22P801
Page: 2 of 2

Result of calibration:- Without adjustment
Function:- Pressure Measurement
Increasing Pressure

Range: 0 inH2O to 36 inH2O
Scale Interval: 0.1 inH2O (The Fifth Estimate)

UUC Indication				
Applied Pressure (inH2O)	High-port side (inH2O)	Low-port side (inH2O)	ΔP (inH2O)	Error (inH2O)
0.00	0.00	0.00	0.00	0.00
2.00	0.98	-0.94	1.92	-0.08
4.00	2.00	-1.98	3.98	-0.02
6.00	3.00	-2.98	5.98	-0.02
8.00	4.00	-3.98	7.98	-0.02
10.00	5.00	-4.98	9.98	-0.02
12.00	6.02	-5.96	11.98	-0.02
14.00	7.02	-6.96	13.98	-0.02
16.00	8.04	-7.98	16.02	0.02
18.00	9.04	-8.98	18.02	0.02
20.00	10.04	-9.98	20.02	0.02
22.00	11.06	-10.98	22.04	0.04
24.00	12.06	-12.00	24.06	0.06
26.00	13.06	-13.00	26.06	0.06
28.00	14.08	-14.02	28.10	0.10
30.00	15.08	-15.02	30.10	0.10
32.00	16.08	-16.04	32.12	0.12
34.00	17.10	-17.04	34.14	0.14
35.80	17.90	-17.86	35.76	-0.04

The uncertainty of measurement was ± 0.11 inH2O

* UUC = Unit Under Calibration

* ΔP = High-port side - Low-port side

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 %.

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
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534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG, BANGKOK 10250
TEL. 0-2717-3000-24 FAX. 0-2719-9484



Certificate of Calibration

Certificate No.: 21P2499
Page: 1 of 2

Equipment: Aneroid Barometer
Manufacturer: Barigo
Model: -
Serial No.: -
ID No.: UAE.ANV.122/2550

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.

Condition As-Received: Used Item
Received Date: 20 July 2021
Calibration Date: 21 July 2021

Reference: 2107-0570WSC
Ambient Temperature: (23 ± 2) °C
Relative Humidity: (50 ± 15) %
Atmospheric Pressure: 1009 mbar

Submitted by: United Analyst and Engineering Consultant Co.,Ltd.

81 Soi Udomsuk 41, Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260

Procedure used: The calibration was conducted by direct comparison method against Pressure Measuring Instruments Standard according to in-house calibration procedure CP-P10, using * DKD-R 6-1; Calibration of Pressure Gauges, Edition 03/2014 * as a guidelines.

Condition of this result of calibration

1. Reference standards instruments:

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Standard Barometer	DP1142	1422505046	MP-0053-21	08 Apr 2022
2. This instrument was installed in vertical orientation and center of the dial was used as the reference level.				
3. This result of calibration was made on requested at the point specified by customer.				
4. This instrument was used clean air as pressure media.				
5. The certificate is valid only to the item calibrated on date and place of calibration.				
6. This Certification is traceable to the International System of Unit maintained at:-				
-National Institute of Metrology Thailand (NIMT)				

Calibrated by: Suwit Aussarree
Issue Date: 22 July 2021

Approved Signatory: Attapol P.
[] Phalinee Prabpaipal
[] Sura Suwannasri
[x] Attapol Panurach

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Cert.No.: 21P2499
Page: 2 of 2

Result of calibration:- Without adjustment

Range: 960 hPa to 1030 hPa

Function:- Absolute Pressure Measurement

Scale Interval: 1 hPa (The Fifth Estimate)

Increasing Pressure

Applied Pressure (hPa)	957.66	969.27	980.15	990.48	1000.69	1010.75	1020.58	1029.49
UUC* Indication (hPa)	960.0	970.0	980.0	990.0	1000.0	1010.0	1020.0	1030.0
Error (hPa)	2.34	0.73	-0.15	-0.48	-0.69	-0.75	-0.58	0.51

Decreasing Pressure

Applied Pressure (hPa)	1029.61	1020.69	1010.80	1000.75	990.59	980.30	969.41	957.79
UUC* Indication (hPa)	1030.0	1020.0	1010.0	1000.0	990.0	980.0	970.0	960.0
Error (hPa)	0.39	-0.69	-0.80	-0.75	-0.59	-0.30	0.59	2.21

The uncertainty of measurement was ± 0.30 hPa

* UUC = Unit Under Calibration

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 %.

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG, BANGKOK 10250
TEL. 0-2717-3000-24 FAX. 0-2719-9484



Certificate of Calibration

Certificate No.: 22H771
Page: 1 of 2

Equipment: Dial Thermo-Hygrometer

Manufacturer: Barigo

Model: -

Serial No.: -

ID No.: UAE.ANV.003/2548

Condition As-Received: Used Item

Received Date: 30 March 2022

Calibration Date: 01 April 2022

Reference: 2203-1124WSC

Ambient Temperature: (25 ± 3) °C

Relative Humidity: (50 ± 20) %

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.

Submitted by: United Analyst and Engineering Consultant Co., Ltd.

81 Soi Udomsuk 41, Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260

Procedure used: Calibration were conducted using in-house calibration procedure CP-H02 according to comparison with standard chilled mirror sensor for humidity measurement function and comparison with standard temperature probe for temperature measurement function into humidity / temperature chamber.

Condition of this result of calibration

1. Reference standards instruments:

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Standard Chilled Mirror Hygrometer Sensor	Dew Prime II	31863	19714	17 Sep 2022
2) Standard Humidity/Temperature Meter	400	10203027	TH-0063-21	01 Jul 2022

2. The 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 maintained at:-

- National Institute of Standards and Technology (NIST), The United States of America
- National Institute of Metrology Thailand (NIMT)

Calibrated by: Somchai Dumwro
Issue Date: 08 April 2022

Approved Signatory:

[✓] Chakrit Waewanjua
[] Pornthippa Tameyakul
[] Viporn Tantiyawutti

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Cert. No.: 22H771
Page.: 2 of 2

Result of Calibration:-

Without Adjustment

Function:

Humidity measurement.

Reference Temperature (°C)	Standard Humidity (%R.H.)	UUC* Reading (%R.H.)	Error (%R.H.)	Uncertainty of Measurement (±%R.H.)
25.0	40.1	42	1.9	1.6
25.0	60.0	61	1.0	1.8
25.0	80.0	78	-2.0	2.0

Result of Calibration:-

Without Adjustment

Function:

Temperature measurement.

Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of Measurement (±°C)
20.02	20.0	-0.02	0.72
29.98	30.0	0.02	0.72
35.02	35.0	-0.02	0.72
40.03	40.0	-0.03	0.72

UUC* : Unit Under Calibration

The reported uncertainty of measurement was based on standard uncertainty multiplied by coverage factor $k = 2.00$, providing confidence level approximately 95%.

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United Analyst and Engineering Consultant Co., Ltd.
3 Soi Udomsuk 41, Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260
Tel. 0 2763 2828 Fax 0 2763 2800 www.uaecconsultant.com E-mail: uae@uaecconsultant.com

MULTI-POINT GAS TEST REPORT

Test Date: Nov 4, 2021

Equipment: Gas Analyzer (NO₂) Model: 421
Manufacturer: Thermo Scientific Serial Number: 1191503038

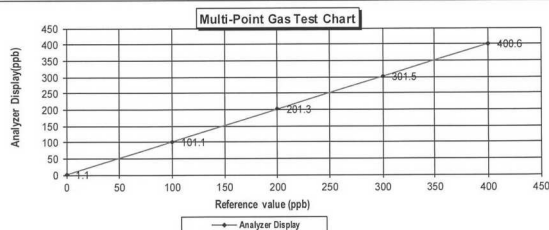
Standard Gas Concentration

Sulphur Dioxide (SO ₂)	44.75	PPM	Manufacturer:	Thermo Scientific
Nitric Oxide (NO)	45.35	PPM	Model:	1461
Methane (CH ₄)	-	PPM	Serial Number:	1180540071
Carbon Monoxide (CO)	1007			
Cylinder No.:	CC159599			
Expiration Date:	Jul 30, 2022			

Dilutor Detail

Multi-point gas test data

Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1 Zero	0.0	1.1	1.10	1.10
Level 2 20.00%	100.0	101.1	1.10	1.09
Level 3 40.00%	200.0	201.3	1.30	0.65
Level 4 60.00%	300.0	301.5	1.50	0.50
Level 5 80.00%	400.0	400.6	0.60	0.15
Remark: Measuring Range	500.0 ppb		Average Difference (%)	0.70
	Acceptable Limit $\pm 5\%$			



Calculate by
Somchai Y.
07/11/21

Approve by
[Signature]
07/11/21

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CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number: E04NI99E15A01D3 Reference Number: 122-402135167-1
Cylinder Number: EB0143262 Cylinder Volume: 144.4 CF
Laboratory: 124 - Durham (SAP) - NC Cylinder Pressure: 2015 PSIG
PGVP Number: B22021 Valve Outlet: 660
Gas Code: CO,NO,NOX,SO₂,BALN Certification Date: Jun 21, 2021

Expiration Date: Jun 21, 2024

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/331, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a mole/mole basis unless otherwise noted.
Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	45.00 PPM	45.96 PPM	G1	+/- 1.4% NIST Traceable	06/14/2021, 06/21/2021
NITRIC OXIDE	45.00 PPM	45.94 PPM	G1	+/- 1.4% NIST Traceable	06/14/2021, 06/21/2021
SULFUR DIOXIDE	45.00 PPM	44.88 PPM	G1	+/- 1.0% NIST Traceable	06/14/2021, 06/21/2021
CARBON MONOXIDE	1000 PPM	984.6 PPM	G1	+/- 0.7% NIST Traceable	06/14/2021
NITROGEN	Balance				

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	20061120	CC708068	49.82 PPM NITRIC OXIDE/NITROGEN	+/- 1.0%	Feb 02, 2025
PRM	12386	D685025	9.91 PPM NITROGEN DIOXIDE/AIR	+/- 2.0%	Feb 20, 2020
GMIS	401423838102	CC505581	4.348 PPM NITROGEN DIOXIDE/NITROGEN	+/- 2.1	Feb 18, 2023
NTRM	16011043	CC473277	49.02 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.8%	Jun 17, 2022
NTRM	14060119	CC434277	990.9 PPM CARBON MONOXIDE/NITROGEN	+/- 0.6%	Nov 15, 2025

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet 6700 AHR0801333 CO	FTIR	Jun 03, 2021
Nicolet 6700 AHR0801333 NO	FTIR	Jun 03, 2021
Nicolet 6700 AHR0801333 NO ₂	FTIR	Jun 03, 2021
Nicolet 6700 AHR0801333 SO ₂	FTIR	Jun 03, 2021

Triad Data Available Upon Request

NOTES: PO #5221002807
GROSS WT: 28.40kg
NET WT: 4.73kg



The analytical test results reported on this certificate relate only to the cylinder number specified above. This concludes the test report.

Approved for Release



MULTI-POINT GAS TEST REPORT

Test Date : Nov 22, 2021

Equipment : Gas Analyzer (SO₂) Model : 43i
Manufacturer : Thermo SCIENTIFIC Serial Number : 1182920014

Standard Gas Concentration

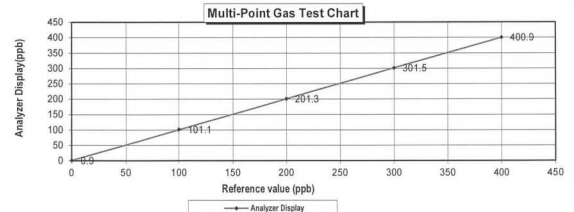
Sulphur Dioxide (SO₂) 44.75 PPM
Nitric Oxide (NO) 45.35 PPM
Methane (CH₄) - PPM
Carbon Monoxide (CO) 1007 PPM
Cylinder No. : CC159599
Expiration Date : Jul 30, 2022

Dilutor Detail

Manufacturer : Thermo SCIENTIFIC
Model : 146i
Serial Number : 1180540071

Multi-point gas test data

	Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.9	0.90	0.90
Level 2	20.00%	100.0	101.1	1.10	1.09
Level 3	40.00%	200.0	201.3	1.30	0.65
Level 4	60.00%	300.0	301.5	1.50	0.50
Level 5	80.00%	400.0	400.9	0.90	0.22
Remark : Measuring Range	500.0 ppb			Average Difference (%)	0.67
:Acceptable Limit \pm 5%					



Calculate by
Srichai y.
22.11.21

Approve by
Pichan u.
22. Nov 2021

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number: E04NI99E15A01D3 Reference Number: 122-402135167-1
Cylinder Number: EB0143262 Cylinder Volume: 144.4 CF
Laboratory: 124 - Durham (SAP) - NC Cylinder Pressure: 2015 PSIG
PGVP Number: B22021 Valve Outlet: 660
Gas Code: CO,NO,NOX,SO₂,BALN Certification Date: Jun 21, 2021

Expiration Date: Jun 21, 2024

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/331, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a mole/mole basis unless otherwise noted.
Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	45.00 PPM	45.96 PPM	G1	+/- 1.4% NIST Traceable	06/14/2021, 06/21/2021
NITRIC OXIDE	45.00 PPM	45.94 PPM	G1	+/- 1.4% NIST Traceable	06/14/2021, 06/21/2021
SULFUR DIOXIDE	45.00 PPM	44.88 PPM	G1	+/- 1.0% NIST Traceable	06/14/2021, 06/21/2021
CARBON MONOXIDE	1000 PPM	984.6 PPM	G1	+/- 0.7% NIST Traceable	06/14/2021
NITROGEN	Balance				

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	20061120	CC708068	49.82 PPM NITRIC OXIDE/NITROGEN	+/- 1.0%	Feb 02, 2025
PRM	12386	D685025	9.91 PPM NITROGEN DIOXIDE/AIR	+/- 2.0%	Feb 20, 2020
GMIS	401423838102	CC505581	4.348 PPM NITROGEN DIOXIDE/NITROGEN	+/- 2.1	Feb 18, 2023
NTRM	16011043	CC473277	49.02 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.8%	Jun 17, 2022
NTRM	14060119	CC434277	990.9 PPM CARBON MONOXIDE/NITROGEN	+/- 0.6%	Nov 15, 2025

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet 6700 AHR0801333 CO	FTIR	Jun 03, 2021
Nicolet 6700 AHR0801333 NO	FTIR	Jun 03, 2021
Nicolet 6700 AHR0801333 NO ₂	FTIR	Jun 03, 2021
Nicolet 6700 AHR0801333 SO ₂	FTIR	Jun 03, 2021

Triad Data Available Upon Request

NOTES: PO #5221002807
GROSS WT: 28.40kg
NET WT: 4.73kg



The analytical test results reported on this certificate relate only to the cylinder number specified above. This concludes the test report.

Approved for Release



MULTI-POINT GAS TEST REPORT

Test Date : Dec 21, 2021

Equipment : Gas Analyzer (CO) Model : 48i
Manufacturer : Thermo Scientific Serial Number : 1201778119

Standard Gas Concentration

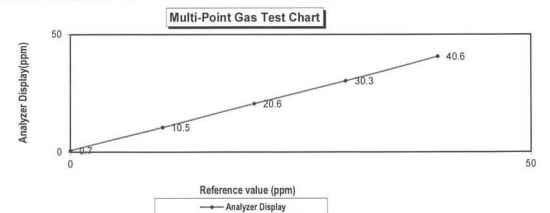
Sulphur Dioxide (SO₂) 44.75 PPM
Nitric Oxide (NO) 45.35 PPM
Methane (CH₄) - PPM
Carbon Monoxide (CO) 1007 PPM
Cylinder No. : CC159599
Expiration Date : Jul 30, 2022

Dilutor Detail

Manufacturer : Thermo Scientific
Model : 146i
Serial Number : 1180540071

Multi-point gas test data

	Reference Value (ppm)	Analyzer Display (ppm)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.7	0.7	0.7
Level 2	20.00%	10.0	10.5	0.5	4.8
Level 3	40.00%	20.0	20.6	0.6	2.9
Level 4	60.00%	30.0	30.3	0.3	1.0
Level 5	80.00%	40.0	40.6	0.6	1.5
Remark : Measuring Range	50.0 ppm			Average Difference (%)	2.17
:Acceptable Limit \pm 5%					



Calculate by
Srichai y.
21.12.21

Approve by
Pichan u.
21. Dec 2021

CERTIFICATE OF ANALYSIS
Grade of Product: EPA Protocol

Part Number: E04NI99E15A01D3
Cylinder Number: EB0143262
Laboratory: 124 - Durham (SAP) - NC
PGVP Number: B22021
Gas Code: CO,NO,NOX,SO2,BALN

Reference Number: 122-402135167-1
Cylinder Volume: 144.4 CF
Cylinder Pressure: 2015 PSIG
Valve Outlet: 660
Certification Date: Jun 21, 2021

Expiration Date: Jun 21, 2024

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a mole/mole basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS					
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	45.00 PPM	45.96 PPM	G1	+/- 1.4% NIST Traceable	08/14/2021, 08/21/2021
NITRIC OXIDE	45.00 PPM	45.94 PPM	G1	+/- 1.4% NIST Traceable	08/14/2021, 08/21/2021
SULFUR DIOXIDE	45.00 PPM	44.88 PPM	G1	+/- 1.0% NIST Traceable	08/14/2021, 08/21/2021
CARBON MONOXIDE	1000 PPM	984.8 PPM	G1	+/- 0.7% NIST Traceable	08/14/2021
NITROGEN	Balance				

CALIBRATION STANDARDS				
Type	Lot ID	Cylinder No	Concentration	Uncertainty
NTRM	20081120	CC708068	49.82 PPM NITRIC OXIDE/NITROGEN	+/- 1.0%
PRM	12386	CC850525	9.91 PPM NITROGEN DIOXIDE/AIR	+/- 2.0%
GMIS	401423838102	CC505581	4.348 PPM NITROGEN DIOXIDE/NITROGEN	+/- 2.1
NTRM	16011043	CC473277	49.02 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.8%
NTRM	14080119	CC434277	990.9 PPM CARBON MONOXIDE/NITROGEN	+/-0.6%

The SRM, PRM or RGM noted above is only in reference to the GMIS used in the assay and not part of the analysis.

ANALYTICAL EQUIPMENT		
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet 6700 AHR0801333 CO	FTIR	Jun 03, 2021
Nicolet 6700 AHR0801333 NO	FTIR	Jun 03, 2021
Nicolet 6700 AHR0801333 NO2	FTIR	Jun 03, 2021
Nicolet 6700 AHR0801333 SO2	FTIR	Jun 03, 2021

Triad Data Available Upon Request

NOTES: PO #5221002807
GROSS WT: 28.40kg
NET WT: 4.73kg

The analytical test results reported on this certificate relate only to the cylinder number specified above. This concludes the test report.

Approved for Release



MULTI-POINT GAS TEST REPORT

Test Date : July 12, 2021

Equipment : Hydrocarbon Analyzer
Manufacturer : HORIBAModel : APHA-370
Serial Number : GAL13KSE

Standard Gas Concentration

Sulphur Dioxide (SO₂) - PPM
Nitric Oxide (NO) - PPM
Methane (CH₄) 39.8 PPM
Carbon Monoxide (CO) - PPM
Cylinder No. : D824432
Expiration Date : Aug 4, 2028

Dilutor Detail

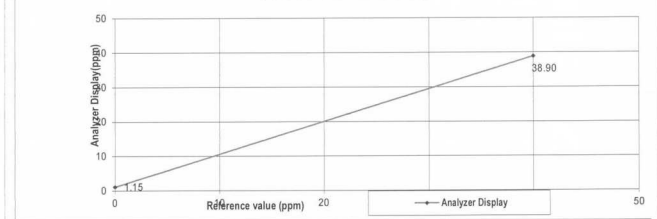
Manufacturer :
Model :
Serial Number :

Multi-point gas test data

	Reference Value (ppm)	Analyzer Display (ppm)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.00	1.15	1.15	1.15
Level 2	80.00%	40.00	38.90	-1.10	-2.83
Remark : Measuring Range	50.00 ppm			Average Difference (%)	1.99

: Acceptable Limit $\pm 5\%$

Multi-Point Gas Test Chart

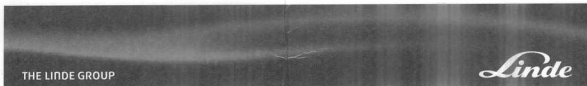


Calculate by
Sukanya Parinyasontorn
12 July 2021

Approve by
Sukanya Parinyasontorn
12 July 2021

Page 1 of 1

เอกสารไม่ควบคุม

Certificate of Analysis
Special Gases Mixture

Customer Details					
Name:		Address:		Customer Tag No.:	
United Analyst & Engineering Co., Ltd.		3 Soi Udomsuk 41, Sukhumvit Rd., Bang Chak, Khet Phra Khanong, Bangkok 10260			
Certificate Details					
Number:	3384/20	Date of Issue:	4-Aug-2020	Expiry date:	4-Aug-2028
Material Details					
Production Order:	90161442	Material Code:	400400-AL-34	Cylinder No.:	D824432
Gas content:	6.60 M ¹	Filling pressure:	137.0 bar	Valve:	CGA 590 BRASS
Cylinder Owner:	LINDE	Cylinder Material:	Aluminum	Cylinder Size:	50L

Laboratory Report				
Analytical Result				
Component	Normal Concentration	Analysis Result ¹	Uncertainty ²	Method of Analysis ³
Methane in Air	40.0 ppm	39.8 ppm	$\pm 1\%$ relative	(6) HPB-352
		Analysis Date	4-Aug-2020	

Reference Standard used in Assay			
Reference Standard	Cylinder number	Concentration	Expiry date:
Methane in Nitrogen	25599956	49.29 \pm 0.39 ppm	4-Oct-2020

Analytical Instruments used in Assay		
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
FTIR Spectrometers Nicolet 550	FTIR-CH4	4-Aug-2020

Recommend usage condition
Minimum utilization: 5% of actual content or before expiry date whichever comes first.
Storage condition: Keep in well ventilation and secure area.

Comments
When reordering, please quote the material number

Note:

- All results expressed in this report are on mole/mole basis, unless otherwise specified. The Assay of this Standard has been performed in accordance with the EPA Traceability Protocol (EPA-600/R-12/531) for the Assay and Certification of Gaseous Calibration Standards using procedure G1.
- The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a level of confidence of approximately 95%. The measurement of this material is traceable to the SI through the reference gas standard which is traceable to the Swiss National Standard of Mass or other recognized national metrology institutes.
- (1) Gas Chromatography, (2) Paramagnetic Oxygen Analyzer, (3) Electrochemical Oxygen Analyzer, (4) Electrochemical Moisture Analyzer, (5) Total Hydrocarbon Analyzer, (6) Other - Specified

Sukanya Parinyasontorn
Signatory for and on behalf of Linde (Thailand) Co., Ltd.

Page 1 of 1

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PB-002/7006

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THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804, 0-2399-0469

Calibration Certificate

Issued by : Calibration & Test Section : Meteorological Instruments Bureau

Date of Issue : 16 August, 2021

Certification No. : 385/21

Page : 1 of 7

Object : เครื่องมือตรวจวัดอุตุนิยมวิทยา

Manufacturer : LSI

Type : Dato Logger E-LOG 305 wind speed and wind direction DNA 827

Thermoislogometers DMA875 Barometer DQA 801

Mfg Code : Dato Logger 19040308 wind speed and wind direction 19020211

Thermoislogometers 19010187 Barometer 19040219

Customer : United Analyst and Engineering Consultant Co., Ltd.

81 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Prakanong, Bangkok 10260.

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1011.2 hPa

NATIONAL STANDARD WIND TUNNEL : Thermal Anemometer 642 S/N 91563

: HOOK GAGE NO 1425

: Wind Aloft Plotting Board

N.I.S.T. Test Reference Number 731/241460

: Ultrasonic Anemometer

Model DA-650-3TV (sensor TR-90AH)

Serial Number 110730029 (sensor 120629586)

JAPAN QUALITY ASSURANCE ORGANIZATION

STANDARD THERMOMETER

: Theodor Friedrich : Dry No.8390/94 Wet No. 8389/94

: testo, testo 645 Serial No. 02848057

: ThermoSchneider No.918802

STANDARD BAROMETER

: Digital Barometer Vaisala Type PTB330 No. 1220015

: Digital Barometer Vaisala Type PTB330 No. 1220001

Calibrated by : Watcharapol Subwat

Signed : Mr. Pisod Promsut

(Authorised Signatory)

Mechanical Engineer

เอกสารไม่ควบคุม



THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804, 0-2399-0469

The Result of Calibration

Wind Speed And Wind Direction

Certification No. 385/21

16 August, 2021 Model DNA821 S/N 19020211

Page : 2 of 7

Standard Ultrasonic Anemometer	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure m/sec	Vacuum inches	Pressure inches	Velocity m/sec	Correction m/sec
1.00	-	-	-	1.0	0.00
3.02	-	-	-	2.7	0.32
5.00	-	-	-	5.0	0.00
7.04	-	-	-	6.7	0.34
9.02	-	-	-	9.0	0.02
11.02	-	-	-	10.7	0.32
13.01	-	-	-	13.0	0.01
15.01	-	-	-	14.7	0.31
17.02	-	-	-	17.0	0.02
20.02	-	-	-	19.7	0.32

Wind Aloft Plotting Board.	
US. DEPARTMENT OF COMMERCE WEATHER BUREAU	
WIND DIRECTION	TESTED WIND DIRECTION
0	0
90	90
180	180
270	270

Calibrated by :
Mr. Watcharapol Subwat
Mechanical Engineer

Calibration & Test Section
Meteorological Instruments Bureau

เอกสารไม่ควบคุม



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-3000-27 FAX. 0-2719-9484



Cert.No.: 22CH60
Page.: 1 of 3

Certificate of Calibration

Equipment : pH Meter
Manufacturer : EcoSense
Model : pH100A
Serial No. : JC03354
ID No. : UAE.EFM.063/2562(ENV.pH 03/62)
Condition As-Received: Used Item
Received Date : 12 January 2022
Calibration Date : 13 January 2022
Reference : 2201-0350WSC-1
Submitted by : United Analyst and Engineering Consultant Co., Ltd.
3 Soi Udomsuk 41, Sukhumvit Road, Bangchak,
Phrakhanong, Bangkok 10260
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 Lernagatrakul

Approved by :
Approved Signatory

(/ Malee Butkruea
() Saitthip Meangmai
() Warakorn Lernagatrakul

Issue Date : 17 January 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.

เอกสารไม่ควบคุม



Cert.No.: 22CH60
Page.: 2 of 3

Condition of this calibration result

- 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 21H1201 26 Oct 2022
This certification is traceable to the International System of Unit maintained at:-
- Traceable to National Institute of Metrology (Thailand), NIMT

- 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	766820	23 Sep 2023
pH 6.982	CPA chem	761017	02 Aug 2022
pH 10.015	CPA chem	766824	04 Sep 2022

- 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 S/N.: JC03354	4.00	177.48	177	4.01	0.58	2.00
	7.00	0.00	0	7.00	0.58	2.00
	7.00	0.00	0	7.00	0.58	2.00
	10.00	-177.48	-178	10.01	0.58	2.00



Cert.No.: 22CH60
Page.: 3 of 3

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.: 200729SIA605377	4.008	4.01	144	0.0079	2.00
	6.982	6.98	-28	0.011	2.00
	6.982	6.98	-27	0.0099	2.00
	10.015	10.01	-200	0.0096	2.00

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model :
- Serial No. : 200729SIA605377
Dimension of probe;
- Length : 112 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	25.003	25.1	0.097	0.13	2.00
30.0	30.002	30.1	0.098	0.13	2.00
35.0	35.004	35.0	-0.004	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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เอกสารไม่ควบคุม

เอกสารไม่ควบคุม



Certificate of Calibration

Equipment : Conductivity Meter
Manufacturer : YSI
Model : Pro 30
Serial No. : 18C105225
ID No. : UAE.EFM.206/2561(ENV.SCT.04/61)
Condition As-Received: Used Item
Received Date : 19 October 2021
Calibration Date : 21 October 2021
Reference : 2110-0604WSC-4
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong, Bangkok 10260
Ambient Temperature : (25 ± 2.5) °C
Relative Humidity : (50 ± 15) %
Calibration Procedure: In-house method :
- CP-CH6 by direct measurement
with certified reference material (CRM)
- CP-CH8 by comparison with standard thermometer

Calibrated by : Warakorn Lernagatrakul

Approved by :
Approved Signatory

(/) Malee Butkruea
() Salthip Meangmai
() Warakorn Lernagatrakul

Issue Date : 29 October 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.

เอกสารไม่ควบคุม
A 0033914



Condition of this result of calibration

1. Reference Standard Instrument :-

Instrument	Serial No.	ID No.	Certificate No.	Due date
1) Thermometer	1963878	130RC095	211977	17 Sep 2022
2) Ref. Std. Thermometer	3240076	60RC033	211193	14 Feb 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
1413.0 µS/cm	CPA Chem	761021	02 Aug 2022
12.8806 mS/cm	CPA Chem	754037	28 June 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.: 18C100559

Standard Conductivity Solution	Before Adjustment UUC* Reading	After Adjustment UUC* Reading	Uncertainty of Measurement (±)	Coverage factor k
1413.0 µS/cm	1390 µS/cm	1413 µS/cm	9.1 µS/cm	2.00
12.8806 mS/cm	12.73 mS/cm	12.85 mS/cm	0.082 mS/cm	2.00

Remark - UUC* = Unit Under Calibration

เอกสารไม่ควบคุม
a 1079152



Calibration Results

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model : PRO 30 COND-T
- Serial No. 18C100559

Dimension of probe;

- Length : 8 mm.
- Diameter : 2.5 mm.
- Immersion Depth : 80 mm.

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of Measurement (± °C)	Coverage factor k
25.0	25.005	25.0	-0.005	0.20	2.00
30.0	30.004	30.0	-0.004	0.20	2.00
35.0	35.004	35.0	-0.004	0.20	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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เอกสารไม่ควบคุม
a 1079151